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Wall Street Bike Lane Study

Carbondale, Illinois

Prepared for:

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Executive Summary

Lochmueller Group completed a Road-Diet and bike lane feasibility study along the Wall Street corridor from Park Street to Main Street in Carbondale, Illinois. Three alternative Road-Diet scenarios were evaluated for the study corridor. These scenarios include:

Scenario 1: Road-Diet scenario with no turn lanes at major intersections under existing traffic volumes

Scenario 2: Road-Diet scenario with turn lanes at major intersections under existing traffic volumes

Scenario 3: Road-Diet scenario with turn lanes at major intersections under 2009 level traffic volumes

Major Findings:

- Average Daily Traffic Volumes (ADT) along the study corridor range from 6,400 to 10,200.

- Major intersections along the study corridor currently operate in acceptable capacity conditions with no significant congestion during peak hours.

- Based on traffic crash data analysis from 2012 to 2016, traffic crashes along the study corridor range from 28 (2014) to 48 (2016).
  - Crash frequencies along the study corridor showed an increasing trend since 2014.
  - There were no fatal crashes along the study corridor. There were 9 A-injury (most severe) crashes along the study corridor.
  - There were 8 pedestrian and 6 bicycle crashes along the study corridor and all of these crashes resulted in injuries.

- A Road-Diet conversion would help improve safety for all travel modes along the study corridor.
  - Road-Diets improve safety by reducing vehicle-to-vehicle conflicts points by 50 percent.
  - FHWA studies have identified that Road Diet conversions reduce 19 to 47 percent of overall crashes.
  - Road-Diets allow bicyclists to travel along physically separated and striped bicycle lanes. Such facilities improve road safety for bicyclists, as bicyclists become more visible, and motorists know where to look for them.
  - Road-Diets help pedestrians by reducing crossing distance, which reduces pedestrian crash risk.

- Scenario 1 is not suitable for the Wall Street corridor, as the majority of the study intersections would operate in congested conditions during the peak hours under existing traffic volumes, mainly due to the absence of dedicated turn lanes.

- Scenario 2 is suitable for the Wall Street corridor, as all major study intersections would operate well within acceptable traffic operational limits during existing peak hours.

- Scenario 3 shows that a Road-Diet conversion with turn lanes at major intersections would generally be able to handle “the worst traffic conditions” scenario, where existing traffic volumes along Wall Street were increased by 34%, and existing traffic volumes along Main Street and Wall Street were increased by 6%, to simulate traffic volumes experienced at the most recent peak in student enrollment for Southern Illinois University (SIU), in 2009.

- The northbound approach of the Wall Street/Walnut Street intersection would operate in oversaturated conditions during the PM peak hour, and the southbound Wall Street approaches at IL 13 would operate in LOS E during both peak hours. However, LOS E is typically considered acceptable for peak period conditions in urban and suburban areas.
- "The worst traffic conditions" would be highly unlikely to occur along the study corridor. It is reasonable to assume that even if student enrollment at Southern Illinois University (SIU) reached its peak 2009 levels, the amount of traffic experienced along Wall Street would be lower than the levels experienced in 2009. This is because students are more likely to utilize multimodal facilities that are safe and convenient, such as bike lanes, when available. It is reasonable to assume that more students would choose bicycling over driving along Wall Street if bicycle lanes are present, as is the case with the proposed Road-Diet conversion.

Recommendations:

- A Road-Diet conversion is recommended for the Wall Street corridor. The conversion should include two travel lanes (one lane in each direction), bike lanes on both sides of Wall Street, and a center Two-Way Left-Turn Lane (TWLTL). The proposed cross section of the Wall Street corridor would include 11 foot travel lanes, 6 foot bike lanes in both directions, and a 10 foot TWLTL.

- Westbound left turn movements at the Wall Street/Eastgate Street intersection should be prohibited to improve traffic safety with the installation of the northbound right turn lane at the intersection of Wall Street/Walnut Street. The Eastgate Street approach should have three-quarter access (right-in/right-out, and left-in only).

- All proposed pavement markings and signs shall follow the Manual on Uniform Traffic Control Devices (MUTCD) guidelines.

- MUTCD sign R3-17: BIKE LANE should be placed at regular intervals along the Wall Street corridor when it is converted to a Road Diet. MUTCD sign R8-3: NO PARKING should also be placed on both sides of the proposed Wall Street corridor at regular intervals.

- MUTCD sign R3-17: BIKE LANE and R3-17a: AHEAD should be placed together, facing the southbound traffic, upstream of the Wall Street/Main Street intersection, and facing the northbound traffic, upstream of Wall Street/Park Street intersection. MUTCD sign R3-17: BIKE LANE and R3-17b: ENDS should be placed facing the northbound traffic, upstream of the Wall Street/Main Street intersection, and facing the southbound traffic, upstream of the Wall Street/Park Street intersection.

- MUTCD sign R4-4: BEGIN RIGHT TURN LANE should be placed at the upstream end of the proposed right turn only lane at the northbound approach of the Wall Street/Walnut Street intersection.

Introduction

Lochmueller Group completed a Road-Diet and bike lane feasibility study along the Wall Street corridor from Park Street to Main Street in Carbondale, Illinois. This report provides details of the existing conditions analysis, the proposed Road-Diet conversion alternatives, and the resulting recommendations for the study corridor.

Existing Conditions Analysis

The existing conditions analysis for the study corridor includes a comprehensive review of the following:

- Roadway geometric conditions
- Traffic operational conditions at major intersections along the study corridor
- Traffic crash analysis
- Major findings

Roadway Geometric Conditions

The Wall Street study corridor is classified as a minor arterial in the regional Long-Range Transportation Plan (LRTP). Urban minor arterials interconnect and supplement the principal arterial system to provide lower travel speed and accommodate shorter trip lengths in comparison to principal arterials.

Curb and gutter are provided on both sides of the study corridor and average pavement width between gutters is approximately 44 feet. Concrete sidewalks are available on both sides of the study corridor. **Figure 1** shows a typical cross-section of the study corridor.

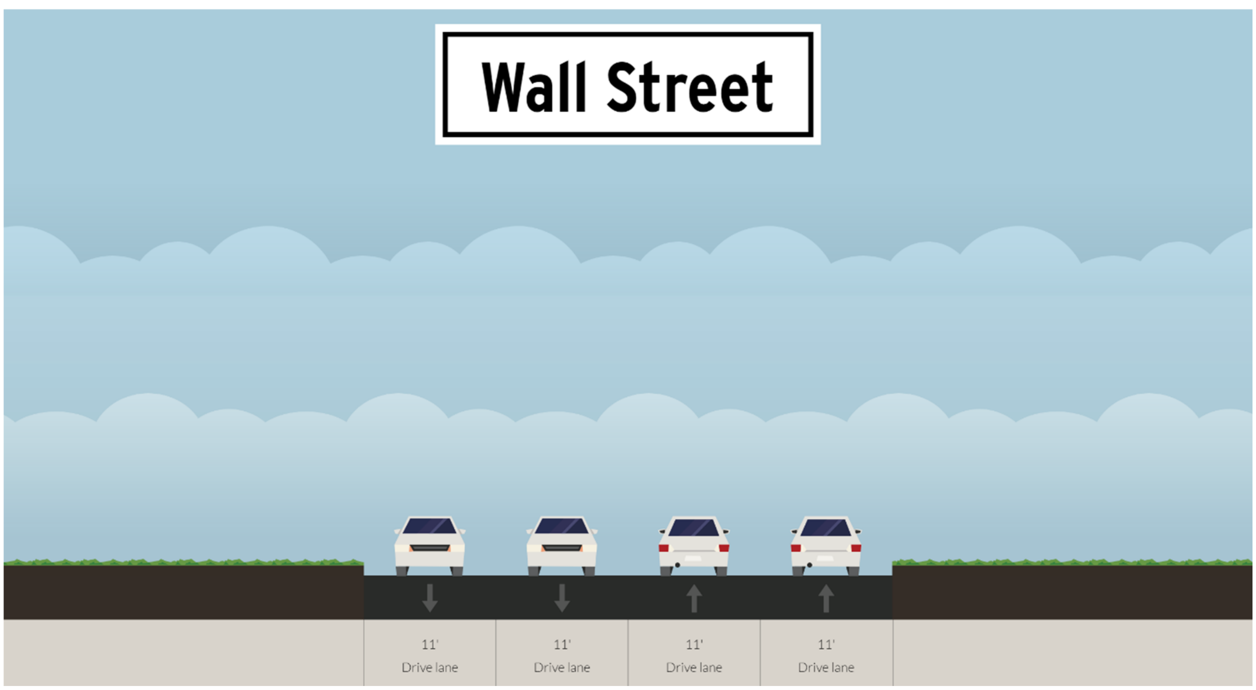

Figure 1: Wall Street Typical Cross-Section

The study corridor has two travel lanes in each direction with no median, and additional turning lanes at major intersection approaches. **Figure 2** shows the study corridor and lane configurations at major intersections.

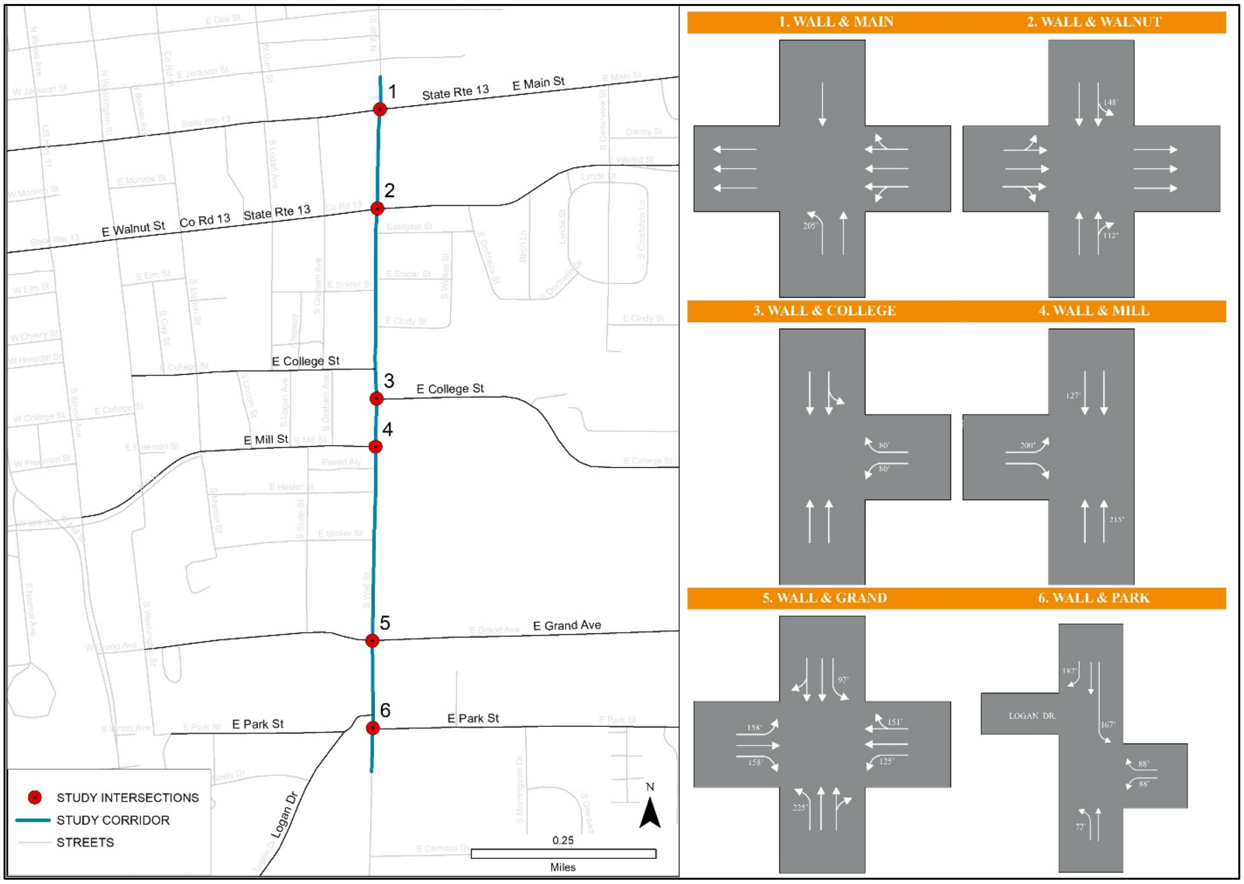

Figure 2: Existing Study Corridor and Lane Configurations at Major Intersections

Traffic Operational Conditions

Average Daily Traffic (ADT) volumes along the study corridor range from 6,400 to 10,200 (Source: IDOT, 2012). **Figure 3** shows ADT volumes along the study corridor and major intersecting roadways. The posted speed limit along the study corridor is 30 mph. As can be seen in Figure 3, ADT volumes along Main Street and Walnut Street are the highest among the intersecting roadways.

