

APPENDIX D TIER 2 DEFINITIONS



JACKSON COUNTY
COMMUTER CORRIDORS
ALTERNATIVES ANALYSIS

DRAFT

TIER 2 DEFINITION OF ALTERNATIVES

Version 4 – November 21, 2012



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1. INTRODUCTION

1.1. PROJECT BACKGROUND

The Mid-America Regional Council (MARC), Jackson County, the City of Kansas City, Missouri, and the Kansas City Area Transportation Authority (KCATA) initiated the Jackson County Commuter Corridors Alternatives Analysis (JCCC AA) to identify transit improvements within the study area originating in the regional core area (downtown Kansas City /Crown Center) and extending to suburban areas in the eastern and southeastern part of the metropolitan area. The study area encompasses all of Jackson County, the northern portion of Cass County, the northwest portion of Johnson County, and the western portion of Lafayette County. The physical boundaries are the Kansas state line on the west, the Missouri River on the north, Missouri Highway 131 on the east, and Missouri Highway 58 on the south.

With the terminus point in downtown Kansas City, the main markets for trips associated with this project are from Kansas City and the suburban areas of Jackson County to downtown Kansas City. This market has needs for peak hour work trips and for off-peak general purpose trips. Additionally, there is a market for trips along the route in the peak commute direction. While minimal now, there is currently a small market for reverse commute trips, both peak and off peak.

The intent of the study is to reach decisions on a Locally Preferred Alternative (LPA), defined in terms of transit mode and general alignment, to meet the project goals. The goals include:

- expanding available transit options,
- improving transit speeds and schedule reliability,
- increasing the mode share and competitiveness of transit for commuting and other trip-making purposes, and
- supporting regional goals for development, redevelopment, and sustainability.

These goals and the problems to be addressed within the study area are more fully presented in the JCCC AA *Purpose and Need Report* (November 2011), which also identifies the major travel markets that could benefit from improved transit service.

1.2. PURPOSE AND STRUCTURE OF TIER 2 DEFINITION OF ALTERNATIVES REPORT

The Tier 2 Definition of Alternatives paper more clearly defines the set of mode and alignment alternatives considered in the JCCC AA that were carried forward from the initial Tier 1 Screening and that will be subjected to more robust analysis and screening in Tier 2. This paper provides all the background information for each mode and alignment that will be inputs to the analysis of ridership, capital and operations costs, and opportunities for land use and economic development associated with each transit investment alternative. At the completion of the Tier 2 analysis a summary report will be created that provides the Tier 2 results.

1.3. SUMMARY OF THE TIER 1 ANALYSIS

As discussed in the *Evaluation Methodology Report* (November 2011), given that the study area encompasses two separate travel corridors, that several potential alignments exist within each corridor, and that there are multiple transit technologies that could be used, the evaluation and decision-making process is complex. A technology that performs well in one corridor, for example, may not perform well

in the other. Therefore, the study team divided the JCCC AA study area into three segments to evaluate alignment and technology alternatives. The three segments are:

- **Common Segment** - Between the regional core and the I-435/I-70 interchange area
- **East Segment** - Generally from the I-435/I-70 interchange area east and parallel to I-70
- **Southeast Segment** - Generally from the I-70/I-435 interchange area Southeast toward Lee’s Summit

The Tier 1 analysis was preceded by a Pre-Screening, which eliminated those modal options that did not perform well given the context of the study. After the pre-screening, the following modes were chosen to be analyzed in Tier 1:

- Express Bus: A bus vehicle that features higher comfort seating than standard local buses.
- Bus Rapid Transit (BRT): An enhanced bus system that may include such elements as a dedicated busway, high frequency, all day service, off-board fare payment, a unique branded identity, distinctive stations or stops, and Intelligent Transportation Systems (ITS) elements such as signal prioritization.
- Diesel Multiple Unit (DMUs): A medium capacity, non-locomotive hauled, diesel powered rail vehicle that can run in an active freight environment, if FRA-compliant.
- Enhanced Streetcar: The Enhanced Streetcar was developed to address the varying operating environments of downtown Kansas City and the suburban areas to the east as well as for future connectivity to the proposed downtown circulator.

Table 1: Typical Characteristics by Mode

Typical Characteristics	Express Bus	Bus Rapid Transit	Enhanced Streetcar	DMU
Service Type	Regional, interurban	Regional, urban	Regional, urban	Regional, interurban
Vehicles	Standard	Standard, articulated	Articulated single or multiple unit	Single, multiple unit
Vehicles per Set	1	1	1-4	1-4
Seated Capacity per Vehicle	40	40	60	79
Guideway	Mixed traffic and/or freeway shoulder lanes	Exclusive right-of-way (busway or transitway), dedicated travel lane in-street, mixed traffic	Fixed-guideway in exclusive right-of-way, dedicated travel lane in-street, mixed traffic	Fixed-guideway in exclusive right-of-way or dedicated travel lane in street (with complete separation from automobiles)
Propulsion (Power Supply)	Diesel or alternative fuel	Diesel or alternative fuel	Electric with overhead catenary wire	Diesel
Suspension	Rubber tire on pavement	Rubber tire on pavement	Steel wheel on steel rail	Steel wheel on steel rail

Stop/Station Spacing	2-10 miles	1/2 to 2 miles	1/4 to 2 miles	2-10 miles
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The Pre-Screening also eliminated one alignment option – the Trench alignment. This alternative was eliminated from further consideration because it was deemed fatally flawed due to restrictions on capacity. The KCT’s “trench” line is near capacity with over 100 trains daily, including eight Amtrak trains arriving or departing Union Station. The project team determined that there are no feasible technology options for the trench without costly infrastructure upgrades, schedule guarantees, and/or operating agreements.

The following alignment alternatives were advanced to the Tier 1 Screening:

Table 2: Alignments Advanced from Pre-Screening to Tier 1

Common Segment	East Segment	Southeast Segment
Knoche Yard Truman Road Trench Embankment Linwood/31st I-70	Kansas City Southern U.S. 40 I-70	Rock Island Railroad Corridor M-50/Rock Island M-350/I-435/I-70

The alignment and modal options that were not eliminated in the separate alignment and mode pre-screening were combined to create distinct alignment and mode alternatives in each segment for the Tier 1 Screening. All mode and alignment alternative combinations were screened at a high level for fatal flaws. Alternatives receiving a “pass” did not present any obvious fatal flaws and alternatives that received a “fail” rating presented a fatal flaw in terms of cost or technical feasibility.

The following criteria were applied to all of the Tier 1 alternatives. The criteria are presented according to the FTA perspectives of Effectiveness, Cost-Effectiveness, Feasibility, Impacts, and Equity.

Effectiveness Measures

Effectiveness directly measures the extent to which the alternative combinations address the project’s goals and objectives.

Table 3: Effectiveness Measures

	Goals	Objectives	Tier 1 Screening Measures	Methodology
Transportation & Mobility	Develop a transit alternative that is competitive with the automobile and can attract new riders	Improve transit travel times and speeds within study area	Directness of route	Length of alignment segment in miles
		Attract new transit riders	Average transit travel speed	Length of alignment in miles and assumed transit vehicle speeds

	Goals	Objectives	Tier 1 Screening Measures	Methodology
		Increase accessibility to transit	Population & employment concentrations within ¼ mile of alignment	Census data and alignments
		Provide transit capacity to meet current and future travel demand	Ability of alternative to meet expected demand	Qualitative assessment of technologies
	Improve transit service reliability within the study area	Improve on-time performance	Length of alignment within fixed guideway	Length in miles of fixed guideway
Land Use and Economic Development	Develop a transit service that supports regional economic development and land use and transportation objectives.	Provide transit service that can support desired land use growth patterns.	Number of targeted activity centers served	Location of activity centers vs. alignments
		Provide convenient and accessible transit service to existing and planned activity centers.	Number of redevelopment sites served	Length of alignment segment in miles
		Provide transit service that is compatible with Smart Moves and KCATA CSA Key Corridor Network	Compatibility with Smart Moves Compatibility with KCATA CSA Key Corridor Network	Qualitative assessment
Sustainability	Develop a transit service that supports regional sustainability goals	Reduce air pollutant emissions, fuel consumption, and VMT/VHT and delay	Sustainability benefits of modal alternatives	Qualitative assessment of difference in sustainability benefits of modal alternatives

Cost-Effectiveness Measures

Cost-effectiveness assesses the extent to which the costs of the alternatives, both capital and operating, are commensurate with their anticipated benefits.

Table 4: Cost Effectiveness Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Capital & O&M Costs	Assessment of capital and O&M costs	Qualitative assessment – high, medium, low
Transit Productivity	NA	NA

Cost Effectiveness	Assessment of cost effectiveness	Qualitative assessment – high, medium, low
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Feasibility Measures

Feasibility assesses the financial and technical feasibility of the alternatives. Financial measures assess the extent to which funding for the construction and operation of each alternative is considered to be readily available. Technical feasibility assesses potential engineering challenges or restrictions that could limit the viability of an alternative.

Table 5: Feasibility Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Technical Feasibility	Assessment of technical feasibility	Subjective assessment of constructability, willingness of the railroads to share right-of-way, etc.
Financial Feasibility	Assessment of financial feasibility	Comparison of order-of-magnitude capital cost estimate with estimated funds available for local match

Impact Measures

Impacts assess the extent to which the alternatives could present potential environmental and traffic issues that could be fatal flaws or otherwise influence the selection of a preferred alternative.

Table 6: Impact Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Environmental Impacts	Qualitative assessment of fatal flaws Sections 4(f) and 106 impacts	Overlay alignments on environmental features
Traffic impacts	Qualitative assessment of fatal flaws	Qualitative assessment of traffic impacts such as grade crossings, lanes removed, safety, etc

Equity Measures

Equity assesses the extent to which an alternative’s costs and benefits are distributed fairly across different population groups.

Table 7: Equity Measures

Evaluation Criteria	Tier 1 Screening Measures	Methodology
Impacts on minority and low-income groups	Transit-dependent populations concentrations within 1/4 mile of alignments	Census and Employment data Qualitative assessment of potential environmental justice

	Concentrations of service sector jobs within 1/4 mile of alignments Environmental Justice Impacts	issues
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RECOMMENDATIONS FOR THE COMMON SEGMENT

Alternatives Eliminated

DMUs along Knoche Yard alignment and DMUs along Trench Embankment alignment were recommended for elimination due to poor performance under the Effectiveness, Cost Effectiveness, Feasibility, and Equity perspectives:

Effectiveness: Knoche Yard and the Trench Embankment did not meet the project’s goals and objectives as well as other alternatives screened. This is especially notable in travel time and activity centers served for Knoche Yard and activity centers served for the Trench Embankment.

Cost Effectiveness: Knoche Yard yields few of the desired benefits for the project, such as travel time improvements, new transit riders, and economic development, and at a substantially higher cost than other non-DMU alternatives due largely to added safety and access control requirements for DMU guideways, higher cost of constructing new alignment and acquiring property for DMU alternatives, and capital investments needed to accommodate DMU operations in active freight corridors.

Feasibility: Both Knoche Yard and the Trench Embankment would require potentially cost prohibitive operating agreements with operating railroads and capacity conflicts with other freight rail (Knoche Yard only) and are largely incompatible with street running environment (street running portion of Trench Embankment only).

Equity: Knoche Yard would not serve high transit-dependent and minority concentrations because it could not accommodate intermediate stations and is largely isolated and inaccessible.

Alternatives Advanced

BRT and Enhanced Streetcar Hybrid along Truman Road alignment and BRT and Enhanced Streetcar along Linwood /31st alignment were recommended to advance because they demonstrated the strongest performance under Effectiveness, Cost Effectiveness, Feasibility, and Equity:

Effectiveness: Alternatives are best suited to meet project’s goals and objectives.

Cost Effectiveness: Ability of alternatives to operate in existing right of way could achieve stated benefits for the project at a substantially lower cost.

Feasibility: Alternatives presented fewest constructability issues, regulatory barriers, and are among the most affordable.

Equity: Alternatives present fairest distribution of costs and benefits among different population groups.

DMUs along Truman Road alignment are recommended to advance because the alternative demonstrated strong performance under the Effectiveness criteria:

Effectiveness: Alternative has potential to meet project goals and objectives, particularly as related to land use and economic development.

Although recommended for elimination, the Trench Embankment was retained for further analysis. It has since been eliminated.

RECOMMENDATIONS FOR THE EAST SEGMENT

Alternatives Eliminated

No alternatives were eliminated in the East Segment.

Alternatives Advanced

All of the alternatives evaluated for the East Segment—BRT along U.S. 40 alignment, Enhanced Streetcar along U.S. 40 alignment, and DMUs along KCS alignment—were recommended to advance. Although DMUs along the KCS alignment performed well under Effectiveness, Impacts, and Equity, the relatively weaker performance under Cost-Effectiveness and Feasibility warrants studying the viability of BRT and Enhanced Streetcar at a Tier 2 Screening level:

Effectiveness: The DMUs along KCS alignment are best suited to meet the Effectiveness criteria. The DMU alternative largely outperformed other alternatives under Transportation and Mobility as it would operate in a dedicated guideway, sharing tracks with light freight traffic.

Cost Effectiveness: Although DMUs along the KCS alignment were best suited to meet project goals and objectives, BRT and Enhanced Streetcar alternatives along U.S. 40 could meet project goals and objectives at a substantially lower cost.

Feasibility: All alternatives present technical and/or financial feasibility issues that warrant further study in Tier 2. For DMU in the KCS alignment, the cost of operating agreements with private railroad companies will largely determine the viability of the alternative from a technical and financial perspective.

Impacts: DMUs in the KCS alignment could present the least amount of environmental impacts, but potential environmental and traffic impacts to the east of the Truman Sports Complex require more detailed study.

Equity: BRT and Enhanced Streetcar on U.S. 40 present the fairest distribution of costs and benefits among different population groups due to location of the alignment.

RECOMMENDATIONS FOR THE SOUTHEAST SEGMENT

Alternatives Eliminated

BRT and Enhanced Streetcar along M-350 alignment and BRT and Enhanced Streetcar along Rock Island/M-50 alignment are recommended for elimination because:

Effectiveness: Compared with BRT and, Enhanced Streetcar and Regional rail on the Rock Island right-of-way, these alternatives would not meet Transportation and Mobility goals as effectively. They are significantly less competitive than the other alignment alternatives in terms of travel times, schedule reliability, and population and employment concentrations within ¼ mile of the alignment.

Alternatives Advanced

BRT, Enhanced Streetcar, and DMUs along Rock Island alignment were recommended for advancement because these alternatives outperformed other options in the Southeast Segment in Effectiveness, Cost Effectiveness, Feasibility, and Impacts:

Effectiveness: Alternatives are best suited for meeting the Transportation and Mobility goals and could provide some support for regional economic development and land use objectives.

Cost Effectiveness: Rock Island alternatives would yield many of the desired project benefits and more detailed information is needed to determine if they would be cost-effective.

Feasibility: Rock Island alternatives present no major impediments to constructability at the Tier 1 level of screening.

Impacts: Rock Island alternatives present the fewest environmental impacts due to operations in a previously environmentally-disturbed location that was previously used for transportation.

2. FULL CORRIDOR ALTERNATIVES TO BE ADVANCED TO TIER 2

The following are the full corridor alternatives recommended to be advanced to Tier 2.

Table 8: Alternatives Recommended for Tier 2 Analysis and Screening

Alternative	Description / Projects
No Build	Existing and committed highway / transit projects with secured funding as identified in MARC TIP. Also includes Kansas City Area Transportation Authority (KCATA) Comprehensive Service Analysis (CSA) recommendations and the downtown circulator.
Transportation System Management (TSM)	<p>Expansion of KC SCOUT ITS / Ramp Metering & Incident Management</p> <p>Expand local bus service frequency along Truman Road and Linwood corridors to generally match headways assumed for more capital intensive alternatives. Service should extend to Truman Sports or beyond.</p> <p>Expand number of KCATA Blue Springs & Lee's Summit to CBD Express Buses (for both AM & PM and mid-day) to match frequency assumed for more capital intensive alternatives. Provide intermediate stops at park-and-rides in outer parts of the corridor such as Raytown. Service should provide reverse commutes.</p> <p>Expand or introduce bus service in US71 corridor.</p> <p>Park and Ride Lot Improvements and new lots at same general locations as stations in the more capital intensive alternatives.</p>
Full Regional Rail (DMU) - Truman	<p>DMUs on Truman - KCS - Rock Island</p> <p>Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Linwood and US71.</p>
Full Enhanced Streetcar #1 – Truman	<p>Enhanced Streetcar on Van Brunt/Truman Road and US40 on the East and Rock Island in the SE</p> <p>Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Linwood and US71.</p>
Full Enhanced Streetcar #2 – Linwood	<p>Enhanced Streetcar on Linwood, U.S. 40 in the East, and Rock Island in the SE</p> <p>Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Truman and US71.</p>
Full BRT #1 – Truman	<p>BRT on Van Brunt/Truman Road and U.S. 40 on the East and Rock Island in the SE</p> <p>Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Linwood and U.S. 71.</p>
Full BRT #2 – Linwood	<p>BRT on Linwood, U.S. 40 in the East, and Rock Island in the SE</p> <p>Scale back TSM bus service to No Build levels, in general, but retain expanded bus on Truman and U.S. 71.</p>

3. ASSUMPTIONS FOR DEFINING ALTERNATIVES

3.1. GUIDING ASSUMPTIONS

The following universal assumptions will be used to guide the definitions and ultimately the analysis of the alternatives. These assumptions were approved by the Project Partnership Team. This information is the same for all alternatives, regardless of mode and alignment:

1. **Study Base Year and Horizon Year:** Base Year of study is 2005 and forecast year is 2035.
2. **Markets:** The service should be designed to capture as many markets as possible, including commuter trips, reverse commute trips, and, to the extent possible, special event trips. The market for these services extends beyond peak hours and weekdays. To the fullest extent possible, each of the alternatives will be designed to serve the same travel markets to allow for an “apples to apples” comparison.
3. **Coverage:** All of the alternatives except for No Build will offer the same service coverage, connecting the Central Business District (CBD)/downtown Kansas City to Oak Grove in the East Corridor and Pleasant Hill in the Southeast Corridor. Extending service to Odessa could be considered in future phases of study. There are no additional communities beyond the areas immediately adjacent to the alignment that will require feeder connections for an initial service.
4. **Termini (may be refined pending Tier 2 Analysis):**
 - a. East: The terminus for all fixed guideway alternatives is Oak Grove.
 - b. Southeast: The terminus for all fixed guideway alternatives is Pleasant Hill.
 - c. CBD:
 - i. The terminus for DMU is Union Station.
 - ii. The Enhanced Streetcar in the CBD or downtown Kansas City should be aligned with the Downtown Circulator streetcar LPA. The initial Enhanced Streetcar alternative runs the full length of the Downtown Circulator Streetcar alignment, sharing the same tracks, terminating at 3rd and Grand Streets.
 - iii. The BRT terminus will be 10th and Main Street in the CBD.
5. **Stations & Central Transfer Station:** The following describes station typologies used in this analysis:
 - a. Type 1- Large park-and-ride: a park-and-ride lot in a suburban setting with greater than 50 parking spaces, transfer locations for feeder buses, with a station, platforms / shelter, ticket vending, and amenities possibly including convenience retail, and digital message boards providing rider information among other station amenities.
 - b. Type 2- Small park-and-ride lot: with the same amenities as described above but with 50 or fewer parking spaces.

- c. Type 3 - Walk-up station: typically within the CBD area, includes a station, platform / shelter and ticket vending only with interface to local buses.
 - d. Type 4 - Intermodal Hub: a larger transfer center with mixed use development and is the central transfer point for the Common Segment, East Segment, and Southeast Segment.
6. **KCATA CSA Key Corridor Plan:** The recommendations contained in the KCATA CSA Key Corridor draft plan will be implemented in the near future and should be assumed in all of the alternatives.
 7. **U.S. 71:** The initial service plan will assume an Express Bus service along the U.S. 71 corridor to Belton in all of the alternatives except No Build.
 8. **Preferential Treatment at Intersections:** The Regional Rail alternatives will have signal preemption via gated intersections in all street running environments. The BRT and Enhanced Streetcar alternatives are currently planned to have signal prioritization for the purpose of increasing travel speed and maintaining schedule. Signal prioritization will be analyzed more fully during future phases of project development.
 9. **Fare Assumptions:** The proposed fixed guideway services will have a zonal fare structure. For the purposes of this analysis, there will be two zones: (1) the common segment and (2) areas outside the common segment. Trips that originate and terminate in the same segment will be charged \$1.50 per one-way trip. Trips that originate and terminate in different segments will be charged \$3.00 per one way trip. This fare structure is in keeping with KCATA's current fares for Express Bus Service (\$3.00 per trip) and local line haul service (\$1.50 per trip).

3.2. MODELING ASSUMPTIONS

For the purposes of this study, the team will be using an enhanced version of the MARC EMME Model. This model previously had a forecast year of 2040 to align with MARC's Long Range Transportation Plan horizon year. For the purposes of this study, the input data was revised by MARC to plan for a forecast year of 2035. Detailed information about the model development can be found in the JCCC AA model methodology paper.

4. NO BUILD ALTERNATIVE

The No Build Alternative serves several purposes. It helps define the problem to be solved, identifies the consequences of “doing nothing,” establishes a baseline for evaluating the benefits and costs of other alternatives, and is a start for meeting National Environmental Policy Act requirements.

4.1. CAPITAL IMPROVEMENTS

The No Build Alternative includes all capital improvements identified in the fiscally constrained MARC Transportation Improvement Program (TIP), listed below:

Table 9: Mid-America Regional Council Transportation Improvement Program (TIP) Fiscally Constrained Projects

Category	Project Name	County	Organization	Fiscally Constrained Cost	Length (miles)
Highway	Business 7 Highway – Pleasant Hill from 7 Hwy to 58 Hwy	Cass	City of Pleasant Hill	\$2,000,000	3.5
Highway	39 th Street Bridge Over the Little Blue River – eastern Independence	Jackson	City of Independence	\$3,000,000	0.2
Highway	Red Bridge Road – Blue River over US 71	Jackson	City of Kansas City, MO	\$23,004,000	2.2
Highway	Blackwell Interchange at US-50 Hwy	Jackson	City of Lee’s Summit	\$23,700,000	1.1
Highway	Lee’s Summit Road – Colbern to West City Limits	Jackson	City of Lee’s Summit	\$8,660,000	1.1
Transit	BRT I-35 Bus on Shoulder Project	Johnson	Johnson County Transit	\$49,000,000	42.5
Transit	Kansas City Streetcar	Jackson	KCATA	\$150,000,000	5.8

4.2. BUS NETWORK

The No Build Alternative includes the sixty-four routes currently operated by the KCATA that collectively make up the existing bus network.

The KCATA recently completed a CSA that identified modifications to a number of these existing routes. These modifications will be implemented over time and will be included in the No-Build alternative assumptions. The modifications are listed below. (Source: KCATA Comprehensive Service Analysis, 2011)

- **Main Street MAX Orange Line**: Midday service frequencies would be improved from every 15 minutes to 10 minutes and evening frequencies would be improved from every 30 minutes to every 15 minutes. MAX will be extended to Bannister and Blue Ridge Boulevard in the intermediate future with the anticipated relocation of the Bannister and Drury transfer center.
- **Troost MAX Green Line**: Troost MAX will provide service between downtown and Bannister and Drury on weekdays and weekends, and will replace Route 25 Troost weekend service to Bannister and Drury.
- **12-12th Street**: To simplify service, Route 12 would be split into two routes: Route 12 will operate primarily along 12th Street between the West Bottoms and 12th and Winchester, and a new Route 15 Truman Road will operate on Truman Road between downtown and Truman and Crystal.
- **24-Independence**: All short trips will travel between downtown and Winner and White, and all long trips will travel between downtown and the Independence Transit Center (Truman and Noland). Final routing on the long trips serving Independence will be coordinated with the new bus service being planned by the City of Independence.
- **24X-Independence Express**: Route 24X would be replaced with new Route 15 Truman Road Express service, which would provide peak period limited stop service between Independence and downtown Kansas City in a manner similar to Route 24X, but with more convenient schedules.
- **25-Troost**: To match weekday service, Route 25 weekend service will operate between downtown and 83rd and Troost. Weekend service south of 83rd Street will be replaced by Troost MAX.
- **27-27th Street**: Service would be straightened through Hospital Hill and extended to the Westside and downtown Kansas City via Summit Road. Weekday schedules will be revised to provide even frequencies.
- **28-Blue Ridge**: Route 28 service would be modified to operate all service between Blue Ridge Crossing and downtown Kansas City via 40 Highway and I-70 (no longer via Linwood Boulevard) to provide faster service between Southeast Kansas City, Blue Ridge, and downtown Kansas City. The route will continue to make connections at the 31st and Van Brunt transfer center. Weekday service would be extended from 7:00 p.m. to 11:00 p.m. In conjunction with this change, Route 31 31st Street would also be extended to Blue Ridge Crossing to improve local service between Kansas City's central areas and Blue Ridge Crossing.

- **28X-Blue Ridge Express**: Route 28X's first morning trip will be scheduled for 5:00 a.m. and the evening trips will be rescheduled at regular 30 minute intervals and provided over a longer period.
- **30-Northeast**: Route 30 service would be extended to the Northeast Industrial District to replace Route 126 East Fifth Street service. To better match service levels with demand, Route 30's weekday schedule will be extended to 11:00 p.m. and the Saturday and Sunday service spans also be reduced slightly.
- **31-31st Street**: Route 31 would be extended to Blue Ridge Crossing instead of Route 28 Blue Ridge to provide more frequent and more consistent service between Kansas City central areas and Blue Ridge Crossing. Route 31 will not travel to the VA Hospital. Instead, Route 35 35th Street will provide service to the VA Hospital.
- **35-35th Street**: Route 35's eastern route will be changed to provide service to the VA Hospital and to Dunbar Apartments. Service frequencies and hours would also be revised with slightly less rush hour service and more midday service.
- **37-Gladstone**: Route 37 would be replaced by a new Route 36X Metro North/Antioch Express route that would provide more service into downtown (including Government District) and Crown Center.
- **37XX-North Broadway Express**: Route would continue to use existing alignment on US 169 and service would be extended at the route's northern end to Gashland and New Mark, and on the southern end to Crown Center. To better match service with demand, the three morning trips would be scheduled at 6:00 a.m., 6:30 a.m., and 7:00 a.m. and the 5:55 p.m. outbound trip would be discontinued due to very low ridership.
- **38-Meadowbrook/Antioch Center**: Route 38's alignment would remain the same as current and schedule would be adjusted to provide more consistent frequencies and to alternate trips between its two outer legs (Gladstone and Vivion/Jackson).
- **38X-Meadowbrook Express**: Route 38X would be replaced by new 36X Metro North-Antioch Center Express route that would provide faster and more frequent service into downtown (including the Government District) and Crown Center.
- **39-39th Street**: Buses will lay over on the west end of the route (39th and Rainbow) to improve service for passengers traveling the route's eastern loop, and all trips will provide service on the entire route. Stops would also be consolidated to make service faster and improve reliability.
- **47-Roanoke**: To improve reliability, Routes 47 and 51 Broadway will be jointly redesigned. Route 47's current eastern routing (Blue Ridge Crossing to Plaza) will be joined with Route 51's current northern segment (Plaza to Crown Center/downtown via Broadway). All service will operate between downtown and Blue Ridge Crossing, with the exception for weeknight service (approximately 7:30 p.m. until 12:30 a.m.) and Sunday service which would operate between downtown and the Plaza.
- **51-Broadway**: To improve reliability, Routes 47 Roanoke and 51 will be jointly redesigned. Route 51's current southern routing (Ward Parkway Center to Plaza) will be joined with Route 47's current northern routing (Plaza via KU Med to downtown). The route will also be extended south from Ward Parkway Center via Ward Parkway and Bannister Road to serve Linden Hills

and connect with Troost MAX. Short trips will operate between downtown and the Plaza (JC Nichols and 47th Street).

- **51X-Ward Parkway Express**: Routes 51X and 56X would be consolidated into a single route that would operate between Red Bridge and downtown Kansas City via Ward Parkway and provide more trips.
- **53-Armour-Swope Park**: Route 53 would be consolidated with Route 54 Armour-Paseo and Route 108 Indiana. All northern end service would operate as Route 54, and southern end service south of Swope Parkway would be provided by an extension of Route 108 Indiana.
- **54-Armour-Paseo**: Route 54's southern end would change to provide new service between 85th Street and The Paseo to Ward Parkway Center. Service at 85th and Prospect would be replaced by Route 175. Service levels would be adjusted to better match service levels with demand: less rush hour service, but twice as much midday service.
- **55-Rockhill**: Service would be discontinued due to low ridership and the upgrade of nearby Troost MAX service. Current service on Holmes at 85th Street would be replaced with Route 54. Service on Holmes to Bannister and 99th would be replaced by Route 51 service.
- **56X-Red Bridge Express**: Routes 51X and 56X would be consolidated into a single route that would operate between Red Bridge and downtown Kansas City via Ward Parkway and provide more trips.
- **57-South Oak**: Service north of 47th Street would be discontinued and consolidated with Main Street MAX to provide more frequent midday and evening MAX service. Service south of 47th Street would be combined with Route 156 Red Bridge to provide local service between the Plaza, Waldo, and Red Bridge. Service would also be reduced to better match service levels with demand.
- **71-Prospect**: Late morning service frequencies would be improved from every 13 minutes to 10 minutes and evening frequencies would be improved from every 30 minutes to every 15 minutes. The route would also be adjusted to operate all service via 11th and 12th Streets to provide better service to the Federal District.
- **108-Indiana**: Route 108 would be extended to the Kansas City Zoo to replace Route 53 Armour-Swope Parkway southern end service. The route would also be reconfigured to provide better service to Swope Health Center, the Shops at Blue Parkway and Bruce Watkins Cultural Center. Midday service frequencies would also be improved.
- **109-9th Street**: Route 109's alignment western route will be extended to Quality Hill to replace current Route 12 service, and the route's eastern route would travel on Hardesty Avenue between 9th and the 31st and Van Brunt transfer center. Route 109's current alignment along 12th Street would be served by changes to Route 12 and service on Winner Road would be discontinued. Schedule changes would also be made to better match service levels with demand.
- **110-Woodland-Brooklyn**: Service would be realigned to operate along Brooklyn Avenue between 18th and 44th Streets to improve directness. Service on Vine and 25th St. discontinued. Weekday schedule levels would be adjusted to better match service levels with demand, and Saturday service would be discontinued due to low ridership.

- **121-Cleveland-Antioch**: A number of alignment changes would be made to make service more direct and space the route from the 108 more efficiently. The route will be straightened in the Northeast Industrial District and moved from St. John Avenue and Hardesty on to Independence Avenue and Belmont. Also, between Truman Road and 45th street, the route will be moved from Cleveland Avenue to Jackson Avenue to expand service coverage to the east and serve part of Jackson Avenue that would no longer be served by Route 12.
- **123-23rd Street**: Service would be realigned to operate through Hospital Hill via 22nd Street and to provide service to the Westside neighborhood along Southwest Boulevard to 31st Street.
- **126-East 5th Street**: Route 126 would be discontinued due to very low ridership. Service to the Northeast Industrial District would be provided instead by an extension of Route 30.
- **129-I-29 Express**: Service would be extended at both ends—to KCI at the north and to Crown Center to the south—and would operate along a consistent alignment in both directions via Tiffany Springs Road, Prairie View Road, I-29, 169 Highway, and Burlington. The revised route would serve all three KCI terminals, provide better service to the Tiffany Springs area, and provide connections to and from other Northland locations. Service would be provided seven days a week from early morning until late night. A new express route, Route 29X, would also be implemented to provide peak period express service between Boardwalk Square and downtown Kansas City.
- **132-Gracemor**: Route 132 would be maintained and extended to Crown Center.
- **133-Vivion/Antioch**: Route 133's alignment in downtown Kansas City would be streamlined to shorten running times and make schedules more convenient. The Iron Street variant through North Kansas City would also be discontinued due to low ridership and to simplify service.
- **133X-Vivion/Antioch Express**: Route 133X would be replaced by new 36X Metro North-Antioch Center Express route that would provide faster and more frequent service into downtown (including Government District) and Crown Center.
- **135-Winwood/69 Highway**: Route 135 would be maintained and extended to Crown Center. Schedule will be revised to serve more typical work times.
- **136-Boardwalk/Antioch Connector**: Service would be provided on weekdays only between 9 a.m. to 3 p.m., and would be improved to operate hourly instead of once every two hours.
- **137-Metro North/Antioch Connector**: Weekday service would be improved to operate every hour instead of once every two hours. Saturday service would be discontinued due to very low ridership.
- **142-North Oak**: Route 142 would be upgraded and operate between Zona Rosa, downtown Kansas City, and Crown Center. Connections with Main Street MAX would be made at the 3rd and Grand Park-and-Ride in the River Market. Service spans would be lengthened to provide service later at night, and Sunday service would be added.
- **155-55th Street**: Route 155's current routing via 55th Street will remain and schedule will be adjusted to provide hourly trips between 6:00 am and 6:00 pm.
- **156-Red Bridge**: Route 156 would be consolidated with the southern end of Route 57 (between the Plaza and Waldo), providing direct local service between Red Bridge, Waldo, and the Plaza. Service will also be reduced to better match service levels with demand.

- **163-63rd Street**: Route 163 would be shortened by discontinuing the segment between Ward Parkway and Brookside Boulevard to provide more convenient schedules. Service levels would also be adjusted to better match service with demand.
- **173-Casino Cruiser**: Route 173 would be reconfigured to provide much faster and more direct service, more convenient schedules, and year-round service to the Worlds of Fun area.
- **175-75th Street**: Route 175 would be realigned to serve 85th and Prospect and replace Route 54 service realigned to Ward Parkway Center. In conjunction with anticipated relocation of the Bannister and Drury transfer center to the Bannister Road at Blue Ridge Boulevard area, Route 175 would operate via 87th Street and Blue Ridge Boulevard to the new transfer center. Service to Overland Park would remain.
- **229-Tiffany Spring MetroFlex**: To provide simpler service, Route 229 MetroFlex service would be replaced by improvements to Route 129 service.
- **237-Gladstone/Antioch MetroFlex**: Route 237's flex boundary would be extended eastward. Scheduled stops would also be introduced at Antioch Center to improve connections with fixed-route services.
- **243-Antioch-Barry Rd. Connector**: Route 243's alignment would change to provide service between 64th Street, Prairie View Road, Gateway, Riverside Community Center, Vivion Road, and North Oak Trafficway. Connections to downtown Kansas City would be available via Route 142 North Oak at North Oak and Vivion and to the I-29 Corridor via Route 129 on Prairie View. Service to Argosy Casino and Saturday service would be discontinued due to low ridership. Weekday service frequencies would improve to operate every hour instead of once every two hours.
- **247-Westside MetroFlex**: Route 247 would be discontinued and replaced with a combination of Route 27 27th Street and Route 123 23rd Street fixed-route service.
- **251-TMC Lakewood Connector**: Service would be provided from 9:00 am to 3:00 pm on weekdays.
- **253-Raytown MetroFlex**: Route 253's southern boundary would be extended to reflect the shift of Bannister and Drury transfer center to the proposed transfer facility in the Bannister Road at Blue Ridge Boulevard area. Scheduled stops would also be introduced at the new transfer center to improve connections with fixed-route services.
- **296-Bannister/Hillcrest MetroFlex**: Route 296's Boundary would be extended to the northeast to improve service in Ruskin/Hickman Mills; service to the Bannister Federal Complex would be replaced with Route 298 expanded service. Scheduled stops would also be introduced at the new Bannister and Blue Ridge transfer center to improve connections with fixed-route services.
- **298-South Kansas City MetroFlex**: Route 298's southern boundary would be extended to the east to include the Bannister Federal District. Scheduled stops would be introduced at Bannister Road and Troost Avenue to improve connections with fixed-route services. Saturday service would be discontinued due to very low ridership.
- **471-71 Highway Express**: Route 471's schedule would be adjusted to provide service over a longer span of time and routing to downtown Kansas City (including Government District) would

travel via Crown Center. Service would be discontinued on Hickman Mills Drive between Red Bridge Road and Longview Road due to very low ridership.

