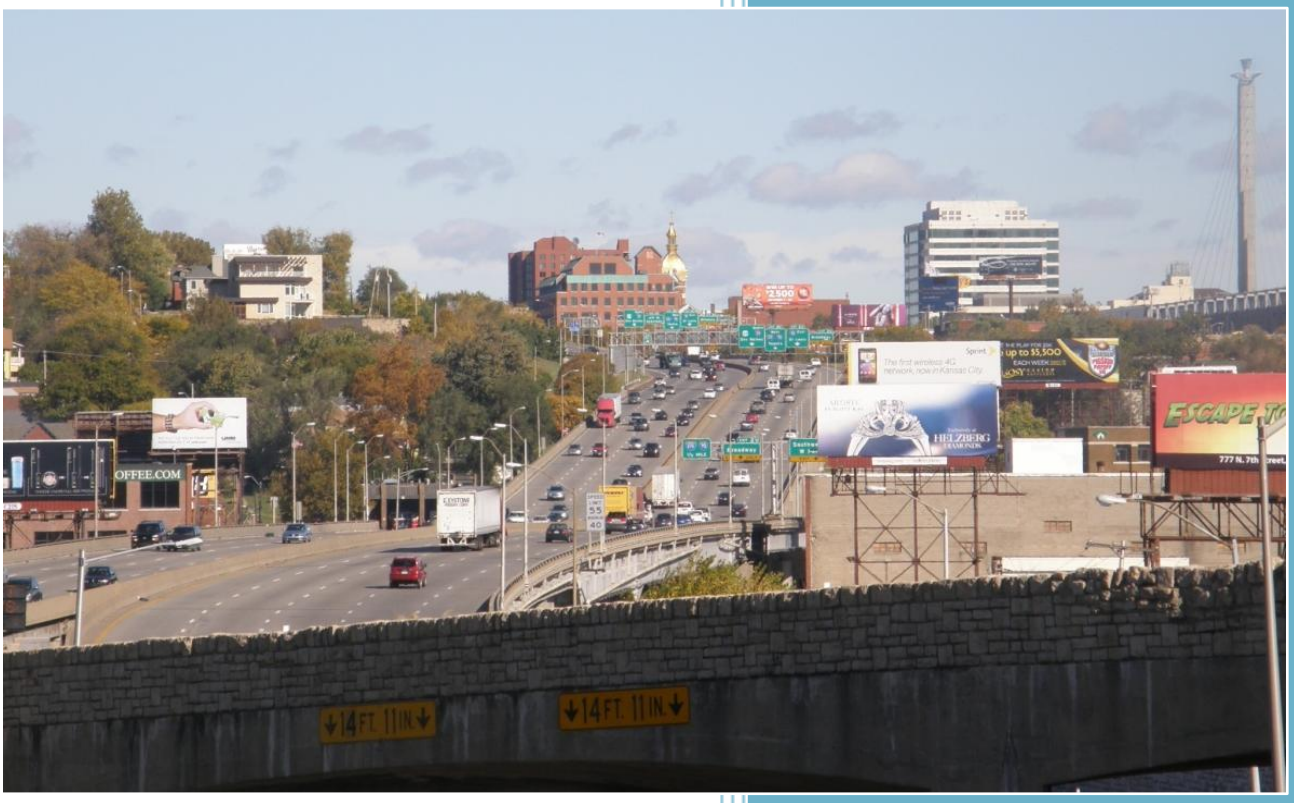
2011

I-35 OPERATIONAL STUDY



Prepared by MoDOT

MoDOT

Contents

Background 6
Study Purpose 6
Study Area 7
Facility History 7
Existing Conditions and Operational Review 9
Existing Conditions 9
Horizontal Alignment 11
Curvature 11
Sight Distance 12
Stopping Sight Distance 12
Shoulder Width 13
Pavement Condition 13
Interchange Spacing 13
Bridge Condition 15
Operational Review 18
Neighborhood Access and Mobility 18
Crash Analysis 20
Traffic Analysis 22
Needs Identification Summary 27
Weaving/Merging and Ramp Length 27
Access to Local Streets and Destinations 28
Support Neighborhood Development and Multimodal Trips 28
Environmental Review 29
Wetlands and Waters of the U.S. 31
Historic and Cultural Resources 31
Archaeology 32
Architecture 32
Bridges 33
Hazardous Waste Sites 33
Floodplains 33
FEMA Buyout Sites 34

Farmland and Soil 34
Threatened and Endangered Species 34
Parklands 35
Air Quality 35
Noise Quality 36
Neighborhood Description 36
Neighborhood History 38
Activity/Employment Centers 39
Demographic Overview 40
Racial Composition of Neighborhoods 40
Environmental Justice 44
Public Involvement Process 47
Initial Public Involvement 47
First On-Line Meeting 48
Second Public Meeting 48
Second On-Line Meeting 49
Range of Concepts 50
Lower Cost Concepts ($100,000 - $500,000) 50
Restripe Lanes 50
Signage 54
Ramp Meters 55
Streetscape 56
Medium Cost Concepts ($15 - $25 Million) 57
20TH Street Ramps 57
27th Street Access 58
27th Street Underpass 59
Higher Cost Concepts ($40 - $80 Million) 62
Rebuild Interchange 62
New I-670 Ramps 64
Conclusions 66

List of Figures

Figure 1- I-35 Project Location Map 8
Figure 2- Design Deficiencies in the Study Corridor 10
Figure 3 – Shoulder Width in the Study Corridor 14
Figure 4 – Bridge Locations and Numbers in the Study Corridor 17
Figure 5 – Southbound Crash Data 21
Figure 6 – Northbound Crash Data 21
Figure 7 – Existing Traffic Volumes and Future Traffic Volume Projections 23
Figure 8 – Level of Service (LOS) 24
Figure 9 – Current (2008) Level of service – AM and PM Rush Hour 25
Figure 10 – Future (2030) Level of Service – AM and PM Rush Hour 26
Figure 11 – Environmental Constraints Near Study Corridor 30
Figure 12 – Generalized Neighborhood Boundaries Near the Study Corridor 37
Figure 13 – Percent of Non-Caucasian Population in Study Area 42
Figure 14 – Percent Hispanic/Latino Population in Study Area 43
Figure 15 – Median Income in the Study Area 45
Figure 16 – Potential Environmental Justice Areas 46
Figure 17 – Online Meeting Needs Identification in Study Corridor 48
Figure 18 – Current Lane Configuration for Southbound I-35 52
Figure 19 – I-35 Southbound Restriping Concept 53
Figure 20 – 20th Street Interchange 58
Figure 21 – New Left Exit and Entrance at 27th Street 60
Figure 22 – 27th Street Underpass 61
Figure 23 – New Interchange at Southwest Trafficway and Broadway 63
Figure 24 – New Directional Ramp from I-35 Southbound to I-670 Westbound 65
Figure 25 – Local Project Process from Concept to Construction 67
Figure 26 – State Funded Project Process from Conception to Construction 68

List of Tables

Table 1 – Pavement Condition Index 13
Table 2 – Bridge Condition Ratings 15
Table 3 - NRHP – Architectural Resources within the Study Area 32
Table 4 - NRHP – Architectural Resources Close to the Study Area 32
Table 5 - KCRHP – Architectural Resources Close to the Study Area 33
Table 6 - Sample of Employers Near Study Area 40

Appendices

Appendix A – Existing Conditions Data
Appendix B – Bridge Condition Ratings
Appendix C – Public Involvement Documents
Appendix D – Race and Ethnicity Definition

Background

In 2008, the Missouri Department of Transportation (MoDOT) started the first phase of environmental study on I-70 in Jackson County. This First Tier Environmental Impact Statement (FTEIS) for the I-70 corridor stretches from the Kansas (Kan.) state line to east of the I-470 interchange including Kansas City's downtown freeway loop. During the public outreach for the first tier improvement strategies, MoDOT received feedback that the section of I-35 from the southwest corner of the downtown loop to the Kan. state line should be included in the FTEIS.

The study area had not been included in any previous studies, including the Northland-Downtown Major Investment Study (MIS), the I-29/35 Paseo Bridge Environmental Impact Statement, the I-35 Transit Alternatives Analysis, and the Kansas Department of Transportation's (KDOT) I-35 MIS. I-35 from I-670 to the Kan. state line was included in the Greater Downtown Area Plan, but because this section of interstate has not been included in recent downtown transportation studies, an Operational Study was necessary to determine if there were transportation issues that needed to be addressed on I-35.

Study Purpose

MoDOT is conducting an operational study to develop potential improvements for approximately two miles of I-35 in the Kansas City metropolitan area. The study is intended to:

- Determine the current and future operational needs of the existing I-35 corridor
- Develop improvement concepts for addressing those needs
- Recommend a range of concepts to meet identified needs in the I-35 corridor

The goal of this operational study is to evaluate any deficiencies in the existing interstate to determine current and future transportation needs on I-35 and suggest concepts for addressing the needs. The study will examine existing conditions, crash data, traffic patterns and future traffic volumes, socioeconomic and environmental information and develop the most practical improvements that meet the transportation needs of the corridor.

Because the study area is among some of the oldest developed portions of Kansas City, the intent is to keep any potential concepts within the existing right-of-way (ROW) and minimize impacts to the surrounding neighborhoods. Concepts that add or remove access might affect ROW, however, no additional lanes will be added to the highway.

The study's range of concepts will guide MoDOT activity in the I-35 corridor and the southwest corner of the downtown loop.

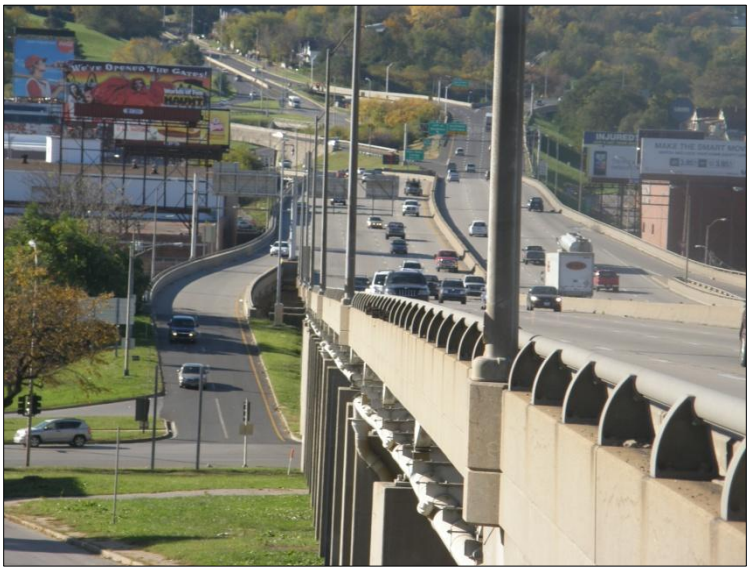
Study Area

I-35 Operational Study corridor is approximately 2.5 miles long and stretches 300 feet on either side of I-35 from 12th Street to the Kan. state line. The study corridor touches several neighborhoods: Downtown, Westside, Crossroads and Crown Center/Union Station. These neighborhoods have a diverse history, development pattern and transportation system. Figure 1 shows the study area for the Operational Study.

Facility History

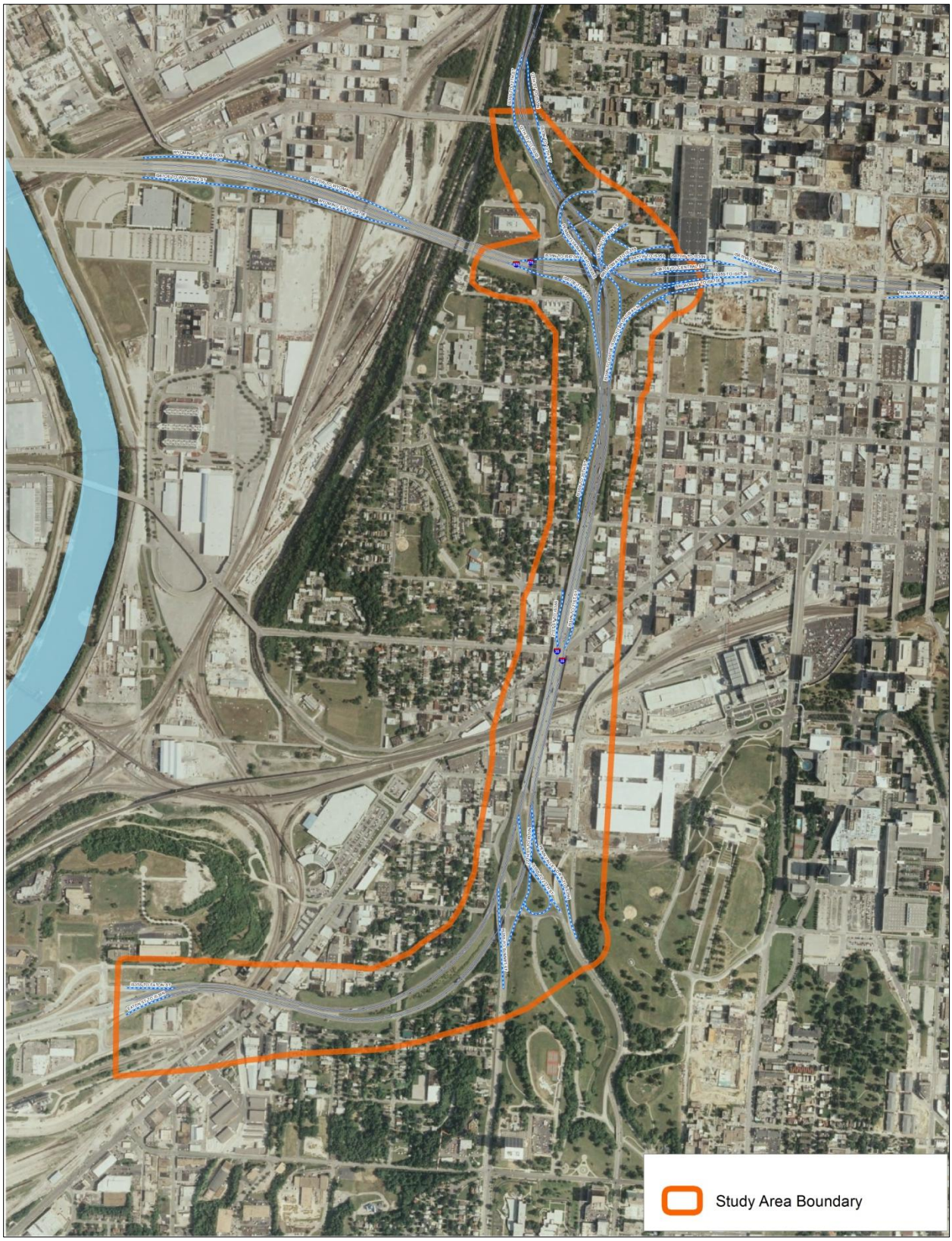
The first section of I-35 was built in the late 1940s as a part of the Southwest Trafficway, a crosstown freeway. The crosstown freeways were an effort to improve urban congestion in the late 1940s. According to MoDOT's Historic Preservation Section, the Mo. State Highway Department recommended a series of limited access highways to connect the congested urban core with the rapidly growing suburban areas of Waldo, Brookside and the Country Club Plaza. During the late 1950s, I-35 construction began in several states. The connection from the Kansas Turnpike in Ottawa, Kan., to Kansas City, Mo., began in the late 1960s, and this portion of Southwest Trafficway was incorporated into I-35 in the 1960s.

Picture 1 – Viaduct from 20th Street over Kansas City Terminal Railway



In the study corridor, the roadway contains twenty-three bridges built between the late 1940s and the late 1960s. One of the original Southwest Trafficway bridges is a viaduct that runs through residential and commercial neighborhoods and over the Kansas City Terminal Railway. This bridge is over 2,900 feet long (0.5 miles).

Figure 1- I-35 Project Location Map



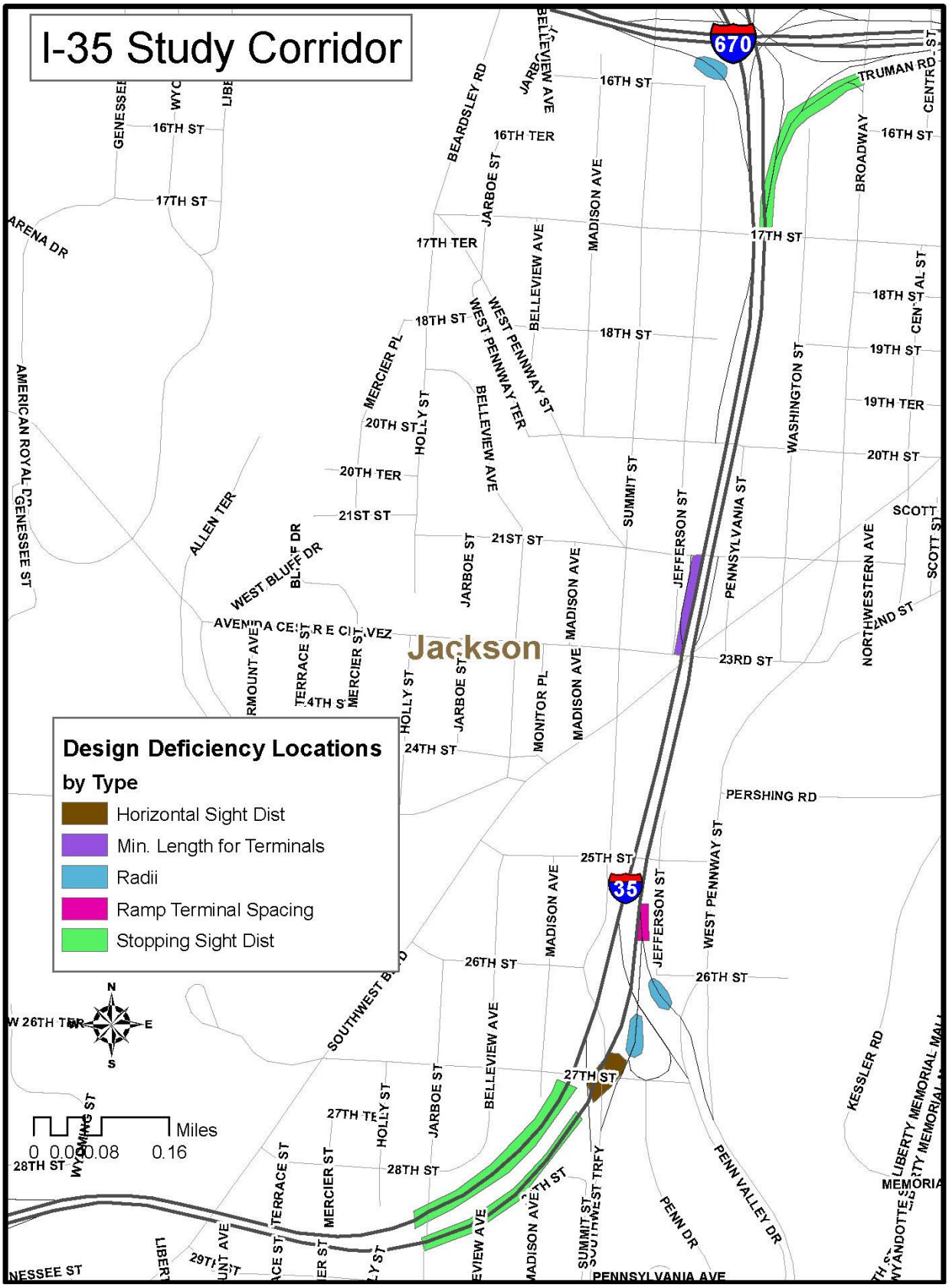
Existing Conditions and Operational Review

An existing conditions review looks at the design of the roadway, condition of the roadway and bridges, traffic flow and volume, future volumes and crashes in the corridor. Detailed tables for the existing conditions review can be found in Appendix A.

