



KINGSHIGHWAY TRAFFIC STUDY

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Prepared for:
City of St. Louis
Board of Public Service



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PURPOSE

The purpose of this study is to develop strategies to calm traffic and increase safety along Kingshighway Boulevard between Nottingham Avenue and Gravois Avenue. Kingshighway Boulevard functions as an arterial street that prioritizes vehicle traffic. Kingshighway Boulevard has two traffic lanes in each direction and traffic signal cycles are long to accommodate through traffic. Many areas along the corridor lack adequate pedestrian and bicycle infrastructure.

The land use context along this section of Kingshighway Boulevard is mostly residential with small businesses and restaurants occupying several existing commercial buildings. Side streets crossing Kingshighway Boulevard are almost exclusively residential with more and more residents wanting a more walkable community and urban experience.

Lower traffic volumes on this segment of Kingshighway Boulevard and multiple travel lanes encourage speeding along the corridor. Residents are concerned about it and its safety implications. Concrete barriers are installed in front of the homes south of Gresham Avenue to stop errant vehicles from leaving the roadway and keeping their homes safe. The corridor needs a solution that discourages speeding rather than attempts to defend itself from it.

Implementing a lane reduction strategy along Kingshighway Boulevard would help reduce speeding, improve safety, and promote a more welcoming environment for all users of the street, including pedestrians, cyclists, and transit users. This study objectively evaluates the feasibility of a lane reduction along this section of Kingshighway Boulevard by detailing its anticipated benefits and impacts to traffic. Included in the proposed lane reduction are recommended intersection safety improvements, most notably at Kingshighway Boulevard and Neosho Street/ Christy Boulevard.





LOCATION

The study area includes Kingshighway Boulevard between Nottingham Avenue to the north and Gravois Avenue to the south. This area touches three City of St. Louis Wards - 12, 13, and 14 - and three neighborhoods - Boulevard Heights, Princeton Heights, and South Hampton. Ward and neighborhood maps are shown in **Figures 1 and 2**.

The three surrounding neighborhoods are predominantly single-family homes. The northern end of the corridor on the east side of Kingshighway Boulevard is commercial and includes a large retail center with off-street parking. The middle portion of the study area is mostly residential with scattered small-scale commercial uses. This mix of land uses continues until the southern end of the corridor at Gravois Avenue which has commercial uses on three quadrants of the intersection and a school in the northeast quadrant.



Figure 1. Kingshighway Boulevard City Wards



Figure 2. Kingshighway Boulevard City Neighborhoods





SCOPE

To assess the feasibility of a lane reduction, this study evaluates existing conditions along Kingshighway Boulevard based on the current configuration of the corridor. Existing conditions included vehicular, pedestrian and bicyclist accommodations and traffic volumes; parking; speed; safety and the overall environment of the corridor. These conditions were then compared to a lane reduction configuration.

Both scenarios were evaluated using existing traffic volumes, focusing on the major intersections:

- Kingshighway Boulevard and Nottingham Avenue
- Kingshighway Boulevard and Neosho Street/Christy Boulevard
- Kingshighway Boulevard and Eichelberger Street
- Kingshighway Boulevard and Rhodes Avenue
- Kingshighway Boulevard and Schollmeyer Avenue
- Kingshighway Boulevard and Gravois Avenue



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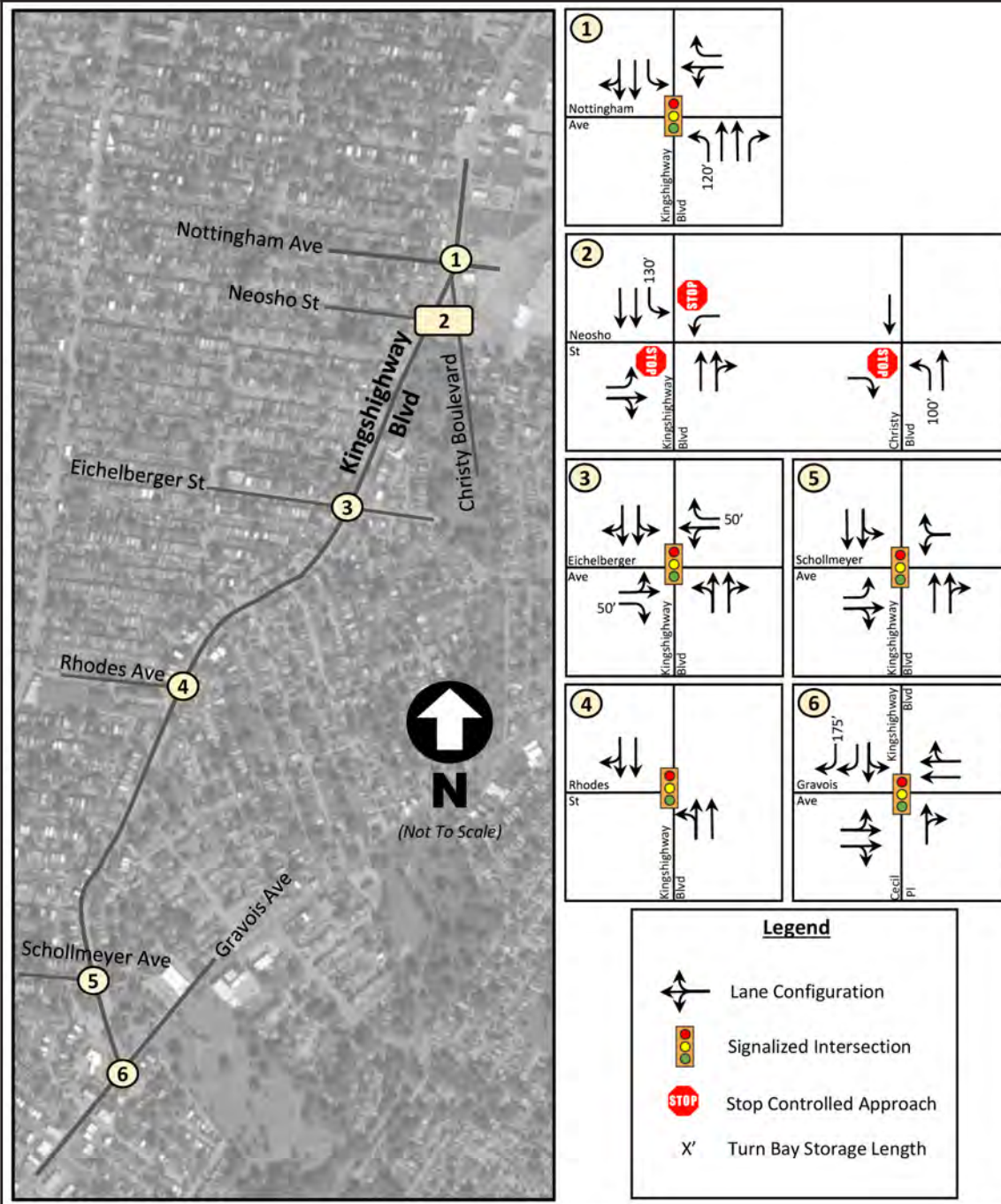
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Figure 3. Existing Lane Configurations



Lane Configuration

In the study area, Kingshighway Boulevard is a four-lane road with two travel lanes in each direction. The curb-to-curb width is approximately 60 feet from Neosho Street to Gravois Avenue. The width increases between Nottingham Avenue and Neosho Street due to the merging of two northbound lanes from Christy Boulevard; it is over 100 feet at its widest point.

The study corridor contains five signalized intersections. The four northern signals operate as part of a coordinated system maintained by the City of St. Louis. The Missouri Department of Transportation (MoDOT) operates the southern most intersection at Kingshighway Boulevard and Gravois Avenue. The lane configuration and method of traffic control at each study intersection is depicted in **Figure 3**.

Areas of Concern

With respect to roadway geometrics, there are several notable areas of concern along the corridor. The first is the northern most intersection of Kingshighway Boulevard, Neosho Street, and Christy Boulevard.

As shown in **Figure 4**, Neosho Street intersects Kingshighway Boulevard with side-street stop-control however the southbound left turn is pulled north from this main intersection and accommodated with an exclusive turn lane. Those on the east leg of Christy Boulevard traveling north and heading towards the westbound approach at the intersection must yield to those making this southbound left turn, which has heavy movement in the afternoon peak period. In addition, an active firehouse sits between Kingshighway Boulevard and Christy Boulevard.

This existing intersection configuration requires extra pavement, making the intersection larger than it needs to be, and creating unclear and unsafe paths for drivers and pedestrians.

Another area of concern is along Kingshighway Boulevard between Gresham Avenue and Bonita Avenue, shown in **Figure 5**. This segment has a significant horizontal curvature which is unsafe for motorists travelling at high speeds.





Figure 6. Pedestrian Crossings Along Major Intersections



Pedestrian Conditions

Sidewalks line both sides of Kingshighway Boulevard along the length of the corridor. The width of sidewalk varies by location from standard 5-foot sidewalks to wide 15-foot sidewalks. The signalized intersections have at least one marked pedestrian crosswalk with push buttons and pedestrian signal indicators; most have more than one leg marked with pedestrian accommodations. Signalized pedestrian facilities and curb ramps are generally not compliant with the regulations set forth in the Americans with Disabilities Act (ADA). Sidewalk conditions vary throughout the corridor. **Figure 6** shows the general crossing distance at each major intersection within the study area.

The intersection of Kingshighway Boulevard and Neosho Street is a concern also from a pedestrian standpoint since the east leg does not provide connectivity to the sidewalk on the east side of Christy Boulevard where these roads intersect. As already noted, this area has expansive pavement and several uncontrolled vehicular movements.



Bicycle Amenities

Kingshighway Boulevard through the study corridor does not have bicycle accommodations or markings however it is located within a network of dedicated and shared lane facilities.

Gravois Avenue, at the southern edge of the study corridor, has a share-the-road configuration denoted by painted “sharrows” with dedicated bike lanes beginning further east of Kingshighway. To the east, the Gravois Avenue bike lanes connect to Morganford Road, a north-south route with “sharrows” and access to Tower Grove Park.

Eichelberger Street, cutting east-west across the middle of the corridor also has a share-the-road configuration with painted “sharrows.” Eichelberger Street intersects Macklind Avenue west of the study area, another north-south route with “sharrow” bike accommodations all the way north to Oakland Avenue near Forest Park.

Christy Boulevard, running parallel to Kingshighway from Gravois Avenue until it intersects Neosho Street, has dedicated striped bike lanes in both directions.

A map of the designated bicycle routes is shown in **Figure 7**.

Figure 7. St. Louis's Bike Lane and Sharrow Network with Proposed Alternative Bike Lanes

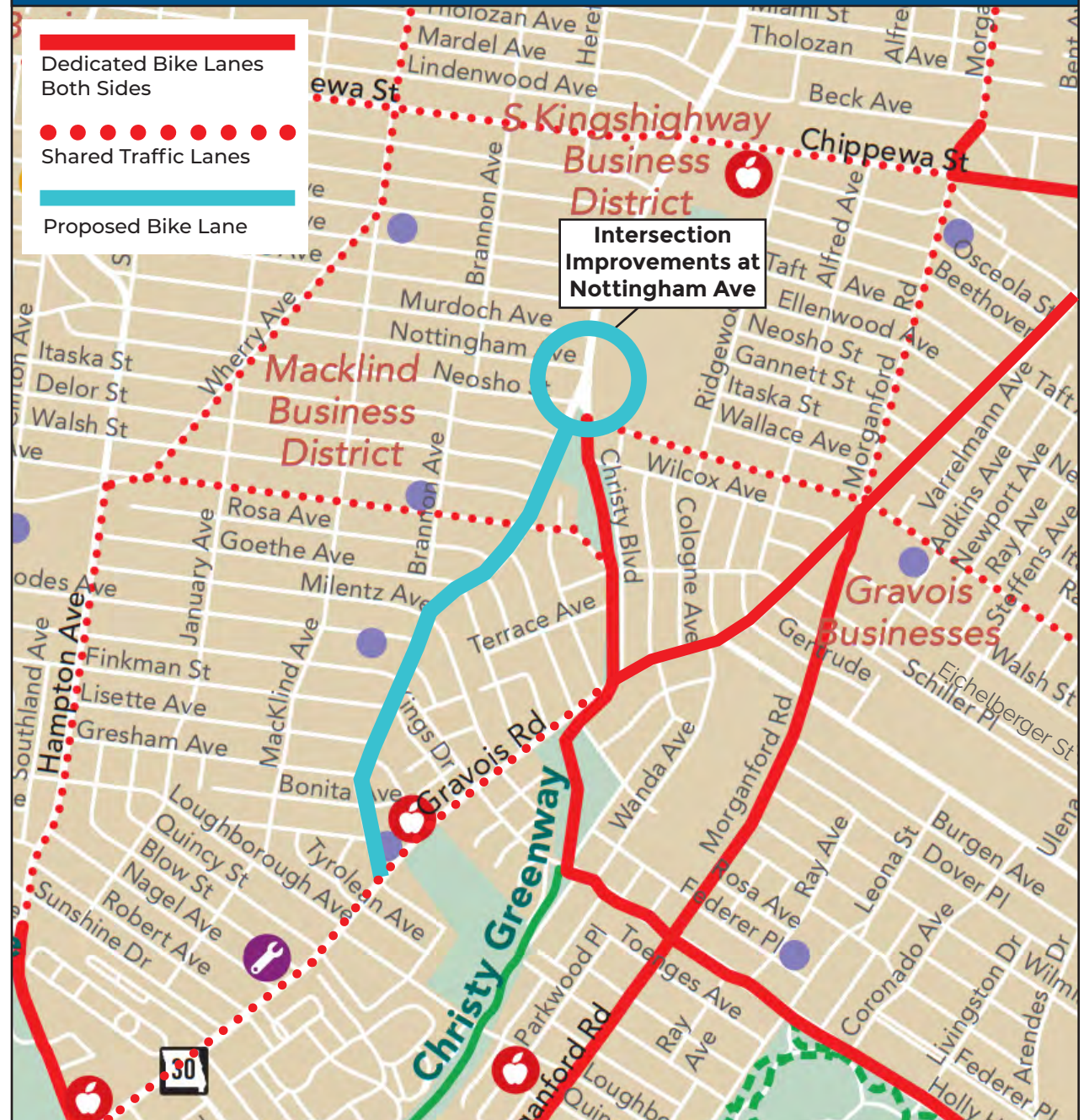
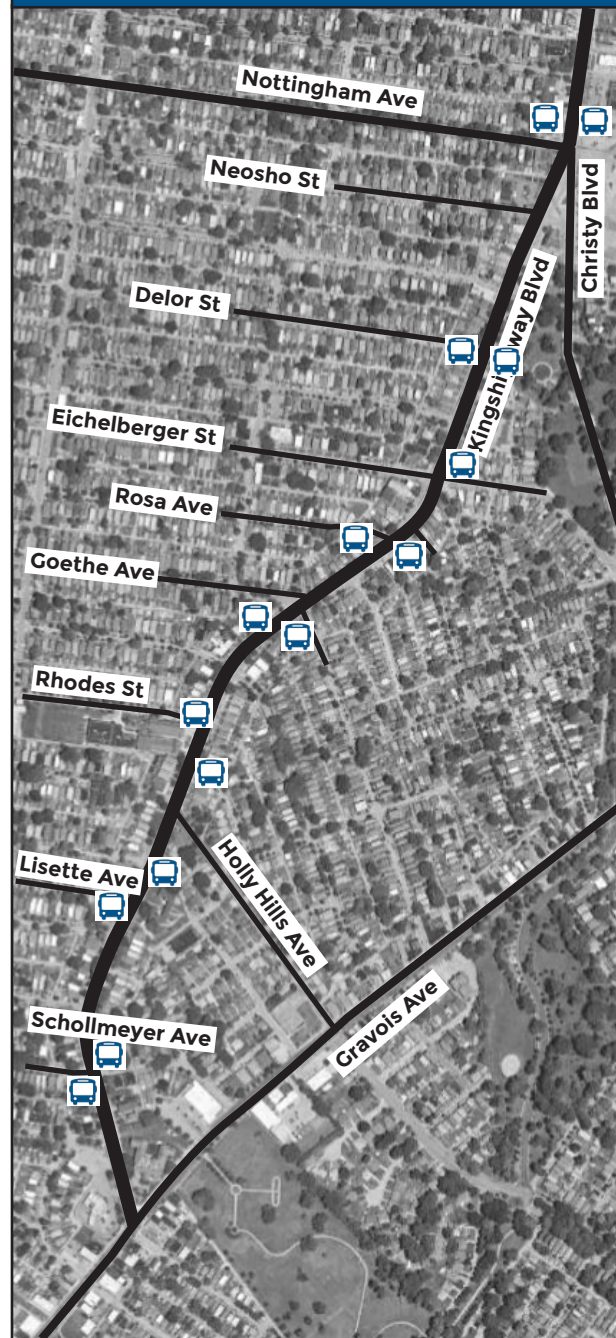




Figure 8. Transit Stops



Transit

The study corridor is served by Metro Transit and the #95 MetroBus route. Service is provided at 15 to 30-minute headways throughout the day with more frequent service during peak periods. There are seven southbound and seven northbound bus stops in the study area, one of which has a covered shelter. A map of the transit stops are shown in **Figure 8**.



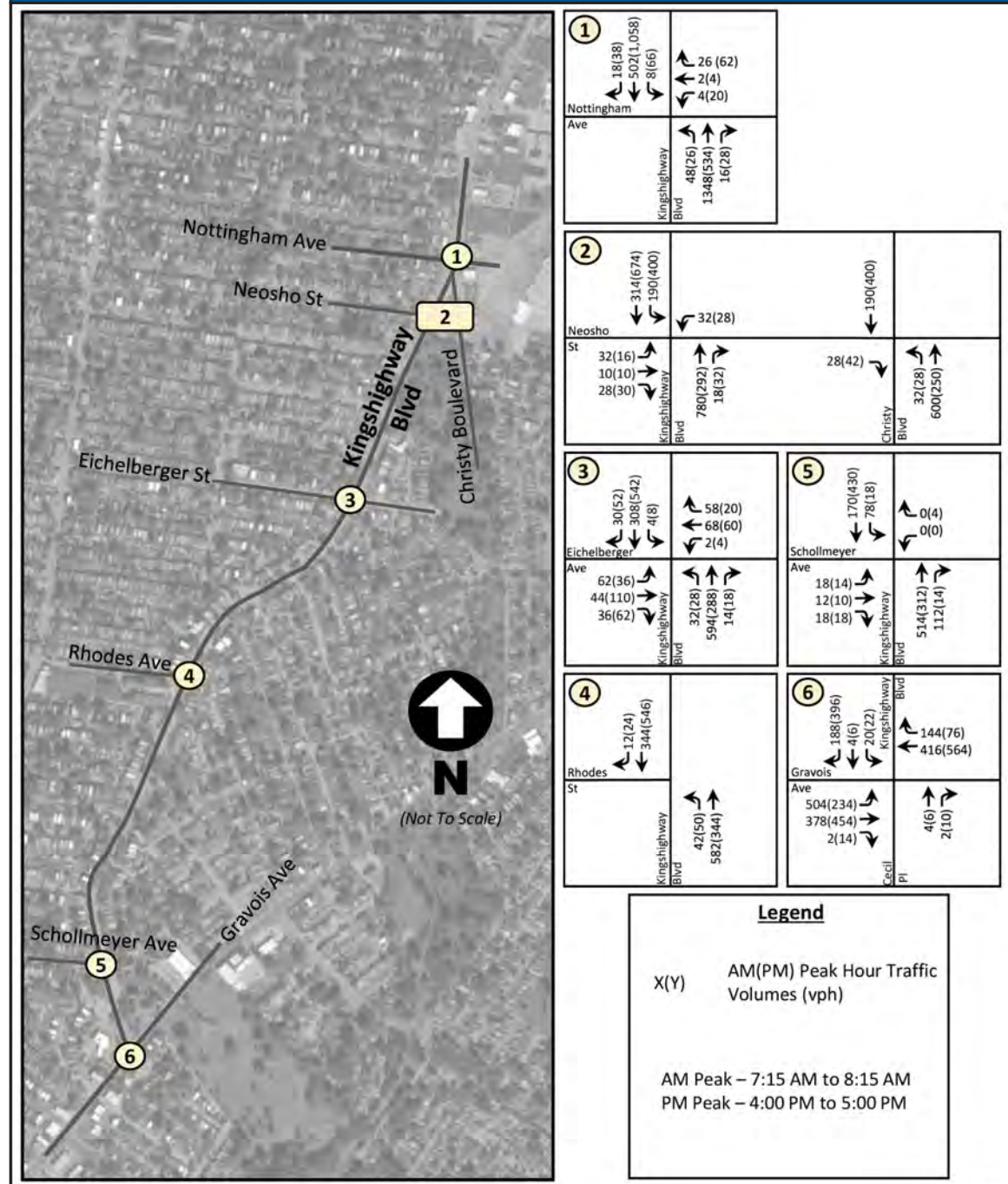
Peak Hour Traffic Volumes

Turning movement counts were collected at each of the study intersections during the weekday peak hours in September and October of 2019. Weekday peak hours occurred from 7:15 AM to 8:15 AM in the morning and from 4:00 PM to 5:00 PM in the evening. These periods were the focus of the traffic analysis. The peak hour volumes are summarized by intersection and movement in **Figure 9**.

