

JACKSON COUNTY COMMUTER CORRIDORS ALTERNATIVES ANALYSIS



Locally Preferred Alternative Report

March 2013



THANK YOU TO THE FOLLOWING FOR THEIR INVOLVEMENT IN THIS PROJECT.

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JACKSON COUNTY COMMUTER CORRIDORS ALTERNATIVES ANALYSIS LOCALLY PREFERRED ALTERNATIVE REPORT

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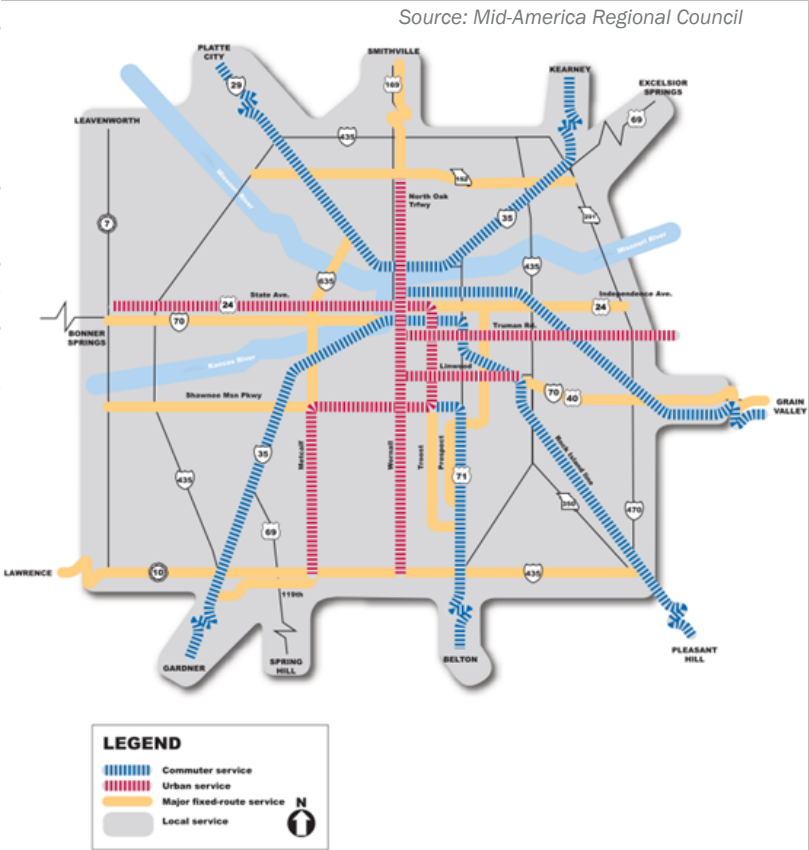
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A. Purpose and Need – This document describes the transportation needs in the study area, as well as goals and objectives for the transportation solution.	
B. Evaluation Methodology – This document describes the methodology for evaluating the alternatives.	
C. Tier 1 Screening – This document provides output from the first tier of screening of alternatives.	
D. Tier 2 Definitions – This document describes the information related to each of the alternatives. It only describes the facts about the alternatives and does not evaluate the alternatives.	
E. Land Use Report – This document describes opportunities and constraints related to station area planning.	
F. Tier 2 Screening – This document provides output from the second tier of screening of alternatives.	
G. Gap Analysis Paper – This document describes previous analysis of the two key corridors and is used to identify work that can be used from previous reports and work that needs to be competed through this process.	
H. Ridership Methodology – This document describes the process through which MARC's travel demand model was use to analyze alternatives for this study.	
I. Costing Detail - This document summarizes the assumptions and calculations used to estimated the capital cost for each alternative	
J. Final Operating Plan Details – This document identifies assumptions, calculations and analysis related to operations of the service, including operating costs, maintenance costs, hours of service and other details needed to identify annual operating costs.	
K. Summary of Public Engagement Process – This document summarizes and details the public and stakeholder engagement that was used in this process to assist with determining the locally preferred alternative.	

1 INTRODUCTION

The Jackson County Commuter Corridors Alternatives Analysis is the latest in the history of regional planning efforts in the Kansas City Metropolitan Area. The study reflects the principles identified in the Smart Moves Regional Transit Vision , which are based on extensive feedback from stakeholders and the public.

The Jackson County Commuter Corridors Alternatives Analysis helps to refine and determine implementation strategies for two of the corridors identified in the Smart Moves Conceptual Map (Figure 1). This report provides an overview of the study process and the identified Locally Preferred Alternative.

FIGURE 1: Smart Moves Conceptual Map
Source: Mid-America Regional Council



PROJECT BACKGROUND

ALTERNATIVES ANALYSIS

A study that evaluates all reasonable multi-modal alternatives and alignments to solve identified transportation needs in a given study area.

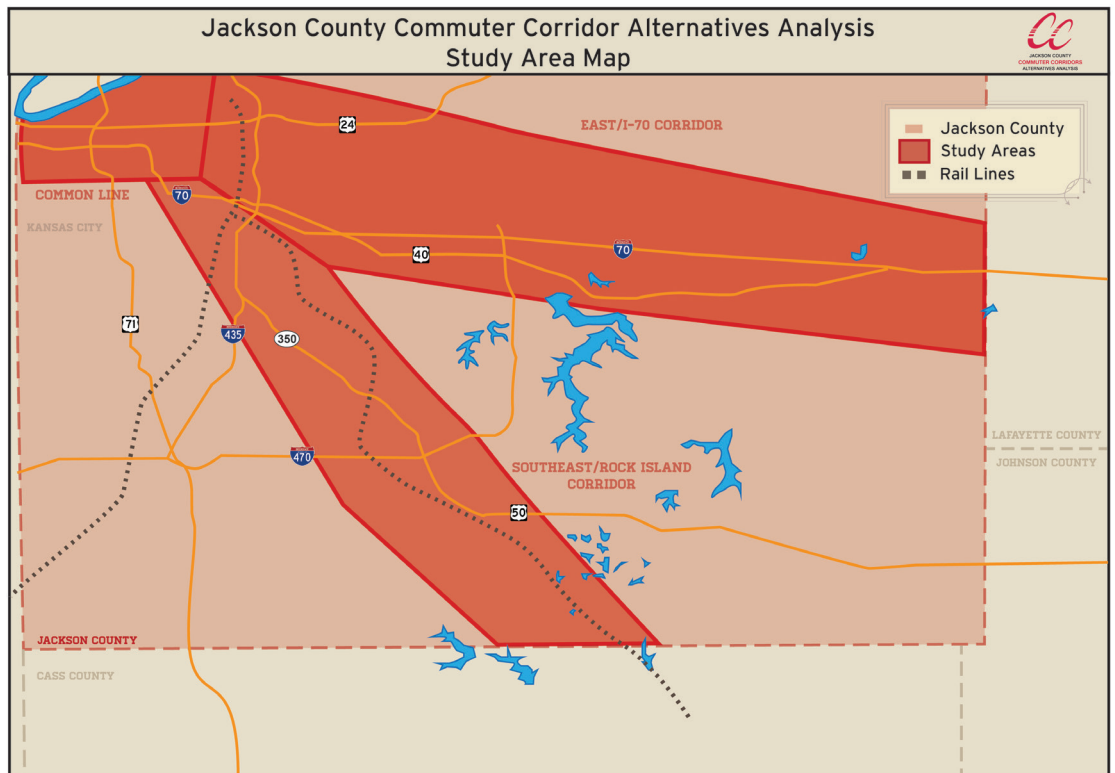
The Mid-America Regional Council (MARC), Jackson County, the City of Kansas City, Missouri, and the Kansas City Area Transportation Authority (KCATA) initiated the Jackson County Commuter Corridors Alternatives Analysis (JCCC AA) in the summer of 2011 to identify transit improvements within the study 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, as shown in Figure 1, encompasses all of Jackson County, with specific interest on areas surrounding I-70 east from downtown Kansas City to the LaFayette county line and surrounding the Rock Island Rail corridor southeast from downtown to Pleasant Hill.

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:

- expand available transit options,
- improve transit speeds and schedule reliability,
- increase the mode share and competitiveness of transit for commuting and other trip-making purposes, and
- support 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 (Draft: May 2012 - Appendix), which also identifies the major travel markets that could benefit from improved transit service.

FIGURE 2: Jackson County Commuter Corridor Alternatives Analysis Study Area Map



PURPOSE OF THE PROJECT

The purpose of a proposed transit investment within the JCCC AA study area is to improve transit system performance and usage, thereby addressing the identified transportation needs in the two study corridors. The project should provide a viable alternative to operating transit vehicles on increasingly congested roadways, improve system reliability, reduce transit trip durations, and increase speed resulting in increased desirability and competitiveness of transit services for commuting and other trip purposes and added mobility options for the region. This project should also catalyze redevelopment in and near transit centric activity centers (current and future) and increase the regional transit mode share fulfilling the goals and objectives of MARC and its partners as they seek to implement the Regional Land Use and Development Policy articulated in Transportation Outlook 2040.

NEED FOR THE PROJECT

Congestion: Today, travelers using the two primary corridors (I-70 and Rock Island's parallel highway M-350) face recurring congestion during morning and afternoon peak commute times. Figure XX shows the level of service (or a scoring of the level of congestion) during the morning peak hour for the highways in the study area. Level of Service A is given to those sections of roadway where travelers are able to travel at the posted speeds with the ability to easily change lanes. Level of Service F describes sections of roadway that are in a traffic jam. When a roadway is at Level of Service F, the user cannot predict how long it will take to get to their end destination, which is especially frustrating for those who use the roadways for their daily commute. The two highway corridors that are the focus of the study area have substantial portions of the corridor that are Level of Service F.

In addition to challenges to recurring congestion, the two highway corridors have frequent congestion related to incidents. Traffic crashes, construction and inclement weather cause even more delay on the corridor. On the I-70 corridor, game day traffic for the Truman Sports Complex can shut down traffic for hours. Frequent users are often able to predict which days and times will be the most congested and will opt for routes using parallel local streets.

With both reoccurring and incident-related congestion affecting travel for users on this corridor today, expected growth will only add to the problem in future years. MoDOT has studied potential solutions to congestion, but has limited funding to implement capacity enhancements and is instead focusing on improving flow at bottleneck locations.

