

I-70 and Scott Boulevard Access Justification Report: Columbia, Missouri



For Submission to:
The Federal Highway Administration

October 2011

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Introduction

The area south of I-70 between Perche Creek and Stadium Boulevard is one of the City of Columbia's key growth areas. Stadium Boulevard is the only practical way to access I-70 from this area, due largely to the barrier formed by Perche Creek. These circumstances put a strain on Stadium Boulevard. This condition leads to daily congestion and gridlock along Stadium Boulevard between I-70 and Broadway.

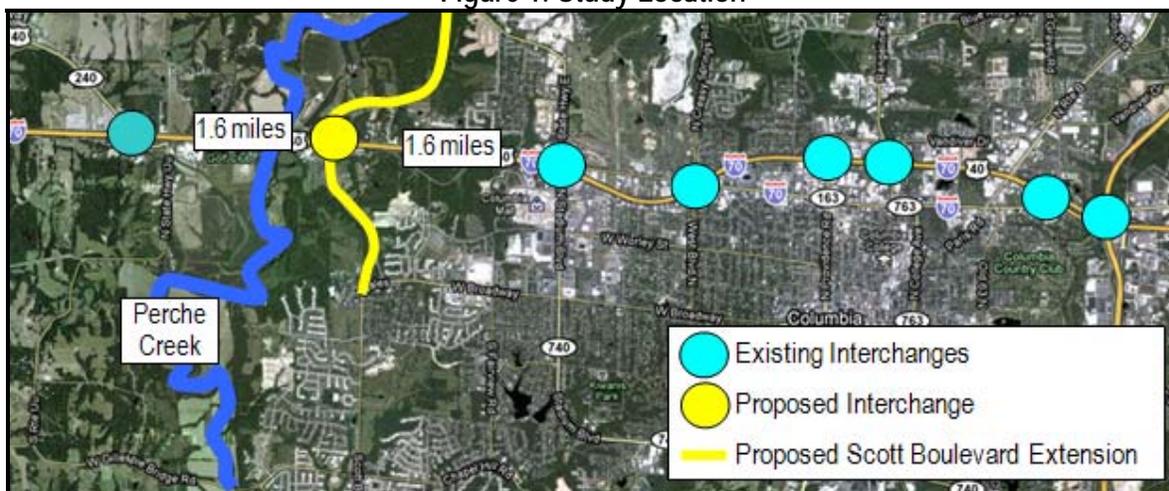
The Stadium Boulevard corridor currently operates at capacity and is unstable. This condition is exacerbated by the close signal spacing on Stadium Boulevard near I-70. Daily fluctuations along the Stadium Boulevard corridor result in congested yet flowing conditions on light traffic days to gridlock on heavier days. Continuous vehicular queues can develop on Stadium Boulevard between I-70 and Broadway, constraining nearly all intersections. The existing interchange is not adequate to handle the very heavy travel demands, especially during the evening peak hour.

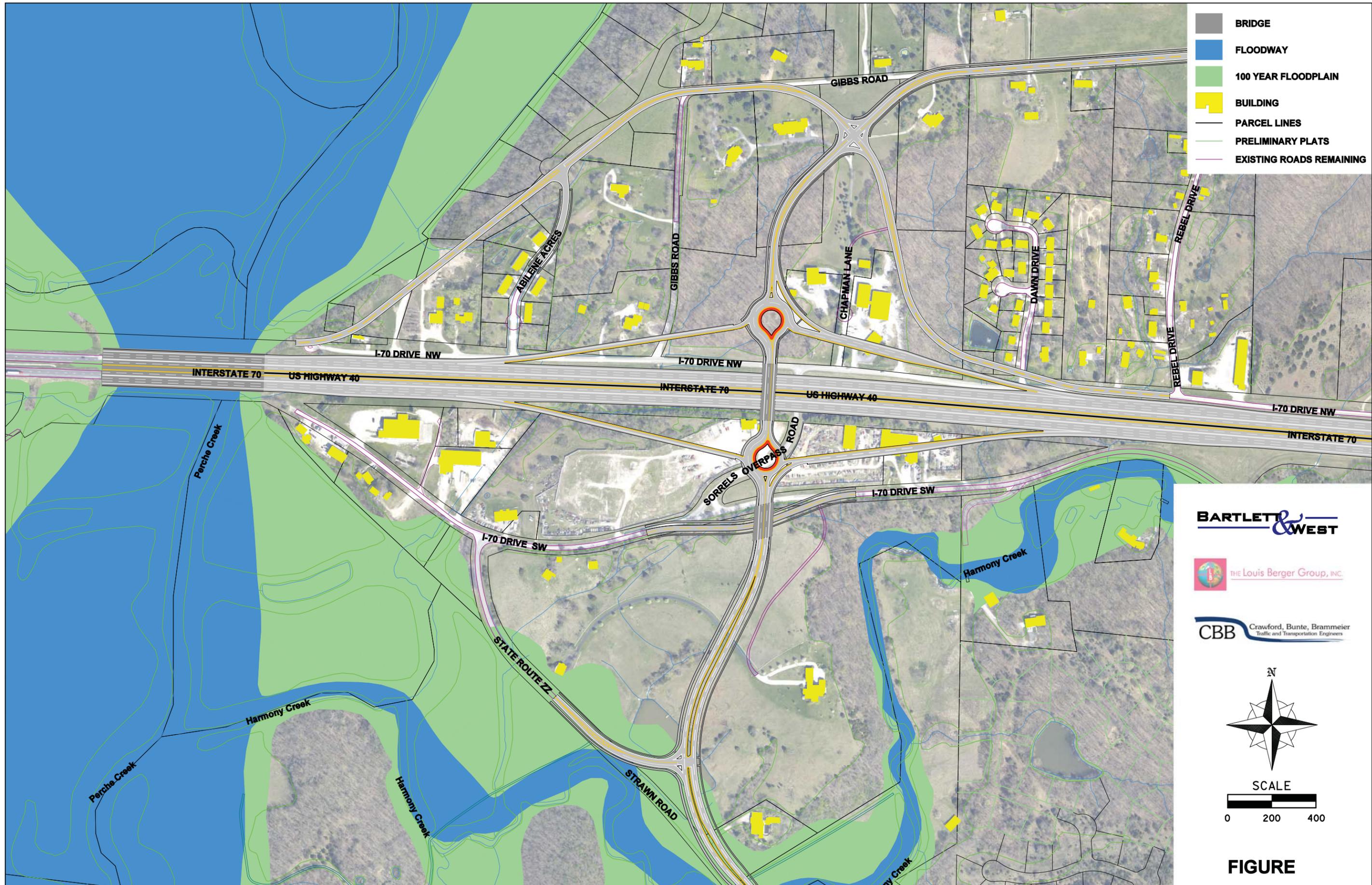
A new freeway interchange at an extended Scott Boulevard would help to alleviate this congestion and also provide much-needed travel options for those wanting to enter western Columbia from I-70. The proposed interchange location is located between the interchanges at Stadium Boulevard (mile marker 124) and US Highway 40 (mile marker 121). Both of these interchanges are diamond layouts. The proposed interchange would be located proximate to the existing Sorrels Road Overpass, which is approximately mid-distance between the US Highway 40 and Stadium Boulevard interchanges.

The intent of the proposed Scott Boulevard/I-70 interchange is to relieve congestion and improve the level of service along West Broadway, Stadium Boulevard, and at the Stadium Boulevard/I-70 interchange and to facilitate the continued growth of the western portion of the City of Columbia.

Figure 1 shows the general interchange location. As illustrated in Figures 2, 3, and 4, the interchange would connect to an extended Scott Boulevard, tying into MO Route E on the north and West Broadway on the South. The total estimate of probable cost for this project is \$65-75 million 2010 dollars, with \$15-20 million required for the I-70 interchange and \$50-55 million required for the extension of Scott Boulevard.

Figure 1: Study Location



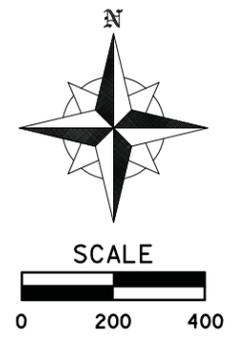


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- FLOODWAY
- 100 YEAR FLOODPLAIN
- BUILDING
- PARCEL LINES
- PRELIMINARY PLATS
- EXISTING ROADS REMAINING

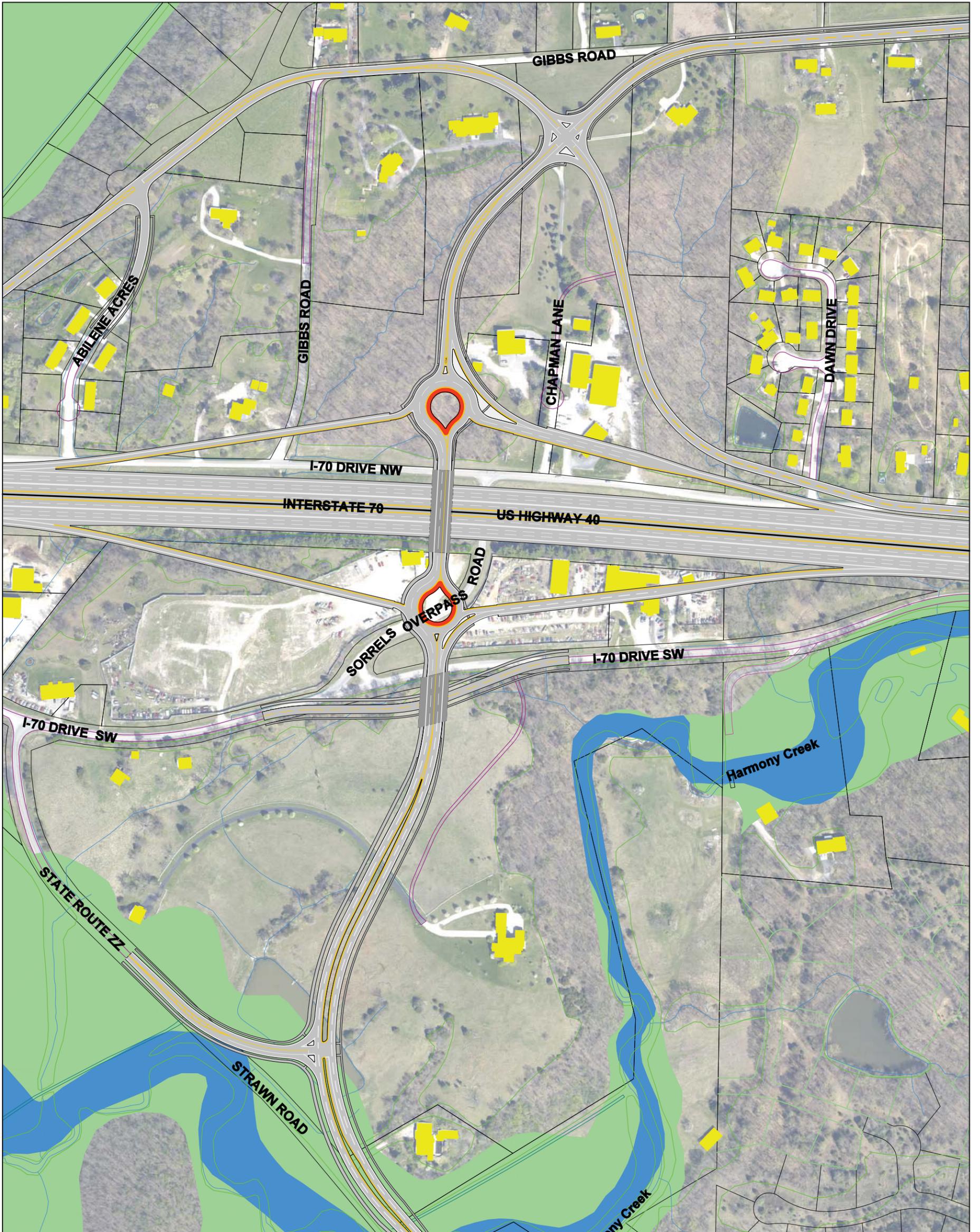
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Traffic and Transportation Engineers



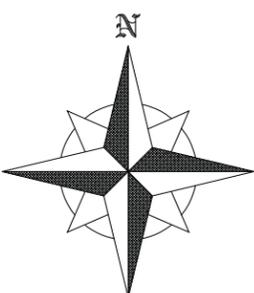
FIGURE



PREFERRED INTERCHANGE ALTERNATIVE

FIGURE

SCALE



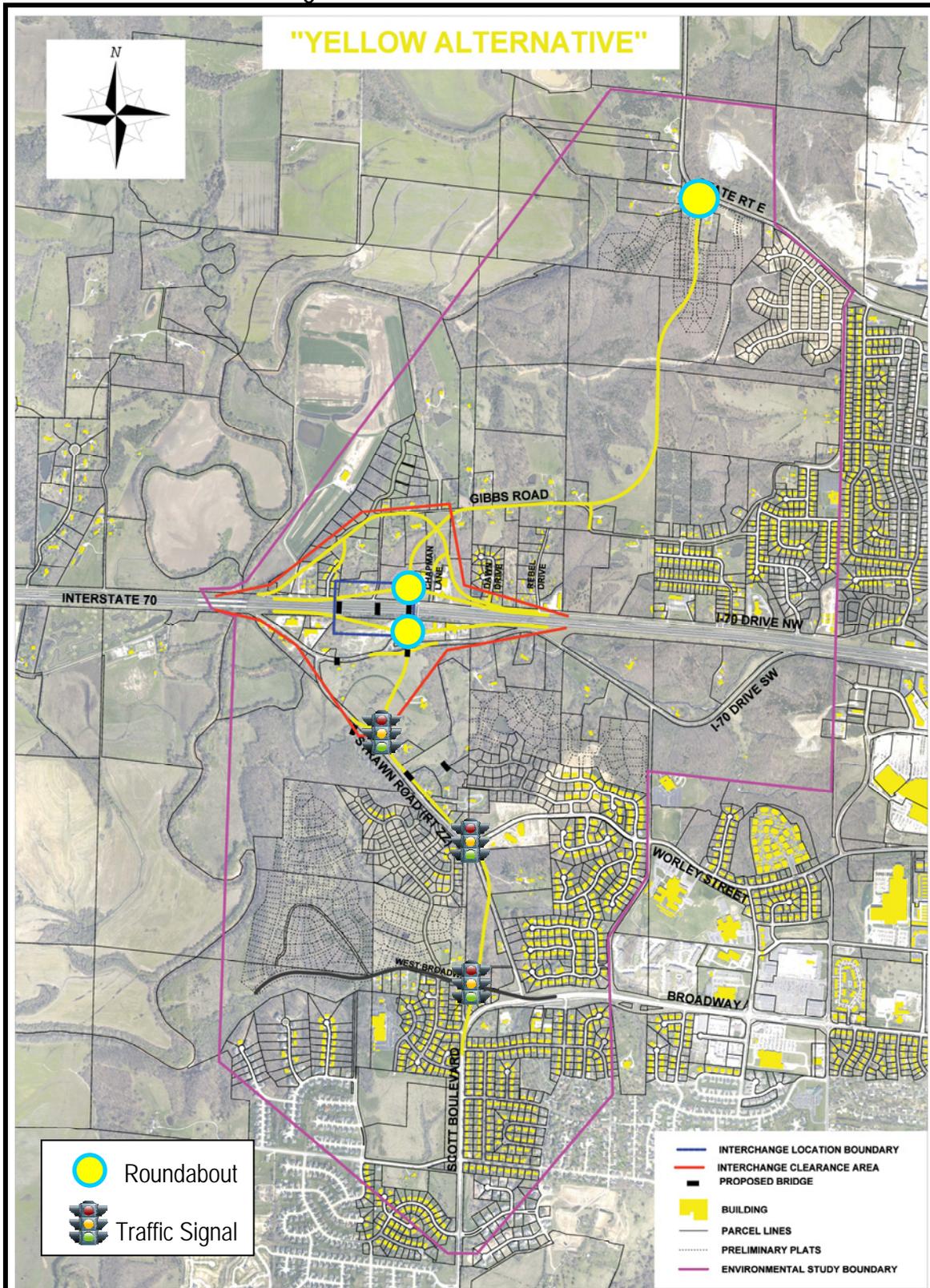
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-  BUILDING
-  PARCEL LINES
-  PRELIMINARY PLATS
-  EXISTING ROADS REMAINING

Figure 4: Recommended Yellow Alternative



PREVIOUS STUDIES

This Access Justification Report (AJR) and the forthcoming Environmental Assessment (EA) are written with a goal toward (1) confirming previous findings that a new I-70 interchange is needed between Perche Creek and Stadium Boulevard, (2) selecting a preferred location and layout for the new interchange, and (3) selecting a preferred corridor for the extension of Scott Boulevard between West Broadway and MO Route E to connect the new interchange to the local arterial roadway system.

Good access from I-70 into this part of Columbia is essential for local residents, the local business community centered on Stadium Boulevard and West Broadway, and emergency responders who provide service into this area. Various studies conducted over the past 10 years show that a new I-70 interchange west of Stadium Boulevard would help to alleviate congestion and improve access into this part of the city.

Stadium Boulevard Corridor Studies: In 2003, Crawford, Bunte, Brammeier (CBB) prepared a corridor study of Stadium Boulevard between I-70 and West Broadway¹. This study evaluated the existing traffic constraints along Stadium Boulevard and the need for roadway and/or signal improvements to relieve this congestion. The study considered the traffic impacts associated with several approved and proposed developments in the surrounding area both in the near and long term, as well as the infrastructure that would be necessary to accommodate such growth.

The study concluded that the road network centered on Stadium Boulevard (Stadium Boulevard, West Broadway, etc.) was operating at capacity and was unstable. Close signal spacing at the north end of the study corridor and the limited capacity of the existing lanes along Stadium Boulevard constrain operations. Daily traffic conditions can vary from congested yet flowing on lighter days to gridlock on heavier days with northbound vehicular queues extending from I-70 to West Broadway. Consequently, conditions at most intersections between I-70 and West Broadway are constrained.

The 2003 study recommended extensive improvements along Stadium Boulevard. However, even with these improvements, the 2003 study found that the improved corridor would be incapable of adequately accommodating future travel demands. The study concluded that the underlying problem resides in the dependence upon Stadium Boulevard as the only viable means of access between I-70 and the southwestern portion of the city. Additionally, no other feasible "local" improvements exist that could accommodate projected growth. The study therefore recommended that additional access to I-70 between Perche Creek and Stadium Boulevard be investigated.

Improve I-70² Studies: Interstate 70, which traverses the study area, is a primary highway serving the Columbia metropolitan area. Since it connects Kansas City, St. Louis, and Columbia with the national interstate freeway system, I-70 is one of the most important transportation corridors in Missouri. In December 2001, the Missouri Department of Transportation (MoDOT) completed the First Tier I-70 Improvement Statement, which determined that the best strategy for improving I-70 was to widen and reconstruct it. In October 2005, MoDOT completed the Second Tier I-70 Final Environmental Impact

¹ Corridor Study of Stadium Boulevard in Columbia, Missouri. Prepared for the Missouri Department of Transportation, the City of Columbia, and the Kroenke Group by Crawford, Bunte, Brammeier, 2003.

² Information about MoDOT's Improve I-70 studies can be found at: <http://www.improvei70.org/>

Statement (FEIS), which provided more information on the location, basic design, impacts, and the cost of preferred improvement alternative. In 2009, MoDOT completed a supplemental EIS which recommends truck-only lanes on I-70 across Missouri. The preferred improvement alternatives were chosen to balance environmental concerns with community needs.

The current Improve I-70 preferred alternative in the Scott Boulevard study area includes:

- Mainline widening to eight lanes west of US Highway 40; two “general purpose” lanes in each direction and two “truck only” lanes in each direction
- Mainline widening east of US Highway 40, ultimately to ten lanes, with two truck-only lanes in each direction and three general purpose lanes in each direction
- Enhanced Diamond Interchange at US Highway 40
- Tight Diamond Interchange at Stadium Boulevard with fly-over ramps onto Fairview Road from westbound I-70 and from Fairview Road onto eastbound I-70³

Detailed traffic modeling was conducted as a part of the Improve I-70 studies to explore the performance of various interchange concepts. This analysis revealed that in the design year 2030, heavy volumes at the intersection of Bernadette Drive and Stadium Boulevard would cause the Stadium Boulevard/I-70 interchange to operate at an unacceptable level of service (LOS), thus validating the results of the 2003 traffic study. The design year 2030 traffic model results indicate problems for both the south ramp and north ramp terminals. Traffic queues at the intersection of Bernadette Drive and Stadium Boulevard extending to the Stadium Boulevard interchange would cause substantial traffic problems at the south ramp terminal and substantial congestion at the north ramp terminal due to the heavy turning volume from westbound I-70 to southbound Stadium Boulevard. **This traffic study reported regional and area benefits of a Scott Boulevard interchange. Table 1 provides the data reported⁴.**

Table 1: Regional/Area Benefits of a Scott Boulevard/I-70 Interchange as Reported by the Improve I-70 FEIS

Regional Benefits
Decrease in vehicle hours traveled (VHT) of 1,100 hours per day
No change in vehicle miles traveled (VMT)
Decrease in volume to capacity ratio (V/C) of 1%
Increase in future capacity across I-70 of 7.5%
Area Benefits*
Decrease in V/C on Stadium, north of Broadway, of 14%
Decrease in V/C on Broadway, west of Stadium Boulevard, of 18%
Decrease in V/C on Broadway, east of Scott Boulevard, of 15%
Decrease in VMT on Broadway (32%) between Scott and Stadium Boulevards
Decrease in VHT on Broadway (34%) between Scott and Stadium Boulevards
Decrease in VMT on Fairview Road (2%) between Broadway and Kunlun Drive
Decrease in VHT on Fairview Road (4%) between Broadway and Kunlun Drive
<i>*Area, in this context, means Scott Boulevard to Stadium Boulevard/I-70 to Broadway</i>

³ The fly-over ramps onto Fairview Road from westbound I-70 and from Fairview Road onto eastbound I-70 may not be needed with the construction of a new interchange at the Scott Boulevard extension.

⁴ MoDOT's *Improve I-70 Second Tier Environmental Impact Statement* – Section 4—MoDOT Job No. J411341G page I-10

The FEIS concluded, "So while the Scott interchange was not included as part of the preferred alternative for the Improve I-70 project, that is not intended to convey that the Scott interchange is not justifiable outside the context of the Improve I-70 project." Additional details about the I-70 Supplemental Environmental Impact Statement (SEIS)/FEIS are discussed in Section 5.0: Comprehensive Interstate Network Study.

Columbia Area Transportation Study Organization (CATSO): On June 26, 2003, the CATSO Coordinating Committee approved an amendment to the Major Roadway Plan to include the extensions of Scott Boulevard and MO Route E to connect with I-70 at a location west of Stadium Boulevard. These roadways were identified as "placeholders," acknowledging that a new interchange was planned in the general vicinity but that the exact location would be determined at a later date. On December 9, 2004, CATSO upgraded the Scott Boulevard extension to I-70 from a placeholder to an identified project in the Major Roadway Plan. Additional details are provided in Section 4.0: Transportation and Land Use Plans.

