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Parcel 24 at the Glen
Traffic Impact Study
Glenview, Illinois
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INTRODUCTION

Sam Schwartz Engineering, DPC (SSE) was retained by Edward R. James Homes, LLC and Willow Creek Community Church to conduct a traffic impact study for the proposed development of Parcel 24 at the Glen in Glenview, Illinois. The northern 14± acres of the 43± acre site will consist of the Willow Creek Community Church, with the remaining 29± acres containing the Westgate at the Glen. The site location is illustrated on **Figure 1**.

As proposed, the Westgate at the Glen project consists of the construction of 173 residential units (34 cluster homes, 68 mews homes, and 71 row homes). The Willow Creek Community Church development consists of constructing a 72,000 ± square-foot, one-story worship facility containing a 1,200-seat auditorium, church office, meeting rooms, and classrooms. The proposed facility will replace the existing North Shore campus services currently held at the Christian Heritage Academy located on Waukegan Road in Northfield, Illinois.

Access to the residential site is proposed onto West Lake Avenue, Shermer Road, Valcour Drive, Dauntless Drive, Constellation Drive, and Saipan Drive. Access to the church site is proposed via Shermer Road and Valcour Drive.

The following report presents and documents SSE's methodology, data collection, analyses, and identifies improvements, as necessary, to mitigate impacts the development's traffic may have on the adjacent roadway network.





EXISTING CONDITIONS

SSE conducted field visits to collect relevant information pertaining to existing land uses in the area, the surrounding roadway network, existing traffic volumes, traffic controls, and roadway lane usage at all critical intersections, as well as public transportation in the study area. This section of the report provides a description of these existing characteristics.

Site Location

Approximately 41 acres of site was primarily part of a 91± acre parcel containing Navy military housing. Approximately 25 acres of the Navy parcel, which abuts the proposed site to the west, is currently being redeveloped by Pulte Homes, consisting of 109 town homes and 40 duplex units. Other area land uses include the Northeast Illinois Public Safety Training Academy and the Glenview National 9 Golf Course to the east of the site, the Glen Club Golf Course to the south of the site, and commercial uses to the west of the site along West Lake Avenue.

Existing Street Characteristics

The area roadways most directly affected by the site redevelopment are West Lake Avenue, Pfingsten Road, Greenwood Road, Monterey Drive, Shermer Road, Patriot Boulevard, Tower Drive, Avenue D, Constellation Drive, and Willow Road. These Roadways are described below in more detail.

West Lake Avenue is an east/west major collector that extends from Pfingsten Road on the west to Lehigh Avenue on the east. At its signalized intersection with Pfingsten Road, West Lake Avenue provides a left-turn and a shared through right-turn lane in the eastbound direction and dual left-turn lanes, one through, and a right-turn lane in the westbound direction. At its all-way stop controlled (AWSC) intersection with Greenwood Road, West Lake Avenue provides one lane of travel in each direction with shared turning movements. Adjacent to the site, West Lake Avenue provides one lane of travel in each direction and a center two-way left-turn lane (TWLTL) and is under the jurisdiction of the Village of Glenview. West Lake Avenue is under the jurisdiction of the Illinois Department of Transportation (IDOT) west of Greenwood Road. At the Shermer Road intersection, the TWLTL becomes a dedicated left-turn lane in the eastbound direction. At its signalized intersection with Patriot Boulevard and Tower Drive, West Lake Avenue provide a left-turn, through, and right-turn lane in each direction. The posted speed limit on West Lake Avenue in the vicinity of the site is 30 miles per hour (MPH) and increases to 35 MPH west of North Lake Terrace. West Lake Avenue is a free-flow condition in the vicinity of Monterey Drive and Shermer Road.

Pfingsten Road is a north/south minor arterial that extends from East Lake Avenue on the south to Waukegan Road in Deerfield to the north. At its signalized intersection with West Lake Avenue, Pfingsten Road provides a left-turn, through, and shared through/right-turn lane in the northbound direction and a left-turn, two through lanes, and a shared through/right-turn lane in the southbound direction. Pfingsten Road is under the jurisdiction of IDOT and has a posted speed limit of 35 MPH.

Greenwood Road is a north/south major collector that extends from West Lake Avenue on the north to Milwaukee Avenue in Niles to the south where it becomes Greenwood Avenue extending southerly through the City of Park Ridge. Greenwood Road is under the jurisdiction of IDOT and has a posted



speed limit of 35 MPH. At its AWSC intersection with West Lake Avenue, Greenwood Road provide a single travel lane with shared turning movements. Two commercial driveways are aligned off-set the Greenwood Road south leg. Improvements are currently planned by the Village of Glenview at this location and include traffic signal installation. Details of the improvements are provided in the *Planned Roadway Improvements* section of this report.

Monterey Drive is a north/south two-lane local road, serving the Southgate at the Glen subdivision, with a posted speed limit of 20 MPH. It is approximately 25 feet wide measured from edge of pavement to edge of pavement. At its unsignalized intersection with West Lake Avenue, Monterey Drive is under STOP sign control. A driveway serving the Youth Services of Glenview/Northbrook is aligned opposite the Monterey Drive south leg and is approximately 23 feet wide measured from edge of pavement to edge of pavement, operating under STOP sign control.

Shermer Road is a north/south local roadway in the site vicinity that extends from West Lake Avenue on the south to Dundee Road (Illinois Route 68) on the north in Northbrook. Adjacent to the site, Shermer Road provides one lane of travel in each direction and is under the jurisdiction of the Village of Glenview. The posted speed limit on Shermer Road in the vicinity of the site is 25 MPH. At its unsignalized T-intersection with West Lake Avenue, southbound Shermer Road is provided with a left-turn and a right-turn lane operating under STOP sign control. Shermer Road is a free-flow condition in the vicinity of Avenue D and Constellation Drive. Turn lanes are not provided at its unsignalized intersections with Avenue D and Constellation Drive. At its signalized intersection with Willow Road, Shermer Road provides a left-turn lane, through lane, and shared through/right-turn lane in the northbound and southbound directions. At the time this study was prepared, Shermer Road was closed north of the study area at the Union Pacific Bridge. The bridge collapsed after a train derailment in July 2012 and is currently being reconstructed. A temporary connection between Shermer Road and Patriot Boulevard via Old Willow Road has been installed to facilitate traffic to/from the businesses south of the Union Pacific Bridge.

Patriot Boulevard is a north/south minor arterial that extends from East Lake Avenue on the south to Willow Road on the north. At its signalized intersection with West Lake Avenue and Tower Drive, Patriot Boulevard provides a left-turn, through, and shared through/right-turn lane in the northbound direction and a left-turn, two through lanes, and a right-turn lane in the southbound direction. Pflingsten Road is under the jurisdiction of the Village of Glenview and has a posted speed limit of 35 MPH.

Tower Drive is a north/south local roadway that extends from Chestnut Avenue on the south to West Lake Avenue on the north. At its signalized intersection with West Lake Avenue and Patriot Boulevard, Tower Drive provides a shared through/left-turn lane and a right turn lane. Tower Drive is under the jurisdiction of the Village of Glenview and has a posted speed limit of 20 MPH.

Avenue D and Constellation Drive are east/west local roadways that serve the existing Navy Housing, Child Development Center, and Pulte Regency at the Glen subdivision (under construction). Avenue D and Constellation Drive are approximately 28 and 34 feet wide, respectively, measured from edge of pavement to edge of pavement and operate under STOP sign control at their intersection with Shermer Road.



In connection with the proposed Westgate at the Glen residential development, access from Shermer Road via Avenue D will be closed; secondary access to the proposed and adjacent residential developments will be provided onto Shermer Road via Valcour Drive, approximately 650 feet north of Constellation Drive.

Willow Road is an east/west, four lane principal arterial extending through the northern section of the Village of Glenview. Separate left turn lanes are provided on Willow Road at its signalized intersection with Shermer Road. It should be noted, Willow Road was reduced to one travel lane in each direction in connection with the Willow Road Reconstruction project at the time this study was conducted. Willow Road is under the jurisdiction of IDOT and has a posted speed limit of 40 MPH. It is designated as a Strategic Regional Arterial (SRA). The SRA designation controls roadway access and signal installation so as to facilitate efficient and safe transportation.

Existing Traffic Volumes

Existing traffic volumes were determined by manual traffic counts conducted in April, May, June, and September 2013 during the weekday morning (7:00 to 9:00 AM), weekday evening (4:00 to 6:00 PM), and Sunday morning (10:00 AM to 1:00 PM) peak periods at the following intersections:

- West Lake Avenue and Pfingsten Road
- West Lake Avenue and Greenwood Road (Sunday morning only)
- West Lake Avenue and Monterey Drive / Youth Service of Glenview Access
- West Lake Avenue and Shermer Road
- West Lake Avenue at Patriot Boulevard and Tower Drive
- Shermer Road and Avenue D
- Shermer Road and Constellation Drive
- Shermer Road and Willow Road

The time periods were chosen since they coincide with the anticipated peak periods of the surrounding roadway system and the proposed developments. The counts were conducted when schools in the study area were in session.

The results indicate that the peak hour of existing traffic during the weekday morning peak generally occurred from 7:15 to 8:15 AM and the weekday evening peak generally occurred from 5:00 to 6:00 PM. The peak hour for each individual intersection was used in the analysis, to provide a conservative (worst-case) analysis scenario.

The heaviest attended worship services at the proposed Willow Creek Community Church are at 9:00 AM and 11:15 AM on Sunday, with a typical duration of an hour and 15 minutes. Accordingly, the peak Sunday church hour traffic is anticipated to occur between 10:15 and 11:15 AM, corresponding with the release of the 9:00 AM service and the arrival of the 11:15 AM service. It is important to note, the results of the counts indicate that the traffic volumes along West Lake Avenue adjacent to the proposed church on the Sunday morning church peak hour correspond to approximately 40% of the weekday PM peak hour.



These counts were supplemented with weekday morning and evening peak hour counts at the intersection of Greenwood Road and West Lake Avenue conducted in 2007 in connection with the Intersection Design Study prepared by ESI Consultants, Ltd. To provide a conservative (worse than expected) analysis, a 1.0 percent annual traffic growth rate was applied to the traffic data collected in 2007 to represent 2013 Existing traffic-volume conditions.

In addition, automatic traffic recorder (ATR) counts were conducted in April and May 2013 on Shermer Road and West Lake Avenue in the site vicinity. The ATR counts indicate that the average weekday traffic on Shermer Road is 1,850 with 75 trucks (4.1%) and the Sunday daily traffic is 800 with 5 trucks (0.6%). On West Lake Avenue, the average weekday traffic is 9,350 with 170 trucks (1.8%) and Sunday daily traffic is 6,150 with 60 trucks (1.0%).