Existing Conditions

Design standards insure continuity in the design of roadways and safe operation. The largest section of roadway in the study area was designed and built in the late 40s, and the rest of the interstate was built in the 1960s. Design standards have changed in the intervening years, so certain parts of the corridor do not meet current standards. This section reviews the areas that do not comply with current guidelines to determine if there is a significant safety or operations impact. Design components reviewed in this corridor include: horizontal alignment, curvature, sight distance, stopping sight distance, shoulder width, pavement condition, neighborhood access and mobility, ramp spacing and bridge condition, crash summary, traffic volumes and future traffic volume projections. Figure 2 shows the locations of design deficiencies in the study corridor.

Figure 2- Design Deficiencies in the Study Corridor



Horizontal Alignment

The horizontal alignment of a roadway depends on the terrain of the land through which the road is built. When curves are too sharp, drivers can have trouble controlling their vehicle and staying on the roadway. Drivers also have trouble seeing around sharp curves. An appropriate horizontal alignment provides drivers with adequate sight distance to comfortably navigate curves and hills at the posted speed. Picture 2 shows the horizontal alignment issues at the convergence of the Broadway and Southwest Trafficway entrance ramps to northbound I-35.[1]

Curvature

Figure 2 shows three locations in the study corridor where the curves do not meet current standards. The entrance ramps from Southwest Trafficway and Broadway to northbound I-35 both have curves that are tighter than current standards allow. The third location is on the I-670 exit ramp to southbound I-35. This ramp curves around a hill, and drivers are not able to see around the corner to the merge with the interstate.

Picture 2 – Horizontal Alignment at Southwest Trafficway and Broadway Ramps

[1] *Google Streetview Map of Broadway and Southwest Trafficway entrance ramps on I-35 in Kansas City, MO. 2010*

Sight Distance

Sight distance is a term that refers to how far ahead a driver can see before the line of sight is blocked. Figure 2 shows locations where the horizontal sight distance does not meet current standards. At 27th Street, interstate travelers are coming from the south at an angle that is below Southwest Trafficway and Broadway. Likewise, drivers on the northbound Southwest Trafficway and Broadway ramps are unable to see cars on I-35 as they come up from behind as shown in Picture 3.

Picture 3 – Non-Standard Sight Distance

Stopping Sight Distance

Stopping sight distance refers to the distance that a driver needs to recognize that there is a condition ahead that requires the vehicle to stop. There are two locations in the study corridor where the stopping sight distance does not meet current standards. I-35 has a long sweeping curve in both northbound and southbound directions between 27th Street and the viaduct over Southwest Boulevard. As drivers head toward downtown on northbound I-35 the highway is below the surrounding development. Drivers navigate under 27th Street on a curve, so sight distance is obstructed by the angle of the culvert walls and 27th Street.

Shoulder Width

I-35 incorporates sections of roadway built in different decades. Design standards change over time, and this is reflected in the shoulder widths of different sections of the interstate. Current desired shoulder width on interstates is 10' on the outside with a minimum four foot shoulder on the inside. Shoulders widths on the existing facility vary from one foot to eight feet. Figure 3 shows the total widths for the inside and outside shoulder on northbound and southbound I-35. A large segment of the corridor has shoulders that are three feet wide or less.

The I-35 Transit Alternatives Analysis proposes bus-on-shoulder operations in the I-35 corridor. However, as shown previously, there are insufficient shoulder widths in most of the study corridor to support bus-on-shoulder operations. Due to constraints in the corridor, adding shoulder width to the interstate would be highly disruptive to the neighborhoods and very costly. This also conflicts with MoDOT's commitment to staying within existing ROW

Pavement Condition

MoDOT rates pavement condition using an index from 0-20. See the Condition Index in Table 1. The Condition Index rating system is based on the visual condition of the road and reviews cracking, patching, potholes, raveling, spalling and joint condition. The average pavement rating in the northbound section of the study corridor is 18.3, with scores ranging from 16.4 – 19.8. Pavement condition southbound is slightly higher with a range from 16.0 to 20, with most of the corridor above 17 and an average pavement rating of 18.7. See Appendix B for a detailed table of pavement conditions in the study corridor.

Table 1 – Pavement Condition Index

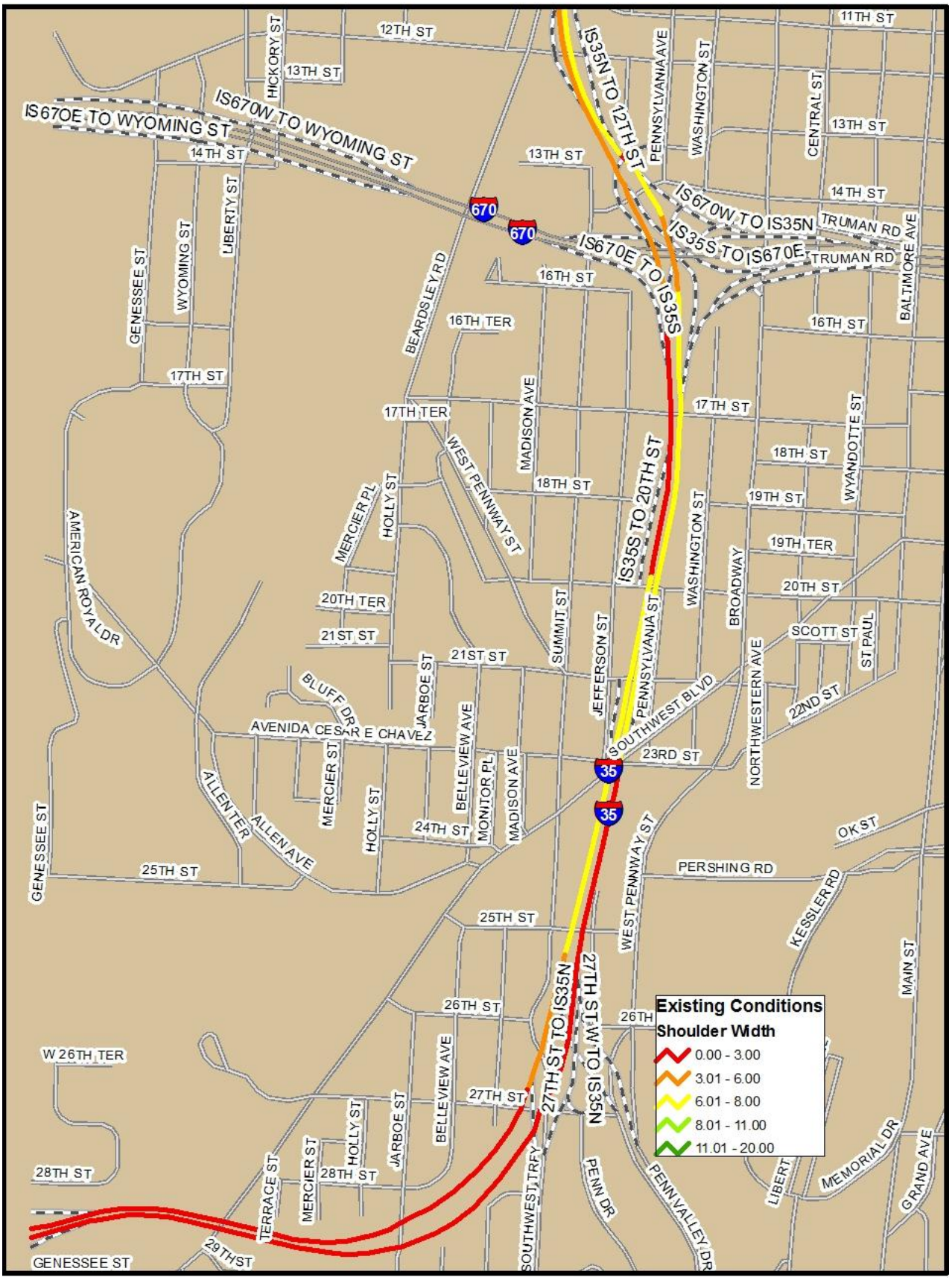
Interstate Condition Index	
Rating	**Value**
Very Good	20.0 - 18.9
Good	18.8 - 17.8
Fair	17.7 - 16.4
Poor	16.3 - 15.3
Very Poor	15.2 - 0.0

Interchange Spacing

Adequate spacing between interchanges is required to give drivers enough space to change lanes when entering and exiting the freeway. According to MoDOT's Engineering Policy Guide (EPG), the optimum spacing for ramps in urban areas is two to three miles apart, although, spacing less than two miles apart may be acceptable based upon the traffic analysis. [2] Interchange spacing varies through the study corridor with some distances meeting the current standards and some interchanges providing less than half of a mile for drivers to merge to and from ramps.

[2] *Interchange spacing standards from MoDOT's Engineering Policy Guide. http://epg.modot.mo.gov/index.php?title=940.2_Spacing_between_Interchanges*

Figure 3 – Shoulder Width in the Study Corridor



Interchanges that are less than a mile apart are spread through the study area. Northbound, the interchanges at Southwest Trafficway/Broadway and West Pennway are less than a mile apart. Southbound, the 12th Street interchange and the first ramp in the I-670 interchange are less than 700 feet apart. Likewise, the I-670 interchange ramps to southbound I-35 are less than half of a mile from the 20th Street interchange. In these situations, current design standards would dictate adding an auxiliary lane or collector distributor road to accommodate lane changes (weaving movements) off the main lanes of the highway to minimize slowdowns and stoppages for through traffic. However, this solution would be extremely expensive and negatively impact the surrounding urban neighborhoods. The only spacing issues that will be addressed are those that can be accommodated within the existing right-of-way.

Bridge Condition

There are 22 bridge structures in the study corridor. Figure 4 shows the locations of each. The remaining bridges in the corridor are shown in Appendix B.

Bridge condition ratings identify and prioritize bridges that need preventative maintenance, complete rehabilitation or replacement. The substructure, superstructure and deck are each rated. The substructure is the foundation of the bridge and consists of the piers and abutments which transfer the load of the bridge deck and superstructure to the soil and rock underneath.[3] The superstructure rests on top of the substructure's piers and abutments and holds the bridge deck which carries vehicle traffic.[4]

Table 2 – Bridge Condition Ratings

BRIDGE CONDITION RATINGS	
Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION
7	GOOD CONDITION
6	SATISFACTORY CONDITION
5	FAIR CONDITION
4	POOR CONDITION
3	SERIOUS CONDITION
2	CRITICAL CONDITION
1	IMMINENT FAILURE CONDITION
0	FAILED CONDITION

The deck, superstructure and substructure of each bridge are rated from 0 to 9, defined in Table 2. When a bridge superstructure or substructure reaches a 2 rating, MoDOT will close the bridge to traffic.

[3] *Information from Answers.com.* http://www.answers.com/topic/bridge#ixzz1BcOKAkvv

[4] *Definition from Answers.com.* http://www.answers.com/topic/bridge#ixzz1BcPEQi6b

Although the bridges in the corridor are in generally good condition, MoDOT has programmed two projects in the study corridor in 2013. Those projects will rehabilitate bridges A1701 and L0232. The bridge deck of bridge A1701 over Southwest Boulevard has a 3 rating, which generally means that the deck is cracked and deteriorating, so drivers will experience a rough ride. All the other bridges in the study corridor have ratings that range from 5-8, so after rehabilitation and with continued preventative maintenance, MoDOT believes these bridges will not need substantial rehabilitation or rebuilding for 20-30 years.

MoDOT standards mandate that bridges over an interstate must be 16‘6” above the roadway, including the shoulders, and bridges over local streets must be 14’6” above the pavement including shoulders. Near the Southwest Trafficway interchange, Table 3 shows that four bridges do not meet current design standards. These bridges were built in the 1950s and 1960s before the current standards were adopted, so because the bridges are in good condition, the clearance height will be addressed whenever the bridges are ready for replacement.

Table 3 – Bridge Clearance Table

Bridge Clearances		
Bridge No.	**Location**	**Clearance**
L0248	S-35 ramp to Broadway over N-35	14ft.11in.
	S-35 ramp to Broadway over N-35 entrance. Ramp	15ft. 6in.
A1708	S-35 over Summit	15ft. 2in.
A1707	S-35 ramp to SW Trafficway over 27th Street	14ft. 3 in.

Figure 4 – Bridge Locations and Numbers in the Study Corridor

Operational Review

This section reviews the operation of the facility or the way traffic flows on the roadway, as well as access, mobility, crash data, current traffic volumes, future traffic projections and level of service (LOS).

Neighborhood Access and Mobility

Picture 4 – Uncoordinated Local and State Signage at West Pennway Exit

The Southwest Trafficway was designed and built to serve traffic patterns and design standards in the late 1940s. At that time, Kansas City, Mo., was still the employment and retail/commercial center of the city and region. The Crosstown Freeway was built to help employees get from the emerging suburbs in the Brookside, Waldo, Prairie Village and Roeland Park areas into the downtown employment and retail center. The transportation system was configured to take workers into downtown in the morning and home in the evening. The employment centers that now exist in Johnson County, Kan., Wyandotte County, Kan., Mo. cities north of the river, Independence, Raytown and Lee's Summit, Mo., were not even imagined during the design of the Crosstown Freeway. So, the oldest section of highway in the study area is configured to serve people traveling downtown or Union Station and returning home southbound.

Picture 5 – Wayfinding Signs at West Pennway Exit

There is only one direct access point for Crown Center and Union Station when northbound on I-35 at West Pennway, but returning southbound can be difficult. For example, a field check at West Pennway revealed that drivers from Southwest Trafficway and Broadway were entering the interstate northbound, exiting at West Pennway, making a u-turn under the bridge and continuing their trip southbound on I-35. Most of the cars making this maneuver had Johnson County, Kan., license plates.

Access to the study area and surrounding neighborhoods is also hindered by the lack of coherent signage strategy between

MoDOT and the City of Kansas City. From 20th Street, there is a wayfinding sign on the ramp for Crown Center, Union Station and Kemper Arena, but there are no local wayfinding signs to help travelers on local streets. Drivers exiting the interstate at West Pennway, are confronted by a confusing selection of state and local signs that do not work together to help drivers get to their final destination. Picture 5 shows a number of non-standard signs that do not provide any clear direction to drivers.

The only access to the Crossroads, Westside and Crown Center from the north is at 20th Street, and depending on the direction of travel may require changing lanes up to four times very quickly. Travel northbound is less difficult, but returning home from the Crossroads area requires going south on Broadway and making a u-turn to go northbound to access I-35. The other choice is to travel north into downtown and enter the interstate at a downtown interchange.

Picture 6 – Confusing Exit Numbers on Northbound I-35

The West Bottoms neighborhood does not directly touch the study area, but as a primarily an industrial area, business owners in the bottoms are very concerned with interstate access and signage. According to the Central Industrial Association, the main issue facing industries and the American Royal is access. Signage on northbound I-35 is confusing to freight drivers who use exit numbers. The three ramps to downtown, eastbound I-670 and westbound I-670 have the same exit number, so three ramps going in three different directions each have the same exit number (2U). This signage confuses drivers and GPS.

Picture 4 – Area under Bridge L0232

In addition to mobility issues on the interstate itself, a large portion of the interstate in the study corridor is built on bridges. These large bridges separate development to the east and west of the structures. Although this is not a direct operational issue for the interstate, it does affect mobility in the neighborhood and mode choice on local streets. Underneath the

bridge structures, the environment is sterile and dark, with sidewalks that have not been upgraded to current standards. The viaduct from 20th Street to the Kansas City Terminal Railway is shown in Picture 7.

The pedestrian environment under the structures could be improved to support walking and biking. An inviting walking environment can help support transit ridership by making stops more accessible to residents. Therefore, the area under the viaduct should be examined to help improve mobility in the surrounding neighborhoods. In addition, by linking the neighborhoods together, MoDOT can support the continued vitality and growth in surrounding neighborhoods.

Crash Analysis

MoDOT's Number One priority is safety. Crash data is used to determine if there are spots in a study corridor that have a higher than expected number of crashes or a high number of disabling or fatal crashes. In order to determine whether the crash rate is high, crash data along a corridor or at an intersection is compared to the average statewide crash rate for similar types of roadways and intersections. This data is matched up with the design review to determine if high accident locations correspond with sites that do not meet current design standards. The analysis looks to identify locations where the design of the roadway could be contributing to a high crash rate.

The initial review of crash data in the study corridor showed that the corridor exceeded the statewide crash rate for interstates. However, a more detailed analysis showed that only one location in each direction exceeded the statewide crash rate. Figures 5 and 6 show crash rates at various locations along the study corridor.

Southbound crash data is shown in Figure 5. Most southbound crashes happened between the 13th Street ramp and the 20th Street exit ramp. Several ramps merge together and a lane of through traffic becomes the 20th Street exit ramp, so through traffic must merge left. Southbound crashes are generally property damage and minor injury only. However, there was one fatality in the southbound direction between 2004 and 2008.

Only a single location northbound exceeds the statewide crash rate. Northbound, the rate between Southwest Trafficway and West Pennway/21st Street exceeds the statewide average. The Southwest Trafficway and Broadway entrance ramps are too close to the West Pennway exit ramp, so there are a number of different lane changes happening in a relatively short space. Most of the crashes in the northbound direction resulted in property damage only or minor injuries. Northbound crash rates by location are shown in Figure 6.

