Ridership Estimation

Ridership is perhaps the most important single criterion in evaluating the feasibility of commuter rail service. Commuter rail service may have several purposes such as mobility enhancement, highway congestion reduction and air quality improvement. None of these may be attained unless the service attracts sufficient passengers to make an impact. Ridership is also critical to the cost-effectiveness of a new service. Commuter rail can be a very efficient transport mode when hundreds of people are on a train, but when projected passenger volumes are in the dozens of people per train, the mode’s potential advantages are not realized.

The purpose of this first phase screening process is to identify the rail corridors with the greatest likelihood of being found feasible for commuter rail service. This initial screening involved obtaining information related to projected year 2020 population and employment densities and estimating 2020 work trip travel patterns. Rail corridors were defined to include all 19 rail lines that radiate outward from downtown Kansas City, Missouri. The ridership potential for the corridors was estimated using a sketch planning ridership estimation approach. Inputs to this model included future year trip tables, trip length information, travel times of the various travel modes and other information that represent the cost of travel by the various modes.

A more detailed assessment of commuter rail ridership will be completed in the second phase of the project. In that phase, selected potential commuter rail lines will be coded into the regional transit network. The mode choice component of the regional EMME/2 travel model will be modified and used to develop refined commuter rail ridership forecasts for each corridor studied.

The following sections describe the current forecasted future travel patterns, land use characteristics and transit service characteristics in the area potentially served by commuter rail. These factors are described here and are also part of the inputs into the forecasts of potential commuter rail ridership discussed at the end of this section on Ridership Estimation.

Current Travel Patterns

Work trip movements between counties provide a general representation of the longer distance travel market from which commuter rail would potentially attempt to attract its share of riders. This representation was estimated by utilizing county to county Journey to Work travel factored to the year 2020 from the initial U.S. Census data for the year 1990. These values were factored to Year 2020 estimates using county population forecasts. The movements from each county to Jackson County and major movements from Jackson County to other counties for Year 2020 are shown in Figure 2. These
movements represent many of the work trip movements from which a share may be attracted to commuter rail. Higher commuting travel movements typically offer a higher potential for commuter rail ridership.

**Figure 2**
Year 2020 County Journey to Work Patterns (selected counties)

Source: 1990 Census Transportation Planning Package (CTPP) journey-to-work patterns of persons 16 years or older who work outside of the home. Values factored from 1990 to 2020 by 2020 population estimates from MARC, the Policy Research Institute at the University of Kansas, and the Missouri Office of Administration Division of Budget and Planning.
**Land Use Characteristics**

The proximity of commuter rail to both population and employment is another important consideration in assessing the feasibility of commuter rail service.

**Population Density**

Forecasted year 2020 population and employment data was obtained from MARC for the areas included in the metropolitan planning area. Socioeconomic data for areas outside the metropolitan planning area was obtained from the State of Missouri Office of Administration Division of Budget and Planning and the State of Kansas Policy Research Institute, University of Kansas. The current population density for the larger commuter rail service area is shown in Figure 3. Population density for the Kansas City metropolitan area as forecast for the year 2020 is shown in Figure 4.

**Employment Density**

Forecast year 2020 employment density for the Kansas City metropolitan area is shown in Figure 5. The potential commuter rail lines converge in the downtown area of Kansas City, Missouri. Other employment areas that could be served by commuter rail or a bus circulation service include the Kansas City, Kansas downtown area, such as the Crown Center and a number of employment centers located adjacent to a rail line such as Independence and Overland Park.

**Activity Centers**

The location of major office and retail areas, as well as hospitals, colleges and other attractions located within the Kansas City metropolitan area are shown in Figure 6. As shown in the figure, some of the major activity centers are within close proximity to a rail line.

**Existing Transit**

Transit services can support the use of commuter rail transit, while in other cases, bus-oriented public transportation may be more competitive in terms of service frequency and flexibility than commuter rail service. Two types of transit services are provided in the Kansas City metropolitan area, traditional fixed route scheduled bus service and paratransit service operated primarily for elderly or disabled persons. Similar services are provided in the city of Lawrence and the city of Topeka. In the Kansas City area, there are three fixed route service providers, the Kansas City Area Transportation Authority (KCATA), Johnson County Transit (JCT) and service provided by the Unified Government of Wyandotte County (The Bus).