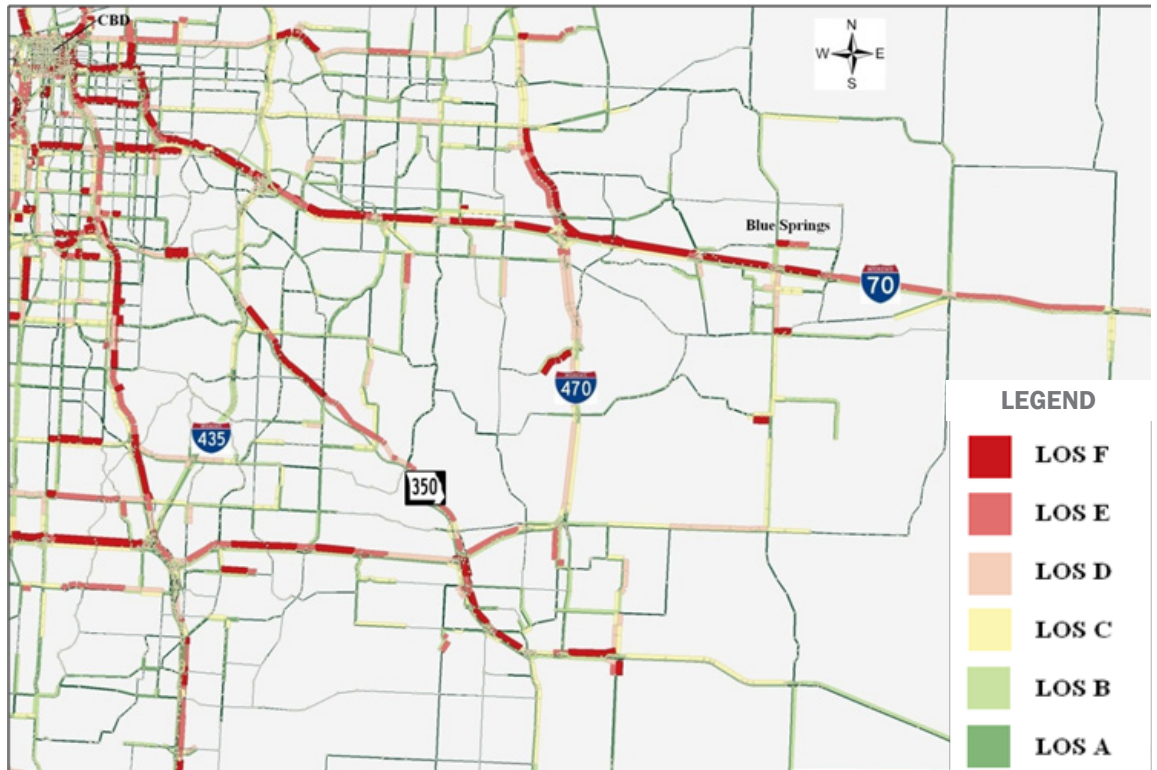
CONGESTION

Congestion on I-70 will continue to affect mobility in the study area:

- I-70: Level of Service is F during the peak hour
 - Level of service=the ease of traffic flow. A=best, F=worst
- MoDOT I-70 EIS shows that improvements needed to improve flow of traffic would cost up to \$1 billion.
- Highway travel time from Grain Valley to downtown:
 - Today – 39 minutes
 - 2040 – 1 hour
- Delay on I-70 costs travelers \$215M annually

*Source: MoDOT
(I-70 First Tier EIS, 2010)*

FIGURE 3: Level of Service Map



Choice: For those who do not want to face traffic congestion, reliable transit service is available, but it does not provide an alternative that is time competitive with driving a private automobile and often does not serve desired destinations. A high percentage of existing transit riders are from transit-dependent groups – 67 percent of riders in 2005 were from low-income groups and 47 percent were from zero-car households. This reinforces the notion that transit could be improved throughout the study area.

Transportation costs, as part of an individual’s cost of living, is higher than the national average in Kansas City* The lack of regional transit makes car ownership necessary for regional mobility

*Source: MARC, KCEconomy.com, 2011

The Kansas City region was rated 90 out of 100 metro areas by a recent Brookings Institute report (“Missed Opportunity: Transit and Jobs in Metropolitan America” 2011) which rated metropolitan area wide transit coverage and access to jobs by public transit. While the report found that the urban core was well served by transit, service outside of Kansas City, Missouri was seen to be limited, especially for those who live in the urban core and work or seek to work elsewhere in Jackson County.

Economic Development: The study area has numerous disinvested properties that could be benefitted by investments in infrastructure, such as enhanced transit. Additionally, there is large-scale development potential at numerous greenfield sites throughout the region. As disinvestment continues at conventional commercial retail sites, the potential brought by a fixed investment in transit to encourage more dense development with a mix of uses could provide new opportunities for underutilized areas.

Sustainability: The Kansas City metropolitan area is currently designated as an attainment area for one-hour and eight-hour air quality standards but has in the past been designated as a maintenance area. In addition, the Environmental Protection Agency (EPA) strengthened the national air quality standards for ground-level ozone in 2008 and is expected to designate the Kansas City region as a nonattainment area after the agency issues more stringent eight-hour standards in 2013. Although not currently required to develop a maintenance plan, local government officials, business leaders, and community group representatives have committed themselves to a serious effort to reduce emissions voluntarily. As noted in the 2011 Clean Air Action Plan, implementing land use policies that foster sustainable growth and development and emphasizing development of a truly multi-modal system that reduces reliance on the automobile and transportation-related greenhouse gas emissions is critical for the region to meet its air quality goals.

After analyzing the needs for a transportation solution, the project partnership team and the stakeholder advisory panel identified three categories of need for a major transit investment in the JCCC AA study area: Transportation, Land Use / Economic Development, and Sustainability / Livability. The public and stakeholders then weighted the priority of the statements for use in evaluation.

TRANSPORTATION NEED STATEMENTS

- Increase time-competitiveness of transit service relative to the automobile.
- Improve reliability of the current transit system as roadway congestion increases.
- Enhance mobility for the largely underserved reverse commute market as well as the high concentration of transit-dependent populations.

Need Statements are used to determine what outcomes are most important to the region. These statements are reflected in the evaluation of alternatives.

LAND USE / ECONOMIC DEVELOPMENT NEED STATEMENTS

- Support local planning initiatives and land use strategies that aim to strengthen communities, foster economic development, and fulfill long range growth goals.
- Improve connectivity between existing and emerging activity centers as well as redevelopment sites.

LIVABILITY / SUSTAINABILITY NEED STATEMENT

- Improve the region's air quality and foster environmentally sensitive travel alternatives.

STUDY GOALS AND OBJECTIVES

Based on the purpose and needs of the study, goals and objectives were derived.

TABLE 1: Study Goal and Objectives

Goals	Objectives
Develop a transit alternative that is competitive with the automobile.	Improve transit travel times and speeds within study area.
	Provide transit capacity needed to meet future travel demand.
Improve transit service reliability within the study area.	Improve on-time performance.
Develop a transit alternative that enhances mobility for the reverse commute market and transit-dependent populations.	Increase transit accessibility.
Develop a transit system that supports local planning initiatives and land use strategies.	Provide transit service that can influence more compact growth patterns.
	Develop transit alternatives that maximize use of existing resources.
Develop a transit system that improves connectivity between existing and emerging activity centers and redevelopment sites.	Provide convenient and accessible transit service to existing and planned activity centers.
Develop a transit system that supports regional sustainability goals.	Reduce air pollutant emissions, fuel consumption, Vehicle Miles Traveled/Vehicle Hours Traveled, and travel delay.

PURPOSE AND STRUCTURE OF LOCALLY PREFERRED ALTERNATIVE REPORT

The Locally Preferred Alternative Report defines the preferred mode and alignment alternative to meet the purpose and need considered in the JCCC AA. Also in this report is a summary of the evaluation methods, the results of the Tier 1 and Tier 2 analysis, the recommended Locally Preferred Alternative, and next steps for implementation.

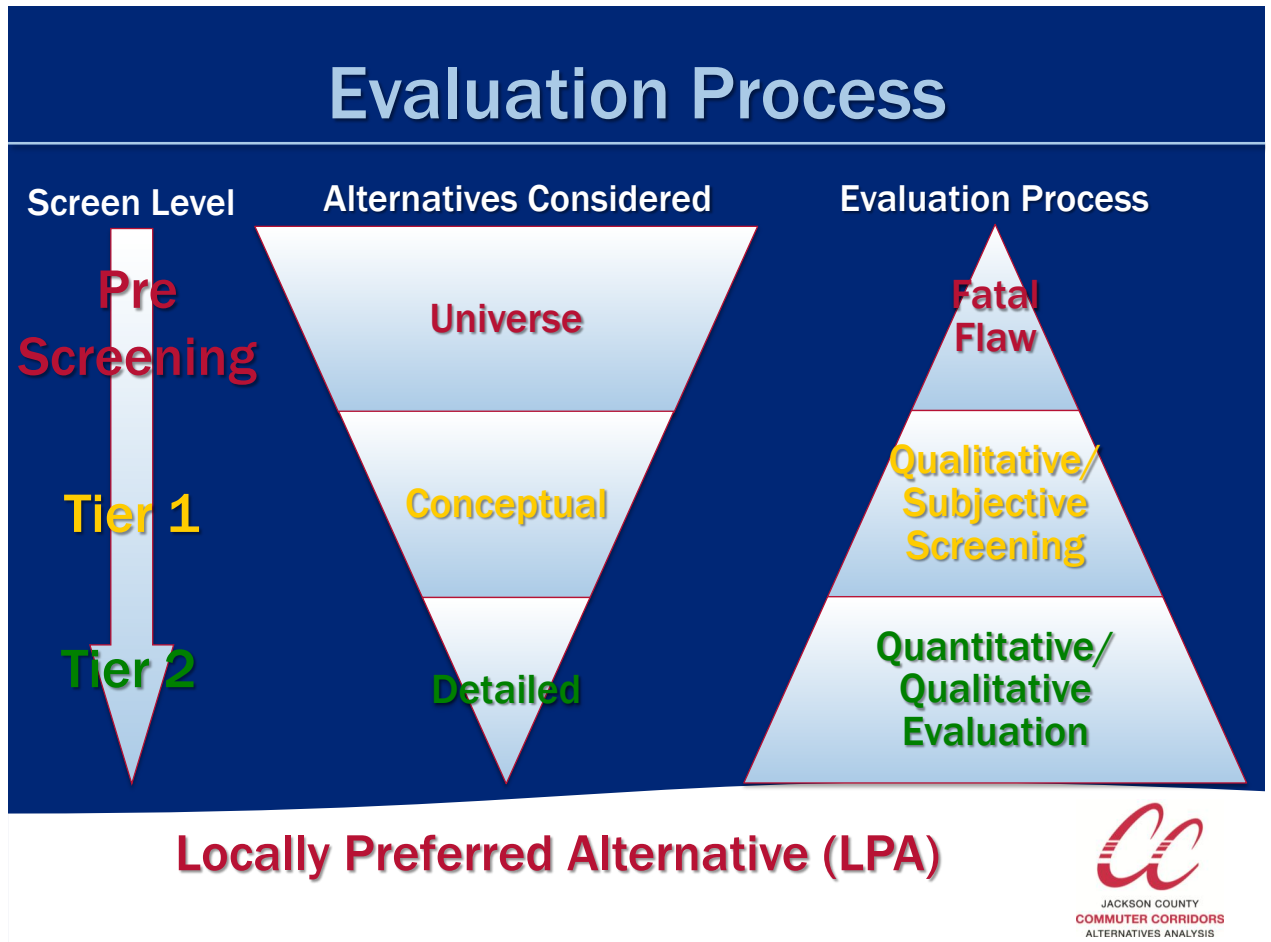
2 EVALUATION METHODOLOGY

The screening of alternatives is not only a technical process, but also part of a broader public involvement and decision-making process. The findings and conclusions of the analyses were vetted through the Project Partnership Team (PPT) composed of MARC, Jackson County, the City of Kansas City, Missouri and the KCATA, through a Stakeholder Advisory Panel and through the broader public engagement process. Decisions on which alternatives were considered in the JCCC AA were made by the PPT informed by public input and the results of the technical analysis.

EVALUATION METHODOLOGY

The evaluation framework used in the JCCC AA was a two-tiered screening process. Using a set of evaluation criteria derived from the Purpose and Need Report, and relatively “high level” analysis results, the Tier 1 Screening identified a short list of the most promising alternatives to be carried forward for more detailed analysis and evaluation. The Tier 2 Screening resulted in the selection of a single LPA defined in terms of mode and general alignment. The project team also conducted a “pre-screening” to identify the long list of alternatives from the infinite universe of alternatives that could be considered. Table 2 summarizes the screening process.