The existing peak hour traffic volumes are illustrated on **Figure 2**. Summaries of the traffic count data are contained in the Appendix of this report.

Union Pacific Railroad West Lake Avenue Crossing

Freight trains were observed at the at-grade railroad crossing along West Lake Avenue, west of Greenwood Road, sporadically throughout the counts, i.e., two trains were observed during the duration of the Sunday counts (3 hour period) one week, while no trains were observed during this same timeframe on the following Sunday. Weekday peak period train occurrences were observed to be similar. Average duration of train crossings were observed to be 2 to 3 minutes. The Sunday train crossings had negligible impact on adjacent street traffic, with vehicle queuing never observed to extend to Greenwood Road to the east or Pfungsten Road to the west. During the morning and evening peak observations, vehicle queues were observed to extend westerly to Pfungsten Road during one train crossing observation; however, these queues dissipated within two to three cycles of the adjacent signalized intersection. East of the crossing extensive vehicle queuing was observed during one observation during the weekday evening peak period; however, the existing capacity constraints experienced at this intersection (one travel lane in each direction with shared turning movements and operating under all-way stop sign control) were a significant contributor to the delays/stacking observed. With the anticipated intersection improvements planned by the Village at the Greenwood Road and West Lake Avenue intersection, substantial improvements are anticipated. Accordingly, this at grade railroad crossing is not anticipated to adversely impact the proposed development.

Pedestrian/Bike Facilities

Sidewalks are provided along both sides of Pfungsten Road, Shermer Road, Patriot Boulevard, Willow Road, Monterey Drive, and Tower Drive and along the west side of Greenwood Road and the north side of West Lake Avenue. An off-street shared use path is provided along the south side of West Lake Avenue. Crosswalks are maintained along all three legs of the West Lake Avenue and Shermer Road intersection, all four legs of the West Lake Avenue and Pfungsten Road intersection, all five legs of the West Lake Avenue and Patriot Boulevard/Tower Drive intersection and the south leg of the West Lake Avenue and Monterey Drive intersection.



Public Transportation

Pace Bus operates three existing bus routes with stops within ½ to 1 mile of the proposed site.

- Pace Bus Route 210 (Lincoln Avenue) operates weekday early morning through early evening service between Glenview and Lincolnwood, picking up and dropping off near the site with stops at West Lake Avenue and Greenwood Road.
- Pace Bus Route 423 (Linden CTA/The Glen/Harlem CTA) operates weekday service between Wilmette and the northwest side of Chicago, picking up and dropping off near the site with stops along Patriot Boulevard including Compass Road, West Lake Avenue, and Navy Boulevard (at the Glen Tower Center) and at Chestnut Avenue and Lehigh Avenue.
- Pace Bus Route 422 (Linden CTA/Glenview/Northbrook Court) operates weekday service between Wilmette and Northbrook, picking up and dropping off near the site with stops at Willow Road and Shermer Road.

Metra provides commuter rail service along the Milwaukee District North Line that begins in Fox Lake and ends at Union Station in Chicago. The Glen of North Glenview Station is located on Old Willow Road, approximately 1-mile east of the proposed site.

Existing Operations

The effectiveness of an intersection's operation is measured in terms of Level of Service ("LOS"), which is assigned a letter from A to F based on the average total delay experienced by each vehicle passing through an intersection. Level of Service A is the highest (best traffic flow and least delay), Level of Service E represents saturated or at-capacity conditions, and Level of Service F is the lowest (oversaturated conditions). Typically, Level of Service D is the lowest satisfactory level accepted by public agencies in Northeastern Illinois for design of peak-hour conditions.

An intersection capacity analysis was utilized to analyze the intersection for the weekday morning, weekday evening, and Sunday morning church peak hours using the methodologies outlined in the *Highway Capacity Manual (HCM)*¹. The results in **Table 1** show that all intersections operate at acceptable levels of services, at LOS "D" or better, with the exception of the intersections of West Lake Avenue and Greenwood Road, West Lake Avenue and Patriot Boulevard/Tower Drive, and Willow Road and Shermer Road. During the weekday morning and evening peak hours, the West Lake Avenue eastbound and westbound approaches and the Greenwood Road northbound approach operate with capacity constraints at a LOS "E/F." However, as previously noted, intersection improvements are currently planned by the Village that will substantially improve operations at this intersection.

At the West Lake Avenue and Patriot Boulevard/Tower Drive intersection, the West Lake Avenue eastbound and westbound approaches as well as the Tower Drive northeast bound approach currently operate at LOS "E," which may be associated with the changing travel patterns in the area due to the ongoing construction projects along with the unique geometrics of this intersection (5-leg intersection) and long pedestrian clearance intervals. Capacity constraints at the Willow Road and Shermer Road intersection are also currently experienced due to the lane closures on Willow Road in connection with aforementioned Willow Road Reconstruction Project.

¹Highway Capacity Manual, Transportation Research Board, National Research Council, Washington, D.C., 2010.



Also, as previously noted, at the time the study was conducted, Shermer Road was closed north of the study area at the Union Pacific Bridge. The HCM spreadsheets containing the intersection analyses are provided in the Appendix.

Table 1: Existing Capacity Analysis Summary

Intersection	Time of Day		
	Weekday AM Peak Hour	Weekday PM Peak Hour	Sunday AM Church Peak Hour
West Lake Ave and Pfingsten Rd	EB – D (47.7) WB – D (45.5) NB – D (50.0) SB – D (43.0) LOS* - D (46.5)	EB – D (42.3) WB – D (47.5) NB – D (44.0) SB – D (45.3) LOS* - D (45.2)	EB – C (28.3) WB – C (33.9) NB – C (22.3) SB – B (18.5) LOS* - C (22.8)
West Lake Ave and Greenwood Rd	EB – F (65.7) WB – F (91.6) NB – F (169.3) SB - B (12.8)	EB – F (58.4) WB – F (245.4) NB – E (38.4) SB - B (12.4)	EB – A (9.9) WB – B (11.8) NB – B (10.8) SB – A (8.7)
West Lake Ave and Monterey Dr	EBL – A (8.1) WBL – A (9.4) NB – C (25.0) SB - B (12.5)	EBL – A (8.8) WBL – A (8.5) NB – C (20.5) SB – B (14.9)	EBL – A (7.7) WBL – A (7.8) NB – B (10.8) SB --- (–)
West Lake Ave and Shermer Rd	EBL – A (8.4) SB – B (13.8)	EBL – A (9.0) SB – B (14.8)	EBL – A (7.8) SB – B (10.7)
West Lake Ave and Patriot Rd / Tower Dr	EB – E (61.1) WB – E (65.7) NB – C (24.0) SB – C (27.9) NEB – E (68.9) LOS* - D (44.2)	EB – E (59.1) WB – E (64.9) NB – C (21.5) SB – C (29.3) NEB – E (65.8) LOS* - D (39.9)	EB – E (65.0) WB – E (70.1) NB – B (14.0) SB – B (17.9) NEB – E (68.9) LOS* - D (37.2)
Shermer Rd and Avenue D	NBL – A (7.9) EB – B (10.1)	NBL – A (7.9) EB – B (10.2)	NBL – A (7.3) EB – A (8.6)
Shermer Rd and Constellation Dr	NBL – A (7.8) EB – A (9.3)	NBL – A (7.8) EB – A (9.5)	NBL – A (7.3) EB – A (8.6)
Willow Rd and Shermer Rd	EB – B (17.8) WB – D (47.8) NB – E (57.4) SB – F (90.0) LOS* - D (46.5)	EB – B (19.6) WB – D (41.0) NB – E (59.3) SB – E (57.8) LOS* - D (37.7)	EB – B (14.5) WB – C (21.8) NB – D (44.1) SB – D (45.7) LOS* - C (23.4)

*LOS – Overall Level of Service for Signalized Intersections

WB – Westbound, EB – Eastbound, NB – Northbound, SB – Southbound, NE – Northeast bound

L – Left-Turn Movement



FUTURE TRAFFIC CHARACTERISTICS

This section of the report presents the traffic characteristics associated with the subject residential and church developments and background development within the vicinity of the site, and evaluates the impact of future traffic on the area street system. This includes discussions regarding site development plans, site-generated traffic volumes and their distributions on the surrounding roadway network. Site access, site traffic assignment and future traffic volumes will also be discussed.

Traffic Growth

The proposed residential and church developments are anticipated to be completed and occupied by the year 2014. In accordance with Village of Glenview requirements, future traffic volume conditions were developed for the year 2019, build-out plus five (5) years. Two develop future traffic volumes, two components of traffic growth were considered. First, an annual average traffic-growth percentage was determined. For the purpose of this study and based on a review of historical IDOT traffic volumes, recent studies performed in the area, and Chicago Metropolitan Agency for Planning (CMAP projections), traffic volumes along the roadways surrounding the site are assumed to experience an overall annual, compounded growth rate of approximately one (1) percent per year. All traffic growth calculations are attached.

Second, any planned or approved specific developments in the area that would generate a significant volume of traffic on study area roadways within the project design horizon were included. The Pulte Homes Regency at the Glen subdivision is located west of the proposed site. The 40 duplex units have been constructed and substantially occupied and the 109 town homes are currently under construction. To estimate the volume of traffic to be generated by the town home component of the development, trip generation rates provided in the Institute of Transportation Engineers (ITE) *Trip Generation, 9th Edition*², Land Use Code (LUC) 230, Condominium/Townhouse, were utilized and assigned to the roadway network.

The site-generation characteristics of the existing site are summarized in **Table 2**. All trip generation calculations are attached.

Table 2: Existing Site Generated Traffic Volumes

Land Use	Weekday AM Peak Hour			Weekday PM Peak Hour			Sunday AM Church Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
Townhouse – 109 Units (LUC 230)	10	45	55	45	20	65	35	40	75

² Trip Generation, 9th Edition, Institute of Transportation Engineers (ITE), Washington, D.C., 2012.



Planned Roadway Improvements

Based on discussions with officials from the Village of Glenview and IDOT, there are three roadway improvement projects currently under construction or planned in the vicinity of the proposed project.

Shermer Road Bridge Repairs

As previously indicated, Shermer Road is currently closed approximately ½ mile north of the subject site due to repairs to the Shermer Road Railroad Bridge by the Union Pacific Railroad. The bridge collapsed after a freight train derailment in July 2012. A temporary connection between Shermer Road and Patriot Boulevard via Old Willow Road has been installed to facilitate traffic to/from the businesses south of the Union Pacific Bridge. A final project completion of 2014 is anticipated. Accordingly, these improvements are included in the analysis of future conditions.

