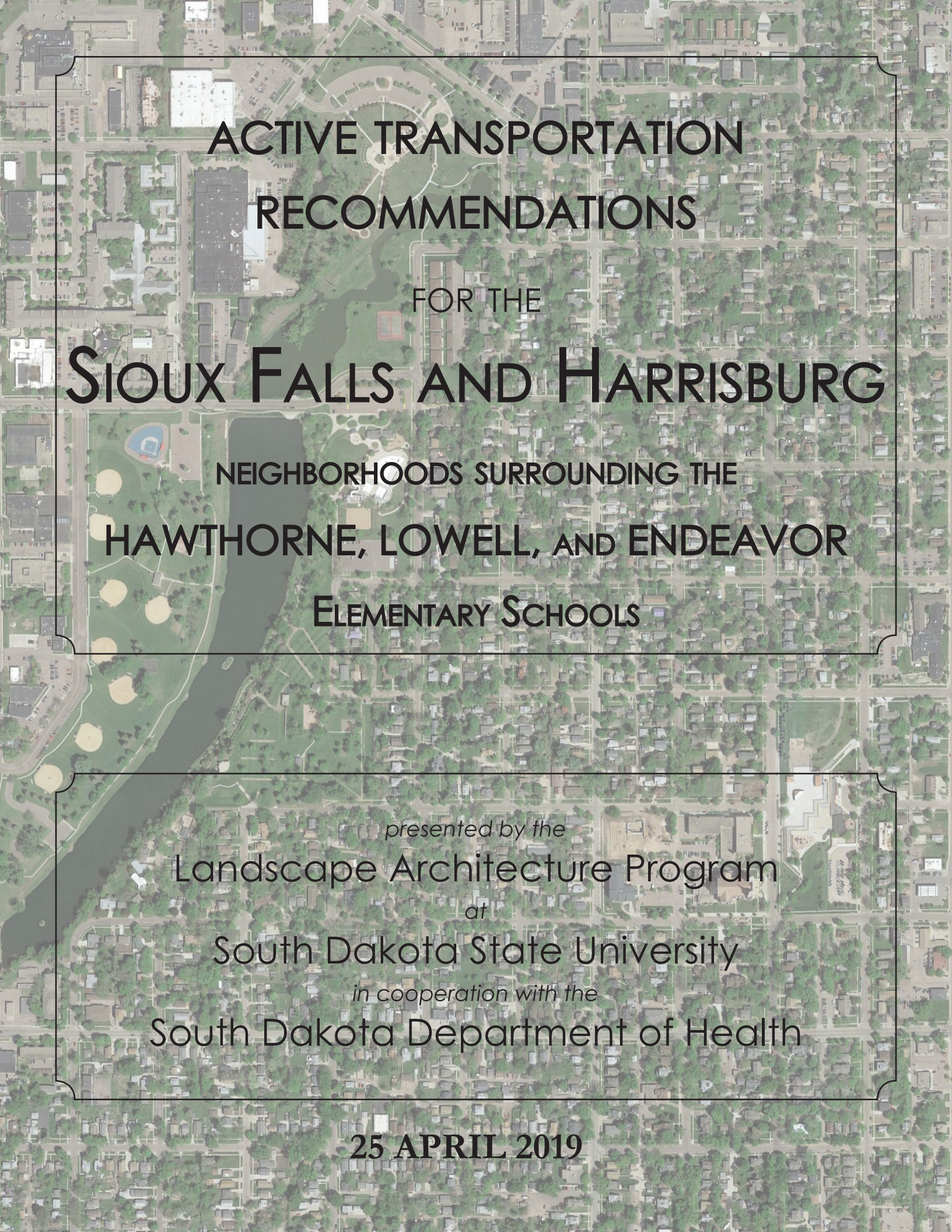

ACTIVE TRANSPORTATION RECOMMENDATIONS

FOR THE

SIOUX FALLS AND HARRISBURG

NEIGHBORHOODS SURROUNDING THE HAWTHORNE, LOWELL, AND ENDEAVOR ELEMENTARY SCHOOLS

presented by the

Landscape Architecture Program

at

South Dakota State University

in cooperation with the

South Dakota Department of Health

25 APRIL 2019

Table of Contents

Acknowledgements

South Dakota Department of Health

Beth Davis
South Dakota Active Transportation Advisory Team

Community Leaders

David Heinold, Sioux Falls School Traffic Safety Advisory Committee
Mary Michaels, Public Health Prevention Coordinator Sioux Falls Health Department

SDSU Landscape Architecture Program

Hailey Bruckner
Gabe Heller
Will Hetherington
Jacob Wolfe

Faculty Advisor

Don Burger

Teaching Assistant

Payton Schafers

Introduction

The built environment affects public and personal health. This fact has been proven and re-proven through studies, interviews, surveys, and mockups the world over. In addition to physical indicators of health such as measuring obesity, calorie intake, and steps walked in a day, there are less-tangible indicators of a community's health. These include perceived friendliness, sense of community, and livability. The built environment impacts all of these indicators.

In 2012, the South Dakota Department of Health initiated the Active Transportation Advisory Team (ATAT) to facilitate change in the built environment of South Dakota. In particular, an effort has been made to help communities encourage using alternative means of transportation (such as walking or cycling) for completing one's daily routine. An outgrowth of the ATAT is the Active Transportation Collaboration project. This project provides resources and expertise to one or two South Dakota communities each year in developing strategies to improve active transportation.

Recommendations are developed over the course of a 16-week semester by students from the South Dakota State University Landscape Architecture program. In the case of the present study, students traveled to the neighborhoods of Hawthorne, Lowell, and Endeavor in Sioux Falls and Harrisburg, South Dakota, in late January and early February, 2019, to conduct interviews with key stakeholders within the community. Students also conducted an analysis of transportation infrastructure, parks and recreation facilities, and neighborhood composition.

After conducting these interviews and analyses, students developed a series of recommendations touching all aspects of active transportation issues, including the further development of active transportation infrastructure such as improvement of destinations, activating spaces, community engagement, enhancement of wayfinding, and user access infrastructure. By approaching active transportation in this holistic way, a balanced, comprehensive plan for improving public and personal health can be achieved.

These recommendations represent a global shift in how people think of their community. Some recommendations represent a major financial investment. However, by shifting community priorities and identifying existing resources within the community, the Hawthorne, Lowell, and Endeavor neighborhoods can become an example of the best neighborhoods Sioux Falls and Harrisburg have to offer and keep Sioux Falls as "One of the Happiest Cities in America."

Destinations

Destinations are places that people want to visit away from their homes. They include parks, shops, landmarks, plazas, memorials, and recreation areas. These areas provide people with experiences and opportunities to meet others and interact with their community.

Residents must be able to see potential destinations. People are drawn to parks, plazas and other urban spaces. Sioux Falls has developed multiple parks where people can congregate and enjoy outdoor activities (refer to Figure 2, 3, and 4).

Recommendation 1: Improve Existing Destinations

Falls Park and Terrace Park are cornerstones of Sioux Falls' public systems. These parks provide ample space for people to gather and provide visitors with amenities such as benches, restrooms, and trails. These two parks have significant features for people to enjoy.

Falls Park covers 123 acres and has several historical buildings including the mill and the dam. Falls Park is also the trailhead of the Sioux Falls bike trail, which provides 29 miles of pedestrian and bike paths [Visit Sioux Falls, 2019].

Terrace park offers residents access to picnic shelters, tennis courts, basketball courts as well as baseball fields. It also has a wedding location, formal garden, walking trail, and aquatic facility. The park also features a Japanese Garden that sits on the east side of Covell Lake.

Figure 1: Falls Park - Walking paths and The Mill.

Figure 2: Looking across Covell Lake at Terrace Park's Japanese Garden City

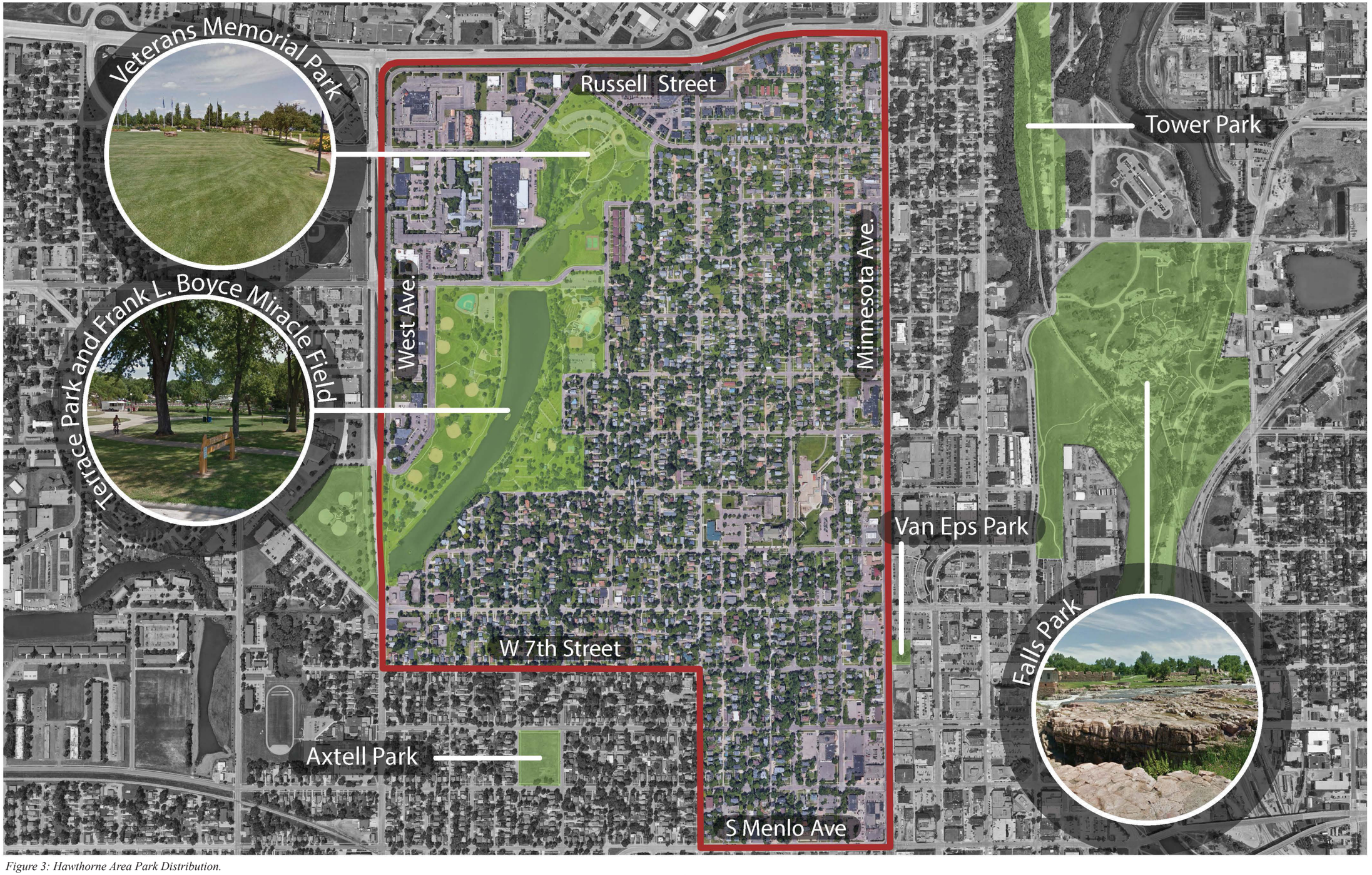

Figure 3: Hawthorne Area Park Distribution.

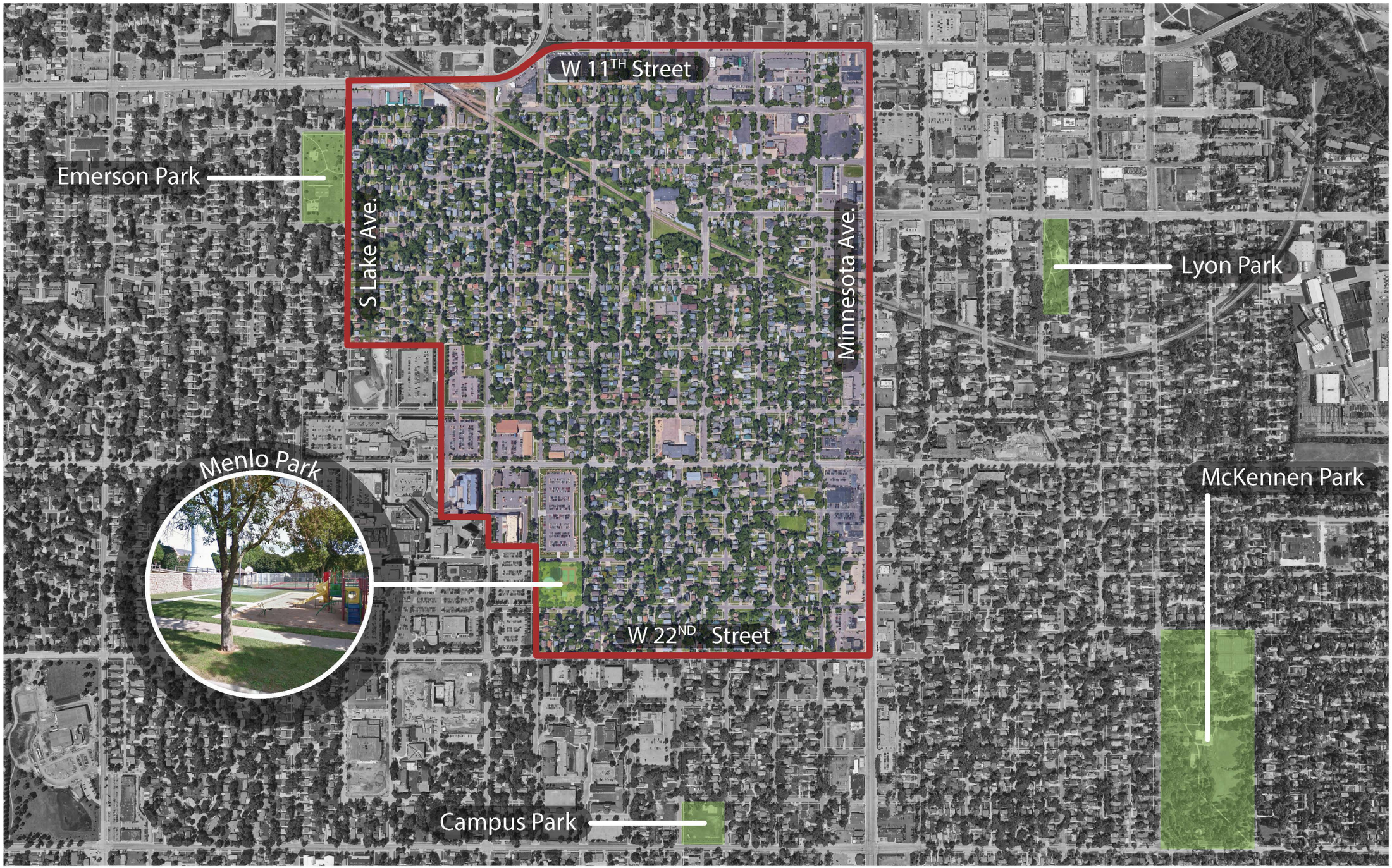

Figure 4: Lowell Area Park Distribution.

