



Jackson Street Multimodal Traffic Safety and Quality of Life Study

Church Avenue to Murdock Avenue
City of Oshkosh

Prepared for:

City of Oshkosh

10/5/2020

Ingenuity, Integrity, and Intelligence.

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**Church Avenue to Murdock Avenue
City of Oshkosh**



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- Appendix C Alternative Cost Estimates
- Appendix D Public Engagement Comments

Executive Summary

The City of Oshkosh retained Ayres Associates to conduct a traffic safety and quality of life study along the Jackson Street corridor from Church Avenue to Murdock Avenue. Existing traffic speed and safety data indicate there is a need to tame traffic speeds in this residential neighborhood that will enhance safety for all users, and improve mobility for vehicles, pedestrians, and bicyclists. The study summarizes existing travel speeds, safety, and operation of the corridor and identifies several roadway cross-section improvement alternatives.

A land use, zoning, urban design, and transportation plan for the area between I-41 and Murdock Avenue, north of the study corridor, is underway concurrently with this traffic safety and quality of life study. Because both studies are located along the Jackson Street corridor, the public engagement process was coordinated and included presentations on both studies, allowing attendees to comment on both study corridors. The corridor study to the north is summarized in a separate document, but references to the other study area can be found in the public engagement portion of this report.

Jackson Street is a north/south, four-lane urban roadway, with a 30-mph posted speed limit. The street is also identified as a “connecting highway” by the Wisconsin Department of Transportation (WisDOT) as US 45 and STH 76. The corridor also serves as the signed alternate route for I-41. The corridor includes 17 intersections, including Murdock Avenue and Church Avenue, as well as 148 private curb openings serving 165 residential properties. The corridor travels through a predominantly residential neighborhood. The presence of Merrill Elementary/Middle School to the east and the University of Wisconsin-Oshkosh to the west creates pedestrian activity along the corridor, with a high number of students of all ages. Traffic signal-controlled intersections are located at New York Avenue, Irving Avenue, and Church Avenue.

The study segment of Jackson Street was reconstructed by WisDOT in 2001, expanding the street from two lanes to four lanes with a greatly reduced terrace width. The width of the roadway is 45', within a 60' right-of-way from Church Avenue to New York Avenue and a 66' right-of-way from New York Avenue to Hobbs Avenue. The intent of this study is not a full roadway reconstruction as the existing roadway still has useable life.

Intersection turning movement counts were gathered at the three study intersections of New York Avenue, Irving Avenue, and Church Avenue from 3:00pm – 6:00pm on Monday, November 18, 2019; 6:00am – 9:00am on Tuesday, November 19, 2019; and 6:00am – 9:00am on Wednesday, November 20, 2019 when surrounding schools were in session.

WisDOT traffic counts gathered in 2019 resulted in the following daily traffic volumes:

- Murdock Avenue to New York Avenue: 17,100 vpd
- New York Avenue to Irving Avenue: 12,300 vpd
- Irving Avenue to Church Avenue: 10,300 vpd

Jackson Street historical daily traffic counts along the study corridor indicate that traffic volumes have remained relatively constant over the last 20 years. Traffic forecasts from the ECWRPC indicate an average annual growth rate of approximately 0.35% per year is expected on Jackson Street, with slightly lower growth on the intersecting streets. This growth rate results in the following daily traffic volume estimates for the design year of 2045

- Murdock Avenue to New York Avenue: 18,650 vpd
- New York Avenue to Irving Avenue: 13,400 vpd
- Irving Avenue to Church Avenue: 11,250 vpd

Vehicle speed data on Jackson Street, collected at two locations along the study corridor, indicate the 85th percentile speeds range between 35 mph and 40 mph and 68% to 92% of traffic exceeds the posted 30 mph speed limit, depending on the location and the direction of travel.

Street segment and intersection crash data provided by the UW TOPS Lab for the five-year period from 2014 through 2018 indicate an average of 63 crashes occur per year within the study corridor with a peak of 75 total crashes in 2016.

The highest intersection crash locations were as follows:

- Murdock Avenue: Average 16 crashes per year
- New York Avenue: Average 13 crashes per year
- Irving Avenue: Average 6 crashes per year

The primary collision patterns involved left-turn, rear-end, and lane-changing/sideswipe crashes. The three intersections identified above experience intersection crash rates above the most recent statewide average crash rate for urban intersections. Four of the corridor crashes during the study time period involved pedestrians. The prevalence of left-turn crashes at the Jackson Street intersection with New York Avenue lead to a decision in 2018 to prohibit northbound and southbound left turns from Jackson Street onto New York Avenue weekdays from 3pm to 7pm. During the 12-month period following the implementation of the left-turn restriction, the Jackson Street intersection with New York Avenue experienced five crashes.

Intersection operation is typically quantified based on its level of service (LOS) during peak traffic volume periods. The LOS is determined based on the average amount of delay experienced by each vehicle entering an intersection during the study period and is categorized by grades 'A' through 'F'. As a National Highway System Route, WisDOT identifies the desirable LOS as LOS 'D' or better.

Table 1 provides a brief summary of the different intersection LOS.

Table 1: Intersection Level of Service Description

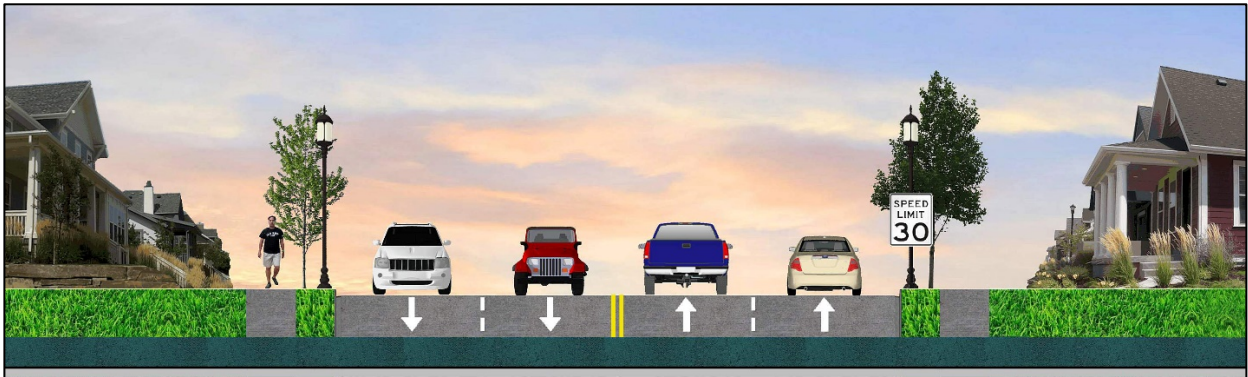
Alpha LOS	Signalized (sec/veh)	Unsignalized Delay (sec/veh)	Description
A	≤ 10	≤ 10	No Congestion: Very few vehicles experience delay.
B	> 10 - 20	> 10 - 15	Minimal Congestion: Some vehicles experience delay but many travel through intersection without stopping.
C	> 20 - 35	> 15 - 25	Minor Congestion: Many vehicles experience delay but some travel through intersection without stopping.
D	> 35 - 55	> 25 - 35	Moderate Congestion: Most vehicles experience delay.
E	> 55 - 80	> 35 - 50	Severe Congestion: Most vehicles experience significant delay. Volumes nearing capacity.
F	> 80 Or V/C >1.0	> 50 Or V/C >1.0	Extreme Congestion: Nearly all vehicles experience significant delay. Volume may be higher than capacity. Potential gridlock.

The three study intersections within the project corridor operate at LOS 'D' or better under the existing conditions and are expected to continue to operate at LOS 'D' or better in the design year of 2045 under a "Do Nothing" scenario.

The study identified three corridor improvement alternatives, all of which are expected to operate at an acceptable LOS 'D' or better.

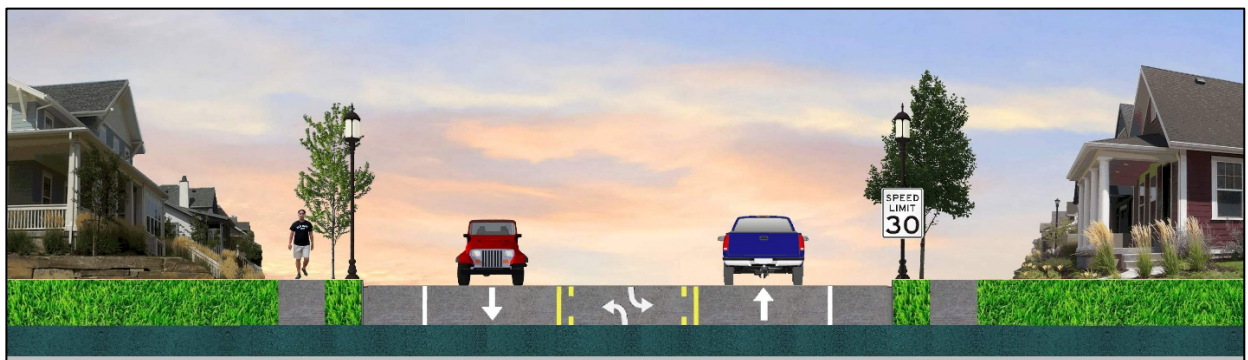
Alternative 1 maintains the existing four-lane cross-section along Jackson Street between Church Avenue and Murdock Avenue, as shown in Figure 1. The alternative would include the installation of speed feedback signs on overhead poles to increase motorist's awareness of their speed and encourage a reduction in travel speed. Two speed feedback signs would be installed in each direction of travel; one shortly after entering the study corridor and a second near Scott Avenue to reinforce the need to comply with the posted speed limit. Maintaining the existing cross-section limits the ability to incorporate geometric improvements along the corridor. The concept drawing for Alternative 1 is shown in the attached Exhibit 1.

Figure 1: Alternative 1 Cross-Section



Alternative 2A reconfigures the existing Jackson Street four-lane cross-section between Church Avenue and Murdock Avenue to one 11'-wide through lane in each direction, a 13'-wide center two-way left-turn lane, and a 5' curb buffer area on each side of the street, as shown in Figure 2. This design changes the roadway image from a highway to an urban street. Along southbound Jackson Street, the two lanes exiting the roundabout at Murdock Avenue would merge to a single lane prior to the intersection with Stanley Avenue. Northbound Jackson Street would expand from one lane to two lanes near the intersection with Hobbs Avenue. This design would also allow for dedicated left-turn lanes to be included at the signalized intersections with a shared through/right-turn lane in each direction. Left turns would be prohibited from northbound Jackson Street to westbound Nevada Avenue to avoid potential left-turning safety conflicts with southbound traffic.

Figure 2: Alternative 2A Cross-Section



Continental-style crosswalk pavement markings would be installed at the unsignalized intersections with Prospect Avenue, Scott Avenue, and Lincoln Avenue, along with pedestrian crossing signs at each of

these locations. A crosswalk would also be added on the north side of the Jackson Street intersection with Congress Avenue. This crossing would feature rectangular rapid flashing beacons (RRFB) to draw more attention to the presence of pedestrians. Continental-style crosswalks provide increased visibility for oncoming traffic and sight impaired pedestrians. The existing crosswalk at the Jackson Street intersection with Hobbs Avenue would be removed for pedestrian safety purposes given the four lanes of traffic, the presence of turning vehicles, and the lane add/drop conditions that would occur with this alternative. The combination of these factors results in several decision points for motorists making it difficult for pedestrians to safely cross the street.

The narrowed travel way of Alternative 2A allows for consideration of curb bump-outs at the locations where pedestrian crosswalks will be added at Lincoln Avenue, Scott Avenue, Prospect Avenue, and Congress Avenue. These bump-outs could involve reconstruction of the curb and gutter and sidewalk extension, or as a painted bump-out with bollards that would leave the existing curb and gutter in its existing location. The painted bump-out with bollards presents challenges with snow removal and therefore is the less desirable option. The reconstruction option provides an improved raised curb refuge area for pedestrians and eliminates the potential for damage to the bollards but would require potential drainage improvements.

Alternative 2A would include the installation of speed feedback signs on side-mounted poles to make motorists aware of their speed and encourage a reduction in travel speed. Two speed feedback signs would be installed for each direction of travel; one shortly after entering the study corridor and a second near Scott Avenue to reinforce the encouragement to comply with the posted speed limit.

Reducing the number of lanes along Jackson Street from four to three in Alternative 2A would reduce the amount of aid received by the City from WisDOT for connecting highways. Based off of year 2020 payments, converting to the three lane cross section for 1.13 miles would reduce the connecting highways funding by \$8,202.10 per year.

The concept drawing for Alternative 2A is shown in the attached Exhibit 2.

Alternative 2B combines the Alternative 2A design south of New York Avenue with the Alternative 1 design north of New York Avenue. The existing four-lane cross-section along Jackson Street between Church Avenue and New York Avenue would be reconfigured to one 11'-wide through lane in each direction, a 13'-wide center two-way left-turn lane, and a 5' curb buffer on each side of the street. This would allow for the improvements previously described in Alternative 2A to be included south of New York Avenue, including designated left-turn lanes at signalized intersections and the addition of continental-style crosswalks and curb bump-outs at Prospect Avenue, Scott Avenue, and Lincoln Avenue.

Jackson Street between New York Avenue and Murdock Avenue would remain under the existing four-lane configuration. The only improvement along this segment would be the installation of a speed feedback sign for southbound traffic exiting the roundabout at the Murdock Avenue intersection. The four-lane cross-section would transition to the three-lane redesigned roadway with a TWLTL between New York Avenue and Prospect Avenue.

Reducing the number of lanes along Jackson Street from four to three in Alternative 2B would reduce the amount of aid received by the City from WisDOT for connecting highways. Based off of year 2020 payments, converting to the three lane cross section for 0.65 miles would reduce the connecting highways funding by \$4,718.02 per year.

The concept drawing for Alternative 2B is shown in the attached Exhibit 3.

The traffic operations analysis for the study intersections during the morning and evening peak hours in the design year of 2045 resulted in the overall intersection LOS, intersection average delay per vehicle, and maximum north/south queues shown in Table 2.

The overall intersection LOS in the design year of 2045 is expected to be similar for all three alternatives, with scores in the LOS 'A' to LOS 'B' range. Alternatives 2A and 2B are expected to experience a slight increase in average delay per vehicle and an increase in the maximum queue lengths for northbound and southbound traffic, when compared to Alternative 1. At New York Avenue, Alternative 2B is expected to experience a decrease in the maximum queue length for southbound traffic.

Sample communities across the country have identified a maximum upper limit of up to 25,000 vpd for consideration of a roadway redesign from a four-lane to a three-lane cross-section. FHWA recommends an upper limit of 20,000 vpd for consideration of a three-lane cross section and the WisDOT FDM recommends an upper limit of 17,500 vpd. Jackson Street, south of New York Avenue is expected to experience a design year AADT of 13,400 vpd and an AADT of 18,650 vpd north of New York Avenue. Although the segment north of New York Avenue is above the upper AADT threshold recommended by WisDOT, the intersection analysis suggests that intersection operations at New York Avenue can be expected to provide an acceptable LOS when redesigned.

Table 2: Comparison of Year 2045 Expected Intersection Traffic Operations

	Church Avenue			Irving Avenue			New York Avenue		
	Alt 1	Alt 2A	Alt 2B	Alt 1	Alt 2A	Alt 2B	Alt 1	Alt 2A	Alt 2B
Morning Peak Hour									
Intersection Level of Service	B	B	B	A	B	B	B	B	B
Intersection Ave Delay (sec)	11.4	12.6	12.6	9.7	10.8	11.3	13.8	16.1	13.7
Maximum N/S Queue (Feet)	75' NB 175' SB	150' NB 275' SB	150' NB 275' SB	75' NB 75' SB	125' NB 175' SB	125' NB 150' SB	75' NB 200' SB	125' NB 425' SB	125' NB 150' SB
Evening Peak Hour									
Intersection Level of Service	B	B	B	A	A	A	B	B	B
Intersection Ave Delay (sec)	14.4	16.5	16.5	7.9	9.5	9.6	12.0	13.6	12.6
Maximum N/S Queue (Feet)	125' NB 125' SB	300' NB 200' SB	300' NB 250' SB	100' NB 75' SB	225' NB 250' SB	225' NB 175' SB	100' NB 150' SB	325' NB 350' SB	325' NB 125' SB

The multimodal traffic safety and quality of life study evaluated the safety and operations of the existing corridor geometrics and multiple potential corridor improvements to identify recommended treatments for improving the quality of life along the corridor and identifying the impacts to safety, travel speeds, and operation. Table 3 provides a qualitative summary of the expected impact that each Alternative will have on the evaluation criteria. Additional details of the expected impact that each alternative will have on operations, safety, and vehicle speeds can be found in this report.




























Alternative 1 is expected to operate with a higher roadway reserve capacity for through traffic than the other two alternatives but provide less improvements to safety and the reduction of travel speeds when compared to the other two alternatives.

Alternative 2A is expected to operate with a lower reserve capacity for through traffic but still maintain an acceptable LOS with higher intersection maximum queue lengths than Alternatives 1 and 2B. Alternative 2A provides the highest potential safety improvement, greatest reduction in travel speeds, needed space for snow storage, easier ingress/egress from corridor driveways, additional pedestrian accommodations, and increased buffer space between vehicles and pedestrians. The existing longitudinal pavement joints will not align with the proposed pavement markings in Alternative 2A, which can lead to driver confusion especially during wet pavement conditions.

