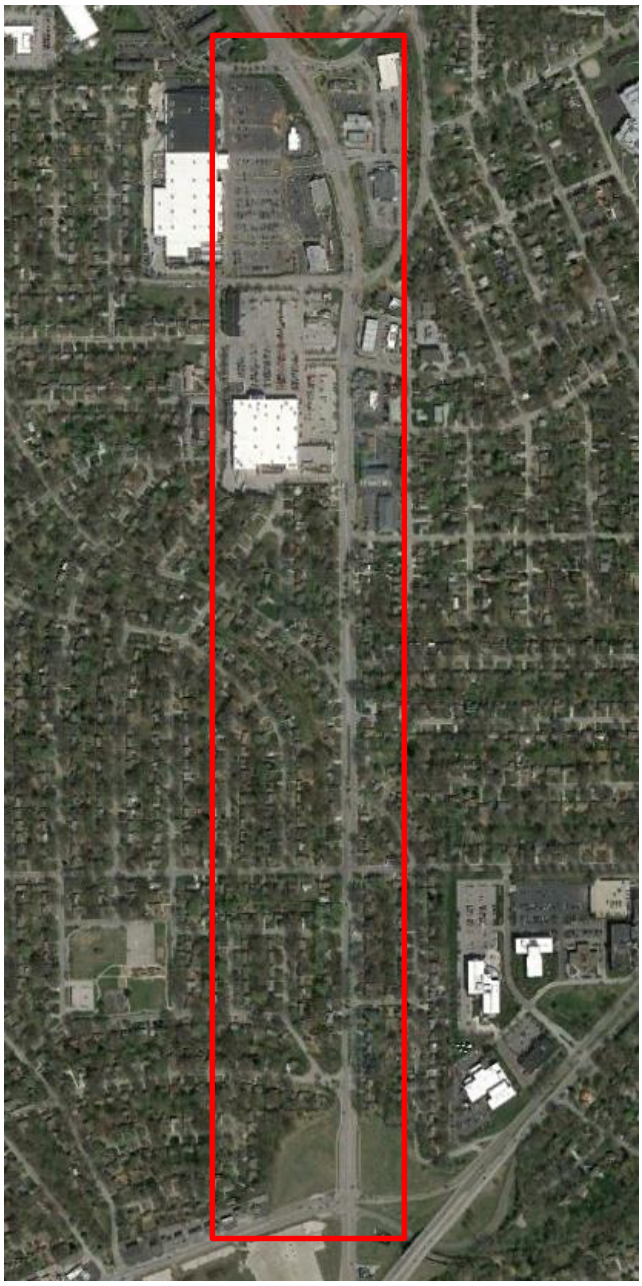
Roe Boulevard Traffic Study



General Location of Study Area

TRAFFIC STUDY

September 2016

Roe Boulevard

Traffic Study

September 2016

I HEREBY CERTIFY THAT THIS REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION, AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER EXISTING UNDER THE LAWS OF THE STATE OF KANSAS