The City of Independence is served by seven routes which are currently operated by the KCATA. These include the #183, #284, #285, #286, #291, #292 and #293 (Table 3.1b). Effective 7/01/12 the City will contract with a private service provider for the operation of these routes and alignments and schedules will be modified at that time. For the AA, current routes and schedules are assumed.

A summary of the bus routes in the No Build Alternative network are summarized in the following table.

Table 10: No Build Alternative KCATA Bus Routes

KCATA Kansas City Routes	Headways (in minutes) AM/mid-day/PM peak/evening		
	Weekday	Saturday	Sunday
#12 Twelfth Street	15/20/15/60	20/20/20/60	60/60/60/60
#24 Independence	15/15/15/30	15/15/15/60	60/30/30/60
#25 Troost	30/30/30/60	30/30/30/60	60/60/60/60
#27 Twenty-seventh Street	30/30/30/61	60/60/60/60	60/60/60/60
#28 Blue Ridge	15/30/15/60	60/60/60/60	60/60/60
#30 Northeast	20/60/20/60	60/60/60/60	60/60/60/60
#31 Thirty-first Street	20/20/20/30	30/30/30/60	60/30/30/60
#35 35th Street	25/50/25/60	60/60/60	60/60/60
#37 Gladstone	30/ - /30	NA	NA
#38 Meadowbrook	30/ - /30	70/70/70	NA
#39 Thirty-ninth Street	20/20/20/30	15/15/15/60	30/30/30/60
#47 Roanoke	30/30/30	60/60/60	NA
#51 Broadway	20/45/20	30/30/30/60	60/60/60/60
#53 Armour/Swope Park	20/60/20/60	60/60/60/60	60/60/60/60
#54 Armour/Paseo	30/30/30/60	60/60/60/60	60/60/60/60
#55 Rockhill	20/ - /20	NA	NA
#56 Country Club	1 IB / 1 OB	NA	NA
#57 South Oak	30/60/60/30	30/60/30/30	60/60/60/60
#58 MAX	10/15/10/30	15/15/15/30	30/30/30/30
#69 Liberty Express	30/ - /30	NA	NA
#71 Prospect	10/10/10/30	15/15/15/30	30/30/30/30
#101 Minnesota	30/30/30/60	60/60/60	60/60/60
#102 Central * <u>Midday UGT</u>	40/60*/40	NA	NA
#104 Argentine	30/60/30/60	60/60/60	NA
#106 Quindaro	30/30/30/60	60/60/60	NA
#107 Seventh St/Parallel	30/60/30	60/60/60	NA
#108 Indiana	20/35/20/60	30/30/30/60	60/60/60/60

KCATA Kansas City Routes	Headways (in minutes) AM/mid-day/PM peak/evening		
	#109 Ninth Street	25/40/25/25	40/40/40
#110 Woodland/Brooklyn	60/60/60	60/60/60	NA
#121 Cleveland	60/60/60	60/60/60	NA
#123 Twenty-third Street	60/60/60	NA	NA
#126 East Fifth Street	60/ - /60	NA	NA
#129 I-29 Express	20/60/20/60	NA	NA
#132 Gracemor	2 IB / 2 OB	NA	NA
#133 Vivion/Antioch	30/60/30/60	NA	NA
#135 Winnwood/69 Hwy	2 IB / 2 OB	NA	NA
#136 Boardwalk/Antioch	120/120/120	120/120/120	NA
#137 Metro North/Antioch	120/120/120	120/120/120	NA
#142 North Oak	20/60/20	60/60/60	NA
#152 LS/Raytown Express	40/ - /40	NA	NA
#155 Fifty-fifth Street	60/60/60	NA	NA
#156 Red Bridge Connector	20/30/20/60	60/60/60	60/60/60
#163 Sixty-third Street	30/30/30/60	60/60/60	60/60/60
#170 Blue Springs	30/ - /30	NA	NA
#173 Casino Cruiser	60/60/60/60	60/60/60/60	60/60/60/60
#175 Seventy-fifth Street	30/30/30	60/60/60	60/60/60
#229 I-29/Tiffany Springs	FLEX	FLEX	FLEX
#237 Gladstone Circulator	FLEX	NA	NA
#243 Antioch/Barry Conn.	120/120/120	120/120/120	NA
#244 NKC Circulator	FLEX	FLEX	FLEX
#247 Westside Circulator	FLEX	NA	NA
#251 TMC Lakewood Conn	60/60/60	NA	NA
#252 Lee's Summit Circ.	FLEX	NA	NA
#253 Raytown Circulator	FLEX	NA	NA
#296 Bannister/Loma Vista	FLEX	FLEX	NA
#298 SKC Wornall	FLEX	FLEX	NA
#471 71 Hwy Express	20/ - /20	NA	NA

Table 11: No Build Alternative Independence Bus Routes

Independence Routes	Headways		
	Weekday	Saturday	Sunday
#183 Green Independence	60/60/60	60/60/60	NA
#284 Purple Independence	60/60/60	60/60/60	NA

Independence Routes	Headways		
	Weekday	Saturday	Sunday
#285 Blue Independence	60/60/60	60/60/60	NA
#286 Silver Independence	90/90/90	NA	NA
#291 Yellow Independence	120/120/120	60/60/60	NA
#292 Orange Independence	60/60/60	60/60/60	NA
#293 Red Independence	120/120/120	60/60/60	NA

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5. TRANSPORTATION SYSTEMS MANAGEMENT (TSM) ALTERNATIVE

The Transportation System Management (TSM) Alternative includes relatively low cost transit service improvements and represents the best that can be done to improve transit service short of a major capital investment in a fixed-guideway. While considered to be a real alternative that could be chosen, the TSM alternative can also serve as a baseline for assessing the added benefits and costs of the more capital intensive alternatives. It can also serve as the first phase of a transit investment program, helping to strengthen the transit market and build ridership in the short term to support a higher capital investment to be added later.

The TSM Alternative includes all of the projects and services included in the No Build Alternative as well as additional capital improvements and bus network enhancements. Bus network enhancements include commuter express transit routes in the East Corridor in Oak Grove, Grain Valley, Blue Springs and eastern Independence on I-70 to the Kansas City, Missouri CBD and Raytown, Lee's Summit and Pleasant Hill in the Southeast Corridor. Most of the service will be oriented to directional service to the CBD in the a.m. peak and from the CBD in the p.m. peak. Some reverse commute service will be provided.

5.1. CAPITAL IMPROVEMENTS

5.1.1. ROADWAY CAPITAL IMPROVEMENTS

The TSM will include all roadway capital improvements proposed under the No Build Alternative.

5.1.2. BUS CAPITAL IMPROVEMENTS

The TSM Alternative will primarily rely on the existing bus transit operations in the regions with some service modifications in the form of new express bus service either using standard 40 foot motor coaches seating 40 passengers, or over the road motor coaches seating 35 to 37 passengers, offering more amenities. The determination of vehicle type will be based on the levels of ridership and the costs of the service. The TSM will include the following transit capital improvements:



Figure 1: Over the Road Coach used for Express Bus Services (Source: Metro Magazine)

New Park and Ride Lots: Large Park and Ride Lots will be paved and include 50 or more parking spaces, two shelters, lighting, monument signage and basic landscaping. Small Park and Ride Lots will be paved

and include fewer than 50 parking spaces, one shelter, lighting, monument signage and basic landscaping.

Table 12: TSM New Park and Ride Lots

New Park and Ride Lots		
Park and Ride Lot Location	Park and Ride Type	Markets Served
I-70 Oak Grove Interchange	Large Park and Ride	Oak Grove residents and commuters from cities to the east
I-70 Grain Valley Interchange	Large Park and Ride	Grain Valley residents
I-70 and Little Blue Valley Interchange	Large Park and Ride	Western Blue Springs residents, employment and commercial
7 Highway & 150 Highway	Small Park and Ride	Pleasant Hill and Greenwood residents and commuters from cities to the southeast
350 Highway and Raytown Road	Large Park and Ride	Raytown residents, employment and commercial

Expansion to Existing Park and Ride Lots: Under the TSM Strategy, two existing parking lots, operated by MoDOT, will be expanded to meet the needs of bus enhancements.

Table 13: TSM Expanded Park and Ride Lots

Expansion to Existing Park and Ride Lots		
Park and Ride Lot Location	Park and Ride Type	Markets Served
I-70 and Woods Chapel Road	Large Park and Ride	Lake Topawingo and Blue Springs residents
I-470 and 350 Highway	Large Park and Ride	Lee’s Summit residents, employment and commercial

Existing Park and Ride Lots with no Expansion Plans: The existing Park and Ride at I-70 and M-7 Highway, currently operated by MoDOT that will be used in its current state.

Upgrades to Shelters, Benches, Lighting and Informational Signage: Upgrades to current bus stops have been identified at these locations:

Table 14: TSM Upgrades to Shelters and Amenities

Linwood Alignment	Truman Alignment
31 st & Van Brunt Linwood @ VA Hospital Linwood & Indiana Linwood & Prospect	Van Brunt & 30 th Ter. Van Brunt & 27 th St. Van Brunt & 23 rd St. Van Brunt & 18 th St. Hardesty & Truman Truman & Jackson Truman & Prospect Truman & Woodland

5.2. BUS NETWORK

The TSM Alternative includes the No Build bus network, with additional changes designed to provide a comparable level of service in terms of headways and hours of operation to the more capital intensive alternatives.

The changes include increasing express bus service in the east corridor and in the Southeast corridor. Three separate routes would be provided in the east corridor. One new route would begin in Oak Grove, stop in Grain Valley and then run express to the Kansas City, Missouri CBD (with one stop in the CBD at 13th and Oak). A second route would provide an increased service level to the existing Route 170 that makes two stops in Blue Springs and then expresses to the Kansas City, Missouri CBD (with one stop in the CBD at 13th and Oak). The third route would provide new service to eastern Independence and express to the Kansas City, Missouri CBD (with one stop in the CBD at 13th and Oak). One route would be provided in the Southeast corridor. This route would have a transit stop at park-and-ride locations in Pleasant Hill, Lee’s Summit and Raytown (with one stop in the CBD at 13th and Oak).

Reverse commute service would also be provided on all of the routes operating from the CBD to each of the locations. Trips to the Independence park-and-ride would connect with local transit service. In Blue Springs, the express bus would circulate to provide access to destinations. Similarly, the express bus would circulate to provide access to destinations in Lee’s Summit.

Stadium event service would be provided on event evenings through deviations to the normal alignments allowing the buses to more directly access the stadium facilities and through extension of operating hours.

The TSM includes expansion of existing Express Bus service from Oak Grove and Lee’s Summit to the Central Business District. A new Express Bus route connecting Belton (in Cass County) and Grandview to the CBD via U.S. 71 is also planned in the TSM. Additionally, the TSM includes these enhancements:

Table 15: East Corridor TSM Enhancements

East Corridor TSM Enhancements	
TSM Enhancements	Markets Served
Park and Ride Lot at Oak Grove (Large Park and Ride)	Oak Grove residents and commuters from cities to the east.

East Corridor TSM Enhancements	
TSM Enhancements	Markets Served
Park and Ride Lot at Grain Valley (Large Park and Ride)	Grain Valley residents
Park and Ride Lot at Little Blue Parkway (Large Park and Ride)	Independence residents
Expanded Park and Ride and Woods Chapel Road (Large Park and Ride)	Lake Topawingo and Blue Springs residents
Sixteen daily round trips between Oak Grove/Grain Valley and the CBD	Oak Grove and Grain Valley residents and commuters from cities to the east.
Twenty daily round trips between Blue Springs and the CBD	Blue Springs residents
Twenty daily round trips between Independence and the CBD	Independence residents

Table 16: Southeast Corridor TSM Enhancements

Southeast Corridor TSM Enhancements	
TSM Enhancements	Markets Served
Park and Ride Lot at M-7 Highway and M-150 Highway (Small Park and Ride)	Pleasant Hill and Greenwood residents and commuters from cities to the southeast
Park and Ride Lot at M-350 Highway and Raytown Road	Raytown residents, employment and commercial
Expanded Park and Ride at M-350 Highway and I-470	Lee's Summit residents, employment and commercial

Southeast Corridor TSM Enhancements	
TSM Enhancements	Markets Served
Twenty daily round trips between Lee's Summit and the CBD	Lee's Summit residents, employment and commercial

Changes to the bus network proposed under the TSM are summarized in the following table.

Table 17: TSM Changes to the Bus Network

Routes	Programmed Headways		Change from No-Build Alternative
	Weekday Peak	Weekday Off-peak	
170 – East I-70 Express (all legs)	20	60	48 additional trips
152 – 350 Hwy Express	20	60	16 additional trips
171 – U.S. 71 Hwy Express	20	n/a	with 10 additional trips for a total of 20 daily

5.3. TRANSPORTATION DEMAND MANAGEMENT (TDM) OPTIONS

At this time, no changes or additions to the regional TDM options, including the regional rideshare program are planned.

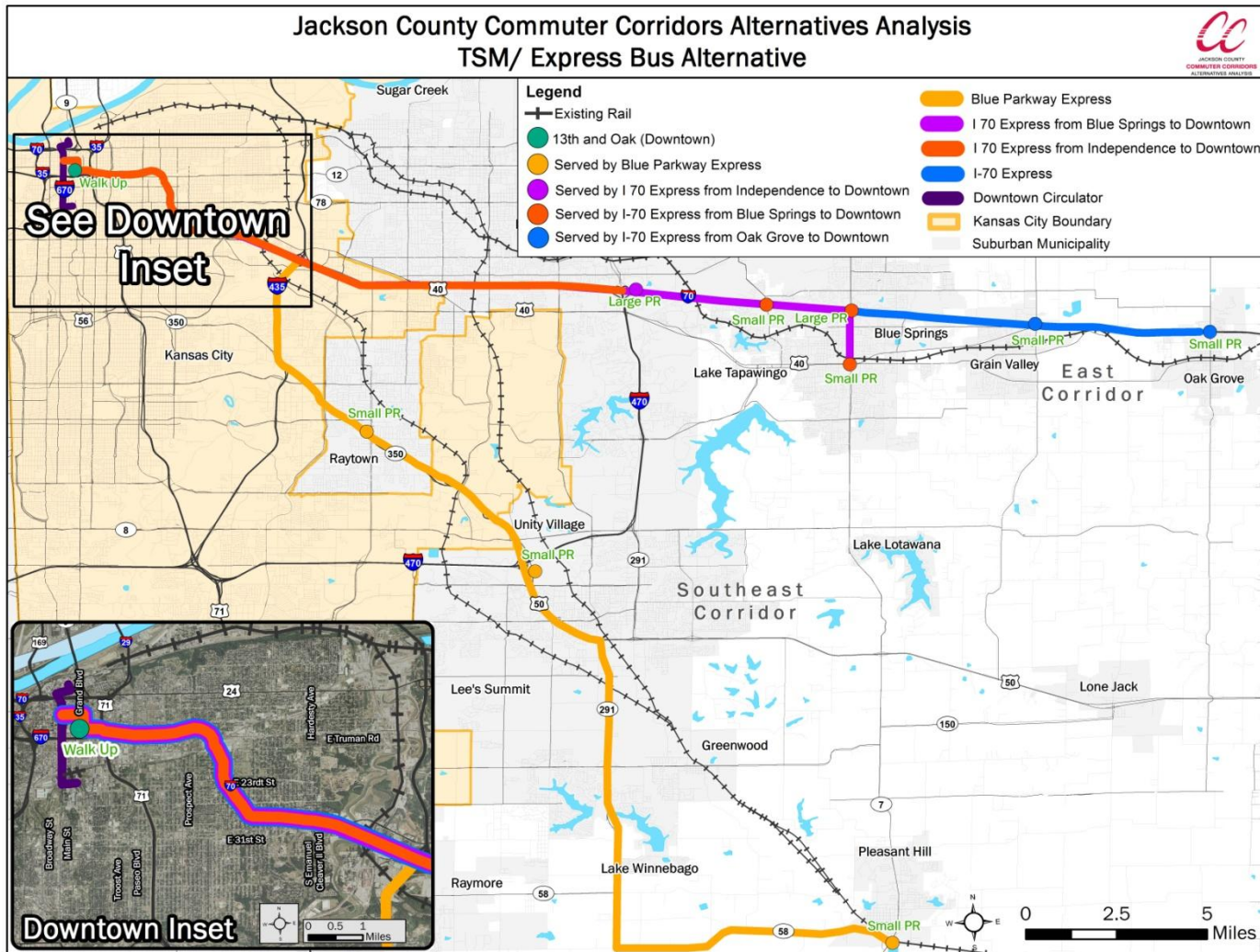


Figure 2: JCCC AA Transportation Systems Management / Express Bus Alternative

6. FULL REGIONAL RAIL ALTERNATIVE

The full regional rail alternative uses DMU style trains to connect suburban jurisdictions in the east and south east to destinations in the CBD, to provide access to other destinations, and to provide opportunities for reverse commutes to suburban employment centers.

6.1. TECHNOLOGY

DMUs are rail cars that contain both passenger accommodations and propulsion (diesel engines located below the passenger compartments). As a self-propelled unit, no large locomotive engine is required. Using dual cab train set configurations, DMUs are capable of running in the reverse direction which eliminates the need for turnaround tracks. The Federal Railroad Administration (FRA) requires that passenger trains operating on active freight tracks must be compliant with its crash worthiness standard (49 CFR Part 238) or operate with temporal separation (i.e., passenger operations during the day with freight operations at night). The vehicle proposed for this alternative would be a fully FRA-compliant DMU based on requirements of the Kansas City Southern Railway, the owning railroad for a portion of the alignment.

Initial specifications call for the train fleet to be comprised of FRA-compliant, single-level DMUs, approximately 85 feet long, 10 feet wide and 14 feet high. Vehicle capacity would be approximately 79 seated passengers per rail car. The vehicle will be designed with a low floor entry, fully compliant with ADA standards. The maximum vehicle operating speed will be 79 mph. The vehicle acceleration rate will be approximately 1.3 mph/s with a braking rate at 3.0 mph/s. Vehicle specifications are modeled after the Nippon-Sharyo standard DMU.



Figure 3: Diesel Multiple Unit (DMU) Source: Nippon Sharyo U.S.A – rendering of Toronto Metrolink’s Air Rail Link System Vehicle

6.2. ALIGNMENT

East Line: Eastern Jackson County Line to 23rd Street at I-435

The East Line begins at Oak Grove in Jackson County and runs on the KCS railroad from Oak Grove to Sterling Avenue in Independence mixed with freight rail traffic. West of Sterling Avenue the alignment continues on a new build segment. The KCS operates 4-6 trains daily on this single track route. The Regional Rail service will begin just west of Main Street in Oak Grove with a station. There is one at-grade crossing at Clinton Street in Oak Grove. The alignment passes through downtown Oak Grove, runs past residential property and mostly agricultural/undeveloped property to Grain Valley. The route continues west to an at-grade crossing with Robinson Road and Stillhouse Road at the western edge of Oak Grove. There is an existing roadway overpass of Old U.S. 40 between Oak Grove and Grain Valley that will remain.

The route then continues west through Grain Valley's downtown toward their airport. The Grain Valley Station will be located in the downtown east of Main Street. There are at-grade crossings with Main Street, E Kirby Road, and Sni-a-bar Drive. Between Grain Valley and Blue Springs the route passes through undeveloped property to a railroad overpass at Adams Dairy Parkway.

As the route travels through Blue Springs, the alignment curves to the north through downtown Blue Springs passing commercial and residential land uses before continuing west toward Lake Tapawingo and Independence. The Blue Springs station will be located in the downtown where the railroad crosses Main Street. In addition to the grade separation at Adams Dairy Parkway, there are four grade separations in Blue Springs (U.S. 40, Route 7, Walnut Street, and 15th Street) and three at-grade crossings (SW 10th Street, Main Street and Valley View Road).

The alignment turns north and proceeds under I-70 adjacent to undeveloped property as it enters Independence. The Independence Center station will be located south of 39th Street and east of Little Blue Parkway. This area is currently undeveloped but is directly adjacent to major commercial, hospital and expanding residential development. As the alignment continues north and then west, there is an at-grade crossing at 39th Street and roadway overpasses at Little Blue Parkway, Jackson Drive and M-291. The alignment then continues through established residential development, adjacent to a library and golf course before reaching more commercial development near Noland Road. In this segment there is an at-grade crossing at Crackerneck Road and Kiger Road and a roadway overpass at Lee's Summit Road. The railroad passes underneath Noland Road and the Union Pacific Railroad; a station will be located east of the rail underpass. The alignment then turns north through established residential areas with an at-grade crossing at McCoy Street. There are rail overpasses at 23rd Street and Chrysler Avenue. An existing stub end track that previously served the Independence Depot resides to the north of the KCS main line roughly between Chrysler and Sterling Avenues. There is an at-grade crossing at Scott Avenue.

Approximately 1000 feet east of Sterling Avenue north of 23rd Street, the alignment moves to a new build, single track segment departing from the KCS and turning south to run along Westport Road. The new build segment turns west and runs in the center of 23rd Street. The 23rd Street corridor is primarily residential with some commercial development near Sterling Avenue. As the alignment approaches I-435, light industrial land use, including underground storage, dominates. A station is located along Westport Road, north of 23rd Street. The new build segment will be grade separated through a rail overpass at Sterling Avenue and Northern Avenue/Westbound 23rd Street as the alignment enters 23rd

Street. Along 23rd Street, two full access intersections will be located at Maywood Avenue and Arlington Avenue (grade issues may require an elevated section to allow more access). The existing Blue Ridge Boulevard roadway overpass will be reconstructed. As the alignment leaves 23rd Street it will be elevated over the eastbound lanes and Industrial Drive.

The new build segment passes over I-435 just south of the 23rd Street Interchange. It also passes over Manchester Trafficway and the parallel active freight corridor (UP, KCS, and KCT) to join with the Southeast Line/Rock Island and the new build Common Line. At this location a wye connection will allow the East Line to connect to the Southeast Line to provide service to the Truman Sports Complex station. East Line service to the Truman Sports Complex is for events with very limited daily service for transfers

The East Line is a single track on the KCS and new build segment with passing tracks at stations. Through agreement with the KCS, the existing freight rail segment will be upgraded to a Class 5 railroad, as described by the FRA. All highway-rail at-grade crossings on the KCS and new build segments will be modified with supplemental safety measures. Four-quadrant gates or medians will create quiet zones by FRA regulation. A quiet zone is a segment of rail line where the locomotive/train horn is not routinely sounded at public highway-rail at-grade crossings.

Along the new build segment there will be additional delay incurred to vehicles and pedestrians that are crossing the alignment due to installation of warning devices at each full access crossing. At a limited number of locations, existing full access intersections will be converted to right-in/right-out access only. The final location of these intersections will be determined during preliminary engineering based on public feedback, system operation and safety considerations.

Southeast Line: Southeastern Jackson County Line to Truman Sports Complex

The Southeast Line begins at Pleasant Hill in Cass County and runs on the inactive Rock Island railroad to the Truman Sports Complex as an exclusive regional rail service. The Rock Island railroad is owned by the Union Pacific and was taken out of service in 1982. The route is a single track with right-of-way ranging from 80 to 300 feet.

The Regional Rail alternative begins just north of Commercial Street near the Cass County Fairgrounds in Pleasant Hill. There would be a station in this location serving the surrounding residential development. As the route continues north, it travels through undeveloped land and runs parallel to the Union Pacific Sedalia subdivision, an active freight rail line. There is an at-grade crossing at 175th Street and two to three private/farm crossings.

As the route enters Greenwood, there is a roadway overpass at Main Street. There will be a station north of Main Street in Greenwood. There is an at-grade crossing at Ranson Road. The route continues to run parallel to the Union Pacific Sedalia subdivision through undeveloped land toward Lee's Summit.

Near the at-grade crossing at Hamblen Road, the alignment departs from the Union Pacific Sedalia subdivision to travel northwest toward Lee's Summit. A station would be located between Hamblen Road and the roadway overpass at M-291. The area east of M-291 is largely undeveloped with some scattered, light industrial development. West of M-291 the route travels through commercial and industrial uses before reaching established residential development. There are at-grade crossings at Scherer Road, Ward Road and Longview Road. There would be an at-grade crossing on the access road to Charles David Hartman Memorial Park, just east of the Pryor Road overpass. This would also be a

station location. The alignment continues to travel to the northwest through established residential development. There are two railway overpasses at 3rd Street and Chipman Road.

The route then passes under I-470 as it travels through undeveloped areas entering into Kansas City. There is an at-grade crossing at Vale Road, an existing 480-foot tunnel at Bannister Road and an at-grade crossing at Brickyard Road before the alignment reaches the Knobtown area.

The rail alternative passes over M-350 before reaching the Knobtown station in the northwest corner of M-350 and Noland Road. There is limited commercial and light industrial development in this area. The route continues north through undeveloped land before entering Raytown. There is an at-grade crossing at Frost Road. At 75th Street the roadway will be realigned and the existing rail bridge improved to accommodate the necessary traffic capacity. In this area there is more established residential development as the route travels over the at-grade crossings at Irwin Road and Woodson Road.

The route through Raytown is mostly through established residential areas. There is a railroad overpass at 67th Street and roadway overpasses at Raytown Road and 63rd Street. The Raytown station will be located just north of 63rd Street in downtown Raytown. The alignment continues north to a new railroad overpass 59th Street which replaces a rail bridge removed when the roadway was widened. There are two more at-grade crossing in Raytown at 56th Street and 53rd Street.

As the route continues back into Kansas City, it travels through light industrial and undeveloped land. There are rail overpasses at 47th Street and Blue Ridge Cutoff. The route then travels just south of the Truman Sports Complex. There is a rail overpass of Sportsman Drive (stadium parking access on the east) and a roadway overpass at Lancer Lane (stadium parking access on the west). Between these two grade separations will be the Truman Sports Complex station to serve events and act as a multi-modal terminal.

The route then continues west, passing under I-435 and into the Leeds/KCS Industrial area. There is an existing rail overpass at Stadium Drive and Manchester Trafficway. The rail continues over the Union Pacific before turning north to travel under I-70 and U.S. 40. Once the alignment has cleared the U.S. 40 overpass a second track will be added to produce a double track section which will continue into the Common Line. Approximately one-half mile north of U.S. 40 the Rock Island right-of-way ends. The route continues adjacent to the Kansas City Terminal right-of-way for a short distance before turning west on a new build alignment to join the Common Line and the East Line.

An extension of the Katy Trail pedestrian and bicycle recreational trail is planned adjacent to this segment of Regional Rail. The rails with trails concept will provide adequate separation between the Regional Rail alignment and the trail with appropriate fencing to direct pedestrians and bicyclists away from the rail. Further study needs to take place to determine the exact placement of the trail along the length of the corridor.

The Southeast Line is a single track on the Rock Island with passing tracks at stations. Much of the former rail is intact along the corridor; however, the track on Rock Island is planned to be rehabilitated to meet current passenger rail standards. All highway-rail at-grade crossings on the Rock Island and new build segments will be modified with supplemental safety measures. Four-quadrant gates or medians will create quiet zones by FRA regulation.

At this time the segment of the Rock Island right-of-way from Hamblen Road in Lee's Summit south to Pleasant Hill is not available for purchase from the Union Pacific Railroad. This segment is included in

this alternative but it is understood that initial service may only extend to the Lee's Summit station at M-291.

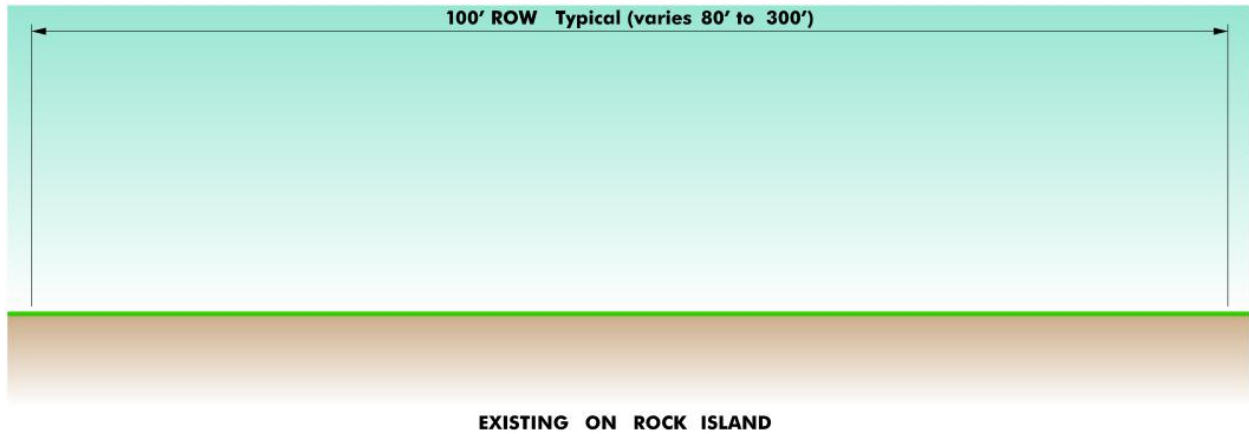


Figure 4: Regional Rail Typical Section Rock Island Railroad - Existing Conditions

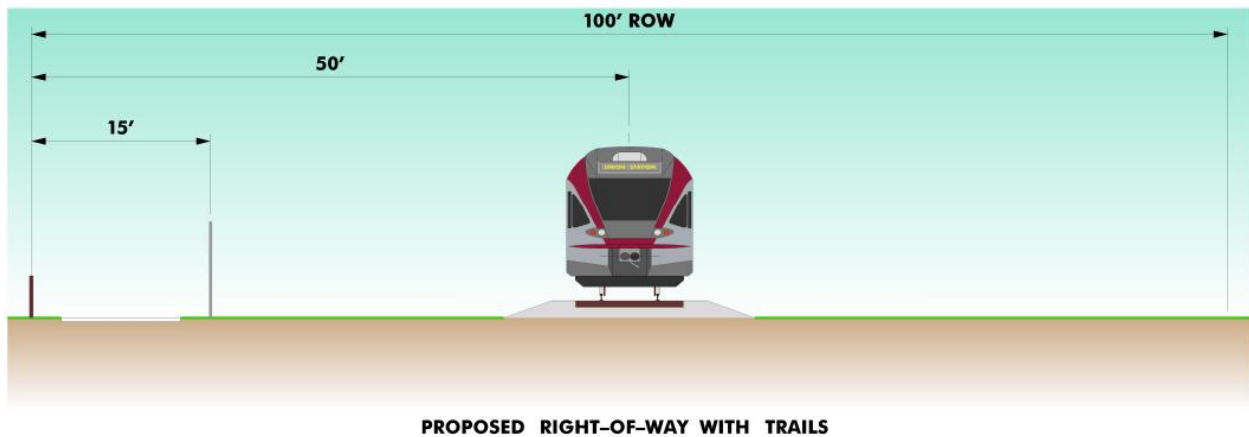


Figure 5: Regional Rail Typical Section Rock Island Railroad

Common Line (Truman Road): Truman Sports Complex to Union Station

The Common Line connects both the East and Southeast Jackson County lines that join together west of the Truman Sports Complex to the CBD. The double-track line begins north of U.S. 40 where the East Line and Southeast Line join together and run as exclusive regional rail service. Just south of 23rd Street the route turns to the northwest crossing the Blue River and 23rd Street with rail overpasses. A short segment of the alignment travels through the very western corner of Blue Valley Park. The alignment stays on undeveloped, forested land between residential and educational uses and travels along the southern edge of the Blue Valley Recreational Center Park to Topping Avenue. The alignment crosses Topping Avenue at grade. The route then continues northwest through an unoccupied multi-family housing development and a block of single family homes. The route will travel under the intersection of 17th Street and Hardesty Avenue as a cut and cover tunnel with a length of 900 feet. The tunnel will end in Van Brunt Park and continue to the northwest with a rail overpass of Van Brunt Boulevard. The route

will continue on a narrow path between commercial developments that front Truman Road and the residential properties south of Truman Road. There will be a station located near Poplar Avenue. There will be at-grade crossings with Poplar or Cleveland Avenue, Chelsea Avenue, Lister Avenue, Lawn Avenue, and Elmwood Avenue.

At Cypress Avenue and Truman Road, the alignment enters Truman Road by a rail overpass. The route continues west in the center of Truman Road traveling under the existing Kansas City Terminal Truman Road Subway and I-70 bridges. There are full-access, at-grade crossings at Jackson Avenue, Cleveland Avenue, and Indiana Avenue. Along this segment of Truman Road there are commercial and light industrial uses, major employers include the United States Post Office regional distribution center and Belfonte.

As the route travels under I-70 it continues running in the center of Truman Road. There are full-access, at-grade crossings at Benton Avenue, Chestnut Avenue, Prospect Avenue, Brooklyn Avenue, Woodland Avenue, Troost Avenue, Campbell Street and the U.S. 71 entrance/exit ramps. The alignment will take advantage of the natural grade on Truman Road to provide a rail overpass of The Paseo. There will be a center platform station located west of Prospect. This segment of Truman Road has park, civic, educational, commercial and multi-family residential uses.

At Campbell Street, the route enters a cut and cover tunnel which turns south at Cherry Street and resumes at grade running south of 16th Street along Cherry. The station serving downtown Kansas City will be located in the tunnel at the corner of Cherry Street and Truman Road.

The route continues to run south along the east side of Cherry Street. There will be full access, at-grade crossings at 17th Street, 18th Street and 19th Street. The Crossroads station will be located south of 19th Street along Cherry Street. South of 20th Street the alignment turns to the west running on the north side of the Kansas City Terminal into the Star Yard storage tracks north of Union Station. The route uses the Star Yard storage tracks north of Union Station for the terminal station.

All highway-rail at-grade crossings on the new build segment will be modified with supplemental safety measures. Four-quadrant gates or medians will create quiet zones by FRA regulation.

Along the new build segment there will be additional delay incurred to vehicles and pedestrians that are crossing the alignment due to installation of warning devices at each full access crossing. At a limited number of locations, existing full access intersections will be converted to right-in/right-out access only. The final location of these intersections will be determined during preliminary engineering based on public feedback, system operation and safety considerations.