KCATA is the largest transit operator and is empowered by the agency’s charter to operate throughout the counties of Cass, Clay, Jackson and Platte in Missouri, and Johnson, Leavenworth and Wyandotte in Kansas. KCATA has a
Figure 3
Year 2000 Study Area Population Density

Source: US Census estimates.
Figure 4
Year 2020 Metropolitan Population Density

Source: MARC 2020 TAZs
Figure 5
Year 2020 Metropolitan Employment Density

Source: MARC 2020 TAZs.
Figure 6
Local Municipal Boundaries and Major Activity Centers
bus fleet of 250 and carries approximately 50,000 passengers each day. JCT has a bus fleet of 24 and carries approximately 800 passengers each day. The Bus has a fleet of 20 vehicles and carries approximately 1,200 passengers each day.

The city of Lawrence just began fixed route service in January 2001, which features service six days a week (Mon-Sat) on 8 fixed routes using a fleet of 10 vehicles. Topeka Transit operates 13 fixed routes and has an average daily ridership of 5,000. There are currently no public transit connections between the Kansas City metropolitan area and these other metropolitan areas located within the commuter rail study area.

AMTRAK operates on two rail lines within the Kansas City area. AMTRAK offers two runs each day in each direction between Kansas City and St. Louis. The service is operated on Union Pacific tracks that connect Warrensburg, Lee’s Summit, Independence and Kansas City, Missouri. The other AMTRAK service links to Kansas City with Chicago and Los Angeles, operating on BNSF tracks, and in general following the Missouri and Kansas Rivers traveling through or near Richmond, Kansas City, Lawrence and Topeka.

Express bus service to the Kansas City, Missouri Central Business District is provided by KCATA along I-29, US-169 in the Northland area of Kansas City, and in the Southtown corridor located directly south of the Kansas City, Missouri CBD. A less frequent level of express service is available to the Kansas City, Kansas area, the Lee’s Summit area and to a number of communities located along I-70. Johnson County Transit operates express transit service in the I-35 corridor.

The feasibility of fixed guideway transit is being studied as part of the Central Business Corridor Study being led by the city of Kansas City, Missouri. The purpose of the study is to develop a consensus on a fixed guideway public transit system in the area from the Missouri River south to 50th Street. The study has examined fixed guideway lines into the portion of Kansas City located north of the river and to an area immediately south of 50th Street. Two parallel lines running north-south, with one located on Troost Avenue and the other on Main Street have become the focus of the study. The Troost Avenue line would have a southern terminus at 53rd Street and the Main Street line would have one at 75th Street. The single northern terminus of both lines would be at the interchange of I-29 and North Oak Trafficway.

KDOT completed a I-35/US-69 Major Investment Study that supported commuter rail as part of the total I-35 strategy. This line would extend from approximately 159th Street in Olathe to Union Station in downtown Kansas City.
**Highway Travel Characteristics**

Congestion makes rail travel times more competitive with highways. The Mid-America Regional Council (MARC) prepares a long-range transportation plan that analyzes transportation needs for 20 years or more into the future. In spite of the fact that Kansas City metropolitan area can claim the highest number of freeway miles per capita of all metropolitan areas over 50,000 population located in the United States, the MARC long-range plan predicts high levels of traffic congestion on many of those freeways, which will make rail travel times more competitive with highway. A summary of the forecasted levels of congestion for major radial freeway corridors is listed in Table 4.

**Table 4**

Forecasted Travel Times to Union Station (Year 2020)

<table>
<thead>
<tr>
<th>Origin</th>
<th>Travel Times</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Highway</td>
</tr>
<tr>
<td>St. Joseph</td>
<td>67</td>
</tr>
<tr>
<td>Excelsior Springs</td>
<td>44</td>
</tr>
<tr>
<td>Richmond</td>
<td>31</td>
</tr>
<tr>
<td>Oak Grove</td>
<td>53</td>
</tr>
<tr>
<td>Warrensburg</td>
<td>71</td>
</tr>
<tr>
<td>Lee’s Summit</td>
<td>40</td>
</tr>
<tr>
<td>Belton</td>
<td>50</td>
</tr>
<tr>
<td>Lawrence</td>
<td>48</td>
</tr>
<tr>
<td>Bonner Springs</td>
<td>27</td>
</tr>
<tr>
<td>Leavenworth</td>
<td>46</td>
</tr>
</tbody>
</table>

Sources: Mid-America Regional Council and RLBA.

**Development of Ridership Forecasts**

Description of Corridors

Corridors were defined to represent a collection of rail lines that served similar origins and destinations. Upon review of the rail lines, eight corridors were defined to radiate outward from Union Station. The eight corridors were described previously.

