TECHNICAL MEMORANDUM

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To: Kevin Even, P.E.
Village Engineer and Public Works Director
Village of Waunakee

From: Kevin Wehner, P.E.
KL Engineering, Inc.

CC: Mike Slavish
President
Hovde Properties

Date: March 23, 2018

Subject: 203 Main Street Redevelopment Traffic Impact Study – Waunakee, WI

Introduction

Hovde Properties is proposing to redevelop the block bounded by East Main Street, Madison Street, Water Street, and Cross Street, in Waunakee, WI. The site is comprised of several parcels of land that total approximately 2.5 acres. A project location map is provided in **Exhibit 1**.

Background

Hovde Properties was requested to perform a traffic study to evaluate the impacts of the proposed development and related roadway improvements, and the nearby library development. KL Engineering was contracted to perform this traffic impact study (TIS).

The purpose of this memorandum is to summarize the traffic study that was performed. The study was performed to document existing conditions, anticipated development impacts, and to evaluate potential improvements. In addition to the proposed 203 Main Street Redevelopment, Hovde properties was also requested by the Village of Waunakee to study the traffic impacts of the Waunakee Public Library proposed nearby.

Study Area

The study area was determined based on the proposed development size, location, access points, and direction from the Village of Waunakee, and includes the following roadways and intersection:

Study Roadways

East Main Street (STH 113/STH 19)

East Main Street is a two-lane undivided roadway with an urban cross section and a speed limit of 25 miles per hour (mph). East Main Street is classified by the Wisconsin Department of Transportation (WisDOT) as a principal arterial within the study area. On street bike lanes are located on both sides of the roadway. Parking is generally allowed along both sides of East Main Street throughout the Village. However, parking is restricted in the vicinity of the intersection of East Main Street with Madison Street. Sidewalks are located along both sides of the roadway.

Madison Street

Madison Street is a two-lane undivided roadway with an urban cross section, and a 25 MPH speed limit. Madison Street is classified by WisDOT as a collector roadway north of East Main Street and a local road to the south. Parking is generally allowed along both sides of the roadway, but not in the vicinity of East Main Street, including the entire block between Water Street and Madison Street. Sidewalks are located along both sides of the roadway.

Study Intersections

East Main Street (STH 113/STH 19) intersection with Madison Street

The intersection of East Main Street with Madison Street is on the southeast corner of the proposed development. This intersection is controlled by a traffic signal that is coordinated with the traffic signal at the intersection of East Main Street with South Division Street to the east. Protected-permitted left turn phasing is provided on the eastbound and westbound East Main Street approaches. Permitted-only phasing is provided on the northbound and southbound Madison Street approaches.

The northbound Madison Street and the eastbound and westbound East Main Street approaches have dedicated left turn lanes with shared through-right turn lanes. The southbound Madison Street approach has a dedicated right turn lane with a shared through-left lane. Crosswalks with pedestrian signals are provided across all approaches.

This intersection was reconstructed, and the traffic signal replaced, during the year 2014 as part of a WisDOT project along East Main Street. No major changes occurred to the geometry at the intersection. Protected-permitted left turn phasing replaced permitted-only left turn phasing on the eastbound and westbound approaches. Right-of-way in the vicinity of the intersection ends at or near the back of the existing sidewalk.

North Madison Street intersection with Cross Street

The intersection of East Main Street with Madison Street is on the northeast corner of the proposed development and is currently a "T-intersection." North Madison Street forms the north and southbound approaches; Cross Street forms the westbound approach. This intersection is stop controlled with a stop sign on the westbound Cross Street approach. No turn lanes are provided at the intersection. A crosswalk is provided across all approaches.

An extension of Cross Street is proposed with the development that would form an eastbound leg of this intersection.

For an overview of the existing roadway network, see **Exhibit 2**.

Existing Conditions

Existing Traffic Volumes

Peak hour turning movement counts at the study intersection were collected by KL Engineering during the week of February 11, 2018. A summary of these volumes is provided in **Exhibit 3**. No traffic volume data was collected at the intersection of North Madison Street with Cross Street. Based on discussion with the Village of Waunakee, a minimal number of turning movements to and from the Cross Street approach is assumed. This assumption is based on nearby land uses and roadway configuration. Through movements on North Madison Street were balanced with volumes counted at the intersection of Madison Street with East Main Street.

Existing Traffic Operations

Existing traffic operations were analyzed using the software programs Synchro and SimTraffic versions 10. Existing traffic volumes, existing traffic signal timings, and the existing roadway network were used for the analysis.

The analysis was used to quantify operations at the study intersection by estimating vehicular delays and queues. For all delay analysis results provided, Synchro software was used to implement the Highway Capacity Manual 2010 (HCM 2010) traffic analysis methodologies and estimate delays for each vehicular movement. SimTraffic software was used to simulate traffic operations and estimate 95th percentile queues along each approach.

Estimated delays were used to assign a level of service (LOS) to each movement. Level of service is determined by taking delay levels from the mathematical models and assigning a letter grade meant to

represent the operating conditions as perceived by the driver as specified in the HCM 2010. Existing levels of service are summarized in **Table 1**.

Table 1. Existing Level of Service by Movement

Intersection	Peak	Movement												Intersection
		Northbound			Southbound			Eastbound			Westbound			
		L	T	R	L	T	R	L	T	R	L	T	R	
Main Street & Madison Street	AM	D	C	C	C	C	C	A	B	B	B	B	B	C
	PM	D	C	C	C	C	C	A	B	B	A	B	B	C

Existing 95th percentile queues are shown in **Exhibit 4**. Analysis outputs are available upon request.

All movements were found to operate at LOS D or better. A maximum 95th percentile queue of 270 feet was estimated for the westbound approach. This generally matched observations of relatively long westbound queues that form when the eastbound left turn phase is called, delaying the timing of the westbound through phase.

Changes to traffic signal offset times may decrease these existing westbound queues, however, traffic signal timings must balance multiple and often competing performance measures. Therefore, additional information would be required to fully evaluate this existing condition and determine if improvements are possible. This corridor was recently retimed; therefore, timings are likely already optimized.

On-Site Development

Project Location

The proposed development site is located in Waunakee, WI. The development site is currently comprised of several parcels of land located in the block bordered by East Main Street, Cross Street, North Madison Street, and Water Street. Most previous development at the site has been demolished. Previous land uses include single and multi-family housing as well as some commercial.

Development Overview

The proposed development consists of a three-story, 101-unit apartment building with approximately 12,000 square feet (SF) of commercial space on the ground floor. Potential commercial tenants include retail and restaurant land uses. The proposed development is planned to have 57 surface level parking stalls and 110 underground parking stalls for a total of 167 parking spaces. Sidewalk along the east side of Water Street is also proposed with the development. A site plan is provided in **Exhibit 5**. The development is planned to be constructed in one phase starting during the year 2018.

In conjunction with the proposed site improvements, the proposed project includes an extension of Cross Street. The proposed Cross Street extension would connect Water Street to Madison Street with a new two-way segment of public roadway, one block north of and parallel to East Main Street. This new segment of public roadway is proposed with sidewalk on the south side and angled parking on the north side of the roadway. **Exhibit 6** provides an overview of the proposed roadway network. The two on-site development access points are proposed on this segment of Cross Street.

The proposed Cross Street extension is also expected to serve other traffic with origins or destinations north and west of East Main Street and North Madison Street, respectively. These trips will increase traffic volumes along Water Street and at the intersection of Cross Street with Water Street. After discussion with the Village, assumptions were made regarding the potential existing volume reassignment resulting from the proposed Cross Street extension. These assumptions were made based on land uses to the west of the proposed intersection of North Madison Street with Cross Street and are summarized in **Exhibit 7**.

Proposed Access

Two full access points are proposed with the development. Both access points are located on the proposed segment of Cross Street. One access point will provide access to the surface lot, while the other will provide access to underground parking.

Trip Generation

The Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition* was used to estimate the number of trips expected to be generated by the proposed development. Trips were generated for the residential land use with the Apartment land use (ITE land use code 220). Land use assumptions were made for the proposed commercial space. Trips were generated using Fast Casual Restaurant (ITE land use code 930), High-Turnover (Sit-Down) Restaurant (ITE land use code 932), and Shopping Center (ITE land use 820) land uses. Trip generation for the proposed development is shown in **Table 2**.

Table 2. On-Site Trip Generation

Land Use	ITE Land Use Code	Size	Weekday Daily Trips (rate)	AM Peak In (%)	AM Peak Out (%)	AM Peak Total (rate)	PM Peak In (%)	PM Peak Out (%)	PM Peak Total (rate)
Apartment	220	101 Dwelling Units	725 (7.16)	10 (23%)	40 (77%)	50 (0.48)	40 (63%)	20 (37%)	60 (0.59)
Fast Casual Restaurant	930	3,115 SF	980 (315.17)	5 (67%)	0 (33%)	5 (2.07)	25 (55%)	20 (45%)	45 (14.13)
High-Turnover (Sit-Down) Restaurant	932	4,705 SF	530 (112.18)	25 (55%)	20 (45%)	45 (9.94)	30 (62%)	15 (38%)	45 (9.77)
Shopping Center	820	3,735 SF	645 (172.14)	5 (62%)	0 (38%)	5 (0.94)	25 (48%)	25 (52%)	50 (12.77)
Total Generated Trips:			**2,880**	**45**	**60**	**105**	**120**	**80**	**200**
Linked Trip Reduction (10%) (Apartment Land Use			(75)	0	(5)	(5)	(5)	0	(5)
Multimodal Trip Reduction (10%)			(280)	(5)	(5)	(10)	(10)	(10)	(20)
Total Driveway Trips:			**2,525**	**40**	**50**	**90**	**105**	**70**	**175**
Pass-by Trips (10%) (Commercial land uses)			(195)	0	0	0	(5)	(5)	(10)
Total New Trips:			**2,330**	**40**	**50**	**90**	**100**	**65**	**165**

Trips were generated using trip generation equations as appropriate with the exception of the AM peak for the Shopping Center land use. Use of the equation resulted in unreasonably high trip generation, therefore the average rate was used.

Linked Trips

Linked trips are trips that occur between land uses within a development that do not result in the addition of trips to the outside roadway network. An example of a linked trip is a resident of the proposed apartments patronizing a retail establishment operating in the proposed commercial space. A 10% linked trip reduction was applied to the apartment land use.

Multimodal Trips

Multimodal trips are those occurring via transit, pedestrian, or bicycle modes of transportation.

The proposed development is not located along any bus routes and therefore no trips to and from the development are anticipated to occur via transit.

The proposed development is located in the Village of Waunakee central business district. Sidewalks are provided along the majority of nearby roadways and more are proposed with the development. Bike lanes are present along both sides of East Main Street. These factors are expected to increase the likelihood of bicycle and pedestrian trips to and from the site. Therefore, a 10% multimodal trip reduction was applied

to the trip generation to account for these potential reductions in passenger vehicle trips to and from the site.

Pass-by Trips
Pass-by trips are trips that were already present on the surrounding roadway network that are now expected to enter and exit the proposed land use before continuing in their original direction. The commercial land use is expected to have some proportion of pass-by trips due to the convenient location of the development and traffic volumes along East Main Street. A 10% pass-by trip reduction was applied to the commercial land use trip generation.

Driveway and New Trips
Driveway trips are those trips that are expected to utilize the development driveway and are estimated by removing linked and multimodal trips from the total trip generation. New trips are the driveway trips less the pass-by trips and represent the number of new trips added to the public roadway network.

The proposed development is expected to generate 2,525 driveway trips per day. Ninety (90) (40 entering/50 exiting) and 175 (105 entering/70 exiting) driveway trips are expected during the morning and afternoon peak traffic volume hours, respectively. Five pass-by trips are expected during the evening peak traffic volume hour.

