CROSS-COUNTY MetroLink Extension

Segment 1
Conceptual Design

Cross-County
MetroLink
Extension

Socio-Economic and Environmental Methodology - Final Technical Report

Prepared for the
East-West Gateway Coordinating Council
in association with the
Bi-State Development Agency
Missouri Department of Transportation

By Parsons Transportation Group
and Associated Consultants

August 1999

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Chicago, Illinois
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1
Introduction and Purpose

This document describes methods for estimating socio-economic and environmental benefits and impacts at a level of detail sufficient to support informed decisions about the conceptual design for the Cross-County MetroLink Extension Segment I project. The environmental analysis will be integrated with the engineering, operations, cost and financial analyses results for use in determining the preferred conceptual design.

1.1 Level of Analysis

The Cross-County MetroLink Extension Segment I project will be financed with local funds (i.e., no federal dollars). Therefore, federal National Environmental Policy Act (NEPA) environmental regulations do not apply. Even though this condition prevails, the level of analysis for this task will be consistent with Council on Environmental Quality guidance on environmental impact assessment as implemented through NEPA. The level of analysis will be similar to an environmental assessment completed under the auspices of NEPA. Input regarding the relevant resource areas will be collected from a review of previous studies, technical staff field investigation, agency coordination, and input received from community engagement activities. The most current data from local sources and recent aerial photography, supplemented by fieldwork, will be used in the analysis. [All references in this document to federal regulations othern than NEPA (e.g., Section 106 and Section 4(f)) are for guidance purposes only with regard to the environmental analysis being conducted for this conceptual design study.]

The impact evaluation process will be focused on identifying both beneficial and adverse impacts. Where significant adverse impacts are identified, design modifications and mitigation measures will be identified to reduce or eliminate the impact.

1.2 Level of Analysis in the Major Transportation Investment Analysis (MTIA)

The environmental analysis in the MTIA for the Cross-County MetroLink corridor included a broad review of environmental factors to identify notable issues and constraints. Where feasible, that information will provide the starting point for this analysis. However, because this analysis requires that the candidate alternatives be evaluated at a level of detail necessary to make certain design decisions, a more rigorous analysis is necessary.

1.3 Relationship to Other Tasks and Critical Milestones

The initial environmental review will be the identification of known environmental constraints identified in previous studies for the Cross-County MetroLink Extension Segment I, coordination with federal, state and local agencies, and information received from community engagement activities. The focus will be on the site-specific impacts, the significance of these impacts and what mitigation measures may be required.

1.4 Relationship to Other Methodology Reports

This document, which describes the methodology for assessing transportation, urban design, socio-economic and environmental impacts, is one of several technical reports that describe the methods for addressing technical aspects of this conceptual design study. This Socio-Economic and Environmental Methodology Draft Technical Report is linked to the Evaluation Methodology Draft Technical Report in that it follows the overall evaluation process described in that technical report. This document focuses on the six design objectives identified in the Evaluation Methodology: Transportation; Urban Design; Economic; Environmental Impacts; Cost and Finances; and MetroLink Compatibility, and their associated criteria and measures.

1.5 Framework for Assessment Methodology

Table 1 lists the six design objectives and associated evaluation criteria and measures which provide the framework for the analysis of the conceptual design alternatives. Table 1 is consistent with Section 3 and Table 2 of the Evaluation Methodology Draft Technical Report. The set of criteria and measures shown in Table 1 will be used to evaluate corridor-level alternatives. These criteria and measures address the six design objectives in the following ways.

- **For transportation, the criteria address the overall utility of the alternative, as measured by ridership and accessibility. Also, the criteria address individual concerns in terms of mobility, personal safety and security, and operational characteristics in terms of traffic safety and congestion.**

- **For urban design, the criteria address LRT/land use relationships as well as visual, aesthetic, and scale characteristics.**

- **For economic effects, the criteria address various development and redevelopment opportunities.**

- **For environmental impacts, the criteria address a comprehensive range of benefits and impacts associated with the natural and man-made environment.**

- **For cost and finances, the criteria address both actual estimated costs for each alternative and cost-effectiveness.**

- **Finally, with regard to MetroLink compatibility, the criteria address the design and operational consistency of new active lines with previous ones.**

Identified in the following sections of this draft technical report are the six design objectives and the appropriate criteria to measure the achievement of each design objective. Within each design objective, the evaluation criteria and measures are discussed according to these components: resource description and impact area; methodology; and expected outcome and possible mitigation.

Table 1 - Criteria and Measures by Category

Objective	Criterion	Measure
(1) Transportation	A. Maximize transit ridership (LRT in combination with bus users)	a. estimated daily ridership b. estimated work trip ridership per day c. estimated ridership for special events
	B. Improve accessibility	a. weighted travel times to major employment[1] centers in corridor. b. weighted travel times to major employment[1] centers outside of corridor
	C. Increase mobility	a. residential population within 1/4 mile walking distance of LRT stations b. employment locations within 1/4 mile walking distance of LRT stations c. number of health care, educational, recreational, commercial and social service locations within 1/4 mile of LRT stations d. change in total travel time for a representative sample of trips within the corridor and trips with one end outside of the corridor.
	D. Maximize safety	a. number of LRT train/traffic movement conflict points weighted by volume potential b. qualitative - pedestrians crossing LRT tracks and passengers walk access to LRT station crossing other traffic c. sight distance available to LRT train operators d. projected changes in accident rates based on comparative data
	E. Enhance traveler's sense of personal security	a. qualitative - application of safety and security principles, e.g., sight distance, visibility, proximity to moving traffic, other security features

[1]Along with identifying employment concentrations, consideration would also be given to major activity centers in which accessibility is associated with customers/visitors rather than employees.

Table 1 - Continued

Objective	Criterion	Measure
	F. Reductions in capacity for other modes	a. intersections traffic capacity for locations affected by LRT b. traffic impact on corridor streets due to access patterns to park-n-ride facilities or by buses to transfer facilities (impact analyzed in terms of added peak hour traffic and intersection capacity)
(2) Urban Design	A. Support existing or planned land-use	a. qualitative - location of stations and influence on land-use b. qualitative - specific comparison with recommended transportation elements c. compatibility with local plans and zoning
	B. Specific enhancement to planned/developing major activity centers	a. walking distance to major activity centers-Clayton CBD core, Washington University (Hilltop Campus), Galleria, Sunnen Business Park, and Hanley Business Park
	C. Maintain viable access to adjacent sites	a. access or driveway impacts in terms of: driveways affected driveways relocated driveways eliminated b. qualitative - changes in access patterns (to and from) in terms of added travel distances, complexity, difficulty.
	D. Create compatibility in design quality with surrounding area.	a. qualitative - assessment of urban design, characteristics (visual, aesthetic, scale, level of activity, etc)
(3) Economic	A. Foster development and redevelopment in strategic locations	a. distance proximity to areas with redevelopment goals - Forest park MetroLink Station, Brentwood, Richmond Heights, Maplewood, and Shrewsbury b. qualitative - opportunities to leverage LRT and other investments, opportunities to create enhanced redevelopment sites c. qualitative - achievement of transit-oriented development principles.

Table 1 - Continued

Objective	Criterion	Measure
	B. Enhances economic viability of key activity centers	a. changes in trade area due to enhanced travel specifications for the Clayton CBD, Galleria area, and Promenade
	C. Enhances corridor tax base	a. qualitative - acres of under utilized land that could have value added b. acres of taxable land removed from tax rolls for transportation facilities
4. Environmental Impact	A. Minimize impact on natural resources	a. impact on waterways and wetlands via reduction in wetland acreage or quality, change in water quality or waterway capacity b. impact on wildlife and vegetation in terms of changes to habitat and removal or damage to unique vegetation
	B. Minimize displacement	a. Number of dwelling units or related structures of property taken or displaced b. Number of non-residential properties displaced (sq. ft. and/or value)
	C. Minimize noise, vibration and electro-magnetic related impacts on sensitive areas	a. changes in noise levels at residential, institutional, and other sensitive land-uses b. changes in vibration levels at sensitive land-uses c. Qualitative - assessment of potential electro-magnetic interferences (EMI), and potential effects of electro-magnetic fields (EMF) on sensitive land-uses
	D. Improve air quality	a. changes in regional AQ emissions b. intersections and parking facility hot spots - emissions associated with traffic operations affected by LRT
	E. Minimize construction impacts	a. qualitative - assessment of land-use impacts due to construction (disruption of access, impact of construction activities) b. length of construction process
	F. Minimize impact on cultural resources (historic, archeological and park lands	a. displacement, damage, impact on function or accessibility, or impact on surrounding environment

Table 1 - Continued

Objective	Criterion	Measure
	G. Achieve equity in terms of project benefits and cost	a. comparison of unit LRT investment levels ($ per mile) for locations in each municipality in the corridor b. number of riders generated in each municipality per capita c. percent of riders generated in each municipality compared to the percent of capital cost for facilities located in each d. comparison of positive and negative impacts per municipality e. comparison of rides generated per traffic analysis zone with zones categorized by income level and transit dependency
(5) Costs and Finances	A. Maximize cost-effectiveness	a. portion of project capital cost devoted to local modes of access per additional rider (compare all alternatives to the least cost alternatives) b. portion of project capital cost devoted to LRT per additional rider (compare to least cost alternative) c. define all trade-offs and compute cost per unit of benefit increased accessibility increased mobility eliminate loss in traffic capacity eliminate loss in site access aesthetic and visual benefits improved LRT travel time reduction in accident potential change in noise impacts increased economic benefits acres of more developable land acres of/units of displacement amount of increased accessible land by major category other to be determined d. qualitative - assess achievement of basic goals (compare to anticipated targets)

Table 1 - Continued

Objective	Criterion	Measure
	B. Minimize project costs while achieving basic design objectives	a. capital costs b. annual operating and maintenance costs c. life cycle costs d. qualitative - assess achievement of basic goals (compare to anticipated targets)
	C. Maximize feasibility of implementation	a. percent of annualized capital cost covered by available resources for capital costs b. percent of annual O/M costs covered by available resources c. qualitative - risk assessment as to the sustainability of financial resources d. risk assessment of constructability
	D. Enhance opportunity of private sector participation in financing.	a. estimated range of possible private sector funds
(6) MetroLink Compatibility	A. Compatibility of design features	a. comparison of station layouts noting similarities and differences from a customer perspective b. comparison of all facilities in terms of maintenance requirements
	B. Opportunity for developing Segments II and III MetroLink Extension	a. operating efficiency of future system/ effective level of service b. potential capital cost to develop junctions c. implications for design requirements or policies affecting future extensions d. effects on overall financial plan

2
Transportation Impacts

The transportation network within the Cross-County MetroLink Extension Segment I corridor includes three interstates, major and minor arterial roadways, city street systems, bus transit routes, and an existing MetroLink system. The criteria for assessing transportation impacts focus on overall utility as expressed by ridership, accessibility, and individual concerns such as mobility, personal safety and security. The criteria also focus on operational characteristics associated with traffic safety and congestion. The specific criteria and measures that will be used are:

Criteria		Measure	
A.	**Maximum transit ridership (LRT in combination with bus users)**	**a.**	**Estimated daily ridership**
		b.	**Estimated work trip ridership per day**
		c.	**Estimated ridership for special events**
B.	**Improve accessibility**	**a.**	**Weighted travel times to major employment centers in corridor.**
		b.	**Weighted travel times to major employment centers outside of corridor.**

C.	**Increase mobility**	**a.**	**residential population within 1/4 mile walking distance of LRT stations**
		b.	**employment locations within 1/4 mile walking distance of LRT stations**
		c.	**number of health care, educational, recreational, commercial and social service locations within 1/4 mile of LRT stations**
		d.	**change in total travel time for a representative sample of trips within the corridor and trips with one end outside of the corridor.**
D.	**Maximize safety**	**a.**	**number of LRT train/traffic movement conflict points weighted by volume potential**
		b.	**qualitative - pedestrians crossing LRT tracks and passengers walk access to LRT station crossing other traffic**
		c.	**sight distance available to LRT train operators**
		d.	**projected changes in accident rates based on comparative data**
E.	**Enhance traveler's sense of personal security**	**a.**	**qualitative - application of safety and security principles, e.g., sight distance, visibility, proximity to moving traffic, other security features**
F.	**Reduction in capacity for other modes**	**a.**	**Intersection traffic capacity for locations affected by LRT**
		b.	**Traffic impacts on corridor streets due to access patterns to park-n-ride facilities or by buses to transfer facilities (impacts analyzed in terms of added peak hour traffic and intersection capacity)**

A general description of the study corridor's transportation resources and the impact area are given below. Following that description the proposed evaluation methods to be applied to each criterion, along with the expected outcome and possible mitigation , are described.

