School Sisters of Notre Dame
Development Traffic Impact Study
Village of Elm Grove, Wisconsin

Prepared For: Mandel Group
Prepared By: Kenneth H. Voigt, P.E.
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Executive Summary

The School Sisters of Notre Dame (SSND) will be moving to a new location at Mount Mary College and have agreed to sell their Elm Grove property on Watertown Plank Road to Mandel Group for residential development. Mandel Group, as part of their development process, has retained Ayres Associates to conduct a technical traffic impact analysis to assure that the new residential development does not adversely impact existing transportation safety and operation at the Watertown Plank Road intersections and neighborhood streets in the vicinity of the School Sisters of Notre Dame property.

The study segment of Watertown Plank Road between North 124th Street and Elm Grove Road is an arterial street with a 25 mph speed limit carrying 9,100 vehicles on a typical weekday. Since 2006 daily traffic on Watertown Plank Road has exhibited a stable or slightly decreasing volume. Between the Stephen Place/Blue Ridge Boulevard and Church Street intersections, Watertown Plank Road is identified as a School Zone area with a 15 mph speed limit when St. Mary's Elementary school is in session. Peak hour traffic periods occur from 7:15 to 8:15 A.M. and 4:30 to 5:30 P.M. From a traffic safety perspective the highest crash study intersections are located at Elm Grove Road with an average of 3.8 crashes per year and at Legion Drive with 2.6 crashes per year. Only one crash involving a pedestrian was reported over the 2015 to 2019 time period.

The Mandel residential development is planned to include 266 apartments, 17 side-by-side duplexes and a 100 unit senior housing component. According to data published by the Institute of Transportation Engineers, the Mandel development is expected to generate 145 morning peak hour trips and 180 evening peak hour trips which will replace the existing 25 morning and 35 evening peak hour trips generated by the existing SSND development.

A traffic analysis of the following Watertown Plank Road intersections was conducted to identify the impact of Mandel residential trips on existing and future year 2023 and 2028 operation:

- North 124th Street
- Stephen Place/Blue Ridge Boulevard
- Crescent drive
- Juneau Boulevard
- Western SSND Access Road
- Legion Drive
- Elm Grove Road

The Stephen Place intersection with the eastern SSND access road is included in this study.

Year 2019: *In 2019, all study intersections were operating at Level of Service (LOS) 'D' or better except for the northeastbound Watertown Plank Road left turn at Legion Drive which was operating at LOS 'E' during the morning peak hour and at LOS 'F' during the evening peak hour. LOS 'E' and 'F' are considered unacceptable operation characterized with long vehicle delays and queuing. This operational problem can be resolved by reassigning 5 seconds of green time from the southwestbound intersection movements on Watertown Plank road to the northeastbound left turn movements resulting in LOS 'D' operation or better for all traffic movements at the Legion Drive intersection.*

Year 2023: *By the year 2023, when the Mandel residential development is planned to be completed, intersection operation without Mandel trips is the same as experienced in 2019 except for the southbound approach of Juneau Boulevard which is expected to operate at LOS 'D' during the evening peak hour due to a southbound delay increase from 24.5 in 2019 to 25.3 seconds in 2023.*

With the addition of trips generated by the Mandel residential development in the year 2023, only two study intersection operating levels are expected to experience a change. This change involves the southwestbound Watertown Plank Road left turn at Elm Grove Road changing from LOS 'A' to LOS 'B' during the morning peak hour with the northbound approach of Stephen Place expected to experience a LOS change from LOS 'C' to LOS 'D' with an increased delay during the evening peak hour from 22.6 seconds to 27.7 seconds with.

Year 2028: *Year 2028 background traffic, without any new residential development, is expected to grow at a rate of one half percent per year. Under this growth assumption all study intersections are expected to continue to operate at the same LOS as they will in 2023.*

The addition of Mandel residential trips in 2028 compared to 2028 background traffic growth is expected to change operation of the southbound Blue Ridge Boulevard intersection approach to Watertown Plank Road from LOS 'B' to LOS 'C' with the southwestbound Watertown Plank Road left turn at Elm Grove Road expected to change from LOS 'A' to LOS 'B' during the morning peak hour. During the evening peak hour the northbound approach of Stephen Place is expected to change from LOS 'C' to LOS 'D' due to an increase in average vehicle delay from 23.7 seconds to 28.7 seconds.

The potential trips generated by additional residential development in the Village of Elm Grove Downtown Corridor Master Plan plus Mandel residential trips is expected to only change operation of the eastbound left turn at North 124th Street from LOS 'A' to LOS 'B' operation compared to year 2028 operation with Mandel residential development trips only.

An additional analysis was also conducted with a third SSND property access road located at the Crescent Drive intersection. Based upon traffic operation analysis findings and traffic safety considerations an additional access road at Crescent Drive is not recommended.

Study recommendations to provide safe and efficient operation of the study intersections include:

1. Modify the signal timing plan at Legion Drive by transferring 5 seconds of green time from the southwestbound through movement on Watertown Plank Road to the northeastbound left turn. This action will improve operation of the northeastbound left turn from its current morning peak hour operation of LOS 'E' and evening peak hour operation of LOS 'F' to LOS 'D' during both peak hours without negatively changing the LOS of Legion Drive.

2. Upgrade the existing 'in-street' pavement yellow flashing pedestrian warning lights to Rectangular Rapid Flashing Yellow Beacons (RRFB's) at the Church Street and Elm Grove Street pedestrian crosswalks to improve driver awareness of pedestrians crossing Watertown Plank Road. This is consistent with the RRFB beacons located at the Crescent Drive crosswalk.

3. Upgrade all crosswalk markings on Watertown Plank Road to 'Continental' design. This design is the most visible crosswalk marking for motorists and sight disadvantaged pedestrians. This should enhance pedestrian safety along Watertown Plank Road.

School Sisters of Notre Dame
Development Traffic Impact Study
Elm Grove, Wisconsin

Introduction

The School Sisters of Notre Dame (SSND) will be moving to a new location at Mount Mary College and have agreed to sell their Elm Grove property on Watertown Plank Road to Mandel Group for residential development. Mandel Group, as part of their development process, has retained Ayres Associates to conduct a technical traffic impact analysis to assure that the new residential development does not adversely impact existing transportation safety and operation at the Watertown Plank Road intersections and neighborhood streets in the vicinity of the School Sisters of Notre Dame property. This study analysis identifies:

- Existing Street , Safety and Traffic
- Mandel Group Residential Development Plan
- Traffic Operation
    - Year 2019 and 2023 Traffic Conditions
    - Year 2028 Traffic Conditions
- Traffic Operation for a Three Access Road Alternative
- Conclusions
- Recommendations

A Technical Supplement to this report contains supporting traffic figures related to development trip assignments and detailed intersection capacity analysis software worksheets.

Existing Street, Safety and Traffic Conditions

This study analyzes traffic and safety conditions at the following Watertown Plank intersections:

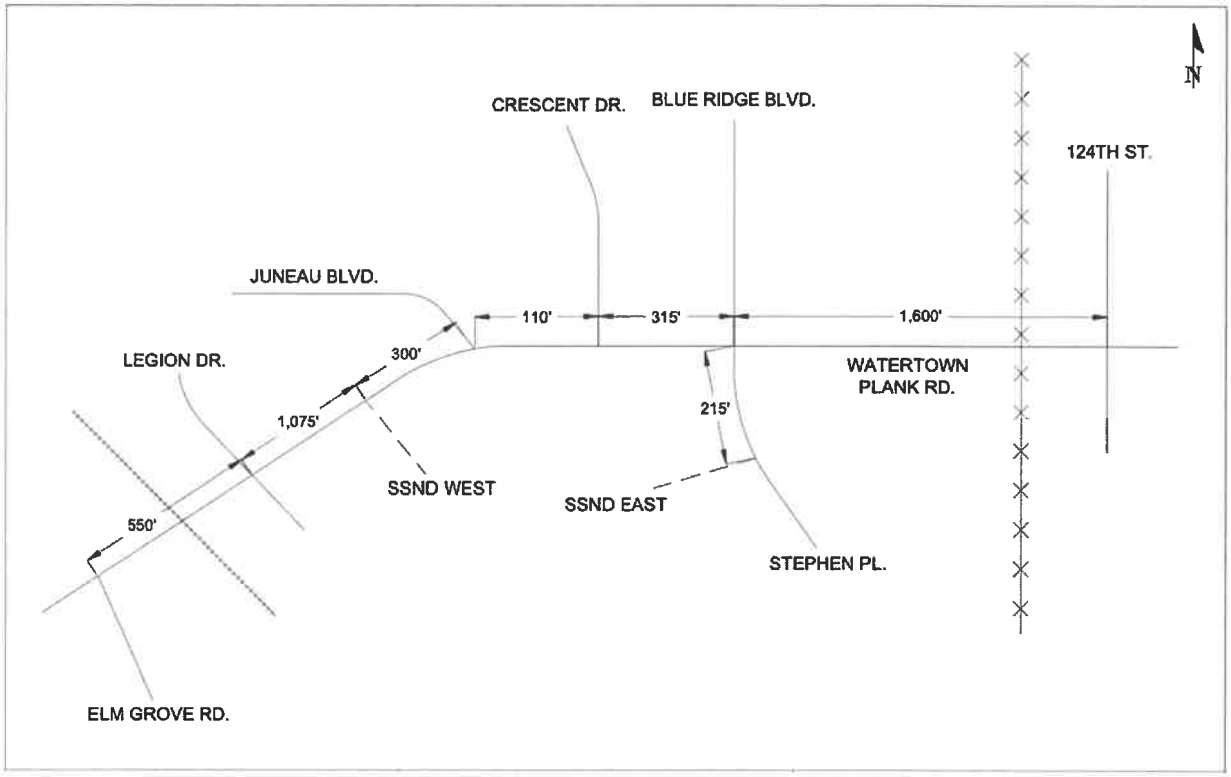
- North 124th Street
- Stephen Place/Blue Ridge Boulevard
- Crescent Drive
- Juneau Boulevard
- School Sisters of Notre Dame entrance road
- Legion Drive
- Elm Grove Road

The traffic analysis also includes the Stephen Place intersection with the School Sisters of Notre Dame eastern access road.

Study Street Segment: Watertown Plank Road is an arterial street with a 25 mph posted speed limit. Between Stephen Place and the western School Sisters of Notre Dame entrance road, Watertown Plank Road is generally 35 feet wide with one lane of traffic in each direction, no

on-street parking and a continuous sidewalk that terminates on the north side of the street at Crescent Drive and along the south side of the street at the Stephen Place intersection. At the western SSND access road, the north curb on Watertown Plank Road tapers over a distance of of 150 feet to create a roadway width of 30 feet after which it widens to provide on-street parking. Between Blue Ridge Boulevard and Church Street, Watertown Plank Road is designated as a 15 mph school zone. Figure 1 provides a diagram of the study segment of Watertown Plank Road between North 124th Street and Elm Grove Road.

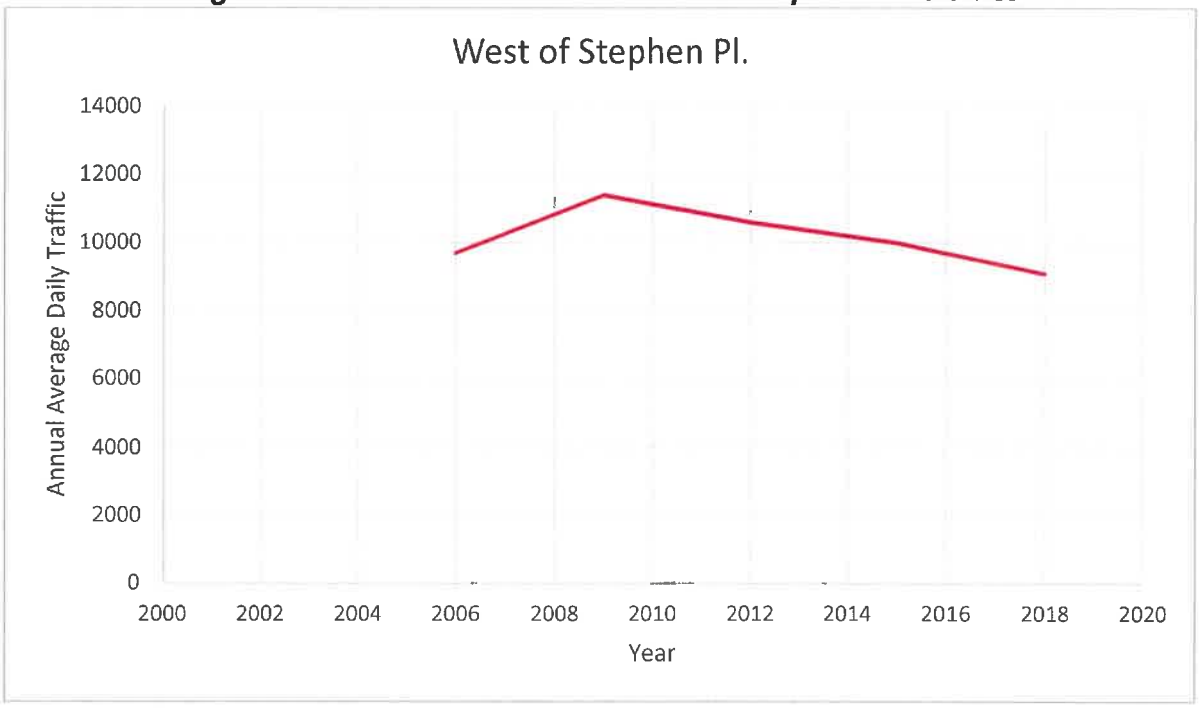
Figure 1: Study Segment of Watertown Plank Road



Both Stephen Place/Blue Ridge Boulevard and Crescent Drive are 24-foot wide, 2-way neighborhood streets without curbs or sidewalks and are stop sign controlled at their intersections with Watertown Plank Road. Juneau Boulevard intersects with Watertown Plank Road at a skewed angle from the west and is stop sign controlled. It is noted that the alignment of Watertown Plank Road curves from an east-west street to a northeast/southwest direction street at Juneau Boulevard. Watertown Plank Road has marked pedestrian crosswalks at its intersections with Stephen Place/Blue Ridge Boulevard, Crescent Drive, Juneau Boulevard, Church Street, Elm Grove Street, Legion Drive and Elm Grove Road. The Juneau Boulevard intersection is a designated school crossing for St. Mary's Elementary School. The crosswalk at Crescent Drive includes a pedestrian activated rectangular rapid flashing yellow beacon. Yellow pedestrian activated 'in pavement' yellow flashing lights are located at the Church Street and Elm Grove Street intersections. The Juneau Boulevard crosswalk includes a 'Yield to Pedestrians' sign located on the roadway centerline.