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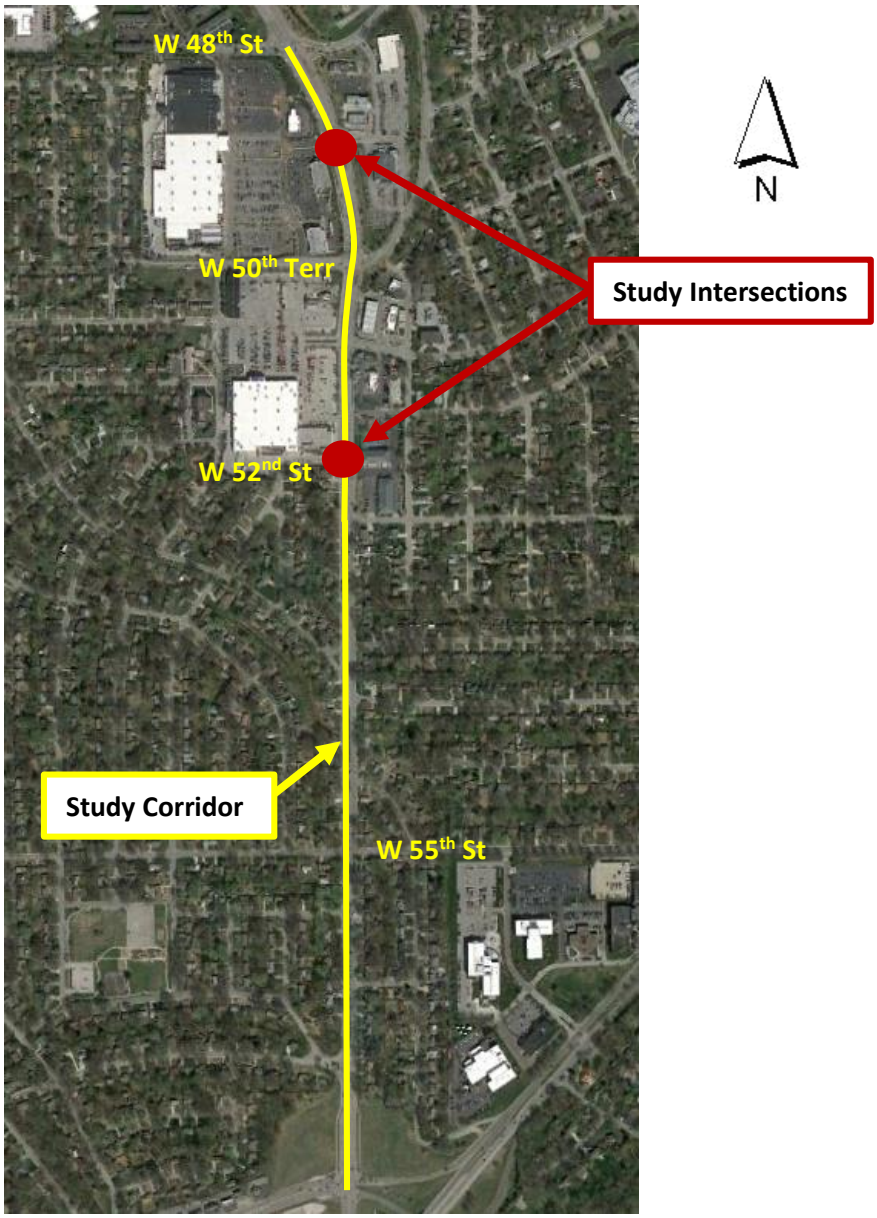
1.1 Purpose and Objectives

The purpose of this study is to assess two existing traffic signals at Bella Roe Plaza's Commercial Drive and at W 52nd Street on Roe Boulevard to recommend improvements to increase capacity and decrease delay along the corridor. Updated traffic counts will also be provided along the Roe Boulevard corridor.

The two study intersections and full study corridor are shown in Figure 1 below:

Figure 1 - Location of Study Intersections



Section 2: Existing Conditions

2.1 Roadway Geometrics

The Roe Boulevard corridor, from Johnson Drive north to W 48th Street, is being evaluated by the city of Roeland Park for means of enhancing efficiencies and safety for all modes of transportation. Of specific interest is a half mile segment between W 48th Street and W 52nd Street which serves numerous major commercial businesses. This section of roadway has two 12-foot northbound and southbound lanes each with a four foot wide raised curb median that separates the northbound and southbound traffic throughout. There are also various combinations of 12-foot dedicated right and left turn lanes at each of the six intersections in this segment. Of the six intersections, five are signalized. The two signalized intersections of interest for this study on Roe Boulevard are located at the entrance to Bella Roe Plaza and the intersection to W 52nd Street that also allows truck access to the CVS and Walmart.

The signal at the entrance to Bella Roe Plaza and Roe Boulevard has dedicated right and left turn lanes on both northbound and southbound Roe Boulevard. The east leg, which provides ingress and egress to a grocery store, fast food restaurant, gas station, and drug store, has a departure lane which is 18 feet wide at the connection to Roe Avenue. The exit of the east leg is 35 feet wide, enough width for individual right and left turn lanes and a through lane. The west leg, which provides access to Bella Roe Plaza, has a departure lane which is 21 feet wide, allowing for two lanes of traffic to enter. There are three lanes for exiting vehicles on this side as well, two left-turn lanes and the remaining lane allowing for through or right turn movements. The intersections to the north and south of the Bella Roe Plaza signal are also signalized. The W 48th Street intersection is approximately 500 feet to the north, and the W 50th Terrace/Roe Lane intersection is approximately 620 feet to the south.

The signal at W 52nd Street has no dedicated turn lanes associated with it. It is a 3-leg intersection, with the third leg running to the west of Roe Boulevard. W 52nd Street is 24 feet wide at the intersection. 25 feet west of the intersection, W 52nd Street has CVS parking to the south and the back side of commercial properties are to the north.

The southern portion of Roe Boulevard is residential from W 52nd Street until Johnson Drive with private driveway access along the Roe Boulevard. The roadway continues from W 52nd Street with two 12-foot lanes running both northbound and southbound. There is a 14-foot grass median that allows for left turn bays when needed to access the residential streets. There is also full curb and gutter on both sides of Roe Boulevard with 6 feet of sidewalk on both sides also. The only signalized intersections in the second segment of Roe Boulevard are at W 55th Street and at Johnson Drive.