FIGURE 4: Evaluation Process



As discussed in the Evaluation Methodology Report (May 2012 - Appendix), 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 to the Jackson County line, parallel to I-70
- **Southeast Segment** - Generally from the I-70/I-435 interchange area Southeast toward Lee's Summit

TABLE 2: Summary of the Screening Process

SCREEN LEVEL	PRE-SCREENING (UNIVERSE OF ALTERNATIVES)	TIER 1 SCREENING (LONG LIST OF ALTERNATIVES)	TIER 2 SCREENING (SHORT LIST OF ALTERNATIVES)
PURPOSE	<ul style="list-style-type: none"> Document alternatives considered and eliminated prior to the formal screening of alternatives Eliminate fatally flawed alternatives from consideration 	<ul style="list-style-type: none"> Identify suitability of each alignment in each segment for each technology Develop a small set of the most promising transit alternatives 	<ul style="list-style-type: none"> Evaluate approximately 5 full corridor alternatives in detail
APPROACH	<ul style="list-style-type: none"> Review of previous studies Document reasons why certain transit modes/ technologies are not suitable for the corridor 	<ul style="list-style-type: none"> Conduct qualitative/subjective evaluation of each mode on each alignment, and drop poorest performers Combine the remaining alignments and modes to arrive at full corridor alternatives. Conduct qualitative/subjective evaluation of each full corridor combination, and drop poorest performers 	<ul style="list-style-type: none"> Optimize so that each remaining full corridor alternative is the best representation of its particular technology Conduct qualitative and quantitative evaluation of full corridor alternatives
EVALUATION MEASURES	<ul style="list-style-type: none"> Has alternative been eliminated in previous studies/ discussions for reasons that are considered valid? Is a mode or alignment clearly ill-suited to addressing purpose and need in these corridors? Does the alignment and/or mode have an obvious fatal flaw? 	See Appendix X	See Appendix X
OUTCOME	<ul style="list-style-type: none"> Long list of modes and alignments for Tier 1 Screening 	<ul style="list-style-type: none"> Approximately 5 most promising mode and alignment combination alternatives for more detailed analysis 	<ul style="list-style-type: none"> Locally Preferred Alternative (LPA)

3 TRANSIT MODE ANALYSIS

Before significant analysis could begin, a reasonable set of transit modes were identified. The universe of transit mode options range from buses to streetcar, light rail, and heavy rail, with each of these options having multiple technological applications. The potential modes and technologies were narrowed based on previous planning studies, feedback received in early project meetings with the Project Partnership Team (PPT), and initial project team observations.

The pre-screening eliminated those modal options that did not perform well given the context of the study. After the pre-screening, four modes were chosen to be analyzed in Tier 1, Express Bus, Bus Rapid Transit (BRT), Diesel Multiple Unit (DMU), and Enhanced Streetcar. Table 3 summarizes the modes considered during the pre-screening and those advanced to Tier 1.

TABLE 3: Modes Advanced from Pre-Screening to Tier 1

Potential Modes Screened	Modes Advanced
Express Bus	Express Bus
Bus Rapid Transit (BRT)	Bus Rapid Transit (BRT)
Light Rail Transit (LRT)	Diesel Multiple Unit (DMU)
Streetcar	Enhanced Streetcar
Diesel Multiple Units (DMUs)	
Electric Multiple Units (EMUs)	
Push-Pull Locomotive	
Heavy Rail	
People Movers	
Maglev	



EXPRESS BUS



BUS RAPID TRANSIT



ENHANCED STREETCAR



DMU

The four modal alternatives advanced to the Tier 1 Screening were:

- Express Bus - A bus vehicle that is 40 feet in length, diesel-powered, and features higher comfort seating than standard local buses.
- 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.
- 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. This vehicle marries the passenger carrying capacity of light rail with the versatility of a streetcar.

Each modal alternative has unique characteristics of operation and capacity. Table 4 highlights some of the differences among the four modes advanced for analysis.

TABLE 4: Mode Characteristics

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

4 SCREENING OF ALTERNATIVES

ALIGNMENT PRE-SCREENING

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 currently 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 5: Alignments Advanced from Pre-Screening to Tier 1

Common Segment	East Segment	Southeast Segment
Knoche Yard Truman Road Trench Embankment Linwood Blvd. 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 public and stakeholders had an opportunity to review and provide feedback on the alternatives at three public meetings in September 2011.

TIER 1 SCREENING

Tier 1 screening uses qualitative information to evaluate the identified alternatives.

The alignment and modal options that were not eliminated in the pre-screening were combined to create distinct alignment and mode alternatives in each of the three segments (Common, East, Southeast) for the Tier 1 Screening. No build and Transportation System Management (TSM) alternatives were included in the analysis to provide a baseline for comparing the performance of the build alternatives. The team determined early in the process that, while it was valuable to do analysis on all three segments, the focus of the Tier 1 Screening was on the Common Segment, which provided the most complex opportunities and challenges. Effectiveness, Cost-Effectiveness, Feasibility, Impacts, and Equity criteria were applied to all of the Tier 1 alternatives. The criteria were developed according to the Federal Transit Administration (FTA) guidelines and the screening measures and methodology were tied directly to the study's goals and objects. Appendix A presents the Tier 1 evaluation criteria definitions. The complete analysis can be found in the Tier One Screening Report (May 2012 - Appendix).

TABLE 6: Tier 1 Summary Matrix



Tier 1 Summary Matrix

Key: ● - Best; ◐ - Good; ○ - Less Good

	Alignment Technology/Mode	Knoche Yard		Truman Road		Trench Embankment	Linwood/31st		I-70
		DMU		DMU	BRT/LRT/SC	DMU	DMU	BRT/LRT/SC	Bus
Effectiveness (Purpose and Need)	Directness of Route	○		●	●	◐	◐	◐	●
	Average Transit Travel Speed	○		◐	◐	○	◐	◐	○
	Population & Employment within 1/4 mile of alignment	○		●	●	○	●	●	○
	Ability of Alternative to Meet Expected Demand	●		●	●	●	●	●	●
	Number of Targeted Activity Center	○		◐	◐	○	◐	◐	○
	Sustainability - Reduce Air Pollution	◐		◐	◐	◐	◐	◐	◐
	Consistency with Land Use Vision	◐		◐	◐	◐	◐	◐	○
	Effectiveness Subtotal								
●	1	2	2	1	1	1	2		
◐	2	5	5	3	6	6	1		
○	4	0	0	3	0	0	4		
Cost Effectiveness	Capital Costs	○		○	◐	○	○	◐	●
	O&M Costs	◐		◐	◐	◐	◐	◐	●
	Cost Effectiveness	○		○	◐	○	○	◐	●
Feasibility	Technical Feasibility / Constructability	◐		○	◐	○	○	◐	●
	Affordability	○		○	◐	○	○	◐	●
Impacts	Subjective Assessment of Environmental Fatal Flaws	●		○	◐	○	○	◐	●
	Section EJ, 4(f), 6(f) & 106 Impacts	●		○	◐	○	◐	◐	●
	Traffic Impacts	●		○	◐	●	○	◐	●
Equity	Transit Dependent Populations within 1/4 mile of Alignment	○		◐	◐	◐	●	●	○
	Concentrations of Service Sector Jobs within 1/4 mile of Alignment	○		◐	◐	○	◐	◐	○
Relation to Other Planning	Compatibility with Smart Moves	●		●	●	●	●	●	●
	Compatibility with KCATA CSA Key Corridor Network	○		●	●	●	●	●	○
Matrix Total									
●	5	4	4	4	4	4	11		
◐	4	7	15	5	10	15	1		
○	10	8	0	10	5	0	7		

3.1.1 TIER 1 RECOMMENDATIONS FOR THE COMMON SEGMENT

BRT and Enhanced Streetcar: These two alternatives were analyzed together because of the similarities in alignment and station spacing. Both alternatives were evaluated for both the Truman Road and the Linwood Blvd. common line alignment options. Each of the mode and alignment pairs in the Common Segment for BRT and Enhanced Streetcar were recommended for further analysis in Tier 2. These alternatives performed strongly in meeting the Purpose and Need (specifically as both successfully served the more urban portions of the corridor, with more station locations in those areas than the other modes. The BRT specifically was highly successful from a cost effectiveness standpoint – providing the lowest cost build alternative with good potential ridership.

DMU: With the opportunities that could be presented by underutilized rail corridors in the East and Southeast Segment, the team evaluated numerous common segment options throughout the study. In Tier 1, the team focused on the feasibility of using Truman Road, the Knoche Yard and an embankment in the Kansas City Terminal Railroad Trench as the Common Segment alignment. It was identified that the Trench Embankment would have too many feasibility challenges related to construction, user access and cost to move it forward into Tier 2. The Knoche Yard, which would require the alignment to travel through an extremely active rail yard to terminate at the River Market, was deemed unfeasible due to the freight congestion in the Yard. The Truman Road alternative presented numerous opportunities, such as providing service to the urban population, use of an underutilized roadway and adjacent access to Union Station. But, the team thought that some of the challenges, such as use of park space and potential requirements for residential land acquisition, required more study to best calculate the cost versus the benefits. For that reason, it was moved into Tier 2.

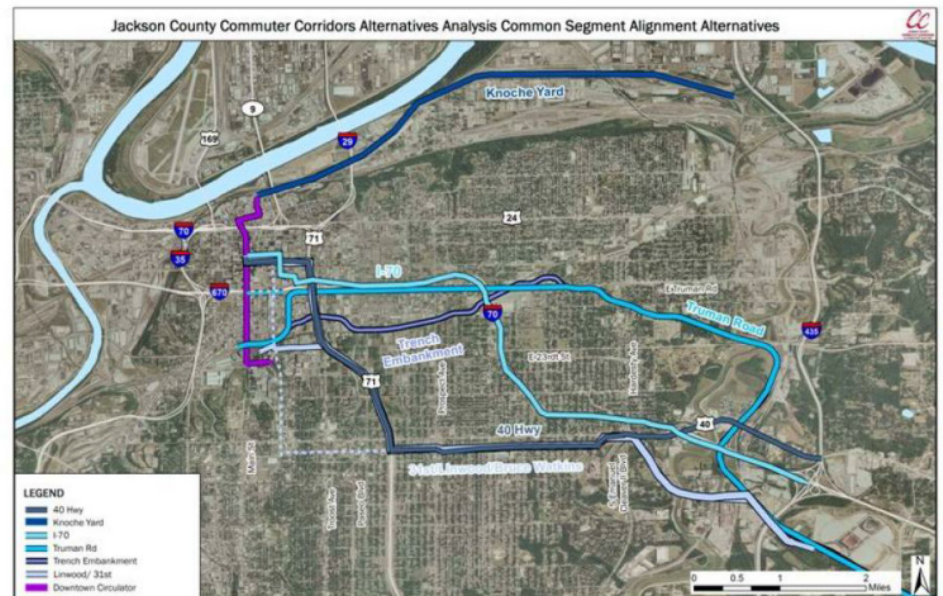
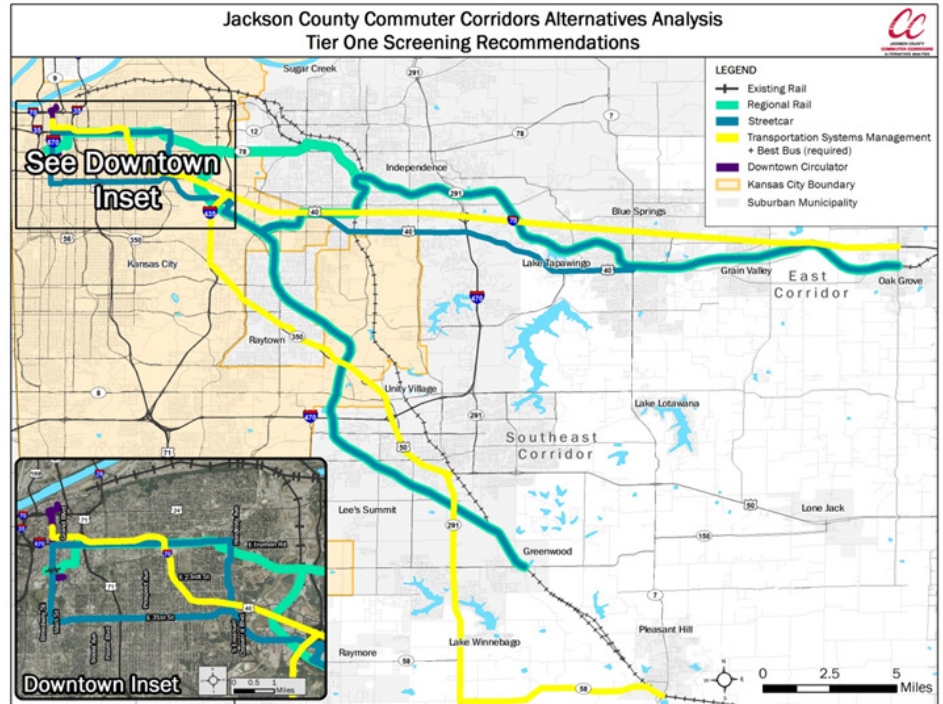
The public and stakeholders were engaged throughout the process. Ten public meetings were held and feedback was used in screening the alternatives.