Trip Distribution and Assignment
Trip distribution for the proposed development was determined based on the existing traffic patterns observed in turning movement and continuous counts performed by KL Engineering and WisDOT. The trip distribution pattern used in this study assumes that 40% of trips will be to or from the west on East Main Street, 40% of trips will be to or from the east on East Main Street, 10% of trips will be to or from the north on North Madison Street, and 10% of trips will be to or from the south on South Madison Street.

New trips were then assigned based on the trip distribution pattern. The proposed trip distribution pattern and new trip assignment are shown in **Exhibit 8**. Pass-by trips are shown in **Exhibit 9**. Driveway trips are shown in **Exhibit 10**.

Off-Site Development
In addition to development proposed with the 203 Main Street Redevelopment, Hovde Properties was also asked by the Village of Waunakee to quantify the traffic impacts of the proposed Waunakee Public Library development. This development is proposed for the year 2019. This proposed facility is intended to replace the current one that the Waunakee Public Library operates in.

Project Location
The proposed library development site is located in Waunakee, WI, at the former Waunakee Alloy site. This site is bordered to the west by North Madison Street, to the south by Sixmile Creek, and to the north and east by residential land uses.

Development Overview
The proposed library development consists of a single, two-story building with approximately 39,500 SF of space. The proposed development is planned to have 110 parking stalls. The development is planned to be constructed during the year 2019.

Proposed Access
Two full access points are proposed with the development. One full access point is proposed on North Madison Street. A second full access point is proposed on Pleasant Drive.

Trip Generation
The ITE *Trip Generation Manual, 10th Edition* was used to estimate the number of trips expected to be generated by the proposed development. Trips were generated using the Library (ITE land use 590) land use. Trip generation for the library development is shown in **Table 3**.

Table 3. Off-Site Trip Generation

Land Use	ITE Land Use Code	Size	Weekday Daily Trips (rate)	AM Peak			PM Peak		
				In (%)	Out (%)	Total (rate)	In (%)	Out (%)	Total (rate)
Library	590	40 KSF	2,845 (72.05)	30 (71%)	10 (29%)	40 (1.00)	155 (48%)	165 (52%)	320 (8.16)
Total Generated Trips:			**2,845**	**30**	**10**	**40**	**155**	**165**	**320**
Multimodal Trip Reduction (10%)			(285)	(5)	0	(5)	(15)	(15)	(30)
Total New Trips:			**2,560**	**25**	**10**	**35**	**140**	**150**	**290**

Based on discussion with the director of the Waunakee Public Library Director Erick Plumb, this may be a conservative trip generation estimate. The current Waunakee Public Library Facility serves approximately 150,000 visitors per year and operates six days per week from 9 am to 9 pm Monday through Thursday and 9 am to 5 pm Fridays and Saturdays. If these visits are averaged across all six days of operation, this results in approximately 480 visitors, or 960 trips per day. Peak visit times, according to the Director, are between 9 am and 11 am, and 3 pm and 5 pm. These peak visit periods do not coincide with morning and afternoon peak traffic volume hours on the nearby roadway network.

Multimodal Trips
The proposed development is not located along any bus routes and therefore no trips to and from the development are anticipated to occur via transit.

The proposed development is located near the Village of Waunakee central business district, and in close proximity to a large amount of residential land use. Sidewalks are provided along the majority of nearby roadways. These factors are expected to increase the likelihood of bicycle and pedestrian trips to and from the site. Therefore, a 10% multimodal trip reduction was applied to the trip generation to account for these potential reductions in passenger vehicle trips to and from the site.

Driveway Trips
The proposed development is expected to generate 2,560 driveway trips per day. Thirty-five (35) (25 entering/10 exiting) and 290 (140 entering/150 exiting) driveway trips are expected during the morning and afternoon peak traffic volume hours, respectively.

Trip Distribution and Assignment
Trip distribution for the proposed library development was based on nearby land uses and discussion with the Village. The trip distribution pattern used for this land use assumes that one third of trips will be to or from the north on North Madison Street. The other two thirds are anticipated to be to or from the south on North Madison Street. Those trips were then assigned to movements at the intersection of East Main Street with Madison Street according to existing turning movement volume proportions there.

No trips were assigned to the Pleasant Drive access point to maintain a conservative estimate of trips using the intersection of East Main Street with Madison Street, and because few trips would be anticipated to utilize this access point due to the nature of Pleasant Drive.

Driveway trips were then assigned based on this trip distribution pattern. The trip assignment for the off-site development is shown in **Exhibit 11**.

Build Traffic Conditions

Build Traffic Volumes
Build traffic volumes were determined by taking the existing traffic volumes (Exhibit 3) and adding Cross Street reassigned traffic (Exhibit 7) and on-site driveway trips (Exhibit 10). Build Traffic volumes and are shown in **Exhibit 12**. Background traffic volumes were not inflated to account for future growth because the project is planned to be constructed in the near future. Background volumes are those anticipated to

be present upon completion of the proposed 203 Main Street Redevelopment (on-site) but prior to completion of the proposed Waunakee Public Library Development (off-site).

Build Traffic Operations

Traffic operations were analyzed using the proposed roadway network, existing traffic signal timings, and build traffic volumes. Levels of service under proposed conditions are summarized in **Table 4**.

Table 4. Build Traffic Level of Service by Movement

Intersection	Peak	Movement												Intersection
		Northbound			Southbound			Eastbound			Westbound			
		L	T	R	L	T	R	L	T	R	L	T	R	
Main Street & Madison Street	AM	D	C	C	D	D	C	B	B	B	B	B	B	C
	PM	D	C	C	D	D	C	B	B	B	A	B	B	C
Cross Street & Madison Street	AM	A	A	A	A	A	A	B	B	B	B	B	B	N/A
	PM	A	A	A	A	A	A	A	A	A	B	B	B	N/A

Build traffic 95th percentile queues are shown in **Exhibit 13**. Analysis outputs are available upon request.

All movements at the intersection of Madison Street with East Main Street are expected to operate at LOS D or better. A maximum queue of 305 feet was estimated for the westbound approach, a 35-foot increase over existing. The southbound left and through movements during both the morning and afternoon peak hours are anticipated to operate at LOS D under build conditions, in contrast to LOS C that they operate at currently. During the morning peak, delay for the southbound and through movements are estimated to increase from approximately 35 seconds to approximately 40 seconds, or by five seconds. During the afternoon peak, delay for the southbound and through movements are estimated to increase from approximately 34 seconds to approximately 35 seconds, or by one second.

The southbound left and through movements at the intersection of East Main Street with Madison Street are anticipated to operate under build conditions at LOS C with adjustments to traffic signal timings at the intersection of East Main Street with Madison Street. Analysis that includes these timings is summarized in *Total Traffic Operations – With Improvements*.

All movements at the intersection of North Madison Street with Cross Street are expected to operate at LOS B or better.

Cross Street Extension

Some existing traffic reassignment is anticipated to result from the proposed Cross Street extension; the reassignment is summarized in Exhibit 7. Some portion of existing traffic may also use Cross Street to bypass the intersection of Madison Street with East Main Street by traveling along Cross Street and then Water Street. However, this would only be expected if this new route is faster or more convenient than the original.

The southbound right turn movement at the intersection of Madison Street with East Main Street is anticipated to operate at LOS C under build and total (see *Total Traffic Operations – With Improvements*) traffic conditions, during peak traffic volume hours. This low delay is anticipated to lead to a low rate of vehicles bypassing the traffic signal using this route. This movement is anticipated to operate at LOS D under total (see *Total Traffic Operations – With Lane Reassignments*) traffic conditions with lane reassignment, during peak traffic volume hours.

Total Traffic Conditions

Total Traffic Volumes

Total traffic volumes were determined by taking the build traffic volumes (Exhibit 12) and adding off-site driveway trips (Exhibit 12) and are shown in **Exhibit 14**.

Total Traffic Operations – No Improvements

Traffic operations were analyzed using the proposed roadway network, existing traffic signal timings, and total traffic volumes. Levels of service under proposed conditions are summarized in **Table 5**.

Table 5. Total Traffic Level of Service by Movement – No Improvements

Intersection	Peak	Movement												Intersection
		Northbound			Southbound			Eastbound			Westbound			
		L	T	R	L	T	R	L	T	R	L	T	R	
Main Street & Madison Street	AM	D	C	C	D	D	C	B	B	B	B	B	B	C
	PM	**F**	C	C	**E**	**E**	C	B	B	B	A	B	B	D
Cross Street & Madison Street	AM	A	A	A	A	A	A	B	B	B	B	B	B	N/A
	PM	A	A	A	A	A	A	B	B	B	B	B	B	N/A

Total traffic 95th percentile queues are shown in **Exhibit 15**. Analysis outputs are available upon request.

Under the total traffic no improvements scenario, the northbound left movement is expected to operate at LOS F and the southbound left and through movements are anticipated to operate at LOS E during the afternoon peak hour. A maximum queue of 380 feet was estimated for the westbound approach, a 70-foot increase over that which is estimated for the build scenario. The southbound queue is estimated to increase to 350 feet, a 70-foot and 135-foot increase over that which was estimated for the build scenario and existing conditions, respectively.

The northbound left movement at the intersection of East Main Street with Madison Street during the afternoon peak hour is anticipated to operate at LOS F under total traffic conditions, as opposed to LOS D under build and existing conditions. During the afternoon peak, delay for the northbound left movement is estimated to increase from approximately 44 seconds estimated under the build scenario to approximately 153 seconds, or by 109 seconds.

All movements at the intersection of North Madison Street with Cross Street are expected to operate at LOS B or better.

Total Traffic Operations – With Improvements

Traffic operations were analyzed using the proposed roadway network with improvements, improved traffic signal timings, and total traffic volumes.

Improvements included in this scenario are changes to traffic signal timing at the intersection of East Main Street with Madison Street and the inclusion of northbound and southbound left turn lanes at the intersection of North Madison Street with Cross Street. It is anticipated that these lanes may be implemented using pavement markings.

Levels of service under proposed conditions are summarized in **Table 6**.

Table 6. Total Traffic Level of Service by Movement – With Improvements

Intersection	Peak	Movement												Intersection
		Northbound			Southbound			Eastbound			Westbound			
		L	T	R	L	T	R	L	T	R	L	T	R	
Main Street & Madison Street	AM	D	C	C	C	C	C	B	C	C	B	B	B	C
	PM	D	C	C	C	C	C	C	B	B	B	C	C	D
Cross Street & Madison Street	AM	A	A	A	A	A	A	B	B	B	B	B	B	N/A
	PM	A	A	A	A	A	A	B	B	B	B	B	B	N/A

Total traffic with improvements 95th percentile queues are shown in **Exhibit 16**. Analysis outputs are available upon request.

All movements at the intersection of Madison Street with East Main Street are expected to operate at LOS D or better. A maximum queue of 470 feet was estimated for the westbound approach, a 95-foot increase over that which is estimated for the total traffic no improvements scenario; a maximum queue of 275' was estimated for the southbound approach, a 75-foot decrease from that which was estimated for the total traffic no improvements scenario.

All movements at the intersection of North Madison Street with Cross Street are expected to operate at LOS B or better. While these operations are similar to those under the "No Improvements" scenario, addition of left turn lanes on North Madison Street is anticipated to reduce the likelihood of turning vehicles blocking through traffic.

Total Traffic Operations – With Lane Reassignments

The Village of Waunakee requested that an improvement alternative involving lane reassignments on the southbound leg of the intersection of East Main Street with Madison Street be evaluated. The reassigned lane configuration would include a shared through-right turn lane and an exclusive left turn lane at the intersection of Madison Street and East Main Street. This alternative was mainly intended to address the increased delays experienced on the northbound and southbound legs of the intersection under total traffic volumes.

