St. Louis Metro South MetroLink Extension

City of St. Louis and St. Louis County, Missouri

Draft Environmental Impact Statement

Prepared by

U.S. Department of Transportation

Federal Transit Administration

And

East-West Gateway Council of Governments

In Cooperation with

Metro

And

Missouri Department of Transportation

November 2005

Volume I of II

Draft Environmental Impact Statement

for the

St. Louis Metro South MetroLink Extension

City of St. Louis and St. Louis County, Missouri

Prepared by

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL TRANSIT ADMINISTRATION

and

EAST-WEST GATEWAY COUNCIL OF GOVERNMENTS

Pursuant to:

National Environmental Policy Act (42 U.S.C. §4332(2)), Federal Transit Laws (49 U.S.C. Chapter 53), 49 U.S.C. §470, 23 CFR Part 771, 23 CFR Part 450, Executive Order 12898; The National Historic Preservation Act of 1966 (16 U.S.C. 470f); and U.S.C. Section 303 (formerly Section 4(f) of the Department of Transportation Act of 1966).

Regional Administrator
Federal Transit Administration

11/02/2005
Date

Executive Director
East-West Gateway Council of Governments

11/01/2005
Date

DRAFT ENVIRONMENTAL IMPACT STATEMENT
St. Louis Metro South MetroLink Extension

Abstract

This document describes and summarizes the social, economic, environmental, and transportation impacts and costs of the transit and supporting facilities being considered for the Metro South Extension of the MetroLink Light Rail Transit (LRT) System into south St. Louis County, Missouri. The proposed project is an improvement to the transportation system in the City of St. Louis and St. Louis County for which East-West Gateway Council of Governments (EWGCOG) may seek federal transit assistance.

A full range of modal alternatives for the Metro South corridor was studied during the Cross-County Major Transportation Investment Analysis in 1995-1997. In September 1997, the EWGCC (now EWGCOG) Board of Directors selected an LRT extension to central and south St. Louis County. The Cross-County extension to mid-county is now under construction. This Draft Environmental Impact Statement (DEIS) analyzes the No-Build, TSM, and Build Alternatives for the Metro South extension into south St. Louis County with respect to their capital and operating/maintenance costs, and considers their potential effects on transportation service and traffic, socioeconomic, and physical environmental factors. The information contained in this DEIS will be used by EWGCOG and the Federal Transit Administration in making a decision on whether to implement the proposed project.

There is a minimum 45-day public review period for this DEIS that begins on November 18, 2005 and concludes on January 6, 2006. A public hearing will be conducted on December 13, 2005 from 4:00-7:00pm at the following location:

Holiday Inn St. Louis-South County Center
6921 S. Lindbergh Blvd.
St. Louis, Missouri 63125

Comments

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St. Louis Metro South MetroLink Extension
City of St. Louis and St. Louis County, Missouri

Draft Environmental Impact Statement

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EXECUTIVE SUMMARY

This section provides a brief summary of this Draft Environmental Impact Statement (DEIS). This section does not include any information that is not in the DEIS chapters. The summary is organized chapter-by-chapter.

PREFACE

This Draft Environmental Impact Statement (DEIS) for the Metro South MetroLink Extension study has been prepared in compliance with the National Environmental Policy Act and its related regulations (NEPA). The DEIS is organized to conform to guidelines and regulations issued by the Federal Transit Administration (FTA). The FTA regulations comply with NEPA in a manner consistent with the Council on Environmental Quality's (CEQ's) guidelines. This section provides a brief background of the study, explains the relationship between federal and state agencies and the rules that apply in carrying out the NEPA process. It also describes the organization of the DEIS, references the documents that were used to support the information presented in this DEIS, and discusses the further steps in the environmental analysis and project development process.

1.0 PURPOSE AND NEED

This chapter provides a general introduction to the DEIS by providing background on the Metro South transportation study, and by describing the study area and the existing transportation system. It identifies the previous planning and analysis steps that have occurred to shape this study and move it forward as a priority corridor. It then describes the transportation problems and issues found in the corridor, and presents a concise statement of the objectives of the study, the "Purpose and Need Statement."

The Metro South MetroLink Extension Alternatives Analysis and Draft Environmental Impact Statement (AA/DEIS) is a key element in the development of improvements in the Cross-County Corridor, which was identified as one of three priority transit corridors for development within the St. Louis region in the East-West Gateway Council of Government's (EWGCOG) *St. Louis Systems Analysis for Major Transit Capital Investments* (1997). After years of further study, the Cross-County MetroLink extension is now under construction to a terminus at Shrewsbury-Lansdowne I-44 station. The Metro

South study has examined possible further extension of MetroLink light rail service from the Shrewsbury-Lansdowne I-44 station into south St. Louis County and the City of St. Louis.

The Metro South study area encompasses approximately 64 square miles (41,000 acres) of predominantly unincorporated St. Louis County, and a portion of the City of St. Louis along the River Des Peres. The boundaries of the study area are the River Des Peres (in the City of St. Louis) on the north, the Mississippi River on the east, the Meramec River on the south, and on the west an irregular boundary formed by Edgar, Watson, Sappington and Gravois Roads to the point where Gravois Road crosses the Meramec River. This study area is the southern part of the area originally defined for the Cross-County Major Transportation Investment Analysis (MTIA). The study area population is approximately 180,000; the study area is the location of 54,000 jobs.

Planning Context: Goals and Objectives

EWGCOG's current approach to regional transportation planning and decision making in the Metro St. Louis area is defined in its March 2002 plan entitled *Legacy 2025: The Transportation Plan for the Gateway Region*. *Legacy 2025* re-emphasized six focus areas to serve as the evaluative framework for identifying and defining problems, developing and evaluating options, and selecting preferred alternatives in long- and short-range transportation planning studies. These focus areas are:

1. Preservation of existing infrastructure,
2. Safety and security in travel,
3. Limiting congestion,
4. Access to opportunity,
5. Sustainable development, and
6. Efficient movement of goods.

In July 2003, agency and public scoping meetings were conducted to gain additional input from potentially affected stakeholders regarding transportation problems in the study area in the context of the focus areas for the region. The most commonly identified issues and needs were:

- Improving access to key activity centers,
- Providing an efficient public transit system that would provide transportation choices other than automobile travel,
- Increasing accessibility to promote economic development as well as walkable mixed-use development around transit stations,

- Enhancing the stability and quality of life by reducing congestion and improving travel times,
- Preserving and enhancing existing communities and neighborhoods, and
- Protecting the cultural and natural resources in the study area.

Based on these efforts and other local and regional studies, the Metro South study identified problems and opportunities facing transportation in the Metro South area, and from these developed certain goals and objectives to be used to formulate and evaluate project alternatives. The goals and objectives include:

Goal: Improve Access to Opportunity for Metro South Study Area

This goal is directed at improving transportation service for all portions of the population in the Metro South study area. Since the regional decision from the Cross-County Corridor MTIA was to not extend high capacity freeways to provide a high capacity, high-speed connection between the study area and mid-County, the provision of improved rail transit service, which was included in the adopted recommendations of the MTIA, takes on greater importance. Achieving the following objectives will help meet this goal.

- Provide convenient, reliable, high frequency public transit to better link the study area with mid-St. Louis County and other centers throughout the region.
- Increase opportunities to access employment, education, medical, shopping and other services. The existing MetroLink line provides high-level service to a significant number of the region's major destinations. By 2006, the available destinations will also include the Clayton Central Business District and St. Louis County Government Center. Expanded transit may increase access opportunities in the Metro South area.
- Reduce transit travel times. A mix of transit modes – LRT operating in exclusive right-of-way, enhanced bus, and feeder bus networks – along with other TSM improvements could provide the best opportunity to achieve this objective.

Goal: Use Transit to Foster Sustainable Development

This goal encompasses a wide range of development and redevelopment objectives that are intended to ensure that Metro South will evolve into a more economically balanced and stable area. Attaining the following objectives will help fulfill this goal.

- Use transit accessibility at stations as a key marketing tool for promoting the economic development or redevelopment in the study area by attracting a broader range of employment categories, especially office and professional jobs. This approach includes transforming existing, largely commercial centers into more mixed-use activity centers.

- Wherever compatible with the existing communities and the engineering and operational needs of the system, locate stations where concerted land use planning can employ a range of Transit-Oriented Development (TOD) principles to promote high-quality, mixed-use "walkable" development or redevelopment focused around the transit stations.

- Create opportunities and mechanisms for public/private development partnerships, especially where such partnerships can overcome a lack of market interest in locations within Metro South that need a new vitality. Transit could serve as a possible mechanism to create opportunities for these partnerships.

Goal: Use Transit to Preserve Existing Communities and Neighborhoods

This goal addresses the need to stabilize generally healthy areas within the Metro South study area, rather than promoting more widespread change. In many respects, protecting and increasing the livability and attractiveness of Metro South neighborhoods promotes this stabilization. Attaining the following objectives could be facilitated by transit improvements to help fulfill this goal.

- Provide residents with a reasonable alternative to auto use by improving bicycle and pedestrian access to transit and creating safety and urban design amenities that make cycling and walking more appealing.

- Ensure that major corridor transit services are convenient to residents across the study area by improving feeder bus routes to existing and proposed transit stations, and by expanding and improving parking facilities at transit stations and other park-and-ride facilities.

- Increase the desirability of older neighborhoods by such actions as the creation of local mixed-use centers that provide a wider range of more easily accessed everyday services, encouragement and assistance in rehabilitation of older structures, and preservation of local landmarks, historic character and open space.

- Coordinate transit planning and station-area development activities with local community plan priorities, especially those focusing on securing greater housing choices, providing support for local businesses, and promoting stabilization and revitalization of aging areas.

- Maintain or enhance the quality of life through station-area policies and requirements that improve the overall quality of the public realm (urban design and environmental protection), promote health and well being (e.g., walkability), and support and complement residents' and business operators' investments and efforts to improve their surroundings.

2.0 ALTERNATIVES CONSIDERED

This chapter presents a description of the alternatives considered during the initial planning and environmental analysis for the Metro South study. Section 2.1 provides background on how the alternatives analysis process complies with the requirements of NEPA and FTA's project development process. The next section describes the process of review and screening of a wide range of initial alternatives that resulted in the identification of a reduced number of alternatives for detailed analysis. Section 2.3 provides a description of the seven alternatives that are analyzed in detail in this DEIS. Sections 2.4 and 2.5 provide additional information on the operating characteristics and costs and the capital costs of each of the seven detailed alternatives.

After consideration and screening of many potential options, the EWGCOG defined the following alternatives for detailed examination in the DEIS:

No-Build Alternative

The No-Build alternative represents the situation that would exist if the Metro South study were to result in a decision not to build any of the contemplated improvements. The result would be a transportation system that is similar to what exists today, plus those improvements that have been planned or programmed independently of the Metro South study. These planned and programmed improvements are described in the region's adopted long-range transportation plan, *Legacy 2025.* The No-Build alternative is required under regulations of the CEQ, implementing NEPA. The No-Build provides the basis of comparison for the other alternatives.

TSM Alternative

The TSM alternative consists of mobility improvements that attempt to serve the study Purpose and Need, without constructing a fixed transit guideway. It is therefore aimed at serving similar markets by incorporating cost-effective improvements with an emphasis on transportation system upgrades, such as: intersection and signalization improvements, minor road widening, ramp upgrades, traffic engineering actions, bus route restructuring, shortened bus headways, reserved bus lanes, expanded park-and-ride facilities, and express and limited-stop service. The estimated capital cost of this alternative is $25 - $30 million in 2010 dollars, to cover the cost of parking, buses, roadway improvements and related facilities.

Unlike the improvements contained in the No-Build alternative, no funding has been identified for the TSM alternative. This alternative is usually selected as the baseline scenario for New Starts applications to the FTA.

Blue Alternative to Butler Hill Road

The Blue alternative runs through the middle of the Metro South study area, generally following the Burlington Northern Santa Fe (BNSF) tracks and I-55. This alternative starts at the MetroLink terminus at Shrewsbury-Lansdowne I-44 in Shrewsbury/City of St. Louis and ends at a station at Butler Hill Road and I-55 in south St. Louis County. The alternative is 8.5 miles long and has five stations. The proposed station locations for the Blue alternative are:

- Near Kenrick Plaza south of Watson Road ("Watson")
- South of the BNSF/Gravois Road grade separation ("Gravois")
- Green Park Road ("Green Park")
- Lindbergh Boulevard, north of the South County Center shopping center ("Lindbergh")
- Butler Hill Road, east of I-55 and south of Butler Hill Road ("Butler Hill")

The projected capital cost of this alternative is $630 - $700 million (2010 dollars).

Blue Alternative to Watson Road

This alternative employs the first leg of the Blue alternative to Butler Hill to continue the extension to a more logical terminus, away from the residential access road at Lansdowne, to a station at Watson Road, opposite Kenrick Plaza. As such, it is the shortest of the detailed Build alternatives. To offset the fact that this shortened alignment does not penetrate the South County area as far as the other alternatives, the Blue alternative to Watson Road is complemented by an enhanced, limited-stop express bus service that will connect the General American and St. Anthony's Hospital campuses, along Tesson Ferry Road, to the Watson station.

This alternative is 1.1 miles long and includes one new station:

- Near Kenrick Plaza south of Watson Road ("Watson")

The projected capital cost of this alternative is $82.5 - $91.0 million (2010 dollars).

Orange Alternative to Butler Hill Road

The Orange alternative is the easternmost alignment under consideration. For most of its length, it makes use of existing transportation corridors, such as River Des Peres Boulevard, Germania Street, and the I-55 right-of-way. It extends from Shrewsbury-Lansdowne I-44 station to a terminal station at Butler Hill Road. The alignment is 11 miles long, with six proposed stations:

- Gravois-Hampton MetroBus Center ("Gravois-Hampton")
- Morganford Road, at the junction with Germania Street ("Morganford")
- Bayless Avenue, east of I-55 ("Bayless")
- Reavis Barracks, east of I-55 ("Reavis Barracks")
- Lindbergh Boulevard at the Westfield Shopping Town/South County Center ("Lindbergh")
- Butler Hill Road, east of I-55 and south of Butler Hill Road ("Butler Hill")

The projected capital cost of this alternative is $586.5 - $648.5 million (2010 dollars).

Orange Alternative to Reavis Barracks Road

In recognition of the cost of constructing the Orange Alignment to a terminus at Butler Hill, the Orange alternative to Reavis Barracks was developed as a possible cost-effective alternative to intercept commuter traffic on I-55. While this alternative retains many of the characteristics of the Orange alternative to Butler Hill, such as access to the Gravois-Hampton Metro Bus Transfer Center and a possible link to a future Southside MetroLink alternative at Bayless Avenue, it does not provide direct access to the South County Center area or the possible park-and-ride lot/development area at I-55 and Butler Hill Road. This alternative is 6.9 miles long.

LRT stations are proposed at:

- Gravois-Hampton Transit Transfer station ("Gravois-Hampton")
- Morganford, at the junction with Germania Street ("Morganford")
- Bayless Avenue, east of I-55 ("Bayless")
- Reavis Barracks, east of I-55 ("Reavis Barracks")

These stations are the same as those presented in the previous section, representing the more northerly portion of the Orange alternative to Butler Hill. The projected capital cost of this alternative is $307.0 - $339.5 million (2010 dollars).

Purple Alternative

The Purple alternative is the second shortest of the detailed alternatives. Like the Blue alternative to Watson, the Purple alternative aims to continue the MetroLink extension along River Des Peres Boulevard, Chippewa, and Watson to a more logical terminus, away from the residential access road at Lansdowne. This terminus is a station at Watson Road, opposite Kenrick Plaza. To offset the fact that this shortened alignment does not penetrate the South County area as far as the other alternatives, the Purple Alignment is complemented by an enhanced, limited stop express bus service that will connect the General American and St. Anthony's Hospital campuses, along Tesson Ferry Road, to the Watson station.

The Purple alternative is 1.5 miles long and includes one new station:

- Near Kenrick Plaza south of Watson Road ("Watson")

The projected capital cost of this alternative is $101.5 - $112.0 million (2010 dollars).

Operating Plan

All of the Build alternatives (the alternatives that include an extension of MetroLink service into the Metro South area) include a similar operating plan for light rail service. The key features of the operating plan include:

- MetroLink would be operated as two branches, one between Scott/Shiloh and Lambert Airport, and the other between Emerson Park (East St. Louis) and the new Metro South terminus. This is similar to the base case plan, with a Scott/Shiloh-to-Lambert branch and an Emerson Park-to-Shrewsbury-Lansdowne I-44 branch.

- Hours of operation would be unchanged from the base: weekdays, 3:30 a.m. to 1:00 a.m., and weekends/holidays, 4:30 a.m. to 1:00 a.m.

- Headways (time between trains) on each branch would be the same as the base: 10 minutes during weekday rush hours, 15 minutes at all other times.

- Fares would be the same as the base case; current fare policy includes a flat fare for the entire MetroLink system, with the exception of tickets purchased at the Lambert Airport stations.

- Run times are based on a calculation of train speed and acceleration characteristics. The average service speed (including station stops) over the MetroLink extension would be approximately 30 miles per hour.

3.0 AFFECTED ENVIRONMENT

This chapter provides an overview and description of the demographics and socioeconomic conditions, the community facilities and services, the cultural resources, and the natural resources that are found in the study area. The descriptions in this chapter are intended to provide a general understanding of the study area's resources and a general understanding of the potential impacts that might be associated with any major transportation initiative in the study area. In Chapter 5, "Environmental Consequences," each of the alternatives is evaluated with respect to its potential impacts on the study-area environment.

Demographics and Socio-Economic Conditions

The Metro South study area includes almost 180,000 residents, or about 7 percent of the total metropolitan area population. It was developed in the early- to mid-twentieth century. The area is now almost fully developed, with a small amount of vacant, open, or agricultural land. Population growth over the last decade has been modest – about 3 percent, compared to more than 6 percent for the metropolitan area.

Compared to the rest of the metropolitan area, the Metro South study area has a lower percentage of children and a somewhat higher percentage of elderly residents. The average family income is slightly above that of the metropolitan area, but below that of the remainder of St. Louis County. The population is predominantly white, with a lower percentage of racial minorities than the metropolitan area. None of the census block groups is in the lowest 20 percent of block groups in the metropolitan area in terms of median income, and there are no block groups with significant minority percentage.

There are about 54,000 jobs in the area. They are located predominantly in the northern part of the study area and around the South County Center at the intersection of Interstates 55 and 270/255.

The largest land use category in the area is single-family residences, with limited areas of multi-family housing.

Community Facilities and Services

More than 90 percent of the population of the study area is in unincorporated St. Louis County. There are nine smaller incorporated municipalities, in addition to the City of St. Louis: Bella Villa (population: 687), Grantwood Village (883), Green Park (2,666), Lakeshire (1,375) Mackenzie (137), Marlborough (2,235), St. George (1,288), Shrewsbury (6,644), and Wilbur Park (475). In addition, there are five school districts and seven local fire districts in the area.

Commercial districts such as the South County Center and community facilities such as high schools serve as important community centers within the study area.

Cultural Resources

The cultural resources in the area include parks and historic sites. Those that may be affected by the Metro South alternatives include two park or recreation facilities: the River Des Peres Park in the City of St. Louis, and the Grant's Trail bikeway through the center of the area. None of the historic sites or buildings that are listed on the National Register of Historic Places is directly impacted by study alternatives. However, there may be additional properties that are eligible for listing that will be documented during later phases of the study.

Natural Resources

The St. Louis area does not attain federal air quality standards for certain pollutants that contribute to smog. The Metro South study, therefore, must be shown to be part of a transportation plan that is consistent with the state's efforts to bring the area into compliance with clean-air goals.

Certain endangered or threatened species of plant and wildlife have been located in the area, but there are no known critical habitats for these species. Other natural resources that may be affected are wetlands and floodplains. These resources occur throughout the area and have been identified and mapped so that impacts can be minimized.

Karst geology, formed by groundwater flow, can produce unusual underground features and unique habitats. There is an area of karst geology in the study area, near the Mississippi River, but it is avoided by all of the alternatives.

4.0 Transportation Impacts

This chapter presents a discussion of the transportation impacts that are anticipated to result from each of the alternatives. The first section is the forecast of the transit ridership that is predicted to result from the introduction of light rail transit into the study area. The second section identifies the travel time savings that would result from implementing each of the alternatives, one of the principal measures of transportation system benefits. The third section is a discussion of light rail transit ridership and land use recognizing the interaction that may take place as development and land-use policies adapt to take advantage of transit improvements. The fourth section is a description of the local traffic impacts of light rail transit, which will occur because of traffic activity at new stations and traffic interruptions where the light rail transit lines cross roadways at grade. More detailed descriptions of the methodology that was used to produce the ridership and transportation impacts analysis is included as Appendix D.

Ridership

The projections of future transit ridership were developed using mathematical models to predict travel behavior. These models were based on the models developed by EWGCOG to conduct metropolitan-wide transportation planning. The ridership forecasting models and procedures conform to FTA requirements.

The travel demand models forecast ridership in the year 2025. These include expected growth in population, employment, and other factors that affect travel. For the purposes of comparing proposed transit projects across the nation, FTA requires that the population and employment forecasts, as well as the distribution of population and employment, be the same for all alternatives, including the No-Build. That is, for the FTA forecasts, the transit extensions proposed in some alternatives are deemed to have no effect on how much development occurs, or where it is located.

Table ES-1, “Summary of Metro South Ridership Forecasts,” shows the ridership forecasts. The table shows total linked transit trips in the metropolitan area for each alternative (a person who transfers from a bus to MetroLink is counted as one linked trip), and also shows total projected boardings at MetroLink rail stations systemwide. In each case, the total is compared to the ridership under the TSM alternative, in accordance with FTA rules.

The Orange-Butler Hill and Blue-Butler Hill alternatives have the greatest impact on ridership. In large part, this is because they include more MetroLink stations, and provide convenient service to more residents and employees.

Table ES-1: Summary of Metro South Ridership Forecasts
Weekday Riders, 2025

Alternative	Systemwide Linked Transit Trips		Systemwide MetroLink Rail Boardings	
	Projected	Change From TSM	Projected	Change From TSM
No Build	152,200	NA	83,100	NA
TSM	153,000	0	83,000	0
Purple	152,700	-200	83,200	+200
Blue Watson	152,700	-200	83,200	+200
Blue Butler Hill	160,200	+7,200	92,600	+9,600
Orange Butler Hill	160,300	+7,300	92,100	+9,100
Orange Reavis Barracks	158,500	+5,500	90,100	+7,100

User Benefits

User benefits are measured in terms of savings in total travel time for transit passengers as a result of the improvements included in each alternative. Savings are compared to travel times under the TSM alternative. The method for calculating these benefits is defined by the FTA, and this measure is used to evaluate projects for federal funding.

The Purple and Blue-Watson alternatives result in very small negative user benefits (that is, they result in a slight increase in total travel time). This small negative benefit – about 40,000 person hours per year – results from rerouting some buses into Watson station instead of other MetroLink stations served in the TSM alternative, or directly served by bus. The other Build alternatives show significant user benefits: Blue-Butler Hill, 2.7 million person-hours per year; Orange-Butler Hill, 2.5 million person-hours per year; and Orange-Reavis Barracks, 1.9 million person-hours per year.

Ridership with Transit-Oriented Development

New MetroLink stations provide an opportunity for changes in local land-use patterns that take advantage of the transportation service provided by MetroLink. Examples of this “Transit-Oriented Development” (TOD) that could occur with supportive land-use policies and zoning include new office and commercial development at or near station locations and higher-density (apartment, town-house) residential development within walking distance of stations. Analysis done by the EWGCOG study team indicated that the total boardings at new stations on the MetroLink extensions could increase by 4 to 10 percent with TOD.

These ridership forecasts with TOD do not comply with FTA’s requirement that land-use inputs must be the same for all alternatives, including the No-

Build. Therefore, these forecasts are not used for purposes of evaluating or comparing alternatives with other transit projects that may be considered for federal funding.

5.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents a description of the potential environmental impacts of each of the alternatives. This analysis considers impacts on both the human, or built, environment, and the natural environment. The discussion below focuses on those impacts that will allow decision makers to differentiate among the alternatives.

Impacts on the Built Environment

Land Use. In general, the proposed MetroLink extensions and stations were found to be compatible with surrounding land uses, whether residential, commercial or other. Direct noise and visual impacts to specific properties are addressed under different impact categories. The other type of land use impact identified is the potential of each alternative to be part of a land use plan that encourages higher density development around transit stations (TOD). Based on an assessment of available or underused land parcels and other factors, the TOD potential of each station area was evaluated and quantified. The Blue-Butler Hill alternative provides the greatest opportunity for new transit-oriented development, followed by the Orange-Butler Hill alternative. The Purple and Blue-Watson alternatives provide significant TOD opportunity, but are limited to a single station site. The Orange-Reavis Barracks and TSM alternatives were found to have no significant TOD opportunity.

Displacements and Property Acquisition. The acquisition of right-of-way for transportation improvements sometimes results in the displacement of households and businesses. These businesses and households would be compensated for the cost of moving and for the value of their property. The longer alternatives require more right-of-way, and as a result create more displacements. The Blue-Butler Hill and Orange-Butler Hill alternatives results in approximately 20 residential displacements and 11 to 24 commercial displacements, with the shorter alternatives correspondingly fewer displacements.

Community. Transportation projects have the potential to disrupt communities by displacing important community facilities and services, or by creating a barrier that divides one part of the community from another. These effects were found to be very modest for the Metro South alternatives because of the planned alignments along existing transportation facilities and minimal number of crossings at grade.

Cultural Impacts. No properties listed on the National Register of Historic Places would be used by any of the alternatives. However, there are historical and archaeological properties that are potentially eligible for listing on the Register that could be adversely impacted by one or more of the alternatives. A separate review process will be required later in the project development process to ensure that these potentially eligible properties are properly evaluated. Several of the alternatives would also require taking of small amounts of cemetery land. The Orange alternatives require a narrow strip of land from one cemetery, and the Purple alternative a strip from a separate cemetery.

Economic Impacts. Economic impacts consist mainly of increased property values around new MetroLink stations. This benefit is expected to be from $5 million to $30 million for each of the Build alternatives, depending on the number of new stations and land uses around those stations.

Safety and Security. The MetroLink extension and other improvements included in the study alternatives are not expected to have any significant impact on safety and security, which are addressed through system-wide awareness and safety programs.

Navigation. There would be no significant impact on navigation by any of the alternatives.

Environmental Justice. No minority or low-income neighborhoods would be adversely affected by the alternatives, and there would be no unfair distribution of benefits or negative impacts on neighborhoods with respect to income or minority population.

Parklands and Open Space. The Purple alternative would require a modest amount (1.7 acres) of right-of-way from the River Des Peres Park, and the two Orange alternatives would require a more substantial amount of land from this park (more than 8 acres). In addition, the Blue Butler Hill and Orange-Butler Hill alternatives cross the Grant's Trail bike path. The use of public parkland for a federally-funded transportation facility requires certain findings, as discussed further in Chapter 7.

Impacts to the Natural Environment

Air Quality. Certain Metro South alternatives would improve air quality by shifting some travel from single-occupant automobiles to less polluting transit modes. In particular, the Blue-Butler Hill, Orange-Butler Hill, and Orange-Reavis Barracks alternatives attract enough new transit riders to more than offset any increase in emissions from transit vehicles. The TSM, Purple, and Blue-Watson alternatives, on the other hand, attract few new transit riders, and as a result have a slight increase in emissions.

