

TRAFFIC IMPACT STUDY:

WAL-MART STORE No. 70824
CITY OF KENOSHA, WISCONSIN

DATE SUBMITTED: MAY 17, 2011

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CHAPTER I – INTRODUCTION & EXECUTIVE SUMMARY

PART A – PURPOSE OF REPORT AND STUDY OBJECTIVES

Wal-Mart Stores, Inc. is proposing to construct a new store north of 52nd Street between 32nd and 30th Avenues in the City of Kenosha, Wisconsin. A traffic impact analysis was conducted by Traffic Analysis & Design, Inc. to determine the expected weekday morning, weekday evening, and Saturday midday peak hour operating conditions and recommendations at adjacent intersections.

This report documents the procedures, findings and conclusions of the traffic impact analysis. The analysis identifies recommended improvements based on existing intersection geometrics, traffic volumes and additional traffic expected to be generated by the Wal-Mart development.

PART B – EXECUTIVE SUMMARY

The executive summary includes a description of the study area, description of the development and conclusions based on the findings of the TIA.

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

The study area for the proposed development includes the following existing intersections:

- 32nd Avenue & 51st Street (two-way stop sign control)
- 32nd Avenue & 52nd Street (two-way stop sign control)
- 31st Avenue & 52nd Street (two-way stop sign control)
- 30th Avenue & 51st Street (two-way stop sign control)
- 30th Avenue & 52nd Street (traffic signal control)

In addition to these intersections, the proposed site access 32nd Avenue is included in the analysis.

B2. On-Site Development Description

The Wal-Mart development is proposed to consist of a 38,806 gross square-foot store that includes a pharmacy and drive-through window. Two 1.25-acre outlots are proposed in front of the store that could be developed into other commercial land uses. For the purposes of this study, the outlots were estimated to be developed as high traffic generators such as a high turnover sit-down restaurant, and a fast-food restaurant. The conceptual site plan for the proposed development is shown in Exhibit 1-1.

For the purpose of this traffic study the proposed development was assumed to be constructed and operational by the year 2011.

B3. Site Generated Traffic

The Wal-Mart SuperCenter development is expected to generate 4,190 total new trips during a typical weekday. Of these, 360 are expected to be linked between the Wal-Mart store and the adjacent outlots. Another 870 trips are expected to be pass-by trips, or trips already on the roadway system, resulting in a total of 2,960 new daily trips to the study area from the proposed Wal-Mart development.

B4. Access to Development

Three site driveways are proposed for the Wal-Mart store. One site driveway is proposed to be located on 52nd Street across from 31st Avenue. Other driveways are proposed to be located on 32nd Avenue, between 51st Street and 52nd Street and on 30th Avenue, directly across from 51st Street. Delivery truck access for the site would be at the site driveway to 32nd Avenue.

B5. Recommended Improvements

The study area intersections were analyzed based on the procedures set forth in the *2000 Highway Capacity Manual* (HCM). For the purpose of this study, LOS D was used to define acceptable peak hour operating conditions.

Year 2011 Background

Year 2011 background traffic volumes represent traffic based on traffic counts conducted at the study intersections in January 2011. With the year 2011 background traffic volumes, all movements at the study area intersections are expected to operate at LOS D or better during the peak hours. Therefore, no improvements are recommended.

Year 2021 Background

Year 2021 background traffic volumes represent a conservative annual growth of one percent per year, even though actual traffic trends show negative growth since 1984. With the year 2021 background traffic volumes, all movements at the study area intersections are expected to operate at LOS D or better during the peak hours. Therefore, no improvements are recommended.

Year 2011 Build

Year 2011 build traffic volumes represent the year 2011 background traffic volumes plus the additional traffic expected from buildout of the proposed Wal-Mart development. With the year 2011 build traffic volumes all study intersections are expected to operate at LOS D or better except for the 52nd Street intersection with 31st Avenue/Wal-Mart driveway. The southbound left-turn/through movement at this intersection is expected to be LOS E during the weekday evening peak hour. No improvements are recommended to mitigate this deficiency because signal warrants are not expected to be met, queues are relatively low, most of the traffic is expected to be served by the available gaps on 52nd Street, and the two other site driveways have excess capacity to handle any traffic not adequately being served at the Wal-Mart driveway to 52nd Street.

The recommended geometrics for the proposed Wal-Mart driveway intersections to are both shown on Exhibit 1-2 and listed as follows:

32nd Avenue and Wal-Mart driveway

- Construct the westbound approach with a single shared left-turn/right-turn lane
- Install stop signs on the westbound driveway approach

30th Avenue and Wal-Mart driveway

- Construct the eastbound approach with a separate left-turn/through and right-turn lane
- Install stop signs on the eastbound driveway approach

52nd Street and 31st Avenue/Wal-Mart driveway

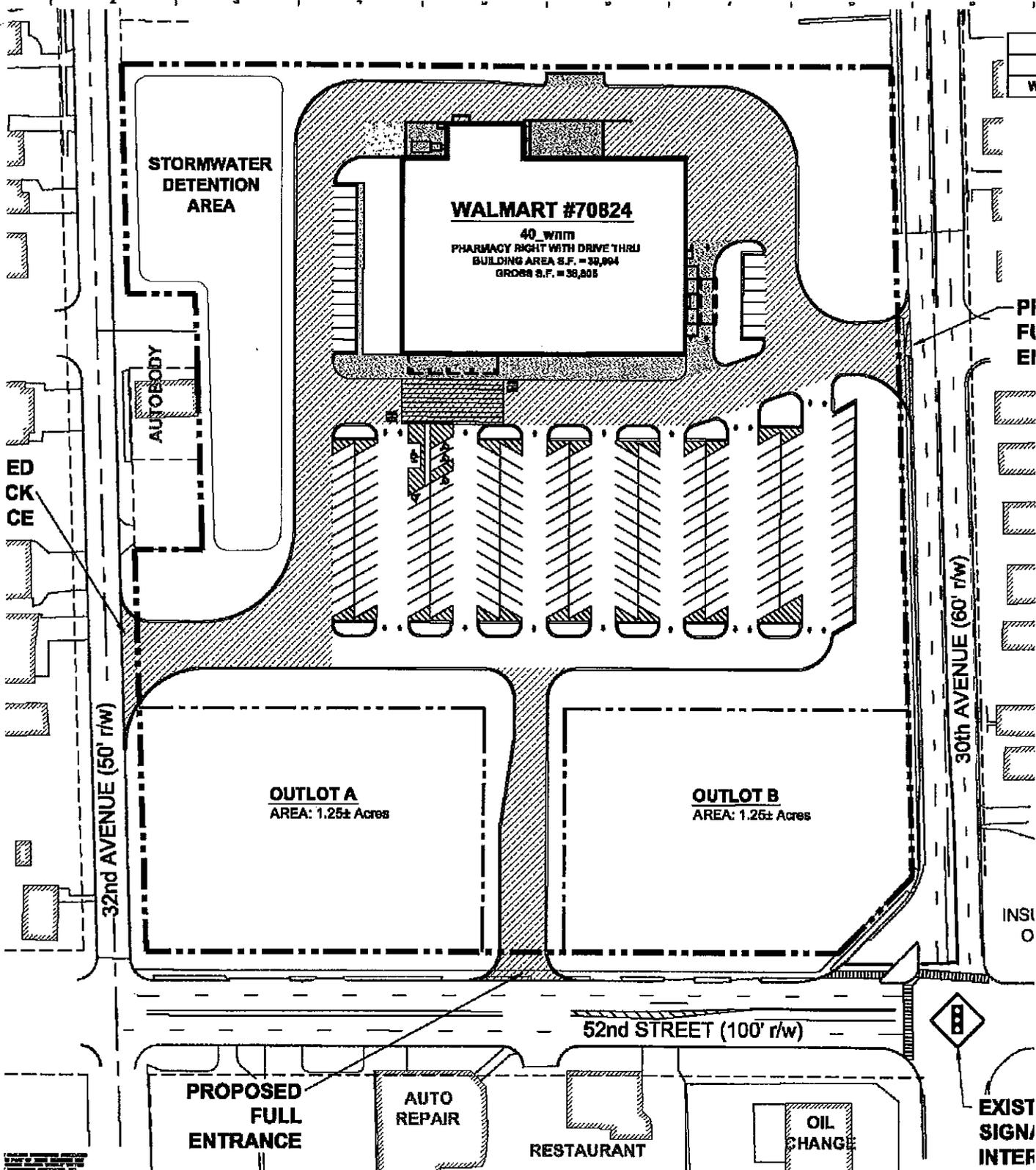
- Construct the southbound approach with a separate left-turn/through and right-turn lane
- Install stop signs on the southbound driveway approach.

Year 2021 Build

Year 2021 build traffic volumes represent the year 2021 background traffic volumes plus the additional traffic expected to be generated by the proposed Wal-Mart development. Although the delays for the southbound left-turn and through movement at the 52nd Street intersection with 31st Avenue/Wal-Mart driveway are expected to be higher than with the year 2011 build traffic volumes, no improvements are recommended. Similar to the year 2011 build traffic condition, signal warrants are not expected to be met, queues are relatively low, and the two other site driveways have excess capacity to handle any traffic not adequately being served at the Wal-Mart driveway to 52nd Street. With the site driveway geometrics recommended for the year 2011 build condition, all other intersections are expected to operate at LOS D or better during the peak hours with the year 2021 build traffic volumes.

B6. Conclusion

The implementation of the above-recommended geometric improvements are expected to result in safe and efficient traffic operations through the year 2021 at the study area intersections with the full buildout of the proposed Wal-Mart development.