ALTERNATIVES DEVELOPMENT

Extensive studies were conducted to select a preferred alignment for the proposed Scott Boulevard extension and location/configuration for the proposed I-70 interchange. A brief summary of this alternatives development and evaluation process is discussed below. A more extensive discussion is included in the Environmental Assessment (EA) also being prepared for this project. More information regarding the status of the EA can be found in: Section 7.0: Status of Planning and NEPA.

Critical Factors: Some of the critical issues influencing the location for a new interchange are the ability to attract traffic, interchange spacing along I-70, connections to the regional arterial system, and topography, land use, and environmental factors.

Ability to Attract Traffic – Previous traffic models have shown that eastern interchange locations would attract more traffic than western interchange locations (there is greater population to be served to the east). More traffic attracted to the proposed interchange would result in less traffic on Stadium Boulevard.

Interchange Spacing along I-70 – Proximity of the new interchange to Stadium Boulevard is a critical factor due to (1) the impact on freeway operations and (2) resulting interchange cost. Closely spaced interchanges can result in substandard freeway weaving conditions. As such, the Federal Highway Administration (FHWA) prefers two-mile interchange spacing but is typically willing to allow one-mile spacing in urban areas. In order to accommodate the tighter spacing, it is often necessary to develop more elaborate interchange configurations, which can influence the cost of construction.

Connections to the Regional Arterial System – Freeway interchanges should provide effective connections to the regional arterial system. The proposed interchange would not fulfill its goal of diverting traffic from Stadium Boulevard without a strong connection to Scott Boulevard and West Broadway. Therefore, it was imperative to create a strong connection between the new interchange and the regional arterials.

Topography, Land Use, and Environmental Factors – The area's topography lends itself to interchange placement at some locations but not at others. Perche Creek also presents an environmental barrier; all

reasonable alternatives should be located far enough east to avoid impacting the creek and if possible, the I-70 structures over the creek. A few corridors are present where undeveloped land and/or existing right-of-way can provide the necessary roadway connections. Hence, a future connection located in one of these corridors would be a practical alternative. Finally, several environmental resources and potential impacts were considered such as:

- Residential, Business, and Public Facilities
- Noise
- Parks, Trails, and Recreation Facilities
- Pedestrian/Bicycle Facilities
- Historic and Cultural Resources
- Waters of the U.S. and Floodplains
- Neighborhoods and Communities
- Threatened and Endangered Species
- Hazardous Waste Sites
- Public Water Supplies
- Water Quality
- Geology
- Farmland Resources

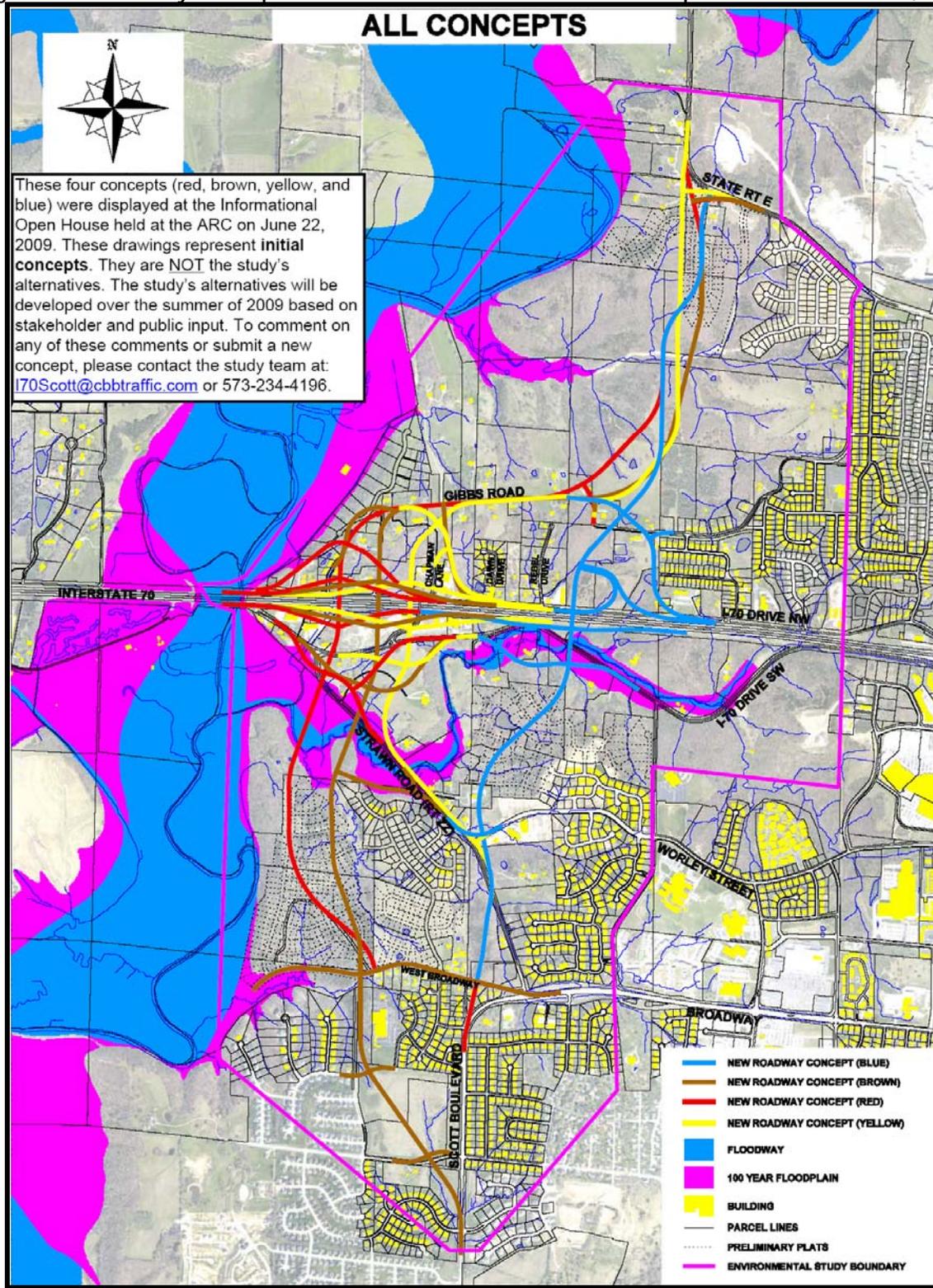
Brainstorming: In an effort to capture as many legitimate ideas as possible; a Study Team consisting of representatives from the City of Columbia, Boone County, MoDOT, FHWA, and the consultant team met on February 2, 2009, to consider various ideas for the interchange alignment/configuration and Scott Boulevard extension alignment. **Figure 5** shows a summary drawing of ideas discussed at the workshop.

Evaluation of Preliminary Concepts: The ideas generated at the brainstorming workshop were refined based upon input from partner agencies and technical analysis (e.g., traffic flow, constructability, and environmental issues). As shown in **Figure 6**, four preliminary concepts (i.e., Red, Brown, Yellow, and Blue) were developed for further analysis. These concepts were presented to the public at an informational open house held on June 22, 2009. The four concepts encompass different alignments that run parallel to Perche Creek with Red being the westernmost alignment and Blue being the easternmost alignment. All four concepts are similar north of I-70 in how they extend to MO Route E.

Figure 5: Alternatives Developed During February 2, 2009 Workshop



Figure 6: Preliminary Concepts Presented at a Public Informational Open House on June 22, 2009



The RED CONCEPT was developed with the goal of avoiding neighborhood impacts by using the “clear” platted land in the western portion of the study corridor. The alignment would cut through the Overlook and Bellwood subdivision plats, cross Harmony Creek and intersect Strawn, with the South Outer Road connecting into Strawn to the east of the alignment. The interchange would require the widening of the I-70 bridge over Perche Creek to accommodate the auxiliary lanes.

The preliminary version of this concept included offset intersections along Broadway between Scott Boulevard from the south and the extension to the north, which is undesirable from a traffic flow perspective. This version would have also resulted in substandard spacing between the South Ramp terminal intersection and the South Outer Road (only about half of the spacing suggested in MoDOT’s Access Management Guidelines). Based on public comment and technical analysis, the Study Team concluded that the Red Concept could be salvaged if the offset intersections along Broadway were eliminated, outer road spacing be improved, and more room allowed for a future South Outer Road crossing of Perche Creek. Eventually the Red Concept’s interchange location was merged with the Yellow Concept’s Scott Boulevard alignment south of I-70 to form the new GREEN ALTERNATIVE. The Red Concept’s Scott Boulevard alignment was dropped because only one alignment west of Bellwood was needed and it was decided to use the Brown Concept’s western Scott Boulevard alignment.

The BROWN CONCEPT made use of the Stone Valley Parkway corridor south of Broadway, which is extended across Broadway in an attempt to address the offset intersections shown in the Red alignment. However, this results in a longer roadway than originally contemplated and makes the Brown the longest alignment. The Brown alignment follows the Red alignment towards I-70 but realigns Strawn to intersect the extended Scott Boulevard further to the south, which in turn allows the South Outer Road to be pulled further to the south. Grades are challenging and retaining walls would be required along the creek. Because of the grades it will likely be necessary to widen the I-70 bridge over Perche Creek to accommodate acceleration and deceleration lanes. The alternative has an offset intersection with the North Outer Road in order to minimize impacts to existing homes. Tying the outer roads into the ramp terminals via roundabouts was considered but determined infeasible (due to capacity constraints at peak times).

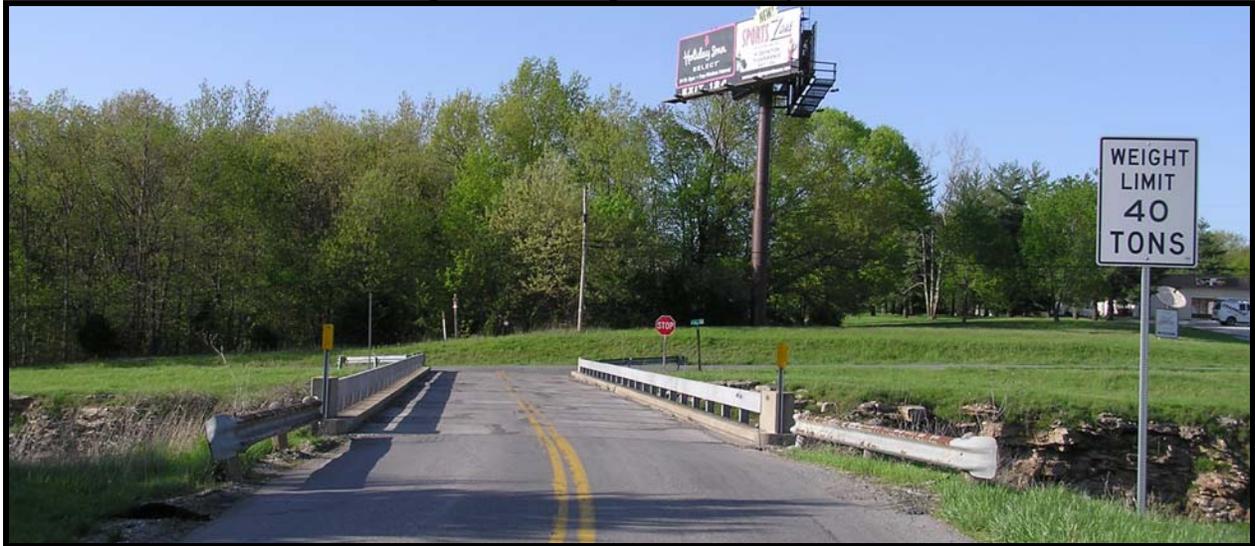
The Brown alignment garnered public support from some residents during the public meeting because of its low impact along existing Scott Boulevard and Strawn Road. However, this alignment also garnered opposition from residents along Haywood Court who feared impacts to their neighborhood. The Brown concept also creates a longer route for motorists and concerns were raised that this may encourage cut-through traffic through the neighborhoods to the east of existing Scott Boulevard as motorists work their way downtown. The Brown Concept was adjusted slightly to form the BROWN ALTERNATIVE.

The YELLOW CONCEPT was developed with the goal of using existing Strawn Road and the existing Sorrels Overpass. However, using the Sorrels Overpass is not feasible due to the complications regarding the future widening of I-70 and the condition of the existing bridge. A new bridge will be required for the interchange. Topography at this location is conducive for interchange placement. Additionally, Strawn Road (the new Scott Boulevard extension) would be widened and reconstructed at a higher elevation to alleviate flooding issues.

The Yellow Concept extends Scott Boulevard across Broadway and then follows the existing alignment of Strawn Road. There would be some displacement impacts at the new intersection of Scott Boulevard and

Broadway and along existing Strawn Road, and the route is parallel to a tributary of Harmony Creek. This alternative provides for a connection to Worley Road. The alignment provides for an intersection with the South Outer Road south of its existing alignment. It crosses I-70 in the proximity of Sorrels Overpass as a means of capitalizing on the existing grade differences. This alignment would not impact the I-70 bridge structures over Perche Creek. The North Outer Road would connect to Gibbs Road.

Figure 7: Existing Sorrels Overpass



The Yellow Concept had substandard spacing between the South Ramp terminal intersection and the South Outer Road (only about one-third of is the spacing suggested in MoDOT's Access Management Guidelines). This spacing is driven by the location of the creek on the south side of I-70. Based on public comment and further technical analysis, the Study Team concluded that the Yellow Concept could be salvaged if the outer road spacing could be improved. This concept eventually became the YELLOW ALTERNATIVE, with the intersection spacing issue ultimately addressed by grade-separating Scott Boulevard from the South Outer Road and providing a connection via a jughandle.

The BLUE CONCEPT was developed to provide for an alignment/interchange on the far eastern side of the study area. This route was the shortest of all conceptual alignments and would make use of the vacant Strawn School property and the Vintage Falls plat. The intersection of Scott Boulevard and Broadway would have been the same as the Yellow Concept. However, north of Strawn School the Blue alignment would have continued to the northeast, bisecting Vintage Falls. Strawn Road and Worley Road would intersect the Blue Concept directly opposite of one another. Folded ramps were provided on the north side of the interchange to avoid impacts to the residential area on Rebel Drive. The North Outer Road would connect to Gibbs Road. A five-lane bridge across I-70 would be necessary and roundabouts would NOT be an option with this configuration because of the topography. The Blue interchange is the most expensive of the four concepts due to significant grade differences creating the need for retaining walls along the ramps.

The Blue Concept has major constructability issues due to existing topography. As such, the cost of the interchange would be twice that of the others. Moreover, Vintage Falls Phase 1 is under construction, and homes will likely be built along the proposed alignment by the time funding is available for right-of-way

acquisition. Therefore, the Blue Concept would likely impact established neighborhoods by the time it would be constructed. Finally, the Blue Concept is not compatible with Improve I-70 plans. The interchange location would provide about 800 feet of freeway weaving distance to the Stadium Boulevard eastbound off-ramp and westbound on-ramp in the event that the Fairview flyover ramps are ever constructed. For these reasons, the Study Team dropped this concept from further analysis.

Figure 8: Topography near Conceptual Blue Alignment



Generation of Reasonable Alternatives: Based on technical analysis and input received from partner agencies and the public informational open house, four reasonable alternatives were created from the preliminary concepts. Brown, Green, Yellow, and Orange Alternatives are shown in **Figure 9**.

The BROWN ALTERNATIVE was brought forward intact from the Brown Concept with a few minor changes. This is the “western” alignment south of I-70 and the “center” interchange location.

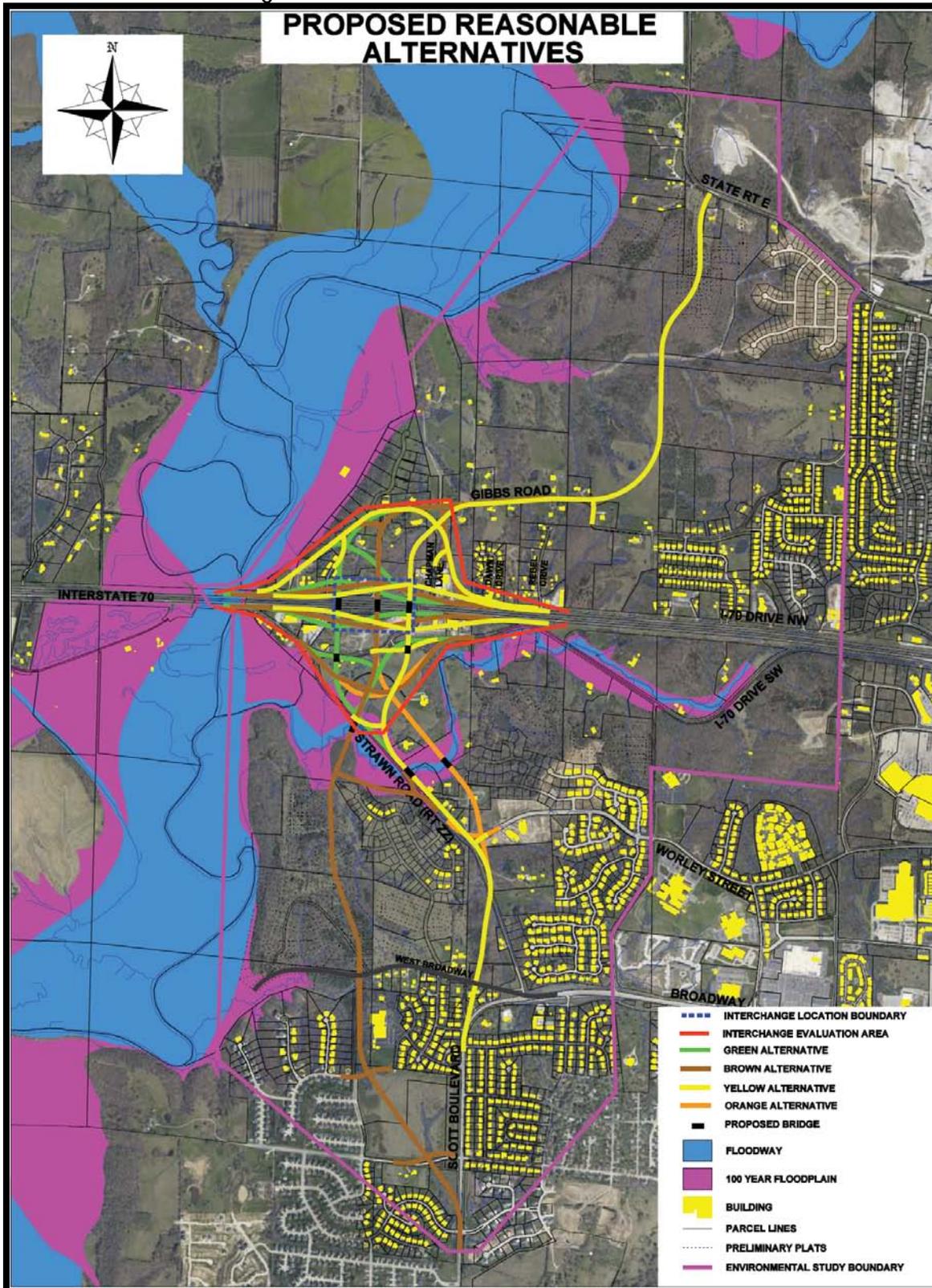
The GREEN ALTERNATIVE was developed by using the far western Red interchange location from the preliminary concepts connecting to a Strawn Road alignment. This is the “center” alignment south of I-70 and the “western” interchange location. This alternative includes a grade separation for South Outer Road and Scott Boulevard and provides an at-grade intersection further south via a jughandle. This provides improved intersection spacing between the South Ramp terminal and the South Outer Road.

The YELLOW ALTERNATIVE was brought forward intact from the Yellow Concept with some modification. Similar to the Green Alternative, the Yellow Alternative has grade separation at South Outer Road and Scott Boulevard. This is the “center” alignment south of I-70 and the “eastern” interchange location.

The ORANGE ALTERNATIVE was developed based upon ideas generated at the June 22, 2009, open house. It was created by connecting the center interchange location to a new Scott Boulevard alignment, which would be slightly east of Strawn Road. This is the “eastern” alignment south of I-70 and the “center” interchange location.

The local road alignments north of I-70 are all identical past the east-west portion of Gibbs Road. All interchange alternatives replace (remove) the existing Sorrels Overpass. All bridge designs are based on the ten-lane section I-70 improvements.

Figure 9: Reasonable Alternatives Considered



Recommendation of a Preferred Alternative: A rigorous engineering, environmental, and traffic operations analysis was conducted on the set of reasonable alternatives to determine a recommendation for a preferred alternative. A detailed discussion of this process is being documented in the project's EA. A summary of major issues considered in this process is discussed below. In general, a series of three questions were asked in order to determine the recommendation for the preferred alternative.

Question 1: Is there an overriding benefit that would drive the selection of the Brown (far western) Alternative? Engineering analysis showed that the Brown Alternative is the longest (and most expensive) of the alternatives, and traffic analysis showed that it would carry less traffic than the other alternatives as some drivers would opt to use Strawn Road for travel to and from Broadway. Additionally, being the longest alternative, Brown has the most severe habitat impacts, the highest chances of major archeological impacts, and would have significant impacts to City-owned parkland south of I-70 and east of Perche Creek. While other alternatives have parkland impacts, the Brown Alternative bisects the future park with the potential to impact over 15 acres of parkland in the environmental study corridor—the most of any alternative. Moreover, this alternative had the most risk for public controversy. While the alternative garnered a number of positive comments during the public meeting (primarily from homes near the intersection of Broadway and Scott Boulevard), it also received a number of negative comments during the public meeting (primarily from the Haywood Court neighborhood). The Brown Alternative was originally considered to avoid residential impacts, but more detailed engineering showed that it would impact almost as many residential structures as the other alternatives and substantially more platted lots. The Study Team could not find justification to recommend the Brown Alternative as the preferred alternative.

Question 2: Is it preferable to choose an alignment that uses Strawn Road (i.e., Yellow and Green Alternatives) over the Orange Alternative? In general, the detailed analysis showed that the Orange, Yellow, and Green alternatives have similar costs, impacts, and benefits. However, the Yellow and Green Alternatives had a distinct advantage over the Orange Alternative from the standpoint of consistency with past public policy. Specifically, the Bellwood and Vintage Falls plats (which are public record) show the Scott Boulevard extension using a Strawn Road alignment. These developments both dedicated land along the Strawn Road corridor for a future Scott Boulevard extension. These plats (and the dedicated right-of-way) could create a public expectation that a future Scott Boulevard Extension would make use of the existing Strawn Road corridor. Other points considered include:

- The City tends to use existing road alignments as much as possible, and using the Strawn Road alignment would be consistent with this practice.
- The Yellow and Green Alternatives would raise the elevation of the existing Strawn Road alignment and thus fix the existing roadway flooding problems that occur there on a regular basis.
- Using the existing Strawn Road alignment provides greater flexibility in the placement of the I-70 interchange. Preliminary engineering shows that a Strawn Road alignment could make use of all three proposed interchange locations, while use of the Orange alignment allows for a much more restricted interchange “window”. This could be important later in the process if unexpected problems are encountered which would require the interchange location to be shifted.
- The Yellow and Green Alternatives provide outer road connections that are preferable to the Orange Alternative. Specifically, the Orange Alternative does not provide for continuous outer roads on the north side of I-70. Additionally, the Yellow and Green Alternatives provide for a grade separated south outer road at the I-70 interchange, which provides for better intersection spacing along Scott Boulevard.