2.2 Commercial Presence within the Study Area

There are several businesses in the north study area. Businesses at the Bella Roe Plaza include Lowe's, Price Chopper, US Bank, and several restaurants and other stores in a strip mall on the west, and a Phillips 66, Burger King, Aldi's, and Walgreens to the east of Roe Boulevard. Businesses directly impacted by the light at W 52nd Street include Wal-Mart and CVS.

2.3 Current Operational Issues

The City of Roeland Park is concerned with the operations and flow of traffic on Roe Boulevard, particularly in the northern section of the corridor where there are several traffic signals that are closely spaced.

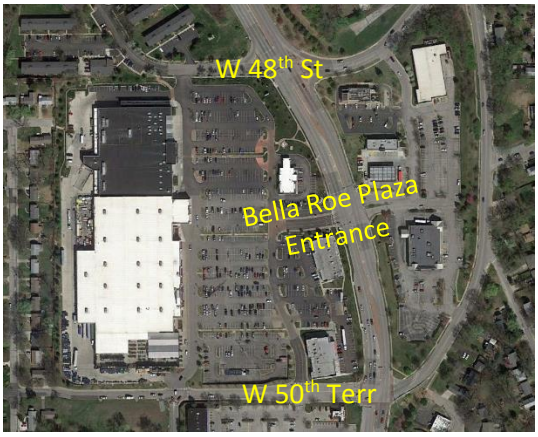
The purpose of this study is to collect and analyze traffic data on Roe Boulevard, and provide analysis and recommendations on the signals.

Section 3: Observed Operational Characteristics

3.1 Bella Roe Plaza Entrance and Roe Boulevard

Peak evening counts were collected on Tuesday, July 26th. The intersection, location shown in Figure 2, was observed to function as needed. There were no noticeable problems with the traffic signal or intersection itself, but the signal disrupts the flow of northbound and southbound traffic, which carry the majority of the vehicles. Figure 3 shows the

Figure 2 - Bella Roe Plaza Entrance Arial



- Southbound vehicles, when stopped at Bella Roe Plaza, back up into the intersection of W 48th Street during peak evening hours.

Figure 3 - Bella Roe Plaza Entrance and Roe Blvd

3.2 W 52nd and Roe Boulevard

Videos for the traffic count and observation of this intersection were completed on July 28th, a Thursday. The location of the W 52nd Street and Roe Boulevard is shown below in Figure 4 and Figure 5 is an image taken of the intersection from W 52nd Street facing east. The following was observed.

Figure 4 – W 52nd Street Arial

- In the morning peak hours, traffic from the intersection at W 51st would often back up in the right northbound lane on Roe Boulevard.
- Most vehicles leaving during the peak hours in both the morning and evening are passenger cars.
- The right turn maneuver from Roe Boulevard to W 52nd Street is tight, especially for trucks. Many of their turns crossed over into the exiting traffic lane. There were no turning conflicts witnessed, and the low traffic volumes entering onto and exiting from W 52nd Street indicate that this would be a rare problem.

Based on these observations, this traffic signal is primarily used by customers during peak hours, although there is the occasional delivery/service truck.

Figure 5 – W 52nd and Roe Blvd Looking East

3.3 Roe Boulevard Corridor Observations

In addition to observing the intersections with traffic signals that are candidates for removal, the corridor as a whole was observed. The following observation was noted.

- The operations of the W 50th Terrace intersection is negatively impacted by queues of southbound vehicles, stopped at adjacent intersections, backing up into the limits of this intersection.

This observation, in concert with observations at Bella Roe Plaza entrance and W 52nd Street, demonstrate the spillover effects of several traffic signals in a small area, hurting the capacity of the roadway.

3.4 Crash History

A five year crash history from 2011 to 2015 was obtained from the City, and is summarized in

Table 1. The bulk of intersection related crashes are on the north segment of Roe Boulevard, at the intersections with the larger volumes of side road traffic.

Table 1 - 2011-2015 Roe Boulevard Crash History

Crash Locations	Number of Crashes
Roe Blvd (non-intesection related)	219
Roe Blvd/W 48th St	61
Roe Blvd/Bella Rose Plaza	4
Roe Blvd/W 50th Terr (Roe Ln)	31
Roe Blvd/W 51st St	15
Roe Blvd/Sycamore Dr	5
Roe Blvd/W 52nd Terr	4
Roe Blvd/W 53rd Ter	1
Roe Blvd/W 54th St	2
Roe Blvd/W 54th Ter	1
Roe Blvd/W 55th St	8
Roe Blvd/W 55th Ter	0
Roe Blvd/W 56th St	0
Roe Blvd/W 57th St	0
Roe Blvd/Johnson Dr	7
TOTAL	**358**

The intersection crash rates were calculated at locations where 24 hour counts were collected along the corridor and crash data were available. As shown in Table 2, W 48th Street has the highest crash rate in comparison to other intersections along the corridor. In order to receive Kansas Department of Transportation (KDOT) Highway Safety Improvement Program (HSIP) funding, an intersection in an urban area should have more than 10 crashes per 10 million entering vehicles over a three year period. Although the three year crash rate is unknown, the five year crash rate fits this criteria.