TABLE 7: Tier 1 Recommendations for the Common Segment

Alignment	Mode	Recommended to advance
Knoche Yard	DMU	NO
Truman Road	DMU	YES
	BRT	YES
	SC	YES
Trench Embankment	DMU	NO
Linwood	BRT	YES
	SC	YES
I-70	Express Bus	YES

In analyzing the East and Southeast segment, the team was able to identify appropriate mode and alignment options to connect in with the Common segment. Once the alignment options were assembled, full alternatives, as described in Figure 5 were moved into Tier 2. While most options allow for one mode through both the East and Southeast, options also allowed for the possibility of separate modes in each corridor with transfer locations.

FIGURE 5: Tier One Screening Recommendations



Using the technical output and feedback from the public and stakeholders, the following alternatives were identified for Tier 2 screening.

TABLE 8: Tier 1 Recommendations

Alternatives Recommended for Tier 2 Screening	
No Build	"No Action"—Alternative includes all highway and transit projects identified in the fiscally constrained MARC Transportation Improvement Program (TIP) and recommendations from the KCATA CSA.
TSM	Relatively low cost improvements that represent best that can be done to improve transit service short of a major capital investment. Alternative includes Express Bus on existing highways (I-70 in the East and Common Segment and M-350/I-435 in the Southeast Segment), possibly operating on the shoulder, and other improvements such as park-and-ride lots.
Full Regional Rail	Alternative includes DMUs (FRA Compliant) via Truman Road to Union Station on Common Segment, KCS rail corridor in East Segment, and Rock Island rail corridor in Southeast Segment.
Regional Rail & Enhanced Streetcar	Alternative combines DMUs and Enhanced Streetcar modes. DMU along KCS rail corridor in East Segment connecting to Multimodal Transfer Center at Truman Sports Complex. Streetcar/LRT Hybrid on Rock Island Line connecting to Truman Sports, serving as the common line into downtown via either Linwood or Truman. Once in downtown, the Enhanced Streetcar could use the Downtown Circulator tracks.
Enhanced Streetcar & BRT	Alternative combines Enhanced Streetcar and BRT modes. BRT or Enhanced Streetcar along US-40 in the East Corridor. Streetcar/LRT Hybrid on Rock Island Line connecting to Truman Sports, serving as the common line into downtown via either Linwood or Truman. Once in downtown, the Enhanced Streetcar could use the Downtown Circulator tracks.

TIER 2 SCREENING

As described, the Tier 2 Screening was conducted on the corridors as a whole (East + Common and Southeast + Common). No build and Transportation System Management (TSM) alternatives were included in the analysis to provide a baseline for comparing the performance of the build alternatives.

The same criteria of Effectiveness, Cost-Effectiveness, Feasibility, Impacts, and Equity criteria were defined in greater detail for Tier 2, with the measures and methodology again tied directly to the study's goals and objectives. The Tier 2 measures and methodology required travel demand model forecasting for transportation analysis; environmental analysis as a precursor to National Environmental Policy Act (NEPA) work that may be required for future project development; and estimates for capital construction and operation costs. Appendix B presents the Tier 2 evaluation criteria definitions. The complete analysis can be found in the Tier Two Screening Report (November 2012 - Appendix).

Tier 2 screening quantifies the results from Tier 1.

TIER 2 SCREENING RESULTS BY CRITERIA

EFFECTIVENESS

How well the project meetings the identified need statements.

3.1.2 EFFECTIVENESS

The Effectiveness category evaluates how each of the alternatives performs in meeting the project’s purpose and need for the following three categories: Transportation and Mobility, Land Use and Economic Development, and Sustainability.

3.1.2.1 Transportation and Mobility

The needs identified under transportation and mobility were to improve transit time competitiveness with auto, improve service reliability and to provide access to transit dependent populations. Each of the modal alternatives have similar transit travel times and are therefore equally competitive with auto travel times. All alternatives have substantial access to employment and households. Ridership was highest for the Enhanced Streetcar on Linwood for the East and Southeast corridors, but it was found that the specific benefit was for riders along Linwood, and that the slow travel times and numerous urban stations actually deterred suburban riders. Transit Service reliability is better for services that operate in their own guideway. The DMU is the only alternative that is required to be in its own guideway for the entirety of the route. The Enhanced Streetcar and the BRT can function in mixed traffic, and would probably do so within the common segment, so those alternatives would be affected by prevailing traffic conditions.

MODE ACRONYMS

TSM: Transportation Systems Management

DMU: Diesel Multiple Unit

ES: Enhanced Streetcar

BRT: Bus Rapid Transit

TABLE 9: Time Competitiveness (Travel Time and Speed)

Measure	End to End Scheduled Travel Time		Average Guideway Travel Speed	
	<i>In minutes</i>		<i>In miles per hour</i>	
Segment	<i>East</i>	<i>Southeast</i>	<i>East</i>	<i>Southeast</i>
No Build	n/a	n/a	n/a	n/a
TSM			n/a	n/a
DMU - Truman	40m 55s	44m 52s	54	53
ES - Linwood	46m 56s	45m 38s	28.2	25.71
ES - Truman	50m 11s	48m 28s	26.29	25.6
BRT - Linwood	46m 56s	45m 38s	26.3	25.5
BRT - Truman	51m 37s	50m 20s	26.29	27.42
DMU/ES - Linwood	29m 40s	46m 56s	57.1	25.71
DMU/ES - Truman	29m 40s	48m 52s	57.1	25.6
DMU/BRT - Linwood	29m 40s	45m 38s	57.1	25
DMU/BRT - Truman	29m 40s	50m 20s	57.1	26

TABLE 10: Time Competitiveness (Travel Time between Key Origins and Destinations)

Measure	Non-Weighted Travel Time Between Selected Origins and Destinations		Weighted Travel Time Between Select Origins and Destinations		Weighted Travel Time Between Select Origins and Destinations	
	<i>Origin - Blue Springs CBD (East) or Lee's Summit CBD (Southeast) to Destination - 10th and Main</i>		<i>Origin - Blue Springs CBD (East) or Lee's Summit CBD (Southeast) to Destination - 10th and Main</i>		<i>Origin - Oak Grove CBD (East) or Pleasant Hill CBD (Southeast) to Destination - 10th and Main</i>	
Segment	East	Southeast	East	Southeast	East	Southeast
No Build	54	65	62	73	n/a	n/a
TSM	52	59	57	66	59	84
DMU - Truman	68	74	88	94	99	109
ES - Linwood	68	65	80	77	93	90

TABLE 11: Time Competitiveness (Ridership Statistics)

Measure	Transit Ridership		Load Factor at Max Point	
	<i>Daily ridership in east and southeast corridors</i>		<i>Number of Passengers During Peak</i>	
Segment	East	Southeast	East	Southeast
No Build	250	350	n/a	n/a
TSM	600	400	n/a	n/a
DMU - Truman	900	400	252	72
ES - Linwood	1,500	800	262	159

TABLE 12: Enhanced Mobility for Transit Dependent Populations (Measure of Households and Jobs within 1/2 Mile of Stations)

Enhance Mobility for Reverse Commute Market and Transit Dependent Population				
Measure	Number of Households Within 1/2 Mile of Stations		Number of Jobs Within 1/2 Mile of Stations	
Segment	East	Southeast	East	Southeast
No Build	n/a	n/a	n/a	n/a
TSM	4,615	2,456	41,416	41,509
DMU - Truman	8,733	7,686	68,528	62,734
ES - Linwood	17,915	14,028	75,094	72,216
ES - Truman	16,519	12,632	62,013	59,135
BRT - Linwood	12,893	9,704	65,476	58,947
BRT - Truman	15,686	12,497	57,853	51,324
DMU/ES - Linwood	3,408	14,028	9,654	72,216
DMU/ES - Truman	3,408	12,632	9,654	59,135
DMU/BRT - Linwood	3,408	9,704	9,654	58,947
DMU/BRT - Truman	3,408	12,497	9,654	51,324

3.1.2.2 Land Use and Economic Development

In order to best understand the benefit to economic development and land use, the project team sponsored Land Use Charrettes in February, 2012. Municipal staff from each of the study area communities was invited to meet with consultant urban designers to discuss conditions around potential station areas and understand opportunities and next steps for economic development related to transit. The JCCC AA Land Use Report is located in the Appendix for more information on this process. In general, the intensity of the transit use and its permanence are the most important indicators as to whether its presence will effect economic development. Transit oriented development (TOD) at station locations offers the following benefits:

- increased transit ridership
- improved walkability
- new retail, employment and entertainment centers
- property value premiums

In addition to information gained at the public meeting, an economic development analysis was conducted by the Mid-America Regional Council to determine the potential impact of rail investment in the two corridors. The analysis found that almost \$971,000,000 in additional regional investment would occur over an initial six-year construction period. Additionally, it was found that property values adjacent to rail stations would increase due to their proximity to rail. Specifically, the I-70 corridor would have a 110% increase in property values due to an investment in DMU. The Rock Island Corridor would have a 39% increase with an investment in DMU and a 50% increase with an investment in Enhanced Streetcar.

Due to that, DMU alternatives in the suburban areas and Enhanced Streetcar in the urban areas were the two alternatives that were seen to be the most successful at leveraging economic development.

TABLE 13: Support Economic Development at Station Areas

Support Economic Development at Station Areas			
Measure	Potential for Economic Development at Stations	Weighted Travel Time From Targeted Activity Center to CBD	
Methodology Information	Qualitative Score: -5 to 5	In minutes. East Activity Center: Independence Center. Southeast Activity Center: Truman Sports Complex	
Segment	Corridor-wide	East	Southeast
No Build	0	71	40
TSM	1	52	40
DMU - Truman	3	82	40
ES - Linwood	5	73	45
ES - Truman	5		
BRT - Linwood	2		
BRT - Truman	2		
DMU/ES - Linwood	4		
DMU/ES - Truman	4		
DMU/BRT - Linwood	2		
DMU/BRT - Truman	2		

3.1.2.3 Sustainability

The Mid-America Regional Council and its partner agencies have done much planning to support sustainability in the Kansas City Metropolitan Area. Due to the length of passenger trips being longer on the DMU mode than the Enhanced Streetcar mode, the reduction in fuel consumption, VMT, VHT and delay are better for the DMU.

TABLE 14: Supports Regional Sustainability Goals

Supports Regional Sustainability Goals				
Measure	<i>Change in Fuel Consumption</i>	<i>Change in Regional VMT</i>	<i>Change in Regional VHT</i>	<i>Change in Regional Delay</i>
Segment	<i>Regional</i>	<i>Regional</i>	<i>Regional</i>	<i>Regional</i>
No Build	0	0	0	0
TSM	-300	-8300	-400	-90
DMU - Truman	-11000	-274300	-7800	-1310
ES - Linwood	-11100	-277200	-7900	-2160

3.1.3 COST EFFECTIVENESS

The Cost Effectiveness measure is one of the scoring categories in the FTA New Starts process. This includes upfront capital costs, operations and maintenance and the effectiveness of the service.

3.1.3.1 Capital Costs

Capital costs are the upfront costs required to construct the transit system. For a rail alternative, this includes the costs to construct track, signaling and station amenities. It also includes costs to build a specialized maintenance facility and purchase the DMU and Enhanced Streetcar vehicles. For bus alternatives, capital costs can include and fixed guideway elements, stations and the buses themselves. Due to that, the bus alternatives provide the lowest possible capital costs. Because the Enhanced Streetcar is run by electricity, a catenary system is required to be constructed on the route. This makes the cost to construct an Enhanced Streetcar substantially higher than to construct the DMU.

