

DRAFT Sage YMCA Facility Expansion Traffic Impact Study



CITY OF CRYSTAL LAKE
MCHENRY COUNTY, ILLINOIS

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TABLE OF CONTENTS

1.	INTRODUCTION.....	I
2.	LAND USE	I
3.	EXISTING ROADWAY CONDITIONS.....	I
4.	EXISTING TRAFFIC STUDIES.....	4
	Traffic Counts	
	Notable Traffic Observations	
	Existing Capacity Analysis	
5.	EXISTING SAGE YMCA FACILITY TRAFFIC ANALYSIS.....	6
	Existing Facility Trip Generation	
	Facility Traffic Directional Distribution	
	Existing Facility Traffic	
6.	PROPOSED SAGE YMCA EXPANSION.....	9
	Proposed Facility Trip Generation	
	Proposed Facility Directional Distribution	
7.	BACKGROUND TRAFFIC.....	10
	Existing Background Traffic	
	Future Background Traffic	
8.	TOTAL FUTURE TRAFFIC	10
9.	ANALYSIS OF FUTURE TRAFFIC IMPACTS.....	10
10.	RECOMMENDATIONS AND CONCLUSIONS – TRAFFIC.....	12
11.	RECOMMENDATIONS AND CONCLUSIONS – PEDESTRIANS AND BICYCLISTS...	13
12.	EXISTING SAGE YMCA PARKING UTILIZATION AND ANALYSIS.....	14
13.	FUTURE SAGE YMCA PARKING ANALYSIS.....	16

EXHIBITS

1. Regional Project Location Map
2. Local Project Location Map
3. Land Use Map
4. Existing Peak Hour Traffic (2013)
5. Existing Sage YMCA Facility Aerial
6. Directional Distribution – YMCA Traffic
7. Existing Peak Hour Facility Traffic (2013)
8. Proposed Sage YMCA Site Plan
9. Proposed Peak Hour Facility Traffic
10. Existing Background Traffic (2013)
11. Future Background Traffic (2019)
12. Total Future Traffic (2019)

APPENDICES

- A. Existing Peak Hour Traffic Volume Spreadsheets
- B. Existing Traffic HCS Text Reports (2013)
- C. Proposed Future HCS Text Reports (2019)

I. INTRODUCTION

TranSystems was hired by the City of Crystal Lake, on behalf of the YMCA, to conduct a traffic impact study to analyze the potential for traffic impacts associated with site improvements proposed at Sage YMCA in the City of Crystal Lake in McHenry County, Illinois. The study also involves a review of the proposed parking lot layout to determine if any internal site flow improvements can be recommended.

The existing Sage YMCA facility is located at 701 Manor Road and is approximately 325 feet east of Manor Road. In addition, the existing building is approximately 0.10 miles west of Illinois Route 31, 0.25 miles south of U.S. Route 14 (Northwest Highway), and 0.15 miles north of Three Oaks Road.

See **Exhibit 1** for a regional project location map and **Exhibit 2** for a local project location map.

2. LAND USE

The existing Sage YMCA facility is located within an established residential neighborhood known as Crystal Manor. North of this neighborhood, along U.S. Route 14, commercial land use exists, with several shopping centers anchored by big box retailers, strip malls, and restaurants. East of the neighborhood, along Illinois Route 31, there is commercial land use, a hotel, and some forested land owned by the YMCA. South of the neighborhood, business park and light industrial land uses exist. West of Pingree Road is the Three Oaks Recreation Area. See **Exhibit 3** for an existing land use map.

3. EXISTING ROADWAY CONDITIONS

Illinois Route 31 (FAP 336) is a north-south Strategic Regional Arterial (SRA) route east of the Sage YMCA property under the maintenance and jurisdiction of IDOT. Near the project limits, it has two through lanes in each direction and generally has shoulders with open ditch drainage, a painted median, and no pedestrian accommodations. Existing Average Daily Traffic (ADT) on Illinois Route 31 near the project limits is approximately 28,500 vehicles per day, according to information provided on the Illinois Department of Transportation (IDOT) website. No parking is permitted along Illinois Route 31 near the project limits. The posted speed limit is 55 miles per hour (mph) on Illinois Route 31 near the project limits.

U.S. Route 14 (Northwest Highway) (FAP 305) is an east-west SRA route north of the Sage YMCA property under the jurisdiction and maintenance of IDOT. It generally has two through lanes in each direction near the project limits, curb and gutter with enclosed drainage, some intermittent segments of sidewalk along either side of the roadway, and no median. No on-street parking is permitted on Northwest Highway near the project limits.

Existing ADT from IDOT's website is approximately 27,100 vehicles per day. The posted speed limit is 40 mph for both directions of traffic.

Three Oaks Road (FAU 4051) is an east-west roadway south of the Sage YMCA property. West of Illinois Route 31, Three Oaks is classified as a major collector roadway that is under the jurisdiction and maintenance of Algonquin Township from Pingree Road to Manor Road and under the jurisdiction and maintenance of the City of Crystal Lake from Manor Road to east of Illinois Route 31. Three Oaks Road is classified as a minor arterial roadway east of Illinois Route 31. The roadway generally has one through lane in each direction, is undivided, has shoulders with open ditch drainage, and does not have pedestrian accommodations along it. Existing ADT from IDOT's website is approximately 4,100 vehicles per day west of Illinois Route 31 and 14,600 vehicles per day east of Illinois Route 31. The speed limit for Three Oaks Road is posted at 25 mph from Pingree Road to Manor Road, 30 mph from Manor Road to Illinois Route 31, and 35 mph east of Illinois Route 31.