Traffic Patterns: According to data collected by the Wisconsin Department of Transportation, weekday traffic volumes on Watertown Plank Road are at 9,100 vpd. Figure 2 shows the historic traffic volume pattern on Watertown Plank Road between Stephen Place/Blue Ridge Boulevard and Crescent Drive.

Figure 2: Watertown Plank Road Historic Daily Traffic Volumes

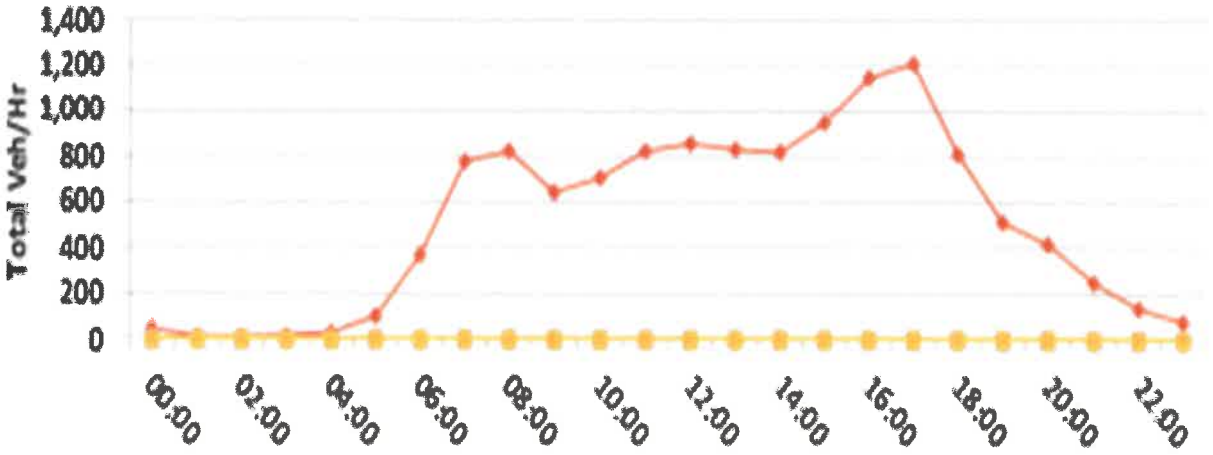


Source: Wisconsin Department of Transportation

As shown on Figure 2, traffic volumes on Watertown Plank Road have remained relatively constant or slightly decreasing since 2006 with only a slight increase to 11,200 vpd in 2009 after which it steadily deceased to about 9,100 vpd. It is noted that this intersection impact study includes an analysis of the year 2023 traffic operation, when the Mandel Group development is planned to be open and the year 2028, 5-years after development opening. To be conservative, the Year 2023 and 2028 traffic analysis periods assume that existing through traffic volumes, contrary to historic decreasing patterns, will grow at a rate of a half percent per year. This is in accordance with accepted traffic study practices.

Figure 3 provides a graph of the hourly traffic distribution on a typical weekday for the segment of Watertown Plank Road between Stephen Place/Blue Ridge Boulevard and Crescent Drive.

Figure 3: Watertown Plank Road Hourly Traffic Distribution



Source: Wisconsin Department of Transportation

As shown on Figure 3, weekday hourly traffic patterns indicate that morning peak traffic occurs between 7:15 A.M. to 8:15 A.M. with a 2-way volume of approximately 800 vph slowly increasing during the day until the 4:30 P.M. to 5:30 P.M. evening peak traffic period when it approaches a high of approximately 1,200 vph.

Based on the traffic data collected by the Wisconsin Department of Transportation, Ayres Associates staff collected morning and evening peak hour turning movement counts at the study intersections. Figures 4 and 5 show the study intersection counts. These counts were collected in in May, 2019 while St. Mary's School was still in session with most classes starting at 7:45 A.M. and dismissing at 2:45 P.M. The counts were collected in 15-minute intervals during the 6:00 A.M. to 9:00 A.M. and the 3:00 P.M. to 6:00 P.M. time periods which confirmed that the highest hourly volumes occur between the morning 7:15 A.M. to 8:15 A.M. at 745 vpd and the evening 4:30 P.M. to 5:30 P.M. hour at 1,060 vph.

Figure 4: Watertown Plank Road Morning Peak Hour Intersection Traffic Movements

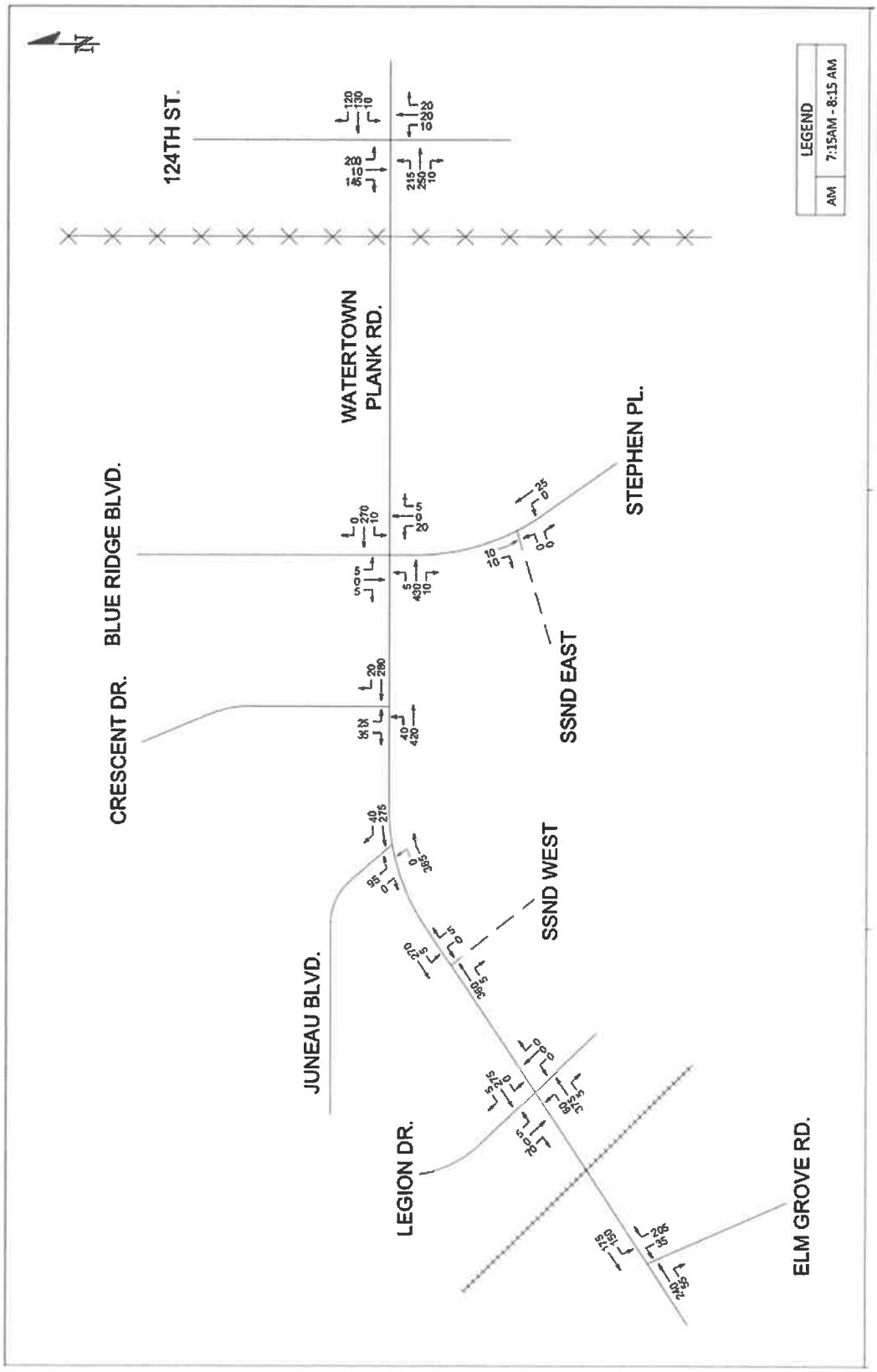
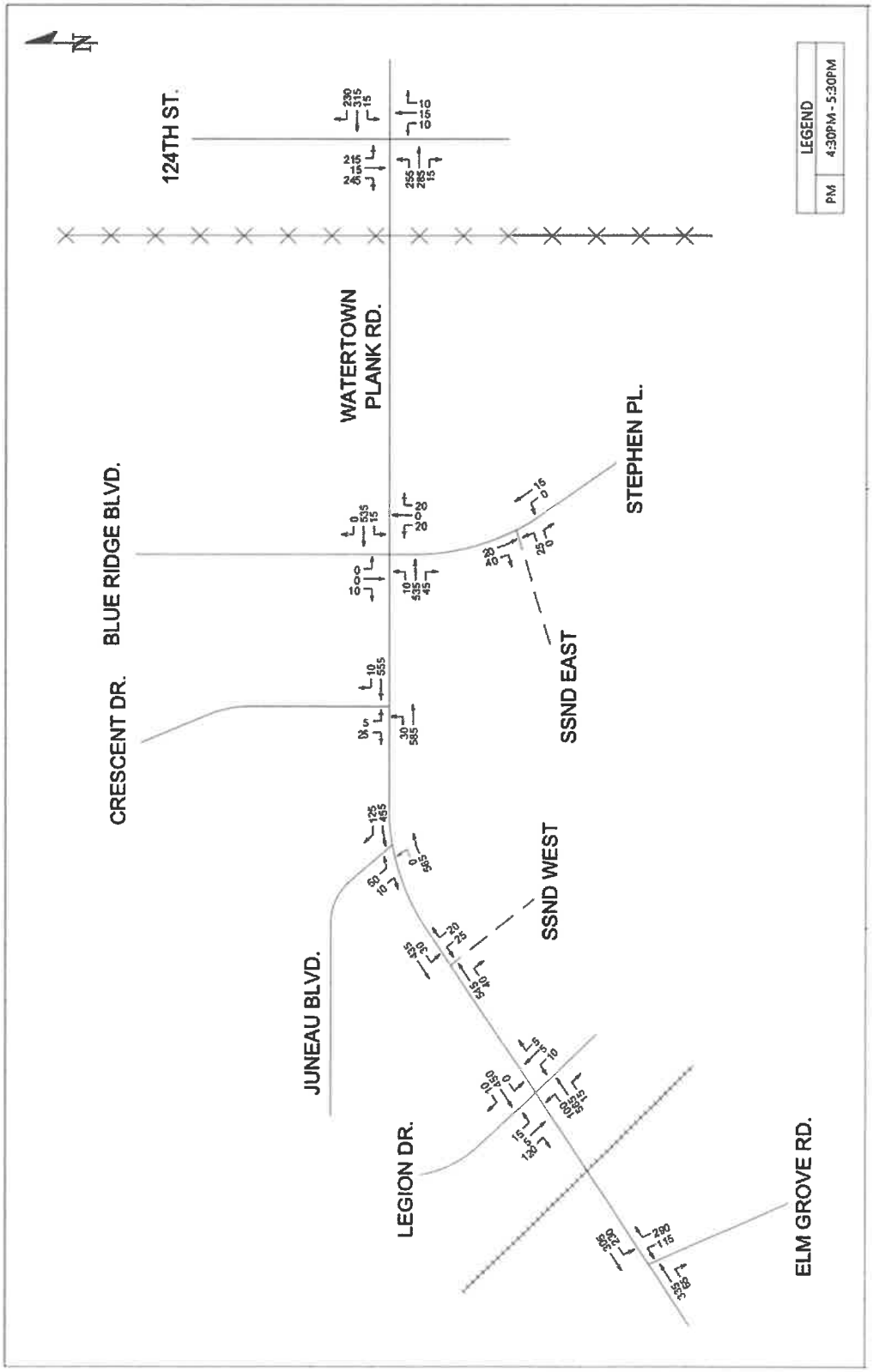


Figure 5: Watertown Plank Road Evening Peak Hour Intersection Traffic Movements



Pedestrians: In addition to collecting the intersection traffic count information shown on Figures 4 and 5 above, Ayres Associates also collected pedestrian count data at the study intersections. Table 1 summarizes the pedestrian crossing activity on Watertown Plank Road at the Stephen Place/Blue Ridge Boulevard and Crescent Drive crosswalks during the 6:00 A.M. to 9:00 A.M. and 3:00 P.M. to 6:00 P.M. time periods.