2.1 Corridor Setting

The key roadways within the Cross-County MetroLink Extension Segment I corridor include, but are not limited to, Interstates 64 (Highway 40) (which runs east-west), 44 which runs (SW; NE), and 170 (which runs north-south along the west side of the corridor), Forest Park Parkway, Millbrook Boulevard, Skinker Boulevard, Big Bend Boulevard, Forsyth Boulevard, Carondelet Avenue, Meramec Avenue, Maryland Avenue, Brentwood Boulevard, Manchester Road, and Hanley Road. Some of the major roadways in the study corridor are congested during peak traffic periods. A substantial number of bus transit routes operated by the Bi-State Development Agency parallel and/or cross through portions of the Cross-County MetroLink Extension corridor with transit transfer facilities in downtown Clayton CBD. The existing MetroLink system currently operates as a double track system from East St. Louis to Lambert International Airport. A St. Clair County extension (under construction further east) will serve Illinois communities.

Sidewalks and other pedestrian facilities are located throughout the corridor and are concentrated in downtown Clayton and in residential areas. Bicycle paths are fairly limited in the corridor except where they have been integrated into Forest Park, Washington University and Shaw Park. Other possible paths and in-street facilities are discussed in EWGCC's "St. Louis Regional Bicycle Facilities Plan" of 1994.

The Cross-County MetroLink Extension Segment I alignment begins at the existing Forest Park MetroLink station, at De Baliviere Avenue, and extends along Forest Park Parkway and Millbrook Boulevard into downtown Clayton, then south to the Galleria area in Richmond Heights and along the CMT right-of-way to I-44. For the at-grade design alternative, the evaluations will give particular focus to key intersections along the MetroLink alignment that experience heavy traffic volumes during peak hours. Traffic impacts will also be addressed in relation to access changes along the MetroLink alignment (either at-grade or grade-separated) and in relation to traffic generated by proposed MetroLink stations (bus and auto).

2.2 Maximize Transit Ridership

2.2.1 Resource Description and Impact Area

The success of MetroLink is associated with ridership. The quality of service and its accessibility to potential customers is reflected in the alternative conceptual designs. The impact area would focus on the proposed station locations throughout the corridor.

2.2.2 Methodology

The method will entail a quantitative analysis of transit ridership. Data will be gathered from the Bi-State Development Agency on existing MetroLink operations and all bus transit lines operating in the study corridor (routes, schedules, ridership numbers, ridership profiles, etc.) Ridership data will also be provided by the travel demand analysis team currently working on the Cross-County MetroLink Extension Segment I project. The travel demand team is preparing ridership estimates for the year of LRT expected opening, 2005, and year 2020. Analysis will be accomplished on the basis of LRT design alternatives from the Forest Park station in the northern part of the study corridor to Shrewsbury at the southern end of the corridor. Daily ridership, in terms of boardings by station, by trip purpose, and by local access mode (auto, bus, walk), will be estimated. Ridership for special activities, which would be non-work trips associated with cultural and recreation events (i.e., downtown St. Louis, travel to Forest Park, or travel to various cultural events) would also be estimated. These special trips are not model outputs; however, current MetroLink experience related to special events in St. Louis will be considered as indicators of this ridership type. Special generators, such as the Galleria and the businesses and government buildings in downtown Clayton, will also be considered.

2.2.3 Expected Outcome and Possible Mitigation

The results of the above ridership analysis will show the relative attractiveness of each alternative as measured by ridership and what features of the design would be the most attractive in terms of capturing ridership and achieving specific transportation purposes.

2.3 Improve Accessibility

2.3.1 Resource Description and Impact Area

Accessibility concerns the geographic relationship between existing and future travel demand and the proposed MetroLink stations. The pattern of trip origins and destinations will define the location of potential riders of MetroLink. In concept, accessibility is associated with the land-use defined by origins and destinations. Transit is seen as an asset that would facilitate the well-being (growth and sustainability) of land-use development. Geographically, the access linkage is defined as reasonable walking distance, although access can be extended via vehicular means (e.g., shuttles).

2.3.2 Methodology

The method will be a combination of corridor map analysis and a qualitative evaluation. Statistics will be obtained from the travel demand analysis team relative to travel times on the roadway and transit network. A set of estimations regarding rider access will be done for major activity centers both inside and outside the corridor. Major activity centers inside the corridor include:

- **Downtown Clayton (center core)**
- **Galleria Shopping Center**
- **Sunnen Business Park**
- **Washington University**
- **Forest Park.**

Major activity centers outside the study corridor include:

- **Downtown St. Louis (center core)**
- **Suburban employment centers to test reverse commute opportunities (up to 4 employment centers will be chosen)**
- **Lambert Airport.**

With regard to this criterion, the above information as applied to the specific measures would result in weighted travel times (internal to the corridor). To accomplish, this a set of "typical" home origin areas will be identified in the corridor and outside the corridor. Network statistics will be used to define a travel time matrix to the selected destinations for each design alternative. Weighted average times will be calculated using trip volumes for selected origin-destination pairs. Weighted travel times will be calculated in the same manner for travel outside of the corridor.

2.3.3 Expected Outcome and Possible Mitigation

These analysis results would identify which design alternatives achieve better accessibility in terms of linkages to employment (linking labor force to development) as a means of supporting commercial, retail and industrial land uses. They would also identify which alternatives achieve better accessibility in terms of linkages to activity centers as a means to measure development access to its trade area (i.e., for customers, patrons and visitors).

2.4 Increase Mobility

2.4.1 Resource Description and Impact Area

Mobility is a capability associated with people and their movement between origins and destinations. Transit would contribute to this mobility by expanding the individuals' opportunity to travel. Thus, the impact areas would be the corridor in the vicinity of each proposed MetroLink station, plus the added area linked to MetroLink by various supporting transit services. As the regional transit system expands, it also expands the mobility of the population.

2.4.2 Methodology

The evaluation method will be a combination of map analysis, quantitative and qualitative evaluations. Land use information within and adjacent to the study corridor will be obtained from EWGCC, City of St. Louis, St. Louis County, and the adjacent municipalities. No formal analytical procedures will be used. Mobility is an important consideration to corridor residents. Mobility is defined by both the quantity and quality of improved or new transit service. This may include a combination of extending MetroLink into the Cross-County corridor plus improvements to the local mode of access such as improved bus service, park-n-ride, bicycle and pedestrian access to LRT stations.

As applied to the specific measures, the existing land use maps will be used as follows: (1) residential and employment populations will be determined within one-half mile walking distance of the potential MetroLink stations; and the percentage of the population within these access zones compared to corridor total population will be calculated, and (2) the number of key land uses (e.g., health, education, recreation, shopping, cultural and social services) will be determined within one-half mile of potential MetroLink stations, and the spot locations, that are representative of all key attractions in the corridor will be identified. The change in travel time to these key locations will be computed. This will result in a comparison to the no-build alternative to determine how the new MetroLink extension increases mobility. For example, estimating the increased area accessible to people within a given travel time.

2.4.3 Expected Outcome and Possible Mitigation

The expected outcome would be to show the benefits of improved access for corridor residents to employment and activity centers with the construction of the new Cross-County MetroLink Extension Segment I.

2.5 Maximize Safety

2.5.1 Resource Description and Impact Area

Within urban areas, traffic safety is a high priority goal, given the amount of traffic, its concentration, and the potential risk of accidents. In this project, alternatives will include at-grade MetroLink concepts. LRT tracks will intersect with various streets carrying vehicles, bikes, and pedestrians. These locations will entail proper consideration of safe design to minimize accident risk. Each MetroLink station will generate traffic (auto, buses, pedestrians). As such, traffic movements need to examined to ensure safe access to and from stations.

2.5.2 Methodology

The method will use a combination of map analysis and empirical data relating to personal safety and traffic safety to define accident rates or portray comparable situations to the Cross-County MetroLink Extension Segment I. No formal analytical procedures will be used. As applied to the specific measures, this qualitative review will be conducted as follows. First, potential LRT train/traffic conflict points will be determined. Typical at-grade situations where other traffic could cross LRT tracks will be illustrated and a daily exposure rate at each at-grade intersection where the MetroLink alternative would be at-grade will be calculated. Pedestrian crossing conflicts will be identified. Each crossing would be rated according to high, medium, or low volume pedestrian crossing if actual pedestrian counts are not available. The condition of crossing points (i.e., pedestrian sight distance, shy or clearance distance, pedestrian standing space, and pedestrian crossing time) will then be qualitatively evaluated.

For intersections where MetroLink will be at grade, an analysis of the traffic signal phase sequencing, cycle lengths, and phasing interval durations will be conducted using nationally accepted procedures. For example, to determine the phase length at an intersection, the duration of each signal phase is based upon the amount of time required to process the required demand, subject to a minimum time required for clearance. The duration of an auto phase is directly proportional to the percent total auto demand moving during the particular phase. This varies by intersection. This time is calculated by providing a minimum "walk" time of seven seconds plus a "don't walk" time equal to the time necessary for a pedestrian to clear the intersection at an average walking speed of four feet per second. LRT clearance timings will also be determined using nationally accepted procedures. For each intersection, all timing plan alternatives will be analyzed using proposed lane configurations and traffic volumes.

At MetroLink/traffic intersections, sight distance will be examined relative to the location of the LRT alignment and auto travel lanes. This will then be compared to operating speed and normal braking distance and traffic safety risk will be assessed. Accident rates will be determined using comparative data. Accident data will be collected from other LRT systems including Dallas, Portland, Sacramento, and Pittsburgh to estimate accident rates that may be comparable to this MetroLink Extension.

2.5.3 Expected Outcome and Possible Mitigation

The expected outcome would be to identify possible locations where pedestrian and rider safety may need to be enhanced. Possible mitigation may include signalized pedestrian cross walks and clearer definition of MetroLink right-of-way to avoid LRT vehicle and automobile conflict, better signing and possible changes in alignment or position of station facilities.

2.6 Enhance Traveler's Sense of Personal Security

2.6.1 Resource Description and Impact Area

A key aspect about the success of transit service is the public's perception about personal security. An urban transit system can have a negative perception that deters people from riding. In this project, the environment of MetroLink stations and access to the stations need to be examined from the standpoint of perceived personal security.

2.6.2 Methodology

The method will be a qualitative assessment only. No formal analytical procedures will be used. As applied to the specific measures, the criteria focus on the rider's sense of security with using new transit facilities and services. The qualitative assessment will focus on specific station situations and on the walk link to and from the MetroLink station. The MetroLink stations will be evaluated considering several factors:

- **Sight distance (can the traveler see the MetroLink train and other vehicular traffic i.e., no blind corners)**
- **Visibility (the passengers can be seen)**
- **Shy distance (the amount of clearance between standing/walking areas and moving traffic)**
- **Lighting (the amount of lighting on the MetroLink platform and connecting lengths from station to park-n-ride or sidewalk, especially at night)**
- **Isolation (the potential presence of MetroLink riders versus one person in a "lonely" location)**
- **Parking or Kiss-n-Ride layout (distance between parking or drop-off areas and the MetroLink station platforms)**

In addition, information will be obtained from all potentially affected municipalities and jurisdictions regarding existing police, fire, ambulance and other emergency services available in the corridor. Coordination will take place with these municipalities regarding any concerns they may have in maintaining adequate security protection during MetroLink construction and operation.

2.6.3 Expected Outcome and Possible Mitigation

The expected outcome would be to identify possible locations where the personal security of LRT riders may be an issue. Possible mitigation may be increased lighting at park-n-ride lots or clearer definition of pedestrian walk and MetroLink right-of-way.

2.7 Reductions in Capacity for Other Modes

2.7.1 Resource Description and Impact Area

As transit is expanded into the Cross-County corridor, it could affect other modes of transportation. The intent is that MetroLink will add substantial transportation compatibility and capacity. It would have a role in a multi-modal transportation system. As such, transit would be designed to be compatible with other modes without detracting from their capability to provide transportation service. The impact on streets, measured at intersections, and access to land-use would be examined throughout the corridor. This would focus on the locations where at-grade MetroLink facilities would be considered and at station locations.

2.7.2 Methodology

The evaluation method will focus on two situations: (1) intersections where MetroLink trains and other traffic mix, and (2) traffic access impacts to MetroLink stations at park-n-ride lots, kiss-n-ride turnarounds, or bus transit access to MetroLink stations. The evaluation method will be analytically based, using the Highway Capacity Manual (HCM) for capacity analyses and using the SIGNAL85 program to examine traffic signal operations/phasing. The travel demand analysis team will provide year 2005 and 2020 traffic assignments to major streets. These daily volume estimates would then be translated into peak-hour equivalents using factors identified by actual counts of current traffic.

Agencies, including the Missouri Department of Transportation (MoDOT), the City of St. Louis, St. Louis County Department of Highways and Traffic and municipalities in the corridor (e.g., Clayton, Richmond Heights, and University City) will be contacted for current transportation information. This information would include traffic volumes and information on proposed roadway widening, relocations, interchange and intersection modifications or

additions, new alignments (if any), park-n-ride lot improvements, major signalization projects, plus pedestrian overpasses, bikeways and trails. These improvements will be documented, because such improvements may affect the potential location and effectiveness of Cross-County MetroLink Extension Segment I alternatives.