Traffic operations were analyzed using the proposed roadway network with improvements at the intersection of Cross Street with Madison Street, the aforementioned lane reassignments, existing traffic signal timings, and total traffic volumes.

Levels of service under proposed conditions are summarized in **Table 7**.

Table 7. Total Traffic Level of Service by Movement – With Lane Reassignments

Intersection	Peak	Movement												Intersection
		Northbound			Southbound			Eastbound			Westbound			
		L	T	R	L	T	R	L	T	R	L	T	R	
Main Street & Madison Street	AM	D	C	C	D	D	D	B	B	B	B	B	B	C
	PM	D	C	C	D	D	D	B	B	B	A	B	B	C
Cross Street & Madison Street	AM	A	A	A	A	A	A	B	B	B	B	B	B	N/A
	PM	A	A	A	A	A	A	B	B	B	B	B	B	N/A

Total traffic with lane reassignment 95th percentile queues are shown in **Exhibit 17**. Analysis outputs are available upon request.

All movements at the intersection of Madison Street with East Main Street are expected to operate at LOS D or better. A maximum queue of 375 feet was estimated for the westbound approach, no change from that which is estimated for the total traffic no improvements scenario; a maximum queue of 305' was estimated for the southbound approach, a 45-foot decrease from that which was estimated for the total traffic no improvements scenario.

Existing traffic signal timings were used in the analysis summarized in Table 7. Therefore, this analysis summarizes delay changes resulting from lane reassignment only. Adjustments to traffic signal timings in conjunction with lane reassignments may result in additional side street delay and queue reduction, while also leading to westbound queue increases.

The southbound right turn movement at the intersection of Madison Street with East Main Street is estimated to operate at LOS D under the lane reassignment improvement scenario. This change should be weighed against potential operational improvements at other locations, especially as is relates to minimizing the likelihood of traffic using the proposed Cross Street connection to bypass the southbound right turn movement at the traffic signal. Existing traffic volume patterns support the current southbound lane configuration.

Recommendations

The proposed 203 Main Street Redevelopment includes a proposed extension of Cross Street. This report also documents potential improvements at the intersection of Cross Street with North Madison Street and East Main Street with Madison Street. Recommendations related to these items are summarized below.

Cross Street Extension

The proposed Cross Street extension would add a new approach to two existing intersections. The intersections of Cross Street with North Madison Street and Water Street. The following recommendations were developed during the course of the study related to the Cross Street extension:

- Implement stop-control for the new eastbound approach to the intersection of Cross Street with North Madison Street.
- Implement stop-control for the northbound Water Street approach to the intersection of Cross Street with Water Street.
- Ensure that pedestrians can be safely accommodated when traveling between the proposed parking on the north side of Cross Street and destinations to the south.

East Main Street intersection with Madison Street

Two different improvement alternatives were identified, changes to traffic signal timing and changes to lane configuration on the southbound approach. The impacts of both improvements are summarized in this document. While analysis indicates that these improvements are necessary to ensure that the intersection operates at LOS D or better for all movements under total traffic volumes, no improvements at this intersection are recommended at this time.

Traffic signal timing changes should not be made until traffic volumes and patterns warrant such changes. Any changes must be coordinated with and approved by the Wisconsin Department of Transportation

Current traffic volumes patterns also support the existing southbound lane configuration. Changes to the lane configuration should be evaluated once traffic volumes present at the intersection support such changes.

East Main Street intersection with Cross Street

The Village requested that the inclusion of northbound and southbound left turn lanes at this location be evaluated as well as turn lanes on the proposed eastbound Cross Street approach.

Traffic operational analysis does not support the need for turn lanes. The intersection was analyzed under all traffic volume scenarios without these lanes and vehicular delays and queues we found to be acceptable. This analysis did not account for the ability of through traffic to bypass queued, turning vehicles on North Madison Street due to the existing pavement widths, meaning that analysis results are likely conservative.

Inclusion of left turn lanes on North Madison Street would allow the bypassing of turning vehicles on by through traffic to occur more reliably and may also provide safety benefits. However, there is not room within the existing pavement width to implement the lanes and to include dedicated on-street bicycle facilities.

Therefore, these lanes are not recommended for implementation with this study as a result of the proposed developments.

Conclusions

Information and analysis summarized in this memorandum describe existing conditions near the proposed development locations and expected impacts of the proposed developments. In summary, the findings and recommendations of this study are as follows:

- Existing traffic operations at the study intersections are considered generally acceptable with low delays and moderate queuing.
- On-Site development (203 Main Street Redevelopment) traffic is expected to result in an approximate 4% increase in total entering volume at the intersection of East Main Street with Madison Street during peak traffic volume hours.
- Volume increases associated with on-site development are expected to result in increased vehicular delays and queues. All movements at the intersection of East Main Street with Madison Street are anticipated to continue to operate at LOS D or better with moderate queueing.
- The proposed segment of Cross Street is anticipated to result in an increase in traffic volumes along Water Street and at the intersection of Cross Street with Water Street.
- Access proposed with the 203 Main Street Redevelopment is anticipated to promote safe and efficient operations.
- Volume increases associated with off-site development (library development) are expected to result in increased vehicular delays and queues. The northbound left turn movement is estimated to operate at LOS F during the afternoon peak hour.
- No improvements at the intersection of East Main Street with Madison Street are recommended at this time, though two improvement alternatives were identified and analyzed for future consideration.

Exhibit 1

LEGEND

= Study Intersection

= Proposed Development

KL Engineering [A] Better Experience

Project Location Map

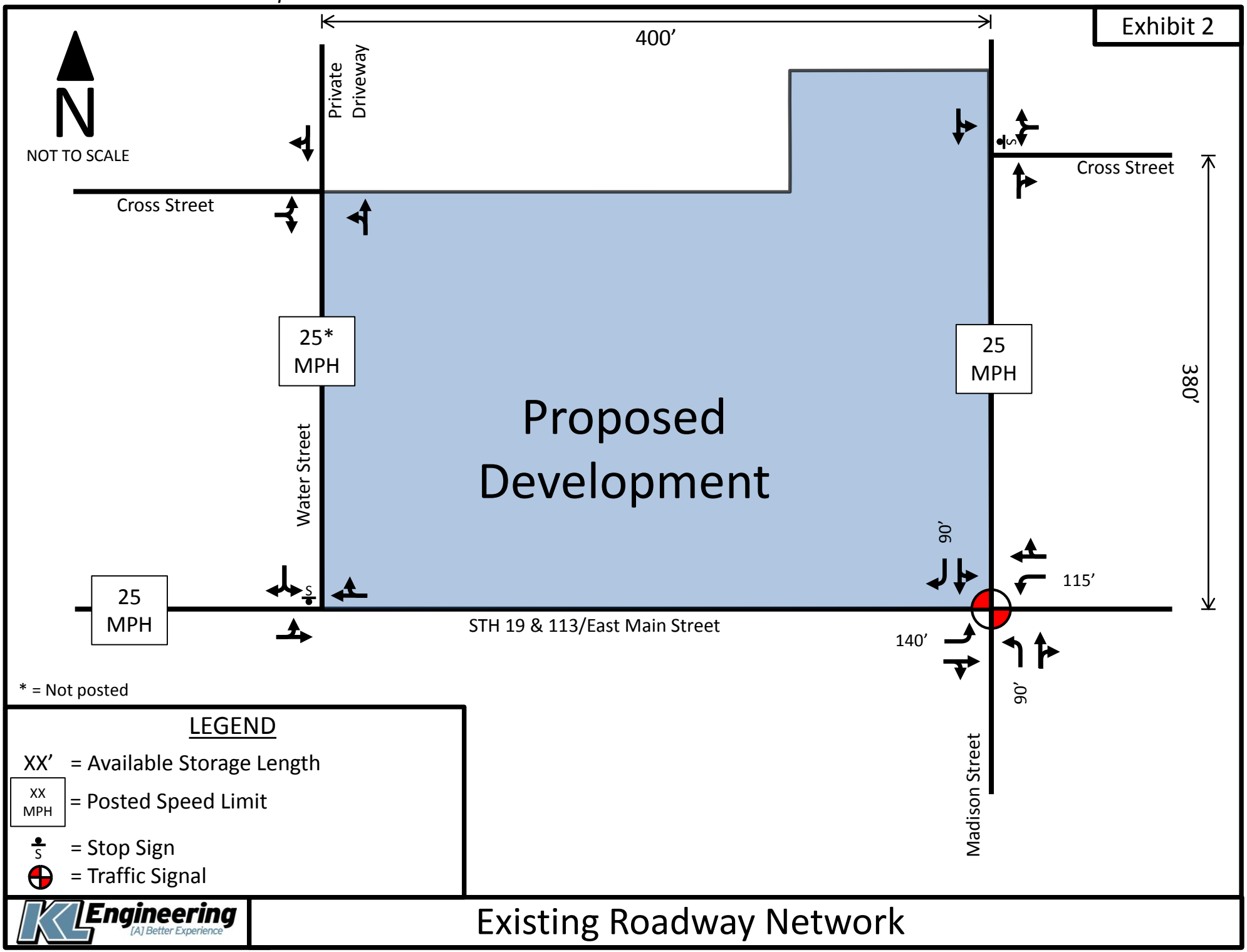
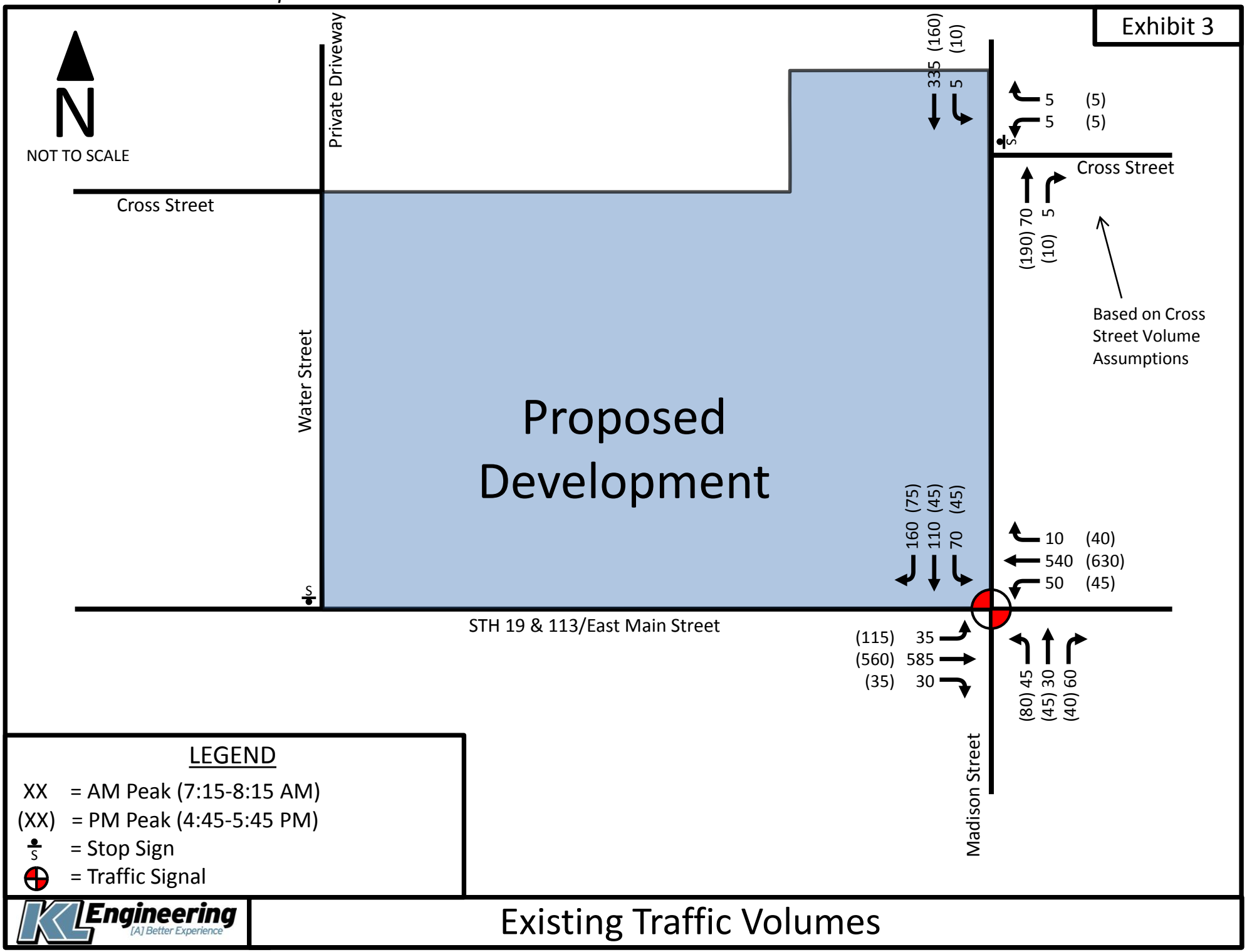