- Using a Strawn Road alignment provides for more of an opportunity to “reuse” existing roadway, consistent with “Smart Growth” principles.

Based on this analysis the Study Team recommended a preferred alignment that would make use of the existing Strawn Road corridor.

Question 3: Which interchange location is preferable: Yellow or Green? Both are reasonable alternatives with similar costs and impacts. The ultimate location was determined based on the following considerations:

- The Yellow Alternative provides for better spacing between the interchange ramp terminals and the outer road intersection on the north side of I-70.
- The Yellow Alternative provides for slightly shorter travel distance for commuters.
- The Yellow Alternative does not require widening of the I-70/Perche Creek bridges. The Green Alternative would require the widening of these bridges to accommodate acceleration and deceleration lanes. This makes the Yellow Alternative easier to construct with less impact to the traveling public.

Based on this analysis, the Study Team recommends Yellow as the preferred alternative.

Description of the Recommended Alternative: The Yellow Alternative extends Scott Boulevard as a four-lane roadway (with turning lanes at intersections) across Broadway (under traffic signal control) and then generally follows along the existing alignment of Strawn Road. A signalized connection is provided to Worley Road. The alignment grade separates Scott Boulevard and the South Outer Road, providing a connecting via a jughandle at the existing Strawn Road. The three lane bridge is configured as a typical diamond interchange with roundabouts at the ramp terminals. **Figures 10 and 11** provide views of I-70 from the Sorrels Overpass.

**Figure 10: View of I-70 West of Proposed Interchange Location
(Towards US Highway 40 Interchange) from Sorrels Overpass**



Figure 11: View of I-70 East of Proposed Interchange Location
(Towards Stadium Boulevard Interchange) from Sorrels Overpass



North of the interchange, Scott Boulevard is configured with two to three lanes (depending on the need for turning bays). The North Outer Road is configured as a traditional two-way stop-controlled intersection which could be signalized if future traffic volumes warrant. A roundabout is not appropriate at this location due to the steep grades. This intersection could become particularly important from a system-wide traffic management standpoint for freeway incident management on I-70. Local agencies and MoDOT have discussed constructing an outer road bridge across Perche Creek on the north side of I-70. If this bridge is constructed, traffic could be routed to the north outer road when I-70 is closed for an incident.

The alignment then follows the Gibbs Road alignment to the east, and turns north to intersect with MO Route E. The MO Route E intersection would be configured as a roundabout to balance traffic flows and enhance safety.

FHWA Policy and Procedures for New or Revised Interstate Access Approval in Missouri

In order for FHWA to consider a new interchange at Scott Boulevard and I-70, it is necessary to consider this improvement in light of the requirements outlined in the eight categories specified by the Missouri Division of the FHWA in *Policy and Procedures for New or Revised Interstate Access Approval in Missouri*, May 2001. This report outlines the policy and procedures applied by the FHWA in Missouri for new or revised Interstate access approval regardless of the funding source. FHWA must grant approval to any new or revised access to the proposed Interstate before any access modifications can be made.

Approval from the FHWA is a two-step process, which provides for conceptual approval and final approval. According to the FHWA, concept approval will be requested by MoDOT via an *Access Justification Report (AJR)*. After concept approval has been obtained, the final approval is automatic after the National Environmental Policy Act (NEPA) requirements have been fulfilled assuming no significant changes have been made to the original concept.

This study constitutes the AJR for new access to I-70 at Scott Boulevard, in the form of a diamond interchange. This alternative would not require any widening to I-70 other than that needed for the transitions at the proposed ramps. The proposed plan is consistent with the Improve I-70 program.

The ultimate intent of a new interchange is to:

- Provide enhanced access to the western part of the City of Columbia and
- Relieve congestion from Stadium Boulevard and West Broadway.

CONTENTS OF THE AJR

The AJR should contain a clear description of the proposed access along with any background information that would explain and/or support the proposal. In addition, new or revised access points to the existing (or future) interstate system should meet the requirements outlined in the following eight categories:

1. Existing Facilities
2. Transportation System Management
3. Access Connections and Design
4. Transportation Land Use Plans
5. Comprehensive Interstate Network Study
6. Coordination with Transportation System Improvements
7. Status and Information on the Planning and NEPA Processes
8. Operational Analysis

The following sections present the applicable policy statement for each element followed by the conclusions with regards to the proposed full access interchange at I-70 and Scott Boulevard.

1.0 EXISTING FACILITIES

FHWA policy states "**Existing Facilities:** *The existing interchanges and/or local roads and streets in the corridor can neither provide the necessary access nor be improved to satisfactorily accommodate the design-year traffic demands while at the same time providing the access intended by the proposal.*"

Access to I-70 from western Columbia is primarily provided by Stadium Boulevard. Section 8: Operational Analysis shows that Stadium Boulevard is currently operating at/over capacity, and will continue to degrade in the future, even with planned improvements. The existing roadway and interchange are not adequate to handle the existing travel demands, and cannot be improved to accommodate peak demands in the future. Stadium Boulevard alone simply cannot serve the I-70 access needs of western Columbia.

A secondary point of access to I-70 is the US Highway 40 interchange. However, Perche Creek forms a barrier to access this interchange. Gillespie Bridge Road is the nearest crossing of Perche Creek south of I-70 and is located almost three miles to the south of I-70. As such, this interchange is largely inaccessible for residents of western Columbia. The City of Columbia has plans to enhance connections across Perche Creek by extending Broadway from Scott Boulevard to Route UU. Moreover, connections of the I-70 frontage roads across Perche Creek are a part of MoDOT's Improve I-70 plans. However, even with these connections in place, the use of the US Highway 40 interchange would result in three to five miles of adverse travel per trip for the predominant travel movements to and from the east. This is not a sustainable long-term solution.

Section 4: Transportation and Land Use Plans discusses plans for the continuing growth in this area of the City. Much of the remaining undeveloped land in western Columbia is already platted for residential development. Many of these subdivisions are currently under construction. A new interchange at an extended Scott Boulevard is needed to provide the access needs of this growing area. This section describes existing roadway facilities in the study area. A more detailed operational analysis including existing and forecasted traffic volume information can be found in Section 8.0 Operational Analysis.

Interstate 70:

I-70 is an interstate freeway serving the Columbia metropolitan area. In its entirety, I-70 runs from I-15 near Cove Fort, Utah to Baltimore, Maryland. I-70 connects Kansas City, St. Louis, and Columbia with the national interstate freeway system and is one of the most important transportation corridors in Missouri. The proposed Scott Boulevard/I-70 interchange is located between existing interchanges at US Highway 40 and Stadium Boulevard. Within the City of Columbia, I-70 is a four-lane divided expressway and carries approximately 67,000 vehicles per day. MoDOT has completed several corridor studies to improve the capacity and safety of I-70 across Missouri, as described in Section 5.0 Comprehensive Interstate Network Study. The proposed Scott Boulevard interchange would shift some commuter traffic from Stadium Boulevard to Scott Boulevard, dispersing traffic volumes between the two interchanges and lessening the risk of traffic backing up from the congested Stadium Boulevard interchange and onto I-70.

Crash statistics were compiled for I-70 between mile markers 121 and 125 for the four-year period between 2004 and 2007 to determine the safety performance of this section of I-70. **Table 2** shows the total number

of fatal, injury, and property-damage-only (PDO) crashes. Figure 12 shows the distribution of crash severity and Figure 13 shows the crash type distribution in our study segment.

Table 2: Number of Crashes (2004-2007) between Mile Markers 121 and 125

	2004	2005	2006	2007	Total
Fatality	1	0	1	1	3
Injury	17	15	15	13	60
PDO	45	37	30	36	148
Total	63	52	46	50	211

Figure 12: Crash Severity Distribution (2004-2007) Between Mile Markers 121 and 125

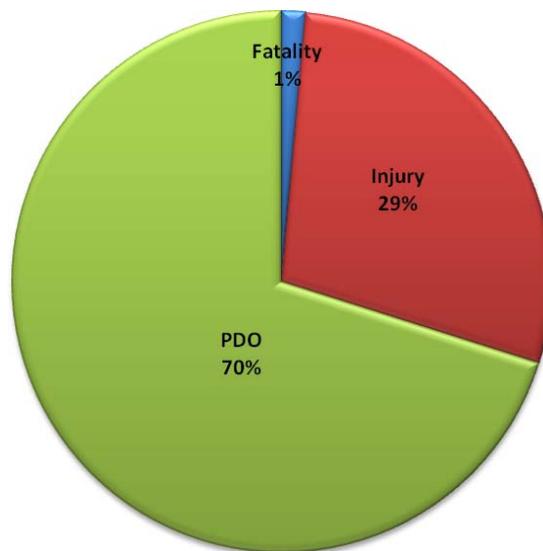
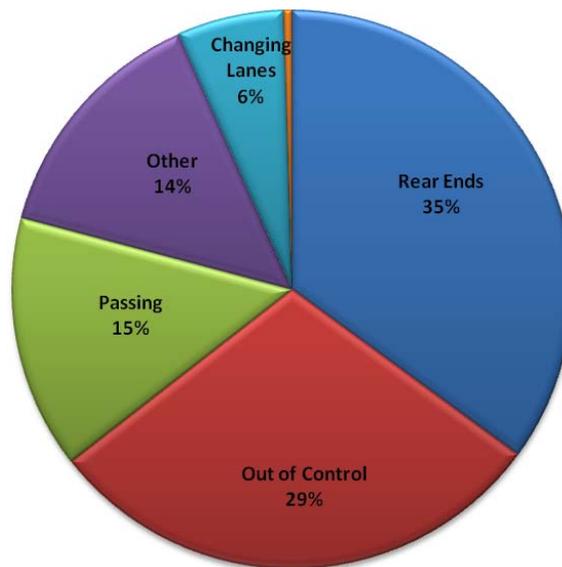


Figure 13: Crash Type Distribution (2004-2007) Between Mile Markers 121 and 125



These findings parallel those found in the Improve I-70 studies. Specifically, both studies report a high percentage of rear-end crashes. According to the Improve I-70 report, “rear-end crashes typically are associated with scenarios in which drivers are confronted with an unexpected speed differential, such as through trips confronted with slowdowns at interchange weaves”. However, rear-end crashes can also occur from poor sight distance or unexpected stopping situations (construction, backups on freeway, unfamiliarity with area, etc). The Improve I-70 studies investigated some crash precursors for this section of I-70 to help determine causes for some of the higher crash rates⁵:

- Eastbound I-70 Perche Creek Bridge (approximately Mile Marker 122) – A high number of crashes occur on this bridge, suggesting that icy conditions may be a precursor.⁶
- Eastbound I-70 under Sorrels Overpass Road (approximately Mile Marker 123) – A high number of crashes occur under this bridge, suggesting sight distance and congested conditions may be precursors.
- MO 740/Stadium Boulevard (approximately Mile Marker 124) – A number of crashes occur on this bridge and south of the interchange, suggesting congested conditions and driver inattention may be precursors.

Table 3 summarizes the crash rates for fatalities, injury accidents, PDO accidents, and all crashes developed during the crash analysis. The four-year crash rate for all MoDOT highways is 109.61 crashes/hundred million vehicle miles of travel (crashes/HMVMT). The crash rate for MoDOT highways in District 5 is 92.3 crashes/HMVMT. The total crash rate for this four-mile section of freeway is 72.3 crashes/HMVMT, which is lower than the statewide and regional averages.

Table 3: I-70 Crash Rates (2004-2007) Between Mile Markers 121 and 125

	Crash Rate
Fatality	1.028
Injury	20.558
PDO	50.710
Total	72.296

The proposed interchange at Scott Boulevard could help relieve some of the congestion at the MO 740/Stadium Boulevard interchange, thereby enhancing the safety of mainline I-70. Additionally, a new interchange at Scott Boulevard could allow for more effective management of incidents on I-70, therefore reducing the frequency of secondary crashes.

The non-continuous nature of the I-70 frontage roads between Stadium Boulevard and Route US 40 can be especially problematic from a traffic operations standpoint during crashes or other freeway incidents. The outer roads in this section of I-70 do not extend over Perche Creek, and freeway capacity reductions (such as lane reductions or total freeway closures) can cause significant traffic queues as traffic has no practical alternative to get around the incident. A new interchange at an extended Scott Boulevard would provide MoDOT with increased flexibility in managing freeway incidents in this section of I-70.

⁵ MoDOT's *Improve I-70 Second Tier Environmental Impact Statement* – Section 4—MoDOT Job No. J411341G page I-27

⁶ Local experience suggests that many of the crashes at this location may also be related to congestion due to construction, maintenance, and incidents.

Major North-South Roadways

Stadium Boulevard is primarily a four-lane expressway/major arterial that runs from US 63 in Southeast Columbia to north of I-70 in northwest Columbia where it becomes MO Route E. Stadium Boulevard (MO Route 740), US 63 and I-70 together result in a transportation corridor loop around the City of Columbia. Stadium Boulevard provides major access to several University of Missouri Columbia academic and athletic facilities from I-70, US 63 and western Columbia. Within the study area, Stadium Boulevard is a five-lane signalized corridor with several large-scale commercial developments.

MoDOT is working with the City of Columbia to widen Stadium Boulevard from the North Outer Road to south of Broadway. The existing five-lane, undivided roadway will be improved to a six-lane divided roadway with a median wide enough to accommodate dual left turns at intersections. The project will also modify the I-70 interchange configuration to a Diverging Crossover Diamond (DCD) to improve traffic flow and safety. Lanes will be added to Fairview Road from Worley Avenue North to the west entrance of the Columbia Mall and to Bernadette Drive from Fairview Road to Beverly Drive. Construction is expected between 2011 and 2013. The improvements are being funded by the City of Columbia, MoDOT, and three transportation development districts⁷.

However, even with the planned improvements, Stadium Boulevard will continue to operate under congested conditions. Operations will degrade with continued residential growth in western Columbia. Traffic operations along Stadium Boulevard can not be improved to the level needed to satisfy future traffic demands unless an additional interchange is constructed to the west. The proposed project would shift commuter traffic from Stadium Boulevard to Scott Boulevard, greatly improving traffic operations and the commercial environment along Stadium Boulevard.

Our review of crashes on Stadium Boulevard revealed 148 crashes in the vicinity of the I-70 interchange during the period between 2004 and 2007. **Table 4** shows that most of the crashes that occurred in this section along Stadium Boulevard were PDO and that there were no fatalities.

Table 4: Number of Crashes (2003-2007) Between I-70 and Broadway

	2003	2004	2005	2006	2007	Total
Fatality	0	0	0	0	0	0
Injury	11	7	2	11	10	41
PDO	12	29	27	37	25	130
Total	23	36	29	48	35	171

Figure 14 shows the different crash types recorded in this section along Stadium Boulevard. Of these, 142 (96 %) were rear-end crashes. This type of crash is clearly a result of the congestion at this location. **Figure 15** shows the crashes along Stadium Boulevard broken down by the day of the week. This statistic implies that there are 50% more crashes on Fridays and Saturdays when commercial corridors see higher traffic volumes. **Figure 16** shows the crashes by the time of day. As shown, 28% of the recorded crashes along this corridor were recorded during the 5pm commuter hour.

⁷ http://www.modot.org/central/major_projects/boone.htm

Figure 14: 2003-2007 Crash Distribution along Stadium Boulevard between I-70 and Broadway

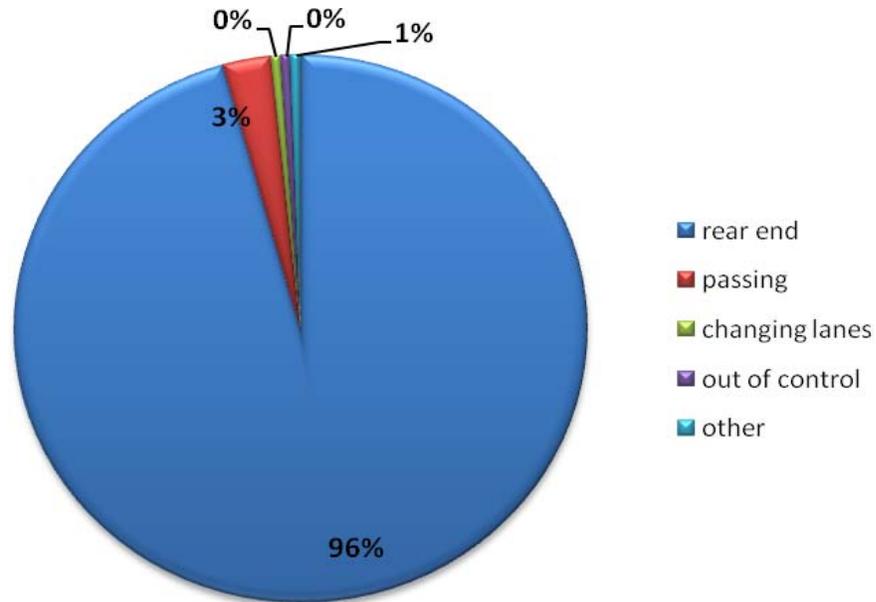


Figure 15: 2003-2007 Crashes by Day of Week along Stadium Boulevard between I-70 and Broadway

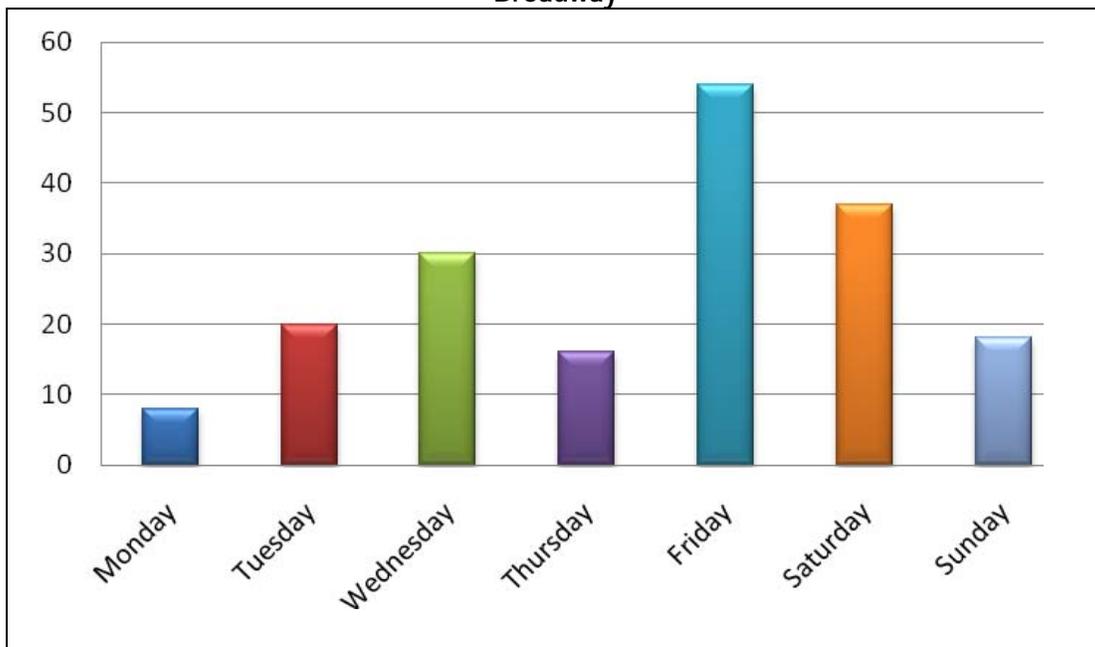
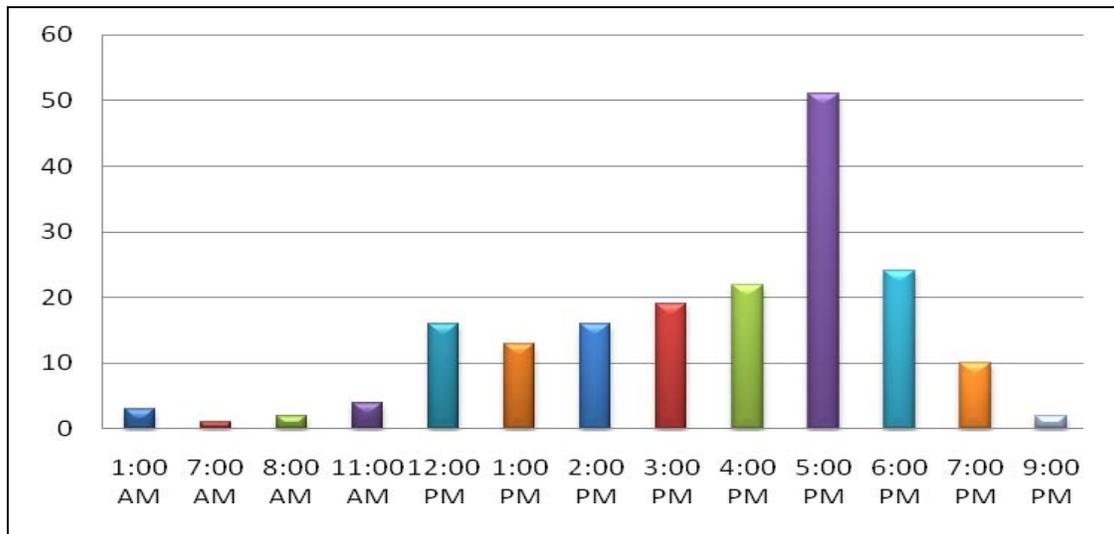


Figure 16: 2003-2007 Crashes by Time of Day along Stadium Boulevard between I-70 and Broadway



Fairview Road is a two-lane major collector from Bernadette Drive to north of Broadway providing access to the Columbia Mall and other commercial land uses. From south of Broadway to Chapel Hill Road, it is a two-lane minor arterial serving primarily residential land uses. A creek crossing causes Fairview Road to intersect with Worley Road via two offset intersections, creating a jog and hindering through traffic. MoDOT's Improve I-70 plans include the provision for future ramps from Fairview Road to and from the east on I-70 if required, to relieve traffic on Stadium Boulevard. However, a new interchange at Scott Boulevard may draw enough traffic from Stadium Boulevard to preclude or postpone the need for these ramps.

Silvey Street is a two-lane neighborhood collector primarily serving residential land uses between South Outer Road and Broadway. The proposed Scott Boulevard interchange would likely have modest impacts to traffic on Silvey Street.

Sorrels Overpass Road is currently a two-lane overpass connecting the North Outer Road and the South Outer Road approximately 1.6 miles west of Stadium Boulevard and is the only roadway crossing over I-70 between the Stadium Boulevard and US Highway 40 interchanges. Sorrels Overpass Road carries very low traffic volume with only an auto salvage yard on the southern end of the road. The proposed Scott Boulevard interchange bridge over I-70 would replace this structure.