Figure 5: Endeavor Area Park Distribution.

These parks are well-built, but they fail to appear in people's mental activity space because they are currently under advertised and tucked out of the way. These parks are great resources for people, and they ought to be noticed and sought out by more residents of Sioux Falls. This can be achieved with more signage, directing peoples travel to these places, as well as more advertisement for the amenities these places provide. If people don't know what there is to do in these parks, they won't actively seek out their use. People need to understand what these parks have to offer.

Adding advertising and wayfinding amenities will attract more people to these parks. Advertising can be achieved in multiple forms. Signage should be increased along Minnesota, and Western Avenue, as well as other high traffic roads including Louise Avenue and 18th Street. Increased advertising along these high traffic roadways will direct people towards these park areas. Other forms of advertising could include screen ads, pamphlets and posters in public spaces and buildings.

Wayfinding aids in these parks will also help people find their way to different amenities within the parks. Signs located at entrances near parking lots and spread throughout the parks serve as wayfinding aids for people visiting. (Refer to wayfinding recommendation for implementation and examples of signage.)

Recommendation 2: Create Community Events in Smaller Parks

Sioux Falls has a plethora of activities for people to participate in. While Sioux Falls has many areas that are sufficient for public gatherings, they are currently underutilized.
Axtel Park, Emerson Park, Menlo Park, and Campus Park are near or within the study neighborhoods. These parks are underutilized leading to a perception that they are dangerous and unsafe places. Even though they are physically safe for people, a lack of activity makes them seem vacant and lonely [Jacobs, 1961].

Community events make public places more active thus reducing negative perception. Likewise, if people are coming together to participate in community events, they are more likely to know their neighbors and their fellow community members. This leads to greater safety and a sense of community ownership and pride.

Events like the Downtown Block Party on the East Bank that happen on the first Friday of the month, May through September, provide live music, food vendors, beer, and wine. Block parties provide a casual atmosphere that is family-friendly and fun for all ages. During the summer, Terrace Park also provides residents with the opportunity to go to concerts put on by the Sioux Falls Municipal Band (Visit Sioux Falls, 2019).

Figure 6: Downtown Block Party on East Bank, Downtown Sioux Falls.

Events like this should happen in the smaller satellite parks of Sioux Falls as well. These kinds of public events are what bring people together. It is recommended that initiative be taken to organize and provide smaller parks with public events that would allow people to be together on a neighborhood scale.

Figure 7: Terrace Park band shell, Sioux Falls Municipal Band

Recommendation 3: Create New Destinations

The Lowell and Hawthorne regions are primarily residential with neighborhood parks intermixed. Having a mix of land uses allows residents to experience more variation closer to their home. Spaces like the Sanford campus can be further expanded to incorporate commercial uses such as grocery stores, corner markets, and other establishments.

The following maps shows areas for proposed infill in a light shade of blue.

By putting destinations closer to residences, it increases the walkability of the area. With commercial options close to homes it decreases the distance people must travel to acquire essentials. Residents will be more inclined to walk or bike rather than drive if destinations are only a few blocks away. Creating destinations like these in a central location for the surrounding neighborhoods allows people to shop locally for quick items such as snack food, drinks, and other essentials, such as toothpaste and bathroom toiletries.

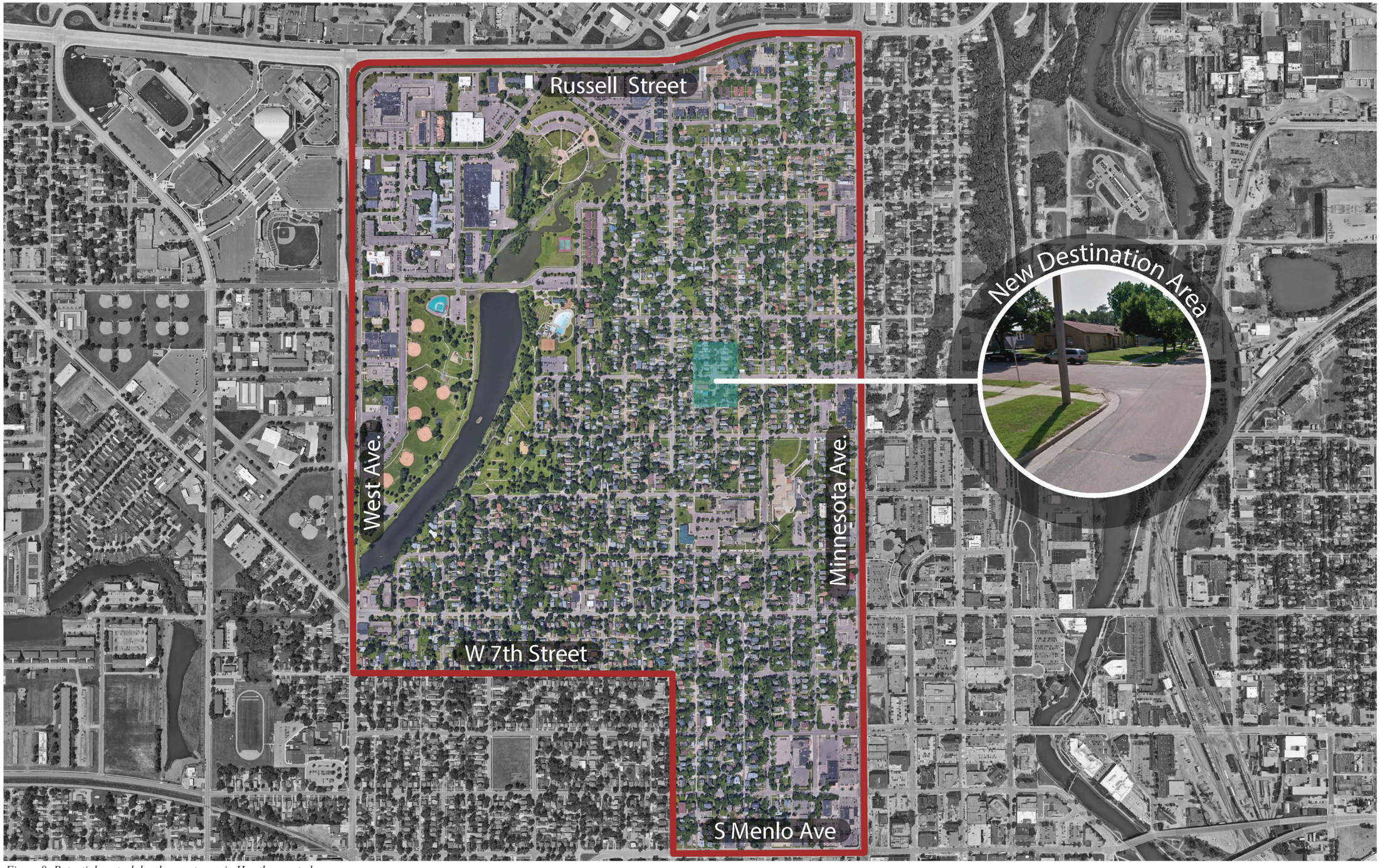

Figure 8: Potential central development area in Hawthorne study zone.

Figure 9: Potential area for new destination in Lowell study area.

Figure 10: Potential area for new destination development in the Endeavor study area.

Hawthorne could be developed centrally, near Summit Ave. and 2nd Street. While it is not undeveloped in that area, it would allow for a small convenience store such as a Handi-Mart or a Walmart neighborhood grocer to be built.

The Endeavor community could develop a centralized location along 85th Street in the undeveloped areas of their neighborhood. This would allow people to grab necessities on their way home from work or make a quick run to the store when they are in a pinch.

Figure 11: Neighborhood grocery store example: Walmart Neighborhood Market.

The Endeavor community also lacks park space. Compared to the other study areas which have significant park space in the study area or in close proximity to the borders, the Endeavor community has virtually none. Platinum Valley Park, located to the west of the neighborhood, is the only park in this region. Potential destinations and attractions include specific trails for biking and walking and running. A trail should spur off the existing Sioux Falls loop to provide active transportation connectivity to the Endeavor Community [see section on connectivity].

It is recommended that each of these study sections become more localized with amenities being closer to individual residences. Central spaces in all three neighborhoods should be developed to provide people with basic needs as well as entertainment and gathering areas.

Recommendation 4: Rezone and Promote Multi-Land Use

Land use zoning helps mitigate undesirable adjacencies but does little to promote active transportation and community. Places like corner stores and "mom and pop shops" provide the community with places to go that are within walking or biking distance. If there is nowhere to go people will not actively seek out spaces to congregate.

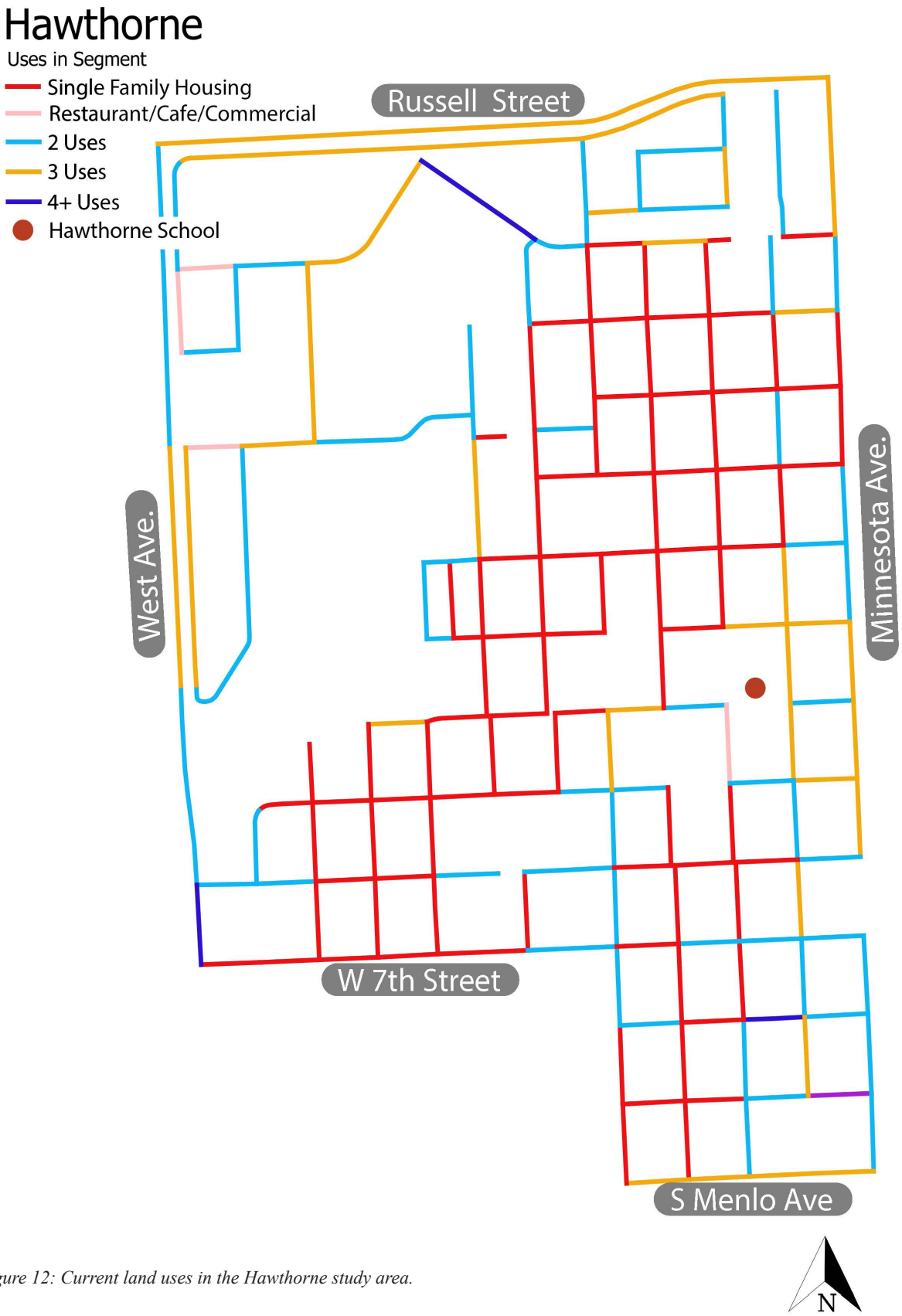

Figure 12: Current land uses in the Hawthorne study area.

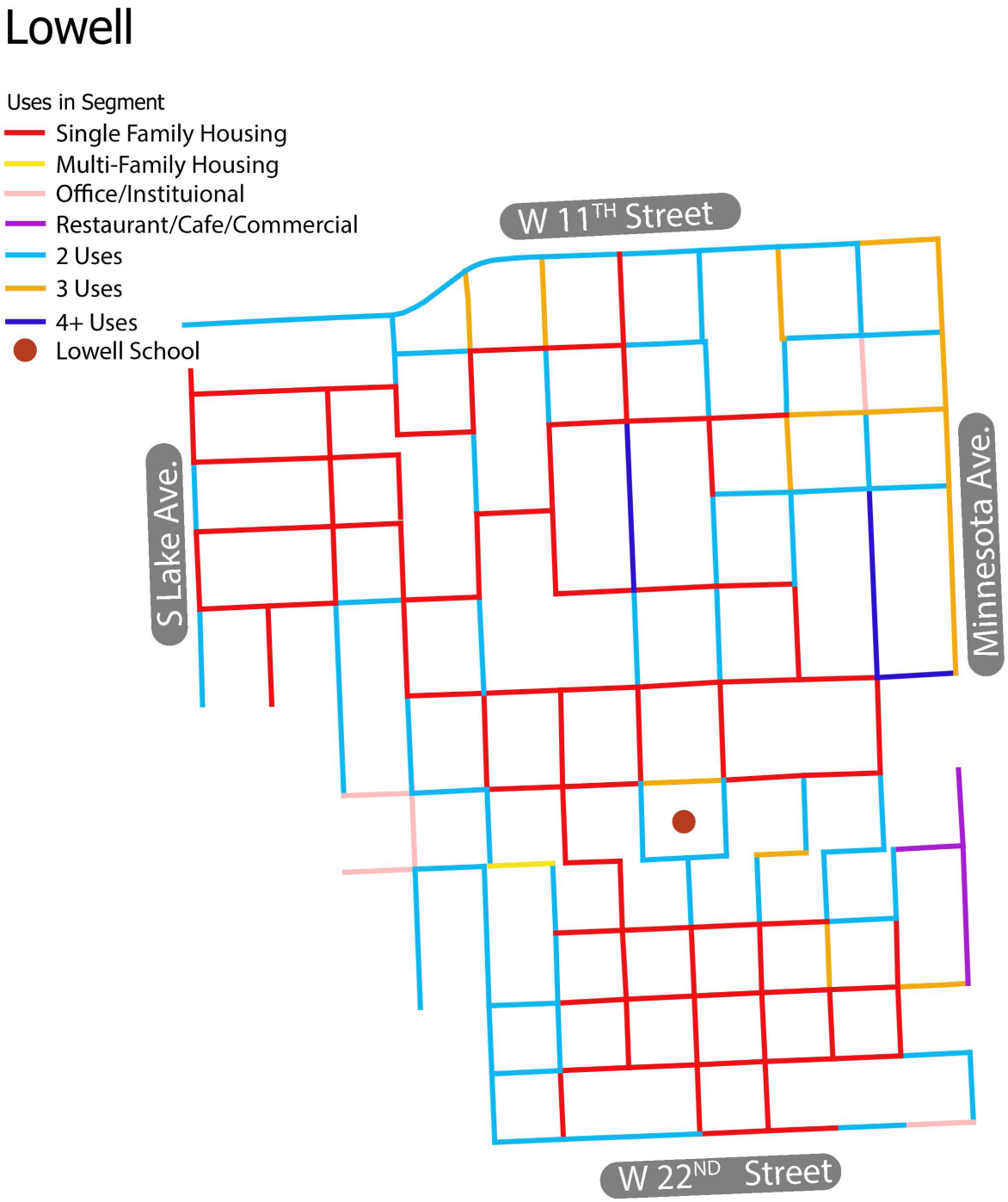

Figure 13: Current land uses in the Lowell study area.