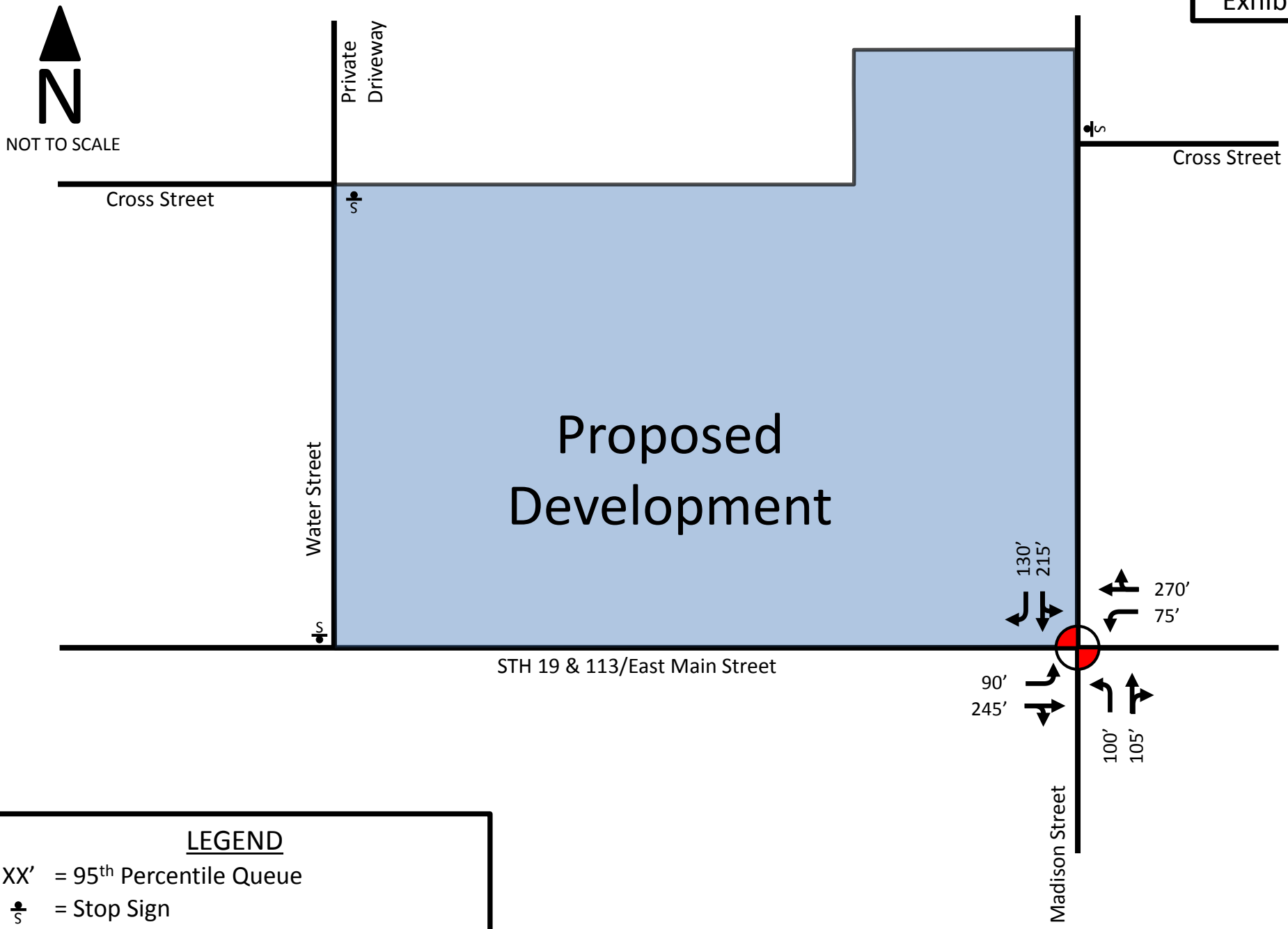
Exhibit 2
N
NOT TO SCALE
400’
Private Driveway
Cross Street
Cross Street
25* MPH
25 MPH
380’
Proposed Development
Water Street
90’
115’
25 MPH
STH 19 & 113/East Main Street
140’
90’
Madison Street
* = Not posted
LEGEND
XX’ = Available Storage Length
XX MPH = Posted Speed Limit
S = Stop Sign
= Traffic Signal
KL Engineering [A] Better Experience
Existing Roadway Network