West Lake Avenue and Greenwood Road

This project consists of geometric and traffic control improvements for the intersection of West Lake Avenue and Greenwood Road, located approximately ¼ mile west of the subject site. This project includes the installation of a traffic control signal at this location, consolidation of the commercial driveways on the north side of West Lake Avenue to align opposite Greenwood Road, widening along West Lake Avenue to provide a three-lane cross-section, and widening along Greenwood Road to provide a separate left- and right-turn lane. The proposed signal is proposed to be interconnected with the existing traffic control signal at West Lake Avenue at Pfingsten Road. The signal will also include the provision for fire and emergency vehicle pre-emption, along with pedestrian indications to safely accommodate pedestrians. The intersection improvements are currently programmed in the IDOT Proposed Multi-Modal Transportation Improvement Program (FY 2014-2019) and are anticipated to be completed in 2014. Accordingly, these improvements are included in the analysis of future conditions.

Willow Road Reconstruction – IL Route 43 to Interstate 94

This project consists of geometric and traffic control improvements along Willow Road between Illinois Route 43 (Waukegan Road) and Interstate 94 (I-94), including improvements to I-94 Westbound Off-Ramp, I-94 Eastbound On-Ramp, Waukegan Road, Sunset Ridge Road, and Wagner Road. The project will also include pedestrian safety features, interconnection of traffic signals, lighting improvements, as well as drainage, water main, and sanitary sewer improvements. One lane of traffic along Willow Road and Waukegan Road will be maintained during construction. The improvements commenced in the spring of 2013 and are slated for completion in the fall of 2014.

2019 No-Build (Non-Site) Conditions

The 2019 No-Build peak hour traffic volumes were accordingly developed by applying a one percent annual growth rate to the existing traffic (Figure 2) and adding the traffic associated with the Pulte Homes Regency at the Glen town home development and the completion of the Shermer Road Bridge (opening of the closed section of Shermer Road north of the study area) and the Willow Road Reconstruction project. The adjustments to the peak hour networks to account for the opening of Shermer Road at the Union Pacific Railroad were accomplished by a review of available historical intersection turning movement counts and daily traffic counts conducted along and at the intersection of Shermer Road and West Lake Avenue prior to the closure of Shermer Road. Similar



adjustments were also made to account for the Willow Road Reconstruction project, again using available historical turning movement counts and daily traffic counts. The 2019 No-Build traffic-flow networks are graphically depicted on **Figure 3**.

Development Plans

The proposed Westgate at the Glen residential development includes the construction of 173 residential units (34 cluster homes, 68 mews homes, and 71 row homes). Access to the residential site is proposed onto West Lake Avenue, Shermer Road, Valcour Drive, Dauntless Drive, Constellation Drive, and Saipan Drive.

The Willow Creek Community Church development includes the construction of a 72,000± square-foot, one-story worship facility containing a 1,200-seat auditorium, church office, meeting rooms, and classrooms. The proposed facility will replace the existing North Shore campus services currently held at the Christian Heritage Academy located on Waukegan Road in Northfield, Illinois.

The proposed facility will provide two scheduled services on Sunday at 9:00 and 11:15 AM, with a typical duration of an hour and 15 minutes; classes and small groups are held concurrently with scheduled services. A third, smaller service, is also held on Sunday from 6:00 to 8:00 PM. A Saturday evening service (5:45 PM) will be added when growth in membership warrants, which is anticipated to occur in the year 2017. Church membership is anticipated to grow approximately five (5) percent per year. Additional, non-reoccurring group meetings/activities may be held on weekdays. Local off-duty police officers are anticipated during peak Sunday morning services to facilitate traffic entering/exiting the proposed access driveways and at adjacent intersections, as well as trained volunteer traffic directors within the church parking lot to facilitate on-site circulation and to discourage cut-through traffic in the adjacent residential neighborhoods.

Access to the church site is proposed via Shermer Road and Valcour Drive. To minimize impacts to adjacent residential neighborhoods, weekday traffic will be directed to access and egress the site via the Shermer Road access. This will be accomplished via temporary measures such as traffic cones placed on the church access to Valcour Drive and/or internal to the site. In addition, to facilitate traffic exiting the site during the peak Sunday services, the Shermer Road access will be restricted to egress only for approximately 20 minutes after the conclusion of the 9:00 AM and 11:15 AM Sunday services (from approximately 10:15 to 10:35 AM and 12:30 to 12:50 AM).

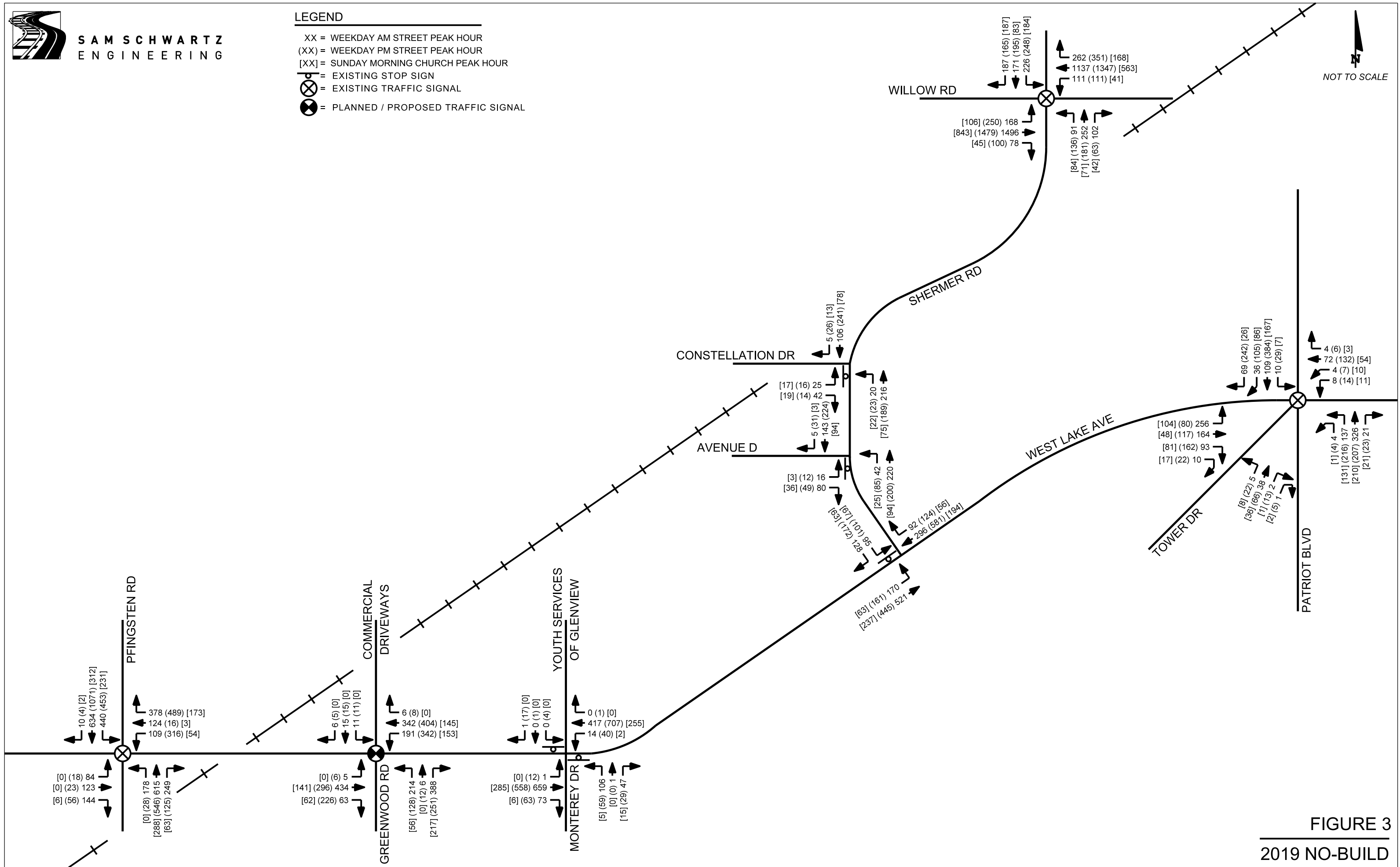
Trip Generation

The estimates of traffic to be generated by the site are based upon the proposed land use type and size. The ITE *Trip Generation* manual was used to estimate the volume of traffic generated by the residential development. The ITE report is a compilation of national traffic data surveys utilized to estimate traffic volumes for various land uses. However, to ensure the specific characteristics associated with this church are reflected, the estimates of traffic to be generated by the proposed relocation are based upon data from the existing Willow Creek Community Church North Shore campus.



LEGEND

- XX = WEEKDAY AM STREET PEAK HOUR
- (XX) = WEEKDAY PM STREET PEAK HOUR
- [XX] = SUNDAY MORNING CHURCH PEAK HOUR
- ⊕ = EXISTING STOP SIGN
- ⊗ = EXISTING TRAFFIC SIGNAL
- ⊗ = PLANNED / PROPOSED TRAFFIC SIGNAL



**FIGURE 3
2019 NO-BUILD**



Trip generation estimates for the proposed church were obtained from the Trip Generation & Distribution Study prepared for the Willow Creek Community Church by Hampton, Lenzini and Renwick, Inc. (HLR) dated May 1, 2013. Since the trip generation estimates provided in this study were based on data provided by church staff, SSE conducted traffic counts at all driveways serving the existing Willow Creek Community Church North Shore campus during the Sunday peak period (10:00 AM to 1:00 PM) in June 2013. A comparison of the traffic counts collected by SSE to the HLR estimates revealed the HLR counts were approximately 25 percent higher than those observed by SSE. Due to the seasonal variation of church attendance, which typically drops during the summer months coinciding with vacations, etc., the variation between the HLR and SSE estimates are reasonable. Accordingly, to provide a conservative (worse-case) analysis scenario, the higher trip generation estimates, as summarized in the HLR memorandum, were used in this study. The HLR memorandum and the traffic counts conducted by SSE at the existing facility are provided in the Appendix.

Based on the information collected for this study at the existing Willow Creek Community Church North Shore campus and the ITE *Trip Generation* manual, the ITE and empirical trip rates were compared and the higher of the two rates were used to determine the expected generation of the proposed church development. A comparison between the ITE trip generation rates and the empirical trip generation are detailed in **Table 3**.