TABLE 15: Capital Costs

Measure	Capital Costs									
Methodology	In 2012 \$M									
Segment	Total		Common		East		Southeast		Maintenance and Vehicles	
	Low	High	Low	High	Low	High	Low	High	Low	High
No Build										
TSM	\$69.00	\$77.00								
DMU - Truman	\$832.01	\$1,051.85	\$226.81	\$269.22	\$206.96	\$254.03	\$230.37	\$283.17	\$167.87	\$245.43
ES - Linwood	\$1,644.33	\$1,956.62	\$371.44	\$442.57	\$516.72	\$616.58	\$501.28	\$598.09	\$254.89	\$299.38
ES - Truman	\$1,654.78	\$1,968.99	\$381.89	\$454.95	\$516.72	\$616.58	\$501.28	\$598.09	\$254.89	\$299.38
BRT - Linwood	\$557.48	\$689.96	\$85.05	\$107.59	\$149.66	\$187.22	\$307.91	\$377.74	\$14.86	\$17.41
BRT - Truman	\$555.53	\$686.59	\$83.10	\$104.22	\$149.66	\$187.22	\$307.91	\$377.74	\$14.86	\$17.41
DMU*/ES - Linwood	\$1,334.57	\$1,594.07	\$371.44	\$442.57	\$206.96	\$254.03	\$501.28	\$598.09	\$254.89	\$299.38
DMU*/ES - Truman	\$1,345.02	\$1,606.45	\$381.89	\$454.95	\$206.96	\$254.03	\$501.28	\$598.09	\$254.89	\$299.38
DMU*/BRT - Linwood	\$767.79	\$984.79	\$85.05	\$107.59	\$206.96	\$254.03	\$307.91	\$377.74	\$167.87	\$245.43
DMU*/BRT - Truman	\$765.84	\$981.42	\$83.10	\$104.22	\$206.96	\$254.03	\$307.91	\$377.74	\$167.87	\$245.43
*DMU alignment change in hybrids will require additional costing work										

3.1.3.2 Operating Costs

Operating costs and the annual costs needed to keep the system operational. Of the build alternatives, the DMU alternative has the lowest operating cost per mile.

3.1.3.3 Cost-Effectiveness

The measure of Capital Costs per Passenger compares the costs of each alternative with how much ridership it can attract. As described earlier, the Enhanced Streetcar has the highest ridership, but because of the high cost, it has the highest cost per passenger. Additionally, because the benefits of the Enhanced Streetcar can only be found in the urban areas, the cost-effectiveness is much worse in the suburban areas. While the BRT is much less expensive than the Enhanced Streetcar, its benefits are also most prominent in the urban areas. Of the build alternatives, the DMU is the most cost-effective for the suburban market that was identified as the main market for this commuter study.

3.1.4 IMPACTS

As a precursor to a NEPA analysis, the alternatives analysis provides some information about the possible environmental and traffic impacts for each possible alternative.

3.1.4.1 Environmental Impacts

Environmental impacts evaluated were potential residential and non-residential displacements, park impacts, water system impacts, and visual and aesthetic impacts. Due to the size and scale of the vehicle and guideway, the DMU alternative on Truman Road had the most possible residential and non-residential displacements with 47 of the 57 displacements on the Common segment and 22 of 26 displacements on the East segment being within environmental justice census tracts. The East corridor also has substantial residential displacements for all capital intensive alternatives. Because of the use of the existing Rock Island railroad, there are no potential displacements in the Southeast Corridor. The DMU alternative on Truman Road also had the most possible park impacts on the Common segment with 28.5 acres total in 3 parks being affected. Also similar to displacements, there are park impacts in the East corridor for most modes. All of the build alternatives had impact to wetlands, streams and floodplains. The largest impacts are in the East corridor and are similarly impactful for most modes. The highest visual and aesthetic impacts are for alternatives on Truman Road. Alternatives in the East segment have the lowest visual and aesthetic impacts.

TABLE 16: Potential Residential and Non-Residential Displacements

Measure	Potential Number of Residential Displacements			Potential Number of Non-Residential Displacements		
	Common	East	Southeast	Common	East	Southeast
<i>Methodology Information</i>						
Segment	Common	East	Southeast	Common	East	Southeast
No Build	0	0	0	0	0	0
TSM	0	0	0	0	0	0
DMU - Truman	44	31	0	25	1	0
ES - Linwood	7	27	0	6	4	0
ES - Truman	7	27	0	6	4	0
BRT - Linwood	0	27	0	0	4	0
BRT - Truman	0	27	0	0	4	0
DMU/ES - Linwood	6	2	0	6	2	0
DMU/ES - Truman	6	2	0	6	2	0
DMU/BRT - Linwood	0	0	0	0	0	0
DMU/BRT - Truman	0	0	0	0	0	0

TABLE 17: Potential Parks Impacts

Measure	Parks Impacts		
	<i>In acres (number of parks)</i>		
Segment	Common	East	Southeast
No Build			0
TSM			0
DMU - Truman	28.5 (3)	0	0
ES - Linwood	5.4 (1)	4.2 (1)	0
ES - Truman	0	3.8 (1)	0
BRT - Linwood	5	4.2 (1)	0
BRT - Truman	0	4.2 (1)	0
DMU/ES - Linwood	15.0 (1)	0	0
DMU/ES - Truman	0	0	0
DMU/BRT - Linwood	5.4 (1)	0	0
DMU/BRT - Truman	0	0	0

TABLE 18: Water System Impacts

Measure	Wetland Impacts			Stream Impacts			Floodplain Impacts		
	<i>In acres</i>			<i>In feet</i>			<i>In acres</i>		
Segment	Common	East	Southeast	Common	East	Southeast	Common	East	Southeast
No Build	0	0	0	0	0	0	0	0	0
TSM	0	0	0	0	0	0	0	0	0
DMU - Truman	13.8	35.1	8.0	5503	23321	34308	134.9	114.8	156.5
ES - Linwood	2.4	37.5	4.5	4280	21893	18480	72.9	107.7	81.1
ES - Truman	2.3	36.5	4.8	4179	21295	18369	72.3	105.6	80.5
BRT - Linwood	0.7	37.4	2.8	4322	21968	8256	73.9	107.1	24.8
BRT - Truman	0.7	37.5	2.4	4985	21744	8321	73.3	107.9	24.2
DMU/ES - Linwood	2.2	15.2	4.1	4041	5524	17050	71.0	14.2	80.5
DMU/ES - Truman	2.2	11.6	4.6	4062	5845	17615	71.7	12.0	81.7
DMU/BRT - Linwood	0.7	11.8	2.4	4046	3353	8224	73.5	12.9	24.4
DMU/BRT - Truman	0.7	12.4	2.4	4850	3342	8255	73.8	13.2	25.2

TABLE 19: Visual / Aesthetic Impacts

Measure	Visual/Aesthetic Impacts		
	<i>Includes Visual Barriers - Structures, View Sheds (High/Medium/Low Scale)</i>		
Segment	Common	East	Southeast
No Build	L	L	L
TSM	L	L	L
DMU - Truman	H	L	M
ES - Linwood	M	L	M
ES - Truman	H	L	M
BRT - Linwood	L	L	M
BRT - Truman	L	L	M
DMU/ES - Linwood	M	L	M
DMU/ES - Truman	H	L	M
DMU/BRT - Linwood	L	L	L
DMU/BRT - Truman	L	L	L

3.1.4.2 Traffic Impacts

Both positive and negative traffic impacts were analyzed. The DMU alternative decreases the VMT more for each rider gained, but the Enhanced Streetcar results in the lowest VMT of all modeled alternatives. Additionally, the impacts to traffic operations – both during construction and during operation – were compared. The DMU on Truman Road has the greatest impact on traffic operations.

TABLE 20: Traffic Impacts

Traffic Impacts				
Measure	Change in Regional VMT	Congestion / Effect On Traffic Operations		
Methodology		Qualitative Score: -5 to 5		
Segment	Regional	Common	East	Southeast
No Build	0	4	4	4
TSM	-8300	4	4	4
DMU - Truman	-274300	-5	2	4
ES - Linwood	-277200	-2	-3	4
ES - Truman		-2	-3	4
BRT - Linwood		-1	-3	4
BRT - Truman		-1	-3	4
DMU/ES - Linwood		-2	2	4
DMU/ES - Truman		-2	2	4
DMU/BRT - Linwood		-1	2	4
DMU/BRT - Truman		-1	2	4

3.1.5 EQUITY

This measurement is used to determine if low income and minority groups have a disproportionate negative impact due to the project. The percentages of impact found are in keeping with socioeconomic levels in each of the corridor. The Environmental Justice displacements are very high for the DMU on Truman Road and high, proportionally, for the fewer impacts on Linwood Blvd.

TABLE 21: Equity Impacts

Equity						
Measure	Percentage of Households Within 1/2 Mile of Alignment that are Low Income			Proportion of Displacements Within EJ Census Tracts		
Segment	Common	East	Southeast	Common	East	Southeast
No Build	n/a	n/a	n/a	0	0	0
TSM	28.19%	7.78%	6.35%	0	0	0
DMU - Truman	30.60%	8.76%	6.46%	47/57	0/21	0/0
ES - Linwood	28.27%	7.75%	4.55%	6/6	2/2	0/0
ES - Truman	28.91%	7.67%	4.55%	6/6	2/2	0/0
BRT - Linwood	28.27%	7.75%	4.55%	0/0	0/0	0/0
BRT - Truman	28.91%	7.67%	4.55%	0/0	0/0	0/0
DMU/ES - Linwood	28.27%	8.23%	4.56%	6/8	22/26	0/0
DMU/ES - Truman	28.92%	8.23%	4.56%	6/8	22/26	0/0
DMU/BRT - Linwood	27.47%	8.23%	4.58%	0/0	22/26	0/0
DMU/BRT - Truman	28.92%	8.23%	4.56%	0/0	22/26	0/0

TIER 2 SCREENING SUMMARY

The Project Partnership Team evaluated the alternatives identified for Tier 2 and concluded that the constructability, parks and equity challenges with the DMU alternatives operating along Truman Road would be too challenging for implementation. Because the DMU Alternative offered benefits in the East and Southeast corridors, due to the availability of the rail corridor and proximity to key activity centers, it was determined that more study would be needed to determine a more constructible alignment through the common segment. To meet that need, a common segment alternative that travelled adjacent to the Union Pacific Neff Yard with a termination point in the River Market (3rd and Grand) was identified for further analysis. Additionally, right sizing of the alternatives to a cost-effective location was needed prior to making an LPA decision.

EAST CORRIDOR

Two alternatives were continued into the right-sizing effort and analysis for the East Corridor. These alternatives were:

- Transportation Systems Management (TSM) Express Bus Alternative: Oak Grove to 10th & Main via I-70 (mixed traffic)
- Diesel Multiple Unit (DMU) Alternative: Oak Grove to 3rd and Grand via KCS Railroad and new build

Table 22 on page 28 provides output from the screening of the two identified alternatives.

In analyzing the two remaining alternatives, it was determined that both alternatives bring value as part of the implementation of an enhanced transit solution along the East corridor. The express bus alternative can be implemented fairly quickly (requiring only the cost of additional buses, station enhancements and annual operations). Because the DMU alternative attracted more riders and had better opportunities for economic development near transit stations, the **DMU was identified as the preferred alternative for the East Corridor.**

SOUTHEAST CORRIDOR

Four alternatives were continued into the right-sizing effort and analysis for the Southeast Corridor. These alternatives were:

- Transportation Systems Management (TSM) Express Bus Alternative: Pleasant Hill to 10th and Main via M-291, M-350, I-435 and I-70 (mixed traffic)
- Diesel Multiple Unit (DMU) Alternative: I-470 and View High Drive (Lee's Summit) to East corridor (Leeds Junction) via Rock Island corridor
- Enhanced Streetcar Alternative: Downtown Raytown (63rd Street) to downtown Kansas City via the Rock Island corridor (separate guideway), Stadium Drive (mixed traffic), Van Brunt Blvd (mixed traffic), 31st Street (mixed traffic), Linwood Blvd (mixed traffic) and Main Street (mixed traffic – in portions using the downtown streetcar tracks)
- Bus Rapid Transit Alternative: Pryor Road (Lee's Summit) to downtown Kansas City via the Rock Island corridor (separate busway), Stadium Drive (mixed traffic), Van Brunt Blvd (mixed traffic), 31st Street (mixed traffic), Linwood Blvd (mixed traffic) and U.S. 71 or Main Street

Table 23 on page 29 provides output from the screening of the four identified alternatives.