Table 1: Pedestrians Crossing Watertown Plank Road at Stephen Place/Blue Ridge Boulevard and Crescent Drive Intersections

	Crescent Drive				Stephen Pl/Blue Ridge Blvd			
Time Period	North	East	South	West	North	East	South	West
6 – 7 AM	0	2	n/a	4	0	0	1	0
7 – 8 AM	0	0	n/a	0	0	0	1	0
8 – 9 AM	0	0	n/a	1	0	2	2	6
3 – 4 PM	0	0	n/a	0	0	0	0	0
4 – 5 PM	0	0	n/a	0	0	1	1	0
5 – 6 PM	0	0	n/a	0	0	0	1	0

As shown on Table 1, the highest volume of pedestrians crossing Watertown Plank Road at Crescent Drive involved 6 pedestrians during the 6:00 A.M. to 7:00 A.M. hour with the highest number of pedestrians crossing at the Stephen Place/Blue Ridge Boulevard intersection involving 10 pedestrians during the 8:00 A.M. to 9:00 A.M. hour. During the other survey time periods, 1 pedestrian per hour was observed crossing Watertown Plank Road.

Traffic Safety: Traffic crashes reported during the 5-year time period from 2015-2019 are summarized in Table 2. As indicated in Table 2, the highest number of intersection crashes occurred at Elm Grove Road which averaged 3.8 crashes per year followed by the Legion Drive intersection with an average of 2.6 crashes per year.

Table 2: Watertown Plank Road Intersection Crash History

Location	Crashes /Year					Crash Severity			Total	Annual Average
	2015	2016	2017	2018	2019	Property Damage Only	Injury	Fatal		
Elm Grove Road	1	2	7	4	5	15	4	0	**19**	**3.8**
Legion Drive	1	3	1	2	6	12	1	0	**13**	**2.6**
Juneau Avenue	0	2	0	0	0	2	0	0	**2**	**0.4**
Crescent Drive	1	3	0	0	2	4	2	0	**6**	**1.2**
Blue Ridge/Stephen Place	0	0	0	0	0	0	0	0	**0**	**0.0**
N. 124th Street	4	2	1	1	1	8	1	0	**9**	**1.8**
Total	**7**	**12**	**9**	**7**	**14**	**41**	**8**	**0**	**49**	**9.8**

Source: University of Wisconsin Transportation Lab

Table 2 data indicates only 8 of the total 49 crashes reported (16%) involved injuries with 50% of those occurring at the Elm Grove Road intersection.

Table 3, identifies the type of collisions reported at the study intersections. The predominate collision pattern involved rear-end crashes. Of the 13 rear-end crashes, the Legion Drive and North 124th Street intersections had the highest number with 5 rear-end crashes each. Of the 6 left-turn crashes, 3 of the crashes occurred at the Elm Grove Road intersection, 2 at the Legion Drive intersection, and 1 at the North 124th Street intersection. Of the 6 sideswipes that occurred between vehicles travelling in the same direction, 4 occurred at the Elm Grove Road intersection. Additionally, there were 5 angle crashes that occurred within the study limits. As also shown on Table 3, there was only one reported crash involving a pedestrian over the 5-year data period.

Table 3: Watertown Plank Road Collision Patterns

Location	Collision Types								Total
	Rear-End	Left-Turn	Sideswipe - Same	Angle	Sideswipe-Opposite	Rear-to-Rear	Pedestrian	Property Damage Only	
Elm Grove	2	3	4	2	0	0	1	7	**19**
Legion	5	2	2	1	1	0	0	2	**13**
Juneau	0	0	0	0	0	0	0	2	**2**
Crescent	1	0	0	0	0	0	0	5	**6**
Blue Ridge/ Stephen Place	0	0	0	0	0	0	0	0	**0**
124th	5	1	0	2	0	1	0	0	**9**
Total	**13**	**6**	**6**	**5**	**1**	**1**	**1**	**16**	**49**

Source: University of Wisconsin Transportation Operations Lab

Mandel Group Residential Development Plan

The Mandel Group Residential Development Plan (Mandel) includes a mix of senior housing, apartments and side-by-side duplexes which are planned to be completed in the year 2023. The existing historic building (Notre Dame Hall and Maria Hall) fronting on Watertown Plank Road, shown on the cover of this report, will remain as a landmark building in the development plan as will the cemetery located between the historic building and the western property boundary. The Mandel Residential Plan is composed of 266 apartments, 100 senior housing units, and 17 side-by-side duplexes. Figure 6 shows the development site plan locations for the residential buildings, the development access roadways, and the internal roadway circulation system.

Figure 6: Planned Mandel Residential Development Site Plan

As shown on the above site plan, apartment uses are clustered in the center core of the property with an internal circulation roadway. Primary apartment access to Watertown Plank Road is focused on the existing SSND roadway connection located between Juneau Avenue and Church Street. The duplexes are located along the eastern edge of the property serving as a transition between the existing single family neighborhood homes on Stephen Place and the planned apartments located in the core development area of the SSND property. The duplexes and a portion of the apartments located between duplexes and the east side of the historic buildings are expected to use Stephen Place to access Watertown Plank Road. Finally, the planned senior housing component of the development is located adjacent to the south property boundary also serving as a transition between that existing residential neighborhood and the apartments located in the core area of the SSND property. Access to the senior housing is provided by the existing SSND access road to Watertown Plank Road between Juneau Boulevard and Church Street.

Trip Generation: For traffic analysis purposes the nationally recognized Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th edition* was used to identify the

number of peak traffic hour trips generated by the Mandel Development Plan. Table 4 summarizes the morning and evening peak period trips generated by the Mandel plan.

Table 4: Mandel Residential Development Peak Hour Trip Generation

Land Use Component	No. of Units	ITE Code	Morning Peak Hour Enter	Morning Peak Hour Exit	Morning Peak Hour Total	Evening Peak Hour Enter	Evening Peak Hour Exit	Evening Peak Hour Total
• Apartments								
o Mid-Rise	200	221	20	55	75	55	35	90
o Historic Bldg	66	221	5	20	25	20	10	30
• Side-by-Side Duplexes	17	220	5	15	20	15	10	25
• Senior Housing	100	251	10	15	25	20	15	35
Total	400		40	105	145	110	70	180

Source: *ITE Trip Generation Manual*, 10th edition

As indicated on Table 4, the 400 residential dwelling units are projected to generate a total of 145 morning and 180 evening peak hour trips. These trips will replace existing trips generated by the current SSND development. The current SSND development, based on traffic counts collected by Ayres Associates, generates 25 morning and 35 evening peak hour trips. The difference between the trips generated by the Mandel development and the current SSND development will reduce Watertown Plank Road traffic impacts from the Mandel development to 120 morning and 145 evening new peak hour trips. Based on peak hour traffic movement data collected at the study intersections, as well as, the Watertown Plank Road intersection with Longview Drive, which serves neighborhoods north and south of Watertown Plank Road between Stephen Place and North 124th Street, the directional distribution pattern of traffic generated by the Mandel development is expected to have 60% of its trip origins and destinations to/from the west with the remaining 40% of the trips originating from or destined to the east.

As previously shown on Figures 2 and 3, there were no vehicles on Stephen Place or Blue Ridge Boulevard that crossed Watertown Plank Road in a north/south direction during peak traffic periods. The only vehicles observed to cross Watertown Plank Road at Longview Drive involved 2 school buses during the peak hour time periods. It is, therefore, not expected that any trips from the Mandel development will use either Crescent Drive or Blue Ridge Boulevard north of Watertown Plank Road.

Peak Hour Traffic: Figures 7 and 8 show the morning and evening peak hour street assignment of trips generated by the Mandel development based on the number of trips entering and exiting the development shown on Table 4. This trip assignment is based on the directional distribution expected from the existing intersection traffic movement patterns previously described.

Figure 7: Trip Distribution of Morning Peak Hour Trips Generated by Mandel Residential Development Plan

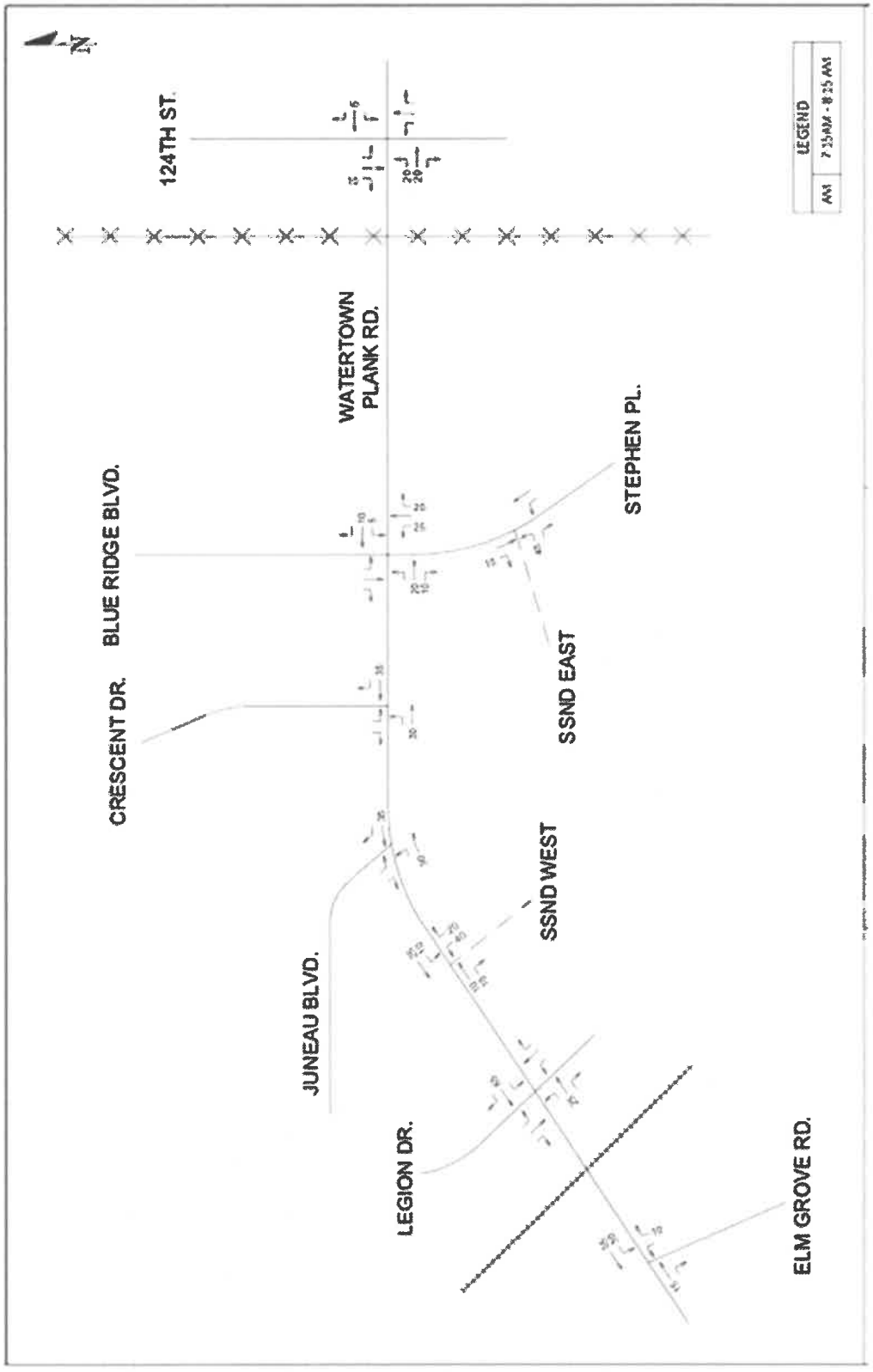
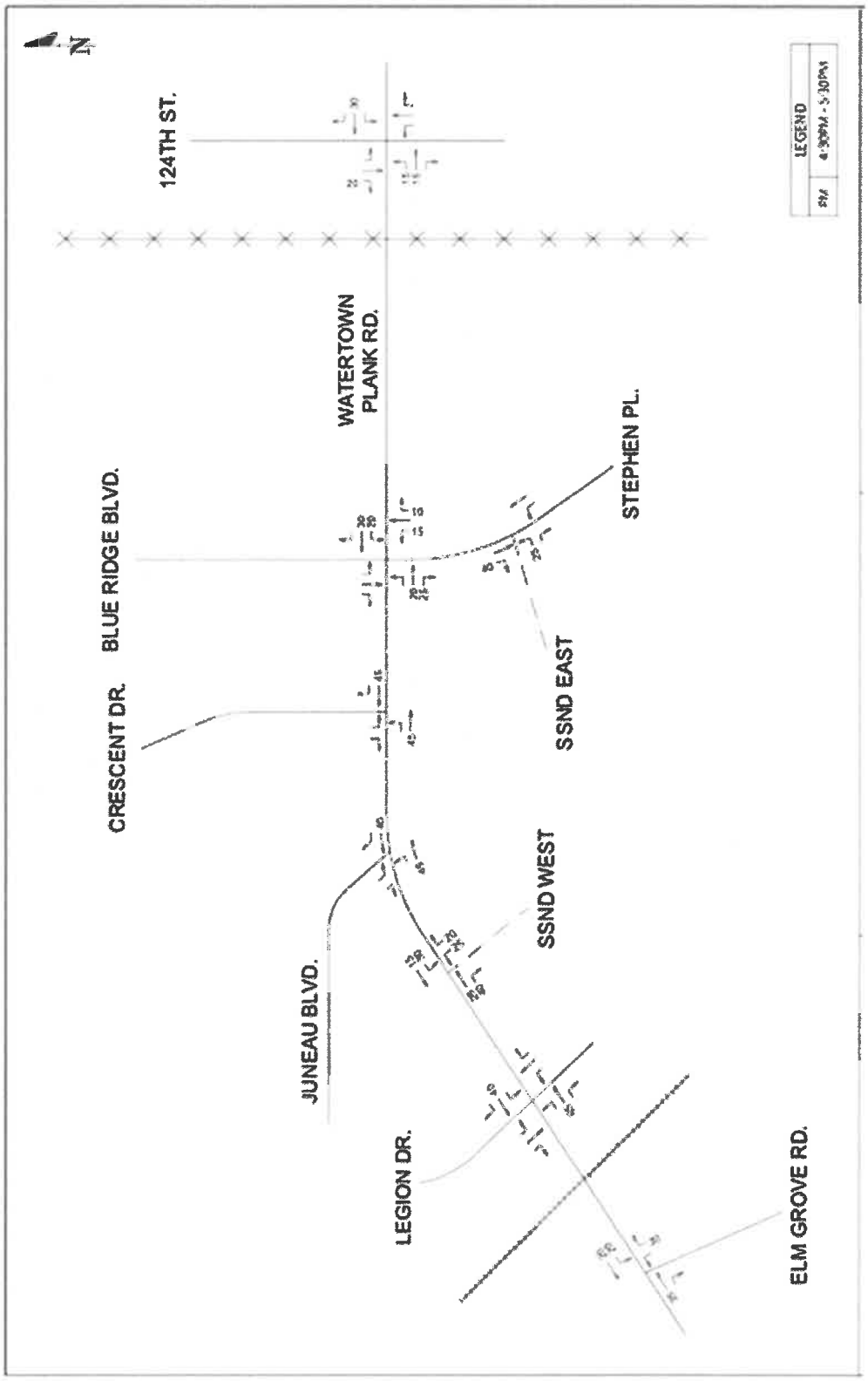