Peak period traffic operational conditions were evaluated at six major intersections along the study corridor. These intersections include:

- Wall Street/E Main Street
- Wall Street/Walnut Street
- Wall Street/College Street
- Wall Street/Mill Street
- Wall Street/Grand Avenue
- Wall Street/Park Street

Figure 4 shows the traffic control types at the study intersections. As can be seen in Figure 4, four of the study intersections have traffic signals and two of the study intersections have stop signs at minor approaches.

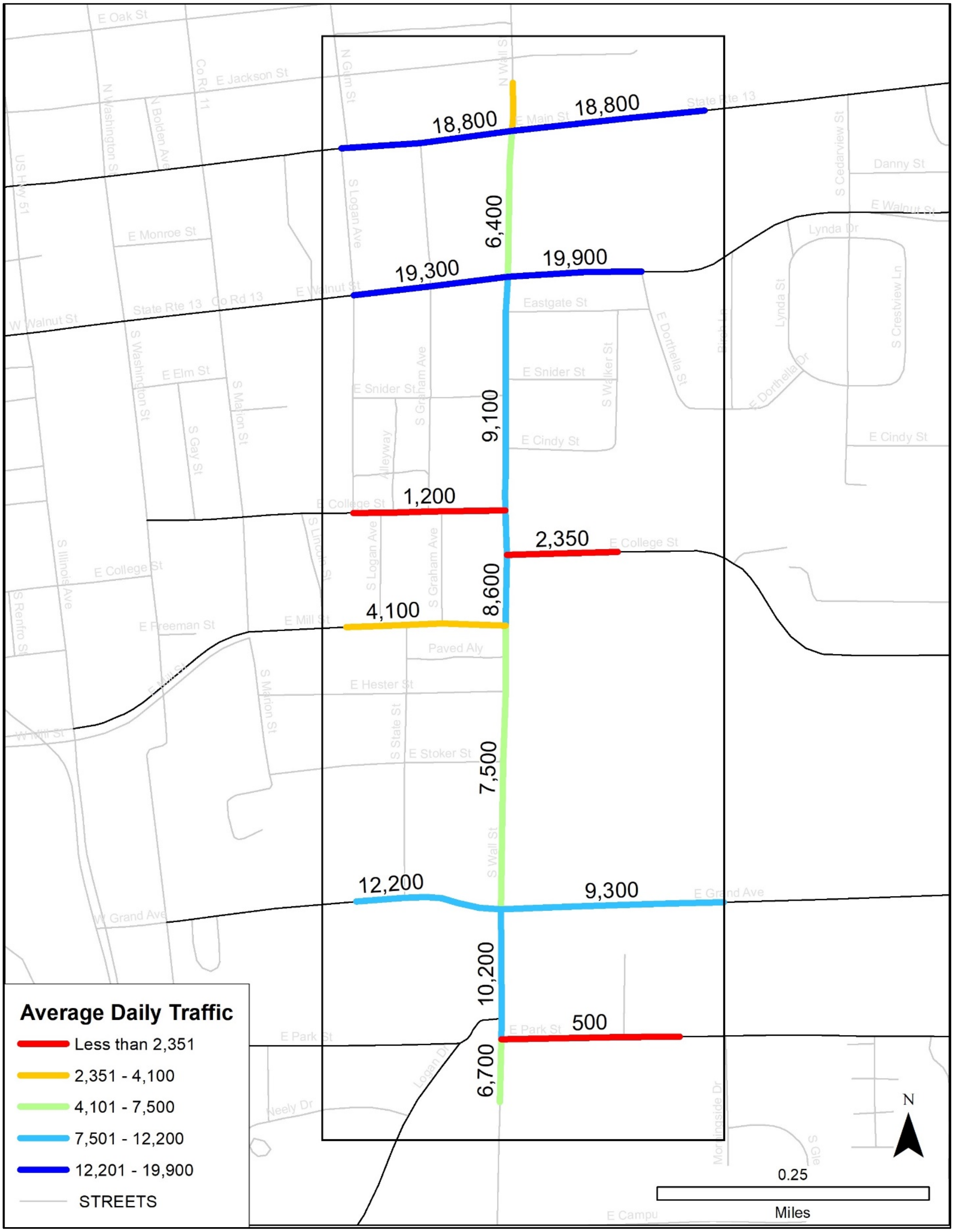

Figure 3: Average Daily Traffic Volumes (Source: Illinois Department of Transportation)

Figure 4: Intersection Control Types

Existing traffic operational conditions at the study intersections were evaluated using traffic turning movement volume data for the AM (7:00-9:00) and PM (4:00-6:00) peak periods during typical weekdays. Peak period traffic count data for the study intersections was obtained from the Southern Illinois Metropolitan Planning Organization (SIMPO) staff.

Traffic operating conditions were evaluated using PTV VISSIM traffic modeling software. VISSIM software analyzes delay experienced by vehicles traveling through the network. These delay outputs were then equated to Levels of Service (LOS) using Highway Capacity Manual (HCM), 6th Edition methodologies. The performance of the transportation system is quantified by Levels of Service (LOS), which are measures of traffic flow that consider factors such as speed, delay, interruptions, safety, and driver comfort and convenience. There are six levels of service ranging from LOS A ("free flow") to LOS F ("oversaturated"). LOS C is commonly used for design purposes and represents a roadway with volumes utilizing 70 to 80 percent of its capacity; however, LOS E is typically considered acceptable for peak period conditions in urban and suburban areas.

Levels of service criteria vary depending upon the roadway component being evaluated. Intersections are most commonly utilized as an overall indicator as roadway capacity is typically dictated by the number of vehicles that can be served at critical intersections. For intersections, the criteria are based on delay and the type of control (i.e., whether it is signalized or unsignalized). For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and then aggregated for each approach and the intersection as a whole. For intersections with partial (side-street) stop control, delay is calculated for the minor movements only (side-street approaches and major road left-turns), since through traffic on the major road is not required to stop.

The levels of service criteria also differ depending on the type of intersection control. Signalized intersections reflect higher delay tolerances as compared to unsignalized and roundabout locations because motorists are accustomed to, and accepting of, longer delays at signals. The thresholds for intersection levels of service are summarized **Table 1.** These thresholds are used for all operational analyses in this report. Existing AM peak hour traffic operating conditions at the study intersections are summarized in **Table 2**, and Existing PM peak hour traffic operating conditions at the study intersections are summarized in **Table 3**. As can be seen in Tables 2 and 3, all the study intersections currently operate in acceptable capacity conditions during the AM and PM peak hours.

Table 1: Intersection Level of Service (LOS) Criteria (Source: HCM 6th Edition)

Level of Service	Control Delay per Vehicle (sec/veh)	
	Signalized	**Unsignalized**
A	≤ 10	0 - 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 -35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

Table 2: Existing AM Peak Hour Levels of Service at the Study Intersections

Intersection	Control Type	Approach	Vehicle Delay (Seconds)	LOS
Wall Street/Main Street	Signalized	Northbound	28.3	C
		Southbound	17.8	B
		Westbound	8.4	A
		Overall	**11.8**	**B**
Wall Street/Walnut Street	Signalized	Northbound	26.0	C
		Southbound	29.4	C
		Eastbound	10.2	B
		Overall	**14.4**	**B**
Wall Street/College Street	1-Way Stop Control (WB)	Westbound	8.1	A
Wall Street/Mill Street	Signalized	Northbound	2.8	A
		Southbound	1.8	A
		Eastbound	18.7	B
		Overall	**5.4**	**A**
Wall Street/Grand Avenue	Signalized	Northbound	11.6	B
		Southbound	13.5	B
		Eastbound	11.8	B
		Westbound	11.1	B
		Overall	**12.7**	**B**
Wall Street/Park Street	1-Way Stop Control (WB)	Westbound	10.0	B

Table 3: Existing PM Levels of Service (LOS) at the Study Intersections

Intersection	Control Type	Approach	Vehicle Delay (Seconds)	LOS
Wall Street/Main Street	Signalized	Northbound	29.8	C
		Southbound	17.0	B
		Westbound	9.2	A
		Overall	**12.4**	**B**
Wall Street/Walnut Street	Signalized	Northbound	35.2	D
		Southbound	27.8	C
		Eastbound	10.6	B
		Overall	**15.5**	**B**
Wall Street/College Street	1-Way Stop Control (WB)	Westbound	8.4	A
Wall Street/Mill Street	Signalized	Northbound	4.0	A
		Southbound	1.5	A
		Eastbound	18.1	B
		Overall	**7.4**	**A**
Wall Street/Grand Avenue	Signalized	Northbound	15.3	B
		Southbound	14.8	B
		Eastbound	13.8	B
		Westbound	12.2	B
		Overall	**15.6**	**B**
Wall Street/Park Street	1-Way Stop Control (WB)	Westbound	9.9	A

Traffic Crash Analysis

Traffic crash data from 2012 to 2016 was analyzed for the study corridor. Crash data was obtained from SIMPO staff. The analysis included both intersection and mid-block crashes. **Figure 5** shows the total number of crashes per year within the study corridor from 2012 to 2016. As shown, the total number of crashes along the study corridor ranged from 28 (2014) to 48 (2016).

