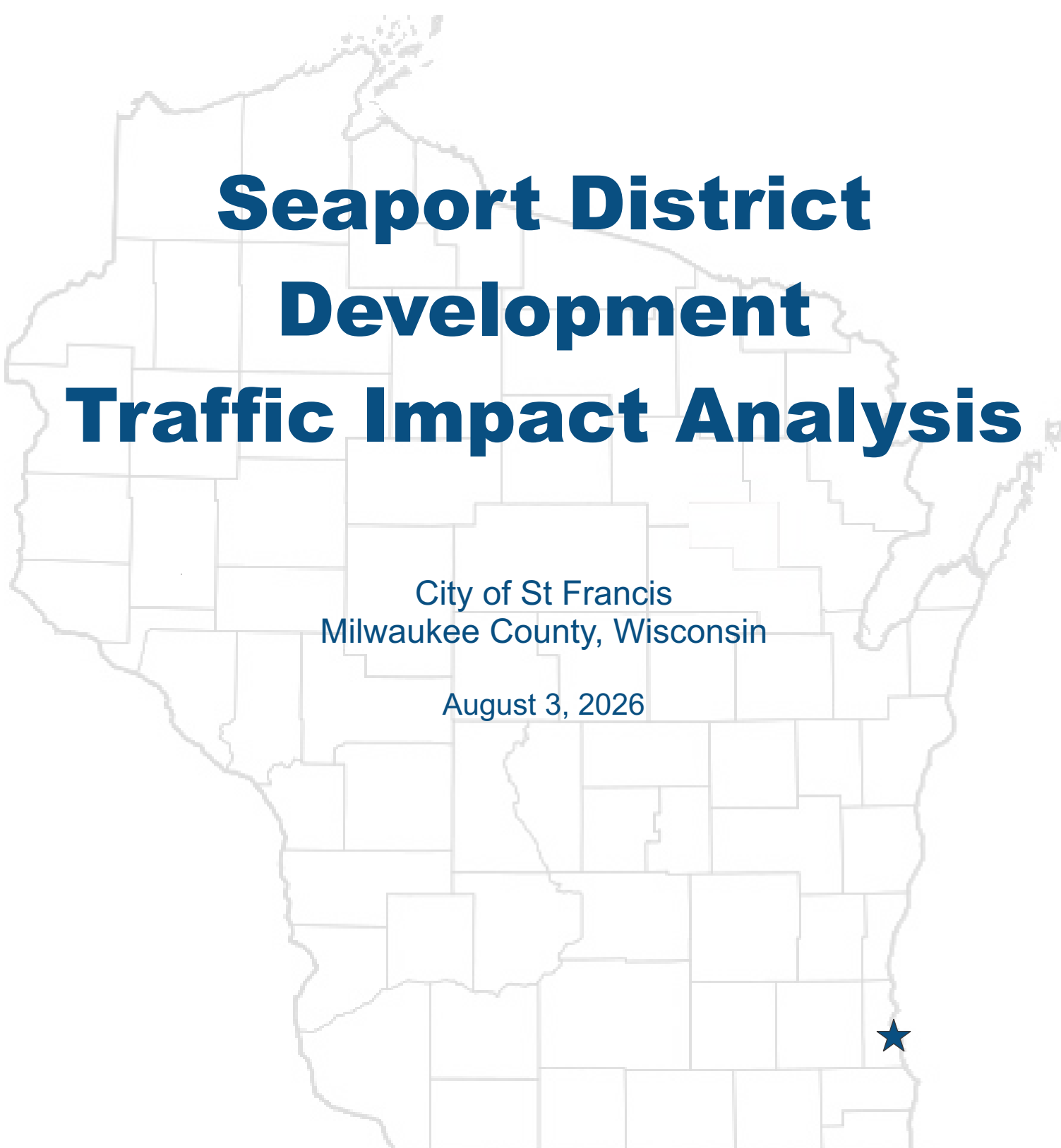




Seaport District Development Traffic Impact Analysis

City of St Francis
Milwaukee County, Wisconsin

August 3, 2026



ABBREVIATED TRAFFIC IMPACT STUDY FOR:

SEAPORT DISTRICT MIXED-USE DEVELOPMENT

CITY OF OAK CREEK, MILWAUKEE COUNTY, WISCONSIN

DATE SUBMITTED: August 3, 2026

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"I certify that this Traffic Impact Analysis has been prepared by me or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering."

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**Seaport District Mixed-Use Development
Traffic Impact Analysis
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CHAPTER I – INTRODUCTION & EXECUTIVE SUMMARY

PART A – PURPOSE OF REPORT AND STUDY OBJECTIVES

A residential/mixed-use development is being proposed on a parcel of land bordered by S. Packard Avenue to the west, S. Lake Drive to the north/east and E. Howard Avenue to the south within the City of St Francis, Milwaukee County. TADI conducted this traffic impact analysis (TIA) to determine the expected weekday morning and weekday evening peak hour operating conditions and recommendations at the study area intersections for the Existing, Background (with identified off-site developments), and Full Build (with on-site and off-site developments) traffic operating conditions.

This report documents the procedures, findings, and conclusions of the TIA. The analysis identifies recommended modifications based on existing intersection geometrics, existing traffic volumes, and additional traffic expected to be generated by the proposed residential/mixed-use development and the previously approved off-site development.

PART B – EXECUTIVE SUMMARY

The executive summary includes a description of the study area, descriptions of the proposed on-site and off-site developments and conclusions based on the findings of the TIA.

B1. Location of Study Site with Respect to Area Roadway Network

A street map illustrating the location of the proposed residential/mixed-use development is shown in [Exhibit 1-1](#) at the end of this chapter. The study area for the proposed residential/mixed-use development includes the following existing intersections:

- E. Howard Avenue with S. Packard Avenue (traffic signal control)
- E. Howard Avenue with S. Troy Avenue (one-way stop control)
- E. Howard Avenue with S. Lake Drive (traffic signal control)
- S. Packard Avenue with E. Sivyer Avenue (existing one-way stop control, proposed two-way stop control)
- S. Packard Avenue with S. Lake Drive (traffic signal control)
- S. Lake Drive with E. Sivyer Avenue (existing one-way stop control, proposed two-way stop control)

In addition to these existing intersections, the following proposed driveways were also included in the study:

- S. Packard Avenue with the Grocery Store driveway (proposed two-way stop control)
- S. Packard Avenue with the Retail driveway (proposed one-way stop control)
- S. Lake Drive with North Driveway (proposed no control – inbound only)

The development site is bordered by residential land uses to the south and west with a planned residential development under construction to the east. A few commercial businesses also exist to the west, on the west side of S. Packard Avenue. The St Francis Lions Community Center and the St Francis Civic Center/City Hall are located further to the west, along the north side of Howard Avenue.

B2. On-Site Development Description

The proposed development includes two multi-story (6 floor) residential buildings with surface parking spaces as well as private underground spaces. An extension of East Sivyer Avenue from its current terminus at South Packard Avenue to the east to terminate at South Lake Drive is proposed to split the site, with one apartment building proposed to the north and a second proposed to the south of East Sivyer Avenue. A separate retail building and grocery building are also proposed to the south of the East Sivyer Avenue extension. The following land uses were assumed for the proposed development:

North Portion of Site

- Multifamily Housing (Mid-Rise, Not Close to Rail Transit) – 155 units

South Portion of Site

- Multifamily Housing (Mid-Rise, Not Close to Rail Transit) – 155 units
- Strip Retail Plaza (<40K) – 6,000 SF
- Supermarket - 24,000 SF

Initial build out of the residential/mixed-use development is expected to start in year 2026 and be completed by late 2027 or early 2028. For purposes of this traffic study, full build out of the entire site was included in the Full Build traffic volume scenario. The conceptual site plan for the proposed residential/mixed-use development is shown in [Exhibit 1-2](#).

B3. Off-Site Development Description

One off-site development has been identified within the immediate study area. A residential development, the “Bluffs on Lake” development, including 278 apartments within a multi-story residential building with first floor commercial space, has previously been approved for a parcel of land on the east side of South Lake Drive, immediately east of the proposed on-site development. Access to the site is proposed via two new access drives along South Lake Drive, one at the existing signalized intersection with South Packard Avenue and one at the proposed East Sivyer Avenue extension intersection. This development, which has been previously approved, is currently under construction and was therefore included in the Background traffic volume scenario. The access points for this off-site development are shown in [Exhibit 1-2](#).

B4. On-Site Generated Traffic

The traffic volumes expected to be generated by the proposed development are based on the size and type of the proposed uses, and on trip rates and fitted curve equations (FCE) as published in the Institute of Transportation Engineer’s (ITE) *Trip Generation Manual, 12th Edition*. A combination of trip rates and FCE’s were utilized to determine the expected new trips based on current ITE practices.

The residential/mixed-use development site is expected to include both linked trips and pass-by trips. A linked trip occurs when a patron of one tenant visits another tenant prior to exiting the site (e.g., a retail patron visits the supermarket prior to entering the highway system). It is estimated that approximately 8-percent of all new trips will be linked trips. This percentage was reduced down to a lower conservative percentage so as not to exceed 10-percent of the calculated total new trips per current ITE practices. Pass-by trips occur when motorists already on the highway system stop at a development site prior to continuing on their intended route (e.g., an existing motorist eastbound on E. Howard Avenue stops at the supermarket prior to continuing eastbound on E. Howard Avenue). Approximately 25 percent of the proposed retail and supermarket driveway trips are expected to be pass-by trips.

Based on the assumptions above, after linked and pass-by reductions, the full build of the proposed on-site development is expected to generate about 160 new vehicular trips (65 entering/95 exiting) during the weekday morning peak hour and 315 new vehicular trips (175 entering/140 exiting) during the weekday evening peak hour under full build conditions. On a typical weekday (24-hour period), the proposed on-site development is expected to generate approximately 3,140 new vehicle trips (1,570 entering/1,570 exiting) under full build conditions.

B5. Off-Site Generated Traffic

The full build of the off-site development is expected to generate about 95 new vehicular trips (30 entering/65 exiting) during the weekday morning peak hour and 110 new vehicular trips (75 entering/35 exiting) during the weekday evening peak hour under full build conditions. On a typical weekday (24-hour period), the off-site development is expected to generate approximately 960 new vehicle trips (480 entering/480 exiting) under full build conditions.

B6. Proposed Access

Five new access points are proposed for the residential/mixed-use development site. A new enter only access driveway, referred to as “North Driveway” is proposed along S. Lake Drive, about 450 feet south of the existing S. Lake Drive intersection with S. Packard Avenue. This new driveway is expected to provide access to the north residential building. A second driveway to the north residential building is proposed along East Sivyer Avenue extension. This driveway is proposed opposite the third driveway, which is proposed on the south side of the East Sivyer Avenue extension, providing access to the south residential building as well as the retail and supermarket buildings. Two additional access driveways are proposed along South Packard Avenue, providing the main access points to the supermarket and retail buildings. The driveways are proposed about 225 feet and 400 feet north of East Howard Avenue, respectively. With the exception of the “North Driveway” which is proposed as an enter only driveway, all other access driveways are proposed as full access driveways.

B7. Recommended Modifications

The study area intersections were analyzed based on the procedures set forth in the *Highway Capacity Manual* (HCM) 7th Edition. Intersection operation is defined by “level of service.” Level of Service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS ‘A,’ to very poor, represented by LOS ‘F.’ For the purpose of this study, LOS D or better was used to define acceptable peak hour operating conditions.

Modifications to address traffic impacts are included for the Existing, Background, and Build traffic conditions and have been shown for the following five scenarios:

- “Existing Traffic” – These modifications are expected to be necessary to accommodate the Existing traffic volumes under current conditions, without the proposed residential/mixed-use development and church.
- “Background Traffic” – These modifications are expected to be necessary to accommodate the Existing traffic volumes under current conditions plus full build out of the identified off-site development, without the proposed on-site development.
- “Full Build Traffic” – These modifications are expected to be necessary to accommodate the Full Build traffic volumes, which includes the full build-out of proposed

residential/mixed-use development and as well as full buildout of the identified off-site development.

The analysis was conducted using existing and planned intersection geometrics and traffic control; specifically, the two planned additional driveways along South Lake Drive to the approved off-site development. The following modifications, as shown in [Exhibit 1-3](#), are recommended to accommodate the Background and Full Build traffic volume scenarios, respectively. *Modifications are for jurisdictional consideration and are not legally binding. the City of St Francis reserves the right to determine alternative solutions.*

General

- *Full Build Traffic:*
 - Extend E. Sivyer Avenue from S. Packard Avenue to S. Lake Drive

Node 100: S. Lake Drive intersection with S. Packard Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:*
 - Provide a new access driveway on the east approach.
 - Update traffic signal hardware to accommodate new east approach.
 - Update traffic signal timings.
- *Full Build Traffic:* No additional modifications.