As applied to the specific measures, the above information will be used as follows. With regard to traffic capacity, HCM analysis will be conducted to estimate levels of service, which reflect the LRT signal phase in the traffic signal operations, at the eight signalized (at-grade) intersections in corridor. [The eight intersections are: Forest Park Parkway with Des Peres and with Skinker Boulevard; Millbrook Boulevard with Hoyt, with Throop, with Big Bend, and Carondelet at Hanley; Meramec with Bonhomme; and Oxford with Big Bend.] For intersections that will be controlled by rail gates/signals or by pre-emptive signal operations, the delay potential at each intersection will be estimated, which would include the percent of one hour that the intersection, street, or driveway is blocked by train movement.

With regard to traffic impacts, traffic in/out movements will be estimated for the peak hour for each LRT station with a park-n-ride lot (i.e., Eager Road, Shrewsbury). For each station with bus interface, estimates will be prepared for bus movements to and from station in the peak hour. With the results of these two tasks, traffic assignments to the streets near LRT stations will be made. To assign directional distributions (direction of approach), model output will be used that indicates general origins and destinations (O/D) pattern for MetroLink riders.

As part of our analysis impacts on the road system will be identified that provides access to LRT stations and/or park-n-ride lots. An HCM analysis will be conducted for key intersections such as Eager/Hanley, Eager/I-170 ramps, Big Bend/Oxford, Shrewsbury/I-64 ramps, Lansdowne/River Des Peres Boulevard, DeBaliviere/Forest Park Parkway. This will determine the potential traffic impacts along major arterial roadways, at interstate highway interchanges and on local streets caused by added traffic generation associated with park-n-ride use, station kiss-n-ride and bus feeder dropoffs.

2.7.3 Expected Outcome and Possible Mitigation

Traffic and intersection impacts are anticipated to be limited to heavily congested intersections where the LRT is surface running and must pass through the same intersections that autos and other vehicular traffic must pass through. Possible temporary impacts to police, fire, and/or emergency services during construction due to access changes or street closures are addressed later in this technical report under Construction. Possible mitigation measures for traffic impacts could include a range of possibilities, such as roadway or pedestrian structures over (or under) roadways to provide increased traffic capacity or separation of transit traffic from other traffic. Also, intersection improvements such as the

addition of turn lanes, traffic signalization or other operational improvements may be appropriate at congested intersections. The addition of bus drop-off lanes might be a solution for congestion at some proposed station locations where off-street bus circulation cannot be readily accommodated. Other mitigation measures will be developed on a site-specific basis to respond to the effects of the alternative designs.

3
Urban Design

The criteria for assessing urban design and land use impacts focus on overall relationships between the Cross-County MetroLink Extension and land-use plans, more specific relationships with major activity centers, and site-oriented considerations associated with access. The criteria also address several key characteristics of urban design in the Cross-County MetroLink Extension corridor. These characteristics include architectural type and quality, scale of development, historical and/or value themes, and density of activity in terms of being urban versus suburban in lifestyle. Specific criteria and measures to be used will be as follows:

Criteria		Measures	
A	Support existing or planned land use	a.	Qualitative: location of stations and influence on land use
		b.	Qualitative: specific comparison with recommended transportation elements
		c.	Compatibility with local plans and zoning
B	Specific enhancement to planned/ developing major activity centers	a.	Walking distance to major activity centers: Clayton CBD core, Washington University (Hilltop Campus), Galleria, Sunnen Business Park, and Hanley Business Park

C	**Maintain viable access to adjacent sites**	**a.**	**Access or driveway impacts in terms of driveways affected, driveways relocated, driveways eliminated**
		b.	**Qualitative: changes in access patterns (to and from) in terms of added travel distances, complexity, difficult**
D	**Create compatibility in design quality with surrounding area**	**a.**	**Qualitative: assessment of urban design characteristics (visual, aesthetic, scale, level of activity, etc.)**

The proposed method to be applied to these criteria is described in the following sections.

3.1 Support Existing or Planned Land Use

3.1.1 Resource Description and Impact Area

The urban fabric along the alternative alignments consists of parkland, institutional uses, historic neighborhoods, commercial centers, light industrial activity, office parks, and public services. Maintaining the aesthetic and urban design features consistent with the existing and proposed uses along the alignment will be a key feature. Integral to maintaining those key elements of the urban fabric is the understanding of the current and proposed land use and zoning along the alternative alignments.

Land use, land use plans, and zoning considerations are important elements within a community that help define how a community will function and grow. These issues are particularly important project variables because there are multiple municipalities in the corridor and each has its own policies and priorities for growth and development and preservation of community and natural resources. The jurisdictions include the following:

- **City of St. Louis**
- **St. Louis County**
- **University City**
- **Clayton**
- **Richmond Heights**
- **Brentwood**
- **Maplewood**
- **Shrewsbury**

St. Louis County and each municipality have land use and property development regulations that will have impacts on the decision-making as part of the evaluation of alternatives process.

Other types of local jurisdictions also influence public policy issues and land use planning in the corridor. The interests of entities such as school districts, Metropolitan Sewer District (MSD), Forest Park, and Ameren UE must be considered in the decision-making process.

The impact area for land use relationships will fall into two areas. The first area is along either side of the alternative alignments, and the area for analysis will be approximately two blocks from the alignment. The second area will be an area of approximately one-quarter mile surrounding each of the stations.

3.1.2 Methodology

The evaluation method will be a combination of map analysis and qualitative evaluation. No formal analytical procedures will be used. Officials charged with economic development, land use planning, zoning regulations, and enforcement from St. Louis City, St. Louis County, and each of the municipalities that would be directly affected by any of the proposed concept alignment alternatives will be consulted and future development plans identified. The information obtained from these consultations will be mapped, as appropriate. Existing land use will be mapped from recent aerial photography and field surveys. Zoning categories will be identified for land along the alignment and near the stations.

As applied to the specific measures, the above database will be used as follows:

a. Measure: location of stations and influence on land use
  1. Define overall organization of land use relative to design alternatives and station locations, i.e., at boundary of land use district or within
  2. Describe land use activities in relation to activities generated by transit stations, i.e.:
    - **Neighborhood residential area with internally oriented activities**
    - **Commercial district with significant movement of people in and out**
  3. Identify whether transit station facilitates linkage between land uses or creates a barrier

b. Measure: specific comparison with recommended transportation elements
  1. Compare specific Cross-County MetroLink Extension alternatives with land use type
  2. Assess implications on land use activities, and whether physical presence of transit facilities will alter basic land use activities or interactions

c. Measure: compatibility with local plans and zoning
  1. Compared local plans relative to a major transit facility, i.e., do local plans anticipate MetroLink and relative facilities

2. **Assess local plans relative to their strategy for change and the role major transit may play to support such strategies or policies, i.e., need enhanced transportation accessibility to create better market opportunities and/or the need for transit-oriented development to address either transportation capacity or sustainability goals.**

3.1.3 Expected Outcome and Possible Mitigation

Land use will be described in terms of past trends and existing conditions that will establish a baseline. This will be done with maps and charts of key indicators. Opportunities for development will be identified for those parcels that are vacant or underutilized and slated for change in accordance with approved land use plans and those changes acknowledged by economic development officials for the communities. The relationship between the alternative alignments' existing activity centers will be graphically displayed in terms of location and accessibility.

The proposed Cross-County MetroLink Extension Segment I alignments will transect a variety of urban conditions that will be described in terms of specific characteristics such as historic neighborhoods, neighborhood cohesiveness, nodes of activities, and linkages among the various elements. Each of the alternative alignments will be evaluated in terms of effects on these urban design elements along the alignment.

Mitigation measures to address unwanted development pressures associated with the Cross-County MetroLink Extension Segment I alignment and LRT stations within the corridor could include (1) implementation of one-way streets; (2) new or revised on-street parking restrictions to minimize spill-over parking; (3) new or revised infrastructure improvements (e.g., lighting, sidewalks); (4) strict zoning enforcement and development of neighborhood conservation plans to maintain existing desirable conditions in appropriate neighborhoods; and (5) zoning changes such as planned unit developments and redevelopment incentives (e.g., Missouri Chapter 353 and tax increment financing zones) could be considered to focus appropriate new development around key locations or stations.

3.2 Specific Enhancement to Planned/Developing Major Activity Center

3.2.1 Resource Description and Impact Area

Within the corridor, the major activity areas that will be examined include:

- **Washington University (Hilltop Campus)**
- **Forest Park**
- **Downtown Clayton**
- **Galleria Area**

- **Hanley Business Park/Promenade Area**
- **Sunnen Business Park**

Specific development plans (as available) will be obtained for each area.

3.2.2 Methodology

The method will be a combination of map analyses and qualitative evaluation. No formal analytical procedures will be used. The available data about these activity centers will be applied to the following measure—walking distance:

1. **Via map analyses, measure walking distance to the proposed MetroLink station as a series of distance/time corridors.**
2. **Assess the likely paths between the MetroLink stations in terms of apparent convenience, visibility, and attractiveness.**
3. **Based on the density and organization of land uses within the activity center, assess the amount of trip attractions by walking distance/time contour to assess the relative proximity of the volume activities to the MetroLink station.**

3.2.3 Expected Outcome and Possible Mitigation

The analyses will identify which station location will create the best accessibility to major activity centers. With regard to mitigation, the results could lead to modified positions for stations, modified access links for stations, and/or new stations as replacement or addition to the MetroLink alternatives being evaluated.

3.3 Maintain Viable Access to Adjacent Sites

3.3.1 Resource Description and Impact Area

The assessment of access will be organized to consider land use districts as well as individual sites. The land use districts will include:

- **Residential neighborhoods adjacent to the alignment along Forest Park Parkway and Millbrook Boulevard**
- **Washington University (Hilltop Campus)**
- **Downtown Clayton**
- **Galleria area**
- **Eager Road/Citizens for Modern Transit right-of-way area**
- **Sunnen Business Park/Deer Creek Center area**
- **Shrewsbury/Lansdowne Avenue area**

Examination of specific site access analysis will focus on downtown Clayton and the Galleria area.

3.3.2 Methodology

The method would be a combination of map analyses and qualitative assessment. Available data (map and site reconnaissance) will be used to identify area and site access.

a. Measure: access or driveways impacts
   1. **Map all affected site access and the likely change—affected, relocation required, or elimination possible**
   2. **Assess opportunities to make needed changes, i.e., opportunities for alternative access**
   3. **Assess impacts of alternative access—travel distance, capacity, convenience.**

b. Measure: changes in access patterns
   1. **Map all affected or anticipated changes in access patterns to districts (physical or operational)**
   2. **Assess opportunity for alternative access patterns**
   3. **Assess impacts of alternative access or lack thereof on the land use districts in terms of capacity and quality (clarity, convenience, travel distance)**

3.3.3 Expected Outcome and Possible Mitigation

The outcomes will identify the extent to which existing access will be changed. Results will include descriptions of alternative access and associated actions. The latter could be a series of access management actions, e.g., driveway consolidation, developing new alleys, consolidating land use to eliminate access, changing street operations, and street improvements.

3.4 Create Compatibility in Design Quality with Surrounding Area

3.4.1 Resource Description and Impact Area

This analysis will be based on an urban design framework developed for the study area (see Figure 1)[2] that depicts the fundamental character of the corridor by its major elements:

- **Residential**
- **Institutional**
- **Commercial**
- **Commercial/industrial**

Assessment of compatibility in design quality will recognize the differences in design associated with such land use districts. For those sections of the corridor where the proposed MetroLink line/stations are in public street rights-of-way, visibility will be the greatest. This analysis will focus on these areas, although attention will be given to the entire corridor.

3.4.2 Methodology

The method will entail a combination of library research (historical and experience review), photographic reconnaissance, and qualitative assessment. No formal analytical procedures will be used. Field reconnaissance will be a key data resource. This will be enhanced by historical review for the corridor. Also, other urban experience will be considered as a means for identifying how compatibility with transit facilities was or was not achieved in other areas. This would be used to provide reference points for identifying positive versus negative relationships.

The on-site analyses will be photo documented, which can then be used for defining the primary visual elements and illustrating impacts. The entire corridor will be categorized into several visual zones based on the characteristics identified during the field and data analysis. Zones would include:

- **Forest Park Expressway (DeBaliviere to Skinker). Potential impacts in this area will be to users of the Forest Park Expressway and Skinker, multifamily residences to the north, and single-family residences to the north and to the south.**
- **Washington University (Skinker to Pershing exit). Potential impacts in this area will be to users of Millbrook Boulevard, Washington University, and the residences to the north and south.**

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[2] Same as urban design figure in the Task 7 technical report, Alternatives Options, September 1998.