Table 2 - Intersection Crash Rates, 2011-2015

	Number of Intersection Crashes	Traffic Volumes Entering Intersection	Crashes per million entering vehicles
W 48th Street	61	33440	1.00
W 50th Terrace	31	27574	0.62
W 55th Street	8	21654	0.20

3.5 Existing and Historical Traffic Volumes and Operations

Vehicle and pedestrian volumes were collected on July 26th, 27th, and 28th (Tuesday, Wednesday and Thursday). Exhibit 1 shows the location of each count as well as the type of count collected. Three intersections in the area had 24 hour turning movement counts collected while the remaining intersections only had peak evening, from 4 PM to 6 PM, counts collected. The raw data from these counts are provided in the Appendix of this report. The evening peak hour traffic volumes are shown in Exhibit 2.

An analysis of past traffic counts was completed using data available on Johnson County's Automated Information Mapping System (AIMS). Historical traffic counts were available for the years of 2004 and 2010 at the intersections of W 55th Street and W 51st Street and Roe Boulevard. Table 3 shows the total Roe Boulevard counts found on AIMS and the traffic counts collected for this study. Traffic volumes have overall declined, although are bouncing back. Considering that the land in the area of the study has been fully developed, any large increase in traffic will likely occur only with future redevelopment that increases residential or commercial density.

Table 3 - Historical Traffic Counts on Roe Boulevard

Intersection	2004	2010	2016
W 55th Street & Roe Boulevard	21,706	19,160	19,676
W 51st Street & Roe Boulevard	23,605	19,980	21,512

All intersections were analyzed using the Highway Capacity Manual's methodology for rating how well intersections are operating using a level of service (LOS) rating. LOS ratings range from A to F, where A means an intersection is operating well and average delays are very short, typically less than 10 seconds, and a LOS rating of F indicates the intersection is at its effective capacity and average delays have become lengthy, typically over 60 seconds. The LOS for each intersection were assessed for the peak evening period. A summary of the results of these analyses can be seen in Table 4 below and the full reports are located in the Appendix.

Table 4 - Existing LOS for Study Intersections

Intersection	Peak PM LOS
Skyline Dr & North Bella Roe Plaza Entrance*	C
W 48th St & Roe Blvd	C
Bella Roe Plaza East Entrance & Roe Blvd	A
Roe Ln/W 50th Terr & Roe Blvd	C
W 50th Terr & T-Mobile/Bella Roe Plaza South Entrance*	C
W 50th Terr & Cedar*	B
W 51st St & Roe Blvd	A
Sycamore Dr & Roe Blvd*	E
W 52nd St & Roe Blvd	A
W 55th St & Roe Blvd	B

* Denotes stop controlled intersections, leg indicated has the worst approach LOS

A signal warrant analysis was also completed using existing conditions for the intersections at the Bella Roe Plaza entrance and W 52nd Street and Roe Boulevard. There are nine warrants, or sets of conditions, where installation or removal of traffic signals may be considered. The meeting of one of the warrants does not require the installation of a signal nor does not meeting any of the warrants require the removal of a signal.

With existing traffic patterns, a traffic signal is warranted at the entrance to Bella Roe Plaza, meeting warrants 1 - eight-hour vehicular volume, 2 - four-hour vehicular volume, and 3 - peak hour. However, at the intersection of W 52nd Street, the signal does not meet any of the warrants. The report of the results of the analyses can be found in the Appendix, and further discussion on the signal warrants will continue in the analysis.

3.6 Existing Intersection Sight Distance at Study Intersections

The intersection sight distance was observed in the field on Wednesday, August 24 at the two study intersections. Guidance for intersection sight distance can be found in AASHTO's (American Association of State Highway and Transportation Officials) Policy on Geometric Design of Highways and Streets. This guidance ensures drivers have enough time to gauge if there is an adequate gap in traffic and to make the desired turning maneuver. The following results were found during the sight distance study.