Table 3: Trip Generation Comparison – Willow Creek Community Church

Land Use / Size	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekday Daily			Sunday AM Church Peak Hour			Sunday Daily		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
ITE															
Church (LUC 560) / 72,000 SF	25	15	40	19	21	40	328	328	656	425	442	867	1319	1319	2638
Willow Creek Community Church Empirical Data															
Year 2019 - HLR Study	27	0	27	27	27	54	86	86	172	440	398	838	1065	1065	2130
(Δ ITE – WCCC)	-2	15	13	-8	-6	-14	242	242	484	-15	44	29	254	254	508

As shown in Table 1, the ITE data, in general, produce higher estimates of proposed trips than the empirical data. Therefore, the ITE data were used in this study to depict the trip-generation characteristics of the proposed project, again, to provide a conservative analysis scenario.

The total trips to be generated for the proposed development are detailed in **Table 4**. All trip generation calculations are provided in the Appendix.



Table 4: Estimated Trip Generation

Land Use / Size	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekday Daily			Sunday AM Church Peak Hour			Sunday Daily		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
Westgate at the Glen															
Cluster Homes – 34 Units (LUC 210)	8	26	34	25	15	40	195	195	390	19	15	34	151	151	302
Mew & Row Homes- 139 Units (LUC 230)	11	56	67	53	26	79	420	420	840	40	42	82	392	392	784
<i>Total</i>	<i>19</i>	<i>82</i>	<i>101</i>	<i>78</i>	<i>41</i>	<i>119</i>	<i>615</i>	<i>615</i>	<i>1230</i>	<i>59</i>	<i>57</i>	<i>116</i>	<i>543</i>	<i>543</i>	<i>1086</i>
Willow Creek Community Church															
Church (LUC 560) / 72,000 SF	25	15	40	19	21	40	328	328	656	425	442	867	1319	1319	2638
Total Parcel 24	44	97	141	97	62	159	943	943	1886	484	499	983	1862	1862	3724

As shown in Table 4, it is expected that the proposed redevelopment of Parcel 24 at the Glen will generate approximately 1,886 total trips on a typical weekday and 3,724 total trips on a typical Sunday. During the weekday morning peak hour, the development is expected to generate approximately 141 new vehicle trips (44 entering and 97 exiting), approximately 159 new vehicle trips (97 entering and 62 exiting) during the weekday evening peak hour, and approximately 983 new vehicle trips (484 entering and 499 exiting) during the Sunday morning church peak hour.

It should be noted, although it is anticipated that 1 to 2 percent of church traffic will be drawn from the adjacent residential developments to provide a conservative (worse case) analysis scenario this traffic was not diverted from the future traffic volume networks and was considered to be all new traffic.

Directional Distribution

The directional distribution of the site-generated traffic is a function of several variables, including the existing traffic volumes, surrounding roadways system, and adjacent land uses. For the church development, the distributions were derived based on information provided by the Willow Creek Church and the direction from which members are expected to enter and exit the facility. The anticipated directional distribution of the site traffic is shown in **Table 5** and on **Figure 4**.



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LEGEND

- XX = RESIDENTIAL TRIPS
- [XX] = CHURCH TRIPS
- ⊥ = EXISTING STOP SIGN
- ⊥ = PROPOSED STOP SIGN
- ⊗ = EXISTING TRAFFIC SIGNAL
- ⊗ = PLANNED / PROPOSED TRAFFIC SIGNAL



NOT TO SCALE

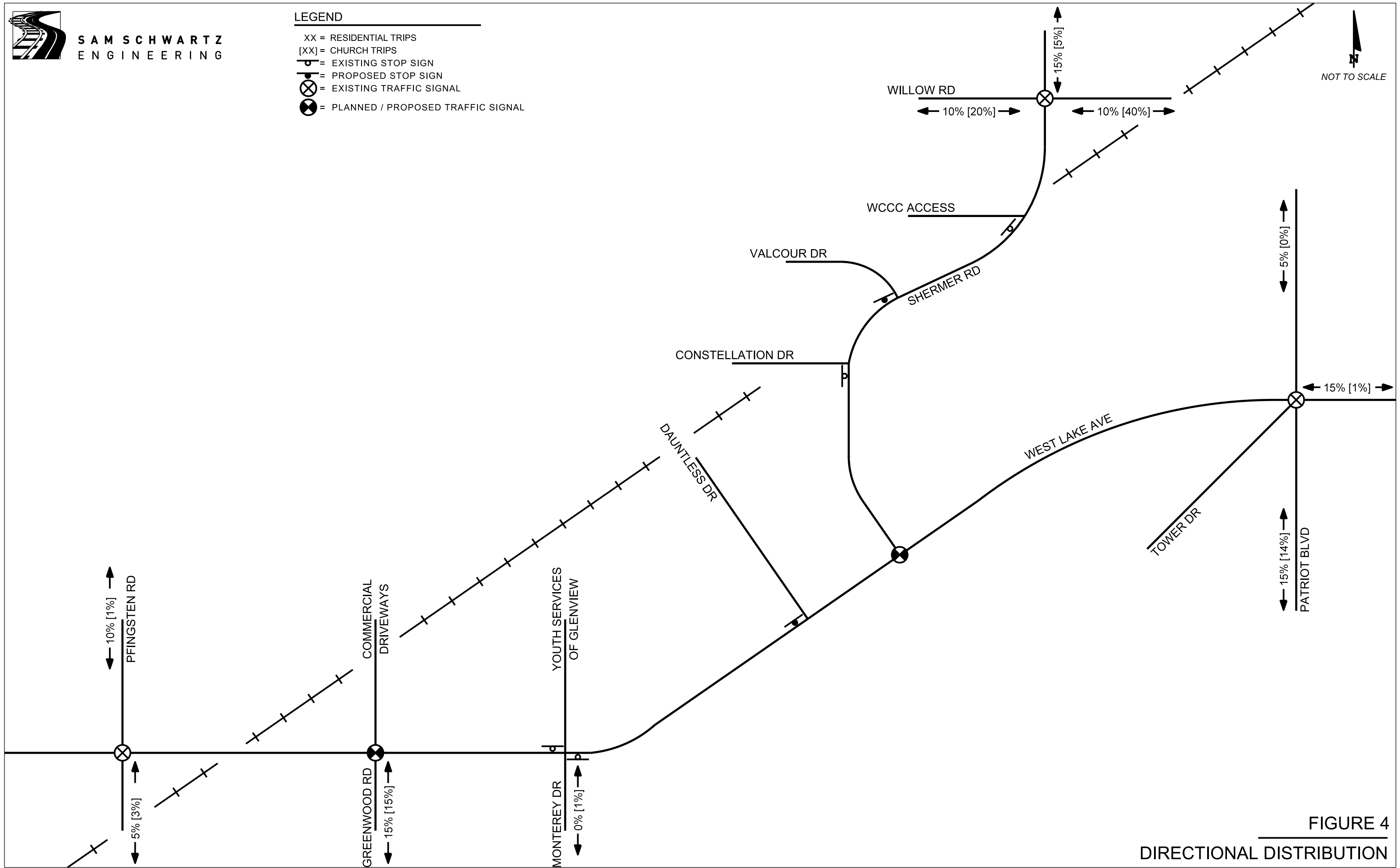


FIGURE 4
DIRECTIONAL DISTRIBUTION



Table 5: Directional Distribution

To/From the...	Directional Distribution	
	Residential	Church
North on Pfingsten Road	10%	1%
South on Pfingsten Road	5%	3%
South on Greenwood Road	15%	15%
South on Monterey Drive	--	1%
North on Patriot Boulevard	5%	--
South on Patriot Boulevard	15%	14%
East on West Lake Avenue	15%	1%
West on Willow Road	10%	20%
East on Willow Road	10%	40%
North on Shermer Rd	15%	5%
Total	100%	

Site Traffic Assignment

Based on the direction of travel, the site-generated trips were assigned to the roadway network by utilizing the site estimated trips listed in Table 4 and the directional distribution outlined in Table 5. The site traffic assignment is illustrated on **Figures 5A and 5B** for the residential and church developments, respectively.

Total Traffic Assignment

The site-generated traffic volumes (Figures 5A and 5B) were then added to the 2019 No-Build traffic volumes (Figure 3) to develop the 2019 Build traffic volumes, which include a reassignment of existing traffic associated with the closure of Avenue D and the new access on Shermer Road, Valcour Drive. The total traffic volumes for the year 2019 are shown on **Figure 6**.



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LEGEND

- XX = WEEKDAY AM STREET PEAK HOUR
- (XX) = WEEKDAY PM STREET PEAK HOUR
- [XX] = SUNDAY MORNING CHURCH PEAK HOUR
- ⊕ = EXISTING STOP SIGN
- ⊕ = PROPOSED STOP SIGN
- ⊗ = EXISTING TRAFFIC SIGNAL
- ⊗ = PLANNED / PROPOSED TRAFFIC SIGNAL