Scott Boulevard is primarily a four-lane major arterial connecting Broadway and Route KK. In its existing configuration, Scott Boulevard provides access and connectivity primarily to residential land uses in western Columbia to and from I-70 via Broadway and Stadium Boulevard. A new interchange on I-70 west of Stadium Boulevard would provide enhanced access to I-70 from western Columbia and would relieve congestion along the Stadium Boulevard corridor and interchange with I-70. As part of the proposed Scott Boulevard interchange along I-70, Scott Boulevard would be extended from Broadway across I-70 to MO Route E. This extension of Scott Boulevard would provide a four-lane major arterial south of I-70 and a two-lane major collector north of I-70. Additionally, this new interchange project would eliminate the "curve" at the intersection along Scott Boulevard at Broadway.

The City of Columbia is currently engaged in a multi-year, three-phase improvement plan to upgrade Scott Boulevard between Rollins Road Route KK. The first phase between Rollins Road and Brookview Terrace consists of widening Scott Boulevard to four lanes plus a center median as well as adding bicycle lanes, new sidewalks on both sides of the road, and a pedestrian underpass just north of Chapel Hill Road. Phase 1 is currently under construction with an expected completion date of Spring 2011. The second phase will improve Scott Boulevard between Brookview Terrace and Vawter School Road by extending bicycle lanes sidewalks to connect to the MKT trail; raising the elevation of Scott Boulevard to reduce flooding; reconstructing the bridge over Hinkson Creek, and constructing a roundabout at the Scott/Vawter School Road intersection. The third phase between Vawter School Road and Route KK will result in two travel lanes divided by a grassy median with breaks at public streets in order to provide for left-turn lanes.

Strawn Road (Route ZZ) is currently a two-lane major collector between South Outer Road and Broadway. This is the western-most north-south route providing access to residences between I-70 and Broadway. This roadway has chronic flooding issues at its crossing Harmony Creek, which is a tributary of Perche Creek. The proposed Scott Boulevard extension would widen and elevate this roadway, ultimately solving the roadway flooding issues. The roadway's functional classification would be upgraded from a major collector to a major arterial. Several of the residents along Strawn Road would be impacted by the proposed Scott Boulevard extension.

US Highway 40 and Route UU are two-lane minor arterials west of Perche Creek. The first I-70 interchange west of Stadium Boulevard is the US Highway 40 Interchange with US Highway 40 to the north and Route UU to the south of the interchange. The US Highway 40 Interchange is located three miles west of Stadium Boulevard. The next I-70 interchange is at the intersection of Route J/O, located three and a half miles further west. Route UU connects with Gillespie Bridge Road to the south, the only Perche Creek crossing between I-70 and Route K.

MoDOT's Improve I-70 plans include upgrading the existing US Highway 40/Route UU interchange. However, even with these improvements, the US Highway 40/Route UU interchange is not likely to divert a significant amount of the major traffic movements, to/from the east, from the Stadium Boulevard interchange. It is too far west and would result in too much adverse travel; even with enhanced connections across Perche Creek. The proposed Scott Boulevard interchange could potentially cause traffic shifts from the US Highway 40 Interchange. However, traffic shifts are likely negligible because of the very small traffic volumes to and from the west on I-70 accessing US Highway 40 Interchange.

Major East-West Roadways

MO Route E is a two-lane minor arterial and is a continuation of Stadium Boulevard north of I-70. Traffic volumes along Stadium Boulevard decrease drastically north of I-70 as MO Route E heads away from the City of Columbia and heavy commercial district. In its current configuration, MO Route E provides connectivity to the rural areas north of I-70 to the City of Columbia and I-70. There is potential for future residential developments in the vicinity of the northern city limits. The proposed Scott Boulevard extension would likely shift traffic off of MO Route E and away from Stadium Boulevard Interchange to the new interchange, predominantly to and from the west.

Gibbs Road is a two-lane neighborhood collector providing access to residences to I-70 via Stadium Boulevard. The proposed Scott Boulevard extension will utilize the Gibbs Road alignment between North Outer Road and Barberry Avenue and will impact residences along this stretch. However, Gibbs Road will connect with the new Scott Boulevard extension west of Barberry Avenue and will provide enhanced access to I-70.

North Outer Road (Interstate 70 Drive NW) is a two-lane minor collector located north of I-70 primarily providing access to residential land uses between Perche Creek and Stadium Boulevard. The proposed Scott Boulevard interchange would relocate the North Outer Road slightly to the north at the interchange. North Outer Road travel patterns would shift with the new interchange due to additional access to I-70.

South Outer Road (Interstate 70 Drive SW) is a two-lane major collector located south of I-70 providing access to both residential and commercial land uses. The proposed Scott Boulevard interchange includes a grade-separation over the South Outer Road and connections between Scott Boulevard and the South Outer Road via a jughandle. This configuration increases the spacing between the South Outer Road signal and the interchange and provides increased future development opportunities. Similar to the North Outer Road, extension of South Outer Road over Perche Creek to connect with US Highway 40 will continue to be a viable future option. South Outer Road travel patterns would shift with the new interchange due to additional access to I-70.

West of Stadium Boulevard, Bernadette Drive is a four-lane major collector primarily providing access to several commercial entities including the Columbia Mall. Because of its location and function, the proposed project would have marginal impacts on Bernadette Drive.

Ash Street is a two-lane major collector between Park de Ville Drive and College Avenue primarily providing access to residential land uses. In the vicinity of Stadium Boulevard, Ash Street provides access to several commercial, institutional and high density residential developments including the Activity & Recreation Center and Tiger Village. Ash Street provides an indirect cut-through connection between Stadium Boulevard and Broadway via Fairview Road, Park De Ville Drive and via Heather Lane. The new interchange at Scott Boulevard at Scott Boulevard is anticipated to result in reduced traffic volumes along Ash Street west of Stadium Boulevard by substantially reducing the cut-through traffic from Stadium Boulevard accessing Broadway.

Worley Street is a two-lane major collector between Strawn Road and Providence Road primarily providing access to residential land uses. It continues east of Providence Road as Rogers Street and then becomes Paris Road, extending north of I-70 where it leads out of the City as Route B. In the vicinity of Stadium Boulevard, Worley Street provides access to several commercial developments including the Columbia Mall and also provides connection between Fairview Road and Stadium Boulevard. There is ongoing residential development along Worley Street in the vicinity of Silvey Street. The new interchange at Scott Boulevard will have minimal impacts to traffic patterns on Worley Street.

Broadway (Route TT) is a four-lane major arterial with a fifth turning lane at major intersections, providing access to varying types of land uses across the City of Columbia. Broadway is the first east-west arterial south of I-70 and is the primary access to western Columbia from I-70. Broadway curves to the south and becomes Scott Boulevard towards the southwest part of the study area.

CATSO's long-range plan includes extending Broadway across the Perche Creek and connecting with Route UU. This extension will serve new developments to the west and provide much-needed connectivity across Perche Creek. While there may be some limited relief for western Columbia traffic by providing an additional connection to I-70, significant adverse travel limits the attractiveness for the predominant I-70 traffic movements to and from the east.

There has been a significant amount of crashes along Broadway between Stadium Boulevard and Scott Boulevard. Table 5 shows the total number of fatal, injury, and property-damage-only (PDO) crashes. The crash data also shows that 42% of recorded crashes were rear end crashes.

Table 5: Number of Crashes (2005-2009) Between Stadium Boulevard and Scott Boulevard

	2005	2006	2007	2008	2009	Total
Fatality	1	0	0	0	0	1
Injury	24	26	21	25	32	128
PDO	93	100	78	68	87	426
Total	118	126	99	93	119	555

Table 6 shows the crash rate associated with this section of Broadway versus the state rate. The crash rates along Broadway are significantly higher.

Table 6: Crash Rates (2005-2009) Between Stadium Boulevard and Scott Boulevard

	2005	2006	2007	2008	2009
Crash Rate	798.24	745.66	585.87	563.97	697.11
State Rate RT (Lettered Routes)	257.07	243.56	245.5	232.03	Unknown
State Rate Two-Lane	204.65	200.8	203.44	193.95	Unknown

The proposed Scott Boulevard interchange would reduce traffic volumes on Broadway by shifting I-70 traffic from Stadium Boulevard to Scott Boulevard. Essentially less traffic will help reduce congestion, thus reduce crashes. Additionally, the proposed Scott Boulevard extension will remove the curve at the Broadway and Scott Boulevard intersection.

Gillespie Bridge Road is a two-lane minor arterial about two and half miles south of I-70. It is the only road that crosses Perche Creek between I-70 and Route K. This roadway does not offer any relief to the congestion at Stadium Boulevard because of substantial adverse travel. The proposed interchange is not anticipated to change traffic patterns on this roadway.

2.0 TRANSPORTATION SYSTEM MANAGEMENT

FHWA policy defines "**Transportation System Management:** *All reasonable alternatives for design options, location and transportation system management type improvements (such as ramp metering, mass transit, and high occupancy vehicle (HOV) facilities) have been assessed and provided for if currently justified, or provisions are included for accommodating such facilities if a future need is identified.*"

The purpose of this criterion is to assure that all reasonable alternatives to new or revised access to the interstate have been considered in the form of system improvements and design options. The Transportation System Management (TSM) approach to congestion mitigation seeks to identify improvements to new and existing facilities of an operational nature. These techniques are designed to improve traffic flow and safety through better management and operation of existing transportation facilities. TSM strategies could include intersection improvements and signalization improvements, a freeway bottleneck removal program, and special events management strategies. These strategies are developed to reduce travel time and enhance system accessibility.

Intersection improvements, such as turning lanes, grade separations, pavement striping, signage and lighting, bus turnouts, and channelization of traffic, can greatly improve traffic flow operation on arterials and at intersections. Traffic signal enhancements include signal timing optimization, signal equipment upgrades, and system interconnection. Freeway and arterial bottleneck removal can consist of improving insufficient acceleration and deceleration lanes and ramps, sharp horizontal and vertical curves, narrow lanes and shoulders, inadequate signage and pavement striping, and other geometric characteristics. The identification and elimination of traffic bottlenecks can greatly improve traveling conditions and safety, especially during peak periods. TSM projects can complement the major capacity improvements and infrastructure by providing improved traffic flow on arterials and local streets.

As is discussed in Section 8.0 Operational Analysis, these types of improvements are being considered to improve operations along Stadium Boulevard and at the US Highway 40 interchange and are included in the study's suite of "committed improvements". However, this and previous studies have shown that TSM style improvements alone will not address future capacity deficiencies and provide for appropriate access to the western part of the City of Columbia.

TSM options, such as ramp metering and intelligent transportation systems (ITS), were considered in the analysis for this AJR. However, ITS applications are generally used for system-wide improvements. The proposed project focuses on a single interchange, and thus, ramp metering and ITS treatments would result in only marginal benefits to the overall system. Future inclusion of ITS and/or ramp metering efforts would not be hindered by the construction of an interchange at Scott Boulevard.

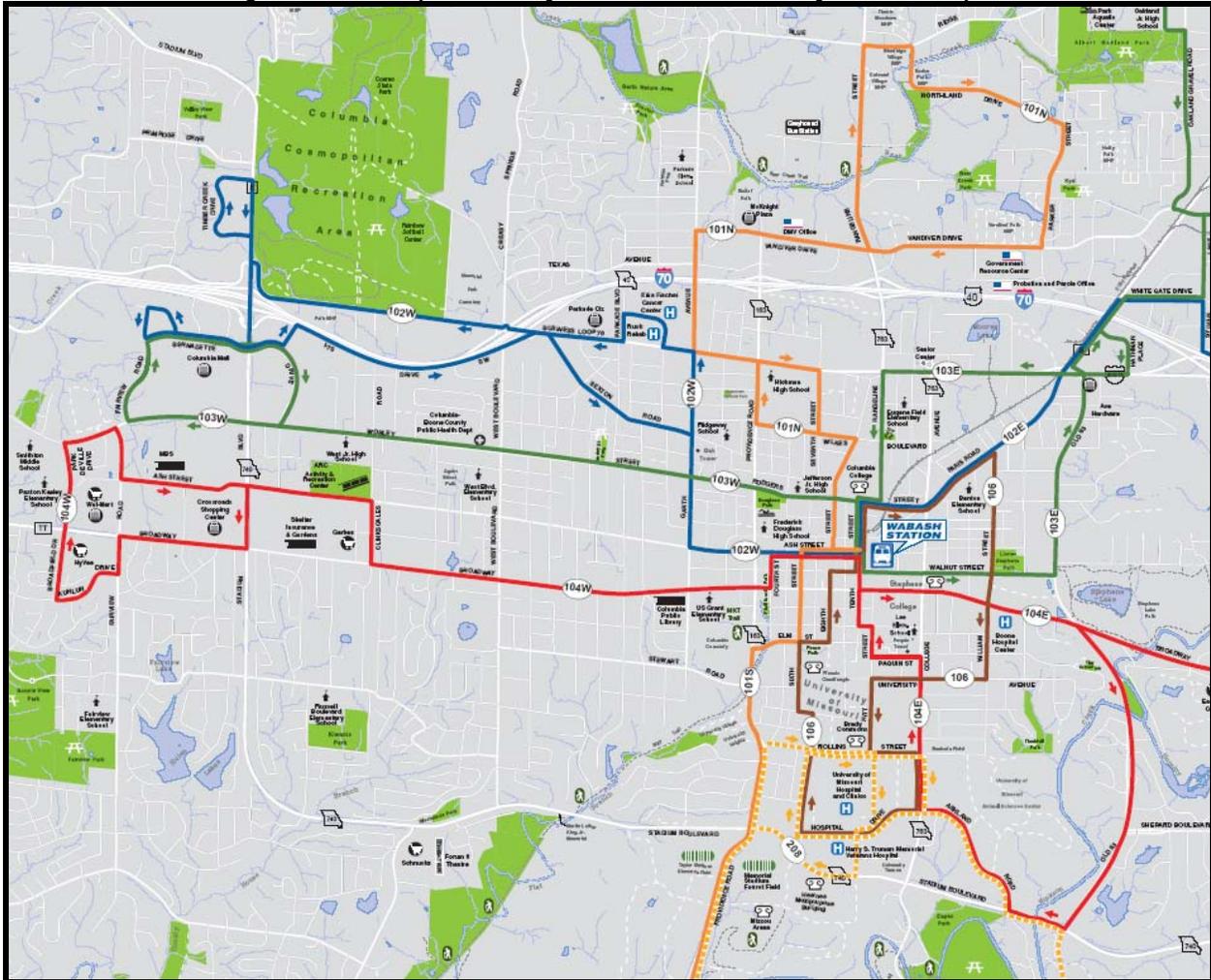
Transit Concepts

Expanding transit services can often reduce the demand placed on the roadway network. There is one major transit service in the City, Columbia Transit⁸. This public bus service has nine major routes

⁸ <http://www.gocolumbiamo.com/PublicWorks/Transportation/>

throughout the City. There are currently three Columbia Transit and paratransit lines that run near the study area, as shown in **Figure 18**. Currently no Columbia Transit routes run as far west as the proposed Scott Boulevard extension. The City of Columbia also has two other limited services in the area, OATS and the University of Missouri (Mizzou) Shuttle service. OATS is a nonprofit service provider offering service to disadvantaged citizens. The Mizzou shuttle service runs Monday through Friday for students and campus employees to get from parking lots to campus buildings or shopping areas.

Figure 18: Excerpt from City of Columbia Weekday Transit Map⁹



The proposed interchange project would not hinder any existing or proposed transit services. Rather, an extended Scott Boulevard could only help to facilitate enhanced future bus service and potentially enhance public transportation to western Columbia.

⁹ <http://www.gocolumbiamo.com/PublicWorks/Transportation/>

3.0 ACCESS CONNECTIONS AND DESIGN

FHWA policy states *“Access Connections and Design: The proposed access connects to a public road only and will provide for all traffic movements, except in only the most extreme circumstances. Less than “full interchanges” for special purpose access for transit vehicles, for HOVs, or into park and ride lots may be considered on a case-by case basis. The proposed access will be designed to meet or exceed current standards for the Interstate System.”*

The purpose of this criterion is to assure that all basic movements are provided for at any proposed interchange, proposed access connects to public roads, and the new interchange will meet all current design standards. The proposed project would create a full-service interchange and connect to an extended Scott Boulevard, which would be a major arterial south of I-70 and a major collector north of I-70.

The proposed interchange is spaced approximately halfway between the US Highway 40 and Stadium Boulevard interchanges with a distance of over one and a half miles between the proposed and adjacent interchanges. This spacing allows for adequate acceleration and deceleration lanes while providing ample room for sign placement between interchanges. The recommended Yellow Alignment does not require any widening of the I-70 Perche Creek bridges.

The interchange will be designed to meet all current standards from the American Association of State Highway and Transportation Officials (AASHTO), MoDOT and the City of Columbia. Moreover, as discussed in Section 5.0 Comprehensive Interstate Network Study, all improvements are being designed to be consistent with the Improve I-70 studies. No design exceptions are anticipated. The appendix provides details about the design standards being used for this study. Some of the key items for the interchange layout are shown below.

Item	Design Criteria	Comments
Roundabout Design Vehicle	WB-67	
Roundabout Diameter	200'	
Interchange Bridge Width	65'-8"	Includes 3 lanes and sidewalks
Other Bridge Widths	77'-8"	Includes 4 lanes and sidewalks
Bridge Clearance	16'-6" vertical and 30' horizontal	
Scott Boulevard Grade	8% maximum	2% at interchange, 6% maximum south of I-70
Ramp Grade	5% maximum	
Ramp Radii	1000' minimum	2857' used
Acceleration/Deceleration Lane Length	400'	
Scott Boulevard Lane Width	12'	
Ramp Lane Width	12'	
Ramp Shoulder Width	4' inside/8' outside	

The construction of the proposed interchange would enhance travel options for western and southern Columbia. Currently, Stadium Boulevard offers the primary access into western Columbia from I-70. However, Stadium Boulevard is a congested commercial corridor carrying a mixture of commercial and commuter traffic. The proposed Scott Boulevard interchange would provide for an alternate commuter connection for areas currently served by the Stadium Boulevard interchange. This would help to eliminate some of the commercial/commuter conflicts that exist along Stadium Boulevard. The proposed interchange

would also enhance travel options for southern Columbia by reducing traffic that now accesses Stadium Boulevard via Providence Road and Forum Boulevard.

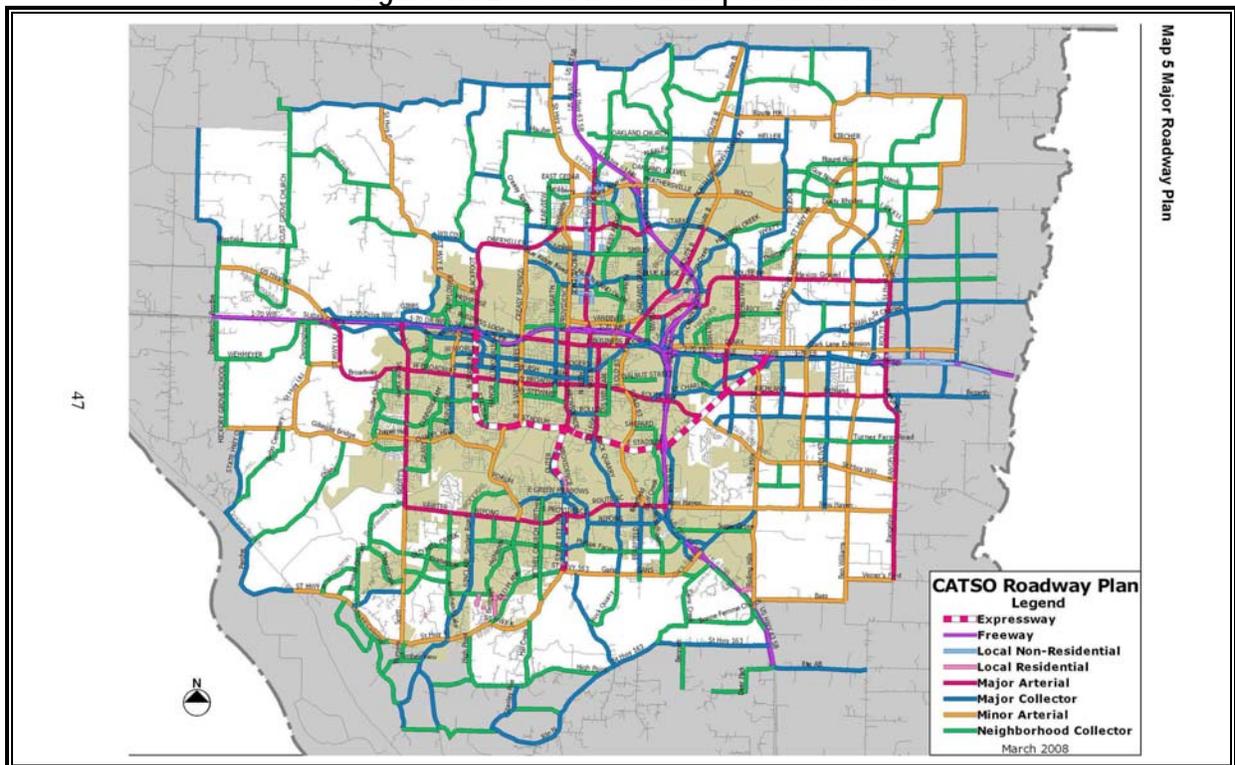
4.0 TRANSPORTATION LAND USE PLANS

FHWA policy states *“Transportation Land Use Plans: The proposal considers and is consistent with local and regional land use and transportation plans. Prior to final approval, all requests for new or revised access must be consistent with the metropolitan and/or statewide transportation plan, as appropriate, the applicable provision of 23 CFR part 450 and transportation conformity requirements of 40 CFR parts 51 and 93.”*

CATSO Long Range Transportation Plan: The purpose of this criterion is to review and coordinate future transportation and land use plans in the vicinity of the proposed project. The following provides a brief history of the Scott Boulevard/I-70 Interchange project inclusion in CATSO’s plan (**Figure 19**).

- On June 26, 2003, the CATSO Coordinating Committee approved an amendment to the Major Roadway Plan to include the extensions of Scott Boulevard and MO Route E to connect with I-70 at a location west of Stadium Boulevard. These roadways were identified as “placeholders,” acknowledging that a new interchange was planned in the general vicinity but that the exact location would be determined at a later date.
- On December 9, 2004, CATSO upgraded the Scott Boulevard extension to I-70 from a placeholder to an identified project in the Major Roadway Plan.
- In 2005 CATSO drafted a Long Range 2030 Transportation Plan which includes an extension of Scott Boulevard and a new interchange with I-70.

Figure 19: 2030 CATSO Transportation Plan



The CATSO 2030 long-range plan states that design and functional classification of each roadway in the Major Roadway Plan must be appropriate to provide for the following; (1) design continuity, (2) adequate main lane capacity, (3) access for adjacent tracts, and (4) functionality with the roadway network¹⁰. The CATSO Plan shows future population growth in western Columbia and traffic volume growth along Stadium Boulevard, with new development (both residential and commercial) driving the increase in traffic volumes.