Traffic volumes are generally heavier going northbound in the morning and southbound in the evening. This reflects prevailing commuter traffic patterns oriented towards Interstates 44 and 64 in the morning and away from those interstates in the evening.

A substantial amount of traffic travels to and from Kingshighway Boulevard to the north and Christy Boulevard to the south during the commuter peak periods. At the Nottingham Avenue intersection, nearly 43% of all the northbound traffic came from Christy Boulevard during the morning peak hour. In the afternoon peak hour, 37% of the southbound traffic turned onto Christy Boulevard.

Figure 9. Existing Peak Hour Traffic Volumes





Peak Hour Traffic Volumes

Throughout a typical day, traffic volumes and conditions along Kingshighway Boulevard vary widely. North of Neosho Street, hourly traffic volumes in the primary commuting direction for each peak hour are around 1200-1400 vehicles per hour (vph) and drop to 600-650 vph south of Neosho Street. Non-peak directional traffic volumes are approximately 500-550 vph north of Neosho Street and 350 vph south of Neosho Street for both peak hours. Northbound is the primary commuting direction in the morning while southbound is the primary commuting direction in the afternoon.



Daily Traffic Volumes

The daily traffic volume on Kingshighway Boulevard was measured between Eichelberger Street and Rhodes Avenue for a period of 48 hours. The average daily traffic volume (ADT) was 11,535 vehicles per day (vpd). The hourly traffic fluctuation throughout the day by direction is depicted in **Figure 10**.

Traffic is heaviest northbound in the morning and southbound in the afternoon.

As a principal arterial, Kingshighway Boulevard serves major activity centers and carries large portions of urban traffic on minimal mileage. Expected volumes for urban principal arterials range from 7,000 to 27,000 vpd. The ADT for Kingshighway Boulevard falls on the low end of this range at 11,535 vpd.

Figure 10. Daily Traffic Volumes on Kingshighway Blvd

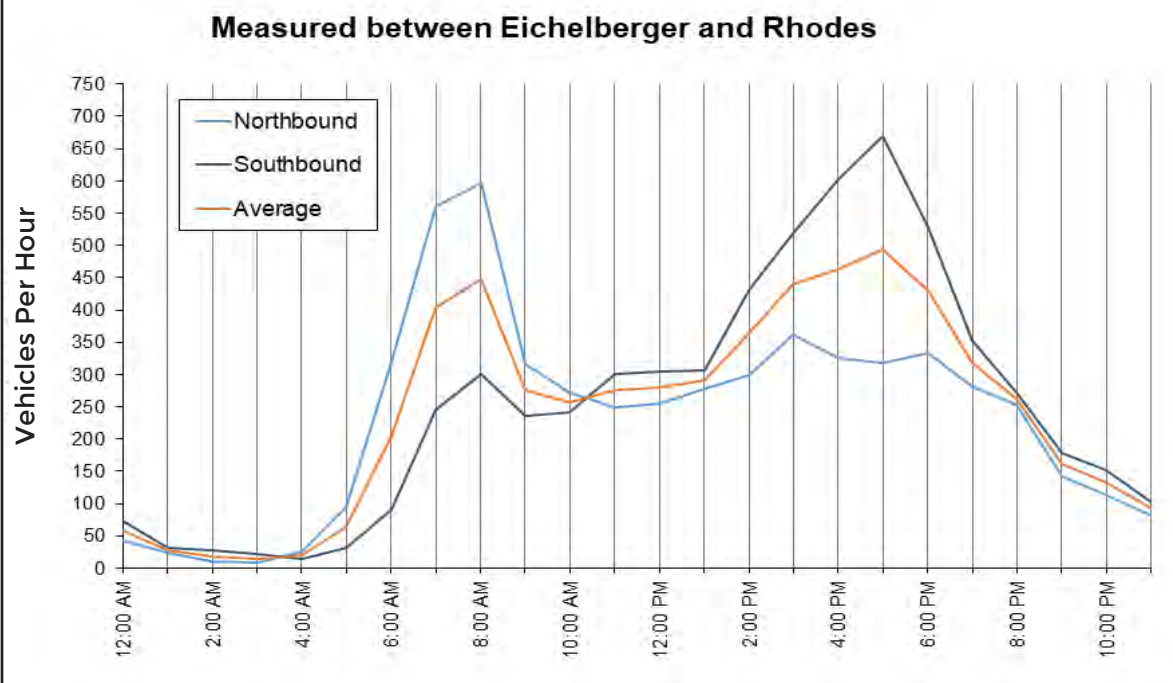
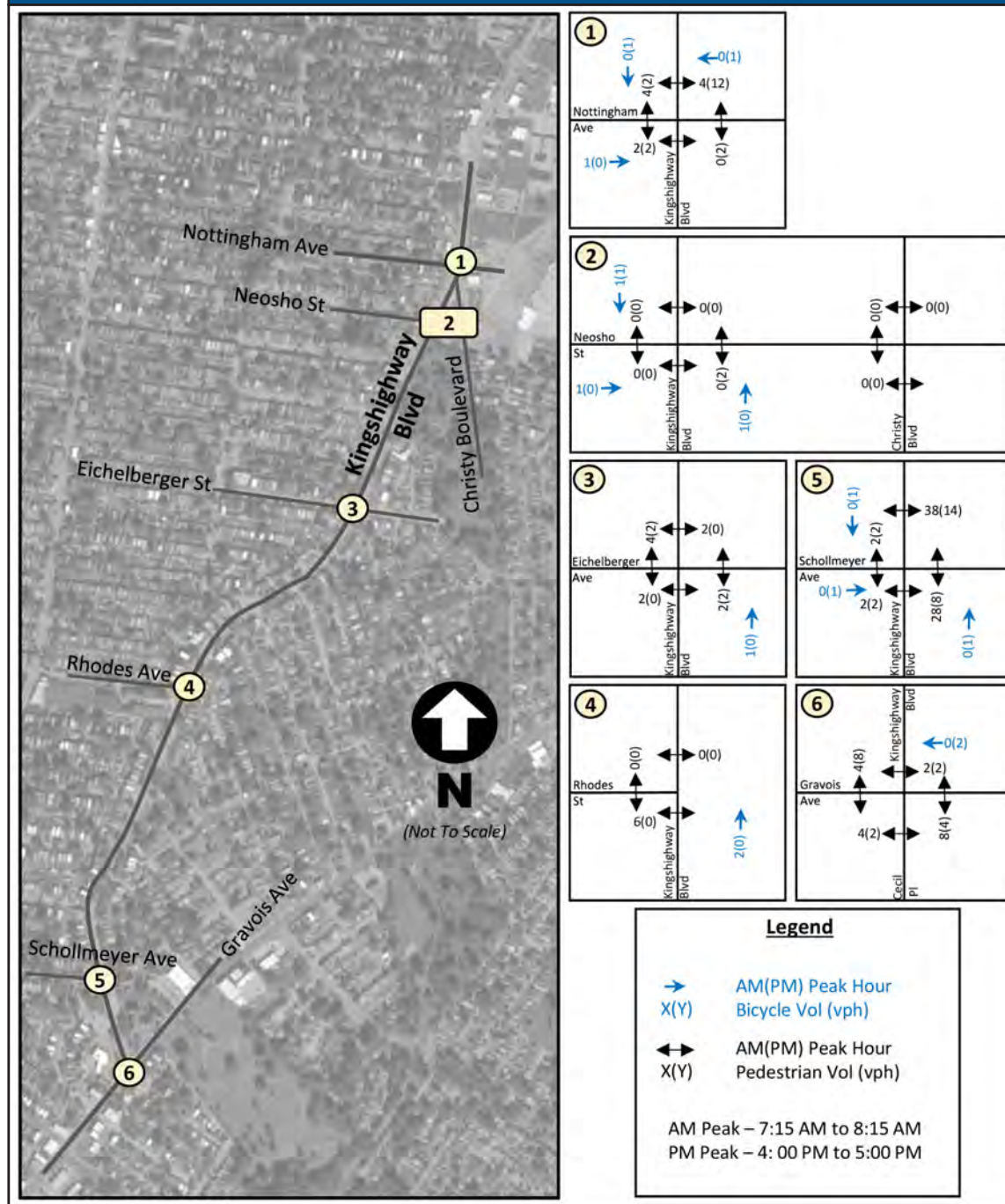


Figure 11. Existing Bicycle and Pedestrian Volumes



Peak Hour Pedestrian & Bicycle Volumes

Pedestrian and bicycle counts were collected with the vehicular traffic counts at the study intersections. The volumes collected at each intersection are summarized for the traffic peak hours in **Figure 11**.

The Schollmeyer Avenue intersection saw the most pedestrian activity with nearly 96 total pedestrians during the peak hours. This was due to the Gateway Science Academy South on the east side of Kingshighway Boulevard. Parents and students used existing crosswalks and pedestrian signal heads to cross Kingshighway Boulevard from street parking and the parking lot on the southwest quadrant of the intersection. Gravois and Nottingham Avenues saw a total of 34 and 28 pedestrians during the peak hours, respectively.

Bicyclists were observed using northbound vehicle lanes on Kingshighway Boulevard at Neosho Street to turn onto Christy Boulevard and using southbound vehicle lanes near Holly Hills Avenue.

Based on the data collected, cyclist and pedestrian activity is uncommon in the study area during peak vehicle hours. This is likely a reflection of the fact that higher traffic volumes usually discourage bicycle and pedestrian use. Peak vehicle traffic hours are not necessarily peak walking or biking hours. There are also no existing bicycle facilities within the study area, impeding safety for cyclists.



Speed

Speed data was collected at two locations to quantify the 85th percentile speeds of those traveling Kingshighway Boulevard. Data was collected in December 2019 to capture school related and commuter traffic. No weekend data was collected. Speed data was collected between the morning and afternoon rush hours and in good, dry weather conditions. The speed collection locations included:

- Between Delor and Walsh Streets
- Between Finkman and Lisette Streets

Locations where speed data was collected are shown in **Figure 12**. Speed data is typically summarized by the 85th percentile speed, which is the speed at which 85 percent of the motoring public are traveling at or below. The 85th percentile speed is useful because it represents the collective judgment of most drivers and ignores high-speed outliers.

Speed profiles for each of the collection locations are summarized in **Figures 13** and **14**. Note that the posted speed limit on Kingshighway Boulevard is 35 miles per hour (mph). The 85th percent speeds at locations 1 and 2 were 14% and 17% over the posted speed limit, respectively. The highest speeds were recorded at location 2, with several vehicles traveling 55 to 65 mph.

Figure 12. Map of Speed Collection locations

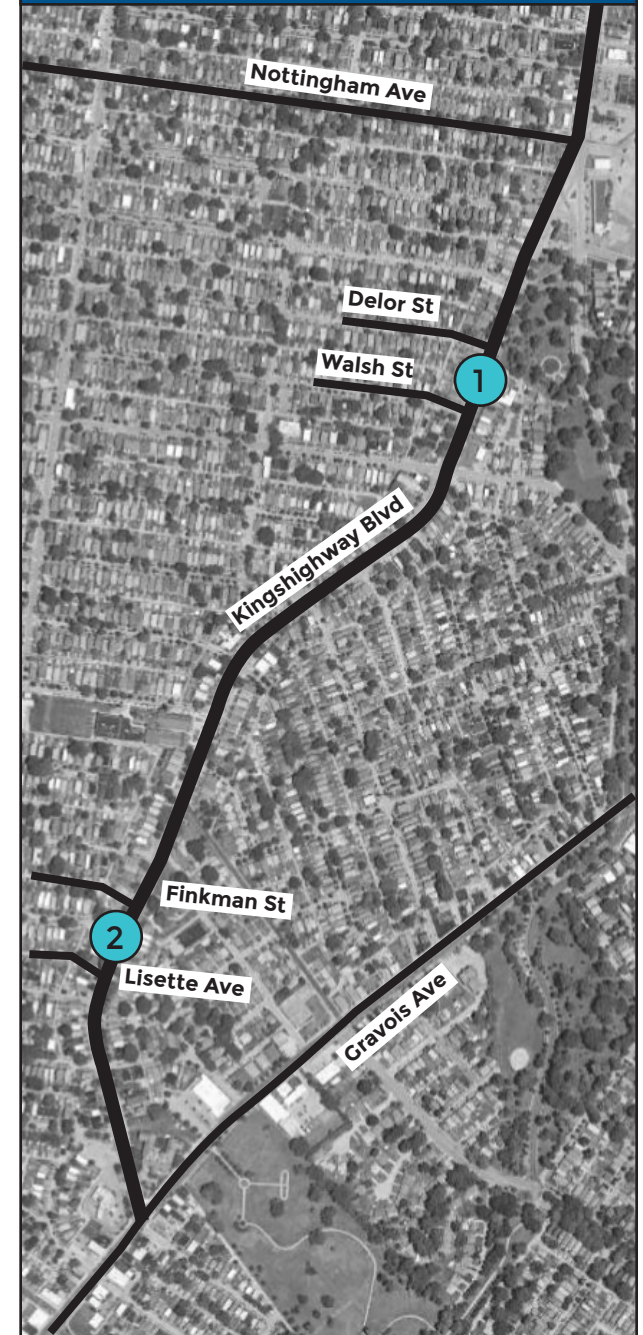


Figure 13. Average Weekday Speed,
Measured between Delor St and Walsh St

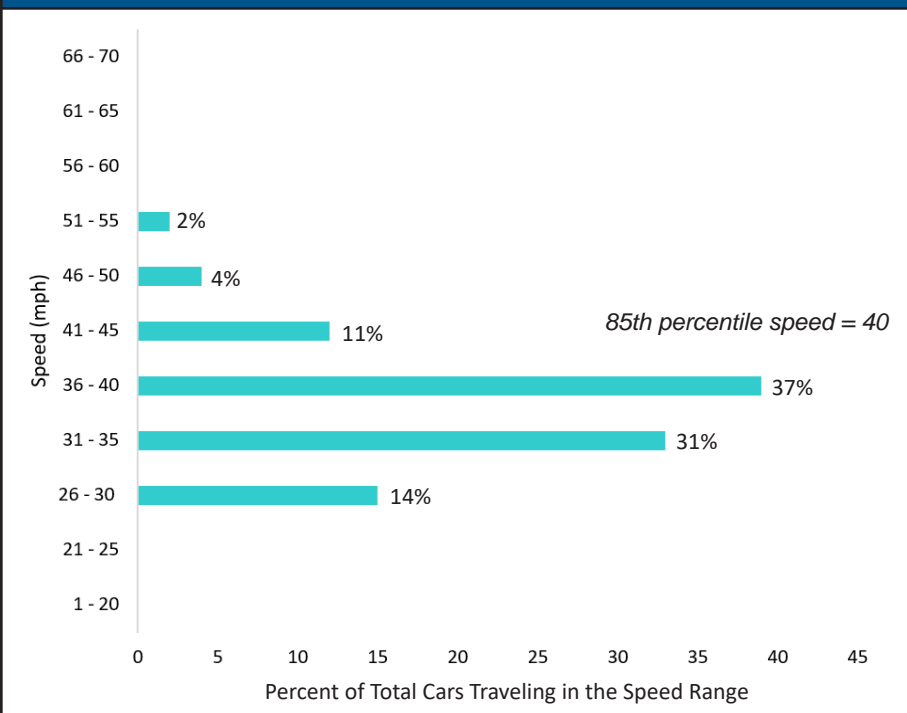
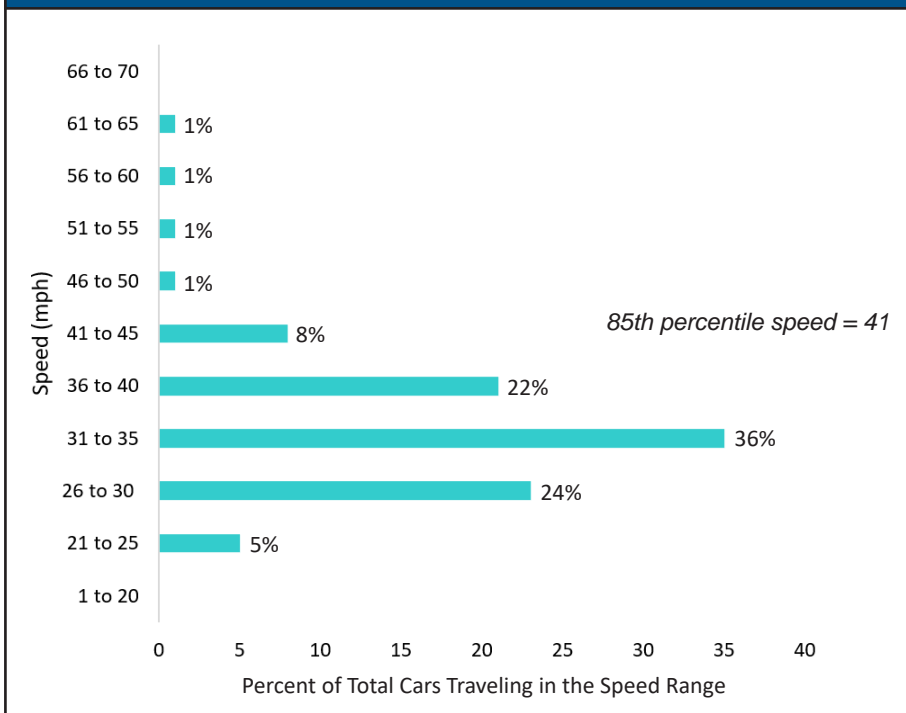


Figure 14. Average Weekday Speed,
Measured Between Finkman St and Lisette St





Safety

Crash data from 2014 to 2018 (5-year period) was gathered using Missouri Department of Transportation (MoDOT) crash records. This crash data included information about crash location, severity, and type. This analysis was supplemented by a review of individual reports for injury crashes furnished by the City of St. Louis.

Crash Location

A heat map of crashes shown in **Figure 15** depicts the locations of all crashes recorded on the study corridor. As shown, Nottingham Avenue and Gravois Avenue were the intersections with the highest number of crashes with 90 and 67 crashes, respectively. **Table 1** lists the intersections with the most crashes.

Crashes were distributed throughout the Kingshighway Boulevard corridor, although crash frequency increased approaching Gravois Avenue after Gresham Avenue. This is likely due to the horizontal curvature of the segment and higher speeds on the south end of the study corridor.

Holly Hills Avenue has an unusually high frequency of crashes for being an unsignalized side street. The majority were property damage only, however there was one disabling injury. Most crashes were right-angle crashes followed by parking or parked car.

A follow-up site visit found that eastbound drivers have poor visibility looking south due to parked cars and existing trees. This movement crosses four lanes on Kingshighway Boulevard to continue on Holly Hills Boulevard. This movement, as well as the southbound left turn, are prominent in the afternoon peak hour. All of these factors, combined with the propensity for motorists to speed in this area, contributes to this crash pattern.