TABLE 22: Tier 2 Right-Sizing East Alternatives

Measure	Unit of Measure	TSM – Express Bus	Rivermarket DMU
End to End Scheduled Travel Time	In Minutes		35.2
Average Transit Travel Speed	In MPH	35-51	57
Travel Time - Blue Springs CBD to 10th and Main (KCMO)	In Minutes	57	51
Travel Time - Oak Grove to 10th and Main (KCMO)	In Minutes	59	61
Transit Ridership	Daily Ridership	600	1,150-2,800
Max Load Point	Peak Number of Passengers During Peak	Varies, separate origins for each city	340
Households Within Half Mile of Stations	GIS Analysis	6,379	8,785
Jobs Within Half Mile of Stations	GIS Analysis	48,701	30,078
Opportunities for Transit Oriented Development	Five-point scale: 1(low) – 5(high) Average from all analyzed stations.	1	3.5
Capital Cost (Common and East Segments)	Low/High in 2012 \$M	\$35 - \$39 million	\$327 - \$434 million
Operating Cost	In Dollars	\$3,600,000	\$10,666,640
Number of Residential Displacements	Full and Partial	0	0
Number of Non-Residential Displacements	Full and Partial	0	7
Vehicular Traffic Impacts	Five-point scale: 1(low) – 5(high)	2	1
Qualitative Analysis of Negative Environmental Justice Impacts	Five-point scale: 1(low) – 5(high)	1	1
Qualitative Analysis of Positive Environmental Justice Impacts	Five-point scale: 1(low) – 5(high)	2	2

TABLE 23: Tier 2 Right-Sizing Southeast Alternatives

Measure	Methodology	TSM- Express Bus	DMU *	Enhanced Streetcar	Bus Rapid Transit
Southeast Terminus		Pleasant Hill	I-470 and View High Drive	Downtown Raytown	I-470 and Pryor Road in Lee's Summit
End to End Scheduled Travel Time	In Minutes	Varies, separate origins for each city	40	26.4	33.3
Average Transit Travel Speed	In MPH	35 to 37	59	25.71	25.5
Travel Time - View High Drive/Pryor Road (Lee's Summit) to Kansas City CBD	In Minutes	35	58	n/a	56
Transit Ridership	Daily Ridership	350	500-1,000	1,850**	500**
Households Within Half Mile of Stations	GIS Analysis	4,326	2,718	9,111	7,292
Jobs Within Half Mile of Stations	GIS Analysis	45,443	4,550	25,197	59,056
Opportunities for Transit Oriented Development	Five-point scale: 1(low) - 5(high) Average from all analyzed stations.	1	3.14	3.5	2
Capital Cost	Low/High in 2012 \$M	\$35 - \$39 million	\$170 - \$225 million	\$402 - \$538 million	\$230 - \$283 million
Operating Cost	Annual Costs per Line	\$3,600,000	\$4,318,260	\$6,108,464	\$3,171,130
Number of Residential Displacements	Full and Partial	0	0	3	0
Number of Non- Residential Displacements	Full and Partial	0	0	6	0
Vehicular Traffic Impacts	Five-point scale: 1(low) - 5(high)	1	2	4	2
Qualitative Analysis of Negative Environmental Justice Impacts	Five-point scale: 1(low) - 5(high)	1	1	1	1
Qualitative Analysis of Positive Environmental Justice Impacts	Five-point scale: 1(low) - 5(high)	2	2	4	3

*Southeast Segment only - does not include common line (wye to Rivermarket)

**Note: the majority of this ridership is along Linwood Blvd and not along the same corridor as the DMU line.

The following tables show the effectiveness of meeting the Purpose and Need.

TABLE 24: Transportation Effectiveness at Meeting the Purpose and Need

Transportation Need	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit
Improve travel times				
Improves on-time performance				
Provides reverse commute options				

TABLE 25: Economic Development and Land Use Effectiveness at Meeting the Purpose and Need

Transportation Need	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit
Support Existing Plans				
Connect activity centers and redevelopment sites				

TABLE 26: Sustainability Effectiveness at Meeting the Purpose and Need

Transportation Need	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit
Improve the region’s air quality				
Provide environmentally sensitive travel alternatives				

In analyzing the four remaining alternatives, it was identified that both the BRT and Enhanced Streetcar alternatives were more effective at meeting short-trip transit needs on Linwood Blvd than long-term commuter transit needs between Lee's Summit and downtown Kansas City. Because of this, it was recommended that analysis of potential enhanced transit along Linwood Blvd should be the focus of additional study, but that the commuter corridor need could be best served in the Southeast corridor through a phased implementation approach including express bus and DMU. Because the costs are smaller for the express bus alternative, it could serve all the communities in the corridor while the DMU service is being funded, design and implemented. The express bus service could also serve areas south of Lee's Summit (such as Greenwood and Pleasant Hill), which will prime those communities for potential DMU service in the future.

It was also identified that the acquisition and use of the Rock Island corridor for trail and transit use was a key priority for the Project Partnership Team.

In analyzing the life cycle investment as well as the annual operating cost, the DMU alternative is the cost-effective build solution as shown in Table 27.

ECONOMIC DEVELOPMENT

Economic Development Benefits of a Transit Investment:

- Numerous studies show benefit to property values for being in proximity of rail transit
 - Residential property premium: 3.5-20%
 - Commercial property premium: 91-120%
- MARC: ½ mile around stations = \$971M in additional regional investment (by 2040)
- Inclusion of a new transit mode also introduces new commercial and residential markets.

TABLE 27: Cost Effectiveness Data

Technical Output	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit
Route Details	Separate origins and destinations along each route	East: 3rd and Grand - Oak Grove Southeast: 3rd and Grand to Pleasant Hill	Southeast: Downtown to Downtown Raytown	Southeast: Downtown to Lee's Summit
East Corridor: Capital Cost/Annual Rider	\$19.39	\$22.55		
East Corridor: Operating Cost/Annual Rider	\$22.64	\$20.38		
South East Corridor: Capital Cost/Annual Rider	\$33.24	\$30.12	\$23.97	\$160.38
South East Corridor: Operating Cost/Annual Rider	\$38.81	\$21.73	\$12.46	\$23.93

5 LOCALLY PREFERRED ALTERNATIVE

The Locally Preferred Alternative is the result of consideration and analysis of reasonable modal and alignment alternatives to provide service that meets the purpose and needs defined in the project. The project partners, stakeholders and the public concluded that a successful transit solution for the East and Southeast corridors must meet needs for transportation, economic development and sustainability.

For *transportation*, the LPA should provide:

- faster travel times
- service reliability, even as congestion worsens
- reverse commute opportunities

For *economic development*, the LPA should:

- support existing plans
- connect activity centers and redevelopment sites

For *sustainability*, the LPA should:

- improve the region's air quality
- provide environmentally-sensitive travel alternatives

DMU as LPA offers:

- Mobility and choice to travelers
- Cost savings over driving
- Consistent travel times
- Economic development at station areas
- Employment through construction and operations

To that end, express bus, bus rapid transit, enhanced streetcar and diesel multiple unit (DMU) alternatives were evaluated to determine their effectiveness at meeting the identified needs. The evaluation also included cost, potential ridership, constructability, environmental impacts, traffic impacts and equity. The screening process included two decision points where alternatives were reduced. In the end, an LPA including a long-term goal of DMU in both corridors was identified as the best at meeting the diverse needs for the two corridors. The following tables depict each alternative’s effectiveness at meeting the need statements.

TABLE 28: Alternative’s Effectiveness at Meeting Transportation Need Statements for both corridors

Transportation Need	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit	Analysis
Improves travel times	Low	High	Medium	Medium	The DMU mode operates in an exclusive guideway for the entirety of the corridor. Average travel speeds are highest on this mode.
Improves on-time performance	Low	High	Medium	Medium	The DMU mode operates in an exclusive guideway for the entirety of the corridor. Average travel speeds are highest on this mode.
Provides reverse commute options	Medium	High	Low	Medium	The DMU alternative travels furthest into the suburban areas and therefore can meet the most reverse commute demands. The availability of reverse commute is contingent upon the hours of service offered.

TABLE 29: Alternative’s Effectiveness at Meeting Economic Development and Land Use Need Statements for both corridors

Economic Development and Land Use Need	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit	Analysis
Support Existing Plans	Low	High	High	Medium	Numerous land use and economic development plans throughout the study area identify the need for enhanced transit and transit amenities. The Enhanced Streetcar is supported in plans identified for Linwood Blvd. The DMU is supported in plans in Blue Springs and Lee’s Summit.
Connect activity centers and redevelopment sites	Low	High	High	Medium	The rail-based strategies are best able to catalyze potential redevelopment at activity centers (the DMU in the suburban areas – the Enhanced Streetcar along Linwood Blvd.)

TABLE 30: Alternative's Effectiveness at Meeting Sustainability Need Statements for both corridors

Sustainability/ Land Use	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit	Analysis
Improve the region's air quality	Medium	High	Low	Low	Transit operations that travel longer distances offer the best opportunity for improving the region's air quality. The DMU and Express Bus options travel the longest distance. Because the DMU vehicle is in its own guideway, it will have the least dwell time, thereby providing a service that emits the least air pollutants.
Provide environmentally sensitive travel alternatives	Medium	High	Medium	Medium	All three build alternatives provide access to regional bicycle and pedestrian amenities, including the Rock Island corridor. These vehicles also accommodate bicycles and the stations will have enhanced bicycle amenities. The terminus of the DMU at 3rd and Grand provides connections to the downtown streetcar, bike share and local pedestrian amenities.

TABLE 31: Alternative's Technical Output of East Alignment

Technical Output	Express Bus	DMU	Analysis
Route Details	Separate origins and destinations along each route	3rd and Grand - Oak Grove	
Ridership	600	1,150-2,800	The DMU is most effective at serving the suburban market. Ridership for the Enhanced Streetcar and BRT is most effective along Linwood.
Capital Cost	\$35-\$39M per corridor	\$10.7	Of the build alternatives, the DMU is the most cost effective over the longest distance.
Operating Cost	\$3.6M per corridor	\$10.7M	The bus alternatives are the most affordable to operate.
End to End Travel Time	Varies - separate origin and destination for each city	35 min, 15 sec	All alternatives provide comparable travel times.

TABLE 32: Alternative’s Technical Output of Southeast Alignment

Technical Output	Express Bus	DMU	Enhanced Streetcar	Bus Rapid Transit	Analysis
Route Details	Separate origins and destinations along each route	Southeast: 3rd and Grand to Pleasant Hill	Downtown to Downtown Raytown	Downtown to Lee’s Summit	
Ridership	Southeast: 350	Southeast: 500-1,000	1,850 (most occurs on Linwood Blvd)	500 (most occurs on Linwood Blvd)	The DMU is most effective at serving the suburban market. Ridership for the Enhanced Streetcar and BRT is most effective along Linwood.
Capital Cost	\$35-\$39M per corridor	Southeast: \$4.3M	\$402-\$538M	\$230-\$283M	Of the build alternatives, the DMU is the most cost effective over the longest distance.
Operating Cost	\$3.6M per corridor	Southeast: \$4.3M	\$6.1M	\$3.2M	The bus alternatives are the most affordable to operate.
End to End Travel Time	Varies – separate origin and destination for each city	Southeast: 22 min, 59 sec	26 min, 22 sec	32 min, 22 sec	All alternatives provide comparable travel times.