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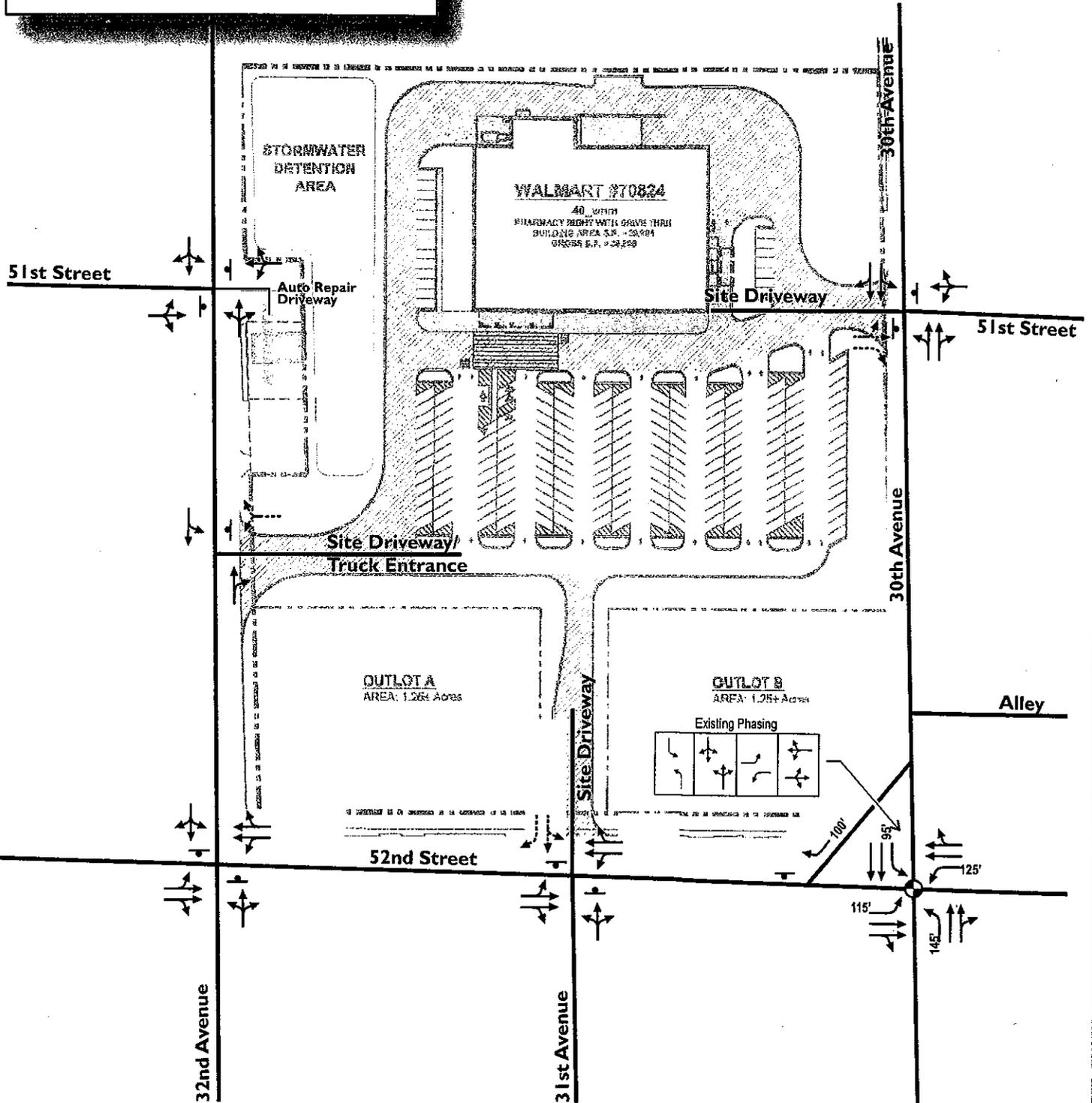
EXHIBIT 1-1
CONCEPTUAL SITE PLAN
WAL-MART STORE No. 70824
KENOSHA, WISCONSIN



May 17, 2011

LEGEND:

-  Traffic Signal
-  Stop Sign
-  Existing Lane Configuration
-  Recommended Lane Configuration
-  XXX' Existing Turn Lane Storage



CHAPTER II – PROPOSED DEVELOPMENT

PART A – ON-SITE DEVELOPMENT

A1. Development Description and Site Location

The Wal-Mart development is proposed to be located north of 52nd Street between 32nd and 30th Avenues. Exhibit 2-1 shows the site location for the proposed development. For the purpose of this traffic study the proposed development was assumed to be constructed and operational during the year 2011.

A2. Land Use and Intensity

The area surrounding the proposed Wal-Mart site consists of primarily residential land uses with commercial land uses (auto repair, restaurant, insurance office, liquor store, etc.) that front 52nd Street.

A3. Site Plan

The Wal-Mart development is proposed to consist of a 38,806 gross square-foot store that includes a pharmacy and drive-through window. Two 1.25-acre outlots are proposed in front of the store that could be developed into other commercial land uses. For the purposes of this study, the outlots were estimated to be developed as high traffic generators such as a high turnover sit-down restaurant, and a fast-food restaurant.

Three site driveways are proposed for the Wal-Mart store. One site driveway is proposed to be located on 52nd Street across from 31st Avenue. Other driveways are proposed to be located on 32nd Avenue, between 51st Street and 52nd Street and on 30th Avenue, directly across from 51st Street. Delivery truck access for the site would be at the site driveway to 32nd Avenue.

The conceptual site plan for the proposed development is shown in Exhibit 2-2.

PART B – STUDY AREA

B1. Influence Area

The proposed development is expected to draw trips from throughout the City of Kenosha, but primarily from the residential areas surrounding and in the vicinity of the site.

B2. Area of Significant Traffic Impact

The study area for the proposed development includes the following existing intersections:

- 32nd Avenue & 51st Street (two-way stop sign control)
- 32nd Avenue & 52nd Street (two-way stop sign control)
- 31st Avenue & 52nd Street (two-way stop sign control)
- 30th Avenue & 51st Street (two-way stop sign control)
- 30th Avenue & 52nd Street (traffic signal control)

In addition to these intersections, the proposed site access 32nd Avenue is included in the analysis.

PART D – SITE ACCESSIBILITY

The study area roadways are discussed below:

52nd Street is a four-lane undivided east/west roadway with a 30-mph speed limit within the study area. According to the Wisconsin Department of Transportation, (WisDOT), the 2008 annual

average daily traffic (AADT) volume on 52nd Street was approximately 22,200 vehicles per day (vpd) west of 30th Avenue and 19,700 vpd east of 30th Avenue.

51st Street is a two-lane east/west residential street that tees into 32nd Avenue on the west side of the site and also tees into 30th Avenue on the east side of the site. 51st Street has a 25-mph speed limit. WisDOT AADT information is not available for 51st Street.

32nd Avenue is a two-lane north/south residential street with a 25-mph speed limit within the study area. AADT information is not available for 32nd Avenue.

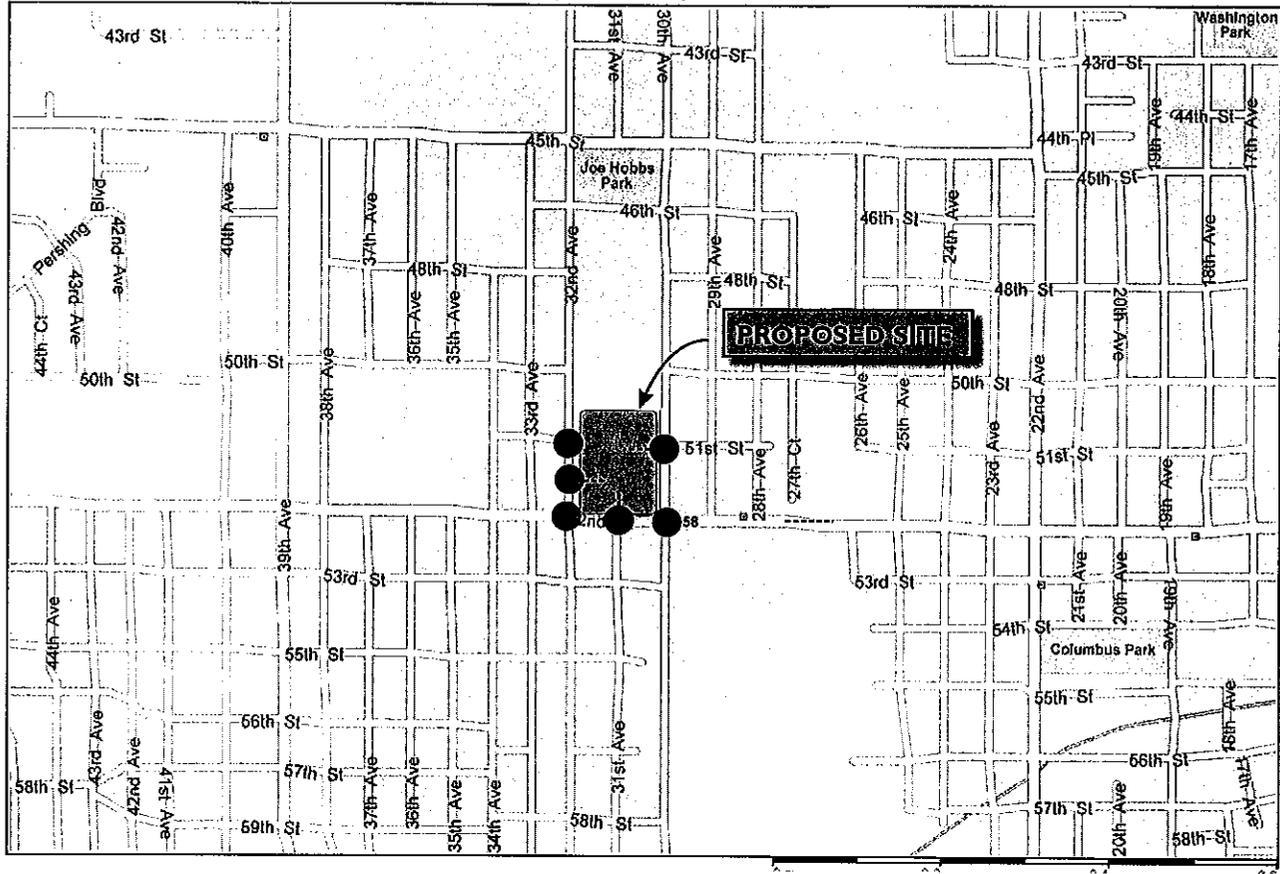
31st Avenue is a two-lane north/south residential street with a 25-mph speed limit that tees into 52nd Street. AADT information is not available for 31st Avenue.

30th Avenue is a four-lane undivided north/south roadway with a 30-mph speed limit within the study area. Some parking is allowed on the east side of 30th Avenue. According to WisDOT, the 2008 AADT volume on 30th Avenue was approximately 10,600 vpd north of 52nd Street and 11,300 vpd south of 52nd Street.