Node 200: S. Lake Drive intersection with North Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:*
 - Provide a new enter only access driveway on the west approach.
 - Provide signage within the site to restrict exiting vehicles.

Node 300: S. Lake Drive intersection with E. Sivyer Avenue/Bluffs on Lake Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:*
 - Provide a new access driveway on the east approach.
- *Full Build Traffic:*
 - Reconstruct the median and east approach to match into the new Sivyer Avenue (extended), located about 110 feet north of the current curb cuts located along S. Lake Drive.
 - Provide stop sign control on the east and west approaches.

Node 400: S. Lake Drive intersection with E. Howard Avenue

- *Existing Traffic:* No modifications.

- *Background Traffic:* No modifications.
- *Full Build Traffic:* No modifications.

Node 500: S. Packard Avenue intersection with E. Sivyer Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:*
 - Provide a new two-lane east/west roadway on the east approach.
 - Provide stop sign control on the east approach.

Node 600: S. Packard Avenue intersection with Retail Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:*
 - Provide a new full-access driveway on the east approach.
 - Provide stop sign control on the east approach.

Node 700: S. Packard Avenue intersection with Grocery Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:*
 - Provide a new full-access driveway on the east and west approaches.
 - Provide stop sign control on the east and west approaches.

Node 800: S. Packard Avenue intersection with E. Howard Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:* No modifications

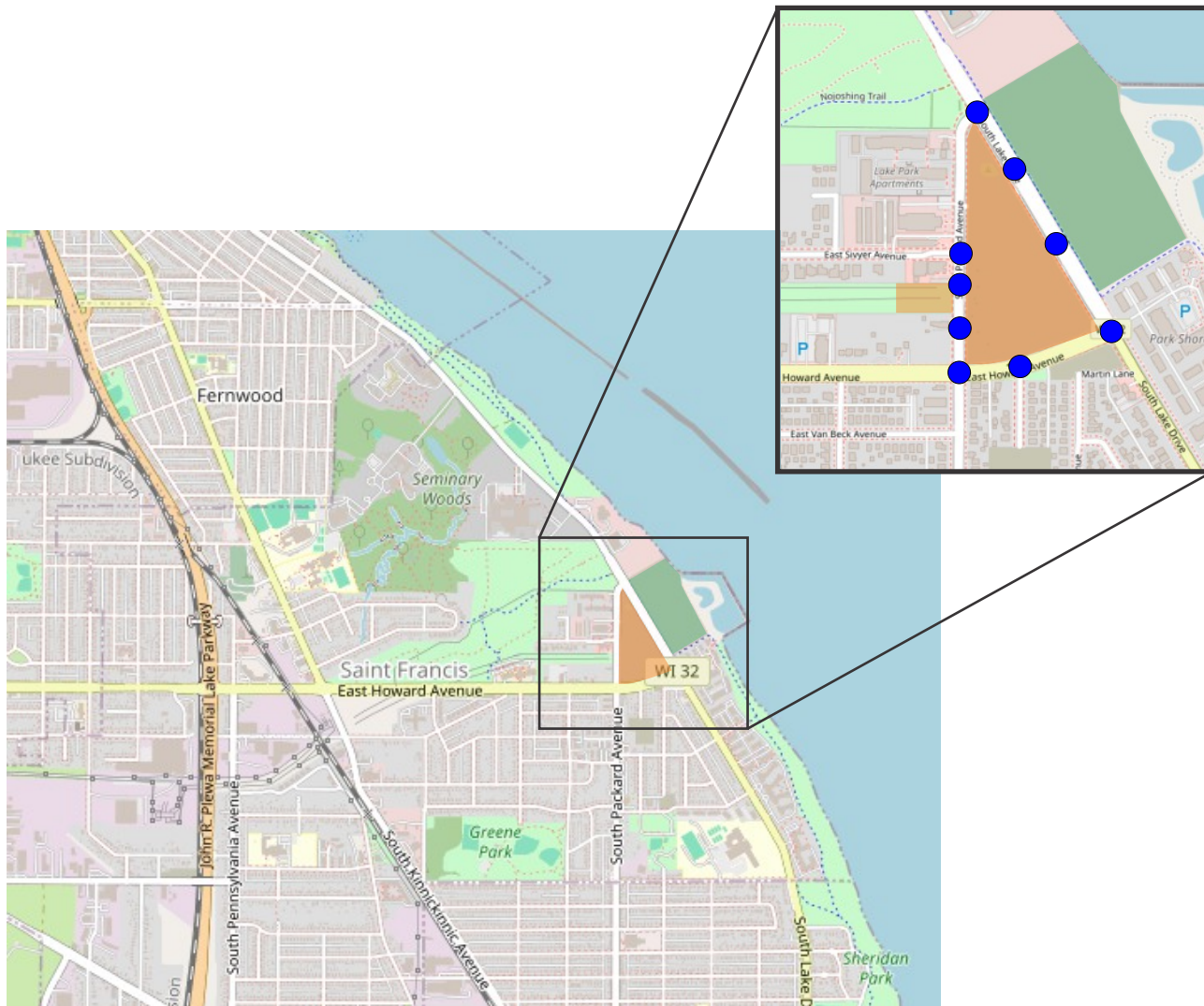
Node 900: E. Howard Avenue intersection with S. Troy Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:* No modifications.

Based on the full traffic signal warrant analysis completed as part of this study, traffic signals are not expected to be met under Full Build traffic volume conditions. In order for traffic signal warrants to be met, background traffic volumes would need to increase by about 500 percent (5 times the current volumes) in addition to the proposed on-site development traffic needing to increase by about 200 percent (2 times the current volumes). Since the current and future traffic volumes at this intersection are far below the thresholds for meeting signal warrants, it is recommended that signals not be installed at this intersection.

B8. Conclusion

All movements at the study area intersections are expected to operate safely and efficiently with the development assumptions outlined in this TIA and with the identified recommended modifications if properly designed and implemented through the design year of the proposed developments.



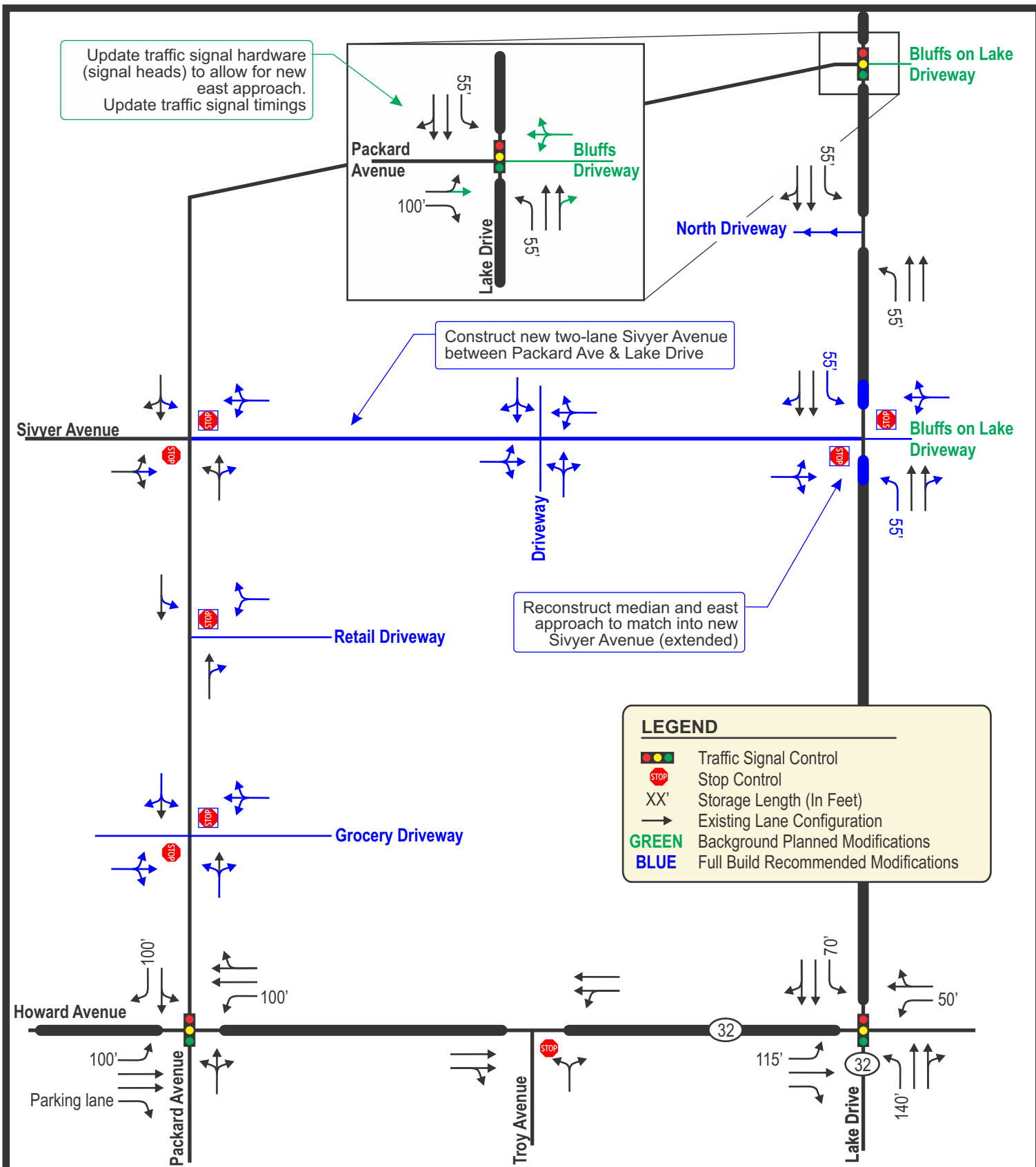
LEGEND

- Study Area Intersection
- On-Site Development Location
- Off-Site Development Location





Engberg Anderson Project No. 253888.00



CHAPTER II – PROPOSED DEVELOPMENT

PART A – ON-SITE DEVELOPMENT

A1. Development Site Location

A residential/mixed-use development is being proposed on a parcel of land bordered by S. Packard Avenue to the west, S. Lake Drive to the north/east and E. Howard Avenue to the south within the City of St Francis, Milwaukee County. The full build includes two multi-story residential buildings with surface parking spaces as well as private underground spaces. A separate retail building and grocery building are also proposed on the southern portion of the site. A street map illustrating the location of the proposed residential/mixed-use development is shown in [Exhibit 2-1](#) at the end of this chapter.

A2. Surrounding Land Use

The proposed residential/mixed-use development site is bordered by residential land uses to the south and west with a planned residential development under construction to the east. A few commercial businesses also exist to the west, on the west side of S. Packard Avenue. The St Francis Lions Community Center and the St Francis Civic Center/City Hall are located further to the west, along the north side of Howard Avenue.

A3. On-Site Development Description

The proposed development includes two multi-story (6 floor) residential buildings with surface parking spaces as well as private underground spaces. An extension of East Sivyer Avenue from its current terminus at South Packard Avenue to the east to terminate at South Lake Drive is proposed to split the site, with one apartment building proposed to the north and a second proposed to the south of East Sivyer Avenue. A separate retail building and grocery building are also proposed to the south of the East Sivyer Avenue extension. The following land uses were assumed for the proposed development:

North Portion of Site

- Multifamily Housing (Mid-Rise, Not Close to Rail Transit) – 155 units

South Portion of Site

- Multifamily Housing (Mid-Rise, Not Close to Rail Transit) – 155 units
- Strip Retail Plaza (<40K) – 6,000 SF
- Supermarket - 24,000 SF

Initial build out of the residential/mixed-use development is expected to start in year 2026 and be completed by late 2027 or early 2028. For purposes of this traffic study, full build out of the entire site was included in the Full Build traffic volume scenario. The conceptual site plan for the proposed residential/mixed-use development is shown in [Exhibit 2-2](#).

A4. On-Site Development Access

Five new access points are proposed for the residential/mixed-use development site. A new enter only access driveway, referred to as “North Driveway” is proposed along S. Lake Drive, about 450 feet south of the existing S. Lake Drive intersection with S. Packard Avenue. This new driveway is expected to provide access to the north residential building. A second driveway to the north residential building is proposed along East Sivyer Avenue extension. This driveway is proposed opposite the third driveway, which is proposed on the south side of the East Sivyer

Avenue extension, providing access to the south residential building as well as the retail and supermarket buildings. Two additional access driveways are proposed along South Packard Avenue, providing the main access points to the supermarket and retail buildings. The driveways are proposed about 225 feet and 400 feet north of East Howard Avenue, respectively. With the exception of the “North Driveway” which is proposed as an enter only driveway, all other access driveways are proposed as full access driveways.