- **Parkway Area (Pershing exit to downtown Clayton). Potential impacts in this area will be to the users of the Parkway and single-family residences on both sides.**
- **Downtown Clayton. Potential impacts in this area will be to users of the surface streets (both in vehicles and pedestrians), retail/commercial establishments at street level, and office users. The City of Clayton has implemented streetscape improvements that should be considered in the urban design aspects of the planning and design.**
- **Existing CMT Rail R/W Corridor (Shaw Park to Sunnen and Sunnen to I-44). Potential impacts in this area will be primarily to adjacent industrial/commercial land uses, limited residential land uses, views from I-170, and limited impacts to users of cross streets such as I-64, Brentwood Boulevard, Manchester Road, and Big Bend Boulevard.**
- **Sunnen Office Park. Potential impacts in this area will be to surface streets (primarily vehicular, but some pedestrian), businesses in the area, and potential developers of new facilities.**

Measure: assessment of urban design characteristics.

First we will conduct a photo reconnaissance to establish basic character of the corridor. Key vistas or visual corridors that exist in the corridor will be identified. Research will be accomplished to define history and culture of the corridor. Other areas in St. Louis where comparisons of transit compatibility have been completed will be identified as reference points. Through consultant team experience and other resources, ways to illustrate design compatibility will be identified. Then proposed transit elements will be compared to the corridor attributes in terms of: (1) Architectural vocabulary; (2) Design themes; (3) Scale (size, mass, level of activity); and (4)Impact on visual aspects. Potential urban design compatibility, neutrality, or conflict will be identified.

3.4.3 Expected Outcome and Possible Mitigation

Short-term or temporary urban design visual impacts during construction of each of the alternatives will be identified. These impacts would include views from the adjacent public right-of-way spaces (streets and walks) and public/private buildings and outdoor spaces. Even though LRT construction will be for a limited time, the urban design impacts should be considered in how they affect the adjacent communities.

In terms of long-term community impacts, the aesthetics of the Cross-County MetroLink Extension Segment I line through the developed areas of the corridor can significantly affect the public's perception of the system. The evaluation would include views from the adjacent public right-of-way spaces (streets and walks), public and private buildings, and other outdoor spaces.

Rail alignments, type, and construction methods of each alternative would be examined to determine the long-term visual impacts. The selection of the rail alignment will determine what areas and who is impacted. The alternative types of rail line (cut and cover, open trench, at grade, or above grade) will directly affect the visual impacts on adjacent properties and the communities. In addition, the alternative construction methods will affect how much area is disturbed during construction, which could impact urban forestry resources, which are actually long-term impacts.

Where proposed construction will significantly impact views, mitigation measures will be considered. Impacts could be in the form of views from residential areas, streetscape viewsheds, views of historic buildings or storefronts, and views from pedestrian areas and vehicles. Findings of the visual impacts could be used to assist in the selection of the preferred alternative. In addition:

- **Mitigation measures to address construction impacts might include screening with aesthetically treated board walls or other elements.**
- **Mitigation measures that may be considered to address long-term impacts might include landscape buffers, selection of building materials/finishes compatible with surrounding areas, special paving materials, design changes, and other detailing that would adapt a standardized design to fit into the context of each community.**

Mitigation measures typically would include berms and landscape buffering, possibly fencing, and land use planning/zoning techniques to improve compatibility where changes in land use may be desirable. Noise walls may also be warranted in some locations. Pedestrian walkways and overpasses or grade-separated crossings will also be considered to maintain a degree of neighborhood cohesion.

4
Economic Effects

It is desirable to improve the economic assets in the corridor by strengthening existing core business areas, attracting new businesses, and redeveloping vacant and underutilized land parcels. The Cross-County MetroLink Extension Segment I alternative alignments offer vital opportunities for continued growth and development in downtown Clayton, the Galleria area and other economic activity centers. Those alternatives that can enhance existing and/or proposed economic development as well as stimulate new development cause positive effects. Conversely, those alternatives which detract from development or which stimulate inappropriate or unwanted development cause adverse effects.

The criteria for assessing the economic effects of the MetroLink extension are connected to an evaluation of the redevelopment opportunities and enhancement of economic vitality in the areas adjacent to the MetroLink stations. Specific criteria and measures to be used will be as follows:

Criteria		Measures
A	Foster redevelopment in strategic location	a. Distance proximity to redevelopment goals-Forest Park MetroLink station, University City Loop, Brentwood, Richmond Heights, Maplewood, and Shrewsbury b. Qualitative: opportunities to leverage LRT and other investments, opportunities to create enhanced redevelopment sites. c. Qualitative - achievement of transit oriented development principles.

B	**Enhance economic viability of key activity center**	**a. Changes in trade area due to enhanced travel for the Clayton CBD Galleria and Promenade.**
C	**Enhances corridor tax base**	**a. Qualitative: acres of under utilized land that could have value added** **b. Acres of taxable land removed from tax rolls for transportation facilities.**

The proposed evaluation methods to be applied to these criteria are described in the following sections.

4.1 Foster Development and Redevelopment in Strategic Locations

The method used for this analysis will be a combination of interviews with economic development officials, local civic leaders, and municipal staff. In addition, a map analysis will be accomplished that links the Cross-County MetroLink Extension Segment I station to adjacent areas.

4.1.1 Resource Description and Impact Area

The study area will be linked to the physical layout of the alternative alignments, specifically where development opportunities are forecast near MetroLink stations and park/ride lots. The focus will be areas that are already designated as redevelopment areas by the municipalities, based on their input and on the first phase of this study.

4.1.2 Methodology

Data collected during interviews with economic development officials, affected property owners, local civic leaders, and municipal staff will be used to identify potential development areas. Additional data of key economic indicators and forecasts will be obtained from existing sources and documents.

These development attributes will be analyzed using the following:

a. Measure: Distance proximity to areas with redevelopment goals, such as Forest Park MetroLink Station, Clayton, Brentwood, Richmond Heights, Maplewood, and Shrewsbury
   1. **Each of the areas with redevelopment goals will be reviewed in relation to the proposed station locations.**
   2. **Proximity of redevelopment areas to the proposed LRT stations or park-n-ride lots will be measured and noted on a map.**

b. Measure: Qualitative evaluation of opportunities to leverage MetroLink and other investments, opportunities to create enhanced redevelopment sites

1. **Describe economic activity occurring in the vicinity of each proposed station.**
2. **Evaluate opportunities for joint development and linkages to the proposed stations.**

c. Measure: Qualitative evaluation of achievement of transit-oriented development principles

1. **Review the potential for redevelopment near the LRT stations. Determine the potential for increased ridership from high-density residential or increased employment.**
2. **Determine the potential for attractions and activity centers to sustain or increase ridership.**

4.1.3 Expected Outcome and Possible Mitigation

For development opportunities, the results of coordination with community representatives and economic development officials will be identified on maps and discussions that describe the potential for development to occur and the potential for joint development opportunities. No mitigation is anticipated.

4.2 Enhance Economic Viability of Key Activity Centers

4.2.1 Resource Description and Impact Area

The study area will be linked to the physical layout of the alternative alignments, specifically where development opportunities are forecast near MetroLink stations and park/ride lots. The primary areas will be locations that are already key activity areas such as the Clayton CBD, the Galleria, and the Promenade.

4.2.2 Methodology

The method used for this analysis will be a combination of interviews with economic development officials, local civic leaders, and municipal staff. In addition, a map analysis will be accomplished that links the Cross-County MetroLink Extension Segment I station to adjacent areas. Data collected during the interviews with economic development officials, affected property owners, local civic leaders, and municipal staff will be used to identify potential development areas.

These development attributes will be analyzed using the following:

a. Measure: Changes in trade area due to enhanced travel specifications for the Clayton CBD, Galleria area, and Promenade.

1. **Determine the ridership area usage rate for the MetroLink Segment I Extension.**
2. **Determine the ridership destinations from the travel demand forecast.**
3. **Assess the value of the increased patronage for each of the areas.**

4.2.3 Expected Outcome and Possible Mitigation

Key activity centers and other areas that have development potential along the alternative alignments will be identified on project study area maps. No mitigation is anticipated.

4.3 Enhances Corridor Tax Base

4.3.1 Resource Description and Impact Area

The study area will be linked to the physical layout of the alternative alignments, specifically where development opportunities are forecast near MetroLink stations and park/ride lots. The focus will be areas that are already designated as redevelopment areas by the municipalities. Areas of land required outside of the right of way will be located from the preliminary plans.

4.3.2 Methodology

The method used for this analysis will be to identify on maps where underutilized parcels are located. In addition, for taxable land that is to be removed from the tax base, the information will come from parcel maps and tax records. Data collected during the interviews with economic development officials, affected property owners, local civic leaders, and municipal staff will be used to identify potential development areas. Parcel ownership maps will be prepared as part of the preliminary engineering.

Impacts on the tax base will be estimated by community jurisdiction, using the appropriate real property, franchise, and municipal and transportation sales tax rates and the estimated increased capital investment resulting from increased development opportunities. The increases will be offset somewhat by the removal of properties from the tax base in order to provide space for the alignment, stations, park/ride lots, and maintenance facilities. Any employment decrease from the property losses will be evaluated against potential gain from new development opportunities. Changes in property values for residences located near the proposed MetroLink alignment will also be qualitatively reviewed.

Construction and employment impacts will be evaluated using the Economic Impact Forecasting System (EIFS) model developed by the Construction Engineering Research Laboratory. The model uses regionally specific cost indices to determine the primary and

secondary impact of the construction dollars. One output defines whether the dollars spent are below a rational threshold value for the region that determines if a significant impact will occur that might trigger other secondary impacts in terms of the need for increased services, etc.

Using employment and income "multipliers" developed with the comprehensive database combined with economic export base techniques, EIFS estimates the regional economic impacts of actions resulting in changes in personnel or expenditures. These multipliers are applied to the direct economic effects of an action to calculate the total impacts upon the region. EIFS evaluates socioeconomic impacts in terms of changes in sales (business) volume, employment and personal income.

These development attributes will be analyzed using the following:

a. Measure: Qualitative – acres of underutilized land that could have value added
   1. Define areas on maps near the stations that could benefit from transit-oriented activity.
   2. Assess the compatibility and potential for development near the station areas.
   3. Assess construction and employment impacts using the Economic Impact Forecasting System (EIFS) model.

b. Measure: Acres of taxable land removed from tax rolls for transportation facilities.
   1. Review the alignment right-of-way plans to determine the area of land required outside of public-controlled right-of-way.
   2. Assess the loss of taxes at current use versus potential for increased tax revenue from new development.

4.3.3 Expected Outcome and Possible Mitigation

The expected outcome would be identifying specific locations in the Cross-County MetroLink Extension Segment I corridor that would enhance tax revenues. If any adverse economic impacts are identified, mitigation measures such as incentives for transit oriented development or redevelopment of housing near LRT stations to offset or compensate for adverse effects will be developed in close coordination with local jurisdictions.

Short-term impacts during construction, such as changes in patron access for local businesses, will be identified and appropriate mitigation measures developed.

5
Environmental Impacts

Potential environmental impacts could be experienced in the areas of natural resources, displacements, noise, air quality, construction, and cultural resources. Table 1 presented in the Introduction section of this report provides an overview of the Evaluation Methodology objectives and criteria. For each of the resource areas discussed below the criteria are listed along with the corresponding measures that will be used to evaluate any impacts identified.

5.1 Minimize Impact on Natural Resources

The criteria for assessing natural resource impacts focus on direct and indirect impacts resulting from the construction and operation of the MetroLink extension. Specific criteria and measures to be used for the evaluation process will be as follows:

Criteria		Measures	
A	Minimize impact on natural resources	a.	Impact on waterways and wetlands via reduction in wetland acreage or quality, changes in water quality or waterway capacity.
		b.	Impact on wildlife and vegetation in terms of changes to habitat and removal or damage to unique vegetation.

The proposed evaluation methods to be applied to these criteria is described in the following section.

5.1.1 Resource Description and Impact Area

Primary water features that would intersect or that may be affected by the construction and operation of Cross-County MetroLink Extension Segment I include the River Des Peres, Deer Creek, Black Creek and tributaries to these waterways. Floodplain areas occur along the River Des Peres, Deer Creek and associated tributaries. For this environmental review, the study area for natural resources will include 100 feet on either side of the alignment alternatives. The majority of the natural environment within the study area has already been significantly altered, disturbed, or destroyed as a result of urbanization. The primary non-urban areas associated with the alternative alignments are the riparian corridors located along the streams identified above.

Wetlands. The St. Louis District, U.S. Army Corps of Engineers (USACE); Region 7 of the Environmental Protection Agency (EPA); and the Missouri Department of Natural Resources (MDNR) regulate impacts to surface waters (Waters of the U.S.), including jurisdictional wetlands, within the study area. Section 404 and Section 401 of the Clean Water Act are the primary regulations that control potential impacts to surface waters.

Water Quality. Missouri Department of Natural Resources (MDNR) and the St. Louis Metropolitan Sewer District (MSD) monitor and regulate the water quality of the waterways in the St. Louis region where the Cross-County MetroLink Extension Segment I would occur.

Waterway Capacity (Floodplain). Floodplain areas are regulated by the Federal Emergency Management Agency in cooperation with the local communities that participate in the National Flood Insurance Program. Those portions of the waterways crossing or adjacent to the alternative alignments for the Cross-County MetroLink Extension Segment I and designated as part of the floodplain and the regulatory floodway will be identified.