Alternative Modes of Transportation

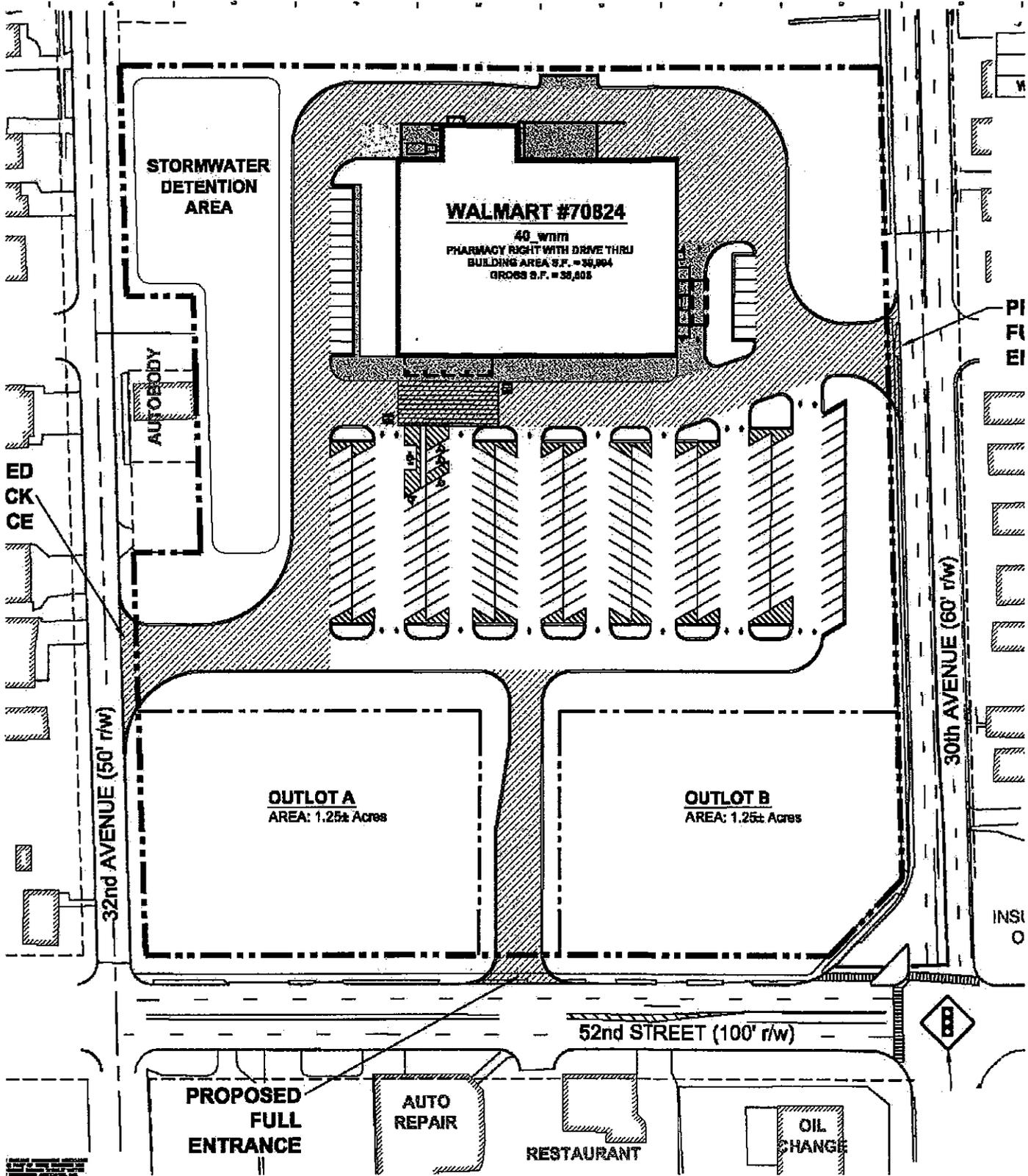
Although the City of Kenosha transit offers bus service along 52nd Street (route 2), no stops are located within the study area for the Wal-Mart development. All trips to/from the Wal-Mart development were therefore assumed to occur via motor vehicle.

Kenosha, Wisconsin, United States



LEGEND:

- Main Study Intersection
- Proposed Building Site
- - - - - Potential Access Point



CHAPTER III – ANALYSIS OF EXISTING CONDITIONS

PART A – PHYSICAL CHARACTERISTICS

Exhibit 3-1 shows the existing transportation detail for the study area intersections and roadways. More specifically, Exhibit 3-1 graphically illustrates existing intersection geometrics, posted speed limits, distances between intersections, and the number of travel lanes and adjacent land uses along roadways within the study area.

PART B – TRAFFIC VOLUMES

Weekday morning, weekday evening, and Saturday midday peak hour turning movement counts were conducted by Traffic Analysis & Design, Inc. in January 2011. Based on the turning movement counts, the peak hours were determined to occur during the following times:

- Weekday Morning (AM): 7:45-8:45 a.m.
- Weekday Evening (PM): 3:15-4:15 p.m.
- Saturday Midday (SAT): 12:00-1:00 p.m.

The turning movement count data showing all vehicles and heavy vehicles (trucks and buses) only are located in Appendix A. The existing traffic volumes were balanced between intersections and are shown as the year 2011 background traffic volumes on Exhibit 3-2.

Peak hour gap count data was also collected at the 52nd Street intersection with 31st Avenue and at the 51st Street intersection with 30th Avenue.

PART C – CAPACITY LEVEL OF SERVICE

The study area intersections were analyzed based on the procedures set forth in the *2000 Highway Capacity Manual* (HCM). Intersection operation is defined by “level of service.” Level of Service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS ‘A,’ to very poor, represented by LOS ‘F’. For the purpose of this study, LOS D was used to define acceptable peak hour operating conditions. Descriptions of the various levels of service are as follows:

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

LOS B represents stable operation. At signalized intersections, average vehicle delays are 10 to 20 seconds. At unsignalized intersections, average delays are 10 to 15 seconds.

LOS C still represents stable operation, but periodic backups of a few vehicles may develop behind turning vehicles. Most drivers begin to feel restricted, but not objectionably so. At signalized intersections, average vehicle delays are 20 to 35 seconds. At unsignalized intersections, average delays are 15 to 25 seconds.

LOS D represents increasing traffic restrictions as the intersection approaches instability. Delays to approaching vehicles may be substantial during short peaks within the peak period, but periodic clearance of long lines occurs, thus preventing excessive backups. At signalized intersections, average vehicle delays are 35 to 55 seconds. At unsignalized intersections, average delays are 25 to 35 seconds.

LOS E represents the capacity of the intersection. At signalized intersections, average vehicle delays are 55 to 80 seconds. At unsignalized intersections, average delays are 35 to 50 seconds.

LOS F represents jammed conditions where the intersection is over capacity and acceptable gaps for unsignalized intersections in the mainline traffic flow are minimal. At signalized intersections, average vehicle delays exceed 80 seconds. At unsignalized intersections, average delays exceed 50 seconds.

Year 2011 Background Traffic Operating Conditions – No Improvements

Exhibit 3-3 shows the year 2011 background traffic (no development) peak hour operating conditions at the study area intersections. The existing geometrics, shown in Exhibit 3-1, were used in the analysis.

As shown in Exhibit 3-3, except for the 32nd Avenue intersection with 52nd Street, all traffic movements at the study intersections are expected to operate at LOS C or better during the peak hours with the existing year 2011 background traffic volumes. According to the HCM analysis in Synchro, the 32nd Avenue intersection with 52nd Street operates at LOS E for the southbound movement during the weekday evening peak hour. However, the HCM tends to underestimate gaps in traffic for stop-controlled intersections. Therefore, the gap study results conducted for 52nd Avenue and 31st Street was applied to the 52nd Avenue intersection with 32nd Avenue since the turning volumes are relatively similar during the peak hours. According to the gap study (see Part D, below), there is a surplus of traffic gaps for turning movements on 52nd Avenue. Therefore, it is estimated that all traffic movements at the 32nd Avenue intersection with 52nd Street operates at least at LOS D or better during the peak hours. The LOS for this intersection on Exhibit 3-3 reflects the expected results based on the gap analysis.

The peak hour capacity analysis worksheets for the year 2011 background traffic conditions are located in Appendix B.

PART D –GAP ANALYSIS

Traffic gap studies measure the length of gaps, in time, between vehicles in roadway traffic streams to determine the ease of completing a turning maneuver onto a roadway. A gap study was conducted along 52nd Street at 31st Avenue, which collected gaps in traffic on 52nd Street for the weekday morning, weekday evening, and Saturday midday time periods. Note that although gap counts were also collected at the 51st Street intersection with 30th Avenue, all future traffic operations at this intersection are expected to operate at LOS C or better during the peak hours. Therefore, further analysis of gaps was not considered necessary for this intersection.

The calculations for the critical gaps and follow-up times for turning movements were based on the Highway Capacity Manual (HCM) equations 17-1 and 17-2. These equations include adjustment factors for heavy vehicles, grade, divided roadways, and intersection geometry. The gap analysis worksheet calculations for this study are located in Appendix A.

Minor Street Left Turn:

A vehicle could complete a southbound left turn from the location of the proposed Wal-Mart driveway across from 31st Avenue onto eastbound 52nd Street in a combined eastbound/westbound gap of about 7.5 seconds. Including follow-up time, two vehicles in queue can complete the turn in succession with 18.6 seconds of gap time, and three vehicles can complete the turn in succession with 29.7 seconds of gap time.

Equivalent gaps (or capacity of gaps) are calculated by adding the number of gaps greater than 29.7 seconds (multiplied by three), the number of gaps between 18.6 seconds and 29.7 seconds

(multiplied by two), and the number of gaps between 7.5 seconds and 18.6 seconds (multiplied by one).

Minor Street Right Turn:

A vehicle could complete a southbound right turn from the location of the proposed Wal-Mart driveway across from 31st Avenue onto westbound 52nd Street in a westbound gap of about 6.9 seconds. Including follow-up time, two vehicles in queue can complete the turn in succession with 17.2 seconds of gap time, and three vehicles can complete the turn in succession with 27.5 seconds of gap time. Equivalent gaps are calculated using the same methodology as described for the minor street left turn gap analysis.

Major Street Left Turn:

A vehicle could complete an eastbound left turn from 52nd Street into the location of the proposed Wal-Mart driveway in a westbound traffic gap of about 4.1 seconds. Including follow-up time, two vehicles in queue can complete the turn in succession with 10.5 seconds of gap time, and three vehicles can complete the turn in succession with 16.9 seconds of gap time. Equivalent gaps are calculated using the same methodology as described for the minor street left turn gap analysis.

Gap Study Results:

Table 1 summarizes the findings of the 52nd Street gap study.

**Table 1
52nd Street Equivalent Gap Results**

	Direction to/from the Wal-Mart Driveway	One-Vehicle Gaps (x1)	Two-Vehicle Gaps (x2)	Three-Vehicle Gaps (x3)	Equivalent Gaps
AM	Southbound Left-Turn Out	67(1)=67	4(2)=8	0(3)=0	75
	Southbound Right-Turn Out	75(1)=75	34(2)=68	15(3)=45	188
	Eastbound Left-Turn In	44(1)=44	46(2)=92	49(3)=147	283
PM	Southbound Left-Turn Out	34(1)=34	1(2)=2	0(3)=0	36
	Southbound Right-Turn Out	86(1)=86	24(2)=48	8(3)=24	158
	Eastbound Left-Turn In	62(1)=62	48(2)=96	32(3)=96	254
SAT	Southbound Left-Turn Out	30(1)=30	6(2)=12	0(3)=0	42
	Southbound Right-Turn Out	100(1)=100	22(2)=44	6(3)=18	162
	Eastbound Left-Turn In	81(1)=81	44(2)=88	28(3)=84	253

Based on the information summarized in Table 1, there are currently 75 AM, 36 PM, and 42 Saturday midday equivalent gaps in the combined eastbound/westbound traffic on 52nd Street for southbound left-turn movements from the proposed Wal-Mart driveway across from 31st Avenue. It is also expected that these same gaps may be available for southbound left turns at the 52nd Street intersection with 30th Avenue. As mentioned in the previous section, the surplus of gaps on 52nd Street is expected to also apply to the 30th Avenue intersection, resulting in at least LOS D or better conditions for all traffic movements during the peak hours.

At the 52nd Street intersection with 31st Avenue, there is expected to be 188 AM, 158 PM, and 162 Saturday midday equivalent gaps available in westbound traffic on 52nd Avenue for southbound right turns from the proposed Wal-Mart driveway. There is also expected to be 283 AM, 254 PM, and 253 Saturday midday equivalent gaps available in westbound traffic on 52nd Avenue for eastbound left turns into the proposed Wal-Mart driveway.

