

## Memorandum

**Date:** July 25, 2016

**To:** Chris Bong, Development Engineering Division Manager

**From:** Chris Marschinke, P.E.  
Aaron Berry, E.I.T.

**Subject:** Prairie Center Development – WaterCAD Modeling

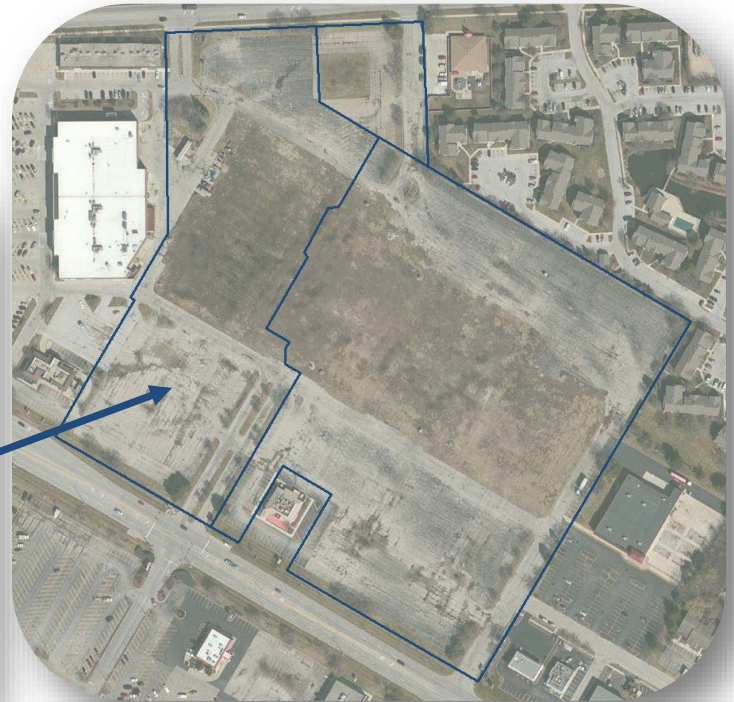
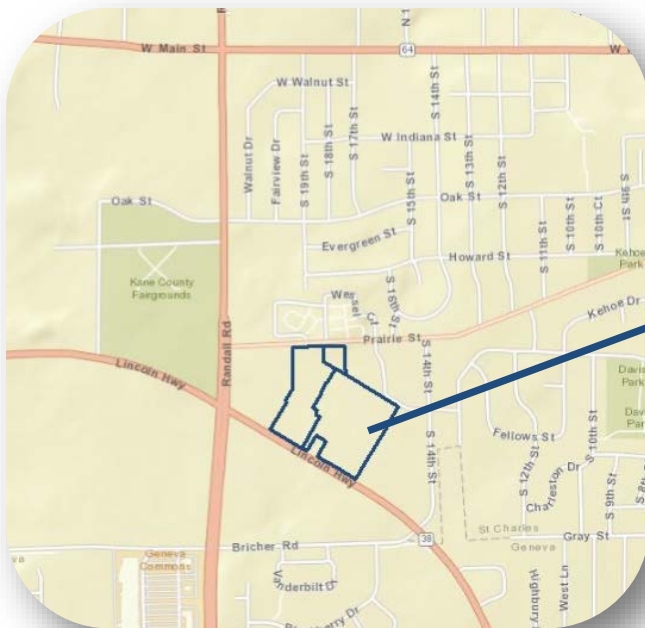
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### PROJECT BACKGROUND

The City of St. Charles is currently reviewing conceptual plans for the proposed Prairie Center Development located along Illinois Route 38 and Prairie Street. This site was developed in the late 1980's and was the location of the St. Charles Mall. The St. Charles Mall closed in the mid 1990's and was eventually demolished. SHODEEN Group, LLC is currently investigating a redevelopment of this location which generally consists of 13 multi-unit residential buildings, six commercial buildings, and three mixed-use commercial/residential buildings. There are approximately 609 residential units in total, and 80,000 square feet of retail/commercial space.

### PROJECT LOCATION MAP

The proposed Prairie Center Development is located along Illinois Route 38 and Prairie Street. The project location is identified in the blue below.





## DISTRIBUTION SYSTEM BACKGROUND

The City of St. Charles maintains roughly 221 miles of water main and approximately 2,840 fire hydrants. Currently the City's distribution system is divided into inner and outer pressure zones. The City is able to transfer water between zones through the use of the seven pressure reducing valves.

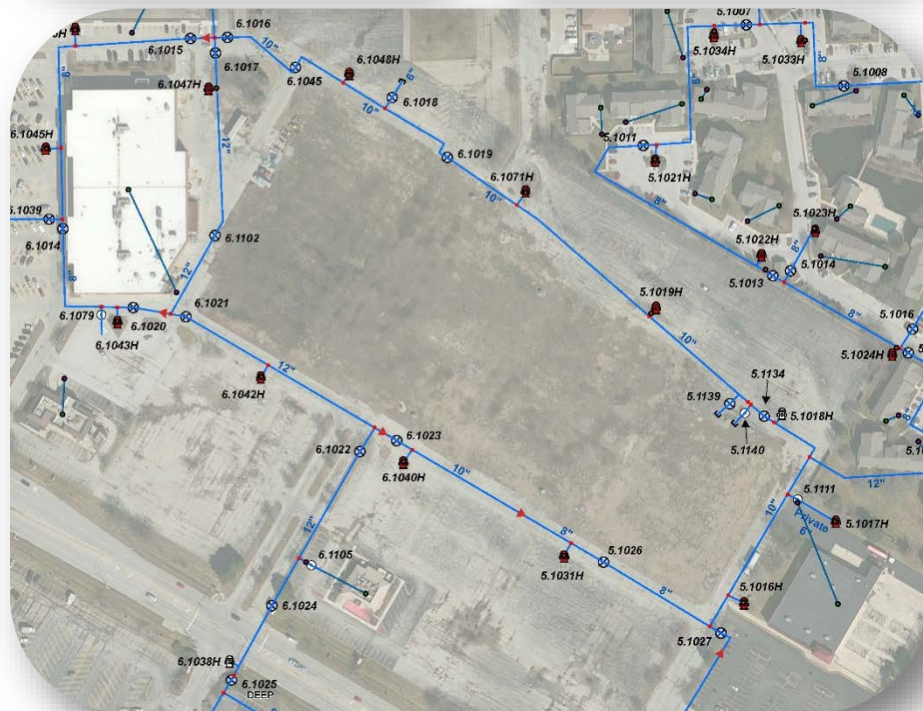
The City Water Department has adopted proactive water main maintenance, flushing, and rehabilitation programs to sustain the level of service provided to the community. The water main rehabilitation program is often coordinated with the City's Capital Improvement's Program for street rehabilitation and reconstruction to minimize costs. As a result, the City of St. Charles has a strong water distribution system.



## EXISTING CONDITIONS

The exhibit below illustrates the existing water system layout with system pressure and fire flow capacity for the surrounding area. The area in consideration is along Illinois Route 38 (Roosevelt Road), generally bound between Prairie Street to the North, South 14<sup>th</sup> Street to the East, Illinois Route 38 (Roosevelt Road) to the South, and Randall Road to the West.

The existing water main in the area consists of 10 and 12-inch water main, with minor portions of 8-inch. This property is located in an area of town with a large amount of water main looping and does not have a significant number of dead end mains. The daily demands in the area consist of both residential and commercial water usage.





## **WATERCAD® DISTRIBUTION SYSTEM MODEL**

### **General Background**

The City maintains a Bentley WaterCAD® V8i distribution system model, hosted by Trotter and Associates, Inc. The model is a valuable tool for evaluating the impact of potential development, as well as to measure the benefits received from capital improvement and rehabilitation projects. In 2007, the WaterCAD® model was updated from its 2001 version to reflect the distribution system's capabilities under Maximum Day Demand (MDD) and Fire Flow conditions.

Through a concerted effort by the City's GIS department the water system data is now managed electronically through GIS. In an effort to create a more accurate WaterCAD® distribution system, in 2014 the City elected to rebuild the model from the existing GIS data incorporating all of the improvements that have occurred since 2007. The new water model has been modified to also include data for all hydrants throughout the service area. In an effort to continue maintaining this goal, the City has asked TAI to provide information in regards to the proposed Prairie Center development and the available fire flows and pressures at this location.

### **Assumptions and Limitations**

The following assumptions were utilized to most accurately analyze the water system at the Prairie Center Development. The existing model used a water velocity constraint of 15 feet per second, which ensures system stability during flushing and fire flow events. In addition, the study area did not consist of the entire system. The study area consisted of the area surrounding the proposed site improvements (Route 38 and South 14<sup>th</sup> Street). The available fire flows and pressures reported represent instantaneously available capacities at the water main adjacent to the proposed buildings and fire hydrants listed within the data tables provided within this memo.

The improvements that were modeled consisted of that which was described on the proposed plans and exhibits, appended to this report for reference. TAI identified several discrepancies in the plans for the existing water main. In the locations where the development did not call for removal and replacement of the existing water mains, TAI used the sizing provided by STC's GIS Department. As a result, a small section of the water main did remain as 8-inch. TAI also assumed that the 10-inch water main located along the back of the existing site was removed from service, and a new 10 and 12-inch water main was installed per the proposed plans.

Assumptions made in regards to future water usage/daily demands at the proposed development are listed in Tables 1 and 2. It was assumed that each of the residential buildings had a 50/50 split of single bedroom and 2-3 bedroom units. A single bedroom apartment equated to a population equivalent of 1.5, while a 2-3 bedroom apartment equated to three PE. Per City data, 75 gallons/PE was used for the average usage. Table 1 outlines the anticipated water consumption per each residential building.





**Table 1: Residential PE & Demands**

Residential Building	Single Bedroom	Two/Three Bedroom	Total Units	Total PE/Unit	Gallons/Day
Residential B1	18	18	36	81	6,075
Residential B2	18	18	36	81	6,075
Residential B3	18	18	36	81	6,075
Residential C1	18	18	36	81	6,075
Residential D1	19	20	36	88.5	6,638
Residential D2	19	20	36	88.5	6,638
Residential D3	19	20	36	88.5	6,638
Residential D4	19	20	39	88.5	6,638
Residential D5	19	20	39	88.5	6,638
Residential E1	22	23	39	102	7,650
Mixed Use B1	18	18	39	81	6,075
Mixed Use B2	18	18	39	81	6,075
Mixed Use B3	18	18	45	81	6,075
Mixed Use D1	19	20	39	88.5	6,638
Mixed Use D2	19	20	39	88.5	6,638
Mixed Use D3	19	20	39	88.5	6,638
<b>Total</b>	<b>300</b>	<b>309</b>	<b>609</b>	<b>1,377</b>	<b>103,275</b>

The commercial properties were assumed to be restaurant locations. In order to quantify the water consumption for each building, TAI utilized the square footage of each building to estimate the water demand. It was estimated that each building would use approximately 0.85 gallons/day/square foot of building space. Table 2 outlines each building and the anticipated daily water use.

**Table 2: Commercial Demands**

Commercial Building	Square Feet	Gallons/Day
Retail/Rest/A	9,000	7,397
Retail/Rest/B1	5,000	4,110
Retail/Rest/B2	5,000	4,110
Retail/Rest/C1	3,475	2,856
Retail/Rest/C2	3,475	2,856
Retail/Rest/D	7,200	5,918
Mixed Use B1 - Retail	12,160	9,995
Mixed Use B2 - Retail	12,160	9,995
Mixed Use B3 - Retail	12,160	9,995
Mixed Use D1 - Retail	15,615	12,834
Mixed Use D2 - Retail	15,615	12,834
Mixed Use D3 - Retail	15,615	12,834
<b>Total</b>	<b>116,475</b>	<b>95,733</b>





### Fire Flow Requirements

Per the adopted 2015 International Fire Code, the fire-flow duration for commercial properties is two hours for Needed Fire Flows (NFF<sub>i</sub>) up to 3,000 gpm and three hours for needed Fire Flows up to 4,000 gpm. Properties requiring greater than 4,000 gpm fire flows require a flow duration of four hours. The needed fire-flow duration for 1-and 2-family dwellings with an effective area of 3,600 square feet or less is one hour, and dwellings larger than 3,600 square feet is two hours. Buildings other than one and two-family dwellings require fire flows per table B105.1 (minimum required fire-flow and flow durations for buildings) within Appendix B of the IFC.

TABLE B105.1(2)  
 REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute) <sup>b</sup>	FLOW DURATION (hours)
Type IA and IB <sup>a</sup>	Type IIA and IIA <sup>a</sup>	Type IV and V-A <sup>a</sup>	Type IIB and IIB <sup>a</sup>	Type V-B <sup>a</sup>		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	4
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m<sup>2</sup>, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.  
 a. Types of construction are based on the *International Building Code*.  
 b. Measured at 20 psi residual pressure.

### PRAIRIE CENTER DEVELOPMENT WATER MODEL EVALUATION

Trotter and Associates, Inc. has performed the requested evaluation of the hydraulic model for the City of St. Charles in regards to the Prairie Center Development. Below are the results of the proposed site development from the hydraulic analysis for both average daily demands, and maximum day demands.

#### Prairie Center Development – Proposed Water Main Layout

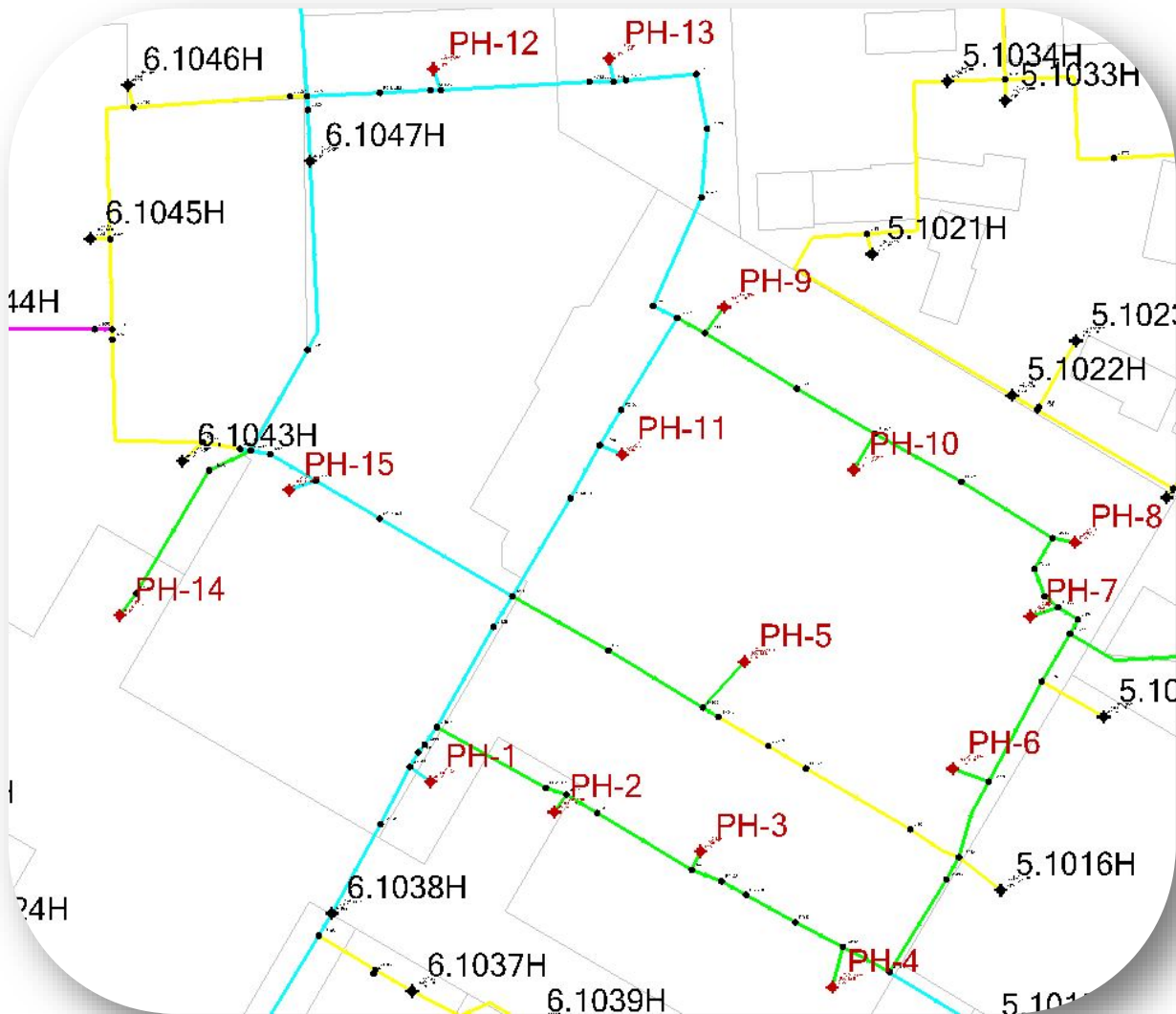
As stated previously, this development has 13 multi-unit residential buildings, six commercial buildings, and three mixed-use commercial/residential buildings. There is approximately a total of 609 residential units, and 80,000 square feet of retail/commercial properties. The proposed water main layout for the Prairie Center Development project is made up mostly 10-inch and 12-inch water main.

This layout includes approximately 1,300 lf of new 12-inch water main, and 1,700 lf of new 10-inch water main. Shown on the following page is the proposed water main layout for the development. Water main in blue represents 12-inch, green is 10-inch, and yellow is 8-inch. The site includes 15 additional hydrants (shown in red) that are to be tied into both the new 10-inch and 12-inch water mains running throughout the site. These new hydrants are to serve the twenty two buildings.



### Fire Flow Analysis

The WaterCAD computer modelling software was used to identify the available fire flow capacity throughout the Prairie Center proposed site development during both average daily and maximum day demands. The available fire flow capacity is defined as the maximum deliverable flow from a single building service and hydrant while maintaining residual pressures of no less than 20 psi at any point in the system.





### Average Day Demand

The model was first run under representative conditions that the City of St. Charles routinely sees throughout its distribution system, referred to as the Average Daily Demand (ADD). This scenario includes roughly 2,950 gallons per minute of water usage throughout the city following residential and commercial demand patterns. The Campton Hills water tower Red Gate water tower serving the high pressure, and the 10th Street water tower serving the low pressure system, and all were run under nearly full conditions. Additionally, the Ohio Avenue water treatment plant and Wells No. 9 & 11 were available to run during the analysis. These wells typically run under average demand conditions.

The results of this modeling are shown in the table below are for the fire hydrants and connection points to each building in the proposed Prairie Center Development.

Building	Pressure (psi) - ADD	Fire Flow Capacity (gpm) - ADD	Hydrant No.	Pressure (psi) - ADD	Fire Flow Capacity (gpm) - ADD*
Residential B1	54	6,030	PH-1	53	4,122
Residential B2	55	5,809	PH-2	53	3,955
Residential B3	54	6,085	PH-3	53	3,960
Residential C1	54	6,284	PH-4	53	3,910
Residential D1	54	6,185	PH-5	53	3,699
Residential D2	54	4,782	PH-6	53	3,864
Residential D3	54	6,224	PH-7	54	4,017
Residential D4	55	5,879	PH-8	54	3,985
Residential D5	55	5,675	PH-9	53	4,055
Residential E1	54	5,806	PH-10	53	3,860
Mixed Use B1	54	6,255	PH-11	53	4,148
Mixed Use B2	54	6,327	PH-12	53	4,179
Mixed Use B3	54	6,130	PH-13	53	4,104
Mixed Use D1	54	6,128	PH-14	53	3,501
Mixed Use D2	54	5,806	PH-15	53	4,094
Mixed Use D3	55	5,733			
Retail/Rest/A	54	4,660			
Retail/Rest/B1	54	6,214			
Retail/Rest/B2	54	6,232			
Retail/Rest/C1	54	5,769			
Retail/Rest/C2	55	5,717			
Retail/Rest/D	55	5,782			

*\*Note: The proposed fire hydrants have available fire flows above 3,000 gpm; this is the instantaneous flow and more than one hydrant in the area may be required to achieve this flow rate. It is anticipated that the maximum flow rate from of a single fire hydrant 4.5-inch outlet is approximately 3,000 gpm.*



### Maximum Day Demand – Scenario 1 (Towers Full)

The model was then run under the highest demand conditions that the City of St. Charles has seen in the past three years, referred to as the Maximum Day Demand. This scenario includes roughly 6,600 gallons per minute of water usage throughout the City. The Campton Hills water tower, Red Gate water tower, and the 10th Street water tower were run under nearly full conditions for scenario one. Additionally, the Ohio Avenue water treatment plant and Wells No. 9 & 11 were available to run during the analysis.

The results of this modeling are shown in the table below are for the fire hydrants and building services and connection points to each building in the proposed Prairie Center Development.

Building	Pressure (psi) - MDD	Fire Flow Capacity (gpm) - MDD
Residential B1	52	5,566
Residential B2	53	5,375
Residential B3	52	5,606
Residential C1	52	5,787
Residential D1	52	5,698
Residential D2	52	4,465
Residential D3	52	5,728
Residential D4	53	5,439
Residential D5	53	5,256
Residential E1	52	5,368
Mixed Use B1	52	5,752
Mixed Use B2	52	5,821
Mixed Use B3	52	5,649
Mixed Use D1	53	5,650
Mixed Use D2	52	5,358
Mixed Use D3	53	5,304
Retail/Rest/A	52	4,351
Retail/Rest/B1	52	5,719
Retail/Rest/B2	52	5,733
Retail/Rest/C1	52	5,334
Retail/Rest/C2	53	5,289
Retail/Rest/D	53	5,346

Hydrant No.	Pressure (psi) - MDD	Fire Flow Capacity (gpm) - MDD
PH-1	51	3,869
PH-2	51	3,715
PH-3	51	3,725
PH-4	51	3,676
PH-5	51	3,486
PH-6	51	3,636
PH-7	52	3,779
PH-8	52	3,751
PH-9	51	3,811
PH-10	51	3,632
PH-11	51	3,892
PH-12	51	3,925
PH-13	51	3,853
PH-14	51	3,305
PH-15	51	3,845





### Maximum Day Demand – Scenario 2 (Campton Hills Tower Empty)

The model was then run again under Maximum Day Demand; however the Campton Hills water tower was taken offline to simulate out-of-service situations such as those during painting or rehabilitation.

The results of this modeling are shown in the table below are for the fire hydrants and connection points to each building in the proposed Prairie Center Development.

Building	Pressure (psi) - MDD	Fire Flow Capacity (gpm) - MDD	Hydrant No.	Pressure (psi) - MDD	Fire Flow Capacity (gpm) - MDD
Residential B1	48	2,365	PH-1	46	2,070
Residential B2	48	2,366	PH-2	46	2,042
Residential B3	47	2,355	PH-3	47	2,066
Residential C1	48	2,387	PH-4	46	2,039
Residential D1	48	2,380	PH-5	46	1,993
Residential D2	48	2,229	PH-6	46	2,031
Residential D3	47	2,374	PH-7	47	2,091
Residential D4	48	2,379	PH-8	47	2,084
Residential D5	48	2,348	PH-9	47	2,081
Residential E1	48	2,350	PH-10	46	2,033
Mixed Use B1	47	2,370	PH-11	46	2,084
Mixed Use B2	47	2,378	PH-12	46	2,101
Mixed Use B3	48	2,370	PH-13	46	2,075
Mixed Use D1	48	2,379	PH-14	46	1,946
Mixed Use D2	47	2,324	PH-15	46	2,080
Mixed Use D3	48	2,350			
Retail/Rest/A	47	2,188			
Retail/Rest/B1	47	2,359			
Retail/Rest/B2	47	2,360			
Retail/Rest/C1	48	2,345			
Retail/Rest/C2	48	2,347			
Retail/Rest/D	48	2,353			



### **SUMMARY OF FINDINGS**

The results of the WaterCAD modeling for the Prairie Center development indicate that during maximum day demand conditions, fire flows in excess of 3,000 gpm are expected to be available at the proposed hydrants and building junctions, with operating pressure of approximately 50 psi. This modeling was performed utilizing a lower residual pressure limit of 20 psi and performed per NFPA recommendations.

As stated previously, the City of St. Charles has adopted the 2015 International Fire Code, which sets requirements for available fire flows and durations for various construction types. Within Appendix B, Fire Code Table B105.1(2) (Reference Table for Tables B105.1(1) and B105.2) states the specific requirements for fire flow capacities of different building types. In order to evaluate the adequacy of fire flow for each building, additional information would be required including building type, construction techniques, building separation, etc. It is recommended that building department evaluate the available fire flows of the proposed development relative to the required fire flow for each building to determine the acceptability of the layout as proposed.



## MEMORANDUM

Date: December 5, 2016

To: Chris Bong P.E.

CC: Russ Colby

From: Greg Chismark

Subject: Prairie Center Sanitary Sewer Evaluation Update

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As requested WBK evaluated the impact of a density bonus increasing the number of residential units in the Prairie Center project. We understand the density bonus would add 61 additional residential units. These units can be allocated as one bedroom and two bedroom units in accordance with the ratios set for in the original study. This will result in 29 additional one bedroom and 32 additional two bedroom units for the density bonus.