Forecasting Methodology

The commuter rail ridership model utilized travel demand information and files from the regional travel model maintained by the Mid-America Regional Council (MARC). Because the area being studied is larger than that included in the MARC model, the data was supplemented with travel data from the Kansas and Missouri journey-to-work census data from 1990 factored to the year 2020.
An effective first phase screening process will identify the rail corridors with the greatest likelihood of being found feasible for commuter rail service. Information was gathered to develop a sketch planning mode choice model that would be used to estimate the share of travel that could be served by commuter rail service. This information includes:

- Travel times for buses, autos and potential commuter rail service
- Park-and-ride frequency and travel times
- Bus fares
- Parking costs
- Walk access percentages
- Drive access times and distances to stations
- Vehicle operating costs
- Trip productions and attractions by commuter rail district

The total transit market consists of those individuals taking trips who would choose either commuter rail or another public transportation service for a trip between locations in the rail service area. The transit market share is a function of the travel service quality by auto or transit as represented by the travel time and travel cost for trips using either mode and a constant term reflecting the other attributes of the modes as perceived by travelers.

The overall transit impedance for a trip from a residential district is the sum of three components: access to bus or rail, line-haul, and distribution to the workplace. These impedance values are computed for each access type (walk or drive) and each transit mode (rail or bus). The estimation of the number of travelers who would use commuter rail service was a multi-step process. Step 1 involved identifying the potential market; step 2 involved estimating the share of the market that would be attracted to transit; step 3 involved allocating the transit market between bus and rail.

**Commuter Rail Corridors**

The initial analysis developed options for the selected line in each corridor. While there would be some variation in the ridership attracted to different lines in the same corridor, these variations would be small relative to the larger question of overall corridor service feasibility.

A set of commuter rail districts were then developed as aggregations of transportation analysis zones (TAZ). Potential stations were located on the representative rail lines within each corridor in order to represent how each commuter rail line might operate. The rail lines, rail corridors, districts and representative stations are shown in Figure 7.
Rail Ridership Results
Using the input data, the mode choice model was run to produce year 2020 estimates of market share for the commuter rail service in the seven travel corridors under study. The results are shown in Table 5. The travel forecasts represent the total travel between the outlying stations and the core area of Kansas City with the primary destination of Union Station. Given that commuter rail service is primarily oriented to work travel, these estimates represent home-to-work and work-to-home travel between outer areas and the Kansas City business core. Shown in the table are total person trips, trips projected to use commuter rail and total transit trips including both commuter rail and bus transit.

The highest rail ridership is anticipated to occur in Corridors D, E and H. The largest total work trip movements are in Corridors E, D and F. Corridor D was able to attract a relatively high percentage of commuter rail ridership. This may be due in part to traffic congestion and slower travel times on I-70. Corridor E attracted a less percentage of the work trip market, but had a larger market base from which to draw from. Corridor F attracts a good percentage of transit riders, but the corridor characteristics appear to be more oriented to bus or light rail transit. Commuter rail in Corridor H also received a good share of ridership, with much of the ridership drawn from an area of Wyandotte County west of I-435.

Table 5
Commuter Rail Ridership and Market Share
(Year 2020)

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Daily Work Trips: All Modes</th>
<th>Daily Work Trips: Commuter Rail</th>
<th>Daily Work Trips: Total Transit</th>
<th>Percent of Trips on Rail</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>17,140</td>
<td>720</td>
<td>1,500</td>
<td>4.2%</td>
</tr>
<tr>
<td>B</td>
<td>13,060</td>
<td>930</td>
<td>1,530</td>
<td>7.1%</td>
</tr>
<tr>
<td>C</td>
<td>4,580</td>
<td>80</td>
<td>610</td>
<td>1.7%</td>
</tr>
<tr>
<td>D</td>
<td>33,190</td>
<td>4,160</td>
<td>7,080</td>
<td>12.5%</td>
</tr>
<tr>
<td>E</td>
<td>44,370</td>
<td>3,800</td>
<td>7,130</td>
<td>8.6%</td>
</tr>
<tr>
<td>F</td>
<td>43,750</td>
<td>1,250</td>
<td>8,730</td>
<td>2.9%</td>
</tr>
<tr>
<td>H</td>
<td>31,680</td>
<td>2,770</td>
<td>5,050</td>
<td>8.8%</td>
</tr>
</tbody>
</table>

Source: RLBA Team.
Environmental Justice Considerations

Environmental justice (EJ) initiatives are meant to involve a potentially affected public in developing transportation projects that fit harmoniously within their communities without sacrificing safety or mobility. According to the Federal Highway Administration (FHWA), EJ is an important part of the planning process and must be considered in all phases of planning. To that end, the concept of EJ will be explored during this phase and its major components identified. However, EJ will not be used as a feasibility criterion. Rather it is seen as more of an implementation aid and will be explored in that context. Efforts concerning EJ will intensify as the corridor selection is narrowed. The following phase of this study will include more specific ways to measure some of the components of EJ as well as preliminary examination of impacted areas and groups.