Table 1. Number of Crashes at Major Intersections

Location	Number of Crashes (2014-2018)
Nottingham	90
Gravois	70
Holly Hills	32
Neosho	31
Eichelberger	27

Figure 15. Crash Frequency & Severity Heat Map

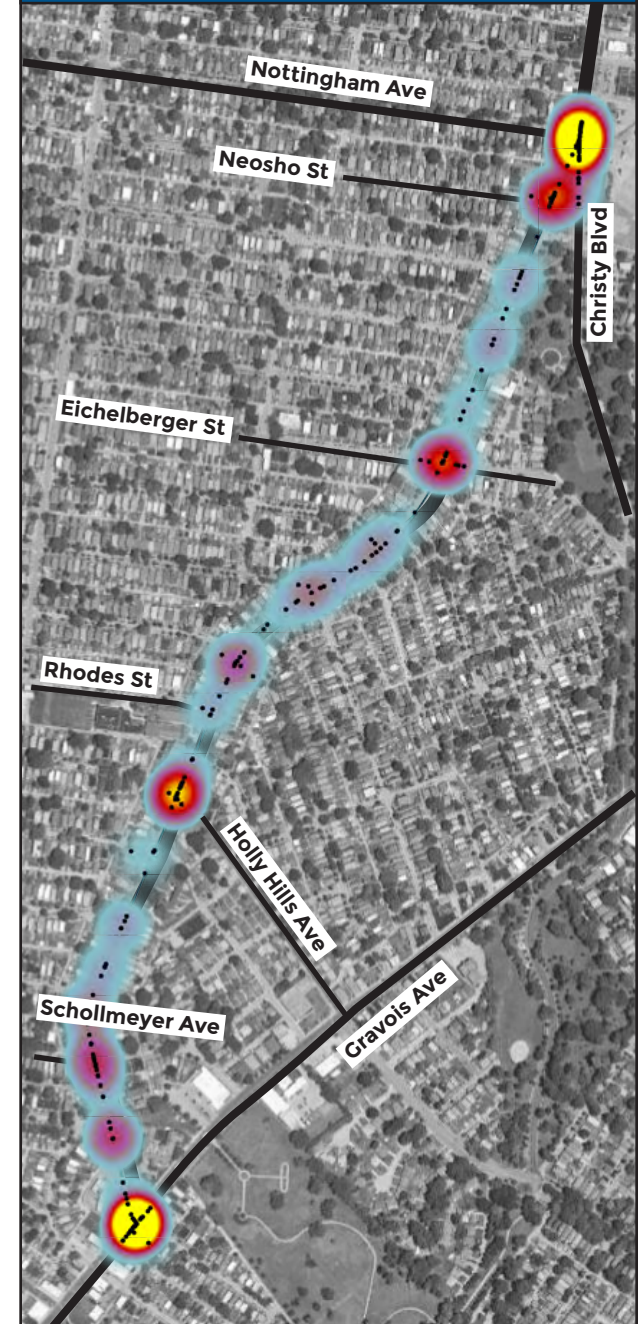


Figure 16. Crashes by Severity

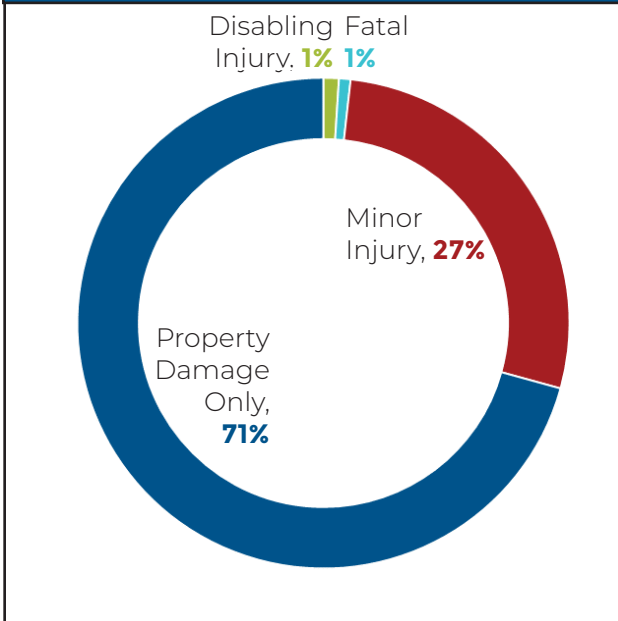


Figure 16 and **Table 2** describe crash severity for the five-year period. From 2014 to 2018, there were 396 crashes along the study corridor. Seventy-one percent (280) of the 396 crashes resulted in property damage only (PDO), 28% (109) resulted in minor injuries, four (1%) resulted in disabling injuries and three in fatalities.

It is noteworthy that the Gravois Avenue intersection accounted for two of the three fatal crashes and two of the four disabling injury crashes. The two fatal crashes involved pedestrians; one disabling crash involved a bicycle and the other was a left-turn crash.

Figure 17. Crashes by Type

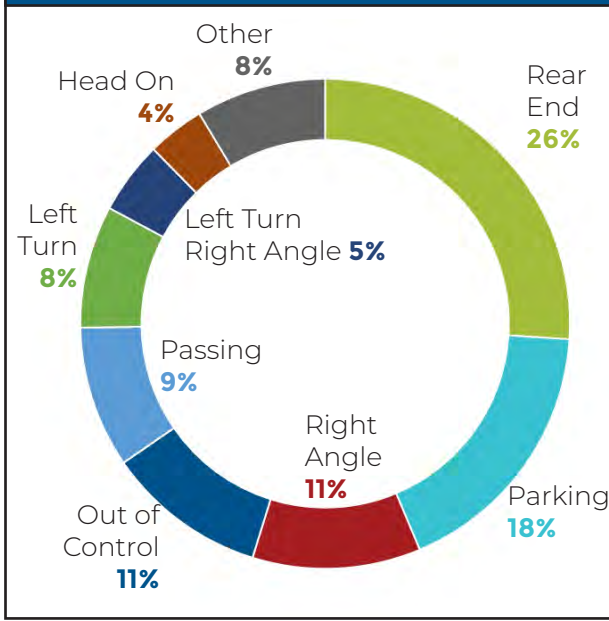


Figure 17 describes crash type for the five-year period. The most common crash types involved rear-end crashes (103 crashes, 26% of total), parking or parked car crashes (70, 18%), right-angle crashes (44, 11%), out of control crashes (42, 11%), and passing (37, 9%). These types of crashes are typical for urban arterials with frequent intersections and on-street parking. Pedestrian crashes made up 1% of all crashes but constituted two of the three fatalities in the corridor, as previously noted and described.

The five intersections that had the highest number of crashes generally follow the overall corridor trends of crash type. Rear end crashes were the most common type of crash at Nottingham Avenue by a significant number and are most likely a result of speeding or signal related. Gravois Avenue also had rear ends as the highest frequency crash followed by passing and left-turn crashes.



Safety

Table 2. Number of Crashes by Severity

Severity	Total Crashes (2014-2018)
Fatal	3
Disabling Injury	4
Minor Injury	109
Property Damage Only	280



Traffic Operations

Traffic operating conditions were evaluated during the weekday morning and evening commuter peak hours. If traffic is well accommodated during peak periods, it will be accommodated at all other times of the day. Evaluation of traffic operations focused on intersection performance, since the number of vehicles that can be served at major intersections dictates Kingshighway Boulevard's capacity. Each intersection was graded as one of six levels of traffic service (LOS) from A through F. LOS E represents acceptable intersection performance in urban areas.

Existing intersection LOS for the morning and evening peak hours are illustrated in **Figure 18** and **Figure 19**.

- All study intersections operate at acceptable overall levels of service – LOS C or better – in the morning and in the evening.
- The eastbound and westbound thru/left at Eichelberger Street and westbound thru at Nottingham Avenue operate at a LOS E or F in the morning and evening.
- The westbound left at Neosho Street operates at LOS E in the morning.
- In the evening the eastbound right at Eichelberger Street operates at LOS F.
- Lower LOS ratings are in part due to long traffic signal cycle lengths (140 seconds).

Figure 18. Kingshighway Blvd
Existing AM LOS



Figure 19. Kingshighway Blvd
Existing PM LOS



The traffic operational analysis methodology is summarized in **Appendix B**. Detailed intersection operating summaries are provided in **Appendix C**, including LOS, delay, and queue lengths by intersection approach.

As mentioned previously, the Gravois Avenue signal is part of a coordinated system along Gravois Avenue that is maintained and operated by MoDOT. The other signals are operated by the City, with all but the Schollmeyer Road signal running in coordination (it runs free).



Parking

Kingshighway Boulevard allows on-street parking on both sides of the street from Neosho Street south to Schollmeyer Avenue. Parking is prohibited along Kingshighway Boulevard between Schollmeyer Avenue and Gravois Avenue, on the east side of Kingshighway Boulevard approaching the Neosho Street intersection, and within 30 feet of all intersections.

On-street parking along Kingshighway Boulevard was observed in the field during the morning (7:00 – 9:00 AM) and evening (4:00 – 6:00 PM) peak periods on a weekday. On-street parking in both peak periods was observed to be 20% - 30% utilized throughout the corridor.

On-street parking was heavily utilized in both the morning and evening peak periods adjacent to the Gateway Science Academy South campus near Schollmeyer Avenue. On-street parking south of Schollmeyer Avenue is used for school drop-off and pick-up but is illegal and marked with no-parking signs. Parents were also observed using the open surface parking lot in the southwest quadrant of Kingshighway Boulevard and Schollmeyer Avenue.





Pavement Conditions

Pavement conditions were evaluated during a weekday morning with dry, clear weather using the PASER evaluation system. PASER evaluates pavement surface conditions based on visual inspection. Numerical ratings from one to ten are assigned based on surface condition of the road, one being a failed condition and ten being excellent or new construction. The overall PASER rating for Kingshighway Boulevard between Nottingham Avenue and Gravois Avenue was determined to be a 6. Surface rating 6 is considered “good” with general conditions showing signs of aging but with sound structural integrity. Maintenance measures are typically crack rout and seal, patching, or sealcoating to extend the life of the pavement.



LANE REDUCTION CONCEPT

A lane reduction concept was developed and tailored to conditions in the Kingshighway Boulevard corridor. The lane reduction conceptual design was evaluated for its feasibility and likelihood of success.

This objective evaluation is intended to provide decision-makers with the most accurate information to assess the feasibility of the lane reduction alternative. This study does not offer a recommendation for or against a lane reduction.



Conceptual Design

The preferred lane reduction concept that would be implemented on Kingshighway Boulevard includes three traffic lanes – one through lane in each direction plus a center two-way left-turn lane. A second, similar option would provide a middle left-turn lane at intersections and a 22-foot concrete median in between as an alternate lane reduction strategy. Converting roadways from four lanes to three lanes is the most common lane reduction application. This concept maintains existing on-street parking, except within 30-feet of signalized intersections and unsignalized intersections.

The lane reduction would begin and end at Neosho Street to the north and Schollmeyer Avenue to the south, with transitions between these signals and the project limits. Neosho Street was chosen because beginning the lane reduction further north at the Nottingham Avenue intersection would significantly impact traffic; there are heavy traffic volumes traveling northbound and southbound on Kingshighway Boulevard at this point and the additional lanes are needed to accommodate the demand. The lane reduction ends at Schollmeyer Avenue because that is the last signal before the Gravois Avenue intersection, which has three lanes on the southbound approach.

To implement the lane reduction, southbound traffic would drop one travel lane as a southbound left-turn lane at Neosho Street. In the northbound direction, a travel lane is added at this intersection to keep the same number of lanes approaching the Nottingham Avenue signal.

Between Schollmeyer Avenue and Gravois Avenue, the southbound lanes would be transitioned back to the three-lane approach at the signal, and there would be only one northbound travel lane to begin with at Gravois Avenue. **Figure 20** shows the lane reduction locations within the study corridor.

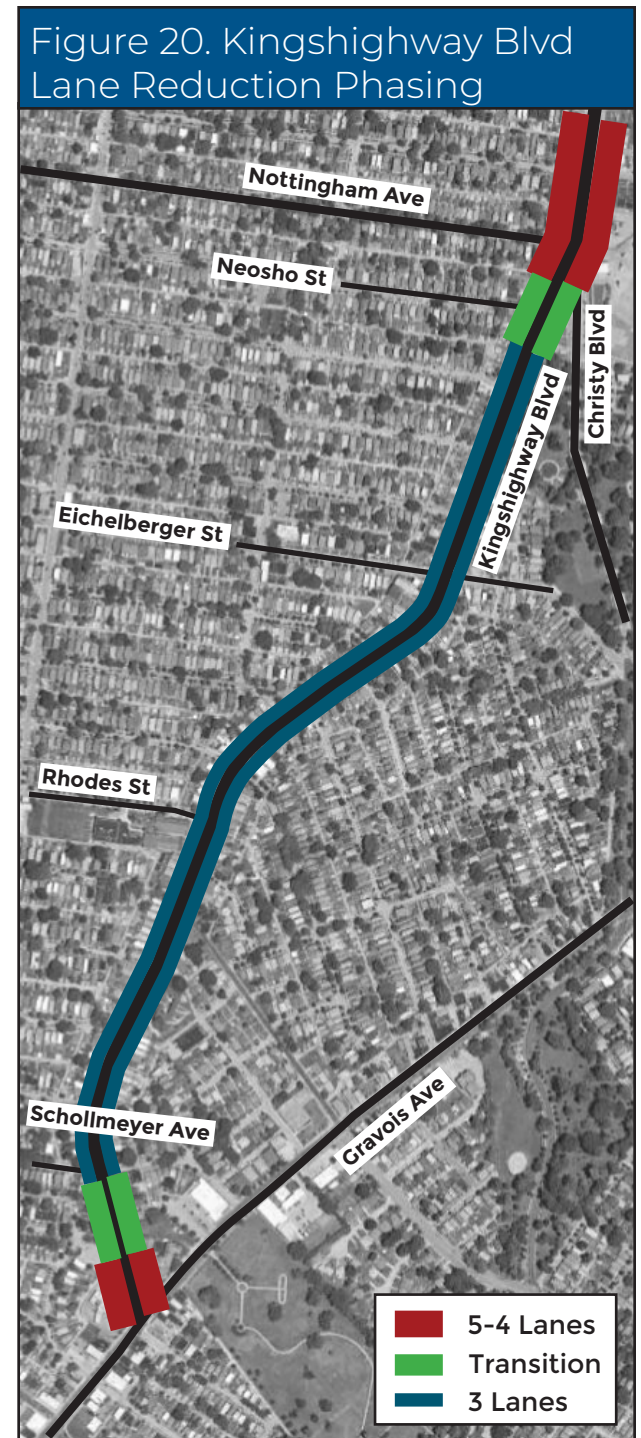




Figure 21. Preferred Lane Reduction Alternative

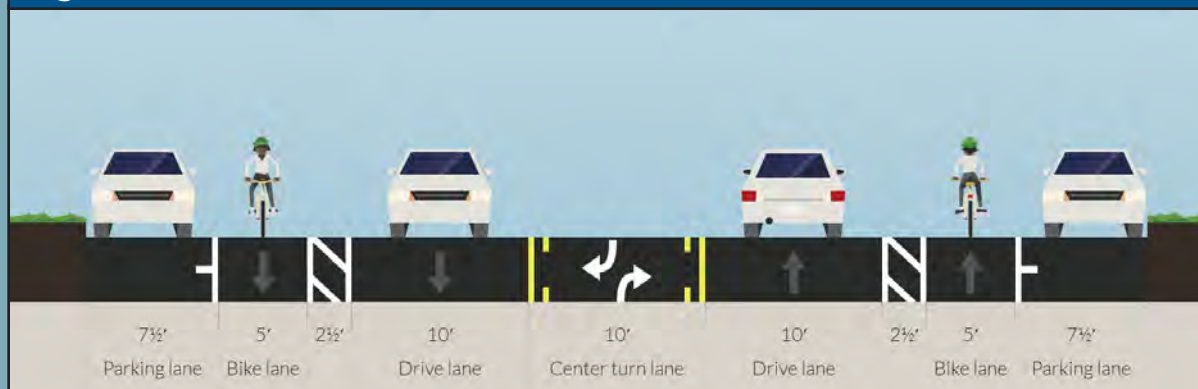
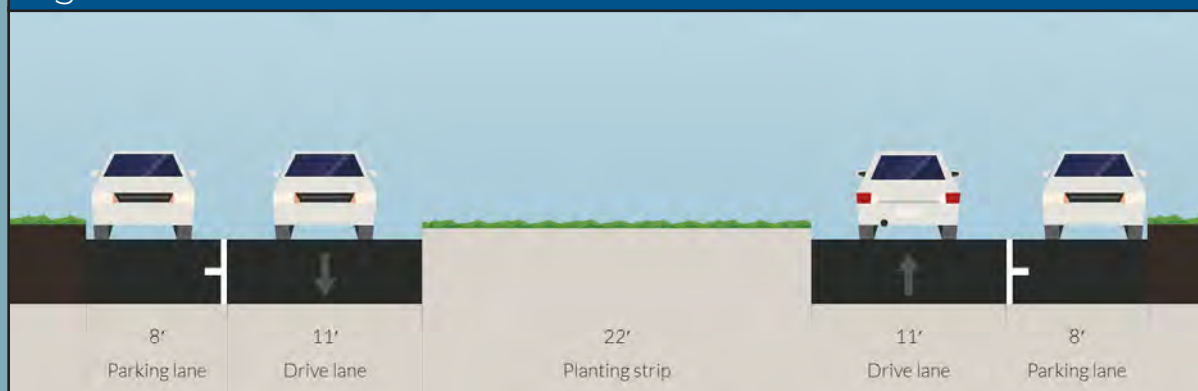


Figure 22. Median Alternative



Conceptual Design

Preferred Option

The typical cross-section with the lane reduction concept assumes the existing right-of-way width of 60 feet remains as it is today. The preferred lane reduction option includes 10-foot traffic lanes in each direction, a 10-foot center two-way left-turn lane plus 7.5-foot outside parking lanes on each side of the street. The travel lanes would be separated from 5-foot bike lanes in each direction by a 2.5-foot striped buffer to further separate cyclists from moving car.

Alternate Option

The alternate option proposes one 11-foot travel lane in each direction and 8-foot parking lanes on each curb. The remaining width of the street is utilized by a 22-foot wide, curbed median which would break at intersections and side streets to allow for a left-turn lane. This option would significantly narrow the width of the street between intersections but does not provide specific bicycle accommodations.

On-street parking remains interrupted for transit stops in both options. These cross sections are illustrated in **Figure 21** and **Figure 22**.

Figure 23. Proposed Lane Configuration with Lane Reduction

Conceptual Design

Proposed Lane Configuration

Figure 23 shows the lane configurations at each intersection for the proposed lane reduction on Kingshighway Boulevard. As shown, the extents of the lane reduction would be from Neosho Street to Gravois Avenue.

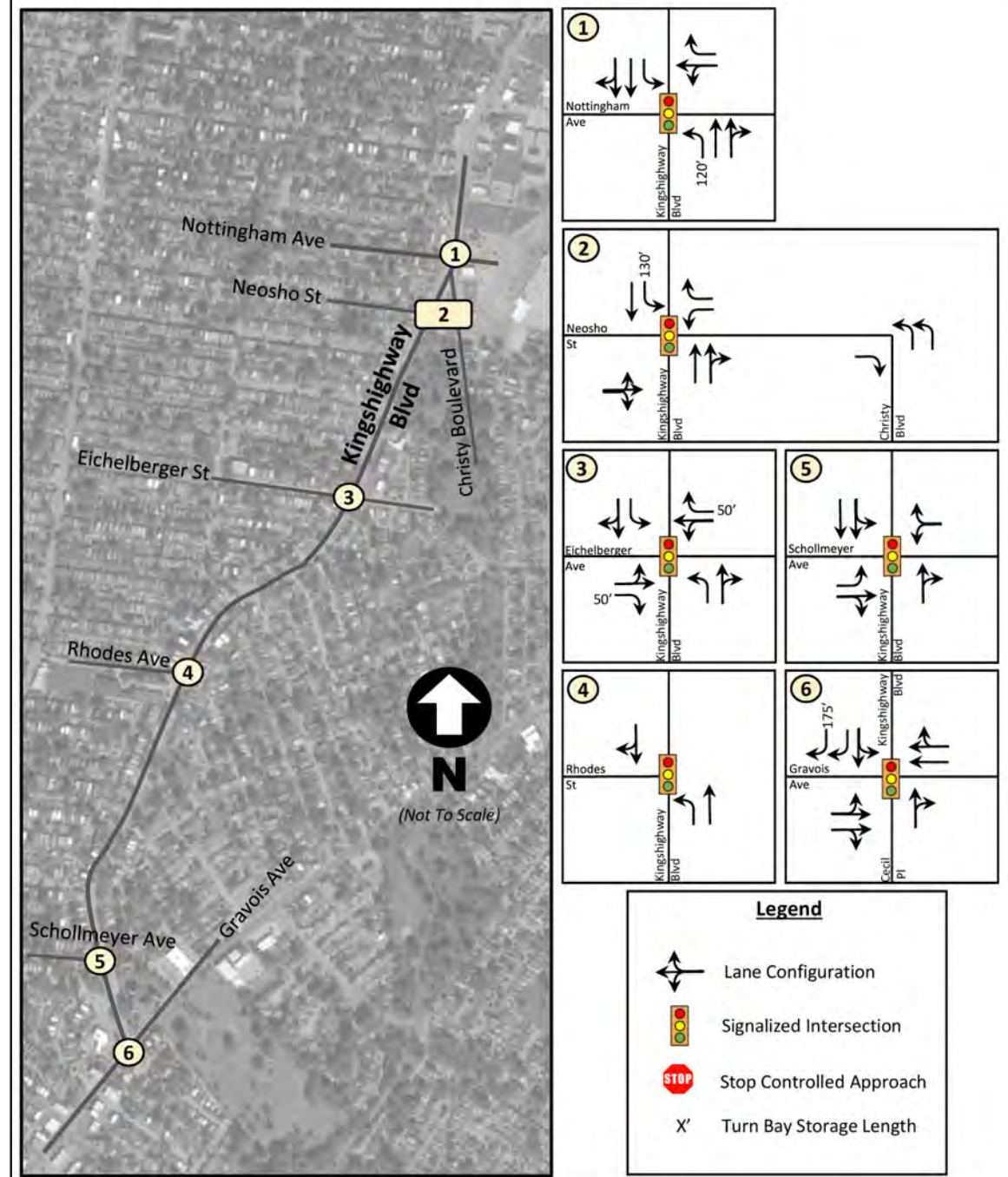
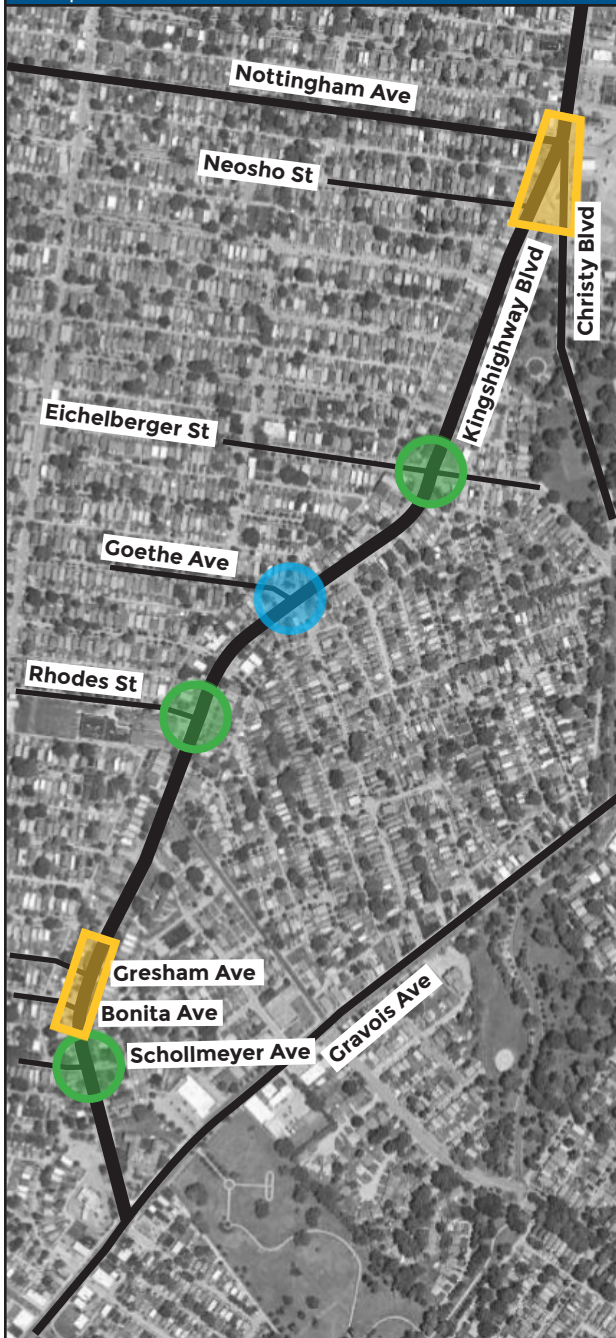