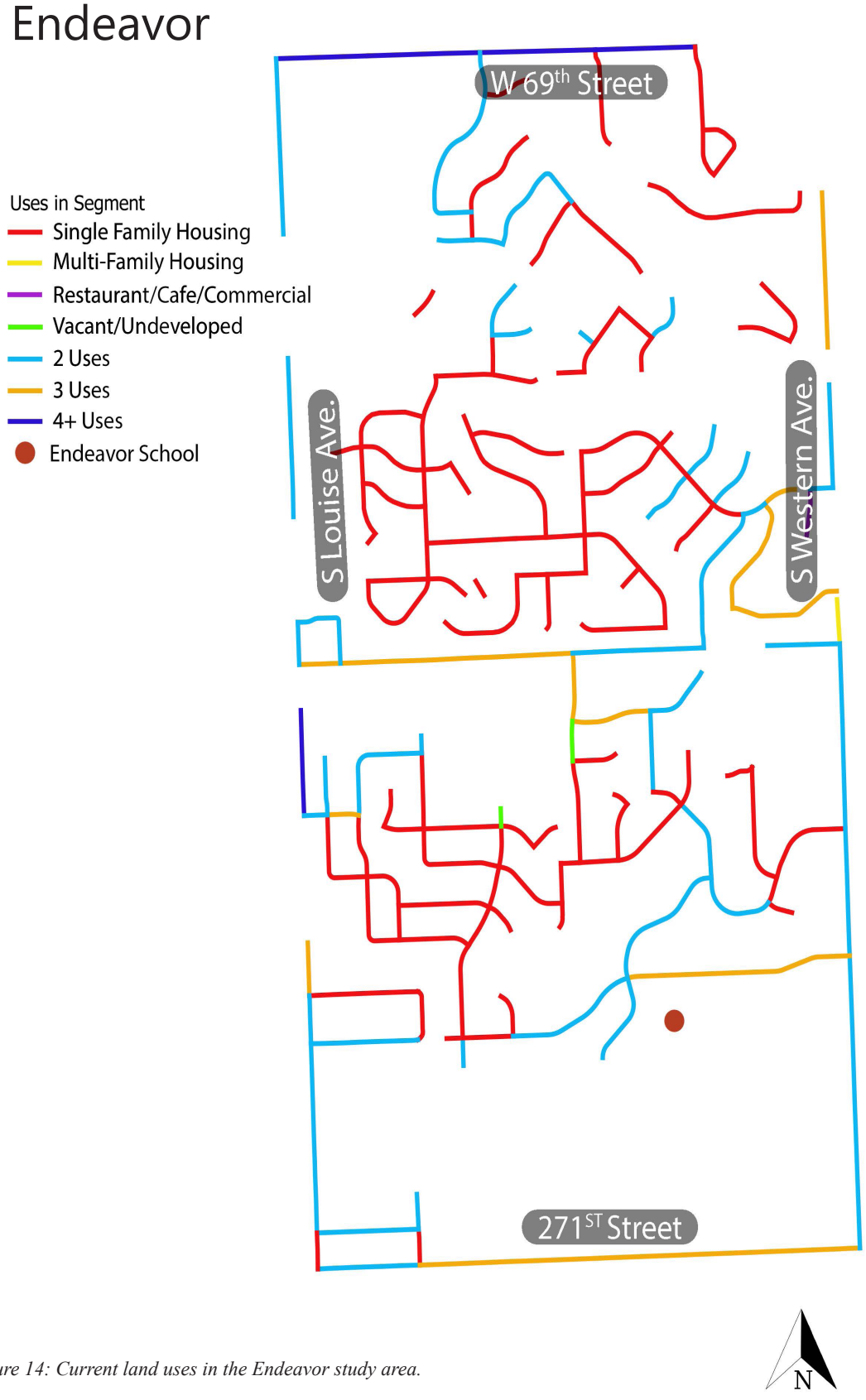

Figure 14: Current land uses in the Endeavor study area.

Sioux Falls is currently a driving community. People enter their vehicles and drive to the nearest shop to get what they need. Once they have run their errands, they return home, park their car and enter their houses, all with little community involvement and interaction.

To assist in creating new spaces within residential neighborhoods, Sioux Falls zoning ordinances should promote appropriate mixed-use development in existing residential neighborhoods. Mixing land uses facilitates physical activity and healthier everyday habits such as shopping walking and playing. More people out in public also makes the space feel safer and more attractive.

Recommendation 5: Increase Safety in School Zones

Currently buses and personal vehicles in the Lowell district drop off and pick up students on 17th Street, Summit Ave. and Prairie Ave. On these secondary streets where pick-up and drop-off happen, buses and personal vehicles wait for the students. These streets already have limited speeds during school hours.

To lessen congestion around Lowell Elementary School, the school district should increase the radius of the school zone one block. With this increased zone the drop off and pick up areas should also be expanded outwards, causing less congestion around the school. Increasing the radius of these zones increases the ease of access for both buses and personal vehicles.

Endeavor elementary school also has traffic problems during drop-off and pick-up times. Input during public meetings noted that these zones are hazardous for students walking as well as vehicles driving in and out. Creating clearer separation between the bus zone and personal vehicle zone can be achieved through separate vehicle areas. Separation prevents mixing of personal vehicles and buses, creating less frenzy around pedestrians.

Jonathan Elementary in Chaska, MN provides an example of separate areas for school buses and personal vehicles. Separation of the bus and vehicular zones provide safety for both vehicles and pedestrians. Endeavor Elementary needs to separate bus travel from personal vehicle travel during pick-up and drop-off times. This can be achieved by adding another entrance on the north loop allowing parents to drop their children off at this location. Buses can continue to utilize the east loop with personal vehicles being parked in the center of the loop.

Figure 15: Map of Lowell School drop-off and pick-up zones: Current vs. Proposed.

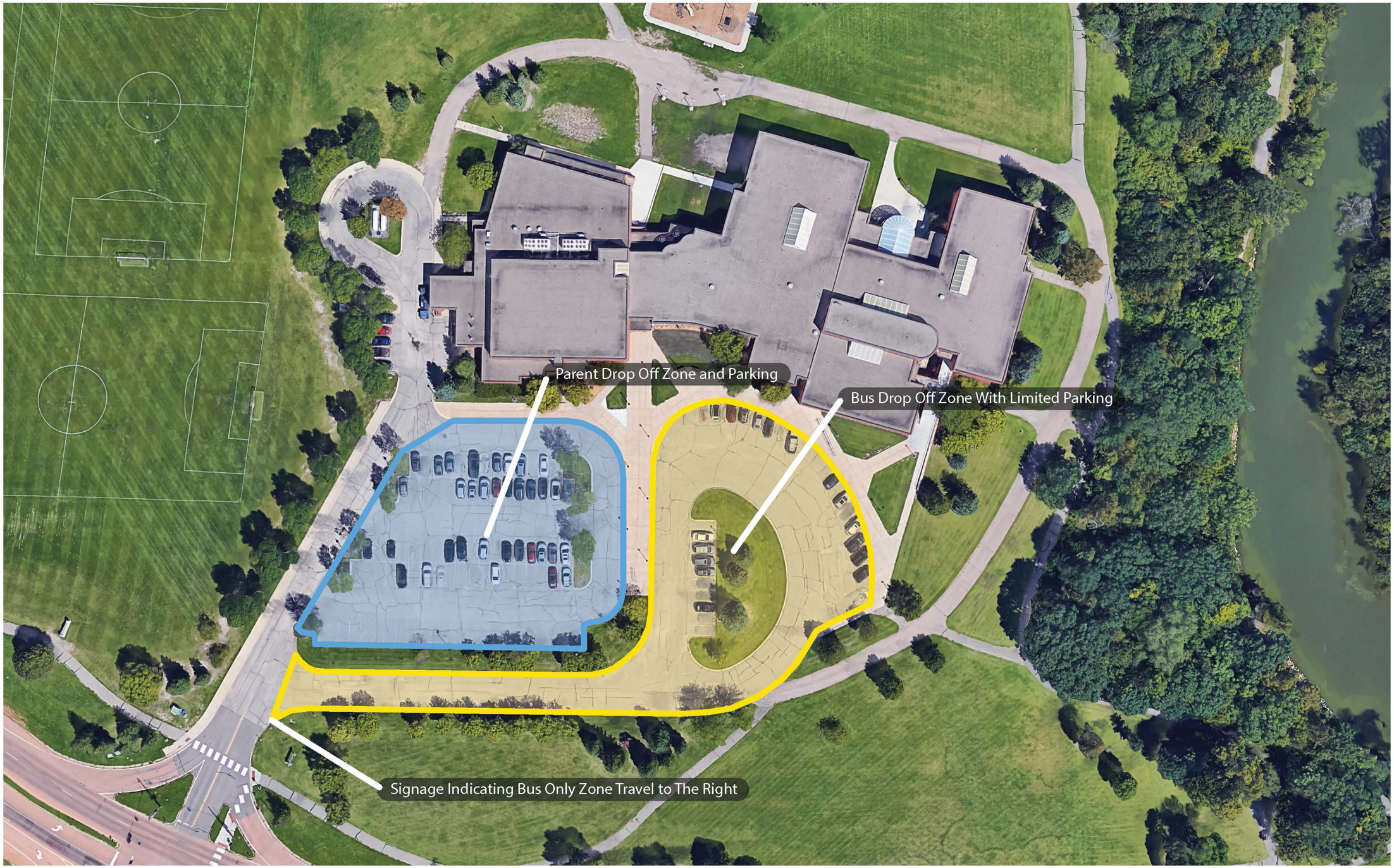

Figure 16: Jonathan Elementary (Chaska, MN), Vehicle and Bus Area.

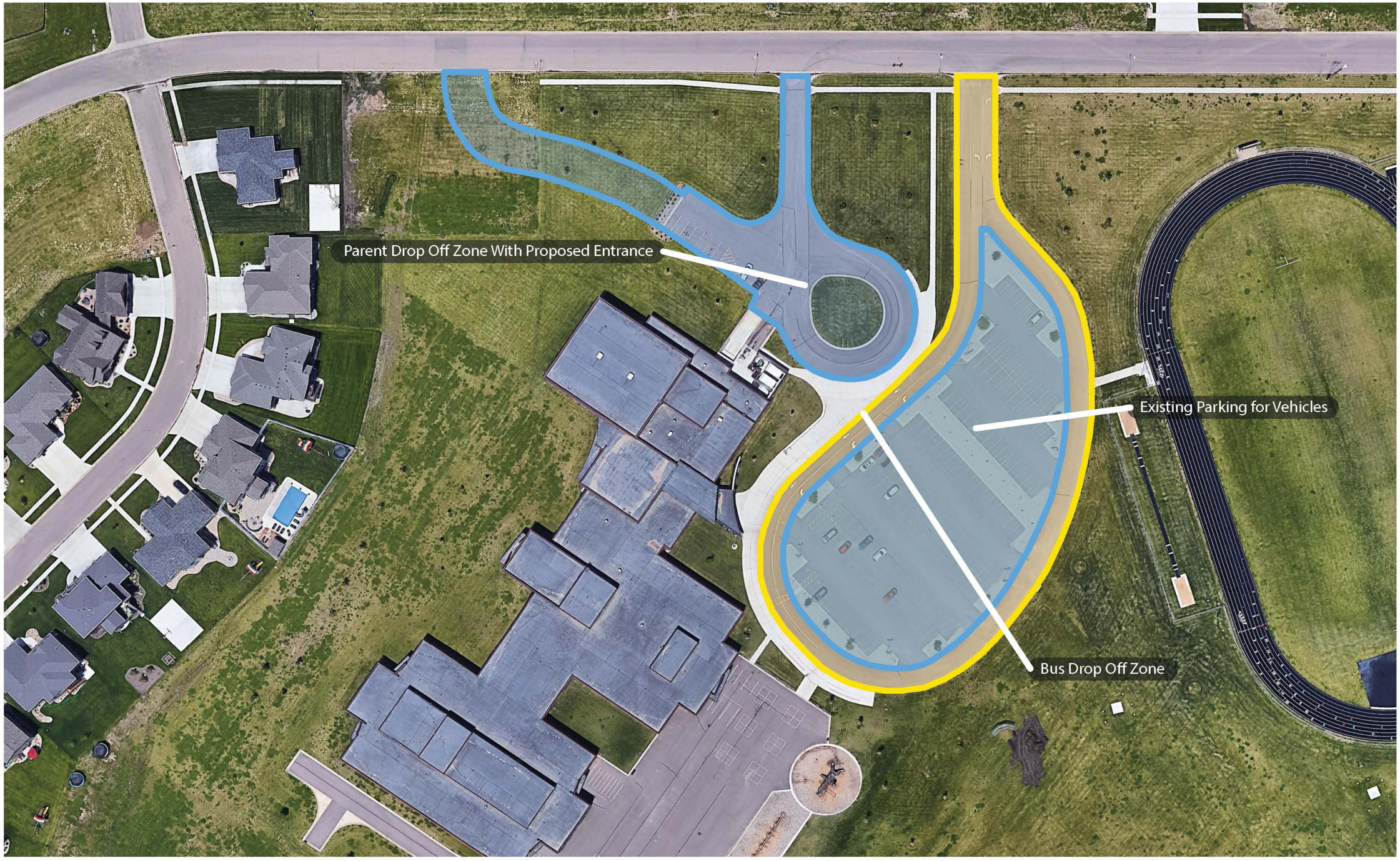

Figure 17: Endeavor Elementary, Vehicle and Bus Area.

This would create a safer environment for pedestrians. In addition to creating separate zones, the entrance to the school parking lots should also be reworked to make traffic flow smoother. This can be achieved by making the turning radius larger.

More information and research is needed to understand and recommend possible solutions and improvements for Hawthorne elementary. Because of the limited knowledge of the Hawthorne school zone, a traffic engineer or consultant should be hired to do a thorough investigation of the zone. Based on the conclusions from their study, further recommendations can be provided for the Hawthorne School District.