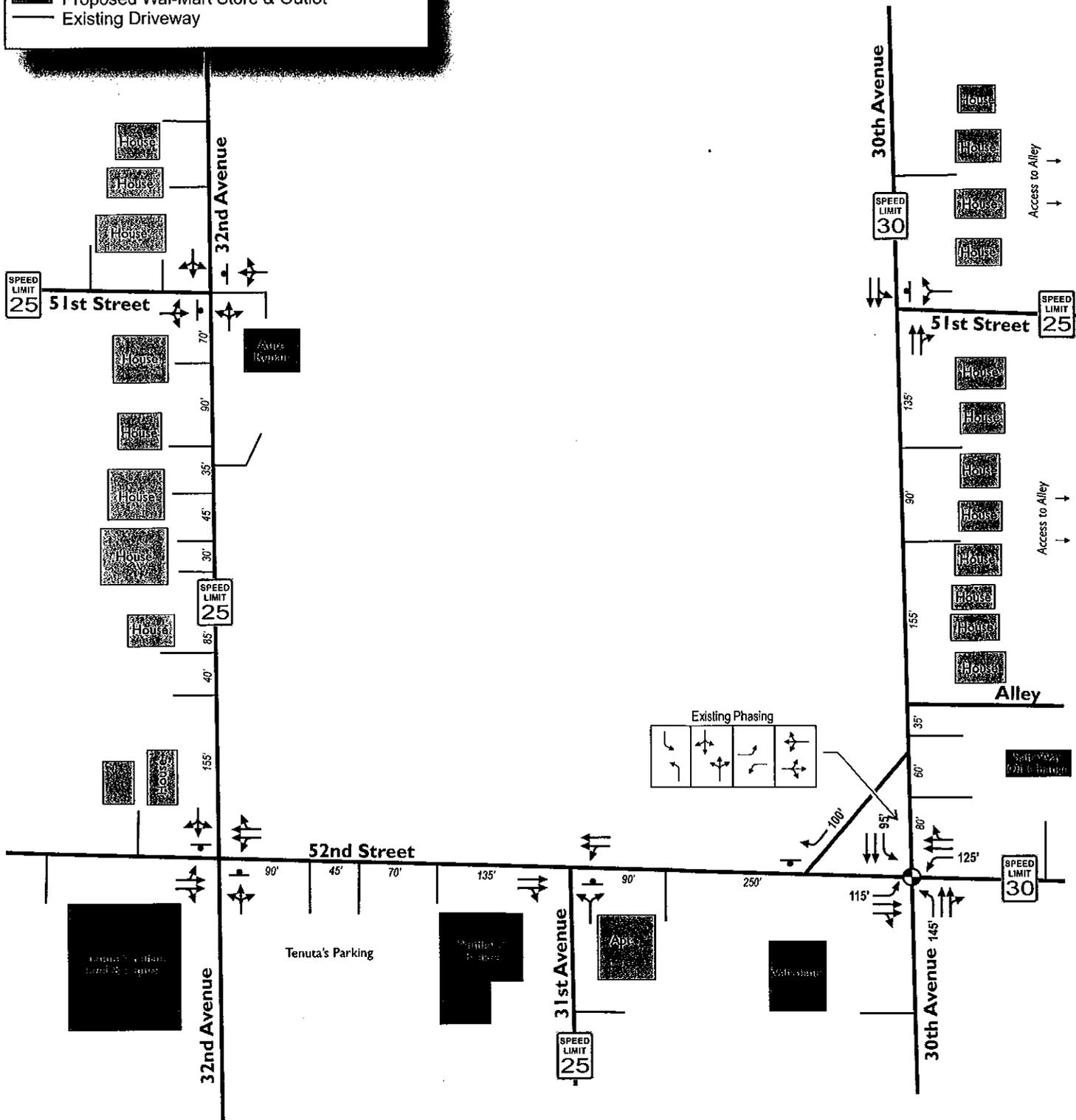
PART E – SOURCES OF DATA

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

- Historical daily traffic volumes – WisDOT coverage counts
- Turning movement traffic counts – Traffic Analysis & Design, Inc.
- Transportation detail – Traffic Analysis & Design, Inc.
- On-site development information – McClure Engineering Associates.

LEGEND:

-  Traffic Signal
-  Stop Sign
-  Existing Lane Configuration
-  Existing Commercial Buildings
-  Proposed Wal-Mart Store & Outlot
-  Existing Driveway



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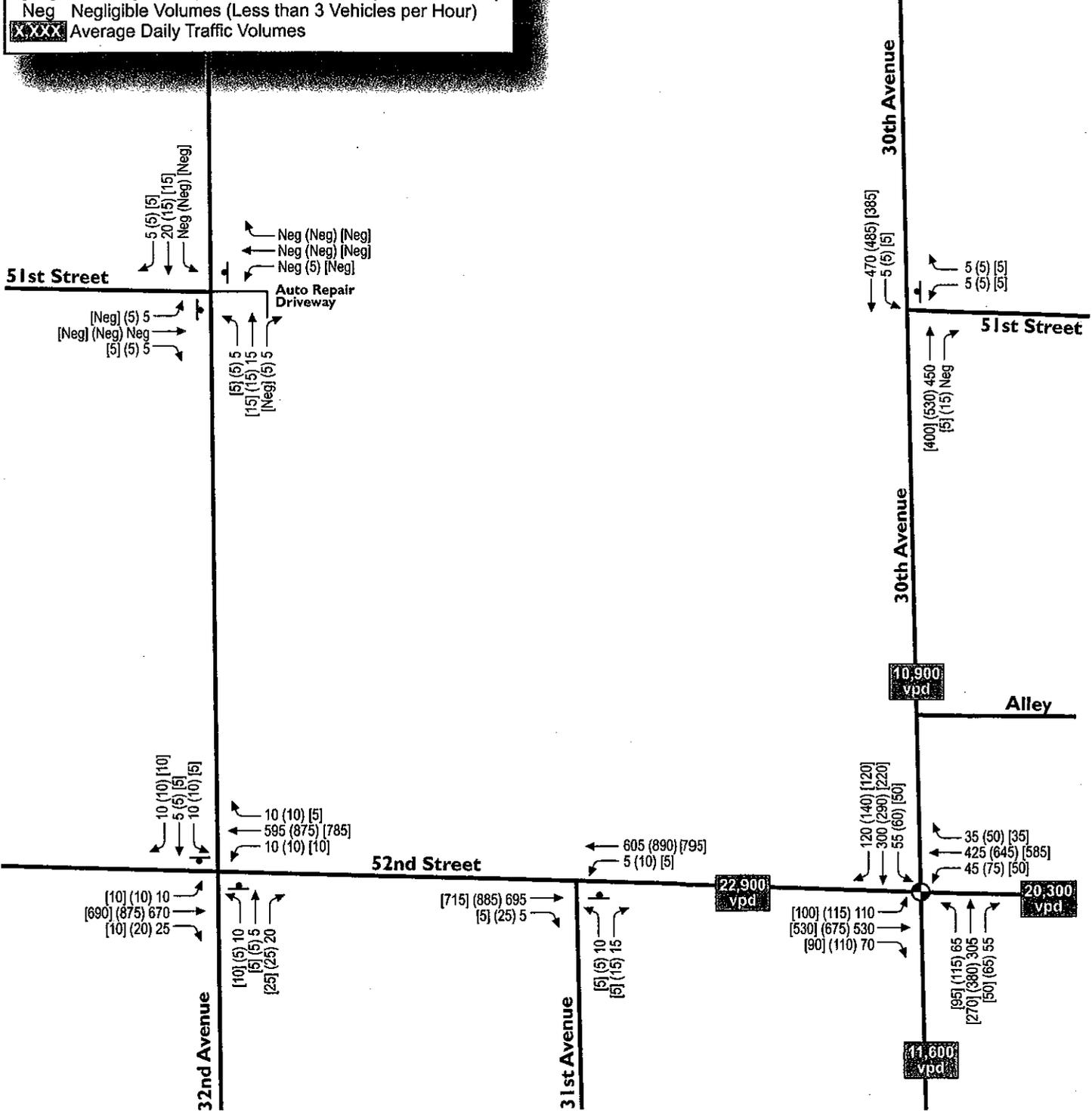
EXHIBIT 3-1
EXISTING TRANSPORTATION DETAIL
 WAL-MART STORE No. 70824
 KENOSHA, WISCONSIN



May 17, 2011

LEGEND:

-  Traffic Signal
-  Stop Sign
- XX Weekday Morning Peak Hour Volumes (7:45-8:45 AM)
- (XX) Weekday Evening Peak Hour Volumes (3:15-4:15 PM)
- [XX] Saturday Midday Peak Hour Volumes (12:00-1:00 PM)
- Neg Negligible Volumes (Less than 3 Vehicles per Hour)
-  Average Daily Traffic Volumes



**Year 2011 Background Traffic Volumes Peak Hour Operating Conditions
Existing Roadway System**

Intersection	Traffic Control	Peak Hour	Level of Service per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
32nd Avenue & 51st Street	Two-Way Stop	AM	A	A	A	A	A	A	A	A	A	A	A	A
		PM	A	A	A	A	A	A	A	A	A	A	A	A
		Sat	A	A	A	A	A	A	A	A	A	A	A	A
32nd Avenue & 52nd Street	Two-Way Stop	AM	A	A	A	A	A	A	C	C	C	D	D	D
		PM	A	A	A	A	A	A	C	C	C	D*	D*	D*
		Sat	A	A	A	A	A	A	C	C	C	C	C	C
31st Avenue & 52nd Street	Two-Way Stop	AM	-	A	A	A	A	-	B	-	B	-	-	-
		PM	-	A	A	A	A	-	C	-	C	-	-	-
		Sat	-	A	A	A	A	-	C	-	C	-	-	-
30th Avenue & 52nd Street	Traffic Signal	AM	B	B	B	B	B	B	B	C	C	B	C	B
		PM	B	C	C	B	C	C	B	C	C	B	C	B
		Sat	B	B	B	B	B	B	B	C	C	B	C	B
30th Avenue & 51st Street	Two-Way Stop	AM	-	-	-	B	-	B	-	A	A	A	A	-
		PM	-	-	-	B	-	B	-	A	A	A	A	-
		Sat	-	-	-	B	-	B	-	A	A	A	A	-

Notes:

- Indicates that the movement is not possible at the intersection.

* Represents LOS based on gap studies conducted along 52nd Street.



CHAPTER IV – PROJECTED TRAFFIC

PART A – BACKGROUND TRAFFIC FORECASTING

Traffic projections for the study area were developed by Traffic Analysis & Design, Inc. to identify year 2021 background traffic volumes. Historical AADT data obtained from the WisDOT coverage counts was utilized to determine an annual growth rate on the arterials surrounding the proposed development. Historical AADT data was collected from the year 1984 to the year 2008.