Pingree Road (FAU 126) is a north-south major collector roadway west of the Sage YMCA property under the jurisdiction and maintenance of the City of Crystal Lake. It generally has one through lane in each direction, a painted median, curb and gutter with enclosed drainage, a sidewalk and grassed parkway running along the west side of the roadway, and a multi-use path and grassed parkway running along the east side of the roadway. A barrier median serving as a pedestrian refuge island is provided on Pingree Road on the south approach of its intersection with Three Oaks Road. Parking on Pingree Road near the study area is prohibited. Based on traffic counts taken on Pingree Road at its intersection with Three Oaks Road, and assuming a K value of 10%, which estimates the percentage of average daily traffic represented during the peak hour, the approximate existing ADT on Pingree Road is 6,050 vehicles per day. The posted speed limit is 40 mph for both directions of traffic.

Manor Road is a north-south local residential roadway approximately 0.40 miles in length. It is under the maintenance and jurisdiction of Algonquin Township and spans from Northwest Highway on the north to Three Oaks Road on the south. Manor Road has one through lane in each direction, shoulders with open ditch drainage, and no median. Sidewalk is provided on the east side of Manor Road south of Saggars Lane. Otherwise, no specific pedestrian accommodations are provided. Daytime parking is permitted on Manor Road, even though this ability was not observed to be heavily utilized. However, no overnight parking is permitted on Manor Road, and parking on-street after a one-inch snowfall is also prohibited. Based on traffic counts taken on Manor Road at its intersection with Three Oaks Road, and assuming a K value of 10%, the approximate existing ADT on Manor Road is 2,500 vehicles per day. The posted speed limit on Manor Road is 25 mph for both directions of traffic.

The existing intersection of Illinois Route 31 and Three Oaks Road is a fully actuated signalized intersection. Illinois Route 31 is the preference route. The west leg of the

intersection has one eastbound shared through-right lane, one eastbound left-turn lane, and one westbound receiving lane. The east leg of the intersection has one westbound shared through-right lane, one westbound left-turn lane, and one eastbound receiving lane. The north leg of the intersection has one southbound shared through-right lane, one exclusive southbound through lane, one southbound left-turn lane, and two northbound receiving lanes. The south leg has one northbound shared through-right lane, one exclusive northbound through lanes, one northbound left-turn lane, and two southbound receiving lanes. The intersection is part of IDOT's Econolite 193 traffic signal interconnect system, with its master controller intersection located at the Three Oaks Road intersection. All four approaches have protected-permissive left-turn signal phasing. Right turns are permitted on red for all four approaches.

The existing intersection of U.S. Route 14 (Northwest Highway) and Manor Road is a fully actuated signalized intersection. Northwest Highway is the preference route. The west leg of the intersection has one eastbound shared through-right lane, one exclusive eastbound through lane, one eastbound left-turn lane, and two westbound receiving lanes. The east leg of the intersection has one westbound shared through-right lane, one exclusive westbound through lane, one westbound left-turn lane, and two eastbound receiving lanes. The north leg of the intersection, which is also referred to as Cog Circle, has one southbound right-turn lane, one southbound through lane, one southbound left-turn lane, and one wide northbound receiving lane that quickly becomes two lanes in the shopping center development north of the intersection. The south leg has one northbound shared through-right lane, one northbound left-turn lane, and two southbound receiving lanes. The intersection is part of IDOT's Econolite 23 traffic signal interconnect system, with its master controller intersection located at the US 14/Main Street intersection. All four approaches have protected-permissive left-turn signal phasing. Right turns are permitted on red for all four approaches.

The existing intersection of Pingree Road and Three Oaks Road is a 3-legged unsignalized intersection with stop control on Three Oaks Road only. Traffic on Pingree Road is able to move freely. The intersection has pedestrian crosswalks crossing both the south approach of Pingree Road and east approach of Three Oaks Road. The Pingree Road crossing has pedestrian-activated rectangular rapid flashing beacons and yellow diamond warning signs on either side of the roadway to help warn motorists that a pedestrian is crossing the roadway. See **Figure 1** for a picture of this traffic control device system.



Figure 1 - Rectangular Rapid Flashing Beacon

The existing intersection of Manor Road and Three Oaks Road is a 3-legged unsignalized intersection with stop control on Manor Road only. Traffic on Three Oaks Road is able to move freely. The intersection has pedestrian accommodations on the northeast quadrant only in the form of sidewalks, but there are no crosswalks or receiving sidewalks on other quadrants of the intersection. The

east approach of the intersection has a slight grade that could make it a sight distance issue for eastbound vehicles turning left from Three Oaks Road onto northbound Manor Road or southbound left or right turning Manor Road vehicles turning onto Three Oaks Road.

4. EXISTING TRAFFIC STUDIES

a. Traffic Counts

In order to understand how existing traffic operates within the study area, traffic turning movement counts were taken at select intersections and field observations were made to better understand traffic patterns and overall conditions. Traffic counts were taken at the following four intersections:

- Illinois Route 31 at Three Oaks Road
- U.S. Route 14 (Northwest Highway) at Manor Road
- Pingree Road at Three Oaks Road
- Manor Road at Three Oaks Road

Traffic counts were conducted during the common roadway network peak periods. The weekday morning peak period was counted on a Tuesday, Wednesday, or Thursday between 7 a.m. and 9 a.m. The weekday evening peak period was counted on the same days of the week as the morning peak period, between 4 p.m. and 6 p.m. A Saturday peak period was also counted between 11 a.m. and 1 p.m. for all four intersections. While the peak hours of traffic at each of the study area intersections varied slightly within the count periods, the typical peak hours established for each of the intersections were 7:30 a.m. – 8:30 a.m., 4:45 p.m. – 5:45 p.m., and 12:00 p.m. – 1:00 p.m., for the morning weekday, evening weekday, and Saturday peak hours, respectively. See **Appendix A** for the existing peak hour traffic volume spreadsheet. See **Exhibit 4** for an existing peak hour traffic volume map.

b. Notable Traffic Observations

Some traffic flow characteristics particular to each of the four intersections were noted during field observations. The following is a brief summary of notable observations at each of the intersections:

Illinois Route 31 and Three Oaks Road

Three Oaks Road east of Illinois Route 31 is classified as a minor arterial route because it serves as a cut-through route for traffic between U.S. Route 14, Illinois Route 31, and Pingree Road. The westbound left-turn movement is especially heavy, particularly during the evening peak period. This movement was not fully served on every traffic signal cycle, with several hundred feet of queuing observed for this movement on the westbound approach of the intersection.