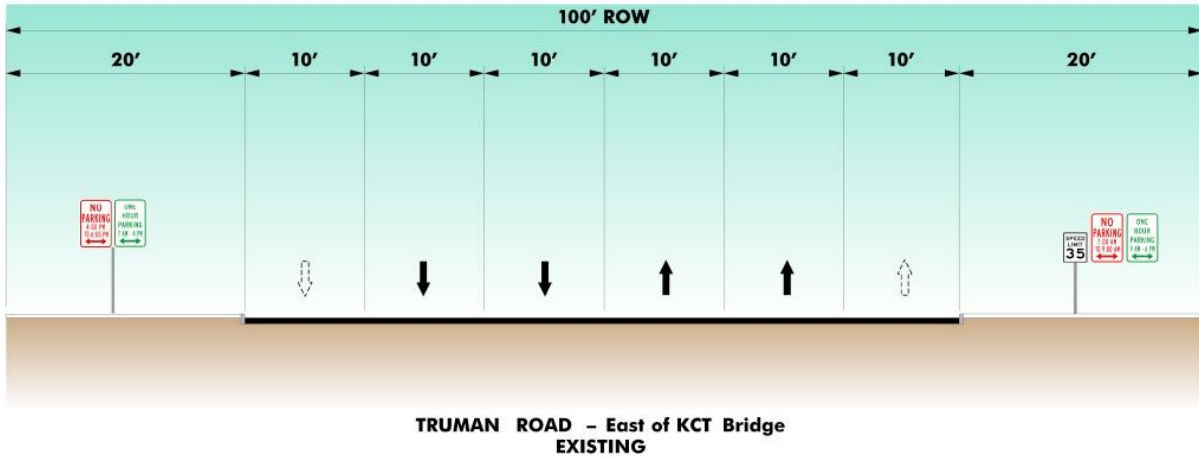


Figure 6: Regional Rail Typical Section on Truman Road – East of KCT Bridge Existing Conditions

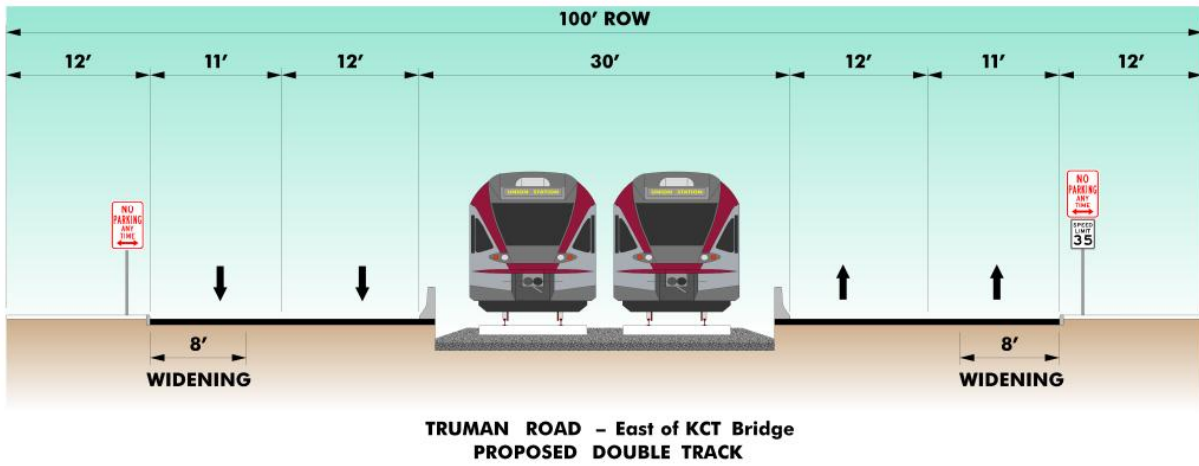


Figure 7: Regional Rail Typical Section on Truman Road - East of KCT Bridge

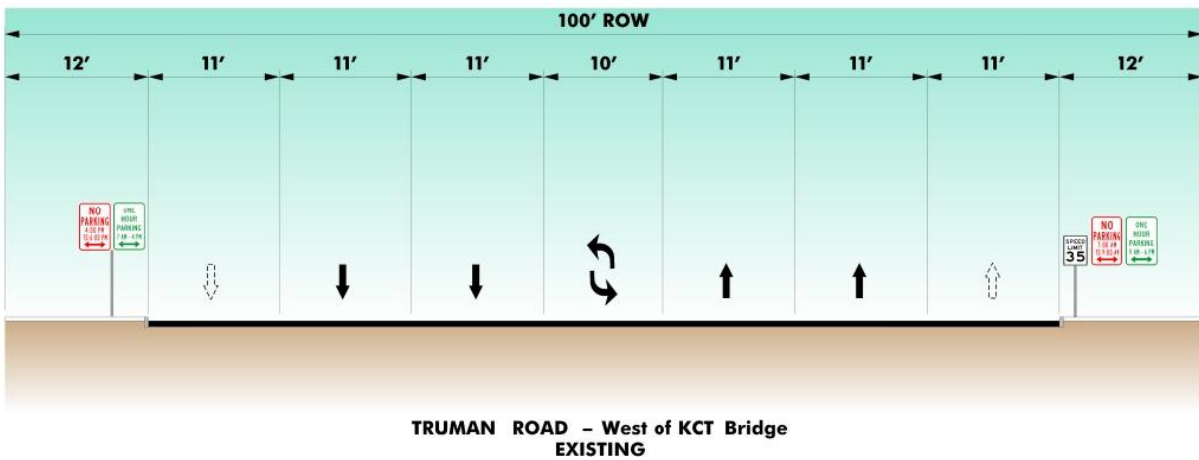


Figure 8: Regional Rail Typical Section on Truman Road - West of KCT Bridge - Existing Conditions

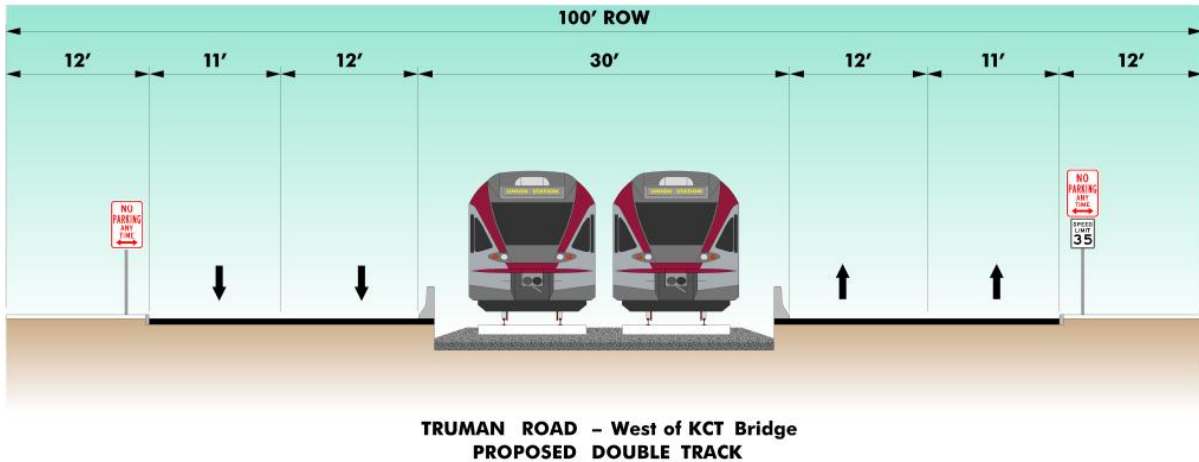


Figure 9: Regional Rail Typical Sections on Truman Road - West of KCT Bridge

Bridge Structures

The bridge structures impacted by the alternative include the following:

Table 18: Regional Rail Bridge Structures

Bridge Structure	Bridge Location	Replace / New
Southeast Segment (Connection Wye to Pleasant Hill)		
Railroad Bridge	North Leg of Overhead Wye to Common Segment	New Bridge
Highway Bridge	Undercrossing at U.S. 40	No Change
Highway Bridge	Undercrossing at I-70	No Change
Railroad Bridge	Crossing Over UPRR	Repair Existing
Railroad Bridge	Crossing Over KCS/Manchester Trafficway	Repair Existing
Railroad Bridge	Crossing Over Stadium Drive	Repair Existing
Highway Bridge	Undercrossing at I-435	No Change
Railroad Bridge	Crossing Over Lancer Ln	Repair Existing
Railroad Bridget	Crossing Over Sportsman Dr.	Repair Existing
Railroad Bridge	Crossing Over Blue Ridge Cutoff	Repair Existing
Railroad Bridge	Crossing Over 47th Street	Repair Existing
Railroad Bridge	Crossing Over 59th Street	New Bridge
Highway Bridge	Undercrossing at 63rd Street	No Change
Highway Bridge	Undercrossing at Raytown Road	Potential Replacement
Railroad Bridge	Crossing Over 67th Street	Repair Existing
Railroad Bridge	Crossing Over Wildwood Lake Inlet	Potential Replacement

Bridge Structure	Bridge Location	Replace / New
Railroad Bridge	Crossing Over 75th Street	Repair Existing
Railroad Bridge	Crossing Over M-350	Repair Existing
Tunnel	Tunnel Under Bannister Road	Repair Existing
Railroad Bridge	Crossing Over Little Blue River	Potential Replacement
Highway Bridge	Undercrossing at I-470	No Change
Railroad Bridge	Crossing Over Chipman Road	Repair Existing
Railroad Bridge	Crossing Over SW 3rd Street	Repair Existing
Highway Bridge	Undercrossing at Pryor Road	No Change
Railroad Bridge	Crossing over Cedar Creek	Potential Replacement
Highway Bridge	Undercrossing at M-291	No Change
Railroad Bridge	Crossing Over Big Creek	Potential Replacement
Railroad Bridge	2nd Crossing Over Big Creek	Potential Replacement
Highway Bridge	Undercrossing at M-150/Main Street	No Change
Railroad Bridge	3rd Crossing Over Big Creek	Potential Replacement
Railroad Bridge	Crossing Over East Branch	Potential Replacement
Railroad Bridge	Crossing Over Wilson Creek	Potential Replacement
Railroad Bridge	4th Crossing Over Big Creek	Potential Replacement
East Segment (Connection Wye to Oak Grove)		
Railroad Bridge	East and South Legs of Wye to Common Segment	New Bridge
Railroad Bridge	Crossing Over KCT/UPRR/KCS	New Bridge
Railroad Bridge	Crossing Over Manchester Trafficway	New Bridge
Railroad Bridge	Crossing Over I-435	New Bridge
Railroad Bridge	Crossing Over East Bound 23rd Street/Industrial Drive	New Bridge
Highway Bridge	Undercrossing at Blue Ridge Blvd	Bridge Modification
Railroad Bridge	Crossing Over West Bound 23rd Street	New Bridge
Railroad Bridge	Crossing Over Sterling Avenue	New Bridge
Railroad Bridge	Crossing Over Chrysler Avenue	No Change
Railroad Bridge	Crossing Over 23rd Street	No Change

Bridge Structure	Bridge Location	Replace / New
Railroad Bridge	Undercrossing at UPRR Just West of Noland Road	No Change
Highway Bridge	Undercrossing at Noland Road	No Change
Highway Bridge	Undercrossing at Lee's Summit Road	No Change
Highway Bridge	Undercrossing at M-291	No Change
Highway Bridge	Undercrossing at Jackson Drive	No Change
Highway Bridge	Undercrossing at Little Blue Parkway	No Change
Railroad Bridge	Crossing Over West Fork of Little Blue River	No Change
Highway Bridge	Undercrossing at I-70	No Change
Railroad Bridge	Crossing Over East Fork of Little Blue River	No Change
Highway Bridge	Undercrossing at NW 15th Street	No Change
Highway Bridge	Undercrossing at SW Walnut Street	No Change
Railroad Bridge	Crossing Over M-7	No Change
Railroad Bridge	Crossing Over U.S. 40	Partial Replacement
Railroad Bridge	Crossing Over SE Adams Dairy Parkway	No Change
Railroad Bridge	Crossing Over Blue Creek	No Change
Railroad Bridge	Crossing Over Sni A Bar Creek	No Change
Highway Bridge	Undercrossing at Old U.S. 40	No Change
Common Segment (Union Station to Connection Wye via Truman Road)		
Highway Bridge	Undercrossing at Main Street	No Change
Highway Bridge	Undercrossing at Grand Blvd	No Change
Highway Bridge	Undercrossing at McGee Street	No Change
Highway Bridge	Undercrossing at Oak Street	No Change
Highway Bridge	Undercrossing at Holmes Road	New Bridge
Highway Bridge	Undercrossing at Charlotte Road	New Bridge
Highway Bridge	Undercrossing at U.S. 71	No Change
Railroad Bridge	Crossing over the Paseo	New Bridge
Highway Bridge	Undercrossing at I-70	No Change
Railroad Bridge	Undercrossing at KCT Bridge on Truman Road	No Change
Railroad Bridge	Crossing over East Bound Truman Road	New Bridge
Railroad Bridge	Crossing over Van Brunt Blvd	New Bridge
Highway Bridge	Undercrossing at Hardesty Avenue	New Bridge
Railroad Bridge	Crossing over 23rd Street	New Bridge
Railroad Bridge	Crossing over the Blue River	New Bridge

6.3. STATIONS

Stations for the full Regional Rail alternative are located near population centers and major regional destinations. The following tables list the station location, station type and areas served. Three types of stations are included in this alternative and follow the typologies assigned in the guiding assumptions

Table 19: Regional Rail Station Locations with Markets Served - East Line

East Line		
Station Location	Station Type	Markets Served
Oak Grove – 11 th Street between Route F and Clinton St	Small Park and Ride	Oak Grove residents and commuters from cities to the east
Gran Valley – Front Street and Main Street	Small Park and Ride	Grain Valley residents
Blue Springs – Main Street between 12 th and 14 th Streets	Large Park and Ride	Blue Springs residents, employment and commercial
Independence Center – East of Little Blue Parkway at Jackson Drive	Large Park and Ride	Independence residents, employees of Center Point Hospital, Children’s Mercy East, Independence Center Mall, other nearby commercial, Independence Event Center
Independence Central – Noland Road at 32 nd Street	Large Park and Ride	Independence residents, nearby commercial, downtown tourist destinations, Jackson County Court via feeder bus
Independence West – 23 rd Street and Westport Road	Small Park and Ride	Independence residents, Sugar Creek residents, nearby commercial
Truman Sports Complex*	Intermodal Hub	Kansas City residents, special events, connections

*Service plan only serves Truman Sports Complex for events with very limited daily service for transfers.

Table 20: Regional Rail Station Locations with Markets Served - Southeast Line

Southeast Line		
Station Location	Station Type	Markets Served
Pleasant Hill – TBD	Small Park and Ride	Pleasant Hill residents
Greenwood – TBD	Small Park and Ride	Greenwood residents
Lee’s Summit – M-291 near Stuart Road	Large Park and Ride	Lee’s Summit residents, Toys-R-Us distribution center

Southeast Line		
Station Location	Station Type	Markets Served
Lee's Summit – Pryor Road at Charles David Hartman Memorial Park	Small Park and Ride	Lee's Summit residents; St. Luke's Hospital, Summit Technology campus, downtown Lee's Summit, MoDOT district headquarters, John Knox Village, Unity Village residents, and other commercial via feeder bus
Knobtown	Large Park and Ride	Kansas City residents
Raytown	Small Park and Ride	Raytown residents
Truman Sports Complex	Intermodal Hub	Kansas City residents, special events, connections

Table 21: Regional Rail Station Locations with Markets Served – Truman Road

Common Line – Truman Road		
Station Location	Station Type	Markets Served
Truman Sports Complex	Intermodal Hub	Kansas City residents, special events, connections
Truman Road East – Truman and Poplar	Small Park and Ride	Kansas City residents, St. Paul's Seminary
Truman Road West – East of Prospect	Walk Up	Kansas City residents, Metro Community College – Pioneer Campus
Government Center – Truman Road and Cherry Street	Walk Up	Kansas City residents, Sprint Center, Power & Light district, Government employees (City of Kansas City, Jackson County, Federal agencies), downtown business and commercial
Crossroads – Cherry Street and 19 th Street	Walk Up	Kansas City residents; Crossroads business and commercial; Hospital Hill medical, university and commercial
Union Station	Walk Up	Terminal station, Kansas City residents, Amtrak connection, Crossroads business and commercial, Crown Center business and commercial

6.4. OPERATING ASSUMPTIONS

The operating assumptions for this alternative are discussed below. This is the initial starting point and may be subject to revisions once the initial model runs are completed.

6.5. SERVICE LEVELS

Service levels for this alternative will consist of peak and off-peak operation. Service frequency on the Common Line will be more frequent because it is being serviced by trains operating on the East Line and the Southeast Line.

Table 22: Regional Rail Service Levels

Time of Day	East Segment / Southeast Segment Headways	Common Segment Headways
Morning Peak	20 minute	10 minute
Mid-day	60 minute	30 minute
Evening Peak	20 minute	10 minute
Off-Peak	60 minute	30 minute

6.6. END TO END OPERATING CHARACTERISTICS

The end to end operating characteristics are summarized below.

Table 23: Regional Rail End to End Operating Characteristics

Alternative	Route Miles	Average Speed	Travel Time
Full Regional Rail – East Line/Truman Alternative	28.7	54 MPH	40m 55s
Full Regional Rail – Southeast Line/Truman Alternative	31.4	53 MPH	44m 52s

6.7. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIMES

The end travel times for the various alternatives and alignments are calculated by using assumed vehicle acceleration, deceleration and dwell times at each station along with assumed top speeds by segment.

Table 24: Regional Rail Station to Station Distance, Speed and Travel Times - East Line and Common Line (Truman Road)

East Line and Common Line – Truman Road							
Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Oak Grove to	28.7	-	-	-	-	-	-
Grain Valley	24.6	4.1	60s	70	2m 51s	1m 19s	5m 10s

East Line and Common Line – Truman Road

Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Blue Springs	19.9	4.7	60s	70	3m 23s	1m 19s	5m 42s
Independence Center	15.8	4.1	60s	70	2m 52s	1m 19s	5m 11s
Independence Central (Noland)	11.0	4.7	60s	70	3m 25s	1m 19s	5m 44s
Independence West	8.3	2.8	60s	70	1m 44s	1m 19s	4m 03s
Truman Sports Complex*							
Truman Road East	3.6	4.7	60s	70	3m 21s	1m 19s	5m 40s
Truman Road West	2.4	1.2	60s	45	1m 13s	0m 50s	3m 03s
Government Center	1.0	1.4	60s	45	1m 25s	0m 50s	3m 15s
Crossroads	0.6	0.4	60s	45	0m 05s	0m 50s	1m 55s
Union Station	0.0	0.6	-	45	0m 22s	0m 50s	1m 12s

*Service plan only serves Truman Sports Complex for events with very limited daily service for transfers. The total travel time for the above run with the stated assumptions is 41 minutes.

Southeast Line and Common Line – Truman Road

Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Pleasant Hill to	31.4	-	-	-	-	-	-
Greenwood	25.6	5.7	60s	70	4m 16s	1m 19s	6m 35s
Lee's Summit South	23.3	2.3	60s	70	1m 21s	1m 19s	3m 40s
Lee's Summit Pryor	20.0	3.2	60s	70	2m 07s	1m 19s	4m 26s
Knobtown	15.2	4.8	60s	70	3m 29s	1m 19s	5m 48s
Raytown	11.4	3.8	60s	70	2m 35s	1m 19s	4m 54s
Truman Sports Complex	8.3	3.1	60s	70	2m 00s	1m 19s	4m 19s
Truman Road East	3.6	4.8	60s	70	3m 26s	1m 19s	5m 45s

Southeast Line and Common Line – Truman Road							
Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Truman Road West	2.4	1.2	60s	45	1m 13s	0m 50s	3m 03s
Government Center	1.0	1.4	60s	45	1m 25s	0m 50s	3m 15s
Crossroads	0.6	0.4	60s	45	0m 5s	0m 50s	1m 55s
Union Station	0.0	0.6	-	45	0m 22s	0m 50s	1m 12s

The total travel time for the above run with the stated assumptions is 44 minutes and 52 seconds.

6.8. FLEET SIZE

The total fleet size is calculated by analyzing the number of vehicles needed in the peak and off peak times multiplied by the consist size (numbers of cars per train). Also, a number of spare vehicles is needed in case a vehicle breakdown or is out of service due to maintenance. The assumed spare ratio is roughly 1/3 based on the total fleet size. The DMU vehicle features 79 seated passengers per vehicle and additional standing room up to 38 passengers per vehicle.

The total fleet size is calculated by analyzing the number of vehicles needed in the peak and off peak times multiplied by the consist size (# of cars per train). Also, a number of spare vehicles is needed in case a vehicle breakdown or is out of service due to maintenance. The assumed spare ratio is roughly 1/3 based on the total fleet size.

Table 25: Regional Rail Fleet Size

Alternative	Total Number of Consist in Peak Service	Total Number of Consist in Off-Peak Service	Peak Consist Size	Off-Peak Consist Size	Total Number of Vehicles in Fleet
East Line and Common Line	4	2	3	2	12+4 Spare = 16
Southeast Line and Common Line	5	2	2	2	10+3 Spare = 13

6.9. BUS NETWORK

The proposed feeder bus network is summarized below. The network is designed to take passengers from various suburban locations and offer them convenient access to the rail stations.

Table 26: Regional Rail Bus Network - East Line

East Line			
Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
Blue Springs Route 1	30 minutes	60 minutes	New Route
Blue Springs Route 2	30 minutes	60 minutes	New Route
Independence Blue Route	30 minutes	60 minutes	Existing Route
Independence Green Route	30 minutes	60 minutes	Existing Route
Independence Orange Route	30 minutes	60 minutes	Existing Route
Independence Purple Route	30 minutes	60 minutes	Existing Route
Independence Red Route	30 minutes	60 minutes	Existing Route
Independence Silver Route	30 minutes	60 minutes	Existing Route

Table 27: Regional Rail Bus Network - Southeast Line

Southeast Line			
Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
Lee's Summit Route 1	30 minutes	60 minutes	New Route
Lee's Summit Route 2	30 minutes	60 minutes	New Route

6.10. PROPOSED MAINTENANCE FACILITY

The proposed site for installation of a rail maintenance facility is at the former Leeds assembly plant. The site is located south of Stadium Drive and east of Manchester Trafficway. The former industrial site is able to accommodate all the functions required.

The facility is a former General Motors automotive plant that was closed in 1988. Oversize doors exist at the south end of the building that was formerly used to allow high cube rail cars to enter the building for cargo loading and unloading. Since that time various businesses have occupied the site. Currently, a portion of the facility is used by Mid-America Locomotive; however, there is sufficient space available to accommodate a regional rail maintenance facility and storage yard.

The Leeds site would require a wye connection be built from the Rock Island right-of-way connecting to the KCS right of way, more specifically the Leeds Industrial Lead Track, which runs parallel to the KCS main line. Trains would travel south on the Leeds Industrial Lead Track before entering the maintenance

facility and storage yard at the south end of the property. The entire property is 73 acres including approximately 1.3 million square feet of existing building that could be reused.



Figure 10: Regional Rail Proposed Maintenance Facility - Former Leeds Plant

Another potential maintenance facility location includes the paved area north of Stadium Drive, directly across from the Leeds facility. This site would require a wye connection be built from the Rock Island right-of-way connecting directly to the site. This site is currently used to store various items including construction trailers and truck trailers and is approximately 23 acres in size.

A third location includes the general area north of Truman Road between Charlotte Street and Lydia Avenue. The current uses of this area include parking lots, a MoDOT maintenance facility, the Evangelistic Center Church, and the Salvation Army. There are many constraints in this location including the existing uses and the bridge piers for the U.S. 71 and I-70 interchange but it may be able to be configured to accommodate the maintenance facility.

The maintenance site would serve as a layover facility during off-peak hours and would include: a storage yard; maintenance and repair area; bypass track (which allows the passenger rail vehicle to bypass any of the maintenance operations and directly access the storage yard); a car washing facility; and support shops, parts storage, mechanical and electrical rooms and administrative offices. Since future expansion of the regional rail system is contemplated, the maintenance facility sites is planned to have the ability to accommodate additional cars if future demand warrants expansion of service. This accommodation is consistent with industry planning practices, which recommend additional capacity to accommodate unforeseen increases in use.

A more detailed analysis of the size of the maintenance facility required for the LPA and a site selection study will be needed in the next phases of project development.

Jackson County Commuter Corridors Alternatives Analysis Regional Rail Alternative

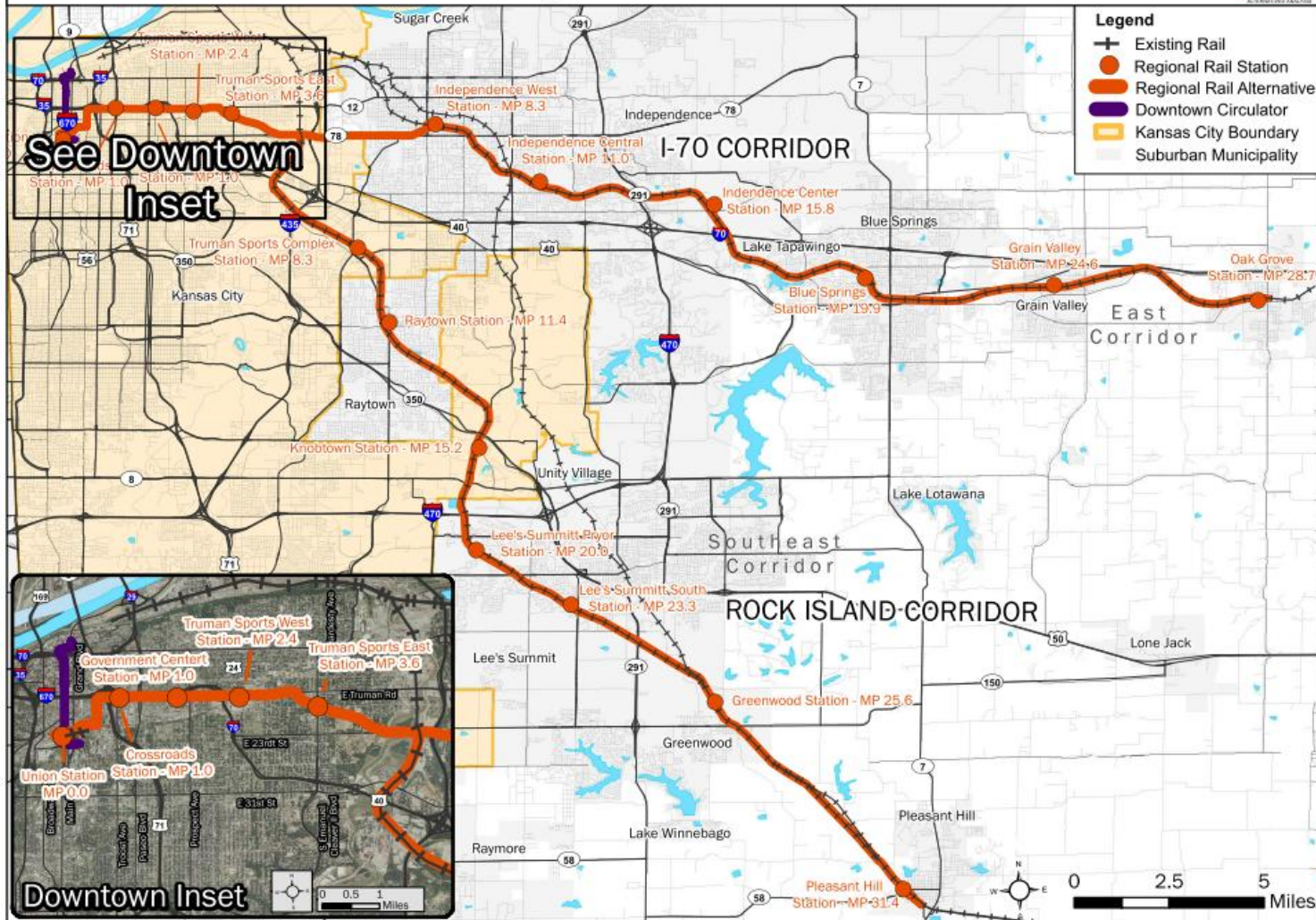


Figure 11 - Regional Rail Alignment

7. FULL ENHANCED STREETCAR ALTERNATIVES

The Enhanced Streetcar Alternative uses a heavy duty streetcar vehicle to connect suburban jurisdictions in the east and southeast to destinations in the CBD as well as provide access to other destinations and provides opportunities for reverse trip patterns.

7.1. TECHNOLOGY

Enhanced Streetcar is a modern steel wheels on steel rails train technology using rail vehicles that are propelled with on-board motors being supplied by an overhead wire or catenary system. The catenary system is needed to supply constant power to the onboard motors.

The proposed vehicle would be comprised of non-FRA compliant, single-level vehicles that can operate in both a fixed guideway and mixed traffic. Vehicle capacity would be approximately 50 seated passengers per rail car. The vehicle is designed with a low floor entry; fully compliant with ADA standards. The maximum vehicle speed is 60 mph.



Figure 12: Enhanced Streetcar Vehicle (Source: Jackson County, Missouri)

7.2. ALIGNMENT

East Line: 40 Hwy and M-7 Highway in Blue Spring to Truman Sports Complex

The East Line Enhanced Streetcar alternative would begin in Oak Grove , connected by a bus transit link operating from Oak Grove to Grain Valley along I-70 and from Grain Valley and M-7 along U.S. 40. The enhanced streetcar mode would begin at the intersections of U.S. 40 and M-7. Enhanced streetcar would operate generally along U.S. 40 to 43rd Street in Independence, then along 43rd Street to Sterling Avenue. From Sterling Avenue the route would continue along a new-build segment to the Truman Sports Complex.

The enhanced streetcar service would operate along a double track configuration from a station located at or near the intersection of U.S. 40 and M-7 that would include a small park and ride. From there the route would proceed west operating in the existing median of U.S. 40 to a station at U.S. 40 and SW 19th Street in Blue Springs. The route would then proceed west along the 40 Hwy median immediately

adjacent to the eastbound segment of U.S. 40. This portion of the alignment passes through predominately light industrial and low intensity commercial land uses.

A new bridge structure, or modification to the existing eastbound U.S. 40 bridge crossing the Little Blue River would be required just east of U.S. 40 and Valley View Parkway. The route would proceed west to a station at U.S. 40 and Valley View Parkway in Independence. This is an area of relatively high intensity commercial land use.

At the I-470 underpass the U.S. 40 median disappears and as a result, widening of U.S. 40 under the I-470 overpass may be necessary. West of the overpass the median resumes for approximately one mile to U.S. 40 and Kendall Street where the median disappears and the double-track rail alignment would transition to the center of U.S. 40 in a guideway. From this point the route would continue west along the center of U.S. 40 to a station with a small park and ride located at U.S. 40 and Lee's Summit Road. This segment of the route passes through relatively sparse development consisting primarily of low intensity commercial and light industrial land uses. The route would then continue west along U.S. 40 to a station located at U.S. 40 and Washington Street just west of Noland Road serving an area of moderate intensity commercial land use.

As the route continues west along U.S. 40, it passes over an existing rail line just west of Washington Street on an existing bridge structure that may need modification. West from this point the route continues to operate in the center of U.S. 40 to 43rd Street where it would transition to 43rd Street operating in the center of the street in a double-track fixed guideway to Blue Ridge Boulevard. At Blue Ridge Boulevard the route would become single-track and transition to the north side of 43rd Street for a distance of approximately one-half mile to Sterling Avenue. A walk access station located midway between Blue Ridge Boulevard and Sterling Avenue would be served by this side-running, single track segment in each direction and would be directly adjacent to a commercial development that includes a Wal-Mart Super Center.

From Sterling Avenue the route would resume a combined double track configuration on a newly constructed segment through mostly undeveloped properties until it connects with the Rock Island right-of-way at Blue Ridge Cut-off and connects to the common segment at the stadium complex.

Southeast Line: Rock Island Right-of-Way and M-291 Highway

The Southeast Line would begin in Pleasant Hill at the intersection of the Rock Island right-of-way and M-58. The enhanced streetcar route would operate generally along the Rock Island right-of-way to the stadium complex.

The enhanced streetcar service would operate along a double track configuration from a station located at or near the intersection of the Rock Island ROW and M-58 in Pleasant Hill. The route would travel northwest through Greenwood, serving a station with a small park and ride at or near the intersection of the ROW and M-150. It would then proceed northwest to a station with a small park and ride located at or near the intersection of the ROW and M-291. West of M-291 the route travels through commercial and industrial uses before reaching established residential development. There are at-grade crossings at Scherer Road, Ward Road and Longview Road. There will be an at-grade crossing on the access road to Charles David Hartman Memorial Park, just east of the Pryor Road overpass. This will also be a location for a station. The alignment continues to travel to the northwest through established residential development. There are two roadway overpasses at 3rd Street and Chipman Road.

The route then passes under I-470 as it travels through undeveloped areas entering into Kansas City. There is an at-grade crossing at Vale Road, an existing 480-foot tunnel at Bannister Road and an at-grade crossing at Brickyard Road before the alignment reaches the Knobtown area.

The route passes over M-350 before reaching the Knobtown station in the northwest corner of M-350 and Noland Road. There is limited commercial and light industrial development in this area. The route continues north through undeveloped land before entering Raytown. There is an at-grade crossing at Frost Road. At 75th Street the roadway will be realigned and the existing rail bridge improved to accommodate the necessary traffic capacity. In this area there is more established residential development as the route travels over the at-grade crossings at Irwin Road and Woodson Road.

The route through Raytown is mostly through established residential areas. There is a railroad overpass at 67th Street and roadway overpasses at Raytown Road and 63rd Street. The Raytown station will be located just north of 63rd Street in downtown Raytown. The alignment continues north to a new railroad overpass 59th Street which replaces a rail bridge removed when the roadway was widened. There are two more at-grade crossing in Raytown at 56th Street and 53rd Street.

As the route continues back into Kansas City, it travels through light industrial and undeveloped land. There are rail overpasses at 47th Street and Blue Ridge Cutoff. The route then travels just south of the Truman Sports Complex. There is a rail overpass of Sportsman Drive (stadium parking access on the east) and a roadway overpass at Lancer Lane (stadium parking access on the west). Between these two grade separations will be the Truman Sports Complex station to serve events and act as a multi-modal terminal.

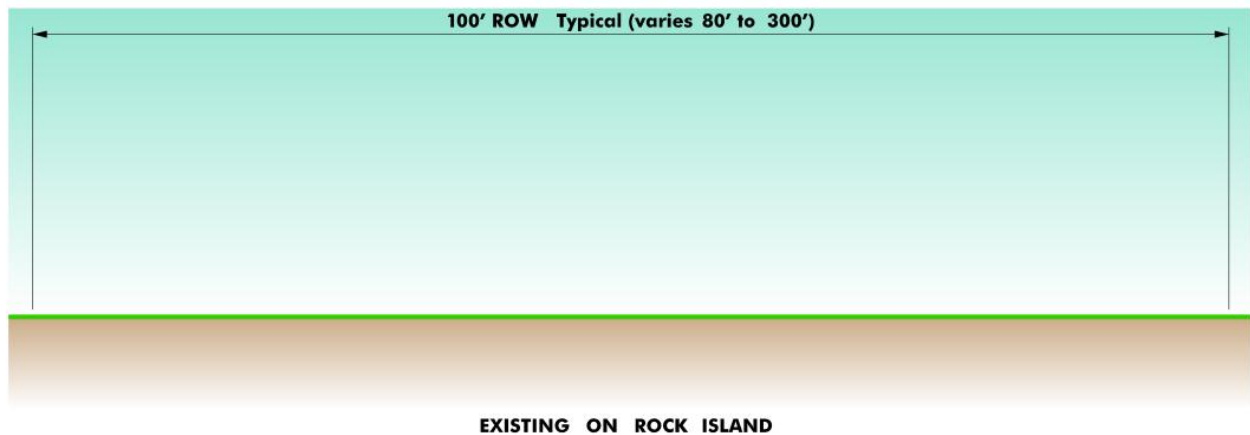


Figure 13: Enhanced Streetcar Typical Section - Rock Island Railroad Existing Conditions

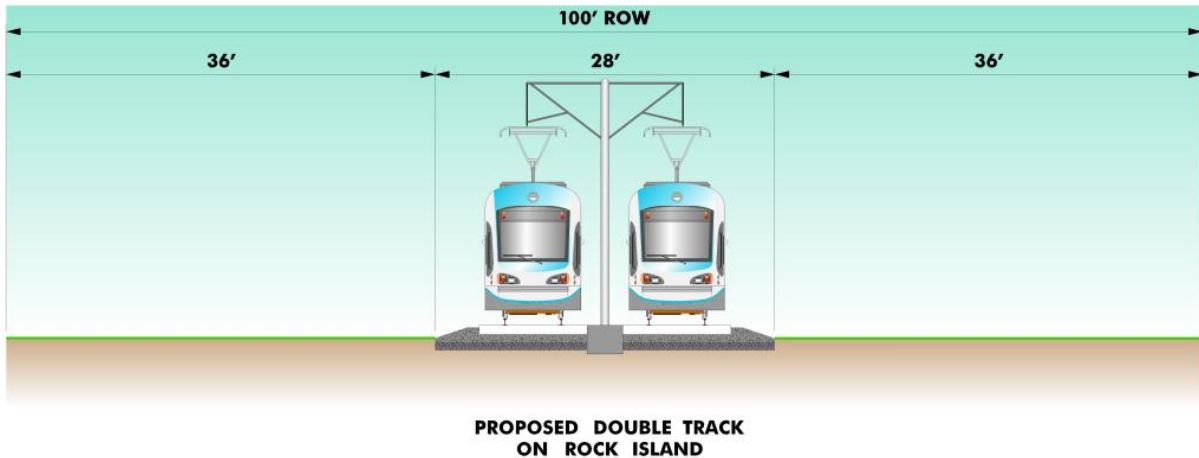


Figure 14: Enhanced Streetcar Rock Island Railroad

Common Line

There are two alternatives for the common line – Truman Road and Linwood Boulevard. Both alternatives are described below.

