

INITIAL RANGE OF STRATEGIES

INTRODUCTION

This chapter summarizes the universe of initial conceptual strategies identified to respond to the project's stated needs and objectives clearly defined in the study's Statement of Purpose and Need. This initial analysis considered and applied data obtained from a variety of sources, including MoDOT traffic and safety evaluations, MARC and KCMO traffic models, and information obtained from other federal, state and local agencies. Information gathering has benefited from a comprehensive agency and stakeholder coordination effort, and is expected to continue as the PEL study proceeds into and future project-level National Environmental Policy Act (NEPA) studies.

CONCEPTUAL SCREENING FRAMEWORK

The effectiveness of each concept, in terms of meeting the needs of the study area, were measured against a wide range of criteria defined by the Purpose and Need and the Study Goals. The successful concepts at each level were then advanced to the next screening level for further evaluation, while the unsuccessful concepts were eliminated from further consideration. Decisions made during the screening process have been thoroughly documented in the *Refined Strategies Impact and Screening Methodologies Report* so that they may be relied upon during future studies. Strategies developed subsequent to a specific level of screening will be subject to the measures of the previous screenings to demonstrate their value for continued evaluation.

No-Build Strategy

The No-Build concept represents the baseline condition in the study area as if no improvements are implemented other than normal operations and maintenance, which also includes those projects programmed in the fiscally constrained MARC Metropolitan Transportation Plan (MTP) or Transportation Improvement Program (TIP).

Universe of Strategies

The first step in the screening process was the development of the Universe of Strategies (Universe), which includes all possible solutions to the transportation problems in the US 169/I-70 North Loop Study Area. Each of the strategies, including the No-Build strategy, were evaluated using the methodology described in the *Strategy Evaluation and Screening Methodology Report*.

MARC Congestion Management Toolbox

The identification and development of the strategies was supported by reference to the MARC Congestion Management Toolbox (CMT), which was updated in 2013 as a component to MARC's current Congestion Management Process (CMP) adopted in 2011 to meet the needs of the Kansas City metropolitan area. The CMP is intended to formulate a systematic approach to monitor, measure, and diagnose causes of current and projected future congestion on the region's multi-modal transportation system. The Process formulates the framework for evaluating and recommending strategies to manage congestion, and to ultimately monitor the performance of implemented strategies. The CMP is integrated into the regional metropolitan process, and conforms with the requirements promulgated by federal transportation legislation (23 CFR 450.320).

The CMT was developed as a companion component to the CMP to provide a reference of strategies to consider in corridor studies and subsequent NEPA documents. In 2013, the Toolbox was updated to expand the number of strategy categories, include additional contemporary strategies, and additional supporting information. In addition to supporting the identification and development of strategy concepts, the Toolbox also provides a general framework for establishing criteria for analyzing and evaluating the strategies as outlined in the Evaluation Criteria Methodology technical memorandum for this PEL study.

The Universe of Strategies were subjected to a two-phase screening process - Level 1A and Level 1B as described below:

- **Level 1A, Fatal Flaw Screening** - The Study Team developed the Universe with input received from stakeholders. Fatal flaw criteria were then utilized to evaluate and screen the Universe against the Purpose and Need. The study team, along with representatives from MARC and its partners, convened to review each strategy against each of the defined study needs (Physical Conditions, System Performance, and Safety and Security) in order to gain consensus on the effectiveness of each strategy in meeting each of the three needs. Those strategies that substantially addressed each need were advanced to Level 1B, while those that did not were eliminated from further consideration.
- **Level 1B, Further Refinement** - In Level 1B analysis, strategies advancing from Level 1A are being evaluated. The level of strategy development is sufficient to allow for the qualitative evaluation against the study goals. Level 1B scoring consists of a mostly qualitative analysis, with the study team using quantitative data when available. At this level, the strategies are summarized and compared to one another relative to their ability to meet study needs and goals. Input from MARC, its partners and the public are being considered during this level of evaluation.

Final Reasonable Strategies

Based on these analyses, strategies that best meet the established study goals were advanced to Level 2 as Reasonable strategies.

- **Level 2, Detailed Evaluation** - In Level 2, the Reasonable strategies were designed to a level of detail as to define the number of lanes, the entrance and exit points for roadway access, and to further clarify any ROW needs. Additionally, predictive traffic volume data was available to quantitatively predict the specific traffic demand, delay and travel time associated with each strategy. More detailed cost estimates for each strategy were also developed at this stage. The level of strategy development was sufficient to allow for the quantitative evaluation against the study goals. The Level 2 screening process will identify the strategy that best address the transportation needs in each geographic area while minimizing the negative impacts.