Alternative 2B provides the same benefits for residents south of New York Avenue as Alternative 2A, related to safety improvement, reduction in travel speeds, needed space for snow storage, easier ingress/egress from corridor driveways, additional pedestrian accommodations, and increased buffer

space between vehicles and pedestrians. North of New York Avenue, Alternative 2B limits the potential for safety and speed improvements to that of Alternative 1 but provides more roadway through capacity than Alternative 2A in the segment where design-year AADT levels are expected to exceed the WisDOT-recommended upper threshold for the consideration of a three-lane cross-section. The existing longitudinal pavement joints will not align with the proposed pavement markings in Alternative 2B, which can lead to driver confusion especially during wet pavement conditions.

Table 3: Comparison of Alternatives

	Alternative 1 Maintain Existing Cross-Section	Alternative 2A Full Roadway Redesign with Two- Way Left-Turn Lane	Alternative 2B Partial Roadway Redesign with Two- Way Left-Turn Lane
Vehicular Reserve Capacity			
Safety			
Vehicular Speeds			
Pedestrian Accommodations			
Snow Storage			
Driveway Access			
Noise			
Public Feedback			
Cost*	\$70K - \$80K	\$180K - \$230K	\$130K - \$180k
Qualitative Comparison Scale:  Higher Positive Impact  Moderate Positive Impact  Lower Positive Impact			

*Costs for Alternatives 2A and 2B include a range for the inclusion of either reconstructed or painted bump-outs.

Recommendation: It is recommended that Alternative 2A be implemented along the Historic Jackson Street study corridor. The redesigned cross-section is a better solution for the City compared to the existing four-lane highway design in a built-up urban area with pedestrian and numerous driveway traffic conflicts. Alternative 2A is expected to provide the greatest safety improvement among the three alternatives along the corridor by improving left-turn offsets, reducing travel speeds and the severity of injury-related crashes, and reducing the potential for pedestrian-related crashes. It simplifies ingress/egress at the 148 private curb openings along the corridor. The buffer space between the travel lane and the curb increases the available snow storage space in winter and provides greater separation between the travel way and sidewalk, creating a more inviting sidewalk space for pedestrians. All primary intersection traffic movements are expected to continue to operate at an acceptable LOS 'D' or better and the recommendation is consistent with information provided in the City's Bicycle and Pedestrian Master Plan. In addition, Alternative 2A does a better job of addressing the comments and concerns expressed by the public at the public engagement sessions and stakeholder meetings. The Jackson Street redesign provides a proven opportunity to enhance safety for vehicular traffic, as well as pedestrians and bicyclists, while also enhancing the quality of life in the adjacent residential neighborhood.

At the request of the City, consideration was given to a phased approach for implementing improvements along Jackson Street. A potential phased improvement moving from Alternative 1 to Alternative 2B to Alternative 2A could include the following steps.

1. Installation of speed feedback signs (similar to Alternative 1).
2. Conversion of the existing roadway to a three-lane cross section with center left-turn lane from Church Avenue to New York Avenue (similar to Alternative 2B).
3. Conversion of the existing roadway to a three-lane cross section with center left-turn lane from New York Avenue to Murdock Avenue (similar to Alternative 2A).

Additionally, the curb bump-outs included in Alternatives 2A and 2B could be constructed at a later date as part of a phased approach. The phased implementation plan is feasible and would allow for an opportunity to measure the performance of the improvements prior to implementing the next roadway improvement. On the other hand, implementing improvements in this manner would have the following drawbacks.

First, the speed feedback signs under Alternative 1 are recommended as overhead signs, making them more visible to drivers within a four-lane cross section. Under the three-lane cross section of Alternative 2A, the speed feedback signs could be post-mounted on the side of the roadway. Using the phased implementation would result in either post-mounted signs that are less effective as an initial improvement in the four-lane cross section, or an increase in the cost of an ultimate three-lane design under Alternative 2A to include overhead signing. It is recommended that if a phased approach is used, overhead signing be installed for improved sign visibility.

The second drawback is the cumulative impact of the improvements would not be fully realized until the final improvement is made. Each of the improvements suggested with Alternative 2A has its individual impact on speeds and safety, but the cumulative effect when combined together and implemented along the entire length of the corridor can be more powerful in redefining the roadway as an urban street as opposed to a higher-speed highway.

A third drawback is the need to restripe the area surrounding the New York Avenue intersection multiple times. The pavement markings applied under the second step, reflecting the design shown in Alternative 2B, would need to be removed for the third step, continuing the three-lane cross section north to Murdock Avenue.

Introduction

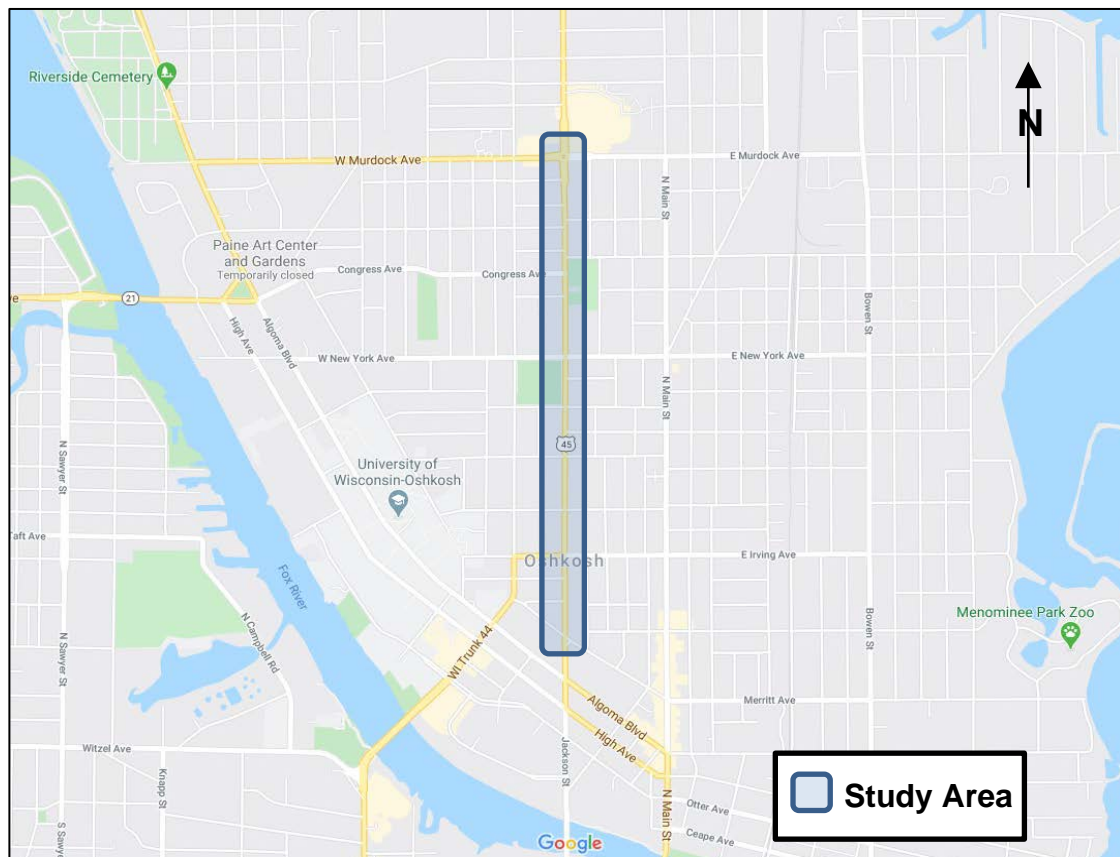
The City of Oshkosh retained Ayres Associates to conduct a traffic safety and quality of life study along the Jackson Street corridor from Church Avenue to Murdock Avenue. Existing traffic speed and safety data indicate there is a need to tame traffic in this residential neighborhood that will enhance safety for all users, and improve mobility for vehicles, pedestrians, and bicyclists. The study summarizes existing travel speeds, safety, and operation of the corridor and identifies several roadway cross-section improvement alternatives. For each alternative, summaries of existing and future year traffic operation are evaluated to provide potential impacts on travel speeds, safety, and neighborhood quality of life. Additional information is provided on the public engagement process used during the study and feedback received from citizens.

A land use, zoning, urban design, and transportation plan for the area between I-41 and Murdock Avenue, north of the study corridor, is underway concurrently with this traffic safety and quality of life study. Because both studies are located along the Jackson Street corridor, the public engagement process was coordinated and included presentations on both studies, allowing attendees to comment on both study corridors. The corridor study to the north is summarized in a separate document, but references to the other study area can be found in the public engagement portion of this report.

Study Area

The location of the Jackson Street study corridor is shown in Figure 3.

Figure 3: Study Area



Jackson Street is a north/south, four-lane urban roadway, with a 30-mph posted speed limit. The street is also identified as a “connecting highway” by the Wisconsin Department of Transportation (WisDOT) as US 45 and STH 76. A connecting highway is a marked route of the state trunk highway system over streets or highways in any municipality for which the municipality will be responsible for maintenance and traffic control and are eligible for aid payments under Wis. Stat. 86.32. The corridor also serves as the signed alternate route for I-41. The corridor includes 17 intersections, including Murdock Avenue and Church Avenue, as well as 148 private curb openings serving 165 residential properties. The corridor travels through a predominantly residential neighborhood. The presence of Merrill Elementary/Middle School to the east and the University of Wisconsin-Oshkosh to the west creates pedestrian activity along the corridor, with a high number of students of all ages. Traffic signal-controlled intersections are located at New York Avenue, Irving Avenue, and Church Avenue.

The study segment of Jackson Street was reconstructed by WisDOT in 2001, expanding the street from two lanes to four lanes with a greatly reduced terrace width. The width of the roadway is 45’, within a 60’ right-of-way from Church Avenue to New York Avenue and a 66’ right-of-way from New York Avenue to Hobbs Avenue. The intent of this study is not a full roadway reconstruction as the existing roadway still has useable life.

Traffic Volumes

Existing Traffic

The following information summarizes the most recent 2019 annual average daily traffic counts (AADT) collected by WisDOT. The count data summarizes the number of vehicles per day (vpd).

- 2019 Existing Annual Average Daily Traffic:
 - Murdock Avenue to New York Avenue: 17,100 vpd
 - New York Avenue to Irving Avenue: 12,300 vpd
 - Irving Avenue to Church Avenue: 10,300 vpd

Hourly traffic volumes on Jackson Street exhibit typical urban morning and evening peak hour directional flow patterns, with an increased volume of southbound traffic during the morning rush hour and an increased volume of both northbound and southbound traffic during the evening rush hour. Figure 4 identifies the hourly traffic distribution northbound (blue) and southbound (red) on Jackson Street south of Irving Avenue.

Figure 4: Jackson Street Hourly Traffic Distribution South of Irving Avenue

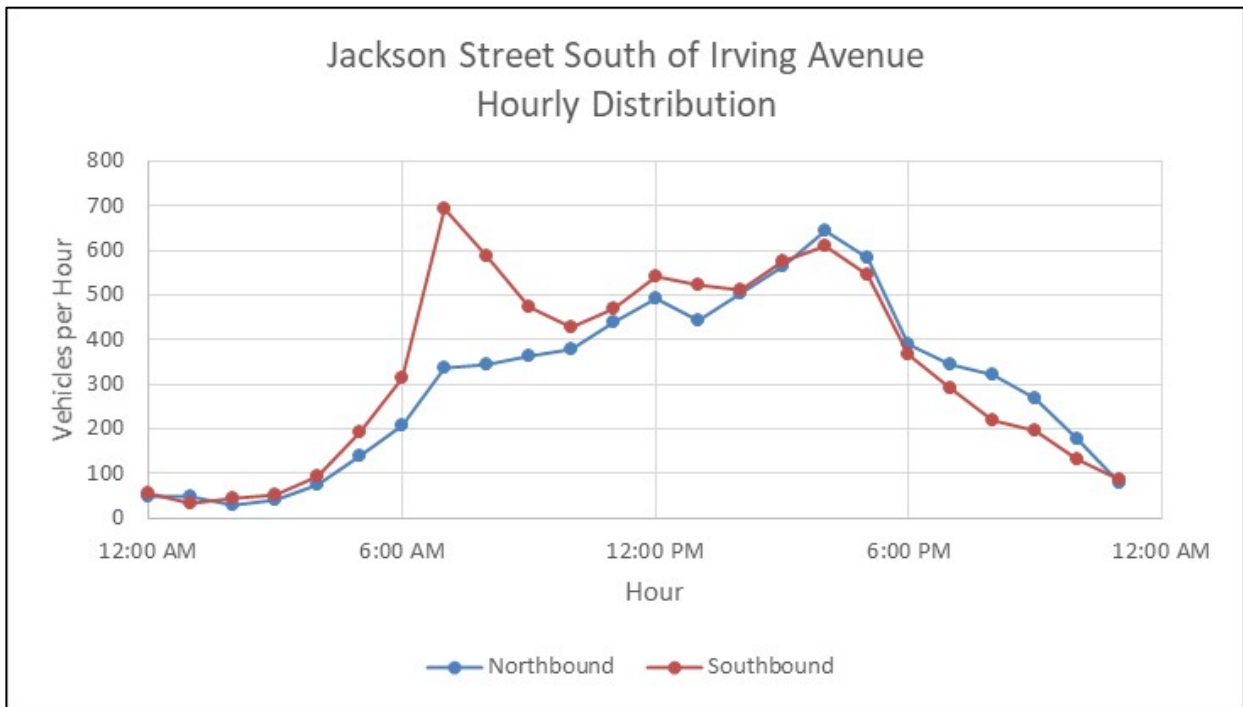
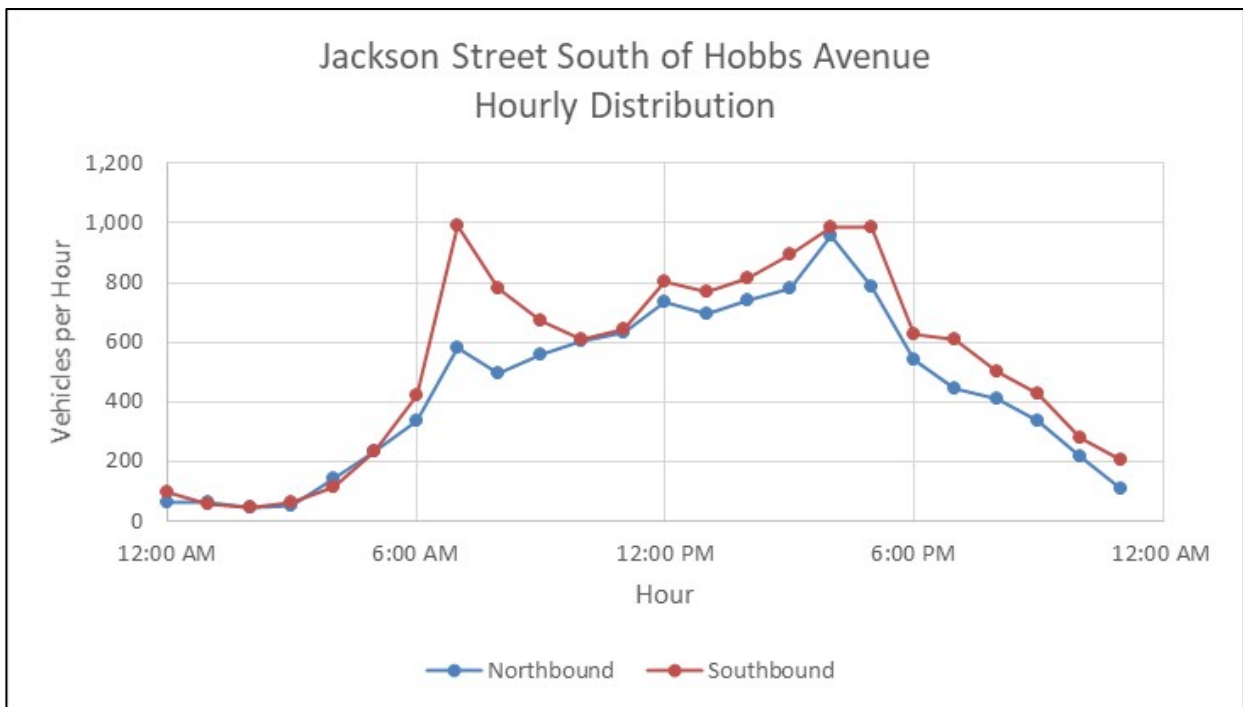


Figure 5 identifies a similar hourly traffic distribution on Jackson Street south of Hobbs Avenue.