Figure 8: Trip Distribution of Evening Peak Hour Trips Generated by Mandel Residential Development Plan



The new Mandel development trips shown on Figures 7 and 8 will be combined with the existing intersection traffic movements along with the reduction in trips attributed to the current SSND development. The Mandel trip distribution assignments attributed to the existing SSND development are included in the Technical Supplement to this report.

Traffic Operation

The primary purpose of this study is to identify how operation of the study intersections will be impacted by trips generated from the Mandel development plan. In order to analyze intersection operating conditions it is first necessary to identify current intersection operation.

Intersection operation is nationally defined by Level of Service (LOS) categories. These LOS categories have been defined by the National Academy of Sciences Transportation Research Board and have been adopted by Federal, state and local municipalities to analyze intersection operation. Level of Service (LOS) 'D', as defined in the Highway Capacity Manual 6th Edition (HCM), is normally used as the threshold for acceptable peak hour intersection operation in built out urban areas The LOS is determined based on the average amount of delay experienced by each vehicle entering an intersection during the study period and is categorized by grades of 'A' through 'F'. Table 5 summarizes the different intersection LOS parameters.

Table 5: Intersection Level of Service Description

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

The 95th percentile queue is also included in the operations summary as an additional performance measure. The 95th percentile queue (sometimes referred to as the "maximum probable queue") represents the distance away from the stop bar of an intersection at which 95% of all queues for a given traffic movement are expected to extend. In other words, there is

only a 5% probability that the 95th percentile queue length will be exceeded during the analysis period.

Intersection operation for the traffic signal and stop sign controls at the study intersections were analyzed using Synchro 10 software. The results presented in this report are based on HCM 2000 analysis format.

Existing and 2023 Traffic Operation: Table 6 summarizes existing 2019 morning and evening background traffic study intersection operation. It also summarizes intersection background traffic operation for the year 2023 when it is planned that the Mandel development construction will be completed.

Table 6: 2019 and 2023 Morning and Evening Peak Hour Background Traffic Intersection Operation

North 124th Street

Scenario	Control	MOE	Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2019 AM Existing	Signal	LOS		A			C			C			C	C	B
		Delay (sec)		9.7			24.2			34.4			28.3	22.5	19.0
		Queue (ft)		125'			100'			75'			175'	100'	--
2019 PM Existing	Signal	LOS		A			C			C			C	C	C
		Delay (sec)		9.4			28.5			33.4			32.1	25.4	22.1
		Queue (ft)		125'			200'			50'			200'	125'	--
			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2023 AM Background	Signal	LOS		A			C			C			C	C	B
		Delay (sec)		9.7			24.2			34.4			28.3	22.5	18.9
		Queue (ft)		125'			100'			75'			175'	100'	--
2023 PM Background	Signal	LOS		A			C			C			C	C	C
		Delay (sec)		9.5			28.7			33.5			32.2	25.6	22.2
		Queue (ft)		125'			200'			50'			200'	125'	--

Stephen Place/Blue Ridge Boulevard

Scenario	Control	MOE	Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2019 AM Existing	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.1			0.4			17.6			13.9		1.0
		Queue (ft)		25'			25'			25'			25'		--
2019 PM Existing	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.3			0.0			22.0			12.0		0.9
		Queue (ft)		25'			25'			25'			25'		--
			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2023 AM Background	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.1			0.4			17.9			14.1		1.0
		Queue (ft)		25'			25'			25'			25'		--
2023 PM Background	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.3			0.0			22.6			12.1		0.9
		Queue (ft)		25'			25'			25'			25'		--

Table 6: 2019 and 2023 Morning and Evening Peak Hour Background Traffic Intersection Operation (con't)

Crescent Drive

Scenario	Control	MOE	Movement						OVERALL
			EBL	EBT	WBT	WBR	SBL	SBR	
2019 AM Existing	Stop	LOS	A		A		C		A
		Delay (sec)	1.2		0.0		15.9		1.8
		Queue (ft)	25'		0'		25'		--
2019 PM Existing	Stop	LOS	A		A		C		A
		Delay (sec)	1.0		0.0		15.4		0.9
		Queue (ft)	25'		0'		25'		--
			Movement						OVERALL
			EBL	EBT	WBT	WBR	SBL	SBR	
2023 AM Background	Stop	LOS	A		A		C		A
		Delay (sec)	1.2		0.0		16.1		1.8
		Queue (ft)	25'		0'		25'		--
2023 PM Background	Stop	LOS	A		A		C		A
		Delay (sec)	1.0		0.0		15.6		0.9
		Queue (ft)	25'		0'		25'		--

Juneau Boulevard

Scenario	Control	MOE	Movement						OVERALL
			WBL	WBR	SBL	SBR	NEL	NER	
2019 AM Existing	Stop	LOS	A		C		A		A
		Delay (sec)	0.0		18.8'		0.0		2.3
		Queue (ft)	0'		50'		25'		--
2019 PM Existing	Stop	LOS	A		C		A		A
		Delay (sec)	0.0		24.5'		0.0		1.4
		Queue (ft)	0'		50'		25'		--
			Movement						OVERALL
			WBL	WBR	SBL	SBR	NEL	NER	
2023 AM Background	Stop	LOS	A		C		A		A
		Delay (sec)	0.0		19.3'		0.0		2.3
		Queue (ft)	0'		50'		25'		--
2023 PM Background	Stop	LOS	A		D		A		A
		Delay (sec)	0.0		25.3'		0.0		1.4
		Queue (ft)	0'		50'		25'		--

Table 6: 2019 and 2023 Morning and Evening Peak Hour Background Traffic Intersection Operation (con't)

Western SSND Access Road

Scenario	Control	MOE	Movement						OVERALL
			NWBL	NWBR	NEBT	NEBR	SWBL	SWBT	
2019 AM Existing	Stop	LOS	B		A		A		A
		Delay (sec)	10.2		0.0		0.2		0.1
		Queue (ft)	25'		0'		25'		--
2019 PM Existing	Stop	LOS	C		A		A		A
		Delay (sec)	15.3		0.0		0.2		0.2
		Queue (ft)	25'		0'		25'		--
			Movement						OVERALL
			NWBL	NWBR	NEBT	NEBR	SWBL	SWBT	
2023 AM Background	Stop	LOS	B		A		A		A
		Delay (sec)	10.3		0.0		0.2		0.1
		Queue (ft)	25'		0'		25'		--
2023 PM Background	Stop	LOS	C		A		A		A
		Delay (sec)	15.6		0.0		0.2		0.2
		Queue (ft)	25'		0'		25'		--

Legion Drive

Scenario	Control	MOE	Movement												OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR	
2019 AM Existing	Signal	LOS	D	C		No vehicles Exited Driveway			E	B		C	B		C
		Delay (sec)	38.2	20.3					76.4	15.1		20.4	15.5		22.2
		Queue (ft)	25'	75'					100'	225'		200'	25'		--
2019 PM Existing	Signal	LOS	D	C		C			F	B		C	B		C
		Delay (sec)	39.0	21.2		29.7			135.4	16.2		22.4	15.5		29.6
		Queue (ft)	50'	100'		50'			175'	300'		275'	25'		--
			Movement												OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR	
2023 AM Background	Signal	LOS	D	C		No vehicles Exited Driveway			E	B		C	B		C
		Delay (sec)	38.2	20.3					76.4	15.0		20.6	15.5		22.2
		Queue (ft)	25'	75'					100'	225'		200'	25'		--
2023 PM Background	Signal	LOS	D	C		C			F	B		C	B		C
		Delay (sec)	39.0	21.2		29.7			135.4	16.3		22.7	15.5		29.6
		Queue (ft)	50'	100'		50'			175'	300'		300'	25'		--

Elm Grove Road

Scenario	Control	MOE	Movement						OVERALL
			NBL	NBR	NEBT	NEBR	SWBL	SWBT	
2019 AM Existing	Signal	LOS	C	C	A	A	A	A	B
		Delay (sec)	20.0	23.1	8.9	7.3	9.7	8.3	11.7
		Queue (ft)	50'	100'	100'	25'	75'	75'	--
2019 PM Existing	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	21.6	23.2	9.0	7.3	10.7	8.9	12.6
		Queue (ft)	100'	125'	125'	25'	100'	125'	--
			Movement						OVERALL
			NBL	NBR	NEBT	NEBR	SWBL	SWBT	
2023 AM Background	Signal	LOS	C	C	A	A	A	A	B
		Delay (sec)	20.0	23.1	8.9	7.3	9.8	8.3	11.8
		Queue (ft)	50'	125'	100'	25'	75'	75'	--
2023 PM Background	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	21.6	23.2	9.1	7.3	11.0	9.0	12.6
		Queue (ft)	100'	125'	125'	25'	125'	125'	--

Table 6: 2019 and 2023 Morning and Evening Peak Hour Background Traffic Intersection Operation (con't)
Stephen Place/Eastern SSND Access Road

SSND East Driveway Traffic Operations												
Scenario	Control	MOE	Movement									OVERALL
			EBL		EBR		NBL	NBT		SBT	SBR	
2019 AM Existing	Stop	LOS	A				A			A		A
		Delay (sec)	0.0				0.0			0.0		0.0
		Queue (ft)	25'				25'			0'		--
2019 PM Existing	Stop	LOS	A				A			A		A
		Delay (sec)	8.8				0.0			0.0		2.6
		Queue (ft)	25'				25'			0'		--
			Movement									OVERALL
			EBL		EBR		NBL	NBT		SBT	SBR	
2023 AM Background	Stop	LOS	A				A			A		A
		Delay (sec)	0.0				0.0			0.0		0.0
		Queue (ft)	25'				25'			0'		--
2023 PM Background	Stop	LOS	A				A			A		A
		Delay (sec)	8.8				0.0			0.0		2.6
		Queue (ft)	25'				25'			0'		--

The analysis summarized in Table 6 indicates that all study intersection traffic movements in 2019 were operating at LOS 'D' or better conditions except for the northeastbound Watertown Plank Road left turn which was operating at LOS 'E' during the morning peak hour and at LOS 'F' during the evening peak hour.

The analysis summarized in Table 6 also indicates that all study intersection traffic movements in 2023are expected to continue operating at or better than LOS 'D' except for the northeastbound Watertown Plank Road left turn at its intersection with Legion Drive which is operating at LOS 'E' during the morning and LOS 'F' during the evening peak traffic. The southeastbound left turn from Legion Drive to Watertown Plank Road is operating at LOS 'D' during both the morning and evening peak hours. The southbound approach of the Juneau Boulevard intersection during the evening peak hour changes from LOS 'C' in 2019 to LOS 'D' operation in the year 2023 due to background traffic growth. All other study intersections are operating at LOS 'D' or better in 2019 and 2023.