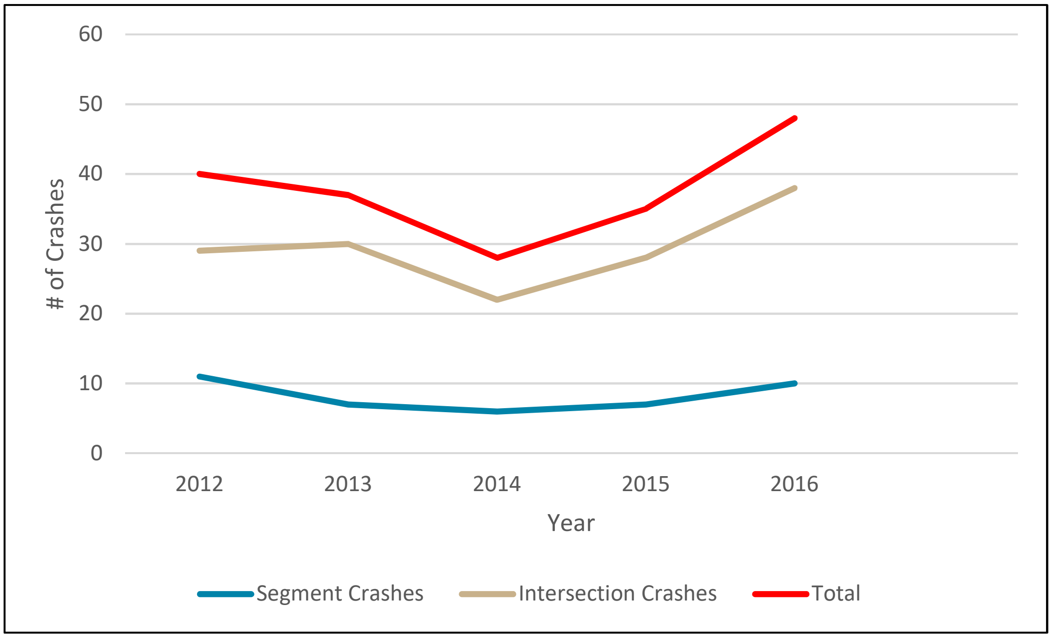

Figure 5: Crash Trends along the Study Corridor (2012-2016)

As can be seen in Figure 5, traffic crashes along the study corridor showed an increasing trend since 2014. Approximately 78% of the crashes along the study corridor occurred at intersections. **Table 4** shows crash frequencies from 2012 to 2016 at major intersections in the study corridor.

Table 4: Crashes at Major Intersections (2012-2016)

Intersection	Year					Total
	2012	**2013**	**2014**	**2015**	**2016**	
Wall Street/Main Street	9	7	7	7	3	**33**
Wall Street/Walnut Street	10	9	5	7	10	**41**
Wall Street/College Street	1	4	0	3	3	**11**
Wall Street/Mill Street	1	3	1	2	3	**10**
Wall Street/Grand Avenue	6	3	5	5	15	**34**
Wall Street/Park Street	1	1	3	2	2	**9**

As can be seen in Table 4, the highest number of crashes occurred at the Wall Street/Walnut Street intersection followed by the Wall Street/Grand Avenue intersection.

Crash Severity

According to Illinois Department of Transportation's (IDOT) Division of Traffic Safety, traffic crash severity levels are classified in the following categories:

- Fatal Crash
- A-Injury Crash
- B-Injury Crash
- C-Injury Crash
- Property Damage Only (PDO) Crash

A-injury crashes are the most severe and C-injury crashes are the least severe. **Figure 6** shows crash severity levels for the study corridor crashes.

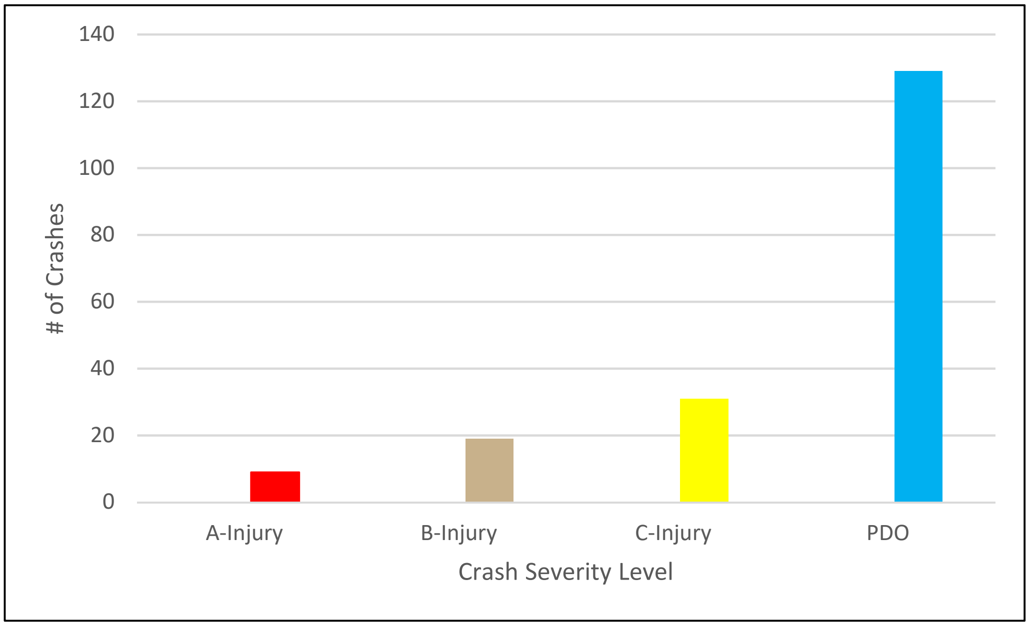

Figure 6: Crash Severity Levels

As can be seen in Figure 6, there were no fatal crashes along the study corridor for the analyzed time period. There were nine A-injury crashes followed by 19 B-injury crashes.

Figure 7 shows the locations of A-injury crashes along the study corridor. The majority of the A-injury crashes (78%) occurred at intersections.

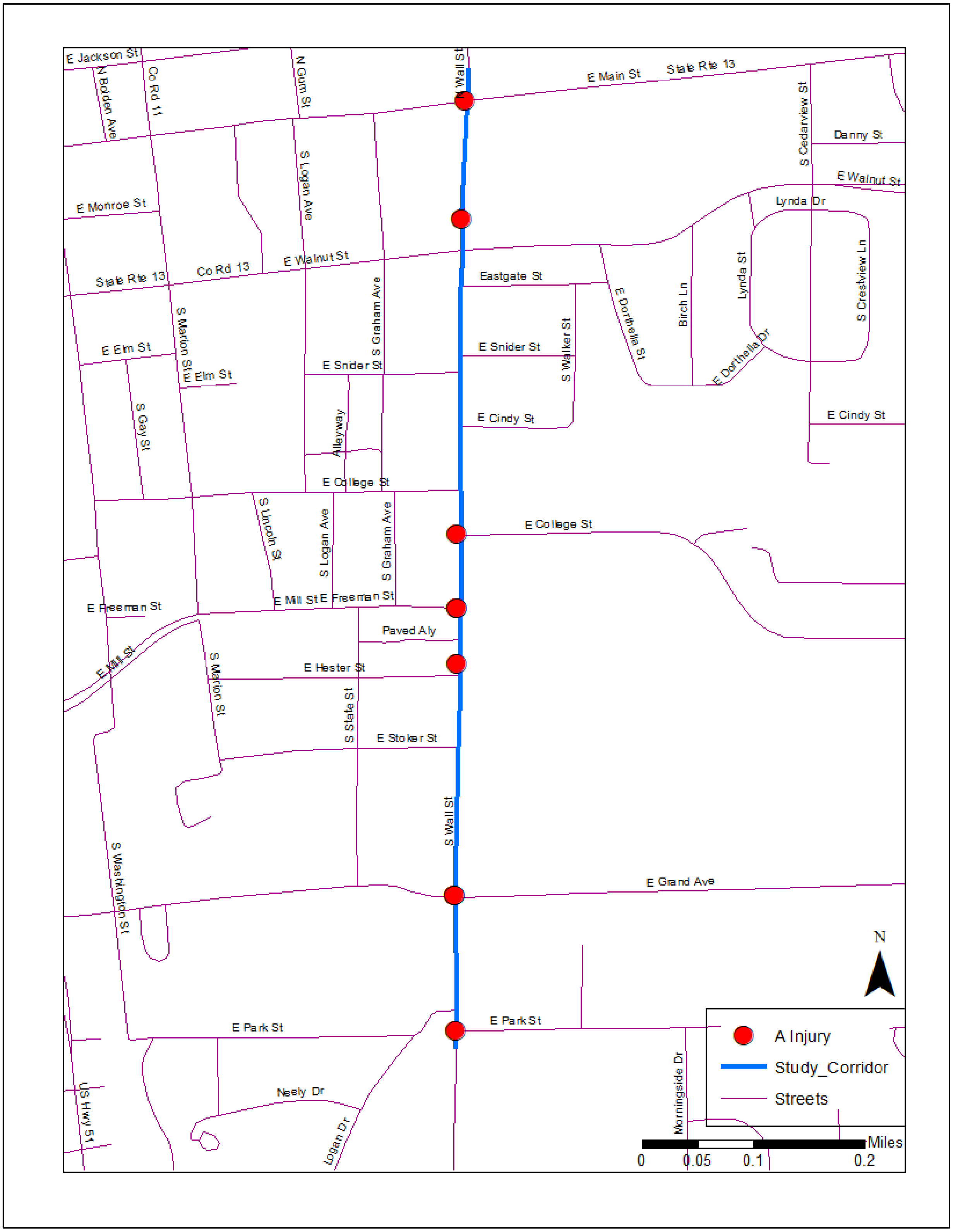

Figure 7: Severe (A-Injury) Crash Locations

Crash Types

Figure 8 shows crash types along the study corridor. As can be seen in Figure 8, 31% of crashes were rear-end crashes followed by turning crashes (24%), and angle crashes (21%) crashes. Pedestrian and bicycle crashes were 4% and 3% of the total crashes, respectively.