Common Line (Truman Road): Truman Sports Complex to CBD

The Truman Road Line would begin at the stadium complex station. The enhanced streetcar route would operate generally along the Rock Island right-of-way to Stadium Drive, along Stadium Drive to Van Brunt, along Van Brunt to Truman Road and along Truman Road to downtown Kansas City, Missouri.

The enhanced streetcar service would operate along a double track configuration from the Truman Sports Complex station. From there the route would proceed west operating along the Rock Island right-of-way to Stadium Drive. The route would then transition from the Rock Island right-of-way to Stadium Drive in the Leed’s Industrial District via a newly constructed elevated structure that would provide a grade separated crossing over existing and active rail lines that cross Stadium Drive at-grade in the Leed’s District.

Once across these existing rail lines the enhanced streetcar line would return to street level operating in the center of Stadium Drive in a separated guideway. The route would proceed west and north along Stadium Drive through the Leed’s Industrial District crossing an existing bridge structure over the Little Blue River that may require modification, to Van Brunt where it will transition to the existing median of Van Brunt and serve a walk access station at Van Brunt and 30th Terrace. The route would then proceed north along the Van Brunt median through an urban residential environment to a walk access station at 27th Street.

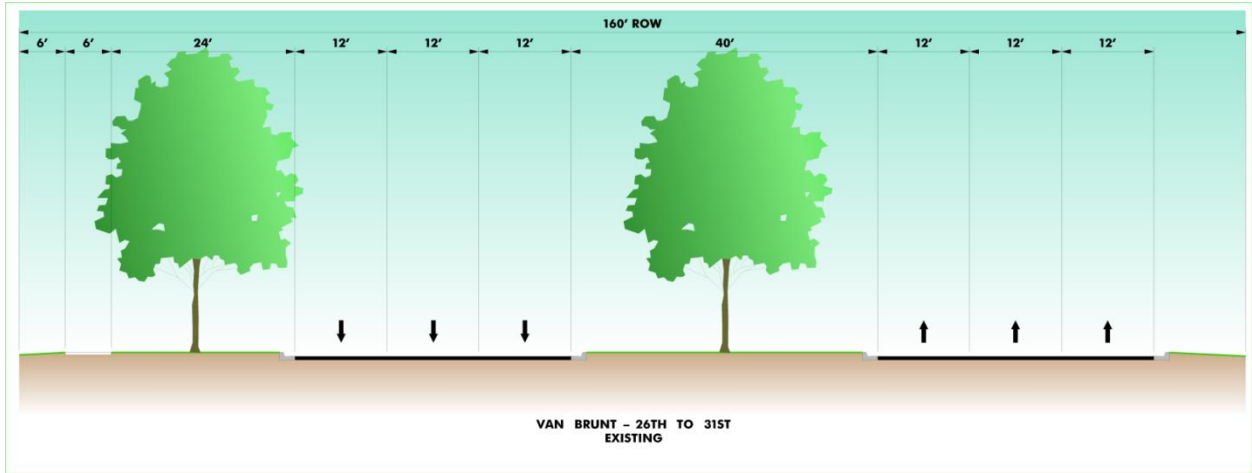


Figure 15: Enhanced Streetcar Truman Road Alignment Typical Section- 26th-31st Street Existing Conditions

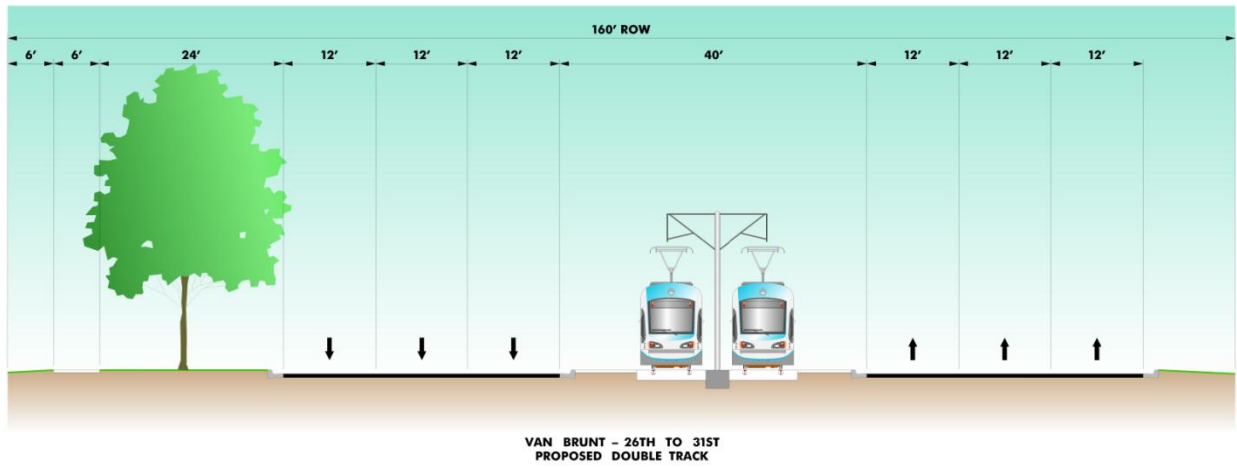


Figure 16: Enhanced Streetcar Truman Road Alignment Typical Section - Van Brunt from 26th to 31st

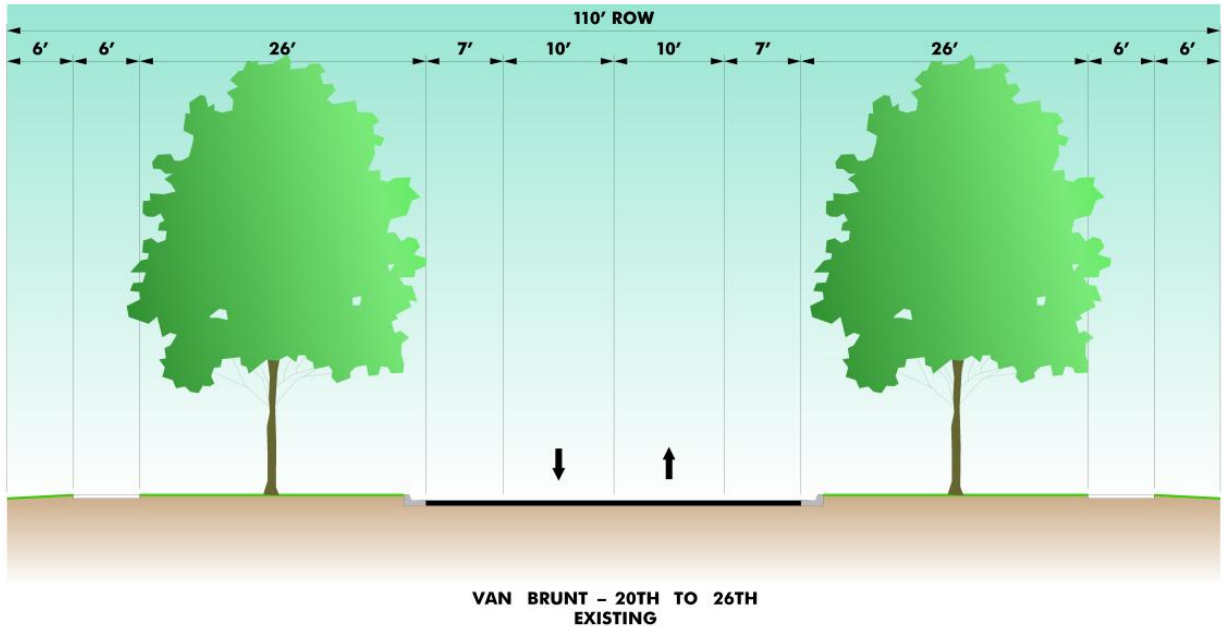


Figure 17: Enhanced Streetcar Truman Road Alignment Typical Section - Van Brunt 20th-26th Streets Existing Conditions

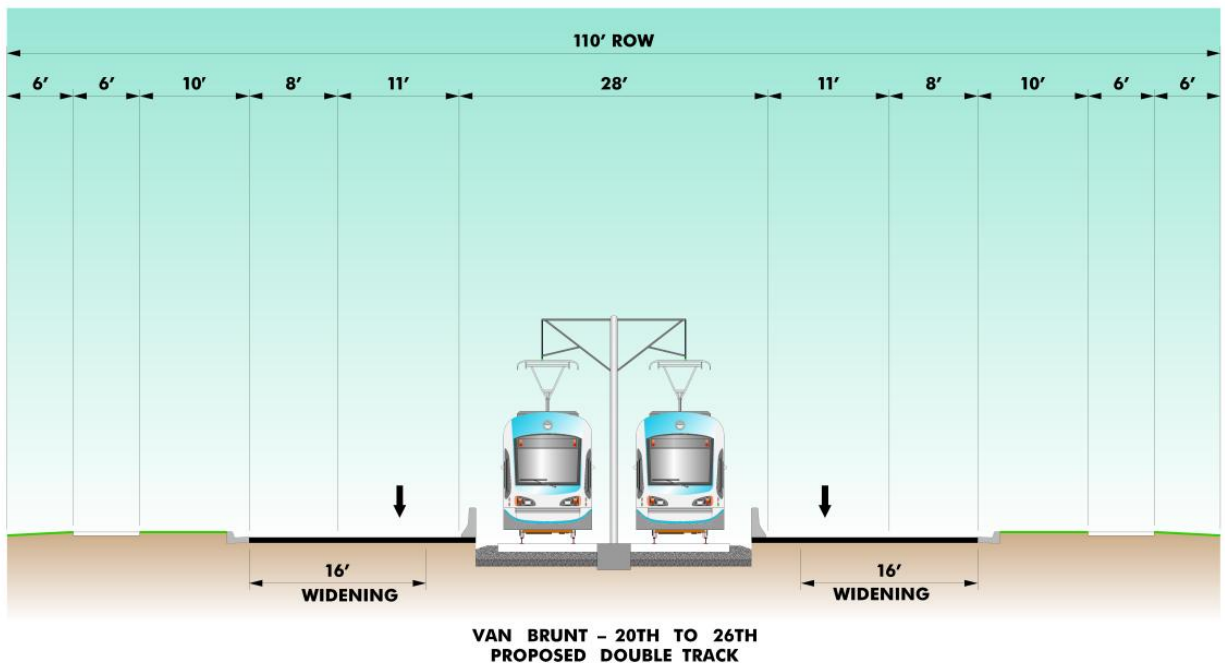


Figure 18: Enhanced Streetcar Truman Road Alignment Typical Section - Van Brunt from 20th-26th Streets

At Van Brunt and 26th Street the Van Brunt median ends. Between this point and 20th Street the roadway would need to be reconstructed taking advantage of existing right-of-way to accommodate the center running guideway and the route would serve a walk access station at 23rd Street in an urban residential environment. North of 20th Street the inbound leg of the route would transition over to Hardesty Avenue and the outbound leg would continue along Van Brunt. A walk access station located between

Van Brunt and Hardesty at 18th Street would serve both inbound and outbound legs. Both the Van Brunt and Hardesty roadways would need to be reconstructed between 20th Street and Truman Road to accommodate the center running single track guideway along each road segment.

The inbound leg would proceed north on Hardesty Avenue, serving a walk access station at Hardesty and Truman Road. At Truman Road the inbound would turn to the west and operate in a single track center guideway along Truman to Van Brunt. The outbound leg would proceed north on Van Brunt, serving a walk access station at Van Brunt and Truman Road. At Truman Road the outbound leg would meet up with the inbound leg in the center of Truman Road and continue west on Truman Road in a double track, center running guideway. The route would then continue west on Truman Road to a walk access stations serving a low intensity commercial/light industrial environment at Truman Road and Jackson Avenue, Truman Road and Prospect Avenue and Truman Road and Woodland Avenue. The route would transition to a single track at Locust Street and then terminate at a walk access station serving downtown Kansas City, Missouri and connecting with the downtown circulator streetcar line at Truman Road and Main Street.

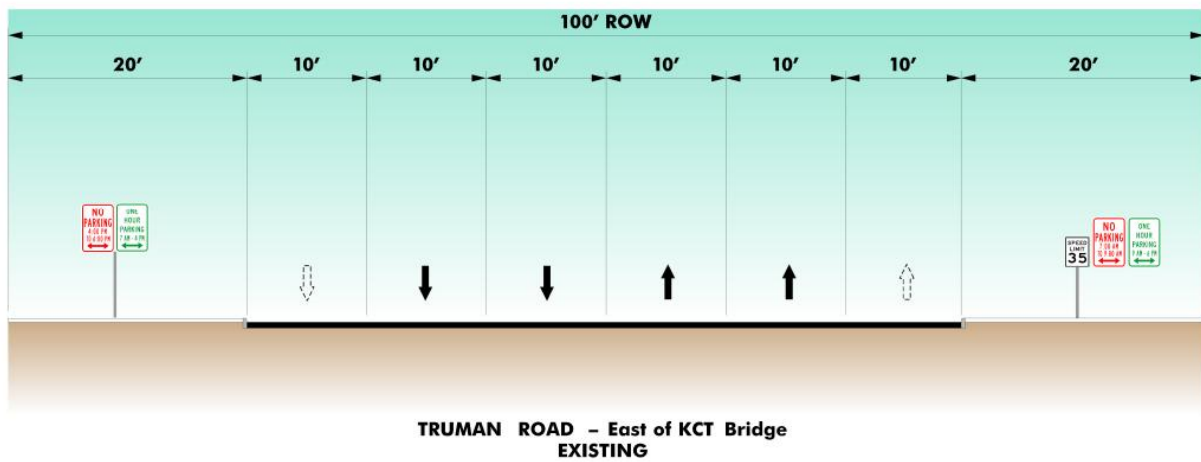


Figure 19: Enhanced Streetcar Typical Section - Truman Road, East of KCT Bridge, Existing Conditions

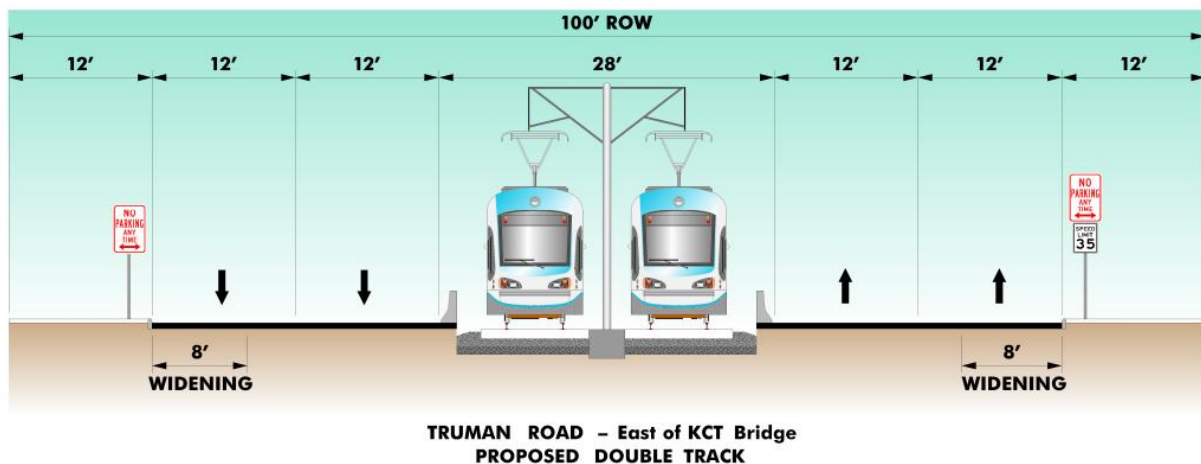


Figure 20: Enhanced Streetcar Typical Section - Truman Road, East of KCT Bridge

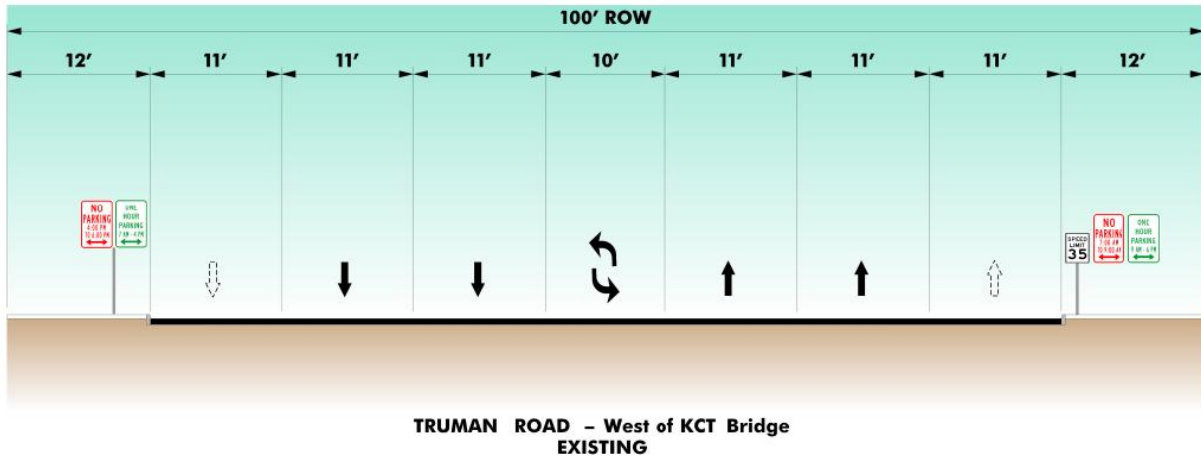


Figure 21: Enhanced Streetcar Typical Section - Truman Road, West of KCT Bridge, Existing Conditions

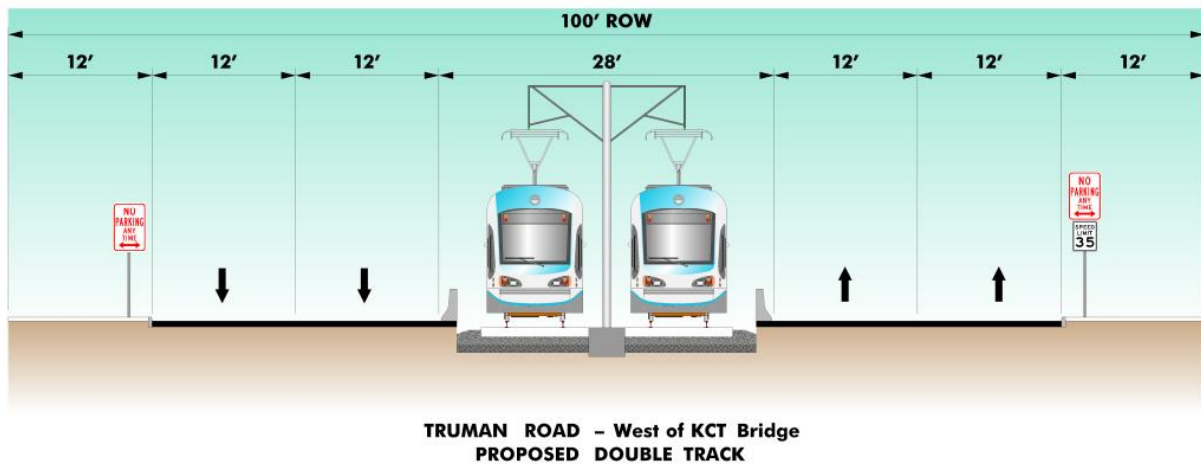


Figure 22: Enhanced Streetcar Typical Section - Truman Road, West of KCT Bridge

Common Line (Linwood Boulevard): Truman Sports Complex to Downtown KCMO

The Linwood Boulevard Line would begin at the Truman Sports Complex station. The enhanced streetcar route would operate generally along the Rock Island right-of-way to Stadium Drive, along Stadium Drive to Van Brunt, along 31st Street to Linwood, along Linwood to Main Street, then along Main Street to Pershing Road where it would connect with the downtown streetcar line.

The enhanced streetcar service would operate along a double track configuration from the stadium complex station. From there the route would proceed west operating along the Rock Island right-of-way to Stadium Drive. The route would then transition from the Rock Island right-of-way to Stadium Drive in the Leed’s Industrial District via a newly constructed elevated structure that would provide a grade separated crossing over existing and active rail lines that cross Stadium Drive at-grade in the Leed’s District.

Once across these existing rail lines the enhanced streetcar line would return to street level operating in the center of Stadium Drive in a separated guideway. The route would proceed west and north along

Stadium Drive through the Leed's Industrial District crossing an existing bridge structure over the Little Blue River that may require modification, to Van Brunt where it will transition to 31st Street and serve a walk access station.

The route would proceed west on 31st Street in a double track, center running guideway configuration for approximately one-quarter mile where it would then transition to Linwood Boulevard and operate in the same configuration west on Linwood Boulevard serving a walk access station adjacent to the Veterans Administration Hospital followed by a station in an urban residential environment at Linwood Boulevard and Indiana and stations in moderate intensity commercial environments at Linwood and Prospect Avenue, Linwood and Troost Avenue, and Linwood and Gillham Road.

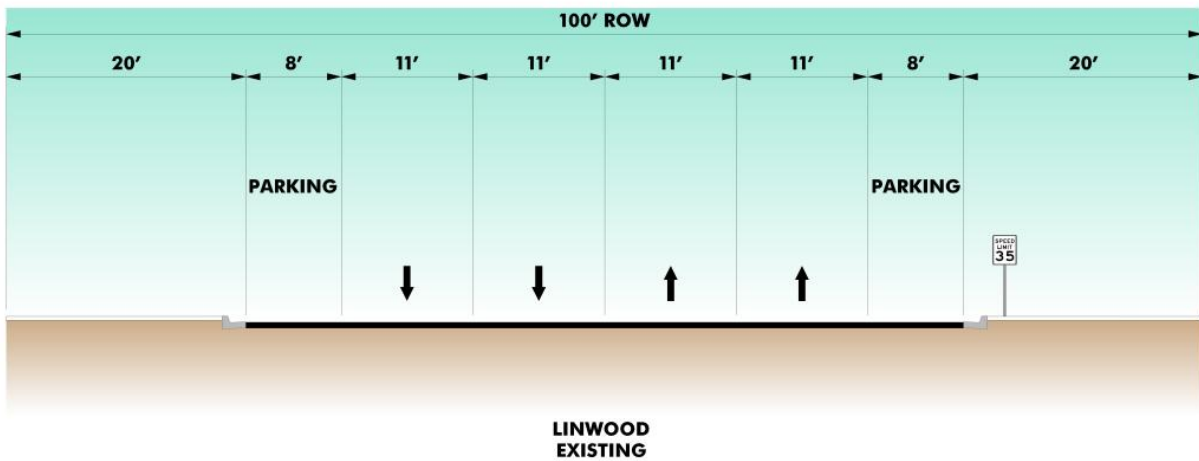


Figure 23: Enhanced Streetcar Linwood Blvd Typical Section, Existing Conditions

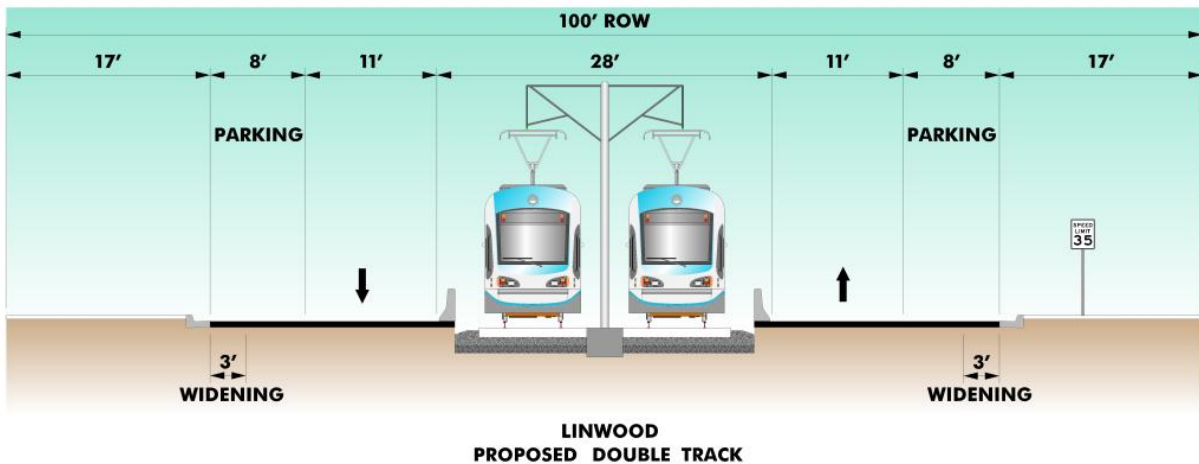


Figure 24: Enhanced Streetcar Linwood Blvd Typical Section

From Gillham Road the route would proceed west to Main Street, where it would transition to Main heading northbound and operate in the same double track, center running guideway configuration. The route would serve stations at Main Street and 31st Street, and adjacent to the Federal Reserve office between 27th and 28th Streets along Main Street. The route would terminate on Main Street adjacent to Union Station, where it would connect with the downtown circulator streetcar line.

Intersection Treatments

In segments where Enhanced Streetcar is center street running, significant improvements will likely be required at intersections with arterial streets. With Enhanced Streetcar in the middle of the street, left turn storage bays will be affected and street typical section will have to be widened to accommodate Enhanced Streetcar and the left turn storage bay. In instances where stations are located near intersections, the impact will be greater in that the platform width will exacerbate the necessity of widening. In some instances where limited right of way width exists, particularly in urban environments, narrower split platforms may be required.

Curb running Enhanced Streetcar has fewer impacts on left turn storage bays and requires less room because a portion of the station platform can be coincident with the sidewalk. On the other hand, significant modifications in the vertical geometry of the intersection occur because the intersection has to be “flattened out” to accommodate the presence of rail at the curb line where there is greater cross slope modification due to curb inlet drainage needs. These improvements invariably “bleed” back into the intersecting street geometry requiring modification of all legs of the intersection. Improvements of horizontal and vertical geometry are also likely to require modification of drainage systems at intersections. Curb inlet leaders are often connected to manholes that lead into the sewer system at intersections. These manholes are often located at the middle of the intersection. Center running Enhanced Streetcar can require major modifications of those sewer and other utility systems. Reconfiguration of traffic signals, lighting and curb side amenities will also be required at intersections.

Bridge Structures

The bridge structures impacted by the alternative include the following:

Table 28: Enhanced Streetcar Bridge Structures

Bridge Structure	Bridge Location	Replace / New
Southeast Segment (Lee’s Summit to Truman Sports Complex)		
Railroad Bridge	Crossing over E. 47th	Replace Existing
Highway Bridge	Undercrossing at Raytown Rd.	Potential RR Bed Widening
Railroad Bridge	Crossing at E 67th St.	Potential RR Bed Widening
Highway Bridge	Undercrossing at E 63rd St.	Potential RR Bed Widening
Railroad Bridge	Crossing over 59 th Street	New Bridge
2 Track Railroad Bridge	Crossing Over M-350	Bridge Modification
Stream Crossing	North of I-470	New Structure
Highway Bridge	Undercrossing at I-470	Potential RR Bed Widening
Railroad Bridge	Crossing over NW Chipman Rd.	Potential Replacement
Railroad Bridge	Crossing over SW 3rd St.	Potential Replacement
Highway Bridge	Undercrossing at SW Pryor Rd	Potential RR Bed Widening
Highway Bridge	Undercrossing at 291	Potential RR Bed Widening

Bridge Structure	Bridge Location	Replace / New
Southeast Segment (Lee's Summit to Truman Sports Complex)		
East Segment (Blue Springs to Truman Sports Complex)		
Railroad Bridge	Crossing Existing Rail Road	Bridge Modification
Highway Bridge	Undercrossing at I-470	Potential Road Widening
Highway Bridge	Crossing over Little Blue River	Bridge Modification
Highway Bridge	Crossing over tributary to Little Blue River	Bridge Modification
Common Segment (Truman Sports Complex to Stadium Drive & Van Brunt)		
Railroad Bridge	Crossing over Sportsman Dr.	Repair existing / Add new parallel bridge
Railroad Bridge	Crossing over Blue Ridge Cutoff	Repair existing / Add new parallel bridge
Highway Bridge	Undercrossing at I-435	No Change
Railroad Bridge	Crossing over KC Southern RR	Repair existing / Add new parallel bridge
Railroad Bridge	Crossing over Missouri Pacific RR	New Double Track Bridge
Highway Bridge	Crossing over Blue River	Bridge Modification
Common Segment (Linwood/Van Brunt)		
Highway Bridge	Crossing over U.S. 71	Bridge Modification
Highway Bridge	Undercrossing at I-70	Potential Road Widening
Common Segment (Truman Road)		
Highway Bridge	Undercrossing at U.S. 71	Bridge Modification
Highway Bridge	Undercrossing at I-70	Bridge Modification
Railroad Bridge	Undercrossing at KC Terminal RR	Potential Road Widening

7.3. STATIONS

The station locations are primarily located in the median. A listing of station locations is provided below:

Table 29: Enhanced Streetcar Stations - East Line

East Line		
Station Location	Station Type	Markets Served
Oak Grove @ I-70	Small Park and Ride	Oak Grove residents, employment and commercial
Grain Valley @ I-70	Small Park and Ride	Grain Valley residents, employment and commercial
U.S. 40 and M-7	Small Park and Ride	Blue Springs residents, employment and commercial
U.S. 40 and SW 19 th St.	Small Park and Ride	Blue Springs residents, employment and commercial
U.S. 40 and Valley View Pkwy	Small Park and Ride	Independence residents, employment and commercial
U.S. 40 and Lee's Summit Road	Small Park and Ride	Independence residents, employment and commercial
U.S. 40 and Washington Ave.	Small Park and Ride	Independence residents, employment and commercial
43 rd St. and Blue Ridge Crossing	Walk up	Independence residents, employment and commercial

Table 30: Enhanced Streetcar Stations - Southeast Line

Southeast Segment (Lee's Summit to Truman Sports Complex)		
Station Location	Station Type	Markets Served
Pleasant Hill	Small Park and Ride	Pleasant Hill residents and commuters from the southeast
Greenwood	Small Park and Ride	Greenwood residents and commuters from the southeast
Blue Parkway and M-291	Small Park and Ride	Greenwood and Pleasant Hill residents and commuters from the southeast
Blue Parkway and I-470	Small Park and Ride	Lee's Summit residents,

Southeast Segment (Lee's Summit to Truman Sports Complex)		
Station Location	Station Type	Markets Served
		employment and commercial
Rock Island ROW and Noland Road	Small Park and Ride	Lee's Summit residents, employment and commercial
Rock Island ROW and 63 rd St.	Small Park and Ride	Raytown residents, employment and commercial

Table 31: Enhanced Streetcar Stations - Common Line Linwood Alternative

Common Segment (Truman Sports Complex to Linwood)		
Station Location	Station Type	Markets Served
Truman Sports Complex	Intermodal Station	Kansas City, Raytown and Independence residents, special events, employment and commercial
31 st St. and Van Brunt	Walk Up	Kansas City residents, employment and commercial
Linwood and VA Hospital	Walk Up	Kansas City residents, employment and commercial
Linwood and Indiana	Walk Up	Kansas City residents, employment and commercial
Linwood and Prospect	Walk Up	Kansas City residents, employment and commercial
Linwood and Troost	Walk Up	Kansas City residents, employment and commercial
Linwood and Gillham	Walk Up	Kansas City residents, employment and commercial
Main Street and Union Station	Walk Up	Kansas City residents, employment and commercial

Table 32: Enhanced Streetcar Stations - Common Line Truman Alternative

Common Segment (Truman Sports Complex to Truman)		
Station Location	Station Type	Markets Served
Truman Sports Complex	Intermodal Station	Kansas City, Raytown and Independence residents, special events, employment and commercial
Van Brunt and 30 th Terrace	Walk Up	Kansas City residents, employment and commercial
Van Brunt and 27 th St.	Walk Up	Kansas City residents, employment and commercial
Van Brunt and 23 rd St.	Walk Up	Kansas City residents, employment and commercial
Van Brunt and 18 th St.	Walk Up	Kansas City residents, employment and commercial
Truman and Jackson	Walk Up	Kansas City residents, employment and commercial
Truman and Prospect	Walk Up	Kansas City residents, employment and commercial
Truman and Woodland	Walk Up	Kansas City residents, employment and commercial
Truman and Main	Walk Up	Kansas City residents, special events, employment and commercial

7.4. OPERATING ASSUMPTIONS

7.4.1. SERVICE LEVELS

Service levels will be the same for Truman Road and Linwood Boulevard Enhanced Streetcar Alternatives. The following table lists the headways that are being assumed for the initial analysis.