Noise and Vibration. The noise and vibration impacts of new light rail operations were measured using procedures and standards developed for the FTA. For the Orange-Butler Hill alternative, 64 residential buildings would have noise impacts above the FTA-established threshold, of which 41 would be impacted at the "severe" level. The other Build alternatives would affect fewer residences, but all of the Build alternatives have some noise impacts. Vibration from light rail trains would not be great in magnitude – well below any physical damage – but would affect a large number of sensitive receptors, chiefly residences. The Orange-Butler Hill alternative, for example, would subject 528 properties to vibration levels that exceed FTA standards based on their potential for annoyance. Other Build alternatives would affect substantially fewer properties.

In terms of the number of properties affected, these vibration impacts are the most extensive – and potentially the most significant – of the environmental impacts of the project alternatives. Once an alternative is selected, the preliminary engineering phase of the project must address these impacts in an effort to define them more accurately, and to reduce or mitigate them to the extent feasible. These mitigation efforts will be presented in the Final Environmental Impact Statement and reflected in project design documents. With these efforts, it is likely that the number of properties affected by vibration, and the magnitude of any impact, can be reduced substantially compared to the initial screening analysis done for the DEIS.

Water Quality. No sensitive water bodies would be affected by any of the alternatives, and the overall effect on water quality is small for each.

Wetlands, Waterways. A number of small streams and wetlands would be crossed by each of the Build alternatives. Such impacts are unavoidable in a large linear study such as this one, and the impacts on wetlands and streams can be minimized and effectively mitigated by careful design.

Wildlife and Habitats. Impacts to wildlife, habitats, and ecosystems are expected to be minor as a result of choosing alignments that are parallel and physically close to existing transportation facilities, such as the BNSF Railway, streets, highways, and parkways.

Floodplains. Floodplains are located throughout the study area, and are impossible to avoid except with the shortest alternatives. Up to 13 acres of floodplain below the 100-year flood mark may be affected by the alternatives. Potential impacts on flood storage capacity will be minimized or mitigated by careful design.

Wild and Scenic Rivers. No designated rivers are affected by any of the alternatives.

Threatened and Endangered Species. No threatened or endangered species would be taken and no critical habitat of such species compromised by any of the alternatives.

Hazardous Waste. Each of the Build alternatives, except the Orange-Reavis Barracks alternative, would be located on or adjacent to land that has been used to store or process hazardous materials, or is the site of a known spill of hazardous materials. These sites would be mitigated or dealt with in accordance with federal and state law, and no further environmental effect would occur.

Visual effects. Visual effects, although subjective, have been identified through the public involvement process as a particular concern for certain study alternatives. The two Blue alternatives, because of the requirements of the adjacent freight railroad, would be located on an embankment that would be approximately 12 feet higher than the current railroad grade. In many locations, this embankment is adjacent to residences and creates a substantial visual barrier that represents a major change in the visual environment for these residents. The Purple alternative and the two Orange alternatives have visual impacts on the River Des Peres Park area.

Energy. There would be energy savings under some alternatives as a result of travelers shifting from single-occupant automobiles to more efficient transit modes. The two Orange alternatives and the Blue-Butler Hill alternative would realize moderate energy savings overall, while the TSM, Purple, and Blue-Watson alternatives would result in an increase in energy consumption.

Soils and Geology. The impacts on agricultural and other sensitive soils will not be significant, as the areas impacted by study alternatives are largely built up. All alternatives avoid the areas of know karst geology (underground features formed by water).

Construction Period Impacts

Construction period impacts would occur over two to three years, and are proportional to the length of each build alternative. Mitigation measures developed during the design and construction phases of the project would reduce the severity of impacts.

Cumulative and Secondary Impacts

These impact categories reflect the manner in which environmental effects might occur (for example: over time, indirectly). The methodology adopted to predict impacts on a resource-by-resource basis were specifically designed to incorporate cumulative and secondary impacts.

6.0 EVALUATION OF ALTERNATIVES

This chapter discusses the evaluation of the DEIS alternatives on a wide range of criteria. In addition to the environmental consequences that are the focus of NEPA, these criteria also include issues such as equity, financial feasibility, travel benefits, and land-use and development objectives. Each of the evaluation measures is discussed briefly, and the results are presented in an evaluation matrix. This chapter addresses the CEQ regulations on preparing an EIS, which requires a comparative evaluation of alternatives.

Evaluation Measures

Chapter 6 presents 65 evaluation measures, and provides information on how the alternatives compare on those measures. Many of the measures were developed and presented in earlier chapters of the DEIS. Examples include environmental impacts, ridership, user benefits, and service to transit-dependent households. In addition, there are several measures such as cost effectiveness that are presented for the first time in Chapter 6. Of the 65 evaluation measures, 14 were selected as representative of the entire set.

Comparison of Alternatives

Three of the alternatives – TSM, Purple, and Blue-Watson – have significantly fewer negative environmental impacts than the other Build alternatives. However, these alternatives are also far less effective in meeting the study Purpose and Need. In particular, they do not achieve ridership improvements or user benefits, and do not produce travel shifts from single-occupant automobile to transit. The remaining Build alternatives offer some advantages and some disadvantages compared with each other.

No preferred alternative has been selected at this time. Following a public presentation of the information in this DEIS and receipt of comments from the public, a preferred alternative may be identified and carried forward for further environmental, ridership and engineering analysis.

7.0 SECTION 4(F) EVALUATION

This chapter presents an evaluation of the potential effect of alternatives on properties that are protected under Section 4(f) of the Department of Transportation Act (now at 49 U.S.C. §303) and Section 6(f) of the Land and Water Conservation act (16 U.S.C. 460l-8(f)(3)). These federal laws impose special requirements for projects that may impact certain park, conservation, recreation, wildlife habitat and historic properties. These restrictions may affect the feasibility or desirability of certain alternatives, so it is appropriate to present these considerations in the DEIS, although the restriction may not apply until a single project proposal is presented for implementation later in the process.

Two properties that are protected under Section 4(f) are impacted by one or more of the alternatives. These are the River Des Peres Park and the Grant's Trail bikeway. Substantial portions (more than 8 acres) of the River Des Peres Park are used by each of the two Orange alternatives. A smaller portion (1.7 acres) of the River Des Peres Park is used by the Purple alternative. The Blue-Butler Hill and Orange-Butler Hill alternatives each cross Grant's Trail and would use a small portion of air rights above the trail and possible bridge pier footings within the trail right-of-way.

The substantial use of the River Des Peres Park by the Orange alternatives means that under Section 4(f) rules, these alternatives cannot be used as the preferred alternative unless there is a finding that the other alternatives (Blue-Butler Hill, Blue-Watson, and Purple) are infeasible or imprudent. In addition, the Secretary of Transportation must find that all planning has been done to minimize the harm resulting from the use of park property. The Blue alternatives may be infeasible if negotiations with the railroad concerning use of the right-or-way are unsuccessful.

8.0 Supplemental Information

This chapter identifies all reference materials and documents, a list of the people responsible for the preparation of the DEIS and a list of agencies and other parties who will receive a copy of the DEIS.

PREFACE

This Draft Environmental Impact Statement (DEIS) for the Metro South MetroLink Extension project has been prepared in compliance with the National Environmental Policy Act and its related regulations (NEPA). The DEIS is organized to conform to guidelines and regulations issued by the Federal Transit Administration (FTA). The FTA regulations comply with NEPA in a manner consistent with the Council on Environmental Quality's guidelines. This section provides a brief background of the project, explains the relationship between federal and state agencies and the rules that apply in carrying out the NEPA process. It also describes the organization of the DEIS, references the documents that were used to support the information presented in this DEIS, and discusses the further steps in the environmental analysis and project development process.

BACKGROUND

This study is titled the Metro South MetroLink Extension Alternatives Analysis and Draft Environmental Impact Statement (AA/DEIS), also referred to as the Metro South Study. The project has examined transportation improvement alternatives in the southern portion of St. Louis County and a small part of the City of St. Louis, both within the state of Missouri. The AA/DEIS has been conducted by the East-West Gateway Council of Governments (EWGCOG),[1] Metro (formerly the Bi-State Development Agency), and the Missouri Department of Transportation, all working in cooperation with the Federal Transit Administration (FTA).

This project is a continuation of the Cross-County Corridor MetroLink extension project, now under construction. The Cross-County corridor was one of three priority corridors identified in the 1991 plan, "St. Louis Systems Analysis for Major Capital Investment," prepared by EWGCOG as part of the regional transportation planning process. The Cross-County Corridor extension will extend MetroLink light rail service from the existing line near Forest Park, through Clayton to a terminal station in Shrewsbury at Lansdowne Avenue. Service on the Cross-County extension is expected to begin in 2006. The Cross-County planning process identified the Metro South corridor as a potential further extension of MetroLink to serve the established neighborhoods and potential redevelopment areas of southern St. Louis County. A

[1] EWGCOG was formerly named the East-West Gateway Coordinating Council. The name was changed in early 2004.

Metro South corridor has been included as a major transit service corridor in the Transportation Plan for the St. Louis region.

The build alternatives examined in the Metro South planning process included various extensions of light rail and bus service from the Shrewsbury/Lansdowne Avenue station to a new terminus in south St. Louis County. The Alternatives Analysis process examined build alignments, each with numerous variations in the location of the terminal stations and number and location of intermediate stations. Through an open and public planning process, this longer list of possibilities was narrowed and refined to the five detailed build alternatives that this DEIS examines. The DEIS also examines a Transportation System Management (TSM) alternative, which includes minor improvements to existing bus services, but does not include a MetroLink extension, and the No-Build alternative that is required under NEPA.

FEDERAL-STATE RELATIONSHIP IN THE DEVELOPMENT OF THE DEIS

The environmental analysis for the Metro South project addresses all federal environmental requirements. These requirements include:

1. The National Environmental Policy Act (NEPA), originally enacted in 1969 and now codified in Title 40 of the United States Code, Sections 4321 through 4347. NEPA established the Council on Environmental Quality (CEQ) and requires a "detailed statement" of the environmental impacts of any project significantly affecting the environment.

2. The regulations of the CEQ for the preparation of environmental impact statements (EISs) are published in the Code of Federal Regulations, Title 40, Parts 1500 through 1508. The CEQ regulations establish the general procedures for developing the EIS, including guidelines on scope and general style. Federal agencies are expected to develop their own regulations for the environmental process that comply with NEPA and CEQ regulations, while dealing with the particular projects, situations, and objectives of the individual agency.

3. The FTA's regulations for the environmental process are published in the Code of Federal Regulations, Title 23, Part 771. These regulations, developed jointly with the Federal Highway Administration, apply to all transit investment projects that are being proposed for federal funding, subject to FTA approval. FTA has also developed guidelines and other documents to aid technical staff in the conduct of the environmental process.

Under the FTA regulations, the Metro South project requires an environmental impact statement because any extension of light rail or other fixed guideway service is deemed to have the potential to significantly affect the environment (see 23 CFR §771.115 (a) (3)).

The FTA is the federal agency responsible under NEPA for the preparation of the EIS. In accordance with FTA's regulations, the responsibility for conducting the analysis of environmental impacts and with preparing the draft text of the EIS is assigned to the local transit agency or other agency given responsibility by the Metropolitan Planning Organization (MPO)[2] for developing the project plans. For the Metro South project, the environmental analysis and draft documents were prepared by the EWGCOG and their consultants, working with Metro and the Missouri DOT. FTA staff at the regional and national level have worked with the metropolitan and state agencies throughout the process and have reviewed and accepted the analysis and conclusions presented here.

FTA published a Notice of Intent to prepare an EIS for the Metro South project on June 25, 2003 (*Federal Register*, Vol. 68, page 37891), as required under FTA (23 CFR §771.123(a)) and CEQ (40 CFR §1508.22) regulations. Since that time, the local agencies have conducted scoping and developed and analyzed alternatives through an open and participatory process, as required by 23 CFR §771.123(b). This scoping process has included certain federal and state resource agencies that have expertise and/or regulatory responsibility for environmental resources that may be affected by the proposed project. A list of the resource agencies consulted is included in Chapter 9 of this DEIS. This draft EIS has been prepared to comply with the requirements of 23 CFR §771.123 (c).

In addition to the NEPA requirements, there are many other federal permits, reviews, and coordination procedures that may be required before this project can be constructed. The DEIS will provide information to support these other programs. The additional requirements may include:

- Permits for fill or other work in wetlands and other Waters of the United States, required under Section 404 of the Clean Water Act (33 USC 1344). These permits are issued by the Army Corps of Engineers.
- Permits for discharges into Waters of the U.S., required under Section 401 of the Clean Water Act (33 USC 1341). These permits are issued by the Missouri Department of Natural Resources. Some discharges, such as drainage from tracks and other area sources, are not covered by this requirement.

[2] The East-West Gateway Council of Governments (EWGCOG) is the MPO for the St. Louis region.

- A finding under Section 4(f) of the federal Department of Transportation Act (49 USC 303). Before approving any project that uses any publicly-owned parkland, recreation area, or wildlife refuge, or any significant historical resource, the U.S. Secretary of Transportation must find that there are no prudent and feasible alternatives to such use and that all possible planning has been done to minimize harm to the resource.
- A coordinated process to address any adverse effects to significant historical resources, required under Section 106 of the National Historic Preservation Act. (No such adverse effects have been found for any of the Metro South alternatives.)
- Approval by the Secretary of the Interior if the project would use any park or recreational properties acquired or improved using federal Land and Water Conservation (LAWCON) funds ("Section 6(f)"). (See 16 USC 460ℓ-8(f)(3).) No such properties are used by the Metro South alternatives.
- Endangered Species Act. The project may not advance if it is shown that the project will result in the direct taking of any endangered plants or animals protected by the Act, and federal agencies must show that the project has been planned to minimize indirect impacts, such as habitat impacts.
- Clean Air Act requirements. The project must be included in a transportation plan and program that has been found to be consistent with the State Implementation Plan for achievement of air quality conformity objectives. (42 USC 7506)
- Compliance with Executive Orders 11988 (floodplain management), 11990 (protection of wetlands), and 12898 (environmental justice). These Executive Orders are directives from the President to federal agencies, instructing them on procedures and policies to address certain national goals.
- Numerous federal resource agencies have adopted procedures to review DEISs and to comment and/or participate in planning in cases where there is a potential impact to resources for which they are responsible.
- If the project requires any bridge or other structure over a navigable waterway, a Bridge Permit will be required from the U.S. Coast Guard under the General Bridge Act (33 USC 525). In such a case, a permit for construction of a navigable waterway, under Section 10 of the Rivers and Harbors Act (33 USC 403) may also be required.
- Farmland protection. The federal Farmland Protection Policy Act (7 USC 4201 *et seq.*) protects agricultural lands and soils that could be

affected by federal projects. This program is under the control of the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture. The Farmland Protection act does not apply to lands that have already been developed as non-agricultural uses.

- FTA "New Starts" reporting requirements. As part of its responsibilities for administering federal transit grants, the FTA requires reporting of project information that can be used to evaluate and compare projects from across the country. This information includes, but goes well beyond, the information required to be reported under NEPA. However, much of this additional information – including land-use policy, user benefits, cost effectiveness, equity and mobility measures – is presented in Chapters 4, 5, and 6 of this DEIS to facilitate the evaluation of project alternatives.

It is important to note that there are overlapping state and federal responsibility for the protection of environmental and cultural resources. The local implementing agencies will be responsible for addressing issues raised by state and federal agencies; the information presented in this DEIS provides information for this effort.

ORGANIZATION OF THE REPORT

This DEIS provides for a comprehensive assessment of the consequences of each project alternative on the human and natural environment. Potential impacts are divided into categories that correspond to the type of resource affected (community or wildlife, for example). For each alternative, the severity of impacts is identified and quantified. Feasible measures that could reduce or eliminate the impacts may, if found to be cost-effective, be included as part of the specification of the alternative. Where a negative environmental consequence cannot be avoided, this impact is clearly identified.

This DEIS has eight chapters and additional materials preceding and following the body of the report. The content, title, and organization of these chapters and other materials conform to the recommended organization presented in the CEQ regulations and in FTA guidelines for the preparation of EISs. The sections of the DEIS are:

***Executive Summary**:* This section is a brief summary of the contents of the DEIS.

Chapter I: Purpose and Need. This chapter establishes the need for the proposed transportation strategy by analyzing study-area characteristics, and current and anticipated transportation problems. It includes the study goals and objectives, which are used to develop and evaluate alternative strategies.

Chapter II: Alternatives Considered. This chapter describes the transportation alternative selection and screening process, and describes the seven detailed alternatives (the five final build alternatives, the TSM alternative, and the No-Build alternative) that were selected for further consideration based on the screening process and public comments.

Chapter III: Potentially Affected Resources in the Corridor. This chapter provides an overview and description of the current transportation resources, social and economic resources, natural environment resources, and cultural resources of the Metro South Study Area. It is intended to provide a general understanding of the impact issues that may be associated with the alternatives.

Chapter IV: Transportation Impacts. This chapter presents an analysis and discussion of the transportation impacts expected to result from the alternatives. Included in this chapter is a presentation of the projected ridership for the alternatives and the impact on the transportation modes serving the study area – roadway and transit systems – that would be expected to result.

Chapter V: Environmental Consequences of the Alternatives. This chapter describes the potential environmental impacts of each alternative and the proposed mitigation measures related to the impacts. This information is organized on a resource-by-resource basis, and presents information for all alternatives using similar methods and levels of detail.

Chapter VI: Evaluation of Alternatives. This chapter compares the final alternatives in terms of their effectiveness in meeting the transportation needs of the corridor, their environmental impacts, their cost effectiveness, and their equity in providing transportation benefits. The alternatives are compared and the trade-offs among them are discussed. No preferred alternative has been identified at this time.

Chapter VII: Draft Section 4(f) Statement. This chapter documents the review of any areas -- such as significant historical resources and publicly owned parklands, recreation areas, or wildlife refuges – that are subject to Section 4(f) protection..

Chapter VIII: Supplementary information. This chapter includes a list of reference materials and documents, a list of the people responsible for the preparation of the DEIS, and a list of agencies and other parties who will receive a copy of the DEIS.

Appendices: Seven appendices to the DEIS provide supporting information for the analysis. The appendices are:

A: Plan and Profile Drawings and Typical Sections

B: Station Area Plans

C: Operations Plan, August 2004

D: 2025 Ridership Forecasting and Methodology Report, December 2004

E: "St. Louis MetroLink South Ridership Forecasts", Robert Cervero, April 2003

F: Walkability Index, July 2004

G: Public Involvement – Summary of Meetings

SUPPORT DOCUMENTS

Support documents are intended to substantiate statements and conclusions made in this DEIS and to provide more detailed records, data, descriptions, and analyses than can reasonably be accommodated within the DEIS. Support documents can be made available for examination on written request to:

Donna Day
East-West Gateway Council of Governments
1 Memorial Drive, Suite 1600
St. Louis, MO 63102

The following are the support documents that were prepared during the development of the environmental analysis for this project:

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Existing Conditions, July 2003

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Purpose and Need, July 2004

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Report on Preliminary Alternatives Development and Analysis, July 2004

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Task 6 Draft Operating Plans for Detailed Alternatives, August 2004

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Definition of Detailed Alternatives, February 2005

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Cost Methodology and Estimates, January 2005

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Noise and Vibration Analysis, January 2005

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Social, Economic and Environmental Analysis, January 2005

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Traffic Impact Assessment, December 2004

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Financial Capacity Analysis, February 2005

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Summary Evaluation, February 2005

NEXT STEPS IN THE DECISION-MAKING PROCESS

This Draft Environmental Impact Statement is subject to review and comment. At the front of this volume can be found information on the date and time of a public hearing to be held on this document as well as instructions for submitting written comments.

This DEIS will be submitted to the federal Environmental Protection Agency when approved by FTA. The agencies, individuals, and organizations identified in Chapter VIII will be sent a copy of the DEIS along with a notice of the public hearing and comment period. Any person may review the DEIS at public libraries in the area or by arrangement with the EWGCOG. The comment period will begin with an official notice to be published in the *Federal Register;* the comment period will extend for 45 days.

Following the comment period, the local proponent may select a preferred alternative and may seek FTA concurrence to proceed into preliminary engineering. The preliminary engineering work will include the preparation of a Final Environmental Impact Statement (FEIS) that will respond to information and comments received during the comment period.

Following the completion of the FEIS, the Federal Transit Administration may issue a Record of Decision for the project, including a finding that the required analysis and reporting required under NEPA has been completed as well as any other required findings.

Following these actions, the project can proceed to the subsequent stages of project development. This will include final design, permitting, equipment procurement, construction, and preparation for system operations.

1.0 PURPOSE AND NEED

This chapter provides a general introduction to the DEIS by providing background on the Metro South transportation study and by describing the project area and the existing transportation system. It identifies the previous planning and analysis steps that have occurred to shape this study and move it forward as a priority corridor. It then describes the transportation problems and issues found in the corridor, and presents a concise statement of the objectives of the study, the "Purpose and Need Statement".

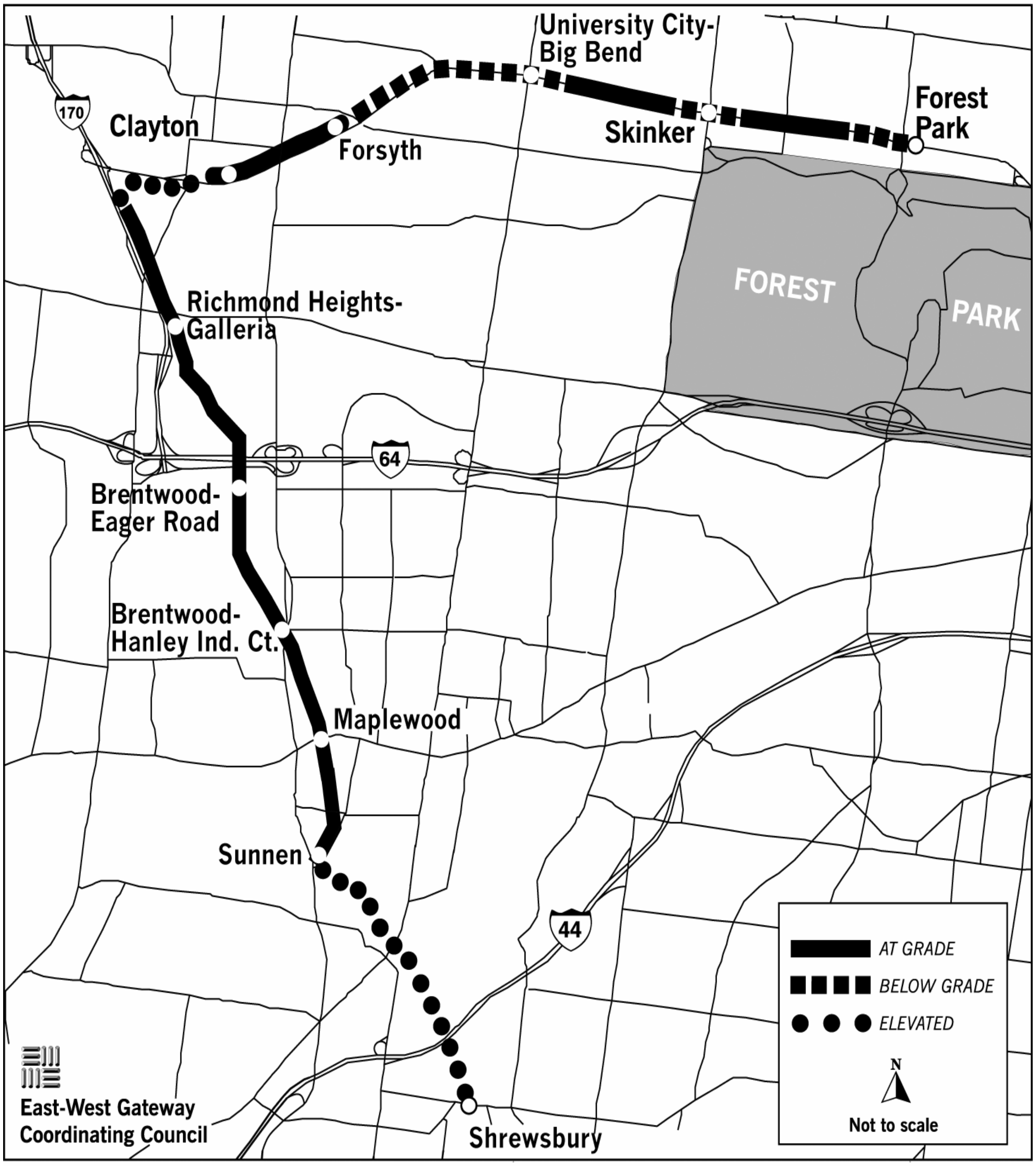
1.1 BACKGROUND

The Metro South MetroLink Extension Alternatives Analysis and Draft Environmental Impact Statement (AA/DEIS) is a key element in the development of improvements in the Cross-County Corridor, which was identified as one of three priority transit corridors for development within the St. Louis region in the East-West Gateway Council of Government's (EWGCOG) *St. Louis Systems Analysis for Major Transit Capital Investments* (1991).

Following that Systems Analysis, the Cross-County Corridor was the subject of a Major Transportation Investment Analysis (MTIA) from 1994-1997. The analysis recommended that the existing light rail transit (LRT) system be extended from the existing Forest Park Station on the MetroLink mainline to serve the Cross-County Corridor. The extension was to extend west through Clayton and into north and south St. Louis County.

In September 1997, the EWGCOG Board of Directors adopted a locally preferred alternative for the Cross-County Corridor Extension. This alternative extends from the existing Forest Park Station west to Clayton and then south to Shrewsbury. The Cross-County extension to Shrewsbury is currently under construction and is scheduled to open for revenue service in 2006. Figure 1-1 shows the location of the Cross-County Extension.

In 2002, the EWGCOG Board of Directors decided to proceed with further project development of the southern portion (Metro South) of the Cross-County Corridor, extending southward from the Shrewsbury terminus. This further extension would fulfill the intent of the 1997 MTIA by extending service into south St. Louis County. Figure 1-2 shows the relationship of the Metro South study area to the existing planned and potential MetroLink sys-



East-West Gateway Coordinating Council map of June 1999 updated to reflect station names of July 2000.