Figure 24. Kingshighway Blvd Improvement Locations



Preferred Option Recommended Improvements

The following improvements are incorporated into the conceptual design of the preferred option:

Create “protected” intersections at Eichelberger Street, Rhodes Avenue, and Schollmeyer Avenue. This improvement coincides with the addition of bikes lanes along both sides of Kingshighway Boulevard.

Add a concrete median between Gresham Avenue and Bonita Avenue. This is an additional traffic calming countermeasure along the segment with a horizontal curve and an existing problem with errant vehicles leaving the roadway and entering residential properties.

Recommended Improvements Applicable to both Preferred and Alternate Options

The following improvements can be implemented with either option, or on their own:

Reconfigure and signalize intersections at Neosho Street and Christy Boulevard. This would create a more standard intersection, making it less confusing for drivers, more accessible for other users of the street, and safer.

Reconfigure Goethe Avenue on the west side of Kingshighway Boulevard. This would better define the footprint of the intersection, making it smaller to reduce turning speeds which, in turn, would provide added traffic calming.

Figure 24 identifies improvement locations.

Kingshighway Boulevard and Neosho Street/Christy Boulevard Intersection Improvement

The existing configuration of the intersection of Kingshighway Boulevard with Neosho Street/Christy Boulevard is excessively large and lacks pedestrian crosswalks. Its configuration is irregular, causing confusion for users. This condition is further exacerbated by the presence of Firehouse No. 36. The proposed signal improvement would bring Christy Boulevard into Kingshighway Boulevard at a right angle, creating a traditional four-way intersection. The proposed reconfiguration of the intersection with a signal is shown in **Figure 25**.

Traffic Movement Alterations

The newly signalized intersection brings Christy Boulevard into Kingshighway Boulevard at a right-angle across from Neosho Street. Northbound Christy Boulevard traffic must now turn right on Kingshighway Boulevard at a signal rather than merging just before Nottingham Avenue. Traffic that used to make a free southbound left-turn north of Neosho Street are now signalized at the new intersection.

Bike Accommodations

With the northern terminus of Christy Boulevard relocated to intersect Kingshighway Boulevard directly across from Neosho Street, the pavement from the previous northbound through lanes is used for a bike lane that travels north to the Nottingham Street signal. Here, cyclists can cross the intersection to a painted bike box in the northeast quadrant, where they can safely wait to cross west to Nottingham Avenue which has access to more bike accommodations and connections. At the intersection of Kingshighway and Neosho Street/Christy Boulevard, the northbound bike lane and southbound bike lane are “protected” at the intersection. Bike lanes are brought against the curb at “protected” intersections and separated from travel lanes by concrete medians.

Pedestrian Accommodations

Pedestrian accommodations are improved with the installation of a signal which provides protected crossings compared to unprotected conditions under two-way stop control. The signal allows for crosswalks at each leg of the intersection and corresponding pedestrian signal heads and push buttons.

Firehouse Accommodations

Firehouse No. 36 is located between Christy Boulevard and Kingshighway Boulevard with driveway access for the firetruck facing north. With the relocation of Christy Boulevard, the stop bar for westbound traffic is set further back to eliminate conflict between waiting cars and the firetruck. A truck apron is provided directly across from the firehouse driveway to accommodate a firetruck turning around and backing into the garage.

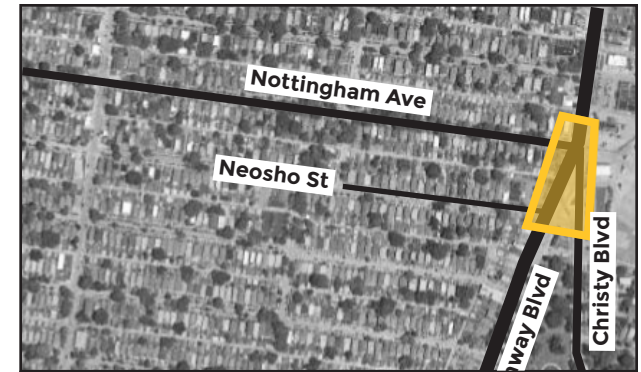
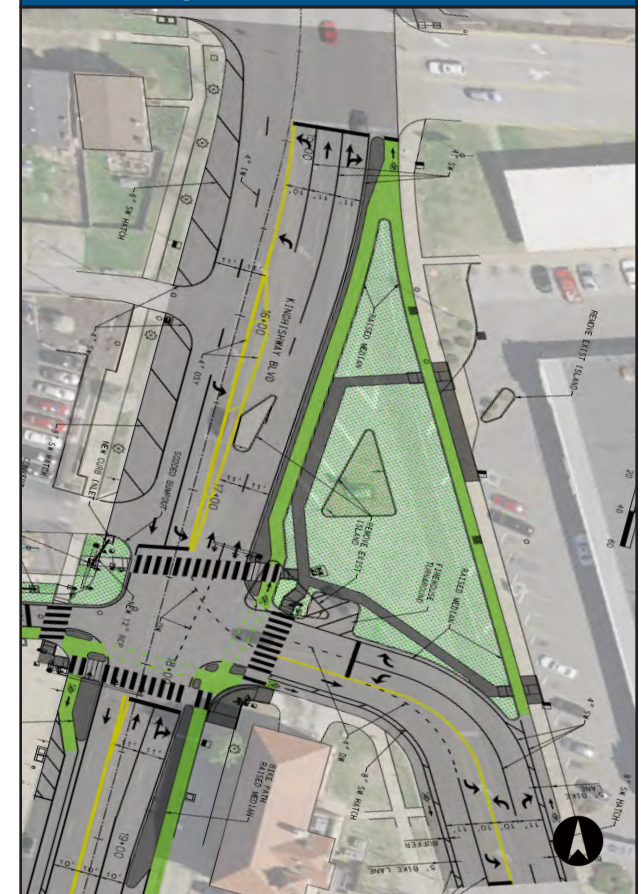


Figure 25. Kingshighway - Christy - Neosho Intersection Reconfiguration



Protected Intersections

Eichelberger Street, Rhodes Avenue, and Schollmeyer Avenue

At Eichelberger Street, Rhodes Avenue, and at Schollmeyer Avenue, the intersection becomes a “protected” intersection for cyclists. At these intersections, parking ends prior to the intersection and the bike lanes are gradually shifted towards the curb with a median that separates bicycles from traffic. The National Association of City Transportation Officials (NACTO) describes “protected” intersection as keeping “bicycles physically separate from motor vehicles up until the intersection” which “can reduce the likelihood of high-speed vehicle turns, improve sightlines and reduce the distance and time during which people on bikes are exposed to conflict.” **Figures 25, 27, and 28** show the proposed intersection improvements for Eichelberger Street, Rhodes Street, and Schollmeyer Avenue.



Figure 26. Eichelberger Street

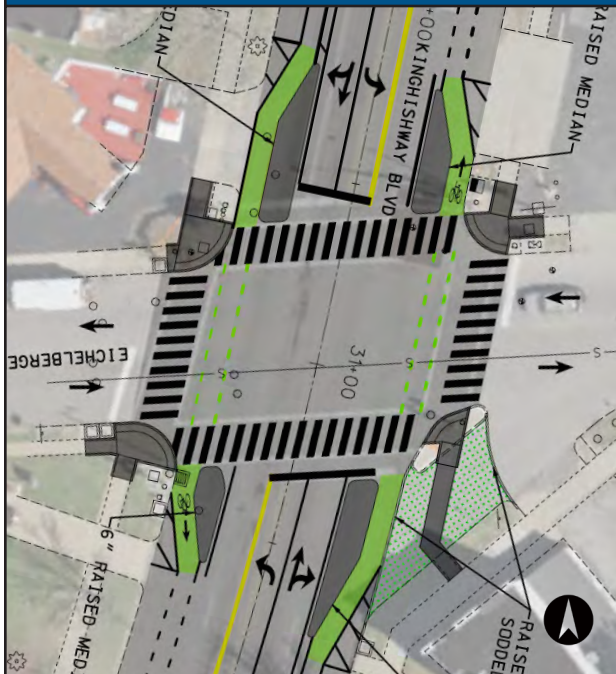


Figure 27. Rhodes Street

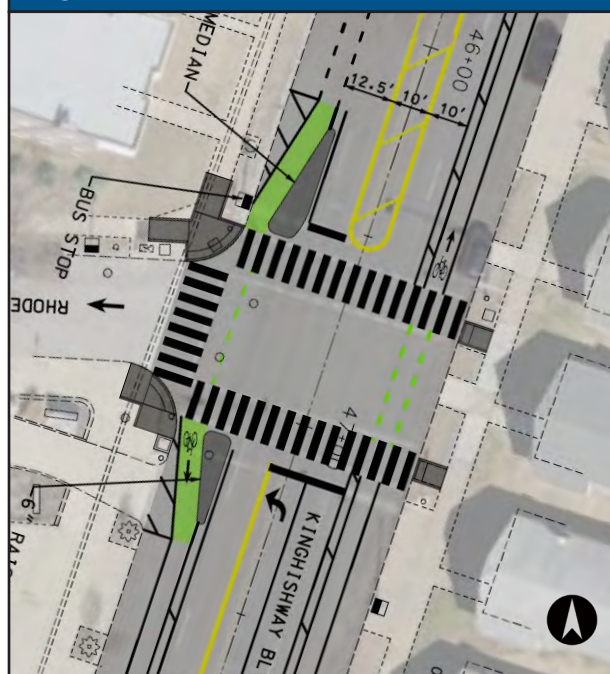


Figure 28. Schollmeyer Avenue



Goethe Avenue Reconfiguration

The existing configuration of Goethe Avenue on the west side of Kingshighway is extremely oversized. Only a one-way street on this side (westbound permitted), it is approximately 130-feet wide currently and broken up by two concrete islands. Motorists making a southbound right turn are provided a channelized turn lane that has a large radius, allowing them to travel at higher speeds.

The existing entrance to Goethe Avenue is proposed to be narrowed to the width between the two existing islands. The northern gap between the existing curb and island is recommended to be closed with the construction of a curb, necessitating the relocation of the nearby fire hydrant. The southern gap between the existing curb and island can be closed with grass plantings and/or a curb. The existing parking at Café Nova can then be pushed out to utilize the extra pavement on Goethe Avenue.

This realignment is preferred because it aligns the west side of Goethe Avenue with the east side of Goethe Avenue for better access management practices, eliminates extra pavement, provides improved pedestrian accommodations, and would provide Café Nova with extra space for outdoor seating. The proposed improvements are shown in **Figure 29**.

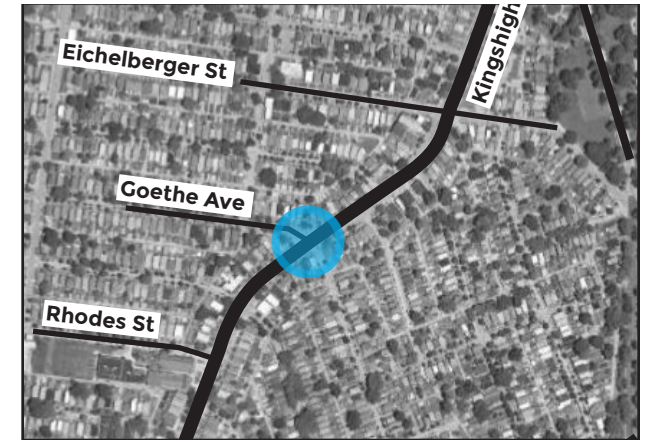


Figure 29. Goethe Ave



Gresham Avenue to Bonita Avenue Safety Improvements

The block of Kingshighway Boulevard from Gresham Avenue to Bonita Avenue has a significant horizontal curvature. The combination of this geometric feature and speeding in the area has prompted the installation of concrete planters and flashing signals on the west side of Kingshighway Boulevard to prevent southbound vehicles from exiting the street and entering residential front yards. Parking is not observed to be utilized on the west side of this block of Kingshighway Boulevard. Without parking, the southbound driving lanes become even wider which encourages speeding.

The installation of a 7-foot median to separate the southbound bike lane from the travel lane is recommended to create a vertical barrier adjacent to the travel lane and further slow vehicles. See **Figure 30** for the proposed design.

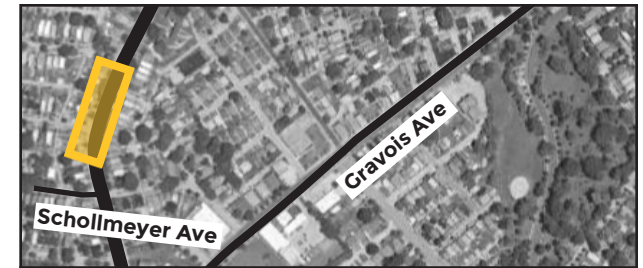
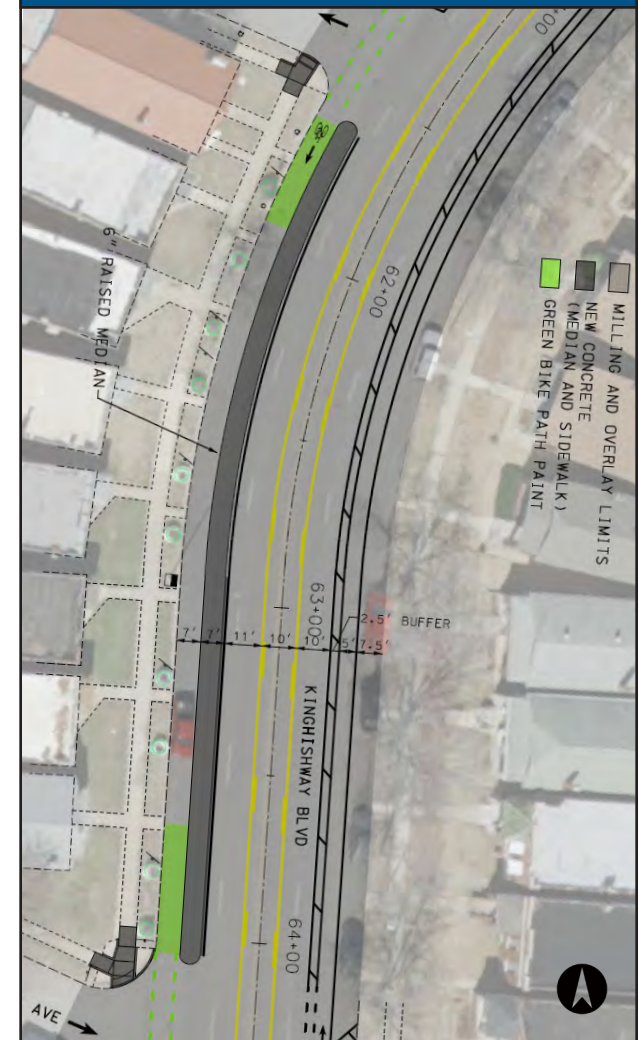


Figure 30. Gresham Ave to Bonita Ave Improvements





Cost Estimates for Improvements

The cost to implement the Preferred Option is estimated to be \$1,668,000. This cost includes:

- The three-lane cross-section with bike lanes and parking (striping and signing included)
- The reconfiguration and signalization of the Neosho Street / Christy Boulevard intersection
- Modifications to the Eichelberger Street, Rhodes Avenue and Schollmeyer Avenue intersections to accommodate protected bike lanes through the signals
- Narrowing of Goethe Avenue intersection
- Mill and overlay of Kingshighway Boulevard
- ADA upgrades to curb ramps
- Special cross-section between Gresham Avenue and Bonita Avenue that includes a 7-foot concrete median

The cost to design and build the Alternate Option is estimated to be \$3,297,000. This cost includes:

- The three-lane cross-section with a 22-foot concrete median between intersections (striping and signing included)
- The reconfiguration and signalization of the Neosho Street / Christy Boulevard intersection
- Narrowing of Goethe Avenue intersection

All cost estimates by location and in total are summarized in **Appendix E**. These cost estimates also include the engineering design fee. The full conceptual design of the Preferred Option is illustrated in **Appendix D**.

Both estimates include improvements to the Neosho Street/Christy Boulevard and Goethe Avenue intersections. If the City chooses to build an option in phases or remove one of these improvements, the individual cost to improve the Neosho Street / Christy Boulevard intersection is \$329,000 and the cost to improve the Goethe Avenue intersection is \$34,000. This information is also broken out in the detailed estimate.



Operational Feasibility

The traffic operational feasibility of implementing the lane reduction concept was considered by applying the same methodology used for existing conditions. Existing traffic volumes were evaluated. No traffic diversions were assumed, despite multiple north-south parallel routes. However, national research shows previous lane reduction implementations diverted 2 percent to 15 percent of their prior traffic volume.

Volumes

Industry guidance suggests that a street is a candidate for a four-lane to three-lane lane reduction conversion if the average daily traffic volume does not exceed 20,000 vehicles per day. The daily traffic volume along Kingshighway Boulevard was 11,535 which is well below that threshold.



Operational Feasibility

Intersection Level of Service (LOS)

In general, the lane reduction concept would not impact the intersection LOS in the corridor. The most tangible traffic impact would be longer delay and queues on Kingshighway Boulevard at Neosho Street, particularly in the morning peak hour because the intersection would be signalized whereas currently Kingshighway Boulevard traffic never has to stop.

Northbound queues in the AM and PM are projected to be 328-feet and 115-feet, respectively. Southbound queues in the AM and PM are projected to be 114-feet and 16-feet. The distance between Nottingham and the proposed Neosho signal is approximately 350-feet, therefore these queues are not expected to impact operations at the upstream signal.

Christy Boulevard traffic will also be greatly affected as northbound traffic will now make a right-turn on to Kingshighway Boulevard at a traditional four-way signalized intersection. The 95th percentile queue for this Christy Boulevard traffic would exceed 600 feet in the morning.

Intersection LOS for the morning and evening peak hours with the lane reduction concept are illustrated in **Figure 31** and **Figure 32**. Detailed intersection operating summaries are provided in **Appendix C**, including LOS, delay, and queue lengths by intersection approach.