Table 33: Enhanced Streetcar Service Levels

Time of Day	East Segment / Southeast Segment Headways	Common Segment Headways
Morning Peak	20	10
Mid-day	60	30
Evening Peak	20	10
Off-Peak	60	30

7.4.2. END TO END OPERATING CHARACTERISTICS

Table 34: Enhanced Streetcar End to End Operational Characteristics

Alternative	Route Miles	Average Speed	Travel Time
East Segment - Truman Alternative	27.74	26.29 mph	50m 11s
East Segment – Linwood Alternative	27.76	28.2 mph	47m 39s
SE Segment – Truman Alternative	29.67	25.6 mph	48m 28s
SE Segment – Linwood Alternative	29.39	25.71 mph	46m 56s

7.4.3. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIMES

Table 35: Enhanced Streetcar Station to Station Distance, Speed and Travel Times

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
East Segment – Linwood Option						
Oak Grove @ I-70	-	60s	-	-	-	-
Grain Valley @ I-70	3.5	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 49s

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
U.S. 40 & M-7	3.9	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	5m 13s
U.S. 40 & SW 19 th	.74	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	2m 4s
U.S. 40 & Valley View	4.40	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	5m 43s
U.S. 40 & Lee's Summit	1.74	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	3m 4s
U.S. 40 & Washington	1.67	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	2m 59s
43 rd St. @ BRC	1.30	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	2m 37s
Sports Complex	2.76	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 15s
31 st & Van Brunt	2.90	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 13s
Linwood @ VA	.40	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 46s
Linwood & Indiana	.79	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 17s
Linwood & Prospect	.56	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 59s
Linwood & Troost	.93	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 28s
Linwood & Gillham	.46	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 51s
Main & Union Station	1.41	v	3mi/hr./sec.	3mi/hr./sec.	35 mph	2m 31s
East Segment – Truman Rd. Option						
U.S. 40 & M7	-	60s	-	-	-	-
U.S. 40 & SW 19 th	.74	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	2m 4s
U.S. 40 & Valley View	4.40	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	5m 43s
U.S. 40 & Lee's Summit	1.74	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	3m 4s
U.S. 40 & Washington	1.67	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	2m 59s
43 rd St. @ BRC	1.30	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	2m 37s

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
Sports Complex	2.76	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 15s
Van Brunt & 30 th Ter	2.91	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 14s
Van Brunt & 27th St	.38	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 44s
Van Brunt & 23rd St	.50	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 54s
Van Brunt & 18th St	.44	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 49s
Truman & Jackson	.72	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 11s
Truman & Prospect	1.01	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 35s
Truman & Woodland	.58	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 1s
Truman & Main	1.19	60s	3mi/hr./sec.	3mi/hr./sec.	36 mph	3m 10s
Southeast Segment – Linwood Option						
Pleasant Hill	-	60s	-	-	-	-
Greenwood	5.81	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	7m 8s
Blue Parkway & M-291	3.16	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 29s
Blue Parkway and I-470	3.5	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 49s
RI ROW & Noland Rd	2.85	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 10s
RI ROW & 63 rd St	3.65	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 58s
Sports Complex	2.97	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 17s
31 st & Van Brunt	2.90	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 13s
Linwood @ VA	.40	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 46s
Linwood & Indiana	.79	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 17s
Linwood & Prospect	.56	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 59s

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
Linwood & Troost	.93	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 28s
Linwood & Gillham	.46	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 51s
Main & Union Station	1.41	60s	3mi/hr./sec.	3mi/hr./sec.	36 mph	2m 32s
Southeast Segment – Truman Rd. Option						
Pleasant Hill	-	60s	-	-	-	-
Greenwood	5.81	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	7m 8s
Blue Parkway & M-291	3.16	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 29s
Blue Parkway and I-470	3.5	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 49s
RI ROW & Noland Rd	2.85	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 10s
RI ROW & 63 rd St	3.65	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 58s
Sports Complex	2.97	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 17s
Van Brunt & 30 th Ter	2.91	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 13s
Van Brunt & 27th St	.38	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 44s
Van Brunt & 23rd St	.50	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 54s
Van Brunt & 18th St	.44	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 49s
Truman & Jackson	.72	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 35s
Truman & Prospect	1.01	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 35s
Truman & Woodland	.58	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 1s
Truman & Main	1.19	60s	3mi/hr./sec.	3mi/hr./sec.	36 mph	2m 7s

7.4.4. FLEET SIZE

The fleet size for the Enhanced Streetcar option will be finalized once the O&M costing and travel demand forecasting is completed. However, based on comparing the seating capacity per consist of the DMUs vs. the enhanced streetcar, the following calculations are shown to be the vehicle fleet sizes for initial costing:

Table 36: Enhanced Streetcar Fleet Size

Alternative	Total Number of Vehicles in Fleet	Total Number of Vehicles in Peak Service	Peak Consist Size	Off-Peak Consist Size
Enhanced Streetcar	10	8	2	1

7.5. BUS NETWORK

The supporting bus network includes the feeder bus network under the TSM, excluding the express bus service and also the following changes or added service to provide feeder transit route connections with the Enhanced Streetcar.

Table 37: Enhanced Streetcar Bus Network - Common Segment

Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
No change to existing routes			

Table 38: Enhanced Streetcar Bus Network - East Line

Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
Circulator in Blue Springs	30	60	New route
Connector route Between Oak Grove/Grain Valley & U.S.40/M-7 Enhanced Streetcar Station	30	n/a	New route

Table 39: Enhanced Streetcar Bus Network - Southeast Line

Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
47	30	60	Modify to access TSC

28	30	60	Modify to access TSC
28x	30	60	Modify to access TSC
Connector Route between Pleasant Hill and RI ROW/M-291 Enhanced Streetcar Station	20	n/a	

7.6. PROPOSED MAINTENANCE FACILITY

The proposed maintenance facility locations for the DMU option have been tentatively identified as being adequate for the Enhanced Streetcar option. The exact size of the facility will differ, but the basic functions and location of the facility make them compatible enough to assume that the location for the DMU Full Regional Rail alternative is adequate for the Enhanced Streetcar alternative, no matter which site is chosen.

DRAFT

Jackson County Commuter Corridors Alternatives Analysis Enhanced Streetcar - Truman Alternative

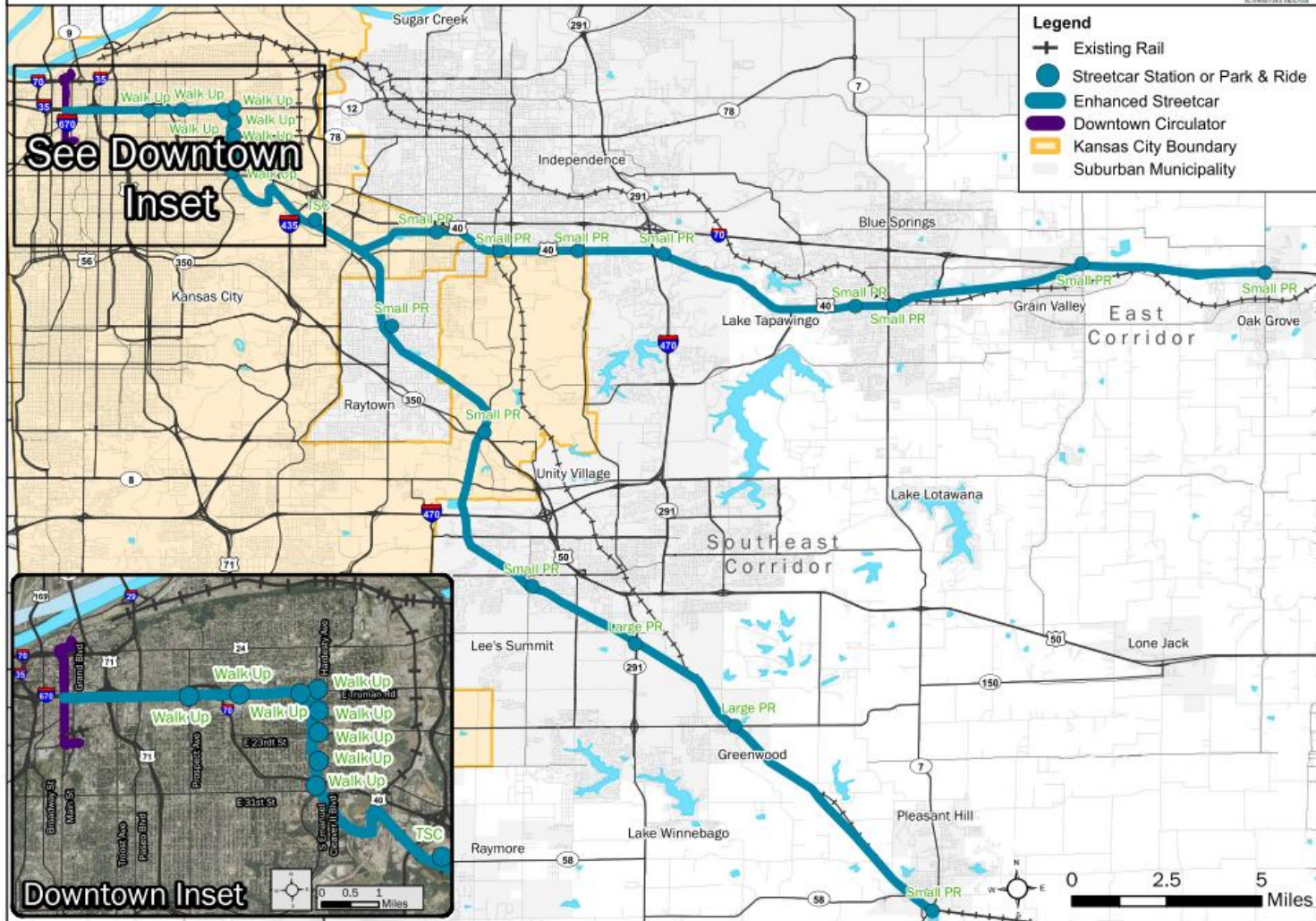


Figure 25: Enhanced Streetcar - Truman Alternative

Jackson County Commuter Corridors Alternatives Analysis Enhanced Streetcar - Linwood Alternative

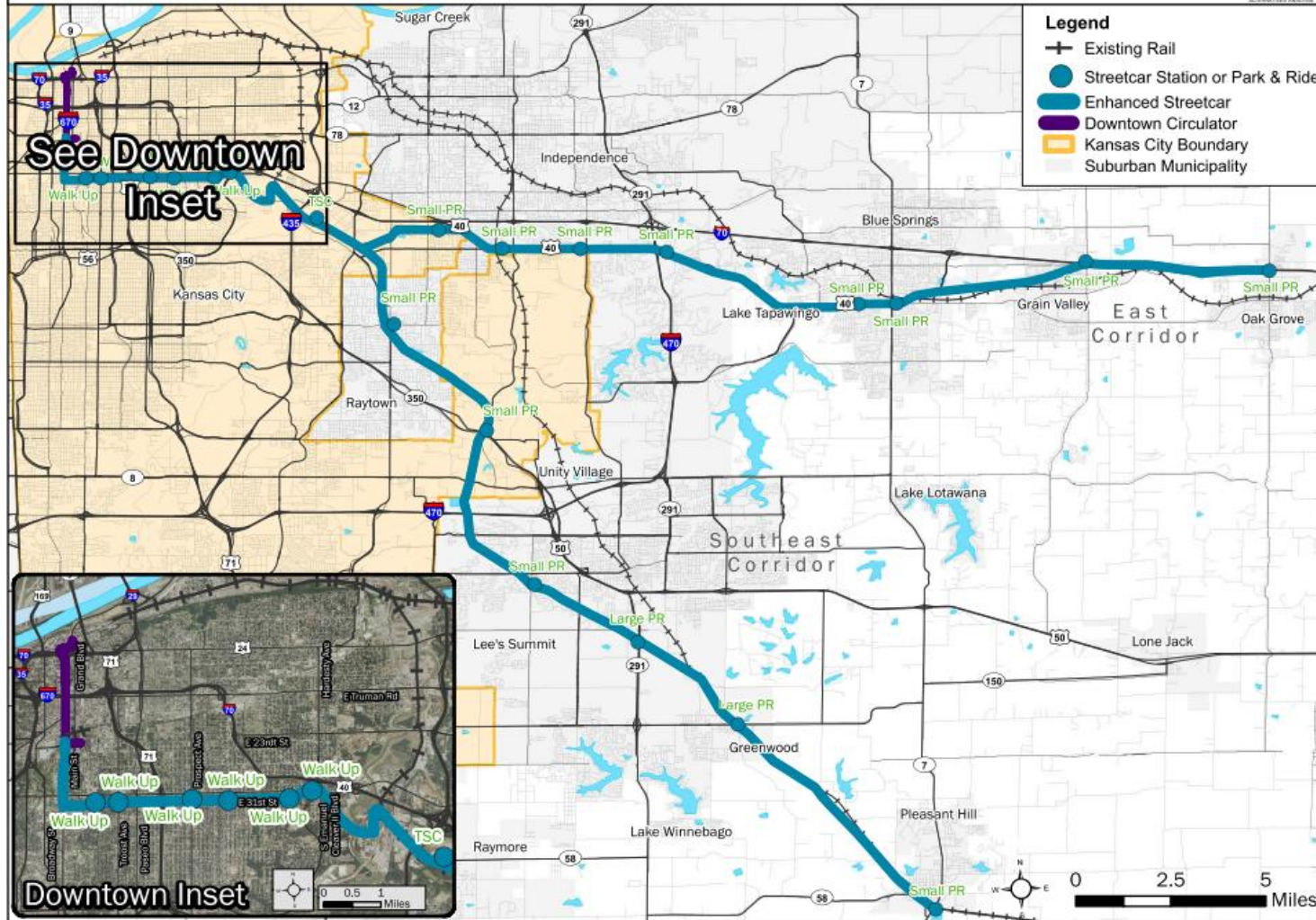


Figure 26: Enhanced Streetcar - Linwood Alternative

8. FULL BUS RAPID TRANSIT (BRT) ALTERNATIVES

This BRT option seeks to provide similar levels of service and serve similar markets with a bus based technology, largely operating in the existing roadways and Rock Island Railroad right-of-way with conventional KCATA MAX vehicles and enhanced amenities at the stops.

8.1. TECHNOLOGY

This technology uses conventional 40 foot transit buses or articulated buses operating in their own guideway or mixed traffic, depending on the situation, along existing streets. It is similar to the existing KCATA Max service. The buses may have a similar livery (paint and graphics) to that of the Max service, or may have a different one to distinguish it from that service. The service will be run with frequent headways and enhanced stop amenities, including next vehicle or NextBus technology.

The proposed vehicle would be a rubber-tire bus vehicle that can operate in both a fixed guideway and mixed traffic. Vehicle capacity would be approximately 40 seated passengers per non-articulated car. The vehicle is designed with a low floor entry; fully compliant with ADA standards. The maximum vehicle speed is 65 mph.



Figure 27: Bus Rapid Transit Vehicle (Source: KCATA)

8.2. ALIGNMENT

East Line: Oak Grove to Stadiums

The East Line would begin in Oak Grove at the intersections of I-70 and Missouri F. The Bus Rapid Transit (BRT) route would operate generally from Oak Grove west along I-70 to Grain Valley, then from Grain Valley along U.S. 40 through Blue Springs and Independence to 43rd Street in Independence, then along 43rd Street to Sterling Avenue. From Sterling Avenue the route would continue along a new-build segment to the stadium complex.

The BRT route would serve a small park and ride at or near the intersection of I-70 and Missouri F. From there it would operate in mixed-traffic along I-70 between Oak Grove and Grain Valley. At Grain Valley the route would exit I-70 and serve a small park and ride at Missouri Aa and U.S. 40 on the north edge of Grain Valley. The route would then proceed west on U.S. 40 in a median-running double-busway to M-7 Highway in Blue Springs. From there the route would continue west in a double-busway configuration from a station located at or near the intersection of U.S. 40 and M-7 that would include a small park and ride. The route would then proceed west operating in the existing median of U.S. 40 to a station with a small park and ride at U.S. 40 and SW 19th Street in Blue Springs. The route would proceed west along the U.S. 40 median immediately adjacent to the eastbound segment of U.S. 40. This portion of the alignment passes through predominantly light industrial and low intensity commercial land uses.

A new bridge structure, or modification to the existing eastbound U.S. 40 bridge crossing the Little Blue River would be required just east of U.S. 40 and Valley View Parkway. The route would proceed west to a station with a small park and ride at U.S. 40 and Valley View Parkway in Independence. This is an area of relatively high intensity commercial land use.

At the I-470 underpass the U.S. 40 median disappears and as a result, widening of U.S. 40 under the I-470 overpass may be necessary. West of the overpass the median resumes for approximately one mile to U.S. 40 and Kendall Street where the median disappears and the double-busway alignment would transition to the center of U.S. 40 in a separated double-busway. From this point the route would continue west along the center of U.S. 40 to a station with a small park and ride located at U.S. 40 and Lee's Summit Road. This segment of the route passes through relatively sparse development consisting primarily of low intensity commercial and light industrial land uses. The route would then continue west along U.S. 40 to a station with a small park and ride located at U.S. 40 and Washington Street just west of Noland Road serving an area of moderate intensity commercial land use..

As the route continues west along U.S. 40 it passes over an existing rail line just west of Washington Street on an existing bridge structure that may need modification. West from this point the route continues to operate in the center of U.S. 40 to 43rd Street where it would transition to 43rd Street operating in the center of the street in a double-busway to Blue ridge Boulevard. At Blue Ridge Boulevard the route would become single busway and transition to the north side of 43rd Street for a distance of approximately one-half mile to Sterling Avenue. A walk access station located midway between Blue ridge Boulevard and Sterling Avenue would be served by this side-running, single busway segment and would be directly adjacent to a commercial development that includes a Wal-Mart Super Center.

From Sterling Avenue the route would resume double-busway configuration on a newly constructed segment through mostly undeveloped properties until it connects with the Rock Island right of way at Blue Ridge Cut-off and connects to the common segment at the stadium complex.

Southeast Line: Rock Island ROW and M-291 Highway

The Southeast Line would begin in Pleasant Hill at the intersection of the Rock Island right-of-way and M-58. The enhanced streetcar route would operate generally along the Rock Island right-of-way to the stadium complex.

The Bus Rapid Transit service would operate along a double-busway configuration from a station located at or near the intersection of the Rock Island ROW and M-58 in Pleasant Hill. The route would travel northwest through Greenwood, serving a station with a small park and ride at or near the intersection of the ROW and M-150. It would then proceed northwest to a station with a small park and ride located at or near the intersection of the ROW and M-291. West of M-291 the route travels through commercial and industrial uses before reaching established residential development. There are at-grade crossings at Scherer Road, Ward Road and Longview Road. There will be an at-grade crossing on the access road to Charles David Hartman Memorial Park, just east of the Pryor Road overpass. This will also be a location for a station. The alignment continues to travel to the northwest through established residential development. There are two roadway overpasses at 3rd Street and Chipman Road. The route then passes under I-470 as it travels through undeveloped areas entering into Kansas City. There is an at-grade crossing at Vale Road, an existing 480-foot tunnel at Bannister Road and an at-grade crossing at Brickyard Road before the alignment reaches the Knobtown area.

The route passes over Route 350 before reaching the Knobtown station in the northwest corner of Route 350 and Noland Road. There is limited commercial and light industrial development in this area. The route continues north through undeveloped land before entering Raytown. There is an at-grade crossing at Frost Road. At 75th Street the roadway will be realigned and the existing rail bridge improved to accommodate the necessary traffic capacity. In this area there is more established residential development as the route travels over the at-grade crossings at Irwin Road and Woodson Road.

The route through Raytown is mostly through established residential areas. There is a railroad overpass at 67th Street and roadway overpasses at Raytown Road and 63rd Street. The Raytown station will be located just north of 63rd Street in downtown Raytown. The alignment continues north to a new busway overpass at 59th Street which replaces a rail bridge removed when the roadway was widened. There are two more at-grade crossing in Raytown at 56th Street and 53rd Street.

As the route continues back into Kansas City, it travels through light industrial and undeveloped land. There are overpasses at 47th Street and Blue Ridge Cutoff. The route then travels just south of the Truman Sports Complex. There is an overpass of Sportsman Drive (stadium parking access on the east) and a roadway overpass at Lancer Lane (stadium parking access on the west). Between these two grade separations will be the Truman Sports Complex station to serve events and act as a multi-modal terminal.

Example cross sections for various parts of the route are depicted on the following pages.

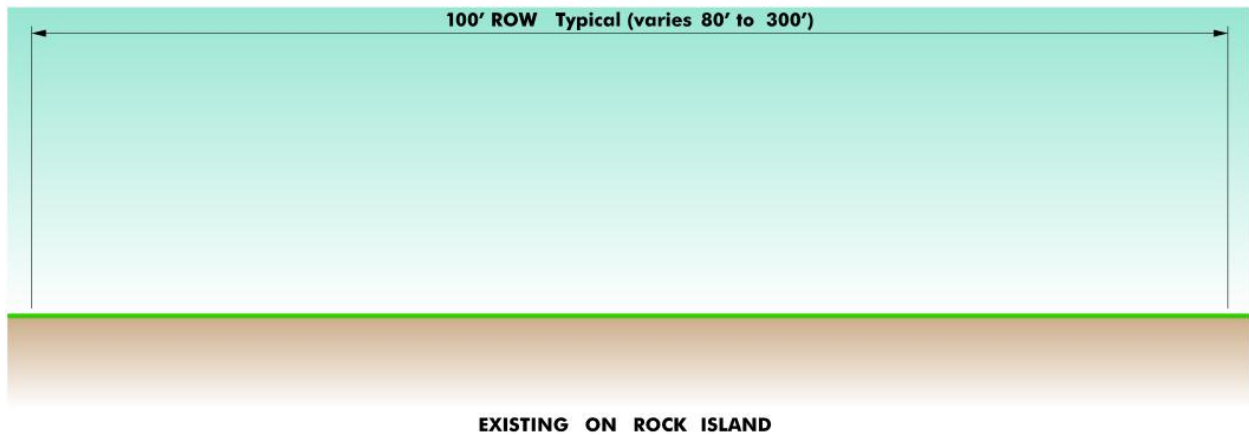


Figure 28: Bus Rapid Transit Rock Island Railroad Typical Section, Existing Conditions

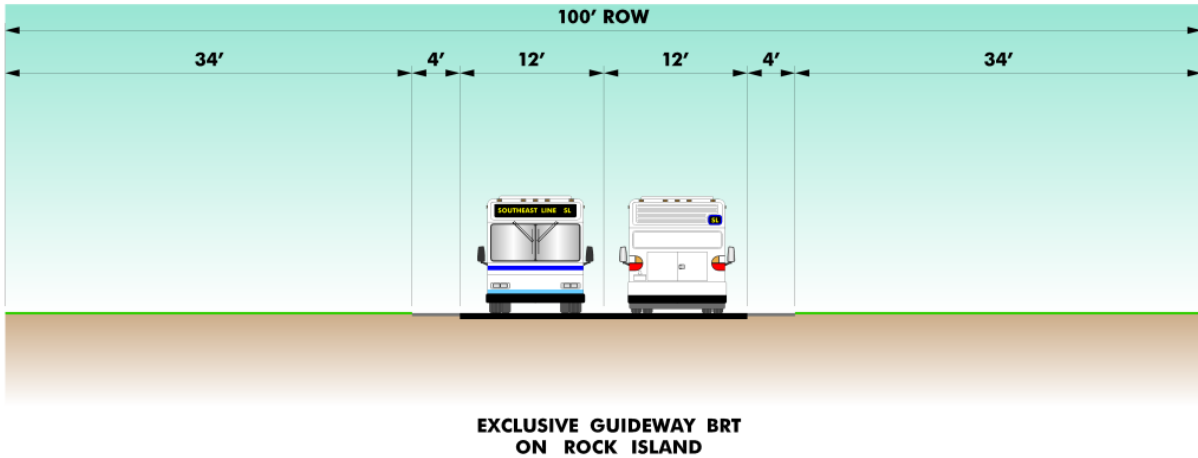


Figure 29: Bus Rapid Transit Rock Island Railroad Typical Section

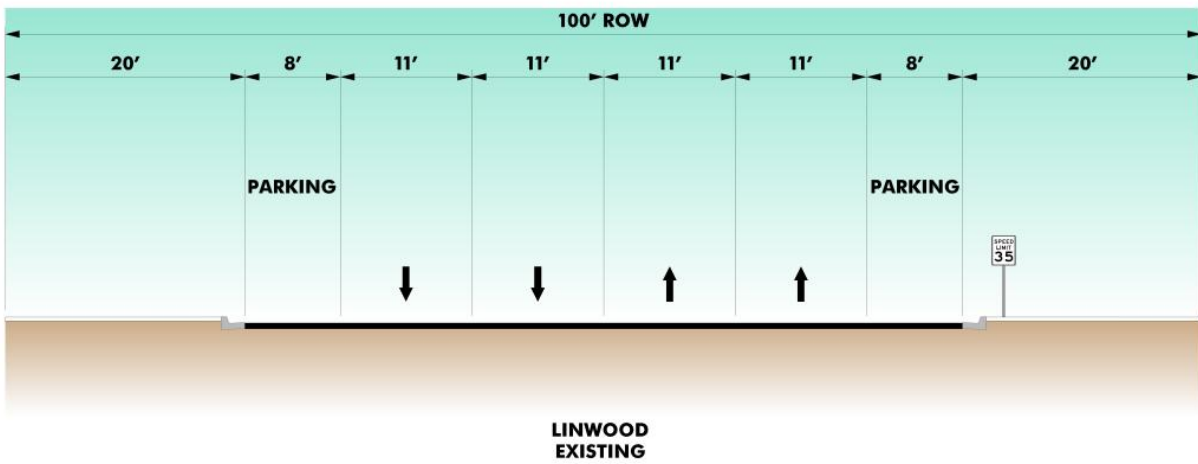


Figure 30: Bus Rapid Transit Linwood Blvd Typical Section, Existing Conditions

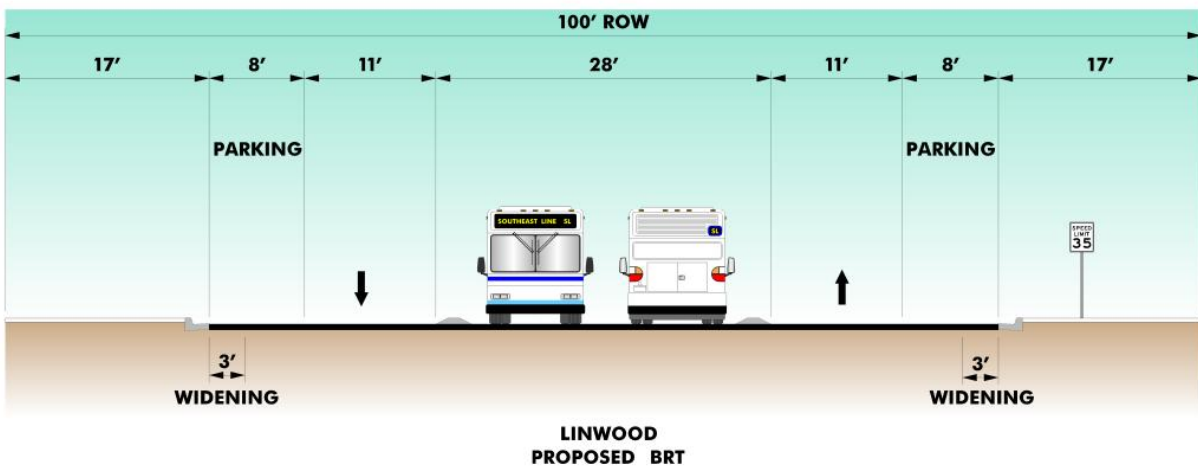


Figure 31: Bus Rapid Transit Linwood Blvd Typical Section

Table 40: BRT Bridge Structures

Bridge Structure	Bridge Location	Replace / New
Southeast Segment (Lee's Summit to Truman Sports Complex)		
Guideway Bridge	Crossing over E. 47th	Replace Existing
Guideway Bridge	Crossing at E 67th St.	Potential Bed Widening
Guideway Bridge	Crossing over 59 th Street	New Bridge

8.3. STATIONS

Station locations are shown in the tables below. The BRT Alternatives include use of the park and ride lots included in the TSM Alternative. For BRT operations, station pairs would be provided on each side of the road or guideway. The stations are envisioned to be similar to the station design provided by the KCATA for the Main Street and Troost MAX BRT. Along the Rock Island Line the stations would be the same as the ones for the Enhanced Streetcar alternative.

Table 41: BRT Station Locations - East Line

East Line		
Station Location	Station Type	Markets Served
Oak Grove @ I-70	Large Park and Ride	Oak Grove residents and commuters from cities to the east
Grain Valley @ I-70	Large Park and Ride	Grain Valley residents
U.S. 40 and M-7	Small Park and Ride	Blue Springs residents, employment and commercial
U.S. 40 and SW 19 th St.	Small Park and Ride	Blue Springs residents, employment and commercial.
U.S. 40 and Valley View Pkwy	Small Park and Ride	Independence residents, employment and commercial
U.S. 40 and Lee's Summit Road	Small Park and Ride	Independence residents, employment and commercial
U.S. 40 and Washington	Small Park and Ride	Independence residents, employment and commercial
43 rd St. and Blue Ridge Crossing	Walk up	Independence residents, employment and commercial

Table 42: BRT Station Locations - Southeast Line

Southeast Line (Lee's Summit to Truman Sports Complex)		
Station Location	Station Type	Markets Served
Pleasant Hill	Small Park and Ride	Pleasant Hill residents and commuters from the southeast
Greenwood	Small Park and Ride	Greenwood residents and commuters from the southeast
Rock Island ROW and M-291	Small Park and Ride	Greenwood and Pleasant Hill residents and commuters from the southeast
Rock Island ROW and Pryor Road	Small Park and Ride	Lee's Summit residents, employment and commercial
Rock Island ROW and Noland Road	Small Park and Ride	Lee's Summit residents, employment and commercial
Rock Island ROW and 63 rd St.	Small Park and Ride	Raytown residents, employment and commercial

Table 43: BRT Station Locations - Common Segment Linwood Alternative

Common Segment (Truman Sports Complex to Linwood)		
Station Location	Station Type	Markets Served
Truman Sports Complex	Intermodal Station	Kansas City, Raytown and Independence residents, special events, employment and commercial
31 st St. and Van Brunt	Walk Up	Kansas City residents, employment and commercial
Linwood and VA Hospital	Walk Up	Kansas City residents, employment and commercial
Linwood and Indiana	Walk Up	Kansas City residents, employment and commercial
Linwood and Prospect	Walk Up	Kansas City residents, employment and commercial
22 nd and Holmes	Walk Up	Kansas City residents, employment and

		commercial
Oak and 13 th	Walk Up	Kansas City residents, special events, employment and commercial

Table 44: BRT Station Locations - Common Segment Truman Alternative

Common Segment (Truman Sports Complex to Truman)		
Station Location	Station Type	Markets Served
Truman Sports Complex	Intermodal Station	Kansas City, Raytown and Independence residents, special events, employment and commercial
Van Brunt and 30 th Terrace	Walk Up	Kansas City residents, employment and commercial
Van Brunt and 27 th St.	Walk Up	Kansas City residents, employment and commercial
Van Brunt and 23 rd St.	Walk Up	Kansas City residents, employment and commercial
Van Brunt and 18 th St.	Walk Up	Kansas City residents, employment and commercial
Truman and Jackson	Walk Up	Kansas City residents, employment and commercial
Truman and Prospect	Walk Up	Kansas City residents, employment and commercial
Truman and Woodland	Walk Up	Kansas City residents, employment and commercial
Oak and 13 th Street	Walk Up	Kansas City residents, special events, employment and commercial

8.4. OPERATING ASSUMPTIONS

Buses would operate in mixed traffic with limited stops and mirror the services provided by KCATA Max service.

8.4.1. SERVICE LEVELS

Service levels will be the same for Truman Road and Linwood Boulevard and are outlined in the following table. The Common segment headways are half those of the others due to the availability of twice as much service coming in from the branch lines.

Table 45: BRT Service Levels

Time of Day	East Segment / Southeast Segment Headways	Common Segment Headways
Morning Peak	20	10
Mid-day	60	30
Evening Peak	20	10
Off-Peak	60	30

8.4.2. END TO END OPERATING CHARACTERISTICS

End to end operating distances, speed and requisite travel times for the trips are calculated below.

Table 46: BRT End to End Operating Characteristics

Alternative	Route Miles	Average Speed	Travel Time
East Segment - Truman Alternative	28.53	26.29 mph	51m 37s
East Segment – Linwood Alternative	26.85	26.3mph	46m 56s
SE Segment – Truman Alternative	29.66	27.42mph	50m 20s
SE Segment – Linwood Alternative	27.98	25.5mph	45m 38s

8.4.3. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIME

Station to station distances, speed and subsequent travel times are depicted below based on assumed vehicle operating characteristics, dwell times and speeds between and along the segments.

Table 47: BRT Station to Station Distance, Speed and Travel Time

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
East Segment – Linwood Option						
Oak Grove @ I-70	-	60s	-	-	-	-
Grain Valley @ I-70	4.05	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	5m 41s
U.S. 40 and M-7	4.15	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	5m 47s
U.S. 40 and SW 19 th	.74	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	2m 4s
U.S. 40 and Valley View	4.40	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	6m 7s
U.S. 40 and Lee’s Summit	1.74	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	3m 10s
U.S. 40 and Washington	1.67	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	3m 5s
43 rd St. @ BRC	1.30	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	2m 41s
Truman Sports Complex	2.76	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 16s
31 st and Van Brunt	2.90	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m25s
Linwood and Veteran’s Admin	.40	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 46s
Linwood and Indiana	.79	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 17s
Linwood and Prospect	.56	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 59s
Holmes and 22 nd St	.93	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 44s
Oak and 13 th St	.46	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	57s
East Segment – Truman Rd. Option						
Oak Grove@ I-70	-	60s	-	-	-	-
Grain Valley @ I-70	4.05	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	5m 41s

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
U.S. 40 and M-7	4.15	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	5m 59s
U.S. 40 and SW 19 th	.74	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	2m 4s
U.S. 40 and Valley View	4.40	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	6m 4s
U.S. 40 and Lee's Summit	1.74	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	3m 10s
U.S. 40 and Washington	1.67	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	3m 5s
43 rd St. and BRC	1.30	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	2m 41s
Truman Sports Complex	2.76	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 16s
Van Brunt and 30 th Terr	2.91	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 26s
Van Brunt and 27th St	.38	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 44s
Van Brunt and 23rd St	.50	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 54s
Van Brunt and 18th St	.44	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 49s
Truman and Jackson	.72	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 11s
Truman and Prospect	1.01	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 35s
Truman and Woodland	.58	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 49s
13 th and Oak	1.18	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 9s
Southeast Segment – Linwood Option						
Pleasant Hill	-	60s	-	-	-	-
Greenwood	5.81	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	7m 36s
Blue Pkwy and M-291	3.16	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 43s

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
Blue Pkwy and I-470	3.5	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	5m 5s
RI ROW and Noland Rd	2.85	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 22s
RI ROW and 63 rd St	3.82	60s	2.4mi/hr./sec.	3mi/hr./sec.	48 mph	5m 14s
Sports Complex	2.97	60s	2.4mi/hr./sec.	3mi/hr./sec.	48 mph	4m 30s
31 st and Van Brunt	2.90	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	4m 25s
Linwood and VA	.40	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 46s
Linwood and Indiana	.79	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 17s
Linwood and Prospect	.56	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 59s
Holmes and 22 nd St	.93	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 44s
Oak and 13 th St	.46	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	57s
Southeast Segment – Truman Rd. Option						
Pleasant Hill	-	60s	-	-	-	-
Greenwood	5.81	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	7m 13s
Blue Pkwy and M-291	3.16	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 43s
Blue Pkwy and I-470	3.5	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	5m 5s
RI ROW and Noland Rd	2.85	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 22s
RI ROW and 63 rd St	3.82	60s	2.4mi/hr./sec.	3mi/hr./sec.	48 mph	5m 14s
Truman Sports Complex	2.97	60s	2.4mi/hr./sec.	3mi/hr./sec.	48 mph	4m 30s
Van Brunt and 30 th Ter	2.91	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	4m 26s
Van Brunt and 27 th St	.38	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 44s

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
Van Brunt and 23rd St	.50	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 54s
Van Brunt and 18th St	.44	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 49s
Truman and Jackson	.72	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 11s
Truman and Prospect	1.01	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 35s
Truman and Woodland	.58	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 1s
Oak and 13th	1.18	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 9s

8.4.4. FLEET SIZE

The fleet size has initially been determined based on the operating parameters described above and are portrayed below. They will be compared and right-sized based on the travel demand forecasting results.