Figure 1-1
Cross-County Alignment via Clayton to Shrewsbury, 1999

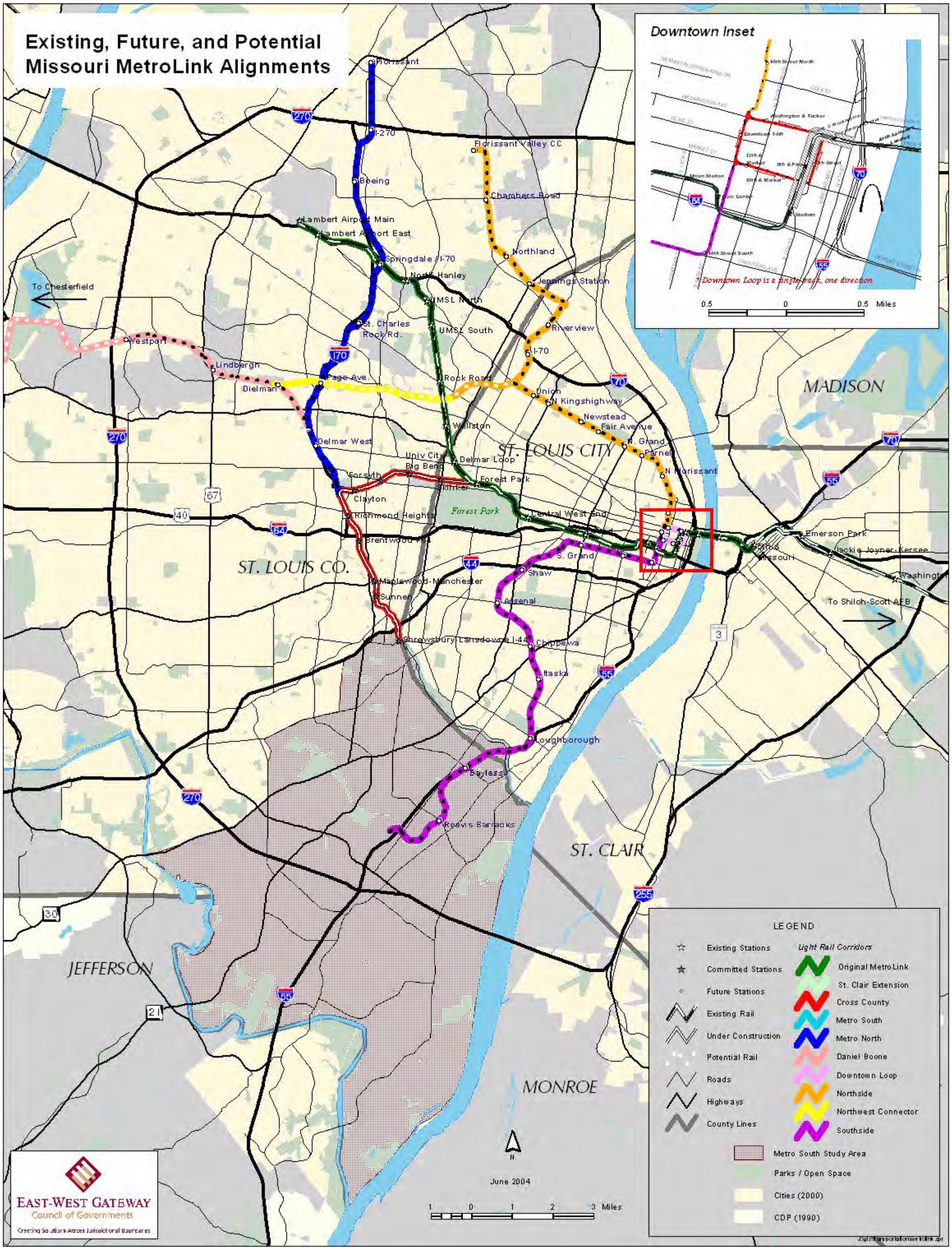

Existing, Future, and Potential Missouri MetroLink Alignments
Downtown Inset
* Downtown Loop is a single track, one direction
MADISON
ST. LOUIS CITY
ST. LOUIS CO.
ST. CLAIR
JEFFERSON
MONROE
To Chesterfield
To Shiloh-Scott AFB
Florissant
I-270
Boeing
Lambert Airport Main
Lambert Airport East
Springdale / I-70
North Hanley
UMSL North
UMSL South
St. Charles Rock Rd.
Page Ave.
Westport
Lindbergh
Dielman
Delmar West
Forsyth
Clayton
Richmond Heights
Brentwood
Maplewood-Manchester
Sunnen
Shrewsbury-Lansdowne I-44
Florissant Valley CC
Chambers Road
Northland
Jennings Station
Riverview
I-70
Rock Road
Union
N Kingshighway
Newstead
Fair Avenue
N. Grand
Parnell
N Florissant
Wellston
Delmar Loop
Univ City
Big Bend
Skinker
Forest Park
Central West End
S. Grand
Shaw
Arsenal
Chippewa
Itaska
Loughborough
Bayless
Reavis Barracks
Emerson Park
Jackie Joyner-Kersee
Washington
East Riverfront
LEGEND
Existing Stations
Committed Stations
Future Stations
Existing Rail
Under Construction
Potential Rail
Roads
Highways
County Lines
Light Rail Corridors
Original MetroLink
St. Clair Extension
Cross County
Metro South
Metro North
Daniel Boone
Downtown Loop
Northside
Northwest Connector
Southside
Metro South Study Area
Parks / Open Space
Cities (2000)
CDP (1990)
June 2004
Miles
EAST-WEST GATEWAY
Council of Governments

Figure 1-2

tem. This DEIS describes the alternatives analysis process for the Metro South study area, and presents environmental and other information on the alternatives found to be most feasible.

1.2 Study Area Characteristics

1.2.1 Study Area Description

The study area encompasses approximately 64 square miles (41,000 acres) of predominantly unincorporated St. Louis County. It extends 14 miles south from the planned Shrewsbury terminal station of the Cross-County line that is currently under construction (Figure 1-3).

The boundaries of the study area are the River Des Peres (in the City of St. Louis) on the north, the Mississippi River on the east, the Meramec River on the south, and on the west an irregular boundary formed by Edgar, Watson, Sappington and Gravois Roads to the point where Gravois Road crosses the Meramec River. This study area is the southern part of the area originally defined for the Cross-County MTIA.

The study area population is approximately 180,000; the study area is the location of 54,000 jobs. Compared to the metropolitan area as a whole, the Metro South study area has a population that is somewhat older than average, has a lower percentage of minority residents, and is near the average income of the metropolitan area. Additional socio-economic information is presented in Chapter 3.

1.2.2 Existing Transportation Network and Facilities

Roadways: The existing arterial road network within the study area generally radiates in a southwesterly direction from a central hub in the downtown area of the City of St. Louis (shown on Figure 1-3). This radial system reflects the historic link between the downtown and the outlying communities. The radial State routes include:

- Gravois Road (Route 30),
- Broadway/Kingston Drive/Telegraph Road (Route 231),
- Lemay Ferry Road (Routes 61,67,267),
- Tesson Ferry Road (Route 21),
- Mackenzie Road (Route P), and
- Watson Road (Route 366).

The only other State route within the study area is Lindbergh Boulevard

Metro South MetroLink Extension
Alternatives Analysis/DEIS

Sponsoring Agencies

East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation

metroSOUTH

Interstate
Major Roadway
Study Area
Cross County
Rivers

Figure 1-3

Study Area & Street Network

0 0.25 0.5 1 1.5 2 Miles

(Route 67), which runs east-west. All of the state and county roadways serving the study area are two- or four-lane arterials with numerous at-grade, signalized intersections and little or no control of access.

Two regional highways bisect the area. They are I-55, which traverses the area in a generally north-south direction from the City of St. Louis to the north to Jefferson County to the south, and I-270/I-255, which traverses in an east-west direction from western St. Louis County to the west to Illinois to the east.

Previous transportation studies have all noted the lack of direct north-south service across the study area to central St. Louis County to the north of I-44. A limited network of north-south county roads does exist within the Metro South area and includes Sappington Road, Baptist Church Road, Laclede Station Road, Union Road, and portions of Mackenzie and Telegraph Roads. These roadways are generally not continuous and require a circuitous route through signalized intersections to reach most areas of mid-St. Louis County.

Current and projected roadway volumes and levels of service for each roadway link are shown in Table 1-1. The level-of-service measures indicate the overall delay on each link. A level of D represents poor service quality (congested/unstable flow), a level of E represents generally unacceptable service quality (very congested/very unstable flow), and a level of F represents a failed condition (stop-and-go/gridlock). Levels of service on roadways in the study area are generally poor.

Transit - Metro Bus: There are fifteen Metro bus routes that currently serve the south St. Louis County area. Twelve of these routes provide access to the north or northeast, and terminate beyond the study area in downtown St. Louis. The busiest four of these bus lines provide most of the service; they have a total ridership of 11,000, or almost 80 percent of all riders on the fifteen routes serving the corridor. In comparison, bus lines not serving downtown St. Louis are fewer, with less frequent service. There is limited bus service over the discontinuous street network to the employment centers in the mid-County/Clayton area. Of the total 572,000 daily person trips generated within the study area, only 2,400 trips were made by transit (0.42 percent of the total).

In 2001, Metro developed a Preliminary Feeder Bus Plan to serve the Cross-County MetroLink extension when it opens in 2006. The plan includes the modification of six existing bus routes within the Metro South study area that would be re-directed to connect to Shrewsbury Station.

Transit - Demand Response Services: In addition to bus service, Metro operates two demand response programs in the St. Louis region: Call-A-Ride and Call-A-Ride Plus. Metro Call-A-Ride provides curb-to-curb van service in St. Louis City and County with advance reservations. Service in the North, West, and South County areas, including the study area, is available seven days per week and is open to the general public. Service in the City Call-A-Ride Plus area is also available seven days per week, but it is restricted Monday-Friday to persons with disabilities who have registered to use the service. However, it is open to the general public on Saturday and Sunday.

Transit - MetroLink LRT: The current LRT system consists of approximately 40 miles of double track, running from its western terminus at Lambert Airport station, on the western side of the St. Louis metropolitan area, to the Shiloh-Scott station east of the Mississippi River in Illinois. A fleet of 65 vehicles operates in trains made up of one or two vehicles. Trains currently operate on 10-minute headways from 6:00 a.m. to 7:30 p.m., Monday through Friday, and on 15-minute headways outside of that period. On Saturday and Sunday, trains operate on 15-minute headways from 7:30 a.m. to 7:30 p.m. and on 30-minute headways during early morning and late-night periods.

The Cross-County extension, currently under construction, is scheduled to open in 2006. This extension will branch from the existing LRT line at the Forest Park station, extend west through Clayton and turn south to a new terminal station at Shrewsbury. This extension will add 7.6 miles to the current system. When the extension opens, the vehicle fleet will be increased to a minimum of 87 vehicles. While the Cross-County extension will bring MetroLink light rail service into the study area for the first time, most study area residents will require an access trip by automobile or feeder bus to access the MetroLink system at Shrewsbury.

Freight Rail: The study area includes both Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) lines. Most of the length of these lines is still active. A portion of the UP railroad in the study area has been abandoned and is now dedicated to recreational use as the Grant's Trail recreational trail. The UP segment east of Grant's Trail is still active and serves a recycling center south of Bayless Road. The UP line currently carries infrequent traffic. On average, there is less than one train per day using this line. The BNSF currently runs from nine to eleven trains per day through the study area. At least one train per day is a coal train that serves Ameren UE to the south; the other trains carry primarily taconite and some grain. Peak freight traffic occurs in the early morning and early evening.

Bicycle/Pedestrian Facilities: The largest exclusive bicycle/pedestrian facility in the study area is the six-mile Grant's Trail. It runs in a generally east-west direction along the former UP right-of-way. Many arterials in the area have sidewalks.

1.3 PLANNING CONTEXT

1.3.1 Regional Transportation Goals and Objectives

EWGCOG's current approach to regional transportation planning and decision-making in the Metro St. Louis area is defined in its March 2002 plan entitled *Legacy 2025: The Transportation Plan for the Gateway Region*. *Legacy 2025* updated earlier regional plans and provides a guide for investing public funds through the year 2025. In addition, *Legacy 2025* re-emphasized six focus areas to serve as the evaluative framework for identifying and defining problems, developing and evaluating options, and selecting preferred alternatives in long- and short-range transportation planning studies. These focus areas are also used by EWGCOG to establish priorities in selecting projects for programming in the Transportation Improvement Program (TIP) and provide a reference point to ensure consistency in the EWGCOG's planning programs.

The six focus areas, and their applicability to the Metro South study area, are described below.

1. **Preservation of existing infrastructure.** This focus area emphasizes maintaining current road, bridge, transit, and intermodal assets in good condition. *Legacy 2025* noted that 50 percent of the pavement in St. Louis County is deficient. While the existing arterial streets in the study area are generally in good condition, current maintenance activities must continue unabated because increasing traffic volumes will contribute to pavement deterioration. Funding for major roadway reconstruction is limited.
2. **Safety and security in travel.** This focus area emphasizes decreasing the risk of personal injury, fatalities, and property damage on, in, and around transportation facilities. The accident rate within the study area is representative of general conditions in St. Louis County, where the annual average number of crash fatalities between 1995 and 2000 was 1.6 times higher than the City of St. Louis.
3. **Congestion.** This focus area emphasizes ensuring that congestion on the region's roadways does not reach levels that compromise productivity and quality of life. In 2001, the levels of service (LOS) on Interstate 55 (I-55), I-270/I-255, and major arterials in the study area such as Tesson Ferry Road and Lindbergh Boulevard, were LOS D, E or F. This level of service indicates very congested and/or stop-and-go traffic during the peak commuting hours. The EWGCOG policy guidance from *Legacy 2025* includes focused efforts on congestion mitigation for major bottlenecks on interstates and principal arterials, and promoting the use of existing transit systems as an alternative to highway use.

4. **Access to opportunity.** This focus area emphasizes addressing the complex mobility needs of persons living in the area, including those living in low-income communities and persons with disabilities. The study area contains a radial arterial street system, which directs most traffic to downtown St. Louis, and a fragmented network of discontinuous north-south roads that connect the arterials. The lack of north-south arterials between the study area and the employment and activity centers in the mid-county area limits accessibility and increases travel times for residents of the Metro South area.

5. **Sustainable development.** This focus area emphasizes coordinating land-use, transportation, economic development, environmental quality, energy conservation, and community aesthetics. Sustainability involves making responsible use of natural and built resources, ensuring that future generations can share in their benefits, and ensuring that all people (including low-income and minority populations) are involved in decisions that affect their lives. Since the Metro South area is characterized by primarily low-density development and a scarcity of vacant land, the link between transportation and land-use planning becomes more important relative to the distribution of area activity/employment centers, economic development potential, and auto dependency. To guide future decisions, EWGCOG policies include promoting transportation and development actions that reduce single-occupancy vehicle travel, promoting changes in public incentives for development and redevelopment to encourage employers to locate closer to labor markets, and encouraging higher-density, mixed-use development at future MetroLink stations.

6. **Efficient movement of goods.** This focus area emphasizes improving the movement of freight within and through the region by rail, water, air, and highway. Since the existing infrastructure currently accommodates the movement of goods through the study area, this particular focus area does not apply to possible future transit improvements in the Metro South area.

Based upon these six focus areas, *Legacy 2025* outlined the following regional goals, which apply to current and future transportation and land-use decisions for the Metro South area:

- **A sustainable and growing economy grounded in the wise and coordinated use of physical, environmental, social, and agricultural resources.** Because the Metro South area contains little undeveloped land, existing neighborhoods and resources have become valuable commodities to be preserved when evaluating possible future transportation and development proposals.

- **A clean and healthy environment.** The successful attainment of this goal is predicated on relieving existing congestion in the Metro South area by reducing vehicle miles of travel and improving local air quality.

- **Safe neighborhoods, communities, and thoroughfares.** The local transportation and land-use plans for the Metro South area, described in Section 1.3.5, identify safety concerns relative to increasing congestion problems, accidents on arterial streets and collector roads, and the need for more sidewalks to ensure pedestrian safety.
- **Accessible resources for learning and personal development.** Accessibility between the study area and the educational/employment centers in the mid-County area is limited due to the discontinuous network of north-south arterial streets. In addition, mobility within the study area is essentially automobile-based due to the dispersed locations of these resources and limited bus service. Future transportation decisions have the potential to improve local access and mobility, particularly for low-income and minority residents.
- **Efficient and balanced patterns of growth and development that respect the land, citizenry, history, and strategic location of the St. Louis region.** Since the majority of the study area is developed, future highway and/or transit improvements will need to minimize their potential impact upon adjoining land-uses and be compatible with local development or redevelopment initiatives.

Responsible planning practices, and Federal law, require that transportation investment decisions align with these goals and objectives that the region's policymakers have adopted.

1.3.2 Project Development Process

The overall transportation project development process is summarized in Figure 1-4. The purpose of the Metro South study is to develop and evaluate possible transportation strategies for south St. Louis County based upon the recommended transit strategy called for in the 1997 Cross-County MTIA.

TRANSPORTATION PROJECT DEVELOPMENT

An Alternative Analysis (AA) is both a planning tool and an evaluative process. It is a step for any major transportation project that may require significant capital investment of federal funds.

Figure 1-4

The publication and review of this DEIS is the final step in the AA/DEIS phase of project development. During the AA stage, assumptions made in the MTIA were revisited and validated based on the updated existing and projected future conditions of the Metro South study area. A key element of the validation is the clear definition of the area's transportation problems in order to firmly establish the purpose and need for a proposed transit improvement. Detailed analyses of the viable alternatives were conducted using the evaluation criteria developed as a result of agency and public input through the scoping process. These analyses and evaluations may lead to the identification of a locally preferred alternative (LPA).

1.3.3 Results of Project Scoping

In July 2003, agency and public scoping meetings were conducted to gain additional input from potentially affected stakeholders regarding transportation problems in the study area in the context of the goals and objectives for the region. The dominant theme identified in the public engagement process was the need for improvements in the transportation infrastructure in South County. The specific results of these meetings are presented in the Metro South Existing Conditions Report and the Metro South Public Scoping Comment Report, published separately. The most commonly identified issues and needs were:

- Improving access to key activity centers
- Providing an efficient public transit system that would provide transportation choices other than automobile travel
- Increasing accessibility to promote economic development as well as walkable mixed-use development around transit stations
- Enhancing the stability and quality of life by reducing congestion and improving travel times
- Preserving and enhancing existing communities and neighborhoods
- Protecting the cultural and natural resources in the study area.

1.3.4 Other Transportation/Land-Use Studies

The following prior and ongoing planning efforts have evaluated all or portions of the Metro South study area. Additional information has been presented in the Metro South *Purpose and Need* report, published separately.

St. Louis Cross-County MTIA (1995-1997): The Cross-County Corridor consisted of two linear corridors that intersected to form a general cross-shaped study area. The north-south corridor extended from the I-270/I-170 interchange on the north to the general vicinity of the I-270/I-55 interchange on the south in the South County area. The east-west corridor extended from east of the I-64/I-270 interchange in St. Louis County to the general vicinity of the I-64/Tower Grove interchange in the City of St. Louis.

Southside MTIA: In the summer of 2000, multimodal MTIAs of the Northside, Southside, and West County (Daniel Boone) study areas were completed. They recommended MetroLink extensions in all three areas. The Southside study area is located in the south and southeast portion of the City of St. Louis and St. Louis County and is roughly bounded by the Mississippi River on the east, I-64 on the north, Gravois and Hampton Roads on the west, and the Meramec River on the south.

Sixth County Council District Community Area Study (1999-2000): The boundaries of the Sixth County Council District of St. Louis County are roughly the same as those for the Metro South study area; i.e., the River Des Peres on the north, the Mississippi River on the east, the Meramec River on the south, and Gravois Road (Route 30) on the west. The principal issues identified in this study included the need to improve the transportation infrastructure and manage traffic congestion on the area's roadways. Other areas of interest were: increasing employment opportunities, converting underutilized commercial property to other uses, and improving the visual character of the area.

The Cross-County MTIA, the Southside MTIA, and the Sixth District Community Area Study provide baseline data and recommendations that will play a role in the process of choosing a Metro South recommendation. Other studies provided local input to the process:

- The St. Louis County Strategic Plan (2000-2004) identified key transportation themes that are applicable to the Metro South study area.

- Both the Oakville Community Area Study (April 1998) and the Affton-Gravois Business Corridor Study (October 1998) identified congestion as a primary concern that needed to be addressed in portions of the Metro South study area. The Oakville study recognized the difficulties associated with traveling north out of the study area, and expressed an interest in creating small neighborhood-scale commercial nodes rather than continuous commercial strips, and in using infill development as an alternative to new low-density residential development. The Affton-Gravois study expressed concerns about pedestrian safety and high numbers of households with persons 65 and older, the limited range of housing options available in the area, and the need for incentives for local development.

- The Shrewsbury Planning Study investigated the need for improved access to I-44 in the vicinity of the existing partial interchange of I-44 and Shrewsbury Avenue.

- In 2003, MoDOT initiated a study to identify transportation needs in the I-55/River Des Peres communities of Lemay, Affton, and south St. Louis City. The purpose of this study was to explore potential transportation improvements that could help these communities become better places in which to live, work and do business. Several of alternatives were developed and analyzed to address three main focus areas: improved safety of and access to I-55, improved access to River Des Peres industrial areas, and improved access to commercial and residential areas. The final pool of recommendations was presented to the public at an open house on February 11, 2004. Improvements in this area could result in improved access by bus and automobile to potential transit station locations in the northern part of the Metro South study area.

The EWGCOG's approved TIP (2003-2007) and proposed 2004-2008 TIP do not identify any highway widening projects to increase capacity along the major corridors in the Metro South study area to relieve current or future congestion. However, *Legacy 2025,* the region's long-range plan, does include some investment priorities slated for funding within the region's fiscal constraints for the years 2021-2025. These investments include adding lanes and operational improvements to Route 21 (Tesson Ferry Road) and Route 231 (Telegraph Road) south of I-270.

1.4 Statement of Purpose and Need

1.4.1 Problems and Opportunities

Problem: Accessibility and Congestion

The Cross-County MTIA identified the poor connectivity between the South County Area and the major destinations in the rest of the St. Louis metropolitan area as one of the principal transportation problems in the study area. While the existing road network provides adequate radial connections to the City of St. Louis, the interconnection between these radial routes is underdeveloped, especially within the study area, where the majority of the road network is oriented toward the City. There are no direct, high-capacity highway routes between the Metro South study area and the mid-county area and Clayton. All of the arterials are congested, discontinuous, and have numerous traffic signals. As a result, South County residents face a penalty in travel times to destinations outside the downtown area, as compared to drivers in other parts of the region.

The only existing transit service in the Metro South area is provided by buses operating on the same fractured street network. Because they must negotiate the same congested signalized intersections, transit travel speeds are similarly handicapped. Transit times for the Metro South study area are up to twice as long as travel times for automobiles on journeys of similar distance to destinations outside the downtown area.

To demonstrate these travel time penalties, the 2000 travel demand model was used to compare travel times in the morning rush hour for journeys of similar distance to destinations outside the downtown area. Vehicle travel times from the study area were up to 40 percent longer than similar journeys to the same destination from other metropolitan areas. For example, Florissant and the southern part of the study area are both 17.4 miles from downtown St. Louis. However, the actual travel time is 31 minutes from Florissant to downtown St. Louis versus 43 minutes from the southern part of the study area. This same pattern holds from Overland to downtown St. Louis when compared to the central part of the study area, 25 minutes versus 32 minutes.

Transit times were also compared. For example, it takes almost twice as long to travel from the central part of the study area to downtown St. Louis via transit than it does from Overland, 85 minutes versus 43 minutes.

Other origin-destination pairs showed the same pattern. As a result, poor highway and transit accessibility places the study area at a significant disadvantage regarding both mobility and accessibility.

Figure 1-5 illustrates job accessibility in the peak hour for automobile users. As shown, a significant portion of the region's population can access the majority of the 1.3 million jobs that a driver can reach within 45 minutes during congested travel periods. However, accessibility drops significantly beyond the I-270/I-255 corridor. In comparison (Figure 1-6), a transit user can reach just over 500,000 jobs within an hour's travel time, or less than 40 percent of jobs in the region. Accessibility by transit disappears almost entirely outside of I-270, and access is even more limited in off-peak hours because of lower-frequency.

An important distinction between highway and transit accessibility is that all destinations can be reached by automobile, even though the travel time may exceed 45 minutes. If the origin or destination of the trip is outside the Metro service area, the trip cannot be made by transit, no matter how much time one is willing to spend.

Figure 1-5: Job Accessibility by Auto

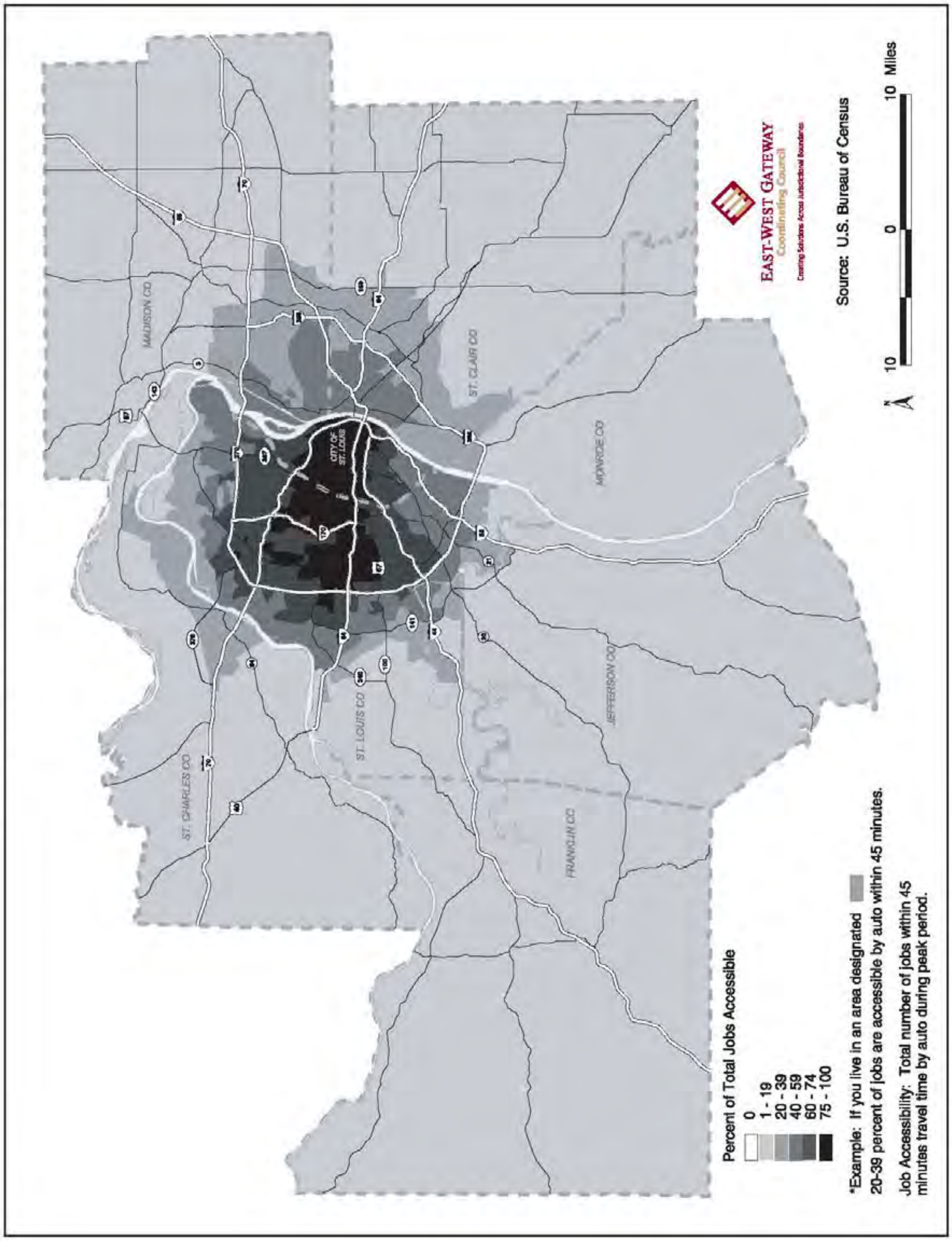
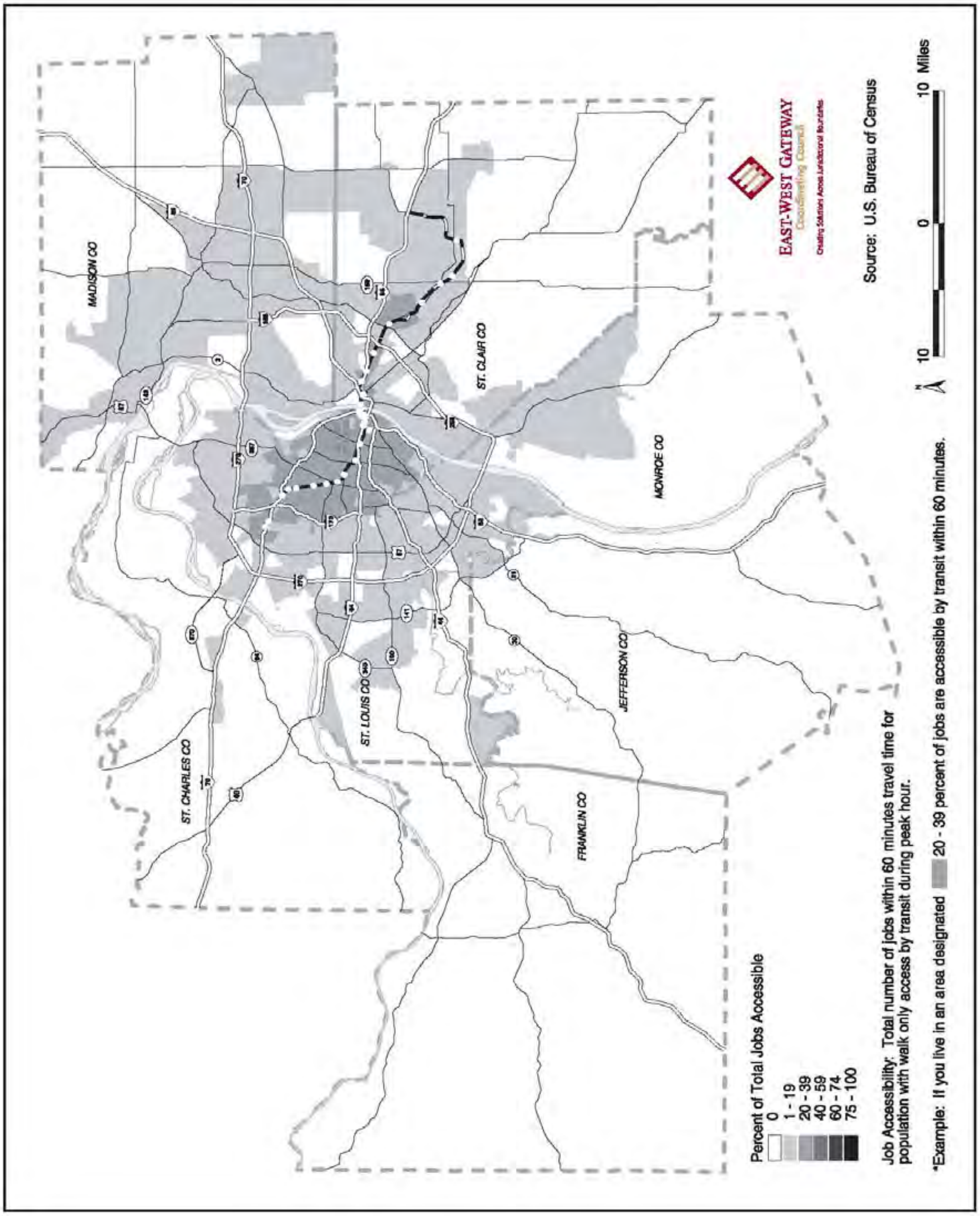


Figure 1-6: Job Accessibility by Transit



The majority of the area's principal arterials are highly congested, as evidenced by LOS E and F (Table 1-1). As the Metro South area and adjoining areas in Jefferson County to the south continue to develop, traffic volumes will undoubtedly increase proportionately, resulting in greater and more frequent congestion over longer periods of the morning and evening rush hours. This problem cannot be alleviated by increasing the capacity of most of the existing four-lane arterials north of I-270 without acquiring a substantive number of business and residential properties since development closely abuts these roadways. A limited amount of widening potential does exist, however, along Tesson Ferry and Lemay Ferry Roads south of I-270.