According to the historical data, traffic along 30th Avenue and 52nd Street has seen a steady decline since 1984 (from -0.4 percent to -2.2 percent per year). For a conservative estimate of traffic growth for this study, the negative traffic growth was ignored, and a one percent per year growth rate was used instead. This growth rate was previously-approved by the City of Kenosha Engineering staff for use in the Wal-Mart SuperCenter Development TIA for the proposed Wal-Mart SuperCenter in the southwest quadrant of 80th Street and 30th Avenue.

The one percent growth rate was applied to the year 2011 background traffic volumes to generate the year 2021 background traffic volumes. The year 2021 background traffic volumes are shown on Exhibit 4-1.

PART B – DEVELOPMENT TRAFFIC FORECASTING

To address any potential future traffic impacts along study area roadways and at the intersections adjacent to the development, it is necessary to identify the hourly and daily volume of traffic generated by the proposed development. The expected traffic volumes generated by the development are based on the size and type of the proposed land uses, and on trip rates as published in the Institute of Transportation Engineer's (ITE) *Trip Generation Manual, 8th Edition, 2008*.

B1. Trip Generation

The expected trip generation for the proposed Wal-Mart development is shown in Exhibit 4-2. As shown, the Wal-Mart store and two adjacent outlots are expected to generate a total of 4,190 total trips on a typical weekday. The development is also expected to generate about 275 total trips during the weekday morning peak hour, 335 total trips during the weekday evening peak hour, and 470 total trips during the Saturday midday peak hour. These total trips are expected to be reduced by linked trips between the Wal-Mart store and adjacent outlots.

B2. Determination of Pass-by and Linked Trip Traffic

Approximately 10 percent of the high-turnover restaurant trips and 20 percent of the fast-food restaurant trips are expected to be linked trips with the Wal-Mart store. A linked trip occurs when a motorist travels between on-site developments without leaving the driveway.

Approximately 10 percent of the Wal-Mart store, 10 percent of the high-turnover restaurant, and 50 percent of the fast-food restaurant trips are expected to be pass-by trips. A pass-by trip occurs when a motorist stops off at a development before continuing on their intended route (i.e. a motorist traveling eastbound on 52nd Street stops off at the fast-food restaurant prior to continuing eastbound on 52nd Street). The Wal-Mart pass-by trips are shown on Exhibit 4-3.

B3. Trip Distribution

The trip distributions for the Wal-Mart development and two adjacent outlots was based on existing traffic patterns (Analogy Method), the location of regionally populated areas both inside and outside the City of Kenosha (Gravity Model Method), and the location of the developments

with respect to the study area. The trip distributions used are shown graphically on Exhibit 4-4a and are summarized as follows.

- 20 percent to/from the north on 30th Avenue
- 25 percent to/from the south on 30th Avenue
- 25 percent to/from the west on 52nd Street
- 25 percent to/from the east on 52nd Street
- 2 percent to/from the north on 32nd Avenue
- 2 percent to/from the south on 32nd Avenue
- 1 percent to/from the south on 31st Avenue

B4. Trip Assignment

Trips generated by the Wal-Mart development were assigned to the adjacent roadway system based on the above directional distributions to determine additional turning movement traffic at the study area intersections. The Wal-Mart new trips are shown on Exhibit 4-4B. The Wal-Mart pass-by trips (Exhibit 4-3) were added to the new trips (Exhibit 4-4B) to generate the Wal-Mart driveway trips, as shown on Exhibit 4-4C.

PART C – BUILD TRAFFIC

C1. Year 2011 Traffic

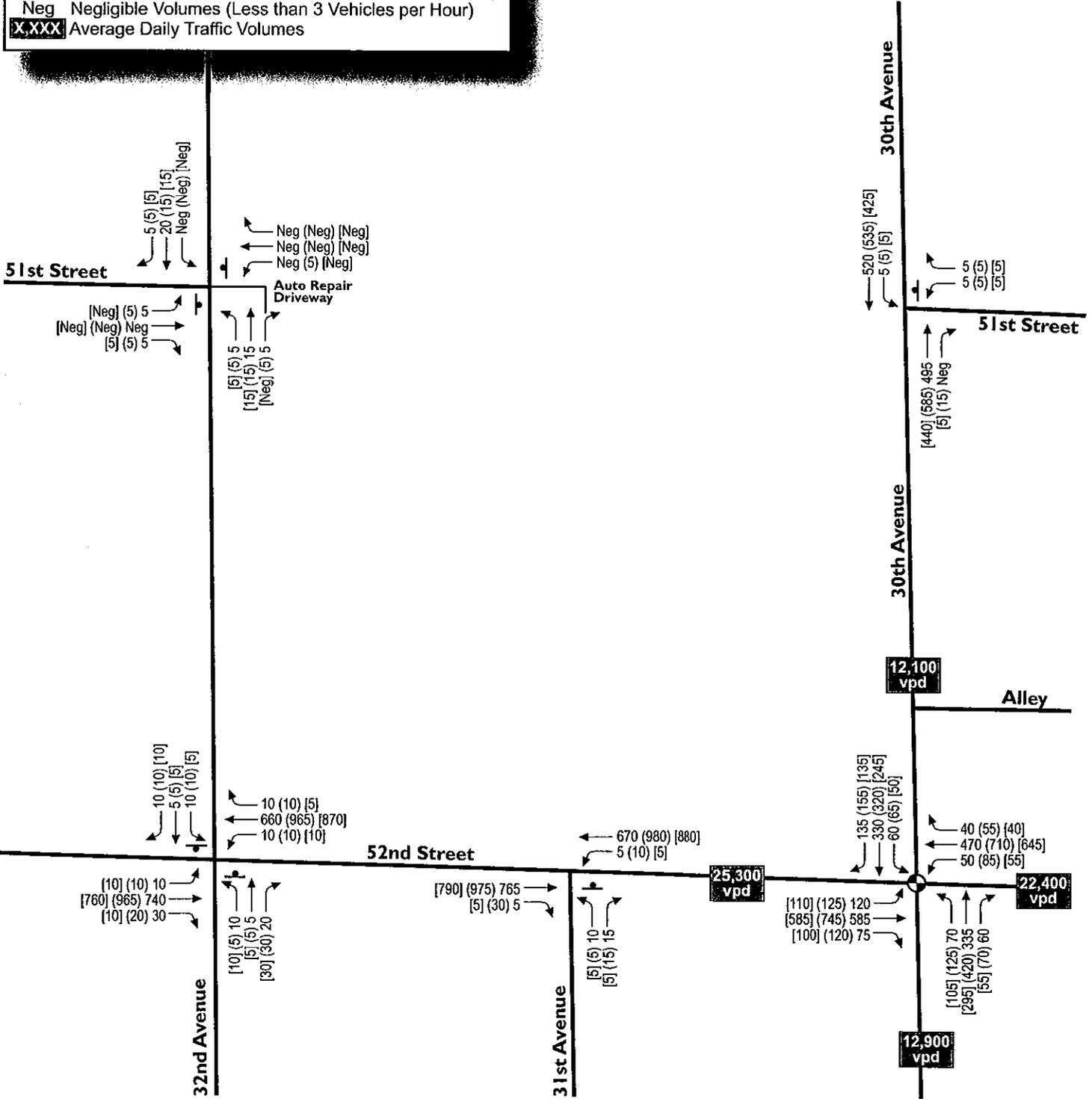
The year 2011 build traffic turning movement volumes were determined by adding the development driveway trips, shown on Exhibit 4-4C, to the year 2011 background traffic volumes (Exhibit 3-2). The year 2011 build traffic volumes are illustrated on Exhibit 4-5.

C2. Year 2021 Traffic

The year 2021 build traffic turning movement volumes were determined by adding the development driveway trips, shown on Exhibit 4-4C, to the year 2021 background traffic volumes (Exhibit 4-1). The year 2021 build traffic volumes are illustrated on Exhibit 4-6.

LEGEND:

- ⊕ Traffic Signal
- ⊖ Stop Sign
- XX Weekday Morning Peak Hour Volumes (7:45-8:45 AM)
- (XX) Weekday Evening Peak Hour Volumes (3:15-4:15 PM)
- [XX] Saturday Midday Peak Hour Volumes (12:00-1:00 PM)
- Neg Negligible Volumes (Less than 3 Vehicles per Hour)
- X,XXX Average Daily Traffic Volumes