Wildlife Habitat and Unique Vegetation. This would include any open areas that have an assemblage of vegetation that would provide habitat. For this urbanized area, this would occur in park areas and along riparian stream corridors.

5.1.2 Methodology

The method used to describe any impacts to this resource category will include a review of available maps of the resource category, a field review along the alignment to identify wetlands areas, streams, floodplain areas, wildlife habitat and unique vegetation. Coordination will occur with resource agencies in each category as necessary. Where appropriate, any impacts will be quantified in a manner commensurate with the conceptual design plans prepared as a part of this project.

Surface waters and wetlands will be identified through field visits along the alignment the best available data from the US Fish and Wildlife Service (USFWS), US Army Corps of Engineers (USACE), US Geological Survey (USGS), and Missouri Department of Natural Resources.

Water quality data will be obtained from MDNR and MSD. Any locations or stream reaches that are currently not meeting water quality standards will be identified as appropriate.

Floodplains will be identified using Federal Emergency Management Agency (FEMA) mapping for rivers, streams, and tributaries in the study area.

The consultant will identify and map any open space areas and natural areas that contain contiguous wildlife habitat. USGS maps, NWI maps, local soil surveys, and other published sources will be reviewed to determine the extent and types of habitats present. Natural resource management plans including park management plans, such as the Forest Park Master Plan, will be reviewed if necessary. The consultant will contact the MDNR, Missouri Department of Conservation (MDOC), and the USFWS in order to determine if there are any threatened, endangered, and/or rare species or ecologically sensitive areas present in the study area. This coordination is required under the Endangered Species Act (ESA, 1973 as amended). Field surveys of the proposed alignment will be conducted to augment the literature search and map review. Where appropriate, any impacts will be quantified in a manner commensurate with the conceptual engineering design plans prepared as a part of this project. The significance of potential impacts will be analyzed and discussed.

As applied to the specific measures, the above information will be used as follows in analyzing the established measures.

a. Measure: Impact to waterways and wetlands via reduction in wetland acreage or quality.
   1. **Identify any potential jurisdictional wetlands along the alternative alignments;**
   2. **Determine type of wetland and acreage;**
   3. **Conduct a qualitative determination of function and value of the wetland;**
   4. **Prepare wetland data form and coordinate the results with the St. Louis District, Corps of Engineers; and**
   5. **If necessary, prepare an evaluation of potential impacts from construction or operation of the Cross-County MetroLink Extension Segment I.**

b. Measure: Change in water quality
   1. **Identify potential impacts from construction activities; and**
   2. **Determine type of runoff contaminants typical of parking lots and maintenance facilities.**

c. Measure: Change in waterway capacity

1. **Determine if any construction/facilities for the Cross-County MetroLink Extension Segment I will occur with the floodplain; and**
2. **Determine if any construction/facilities for the Cross-County MetroLink Extension Segment I will occur with the regulatory floodway.**

d. Measure: Changes or removal of wildlife habitat:

1. **Conduct a review of aerial photography and a field survey to identify any quality wildlife habitat along the alternative alignments;**
2. **Coordinate with Missouri Department of Conservation urban biologist, if necessary; and**
3. **Map any areas that have the potential to be impacted from the construction or operation of the Cross-County MetroLink alignment.**

e. Measure: Changes, removal or damage to unique vegetation:

1. **Conduct a review of aerial photography and field survey to identify any unique vegetation along the alternative alignments;**
2. **Coordinate with Missouri Department of Conservation urban biologist if necessary; and map any areas that have the potential to be impacted from the construction or operation of the Cross-County MetroLink alignment.**

5.1.3 Expected Outcome and Possible Mitigation

For any wetlands located as part of this effort, data forms and photographs will be prepared and the location will be sited on USGS topographic maps. Wetland acreage likely to be affected within the corridor will be determined and coordination will occur with the St. Louis District Corps of Engineers. Other Waters of the U.S. including lakes, ponds, streams, headwaters, and wet weather conveyances will be identified and mapped. Stream crossings will be evaluated to determine if channelization or other construction will impact the waterways.

The effects of construction and operation of the proposed Cross-County MetroLink Extension Segment I on water quality, surface waters, and wetlands will be identified. Construction operations such as grading, cut and fill, stream modification/channelization, and other site construction/preparation activities can adversely impact water quality. The creation of impervious surfaces can impact stormwater discharges that affect surface waters.

Water quality impacts associated with the operations will include runoff containing grease and oils from the park and ride lots and the same plus detergents, metals, etc from the maintenance facility. Activities, if any, that alter, modify, or encroach upon floodplains or activities that alter the flood flow capacity of floodplains, including secondary effects, will be noted, as necessary. If construction is anticipated within the designated floodplain, this will be described and the process to coordinate approval will be identified. This approval process would occur later during the design phase of the project.

Areas that will be adversely impacted as a result of construction impacts, such as any stream crossings or channelizations, will be identified on maps illustrating the alternative alignments. Based on the conceptual engineering for the maintenance facility and park/ride areas the potential type of contaminants requiring treatment or pretreatment according to MSD regulations will be identified along with appropriate measures and permits required. No specific type of treatment or size of treatment for runoff will be detailed for this project. Water quality impacts from construction can usually be avoided or minimized through the use of best management practices, such as soil erosion prevention techniques, avoidance, and/or through mitigation. When it is not practical to avoid Waters of the U.S., potential mitigation measures may include replacement or enhancement of wetlands or stream channels. Coordination with the St. Louis District Corps of Engineers and other appropriate regulatory and resource agencies will occur as necessary if mitigation measures need to be developed.

The area is highly urbanized and the potential for the threatened and endangered plant or animal species listed for the St. Louis area is highly unlikely along the Cross-County MetroLink alignment segments. Possible mitigation measures may include design modifications, landscaping, special design amenities, avoidance, habitat enhancements, and/or in-kind replacement of acreage.

Based on the initial field review and because the alternative alignments are located for the most part on existing public or CMT right of way there does not appear to be any park land that would be required. This will be substantiated with the investigation described above. Parkland and historic properties located within 100 feet of the alternative alignments will be located on plan view maps that illustrate the alternative alignments.

5.2 Minimize Displacement

The criteria for land acquisitions and displacement evaluate those elements related to both residential units and non-residential properties. Non-residential properties covers a range of uses that could include, but not be limited to, commercial, industrial and public properties.

Criteria	Measures
B. Minimize displacement	a. Number of dwelling units or related structures of property taken (square footage as available)
	b. Number of non-residential properties displaced (square foot or acres)

5.2.1 Resource Description and Impact Area

The resources in this category include a variety of land use activities along the Cross-County MetroLink Extension Segment I corridor that cover a broad range from residential, to commercial, institutional, government, industrial, and parkland. The conceptual alternatives will make use of existing public or CMT right of way where feasible and where this is not possible, the alternatives will be adjacent to public right-of-way whenever possible. Those residential, business, institutional, and government properties required for construction and operation of the Cross-County MetroLink Extension Segment I will be identified on the conceptual engineering drawings.

5.2.2 Methodology

The method used to determine the impacts on residential and non-residential properties will involve a combination of map analysis, review of aerial photography and field visits along the Cross-County MetroLink alignments. As part of the review of the alignment alternatives, the required right of way will be identified and any displacements will be determined from a review of aerial photographs, design cross sections, and field surveys. Residential displacements associated with each alternative will be estimated by dwelling type (multi-family, single-family). Dwelling types will include a description of the socio-economic characteristics of the residents based upon census data. The assessed value of typical affected properties will be obtained as necessary and real estate agents will be contacted to assist in estimating typical sale prices for the potential displacements and the availability of relocation units. The number of properties affeced by a partial taking of the property will be calculated.

For non-residential displacements, the primary concern will be business types. As part of the analysis a description of business characteristics, including an estimate of the number of jobs affected and the probability for the business to be relocated successfully will be prepared. The assessed value of typical affected properties will be obtained and real estate agents will be contacted to assist in estimating typical sale prices for the potential displacements and the availability of relocation units. The number of properties affected by a partial taking of the property will be calculated.

As applied to the specific measures, the information collected above will be used as follows:

a. Measure: Number of dwelling units or related structures of property taken.

1. **Determine the number and type of residential structures required for the alternative alignments i.e., single-family; multi-family;**
2. **Estimate the number of residents to be relocated based on existing census data and type of units i.e., single-family, duplexes, apartments, etc.;**
3. **Determine the amount and number of residential properties required that would not require the taking of the residential structure and how the taking would affect the remainder of the property; and**

4. **Determine the availability of comparable residential units available for relocation.**

b. **Measure: Number, size, and value of non-residential properties to be displaced.**

1. **Determine the number and type of businesses to be relocated;**
2. **Determine the number and amount of institutional, governmental and industrial properties required for the construction or operation of the MetroLink extension; and**
3. **Estimate the number of employees to be relocated as part of the displacements.**

5.2.3 Expected Outcome and Possible Mitigation

The use of existing public right of way or CMT right of way for a majority of the alignments will minimize the amount of land acquisitions and displacements required for construction and operation of the Cross-County MetroLink Extension Segment 1. Avoidance of displacements where feasible will be a goal of the project. The primary areas that will require acquisition and displacements may occur at the park/ride locations and the maintenance facility. Tables will be presented that estimate the number and type of structures requiring relocation and an estimate of the number of residents or in the case of commercial or public buildings, the number of employees requiring relocation.

Where avoidance is not possible, mitigation will involve an effective property acquisition and/or relocation.

5.3 Minimize Noise, Vibration, and Electro-Magnetic Related Impacts on Sensitive Areas

The criteria for assessing potential noise impacts focus on the relationship between the construction and operation of the Cross-County MetroLink Extension Segment I and the surrounding land uses, especially any sensitive noise receptors. The specific environmental impact criteria and measures to be used are as follows: minimize noise impacts on sensitive areas (criteria) and changes in noise levels at residential, institutional, and other sensitive land uses (measure).

Criteria	Measures
C. Minimize noise, vibration, and electro-magnetic related impacts on sensitive areas	a. Changes in noise levels at residential, institutional, and other sensitive land uses b. Changes in vibration levels at sensitive land-uses c. Qualitative - assessment of potential electro-magnetic interference (EMI), and potential effects of electro-magnetic fields (EMF) on sensitive land-uses

5.3.1 Resource Description and Impact Area

Auto traffic is a major contributor to noise in the Cross-County MetroLink Extension Segment I corridor. MetroLink's electric traction motors, steel-wheel-on-steel rail operations, cooling fans and HVAC equipment would constitute the primary noise from LRT. The LRT vehicle bells and horns are also a concern to residents.

Noise sources other than MetroLink exist in the study corridor. The areas near the proposed rail stations and rail line routinely experience noise to varying degrees from auto and truck traffic, industry, freight trains, and occasionally aircraft overflights. The combination of noise from all these sources is referred to as community noise and is most commonly measured in A-weighted decibels (dBA). A decibel (dB) is a logarithmic unit used to quantify sound. A-weighting of a sound refers to sound frequency weightings that correspond to the variation in sensitivity of the human ear to different acoustic frequencies.

Single number descriptors have been developed to aid in the analysis of the continuously fluctuating community noise environment. Two descriptors commonly used in environmental planning documents are the Leq and Ldn. The Leq is a sound level with the same energy as the fluctuating noise level over a given time period. The Ldn is a 24-hour average calculated from hourly Leq values. Community noise in the Cross-County MetroLink Segment I Extension corridor results primarily from freeway, arterial and local street traffic, and some commercial and industrial uses.

Vibration during operation or during construction is a factor of soil condition, distance from the source, and the auto and LRT activity causing the vibration. Office buildings or other structures sensitive to vibration may be an issue for the Cross-County MetroLink Extension Segment I but only if they are located close to the LRT alignment. Construction noise is addressed later in this technical report.

Professors at the Washington University Department of Chemistry are conducting research into electro-magnetic imaging. There is a concern that radiation effects from the MetroLink vehicles' motor or catenary system may disrupt or interfere (Electro-Magnetic Interference-EMI) with this research since the at-grade design alternatives may be located close to their research building. Also, there could be a potential concern regarding Electro-Magnetic Fields (EMF) if any of the high voltage transmission lines in the CMT right-of-way have to be relocated for Cross-County MetroLink Extension construction.

The impact area begins in the northern portion of the corridor at the existing Forest Park MetroLink station and it follows the proposed Segment I corridor throughout the project area. The area of concern for noise impacts would be the properties adjacent to and on either side of the LRT centerline of a street-running LRT design alternative. This would be true for any conceptual alternative running along Forest Park Parkway and Millbrook Boulevard in the northern portion of the corridor, the downtown Clayton and Galleria alignment alternatives, and the CMT right-of-way in the southern portion of the study corridor. Station locations, especially if associated with a park-and-ride facility, and major street intersections present the most likely areas for potential noise impacts. Of the various land uses within the study corridor, residential areas are the most noise-sensitive, especially the first row of houses next to the LRT alignment. The noise impact concern originates from the combination of LRT and auto traffic along the LRT alignment roadways. In areas where the LRT alignment may be elevated above ground, such as along Forest Park Parkway in Clayton, the Galleria in Richmond Heights, and on the CMT right-of-way near Big Bend Boulevard and I-44, the potential for noise impacts may be greater.