3.6.1 Bella Roe Plaza Entrance and Roe Boulevard

As the intersection is currently constructed, sight distance is only necessary for right turning movements off the side road, as through and left turning movements are protected by the traffic signal. The available sight distance for tight turn movements was field measured to meet required sight distance lengths for a passenger car. If the traffic signal were to be removed, which is part of this study, the left turn and through movements would not have adequate sight distance for eastbound traffic due to trees and shrubbery as well as the fountain at the entrance. A diagram of the sight distances can be seen in Exhibit 3.

3.6.2 W 52nd Street and Roe Boulevard

The sight distance required for a stop sign at W 52nd Street and free flowing traffic on Roe Boulevard was analyzed, as shown in Exhibit 3. The sight distance requirements were met, although some trees and shrubs were in the way to see oncoming northbound traffic when considering the sight distance required for a semi-truck. Sight distance for southbound traffic was adequate and reaches back to the signalized intersection at W 51st Street.

Section 4: Analysis and Recommendations

4.1 Bella Roe Plaza and Roe Boulevard Analysis and Recommendations

The traffic signal at the access point to Bella Roe Plaza on Roe Boulevard was analyzed to consider its removal. In order to continue a satisfactory flow of traffic at this intersection, removal of eastbound and westbound through and left turn movements were considered.

4.1.1 Corridor Operations

As mentioned in Section 3.5 - Existing and Historical Traffic Volumes and Operations, signal warrants were found to be met for the intersection of the Bella Roe Plaza access point and Roe Boulevard. However, the meeting of one of the warrants does not require the installation of a signal nor does not meeting any of the warrants require the removal of a signal. The spacing of the signalized intersections along the north section of Roe Avenue are much closer than access management principles would suggest is desirable. The corridor exhibits several of the operational issues that can occur with closely spaced signals. Thus, operations were reviewed under a scenario where this signal was removed and a portion of the intersection movements were reallocated to adjacent intersections.

The current LOS for the intersection at Bella Roe Plaza and Roe Boulevard is a B. A LOS B is more than acceptable during peak hour traffic. When looking at each approach, northbound and southbound traffic

on Roe Boulevard both have LOS A and the eastbound and westbound approaches have LOS of D and E respectively, with the worst movements being left turns and through movements. Reports with the LOS can be seen in the Appendix.

If the intersection remained as it is, but had minor road stop control for eastbound and westbound traffic, the LOS for the intersection would be F due to the minor road left turns and through movements failing. However, when removing the left and through movements from eastbound and westbound traffic, the LOS of the intersection is B. However, this could cause deterioration in LOS at nearby intersections as the through and left turning movements will either head north to W 48th Street or south to W 50th Terrace to get to Roe Boulevard.

To see the impacts the redistributed traffic would incur on both W 48th Street and W 50th Terrace intersections with Roe Boulevard, the LOS was reevaluated at those locations. Overall, the LOS is only negatively impacted at the Bella Roe Plaza intersection with W 50th Terrace where the additional left turns cause the southbound leg's LOS to decline from C to D. All existing and proposed LOS can be seen in Table 5. The LOS actually improves at W 50th Terrace and W 48th Street intersections with Roe Boulevard, this is due to the optimized signal timings and removal of the Bella Roe Plaza signal.

Table 5 – Intersections near Bella Roe Plaza - Existing and Proposed LOS

Intersection	Existing Peak PM LOS	Proposed Peak PM LOS
Skyline Dr & North Bella Roe Plaza Entrance, SB Leg*	C	C
W 48th St & Roe Blvd	C	B
Bella Roe Plaza & Roe Blvd, EB/WB Legs*	A	B
W 50th Terr & T-Mobile/Bella Roe Plaza South Entrance, SB Leg*	C	D
W 50th Terr & Cedar, NB/SB Leg*	B	B
Roe Ln/W 50th Terr & Roe Blvd	C	B

* Denotes stop controlled intersections, leg indicated has the worst approach LOS

The delay time at the Bella Roe Plaza intersection is also reduced, from a total 5.9 hours of delay during the peak PM hour to 1.3 hours of delay with the signal removed.

4.1.2 Safety

When assessing safety at the intersection, the Highway Safety Manual's (HSM) Part C – Predictive Methods were utilized. The HSM is a relatively new assessment tool that quantifies safety with equations that predict the number of crashes along a roadway or at an intersection using several variables including traffic volumes, number of left and right turn lanes among other variables. While the actual crashes predicted for these intersections may not be accurate as there is no calibration factor yet available, looking at percentage change in these numbers indicates the expected changes in safety. Removing the signal and exiting through and left turning traffic, reduces the average predicted number of crashes by 40%.

Although safety will be improved at this intersection, it will have a slightly negative impact on the nearby intersections the exiting vehicles will be rerouted to. In the assessment, the intersection of W 48th Street and Roe Boulevard sees a crash increase of less than 5% due to the projected increase in eastbound and westbound traffic. The intersection at W 50th Terrace and Roe Boulevard sees an even smaller increase of 3% crashes per year. Overall, there will likely be a net reduction in crashes.