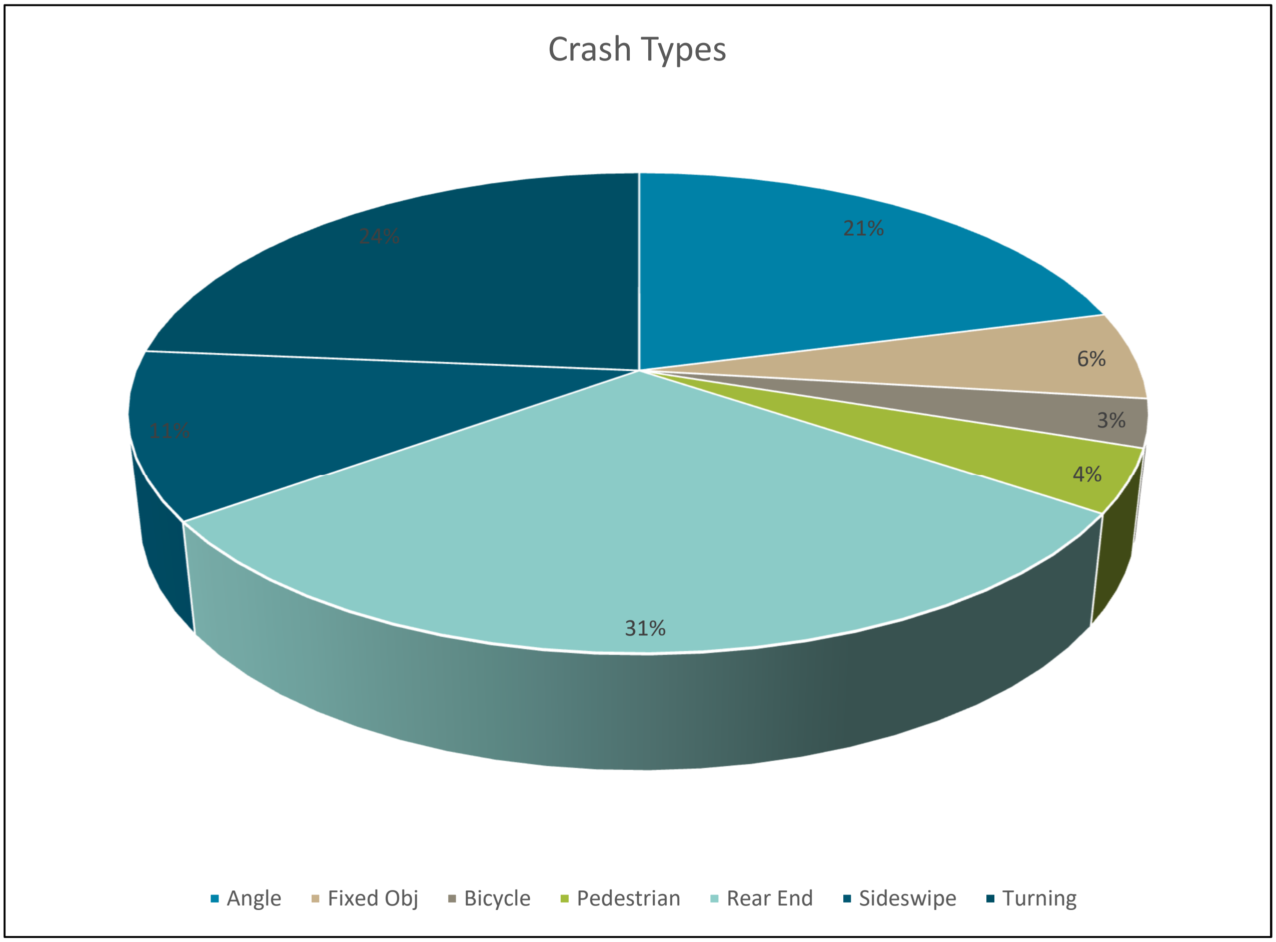

Figure 8: Crash Types

Pedestrian and Bicycle Crashes

Pedestrians and bicyclists are the most vulnerable road users. There were 8 reported pedestrian crashes and 6 reported bicycle crashes along the study corridor from 2012 to 2016. **Table 5** shows details of pedestrian crashes along the study corridor. As can be seen in Table 5, all the pedestrian crashes resulted in injuries. There were two pedestrian crashes at the Wall Street/Grand Avenue intersection. **Table 6** shows details of bicycle crashes along the study corridor. As shown in Table 6, all the bicycle crashes resulted in injuries. The Wall Street/Grand Avenue and the Wall Street/Walnut Street intersections had two bicycle crashes each. **Figure 9** shows the locations of pedestrian and bicycle crashes along the study corridor.

Table 5: Pedestrian Crashes

Date	Location	Light Condition	Severity Level
1/28/2012	Mid-Block	Dark, Lighted Road	A-Injury
9/10/2012	Mid-Block	Daylight	A-Injury
9/16/2012	Wall St/Mill St	Dark, Lighted Road	B-Injury
8/13/2013	Wall St/Main St	Daylight	B-Injury
11/10/2015	Wall St/Grand Ave	Daylight	C-Injury
3/9/2016	Wall St/Grand Ave	Dark, Lighted Road	C-Injury
10/15/2016	Mid-Block	Dark	C-Injury
11/18/2016	Wall St/Walnut St	Dark, Lighted Road	C-Injury

Table 6: Bicycle Crashes

Date	Location	Light Condition	Severity Level
5/19/2012	Wall St/Walnut St	Dusk	B-Injury
10/4/2012	Mid-Block	Daylight	B-Injury
10/4/2013	Wall St/Mill St	Daylight	C-Injury
11/2/2015	Wall St/Grand Ave	Dark, Lighted Road	A-Injury
5/2/2016	Wall St/Walnut St	Daylight	C-Injury
11/28/2016	Wall St/Grand Ave	Daylight	B-Injury

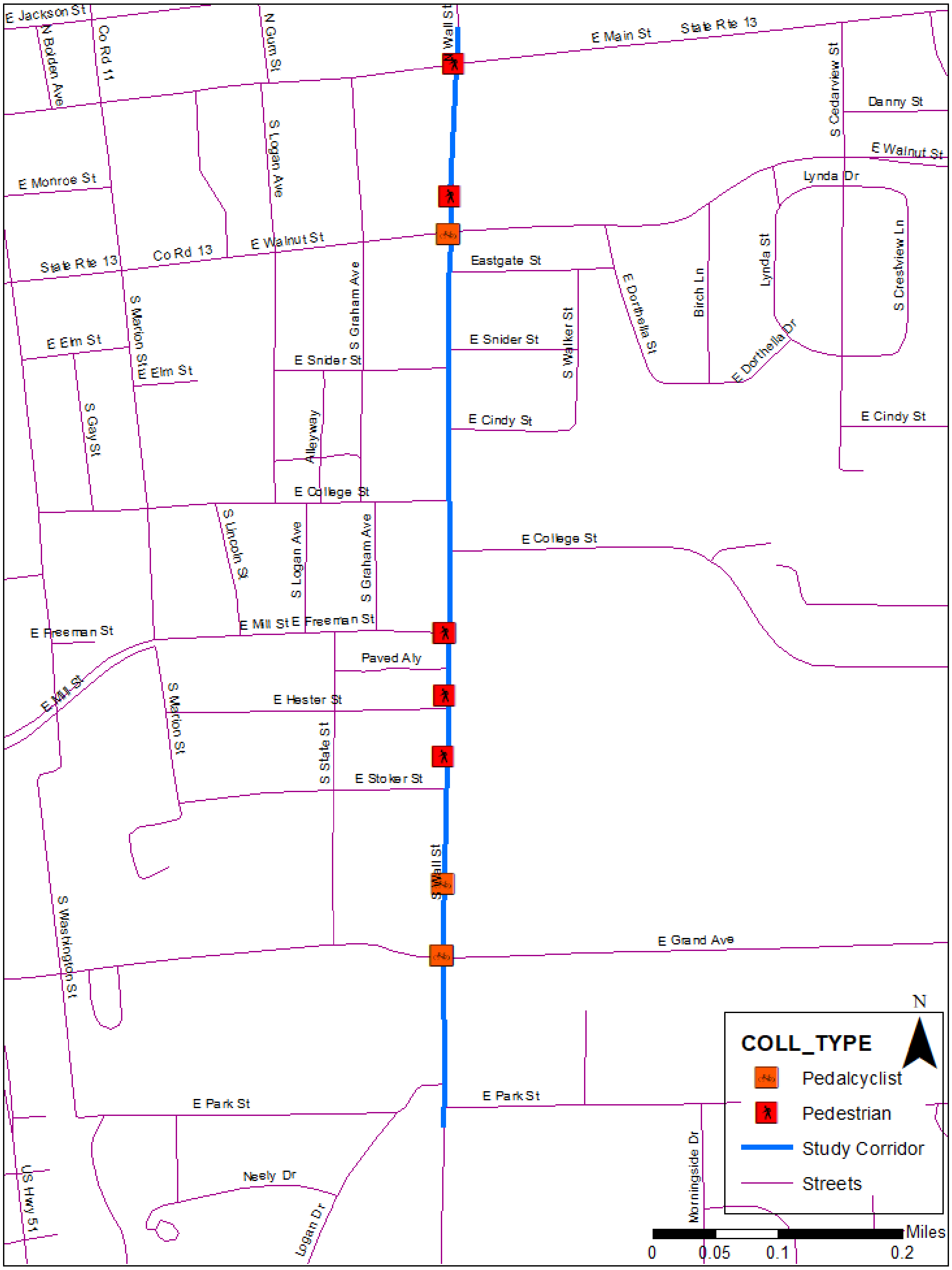

Figure 9: Pedestrian and Bicycle Crashes

Road-Diet Conversion

Road-Diet is a commonly used term in transportation planning and engineering to describe a specific roadway reconfiguration. It is a relatively low-cost improvement typically applied to traditional four-lane undivided roadways to convert them into three-lane roadways consisting of two through lanes and a center, Two-Way Left Turn Lane (TWLTL). A typical example of a Road-Diet conversion is shown **in Figure 10**. The Federal Highway Administration (FHWA) recommends roadways with ADT of 20,000 vehicles or less as generally good candidates for Road Diet conversion.

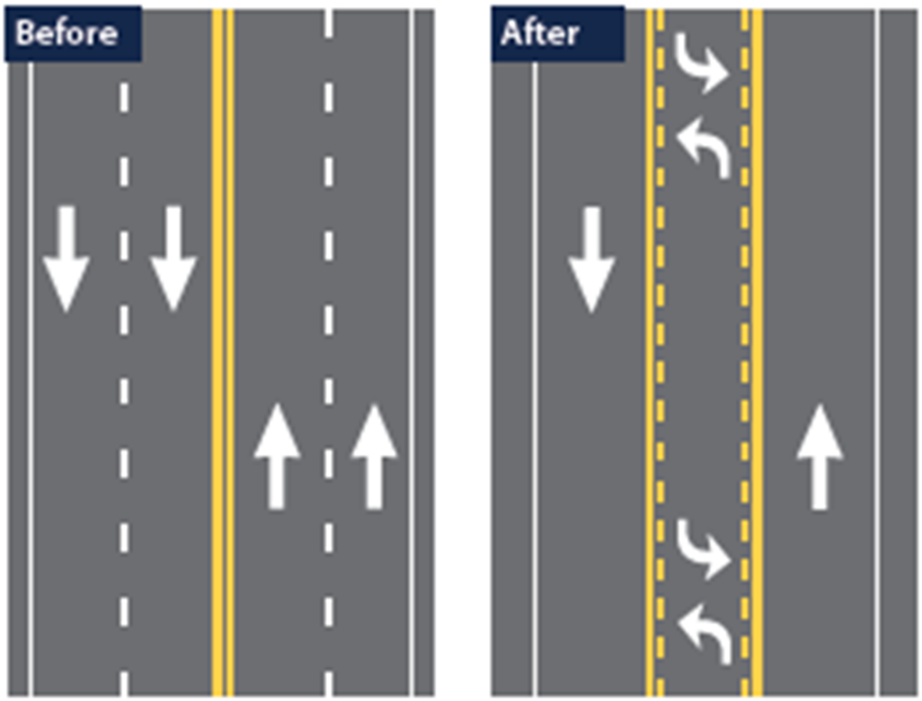

Figure 10: Example of Road-Diet Conversion (Source: FHWA)

Benefits of Road-Diets

The most notable benefits of a Road-Diet conversion include[1] safety improvements, operational benefits, pedestrian and bicycle benefits, and livability benefits.

Safety Improvements

Road-Diets improves safety by reducing potential vehicle-to-vehicle conflict points by 50%. **Figure 11** shows mid-block conflict points for a typical four-lane undivided roadway and a Road-Diet cross section. With the reduction in conflict points, FHWA studies have identified that Road Diet conversions reduce 19 to 47 percent of overall crashes.

[1] Road Diet Informational Guide – Federal Highway Administration (FHWA), accessed from the https://safety.fhwa.gov/road_diets/ page.