Table 48: BRT Fleet Size

Alternative	Total Number of Vehicles in Fleet	Total Number of Vehicles in Peak Service	Peak Consist Size	Off-Peak Consist Size
East Segment - Truman Alternative	4	4	n/a	n/a
East Segment – Linwood Alternative	4	4	n/a	n/a
SE Segment – Truman Alternative	4	4	n/a	n/a
SE Segment – Linwood Alternative	4	4	n/a	n/a

8.5. BUS NETWORK

Table 49: BRT Bus Network - Common Segment

Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
No change to existing routes			

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Table 50: BRT Bus Network - East Line

Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
Circulator in Blue Springs	30	60	New route

Table 51: BRT Bus Network Southeast Line

Routes	Programmed Headways		Change from TSM Alternative
	Weekday Peak	Weekday Off-peak	
47	30	60	Modify to access Truman Sports Complex
28	30	60	Modify to access Truman Sports Complex
28x	30	60	Modify to access Truman Sports Complex
253	30	60	Expand service span

8.6. PROPOSED MAINTENANCE FACILITY

Maintenance of the BRT vehicle fleet is presumed to occur at the existing KCATA maintenance facility located at 17th and Forest in Kansas City, Missouri. In order to minimize deadhead miles and hours end-of-line vehicle storage would need to be provided. Storage facilities would be located in Oak Grove, near M-7 & U.S. 40 in Blue Springs and in Pleasant Hill. Each facility would need to accommodate up to four vehicles during non-peak hours.

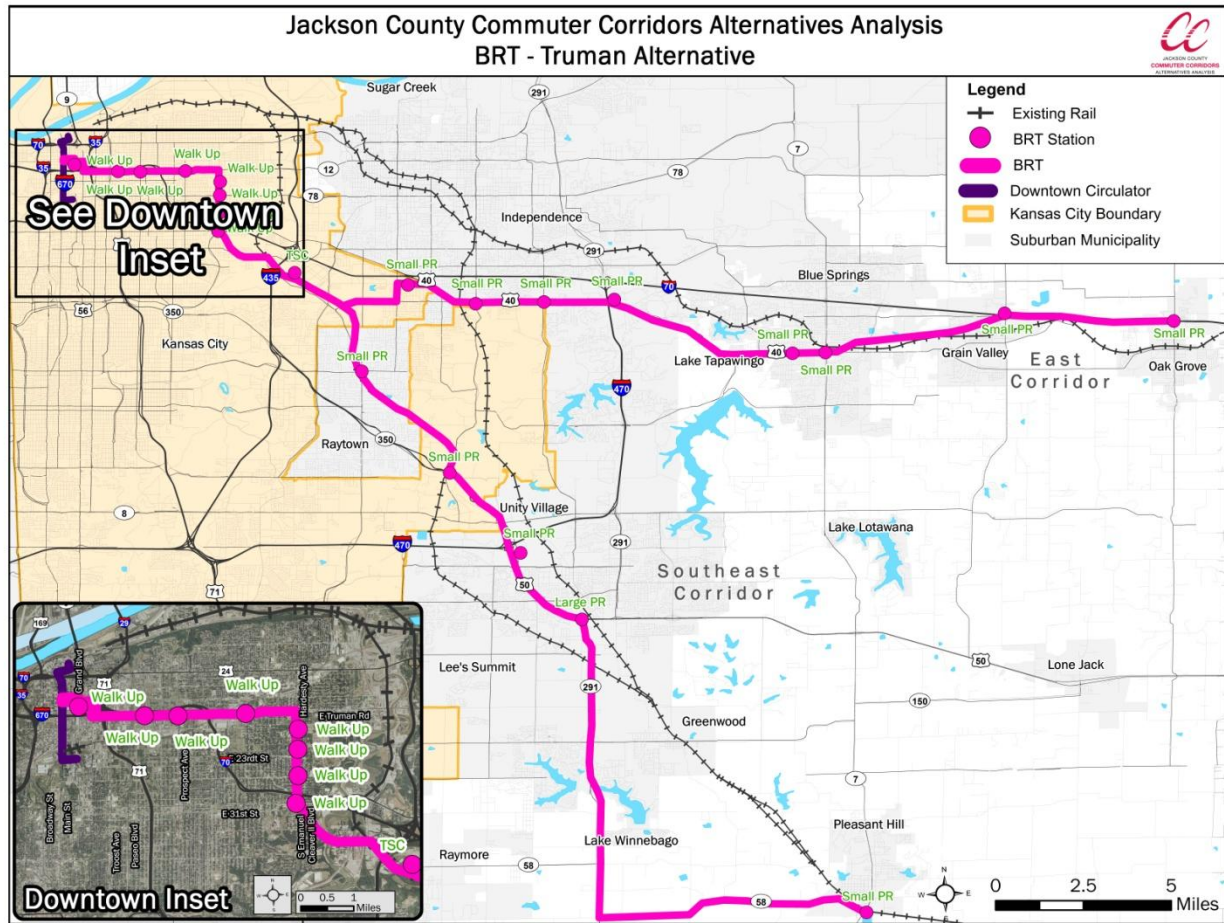


Figure 32: JCCC AA BRT Truman Alternative

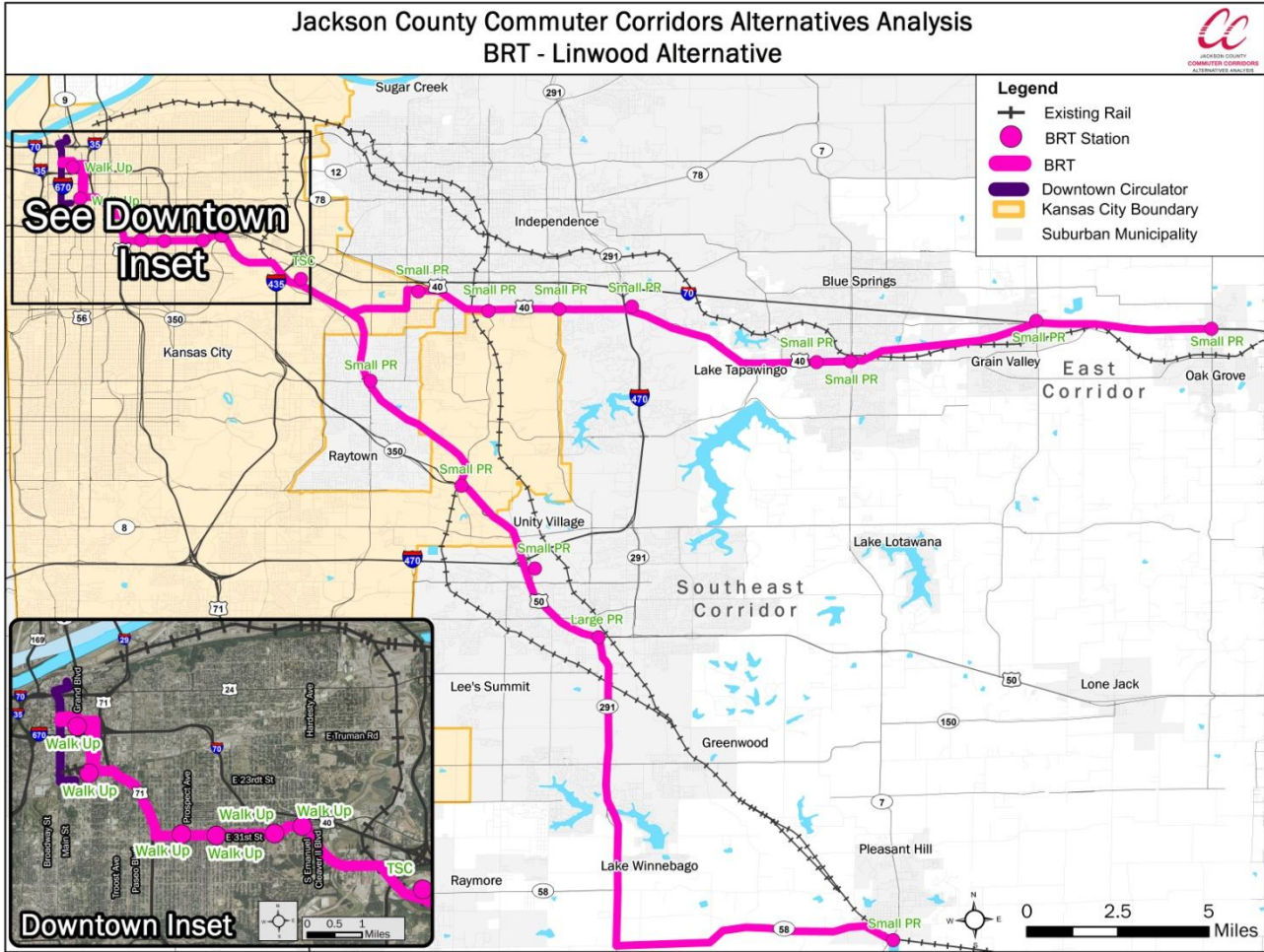


Figure 33: JCCC AA BRT Linwood Alternative

9. REGIONAL RAIL & ENHANCED STREETCAR HYBRID ALTERNATIVES

The Hybrid option would seek to utilize DMU technology in the East Segment and Enhanced Streetcar along the south east line (Rock Island) and the common line with a forced transfer from the east line at the Truman Sports complex.

9.1. TECHNOLOGY

The technology used for regional rail is the Diesel Multiple Unit (DMU) and is consistent with the technology description in Section 6.1. The technology used for the Enhanced Streetcar is consistent with the technology description in Section 7.1.

9.2. ALIGNMENT

East Line: Eastern Jackson County Line to Truman Sports Complex

The East line alignment is consistent with that described in Section 6.2 until just east of the underpass at Noland Road. The alignment then turns south through established residential areas to parallel the Union Pacific Sedalia subdivision. The rail passes over I-70 and turns west along the south side of I-70. The alignment follows the I-70 embankment and crosses Crylser Avenue at-grade. The route continues west with the rail passing over Blue Ridge Boulevard and U.S. 40. There is a station at Blue Ridge Boulevard.

The rail alignment passes over Sterling Avenue and the I-70 exit ramp before turning south toward Riss Lake. South of Riss Lake the alignment turns west and travels through undeveloped land toward the Truman Sports Complex. Just east of Blue Ridge Cutoff the alignment enters the Rock Island right-of-way to utilize the existing rail overpasses of Blue Ridge Cutoff and Sportsman Drive. West of Sportsman Drive will be the Truman Sports Complex station to serve events and act as a multi-modal terminal with the Enhanced Streetcar lines.

The East Line is a single track on the KCS and new build segment with passing tracks at stations. Through agreement with the KCS, the existing freight rail segment will be upgraded to a Class 5 railroad, as described by the FRA. All highway-rail at-grade crossings on the KCS and new build segments will be modified with supplemental safety measures. Four-quadrant gates or medians will create quiet zones by FRA regulation.

The Southeast Line is consistent with the description in Section 7.2.

9.3. STATIONS

Table 52: Regional Rail/Enhanced Streetcar Hybrid Station Locations - East Line

East Line		
Station Location	Station Type	Areas Served
Oak Grove – 11 th Street between Route F and Clinton St	Small Park and Ride	Oak Grove residents and commuters from cities to the east

Gran Valley – Front Street and Main Street	Small Park and Ride	Grain Valley residents
Blue Springs – Main Street between 12 th and 14 th Streets	Large Park and Ride	Blue Springs residents, employment and commercial
Independence Center – East of Little Blue Parkway at Jackson Drive	Large Park and Ride	Independence residents, employees of Center Point Hospital, Children’s Mercy East, Independence Center Mall, other nearby commercial, Independence Event Center
Independence Central – Noland Road at 32 nd Street	Large Park and Ride	Independence residents, nearby commercial; downtown tourist destinations, Jackson County Court via feeder bus
Independence West – Blue Ridge	Large Park and Ride	Independence residents, nearby commercial
Truman Sports Complex	Intermodal Station	Kansas City residents, special events, terminal transfers

The Southeast line stations are consistent with those described in Section 7.3 for the Southeast alignment.

9.4. OPERATING ASSUMPTIONS

Operating assumptions for the hybrid would be the same for the individual components as explained and introduced above.

9.5. SERVICE LEVELS

Service levels will be outlined below.

Table 53: Regional Rail/Enhanced Streetcar Hybrid Service Levels

Time of Day	Regional Rail - East Line Headways	Enhanced Streetcar - Southeast Line/ Common Segment Headways
Morning Peak	20 minute	20 minute
Mid-day	60 minute	60 minute
Evening Peak	20 minute	20 minute
Off-Peak	60 minute	60 minute

9.6. END TO END OPERATING CHARACTERISTICS

Operating characteristics for the East line are consistent with those listed in Section 9.6. Operating characteristics for the Southeast line are consistent with those listed in Section 7.4.2.

9.7. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIME

Station to station distances, speed and travel times with assumed vehicle acceleration / deceleration and station dwell times for the DMU vehicles in the east are summarized below. Station to station distances, speed and travel time for the southeast and common lines are consistent with those identified in 7.4.3.

Table 54: Regional Rail/Enhanced Streetcar Hybrid Station to Station Distance, Speed and Travel Time - East Line

East Line Hybrid – Oak Grove to Truman Sports Complex							
Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Oak Grove to	32.1	-	-	-	-	-	
Grain Valley	28.0	4.1	60s	70	2m 51s	1m 19s	5m 10s
Blue Springs	23.3	4.7	60s	70	3m 23s	1m 19s	5m 42s
Independence Center	19.2	4.1	60s	70	2m 52s	1m 19s	5m 11s
Independence Central (Noland)	14.5	4.7	60s	70	3m 20s	1m 19s	5m 39s
Independence Blue Ridge	11.6	2.9	60s	60	2m 20s	1m 07s	4m 27s
Truman Sports Complex	8.3	3.3	-	60	2m 24s	1m 07s	3m 31s

The Southeast line station to station distance, speed and travel time are consistent with those identified for the Southeast line in Section 7.4.3.

9.8. FLEET SIZE

Fleet size for the east line has been previously calculated and is summarized below. Fleet size for the Enhanced Streetcar segment on the southeast line and the common line will be determined.

Table 55: Regional Rail/Enhanced Streetcar Hybrid Fleet Size

Alternative	Total Number of Consist in Peak Service	Total Number of Consist in Off-Peak Service	Peak Consist Size	Off-Peak Consist Size	Total Number of Vehicles in Fleet
DMU	4	2	3	2	12+3 Spare = 15
Enhanced Streetcar	4	5	2	1	78

9.9. BUS NETWORK

The feeder bus network for the hybrid utilizes the same network for the east line DMU options as that of the full regional rail alternative. For the Southeast line, the bus network is the same as that for the Enhanced Streetcar option in Section 7.5.

9.10. PROPOSED MAINTENANCE FACILITY

The proposed maintenance facilities for this alternative are in keeping with those identified in Section 6.10. Because of this facility would house both DMU and Enhanced Streetcar vehicles, additional study will be needed to identify routing for vehicles to get to the shared Maintenance Facility that complies with FRA guidelines.

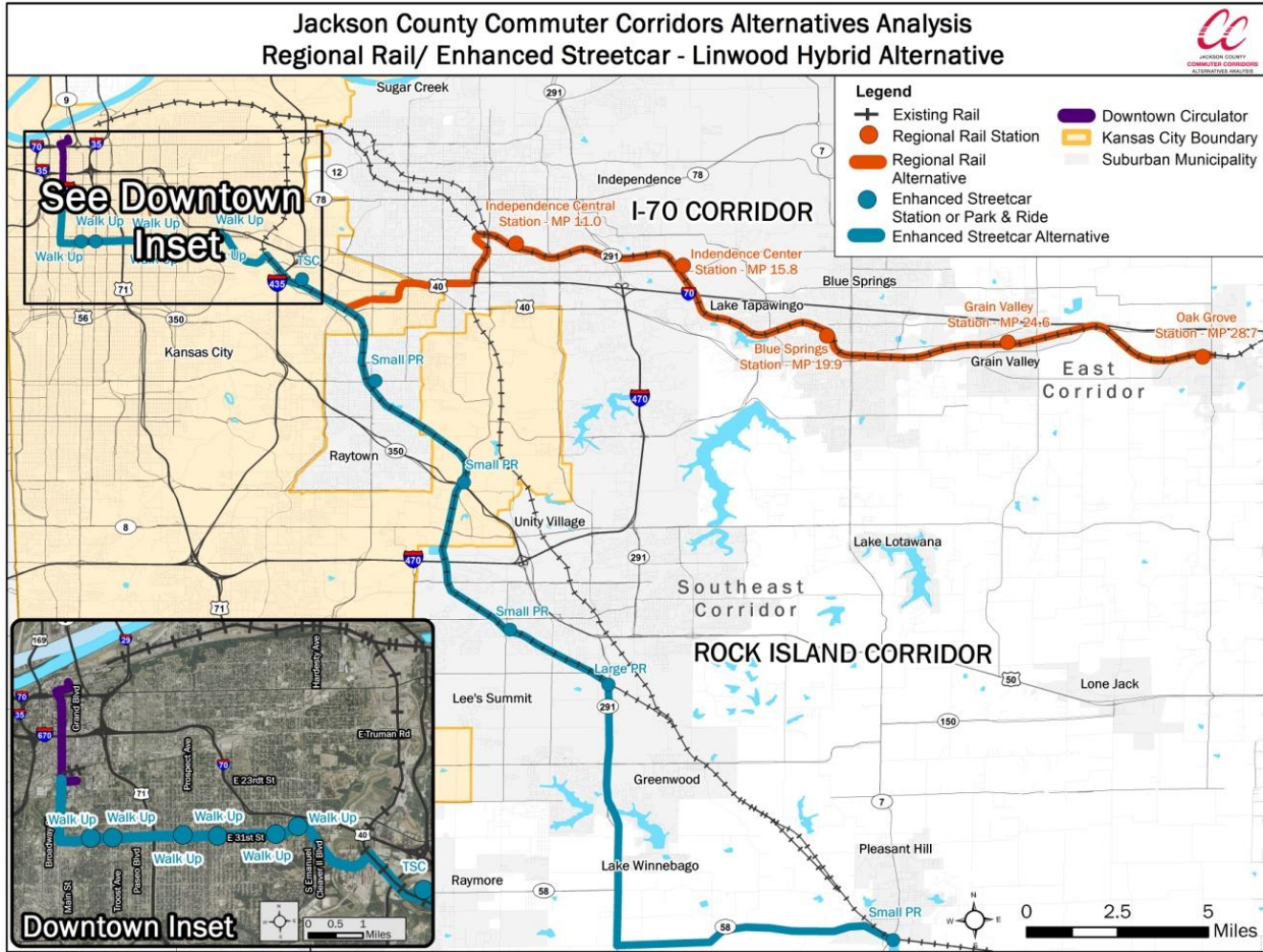


Figure 34: Regional Rail/Enhanced Streetcar - Linwood Alternative

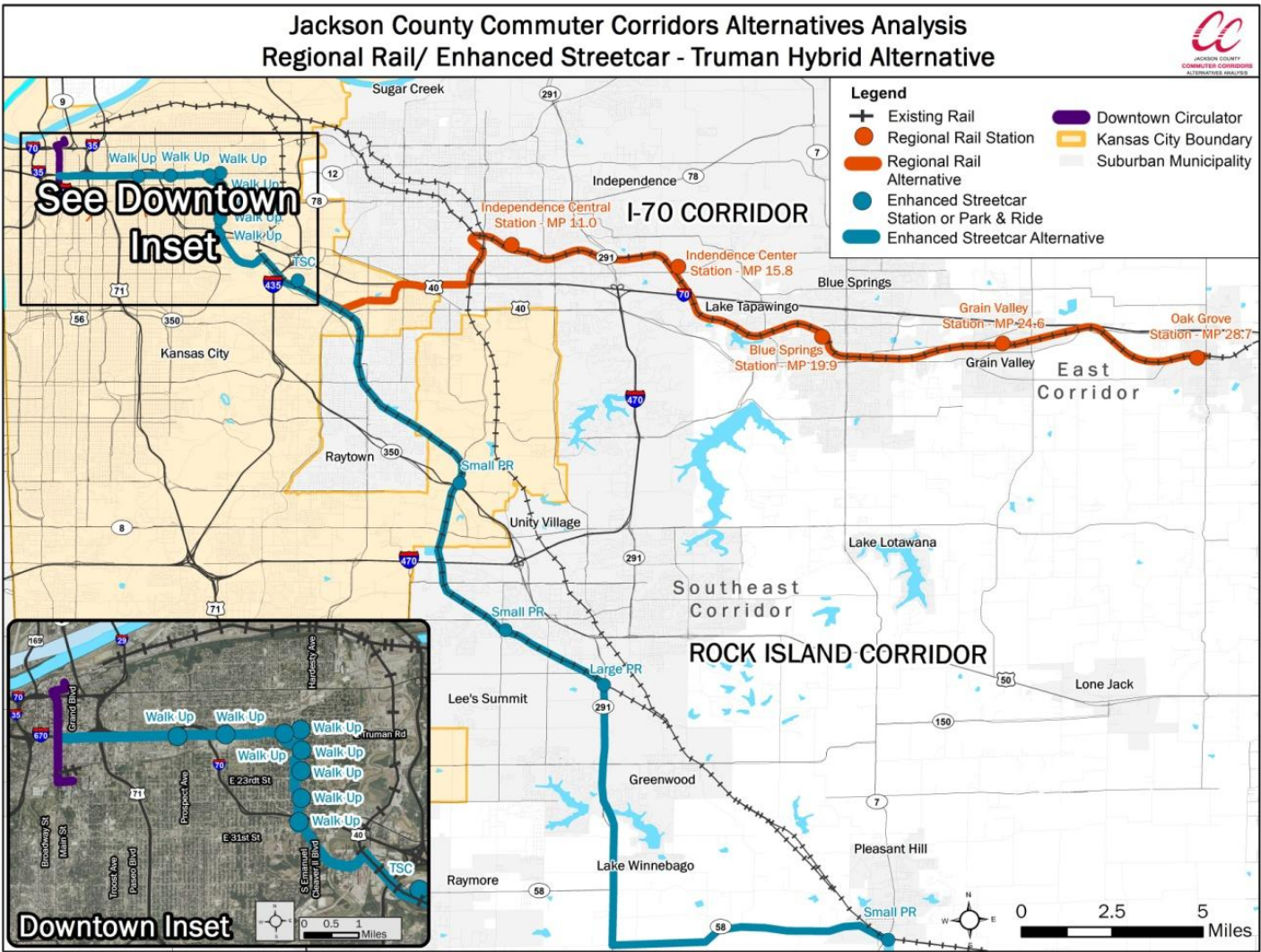


Figure 35: Regional Rail/Enhanced Streetcar - Truman Hybrid Alternative

10. REGIONAL RAIL AND BRT HYBRID ALTERNATIVES

The Hybrid option would seek to utilize DMU technology in the East Segment and BRT along the south east line (Rock Island) and the common line with a forced transfer from the east line at the Truman Sports complex.

10.1. TECHNOLOGY

The technology used for regional rail is the Diesel Multiple Unit (DMU) and is consistent with the technology description in Section 6.1. The technology used for the BRT is consistent with the technology description in Section 8.1. Alignment

10.2. ALIGNMENT

The alignment for the East corridor is consistent with the alignment shown in Section 9.2. The alignment for the Southeast corridor is consistent with the alignment shown in Section 8.2.

10.3. STATIONS

Stations for the East corridor are consistent with those shown in Section 9.3. The stations for the Southeast corridor are consistent with those shown in Section 8.3.

10.4. OPERATING ASSUMPTIONS

The operating assumptions for the East corridor are consistent with those listed in Section 9.4. The operating assumptions for the Southeast corridor are consistent with those listed in Section 8.4.

10.5. SERVICE LEVELS

Service levels will be the same for Truman Road and Linwood Boulevard Alternatives. Headways for peak and off peak are summarized below.

Table 56: Regional Rail/BRT Service Levels

Time of Day	Regional Rail - East Segment Headways	Bus Rapid Transit Southeast / Common Segment Headways
Morning Peak	20 minute	20 minutes
Mid-day	60 minute	60 minutes
Evening Peak	20 minute	20 minutes
Off-Peak	60 minute	60 minutes

10.6. END TO END OPERATING CHARACTERISTICS

Table 57: Regional Rail/BRT End to End Operating Characteristics

Alternative	Route Miles	Average Speed	Travel Time
Regional Rail East Line to Truman Sports Complex	23.4	57.1 MPH	29m 20s
Southeast Line Bus Rapid Transit - Truman	48.9	23 MPH	50m 20s
Southeast Line Bus Rapid Transit- Linwood	45.6	25 MPH	45m 38s

10.7. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIME

Table 58: Regional Rail/BRT Station to Station Distance, Speed and Travel Time Characteristics - East Line

East Line Hybrid – Oak Grove to Truman Sports Complex							
Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Oak Grove to	32.1	-	-	-	-	-	
Grain Valley	28.0	4.1	60s	70	2m 50s	1m 20s	5m 10s
Blue Springs	23.3	4.7	60s	79	2m 50s	1m 30s	5m 20s
Independence Center	19.2	4.1	60s	70	2m 50s	1m 20s	5m 10s
Independence Central (Noland)	14.5	4.7	60s	70	3m 25s	1m 20s	5m 45s
Independence Blue Ridge	11.6	2.9	60s	60	2m 20s	1m 05s	4m 25s
Truman Sports Complex	8.3	3.3	-	60	2m 25s	1m 05s	3m 30s

Station to station distance, speed and travel time for the BRT alternatives is consistent with the Southeast Truman/Linwood description shown in 8.4.3.

10.8. FLEET SIZE

The DMU fleet size has been previously determined and the fleet size for the BRT option will be determined.

Table 59: Regional Rail/BRT Fleet Size

Alternative	Total Number of Consist in Peak Service	Total Number of Consist in Off-Peak Service	Peak Consist Size	Off-Peak Consist Size	Total Number of Vehicles in Fleet
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DMU	4	2	3	2	12+4 Spare = 16
BRT	4	5	1	1	94

10.9. BUS NETWORK

The feeder bus network for the hybrid utilizes the same network for the East line as shown in Section 6.9 and for the Southeast line in 8.5.

10.10. PROPOSED MAINTENANCE FACILITY

The proposed maintenance facility for the DMU vehicle for this alternative is in keeping with those identified in Section 6.10. The proposed maintenance facility for BRT is in keeping with those identified in Section 8.6.

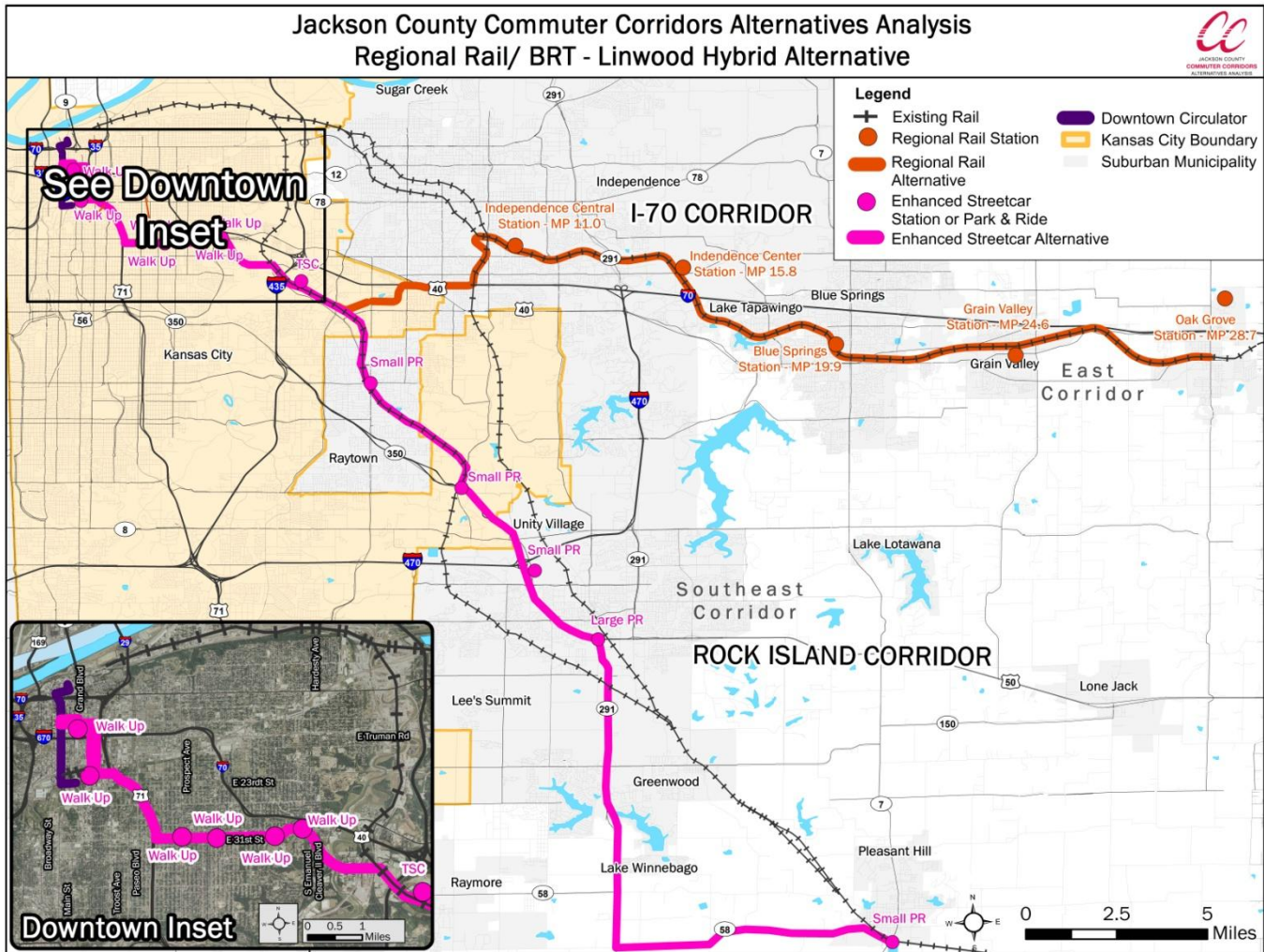


Figure 36: Regional Rail and BRT Hybrid - Linwood Alternative

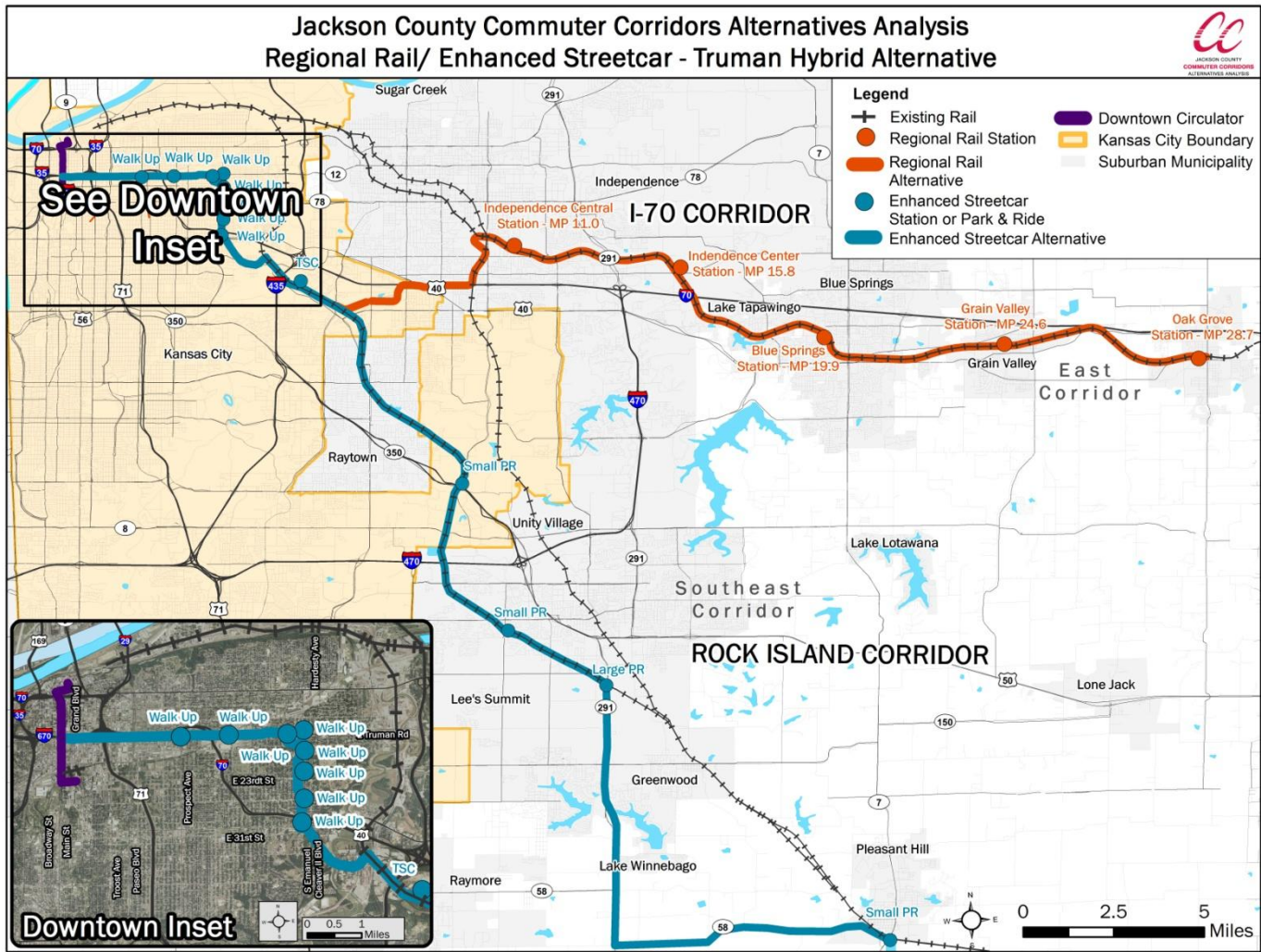


Figure 37 - Regional Rail and BRT - Truman Alternative

11. SUMMARY OF TIER 2 ALTERNATIVES

Table 60: Summary of Tier 2 Alternatives

	Route Miles	Number of Stations			Peak Headways			End to End Travel Time (E / SE) in Minutes	Total Peak Vehicles
		Walk-ups	Park and Rides	Total	Southeast Line	East Line	Common Segment		
Express Bus (as defined in the TSM)	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies	Varies
Full Regional Rail - Truman	60.10	4	14	18	20	20	10	40m 55s / 44m 52s	16
Full Enhanced Streetcar #1 – Truman	41.01	9	13	22	20	20	10	50m 11s / 48m 28s	16
Full Enhanced Streetcar #2 – Linwood	40.48	8	13	21	20	20	10	47m 39s / 46m 56s	16
Full BRT #1 – Truman	48.69	9	13	22	20	20	10	51m 37s / 50m 20s	16
Full BRT #2 – Linwood	45.63	7	13	20	20	20	10	46m 56s / 45m 38s	16
Hybrid #1 Regional Rail with Enhanced Streetcar - Truman									
<i>Regional Rail (to TSC)</i>	23.4	0	7	7	20	20	20	29m 40s	12
Enhanced Streetcar	41.1	7	7	13	20	20	20	48m 52s	12
Hybrid #2 Regional Rail with Enhanced Streetcar - Linwood									
<i>Regional Rail (to TSC)</i>	23.4	0	7	7	20	20	20	29m 40s	12
Enhanced Streetcar	40.48	7	7	14	20	20	20	46m 56s	12
Hybrid #3 Regional Rail with BRT - Truman									
<i>Regional Rail (to TSC)</i>	23.4	0	7	7	20	20	20	29m 40s	12
<i>BRT</i>	48.69	8	7	15	20	20	20	50m 20s	12
Hybrid #4 Regional Rail with BRT - Linwood									
<i>Regional Rail (to TSC)</i>	23.4	0	7	7	20	20	20	29m 40s	12
<i>BRT</i>	45.63	6	7	13	20	20	20	45m 38s	12

12. LPA ALTERNATIVE 1 – EAST AND SOUTHEAST CORRIDOR DMU TO RIVERMARKET

The full regional rail alternative uses DMU style trains to connect suburban jurisdictions in the east and south east to destinations in the CBD, to provide access to other destinations, and to provide opportunities for reverse commutes to suburban employment centers.