Year 2023 Traffic Operation with Mandel Development Trips: Figures 9 and 10 show peak hour traffic volumes with the residential trips generated by the Mandel development.

Figure 9: Year 2023 Morning Peak Hour Traffic with Mandel Development Trips

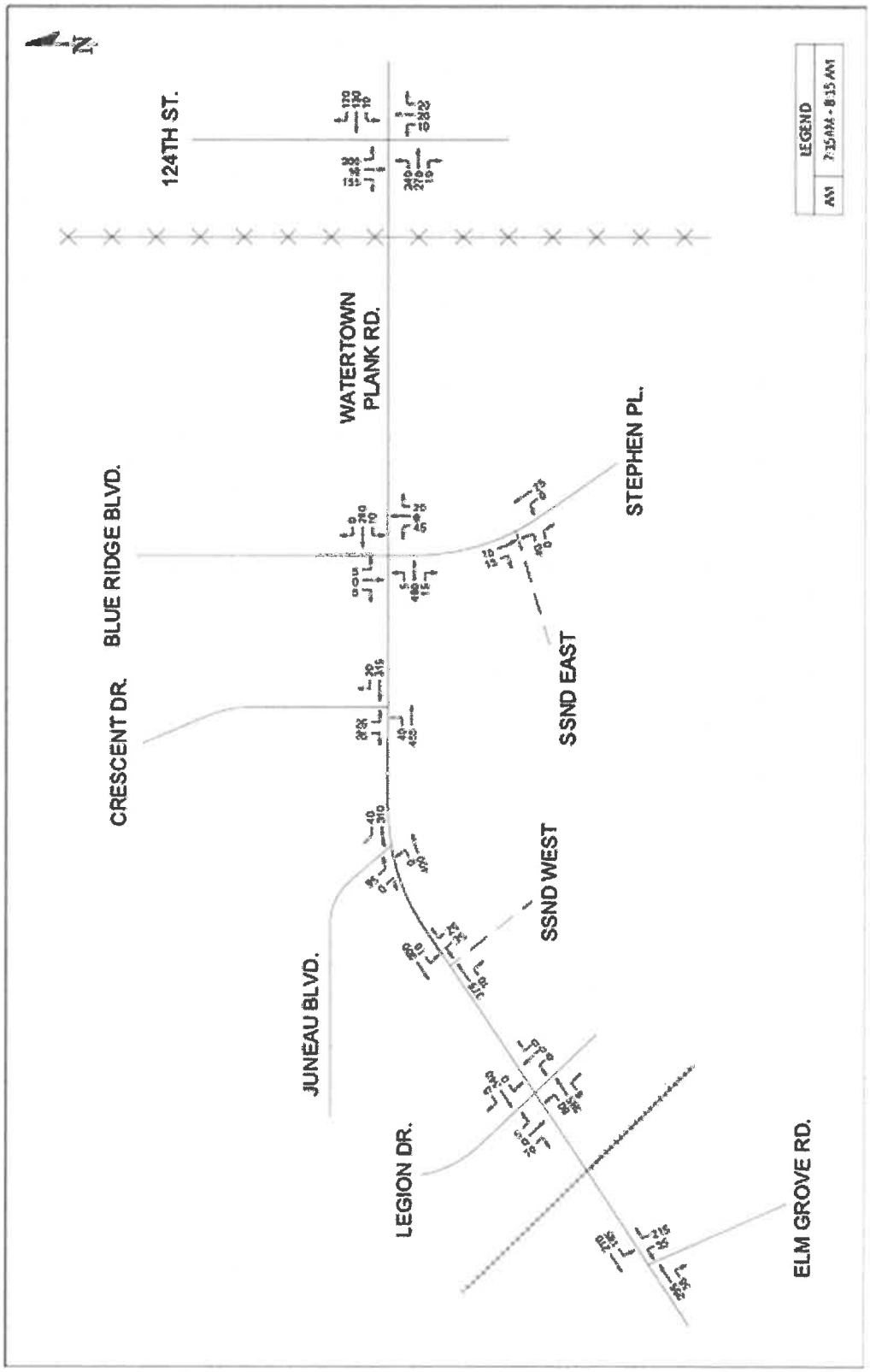
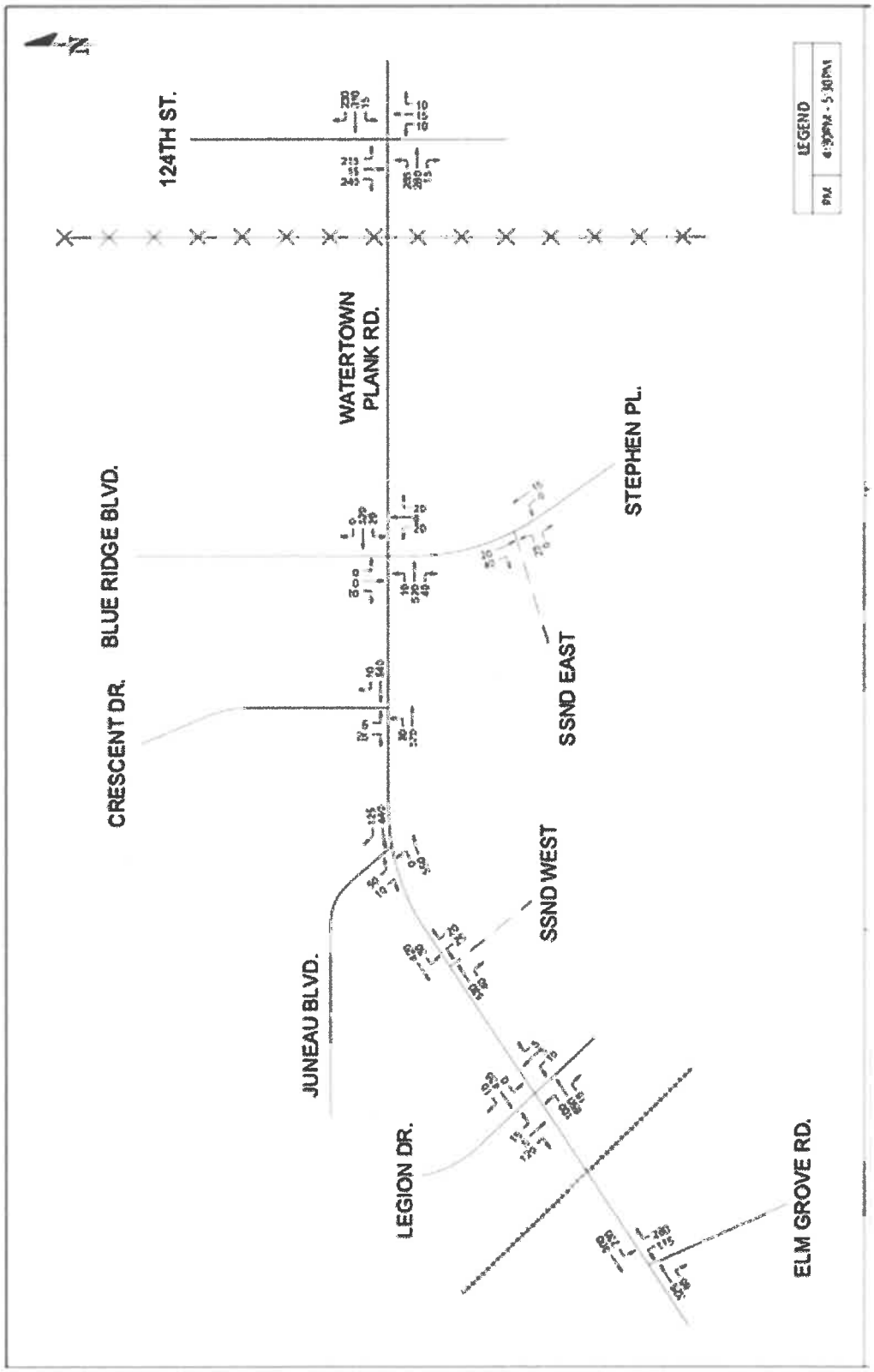


Figure 10: Year 2023 Evening Peak Hour Traffic with Mandel Development Trips



The peak hour volumes on Figures 9 and 10 with Mandel development trips were analyzed to identify the impact on year 2023 background traffic operation which were previously summarized in Table 6. Table 7 shows year 2023 intersection operation with the additional residential trips generated by the Mandel development.

Table 7: Year 2023 Peak Hour Traffic Operation with Mandel Development Trips

North 124th Street

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2023 AM with SSND Development	Signal	LOS		A			C			C			C	C	B
		Delay (sec)		9.9			24.3			34.4			28.3	22.6	18.7
		Queue (ft)		125'			100'			75'			175'	100'	--
2023 PM with SSND Development	Signal	LOS		A			C			C			C	C	C
		Delay (sec)		9.6			29.0			33.8			32.6	26.4	22.4
		Queue (ft)		125'			200'			50'			200'	125'	--

Stephen Place/Blue Ridge Boulevard

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2023 AM with SSND Development	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.1			0.4			20.1			14.9		2.0
		Queue (ft)		25'			25'			25'			25'		--
2023 PM with SSND Development	Stop	LOS		A			A			D			B		A
		Delay (sec)		0.3			0.7			27.7			12.4		1.5
		Queue (ft)		25'			25'			25'			25'		--

Crescent Drive

			Movement						OVERALL
			EBL	EBT	WBT	WBR	SBL	SBR	
2023 AM with SSND Development	Stop	LOS	A		A		C		A
		Delay (sec)	1.2		0.0		17.3		1.8
		Queue (ft)	25'		0'		25'		--
2023 PM with SSND Development	Stop	LOS	A		A		C		A
		Delay (sec)	1.0		0.0		17.0		0.9
		Queue (ft)	25'		0'		25'		--

Juneau Boulevard

			Movement						OVERALL
			WBL	WBR	SBL	SBR	NEL	NER	
2023 AM with SSND Development	Stop	LOS	A		C		A		A
		Delay (sec)	0.0		21.2'		0.0		2.4
		Queue (ft)	0'		50'		25'		--
2023 PM with SSND Development	Stop	LOS	A		D		A		A
		Delay (sec)	0.0		28.7'		0.0		1.5
		Queue (ft)	0'		50'		25'		--

Western SSND Access Road

			Movement						OVERALL
			NWBL	NWBR	NEBT	NEBR	SWBL	SWBT	
2023 AM with SSND Development	Stop	LOS	B		A		A		A
		Delay (sec)	14.1		0.0		0.4		1.3
		Queue (ft)	25'		0'		25'		--
2023 PM with SSND Development	Stop	LOS	C		A		A		A
		Delay (sec)	20.7		0.0		1.0		1.3
		Queue (ft)	25'		0'		25'		--

Table 7: Year 2023 Peak Hour Traffic Operation with Mandel Development Trips (con't)

Legion Drive

			Movement												OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR	
2023 AM with SSND Development	Signal	LOS	D	C		No vehicles Exited Driveway			E	B		C		B	C
		Delay (sec)	38.2	20.3					76.4	15.3		22.3		15.5	22.8
		Queue (ft)	25'	75'					100'	225'		250'		25'	--
2023 PM with SSND Development	Signal	LOS	D	C		C			F	B		C		B	C
		Delay (sec)	39.0	21.2		29.7			135.4	17.6		23.5		15.5	29.7
		Queue (ft)	50'	100'		50'			175'	350'		325'		25'	--

Elm Grove Road

			Movement						OVERALL
			NBL	NBR	NEBT	NEBR	SWBL	SWBT	
2023 AM with SSND Development	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	20.0	23.3	9.0	7.3	10.7	8.6	11.9
		Queue (ft)	50'	125'	125'	25'	100'	100'	--
2023 PM with SSND Development	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	21.6	23.8	9.3	7.3	11.8	9.1	13.0
		Queue (ft)	100'	150'	150'	25'	125'	125'	--

Stephen Place/Eastern SSND Access Road

			Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
2023 AM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	9.0		0.0		0.0		4.0
		Queue (ft)	25'		25'		0'		--
2023 PM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	9.0		0.0		0.0		2.2
		Queue (ft)	25'		25'		0'		--

The operation analysis summarized on Table 7 indicates that the only year 2023 intersection approaches that change LOS with trips generated by the Mandel development when compared to year 2023 background traffic growth only is the southwestbound Watertown Plank Road left turn at Elm Grove Road which changes from LOS 'A' to LOS 'B' during the morning peak hour and the northbound approach of Stephen Place to Watertown Plank Road which is expected to change from LOS 'C' to LOS 'D' operation during the evening peak hour due to an average vehicle delay increase from 22.6 seconds to 27.7 seconds. All other intersections continue to operate at the same LOS in the year 2023 with and without Mandel development traffic.

Year 2028 Traffic Operation: The traffic analysis for the year 2028 investigates the following three different development traffic scenarios:

1. Year 2028 background traffic growth without any new development
2. Year 2028 background traffic growth plus Mandel development trips
3. Year 2028 background traffic growth plus Mandel and Village Master Plan Downtown Corridor residential trips

1. Year 2028 Background Traffic Growth Operation Without Any New Development: Table 8 summarizes study intersection operation under the assumed one half percent annual growth of background through traffic on Watertown Plank Road.