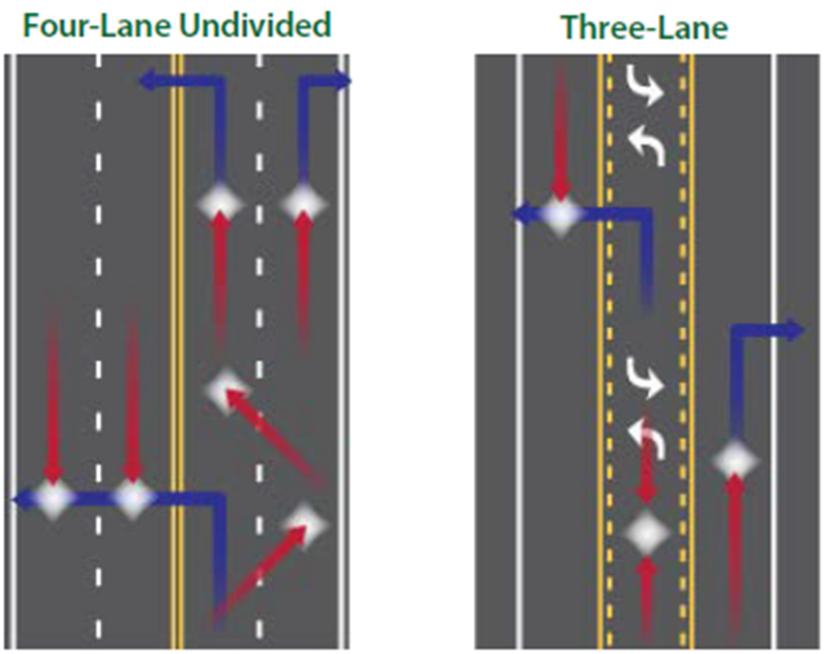

Figure 11: Mid-Block Conflict Points Comparisons (Source: FHWA)

Operational Benefits

Road-Diet conversions separate left-turning vehicles through the provision of a TWLTL, which improves traffic flow along the corridor. Additionally, through lane changes are eliminated, and side street traffic can enter the mainline roadway more safely as there are fewer lanes to cross. **Figure 12** shows potential conflict points between through traffic and crossing traffic for four-lane undivided roadways compared to a Road-Diet cross section, which again are reduced by half. Road-Diets also help reduce speed differential and form more consistent traffic flow along the corridor.

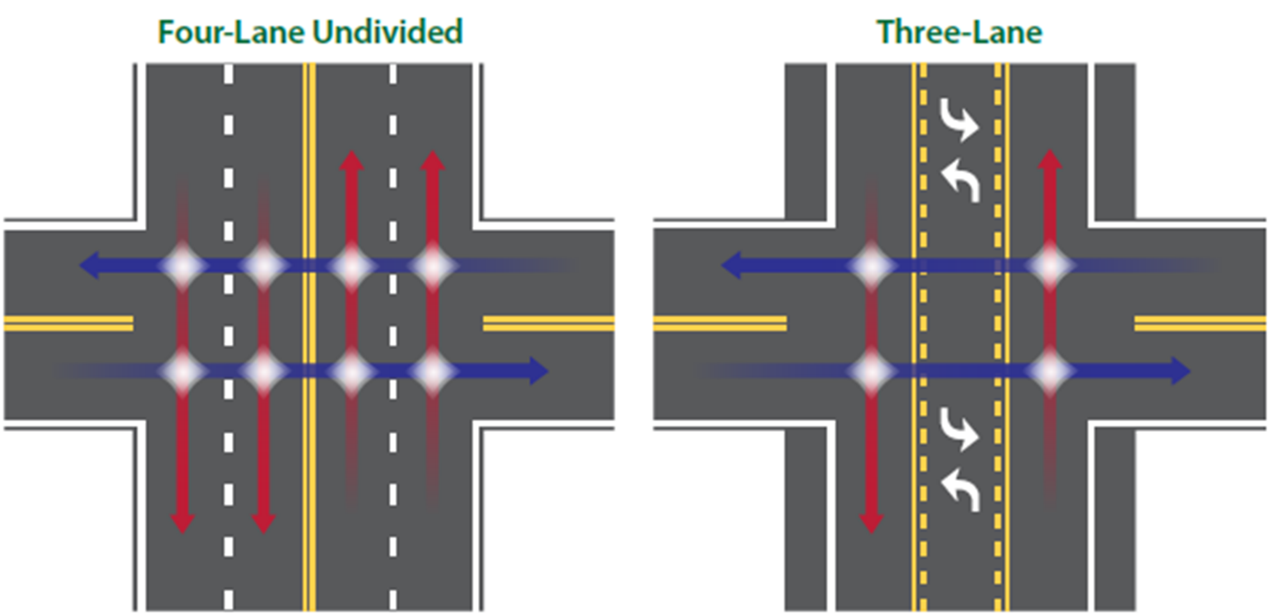

Figure 12: Crossing and Through Traffic Conflict Points Comparisons (Source: FHWA)

Pedestrian and Bicycle Benefits

Road-Diets are highly beneficial for non-motorized road users. Vehicle travel lane space often gets reallocated for bike lanes, and in some cases, for sidewalks where these facilities were non-existent. Road-Diets can help bicyclists to travel along physically separate striped bicycle lanes. Such facilities improve road safety for bicyclists as they become more visible and motorists know where to look for them. Additionally, Road-Diets help pedestrians by reducing crossing distance, which reduces pedestrian crash risk.

Livability Benefits

Road-Diets can improve the comfort level and quality of life for all road users by providing a combination of bike lanes, pedestrian improvements, and reduced speed differential. In corridors with significant side-street or driveway access, the reduction in driver stress through the provision of a TWLTL may be substantial.

Proposed Scenarios

Three alternative Road-Diet scenarios were evaluated for the study corridor. These scenarios include:

- **Scenario 1:** Road-Diet scenario with no turn lanes at major intersections under existing traffic volumes
- **Scenario 2:** Road-Diet scenario with turn lanes at major intersections under existing traffic volumes
- **Scenario 3:** Road-Diet scenario with turn lanes at major intersections under 2009 level traffic volumes

In all of these scenarios, the Road-Diet conversion includes two travel lanes (one lane in each direction), bike lanes on both sides, and a TWLTL. **Figure 13** compares the existing mid-block cross section and the proposed Road Diet scenario mid-block cross section for the study corridor.

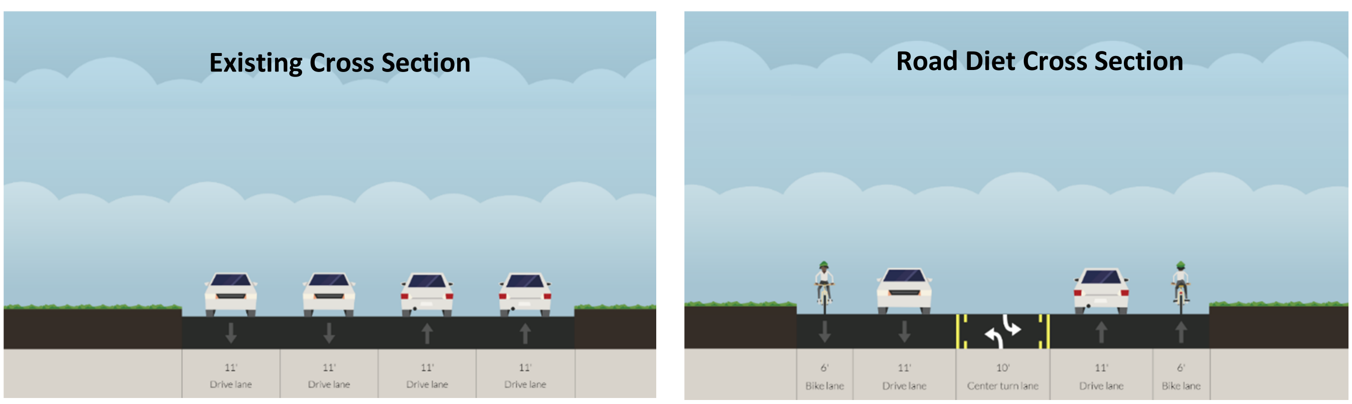

Figure 13: Existing vs. Road-Diet Cross Sections for the Study Corridor

Scenario 1

Scenario 1 was developed with the Road-Diet conversion along the study corridor and eliminating turn lanes at the study corridor approaches at major intersections. Existing traffic volumes were considered for the operational analysis for this scenario. **Figure 14** shows lane configurations at the study intersections for Scenario 1. The expected traffic operational conditions at the study intersections during the weekday AM and PM peak hours are shown in **Table 7**. As can be seen in Table 7, numerous intersection approaches would operate in oversaturated/unacceptable conditions during the weekday AM and PM peak hours for Scenario 1 conditions.