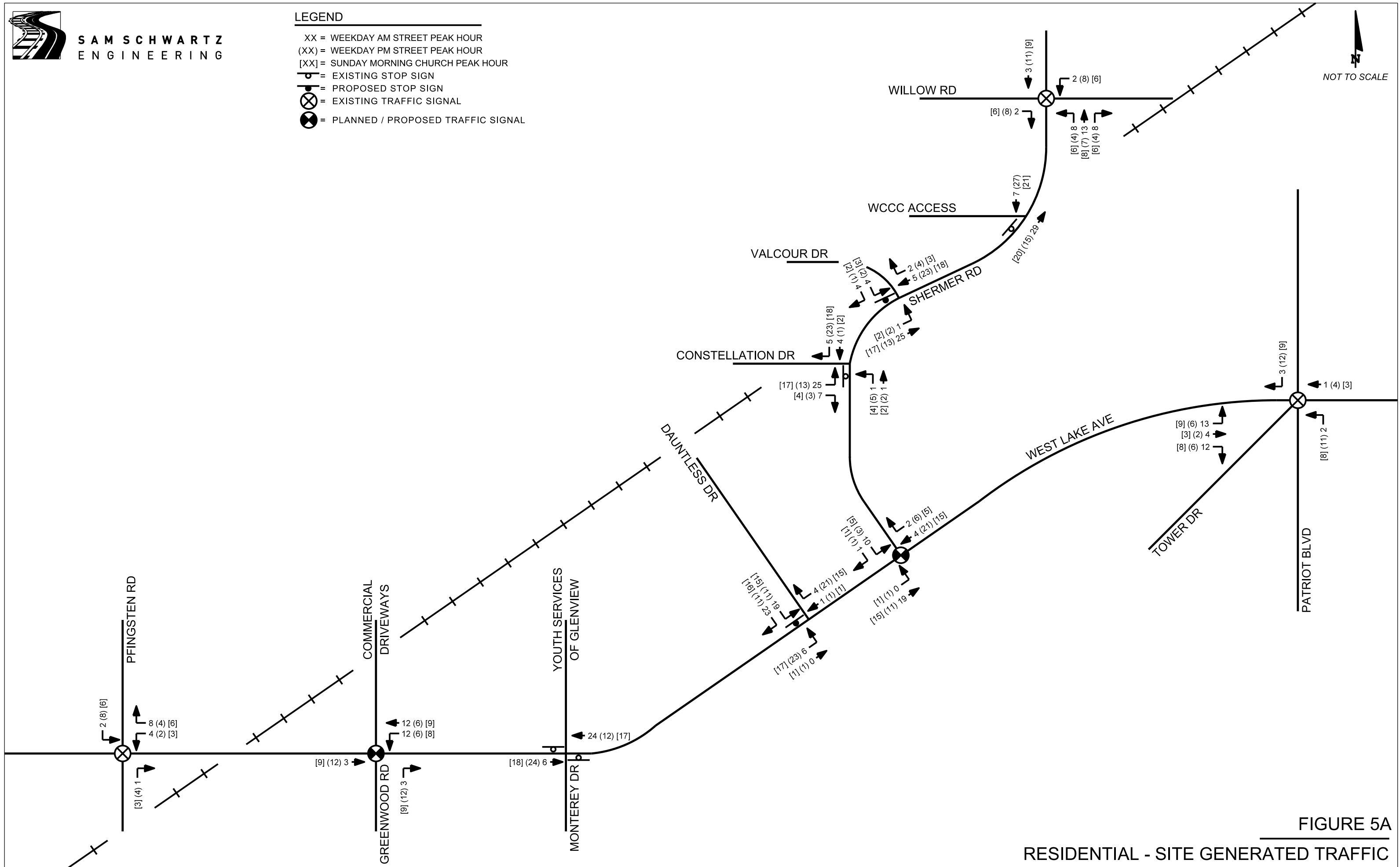


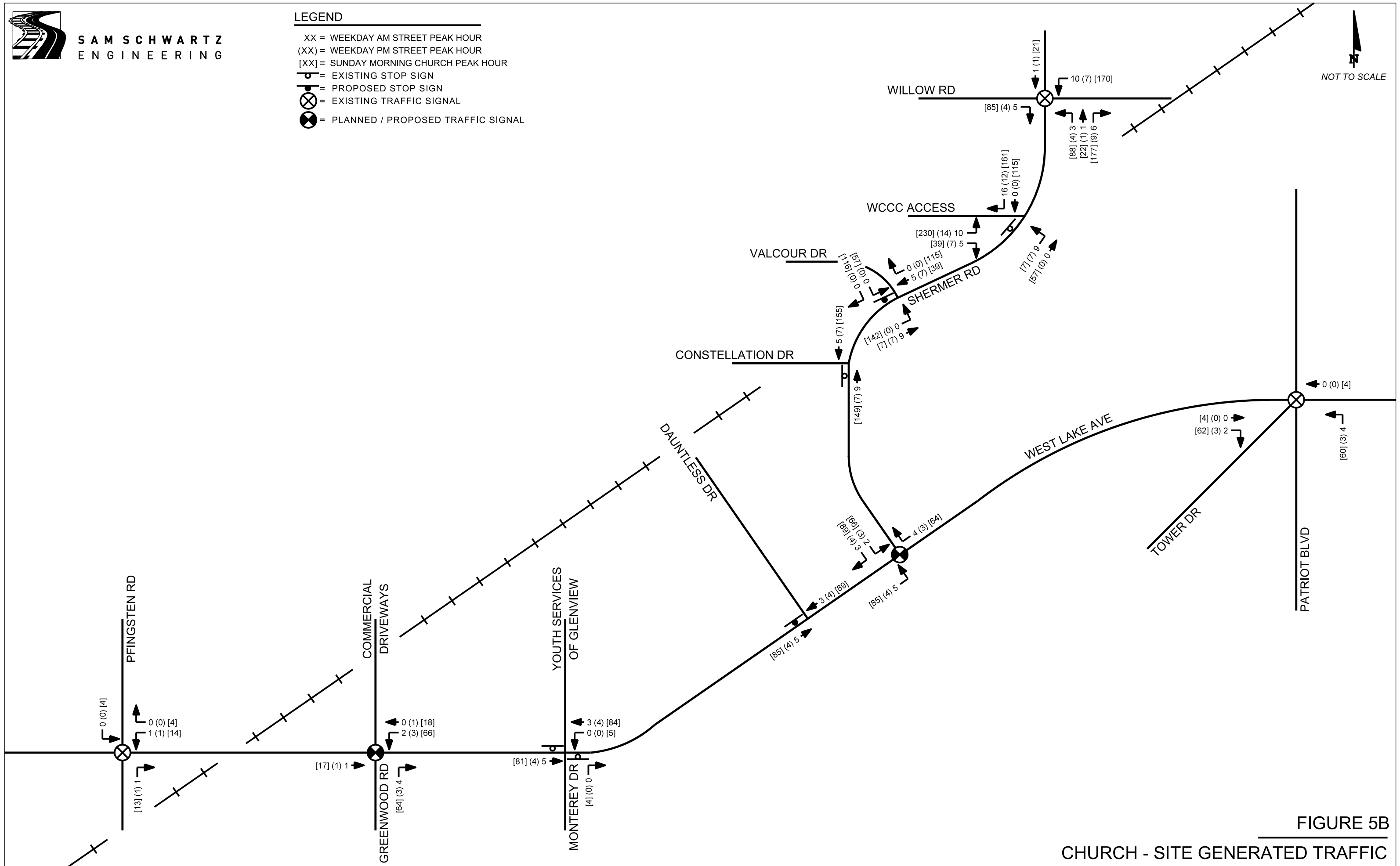
FIGURE 5A
RESIDENTIAL - SITE GENERATED TRAFFIC



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LEGEND

- XX = WEEKDAY AM STREET PEAK HOUR
- (XX) = WEEKDAY PM STREET PEAK HOUR
- [XX] = SUNDAY MORNING CHURCH PEAK HOUR
- ⊥ = EXISTING STOP SIGN
- ⊥ = PROPOSED STOP SIGN
- ⊗ = EXISTING TRAFFIC SIGNAL
- ⊗ = PLANNED / PROPOSED TRAFFIC SIGNAL



**FIGURE 5B
CHURCH - SITE GENERATED TRAFFIC**



LEGEND

- XX = WEEKDAY AM STREET PEAK HOUR
- (XX) = WEEKDAY PM STREET PEAK HOUR
- [XX] = SUNDAY MORNING CHURCH PEAK HOUR
- ⊥ = EXISTING STOP SIGN
- ⊥ = PROPOSED STOP SIGN
- ⊗ = EXISTING TRAFFIC SIGNAL
- ⊗ = PLANNED / PROPOSED TRAFFIC SIGNAL

NOT TO SCALE

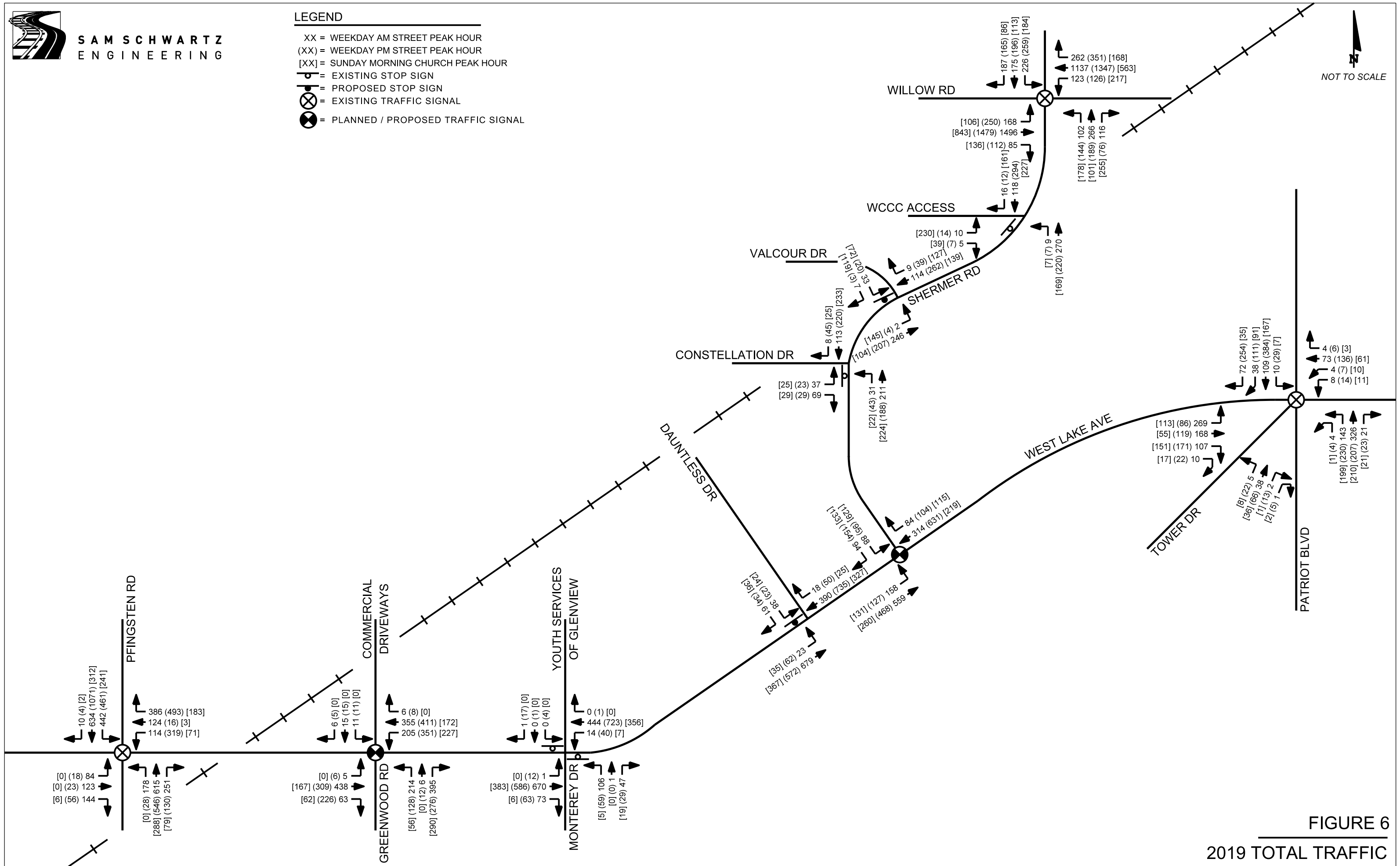


FIGURE 6
2019 TOTAL TRAFFIC



Traffic Increases

The proposed development project will result in increases in traffic on the study area roadways. As shown on Figures 5A and 5B, the traffic volume increases beyond the study area are expected to be the following:

- On West Lake Avenue, east of Shermer Road, through the Patriot Boulevard intersection: 41 to 47 vehicles during the weekday AM and PM peak hours and 170 vehicles during the Sunday AM peak hour;
- On Shermer Road, north of Valcour Drive, through the Willow Road intersection: 62 to 68 during the weekday AM and PM peak hours and 604 vehicles during the Sunday AM peak period;
- On Monterey Road, south of West Lake Avenue: 9 vehicles during the Sunday AM peak hour;
- On Greenwood Road, south of West Lake Avenue: 21 to 24 vehicles during the weekday AM and PM peak hours and 147 vehicles during the Sunday AM peak hour; and
- On West Lake Avenue, west of Greenwood Road, through the Pfingsten Road intersection: 16 to 20 vehicles during the weekday AM and PM peak hours and 53 vehicles during the Sunday AM peak hour.