PART B – STUDY AREA

B1. Influence Area

The proposed residential/mixed-use development is expected to draw from the City of St Francis, and the greater City of Milwaukee and Milwaukee County area.

B2. Area of Significant Traffic Impact

As discussed with the City of St Francis, the study area for the proposed residential/mixed-use development includes the following existing intersections:

- E. Howard Avenue with S. Packard Avenue (traffic signal control)
- E. Howard Avenue with S. Troy Avenue (one-way stop control)
- E. Howard Avenue with S. Lake Drive (traffic signal control)
- S. Packard Avenue with E. Sivyer Avenue (existing one-way stop control, proposed two-way stop control)
- S. Packard Avenue with S. Lake Drive (traffic signal control)
- S. Lake Drive with E. Sivyer Avenue (existing one-way stop control, proposed two-way stop control)

In addition to these existing intersections, the following proposed driveways were also included in the study:

- S. Packard Avenue with the Grocery Store driveway (proposed two-way stop control)
- S. Packard Avenue with the Retail driveway (proposed one-way stop control)
- S. Lake Drive with North Driveway (proposed no control – inbound only)

PART C – OFF-SITE DEVELOPMENT

One off-site development has been identified within the immediate study area. A residential development, the Bluffs on Lake development, including 278 apartments within a multi-story residential building with first floor commercial space, has previously been approved for a parcel of land on the east side of South Lake Drive, immediately east of the proposed on-site development. Access to the site is proposed via two new access drives along South Lake Drive, one at the existing signalized intersection with South Packard Avenue and one at the proposed East Sivyer Avenue extension intersection. This development, which has been previously approved, is currently under construction and was therefore included in the Background traffic volume scenario. The access points for this off-site development are shown in [Exhibit 2-2](#).

PART D – SITE ACCESSIBILITY

D1. Study Area Roadways

The study area roadways are discussed below:

South Lake Drive is a northwest/southeast four-lane median divided Minor Arterial with a posted speed limit of 30-mph through the project limits. South of E. Howard Avenue, S. Lake Drive is considered part of a connecting highway system (STH 32). The Year 2025 WisDOT annual average daily traffic (AADT) volumes on S. Lake Drive were approximately 4,700 vehicles per day (vpd) north of S. Packard Avenue, 3,600-vpd (2018 count) south of S. Packard Avenue and 5,200-vpd (2018 count) south of E. Howard Avenue. From the north project limits, sidewalks are currently provided along the west side of S. Lake Drive with the Oak Leaf Bike Trail located along the west side up to a point immediately north of E. Howard Avenue where the trail bends towards Lake Michigan. South of this point, sidewalks are provided along both sides of S. Lake Drive through the southern project limits. Parking is only allowed along the west side of S. Lake Drive between S. Packard Avenue and E. Howard Avenue.

East Howard Avenue is an east/west four-lane median divided Minor Arterial with a posted speed limit of 30-mph through the project limits. West of S. Lake Drive, E. Howard Avenue is considered part of a connecting highway system (STH 32) as it heads west to connect into S. Kinnickinnic Avenue. The Year 2022 WisDOT AADT volumes on E. Howard Avenue were approximately 8,000-vpd to the east of S. Kinnickinnic Avenue and 2,700-vpd (2018 count) to the west of S. Lake Drive. Sidewalks are currently provided along both sides of E. Howard Avenue within the limits of the study area. Parking is not allowed along either side of E. Howard Avenue between S. Packard Avenue and S. Lake Drive.

South Packard Avenue is a north/south two-lane undivided Minor Arterial with a posted speed limit of 30-mph through the project limits. The Year 2025 WisDOT AADT volumes on S. Packard Avenue were approximately 1,800-vpd to the south of S. Lake Drive and 2,400-vpd to the south of E. Howard Avenue. Sidewalks are currently provided along both sides of S. Packard Avenue within the limits of the study area. Parking is allowed along both sides of S. Packard Avenue between E. Howard Avenue and a point about 200 feet south of S. Lake Drive.

East Sivyver Avenue is an east/west two-lane undivided local street with a posted speed limit of 25-mph that intersects S. Packard Avenue as the west approach of a conventional three-legged stop sign controlled intersection. There are currently no WisDOT AADT volumes available along E. Sivyver Avenue. Sidewalks are currently provided along both sides of E. Sivyver Avenue within the limits of the study area.

South Troy Avenue is a north/south two-lane undivided local street with a posted speed limit of 25-mph that intersects E. Howard Avenue as the south approach of a conventional three-legged stop sign controlled intersection. There are currently no WisDOT AADT volumes available along S. Troy Avenue. Sidewalks are currently provided along both sides of S. Troy Avenue within the limits of the study area.

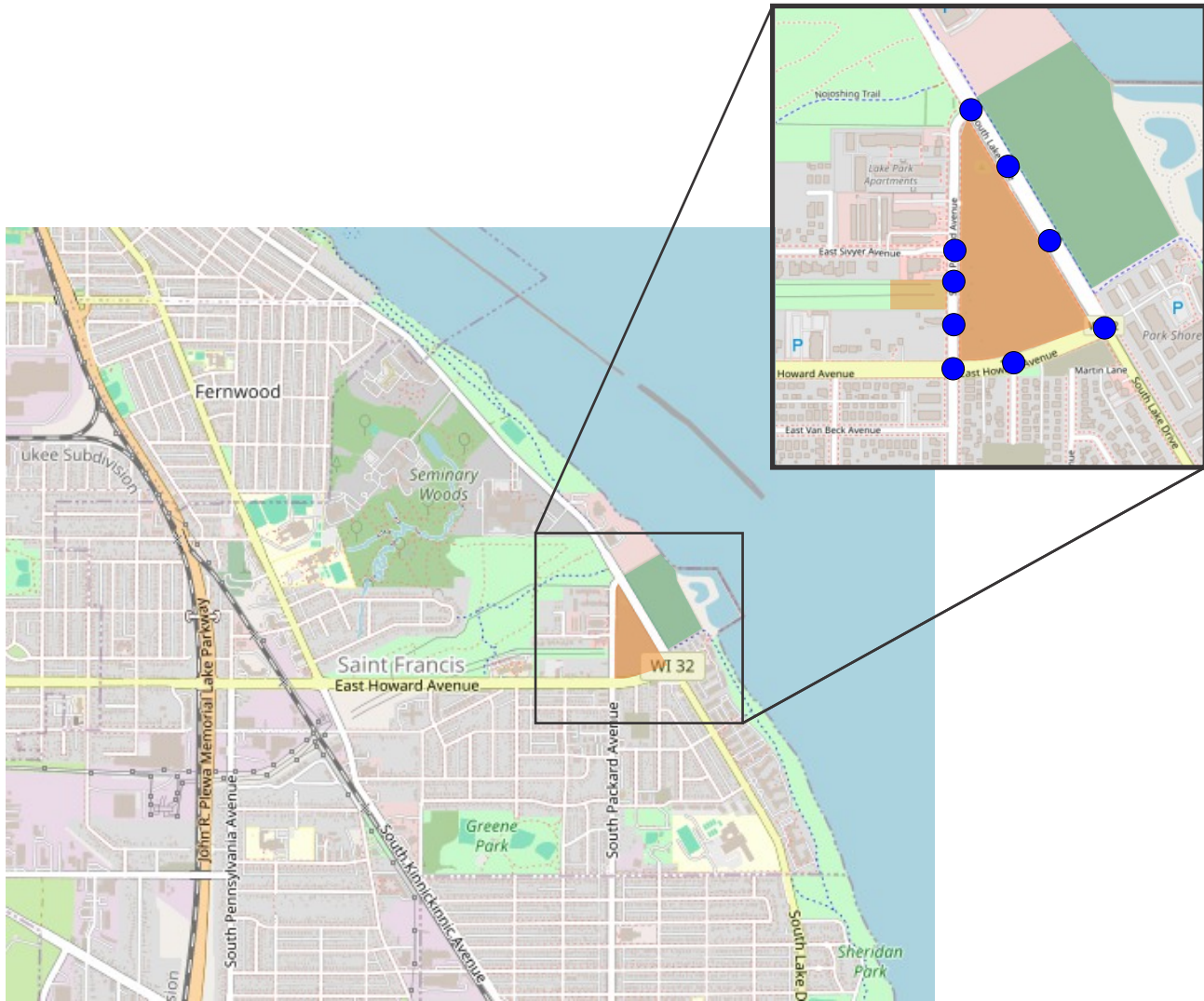
D2. Alternative Modes of Transportation

Sidewalks currently exist along many of the roadways within the limits of the study area. No designated on-street or off-street bicycle facilities were identified.

Pedestrians and bicyclists may use their respective modes to access the proposed development. However, to allow for a conservative (highest vehicular volume) analysis, these modes were assumed to make up a relatively small portion of the overall trips to/from the study area. For the

purpose of this TIA, all trips to/from the proposed development site were assumed to occur via motor vehicle.

Transit is not present within the area with the closest Milwaukee County Transit Service (MCTS) Bus Line running along S. Kinnickinnic Avenue which is located about $\frac{3}{4}$ -mile west of the proposed development site along E. Howard Avenue.



LEGEND

- Study Area Intersection
- On-Site Development Location
- Off-Site Development Location





Engberg Anderson Project No. 253888.00



CHAPTER III – ANALYSIS OF EXISTING CONDITIONS

PART A – EXISTING PHYSICAL CHARACTERISTICS

[Exhibit 3-1](#) shows the existing transportation detail for the study area intersections. More specifically, the exhibit illustrates intersection lane configurations, intersection traffic controls, posted speed limits, and approximate intersection spacing.

PART B – EXISTING TRAFFIC VOLUMES

The weekday morning and weekday evening peak hours are expected to drive the improvements needed to adequately accommodate the proposed residential/mixed-use development, as they represent the highest trip generation for the site. Therefore, in mid-July of 2026, TADI conducted weekday morning (6:00 to 9:00 am) and weekday evening (3:00 to 6:00 pm) turning movement traffic counts at the following intersections:

- E. Howard Avenue with S. Packard Avenue
- E. Howard Avenue with S. Troy Avenue
- E. Howard Avenue with S. Lake Drive
- S. Packard Avenue with E. Sivyer Avenue
- S. Packard Avenue with S. Lake Drive

In addition, a thirteen-hour (6:00 am to 7:00 pm) turning movement count was conducted at the S. Lake Drive intersection with E. Sivyer Avenue/Bluffs on Lake driveway extended to perform a traffic signal warrant analysis study at this intersection under the full build traffic volume conditions.

Based on the turning movement counts and using the E. Howard Avenue signalized intersections as the controlling intersections, the weekday morning and weekday evening peak hours were identified as being 7:30 to 8:30 am and 5:00 to 6:00 pm; respectively. Copies of the existing traffic counts and related calculations are included in [Appendix A](#). The Existing peak hour traffic volumes, balanced along the study corridors, are shown in [Exhibit 3-2](#).

PART C – EXISTING CAPACITY LEVEL OF SERVICE

C1. Level of Service Definitions

The study area intersections were analyzed based on the procedures set forth in the *Highway Capacity Manual* (HCM) 7th Edition. Intersection operation is defined by “level of service.” Level of service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS ‘A,’ to very poor, represented by LOS ‘F.’ For the purpose of this study, LOS D was used to define acceptable peak hour operating conditions. Descriptions of the various levels of service are as follows:

LOS A is the highest level of service that can be achieved. Under this condition, intersection approaches appear quite open, turning movements are easily made, and nearly all drivers find freedom of operation. At unsignalized intersections, average delays are less than [10](#) seconds.

LOS B represents stable operation. At unsignalized intersections, average delays are [10 to 15](#) seconds.

LOS C still represents stable operation, but periodic backups of a few vehicles may develop behind turning vehicles. Most drivers begin to feel restricted, but not objectionably so. At unsignalized intersections, average delays are [15 to 25](#) seconds.

LOS D represents increasing traffic restrictions as the intersection approaches instability. Delays to approaching vehicles may be substantial during short peaks within the peak period, but periodic clearance of long lines occurs, thus preventing excessive backups. At unsignalized intersections, average delays are 25 to 35 seconds.

LOS E represents the capacity of the intersection. At unsignalized intersections, average delays are 35 to 50 seconds.