Figure 5 – Southbound Crash Data

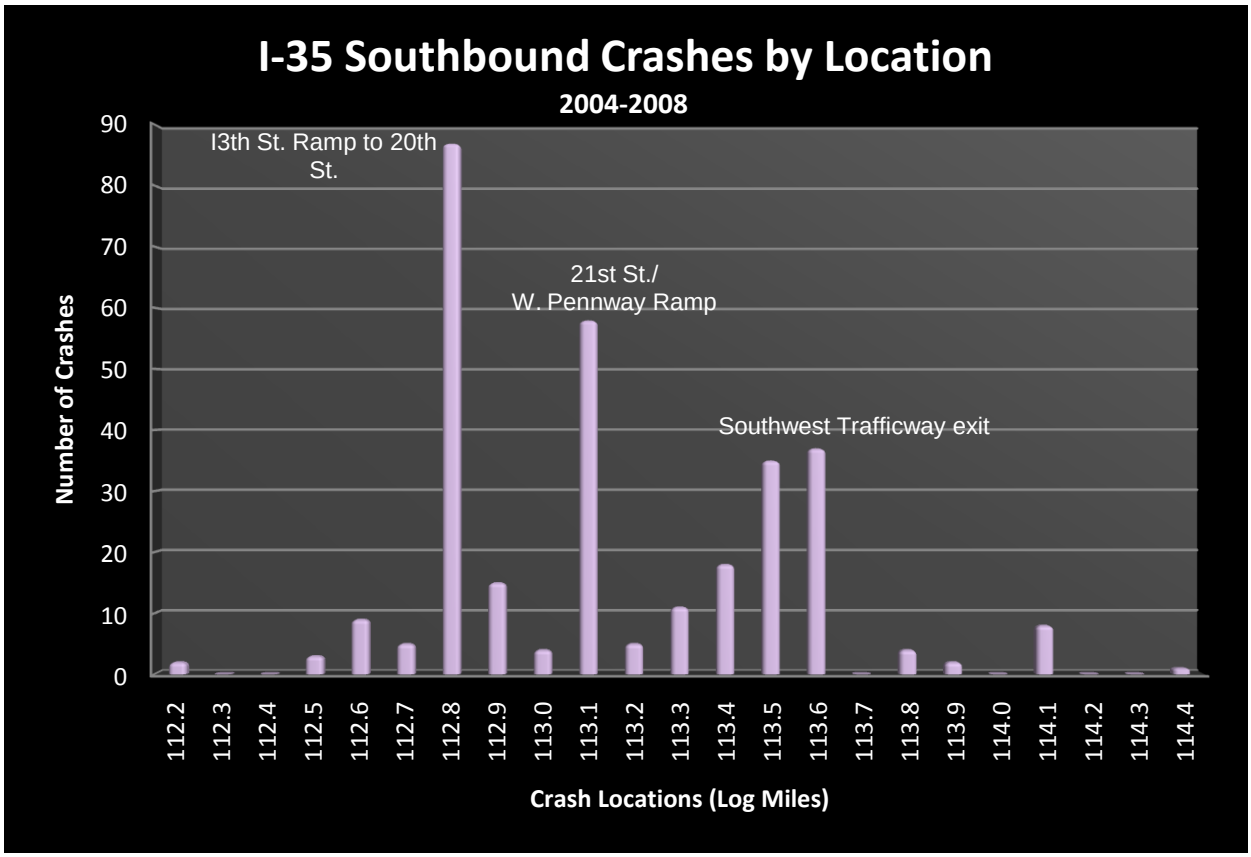
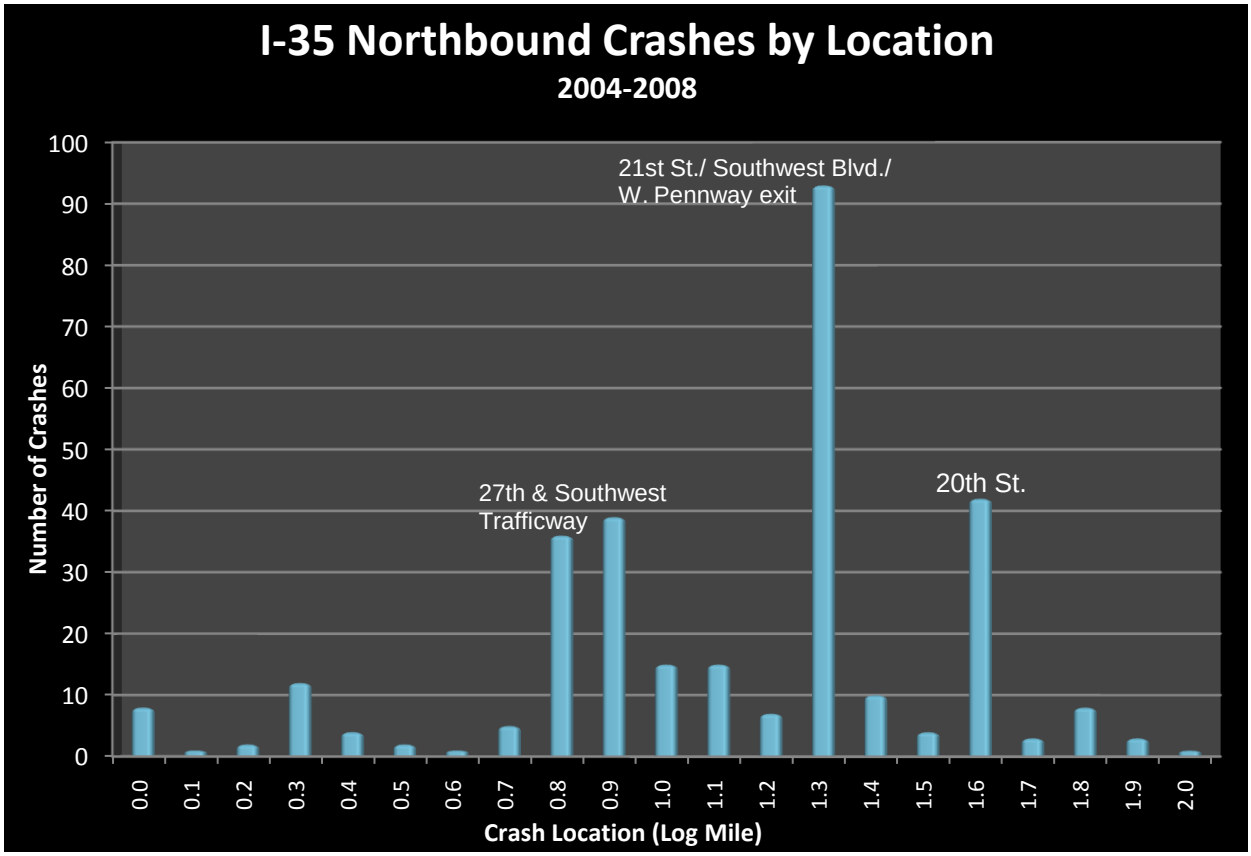


Figure 6 – Northbound Crash Data



Traffic Analysis

Traffic analysis helps planners and engineers analyze the function of a roadway to determine if congestion mitigation solutions are warranted. The duration of the delays and location of congested segments will help determine if any counter measures can or should be applied in the study corridor.

Traffic data was collected and used to calibrate traffic modeling software, which produced the future traffic volumes. Current and future volumes were then compared to the roadway capacity to determine congestion levels and delay.

Existing Traffic Volumes

The first step in the traffic analysis process is to compile existing traffic data in the study corridor. Traffic data is collected at various locations. Because traffic volumes fluctuate by day of the week, time of day and time of the year, traffic counts are generally collected on a regular basis, averaged over a year and reported as Average Annual Daily Traffic (AADT).[5] Figure 7 shows current AADT in the corridor, which ranges from about 30,000 to 70,000.

Forecast Traffic Volumes

The second step in traffic analysis is to forecast traffic volumes for 20 years into the future. Future employment and population estimates are input into the Mid-America Regional Council (MARC) travel demand model to project future interstate volumes. Because the land in and around the study area is generally developed, lower growth rates of 0.5 to 2 percent are applied to existing traffic volumes. The lowest rate, 0.5 percent, is used near downtown and the Westside neighborhood. Closer to the Cambridge exit ramps where more land could be developed a 2 percent growth rate is applied. Figure 7 shows the projected AADT for 2030.

Daily traffic volumes are useful but provide a limited perspective because there is no mechanism for comparing and evaluating the operation of the roadway from the traffic volume alone. A large AADT does not necessarily reflect higher levels of congestion or obstructed traffic flows on the interstate. For example, an AADT of 80,000 could represent grid-lock on one roadway, but the same AADT could represent nearly free flow traffic on another facility.

[5] *Wikipedia. Average Annual Daily Traffic definition. http://en.wikipedia.org/wiki/Annual_average_daily_traffic*

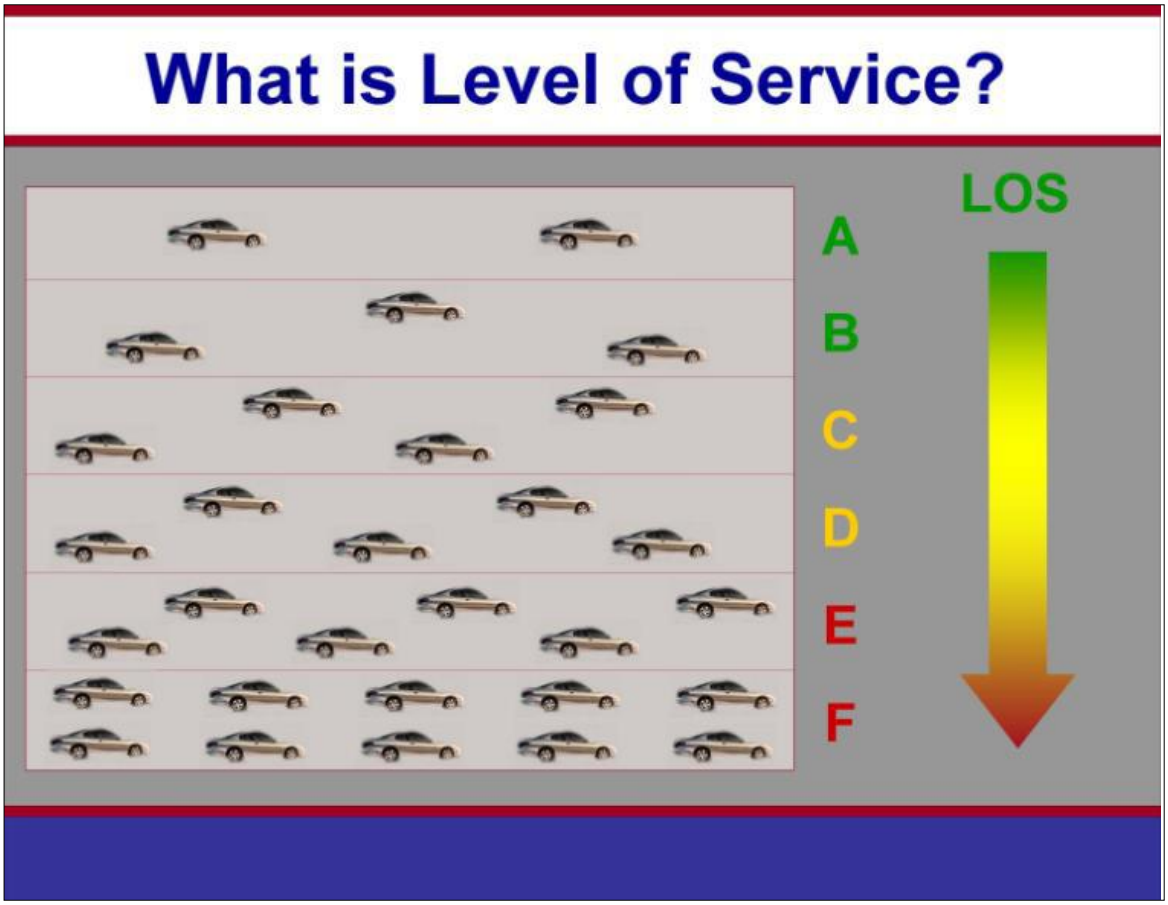
Figure 7 – Existing Traffic Volumes and Future Traffic Volume Projections

Level of Service

Level of service (LOS) or capacity analysis compares the operation of roadway segments based on the methodology in the Highway Capacity Manual. LOS measures the effect of traffic flow factors such as speed and travel time, interruption, freedom to maneuver, driver comfort, convenience, and indirect safety and operating costs. Peak hour data is necessary to calculate LOS, so peak hour traffic volumes are extracted from the current and projected AADT.

Level of service categorizes roadway operation into six categories that work much like a grade card: LOS A represents the best operation and LOS F represents highly restricted operation. For example, LOS A exists when there is little or no restriction in speed or maneuverability caused by other vehicles, and LOS F exists when traffic moves at low speed, including many stoppages, with the highway acting as a storage area. Figure 8 illustrates the traffic conditions at each LOS level.

Figure 8 – Level of Service (LOS)



Current data for the model was collected in 2008. Figure 9 shows LOS for 2008 morning and afternoon rush hour periods. The corridor operates at an acceptable LOS, with the exception of

one segment. The segment between I-670 and Southwest Trafficway operates at LOS F northbound in the morning rush hour and southbound during the afternoon rush hour.

The future traffic projections assume no physical changes are made to the interstate or interchanges in the study corridor by 2030. AADT and peak hour volumes increase in 2030, and LOS generally shifts lower. By 2030, most of the corridor continues to operate at an acceptable LOS. However, the section between I-670 and Southwest Trafficway shows significant congestion in the future. Figure 10 shows LOS for 2030.

Figure 9 – Current (2008) Level of service – AM and PM Rush Hour

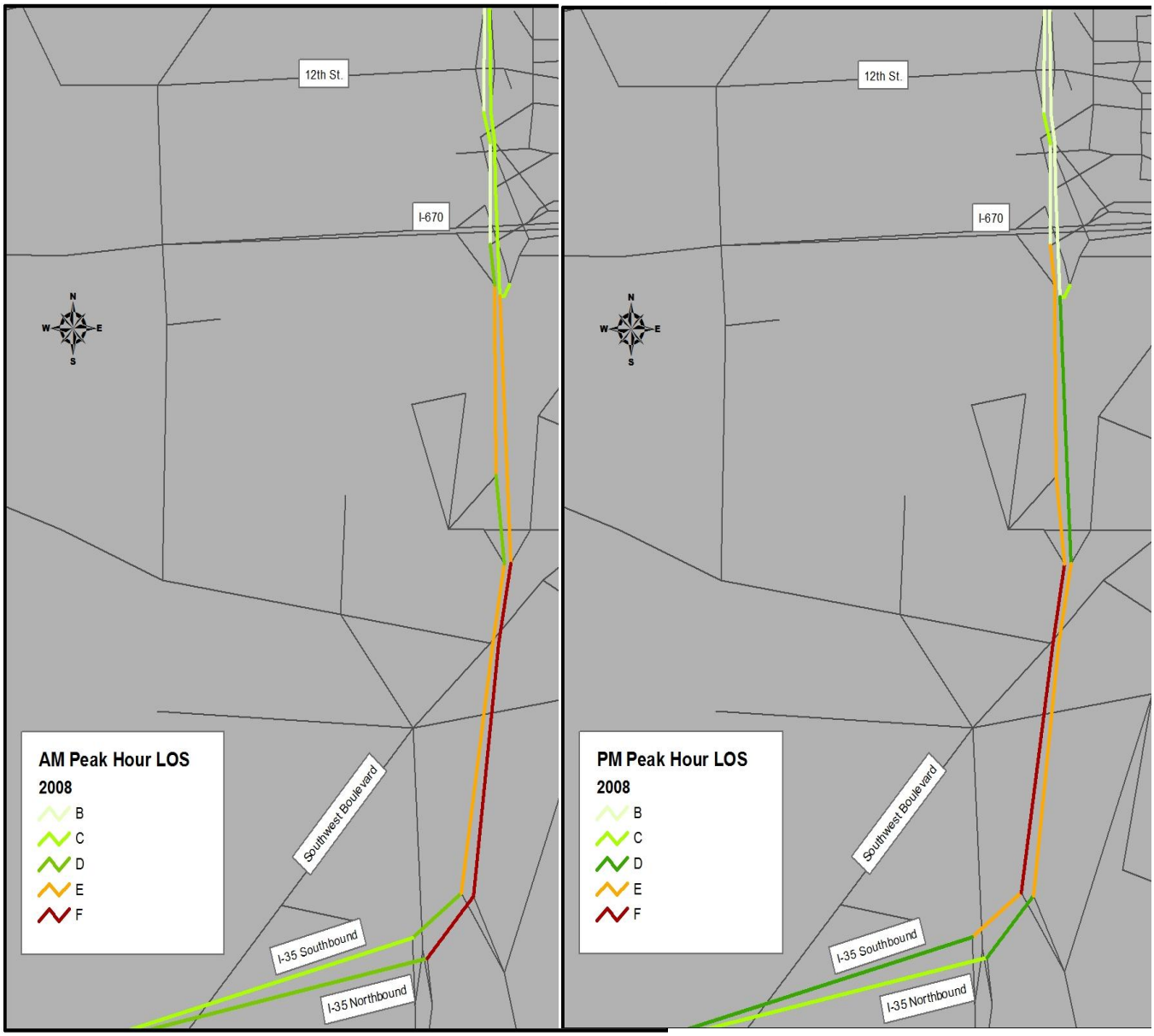
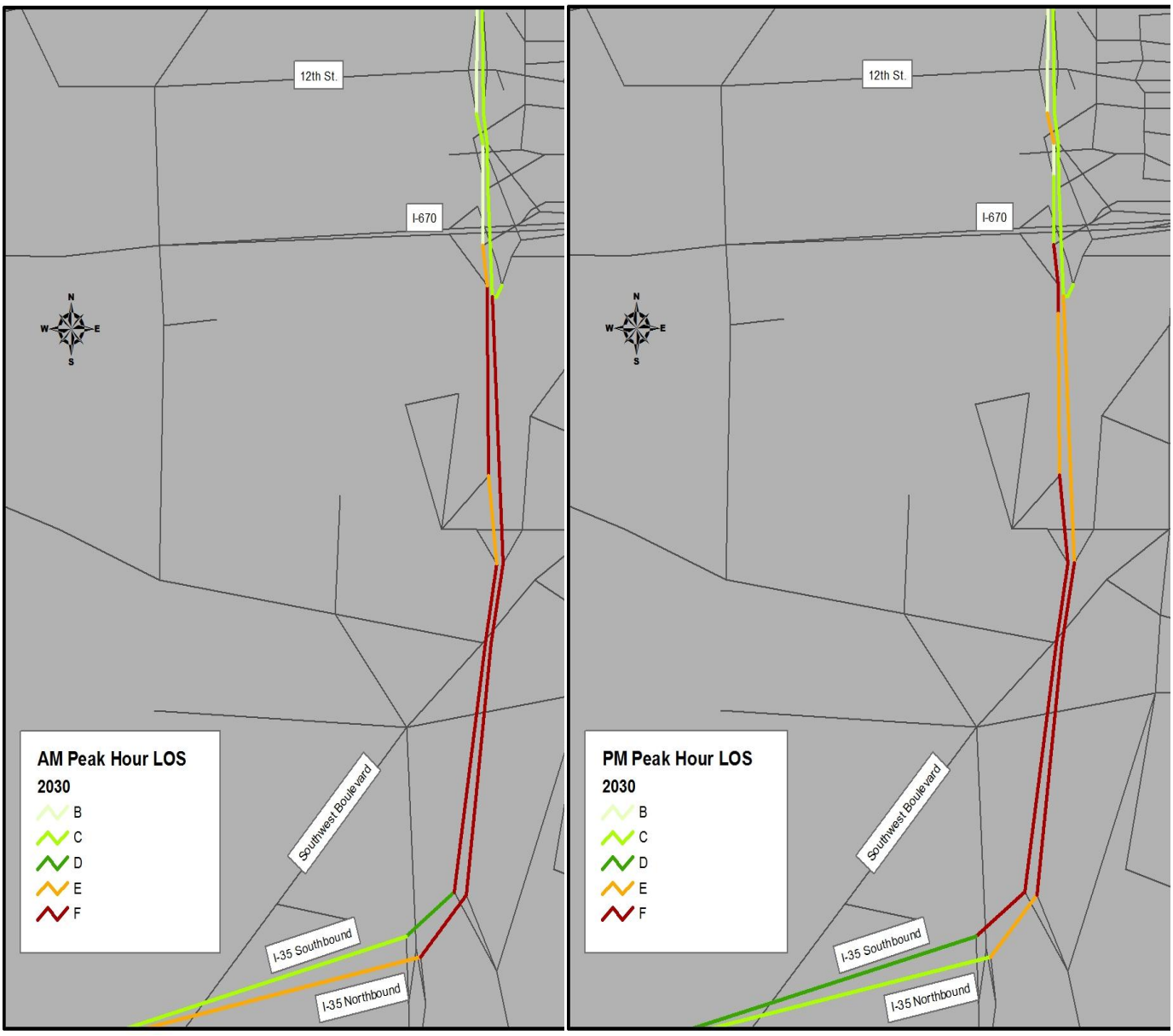


Figure 10 – Future (2030) Level of Service – AM and PM Rush Hour



The most serious congestion points in the corridor occur where traffic enters the highway on the rights and exits on the left or enters on the left and exits on the right. In these locations drivers have to change lanes multiple times to get to an exit ramp sometimes in a short space. For example, from the 12th Street entrance ramp, drivers who want to go east on I-670 must cross two lanes in about 650 feet. Between the I-670 /I-35 South merge and the 20th Street exit, vehicles coming from I-670 westbound and exiting at 20th Street have to cross three lanes in less than half a mile. Meanwhile drivers southbound on I-35 are merging left because the

right lane becomes the 20th Street exit ramp. Where these lane changes occur, through traffic often must slow down or brake to avoid vehicles making sudden lane changes, which can intensify congestion.