4.1.3 Impact on Businesses

Access to businesses in the Bella Roe Plaza on the west and Walgreen's and other business on the east of Roe Boulevard will remain as it currently is, but much of the exiting traffic will be forced to nearby intersections. As streets become significantly more congested, state transportation agencies have found solutions in implementing access management. Access management, configuring roadway entrance and exit points to improve traffic safety and flow, is a way that traffic congestion can be alleviated without making significant changes to the existing roadway. For retail businesses, more access is seen as more business; therefore access management is often seen as a negative change. Business owners worry that customers who cannot access their stores from the multiple entrances that existed before will leave and conduct their business somewhere else. In addition to this, a common belief among businesses is to think that slower traffic will bring more consumers in because drivers stuck in traffic will be exposed to their business for a longer period of time. However, through a multitude of different studies, both of these hypotheses have been proven false.

Managing the access points in and out of different retail areas significantly increases the flow of traffic and in effect either have no impact, or have a positive impact on the businesses in that area. One way that the flow of a road is improved is by decreasing the amount of crashes that occur. A national study of nearly 40,000 crashes in the late 1990s found that an increase from 10 to 20 access points per mile increased the crash rate by about 30% on major arterial roads. Reports by the National Highway Institute show that just a 10 percent reduction in average travel speed can lead to a business losing 20% of its market area. In Iowa, businesses in an area where access management practices were implemented had only five percent reporting a decrease in sales, with the other 95 percent reporting no change or growth in sales. By improving traffic flow, the number of customers that are exposed to businesses along the road rises. This is especially beneficial for businesses that depend on passerby customers. "Destination" businesses such as doctors, specialty retail stores, and service-oriented businesses have been shown generally unaffected by access management practices because of their consistent consumer base.

Though some business owners worry about added time to reach their stores, it has been shown that businesses are not negatively affected by limiting the number of access points to their location. It should be noted that location and access are not the most important factors that determine whether a business succeeds of fails. One study done in Orlando showed that most customers do not mind making U-turns to get to their destination. A study done in 1996 collected before and after data during access management improvements and showed that close to 80 percent of businesses did not report any complaints about changes in access. Businesses tend to overemphasize the importance of accessibility to their store, especially when comparing it to other aspects like customer service and product quality.

Access management is a tool that increases the roadway safety of an area while simultaneously boosting the economy. When access management techniques are applied, traffic flow increases, reducing overall delay and increasing the number of customers that are exposed to surrounding businesses. It has been noted by multiple sources that consumers don't mind going slightly out of their way in order to get to a business. Accessibility is made a priority, and for drivers and business owners this makes the overall experience superior.

4.1.4 Cost

The annual maintenance and operations of a typical traffic signal is about $8,000 per year. This includes cost of electricity, preventive maintenance, responding to trouble/outage calls, replacement of worn components, and retiming efforts which should be done every few years. There is also the capital expenditure cost of replacing the entire traffic signal, which can occur every 20-30 years. The cost of a new signal is approximately $250,000 for a 4-leg signal. In the next 20 years, assuming the traffic signal would be replaced, average annual maintenance, and retiming of the signal, the cumulative cost would approach $410,000.

4.1.5 Recommendations

The removal of the signal at Bella Roe Plaza is recommended if the city is able to remove both the through and left turn movements for exiting traffic. Doing so will maintain the operations of the intersection and improve the operations of the corridor by increasing the distance between adjacent signal at W 48th Street and 50th Terrace to over 1,000 feet. Doing so will also greatly reduce crashes at this intersection. A slight increase in crashes will be seen at nearby intersections, but overall a reduction in crashes is expected. The sight distance is adequate for motorists making right turns into northbound and southbound traffic.

To remove the signal, further engineering work would need to be completed to meet the Manual on Uniform Traffic Control Devices (MUTCD) standards. Section 4B.02 outlines the steps for removal of a traffic signal as the following:

A. Determine the appropriate traffic control to be used after removal of the signal.
B. Remove any sight-distance restrictions as necessary.
C. Inform the public of the removal study.
D. Flash or cover the signal heads for a minimum of 90 days, and install the appropriate stop control or other traffic control devices.
E. Remove the signal if the engineering data collected during the removal study period confirms that the signal is no longer needed.

The first two items on the MUTCD have been examined in this study. It is recommended to use minor road stop control, placing a stop sign on the east and west legs of the intersection, for the right-out only traffic. There are a few sight-distance restrictions for the exiting right turns which will need to be resolved. A few bushes may need to be trimmed, but nothing substantial. The last three items on the list provided by the MUTCD would need to be completed if the city were to continue with the removal of the signal.