Additional flow was calculated based on increased unit count from the density bonus. The additional flow (0.038 cfs) represents an approximate 10% increase in Prairie Center flows. The flow values were then added to the total flow originally calculated for Prairie Center. The Prairie Center & Density Bonus flows were then compared to pipe capacity for each pipe segment downstream of the project connection.

Likewise, the additional density bonus flow was added to the Prairie Center + Future Development flow condition which considers build out of sites adjacent to Prairie Center. The Prairie Center & Density Bonus + Future Development flows were then compared to pipe capacity for each pipe segment downstream of the project connection.

The results of the analysis indicates no significant adverse impact as a result of the density bonus. We note a slight increase in pipe capacity utilization of 2% maximum and 3% maximum for the Prairie Center and Prairie Center + Future Development scenarios respectively. No additional pipe segments are indicated as deficient and the original recommendations for improvements to the sewer system remain unchanged.

***Prairie Centre Redevelopment***  
***Sanitary Sewer Evaluation***



**CITY OF**  
**ST. CHARLES**

∞ ILLINOIS • SINCE 1834 ∞

Prepared by

**WBK**   
engineering

August 22, 2016

## **Introduction**

On behalf of the City of St. Charles, WBK Engineering has evaluated the existing sanitary sewer system downstream of the proposed redevelopment project known as Prairie Center. This project is a mixed use redevelopment of the former St. Charles Mall site near the Illinois Route 38 and Randall Road intersection. The project consists of residential uses including apartments and condos, and commercial uses such as general retail and restaurants. This report considers existing conditions as well as the ability of sanitary sewer system to facilitate flows from the Prairie Centre project and tributary undeveloped parcels. The extent of the collection system evaluated includes gravity sewers from the project site to the Park Shore siphon under the Fox River. A comparison of flows at the Park Shore was also performed to determine the impact of the proposed project on the Siphon as an initial evaluation.

## **Existing Conditions**

The existing conditions evaluation of the wastewater collection system consisted of a “flowing full” capacity analysis of the gravity sanitary sewers serving the project from the former St. Charles Mall site to the Park Shore siphon.

### Data Sources

Physical pipe characteristics including pipe diameter and slope were obtained from several sources:

- 1996 Black and Veatch Report
- 1999 RHAA Plans for Gray Street Improvements
- 2008 Ground Survey from Thompson Survey
- 2016 City GIS Data

Sanitary sewers from the siphon to the project site range in size from 12 to 21 inches in diameter. It should be noted that some pipes are identified as backpitched. It is our recommendation to correct this condition as part of any proposed sewer improvement project.

Existing flow data was evaluated from two data sources:

- 1996 Black & Veatch Report
- 2009 RJN Report

From these data sources several types of flows were compared including peak sanitary, infiltration and inflow. Both studies considered a 10 year recurrence frequency for infiltration and inflow. The most conservative value for each of these flow regimes was utilized. Peak sanitary flows were derived from the 2009 RJN report. Inflow and Infiltration flows were

derived from the 1996 Black and Veatch report. Flow values were distributed to each sewer segment based on the Black and Veatch distribution schema and extrapolated or interpolated as appropriate. The only variation from this approach is a flow split at manhole 5.1 200 where significant flow from the Fellow Street / Davis School collector sewer combines with the Gray Street collector sewer. At this manhole, flow values were assigned to Fellows and Gray Street sewers based on proportional tributary area to each sewer segment.

### **Proposed Conditions**

Wastewater flows from Prairie Centre and undeveloped parcels (future development) were added to the sewer system network based on proposed land uses defined in Exhibit A. The Prairie Centre land uses were based on information provided by Dave Patzelt (ShoDeen Construction Co. LLC) via e-mail dated May 25, 2016.

Residential units include 287 one bedroom and 322 two bedroom units with 1.5 and 3.0 occupants per unit respectively in accordance with IEPA guidelines. A wastewater flow generation rate of 80 gal/capita/day for residential uses was utilized. This value was based on local water usage rates for similar land uses and within recognized study range values as determined by a 2002 USEPA study.

Commercial uses include several restaurant/retail and mixed use buildings. The City and developer expect 33,150 sf of restaurant use and 83,328 sf retail (i.e. non-restaurant general commercial uses). These uses will be spread and distributed between buildings and phases based on market conditions. For restaurants the wastewater flow was generated based on data from the Restaurant Operations Report, 2010 to derive the average seats per square foot and the average turnover (meals / seat). The Illinois Administrative Code wastewater rate of 10 gpd/meal was utilized and applied to establish the final rate of 0.563 gpd/sf for restaurant use. For all other non-specific commercial uses a wastewater generation rate of 0.12 gpd/sf was utilized.

A peaking factor was applied to all average daily wastewater rates noted above. This factor is commonly applied and referenced in The Great lakes – Upper Mississippi Recommended Standards for Wastewater Facilities 2014 edition. All flows are considered as “full build out” conditions and phasing of the project was not considered.

There are three undeveloped parcels tributary to the sewer segments which will serve the proposed redevelopment. These parcels; Anderson property, Tri-City Plaza and Moose property, have been assigned uses and allowable square footage build out based on allowable zoning classifications and through discussion and direction from City staff. For the sake of simplicity all parcels are considered as “full build out” and flows applied at the upstream end of the sanitary sewer segments being evaluated.

The former St. Charles Mall, now demolished, consisted of 290,000 square feet of retail space. This includes two anchor stores; Kmart and Spiess and the remainder specialty store square footage. Utilizing the same flow generation rate for non-specific commercial uses noted above the “Old Mall” had the potential to generate an average of 34,800 gpd. By comparison the proposed uses are expected to generate an average 140,380 gpd.

### **Redevelopment System Connection**

The existing sanitary sewer network serving the redevelopment parcel is tributary to a collector sewer that flows east along Fellows Street and then south along Seventh Court to Gray Street. From Gray Street flows travel east along Gray to Elm, Roosevelt, IL 31 and ultimately the Park Shore Siphon. The Fellows Street collector serves the neighborhood known as the Davis School area and has had a history of sanitary sewer backups during extreme rainfall events. Accordingly we recommend an alternate route for the redevelopment parcel that will divert flows away from the Fellows collector sewer to the Gray Street collector sewer. This alternate routing will route all proposed flows and some existing flows from the Fellows Street sanitary sewer to Gray Street. The sanitary sewer from the redevelopment site to Gray Street is a minimum 8 inch diameter pipe with limited tributary area and connections. Additionally, the City increased the Gray Street sewer from the Seventh Court to Elm Street to a 21 inch diameter pipe. An initial evaluation of these sewers indicate they have adequate capacity for the design event and proposed conditions. Re-routing of redevelopment flows benefits the City by rerouting flows from the Davis School area and benefits the development from having to reconstruct the Fellows Street collector sewer.

### **Gravity Sewer Capacity Evaluation**

The capacity of the existing gravity sanitary sewer from the project site to the Park Shore siphon was determined based on a flowing full capacity utilizing manning’s equation. Pipe slopes were determined from data sources noted previously. Manning’s roughness coefficients were selected based on “normal” pipe condition for vitrified clay and PVC pipe as appropriate. It was determined that a 90% capacity threshold would be utilized to identify pipe segments requiring replacement. The 90% threshold accounts for pipe conditions of a mature collection system such as root intrusion, joint displacement and pipe integrity.

Proposed flow values were input for all proposed land development including the Prairie Centre project as well as all future development at the upstream end of the collection system. This is a conservative approach since the future Anderson property would connect to the system several segments downstream from the end segment.

Three flow scenarios were considered including:

- Existing Conditions (based on 2009 flow monitoring values)
- Proposed Conditions with Prairie Centre (full build out)
- Future Conditions with Prairie Centre and Future Development

A spreadsheet was developed that distributed peak sanitary, inflow and infiltration flows to each pipe segment within the system based on the Black and Veatch assignment except manhole 5.1 200 where flow values were determined based on proportional tributary area to each sewer segment. The total flow for the three conditions herein are compared to the 90% Manning's capacity to provide a recommendation for system improvements.

## **Results**

Existing Conditions - Three segments of gravity sanitary sewer pipe are noted as deficient (greater than 90% capacity) under existing conditions with the worst segment being 100% flowing full capacity for the 10 year design event.

Proposed with Prairie Centre - Five segments of gravity sanitary sewer pipe are noted as deficient (greater than 90% capacity) under proposed conditions with Prairie Centre with the worst segment being 106% flowing full capacity for the 10 year design event.

Prairie Centre and Future Development - Five segments of gravity sanitary sewer pipe are noted as deficient (greater than 90% capacity) under future conditions with the worst segment being 108% flowing full capacity for the 10 year design event. It is noted that the first segment (upstream end) is reported at 91% capacity but not highlighted because flows from the Anderson property will connect well downstream of this location.

Four gravity sanitary sewer pipe segments are identified as backpitched and are noted as such on the spreadsheet. All segments are relatively short with the longest being 27 feet in length.

It is noted that the I & I values from flow monitoring are significantly greater than values generally used for sanitary sewer construction. The acceptable testing standards for new sewers according to the Greg Lakes – Upper Mississippi River Board - Ten State Standards of 100 gal/in/mi/day. It is common practice to utilize a factor of safety of 2.0 to this value to account for a mature or aging system. Applying a factor of 200 gal/in/mi/day to all segments in the system being evaluated results in a total I & I flows of 0.50 cfs. The I & I determined from the flow monitoring is 4.32 cfs or 864% of the design value noted herein.



### **Park Shore Siphon Flow Comparison**

A comparison of flows at the Park Shore siphon was performed to determine the relative impact of the proposed Prairie Centre project with and without future development. A detailed evaluation and analysis of the siphon is not in the scope of this study and was not performed.

Similar to the gravity sewer analysis, flows from the Black and Veatch and RJN studies were compared and combined to establish three conditions:

- Existing
- Proposed with Prairie Centre
- Prairie Centre with future conditions

Peak sanitary flows were derived from the RJN flow monitoring study while I & I flows were derived from the Black and Veatch Study. The Proposed Prairie Centre and Future Development flows calculated for the gravity sewer evaluation were used in this flow comparison as well.

The estimated 10 year design event flows are 16.16 cfs for existing conditions, 16.47 cfs including Prairie Centre and 16.58 cfs including Prairie Centre with Future Development conditions. The increase in flow as a result of the Prairie Centre project is 2% of the existing flow to the siphon and not considered significant. Based on the limited increase in flows further evaluation of the siphon is not warranted as a result of the Prairie Centre project.

### **Recommendations**

The results indicate a number of segments are over capacity and require replacement. As a practical matter, we recommend that sewer segments be grouped and replaced in series of pipes to create a defined project based on logical beginning and end locations. We also recommend that pipe diameters are dimensionally consistent and that no downstream pipe diameter is smaller than the upstream pipe diameter. Since there are significant segments of 21" diameter pipe on Gray and Elm Street (2,650 lf) we recommend all pipe downstream from these segments be no less than 21" diameter. A pipe system where downstream pipes have a smaller diameter are more prone to obstructions and blockages than a system where pipe sizes are consistent or increasing. Additionally the hydraulic losses due to a constriction and the smaller pipe size is significant. Additionally, a comparison of friction losses for the segments recommended for replacement show the existing 15" VCP to create 19.5 feet and 28.3 feet of friction losses when the pipes are in good (new) and poor (end of service life) conditions respectively. By comparison the proposed 21" PVC creates 2.1 feet and 3.2 feet of friction

losses when the pipes are in good (new) and poor (end of service life) conditions respectively. These values were calculated assuming 5 cfs peak design flow. This improvement in friction loss provides the potential to convey flow greater than the 10 year I & I design event considered herein and provides a factor of safety against increasing I & I as the City's sewer system ages.

Accordingly 21 segments of sanitary sewer along IL 31, Roosevelt and Elm Street are recommended for replacement and two segment recommended for lining.

Nine segments along IL 31 from the Park Shore Siphon to Roosevelt Street are recommended for replacement including eight 15" vitrified clay pipes (VCP) and one 18" VCP pipe. Nine segments of 15" VCP pipe along Roosevelt Street from IL 31 to Elm Street are recommended for replacement. Three segments of 15" VCP pipe along Elm Street from Roosevelt to Gray Street are recommended for replacement while two segments of 21"VCP are recommended for lining. It is noted that the segments recommended for lining are assumed to be in satisfactory structural condition which should be verified with preliminary design of any rehabilitation project. A Recommended Improvement evaluation was performed and the proposed sanitary sewer pipe size was determined based on the system being able to convey flows such that the flowing full capacity is less than 75% of the projected wastewater flows. It should be noted that all backpitched segments are replaced as a result of these recommendations except for one at the west end of Gray Street. We recommend this segment be surveyed to verify inverts and actual field conditions.

It is noted that some of the pipes recommended for replacement are not specifically attributable to the proposed Prairie Centre project. However, the rerouting of flows to Gray Street takes advantage of a prior sanitary sewer improvements funded entirely by the City. Additionally, consideration should be given to the age and condition of the downstream sewer system. Based on the assumed age of the pipes along IL 31 and Roosevelt the system can be generally considered to be near the end of its service life. The age of downstream sanitary sewers provides an opportunity for financial participation in sanitary sewer improvements and for the development to partner with the City in infrastructure improvements benefitting both the project and surrounding neighborhoods.

### **Cost Estimate**

Concept level cost estimates have been developed to help determine the magnitude of cost for sanitary sewer rehabilitation projects. It is generally assumed that the sanitary sewer will be replaced in the same location as they exist today with an increase in pipe size or pipes will be lined. Costs have been developed considering three separate and distinct construction conditions and segment lengths. These segments are: Elm Street, Roosevelt Street and Illinois

Route 31 Sewers. The cost table below summarizes the project costs based on the afore-noted procedure and conclusions.

These costs are conceptual only and not based on preliminary engineering. Further refinement is recommended to better define project costs subsequent to approval of a final land plan and project scope evaluation by City staff.

			<b>2016</b>
Segment 1:	Elm Street	Sub-Total =	\$226,000
Segment 2:	Roosevelt Street	Sub-Total =	\$864,000
Segment 3:	IL Route 31	Sub-Total =	\$857,000
<b>TOTAL =</b>			<b>\$1,947,000</b>

**Additional Consideration**

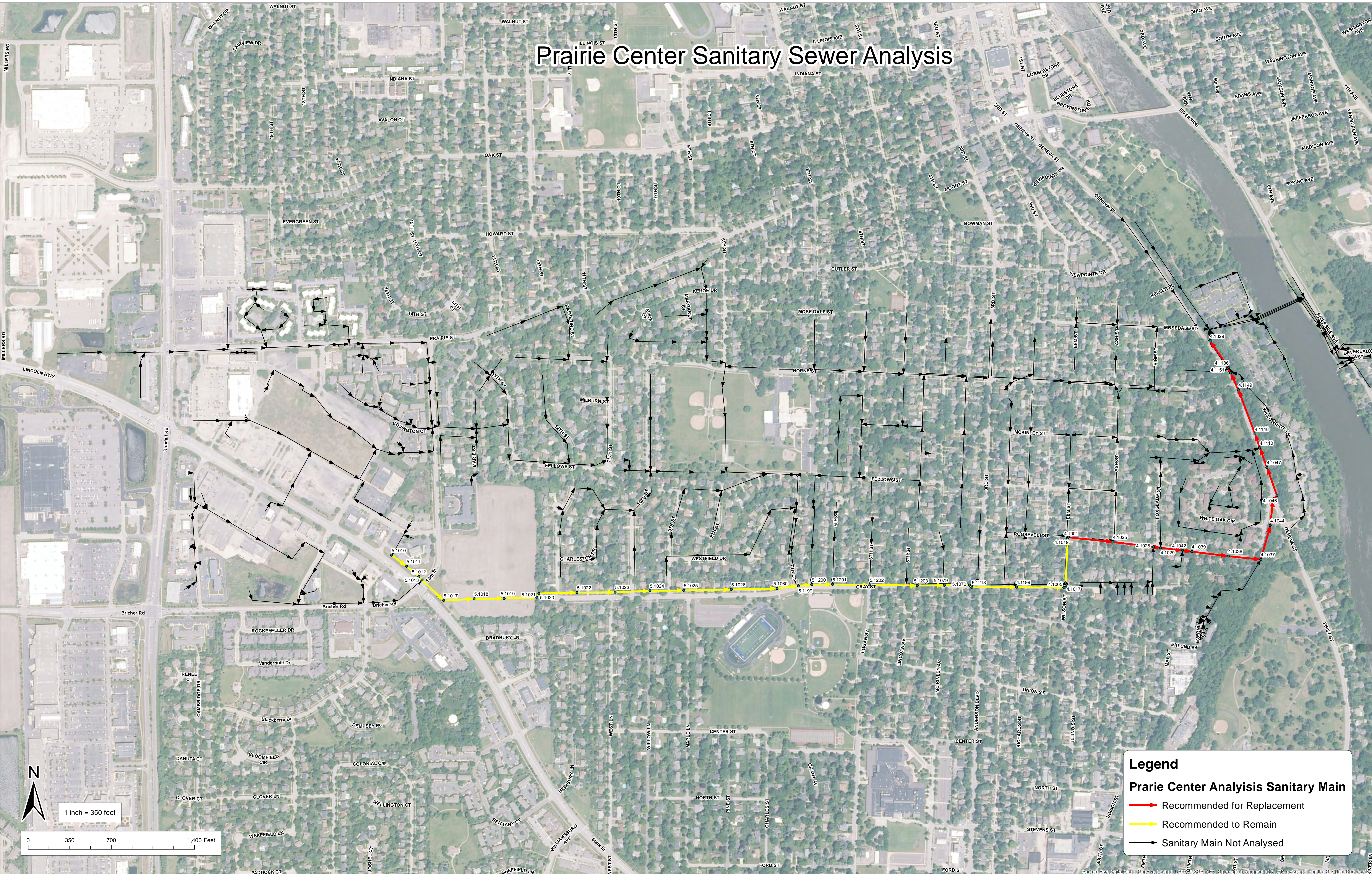
The City has recently drafted a Capacity Management Operations and Maintenance Plan (CMOM) for the wastewater collection system. The goal of the CMOM program is to reduce sanitary system overflows and basement backups through implementation of asset management techniques developed for wastewater collection systems. This plan sets forth a program of activities and funding strategies that will help the City manage the wastewater collections system and achieve the goals of the CMOM plan. The data collected for the CMOM plan is system wide and not specific to our study area. It was determined the CMOM data available at the time of this report would not be useful to this study and evaluation. However we advocate the City’s efforts in developing a CMOM plan and recommend a continuing program to study and remove inflow and infiltration (I & I) from the wastewater collection system.

Also, it is recognized that the flow projections from the 1996 Black & Veatch study are extrapolated from flow monitor locations and data. Although this is determined to be the best available information, it is recommended that additional flow monitoring consistent with the CMOM plan for the sewer segments evaluated herein be initiated. Additional flow monitoring will provide specific flow values to better define the extent and timing of required sanitary sewer improvements.

Finally, this study is limited based on the focus towards the Prairie Centre project. The recommended improvements and costs noted herein require further evaluation and refinement and warrant a preliminary engineering phase prior to initiation of final design.

## Appendix A

# Prairie Center Sanitary Sewer Analysis



**Legend**

**Prairie Center Analysis Sanitary Main**

- Recommended for Replacement
- Recommended to Remain
- Sanitary Main Not Analysed

Prairie Center Sanitary Sewer Capacity Analysis - 10 Year Event

Line ID	Street Name	Diameter (in)	Existing Pipe capacity (CFS)	90% Capacity	2009 Design Flow (CFS)	2009 Percent of Total Capacity	With Prairie Center Flow (CFS)	W/ P.C. % of Pipe Capacity	W/ P.C. & Future Dev. Flow (CFS)	W/ P.C. & F.D. % of Pipe Capacity	Proposed Pipe Diameter (in)	Proposed Pipe Capacity	W/ P.C. & F.D. % of Pr. Pipe Capacity
4.1186 - 4.1329	IL Rte 31	18	6.9	6.22	5.184	75%	5.50	80%	5.60	81%	21	10.43	54%
4.1187 - 4.1186	IL Rte 31	15	0.0	0.00	5.183	Backpitched	5.50	Backpitched	5.60	Backpitched	21	0.00	Backpitched
4.1187 - 4.1150	IL Rte 31	15	5.7	5.13	5.177	91%	5.49	96%	5.60	98%	21	13.98	40%
4.1149 - 4.1150	IL Rte 31	15	9.4	8.44	5.145	55%	5.46	58%	5.56	59%	21	23.00	24%
4.1148 - 4.1149	IL Rte 31	15	5.5	4.96	5.128	93%	5.44	99%	5.55	101%	21	13.52	41%
4.1110 - 4.1148	IL Rte 31	15	6.5	5.84	5.100	79%	5.42	84%	5.52	85%	21	15.91	35%
4.1047 - 4.1110	IL Rte 31	15	7.8	7.06	5.073	65%	5.39	69%	5.49	70%	21	19.25	29%
4.1046 - 4.1047	IL Rte 31	15	7.7	6.92	5.070	66%	5.39	70%	5.49	71%	21	18.85	29%
4.1045 - 4.1046	IL Rte 31	15	5.0	4.54	5.029	100%	5.35	106%	5.45	108%	21	12.38	44%
4.1044 - 4.1045	Roosevelt St	15	5.8	5.24	5.003	86%	5.32	91%	5.42	93%	21	14.28	38%
4.1037 - 4.1044	Roosevelt St	15	7.0	6.33	4.987	71%	5.30	75%	5.41	77%	21	17.25	31%
4.1038 - 4.1037	Roosevelt St	15	10.2	9.17	4.969	49%	5.29	52%	5.39	53%	21	25.00	22%
4.1039 - 4.1038	Roosevelt St	15	10.5	9.41	4.908	47%	5.22	50%	5.33	51%	21	25.64	21%
4.1042 - 4.1039	Roosevelt St	15	9.2	8.27	4.838	53%	5.15	56%	5.26	57%	21	22.54	23%
4.1029 - 4.1042	Roosevelt St	15	6.5	5.81	4.780	74%	5.10	79%	5.20	81%	21	15.83	33%
4.1028 - 4.1029	Roosevelt St	15	7.6	6.88	4.706	62%	5.02	66%	5.13	67%	21	18.76	27%
4.1025 - 4.1028	Roosevelt St	15	5.5	4.97	4.665	85%	4.98	90%	5.08	92%	21	13.53	38%
4.1019 - 4.1025	Roosevelt St	15	5.8	5.22	4.607	79%	4.92	85%	5.03	87%	21	14.24	35%
4.1001 - 4.1019	Elm St	21	14.2	12.81	4.604	32%	4.92	35%	5.02	35%		14.24	35%
4.1005 - 4.1001	Elm St	21	14.2	12.81	4.515	32%	4.83	34%	4.93	35%		14.24	35%
4.1017 - 4.1005	Elm St	21	14.2	12.81	4.512	32%	4.83	34%	4.93	35%		14.24	35%
4.1016 - 4.1017	Elm St	15	0.0	0.00	4.436	Backpitched	4.75	Backpitched	4.86	Backpitched	21	0.00	Backpitched
4.1198 - 4.1016	Gray St	21	0.0	0.00	4.435	Backpitched	4.75	Backpitched	4.86	Backpitched	21	0.00	Backpitched
4.1199 - 4.1198	Gray St	21	9.0	8.12	4.426	49%	4.74	53%	4.85	54%		9.02	54%
5.1213 - 4.1199	Gray St	21	9.9	8.90	4.416	45%	4.73	48%	4.84	49%		9.88	49%
5.1070 - 5.1213	Gray St	21	18.1	16.26	4.416	24%	4.73	26%	4.84	27%		18.07	27%
5.1079 - 5.1070	Gray St	21	11.1	10.00	4.378	39%	4.69	42%	4.80	43%		11.11	43%
5.1203 - 5.1079	Gray St	21	9.2	8.32	4.368	47%	4.69	51%	4.79	52%		9.25	52%
5.1202 - 5.1203	Gray St	21	9.8	8.85	4.352	44%	4.67	48%	4.77	49%		9.83	49%
5.1201 - 5.1202	Gray St	21	11.2	10.12	4.339	39%	4.66	41%	4.76	42%		11.25	42%
5.1200 - 5.1201 *	Gray St	21	8.5	7.65	4.332	51%	4.65	55%	4.75	56%		8.50	56%
5.1199 - 5.1200 *	Gray St	21	16.3	14.66	0.999	6%	1.32	8%	1.42	9%		16.29	9%
5.1060 - 5.1199	Gray St	12	4.3	3.85	0.973	23%	1.29	30%	1.39	33%		4.28	33%
5.1026 - 5.1060	Gray St	12	4.0	3.64	0.920	23%	1.24	31%	1.34	33%		4.05	33%
5.1025 - 5.1026	Gray St	12	2.5	2.23	0.865	35%	1.18	48%	1.28	52%		2.48	52%
5.1024 - 5.1025	Gray St	12	2.4	2.19	0.826	34%	1.14	47%	1.25	51%		2.44	51%
5.1023 - 5.1024	Gray St	12	2.4	2.18	0.784	32%	1.10	45%	1.20	50%		2.43	50%
5.1022 - 5.1023	Gray St	12	3.3	2.96	0.741	23%	1.06	32%	1.16	35%		3.29	35%
5.1021 - 5.1022	Gray St	12	2.3	2.07	0.696	30%	1.01	44%	1.12	48%		2.31	48%
5.1020 - 5.1021		12	0.0	0.00	0.694	Backpitched	1.01	Backpitched	1.11	Backpitched		0.00	Backpitched
5.1019 - 5.1020		12	1.5	1.35	0.656	44%	0.97	65%	1.08	72%		1.50	72%
5.1018 - 5.1019		12	1.6	1.48	0.617	38%	0.93	57%	1.04	63%		1.64	63%
5.1017 - 5.1018		12	1.7	1.52	0.579	34%	0.90	53%	1.00	59%		1.69	59%
5.1013 - 5.1017	IL Rte 38	12	1.9	1.75	0.552	28%	0.87	45%	0.97	50%		1.94	50%
5.1012 - 5.1013	IL Rte 38	8	3.2	2.84	0.533	17%	0.85	27%	0.95	30%		3.15	30%
5.1011 - 5.1012	IL Rte 38	8	2.0	1.84	0.469	23%	0.79	38%	0.89	43%		2.05	43%
5.1010 - 5.1011	IL Rte 38	8	0.9	0.80	0.385	43%	0.70	79%	0.81	91%		0.89	91%

\* Jump in profile at structure 5.1200 due to discrete data sets not aligning and may not be representative of actual conditions.