Recommendation 6: Modify School Zone Radii and Speeds

Pedestrian and vehicular traffic would see a benefit of vehicle speed reduction measures in the neighborhoods around Hawthorne and Lowell Elementary Schools. Currently, the school zone speed is set at 15 mph within a one block radius of the school. Patrolled school zones are very effective at slowing traffic. During drop-off and pick-up times, a high quantity of vehicles driving in the school zone results in an unsafe and congested environment for students trying to get into the school. This significantly increases the risk of pedestrian/vehicular conflict.

The City should extend the school zone to include all streets between Summit Avenue and Minnesota Avenue on the west and east, and between 2nd and 6th Streets on the north and south, respectively, around Hawthorne Elementary School. Speed limits should be lowered in this area to ten miles per hour. In addition, the city should lower the speed limit one block out from the school zone, or two blocks out from the school to 20 mph shown in **figures 28-29**. In addition, regular patrolling by the Sioux Falls Police Department around all schools is necessary.

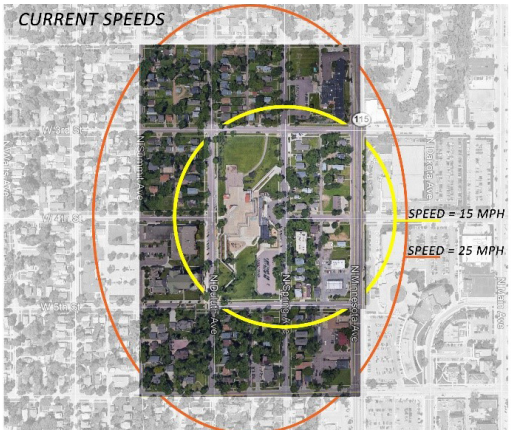

Figure 28: Current Hawthorne school zone and area speeds.

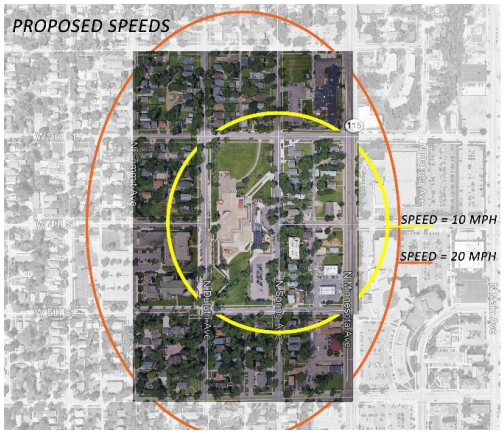

Figure 29: Proposed Hawthorne school and area speed limits.

These modifications will result in a more suitable walking environment for students, parents and school staff, promoting walking to school as a more efficient and safer mode of transportation. This speed reduction as well as the possibility for a more structured pick-up and drop-off route, will be a safer and more effective system for the vehicles trying to drop off students in a timely manner.

This model can also be used for other schools around Sioux Falls and in particular, Lowell Elementary School. These recommendations will create a more pleasing environment for all modes of transportation and will keep not just students safe but all pedestrians in these areas.

Connectivity Infrastructure

Sioux Falls has an annual growth rate of 2.6%. This means there is a increase of nearly 5,000 people per year [City of Sioux Falls, 2019]. Because Sioux Falls is growing at such a fast rate, connectivity and related infrastructure are a crucial part of the city's planning process. City connectivity refers to both the physical infrastructure (i.e. roads, sidewalks, buildings, utilities, etc.) and non-physical systems (i.e. culture, economy, perceptions, etc.) that tie the city together. These components create a working network that allows people and goods to move throughout a city and for the city to function. If a city is well-connected, destinations are less likely to be underutilized and physical routes (roads, sidewalks, bike trails, etc.) are less likely to become congested. This section explains the different ways the City of Sioux Falls can improve connectivity to ensure the physical and non-physical networks are working properly and efficiently.

Recommendation 7: Connect Existing Bike Trail to Areas of Importance

Cycling is a great example of active transportation. Not only does bicycle infrastructure provide another means of travel, but it also promotes a healthy recreational activity that can be enjoyed by a broad range of people. Strong bicycle infrastructure also leads to less congestion of pedestrian and vehicular pathways and, consequently, an overall safer transportation system.

The Sioux Falls multi-modal city bike trail is currently 19.1 miles long. It is oriented along the Big Sioux River with additional lanes, sharrows, and side paths extending from that main corridor.

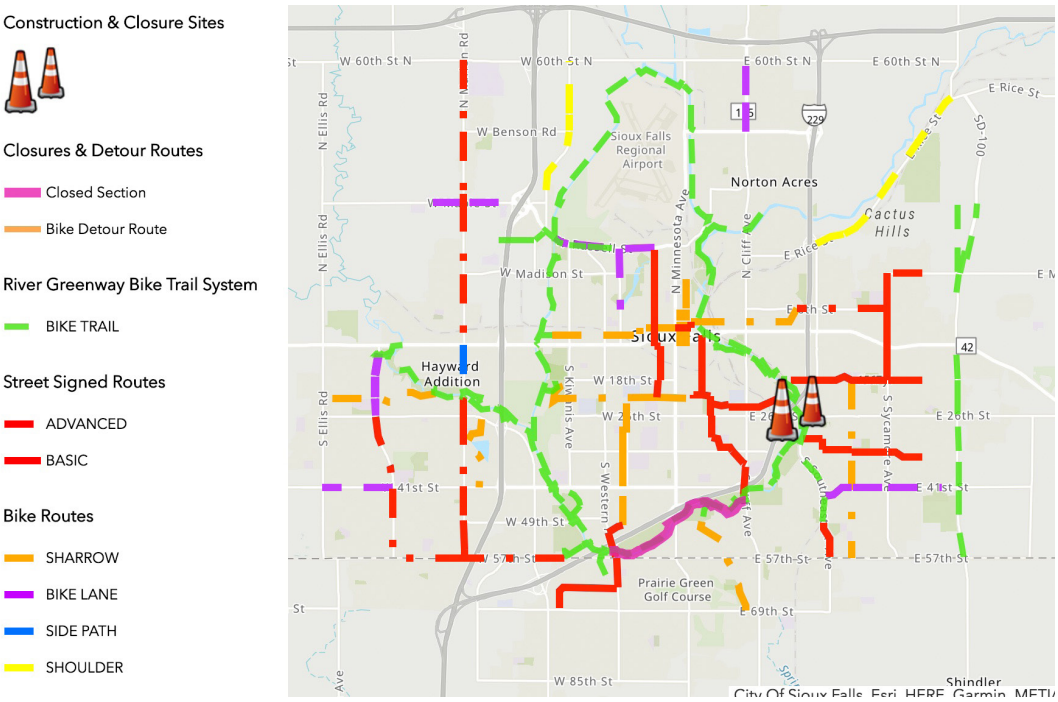

Figure 18: Current Sioux Falls City Bike Routes

The trail extends as far south as West 69th St. This means that Endeavor Elementary School and the surrounding neighborhood are currently disconnected from the bike trail and, in turn, the entirety of the Sioux Falls community through this means of travel. We recommend that the Sioux Falls bike route be extended into this part of town. This implementation would promote greater interaction and activity among the Endeavor residents and between Sioux Falls and Harrisburg.

The 2015 Sioux Falls Bicycle Plan shows the extension of the bike trail into a portion of both the upper and lower parts of the Endeavor neighborhood, as well as along its eastern border (S. Western Avenue). The northern-most proposed trail extension is of high priority. The other additions are shown as moderate priority and long term/underpass additions (see Figure 19).

One of the most important aspects to consider when reevaluating the bicycle system within the three neighborhoods in this study is where people need to go and where people want to go. Because biking is an alternative means of transportation, it is crucial that proper bike infrastructure be implemented that allows people to easily and safely reach their destinations. Important destinations to consider would be high-volume business areas like those along Minnesota Avenue, recreational facilities like Falls Park and Terrace Park, shopping centers, and residential neighborhoods. Positive connectivity between these areas allows for people to travel between work, home, and play easily and safely. This will result in more people using bicycling as an alternative mode of transportation.

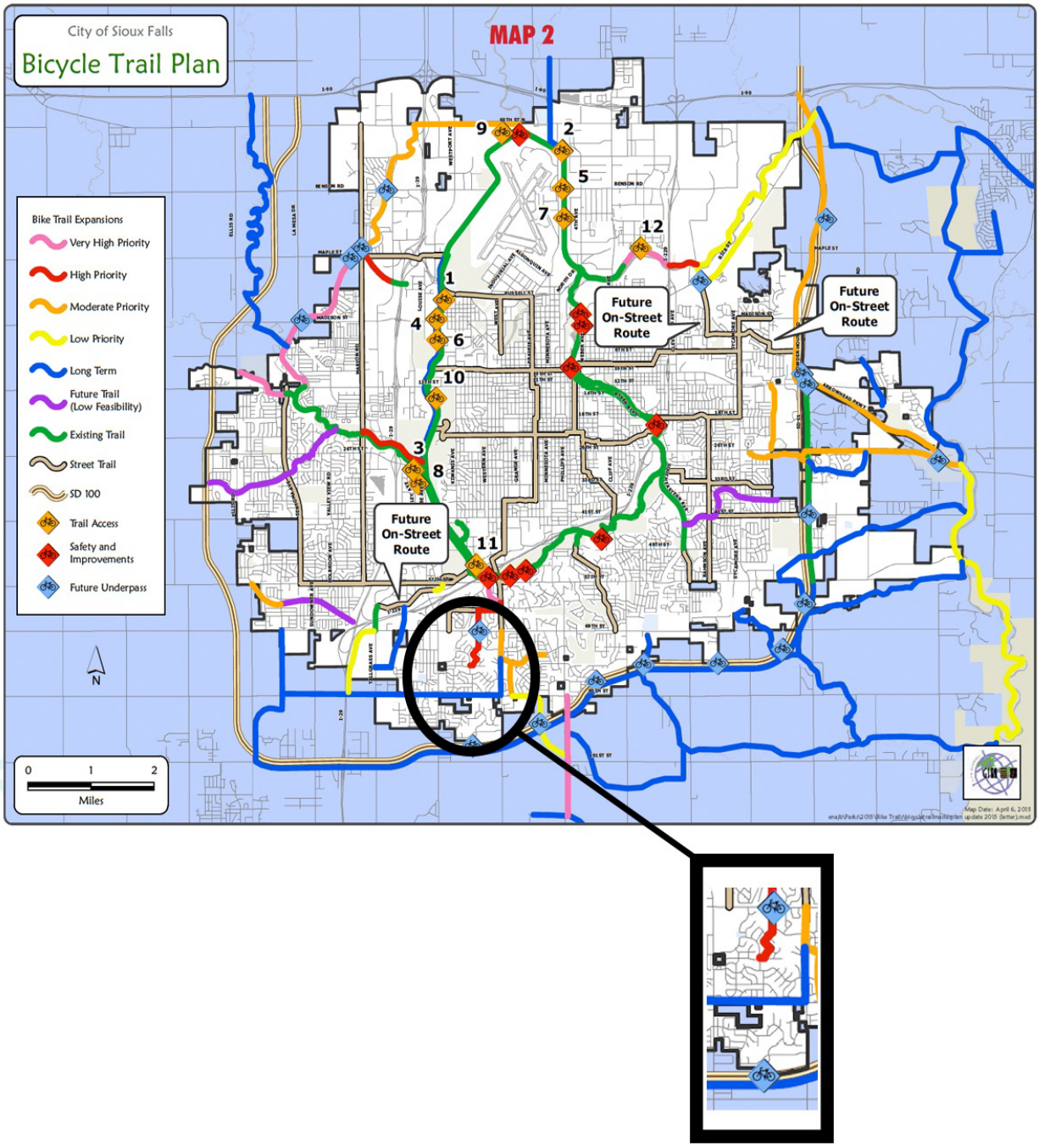

Figure 19: 2015 Sioux Falls Bicycle Plan - Highlighted Endeavor Community.

Recommendation 8: Improve Wayfinding

Wayfinding can be defined as any device used to help people navigate from place to place or orient themselves in their physical environment. Wayfinding promotes spatial awareness. Typical wayfinding aids include (but are not limited to) street signs, maps, and universal symbols. Wayfinding also includes landmarks and physical cues that help people understand their surroundings. Without adequate wayfinding, people can get lost and disoriented when trying to navigate to a destination. People are less likely to seek out a destination the harder it becomes to find. The City of Sioux Falls is dependent on wayfinding, especially as it continues to grow, to orient visitors and residents and help them to find the place they seek.

Currently, all three neighborhoods we observed have street signs. We recommend that the Sioux Falls streets department conduct visual assessments and repair existing street signs, particularly in the Lowell neighborhood (see Figure 20).

One area, in particular, requiring additional wayfinding is near Endeavor Elementary School. Several people mentioned that they didn't know which way to turn or how to get to the school until they were already driving past it. We recommend that signage be added that indicates directions to the school from surrounding main roads and sidewalks. These signs should be designed to facilitate wayfinding in all modes of transportation (see additional resources at the end of this section for design strategies).

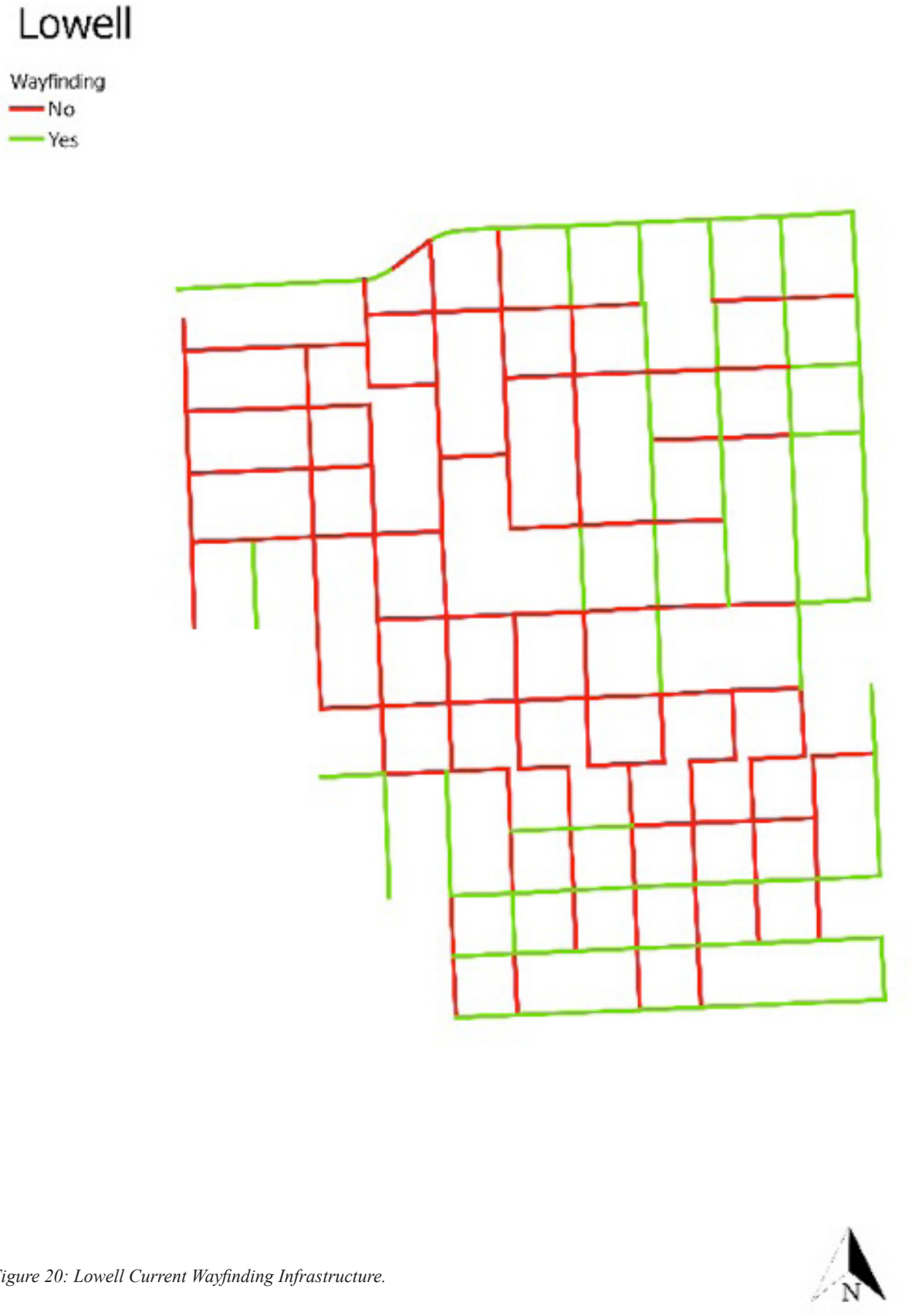

Figure 20: Lowell Current Wayfinding Infrastructure.