GEOGRAPHICAL REGIONS

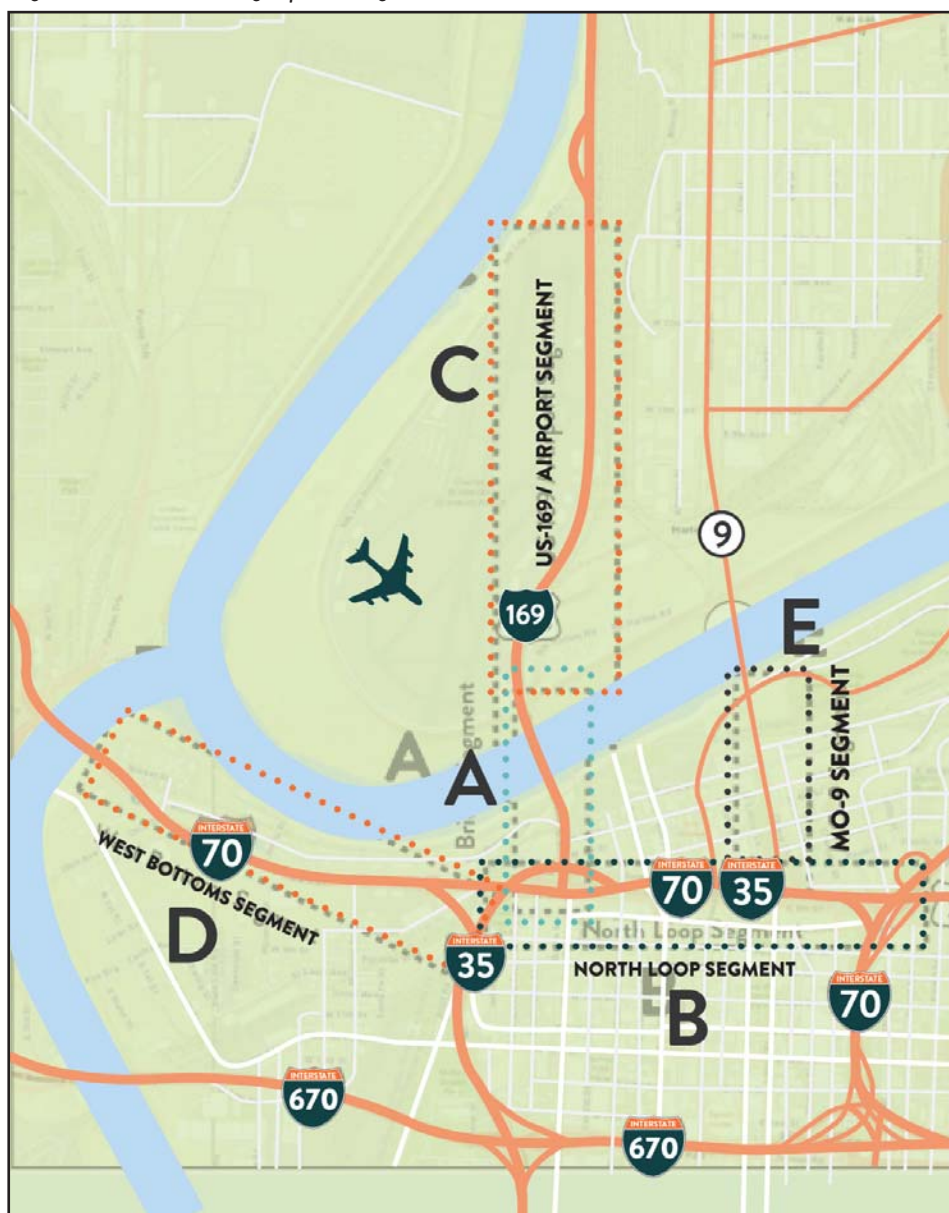
The study area contains several different physical and operational characteristics. To facilitate the evaluation, screening, and refinement of the potential strategies, the study area has been divided into five geographical segments. These are not currently distinct segments of independent utility. As subsequent detailed strategy development and evaluation activities proceed, certain refinements will be necessary to address how these different segments will interrelate, and potentially how they will be phased.

- **Area A - Missouri River Bridge and Interchange:** This segment includes US-169 from landward of the floodwall near the north bank of the Missouri River to I-35/I-70 at the northwest corner of the Kansas City downtown central business district (CBD). This set of strategies includes connections linking US-169 with I-70, I-35, and directly with the downtown KCMO local roadway network.
- **Area B - I-70 North Loop:** This segment includes the 3/4-mile section of I-70 from the northeast corner of the CBD to the northwest corner of the CBD. This segment is currently co-designated as I-35 and I-70. Strategies in this area include strategy modifications to access and the overall transportation system serving the various land uses in the study area.
- **Area C - Charles B. Wheeler Downtown Airport:** This segment includes US-169 from just north of the Wheeler Airport (NW Lou Holland Drive), to landward of the floodwall near the north bank of the Missouri River. This set of strategies includes maintaining and improving access to the Wheeler Airport to the west, and

the Harlem area of Kansas City to the east. It also includes strategies to improve access between the airport and US-169 that are independent of the interchange strategies.

- **Area D - West Bottoms:** This segment includes I-70 from US-169 to the Kansas River. This set of strategies are focused on connections to the West Bottoms from KCMO, which are potentially affected by strategies along the Missouri River Bridge and I-70 North Loop segments.
- **Area E - Missouri Route 9:** This segment includes the 0.5-mile section of Missouri Route 9 from the Heart of America Bridge to Admiral Boulevard. These strategies were previously included in the I-70 North Loop segment and focus on bringing all or part of Missouri Route 9 back down to grade to reconnect the River Market and Columbus Park neighborhoods on either side.

Figure 5.1 - Five Geographic Regions



INITIAL STRATEGIES SUMMARY

At the Level 1 Initial Strategies stage of the PEL study, a set of potential strategies were developed for each of the five identified geographical segments. The strategies were developed at a concept level of limited detail to provide a general location and notion of traffic operations for mainline and access movements.

The Level 1 screening was performed within each geographical segment based on two primary components. A detailed matrix was developed based on a comprehensive list of quantitative and qualitative measurable items developed to provide the best relative assessment of strategies possible based on current available data. Other elements where information could not be obtained, was not available, or was prohibitively cumbersome to calculate, such as detailed traffic operational analysis, were given a qualitative measure based on expert opinion and relative performance.

TRANSPORTATION SYSTEM MANAGEMENT

Transportation System Management (TSM) is an approach in planning and engineering aimed at increased efficiencies, capacity and safety of existing infrastructure through low cost improvements. This section provides an overview of TSM categories and initiatives as well as their suitability in potential strategies in the Broadway PEL extents and surrounding facilities.