The U.S. EPA Office of Environmental Justice defines EJ as:

"The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including racial, ethnic, or socio-economic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or execution of federal, state, local and tribal programs and policies."

In general, this means that for any program or activity for which any federal funds will be used, the agency receiving the federal funds:

- must make a meaningful effort to involve low income and minority populations in the processes established to make the decision about the use of the federal funds, and

- must evaluate the nature, extent, and incident of probable favorable and adverse human health or environmental impacts of the program or activity upon minority or low-income populations.

The first step in EJ compliance is to identify the low income and minority populations who should be involved in the decision making process and who may be impacted by the expenditure of federal transportation funds. To that end the following must be addressed:

- what is the area of impact for the use of the federal transportation funds
- what constitutes low income and minority populations, and
• how should the specific target low income and minority population for the area impacted be identified?

The determination of a project impact area should be presented, reviewed and agreed to by participants in the public involvement process. These discussions should be documented as part of documenting the entire EJ process. In instances of a specific project one could use all the areas within the logical termini of the project area as well as adjacent areas that may be reasonably impacted by it. The census tracts within and adjacent to the proposed corridors could potentially serve in this capacity.

Definitions of what constitutes low income and minority populations can be found in final USDOT Order 56102.2 on Environmental Justice, contained in the Federal Register on April 15, 1997.

U.S. Census data can be used to identify low income and minority populations. The number and percentage of low income and minority populations in the project impact area should be identified. The same can be done for the region or metropolitan area and that percentage can be used as a benchmark to identify locations with target EJ populations of low income and minority populations.

After identification of a "target" population, an assessment is made as to whether potential effects on that population could be high and adverse. Definitions are contained in the final USDOT Order of Environmental Justice, contained in the Federal Register on April 15, 1997. A quick summation of high and adverse effects would include those having a significant human health or environmental effect.

Efforts in Task 4, Detailed Assessment of Feasible Commuter Rail Corridors, will examine data MARC may have available that could be used in future EJ considerations. Subsequently, EJ efforts in Task 5 (Develop Implementation Strategy) will outline an approach to map out an impact area and identify potential target EJ populations.

**Capital Cost**

Capital costs to implement service consist primarily of rail equipment, commuter stations, parking facilities, other passenger rail facilities such as layover yards or servicing facilities, and improvements to freight railroad trackage to permit higher passenger train speeds or to enhance capacity to enable shared commuter and freight use. In this screening process, capital cost estimation was largely a "desk top" exercise, in which service plans were developed and information concerning railroad tracks and facilities evaluated.
From that analysis, the new equipment and facilities and improvements to existing trackage were determined and associated costs estimated. The total capital cost excluding capacity improvements required to implement service has been developed for each corridor as a stand-alone project. In this phase, issues of rail capacity will be dealt with as described in the following section.

**Track and Signal Improvements**  
Individual track segments that make up each of 19 lines were identified and the current track speed for each segment established. Taking into consideration the configuration of each segment, a proposed track speed for each segment has been developed which could reasonably be attained with track improvements. Larger increases in the difference between current and proposed speeds will require higher levels of track improvements, and thus higher costs. Contemplated track improvements include crosstie replacement, surfacing and alignment, and rail replacement. Unit costs for each work item are derived from typical Class 1 railroad estimates obtained in similar studies. Based on experience with other commuter rail startups, it is assumed that at least a minimal tie renewal and surfacing program will be necessary for passenger service implementation, even on those lines that are currently in the best condition, so at least a minimal upgrade program has been estimated for all line segments.

Lines that do not currently have wayside signal systems controlling train movements would require the installation of Centralized Traffic Control (CTC) both for safety and capacity purposes. CTC is a system in which train movements are controlled by fixed signals along the route or by signals transmitted directly to the train control compartment ("cab" signals). Long stretches (100 miles of line or more) are controlled by one dispatcher and he/she has the ability to remotely control switch positions in order to route trains from one track to another. This system has been shown to provide both a high level of safety and operational flexibility which greatly increases line capacity, not to mention passenger train reliability. Current estimates for the installation of CTC are approximately $450,000 per mile, Making CTC installation a significant cost item. The estimates also include costs, where appropriate, for upgrading existing rail/highway grade crossing systems to accommodate higher, where appropriate, train speeds.