Figure 5: Jackson Street Hourly Traffic Distribution South of Hobbs Avenue



Jackson Street serves as a southbound bus route for Go Transit Bus Route 2 “Main/Jackson.” The route runs Monday through Saturday from 6:15am to 6:45pm with a 30-minute frequency. Bus stops are located within the study area along the west side of Jackson Street at the following side streets:

- Stanley Avenue
- Nevada Avenue
- New York Avenue
- Scott Avenue
- Irving Avenue

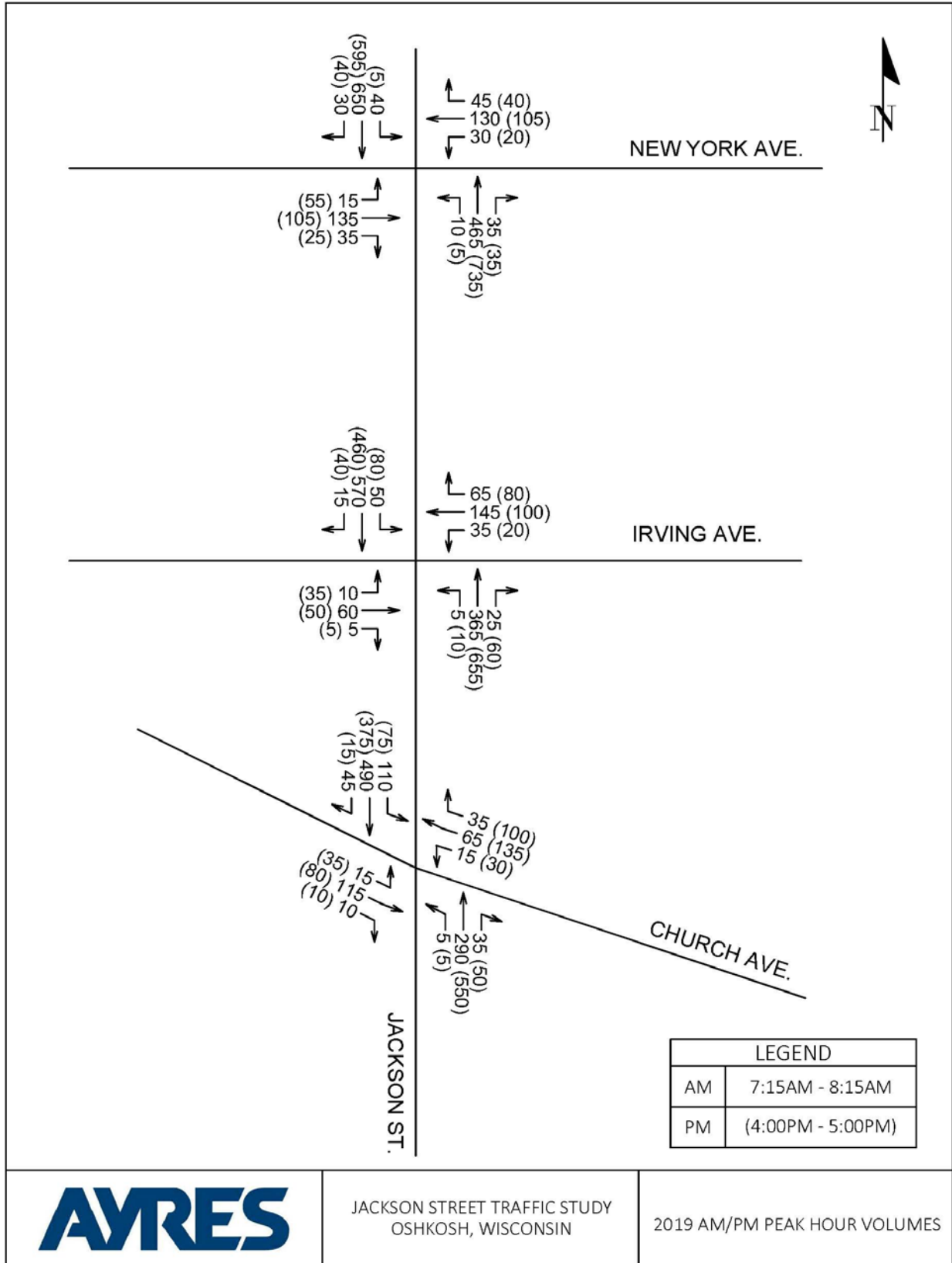
Intersection turning movement counts were gathered at three study intersections from 3:00pm – 6:00pm on Monday, November 18, 2019; 6:00am – 9:00am on Tuesday, November 19, 2019; and 6:00am – 9:00am on Wednesday, November 20, 2019 when surrounding schools were in session. The Jackson Street study intersections included:

- New York Avenue
- Irving Avenue
- Church Avenue

The intersection turning movement counts included vehicular, bicycle, and pedestrian traffic. The peak hour intersection traffic count data is shown in Figure 6. As an overall downtown system, the morning peak hour occurs approximately from 7:15am – 8:15am with the evening peak hour occurring approximately from 4:00pm – 5:00pm. Trucks compose approximately 2% of traffic along Jackson Street during the peak hours. The intersection turning movement count data is included in Appendix A of the technical supplement.

As the I-41 Alternate Route, Jackson Street experiences an increase in traffic volumes when major incidents cause a closure of I-41. From discussion with City Police Department staff, it is estimated these incidents occur approximately four or five times each year.

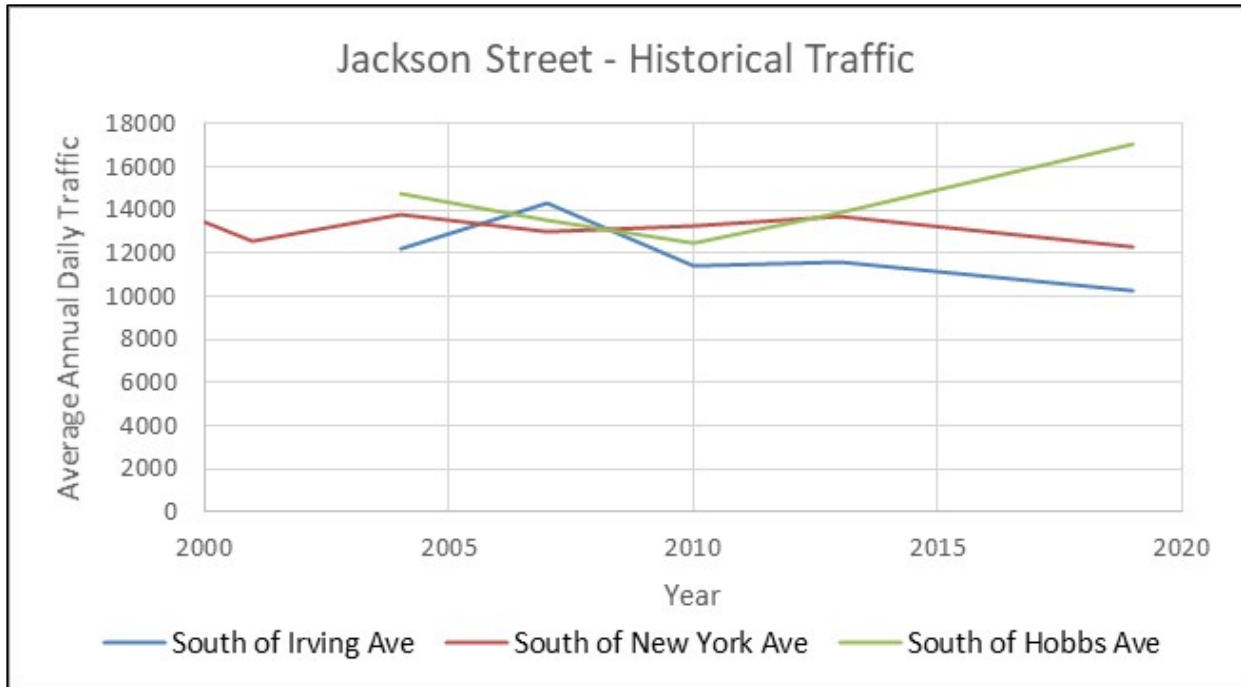
Figure 6: 2019 Existing Peak Hour Traffic Volumes



Traffic Forecast

Jackson Street historical daily traffic counts along the study corridor indicate that traffic volumes have remained relatively constant over the last 20 years. As shown in Figure 7, daily traffic counts at three locations along the corridor remained relatively flat.

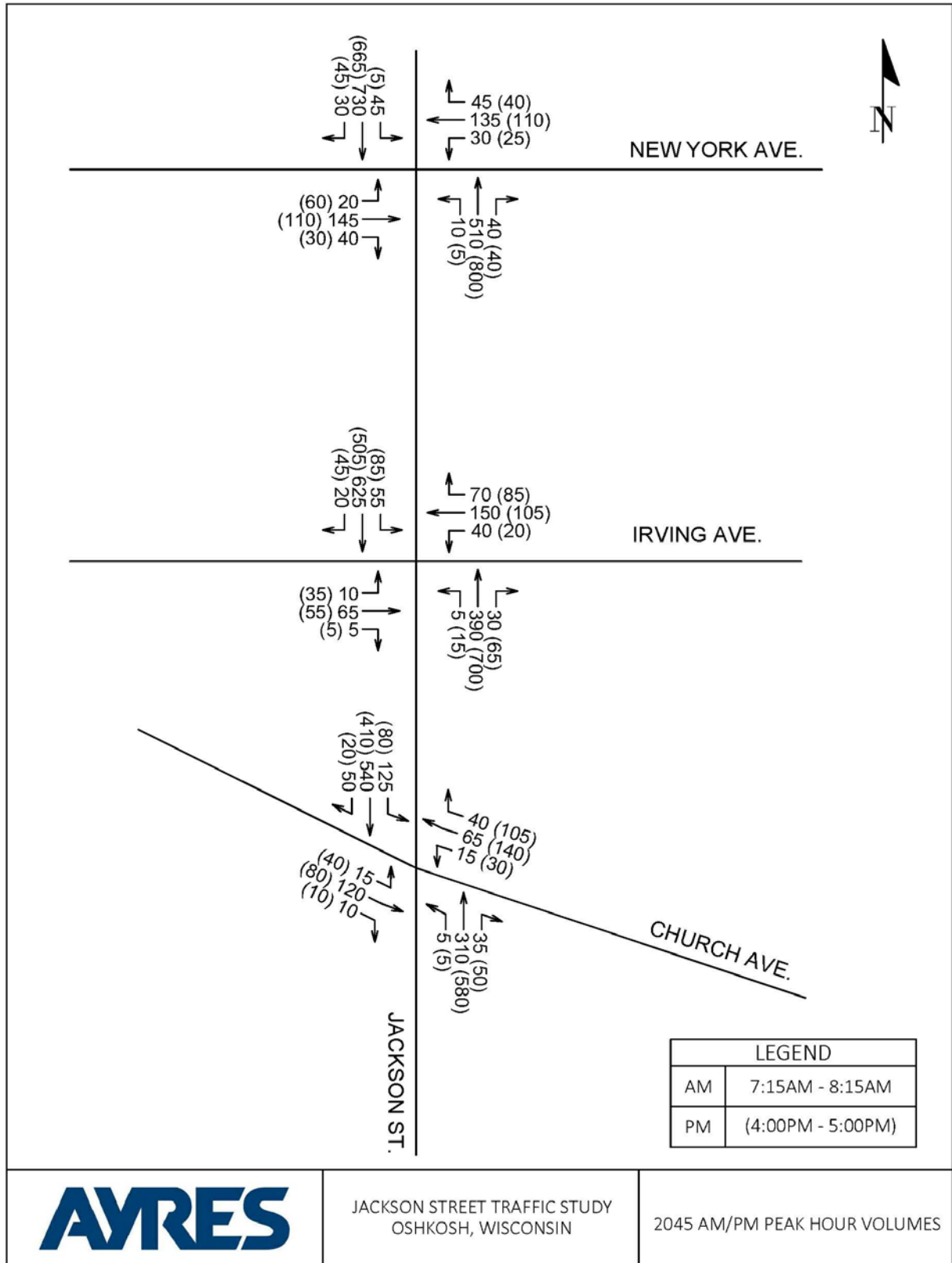
Figure 7: Jackson Street Historical Daily Traffic Pattern



Forecasted 2045 horizon year traffic projections were provided by the East Central Wisconsin Regional Planning Commission (ECWRPC). These forecasted volumes indicate an average annual traffic growth rate of approximately 0.35% per year on Jackson Street, with slightly lower growth on the intersecting streets. Applying the growth rates provided by ECWRPC to the 2019 AADTs results in the expected 2045 daily traffic volumes shown below and the 2045 intersection turning movement volumes shown in Figure 8.

- 2045 Forecasted Annual Average Daily Traffic:
 - Murdock Avenue to New York Avenue: 18,650 vpd
 - New York Avenue to Irving Avenue: 13,400 vpd
 - Irving Avenue to Church Avenue: 11,250 vpd

Figure 8: 2045 Peak Hour Traffic Volumes

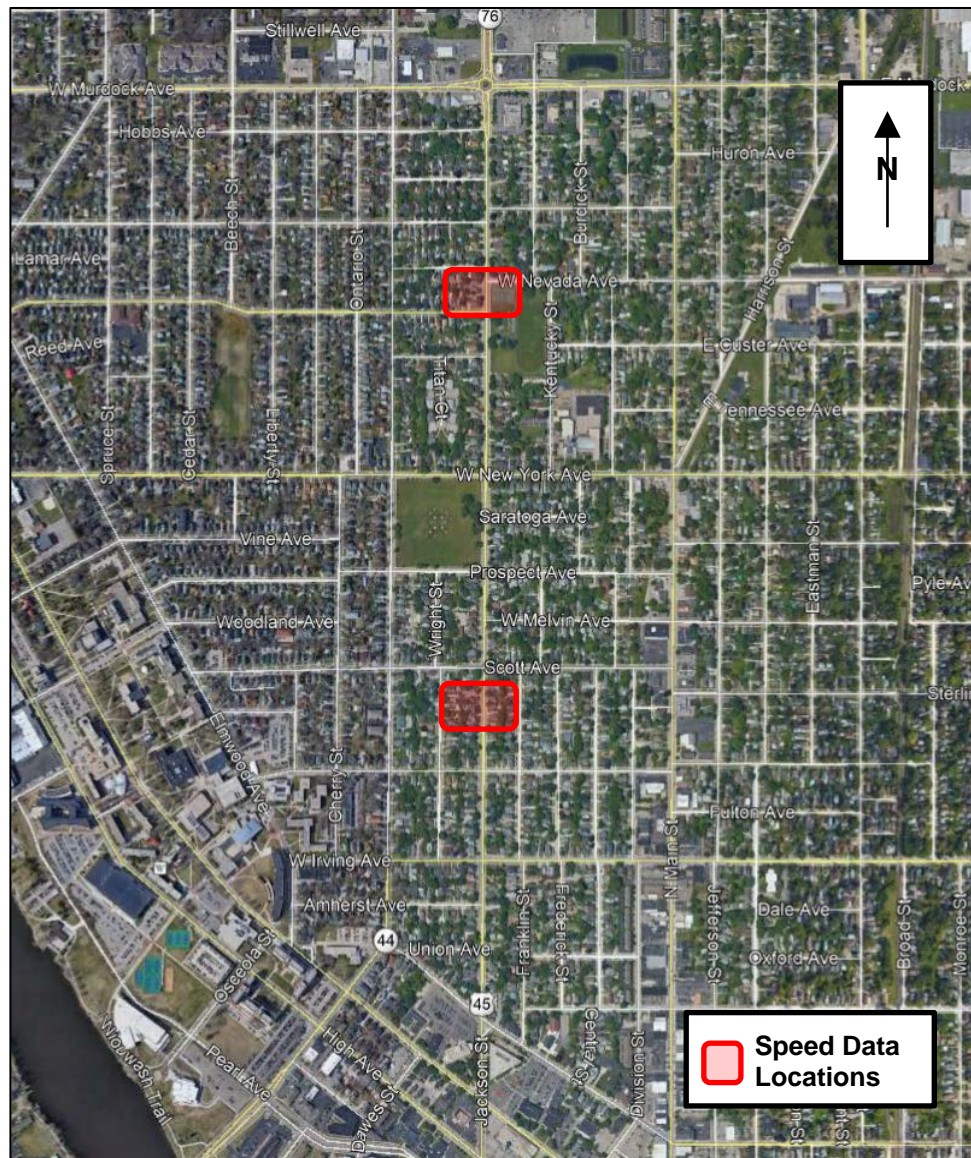


Existing Conditions

Traffic Speeds

Residents along Jackson Street have expressed concerns about their neighborhood quality of life being negatively impacted by vehicular traffic speeds. To evaluate existing conditions, traffic speed data was collected at two locations in the study corridor on Monday, November 18 through Wednesday November 20, 2019. Speed data was collected at two locations as shown in Figure 9: 1) “south location” between Scott Avenue and Lincoln Avenue and 2) “north location” between Nevada and Congress Avenue.

Figure 9: Traffic Speed Data Collection Locations



The speed data identifies the 85th percentile speed and the percent of vehicles exceeding the posted 30 mph speed limit. The results of the speed study indicate the 85th percentile speeds range between 35 mph and 40 mph and 68% to 92% of traffic exceeds the posted 30 mph speed limit, depending on the location and the direction of travel, as shown in Table 4.

Table 4: Jackson Street Collected Travel Speeds

Speed Counter Location and Direction	Percent Exceeding Speed Limit	85 th Percentile Speed
North Location		
Northbound	86.7%	39 mph
Southbound	91.6%	40 mph
South Location		
Northbound	82.4%	39 mph
Southbound	68.1%	35 mph

In addition to the speed data summarized above, the speed curves shown below in Figure 10 and Figure 11 highlight the distribution of traffic speeds at each location by direction of travel. The 30 mph posted speed limit is noted in red.