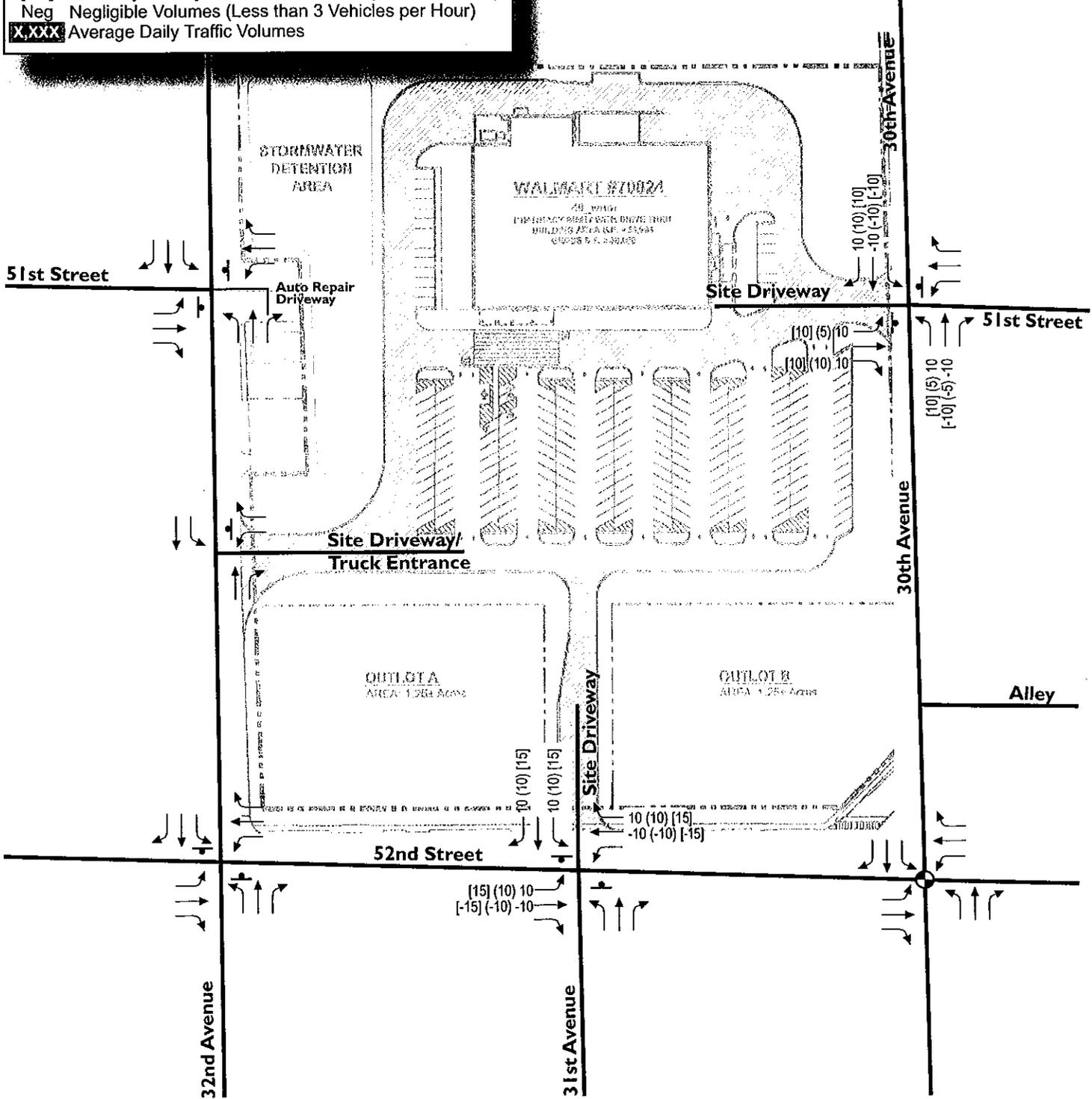


**Wal-Mart Kenosha North
Trip Generation Table**

Land Use	ITE Code	Proposed (Size)	Weekday Daily	AM Peak			PM Peak			SAT Peak		
				In	Out	Total	In	Out	Total	In	Out	Total
Wal-Mart Store	813	38,800 SF	2,060 (53.13)	35 (56%)	30 (44%)	65 (1.67)	90 (49%)	90 (51%)	180 (4.61)	110 (50%)	110 (50%)	220 (5.64)
High Turnover Sit-Down Restaurant	932	5,000 SF	640 (127.15)	30 (52%)	30 (48%)	60 (11.52)	30 (59%)	25 (41%)	55 (11.15)	35 (53%)	35 (47%)	70 (14.01)
Fast-Food Restaurant	934	3,000 SF	1,490 (496.12)	75 (51%)	75 (49%)	150 (49.35)	50 (52%)	50 (48%)	100 (33.84)	90 (51%)	90 (49%)	180 (59.39)
Total Trips			4,190	140	135	275	170	165	335	235	235	470
<i>Minus Linked Trips</i>	(932)	10%	60	5	5	10	5	5	10	5	5	10
<i>Minus Linked Trips</i>	(934)	20%	300	15	15	30	10	10	20	20	20	40
Total Linked Trips (Minus)			360	20	20	40	15	15	30	25	25	50
Total Driveway Trips			3,830	120	115	235	155	150	305	210	210	420
<i>Minus Pass-by Trips</i>	(813)	10%	210	5	5	10	10	10	20	10	10	20
<i>Minus Pass-by Trips</i>	(932)	10%	60	5	5	10	5	5	10	5	5	10
<i>Minus Pass-by Trips</i>	(934)	50%	600	30	30	60	20	20	40	35	35	70
Total Pass-by Trips (Minus)			870	40	40	80	35	35	70	50	50	100
Total New Trips			2,960	80	75	155	120	115	235	160	160	320

LEGEND:

- ⊕ Traffic Signal
- ⊥ Stop Sign
- XX Weekday Morning Peak Hour Volumes (7:45-8:45 AM)
- (XX) Weekday Evening Peak Hour Volumes (3:15-4:15 PM)
- [XX] Saturday Middy Peak Hour Volumes (12:00-1:00 PM)
- Neg Negligible Volumes (Less than 3 Vehicles per Hour)
- X,XXX Average Daily Traffic Volumes



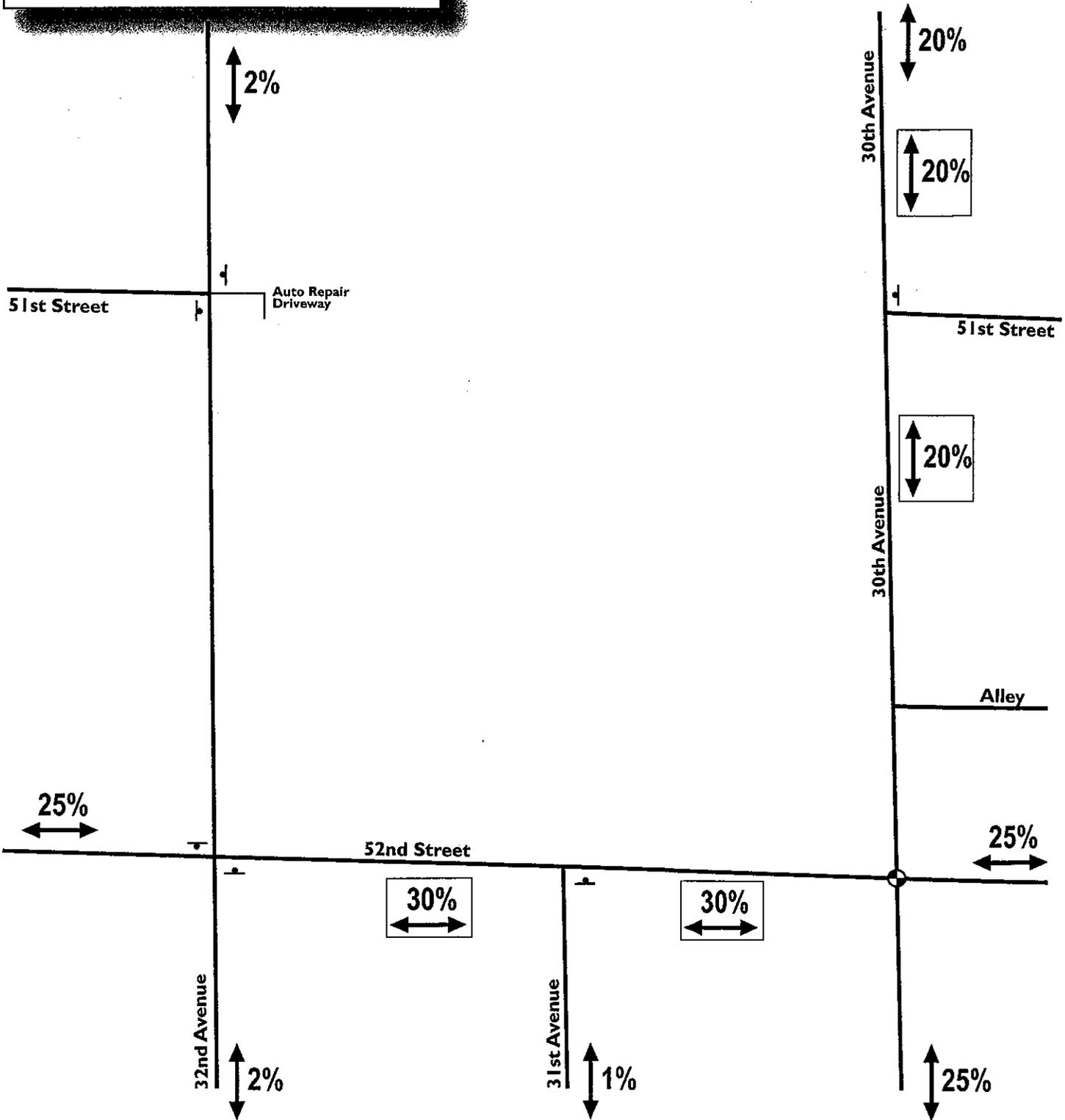
LEGEND:

 Traffic Signal

 Stop Sign

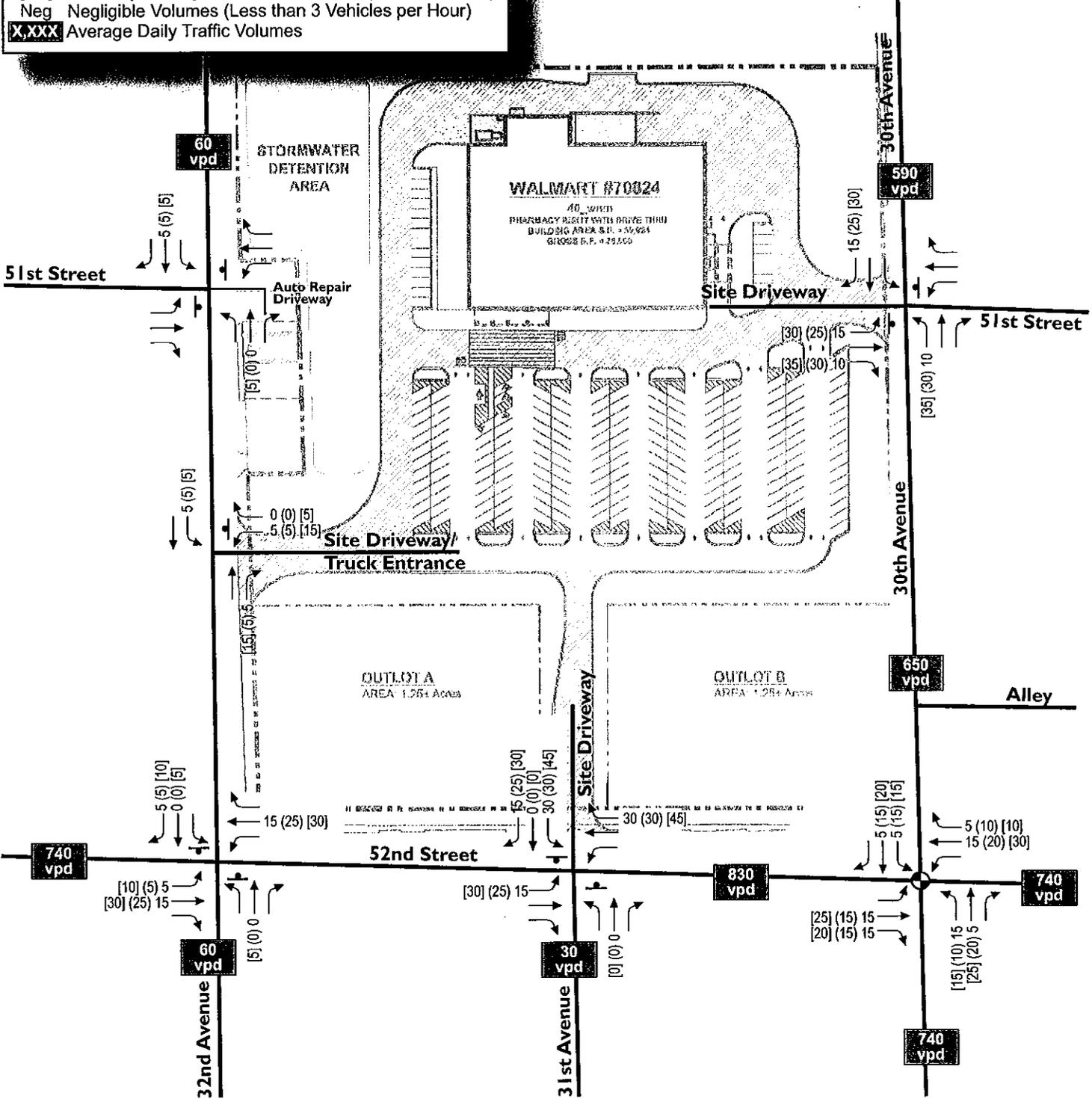
 XX% New Trips Distribution Percentage

 XX% Pass-by Trips Distribution Percentage



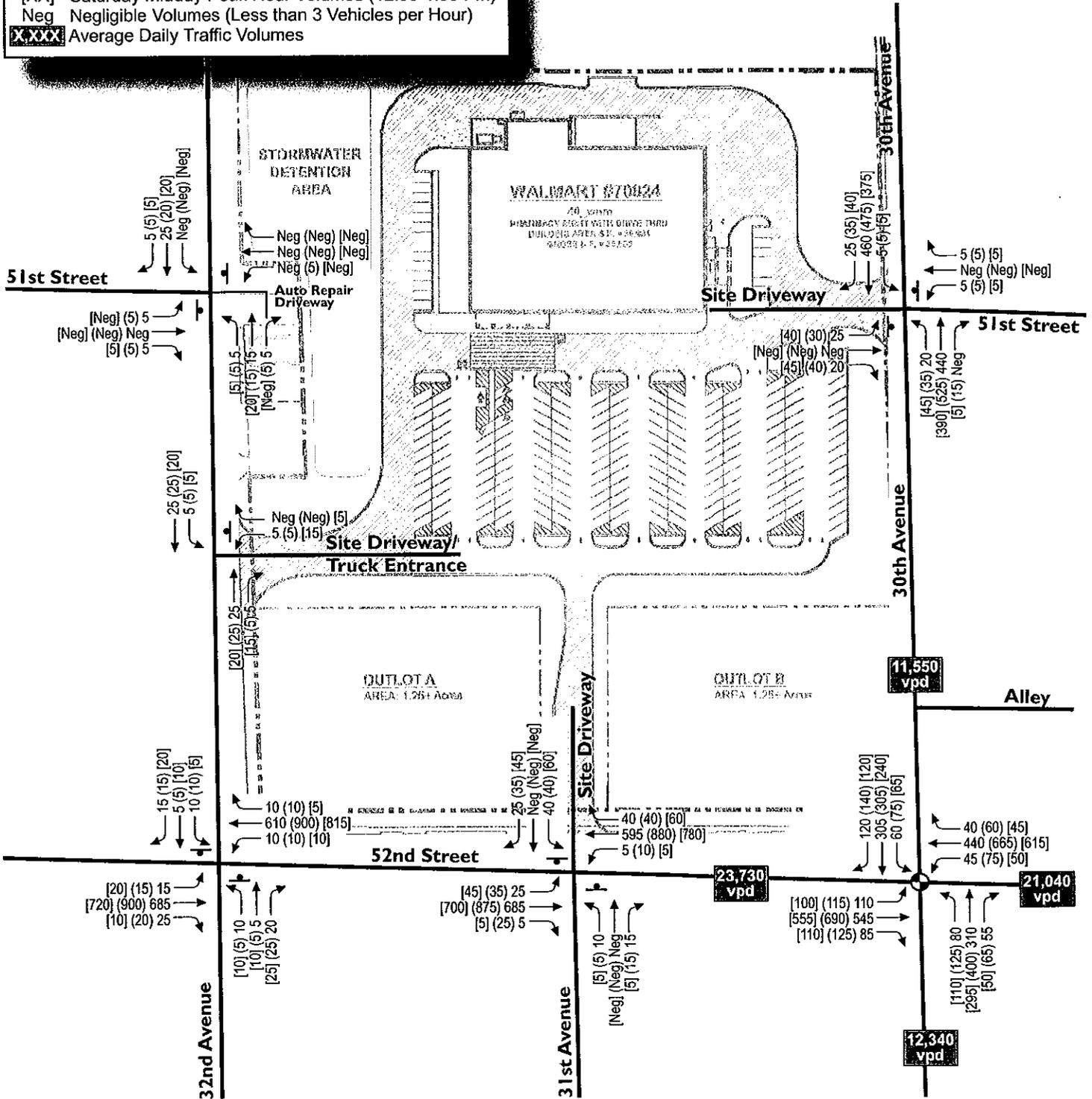
LEGEND:

-  Traffic Signal
-  Stop Sign
- XX Weekday Morning Peak Hour Volumes (7:45-8:45 AM)
- (XX) Weekday Evening Peak Hour Volumes (3:15-4:15 PM)
- [XX] Saturday Midday Peak Hour Volumes (12:00-1:00 PM)
- Neg Negligible Volumes (Less than 3 Vehicles per Hour)
- X,XXX Average Daily Traffic Volumes



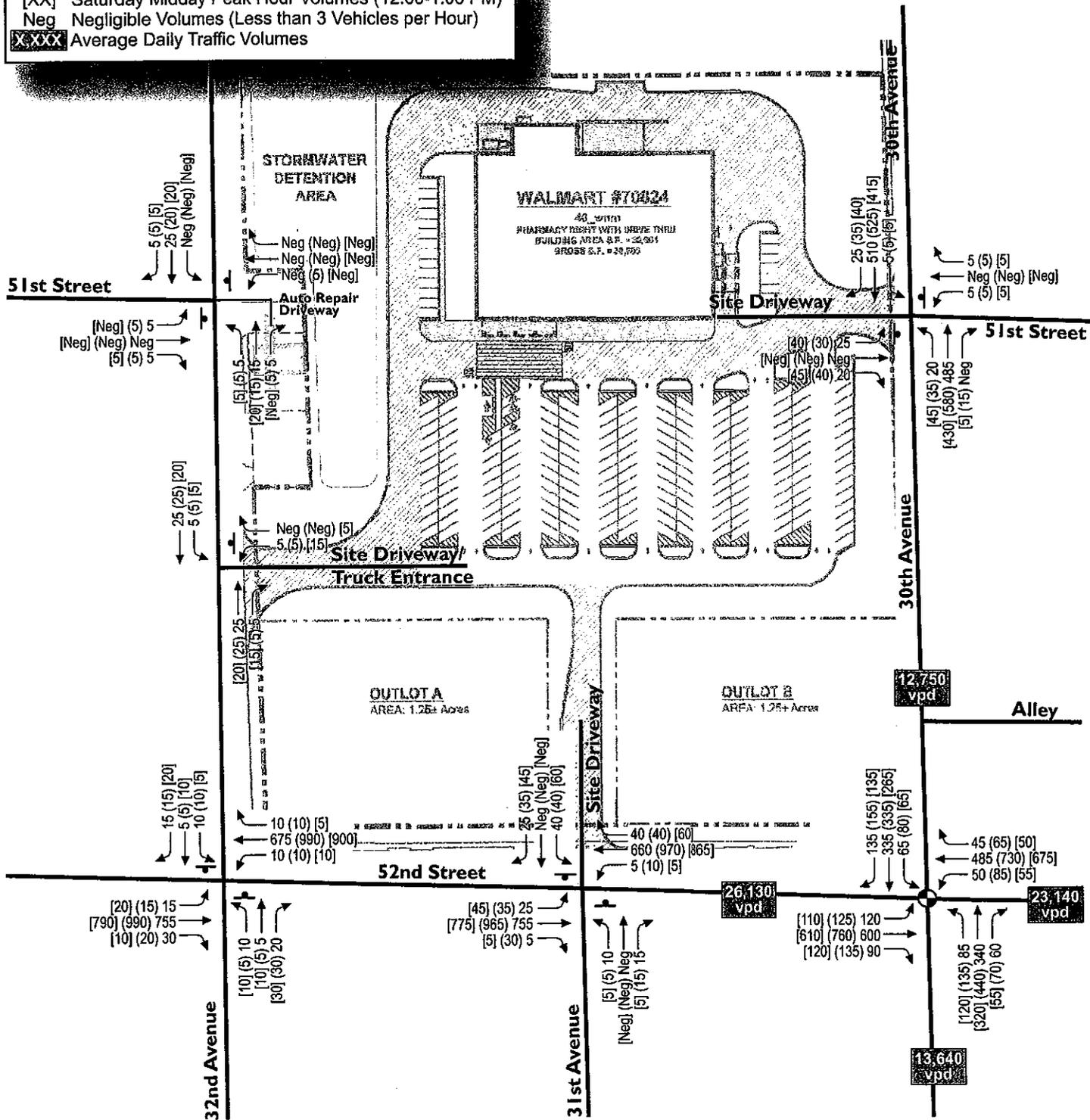
LEGEND:

- ⊙ Traffic Signal
- ⊙ Stop Sign
- XX Weekday Morning Peak Hour Volumes (7:45-8:45 AM)
- (XX) Weekday Evening Peak Hour Volumes (3:15-4:15 PM)
- [XX] Saturday Midday Peak Hour Volumes (12:00-1:00 PM)
- Neg Negligible Volumes (Less than 3 Vehicles per Hour)
- X,XXX Average Daily Traffic Volumes



LEGEND:

- ⊙ Traffic Signal
- ⊥ Stop Sign
- XX Weekday Morning Peak Hour Volumes (7:45-8:45 AM)
- (XX) Weekday Evening Peak Hour Volumes (3:15-4:15 PM)
- [XX] Saturday Midday Peak Hour Volumes (12:00-1:00 PM)
- Neg Negligible Volumes (Less than 3 Vehicles per Hour)
- X:XXX Average Daily Traffic Volumes



CHAPTER V – TRAFFIC AND IMPROVEMENT ANALYSIS

PART A – CAPACITY / LEVEL OF SERVICE ANALYSIS

A1. Year 2021 Background Traffic Operating Conditions – No Improvements

Exhibit 5-1 shows the year 2021 background traffic (no development) peak hour operating conditions at the study area intersections. The existing geometrics, shown in Exhibit 3-1, and the existing traffic signal sequence of operations were used in the analysis. Similar to the year 2011 background traffic condition, the LOS of the 32nd Avenue intersection with 52nd Street was based on the gap analysis results for 52nd Street.

As shown in Exhibit 5-1, all traffic movements at the study intersections are expected to continue to operate at LOS D or better conditions during the peak hours with the year 2021 background traffic volumes. The peak hour capacity analysis worksheets for the year 2021 background traffic conditions are located in Appendix B.

A2. Year 2011 Build Traffic – No Improvements

Exhibit 5-2 shows the year 2011 build traffic (2011 background traffic plus the additional traffic expected from the Wal-Mart development) peak hour operating conditions at the study intersections. The intersections were evaluated with the existing geometrics and traffic control for each study intersection. Similar to the year 2011 background traffic condition, the LOS of the 32nd Avenue intersection with 52nd Street was based on the gap analysis results for 52nd Street. The LOS of the 52nd Street intersection with 31st Avenue/Wal-Mart driveway was also based on the 52nd Street gap study results.

As shown in Exhibit 5-2, all study intersections are expected to operate at LOS D or better during the peak hours, except for the 52nd Street intersection with 31st Avenue/Wal-Mart driveway. Based on the Synchro analysis, the southbound left-turn and through trips from the proposed Wal-Mart site driveway are expected to operate at LOS E with 37.2 seconds of delays during the weekday evening peak hour. No mitigation measures are recommended to address operational deficiencies at this intersection for the following reasons:

- The traffic volumes at this intersection are not expected to be high enough to meet warrants for traffic signal control;
- This delay is not excessive and is only 2.2 seconds above the 35.0-second threshold for LOS D conditions.
- The traffic assignment for these movements exceeds the number of available gaps by only four vehicles during the weekday evening peak hour.
- The proposed Wal-Mart driveways to 32nd Avenue and 30th Avenue are expected to have excess capacity and operate at LOS C or better during the peak hours, so they will be able to accommodate additional traffic if delays or queues at the proposed Wal-Mart driveway to 52nd Street become excessive.