U.S. Route 14 and Manor Drive

Traffic on the northbound approach of the intersection was largely generated by the strip malls on the southeast quadrant of the intersection, as well as by the gas station on the southwest quadrant. Vehicles observed making a westbound left turn, eastbound right turn, or southbound through movement onto southbound Manor Road were also observed heading to these properties, with very few vehicles continuing further south. The same observation can be made about the northbound traffic movements on the south approach. Most of the traffic making these movements were coming from these same properties, with very few vehicles observed coming from further south on Manor Road.

Pingree Road and Three Oaks Road

The geometry and striping at this intersection is primarily concerned with the pedestrian crossings. Since rectangular rapid flashing beacons are used, stop bars have been painted on Pingree Road. Several vehicles were observed as being confused by the stop bars, with vehicles thinking they were running a stop sign and stopping when no pedestrians were present. While no rear-end or other crashes were observed, a few near-miss situations were observed.

Manor Road and Three Oaks Road

Most vehicles traveling to or from the Sage YMCA facility were observed driving through this intersection. Several vehicles were observed heading east from Pingree Road, making a left turn onto northbound Manor Road, and making a right into the YMCA. Similarly, several vehicles were observed heading west on Manor Road, making a right turn onto northbound Manor Road, and making a right into the YMCA. Vehicles from the YMCA heading southbound on Manor Road toward this intersection were observed as split almost equal in terms of whether they turned right or turned left onto Three Oaks Road.

c. Existing Capacity Analysis

Once traffic counts and observations were completed, *Highway Capacity Software (HCS)* was used to analyze the lane usage and operations of the intersections given the amount of traffic traveling through them. At the two signalized intersections, existing cycle lengths were taken from IDOT's Signal Coordination and Timing (SCAT) list of coordinated intersection systems. Intersections were conservatively analyzed with no right turns on red, indicating that capacity analysis results may be slightly better in reality than are determined by the HCS program, since some observed signal cycles had several vehicles making right turns on red when permissible.

Traffic was analyzed using a traditional Level of Service (LOS) method to measure intersection delay in seconds at signalized intersections and stop-controlled

movements at the unsignalized intersections. The LOS system rates each modeled intersection’s delay on how much delay the average vehicle experiences driving through the intersection or performing the specific movement. This delay measurement system uses a lettered system, with LOS A representing the least delay and LOS F representing the most delay. See **Figure 2** for a Level of Service table for signalized intersections and **Figure 3** for unsignalized intersections. See **Appendix B** for the existing traffic HCS text reports.

Level of Service (LOS)	Intersection Delay Range (Seconds)
A	0 to 10
B	> 10 to 20
C	> 20 to 35
D	> 35 to 55
E	> 55 to 80
F	> 80

Figure 2 - Signalized Intersection LOS Table

Level of Service (LOS)	Intersection Delay Range (Seconds)
A	0 to 10
B	> 10 to 15
C	> 15 to 25
D	> 25 to 35
E	> 35 to 50
F	> 50

Figure 3 - Unsignalized Intersection LOS Table

Figure 4 provides a synopsis of LOS and delay in seconds for each of the four study area intersections and for each of the three peak hour periods analyzed. For the two signalized intersections of Illinois Route 31/Three Oaks and U.S. Route 14/Manor, the LOS and delay is for the entire intersection. For the two unsignalized intersections of Pingree/Three Oaks and Manor/Three Oaks, the LOS and delay is for the stop-controlled movement at the intersection, which are the westbound approach and southbound approach, respectively.

Intersection	AM Peak Period		PM Peak Period		Saturday Peak Period	
	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)
IL Route 31/Three Oaks	C	27.0	C	34.3	C	26.7
US Rte 14/Manor	C	22.9	C	28.2	C	28.0
Pingree/Three Oaks	B	10.3	B	13.6	B	13.7
Manor/Three Oaks	B	10.2	B	12.1	B	11.4

Figure 4 - Existing LOS/Delay (2013)

5. EXISTING SAGE YMCA FACILITY TRAFFIC ANALYSIS

The existing Sage YMCA facility is located at 701 Manor Road in the City of Crystal Lake. See **Exhibit 5** for an aerial view of the existing Sage YMCA and parking lot. The existing building has a gross floor area of approximately 31,320 square feet. Amenities contained within the existing building include a 6-lane, 25-yard pool; racquetball, wallyball, and

handball courts; indoor volleyball courts; free weights; a workout facility; space for various programs including a preschool program; locker rooms and bathrooms; administrative areas, and open space. The existing parking lot has 184 parking spaces. A single access drive with one lane in each direction provides access to and from the parking lot from Manor Road. This access drive is positioned directly across from Saggars Lane, an east-west residential roadway within the Crystal Manor subdivision that extends west to Pingree Road, where it ends as a t-intersection. Although this roadway heads directly to the facility access drive, very few vehicles were observed using this road to travel to and from the site, with a majority of the vehicles coming from and going to the south versus to and from the north or west. The reason for this appears to be that motorists respect that Saggars Lane is a purely residential roadway, whereas the feel and functional classification of Manor Road, as well as Pingree Road and Three Oaks Road, feels more like a connector roadway.

a. Existing Facility Trip Generation

In order to determine the number of trips generated by the existing Sage YMCA Facility, *Trip Generation, 9th Edition*, published by the Institute of Transportation Engineers (ITE), was consulted. The manual contains various land use categories (LUC) and regression equations and averages associated with these land uses that determine the number of trips generated. These equations and averages were determined by studies of similar existing facilities. A percentage of generated trips is estimated to be entering the land use, while the remaining percentage of trips is estimated to be exiting the land use.