Figure 10: Jackson Street Speed Distribution at North Location

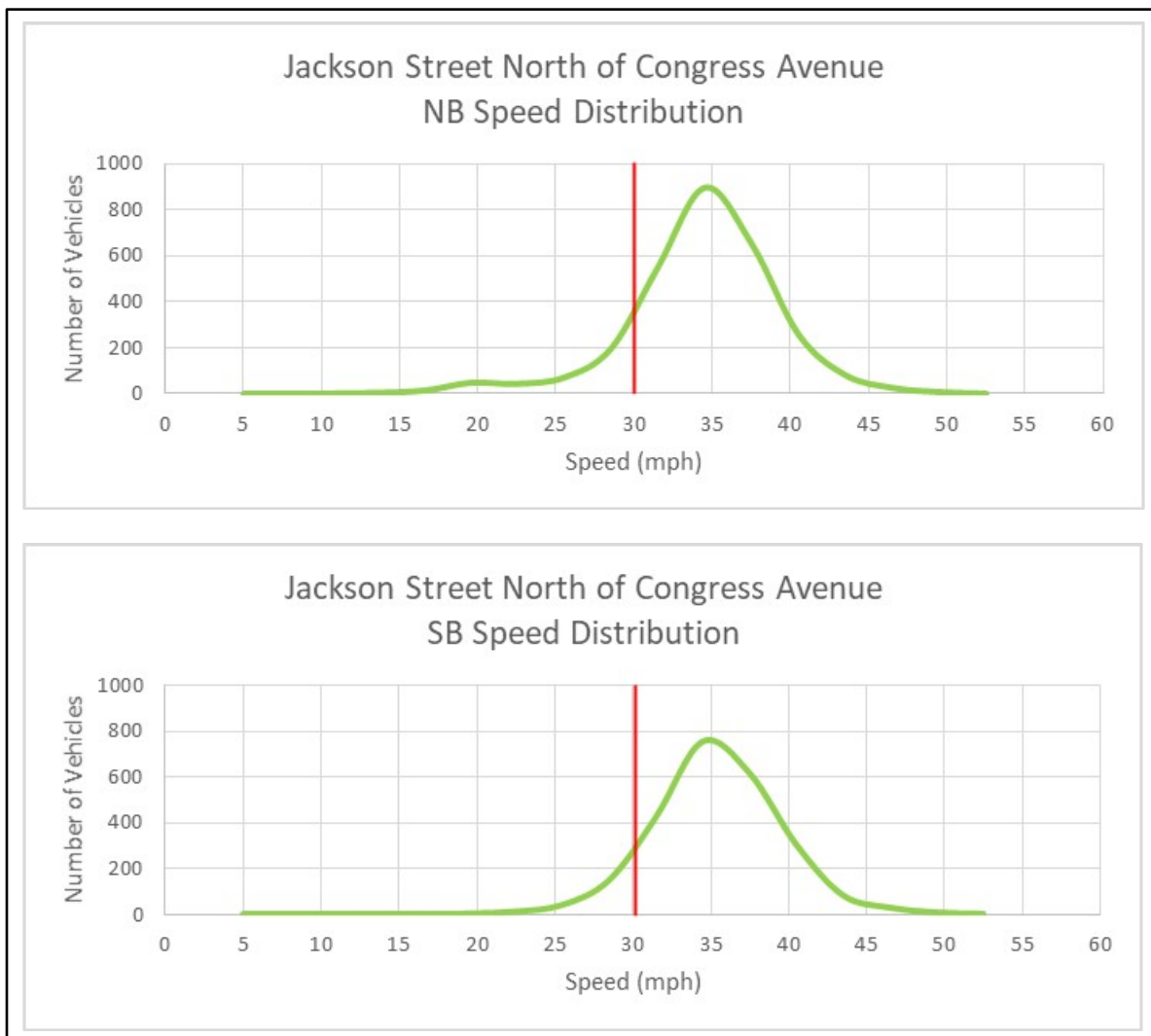
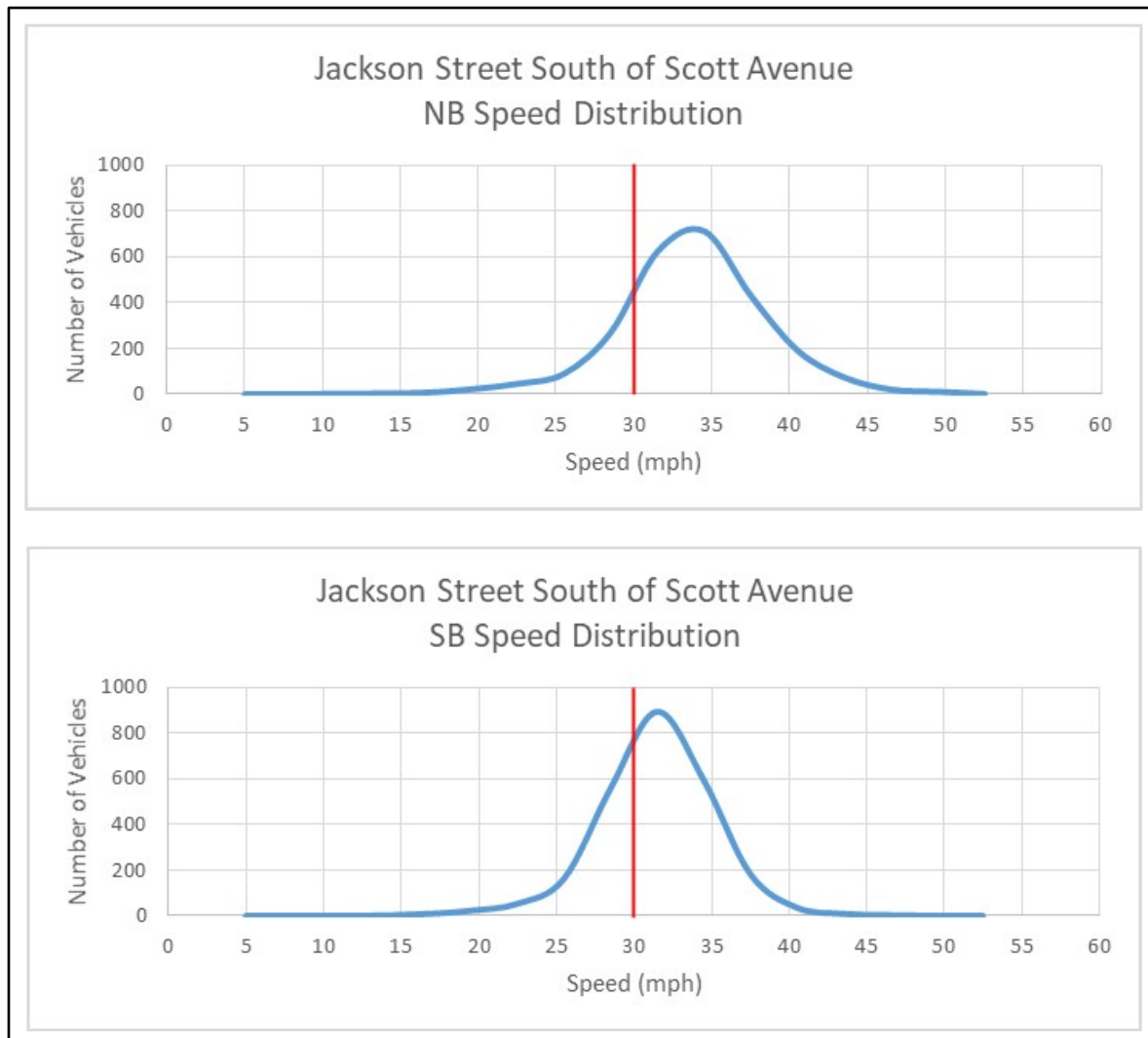


Figure 11: Jackson Street Speed Distribution at South Location



Crash History

A five-year summary of street segment and intersection crashes reported along Jackson Street from the Church Avenue intersection to the Murdock Avenue intersection was obtained from the University of Wisconsin-Madison Traffic Operations and Safety Laboratory (UW TOPS Lab) from 2014 through 2018. During the study period, the corridor reached a peak of 75 total crashes in 2016. The total number of crashes per year is summarized in Table 5.

Table 5: Jackson Street Reported Crashes by Location

Location	Reported Crashes per Year					Total	Yearly Average
	2014	2015	2016	2017	2018		
Murdock Ave	27	23	18	9	3	80	16
Hobbs Ave	0	1	2	1	2	6	1
Stanley Ave	0	1	1	0	1	3	1
Bent Ave	0	0	5	1	1	7	1
Nevada Ave	1	0	2	1	0	4	1
Congress Ave	1	2	1	4	2	10	2
Annex Ave	2	2	0	0	1	5	1
New York Ave*	13	15	17	12	9	66	13
Saratoga Ave	1	0	0	1	0	2	0
Prospect Ave	4	3	5	7	1	20	4
Melvin Ave	1	2	1	0	2	6	1
Scott Ave	1	5	5	5	2	18	4
Lincoln Ave	2	3	3	1	3	12	2
Irving Ave	1	4	7	10	7	29	6
Amherst Ave	0	0	0	0	1	1	0
Union Ave	1	0	2	3	1	7	1
Church Ave	3	2	3	6	8	22	4
Segments Between Intersections	7	5	3	2	2	19	4
Total	65	68	75	63	46	317	

*Left-turn prohibition implemented in 2018 for northbound/southbound left turns weekdays from 3pm to 7pm.

Overall, the total number of corridor crashes has been relatively stable aside from a reduction in 2018. The highest intersection crash locations were as follows:

- Murdock Avenue: Average 16 crashes per year
- New York Avenue: Average 13 crashes per year
- Irving Avenue: Average 6 crashes per year

One pedestrian-involved crash was reported at Hobbs Avenue, one at Bent Avenue, and two at New York Avenue.

Based on annual average daily traffic (AADT) counts collected in 2019, the crash rate for the Jackson Street intersection with the Murdock Avenue roundabout was 1.56 crashes per million entering vehicles (MEV). The crash rate for the Jackson Street intersection with New York Avenue was 2.04 crashes per MEV. The crash rate for the Jackson Street intersection with Irving Avenue was 1.08 crashes per MEV. These crash rates are higher than the most recent available statewide average urban crash rate of 0.96 crashes per MEV.

The primary collision patterns involved left-turn, rear-end, and lane-changing/sideswipe crashes. The prevalence of left-turn crashes at the Jackson Street intersection with New York Avenue lead to a decision in 2018 to prohibit northbound and southbound left turns from Jackson Street onto New York Avenue weekdays from 3pm to 7pm. During the 12-month period following the implementation of the left-turn restriction, the Jackson Street intersection with New York Avenue experienced five crashes.

Traffic Operations

Methodology

For the purpose of this study, LOS 'D' as defined in the Highway Capacity Manual 6th Edition (HCM 6th Edition) is used as the threshold for acceptable peak hour intersection operating conditions. Intersection operation is typically quantified based on its LOS during peak traffic volume periods. The LOS is determined based on the average amount of delay experienced by each vehicle entering an intersection during the study period and is categorized by grades 'A' through 'F'. As a National Highway System Route, WisDOT identifies the desirable LOS as LOS 'D' or better.

Table 6 provides a brief summary of the different intersection LOS.

Table 6: Intersection Level of Service Description

Alpha LOS	Signalized (sec/veh)	Unsignalized Delay (sec/veh)	Description
A	≤ 10	≤ 10	No Congestion: Very few vehicles experience delay.
B	> 10 - 20	> 10 - 15	Minimal Congestion: Some vehicles experience delay but many travel through intersection without stopping.
C	> 20 - 35	> 15 - 25	Minor Congestion: Many vehicles experience delay but some travel through intersection without stopping.
D	> 35 - 55	> 25 - 35	Moderate Congestion: Most vehicles experience delay.
E	> 55 - 80	> 35 - 50	Severe Congestion: Most vehicles experience significant delay. Volumes nearing capacity.
F	> 80 Or V/C >1.0	> 50 Or V/C >1.0	Extreme Congestion: Nearly all vehicles experience significant delay. Volume may be higher than capacity. Potential gridlock.

The 95th percentile queue is also included in the operations summary as an additional performance measure. The 95th percentile queue (sometimes referred to as the "maximum probable queue") represents the distance from the stop bar at which 95% of all queues for a given movement within the analysis time period are expected to be contained. In other words, there is only a 5% probability that the 95th percentile queue length will be exceeded during the analysis period.

Intersection operation for traffic signal control at the study intersections were analyzed using Synchro 10 software. The results presented within this report are based on HCM 6th Edition equations and methodologies. The HCM analysis outputs are shown in Appendix B of the technical supplement.

2019 Existing Operations

Existing traffic in 2019 operates with all study intersection movements at LOS 'C' or better during both the morning and evening peak hours with the exception of the eastbound left turn movement on Church Avenue in the evening peak hour. All northbound and southbound movements at the Church Avenue, Irving Avenue, and New York Avenue intersections operate at LOS 'A' except for the southbound movements at New York Avenue. These southbound movements operate at LOS 'B' for both the morning and evening peak hours. All eastbound and westbound movements at the three intersections operate at LOS 'C' with the exception of the eastbound left turn on Church Avenue as previously stated.

In summary, all movements operate at an acceptable LOS 'D' or better during both peak hours, which can be seen in Table 7 (2019 Existing AM Peak Hour Traffic Operations) and Table 8 (2019 Existing PM Peak Hour Traffic Operations).

Table 7: 2019 Existing AM Peak Hour Traffic Operations

2019 Existing AM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement												OVERALL		
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	C	C		C	C		A	A		A		B			
		Delay (sec)	29.0	28.3		29.9	27.6		8.5	0.0		5.7		11.2			
		Queue (ft)	25'	125'		25'	100'		75'	25'		150'		--			
			Movement												OVERALL		
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A			
		Delay (sec)	33.1	28.8		30.8	32.1	28.1		3.3		3.9		9.6			
		Queue (ft)	25'	75'		50'	150'	50'		75'		75'		--			
			Movement												OVERALL		
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	C	C		C	C		A		B		B				
		Delay (sec)	30.7	28.7		31.2	29.0		5.2		11.2		13.5				
		Queue (ft)	25'	150'		50'	175'		75'		175'		--				

Table 8: 2019 Existing PM Peak Hour Traffic Operations

2019 Existing PM Peak Hour Traffic Operations - Jackson Street															
Intersection	Control	MOE	Movement												OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		
Church Avenue	Signal	LOS	D	C		C	C		A	A		A		B	
		Delay (sec)	37.1	26.6		28.5	34.0		9.6	0.0		5.1		14.3	
		Queue (ft)	50'	100'		50'	225'		125'	50'		100'		--	
			Movement												OVERALL
EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR	
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A	
		Delay (sec)	31.4	28.0		28.9	29.3	28.2		3.8		3.7		7.9	
		Queue (ft)	50'	75'		50'	100'	75'		100'		50'		--	
			Movement												OVERALL
EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR	
New York Avenue	Signal	LOS	C	C		C	C		A		B		B		
		Delay (sec)	30.8	26.9		28.4	27.4		5.9		10.3		11.8		
		Queue (ft)	75'	125'		50'	125'		100'		150'		--		

2045 No-Build Operations

Background traffic in 2045 under a "Do Nothing" condition is expected to continue to operate with all study intersection movements at LOS 'C' or better during both the morning and evening peak hours with the exception of the same eastbound left turn movement on Church Avenue in the evening peak hour. The LOS operations of the movements at the three study intersections are expected to remain consistent with the existing 2019 traffic operations, with slight increases in average vehicle delay due to increases in volume. All queue lengths for the three intersections are expected to remain unchanged or increase by

25 feet, the equivalent of one vehicle. Overall, the movements at the three study intersections are expected to continue to operate at an acceptable LOS 'D' or better during both the peak hour periods which can be seen in Table 9 (2045 No-Build AM Peak Hour Traffic Operations) and Table 10 (2045 No-Build PM Peak Hour Traffic Operations).

Table 9: 2045 No-Build AM Peak Hour Traffic Operations

2045 No-Build AM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement												OVERALL		
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	C	C		C	C		A	A		A		B			
		Delay (sec)	29.3	28.5		30.1	27.9		8.6	0.0		6.5		11.4			
		Queue (ft)	25'	125'		25'	100'		75'	25'		175'		--			
			Movement												OVERALL		
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A			
		Delay (sec)	33.4	29.0		31.3	32.4	28.2		3.3		4.1		9.7			
		Queue (ft)	25'	75'		50'	150'	50'		75'		75'		--			
			Movement												OVERALL		
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	C	C		C	C		A		B		B				
		Delay (sec)	31.2	29.4		32.0	29.2		5.3		11.9		13.8				
		Queue (ft)	50'	175'		50'	175'		75'		200'		--				

Table 10: 2045 No-Build PM Peak Hour Traffic Operations

2045 No-Build PM Peak Hour Traffic Operations - Jackson Street														
Intersection	Control	MOE	Movement											OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR	
Church Avenue	Signal	LOS	D	C		C	C		A	A		A		B
		Delay (sec)	38.5	26.6		28.5	34.9		9.8	0.0		5.4		14.4
		Queue (ft)	50'	100'		50'	225'		125'	50'		125'		--
			Movement											OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR	
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A
		Delay (sec)	31.6	28.1		29.1	29.5	28.3		3.9		3.8		7.9
		Queue (ft)	50'	75'		50'	100'	75'		100'		75'		--
			Movement											OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR	
New York Avenue	Signal	LOS	C	C		C	C		A		B		B	
		Delay (sec)	31.3	27.2		29.0	27.5		6.1		10.7		12.0	
		Queue (ft)	75'	125'		50'	150'		100'		150'		--	

Alternatives Analysis

Methodology

The multimodal traffic safety and quality of life study evaluated traffic safety and operations of the existing corridor geometrics and multiple potential corridor improvements to identify the recommended treatments for improving the safety, travel speeds, operations, and quality of life along the corridor. This evaluation included traffic operations analysis using Synchro software, the evaluation of safety using the Federal Highway Administration's (FHWA) Crash Modification Factors Clearinghouse, and estimating impacts on vehicular travel speeds using FHWA published research.