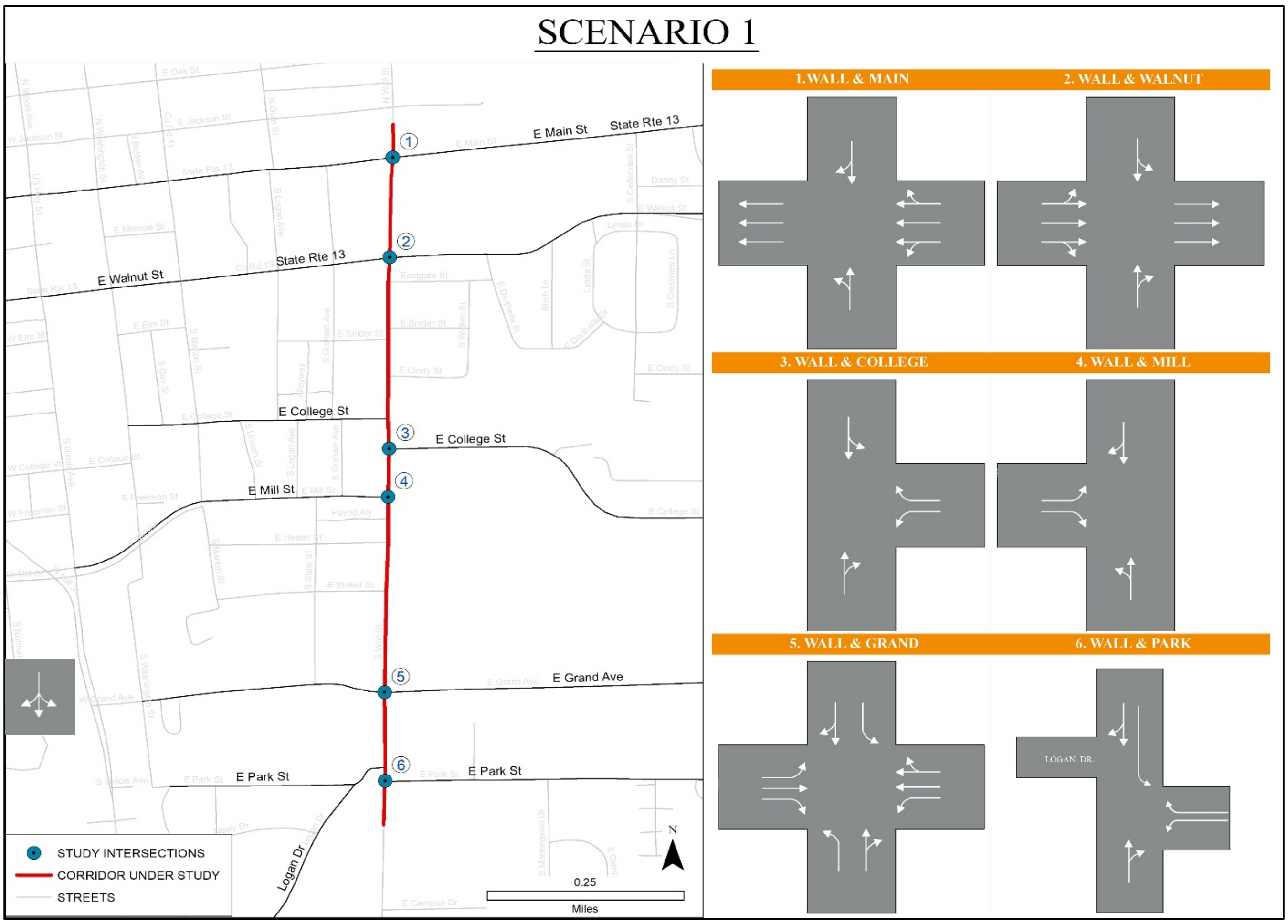

Figure 14: Scenario 1 Lane Configurations at Major Intersections

Table 7: Traffic Operational Conditions for Scenario 1

Intersection	Control Type	Approach	AM Peak		PM Peak	
			Vehicle Delay (sec.)	**LOS**	**Vehicle Delay (sec.)**	**LOS**
Wall Street/Main Street	Signalized	Northbound	35.0	D	36.4	D
		Southbound	**312.2**	**F**	**128.9**	**F**
		Westbound	**89.9**	**F**	37.4	D
		Overall	**76.4**	**E**	**31.8**	**C**
Wall Street/Walnut Street	Signalized	Northbound	**107.4**	**F**	**188.6**	**F**
		Southbound	**119.6**	**F**	**92.9**	**F**
		Eastbound	10.4	B	10.7	B
		Overall	**33.4**	**C**	**38.4**	**D**
Wall Street/College Street	1-Way Stop Control (WB)	Westbound	9.0	A	46.8	D
Wall Street/Mill Street	Signalized	Northbound	3.7	A	**169.4**	**F**
		Southbound	2.3	A	**200.3**	**F**
		Eastbound	18.9	B	6.1	A
		Overall	6.0	A	**119**	**F**
Wall Street/Grand Avenue	Signalized	Northbound	12.5	B	17.8	B
		Southbound	16.4	B	17.7	B
		Eastbound	12.3	B	17.2	B
		Westbound	11.0	B	14.3	B
		Overall	**13.6**	**B**	**17.3**	**B**
Wall Street/Park Street	1-Way Stop Control (WB)	Westbound	10.1	B	10	A

Scenario 2

Scenario 2 was developed for the study corridor with the Road-Diet conversion and keeping appropriate turn lanes at the Wall Street approaches at major intersections. Existing traffic volumes were considered for the operational analysis for this scenario. **Figure 15** shows the lane configurations at study intersections for Scenario 2. **Table 8** shows the expected traffic operational conditions at study intersections during the AM and PM peak hours for Scenario 2. As can be seen in Table 8, all of the study intersections would operate acceptably during both peak hours in Scenario 2.

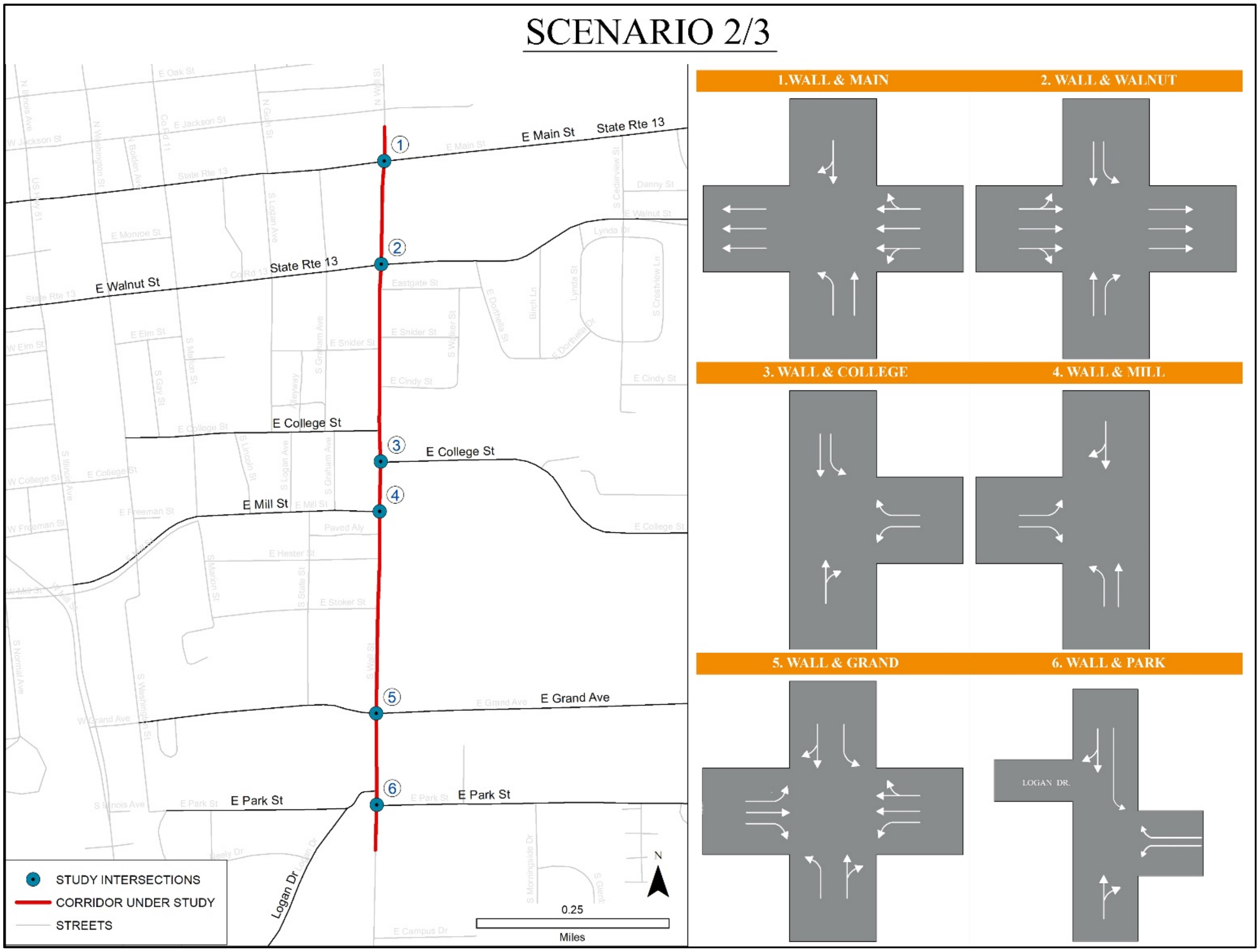

Figure 15: Scenario 2/3 Lane Configurations at Major Intersections

Table 8: Traffic Operational Conditions for Scenario 2

Intersection	Control Type	Approach	AM Peak		PM Peak	
			Vehicle Delay (sec.)	**LOS**	**Vehicle Delay (sec.)**	**LOS**
Wall Street/Main Street	Signalized	Northbound	28.1	C	28.4	C
		Southbound	18.3	B	16.7	B
		Westbound	9.3	A	10.0	A
		Overall	**12.4**	**B**	**12.8**	**B**
Wall Street/Walnut Street	Signalized	Northbound	32.9	C	37.6	D
		Southbound	30.9	C	29.9	C
		Eastbound	11.1	B	11.4	B
		Overall	**14.9**	**B**	**15.8**	**B**
Wall Street/College Street	1-Way Stop Control (WB)	Westbound	5.2	A	6.3	A
Wall Street/Mill Street	Signalized	Northbound	16.5	B	16.2	B
		Southbound	3.6	A	5.2	A
		Eastbound	4.9	A	5.6	A
		Overall	6.0	A	**8.6**	**A**
Wall Street/Grand Avenue	Signalized	Northbound	14.8	B	18.4	B
		Southbound	17.0	B	18.7	B
		Eastbound	12.2	B	13.9	B
		Westbound	11.2	B	11.4	B
		Overall	**14.3**	**B**	**16.4**	**B**
Wall Street/Park Street	1-Way Stop Control (WB)	Westbound	10.5	B	10.3	B

Scenario 3

Scenario 3 includes the Road-Diet conversion for the study corridor and the same intersection lane configurations as Scenario 2. Traffic volumes for this operational analysis were increased to reflect demands in 2009 when Southern Illinois University (SIU) had the highest student enrollment in the university's history. The enrollment has decreased significantly since 2009, thereby reducing traffic demands on the adjoining street system.

Historic traffic volume data was not available for the Wall Street corridor directly. However, IDOT's online traffic map contains historic traffic volumes for some of the major intersecting roadways within the study corridor. These roadways include Main Street, Walnut Street, and Grand Avenue. Based on traffic volume trend analysis along these intersecting corridors, existing traffic volumes were increased by the following percentages to get to the estimated 2009 levels:

- Main Street and Walnut Street volumes were increased by 6%.
- Wall Street, Mill Street, College Street, Mill Street, Grand Avenue, and Park Street volumes were increased by 34%.

Table 9 shows the traffic operational conditions at the study intersections during the weekday AM and PM peak hours under Scenario 3. As can be seen in Table 9, the northbound approach of the Wall Street/Walnut Street intersection would operate at LOS F under Scenario 3 during the PM peak hour. Additionally, several Wall Street approaches would operate at LOS E during the peak hours. However, LOS E is often considered acceptable for peak period conditions in urban and suburban areas.

It is important to note that Scenario 3 represents a worst-case condition with significant traffic volume increases as compared to the existing conditions within the study area. A Road-Diet conversion with bike lanes on both sides of the study corridor would promote travel mode shift among the road users. It is reasonable to assume that any anticipated traffic volume increase due to higher student enrollment at SIU would be lower than the levels experienced in 2009.

Table 9: Traffic Operational Conditions for Scenario 3

Intersection	Control Type	Approach	AM Peak		PM Peak	
			Vehicle Delay (sec.)	**LOS**	**Vehicle Delay (sec.)**	**LOS**
Wall Street/Main Street	Signalized	Northbound	39.9	D	38.0	D
		Southbound	76.1	E	43.2	D
		Westbound	32.0	C	29.2	C
		Overall	**34.9**	**C**	**30.5**	**C**
Wall Street/Walnut Street	Signalized	Northbound	45.4	D	**81.0**	**F**
		Southbound	**74.2**	**E**	**71.7**	**E**
		Eastbound	11.4	B	12.5	B
		Overall	**24.4**	**C**	**28.C**	**C**
Wall Street/College Street	1-Way Stop Control (WB)	Westbound	10.4	B	11.0	B
Wall Street/Mill Street	Signalized	Northbound	5.3	A	7.1	A
		Southbound	3.0	A	4.8	A
		Eastbound	19.1	B	19.4	B
		Overall	6.7	A	**10.0**	**B**
Wall Street/Grand Avenue	Signalized	Northbound	15.9	B	21.9	C
		Southbound	18.3	B	23.6	C
		Eastbound	12.3	B	18.1	B
		Westbound	12.9	B	14.0	B
		Overall	**15.6**	**B**	**20.6**	**C**
Wall Street/Park Street	1-Way Stop Control (WB)	Westbound	13.5	B	12.5	B