In summary, the challenges posed by the existing transportation system serving the Metro South study area are:

- There are no high-speed highway connections to the central part of the county.
- There are relatively few north-south connectors serving the Metro South area.
- The north-south connectors that do exist have poor connectivity and increasing local congestion, making through movements in the north-south direction less efficient.
- The proliferation of traffic signals along all the major arterial routes in the study area reduces the efficiency of the overall road network and contributes to local congestion.
- Transit service is much worse than auto because of the limited number of routes and minimal service area.
- Transit service that does exist is hampered by the same roadway conditions that restrict vehicular speeds in the Metro South area.

Opportunity – The development and implementation of an expanded light rail transit system could create the opportunity to increase regional accessibility and mobility by reducing congestion and travel time, as well as by providing a direct north-south connection to the mid-county area. In Metro South, transit enhancements could also create potential land-use advantages to help structure future development at and near proposed LRT stations with transit-oriented development (TOD) and bicycle/pedestrian access improvements.

Table 1-1: Traffic Volumes and Levels of Service (LOS)

Roadway	Segment		2001 ADT	Peak Hour	2025 ADT	Peak Hour
	From	To	Volume	LOS	Volume	LOS
Telegraph Rd/Rte.231	Meramec River	Christopher Road	6,510	---	6,799	---
	Christopher Road	I-255	53,506	F	55,879	F
	I-255	Reavis Barracks Road	27,448	F	28,665	F
	Reavis Barracks Road	River Des Peres	11,764	D	12,286	D
Lemay Ferry Rd/ Rte.267	Meramec River	New Baumgartner Road	18,251	---	21,806	---
	New Baumgartner Road	Butler Hill Road	28,192	E	33,683	E
	Butler Hill Road	I-270	49,058	E	58,613	F
	I-270	Lindbergh Boulevard	28,189	F	33679	F
	Lindbergh Boulevard	Reavis Barracks Road	28,189	E	33,679	E
	Reavis Barracks Road	Weber Road	12,386	---	14,798	---
	Weber Road	River Des Peres	12,386	---	14,798	---
Tesson Ferry Rd/ Rte.21	Meramec River	Butler Hill Road	24,196	D	33,738	D
	Butler Hill Road	I-270	58,375	F	81,397	F
	I-270	Lindbergh Boulevard	35,006	F/E	48,812	F/F
	Lindbergh Boulevard	Gravois Road	27,664	E	38,754	F
Gravois Rd/ Rte.30	Meramec River	I-270	47,117	F/D	57,615	F/F
	I-270	Lindbergh Boulevard	32,310	F	39,509	F
	Lindbergh Boulevard	Tesson Ferry Road	18,789	D	22,975	D
	Tesson Ferry Road	Mackenzie Road	34,776	F	42,524	F
	Mackenzie Road	River Des Peres	23,273	E	28,458	F
Watson Rd/ Route 366	Sappington Road	Laclede Station Road	25,983	E	33,136	F
	Laclede Station Road	River Des Peres	15,890	---	20,264	---
Mackenzie Rd/Route P	Watson Road	Heege Road	10,437	E	12,889	E
	Heege Road	Gravois Road	20,771	E	25,651	E
Lindbergh Blvd/61-67	Gravois Road	Tesson Ferry Road	15,079	F	27,051	F
	Tesson Ferry Road	I-55	26,543	F	47,616	F
	I-55	Union	17,204	F	30,863	F
	Union Road	Lemay Ferry Road	26,192	D	46,987	F
	Lemay Ferry Road	I-255	22,286	E/F	39,980	F/F
I-55	Meramec River	Butler Hill Road	94,624	F	104,943	F
	Butler Hill Road	I-270	103,750	---	115,064	F
	I-270	Reavis Barracks Road	81,389	D	90,264	D
	Reavis Barracks Road	River Des Peres	93,424	D/E/D	103,612	E
I-270/I-255	Gravois Road	Tesson Ferry Road	132,182	E	151,023	F
	Tesson Ferry Road	I-55	128,501	E	146,817	F
	I-55	Lemay Ferry Road	99,149	D	113,282	E
	Lemay Ferry Road	Mississippi River	69,796	D	79,745	E
I-44	Elm Avenue	Laclede Station Road	124,914	F	137,272	F
	Laclede Station Road	River Des Peres	104,974	D/E	115,360	E

Source: MoDOT, 2003

Problem: Sustainable Development

The lack of substantive areas of undeveloped land limits the economic development potential of the Metro South area as well as the economic viability of the existing business communities. Without some new and effective catalyst or stimulus for economic growth and change, any substantial growth beyond current levels is not foreseen. The following needs for sustainable development emerged from the review of local plans, the examination of existing conditions, and public comments:

- Increasing economic development, especially employment types, to broaden the Metro South job base.
- Supporting stabilization/revitalization/redevelopment of key areas through Transit-Oriented Development (TOD).
- Improving the jobs/housing balance.
- Promoting "reverse commutes" and more balanced transit flow.

Opportunity - Broader Employment Base: There would be an opportunity for increasing and broadening the study area's employment base is through aggressively using transit improvements to attract some of the development spillover from Clayton, where anticipated demand far exceeds the likely supply of space to accommodate it. Stations within the study area will be especially attractive for spillover office users with labor and operational ties to the office core in the Clayton business community. In addition, transit stations could capture a majority of office space created to replace a portion of the existing study area inventory as it ages and becomes increasingly less competitive. A market study of potential space needs for these two sources of demand –Clayton-related and replacement-related – suggested that at least 925,000 square feet of offices could be accommodated at or near future stations in the study area by 2025.

Study-area retail facilities draw patronage from a broad swath of the South County/Jefferson County area. With two of the region's eleven malls and numerous convenience, specialty and "big box" centers, Metro South will continue to attract a significant share of this overall retail patronage. However, total retail is not expected to grow much beyond today's level. Market analysis suggests that the study area will attract approximately 120,000 square feet of net new retail space. In contrast, some 1.5 million square feet of its existing retail inventory (25 percent of today's total) must be replaced as it ages and becomes obsolete. Possible MetroLink stations present the opportunity to attract certain types and scales of future retail facilities.

Opportunity - Stabilization/Revitalization/Redevelopment of Key Areas: TOD at MetroLink stations can help promote the stabilization or redevelopment of those neighborhoods, commercial corridors, and employment centers that are located near them. To fully realize this potential, strategic station-area land-use plans should, in time, become integrated into more comprehensive local land-use plans (e.g., future updates of the Affton Community Plan or the St. Louis County Sixth District Study). Station-area planning should emphasize adding currently missing land-uses and community amenities aimed at meeting specific local community needs, such as adding retail where it is missing, broadening housing choices for potential new residents, or adding a community center. Given the absence of large "greenfield" sites, most redevelopment or enhancements to existing developed areas would likely need to be achieved through TOD.

Through careful planning and design, TOD can create a more sustainable community by creating a high quality urban environment that is more attractive and marketable for residents and tenants. TODs also present an opportunity to create more "walkable" and safer access for pedestrians (and bicyclists) to encourage choosing transit over private automobile use. The degree to which a candidate alignment can support TOD opportunities around candidate stations will be one test used in evaluating and comparing all the alternatives.

While the idea of TOD is appealing, it will not automatically occur around stations. Because of Metro South's current development character with few emerging mixed-use areas of modest scale, targeted public sector intervention will likely be needed to make even modestly scaled TOD plans feasible. This is especially crucial for redevelopment situations where the necessary market interest in choosing Metro South locations over other competing regional sites will need nurturing. Thus, public-private partnerships can present opportunities to develop an effective balance of incentives and requirements. For example, a developer can be encouraged to provide a desirable land-use mix and community amenities in return for lessened parking requirements, density bonuses, public assumption of infrastructure expenses, or tax rebates.

Development incentives are not always monetary. More streamlined approval processes, fewer conditional approvals, and zoning that allows more transit supportive land-uses, while restricting those uses not appropriate for meeting TOD goals, can also offer developers reasons to pursue TOD. A review of existing development codes – especially zoning and the subdivision regulations – made it clear that local codes will need to become more TOD-friendly if transit implementation is to be an effective instrument of land-use changes and sustainable development. Local land-use policies that encourage transit-supportive development patterns may also improve the prospects for federal funding of rail transit projects in the corridor. The project justification criteria used by the FTA to evaluate projects competing for federal funds place specific emphasis on such land-use policies.

Opportunity - Improve the Jobs/Housing Balance: Implementation of a proposed MetroLink extension could present an opportunity to promote office-centered, mixed-use development in the Metro South area as well as make the area more accessible to the regional labor pool. St. Louis County has a jobs/housing ratio of 1.51, indicating that county employers import much of their workforce as commuters living outside the county. In contrast, the study area has a jobs/housing ration of 0.74, which is decidedly jobs-poor and indicates the study area exports a large number of its resident workers to other parts of the region. A more balanced jobs/housing ratio for Metro South, would be in the range of 1.00 to 1.25. Proper planning in the ½-mile area around a proposed station offers the opportunity to add office or multi-family housing in sufficient proportions to foster greater housing opportunity, economic development, and a balanced mixed-use environment that is compatible with the surrounding development.

Opportunity - Promote "Reverse Commutes" and More Balanced Transit Flows: The potential for transit commuting into the study area implies that workers live nearby (e.g., in Shrewsbury, Maplewood, or University City) or have easy park-and-ride or bus transfer access to MetroLink stations. Full examination of reverse-commute potential will therefore require some examination of the station-area development characteristics (existing and potential) and demographics along the larger system.

The current low study area job/housing balance (0.74) cited above indicates that most local residents commute out of the study area each day to reach their workplaces. Thus, any future MetroLink service could see fairly full trains running north from Metro South in the morning and back south in the evening, but the reverse trips would probably be less crowded. Fostering employment growth around transit stations would, therefore, create a larger potential ridership pool for these otherwise less traveled runs.

Problem: Preserving Communities and Neighborhoods

There are several potential threats to the long-term attractiveness of the study area. Its older commercial corridors, such as along Watson and Gravois Roads, are sometimes less than economically or physically appealing because there are too many commercial properties that diminish the overall quality of the public realm. Even newer areas, such as those surrounding the Westfield Shoppingtown/South County Mall and along Lindbergh Boulevard, have urban design deficiencies due to minimal landscaping, extensive paving, sign proliferation, and poor pedestrian accommodations. In addition, almost all commercial areas and many residential neighborhoods are oriented exclusively to automobile access, and there are few neighborhood centers to which one can easily walk. In the Metro South area, the community and neighborhood preservation concerns are:

- Ensuring community stability/attractiveness as aging population moves out (neighborhood succession)
- Increasing housing choices and affordability
- Protecting historical landmarks, parks, floodplains and other environmentally-sensitive areas
- Enhancing opportunities for enhancements to bike and pedestrian environments

Opportunity – Manage Neighborhood Succession: As indicated in Section 2.0, the current demographic profile of the study area is notable for the high proportion of elderly residents and householders. However, there are many assets upon which Metro South can draw to promote itself as an attractive area in which to move; e.g., affordable housing, residential areas in good physical condition, and a low incidence of industrial employment uses. In the long run, the future of much of Metro South (especially the areas north of I-255/I-270) will hinge on whether its older neighborhoods can remain or become attractive to a new generation of residents to prevent a cycle of long-term decline.

Improving the commercial mix and the public realm of various locations throughout the study area will do much to attract younger couples, younger families, and single people whose incomes and tastes are geared to high quality, more urban lifestyles and attractive urban environments. Transit improvements create the opportunities to promote Metro South as such an area, partly by offering a more stress-free alternative to auto-dependency and partly through the quality of its station-area planning.

Opportunity - Increase Housing Choices and Affordability: Single-family detached housing dominates current Metro South land-use patterns with little provision for other housing types that may be better suited to the needs of potential new residents. This situation was identified in the *Affton Community Plan*.

TOD planning presents the opportunity to alleviate this condition by supporting new housing types at higher densities; e.g., single attached housing such as townhomes and even higher density single-family detached homes that the current development patterns and housing market have largely ignored. Whether integrated into mixed-use projects or as stand alone developments, a healthy dose of multi-family housing at densities of 12 dwelling units/acre and up is an ideal land-use close to station areas. Apartments are physically more compatible with general TOD goals and are easily integrated with other uses such as ground floor retail. Apartment development close to stations would increase the potential ”walk up” ridership pool as well.

Opportunity - Protect Historic Landmarks, Parks, Floodplains and Other Environmentally-Sensitive Areas: By utilizing existing transportation corridors, a potential LRT extension will minimize, if not avoid, potential impacts to existing historic landmarks, parks, floodplains and other environmentally sensitive areas. For example, a potential LRT alignment along the River Des Peres floodplain could be designed to avoid an increase in the base flood elevation.

Opportunity – Enhance Bicycle/Pedestrian Environments: Providing for more concentrated development near transit stations can contribute to meeting such overall goals as improving mobility, reducing auto-dependency, and creating bicycle and pedestrian access opportunities. The development of any LRT alternative could incorporate best practices to accommodate bicycle/pedestrian access along the corridor and in the vicinity of proposed LRT stations. Since the study area contains few sidewalks and limited separation between pedestrians and vehicles, development planning in the vicinity of proposed stations provides the opportunity to increase the number of sidewalks in the area as well as separate pedestrians from moving and/or parked vehicles and create a more pedestrian-friendly environment.

1.4.2 Goals and Objectives

The Problems and Opportunities have been translated into goals to be achieved by the implementation of a transit alternative in the Metro South study area. The objectives associated with each goal are intended to guide the development, evaluation, and ultimate selection of the transit alternative that will best serve the study area and assist in reducing the study area’s current transportation problems.

Goal: Improve Access to Opportunity for Metro South Study Area

This goal is directed at improving transportation service for all portions of the population in the Metro South study area. Since the regional decision from the Cross-County Corridor MTIA was not to extend high capacity freeways to provide a high capacity, high-speed connection between the study area and mid-County, the provision of improved rail transit service, which was included in the adopted recommendations of the MTIA, takes on greater importance. Achieving the following objectives will help meet this goal.

- Provide convenient, reliable, high frequency public transit to better link the study area with mid-St. Louis County and other centers throughout the region.

- Increase opportunities to access employment, education, medical, shopping and other services. The existing MetroLink line provides high-level service to a significant number of the region's major destinations. By 2006, the available destinations will also include the Clayton Central Business District and St. Louis County Government Center. Expanded transit may increase access opportunities in the Metro South area.
- Reduce transit travel times. A mix of transit modes – LRT operating in exclusive right of way, enhanced bus, and feeder bus networks – along with other TSM improvements could provide the best opportunity to achieve this objective.

Goal: Use Transit to Foster Sustainable Development

This goal encompasses a wide range of development and redevelopment objectives that are intended to ensure that Metro South will evolve into a more economically balanced and stable area. Attaining the following objectives will help fulfill this goal.

- Use transit accessibility at stations as a key marketing tool for promoting the economic development or redevelopment in the study area by attracting a broader range of employment categories, especially office and professional jobs. This approach includes transforming existing, largely commercial centers into more mixed-use activity centers.
- Wherever compatible with the existing communities and the engineering and operational needs of the system, locate stations where concerted land-use planning can employ a range of TOD principles to promote high-quality, mixed use "walkable" development or redevelopment focused around the transit stations.
- Create opportunities and mechanisms for public/private development partnerships, especially where such partnerships can overcome a lack of market interest in locations within Metro South that need a new vitality. Transit could serve as a possible mechanism to create opportunities for these partnerships.

Goal: Use Transit to Preserve Existing Communities and Neighborhoods

This goal addresses the need to stabilize generally healthy areas within Metro South, rather than promoting more widespread change. In many respects, protecting and increasing the livability and attractiveness of Metro South neighborhoods promotes this stabilization. Attaining the following objectives could be facilitated by transit improvements to help fulfill this goal.

- Provide residents with a reasonable alternative to auto use by improving bicycle and pedestrian access to transit and creating safety and urban design amenities that make cycling and walking more appealing.
- Ensure that major corridor transit services are convenient to residents across the study area by improving feeder bus routes to existing and proposed transit stations, and by expanding and improving parking facilities at transit stations and other park-ride facilities.
- Increase the desirability of older neighborhoods by such actions as the creation of local mixed use centers that provide a wider range of more easily accessed everyday services, encouragement and assistance in rehabilitation of older structures, and preservation of local landmarks, historic character and open space.
- Coordinate transit planning and station-area development activities with local community plan priorities, especially those focusing on securing greater housing choices, providing support for local businesses, and promoting stabilization and revitalization of aging areas.
- Maintain or enhance the quality of life through station-area policies and requirements that improve the overall quality of the public realm (urban design and environmental protection), promote health and well being (e.g., walkability), and support and complement residents’ and business operators’ investments and efforts to improve their surroundings.

2.0 ALTERNATIVES CONSIDERED

This chapter presents a description of the alternatives considered during the initial planning and environmental analysis for the Metro South study. Section 2.1 provides background on how the alternatives analysis process complies with the requirements of NEPA and FTA's project development process. The next section describes the process of review and screening of a wide range of initial alternatives that resulted in the identification of a manageable number of alternatives for detailed analysis. Section 2.3 provides a description of the seven alternatives that are analyzed in detail in this DEIS. Sections 2.4 and 2.5 provide additional information on the operating characteristics and costs, and the capital costs of each of the seven alternatives.

2.1 BACKGROUND

Federal environmental laws and regulations (NEPA) require that a DEIS document the analysis of alternatives for the proposed action. This is intended to "sharply define" the environmental issues and to provide a "clear basis for choice" among the alternatives.[1]

FTA likewise requires that all potential applicants for federal transit funding under the "New Starts" program conduct a comprehensive analysis of alternatives. This alternatives analysis (AA) is not independent, but is coordinated with both continuing metropolitan area transportation planning and FTA's evaluation of projects from across the country that are candidates for New Starts funding. The range of alternatives considered in this process is generally considered to be much broader than that required under NEPA. The AA considers many issues that are not traditionally associated with environmental impacts – such as mobility, land-use goals, and economics – and often considers alternative program-level approaches to the objectives.

This chapter is intended to document an alternatives analysis that satisfies both the NEPA requirements and FTA funding requirements. Much of the early screening analysis occurred before the drafting of this DEIS. Alternatives have been developed and evaluated in an ongoing process that has oc-

[1] CEQ regulations at 40 C.F.R. § 1502.14

curred within this region over a period of years. That screening process is summarized here. This chapter also describes in detail the seven alternatives that emerged from the screening process and are examined in this DEIS.

The comparative evaluation that is described in the CEQ regulations as part of this chapter has been included in Chapter 6 of this DEIS. This is consistent with the FTA guidelines.

2.2 Development and Screening of Project Alternatives

2.2.1 Types of Alternatives Considered

Choices: The types of alternatives that have been evaluated are (1) the No-Build alternative, (2) the Transportation Systems Management (TSM) alternative, and (3) a variety of Build alternatives. These provide a wide range of choices that vary significantly in their ability to provide transportation improvements to the South County area, their capital and operating costs, and their effects on resources.

The No-Build alternative: The No-Build alternative implies that no action will be taken as part of this study. It does include, however, all planned improvements that can be reasonably expected to take place in the South County area. It includes transportation projects and initiatives programmed in the region's long-range transportation plan, *Legacy 2025*. These improvements of course include the light rail transit station at Lansdowne Avenue (in Shrewsbury and the City of St. Louis) and feeder bus service to this station. The No-Build alternative is a viable alternative in itself and also provides a basis of comparison for the TSM and Build alternatives.

The Transportation Systems Management alternative: The TSM alternative proposes smaller-scale transportation improvements that work towards the Purpose and Need of the study without the requirement for a major capital expenditure. These improvements include upgrades to the existing transportation systems in the area. Upgrades to the existing bus system include routing changes, shortened headways, reserved lanes or special ramps, and expanded park-and-ride facilities. Upgrades to the existing roadway system might include intersection and signalization improvements, minor road widening, ramp upgrades, and a variety of traffic engineering measures. These improvements would be in addition to the currently programmed projects and initiatives included in the No-Build alternative, and are specifically aimed at improving transit mobility.

Build alternatives: This corridor was first studied during 1994 to 1997 as part of the Cross-County Major Transportation Investment Analysis (MTIA). As a result of this study, the East West Gateway Coordinating Council's

(EWGCC) Board of Directors adopted a locally preferred alternative on March 26, 1997, which included light rail transit (LRT) that would extend the existing MetroLink line from Forest Park station to Butler Hill Road, south of Interstate 270/255. The Cross-County Extension from Forest Park Station to Shrewsbury-Lansdowne I-44 Station, which is currently under construction, partially fulfills the goals of this locally preferred alternative. In view of the previous transportation investments that have been made the modes that are most appropriate for the area are limited to extending light rail transit (LRT) and/or buses. Existing land-uses dictate that the routes for extending LRT, or expanding bus service are mainly limited to existing transportation corridors.

2.2.2 Major Mode and Route Choices

Mode Choice: The extension of the MetroLink light rail system to the northern edge of the South County area was a major regional decision that shaped future transportation choices for the area. This extension through Clayton to I-44 in Shrewsbury (near the St. Louis city line) will serve a total of nine new stations, including two stations with substantial parking for transit users. The Clayton-to-Shrewsbury section will attract 18,000 additional riders per weekday, compared to the existing light rail system. It also provides important opportunities for transit-oriented development, including a station at Sunnen Drive in Maplewood that was planned in coordination with local commercial development plans. This extension now under construction has substantial benefits and utility that are independent of any future transportation improvements. Nevertheless, the intent of regional transportation planning has been that the light rail system would extend beyond its currently-planned terminal station in Shrewsbury-Lansdowne I-44 to serve the South County area. Light rail has been determined to be the appropriate mode for the area because (1) it provides an attractive alternative to the automobile, (2) it is not dependent on the existing congested roadway system, (3) it has the operational flexibility to meet the varying physical conditions in the area, and (4) it builds on previous regional investments in light rail transit.

Alternatives that would extend service into South County using a different transit mode have been considered during the alternatives analysis process. One examples of such an alternative is a “bus rapid transit” service that would operate from Shrewsbury to South County on a combination of existing streets and reserved rights of way. These alternatives would require a change of mode (from bus to light rail) at the Shrewsbury-Lansdowne I-44 station. The additional time and inconvenience of this transfer would significantly reduce the demand for transit services between South County and downtown St. Louis or other points served by MetroLink. Further, the Shrewsbury-Lansdowne I-44 station area is not a major commercial center, and is unlikely to attract a significant number of trips, as a destination itself, on a bus rapid transit system or other feeder transit mode. Therefore, major build alternatives that would require a change of mode were not carried forward into this DEIS.

Origin and Terminus of Transit Service: The point of origin of LRT service must necessarily be Shrewsbury-Lansdowne I-44 station in Shrewsbury/City of St. Louis, the terminus of the Cross-County route now under construction. All potential transit routes would extend from this point. The criteria for selection of a terminal point of the transit system include: (1) that it provides for sufficient penetration into the South County area to provide an enhancement to transportation services, (2) that it has sufficient connectivity to the regional roadway network to allow for automobile access, (3) that sufficient space at the site is available to allow for typical terminal station activities such as parking and transfers to feeder buses, and (4) that, if appropriate, sufficient development potential exists near the station to take advantage of the development catalyst potential of a terminal station.

Route Choices: The South County area is almost completely developed. An entirely new transportation route through the area is not possible without an unacceptable level of displacements. Therefore, any transportation routes through the area must use existing transportation infrastructure, including major arterial streets, the rights-of-way of limited access highways, and railroad rights-of-way.

2.2.3 Identification of Candidate Station Locations

Activity Centers: Existing activity centers within the South County area such as commercial centers, mixed-use centers, or employment centers were identified as potential station sites. These are logical origins or destinations for transit riders. Activity centers include the General American Office Park, St. Anthony's Medical Center, Westfield Shopping Town/South County Center, the Affton White-Rodgers Community Center, Grant's Farm, St. Louis Community College, and high schools.