Alternatives

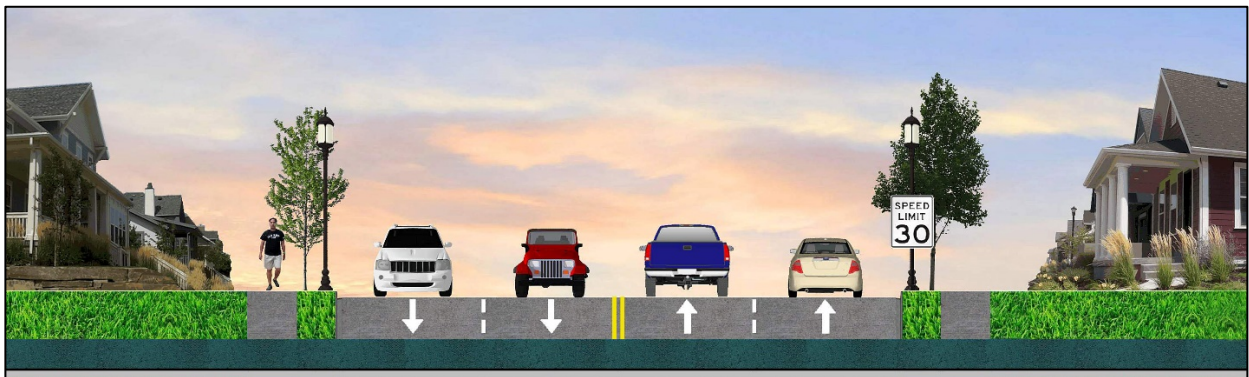
The study identified three corridor improvement alternatives for consideration.

Alternative 1: Maintain Existing Cross-Section

Description

Alternative 1 maintains the existing four-lane cross-section along Jackson Street between Church Avenue and Murdock Avenue, as shown in Figure 12. The alternative would include the installation of speed feedback signs on overhead poles to increase motorist's awareness of their speed and encourage a reduction in travel speed. Two speed feedback signs would be installed in each direction of travel; one shortly after entering the study corridor and a second near Scott Avenue to reinforce the need to comply with the posted speed limit. Maintaining the existing cross-section limits the ability to incorporate geometric improvements along the corridor. The concept drawing for Alternative 1 is shown in the attached Exhibit 1.

Figure 12: Alternative 1 Cross-Section



Traffic Operations

Alternative 1 was analyzed for the expected intersection delay and queuing during the morning and evening peak hours using the base year 2019 data and the forecasted 2045 traffic volumes. Because no geometric changes were made to the corridor, the traffic operations are expected to remain consistent with the existing and "Do Nothing" scenarios.

2019: The study intersections operate in Alternative 1 under 2019 volumes with all study intersection movements at LOS 'C' or better during both the morning and evening peak hours with the exception of the eastbound left turn movement on Church Avenue in the evening peak hour. All northbound and

southbound movements at the Church Avenue, Irving Avenue, and New York Avenue intersections operate at LOS 'A' except for the southbound movements at New York Avenue. These southbound movements operate at LOS 'B' for both the morning and evening peak hours. All eastbound and westbound movements at the three intersections operate at LOS 'C' with the exception of the eastbound left turn on Church Avenue as previously stated. Queue lengths along Jackson Street are expected to reach a maximum of 125 feet northbound at Church Avenue during the morning peak hour and 175 feet southbound at New York Avenue during the evening peak hour. In summary, all movements operate at an acceptable LOS 'D' or better during both peak hours, which can be seen in Table 11 and Table 12.

Table 11: 2019 Alternative 1 AM Peak Hour Traffic Operations

2019 Alternative 1 AM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	C	C		C	C		A	A		A		B			
		Delay (sec)	29.0	28.3		29.9	27.6		8.5	0.0		5.7		11.2			
		Queue (ft)	25'	125'		25'	100'		75'	25'		150'		--			
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A			
		Delay (sec)	33.1	28.8		30.8	32.1	28.1		3.3		3.9		9.6			
		Queue (ft)	25'	75'		50'	150'	50'		75'		75'		--			
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	C	C		C	C		A		B		B				
		Delay (sec)	30.7	28.7		31.2	29.0		5.2		11.2		13.5				
		Queue (ft)	25'	150'		50'	175'		75'		175'		--				

Table 12: 2019 Alternative 1 PM Peak Hour Traffic Operations

2019 Alternative 1 PM Peak Hour Traffic Operations - Jackson Street														
Intersection	Control	MOE	Movement											OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
Church Avenue	Signal	LOS	D	C		C	C		A	A		A		B
		Delay (sec)	37.1	26.6		28.5	34.0		9.6	0.0		5.1		14.3
		Queue (ft)	50'	100'		50'	225'		125'	50'		100'		--
			Movement											OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A
		Delay (sec)	31.4	28.0		28.9	29.3	28.2		3.8		3.7		7.9
		Queue (ft)	50'	75'		50'	100'	75'		100'		50'		--
			Movement											OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	
New York Avenue	Signal	LOS	C	C		C	C		A		B		B	
		Delay (sec)	30.8	26.9		28.4	27.4		5.9		10.3		11.8	
		Queue (ft)	75'	125'		50'	125'		100'		150'		--	

2045: The study intersections are expected to operate in Alternative 1 under 2045 volumes with all movements at LOS 'C' or better during both the morning and evening peak hours with the exception of the same eastbound left turn movement on Church Avenue in the evening peak hour. The LOS

operations at the three study intersections are expected to remain consistent with the existing 2019 traffic operations with slight increases in average vehicle delay due to increases in volume. All queue lengths for the three intersections are expected to remain unchanged or increase by 25 feet, the equivalent of one vehicle. Overall, the movements at the three study intersections are expected to continue to operate at an acceptable LOS 'D' or better during both the peak hour periods which can be seen in Table 13 and Table 14.

Table 13: 2045 Alternative 1 AM Peak Hour Traffic Operations

2045 Alternative 1 AM Peak Hour Traffic Operations - Jackson Street															
Intersection	Control	MOE	Movement												OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		
Church Avenue	Signal	LOS	C	C		C	C		A	A		A		B	
		Delay (sec)	29.3	28.5		30.1	27.9		8.6	0.0		6.5		11.4	
		Queue (ft)	25'	125'		25'	100'		75'	25'		175'		--	
			Movement												OVERALL
EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR	
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A	
		Delay (sec)	33.4	29.0		31.3	32.4	28.2		3.3		4.1		9.7	
		Queue (ft)	25'	75'		50'	150'	50'		75'		75'		--	
			Movement												OVERALL
EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR	
New York Avenue	Signal	LOS	C	C		C	C		A		B		B		
		Delay (sec)	31.2	29.4		32.0	29.2		5.3		11.9		13.8		
		Queue (ft)	50'	175'		50'	175'		75'		200'		--		

Table 14: 2045 Alternative 1 PM Peak Hour Traffic Operations

2045 Alternative 1 PM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	D	C		C	C		A	A		A		B			
		Delay (sec)	38.5	26.6		28.5	34.9		9.8	0.0		5.4		14.4			
		Queue (ft)	50'	100'		50'	225'		125'	50'		125'		--			
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A		A		A			
		Delay (sec)	31.6	28.1		29.1	29.5	28.3		3.9		3.8		7.9			
		Queue (ft)	50'	75'		50'	100'	75'		100'		75'		--			
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	C	C		C	C		A		B		B				
		Delay (sec)	31.3	27.2		29.0	27.5		6.1		10.7		12.0				
		Queue (ft)	75'	125'		50'	150'		100'		150'		--				

Travel Speeds

Alternative 1 incorporates speed feedback signs for communicating travel speeds to motorists to encourage compliance with the posted speed limit. According to FHWA, research shows that speed feedback signs have been effective at reducing speeds by 5mph. This conclusion is based on before and

after studies that indicated average and 85th percentile travel speeds were reduced between 1mph and 7mph depending on the roadway location and characteristics.

Safety

FHWA's Crash Modification Factor Clearinghouse provides data related to the expected reduction in crashes based on a wide variety of roadway treatments. Although the studies related to speed feedback signs were based on rural study locations, the data indicates that these signs can be expected to reduce the number of all crash types by 5%.

Estimated Cost

The estimated cost of Alternative 1 is expected to be in the range of \$70,000 to \$80,000 as shown in Appendix C of the technical supplement.

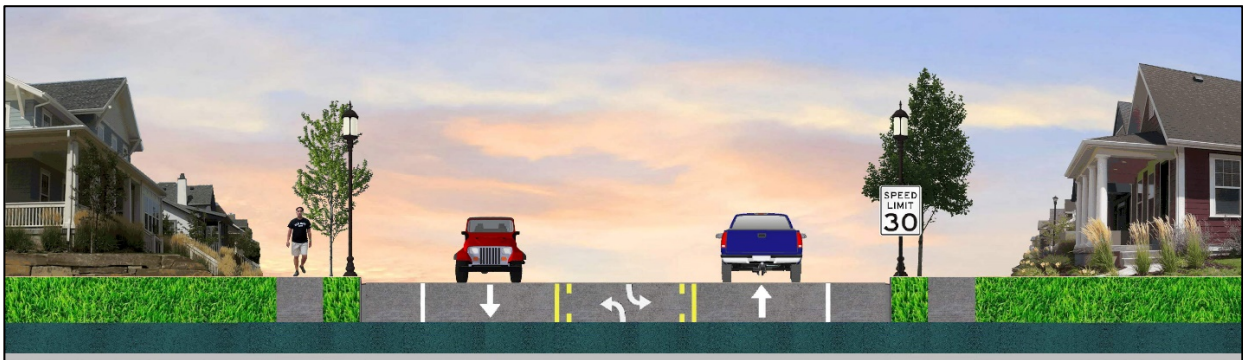
Alternative 2A: Full Roadway Redesign with Two-Way Left-Turn Lane

Description

Alternative 2A reconfigures the existing Jackson Street four-lane cross-section between Church Avenue and Murdock Avenue to one 11'-wide through lane in each direction, a 13'-wide center two-way left-turn lane, and a 5' curb buffer area on each side of the street, as shown in Figure 13. This design changes the roadway image from a highway to an urban street. The term "roadway redesign" used here is interchangeable with the term "road diet" often used in other studies and referenced elsewhere in supporting materials. Along southbound Jackson Street, the two lanes exiting the roundabout at Murdock Avenue would merge to a single lane prior to the intersection with Stanley Avenue. Northbound Jackson Street would expand from one lane to two lanes near the intersection with Hobbs Avenue. This design would also allow for dedicated left-turn lanes to be included at the signalized intersections with a shared through/right-turn lane in each direction. Left turns would be prohibited from northbound Jackson Street to westbound Nevada Avenue to avoid potential left-turning safety conflicts with southbound traffic.

Consideration was given to the 5' curb buffer area as a marked bicycle lane, but it was determined through discussions with City staff that it was not desirable to mark this area as a designated bike lane. First, the City of Oshkosh *Bicycle and Pedestrian Master Plan 2019* does not identify Jackson Street as a recommended bicycle facility. N. Main Street, located a ¼ mile to the east and parallel to Jackson Street, is a recommended bike route in the master plan that provides marked bicycle lanes. Second, the 5' curb buffer space would include a 1' gutter pan, resulting in an undesirable longitudinal joint within the 5' width.

Figure 13: Alternative 2A Cross-Section



Continental-style crosswalk pavement markings would be installed at the unsignalized intersections with Prospect Avenue, Scott Avenue, and Lincoln Avenue, along with pedestrian crossing signs at each of

these locations. A crosswalk would also be added on the north side of the Jackson Street intersection with Congress Avenue. This crossing would feature rectangular rapid flashing beacons (RRFB) to draw more attention to the presence of pedestrians and a pedestrian refuge island in the median. Continental-style crosswalks provide increased visibility for oncoming traffic and sight impaired pedestrians. The existing crosswalk at the Jackson Street intersection with Hobbs Avenue would be removed for pedestrian safety purposes given the four lanes of traffic, the presence of turning vehicles, and the lane add/drop conditions that would occur with this alternative. The combination of these factors results in several decision points for motorists making it difficult for pedestrians to safely cross the street.

The narrowed travel way of Alternative 2A allows for consideration of curb bump-outs at the locations where pedestrian crosswalks will be added at Lincoln Avenue, Scott Avenue, Prospect Avenue, and Congress Avenue. These bump-outs could involve reconstruction of the curb and gutter and sidewalk extension, or as a painted bump-out with bollards that would leave the existing curb and gutter in its existing location. The painted bump-out with bollards presents challenges with snow removal and the City has expressed that this option is not desired. An example of a painted bump-out is provided in Figure 14. The reconstruction option provides an improved raised curb refuge area for pedestrians and eliminates the potential for damage to the bollards but would require potential drainage improvements.

Figure 14: Painted Bump-Out Example



Alternative 2A would include the installation of speed feedback signs on side-mounted poles to make motorists aware of their speed and thereby encourage a reduction in travel speed. Two speed feedback signs would be installed for each direction of travel; one shortly after entering the study corridor and a second near Scott Avenue to reinforce the encouragement to comply with the posted speed limit.

The concept drawing for Alternative 2A is shown in the attached Exhibit 2.

Traffic Operations

Alternative 2A was analyzed for expected intersection delay and queuing impacts during the morning and evening peak hours using the base year 2019 data and the forecasted 2045 traffic volumes.

2019: The study intersections are expected to operate under 2019 volumes with all study intersection movements at LOS 'C' or better during both the morning and evening peak hours with the exception of the eastbound left turn movement on Church Avenue in the evening peak hour. All northbound and southbound movements at the Church Avenue, Irving Avenue, and New York Avenue intersections are

expected to operate at LOS 'B' or better. All eastbound and westbound movements at the three intersections operate at LOS 'C' with the exception of the eastbound left turn on Church Avenue as previously stated. Queue lengths along Jackson Street are expected to increase when compared to Alternative 1 and reach a maximum of 300 feet northbound at Church Avenue during the evening peak hour and 425 feet southbound at New York Avenue during the morning peak hour. In summary, all movements operate at an acceptable LOS 'D' or better during both peak hours, which can be seen in Table 15 and Table 16.

Table 15: 2019 Alternative 2A AM Peak Hour Traffic Operations

2019 Alternative 2A AM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	C	C		C	C		B	A	A		A	A	B		
		Delay (sec)	29.0	28.3		29.9	27.6		13.9	9.8	0.0		7.7	7.1	9.5		
		Queue (ft)	25'	125'		25'	100'		25'	125'	25'		75'	275'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	B		
		Delay (sec)	33.1	28.8		30.8	32.1	28.1		5.5	4.1		4.2	5.1	10.5		
		Queue (ft)	25'	75'		50'	150'	50'		25'	125'		25'	125'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	C	C		C	C		B	A		B	B	B			
		Delay (sec)	30.9	28.8		31.3	29.2		15.2	6.7		13.3	16.7	16.6			
		Queue (ft)	25'	150'		50'	175'		25'	150'		50'	425'	--			

Table 16: 2019 Alternative 2A PM Peak Hour Traffic Operations

2019 Alternative 2A PM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	D	C		C	C		B	B	A		B	A	B		
		Delay (sec)	37.2	26.7		28.5	34.1		10.2	13.0	0.0		12.4	5.3	14.5		
		Queue (ft)	50'	100'		50'	225'		25'	300'	50'		75'	225'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	A		
		Delay (sec)	31.4	28.0		29.0	29.3	28.2		4.0	5.8		7.2	4.0	9.2		
		Queue (ft)	50'	75'		50'	100'	75'		25'	225'		25'	100'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	C	C		C	C		B	A		B	B	B			
		Delay (sec)	30.9	26.9		28.5	27.4		12.2	10.0		19.0	14.7	15.3			
		Queue (ft)	75'	125'		50'	125'		25'	275'		25'	375'	--			

The street redesign included in Alternative 2A provides for an improved offset of opposing northbound and southbound left-turn lanes on Jackson Street. This will allow consideration of removing the existing left-turn prohibition from Jackson Street to New York Avenue weekdays during the 3pm to 7pm time period.

2045: The study intersections are expected to operate in Alternative 2A with all traffic movements at LOS 'C' or higher during both the morning and evening peak hours with the exception of the eastbound left turn movement on Church Avenue in the evening peak hour and the eastbound and westbound approaches of New York Avenue during the morning and evening peak hours, which are expected to operate at LOS 'D'. Queue lengths along Jackson Street are expected to increase when compared to Alternative 1 and reach a maximum of 325 feet northbound at New York Avenue during the evening peak hour and 425 feet southbound at New York Avenue during the morning peak hour. Overall, the movements at the three study intersections are expected to continue to operate at an acceptable LOS 'D' or better during both the peak hour periods which can be seen in Table 17 and Table 18.