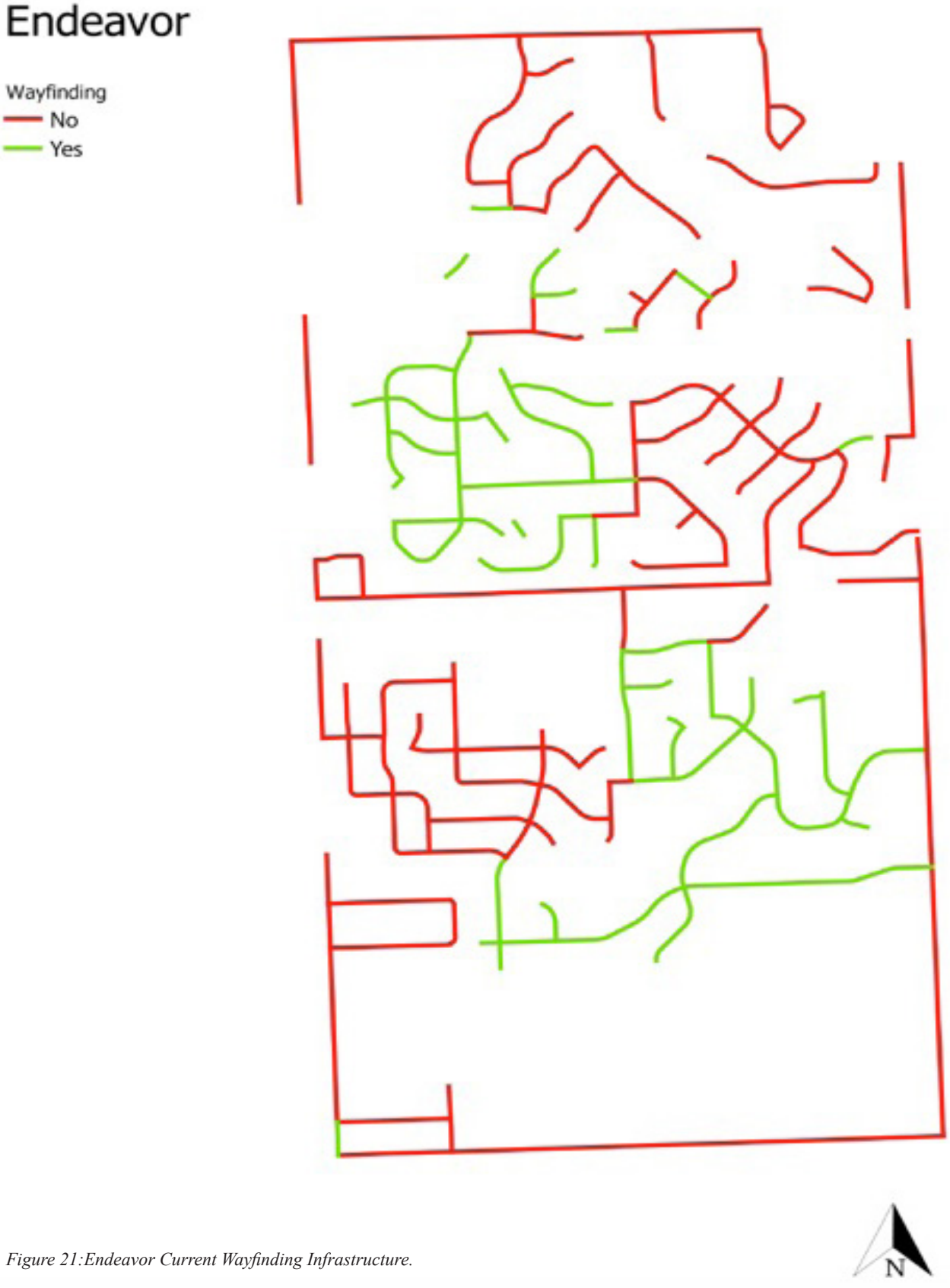

Figure 21:Endeavor Current Wayfinding Infrastructure.

In addition, wayfinding should be added to important destinations. These destinations are highlighted previously in the "Improvements on Existing Destinations" section. Signage should be included leading up to and at the entrance of each location. If the destination has an internal pathway network (park), it should also include internal signage that directs people within that destination. Larger signs should be used to indicate arrival at main entrances. Informational signage should be at a smaller scale at multiple locations within a destination to orient people within the space. Directional wayfinding should be added leading up to the destination and should be sized appropriately based on orientation to the road or pedestrian walkways. All signage, regardless of placement or scale, should be uniform in style throughout the entire destination and should be consistent with the rest of the Sioux Falls Community (See Figure 22 for an example of different wayfinding varieties of the same style).

Figure 22: Current Signage in the City of Sioux Falls.

The important principles to consider when implementing wayfinding are as follows:

- Text-based signs should be used only when necessary
- Location is part of the planning process
- Messages should be short and simple to leave little room for interpretation or confusion
- Signs should be consistent (typefaces, colors, etc.) [Modulex]

A design firm specializing in wayfinding should be consulted during the design process.

Below are some additional wayfinding resources that are of interest:

- Basics of Wayfinding: https://www.graphicproducts.com/infographics/wayfinding-infographic/
- The Comprehensive Guide to Wayfinding and Signage: http://modulex.com/Files/Billeder/ModulexWeb2016/CPD/MODULEX_CPD_RIBA_APPROVED.pdf

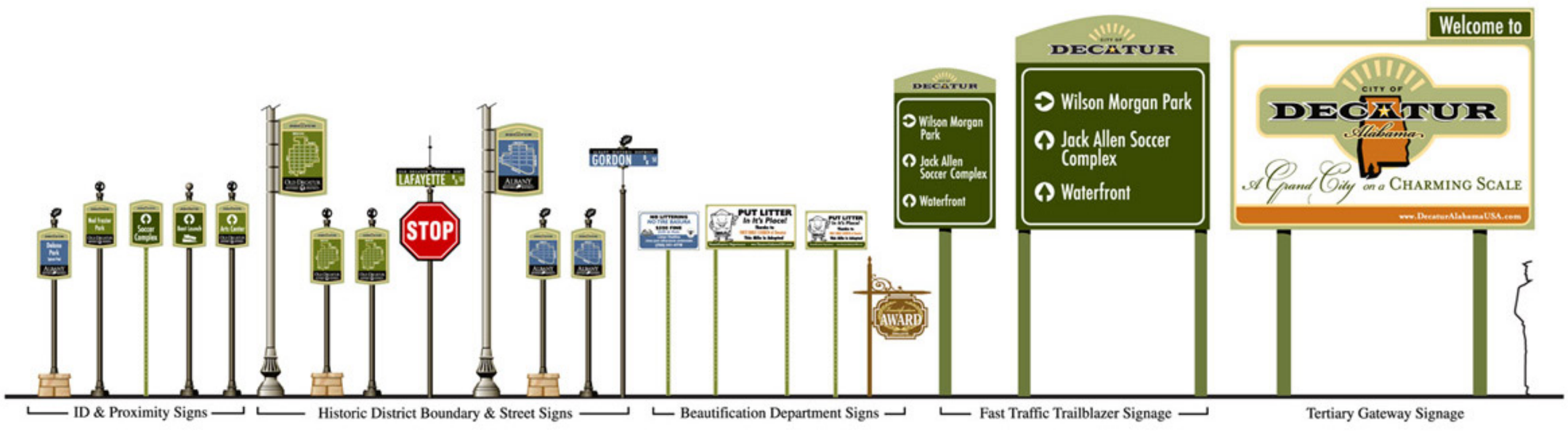

Figure 23: Comprehensive Wayfinding System (Decatur, AL).

Recommendation 9: Connecting Endeavor Neighborhood to Sioux Falls

Sidewalks are linear elements located adjacent to streets that allow pedestrians to travel from one destination to the next without interfering with motor vehicles or bicyclists. These routes are extremely important in an urban environment. Without proper pedestrian paths, people cannot readily access their destinations, leading to underutilized, neglected, and forgotten public places.

Currently, the Endeavor neighborhood is disconnected from the rest of Sioux Falls. This is partially due to the fact that it is a newer development and not all of the sidewalks have been completed in the area. This problem will be resolved as the neighborhood is built out and sidewalks are finished. However, a road of concern is West 69th Street. This arterial currently stands as a major barrier to pedestrian traffic because of the amount of vehicular traffic it receives. According to the "Traffic Volume Counts for the City of Sioux Falls (2008-2012)", West 69th Street sees about 7,300 motor vehicles on an average weekday [Sioux Falls, 2012]. This road is important to vehicular transportation, but an emphasis on improving the current state of the pedestrian infrastructure and making sure that the road is safe and inviting for people who do wish to cross it is necessary.

We recommend that all sidewalks be completed along this road. We also recommend that crosswalks and pedestrian signage be implemented at intersections. Currently, there are neither of these amenities located along West 69th Street between Louise Avenue and Western Avenue. A lack of proper pedestrian safety infrastructure can lead to people not crossing the road, or worse, somebody crossing in an unmarked area and being seriously injured. Adding specified crosswalk areas will show pedestrians that they can safely cross this street and warn motorists to pay attention for pedestrians. These implemented crosswalks should also be accompanied by proper pedestrian signage.

Figure 25: Current W 69th St. Intersection (top) and example of recommended crosswalk implementation (bottom).

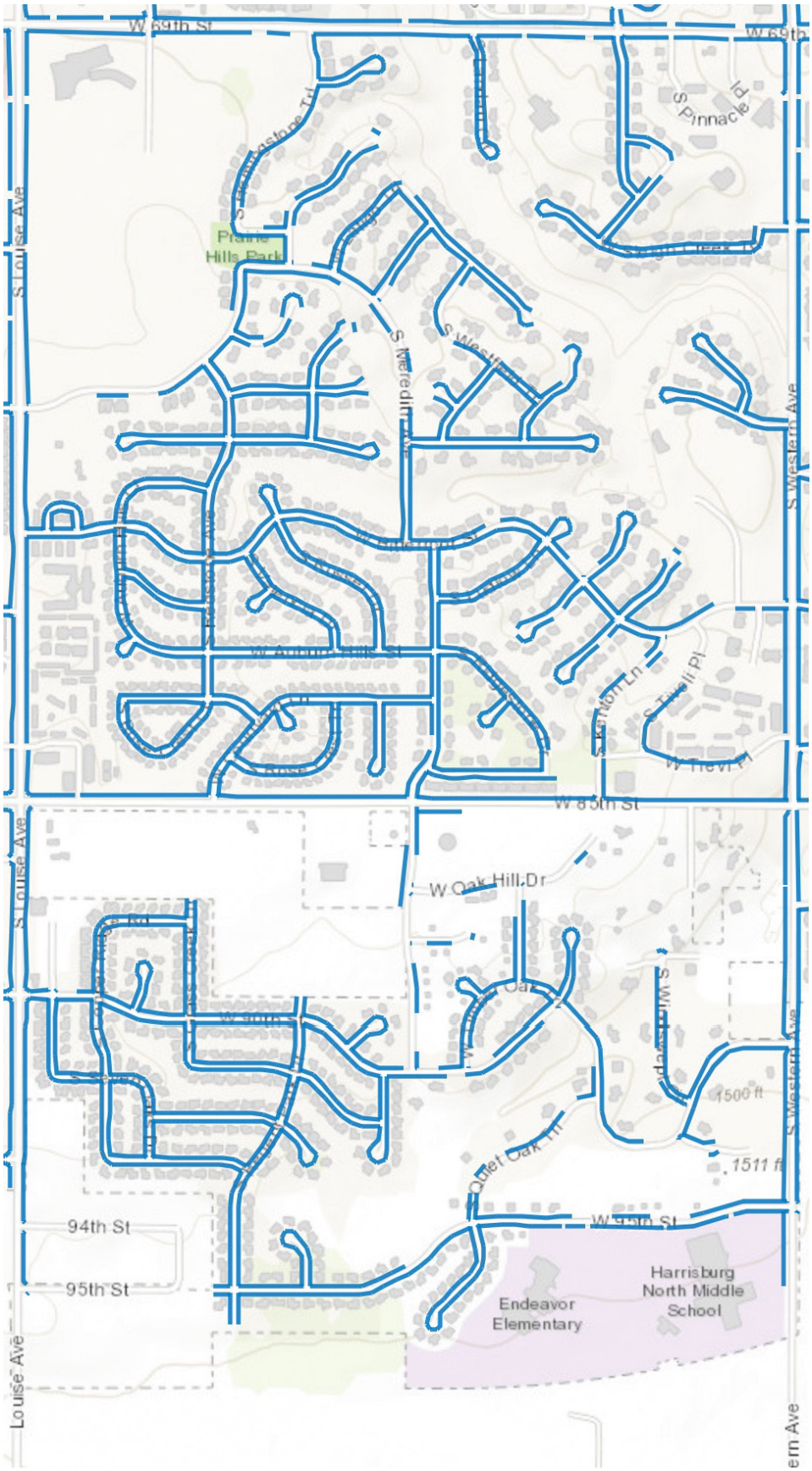

Figure 24: Sidewalk Map of Endeavor Community

Recommendation 10: Enhancement of Signage

Signage is a good resource for all travelers no matter the type of transportation. Street signs let people know where they are going, while warning signs let people know what to watch out for. Walking though these neighborhoods there were street signs at every corner, but a lack of pedestrian warning/crossing signs creating the perception that people aren't supposed to walk there. Pedestrian warning signs should be placed before all crosswalks and on streets within at least a quarter-mile radius of a school.

Figure 42: Example of proper pedestrian warning signage.