Impacts: The recommended Yellow Alternative would impact approximately 35 structures (approximately 25 – 30 residential structures and 4 – 5 commercial structures). Most of these impacts occur along existing arterial/collector roadways in the following areas: (1) near the intersection of Broadway and Scott Boulevard, (2) along Strawn Road, (3) in the immediate vicinity of the proposed I-70 interchange (mostly commercial impacts), and (4) along Gibbs Road. Additionally, the project has the potential to impact platted land, as is discussed below.

Platted Land South of I-70: None of the plats south of I-70 would be impacted by the recommended Yellow Alternative.

- The Bellwood Plat is located north of Broadway on the west side of Strawn Road. There are two phases to this development with the first phase containing 96 sites and phase two containing 73 sites. Phase one is approximately 18% built out, and will not be impacted by any of the Scott Boulevard alternatives under study. Phase two would have been substantially impacted by the Brown Alternative, but the recommended Yellow Alternative has no impact on this development.
- The Overlook Plat is located just south of Bellwood phase two. This plat contains 200 sites, none of which are yet under construction. As with Bellwood phase two, this plat would have been significantly impacted by the Brown Alternative but is not impacted by the recommended Yellow Alternative.
- The Vintage Falls Plat is located north of Worley Road east of Strawn Road. This development contains 147 sites and is approximately 21% built out. This land would have been substantially impacted by the Blue Concept, but is not impacted by the recommended Yellow Alternative.

Platted Land North of I-70: There is significant undeveloped acreage north of I-70 with the potential for future residential neighborhoods. Most of this land is unplatted at this time. However, the Scott Boulevard extension will have a significant impact on the Monterrey Plat which lies at the tie-in point between the Scott Boulevard extension and MO Route E. This plat contains 99 sites, none of which are yet under construction.

¹⁰ <http://www.gocolumbiamo.com/Planning/LongRangePlan2030>

5.0 COMPREHENSIVE INTERSTATE NETWORK STUDY

FHWA policy states “*Comprehensive Interstate Network Study: In areas where the potential exists for future multiple interchange additions, all requests for new or revised access are supported by a comprehensive interstate network study with recommendations that address all proposed and desired access within the context of a long-term plan.*”

The proposed Scott Boulevard/I-70 Interchange is located between existing interchanges at US Highway 40 and Stadium Boulevard. I-70 is a primary highway serving the Columbia metropolitan area. Since it connects Kansas City, St. Louis, and Columbia with the national interstate freeway system, I-70 is one of the most important transportation corridors in Missouri. The MoDOT has completed several corridor studies¹¹ to improve the capacity and safety of I-70 across Missouri.

In December 2001, MoDOT completed the First Tier I-70 Improvement Study, which determined that the best strategy for improving I-70 was to widen and reconstruct it. In October 2005, MoDOT completed the Second Tier I-70 EIS, which provided more information on the location, basic design, impacts, and the cost of the preferred improvement alternative. In 2009 MoDOT completed a Supplemental EIS which recommends truck-only lanes on I-70 across Missouri. The preferred improvement alternatives were chosen to balance environmental concerns with community needs.

This study has undertaken significant coordination efforts with the Improve I-70 team to ensure that the proposed Scott Boulevard interchange would be compatible with and complimentary to the proposed Improve I-70 improvements. Members of the Improve I-70 team have attended the Scott Boulevard interchange Core Team meetings and have participated in the development of alternatives and recommendations.

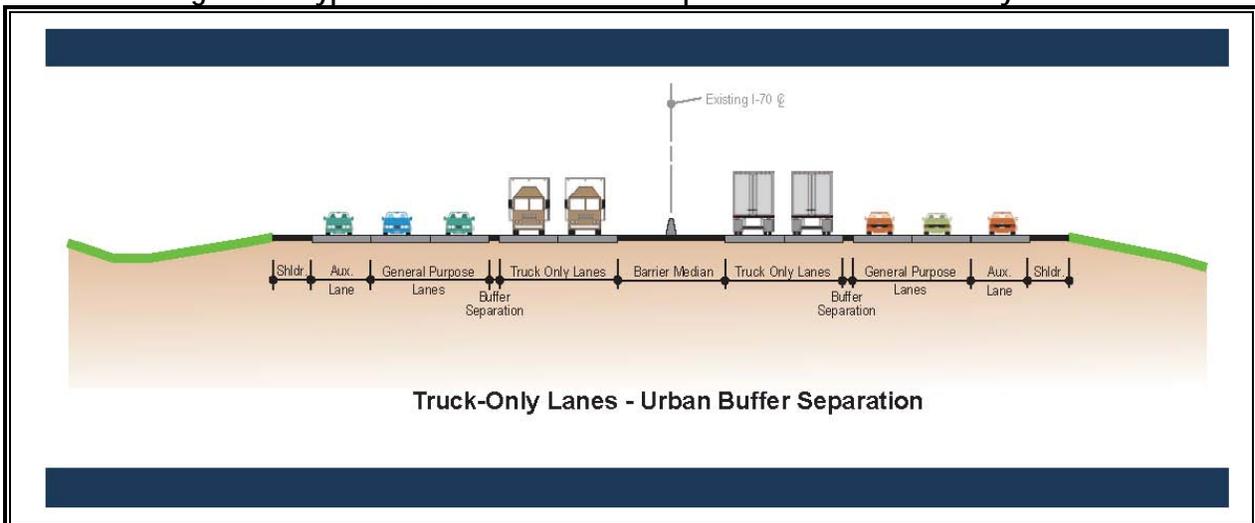
Improve I-70 Strategy

The preferred Improve I-70 strategy is to construct truck-only lanes on the inside of general purpose lanes through Missouri. In rural areas, the strategy includes two truck-only lanes separated from the two general purpose lanes by a grass median. In urban areas, the strategy includes two truck-only lanes separated from two or more general purpose lanes. The truck-only lanes would be buffer-separated from the general purpose lanes by either a rumble strip or a two-foot-wide paint stripe. Access to local interchanges from the truck-only lanes could be provided by a dedicated truck interchange, slip ramps between truck-only lanes and general purpose lanes, or controlled breaks in the buffer separation.

The preferred design for mainline I-70 through the Scott Boulevard interchange study area is two truck-only lanes and three general purpose lanes each direction separated by a buffer, as shown in Figure 14. Access to and from the truck-only lanes through Columbia is being planned via controlled breaks in the buffer separation. No slip ramps or dedicated truck interchanges are being planned in the study area. The Improve I-70 team has tentatively identified buffer separation breaks on each side of the Scott Boulevard interchange that would provide access for any trucks destined to the Scott Boulevard, Stadium Boulevard, and US Highway 40 interchanges.

¹¹ www.improvei70.org

Figure 20: Typical Mainline Section for Improve I-70 within the Study Area



Currently, the preferred alternative shown in the Improve I-70 EIS at Stadium Boulevard is to construct a tight diamond interchange with future fly-over ramps onto Fairview Road to and from the east (Figure 21). However, in light of near term improvement plans¹², MoDOT may consider modifying the preferred alternative to a Diverging Crossover Diamond Interchange (DCD) configuration.

Figure 21: Proposed Improve I-70 Stadium Boulevard Interchange

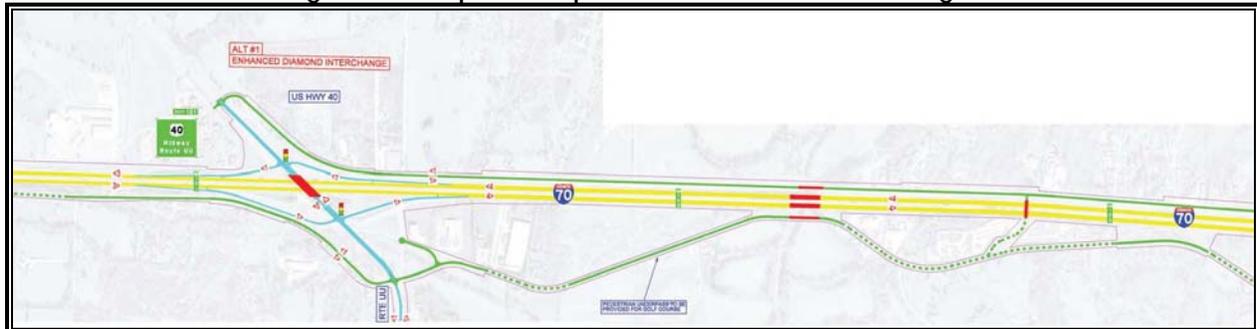


Source – www.improvei70.org

¹² http://www.modot.org/central/major_projects/boone.htm

Improve I-70 recommends upgrading the diamond interchange at US Highway 40 to a standard diamond interchange by consolidating the existing two intersections of the eastbound ramps and relocating the eastbound ramp terminal further west of its existing location (Figure 22).

Figure 22: Proposed Improve I-70 Route 40 Interchange



Source – www.improvei70.org

Compatibility of Scott Boulevard Interchange and Improve I-70 Projects

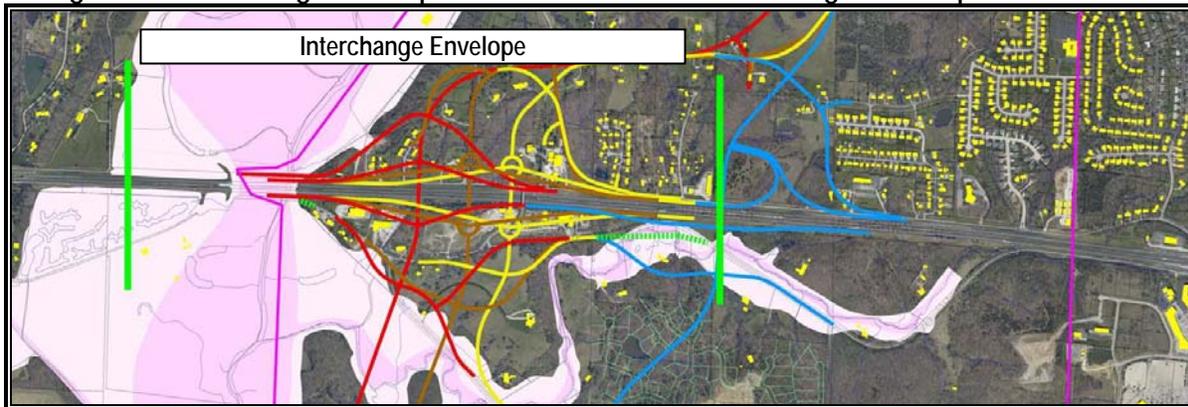
Although not a required component of the Improve I-70 project, the Improve I-70 studies did acknowledge the benefits of a future I-70 interchange at Scott Boulevard. Because the Improve I-70 and Scott Boulevard Interchange projects are so intertwined, the project teams collaborated extensively to ensure compatibility of the two projects. Members of the Improve I-70 team served on the Scott Boulevard AJR Core Team and participated in the development of alternatives and study recommendations. The following are key collaboration factors.

Location of Scott Boulevard Interchange: The US Highway 40 and Stadium Boulevard interchanges are approximately 3.2 miles apart. The recommended Scott Boulevard interchange location falls approximately midway between these interchanges with 1.6 miles to each adjacent interchange. As discussed in Section 8 Operational Analysis, this is adequate distance to provide for freeway merging and weaving. The proposed Fairview ramps are directional ramps serving movements to and from the east on I-70. These directional ramps would provide 1.3 miles of separation from the proposed Scott Boulevard interchange. If these ramps are constructed they would provide for adequate distance for freeway merging and weaving. Thus, the recommended Scott Boulevard interchange location provides for adequate separation between the proposed Scott Boulevard interchange and all proposed improvements to Stadium Boulevard.

As a part of the collaborative efforts, the Improve I-70 team provided the Scott Boulevard interchange team with a recommended 'envelope' to locate a future Scott Boulevard interchange (Figure 23). The recommended Yellow interchange location falls entirely within the recommended envelope.

Structure Length: The Improve I-70 plans call for two truck-only lanes and three general purpose lanes in each direction through the Scott Boulevard interchange study area. Accordingly, the Scott Boulevard overpass is being designed to span the entire ten-lane section of the future freeway. Additionally, ramp tie-ins from the Scott Boulevard interchange are being designed to ultimately fit the proposed I-70 ten-lane section. Temporary tie-ins to the existing four-lane freeway will be designed in the event that the Scott Boulevard interchange is constructed before Improve I-70 plans are put into place.

Figure 23: Interchange Envelope for Scott Boulevard Interchange from Improve I-70 Team



Continuous Outer Roads: Improve I-70 plans call for continuous outer roads through the Scott Boulevard interchange study area to achieve system redundancy in the event of incidents on I-70. This will be accomplished by maintaining the existing outer roads and constructing bridges over Perche Creek that parallel I-70. The recommended Yellow Alternative maintains continuous outer roads both north and south of I-70 with Improve I-70 tie-in points on both sides of the study area.

6.0 COORDINATION WITH TRANSPORTATION SYSTEM IMPROVEMENTS

FHWA policy states "**Coordination with Transportation System Improvements:** *The request for a new or revised access generated by new or expanded development demonstrates appropriate coordination between the development and related or otherwise required transportation system improvements.*"

It is anticipated that this will be a publicly funded project. Currently, there are no private interests participating in the planning process. Therefore, coordination of project financing/staging with private interests is not an issue.

However, the proposed Scott Boulevard/I-70 interchange would be built in conjunction with a project to extend Scott Boulevard from its current terminus at Broadway across I-70 to MO Route E. The Scott Boulevard Extension project would connect the new interchange to the regional arterial system. Currently there is no funding identified for either the proposed interchange or Scott Boulevard extension project. Therefore, construction schedules are undetermined at this time.

Additionally, as discussed in Section 5.0 Comprehensive Interstate Network Study, this project is being designed to be compatible with MoDOT's Improve I-70 project. Funding has also not been identified for that project, and it also has an undefined schedule for construction. As such the proposed Scott Boulevard interchange is being planned so that it could be constructed before, in conjunction with, or after the Improve I-70 project.

7.0 STATUS OF PLANNING AND NEPA

FHWA policy states "**Status of Planning and NEPA:** *The request for new or revised access contains information relative to the planning requirements and the status of the environmental processing of the proposal.*"

FHWA approval constitutes a Federal action and therefore, requires that NEPA procedures be followed, regardless of the funding source. As suggested by the FHWA in the Policy and Procedures for New or Revised Interstate Access Approval in Missouri, concept approval should be sought as soon as possible once the City of Columbia and MoDOT have a good understanding of the scope and impact of the proposed improvement.

A project scoping meeting was held on June 26, 2008, with representatives from the City of Columbia, MoDOT District 5, MoDOT Central Office, FHWA, and the consultant team. Consensus was reached at this meeting that a Scott Boulevard/I-70 interchange study would also need to consider an extension of Scott Boulevard between Broadway and MO Route E to connect the interchange with the local arterial system. Consensus was also reached that the complexities of extending Scott Boulevard warranted an EA.

This AJR is being submitted for Concept Approval while the EA is being prepared. The EA should be submitted to FHWA during the summer of 2010 with a public hearing anticipated in fall of 2010. There is currently no funding identified for the design or construction of either the interchange or Scott Boulevard extension, so the timeframe for construction is undetermined.

When submitted, the EA will include detailed environmental impacts. The EA is considering a 500-foot study corridor (250 feet on each side of the centerline). The architectural investigation will include an Area of Potential Effect (APE), which is an additional 100 feet on both sides of the environmental study corridor. This area shall be examined for the corridor's effect on architectural resources due to the proximity of the improvements. For natural resource constraints (wetlands, streams, and protected species habitat) the comparison includes all resources in the environmental study corridor. For historic resources and archaeological resources, the comparison includes all resources in the environmental study corridor and the APE. Impacts to residences, businesses, schools, and potential 4(f) resources are being assessed primarily within the construction limits.

For the EA, major areas of concern include: (1) Socioeconomic Considerations (e.g., businesses impacts, residential impacts, and noise); (2) Natural Resources (e.g., wetlands/streams, protected species habitat-riparian forests/forested uplands, and climax forests designated by the City of Columbia); and (3) Historic Resources/4(f) Resources (e.g., archaeological sites, historic structures, and parkland impacts).

Socioeconomic considerations include impacts to business and residences and noise impacts. The majority of business impacts would occur in the interchange area. Sorrels Auto Parts, if impacted, could require environmental clean-up of hazardous materials from auto salvage operations. Noise impacts will also be a primary concern in the interchange area.

Natural resources in the corridor include streams, wetlands, and protected species habitat. In particular, forested riparian corridors and uplands along Harmony Creek, tributaries to Harmony Creek, and tributaries

to Perche Creek, serve as potential habitat to the federally and state-listed endangered species, gray bat (*Myotis grisescens*) and Indiana bat (*Myotis sodalis*). In addition, the City of Columbia has designated climax forests as a regulated natural resource in the project area.

Historic and cultural resources include reported archaeological sites, historic structures located near the northern connection at north Broadway, and 23 farmsteads that require further investigation. In the study area, a potential exists for pre-historic burial grounds, burial mounds, and family plots. Historic resources within the APE of reasonable alternatives that are determined eligible for the National Register of Historic Places (NRHP) and cannot be avoided would require consultation with the State Historic Preservation Office (SHPO), FHWA, and MoDOT. Impacting any historic resources that requires preservation in place would also require a Section 4(f) evaluation. The City of Columbia has a planned park that borders existing Strawn Road. Impacts to parkland would require a 4(f) evaluation and consultation with FHWA and MoDOT.

The Study Team conducted a public open house on June 22, 2009, to discuss potential impacts of the proposed interchange and Scott Boulevard extension. This meeting also provided an opportunity for the Study Team and public to share ideas on potential alternatives. The open house was located at the Activity & Recreation Center (ARC) and was open to the public from 4:00 p.m. to 8:00 p.m.

Figure 24: Discussion during the June 22, 2009 Public Open House



Notices of the public open house were provided via the Columbia Tribune, a newsletter that was sent to approximately 500 households (including property owners potentially impacted by the alternatives and

those within or near the study area), and the posting of the newsletter on the City of Columbia's website. Approximately 100 people attended the meeting. At the open house, four ten-minute Power Point presentations were given to provide a general overview of the study. This presentation was consequently posted on the City of Columbia's website after the meeting. Exhibits were displayed and project personnel were available for questions from the public as well as for alternative development brainstorming. Copies of the newsletter, exhibit boards, and PowerPoint presentation are shown in the Appendix.

As a result of the newsletter and public open house, 44 comments were received and documented (of which 29 were provided via the comment form or email). In general, public comments were in favor of an additional interchange west of Stadium Boulevard. Nearly 80% of those who submitted comments were residents or business owners within the study area. Approximately 62% indicated a need for the interchange, only 7% indicated that they did not feel there was a need, and 31% did not indicate a preference. Some common concerns relayed were: (1) the impact of the proposed extension of Scott Boulevard on the Christian Fellowship School (specifically its playground); (2) the chronic flooding of Strawn Road; and (3) the need to minimize the disruption to existing residents/homes/businesses.

Several news stories related to this project have been written for the *Columbia Tribune* and the *Columbia Missourian*. Based on open house comments and other input (such as public blogs), there appears to be a general consensus among the public that this project is warranted. No public controversies are expected.

8.0 OPERATIONAL ANALYSIS

FHWA policy states *“Operational Analysis: The proposed access point does not have a significant adverse impact on the safety and operation of the Interstate facility based on an analysis of current and future traffic. The operational analysis for existing conditions shall, particularly in urbanized areas include an analysis of section of Interstate to and including at least the first adjacent existing or proposed interchange on each side. Crossroads and other roads and streets shall be included in the analysis to the extent necessary to assure their ability to collect and distribute traffic to and from the interchange with the new or revised access points.”*

Capacity Analysis Methodology

A detailed capacity analysis was undertaken to determine the anticipated roadway operating conditions for the existing, no-build, and build conditions. Various tools were used to evaluate the operating conditions of the different scenarios. SYNCHRO, VISSIM, and the Highway Capacity Software (HCS+) traffic evaluation packages were used in the analysis to capitalize on the strengths of each tool and to compare the results of various packages for further verification.

SYNCHRO and HCS+ analysis procedures are based upon the methodologies outlined in the “Highway Capacity Manual” (HCM), last updated by the Transportation Research Board (TRB) in 2000. The HCM, used universally by highway and traffic engineers to measure roadway capacity, establishes criteria for six Levels of Service (LOS): LOS A (“Free Flow”) through LOS F (“Breakdown Conditions”). SYNCHRO was used to evaluate the operating conditions at the signalized intersections in the study area. HCS+ was utilized to evaluate the merge, diverge, and basic freeway segments along mainline I-70.

VISSIM is a micro-simulation model used to analyze complex transportation systems. It allows the user to observe simulated traffic conditions. Output from VISSIM models was used to evaluate at-grade intersection and freeway operations. Default driving behavior parameters for version 5.10 were used in this analysis and no changes were made to driving behavior sets. We have found that the default driving behavior parameters tend to provide for reasonable capacities and saturation flow rates for Missouri freeways and urban roadways.

These various packages used together are a powerful tool for analyzing conditions on a system network like the one proposed in this study. For example, traffic signal optimization was completed in SYNCHRO and exported into the VISSIM models. Moreover, the VISSIM models were built with origin destination tables, rather than turning movements at each individual intersection. This structure ensures more realistic vehicle paths through the model network and also allows for more efficient testing of multiple alternatives.

Several Measures of Effectiveness (MOE) were used in this evaluation including: LOS, volume to capacity ratios (v/c), intersection capacity utilization (ICU), vehicular delay, density, travel speed, and queue lengths. LOS is directly related to control delay. At signalized intersections, the LOS criteria differ from that at unsignalized intersections primarily because different transportation facilities create different driver expectations. The expectation is that a signalized intersection is designed to carry higher traffic volumes and, consequently, may experience greater delay than an unsignalized intersection. **Table 7** summarizes

the LOS thresholds used in the analysis for intersections. Typically LOS D is considered acceptable in urban areas for both freeways and arterial roadways.

Table 7: Intersection Level of Service Thresholds

Level of Service (LOS)	Control Delay per Vehicle (seconds/vehicle)	
	Signalized Intersections/Roundabouts	Unsignalized Intersections
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

In addition to LOS, v/c ratios and ICU rates provide important measures to describe an intersection's operations. Intersection movements can have acceptable LOS (D or better) yet still have unacceptably high v/c ratios and ICU rates. In general, v/c ratios and ICU rates around 0.9 result in occasional queuing and cycle failure, v/c ratios and ICU rates between 0.9 and 1.0 result in frequent queuing and cycle failure, and v/c ratios and ICU rates over 1.0 result in general failure of the movement. Therefore, it is important to consider v/c ratios and ICU rates in addition to LOS and vehicular delay when evaluating an intersection's operations.

The mainline I-70 operating conditions analysis was performed using VISSIM and HCS+. Both analysis techniques used density as an MOE to determine LOS along a freeway. Although speed is a major indicator of service quality to drivers, freedom to maneuver within the traffic stream and proximity to other vehicles, as measured by the density of the traffic stream, are equally noticeable concerns. Density increases as flow increases up to capacity, resulting in an MOE that is sensitive to a broad range of flows. For these reasons, density is the parameter used to define LOS for the freeway and ramp sections, as shown in Table 8.