Table 17: 2045 Alternative 2A AM Peak Hour Traffic Operations

2045 Alternative 2A AM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	C	C		C	C		B	B	A		A	A	B		
		Delay (sec)	29.3	28.5		30.1	27.9		15.8	10.1	0.0		8.4	7.8	12.6		
		Queue (ft)	25'	125'		25'	100'		25'	150'	25'		75'	275'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	B		
		Delay (sec)	33.4	29.0		31.4	32.4	28.3		6.6	4.6		4.5	5.8	10.8		
		Queue (ft)	25'	75'		50'	150'	50'		25'	125'		25'	175'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	D	D		D	D		B	A		A	B	B			
		Delay (sec)	38.1	38.2		39.3	38.2		11.0	3.8		8.9	13.3	16.1			
		Queue (ft)	50'	200'		50'	175'		25'	125'		25'	425'	--			

Table 18: 2045 Alternative 2A PM Peak Hour Traffic Operations

2045 Alternative 2A PM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	D	C		C	C		B	B	A		B	A	B		
		Delay (sec)	38.5	26.7		28.5	34.9		10.7	13.5	0.0		13.7	5.5	16.5		
		Queue (ft)	50'	100'		50'	225'		25'	300'	50'		50'	200'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	A		
		Delay (sec)	31.6	28.1		29.1	29.5	28.3		4.4	6.4		8.4	4.3	9.5		
		Queue (ft)	50'	75'		50'	100'	75'		25'	225'		50'	250'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	D	C		D	C		A	A		B	B	B			
		Delay (sec)	38.6	33.7		35.0	34.4		8.3	5.9		12.3	11.5	13.6			
		Queue (ft)	75'	150'		50'	150'		25'	325'		25'	350'	--			

If the current left-turn prohibition at New York Avenue is removed under Alternative 2A, the evening peak hour volumes can be expected to change as some through vehicles will return to making left turns in the

northbound and southbound directions. For the purpose of analyzing the potential shift in traffic volumes, it is assumed that the northbound and southbound left-turning vehicles would be similar in volume to the left-turn volumes at the Jackson Street intersection with Irving Avenue. The analysis of these adjusted volumes with permissive left-turn phasing indicates a very small decrease in the overall delay of the intersection, with minor increases in the left-turn delay and queuing and decreased delay and queueing for the through movements. The design of the intersection under Alternative 2A also provides the opportunity to consider protected phasing if desired, recognizing that this would result in increased delay for other movements.

Travel Speeds

Travel speeds along Jackson Street under Alternative 2A are expected to be reduced as a result of corridor improvements. The following summarizes the potential speed reduction of each isolated improvement, but it should be noted that the reductions are not additive. The benefit of applying more than one traffic taming technique is synergistic in that one improvement serves to reinforce another and add incremental benefits to create a street with reduced travel speeds. The following Alternative 2A improvements are expected to reduce travel speeds along Jackson Street:

- **Roadway Redesign:** According to FHWA, several urban lane narrowing and reduction projects have resulted in a reduction of average vehicle travel speeds of 2mph to 4mph.
- **Speed Feedback Signs:** As identified for Alternative 1, FHWA research shows that speed feedback signs have been effective at reducing speeds by 5mph. This conclusion is based on several before and after studies that found average and 85th percentile travel speeds were reduced between 1mph and 7mph depending on the roadway location and characteristics.
- **Bump-Outs:** According to FHWA, bump outs have been shown to reduced average vehicle speeds and 85th percentile speed by up to 4mph.

Safety

FHWA's Crash Modification Factor Clearinghouse provides data related to the expected reduction in crashes based on a wide variety of roadway treatments. As more than one safety improvement is made along a given corridor, the potential overall impact is not additive for each isolated treatment, similar to the previous discussion of impacts to travel speeds. But the combination of multiple safety improvements does have incremental safety benefits, especially for multiple roadway users, and helps to create a safer and more walkable urban street. The following Alternative 2A improvements are expected to reduce the likelihood of crashes along Jackson Street:

- **Roadway Redesign:** FHWA provides crash reduction data based on multiple roadway redesign studies that indicate the overall number of crashes along the corridor can be reduced between 19% and 25%.
- **Improved Left-Turn Offset:** The roadway redesign included in Alternative 2A allows for an improved left-turn offset at intersections, converting the existing negative offset to a neutral offset and allowing left-turning vehicles to have a better sight line for judging gaps in oncoming traffic. Studies based on Wisconsin data have shown that improvements that create a positive left-turn offset can reduce injury-related crashes by 35%. The improvement from a negative to a neutral offset may be less than the 35% identified in this research but still provide improvement over the existing condition.
- **Continental-Style Crosswalk Markings:** According to FHWA, continental-style crosswalk pavement markings have been shown to reduce the likelihood of pedestrian-related crashes by 40%.

- **Rectangular Rapid Flashing Beacons (RRFB):** According to FHWA, RRFBs have been shown to reduce the likelihood of pedestrian-related crashes at unsignalized crossings by 47%.
- **Bump-Outs:** Bump-outs located at unsignalized crossings in Alternative 2A have the benefit of reducing the crossing distance for pedestrians and making the corridor more pedestrian friendly.
- **Speed Feedback Signs:** Although the FHWA studies related to speed feedback signs were based on rural study locations, the data indicates that these signs can be expected to reduce the number of all crash types by 5%.

Estimated Cost

The estimated cost of Alternative 2A was calculated for two conditions. The first assumes the curb bump-outs are incorporated as a reconstructed curb and gutter and expanded sidewalk. The second assumes the curb bump-outs are incorporated using colored pavement markings and bollards and that the existing curb and gutter remains in its current location. The resulting estimated costs are expected to be in the range of \$210,000 to \$230,000 for the curb and gutter reconstruction and in the range of \$170,000 to \$190,000 for the pavement markings and bollards. The costs are shown in Appendix C of the technical supplement.

Alternative 2B: Partial Roadway Redesign with Two-Way Left-Turn Lane

Description

Alternative 2B combines the Alternative 2A design south of New York Avenue with the Alternative 1 design north of New York Avenue. The existing four-lane cross-section along Jackson Street between Church Avenue and New York Avenue would be reconfigured to one 11'-wide through lane in each direction, a 13'-wide center two-way left-turn lane, and a 5' curb buffer on each side of the street. This would allow for the improvements previously described in Alternative 2A to be included south of New York Avenue, including designated left-turn lanes at intersections and the addition of continental-style crosswalks and curb bump-outs at Prospect Avenue, Scott Avenue, and Lincoln Avenue.

Jackson Street between New York Avenue and Murdock Avenue would remain under the existing four-lane configuration. The only improvement along this segment would be the installation of a speed feedback sign for southbound traffic exiting the roundabout at the Murdock Avenue intersection. The four-lane cross-section would transition to the three-lane redesigned roadway with a TWLTL between New York Avenue and Prospect Avenue. The concept drawing for Alternative 2B is shown in the attached Exhibit 3.

Traffic Operations

Alternative 2B was analyzed for the expected delay and queuing during the morning and evening peak hours using the base year 2019 data and the forecasted 2045 traffic volumes. The study intersections under Alternative 2B will operate similar to Alternative 2A, with the major difference being the additional southbound through lane at New York Avenue. This alternative was developed to help accommodate the higher daily traffic volumes north of New York Avenue and provide additional capacity from New York Avenue to Murdock Avenue.

2019: The study intersections are expected to operate under 2019 volumes with all study intersection movements at LOS 'C' or better during both the morning and evening peak hours with the exception of the eastbound left turn movement on Church Avenue in the evening peak hour. All northbound and southbound movements at the Church Avenue, Irving Avenue, and New York Avenue intersections operate at LOS 'B' or better. All eastbound and westbound movements at the three intersections operate at LOS 'C' with the exception of the eastbound left turn on Church Avenue as previously stated. Queue lengths along Jackson Street are expected to be similar to Alternative 2A with an improvement for

southbound traffic at New York Avenue and reach a maximum of 300 feet northbound at Church Avenue during the evening peak hour and 275 feet southbound at Church Avenue during the morning peak hour. In summary, all movements operate at an acceptable LOS 'D' or better during both peak hours, which can be seen in Table 19 and Table 20.

Table 19: 2019 Alternative 2B AM Peak Hour Traffic Operations

2019 Alternative 2B AM Peak Hour Traffic Operations - Jackson Street															
Intersection	Control	MOE	Movement											OVERALL	
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT		SBR
Church Avenue	Signal	LOS	C	C		C	C		B	A	A		A	A	B
		Delay (sec)	29.0	28.3		29.9	27.6		13.9	9.8	0.0		7.7	7.1	12.3
		Queue (ft)	25'	125'		25'	100'		25'	125'	25'		75'	275'	--
			Movement											OVERALL	
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT		SBR
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	B
		Delay (sec)	33.1	28.8		30.8	32.1	28.1		5.5	4.1		4.3	6.0	10.9
		Queue (ft)	25'	75'		50'	150'	50'		25'	125'		25'	125'	--
			Movement											OVERALL	
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT		SBR
New York Avenue	Signal	LOS	C	C		C	C		A	A		B	B	B	
		Delay (sec)	30.7	28.8		31.3	29.0		7.1	6.9		13.3	10.6	14.0	
		Queue (ft)	25'	150'		50'	175'		25'	150'		50'	150'	--	

Table 20: 2019 Alternative 2B PM Peak Hour Traffic Operations

2019 Alternative 2B PM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	D	C		C	C		B	B	A		B	A	B		
		Delay (sec)	37.2	26.7		28.5	34.1		10.2	13.0	0.0		12.4	5.3	16.1		
		Queue (ft)	50'	100'		50'	225'		25'	300'	50'		50'	200'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	A		
		Delay (sec)	31.4	28.0		29.0	29.3	28.2		4.0	5.8		7.5	4.4	9.3		
		Queue (ft)	50'	75'		50'	100'	75'		25'	225'		25'	100'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	C	C		C	C		B	B		B	B	B			
		Delay (sec)	30.8	26.9		28.5	27.4		6.5	11.1		19.0	10.2	14.1			
		Queue (ft)	75'	125'		50'	125'		25'	275'		25'	150'	--			

The roadway redesign included as part of Alternative 2B provides for an improved offset of opposing northbound and southbound left-turn lanes on Jackson Street. This will allow for the consideration of removing the existing left-turn prohibition from Jackson Street to New York Avenue weekdays from 3pm to 7pm.

2045: The study intersections are expected to operate in Alternative 2B under 2045 volumes with all movements at LOS 'C' or better during both the morning and evening peak hours with the exception of

the eastbound left turn movement on Church Avenue in the evening peak hour and the eastbound and westbound approaches of New York Avenue during the morning and evening peak hours, which are expected to operate at LOS 'D'. Queue lengths along Jackson Street are expected to be similar to Alternative 2A with an improvement for southbound traffic at New York Avenue and reach a maximum of 325 feet northbound at New York Avenue during the evening peak hour and 275 feet southbound at Church Avenue during the morning peak hour. Overall, the movements at the three study intersections are expected to continue to operate at an acceptable LOS 'D' or better during both the peak hour periods, which can be seen in Table 21 and Table 22.

Table 21: 2045 Alternative 2B AM Peak Hour Traffic Operations

2045 Alternative 2B AM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	C	C		C	C		B	B	A		A	A	B		
		Delay (sec)	29.3	28.5		30.1	27.9		15.8	10.1	0.0		8.4	7.8	12.6		
		Queue (ft)	25'	125'		25'	100'		25'	150'	25'		75'	275'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	B		
		Delay (sec)	33.4	29.0		31.4	32.4	28.3		6.6	4.3		4.6	7.0	11.3		
		Queue (ft)	25'	75'		50'	150'	50'		25'	125'		25'	150'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	D	D		D	D		A	A		A	A	B			
		Delay (sec)	37.8	38.2		39.3	37.7		4.1	4.0		8.9	7.9	13.7			
		Queue (ft)	50'	200'		50'	175'		25'	125'		25'	150'	--			

Table 22: 2045 Alternative 2B PM Peak Hour Traffic Operations

2045 Alternative 2B PM Peak Hour Traffic Operations - Jackson Street																	
Intersection	Control	MOE	Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Church Avenue	Signal	LOS	D	C		C	C		B	B	A		B	A	B		
		Delay (sec)	38.5	26.7		28.5	34.9		10.7	13.5	0.0		13.7	5.5	16.5		
		Queue (ft)	50'	100'		50'	225'		25'	300'	50'		75'	250'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
Irving Avenue	Signal	LOS	C	C		C	C	C		A	A		A	A	A		
		Delay (sec)	31.6	28.1		29.1	29.5	28.3		4.4	6.4		8.8	4.7	9.6		
		Queue (ft)	50'	75'		50'	100'	75'		25'	225'		50'	175'	--		
			Movement											OVERALL			
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR			SBL	SBT
New York Avenue	Signal	LOS	D	C		D	C		A	A		B	A	B			
		Delay (sec)	38.5	33.7		35.0	34.3		3.6	7.0		12.3	7.5	12.6			
		Queue (ft)	75'	150'		50'	150'		25'	325'		25'	125'	--			

If the current left-turn prohibition at New York Avenue is removed under Alternative 2B, the evening peak hour volumes can be expected to change as some through vehicles will return to making left turns in the northbound and southbound directions. For the purpose of analyzing the potential shift in traffic volumes,

it is assumed that the northbound and southbound left-turning vehicles would be similar in volume to the left-turn volumes at the Jackson Street intersection with Irving Avenue. The analysis of these adjusted volumes with permissive left-turn phasing indicates a very small increase in the overall delay of the intersection, with minor increases in the left-turn delay and queuing and decreased delay and queueing for the through movements. The design of the intersection under Alternative 2B also provides the opportunity to consider protected phasing if desired, recognizing that this would result in increased delay for other movements.

Travel Speeds

Travel speeds along Jackson Street under Alternative 2B are expected to be reduced as a result of several corridor improvements. South of New York Avenue, where the roadway redesign will be incorporated, the speed reduction is expected to be greater and comparable to Alternative 2A. North of New York Avenue, the speed reduction will be limited to the impact of the speed feedback sign for southbound traffic. The following summarizes the potential speed reduction of each isolated improvement. As previously mentioned, these reductions in speed are not additive but the benefit of applying more than one traffic taming technique is that one will reinforce another and add incremental benefits in an effort to create a street with reduced travel speeds. The following Alternative 2B improvements are expected to reduce travel speeds along Jackson Street south of New York Avenue:

- **Roadway Redesign:** According to FHWA, several urban roadway redesign projects have resulted in a reduction of average vehicular travel speeds of 2mph to 4mph.
- **Speed Feedback Signs:** As identified for Alternative 1, FHWA research shows that speed feedback signs have been effective at reducing speeds by 5mph. This conclusion is based on several before and after studies that found average and 85th percentile travel speeds were reduced between 1mph and 7mph depending on the roadway location and characteristics.
- **Bump-Outs:** According to FHWA, bump-outs have been shown to reduced average vehicle speeds and 85th percentile speed by up to 4mph.

North of New York Avenue, speed reductions will be limited to the impact of speed feedback signs on southbound traffic.

Safety

FHWA's Crash Modification Factor Clearinghouse provides data related to the expected reduction in crashes based on a wide variety of roadway treatments. As more than one safety improvement is made along a given corridor, the potential overall impact is not additive for each isolated treatment, similar to the previous discussion of impacts to travel speeds. But the combination of multiple safety improvements does have incremental safety benefits, especially for multiple roadway users, and helps to create a safer and more walkable urban street. The following Alternative 2B improvements are expected to reduce the likelihood of crashes along Jackson Street:

- **Roadway Redesign:** FHWA provides crash reduction data based on multiple roadway redesign studies that indicate the overall number of crashes along the corridor can be reduced between 19% and 25%. This safety improvement would be limited to the Jackson Street segment south of New York Avenue.
- **Improved Left-Turn Offset:** The roadway redesign included in Alternative 2B allows for an improved left-turn offset at intersections, converting the existing negative offset to a neutral offset and allowing left-turning vehicles to have a better sight line for judging gaps in oncoming traffic. Studies based on Wisconsin data have shown that improvements that create a positive left-turn offset can reduce injury-related crashes by 35%. The improvement from a negative to a neutral

offset may be less than the 35% identified in this research but still provide improvement over the existing condition. This safety improvement would be limited to the Jackson Street segment south of and including New York Avenue.

- **Continental-Style Crosswalk Markings:** According to FHWA, continental-style crosswalk pavement markings have been shown to reduce the likelihood of pedestrian-related crashes by 40%.
- **Bump-Outs:** Bump-outs located at unsignalized crossings in Alternative 2A have the benefit of reducing the crossing distance for pedestrians and making the corridor more pedestrian friendly.
- **Speed Feedback Signs:** Although the FHWA studies related to speed feedback signs were based on rural study locations, the data indicates that these signs can be expected to reduce the number of all crash types by 5%.

Alternative 2B, as compared to Alternative 2A, would not provide the additional pedestrian crosswalk and RRFBs recommended at Congress Avenue.