The Sage YMCA facility was assumed to fit well within ITE Land Use 495, *Recreational Community Center*. The description of this land use specifies that YMCAs are included in it. **Figure 5** shows the existing development traffic ITE trip data and percentages of entering and exiting vehicles.

Description	ITE LUC	Variable	Weekday AM Peak Hour			Weekday PM Peak Hour			Saturday Peak Hour		
			ITE Average Rate	% Enter	% Exit	ITE Average Rate	% Enter	% Exit	ITE Average Rate	% Enter	% Exit
<i>Recreational Community Center</i>	495	1000 sf	2.05	66%	34%	2.74	49%	51%	1.07	54%	46%

Figure 5 - Trip Generation Data and Percent Entering/Exiting – Existing Facility

Based on the type of land use a Recreational Community Center is and site characteristics, and to remain conservative in the analysis, pass-by and internal trips were not considered. Regarding mode split, typical consideration is usually given to the number of personal vehicles, pedestrians/bicyclists, and transit users represented in the generated traffic numbers. Since no transit users, pedestrians, or bicyclists were observed accessing the facility during the peak hour observation periods, it is assumed that all trips generated by the existing facility are personal

vehicles or delivery trucks. Based on previous studies, the number of vehicle trips estimated for the existing facility also includes both those driving to and parking at the facility and those dropping off or picking up people at the facility.

Considering a 31,320 square foot existing facility and the information in Figure 5, the total generated trips for the existing facility were determined and are presented in **Figure 6**.

Peak Hour	New Trips		
	Total	Enter	Exit
AM Peak Hour	65	40	25
PM Peak Hour	85	40	45
Saturday Peak Hour	35	20	15

Figure 6 - Total Generated Trips – Existing Facility

b. Facility Traffic Directional Distribution

Based on traffic observations made at each of the four study area intersections, as well as at the existing Sage YMCA access drive across from Sagers Lane, it is expected the majority of traffic will travel to and from the south using Three Oaks Road and Manor Road. During one period of observation of vehicles dropping off and picking up people at the facility, it was determined that a suitable approximation for this majority of vehicle trips is 70% of the trips are coming from and going to the south. Once at Three Oaks Road, it appears from observations that site traffic is split nearly equally, with 50% of the traffic coming from and heading to the east and 50% coming from and heading to the west.

Of the 30% of traffic not coming from and heading to the south, it was assumed that 25% of the traffic is coming from and heading to the north on Manor Road and 5% is coming from and heading to the west on Sagers Lane. Since little to no traffic was observed using Sagers Lane, it is safe to reason that 5 out of 100 vehicles would use this route and would not adversely affect any intersections along it.

No substantial change in the directional distribution of site-related traffic was observed from one peak period to the next.

See **Exhibit 6** for a directional distribution aerial diagram.

c. Existing Facility Traffic

In order to determine the existing Sage YMCA facility traffic movements at the study area intersections, the directional distribution was applied to the existing peak hour traffic counts. The resulting existing peak hour facility traffic turning movements are depicted in **Exhibit 7**.

6. PROPOSED SAGE YMCA EXPANSION

The existing Sage YMCA facility is proposed to be improved and augmented to increase capacity of the facility while also increasing and updating many of the facility’s amenities, which will include a new competition pool with a spectator seating area. The proposed facility involves a 34,480 square-foot building addition, as well as an expanded and redesigned parking lot and site flow pattern. The total gross square footage of the improved Sage YMCA facility will be approximately 65,800 square feet. See **Exhibit 8** for the proposed site plan, as provided by Charles Vincent George Architects. The proposed facility’s access drive to Manor Road will remain where it is today.

a. Proposed Facility Trip Generation

Proposed facility site traffic can be developed using the same methodology that was used for the existing facility’s traffic. Total proposed site traffic will consider the total gross square footage of the improved site. The same ITE Trip Generation Manual Land Use Code and assumed percentages of entering and exiting traffic can also be used. See **Figure 7** for the proposed development traffic ITE trip data and percentages of entering and exiting vehicles. In order to remain conservative and given that the Sage YMCA property is somewhat isolated aside from the Crystal Manor subdivision, no pedestrian or bicycle trips are being considered; all trips represented in Figure 7 are vehicle trips.

Peak Hour	Total Trips (65,800 Sq. Ft.)		
	Total	Enter	Exit
AM Peak Hour	135	90	45
PM Peak Hour	180	90	90
Saturday Peak Hour	75	40	35

Figure 7 - Total Generated Trips – Entire Proposed Facility

a. **Proposed Facility Directional Distribution**

As was done with existing facility generated traffic, the proposed facility traffic will be distributed onto the existing adjacent roadway network. The directional distribution percentages that were previously assumed will also be used for the proposed facility traffic volumes. See **Exhibit 9** for the proposed facility traffic peak hour turning movements.