A lot of people think bikes should travel on sidewalks, but it has been proven that if given room to do so, it is safer for the bike to be on the street going with the flow of traffic, especially in a school zoned area where the speed limits are typically lower and more pedestrians are at risk. In some places it is even illegal for cyclists to ride a bike on the sidewalk over a certain age [Wang, 2013]. There needs to be a more inviting environment for the biking community and additional signs to let them know what the laws are, where they can ride, and where the nearest trails are will help in creating that. These signs should be placed along main roads with bike lanes.

Figure 43: Bicycle Wayfinding.

In these areas, very few bus stops were noticed, and if someone didn't have access to a smartphone, they would not know where to find them and know where the buses were going. Adding a few more signs at the entrance and parks of these neighborhoods giving bus stop locations and routes would increase the use of public transportation.

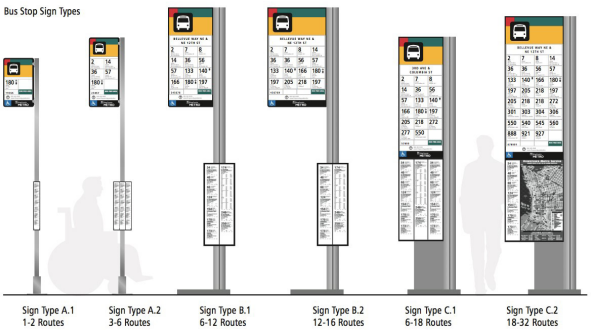

Figure 47: Bus Stop Sign Types.

Recommendation 11: Improve Community Involvement

The social aspects of a city are just as important to a healthy city system as any built environment. Without the involvement of community members, city planning decisions are left up to a very small number of individuals. This can lead to citizen dissatisfaction with the results and underutilized infrastructure. Community involvement brings new perspectives, opinions, and information to projects that bring a sense of ownership to participants. When people take pride in a program, they are more likely to utilize it as well as get others involved.

Through our research and speaking to community members, we found that there is currently an issue when it comes to citizen participation. The three communities we observed all had issues with getting people to engage in planning meetings and even community events. This has led to a disconnect between the citizens and the physical infrastructure of the community. If not addressed, inhabitants of all three communities will become more unsocial, unhappy, and unwilling to participate.

When beginning to address community involvement, it is first important to understand what is keeping people from participating. According to an article published by John-Paul Flintoff titled "Eight Reasons People Don't Get Involved", the top three reasons for a lack in community involvement include the following:

1. People aren't sure they want to join.
2. People don't understand how they can make a difference.
3. It's too much work [Flintoff, 2014].

We recommend that a focus be put on getting the community involved through education and advocacy efforts. The most important aspects to consider when doing this include (but are not limited to) making it easy to get involved, understanding that everyone is different and not everyone will respond the same to every situation, and understanding that you will not get 100% engagement.

Making it easy for people to get involved may seem like a simple concept, but it is something that is constantly overlooked. People tend to not engage in things out of their current habits, especially if those engagements require an excess of effort or thought. Knowing this effects every aspect of gaining community involvement. An example of this is to carefully consider a meeting or event venue and time as to appease the greater number of participants.

This also goes hand-in-hand with making sure people have easy access to information about when and where things are and how they can find out more information. Advertisements and announcements should be easily found and understood.

Every individual in a community is independent with their own opinions and ideas. At face value, this may seem like a competitor to the idea of a social and coordinated community network. If addressed properly, this can create a diverse and interesting dynamic to the development of the three communities. Different people bring different ideas and ways of doing things to the table. This gives a wide variety of options when making decisions and, in turn, allows for a broader range of accommodations that best suit the entire community. Understanding that not everyone wants the same things is the first step in creating a versatile and healthy social structure within a community [Betancourt, 2009].

Lastly, it is important that a devotion to community involvement be shown by those that are trying to attain it. Being persistent for long periods of time provides the best results.

Vehicular Infrastructure

Recommendation 12: Calm Traffic on Neighborhood Streets

The neighborhoods surrounding Hawthorne, Lowell and Endeavor Elementary Schools are dominated by cars. Vehicle-oriented environments are unsafe for pedestrians and drivers alike. Pedestrians are put at risk while crossing the road, while motorists often travel too quickly and are less mindful of the entire road environment, leading to greater risk for collisions.

Pedestrian flow and circulation both on and off the road are also a concern. Cyclists currently do not feel safe on many neighborhood roads due high traffic speeds and limited designated on-street infrastructure. As a result, many cyclists ride on the sidewalk, leading to pedestrian/cyclist conflicts. These concerns can be addressed by through traffic calming measures such as reduced speed limits, expanded school zones, and further development of built infrastructure along the roadways. Neighborhood roadways require traffic calming and circulation redevelopment to make them safer and promote active modes of transportation.

According to the Federal Highway Administration (FHWA), the primary purpose of traffic calming is to "support the livability and vitality of residential and commercial areas through improvements in non-motorist safety, mobility, and comfort.

These objectives are typically achieved by reducing vehicle speeds or volumes on a single street or a street network. Traffic calming measures consist of horizontal, vertical, lane narrowing, road-side, and other features that use self-enforcing physical or psycho-perception means to produce desired effects" [Traffic Calming E-Primer].

The implementation of traffic calming methods in the City of Sioux Falls will create an inviting and less stressful environment for every mode of transportation. These measures will come at the cost of slowing vehicle traffic in order to make a safer environment. There are many areas of specific consideration.

Recommendation 13: Update and Modify Speed Limit Signage

The on-street analysis revealed that some neighborhood areas feature a lack of (or in some cases a complete absence of) speed limit signage. This is a problem that results in drivers not being aware of the rate of speed at which they may legally operate a vehicle.

The Endeavor Elementary School region in this study shows particular need of improved speed limit awareness. Figure 30 outlines the presence of speed limit signage; streets highlighted in red are devoid of signage whatsoever. The remaining streets show scattered and spread out signage which results in inconsistent speeds and dangerous intersections. A traffic consultant should be hired to analyze traffic speeds, resulting in a better understanding of which areas would best benefit from traffic calming measures.

Figure 30: Endeavor School region speed limit signage.

Recommendation 14: Reduce Lane and Street Widths

The reduction of lane size and street width will aid in making active transportation a primary mode of getting around Sioux Falls. The reduced amount of vehicle traffic will in turn make it safer for both pedestrians and drivers to move safely around the city.

The current state of many of the highly trafficked roads are constructed in such a way that allow for maximum flow at the risk of safety. Currently, streets such as West 11th Street (see **Figure 31**) are constructed in such a way that the lanes are large and spread out, naturally increasing traffic speeds as drivers subconsciously perceive a lack of obstructions.

As the city reduces lane and street widths, drivers will naturally slow down and be more attentive and deliberate about the way that they are driving. Also, by editing lane and street size it allows for cyclists and other pedestrians to take advantage of the space for the creation of bike lanes or other types of recreations space. By doing this, there is a great opportunity for other implementations to occur such as, buffers and other pedestrian separation elements that can work in a cohesive manner creating one complete, safe and inviting experience for everyone.

A street analysis conducted in Beijing China examined the correlation between wide street lanes and traffic-related fatalities [Ma, 2010]. This study revealed that the ideal driving lane with was 9' to 10.5' wide. This allows for the road to remain wide enough for safe driving conditions but slows traffic, helping drivers better comprehend the entire streetscape. In the sense of trying to create a more suitable environment for pedestrians and drivers to coexist, this improvement would maximize efficiency while creating a safer space for pedestrians. The City of Sioux Falls should use this analysis as a model and make lanes narrower to make the roadways and streetscape safer and more inviting. The section elevation graphic shown in **Figure 32**, shows the result of narrowing traffic lanes and the road will provide for pedestrians as well as creating room for added buffers and the development of green streets.

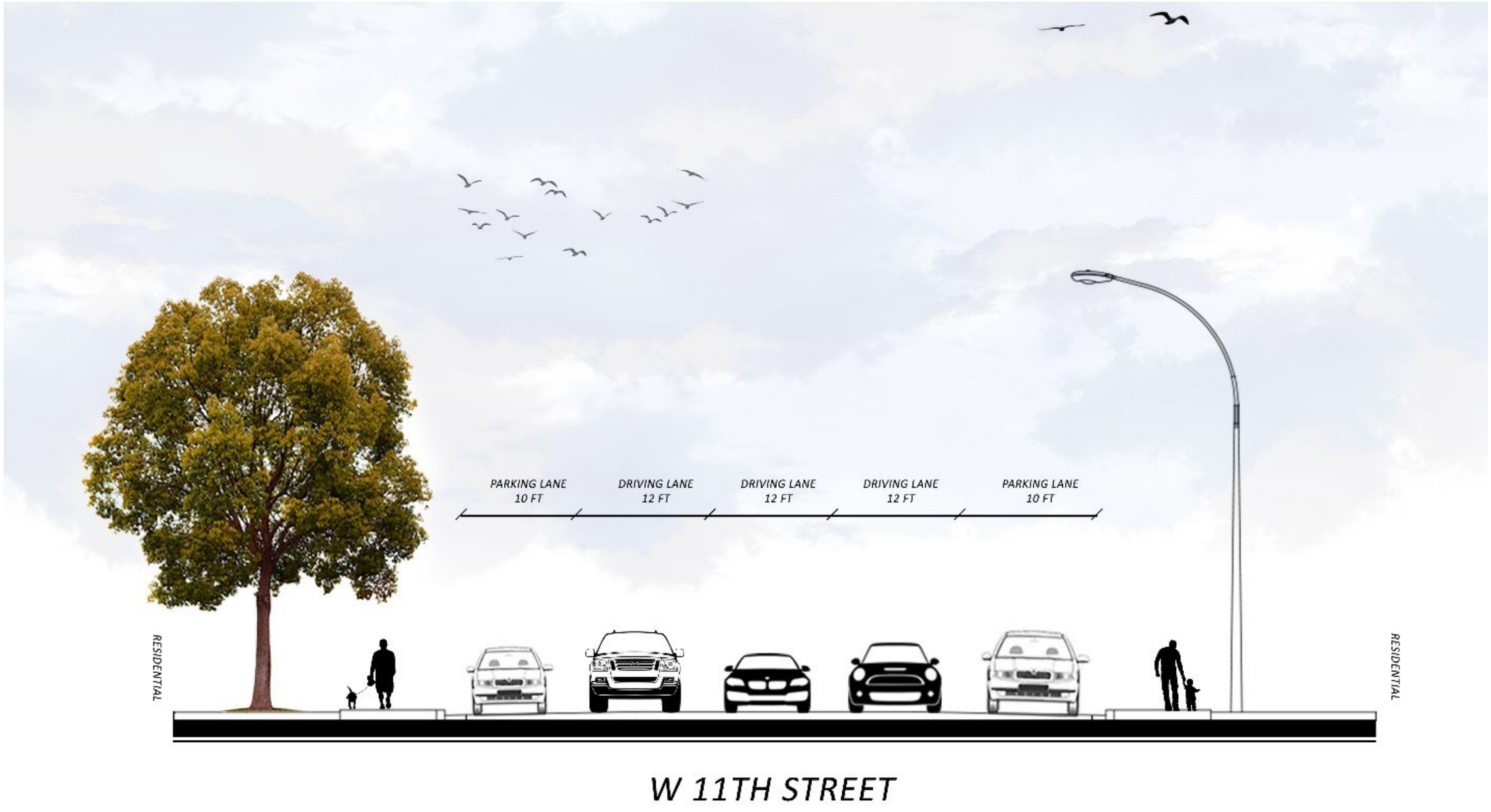

Figure 31: Current Street/Lane Section.

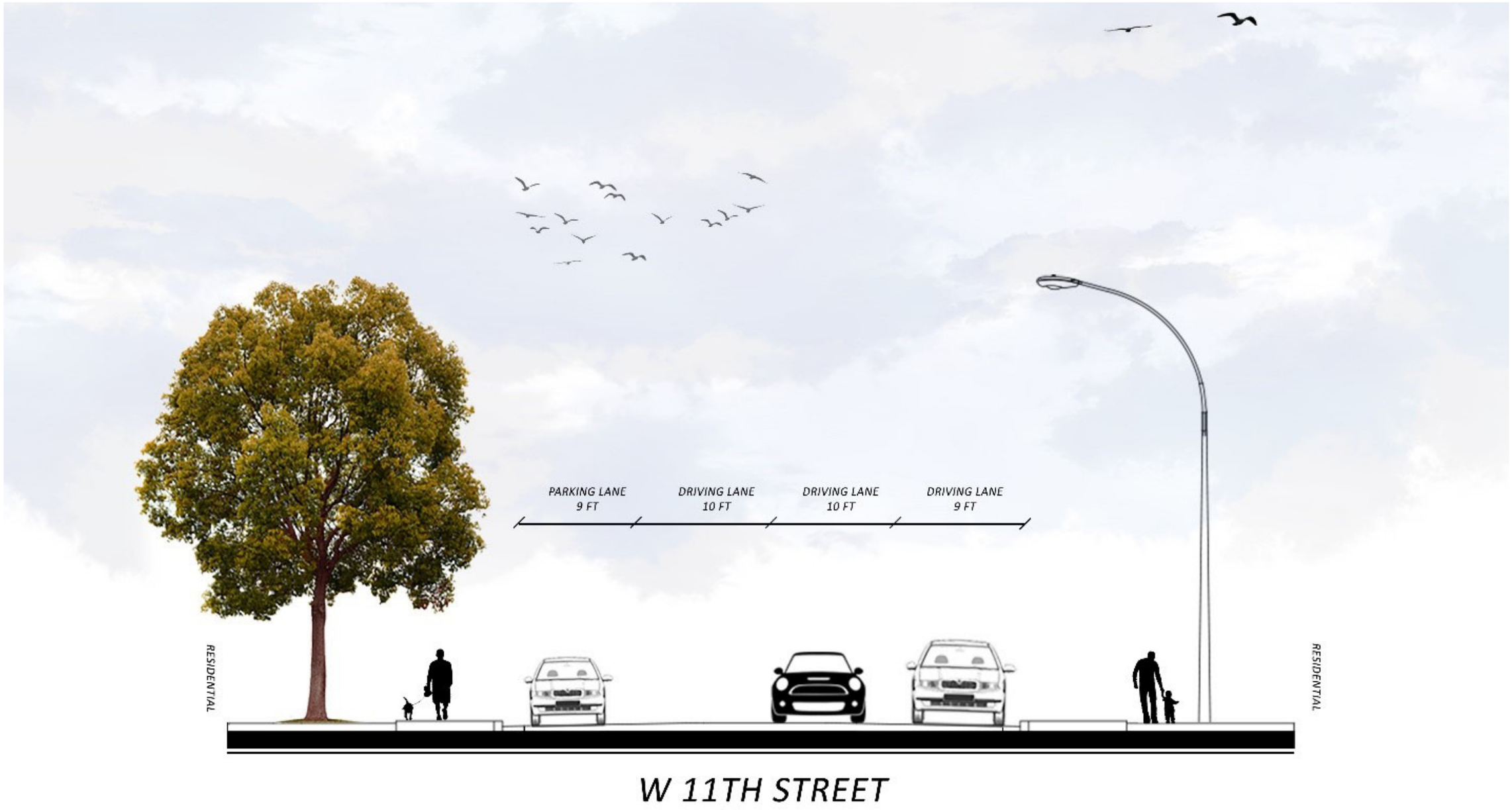

Figure 32: Recommended Street Lane Section.