Estimated Cost

The estimated cost of Alternative 2B was calculated for two conditions. The first assumes the curb bump-outs are incorporated as a reconstructed curb and gutter and expanded sidewalk. The second assumes the curb bump-outs are incorporated using colored pavement markings and bollards and that the existing curb and gutter remains in its current location. The resulting estimated costs are expected to be in the range of \$160,000 to \$180,000 for the curb and gutter reconstruction and in the range of \$120,000 to \$140,000 for the pavement markings and bollards. The costs are shown in Appendix C of the technical supplement.

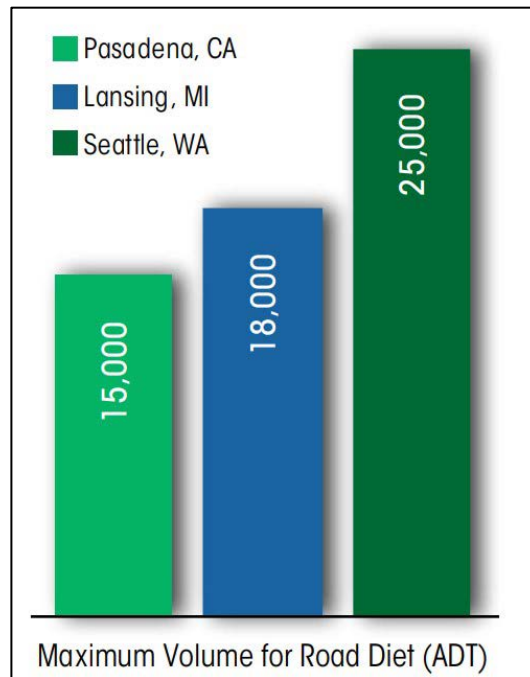
Two-Way Left-Turn Lane (TWLTL) and Traffic Volume Guidance

FHWA's *Road Diet Informational Guide* discusses AADT thresholds at which roadway redesigns (road diets) may be considered. The *Guide* states that various maximum AADT volumes are used across the country to determine appropriate corridors. For example, a "2011 Kentucky study showed Road Diets could work up to an ADT of 23,000 vehicles per day (vpd)." Figure 15 is taken from the *Guide* and identifies the maximum AADT threshold used by three cities across the country to identify potential roadway redesign candidates. Review of several roadway redesign projects in Iowa found that the feasibility of implementing a roadway redesign became less likely when peak hour traffic volumes exceeded 875 vehicles per hour per day. The *Guide's* conclusion is that "FHWA advises that roadways with ADT of 20,000 vpd or less may be good candidates for a Road Diet and should be evaluated for feasibility.

The WisDOT Facilities Development Manual (FDM) provides guidance in Chapter 11-25 for the design criteria of TWLTLs. Section 5.4.2 states that the acceptable design year AADT for a 3-lane TWLTL is up to 17,500 vpd. The *City of Oshkosh Bicycle and Pedestrian Master Plan 2019* states that streets with an AADT count of less than 20,000 vehicles are ideal candidates for conversion from a four-lane roadway to two travel lanes with a center turn lane. Streets with 20,000 – 30,000 AADT counts are potential candidates that require further analysis.

The Jackson Street corridor south of Irving Avenue and south of New York Avenue, with forecasted AADTs of 11,250 vpd and 13,400 vpd, respectively, sit comfortably within the recommended AADT range identified in the FDM. North of New York Avenue, Jackson Street and its forecasted AADT of 18,650 is expected to be above the upper threshold identified by WisDOT and under the 20,000 vpd threshold identified by FHWA and the City of Oshkosh Bike and Pedestrian Master Plan.

Figure 15: FHWA Guidance on Maximum Volume for Roadway Redesign¹



Comparable TWLTL Corridors

The City of Oshkosh has implemented roadway redesigns along the Murdock Avenue corridor and the 9th Avenue corridor in recent years. Table 23 compares the most recent AADT volumes along each of these recent roadway redesign corridors and the study segment of Jackson Street.

Table 23: City of Oshkosh Roadway Redesign Corridors – AADT Comparison

	AADT (Vehicles per Day)
Murdock Avenue	
From Sheridan Street to Wisconsin Street	9,800 to 10,400
9th Avenue	
From Reichow Street to Knapp Street	12,400 to 12,500
Jackson Street	
South of Hobbs Avenue	17,100
South of New York Avenue	12,300
South of Irving Avenue	10,300

¹ *Road Diet Informational Guide*, FHWA Safety Program, U.S. Department of Transportation Federal Highway Administration, November 2014, https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/rdig.pdf.

Public Engagement

The public engagement process included two public information and feedback meetings and a series of corridor stakeholder meetings. The meetings were held in coordination with a long-range planning study for the Jackson Street corridor immediately north of the Historic Neighborhood, from Murdock Avenue to I-41.

Stakeholder Meetings

Stakeholder meetings were held throughout the day on December 11, 2019. These meetings were held at City Hall with residents and business owners from the Jackson Street corridor and provided an opportunity for attendees to express their thoughts and concerns on the existing corridor and offer suggestions for potential improvements. The following summarizes the comments that were heard most often for the Historic Jackson Street study corridor during the Stakeholder meetings:

- Primary concerns of high vehicular travel speeds and safety
- Character of roadway as a highway vs street
- Would prefer a more walkable street
- East/west bike and pedestrian connectivity
- Consider additional crosswalks, speed feedback signs, and roadway redesign
- Terrace width and limited snow storage in winter
- Crossing maneuver between Congress Avenue and Nevada Avenue can be challenging
- Challenges for the high number of driveways to enter/exit residences
- High number of rental properties near south end of the study area
- Suggestion to move the I-41 Alternate Route designation to a different corridor

The full summary of comments received during the stakeholder meetings are included in Appendix D of the technical supplement.

Public Engagement & Listening Session

A Public Engagement and Listening Session was held later that evening on December 11, 2019 at Oaklawn Elementary School from 6PM – 7:30PM. The purpose of the meeting was to summarize the intent of the study, provide background on safety, vehicle speeds, and traffic volumes that had been collected, and provide an opportunity in a public format for attendees to express their thoughts, concerns, and suggestions for the corridor.

Following the public comment portion of the meeting, attendees gathered into small groups around aerial maps of the corridor and provided written markups on the exhibits highlighting their concerns and suggestions. The themes of the public comments and written notes, included in Appendix D of the technical supplement, echoed the same messages heard earlier in the day during the stakeholder meetings.

Comments:

- Pedestrians feel unsafe on sidewalks adjacent to high speed traffic
- High traffic speeds exceed posted speed limit
- Very difficult to exit driveways
- There are very few marked crosswalks making it difficult to cross the street (especially at bus stops and near schools/parks)
- Lack of snow storage ability along Historic Jackson Street Corridor segment
- Roadway noise is very loud

- Street lighting needs improvement
- Pedestrian safety at Murdock roundabout crossings

Suggestions:

- Need sidewalks along entire corridor
- Apply traffic speed taming tools
- Consider 'roadway redesign' improvement
- Install crosswalk at bus stops and near school/park locations
- Consider flashing beacons
- Reduce sign clutter
- Consider rerouting I-41 Alternate Route

Public Engagement Meeting #2

A second public engagement meeting was held on March 4, 2020 at Oaklawn Elementary School from 6PM – 7:30PM. The purpose of the meeting was to review the intent of the study, provide a summary of the comments heard during the first public engagement session, identify the evaluation criteria for the corridor and summarize the improvement options being considered.

The alternatives presented at the second public engagement meeting included preliminary versions of the three alternatives included in this report.

- Alternative 1: Maintain Existing Cross-Section
 - This alternative included only the installation of four speed feedback signs, similar to the current Alternative 1 concept.
- Alternative 2A: Full Roadway Redesign (Full TWLTL)
 - Alternative 2A, as presented at the second public engagement meeting, included the roadway redesign from a four-lane cross-section to one through lane in each direction, a center two-way left-turn lane, and an outside buffer on each side of the roadway. The roadway redesign extended from Church Avenue to the Nevada Avenue intersection and returned to a four-lane cross-section north of Nevada Avenue to Murdock Avenue.
 - Alternative 2A did not include the proposed crosswalk and RRFBs at Congress Avenue but did include a crosswalk near Nevada Avenue.
- Alternative 2B: Partial Roadway Redesign (Partial TWLTL)
 - This alternative included the reconfiguration of Jackson Street to a three-lane cross-section south of New York Avenue and maintained the four-lane cross-section north of New York Avenue, similar to the current Alternative 2B concept.

The most common comments received are summarized below and the full comment summary is included in Appendix D of the technical supplement.

Comments:

- Snow removal concern at bump-outs
- Preference in Alternative 2A to extend the three-lane cross-section farther north to address traffic speeds and safety
- Consider adding more crosswalks in the vicinity of Nevada Avenue
- Support expressed for Alternative 2A and the potential speed and safety improvements
- Vehicle and pedestrian safety concerns at the offset alignment of Nevada Avenue

- Suggestion to implement the three-lane cross-section immediately south of Murdock Avenue
- Consider relocating Jackson Street bus route to Wisconsin Street
- School board is considering options for the Merrill Elementary/Middle School site and Jackson Athletic Field
- Consider adding left-turn arrows at Irving Avenue and New York Avenue
- Pedestrian crossing concerns at Murdock Avenue roundabout

Other Improvement Considerations

During the public engagement process, several comments were received concerning additional possible improvements to areas of operational or safety concern. Although long-term improvements to address these comments are not included in the scope of this study, information is provided below to document the consideration given to these issues.

Congress Avenue & Nevada Avenue Intersections

The Jackson Street offset intersections at Congress Avenue and Nevada Street present operational concerns as eastbound and westbound vehicles weave through this pair of intersections. In addition, the presence of Merrill Elementary/Middle School and the Jackson Athletic Field results in the presence of school-age pedestrians.

During the first public engagement meeting, comments were received that special consideration should be given to the operations and safety in this area. Possible long-term improvements included consideration of realigning the east leg of Nevada Street to create a more-typical four-legged intersection and simplify the crossing maneuver for eastbound and westbound traffic. After discussions with the City, it was determined that the option of realigning Nevada Street was outside of the scope of this study. Additionally, the Oshkosh School District is evaluating potential future uses of the existing Merrill Elementary/Middle School and Jackson Athletic Field sites that could potentially impact this area. For this reason, long-term recommendations for the realigning of Nevada Street are not included in this study.

It should be noted that the speed feedback signs included in all alternatives should reduce travel speeds along the corridor, which may help allow turning vehicles to find adequate gaps in Jackson Street traffic and help reduce the likelihood of crashes. In addition, the roadway reconfiguration under Alternative 2A should further reduce travel speeds and would simplify the crossing maneuver by reducing the number of lanes on Jackson Street and allow for a two-stage left-turn movement.

Murdock Avenue Roundabout

During each of the two public engagement meetings, comments were received concerning the pedestrian crossing accommodations at the Jackson Street roundabout with Murdock Avenue. The intersection was reconstructed as a roundabout in 2010. The pedestrian crosswalks are located so that vehicles stopped at the roundabout occupy the crosswalk space and obstruct the ability of pedestrians to safely cross. Desirably, the crosswalk should be located far enough from the vehicular yield point that pedestrians are able to cross behind the stopped vehicle.

The Oshkosh Bicycle and Pedestrian Advisory Committee conducted a meeting on March 17, 2016 that featured a discussion of this issue. At that meeting, a representative from WisDOT explained that the location of the crosswalks was selected to ensure that adequate width is provided for a pedestrian waiting in the median island. The roundabout had been designed to minimize the taking of right-of-way and adjacent parcels and shifting the crosswalks farther from the center of the roundabout would require major reconstruction of the roundabout. In 2013, RRFBs were added to all four approaches of the roundabout. No pedestrian-involved crashes were reported in the study period.

After discussion with City staff, it was determined that this study would not include a full reconstruct of the roundabout approaches. Consideration was given to a number of possible improvements but were not deemed appropriate.

- “Yield Here to Pedestrians” Sign: Consideration was given to adding the R1-5 sign at the roundabout approaches at each crosswalk but the Manual on Uniform Traffic Control Devices (MUTCD) states in Section 2B.11 “Yield (stop) lines and Yield Here to (Stop Here For) Pedestrians signs should not be used in advance of crosswalks that cross an approach to or departure from a roundabout.”
- Triangle Yield Line Pavement Markings: The MUTCD offers the option of including white triangle pavement markings at the yield point for entering the roundabout. Consideration was given to using these markings in advance of the crosswalk, but the concern was raised that this marking would lead to motorist confusion as to the appropriate yield location for entering the circulating roadway within the roundabout.




























Providing crosswalks set sufficiently back from the circulating roadway to reduce the likelihood of vehicle obstructions requires significant reconstruction of the roundabout. It was determined that no additional signing or changes at the roundabout would be included as part of this study.

Comparison of Alternatives

The multimodal traffic safety and quality of life study evaluated the safety and operations of the existing corridor geometrics and multiple potential corridor improvements to identify recommended treatments for improving the quality of life along the corridor and identifying the impacts to safety, travel speeds, and operation. Table 24 provides a qualitative summary of the expected impact that each Alternative will have on the evaluation criteria.

Alternative 2A, the full roadway redesign for nearly the entire study corridor, is expected to have the highest positive impact on all criteria with the exception of roadway reserve capacity for vehicular through traffic. Alternative 1, which maintains the existing four-lane capacity and installs speed feedback signs, is expected to have the least positive impact on criteria outside of the roadway reserve capacity. Alternative 2B, which combines components of the other two alternatives, is expected to provide moderate improvements when compared to the other two alternatives.

Table 24: Comparison of Alternatives

	Alternative 1 Maintain Existing Cross-Section	Alternative 2A Full Roadway Redesign with Two- Way Left-Turn Lane	Alternative 2B Partial Roadway Redesign with Two- Way Left-Turn Lane
Vehicular Reserve Capacity			
Safety			
Vehicular Speeds			
Pedestrian Accommodations			
Snow Storage			
Driveway Access			
Noise			
Public Feedback			
Cost*	\$70K - \$80K	\$180K - \$230K	\$130K - \$180k
Qualitative Comparison Scale:  Higher Positive Impact  Moderate Positive Impact  Lower Positive Impact			

*Costs for Alternatives 2A and 2B include a range for the inclusion of either reconstructed or painted bump-outs.

Conclusions & Recommendations

The City of Oshkosh retained Ayres Associates to conduct a traffic safety and quality of life study along the Jackson Street corridor from Church Avenue to Murdock Avenue. Existing traffic speed and safety data indicate there is a need to tame traffic in this residential neighborhood that will enhance safety for all users, and improve mobility for vehicles, pedestrians, and bicyclists. The study summarizes existing travel speeds, safety, and operation of the corridor and identifies several roadway cross-section improvement alternatives.

Jackson Street is a north/south, four-lane urban roadway, with a 30-mph posted speed limit. The street is also identified as a “connecting highway” by the Wisconsin Department of Transportation (WisDOT) as US 45 and STH 76. The corridor also serves as the signed alternate route for I-41 and experiences an increase in traffic when closures occur on I-41, approximately four to five times per year. The corridor includes 17 intersections, including Murdock Avenue and Church Avenue, as well as 148 private curb openings serving 165 residential properties. The corridor travels through a predominantly residential neighborhood. The presence of Merrill Elementary/Middle School to the east and the University of Wisconsin-Oshkosh to the west creates pedestrian activity along the corridor, with a high number of students of all ages. Traffic signal-controlled intersections are located at New York Avenue, Irving Avenue, and Church Avenue.

The study segment of Jackson Street was reconstructed by WisDOT in 2001, expanding the street from two lanes to four lanes with a greatly reduced terrace width. The width of the roadway is 45', within a 60' right-of-way from Church Avenue to New York Avenue and a 66' right-of-way from New York Avenue to Hobbs Avenue. The intent of this study is not a full roadway reconstruction as the existing roadway still has useable life.

Intersection turning movement counts were gathered at the three study intersections of New York Avenue, Irving Avenue, and Church Avenue from 3:00pm – 6:00pm on Monday, November 18, 2019; 6:00am – 9:00am on Tuesday, November 19, 2019; and 6:00am – 9:00am on Wednesday, November 20, 2019 when surrounding schools were in session.

WisDOT traffic counts gathered in 2019 resulted in the following daily traffic volumes:

- Murdock Avenue to New York Avenue: 17,100 vpd
- New York Avenue to Irving Avenue: 12,300 vpd
- Irving Avenue to Church Avenue: 10,300 vpd

Jackson Street historical daily traffic counts along the study corridor indicate that traffic volumes have remained relatively constant over the last 20 years. Traffic forecasts from the ECWRPC indicate an average annual growth rate of approximately 0.35% per year is expected on Jackson Street, with slightly lower growth on the intersecting streets. This growth rate results in the following daily traffic volume estimates for the design year of 2045

- Murdock Avenue to New York Avenue: 18,650 vpd
- New York Avenue to Irving Avenue: 13,400 vpd
- Irving Avenue to Church Avenue: 11,250 vpd

Vehicular speed data on Jackson Street, collected at two locations along the study corridor, indicate the 85th percentile speeds range between 35 mph and 40 mph and 68% to 92% of traffic exceeds the posted 30 mph speed limit, depending on the location and the direction of travel.

Street segment and intersection crash data provided by the UW TOPS Lab for the five-year period from 2014 through 2018 indicate an average of 63 crashes occur per year within the study corridor with a peak of 75 total crashes in 2016.