These increases represent, on average, less than one additional vehicle every minute during the weekday morning and evening peak periods, which represents about 2 additional vehicle trips per cycle length at the adjacent signalized intersections.

As shown in the existing and future capacity analysis and traffic simulations, there is able capacity available at the adjacent study area intersections to adequately accommodate the increase in Sunday morning church traffic, with the implementation of the planned and proposed geometric and signal improvements and with the use of off-duty police officers during the Sunday morning church peak services.

Land Use Trip Generation Comparison – Northern 14± Acre Parcel

A comparison was made between what the northern 14± acre parcel would generate if it were operating as a residential development versus the proposed Willow Creek Community Church development. Two alternative residential development scenarios were evaluated: cluster home subdivision (60 homes) and an apartment development (216 units). A summary of this trip generation comparison is provided in **Table 6**.



Table 6: Trip Generation Comparison - 14± Acre Parcel

Land Use / Size	Weekday AM Peak Hour			Weekday PM Peak Hour			Weekday Daily			Sunday AM Church Peak Hour			Sunday Daily		
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
Cluster Homes															
60 Units (LUC 210)	13	39	52	42	24	66	328	328	656	30	27	57	151	151	517
Apartments															
216 Units (LUC 220)	22	88	110	88	48	136	717	717	1434	55	55	110	643	643	1286
Willow Creek Community Church															
Church (LUC 560) / 72,000 SF	25	15	40	19	21	40	328	328	656	425	442	867	1319	1319	2638
Net Change in Site Trips (Δ Church – Single Family)	12	-24	-12	-23	-3	-26	0	0	0	395	415	810	1168	1168	2121
Net Change in Site Trips (Δ Church – Apartments)	3	-73	-70	-69	-27	-96	-389	-389	-778	370	387	757	676	676	1352

As shown in Table 6, during the critical weekday peak hours, the Willow Creek Community Church development is expected to generate 12 less bi-directional trips during the weekday AM peak hour and 26 less bi-directional trips during the weekday PM peak hour as compared to a single family development. This represents, on average, approximately, one less vehicle every two to five minutes during the weekday peak hours. Similarly, the Willow Creek Community Church development is expected to generate 70 less bi-directional trips during the weekday AM peak hour and 27 less bi-directional trips during the weekday PM peak hour as compared to a multi-family housing development. This represents, on average, approximately one to two less vehicles every minute during the weekday peak hours.

During the Sunday morning church peak hour, the Willow Creek Community Church development is expected to generate 757 to 810 additional bi-directions trips as compared to an apartment and single family development, respectively. This represents, on average, approximately 12 to 14 additional vehicles every minute during the Sunday morning church peak hour. However, the Sunday morning church peak hour traffic is significantly less than the weekday morning and evening peak hours. Accordingly, there is ample capacity available at the study area intersections to adequately accommodate the increase in Sunday morning church traffic, with the implementation of the planned and proposed geometric and signal improvements and with the use of off-duty police officers during the Sunday morning church peak services.



ANALYSIS

Analyses were conducted to determine whether the adjacent roadway network would be able to accommodate the needs of the proposed residential and church developments. The analyses conducted include signal warrant analysis, turn-lane warrant analysis and capacity and queue analyses for the future traffic conditions at the study intersections.

Signal Warrant Analysis

A signal warrant analysis was performed for the intersection of West Lake Avenue and Shermer Road. The analysis was based on the Manual on Uniform Traffic Control Devices (“MUTCD”)³, criteria for installation of a traffic control signal.

The warrant analysis considers peak hour traffic volumes at the intersections and makes comparisons to minimum traffic volume thresholds to determine if the installation of a traffic signal should be considered. The MUTCD is the standard reference application of traffic signals and contains eight different warrant types for the justification of traffic signals. It is stated that if one or more of the warrants are satisfied, a traffic signal is justified and could be installed.

Section 4C.04, Warrant 3 - Peak Hour of the MUTCD, was examined to determine whether a traffic signal was warranted due to the amount of delay that a minor street suffers when entering a major street. In order for a traffic signal to be warranted under this condition, the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding vehicles per hour on the higher-volume minor street approach (one direction only) for 1 hour of an average day must fall above the applicable curve on Figure 4C-3 of the MUTCD for the existing combination of approach lanes. The graphical representation and the application of the estimated traffic volumes are shown on Figure 4C-3 provided in the Appendix.

As shown on the graph presented in the Appendix, it can be concluded that the signal warrant is met under future (year 2019) No-Build (non-site) conditions at the intersection of Shermer Road and West Lake Avenue. Accordingly, a traffic control signal should be installed at this intersection.

The proposed signalized intersection should be coordinated with the existing traffic signal at the intersection of West Lake Avenue and Patriot Boulevard, as well as the proposed traffic signal at West Lake Avenue and Greenwood Road, due to the close proximity of these intersections and to allow progression of traffic along West Lake Avenue.

Auxiliary Lane Analysis

Based on the preliminary site plan, access to the church site will be provided onto Shermer Road via Valcour Drive, approximately 650 feet north of Constellation Drive, and a full access driveway approximately 825 feet north of Valcour Drive, center line to center line. Access to the residential site will be provided onto Shermer Road via Constellation Drive and Valcour Drive as well as onto West Lake Avenue, approximately 480 feet west of Shermer Road. This study examined whether a right-turn deceleration lane and/or a left-turn storage lane is required for each access drive under future

³ Manual on Uniform Traffic Control Devices, Federal Highway Administration, 2009 Edition.



design year conditions (year 2019). A two-way left-turn lane is currently provided along West Lake Avenue adjacent to the site.

*IDOT's Bureau of Design and Environment Manual (BDE)*⁴ was utilized to determine the need for exclusive right and left turn lanes. *Section 36-3 – Auxiliary Turn Lanes* indicates that a right turn lane is considered at any unsignalized intersection that satisfies the criteria illustrated in Figure 36-3A for two-lane highways. Based on the geometric design and lane usage of West Lake Avenue and Shermer Road and the estimated volume of traffic, an auxiliary right turn lane is warranted on westbound West Lake Avenue at the residential access (Dauntless Drive). The right-turn lane storage length should be a minimum of 125 feet with a turn lane taper of 155 feet for a design speed of 35 mph. A right-turn lane is warranted on southbound Shermer Road at Valcour Drive and should provide a minimum storage length of 100 feet with a 135 foot taper. In addition, a right-turn lane is warranted on southbound Shermer Road at the proposed church access; however, due to existing right-of-way constraints on Shermer Road north of the subject site, a southbound right-turn lane cannot be adequately developed. It should be noted, this turn lane is warranted for a short duration, during the Sunday morning peak services only. Furthermore, an off-duty police officer will be controlling intersection operations during this time period, which will facilitate entering and exiting traffic and in the unlikely event that queuing (back-ups) were to occur on southbound Shermer Road, southbound entering traffic would be directed to the adjacent intersection of Valcour Drive, where a right-turn lane will be provided. A right-turn lane is not warranted for Constellation Drive. The graphical representation and the application of the estimated traffic volumes on Figure 36-3A for the right-turn lane warrant analyses are provided in the Appendix.

In addition, a left-turn lane is warranted at any unsignalized intersection that satisfies the guidelines depicted in Figure 36-3G for two-lane highways with a design speed of 40 mph. Based on the geometric design and lane usage of Shermer Road at Valcour Drive, Constellation Drive, and the church access driveway and the estimated volume of site-generated traffic, a left-turn lane is warranted on northbound Shermer Road at Valcour Drive. The left-turn lane should provide a minimum of 100 feet of storage length with a turn lane taper of 135 feet for a design speed of 30 mph. A left-turn lane is not warranted on Shermer Road at Constellation Drive or the church access driveway. The graphical representation and the application of the estimated traffic volumes on Figure 36-3G for the left-turn lane warrant analyses are provided in the Appendix.

Capacity and Queue Analysis

Capacity and queue analyses were conducted for assessing future (year 2019) traffic conditions of the weekday morning, weekday evening, and Sunday morning church peak hours using the methodologies outlined in the *Highway Capacity Manual*. In addition, the SimTraffic microsimulation program from Trafficware was utilized to evaluate queue lengths and blocking issues where necessary.

The 2013 existing capacity analysis, as previously summarized, assume the existing traffic volumes and geometric conditions. The 2019 No-Build (non-site) conditions assumed the planned signal and geometric improvements at the Greenwood Road and West Lake Avenue intersection, the

⁴Bureau of Design and Environment Manual, Illinois Department of Transportation, 2010 Edition.



completion of the Shermer Road Bridge Repairs (opening of the currently closed section of Shermer Road at the Union Pacific Bridge, north of the site) and the Willow Road Reconstruction project, general background growth (1% compounded annual growth rate), and the completion of the Pulte Regency at the Glen residential development. The 2019 Build conditions assume the 2019 No-Build conditions plus the site generated traffic and the previously described recommended improvements: construction of a northbound left-turn lane and southbound right-turn lane on Shermer Road at Valcour Drive, signal and geometric improvements at Shermer Road and West Lake Avenue, construction of westbound right-turn lane on West Lake Avenue at the residential access driveway (Dauntless Drive), and the use of off-duty police officers during the Sunday morning church peak period on Shermer Road at Valcour Drive and the church access drive and on Valcour Drive and the church access drive.