Figure 31. Kingshighway Blvd
Proposed AM LOS



Figure 32. Kingshighway Blvd
Proposed PM LOS





Figure 21. Kingshighway Blvd Improvement Locations



Operational Feasibility

Intersection Level of Service (LOS)

Traffic impacts to other intersections in the corridor would be mostly negligible. The intersection of Kingshighway Boulevard and Eichelberger Street would experience a slight improvement in LOS due to the addition of left-turn lanes on Kingshighway Boulevard. A summary of the impacts on each intersection is below:

Nottingham Ave.	No anticipated impact
Neosho St.	Traffic control change, LOS change for both northbound and southbound directions on Kingshighway Boulevard, lengthy queue for merging Christy Boulevard traffic onto Kingshighway Boulevard
Eichelberger St.	LOS unchanged or better, slight delay increases for northbound/southbound traffic
Rhodes Ave.	LOS unchanged
Schollmeyer Ave.	LOS unchanged
Gravois Ave.	No anticipated impact



Anticipated Benefits



Speed

A decrease in speeds along Kingshighway Boulevard is expected due to the inability of higher speed motorists to make lane changes. Case studies reveal an average speed reduction of approximately 5 mph.



Safety

Lane reductions typically reduce crashes due to the elimination of passing maneuvers and introduction of a continuous two-way left-turn lane. Published guidance by the Federal Highway Administration suggests that a crash reduction of 29 percent is most applicable for the lane reduction alternative in the Kingshighway Boulevard corridor



Pedestrian Crossings

The new pedestrian accommodations at the signalized intersection of Kingshighway Boulevard and Neosho Street improve pedestrian safety.



Parking

For much of the study corridor, the lane reduction alternative does not impact the supply of on-street parking. The exception being Gresham Avenue to Bonita Avenue where parking is suggested to be removed on the west curb to install a median as a safety measure for high speed motorists rounding the horizontal curve.



Bike Lanes

The lane reduction concept would add dedicated bike lanes to both sides of Kingshighway Boulevard. The bike lanes would be bound by a 2.5 ft painted buffer to the left and parallel on-street parking to the right. A dedicated bike lane within the study area would increase connectivity to the regional bike network and improve safety as discussed prior.

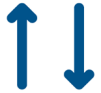


Transit

Transit operations should not be affected by the lane reduction at most bus stops. However, where bus stops and the “protected” intersections overlap, bus stops could be designed to maintain the protected bike lane while still allowing stops to keep normal operations.



Anticipated Draw-Backs



Traffic Diversion

Traffic may be diverted to parallel north south streets, particularly Macklind Ave and Morganford Road. According to published research, traffic diversion to parallel routes from lane reduction implementation ranges from 2% to 15%.



Perceived Congestion

Motorists traveling on Kingshighway Boulevard may perceive increased congestion due to the inability to pass slower moving traffic and the resulting uniformity of traffic flow. These conditions should be limited to the weekday peak commuter periods. At other non-peak times of the day, the lane reduction alternative should not adversely impact traffic operations. The lane reduction alternative is expected to provide benefits all times of day to all users of the street.



Queues

Motorists may experience longer delays and greater difficulty turning onto Kingshighway Boulevard at unsignalized locations during peak hours. There will likely be longer queues on Kingshighway Boulevard, particularly at the intersection with Neosho Street. The westbound right-turn queue coming from Christy Boulevard would likely exceed 600 feet –greater than existing queues. This draw-back is a result of the intersection becoming signalized and not a result of the lane reduction.



CONCLUSION

The purpose of this study was to develop strategies to calm traffic and increase safety along Kingshighway Boulevard between Nottingham Avenue and Gravois Avenue. Reducing lanes or implementing a lane reduction was the strategy evaluated in this study to calm traffic and promote other modes of travel. The goal of this objective evaluation is to provide information to help decision makers. A recommendation is not offered for or against the lane reduction concept.

The lane reduction concept includes three traffic lanes – one through lane in each direction plus a center two-way left-turn lane. Lane modifications occur between Neosho Street and the termination of Kingshighway Boulevard at Gravois Avenue. The traffic operational feasibility of implementing the lane reduction concept is summarized as follows:

- The Kingshighway Boulevard corridor is a good candidate for a lane reduction. Industry guidance suggests lane reductions are appropriate for streets with volumes below 20,000 vehicles per day – Kingshighway Boulevard's is 11,535 vehicles per day.
- The lane reduction would not impact overall intersection levels of service. The most tangible traffic impact is likely to be longer queues and delay time during the peak periods on Kingshighway Boulevard at the intersection with Neosho Street.
- The lane reduction would promote a more welcoming environment for all modes by reducing traffic speeds, improving safety, shortening pedestrian crosswalks, adding dedicated bicycle lanes, and protecting cyclists through signalized intersections.

The cost estimate for the preferred lane reduction concept is \$1,668,000. The cost estimate for the alternative lane reduction concept is \$3,297,000. Both cost estimates are detailed in **Appendix E**.





411 N. 10th St., Suite 200
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KINGSHIGHWAY

TRAFFIC STUDY APPENDIX

APPENDIX

Appendix A: Existing Count Data

Appendix B: Traffic Operations Analysis Methodology

Appendix C: Traffic Operations Conditions

Appendix D: Preferred Option Conceptual Design

Appendix E: Cost Estimate

Appendix A: Existing Count Data

Nottingham and Kingshighway - TMC

Tue Sep 10, 2019

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 697206, Location: 38.585189, -90.276619, Site Code: 01

Provided by: Engineering Design Source Inc.
16141 Swingley Ridge Road,
Chesterfield, MO, 12345, US

Leg Direction	North Southbound						East Westbound						South Northbound						West Eastbound							
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int	
2019-09-10 7:00AM	6	95	1	0	102	0	8	1	2	0	11	1	2	268	4	0	274	0	0	0	0	0	0	0	0	387
7:15AM	5	100	1	0	106	0	5	0	0	0	5	1	7	389	11	0	407	0	0	0	0	0	0	0	0	518
7:30AM	2	150	1	0	153	0	9	0	0	0	9	1	2	348	13	0	363	0	1	0	0	0	1	1	526	
7:45AM	5	132	1	0	138	2	8	2	3	0	13	1	2	285	14	0	301	0	0	0	1	0	1	0	453	
Hourly Total	18	477	4	0	499	2	30	3	5	0	38	4	13	1290	42	0	1345	0	1	0	1	0	2	1	1884	
8:00AM	5	120	5	0	130	1	4	0	0	0	4	1	4	326	9	0	339	0	0	0	0	0	0	0	473	
8:15AM	3	126	2	0	131	2	8	1	2	0	11	1	2	276	9	0	287	0	0	0	0	0	0	0	429	
8:30AM	4	103	3	0	110	2	7	0	2	0	9	2	2	224	5	0	231	0	0	0	0	0	0	0	350	
8:45AM	6	91	6	0	103	1	5	1	0	0	6	1	5	189	5	0	199	0	0	0	0	0	0	0	308	
Hourly Total	18	440	16	0	474	6	24	2	4	0	30	5	13	1015	28	0	1056	0	0	0	0	0	0	0	1560	
9:00AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4:00PM	7	271	17	0	295	0	15	1	6	0	22	2	11	131	3	0	145	1	0	0	0	0	0	1	462	
4:15PM	10	271	16	0	297	0	18	0	6	0	24	6	6	140	9	0	155	0	0	0	0	0	0	0	476	
4:30PM	11	278	20	0	309	2	16	1	3	0	20	2	8	121	6	0	135	0	0	0	0	0	0	0	464	
4:45PM	10	238	13	1	262	0	13	2	5	0	20	1	3	142	8	0	153	0	0	0	0	0	0	0	435	
Hourly Total	38	1058	66	1	1163	2	62	4	20	0	86	11	28	534	26	0	588	1	0	0	0	0	0	1	1837	
5:00PM	8	276	15	0	299	3	3	2	7	0	12	0	2	123	7	0	132	1	0	0	0	0	0	1	443	
5:15PM	15	241	20	0	276	0	20	4	4	0	28	3	4	156	8	0	168	0	0	0	0	0	0	0	472	
5:30PM	16	252	17	0	285	0	15	2	8	0	25	5	1	150	9	0	160	0	0	0	0	0	0	0	470	
5:45PM	10	256	16	0	282	0	10	2	6	0	18	3	3	125	8	0	136	0	0	0	0	0	0	0	436	
Hourly Total	49	1025	68	0	1142	3	48	10	25	0	83	11	10	554	32	0	596	1	0	0	0	0	0	1	1821	
6:00PM	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	
Hourly Total	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	
Total	123	3001	154	1	3279	13	164	19	54	0	237	31	64	3394	128	0	3586	2	1	0	1	0	2	3	7104	
% Approach	3.8%	91.5%	4.7%	0%	-	-	69.2%	8.0%	22.8%	0%	-	-	1.8%	94.6%	3.6%	0%	-	-	50.0%	0%	50.0%	0%	-	-	-	
% Total	1.7%	42.2%	2.2%	0%	46.2%	-	2.3%	0.3%	0.8%	0%	3.3%	-	0.9%	47.8%	1.8%	0%	50.5%	-	0%	0%	0%	0%	0%	-	-	
Motorcycles	0	8	1	0	9	-	1	0	0	0	1	-	0	7	0	0	7	-	0	0	0	0	0	-	17	
% Motorcycles	0%	0.3%	0.6%	0%	0.3%	-	0.6%	0%	0%	0%	0.4%	-	0%	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	0%	-	0.2%	
Lights	123	2922	150	1	3196	-	160	19	52	0	231	-	62	3318	126	0	3506	-	0	0	1	0	1	-	6934	
% Lights	100%	97.4%	97.4%	100%	97.5%	-	97.6%	100%	96.3%	0%	97.5%	-	96.9%	97.8%	98.4%	0%	97.8%	-	0%	0%	100%	0%	50.0%	-	97.6%	
Single-Unit Trucks	0	23	2	0	25	-	2	0	1	0	3	-	1	23	0	0	24	-	0	0	0	0	0	-	52	
% Single-Unit Trucks	0%	0.8%	1.3%	0%	0.8%	-	1.2%	0%	1.9%	0%	1.3%	-	1.6%	0.7%	0%	0%	0.7%	-	0%	0%	0%	0%	0%	-	0.7%	
Articulated Trucks	0	4	0	0	4	-	0	0	1	0	1	-	0	4	1	0	5	-	0	0	0	0	0	-	10	
% Articulated Trucks	0%	0.1%	0%	0%	0.1%	-	0%	0%	1.9%	0%	0.4%	-	0%	0.1%	0.8%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0.1%	
Buses	0	43	0	0	43	-	0	0	0	0	0	-	1	42	1	0	44	-	0	0	0	0	0	-	87	
% Buses	0%	1.4%	0%	0%	1.3%	-	0%	0%	0%	0%	0%	-	1.6%	1.2%	0.8%	0%	1.2%	-	0%	0%	0%	0%	0%	-	1.2%	
Bicycles on Road	0	1	1	0	2	-	1	0	0	0	1	-	0	0	0	0	0	-	1	0	0	0	1	-	4	
% Bicycles on Road	0%	0%	0.6%	0%	0.1%	-	0.6%	0%	0%	0%	0.4%	-	0%	0%	0%	0%	0%	-	100%	0%	0%	0%	50.0%	-	0.1%	
Pedestrians	-	-	-	-	-	13	-	-	-	-	-	28	-	-	-	-	-	2	-	-	-	-	-	2	-	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	90.3%	-	-	-	-	-	100%	-	-	-	-	-	66.7%	-	
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	1	-	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	9.7%	-	-	-	-	-	0%	-	-	-	-	-	33.3%	-	

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Neosho and Kingshighway - TMC

Tue Sep 10, 2019

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 697208, Location: 38.584285, -90.277056, Site Code: 02

Provided by: Engineering Design Source Inc.

16141 Swingley Ridge Road,

Chesterfield, MO, 12345, US

Leg Direction	North Southbound						East Westbound						South Northbound						West Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2019-09-10 7:00AM	0	61	0	0	61	0	0	0	5	0	5	0	7	151	0	0	158	0	3	3	14	0	20	0	244
7:15AM	0	59	1	0	60	0	1	0	8	0	9	0	2	235	0	0	237	0	5	2	10	0	17	0	323
7:30AM	1	103	0	0	104	0	0	0	9	0	9	0	6	198	0	0	204	0	7	2	8	0	17	0	334
7:45AM	0	81	0	0	81	0	1	0	7	0	8	0	3	161	0	0	164	0	11	3	5	0	19	0	272
Hourly Total	1	304	1	0	306	0	2	0	29	0	31	0	18	745	0	0	763	0	26	10	37	0	73	0	1173
8:00AM	0	71	0	1	72	0	0	0	7	0	7	0	7	186	0	1	194	0	4	2	9	0	15	0	288
8:15AM	0	65	2	0	67	0	0	0	6	0	6	0	7	144	0	0	151	0	9	3	9	0	21	0	245
8:30AM	0	62	0	0	62	0	0	0	3	0	3	0	5	129	0	0	134	0	4	1	5	0	10	0	209
8:45AM	0	49	0	0	49	0	0	0	5	0	5	0	6	109	0	0	115	0	3	2	5	0	10	0	179
Hourly Total	0	247	2	1	250	0	0	0	21	0	21	0	25	568	0	1	594	0	20	8	28	0	56	0	921
9:00AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1
4:00PM	0	175	0	0	175	0	0	0	7	0	7	0	13	67	0	0	80	0	10	4	3	0	17	0	279
4:15PM	0	175	1	0	176	0	0	0	9	0	9	0	5	80	0	0	85	0	6	2	5	0	13	0	283
4:30PM	0	177	0	0	177	0	1	0	5	0	6	0	6	60	0	0	66	0	7	3	3	0	13	0	262
4:45PM	0	147	0	0	147	0	0	0	6	0	6	0	7	85	0	0	92	1	7	1	4	0	12	0	257
Hourly Total	0	674	1	0	675	0	1	0	27	0	28	0	31	292	0	0	323	1	30	10	15	0	55	0	1081
5:00PM	0	185	2	0	187	0	0	0	5	0	5	0	12	75	0	0	87	0	10	2	5	0	17	0	296
5:15PM	0	141	0	0	141	0	1	0	5	0	6	0	9	81	0	0	90	0	8	7	6	0	21	0	258
5:30PM	0	160	0	0	160	0	0	0	9	0	9	0	10	74	0	0	84	0	7	2	1	0	10	0	263
5:45PM	0	138	0	0	138	0	0	0	9	0	9	1	7	80	0	0	87	1	8	1	5	0	14	1	248
Hourly Total	0	624	2	0	626	0	1	0	28	0	29	1	38	310	0	0	348	1	33	12	17	0	62	1	1065
6:00PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	1849	6	1	1857	0	4	0	105	0	109	1	112	1916	0	1	2029	2	109	40	97	0	246	1	4241
% Approach	0.1%	99.6%	0.3%	0.1%	-	-	3.7%	0%	96.3%	0%	-	-	5.5%	94.4%	0%	0%	-	-	44.3%	16.3%	39.4%	0%	-	-	-
% Total	0%	43.6%	0.1%	0%	43.8%	-	0.1%	0%	2.5%	0%	2.6%	-	2.6%	45.2%	0%	0%	47.8%	-	2.6%	0.9%	2.3%	0%	5.8%	-	-
Motorcycles	0	5	0	0	5	-	0	0	1	0	1	-	0	5	0	0	5	-	0	1	0	0	1	-	12
% Motorcycles	0%	0.3%	0%	0%	0.3%	-	0%	0%	1.0%	0%	0.9%	-	0%	0.3%	0%	0%	0.2%	-	0%	2.5%	0%	0%	0.4%	-	0.3%
Lights	0	1797	5	1	1803	-	4	0	99	0	103	-	108	1874	0	1	1983	-	106	37	96	0	239	-	4128
% Lights	0%	97.2%	83.3%	100%	97.1%	-	100%	0%	94.3%	0%	94.5%	-	96.4%	97.8%	0%	100%	97.7%	-	97.2%	92.5%	99.0%	0%	97.2%	-	97.3%
Single-Unit Trucks	0	13	1	0	14	-	0	0	2	0	2	-	2	12	0	0	14	-	1	1	0	0	2	-	32
% Single-Unit Trucks	0%	0.7%	16.7%	0%	0.8%	-	0%	0%	1.9%	0%	1.8%	-	1.8%	0.6%	0%	0%	0.7%	-	0.9%	2.5%	0%	0%	0.8%	-	0.8%
Articulated Trucks	0	4	0	0	4	-	0	0	1	0	1	-	0	1	0	0	1	-	1	0	0	0	1	-	7
% Articulated Trucks	0%	0.2%	0%	0%	0.2%	-	0%	0%	1.0%	0%	0.9%	-	0%	0.1%	0%	0%	0%	-	0.9%	0%	0%	0%	0.4%	-	0.2%
Buses	0	29	0	0	29	-	0	0	2	0	2	-	1	24	0	0	25	-	0	1	1	0	2	-	58
% Buses	0%	1.6%	0%	0%	1.6%	-	0%	0%	1.9%	0%	1.8%	-	0.9%	1.3%	0%	0%	1.2%	-	0%	2.5%	1.0%	0%	0.8%	-	1.4%
Bicycles on Road	1	1	0	0	2	-	0	0	0	0	0	-	1	0	0	0	1	-	1	0	0	0	1	-	4
% Bicycles on Road	100%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0.9%	0%	0%	0%	0%	-	0.9%	0%	0%	0%	0.4%	-	0.1%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	1	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Eichelberger and Kingshighway - TMC

Thu Sep 12, 2019

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 697210, Location: 38.58096, -90.278831, Site Code: 03

Provided by: Engineering Design Source Inc.
16141 Swingley Ridge Road,
Chesterfield, MO, 12345, US