# Restaurant Wastewater Generation Rates

Restaurant Type	Median Sales (\$/seat)*	Median Sales (\$/SF)*	Average Daily Turnover*	SF/Seat	Meals / SF	GPD / Meal**	GPD/SF
Full Service - Mean Check < \$15	\$ 9,414.00	\$ 275.50	1.9	34	0.056	10	0.556
Full Service - Mean Check \$15-\$15	\$ 10,154.00	\$ 362.00	1.5	28	0.053	10	0.535
Full Service - Mean Check >\$25	\$ 11,474.00	\$ 415.50	0.8	28	0.029	10	0.290
Limited Service	\$ 11,197.00	\$ 314.69	3.1	36	0.087	10	0.871
<b>Average GPD/SF</b>							<b>0.563</b>

\* Source: Restaurant Industry Operation Report, 2010 edition, published by the National Restaurant Association

\*\* Source: IL Admin. Code Section 370, Appendix B, Table No. 2

# Prairie Center Design Flow Rates

Use Type	Square feet	Units	Wastewater Generation Rate	Total GPD	Population Equivalent (assumes 100 gal/cap/day**)	Peaking Factor**	Peak Flow (GPD)	Peak Flow (CFS)
Residential - One Bedroom	N/A	287	120 GPD / unit*	34,440	345	1.6	55,799	0.086
Residential - Two Bedroom	N/A	322	240 GPD / unit*	77,280	773	1.4	111,300	0.172
Commercial - Restaurant	33,150	N/A	0.563 GPD / SF	18,661	187	1.8	33,443	0.052
Commercial - Non-Restaurant	83,328	N/A	0.1 GPD / SF + 20 GPD / Employee, (1 Employee / 1000 SF)	9,999	100	2.0	19,999	0.031
<b>Total peak flow (CFS)</b>								<b>0.341</b>

## On-site Buildings to be Demolished

Use Type	Square feet	Units	Wastewater Generation Rate	Total GPD	Population Equivalent (assumes 100 gal/cap/day**)	Peaking Factor**	Peak Flow (GPD)	Peak Flow (CFS)
Restaurant - Burger King	6000	N/A	0.563 GPD / SF	3378	34	2.4	8,189	0.013
Restaurant - Colonial Café	5400	N/A	0.563 GPD / SF	3040	31	2.5	7,489	0.012
<b>Total peak flow (CFS)</b>								<b>0.024</b>

\* Assumes 80 gal/cap/day

\*\* From Recommended Standards for Wastewater Facilities 2014 Edition

$$\frac{Q_{Peak\ Hourly}}{Q_{Design\ Average}} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

<b>Proposed Development</b>	0.341
<b>Demolished Buildings</b>	-0.024
<b>Net Total Site Flow</b>	<b>0.317</b>



# Future Land Use Flow Rates

## Future Development

Site	Use	Wastewater Generation Rate	Total Site Area (SF)	Floor Space (SF)**	Units	Wastewater Flow (GPD)	Population Equivalent (assumes 100 gal/cap/day***)	Peaking Factor***	Peak Flow (GPD)	Peak Flow (CFS)
Anderson Property	Retail	0.1 GPD / SF + 20 GPD / Employee, (1 Employee / 1000 SF)	217,800	54450	N/A	6,534	66	2.2	14,079	0.022
Anderson Property	Residential Senior Living*	144 GPD	309,276	N/A	46	6624	67	2.1	14,234	0.022
Tri-City Property	Retail	0.1 GPD / SF + 20 GPD / Employee, (1 Employee / 1000 SF)	264,152	66038	N/A	7,925	80	2.1	16,495	0.026
Tri-City Property	Resturant	0.563 GPD / SF	28,000	7000	N/A	3941	40	2.4	9,285	0.014
Moose Property	Retail	0.1 GPD / SF + 20 GPD / Employee, (1 Employee / 1000 SF)	189,000	47250	N/A	5,670	57	2.2	12,543	0.019
<b>Total Peak Flow</b>									<b>0.103</b>	

\* Assumes 80% 1 bedroom units (120 GPD), 20% 2 and 3 bedroom units (240 GPD)

\*\* Assumes 1/4 of land will be developed as floor space

\*\*\* From Recommended Standards for Wastewater Facilities 2014 Edition

$$\frac{Q_{Peak\ Hourly}}{Q_{Design\ Average}} = \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

# Park Shore Siphon Flow Comparison

Existing Conditions						
Basin	Peak Sanitary*		Peak I/I**		Sub-Basin Total	
	MGD	CFS	MGD	CFS	MGD	CFS
SC01	0.2	0.31	1.38	2.14	1.58	2.45
SC02	0.56	0.87	2.78	4.30	3.34	5.17
R4	0.48	0.74	5.04	7.80	5.52	8.54
Siphon Total					10.44	16.16

\* From 2009 RJN Monitoring

\*\* From 1996 B&V Report

Existing Conditions + Prairie Center Development <sup>+</sup>						
Basin	Peak Sanitary		Peak I/I		Sub-Basin Total	
	MGD	CFS	MGD	CFS	MGD	CFS
SC01	0.2	0.31	1.38	2.14	1.58	2.45
SC02	0.76	1.18	2.78	4.30	3.54	5.48
R4	0.48	0.74	5.04	7.80	5.52	8.54
Siphon Total					10.65	16.47

<sup>+</sup> equal to existing conditions, but adds Prairie Center sanitary flow

Existing Conditions + Prairie Center + Future Development <sup>++</sup>						
Basin	Peak Sanitary		Peak I/I		Sub-Basin Total	
	MGD	CFS	MGD	CFS	MGD	CFS
SC01	0.2	0.31	1.38	2.14	1.58	2.45
SC02	0.83	1.29	2.78	4.30	3.61	5.59
R4	0.48	0.74	5.04	7.80	5.52	8.54
Siphon Total					10.71	16.58

<sup>++</sup> equal to existing conditions, but adds Prairie Center sanitary flow and other future development sanitary flow

# Pipe and Flow Distribution Data Sources

	Thompson	99 RHAA Plans	Linearly Interpolated				B&V Data	B&V Data, not direct ID Match			From 2009 RJN Report Adjusted Proportionally		
	GIS Data		Set = U/S invert in same structure				Interpolated	Flow split proportionally by area			Adjusted Absolute Difference		
	B&V Data		Assume 0.5%				Extrapolated				Peak Sanitary x 4.5 (10-yr peaking factor)		
	Final Data						Final 1996 Flow Data				Adjust based on 2009 Data		
SEGMENTID	From Invert (ft)	To Invert (ft)	Length (ft)	Diameter (in)	Slope (%)	Cumulative Length (ft)	Peak Sanitary (CFS)	10-yr Total Infil. (CFS)	10-yr Total Infil. (CFS)	Total Flow (CFS)	Peak 10-yr 60-min total flows	Peak Sanitary (CFS)	I/I 10-yr 60 Total flows
4.1186 - 4.1329	679.3	677.81	298	18	-0.500%	298	0.495	0.186	4.132	4.813	1.980	0.866	2.847
4.1187 - 4.1186	679.27	679.3	9	15	0.333%	307	0.494	0.186	4.132	4.811	1.980	0.866	2.846
4.1187 - 4.1150	679.71	679.27	49	15	-0.898%	356	0.491	0.184	4.131	4.805	1.977	0.863	2.840
4.1149 - 4.1150	685.86	679.71	253	15	-2.431%	609	0.474	0.172	4.127	4.773	1.964	0.846	2.810
4.1148 - 4.1149	688.37	685.86	299	15	-0.839%	908	0.46	0.164	4.132	4.756	1.957	0.832	2.789
4.1110 - 4.1148	689.8	688.37	123	15	-1.163%	1031	0.448	0.155	4.125	4.728	1.946	0.820	2.765
4.1047 - 4.1110	692.78	689.8	175	15	-1.703%	1206	0.436	0.147	4.118	4.701	1.935	0.808	2.742
4.1046 - 4.1047	696.96	692.78	256	15	-1.633%	1462	0.424	0.138	4.136	4.698	1.933	0.796	2.729
4.1045 - 4.1046	697.27	696.96	44	15	-0.705%	1506	0.412	0.13	4.115	4.657	1.916	0.784	2.700
4.1044 - 4.1045	699.33	697.27	220	15	-0.936%	1726	0.4	0.121	4.11	4.631	1.906	0.772	2.678
4.1037 - 4.1044	703.5	699.33	305	15	-1.367%	2031	0.387	0.112	4.116	4.615	1.899	0.759	2.658
4.1038 - 4.1037	711.71	703.5	286	15	-2.871%	2317	0.375	0.104	4.118	4.597	1.892	0.747	2.639
4.1039 - 4.1038	721.06	711.71	309.6	15	-3.020%	2627	0.369	0.102	4.065	4.536	1.867	0.741	2.607
4.1042 - 4.1039	722.85	721.06	76.7	15	-2.335%	2703	0.363	0.1	4.003	4.466	1.838	0.735	2.573
4.1029 - 4.1042	729.75	722.85	186.9	15	-1.151%	2890	0.357	0.099	3.952	4.408	1.814	0.729	2.543
4.1028 - 4.1029	726	725.00	61.8	15	-1.617%	2952	0.35	0.097	3.887	4.334	1.783	0.722	2.505
4.1025 - 4.1028	728.88	726.00	342.2	15	-0.842%	3294	0.344	0.095	3.854	4.293	1.767	0.716	2.482
4.1019 - 4.1025	732.37	728.88	374.6	15	-0.931%	3669	0.338	0.093	3.804	4.235	1.743	0.710	2.453
4.1001 - 4.1019	732.48	732.37	11.9	21	-0.931%	3681	0.338	0.093	3.802	4.232	1.742	0.709	2.451
4.1005 - 4.1001	735.98	732.48	375.9	21	-0.931%	4057	0.325	0.090	3.728	4.143	1.705	0.697	2.402
4.1017 - 4.1005	736.10	735.98	12.9	21	-0.931%	4070	0.325	0.09	3.725	4.140	1.704	0.697	2.400
4.1016 - 4.1017	736.05	736.10	27.3	15	0.183%	4097	0.319	0.088	3.657	4.064	1.672	0.691	2.363
4.1198 - 4.1016	736.51	740.65	19.7	21	21.062%	4117	0.319	0.088	3.657	4.064	1.672	0.690	2.363
4.1199 - 4.1198	737.56	736.64	398.8	21	-0.231%	4515	0.309	0.085	3.659	4.054	1.668	0.681	2.349
5.1213 - 4.1199	738.70	737.66	375.3	21	-0.277%	4891	0.301	0.083	3.661	4.045	1.664	0.672	2.337
5.1070 - 5.1213	738.99	738.74	27.0	21	-0.926%	4918	0.300	0.083	3.661	4.044	1.664	0.672	2.336
5.1079 - 5.1070	739.83	739.09	211.4	21	-0.350%	5129	0.294	0.081	3.631	4.006	1.649	0.666	2.314
5.1203 - 5.1079	740.48	739.93	226.7	21	-0.243%	5356	0.292	0.080	3.625	3.997	1.645	0.663	2.308
5.1202 - 5.1203	741.68	740.58	401.4	21	-0.274%	5757	0.287	0.079	3.614	3.980	1.638	0.659	2.297
5.1201 - 5.1202	742.90	741.78	312.1	21	-0.359%	6069	0.284	0.078	3.605	3.967	1.633	0.656	2.288
5.1200 - 5.1201	743.36	743.00	175.8	21	-0.205%	6245	0.282	0.078	3.6	3.960	1.630	0.654	2.283
5.1199 - 5.1200	743.51	742.75	101	21	-0.752%	6346	0.045	0.012	0.571	0.628	0.258	0.417	0.675
5.1060 - 5.1199	748.35	745.2	189	12	-1.667%	6535	0.043	0.012	0.547	0.602	0.248	0.415	0.662
5.1026 - 5.1060	754.1	748.35	386	12	-1.490%	6921	0.039	0.011	0.498	0.548	0.226	0.411	0.637
5.1025 - 5.1026	756.35	754.1	402	12	-0.560%	7323	0.035	0.010	0.448	0.493	0.203	0.407	0.610
5.1024 - 5.1025	757.87	756.35	282	12	-0.539%	7605	0.032	0.009	0.413	0.454	0.187	0.404	0.591
5.1023 - 5.1024	759.48	757.87	301	12	-0.535%	7906	0.029	0.008	0.375	0.412	0.170	0.401	0.571
5.1022 - 5.1023	762.59	759.48	316	12	-0.984%	8222	0.026	0.007	0.335	0.369	0.152	0.398	0.550
5.1021 - 5.1022	764.14	762.59	321	12	-0.483%	8543	0.023	0.006	0.295	0.325	0.134	0.395	0.529
5.1020 - 5.1021	763.91	764.14	18	12	1.278%	8561	0.023	0.006	0.293	0.322	0.133	0.395	0.527
5.1019 - 5.1020	764.47	763.91	274	12	-0.204%	8835	0.020	0.006	0.258	0.284	0.117	0.392	0.509
5.1018 - 5.1019	765.16	764.47	282	12	-0.245%	9117	0.017	0.005	0.223	0.245	0.101	0.389	0.490
5.1017 - 5.1018	765.87	765.16	275	12	-0.258%	9392	0.015	0.004	0.189	0.207	0.085	0.387	0.472
5.1013 - 5.1017	766.55	765.87	198	12	-0.343%	9590	0.013	0.004	0.164	0.180	0.074	0.385	0.459
5.1012 - 5.1013	769.53	766.55	38	8	-7.842%	9628	0.011	0.003	0.146	0.161	0.066	0.383	0.449
5.1011 - 5.1012	773.66	769.53	125	8	-3.304%	9753	0.007	0.002	0.089	0.097	0.040	0.379	0.419
5.1010 - 5.1011	774.69	773.66	165	8	-0.624%	9918	0.001	0.000	0.012	0.014	0.006	0.373	0.378

Prairie Centre  
Elm / Roosevelt / Illinois Route 31 Sanitary Trunk Sewer  
Estimate Summary

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Segment 1:	Elm Street	Sub-Total = \$225,533
Segment 2:	Roosevelt Street	Sub-Total = \$864,321
Segment 3:	Illinois Route 31	Sub-Total = \$857,457

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**TOTAL= \$1,947,311**

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Dollar Values are for year 2016



**PRAIRIE CENTRE SANITARY IMPROVEMENTS  
ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST  
ROSEVELT ROAD IMPROVEMENTS**

GJC  
7/11/2016

ITEM		UNIT	QUANTITY	UNIT PRICE	TOTAL	
			<b>2163</b>			
<b>SOIL EROSION CONTROL</b>						
INLET PROTECTION		EA	10	\$ 150.00	\$ 1,500.00	
EROSION CONTROL MAINTENANCE	STREET SWEEPING	LF	2200	\$ 3.00	\$ 6,600.00	
						\$ 8,100.00
<b>SANITARY SEWER IMPROVEMENTS</b>						
ROCK EXCAVATION		LF	2200	\$ 10.00	\$ 22,000.00	
REMOVE MANHOLE STRUCTURE		EA	9	\$ 1,000.00	\$ 9,000.00	
REMOVE EXISTING SEWER	AVERAGE DEPTH 9.5'	LF	2200	\$ 15.00	\$ 33,000.00	
SANITARY SEWER, PVC SDR 26	21"	LF	2200	\$ 100.00	\$ 220,000.00	
SANITARY MANHOLE, TYPE A	48" DIA, <10' DEEP	LF	9	\$ 3,500.00	\$ 31,500.00	
SANITARY TRENCH BACKFILL	CA-7	LF	2200	\$ 20.00	\$ 44,000.00	
BYPASS PUMPING SYSTEM	MOBILIZATION, PUMP, PIPE	DAY	30	\$ 1,500.00	\$ 45,000.00	
SERVICE RECONNECTION		EA	38	\$ 1,500.00	\$ 57,000.00	
						\$ 461,500.00
<b>ROADWAY IMPROVEMENTS</b>						
REMOVE BITUMINOUS, SAW CUT	FULL DEPTH	LF	2200	\$ 10.00	\$ 22,000.00	
HOT-MIX ASPHALT SURFACE COURSE	2", MIX "C", N50	TON	141	\$ 75.00	\$ 10,541.67	
HOT-MIX ASPHALT BINDER COURSE	2-1/2", IL-19.0, N50	TON	176	\$ 75.00	\$ 13,177.08	
AGGREGATE BASE COURSE	12", TYPE B	SY	1222	\$ 15.00	\$ 18,333.33	
TRAFFIC CONTROL		DAY	45	\$ 400.00	\$ 18,000.00	
						\$ 82,052.08
<b>RESTORATION</b>						
FINAL RESTORATION		SY	200	\$ 12.00	\$ 2,400.00	
						\$ 2,400.00
						SUB-TOTAL \$ 554,052.08
						\$ 111,968.00
<b>MISCELLANEOUS</b>						
CONSTRUCTION LAYOUT/STAKING			5%	\$ 27,702.60	\$ 27,702.60	
ENGINEERING			15%	\$ 83,107.81	\$ 83,107.81	
INSPECTION			10%	\$ 55,405.21	\$ 55,405.21	
						\$ 166,215.63
CONTINGENCY			20%		\$ 144,053.54	
						TOTAL \$ 864,321.25
			<b>COST PER LINEAR FOOT OF SANITARY</b>		<b>\$ 399.59</b>	
			<b>USE</b>		<b>\$ 400.00</b>	

**Notes**

1. Sewer connections assumed based on adjacent rooftops. Services NOT replaced to ROW.

**TOWNE CENTRE SANITARY IMPROVEMENTS**  
**ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST**  
**ILLINOIS ROUTE 31 IMPROVEMENTS**

GJC  
7/11/2016

ITEM		UNIT	QUANTITY	UNIT PRICE	TOTAL	SUB-TOTAL	
<b>SOIL EROSION CONTROL</b>							
			1506				
STABILIZED CONSTRUCTION ACCESS		EA	2	\$ 1,500.00	\$ 3,000.00		
INLET PROTECTION		EA	12	\$ 150.00	\$ 1,800.00		
EROSION BARRIER		LF	1500	\$ 3.00	\$ 4,500.00		
EROSION CONTROL MAINTENANCE	STREET SWEEPING	LF	1500	\$ 9.00	\$ 13,500.00		
						\$ 22,800.00	
<b>SANITARY SEWER IMPROVEMENTS</b>							
ROCK EXCAVATION		LF	1500	\$ 25.00	\$ 37,500.00		
REMOVE MANHOLE STRUCTURE		EA	10	\$ 1,000.00	\$ 10,000.00		
REMOVE EXISTING SEWER	AVERAGE DEPTH 9.5'	LF	1500	\$ 15.00	\$ 22,500.00		
SANITARY SEWER, PVC SDR 26	21"	LF	1500	\$ 120.00	\$ 180,000.00		
SANITARY MANHOLE, TYPE A	48" DIA, <10' DEEP	EA	10	\$ 4,000.00	\$ 40,000.00		
SANITARY TRENCH BACKFILL	CA-7	LF	1500	\$ 20.00	\$ 30,000.00		
BYPASS PUMPING SYSTEM	MOBILIZATION, PUMP, PIPE	DAY	30	\$ 1,500.00	\$ 45,000.00		
						\$ 365,000.00	
<b>ROADWAY IMPROVEMENTS</b>							
REMOVE C & G, SAW CUT	FULL DEPTH	LF	1500	\$ 10.00	\$ 15,000.00		
B 6.12 C & G	ALL CURB DAMGED	LF	1500	\$ 25.00	\$ 37,500.00		
HMA REMOVAL	2"	SY	5000	\$ 2.50	\$ 12,500.00		
HOT-MIX ASPHALT SURFACE COURSE	1.5", MIX "C", N50	TON	431	\$ 80.00	\$ 34,500.00		
HOT-MIX ASPHALT LEVEL BINDER	3/4"	LF	216	\$ 80.00	\$ 17,250.00		
DRAINAGE STRUCTURE ADJUSTMENTS		EA	6	\$ 1,500.00	\$ 9,000.00		
TRAFFIC CONTROL		DAY	45	\$ 800.00	\$ 36,000.00		
						\$ 161,750.00	
<b>RESTORATION</b>							
FINAL RESTORATION	SOD AND WATERING	SY	2000	\$ 12.00	\$ 24,000.00		
						\$ 24,000.00	
						SUB-TOTAL	\$ 573,550.00
<b>MISCELLANEOUS</b>							
CONSTRUCTION LAYOUT/STAKING			5%	\$ 28,677.50	\$ 28,677.50		
ENGINEERING			15%	\$ 86,032.50	\$ 86,032.50		
INSPECTION			10%	\$ 57,355.00	\$ 57,355.00		
						\$ 172,065.00	
CONTINGENCY			15%		\$ 111,842.25		
<b>TOTAL</b>						<b>\$ 857,457.25</b>	
<b>COST PER LINEAR FOOT OF SANITARY SEWER:</b>				<b>\$ 569.36</b>			
<b>USE</b>				<b>\$ 570.00</b>			

# **Prairie Centre Traffic Impact Study**

Originally Submitted: August 17, 2016  
**Revision 1: January 3, 2017**

**Prepared for:**

**City of St. Charles**

**Prepared By:**



**Hampton, Lenzini and Renwick, Inc.**

Civil Engineers    Structural Engineers  
380 Shepard Drive, Elgin, Illinois 60123

Land Surveyors  
847-697-6700



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## I. Executive Summary

Shodeen Group has proposed redevelopment the former St. Charles Mall site on IL Route 38 just east of Randall Road in St. Charles, Illinois. Shodeen Group has previously proposed a number of redevelopment concepts, none of which has been executed. Hampton, Lenzini and Renwick, Inc. (HLR) provided traffic engineering services to the City of St. Charles on most of those previous concepts, the most recent of which was in the form of a Traffic Impact Study in 2010. At that time, the development was known as the St. Charles Towne Centre.

The current concept is a mixed-use development called the St. Charles Prairie Centre. The Prairie Centre property is a 26± acre site located on the block bounded by IL Route 38 (Lincoln Highway), Randall Road, Prairie Street, and 14<sup>th</sup> Street in the City of St. Charles. See the Appendix for a general location map of the study area, an aerial photo overview and a preliminary plan of the proposed development. The concept plan consists of a mix of restaurant, retail, and residential spaces. The current concept plan is similar to the 2010 concept but includes shorter buildings and fewer units. As currently proposed, the Prairie Centre will utilize and improve existing access locations onto IL Route 38 and Prairie Street. No new access points to the surrounding street system are proposed.

This report summarizes and documents the analyses and findings of the Traffic Impact Study performed by HLR based on the current concept provided by Shodeen Group. The original Traffic Impact Study was completed August 17, 2016. This revision incorporates the addition of 61 residential units to the concept by Shodeen Group after the initial study was submitted.

### Existing Traffic Conditions

Peak period turning movement traffic counts were conducted on weekdays from 6:00 – 9:00 AM and from 3:30 – 6:30 PM and on Saturdays from 11:00 AM – 2:00 PM in May 2016 at the following 16 intersections:

- IL Route 38 & Randall Road
- IL Route 38 & Jewel Driveway
- IL Route 38 & West Mall Entrance
- IL Route 38 & East Mall Entrance/Vanderbilt Drive
- IL Route 38 & 14<sup>th</sup> Street/Bricher Road
- Randall Road & Prairie Street
- Prairie Street & Jewel Driveway
- Prairie Street & West Mall Entrance
- Prairie Street & East Mall Entrance
- Prairie Street & Covington Court/Wessel Court
- Prairie Street & 16<sup>th</sup> Street
- Prairie Street & 14<sup>th</sup> Street
- Prairie Street & 7<sup>th</sup> Street
- Prairie Street & 3<sup>rd</sup> Street
- 14<sup>th</sup> Street & Vanderbilt Drive
- 14<sup>th</sup> Street & Covington Court/Horne Street

Thirteen-hour weekday counts were also collected from 6:00 AM – 7:00 PM at three intersections on Prairie Street: at 14<sup>th</sup> Street, 7<sup>th</sup> Street and 3<sup>rd</sup> Street.