Strategy Definitions

- **System Management** - System-wide TSM improvements that increase access, mobility, capacity and communications across the entire TSM platform.
- **Travel Demand** - Lower the demand for single passenger vehicles and increase the multimodality of existing road facilities through innovative methods that give travelers multiple options for commuting and routing.
- **Increasing Capacity** - Increase the capacity of existing infrastructure while modifying lanes, signage and interchanges to prioritize travel and develop system-wide efficiencies.
- **Pedestrian** - Assist and enhance pedestrian safety and mobility at intersections.
- **Cycling** - Assist and enhance cyclist's safety and mobility at intersections.
- **Transit** - Assist in enhancing transit safety, mobility and overall performance of the transit system.
- **Traffic Control** - Strategies which operate traffic signal infrastructure in a safe and cost effective manner.
- **Traffic Signs** - Strategies which help manage and schedule traffic sign maintenance and consistency.
- **Pavement Markings** - Maintain existing pavement markings on roads and at intersections.
- **Traffic Management Center (TMC)** - Evolve and expand the Scout TMC to better manage transportation systems and incidents.
- **Traffic Signal and Camera Infrastructure** - Improve the communication and technological capacity of the camera and signal infrastructure to increase the safety of travelers and to gather real-time data for analysis.
- **Central Traffic Control System** - Allow for traffic signals to communicate with a central computer so that traffic signals can be synchronized, monitored and adjusted.
- **Enhanced Traffic Incident Management** - Traffic Incident Management is the systematic coordinated use of automated and human and technical resources to reduce the severity and amount of traffic incidents as well as to improve the response to incidents.
- **Innovative TSM Technologies and Services** - New innovations in TSM that help increase safety and mobility overall as well as to guide future technological growth in transportation jobs.

Consistency with Purpose and Need

Although TSM strategies can be effective in managing traffic, the strategies contained in this section are not stand-alone strategies and do not meet purpose and need alone. However, the strategies do help overall traffic operations and system mobility by augmenting the viable build strategies outlined in the previous sections. As such, the inclusion of TSM strategies will be outlined with the final build strategies identified as reasonable and feasible.

Suitability Analysis

While several of the TSM strategies were deemed unsuitable to be included in the final reasonable strategies, the following TSM options should be evaluated in coordination with other strategies as the process moves into the NEPA process (Table 5.1).

Table 5.1 - Viable TSM Strategies

TSM Strategy	Description
System Management	
Freeway & Arterial Bottleneck Removal	Minor roadway geometric or traffic control improvements
Access Management	Careful planning of access points along roadways
Traffic Incident Management	Planned process to detect and respond to traffic incidents
Increasing Capacity	
Modify or add interchanges	Adding capacity to existing interchanges or adding new interchanges
Traffic Control Systems	
Inspect, Test & Maintain Conflict Monitors	Conflict monitors are installed in all traffic signal controller cabinets
Traffic Signal Improvements	Updating equipment, signal timing optimization and interconnection
LED Replacement	Replacement of LED signal displays
Traffic Signs	
Traffic Signal Inspection Program	Regular sign inspections to monitor reflectometry
Wayfinding Signage	Direction information for key destinations, streetcar stops, or highway access
Traffic Sign Inventory	Create a data management system for traffic signs
Pavement Markings	
Roadway Markings (Long/Traverse)	Annual application of new roadway markings
Intersection Markings	Bi-annual painting of both signalized and unsignalized intersections
Traffic Management Center	
Active Traffic & Demand Mgmt.	Dynamically monitor, control and influence travel demand and traffic flow of key highway corridors.
Central Traffic Control System	
Adaptive & Demand Responsive Signals	Traffic signal algorithms designed to better synchronize traffic flow
Emergency Vehicle Pre-Emption	Expand GPS based emergency vehicle pre-emption network
Street Car Transit Compatibility	Plan traffic system computability to support “at-grade” Streetcar applications
Enhanced Traffic Incident Management	
Incident Detection, Response & Clearance	Real-time incident detection, enhanced reaction time, and improved clearing of traffic related incidents.
Traveler Information	Timely and accurate information to roadway users about conditions and alternative routing through the Traveler Information Services (TIS)
Innovative TSM Technologies and Services	
Incident Detection Systems	Detect incidents automatically and provide future predictability
Intelligent Vehicle Technologies	Leverage advancements in CV/AV
Freeway Incident Management System	Prompt removal of disabled vehicles from travel lanes