Table 8: Freeway Level of Service Criteria

Level of Service	Freeway Weaving Segment Density (pc/mi/ln)*	Merging and Diverging Segment Density (pc/mi/ln)*	Basic Freeway Segment Density (pc/mi/ln)*
A	0 – 10	0 – 10	0 – 11
B	> 10 – 20	> 10 – 20	> 11 – 18
C	> 20 – 28	> 20 – 28	> 18 – 26
D	> 28 – 35	> 28 – 35	> 26 – 35
E	> 35 – 43	> 35	> 35 – 45
F	> 43	Demand exceeds capacity	> 45

* pc/mi/ln = passenger cars per mile per lane

Existing Traffic Conditions

The area south of I-70 between Perche Creek and Stadium Boulevard is one of the City of Columbia's key growth areas. Stadium Boulevard is the only practical way to access I-70 from this area, due largely to the

barrier formed by Perche Creek. These circumstances put a strain on Stadium Boulevard. This condition leads to daily congestion and gridlock along Stadium Boulevard between I-70 and Broadway.

Field observations show that the Stadium Boulevard corridor currently operates at capacity and is unstable. This condition is exacerbated by the close signal spacing on Stadium Boulevard near I-70. Daily fluctuations along the Stadium Boulevard corridor result in congested yet flowing conditions on light traffic days to gridlock on heavier days. Continuous vehicular queues can develop on Stadium Boulevard between I-70 and Broadway, constraining nearly all intersections. The existing interchange is not adequate to handle the very heavy travel demands, especially during the evening peak hour.

Within the study area, the Stadium Boulevard corridor is a five-lane undivided roadway with a center two-way left-turn lane. Base traffic volumes were collected from field counts gathered by MoDOT in 2006. Data Collection for this study entailed manual turning movement volumes and machine counts collected in October 2008 to supplement the count data provided by MoDOT. During this process, manual vehicle classification counts on I-70 and Stadium Boulevard were collected to ensure accurate use of truck percentages in operational analysis models.

Our data indicate 15% trucks on I-70 and 2% trucks on local roads during the peak hours. The trucks were sub-classified into single unit trucks and combination unit trucks. For I-70, trucks included 30% Single-Unit and 70% Combination-Unit. For local roads, trucks included 75% Single-Unit and 25% Combination-Unit. **Figure 25** shows locations and type of traffic count data obtained and **Figure 26** shows the existing morning (7:00 - 8:00 am) and afternoon (4:30 – 5:30 pm) peak period traffic volumes used for this study.

The existing intersection operations analysis results from SYNCHRO and VISSIM are shown in **Tables 9 and 10** for the morning and afternoon peak hours. The existing freeway operations analysis results from HCS+ and VISSIM are summarized in **Tables 11 and 12**. The highlighted areas of the tables signify intersections or roadway segments of concern. Specifically red highlighting denotes LOS F or ICU over 100% and yellow highlighting denotes LOS E or ICU between 90% and 100%.

Table 9: Existing Conditions Intersections Analysis Results (SYNCHRO)

Intersections along Stadium Boulevard	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)*	ICU	LOS	Delay (sec/veh)*	ICU
North Outer Road	B	10.8	67.8%	B	11.1	68.5%
I-70 WB Ramps	C	34.1	117.7%	E	69.8	128.1%
I-70 EB Ramps	C	23.3	117.7%	F	88.8	128.1%
South Outer Road	D	39.6	87.2%	F	121.0	108.6%
Bernadette Drive	B	17.3	74.0%	F	89.3	85.9%
Worley Street	C	24.5	67.3%	E	56.3	85.9%
Ash Street	C	21.5	69.8%	E	74.9	97.0%
Broadway Boulevard	C	28.7	67.5%	E	70.2	89.7%

* sec/veh = seconds per vehicle

** ft = feet

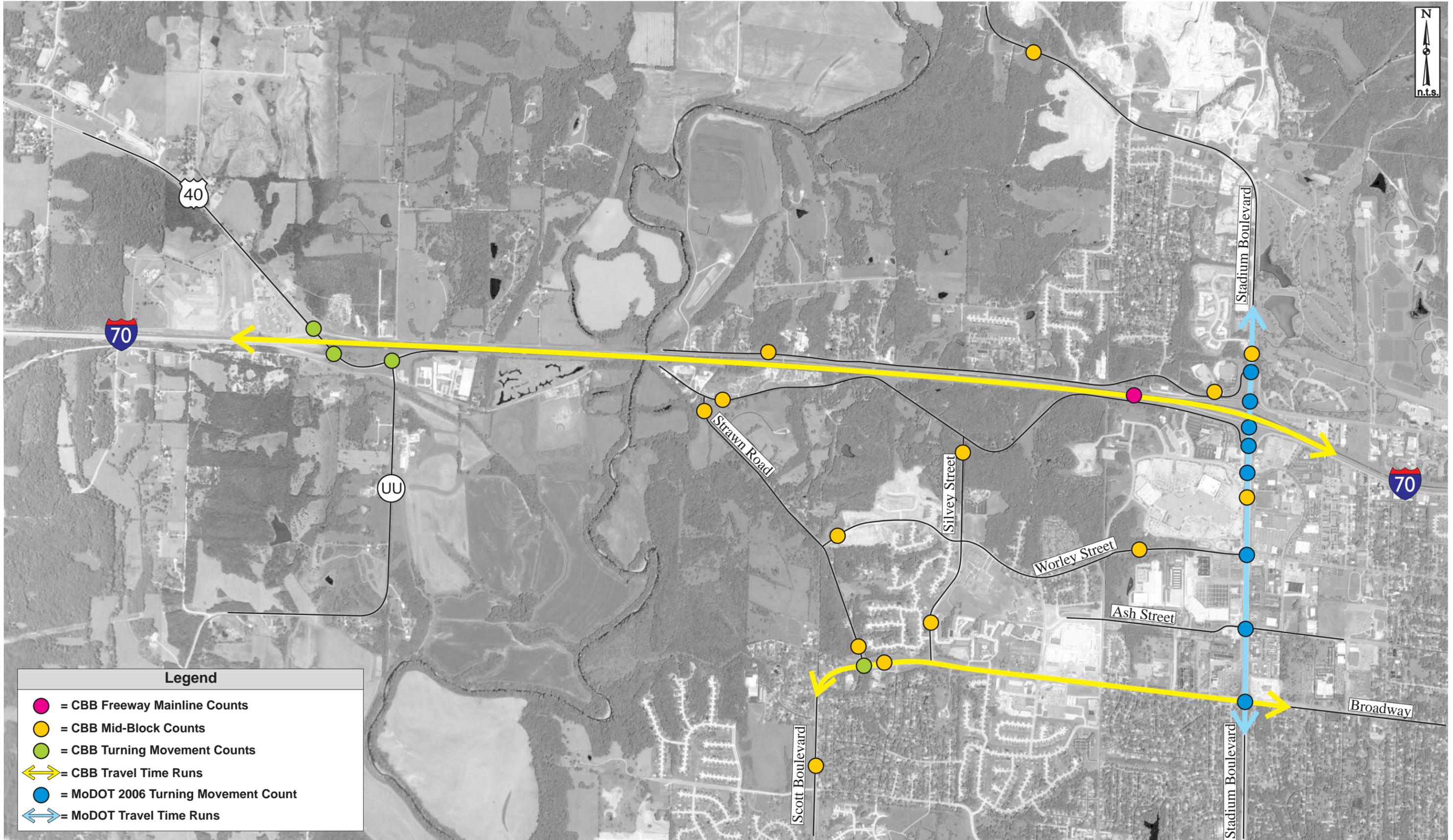
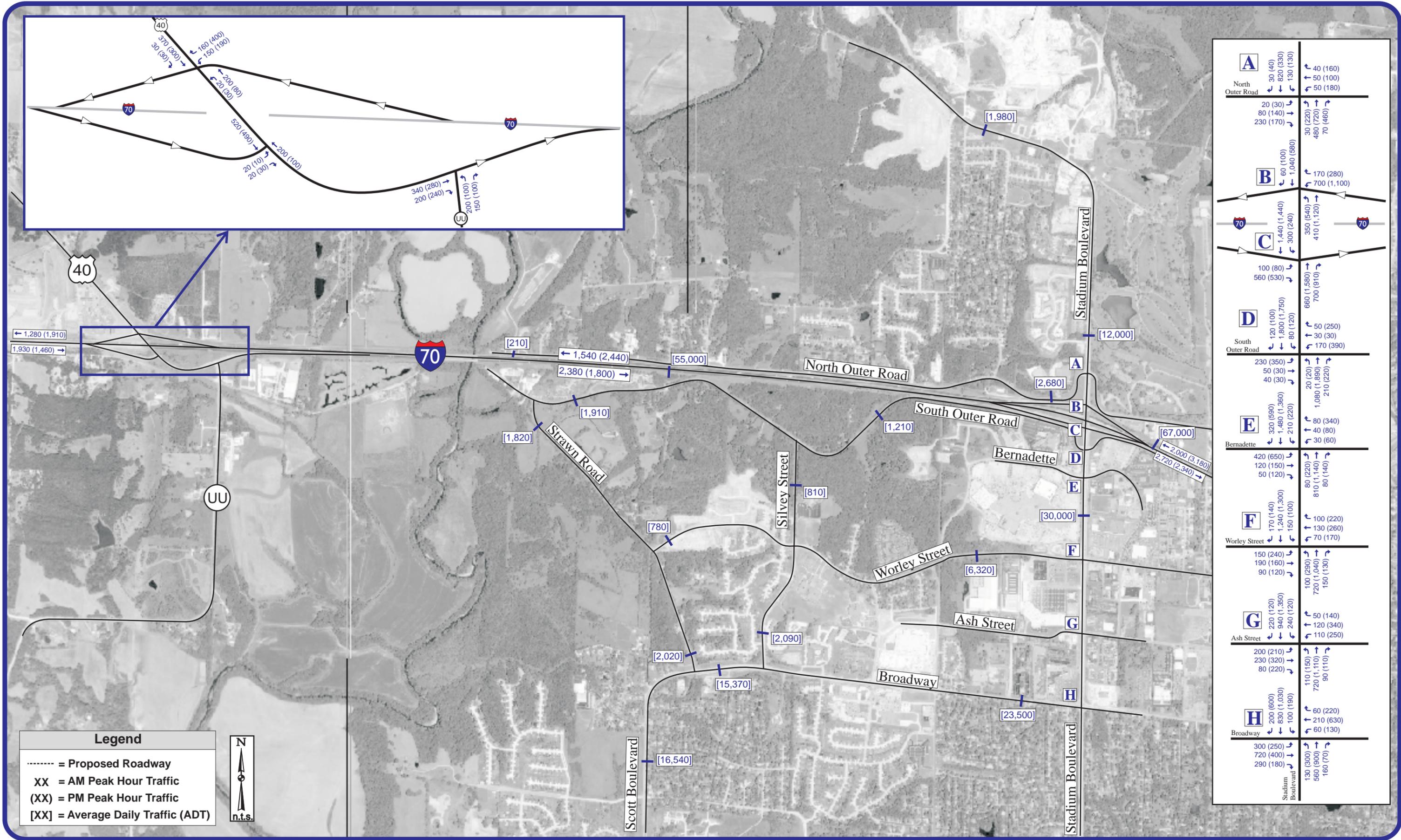


Figure 25: Traffic Counts



A	30 (40) 820 (330) 130 (130)	40 (160) 50 (100) 50 (180)
North Outer Road	20 (30) 80 (140) 230 (170)	30 (220) 480 (720) 70 (460)
B	60 (100) 1,040 (580)	170 (280) 700 (1,100)
C	1,440 (1,440) 300 (240)	350 (540) 410 (1,120)
D	120 (100) 1,800 (1,750) 80 (120)	50 (250) 30 (30) 170 (390)
South Outer Road	230 (350) 50 (30) 40 (30)	20 (20) 1,080 (1,890) 210 (220)
E	320 (580) 1,480 (1,360) 210 (220)	80 (340) 40 (80) 30 (60)
Bernadette	420 (650) 120 (150) 50 (120)	80 (220) 810 (1,140) 80 (140)
F	170 (140) 1,240 (1,300) 150 (100)	100 (220) 130 (260) 70 (170)
Worley Street	150 (240) 190 (160) 90 (120)	100 (280) 720 (1,040) 150 (130)
G	220 (120) 940 (1,350) 240 (120)	50 (140) 120 (340) 110 (250)
Ash Street	200 (210) 230 (320) 80 (220)	110 (150) 720 (1,110) 90 (110)
H	200 (600) 830 (1,030) 100 (190)	60 (220) 210 (630) 60 (130)
Broadway	300 (250) 720 (400) 290 (180)	130 (300) 560 (900) 160 (70)
Stadium Boulevard		

Figure 26: Existing Traffic Volumes

Table 10: Existing Conditions Intersections Analysis Results (VISSIM)

Intersections along Stadium Boulevard	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)*	Max Queue, ft**	LOS	Delay (sec/veh)*	Max Queue, ft**
North Outer Road	A	6.4	150	B	10.7	290
I-70 WB Ramps	C	31.7	440	D	36.2	720
I-70 EB Ramps	B	17.0	430	C	28.8	510
South Outer Road	D	50.3	750	D	39.2	740
Bernadette Drive	C	34.2	800	E	74.5	1570
Worley Street	B	19.8	320	E	79.7	1360
Ash Street	C	30.1	810	E	68.9	1360
Broadway Boulevard	C	24.6	400	D	51.1	1190

* sec/veh = seconds per vehicle

** ft = feet

Table 11: Existing Conditions Freeway Analysis Results (HCS+)

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
West of US 40	EB	Freeway	B	16.1	70.0	B	12.2	70.0
I-70 to US 40 Off-Ramp	EB	Diverge	C	20.9	61.5	B	16.2	61.5
US 40 to I-70 On-Ramp	EB	Merge	C	24.1	60.0	B	19.0	61.0
Between US 40 and Stadium Blvd	EB	Freeway	C	19.9	70.0	B	15.0	70.0
I-70 to Stadium Blvd Off-Ramp	EB	Diverge	C	23.5	55.5	B	19.6	53.6
Stadium Blvd to I-70 On-Ramp	EB	Merge	C	26.7	53.0	C	23.1	54.0
East of Stadium Blvd	EB	Freeway	D	26.5	60.0	C	22.8	60.0
East of Stadium Blvd	WB	Freeway	C	19.5	60.0	D	31.3	59.3
I-70 to Stadium Blvd Off-Ramp	WB	Diverge	C	21.7	53.1	D	33.5	52.2
Stadium Blvd to I-70 On-Ramp	WB	Merge	B	16.6	54.0	C	24.5	54.0
Between US 40 and Stadium Blvd	WB	Freeway	B	12.9	70.0	C	20.4	69.9
I-70 to US 40 Off-Ramp	WB	Diverge	B	17.0	60.8	C	26.1	60.0
US 40 to I-70 On-Ramp	WB	Merge	B	14.6	62.0	C	20.3	61.0
West of US 40	WB	Freeway	A	10.7	70.0	B	15.9	70.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table 12: Existing Conditions Freeway Analysis Results (VISSIM)

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
West of US 40	EB	Freeway	B	13.4	72.0	A	10.1	72.2
I-70 to US 40 Off-Ramp	EB	Diverge	B	13.4	72.0	B	10.1	72.2
US 40 to I-70 On-Ramp	EB	Merge	B	11.8	67.2	A	8.8	68.2
Between US 40 and Stadium Blvd	EB	Freeway	B	17.8	67.1	B	13.3	68.0
I-70 to Stadium Blvd Off-Ramp	EB	Diverge	B	17.8	67.1	B	13.3	68.0
Stadium Blvd to I-70 On-Ramp	EB	Merge	B	14.8	60.1	B	12.4	60.4
East of Stadium Blvd	EB	Freeway	C	21.8	61.3	C	18.3	61.6
East of Stadium Blvd	WB	Freeway	B	16.2	61.9	C	26.0	61.2
I-70 to Stadium Blvd Off-Ramp	WB	Diverge	B	16.2	61.9	C	26.0	61.2
Stadium Blvd to I-70 On-Ramp	WB	Merge	A	8.4	61.3	B	13.5	60.6
Between US 40 and Stadium Blvd	WB	Freeway	A	10.9	70.9	B	17.6	70.3
I-70 to US 40 Off-Ramp	WB	Diverge	B	10.9	70.9	B	17.6	70.3
US 40 to I-70 On-Ramp	WB	Merge	A	6.1	71.8	A	9.3	71.6
West of US 40	WB	Freeway	A	9.2	71.6	B	14.0	71.3

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

The above tables show several intersections along Stadium Boulevard operating at LOS E/F during the evening peak hour. Also, almost all intersections are close to or over capacity during the evening peak hour. It is noteworthy that the SYNCHRO and VISSIM models often provide different results. These differences can reveal nuances in the operational aspects of the corridor. For instance, the SYNCHRO analysis shows LOS F for the eastbound I-70 ramps in the evening peak hour (see Table 9) but the VISSIM models shows LOS C for this same intersection (see Table 10). This is a result of traffic metering (and traffic starvation at the signal) that occurs along northbound Stadium Boulevard which is accounted for in the VISSIM models but not the SYNCHRO models. However, the SYNCHRO results show that the elimination of these upstream constraints would result in significant capacity problems at this intersection.

All basic freeway and merge/diverge segments along I-70 operate at acceptable conditions with LOS D or better during both peak hours. VISSIM snapshots in Figures 27 and 28 illustrate congested traffic conditions and queuing during the evening peak hour.

Figure 27: VISSIM Screenshot of Typical PM Peak Period Existing Conditions
Queuing along Stadium Boulevard (North End)

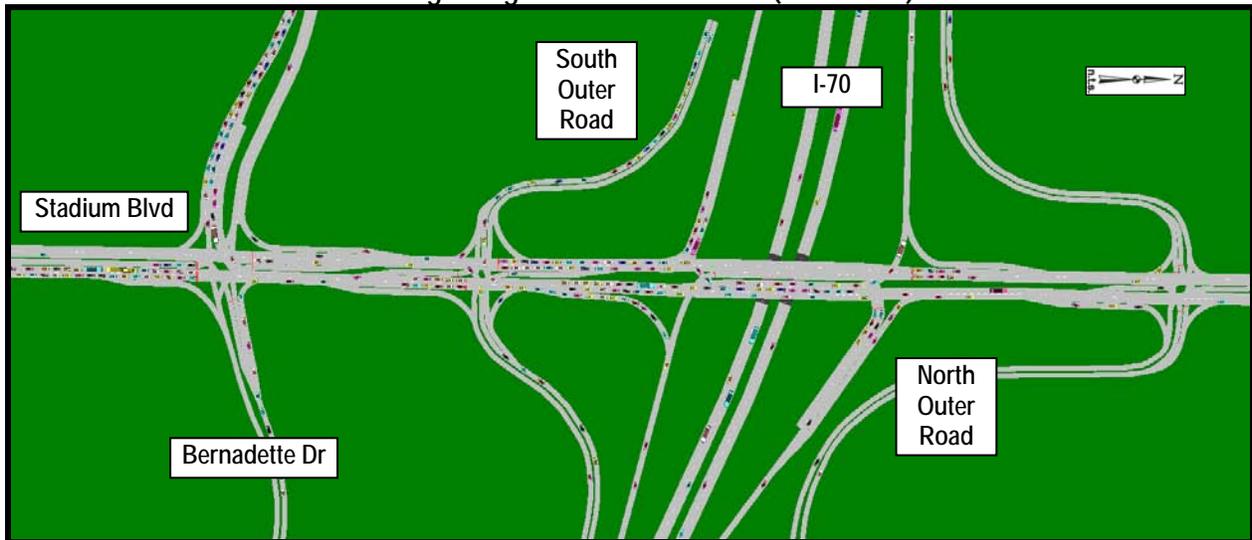
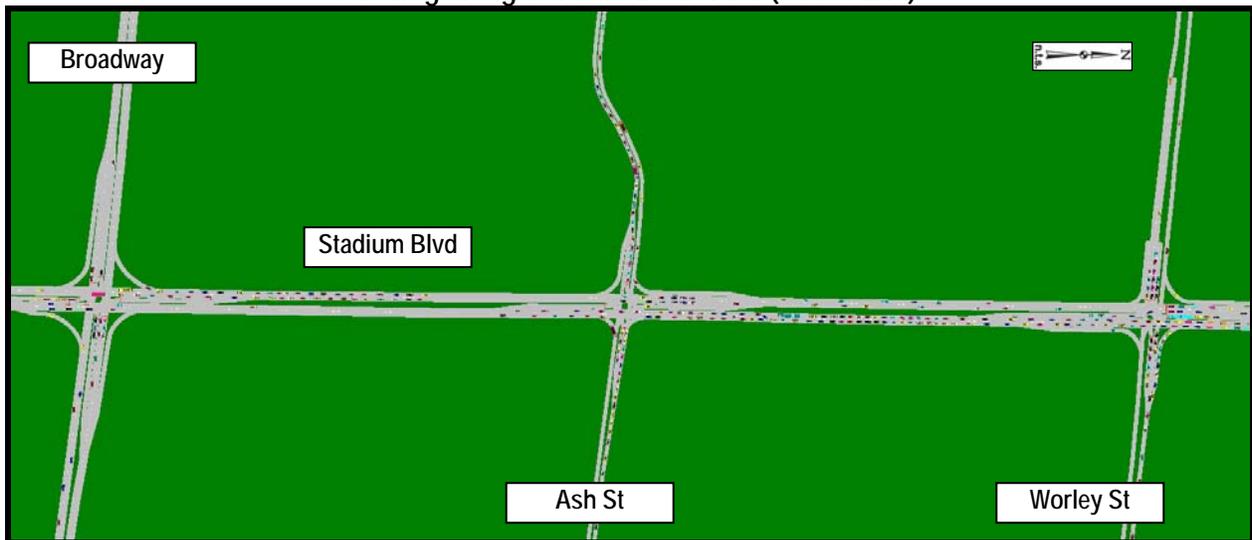


Figure 28: VISSIM Screenshot of Typical PM Peak Period Existing Conditions
Queuing along Stadium Boulevard (South End)