The peak hour capacity analysis worksheets for the year 2011 build traffic conditions are located in Appendix C.

A3. Year 2021 Build Traffic – No Improvements

The year 2021 build traffic (2021 background traffic volumes plus the additional traffic expected from the Wal-Mart development) peak hour operating conditions are shown on Exhibit 5-3. The

intersections were evaluated with the existing geometrics and traffic control for each study intersection.

As shown in Exhibit 5-3, except for the 31st Avenue intersection with 52nd Street, the study intersections are expected to operate with LOS D or better for all traffic movements during the peak hours.

Based on the Synchro analysis, the southbound left-turn and through trips from the proposed Wal-Mart site driveway are expected to operate at LOS F with 52.5 seconds of delays during the weekday evening peak hour and 37.2 seconds of delay during the Saturday midday peak hour. Although the weekday evening peak hour delay elevates to LOS F according to the HCM/Synchro, it is still expected to be less than 60 seconds of wait time per vehicle turning at the driveway. Since the HCM underestimates gaps and the traffic assigned to that movements is only four cars greater than the number of existing available gaps (although these gaps may decrease as traffic increases on 52nd Street), the LOS and delay could actually be a lot less. Similar to the year 2011 build condition, the intersection is not expected to meet warrants for traffic signal control, and any excess traffic not served by existing gaps can alternatively use either of the other site driveways to 32nd Avenue or 30th Avenue. Therefore, no mitigating improvements are recommended to accommodate year 2021 build traffic volumes.

The peak hour capacity analysis worksheets for the year 2021 build traffic conditions are located in Appendix C.

PART B – WARRANT ANALYSIS

A traffic signal warrant analysis was conducted to determine if signals would be warranted at the 52nd Street intersection with 31st Avenue/Wal-Mart driveway with the year 2021 build traffic volumes.

The warrant study was based on traffic volume warrants from the 2003 *Manual on Uniform Traffic Control Devices* (MUTCD). Both 31st Avenue and the Wal-Mart driveway were evaluated as the minor street approaches with one lane and zero percent of the right turn volumes included in the analysis. This is standard practice for minor street approaches where an exclusive right turn lane is present. 52nd Street was evaluated as the major street with two-lane approaches. Since the speed limit on 52nd Street is less than 40 mph, urban warrants were utilized.

Chapter 4C of the 2003 *Manual on Uniform Traffic Control Devices* (MUTCD) outlines the standards for determining the need for traffic signals at a particular location. For a traffic signal to be installed, at least one of the following warrants must be satisfied. The eight signal warrants are listed below:

- Warrant 1, Eight-Hour Vehicular Volume.
- Warrant 2, Four-Hour Vehicular Volume.
- Warrant 3, Peak Hour.
- Warrant 4, Pedestrian Hour.
- Warrant 5, School Crossing.
- Warrant 6, Coordinated Signal Systems.
- Warrant 7, Crash Experience.
- Warrant 8, Roadway Network.

For this study, Warrants 1, 2 and 3 were evaluated. The left-turn conflict analysis, which is defined in the WisDOT Facilities Development Manual (FDM), was also evaluated. Warrants 1, 2, 3 and the left-turn conflict analysis are described below:

Warrant 1, Eight Hour Vehicular Volume states that a traffic signal may be considered if either Condition A or Condition B volume thresholds from the MUTCD Table 4C-1 are met for at least eight hours of an average day.

For situations where neither condition A or condition B are met, 80 percent of both conditions A and B can be met after adequate trials of remedial measures are taken.

Warrant 2, Four Hour Volume is satisfied if during any four hours of an average day the major street and minor street volumes fall above the MUTCD Figure 4C-2 four-hour curve.

Warrant 3, Peak Hour Volume is satisfied if during any hour of an average day the major street and minor street fall above the MUTCD Figure 4C-4 peak hour curve. Note that Warrant 3 shall be applied only in unusual cases, such as office complexes, manufacturing plants, or high-occupancy facilities that attract or discharge large numbers of vehicles over a short time.

Left-turn Conflict Analysis is met if the product of the major street left-turn volume and opposing through plus right-turn movements exceed 100,000 (one left-turn lane and two opposing through lanes) or 80,000 (one left-turn lane and one opposing through lane).

The warrant analyses conducted for the 52nd Street intersection with 31st Avenue/Wal-Mart driveway was based on existing traffic counts collected for 12 hours from 6:00 a.m. to 6:00 p.m. These volumes were increased by the study growth rate of one percent per year. The new trips expected from the proposed Wal-Mart store and adjacent outlots were distributed through the 12-hour analysis period using land use distributions prepared by WisDOT. These new trips were added to the forecasted traffic volumes to get the estimated 12-hour distribution for the year 2021 build traffic volumes as shown in Table 2. Detailed traffic volume data used for the warrant analysis are located in Appendix D of this report.

Table 2
Year 2021 Build Traffic Volumes: 52nd Street & 31st Avenue/Wal-Mart Driveway

Start Time	MAJOR ↓			←			↑			→			Intersection Totals
	WalMart Dwy from North			52nd St. from East			31st Ave. from South			52nd St. from West			
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
6-7am	15	0	15	15	393	1	4	0	7	3	343	15	811
7-8am	25	0	35	36	665	4	12	0	14	6	786	25	1609
8-9am	25	0	35	35	747	3	10	0	8	2	803	25	1693
9-10am	15	0	20	20	664	4	9	0	3	6	571	20	1332
10-11am	30	0	35	30	642	3	10	0	2	3	554	20	1330
11am-12pm	40	0	50	50	813	4	7	0	4	3	650	40	1662
12-1pm	45	0	65	65	849	8	9	0	2	7	775	45	1869
1-2pm	35	0	40	35	870	9	14	0	7	4	817	25	1856
2-3pm	30	0	30	25	946	9	15	0	4	7	900	25	1991
3-4pm	20	0	25	25	1034	14	13	0	4	18	949	20	2124
4-5pm	30	0	30	35	1080	12	12	0	9	23	971	35	2238
5-6pm	30	0	45	45	804	7	9	0	6	19	831	30	1824

These hourly traffic volumes were used to evaluate the traffic volume thresholds for Warrants 1, 2, 3, and the left-turn conflict analysis. The results of the warrant study are shown on Exhibit 5-4. As shown, neither Warrants 1, 2, 3, nor the left-turn conflict analysis is expected to be met through with the year 2021 build traffic volumes for the 52nd Street intersection with 31st Avenue/Wal-Mart driveway. Therefore, traffic signals are not recommended for this intersection.

PART C – QUEUEING ANALYSIS

To estimate storage length requirements for turn bays at the study area intersections, a queuing analysis has been conducted. A 95% probable queue length was used for the design of turn bays at

the intersections. These queues were obtained from the SYNCHRO computer software output. The following is a list of where the results of the queuing analysis can be found.

- Year 2011 Background Traffic (No Development) – Exhibit 5-5a.
- Year 2021 Background Traffic (No Development) – Exhibit 5-5b.
- Year 2011 Build Traffic (With Wal-Mart Development) – Exhibit 5-5c.
- Year 2021 Build Traffic (With Wal-Mart Development) – Exhibit 5-5d.

PART D – PEDESTRIAN, BICYCLE AND MULTI-USE TRAIL CONSIDERATIONS

Except for the east side of 32nd Avenue, north of 52nd Street, sidewalks exist along both sides of the study roadways. No other sidewalks, bicycle lanes or multi-use trails were identified.

CHAPTER VI – RECOMMENDATIONS AND CONCLUSION

PART A – RECOMMENDATIONS

The study area intersections were analyzed based on the procedures set forth in the *2000 Highway Capacity Manual* (HCM). For the purpose of this study, LOS D was used to define acceptable peak hour operating conditions. Based on the results of the analysis performed at the study intersections, the following improvements are recommended.

A1. Year 2011 Background Traffic Recommended Improvements

Year 2011 background traffic volumes represent traffic based on traffic counts conducted at the study intersections in January 2011. With the year 2011 background traffic volumes, all movements at the study area intersections are expected to operate at LOS D or better during the peak hours. Therefore, no improvements are recommended.

A2. Year 2021 Background Traffic Recommended Improvements

Year 2021 background traffic volumes represent a conservative annual growth of one percent per year, even though actual traffic trends show negative growth since 1984. With the year 2021 background traffic volumes, all movements at the study area intersections are expected to operate at LOS D or better during the peak hours. Therefore, no improvements are recommended.

A3. Year 2011 Build Traffic Recommended Improvements

Year 2011 build traffic volumes represent the year 2011 background traffic volumes plus the additional traffic expected from buildout of the proposed Wal-Mart development. With the year 2011 build traffic volumes all study intersections are expected to operate at LOS D or better except for the 52nd Street intersection with 31st Avenue/Wal-Mart driveway. The southbound left-turn/through movement at this intersection is expected to be LOS E during the weekday evening peak hour. No improvements are recommended to mitigate this deficiency because signal warrants are not expected to be met, queues are relatively low, most of the traffic is expected to be served by the available gaps on 52nd Street, and the two other site driveways have excess capacity to handle any traffic not adequately being served at the Wal-Mart driveway to 52nd Street.

The recommended geometrics for the proposed Wal-Mart driveway intersections to are as follows:

32nd Avenue and Wal-Mart driveway

- Construct the westbound approach with a single shared left-turn/right-turn lane
- Install stop signs on the westbound driveway approach

30th Avenue and Wal-Mart driveway

- Construct the eastbound approach with a separate left-turn/through and right-turn lane
- Install stop signs on the eastbound driveway approach

52nd Street and 31st Avenue/Wal-Mart driveway

- Construct the southbound approach with a separate left-turn/through and right-turn lane
- Install stop signs on the southbound driveway approach.

A4. Year 2021 Build Traffic Recommended Improvements

Year 2021 build traffic volumes represent the year 2021 background traffic volumes plus the additional traffic expected to be generated by the proposed Wal-Mart development. Although the delays for the southbound left-turn and through movement at the 52nd Street intersection with 31st Avenue/Wal-Mart driveway are expected to be higher than with the year 2011 build traffic

volumes, no improvements are recommended. Similar to the year 2011 build traffic condition, signal warrants are not expected to be met, queues are relatively low, and the two other site driveways have excess capacity to handle any traffic not adequately being served at the Wal-Mart driveway to 52nd Street. With the site driveway geometrics recommended for the year 2011 build condition, all other intersections are expected to operate at LOS D or better during the peak hours with the year 2021 build traffic volumes.

PART B – CONCLUSION

The implementation of the above-recommended geometric improvements are expected to result in safe and efficient traffic operations through the year 2021 at the study area intersections with the full buildout of the proposed Wal-Mart development.