7. BACKGROUND TRAFFIC

a. **Existing Background Traffic**

Background traffic is defined as traffic on the roadway network within the study area that is not associated with the Sage YMCA facility. In order to determine the existing background traffic on the roadway network, the traffic volumes depicted in Exhibit 7 were subtracted to the peak hour traffic volumes depicted in Exhibit 4. The resulting existing background traffic is provided in **Exhibit 10**.

b. **Future Background Traffic**

Existing background traffic was then grown to arrive at an appropriate design horizon. Since the proposed expansion of the Sage YMCA facility is to be constructed in 2013, with completion anticipated in 2014, background traffic was grown 5 years beyond “opening day” of the proposed improvements, to the year 2019. The 2019 background traffic volumes include a 1.00% annual growth rate in traffic on all study area roadways, based on recent economic conditions. Therefore, the total growth in background traffic over the 6-year period from 2013 to 2019 is assumed to be 6%. See **Exhibit 11** for future background peak hour traffic.

8. TOTAL FUTURE TRAFFIC

Total future traffic for Design Year 2019 was determined by adding the future background peak hour traffic presented in Exhibit 11 to the proposed facility traffic peak hour volumes in Exhibit 9. The resulting traffic volumes are shown in **Exhibit 12**.

9. ANALYSIS OF FUTURE TRAFFIC IMPACTS

Once future traffic volumes were determined, *Highway Capacity Software (HCS)* was used to analyze the lane usage and operations of the intersections given the increased amount of traffic traveling through them. The cycle lengths at the two signalized intersections remained the same as in the existing analysis. Intersections were still conservatively analyzed with no right turns on red, indicating that capacity analysis results may be slightly better in reality than are determined by the HCS program, since some observed signal cycles had several vehicles making right turns on red when permissible. As was done in

Figure 4 for existing capacity analysis results, **Figure 8** provides LOS and delay in seconds given proposed future traffic conditions. See **Appendix C** for proposed future HCS text reports.

Intersection	AM Peak Period		PM Peak Period		Saturday Peak Period	
	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)
IL Route 31/Three Oaks	C	32.1	D	39.7	C	30.1
US Rte 14/Manor	C	23.7	C	30.2	C	33.8
Pingree/Three Oaks	B	10.8	C	15.3	B	14.7
Manor/Three Oaks	B	10.7	B	13.4	B	12.0

Figure 8 - Future LOS/Delay (2019)

Signalized Intersections

Overall, the increase in traffic due to the proposed Sage YMCA facility expansion, and in consideration of some future traffic growth, can be accommodated by the existing traffic signal installations and intersection geometric layouts. The addition of increased YMCA traffic to certain movements, such as the eastbound right-turn and westbound left-turn movements at the intersection of U.S. Route 14 and Manor Road, will not create a condition that requires improvements such as an additional turn lane or lengthening of existing turn lanes.

One exception to these conclusions involves the intersection of Illinois Route 31 and Three Oaks Road. The westbound approach (east leg of the intersection) is already shown to be problematic with respect to delay and queuing, particularly during the existing evening peak period. This is because Three Oaks Road is a suitable cut-through route for vehicles traveling west/southwest from U.S. Route 14. It is a challenge for the existing geometric conditions and traffic signal timing to accommodate the conflicting critical movements at this intersection. Some general recommendations to improve this intersection can be made. However, if a capacity analysis were run using only 2019 background traffic for the evening peak period, it would be evident that the addition of YMCA traffic generated by the proposed facility expansion would only exacerbate a preexisting issue.

Unsignalized Intersections

The unsignalized intersections of Pingree/Three Oaks and Manor/Three Oaks will operate efficiently under future traffic conditions, including the traffic from the Sage YMCA expansion. The 95th percentile queues for the stop-controlled intersection approaches will see nominal increases but will still average less than 2 car lengths. When compared to existing queuing, little to no increase in queuing at the intersection will be perceived during average peak hour operations.

Right and left turning volumes at both intersections are not high enough to consider additional exclusive lanes for these movements. Unless a perceived increase in crashes associated with turning movements begins to occur at the intersections, the existing geometric conditions suit the future traffic conditions.

10. RECOMMENDATIONS AND CONCLUSIONS – TRAFFIC

The general conclusion regarding the traffic impact analysis of the Sage YMCA facility expansion is that no roadway improvements will be required to successfully accommodate the increase in traffic that is generated. However, a few intersection-specific recommendations are presented below to document some observed traffic conditions at the study area intersections.

Illinois Route 31 at Three Oaks Road

This intersection is the master intersection of a traffic signal interconnect system along Illinois Route 31 and currently runs a 110-second cycle length during the morning and evening peak periods and a 95-second cycle length during the midday and weekend peak periods. According to IDOT's Signal Coordination and Timing report, this traffic signal system was last optimized in November 2000. With the growth of McHenry County over the last decade, it is evident that this traffic signal system should be re-optimized and that the cycle lengths will increase to better accommodate the traffic volumes flowing through the system's intersections. It is possible that widening on the east leg of the intersection, on Three Oaks Road, in order to construct westbound dual left-turn lanes, as well as exclusive through and right-turn lanes may be required. However, a dual left-turn condition would require protected only left-turn phasing. The current eastbound through and right-turn movements are much less than the opposing left-turn movements. Therefore, the intersection is currently operating best with protected/permissive left turn phasing, as several suitable gaps in opposing traffic can be successfully used by westbound left turning vehicles.

While these recommendations would require further investigation, it is the conclusion of this study's analysis that these recommendations are solutions to preexisting conditions of the intersection and are not specifically created as a result of increased Sage YMCA traffic due to expansion of the facility.

Pingree Road at Three Oaks Road

Motorists appear to be confused by the pedestrian accommodations crossing Pingree Road on the south approach of this intersection. Several motorists were observed thinking that they were required to stop at the stop bar, even if no pedestrians were present at the intersection, and consequently stopping abruptly. It is our understanding that some educational outreach has been performed by the City in the form of a newsletter. It may be

advantageous to provide this information in several subsequent newsletters, in pamphlets at City Hall or at public events, and in a highlighted section on the City website. Over time, the region's drivers will become more familiar with the law requiring motorists to stop for all pedestrians in crosswalks and this traffic issue will reduce in occurrence.