Table 8: Year 2028 Peak Hour Background Traffic Operation Without Any New Development

North 124th Street

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM Background	Signal	LOS	A			C			C			C		C	B
		Delay (sec)	9.8			24.4			34.8			28.6		22.8	19.0
		Queue (ft)	125'			100'			75'			175'		100'	--
2028 PM Background	Signal	LOS	A			C			C			C		C	C
		Delay (sec)	9.5			28.3			33.7			32.4		25.9	22.0
		Queue (ft)	125'			200'			50'			200'		125'	--

Stephen Place/Blue Ridge Boulevard

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM Background	Stop	LOS	A			A			C			B			A
		Delay (sec)	0.1			0.4			18.5			14.5			1.0
		Queue (ft)	25'			25'			25'			25'			--
2028 PM Background	Stop	LOS	A			A			C			B			A
		Delay (sec)	0.3			0.0			23.7			12.2			0.9
		Queue (ft)	25'			25'			25'			25'			--

Crescent Drive

			Movement						OVERALL
			EBL	EBT	WBT	WBR	SBL	SBR	
2028 AM Background	Stop	LOS	A		A		C		A
		Delay (sec)	1.2		0.0		16.5		1.8
		Queue (ft)	25'		0'		25'		--
2028 PM Background	Stop	LOS	A		A		C		A
		Delay (sec)	1.0		0.0		16.0		0.9
		Queue (ft)	25'		0'		25'		--

Juneau Boulevard

			Movement						OVERALL
			WBL	WBR	SBL	SBR	NEL	NER	
2028 AM Background	Stop	LOS	A		C		A		A
		Delay (sec)	0.0		19.9'		0.0		2.3
		Queue (ft)	0'		50'		25'		--
2028 PM Background	Stop	LOS	A		D		A		A
		Delay (sec)	0.0		26.6'		0.0		1.4
		Queue (ft)	0'		50'		25'		--

Western SSND Access Road

			Movement						OVERALL
			NWBL	NWBR	NEBT	NEBR	SWBL	SWBT	
2028 AM Background	Stop	LOS	B		A		A		A
		Delay (sec)	10.3		0.0		0.2		0.1
		Queue (ft)	25'		0'		25'		--
2028 PM Background	Stop	LOS	C		A		A		A
		Delay (sec)	16.1		0.0		0.2		0.2
		Queue (ft)	25'		0'		25'		--

Table 8: Year 2028 Peak Hour Background Traffic Operation Without Any New Development (con't)

Legion Drive

			Movement												OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR	
2028 AM Background	Signal	LOS	D	C		No vehicles Exited Driveway			E	B		C		B	C
		Delay (sec)	38.2	20.3					76.4	15.2		20.6		15.5	22.2
		Queue (ft)	25'	75'					100'	225'			200'	25'	--
2028 PM Background	Signal	LOS	D	C		C			F	B		C		B	C
		Delay (sec)	39.0	21.2		29.7			135.4	16.6		23.1		15.5	29.7
		Queue (ft)	50'	100'		50'			175'	300'		300'		25'	--

Elm Grove Road

			Movement						OVERALL
			NBL	NBR	NEBT	NEBR	SWBL	SWBT	
2028 AM Background	Signal	LOS	C	C	A	A	A	A	B
		Delay (sec)	20.0	23.4	9.0	7.3	10.0	8.5	11.9
		Queue (ft)	50'	125'	125'	25'	75'	100'	--
2028 PM Background	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	21.6	23.4	9.1	7.3	11.1	9.0	12.7
		Queue (ft)	100'	125'	125'	25'	125'	125'	--

Stephen Place/Eastern SSND Access Road

			Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
2028 AM Background	Stop	LOS	A		A		A		A
		Delay (sec)	0.0		0.0		0.0		0.0
		Queue (ft)	25'		25'		0'		--
2028 PM Background	Stop	LOS	A		A		A		A
		Delay (sec)	8.8		0.0		0.0		2.6
		Queue (ft)	25'		25'		0'		--

As shown on Table 8, all of the study intersection peak hour traffic operations in 2028 continue to operate at the same LOS they experienced in 2023. The year 2028 traffic volumes without any new development represents an assumed 'through' traffic growth rate of one half percent per year.

2. Year 2028 Background Growth Traffic Operation with Mandel Development Trips: Table 9 summarizes study intersection operation under the assumed one half percent annual growth of through traffic on Watertown Plank Road and the addition of residential trips generated by the Mandel development.

Table 9: Year 2028 Peak Hour Traffic Operation With Mandel Development Trips

North 124th Street

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM with SSND Development	Signal	LOS	A			C			C			C		C	B
		Delay (sec)	10.0			24.4			34.8			28.6		22.9	18.9
		Queue (ft)	125'			100'			75'			175'		100'	--
2028 PM with SSND Development	Signal	LOS	A			C			C			C		C	C
		Delay (sec)	9.6			29.3			33.8			32.6		26.7	22.5
		Queue (ft)	125'			200'			50'			200'		125'	--

Stephen Place/Blue Ridge Boulevard

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM with SSND Development	Stop	LOS	A			A			C			C			A
		Delay (sec)	0.1			0.4			20.9			15.3			2.0
		Queue (ft)	25'			25'			25'			25'			--
2028 PM with SSND Development	Stop	LOS	A			A			D			B			A
		Delay (sec)	0.3			0.5			28.7			12.5			1.5
		Queue (ft)	25'			25'			25'			25'			--

Crescent Drive

			Movement						OVERALL
			EBL	EBT	WBT	WBR	SBL	SBR	
2028 AM with SSND Development	Stop	LOS	A		A		C		A
		Delay (sec)	1.2		0.0		17.7		1.8
		Queue (ft)	25'		0'		25'		--
2028 PM with SSND Development	Stop	LOS	A		A		C		A
		Delay (sec)	1.0		0.0		17.0		0.9
		Queue (ft)	25'		0'		25'		--

Juneau Boulevard

			Movement						OVERALL
			WBL	WBR	SBL	SBR	NEL	NER	
2028 AM with SSND Development	Stop	LOS	A		C		A		A
		Delay (sec)	0.0		21.9'		0.0		2.4
		Queue (ft)	0'		50'		25'		--
2028 PM with SSND Development	Stop	LOS	A		D		A		A
		Delay (sec)	0.0		30.3'		0.0		1.5
		Queue (ft)	0'		50'		25'		--

Western SSND Access Road

			Movement						OVERALL
			NWBL	NWBR	NEBT	NEBR	SWBL	SWBT	
2028 AM with SSND Development	Stop	LOS	B		A		A		A
		Delay (sec)	14.4		0.0		0.4		1.3
		Queue (ft)	25'		0'		25'		--
2028 PM with SSND Development	Stop	LOS	C		A		A		A
		Delay (sec)	21.7		0.0		1.0		1.3
		Queue (ft)	25'		0'		25'		--

Table 9: Year 2028 Peak Hour Traffic Operation With Mandel Development Trips (con't)

Legion Drive

			Movement												OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR	
2028 AM with SSND Development	Signal	LOS	D	C		No vehicles Exited Driveway			E	B		C		B	C
		Delay (sec)	38.2	20.3					76.4	15.5		22.3		15.5	22.8
		Queue (ft)	25'	75'					100'	250'		250'		25'	--
2028 PM with SSND Development	Signal	LOS	D	C		C			F	B		C		B	C
		Delay (sec)	39.0	21.2		29.7			135.4	18.0		23.9		15.5	29.8
		Queue (ft)	50'	100'		50'			175'	350'		325'		25'	--

Elm Grove Road

			Movement						OVERALL
			NBL	NBR	NEBT	NEBR	SWBL	SWBT	
2028 AM with SSND Development	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	20.0	23.5	9.2	7.3	10.9	8.7	12.0
		Queue (ft)	50'	125'	125'	25'	100'	100'	--
2028 PM with SSND Development	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	21.6	24.0	9.4	7.3	12.0	9.2	13.1
		Queue (ft)	100'	150'	150'	25'	125'	125'	--

Stephen Place/Eastern SSND Access Road

			Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
2028 AM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	9.0		0.0		0.0		4.0
		Queue (ft)	25'		25'		0'		--
2028 PM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	9.0		0.0		0.0		2.2
		Queue (ft)	25'		25'		0'		--

As shown on Table 9, during the morning peak hour operation of the southwestbound Watertown Plank Road left turn at Elm Grove Road is expected to change from LOS 'A' to LOS 'B' in the year 2028 with Mandel development traffic with operation of the southbound approach on Blue Ridge Boulevard expected to change from LOS 'B' to LOS 'C' in 2028 with the addition of Mandel development trips. During the evening peak hour the northbound approach of Stephen Place expected to change from LOS 'C' operation to LOS 'D' during the evening peak hour in 2028 with the addition of Mandel residential trips due to an increase in average vehicle delays from 23.7 seconds to an average vehicle delay of 28.7 seconds. All of the other study intersections continue to operate at the same LOS as they did in 2023.

3. Year 2028 Traffic Growth with Mandel and Village Downtown Corridor Master Plan Residential Development Trip Operation: In order to analyze year 2028 traffic impacts it is necessary to quantify the number of trips that may be generated by future residential development identified in the Village Downtown Corridor Master Plan. On page 97 of the Village of Elm Grove Downtown Corridor Plan a total of 243 new residential multi-family dwelling units may be constructed. The Downtown Corridor Plan does not include the SSND property. Table 10 Provides a summary of the Master Plan number of new residential trips

generated between the Legion Drive and Elm Grove Road intersections according to date published in the *ITE Trip Generation Manual,* 10th edition.

Table 10: Village Downtown Corridor Master Plan Residential Trip Generation

Land Use	No. of Units	ITE Code	Morning Peak Hour Enter	Morning Peak Hour Exit	Morning Peak Hour Total	Evening Peak Hour Enter	Evening Peak Hour Exit	Evening Peak Hour Total
• Mid-Rise Apartments	243	221	20	65	85	65	40	105

Table 11 summarizes study intersection operation under the assumed one half percent annual growth of through traffic on Watertown Plank Road along with traffic generated by the Mandel development and the Village Downtown Corridor Master Plan residential development.

Table 11: Year 2028 Peak Hour Background Traffic Operation With Mandel Development and Village Downtown Corridor Master Plan Residential Trips

North 124th Street

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM with SSND & Village Development	Signal	LOS	B			C			C			C		C	B
		Delay (sec)	10.1			24.5			34.8			28.6		23.0	18.8
		Queue (ft)	125'			125'			75'			175'		100'	--
2028 AM with SSND & Village Development	Signal	LOS	A			C			C			C		C	C
		Delay (sec)	9.7			29.7			33.9			33.0		27.4	22.8
		Queue (ft)	125'			225'			50'			200'		150'	--

Stephen Place/Blue Ridge Boulevard

			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM with SSND & Village Development	Stop	LOS	A			A			C			C			A
		Delay (sec)	0.1			0.4			22.2			15.8			2.0
		Queue (ft)	25'			25'			25'			25'			--
2028 AM with SSND & Village Development	Stop	LOS	A			A			D			B			A
		Delay (sec)	0.3			0.7			31.4			12.8			1.6
		Queue (ft)	25'			25'			25'			25'			--

Crescent Drive

			Movement						OVERALL
			EBL	EBT	WBT	WBR	SBL	SBR	
2028 AM with SSND & Village Development	Stop	LOS	A		A		C		A
		Delay (sec)	1.2		0.0		18.5		1.8
		Queue (ft)	25'		0'		25'		--
2028 AM with SSND & Village Development	Stop	LOS	A		A		C		A
		Delay (sec)	1.0		0.0		17.6		1.0
		Queue (ft)	25'		0'		25'		--

Table 11: Year 2028 Peak Hour Background Traffic Operation With Mandel Development and Village Downtown Corridor Master Plan Residential Trips (con't)

Juneau Boulevard

			Movement						OVERALL
			WBL	WBR	SBL	SBR	NEL	NER	
2028 AM with SSND & Village Development	Stop	LOS	A		C		A		A
		Delay (sec)	0.0		23.4'		0.0		2.5
		Queue (ft)	0'		50'		25'		--
2028 AM with SSND & Village Development	Stop	LOS	A		D		A		A
		Delay (sec)	0.0		32.7'		0.0		1.6
		Queue (ft)	0'		50'		25'		--

Western SSND Access Road

			Movement						OVERALL
			NWBL	NWBR	NEBT	NEBR	SWBL	SWBT	
2028 AM with SSND & Village Development	Stop	LOS	B		A		A		A
		Delay (sec)	15.0		0.0		0.4		1.2
		Queue (ft)	25'		0'		25'		--
2028 AM with SSND & Village Development	Stop	LOS	C		A		A		A
		Delay (sec)	23.3		0.0		1.0		1.3
		Queue (ft)	25'		0'		25'		--

Legion Drive

			Movement												OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR	
2028 AM with SSND & Village Development	Signal	LOS	D	C		No vehicles Exited Driveway			E	B		C	B	C	C
		Delay (sec)	38.2	20.3					76.4	16.1		22.6	15.5	23.0	
		Queue (ft)	25'	75'		--			100'	250'		250'	50'	--	
2028 AM with SSND & Village Development	Signal	LOS	D	C		C			F	B		C	B	C	C
		Delay (sec)	39.0	21.2		29.7			135.4	18.4		24.8	15.5	30.0	
		Queue (ft)	50'	100'		50'			175'	375'		350'	25'	--	

Elm Grove Road

			Movement						OVERALL
			NBL	NBR	NEBT	NEBR	SWBL	SWBT	
2028 AM with SSND & Village Development	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	20.0	23.6	9.2	7.3	11.6	8.9	12.2
		Queue (ft)	50'	125'	125'	25'	125'	100'	--
2028 AM with SSND & Village Development	Signal	LOS	C	C	A	A	B	A	B
		Delay (sec)	21.6	24.5	9.6	7.3	12.8	9.3	13.4
		Queue (ft)	100'	150'	150'	25'	150'	150'	--

Stephen Place/Eastern SSND Access Road

			Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
2028 AM with SSND & Village Development	Stop	LOS	A		A		A		A
		Delay (sec)	9.0		0.0		0.0		4.0
		Queue (ft)	25'		25'		0'		--
2028 AM with SSND & Village Development	Stop	LOS	A		A		A		A
		Delay (sec)	9.0		0.0		0.0		2.2
		Queue (ft)	25'		25'		0'		--

As shown on Table 11, the only intersection that is expected to experience an operational LOS change in the year 2028 attributed to the Village of Elm Grove Downtown Corridor Master Plan in combination with the Mandel residential trip generation compared to year 2028 operation with Mandel only trips, shown in Table 9, is the eastbound approach at North 124th Street which is expected to change from LOS 'A' to LOS 'B' during the morning peak hour. The Stephen Place northbound approach to Watertown Plank Road continues to operate at LOS 'D' during the evening peak hour which is identical to its operation in 2028 with Mandel development traffic and slightly lower than its existing LOS 'C' operation in 2019. At LOS 'D' operation in 2028 with Mandel and Village Downtown Corridor residential trips, the northbound approach of Stephen Place maintains a 1-car backup with an average vehicle delay of 31.4 seconds per vehicle compared to the delay in 2023 of 22.6 seconds per vehicle. The Juneau Boulevard southbound approach LOS remains at LOS 'D' similar to that expected with background traffic growth in the year 2023 without any new residential development.