4.2 W 52nd Street and Roe Boulevard Analysis and Recommendations

The intersection at W 52nd Street and Roe Boulevard has the second signal to be considered for removal. The primary reason for the signal was to allow easier egress for trucks making deliveries to businesses located to the northwest corner of the intersection.

4.2.1 Intersection Operations

A signal warrant analysis was completed for the intersection of W 52nd Street and Roe Boulevard. The warrant analysis indicates that a signal is not warranted at this location, due to the low traffic volumes on the west leg of the intersection. The completed warrant analysis can be seen in the Appendix.

The current LOS for the intersection at W 52nd Street and Roe Boulevard is an A. A LOS A indicates the intersection is operating as well as it can. When looking at each approach, northbound and southbound traffic on Roe Boulevard both have LOS A and westbound approach on W 52nd Street has a LOS D. A report with the LOS can be seen in the Appendix.

If the traffic signal was removed from the intersection and the operations changed to minor road stop control, the northbound and southbound lanes would operate at a LOS B and the exiting eastbound lane would operate at a LOS of E. As the number of vehicles using this approach is small, only 11 vehicles used this approach during peak hour, the LOS deterioration in converting to stop control would impact few drivers.

The total delay at the intersection decreases from 0.5 hours to 0.2 hours with the removal of the traffic signal.

4.2.2 Safety

When assessing safety at the intersection, the Highway Safety Manual's (HSM) Part C – Predictive Methods were utilized. The HSM is a relatively new assessment tool that quantifies safety with equations that predict the number of crashes along a roadway or at an intersection using several variables including traffic volumes, number of left and right turn lanes among other variables. While the actual crashes predicted for these intersections may not be accurate as there is no calibration factor yet available, looking at percentage change in these numbers indicates the expected changes in safety. Removing the signal reduces the average predicted number of crashes by 27%.

4.2.3 Impact on Businesses

Converting this intersection to minor road stop control should have minimal impact on businesses as most of the traffic for businesses enters from the two intersections to the north, at W 50th Terrace and W 51st Street. The removal of the signal will most impact any trucks making deliveries to the businesses. As most of the truck traffic does not occur during peak hours, the city may want to have discussions with the businesses to ensure that removing the signal will not negatively impact trucks making deliveries.

4.2.4 Cost

The annual maintenance and operations of a typical traffic signal is about $8,000 per year. This includes cost of electricity, preventive maintenance, responding to trouble/outage calls, replacement of worn components, and retiming efforts which should be done every few years. There is also the capital expenditure cost of replacing the entire traffic signal, which can occur every 20-30 years. The cost of a new signal is approximately $200,000 for a 3-leg signal. In the next 20 years, assuming the traffic signal would be replaced, average annual maintenance, and retiming of the signal, the cost would exceed $385,000.

4.2.5 Recommendations

It is recommended to remove the signal at W 52nd Street and Roe Boulevard. There is minimal side road traffic at this location and few trucks using it during the peak hours, causing the signal to not be warranted. As far as safety is concerned, removing the signal will reduce the chance of a crash at this location.

To remove the signal, the same MUTCD guidelines provided in Section 4.1.5 of this report will need to be followed. This study recommends placing minor road stop control, which would be on the west leg of the intersection on W 52nd Street. There are some trees that may need to be trimmed to meet sight distance requirements for left turning vehicles that are watching for appropriate gaps in the northbound traffic. The last three items on the MUTCD list would need to be completed if the city were to continue with the traffic signal removal process at this location.

4.3 Corridor Analysis and Recommendations

As mentioned in the previous sections in this section, while there are improvements at the selected intersections of study, the redistribution of traffic could have a negative impact on surrounding intersections and the corridor as a whole. This section will examine the impacts to other intersections along the corridor.

4.3.1 Corridor Operations

Because of the close proximity of the intersections along Roe Boulevard, the operations of the corridor as a whole also need to be evaluated. Minimizing the number of traffic signals can decrease delays as every traffic signal per mile added to a road is shown to reduce through travel speed by two to three mph. Evaluations were completed using the Synchro and SimTraffic software that are able to evaluate not only a single intersection but also the Roe Boulevard corridor. To properly evaluate the proposed corridor with the two removed signals, the signal timings, lengths and lead/lag phasing were optimized from the existing timings that they currently run on. These timings can be found in the Synchro outputs in the Appendix of this report.

Table 6 and

Table 7 show different parameters that SimTraffic evaluated on the Roe Boulevard corridor for the northbound and southbound traffic respectively for both the existing corridor and the proposed corridor, which removes the traffic signals at Bella Roe Plaza and W 52nd Street. Table 8 compares the total delay, travel time, and number of stops during the peak evening hour along Roe Boulevard, showing a decrease in each category with the proposed signal removal.