KL Engineering [A] Better Experience

Existing Traffic Volumes

Exhibit 4



LEGEND

XX' = 95th Percentile Queue

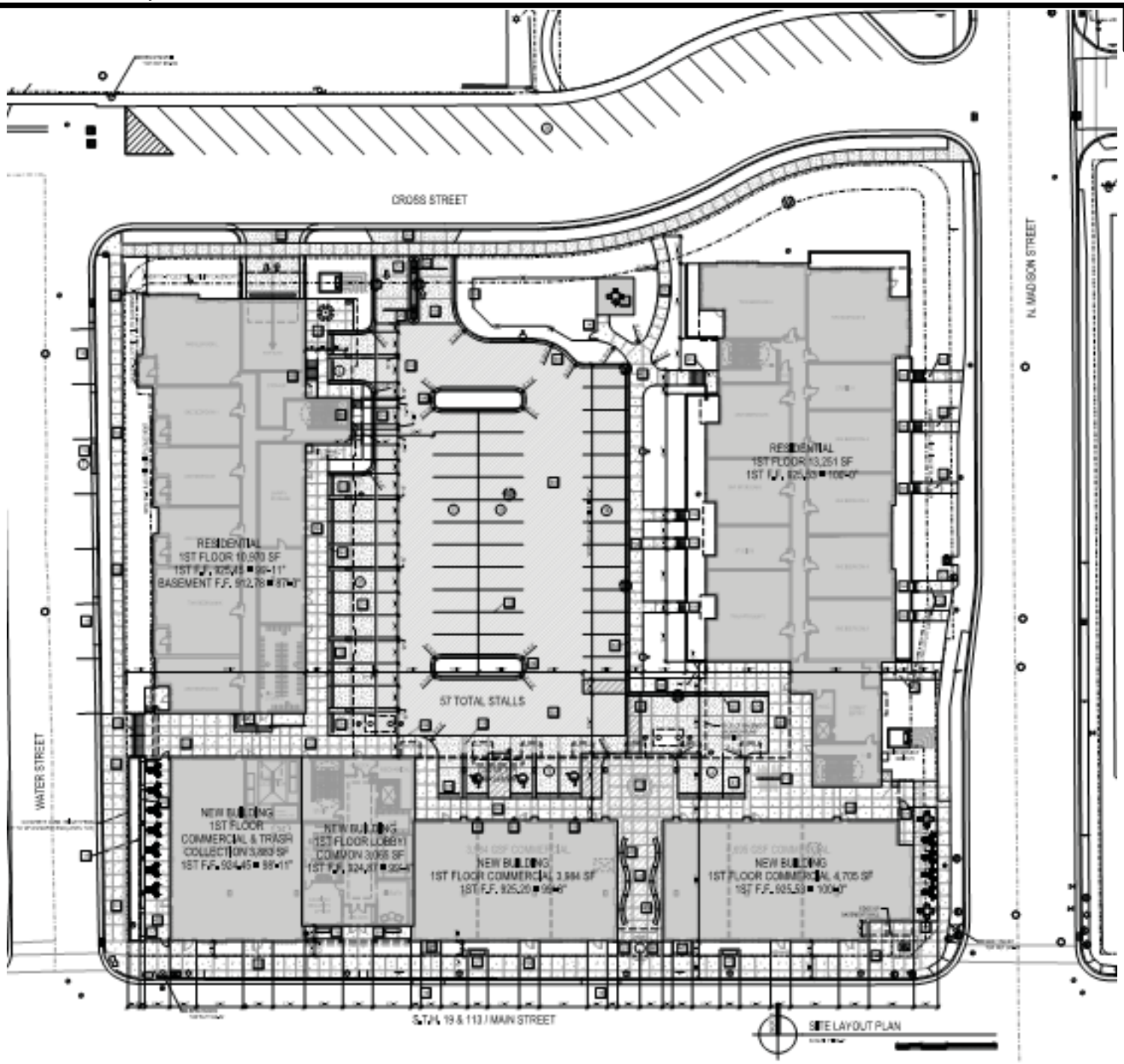
S = Stop Sign

= Traffic Signal

KL Engineering [A] Better Experience

Existing 95th Percentile Queues

Exhibit 5



KL Engineering [A] Better Experience

Site Plan

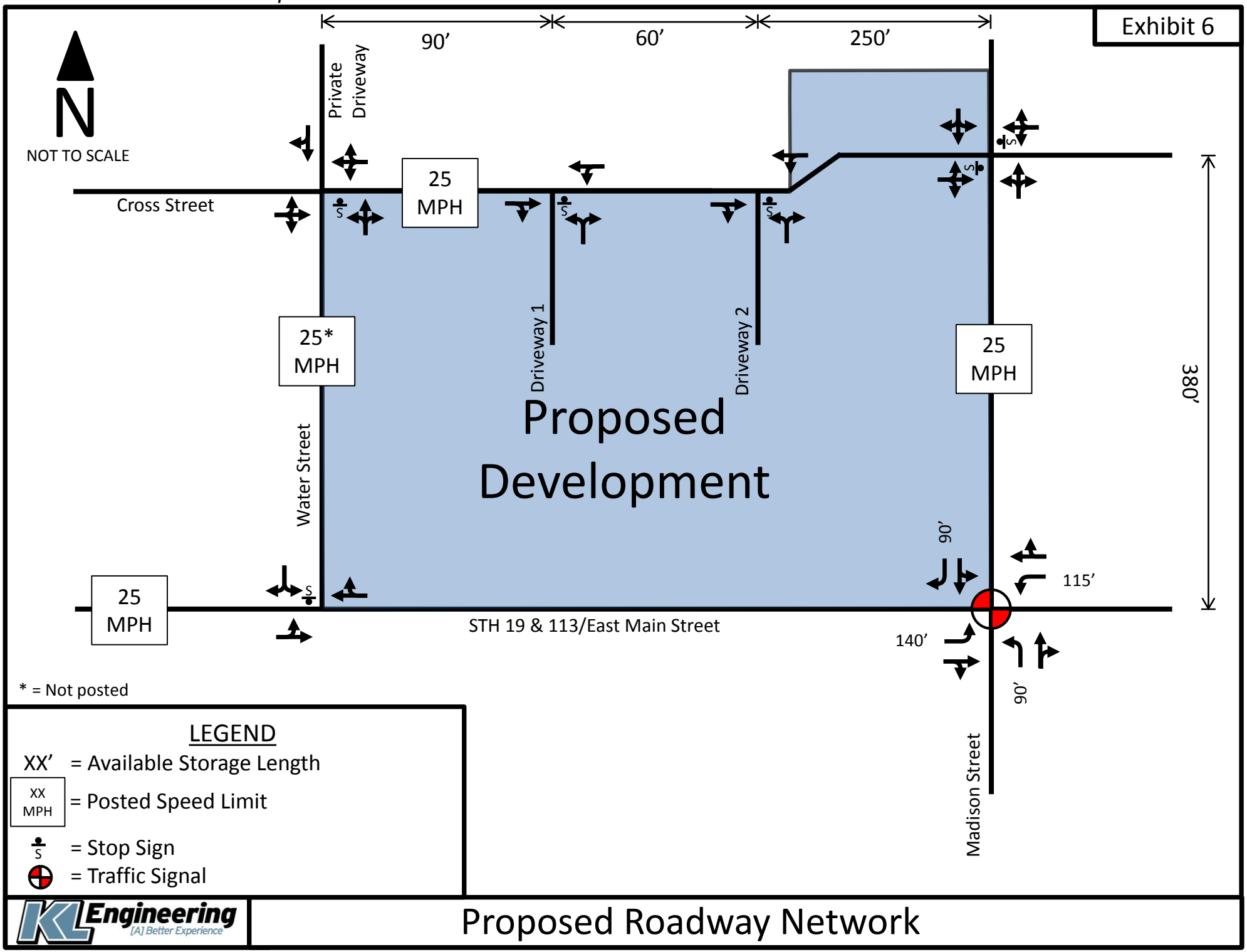
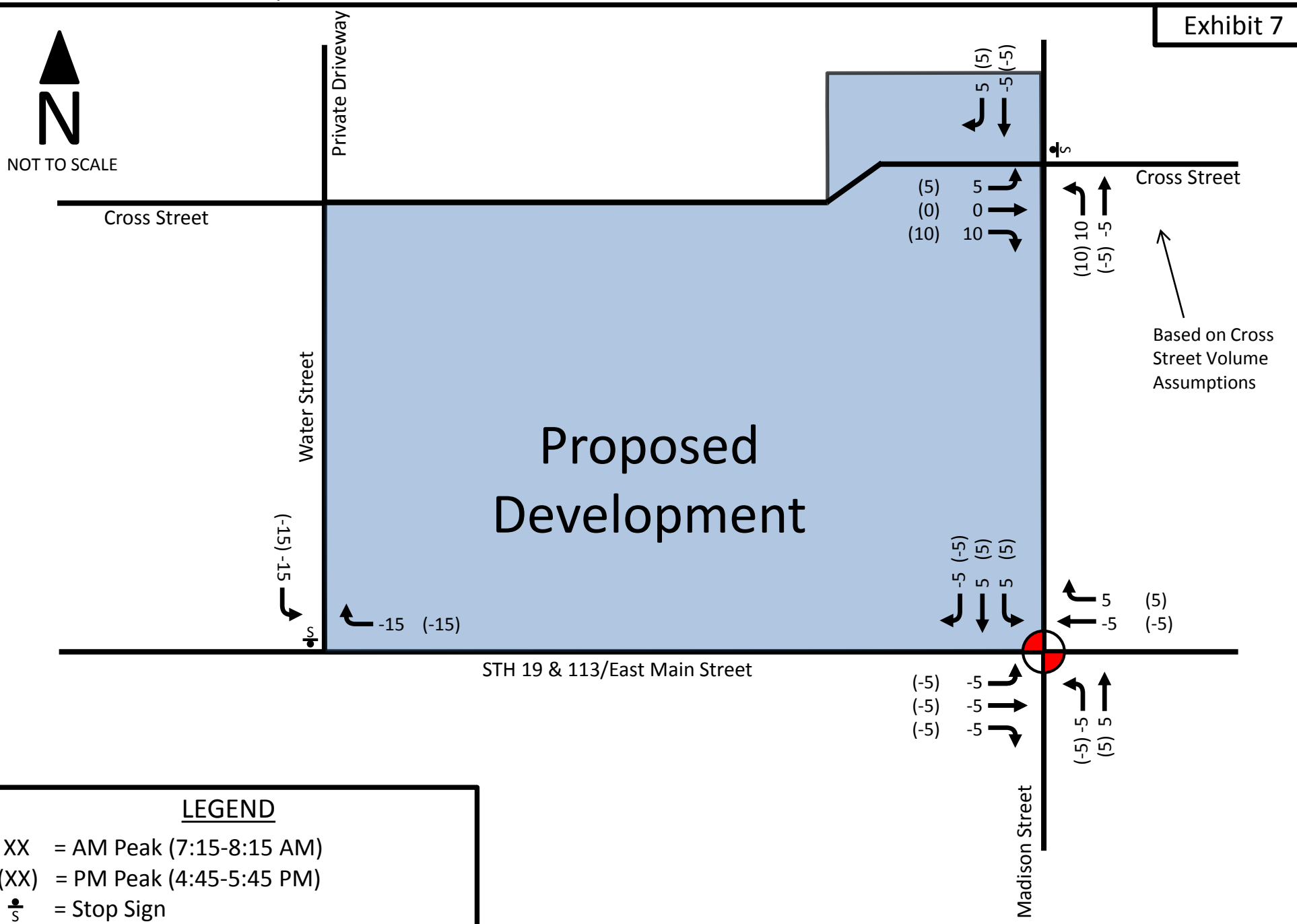


Exhibit 6
N
NOT TO SCALE
90’
60’
250’
Private Driveway
Cross Street
25 MPH
25* MPH
Driveway 1
Driveway 2
25 MPH
Water Street
Proposed Development
380’
90’
115’
25 MPH
STH 19 & 113/East Main Street
140’
90’
Madison Street
* = Not posted
LEGEND
XX’ = Available Storage Length
XX MPH = Posted Speed Limit
= Stop Sign
= Traffic Signal
KL Engineering
[A] Better Experience
Proposed Roadway Network

Exhibit 7



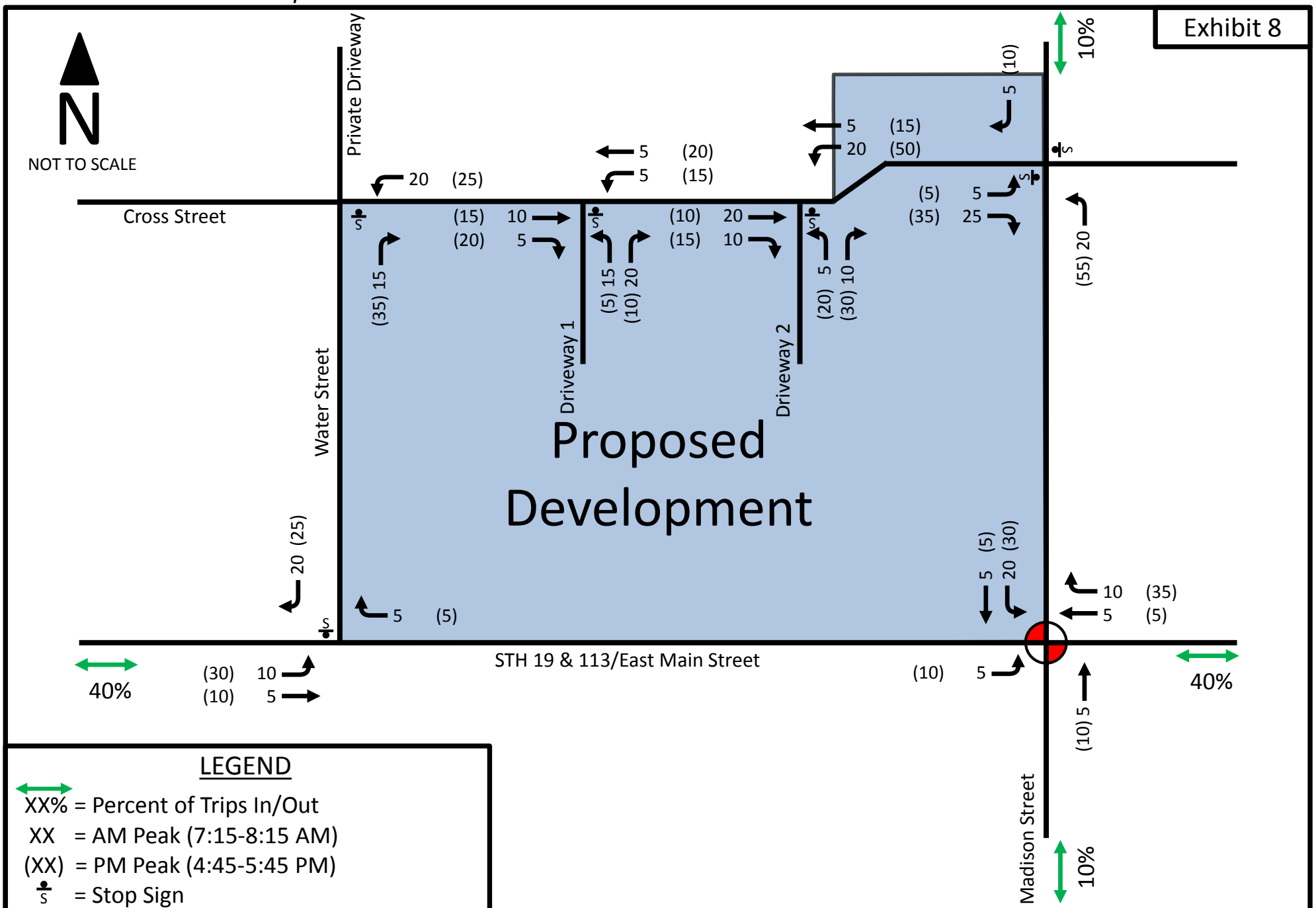
LEGEND

XX = AM Peak (7:15-8:15 AM)
(XX) = PM Peak (4:45-5:45 PM)
S = Stop Sign
= Traffic Signal