Manor Road at Three Oaks Road

While this intersection appears to operate well under existing conditions and is expected to continue to operate well after the Sage YMCA facility expansion, site observations indicated a decent grade on the east approach of the intersection. This grade appeared to potentially create a sight distance issue for southbound left and right turning vehicles. While increased traffic may not create capacity issues or excessive delay, this intersection may need all-way stop control in the future, with proper advance signing, so that the potential for crashes associated with any sight distance issues can be reduced. Observation of this intersection and monitoring of crash statistics will help dictate when a solution may need to be further investigated.

Manor Road at Sage YMCA Access Drive/Saggers Lane

Based on traffic volumes along Manor Road, the need for a southbound left-turn lane or northbound right-turn lane does not appear to be substantiated. Impacts associated with any future channelization would need to be skewed eastward, in order to avoid impacts to the residential properties along the west side of the roadway. In addition, it is our recommendation that the access drive to the expanded facility remain where it is today, across from Saggers Lane. However, any access drive relocation should be done directly across from one of the Crystal Manor east-west residential roadways, such as Drive-in Lane. If an access drive were placed at a location somewhere between Saggers Lane and Drive-in Lane, the headlights of vehicles leaving the YMCA property would be shining directly into the residences along the west side of Manor Road.

If another access drive is still desired, one potential compromise would be for that drive to be a right-in/right-out access point or just a right-in access point. This would minimize or completely eliminate the number of exiting vehicles that would potentially disrupt the residents along Manor Road. There are a few mature trees along the east side of Manor Road along the YMCA property frontage. A relocated or second access point should avoid the need for removal of these trees if possible, and if the trees remain, sight distance would need to be considered to ensure the trees do not create a hazardous intersection.

II. RECOMMENDATIONS AND CONCLUSIONS – PESTRIANS AND BICYCLISTS

Very few pedestrians and bicyclists were observed on the roadways adjacent to the Sage YMCA facility. Sidewalks or other pedestrian/bicyclist accommodations along the Crystal Manor roadways do not appear to be warranted. Any pedestrian accommodations as part

of the proposed Sage YMCA facility expansion improvements that intend to connect to existing pedestrian facilities need to consider whether a connection can be made. For instance, sidewalk near the facility is currently confined to the northeast quadrant of the intersection of Manor Road and Three Oaks Road. A sidewalk may be constructed to connect into this existing sidewalk network, but it is important to realize that this existing sidewalk network is isolated and does not extend beyond the general area.

The multi-use path along the east side of Pingree Road is a suitable path for area pedestrians and bicyclists that may desire to travel to and from the YMCA facility. It would make sense to use small path-sized (versus roadway-sized) signage to direction pedestrians and bicyclists to the YMCA facility along Saggars Lane. The small signs should be placed such that they are not likely to be viewed by motorists. Vehicular traffic should not be directed to use Saggars Lane. Since it appears that most vehicles avoid Saggars Lane today and stay on Manor and Three Oaks Road, even if they use southbound Pingree Road to travel to the YMCA property, additional larger roadway-sized YMCA signage can be installed to help augment the existing wayfinding signage that is in place today, further directing motorists to remain on the collector routes instead.

12. EXISTING SAGE YMCA PARKING UTILIZATION AND ANALYSIS

In order to determine the suitability of the facility expansion's proposed parking lot reconfiguration and improvements, the existing Sage YMCA facility parking lot was analyzed in terms of utilization of parking spaces. All parking lot sizing must me all applicable codes above all else. However, a utilization study will help determine what the true parking demands are now and what they are expected to be in the future.

Figure 9 provides a synopsis of several observations made in terms of parking utilization. The utilization percentage is based on the number of spaces occupied versus a total of 184 existing parking lot spaces. It is important to realize that parking lot utilization does not perfectly correlate to the number of vehicle trips generated by the YMCA facility. The reason for this is that several vehicle trips are made to drop off or pick people up for the facility's several classes, programs, sport practices, and other activities.

Date	Day	Time	Spaces Occupied	% Utilization
January 19, 2013	Saturday	1:00 PM	65	35%
January 23, 2013	Wednesday	7:00 AM	20	11%
January 23, 2013	Wednesday	9:00 AM	79	43%
January 23, 2013	Wednesday	4:00 PM	37	20%
January 23, 2013	Wednesday	6:00 PM	71	39%
January 24, 2013	Thursday	3:30 PM	42	23%
January 24, 2013	Thursday	6:00 PM	87	47%
January 26, 2013	Saturday	10:45 AM	115	63%
January 26, 2013	Saturday	1:00 PM	87	47%

Figure 9 - Existing Parking Lot Utilization

From the data in the figure, it is evident that the parking lot is largely underutilized most of the time. The only time when the parking lot was observed as being over half utilized was mid-morning on a Saturday morning (January 26, 2013). It should be noted that a YMCA open house was occurring on this day during both of the observations, which likely increased the utilization rate from the expected average rate for a typical Saturday in January.

Next, *Parking Generation, 4th Edition*, published by the Institute of Transportation Engineers (ITE), was consulted to compare the existing parking lot's size to the typical lot size required based on studies of similar facilities. As was done for trip generation, the Regional Community Center Land Use Code (LUC) was used. Data in the manual is provided for a weekday considering a peak facility usage period between 6:00 p.m. and 8:00 p.m. The average peak period parking demand for this period is 3.20 vehicles per 1,000 square feet of gross floor area. If the 3.20 average is considered, along with the size of the existing facility, 31,320 square feet, the following parking demand can be determined:

$$3.20 \times (31,320/1,000) = 100.224 = 100 \text{ parking spaces demanded, on average}$$

Comparing this demand to the data in Figure 9, it can be concluded that the existing 184-space parking lot should successfully accommodate typical daily operations of the facility and would even provide enough parking to capture additional parking demand created during special events or other days that have above average facility usage. It is important to realize that the observed utilization rate ranged between 35% and 50%, whereas 100 parking spaces represents 54% utilization, which is higher than what was observed.