Recommendation 15: Addition of Street Trees

With the creation of more space along the roads edge, the addition of more trees works in both form and function. In terms of form it will act as a street beautification and aid in making the streets and their periphery more inviting. It will also work in a functional way as yet another way of slowing down traffic and making it more difficult for vehicles to get around. It will work as a way to make the roadways seem even more enclosed and smaller than they really are. This will in turn slow drivers down freeing up space for pedestrians and making it a safer environment as a whole.

A 2006 study conducted by urban designer Dan Burden in Michigan reported that using trees along roadways brought down average speeds by up to eight miles per hour. Researchers theorize that streets with landscaped center medians or perimeter street trees may affect driver perception of lane width, causing something called the "edge effect." This edge effect provides them with a psychological prompt to go slower. Historic tree plantings reduce speeds, provide greater green cover, and allow homes to face streets, thus rewarding walking activity [Irmira, 2016].

Sioux Falls should add more trees to narrow the view of drivers and slow them down to create a safer environment for pedestrians and bicyclists. The slower speed on the roadway will result in a more inviting space for pedestrians of many forms to use the space more regularly and enhance the active transportation of that area. The images in **Figures 7-8** show the result and the view that a driver would have and the effect that the slower traffic has on the pedestrians.

Figure 33: Street Trees.

Figure 34: Street Trees and Pedestrian Use.

Figure 35: Street Tree Concept.

Recommendation 16: Develop Minnesota Avenue Pedestrian Corridor

Minnesota Avenue is used as a vehicle corridor, people traveling north and south in the heart of Sioux Falls currently depend on Minnesota Ave to efficiently travel from one end of the city to the other. While there are stores and shops along Minnesota that provide services to residents, the street does not attract people for leisurely strolls and recreation.

Stores on Minnesota are currently set back from the street with parking lots fronting the road. This type of construction works well for vehicles but is not attractive for pedestrians. Stores are also surrounded by concrete and hardscape, discouraging pedestrians and cyclists.

Shifting stores closer to the road with parking behind them promotes foot travel to these spaces. Adding vegetation and green material along Minnesota Avenue humanizes the streetscape, providing greater psychological and physical comfort to shoppers. These changes will help make the space more accommodating to people on foot and using modes of transportation other than cars. The image in **figure 37** shows the intimate nature of this shift of moving store fronts to closer to the street, creating one cohesive streetscape.

The image shown in **figure 36** is an example what the current condition of the Minnesota Avenue Corridor. As one can see the orientation of the buildings to the roads is very uninviting to the pedestrian walking or bicyclists. The appeal for people to transport in an active manner is created by creating destinations and spaces that are inviting and suitable for said active transportation.

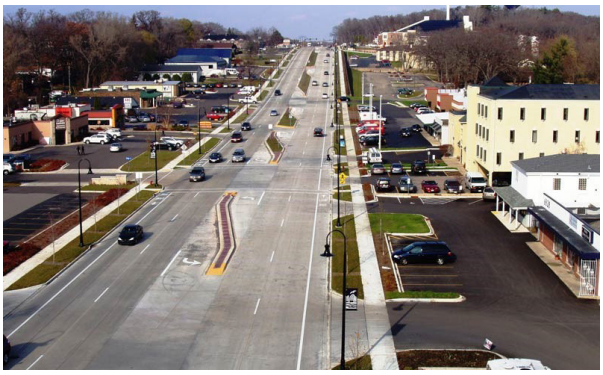

Figure 36: Current Minnesota Corridor.

The corridor of Minnesota Avenue in Sioux Falls is a prime location for the creation and establishment of a pedestrian and vehicle corridor that would allow for the symbiotic relationship of the two. This road in the city is a road that sees a lot of traffic and it is an area that continues to see development. The city should shift the focus to the pedestrian in an attempt to establish an inviting thoroughfare for all forms of transportation.

Currently along Minnesota Avenue there is a good base of pedestrian infrastructure. Sidewalks, street lighting, store fronts, and wayfinding aids all exist along this thoroughfare, but some elements could be improved.

Figure 37: Proposed Minnesota Corridor Streetscape.

Creating a more intimate pedestrian experience inside this business rich district would be impactful for the nearby residents because it would invite them to interact with the district like they haven't been able to in the past. Implementing a good buffer system along the sidewalks with pedestrian scale lighting, crosswalks, and reducing the speed limits would give them more of a reason to walk to their destination instead of driving.

Another way to lighten up the Minnesota Avenue environment would be to move the private parking behind their corresponding buildings and limit those lots to an appropriate amount of parking spaces for that building. With parking lots out of the way and limited, there is an opportunity to see storefronts right away, then they have the opportunity to give an invitational feel to passersby. **Figure 38** shows the disconnect that exists in this region of Sioux Falls between the buildings and the roadway. This disconnect creates an uninviting environment for pedestrians and cyclists alike. Introducing these elements along the streetscape will provide a smaller, downtown feel, instead of a vehicle dominated roadway.

Figure 38: Current Minnesota Section.

Pedestrian Infrastructure

The existing pedestrian infrastructure in the districts of Hawthorne, Endeavor, and Lowell schools has strengths and weaknesses. Right now, there are plenty of hazard-less sidewalks, street lights along most of those walks, and a good base of wayfinding signage throughout. Some of these features can be improved with a little work to better the entire experience. The main features these districts need for more people to feel as safe as possible walking, running, and biking are crosswalks, pedestrian scale lighting, signage, and more significant sidewalk buffers. The more attractive the path is for the pedestrian, the more encouraged they feel to take it.

Recommendation 17: Addition of Crosswalks

The Pedestrians Avoiding Traffic Hazards (PATH) advocacy group has already identified safe routes to school for the Hawthorne and Lowell Elementary Schools, and the location of marked crosswalks in those neighborhoods. The continued development of a school-zone crosswalk system with pedestrian warning signs and crossing guards will promote walking and cycling to school. Families living within walking distance would then be able to leave for work worry free about their child making it to school safely. More children walking to school will result in fewer cars driving inside the school zone for drop off and pick up. When crosswalks are introduced at relatively busy intersections, pedestrians feel more inclined to cross that street. If that feature does not exist on a busy road, that road then acts as a barrier to anyone who wants to walk or run across, lessening the chances for active transportation.

Referring to Figures 39, 40, and 41, every red line on the map indicates a street with no marked crosswalks. We propose there be crosswalks at:

- Every sidewalk intersection
- Street intersections larger than 2 lanes
- Every intersection with a street light
- Every stop sign within the bounds of the black circle on the maps above

Making cars stop for all pedestrians by using the lines painted on the street will slow drivers down and give safe passage to any pedestrian crossing. There should also be consideration of raised crosswalks at key locations within a one-block radius of each school to create a speed table encouraging drivers to slow down. This would require a phased plan, but the crosswalk priorities should be along 6th Street, 11th Street, 18th Street, and Minnesota Avenue on walking routes to schools.

Endeavor

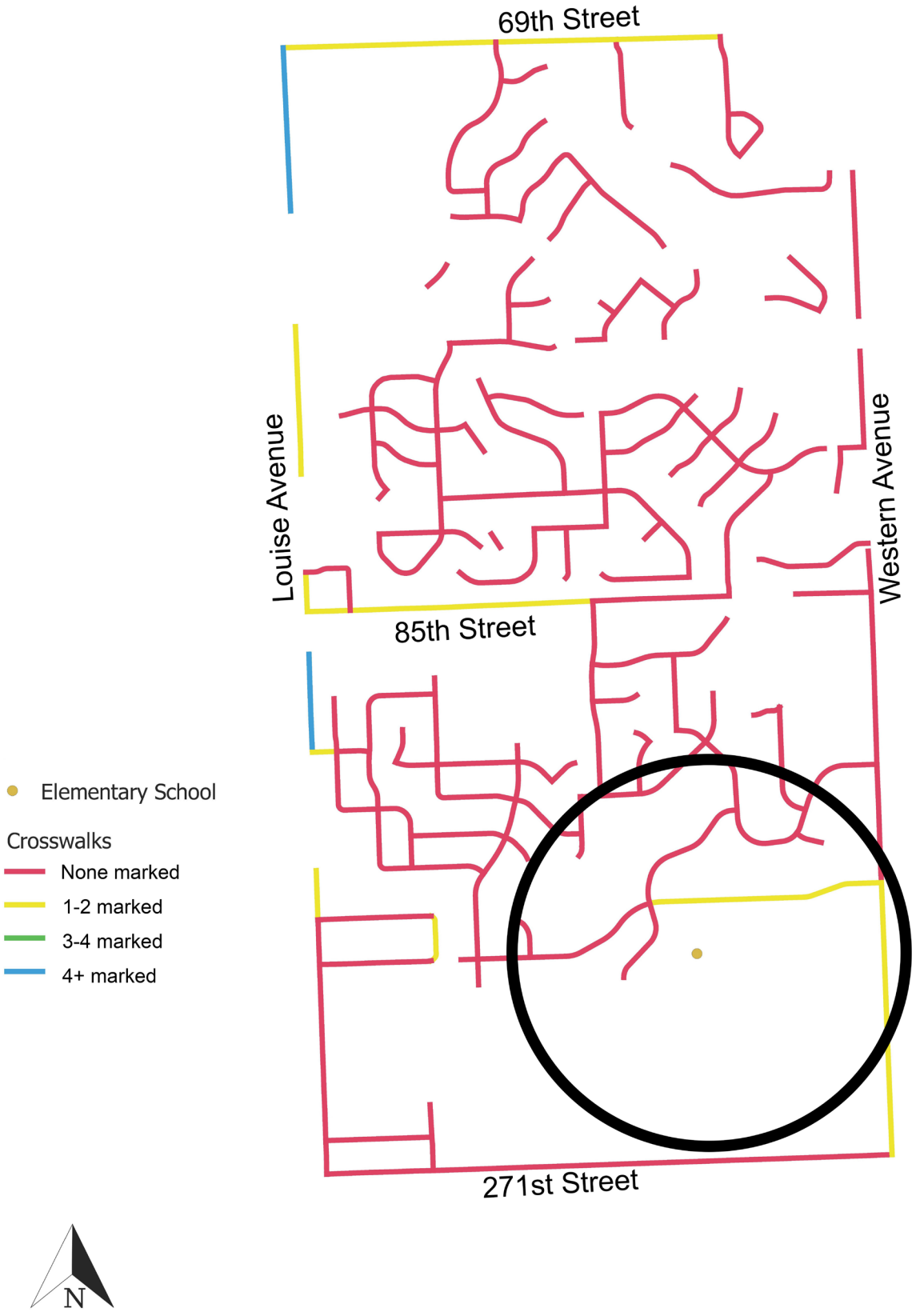

Figure 39: Endeavor Study Area Crosswalks.

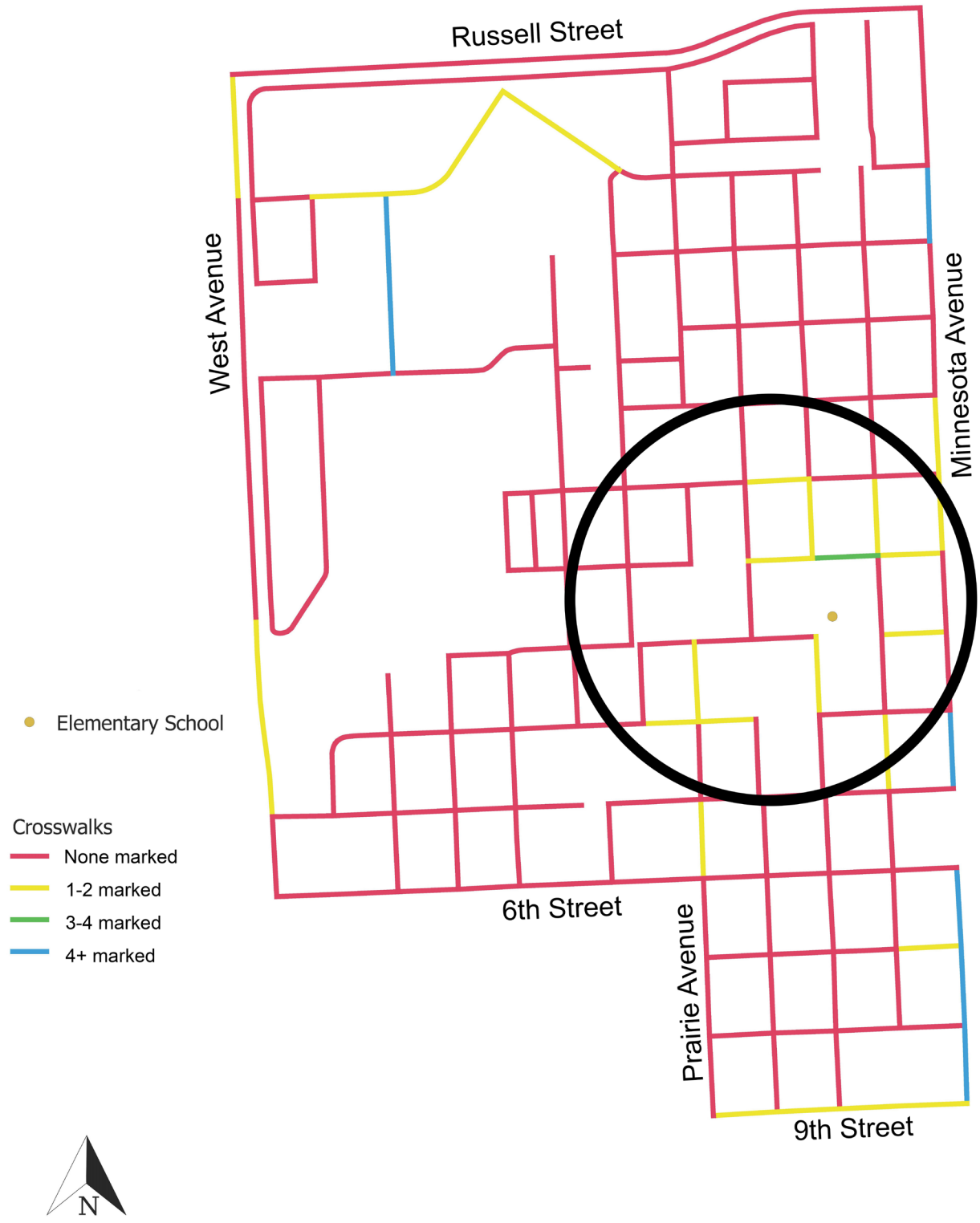

Figure 40: Hawthorne Study Area Crosswalks.

Figure 41: Lowell Study Area Crosswalks.

Recommendation 18: Introduce Pedestrian Lighting along Key Streets

The use of pedestrian-scale lighting increases the amount of time people spend outside being active [Project for Public Spaces, 2008]. Lighting focused on sidewalks will draw people outside to follow the path and give pedestrians a more human-scale landscape. When more people are outside on the street at more times during the day, the safer the streetscape will be. Many streets in the study neighborhoods feature street-oriented lighting on the corners of blocks. These lights are generally 15-25 feet tall and are designed to improve navigation for vehicles. We recommend that all intersections should have street-oriented lighting installed at a minimum. In addition, we recommend that streets designated as safe routes to school incorporate pedestrian-oriented lighting. Pedestrian-oriented lighting is no more than 15 feet tall, and should be spaced to maximize lighting while reducing glare (30-50' on-center).