Table 6 - Northbound Corridor Statistics

	Existing Corridor	Proposed Corridor
Average Delay (s/veh)	34.9	26.9
Travel Time (s)	79.5	71.7
Arterial Speed (mph)	20	22

Table 7 - Southbound Corridor Statistics

	Existing Corridor	Proposed Corridor
Average Delay (s/veh)	28.3	23.9
Travel Time (s)	76.5	72.5
Arterial Speed (mph)	22	24

Table 8 - Corridor Statistics Over Evening Peak Hour

	Existing	Proposed	Change
Total Delay (hr)	39.5	30.9	- 8.6
Total Travel Time (hr)	82.8	72.1	- 10.7
Total Stops	4550	4100	- 450

Looking at the SimTraffic output, it can be seen that removing the two signals and optimizing timing along the corridor decreases delay and travel time and increases the average travel speed. The impact is greater for northbound vehicles. It should be noted that these are the times produced by simulated software and using the phase timings available in the traffic signal cabinets. While in the field, it took roughly 120 seconds to travel the corridor in the southbound movement, which is more than the simulated estimation of 76.5 seconds.

Table 9 shows the effects of the removal of the signals by comparing the LOS before removal to after. The decrease in LOS at the W 52nd Street intersection is due to the west leg only, which was at a LOS D for the approach in existing conditions.

Table 9 – Roe Boulevard Corridor Existing and Proposed LOS

Intersection	Existing Peak PM LOS	Proposed Peak PM LOS
W 48th St & Roe Blvd	C	B
Price Chopper/Lowes East Entrance & Roe Blvd*	A	B
Roe Ln/W 50th Terr & Roe Blvd	C	B
W 51st St & Roe Blvd	A	A
Sycamore Dr & Roe Blvd*	E	E
W 52nd St & Roe Blvd*	A	E

* Denotes stop controlled intersections, leg indicated has the worst approach LOS

4.3.2 Corridor Safety

While the effects of the removal of the traffic signals at both Bella Roe Plaza and W 52nd Street were evaluated, the relatively high crash rate at W 48th Street and Roe Boulevard was another concern for safety along the corridor.

An investigation into the qualifications for receiving Highway Safety Improvement Program (HSIP) funds was conducted to help the city find funding to increase safety at this intersection. The following the four guidelines outlined by the Federal Highway Administration (FHWA) are the standards that must be met:

- Address a priority in the State's Strategic Highway Safety Plan (SHSP).
- Be identified through a data-driven process.
- Target and identified safety problem.
- Contribute to a reduction in fatalities and serious injuries.

The Kansas Department of Transportation (KDOT) SHSP has a goal of reducing injury and fatal crashes at intersections, using both innovative and proven engineering countermeasures. These can include utilizing advancing street name signs, signal pre-emption that gives right-of-way to emergency vehicles, and signal coordination via real-time adaptive traffic signal technology. Improvements to W 48th Street and Roe Boulevard would likely meet KDOT's standard.

KDOT also requires that the three year crash rate of an intersection in an urban area be at least 10 crashes per 10 million entering vehicles (TMEV). They also require the official crash reports and a collision diagram for the intersection as well as proposed improvements for the intersection. Plans have been made to improve this intersection, but a safety evaluation would need to be completed to determine the benefit/cost ratio.

4.3.3 Corridor Recommendations

To further improve the corridor flow and operations, it is recommended to improve the signal timings and phasings on the traffic signals that will remain along the Roe Boulevard corridor. The recommended changes can be seen in both the Synchro report in the Appendix.

4.4 Summary of Recommendations

The Roe Boulevard corridor just south of I-35 is contains a dense cluster of commercial development while also serving residents of Roeland Park throughout the 1.1 mile long corridor. Currently, the five signals in the 0.4 mile stretch of Roe Boulevard can cause many delays and less than desirable operations. In order to improve the corridor flow, the following recommendations are being made:

- Remove the signal at Bella Roe Plaza/Walgreen's and Roe Boulevard to reduce delays caused by the existing traffic signal and improve traffic flow through the corridor. Through and left turning movements from the east and west legs will need to be removed and redirected to the intersections of W 48th Street and W 50th Terrace.
- Remove the signal at W 52nd Street and Roe Boulevard to reduce delays and improve overall operations on the southern portion of the corridor.
- Improve and update signal timings at remaining traffic signals at W 48th Street, W 50th Terrace, and W 51st Street intersections to further improve the flow of the corridor.

Following these recommendations will improve the flow, operations and safety of the Roe Boulevard corridor.