These estimates reflect costs of upgrading existing tracks to support higher speeds, but do not include any costs for construction of new tracks to expand line capacity. The cost estimates should be used for corridor comparison purposes only, not as estimates of the total cost of establishing commuter rail service.
**Passenger Facilities: Stations, Parking and Layover**

The number and general location of stations on each line has been identified based on preliminary ridership information. Costs for establishing these stations are included in the estimates, including costs for providing parking facilities considered adequate given projected ridership. Parking estimates are based upon 80 percent of the forecast inbound morning ridership, with a minimum of 400 parking spaces per line. Parking lot land costs are not included.

Each rail line cost estimate also includes the cost of constructing a layover facility. This facility would provide storage space for commuter train equipment at night and on weekends as well as a place where the equipment can be cleaned and serviced.

**Equipment**

It is estimated that the cost to acquire new coaches and “cab” cars averages approximately $1.8 million per unit. This estimate is based on a review of orders placed by commuter rail operators in recent years. The supply of used but still serviceable coaches is spotty and uncertain and, therefore, it was not assumed that a sufficient number of acceptable used coaches could be procured when needed.

The cost to acquire a reliable rebuilt locomotive is estimated to be approximately $1.5 million per unit based on costs of other similar purchases involving both passenger and freight locomotives. (New unit prices from both major builders, General Electric and the Electro-Motive Division of General Motors, are in the range of $3.0 million per unit.) While there have been sufficient freight locomotives in the 3,000 horsepower range suitable for rebuilding to meet the recent demands of passenger operators, new emission requirements and the eventual diminished supply of suitable candidates for rebuilding (due to lack of new four-axle locomotive construction over the past decade) indicate that new locomotives should be assumed for cost estimation purposes.

A minimum of one spare locomotive, coach and cab control car is included in the cost projections of each corridor, with additional spares on lines with larger equipment fleets. An allowance of 25 percent of the equipment cost is made for shop facilities and spare parts.

**Capital Cost Summary**

Capital costs are summarized in Table 6 below.
Table 6  
Capital Cost Summary

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Track Upgrade</th>
<th>Signal Improvements</th>
<th>Stations and Facilities</th>
<th>Equipment and Shop</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. St. Joseph</td>
<td>$3,974,360</td>
<td>$2,205,000</td>
<td>$4,994,400</td>
<td>$26,300,000</td>
<td>$37,473,760</td>
</tr>
<tr>
<td>B. Excelsior Springs</td>
<td>2,119,230</td>
<td>300,000</td>
<td>3,809,400</td>
<td>33,000,000</td>
<td>39,228,630</td>
</tr>
<tr>
<td>C. Richmond</td>
<td>2,570,100</td>
<td>1,415,000</td>
<td>3,876,400</td>
<td>26,300,000</td>
<td>34,161,500</td>
</tr>
<tr>
<td>D. Odessa</td>
<td>6,606,430</td>
<td>16,485,000</td>
<td>8,436,400</td>
<td>76,500,000</td>
<td>108,027,830</td>
</tr>
<tr>
<td>E. Warrensburg</td>
<td>3,784,325</td>
<td>320,000</td>
<td>9,476,400</td>
<td>76,500,000</td>
<td>90,080,725</td>
</tr>
<tr>
<td>F. Belton</td>
<td>1,875,050</td>
<td>300,000</td>
<td>6,227,400</td>
<td>33,000,000</td>
<td>41,402,450</td>
</tr>
<tr>
<td>G. Olathe</td>
<td>See Total</td>
<td>See Total</td>
<td>See Total</td>
<td>See Total</td>
<td>30,900,000</td>
</tr>
<tr>
<td>H. Topeka</td>
<td>$3,921,245</td>
<td>$330,000</td>
<td>$8,455,400</td>
<td>$46,500,000</td>
<td>$59,206,645</td>
</tr>
</tbody>
</table>


Rail Line Capacity and Conflicts

One of the most attractive characteristics of commuter rail is its ability almost always to use existing freight rail rights-of-way, thus avoiding the costly, difficult and sometimes impossible process of developing a new transportation corridor. However, many freight lines do not have excess capacity to share with commuter service and the owning railroads may be concerned about the adverse impacts upon their freight business of adding high-priority commuter trains (which, to attract and keep riders, must adhere closely to published schedules) to existing and expected freight trains, which characteristically flows in irregular patterns. Thus freight railroad issues need to be considered in evaluating a corridor’s commuter rail potential, encompassing line capacity, traffic volume and important physical constraints.