LOS F represents jammed conditions where the intersection is over capacity and acceptable gaps for unsignalized intersections in the mainline traffic flow are minimal. At unsignalized intersections, average delays exceed 50 seconds.

C2. Existing Traffic Operations

[Exhibit 3-3](#) shows the Existing traffic peak hour operating conditions at the study area intersections. The Existing traffic analysis was conducted using the existing lane configurations shown in [Exhibit 3-1](#) and the Existing traffic volumes shown in [Exhibit 3-2](#).

As shown in [Exhibit 3-3](#), all movements at the study area intersections are currently operating acceptably with LOS C or better conditions during the typical weekday morning and weekday evening peak hours under the Existing traffic scenario.

PART D – SOURCES OF DATA

The following sources of data were obtained for use in conducting this traffic study:

- Turning movement traffic counts – TADI
- Existing transportation detail – TADI along with Google Earth
- Existing traffic signal timings – TADI
- On-site development information – Pinnacle Engineering Group
- Off-site development information – TADI via online search (rmk.com)



LEGEND

-  Traffic Signal Control
-  Stop Sign Control
-  Existing Lane Configuration
-  XX' Existing Storage Length (in Feet)
-  XX' Distance Between Roadways (in Feet)
-  Divided Roadway Median

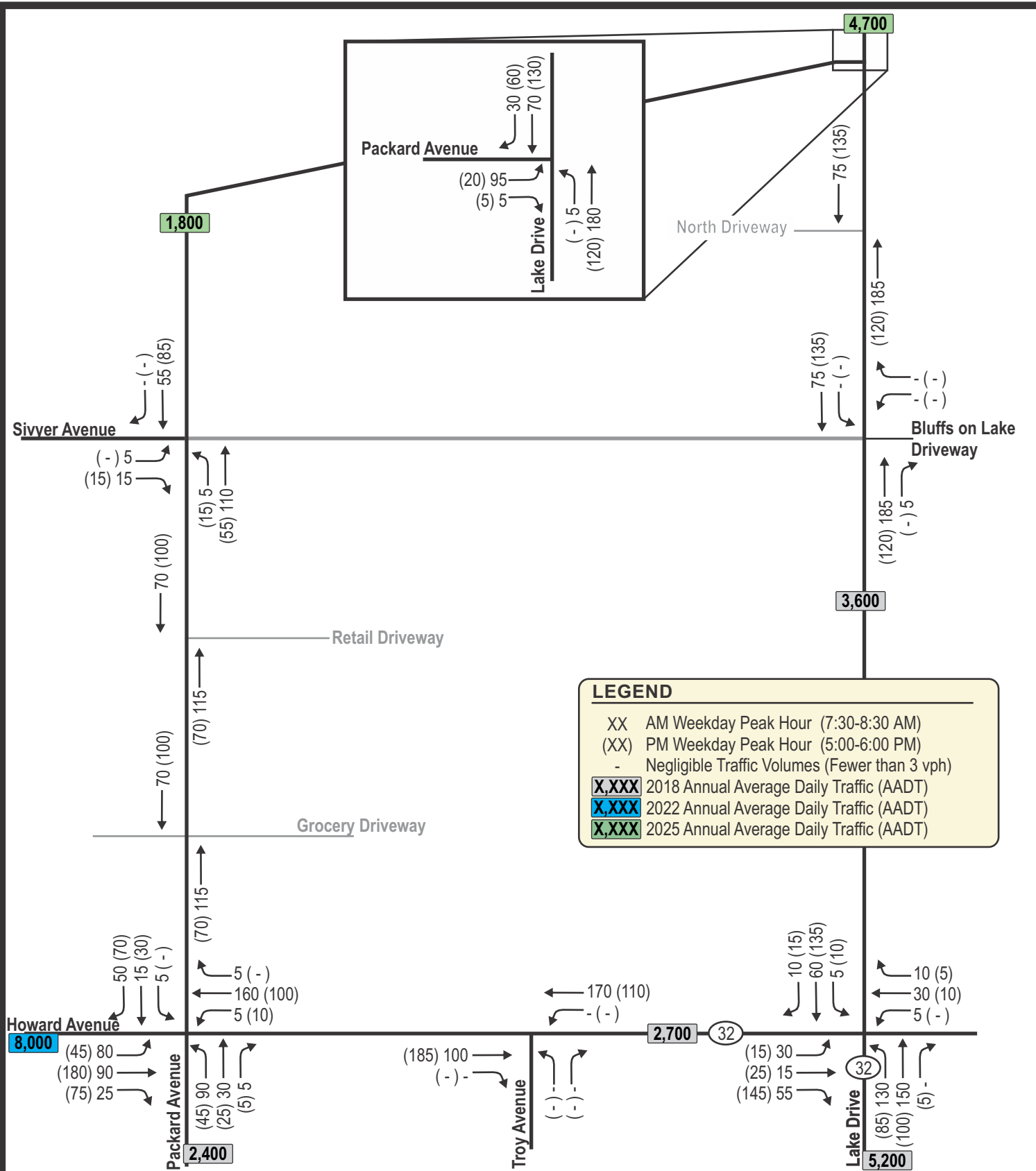


Exhibit 3-3
Existing Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach												I/S LOS & Delay
			Eastbound			Westbound			Northbound			Southbound			
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙	
Node 100: S Lake Drive & S Packard Avenue <i>Traffic Signal Control</i>	AM	Lanes->	1	-	1	-			1	2>		1	2>		6.9
		LOS	C	-	B	-			A	A		A	A		
		Delay	21.2	-	19.1	-			2.1	2.1		2.2	2.1		
		Queue	65'	-	25'	-			25'	25'		25'	25'		
	PM	LOS	C	-	C	-			A	A		A	A		2.8
		Delay	20.8	-	20.7	-			1.5	1.4		1.4	1.5		
Node 400: S Lake Drive & E Howard Avenue <i>Traffic Signal Control</i>	AM	Lanes->	1	1	1	1	2>		1	2>		1	2>		5.6
		LOS	B	B	B	B	B		A	A		A	A		
		Delay	13.7	12.9	13.4	12.9	13.4		3.2	2.8		2.9	2.7		
		Queue	25'	25'	25'	25'	25'		30'	25'		25'	25'		
	PM	LOS	B	B	B	B	B		A	A		A	A		6.3
		Delay	12.9	12.9	14.8	12.9	12.7		3.3	2.9		3.0	2.9		
Node 500: S Packard Avenue & E Sivyer Avenue <i>One-Way Stop Control</i>	AM	Lanes->	<1>			-			<1>			<1>			
		LOS	A			-			A			*			
		Delay	9.0			-			7.3			*			
		Queue	25'			-			25'			*			
	PM	LOS	A			-			A			*			
		Delay	8.9			-			7.4			*			
Node 800: S Packard Avenue & E Howard Avenue <i>Traffic Signal Control</i>	AM	Lanes->	1	2	1	1	2>		<1>			<1		1	5.9
		LOS	A	A	A	A	A		A			A		A	
		Delay	5.2	4.4	4.4	4.5	4.6		8.7			8.0		8.1	
		Queue	25'	25'	25'	25'	25'		40'			25'		25'	
	PM	LOS	A	A	A	A	A		A			A		A	5.5
		Delay	4.7	4.5	4.6	4.8	4.4		8.4			8.1		8.4	
Node 900: E Howard Avenue & S Troy Avenue <i>One-Way Stop Control</i>	AM	Lanes->	-	2>		<2		-	<1>			-			
		LOS	-	*		A		-	A			-			
		Delay	-	*		7.4		-	9.2			-			
		Queue	-	*		25'		-	25'			-			
	PM	LOS	-	*		A		-	A			-			
		Delay	-	*		7.6		-	9.5			-			

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.

Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

CHAPTER IV – FORECASTED TRAFFIC

PART A – BACKGROUND TRAFFIC FORECASTING

Since the identified off-site development has been previously approved and is currently under construction, the off-site development has been included in the Background traffic volumes used in this study. The off-site development new traffic was added to the existing peak hour turning movement volumes to determine the Background traffic volumes as shown in [Exhibit 4-1](#) (see *Chapter IV, Section C1* for further discussion).

PART B – SITE TRAFFIC FORECASTING

The traffic volumes expected to be generated by the proposed on-site and off-site developments are based on the size and type of the proposed uses, and on trip rates as published in the Institute of Transportation Engineer's (ITE) *Trip Generation Manual, 12th Edition*. A combination of trip rates and fitted curve equations were utilized to determine the expected new trips based on current ITE practices.

B1. Trip Generation

As shown in [Exhibit 4-3A](#), under full build out, the on-site development is expected to generate 205 new trips (85 entering/120 exiting) during a typical weekday morning peak hour. Of the 205 new trips, 15 are expected to be linked trips and another 30 are expected to be pass-by trips resulting in 160 new trips (65 entering/95 exiting) during a typical weekday morning peak hour. During a typical weekday evening peak hour, the on-site development is expected to generate 415 new trips (230 entering/185 exiting). Of the 415 new trips, approximately 30 are expected to be linked trips and another 70 are expected to be pass-by trips resulting in 315 new trips (175 entering/140 exiting). On a typical weekday, the development is expected to generate 4,110 new trips of which approximately 340 are expected to be linked trips and another 630 are expected to be pass-by trips resulting in approximately 3,140 new trips (1,570 entering/1,570 exiting) under full build conditions.

As shown in [Exhibit 4-3B](#), under full build out, the off-site development is expected to generate about 95 new vehicular trips (30 entering/65 exiting) during the weekday morning peak hour and 110 new vehicular trips (75 entering/35 exiting) during the weekday evening peak hour under full build conditions. On a typical weekday (24-hour period), the off-site development is expected to generate approximately 960 new vehicle trips (480 entering/480 exiting) under full build conditions.

B2. Mode Split

Pedestrians, bicyclists, and future bus users may use their respective modes to access the proposed development, though these alternate modes are expected to make up a very small portion of the overall trips to/from the study area. Therefore, for the purpose of this TIA, all trips to/from the on-site development and off-site development were assumed to occur via motor vehicle.

B3. Determination of Linked and Pass-by Trip Traffic

The residential/mixed-use development site is expected to include both linked trips and pass-by trips. A linked trip occurs when a patron of one tenant visits another tenant prior to exiting the site (e.g., a retail patron visits the supermarket prior to entering the highway system). It is estimated that approximately 8-percent of all new trips will be linked trips. This percentage was

reduced down to a lower conservative percentage so as not to exceed 10-percent of the calculated total new trips per current ITE practices. Pass-by trips occur when motorists already on the highway system stop at a development site prior to continuing on their intended route (e.g., an existing motorist eastbound on E. Howard Avenue stops at the supermarket prior to continuing eastbound on E. Howard Avenue). Approximately 25 percent of the proposed retail and supermarket driveway trips are expected to be pass-by trips.

B4. Trip Distribution

The trip distribution for the on-site and off-site developments, listed below and shown in table format in [Exhibits 4-3A&B](#), and graphically on [Exhibit 4-4](#), was determined based on the existing traffic counts, the type of proposed land uses, the location of existing populations, and anticipated growth areas outside the immediate study area.

- 25 percent to/from the north on S. Lake Drive
- 30 percent to/from the south on S. Lake Drive
- 35 percent to/from the west on E. Howard Avenue
- 10 percent to/from the south on S. Packard Avenue

B5. Trip Assignment

The full build new trips for the on-site development were assigned to the study area and are shown in [Exhibit 4-5A](#), and the full build on-site development pass-by trips are shown in [Exhibit 4-5B](#). The full build new trips were added to the full build pass-by trips to determine the full build driveway trips for the on-site development, as shown in [Exhibit 4-5C](#).

The full build new trips for the identified off-site development were assigned to the study area and are shown in [Exhibit 4-8](#).

PART C – BACKGROUND AND BUILD TRAFFIC

C1. Background Traffic

Background traffic volumes include the full build-out of the “Bluffs on Lake” off-site development. The Background traffic volumes were determined by adding the Existing traffic volumes ([Exhibit 3-2](#)) to the off-site development new trips ([Exhibit 4-8](#)). The Background traffic volumes are shown in [Exhibit 4-1](#).

C2. Full Build Traffic

The Full Build traffic volumes assume the full build-out of the proposed residential/mixed-use on-site development. The Full Build traffic volumes were determined by adding the Background traffic volumes ([Exhibit 4-1](#)) to the Full Build new trips ([Exhibit 4-5C](#)). The Full Build traffic volumes are shown in [Exhibit 4-11](#).