Leg Direction	North Southbound						East Westbound						South Northbound						West Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2019-09-12 7:00AM	10	61	0	0	71	0	10	21	1	0	32	1	4	128	6	0	138	0	4	14	8	0	26	0	267
7:15AM	12	51	1	0	64	0	20	28	0	0	48	1	4	163	9	0	176	0	7	11	18	0	36	1	324
7:30AM	3	113	1	0	117	2	18	17	1	0	36	1	4	160	8	0	172	0	11	15	15	0	41	0	366
7:45AM	10	90	1	0	101	1	6	15	0	0	21	0	3	137	6	0	146	0	4	13	17	0	34	1	302
Hourly Total	35	315	3	0	353	3	54	81	2	0	137	3	15	588	29	0	632	0	26	53	58	0	137	2	1259
8:00AM	5	54	0	0	59	0	13	8	0	0	21	0	2	133	8	0	143	1	14	5	11	0	30	0	253
8:15AM	3	62	0	0	65	0	11	8	0	0	19	0	1	115	4	0	120	0	5	3	9	0	17	0	221
8:30AM	1	40	1	0	42	1	11	14	1	0	26	0	1	108	4	0	113	1	6	9	14	0	29	0	210
8:45AM	5	51	0	0	56	0	1	11	1	0	13	2	0	85	2	0	87	1	7	7	11	0	25	0	181
Hourly Total	14	207	1	0	222	1	36	41	2	0	79	2	4	441	18	0	463	3	32	24	45	0	101	0	865
9:00AM	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
Hourly Total	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
4:00PM	13	146	3	0	162	0	6	17	0	0	23	0	6	74	7	0	87	0	16	30	12	0	58	0	330
4:15PM	11	130	0	0	141	0	3	12	3	0	18	0	7	69	8	0	84	0	14	21	3	0	38	0	281
4:30PM	17	137	3	0	157	0	4	13	0	0	17	0	2	64	7	0	73	0	11	29	15	0	55	0	302
4:45PM	11	128	2	0	141	1	6	18	1	0	25	0	3	81	5	0	89	1	20	29	6	0	55	0	310
Hourly Total	52	541	8	0	601	1	19	60	4	0	83	0	18	288	27	0	333	1	61	109	36	0	206	0	1223
5:00PM	15	137	2	0	154	0	2	18	3	0	23	0	1	64	8	0	73	0	21	22	7	0	50	0	300
5:15PM	10	133	4	0	147	0	5	19	0	0	24	0	1	82	4	0	87	0	14	23	4	0	41	0	299
5:30PM	18	132	1	0	151	0	2	19	3	0	24	0	6	75	4	0	85	2	17	24	7	0	48	0	308
5:45PM	17	139	1	0	157	0	5	12	1	0	18	0	1	80	5	0	86	0	15	22	13	0	50	0	311
Hourly Total	60	541	8	0	609	0	14	68	7	0	89	0	9	301	21	0	331	2	67	91	31	0	189	0	1218
6:00PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	161	1605	20	0	1786	5	123	250	15	0	388	5	46	1619	95	0	1760	6	186	277	170	0	633	2	4567
% Approach	9.0%	89.9%	1.1%	0%	-	-	31.7%	64.4%	3.9%	0%	-	-	2.6%	92.0%	5.4%	0%	-	-	29.4%	43.8%	26.9%	0%	-	-	-
% Total	3.5%	35.1%	0.4%	0%	39.1%	-	2.7%	5.5%	0.3%	0%	8.5%	-	1.0%	35.4%	2.1%	0%	38.5%	-	4.1%	6.1%	3.7%	0%	13.9%	-	-
Motorcycles	0	1	0	0	1	-	1	2	0	0	3	-	0	5	0	0	5	-	0	0	1	0	1	-	10
% Motorcycles	0%	0.1%	0%	0%	0.1%	-	0.8%	0.8%	0%	0%	0.8%	-	0%	0.3%	0%	0%	0.3%	-	0%	0%	0.6%	0%	0.2%	-	0.2%
Lights	158	1555	18	0	1731	-	119	240	12	0	371	-	44	1575	93	0	1712	-	181	272	167	0	620	-	4434
% Lights	98.1%	96.9%	90.0%	0%	96.9%	-	96.7%	96.0%	80.0%	0%	95.6%	-	95.7%	97.3%	97.9%	0%	97.3%	-	97.3%	98.2%	98.2%	0%	97.9%	-	97.1%
Single-Unit Trucks	2	17	1	0	20	-	1	2	1	0	4	-	1	15	0	0	16	-	1	1	1	0	3	-	43
% Single-Unit Trucks	1.2%	1.1%	5.0%	0%	1.1%	-	0.8%	0.8%	6.7%	0%	1.0%	-	2.2%	0.9%	0%	0%	0.9%	-	0.5%	0.4%	0.6%	0%	0.5%	-	0.9%
Articulated Trucks	0	5	0	0	5	-	0	0	0	0	0	-	0	4	1	0	5	-	0	1	0	0	1	-	11
% Articulated Trucks	0%	0.3%	0%	0%	0.3%	-	0%	0%	0%	0%	0%	-	0%	0.2%	1.1%	0%	0.3%	-	0%	0.4%	0%	0%	0.2%	-	0.2%
Buses	1	27	1	0	29	-	2	5	2	0	9	-	1	19	1	0	21	-	1	3	1	0	5	-	64
% Buses	0.6%	1.7%	5.0%	0%	1.6%	-	1.6%	2.0%	13.3%	0%	2.3%	-	2.2%	1.2%	1.1%	0%	1.2%	-	0.5%	1.1%	0.6%	0%	0.8%	-	1.4%
Bicycles on Road	0	0	0	0	0	-	0	1	0	0	1	-	0	1	0	0	1	-	3	0	0	0	3	-	5
% Bicycles on Road	0%	0%	0%	0%	0%	-	0%	0.4%	0%	0%	0.3%	-	0%	0.1%	0%	0%	0.1%	-	1.6%	0%	0%	0%	0.5%	-	0.1%
Pedestrians	-	-	-	-	-	5	-	-	-	-	-	5	-	-	-	-	-	4	-	-	-	-	-	2	
% Pedestrians	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	66.7%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	33.3%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Rhodes and Kingshighway - TMC

Thu Sep 12, 2019

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 697213, Location: 38.577801, -90.282554, Site Code: 04

Provided by: Engineering Design

Source Inc.

16141 Swingley Ridge Road,

Chesterfield, MO, 12345, US

Leg Direction	North Southbound					South Northbound					West Eastbound					
Time	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	Int
2019-09-12 7:00AM	1	60	0	61	0	130	7	0	137	0	0	0	0	0	2	198
7:15AM	2	53	0	55	0	153	11	0	164	0	0	0	0	0	1	219
7:30AM	6	111	0	117	0	149	12	0	161	0	0	0	0	0	2	278
7:45AM	1	110	0	111	0	147	9	0	156	0	0	0	0	0	1	267
Hourly Total	10	334	0	344	0	579	39	0	618	0	0	0	0	0	6	962
8:00AM	3	69	0	72	0	132	10	0	142	0	0	0	0	0	1	214
8:15AM	4	57	0	61	0	99	10	0	109	1	0	0	0	0	0	170
8:30AM	1	45	0	46	0	106	8	0	114	0	0	0	0	0	0	160
8:45AM	5	45	0	50	0	93	10	0	103	0	0	0	0	0	0	153
Hourly Total	13	216	0	229	0	430	38	0	468	1	0	0	0	0	1	697
9:00AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00PM	3	147	0	150	0	92	9	1	102	0	0	0	0	0	0	252
4:15PM	7	136	0	143	0	91	17	0	108	0	0	0	0	0	0	251
4:30PM	2	135	0	137	0	69	10	0	79	0	0	0	0	0	0	216
4:45PM	11	128	1	140	0	92	14	1	107	0	0	0	0	0	0	247
Hourly Total	23	546	1	570	0	344	50	2	396	0	0	0	0	0	0	966
5:00PM	5	158	0	163	0	77	17	0	94	0	0	0	0	0	0	257
5:15PM	11	132	0	143	0	84	13	0	97	0	0	0	0	0	2	240
5:30PM	7	131	0	138	0	85	12	0	97	0	0	0	0	0	0	235
5:45PM	9	124	0	133	2	84	13	0	97	1	0	0	0	0	1	230
Hourly Total	32	545	0	577	2	330	55	0	385	1	0	0	0	0	3	962
6:00PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	78	1641	1	1720	2	1683	182	2	1867	2	0	0	0	0	10	3587
% Approach	4.5%	95.4%	0.1%	-	-	90.1%	9.7%	0.1%	-	-	0%	0%	0%	-	-	-
% Total	2.2%	45.7%	0%	48.0%	-	46.9%	5.1%	0.1%	52.0%	-	0%	0%	0%	0%	-	-
Motorcycles	0	4	0	4	-	4	0	0	4	-	0	0	0	0	-	8
% Motorcycles	0%	0.2%	0%	0.2%	-	0.2%	0%	0%	0.2%	-	0%	0%	0%	-	-	0.2%
Lights	76	1593	1	1670	-	1636	177	2	1815	-	0	0	0	0	-	3485
% Lights	97.4%	97.1%	100%	97.1%	-	97.2%	97.3%	100%	97.2%	-	0%	0%	0%	-	-	97.2%
Single-Unit Trucks	1	15	0	16	-	18	0	0	18	-	0	0	0	0	-	34
% Single-Unit Trucks	1.3%	0.9%	0%	0.9%	-	1.1%	0%	0%	1.0%	-	0%	0%	0%	-	-	0.9%
Articulated Trucks	0	4	0	4	-	3	0	0	3	-	0	0	0	0	-	7
% Articulated Trucks	0%	0.2%	0%	0.2%	-	0.2%	0%	0%	0.2%	-	0%	0%	0%	-	-	0.2%
Buses	1	25	0	26	-	21	3	0	24	-	0	0	0	0	-	50
% Buses	1.3%	1.5%	0%	1.5%	-	1.2%	1.6%	0%	1.3%	-	0%	0%	0%	-	-	1.4%
Bicycles on Road	0	0	0	0	-	1	2	0	3	-	0	0	0	0	-	3
% Bicycles on Road	0%	0%	0%	0%	-	0.1%	1.1%	0%	0.2%	-	0%	0%	0%	-	-	0.1%
Pedestrians	-	-	-	-	2	-	-	-	-	2	-	-	-	-	9	-
% Pedestrians	-	-	-	-	100%	-	-	-	-	100%	-	-	-	-	90.0%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-
% Bicycles on Crosswalk	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-	10.0%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Engineering Design Source Inc.
16141 Swingley Ridge Road
Chesterfield, Missouri, United States 12345
636.537.5585 go@engdesignsource.com

Count Name: Schollmeyer and Kingshighway
Site Code:
Start Date: 10/22/2019
Page No: 1

Turning Movement Data

Start Time	Southbound Approach						Westbound Approach						Northbound Approach						Eastbound Approach						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
4:00 PM	0	112	8	0	0	120	0	0	0	0	11	0	7	88	0	0	8	95	6	2	2	0	1	10	225
4:15 PM	0	123	4	0	0	127	3	0	0	0	0	3	2	74	0	0	1	76	3	2	1	0	0	6	212
4:30 PM	0	91	4	0	1	95	1	0	0	0	1	1	3	78	0	0	0	81	4	0	2	0	0	6	183
4:45 PM	0	103	2	0	0	105	0	0	0	0	1	0	2	73	1	0	0	76	4	1	3	0	0	8	189
Hourly Total	0	429	18	0	1	447	4	0	0	0	13	4	14	313	1	0	9	328	17	5	8	0	1	30	809
5:00 PM	0	122	1	0	0	123	0	0	0	0	1	0	7	64	0	0	1	71	1	0	3	0	0	4	198
5:15 PM	0	95	1	0	0	96	0	0	0	0	0	0	4	71	0	0	1	75	2	0	0	0	0	2	173
5:30 PM	0	104	2	0	2	106	0	0	0	0	2	0	3	61	0	0	0	64	2	0	1	0	2	3	173
5:45 PM	0	99	4	0	0	103	1	0	0	0	6	1	4	80	0	0	0	84	2	0	2	0	1	4	192
Hourly Total	0	420	8	0	2	428	1	0	0	0	9	1	18	276	0	0	2	294	7	0	6	0	3	13	736
6:00 PM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
7:00 AM	0	44	3	0	0	47	0	0	0	0	0	0	7	110	0	0	0	117	3	0	2	0	0	5	169
7:15 AM	0	36	5	0	0	41	0	0	0	0	0	0	14	120	0	0	0	134	4	0	2	0	0	6	181
7:30 AM	0	48	22	2	0	72	0	0	0	0	9	0	22	131	0	0	9	153	7	5	4	0	0	16	241
7:45 AM	0	44	34	1	1	79	0	0	0	0	22	0	47	148	0	0	16	195	3	4	6	0	1	13	287
Hourly Total	0	172	64	3	1	239	0	0	0	0	31	0	90	509	0	0	25	599	17	9	14	0	1	40	878
8:00 AM	0	42	17	0	0	59	0	0	0	0	7	0	28	114	0	0	3	142	4	2	6	0	0	12	213
8:15 AM	0	57	1	0	1	58	0	0	0	0	4	0	3	97	0	0	0	100	2	0	6	0	0	8	166
8:30 AM	0	51	3	0	0	54	0	0	0	0	0	0	2	91	0	0	0	93	1	0	0	0	0	1	148
8:45 AM	0	32	0	0	0	32	0	0	0	0	0	0	2	69	0	0	0	71	1	0	1	0	0	2	105
Hourly Total	0	182	21	0	1	203	0	0	0	0	11	0	35	371	0	0	3	406	8	2	13	0	0	23	632
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	1204	111	3	5	1318	5	0	0	0	64	5	157	1469	1	0	39	1627	49	16	41	0	5	106	3056
Approach %	0.0	91.4	8.4	0.2	-	-	100.0	0.0	0.0	0.0	-	-	9.6	90.3	0.1	0.0	-	-	46.2	15.1	38.7	0.0	-	-	-
Total %	0.0	39.4	3.6	0.1	-	43.1	0.2	0.0	0.0	0.0	-	0.2	5.1	48.1	0.0	0.0	-	53.2	1.6	0.5	1.3	0.0	-	3.5	-
All Vehicles (no classification)	0	1200	110	3	-	1313	5	0	0	0	-	5	157	1467	1	0	-	1625	49	15	41	0	-	105	3048
% All Vehicles (no classification)	-	99.7	99.1	100.0	-	99.6	100.0	-	-	-	-	100.0	100.0	99.9	100.0	-	-	99.9	100.0	93.8	100.0	-	-	99.1	99.7
Bicycles on Road	0	4	1	0	-	5	0	0	0	0	-	0	0	2	0	0	-	2	0	1	0	0	-	1	8
% Bicycles on Road	-	0.3	0.9	0.0	-	0.4	0.0	-	-	-	-	0.0	0.0	0.1	0.0	-	-	0.1	0.0	6.3	0.0	-	-	0.9	0.3
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	2.6	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	5	-	-	-	-	-	64	-	-	-	-	-	38	-	-	-	-	-	5	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	97.4	-	-	-	-	-	100.0	-	-

Gravois and Kingshighway - TMC

Tue Sep 17, 2019

Full Length (7 AM-9 AM, 4 PM-6 PM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 697215, Location: 38.571394, -90.283788, Site Code: 05

Provided by: Engineering Design Source Inc.

16141 Swingley Ridge Road,

Chesterfield, MO, 12345, US

Leg Direction	North Southbound						East Westbound						South Northbound						West Eastbound						
Time	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	R	T	L	U	App	Ped*	Int
2019-09-17 7:00AM	50	0	2	0	52	0	14	88	0	0	102	0	0	0	0	0	0	0	0	74	94	0	168	0	322
7:15AM	37	0	3	0	40	0	8	104	0	0	112	0	1	0	0	0	1	1	1	91	143	0	235	0	388
7:30AM	46	2	3	0	51	3	27	99	0	0	126	0	1	2	0	0	3	2	0	91	133	0	224	0	404
7:45AM	51	1	9	1	62	0	70	112	0	0	182	2	0	1	0	0	1	4	1	113	107	0	221	4	466
Hourly Total	184	3	17	1	205	3	119	403	0	0	522	2	2	3	0	0	5	7	2	369	477	0	848	4	1580
8:00AM	53	0	4	0	57	1	39	100	0	0	139	0	0	1	0	0	1	1	0	83	120	0	203	0	400
8:15AM	47	0	2	0	49	0	12	75	0	0	87	1	0	2	0	0	2	3	0	87	82	0	169	0	307
8:30AM	43	0	0	0	43	0	2	85	0	0	87	0	1	2	0	0	3	1	1	83	74	0	158	0	291
8:45AM	36	0	4	0	40	1	2	81	0	0	83	0	0	0	0	0	0	2	1	74	64	0	139	0	262
Hourly Total	179	0	10	0	189	2	55	341	0	0	396	1	1	5	0	0	6	7	2	327	340	0	669	0	1260
9:00AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:00PM	113	3	10	0	126	0	32	152	0	0	184	0	1	1	0	0	2	0	5	126	58	0	189	0	501
4:15PM	90	1	3	0	94	6	13	142	0	0	155	0	2	0	0	0	2	1	1	120	54	1	176	1	427
4:30PM	91	2	5	0	98	0	16	131	0	0	147	1	5	3	1	0	9	1	5	121	60	0	186	0	440
4:45PM	102	0	3	0	105	1	15	139	0	0	154	0	1	1	0	0	2	1	3	86	62	0	151	0	412
Hourly Total	396	6	21	0	423	7	76	564	0	0	640	1	9	5	1	0	15	3	14	453	234	1	702	1	1780
5:00PM	104	2	9	0	115	1	17	146	0	0	163	0	0	3	1	0	4	2	4	109	56	0	169	0	451
5:15PM	104	2	7	0	113	2	14	123	0	0	137	0	1	1	0	1	3	0	3	102	63	0	168	0	421
5:30PM	99	1	12	0	112	2	12	131	0	0	143	0	5	5	0	0	10	1	1	115	60	0	176	3	441
5:45PM	68	2	6	0	76	3	15	128	0	0	143	0	2	2	0	0	4	0	3	123	57	0	183	0	406
Hourly Total	375	7	34	0	416	8	58	528	0	0	586	0	8	11	1	1	21	3	11	449	236	0	696	3	1719
6:00PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1
Total	1134	16	82	1	1233	20	308	1836	0	0	2144	4	20	24	2	1	47	20	29	1599	1287	1	2916	8	6340
% Approach	92.0%	1.3%	6.7%	0.1%	-	-	14.4%	85.6%	0%	0%	-	-	42.6%	51.1%	4.3%	2.1%	-	-	1.0%	54.8%	44.1%	0%	-	-	-
% Total	17.9%	0.3%	1.3%	0%	19.4%	-	4.9%	29.0%	0%	0%	33.8%	-	0.3%	0.4%	0%	0%	0.7%	-	0.5%	25.2%	20.3%	0%	46.0%	-	-
Motorcycles	3	0	1	0	4	-	2	9	0	0	11	-	0	0	0	0	0	-	0	8	1	0	9	-	24
% Motorcycles	0.3%	0%	1.2%	0%	0.3%	-	0.6%	0.5%	0%	0%	0.5%	-	0%	0%	0%	0%	0%	-	0%	0.5%	0.1%	0%	0.3%	-	0.4%
Lights	1102	16	78	1	1197	-	303	1781	0	0	2084	-	17	24	2	1	44	-	29	1538	1251	1	2819	-	6144
% Lights	97.2%	100%	95.1%	100%	97.1%	-	98.4%	97.0%	0%	0%	97.2%	-	85.0%	100%	100%	100%	93.6%	-	100%	96.2%	97.2%	100%	96.7%	-	96.9%
Single-Unit Trucks	7	0	1	0	8	-	1	14	0	0	15	-	3	0	0	0	3	-	0	25	11	0	36	-	62
% Single-Unit Trucks	0.6%	0%	1.2%	0%	0.6%	-	0.3%	0.8%	0%	0%	0.7%	-	15.0%	0%	0%	0%	6.4%	-	0%	1.6%	0.9%	0%	1.2%	-	1.0%
Articulated Trucks	3	0	1	0	4	-	0	2	0	0	2	-	0	0	0	0	0	-	0	7	3	0	10	-	16
% Articulated Trucks	0.3%	0%	1.2%	0%	0.3%	-	0%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%	0.4%	0.2%	0%	0.3%	-	0.3%
Buses	19	0	1	0	20	-	1	29	0	0	30	-	0	0	0	0	0	-	0	21	21	0	42	-	92
% Buses	1.7%	0%	1.2%	0%	1.6%	-	0.3%	1.6%	0%	0%	1.4%	-	0%	0%	0%	0%	0%	-	0%	1.3%	1.6%	0%	1.4%	-	1.5%
Bicycles on Road	0	0	0	0	0	-	1	1	0	0	2	-	0	0	0	0	0	-	0	0	0	0	0	-	2
% Bicycles on Road	0%	0%	0%	0%	0%	-	0.3%	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	0%	-	0%	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	-	18	-	-	-	-	-	4	-	-	-	-	-	20	-	-	-	-	-	8	-
% Pedestrians	-	-	-	-	-	90.0%	-	-	-	-	-	100%	-	-	-	-	-	100%	-	-	-	-	-	100%	-
Bicycles on Crosswalk	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-
% Bicycles on Crosswalk	-	-	-	-	-	10.0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-	-	-	-	-	0%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Appendix B: Traffic Operational Analysis Methodology

Traffic operating conditions were evaluated using Synchro 10 traffic modeling software, which is based upon methodologies outlined in the Highway Capacity Manual, 6th Edition (HCM) published by the Transportation Research Board.

The performance of a transportation system is quantified by Levels of Service (LOS), which are measures of traffic flow that consider factors such as speed, delay, interruptions, safety, and driver comfort and convenience. There are six levels of service ranging from LOS A (“free flow”) to LOS F (“oversaturated”). LOS C is commonly used for design purposes and represents a roadway with volumes utilizing 70 to 80 percent of its capacity. LOS E is typically considered acceptable for peak period conditions in urban areas.

Level of service criteria vary depending upon the roadway component being evaluated. Intersections are most commonly evaluated since roadway capacity is typically dictated by the number of vehicles that can be served at critical intersections. For intersections, the criteria are based on delay and the type of control (i.e., whether it is signalized or unsignalized/roundabout).

Signalized intersections reflect higher delay tolerances as compared to unsignalized locations because motorists are accustomed to and accepting of longer delays at signals. For signalized and all-way stop intersections, the average control delay per vehicle is estimated for each movement and then aggregated for each approach and the intersection as a whole. For intersections with partial (side-street) stop control, the delay is calculated for the minor movements only (side-street approaches and major road left-turns) since through traffic on the major road is not required to stop. The thresholds for intersection levels of service are summarized in **Table B1**.