According to MoDOT's EPG, a roadway segment in an urban or suburban location that experiences a LOS E is acceptable. LOS E is the point at which drivers experience noticeable delays and slow downs. While the largest volumes of traffic usually occur during the peak hour, these volumes generally only account for about 10 percent of the total traffic that uses the roadway. MoDOT believes that it is reasonable to expect some delays and slowdowns during these short time periods, especially if the majority of the time most drivers could still experience light to no congestion or delay. This policy is based on cost-benefit analysis that examined the costs of addressing an hour or two of congestion vs. the benefits of reducing congestion in urban and suburban areas.

Improving the LOS of a roadway often requires adding roadway capacity in the form of general purpose lanes, auxiliary lanes, collector distributor lanes, etc. Capacity additions to the interstate system in the study corridor would be expensive and have wide-ranging impacts to surrounding neighborhoods. Under these circumstances, LOS F also can be acceptable because the cost of adding capacity and the neighborhood impacts far outweighs the benefits of improving LOS from F to E.

Needs Identification Summary

Based upon the operational review, several issues were identified in the corridor, however there were no critical operational or structural issues requiring immediate attention. The operational issues were access to amenities near the corridor and mobility on or around the interstate.

Weaving/Merging and Ramp Length

Lane changes or weaves, and merge movements happen whenever drivers enter or exit the interstate. As shown in the Operational Review section, the northern portion of the study corridor contains a series of ramps and interchanges, some of which are less than half-of a mile apart. When ramps are too close together, speed tends to decrease as drivers approach the interchange areas where cars are entering and exiting the interstate. These slowdowns and rapid lane changes or merges can lead to increased crashes.

In order to address the weaving and merging sections, four sets of opportunities were identified for the range of concepts:

- Identify opportunities to improve weaves, merges and lane changes in the study corridor;
- Identify opportunities to reconfigure entrance and exit ramps at problematic locations;
- Identify opportunities to support transit service in or near the study area;
- Identify opportunities to improve safety on the interstate at or near weaving/merging sections, and at entrance and exit ramps.

Access to Local Streets and Destinations

Connections to local streets in the study corridor support some travel choices, but do not fully support today's bi-directional travel. This leads to situations where drivers make unexpected maneuvers to access the closest interstate ramp. In addition, some interstate exit ramps connect to neighborhood streets. Better connections between the interstate and local streets are needed.

In order to access to local streets and destinations, four sets of opportunities were identified for the range of concepts:

- Identify opportunities to add access to and from the interstate;
- Coordinate information to help travelers move through the corridor and access local destinations;
- Identify opportunities for alternate alignments on underutilized major city streets;
- Identify opportunities to improve safety at locations where local streets and MoDOT facilities intersect.

Support Neighborhood Development and Multimodal Trips

The interstate is a part of the neighborhood, and it is important to neighborhood health and vitality that all the neighbors work together. It also provides an important link to attractions and activity centers in the community support economic health and vitality.

In order to address neighborhood development and multimodal travel, six sets of opportunities were identified for the range of concepts:

- Identify ways to improve the walking and biking environment under the elevated sections of interstate;
- Identify opportunities to coordinate with the City of Kansas City, Mo., and neighborhood groups;
- Identify opportunities to improve safety under and near the interstate facility;
- Identify opportunities to support transit usage near the study corridor;

- Identify opportunities to direct traffic to appropriate non-residential streets;
- Identify opportunities to limit impacts to neighborhoods.

Environmental Review

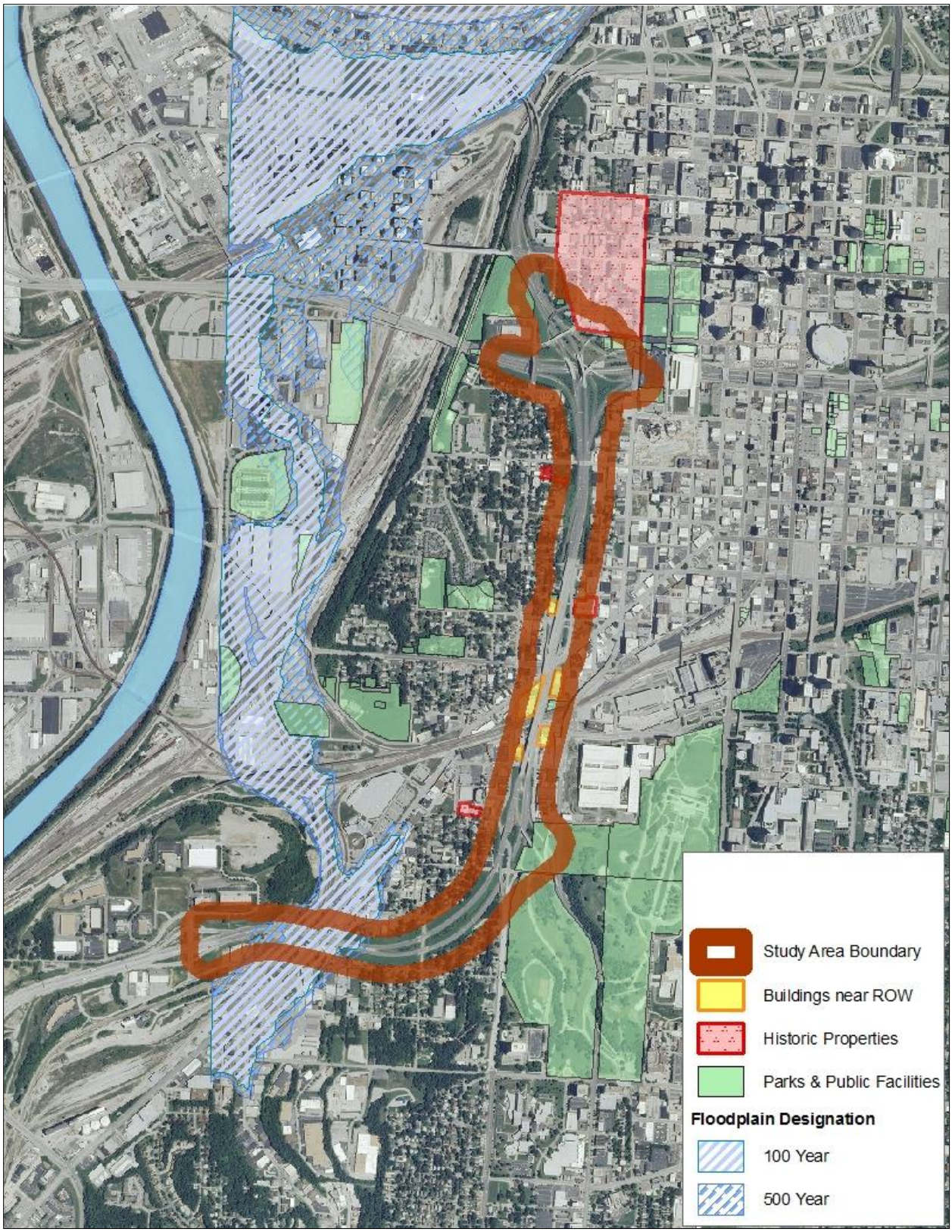
MoDOT is required by federal law to review the environment around a study corridor. An environmental review examines ecological, historical and demographic data within and near the study area. Items reviewed for this study include:

- Wetlands and waters of the US
- Historic and cultural resources
- Hazardous waste sites
- Floodplains
- Federal Emergency Management Agency buyout sites
- Farm land and soil
- Threatened and endangered species
- Parkland
- Air quality
- Noise quality
- Environmental justice areas

Figure 11 shows the locations of some environmental constraints in the corridor.

The neighborhood review focuses on the areas immediately adjacent to the study area, but the demographic review includes a larger area of block groups that extend from the state line to Grand Street.

Figure 11 – Environmental Constraints Near Study Corridor



Wetlands and Waters of the U.S.

The Clean Water Act of 1972 requires MoDOT to evaluate every project and determine whether the project could have a negative impact on any waters of the U.S. including wetlands, streams, and special aquatic sites.

Following the review of topographic, aerial, and National Wetland Inventory (NWI) maps, it was determined that no wetlands or streams are located within the study area. However, a field survey would be required to verify this determination for any future project activities.

Historic and Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 requires cultural resources investigations. Cultural resources can include archaeological sites, buildings, bridges, and other structures such as dams and tunnels, and even landscapes that still maintain a palpable connection to the past. A significant cultural resource is one that meets certain criteria and is included in or eligible for inclusion in the National Register of Historic Places (NHRP) and is termed a historic property or historic resource. Not all cultural resources are historically significant, but potential project impacts to all must be considered.

In addition to a Section 106 review, Section 4(f) of the Department of Transportation Act of 1966 (DOT) Act can also apply to structures and sites that are of national, state or local significance. This section was created to ensure that federal transportation policy encouraged efforts to preserve the beauty and integrity of publicly owned parks, recreation areas, waterfowl and wildlife refuges, and historic sites considered to have national, state or local significance. [6]

Section 4(f) stipulated that the Federal Highway Administration (FHWA) and other federal DOT agencies could not approve the use of land from a significant publicly owned park, recreation area, wildlife or waterfowl refuge, or any significant historic site unless the following conditions apply:

- There is no feasible and prudent alternative to the use of land.
- The action includes all possible planning to minimize harm to the property resulting from use.

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[6] *Maryland Department of Transportation. State Highway Administration. Website summarizing National Environmental Policy Act provisions. History Section. http://www.section4f.com/history.htm*

The operational study looked to identify any such sites, so that those locations could be avoided. A preliminary evaluation was conducted to identify any known resources in three categories: archaeology, architecture, and bridges.

Archaeology

The Missouri State Historic Preservation Office (SHPO) archaeological database has identified no archaeological sites in the study area.

Architecture

There are three NRHP listings for architectural resources in the study area. Table 4 provides the name and location of these resources.

Table 4 - NRHP – Architectural Resources within the Study Area

Name	Location
Quality Hill Historic District	Bounded by Broadway, 10th, 14th, and Jefferson Street, KCMO
Howe, Frank M., Residence	1707 Jefferson Street, Kansas City, Mo.
Jensen-Salsbery Laboratories	520 West 21st Street, Kansas City, Mo.

NHRP has listed two architectural resources close to the study area. Table 5 below provides the names and locations of these resources.

Table 5 - NRHP – Architectural Resources Close to the Study Area

Name	Location
Peppard, Joseph Grear, House	1704 Jefferson Street, Kansas City, Mo.
Sacred Heart Church, School and Rectory	2540-2544 Madison Avenue and 910 West 26th Street, Kansas City, MO

The northern end of the study area intersects the Quality Hill Historic District, which is included in the NRHP and the Kansas City Register of Historic Places (KCRHP). KCRHP has listed no specific architectural resources in the Quality Hill Historic District that are within the I-35 Operational Study analysis area boundary. However, KCRHP has identified one resource near the study area. Table 6 provides the name and location of this resource.

Table 6 - KCRHP – Architectural Resources Close to the Study Area

Name	Location
Moss Residence	1714 Jefferson Street, Kansas City, MO

Bridges

There are 22 bridges within the study area. Two of the bridges, L0232 and L0248, were built prior to 1965. The remaining bridges were built in the late 1960's and some were reconstructed or rehabilitated in the late 1980s or early 1990s. None of the 22 bridges are on the 1996 Missouri Historic Bridge Inventory and none of the bridges are listed on or considered eligible for listing on the NRHP.

Hazardous Waste Sites

MoDOT evaluates project corridors for hazardous waste sites, provides management and oversight of sites acquired, and monitors projects for compliance with applicable federal and state laws and regulations. Any unknown sites that are found during project construction will be handled in accordance with applicable federal and state laws and regulations. The Missouri Department of Natural Resources is contacted for coordination and approval of required activities as needed.

Based upon a review of existing databases, several potential hazardous waste sites were found within study area. These potential sites include residential homes, commercial businesses, industrial facilities, and a railroad that could all pose a direct or indirect impact on the project. Any improvements outside the current right-of-way will need additional investigation.

Floodplains

MoDOT must evaluate every project and determine whether it could have a negative impact on the base (100-year) floodplain or regulatory floodway. The Federal Emergency Management Agency (FEMA) and FHWA guidelines 23 CFR 650 identify the base (100-year) flood as the flood having a one-percent probability of being equaled or exceeded in any given year. The base floodplain is the area of 100-year flood hazard within a county or community. The regulatory floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood discharge can be conveyed without increasing the base flood elevation more than a specified amount. FEMA has mandated that projects can cause no rise in the regulatory floodway and no more than a one-foot cumulative rise for all projects in the base (100-year) floodplain.

There is a base (100-year) floodplain at the southwestern end of the study corridor, near the Kan. state line. Any new right-of-way or easement, or fill placed within this Special Flood Hazard Area (SFHA) will require a floodplain development permit from State Federal Emergency Management Agency.

FEMA Buyout Sites

The Flood Disaster Protection Act of 1973, as amended by the Disaster Relief and Emergency Assistance Act of 1988 (The Stafford Act), identified the use of disaster relief funds under Section 404 for the Hazard Mitigation Grant Program (HMGP), including the acquisition and relocation of flood damaged property. The Volkmer Bill further expanded the use of HMGP funds under Section 404 to "buyout" flood damaged property, which had been affected by the Great Flood of 1993.

There are numerous restrictions on FEMA buyout properties. Available references indicate no FEMA buyout sites in the project area.

Farmland and Soil

The Farmland Protection Policy Act (FPPA) requires MoDOT to evaluate every project and determine whether it could have a negative impact on farmland. Both the relative value of the soils present on the site and the impact that the project will have on the area relative to agricultural use are considered for that determination.

The study area is located in the urbanized city of Kansas City, Mo. Over time, development has transformed any farmland in this area to urban uses including homes and businesses. As a result there are no farmlands located within the study area.

Threatened and Endangered Species

Federal laws require MoDOT to thoroughly address any potential impacts their projects might have on federally listed threatened and endangered (T&E) species and eliminate or minimize those impacts. T&E species considerations for MoDOT projects include potential impacts to rare plants, animals, critical habitat, and natural communities (e.g., caves).

A cursory evaluation of the study corridor was inconclusive, so staff was unable to completely determine whether future projects would result in any T&E issues. T&E would be reviewed in greater detail when a project is proposed for the study area.

Parklands

MoDOT monitors all federally funded roadway improvement projects for compliance with federal regulations concerning the use of public lands, specifically Section 4(f) and Section 6(f) requirements. MoDOT considers the impact on using public land in the planning process and then attempts to minimize and mitigate when impacts are unavoidable. Section 4(f) refers to the original section within the Department of Transportation (DOT) Act of 1966, which set the requirement for consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites in transportation project development. 4(f) resources include any publicly owned park, recreation area, or wildlife refuge or any publicly or privately owned historic site. Section 6(f) is part of the Land and Water Conservation Fund (LWCF) Act, which was designed to provide restrictions for public recreation facilities funded with LWCF money by restricting non-recreation uses.

There are several publicly owned properties in the study corridor, including Penn Valley Park, which is potentially both a Section 4(f) and Section 6(f)-eligible property, an LB Kansas City Technology Holding property north of 25th Street and east of I-35, and property listed as belonging to KC Parks north of 21st Street on the west side of I-35 over to Jefferson Street. All publicly held land should be avoided.

Air Quality

The Federal Clean Air Act set air quality standards to protect public health, safety and welfare from known or anticipated effects of specific pollutants such as ozone and carbon monoxide. All states must identify geographic areas with monitored levels that meet or exceed the National Ambient Air Quality Standards (NAAQS) primary standard for each of these pollutants. A geographic area exceeding the NAAQS for any criteria pollutant is designated "non-attainment" areas for that pollutant.

The Kansas City region is currently in attainment status for all pollutant criteria, so the region currently does not exceed NAAQS. However, there are air quality monitors in the region that have exceeded the standards in recent years, and the region could exceed NAAQS in the near future.

The I-35 study area is located in the Kansas City region, and any projects that are suggested for the area are subject to Air Quality analysis. Because the region is currently an attainment area, conformity requirements for non-attainment status do not apply to the concepts presented in this study. However, the region is expected to become a non-attainment area in a few years. When the region becomes a non-attainment area, any project proposed for the I-35 within this study area would be reevaluated for air quality implications.

Noise Quality

The Federal Aid Highway Act of 1970 established the requirements contained in 23 CFR, Part 772 that traffic noise control be a part of the planning and design of all federally funded highway projects. To conform to 23 CFR 772, MoDOT has a traffic noise policy approved by FHWA to provide guidance for determining the feasibility and need of noise abatement measures such as sound walls.

Noise abatement measures would be considered when there is highway construction or when certain type of improvement to the existing highway as listed in the MoDOT Noise Policy are proposed. The I-35 Operational Study does present some improvement concepts which would require the consideration of noise abatements measures and an appropriate traffic noise analysis.

Neighborhood Description

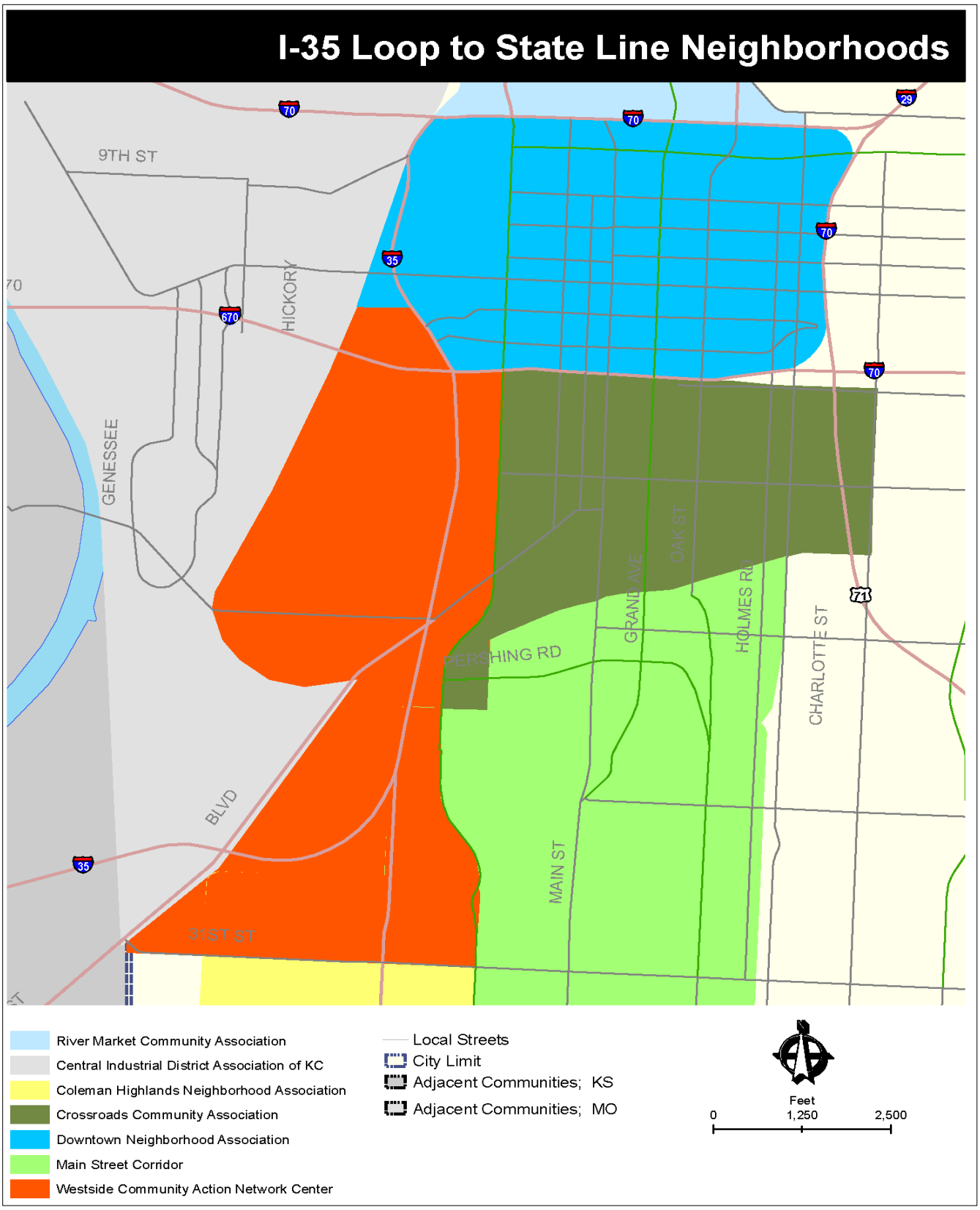
There are several neighborhoods within or near the study area, including, Quality Hill, Westside, Westside South, Crossroads, Hospital Hill, Crown Center, Coleman Highland and Union Hill. These neighborhoods provide diverse housing, commercial, retail and recreation opportunities for residents.