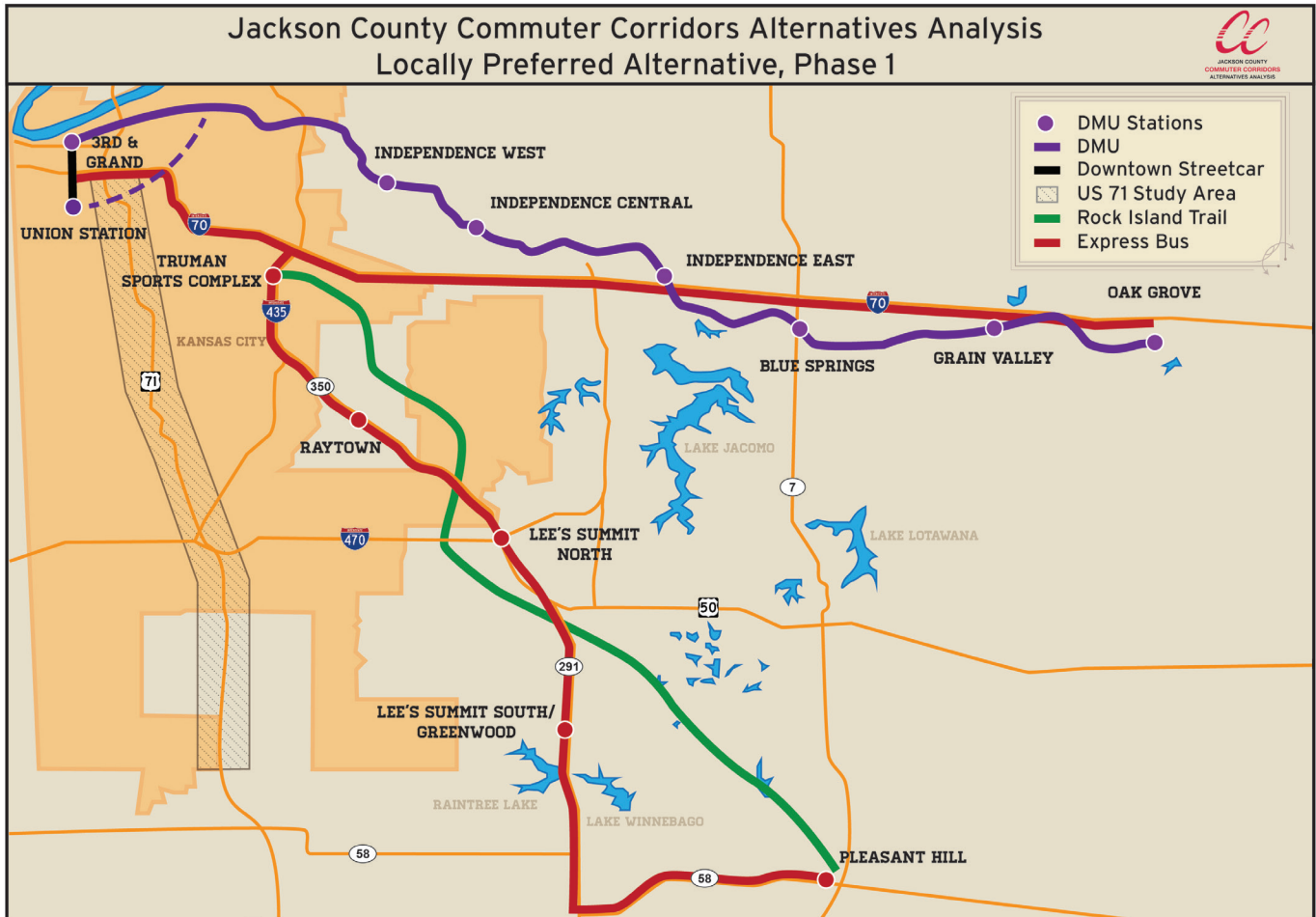
THE LOCALLY PREFERRED ALTERNATIVE – A LONG-TERM STRATEGY FOR DMU IN BOTH CORRIDORS

In evaluating the potential alternatives, only one mode was able to effectively meet all three of the expressed needs (transportation, economic development, sustainability). While the DMU alternative is the long-term strategy for transit enhancement in both corridors, a phased approach will be necessary for implementation. This strategy will include implementation of enhanced express bus as an immediate step, acquisition of key corridors and, finally, implementation of the DMU strategy. The phased approach is as follows:

PHASE 1

- Immediate/Near-term express bus service in I-70 and Rock Island Corridors.
- Immediate/Near-term bicycle and pedestrian trails, including the Rock Island/Katy Trail extension. Please Show the Rock Island Trail extending to Pleasant Hill/ the county line.
- Construction & Implementation of I-70 DMU Service.
- Realignment of local transit routes and deployment of supplemental local feeder and circulator services.

FIGURE 6: Locally Preferred Alternative - Phase 1



East Corridor

Mode: Diesel Multiple Unit (DMU)

Route: The first phase of development will operate from Oak Grove in eastern Jackson County to 3rd and Grand in the River Market. This route will operate on the Kansas City Southern rail line that is parallel to I-70 until west of Independence, where it will travel adjacent to the Union Pacific Neff Yard until it terminates in the vicinity of 3rd and Grand. Stations will be located in Oak Grove, Grain Valley, Blue Springs, Independence and the River Market.

DMU Stations are identified at the following (locations pending):

- Oak Grove - 11th Street between Route F and Clinton Street
- Grain Valley - Front Street and Main Street
- Blue Springs - Main Street between 12th and 14th Streets
- Independence - East of Little Blue Parkway at Jackson Drive
- Independence - Noland Road at 32nd Street
- Kansas City - 2nd and Grand

Southeast Corridor

Mode: Express Bus

Route: For the Rock Island Corridor, enhanced express bus service in the M-350 corridor will be implemented, similar to the currently offered services in Lee’s Summit, but with the addition of routes from Pleasant Hill, Greenwood and Raytown. Services will also be offered more frequently and for longer spans during the day. In addition to additional enhanced transit service, enhancements to park and ride facilities on both corridors will be part of the Phase 1 implementation strategy.

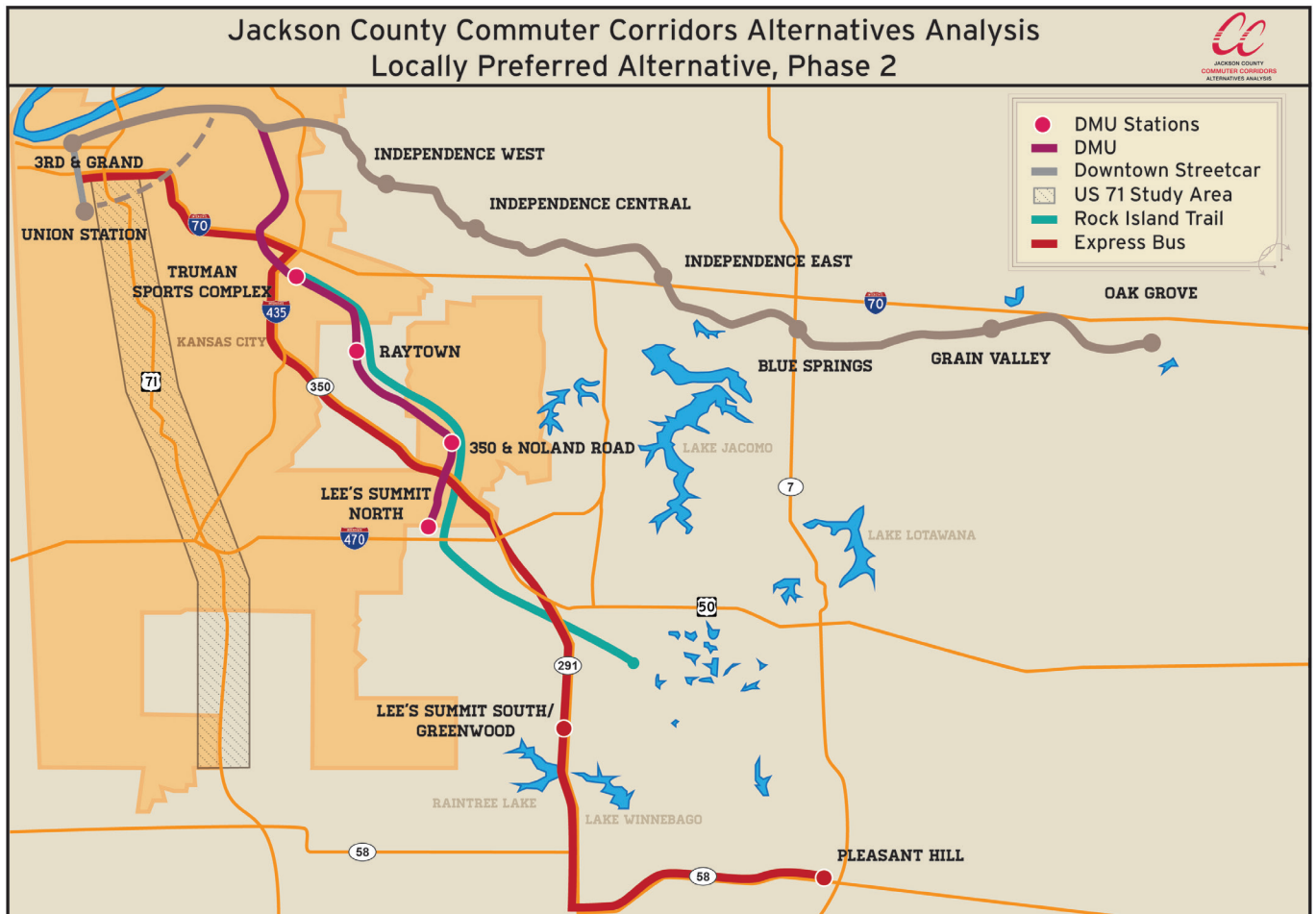
Mode: Bicycle/Pedestrian

Route: As part of a strategy to preserve the Rock Island corridor and extend the Katy Trail into Kansas City, Phase 1 would include the development of a recreational trail along or adjacent to the Rock Island Railroad from the Truman Sports Complex to Pleasant Hill. This trail would connect with trails throughout Jackson County and would be constructed to not preclude potential transit development in the corridor.

PHASE 2

Extension of DMU on Rock Island The colored lines in Figure 7 show the enhancements made during Phase 2.

FIGURE 7: Locally Preferred Alternative, Phase 2



Southeast Corridor

Mode: Diesel Multiple Unit (DMU)

Route: As an extension of the I-70 line, a segment that travels southeast via the Rock Island corridor is part of the Phase 2 implementation plan. In this phase, an extension would split from the main I-70 commuter line at Leed's Junction and would travel southeast along the Rock Island with stations at the Truman Sports Complex, Downtown Raytown, 350 and Noland Road, and I-470 and View High Drive in Lee's Summit.

In addition to improvements to the rail line and the acquisition of DMU vehicles, stations will be developed at each location that allow for parking, connections to other modes, and serve as landmarks in the community. Areas around transit stations will be planned to consider Transit Oriented Development (TOD) principles to best optimize the investment in transit.