Traffic Projections

To account for increases in overall traffic growth beyond what the proposed developments will generate, the existing traffic volumes were increased using growth rates provided by the Chicago Metropolitan Agency for Planning (CMAP). A copy of the memo from CMAP regarding these growth rates is included in the Appendix.

Estimated Site-Generated Traffic

Site-generated traffic was estimated using the ITE’s *Trip Generation Manual, 9<sup>th</sup> Edition*. Land use assumptions were based on information provided by the developer. The residential units were modeled with ITE Code 220, Apartment. The restaurant units were modeled as a combination of ITE Code 932, High-turnover (Sit-down) Restaurant, and ITE Code 934, Fast-food Restaurant with Drive-through Window. The retail units were modeled with ITE Code 826, Specialty Retail Center, except for the weekday AM peak hour, for which ITE Code 820, Shopping Center, was determined to be more reasonable. Adjustments were made to the generated trip amounts for a combined 20% internal capture and pass-by reduction applied to the appropriate uses. The table below summarizes the resulting generated traffic volumes.

**Total New Trips after all Adjustments in veh/hr**

Peak Hour	In	Out	Total
Weekday AM	382	497	879
Weekday PM	512	386	898
Saturday	489	463	952

Source: ITE *Trip Generation Manual, 9<sup>th</sup> Edition*

Analyses and Recommendations

Capacity analyses were performed for the study area intersections using Synchro and Highway Capacity Software. The analyses were run for the weekday AM and PM peak hours and the Saturday peak. Analyses were performed for the 2016 Existing Traffic, 2026 Base Year Traffic, and the 2026 Total Traffic. Signal warrants were also analyzed for three intersections on Prairie Street. The resulting recommendations are summarized below. Where a study area intersection is not listed below, no improvements are recommended, and no significant issues were discovered.

IL Route 38 & Randall Road: This intersection and its turn lanes have sufficient capacity to accommodate the projected 2026 Total Site traffic. Individual movements may operate at LOS E or F, though this is not entirely attributed to the Prairie Centre Development as this occurs in the 2026 Base Traffic scenario also. The proposed future Kane County improvement to add through-traffic lanes to Randall Road will further enhance the capacity of this intersection. No improvements to this intersection are recommended as a result of the proposed development.

IL Route 38 & West Mall Entrance: The site plans show conversion of the southbound approach to consist of an exclusive left turn lane, an exclusive through lane, and an exclusive right turn lane. Additionally, the northbound and southbound left turn phases should be converted to protected-permissive phasing.

IL Route 38 & 14<sup>th</sup> Street: This intersection has the overall capacity to accommodate the projected 2026 Total Traffic. Consideration should be made for adding a northbound right

turn lane to reduce existing delays and queues on that approach. No improvements are recommended in connection with the development.

Randall Road & Prairie Street: This intersection has the overall capacity to accommodate the projected 2026 Total Traffic. However, there are existing issues with the westbound left turn queues and with the interaction between this intersection and the Randall Road and IL Route 38 intersection. Reconfiguration of the westbound approach and the driveways on that leg could help address this problem. Further, the planned widening of Randall Road will help alleviate these issues. However, since these are existing issues, no specific improvements are recommended as part of this development.

Prairie Street & 14<sup>th</sup> Street: Under 2026 traffic, the northbound left will enter LOS F range during the PM peak hour. However, this intersection has the overall capacity to accommodate the 2026 Total Traffic volumes, with queues reaching four vehicles at most. Although traffic signal warrants are met under the existing traffic at the intersection, installation of traffic signal control is not recommended at this time.

Prairie Street & 7<sup>th</sup> Street: Base Year average delays for this intersection reach LOS F during the PM peak hour. Traffic signal control is warranted under existing traffic. A number of improvements could alleviate delays, including signalization or conversion to a roundabout. No improvements are recommended as a part of the development, as the issues here are primarily existing.

Prairie Street & 3<sup>rd</sup> Street: Base Year average delays for this intersection reach LOS F during the PM peak hour. Traffic signal control is warranted under existing traffic. A number of improvements could alleviate delays, including signalization or conversion to a roundabout. No improvements are recommended as a part of the development, as the issues here are primarily existing.

In summary, few improvements are recommended with this development. The analyses revealed existing concerns within the study area, particularly along Randall Road and along the east end of Prairie Street. While the Prairie Centre development related traffic is expected to contribute to these concerns, the analyses show that the problems will not be avoided by preventing the development.

Kane County has plans to widen Randall Road through the study area limits, which is expected to address the vast majority of issues at the Randall Road intersections. The Prairie Street intersections at 14<sup>th</sup> Street, 7<sup>th</sup> Street, and 3<sup>rd</sup> Street could be improved with signalization, conversion to modern roundabouts, or other possible solutions, as determined by the City of St. Charles.

## II. Introduction

Shodeen Group has proposed redevelopment of their property on IL Route 38 just east of Randall Road in St. Charles, Illinois. The St. Charles Mall previously occupied this property before closing in 1996 and later being demolished. Since then, Shodeen Group has proposed a number of redevelopment concepts, none of which has been executed. Hampton, Lenzini and Renwick, Inc. (HLR) provided traffic engineering services to the City of St. Charles on most of those previous concepts, the most recent of which was in the form of a Traffic Impact Study in 2010. At that time, the development was known as the St. Charles Towne Centre.

The current concept is a mixed-use development called the St. Charles Prairie Centre. The Prairie Centre property is a 26± acre site located on the block bounded by IL Route 38 (Lincoln Highway), Randall Road, Prairie Street, and 14<sup>th</sup> Street in the City of St. Charles. See Exhibit 1A at the end of the report for a general location map of the study area. Exhibit 1B displays an aerial photo overview of the existing development parcel and adjoining land uses. A preliminary plan of the proposed development is included as Exhibit 2.

The Prairie Centre concept plan consists of a mix of restaurant, retail, and residential spaces. The current concept plan is similar to the 2010 concept but includes shorter buildings and fewer units. As currently proposed, the Prairie Centre will utilize and improve existing access locations onto IL Route 38 and Prairie Street. No new access points to the surrounding street system are proposed.

This report summarizes and documents the analyses and findings of the Traffic Impact Study performed by HLR based on the current concept provided by Shodeen Group. The original Traffic Impact Study was completed August 17, 2016. This revision incorporates the addition of 61 residential units to the concept by Shodeen Group after the initial study was submitted.

## III. Existing Conditions

A field reconnaissance of the site was conducted to inventory information on surrounding land uses and the area roadway network. In addition, traffic counts were conducted during the morning, evening and Saturday peak periods at 16 critical intersections.

### Surrounding Land Uses

Land uses surrounding the site are predominantly residential to the north and east and predominantly commercial to the south and west. A Jewel supermarket adjoins the west edge of the site, while a series of retail stores adjoin the southeast edge.

### Surrounding Roadway Network

The major roadways servicing the study area are Randall Road and IL Route 38. Prairie Street is a collector route that also provides access to this area. 14<sup>th</sup> Street is a minor collector street to which the site will also have indirect access. A brief description of these roadways is provided below:

- **Illinois Route 38**, along the frontage of the proposed site, is a four-lane, two-way, east-west major arterial roadway. There is a flush median along the frontage of the site with pavement striping providing left turn lanes at both existing full-access entrances into the

site. The western entrance is controlled by traffic signals. The eastern entrance is controlled by a stop sign on the entrance approach. Approaching Randall Road, the IL Route 38 median is raised and widens to provide dual left turn lanes at the Randall Road intersection. IL Route 38 is under the jurisdiction of IDOT and is posted with a 45 miles-per-hour (mph) speed limit. It has *not* been designated as a Strategic Regional Arterial (SRA) by IDOT.

- **Randall Road** is a major north-south arterial roadway. Through this area, Randall Road provides two through lanes in each direction with left turn lanes at intersections. Randall Road is under the jurisdiction of the Kane County Division of Transportation (KDOT) and has been designated as an SRA. Randall Road is posted with a 45 mph speed limit. The Randall Road intersections with IL Route 38 and with Prairie Street are controlled by traffic signals, which are interconnected with signalized intersections to the north and south along Randall Road, as well as to the east and west along IL Route 38.
- **Prairie Street**, along the frontage of the proposed site, is a three-lane, two-way collector street. Prairie Street extends from Randall Road east over the Fox River to Riverside Avenue. Its intersection with Randall Road is controlled by traffic signals. Its intersections with 7<sup>th</sup> Street and with 3<sup>rd</sup> Street are controlled by all-way stop signs. Prairie Street is under the jurisdiction of the City of St. Charles and is posted with a 30 mph speed limit (25 mph east of 3<sup>rd</sup> Street).
- **14<sup>th</sup> Street** is a two-lane, two-way, north-south collector street that extends from IL Route 38 north to Prairie Street. 14<sup>th</sup> Street is under the jurisdiction of the City of St. Charles and is posted with a 25 mph speed limit.

Two other nearby streets of interest include 16<sup>th</sup> Street and Horne Street. 16<sup>th</sup> Street is a local street that extends north from Prairie Street and provides a connection to the neighborhood north of Prairie Street and east of Randall Road. Horne Street is a collector street that extends from IL Route 31 west to 14<sup>th</sup> Street. The westernmost three blocks of this route consist of several turns before Horne Street intersects 14<sup>th</sup> Street.

#### Existing Traffic Conditions

Peak period turning movement traffic counts were conducted on weekdays from 6:00 – 9:00 AM and from 3:30 – 6:30 PM and on Saturdays from 11:00 AM – 2:00 PM in May 2016 at the following 16 intersections:

- IL Route 38 & Randall Road
- IL Route 38 & Jewel Driveway
- IL Route 38 & West Mall Entrance
- IL Route 38 & East Mall Entrance/Vanderbilt Drive
- IL Route 38 & 14<sup>th</sup> Street/Bricher Road
- Randall Road & Prairie Street
- Prairie Street & Jewel Driveway
- Prairie Street & West Mall Entrance
- Prairie Street & East Mall Entrance
- Prairie Street & Covington Court/Wessel Court
- Prairie Street & 16<sup>th</sup> Street
- Prairie Street & 14<sup>th</sup> Street
- Prairie Street & 7<sup>th</sup> Street

- Prairie Street & 3<sup>rd</sup> Street
- 14<sup>th</sup> Street & Vanderbilt Drive
- 14<sup>th</sup> Street & Covington Court/Horne Street

Exhibit 3 in Appendix A presents the existing peak hour volumes at these intersections. Thirteen-hour weekday counts were also collected from 6:00 AM – 7:00 PM at three intersections on Prairie Street: at 14<sup>th</sup> Street, 7<sup>th</sup> Street and 3<sup>rd</sup> Street. It should be noted that the St. Charles Mall was demolished in 2002, well before the traffic counts were performed.

Traffic Projections

To account for increases in overall traffic growth beyond what the proposed developments will generate, the existing traffic volumes depicted on Exhibit 3 were increased at a rate of 1.04 percent per year on IL Route 38, 0.63 percent per year on Randall Road, 2.56 percent per year on Prairie Street, and 1.17 percent per year on 14<sup>th</sup> Street for 12 years. These growth rates were provided by the Chicago Metropolitan Agency for Planning (CMAP). A copy of the memo from CMAP regarding these growth rates is included in Appendix J. These increased traffic volumes were used to develop the 2026 Base Year Traffic.

Traffic generated by the new CVS Pharmacy and its outlots was added to the 2026 Base Year Traffic. This development was under construction at the time this study was executed. Table 1 below shows the traffic volumes added to the 2026 Base Year Traffic volumes. The traffic generated by this site was estimated using the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 9<sup>th</sup> Edition*. The ITE numbers referenced in Table 1 refer to the land use codes from the *Trip Generation Manual*. The final 2026 Base Year Traffic (no development) volumes can be seen in Exhibit 4.

**Table 1**  
**2026 Base Traffic Adjustments**

Land Use	Weekday AM		Weekday PM		Saturday	
	In	Out	In	Out	In	Out
CVS Pharmacy (ITE 934)	22	20	59	59	48	49
Outlot (ITE 826)	13	15	14	16	1	1
<b>Total Adjustment</b>	<b>35</b>	<b>35</b>	<b>73</b>	<b>75</b>	<b>49</b>	<b>50</b>

Source: ITE Trip Generation Manual, 9<sup>th</sup> Edition

Capacity Analysis – Existing Traffic and 2026 Base Traffic

Capacity analyses of existing and 2026 Base Year (estimated short-term, no development) weekday AM and PM and Saturday mid-day peak hour traffic conditions were conducted at the aforementioned intersections.

Level of Service (LOS) criteria for signalized and stop sign controlled intersections are based on the methodologies presented in the *Highway Capacity Manual (HCM)* published by the Transportation Research Board (TRB). LOS criteria range from “A” (good) to “F” (poor) and are based on average delay. It should be noted that the LOS thresholds are different for signalized and stop sign controlled intersections. At two-way stop intersections, LOS criteria for stop sign controlled intersections are defined for each minor movement and are *not* defined for the intersection as a whole. The LOS delay thresholds for stop sign controlled intersections are also lower than for signalized intersections since driver expectation at a signalized intersection

is for a greater delay. The LOS criteria for signalized and stop sign controlled intersections are presented in Table 2.

**Table 2**  
**Level of Service Criteria for Signalized and Stop Sign Controlled Intersections**

<b>Signalized Intersections</b>		
<b>Level of Service</b>	<b>Type of Operating Condition</b>	<b>Average Vehicle Delay (seconds)</b>
A	Very low delay, most vehicles arrive during the green and do not stop at all.	≤ 10.0
B	More vehicles stop at the traffic signal than LOS “A”, but otherwise good progression of traffic through the intersection.	10.1 – 20.0
C	Congestion starts to occur; number of vehicles stopping at the intersection is significant.	20.1 – 35.0
D	Congestion is more noticeable, longer delays; some vehicles may not clear on a single cycle.	35.1 – 55.0
E	High delays, poor progression through intersection. Most vehicles do not clear the intersection on a single cycle.	55.1 – 80.0
F	Unacceptable high delay to drivers, demand exceeds capacity, increasing queue lengths.	> 80.0

**Stop Sign Controlled Intersections**

<b>Level of Service</b>	<b>Average Control Delay (sec/veh.)</b>
A	0 – 10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F	>50

Source: *Highway Capacity Manual 2000*, Transportation Research Board, National Research Council, Washington, D.C.

Table 3 presents the existing and 2026 Base Year (projected short-term) traffic operations at the signalized intersections studied. Analysis of 2016 existing traffic was conducted using existing signal controller settings and existing intersection geometry. Analysis of 2026 Base Year Traffic retained existing intersection geometry but assumed that the traffic signal timings would be re-optimized. Copies of the capacity analysis summaries conducted for the existing critical intersections are included in Appendices E and F.



**Table 3**  
**Summary of Existing and Base Year (no development) Traffic Conditions**  
**Intersection Level of Service (LOS) and Delay (seconds)**

**Signalized Intersections**

Intersection	Existing 2016 Traffic			Base Year 2026 Traffic (no site)		
	AM Peak	PM Peak	Sat Peak	AM Peak	PM Peak	Sat Peak
IL 38 & Randall Rd	D (39)	D (43)	D (43)	D (40)	D (49)	D (45)
IL 38 & West Mall Entrance	A (6)	A (6)	A (5)	A (6)	A (8)	A (7)
IL 38 & 14 <sup>th</sup> St	C (28)	C (32)	C (34)	C (24)	D (37)	C (31)
Prairie St & Randall Rd	B (11)	C (23)	C (28)	B (12)	D (42)	D (44)

It should be noted that some individual movements operate at LOS E or F. Table 4 gives a detailed breakdown of the 2026 Base Year Traffic, showing each individual movement's Level of Service.

**Table 4**  
**LOS & Delay by Movement for 2026 Base Traffic**

Intersection	Peak Hour	Overall LOS & (delay)	LOS & (delay) by Movement											
			Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
IL 38 & Randall Rd	AM	D (40)	E (72)	D (54)	A (0)	E (67)	D (53)	B (15)	E (74)	D (38)	A (0)	F (81)	C (22)	A (3)
	PM	D (49)	F (84)	D (49)	A (6)	E (74)	E (73)	D (38)	E (77)	E (57)	A (0)	F (87)	C (28)	A (7)
	Sat	D (45)	F (87)	E (61)	A (9)	F (87)	F (87)	D (32)	E (63)	D (40)	A (1)	E (71)	C (26)	A (2)
IL 38 & W Mall Entrance	AM	A (6)	A (2)	A (6)		A (2)	A (2)		E (57)	B (17)		D (49)	D (48)	A (0)
	PM	A (8)	A (3)	A (6)		A (1)	A (5)		E (58)	B (15)		D (51)	D (46)	A (0)
	Sat	A (7)	A (3)	A (7)		A (1)	A (3)		D (49)	B (13)		D (43)	D (40)	A (0)
IL 38 & 14 <sup>th</sup> St	AM	C (24)	B (11)	B (19)		B (14)	B (19)		C (25)	D (43)		C (33)	D (35)	
	PM	D (37)	C (27)	C (38)		C (23)	C (34)		C (24)	E (56)		C (35)	D (40)	
	Sat	C (31)	B (16)	C (31)		D (37)	C (28)		B (18)	D (39)		C (24)	C (30)	
Prairie St & Randall Rd	AM	B (12)	D (45)	D (36)		E (68)	D (51)	A (10)	A (2)	A (5)		B (15)	B (12)	
	PM	D (42)	D (50)	D (37)		F (292)	E (61)	C (33)	B (11)	C (30)		D (43)	B (19)	
	Sat	D (44)	D (41)	D (53)		F (103)	D (53)	D (38)	B (16)	D (47)		E (75)	C (32)	

Analysis results show the following:

IL Route 38 and Randall Road: Under existing conditions and signal timings, this intersection operates at an over-all Level of Service D, although some individual movements currently operate at LOS E or F during peak times. With background traffic growth projected to 2026, and signal timings re-optimized, there will be both slight increases and slight decreases in delay depending on the particular movement and peak hour. Some vehicle queues do exceed turn lane storage lengths in both analyses, including some through-lane queues that extend beyond the turn lane tapers, periodically blocking entry by turning vehicles until through traffic moves up. Traffic volumes currently approach the capacity of the intersection and are expected to remain so under 2026 Base Year Traffic conditions.

IL Route 38 and the West Mall Entrance: Analyses of existing traffic using existing signal timing settings show minimal delays to IL Route 38 traffic through this intersection. Drivers on the shopping center driveway approaches experience delays in the range of LOS D. Currently, IL Route 38 traffic is assigned about 75% of the available green time, which is an appropriate balance based on traffic volumes and the need to move traffic on the arterial route. Traffic volumes currently do not exceed the capacity of the intersection and are not expected to do so under 2026 Base Year Traffic conditions.

IL Route 38 and 14<sup>th</sup> Street: Traffic on IL Route 38 currently operates at an acceptable LOS C with small increases to delay in the projected 2026 base year. Vehicle queues do not exceed turn lane storage lengths in either analysis, although through-lane queues will extend beyond the turn lane tapers, periodically blocking entry by turning vehicles until through traffic moves up. As the volume of through traffic increases on IL Route 38, delays for all left turns and cross street movements will increase. However, analyses of existing and the 2026 base year show that traffic will not exceed the capacity of the intersection. Note that there are also lengthy delays on the northbound approach. Addition of a northbound right turn lane could reduce these delays. However, as mitigation for an existing issue, this improvement is not recommended as part of this study.

Prairie Street and Randall Road: Analysis of existing traffic shows that the overall Level of Service at this intersection is B to C. However, during PM and Saturday peak periods, the queue of westbound left turning traffic significantly overflows the westbound left turn lane. This movement operates at LOS E or F during these times. Green time for Prairie Street is limited by the need to provide adequate time for the large volume of traffic flowing on Randall Road and to keep these movements coordinated with the nearby IL Route 38/Randall Road intersection to the south. The existing peak period overflow of the westbound left turn lane will frequently block the Jewel Supermarket driveway, as well as the entrance to the retail strip mall on the south side of the street west of the Jewel store. These entrances could be converted to allow only right turns to reduce potential conflicts for left turning driveway traffic with the westbound queues from Randall Road. The retail development on the north side of Prairie Street has access to another Prairie Street driveway 200 feet to the east, and the Jewel supermarket has access to another Prairie Street driveway about 500 feet to the east. Additionally, the full access entry to the Jewel site could be relocated to align with the drive aisle at the front of the Jewel store to maintain Jewel's current access. Cross access from the Jewel site would need to be provided to the retail strip mall in the southeast corner of Randall Road and Prairie Street, since that site's full access on Prairie Street is currently its only access. This driveway conversion would enable the Prairie Street westbound left turn

lane at Randall Road to be lengthened, allowing traffic to clear more efficiently during the westbound left turn arrow. In order to reinforce the right-turn-only operation of these driveways and prevent illegal left turns, the flush median on Prairie Street would need to be converted to a raised median from Randall Road at least along the length of the extended westbound left turn lane and preferably to the relocated full access Jewel driveway.

In the 2026 PM and Saturday peak hours, northbound through queues are expected to spill back into the Randall Road/IL Route 38 intersection. The best way to alleviate this concern is to construct the planned widening of Randall Road to six lanes, which is discussed in detail later in this report.

Table 5 shows a summary of analysis results for stop sign controlled intersections. Capacity analyses of stop sign controlled intersections provide Levels of Service and delays for individual intersection movements, but not the intersection as a whole. Results for the most critical movement at each intersection are shown in the table below.

**Table 5  
Summary of Existing and Base Year (no development) Traffic Conditions  
Level of Service (LOS) and Delay (seconds)  
Stop Sign Controlled Intersections**

Critical Movement	Existing 2016 Traffic			Base Year 2026 Traffic (no site)		
	AM Peak	PM Peak	Sat Peak	AM Peak	PM Peak	Sat Peak
East Mall Entrance at IL 38	SB D (25)	SB D (28)	NB E (45)	NB C (23)	SB F (62)	NB F (85)
Prairie St at West Mall Ent.	NB A (9)	NB B (12)	NB B (10)	NB B (11)	NB B (13)	NB B (11)
Prairie St at East Mall Entrance	NBL B (13)	NBL C (15)	NBL B (13)	NBL B (15)	NBL C (19)	NBL C (16)
Prairie St at 16 <sup>th</sup> St	SB B (12)	SB B (15)	SB B (13)	SB B (14)	SB C (19)	SB C (17)
Prairie St at 14 <sup>th</sup> St	NBL C (16)	NBL D (31)	NBL C (19)	NBL C (20)	NBL F (73)	NBL D (33)
Prairie St at 7 <sup>th</sup> St	EB D (26)	WB D (27)	EB B (13)	EB E (39)	WB F (82)	EB C (16)
Prairie St at 3 <sup>rd</sup> St	EB D (27)	WB E (36)	WB B (14)	EB E (50)	WB F (197)	WB C (21)
14 <sup>th</sup> St at Covington Ct	WB B (12)	WB C (17)	WB B (12)	WB B (13)	WB C (19)	WB B (14)
14 <sup>th</sup> St at Vanderbilt Dr	EB B (11)	EB B (12)	EB B (12)	EB B (12)	EB B (15)	EB B (14)

Analysis of existing conditions and 2026 Base Year (no development) Traffic shows that the critical movements at the majority of the stop-controlled intersections included in the analysis operate at acceptable LOS D. There are some exceptions described below, which operate below LOS D.

East Mall Entrance at IL Route 38: The northbound approach during the Saturday peak hour currently has an LOS E. Both northbound and southbound are projected to have LOS F in

2026, with delays reaching 85 seconds for northbound traffic in the Saturday peak. The delays to the Entrance can be attributed to the large volume of east- and westbound through traffic conflicting with the left turning traffic from the Entrance. The expected 95% queue approaches 70 feet (almost three vehicles) in 2026.

Prairie Street at 14<sup>th</sup> Street: The northbound left turn movement during the 2026 Base Year PM peak hour is expected to reach LOS F, with delays up to 73 seconds. This delay can be attributed to the northbound left turning traffic having to wait for a sufficient gap in the east- and westbound through traffic. This approach is not expected to have any queuing problems, as the expected 95% queue is only 75 feet (three vehicles) which is well within the provided storage length. Although traffic signal warrants are met under the existing traffic at the intersection, installation of traffic signal control is not recommended at this time. The intersection currently operates satisfactorily under stop sign control. Further, signalization of the intersection could contribute to or create operational problems at Prairie Street and 16<sup>th</sup> Street, likely due to the resulting eastbound queues. Conversely, it could create gaps for turning traffic to enter Prairie Street by creating platoons and gaps of vehicles on Prairie Street. It is therefore recommended that there be no immediate change made to the intersection traffic control or geometry and that the intersection be monitored periodically as the site is developed, for example after each development phase, to determine the need for any changes in traffic control or geometry. If traffic control changes are to be made in the future, careful attention should be paid to the impacts on the adjacent 16<sup>th</sup> Street intersection.