KL Engineering [A] Better Experience

Cross Street Existing Volume Reassignment

Exhibit 8



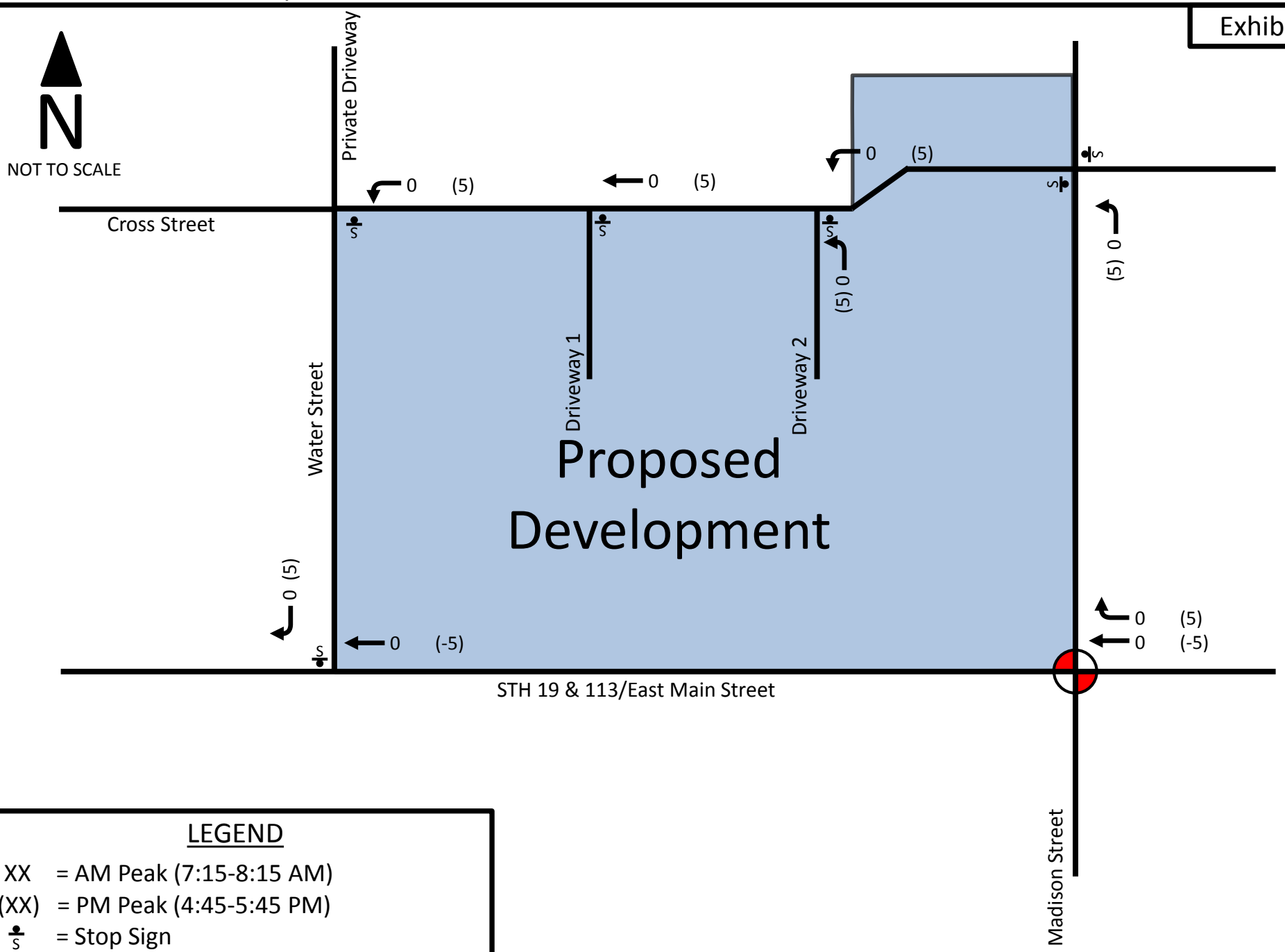
LEGEND

- XX% = Percent of Trips In/Out
- XX = AM Peak (7:15-8:15 AM)
- (XX) = PM Peak (4:45-5:45 PM)
- S = Stop Sign
- = Traffic Signal

KL Engineering [A] Better Experience

On-Site New Trips and Trip Distribution

Exhibit 9

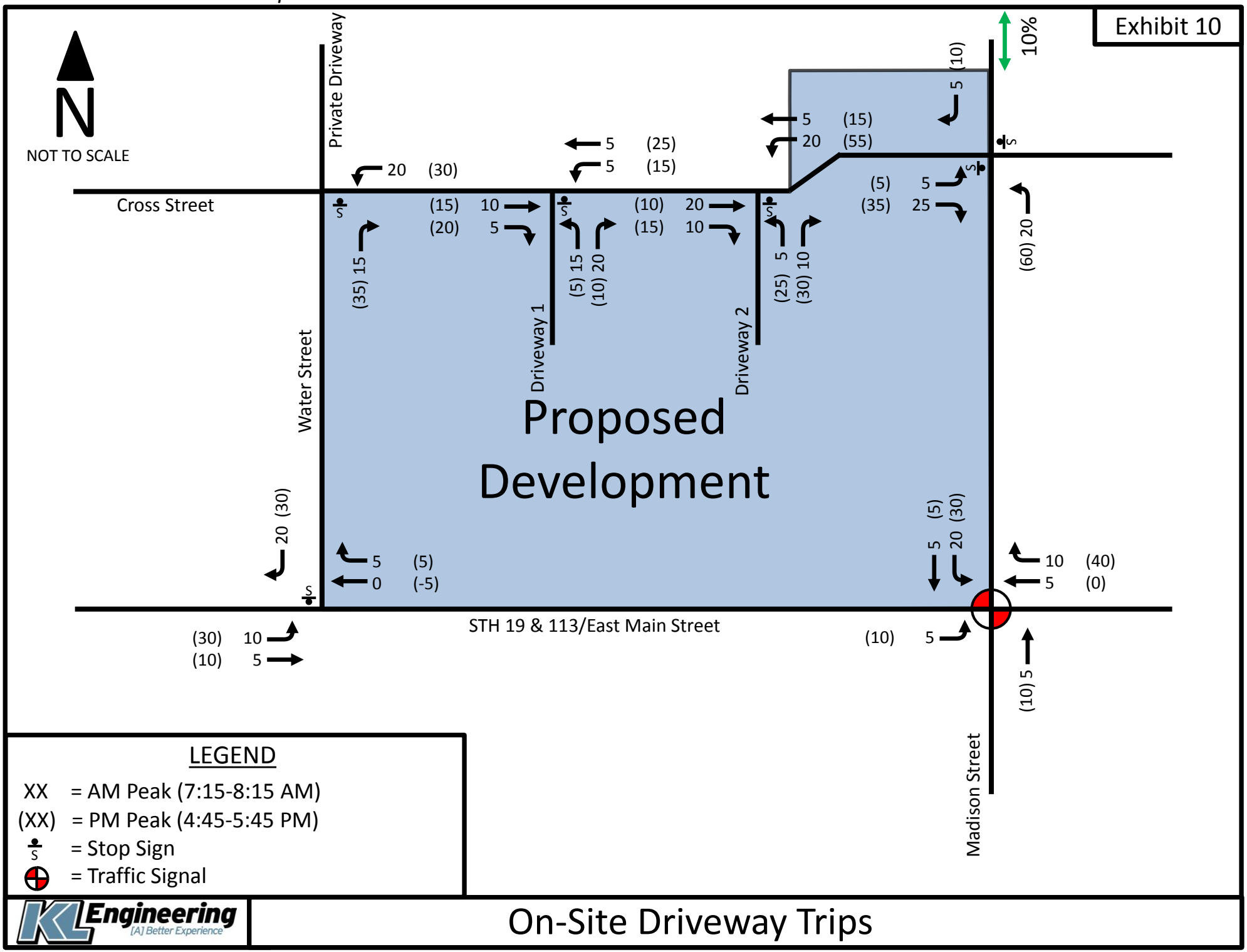


LEGEND

XX = AM Peak (7:15-8:15 AM)
(XX) = PM Peak (4:45-5:45 PM)
S = Stop Sign
= Traffic Signal