The area of concern for vibration most likely would be downtown Clayton where the streets are more narrow and MetroLink may be located closer to existing buildings. For EMI effects, the area along the Washington University campus on Millbrook Boulevard would be the potential impact area. For EMF effects, the potential impact area would be the CMT right-of-way.

5.3.2 Methodology

For noise, the analysis method will be a combination of corridor visits to identify sensitive receptors, field noise monitoring to establish a baseline condition, collection and review of applicable traffic data at roadway intersections near sensitive receptors, and noise modeling to determine the change in noise levels at the sensitive land uses.

The FTA guidance manual, *Transit Noise and Vibration Impact Assessment*, will be used to define the approach to this noise study. Corridor site visits will be conducted to identify representative sensitive receptor locations and conduct field noise measurements to evaluate existing background noise levels in the project area.

The entire corridor will be toured prior to these field noise measurements to determine the location of all noise-sensitive receptors (e.g., houses, historic structures, hospitals, schools, public assembly buildings, etc.). The measurement locations represent receptors both adjacent to and within one block from the corridor. Aerial photography and corridor mapping will also be reviewed to consider surrounding land uses. Noise measurements will be conducted at approximately 15 locations along the LRT alignment. All short-term noise measurements will be conducted during peak hours or as close to peak hours as possible. Noise measurements will also be taken at points along the existing MetroLink alignment, for community information purposes and to aid in calibrating the model. A table will be prepared summarizing the noise measurement locations and monitored readings in equivalent noise levels (Leq), measured in decibels (dBA).

With regard to federal noise regulations, no regulations stipulate absolute noise levels that must be met by a project of this type. The FTA has drafted noise criteria for LRT systems that are designed to result in an acceptable community noise environment. For traffic generated roadway noise, the FHWA noise abatement criteria (NAC) will be used.

As applied to the specific measures, the information collected above will be used as follows:

a. Measure: Changes in noise levels at residential, institutional, and other sensitive land uses

1. **Future noise levels at noise-sensitive land uses will be predicted using an FTA and FHWA approved noise model specially designed to predict LRT noise levels, taking into account such factors as vehicle type, speed, traffic volumes, and the distance from the noise source to the receiver.**
2. **The study team will then compare the predicted noise levels against the ambient or existing levels to calculate the change in noise, if any, caused by the LRT project and any projected change in auto traffic.**
3. **The study team will also compare the predicted noise levels without the LRT project (vehicular traffic only) to determine the contribution, if any, the project is making to the study corridor noise levels.**
4. **The maximum level of a single pass-by (Lmax) will be used to measure the intermittent (short duration, but loud) noise caused by the Cross-County MetroLink Extension Segment I. The change in peak hour equivalent noise (Leq) will be used to compare the relative difference between ambient and predicted noise levels caused by train or vehicular noise.**

b. Measure: Changes in vibration at sensitive land-uses

1. **Conduct field visit along the Cross-County MetroLink corridor to identify vibration sensitive receptor locations, if any.**
2. **Determine the proximity of each potential vibration-sensitive building or structure to the MetroLink alignment.**

3. If vibration sensitive receptors are identified, conduct vibration measures of existing peak hour traffic vibrations near sensitive receptor, if appropriate.
4. Document results of field review and analysis in environmental evaluation report.

c. Measure: Qualitative - assessment of potential electro-magnetic interference (EMI) and potential effects of electro-magnetic fields (EMF) on sensitive land-uses.
1. Obtain and review information regarding the Washington University Department of Chemistry electro-magnetic imaging research.
2. Review existing electro-magnetic interference (EMI) and electro-magnetic fields (EMF) research and other appropriate studies. Conduct field investigations, especially in area of Washington University and CMT right-of-way. Determine proximity of MetroLink Segment I alignment to Washington University laboratory and LRT stations to CMT power poles.
3. Qualitatively assess the potential effects of EMI, if any, as caused by MetroLink vehicles on Washington University research experiments, and the potential effects of EMF, if any, at MetroLink stations along the CMT right-of-way.
4. Document results of qualitative assessment in environmental evaluation report. If further investigations are necessary, they will occur prior to final design and construction.

5.3.3 Expected Outcome and Possible Mitigation

Tables will be prepared showing the ambient and predicted levels with appropriate noise impact thresholds and the number of receptors potentially affected. The main sources of noise from the operation of the Cross-County MetroLink Extension Segment I will be from vehicular traffic and LRT vehicles. Receptors along the LRT alignment will experience noise from LRT wheel-track interaction and its various cooling fans and from vehicular wheel-pavement interaction and shifting gears (e.g., trucks at intersections). Receptors near stations will experience noise from bus and auto traffic and LRT warning devices (bells and possibly horns). The degree of noise impact resulting from this project will depend on the noise levels produced, the location of the receptors, and existing or ambient noise levels. Generally, little additional noise contribution caused by the LRT would be expected over what is existing, especially in areas along high traffic volume roadways like Forest Park Parkway or Brentwood Boulevard or in high density commercial areas, like the Galleria. The potential noise concern from LRT is expected to be in residential areas (for a LRT surface running alignment) with only low traffic volume (local) streets. Vibration is not anticipated to be an issue on this project. Therefore, no mitigation measures for vibration are anticipated.

Possible mitigation measures for noise will be identified as appropriate, and the feasibility and cost of various measures will be considered. Possible measures to reduce rail noise at the

source include resilient wheels, vehicle skirts, wheel truing, rail grinding, undercar absorption or changes in track ballast or weld type. Barriers close to the LRT guideway are effective and may be considered where necessary to interrupt the path of the noise from the source to the receptor. In residential areas, if potentially significant impacts occur, noise walls or berms would be considered or where appropriate, the feasibility of placing the alignment in a trench or below ground and covered in order to reduce noise levels will be reviewed.

With regard to potential EMI and EMF effects, if impacts are identified mitigation measures will be considered as appropriate. The feasibility and cost of possible mitigation measures will also be considered. Possible measures may include grounded steel shielding at the Washington University laboratory building (EMI), or grounded shielding, if appropriate, at MetroLink stations along the CMT right-of-way.

5.4 Improve Air Quality

Maintaining St. Louis metropolitan regional air quality is important to the overall health and well-being of the residents. The criteria for assessing air quality impacts with regard to regional air quality focus on the net reduction in emissions the LRT project creates when considered in context with other transportation improvements that are a part of the region's long range transportation plan. With regard to localized project-specific emissions, the focus is the operation of MetroLink (surface-running alignment) in combination with vehicular traffic on the study corridor's major streets and roadways, especially at roadway intersections that may experience heavy traffic congestion during peak travel hours. Specific criteria and measures to be used will be as follows:

Criteria	Measures
D. Improve air quality	a. Changes in regional air quality b. Intersection and parking facility hot spots-emissions associated with traffic operations affected by MetroLink Segment I Extension

The proposed method to be applied to these criteria is described in the following paragraphs.

5.4.1 Resource Description and Impact Area

Currently, the St. Louis region is in attainment for carbon monoxide (CO), and particulates and non-attainment for ozone. In addition, the Cross-County MetroLink Extension Segment I is part of a region-wide conforming long-range transportation plan. The construction and operation of this LRT system should increase transit ridership and should help to reduce auto

emissions and incrementally, help achieve the region's air quality conformity objectives. However, air quality concerns may arise at certain traffic congested intersections in the study corridor, especially where left-turning volumes are high and long cues of autos may arise during peak hours. Also, LRT stations, transit, park-n-ride, and kiss-n-ride facilities may concentrate buses and autos at selected locations during peak travel hours.

Motor vehicles generate air pollutants including carbon monoxide (CO), nitrogen oxides/hydrocarbons (ozone (O3) precursors), lead, and suspended particulates less than 10 microns in diameter (PM10). For this project, the pollutant of most concern is CO. The impact area is specifically focused on traffic-congested street intersections along the LRT alignment where the LRT is surface running and traffic volumes are heavy during peak AM and PM hours. This may include intersections along Forest Park Parkway at Skinker or Big Bend or intersections along Brentwood near the Galleria area. Based upon current traffic counts, worst case intersections will be identified as the primary impact areas.

5.4.2 Methodology

The method will identify the worst case intersections, if any (for surface running LRT alignment), and establish background carbon monoxide (CO) concentrations in the corridor. The method will also include modeling worst case, or "hot spot" intersections for CO concentrations (if necessary), and determining the air quality impact, if any, at these intersections.

For changes in regional air quality emissions, EWGCC, U.S.EPA and Missouri Department of Natural Resources staff will be contacted to verify that the Cross-County MetroLink Extension Segment I is part of a conforming Long Range Transportation Plan.

For localized air quality emissions, the U.S. EPA has established National Ambient Air Quality Standards (NAAQS) to protect the public from air pollution. The criteria pollutants includes carbon monoxide (CO). Coordination will occur with EPA region staff as well as appropriate air quality personnel at Missouri Department of Natural Resources to discuss CO analysis assumptions (e.g., background CO concentrations) prior to any CO modeling. CO levels are a localized phenomenon. It may be determined that no CO modeling will need to be done as part of this project.

As applied to the specific measures, the information collected will be used as follows:

a. Measure: Changes in regional air quality

1. If information is available as to the net reduction in regional air quality emissions resulting from the inclusion of the Segment I project in the Long Range Transportation Plan, that information will be documented in the environmental assessment report.

2. **No formal analytical procedures will be used since this conformity analysis has already been completed.**

b. **Measure: Intersection and parking facility hot spots-emissions associated with traffic operations affected by Segment I Extension**

1. **Air quality monitoring data gathered by EPA near or in the study corridor will be obtained and reviewed as appropriate. Traffic data at all major intersections will also be reviewed to determine the "worst case" intersections, if any. It may be determined that CO modeling may not be necessary as part of this project.**
2. **If a CO "hot spot" analysis is conducted.**
   - **The air quality model CAL3QHC will be used to determine the dispersion of CO from vehicles to receptor sites (locations that could be affected by CO). This model takes into account the meteorological conditions (wind speed, direction, air temperature, etc.), the number of vehicles, the physical layout of the intersection modeled, the traffic signal phasing, vehicle delay, and other factors to determine a CO concentration at receptors.**
   - **Conservative modeling assumptions involving meteorological conditions and vehicle activity will be made for the worst case condition. Up to two identified congested intersections and a proposed park-n-ride lot anticipated to generate the greatest traffic movements in the peak period will be modeled if appropriate. The distance to the nearest sensitive receptor will be specified.**

3. **Baseline year 1999 and the post-construction/operation year 2005 will be modeled under AM or PM peak traffic conditions to estimate existing CO concentrations under current conditions and predicted CO emission levels at worst-case intersections.**

5.4.3 Expected Outcome and Possible Mitigation

As already mentioned, the air quality conformity analysis has already been completed. If conducted, results of the CO "hot spot" analysis should show an incremental reduction in CO emissions and no exceedances of NAAQS standards. The results would be compared to determine the percent change, if any, in CO concentrations from the existing condition and the future condition (with LRT and vehicular traffic). CO modeling results would also be compared to NAAQS standards for the 8-hour and 1-hour periods. A table would be prepared that shows CO analysis results at each receptor site; any exceedances of NAAQS standards will be noted.

Anticipated CO analysis results should show no exceedances of NAAQS standards. If this is the case, no mitigation measures would be necessary. Coordination with EPA and MDNR would be ongoing throughout the study as necessary. If an intersection shows an exceedance of NAAQS standards, mitigation measures would be considered. These measures could include additional intersection improvements, traffic signalization, or other operational improvements. Moreover, if any park-n-ride facilities generate pollution in excess of NAAQS standards (not anticipated), they could be reduced in size, provided with additional access points to more quickly dissipate traffic congestion, and/or be more heavily landscaped to absorb air pollutants.

5.5 Minimize Construction Impacts

Construction of the Cross-County MetroLink Extension Segment I, which includes the LRT system, LRT stations, and related intersection and roadway improvements and utility relocations, will have a short-term effect on the natural and man-made environment during construction. The criteria for assessing construction impacts focus on the physical activities involved in constructing an LRT system and the potential effects these activities may have on adjacent and surrounding land uses and on the environmental resources within the study corridor.

Criteria	Measures
E. Minimize construction impacts	a. Qualitative assessment of land use impacts due to construction (disruption of access, impact of construction activities) b. Length of construction process

5.5.1 Resource Description and Impact Area

Detours and changes in access to surrounding land uses will be required for pedestrians and motorists. Moreover, noise, fugitive dust, and stormwater runoff over exposed soils are issues during construction. Key resource areas where construction impacts are likely to occur include noise, air and water quality, traffic and transportation, wetlands, visual and aesthetics, socio-economic, and historic and archaeological resources.