12.1. TECHNOLOGY

DMUs are rail cars that contain both passenger accommodations and propulsion (diesel engines located below the passenger compartments). As a self-propelled unit, no large locomotive engine is required. Using dual cab train set configurations, DMUs are capable of running in the reverse direction which eliminates the need for turnaround tracks. The Federal Railroad Administration (FRA) requires that passenger trains operating on active freight tracks must be compliant with its crash worthiness standard (49 CFR Part 238) or operate with temporal separation (i.e., passenger operations during the day with freight operations at night). The vehicle proposed for this alternative would be a fully FRA-compliant DMU based on requirements of the Kansas City Southern Railway, the owning railroad for a portion of the alignment.

Initial specifications call for the train fleet to be comprised of FRA-compliant, single-level DMUs, approximately 85 feet long, 10 feet wide and 14 feet high. Vehicle capacity would be approximately 79 seated passengers per rail car. The vehicle will be designed with a low floor entry, fully compliant with ADA standards. The maximum vehicle operating speed will be 79 mph. The vehicle acceleration rate will be approximately 1.3 mph/s with a braking rate at 3.0 mph/s. Vehicle specifications are modeled after the Nippon-Sharyo standard DMU.



Figure 38: Diesel Multiple Unit (DMU) Source: Nippon Sharyo U.S.A – rendering of Toronto Metrolink’s Air Rail Link System Vehicle



12.2. ALIGNMENT

12.2.1. EAST CORRIDOR (DMU TO RIVERMARKET)

The East Line begins at Oak Grove in Jackson County and runs on the KCS railroad from Oak Grove to Sterling Avenue in Independence mixed with freight rail traffic. West of Sterling Avenue the alignment continues on a new build segment. The KCS operates 4-6 trains daily on this single track route. The Regional Rail service will begin just west of Main Street in Oak Grove with a station. There is one at-grade crossing at Clinton Street in Oak Grove. The alignment passes through downtown Oak Grove, runs past residential property and mostly agricultural/undeveloped property to Grain Valley. The route continues west to an at-grade crossing with Robinson Road and Stillhouse Road at the western edge of Oak Grove. There is an existing roadway overpass of Old U.S. 40 between Oak Grove and Grain Valley that will remain.

The route then continues west through Grain Valley's downtown toward their airport. The Grain Valley Station will be located in the downtown east of Main Street. There are at-grade crossings with Main Street, E Kirby Road, and Sni-a-bar Drive. Between Grain Valley and Blue Springs the route passes through undeveloped property to a railroad overpass at Adams Dairy Parkway.

As the route travels through Blue Springs, the alignment curves to the north through downtown Blue Springs passing commercial and residential land uses before continuing west toward Lake Tapawingo and Independence. The Blue Springs station will be located in the downtown where the railroad crosses Main Street. In addition to the grade separation at Adams Dairy Parkway, there are four grade separations in Blue Springs (U.S. 40, M-7, Walnut Street, and 15th Street) and three at-grade crossings (SW 10th Street, Main Street and Valley View Road).

The alignment turns north and proceeds under I-70 adjacent to undeveloped property as it enters Independence. The Independence Center station will be located south of 39th Street and east of Little Blue Parkway. This area is currently undeveloped but is directly adjacent to major commercial, hospital and expanding residential development. As the alignment continues north and then west, there is an at-grade crossing at 39th Street and roadway overpasses at Little Blue Parkway, Jackson Drive and M-291. The alignment then continues through established residential development, adjacent to a library and golf course before reaching more commercial development near Noland Road. In this segment there is an at-grade crossing at Crackerneck Road and Kiger Road and a roadway overpass at Lee's Summit Road. The railroad passes underneath Noland Road and the Union Pacific Railroad; a station will be located east of the rail underpass. The alignment then turns north through established residential areas with an at-grade crossing at McCoy Street. There are rail overpasses at 23rd Street and Chrysler Avenue. An existing stub end track that previously served the Independence Depot resides to the north of the KCS main line roughly between Chrysler and Sterling Avenues. There is an at-grade crossing at Scott Avenue. The Independence West station will be located at Sterling Avenue.

The alignment continues west on the KCS where the railroad passes over Sterling Avenue. There is an at-grade crossing at Northern Boulevard and the rail passes over 18th Street. As the alignment turns north, the railroad passes under Winner Road and continues to then travel under Truman Road. The route then travels over U.S. 24/Independence Avenue. There is an at-grade crossing with 7th Street followed by a



rail over pass at Wilson Road. The KCS then begins running parallel to the Union Pacific Sedalia subdivision with an at-grade crossing at Kentucky Avenue.

This section of railroad is commonly referred to as Rock Creek Junction. It is the intersection of the KCS, UP and BNSF Railway. The KCS and UP are running at-grade and the BNSF is elevated on the Sheffield Flyover. Just south of the Sheffield Flyover new track on existing KCS/KCT right-of-way will be constructed for the Regional Rail alignment. The track will travel under an existing opening of the Sheffield Flyover and turn west traveling between the KCT Blue Valley Yard and the Sheffield Flyover. The alignment will be elevated to cross over the KCS Pittsburgh subdivision, the Blue River, the UP Coffeyville Subdivision, KCS industry tracks and KCT industry tracks. At this point, for Alternative 1, the East Line joins with the Southeast Line to transition into the Common segment of the Regional Rail alignment to the River Market.

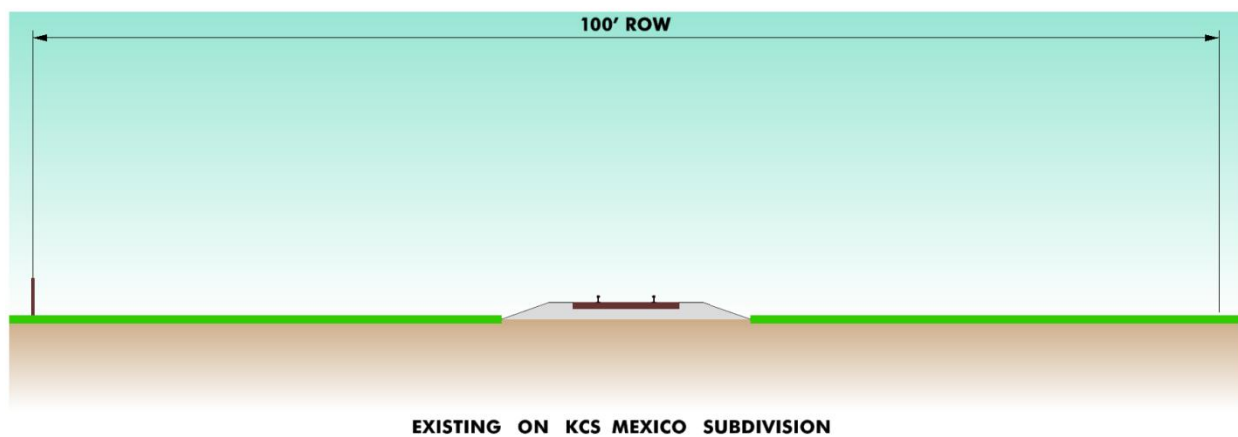


Figure 39: Regional Rail Typical Section KCS Railroad - Existing Conditions

The East Line is a single track on the KCS and new build segment with passing tracks at stations. Through agreement with the KCS, the existing freight rail segment will be upgraded to a Class 5 railroad, as described by the FRA. All highway-rail at-grade crossings on the KCS and new build segments will be modified with supplemental safety measures. Four-quadrant gates or medians will create quiet zones by FRA regulation. A quiet zone is a segment of rail line where the locomotive/train horn is not routinely sounded at public highway-rail at-grade crossings.

The double-track line begins north of St. John Avenue and east of Manchester Trafficway where it will run as exclusive regional rail service. As the alignment turns west, it crosses at-grade with Manchester Trafficway. The alignment continues along inactive railroad right-of-way at the base of the bluff. As the alignment meets with the UP Neff yard, it leaves railroad right-of-way and moves on to City of Kansas City, Missouri property. The double track alignment will generally be located south of the UP Neff Yard access road at the base of Kessler Park. The alignment will pass under Chestnut Avenue, I-29/I-35, and NE Industrial Trafficway/3rd Street. Just east of the I-29/I-35 highway overpass, the alignment moves back onto inactive railroad right-of-way.



As the alignment passes under NE Industrial Trafficway/3rd Street it turns slightly to begin entering the River Market district. At this location the alignment will travel through private property before returning to City of Kansas City, Missouri right-of-way along the former 2nd Street. The alignment crosses Holmes Street at grade and passes under Missouri Route 9 (the Heart of America Bridge) before it reaches the terminal station at Grand Boulevard and 2nd Street.

All highway-rail at-grade crossings on this segment will be modified with supplemental safety measures. Four-quadrant gates or medians will create quiet zones by FRA regulation.

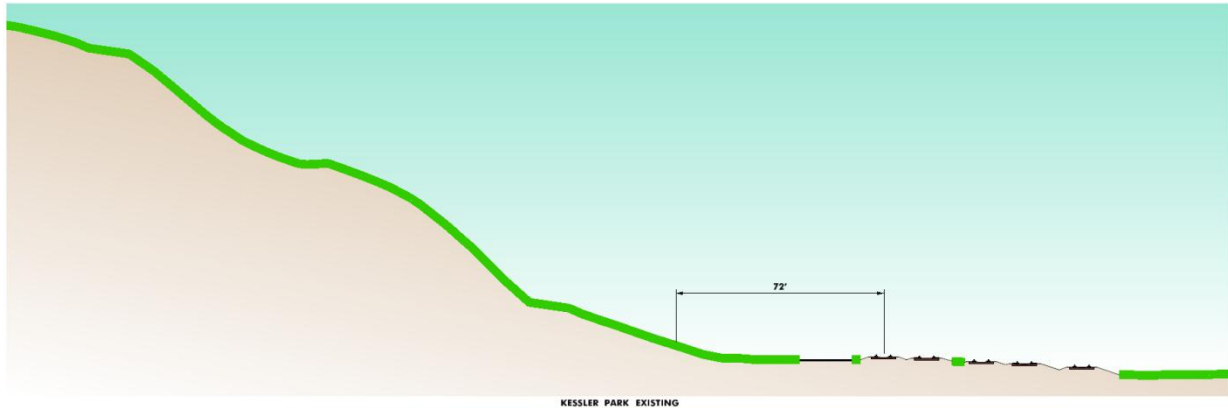


Figure 40: Regional Rail Typical Section on Common Segment – East of Chestnut Avenue – Kessler Park Existing Conditions

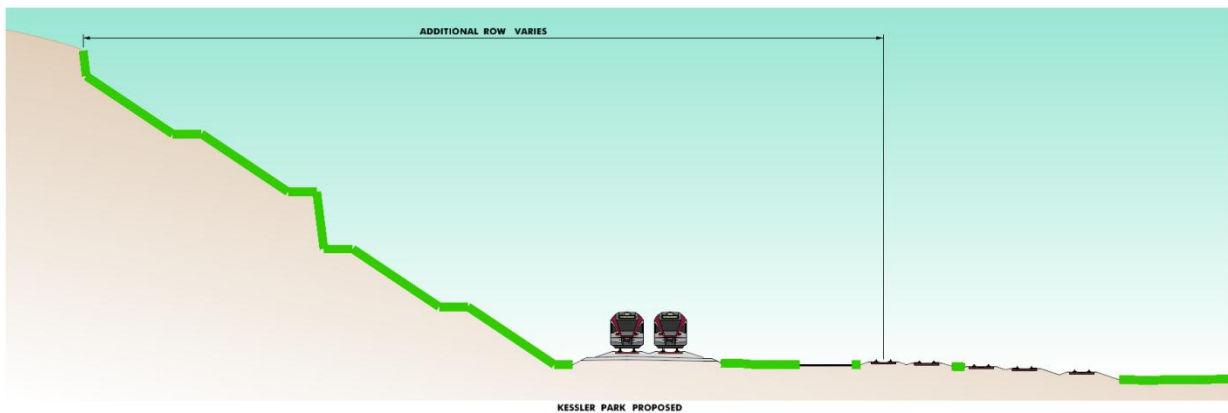


Figure 41: Regional Rail Typical Section on Common Segment – East of Chestnut Avenue – Kessler Park Proposed Excavation



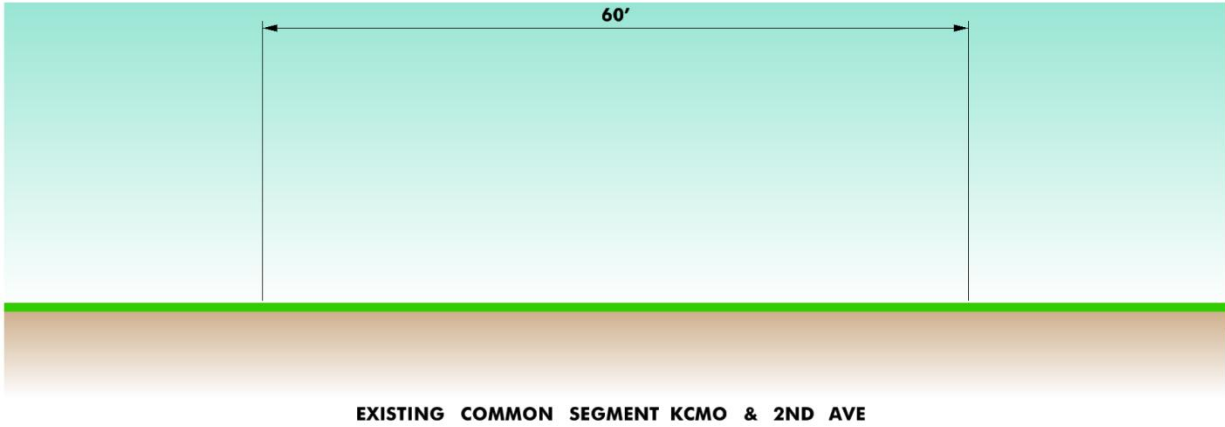


Figure 42: Regional Rail Typical Section on Common Segment – 2nd and Holmes Existing Conditions



Figure 43: Regional Rail Typical Section on Common Segment – 2nd and Holmes Proposed Conditions



Bridge Structures

The bridge structures impacted by the alternative include the following:

Table 61: Regional Rail Bridge Structures

Bridge Structure	Bridge Location	Replace / New
East Segment (Connection Wye to Oak Grove)		
Railroad Bridge	East and South Legs of Wye to Common Segment	New Bridge
Railroad Bridge	Crossing Over KCT/UPRR/KCS	New Bridge
Railroad Bridge	Crossing Over Manchester Trafficway	New Bridge
Railroad Bridge	Crossing Over I-435	New Bridge
Railroad Bridge	Crossing Over East Bound 23rd Street/Industrial Drive	New Bridge
Highway Bridge	Undercrossing at Blue Ridge Blvd	Bridge Modification
Railroad Bridge	Crossing Over West Bound 23rd Street	New Bridge
Railroad Bridge	Crossing Over Sterling Avenue	New Bridge
Railroad Bridge	Crossing Over Chrysler Avenue	No Change
Railroad Bridge	Crossing Over 23rd Street	No Change
Railroad Bridge	Undercrossing at UPRR Just West of Noland Road	No Change
Highway Bridge	Undercrossing at Noland Road	No Change
Highway Bridge	Undercrossing at Lee's Summit Road	No Change
Highway Bridge	Undercrossing at M-291	No Change
Highway Bridge	Undercrossing at Jackson Drive	No Change
Highway Bridge	Undercrossing at Little Blue Parkway	No Change
Railroad Bridge	Crossing Over West Fork of Little Blue River	No Change
Highway Bridge	Undercrossing at I-70	No Change
Railroad Bridge	Crossing Over East Fork of Little Blue River	No Change
Highway Bridge	Undercrossing at NW 15th Street	No Change
Highway Bridge	Undercrossing at SW Walnut Street	No Change
Railroad Bridge	Crossing Over M-7	No Change
Railroad Bridge	Crossing Over U.S. 40	Partial Replacement
Railroad Bridge	Crossing Over SE Adams Dairy Parkway	No Change
Railroad Bridge	Crossing Over Blue Creek	No Change
Railroad Bridge	Crossing Over Sni A Bar Creek	No Change
Highway Bridge	Undercrossing at Old U.S. 40	No Change

12.2.2. SOUTHEAST CORRIDOR (DMU TO EAST CORRIDOR AT WYE CONNECTION, VIA ROCK ISLAND)

The Southeast Line begins at Pleasant Hill in Cass County and runs on the inactive Rock Island railroad to the Truman Sports Complex as an exclusive regional rail service. The Rock Island railroad is owned by the Union Pacific and was taken out of service in 1982. The route is a single track with right-of-way ranging from 80 to 300 feet.

The Regional Rail alternative begins just north of Commercial Street near the Cass County Fairgrounds in Pleasant Hill. There would be a station in this location serving the surrounding residential development. As the route continues north, it travels through undeveloped land and runs parallel to the Union Pacific Sedalia subdivision, an active freight rail line. There is an at-grade crossing at 175th Street and two to three private/farm crossings.

As the route enters Greenwood, there is a roadway overpass at Main Street. There will be a station north of Main Street in Greenwood. There is an at-grade crossing at Ranson Road. The route continues to run parallel to the Union Pacific Sedalia subdivision through undeveloped land toward Lee's Summit.

Near the at-grade crossing at Hamblen Road, the alignment departs from the Union Pacific Sedalia subdivision to travel northwest toward Lee's Summit. A station would be located between Hamblen Road and the roadway overpass at M-291. The area east of M-291 is largely undeveloped with some scattered, light industrial development. West of M-291 the route travels through commercial and industrial uses before reaching established residential development. There are at-grade crossings at Scherer Road, Ward Road and Longview Road. There would be an at-grade crossing on the access road to Charles David Hartman Memorial Park, just east of the Pryor Road overpass. This would also be a station location. The alignment continues to travel to the northwest through established residential development. There are two railway overpasses at 3rd Street and Chipman Road.

The route then passes under I-470 as it travels through undeveloped areas entering into Kansas City. There is an at-grade crossing at Vale Road, an existing 480-foot tunnel at Bannister Road and an at-grade crossing at Brickyard Road before the alignment reaches the Knobtown area.

The rail alternative passes over M-350 before reaching the Knobtown station in the northwest corner of M-350 and Noland Road. There is limited commercial and light industrial development in this area. The route continues north through undeveloped land before entering Raytown. There is an at-grade crossing at Frost Road. At 75th Street the roadway will be realigned and the existing rail bridge improved to accommodate the necessary traffic capacity. In this area there is more established residential development as the route travels over the at-grade crossings at Irwin Road and Woodson Road.

The route through Raytown is mostly through established residential areas. There is a railroad overpass at 67th Street and roadway overpasses at Raytown Road and 63rd Street. The Raytown station will be located just north of 63rd Street in downtown Raytown. The alignment continues north to a new railroad overpass 59th Street which replaces a rail bridge removed when the roadway was widened. There are two more at-grade crossings in Raytown at 56th Street and 53rd Street.

As the route continues back into Kansas City, it travels through light industrial and undeveloped land. There are rail overpasses at 47th Street and Blue Ridge Cutoff. The route then travels just south of the Truman Sports Complex. There is a rail overpass of Sportsman Drive (stadium parking access on the east) and a roadway overpass at Lancer Lane (stadium parking access on the west). Between these two grade separations will be the Truman Sports Complex station to serve events and act as a multi-modal terminal.

The route then continues west, passing under I-435 and into the Leeds/KCS Industrial area. There is an existing rail overpass at Stadium Drive and Manchester Trafficway. The rail continues over the Union Pacific before turning north to travel under I-70 and U.S. 40. Once the alignment has cleared the U.S. 40 overpass a second track will be added to produce a double track section which will continue into the Common Line. Approximately one-half mile north of U.S. 40 the Rock Island right-of-way ends and the route will continue adjacent to and on the Kansas City Terminal right-of-way. At this point the alignment will consist of a double track for the remainder of the Southeast Line before it joins to the common segment except for the Blue River Crossing which will remain single track. The existing KCT track will be upgraded and a new, adjacent track will be built.

Starting at the terminus of the Rock Island, the alignment will continue under the 23rd Street overpass and over the Blue River on the existing single-track KCT bridge. There is an at-grade crossing at 17th Street and the railroad will pass under Truman Road. Continuing north, there is an at-grade crossing at 12th Street and the railroad will pass under U.S. 24/Independence Avenue. There are two at-grade crossings north of Independence Avenue at Roberts Street and Winner Road. These crossings are currently gated with locks to only allow access to authorized vehicles.

At Winner Road the alignment will enter a new build section of trench. The trench will be constructed to travel under the Sheffield Flyover High Lines and Low Lines. The trench will reach grade at St. John Avenue, leaving this as an at-grade crossing. North of St. John Avenue the Southeast Line joins with the East Line to transition into the Common segment of the Regional Rail alignment to the River Market.

An extension of the Katy Trail pedestrian and bicycle recreational trail is planned adjacent to this segment of Regional Rail. The rails with trails concept will provide adequate separation between the Regional Rail alignment and the trail with appropriate fencing to direct pedestrians and bicyclists away from the rail. Further study needs to take place to determine the exact placement of the trail along the length of the corridor.

The Southeast Line is a single track on the Rock Island with passing tracks at stations. Much of the former rail is intact along the corridor; however, the track on Rock Island is planned to be rehabilitated to meet current passenger rail standards. The segment north of the Rock Island along KCT right-of-way will upgrade the existing track and build a new, adjacent track allowing for double track operation. All highway-rail at-grade crossings on the Rock Island and new build segments will be modified with supplemental safety measures. Four-quadrant gates or medians will create quiet zones by FRA regulation.

At this time the segment of the Rock Island right-of-way from Hamblen Road in Lee's Summit south to Pleasant Hill is not available for purchase from the Union Pacific Railroad. This segment is included in this alternative but it is understood that initial service may only extend to the Lee's Summit station at M-291.

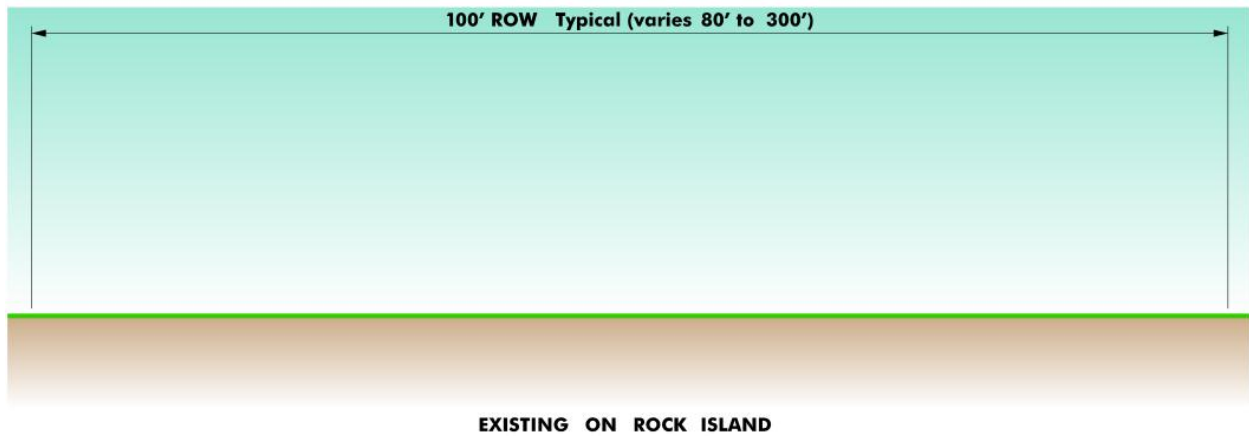


Figure 44: Regional Rail Typical Section Rock Island Railroad - Existing Conditions

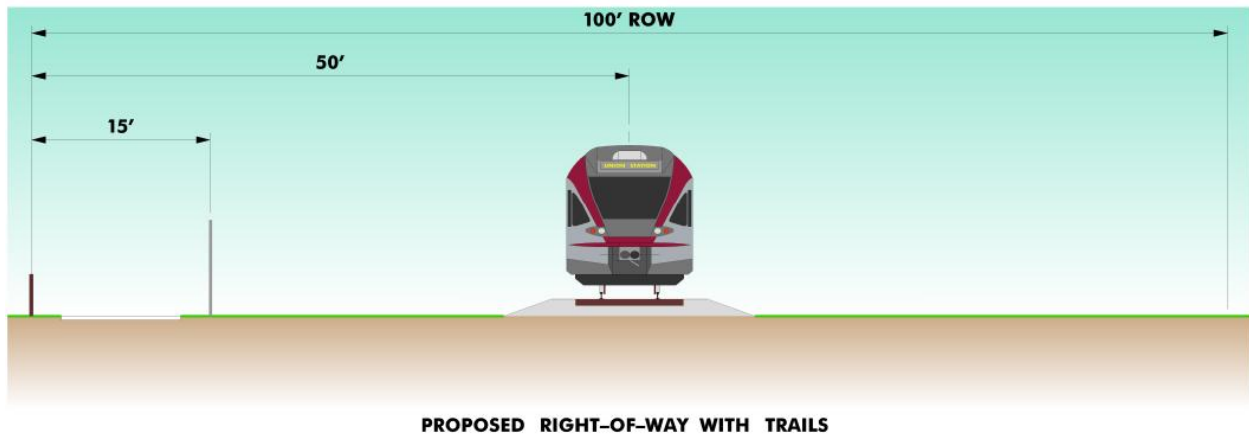


Figure 45: Regional Rail Typical Section Rock Island Railroad

Table 62: Regional Rail Bridge Structures

Bridge Structure	Bridge Location	Replace / New
Southeast Segment (Connection Wye to Pleasant Hill)		
Railroad Bridge	North Leg of Overhead Wye to Common Segment	New Bridge
Highway Bridge	Undercrossing at U.S. 40	No Change
Highway Bridge	Undercrossing at I-70	No Change
Railroad Bridge	Crossing Over UPRR	Repair Existing
Railroad Bridge	Crossing Over KCS/Manchester Trafficway	Repair Existing
Railroad Bridge	Crossing Over Stadium Drive	Repair Existing
Highway Bridge	Undercrossing at I-435	No Change
Railroad Bridge	Crossing Over Lancer Ln	Repair Existing
Railroad Bridget	Crossing Over Sportsman Dr.	Repair Existing
Railroad Bridge	Crossing Over Blue Ridge Cutoff	Repair Existing
Railroad Bridge	Crossing Over 47th Street	Repair Existing
Railroad Bridge	Crossing Over 59th Street	New Bridge
Highway Bridge	Undercrossing at 63rd Street	No Change
Highway Bridge	Undercrossing at Raytown Road	Potential Replacement
Railroad Bridge	Crossing Over 67th Street	Repair Existing
Railroad Bridge	Crossing Over Wildwood Lake Inlet	Potential Replacement
Railroad Bridge	Crossing Over 75th Street	Repair Existing
Railroad Bridge	Crossing Over M-350	Repair Existing
Tunnel	Tunnel Under Bannister Road	Repair Existing
Railroad Bridge	Crossing Over Little Blue River	Potential Replacement
Highway Bridge	Undercrossing at I-470	No Change
Railroad Bridge	Crossing Over Chipman Road	Repair Existing
Railroad Bridge	Crossing Over SW 3rd Street	Repair Existing
Highway Bridge	Undercrossing at Pryor Road	No Change
Railroad Bridge	Crossing over Cedar Creek	Potential Replacement
Highway Bridge	Undercrossing at M-291	No Change
Railroad Bridge	Crossing Over Big Creek	Potential Replacement
Railroad Bridge	2nd Crossing Over Big Creek	Potential Replacement
Highway Bridge	Undercrossing at M-150/Main Street	No Change

Bridge Structure	Bridge Location	Replace / New
Railroad Bridge	3rd Crossing Over Big Creek	Potential Replacement
Railroad Bridge	Crossing Over East Branch	Potential Replacement
Railroad Bridge	Crossing Over Wilson Creek	Potential Replacement
Railroad Bridge	4th Crossing Over Big Creek	Potential Replacement

12.3. STATIONS

12.3.1. EAST CORRIDOR

Stations for the full Regional Rail alternative are located near population centers and major regional destinations. The following tables list the station location, station type and areas served. Three types of stations are included in this alternative and follow the typologies assigned in the guiding assumptions

Table 63: Regional Rail Station Locations with Markets Served - East Line

East Line		
Station Location	Station Type	Markets Served
Oak Grove – 11 th Street between Route F and Clinton St	Small Park and Ride	Oak Grove residents and commuters from cities to the east
Gran Valley – Front Street and Main Street	Small Park and Ride	Grain Valley residents
Blue Springs – Main Street between 12 th and 14 th Streets	Large Park and Ride	Blue Springs residents, employment and commercial
Independence Center – East of Little Blue Parkway at Jackson Drive	Large Park and Ride	Independence residents, employees of Center Point Hospital, Children’s Mercy East, Independence Center Mall, other nearby commercial, Independence Event Center
Independence Central – Noland Road at 32 nd Street	Large Park and Ride	Independence residents, nearby commercial, downtown tourist destinations, Jackson County Court via feeder bus
Independence West – 23 rd Street and Westport Road	Small Park and Ride	Independence residents, Sugar Creek residents, nearby commercial
Rivermarket 2 nd and Grand	Intermodal Hub	Downtown employees, commercial, downtown tourist destinations, Rivermarket Residents

12.3.2. SOUTHEAST CORRIDOR

Table 64: Regional Rail Station Locations with Markets Served - Southeast Line

Southeast Line		
Station Location	Station Type	Markets Served
Pleasant Hill – TBD	Small Park and Ride	Pleasant Hill residents
Greenwood – TBD	Small Park and Ride	Greenwood residents
Lee’s Summit – M-291 near Stuart Road	Large Park and Ride	Lee’s Summit residents, Toys-R-Us distribution center
Lee’s Summit – I-470 and View High Drive	Small Park and Ride	Lee’s Summit residents; St. Luke’s Hospital, Summit Technology campus, downtown Lee’s Summit, MoDOT district headquarters, John Knox Village, Unity Village residents, and other commercial via feeder bus
Knobtown	Large Park and Ride	Kansas City residents
Raytown	Small Park and Ride	Raytown residents
Truman Sports Complex	Intermodal Hub	Kansas City residents, special events, connections

12.4. OPERATING ASSUMPTIONS

The operating assumptions for this alternative are discussed below. This is the initial starting point and may be subject to revisions once the initial model runs are completed.

12.5. SERVICE LEVELS

Service levels for this alternative will consist of peak and off-peak operation. Service frequency on the Common Line will be more frequent because it is being serviced by trains operating on the East Line and the Southeast Line.

Table 65: Regional Rail Service Levels

Time of Day	East Segment / Southeast Segment Headways	Common Segment Headways
Morning Peak	20 minute	10 minute
Mid-day	60 minute	30 minute
Evening Peak	20 minute	10 minute
Off-Peak	60 minute	30 minute

12.6. END TO END OPERATING CHARACTERISTICS

The end to end operating characteristics are summarized below.

Table 66: Regional Rail End to End Operating Characteristics

Alternative	Route Miles	Average Speed	Travel Time
Full Regional Rail – East Line and Common Line to River Market	29.3	57 MPH	35m 15s
Full Regional Rail – Southeast Line and Common Line to River Market	32.8	59 MPH	40m 00s

12.7. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIMES

The end travel times for the various alternatives and alignments are calculated by using assumed vehicle acceleration, deceleration and dwell times at each station along with assumed top speeds by segment.

Table 67: Regional Rail Station to Station Distance, Speed and Travel Times - East Line and Common Line (Rivermarket)

East Line and Common Line to River Market							
Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Oak Grove to	29.3	-	-	-	-	-	-
Grain Valley	25.2	4.1	60s	70	2m 51s	1m 19s	5m 10s
Blue Springs	20.5	4.7	60s	70	3m 23s	1m 19s	5m 42s
Independence Center	16.4	4.1	60s	70	2m 52s	1m 19s	5m 11s
Independence Central (Noland)	11.7	4.7	60s	70	3m 25s	1m 19s	5m 44s
Independence West	8.9	2.8	60s	70	1m 44s	1m 19s	4m 03s
Truman Sports Complex*							
River Market	0.0	8.9	-	60	8m 30s	0m 56s	9m 26s

*Service plan only serves Truman Sports Complex for events with very limited daily service for transfers. The total travel time for the above run with the stated assumptions is 35 minutes 15 seconds.

*Service plan only serves Truman Sports Complex for events with very limited daily service for transfers. The total travel time for the above run with the stated assumptions is 41 minutes.

Table 68: Regional Rail Station to Station Distance, Speed and Travel Times – Southeast Line and Common Line to River Market

Southeast Line and Common Line to River Market							
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Station	Station MP	Route Miles	Dwell Time	Top Speed	Time at Top Speed	Acc + Dec Time	Travel Time
Pleasant Hill to	32.8	-	-	-	-	-	-
Greenwood	27.0	5.8	60s	70	4m 16s	1m 19s	6m 35s
Lee's Summit South	24.7	2.3	60s	70	1m 21s	1m 19s	3m 40s
Lee's Summit North	18.72	5.98	60s	70	4m 28s	1m 19s	6m 47s
Knobtown	16.6	2.09	60s	70	1m 09s	1m 19s	3m 28s
Raytown	12.9	3.7	60s	70	2m 35s	1m 19s	4m 54s
Truman Sports Complex	9.8	3.1	60s	70	2m 00s	1m 19s	4m 19s
River Market	0.0	9.8	-	60	9m 22s	0m 56s	10m 18s

The total travel time for the above run with the stated assumptions is 44 minutes and 52 seconds.

12.8. FLEET SIZE

The total fleet size is calculated by analyzing the number of vehicles needed in the peak and off peak times multiplied by the consist size (numbers of cars per train). Also, a number of spare vehicles is needed in case a vehicle breakdown or is out of service due to maintenance. The assumed spare ratio is roughly 1/3 based on the total fleet size. The DMU vehicle features 79 seated passengers per vehicle and additional standing room up to 38 passengers per vehicle.

The total fleet size is calculated by analyzing the number of vehicles needed in the peak and off peak times multiplied by the consist size (# of cars per train). Also, a number of spare vehicles is needed in case a vehicle breakdown or is out of service due to maintenance. The assumed spare ratio is roughly 1/3 based on the total fleet size.