A basic LED post-top mount light will usually cost under $200 [Green Light Depot, 2019] and a basic fiberglass buried pole will usually cost under $600 [Light Poles Plus, 2019].

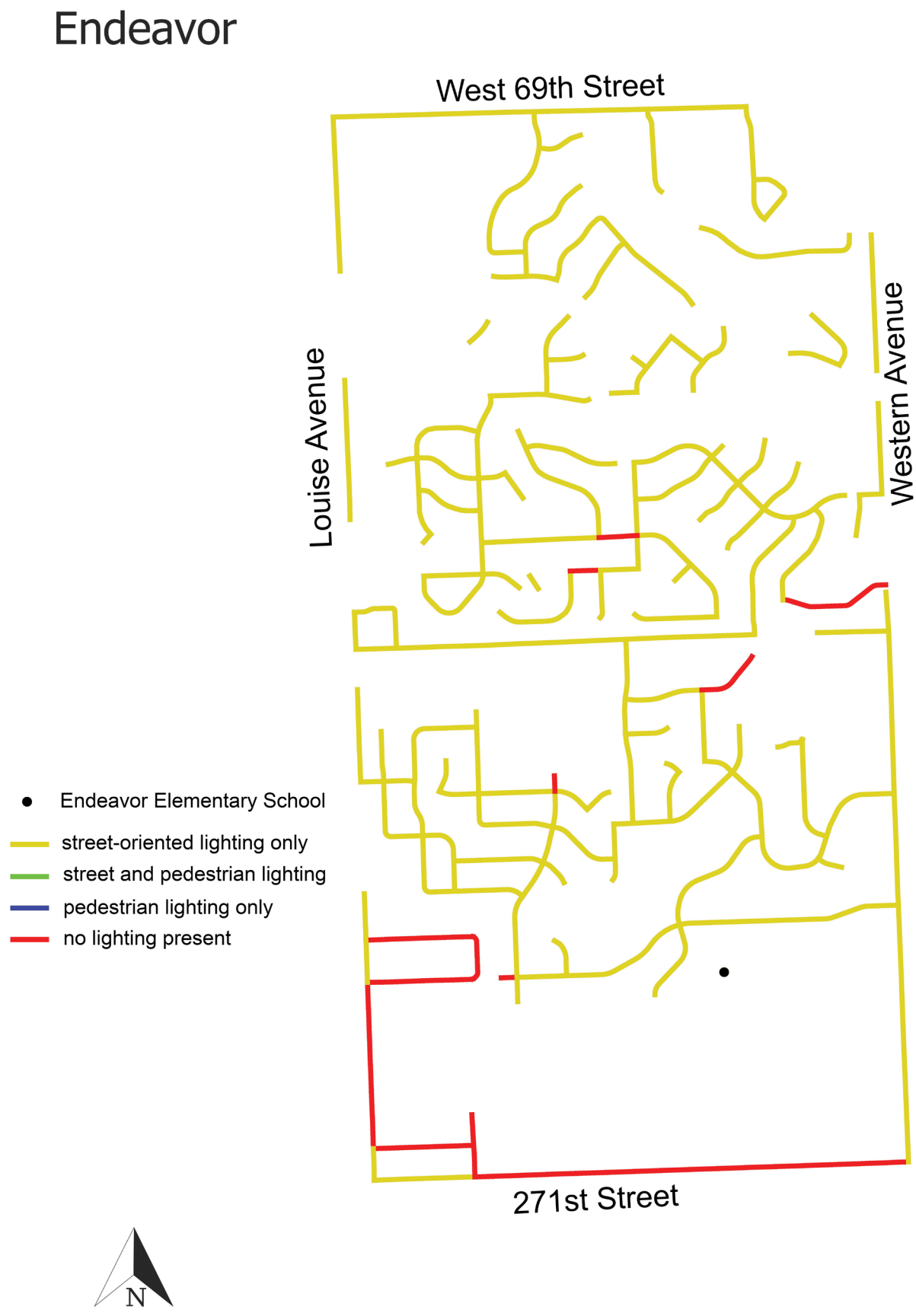

Figure 44: Endeavor Study Area Lighting.

Hawthorne

Figure 45: Hawthorne Study Area Lighting.

Figure 46: Lowell Study Area Lighting.

Recommendation 19: Develop Sidewalk Buffers

A sidewalk buffer is the separation between the street and the sidewalk, this space usually holds groundcovers and a line of trees to break up the view. Sidewalks buffers are a great idea because they add interest to the streetscape and increase the safety of the people using the sidewalks. One area that stood out in these districts was walking down Minnesota Avenue. This street is a little scary to walk right next to with the sidewalk right up to the street, adding a 4-6-foot buffer between the street and the sidewalk that creates a visual edge would increase the amount of people using that pathway. Adding trees and/or medium height shrubs in between the sidewalk and the street would create a visual edge and allow pedestrians to feel safer.

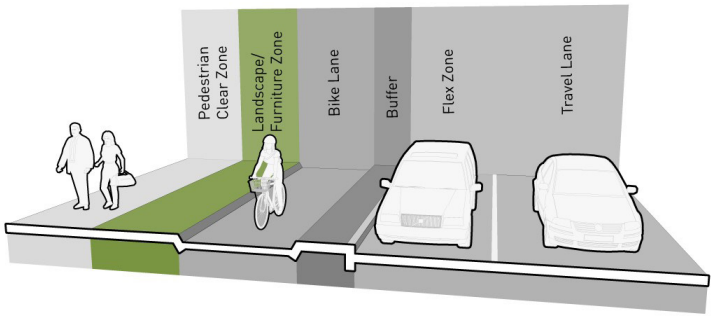

Figure 48: Example of Pedestrian Corridor in Streetscape.

Designing a good buffer is very simple, the most common buffers feature a 3+ foot bed of grass, but a better buffer would be to have at least 5 feet of groundcovers, with trees spaced at every 20 feet along the walk way, and some low shrubs to add interest to the understory. A buffer can also be introduced in between the car and bike traffic.

Another addition that could be used as a buffer is extending the sidewalks at major pedestrian intersections into the street a few feet. This can be done by pulling out the sidewalk a few feet and adding a mini-plaza space in the negative space that has benches, lighting, and accented landscaping creating bulb-outs. This narrows the distance that it takes to cross the street, cars slow down, and people find it easier to get to the other side. We propose these be installed at busy intersections with arterial streets that have on-street parking.

Figure 49: Sidewalk Buffer Example.

References

[1] Atkinson, Ray. "Road Diet and Buffered Bike Lanes on Loop Road." *0 To 100*, 26 June 2014, www.rayatkinsonplans.wordpress.com/2014/05/21/loop-road-redesign/.

[2] Betancourt, Leah. "10 Rules for Increasing Community Engagement." *Mashable*, Mashable, 16 Dec. 2009, mashable.com/2009/12/16/community-engagement/.

[3] Brown, Karla. "Report: Sioux Falls Is One of the Happiest Cities in America." *Mix 97-3*, 1 Sept. 2016, mix97-3.com/report-Sioux-falls-is-one-of-the-happiest-cities-in-america/.

[4] City of Sioux Falls. "Recreation Trails." *Official Site of the City of Sioux Falls South Dakota*, 2018, www.siouxfalls.org/parks/bike.

[5] City of Sioux Falls. "River Greenway Bike Trails, Street Routes & Recreation Trails." *City of Sioux Falls*.

[6] City of Sioux Falls. "Sioux Falls Population Grows to Estimated 187,200." *Official Site of the City of Sioux Falls South Dakota*, 4 Feb. 2019, www.siouxfalls.org/news/2019/February/04/population.

[7] "Darcy (DART Bus Assistant Based on BeagleBone Black)." *TI E2E™ Community*, www.e2e.ti.com/support/archive/launchyourdesign/m/msp430microcontrollerprojects/666607.

[8] "Detroit Bicycle Wayfinding." LivingLAB Detroit, 2017, www.livinglabdetroit.com/portfolio/detroit-bicycle-wayfinding/.

[9] "Downtown Block Party On The Eastbank." Artssiouxfalls.org- Home, Sioux Falls Art Council, https://www.artssiouxfalls.org/event/downtown-block-party-eastbank/.

[10] "Falls Park." South Dakota Department of Tourism, 20 Mar. 2019, www.travelsouthdakota.com/business-detail/falls-park.

[11] "Falls Park." *Visit Sioux Falls*, 9 Jan. 2015, visitsiouxfalls.com/things-to-do/falls-park/.

[12] Flintoff, John-Paul. "Eight Reasons People Don't Get Involved." *The Guardian*, Guardian News and Media, 25 Sept. 2014, www.theguardian.com/lifeandstyle/2014/sep/25/eight-reasons-people-do-not-involved-community.

[13] "Google Earth." *Google Earth*, Google, 2004.

[14] Google Earth Pro 7.3.2.5776. 2011. Terrace Park 43˚33'27.65" W, 96˚44'27.66" W, elevation 1416Ft. Viewed 4/17/2019.

[15] Google Earth Pro 7.3.2.5776. 2015. Veterans Memorial Park 43˚33'43.04" N, 96˚44'24.48" W, elevation 1377Ft. Viewed 4/17/2019.

[16] Google Earth Pro 7.3.2.5776. 2015. Falls Park 43˚33'22.15" N, 96˚43'22.33" W, elevation 1404Ft. Viewed 4/17/2019.

[17] Google Earth Pro 7.3.2.5776. 2011. Menlo Park 43˚32'02.55" N, 96˚44'20.95" W, elevation 1492Ft. Viewed 4/17/2019.

[18] Google Earth Pro 7.3.2.5776. 2018. Summit Ave. and 2nd Street 43˚33'22.82" N, 96˚44'08.68" W, elevation 1461Ft. Viewed 4/17/2019.

[19] Google Earth Pro 7.3.2.5776. 2017. Sanford USD Medical Center 43˚32'11.67" N, 96˚44'24.52" W, elevation 1512Ft. Viewed 4/17/2019.

[20] Google Earth Pro 7.3.2.5776. 2011. Endeavor 85th Street 43˚28'30.06" N, 96˚45'33.47" W, elevation 1545Ft. Viewed 4/17/2019.

[21] Green Light Depot. "LED Street Lights." Green Light Depot, 2019, www.greenlightdepot.com/collections/led-street-lights.

[22] Hays, Brooks. "California's Urban Trees Offer $1 Billion in Benefits." *UPI*, UPI, 14 June 2016, www.upi.com/Californias-urban-trees-offer-1-billion-in-benefits/1151465936848/.

[23] "Irimia R, Gottschling M (2016) Taxonomic Revision of Rochefortia Sw. (Ehretiaceae, Boraginales)." Biodiversity Data Journal 4: e7720. Https://Doi.org/10.3897/BDJ.4.e7720. *Urban Street Trees*, 7 July 2016, doi:10.3897/bdj.4.e7720.figure2f.

[24] Jacobs, Jane. "The Uses of Sidewalks: Safety." *The City Reader,* by Richard T. LeGates and Frederic Stout, Sixth Edition ed., Routledge, 2016, pp. 149–153.

[25] Ksfy. "69th & Western Construction Begins Monday." *KSFY,* 17 Apr. 2017, www.ksfy.com/content/news/69th--Western-construction-begins-Monday-419499453.html.

[26] "Lesson 10 - Federal Highway Administration University Course on Bicycle and Pedestrian Transportation, July 2006 - FHWA-HRT-05-104." U.S. Department of Transportation/ Federal Highway Administration, July 2006, https://www.fhwa.dot.gov/publications/research/safety/pedbike/05085/pptchapt10.cfm.

[27] Light Poles Plus. "Round Tapered Fiberglass Burial." LightPolesPlus.com, 2019, https://www.lightpolesplus.com/light-poles/fiberglass-light-poles/round-tapered-fiberglass-burial.

[28] Ma, Ming et al (2010). "Safety Analysis of Urban Arterials Under Mixed-Use Patterns in Beijing." *Transportation Research Record: Journal of the Transportation Research Board*, No. 2193, Transportation Research Board of the National Academies, Washington, DC, 2010, pp. 105-115. http://www.tjsafety.cn/bgAdmin/htmledit/uploadfile/20130521161315941.pdf.

[29] The McComm Group. "The McComm Group » Decatur Wayfinding Signage." *The McComm Group*, www.mccommgroup.com/project/decatur-wayfinding-signage/.

[30] Modulex. "The Comprehensive Guide to Wayfinding and Signage." *The British Contract Furnishing Association*.

[31] Project for Public Spaces (2008). "Lighting Use and Design". https://www.pps.org/article/streetlights.

[32] "Protected Bike Lanes." Protected Bike Lanes: Seattle Streets Illustrated, 2019, www.streetsillustrated.seattle.gov/design-standards/bicycle/protected-bike-lanes/.

[33] Seamans, Georgia Silvera. "Mainstreaming the Environmental Benefits of Street Trees." *Urban Forestry & Urban Greening*, vol. 12, no. 1, 2013, pp. 2–11., doi:10.1016/j.ufug.2012.08.004.

[34] "Sioux Falls Events." SiouxFallsEvents.com - Home, Forward Sioux Falls, www.siouxfallsevents.com/eventDetails.CFM?EventID=17760&EventDateID=317147.

[35] Sioux Falls Public Works Department-Engineering Division. "TRAFFIC VOLUME COUNTS FOR THE CITY OF SIOUX FALLS." Dec. 2012.

[36] "Terrace Park Japanese Garden." Official Site of the City of Sioux Falls South Dakota, www.siouxfalls.org/parks/parks/weddings/terrace-rules/gallery.

[37] "Traffic Calming EPrimer - Safety | Federal Highway Administration." *Safety*, Federal Highway Administration, 14 Feb. 2017, safety.fhwa.dot.gov/speedmgt/ePrimer_modules/module2.cfm#mod21.

[38] "Urban Corridor Revitalization-Monona Drive – Monona, WI." *Strand Associates, Inc.*, www.strand.com/strand_projects/urban-corridor-revitalization-monona-drive-monona-wi/.

[39] "Walmart Neighborhood Market." EMJ, EMJ Corporation, www.emjcorp.com/project/walmart-neighborhood-market-hurst-tx/.

[40] Wang, Betty. "Legal to Ride a Bike on a Sidewalk?" Findlaw, 24 Aug. 2013, www.blogs.findlaw.com/law_and_life/2013/08/legal-to-ride-a-bike-on-sidewalk.html.

[41] Warner, Alison. "Basics of Wayfinding." *Graphic Products*, 22 Feb. 2019, www.graphicproducts.com/infographics/wayfinding-infographic/.

[42] Yurtoğlu, Nadir. "Http://Www.historystudies.net/Dergi//Birinci-Dunya-Savasinda-Bir-Asayis-Sorunu-Sebinkarahisar-Ermeni-isyani20181092a4a8f.Pdf." *History Studies International Journal of History*, vol. 10, no. 7, 2018, pp. 241–264., doi:10.9737/hist.2018.658.