2030 Traffic Forecasts

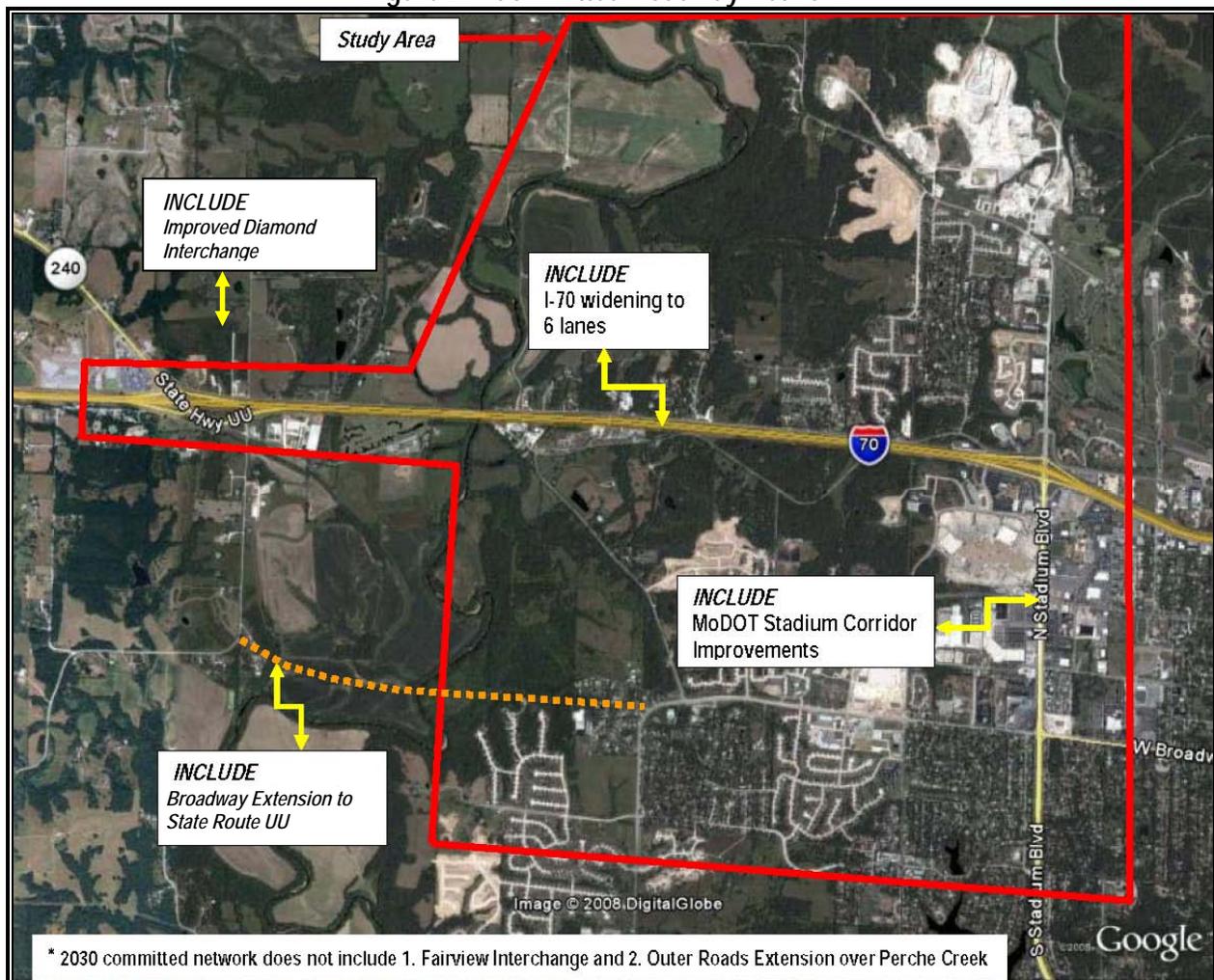
2030 traffic forecasts were developed for both committed network (no-build) and Yellow Alternative (build) conditions to provide comparative analysis. Committed projects are those that are likely to be constructed before 2030. The “Committed Network” was determined on the basis of discussions with the project’s Core Team. The projects considered in our analysis are shown in **Figure 29** and include:

- **Widening I-70:** The Improve I-70 project calls for mainline I-70 to be widened through the study area to ten lanes with the center four lanes (two in each direction) being dedicated truck-only lanes. This plan allows for six general purpose lanes carrying a mixture of automobile and truck traffic. Funding has not

been identified for this project. This study's geometric layouts (and associated cost estimates) and environmental clearances are being prepared assuming a worst case scenario "footprint"; which includes MoDOT's plans for truck-only lanes. However, the traffic modeling completed for this study has evaluated the I-70 traffic operations from a "worst-traffic-case" scenario (for freeway weaving, merging, and diverging) by assigning all trucks to the general purpose lanes.

- Widening Stadium Boulevard: Various plans call to widen Stadium Boulevard to six lanes between Broadway and I-70. These plans also call for intersection improvements between the I-70 North Outer Road and Broadway.
- Broadway Extension: CATSO's 2030 long-range plan calls for an extension of Broadway to Route UU.

Figure 29: Committed Roadway Network



- Upgrade US Highway 40 interchange: Improve I-70 calls for the US Highway 40 interchange to be upgraded to a standard diamond interchange by relocating the eastbound on-ramp to the west. However, it is uncertain whether or not this improvement will be constructed as shown in the Improve I-

70 studies due to prevailing traffic patterns. Moreover, the time line of this improvement is uncertain, and could occur after the proposed Scott Boulevard interchange is constructed. As such, this study assumed that the existing US Highway 40 interchange would be improved, and reconstructed in its current configuration. This represents the “worst-traffic-case” scenario from a freeway operations standpoint by (1) allowing all US Highway 40 traffic to enter the network while (2) maintaining the existing eastbound on-ramp gore-point. (A traditional diamond interchange would probably shift the eastbound on-ramp merging gore further to the west)

There are two Improve I-70 projects that are not included in the committed network. First, the I-70 outer-road connections across Perche Creek are not included in the committed network. Although these bridges are a part of the Improve I-70 project and there is a local desire to provide for a local connection across Perche Creek, the Core Team elected to leave them out of the committed network. Due to current financial constraints and economic conditions, their construction is questionable as a part of any initial construction project. For the purposes of evaluating traffic movements in this study, the City's proposed extension of West Broadway to Route UU is assumed to account for a future local connection across Perche Creek. However, the Yellow Alternative was developed to allow for future outer road connections across Perche Creek in the event that they are constructed as a part of a future project, such as Improve I-70.

Second, the Improve I-70 Fairview fly-over ramps are not included in the committed network for traffic analysis. These ramps have been accommodated in the proposed Scott Boulevard interchange design. However, these ramps may not need to be constructed if the Scott Boulevard interchange is built (at least during the project's design life). Leaving them out of the traffic analysis leaves more traffic on I-70 and thus represents a “worst-traffic-case” scenario for I-70 traffic. For these reasons the Core Team elected to leave these ramps out of the committed network

Traffic forecasts for the 2030 roadway network were generated based on analysis of population and traffic growth trends in the region and on outputs from the CATSO regional travel demand model. As can be seen from **Figures 30 and 31**, the City of Columbia and Boone County have experienced substantial population and traffic growth over the past few decades. This growth trend is expected to continue.

Our analysis of historic growth trends and CATSO model outputs assumes the following growth rates for design year 2030 Committed Network traffic:

- 20% increase in traffic volumes on all cross-streets along Stadium Boulevard
- 60% increase on US Highway 40
- 20% increase on Stadium Boulevard north of I-70
- 50% increase on Broadway west of Stadium Boulevard
- 50% increase on Stadium Boulevard south of Broadway
- 60% increase on I-70 (Note - this growth cannot occur unless I-70 is widened in the future).

2030 Yellow Alternative forecasts were generated based on traffic shifts from the committed network from CATSO model outputs. **Figures 32 and 33** show the 2030 forecasted committed network and build alternative morning (7:00 - 8:00 am) and afternoon (4:30 - 5:30 pm) peak period traffic volumes respectively.

Figure 30: Population Growth in City of Columbia and Boone County

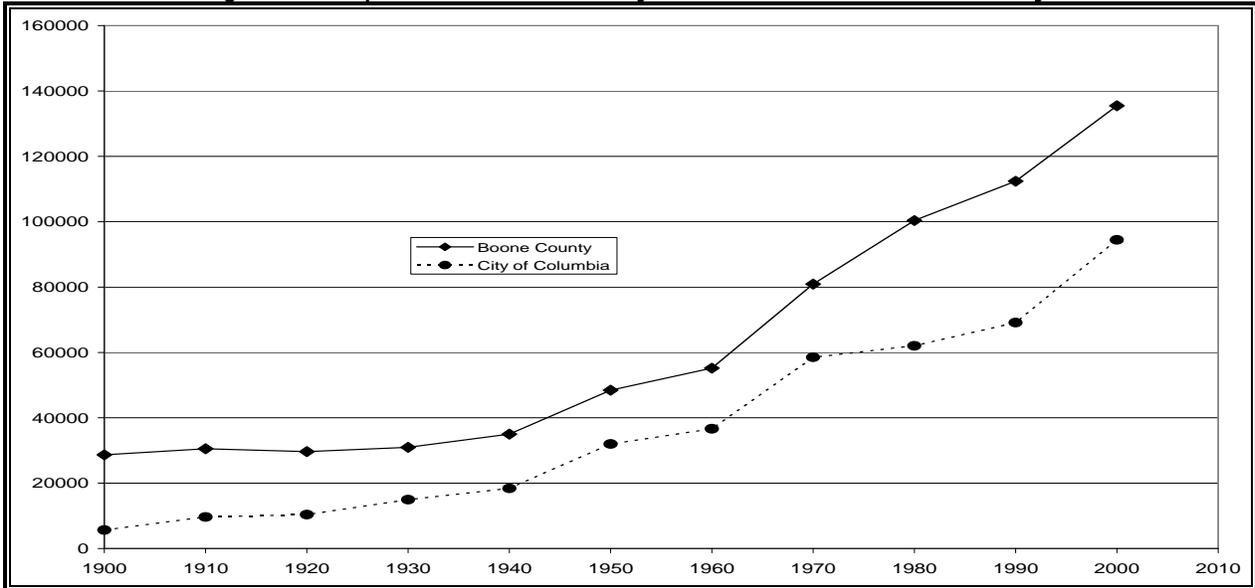
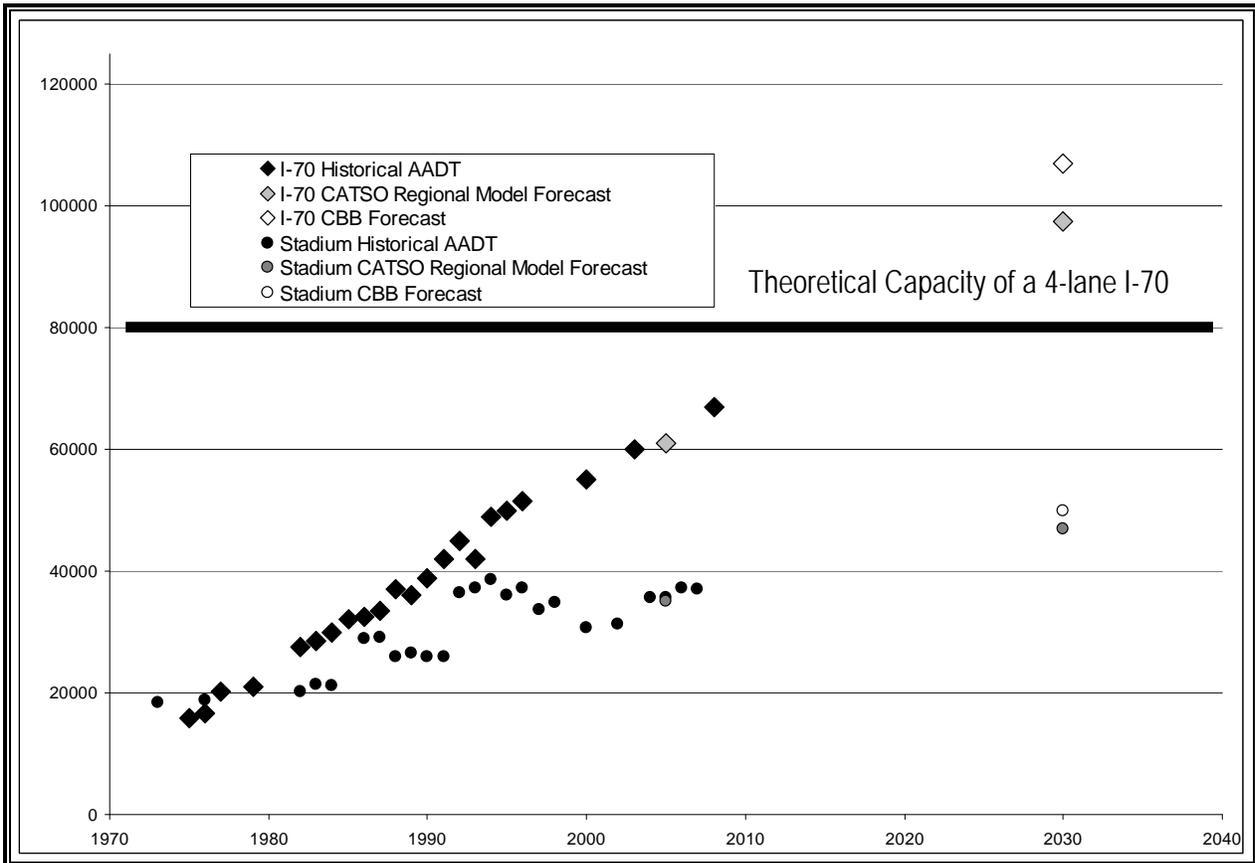


Figure 31: Historical Average Annual Traffic Volumes (AADT) and Travel Demand Forecasts for I-70 at Stadium Boulevard



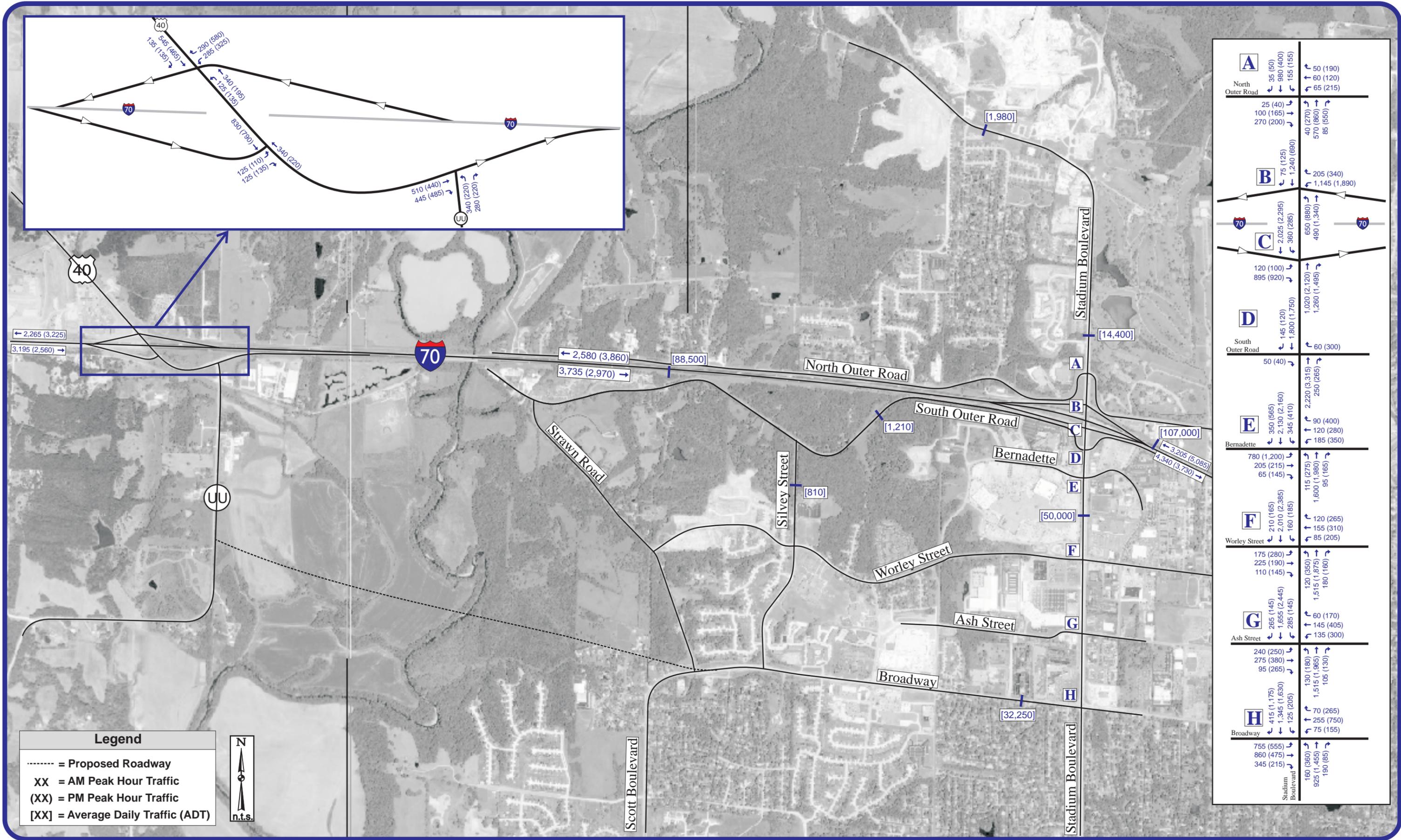


Figure 32: 2030 Committed Network Forecasted Traffic Volumes (Without Yellow Alternative)

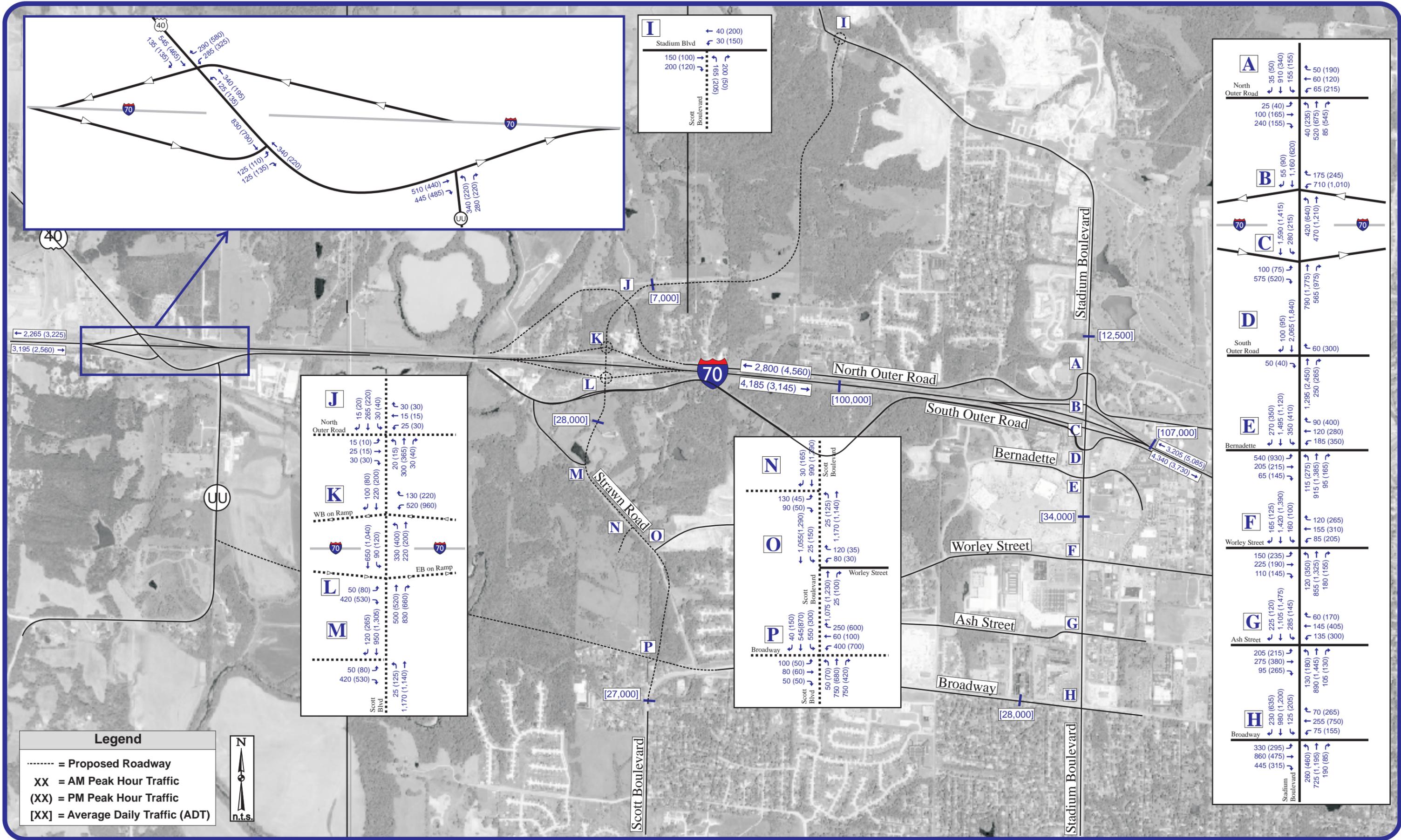


Figure 33: 2030 Scott Boulevard Extension Alternative Yellow Forecasted Traffic Volumes

2030 Committed Network Operating Conditions

The 2030 Committed Network intersection operations results from SYNCHRO and VISSIM are shown in Tables 13 and 14 for the morning and evening peak hours. The 2030 Committed Network freeway operations results from HCS+ and VISSIM are summarized in Tables 15 and 16.

**Table 13: 2030 Committed Network Intersections Analysis Results (SYNCHRO)
 (without Yellow Alternative)**

Intersections along Stadium Boulevard	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)*	ICU	LOS	Delay (sec/veh)*	ICU
North Outer Road	B	12.7	75.1%	C	21.5	78.5%
I-70 WB Ramps	C	29.2	131.6%	D	51.7	145.7%
I-70 EB Ramps	C	26.0	131.6%	E	78.1	145.7%
South Outer Road (TWSC ¹³)	B	10.2	52.6%	B	13.1	77.7%
Bernadette Drive	C	34.1	79.0%	F	116.7	100.8%
Worley Street	B	14.6	71.5%	D	49.2	93.7%
Ash Street	C	24.8	80.3%	F	103.8	107.2%
Broadway Boulevard	E	68.2	72.5%	F	159.5	113.8%

* sec/veh = seconds per vehicle

**Table 14: 2030 Committed Network Intersections Analysis Results (VISSIM)¹⁴
 (without Yellow Alternative)**

Intersections along Stadium Boulevard	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)*	Max Queue, ft**	LOS	Delay (sec/veh)*	Max Queue, ft**
North Outer Road	A	8.5	200	B	14.6	440
I-70 WB Ramps	C	28.2	550	D	38.5	540
I-70 EB Ramps	B	15.1	580	C	33.2	1480
South Outer Road (TWSC)	A	7.8	320	F	518.3	910
Bernadette Drive	C	29.6	560	F	97.0	1230
Worley Street	C	31.2	990	E	56.1	1330
Ash Street	C	21.3	530	F	89.2	1330
Broadway Boulevard	E	63.6	1700	D	45.3	1380

* sec/veh = seconds per vehicle

** ft = feet

¹³ TWSC = two way stop control intersection

¹⁴ During VISSIM model runs, gridlock conditions resulted in unmet demand at several input locations. This unmet demand may result in lower numerical values for delays and queues. Moreover, the VISSIM queues also result in intersection blocking which could result in poorer LOS at other locations.