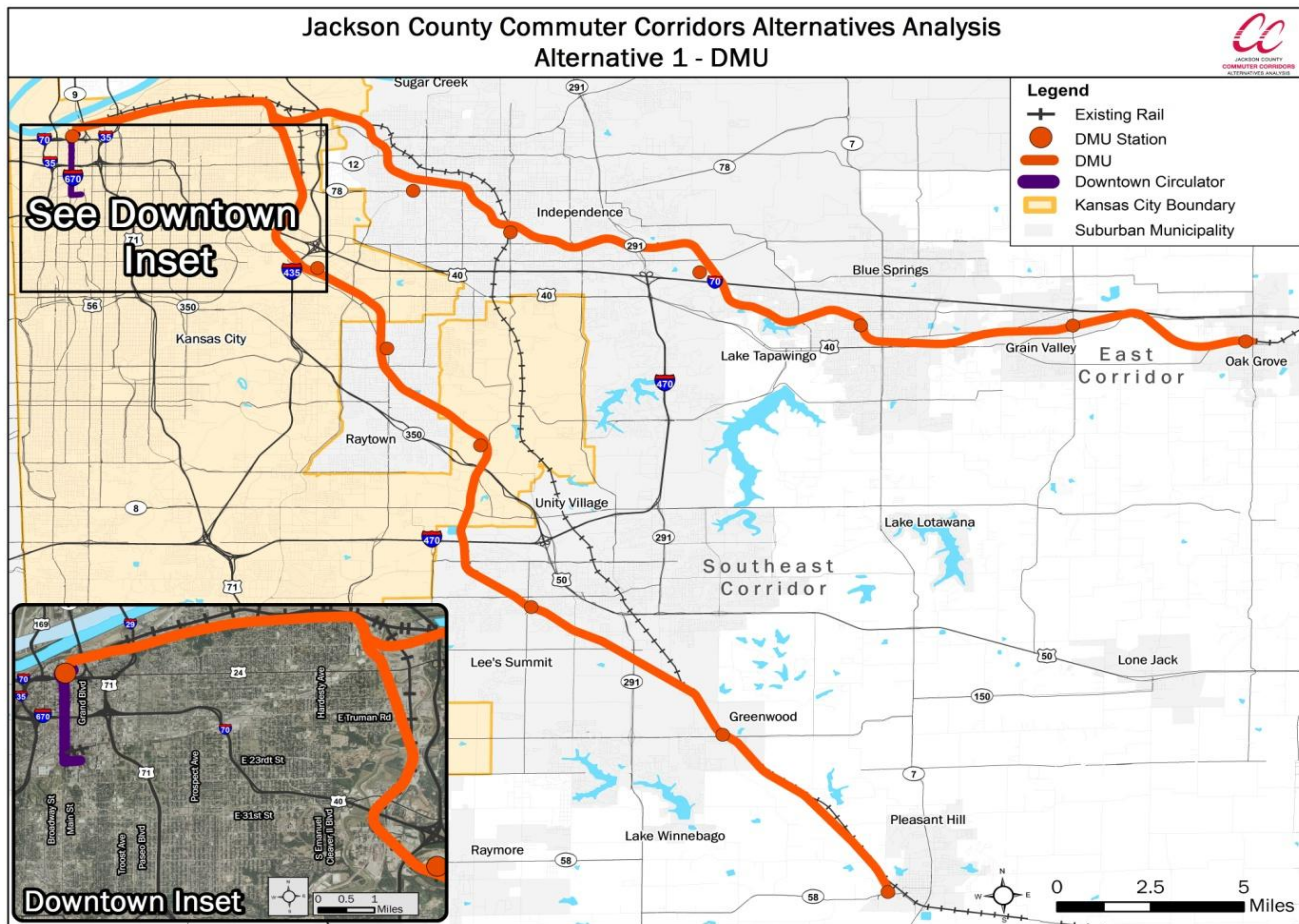
Table 69: Regional Rail Fleet Size

Alternative	Total Number of Consist in Peak Service	Total Number of Consist in Off-Peak Service	Peak Consist Size	Off-Peak Consist Size	Total Number of Vehicles in Fleet
East Line and Common Line	4	2	3	2	12+4 Spare = 16
Southeast Line and Common Line	5	2	2	2	10+3 Spare = 13

12.9. BUS NETWORK

The proposed feeder bus network is summarized below. The network is designed to take passengers from various suburban locations and offer them convenient access to the rail stations.

Figure 46: Alternative 1 (DMU in East and Southeast Corridors)



13. LPA ALTERNATIVE 2 – EAST AND CORRIDOR DMU TO RIVERMARKET SOUTHEAST
CORRIDOR ENHANCED STREETCAR VIA LINWOOD BLVD.

This Alternative would seek to utilize DMU technology in the East Segment and Enhanced Streetcar along the south east line (Rock Island). This alternative would have no common line.

13.1. TECHNOLOGY

The technology used for regional rail is the Diesel Multiple Unit (DMU) and is consistent with the technology description in Section 6.1. The technology used for the Enhanced Streetcar is consistent with the technology description in Section 7.1.

13.2. ALIGNMENT

The east line is as described in Section 12.2.1.

The easternmost point of the Enhanced Streetcar Route will be in Downtown Raytown at 63rd Street and the Rock Island ROW. The alignment continues north to a new railroad overpass 59th Street which replaces a rail bridge removed when the roadway was widened. There are two more at-grade crossing in Raytown at 56th Street and 53rd Street.

As the route continues into Kansas City, it travels through light industrial and undeveloped land. There are rail overpasses at 47th Street and Blue Ridge Cutoff. The route then travels just south of the Truman Sports Complex. There is a rail overpass of Sportsman Drive (stadium parking access on the east) and a roadway overpass at Lancer Lane (stadium parking access on the west). Between these two grade separations will be the Truman Sports Complex station to serve events and act as a multi-modal terminal.

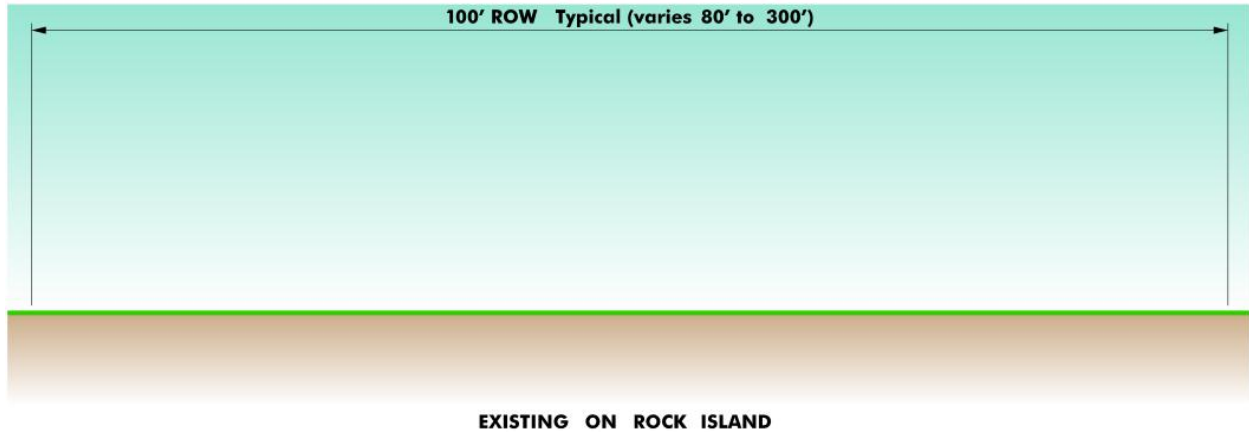


Figure 47: Enhanced Streetcar Typical Section - Rock Island Railroad Existing Conditions

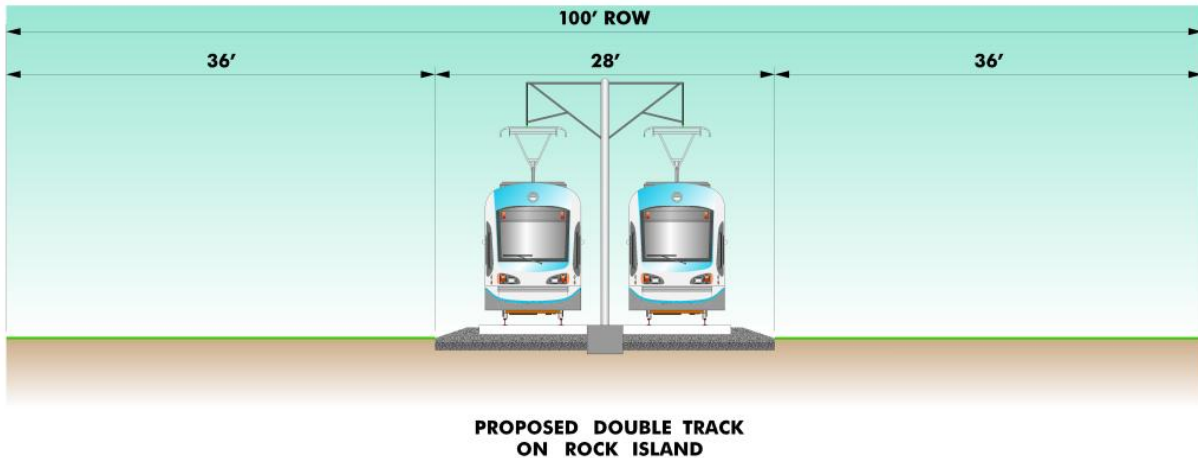


Figure 48: Enhanced Streetcar Rock Island Railroad

The enhanced streetcar route would operate generally along the Rock Island right-of-way to Stadium Drive, along Stadium Drive to Van Brunt, along 31st Street to Linwood, along Linwood to Main Street, then along Main Street to Pershing Road where it would connect with the downtown streetcar line.

The enhanced streetcar service would operate along a double track configuration from the stadium complex station. From there the route would proceed west operating along the Rock Island right-of-way to Stadium Drive. The route would then transition from the Rock Island right-of-way to Stadium Drive in the Leed's Industrial District via a newly constructed elevated structure that would provide a grade separated crossing over existing and active rail lines that cross Stadium Drive at-grade in the Leed's District.

Once across these existing rail lines the enhanced streetcar line would return to street level operating in the center of Stadium Drive in a separated guideway. The route would proceed west and north along Stadium Drive through the Leed's Industrial District crossing an existing bridge structure over the Little Blue River that may require modification, to Van Brunt where it will transition to 31st Street and serve a walk access station.

The route would proceed west on 31st Street in a double track, center running guideway configuration for approximately one-quarter mile where it would then transition to Linwood Boulevard and operate in the same configuration west on Linwood Boulevard serving a walk access station adjacent to the Veterans Administration Hospital followed by a station in an urban residential environment at Linwood Boulevard and Indiana and stations in moderate intensity commercial environments at Linwood and Prospect Avenue, Linwood and Troost Avenue, and Linwood and Gillham Road.

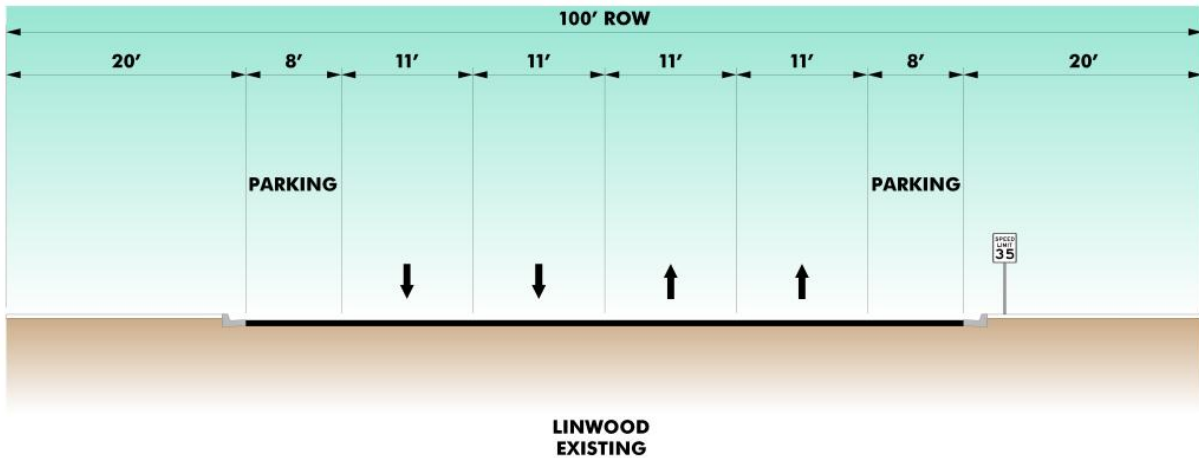


Figure 49: Enhanced Streetcar Linwood Blvd Typical Section, Existing Conditions

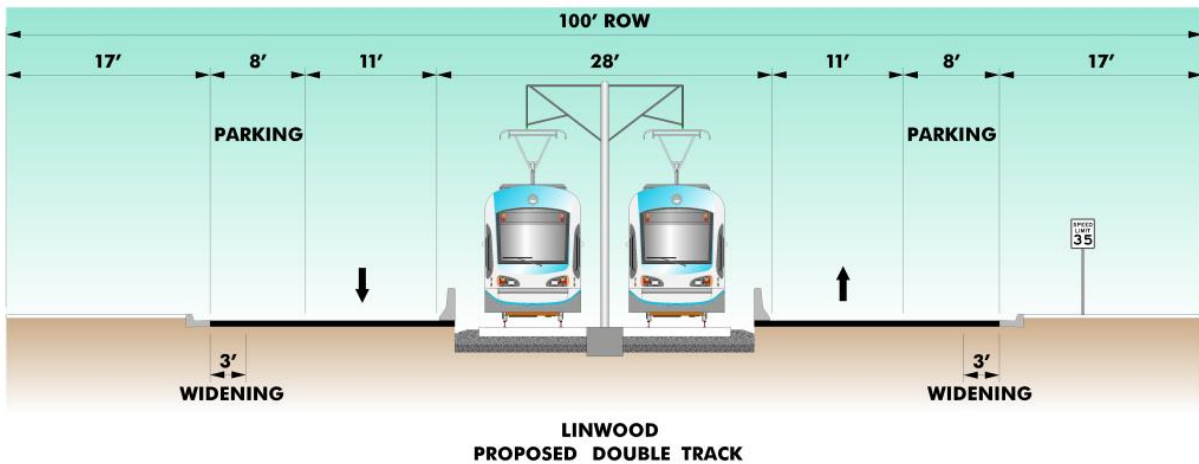


Figure 50: Enhanced Streetcar Linwood Blvd Typical Section

From Gillham Road the route would proceed west to Main Street, where it would transition to Main heading northbound and operate in the same double track, center running guideway configuration. The route would serve stations at Main Street and 31st Street, and adjacent to the Federal Reserve office between 27th and 28th Streets along Main Street. The route would terminate on Main Street adjacent to Union Station, where it would connect with the downtown circulator streetcar line.

13.3. STATIONS

Stations in the east corridor are consistent with the description in 12.3.1. The following are stations for the east corridor

Table 70: Alternative 2 Enhanced Streetcar Stations

Alternative 2 Enhanced Streetcar Stations		
Station Location	Station Type	Markets Served
Rock Island ROW and 63 rd St.	Small Park and Ride	Raytown residents, employment and commercial
Truman Sports Complex	Intermodal Station	Kansas City, Raytown and Independence residents, special events, employment and commercial
31 st St. and Van Brunt	Walk Up	Kansas City residents, employment and commercial
Linwood and VA Hospital	Walk Up	Kansas City residents, employment and commercial
Linwood and Indiana	Walk Up	Kansas City residents, employment and commercial
Linwood and Prospect	Walk Up	Kansas City residents, employment and commercial
Linwood and Troost	Walk Up	Kansas City residents, employment and commercial
Linwood and Gillham	Walk Up	Kansas City residents, employment and commercial
Main Street and Union Station	Walk Up	Kansas City residents, employment and commercial

13.4. OPERATING ASSUMPTIONS

Operating assumptions would be the same for the individual components as explained and introduced above.

13.5. SERVICE LEVELS

Service levels will be outlined below.

Table 71: Alternative 2 Headways

Time of Day	East Corridor (DMU) Headways	Southeast Corridor (ES) Headways
Morning Peak	20 minute	20 minute

Time of Day	East Corridor (DMU) Headways	Southeast Corridor (ES) Headways
Mid-day	60 minute	60 minute
Evening Peak	20 minute	20 minute
Off-Peak	60 minute	60 minute

13.6. END TO END OPERATING CHARACTERISTICS

Table 72: Regional Rail End to End Operating Characteristics

Alternative	Route Miles	Average Speed	Travel Time
Full Regional Rail – East Line and Common Line to River Market	29.3	57 MPH	35m 15s
Enhanced Streetcar – Southeast Line and Common Line to Union Station	14.07	25.71 MPH	26m 22s

13.7. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIME

Station to station distances, speed and travel times with assumed vehicle acceleration / deceleration and station dwell times for the DMU vehicles in the east are consistent with Section 12.7. Station to station distances, speed and travel time for the southeast segment is described below.

Table 73: Alternative 2 Southeast Corridor (ES) Station to Station Distance, Speed and Travel Time

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
Southeast Segment – Linwood Option						
RI ROW & 63 rd St	3.65	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 58s
Sports Complex	2.97	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 17s
31 st & Van Brunt	2.90	60s	3mi/hr./sec.	3mi/hr./sec.	60 mph	4m 13s
Linwood @ VA	.40	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 46s
Linwood & Indiana	.79	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 17s
Linwood & Prospect	.56	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 59s
Linwood & Troost	.93	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	2m 28s
Linwood & Gillham	.46	60s	3mi/hr./sec.	3mi/hr./sec.	45 mph	1m 51s
Main & Union Station	1.41	60s	3mi/hr./sec.	3mi/hr./sec.	36 mph	2m 32s

13.8. FLEET SIZE

Fleet size for the east line has been previously calculated and is summarized below. Fleet size for the Enhanced Streetcar segment on the southeast line and the common line will be determined.

Table 74: Regional Rail/Enhanced Streetcar Hybrid Fleet Size

Alternative	Total Number of Consist in Peak Service	Total Number of Consist in Off-Peak Service	Peak Consist Size	Off-Peak Consist Size	Total Number of Vehicles in Fleet
DMU	4	2	3	2	12+3 Spare = 15
Enhanced Streetcar	4	5	2	1	12+3 Spare = 15

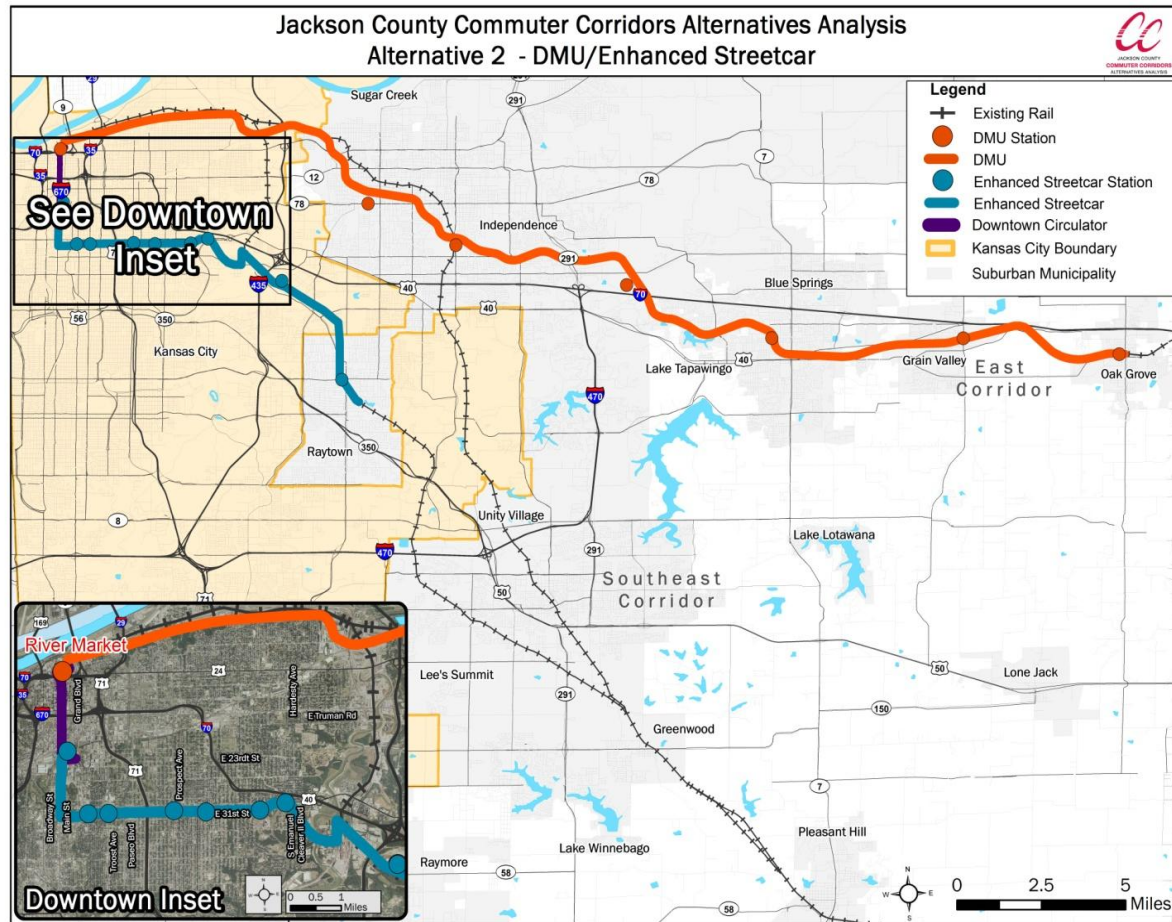
13.9. BUS NETWORK

The feeder bus network for the hybrid utilizes the same network for the east line DMU options as that of the full regional rail alternative. For the Southeast line, the bus network is the same as that for the Enhanced Streetcar option in Section 7.5.

13.10. PROPOSED MAINTENANCE FACILITY

The proposed maintenance facilities for this alternative are in keeping with those identified in Section 6.10. Because of this facility would house both DMU and Enhanced Streetcar vehicles, additional study will be needed to identify routing for vehicles to get to the shared Maintenance Facility that complies with FRA guidelines

Figure 51: Alternative 2 (DMU in East Corridor and Enhanced Streetcar in Southeast)



14. ALTERNATIVE 3: DMU IN EAST CORRIDOR TO RIVERMARKET AND BUS RAPID TRANSIT IN SOUTHEAST CORRIDOR VIA LINWOOD TO CBD

The alternative would seek to utilize DMU technology in the East Segment and BRT along the south east line (Rock Island) with no common segment.

14.1. TECHNOLOGY

The technology used for regional rail is the Diesel Multiple Unit (DMU) and is consistent with the technology description in Section 6.1. The technology used for the BRT is consistent with the technology description in Section 8.1. Alignment

14.2. ALIGNMENT

The alignment for the East corridor is consistent with the alignment shown in Section 12.2.1. The alignment for the Southeast corridor is described below.

The initial station for the southeast alignment BRT is adjacent to Pryor Road and the Rock Island ROW in Lee's Summit. The alignment continues to travel to the northwest through established residential development. There are two roadway overpasses at 3rd Street and Chipman Road. The route then passes under I-470 as it travels through undeveloped areas entering into Kansas City. There is an at-grade crossing at Vale Road, an existing 480-foot tunnel at Bannister Road and an at-grade crossing at Brickyard Road before the alignment reaches the Knobtown area.

The route passes over M-350 before reaching the Knobtown station in the northwest corner of M-350 and Noland Road. There is limited commercial and light industrial development in this area. The route continues north through undeveloped land before entering Raytown. There is an at-grade crossing at Frost Road. At 75th Street the roadway will be realigned and the existing rail bridge improved to accommodate the necessary traffic capacity. In this area there is more established residential development as the route travels over the at-grade crossings at Irwin Road and Woodson Road.

The route through Raytown is mostly through established residential areas. There is a railroad overpass at 67th Street and roadway overpasses at Raytown Road and 63rd Street. The Raytown station will be located just north of 63rd Street in downtown Raytown. The alignment continues north to a new busway overpass at 59th Street which replaces a rail bridge removed when the roadway was widened. There are two more at-grade crossing in Raytown at 56th Street and 53rd Street.

As the route continues back into Kansas City, it travels through light industrial and undeveloped land. There are overpasses at 47th Street and Blue Ridge Cutoff. The route then travels just south of the Truman Sports Complex. There is an overpass of Sportsman Drive (stadium parking access on the east) and a roadway overpass at Lancer Lane (stadium parking access on the west). Between these two grade separations will be the Truman Sports Complex station to serve events and act as a multi-modal terminal.

Example cross sections for various parts of the route are depicted on the following pages.

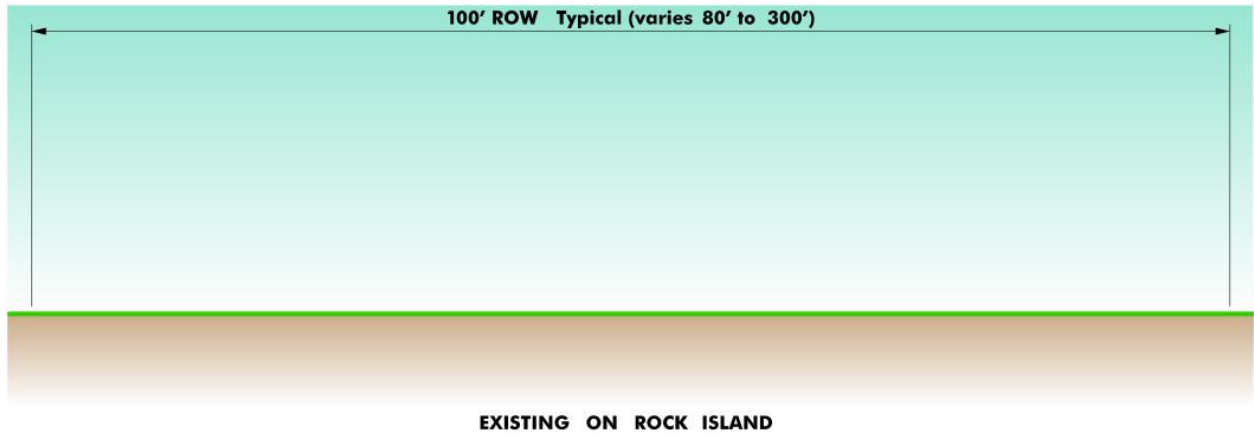


Figure 52: Bus Rapid Transit Rock Island Railroad Typical Section, Existing Conditions

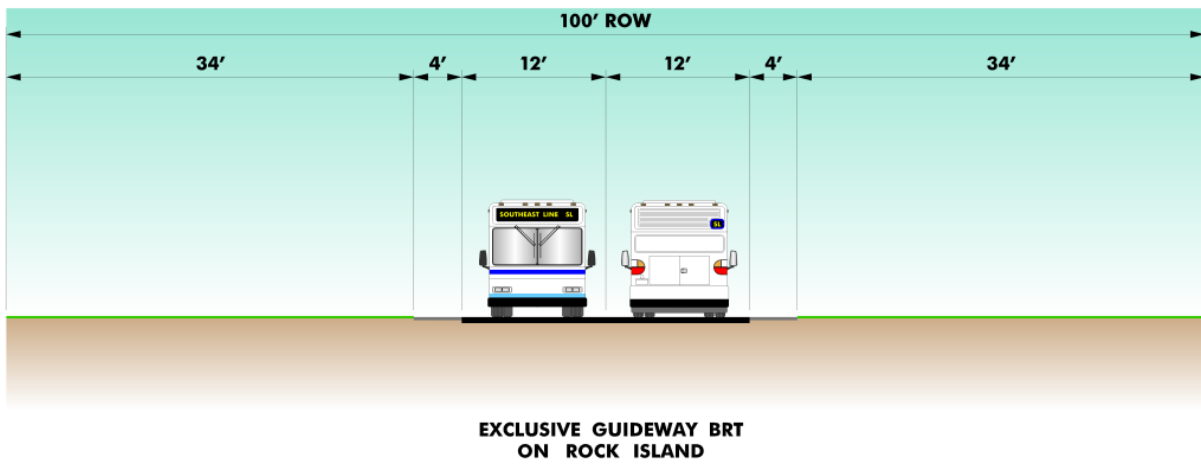


Figure 53: Bus Rapid Transit Rock Island Railroad Typical Section

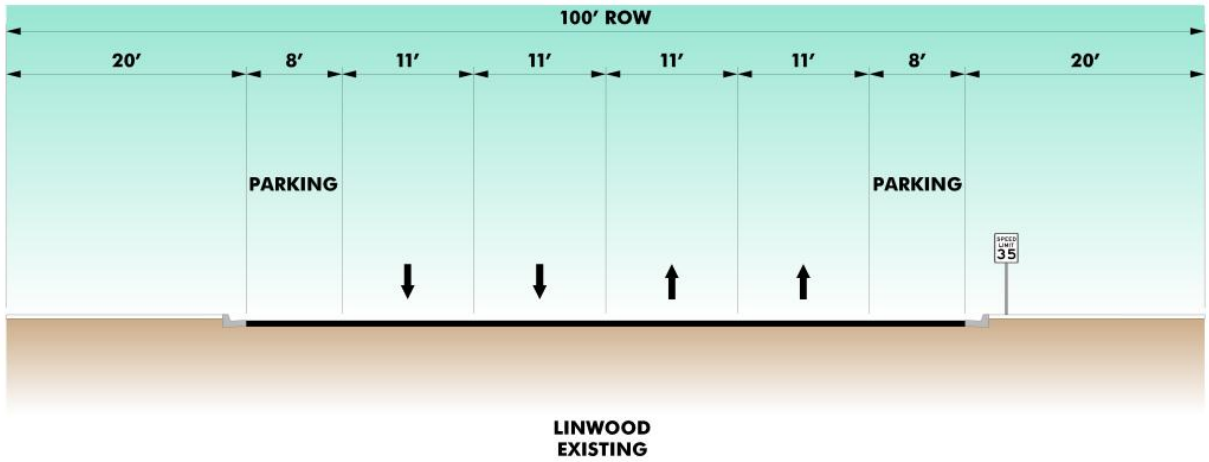


Figure 54: Bus Rapid Transit Linwood Blvd Typical Section, Existing Conditions

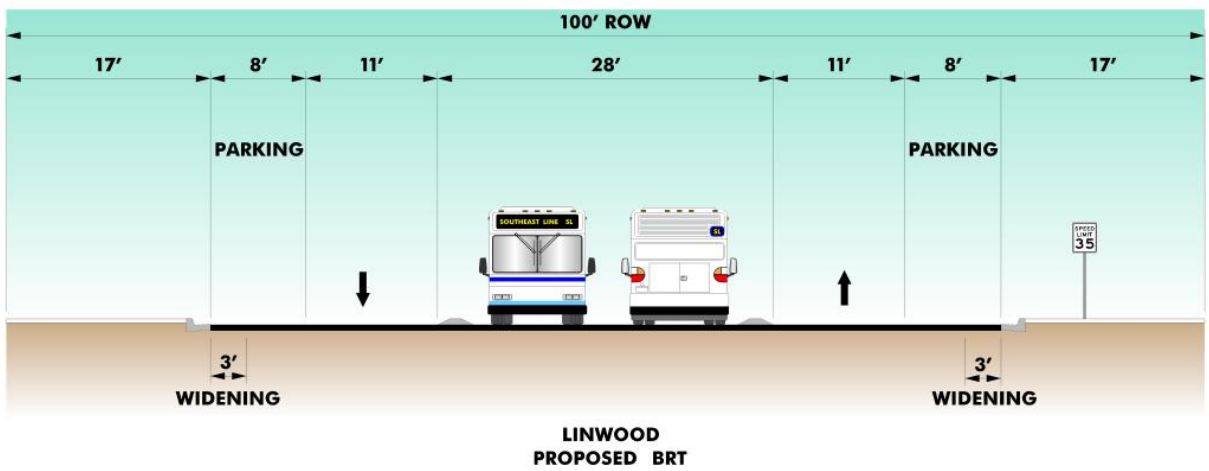


Figure 55: Bus Rapid Transit Linwood Blvd Typical Section

14.3. STATIONS

Stations for the East corridor are consistent with those shown in Section 9.3. The stations for the Southeast corridor are described below.

Table 75: BRT Station Locations - Southeast Line

Southeast Line Alternative 3 Bus Rapid Transit Stations		
Station Location	Station Type	Markets Served
Rock Island ROW and Pryor Road	Small Park and Ride	Lee’s Summit residents, employment and commercial
Rock Island ROW and Noland Road	Small Park and Ride	Lee’s Summit residents, employment and commercial
Rock Island ROW and 63 rd St.	Small Park and Ride	Raytown residents, employment and commercial
Truman Sports Complex	Intermodal Station	Kansas City, Raytown and Independence residents, special events, employment and commercial
31 st St. and Van Brunt	Walk Up	Kansas City residents, employment and commercial
Linwood and VA Hospital	Walk Up	Kansas City residents, employment and commercial
Linwood and Indiana	Walk Up	Kansas City residents, employment and commercial
Linwood and Prospect	Walk Up	Kansas City residents, employment and commercial
22 nd and Holmes	Walk Up	Kansas City residents, employment and commercial
Oak and 13 th	Walk Up	Kansas City residents, special events, employment and commercial

14.4. OPERATING ASSUMPTIONS

The operating assumptions for the East corridor are consistent with those listed in Section 9.4. The operating assumptions for the Southeast corridor are consistent with those listed in Section 8.4.

14.5. SERVICE LEVELS

Service levels will be the same for Truman Road and Linwood Boulevard Alternatives. Headways for peak and off peak are summarized below.

Table 76: Regional Rail/BRT Service Levels

Time of Day	Regional Rail - East DMU to Rivermarket	Bus Rapid Transit - Southeast to CBD
	Headways	Headways
Morning Peak	20 minute	20 minutes
Mid-day	60 minute	60 minutes
Evening Peak	20 minute	20 minutes
Off-Peak	60 minute	60 minutes

14.6. END TO END OPERATING CHARACTERISTICS

Table 77: Regional Rail/BRT End to End Operating Characteristics

Alternative	Route Miles	Average Speed	Travel Time
Full Regional Rail – East Line and Common Line to River Market	29.3	57 MPH	35m 15s
SE Segment – Linwood Alternative	19.18	25.5 MPH	33m 22s

14.7. STATION TO STATION DISTANCE, SPEED, AND TRAVEL TIME

The East Alignment Station to Station Distance, Speed and Travel Time is consistent with Section 12.7. Information for Bus Rapid Transit is shown below.

Table 78: Southeast Corridor – Alternative 3 (BRT) Station Distance, Speed and Travel Time

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
Southeast Segment – Linwood Option						
Blue Pkwy and I-470	3.5	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	5m 5s
RI ROW and Noland Rd	2.85	60s	2.4mi/hr./sec.	3mi/hr./sec.	36 mph	4m 22s
RI ROW and 63 rd St	3.82	60s	2.4mi/hr./sec.	3mi/hr./sec.	48 mph	5m 14s

Station	Route Miles	Dwell Time	Acceleration Rate	Deceleration Rate	Top Speed	Travel Time
Sports Complex	2.97	60s	2.4mi/hr./sec.	3mi/hr./sec.	48 mph	4m 30s
31 st and Van Brunt	2.90	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	4m 25s
Linwood and VA	.40	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 46s
Linwood and Indiana	.79	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 17s
Linwood and Prospect	.56	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	1m 59s
Holmes and 22 nd St	.93	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	2m 44s
Oak and 13 th St	.46	60s	2.4mi/hr./sec.	3mi/hr./sec.	24 mph	57s

14.8. FLEET SIZE

The DMU fleet size has been previously determined and the fleet size for the BRT option will be determined.

Table 79: Regional Rail/BRT Fleet Size

Alternative	Total Number of Consist in Peak Service	Total Number of Consist in Off-Peak Service	Peak Consist Size	Off-Peak Consist Size	Total Number of Vehicles in Fleet
DMU	4	2	3	2	12+4 Spare = 16
BRT	4	5	1	1	12+4 Spare = 16

14.9. BUS NETWORK

The feeder bus network for the hybrid utilizes the same network for the East line as shown in Section 6.9 and for the Southeast line in 8.5.

14.10. PROPOSED MAINTENANCE FACILITY

The proposed maintenance facility for the DMU vehicle for this alternative is in keeping with those identified in Section 6.10. The proposed maintenance facility for BRT is in keeping with those identified in Section 8.6

Figure 56: Alternative 3 (DMU in East Corridor and Bus Rapid Transit in Southeast)