Prairie Street at 7<sup>th</sup> Street: The eastbound and westbound movements are expected to experience LOS E or F during the weekday peaks in 2026, with the highest delay at 82 seconds. This delay can be attributed primarily to the large volume of traffic using Prairie Street during these peak periods. Despite these delays, the analysis results show the intersection approaching capacity in this scenario.

Prairie Street at 3<sup>rd</sup> Street: The westbound movement during the PM peak hour has an LOS E. In the base year 2026 scenario, that LOS drops to F, while the eastbound approach drops to E in the AM peak. In the 2026 PM peak, the eastbound and southbound movements also drop to LOS F. Delays up to 197 seconds are anticipated. This delay can be attributed primarily to the large volume of traffic using this intersection. The analysis results show the intersection approaching capacity. Even with some capacity at this intersection, attention should be paid to the interaction of traffic here with the intersection of IL Route 31 and Prairie Street. Based on the data, this will be of primary concern for westbound traffic during the PM peak. Queues at this intersection are likely to back into the IL Route 31 intersection. Also, eastbound queues from the IL Route 31 intersection could back into this intersection.

#### IV. Site Traffic Characteristics of Proposed Development

##### Proposed Land Uses

The concept plan for the proposed development includes the following uses:

- Residential
- Restaurant
- Retail

The current site plan has a number of restaurants along the IL Route 38 frontage, with some sit-down type restaurants and some fast food. The remainder of the site consists of 16 four-story

buildings. The central ones are planned to be residential consisting of apartments. Those closer to IL Route 38 and to Prairie Street will have apartments on the upper floors, while the ground floor will be retail.

The proposed site will also include the necessary access lanes, parking lots, and landscaped areas required by City ordinances. Access to the site is proposed via the following locations:

- IL Route 38 & Jewel right-turns-only driveway (existing, near west edge of site)
- IL Route 38 & West Mall Entrance (existing)
- IL Route 38 & East Mall Entrance (existing, west of JiffyLube)
- Prairie Street & West Mall Entrance (existing, behind Jewel)
- Prairie Street & East Mall Entrance (existing)
- 14<sup>th</sup> Street & Vanderbilt Drive (existing indirect access, south of Binny's)

The locations of proposed points of access can be seen on the aerial photo in Exhibit 1B and on the concept plan in Exhibit 2. For traffic projection purposes, it is assumed that traffic signal control will remain at the IL Route 38/West Mall Entrance intersection. All other entrances to the proposed site will be controlled by stop signs on the minor street approaches.

Estimated Site-Generated Traffic

Site-generated traffic was estimated using the ITE's *Trip Generation Manual, 9<sup>th</sup> Edition*. The residential units were modeled with ITE Code 220, Apartment. The restaurant units were modeled as a combination of ITE Code 932, High-turnover (Sit-down) Restaurant, and ITE Code 934, Fast-food Restaurant with Drive-through Window. The retail units were modeled with ITE Code 826, Specialty Retail Center, which was determined to be the most appropriate use based on the information provided by the developer. However, there is no trip generation data for the weekday AM peak hour of adjacent street traffic for this use. The trip generation based on the weekday AM peak hour of the generator resulted in volumes that were much higher than seemed reasonable. Therefore, for the weekday AM peak hour trip generation estimates, the retail units were based on ITE Code 820, Shopping Center, weekday AM peak hour of adjacent street traffic. With the final site occupants unknown, it was determined that attempting further detail in land uses would be inappropriate at this time. The proposed land uses and sizes provided by the developer were used to estimate morning, evening, and Saturday peak hour trips to and from the site. The resulting generated traffic is shown in Table 6 below. Also refer to Appendix M for a more detailed breakdown.

**Table 6  
Trip Generation Table**

Land Use	ITE Code	Units	Qty	AM Peak Hour Volumes (veh/hr)			PM Peak Hour Volumes (veh/hr)			SAT Peak Hour Volumes (veh/hr)		
				In	Out	Total	In	Out	Total	In	Out	Total
Residential	220	DU	670	66	266	332	251	135	386	174	174	348
Retail	826	1000 SF	83	86	53	139	97	124	221	18	17	35
Sit-down Restaurants	932	1000 SF	26	156	127	283	155	103	258	196	173	369
Fast-food	934	1000 SF	7	161	155	316	118	109	227	209	201	410

Source: ITE *Trip Generation Manual, 9<sup>th</sup> Edition*

These projected trips have been adjusted for “internal capture” where there is potential for interaction among various uses within the multi-use site, i.e. between residential and restaurant

or between residential and retail. These trips occur entirely within the site and account for a portion of the trips generated by each land use. The capture rate of 15% percent was calculated using the ITE Internal Capture worksheet provided in Chapter 7 of the ITE *Trip Generation Handbook*. ITE internal capture estimation methods only pertain to PM peak hour scenarios. In order to determine the most accurate rate for AM and Saturday peaks, an internal capture field study would be required. Without conducting an internal capture field study, it is reasonable to apply the PM peak hour rate to all scenarios. A discussion of multi-use developments and internal capture from the ITE *Trip Generation Handbook* is included in Appendix N to this report for further reference.

The projected trip generation has also been adjusted for pass-by trips. Pass-by trips are those that already exist on the network but make an intermediate stop at the site location. For example, a driver on their way to work may leave their primary route to buy a cup of coffee and then re-enter their route at the same location. This would add turning movements to the intersection by diverting pre-existing main street through movements. A visual representation of this is provided in Exhibit 5. In the St. Charles Prairie Centre case, pass-by trip generation would not apply to the residential uses. A 5% pass-by rate was applied to the retail and restaurant uses. A higher pass-by rate would be reasonable given the proposed site uses, but IDOT limits the amount of internal capture and pass-by rates to a combined 20%. The resulting trip generation, in terms of its impact to the external intersections, is therefore conservatively high. It was determined that pass-by trips would most likely utilize primarily the West Mall Entrance on IL Route 38. The pass-by trip adjustment is provided in Exhibit 6. In Table 7, a summary is given of the total new trips generated after the internal capture and pass-by adjustments.

**Table 7**  
**Total New Trips after all Adjustments in veh/hr**

Peak Hour	In	Out	Total
Weekday AM	382	497	879
Weekday PM	512	386	898
Saturday	489	463	952

Source: ITE *Trip Generation Manual, 9<sup>th</sup> Edition*

Estimated Trip Distribution

The direction by which traffic will approach and depart the site is dependent on a variety of factors. These factors include existing travel patterns, characteristics and operating conditions of the surrounding roadways, ease of access, location of population and employment centers, and locations of similar competing uses. Based on these factors and a familiarity with the sites and the environs, trip distribution estimates were developed and are presented on Exhibit 7. Separate distribution factors were used for residential, office, and commercial trips, which are reflected in the exhibit. In that exhibit, the Commercial rates provided apply to the restaurant and retail uses. Note that the Commercial rates also apply to the CVS Pharmacy use and its outlots in the development of the 2026 Base Year Traffic.

Site Traffic Assignments

The estimated site-generated traffic volumes from the proposed development were assigned to the area roadway system based on the directional distribution identified above and on Exhibit 7. These volumes are the adjusted volumes, having removed internally captured trips and pass-by

trips, only leaving primary trips to and from the St. Charles Prairie Centre. The primary trip assignments for the proposed Prairie Centre development are illustrated on Exhibit 8 in Appendix A. The trip assignments presented on Exhibit 8 do *not* reflect assignment of the *off*-site development generated traffic from the CVS Pharmacy and its outlots described previously. These trips were included in the 2026 Base Year Traffic.

#### Total Traffic Assignments

The development's generated site traffic assignment was then combined with the pass-by traffic and the 2026 Base Year projected traffic to develop a Total Traffic Assignment, shown on Exhibit 9 in Appendix A.

### V. Future Traffic Operations

#### Traffic Operations

Capacity analyses were conducted based on the traffic volumes estimated for the projected traffic assignments at the 16 intersections included in this study. Traffic signal warrant evaluation is discussed later in the report. There are several geometric improvements already included in these analyses. These improvements are those proposed at the entrances as shown on the developer's current concept plan. These improvements include reconstruction of the exit approaches to add or better demarcate turn lanes. The West Mall Entrance at IL Route 38 will have an exclusive left turn lane, an exclusive through lane, and an exclusive right turn lane on the exiting approach. At the East Mall Entrance on IL Route 38, the exiting approach will consist of an exclusive left turn lane and a shared through/right turn lane. The exiting approach of the East Mall Entrance on Prairie Street will have an exclusive left turn lane and an exclusive right turn lane. The lane configurations used in the 2026 Total Traffic analysis can be seen in Exhibit 10 in Appendix A.

For the analysis of 2026 Total Traffic conditions, no other geometric improvements were assumed. However, the signal timing plans were optimized for the anticipated traffic levels. There was one significant change recommended for this scenario. The existing northbound and southbound left turn phasing at the West Mall Entrance on IL Route 38 is permissive only. That is, left turns from the entrance approaches are currently only permitted with the green ball. Under the 2026 Total Traffic, it is recommended that exclusive left turn phases be added to these movements, converting them to protected/permitted left turns. Under protected/permitted operations, left turns are protected by left turn arrows for a portion of the cycle and then are permitted concurrently with the adjacent green ball during another portion of the cycle. Additionally, the analyses allowed for various lead/lag operations at Randall Road and Prairie Street. This intersection is owned by Kane County, and the signals have 4-section Flashing Yellow Arrow operation for all of the left turns, which enables a lot of flexibility. This flexibility in operation was not assumed at any of the IL Route 38 intersections because IDOT has been very hesitant to adopt such signal improvements and operations. Table 8 presents the results of the capacity analyses and provides a comparison to the year 2026 Base Year (no development) Traffic discussed earlier in this report. Synchro reports are also included in Appendices G and H for the 2026 Total Traffic with and without changes to the system.

**Table 8**  
**Summary of Base Year (no development) and Total (with site) Traffic Conditions**  
**Intersection Level of Service (LOS) and Delay (seconds)**  
**Signalized Intersections**

Intersection	Base Year 2026 Traffic (no site)			2026 Total Traffic (with site)		
	AM Peak	PM Peak	Sat Peak	AM Peak	PM Peak	Sat Peak
IL 38/ Randall Rd	D (40)	D (49)	D (45)	D (41)	D (52)	D (39)
IL 38/ West Mall Entrance	A (6)	A (8)	A (7)	A (8)	B (13)	B (17)
IL 38/ 14 <sup>th</sup> St	C (24)	D (37)	C (31)	B (19)	C (34)	C (32)
Prairie St/ Randall Rd	B (12)	D (42)	D (44)	B (12)	D (47)	E (56)

Note that when traffic growth occurs and signal timings are re-optimized to favor the higher-volume arterial street traffic, the over-all intersection delay may reduce, even though delays for some minor street movements will increase. Some individual movements have LOS E or F. Table 9 shows a detailed breakdown of individual movements for the 2026 Total Traffic.

**Table 9**  
**LOS & Delay by Movement for 2026 Total Traffic with Improvements**

Intersection	Peak Hour	Overall LOS & (delay)	LOS & (delay) by Movement											
			Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
IL 38 & Randall Rd	AM	D (41)	E (61)	D (54)	A (0)	E (63)	D (51)	B (18)	E (61)	D (42)	A (3)	E (74)	C (26)	A (4)
	PM	D (52)	F (101)	D (49)	B (11)	E (62)	E (61)	D (38)	E (62)	E (80)	A (8)	F (86)	C (21)	A (7)
	Sat	D (39)	D (50)	E (74)	B (13)	D (49)	E (55)	D (48)	B (18)	D (40)	A (8)	D (50)	C (28)	A (4)
IL 38 & W Mall Entrance	AM	A (8)	A (2)	A (3)	A (5)	A (9)			D (39)	B (18)		D (44)	D (47)	B (13)
	PM	B (13)	B (15)	B (15)	A (2)	A (7)			D (40)	B (17)		D (43)	D (49)	B (16)
	Sat	B (17)	B (16)	C (23)	A (3)	A (6)			D (50)	B (19)		D (54)	E (58)	B (16)
IL 38 & 14 <sup>th</sup> St	AM	B (19)	A (4)	A (8)	B (15)	B (19)			C (25)	D (45)		D (35)	C (35)	
	PM	C (34)	D (40)	B (19)	C (23)	D (35)			C (25)	E (59)		D (45)	D (41)	
	Sat	C (32)	A (9)	B (19)	C (30)	C (29)			C (28)	E (60)		D (46)	D (42)	
Prairie St & Randall Rd	AM	B (12)	D (39)	C (30)	E (65)	D (48)	B (17)		A (2)	A (5)		C (30)	B (11)	
	PM	D (47)	D (44)	D (43)	F (130)	E (55)	C (30)		C (22)	D (55)		F (86)	C (22)	
	Sat	E (56)	D (51)	F (86)	F (137)	E (63)	E (59)		C (24)	E (60)		F (119)	C (32)	



Analysis of the 2026 Total Traffic shows the following results:

IL Route 38 and Randall Road: With projected 2026 Total Traffic and re-optimized signal timings, this intersection operates at an over-all Level of Service D, although some individual movements will operate at LOS E or F during peak times. There is a general increase in delay when compared to the 2026 Base Year Traffic, which would be expected due to the additional traffic. Vehicle queues do not exceed turn lane storage lengths, although through-lane queues will occasionally extend beyond the turn lane tapers, periodically blocking entry by turning vehicles until through traffic moves up. Traffic volumes will not exceed the capacity of the intersection, though several movements do approach capacity. This analysis is very similar to both the existing conditions and the 2026 Base Year conditions, in which the intersection also approaches capacity. Virtually all of the potential improvements that could be reasonably considered have already been implemented at this intersection. Additional capacity was already recognized by Kane County as a need for Randall Road, hence the projected widening of Randall Road, which is discussed later in this report. Widening of IL Route 38 could similarly have beneficial impacts on operation.

IL Route 38 and the West Mall Entrance: With the projected 2026 Total Traffic and re-optimized signal timings, as well as the additional northbound and southbound left turn phases, this intersection operates at an overall LOS B during the PM and Saturday peaks. Drivers on the proposed site roadway approaches may experience delays in the range of LOS D or even E. Left turn queues are expected to reach six to seven vehicles. Currently, IL Route 38 traffic is assigned about 75% of the available green time, which can be expected in the future, since these signals are controlled by IDOT. Traffic volumes are not expected to exceed the capacity of the intersection under 2026 Total Traffic conditions.

IL Route 38 and 14<sup>th</sup> Street: With the projected 2026 Total Traffic and re-optimized signal timings, the intersection is expected to experience similar delays to those in the 2026 Base Year analysis, with different movements showing either slightly higher or slightly lower delay. The overall LOS is expected to be C or better. Analysis of 2026 Total Traffic shows that projected traffic will not exceed the capacity of the intersection.

Prairie Street and Randall Road: Analysis of 2026 Total Traffic with signal timings re-optimized and variable left turn phasing shows that the overall Level of Service at this intersection will be B to E. The queue of westbound left turning traffic will continue to overflow the westbound left turn lane frequently during peak times. This movement will operate at LOS F during the PM and Saturday peaks. The queue of southbound left turning traffic during the PM and Saturday peak hours can also be expected to overflow the left turn lane with vehicle queues of 10 to 15 cars. This movement will operate at LOS F during the AM and Saturday peaks. As previously noted, green time for Prairie Street will continue to be limited by the need to provide adequate time for the large volume of traffic flowing on Randall Road and to keep these movements coordinated with the nearby IL Route 38/Randall Road intersection to the south. Further, the northbound through queue can be expected to spill back into the Randall Road/IL Route 38 intersection in the PM and Saturday peaks. This intersection, similar to the existing and 2026 Base Year Traffic, is expected to operate at or near capacity in peak periods. As mentioned under the Base Year analysis, the best solution is to execute the planned widening of Randall Road. The widening of Randall Road is described in greater detail later in the report. Alternative improvements could include extending turn lanes, adding right turn lanes, or reconfiguring the driveways on

Prairie Street east of Randall Road to reduce their potential interaction with the intersection, which is also discussed under the Base Year analysis.

In summary, the two Randall Road intersections are currently experiencing capacity issues, which are expected to continue into the future. The addition of traffic from new developments in the area will exacerbate these conditions. Optimizing the traffic signals and changing the order of phase operations can help significantly. Further improvements are needed to address what is an existing issue. Conversely, the other two signalized intersections studied are expected to continue to operate under capacity with relatively minimal changes, namely the addition of the left turn phases at the West Mall Entrance.

Table 10 shows a summary of analysis results for stop sign controlled intersections under 2026 Total Traffic. As noted before, capacity analyses of stop sign controlled intersections provide Levels of Service and delays for individual intersection movements, but not the intersection as a whole. Results for the most critical movement at each intersection are shown in Table 10.

**Table 10**  
**Summary of Base Year (no development) and Total (with site) Traffic Conditions**  
**Level of Service (LOS) and Delay (seconds)**  
**Stop Sign Controlled Intersections**

Critical Movement	Base Year 2026 Traffic (no site)			2026 Total Traffic (with site)		
	AM Peak	PM Peak	Sat Peak	AM Peak	PM Peak	Sat Peak
East Mall Entrance at IL 38	NB C (23)	SB F (62)	NB F (85)	SBL E (42)	SBL F (175)	NB F (165)
Prairie St at West Mall Entrance	NB B (11)	NB B (13)	NB B (11)	NB B (14)	NB C (18)	NB B (15)
Prairie St at East Mall Entrance	NBL B (15)	NBL C (19)	NBL C (16)	NBL C (23)	NBL D (34)	NBL C (26)
Prairie St at 16 <sup>th</sup> St	SB B (14)	SB C (19)	SB C (17)	SB C (16)	SB C (24)	SB C (21)
Prairie St at 14 <sup>th</sup> St	NBL C (20)	NBL F (73)	NBL D (33)	NBL C (25)	NBL F (113)	NBL E (45)
Prairie St at 7 <sup>th</sup> St	EB E (39)	WB F (82)	EB C (16)	EB F (81)	WB F (131)	EB C (24)
Prairie St at 3 <sup>rd</sup> St	EB E (50)	WB F (197)	WB C (21)	EB F (87)	WB F (237)	WB D (31)
14 <sup>th</sup> St at Covington Ct	WB B (13)	WB C (19)	WB B (14)	WB B (13)	WB C (20)	WB B (14)
14 <sup>th</sup> St at Vanderbilt Dr	EB B (12)	EB B (15)	EB B (14)	EB B (11)	EB B (15)	EB B (14)

Analysis of 2026 Total Traffic shows that critical movements at the stop-controlled intersections included in the analysis operate in range of Level of Service from B to F. Below is a description of the intersections not meeting LOS D or better. See also Exhibit 12 for queue comparisons.

East Mall Entrance at IL Route 38: The southbound left turn movement is expected to operate at LOS F during the PM and Saturday peak hours. However, the vehicle queues are only anticipated to reach two cars, and the analyses show the intersection having reached

only about half its capacity. The large delay is caused by the large volume of through traffic on IL Route 38. There will be very few acceptable gaps for left turning vehicles to utilize. Further geometric improvements will not significantly affect the delay. Signalization is not appropriate to consider, as IDOT would not allow it due to the close spacing of existing signalized intersections nearby. No improvements are recommended.

14<sup>th</sup> Street at Prairie Street: The northbound left turn movement is expected to operate at a LOS E during the Saturday peak hour and F during the PM peak hour. Vehicle queues are not expected to grow by more than one vehicle. However, a left turning vehicle may be delayed an extended period of time waiting for a sufficient gap in traffic. The analysis results also show plenty of remaining capacity at this intersection. No improvements are recommended. See the Base Year analysis for a discussion of signalization.

Prairie Street at 7<sup>th</sup> Street: This intersection is expected to exceed capacity with the addition of 2026 Total Traffic volumes. Both the east- and westbound movements at this intersection are expected to see LOS F during the AM and PM peak hours. This delay is caused by the large volume of vehicles making a stop at this intersection. According to the analysis results, the intersection has not reached capacity. No improvements are recommended.

Prairie Street at 3<sup>rd</sup> Street: This intersection is expected to be near capacity in the PM peak hour with the addition of 2026 Total Traffic volumes. Several movements at this intersection are expected to reach LOS F during the peak hour. This delay is caused by the large volume of vehicles proceeding through this intersection. As described previously, the interaction between this intersection and the nearby signalized intersection of IL Route 31 and Prairie Street may need some attention. No mitigation is recommended.

#### Randall Road Widening

Kane County has completed a Phase I engineering study and design to widen Randall Road to provide six through-traffic lanes from north of IL Route 64 to south of Bricher Road. The first stage of this project was constructed in 2007, widening Randall Road from north of IL Route 64 south to Oak Street. The widening of Randall Road from Oak Street through the IL Route 38 intersection is planned as Stage 2 of the improvement. Construction is not currently programmed while the County seeks funding for the work.

If the Randall Road improvement is constructed by 2026, which can be reasonably anticipated, it will benefit traffic flow not only on Randall Road, but also on intersecting routes such as IL Route 38 and Prairie Street. Analysis of the peak hours at Randall Road intersections with six lanes on Randall Road is expected to show that the added capacity will reduce delays and shorten vehicle queues on all approaches at both intersections. Table 11 presents the results of the capacity analyses and provides a comparison to the year 2026 Total Year (with site) Traffic discussed earlier in this report. For the analyses shown, the only improvements assumed were the same as described in the previous section plus the widening of Randall Road from four to six lanes. As before, the phase order at Randall Road and Prairie Street was allowed to change by time of day. Synchro reports are also included in Appendix I.

Note at Randall Road and Prairie Street, the northbound and southbound left turn movements have been evaluated with protected-only phasing, meaning turns are only allowed on a green arrow. This is required because IDOT does not allow permissive phasing across three opposing through lanes.

**Table 11**  
**Summary of Total (with site) and Total (with site) with Randall Widening Traffic Conditions**  
**Intersection Level of Service (LOS) and Delay (seconds)**  
**Signalized Intersections**

Intersection	2026 Total Year Traffic (with site)			2026 Total Traffic (with site) with Randall Road Widening		
	AM Peak	PM Peak	Sat Peak	AM Peak	PM Peak	Sat Peak
IL 38/ Randall Rd	D (41)	D (52)	D (39)	C (32)	D (35)	C (27)
IL 38/ West Mall Entrance	A (8)	B (13)	B (17)	B (11)	B (12)	B (13)
IL 38/ 14 <sup>th</sup> St	B (19)	C (34)	C (32)	B (19)	D (35)	C (31)
Prairie St/ Randall Rd	B (12)	D (47)	E (56)	B (12)	C (28)	C (30)

Note that with the widening of Randall Road assumed and signal timings re-optimized to favor the higher-volume arterial street traffic, the over-all intersection delay may reduce, even though delays for some minor street movements will increase. Some individual movements have LOS E or F. Table 12 shows a detailed breakdown of individual movements for the 2026 Total Traffic with Randall Road widening.

**Table 12**  
**LOS & Delay by Movement for 2026 Total Traffic with Improvements and Randall Widening**

Intersection	Peak Hour	Overall LOS & (delay)	LOS & (delay) by Movement											
			Eastbound			Westbound			Northbound			Southbound		
			L	T	R	L	T	R	L	T	R	L	T	R
IL 38 & Randall Rd	AM	C (32)	D (51)	D (43)	A (0)	D (48)	D (38)	B (15)	D (48)	C (34)	A (4)	E (63)	B (19)	A (2)
	PM	D (35)	E (68)	D (45)	A (4)	D (48)	D (44)	C (32)	E (62)	D (39)	A (7)	E (62)	B (18)	A (8)
	Sat	C (27)	C (34)	D (53)	A (8)	C (28)	D (42)	C (34)	B (16)	C (33)	A (8)	C (30)	B (15)	A (5)
IL 38 & W Mall Entrance	AM	B (11)	A (2)	A (6)		B (11)	B (19)		C (29)	B (15)		C (32)	D (37)	B (11)
	PM	B (12)	B (17)	B (15)		A (2)	A (6)		D (40)	B (17)		D (43)	D (49)	B (16)
	Sat	B (13)	A (10)	B (14)		A (4)	A (8)		D (40)	B (16)		D (43)	D (48)	B (15)
IL 38 & 14 <sup>th</sup> St	AM	B (19)	A (7)	B (13)		B (15)	B (20)		C (20)	D (37)		C (27)	C (27)	
	PM	D (35)	D (40)	C (22)		C (23)	D (35)		C (25)	E (59)		D (45)	D (41)	
	Sat	C (31)	A (10)	C (23)		C (31)	C (27)		C (24)	D (53)		D (39)	D (37)	
Prairie St & Randall Rd	AM	B (12)	C (30)	C (25)		D (51)	D (39)	A (6)	C (29)	A (6)		E (55)	B (10)	
	PM	C (28)	D (38)	D (40)		E (67)	D (47)	C (20)	D (50)	C (23)		E (78)	B (20)	
	Sat	C (30)	D (40)	D (52)		E (74)	D (50)	C (26)	D (52)	C (25)		F (87)	C (20)	

If the proposed add-lanes improvement to Randall Road is in place by 2026, delays and queues are expected to be significantly reduced. This improvement is particularly necessary to alleviate the spillback concerns on Randall Road between IL Route 38 and Prairie Street. Note however, there will still be queuing concerns for the southbound and westbound left turn lanes at Randall Road and Prairie Street. This is due to the requirement to use protected-only phasing for the northbound and southbound left turns. Permissive phasing would help reduce the expected queues but would need to be studied carefully and would require obtaining concurrence from IDOT.