Table B1: Intersection Level of Service Thresholds

Level of Service	Delay per Vehicle (sec/veh)	
	Signalized	Unsignalized
A	< 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

Appendix C: Traffic Operating Conditions

Table C1: Existing Operating Conditions

Intersection	Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Max. Queue (ft)	LOS	Delay (s)	Max. Queue (ft)
Kingshighway Boulevard & Nottingham Avenue	NB	L	A	1.5	9	A	1.8	6
		R	A	0.0	0	A	0.2	1
		T	A	3.7	217	A	3.8	79
		Overall	A	3.6	217	A	3.5	79
	SB	L	A	1.8	3	A	1.7	14
		TR	A	4.0	84	A	4.6	201
		Overall	A	4.0	84	A	4.4	201
	WB	LT	E	62.2	18	E	65.2	55
		R	B	13.4	4	B	19.9	49
		Overall	C	22.0	18	C	32.3	55
Overall		A	4.1	217	A	5.5	201	
Kingshighway Boulevard & Christy Boulevard	NWB	T	F	102.8	522	B	11.3	35
		Overall	F	102.8	522	B	11.3	35
	SB	L	B	11.2	26	A	9.6	41
		Overall	B	11.2	26	A	9.6	41
	Overall		D	33.9	522	A	4.1	41
Kingshighway Boulevard & Neosho Street	EB	L	C	22.4	11	C	21.1	7
		TR	C	16.0	9	B	14.4	9
		Overall	C	18.9	11	C	16.3	9
	NB	TR	A	0.0	0	A	0.0	0
		Overall	A	0.0	0	A	0.0	0
	SB	T	A	0.0	0	A	0.0	0
		Overall	A	0.0	0	A	0.0	0
	WB	L	E	39.1	20	C	19.1	9
		Overall	E	39.1	20	C	19.1	9
	Overall		A	1.9	20	A	1.5	9
Kingshighway Boulevard & Eichelberger Street	EB	LT	F	87.3	166	E	78.1	216
		R	C	21.4	38	F	116.5	102
		Overall	E	70.7	166	F	89.6	216
	NB	LTR	A	4.6	124	A	4.1	57
		Overall	A	4.6	124	A	4.1	57
	SB	LTR	A	4.0	58	A	3.3	125
		Overall	A	4.0	58	A	3.3	125
	WB	LT	E	62.2	104	E	57.3	110
		R	B	13.9	20	B	11.4	0
		Overall	D	40.2	104	D	47.2	110
Overall		B	15.9	166	C	21.7	216	
Kingshighway Boulevard & Rhodes Avenue	NB	LT	A	0.2	0	A	0.1	0
		Overall	A	0.2	0	A	0.1	0
	SB	TR	A	0.1	0	A	0.1	0
		Overall	A	0.1	0	A	0.1	0
Overall		A	0.2	0	A	0.1	0	
Kingshighway Boulevard & Schollmeyer Avenue	EB	LT	B	16.3	25	B	15.5	19
		R	A	0.2	0	A	0.9	0
		Overall	B	10.2	25	A	9.2	19
	NB	TR	A	5.2	84	A	5.1	44
		Overall	A	5.2	84	A	5.1	44
	SB	LT	A	5.2	36	A	5.4	63
		Overall	A	5.2	36	A	5.4	63
	WB	R	A	0.0	0	A	0.0	0
Overall		A	0.0	0	A	0.0	0	
Overall		A	5.5	84	A	5.5	63	
Kingshighway	EB	LTR	D	41.1	495	C	28.9	331

Intersection	Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Max. Queue (ft)	LOS	Delay (s)	Max. Queue (ft)
Boulevard & Gravois Avenue		Overall	D	41.1	495	C	28.9	331
	NB	TR	C	25.2	11	C	25.5	22
		Overall	C	25.2	11	C	25.5	22
	SB	LT	C	25.4	34	C	25.4	37
		R	C	27.4	94	C	31.1	201
		Overall	C	27.2	94	C	30.7	201
	WB	TR	B	16.0	162	B	19.6	227
		Overall	B	16.0	162	B	19.6	227
	Overall		C	29.7	162	C	25.9	331

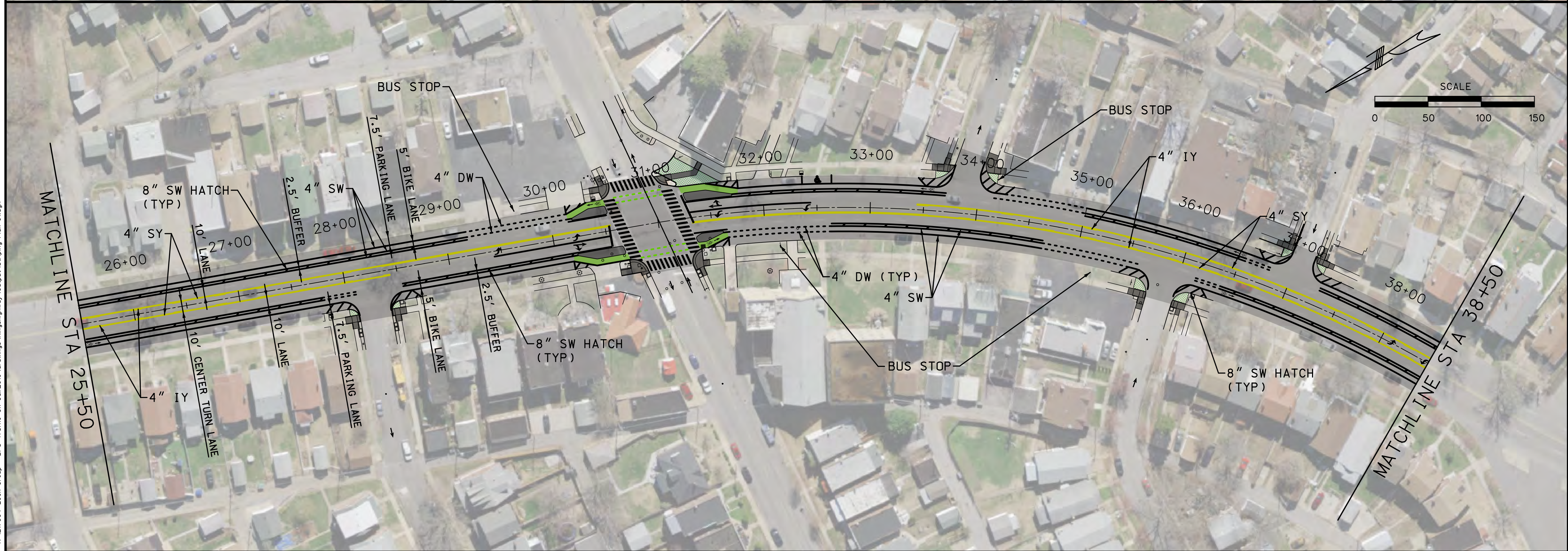
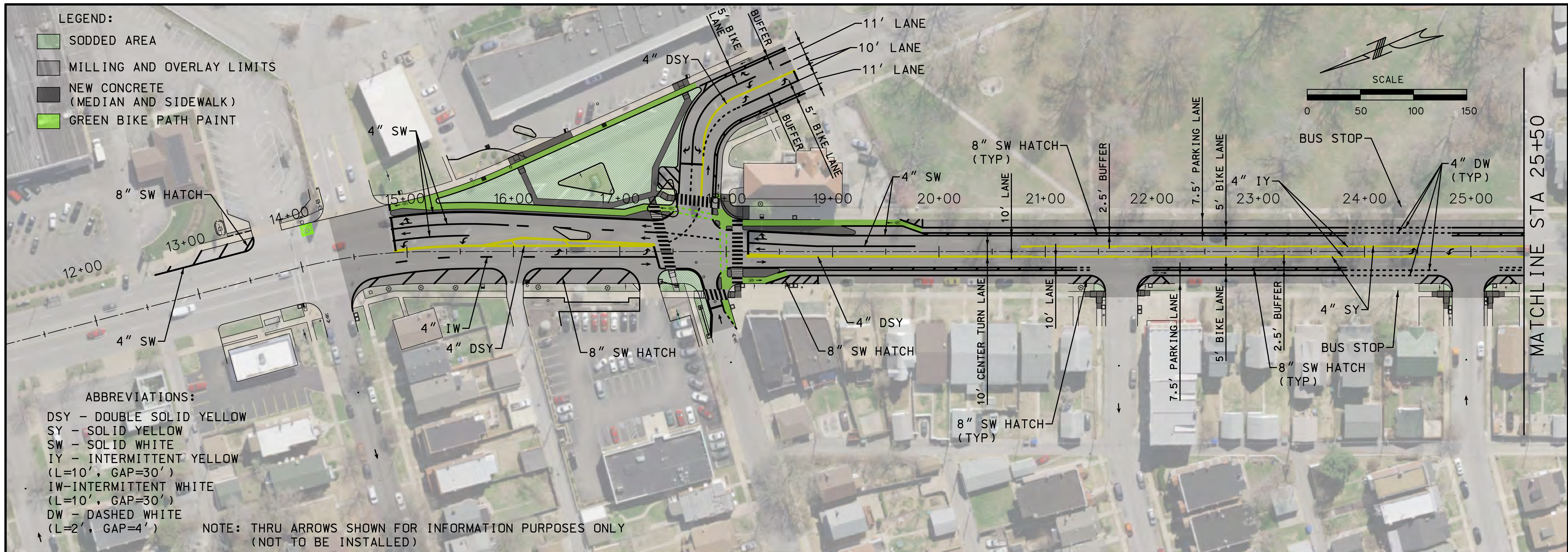
Table C2: Forecasted Operating Conditions with preferred “Lane Reduction” Option

Intersection	Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Max. Queue (ft)	LOS	Delay (s)	Max. Queue (ft)
Kingshighway Boulevard & Nottingham Avenue	NB	L	A	2.9	15	A	3.4	10
		TR	A	7.9	324	A	8.4	151
		Overall	A	7.7	324	A	8.2	151
	SB	L	A	1.8	3	A	1.8	14
		TR	A	4.0	84	A	4.6	201
		Overall	A	4.0	84	A	4.4	201
	WB	LT	E	62.2	18	E	65.2	55
		R	B	13.4	4	B	19.9	49
		Overall	C	22.0	18	C	32.3	55
	Overall		A	7.0	324	A	7.0	201
Kingshighway Boulevard & Neosho Street	EB	LTR	E	57.2	113	E	74.5	100
		Overall	E	57.2	113	E	74.5	100
	NB	TR	C	28.2	328	B	10.8	115
		Overall	C	28.2	328	B	10.8	115
	SB	L	B	13.5	68	A	3.3	50
		T	A	6.5	114	A	1.9	16
		Overall	A	9.1	114	A	2.4	50
	WB	L	D	54.4	62	E	69.2	60
		R	D	51.7	739	D	53.4	297
		Overall	D	51.8	62	E	55.0	297
	Overall		C	30.5	328	B	15.9	297
Kingshighway Boulevard & Eichelberger Street	EB	LT	F	86.8	165	E	76.2	212
		R	C	21.4	38	C	25.4	63
		Overall	E	70.3	165	E	61.0	212
	NB	L	A	4.2	17	A	4.5	16
		TR	A	6.2	280	A	4.7	113
		Overall	A	6.1	280	A	4.7	113
	SB	L	A	8.5	6	A	4.1	4
		TR	A	8.9	186	A	5.8	235
		Overall	A	8.9	186	A	5.8	235
	WB	LT	E	62.0	104	E	56.6	101
		R	B	14.2	21	B	17.9	24
		Overall	D	40.2	104	D	47.3	101
	Overall		B	18.1	280	B	18.2	235
Kingshighway Boulevard & Rhodes Avenue	NB	L	A	0.1	0	A	0.2	0
		T	A	0.4	0	A	0.2	0
		Overall	A	0.4	0	A	0.2	0
	SB	TR	A	0.3	0	A	0.4	0
		Overall	A	0.3	0	A	0.4	0
	Overall		A	0.3	0	A	0.3	0
Kingshighway Boulevard & Schollmeyer Avenue	EB	LT	C	30.2	40	A	7.9	12
		R	A	0.3	0	A	3.1	0
		Overall	B	19.0	40	A	4.5	12
	NB	TR	A	6.1	141	A	6.9	113
		Overall	A	6.1	141	A	6.9	113
	SB	LT	A	3.3	56	A	5.7	68
		Overall	A	3.3	56	A	5.7	68
	WB	R	A	0.0	0	A	0.0	0
		Overall	A	0.0	0	A	0.0	0
	Overall		A	6.0	141	A	6.0	113
Kingshighway Boulevard & Gravois	EB	LTR	D	41.1	495	C	28.9	331
		Overall	D	41.1	495	C	28.9	331

Intersection	Approach	Lane Group	AM Peak Hour			PM Peak Hour		
			LOS	Delay (s)	Max. Queue (ft)	LOS	Delay (s)	Max. Queue (ft)
Avenue	NB	LTR	C	25.2	11	C	25.6	23
		Overall	C	25.2	11	C	25.6	23
	SB	LT	C	25.4	34	C	25.4	37
		R	C	27.4	94	C	31.1	201
		Overall	C	27.2	94	C	30.7	201
	WB	TR	B	16.0	162	B	19.6	227
		Overall	B	16.0	162	B	19.6	227
	Overall		C	29.7	162	C	25.9	331

Appendix D: Preferred Alternative Conceptual Design

12/18/2019
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XX-XXX-XXXX (XXX)
BPS Project Number



CITY OF SAINT LOUIS
MISSOURI
DEPARTMENT OF THE PRESIDENT
BOARD OF PUBLIC SERVICE
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XX
Chief Engineer
Bridge Division

KINGSHIGHWAY BLVD CORRIDOR
TRAFFIC STUDY
KNOTTINGHAM AVE TO GRAVOIS AVE
PAVEMENT MARKINGS

Sheet 1

Revision No. Date

12/18/2019
Date

File Number
Striping Plan 01.dgn

12/18/2019
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Chief Engineer
Bridge Division

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TRAFFIC STUDY
KNOTTINGHAM AVE TO GRAVOIS AVE
PAVEMENT MARKINGS

Sheet 2

Revision No. Date

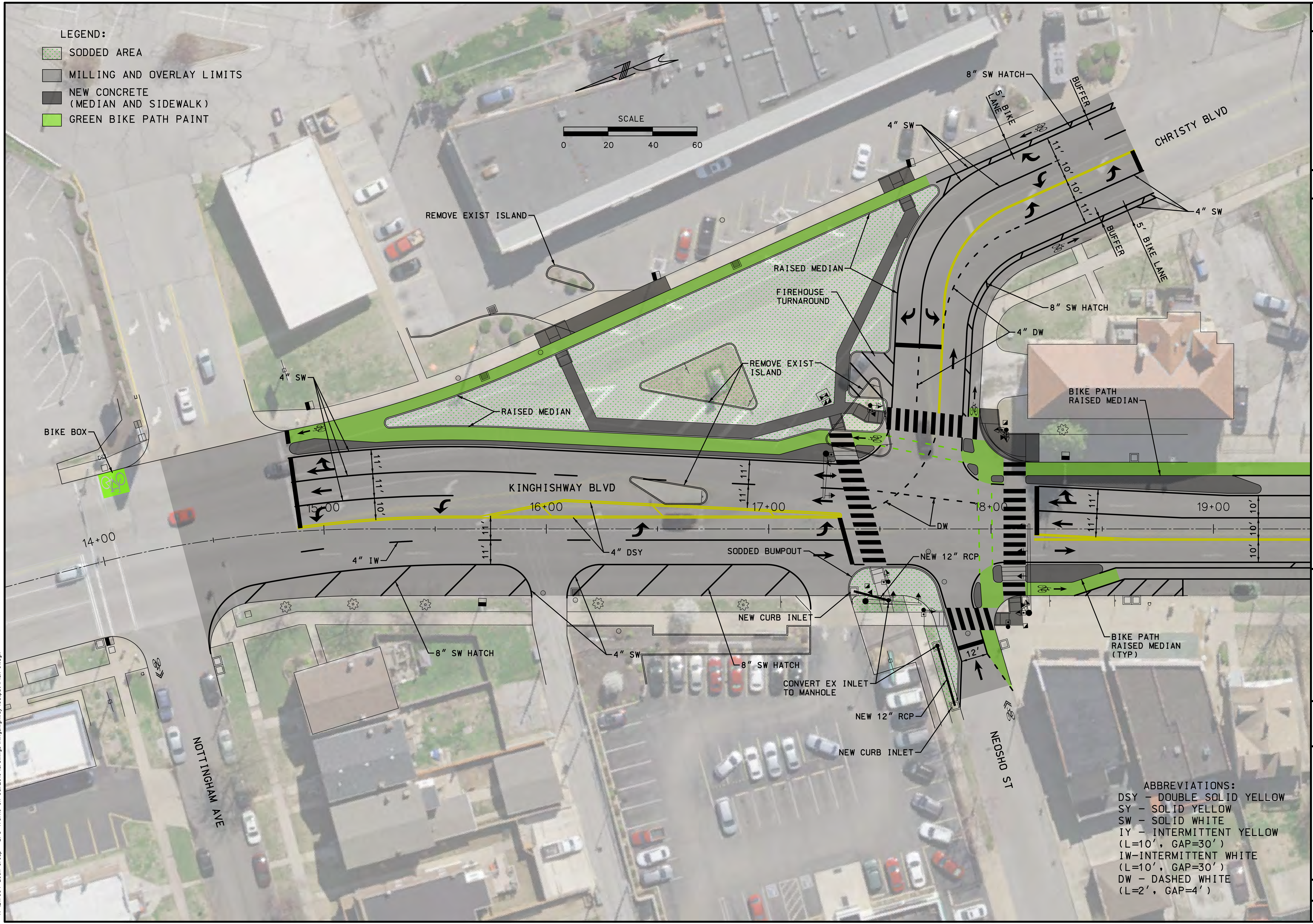
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Date

File Number

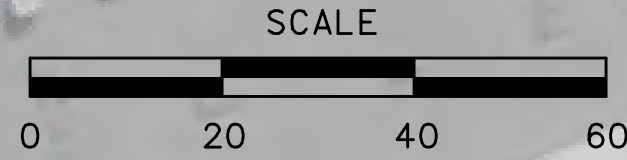
Striping Plan 02.dgn

12/18/2019
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LEGEND:

- SODDED AREA
- MILLING AND OVERLAY LIMITS
- NEW CONCRETE
(MEDIAN AND SIDEWALK)
- GREEN BIKE PATH PAINT



XX-XXX-XXXX(XXX)

BPS Project Number



DEPARTMENT OF THE PRESIDENT
BOARD OF PUBLIC SERVICE
ROOM 301 CITY HALL
ST. LOUIS, MISSOURI 63103
PHONE (314) 622-4576
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XX

Chief Engineer
Bridge Division

KINGSHIGHWAY BLVD CORRIDOR
TRAFFIC STUDY
KNOTTINGHAM AVE TO GRAVOIS AVE
ENLARGED PLAN

Sheet 4

Revision No. Date

ABBREVIATIONS:
DSY - DOUBLE SOLID YELLOW
SY - SOLID YELLOW
SW - SOLID WHITE
IW - INTERMITTENT YELLOW
(L=10', GAP=30')
IW-INTERMITTENT WHITE
(L=10', GAP=30')
DW - DASHED WHITE
(L=2', GAP=4')