Potential Development and Redevelopment Areas: Because one of the study purposes is to foster sustainable development, potential development and redevelopment areas were also considered as station sites.

2.2.4 Development of a Full Range of Transit System Alternatives

Initial Build Alternatives: A network of potential transit links was developed that satisfied the following basic criteria:

- Originate at Shrewsbury-Lansdowne I-44 station
- Generally extend south into South St. Louis County to a logical terminal point
- Generally follow an existing transportation right-of-way

- Connect activity centers and potential development and redevelopment centers

The resulting network of alignments through the South County area was presented to the public at an initial scoping meeting on July 23, 2003, to solicit public opinion and comments. At this meeting, the public were also provided with maps of the area and invited to propose their own alternatives, which resulted in more than 80 suggestions. The initial pool was then modified to incorporate the public comments and all of the public proposals that met the original four basic criteria. This resulted in a pool of more than 300 alignments for extending LRT service, which was felt to represent all reasonable possibilities for LRT transit services. The alternatives were then subjected to a substantial screening process.

2.2.5 Selection Criteria and Screening Process

First-Step Screening: The full range of alternatives was analyzed using two key factors:

1) **Route Directness:** The overall speed and efficiency of an alignment significantly affects its appeal to potential riders. Therefore, the overall length of each alignment was compared against the straight-line distance between the ultimate trip destination and its origin at the Shrewsbury-Lansdowne I-44 station. This analysis measured the percentage increase over the straight-line distance for each alignment. Higher figures indicated lower efficiency for the alignment.

2) **Activity Center Connections:** Each activity center was assigned a point value according to its relative importance, based on a sketch evaluation of the number of visitors or employees, the square footage of commercial space, and the redevelopment potential in the immediate area of the activity center.

As a result of the first step screening, the number of alternatives was reduced from more than 300 to approximately 90.

Second Step Screening: A second route directness test and four other general evaluation criteria were introduced into the evaluation process:

1) **Route Directness:** The percentage increase route directness measurement was complemented by adding a measurement of the number of turns for each alignment to measure the impact on running speeds and, consequently, travel times.

2) **Right-of-way Constraints:** Right-of-way constraints were evaluated using three measurements:

- Right-of-way width vs. existing pavement width provided a measure of latent additional capacity. For the BNSF railroad right-of-way, existing and planned tracks plus the existing power lines were used.

- Average setbacks of buildings from the existing roadway right-of-way provided a measure of potential right-of-way requirements relative to potential community disruption and relocation.

- Existing average daily traffic per lane provided a measure of potential increased traffic congestion due to loss of travel lanes to accommodate light rail transit. These constraints provided an indication of potential higher costs and higher community impacts.

3) **Grades:** This analysis evaluated the percentage of each alignment where the natural grades exceeded the maximum allowable grade of 6 percent that was mandated by light rail transit design guidelines. Alignments with a higher percentage of grades exceeding 6 percent presented greater engineering challenges and increased project costs.

4) **Service Coverage:** This test estimated the percentage of total study area households and the percentage of total study area jobs that each alternative would serve. These data were derived from the number of households and jobs within approximately ½ mile of the transit alignments. Traffic analysis zone information was used to determine the number of households and jobs. This measure indicated which alignments might have higher potential ridership based on local accessibility.

5) **Environmental Disruption:** This test provided an estimation of the extent to which wetlands, parklands, or floodplains might be adversely affected. Adverse impacts were determined on the basis of substantive disturbances and loss of resources. Each factor was assigned a value of high, medium, or low. No one resource was considered more important that the others.

This approach provided a means for ranking and comparing the alternatives. In some cases, certain elements of some transportation alternatives were combined to form a new alternative to better address the Purpose and Need. In other cases, segments of some alternatives were eliminated due to technical factors or public concern. The combination of community input and technical analysis resulted in the selection of four Build alternatives, which were given color names red, blue, green, and orange.

2.2.6 Resultant List of Preliminary Alternatives for Further Analysis

1) **The No-Build alternative,** including all currently programmed light rail transit and roadway improvements.

2) **The TSM alternative,** including new and expanded bus service and facilities, and roadway intersection and other miscellaneous improvements along transit routes.

3) **The Red LRT alternative** is the western most alignment of the four alternatives under consideration. It leaves Shrewsbury-Lansdowne I-44 Station on the west side of River Des Peres Boulevard, and then runs southwest in the median of Watson Road. It continues in-street operation south along Laclede Station Road, Rock Hill Road to Tesson Ferry Road, and follows Tesson Ferry Road south to generally the General American office campus. At I-270, the Red alternative shifts to the westerly side of Tesson Ferry Road, crossing over I-270, and continuing to its terminus at the General American campus near Butler Hill Road. This alternative includes LRT stations at the following proposed locations:

   - Kenrick Plaza on Watson Road
   - Rock Hill Road, north of Gravois Road
   - Tesson Ferry Road, north of Grant's Trail
   - Tesson Ferry Road and Lindbergh Boulevard
   - Tesson Ferry Road at St. Anthony's Medical Center
   - Tesson Ferry Road at General American Office Park

   This alternative has two sub-options that were also evaluated. With Option 1, the Red alternative would leave the Shrewsbury-Lansdowne I-44 Station via the west side of the BNSF railroad right-of-way (R/W) to connect to Watson Road. Under Option 2, the Red alternative would follow Laclede Station Road south to Gravois Road (bypassing Rock Hill Road), and then follow Grant's Trail from Gravois Road to Tesson Ferry Road. Option 2 would include a station on Gravois Road near Grant's Trail in lieu of the Rock Hill Road Station.

4) **The Blue LRT alternative** was one of two alternatives proposed in the center of the Metro South study area. It leaves the Shrewsbury-Lansdowne I-44 Station via the east side of the BNSF R/W and follows the railroad R/W south to Lindbergh Boulevard, where it proceeds easterly along Lindbergh Boulevard around South County Center and enters the I-55 corridor. The Blue alternative then continues south along the east side of I-55 to its terminus at Meramec Bottom Road. This alternative has two sub-options under consideration. The first option follows Union Road, south of Lindbergh Boulevard, on the west side of South

County Center and then proceeds either south along the east side of I-55 to its terminus at Meramec Bottom Road or south along the second optional route that follows Lemay Ferry Road south to the St. Louis Community College campus on Meramec Bottom Road. Proposed station locations for the Blue alternative include:

- Kenrick Plaza on Watson Road
- South of the BNSF/Gravois Road grade separation
- Green Park Road
- Lindbergh Boulevard, north of South County Center
- Butler Hill Road, east of I-55 and north of Butler Hill Road
- Meramec Bottom Road, east of I-55 and south of Meramec Bottom Road

Blue alternative Option 1 would include an LRT station on Union Road, west of South County Center, instead of the station on Lindbergh Boulevard. The Blue alternative passes through areas that are more industrial in nature than the other alternatives under consideration and provides links to different potential redevelopment possibilities on Watson and Gravois Roads. It also provides the same links as the Green and Orange alternatives (described below) to South County Center, a potential park-and-ride area east of the I-55/Butler Hill Road interchange, and the St. Louis Community College.

5) **The Green LRT alternative** represented the other central alternative. It departs Shrewsbury-Lansdowne I-44 Station along the west side of River Des Peres Boulevard and turns southwest for in-street operations on Watson Road. The alignment then proceeds south in the Mackenzie Road median to Reavis Barracks Road, where it continues east along Reavis Barracks Road, crosses to the east side of I-55, and proceeds south along I-55 to Meramec Bottom Road. The Green alternative stations are proposed at the following locations:

- Watson Road, northeast of the Watson Road/Mackenzie Road intersection
- Mackenzie Road, south of Heege Road
- Mackenzie Road, south of Weber Road
- I-55 (east side), south of Reavis Barracks Road
- Lindbergh Boulevard, north of the Westfield Shopping Town/South County Center
- Butler Hill Road, east of I-55 and north of Butler Hill Road
- Meramec Bottom Road, east of I-55 and south of Meramec Bottom Road

One sub-option for this route would be to continue on Reavis Barracks Road past I-55 to Union Road, and proceed south along Union Road to South County Center before following I-55 to Meramec Bottom Road. This option would include a station on Union Road on the west side of the South County Center. Another optional alignment for the Green alternative, south of I-255, would be along Lemay Ferry Road south to the St. Louis Community College with stations at Butler Hill Road and Meramec Bottom Road approximately 0.5 mile east of I-55.

6) **The Orange LRT alternative** is the easternmost alignment under consideration. It leaves Shrewsbury-Lansdowne I-44 Station and proceeds along the southwest side of River Des Peres Boulevard to Gravois Road. Just north of Gravois Road, the alignment shifts to the northeasterly side of River Des Peres to serve the Gravois/Hampton Transit Transfer Station and continues to the east side of I-55, where it turns south and continues to South County Center. At South County Center, the alignment veers east from the interstate R/W to access the mall area and then proceeds back to the interstate to continue south to Meramec Bottom Road. LRT stations are proposed at:

   - Gravois-Hampton Transit Transfer Station
   - Bayless Avenue, east of I-55
   - Lindbergh Boulevard at the Westfield Shopping Town/South County Center
   - Butler Hill Road, east of I-55 and north of Butler Hill Road
   - Meramec Bottom Road, east of I-55 and south of Meramec Bottom Road

   This alignment also has two possible sub-options. One leaves River Des Peres at Morganford Road and heads south in the median of Morganford Road before intersecting I-55 at Union Road. An LRT station would be located on Morganford Road, north of Weber Road. The other sub-option leaves the I-55 R/W just north of the BNSF overcrossing and heads south along Lemay Ferry Road to the St. Louis Community College campus. This option would have stations on Lemay Ferry Road, just north of Butler Hill Road and adjacent to the college on Meramec Bottom Road.

2.2.7 Further Screening and Refinement of Preliminary Alternatives

These preliminary alternatives were subject to analysis using criteria that were developed around the goals and objectives identified for the Metro South study. Each goal can be directly related to one of the goals established in the Purpose and Need, as follows:

Goal: Improve Access to Opportunity

Number of major attractions served
Route directness
Connectivity to future Southside MetroLink extension
Low income houses served
Zero-car households served
Distance of park-and-ride lots from major intersections
Number of park-and-ride spaces demanded
Projected ridership
Passenger miles

Goal: Sustainable Development

- Existing households served
- 2025 households (official projections) served
- 2025 households (TOD redevelopment) served
- Existing employment served
- 2025 jobs (official projections) served
- 2025 jobs (TOD redevelopment) served
- TOD development/redevelopment potential

Goal: Preserving Neighborhoods

- Residential property value benefit
- Business property value benefit
- Increase in housing choice
- Minimize number of business displacements
- Minimize number of jobs displaced
- Minimize number of residential displacements
- Minimize number of dwelling units within 75 feet of LRT center-line
- Minimize number of potential on-street parking spaces displaced
- Minimize number of right-in/right-out only intersections created at streets and driveways
- Minimize number of street closures
- Minimize number of new LRT signalized intersections
- Minimize vehicle delays at gated crossings
- Minimize parkland taken
- Minimize impact of new LRT maintenance facility

Performance and Cost

- Average speed
- Annual travel time savings
- Project cost
- Project cost per mile
- Capital cost per passenger mile
- Annual operating and maintenance cost (bus and rail)
- Cost per hour of time saved

Public information meetings were conducted on December 9, 2003, at the Shrewsbury City Center and on December 10, 2003, at the Sperreng Middle School to present the results of this analysis. Approximately 275 people attended each meeting; the majority of the attendees completed and submitted comment forms. The detailed results of the public meetings are included in the Public Meeting Comment Summary Report.

The meetings followed an open house format and included a brief presentation by study team members. The purposes of the meetings were to:

- Present the results of the preliminary analysis of the four preliminary LRT alignment alternatives,
- Obtain public feedback on the results, and
- Obtain public opinion on which criteria should be emphasized as alternatives are developed for more detailed analyses.

As discussed, comparisons were made among the four proposed preliminary Build alternatives for each of the four goals included in the Purpose and Need. No comparisons were made with the No-Build and TSM alternatives, because these alternatives would be carried forward in any case. The preliminary alternatives were given ratings of favorable, neutral, and unfavorable for each criterion and they were assessed on how each alternative performed relative to the others in each overall goal category.

1. Access to Opportunity

- The Orange and Green alternatives would likely serve the greatest number of low-income households, which are located mainly in the eastern portion of the study area. Public comments indicated that this criterion should be seriously considered in the detailed analysis of the most viable alternatives.
- Park-and-ride lots along either the Orange or Green alternative would be closer to major intersections or freeway interchanges than the other

two alternatives, thereby facilitating transfers between automobiles and LRT.

- The Blue, Green, and Orange alternatives would provide the greatest parking opportunities at LRT stations.
- The Blue, Green, and Orange alternatives would serve a greater number of activity centers than the Red alternative. The public indicated this factor should be weighed more heavily in the detailed alternatives analysis.
- The public also indicated that the projected ridership for each alternative should be a key discriminator at that point in the analysis. The Red alternative was projected to have the lowest potential ridership of the four alternatives.

In summary, the Orange and Green alternatives performed better than the other two alternatives in providing access to opportunity.

2. Foster Economic Development

- The Green alternative received the highest rating of all alternatives for serving existing households and the projected number of households in 2025, while the Red alternative received the lowest rating. The public felt that this was a necessary attribute for a new transit line and recommended this factor be considered during detailed analysis.
- The Blue and Red alternatives rated the highest relative to serving existing and future employment centers. Again, the public indicated this criterion is important in attracting potential riders.

On balance, the Blue and Green alternatives were rated most favorable in fostering economic development.

3. Preserve Neighborhoods

- While the Red alternative would result in the least number of business and residential displacements, thereby rating favorable for those criteria, the difference compared to the Blue and Orange alternatives was small. The public identified residential displacements as a factor that should be included in the detailed analysis of alternatives.
- The Blue and Orange alternatives would have less impact on access to and from local streets than the Red and Green alternatives. Local street access relates to on-street parking displacements and the number of right-in/right-out only and LRT signalized intersections created. This distinction is due to the absence or minimal use of in-street LRT operation in the Blue and Orange alternatives.

- A maintenance facility along either the Blue or Orange alternative would have less impact upon the community than such a facility on the Red or Green alternative.

In summary, the Blue and Orange alternatives were most favorable in achieving the goal of neighborhood preservation.

4. Performance and Cost

The information developed for this category was based on very conceptual designs. Hence the data could not be judged in absolute terms, but provided a means to rank alternatives relative to each other, as follows:

- Of the four preliminary alternatives being considered, the Red alternative would have the lowest overall cost because it would be the shortest. However, it would have the greatest project cost per mile and capital cost per passenger mile. As a result, the Red alternative is the least desirable when considering performance and cost.
- The Blue, Green, and Orange alternatives would result in the most favorable travel time savings on a yearly basis, but LRT operating speeds would be better on the Blue or Orange alternatives. Thus, the Blue and Orange alternatives are more desirable.
- The Orange alternative would require the least amount of new right-of-way since it is located primarily within existing freeway right-of-way. Although the Blue alternative is located predominantly within BNSF right-of-way, some additional property would be required along its entire length.

The public stressed that the cost and time savings criteria needed to be key discriminators during the detailed alternatives analysis. Overall, the Orange alternative rated the best with respect to performance and cost.

In considering each preliminary alternative relative to the criteria in the four evaluation categories, the Blue and Orange alternatives rated more favorably than the Red and Green alternatives due to engineering, environmental, operational, and cost considerations. Furthermore, the public input received during the evaluation process indicated that residents in the study area recognized many of the same benefits and challenges. As a result, the Red and Green alternatives were eliminated from further consideration, primarily due to their greater potential impact upon neighborhoods.

In addition to the Orange and Blue alternatives, a Purple alternative between Shrewsbury-Lansdowne I-44 station and Watson Road was also identified. This alternative would bring LRT service one stop beyond Shrewsbury-Lansdowne I-44 station and would include an enhanced bus service to serve the central and southern parts of the study area. Due to its similarity to the beginning segment of the discontinued Red alternative, the color designation was changed for this short alternative to avoid public confusion. Since the Purple alternative is a distinct alternative, with independent utility, the study team felt changing the color would help the public realize that it was not a first phase of a full Red alternative. The Purple alternative was included in the detailed alternatives analysis for the following reasons:

- Negotiations with the BNSF regarding the use of their right-of-way for the Blue alternative are at a very early stage and potential conflicts with their operations and safety requirements could ultimately exclude this alignment from consideration. The Purple alternative does not use any railroad right-of-way.

- The Orange alternative would require the use of publicly owned parkland along the River Des Peres. Potential conflicts associated with the proposed use of this land, relative to Section 4(f) of the Department of Transportation Act of 1966 (49 USC 303(f)) and future park planning by the City of St. Louis Parks Department, may impact its viability as an acceptable alternative. The Purple alternative uses less parkland.

- The Shrewsbury-Lansdowne I-44 station was never intended as a permanent terminus for MetroLink. A terminal LRT station at Watson Road, coupled with enhanced rapid bus service from the Metro South study area and road system enhancements such as signal prioritization and queue-jumper lanes, could present an attractive Build solution. The Watson station would provide better auto access for South County residents commuting to the mid-county area and would allow better bus transfer interface than the Shrewsbury-Lansdowne I-44 station because arterial streets would be used instead of neighborhood streets. The Purple alternative, with a terminal station at Watson Road, would be consistent with the study goal of preserving neighborhoods by moving terminal-related activity away from Shrewsbury-Lansdowne I-44 station. A station at Watson Road would provide redevelopment potential at a greater scale than available in the Shrewsbury-Lansdowne I-44 station area, and be consistent with the study goal of fostering economic development.

The meeting participants expressed both opposition to and support for the proposed MetroLink extension. The opponents indicated they did not feel that there is a need for LRT service in the area. The supporters stated that they would like the MetroLink extension because it would reduce traffic congestion and provide an alternative travel mode for area residents and commuters. The majority of comments came from residents concerned about their property and neighborhoods being negatively impacted by the proposed extension. Of particular concern were the Red and Green alternatives that involved in-street operation. Some specific comments expressed opposition to the Red and Green alternatives because they:

- Could be destructive and disruptive to the character of the area and jeopardize neighborhood stability,
- Could take residential property and decrease the value of the area and surrounding properties,
- Could create traffic problems for residents and automobile users, and
- May not serve the low-income and elderly populations likely to use LRT.

Other comments included:

- Use parkways and freeway right-of-way for the LRT route and avoid neighborhood streets.
- Focus on existing commercial corridors as destinations and starting points rather than residential areas.
- Construct smaller rail facilities to integrate them with the neighborhoods.
- Provide access from biking/walking trails to LRT stations.
- Consider routes that serve multi-family dwellings and retirement communities.
- Do not mix LRT with bus service because people do not like to transfer.
- Serve St. Anthony's and General American with enhanced bus service rather than LRT.

Few objections were expressed regarding the Blue and Orange alternatives. If a MetroLink extension were to be constructed, respondents indicated that either the Blue alternative or Orange alternative would be superior because these alternatives would be less disruptive to residential areas and could potentially serve low-income and no-vehicle homes.

2.2.8 Appropriate Terminal Locations

Additional analysis of the Blue and Orange alternatives was conducted to determine the most feasible southern terminus. During this analysis, the following potential termini were considered:

Orange alternative:

- Meramec Bottom Road
- Butler Hill Road
- South County Center
- Reavis Barracks Road

Blue alternative:

- Meramec Bottom Road
- Butler Hill Road
- Gravois
- Kenrick Plaza

The factors used in the analysis of terminal locations included right-of-way requirements, potential displacements, ease of construction, park-and-ride potential, and projected ridership and cost. This analysis produced the following conclusions:

Meramec Bottom Road: It was determined that the LRT cost for the two-mile segment extending the system from Butler Hill Road further south to Meramec Bottom Road was far greater than the anticipated benefit for the following reasons:

- Right-of-way would need to be acquired along the east side of I-55, resulting in the displacement of multifamily and single family residential units.

- Construction of this LRT segment would require expensive excavation through rocky terrain and relatively steep grades would have to be used.

- There would not be an appreciable increase in ridership by extending the proposed LRT line to Meramec Bottom Road.

Butler Hill Road: It was determined that relocating the Butler Hill Road station to a development area on the south side of Butler Hill Road would greatly enhance this location as a terminus station, providing the following benefits:

- There would be access to the station from I-55 through an existing signalized intersection.

- There would be fewer takings of existing multi-family buildings to create station and parking facilities.

- Vacant land is available for transit-oriented development.

South County Center: It was determined that access to this location from I-55/I-270/I-55 is complicated by the existing land-uses and conditions. It does not provide a good site for a park-and-ride facility. Furthermore, this location offers significant potential for redevelopment around the station, but parking requirements would compete for the land available for redevelopment in a prime real estate location. As a result, this location was removed from consideration.

Reavis Barracks Road: It was determined that this location, on the Orange alternative, offered good access to I-55. While it lacked the development potential available at Butler Hill Road and did not connect to South County Center, it was deemed appropriate for a large park-and-ride terminus station to attract I-55 commuters, while eliminating the significant engineering and construction costs associated with providing access to and from South County Center. This park-and-ride station was considered as a minimal operable segment for the Orange alternative during the detailed analysis.

Gravois Road: It was determined that, while the Gravois location had development potential, it lacked adequate access to the major highway network to attract sufficient ridership as a terminus station. The location at Gravois was initially considered as a potential terminus in the event that a full build to Butler Hill did not prove viable. However, the modeling analysis that was performed as part of the review of the preliminary alternatives clearly demonstrated that ridership was heavily influenced by access to the major highway network. Alternatives, such as the Red alternative, that did not have good access to I-55, I-255 and/or I-270 resulted in significantly reduced ridership forecasts.

Watson Road: In the event that a Blue alternative to Butler Hill Road did not prove viable, a short Blue alternative extension to Kenrick Plaza at Watson Road might. Such an extension, coupled with enhanced rapid bus service, would provide better auto access for South County residents commuting to the mid-county area than the Shrewsbury-Lansdowne I-44. Kenrick Plaza at Watson Road offers good access to Tesson Ferry Road and Mackenzie Road, two of the major north-south roadways, and to Watson Road, which is a major east-west arterial. A Watson Road station would allow better bus and auto transfer interface than the Shrewsbury-Lansdowne I-44 station because arterial streets would be utilized instead of neighborhood streets. In addition, a station at Kenrick Plaza would provide a greater redevelopment potential than in the Shrewsbury-Lansdowne I-44 station area, which is consistent with the study goal of fostering economic development. As a result, this shortened Blue alternative was included as potential alternative for consideration.

2.2.9 Final List of Alternatives

The following alternatives were recommended for advancement to a more detailed design and to a more detailed analysis of their potential impacts:

- The No-Build alternative
- The TSM alternative
- Purple alternative to Watson Road
- Blue alternative to Butler Hill Road
- Blue alternative to Watson Road
- Orange alternative to Butler Hill Road
- Orange alternative to Reavis Barracks Road

2.3 DESCRIPTION OF THE EIS ALTERNATIVES

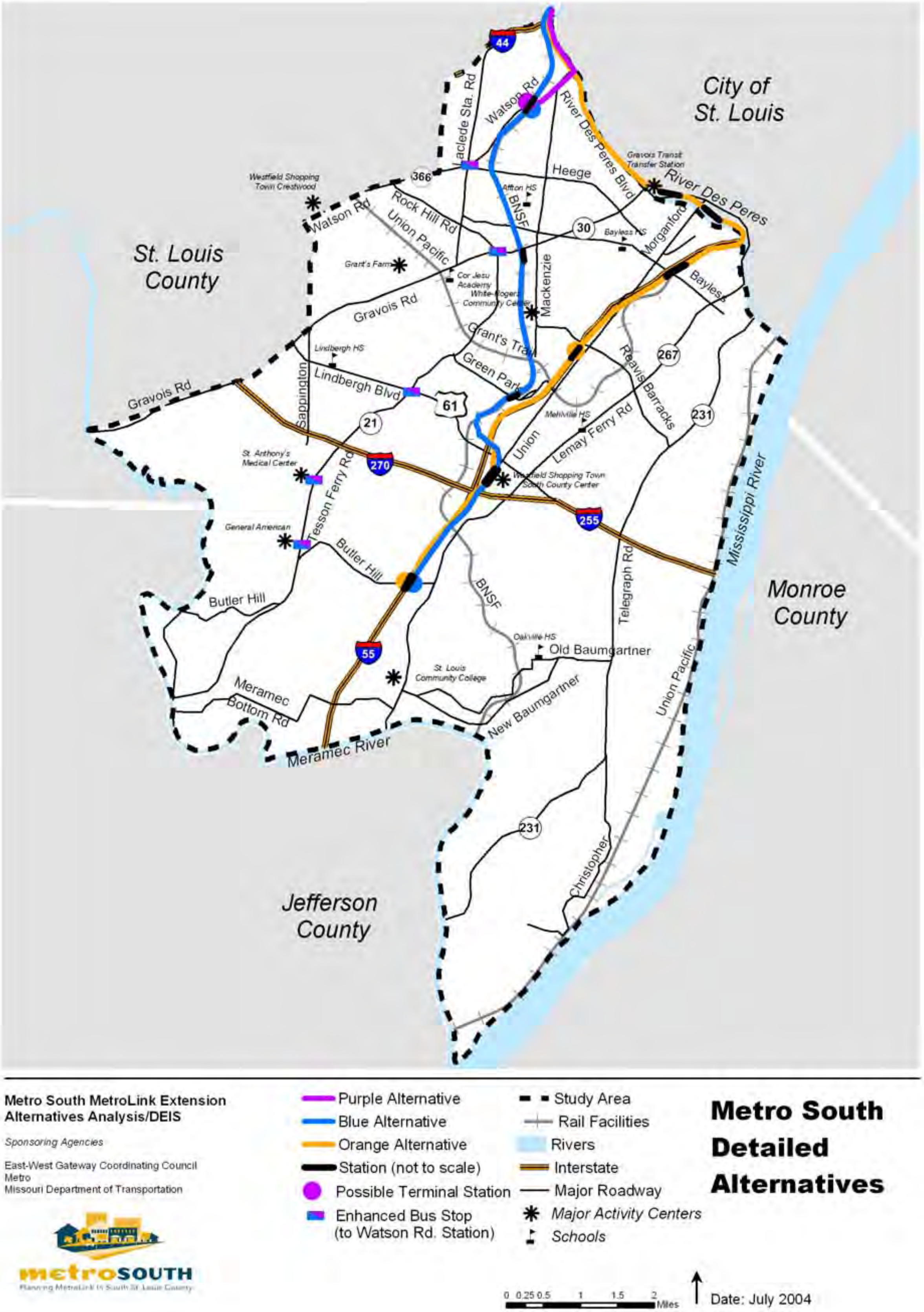
This section describes the seven alternatives that are examined in detail in this DEIS: the No-Build alternative, the TSM alternative, and the five Build alternatives that emerged from the preliminary alternatives analysis and screening process.

For the Build alternatives, this section includes descriptions of the alignment and station locations. Figure 2-1 shows the location of the Build alternatives. Appendix A includes more detailed plans and profiles of alternative alignments. Additional information on the operating characteristics of the alternatives and on their capital costs is included in later sections of this chapter.