#### Traffic Signal Warrants

Traffic Signal Warrants were analyzed at three intersections with this study. Traffic Signal Warrants are analytical tools outlined in Part 4C of the *Manual on Uniform Traffic Control Devices* (MUTCD) published by the Federal Highway Administration (FHWA). The MUTCD outlines nine warrants dealing with various factors in the need for traffic signals, such as traffic volumes, pedestrian activity, school crossings, railroad crossings, etc. It is important to understand that meeting at least one traffic signal warrant is necessary before traffic signals should be installed at an intersection. However, meeting a traffic signal warrant does not require an agency to install traffic signals at an intersection. Often, traffic signals are not the best solution to handling traffic, even where warrants are met.

For the analyses provided, 13-hour traffic count data was collected. For analyses of the existing traffic, all count data was able to be used. For future years, projection of traffic volume counts is only reasonable for the peak hour volumes. Therefore, analysis of Warrant 1, Eight-hour Vehicular Volume, is limited to what can be estimated. The eighth-highest hour of traffic volume can be estimated as 55% of the peak hour volume. This rule of thumb is an industry practice and is used by IDOT in their Signal Warrant analyses (IDOT *BDE Manual*, 2002 Ed., p. 14-3(3), item 4c. Proposed Volumes). Caution needs to be applied when using the 55% estimate of eighth-highest hourly volumes to evaluate Warrant 1. Similarly, Warrant 2, Four-hour Vehicular Volume, is even more difficult to analyze. There is no accepted method to estimate the fourth-highest hourly volume in the absence of actual traffic count data. Subsequently, where the estimated eighth-highest hourly volume satisfies Warrant 2, it could be reasonably assumed the warrant is met. However, if the peak hour volumes meet it but the eighth-highest hourly volume does not, no conclusion can be drawn regarding Warrant 2.

Prairie Street & 14<sup>th</sup> Street: Traffic Signal Warrant 1A, Minimum Vehicular Volumes, has been met by existing traffic volumes at this intersection. This means that, for at least eight hours of the day, the traffic counted at this intersection exceeded the thresholds outlined in the *MUTCD*. Traffic Signal Warrant 3, Peak Hour, also has been met with existing traffic volumes. Additional warrants are anticipated to be met by future traffic volumes. However, despite delays to the northbound left turn, the capacity analyses show remaining capacity in the operations and short queue lengths under all scenarios studied. Installation of traffic signal control is not recommended at this time.

Prairie Street & 7<sup>th</sup> Street: Traffic Signal Warrant 2, Four-hour Vehicular Volume, has been met by existing traffic volumes at this intersection. This means that, for at least four hours of the day, the traffic counted at this intersection exceeded the thresholds outlined in the *MUTCD*. Additional warrants are anticipated to be met by future traffic volumes. Traffic operations at this intersection are at or near capacity with or without the site traffic added. Note also the distance of the intersection from the site, which makes it difficult to assign

impact from the site to this intersection relative to existing traffic and surrounding traffic generators. Installation of traffic signals at this intersection could potentially improve operations, although this and other remedies have not been studied in detail. Installation of traffic signal control or other mitigation techniques are not recommended at this time.

Prairie Street & 3<sup>rd</sup> Street: Traffic Signal Warrant 2, Four-hour Vehicular Volume, has been met by existing traffic volumes at this intersection. This means that, for at least four hours of the day, the traffic counted at this intersection exceeded the thresholds outlined in the *MUTCD*. Additional warrants are anticipated to be met by future traffic volumes. Traffic operations at this intersection are at or near capacity with or without the site traffic added. Note also the distance of the intersection from the site, which makes it difficult to assign impact from the site to this intersection relative to existing traffic and surrounding traffic generators. Installation of traffic signals at this intersection could potentially improve operations, although this and other remedies have not been studied in detail. Installation of traffic signal control or other mitigation techniques are not recommended at this time.

## VI. Additional Considerations

### Cut Through Routes

Some concerns have been raised about the existing use of neighborhood residential streets by cut-through traffic. These streets include 7<sup>th</sup> Street, 12<sup>th</sup> Street, 13<sup>th</sup> Street, 14<sup>th</sup> Street, 16<sup>th</sup> Street and Oak Street. Seventh, 12<sup>th</sup>, and Oak Streets adjoin schools and are school traffic routes. Seventh and Oak Streets, along with Prairie Street, are designated as collector streets in the City's Comprehensive Plan. Concerns have also been raised about the potential for increased use of these streets by cut-through traffic with the development of the Prairie Centre site and the additional traffic it will generate.

A study and analysis that would quantify the existing volumes of cut-through traffic on surrounding west-side neighborhood streets would be an undertaking that requires a significant investment of time and manpower. Due to the variable nature of this driver behavior, a prediction of any future increase in cut-through traffic on individual streets could only be very roughly estimated. Any recommendations to discourage or impede cut-through traffic on an individual street would need to be carefully considered, as this often results in traffic diverting to the nearest adjacent street. Following a discussion of this with City staff, HLR was directed to not undertake a formal engineering study of cut-through traffic, but to instead provide an overview of the potential cause and remedy for this situation.

Drivers typically use side streets as cut-through routes to avoid traffic congestion along an otherwise desired route. If traffic is flowing smoothly, drivers are more likely to stay on the through street. During peak traffic periods, Prairie Street now experiences some congestion at its all-way stop intersections at 7<sup>th</sup> and 3<sup>rd</sup> Streets. Traffic volumes at these intersections do meet traffic signal warrants without the addition of the Prairie Centre development.

If congestion is not alleviated on the main collector route (such as Prairie Street), measures taken to discourage or block through traffic on individual side streets often result in traffic rerouting to the next adjacent street. If the 3<sup>rd</sup> Street and 7<sup>th</sup> Street intersections remain under all-way stop control, peak hour delays and the lengths of lines of traffic will increase, further encouraging drivers to seek alternate routes down other streets. If both intersections are signalized and are under coordinated control with each other and with Prairie Street at IL Route

31, delays and congestion will be significantly reduced. This will reduce the desirability of using cut-through routes down side streets, drawing those drivers back to Prairie Street, the main collector route.

#### Traffic Calming

Traffic should continue to be monitored on the surrounding street network for issues that may require traffic calming. Should measures be required, the City of St. Charles has a traffic calming policy that should be followed.

The developer has many features planned to be incorporated into the site plan that will have traffic calming benefits for the on-site traffic circulation. The following list enumerates some of the planned traffic calming features and other design features that will have some traffic calming effects:

- Central, circular, landscaped island/traffic circle on the main driveway
- Narrow vehicle lanes
- Brick crosswalks
- Corner bump-outs
- On-street parking
- Non-continuous vehicle routes through the site

#### On-site Traffic Circulation

A detailed review of the site plan should be conducted by City staff and by the Fire Department to ensure that adequate access is provided for emergency vehicles throughout the site. When geometric plans for the access lanes within the site are finalized, they should be reviewed for access by the largest St. Charles Fire Department truck, which can be approximated with a WB-50 turning template. Locations of trash collection areas and standing/parking areas for service and delivery vehicles should also be reviewed to ensure that these operations do not block traffic circulation. Truck access to the Jewel store west of the site will be modified or affected by the development of the Prairie Centre site. Care should also be taken in the site design to ensure that the trucks have a viable route in and out of the site. Finally, the site plan should provide for sufficient lane widths throughout the site, particularly at locations where it can be expected that traffic will need to go around stopped or standing vehicles in loading zones, etc.

Many of the traffic calming features described above also have, or primarily have, benefits for pedestrian traffic. Considering the nature of the development and the surrounding residential areas, the site design should include safe and efficient pathways for pedestrian use. The current preliminary site plan appears to make safe pedestrian access a priority. As the site plan develops further, it should be reviewed by City staff to ensure that safe and efficient pedestrian routing is provided.

Finally, it should be noted that, even with installation of the pedestrian features previously described, and considering the relatively dense nature of the development, it is unlikely that the Prairie Centre site will generate significant pedestrian traffic that would cross IL Route 38. Adjacent to the site, IL Route 38 is a five-lane arterial maintained by IDOT. Due to the width of the street and the volume of traffic on IL Route 38, it would be difficult for pedestrians to cross and feel safe. Further, with this site being located in a northern climate, user habits will tend toward moving the vehicle for each stop, especially when crossing to sites on the opposite side of IL Route 38.

Alternate Development Ideas

As a point of reference, this section discusses some potential alternatives for development of the Prairie Centre site. Comparisons of estimated generated traffic from two alternatives to the generated traffic presented in this study are summarized in this section. The first comparison was to the estimated volumes from the previous study in 2010. The second comparison was to a development scenario that could potentially be constructed under the existing zoning of the site.

The last time this site was studied was in 2010, and the site was referred to as the Towne Centre. At that time, the general concept for development of the site was similar to the current proposal. The primary difference was in the number of units on the site. The residential use was slightly more intense in the 2010 proposal as compared to the current one. The retail uses, including restaurants, had about three times the square footage. The previous proposal also included a hotel and about 142,000 SF of office space, which are not included in the current proposal. Table 13 summarizes the trips generated in the 2010 study. Note that the previous study was performed prior to the publication of the 9<sup>th</sup> Edition of *Trip Generation Manual*. The data presented in Table 13 were taken straight from that study. The 2010 study based trip generation on the 8<sup>th</sup> Edition of *Trip Generation Manual*, which was the current edition at that time. The formulas and rates in the 9<sup>th</sup> Edition are only slightly different for most of the assumed land uses, while many of the uses have no changes. Also note that the data presented in Table 13 account for a combined reduction of 20% due to internal capture and to pass-by trips. However, pass-by does not apply to all uses, such as residential. Therefore, the values for the combined internal capture and pass-by trips will not equal 20% of the raw total generated trips.

**Table 13**  
**Trip Generation Table from 2010 Towne Centre TIS**

Land Use	ITE Code	Units	Qty	AM Peak Hour Volumes (veh/hr)			PM Peak Hour Volumes (veh/hr)			SAT Peak Hour Volumes (veh/hr)		
				In	Out	Total	In	Out	Total	In	Out	Total
Residential	233	DU	650	54	182	236	303	179	482	125	106	231
Office	710	1000 SF	142	218	30	248	40	198	238	26	23	49
Commercial	820	1000 SF	349	196	126	322	721	750	1471	1005	927	1932
Hotel	310	Rms	115	30	19	49	36	32	68	47	37	84
Total Generated Trips				498	357	855	1100	1159	2259	1203	1093	2296
Internal Capture + Pass-by (20%)				(68)	(52)	(120)	(180)	(186)	(366)	(210)	(199)	(409)
Total New Trips				430	305	735	920	973	1893	993	894	1887

Source: Towne Centre Traffic Impact Study, January 26, 2010

For another comparison, City staff recommended generating traffic based on a land use assumption that assumes full development of the site with land uses that conform to the existing zoning for the site. Being constructed per existing zoning, this potential development would not require review by the City's Plan Commission. This scenario was also examined in the 2010 Towne Centre study. At that time, City staff provided recommended land use assumptions for the basis of this analysis via a memo dated January 29, 2009, which is included in Appendix K for reference. The City's recommendation was to model a development consisting of approximately 626,000 SF of gross leasable area of Shopping Center (ITE Land Use 820). Table 14 summarizes the estimated generated trips for such a development with and without an estimated combined 20% of internal capture and pass-by.



**Table 14 - Trip Generation Table for Alternate Development of Prairie Centre Site**

Land Use	ITE Code	Units	Qty	AM Peak Hour Volumes (veh/hr)			PM Peak Hour Volumes (veh/hr)			SAT Peak Hour Volumes (veh/hr)		
				In	Out	Total	In	Out	Total	In	Out	Total
Shopping Center	820	1000 SF	626	296	181	477	983	1066	2049	1498	1384	2882
Internal Capture + Pass-by (20%)				(59)	(36)	(95)	(197)	(213)	(410)	(300)	(277)	(577)
Total New Trips				237	145	382	786	853	1639	1198	1107	2305

Source: ITE Trip Generation Manual, 9<sup>th</sup> Edition

In general, both of the outlined alternatives are expected to generate much larger volumes of traffic than does the current proposal. Although the weekday AM peak hour volumes are expected to be similar in all three cases, the generated volumes are much higher in the weekday PM and Saturday peak hour cases. Tables 15 and 16 summarize and compare the generated traffic for each development case with a percentage change relative to the traffic generated by the current proposal. Table 15 shows the comparison without any internal capture or pass-by adjustments, while Table 16 includes those adjustments.

**Table 15  
Total Site Generated Traffic (vph) *without* Internal Capture or Pass-by Adjustments by Development Scenario and Peak Hour**

Development Scenario	AM Peak	PM Peak	SAT Peak
	Total	Total	Total
Prairie Centre	1070	1092	1162
Towne Centre 2010	855	2259	2296
Percentage Difference	-20%	+107%	+98%
Max Development per Current Zoning	477	2049	2882
Percentage Difference	-55%	+88%	+148%

Sources: ITE Trip Generation Manual, 9<sup>th</sup> Edition and Towne Centre Traffic Impact Study, January 26, 2010

**Table 16  
Total Site Generated Traffic (vph) *with* Internal Capture and Pass-by Adjustments by Development Scenario and Peak Hour**

Development Scenario	AM Peak	PM Peak	SAT Peak
	Total	Total	Total
Prairie Centre	879	898	952
Towne Centre 2010	735	1893	1887
Percentage Difference	-16%	+111%	+98%
Max Development per Current Zoning	382	1639	2305
Percentage Difference	-57%	+83%	+142%

Sources: ITE Trip Generation Manual, 9<sup>th</sup> Edition and Towne Centre Traffic Impact Study, January 26, 2010

As shown, the 2010 Towne Centre proposal was expected to generate just over twice the traffic of the Prairie Centre proposal for the weekday PM and Saturday peaks, while the Saturday peak is 1.5 times the Prairie Centre traffic for the potential development under current zoning. Although the weekday AM peak volume is expected to be higher for the Prairie Centre as compared to both alternate scenarios, the critical peak hours were still the weekday PM and Saturday peak hours, for which both the generated traffic volumes and the counted traffic volumes were higher than those for the weekday AM peak hour.

The larger volumes anticipated for the alternate development scenarios result in more significant impacts to the surrounding roadway network. To provide satisfactory operation, more improvements are needed. Dual left turn lanes would be needed at the main entrance on IL Route 38. Many turn lanes in the area would need to be extended. The interaction on Randall Road between IL Route 38 and Prairie Street would be exacerbated. Longer delays would be experienced at many of the driveways where further improvements are unrealistic for various reasons.

## VII. Findings and Recommendations

The estimates and analyses discussed in the preceding pages, based on the proposed site layout and access as shown in Exhibit 2, indicate the following:

IL Route 38 & Randall Road: This intersection and its turn lanes have sufficient capacity to accommodate the projected 2026 Total Site traffic. Individual movements may operate at LOS E or F, though this is not entirely attributed to the Prairie Centre Development as this occurs in the 2026 Base Traffic scenario also. The proposed future Kane County improvement to add through-traffic lanes to Randall Road will further enhance the capacity of this intersection. No improvements to this intersection are recommended as a result of the proposed development.

IL Route 38 & West Mall Entrance: The site plans show conversion of the southbound approach to consist of an exclusive left turn lane, an exclusive through lane, and an exclusive right turn lane. Additionally, the northbound and southbound left turn phases should be converted to protected-permissive phasing.

IL Route 38 & East Mall Entrance: This intersection has the overall capacity to accommodate the projected 2026 Total Traffic. The north- and southbound left turn movements will experience long delays and LOS F but with short queues.

IL Route 38 & 14<sup>th</sup> Street: This intersection has the overall capacity to accommodate the projected 2026 Total Traffic. The eastbound and westbound left turn queues will periodically approach the full left turn lane length during PM and Saturday peak hours. If needed, the painted median and taper can be adjusted to increase the storage length of the left turn lane. Further, consideration should be made for adding a northbound right turn lane to reduce existing delays and queues on that approach.

Randall Road & Prairie Street: This intersection has the overall capacity to accommodate the projected 2026 Total Traffic. The peak period queues of southbound left turning traffic are anticipated to be as long as 10 to 15 cars. This is due partly to a projected increase in the left turning volume and partly to anticipated background growth in opposing through-

traffic volumes, limiting the amount of green time available for the left turn movement. An interim improvement can be made by adjusting the median and left turn lane alignment to provide additional storage length in the taper. If the proposed add-lanes improvement to Randall Road is in place by 2026, the southbound left turn queues can be expected to be reduced. There is also the potential for spillover on the northbound approach into the IL Route 38 intersection during the PM and Saturday peak periods. The proposed widening of Randall Road will be necessary to alleviate this concern.

Further, the existing peak period overflow of the westbound left turn lane will be increased with the addition of projected traffic, frequently blocking the Jewel Supermarket driveway, as well as the entrance to the retail strip mall on the south side of the street west of the Jewel store. These entrances could be converted to right turns only, as described in detail in the Base Year analysis. These improvements are not recommended with this development, as it treats what is an existing issue. Additionally, the degree of improvement needed will be impacted by the planned Randall Road widening. Therefore, the specific improvements to the westbound approach should be developed with some accounting for the Randall Road widening and when the two sets of improvements would happen relative to each other.

Prairie Street & 14<sup>th</sup> Street: Existing average delays to the northbound left turn movement are in the range of LOS D. With the addition of the background growth and the site development traffic, this movement will enter LOS F range during the PM peak hour. However, this intersection has the overall capacity to accommodate the 2026 Total Traffic volumes, with queues reaching four vehicles at most. Although traffic signal warrants are met under the existing traffic at the intersection, installation of traffic signal control is not recommended at this time. See Base Year analysis for more discussion about signalization.

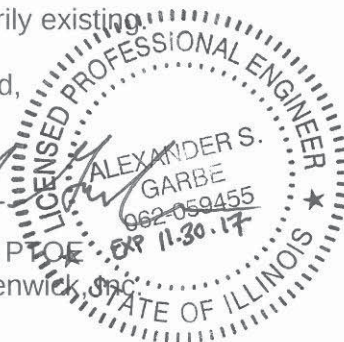
Prairie Street & 7<sup>th</sup> Street: Base Year average delays for this intersection reach LOS F during the PM peak hour. The addition of site development traffic only adds to the delays at this intersection. For the westbound approach, queues will extend past the Prairie Street & 6<sup>th</sup> Street intersection. Traffic signal control is warranted under existing traffic. A number of improvements could alleviate delays, including signalization or conversion to a roundabout. No improvements are recommended as a part of the development, as the issues here are primarily existing.

Prairie Street & 3<sup>rd</sup> Street: Base Year average delays for this intersection reach LOS F during the PM peak hour. The addition of site development traffic only adds to the delays at this intersection. For the westbound approach, queues will nearly reach the IL Route 31 and Prairie Street intersection. Traffic signal control is warranted under existing traffic. A number of improvements could alleviate delays, including signalization or conversion to a roundabout. No improvements are recommended as a part of the development, as the issues here are primarily existing.

Respectfully Submitted,



Alexander S. Garbe, PE, PTOE  
Hampton, Lenzini and Renwick, Inc.



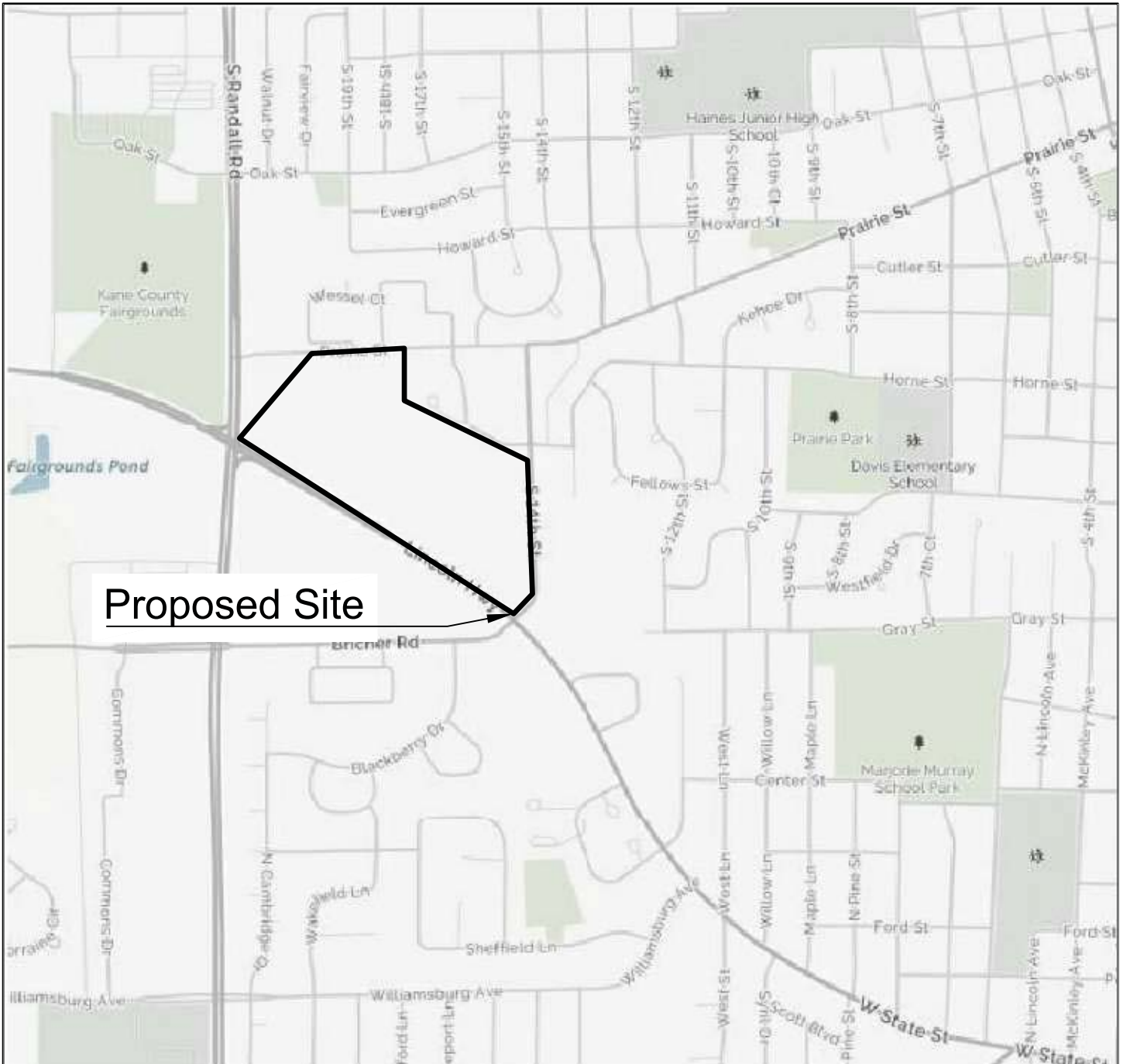
## APPENDIX

- A. EXHIBITS
- B. HCS ANALYSIS REPORTS, 2016 EXISTING TRAFFIC
- C. HCS ANALYSIS REPORTS, 2026 BASE TRAFFIC
- D. HCS ANALYSIS REPORTS, 2026 TOTAL TRAFFIC
- E. SYNCHRO ANALYSIS REPORTS, 2016 EXISTING TRAFFIC
- F. SYNCHRO ANALYSIS REPORTS, 2026 BASE TRAFFIC
- G. SYNCHRO ANALYSIS REPORTS, 2026 TOTAL TRAFFIC, NO IMPROVEMENTS
- H. SYNCHRO ANALYSIS REPORTS, 2026 TOTAL TRAFFIC, WITH IMPROVEMENTS
- I. SYNCHRO ANALYSIS REPORTS, 2026 TOTAL TRAFFIC, RANDALL WIDENING
- J. CMAP MEMO TO ST. CHARLES, JUNE 3, 2016
- K. ST. CHARLES ALTERNATE DEVELOPMENT MEMO, JANUARY 29, 2009
- L. ITE LAND USE DIAGRAMS
- M. TRIP GENERATION DIAGRAMS
- N. ITE TRIP GENERATION HANDBOOK CH. 7, MULTI-USE DEVELOPMENT
- O. INTERNAL CAPTURE DIAGRAM
- P. TRAFFIC COUNTS
- Q. TRAFFIC SIGNAL WARRANT ANALYSIS REPORTS

## APPENDIX A

### Exhibits

1. Location Exhibits
  - a. Location Map
  - b. Aerial Photo
2. Preliminary Site Plan
3. 2016 Existing Traffic
4. 2026 Base Traffic
5. Pass-by Traffic Example
6. Pass-by Traffic
7. Trip Distribution Diagram
8. Preliminary Site Traffic
9. 2026 Total Traffic
10. Lane Configurations
11. Intersection Spacing
12. Queue Length Exhibits
  - a. Prairie Street & 14<sup>th</sup> Street
  - b. Prairie Street at 7<sup>th</sup> Street and at 3<sup>rd</sup> Street