13. FUTURE SAGE YMCA PARKING ANALYSIS

a. Expected Future Parking Demand

As shown in Exhibit 8, the proposed Sage YMCA facility expansion will include 285 parking spaces. The data from *Parking Generation, 4th Edition*, can be used to determine if this amount of parking satisfies average parking demand of the entire proposed 65,800 square foot facility, based on previous studies of similar facilities.

$$3.20 \times (65,800/1,000) = 210.56 = 210 \text{ parking spaces demanded, on average}$$

Based on the analysis of the existing parking utilization versus the parking demand specified by the manual, the proposed parking lot should have enough room to accommodate above average traffic conditions to a degree. It should be noted that while parking utilization and demand analyses can help determine the proper amount of parking, it is still important that the parking lot's size and types of parking successfully meet all necessary parking codes.

a. Proposed Parking Lot Layout Analysis

The proposed parking lot layout is provided in **Figure 10** and shows that the existing access drive across from Saggars Lane is to remain in place.

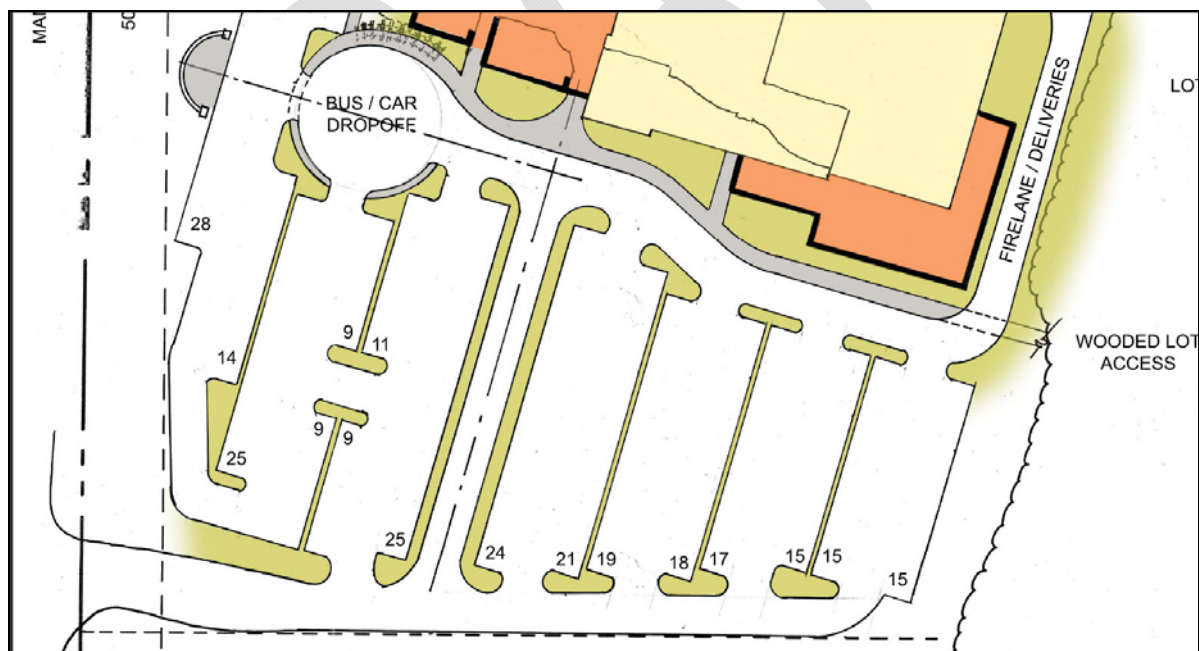


Figure 10 - Proposed Parking Layout

Several parallel aisles with 90-degree parking spaces are shown in alignment with the front of the proposed facility. A front drive for bus and car drop-off/pick-up procedures is also proposed. In the center of the parking lot, in direct alignment with the entrance to the

facility, a main artery is shown for the drop-off/pick-up vehicles to use, as well as to help promote internal circulation. West of this main artery, the parking lot configuration loses some uniformity and presents the potential for some internal flow and vehicle conflict issues.

Figures 11 and 12, which are excerpted from the site plan developed by Charles Vincent George Architects, show the existing layout and two potential parking lot layout alternatives that may help improve internal flow and minimize the potential for conflicts. Any potential for loss of parking as a result of parking lot reconfiguration should be either largely or completely offset.

Parking Lot Layout Alternative 1, presented in Figure 11, shows removal of the mid-aisle access point between the two westernmost parking aisles in the proposed lot. Instead, this cross-aisle access point is relocated further south, to the end of the aisles, similar to the parallel parking aisles further east in the lot. As the proposed parking lot is shown in Figure 10, a dead end was created in the southern portion of the westernmost parking aisle. The recommended alternative removes that dead end situation. One other point of concern is the access at the southern end of the aisles, which leads directly to and from the main access drive off of Manor Road. It is recommended that this point be designed such that it would be an exit only from the parking aisles, versus a full access driveway. During busy periods, vehicles may stop to make an eastbound left turn into this access drive, to cut vehicles off driving further east to the main access drive aligned with the proposed front door of the facility. The potential for rear-end and other crashes associated with vehicles turning into and out of this access point would be reduced if this drive were restricted to vehicles desiring to leave the parking lot for Manor Road.