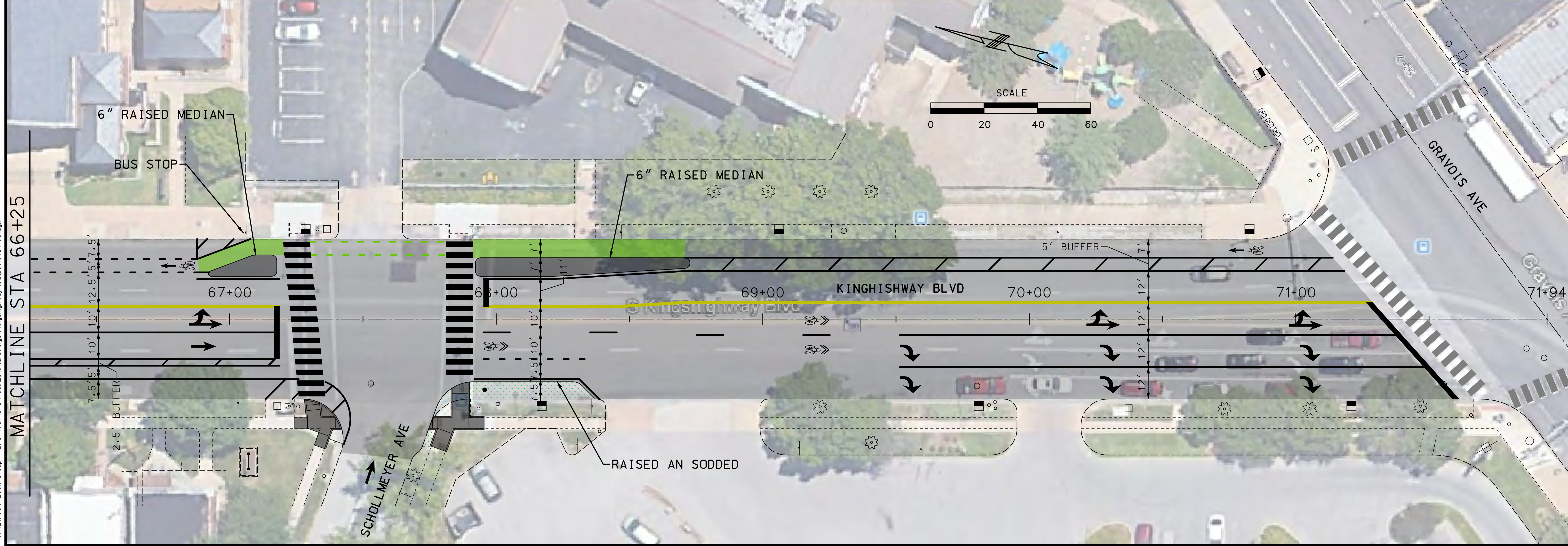
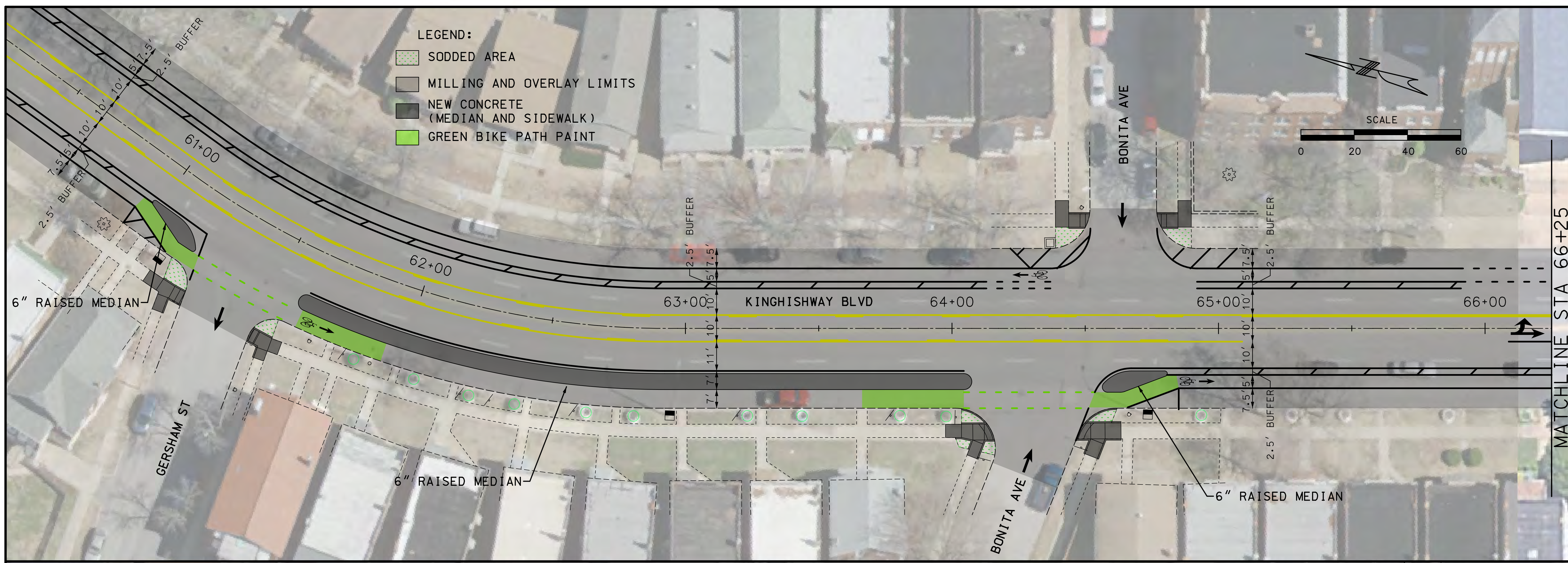
12/18/2019

Date

File Number

Plan 01.dgn

12/18/2019
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XX-XXX-XXXX (XXX)
BPS Project Number

CITY OF SAINT LOUIS
MISSOURI

DEPARTMENT OF THE PRESIDENT
BOARD OF PUBLIC SERVICE
ROOM 301 CITY HALL
ST. LOUIS, MISSOURI 63103
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Chief Engineer
Bridge Division

KINGSHIGHWAY BLVD CORRIDOR
TRAFFIC STUDY
KNOTTINGHAM AVE TO GRAVOIS AVE

ENLARGED PLAN

Sheet 6

Revision No. Date

12/18/2019
Date

File Number

Appendix E: Conceptual Design Cost Estimate

KINGSHIGHWAY CORRIDOR IMPROVEMENTS PREFERED CONCEPT					
		CITY OF ST. LOUIS			
		1/3/2020			
DESCRIPTION	Units	Quantity	Unit Price	COST	
NEOSHO INTERSECTION - SIGNAL & GEOMETERIC IMPROVEMENTS					
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 15,000.00	\$	15,000.00
GRANULAR BASE	SY	938	\$ 11.00	\$	10,314.61
ASPHALT PAVEMENT	TON	51	\$ 200.00	\$	10,200.00
EARTHWORK - FILL	CY	76	\$ 15.00	\$	1,140.00
PCC MEDIANS (4 INCH CONCRETE)	SY	187	\$ 47.00	\$	8,789.00
SOD	SY	1229	\$ 15.00	\$	18,435.00
TYPE 'S' CURB	LF	1667	\$ 29.00	\$	48,343.00
TRUNCATED DOMES	SF	157	\$ 40.00	\$	6,280.00
4" PCC SIDEWALK	SY	203	\$ 40.00	\$	8,120.00
7 IN PCC CURB RAMP	SY	95	\$ 215.00	\$	20,425.00
TYPE A INTEGRAL CURB	LF	180	\$ 20.00	\$	3,600.00
A.P.S.	EA	1	\$ 10,000.00	\$	10,000.00
CONTROLLER	EA	1	\$ 24,000.00	\$	24,000.00
PULLBOX	EA	4	\$ 1,500.00	\$	6,000.00
SIGNAL HEADS	EA	19	\$ 1,000.00	\$	19,000.00
TYPE A FOUNDATION AND MASTARM	EA	3	\$ 20,650.00	\$	61,950.00
TYPE C FOUNDATION AND POST	EA	5	\$ 2,140.00	\$	10,700.00
DETECTION	EA	1	\$ 30,000.00	\$	30,000.00
4 IN CONDUIT	LF	600	\$ 25.00	\$	15,000.00
POWER SUPPLY & LIGHTING CONTROLLER	EA	1	\$ 8,000.00	\$	8,000.00
BATTERY BACK UP SYSTEM	EA	1	\$ 10,000.00	\$	10,000.00
SIGNAL CABLES	LS	1	\$ 15,000.00	\$	15,000.00
ITS (EQP, FIBER, SPLICING, ETC.)	LS	1	\$ 15,000.00	\$	15,000.00
CURB INLET	EA	2	\$ 3,500.00	\$	7,000.00
CONVERT INLET TO MANHOLE	EA	2	\$ 1,800.00	\$	3,600.00
12" RCP STORM PIPE	LF	44	\$ 57.00	\$	2,508.00
			SUB TOTAL	\$	388,404.61
EICHELBERGER INTERSECTION GEOMETRIC IMPROVEMENTS					
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 5,000.00	\$	5,000.00
4" GRANULAR BASE	SY	333	\$ 7.00	\$	2,327.89
EARTHWORK - FILL	CY	48	\$ 15.00	\$	720.00
PCC MEDIAN (4 INCH CONCRETE)	SY	104	\$ 47.00	\$	4,888.00
SOD	SY	86	\$ 15.00	\$	1,290.00
TYPE 'S' CURB	LF	409	\$ 29.00	\$	11,861.00
TRUNCATED DOMES	SF	27	\$ 40.00	\$	1,060.00
PCC SIDEWALK (4 INCH CONCRETE)	SY	18	\$ 47.00	\$	858.38
7 IN PCC CURB RAMP	SY	13	\$ 215.00	\$	2,795.00
TYPE A INTEGRAL CURB	LF	28	\$ 20.00	\$	554.00
			SUB TOTAL	\$	31,354.27
GOETHE INTERSECTION GEOMETRIC IMPROVEMENTS					
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 5,000.00	\$	5,000.00
4" GRANULAR BASE	SY	104	\$ 7.00	\$	728.00
EARTHWORK - FILL	CY	250	\$ 15.00	\$	3,750.00
PCC SIDEWALK (4 INCH CONCRETE)	SY	95	\$ 47.00	\$	4,465.00
SOD	SY	355	\$ 15.00	\$	5,325.00
TYPE 'S' CURB	LF	381	\$ 29.00	\$	11,049.00
TRUNCATED DOMES	SF	22	\$ 40.00	\$	880.00
7 IN PCC CURB RAMP	SY	9	\$ 215.00	\$	1,935.00
TYPE A INTEGRAL CURB	LF	28	\$ 20.00	\$	560.00
ADJUST CURB INLET	EA	1	\$ 1,800.00	\$	1,800.00
			SUB TOTAL	\$	35,492.00
RHODES INTERSECTION GEOMETRIC IMPROVEMENTS					
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 5,000.00	\$	5,000.00
4" GRANULAR BASE	SY	87	\$ 7.00	\$	609.00
PCC MEDIAN (4 INCH CONCRETE)	SY	29	\$ 47.00	\$	1,363.00
TYPE 'S' CURB	LF	120	\$ 29.00	\$	3,480.00
			SUB TOTAL	\$	10,452.00
GERSHAM TO BONITA					
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 9,500.00	\$	9,500.00
PCC MEDIAN (4 INCH CONCRETE)	SY	196	\$ 47.00	\$	9,212.00
4" GRANULAR BASE	SY	588	\$ 7.00	\$	4,116.00
TYPE 'S' CURB	LF	628	\$ 29.00	\$	18,212.00
			SUB TOTAL	\$	41,040.00
SCHOLLMMEYER					
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 1,000.00	\$	1,000.00
4" GRANULAR BASE	SY	210	\$ 11.00	\$	2,310.00
EARTHWORK - FILL	CY	21	\$ 15.00	\$	315.00
PCC MEDIANS (4 INCH CONCRETE)	SY	70	\$ 47.00	\$	3,290.00
SOD	SY	38	\$ 15.00	\$	570.00
TYPE 'S' CURB	LF	304	\$ 29.00	\$	8,816.00
4" PCC SIDEWALK	SY	7	\$ 40.00	\$	284.44
7 IN PCC CURB RAMP	SY	15	\$ 215.00	\$	3,225.00
TYPE A INTEGRAL CURB	LF	69	\$ 20.00	\$	1,376.00
			SUB TOTAL	\$	21,186.44
CORRIDOR PAVEMENT MARKINGS					
PAVEMENT MARKINGS	L.S.	1	\$ 65,636.21	\$	65,636.21
SIGNS	L.S.	1	\$ 8,000.00	\$	8,000.00
MILL AND OVERLAY	SY	41,114	\$ 7.50	\$	308,355.00
SIGNAL INTERCONNECT	L.S.	1	\$ 55,776.00	\$	55,776.00
CORRIDOR CURB RAMPS (SEE CHART)	L.S.	1	\$ 124,500.00	\$	124,500.00
			SUB TOTAL	\$	562,267.21
CONSTRUCTION SUBTOTAL				\$	1,090,196.54
MOBILZATION (18%)				\$	196,235.38
TRAFFIC CONTROL (8%)				\$	87,215.72
CONTINGENCY (15%)				\$	163,529.48
ENGINEERING DESIGN COST (12%)				\$	130,823.58
			TOTAL	\$	1,668,000.70

CURB RAMP REPLACEMENT TABLE	
INTERSECTION	CURB RAMP REPLACEMENT COST
Itaska	\$5,000
Delor	\$5,000
Walsh	\$5,000
Eichelberger	\$9,750
E Rosa	\$5,000
W Rosa	\$5,000
Sigel	\$5,000
E Goethe	\$5,000
W Goethe	\$5,000
E Milentz	\$5,000
W Milentz	\$5,000
W Rhodes	\$11,500
E Rhodes	\$5,000
E Holly Hills	\$5,000
W Holly Hills	\$5,000
Kings	\$5,000
Finkman	\$5,000
Lisette	\$5,000
Alma	\$5,000
Gersham	\$5,000
E Bonita	\$5,000
W Bonita	\$5,000
Schollmeyer	\$3,250
TOTAL	\$124,500

NOTE: THIS ESTIMATE REPRESENTS COST ASSOCIATED WITH REPLACEMENT OF ALL CURB RAMPS AT AN INTERSECTION. PEDESTRIAN SIGNAL UPGRADES ARE NOT INCLUDED.

CURB RAMP REPLACEMENT TABLE	
INTERSECTION	CURB RAMP REPLACEMENT COST
Itaska	\$5,000
Delor	\$5,000
Walsh	\$5,000
Eichelberger	\$9,750
E Rosa	\$5,000
W Rosa	\$5,000
Sigel	\$5,000
E Goethe	\$5,000
W Goethe	\$5,000
E Milentz	\$5,000
W Milentz	\$5,000
W Rhodes	\$11,500
E Rhodes	\$5,000
E Holly Hills	\$5,000
W Holly Hills	\$5,000
Kings	\$5,000
Finkman	\$5,000
Lisette	\$5,000
Alma	\$5,000
Gersham	\$5,000
E Bonita	\$5,000
W Bonita	\$5,000
Schollmeyer	\$3,250
TOTAL	\$124,500

NOTE: THIS ESTIMATE REPRESENTS COST ASSOCIATED WITH REPLACEMENT OF ALL CURB RAMPS AT AN INTERSECTION. PEDESTRIAN SIGNAL UPGRADES ARE NOT INCLUDED.

EXHIBIT B												
PAVEMENT MARKING SEGMENTS - PREFERRED CONCEPT												
ITEM	UNIT	SEGMENTS										
REMOVAL	LF	Nottingham to Itaska	Itaska to Walsh	Walsh to Rosa	Rosa to Milentz	Milentz to Holly Hills	Holly Hills to Lisette	Lisette to Bonita	Bonita to Gravois	SUM	UNIT PRICE	COST
4" SOLID YELLOW WATERBORNE PAVEMENT MARKING PAINT TYPE P BEADS	LF	1,919	1,297	1,358	1,718	1,315	1,355	1,321	1,232	11,515	\$0.45	\$5,181.75
4" SOLID WHITE WATERBORNE PAVEMENT MARKING PAINT TYPE P BEADS	LF	3,759	3,051	2,917	4,063	2,830	3,170	2,725	2,356	24,871	\$0.45	\$11,191.95
4" DASHED YELLOW WATERBORNE PAVEMENT MARKING PAINT TYPE P BEADS	LF	49	324	129	430	171	339	330	36	1,808	\$0.45	\$813.60
4" DASHED WHITE WATERBORNE PAVEMENT MARKING PAINT TYPE P BEADS	LF	78							39	117	\$0.45	\$52.65
4" SHORT-DASHED WHITE WATERBORNE PAVEMENT MARKING PAINT TYPE P BEADS	LF	79	158	243	170	167	167	86	78	1,148	\$0.45	\$516.60
4" SHORT-DASHED GREEN WATERBORNE PAVEMENT MARKING PAINT TYPE P BEADS	LF	38		45	30	23		35	33	204	\$0.70	\$142.80
8" SOLID WHITE WATERBORNE PAVEMENT MARKING PAINT TYPE P BEADS	LF	449	255	303	421	316	374	224	203	2,545	\$0.95	\$2,417.75
12" SOLID YELLOW	LF	16				38				54	\$1.75	\$94.50
12" SOLID WHITE	LF									0	\$1.75	\$0.00
24" WHITE STOP BAR / CROSSWALK	LF	545		559	80	410			357	1,951	\$5.50	\$10,730.50
GREEN BIKE PATH PAINT	SY	436		116		44		69	106	771	\$18.00	\$13,885.00
ARROW SYMBOLS	EA	12	2	6	4	2	2	2	10	40	\$180.00	\$7,200.00
BIKE LANE SYMBOLS	EA	9	2	4	5	4	3	4	6	37	\$190.00	\$7,030.00
COST PER SEGMENT		\$17,851.45	\$3,155.75	\$9,413.00	\$5,402.40	\$6,567.15	\$3,549.25	\$4,607.20	\$8,710.90		TOTAL	\$59,257.10

EXHIBIT C				
KINGSHIGHWAY CORRIDOR IMPROVEMENTS ALTERNATE CONCEPT				
		CITY OF ST. LOUIS		
		1/6/2020		
DESCRIPTION	Units	Quantity	Unit Price	COST
NEOSHO INTERSECTION - SIGNAL & GEOMETERIC IMPROVEMENTS				
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 15,000.00	\$ 15,000.00
GRANULAR BASE	SY	938	\$ 11.00	\$ 10,314.61
ASPHALT PAVEMENT	TON	51	\$ 200.00	\$ 10,200.00
EARTHWORK - FILL	CY	76	\$ 15.00	\$ 1,140.00
PCC MEDIANS (4 INCH CONCRETE)	SY	187	\$ 47.00	\$ 8,789.00
SOD	SY	1229	\$ 15.00	\$ 18,435.00
TYPE 'S' CURB	LF	1667	\$ 29.00	\$ 48,343.00
TRUNCATED DOMES	SF	157	\$ 40.00	\$ 6,280.00
4" PCC SIDEWALK	SY	203	\$ 40.00	\$ 8,120.00
7 IN PCC CURB RAMP	SY	95	\$ 215.00	\$ 20,425.00
TYPE A INTEGRAL CURB	LF	180	\$ 20.00	\$ 3,600.00
A.P.S.	EA	1	\$ 10,000.00	\$ 10,000.00
CONTROLLER	EA	1	\$ 24,000.00	\$ 24,000.00
PULLBOX	EA	4	\$ 1,500.00	\$ 6,000.00
SIGNAL HEADS	EA	19	\$ 1,000.00	\$ 19,000.00
TYPE A FOUNDATION AND MASTARM	EA	3	\$ 20,650.00	\$ 61,950.00
TYPE C FOUNDATION AND POST	EA	5	\$ 2,140.00	\$ 10,700.00
DETECTION	EA	1	\$ 30,000.00	\$ 30,000.00
4 IN CONDUIT	LF	600	\$ 25.00	\$ 15,000.00
POWER SUPPLY & LIGHTING CONTROLLER	EA	1	\$ 8,000.00	\$ 8,000.00
BATTERY BACK UP SYSTEM	EA	1	\$ 10,000.00	\$ 10,000.00
SIGNAL CABLES	EA	1	\$ 15,000.00	\$ 15,000.00
ITS (EQP, FIBER, SPLICING, ETC.)	LS	1	\$ 15,000.00	\$ 15,000.00
CURB INLET	EA	2	\$ 3,500.00	\$ 7,000.00
CONVERT INLET TO MANHOLE	EA	2	\$ 1,800.00	\$ 3,600.00
12" RCP STORM PIPE	LF	44	\$ 57.00	\$ 2,508.00
			SUB TOTAL	\$ 388,404.61
GOETHE INTERSECTION GEOMETRIC IMPROVEMENTS				
REMOVAL OF IMPROVEMENTS	L.S.	1	\$ 5,000.00	\$ 5,000.00
4" GRANULAR BASE	SY	104	\$ 7.00	\$ 728.00
EARTHWORK - FILL	CY	250	\$ 15.00	\$ 3,750.00
PCC SIDEWALK (4 INCH CONCRETE)	SY	95	\$ 47.00	\$ 4,465.00
SOD	SY	355	\$ 15.00	\$ 5,325.00
TYPE 'S' CURB	LF	381	\$ 29.00	\$ 11,049.00
TRUNCATED DOMES	SF	22	\$ 40.00	\$ 880.00
7 IN PCC CURB RAMP	SY	9	\$ 215.00	\$ 1,935.00
TYPE A INTEGRAL CURB	LF	28	\$ 20.00	\$ 560.00
ADJUST CURB INLET	EA	1	\$ 1,800.00	\$ 1,800.00
			SUB TOTAL	\$ 35,492.00
CORRIDOR PAVEMENT MARKINGS				
PAVEMENT MARKINGS	LS	1	\$ 35,000.00	\$ 35,000.00
SIGNS	LS	1	\$ 33,891.95	\$ 33,891.95
			SUB TOTAL	\$ 68,891.95
CORRIDOR CENTER MEDIAN				
REMOVAL OF IMPROVEMENTS	LS	1	\$ 20,000.00	\$ 20,000.00
SAWCUT	LF	5029	\$ 25.00	\$ 125,725.00
TYPE S CURB	LF	5029	\$ 105.00	\$ 528,045.00
FILL	CY	21234	\$ 35.00	\$ 743,190.00
MILL AND OVERLAY	SY	35,790	\$ 7.50	\$ 268,425.00
SODDING	SY	5324	\$ 15.00	\$ 79,860.00
			SUB TOTAL	\$ 1,765,245.00
CONSTRUCTION SUBTOTAL				\$ 2,258,033.56
MOBILIZATION (18%)				\$ 406,446.04
TRAFFIC CONTROL (6%)				\$ 135,482.01
CONTINGENCY (10%)				\$ 225,803.36
ENGINEERING DESIGN COST (12%)				\$ 270,964.03
			TOTAL	\$ 3,296,729.00