Proposed Site

# Exhibit 1A

## Location Map

City of Saint Charles

Prairie Centre

**Hampton, Lenzini and Renwick, inc.**

Civil & Structural Engineers . Land Surveyors . Environmental Services



ELGIN . SPRINGFIELD . WOODRIDGE . MT. CARMEL

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# Exhibit 1B

## Aerial Photo Overview City of Saint Charles Prairie Centre

**Hampton, Lenzini and Renwick, Inc.**

Civil & Structural Engineers . Land Surveyors . Environmental Services



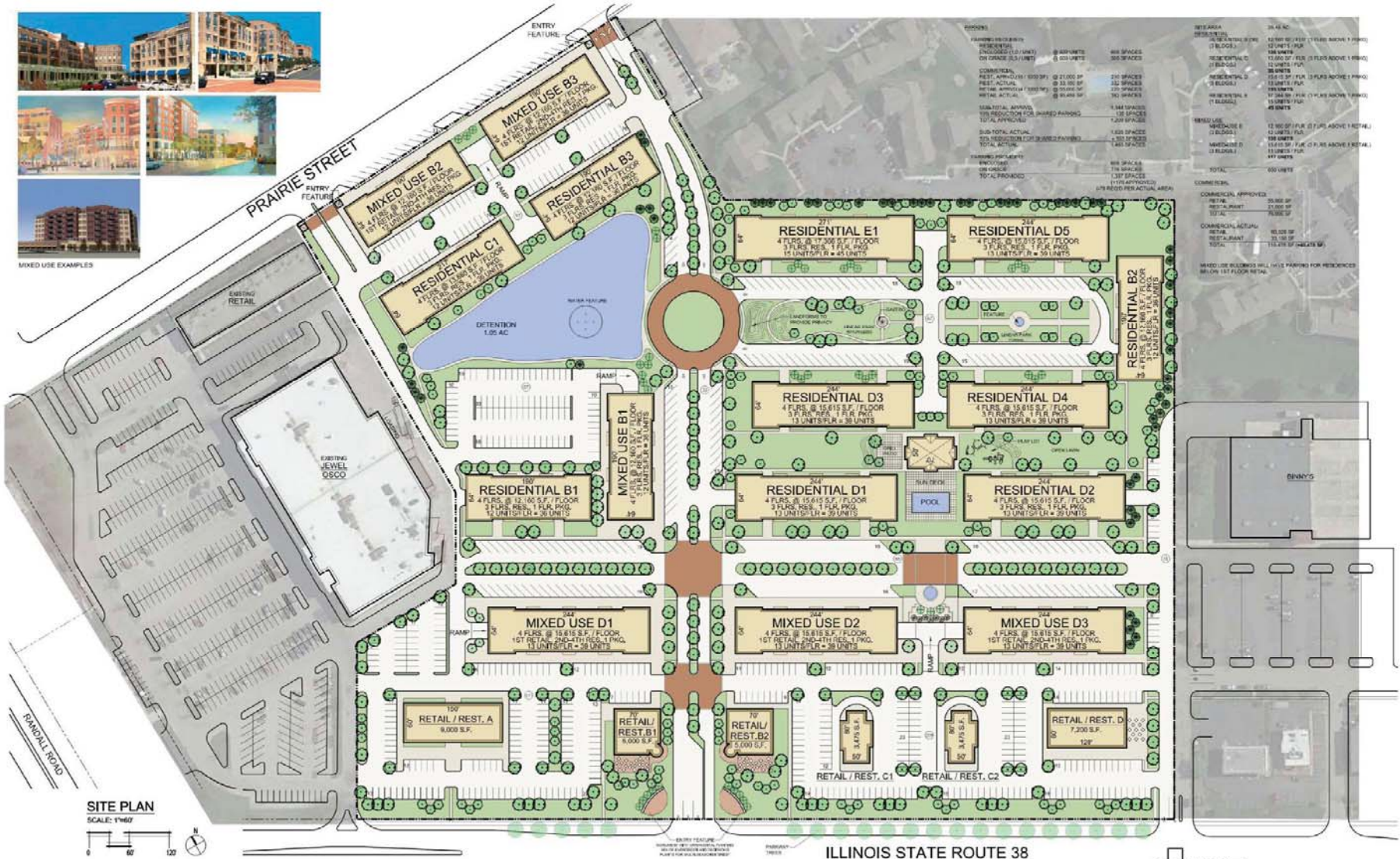
ELGIN . SPRINGFIELD . WOODRIDGE . MT CARMEL

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MIXED USE EXAMPLES



SITE PLAN  
SCALE: 1"=60'

PRAIRIE CENTRE  
ST. CHARLES, ILLINOIS

SHODEEN

ILLINOIS STATE ROUTE 38



OKW Architects

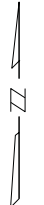
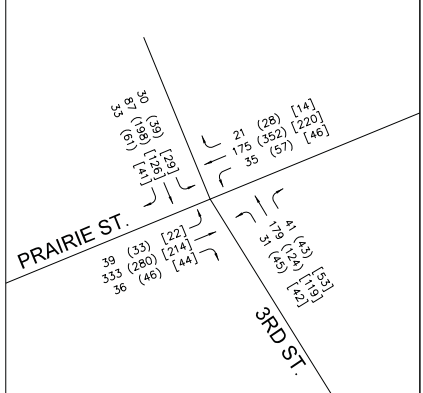
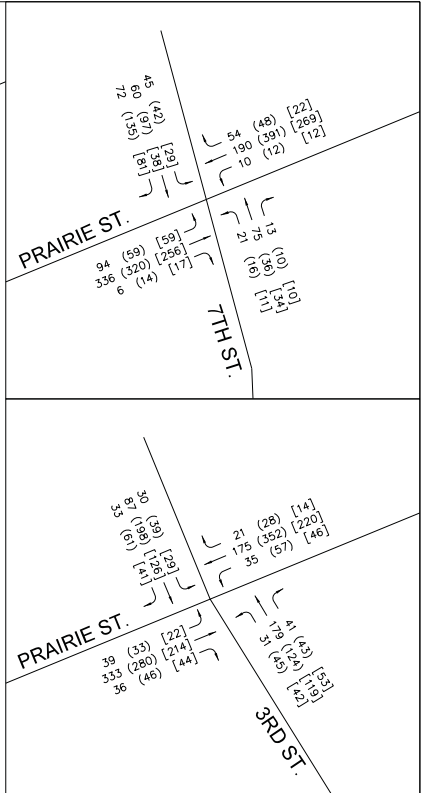
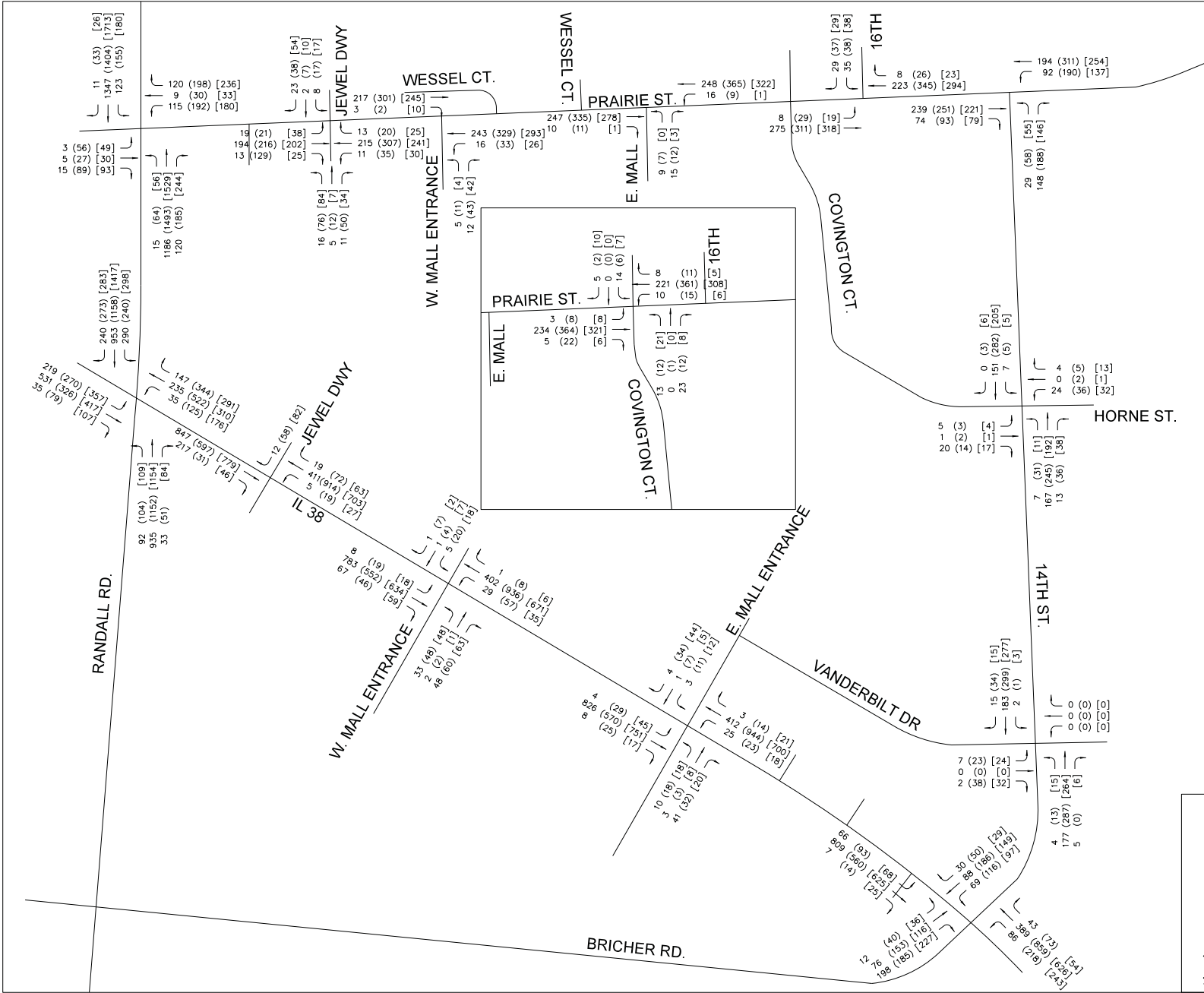
DATE: APRIL 16, 2015

PROJECT NUMBER: 0050

**Exhibit 2**  
**Site Plan**  
City of Saint Charles  
Prairie Centre

Hampton, Lenzel and Renwick, Inc.  
1000 SOUTH SPRINGFIELD, WOODBRIDGE, ILLINOIS  
WWW.HLRARCHITECTS.COM  
ILLINOIS LICENSE PROFESSIONAL ARCHITECTS NO. 043000000





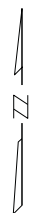
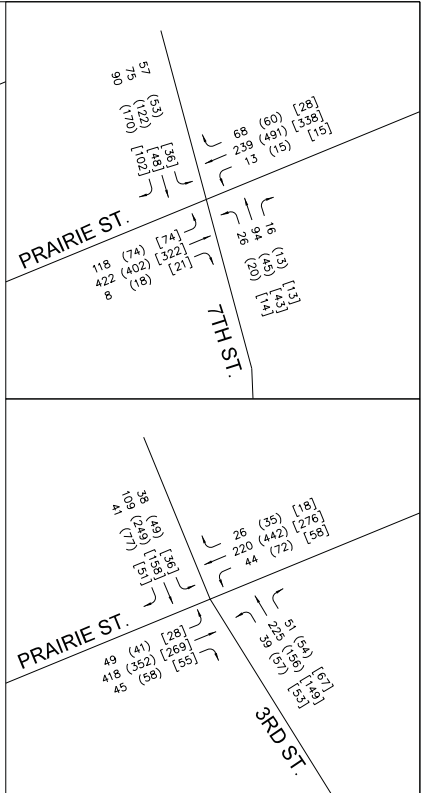
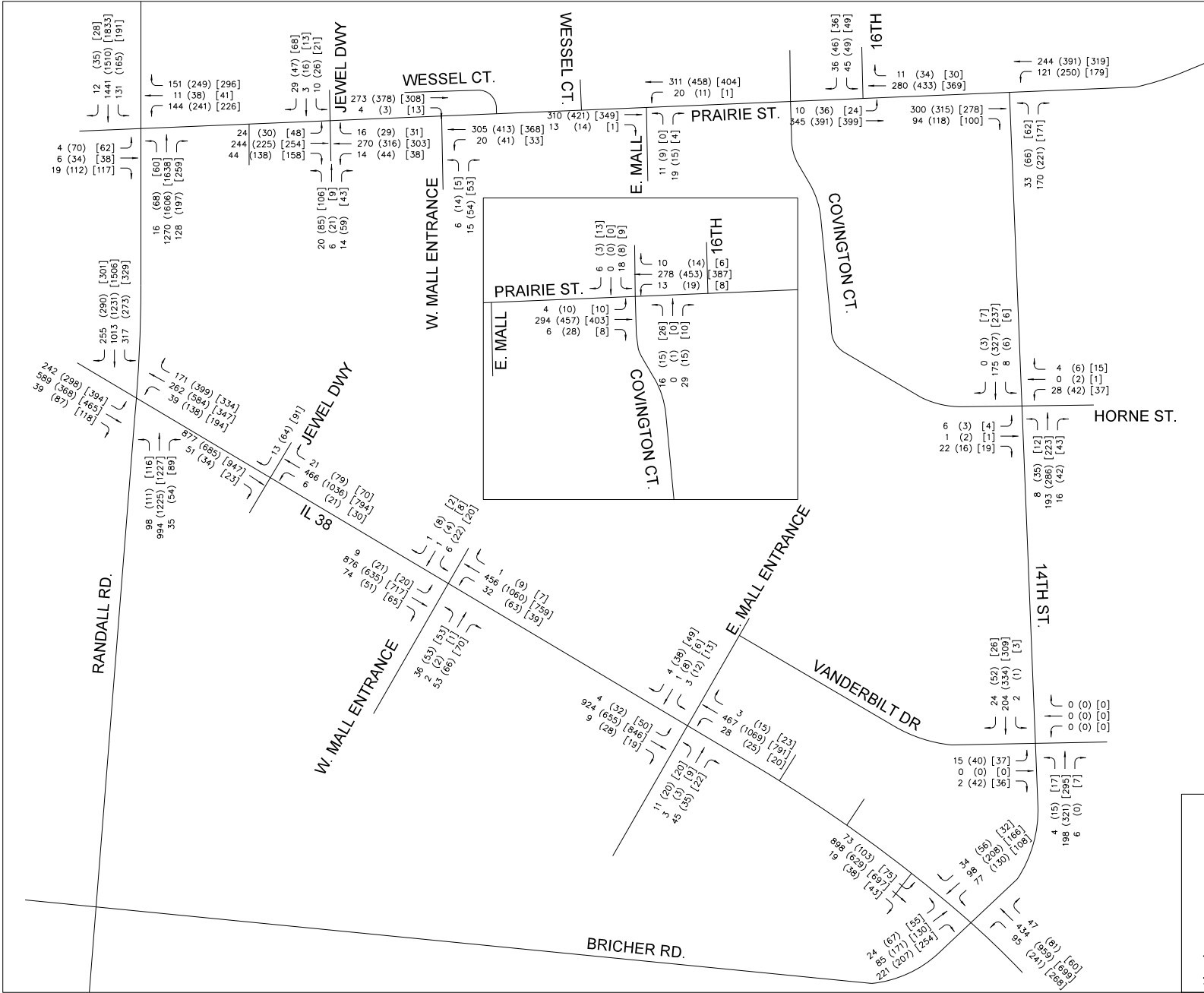
LEGEND  
AM (PM) [SAT]

# Exhibit 3

## 2016 Existing Traffic

### City of Saint Charles Prairie Centre

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LEGEND  
AM (PM) [SAT]

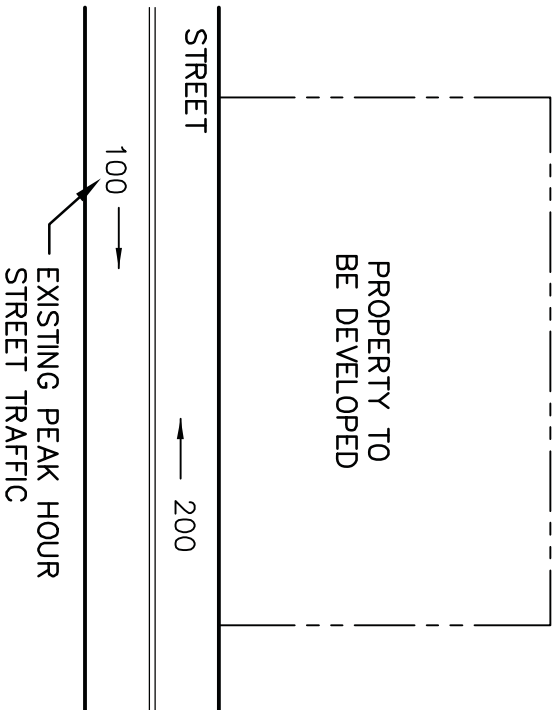
# Exhibit 4

## 2026 Base Traffic

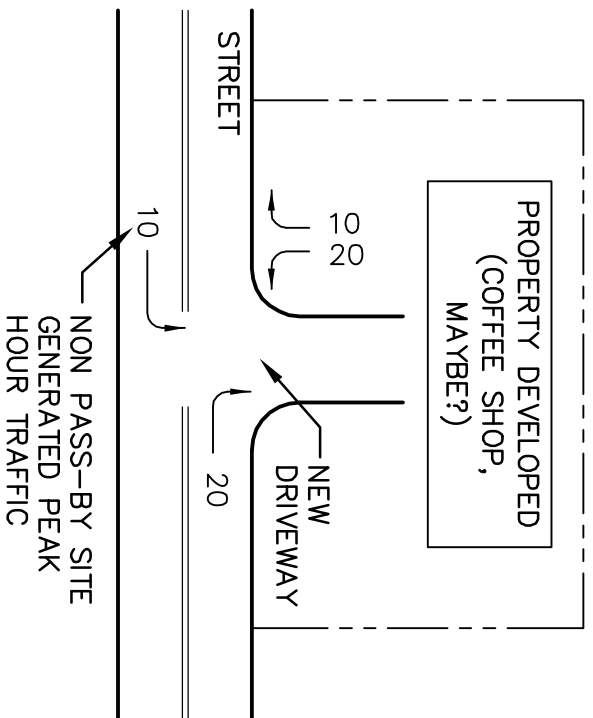
### City of Saint Charles Prairie Centre

Hampton, Lenzini and Renwick, Inc.  
Civil & Structural Engineers - Land Surveyors - Environmental Services  
 ELGIN · SPRINGFIELD · WOODRIDGE · MT CARMEL  
[www.hlrengineering.com](http://www.hlrengineering.com)  
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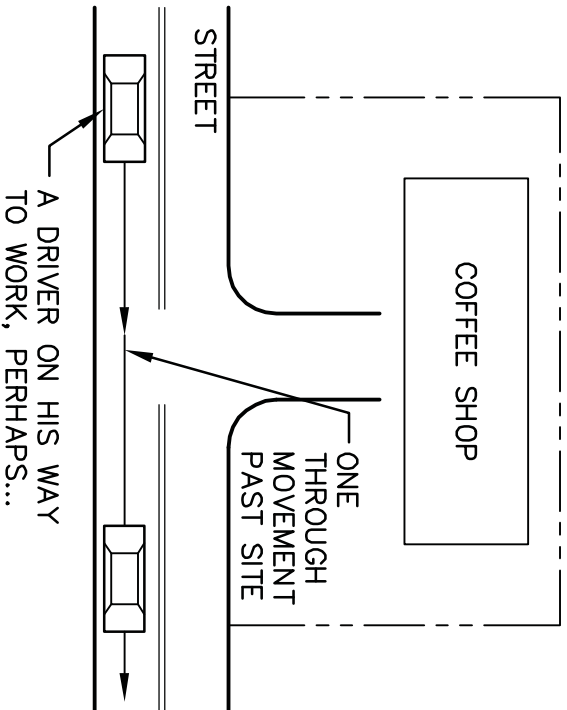
① EXISTING



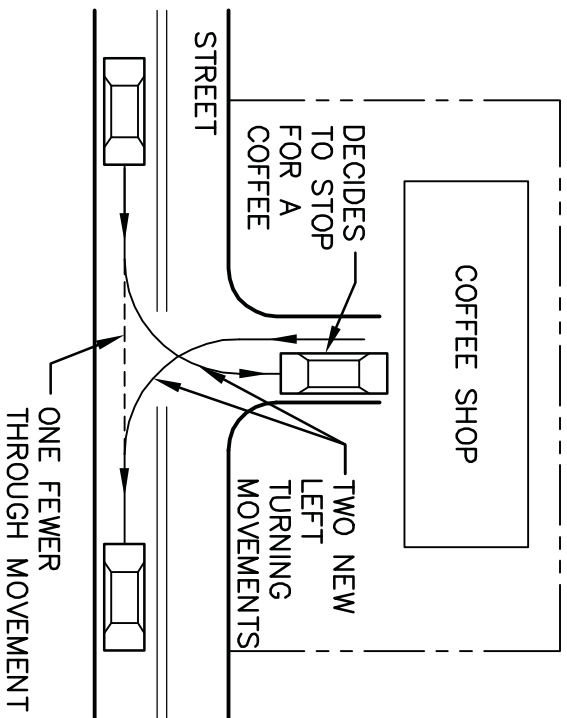
② PROPOSED



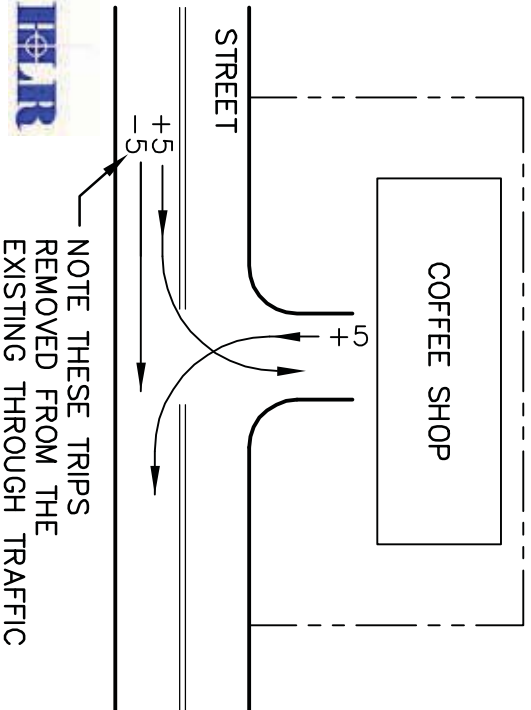
③ A PASS-BY TRIP...



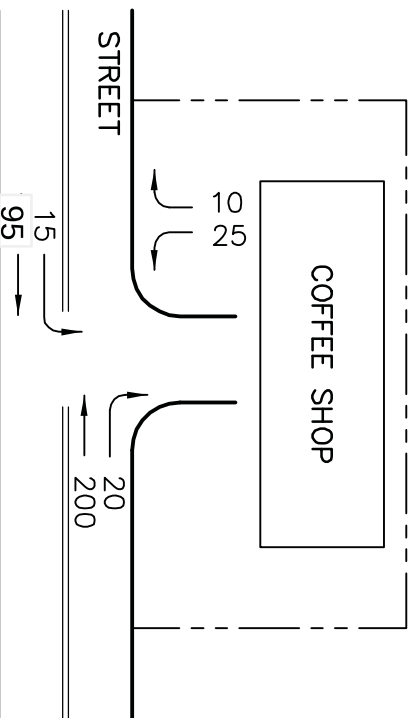
④ LOOKS LIKE THIS...