Major Findings

- Average Daily Traffic Volumes (ADT) along the study corridor range from 6,400 to 10,200.
- Major intersections along the study corridor currently operate in acceptable capacity conditions with no congestion during peak hours.
- Based on traffic crash data analysis from 2012 to 2016, traffic crashes along the study corridor range from 28 (2014) to 48 (2016).
    - Crash frequencies along the study corridor showed an increasing trend since 2014.
    - There were no fatal crashes along the study corridor. There were 9 A-injury (most severe) crashes along the study corridor.
    - There were 8 pedestrian and 6 bicycle crashes along the study corridor and all of these crashes resulted in injuries.
- A Road-Diet conversion would help improve safety for all travel modes along the study corridor.
    - Road-Diets improve safety by reducing vehicle-to-vehicle conflict points by 50 percent.
    - FHWA studies have identified that Road-Diet conversions reduce 19 to 47 percent of overall crashes.
    - Road-Diets allow bicyclists to travel along physically separated and striped bicycle lanes. Such facilities improve road safety for bicyclists, as bicyclists become more visible, and motorists know where to look for them.
    - Road-Diets help pedestrians by reducing crossing distance, which reduces pedestrian crash risk.
- Scenario 1 is not suitable for the Wall Street corridor, as the majority of the study intersections would operate in congested conditions during the peak hours under existing traffic volumes, mainly due to the absence of dedicated turn lanes.
- Scenario 2 is suitable for the Wall Street corridor, as all major study intersections would operate well within acceptable traffic operational limits during existing peak hours.
- Scenario 3 shows that a Road-Diet conversion with turn lanes at major intersections would generally be able to handle “the worst traffic conditions” scenario, where existing traffic volumes along Wall Street were increased by 34%, and existing traffic volumes along Main Street and Wall Street were increased by 6%, to simulate traffic volumes experienced at the most recent peak in student enrollment for Southern Illinois University (SIU), in 2009.
    - The northbound approach of the Wall Street/Walnut Street intersection would operate in oversaturated conditions during the PM peak hour, and the southbound Wall Street approaches at IL 13 would operate in LOS E during both peak hours. However, LOS E is typically considered acceptable for peak period conditions in urban and suburban areas.
    - “The worst traffic conditions” would be highly unlikely to occur along the study corridor. It is reasonable to assume that even if student enrollment at Southern Illinois University (SIU) reached its peak 2009 levels, the amount of traffic experienced along Wall Street would be lower than the levels experienced in 2009. This is because students are more likely to utilize multimodal facilities that are safe and convenient, such as bike lanes, when available. It is reasonable to assume that more students would choose bicycling over driving along Wall Street if bicycle lanes are present, as is the case with the proposed Road-Diet conversion.

Recommendations

The following recommendations for improvements to the Wall Street corridor are based on the comprehensive traffic operational and safety evaluations of the existing and future expected scenarios including a Road-Diet conversion:

- A Road-Diet conversion is recommended for the Wall Street corridor. This conversion should include two travel lanes (one lane in each direction), bike lanes on both sides of Wall Street, and a center Two-Way Left-Turn Lane (TWLTL). As shown in Figure 13, the proposed cross section of the Wall Street corridor would include 11 foot travel lanes, 6 foot bike lanes in both directions, and a 10 foot TWLTL.

- Recommended lane profiles at the major study intersections, as well as planning level layouts of the study corridor segments with a Road- Diet conversion, are shown in **Figures 16, 17, 18, 19, and 20**. These are conceptual drawings only. Elements such as lane alignment, sight distance, and offset allowances should be verified during the design phase.

- **Figure 21** shows a rendered comparison of the Wall Street corridor before the proposed Road Diet conversion and after.

- **Table 10** shows the recommended minimum lengths for dedicated turn lanes on Wall Street approaches at the major study intersections. These lengths were obtained by utilizing VISSIM microsimulation analysis for the study corridor for Scenario 3 (the worst condition scenario).

Table 10. Recommended Minimum Turn Lane Lengths at Wall Street Approaches

Intersection	Northbound Lanes		Southbound Lanes	
	Left	Right	Left	Right
Wall/Main	60’	-	-	-
Wall/Walnut	-	100’	110’	-
Wall/College	-	-	50’	-
Wall/Mill	50’	-	-	-
Wall/Grand	50’	-	50’	50’
Wall/Park	-	-	50’	-

- Westbound left turn movements at the Wall Street/Eastgate Street intersection should be prohibited to improve traffic safety with the installation of the northbound right turn lane at the intersection of Wall Street/Walnut Street. The Eastgate Street approach should have three-quarter access (right-in/right-out, and left in only).