Summaries of the capacity analysis results indicating the LOS and delay for all study intersections under future conditions are presented in **Table 7** and are discussed below. All output worksheets used for these analyses are contained in the Appendix.

West Lake Avenue and Pfingsten Road

Comparison of existing and future conditions capacity analyses at the intersection of West Lake Avenue and Pfingsten Road, show the overall intersection and approaches will continue to operate at the same LOS in the future, at acceptable LOS “D,” or better. The intersection experiences minimal increases in delay, if any, as a result of the proposed projects.

West Lake Avenue and Greenwood Road

As previously described, the intersection of West Lake Avenue and Greenwood Road currently operates with capacity constraints during the weekday morning and evening peak hours at LOS “E/F.” Under future (year 2019) No-Build conditions (non-site), with the anticipated traffic growth within the study area, the completion of the Pulte Regency at the Glen subdivision, the Shermer Road Bridge Repairs, and the Village planned roadway and signal improvements, the intersection is modeled to operate at an overall level of service “C” during all three peak hours studies, with all approaches operating at acceptable levels, at LOS “D,” or better. Under 2019 Total Traffic conditions, with the addition of the site-generated traffic to 2019 No-Build conditions, this intersection is projected to continue to operate at an overall LOS “C” during all three peak periods. This intersection experiences minimal increases in delay, if any, as a result of the proposed project. No changes to the existing signal timing and phasing are required to accommodate the development traffic.



Table 7: Intersection Capacity Analysis Summary

Intersection	Existing Conditions			2019 No-Build (Non-Site)			2019 Total Traffic (With Site)		
	AM Peak	PM Peak	SUN Peak	AM Peak	PM Peak	SUN Peak	AM Peak	PM Peak	SUN Peak
West Lake Ave and Pflingsten Rd	EB – D (47.7) WB – D (45.5) NB – D (50.0) SB – D (43.0) LOS* - D (46.5)	EB – D (42.3) WB – D (47.5) NB – D (44.0) SB – D (45.3) LOS* - D (45.2)	EB – C (28.3) WB – C (33.9) NB – C (22.3) SB – B (18.5) LOS* - C (22.8)	EB – D (52.2) WB – D (46.6) NB – D (52.3) SB – D (41.8) LOS* - D (47.6)	EB – D (43.8) WB – D (49.6) NB – D (50.6) SB – D (38.7) LOS* - D (43.6)	EB – C (27.5) WB – C (33.8) NB – C (23.4) SB – B (19.5) LOS* - C (23.6)	EB – D (52.2) WB – D (46.8) NB – D (52.7) SB – D (42.3) LOS* - D (47.9)	EB – D (43.8) WB – D (49.7) NB – D (51.0) SB – D (40.7) LOS* - D (44.6)	EB – C (27.5) WB – C (34.4) NB – C (23.6) SB – B (19.6) LOS* - C (24.1)
West Lake Ave and Greenwood Rd	EB – F (65.7) WB – F (91.6) NB – F (169.3) SB - B (12.8)	EB – F (58.4) WB – F (245.4) NB – E (38.4) SB – B (12.4)	EB – A (9.9) WB – B (11.8) NB – B (10.8) SB – A (8.7)	EB – C (24.3) WB – B (16.2) NB – D (40.7) SB – C (28.3) LOS* - C (27.7)	EB – C (23.3) WB – B (14.1) NB – D (45.0) SB – D (35.3) LOS* - C (24.6)	EB – C (29.3) WB – B (14.2) NB – C (25.3) SB – B (15.6) LOS* - C (22.1)	EB – C (24.4) WB – B (13.2) NB – D (41.4) SB – C (28.3) LOS* - C (26.8)	EB – C (23.8) WB – B (11.7) NB – D (46.6) SB – D (35.3) LOS* - C (24.1)	EB – C (30.4) WB – B (14.9) NB – C (25.9) SB – B (15.6) LOS* - C (22.3)
West Lake Ave and Monterey Dr	EBL – A (8.1) WBL – A (9.4) NB – C (25.0) SB - B (12.5)	EBL – A (8.8) WBL – A (8.5) NB – C (20.5) SB – B (14.9)	EBL – A (7.7) WBL – A (7.8) NB – B (10.8) SB – N/A	EBL – A (8.2) WBL – A (9.8) NB – D (32.4) SB – B (13.2)	EBL – A (9.2) WBL – A (9.0) NB – D (26.2) SB – C (17.0)	EBL – A (7.8) WBL – A (8.7) NB – B (13.3) SB – N/A	EBL – A (8.3) WBL – A (9.9) NB – D (34.0) SB – B (13.6)	EBL – A (9.3) WBL – A (9.1) NB – D (27.6) SB – C (17.5)	EBL – A (8.3) WBL – A (8.6) NB – B (12.5) SB – N/A
West Lake Ave and Residential Access (Dauntless Drive)	N/A	N/A	N/A	N/A	N/A	N/A	EBL – A (8.5) SB – C (15.6)	EBL – A (10.0) SB – C (18.9)	EBL – A (8.4) SB – B (13.2)
West Lake Ave and Shermer Rd	EBL – A (8.4) SB – B (13.8)	EBL – A (9.0) SB – B (14.8)	EBL – A (7.8) SB – B (10.7)	EBL – A (9.0) SB – D (30.3)	EBL – B (10.2) SB – C (23.0)	EBL – A (7.9) SB – B (11.7)	EB – A (3.6) WB – B (11.7) SB – C (34.7) LOS* - B (10.5)	EB – A (3.9) WB – B (16.1) SB – C (34.4) LOS* - B (14.4)	EB – A (5.1) WB – B (14.6) SB – C (22.3) LOS* - B (13.2)
West Lake Ave and Patriot Blvd/Tower Dr	EB – E (61.1) WB – E (65.7) NB – C (24.0) SB – C (27.9) NEB – E (68.9) LOS* - D (44.2)	EB – E (59.1) WB – E (64.9) NB – C (21.5) SB – C (29.3) NEB – E (65.8) LOS* - D (39.9)	EB – E (65.0) WB – E (70.1) NB – B (14.0) SB – B (17.9) NEB – E (68.9) LOS* - D (37.2)	EB – E (58.1) WB – E (65.5) NB – C (23.3) SB – C (26.9) NEB – E (68.9) LOS* - D (41.4)	EB – E (60.2) WB – E (63.4) NB – C (20.6) SB – C (31.0) NEB – E (65.9) LOS* - D (39.3)	EB – E (64.1) WB – E (70.0) NB – B (12.1) SB – B (16.7) NEB – E (68.8) LOS* - C (33.1)	EB – E (58.2) WB – E (65.4) NB – C (23.9) SB – C (27.6) NEB – E (68.9) LOS* - D (42.0)	EB – E (60.1) WB – E (63.3) NB – C (21.6) SB – C (37.7) NEB – E (65.9) LOS* - D (40.6)	EB – E (63.2) WB – E (67.5) NB – B (14.6) SB – B (16.7) NEB – E (68.8) LOS* - D (35.8)
Shermer Rd and Avenue D	NBL – A (7.9) EB – B (10.1)	NBL – A (7.9) EB – B (10.2)	NBL – A (7.3) EB – A (8.6)	NBL – A (7.7) EB – B (10.3)	NBL – A (7.7) EB – A (9.8)	NBL – A (7.4) EB – A (9.0)	N/A	N/A	N/A
Shermer Rd and Constellation Dr	NBL – A (7.8) EB – A (9.3)	NBL – A (7.8) EB – A (9.5)	NBL – A (7.3) EB – A (8.6)	NBL – A (7.5) EB – B (10.0)	NBL – A (8.1) EB – B (11.6)	NBL – A (7.4) EB – A (9.3)	NBL – A (7.6) EB – B (10.3)	NBL – A (8.1) EB – B (11.6)	NBL – A (8.0) EB – B (12.1)
Shermer Rd and Valcour Dr	N/A	N/A	N/A	N/A	N/A	N/A	NBL – A (7.6) EB – B (10.9)	NBL – A (8.1) EB – B (12.4)	EBL ¹ – A (9.3) SB ¹ – C (22.1)
Shermer Rd and Church Access	N/A	N/A	N/A	N/A	N/A	N/A	NBL – A (7.5) EB – B (10.8)	NBL – A (7.9) EB – B (12.1)	NBL ¹ – N/A EB ¹ – F (121.4)
Shermer Rd and Willow Rd	EB – B (17.8) WB – D (47.8) NB – E (57.4) SB – F (90.0) LOS* - D (46.5)	EB – B (19.6) WB – D (41.0) NB – E (59.3) SB – E (57.8) LOS* - D (37.7)	EB – B (14.5) WB – C (21.8) NB – D (44.1) SB – D (45.7) LOS* - C (23.4)	EB – C (31.7) WB – C (30.8) NB – E (55.5) SB – E (55.6) LOS* - D (37.1)	EB – C (28.8) WB – D (51.4) NB – E (61.9) SB – E (69.6) LOS* - D (45.7)	EB – C (24.1) WB – C (22.9) NB – C (32.6) SB – D (35.3) LOS* - C (26.5)	EB – C (32.4) WB – C (31.8) NB – E (59.3) SB – E (58.4) LOS* - D (38.7)	EB – C (29.1) WB – D (51.3) NB – E (65.1) SB – E (77.7) LOS* - D (47.3)	EB – C (27.0) WB – C (29.6) NB – D (49.9) SB – D (39.0) LOS* - C (33.2)

¹ Intersection is controlled by police detail during the Sunday AM peak hour; therefore, operations better than those presented can be expected.
 *LOS –Overall for Signalized Intersections, WB –Westbound, EB –Eastbound, NB –Northbound, SB –Southbound, NE –Northeast Bound, L – Left Turn Movement



West Lake Avenue and Monterey Drive

Under future (year 2019) No-Build (non-site) and Total (with site) traffic conditions, turns entering Monterey Drive and the Youth Services of Glenview/Northbrook driveway from West Lake Avenue are expected to continue to operate at desirable LOS “A,” during all three peak periods studied. The Monterey Drive northbound approach and the Youth Services of Glenview/Northbrook driveway are expected to operate at acceptable LOS “D,” or better. The installation of the Village planned traffic control signal on West Lake Avenue at Greenwood Road and the proposed development installed traffic control signal at Shermer Road and West Lake Avenue will provide for gaps in the West Lake Avenue traffic that will allow entering from nearby side streets and driveways, such as Monterey Drive, to safely enter West Lake Avenue.