Legion Drive Intersection Operational Improvement Analysis

All the intersection analyses conducted in this study indicate the Legion Drive intersection with Watertown Plank Road the northeastbound left turn is experiencing LOD 'E' operation during the morning peak hour and LOS 'F operation during the evening peak hour. This poor LOS exists in the year 2019 through 2028. A signal timing improvement that reassigns 5 seconds of green time from the southwestbound through movement on Watertown Plank Road to the northeastbound left turn improves northeastbound left turn operation to LOS 'D'. Under this signal timing change all other intersection movements remain at LOS 'D' or better operation. Table 12 summarizes the change in Legion Drive operation with the signal timing improvement.

Table 12: Legion Drive Intersection Signal Timing Improvement Operation

Legion Drive Traffic Operations																
Scenario	Control	MOE	Movement													OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR		
2019 AM Existing	Signal	LOS	D	C		No vehicles Exited Driveway			D	B		C		B		C
		Delay (sec)	38.2	20.3					44.2	15.1		24.8		18.5		21.3
		Queue (ft)	25'	75'					100'	225'		225'		25'		--
2019 PM Existing	Signal	LOS	D	C		C			D	B		C		B		C
		Delay (sec)	39.0	21.2		29.7			49.5	16.2		27.6		18.5		24.1
		Queue (ft)	50'	100'		50'			125'	300'		300'		25'		--
			Movement													OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR		
2023 AM Background	Signal	LOS	D	C		No vehicles Exited Driveway			D	B		C		B		C
		Delay (sec)	38.2	20.3					44.2	15.0		25.0		18.5		21.4
		Queue (ft)	25'	75'					100'	225'		225'		25'		--
2023 PM Background	Signal	LOS	D	C		C			D	B		C		B		C
		Delay (sec)	39.0	21.2		29.7			49.5	16.3		28.1		18.5		24.3
		Queue (ft)	50'	100'		50'			125'	300'		325'		25'		--
			Movement													OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR		
2023 AM with SSND Development	Signal	LOS	D	C		No vehicles Exited Driveway			D	B		C		B		C
		Delay (sec)	38.2	20.3					44.2	15.3		27.4		18.5		22.6
		Queue (ft)	25'	75'					100'	225'		275'		25'		--
2023 PM with SSND Development	Signal	LOS	D	C		C			D	B		C		B		C
		Delay (sec)	39.0	21.2		29.7			49.5	17.6		29.2		18.5		24.9
		Queue (ft)	50'	100'		50'			125'	350'		350'		25'		--
			Movement													OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR		
2028 AM Background	Signal	LOS	D	C		No vehicles Exited Driveway			D	B		C		B		C
		Delay (sec)	38.2	20.3					44.2	15.2		25.0		18.5		21.4
		Queue (ft)	25'	75'					100'	225'		225'		25'		--
2028 PM Background	Signal	LOS	D	C		C			D	B		C		B		C
		Delay (sec)	39.0	21.2		29.7			49.5	16.6		28.7		18.5		24.5
		Queue (ft)	50'	100'		50'			125'	300'		325'		25'		--
			Movement													OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR		
2028 AM with SSND Development	Signal	LOS	D	C		--			D	B		C		B		C
		Delay (sec)	38.2	20.3		--			44.2	15.5		27.4		18.5		22.6
		Queue (ft)	25'	75'		--			100'	250'		275'		25'		--
2028 PM with SSND Development	Signal	LOS	D	C		C			D	B		C		B		C
		Delay (sec)	39.0	21.2		29.7			49.5	18.0		29.9		18.5		25.3
		Queue (ft)	50'	100'		50'			125'	350'		350'		25'		--
			Movement													OVERALL
			SEBL	SEBT	SEBR	NWBL	NWBT	NWBR	NEBL	NEBT	NEBR	SWBL	SWBT	SWBR		
2028 AM with SSND & Village Development	Signal	LOS	D	C		--			D	B		C		B		C
		Delay (sec)	38.2	20.3		--			44.2	16.1		27.8		18.5		22.9
		Queue (ft)	25'	75'		--			100'	250'		275'		25'		--
2028 PM with SSND & Village Development	Signal	LOS	D	C		C			D	B		C		B		C
		Delay (sec)	39.0	21.2		29.7			49.5	18.4		31.4		18.5		26.0
		Queue (ft)	50'	100'		50'			125'	375'		375'		25'		--

As shown on Table 12, under all development scenarios in 2023 and 2028 the Legion Drive traffic movements should operate at LOS 'D' or better during both the morning and evening peak traffic periods.

Traffic Analysis for Three SSND Property Access Road Alternative

An additional analysis was conducted of a Mandel development site plan alternative that would include a third SSND property access road aligning directly with Crescent Drive as a standard 4-leg intersection. The only intersections impacted by the access alternative, in comparison to the existing two SSND access road condition are the Crescent Drive and Stephen Place/Blue Ridge Drive intersections and the Stephen Place intersection with the existing eastern SSND access road.

Figures 11 and 12 illustrate the redistribution of traffic movements with a three SSND access road alternative.

Figure 11: 2023 Morning Peak Hour Traffic with Three Access Road Mandel Development

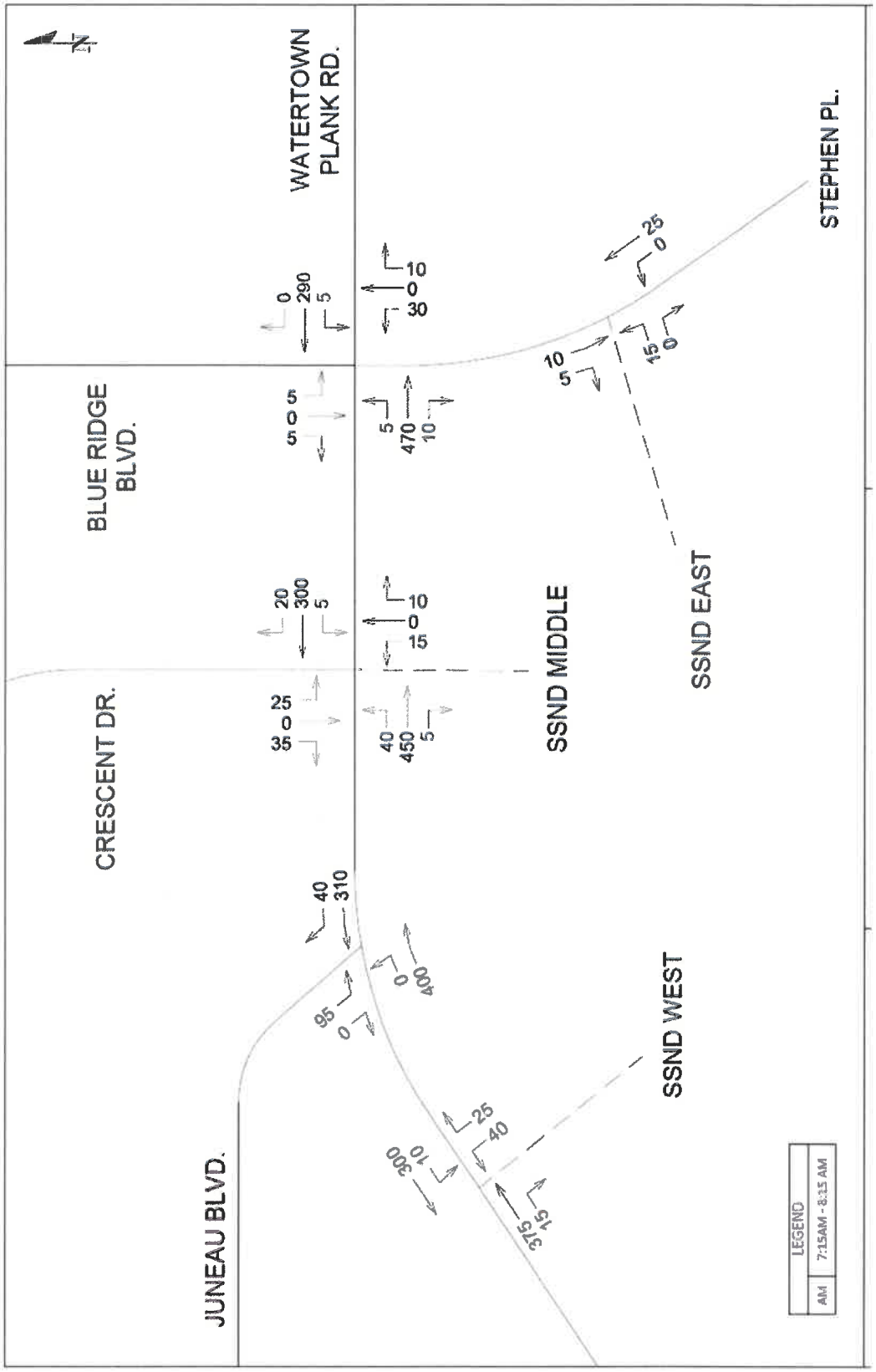
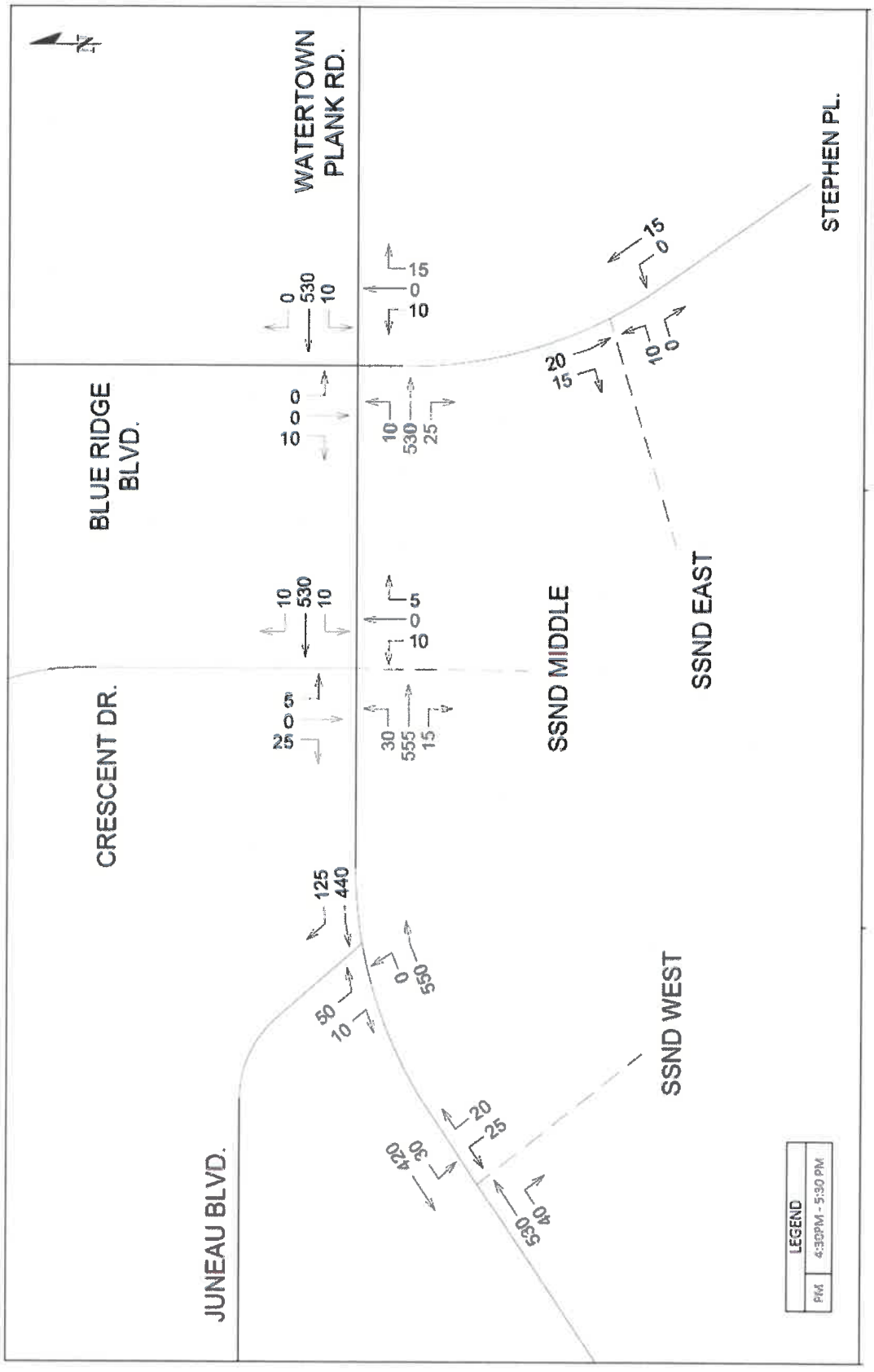


Figure 12: 2023 Evening Peak Hour Traffic with Three Access Road Mandel Development



With three SSND property access roads, trips generated by the 17 side-by-side duplexes are expected to use the eastern access road at Stephen Place. The apartments located adjacent to the east side of the existing SSND historic buildings would use the new center access road connection at Crescent Drive as shown on Figures 11 and 12. This access road trip utilization pattern would remain constant under the 2028 development scenarios with three access points.