AREA A: MISSOURI RIVER BRIDGE STRATEGIES

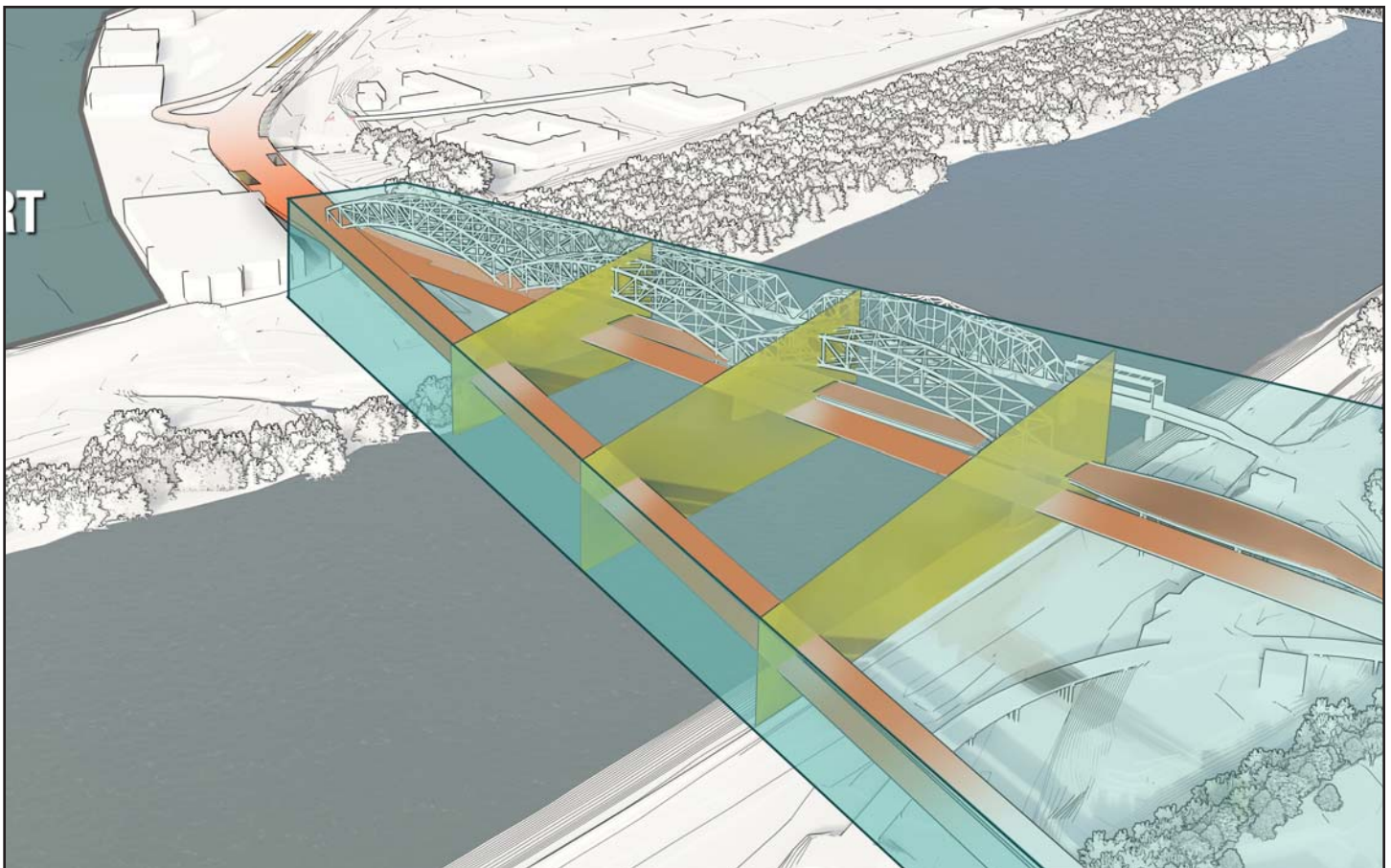
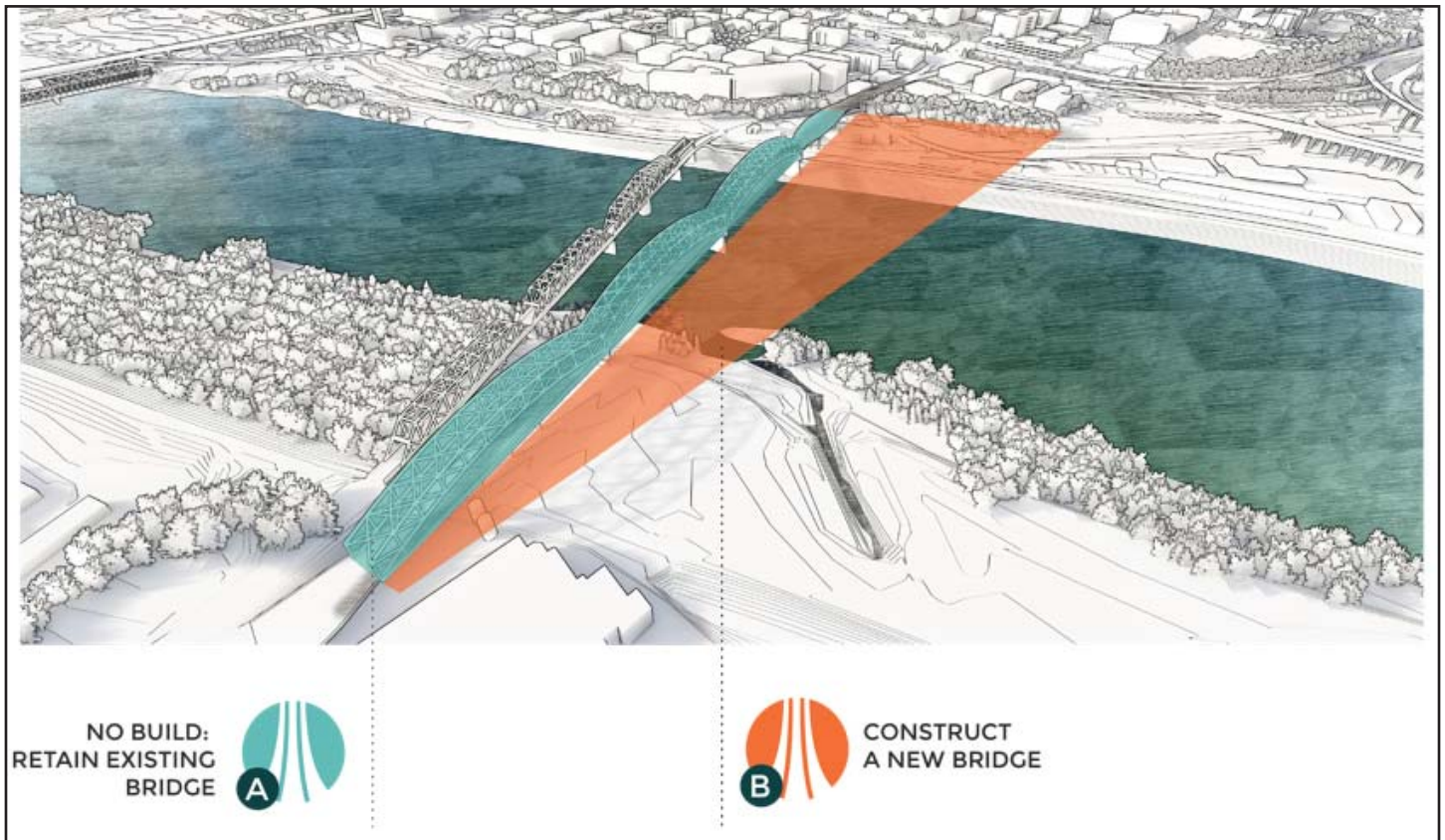
The existing US-169 Buck O'Neil Bridge over the Missouri River is nearing the end of its service life and has been reviewed for replacement or rehabilitation by MoDOT. Three alternate alignments are being considered for a new bridge - a western, central and eastern alignment. In addition, given its current condition and status of potential inclusion in the Missouri five-year State Transportation Improvement Program (STIP), a major rehabilitation of the existing bridge will constitute the No-Build alternate. The study also evaluated the possibility of building a new bridge while keeping and repurposing the old structure as well as evaluating a joint use bridge that accommodates both vehicular and rail traffic.