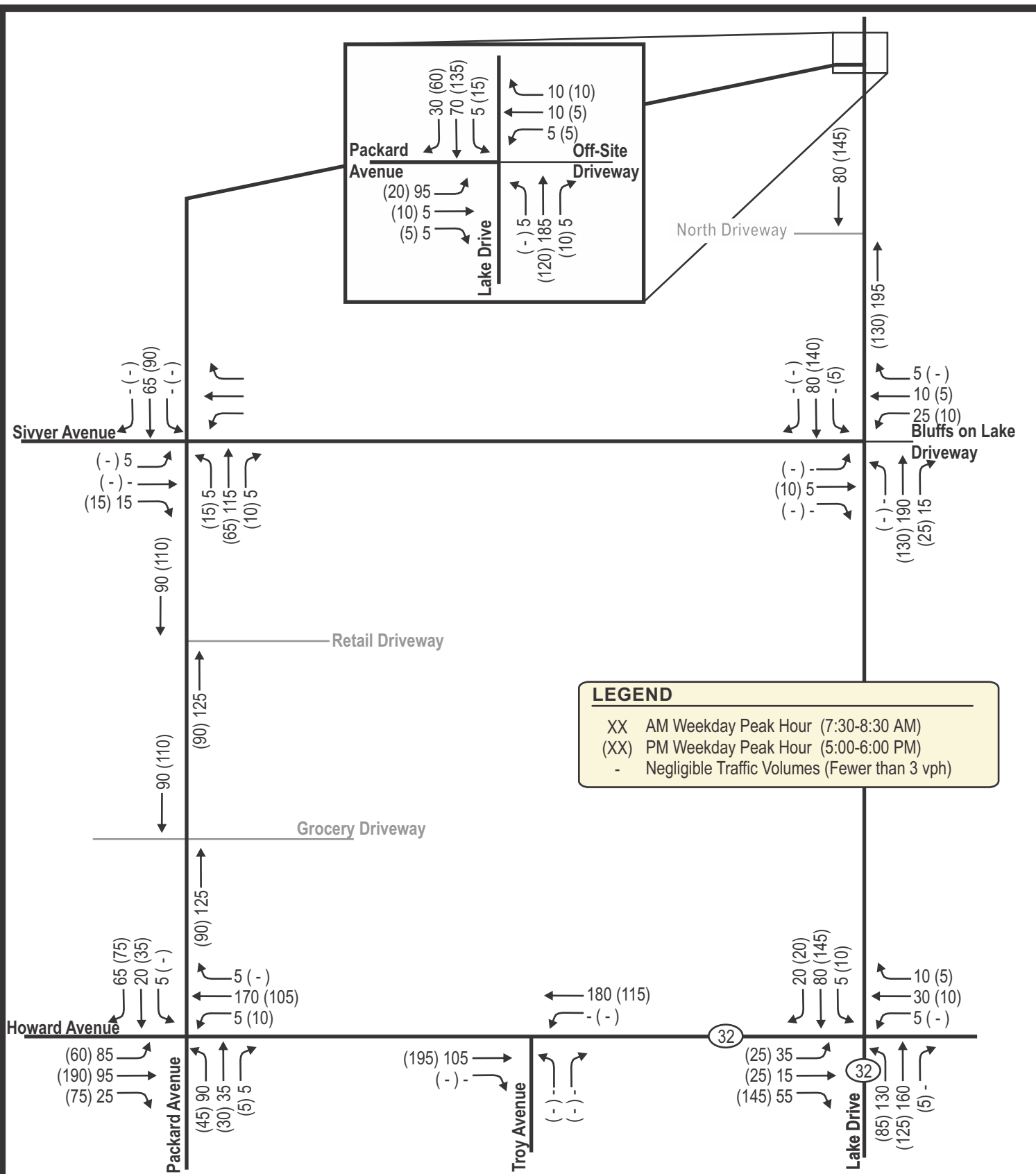


Exhibit 4-3A
On-Site Trip Generation Table¹

Land Use	ITE Code	Proposed Size	Weekday Daily	AM Peak			PM Peak		
				In	Out	Total	In	Out	Total
Multifamily Housing (Mid-Rise) (Not Close to Rail Transit)	221	155 Units	690 (4.46)	15 (23%)	40 (77%)	55 FCE	40 (64%)	20 (36%)	60 FCE
Multifamily Housing (Mid-Rise) (Not Close to Rail Transit)	221	155 Units	690 (4.46)	15 (23%)	40 (77%)	55 FCE	40 (64%)	20 (36%)	60 FCE
Strip Retail Plaza (<40k)	822	6,000 x 1,000 SF	330 (54.45)	15 (55%)	10 (45%)	25 (3.93)	30 (50%)	25 (50%)	55 FCE
Supermarket	850	24,000 x 1,000 SF	2,400 FCE	40 (59%)	30 (41%)	70 (2.95)	120 (50%)	120 (50%)	240 FCE
Total Trips			4,110	85	120	205	230	185	415
Total Linked Trip Reduction			8%	-340	-5	-10	-15	-20	-30
Total Driveway Trips			3,770	80	110	190	210	175	385
Wkday: AM (PM) Pass-by Trips	(822)	25%: 25% (25%)	-80	-5	-5	-10	-5	-5	-10
Wkday: AM (PM) Pass-by Trips	(850)	25%: 25% (25%)	-550	-10	-10	-20	-30	-30	-60
Total Pass-by Trip Reduction			-630	-15	-15	-30	-35	-35	-70
Total New Trips			3,140	65	95	160	175	140	315

¹ ITE Trip Rates (X.XX) and/or Fitted Curve Equations (FCE) are from the ITE Trip Generation Manual, 12th Edition.

² Linked Trip reductions were reduced from WisDOT acceptable values so that % was 10% or less of total new trip traffic.

TRIP DISTRIBUTION (New Trips)

North on Lake Drive	25%	785	15	25	45	35
South on Lake Drive	30%	940	20	30	55	40
West on Howard Avenue	35%	1100	25	30	60	50
South on Packard Avenue	10%	315	5	10	15	15
	100%	3140	65	95	175	140

TRIP DISTRIBUTION (Pass-by Trips)

North on Lake Drive	15% (30%)	0	0	10	10
South on Lake Drive	55% (30%)	10	10	10	10
West on Howard Avenue	30% (40%)	5	5	15	15
		15	15	35	35

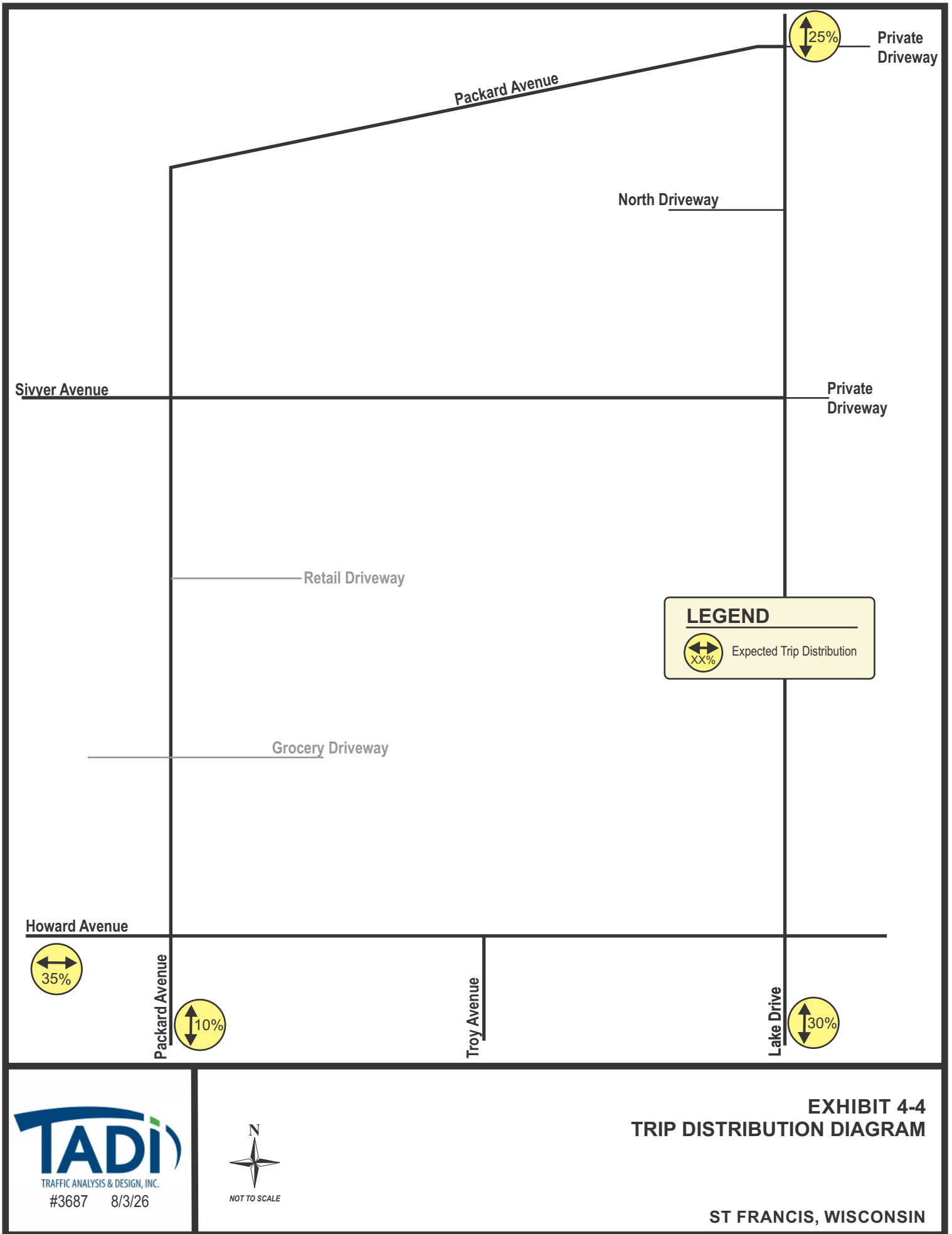
Exhibit 4-3B
Off-Site (Bluffs on Lake Drive) Trip Generation Table¹

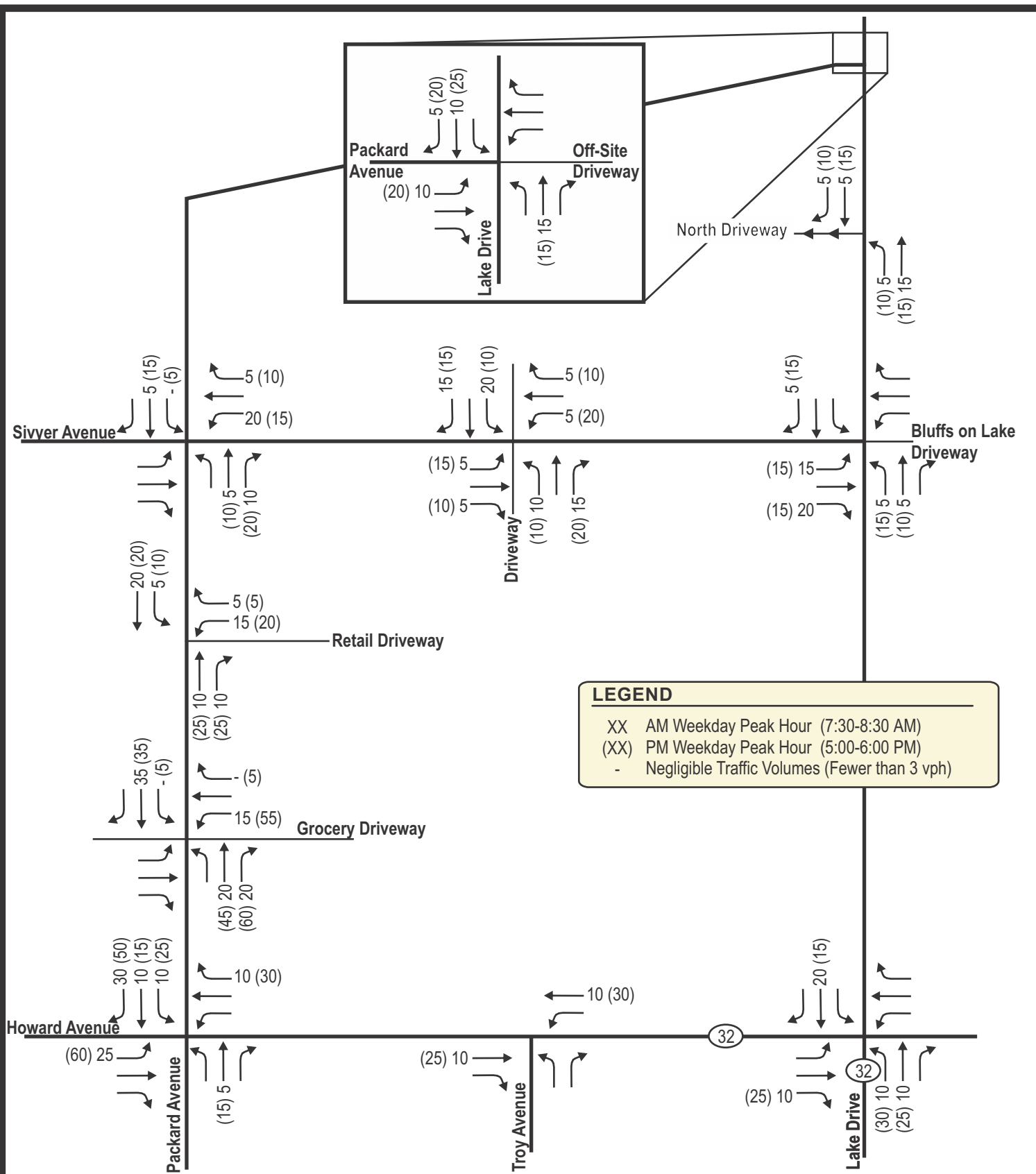
Land Use	ITE Code	Proposed Size	Weekday Daily	AM Peak			PM Peak		
				In	Out	Total	In	Out	Total
Mid-Rise Residential with Ground-Floor Commercial (4-10 Floors) (1-25k)	231	278 Units	960 (3.44)	30 (30%)	65 (70%)	95 (0.34)	75 (70%)	35 (30%)	110 (0.40)
Total New Trips			960	30	65	95	75	35	110