2.3.1 No-Build Alternative

The No-Build alternative represents the situation that would exist if the Metro South study were to result in a decision not to build any of the contemplated improvements. The result would be a transportation system that is similar to what exists today, plus those improvements that have been planned or programmed independently of the Metro South study. These planned and programmed improvements are described in the region's adopted long-range transportation plan, *Legacy 2025*.

Figure 2-1: Build Alternatives



The No-Build alternative is required under regulations of the Council of Environmental Quality, implementing NEPA. The No-Build provides the basis of comparison for the other alternatives.

The improvements that are included in the No-Build, or base case, are as follows:

Transit Improvements

The only significant transit improvements identified in *Legacy 2025* that would affect the study area are the Cross-County MetroLink extension to Shrewsbury, currently under construction, and the associated planned changes to the feeder bus plan. Therefore, the No-Build alternative would be based on the existing Metro transit system, with the following changes:

- MetroLink Cross-County Extension to Shrewsbury. Trains would operate at 10-minute peak and 15-minute off-peak headways.
- Feeder Bus Service to Shrewsbury-Lansdowne I-44 station and other MetroLink stations, including the following routes serving the Metro South study area.
  - #11 Chippewa: Watson Road to Shrewsbury-Lansdowne I-44 station via River Des Peres Boulevard.
  - #46 Laclede Station (St. Anthony's leg of current #47): Tesson Ferry Road, Gravois Road, Laclede Station Road, and Hanley Road to Maplewood and Brentwood/Eager stations.
  - Buses would operate at 30-minute peak and 45-minute off-peak headways.

Figure 2-2 illustrates these changes.

Roadway Improvements

The No-Build alternative would also include the highway improvements that are identified in *Legacy 2025*, including the widening of State Route 21 (Tesson Ferry Road, south of I-270) and Route 231 (Telegraph Road, south of I-255). Table 2-1 describes these roadway improvements. These improvements are also shown on Figure 2-3.

Figure 2-2: No-Build Alternative Bus System

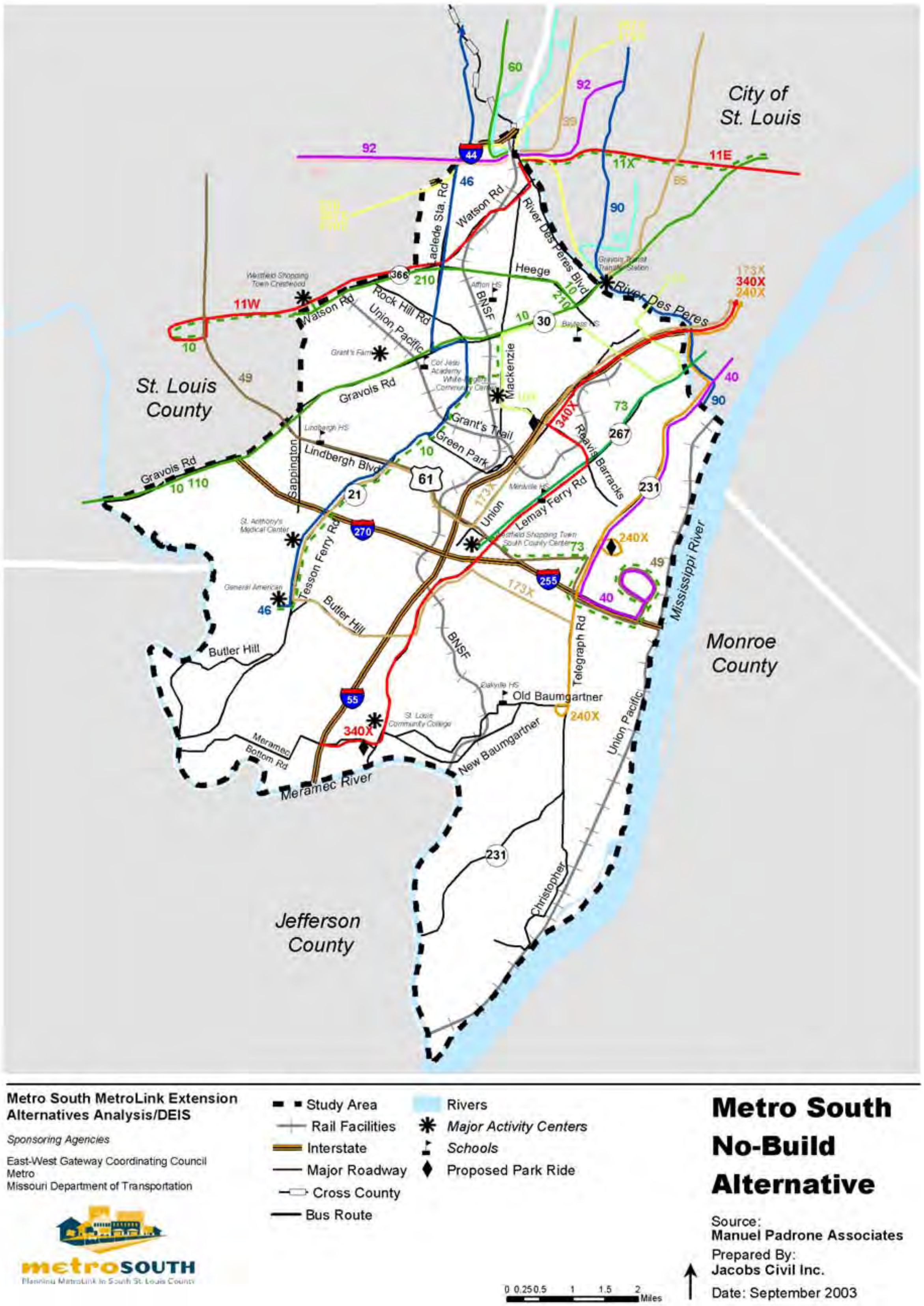


Table 2-1: No-Build Roadway Improvements in Metro South Study Area

Roadway	Location*	Improvement	Fig 2-3 Reference
Operation Improvements			
Telegraph Rd. (Rte. 231)	North of I-255	These include access management, driveway consolidation, turn lanes, or traffic signal improvements.	1
Lemay Ferry Rd. (Rte. 267)	North of I-255		2
Tesson Ferry Rd. (Rte. 21)	North of I-270 to Lindbergh Blvd.		3
Capacity Projects			
Telegraph Rd. (Rte. 231)	Christopher Rd. to I-255	Add lanes and median	4
Tesson Ferry Rd. (Rte. 21)	Meramec River to I-270	Add lanes and median	5
Keller Rd.	Pocasset Dr. to Keller Rd.	Roadway extension	6
Baumgartner Rd.	Telegraph Rd. to Blackforest Dr.	Add lanes (or widen) and median	7
Reavis Barracks Rd.	Union Rd. to I-55	Add lane	8
Forder Rd.	Ringer to Telegraph Rd.	Widen from 2 to 3 lanes	9
I-44 Interchange	Shrewsbury Rd. Interchange	Realignment and connection of River Des Peres Blvd to Big Bend Blvd with a new interchange at I-44.	10
Traffic Signal /Intersection Improvements			
Gravois Rd. (Route 30)	Laclede Station Rd.	Signal improvements	11
Gravois Rd. (Route 30)	Baptist Church Rd.	Signal improvements	12
Gravois Rd. (Route 30)	Eddie and Park Rd.	Signal improvements	13
Lindbergh Blvd. (Rte. 61)	Lemay Ferry Rd. (Route 267)	Add turn lanes and improve intersection capacity	14
Mattis Rd.	Ambs Rd.	Reconstruct intersection/add signal	15
Mattis Rd.	Tesson Ferry Rd. (Route 21)	Signal improvements with improvements to Worthington Rd.	16

**Location has been indicated by general vicinity or by study limits where available.*

Figure 2-3: No-Build Alternative Roadway System

2.3.2 TSM Alternative

The TSM alternative consists of mobility improvements that attempt to serve the study Purpose and Need, without constructing a fixed transit guideway. It is therefore aimed at serving similar markets by incorporating cost-effective improvements with an emphasis on transportation system upgrades, such as: intersection and signalization improvements, minor road widening, ramp upgrades, traffic engineering actions, bus route restructuring, shortened bus headways, reserved bus lanes, expanded park/ride facilities, and express and limited-stop service. Unlike the improvements contained in the No-Build alternative, no funding has been identified for the TSM alternative. This alternative is usually selected as the baseline scenario for New Starts applications to the FTA.

Transit Improvements

The TSM alternative has been developed to meet the Purpose and Need of the study, and to serve similar markets as the Build alternatives. For the study area, most of the recommended transit improvements would involve expanded bus service, including local and express routes to more closely parallel the service proposed in the Build alternatives. New or expanded bus service would link the South County area with MetroLink (see proposed routes 17, 46, and 50 below). These changes would improve access to Clayton and other locations along the existing MetroLink line and the extension under construction.

The following facilities and service improvements are proposed:

- New South County Transit Center at Westfield Shopping Town/South County Center (South County Center), including a park-and-ride lot and amenities such as real time schedule information.

- Restructure local routes to connect with South County Transit Center (SCTC):

  - #40 Broadway: reroute via Sappington Road to terminus at SCTC (vs. VA Hospital)

  - #49 Lindbergh South: serve SCTC and continue to VA Hospital

  - #73 Carondelet: improve peak headway to 15 minutes; redirect route south of SCTC to the Community College via Lemay Ferry Road.

- New and expanded bus service.

  - #46 Laclede Station (formerly south leg of #47): Extend to include outer loop of Tesson Ferry Road, Hageman Road, Meramec Bottom

Road, and Wells Road. Off-peak headways will be improved to 30 minutes.

- New local route #17: Outer terminal loop of Telegraph Road, Becker Road, and Christopher Road, then via Telegraph Road and Forder Road to the new SCTC. From SCTC to Shrewsbury-Lansdowne I-44 station via Union Road, Reavis Road, Mackenzie Road, and River Des Peres Boulevard. Buses will operate at 30-minute headways for both peak and off-peak periods.

- New express route #50: SCTC to Shrewsbury-Lansdowne I-44 station via Union, Morganford, and Germania Roads to the Gravois-Hampton Transit Transfer Center; then via Jamieson and Lansdowne Avenues to Lansdowne station. Buses will operate at 15-minute peak and 30-minute off-peak headways.

- New bi-directional loop; route #51: From Shrewsbury-Lansdowne I-44 station via River Des Peres Boulevard, Carondelet Boulevard, Telegraph Road, Barracks View Road, and Lindbergh Boulevard to SCTC, and then via Lemay Ferry Road, Carondelet Boulevard, and River Des Peres Boulevard back to Shrewsbury-Lansdowne I-44 station. Buses will operate at 30-minute peak and 60-minute off-peak headways.

Figure 2-4 illustrates additional bus routes that could be implemented in the TSM transit alternative and provides comparable coverage to that provided by the Build alternatives defined below.

Roadway Improvements

Table 2-2 outlines the proposed roadway improvements that are under consideration to be part of the TSM alternative. These roadway improvements were designed to improve the efficiency of the transportation corridors that served transit and are identified on Figure 2-5.

Figure 2-4: TSM Alternative Transit Improvements

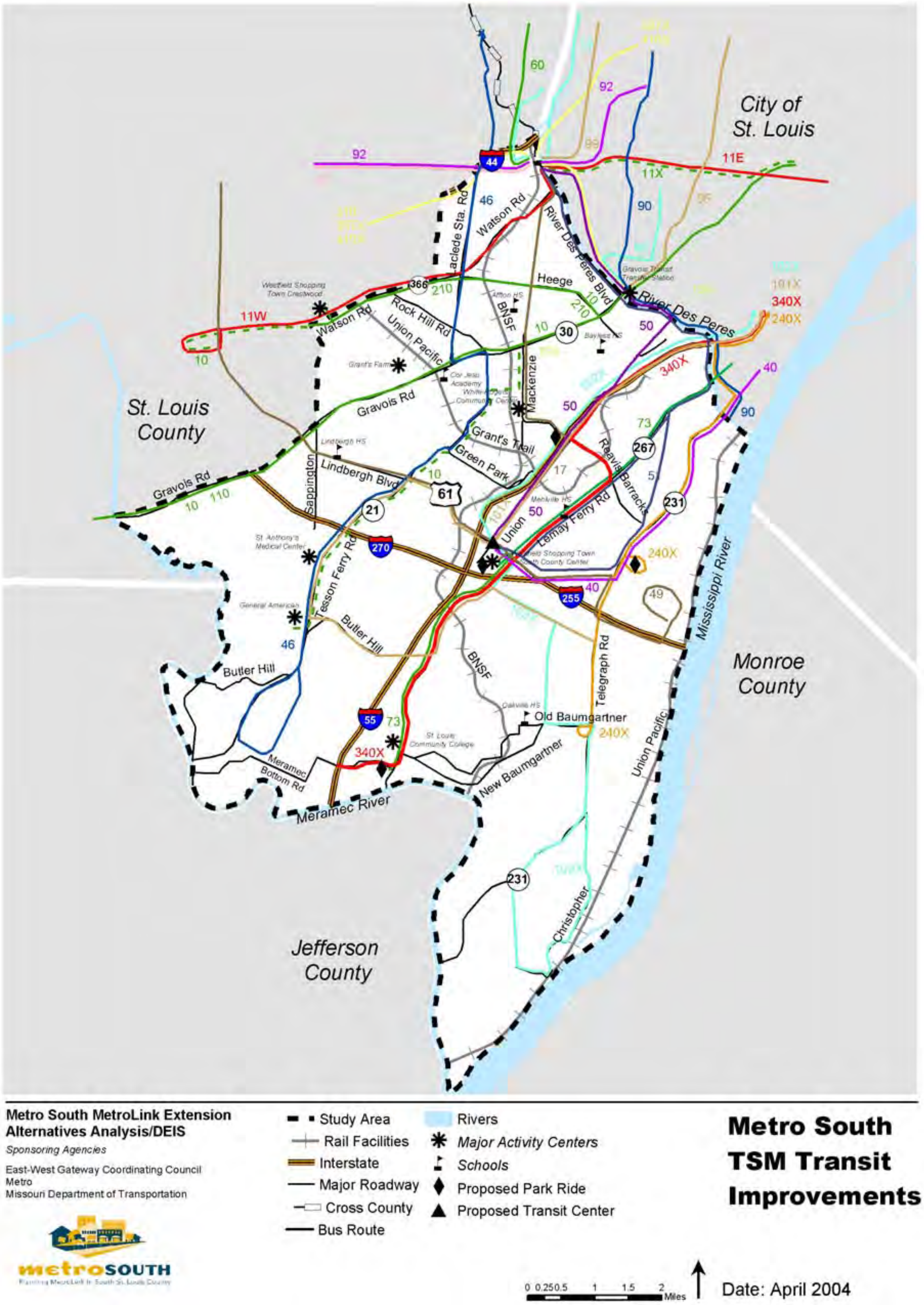


Table 2-2: TSM Roadway Improvements Metro South Study Area

Roadway	Location	Improvement	Fig 2-5 Reference
Gravois (Route 30)	Grant Road	Add eastbound turn lane	1
Laclede Station	Rock Hill Road	Intersection/Signal upgrades	2
I-55 (NB off-ramp)	Reavis Barracks	Reconstruct ramp to current standards	3
Gravois (Route 30)	Tesson Ferry (Route 21)	Add EB and WB right turn lanes, WB dual left, and rebuild signals	4
Watson (Route 366)	Laclede Station Road	Intersection reconstruction	5
Watson (Route 366)	Heege Road	Intersection reconstruction	5
Parts of Lemay Ferry Road, Watson Road and Tesson Ferry Road		Access Management Plans	N/A
Gravois Hampton MetroBus Center Improvement	Westbound Hampton Avenue	Add bus pullout	6
	NW Corner Hampton Avenue /Gravois Road	Curb cut	6
	Southbound Gravois	Move stop bar	6
	Gravois/Hampton/Germania	Adjust signal timing	6
	Northbound Gravois/ Hampton Avenue	Add bus-only left turn bay	6
Gravois Road	Laclede Station Road	Bus Stops	7
River Des Peres Boulevard	Loughborough Avenue	Signalize Intersection	8
River Des Peres Boulevard	Gravois Road	Intersection Improvements	9
River Des Peres Boulevard	Watson Road	Intersection Improvements	10
Watson Road	Trianon Parkway	Pedestrian Improvements	11
Watson Road	Entrance Cardinal Carberry Senior Living Center	Pedestrian Improvements	12
Tesson Ferry Road	South of Gravois Road	Pedestrian Improvements	13
Gravois Road	South of Lindbergh Boulevard	Pedestrian Improvements	14

Figure 2-5: TSM Alternative Roadway Improvements

2.3.3 Blue Alternative to Butler Hill Road

The Blue alternative runs through the middle of the Metro South study area, generally following the BNSF tracks and I-55. This alternative starts at the MetroLink terminus at Shrewsbury-Lansdowne I-44 in Shrewsbury/City of St. Louis and ends at a station at Butler Hill Road and I-55 in south St. Louis County. The alternative is 8.5 miles long and has five stations. The proposed station locations for the Blue alternative are:

- Near Kenrick Plaza south of Watson Road ("Watson")
- South of the BNSF/Gravois Road grade separation ("Gravois")
- Green Park Road ("Green Park")
- Lindbergh Boulevard, northwest, of the South County Center shopping center ("Lindbergh")
- Butler Hill Road, east of I-55 and south of Butler Hill Road ("Butler Hill")

The Blue alternative passes through areas of light industrial and warehousing and distribution uses, behind single-family subdivisions, and along the east side of the interstate highway. Where the alignment is fronted by commercial uses, they often act as buffers between the existing railroad tracks (and the potential LRT service) and nearby residential areas. The Gravois, Green Park, and Lindbergh stations provide some direct access to existing employment uses.

For approximately two-thirds of its length, the northern portion of the Blue alternative makes use of the existing BNSF right-of-way. South of the Green Park station, the alignment crosses to the east side of the I-55 corridor, over to Lindbergh Boulevard near the Westfield Shoppingtown South County Center, and then continues south along I-55 to its terminus at Butler Hill Road.

Where the Blue alternative follows the BNSF alignment, safety regulations of the Federal Railroad Administration do not allow the light rail vehicles to share tracks with the freight trains. Separate tracks would have to be constructed.

In addition, the BNSF, which owns the right-of-way, has stipulated certain safety requirements that must be incorporated into any design. To provide a buffer zone, in the event that a freight train derails, the centerline of the nearest light rail track must be approximately 36 feet from the centerline of the existing freight track, and 10 to 15 feet above the existing freight tracks. To accommodate these requirements, it would necessary to acquire a strip of property, approximately 12 feet to 15 feet wide, where the Blue alternative abuts the BNSF right-of-way. In addition, the light rail tracks cannot share any railroad facilities, such as grade crossing protection devices and gates. To avoid conflicts, the Blue alternative is grade separated from any vehicular crossings. This approach is continued when the Blue alternative leaves the BNSF rail corridor, with the light rail tracks passing over or under any road that it crosses, including ramps for interstate highway interchanges.

A detailed description of the alignment follows. (Also see the conceptual Plan and Profile drawings in Appendix A.)

Existing Shrewsbury-Lansdowne I-44 Station to Watson

The Blue alternative leaves the elevated Shrewsbury-Lansdowne I-44 station in Shrewsbury/City of St. Louis along the east side of the BNSF right-of-way and crosses Lansdowne Road on an aerial structure. Once across Lansdowne, the alignment rises to cross to the west side of the BNSF just north of Weil Avenue. The Blue alignment continues along the west side of the freight rail, past the Villas at Kenrick development and over Watson Road on an elevated structure to a station that is located opposite Kenrick Plaza, between the BNSF tracks and Watson Road.

With the LRT tracks located on the west side of the BNSF tracks, the Watson station has the benefit of direct access to and from Watson Road, and avoids impacts to Mackenzie Point and the need to take property from Resurrection Cemetery. However, in transferring to the west side of the BNSF tracks, the alignment now impacts the Villas at Kenrick development, north of Trianon Parkway. While none of the town homes would be taken, part of the circulation access road to the east of the residences would have to be narrowed to make way for the tracks.

The Watson station is opposite Kenrick Plaza and is located at ground level within a sizable tract of commercial properties, which would have to be cleared to make way for the station. These commercial properties have restricted, roundabout access, and are underutilized compared to nearby commercial areas. The transit facilities at this station include the ability for MetroLink passengers to transfer to/from bus Route #11, a drop-off and parking for 150-200 cars. An extension of Trianon Parkway could provide direct access from the residential areas and a revitalized mixed-use center on the underutilized Kenrick Plaza site to the north of Watson Road. The station would thus be highly accessible to currently underused or stressed commercial sites for which implementation of light rail service could provide a catalyst for mixed-use redevelopment in the area.

Watson Station to Gravois Station

From the Watson station, the Blue alternative continues south on the west side of the BNSF toward Gravois, passing behind the properties on the east side of Birkenhead and over Heege and Valcour on an aerial structure. By remaining on the west side of the railway, two properties on the east side of Birkenhead will be taken. In addition, seventeen properties on the east side of Birkenhead and one property on the north side of Heege are impacted to varying degrees by a retaining wall that will be needed to construct the embankment that supports the light rail tracks. In general, this wall would be approximately 12 feet higher than the existing embankment. However, at the southern end of Birkenhead, the wall is higher still, due to the need for the light rail tracks to cross both Heege and Valcour on an aerial structure. This results in the light rail rising to approximately 20 feet above the freight tracks, which cross Valcour at grade. There is a corresponding increase in the height of the wall that is required to support the tracks.

The Blue alternative continues south on the west side of the BNSF, crossing the intersection of New Hampshire Avenue and Weber Road and Gravois on aerial structures. This alignment does require the taking of two properties on New Hampshire and two properties on Bonnie Court. In addition, three properties on Security Court; one property on Weber Road; seven properties on New Hampshire, south of Weber Road; and one property on Bonnie Court, all of which back up to the existing railroad will experience impacts to a varying degree.

The decision to stay on the west side of the BNSF was made for the following reasons:

- The western alignment locates the Gravois station on the west side of the BNSF, which is the optimum position for access and locating park-and-ride facilities.
- The western alignment minimizes impacts to the multi-family development that backs up to the tracks south of Langley Avenue.
- The western alignment provides access to a parcel of land at the junction of Valcour and Heege that has been identified as a potential, future Maintenance and Storage Facility, if and when the expanded fleet size justifies it.
- The western alignment avoids crossing the BNSF, which requires a minimum clearance of 23 feet. Practical limitations for the vehicles limit the approach and departure grades to a maximum of 6 percent,[2]

[2] Percentage, when referring to a highway or railroad grade, refers to the amount of vertical rise (or drop) over a certain horizontal distance. For example, a track on a 6 percent grade

and crossing the railroad would require an exceptionally long and tall structure to gain the height needed to clear the BNSF tracks. Such a structure would have significant visual impacts to residential properties in the area.

- Crossing back to the eastern side of the tracks, south of the station at Watson, would require property from Resurrection Cemetery.

The Gravois station is located south of Gravois Road, which provides good access to the main north-south arterials of Tesson Ferry Road and Mackenzie Road (via Reavis Road). This is an area where space is available for the station and parking facilities, without significant residential displacement. The transit facilities at this station include the ability for MetroLink passengers to transfer to/from bus Route #s 10, 10X, 110, 17 and 46, together with a drop-off and parking for 150-200 cars.

The proposed station location – some 1,000 feet to the south of Gravois – and the close proximity to the BNSF tracks somewhat diminish the role of the station as a focus for transit-oriented development (TOD). Nevertheless, the proposed site offers several access options from the west and the south for park-and-ride and kiss-and-ride[3] transfers. Implementing LRT service will still create greater interest in the economic development and mixed-use potential of the area. This potential includes spurring redevelopment of the aging multifamily sites to the west of the right-of-way south of Gravois Road that will be impacted by a station access road from Tesson Ferry Road.

The station at Gravois is located in an area that St. Louis County has targeted for stabilization and redevelopment. This location provides space that is available for the station and parking facilities, without significant residential displacement and good access to the main north-south arterials of Tesson Ferry Road and Mackenzie Road (via Reavis Road). However, the depression of Gravois below the BNSF Railway creates difficult access for what would otherwise be street front properties along Gravois, and this will constrain the area's transit-oriented development (TOD) potential.[4]

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would rise 6 feet in vertical elevation for each 100 feet of horizontal distance.

[3] "Park-and-ride" refers to rail passengers who park their cars at the station, and "kiss and ride" refers to passengers who are dropped off at the station by family or friends.

[4] In an attempt to address this issue, and to mitigate some of the undesirable impacts on the residential properties north of Gravois, consideration was given to lowering the BNSF Railway and the light rail line so that they operated in a trench. This would locate the trains so that they would be out of sight of the residential properties and would allow Gravois Road to be raised, thereby fulfilling local planners desire to return Gravois to a pedestrian friendly "main street" environment that would spur street front development. This would also provide an opportunity for a light rail station below Gravois Road, which would provide greater impetus to transit-oriented development.

A preliminary review determined that it would be technically possible to depress the BNSF

Gravois Station to Green Park Station

From Gravois station, the Blue alternative continues south on the west side of the BNSF toward Green Park, crossing over Reavis Road on an aerial structure. This alignment would impact approximately 16 houses that back onto the existing railroad from Tesson Creek Estates Drive, Concord Valley Road and Concord Hills Court. While it will not be necessary to take property from any of the individual residential parcels, it will be necessary to acquire a narrow strip of the common land behind these properties to accommodate the LRT alignment. In addition, the visual perspective would change from that of a railroad embankment to a landscaped retaining wall, which is necessary to retain the earth needed to support the light rail tracks.

The Blue alternative remains parallel to the BNSF, crossing over Grant's Trail and Green Park Industrial Drive on aerial structures. South of Grant's Trail, the western alignment makes use of the natural terrain by being on the high side of the freight railroad tracks.

Remaining on the west side of the BNSF makes greater use of vacant property on the west side of the BNSF and impacts fewer residences and businesses, which are more numerous on the eastern side of the railroad.

The Green Park station is located on the side of the hill, above Green Park Road. This location provides good access to the large residential communities to the south and west. The transit facilities at this station include a bump out for MetroLink for MetroLink passengers transferring to/from bus Route # 51 and a drop-off, all of which could be incorporated into pending improvements to Green Park Road. No parking facilities are envisioned for this location.

This is a highly visible location on a main local road. Its proximity to the intersection of Green Park Road and Lin Valle gives it access to the existing employment uses in this area. With its visibility from I-55, much of the area south and east of the station has potential to redevelop as office focused mixed-use employment. However access from the interstate is poor. Citing fears of increased traffic, the town of Green Park wishes to maintain this location as a stable area. Consequently, no redevelopment sites have been identified and no increment over the official projections for households or jobs was attributed to this station. Nevertheless, the Green Park station location provides the town with flexibility to alter this policy should they wish.

Railway and light rail line, thereby eliminating the existing BNSF grade crossings at New Hampshire Avenue and Weber Road. However, it was felt that the cost of pursuing this solution could not be justified as part of the project cost, but could be viable if alternative funding could be found.

Green Park Station to South County Center

South of the Green Park station, the Blue alternative crosses over Green Park Road, then continues south in a narrow strip of common ground behind the Cedarberry subdivision, while descending to pass under the railroad, and through a largely industrial area, to pass under I-55 to the east side of the I-55 corridor. Once on the east side of the I-55 corridor, the Blue alternative makes use of vacant land to the north of the Holiday Inn and passes between the Holiday Inn and an underutilized strip mall, crossing the parking lot in front of the strip mall to a station that has been located under Lindbergh Boulevard. This alignment will marginally impact the Holiday Inn parking lot, but will have more significant impacts on the parking lot in front of the strip mall.