The impact area is the entire corridor length of the Cross-County MetroLink Extension Segment I from the existing Forest Park MetroLink station, along Forest Park Parkway, through downtown Clayton and along the CMT right-of-way in Richmond Heights, Brentwood, Maplewood and Shrewsbury. LRT construction will be limited to a defined right-of-way in this linear corridor except in areas where park-n-ride or other transit related facilities are planned.

Hazardous and special waste concerns include the potential for several contaminants. Along the alternative alignments, there are past railroad right-of-way and industrial activities that may have resulted in practices that today would be classified as environmental contamination. Therefore, the primary area of concern will be the industrial areas which exist along the alignment south of Interstate 64 and continue interspersed with office parks, residential areas and commercial districts until the end of the alignment at Interstate-44.

5.5.2 Methodology

The evaluation method will be qualitative in nature. No formal analytical procedures will be used. Based upon previous LRT planning, design and construction experience by the lead agencies and the consultant team, and the specific construction methods to be used for this LRT extension, the construction impacts for adjacent land uses and for each resource area mentioned above will be identified. Coordination with local and state regulatory agencies, as appropriate, will occur throughout the analysis process.

Identification of hazardous and special wastes at this alternatives analysis stage will be limited to locating known sites in relation to study alternatives. The identification of known sites will be accomplished through a database search of environmental databases. From the listing generated from the database search, a table will be prepared that identifies any sites within the Cross-County corridor or immediately adjacent to a Metrolink Segment I alignment. The purpose of identifying the immediate adjacent sites will be to identify not only those sites that may be affected by the construction but also those adjacent sites that may have a potential to impact the alignment or LRT operations in some manner.

No on-site testing or laboratory analyses will be undertaken at this time. The level of analysis for this task will not identify buildings with lead-based paint or those structures containing asbestos. If it is determined that certain sites should be considered for further investigation prior to final design and construction, recommendations will be made during the evaluation of the study alternatives.

Throughout LRT construction there will be activity within the corridor. Contractors will be required to conform to the provisions of standard engineering and construction practices to control various adverse impacts associated with construction activities. The following construction activities will be accomplished: site preparation and clearing, utility relocation and grading, ballast, tie, and track installation. Excavations for the surface-running alternatives will generally be shallow, minimizing the need for utility relocation. This is not true for alternatives being placed in an open trench or cut and cover. Rail sections would be delivered by truck or freight rail. Other construction materials, such as ballast, ties, concrete, precast members for structures most likely would be delivered by truck. Haul routes for the construction materials will be designated by the contractor. The installation of power systems will occur, for the most part, after track and station construction is nearing completion. Power poles will be installed on concrete foundations and wire then strung between the poles.

As applied to the specific measures, the information collected above will be used as follows:

a. Measure: Qualitative assessment of land use impacts due to construction (disruption of access, impact of construction activities)

1. **All construction related activities will be thoroughly discussed with the consultant design team while viewing engineering drawings and aerial maps, so that the environmental assessment team will have a thorough understanding of the planned construction.**
2. **Construction related impacts will be qualitatively documented for each resource area as appropriate.**
3. **A review of known hazardous waste sites will be identified from a search of databases for areas within approximately 300 feet of the candidate alternatives.**

b. Measure: Length of construction process

1. **To determine the length of the construction process, the past experience of the Bi-State Development Agency in constructing the existing MetroLink line to Lambert International Airport and into St. Clair County, Illinois will be investigated to estimate how long the MetroLink Extension Segment I would take.**
2. **Also, construction phasing (specific construction activities in certain areas of the corridor at certain times during the construction schedule) will be considered.**

5.5.3 Expected Outcome and Possible Mitigation

Construction activity and disturbance will be visible, and will include short-term visual impacts. For residences and businesses located near the project area, there will be temporary negative visual impacts associated with construction work, particularly from earthwork operations and storage of materials/equipment. Temporary visual impacts also include the removal of street trees, landscaping, and the possible relocation of light standards or traffic signals. As possible mitigation, the contractor most likely would be required to maintain and restore all work areas and storage yards to minimize these impacts. Street trees, landscaping, and street lighting and signals will be replaced.

Business and property owners, especially in the Clayton CBD and near the Galleria may experience temporary loss of access points to the businesses, either direct patron or delivery access. Possible mitigation would be to work with business owners to preserve at least one access at all times for businesses, or to provide alternative access and parking. Also, directional signage, prominently displayed along the construction site, would be important so patrons know which businesses are open and how to get there.

Deer Creek and any other potential stream or drainageway crossing may require special consideration during the construction process. Cut and fill operations in the vicinity of these waters may contribute minor siltation during the construction of bridges or elevated track sections over these waterways. Sediment transport is potentially greater during construction than after the permanent facility is completed. Best Construction Management Practices and standard erosion protection measures will be used to minimize erosion during this time. An erosion control plan most likely would be required as part of project construction. Permanent adverse impacts to water quality with regard to construction activity or stormwater runoff are not expected. It is anticipated that wetlands, if any, could be avoided.

During construction, vegetation would be disturbed, especially along the CMT right-of-way in Richmond Heights where trees and other vegetation have grown within the right-of-way. No permanent impact to vegetation or any impact (short-term or long-term) to threatened and endangered plant species is anticipated. Revegetation and landscaping after completion of construction would be the most likely mitigation measure.

Adverse air quality impacts associated with construction activities include emissions from vehicles and equipment, and fugitive dust from clearing, excavation, and grading. Vehicular emissions would be temporary and could be minimized by maintaining traffic flow during construction periods. Contractors most likely would be required to control fugitive dust and airborne particulates by applying water to exposed soils, revegetating exposed soils as soon as possible and limiting the extent and duration of exposed soils and material piles.

Trucks and machinery used for construction produce noise, which may affect some land uses. Construction workers can reduce disturbance to resident and businesses by ensuring that all machinery is equipped with proper mufflers, that machinery is well maintained, and that noise levels conform to local, state and/or federal guidance. Other possible mitigation measures could be to adjust the duration and time of day for certain construction activities near sensitive receptors. Also, good coordination with the community is necessary to minimize adverse reactions to construction noise. Residents could be notified in advance of the scheduled construction activity.

Utility relocations will occur and potential disruptions to emergency services may occur. Possible mitigation would include notifying business owners and residents early in advance of construction so they may plan around construction areas. Emergency services may be affected because some access may change and some streets may be closed off for a short time. Coordination with emergency personnel will be important during construction so they can continue to perform their duties effectively.

Traffic delays and detours most likely would occur to some extent. Possible mitigation would be to limit detours to off-peak travel hours. Also, staging of construction may help minimize overall impacts to a certain area. Contractors most likely would be required to conduct their operations in a manner that results in a minimum amount of inconvenience and delay to local and through traffic. Access to adjacent areas could be maintained where practical. Detours and alternate routes could be adequately signed, and barricades, lighting, and traffic control devices could be used to protect the construction worker and public access and safety.

Considering the urbanized character of the study area, there may be hazardous materials sites on either side of the alternative alignments. Many of these locations will be current or former underground storage tank locations that were part of gas stations, with many of the tanks having been removed from service. Another large group will likely be RCRIS Small Quantity Generators. These are the commercial and industrial facilities that generate small quantities of hazardous wastes and are required to identify the type, quantity of usage and disposal methods for hazardous materials used or generated on site.

Alignment evaluation will be done to avoid potentially contaminated locations, where possible. Where avoidance is not practical, mitigation of hazardous and special wastes normally involves containment or clean up. It is anticipated that many of the sites that will be identified through the database searches are known sites that are regulated and where appropriate are already undergoing remediation if required.

5.6 Minimize Impact on Cultural Resources (Historical, Archaeological)

The criteria for assessing impacts to historical and archaeological resources involve the minimization of any potential adverse impacts.

Criteria		Measures	
F.	**Minimize impact on cultural resources (historic, archaeological)**	**a.**	**Displacement, damage, impact on function or accessibility, or impact on surrounding environment.**

The proposed method to be applied to these criteria is described in the following paragraphs.

5.6.1 Resource Description and Impact Area

Historic and archaeological resources within the study corridor are important to the community because they define its heritage and sense of place. There is considerable interest in the alignment selection and design concepts for the Cross-County MetroLink Extension Segment I from several historic neighborhoods along the study corridor, particularly in the City of St. Louis, University City and Clayton.

In order to ensure that any impacts from the construction and operation of the Cross-County MetroLink Extension Segment I are considered with regard to this resource, the area of impact will include any historical structure, historic neighborhood, or archaeological site within 100 feet or up to one block in distance from the alternative alignments.

5.6.2 Methodology

The methods used to evaluate impacts will be combination of data collected from the SHPO for known sites and districts listed on the NRHP and reviewing these locations in regard to the alternative alignments. Historic and archaeological resources (including specific sites and districts) within the alternative alignments study area that are of state or local significance, or are listed or eligible for listing in the National Register of Historic Places (NRHP), will be identified and mapped in relation to the alternative alignments. This will be accomplished by contacting the Archaeological Survey of Missouri (ASM) and the Missouri State Historic Preservation Officer. Additional contacts will include local historical societies and groups.

Impacts to identified historic or archaeological properties associated with the alignment alternatives will be assessed by applying the Federal criteria of adverse effect (36 CFR 800) and summarized in a technical memorandum. The proximity of the corridor may involve adverse effects such as noise, visual intrusion, or change in access. Positive results may accrue in certain cases, such as improved access to a historic property that has an educational mission. This evaluation will include a description of the potential impacts to the historic properties and application of the criteria of effect, an evaluation of alternatives which would minimize or eliminate any adverse effect, and a discussion of potential mitigation measures.

As applied to the specific measures, the information collected above will be used as follows:

a. Measure: Displacement, damage, impact on function or accessibility, or impact on surrounding environment.

1. Determine the number of affected properties, sites and districts.

2. Analyze any potential adverse effects.

3. Determine avoidance alternatives where feasible.

5.6.3 Expected Outcome and Possible Mitigation

Section 106 of the National Historic Preservation Act (NHPA) and Section 4(f) of the Department of Transportation Act provide for the preservation of such cultural resources and provide guidance that displacements of historic structures and park lands must be avoided wherever possible. Since the Cross-County MetroLink Extension Segment I project will be financed with local funds (i.e., no federal dollars), federal environmental regulations do not apply and are not required for this coneptual design study. However, avoidance of direct impact to all Section 4(f) and Section 106 resources where feasible will be the goal of the project. The importance of continuous coordination with the historical neighborhood associations will be key to defining alternatives that will minimize impacts. Presentation of any impacts will be made graphically on plan view sheets that illustrate noise contours, lighting, traffic patterns, neighborhood access, pedestrian walkways, and relationships with adjacent activity centers all in relationship to historic neighborhood boundaries.

In order to ensure the proper treatment of historic and archaeological resources that may be discovered during the construction of the Cross-County MetroLink Extension Segment I, a Programmatic Agreement will be established if necessary with the State Historical Preservation Officer (SHPO). This agreement would define a recovery program to retrieve the cultural resources according to accepted standards.

Mitigation measures for structures or property that would be adversely affected could include: buffering/screening; modification of neighborhood access or traffic flow; and enhancing the compatibility of the design elements of the project with respect to the historic properties.

5.7 Achieve Equity in Terms of Project Benefits and Costs

Equity in this analysis is applied as a measure of fairness in terms of the investments, impacts and ridership opportunities linked to the neighborhoods and associated municipalities along the candidate alternative alignments. Specific criteria and measures to be used will be as follows:

Criteria	Measures
G. Achieve equity in terms of project benefits and cost	**a. Comparison of unit LRT investment levels ($/mile) for locations in each municipality in the corridor** **b. Number of riders generated in each municipality per capita** **c. Percent of riders generated in each municipality compared to the percent of capital cost for facilities located in each municipality** **d. Comparison of positive and negative impacts per municipality** **e. Comparison of riders generated per traffic analysis zone with zones categorized by income level and transit dependency**

The challenge in assuring equity is to measure the relationship between investments made in a geographical area or municipality and the projected ridership activity expected. The goals are to strive to achieve equity in terms of capturing higher ridership levels with a corresponding level of investment and to ensure that a disproportionate share of the investment is not allocated to a particular area unless warranted by overriding physical, environmental, or economic constraints.

5.7.1 Resource Description and Impact Area

The investments for the construction of the LRT and associated stations will be determined along the entire candidate alternative alignments. Ridership projections for the Cross-County MetroLink Extension Segment I will be utilized for the entire alignment and segmented as appropriate.

5.7.2 Methodology

The monetary investments for track and station platforms will be calculated for each of the municipalities. This data will be collected as an output from the conceptual engineering report. The investment data will also be used to develop a facilities capital cost/rider index that can be calculated for each municipality.

Ridership data is currently being developed as part of another study and will be applied to the Cross-County MetroLink Extension Segment I project. The ridership along the alignment will be calculated according to total ridership for the municipal area, which will be divided by the total municipal population to determine a ridership/residents ratio.