KL Engineering [A] Better Experience

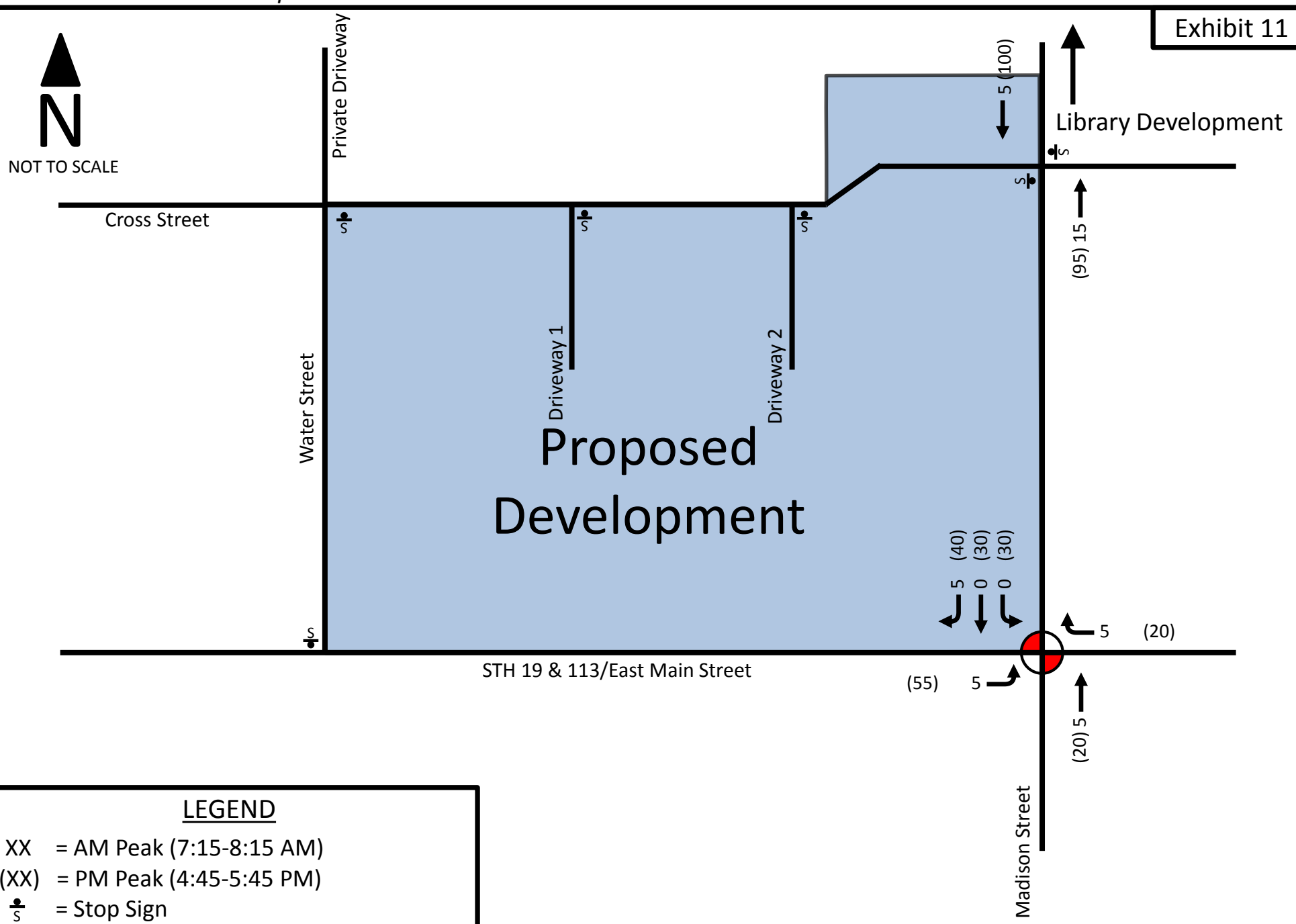
On-Site Pass-By Trips



KL Engineering [A] Better Experience

On-Site Driveway Trips

Exhibit 11



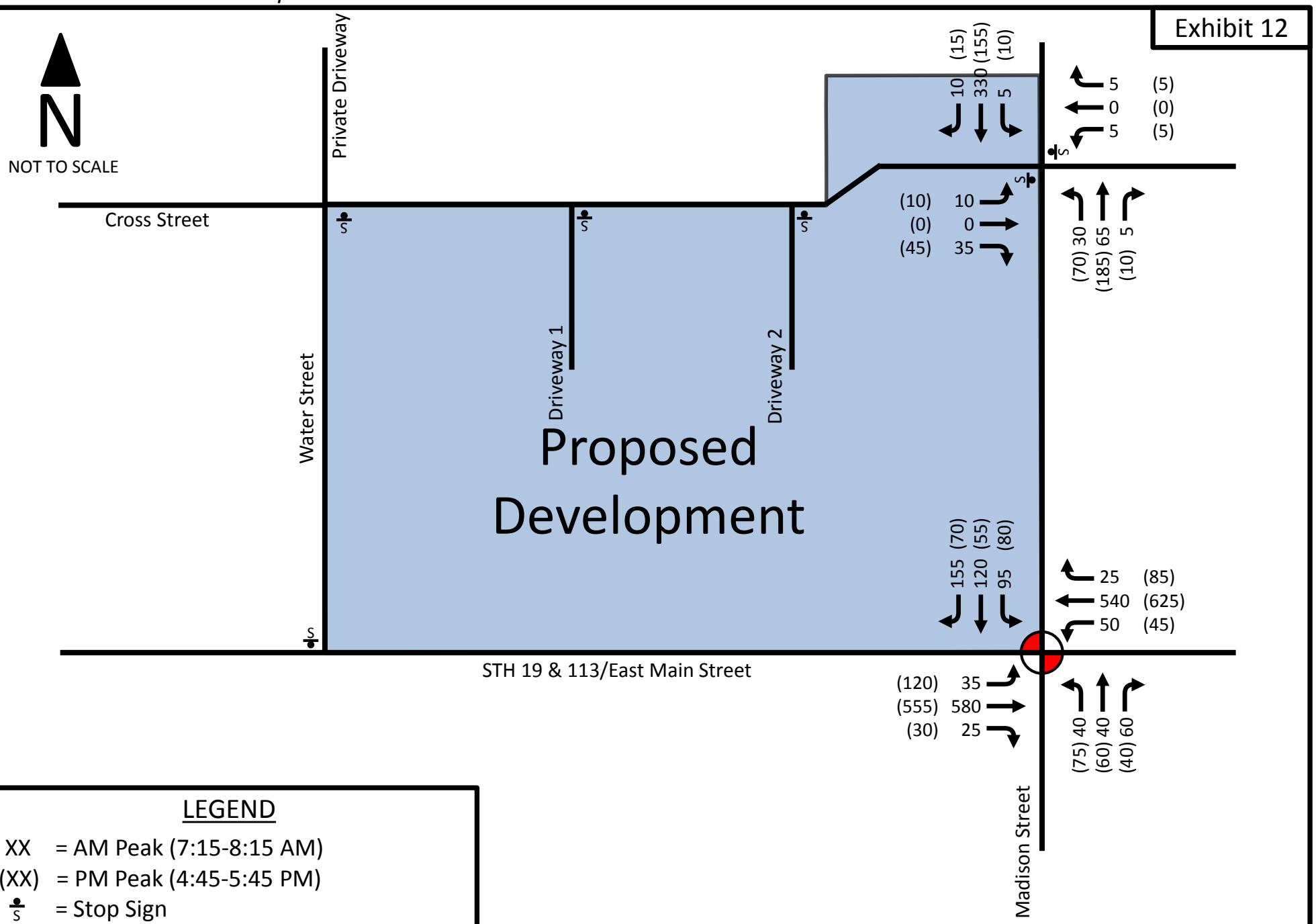
LEGEND

XX = AM Peak (7:15-8:15 AM)
(XX) = PM Peak (4:45-5:45 PM)
S = Stop Sign
= Traffic Signal

KL Engineering [A] Better Experience

Off-Site Trips

Exhibit 12



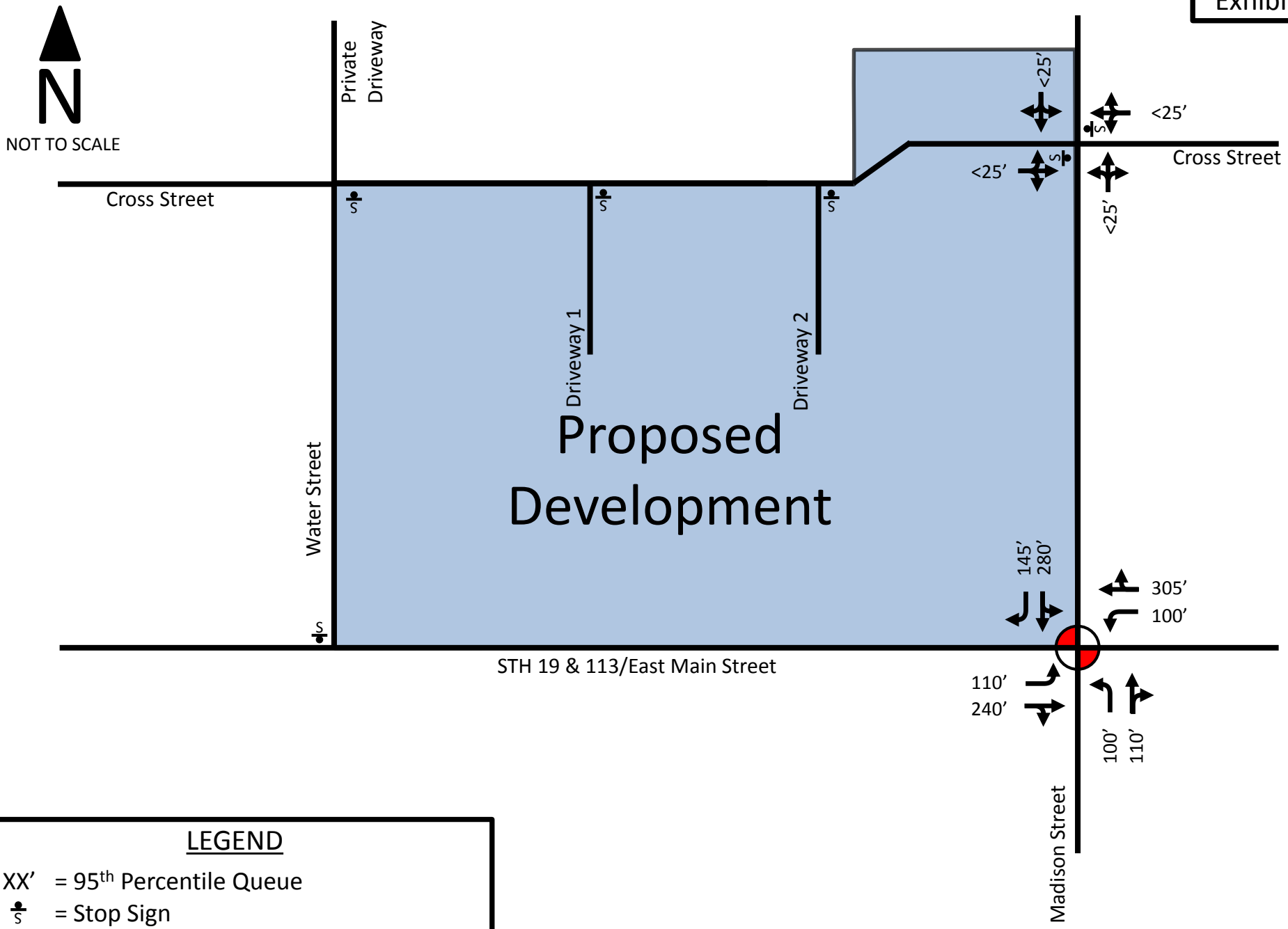
LEGEND

XX = AM Peak (7:15-8:15 AM)
(XX) = PM Peak (4:45-5:45 PM)
S = Stop Sign
= Traffic Signal