The decision to pass under the railroad was made to minimize what could be a significant visual impact to the adjacent Cedarberry neighborhood if a tall structure was used to pass over the railroad.

The Lindbergh station location, just west of Union Road, will serve the recently expanded Westfield Shoppingtown South County mall and other nearby uses. Locating the station under Lindbergh Boulevard also provides a vital direct link between redevelopment sites and current uses to both the north and south of Lindbergh without the need for pedestrians to cross this highly congested roadway. The transit facilities at this station include bus transfer facility for passengers transferring to/from bus Route #s 17, 40, 49, 50, 73L, and 173X and a drop-off. No parking facilities are envisioned for this location.

Such direct access to the station can provide a catalyst to a more mixed-use development of retail, commercial, and office space, primarily by the addition of significant office space in the areas between I-55 and Union Road. The area to the south of the station, bounded by the proposed tracks, Union Road and Lindbergh Boulevard, has good access to Union Road and Lindbergh Boulevard. This area has been earmarked for the location of the bus transfer facility and a kiss-n-ride. To provide space for these facilities, it would be necessary to displace a number of retail businesses and relocate the access roads.

South County Center to Butler Hill

The Blue alternative continues south, rising to a grade crossing at Union Road and then onto an aerial structure to cross I-255. Once over I-255, the alignment descends to parallel the east side of the I-55 corridor, passing under the BNSF and Mattis Road. The Blue alternative continues parallel to I-55 along the east side of the right-of-way until just north of Butler Hill Road. It then swings to the southeast to cross Butler Hill Road at right angles on an aerial structure to reach the proposed station location to the east of the existing hotel complex.

Minor impacts will be experienced by the multi-family residences that are accessed by Brandy Road and which back up to I-55. However, two of the apartment buildings on the western end of Clayridge Drive adjacent to I-55 will have to be removed to make way for the alignment. The western end of Clayridge Drive will have to be realigned.

The location of the structure to cross I-255 is confined to a narrow strip between two ramps on the south side of the highway, which provide a “valley,” through which the alignment must pass, to limit the height of the structure. South of this crossing, the alignment makes maximum use of the existing I-55 right-of-way to minimize the impacts to adjacent business and residential property.

The terminal station at Butler Hill Road would be above a significant park-and-ride garage of up to 2,000 spaces, located under the station to take advantage of the existing topography. In addition to the parking garage, the transit facilities at this station include a facility for MetroLink passengers to transfer to/from bus Route #s 46 and 73L, and a drop-off.

Street-level retail along Butler Hill Road and the existing Holiday Inn can be integrated with this station complex to take advantage of the expected walk-up and park-and-ride transit ridership, as well as serve the future mixed-use developments. Currently vacant adjacent areas can be re-planned and reconfigured as a significant station related mixed-use complex. Proximity to the station gives the area around the intersection of Butler Hill Road and Lemay Ferry Road the potential to redevelop in more of a pedestrian friendly “town center” form.

2.3.4 Blue Alternative to Watson Road

This alternative employs the first leg of the Blue alternative to Butler Hill to continue the extension to a more logical terminus, away from the residential access road at Lansdowne, to a station at Watson Road, opposite Kenrick Plaza. As such, it is the shortest of the detailed Build alternatives. Required use of publicly owned parkland on the Purple and Orange alternatives necessitated an alternate option. To offset the fact that this shortened alignment does not penetrate the South County area as far as the other alternatives, the Blue alternative to Watson Road is complemented by an enhanced, express bus service that will connect the General American and St. Anthony’s Hospital campuses, along Tesson Ferry Road, to the Watson station. The enhanced service would include limited stops and signal priority to speed up bus travel times, and the service would be operated with special buses.

This alternative includes one station near Kenrick Plaza, south of Watson Road ("Watson"). A detailed description of the alignment follows:

Existing Shrewsbury-Lansdowne I-44 Station to Watson

The Blue alternative to Watson leaves the elevated Shrewsbury-Lansdowne I-44 station along the east side of the BNSF right-of-way and crosses Lansdowne Road on an aerial structure. Once across Lansdowne, the alignment rises to cross to the west side of the BNSF just north of Weil Avenue. The alignment continues along the west side of the freight railroad, past the Villas at Kenrick development and over Watson Road on an elevated structure to a station that is located opposite Kenrick Plaza, between the BNSF tracks and Watson Road.

With the LRT tracks located on the west side of the BNSF tracks, the Watson station has the benefit of direct access to and from Watson Road, and avoids impacts to Mackenzie Point and the need to take property from Resurrection Cemetery. However, in transferring to the west side of the BNSF tracks, the alignment now impacts the Villas at Kenrick development, north of Trianon Parkway. While none of the town homes would be taken, part of the circulation access road to the east of the residences would have to be narrowed to make way for the tracks.

The Watson station is opposite Kenrick Plaza and is located at ground level within a sizable tract of commercial properties, which would have to be cleared to make way for the station. These commercial properties have restricted, roundabout access, and these properties are underutilized compared to nearby commercial areas. The transit facilities at this station include the facility for MetroLink passengers to transfer to/from Route #s11 and 46, a drop-off and parking for 150-200 cars. As a terminus, the station area would feature significantly more parking than would be provided at this location on the Blue alternative to Butler Hill.

An extension of Trianon Parkway could provide direct access from the residential areas and a revitalized mixed-use center on the struggling Kenrick Plaza site to the north of Watson Road. The station would thus be highly accessible to currently underused or stressed commercial sites for which implementation of light rail service could provide a catalyst for mixed-use redevelopment in the area.

2.3.5 Orange Alternative to Reavis Barracks, or Butler Hill Road

The Orange alternative is the easternmost alignment under consideration. For most of its length, it makes use of existing transportation corridors, such as River Des Peres Boulevard, Germania Street, and the I-55 right-of-way. The full build alternative extends from Shrewsbury-Lansdowne I-44 station to a terminal station at Butler Hill Road. This alignment is 11 miles long, with six proposed stations. These stations are:

- Gravois-Hampton MetroBus Center (“Gravois-Hampton”)
- Morganford Road, at the junction with Germania Street (“Morganford”)
- Bayless Avenue, east of I-55 (“Bayless”)
- Reavis Barracks, east of I-55 (“Reavis Barracks”)
- Lindbergh Boulevard at the Westfield Shopping Town/South County Center (“Lindbergh”)
- Butler Hill Road, east of I-55 and south of Butler Hill Road (“Butler Hill”)

The Orange alternative to Butler Hill Road provides access to activity centers as diverse as the Gravois-Hampton MetroBus Center, the South County Center area, and a possible park-and-ride lot/development area at I-55 and Butler Hill Road. Butler Hill has some sizable undeveloped area (a rarity within the study area) that could be part of a significant mixed-use development program and South County could see underused commercial sites convert to intensive office development.

In recognition of the cost of constructing the Orange alignment to a terminus at Butler Hill, a second Orange alternative, to Reavis Barracks, was also developed as a possible cost-effective alternative that would still intercept commuter traffic on I-55. This shortened alignment is 6.9 miles long with four proposed stations. The stations are:

- Gravois-Hampton MetroBus Center (“Gravois-Hampton”)
- Morganford Road, at the junction with Germania Street (“Morganford”)
- Bayless Avenue, east of I-55 (“Bayless”)
- Reavis Barracks, east of I-55 (“Reavis Barracks”)

While this alternative retains many of the characteristics of the Orange alternative to Butler Hill, such as access to the Gravois-Hampton MetroBus Center and a possible link to a future Southside MetroLink alternative, it does not provide direct access to the South County Center area, or the possible park-and-ride lot/development area at I-55 and Butler Hill Road.

A detailed description of the alignment follows:

Shrewsbury-Lansdowne I-44 Station to Gravois-Hampton Station

The Orange alternative leaves the elevated Shrewsbury-Lansdowne I-44 station along the east side of the BNSF right-of-way and crosses Lansdowne Road on an aerial structure, after which it returns to grade between River Des Peres Boulevard and the River Des Peres. From here the alignment follows the west side of River Des Peres toward Gravois Avenue, crossing Chippewa on an aerial structure. At a point just north of Gravois Avenue, the Orange alternative crosses over to the east side of the River Des Peres, rising as it crosses the river in order that it can cross Gravois on an aerial structure, to an aerial station at the southwest corner of Gravois and Germania. This alignment would slightly impact Walgreens' parking lot. The planned Gravois-Hampton station facilities would require the displacement of the existing Steak-n-Shake restaurant and eight residential properties

The decision to cross to the east side of the river provides an opportunity to relocate the existing Gravois-Hampton MetroBus Center from its current location to the new MetroLink station. Integrating the bus transfer station into the Gravois-Hampton station would enhance transfer between modes and, therefore, mobility.

The Gravois-Hampton station facilities would include the aforementioned Gravois-Hampton MetroBus Center for passengers transferring to/from bus Route #s 10, 11X, 50, 51, 80, 90, 95, and 210, and a drop-off. The station would serve an essentially stable residential area that currently shows increasing interest in rehabilitation and is near a locally serving cluster of businesses that could be expanded. Gravois Road offers fairly direct pedestrian access to the predominantly residential areas across the River des Peres.

Gravois Station to Morganford Station

From the elevated station at Gravois, the Orange alternative continues south between Germania and the River Des Peres toward Morganford. The alignment returns to grade as it merges with Germania and occupies the existing two southbound lanes to avoid interference with the numerous pumping stations along the river. In this location, Germania would be reduced to one lane in each direction, plus one center lane. The Orange alternative crosses Morganford at-grade at the signalized intersection with Germania to a station in the southwest corner of the junction.

The alignment, on the on the east side of the River Des Peres, avoids what would be a significant impact to parkland and ball fields on the west side of the river, between Gravois and Morganford.[5]

[5] During meetings with City of St. Louis Aldermen, Alderman Fred Heitert asked the study

The station at Morganford is planned to operate as a local, neighborhood station.[6] Station facilities would include the ability for MetroLink passengers to transfer to/from bus Route #s 10X, 50, 51, and 90. This station is located in an area of residential land-use with predominantly single family detached and a limited amount of medium density apartment housing. It is not planned to incorporate any significant parking or redevelopment opportunities. The nearby bridge offers adequate pedestrian access to residential areas to the south of River des Peres.

Morganford Station to Bayless Station

From the Morganford station, the Orange alternative continues in the southbound lanes of Germania toward I-55. In this location, Germania will be reduced to one lane in each direction only. Just to the north of I-55, the Orange alternative elevates to cross over the River Des Peres, Carondelet Boulevard, I-55, and the entrance ramp from Carondelet to I-55 on an aerial structure and turns southwest to parallel the northbound lanes of I-55. The Orange alternative remains elevated to cross the I-55 entrance ramp from Weber and Weber Road itself, after which it returns to grade to provide access to a potential yard and maintenance facility on the existing “Stupp Brothers” site. Thereafter, the Orange alternative returns to an aerial structure to an elevated station just to the north of Bayless Avenue.

The decision to stay on the on the east side of the River Des Peres avoids what would be a significant impact to residences if the alignment were to cross to the west side to follow Carondelet. Existing traffic on Carondelet requires four lanes of traffic, while existing street patterns in this area of Germania can be serviced by two lanes and do not require a turn lane.

Crossing to the east side of I-55 eliminates the use of very tight curves that would be necessary to stay on the west side in the I-55 corridor, which would

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team to reconsider the alignment along Germania and, instead, consider an alignment that continued along River Des Peres Boulevard and Carondelet to the I-55 right-of-way. The study team accommodated this request and found that an alignment along the west side of the River Des Peres, following River Des Peres Boulevard and Carondelet would create significant impacts to parkland and ball fields on the west side of the river, between Gravois and Morganford, and would have significant impacts to residences between Morganford and the I-55 right-of-way. In addition, the curve between Carondelet and the I-55 right-of-way would be much tighter and closer to residences, slowing the trains and increasing noise in the area. As a result of this assessment, the study team believes that the “Germania” alignment has better utility and produces fewer impacts.

[6] Alderman Heitert asked the study team to consider a station at the junction of Germania and Morganford to provide City residents with greater opportunity to access the system. While a station at Morganford had not been considered in earlier parts of the study, the study team agreed to include a station at this location in future analyses

significantly slow the trains in this area. The eastern alignment also brings the Orange alternative closer to the more transit-dependent population in Lemay, provides a potential link to a Southside MetroLink extension from the City of St. Louis and provides better access to stations to the south (especially the South County Center).

The station at Bayless is confined between the Union Pacific right-of-way, Bayless Avenue, and I-55, and would serve an essentially stable, largely residential neighborhood. It is envisioned that access to the station will be made via an aerial walkway over the Union Pacific Railroad. Station facilities would include the ability for MetroLink passengers to transfer to/from bus Route # 10X.

The station will be located near the proposed Grant's Trail extension, which is proposed to parallel I-55 from the existing trailhead at Reavis Barracks. North of the Bayless station the trail follows an existing greenway east of the alignment.

The location of this station limits opportunities to provide parking and redevelopment; however, the low-key strip commercial development along Bayless, between I-55 and Morganford Road, could see some long-term redevelopment.

Bayless Station to Reavis Barracks Station

The Orange alternative crosses Bayless on an aerial structure and continues at grade along the east side of the I-55 corridor toward Reavis Barracks. The alignment crosses Union Road, the I-55 entrance ramp from Union Road, Reavis Barracks, and the I-55 entrance and exit ramps at Reavis Barracks on aerial structures, to a station that is built on retained earth, south of Reavis Barracks.

The station at Reavis Barracks is located between I-55 and Union Road and would be the terminus for the shortened Orange alternative. This location provides good access to I-55 and planned improvements to lengthen the ramp, and possible direct access to the station, will greatly improve accessibility. The station is also opposite an existing MoDOT commuter parking lot that is located on the west side of I-55 and the station plans include an aerial walkway to connect the station to this facility. The station is planned to include bus transfer for passengers transferring from Route Numbers 17, 50, and 51; major parking facilities; and an aerial walkway to connect the station to the existing MoDOT commuter lot, located west of I-55.

The Reavis Barracks station is not likely to spur any major redevelopment, given the type and age of nearby developments. This station is seen as primarily geared to the needs of a park-and-ride transfer ridership. However, as a terminus station, parking demand will increase to approximately 1,400 cars and the MoDOT commuter parking lot, which is located on the west side of I-55, will require significant development to accommodate this demand.

Reavis Barracks Station to Lindbergh Station

The Orange alternative to Butler Hill continues south along the east side of the I-55 corridor toward Lindbergh Boulevard. Just north of Lindbergh, the Orange alternative deviates from the I-55 corridor. The alignment veers to the east and makes use of vacant land to the north of the Holiday Inn, passes between the Holiday Inn and an underutilized strip mall, and crosses the parking lot in front of the strip mall to a station that has been located under Lindbergh Boulevard. This alignment will marginally impact the Holiday Inn parking lot, but will have more significant impacts on the parking lot in front of the strip mall.

The Lindbergh station location is the same as that proposed for the Lindbergh station in the Blue alternative to Butler Hill (see Section 2.3.3). The station is just west of Union Road. It will serve the recently expanded Westfield Shoppingtown South County mall and other nearby uses. Locating the station under Lindbergh Boulevard also provides a vital direct link between redevelopment sites and current uses to both the north and the south of Lindbergh without the need for pedestrian to cross this highly congested roadway. The transit facilities at this station include bus transfer facility for MetroLink passengers transferring to/from bus Route Numbers 17, 40, 49, 50, 73L, and 173X and a drop-off. No parking facilities are envisioned for this location.

Such direct access to the station can provide a catalyst to a more mixed-use development of retail, commercial and office space, primarily by the addition of significant office space in the areas between I-55 and Union Road. The area to the south of the station – bounded by the proposed tracks, Union Road, and Lindbergh Boulevard – has good access to Union Road and Lindbergh Boulevard. It has been earmarked for the location of the bus transfer facility and a kiss-n-ride. To provide space for these facilities, it would be necessary to displace a number of retail businesses and relocate the access roads.

South County Center to Butler Hill

The Orange alternative continues south, rising to a grade crossing at Union Road and then onto an aerial structure to cross I-255. The location of this structure is confined to a narrow strip between two ramps on the south side of the highway, which provide a "valley' through which the alignment must pass to limit the height of the structure. Once over I-255, the alignment descends to parallel the east side of the I-55 corridor, passing under the BNSF and Mattis Road. This alignment makes maximum use of the existing I-55 right-of-way to minimize the impacts to adjacent business and residential property. The

Orange alternative continues parallel to I-55 along the east side of the right-of-way until just north of Butler Hill. Here, it swings to the southeast to cross Butler Hill Road at right angles on an aerial structure and land to the east of the current hotel complex. Minor impacts will be experienced by the multi-family residences that are accessed by Brandy Road, and which back up to I-55. However two of the apartment buildings on the western end of Clayridge Drive, adjacent to I-55 will have to be removed to make way for the alignment. The western end of Clayridge Drive will have to be realigned.

The station at Butler Hill Road is the same as that described for the Blue alternative to Butler Hill. It would be above a significant park-and-ride garage of up to 2,000 spaces, located under the station to take advantage of the existing topography. In addition to the parking garage, the transit facilities at this station include the ability for MetroLink passengers to transfer to/from Route #s 46 and 73L, and a drop-off.

Street-level retail along Butler Hill Road and the existing Holiday Inn can be integrated with this station complex to take advantage of the expected walk up and park-and-ride transit ridership, as well as serve the future mixed-use developments. Currently vacant adjacent areas can be re-planned and reconfigured as a significant station related mixed-use complex. Proximity to the station, gives the area around the intersection of Butler Hill Road and Lemay Ferry Road the potential to redevelop in more of a pedestrian friendly “town center” form.

2.3.6 Purple Alternative

The Purple alternative is the second shortest of the detailed alternatives. Like the Blue alternative to Watson, the Purple alternative aims to continue the MetroLink extension to a more logical terminus, away from the residential access road at Lansdowne. This terminus is a station at Watson Road, opposite Kenrick Plaza. To offset the fact that this shortened alignment does not penetrate the South County area as far as the other alternatives, the Purple Alignment is complemented by an enhanced, express bus service that will connect the General American and St. Anthony’s Hospital campuses, along Tesson Ferry Road, to the Watson station. The enhanced service would include limited stops and signal priority to speed up bus travel times, and the service would be operated with special buses.

This alternative includes one station near Kenrick Plaza, south of Watson Road (“Watson”). A detailed description of the alignment follows:

Existing Shrewsbury-Lansdowne I-44 Station to Watson

The Purple alternative leaves the elevated Shrewsbury-Lansdowne I-44 station via the east side of the BNSF right-of-way and crosses Lansdowne Road on an aerial structure before coming down to grade on the west side of River Des Peres Boulevard. Shortly thereafter, the Purple alternative rises to cross over the River Des Peres Boulevard access of Weil Avenue and then curves to the west, passing over Chippewa and Creighton, to parallel Watson Road on the south side. Shortly after Creighton, the Purple alignment descends below grade to pass under Mackenzie Road. The alignment continues on the south side of Watson, under the BNSF bridge and then turns parallel to the BNSF to a station opposite the existing Kenrick Plaza. This locates the Watson Road station opposite Kenrick Plaza, between the BNSF and Watson Road, thereby providing direct access to the station from Watson Road.

The Watson station is opposite Kenrick Plaza and is located at ground level within a sizable tract of commercial properties, which would have to be cleared to make way for the station. These commercial properties have restricted, roundabout access, and these properties are underutilized compared to nearby commercial areas. The transit facilities at this station include a facility for MetroLink passengers to transfer to/from bus Route #s11 and 46, a drop-off and parking for 150-200 cars. As a terminus to the Purple alternative, the station area would feature significantly more parking than would be provided at this location on the Blue alternative to Butler Hill.

An extension of Trianon Parkway could provide direct access from the residential areas and a revitalized mixed-use center on the struggling Kenrick Plaza site to the north of Watson Road. The station would thus be highly accessible to currently underused or stressed commercial sites for which implementation of light rail service could provide a catalyst for mixed-use redevelopment in the area.

2.4 Operating Characteristics and Costs

This section discusses characteristics of the alternatives such as train frequency, run times, distances, and vehicle requirements. It also presents information on feeder bus services and on the projected costs of operations and maintenance. Each of the measurements is explained, and the characteristics of the alternatives are summarized in a table at the end of this subsection. This section provides information that may be useful in understanding the environmental effects of the various alternatives. More detailed operating information, as well as an explanation of how operating costs were calculated, is presented in a support document published separately: *Technical Memorandum: Task VI Operating Plans for Detailed Alternatives*, August 2004 (see Appendix C).

For each of the alternatives that includes an extension of MetroLink service, the operating characteristics are largely shaped by the operating decisions and the technical limitations related to the existing system extension to the Shrewsbury-Lansdowne I-44 station that is now under construction.

2.4.1 Light Rail (MetroLink) Operations

All of the Build alternatives being examined in this DEIS include an extension of the Cross-County MetroLink line, now under construction to Shrewsbury-Lansdowne I-44 station in Shrewsbury/City of St. Louis. The Cross-County line will operate between Shrewsbury-Lansdowne I-44 station in Shrewsbury/City of St. Louis to Emerson Park station in East St. Louis. It will share part of the route and many of the station stops with the other MetroLink line, which operates from Lambert Airport to Scott/Shiloh. The stations from Forest Park to Emerson Park will be served by both lines. The need to provide a coordinated and efficient service for the entire system will determine many of the operating parameters for service on the Metro South extension. These service parameters include:

Hours of operation

MetroLink operates between 3:30 a.m. and 1:00 a.m. on weekdays (21.5 hours per day), and 4:30 a.m. to 1:00 a.m. on weekends and holidays (20.5 hours per day). "Peak periods," when service frequency is greater, are from 6:00 a.m. to 9:30 a.m. and 3:45 p.m. to 6:00 p.m. on weekdays. All Metro South extension alternatives will follow the same hours of operation. The first northbound trains will leave the terminal at about 3:30 a.m. and the last southbound train will arrive at about 1:00 a.m.

Headway

"Headway" is a measure of the average time between trains or other transit vehicles. It is measured from the arrival of one train to the arrival of the next train. It is mathematically related to frequency. If trains are scheduled to arrive at 6:00 a.m., 6:10 a.m., 6:20 a.m., and so on, then the headway is 10 minutes and the frequency is six trains per hour.

MetroLink headways are set to be uniform across the entire system. The operating plan that will be in effect when the Cross-County line opens calls for peak-period 10-minute headways on each of the two lines. Where the two lines overlap, as they do between Forest Park and Emerson Park, the combined headway is five minutes.

During off-peak hours (before 6:00 a.m., between 9:30 a.m. and 3:45 p.m., and after 6:00 p.m.) on weekdays, and all day on weekends and holidays, the headway on each line will be 15 minutes.

Train Consist

The term "consist" is used to denote the number of individual cars that make up a train. All MetroLink trains consist of two cars on weekdays and a single car on weekends and holidays.

Route Length

The length of each extension is measured from the end of the station at Shrewsbury-Lansdowne I-44 in Shrewsbury/City of St. Louis to the end of the new terminal station, following the proposed alignment for each alternative. There may be additional track (not counted in the route length figure) built to store trains at the end of the line or to allow trains to switch back and forth from one track to another. The extensions vary from 1.1 miles to 11.0 miles in length, as shown in Table 2-3.

Running Times

Train running times are calculated using a mathematical model. The model takes into account the acceleration characteristics of the train, passenger loads, the effects of curves and grades, the maximum speed of the train, any speed limits imposed by policy, and the time spent at each station. The maximum speed a MetroLink train can usually achieve is 55 miles per hour; with station stops and other factors included, the average in-service speed in the Metro South area is approximately 35 miles per hour.

The run times reported here for the Build alternatives are one-way running times. These times are measured from when the train leaves the terminal station on the proposed Metro South extension to when it arrives at Shrewsbury-Lansdowne I-44 station or at Emerson Park station. For Table 2-3, below, the running times are the average of the two directions, rounded to the nearest minute. The No-Build and TSM alternatives do not include a MetroLink extension, so the running times to Emerson Park shown below represent the times from Shrewsbury-Lansdowne I-44 station.

Revenue Vehicle Miles

This is a measure of the total amount of service provided. A revenue vehicle mile represents one light rail vehicle traveling one mile in passenger-carrying (revenue) service. Two-car trains register two vehicle miles for each mile of train service. Both the annual revenue vehicles miles for the entire MetroLink system (systemwide) and the incremental annual revenue vehicle miles for each of the proposed extensions beyond the Shrewsbury-Lansdowne I-44 station are reported in Table 2-3.

Table 2-3: Rail Operating Characteristics

	NO-BUILD	TSM	PURPLE	BLUE-BUTLER	BLUE-WATSON	ORANGE-BUTLER	ORANGE-REAVIS
Hours of operation	weekdays: 3:30 am to 1:00 am weekends/holidays: 4:30 am to 1:00 am						
Headways Cross-County / Metro South line	weekdays, peak hours: 10 minutes weekdays, off-peak: 15 minutes weekends: 15 minutes						
Train consist	weekdays: 2 cars per train weekends: 1 car per train						
Route length	base	base	1.5 mi	8.8 mi	1.1 mi	11.0 mi	6.9 mi
Run Time to Shrews-Lansd-I-44 to Emerson Park	 0 44 min	 0 44 min	 3 min 47 min	 14 min 58 min	 3 min 47 min	 21 min 63 min	 14 min 57 min
Annual Revenue vehicle miles -systemwide -Metro South only	6.51 mil -	6.51 mil -	6.69 mil 176,000	7.54 mil 1,034,000	6.68 mil 170,000	7.80 mil 1,292,000	7.32 mil 811,000
Vehicles required	64	64	64	71	64	74	69

-No-Build and TSM reflect MetroLink service to Shrewsbury-Lansdowne I-44
-Items may not add to totals shown because of rounding

Vehicles Required

This measure is the total number of light rail cars that would be required to operate the whole MetroLink system during peak operating hours. The number of vehicles required to operate service during peak hours for each line can be calculated by dividing the cycle time by the headway and multiplying by the train consist (two cars). To this number must be added 15 percent, to allow for the fact that some cars will be out of service on any day for inspection or repair.

For the system, including the Metro South extension alternatives, the number of cars needed was calculated based on the cycle time for the extension contemplated. As shown in Table 2-3, the shortest extensions (Purple and Blue to Watson) do not increase the cycle time enough to require additional cars over the 64 required by the base system. The longest extension, Orange to Butler Hill, would require 74 cars.

Metro currently owns or has on order 87 LRT vehicles, more than enough to operate the entire system including any of the Metro South extensions.

Fares

The fares to be charged on the Metro South extension would be consistent with the fares charged on the rest of the MetroLink system. At the present time (December 2004), the fare is a flat $1.50 each way from all stations, except tickets purchased at the Airport stations are $3.00. Reduced fares are available for seniors, children, and those with disabilities. Reduced rates for transfers and monthly passes are also available. These fares may be changed by Metro in accordance with their procedures.

2.4.2 Feeder Buses

The TSM alternative includes a number of changes to bus service designed to address some or all of the goals of the study. These changes are detailed in Section 2.3.2, above. In addition, each of the Build alternatives includes changes to the bus network to provide better bus access to new MetroLink stations and to reduce or eliminate redundant service.

The proposed feeder bus changes are detailed in tables included as Appendix C of this DEIS. These proposed changes have been developed to help analyze service, operating cost, and ridership impacts of the alternatives. Metro reevaluates service on a regular basis and makes changes that may be needed to respond to ridership changes and to improve economic efficiency. The bus route alterations shown in Appendix C, therefore, are subject to change.