West Lake Avenue and Residential Access Driveway (Dauntless Drive)

Under future (year 2019) Total traffic conditions, turns entering and exiting the residential access driveway (Dauntless Drive) from/to West Lake Avenue are expected to operate at acceptable LOS “C” or better during all three peak periods studied. Future conditions also assumed that West Lake Avenue westbound would be widened at the access driveway to provide an exclusive right-turn lane.

Approximately 595 feet is provided (center line to center line) is provided between Dauntless Drive and Monterey Drive, providing stacking for approximately 21 vehicles (525 feet). The analysis and simulations conducted also show that the 95% percentile queue lengths for eastbound left-turning vehicles on West Lake Avenue at Dauntless Drive are not anticipated to exceed 1 vehicle, which will not impact adjacent intersection operations.

West Lake Avenue and Shermer Road

Under future (year 2019) No-Build conditions (non-site), with the anticipated traffic growth within the study area, the completion of the Pulte Regency at the Glen subdivision, the Shermer Road Bridge Repairs, and the Village planned roadway and signal improvements, turns entering Shermer Road from West Lake Avenue are expected to operate at desirable LOS “A/B” during all three peak hours studied. The Shermer Road southbound approach is anticipated to operate at acceptable LOS “D,” “C,” and “B” during the weekday morning, weekday afternoon, and Sunday morning church peak hours, respectively.

Under 2019 Total Traffic conditions, with the addition of the site-generated traffic, this intersection is anticipated to operate at an overall LOS “B” during all three peak periods. The analysis of the future total traffic conditions considered that a traffic signal would be installed at this intersection. Furthermore, the proposed signalized intersection at West Lake Avenue and Shermer Road should be coordinated with the existing traffic signal at the intersection of West Lake Avenue and Patriot Boulevard, as well as the proposed traffic signal at West Lake Avenue and Greenwood Road, due to the close proximity of these intersections and to allow progression of traffic along West Lake Avenue.

As proposed, the residential access on West Lake Avenue (Dauntless Drive) is located approximately 480 feet west of Shermer Road (center line to centerline), providing stacking for approximately 17 vehicles (425 feet). Eastbound 95th percentile vehicle queue lengths on West



Lake Avenue at the proposed signalized intersection with Shermer Road are not anticipated to exceed 100 feet (approximately 4 vehicles) which will not impact traffic operations at Dauntless Drive.

West Lake Avenue and Patriot Boulevard/Tower Drive

Comparison of existing and future conditions capacity analyses at the intersection of West Lake Avenue and Pfingsten Road, show the overall intersection and approaches will continue to operate at the same LOS in the future. The intersection experiences minimal increases in delay, if any, as a result of the proposed projects.

Shermer Road at Constellation Drive

Under future no-build and total traffic conditions, all approaches at the unsignalized intersection of Shermer Road at Constellation Drive operate at acceptable levels of service (LOS “B” or better) during all three peak periods studies.

Shermer Road at Valcour Drive

Under future no-build and total traffic conditions, all approaches at the proposed unsignalized intersection of Shermer Road at Valcour Drive operate at acceptable levels of service (LOS “B” or better) during all three peak periods studies. This intersection will be controlled by police detail during the Sunday morning church peak hour, thus operating at levels of service better than presented in Table 6, similar to if it were operating under traffic signal control. This can be seen in the traffic simulations conducted.

Future conditions also assumed that Shermer Road would be widened at Valcour Drive to provide a southbound right-turn lane and a northbound left-turn lane; the Valcour Drive eastbound approach will provide a separate left- and right-turn lane.

Shermer Road at Church Access Drive

Under future (year 2019) Total traffic conditions, turns entering the church access driveway from Shermer Road are expected to operate at desirable LOS “A,” during all three peak periods studied. The church access driveway will be controlled by police detail during the Sunday morning church peak hour, thus operating at levels of service better than presented in Table 7, similar to if it were operating under traffic signal control. This can be seen in the traffic simulations conducted.

Shermer Road and Willow Road

Under future (year 2019) No-Build conditions (non-site), with the anticipated traffic growth within the study area, the completion of the Pulte Regency at the Glen subdivision, the Shermer Road Bridge Repairs, and the Willow Road Reconstruction project, the signalized intersection of Willow Road and Shermer Road is anticipated to continue to operate with capacity constraints during the weekday morning and evening peak periods. Comparison of future No-Build (non-site) and Build (with the proposed church and residential developments) traffic conditions capacity analyses show the overall intersection and approaches will continue to operate at the same LOS in the future during the weekday morning and weekday evening peak hours. The intersection experiences minimal increases in delay, if any, as a result of the proposed projects during these time periods. It



is recommended that a Sunday morning timing plan be implemented at this intersection to facilitate church traffic.

Cut-Through Traffic Analysis

As previously indicated, an off-duty police officer will be positioned at the church access with Valcour Drive, which will direct all outbound traffic following each service to the east on Valcour Drive to minimize the potential for cut-through traffic through the adjacent residential neighborhoods.

In regards to church traffic using the South Gate at the Glen residential streets (Monterey Drive and Independence Avenue to access Patriot Boulevard, based on the lower travel speeds on Monterey Drive and Independence Avenue (20 MPH) versus West Lake Avenue and Patriot Boulevard (30 MPH); the circuitous nature of the route, with multiple turns and stops; and the associated longer travel times, it is expected that the church cut-through traffic to be minimal, if any.

Parking Analysis

Analyses were conducted to determine the number of parking spaces required to accommodate the proposed church component of the development, and identify the adequacy of the proposed parking supply. According to the preliminary site plan, the church development will provide 717 parking spaces. In order to determine the required number of parking spaces for the proposed development two main sources were referenced:

- *The Village of Glenview Code*
- Parking counts conducted at the existing North Shore campus located in Northfield, Illinois by Willow Creek Community Church staff in January and February 2013 and by SSE in June 2013.

Parking Requirements

Based on the parking requirements outlined in the Village of Glenview Ordinance, 528 off-street parking spaces are required for the proposed development. A total of 1 parking space is required for each three seats (maximum, permanent seating capacity 1,585 persons: 1,200 auditorium, 300 community area/lobby, and 85 support staff).

Existing Church Parking Demand

Willow Creek Community Church staff conducted a parking demand survey on six Sundays (January 6, 13, 20, 2013 and February 3, 10, and 17, 2013) at the existing North Shore campus in to determine existing parking characteristics. SSE conducted an independent count on Sunday, June 23, 2013 to supplement and verify the church provided data. The total parking demand was recorded for the two services held on Sunday at 9:00 AM and 11:00 AM. The reported demand includes those attending the scheduled services, as well as volunteers and staff. **Table 8** presents a summary of the parking survey results.

**Table 8: Existing Parking Demand**

Date	Total Parking Demand ¹	
	9:00 AM Service	11:00 AM Service
Sunday, January 6, 2013	369	467
Sunday, January 13, 2013	353	580
Sunday, January 20, 2013	379	613
Sunday, February 3, 2013	473	618
Sunday, February 20, 2013	433	595
Sunday, February 17, 2013	434	594
Sunday, June 23, 2013	309	582

¹ Total occupied spaces, includes both visitors and staff.

Existing Vehicle Occupancy

In an effort to determine the average occupancy of vehicles accessing the church, a count of church attendance was conducted for each service. The attendance count of staff and visitors was performed by church staff for each of the scheduled services, corresponding to the parking data collected. The total number of people at the church, the overall parking demand, and the average vehicle occupancy is presented in **Table 9**.

Table 9: Average Vehicle Occupancy

Date/Time	Church Attendance	Total Parking Demand ¹	Average Vehicle Occupancy (Persons/Vehicle) ²
<i>Sunday, January 6, 2013</i>			
9:00 AM Service	796	369	2.16
11:00 AM Service	1501	467	3.21
<i>Sunday, January 13, 2013</i>			
9:00 AM Service	905	353	2.56
11:00 AM Service	1212	580	2.09
<i>Sunday, January 20, 2013</i>			
9:00 AM Service	981	379	2.59
11:00 AM Service	1434	613	2.34
<i>Sunday, February 3, 2013</i>			
9:00 AM Service	940	473	1.99
11:00 AM Service	1184	618	1.92
<i>Sunday, February 20, 2013</i>			
9:00 AM Service	933	433	2.15
11:00 AM Service	1462	595	2.46
<i>Sunday, February 17, 2013</i>			
9:00 AM Service	864	434	1.99
11:00 AM Service	1410	594	2.37
<i>Sunday, June 23, 2013</i>			
9:00 AM Service	722	309	2.34
11:00 AM Service	1186	582	2.04
Average Sunday Vehicle Occupancy			2.28

¹ From Table 5.

² Church attendance divided by parking demand (i.e., for the Sunday, January 6, 2013 9:00 AM Service, Average Vehicle Occupancy = 796/369 = 2.16).

As shown in Table 9, the vehicle occupancy ranged between 1.92 to 3.21 persons per vehicle, with an average rate of 2.28 for the Sunday services.



Future Parking Demand

As previously indicated, the existing total parking demand observed for both Sunday services (9:00 AM and 11:00 AM) held at the North Shore campus in Northfield, IL was 618 vehicles. Therefore, the existing parking demand can be accommodated well within the proposed 717 parking spaces on-site.

The proposed developed has an occupancy capacity of 1,585 persons (1,200 in the sanctuary, 300 in the community area/lobby, and 85 support staff). As previously indicated, the average vehicle occupancy observed for the two Sunday services is 2.28 persons per vehicle. This ratio was applied to the maximum capacity of the church to determine if the proposed parking supply of 717 parking spaces will be sufficient to meet the maximum demand of the church facility. These calculations are detailed in **Table 10**.

Table 10: Future Parking Demand

Willow Creek Community Church	
Average Parking Ratio	2.28 persons/vehicle
Maximum Capacity	1,585 persons
Maximum Parking Demand	695 vehicles
Provided Parking Spaces	717 Spaces
<i>Parking Differential</i>	<i>+22 Spaces</i>

As shown in Table 9, the Willow Creek Community Church on site parking will provide sufficient parking when the facility reaches the maximum capacity of 1,585 persons, which will not impact the on-street parking along existing/proposed adjacent residential streets. A parking contingency plan is provided in the traffic management plan, which provides for overflow parking, should the need arise.



CONCLUSION

Analyses have been conducted under existing (2013) and future (2019) conditions of the intersections in the study area to determine the impact from the proposed redevelopment of Parcel 24. The capacity analysis results indicate that the increase in projected site-generated traffic, with the implementation of geometric and signal improvements and with the use of off-duty police officers at the church access driveways during the Sunday morning church peak services, has little effect upon the operations of the area roadway network.

Based on the parking analysis, it can be concluded the proposed church development will provide sufficient parking spaces to accommodate the anticipated parking demand.