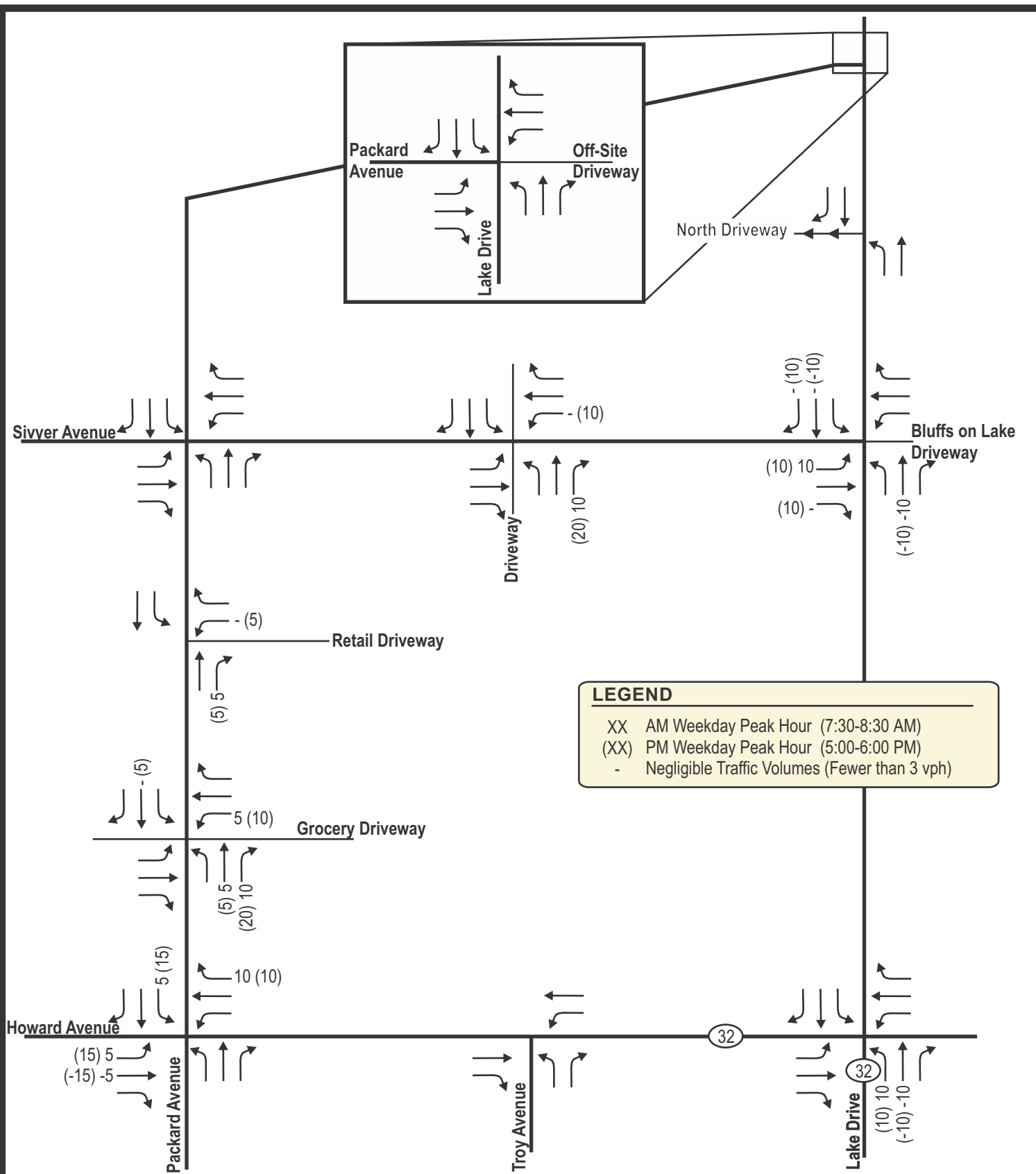
¹ ITE Trip Rates (X.XX) and/or Fitted Curve Equations (FCE) are from the ITE Trip Generation Manual, 12th Edition.

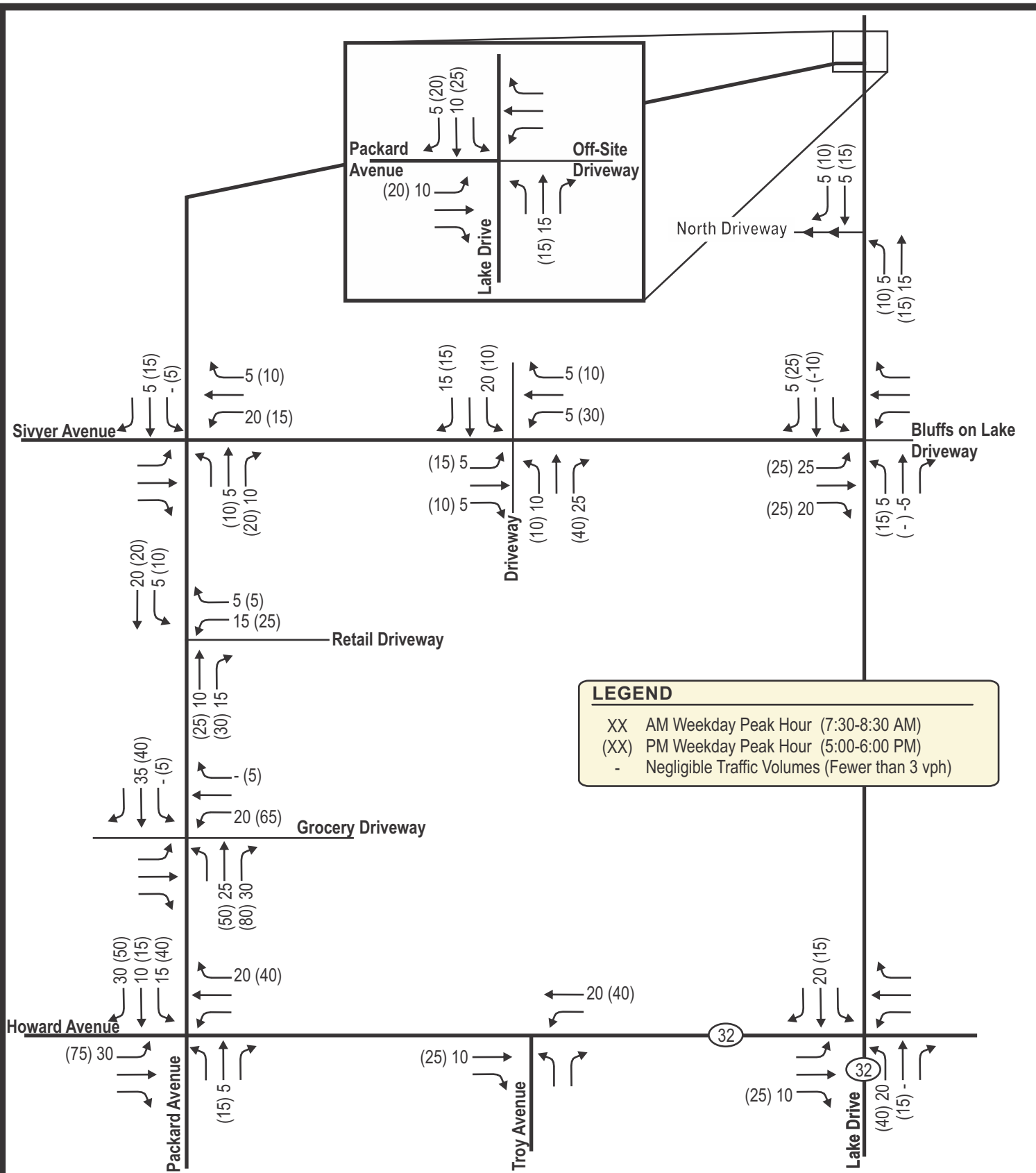
TRIP DISTRIBUTION (New Trips)

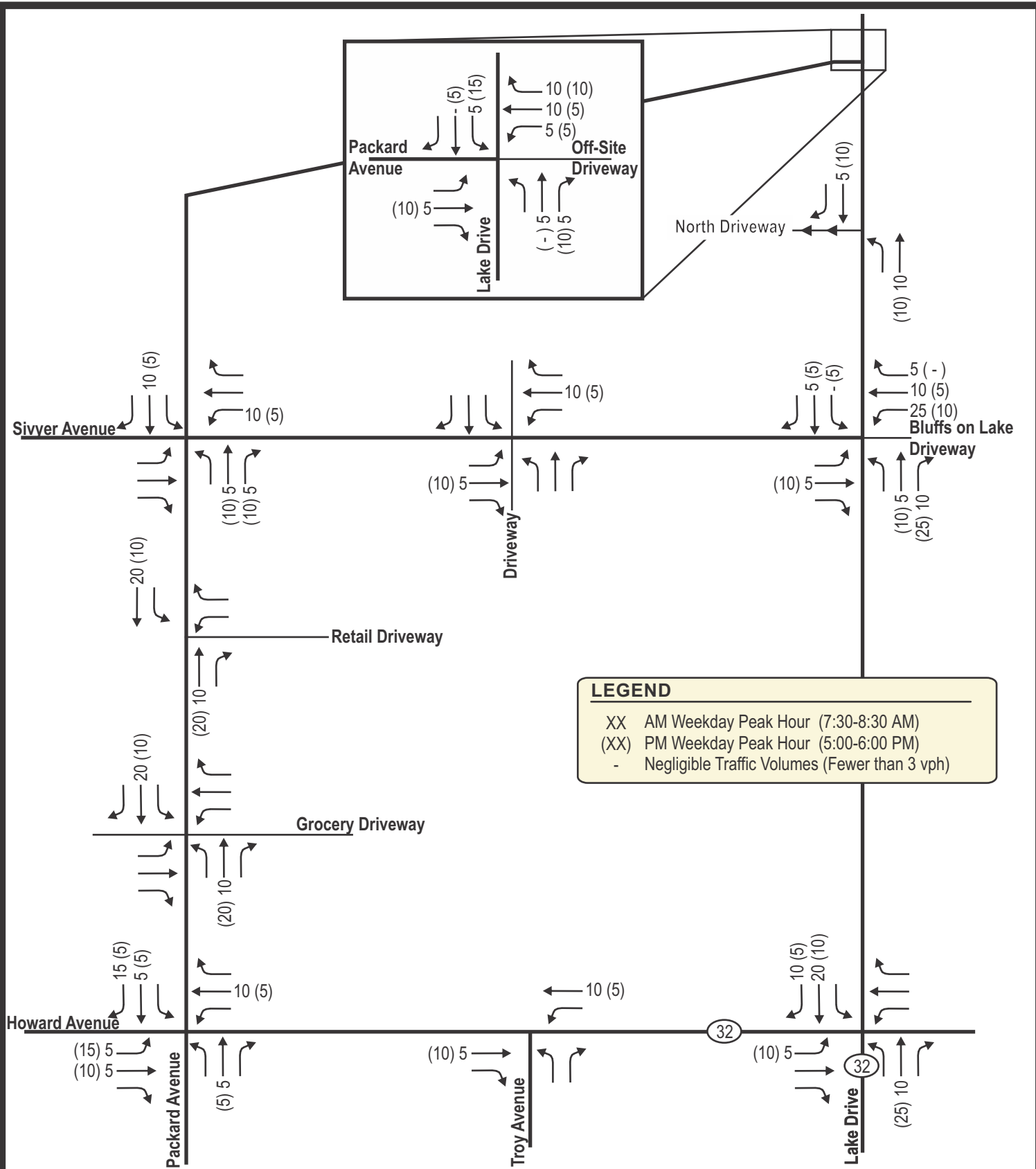
North on Lake Drive	25%	240	5	15	20	10
South on Lake Drive	30%	290	10	20	25	10
West on Howard Avenue	35%	335	10	25	25	10
South on Packard Avenue	10%	95	5	5	5	5
	100%	960	30	65	75	35