The bridge strategies are defined by their relative position to the existing bridge and the river. On the north side of the river and landward of the floodwall, all new bridge alignments are immediately adjacent to the existing US-169 alignment and are constrained by the BNSF railroad to the east and the existing airport building to the west. Because the bridge alignment directly influences the type and location of interchange for connections with I-35, I-70, and the CBD, various interchange strategies are also considered for connecting the bridge into highways and local roads south of the Missouri River.

Table 5.2 - Missouri River Bridge Initial Strategy Recommendations

	Strategy	Description	Status
Rehabilitate the Existing O'Neil Bridge (No-Build Condition)	A1	Rehabilitation of the existing bridge as currently programmed would consist of a \$52 million project and would restore the structure to satisfactory physical condition, and would extend the expected life of the bridge an additional 35 years	Advanced
Western Alignment	A2	Approximate 28-degree skew from perpendicular to the navigation channel. Most direct connection to I-35.	Advanced
Central Alignment	A3	Approximate 21-degree skew from perpendicular to the navigation channel. Approximately halfway between the existing bridge at Broadway and I-35 at the west side of the loop.	Advanced
Eastern Alignment	A4	Approximate 10-degree skew from perpendicular to the navigation channel. Location adjacent to existing bridge. Requires reconfiguration of existing Broadway interchange	Advanced
New Bridge with Rehabilitation and Re-purposed O'Neil Bridge	A5	Construction of a new bridge at either the previously described A2 or A3 locations, combined with the rehabilitation of the existing bridge.	Screened Out
Combination New Bridge with New Railroad Bridge	A6	Construction of a structure that combines a new highway bridge with a replacement of the existing Hannibal Bridge that carries the BNSF railway.	Screened Out

Figure 5.2 - Potential Bridge Locations with Buildable Volume and Section Planes



AREA B: I-70 NORTH LOOP STRATEGIES

The North Loop strategies include highway, local road, and interchange modifications along I-70 North Loop which can be built independently of a new river bridge and interchange concept. The refined concepts were developed so they could ultimately be incorporated into subsequent phased deployment of other long-term strategies. The North Loop strategies included:

- Access Consolidation
- Compressed Footprint (Three Strategies)
- Remove and Reclassify
- One-Way Circulation Strategies

Table 5.3 - I-70 North Loop Strategy Recommendations

	Strategy	Description	Status
Access Consolidation Strategies			
Re-Use I-70 Mainline and Consolidation of Ramps and Access Points	B1	Replicates the design concept that was developed in 2005 to support the original I-29/I-35 corridor EIS.	Advanced
New Collector Distributor (CD) System	B2	Removes short sections of auxiliary lanes from the existing I-70 mainline and constructs a new CD System within the I-70 right-of-way to consolidate and distribute access into the River Market and CBD	Screened Out
Compressed Footprint Strategies			
Compressed Footprint South Strategy	B3-6a	Compressed I-70 Along South Side of Corridor with Access at Independence Ave. Roundabout and MO-9	Advanced
Compressed Footprint North Strategy	B3-6b	Compressed I-70 Along North Side of Corridor with Access at Broadway and MO-9	Advanced
Compressed Footprint on Centered Strategy	B3-7	Compressed I-70 Along Centerline of existing I-70	Advanced
One-Way Circulation Strategies			
Reconfigure the Downtown Loop to One-Way	B4	Reconfigures the entire loop system to carry traffic one-way in the counter clockwise direction.	Screened Out
Reconfigure the Downtown Loop to One-Way with CD System	B5	Mimics Strategy B4 and includes a CD system in the opposing direction to mitigate the major missing directional connections on the east and west legs.	Screened Out
Reconfigure the Downtown Loop to Partial One-Way	B6	Reconfigures the downtown loop to partial one-way counter clockwise circulating interstate system.	Screened Out
Remove and Reclassify North Loop			
Reclassify North Loop to Local Street Network	B7-1	Develop local roadways to support primary east-west traffic connections including Independence Avenue converted to an arterial roadway with connections across MO-9 and 6th Street two-way between Broadway and Charlotte with connections at MO-9.	Advanced