Crescent Drive: Table 13 summarizes the year 2023 and 2028 SSND three access road alternative operation for the Crescent Drive intersection with Watertown Plank Road.

Table 13: Year 2023 and 2028 Crescent Drive Peak Hour Operation Scenarios Under a Three SSND Access Road Alternative

Crescent Drive Traffic Operations																	
Scenario	Control	MOE	Movement														OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR	
2023 AM with SSND Development	Stop	LOS		A				A				C				C		A
		Delay (sec)		1.2				0.2				22.5				19.8		2.6
		Queue (ft)		25'				25'				25'				25'		--
2023 PM with SSND Development	Stop	LOS		A				A				E				C		A
		Delay (sec)		1.0				0.3				35.5				18.1		1.5
		Queue (ft)		25'				25'				25'				25'		--
			Movement															OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR	
2028 AM with SSND Development	Stop	LOS		A				A				C				C		A
		Delay (sec)		1.2				0.2				23.2				20.4		2.6
		Queue (ft)		25'				25'				25'				25'		--
2028 PM with SSND Development	Stop	LOS		A				A				E				C		A
		Delay (sec)		1.0				0.3				37.5				18.7		1.5
		Queue (ft)		25'				25'				25'				25'		--
			Movement															OVERALL
			EBL	EBT	EBR		WBL	WBT	WBR		NBL	NBT	NBR		SBL	SBT	SBR	
2028 AM with SSND & Village Development	Stop	LOS		A				A				C				C		A
		Delay (sec)		1.2				0.2				24.6				21.6		2.6
		Queue (ft)		25'				25'				25'				25'		--
2028 AM with SSND & Village Development	Stop	LOS		A				A				E				C		A
		Delay (sec)		1.0				0.3				40.4				19.6		1.6
		Queue (ft)		25'				25'				25'				25'		--

The peak hour traffic operation at the Crescent Drive intersection, with a new center SSND access road summarized on Table 13, indicates that all intersection traffic movements in 2023 and 2028, with trips generated by the Mandel development and Village Downtown Corridor Master Plan residential development, should operate at LOS 'C' or better conditions except for the northbound SSND center access road approach to Watertown Plank Road during the evening peak hour when it is expected to operate below design levels at LOS 'E'. This evening LOS represents 35.5 to 40.4 seconds of average northbound vehicle delay exiting the Mandel residential development with a maximum vehicle backup of 1 car. The 'Stop Sign' operation analysis results from our experience and long involvement with the TRB Highway Capacity Committee is very conservative tending to overstate vehicle delays. In most situations, vehicles will use gaps in the Watertown Plank Road traffic stream before it experiences LOS 'E' delay

thresholds. Southbound traffic operation on Crescent Drive remains at LOS 'C' with a slight increase of 2 to 3 seconds in average vehicle delay.

Stephen Place/Blue Ridge Boulevard: Table 14 summarizes the three SSND three access road alternative intersection operation for the Stephen Place/Blue Ridge Boulevard intersection with Watertown Plank Road.

Table 14: Year 2023 and 2028 Stephen Place/Blue Ridge Boulevard Peak Hour Operation Scenarios Under a Three SSND Access Road Alternative

Scenario	Control	MOE	Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2023 AM with SSND Development	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.1			0.2			19.3			14.7		1.3
		Queue (ft)		25'			25'			25'			25'		–
2023 PM with SSND Development	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.3			0.3			22.9			12.5		0.9
		Queue (ft)		25'			25'			25'			25'		–
			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM with SSND Development	Stop	LOS		A			A			C			C		A
		Delay (sec)		0.1			0.2			19.8			15.0		1.3
		Queue (ft)		25'			25'			25'			25'		–
2028 PM with SSND Development	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.3			0.2			23.4			12.6		0.9
		Queue (ft)		25'			25'			25'			25'		–
			Movement												OVERALL
			EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
2028 AM with SSND & Village Development	Stop	LOS		A			A			C			C		A
		Delay (sec)		0.1			0.2			20.9			15.5		1.3
		Queue (ft)		25'			25'			25'			25'		–
2028 AM with SSND & Village Development	Stop	LOS		A			A			C			B		A
		Delay (sec)		0.3			0.2			24.7			13.0		0.9
		Queue (ft)		25'			25'			25'			25'		–

The peak hour traffic operation at the Stephen Place/Blue Ridge Boulevard intersection under a new center SSND access road alternative shown on Table 13 indicates that all Stephen Place intersection traffic movements in 2023 and 2028 with trips generated by the Mandel development and the Village Downtown Corridor Master Plan residential development trips should operate at LOS 'C' or better conditions with a maximum backup of 1 car.

Stephen Place/SSND East Access Road: Table 15 summarizes the SSND three access road alternative intersection operation for the Stephen Place intersection with the existing eastern SSND access road.

Table 15: Year 2023 and 2028 Stephen Place/SSND Eastern Access Road Peak Hour Operation Scenarios Under a Three SSND Access Street Alternative

Scenario	Control	MOE	Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
			Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
2023 AM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	8.8		0.0		0.0		2.4
		Queue (ft)	25'		25'		0'		–
2023 PM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	8.8		0.0		0.0		1.4
		Queue (ft)	25'		25'		0'		–
			Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
2028 AM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	8.8		0.0		0.0		2.4
		Queue (ft)	25'		25'		0'		–
2028 PM with SSND Development	Stop	LOS	A		A		A		A
		Delay (sec)	8.8		0.0		0.0		1.4
		Queue (ft)	25'		25'		0'		–
			Movement						OVERALL
			EBL	EBR	NBL	NBT	SBT	SBR	
2028 AM with SSND & Village Development	Stop	LOS	A		A		A		A
		Delay (sec)	8.8		0.0		0.0		2.4
		Queue (ft)	25'		25'		0'		–
2028 AM with SSND & Village Development	Stop	LOS	A		A		A		A
		Delay (sec)	8.8		0.0		0.0		1.4
		Queue (ft)	25'		25'		0'		–

The peak hour traffic operation at the Stephen Place intersection with the existing SSND access road shown on Table 15 continues to operate with all traffic movements at LOS 'A' under all conditions through 2028 with or without the additional trips generated by the Mandel development or new residential development trips identified in the Village Downtown Corridor Master Plan.

Conclusions

This study identifies existing street, intersection safety and traffic conditions, it reports on the detailed analysis of existing and future Year 2023 and 2028 traffic patterns, trip generation and distribution from the Mandel residential development and potential trips from new residential development referenced in the Village of Elm Grove Downtown Corridor Master Plan, and the impact of those development trips on morning and evening peak hour operation at the Watertown Plank Road study intersections.

From the study findings it is concluded that:

1. All study intersections are currently operating at LOS 'D' or better conditions during the morning and evening peak traffic hours except for the northeastbound left turn at the Legion Drive intersection which experiences LOS 'E' morning and 'F' evening operation.
2. Traffic safety data over the 5-year time period from 2015 through 2019 indicates the highest study crashes occurred at the Elm Grove Road intersection with an average of

3.8 crashes per year followed by the Legion Drive intersection with an average of 2.6 crashes per year. The majority of crashes involved rear-end vehicle collisions. There was only 1 crash involving a pedestrian which was reported at the Elm Grove Road intersection.

3. Historic traffic volumes on Watertown Plank Road have demonstrated a flat or slightly decreasing volume since 2006. The 24-hour weekday volume on the study segment of Watertown Plank Road in 2019 was 9,100 vehicles per day. (In conformance with accepted traffic study practices this report analyzes future year 'through' background traffic growth at an increasing rate on 0.5% per year).
4. In 2019 all study intersections are currently operating at LOS 'D' or better conditions during the morning and evening peak traffic hours except for the northeastbound Watertown Plank Road left turn at the Legion Drive intersection which experiences LOS 'E' morning and 'F' evening operation.
5. In 2023, under a 0.5% traffic growth without any Mandel development trips all intersection traffic movements are expected to provide the same LOS as in 2019, except for the southbound approach of Juneau Boulevard during the evening peak hour which will change from LOS 'C' to LOS 'D' operation.
6. The Mandel development is estimated to generate 145 morning and 180 evening peak hour trips. Of those trips, it is estimated that 60% will have a trip origin or destination to/from the west with the remaining 40% originating or destined to the east.
7. The Mandel trips will replace the 25 morning and 35 evening existing SSND generated trips.
8. In 2023, with Mandel residential development trips, LOS at the study intersections are expected to operate similar to how they operate in 2023 without any Mandel development trips except for the southwestbound Watertown Plank Road left turn at Elm Grove Road which changes from LOS 'A' to LOS 'B' and the northbound approach movements on Stephen Place which change from LOS 'C' to LOS 'D' operation.
9. In the year 2028, background traffic growth without any new development trips, the study intersections are expected to continue to operate the same as they operate in 2023.
10. In the year 2028, with background traffic growth and the addition of Mandel development trips, the study intersections continue to operate the same as they operate without Mandel development trips except for the southwestbound Watertown Plank Road left turn at Elm Grove Road which changes from LOS 'A' to LOS 'B', as well as, Blue Ridge Boulevard southbound approach to Watertown Plank Road which is expected to change from LOS 'B' to LOS ' C' during the morning peak hour. During the evening peak hour the northbound approach of Stephen Place is expected to change from LOS 'C' to LOS 'D' due to an average increase in vehicle delay from 23.7 to 28.7 seconds.
11. It is expected that by the year 2028 that the Village Downtown Corridor Master Plan may have added an additional 234 residential units which would generate 85 morning and 105 evening peak hour trips.
12. In the year 2028, with trips generated by the potential residential development in the Village Downtown Corridor Master Plan plus trips generated by the Mandel

development, it is expected that the study intersections will continue to operate as they would in 2028 without any development during the morning peak hour except for the eastbound approach of North 124th Street to Watertown Plank Road which would change from LOS 'A' to LOS 'B'.

13. Under a SSND three property access road alternative, which involves a new SSND connection at the Crescent Drive intersection plus the two existing road connections, peak hour traffic operation at the new SSND property center road connection is expected to operate at LOS 'E' during the evening peak hour with a one vehicle backup. It is expected that the Stop Sign control software overstates this condition as experience has shown it to be very conservative as single cars typically find safe gaps to enter the traffic stream. The only other intersection directly impacted by this alternative is at Stephen Place which indicates the southbound approach changes from LOS 'B' in 2023 to LOS 'C' in 2028 with Mandel development trips.

The Technical Supplement to this report contains supporting traffic figures related to the Mandel residential development and the potential Elm Grove Downtown Corridor Master Plan residential development trip assignments and detailed intersection capacity analysis worksheets.

Recommendations

The following street improvements are recommended to maximize traffic operation and safety at the Watertown Plank Road intersections:

1. Modify the signal timing plan at Legion Drive by transferring 5 seconds of green time from the southwestbound through movement on Watertown Plank Road to the northeastbound left turn. This action will improve operation of the northeastbound left turn from its current morning peak hour operation of LOS 'E' and evening peak hour operation of LOS 'F' to LOS 'D' during both peak hours without negatively changing the LOS of Legion Drive.

2. Upgrade the existing 'in-street' pavement yellow flashing pedestrian warning lights to Rectangular Rapid Flashing Yellow Beacons (RRFB's) at the Church Street and Elm Grove Street pedestrian crosswalks to improve driver awareness of pedestrians crossing Watertown Plank Road. This is consistent with the RRFB beacons located at the Crescent Drive crosswalk.

3. Upgrade all crosswalk markings on Watertown Plank Road to 'Continental' design. This design is the most visible crosswalk marking for motorists and sight disadvantaged pedestrians. This should enhance pedestrian safety by increasing pedestrian awareness to drivers.

4. It is not recommended to construct a third access road to the SSND property due to safety concerns associated with its close proximity to traffic movements and pedestrian activity at the Juneau Boulevard and Crescent Drive intersections.