Activity centers in this area include the Sprint Center, Power & Light District, Kemper Arena, Union Station, Hospital Hill and Crown Center. The neighborhoods that intersect the study area are also home to a number of jobs, including the recently constructed Federal Reserve Bank and IRS facilities.

Because many of the neighborhoods in or near the study area are some of the oldest in the city, there is very little open land available for development. Approximately 45 percent of homes in the Westside neighborhood were built on or before 1939.[7] New housing stock is generally available where an older residence was removed and rebuilt or a building site is repurposed from commercial or manufacturing to apartments and condominiums. In the Freight House and Crossroads Districts, many former manufacturing and commercial sites have been converted into urban lofts. A general neighborhood boundary map is shown in Figure 12.

[7] *US Census Bureau 2000 data.*

Figure 12 – Generalized Neighborhood Boundaries Near the Study Corridor



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Neighborhood History

The neighborhoods in the study area are some of the oldest in the city with rich histories. Kansas City became a major stop for settlers traveling west. As settlers moved west, some of the settlers stopped in Kansas City, built homes and found jobs. For those settlers heading to Santa Fe, their wagon trains would leave Kansas City through the Penn Valley Ravine, which was later incorporated as a part of Penn Valley Park.[9]

In 1904 a large area surrounding the Penn Valley Ravine was incorporated as a park. The park covers 176 acres between Union Station and 31st Street. The main feature of the park at that time was the Penn Valley Ravine. Within two decades, the construction of the Liberty Memorial and Union Station created destinations on the eastern side of the study corridor.

A very important factor in the growth of Kansas City and the formation of the neighborhoods near the study area was the railroad. Kansas City became a connecting point between north-south and east-west routes. Several rail lines cross the study area. The largest section of track in the study area is operated by the Kansas City Terminal (KCT) Railway. The KCT was created by twelve railroads in the early 1900s after a flood destroyed the city's main depot in the West Bottoms. Today, the KCT serves four Class I railroads: Burlington Northern and Santa Fe (BNSF), Kansas City Southern (KCS), Norfolk Southern (NS) and the Union Pacific (UP). Other smaller railroads such as Iowa, Chicago and Eastern Railroad, the Missouri and Northern Arkansas Railroad and Amtrak also use the KCT[10]. The BNSF railroad operates on a number of tracks that generally parallel the interstate.

Railroad lines brought goods, visitors, employees and immigrants to the city. Kansas City is the largest rail hub in the country behind Chicago.[11] Railroad tracks through the study area define the area available for development of housing, retail, commercial and roadways. A number of the workers and visitors stayed in the city and some settled in the Westside contributing to the rich mix of cultures.

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[8] Map provided by the City of Kansas City, Mo., Community Development Department. 2010. Neighborhood boundaries are generalized and may change over time.

[9] Information from Parks Department pages on the KCMO website. http://www.kcmo.org/CKCMO/Depts/ParksandRecreation/PennValleyPark/index.htm

[10] Information from Wikipedia. Webpage "Kansas City Terminal Railway." http://en.wikipedia.org/wiki/Kansas_City_Terminal_Railway.

[11] Information from Wikipedia. Webpage "Kansas City Terminal Railway." http://en.wikipedia.org/wiki/Kansas_City_Terminal_Railway.

Activity/Employment Centers

Activity centers provide employment, service and recreation opportunities. Near the study area, the Downtown Loop, Union Station/Crown Center and Crossroads areas provide a broad mix of employment, service and recreation opportunities.

Downtown Kansas City, Mo., has the densest concentration of employees in the metro area. This concentration of employment makes the downtown loop a destination for thousands of employees from all over the metropolitan area each day. In addition to employment opportunities, the downtown area provides a variety of cultural and entertainment sites, such as the Lyric Theater, Bartle Hall, Music Hall, Sprint Center and Power & Light District. These amenities provide jobs and attract visitors to shows and concerts. In the early fall 2011, the Kauffman Center for the Performing Arts center will open. This center is located just to the east of the study area, and I-35 provides access to this site.

To the south of downtown, the Crossroads and Union Station/Freight House District neighborhoods have emerged in the last decades. The restoration of Union Station happened as the Freight House and Crossroads Districts emerged, creating a renewed residential and entertainment area. In addition to new residential opportunities, the Internal Revenue Service and Federal Reserve Bank have recently located in the area bringing large numbers of employees.

To the east of Union Station, the Crown Center and Hospital Hill areas also attract large numbers of employees, visitors and patients. In addition to the thousands of employees entering this area each day, thousands of visitors stay in nearby hotels, visit Hallmark, shop or eat at the venues in the area. Crown Center also offers ice skating in the winter and periodic movies and concerts in the summer.

The western portion of the study area is bordered by the Westside and West Bottoms neighborhoods. The Westside community is one of the oldest neighborhoods in town and an ethnically diverse area with a high percentage of Hispanic residents. It is known as a dining destination for ethnic food, especially Mexican. However, the area also boasts a variety of other industries, such as the Boulevard Brewing Company and the Roasterie Coffee Processing plant.

The West Bottoms like the Westside has a long, rich history and is probably best known as the home of the stockyards. By the 1920s, the stockyards were processing over 2 million head of

cattle a year making Kansas City the second biggest producer of beef after Chicago.[12] The stockyards were destroyed in the flood of 1951 and never fully recovered. The most visible legacy of the stockyards is the American Royal agricultural show, which runs for six weeks in the late summer at Kemper Arena. Since the flood of 1951, the West Bottoms has been slowly becoming a hub for industry[13].

Table 7 below provides a small sample of employers near the study area.

Table 7 - Sample of Employers Near Study Area[14]

Company	Daily Employees	Company	Daily Employees
Children's Mercy Hospital	2,500 – 3,000	Truman Med Cntr West	2,000
Federal Reserve Bank	900	Internal Revenue Service	3,940
Boulevard Brewing Company	100	Roasterie Coffee	50
Faultless Starch/Bon Ami	500-1,000	CFM Distributors	55-60

Demographic Overview

A demographic review of the area looks at the general social characteristics of the population in and around the study area. These characteristics include racial and ethnic composition and average income of each tract or block group. These factors are reviewed to determine if the area might qualify as an environmental justice area.

Racial Composition of Neighborhoods

Race and ethnic identity are defined by country and continent of origin. However, race and ethnicity are defined differently by the Census Bureau for self reporting purposes. Race is not defined by country or continent of origin, but by five broad racial categories. Census respondents are asked to classify themselves as White, Black, American Indian/Alaskan Native, Asian, Hawaiian/Pacific Islander or a combination of two or more races. Ethnic classifications

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[12] *Information from Wikipedia. http://en.wikipedia.org/wiki/Kansas_City_Stockyards*

[13] *Information from Wikipedia. http://en.wikipedia.org/wiki/Kansas_City_Stockyards*

[14] *The numbers shown are approximate numbers gathered from phone calls and websites.*

are subsets of race that can be tied to nationality or location, such as Italian, Irish or German. However, the only ethnic classification tracked in the Census is Hispanic/Latino, and individuals within any of the Census' five racial classifications can self report as Hispanic/Latino. A more detailed description of how race and ethnicity are defined in the 2000 Census is provided in Appendix D.

In order to determine whether any of the census blocks near the study area qualify as environmental justice area, the racial and ethnic composition of the city of Kansas City, Mo., is compared to the same data in blocks near the study corridor. Nineteen census blocks surrounding the study corridor were selected to represent neighborhood areas. Those blocks with racial and ethnic populations higher than the city as a whole were identified in each category.

Minority Population:

For this study minority populations are defined as any non-Caucasian/non-White person. Approximately 60 percent of residents in the Kansas City, Mo., area identify themselves as White/Caucasian, and 40 percent of residents identify themselves as another race, such as Black, American Indian/Alaskan Native, Asian, Hawaiian/Pacific Islander or a mix of two or more races. Eight block groups near the study area have minority populations higher than the city as a whole. These blocks are shown in orange and red in Figure 13.

Hispanic Population:

In the Kansas City area, 7 percent of residents identify themselves as Hispanic/Latino according the Census' Community Profile. Fifteen block groups, of the nineteen analyzed, have Hispanic/Latino populations greater than the city wide percentage. Blocks with a Hispanic population above 7 percent are shown in medium blue, orange and red in Figure 14.

Figure 13 – Percent of Non-Caucasian Population in Study Area

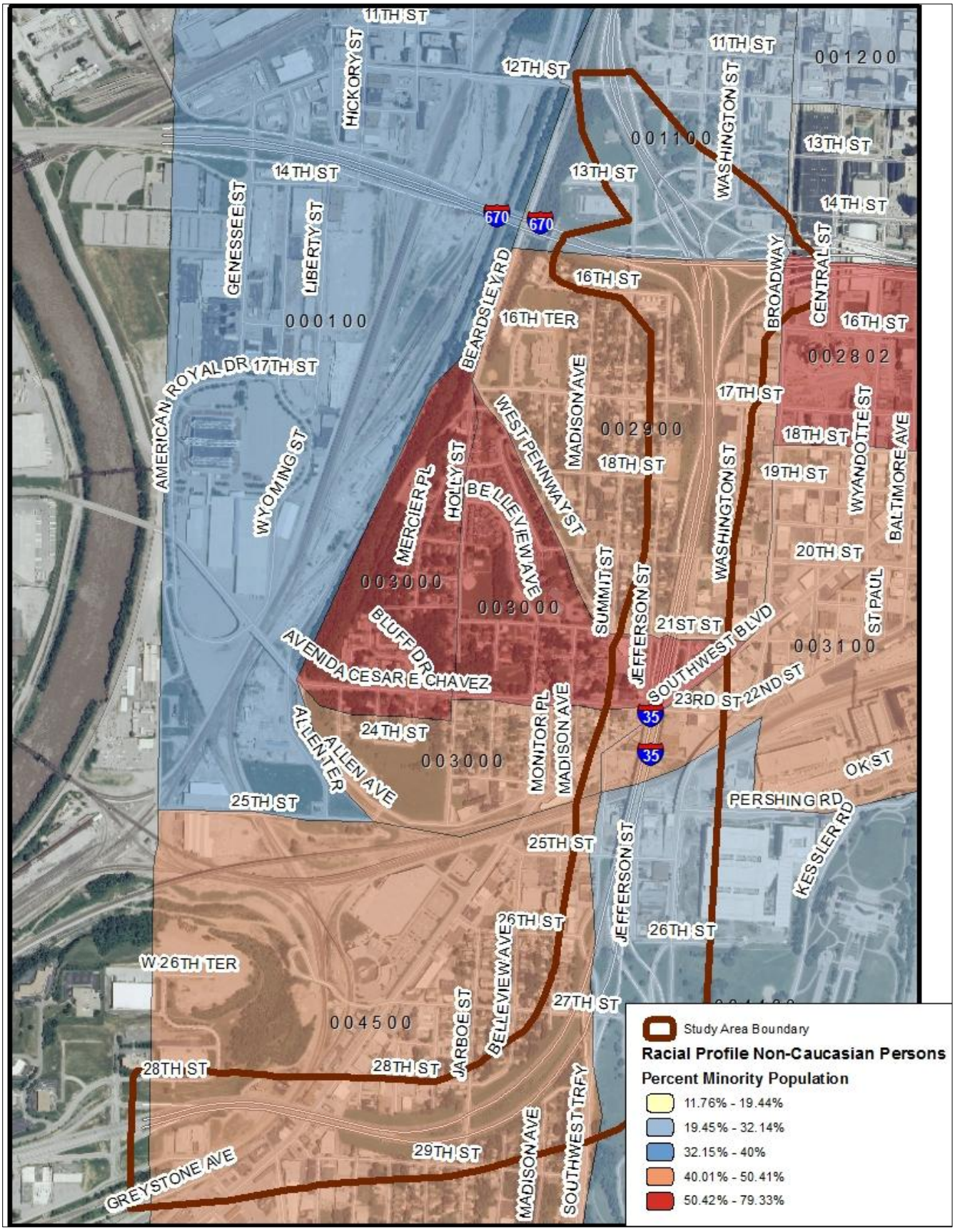
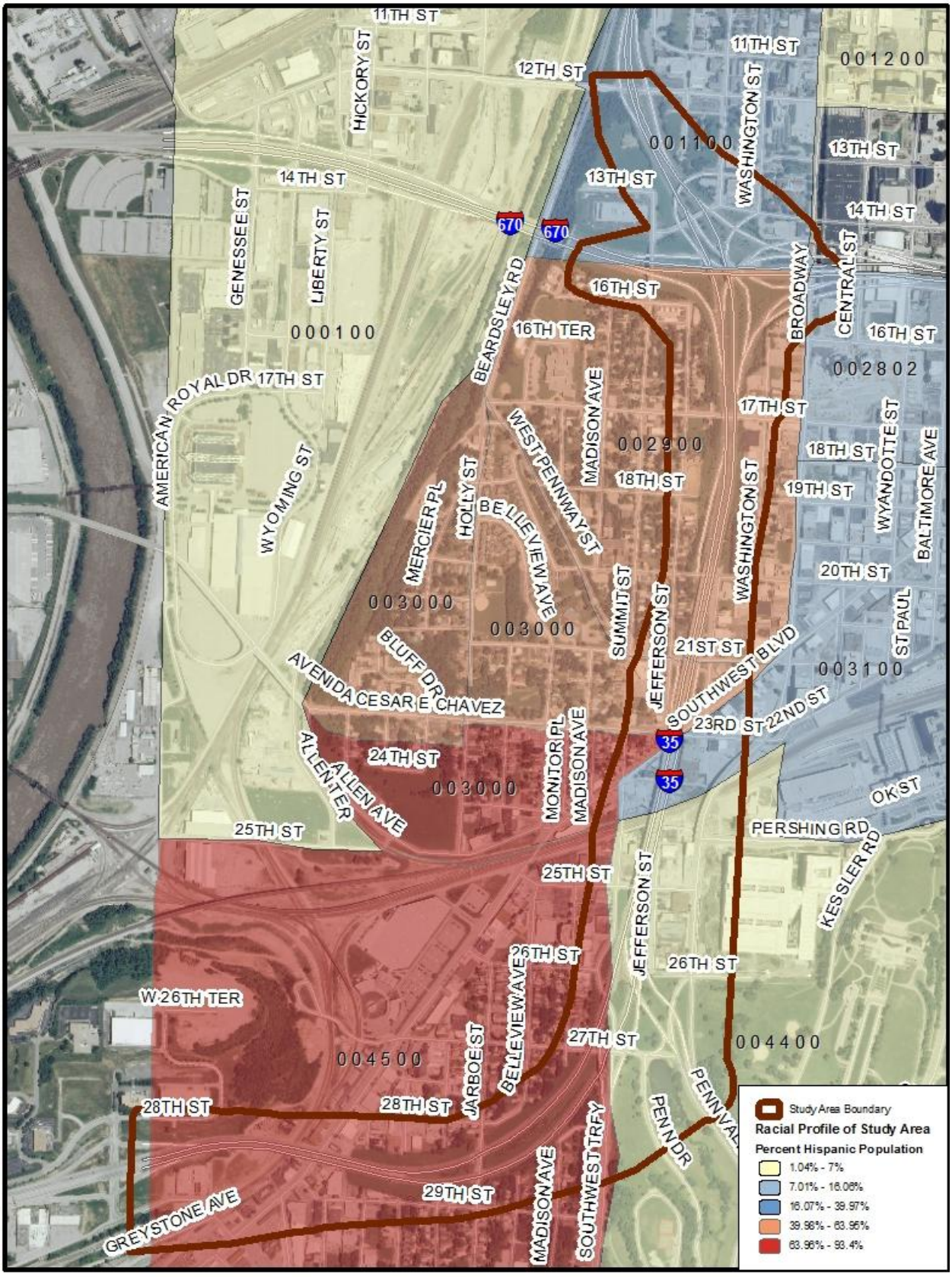


Figure 14 – Percent Hispanic/Latino Population in Study Area



Low Income:

The Census provides information on the median per person (per capita) income of Kansas City, Mo. The median is the middle number in a range of values, so that half the incomes are above and half are below the median income per year. For Kansas City, Mo., the median per capita income was approximately $20,800 according to the 2000 US Census.

Income values in the study corridor were compared to the median Kansas City income. Those blocks with incomes lower than $20,800 were highlighted. Approximately, 11 blocks near the study area have a per capita income below the city-wide median. Those blocks are shown in pink, purple and dark blue in Figure 15.

Environmental Justice

Environmental justice is a process used to identify and avoid any disproportionately high or adverse human health or environmental effects on minority and low-income populations. FHWA has provided three fundamental environmental justice principles, which have been incorporated into MoDOT policy:

(1) Avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations;

(2) Ensure the full and fair participation by all potentially affected communities in the transportation decision-making process;

(3) Prevent the denial of, reduction in or significant delay in the receipt of benefits by minority and low-income populations.

Environmental Justice Areas:

To identify environmental justice areas, areas of high minority populations, high ethnicity and low-income blocks were identified. Eight blocks near the study area meet these qualifications. In these areas, MoDOT must ensure that environmental justice principles are applied. These blocks are shown in Figure 16.