The highest intersection crash locations were as follows:

- Murdock Avenue: Average 16 crashes per year
- New York Avenue: Average 13 crashes per year
- Irving Avenue: Average 6 crashes per year

The primary collision patterns involved left-turn, rear-end, and lane-changing/sideswipe crashes. The three intersections identified above experience intersection crash rates above the most recent statewide average crash rate for urban intersections. Four of the crashes during the study time period involved pedestrians.

The three study intersections within the project corridor operate at LOS 'D' or better under the existing conditions and are expected to continue to operate at LOS 'D' or better in the design year of 2045.

Sample communities across the country have identified a maximum upper limit of up to 25,000 vpd for consideration of a roadway redesign from a four-lane to a three-lane cross-section. FHWA recommends an upper limit of 20,000 vpd for consideration of a three-lane cross section and the WisDOT FDM recommends an upper limit of 17,500 vpd.

The study identified three corridor improvement alternatives, all of which are expected to operate at an acceptable LOS. Alternative 1, which maintains the existing four-lane cross-section and installs speed feedback signs along the corridor, is expected to operate with a higher roadway reserve capacity for through traffic than the other two alternatives, but provide less improvements to safety and the reduction of travel speeds when compared to the other two alternatives.

Alternative 2A, which reconfigures the corridor from a four-lane to a three-lane cross-section with a center two-way left-turn lane, is expected to operate with a lower reserve capacity for through traffic but still maintain an acceptable LOS with higher intersection maximum queue lengths than Alternatives 1 and 2B. Alternative 2A provides the highest potential safety improvement, greatest reduction in travel speeds, much-needed space for snow storage, easier ingress/egress from corridor driveways, additional pedestrian accommodations, and increased space between vehicles and pedestrians.

Alternative 2B, which reconfigures the corridor south of New York Avenue from a four-lane to a three-lane cross-section with a center two-way left-turn lane, provides the same benefits for residents south of New York Avenue as Alternative 2A, related to safety improvement, reduction in travel speeds, needed space for snow storage, easier ingress/egress from corridor driveways, additional pedestrian accommodations, and increased buffer space between vehicles and pedestrians. North of New York Avenue, Alternative 2B limits the potential for safety and speed improvements to that of Alternative 1 but provides additional roadway through capacity in the segment where AADT levels are expected to exceed the WisDOT-recommended upper threshold for the consideration of three-lane cross-sections.

Recommendation: It is recommended that Alternative 2A be implemented along the Historic Jackson Street study corridor. The redesigned cross-section is a better solution for the City compared to the existing four-lane highway design in a built-up urban area with pedestrian and numerous driveway traffic conflicts. Alternative 2A is expected to provide the greatest safety improvement along the corridor by improving left-turn offsets, reducing travel speeds and the severity of injury-related crashes, and reducing the potential for pedestrian-related crashes. It simplifies ingress/egress at the 148 private curb openings along the corridor. The buffer space between the travel lane and the curb increases the available snow storage space in winter and provides greater separation between the travel way and sidewalk, creating a more inviting sidewalk space for pedestrians. All primary intersection traffic movements are expected to continue to operate at an acceptable LOS 'D' or better and the recommendation is consistent with

information provided in the City's Bicycle and Pedestrian Master Plan. In addition, Alternative 2A does a better job of addressing the comments and concerns expressed by the public at the public engagement sessions and stakeholder meetings. The Jackson Street redesign provides a proven opportunity to enhance safety for vehicular traffic, as well as pedestrians and bicyclists, while also enhancing the quality of life in the adjacent residential neighborhood.

At the request of the City, consideration was given to a phased approach for implementing improvements along Jackson Street. A potential phased improvement moving from Alternative 1 to Alternative 2B to Alternative 2A could include the following steps.

1. Installation of speed feedback signs (similar to Alternative 1).
2. Conversion of the existing roadway to a three-lane cross section with center left-turn lane from Church Avenue to New York Avenue (similar to Alternative 2B).
3. Conversion of the existing roadway to a three-lane cross section with center left-turn lane from New York Avenue to Murdock Avenue (similar to Alternative 2A).

Additionally, the curb bump-outs included in Alternatives 2A and 2B could be constructed at a later date as part of a phased approach. The phased implementation plan is feasible and would allow for an opportunity to measure the performance of the improvements prior to implementing the next roadway improvement. On the other hand, implementing improvements in this manner would have the following drawbacks.

First, the speed feedback signs under Alternative 1 are recommended as overhead signs, making them more visible to drivers within a four-lane cross section. Under the three-lane cross section of Alternative 2A, the speed feedback signs could be post-mounted on the side of the roadway. Using the phased implementation would result in either post-mounted signs that are less effective as an initial improvement in the four-lane cross section, or an increase in the cost of an ultimate three-lane design under Alternative 2A to include overhead signing. It is recommended that if a phased approach is used, overhead signing be installed for improved sign visibility.

The second drawback is the cumulative impact of the improvements would not be fully realized until the final improvement is made. Each of the improvements suggested with Alternative 2A has its individual impact on speeds and safety, but the cumulative effect when combined together and implemented along the entire length of the corridor can be more powerful in redefining the roadway as an urban street as opposed to a higher-speed highway.

A third drawback is the need to restripe the area surrounding the New York Avenue intersection multiple times. The pavement markings applied under the second step, reflecting the design shown in Alternative 2B, would need to be removed for the third step, continuing the three-lane cross section north to Murdock Avenue.

Exhibits

Exhibit 1: Alternative 1 Conceptual Plan

Exhibit 2: Alternative 2A Conceptual Plan

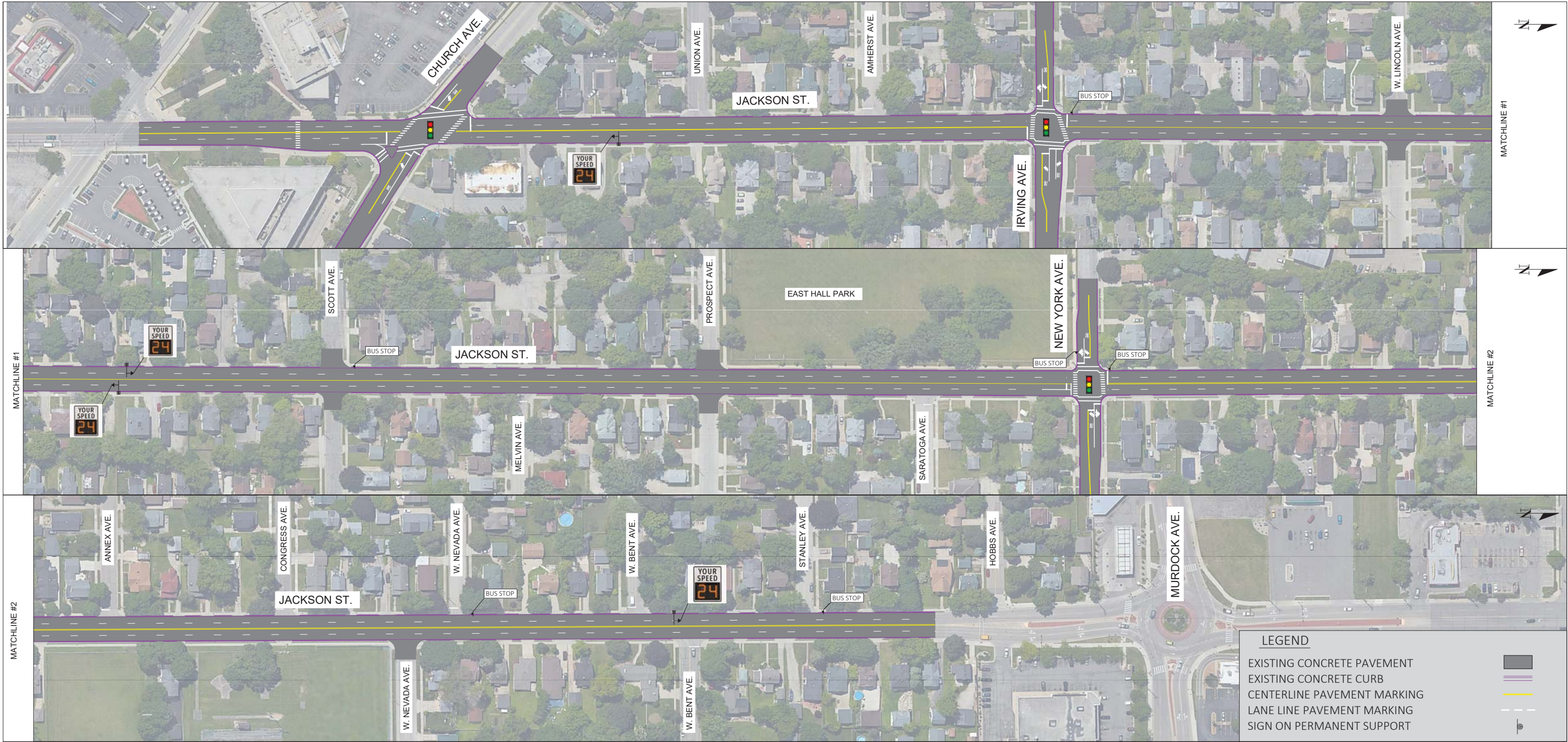
Exhibit 3: Alternative 2B Conceptual Plan

Exhibits

Exhibit 1: Alternative 1 Conceptual Plan

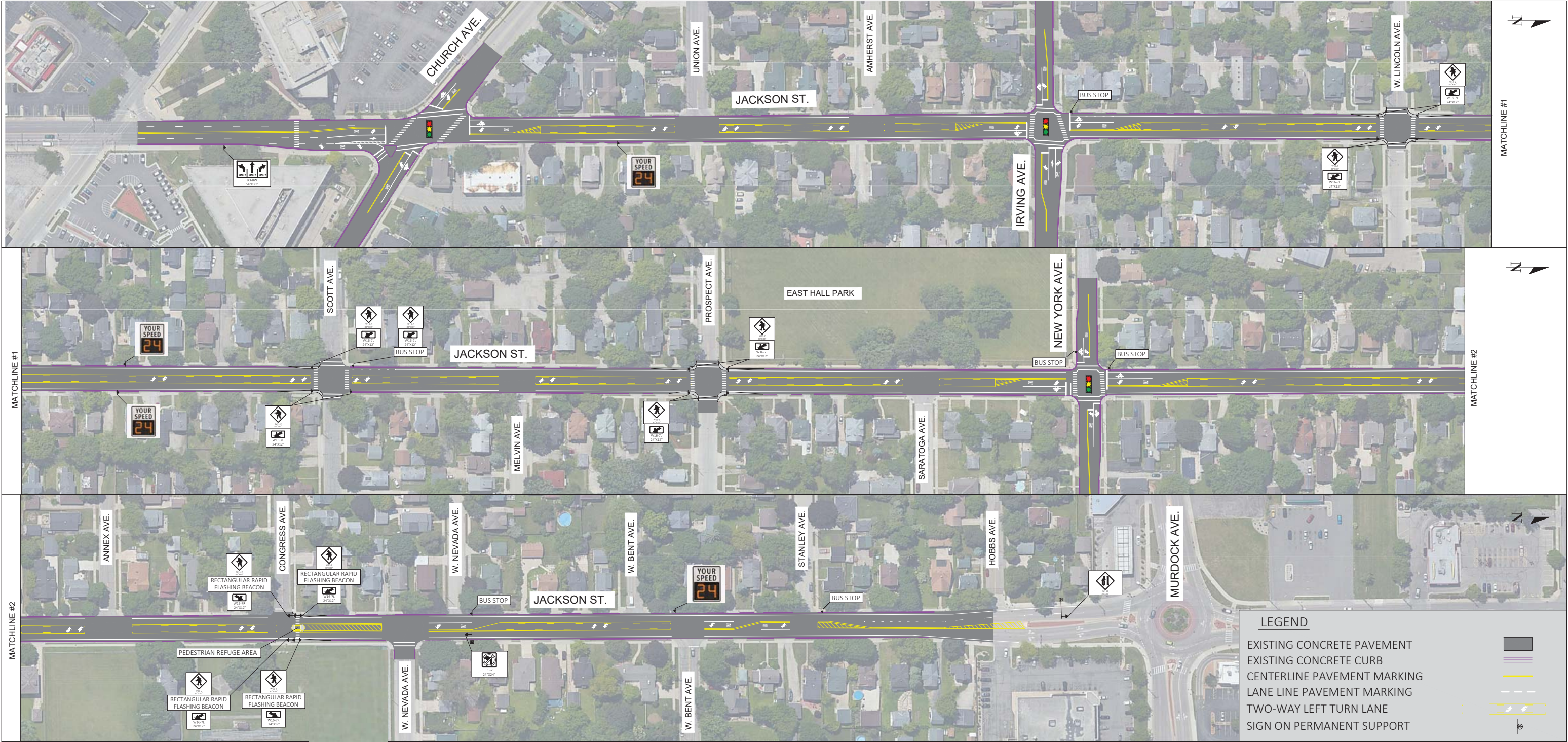
Exhibit 2: Alternative 2A Conceptual Plan

Exhibit 3: Alternative 2B Conceptual Plan



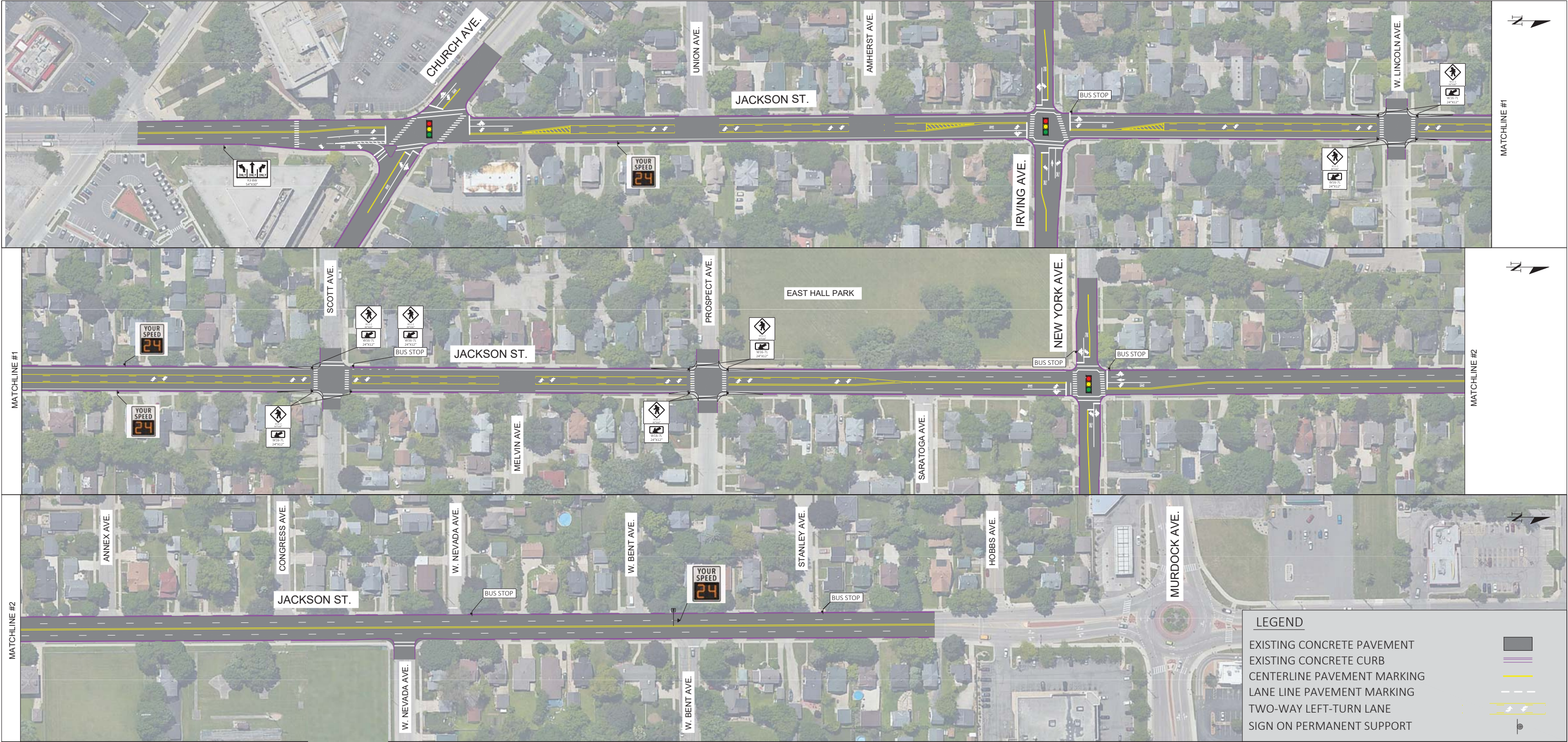
JACKSON STREET CORRIDOR PLAN AND SAFETY STUDY
OSHKOSH, WI

EXHIBIT 1
ALTERNATIVE 1: MAINTAIN EXISTING CROSS SECTION



JACKSON STREET CORRIDOR PLAN AND SAFETY STUDY
OSHKOSH, WI

EXHIBIT 2
ALTERNATIVE 2A: FULL ROADWAY REDESIGN WITH TWLTL



JACKSON STREET CORRIDOR PLAN AND SAFETY STUDY
OSHKOSH, WI

EXHIBIT 3
ALTERNATIVE 2B: PARTIAL ROADWAY REDESIGN WITH TWLTL