Capacity and characteristics of a selected line in each corridor were evaluated based upon information gathered in the corridor inventory subtask and considering the projected commuter service plan. The product of the analysis is a qualitative rating of the expected passenger-freight conflicts resulting from implementing commuter rail service given present freight train volumes, shown in Table 7 below. Freight train use of all lines is depicted in Figure 8.
### Table 7

**Passenger/Freight Conflict Potential**

<table>
<thead>
<tr>
<th></th>
<th>Daily Freight Trains</th>
<th>Tracks: Single Or Double</th>
<th>Conflict Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>St. Joseph</td>
<td>43</td>
<td>Single</td>
</tr>
<tr>
<td>B</td>
<td>Excelsior Springs</td>
<td>10</td>
<td>Double</td>
</tr>
<tr>
<td>C</td>
<td>Richmond</td>
<td>7-35(1)</td>
<td>Single</td>
</tr>
<tr>
<td>D</td>
<td>Odessa</td>
<td>5</td>
<td>Double</td>
</tr>
<tr>
<td>E</td>
<td>Warrensburg</td>
<td>33</td>
<td>Single</td>
</tr>
<tr>
<td>F</td>
<td>Belton</td>
<td>15</td>
<td>Single</td>
</tr>
<tr>
<td>G</td>
<td>Olathe</td>
<td>30</td>
<td>Double</td>
</tr>
<tr>
<td>H</td>
<td>Topeka</td>
<td>Over 70 east of Holliday, 6 west</td>
<td>Multiple east of Holliday, single west</td>
</tr>
</tbody>
</table>

Note: All corridors except G will incur high conflict potential when using KCT tracks to reach Union Station.

1. There are 25 trains between Birmingham and Maxwell and 7 trains between Maxwell and Richmond.
2. High Between Birmingham and Maxwell and Low between Maxwell and Richmond.

Sources: RLBA, HNTB & Railroad Officials.

In addition to the potential conflicts outlined above, all corridors except G (the I-35 service) must use main line tracks of the KCT for varying distances in order to access Union Station. The KCT main track is a mixture of double and triple track with a CTC signal system. It hosts approximately 70 freight trains per day along with six Amtrak passenger trains.

Improvements necessary to relieve capacity problems can range from a few million dollars for interlocking improvements to $6-8 million for installation of a new siding to in excess of $100 million for extensive construction of additional main line trackage with necessary signals, crossovers and interlockings. It is difficult to predict what improvements the owner of a given corridor will require; the outcome depends both upon analysis of existing and anticipated traffic and operations as well as negotiations between the track owner and the commuter rail sponsor. Since annual payment for hosting commuter rail service generally is a tiny fraction of freight revenue, the owner may increase requested capacity improvements as a way of making the commuter service worthwhile from its perspective. No capacity cost estimates were made during this phase of the study. The qualitative “Conflict Potential” measure should be used as a surrogate for capacity improvement costs at this level of analysis.
Source: RLBA Team.
Operating Cost

In addition to the capital expenditures necessary to implement commuter service and to relieve capacity problems, the commuter rail sponsor will be responsible for the system’s ongoing operating cost, only a portion of which would be covered by farebox and other revenues. Major components of operating cost include:

- Train operations (crews and fuel)
- Equipment maintenance
- Railroad charges and fees
- Station maintenance and operations
- Insurance
- General and administrative

Operating costs shown below were developed by applying a representative cost per train-mile to the annual train-miles operated in each corridor. Estimates will be refined for those corridors advancing to the next phase of the study.

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Estimated Operating Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A St. Joseph</td>
<td>$3,423,000</td>
</tr>
<tr>
<td>B Excelsior Springs</td>
<td>1,556,000</td>
</tr>
<tr>
<td>C Richmond</td>
<td>2,151,000</td>
</tr>
<tr>
<td>D Odessa</td>
<td>3,595,000</td>
</tr>
<tr>
<td>E Warrensburg</td>
<td>5,942,000</td>
</tr>
<tr>
<td>F Belton</td>
<td>1,556,000</td>
</tr>
<tr>
<td>G Olathe</td>
<td>N/A</td>
</tr>
<tr>
<td>H Topeka</td>
<td>3,494,000</td>
</tr>
</tbody>
</table>

Source: RLBA.

Operating costs are estimated for each corridor on a stand-alone basis, i.e., as if commuter service were operating on that corridor only. Thus each bears the full general and administrative expenses related to management, accounting, administration, marketing and other overhead activities. Were service operated in a second or third corridor, general and administrative expenses would not increase proportionally so total operating expense of several corridors would be less than the sum of their stand-alone estimates.

1 Virtually all passenger transportation systems, including highway and air transportation; receive substantial government subsidy. Commuter rail is no exception.
Conclusion and Recommendations
The team has followed guidelines of FTA’s New Starts Criteria to the extent possible in a preliminary feasibility study, addressing New Starts factors in a general manner, so as to facilitate decision-making and assist in moving the project to the next stage, if warranted. A proposed set of evaluation criteria were identified and discussed in a separate report previously submitted to MARC by the study team.