Figure 5.3 - I-70 North Loop Strategies

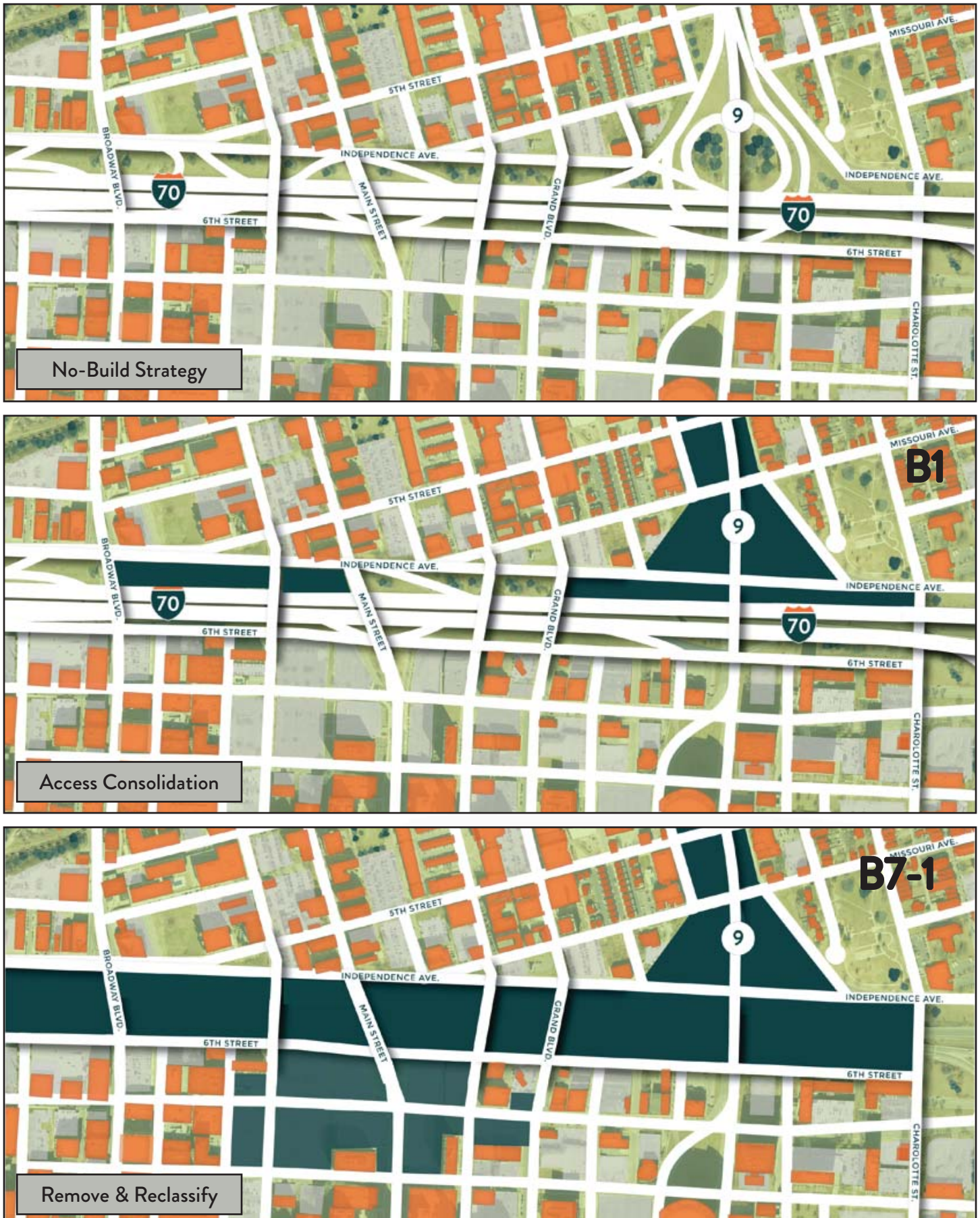


Figure 5.3 - I-70 North Loop Strategies (Continued)



AREA C: WHEELER AIRPORT STRATEGIES

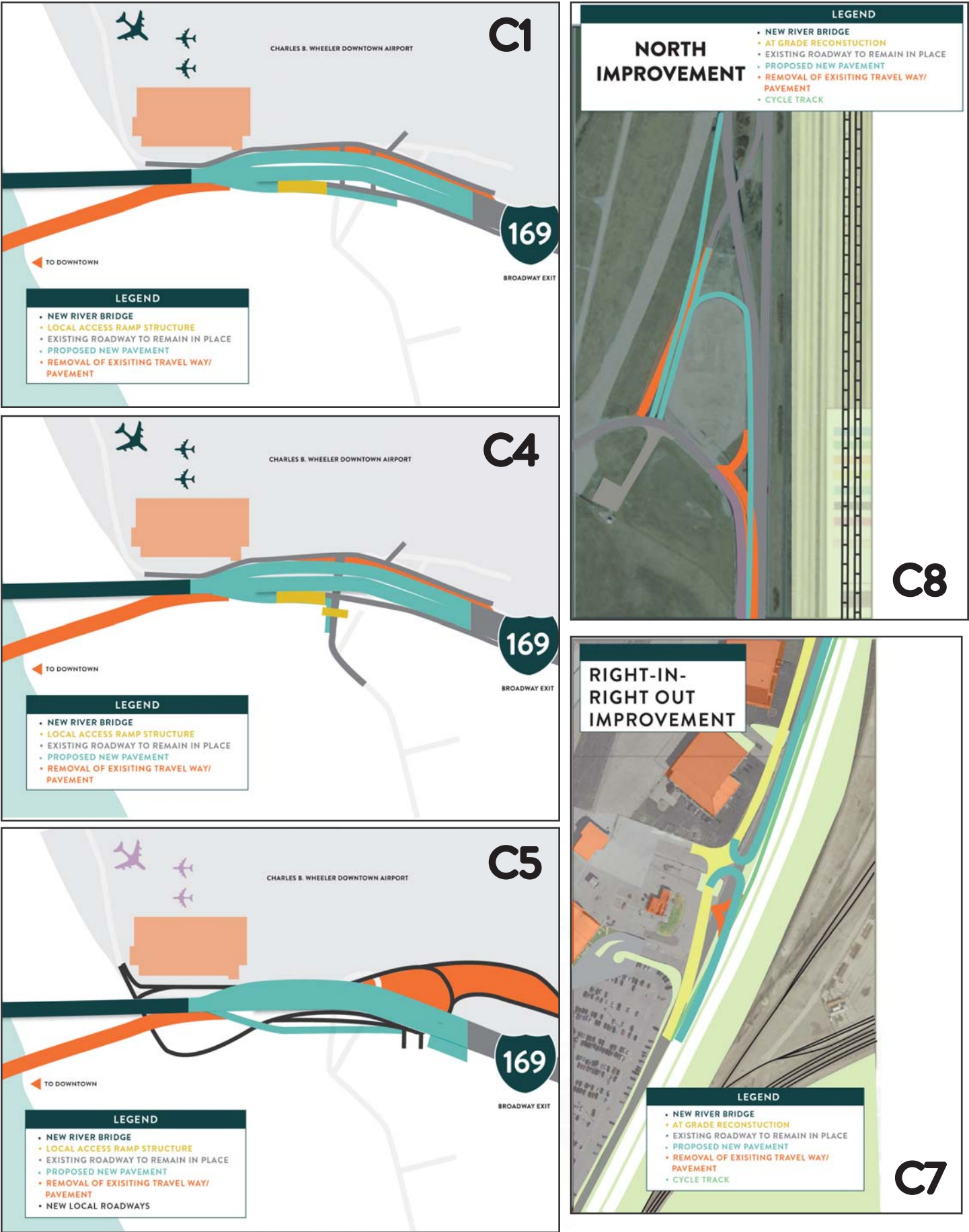
US-169 runs north from the existing Buck O'Neill Bridge between Wheeler Airport on the west and the BNSF Railway on the east in a highly confined corridor. At a minimum, redundant access provisions to US-169 for airport patrons and on-site business will be maintained at current levels which include one northbound exit ramp, two northbound entrance ramps, two southbound exit ramps, and two southbound entrance ramps. One southbound entrance ramp is moved from the south interchange to the north interchange for all strategies.