Table 15: 2030 Committed Network Freeway Analysis Results (HCS+)
 (without Yellow Alternative)

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
West of US 40	EB	Freeway	B	17.8	70.0	B	14.2	70
I-70 to US 40 Off-Ramp	EB	Diverge	C	23.4	61.0	B	19.6	61.0
US 40 to I-70 On-Ramp	EB	Merge	C	25.1	60.0	C	20.7	61.0
Between US 40 and Stadium Blvd	EB	Freeway	C	20.8	69.9	B	16.5	70.0
I-70 to Stadium Blvd Off-Ramp	EB	Diverge	C	27.9	52.8	C	23.7	52.8
Stadium Blvd to I-70 On-Ramp	EB	Merge	D	30.6	52.0	C	27.8	53.0
East of Stadium Blvd	EB	Freeway	D	28.2	60.0	C	24.2	60.0
East of Stadium Blvd	WB	Freeway	C	20.8	60.0	D	34.1	58.2
I-70 to Stadium Blvd Off-Ramp	WB	Diverge	C	25.9	52.2	F	37.6	50.7
Stadium Blvd to I-70 On-Ramp	WB	Merge	B	18.8	54.0	C	26.4	53.0
Between US 40 and Stadium Blvd	WB	Freeway	B	14.4	70.0	C	21.5	69.8
I-70 to US 40 Off-Ramp	WB	Diverge	C	20.4	60.1	D	28.3	59.2
US 40 to I-70 On-Ramp	WB	Merge	B	15.8	61.0	C	21.0	61.0
West of US 40	WB	Freeway	B	12.6	70.0	B	17.9	70.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table 16: 2030 Committed Network Freeway Analysis Results (VISSIM)¹⁵
 (without Yellow Alternative)

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
West of US 40	EB	Freeway	B	14.8	72.0	B	11.8	72.1
I-70 to US 40 Off-Ramp	EB	Diverge	B	14.8	72.0	B	11.8	72.1
US 40 to I-70 On-Ramp	EB	Merge	B	13.9	67.2	B	10.9	67.8
Between US 40 and Stadium Blvd	EB	Freeway	C	18.5	67.5	B	15.6	63.9
I-70 to Stadium Blvd Off-Ramp	EB	Diverge	B	18.5	67.5	B	15.6	63.9
Stadium Blvd to I-70 On-Ramp	EB	Merge	B	17.9	59.6	B	14.1	59.7
East of Stadium Blvd	EB	Freeway	C	23.2	61.4	C	18.2	61.8
East of Stadium Blvd	WB	Freeway	B	17.3	61.8	D	29.4	57.7
I-70 to Stadium Blvd Off-Ramp	WB	Diverge	B	17.3	61.8	D	29.4	57.7
Stadium Blvd to I-70 On-Ramp	WB	Merge	B	10.5	60.8	B	15.0	60.1
Between US 40 and Stadium Blvd	WB	Freeway	B	12.1	70.8	B	17.2	70.3
I-70 to US 40 Off-Ramp	WB	Diverge	B	12.1	70.8	B	17.2	70.3
US 40 to I-70 On-Ramp	WB	Merge	A	7.9	70.4	B	10.8	70.5
West of US 40	WB	Freeway	B	10.6	70.7	B	14.5	70.6

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

As indicated in the above tables, several intersections along Stadium Boulevard will operate at failing conditions by 2030 with LOS E/F, especially during the evening peak hour. Our VISSIM analysis concluded that severe congestion will exist, even with committed network improvements. In fact, by 2030 the corridor will not have adequate capacity to service the anticipated travel demand. Even with the illustrated levels of congestion and delay, the models predict an excess demand of 2-8% during the peak periods. Put another way, 8% of the vehicles in the year 2030 evening peak periods models never even make it onto Stadium Boulevard due to a lack of capacity. Moreover, the evening peak hour forecasted traffic volume of 2,230 vehicles per hour on the westbound off-ramp to Stadium Boulevard from I-70 is close to the theoretical capacity of the off-ramp. This may result in lane-changing failures on I-70, thus impacting the traffic flow on mainline I-70. **Figures 34 and 35** show VISSIM snapshots of congested 2030 traffic conditions.

¹⁵ During VISSIM model runs, gridlock conditions resulted in unmet demand at several input locations. This unmet demand may result in lower numerical values for delays and queues. Moreover, the VISSIM queues also result in intersection blocking which could result in poorer LOS at other locations.

Figure 34: VISSIM Screenshot of Anticipated 2030 PM Peak Period Conditions
Queuing along Stadium Boulevard (North End)

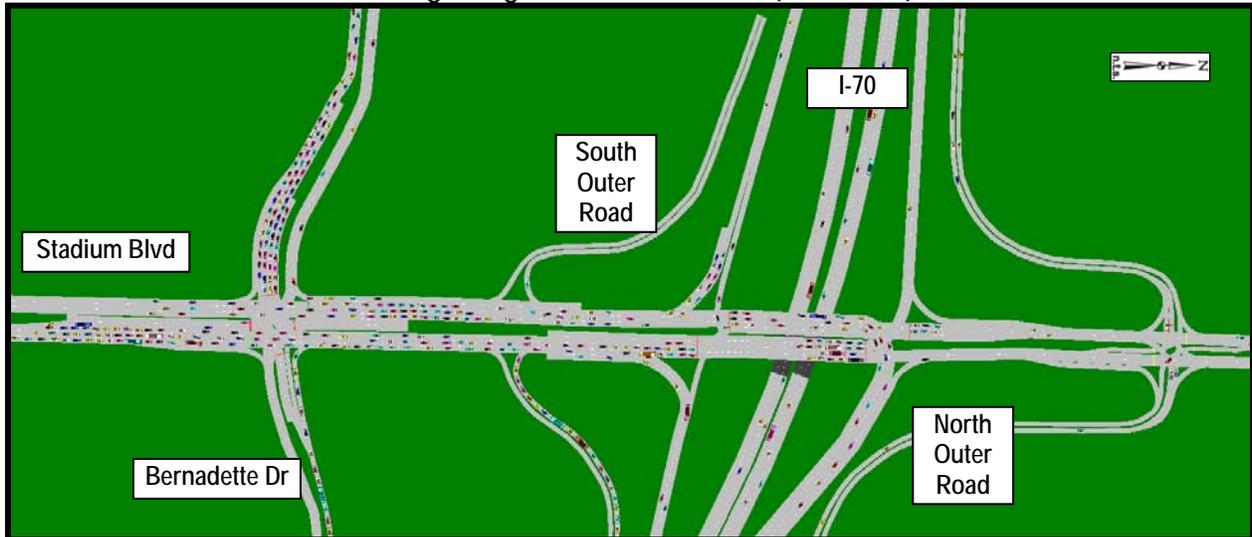
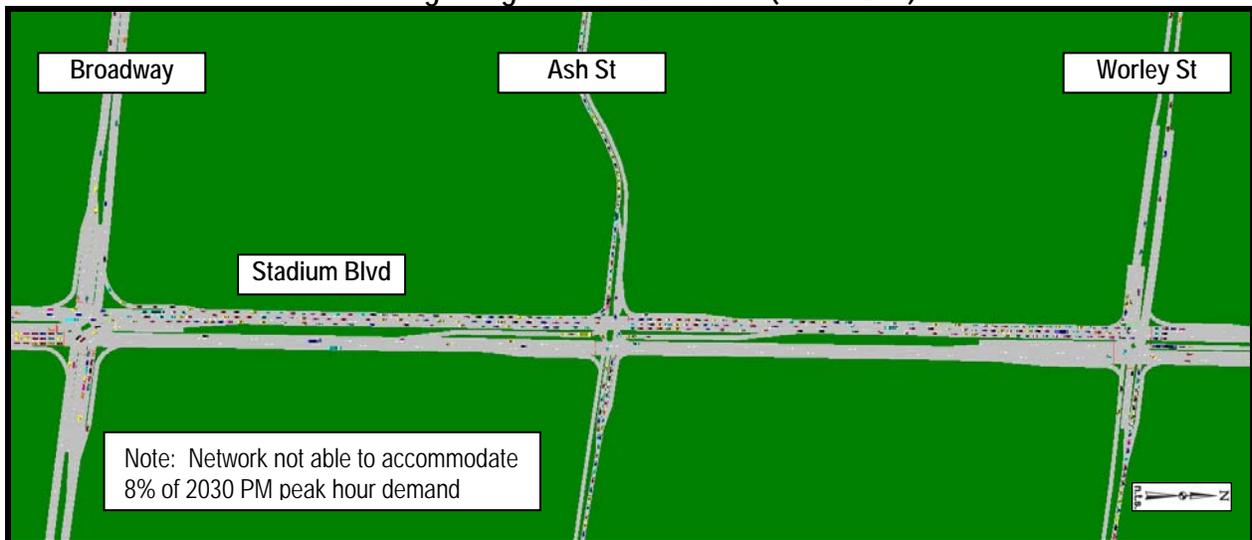


Figure 35: VISSIM Screenshot of Anticipated 2030 PM Peak Period Conditions
Queuing along Stadium Boulevard (South End)



2030 Yellow Alternative Operating Conditions

As described earlier, the Yellow Alternative extends Scott Boulevard from Broadway to MO Route E with an interchange at I-70. The following is a description of lane and intersection configurations for the extension:

North of I-70 to MO Route E: Two-lane roadway with left-turn storage bays at intersections
MO Route E – Roundabout

Gibbs Road – Unsignalized Two-Way Stop Control (TWSC)
 North Outer Road - Unsignalized TWSC

I-70 Interchange: Three-lane roadway over I-70
 Westbound Ramps – Two-lane Turbo Roundabout
 Eastbound Ramps – Two-lane Turbo Roundabout

South of I-70 to Broadway: Four-lane roadway with left-turn storage bays at intersections
 South Outer Road – Grade-Separation
 South Outer Road Loop – Signalized
 South Outer Road / South Outer Road Loop - Unsignalized TWSC
 Bellwood - Unsignalized TWSC with U-turn at Worley
 Worley Street – Signalized
 Broadway – Signalized

The 2030 Yellow Alternative intersection operations results from SYNCHRO and VISSIM are shown in **Tables 17 and 18** for the morning and evening peak hours. The 2030 Yellow Alternative freeway operations results from HCS+ and VISSIM are summarized in **Tables 19 and 20**.

Table 17: 2030 Yellow Alternative Intersections Analysis Results (SYNCHRO/SIDRA)

Intersections along Stadium Boulevard	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)*	ICU	LOS	Delay (sec/veh)*	ICU
North Outer Road	B	11.5	71.3%	B	13.5	70.7%
I-70 WB Ramps	B	18.1	57.9%	B	18.6	92.1%
I-70 EB Ramps	B	11.7	57.9%	B	12.9	92.1%
South Outer Road (TWSC?)	A	9.7	41.6%	B	12.0	65.2%
Bernadette Drive	C	23.3	62.6%	D	39.2	84.2%
Worley Street	B	13.2	60.1%	C	20.9	73.2%
Ash Street	B	19.7	68.3%	C	33.2	88.4%
Broadway Boulevard	D	36.6	67.6%	D	37.4	83.2%
Intersections along Scott Boulevard						
Route E	A	8.1	35.9%	A	9.6	37.6%
Gibbs Road	B	12.7	27.4%	B	13.2	30.5%
North Outer Road	C	19.4	51.9%	C	19.3	43.3%
I-70 WB Ramps	B	11.7	45.0%	C	20.2	78.0%
I-70 EB Ramps	A	7.4	82.1%	A	8.7	80.0%
South Outer Road	A	7.2	46.1%	B	10.7	61.4%
Bellwood	C	20.0	48.6%	C	22.6	57.3%
Worley Street	A	8.5	53.4%	A	7.4	61.0%
Broadway	C	27.0	73.0%	D	35.6	79.7%

* sec/veh = seconds per vehicle

Table 18: 2030 Yellow Alternative Intersections Analysis Results (VISSIM)

Intersections along Stadium Boulevard	AM Peak Hour			PM Peak Hour		
	LOS	Delay (sec/veh)*	Max Queue, ft**	LOS	Delay (sec/veh)*	Max Queue, ft**
North Outer Road	A	6.6	160	B	11.4	320
I-70 WB Ramps	B	16.9	250	A	8.8	290
I-70 EB Ramps	A	7.2	260	A	4.4	240
South Outer Road (TWSC)	A	2.0	110	A	1.6	290
Bernadette Drive	B	19.8	300	C	29.9	710
Worley Street	C	28.9	960	C	21.1	770
Ash Street	C	21.2	650	C	26.7	960
Broadway Boulevard	C	24.5	430	C	26.2	470
Intersections along Scott Boulevard						
Route E (Roundabout)	A	1.5	60	A	1.6	60
Gibbs Road (TWSC)	A	9.2	50	B	10.0	40
North Outer Road (TWSC)	B	14.6	70	C	24.8	60
I-70 WB Ramps (Roundabout)	A	4.2	220	B	16.1	550
I-70 EB Ramps (Roundabout)	A	1.9	170	A	4.6	540
South Outer Road	A	4.3	270	A	4.3	230
Bellwood (TWSC)	B	10.4	110	C	16.7	110
Worley Street	A	5.5	270	A	3.9	230
Broadway	C	30.3	590	C	20.9	410

* sec/veh = seconds per vehicle

** ft = feet

Table 19: 2030 Yellow Alternative Freeway Analysis Results (HCS+)

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
West of US 40	EB	Freeway	B	17.8	70.0	B	14.2	70.0
I-70 to US 40 Off-Ramp	EB	Diverge	C	23.4	61.0	B	19.6	61.0
US 40 to I-70 On-Ramp	EB	Merge	C	25.1	60.0	C	20.7	61.0
Between US 40 and Scott Blvd	EB	Freeway	C	20.8	69.9	B	16.6	70.0
I-70 to Scott Blvd Off-Ramp	EB	Diverge	C	26.7	53.8	C	22.8	53.6
Scott Blvd to I-70 On-Ramp	EB	Merge	C	27.9	53.0	C	21.9	54.0
Between Scott Blvd and Stadium Blvd	EB	Freeway	C	23.5	69.3	B	17.5	70.0
I-70 to Stadium Blvd Off-Ramp	EB	Diverge	D	29.5	53.4	C	23.7	53.6
Stadium Blvd to I-70 On-Ramp	EB	Merge	D	28.6	53.0	C	26.2	53.0
East of Stadium Blvd	EB	Freeway	D	28.3	59.9	C	24.2	60.0
East of Stadium Blvd	WB	Freeway	C	20.8	60.0	D	34.1	58.2
I-70 to Stadium Blvd Off-Ramp	WB	Diverge	C	24.7	53.1	D	34.9	52.4
Stadium Blvd to I-70 On-Ramp	WB	Merge	B	19.3	54.0	D	29.4	53.0
Between Stadium Blvd and Scott Blvd	WB	Freeway	B	15.6	70.0	D	26.1	68.1
I-70 to Scott Blvd Off-Ramp	WB	Diverge	C	21.9	53.5	D	32.4	52.4
Scott Blvd to I-70 On-Ramp	WB	Merge	B	18.0	51.0	C	25	54.0
Between US 40 and Scott Blvd	WB	Freeway	B	14.4	70.0	C	21.5	69.8
I-70 to US 40 Off-Ramp	WB	Diverge	C	20.4	60.1	D	28.3	59.2
US 40 to I-70 On-Ramp	WB	Merge	B	15.8	61.0	C	21.0	61.0
West of US 40	WB	Freeway	B	12.6	70.0	B	17.9	70.0

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

Table 20: 2030 Yellow Alternative Freeway Analysis Results (VISSIM)

SECTION	DIRECTION	TYPE	AM Peak Hour			PM Peak Hour		
			LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**	LOS	Density (pc/mi/ln)*	Avg. Speed (mph)**
West of US 40	EB	Freeway	B	14.8	72.0	B	11.8	72.2
I-70 to US 40 Off-Ramp	EB	Diverge	B	14.8	72.0	B	11.8	72.2
US 40 to I-70 On-Ramp	EB	Merge	B	13.8	67.5	B	10.8	68.4
Between US 40 and Scott Blvd	EB	Freeway	B	17.8	70.3	B	13.9	71.1
I-70 to Scott Blvd Off-Ramp	EB	Diverge	B	13.1	71.3	B	10.4	71.6
Scott Blvd to I-70 On-Ramp	EB	Merge	B	14.9	70.1	B	11.1	70.8
Between Scott Blvd and Stadium Blvd	EB	Freeway	C	20.3	68.8	B	15.1	69.5
I-70 to Stadium Blvd Off-Ramp	EB	Diverge	C	20.3	68.8	B	15.1	69.5
Stadium Blvd to I-70 On-Ramp	EB	Merge	B	18.0	60.4	B	15.3	60.4
East of Stadium Blvd	EB	Freeway	C	23.6	61.4	C	20.0	61.7
East of Stadium Blvd	WB	Freeway	B	17.3	61.9	D	27.8	61.1
I-70 to Stadium Blvd Off-Ramp	WB	Diverge	B	17.3	61.9	C	27.8	61.1
Stadium Blvd to I-70 On-Ramp	WB	Merge	B	11.4	61.2	B	19.0	60.0
Between Stadium Blvd and Scott Blvd	WB	Freeway	B	13.7	68.5	C	23.0	66.6
I-70 to Scott Blvd Off-Ramp	WB	Diverge	A	9.8	71.8	B	16.3	70.3
Scott Blvd to I-70 On-Ramp	WB	Merge	A	9.2	70.5	B	13.8	70.1
Between US 40 and Scott Blvd	WB	Freeway	B	12.3	70.4	C	18.3	70.3
I-70 to US 40 Off-Ramp	WB	Diverge	B	12.3	70.4	B	18.3	70.3
US 40 to I-70 On-Ramp	WB	Merge	A	8.0	70.5	B	11.4	70.4
West of US 40	WB	Freeway	A	10.5	72.2	B	14.9	71.9

* pc/mi/ln = passenger cars per mile per lane

** mph = miles per hour

As can be seen from the above tables, the Yellow Alternative provides for LOS D or better at all intersections along Scott Boulevard and Stadium Boulevard during the morning and evening peak hours. Similarly, all freeway segments on I-70 from US Highway 40 to Stadium Boulevard operate at LOS D or

better. Thus, the recommended Yellow Alternative provides significant improvements over 2030 committed network operations both for Stadium Boulevard and I-70. Figures 36, 37 and 38 show VISSIM snapshots of acceptable 2030 traffic conditions.

Figure 36: VISSIM Screenshot of Anticipated 2030 PM Peak Period Yellow Alternative – Showing Uncongested and Acceptable Traffic Operations along Stadium Boulevard (North End)

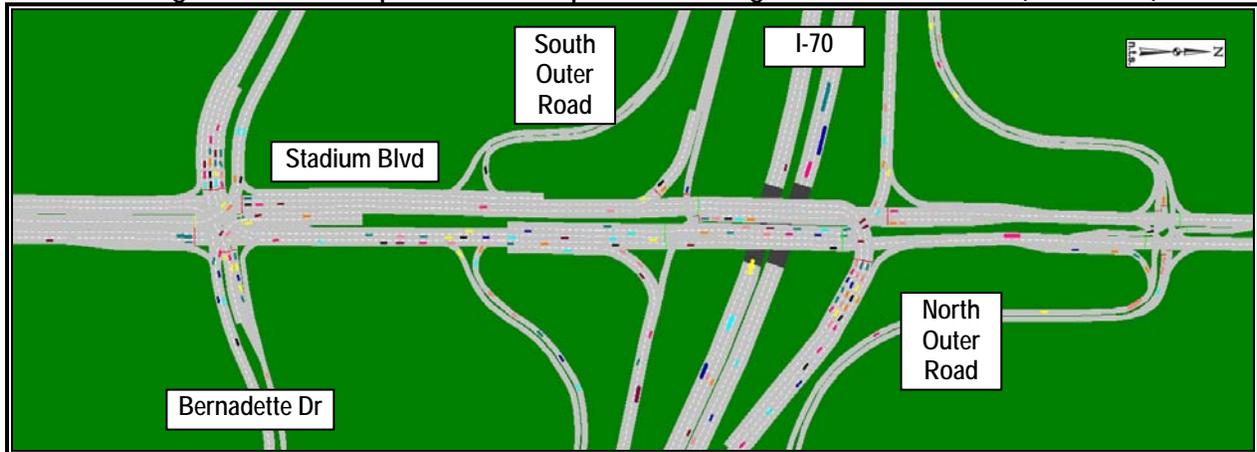


Figure 37: VISSIM Screenshot of Anticipated 2030 PM Peak Period Yellow Alternative – Showing Uncongested and Acceptable Traffic Operations along Stadium Boulevard (South End)

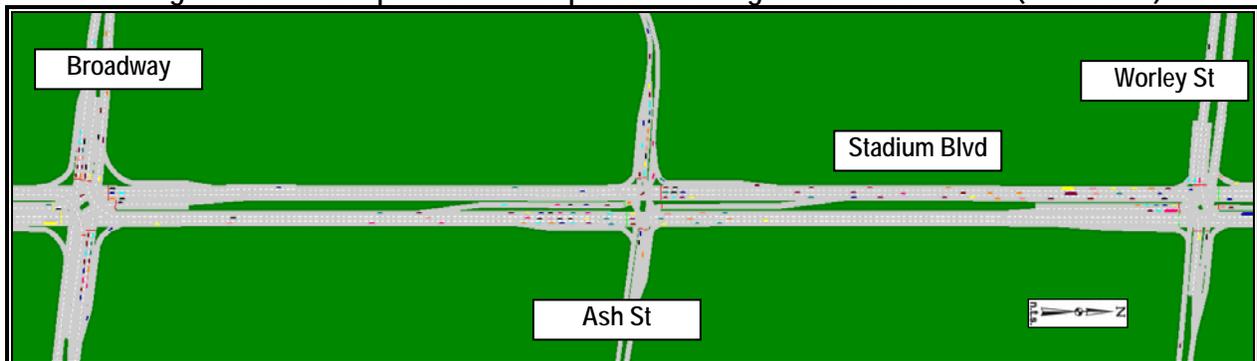


Figure 38: VISSIM Screenshot of Anticipated 2030 PM Peak Period Yellow Alternative – Showing Uncongested and Acceptable Traffic Operations at Scott Boulevard / I-70 Interchange



Our analyses show that by year 2030, even with the addition of MoDOT's planned widening and other improvements along Stadium Boulevard, the interchange at I-70 as well as intersections along the corridor will continue to operate at or over capacity especially in the evening peak hour. Our analysis concludes that there is a strong need for an additional connection to I-70 to serve this rapidly growing southwestern part of the City of Columbia.

Specifically, without the proposed Scott Boulevard interchange several intersections along Stadium Boulevard will operate at failing conditions by 2030 with LOS E/F, especially during the evening peak hour. Our analysis shows that the recommended Yellow Alternative will significantly improve traffic conditions by providing LOS D or better. Moreover, without the proposed Scott Boulevard interchange, evening peak period traffic volumes of 2,230 vehicles per hour are forecasted for the westbound Stadium Boulevard off-ramp. These volumes are close to the theoretical capacity of the off-ramp, resulting in the freeway segment operating at LOS F with lane-changing failures on I-70. The Yellow Alternative improves this condition to LOS D and improves mainline I-70 operations.

In summary, the recommended Yellow Alternative provides acceptable traffic operations on Scott Boulevard and greatly improves traffic conditions on Stadium Boulevard and mainline I-70. A new Scott Boulevard interchange would provide for substantial improvement over anticipated 2030 committed network operations.