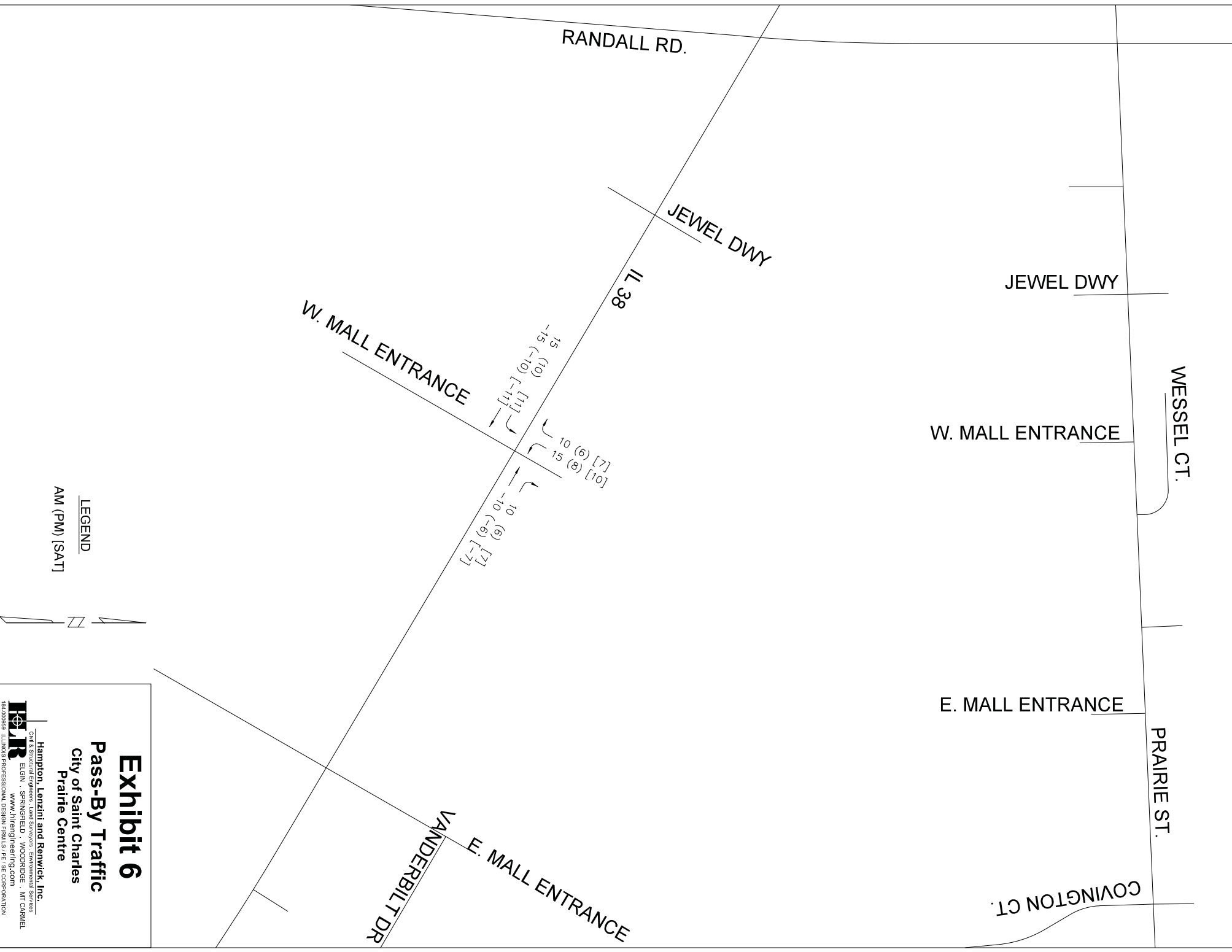


⑤ PASS-BY TRAFFIC IS ADDED TO THE INTERSECTION LIKE THIS (WE'LL JUST DO EAST BOUND IN THIS EXAMPLE)



⑥ SO YOUR NEW TOTAL VOLUME IS... (EXISTING + NON-PASS-BY + PASS-BY)

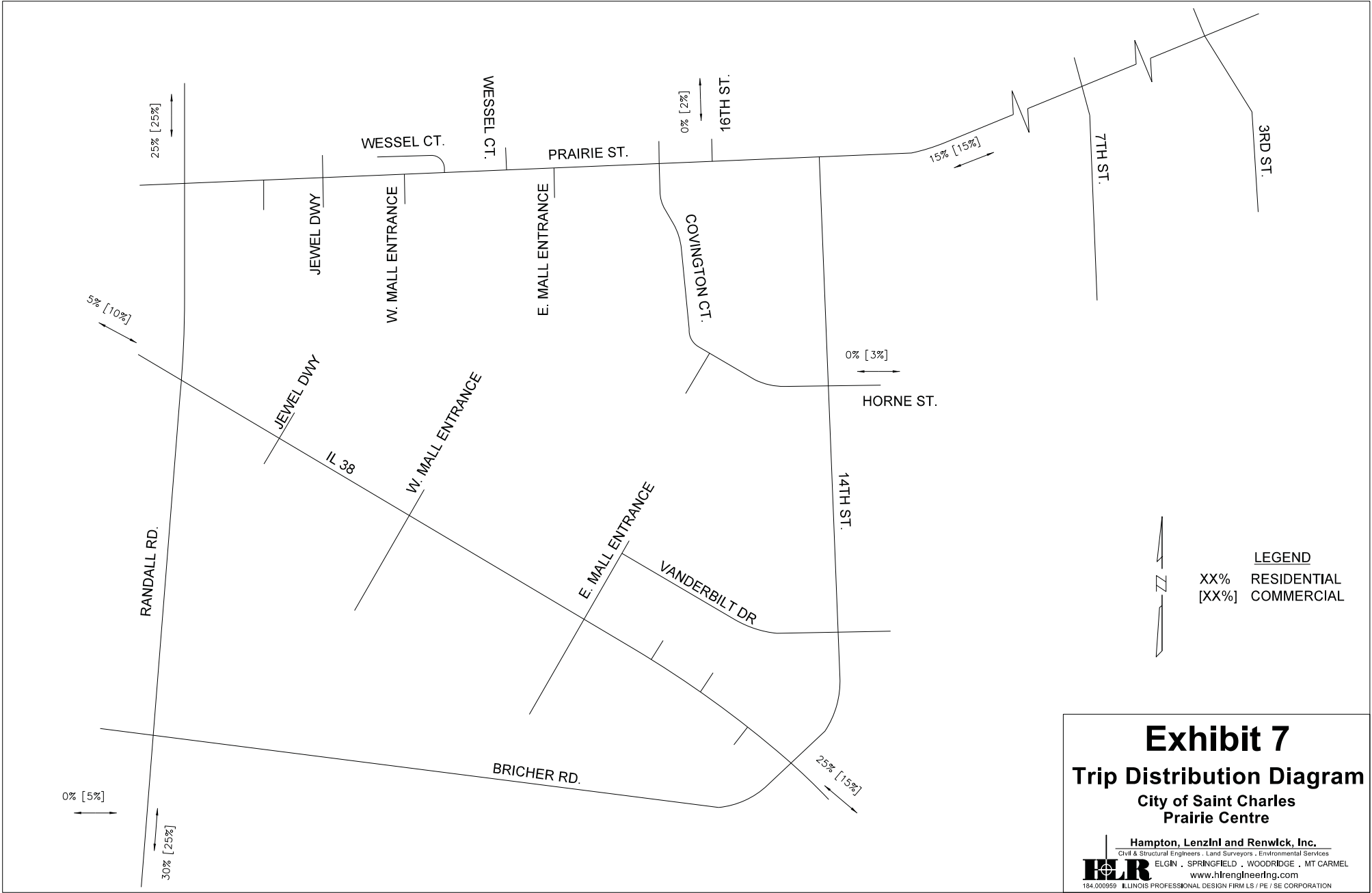




LEGEND  
 AM (PM) [SAT]

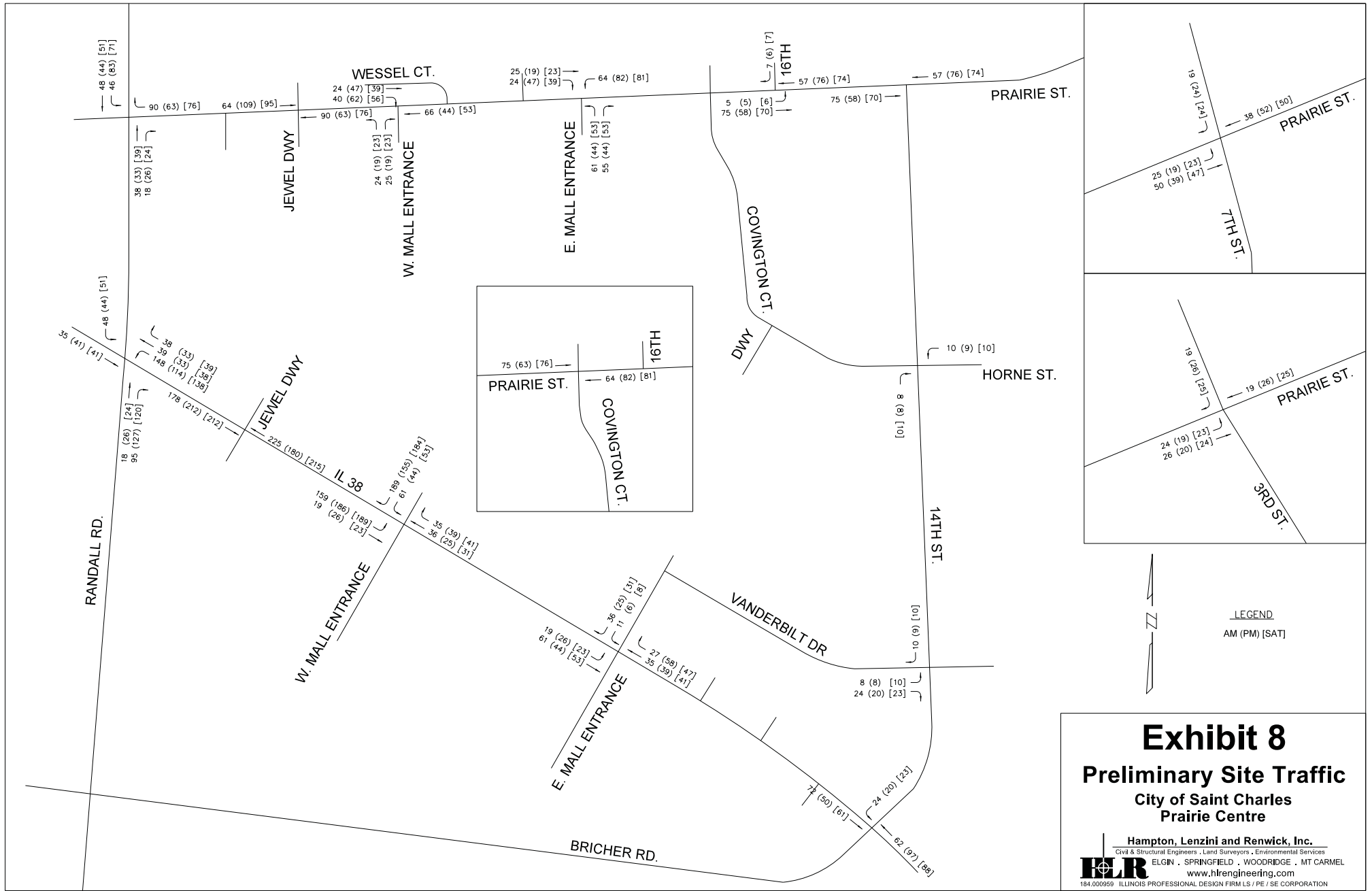
**Exhibit 6**  
**Pass-By Traffic**  
 City of Saint Charles  
 Prairie Centre

Hampton, Lentzini and Renwick, Inc.  
 Civil & Structural Engineers, Land Surveyors, Environmental Services  
 ELGIN • SPRINGFIELD • WOODBRIDGE • MT CARMEL  
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**Exhibit 7**  
**Trip Distribution Diagram**  
 City of Saint Charles  
 Prairie Centre

**Hampton, Lenzini and Renwick, Inc.**  
Civil & Structural Engineers · Land Surveyors · Environmental Services  
**HLR** ELGIN · SPRINGFIELD · WOODRIDGE · MT CARMEL  
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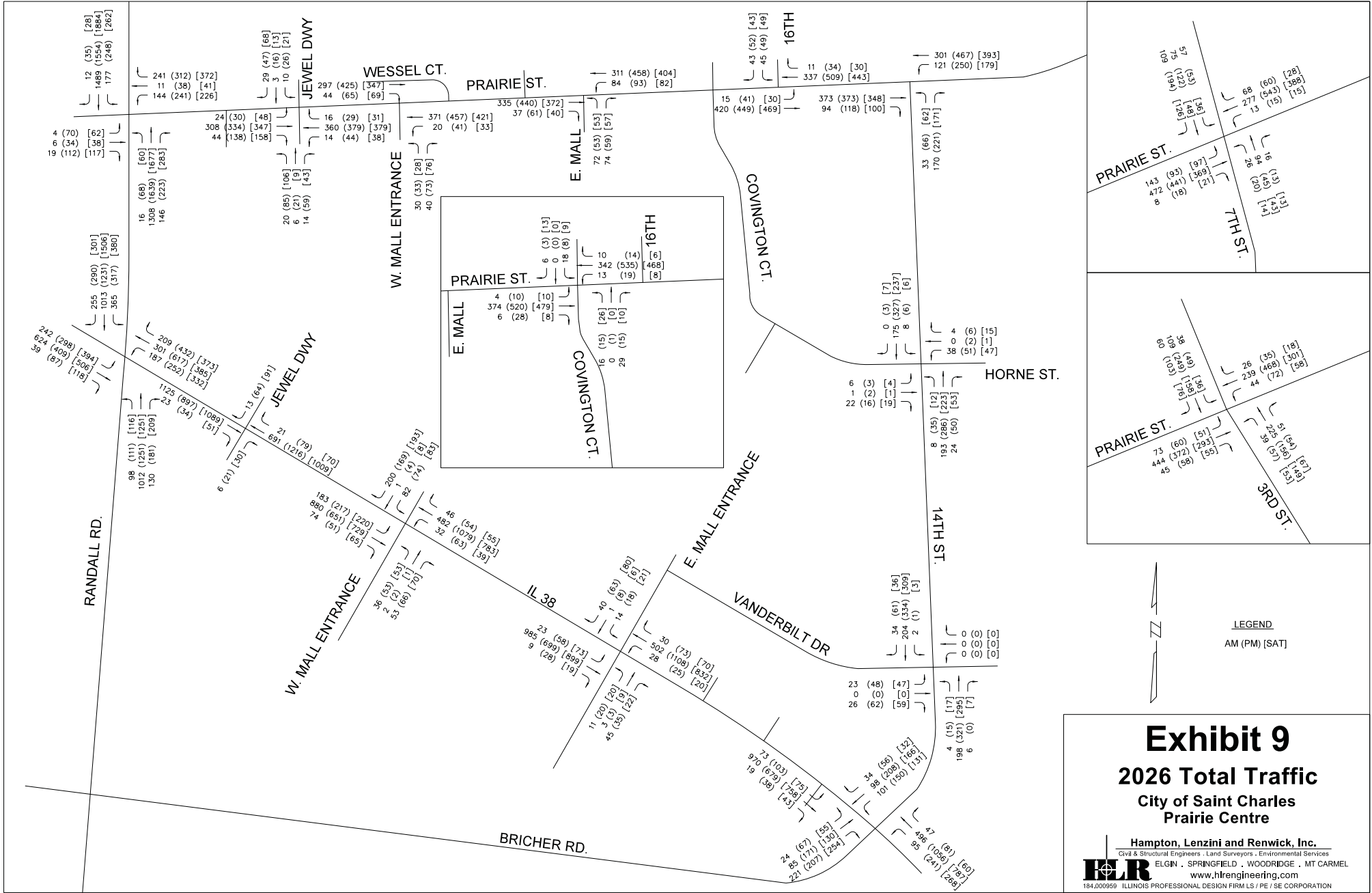


**Exhibit 8**  
**Preliminary Site Traffic**  
 City of Saint Charles  
 Prairie Centre

Hampton, Lenzini and Renwick, Inc.  
Civil & Structural Engineers · Land Surveyors · Environmental Services

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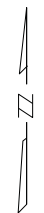
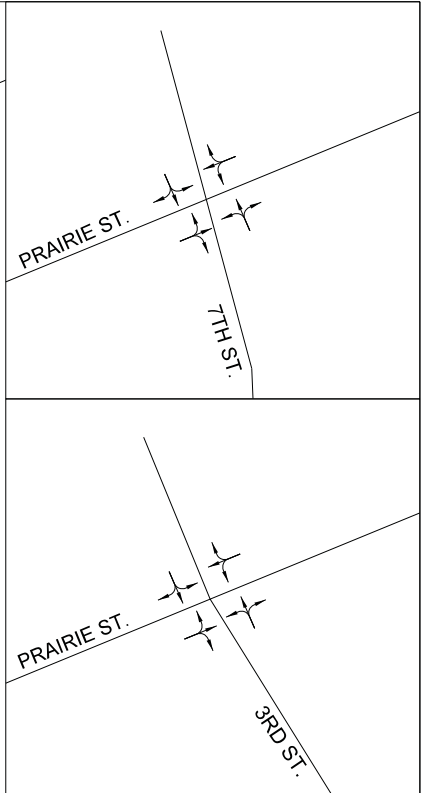
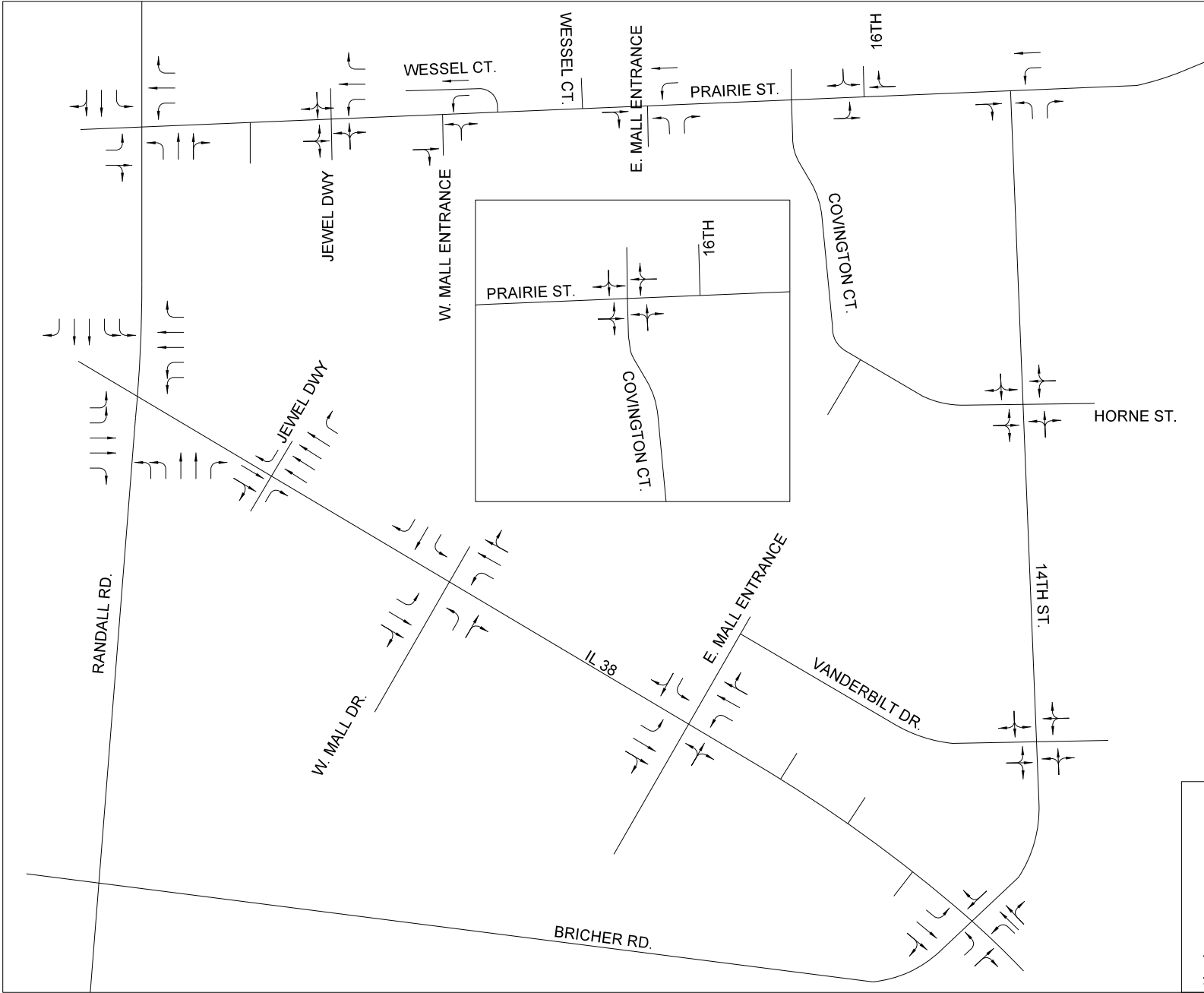
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**LEGEND**  
AM (PM) [SAT]

**Exhibit 9**  
**2026 Total Traffic**  
 City of Saint Charles  
 Prairie Centre

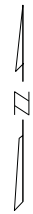
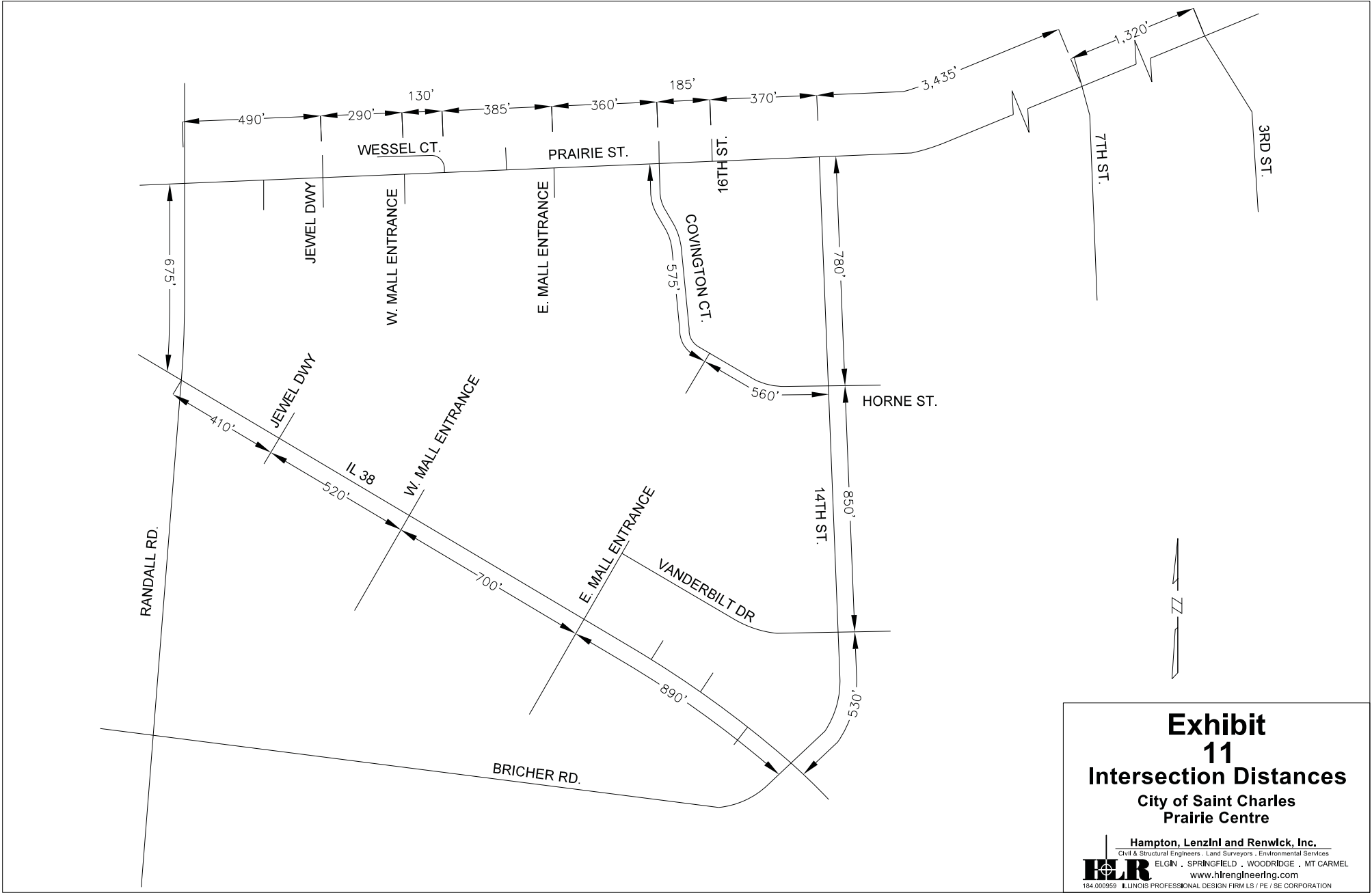
**Hampton, Lenzini and Renwick, Inc.**  
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**Exhibit  
10  
Lane Configurations**  
City of Saint Charles  
Prairie Centre

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**Exhibit**  
**11**  
**Intersection Distances**  
 City of Saint Charles  
 Prairie Centre

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Traffic Volume Entering Intersection			
14th Street	AM	PM	Sat
2026 Base Traffic	962	1361	1109
2026 Total Traffic	1094	1495	1253
% Increase	13.7%	9.8%	13.0%



Legend

- Base Queue
- Added Queue

# Exhibit 12A

## 95% Queue

City of Saint Charles

Prairie Center

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Traffic Volume Entering Intersection				
7th Street	AM	PM	Sat	
2026 Base Traffic	1226	1483	1054	
2026 Total Traffic	1358	1617	1198	
% Increase	10.8%	9.0%	13.7%	

Traffic Volume Entering Intersection				
3rd Street	AM	PM	Sat	
2026 Base Traffic	1305	1642	1218	
2026 Total Traffic	1393	1733	1315	
% Increase	6.7%	5.5%	8.0%	

**Legend**

- █ Base Queue
- █ Added Queue

**Exhibit 12B**  
**95% Queue**  
 City of Saint Charles  
 Prairie Center

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