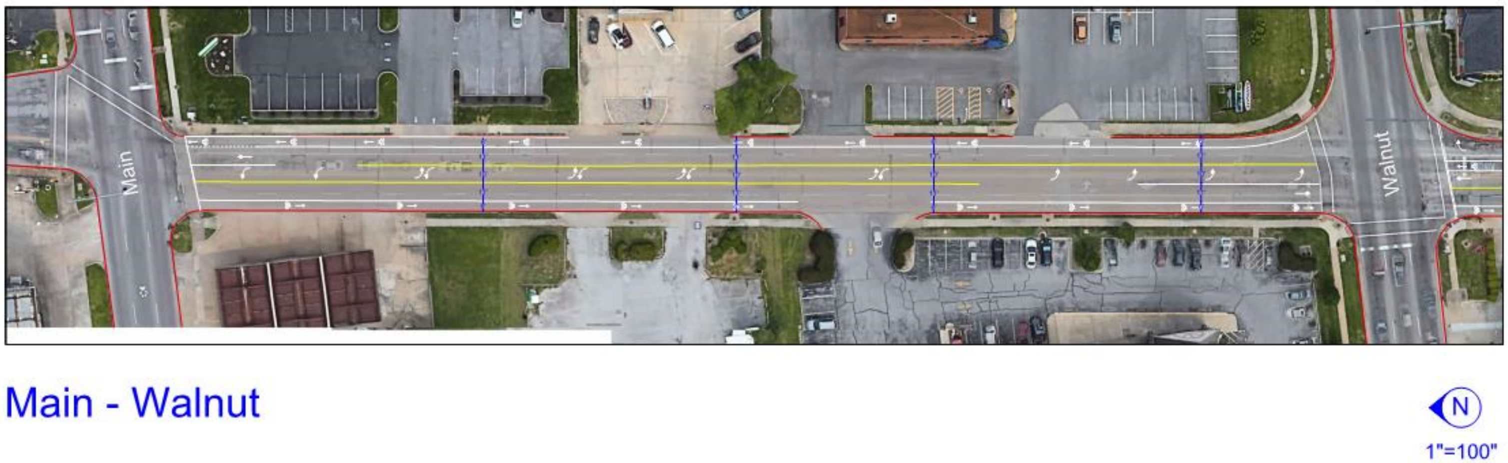

Figure 16. Proposed Wall Street Roadway Segment – Main to Walnut

Figure 17. Proposed Wall Street Roadway Segment – Walnut to College

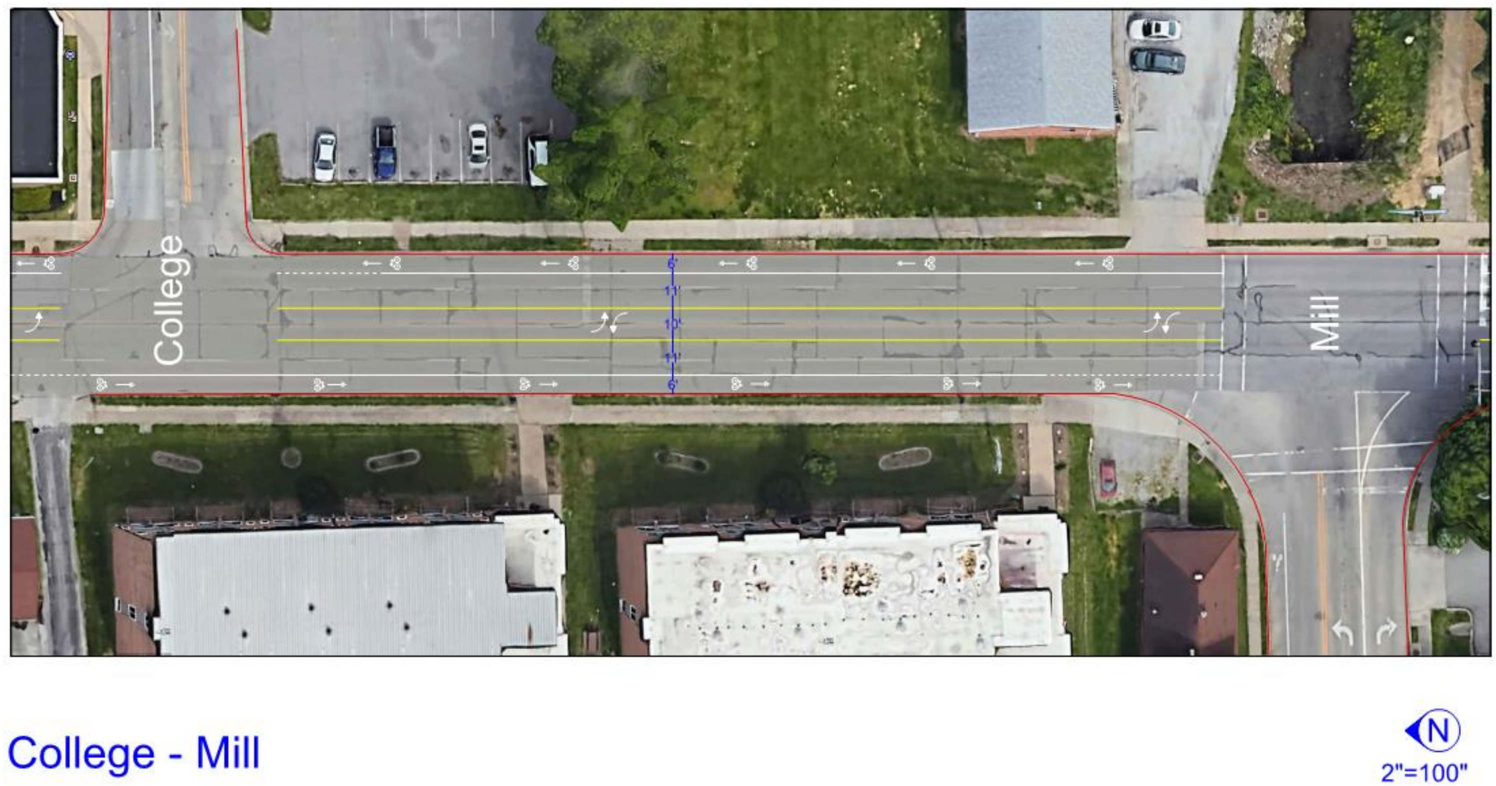

Figure 18. Proposed Wall Street Roadway Segment – College to Mill

Figure 19. Proposed Wall Street Roadway Segment – Mill to Grand

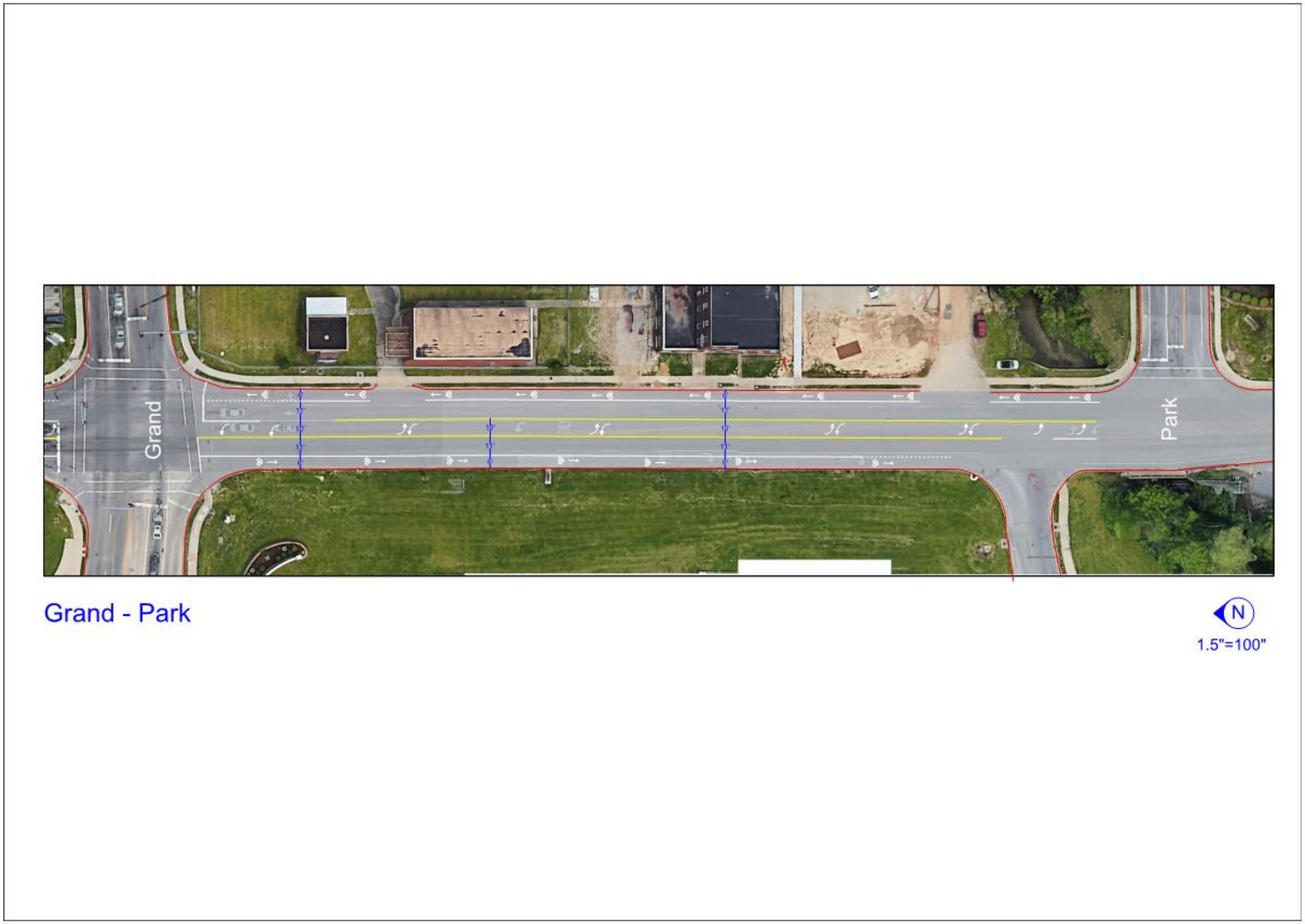

Figure 20. Proposed Wall Street Roadway Segment – Grand to Park

Figure 21. Before (top) and After (bottom) Wall Street Road-Diet Conversion

- All proposed pavement markings and signs shall follow the Manual on Uniform Traffic Control Devices (MUTCD) guidelines. **Figure 22** shows word, symbol, and arrow pavement markings for bicycle lanes, as shown in MUTCD 2009 edition.

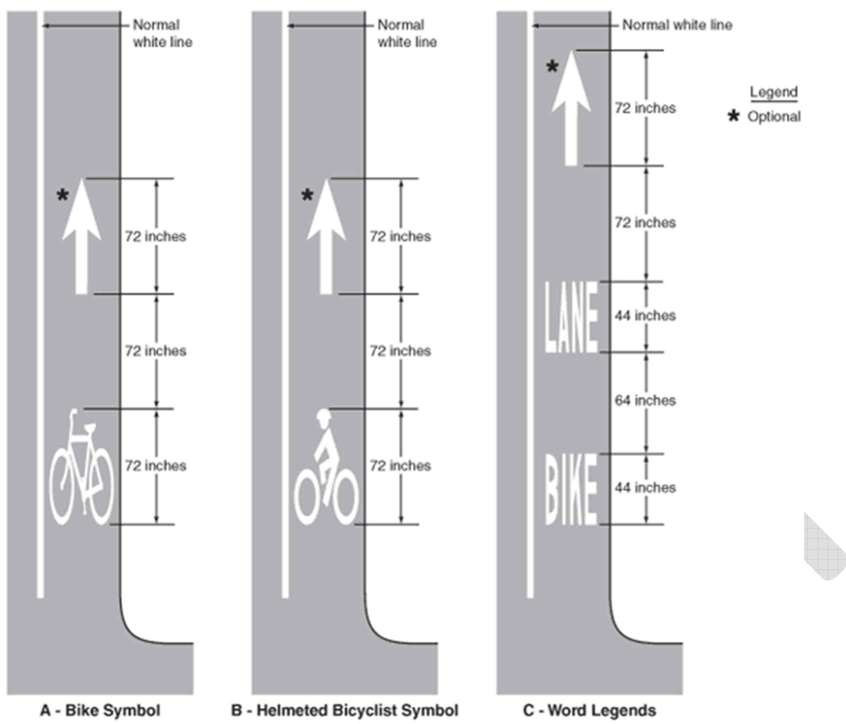

Figure 22. MUTCD Reference for Bicycle Lane Pavement Markings

- MUTCD sign R3-17: BIKE LANE should be placed at regular intervals along the Wall Street corridor that is converted to a Road-Diet. MUTCD sign R8-3: NO PARKING should also be placed on both sides of the proposed Wall Street corridor at regular intervals. **Figure 23** shows MUTCD signs R3-17 and R8-3.

Figure 23. MUTCD signs R3-17 and R8-3

- MUTCD sign R3-17: BIKE LANE and R3-17a: AHEAD should be placed together, facing the southbound traffic, upstream of the Wall Street/Main Street intersection, and facing the northbound traffic, upstream of Wall Street/Park Street intersection. MUTCD sign R3-17: BIKE LANE and R3-17b: ENDS should be placed facing the northbound traffic, upstream of the Wall Street/Main Street intersection, and facing the southbound traffic, upstream of the Wall Street/Park Street intersection. **Figure 24** shows MUTCD signs R3-17, R3-17a, and R3-17b.

Figure 24. MUTCD signs R3-17, R3-17a, and R3-17b

- MUTCD sign R4-4: BEGIN RIGHT TURN LANE should be placed at the upstream end of the proposed right turn only lane at the northbound approach of the Wall Street/Walnut Street intersection. An example of typical bicycle lane treatment at a right turn only lane is shown in **Figure 25**.

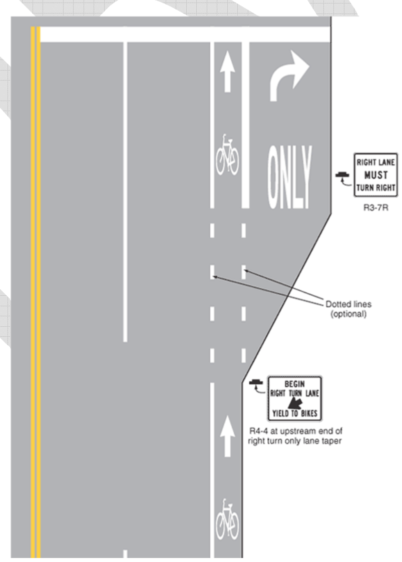

Figure 25. MUTCD sign R4-4

APPENDIX

Comments and Response

The following section displays comments received from the study reviewers along with Lochmueller Group's response to each item.

1. We would like to see/include the traffic LOS analysis for existing conditions at the intersections as well as the projected traffic conditions (2009 levels as stated in Scenario 3); this will give us a better base to start from.

Lochgroup Response:
LOS analysis for the study corridor intersections for different scenarios including the 2009 levels were provided in the Deliverables 1 and 2. We will update the tables and try to show LOS for different scenarios side by side.

2. We should plan for traffic to at least reach the 2009 peak levels if not more, the community is in a deep slump right now and everyone is planning/hoping to see 1000's more students return to SIU and significant job growth moving forward in the next 5+ years. To not plan for growth and a return to higher populations would be a mistake.

Lochgroup Response
Scenario 3 for the study corridor considered 2009 traffic levels for the study corridor by bumping up traffic volumes by the following levels around the study corridor from the existing levels:

- Main Street and Walnut Street volumes were increased by 6%.
- Wall Street, Mill Street, College Street, Grand Avenue, and Park Street volumes were increased by 34%.

These increases would sufficiently accommodate traffic volumes increase due to planned increased enrollment and business activities in the next 5+ years.

3. I (Sean H.) traveled this corridor daily from 2005 thru 2013 between College Street and Main Street, the traffic backups at peak hours for NB traffic at Walnut and Wall were significant, often taking 3-4 cycles to make the straight thru movement; I suspect the actual LOS is not very good under 2009 traffic volumes.

Lochgroup Response
Staff used the latest VISSIM (developed by PTV America) microsimulation software tool for traffic conditions analysis for different scenarios. LOS analysis for Scenario 3 (the worst condition), showed congested conditions for the following approaches during the peak hours:

- Southbound approach of the Wall Street/Main Street intersection during the morning peak hour.
- Southbound approach of the Wall Street/Walnut Street intersection during the morning peak hour.
- Northbound approach of the Wall Street/Walnut Street intersection during the evening peak hour.

The study staff will recommend appropriate mitigation steps to alleviate congestion concerns at key intersections.

4. Appropriate/adequate queuing needs to be provided consideration at the intersections should a road diet be implemented.

Lochgroup Response
All the queuing details (where applicable) will be provided in the Recommendation Deliverable.

5. In general Public Works has reservations about reducing the lanes in this corridor. Besides general traffic capacity and wanting to maintain a high LOS at the intersections; as it also serves as the primary detour route through town when we close Illinois Avenue or University Avenue for festivals and parades. During these times all the thru lanes are needed to accommodate the turning movements and traffic on the detour route.

Lochgroup Response
The study staff completely understand the PW staff's concern. This study is being performed for the typical traffic operational conditions. Special events fall outside of that scope. It is our belief that the everyday benefits of a road diet regarding enhanced safety and multimodal access outweigh the concerns associated with occasional influx of traffic due to special events.

6. We would like to have some discussion/analysis of the safety aspect of a road diet, adding bicycle lanes between Walnut and Main seems like a real safety problem due to all the traffic generators and turning movements.

Lochgroup Response
One of the major goals of this study is to improve safety for all travel modes. The staff will evaluate all the safety aspects while providing appropriate recommendations.

7. In regards to Scenario 3, while we can agree level of service D or E may be acceptable in suburban areas we feel the level of service should be more harshly criticized for the Carbondale area as expectations are different in a rural community. Delays of this nature/time are not typical and would be harshly criticized by the traveling/motoring public.

Lochgroup Response
The study staff understands that poor LOS at Wall/Walnut and Wall/Main may receive harsh criticism from the public/commuters. As mentioned in Deliverable #2, Scenario 3 conditions represent the worst possible condition for the study corridor. The study staff experienced similar reactions from the public while working on lane reduction/road-diets along corridors in near University campuses. Staff would like to highlight the facts that typically road-diet conversions with bike lanes on both sides promote a travel mode shift among the road users. Also, students in the university campuses are showing increasing trends for choosing sustainable transportation choices for their daily commutes. It is reasonable to assume that any anticipated traffic volume increase due to higher student enrollment at SIU would be lower than the levels experienced in 2009, as students are more likely to utilize bicycle lanes that are safe and convenient, as is the case with road diet conversions.

8. In considering future traffic growth we should also consider future development in the commercial corridor area (Snider to Jackson along Wall Street) area could really affect volumes. Additionally poor LOS at the intersections could negatively affect possible development.

Lochgroup Response
The scenario 3 analysis bumped up existing traffic along Wall Street and most of the intersecting street by 34%. This increase would accommodate traffic volume increases due to any future commercial developments (e.g, retail, restaurants) along the study corridor.