The analysis for equity will utilize the following:

a. Measure: Comparison of unit LRT investment levels ($/mile) for locations in each municipality in the corridor.
   1. Determine costs from the conceptual design report.
   2. Calculate $/mile costs for each municipality.
   3. Calculate the costs for the stations in each municipality.
   4. Calculate costs for mitigation and design amenities.

b. Measure: Number of riders generated in each municipality per capita.
   1. Determine the number of riders from travel demand modeling effort and categorize according to municipality.
   2. Divide the number of riders generated by the municipality population to determine the measure.

c. Measure: Percent of riders generated in each municipality compared to the percent of capital cost for facilities located in municipality.
   1. From the results of measures (a) and (b), compare the results in terms of riders generated versus cost of the LRT investment.

d. Measure: Comparison of positive and negative impacts per municipality.
   1. The results of the environmental impact evaluation completed in tasks 5.1 through 5.6 will be assembled in data sets defined according to each municipality.

e. Measure: Comparison of riders generated per traffic analysis zone with zones categorized by income level and transit dependency.
   1. The traffic analysis zone projected ridership numbers will be compared with census data relative to income levels and transit mobility.
   2. A comparison will be completed to describe any differences in ridership relative to the income and transit attributes.

5.7.3 Expected Outcome and Mitigation

The expected outcome from the equity analysis will be ratios, charts, and tables that illustrate the how the dollars invested for light rail expansion in each municipality relate to projected ridership, environmental impacts and service to lower income and transit dependent populations. Potential neighborhood impacts (especially to minority or lower income neighborhoods) such as community disruption, loss of access or community cohesion will also be identified as appropriate. The results of the equity analysis will be used as part of the overall alternatives analysis process where trade-offs are considered relative to the investment and impacts analyzed in terms of the benefits received for each municipality and overall.

6
Cost and Finances

Costs associated with the alternatives and the potential for implementation are key aspects of evaluation. The criteria and measures to be used will be:

Criteria		Measures	
A.	**Maximize Cost-Effectiveness**	**a.**	**Local access cost per additional rider.**
		b.	**Line haul cost per additional rider.**
		c.	**Various trade-offs in terms of cost per additional benefits.**
		d.	**Qualitative - achievement of basic goals.**
B.	**Minimize Project Costs**	**a.**	**Capital costs.**
		b.	**Annual operating and maintenance cost.**
		c.	**Life cycle costs.**
		d.	**Qualitative-achievement of basic project goals.**

C.	**Maximize Feasibility for Implementation**	**a.**	**Percent of annualized capital cost covered by available resources.**
		b.	**Percent of annual operating and maintenance cost covered by available resources.**
		c.	**Qualitative - risk assessment concerning sustainability of financial resources.**
		d.	**Risk assessment of constructability.**
D	**Enhance Opportunity for Private Sector Participating in Financing**	**a.**	**Estimated range of possible private sector funds.**

6.1 Resource Description and Impact Area

The candidate alternatives represent a range of possible capital costs as associated with belowgrade, at-grade, and an elevated alignment for the Cross-County MetroLink Extension Segment I. The estimated operating and maintenance costs will probably exhibit less difference between alternatives since the operating plan would be the same for all of the alternatives.

Costs and finances will be evaluated using the four criteria and measures just noted. The resource description and impact area for all four criteria is noted in this section. The method, applied to each, is described in the following methodology sections for each criteria. The information used will be prepared via methodologies described in other documents; i.e., (1) capital, operating and maintenance, and life cycle cost estimates; and (2) financial capacity analysis. These results will be formatted to address the measures identified for the criteria, herein.

Relative to the Cross-County MetroLink Extension Segment I project, the intent is to finance project costs via local resources without the use of federal funds. The local funds will be derivedfrom the Proposition M sales tax for transportation; currently funds are accumulating for this project.

The impact area is the costs directly associated with the MetroLink facilities and their operation. Capital costs also include various utility modifications required.

6.2 Maximize Cost Effectiveness

6.2.1 Methodology

This criteria will be examined using information provided via other methods (as noted above). Information will also be assembled from the travel demand analysis (i.e., ridership estimates), as prepared by others. The method will be essentially formatting these other results to develop comparative information. No formal analysis method will be applied.

The measures to be used will be as follows:

a. Estimated local access capital cost per additional rider.
  1. Assemble capital costs associated with local access including bus service, bus transfer facilities, park-n-ride and kiss-n-ride facilities, and any road/street access improvements.
  2. Identify ridership for each alternative.
  3. Compare differences in local access capital cost relative to differences in ridership with the intent to identify if added investment in local access will increase ridership potential.

b. Capital cost associated with MetroLink (tracks, power facilities, stations, structures, utilities, etc.) per additional rider.
  1. Assemble capital costs, excluding costs associated with local access modes.
  2. Compare differences in capital costs relative to differences in ridership to identify if added investment in primary facilities will increase ridership.

c. Define trade-offs and compute costs per unit of benefit.
  1. Identify potential trade-offs, i.e., those relationships between transit performance and cost, benefit and cost, and impact and cost that define the following types of situation:
    - cost to achieve improved performance (i.e., lower travel time)
    - cost to enhance traffic capacity (improved capacity or level of service)
    - cost to achieve certain design qualities.
    - cost to achieve reduced accident risk.
    - cost to increase accessibility (more land within walking distance).
  2. Prepare comparison.

d. Qualitative - assess achievement of basic goals.
  1. Using input from the previous three measures, assess each design alternative's ability to achieve project goals.
  2. Prepare comparison to anticipated goal targets.

6.2.2 Expected Outcome

The results should indicate which alternatives, or portions thereof, represent the most cost-effective investment.

6.3 Minimize Project Costs to Achieve Objectives

6.3.1 Methodology

This criteria will be addressed using information developed by other methods or analyses. This information will be used to develop comparisons. No formal analysis methods will be applied.

The measures to be used will be as follows:

a. Capital Costs

1. Cost estimates will be formatted to identify total cost for each conceptual design alternative as well as the costs for the primary elements including trackway, stations, local access facilities, vehicles, system facilities, and utilities.

b. Annual Operating and Maintenance Costs

1. Cost estimates will be summarized to identify total O/M costs for each alternative.

c. Life Cycle Costs

1. Cost estimates will be summarized to identify life cycle costs for each alternative.

d. Assess Achievement of Basic Goals

1. The results of all analysis by criteria (measures as described in other sections of this report) will be summarized in relation to the six design objectives stipulated for this MetroLink extension project. The format will attempt to illustrate how well each alternative would achieve each objective. Targets or expectations set for each objective will be used as a reference point for the evaluation results.

6.3.2 Expected Outcome

The results will provide direct comparisons of estimated cost by alternative. Along with a comparison of objectives achievement, these results will provide clear indications as to the potentially best alternative.

6.4 Maximize Feasibility of Implementation

6.4.1 Methodology

This criteria will also use information developed from other methods. No formal analysis procedures will be used.

The measures to be used will be as follows:

a. Percent of annualized capital cost covered by available resources.

1. **Prepare comparisons to assess financial feasibility to support estimated capital cost on a lump sum and annualized basis.**

b. Percent of annual O/M costs covered by estimated resources.

1. **Prepare comparisons to assess proportion of annual O/M that can be supported by fare revenue and other operating fund resources.**

c. Risk assessment as to sustainability of financial resources.

1. **Identify any assumptions associated with estimates of financial resources.**
2. **Identify the extent of reserve financial capacity subsequent to construction to pay costs for the Segment I project.**
3. **Identify sustaining cost requirements; these would be potentially debt service, O/M, and rehabilitation (depreciation) costs.**
4. **Identify sources of on-going financial resources to pay for sustaining cost.**
5. **Identify actions needed to develop sustaining funds (e.g., legislative action, referendum, federal fund); assess likelihood of these actions occurring.**

d. Risk assessment of constructability

This measure concerns potential issues of constructability, i.e., ability to build the alternative as designed, space for construction, and impact on existing land-uses associated with construction and the likelihood that these impacts can be tolerated or mitigated. The results of Section 5.5 would be input to this consideration.

1. **Identify sections of the alternative where unique construction conditions may exist (i.e., complex design, limited right-of-way, proximity to active land-uses).**
2. **Assess general constructability for each section, identify any special requirements to achieve constructability.**
3. **Identify potentially significant impacts of construction on existing active land-uses.**

6.4.2 Expected Outcome

These results will indicate if the project is feasible. Results may identify cost containment or staging strategies in order to achieve feasibility.

6.5 Enhance the Opportunity for Private Sector Participation in Financing

6.5.1 Methodology

This criteria will use information from other methods. No formal analysis procedures will be used.

The measure to be used will be:

(a) Estimated range of possible private sector funds.

1. **Identify elements of the overall project that could be funded (in total or partially) by private funds; these could include special urban features (e.g., streetscaping, landscaping, and pedestrian way improvements, road access, and right-of-way).**
2. **Identify joint development opportunities in connection with proposed stations.**
3. **Identify potential costs associated with items that could involve private sector financial support.**
4. **Identify any differences among alternatives relative to potentials for private sector participation.**

6.5.2 Expected Outcome

This assessment will identify opportunities to enhance project finances via private sector participation. This could aid in achieving feasibility.

7
MetroLink Compatibility

This proposed project, the Cross-County MetroLink Extension Segment I connects with three proposed MetroLink extensions. Segment I also represents a significant extension of the existing MetroLink facilities. For both these reasons this project needs to be designed to be compatible with existing and future MetroLink lines.

The criteria and measures to be used will be:

Criteria		Measures	
A.	Compatibility of Design Features	a.	Comparison of station layouts from a customer perspective.
		b.	Comparison of all facilities in terms of maintenance requirements.
B.	Opportunity for Developing Cross-County MetroLink Extension Segments II and III	a.	Operating efficiency of future system/effective level of service.
		b.	Potential capital cost to develop junctions.
		c.	Implications for design requirements or policies affecting future extensions.
		d.	Effects on overall financial plan.

7.1 Resource Description and Impact Area

The candidate alternatives involve a common connection to the existing MetroLink line at the Forest Park station. The connection to a possible Segment II would be generally common for all alternatives. There are different locations or concepts for the junction with the potential Segment III and a possible west county transit corridor.

The evaluation will consider possible future MetroLink extensions, as defined by prior planning documents. The compatibility of this project with the existing MetroLink system will focus on any differences in design features.

7.2 Compatibility of Design Features

Compatibility is insured by the fact that the design of candidate alternatives is controlled by MetroLink design policies and standards. However, because the Cross-County MetroLink corridor has conditions different than previous MetroLink locations, there is a potential that varied applications of design standards could result in slightly different design concepts.

7.2.1 Methodology

The methods to be used will be qualitative. No formal analytical procedures will be used.

The measures to be applied will be as follows:

a. Comparison of Station Layouts from a Customer Perspective
   1. **Identify platform template for existing MetroLink stations and compare to the template used for proposed stations, note differences in content, material used, or placement.**
   2. **Assess whether differences noted will be positive or neutral from a customer perspective.**

b. Comparison of Facilities Relative to Maintenance Requirements
   1. **Identify any unique elements of the proposed design of candidate alternatives, e.g.,**
      - **urban design features**
      - **traffic controls**
      - **trackway design**
      - **utilities**
   2. **Assess the need for unusual or added level of effort maintenance requirements for these unique elements.**

7.2.2 Expected Outcome and Possible Mitigation

The evaluation will identify any compatibility issues associated with candidate alternatives. These could identify policy implications for Bi-State Development Agency, as the operator of MetroLink. No mitigation is anticipated.

7.3 Opportunity for Developing Segments II and III of the Cross-County MetroLink Extension.

7.3.1 Methodology

Qualitative methods will be used to assess the opportunity for developing future segments of the Cross-County MetroLink.

The measures to be applied will be as follows:

a. Operating efficiency of future system/effective level of service.
   1. **Identify the possible junctions for each candidate alternative relative to Segment II and III.**
   2. **Identify operating characteristics of these junctions.**
   3. **Assess potential operating efficiency of these junctions.**
   4. **Assess any relative advantages of alternatives.**

b. Potential capital cost to develop junctions.
   1. **For potential junctions estimate possible capital costs associated with track, structures, and right-of-way.**
   2. **Identify the range of capital costs associated with junction design differences.**

c. Implications for design requirements or policies affecting future extensions
   1. **Future implication could be associated with:**
      - **operations (e.g., headway, train routes)**
      - **station functions**
      - **power supply, communication and controls**
      - **right-of-way.**
   2. **Assess relative differences between candidate alternatives associated with these future implications.**

d. Effects on overall financial plan
   1. **The implications for capital cost and maintenance cost will be identified in relation to Segments II and III junctions.**
   2. **These implications would be examined in relation to the financial analysis results, discussed in Chapter 6, to assess if these would significantly affect financial sustainability.**

7.3.2 Expected Outcome and Possible Mitigation

The results of this assessment will indicate whether any candidate alternative will enhance or constrain the potential for continuing MetroLink Extension via Segments II and III and the potential for a West County corridor connection. No mitigation is anticipated.