Figure 15 – Median Income in the Study Area

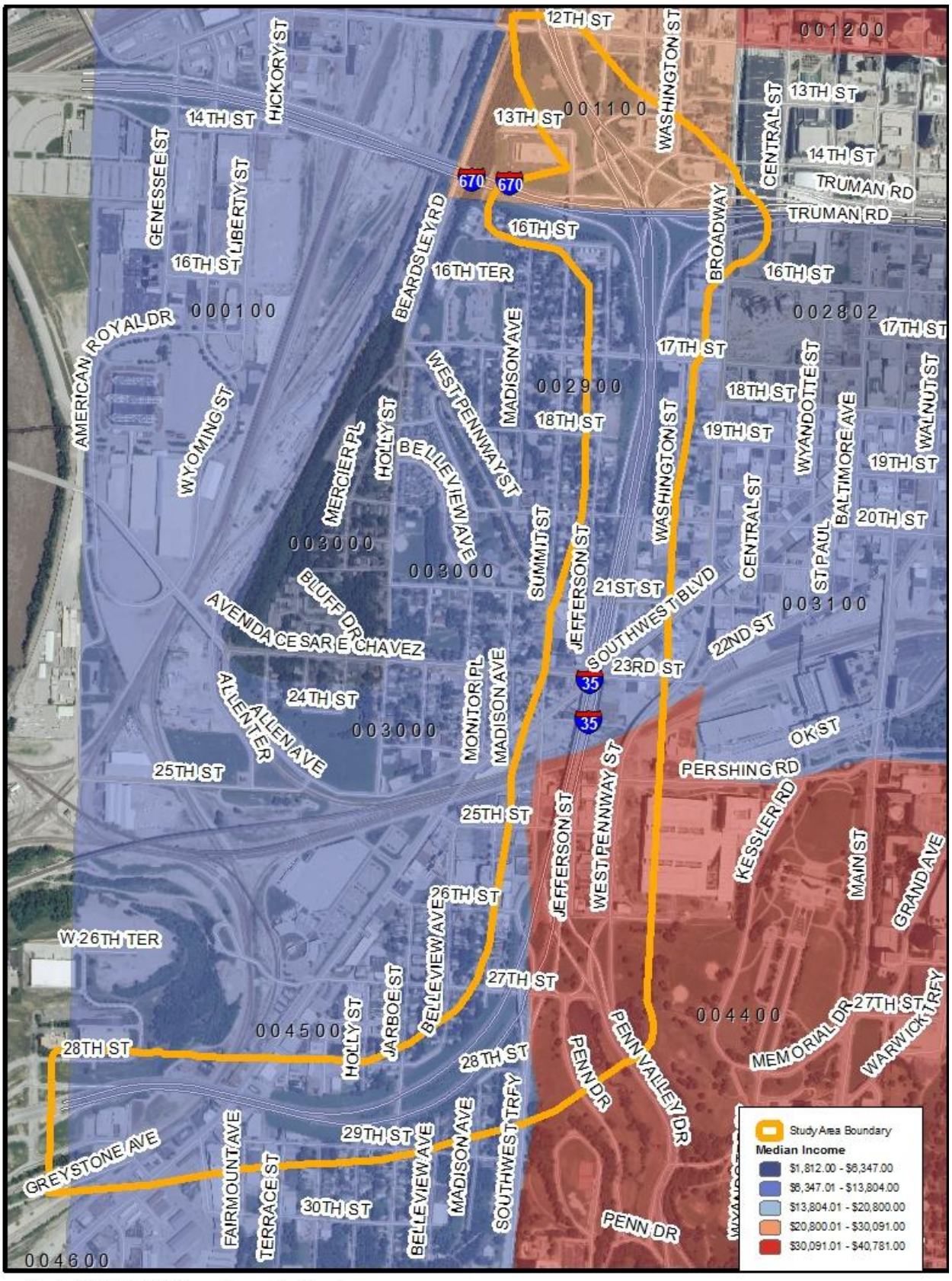


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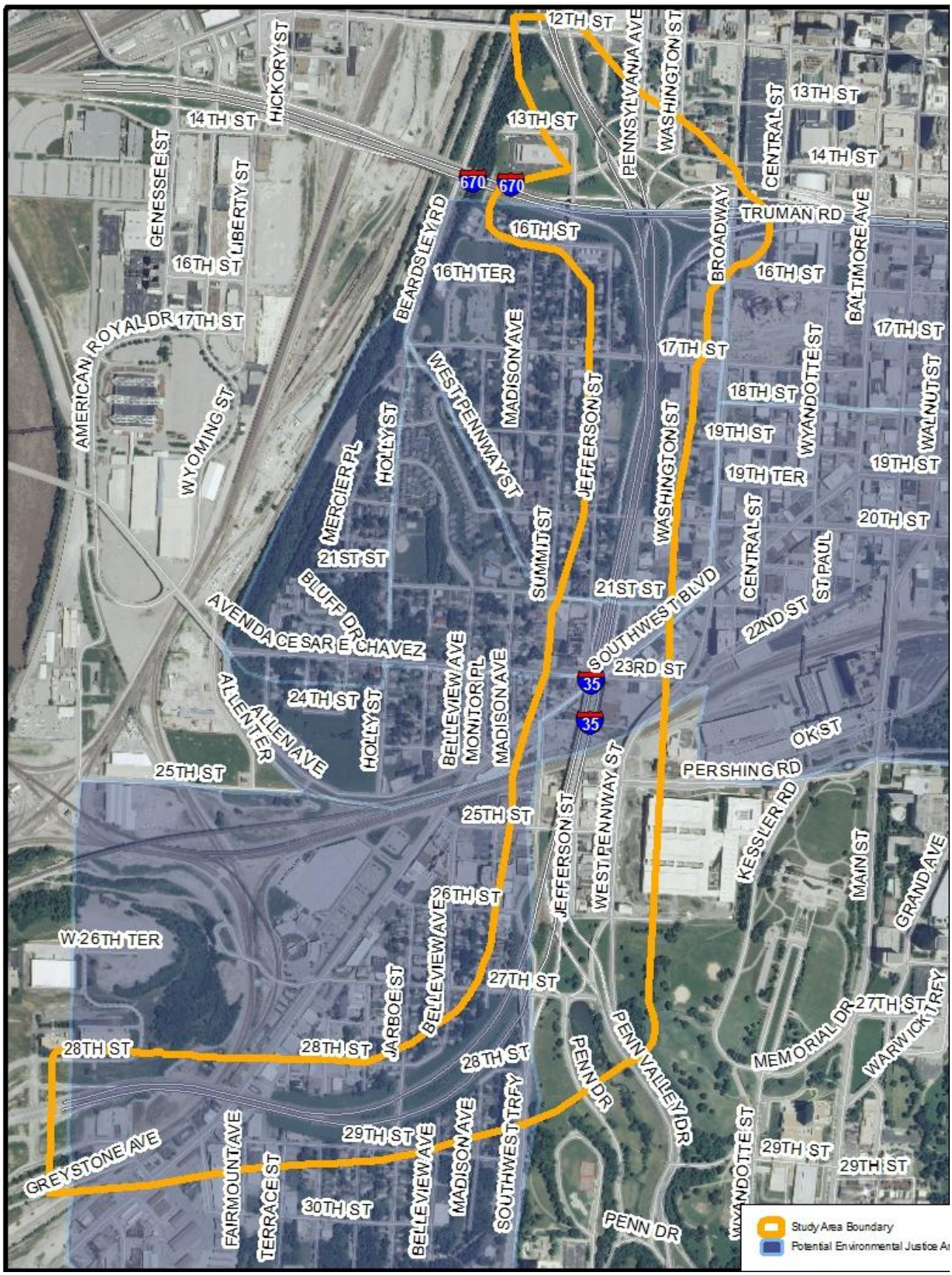
Figure 16 – Potential Environmental Justice Areas



Public Involvement Process

MoDOT values public input in the planning process, so during the study, MoDOT offered four opportunities for the public to offer comment on issues and needs and concepts. At the first meeting, neighborhood residents were asked to discuss the issues and concerns surrounding the interstate corridor. After the neighborhood meeting, an online meeting gave the public an opportunity to comment on the commute experience. MoDOT returned to the neighborhood to present a range of concepts that could be used to address the operational needs in the study corridor. The public was offered the option to participate in a second online meeting modeled after the live public meeting, as well.

Because there are potential environmental justice areas in the study area, any future concepts that include construction, such as, a new ramp or aesthetic improvements under the viaduct, will include a community outreach effort.

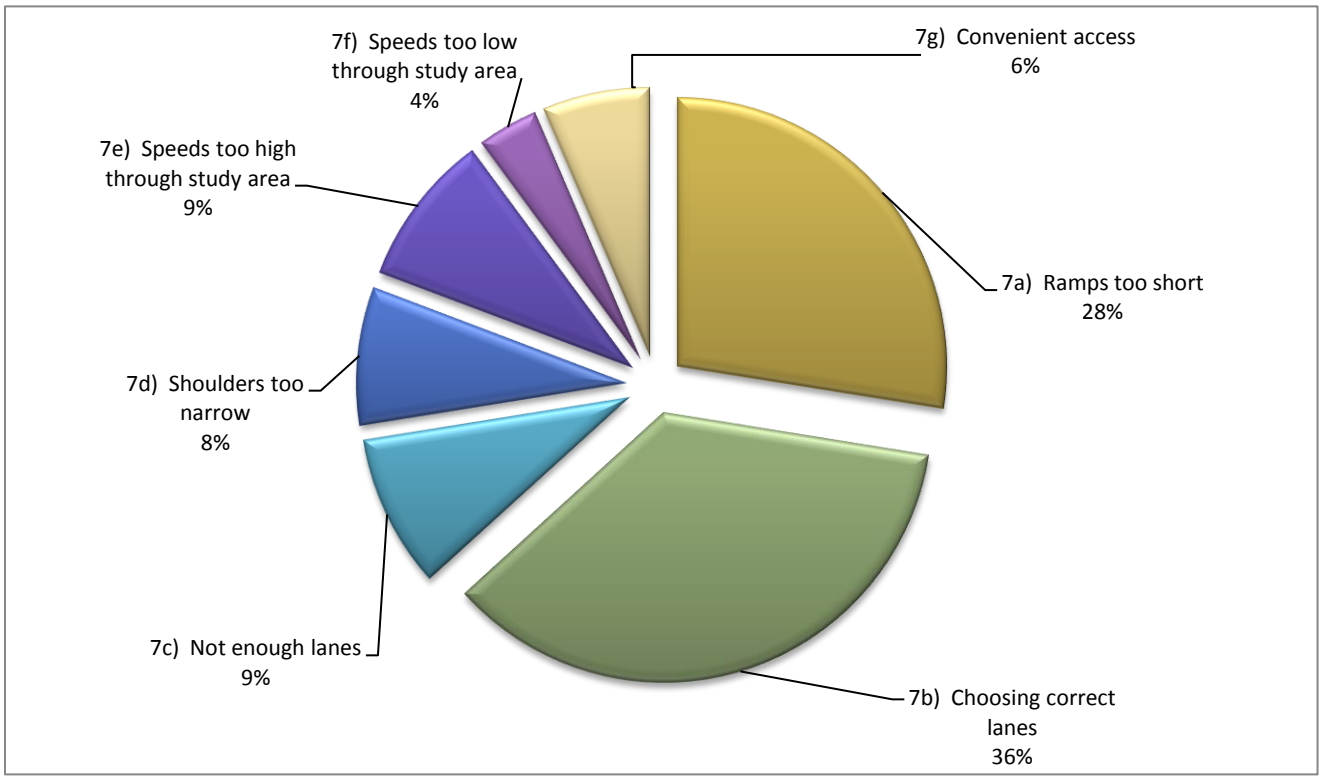
Initial Public Involvement

The first public involvement activity occurred in June 2010. MoDOT met with neighborhood groups to discuss the needs and issues related to I-35. Detailed notes from the public meetings are included in Appendix C. Approximately 20 residents attended the neighborhood meeting. MoDOT staff gave a short presentation on the review of traffic operations and facility condition for I-35. The presentation covered topics such as why MoDOT is studying this section of the I-35 corridor, how ideas become projects, an overview of the study process, the study time line and existing traffic conditions on I-35. MoDOT indicated to the group that the intention of this study is not to add general purpose lanes to I-35 in the study area. Our goal is to stay within the existing right-of-way to the extent possible.

Attendees were asked to sit at tables with maps to discuss issues and needs related to the interstate in the corridor. The four groups created a list of issues and then prioritized those issues as a final activity. The basic meeting themes from the priority list were:

1. Roadway operations
2. Protect surrounding neighborhoods
3. Improve the environment
4. Improve signage and communication

Figure 17 – Online Meeting Needs Identification in Study Corridor



First Online Meeting

MoDOT initiated an online meeting in early July for public comment on interstate operation. The online meeting ran for two weeks, and received 55 comments related to the study corridor. Since that time several additional surveys were received and incorporated into the charts. Comments are shown in Figure 17.

The online meeting was designed to collect information about commuting on the interstate in the study area. Survey takers were asked to identify where they lived in general terms, if they faced issues, where the issues occurred, major issues encountered and the issue that MoDOT should address first. Most respondents indicated that getting into the correct lane was the issue that caused the most difficulty for drivers, with the second highest response relating to the short ramps in the corridor.

Second Public Meeting

The second set of public involvement activities also occurred in two phases: a live meeting and an online meeting. MoDOT presented the proposed concepts to the public on Dec. 9, 2010. Meeting participants were asked to review, provide comment and rank the draft concepts. A meeting summary is provided in Appendix C.

Concepts were separated into three cost categories: lower, medium and higher. In the lower cost category, participants ranked restriping the interstate highest. In the medium cost category, participants ranked the Tunnel/27th Street Underpass option highest, and in the higher cost category, participants ranked rebuilding the Southwest Trafficway interchange option above a new directional ramp to I-670 West.

Some attendees wanted MoDOT to include a study to relocate I-35 in the range of concepts. Residents indicated that I-35 created a visual scar, separated parts of the city and created pollution in the neighborhood. According to citizens participating in the Westside I-35 Committee, moving I-35 would reconnect the neighborhood and open approximately 50 blocks of land for redevelopment. The group believed that the concept should be included in the operational study as a concept.

At the December 9 public meeting, MoDOT told residents that the purpose of the I-35 study was to review the operations of the existing facility only. MoDOT did not identify any structural or operational issues that suggested a need to substantially rehabilitate or rebuild the interstate. In addition, insufficient staff resources were allocated to the project to properly evaluate the relocation concept when it was brought forward by the neighborhood. Therefore, relocating the interstate was not explored during the operational study.

MoDOT also told participants that if relocation of the interstate was a priority for the city, then MoDOT recommended that the city prioritize the project and initiate a full study of the relocation concept, in which MoDOT will participate.

Second Online Meeting

The second online meeting became active on December 9th, as well. MoDOT received 16 responses, and of those, only 11 respondents ranked the concepts to indicate preference. Response was less than expected based upon the results from the first meeting. The low response rate was assumed to be a result of the time of year and the flow of the meeting on MoDOT's website. The online meeting began during the holiday season, so we assumed that this depressed the response rate. MoDOT's website content was structured to mirror the live meeting format, and participants had to choose the back button to continue reading the content. We believed that most participants did not realize there were more sections to the meeting, because most of the responses only addressed the low-cost options. Due to the low response rate, the information was inconclusive.

Response charts and comments are included in the Appendix C.

Range of Concepts

The ideas presented at the public meeting were identified as a range of solutions to address operational concerns on the interstate and connections to local streets. Because the term "solution" seemed to suggest that project ideas were being recommended for construction, in this report, the word "solution" is being replaced with the word "concept."

The range of concepts provides ideas to show how operational and design issues might be addressed in the future. The concepts can be pursued individually or in combination based upon specific site conditions and area needs. The range of concepts seemed to provide the most flexibility to choose concepts in the future as funding levels and local priorities change. When projects are proposed in the corridor, a more detailed design study will be initiated to review environmental findings from the Operational Study and examine impacts and design options in much greater detail.

The range of concepts was divided into three categories based upon potential cost of implementation and complexity. Funding for transportation projects is uncertain at the state and federal levels, so the range of concepts was structured to identify beneficial projects that were simpler or cheaper that could be implemented in the short-term, as well as, more complicated longer-term projects that address issues of access. None of the cost ranges include any estimate of right-of-way costs.

Lower Cost Concepts ($100,000 - $500,000)

Lower cost concepts are projected to cost between $100,000 and $500,000 to implement. These concepts involve minor changes to the existing infrastructure, but no major modifications to the interstate or additional access.

Restripe Lanes

This concept presents one way that the southbound lanes could be restriped and suggests guardrail should be added to northbound I-35 between 20th Street Broadway to prevent out of control vehicles from leaving the right-of-way. This location is being reviewed because this segment of the study area corresponds to the highest crash location on southbound I-35.

The I-35/I-670 interchange is a tangle of ramps that enter and exit from the right and left. Existing southbound I-35 is a two lane roadway on the west side of the loop. Before I-670, the ramp to eastbound I-670 exits to the left, and the 13th Street entrance ramp merges from the right. South of I-670, the three-lane ramp from westbound I-670 and Truman Road merges on the left. Soon after this merge the ramp from eastbound I-

670 merges on the right, and then outside lane of southbound I-35 becomes the exit lane to 20th Street, so drivers must merge left.

This concept seeks to eliminate the dropped lane on southbound I-35 and reduce required merges. The ramps from westbound I-670 westbound and Truman Road would be reduced from three lanes to two lanes before the merge with southbound I-35. This change would require vehicles from Truman Road to merge to the left, and an existing lane would be striped or barricaded to traffic for some distance so that at the merge point with southbound I-35, the through lanes would be shifted into the available lane. The eastbound I-670 ramp would be restriped to also serve as the 20th Street exit ramp. Figure 18 shows the existing lane configuration and Figure 19 shows a potential reconfiguration of the southbound lanes.

There is no expected impact to surrounding neighborhoods or additional right-of-way required. Figures 18 and 19 show there is no change to the existing number of lanes or additional right-of-way required.