Table 9 below summarizes the evaluation measures to be used and identifies relevant FTA criteria. Based upon that information and with on-going support from the study team the MARC Transit Committee will be in position to select those corridors that demonstrate sufficient potential to advance to the detailed feasibility assessment in Phase Two (Tasks 4, 5 and 6) of this study.

<table>
<thead>
<tr>
<th>Study Measure</th>
<th>Related FTA Criteria</th>
<th>Units of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Speed</td>
<td>1. Mobility</td>
<td>MPH</td>
</tr>
<tr>
<td>Ridership</td>
<td>2. Environmental and 6. Other</td>
<td>Daily Boardings</td>
</tr>
<tr>
<td>Operating Cost per Passenger-mile</td>
<td>3. Operating Efficiencies</td>
<td>$/Passenger-mile or $/Passenger</td>
</tr>
<tr>
<td>Capital Cost per Corridor</td>
<td>4. Cost Effectiveness</td>
<td>$</td>
</tr>
<tr>
<td>Capital Cost per Passenger</td>
<td>4. Cost Effectiveness</td>
<td>$/Passenger</td>
</tr>
<tr>
<td>Corridor Opportunities: land use, facilities served, barriers</td>
<td>5. Land Use and 6. Other</td>
<td>Qualitative</td>
</tr>
<tr>
<td>Railroad Considerations: capacity, constraints</td>
<td>6. Other</td>
<td>Qualitative</td>
</tr>
</tbody>
</table>

Source: RLBA.

The RLBA Team believes that ridership is the most important screening criteria. At this early stage of consideration, corridors with solid potential ridership should be eliminated from further consideration only by a genuine fatal flaw, a barrier that truly cannot be overcome or whose cost to cure is blatantly beyond reason. The Team did not discover any such flaws at this level of examination. The Team believes that the most difficult matter to overcome will be the combined issue of track capacity, cost of capacity improvements and reaching an agreement with the host railroads. The Team does not believe that the
towel should be thrown in on this issue at this early stage, thus it is not
deemed a fatal flaw and the focus remains upon ridership.

The importance of the magnitude of ridership as a screening measure is not
only intuitive, after all, isn’t attracting riders the object?—but also relates
directly or indirectly to the first five FTA New Starts Criteria:

1. Mobility Improvements
2. Environmental Benefits
3. Operating Efficiencies
4. Transportation System User Benefits (Cost-Effectiveness)
5. Existing Land Use, Transit Supportive Land Use Policies

The more riders, the greater the Mobility Improvements (#1). Well-filled
commuter trains tend to reduce pollutant emissions and energy consumption
(Environmental Benefits, #2). A larger number of riders produces a lower
operating cost per passenger mile (Operating Efficiencies, #3) and tends to
improve Transportation System User Benefits (#4) while at the same time
supporting Transit Supportive Land Use Policies (#5).

When considering feasibility thresholds, the question often is posed, “How
many riders should you carry to justify commuter rail?” There is no single,
established answer for the question. Each community must decide that for
itself, considering transportation needs, alternatives, costs and the
community’s long-term goals in terms of development and mobility. One way
to think about the question of what ridership justifies implementation is to think
about effective use of commuter rail as a tool. One of commuter rail’s greatest
attributes is its ability to carry a large number of people on a single train.
Chicago’s Metra operates trains of eight to ten “gallery” bilevel cars, equivalent
to a seated capacity of 1,200 to 1,500 per train. A much smaller train of four
single level cars could still seat over 450 persons. VRE averages 450
passengers per train and Altamont Commuter Express (ACE) averages 475,
both on predominantly peak period service. Maryland Rail Commuter (also
known by the MARC acronym) service averages only 244, but operates a
substantial mid-day and off-peak service, lowering its average. So it would be
seen that if peak period trains were not to handle several hundred people,
commuter rail may not be the proper tool. Applying 300 riders per peak period
train to six trains per day (three in each direction) would yield daily boarding of
1,800; four trains in each direction would indicate 2,400 boarding. Based on
the ridership data employed in this initial phase of the study, corridors D, E and
H would appear to attain those levels.

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2 As shown in U.S. DOT Federal Transit Administration 49 CFR Part 611: Major Capital
Another measure is to consider the number of riders per route (or corridor). Again, there is no magic number, but Figure 9 shows that selected existing systems (excluding long-established systems in the Northeast, Chicago and San Francisco) generally handle about 3,000 or more daily boardings per route. Again, corridors D, E and H would qualify. Also shown on Table 10 is the VRE initial ridership of 1,750 passengers per route, indicative of start-up levels of service and patronage. None of the other corridors attain that system’s start-up level.