KL Engineering [A] Better Experience

Build Traffic Volumes

Exhibit 13



LEGEND

XX' = 95th Percentile Queue

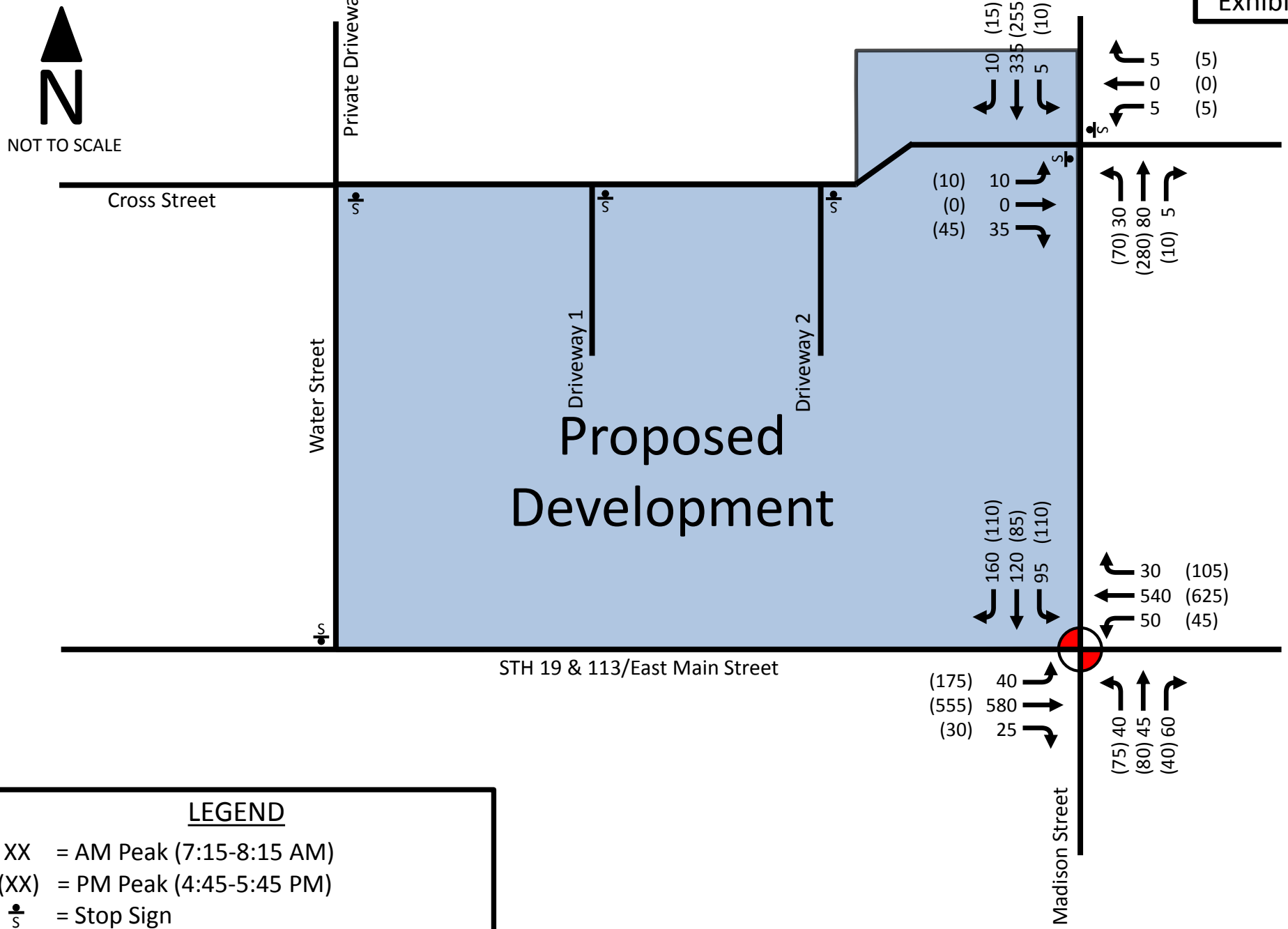
S = Stop Sign

= Traffic Signal

KL Engineering [A] Better Experience

Build Traffic 95th Percentile Queues

Exhibit 14



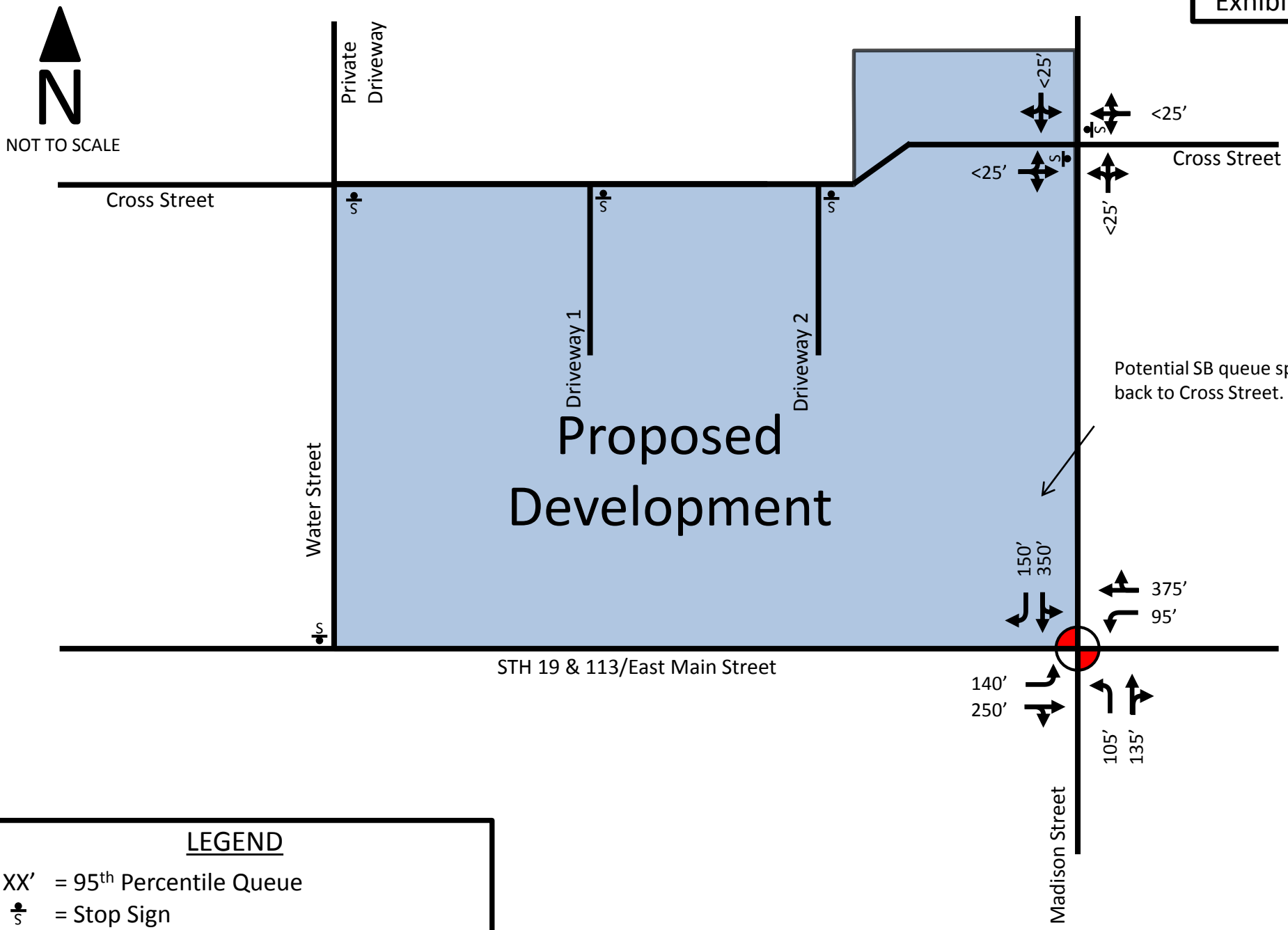
LEGEND

XX = AM Peak (7:15-8:15 AM)
(XX) = PM Peak (4:45-5:45 PM)
= Stop Sign
= Traffic Signal

KL Engineering [A] Better Experience

Total Traffic Volumes

Exhibit 15



LEGEND

XX' = 95th Percentile Queue

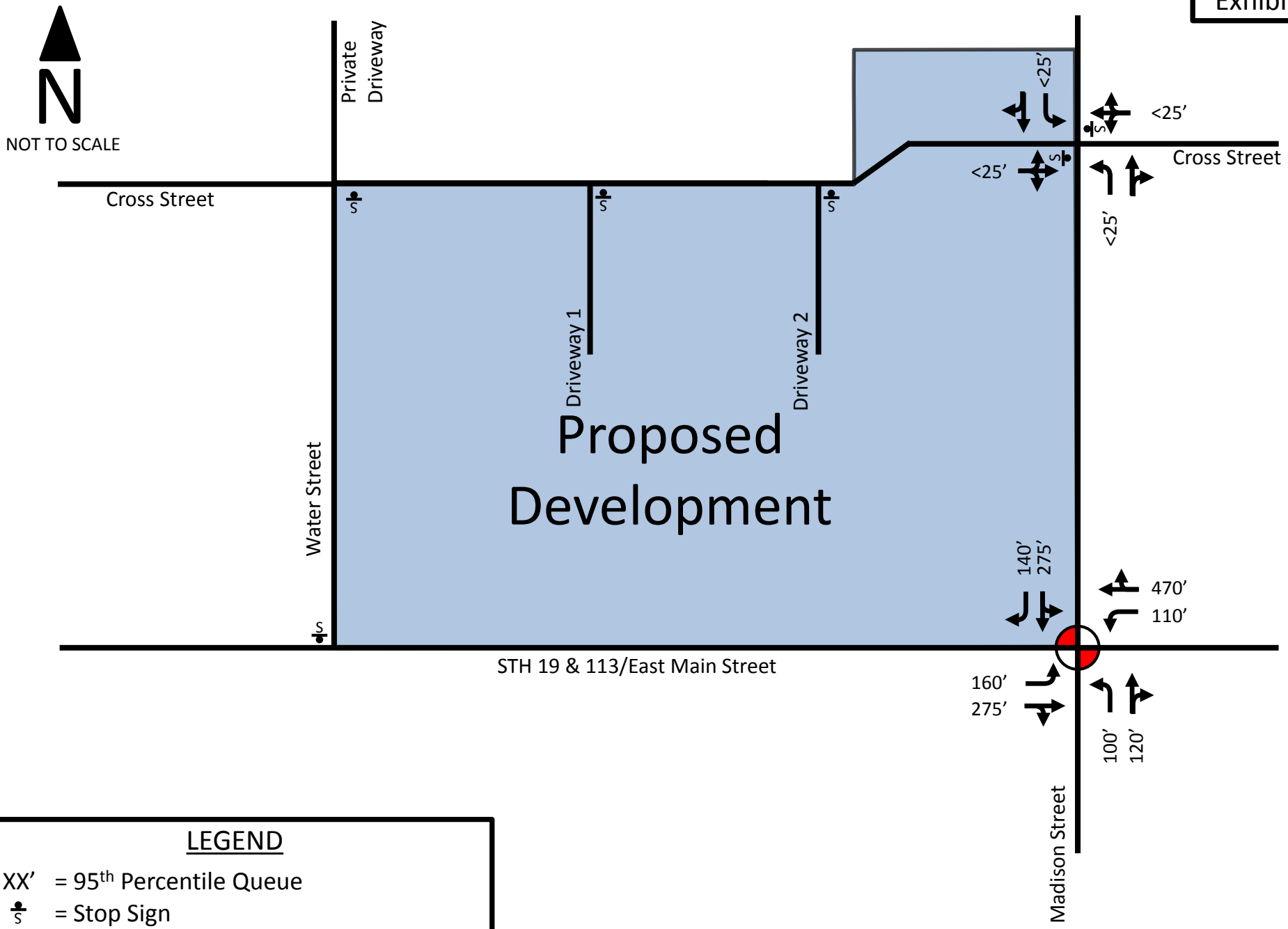
S = Stop Sign

= Traffic Signal

KL Engineering [A] Better Experience

Total Traffic 95th Percentile Queues

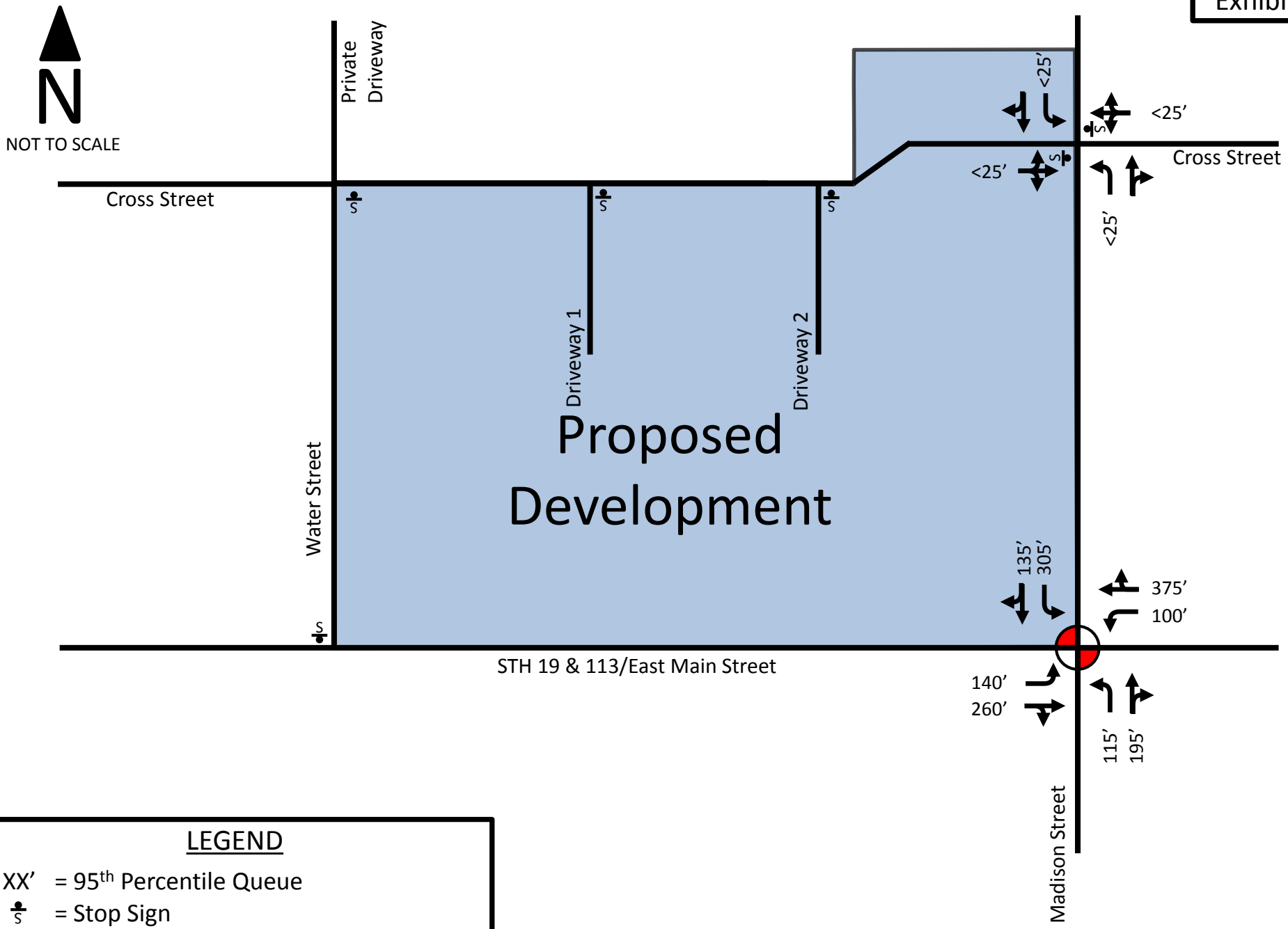
Exhibit 16



KL Engineering [A] Better Experience

Total Traffic With Improvements 95th Percentile Queues

Exhibit 17



LEGEND

XX' = 95th Percentile Queue

S = Stop Sign

= Traffic Signal

KL Engineering [A] Better Experience

Total Traffic Lane Reassignment 95th Percentile Queues