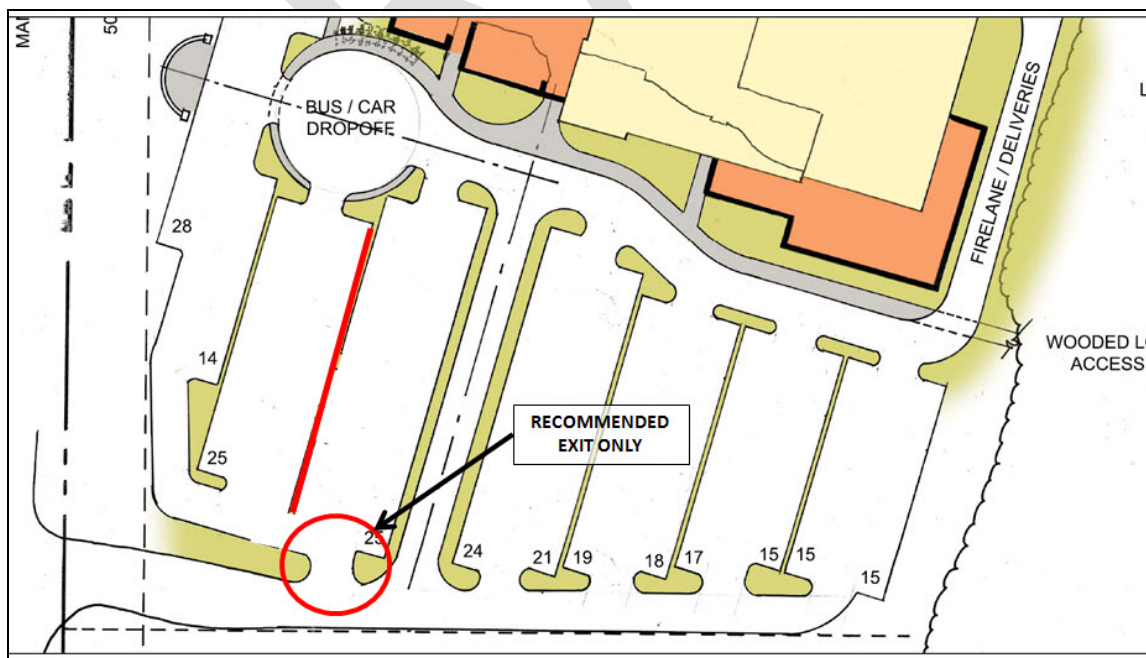


Figure 11 - Parking Lot Layout Alternative 1

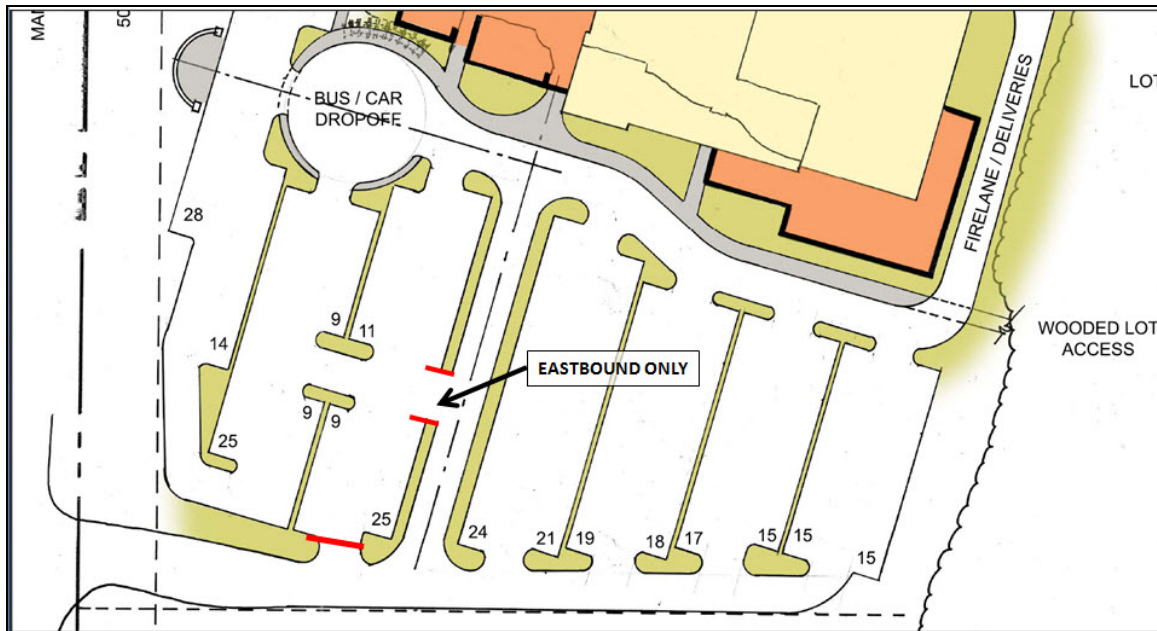


Figure 12 - Parking Lot Layout Alternative 2

Parking Lot Layout Alternative 2, presented in Figure 12, shows the mid-aisle access point between the two westernmost parking aisles remaining, with an additional mid-aisle access continued eastward to the main access aligned with the proposed facility's front door. The access point to the westernmost aisles from the main access drive from Manor Road is shown as removed. The mid-aisle access point to the main access leading to the front of the building could be designed to be restricted to eastbound traffic only, minimizing the potential for northbound left turn movements into this drive. While there are still dead ends in the westernmost aisles, conflict points in the parking lot are minimized versus the original proposed layout. This alternative would require a slight loss in parking because of the additional mid-aisle access point.

Whatever layout is carried forward, it is important to positively direct and restrict motorists where necessary through ample signage, yet to provide the minimal effective amount of signage. In cases where signage is overused, it is often determined to be overlooked by motorists, or it ends up being overwhelming or otherwise confusing.