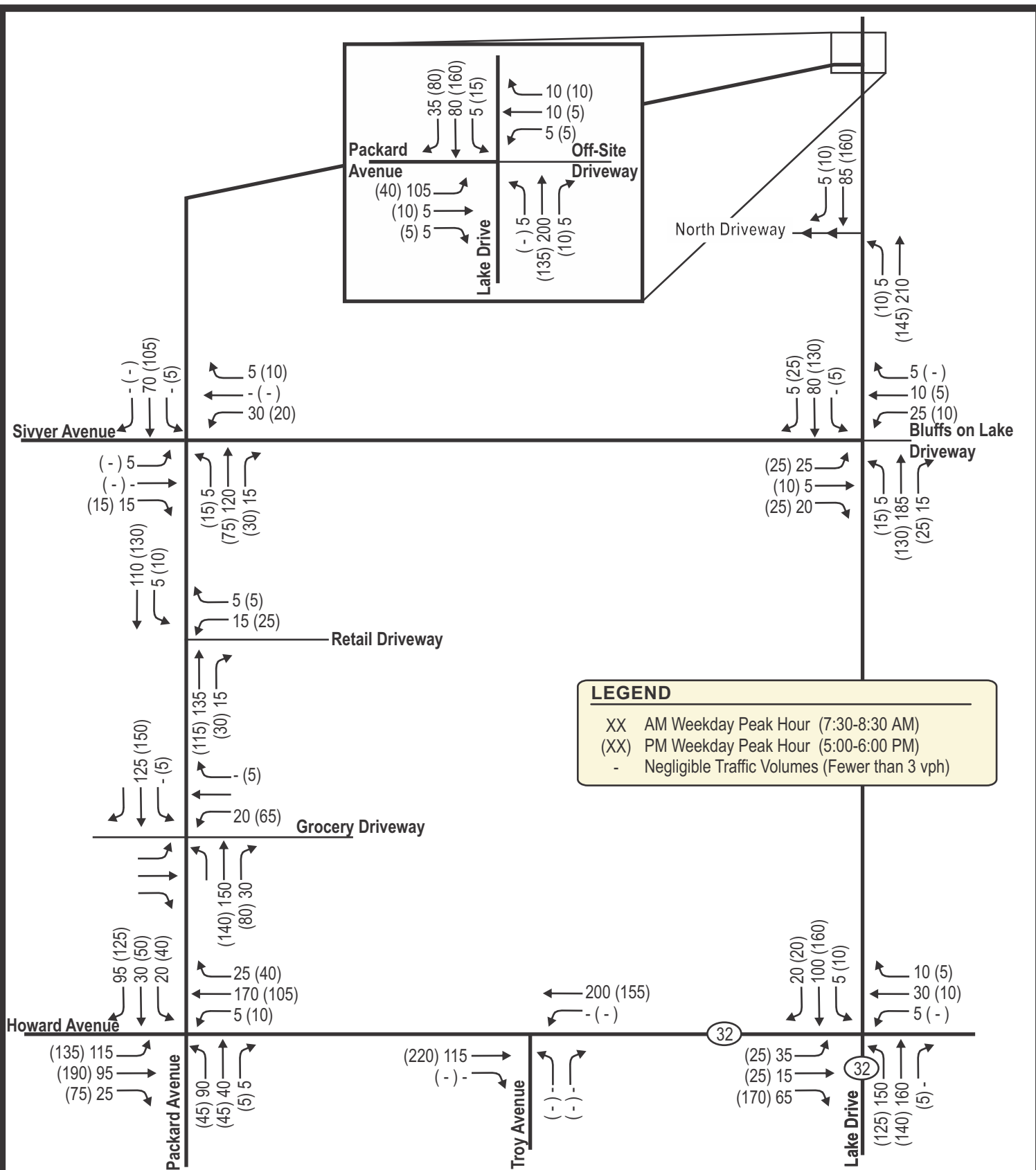












CHAPTER V – TRAFFIC AND IMPROVEMENT ANALYSIS

PART A – SITE ACCESS

Five new access points are proposed for the residential/mixed-use development site. A new enter only access driveway, referred to as “North Driveway” is proposed along S. Lake Drive, about 450 feet south of the existing S. Lake Drive intersection with S. Packard Avenue. This new driveway is expected to provide access to the north residential building. A second driveway to the north residential building is proposed along East Sivyver Avenue extension. This driveway is proposed opposite the third driveway, which is proposed on the south side of the East Sivyver Avenue extension, providing access to the south residential building as well as the retail and supermarket buildings. Two additional access driveways are proposed along South Packard Avenue, providing the main access points to the supermarket and retail buildings. The driveways are proposed about 225 feet and 400 feet north of East Howard Avenue, respectively. With the exception of the “North Driveway” which is proposed as an enter only driveway, all other access driveways are proposed as full access driveways.

PART B – CAPACITY LEVEL OF SERVICE ANALYSIS

B1. Background Traffic Operating Conditions

[Exhibit 5-1](#) shows the Background traffic peak hour operating conditions at the study area intersections without modifications.

Based on the analysis, the study area intersections are expected to continue to operate acceptably at LOS C or better conditions during the typical weekday morning and weekday evening peak hours under the Background traffic peak hour operating conditions, which includes the identified off-site development.

B2. Full Build Traffic Operating Conditions

[Exhibit 5-3](#) shows the Full Build traffic peak hour operating conditions at the study area intersections, without additional modifications. Based on the analysis, the study area intersections are expected to continue to operate acceptably at LOS C or better conditions during the typical weekday morning and weekday evening peak hours under the Full Build traffic peak hour operating conditions.

B3. Traffic Operating Conditions – *With Recommended Modifications*

Other than the new access driveways and the modifications necessary to provide a new roadway extension of E. Sivyver Avenue as described and summarized in *Chapter VI – Recommendations and Conclusion*, no additional modifications (turn lane extensions, etc.) are recommended to accommodate the Full Build traffic volumes. As shown in [Exhibits 5-12](#), all movements are expected to continue to operate desirably at LOS C or better conditions during the typical weekday morning and weekday evening peak hours with recommended modifications under the Full Build traffic conditions.

PART C – QUEUEING ANALYSIS

To estimate storage length requirements for turn bays at the study area intersections with modifications, a queuing analysis has been conducted. Note that the 95th percentile probable queue lengths were used for the design of turn bay storage at stop sign controlled intersections. The following is a list of where the results of the queuing analysis can be found.

- Existing Traffic – [Exhibit 3-3](#)
- Background Traffic – [Exhibits 5-1](#)
- Year 2036 Full Build Traffic – [Exhibits 5-12](#)

PART D – TRAFFIC SIGNAL WARRANT ANALYSIS

Warrants should be viewed as guidelines to help decide whether traffic signal controls may be installed. Meeting warrants does not translate to a legal requirement for their installation.

Completed warrant analysis worksheets are included in the [Appendix](#) of this report.

Development-related traffic was included based on the WisDOT hourly distributions of traffic for the various land use types for each included development area. Warrants 1 and 2 and a left-turn conflict analysis were evaluated as a part of this study under urban thresholds.

Traffic signal warrants were investigated in accordance with the *MUTCD, 11th Edition*. Traffic signal warrants were investigated at the S. Lake Drive intersection with E. Sivyer Avenue/ Bluffs on Lake driveway under the Full Build traffic volume conditions.

Based on the signal warrant analysis, none of the applicable warrants were met at the identified intersection under Full Build traffic volume conditions. In order for traffic signal warrants to be met, background traffic volumes would need to increase by about 500 percent (5 times the current volumes) in addition to the proposed on-site development traffic needing to increase by about 200 percent (2 times the current volumes). Since the current and future traffic volumes at this intersection are far below the thresholds for meeting signal warrants, it is recommended that signals not be installed at this intersection.

Exhibit 5-1
Background Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											I/S LOS & Delay	
			Eastbound			Westbound			Northbound			Southbound			
			↗	→	↘	↖	←	↗	↖	↑	↗	↘	↓	↖	
Node 100: S Lake Drive & S Packard Avenue <i>Traffic Signal Control</i>	AM	Lanes->	1	-	1	-			1	2>		1	2>		A 7.7
		LOS	C	-	B	-			A	A		A	A		
		Delay	20.6	-	18.8	-			2.3	2.3		2.4	2.2		
		Queue	65'	-	25'	-			25'	25'		25'	25'		
	PM	LOS	C	-	B	-			A	A		A	A		A 4.3
		Delay	20.2	-	19.7	-			1.8	1.8		1.8	1.9		
Node 300: S Lake Drive & E Sivyer Avenue/Bluffs Driveway <i>Two-Way Stop Control</i>	AM	Lanes->	<1>			<1>			1	2>		1	2>		
		LOS	B			B			A	*		A	*		
		Delay	10.6			10.8			7.4	*		7.7	*		
		Queue	25'			25'			25'	*		25'	*		
	PM	LOS	B			B			A	*		A	*		
		Delay	11.1			10.7			7.5	*		7.6	*		
Node 400: S Lake Drive & E Howard Avenue <i>Traffic Signal Control</i>	AM	Lanes->	1	1	1	1	2>		1	2>		1	2>		A 5.5
		LOS	B	B	B	B	B		A	A		A	A		
		Delay	13.8	12.8	13.3	12.9	13.3		3.3	2.8		3.0	2.8		
		Queue	25'	25'	25'	25'	25'		30'	25'		25'	25'		
	PM	LOS	B	B	B	B	B		A	A		A	A		A 6.2
		Delay	13.0	12.8	14.7	12.8	12.7		3.4	2.9		3.1	3.0		
Node 500: S Packard Avenue & E Sivyer Avenue <i>Two-Way Stop Control</i>	AM	Lanes->	<1>			<1>			<1>			<1>			
		LOS	A			B			A			A			
		Delay	9.1			10.0			7.4			7.5			
		Queue	25'			25'			25'			25'			
	PM	LOS	A			A			A			A			
		Delay	9.0			9.9			7.4			7.4			
Node 800: S Packard Avenue & E Howard Avenue <i>Traffic Signal Control</i>	AM	Lanes->	1	2	1	1	2>		<1>			<1		1	A 6.0
		LOS	A	A	A	A	A		A			A		A	
		Delay	5.2	4.4	4.4	4.5	4.6		8.8			8.0		8.3	
		Queue	25'	25'	25'	25'	25'		40'			25'		25'	
	PM	LOS	A	A	A	A	A		A			A		A	A 5.6
		Delay	4.8	4.5	4.5	4.8	4.4		8.5			8.2		8.5	
Node 900: E Howard Avenue & S Troy Avenue <i>One-Way Stop Control</i>	AM	Lanes->	-	2>		<2		-	<1>			-			
		LOS	-	*		A		-	A			-			
		Delay	-	*		7.5		-	9.2			-			
		Queue	-	*		25'		-	25'			-			
	PM	LOS	-	*		A		-	A			-			
		Delay	-	*		7.7		-	9.6			-			

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.

Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

Exhibit 5-3
Full Build Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach												I/S LOS & Delay
			Eastbound			Westbound			Northbound			Southbound			
			↗	→	↘	↖	←	↗	↖	↑	↘	↓	↗	↖	
Node 100: S Lake Drive & S Packard Avenue Traffic Signal Control	AM	Lanes->	<1		1>	<1>			1	2>		1	2>		
		LOS	C		B	B			A	A		A	A		A
		Delay	20.7		18.8	19.2			2.3	2.4		2.4	2.3		7.7
	PM	Queue	75'		25'	25'			25'	25'		25'	25'		
		LOS	C		B	B			A	A		A	A		A
		Delay	20.2		19.4	19.7			2.1	2.0		2.0	2.1		4.8
Queue	40'		25'	25'			25'	25'		25'	25'				
Node 200: S Lake Drive & North Driveway One-Way Yield Control	AM	Lanes->	-		-	-			1	2>		1	2>		
		LOS	-		-	-			A	*		*	*		
		Delay	-		-	-			7.4	*		*	*		
	PM	Queue	-		-	-			25'	*		*	*		
		LOS	-		-	-			A	*		*	*		
		Delay	-		-	-			7.6	*		*	*		
Queue	-		-	-			25'	*		*	*				
Node 300: S Lake Drive & E Sivyer Avenue/Bluffs Driveway Two-Way Stop Control	AM	Lanes->	<1>			<1>			1	2>		1	2>		
		LOS	A			B			A	*		A	*		
		Delay	9.9			10.9			7.4	*		7.7	*		
	PM	Queue	25'			25'			25'	*		25'	*		
		LOS	B			B			A	*		A	*		
		Delay	10.5			11.1			7.6	*		7.6	*		
Queue	25'			25'			25'	*		25'	*				
Node 400: S Lake Drive & E Howard Avenue Traffic Signal Control	AM	Lanes->	1	1	1	1	2>		1	2>		1	2>		
		LOS	B	B	B	B	B		A	A		A	A		A
		Delay	13.7	12.8	13.4	12.8	13.3		3.4	2.9		3.0	2.8		5.5
	PM	Queue	25'	25'	25'	25'	25'		35'	25'		25'	25'		
		LOS	B	B	B	B	B		A	A		A	A		A
		Delay	12.9	12.7	15.1	12.8	12.6		3.7	3.0		3.2	3.1		6.2
Queue	25'	25'	50'	25'	25'		35'	25'		25'	25'				
Node 500: S Packard Avenue & E Sivyer Avenue Two-Way Stop Control	AM	Lanes->	<1>			<1>			<1>			<1>			
		LOS	A			B			A			A			
		Delay	9.2			10.2			7.4			7.5			
	PM	Queue	25'			25'			25'			25'			
		LOS	A			B			A			A			
		Delay	9.1			10.1			7.5			7.5			
Queue	25'			25'			25'			25'					
Node 600: S Packard Avenue & Retail Driveway One-Way Yield Control	AM	Lanes->	-			<1>			-	1>		<1>		-	
		LOS	-			B			-	*		A		-	
		Delay	-			10.0			-	*		7.6		-	
	PM	Queue	-			25'			-	*		25'		-	
		LOS	-			B			-	*		A		-	
		Delay	-			10.6			-	*		7.6		-	
Queue	-			25'			-	*		25'		-			
Node 700: S Packard Avenue & Grocery Driveway One-Way Yield Control	AM	Lanes->	<1>			<1>			<1>			<1>			
		LOS	B			B			A			A			
		Delay	10.3			10.9			7.5			7.6			
	PM	Queue	25'			25'			25'			25'			
		LOS	B			B			A			A			
		Delay	10.7			12.0			7.6			7.7			
Queue	25'			25'			25'			25'					
Node 800: S Packard Avenue & E Howard Avenue Traffic Signal Control	AM	Lanes->	1	2	1	1	2>		<1>			<1>	1		
		LOS	A	A	A	A	A		A			A	A		A
		Delay	5.5	4.4	4.3	4.5	4.6		9.0			8.3	8.6		6.2
	PM	Queue	35'	25'	25'	25'	25'		45'			25'	25'		
		LOS	A	A	A	A	A		A			A	A		A
		Delay	5.4	4.5	4.5	4.8	4.5		8.7			8.7	8.9		6.0
Queue	35'	25'	45'	25'	25'		35'			30'	30'				
Node 900: E Howard Avenue & S Troy Avenue One-Way Stop Control	AM	Lanes->	-	2>		<2	-		<1>			-			
		LOS	-	*		A	-		A			-			-
		Delay	-	*		7.5	-		9.3			-			-
	PM	Queue	-	*		25'	-		25'			-			-
		LOS	-	*		A	-		A			-			-
		Delay	-	*		7.7	-		9.8			-			-
Queue	-	*		25'	-		25'			-			-		

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
 Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

Exhibit 5-12
Full Build Traffic Peak Hour Operating Conditions
With Modified Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach												I/S LOS & Delay							
			Eastbound			Westbound			Northbound			Southbound										
			↗	→	↘	↖	←	↙	↖	↑	↗	↘	↓	↙								
Node 100: S Lake Drive & S Packard Avenue Traffic Signal Control	AM	Lanes->	<1			1>			<1>			1			2>			A 7.7				
		LOS	C			B			B			A			A							
		Delay	20.7			18.8			19.2			2.3			2.4				2.4			2.3
	PM	Queue	75'			25'			25'			25'			25'			25'			A 4.8	
		LOS	C			B			B			A			A			A				
		Delay	20.2			19.4			19.7			2.1			2.0			2.0				2.1
Node 200: S Lake Drive & North Driveway One-Way Yield Control	AM	Lanes->	-			-			1			2>			1			2>				
		LOS	-			-			A			*			*			*				
		Delay	-			-			7.4			*			*			*				
	PM	Queue	-			-			25'			*			*			*				
		LOS	-			-			A			*			*			*				
		Delay	-			-			7.6			*			*			*				
Node 300: S Lake Drive & E Sivyer Avenue/Bluffs Driveway Two-Way Stop Control	AM	Lanes->	<1>			<1>			1			2>			1			2>				
		LOS	A			B			A			*			A			*				
		Delay	9.9			10.9			7.4			*			7.7			*				
	PM	Queue	25'			25'			25'			*			25'			*				
		LOS	B			B			A			*			A			*				
		Delay	10.5			11.1			7.6			*			7.6			*				
Node 400: S Lake Drive & E Howard Avenue Traffic Signal Control	AM	Lanes->	1	1	1	1	2>	1			2>			1			2>			A 5.5		
		LOS	B	B	B	B	B	A			A			A			A					
		Delay	13.7	12.8	13.4	12.8	13.3	3.4			2.9			3.0			2.8					
	PM	Queue	25'	25'	25'	25'	25'	35'			25'			25'			25'			A 6.2		
		LOS	B	B	B	B	B	A			A			A			A					
		Delay	12.9	12.7	15.1	12.8	12.6	3.7			3.0			3.2			3.1					
Node 500: S Packard Avenue & E Sivyer Avenue Two-Way Stop Control	AM	Lanes->	<1>			<1>			<1>			<1>			<1>							
		LOS	A			B			A			A			A							
		Delay	9.2			10.2			7.4			7.5			7.5							
	PM	Queue	25'			25'			25'			25'			25'			25'				
		LOS	A			B			A			A			A							
		Delay	9.1			10.1			7.5			7.5			7.5							
Node 600: S Packard Avenue & Retail Driveway One-Way Yield Control	AM	Lanes->	-			<1>			-			1>			<1>			-				
		LOS	-			B			-			*			A			-				
		Delay	-			10.0			-			*			7.6			-				
	PM	Queue	-			25'			-			*			25'			-				
		LOS	-			B			-			*			A			-				
		Delay	-			10.6			-			*			7.6			-				
Node 700: S Packard Avenue & Grocery Driveway One-Way Yield Control	AM	Lanes->	<1>			<1>			<1>			<1>			<1>							
		LOS	B			B			A			A			A							
		Delay	10.3			10.9			7.5			7.6			7.6							
	PM	Queue	25'			25'			25'			25'			25'			25'				
		LOS	B			B			A			A			A							
		Delay	10.7			12.0			7.6			7.7			7.7							
Node 800: S Packard Avenue & E Howard Avenue Traffic Signal Control	AM	Lanes->	1	2	1	1	2>	<1>			<1>			1			A 6.2					
		LOS	A	A	A	A	A	A			A			A								
		Delay	5.5	4.4	4.3	4.5	4.6	9.0			8.3			8.6								
	PM	Queue	35'	25'	25'	25'	25'	45'			25'			25'			A 6.0					
		LOS	A	A	A	A	A	A			A			A								
		Delay	5.4	4.5	4.5	4.8	4.5	8.7			8.7			8.9								
Node 900: E Howard Avenue & S Troy Avenue One-Way Stop Control	AM	Lanes->	-			2>			<2>			<1>			-			-				
		LOS	-			A			-			A			-							
		Delay	-			7.5			-			9.3			-							
	PM	Queue	-			25'			25'			25'			-			-				
		LOS	-			A			-			A			-							
		Delay	-			7.7			-			9.8			-							

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

CHAPTER VI – RECOMMENDATIONS AND CONCLUSION

PART A – RECOMMENDATIONS

The study area intersections were analyzed based on the procedures set forth in the *Highway Capacity Manual* (HCM) 7th Edition. Intersection operation is defined by “level of service.” Level of Service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS ‘A,’ to very poor, represented by LOS ‘F.’ For the purpose of this study, LOS D or better was used to define acceptable peak hour operating conditions.

Modifications to address traffic impacts are included for the Existing, Background, and Build traffic conditions and have been shown for the following five scenarios:

- “Existing Traffic” – These modifications are expected to be necessary to accommodate the Existing traffic volumes under current conditions, without the proposed residential/mixed-use development and church.
- “Background Traffic” – These modifications are expected to be necessary to accommodate the Existing traffic volumes under current conditions plus full build out of the identified off-site development, without the proposed on-site development.
- “Full Build Traffic” – These modifications are expected to be necessary to accommodate the Full Build traffic volumes, which includes the full build-out of proposed residential/mixed-use development and as well as full buildout of the identified off-site development.

The analysis was conducted using existing and planned intersection geometries and traffic control; specifically, the two planned additional driveways along South Lake Drive to the approved off-site development. The following modifications, as shown in [Exhibit 1-3](#), are recommended to accommodate the Background and Full Build traffic volume scenarios, respectively. *Modifications are for jurisdictional consideration and are not legally binding. the City of St Francis reserves the right to determine alternative solutions.*

General

- *Full Build Traffic:*
 - Extend E. Sivyer Avenue from S. Packard Avenue to S. Lake Drive

Node 100: S. Lake Drive intersection with S. Packard Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:*
 - Provide a new access driveway on the east approach.
 - Update traffic signal hardware to accommodate new east approach.
 - Update traffic signal timings.
- *Full Build Traffic:* No additional modifications.

Node 200: S. Lake Drive intersection with North Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.

- *Full Build Traffic:*
 - Provide a new enter only access driveway on the west approach.
 - Provide signage within the site to restrict exiting vehicles.

Node 300: S. Lake Drive intersection with E. Sivyer Avenue/Bluffs on Lake Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:*
 - Provide a new access driveway on the east approach.
- *Full Build Traffic:*
 - Reconstruct the median and east approach to match into the new Sivyer Avenue (extended), located about 110 feet north of the current curb cuts located along S. Lake Drive.
 - Provide stop sign control on the east and west approaches.

Node 400: S. Lake Drive intersection with E. Howard Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:* No modifications.

Node 500: S. Packard Avenue intersection with E. Sivyer Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:*
 - Provide a new two-lane east/west roadway on the east approach.
 - Provide stop sign control on the east approach.

Node 600: S. Packard Avenue intersection with Retail Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:*
 - Provide a new full-access driveway on the east approach.
 - Provide stop sign control on the east approach.

Node 700: S. Packard Avenue intersection with Grocery Driveway

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:*
 - Provide a new full-access driveway on the east and west approaches.
 - Provide stop sign control on the east and west approaches.

Node 800: S. Packard Avenue intersection with E. Howard Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:* No modifications

Node 900: E. Howard Avenue intersection with S. Troy Avenue

- *Existing Traffic:* No modifications.
- *Background Traffic:* No modifications.
- *Full Build Traffic:* No modifications.

Based on the full traffic signal warrant analysis completed as part of this study, traffic signals are not expected to be met under Full Build traffic volume conditions. In order for traffic signal warrants to be met, background traffic volumes would need to increase by about 500 percent (5 times the current volumes) in addition to the proposed on-site development traffic needing to increase by about 200 percent (2 times the current volumes). Since the current and future traffic volumes at this intersection are far below the thresholds for meeting signal warrants, it is recommended that signals not be installed at this intersection.

PART B – CONCLUSION

All movements at the study area intersections are expected to operate safely and efficiently with the development assumptions outlined in this TIA and with the identified recommended modifications if properly designed and implemented through the design year of the proposed developments.