Considering other measures presented in Table 10, the mobility (average speed) measure favors longer corridors, since maximum speeds are slower in the central area and higher in outlying areas. Operating cost per passenger is sensitive to corridor length as well as ridership. Corridors with more than three trains would achieve some economies of scale not reflected in these estimates.

The most important determinants of capital cost are the need for signal system installation (Corridor D only) and the number of cars and locomotives needed to provide the service. The latter naturally means that corridors that appear to carry the most passengers have higher costs for equipment (and parking lot construction as well). Capital cost per rider is more appropriate for making comparisons, although fiscal realities necessitate attention to the total figure as well. As previously noted, cost of capacity-related improvements is not included and thus implementation costs will be higher, perhaps considerably higher, than those shown. The “Potential Freight Conflicts” measure addressed the capacity problem and thus is a proxy for possible capacity expenditures.

The column labeled “Opportunities and Fatal Flaws” is left blank for MARC reviewers to contribute insights about which lines may have special considerations that make them more or less attractive. All corridors except A and C serve one or more of the outer Transit Centers identified in the MTI-DA report. Corridors E and F may have the potential to provide special event service to the sports complex. The Team has not found any fatal flaws at this stage.

As shown on Figure 10, the Team finds that corridors D and E are the most promising and should be selected for closer examination in the next phase of the study. Should a third route be advanced, corridor H is the most promising. Corridor G, already in Preliminary Engineering sponsored by Johnson County, would otherwise be in close competition with Corridor H (see Figure 10 for both). Early in the study process, ranking the corridors as to “high, medium, low and no-build” was contemplated, but the Team believes that it is premature at this stage to establish rankings beyond advance or don’t advance to the next phase of the study.
Projected Daily Ridership per Route
KC Region Corridors (Year 2020) and Existing Commuter Rail Systems

Key
Potential KC Region Corridors
Existing Commuter Rail Services
Red and green lines indicate VRE initial and mature ridership
Table 10
Corridor Summary

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Mobility (MPH)</th>
<th>Daily Boardings</th>
<th>Operating Cost per Passenger ($)</th>
<th>Capital Cost: Track, Stations &amp; Equipment ($million)</th>
<th>Capital Cost per Passenger ($000)</th>
<th>Opportunities or Barriers</th>
<th>Potential Freight Conflicts</th>
</tr>
</thead>
<tbody>
<tr>
<td>A St. Joseph</td>
<td>45.3</td>
<td>720</td>
<td>18.34</td>
<td>37.5</td>
<td>52.1</td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>B Excelsior Springs</td>
<td>34.2</td>
<td>930</td>
<td>6.41</td>
<td>39.2</td>
<td>42.2</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>C Richmond</td>
<td>42.0</td>
<td>80</td>
<td>104.72</td>
<td>34.2</td>
<td>427.5</td>
<td>High/Low</td>
<td>Low</td>
</tr>
<tr>
<td>D Odessa</td>
<td>38.3</td>
<td>4,160</td>
<td>3.32</td>
<td>108.0</td>
<td>26.0</td>
<td>Low</td>
<td></td>
</tr>
<tr>
<td>E Warrensburg</td>
<td>42.4</td>
<td>3,800</td>
<td>6.01</td>
<td>90.1</td>
<td>23.8</td>
<td>High/Low</td>
<td>High/Low</td>
</tr>
<tr>
<td>F Belton</td>
<td>35.3</td>
<td>1,250</td>
<td>4.78</td>
<td>41.4</td>
<td>33.1</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>G Olathe</td>
<td>34.5</td>
<td>2,600</td>
<td>6.21</td>
<td>30.9</td>
<td>11.9</td>
<td>Medium</td>
<td></td>
</tr>
<tr>
<td>H Topeka</td>
<td>44.4</td>
<td>2,780</td>
<td>4.84</td>
<td>59.2</td>
<td>21.3</td>
<td>High/Low</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
Most favorable results in each corridor (other than G) depicted in **bold underline**; least favorable in *plain italics.*
Corridor G estimates were prepared using different methods than other corridors and may not be comparable.

Sources:
Table 7
Corridor G information sources:
- MPH: RLBA calculation
- Boardings: midpoint of range (1,400-3,800) in FTA Annual Report on New starts, March 6, 2000
- Operating cost per passenger: RLBA calculation
- Capital cost: FTA Annual Report on New starts, March 6, 2000
- Capital cost per passenger: RLBA calculation
- Potential freight conflicts: RLBA

All other: RLBA Team.
Figure 10
Rail Corridor Recommendations

Potential Rail Lines
Other
Recommended

Destination Points
Line Subject of Preliminary Engineering Study

Source: RLBA Teams