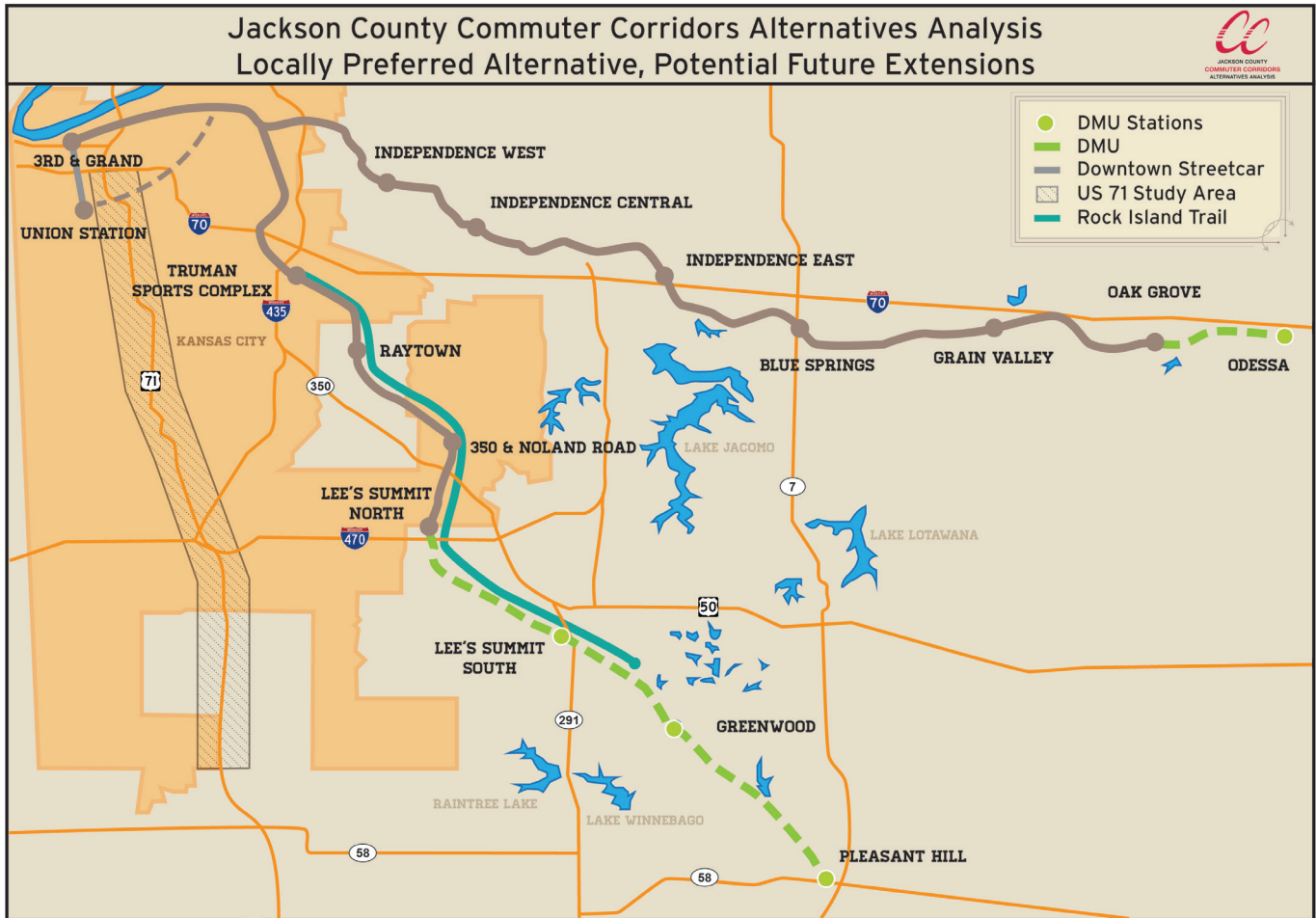
DMU Stations are identified at the following locations (preliminary):

- Lee's Summit - I-470 and View High Drive
- Kansas City - 350 and Noland Road
- Raytown - 63rd and Raytown Road
- Kansas City - Truman Sports Complex

POTENTIAL FUTURE EXTENSIONS

Implementation of enhanced transit in the U.S. 71 corridor and extensions of the Rock Island and I-70 lines. The colored lines in Figure 8 show the enhancements made during Potential Future Extensions.

FIGURE 8: Locally Preferred Alternative, Potential Future Extensions



East Corridor

Mode: Diesel Multiple Unit (DMU)

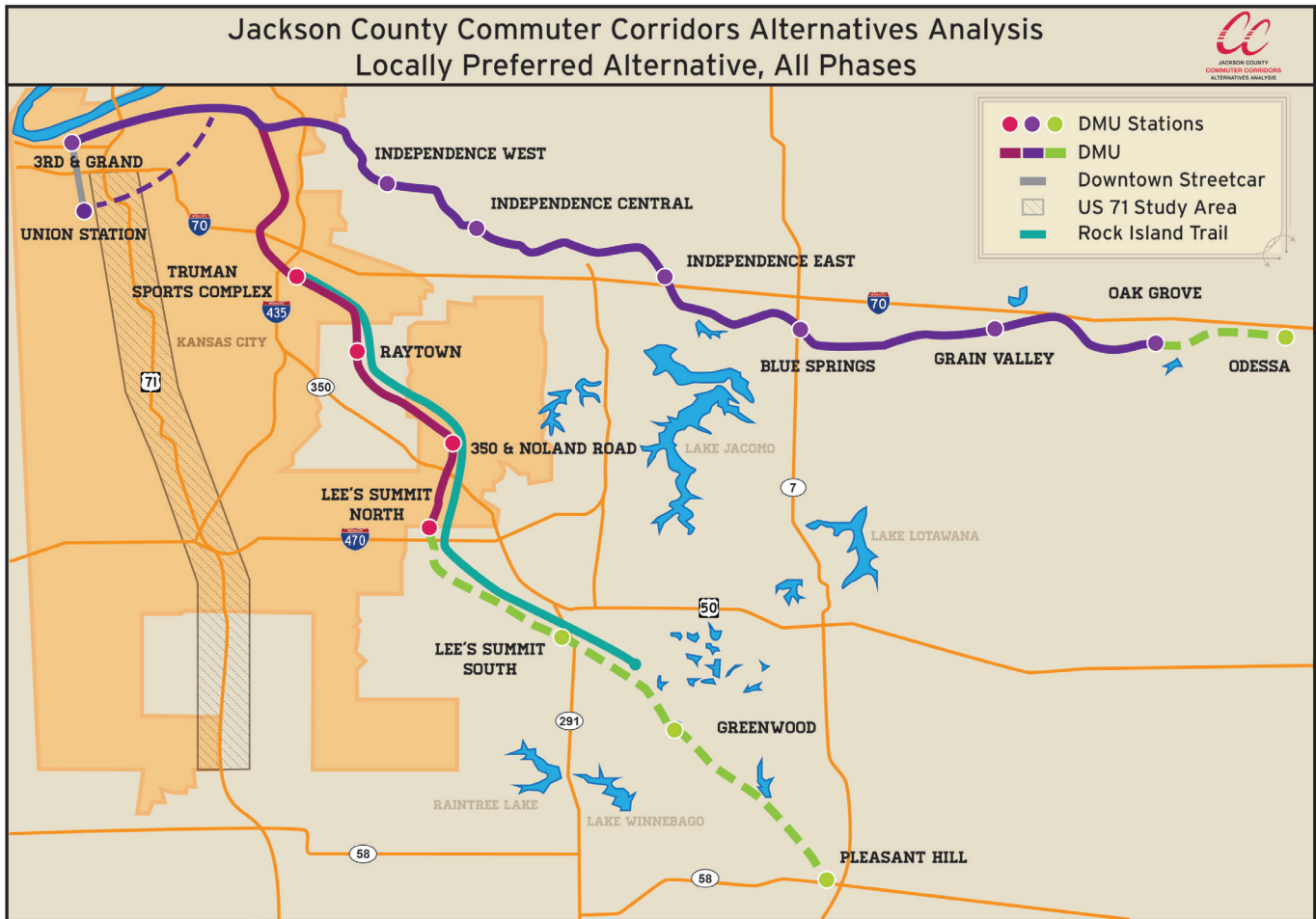
Route: The I-70 corridor could potentially extend from the Phase 2 terminus of Oak Grove to Odessa. At this terminus point, a station would be located that allows for parking and multimodal connections.

Southeast Corridor

Mode: Diesel Multiple Unit (DMU)

Route: The Rock Island corridor could potentially extend from the Phase 2 terminus of northern Lee’s Summit to Pleasant Hill. Access to the existing rail corridor would need to be secured and new stations would be located at south Lee’s Summit, Greenwood and Pleasant Hill and will allow parking and multimodal connections.

FIGURE 9: Locally Preferred Alternative, All Phases



6 FINANCING STRATEGY AND NEXT STEPS

In order to implement the long-term strategy of DMU, in both corridors a specific funding source will need to be identified and enacted. While a number of financial strategies and tools exist, for the purpose of the LPA, the goal was to ensure there was a feasible financial strategy to support the implementation of the LPA recommendations. Based on an analysis of multiple funding sources the Project Partnership Team has identified that a county-wide sales tax increase as a feasible mechanism for supporting the construction, operations, and maintenance of the services in question.

TABLE 33: Evaluated Financing Strategies

Revenue Sources	Use	Considerations	Revenue Estimate	
Sales Tax	Operating and Capital	<ul style="list-style-type: none"> • Significant revenue at low rates • Easy to administer • Subject to county-wide voter approval • Successfully implemented by many transit agencies • Revenue needs determine size the rate • Subject to economic cycles 	1-cent sales tax = \$86 million in Jackson County (annually)	Recommended as a funding strategy
Property Tax	Operating and Capital	<ul style="list-style-type: none"> • Broad coverage (business and individuals) • Easy to administer • Generates significant revenue at low rates • Subject to county-wide voter approval • Competes with school districts and other beneficiaries of the tax 	One mill generates \$82,500 annually	Not recommended as a funding strategy
Farebox Revenue	Operating	<ul style="list-style-type: none"> • Direct users pay for the project • Ease of revenue collection • Limited revenues available 	Dependent on the system and service type – generally supports 20% of operating costs	Recommended as a funding strategy
Federal Funding	Capital	<ul style="list-style-type: none"> • Helps jump start programs • Reduces needs for local revenue • Competition nationally for such programs • Funding is being reduced 	The New Starts Program could provide 30-50% of construction costs.	While this source will continue to be considered, it is recommended that the sales tax source be large enough to fund the entire cost to construct and operate the system.

NEXT STEPS

With an LPA identified, the Project Partnership Team is now working on the following tasks that will continue the implementation of the LPA:

- **Completing the U.S. 71 Transit Study:** The U.S. 71 Transit Study is currently in the second tier of evolution of potential enhanced transit along or parallel to the U.S. 71 corridor between downtown Kansas City and Grandview. The Locally Preferred Alternative for this study will be identified in early 2013.
- **Finalizing Negotiations with Partner Railroads:** Agreements will be required with partner railroads in order to implement the LPA. The Union Pacific Railroad currently owns the Rock Island Railroad (Southeast Corridor) and the Neff Yard (East Corridor – common segment with Southeast). The Kansas City Southern owns the KCS line traveling east from Kansas City (East Corridor). Negotiations continue with the railroads and will be finalized in 2013.
- **Initiating Further Project Development:** With an LPA identified, the Project Partnership Team will now be moving the project further into implementation by starting any required environmental study and conceptual engineering.
- **Planning for Circulation Services in Suburban Communities:** Access to stations along the LPA in suburban communities may require enhancements. The Project Partnership Team will coordinate with local communities regarding enhanced transit circulation.

APPENDIX

- A. **Purpose and Need** – This document describes the transportation needs in the study area, as well as goals and objectives for the transportation solution.
- B. **Evaluation Methodology** – This document describes the methodology for evaluating the alternatives.
- C. **Tier 1 Screening** – This document provides output from the first tier of screening of alternatives.
- D. **Tier 2 Definitions** – This document describes the information related to each of the alternatives. It only describes the facts about the alternatives and does not evaluate the alternatives.
- E. **Land Use Report** – This document describes opportunities and constraints related to station area planning.
- F. **Tier 2 Screening** – This document provides output from the second tier of screening of alternatives.
- G. **Gap Analysis Paper** – This document describes previous analysis of the two key corridors and is used to identify work that can be used from previous reports and work that needs to be completed through this process.
- H. **Ridership Methodology** – This document describes the process through which MARC's travel demand model was used to analyze alternatives for this study.
- I. **Costing Detail** – This document summarizes the assumptions and calculations used to estimate the capital cost for each alternative.
- J. **Final Operating Plan Details** – This document identifies assumptions, calculations and analysis related to operations of the service, including operating costs, maintenance costs, hours of service and other details needed to identify annual operating costs.
- K. **Summary of Public Engagement Process** – This document summarizes and details the public and stakeholder engagement that was used in this process to assist with determining the locally preferred alternative.