Conceptual improvements address safety concerns and mobility at the north and south interchanges and the southbound right-in / right-out located on the east side of the airport. All the strategies for this area will work with any of the Missouri River Bridge Strategies listed in Section 2.2.

Table 5.4 - Wheeler Airport Strategy Recommendations

	Strategy	Description	Status
Interchange Improvements			
Half Diamond Interchange with Existing Harlem Road Access	C1	A half diamond interchange, with the exit and entrance ramps on the east side.	Advanced
Half Diamond Interchange with Direct Connection to Northbound Richards Road	C2	Similar to strategy C1 except US-169 NB exit ramps connects to Richards Road.	Screened Out
Half Diamond Interchange with Relocated Harlem Railroad Crossing and Improved Direct Connection to Northbound Richards Road	C3	Similar to strategy C1 except the Harlem Road railroad crossing is relocated.	Screened Out
Half Diamond Interchange with Split Lou Holland Undercrossing	C4	Similar to strategy C1 except Northbound Lou Holland drive splits near the floodwall and provides direct connection to Northbound US-169 and Richards Road via a weaving movement.	Advanced
Half Diamond Interchange with New Single Harlem Road Railroad Crossing	C5	A half diamond interchange, with the exit and entrance ramps on the east side. Harlem Eastbound and Westbound traffic is brought together for a single railroad undercrossing.	Advanced
Button-Hook Interchange with Relocated Harlem Railroad Crossing	C6	A half diamond interchange with button-hook style ramps, along with the exit and entrance ramps on the east side. The Harlem Road railroad undercrossing is relocated either to the north or south.	Screened Out
Auxiliary Improvements			
Right-In/Right-Out At Grade Improvements	C7	Improve existing RIRO by providing separated accel/ decel lanes	Advanced
Interchange Improvements at Richards Road (North)	C8	SB on and exit ramp connections and NB entrance ramp Connections	Advanced