Figure 18 – Current Lane Configuration for Southbound I-35

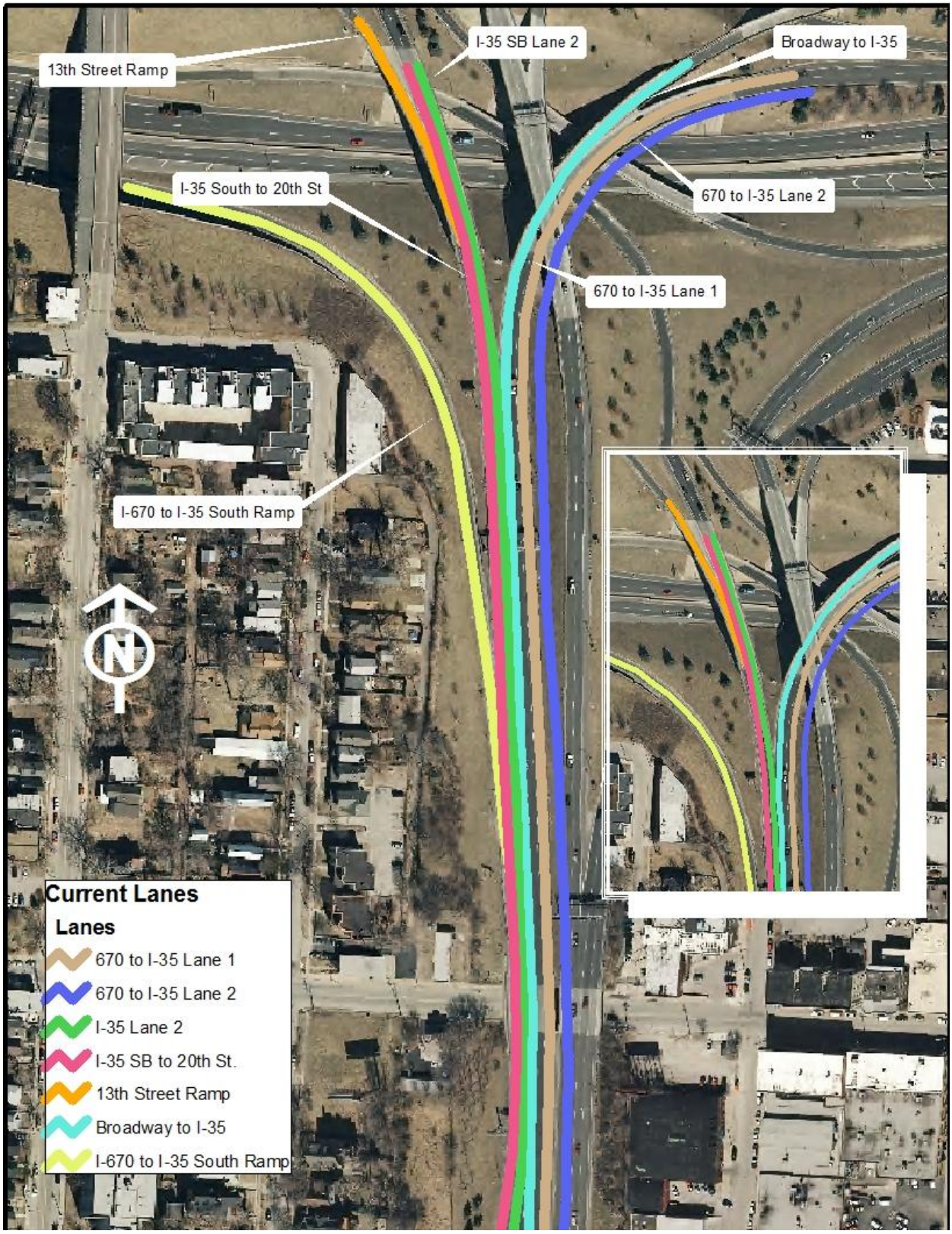
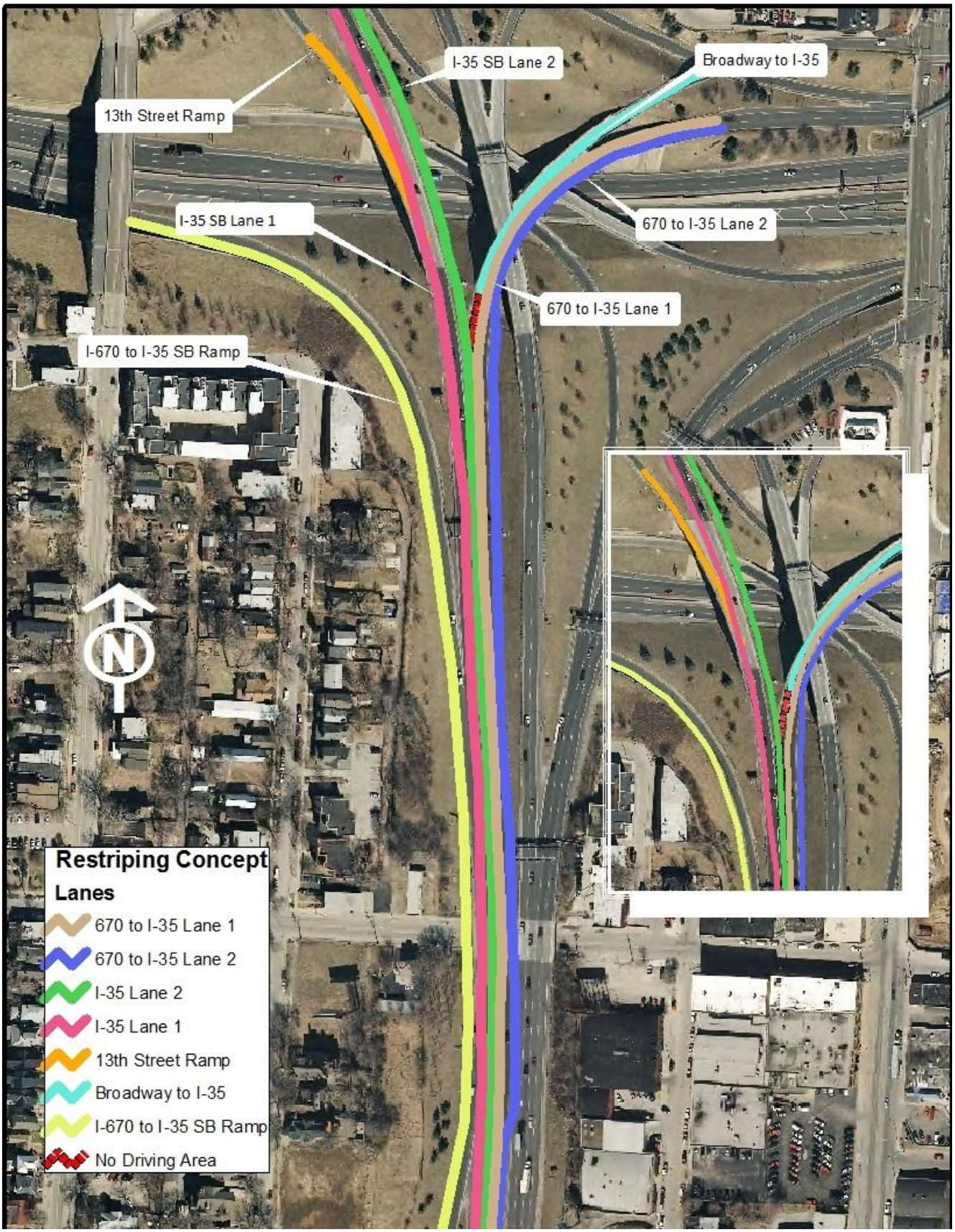


Figure 19 – I-35 Southbound Restriping Concept



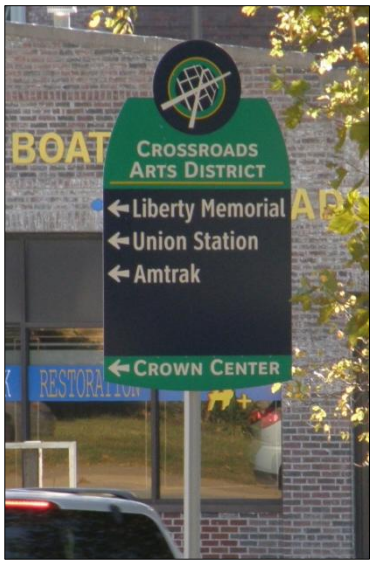
Signage

Signage can help reduce driver confusion and the traffic impacts associated with uncertainty about routing. In addition a good signage system can help commuters, tourists, freight haulers and local residents find an appropriate route to their final destinations. This concept proposes improving signage in the corridor and along alternate routes to provide clear direction to employment areas, activity centers and industrial areas to keep this traffic out of residential neighborhoods.

Picture 8 – Coordinated Wayfinding Signage Example

A coordinated wayfinding system can transition travelers from the state system to local roads. As shown in the example from Grand Rapids, these signs welcome travelers to the neighborhood, direct them to attractions and help non-motorized travelers reach attractions within the neighborhood a neighborhood.[15]

Picture 9 – Kansas City Wayfinding Signs Near Study Corridor



Kansas City, Mo., has a wayfinding signage system, and these signs should be coordinated with state signage in Kansas and Missouri to provide alternate routes to major destinations near the study corridor.

Pictures in the Neighborhood Access and Mobility Section show the current signage in the study corridor. The mixed signage shown in that section does not help travelers or residents make route decisions.

Some examples of enhanced signage in or near the study corridor could include:

- Destination signs at 7th Street Trafficway & Rainbow Boulevard or Southwest Boulevard/Mission Road for

[15] *Michigan Street Wayfinding Signs Conceptual Approach. 2008. Grand Rapids SmartZone. Grand Rapids, Michigan.*

alternate access to the Crown Center, Union Station, Crossroads, West Side, and Hospital Hill.

- Signage to help truckers and livestock haulers navigate the loop reach the West Bottoms and the American Royal via the interstate. Some signage could be placed north of the river to direct travelers to alternate routes into the West Bottoms.
- Create separate exit numbers for the three ramps on northbound I-35 to Topeka, St. Louis and Broadway, so that all three do not use number 2U.

This concept addresses driver confusion and access to the Crossroads, Crown Center, Union Station and Westside attractions and employment centers. There is no additional right-of-way required.

Ramp Meters

This concept seeks to increase space between vehicles to make lane changes easier and safer by addressing weaving problems between Southwest Trafficway and West Pennway. Ramp meters are special signals designed to control the flow of traffic onto an interstate by limiting the number of cars entering the interstate together.

According to the KC Scout site, ramp meters have the following benefits:

- Smoother and safer freeway entries.
- Minimized sudden weaving and braking.
- More consistent traffic flows.
- Improved freeway speeds.
- Decreased travel times
- Reduced rear end accidents.

Picture 10 – Ramp Meters in the I-435 Corridor

One location in the study corridor where ramp meters might be considered is at the Southwest Trafficway/Broadway entrance ramp. This is an area where two arterials merge onto a single ramp. Because this entrance ramp is close to the West Pennway exit ramp, there is very little space for vehicles entering and exiting the interstate to change lanes.

There are no impacts beyond existing MoDOT or city right-of-way.

Streetscape

Streetscape projects can be simple, small spaces or longer corridors that provide green or other aesthetic elements to create an attractive area that supports walking and other street level activity.[16] In the study area, streetscape improvements would be used to link neighborhoods separated by the interstate together.

Picture 11 – Small Street-Level Green Space

One of the unique features of I-35 in the study area is that two long sections of interstate are elevated on bridges. In most of the corridor, however, the land owned by MoDOT does not extend much farther than the bridge structure. In order to better link the neighborhoods together, streetscape projects will require a partnership between neighborhoods, the City of Kansas City and MoDOT. These partnerships will also ensure that design concepts from the Greater Downtown Area Plan and other neighborhood studies are incorporated into proposed projects.

Picture 12 – Public Art under the Aurora Bridge in Freemont, WA

Participants in the first neighborhood meeting indicated that they would like to enhance the streetscape along local streets that cross under the viaduct. Some of the sidewalks were in good condition. However, others were broken, interrupted by obstructions and littered with debris and dirt or gravel. In addition, the area under the viaduct was mostly gravel and dirt with a great deal of soil washing down the hill onto the sidewalks and dust blowing on windy days.

[16] *Photo courtesy http://philip.greenspun.com*

This concept addresses the need to improve the pedestrian environment beneath the viaducts and strengthening connections between neighborhoods. There could be some right-of-way impacts to the neighborhoods, depending on the scope of each project. These impacts could include temporary easements for construction to permanent easements for street features.

Medium Cost Concepts ($15 - $25 Million)

Medium cost concepts are expected to range in cost from $15 to $25 million in 2010 dollars.[17] These concepts are substantially higher than the lower cost concepts because they include more significant changes to the existing infrastructure.

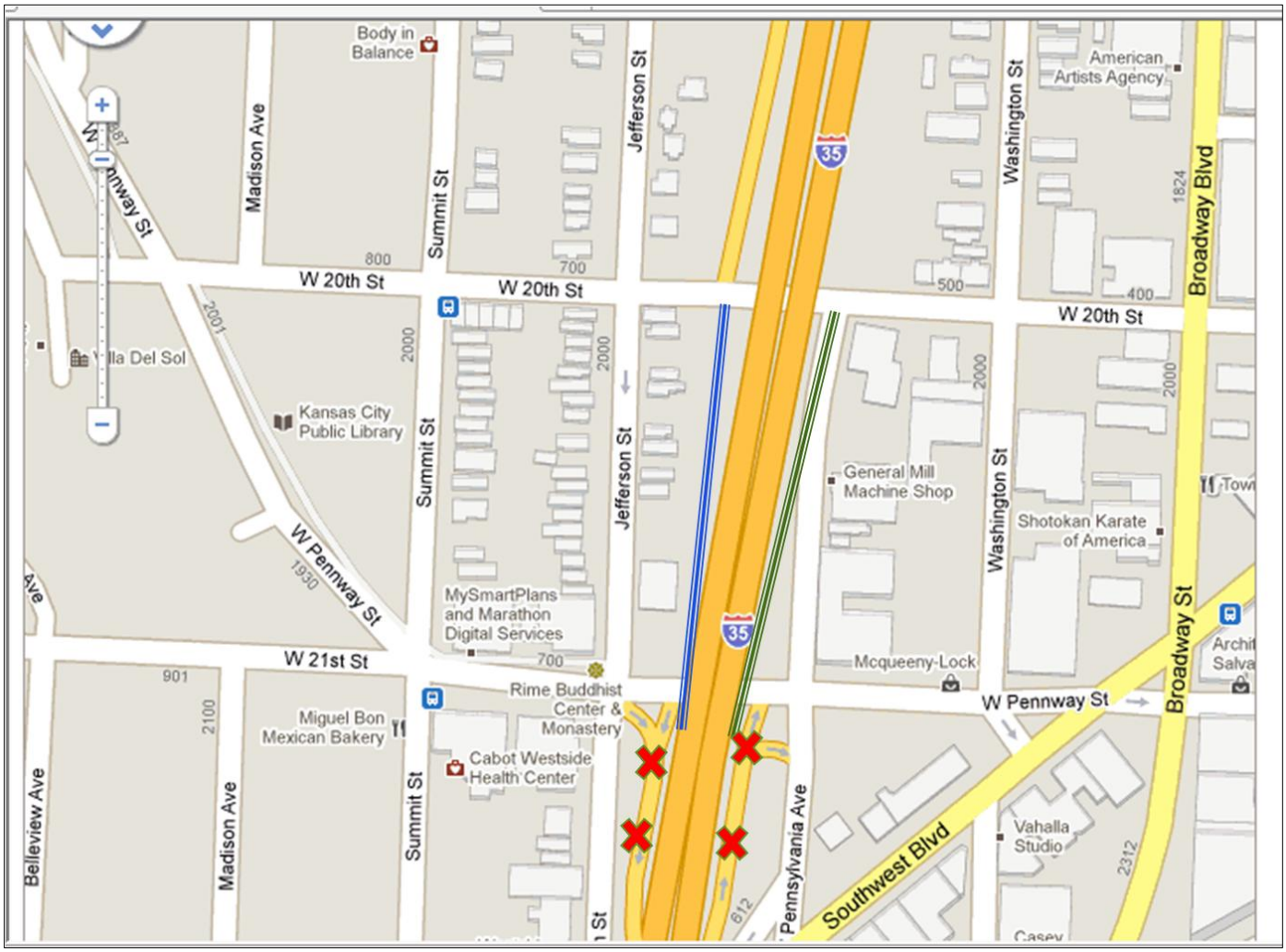
20TH Street Ramps

Ramps in urban areas are often too close together and tend to be shorter than current standards would require. When ramps are too short, there is no room for acceleration, so cars enter the highway at slow speeds. Drivers on the interstate have to brake or change lanes suddenly to avoid these vehicles. When ramps are too close together, drivers entering and exiting the interstate are changing lanes within the same space, which can lead to sudden braking and lane changes.

This concept addresses the spacing between ramps and weaving to get into the correct lane. To increase the distance between Southwest Trafficway/Broadway and the next interchange to the north, West Pennway ramps would be relocated north to 20th Street. A new exit ramp from northbound I-35 and a new entrance ramp to southbound I-35 would be constructed. These new ramps would give drivers from Southwest Trafficway/Broadway more distance to merge with northbound I-35 and get into the correct lane. Southbound commuters would also have more ramp length for acceleration before merging with southbound I-35.

[17] *These costs do not include any right-of-way cost estimates.*

Figure 20 – 20th Street Interchange



This concept could be impactful to portions of the residential block between 20th and 21st Streets on the west side of the interstate and the fire station. MoDOT strives to minimize impacts, but exact information would require more detailed design. Figure 20 shows a map view of two new directional ramps at 20th Street.[18]

27th Street Access

The most direct access to and from the Crown Center, Hospital Hill or Crossroads areas from Kan. is via West Pennway, but the exit ramp from northbound I-35 is too close to the Southwest Trafficway/Broadway entrance ramp. During rush

[18] *Google Maps. Kansas City, MO. 2010.*

hour, the lanes between Southwest Trafficway and West Pennway become congested making merging and lane changes difficult. The West Pennway entrance to southbound I-35 does not appear to conflict with the left exits to Broadway and Southwest Trafficway, but because the entrance ramp is short, drivers cannot accelerate before entering the interstate causing safety concerns when traffic is congested.

This concept would build a modified half diamond interchange at 27th Street to provide an alternative to the West Pennway interchange. The new interchange would include an exit ramp from northbound I-35 and an entrance ramp to southbound I-35. Because the right-of-way in this area is limited on the east side of the interstate, the new ramp from northbound I-35 would exit to the left. On the west side of the interstate, the ROW is wide enough to accommodate a standard entrance ramp to southbound I-35 with no permanent impacts to the neighborhood. Figure 21 shows the new ramps at 27th Street

This concept does not have a significant right-of-way impact. However, there may be some temporary easements required to construct the southbound I-35 entrance ramp. More detailed design is necessary to precisely determine if any properties will be impacted.

27th Street Underpass

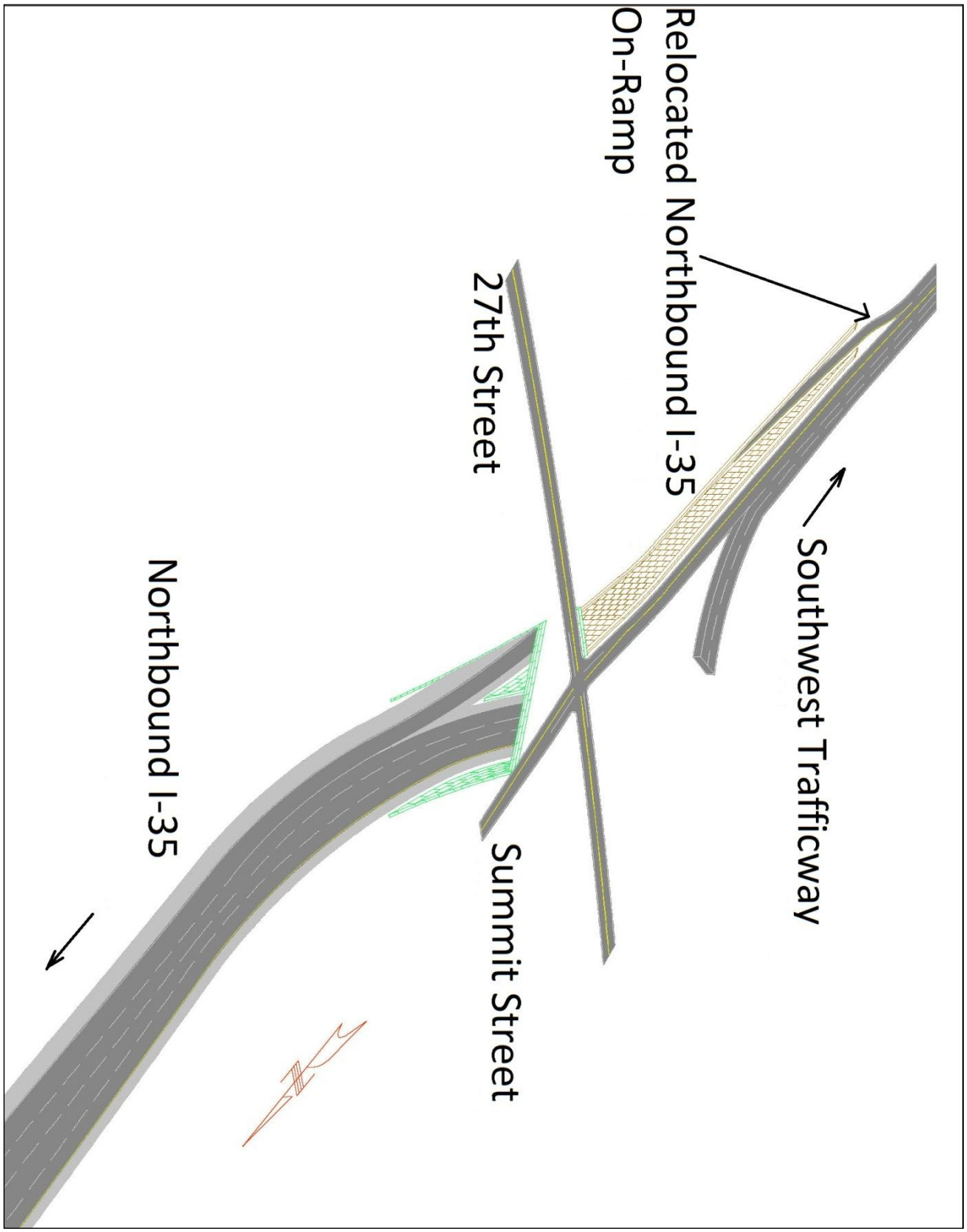
As presented in other concepts, improving traffic flow between closely spaced interchanges can be achieved by separating the ramps. This concept would separate Southwest Trafficway from Broadway to provide more distance for merging into highway traffic. A section of Southwest Trafficway would be reconstructed. Traffic entering the interstate from Southwest Trafficway would merge into a single lane on the entrance ramp. The new ramp would be built under 27th Street.

Existing intersections would be modified. The existing northbound Southwest Trafficway ramp would be removed. In addition, the 27th Street intersection at Penn Valley Drive/Broadway would need to be adjusted to allow local traffic from 27th Street or Summit Street to make a left turn onto the Broadway/Penn Valley Drive ramp to northbound I-35. Figure 22 shows the realignment of the Southwest Trafficway new entrance ramp.

This concept would shift Southwest Trafficway to the east slightly, which would impact Penn Valley Park.

Figure 21 – New Left Exit and Entrance at 27th Street

Figure 22 – 27th Street Underpass



Higher Cost Concepts ($40 - $80 Million)

Higher cost concepts costs are estimated to be between $40 and $80 million dollars without any right-of-way estimates. These projects include substantial new or reconstruction at interchanges.

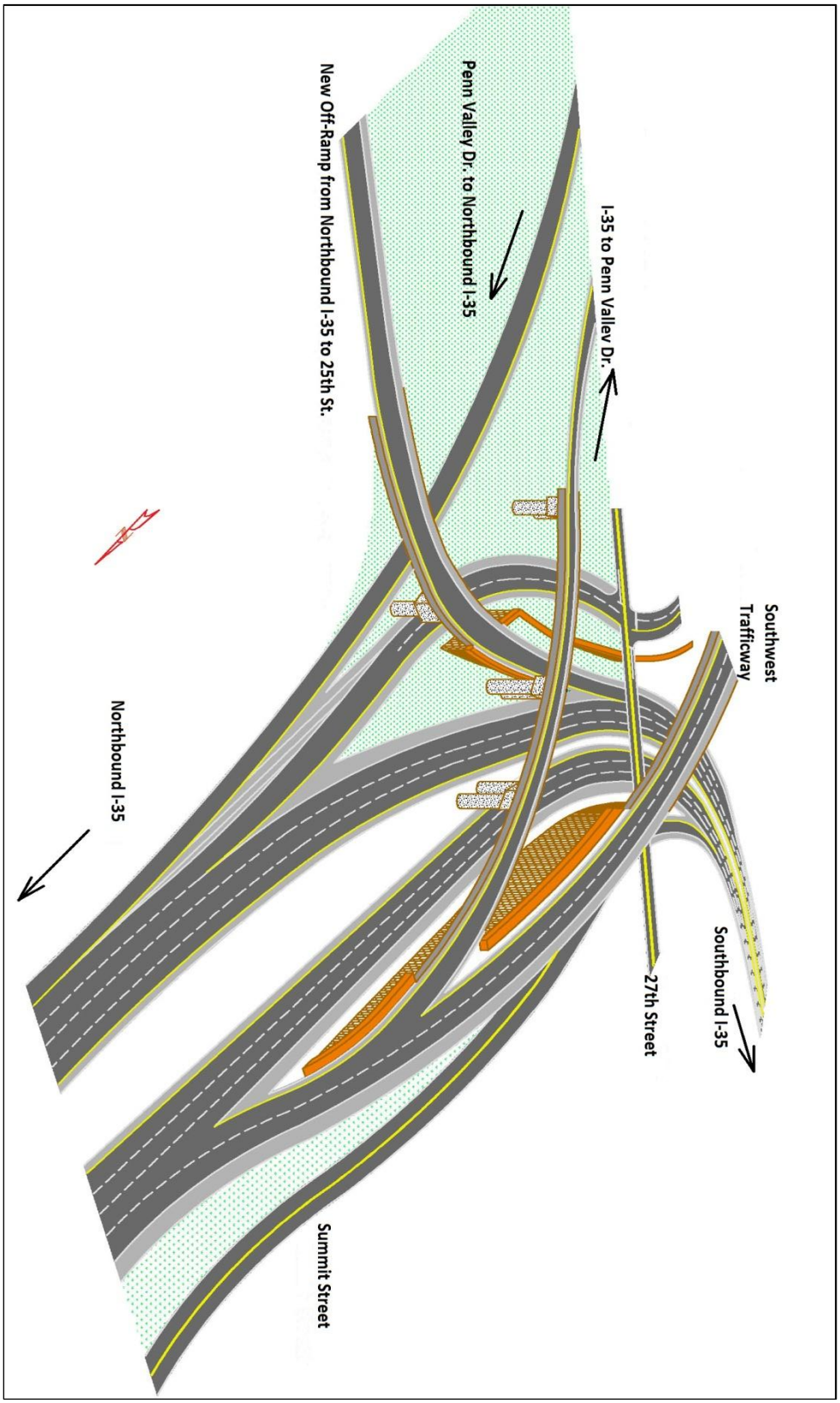
Rebuild Interchange

The Southwest Trafficway/Broadway interchange was built when traffic was moving from southern parts of Kansas City to downtown in the morning and back home at night. Today's traffic patterns are much more complicated and dispersed, making access to and from the interstate difficult from some directions. In order to improve access into the Crown Center and Crossroads areas, this concept proposes a complete rebuilding of the Southwest Trafficway and Broadway interchange from 26th to 27th Streets.

The southbound lanes of I-35 would be moved closer to the northbound lanes to provide extra right-of-way for rebuilding ramps and connections to the local system. The existing left exits to Southwest Trafficway and Broadway would be removed. In place of these ramps, a new right exit would be constructed, and Summit Street would be straightened and moved slightly to the west. A new ramp to southbound Broadway would exit from the left side of the new auxiliary lanes. Travelers could exit northbound I-35 at 26th Street to avoid the lane change at the West Pennway exit. A new entrance ramp would be added from 27th Street to southbound I-35. The Southwest Trafficway/Broadway entrance ramps would essentially stay the same. This concept is shown in Figure 23.

More detailed design is required to determine if there are any property impacts. However, initial indications are that the improvements are wholly within existing right-of-way, although there may be some construction easements required.

Figure 23 – New Interchange at Southwest Trafficway and Broadway



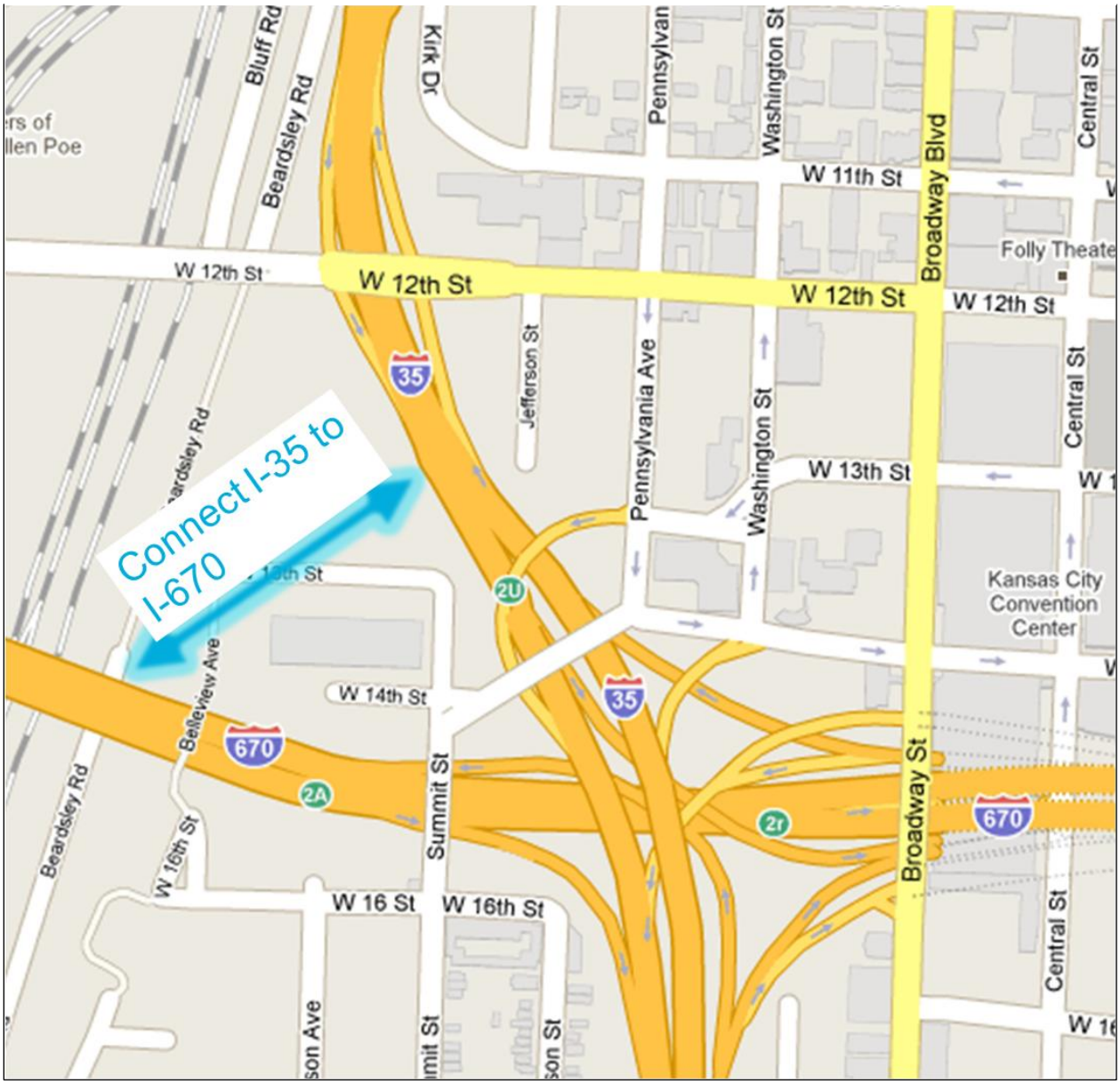
New I-670 Ramps

On the west side of the loop, the I-670 interchange with I-35 does not provide full access to both interstates. Travelers on southbound I-35 who want to go westbound on I-670 must take eastbound I-70 to westbound I-670. Likewise travelers from the West can only access northbound I-35 via eastbound I-670 and westbound I-70 on the east side of the loop. The missing ramps and the lack of directional signing north of the river can lead many travelers into the neighborhoods of the Westside as they try to find a way into the West Bottoms or a way to turn around to get back on the interstate.

This concept would look for options to add directional ramps for I-35 and I-670 so that the interchange is fully directional. This option needs a significant amount of study because it affects the operation of the entire downtown interstate loop. In order to study alternate alignments in the appropriate detail this concept will be included in the future I-70 Second Tier Environmental Studies. This concept is shown on a map in Figure 24.

There will be right-of-way impacts with this concept, however more detailed design work is necessary to identify alternatives in order to determine the amount and location of right-of-way impacts.

Figure 24 – New Directional Ramp from I-35 Southbound to I-670 Westbound



Conclusions

The Missouri Highways and Transportation Commission and MoDOT senior management have created a five-year direction to address the limited and uncertain availability of funds between 2011 -2015. The new five-year direction impacts the I-35 Operational Study conclusions and recommendations.

In the next five years, MoDOT is facing:

- Stagnant state revenues
- Uncertain federal funding
- Rising internal costs
- No more money from Amendment 3 bonds
- A construction program 2011-2015 that averages just $500 million a year - barely enough to take care of the existing system

Given the funding situation, MoDOT has pledged to complete the following activities:

- Honor our commitments
- Keep major roads in good condition
- Improve minor roads
- Hold our own on bridges
- Provide outstanding customer service

However, because the amount of funding available is limited, MoDOT will not be able to:

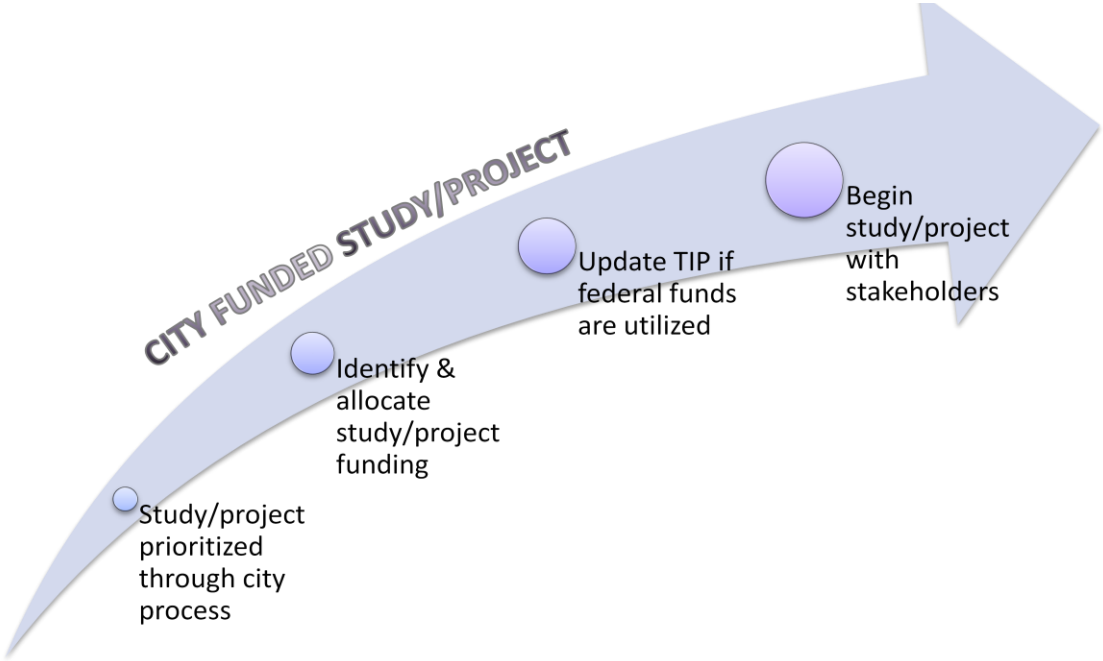
- Make significant safety improvements
- Reduce congestion
- Support economic development
- Use longer-term treatments
- Deliver corridor improvements
- Deal with major bridges

Based upon MoDOT's five year direction and uncertain funding availability, this study does not include a specific set of recommendations for the study corridor. Instead a range of concepts is presented in lower, medium and higher cost categories. This strategy is designed to provide MoDOT flexibility to mix and match options in the corridor to respond to changing conditions and community priorities over the next 20 years. For instance, lower cost concepts provide an opportunity for short-term improvements, and they can be pursued individually or in combination with any other lower, medium or higher cost concept.

In order for a project in the study corridor to come forward for study, design or construction, there are two processes for getting a new study or project started. The process depends on whether Kansas City or MoDOT funds the study/project. If the city funds a project, then the city would need to follow its internal process for project selection and prioritization. When the funding is identified and allocated, then the project would need to be included in the regional Transportation Improvement Program (TIP) if federal funding is going to be utilized. When funding is available, the city will be able to begin the study or project with stakeholders, including MoDOT, KDOT and FHWA, if changes to the interstate or interstate right-of-way are involved.

However if MoDOT funds a study/project, then there are slightly different steps to follow in

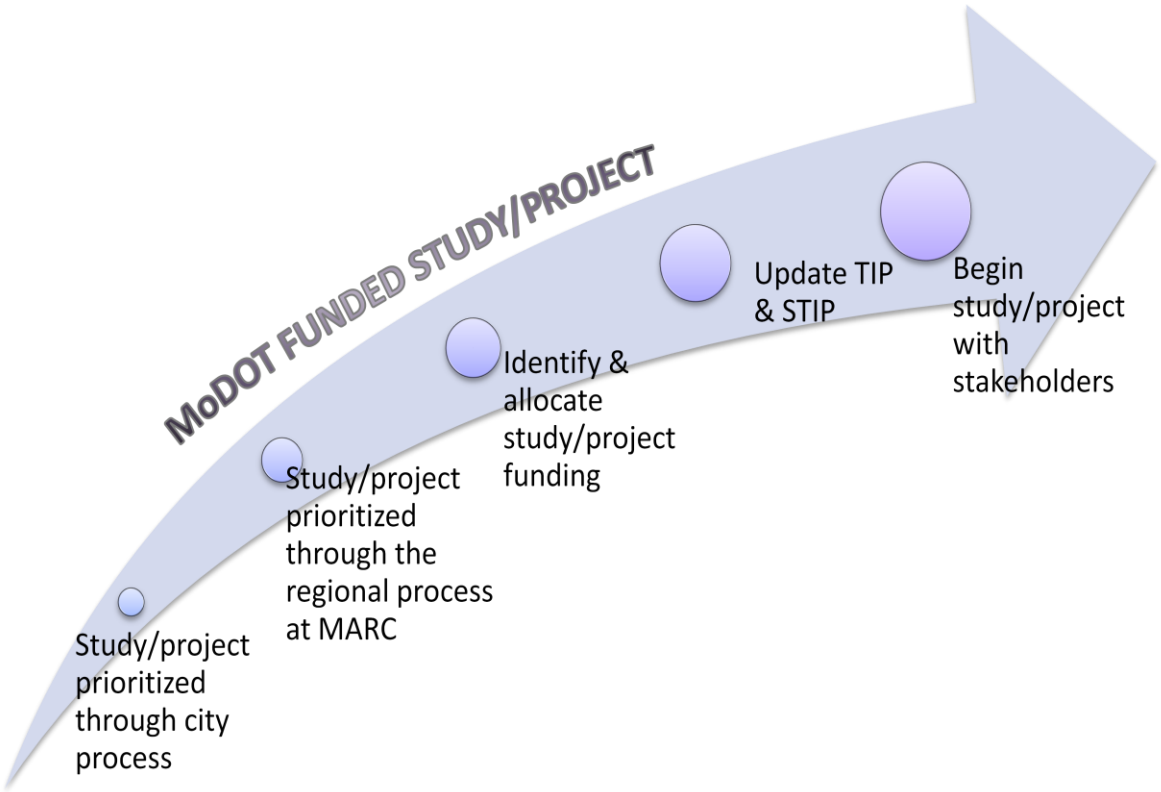
Figure 25 – Local Project Process from Concept to Construction



order to make funding available. The study/project must still be selected and prioritized through Kansas City's internal process and then be prioritized through the regional process at MARC. Once funding is identified and allocated, the study/project would be included in the TIP and the State Transportation Improvement Program (STIP). At that point, the study/project can begin with stakeholders, including MoDOT and KDOT.

As studies/projects are identified for funding in this corridor, most of them will include additional opportunities for public input and coordination. Projects such as restriping a section

Figure 26 – State Funded Project Process from Conception to Construction



of I-35 or installing guardrail may not have additional public input. However projects that impact surrounding neighborhoods, such as landscape enhancements under the viaduct or any significant change to the existing infrastructure would require more extensive public input and coordination with the city and neighborhoods.