Figure 5.4 - Wheeler Airport Strategies



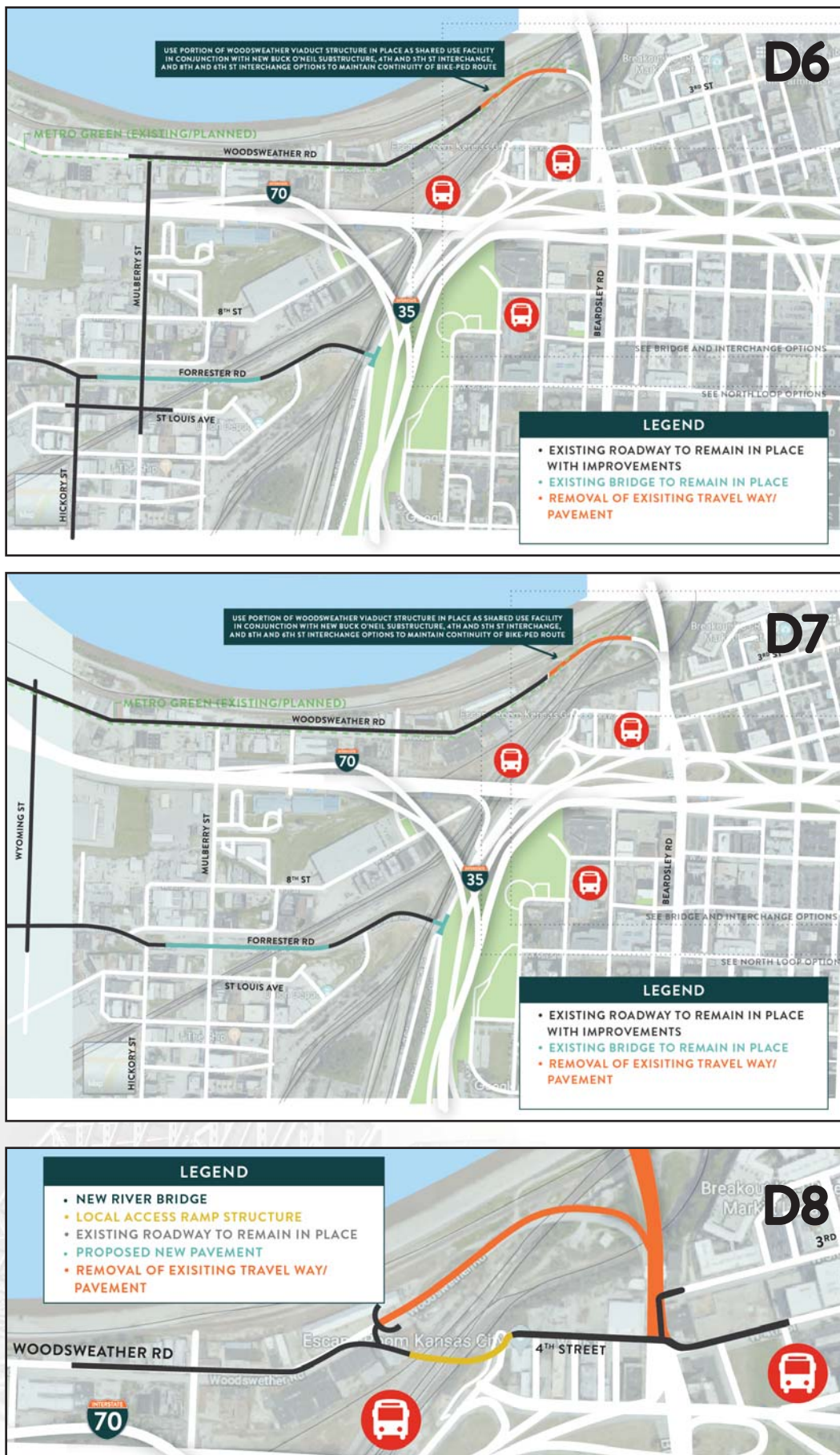
AREA D: WEST BOTTOMS STRATEGIES

Depending on the new bridge strategy chosen, access to the West Bottoms via the Woodswether Bridge will be restricted or eliminated. Local access to and from the West Bottoms is served from the Woodswether Viaduct which connects with Broadway and 3rd Street at the east end beneath the US-169/O'Neil Bridge approach span, and Woodswether Road at the west end. Because of the potential change in access to the West Bottoms, several West Bottoms improvement strategies were evaluated. Generally, the West Bottoms access strategies are grouped into two categories: A new interchange on the I-70 Lewis and Clark viaduct; and local roadway improvements to carry traffic on Forrester Road and the Forrester Viaduct. The strategies were developed at a concept level of limited detail to provide a general location and conceptual analysis of circulation and traffic operations for mainline and access movements.

Table 5.5 - West Bottoms Strategy Recommendations

	Strategy	Description	Status
New Interchange Strategies on I-70 to mitigate possible closure of Woodswether viaduct			
Half Diamond Interchange at Wyoming Street	D1	Provides partial interchange access into and out of the West Bottoms from I-70. Reduces impacts to the existing Kansas City Missouri Waste Water Treatment Facility.	Screened Out
Full Diamond Interchange at Wyoming Street	D2	Provides all traffic movements between I-70 and Wyoming Street.	Screened Out
Folded Diamond Interchange at Wyoming Street	D3	Eliminates impacts to the existing Kansas City Missouri waste water treatment facility in the NW quadrant of I-70 and Wyoming Street. Provides all movements to and from I-70 at Wyoming Street. Provides additional separation distance from future Phase 2 construction of the LCV.	Screened Out
Partial Folded Diamond Interchange at Wyoming Street	D4	Eliminates impacts to the existing Kansas City Missouri waste water treatment facility in the NW quadrant of I-70 and Wyoming Street. Eliminates tight radius (20 mph) loop ramp for EB I-70.	Screened Out
Local Street Improvements in West Bottoms			
Madison Ave to Santa Fe	D5	Madison Avenue and approximately 1,000 feet of industrial roadway on new alignment to 8th Street connecting with Hickory Street, Santa Fe Street and Forrester Road	Screened Out
Mulberry St to Forrester Rd	D6	Utilize existing Mulberry St between Woodswether and Forrester	Advanced
Wyoming St to Forrester Rd	D7	Utilize existing Wyoming St between Woodswether and Forrester	Advanced
4th St to Woodswether Bridge	D8	Extend 4th Street west across the railroad on a new bridge to into Woodswether Road.	Advanced

Figure 5.5 - West Bottoms Strategies Advanced as Reasonable



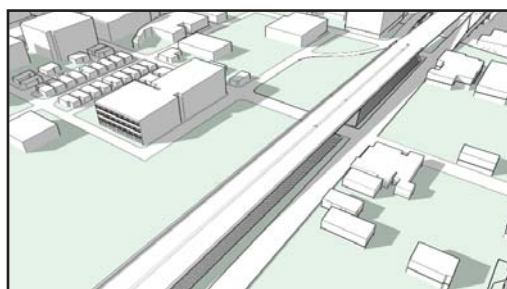
AREA E: MISSOURI ROUTE 9 STRATEGIES

Missouri Route 9 connects I-70 and downtown Kansas City to North Kansas City along a half mile stretch of freeway connecting Locust Street and Oak Street downtown to the Heart of America Bridge over the Missouri River. At I-70 there is an interchange providing some, but not all movements between I-70 and Missouri Route 9. Independence Avenue is not connected across Missouri Route 9. Four strategies have been defined for improving the Missouri Route 9 area.

Table 5.6 - Missouri Route 9 Strategy Recommendations

	Strategy	Description	Status
All At-grade Crossings on Existing Alignment	E2a	MO- 9 brought back to grade with at-grade crossings at 3rd Street, 5th Street, Independence Avenue, and 6th Street. No shift in MO-9 alignment	Advanced
All at-grade Crossings on Western Alignment	E2b	MO-9 brought back to grade with at-grade crossings at 3rd Street, 5th Street, Independence Avenue, and 6th Street. Route 9 alignment shifted west.	Advanced
South At-Grade Connections	E3	I-70/MO-9 interchange removed and replace with at-grade intersections at Independence Avenue and 6th Street	Advanced
South At-Grade Connections / Split Lanes	E4	I-70/MO-9 interchange removed. Northbound and southbound MO-9 split with each having at-grade intersections at Independence Avenue and 6th Street	Advanced

Figure 5.6 - Missouri Route 9 Opportunities



Just north of I-70, Route 9 is an elevated section (above) bisecting River Market from Columbus Park. Bringing Route 9 down to grade provides economic development opportunities (right) and better connectivity between these important neighborhoods.