2.4.3 Operating and Maintenance Costs

The ongoing costs to operate and maintain light rail transit and bus service (O&M costs) have been estimated using a mathematical model that is based on Metro's experience with the rail and bus system. The model uses inputs such as the number of vehicles required, vehicle miles of service, and vehicle hours. Rail O&M costs include both the costs of operating and maintaining the transit vehicles and the costs of operating and maintaining the stations, trackways, maintenance facilities, and all related systems. Bus O&M costs include primarily the costs of operating and maintaining buses and the costs of operating and maintaining bus maintenance facilities. In both cases, the costs include changes in administrative costs that are allocated in proportion to changes in the level of service provided. This model is described in the supporting document: *Technical Memorandum: Task VI Draft Operating Plans for Detailed Alternatives,* August 2004 (see Appendix C).

The results of operating and maintenance cost calculations are presented in Table 2-4. These costs are shown in 2004 dollars, and do not reflect any offset from fares collected.

Table 2-4: Annual Operating and Maintenance Costs

	NO-BUILD	TSM	PURPLE	BLUE-BUTLER	BLUE-WATSON	ORANGE-BUTLER	ORANGE-REAVIS
Systemwide Rail O&M Costs	$48.1	$47.9	$48.6	$53.3	$48.6	$54.7	$52.0
Systemwide Bus and Paratransit O&M Costs	$137.6	$142.1	$141.3	$139.4	$141.3	$138.8	$139.3
Total Systemwide O&M Costs	$185.6	$190.1	$189.9	$192.7	$189.9	$193.5	$191.3
Additional annual cost of Metro South alternative	base	$4.5	$4.3	$7.1	$4.3	$7.9	$5.6

-millions of 2004 dollars

2.5 CAPITAL COSTS

The capital costs of study alternatives include all of the front-end investment required to implement the project. While these costs are not directly relevant to the assessment of environmental impacts, they are important in the comparative evaluation of study alternatives and identification of mitigation measures. The capital cost projections include the costs of:

- Construction of tracks, stations, bridges, and associated utility relocations
- Construction of roadway improvements, mitigation measures, and other related investments
- System improvements, including power, signals, and fare collection
- Buses and other transit vehicles
- Right-of-way acquisition
- Relocation costs for displaced businesses and residences
- Preliminary engineering (after completion of the DEIS), final design, construction phase engineering services, and construction management
- Project administration costs

The cost of light rail vehicles is normally included in capital costs. The existing vehicle fleet, including vehicles on order, is adequate to serve the entire MetroLink system with any of the Metro South extensions included. Therefore, no vehicles need be purchased as part of this study.

The cost projections made at this phase in project development are, by necessity, based on conceptual study plans and typical station and trackway designs. These designs are likely to change as additional engineering studies are done, and these changes may result in additional capital costs. For this reason, the cost projections include a substantial contingency amount – 25 percent of estimated construction costs, for example – to allow for these costs changes. In addition, costs are shown using dollars valued in the base year (2004), and also projected out (using a cost inflation factor of 2.5 percent per year) to the estimated midpoint of the possible construction period for a build option (2010).

The capital cost projections for each of the alternatives are shown in Table 2-5. Costs are in 2004 dollars, except the last line, which reflects costs escalated to 2010, representing the midpoint of construction of the build alternatives.

Table 2-5: Projected Capital Costs

	NO-BUILD	TSM	PURPLE	BLUE-BUTLER	BLUE-WATSON	ORANGE-BUTLER	ORANGE-REAVIS
Soft costs (engineering, financing, administration)	-	-	$16.7	$111.8	$13.1	$116.3	$23.4
Right-of-way acquisition/relocation	-	-	$19.7	$107.0	$18.9	$45.0	$14.1
Track, embankment, structures	-	-	$37.3	$254.6	$28.7	$246.2	$140.2
Stations	-	$7.7	$4.7	$47.4	$2.5	$52.3	$16.3
Systems (power, signals, fare collection)	-	-	$8.8	$55.0	$ 7.1	$70.3	$42.9
Roadway improvements	-	$12.6	$0.5	-	-	$2.5.	$1.8mil
Vehicles (buses)	-	$3.5	$4.6	-	$4.6	-	-
SUBTOTAL (2004 $)	-	$23.8	$92.2	$575.8	$74.8	$532.6	$278.8
Inflation to midpoint of construction	-	$3.8	$14.7	$92.0	$12.0	$85.0.	$44.5
TOTAL (2010 $)	-	$27.6	$101.6	$667.8	$86.8	$617.6	$323.4

-millions of 2004 dollars, unless otherwise indicated

3.0 AFFECTED ENVIRONMENT

This chapter provides an overview and description of the demographics and socioeconomic conditions, the community facilities and services, the cultural resources, and the natural resources that are found in the study area. The descriptions in this chapter are intended to provide a general understanding of the study area's resources and a general understanding of the potential impacts that might be associated with any major transportation initiative in the study area. In Chapter 5, "Environmental Consequences," each of the alternatives will be evaluated with respect to its potential impacts on the study-area environment.

3.1 DEMOGRAPHICS AND SOCIOECONOMIC CONDITIONS

The description of study-area demographics and socioeconomic conditions consists of: 1) demographic characteristics, which include population, household, and age statistics and trends, 2) income and employment, and the related concept of transit dependence, 3) housing, and 4) environmental justice considerations, which seek to recognize and avoid disproportionately high and adverse impacts on low-income or minority populations.

3.1.1 Demographic Characteristics

For many U.S. metropolitan areas, the period from 1990 to 2000 brought significant change. Economic expansion led to the growth and diversification of urban populations and related growth in residential construction. In contrast, the St. Louis Metropolitan Statistical Area (MSA) did not share in this type of change.[1] Along with many other industrially-based Midwestern urban cen-

[1] For this report, U.S. Census data were available for three distinct geographies: the Metro South study area, St. Louis County, and the St. Louis MSA. MSAs are the smallest regional unit for which the U.S. Census aggregates data that is used that data to compile regional indicators such as average household size and mean family incomes. The MSA is defined by the United States Census Bureau as a 12-county region, including Franklin, Jefferson, St. Charles, St. Louis, Madison, Monroe, St. Clair, Clinton, Jersey, Lincoln, and Warren Counties, and the City of St. Louis. It is important to point out that the latter four counties (Clinton and Jersey in Illinois and Lincoln and Warren in Missouri) are *not* part of the EWGCOG's official eight-county jurisdiction. (See Figure 3-1, "Regional Context.") Any references to MSA data refer specifically to the entire 12-county region and should not be confused with the smaller area that constitutes the Council.

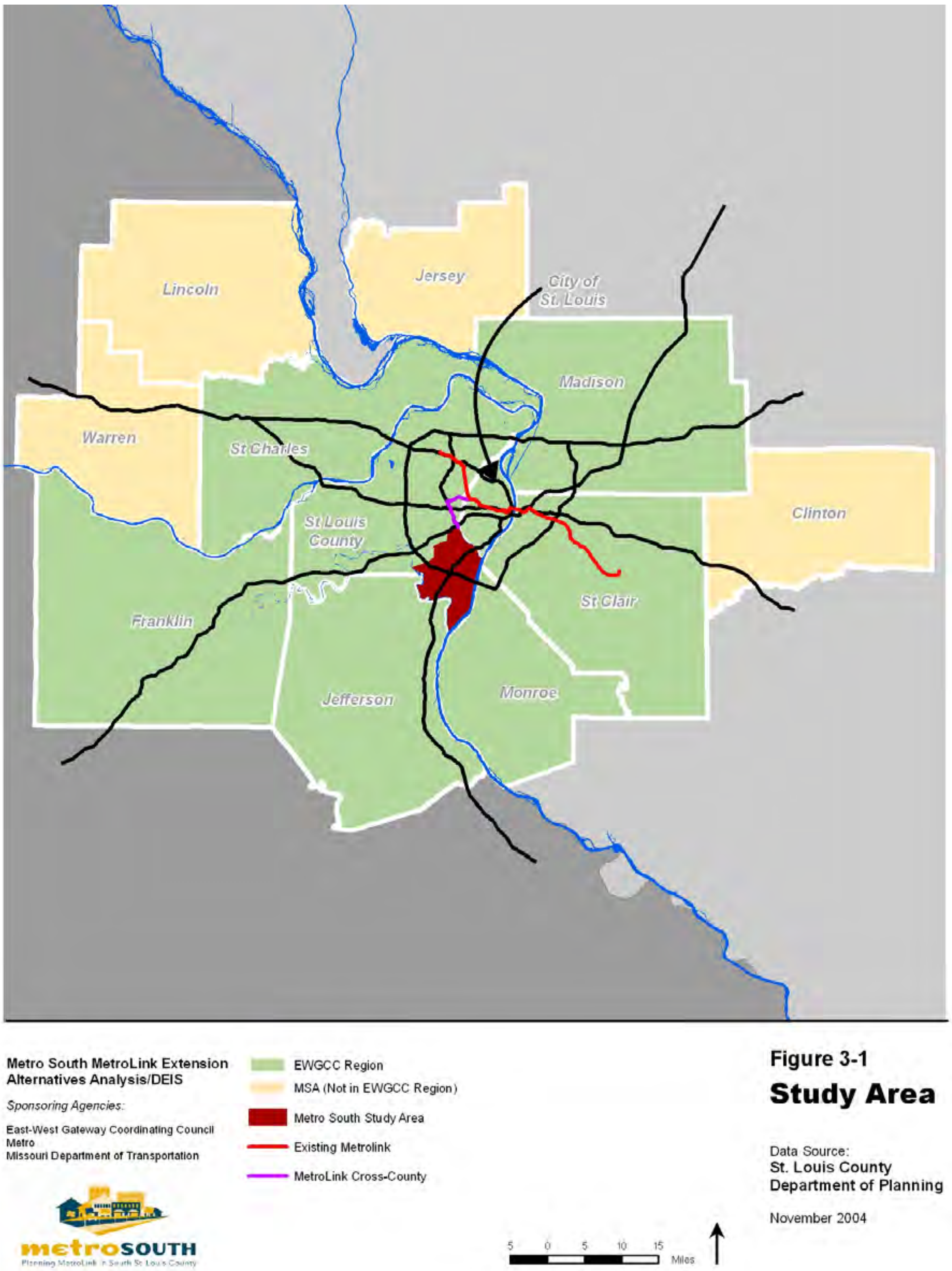


Figure 3-1
Study Area

ters, the St. Louis MSA did not fully participate in the technology boom of the 1990s. Consequently, the St. Louis region saw relatively slow population growth during the 1990s,[2] and the MSA saw its job growth rate dip progressively lower. The EWGCOG's 2002 publication, *Where We Stand*, ranks St. Louis 29th among 30 peer metropolitan areas in the rate of job creation in 2000. Other important indicators for the metropolitan St. Louis area included slow growth in the non-white and Hispanic populations, significant growth in non-family households, an increase in the number of owner-occupied housing units, and increased use of single-occupant vehicles for the commute to work.[3]

Population increased rapidly in jurisdictions outside of the City of St. Louis, including St. Charles and Jefferson Counties. By 2000, 87 percent of the region's population, and 82 percent of its jobs were located outside of the City of St. Louis.[4] The outward movement of population has been demographically unbalanced: poor residents, minority residents, and female-headed households did not participate in this outward movement as the general population did and are now concentrated in the City of St. Louis and inner-ring suburbs.

1) Population

Many demographic indicators in St. Louis County and the Metro South study area followed the same patterns displayed at the metropolitan scale, but less markedly so. For example, the number of residents and housing units increased more slowly in the study area than they did in the MSA, and the share of white residents in the study area declined more slowly in the study area than it did in the MSA.

The population of the study area was 178,355 in 2000. Table 3-1, "Total Population, and Male and Female Components," shows that St. Louis County and the Metro South study area grew at much slower rates that the St. Louis MSA during the 1990s. The balance between male and female residents remained essentially unchanged, with female residents outnumbering male residents by a few percentage points.

[2] The population of the St. Louis metro area grew by 4.5 percent between 1990 and 2000, slower than 219 of 280 American MSAs during the same period.
[3] 1990 and 2000 U.S. Census, St. Louis MSA.
[4] Brookings Institution, *Growth in the Heartland*, 2002, pp. 37-9.

Table 3-1: Total Population and Male and Female Components

Population	1990	2000	Change	%Change
Metro South	172,852	178,355	5,503	3.2%
St. Louis County	993,529	1,016,315	22,786	2.3%
St. Louis MSA	2,491,490	2,603,607	112,117	6.5%
Male Population	**1990**	**2000**	**1990 Share**	**2000 Share**
Metro South	82,595	84,617	47.8%	47.4%
St. Louis County	473,824	481,014	47.7%	47.3%
St. Louis MSA	1,190,932	1,250,837	47.8%	48.0%
Female Population	**1990**	**2000**	**1990 Share**	**2000 Share**
Metro South	90,257	93,738	52.2%	52.6%
St. Louis County	519,705	535,301	52.3%	52.7%
St. Louis MSA	1,300,557	1,352,770	52.2%	52.0%

2) Households

In keeping with national trends, while the population of the St. Louis region grew, the average size of local households shrank. This trend is evident in the MSA, in St. Louis County, and in the Metro South study area. Table 3-2, "Average Household and Family Size," shows the downward trend in household size across the region, and separates family and non-family households. In almost every case, household size shrank during the 1990s. This trend has been especially strong in the study area where the average household size dropped 6.0 percent, compared with 3.1 percent for the St. Louis MSA.

Table 3-2: Average Household and Family Size

Household Size	1990	2000	%Change
Metro South	2.49	2.34	-6.0%
St. Louis County	2.57	2.46	-4.0%
St. Louis MSA	2.60	2.52	-3.1%
Family Size	**1990**	**2000**	**%Change**
Metro South	3.05	3.00	-0.5%
St. Louis County	3.11	3.09	-0.8%
St. Louis MSA	3.20	3.15	-1.5%
Non-Family Household Size	**1990**	**2000**	**%Change**
Metro South	1.14	1.12	-1.8%
St. Louis County	1.20	1.17	-2.0%
St. Louis MSA	1.17	1.19	1.6%

Table 3-3, "Numbers of Residents in Households," provides a more detailed picture of the shift in household character. The study area, the County, and the MSA all saw a sharp increase in the number of one- and two-person households and a general decrease in the number of very large households. On the other hand, the MSA as a whole saw small but steady growth in the number of households with three to six people. This divergence between household size in St. Louis County and the Metro South study area, and the household size in the MSA is evidence of a significant shift in the region's settlement patterns: while household sizes are generally declining, larger households—including families—are decreasing in number in inner-ring jurisdictions (such as St. Louis County and the City of St. Louis) and increasing in outer counties.

Table 3-3: Number of Residents in Households

	Number of Households with specified number of residents							
Study Area	**1**	**2**	**3**	**4**	**5**	**6**	**7 +**	**Total**
1990	17,538	23,493	11,423	10,040	4,265	1,410	375	68,544
2000	22,386	25,498	11,062	9,520	4,024	1,210	335	74,620
Change	27.6%	8.5%	-3.2%	-5.2%	-5.7%	-14.2%	-10.7%	8.9%
County	**1**	**2**	**3**	**4**	**5**	**6**	**7 +**	**Total**
1990	93,532	125,650	66,554	58,093	24,640	7,931	3,710	380,110
2000	113,027	133,288	65,641	56,533	24,523	8,499	3,096	404,607
Change	20.80%	6.10%	-1.40%	-2.70%	-0.50%	7.20%	-16.50%	6.40%
MSA	**1**	**2**	**3**	**4**	**5**	**6**	**7 +**	**Total**
1990	239,021	286,761	161,702	140,836	62,262	21,397	12,754	924,733
2000	277,005	322,261	168,146	146,689	65,808	23,251	10,181	1,013,341
Change	15.90%	12.40%	4.00%	4.20%	5.70%	8.70%	-20.20%	9.60%

This increase in the number of small households (one or two persons) and the continued decline in the average household size in general create something of a paradox for Metro South. If the area remains attractive to small households rather than to larger families, it is possible that the overall number of households will increase over the next 25 years while the population itself will remain the same or even decline. Such a trend will affect land-use in that 1) there will be a greater potential demand for smaller housing unit types, such as townhomes, that currently represent a small part of the available housing stock, and 2) there will be a need to find locations to create additional housing of all types, as the number of households rises (assuming the area remains attractive in the marketplace).

3) Age

Age plays a significant role in assessing the need for transit. Young people without cars and the elderly who have less ability or desire to drive are two age categories that may use transit more than other ages, through necessity or choice. Even in a metropolitan region with a high median age, the Metro South area is notable for the number of residents aged 65 years and over. Consequently, study-area transit demand may be influenced by the high proportion of elderly residents.

In 2000, the St. Louis MSA had one of the oldest populations in America. Between 1990 and 2000, the study area saw a significant increase in the number of residents over 65 years of age. This increase in the older population is apparent when comparing the percentage of the population in older age groups to the percentage in the St. Louis MSA. (See Figure 3-2, "Persons Aged 60 and Above as a Percentage of Total Population.") Older residents also make up a larger share of the study area population (18.7 percent) than they do of the MSA population (12.9 percent). Also evident in the data is an increase in the age of householders.[5] Table 3-4, "Age of Householders," demonstrates this change, showing a sharp increase in the number of householders over the age of 75, as well as a sharp decrease in younger householders (ages 25 to 34).

Table 3-4: Age of Householders

Study Area	**15 to 24**	**25 to 34**	**35 to 44**	**45 to 54**	**55 to 64**	**65 to 74**	**75+**
1990	2,652	13,115	14,449	10,186	10,890	9,957	7,295
2000	2,946	9,916	14,994	14,589	10,729	10,487	10,959
Change	11.1%	-24.4%	3.8%	43.2%	-1.5%	5.3%	50.2%
St. Louis County	**15 to 24**	**25 to 34**	**35 to 44**	**45 to 54**	**55 to 64**	**65 to 74**	**75+**
1990	13,641	80,617	85,852	62,955	55,299	47,355	34,391
2000	16,423	63,302	92,447	84,103	56,009	47,354	44,969
Change	20.40%	-21.50%	7.70%	33.60%	1.30%	0.00%	30.80%
MSA	**15 to 24**	**25 to 34**	**35 to 44**	**45 to 54**	**55 to 64**	**65 to 74**	**75+**
1990	41,699	206,160	202,093	143,039	128,455	114,494	88,793
2000	45,908	170,710	240,150	202,360	134,909	114,119	105,185
Change	10.10%	-17.20%	18.80%	41.50%	5.00%	-0.30%	18.50%

[5] The U.S. Census defines a "householder" as a member of a household who lives at a housing unit and owns, is buying, or rents the housing unit. If there is no such person present when the Census Bureau contacts the household, any household member who is at least 15 years old can serve as the householder for the purposes of a census or survey.

Figure 3-2

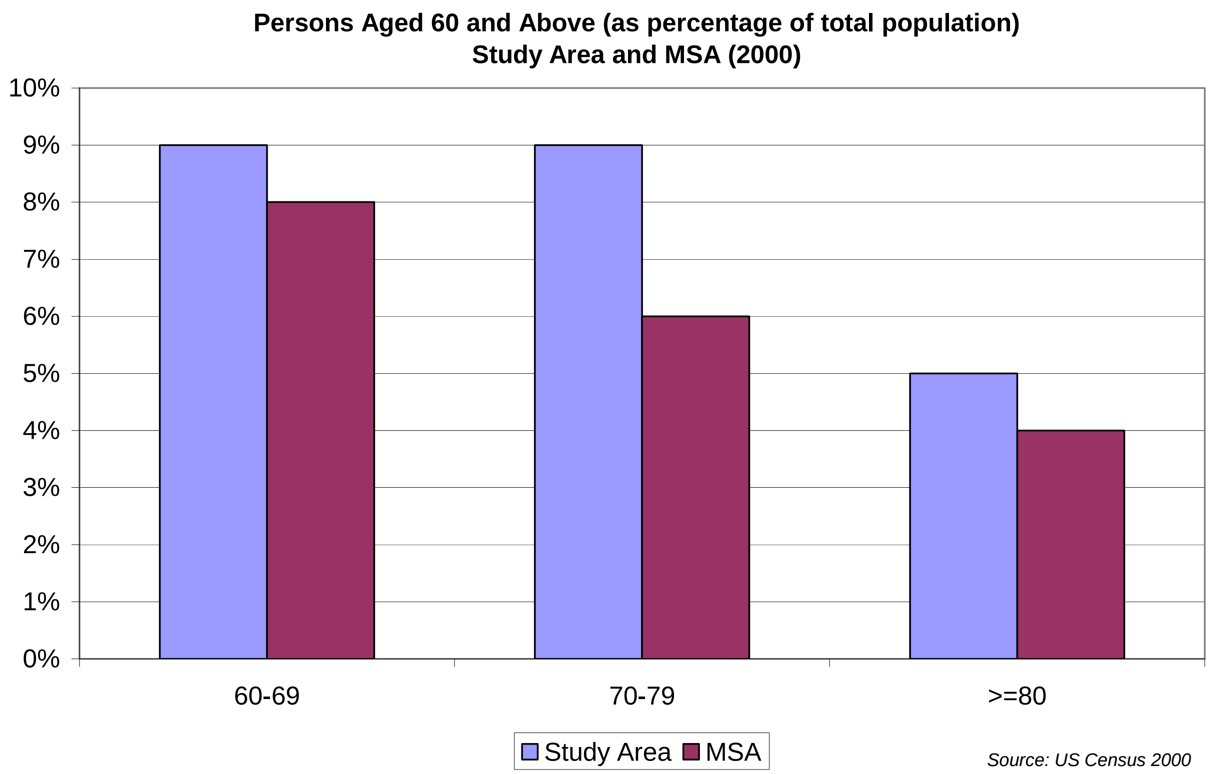
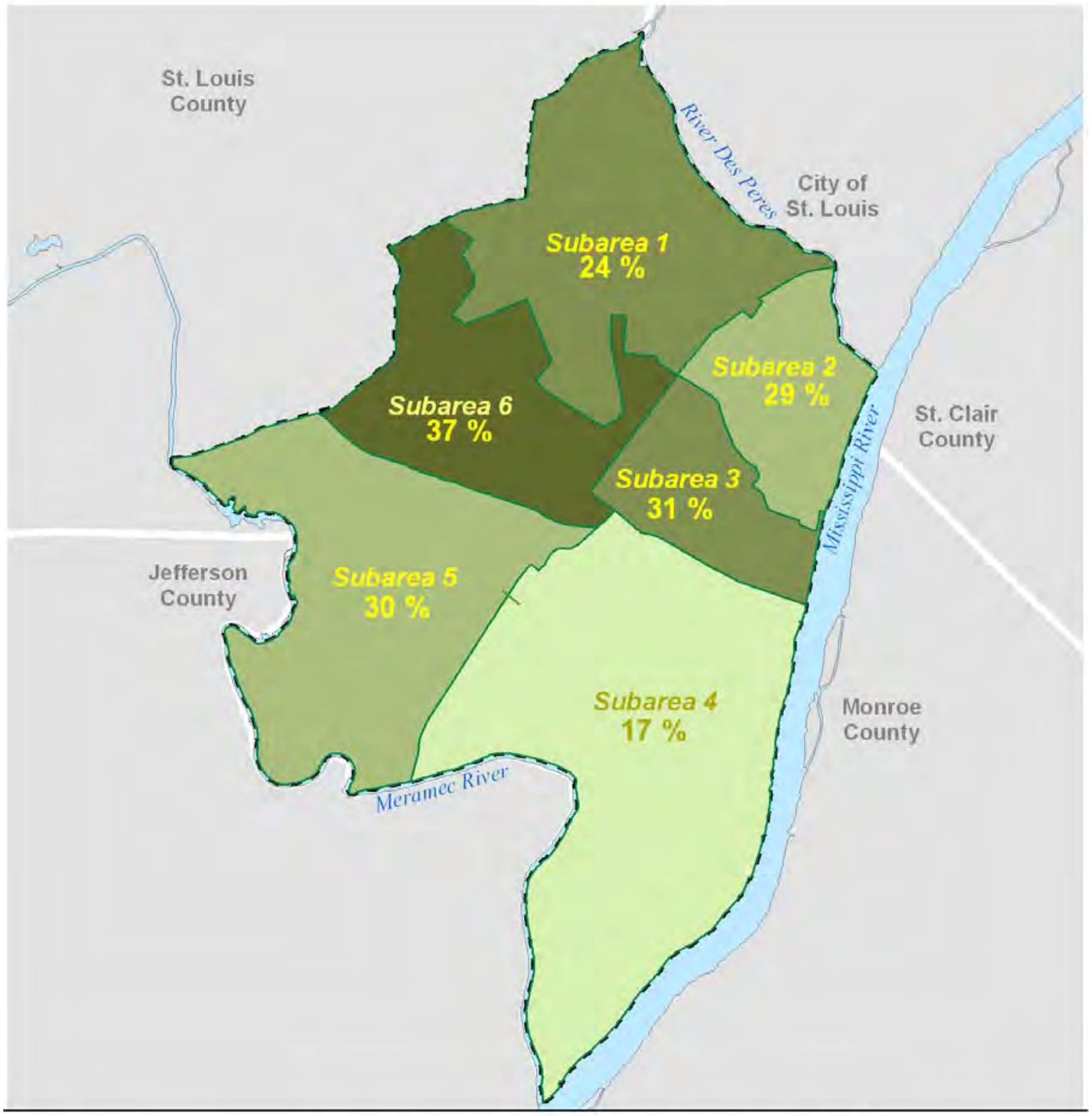


Table 3-5, "Year 2000 Householders over 65 by Subarea," shows the number of householders over the age of 65 in each of the six subareas within the study area. These older householders generally total about one-third of all householders. The exception is Subarea 4 in the southeast corner of the study area, where the share is much less (See Figure 3-3, "Householders over 65 Years Old").

Table 3-5: Year 2000 Householders Over 65 by Subarea

	Total Households	Householder Over 65	Share of Households
Subarea 1	21,856	7,363	33.7%
Subarea 2	7,183	2,095	29.2%
Subarea 3	6,120	1,903	31.1%
Subarea 4	18,932	3,181	16.8%
Subarea 5	9,616	2,902	30.2%
Subarea 6	10,913	4,002	36.7%



Metro South MetroLink Extension
Alternatives Analysis/DEIS

Sponsoring Agencies:

East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation

metroSOUTH
Planning MetroLink in South St. Louis County

*Households with persons over 65 years old (%)

- 0-25
- 26 - 30
- 31 - 35
- >35

*As a percentage of total number of households

Figure 3-3
Households with Persons over 65 years old

Data Source:
St. Louis County Department of Planning

November 2004

This age trait has land-use implications for housing turnover in the study area, which is likely to accelerate in coming years. One priority of coordinating transit implementation with land-use policy is to plan for transit-oriented development (TOD) that can attract young families to Metro South. Planning can foster the stabilization and enhancement necessary to keep such areas attractive and avert increasing vacancies in existing units. Also needed are new units of a type that can attract younger householders.

As shown in Table 3-4, the significant increase in very young householders (ages 15 to 24) throughout the region is also noteworthy. It may simply be an artifact of the "echo boom," as children of baby boomers begin to establish their own families. The influx of young householders may also be an indication of a more widespread demographic shift in the St. Louis MSA, as young residents begin to choose the region as their home. Though the causes are not readily apparent, this trend may in time affect future Metro South population characteristics and the composition of potential transit riders.

3.1.2 Income and Employment

1) Income

Table 3-6, "Average Household Income," shows the 1989 and 1999 average household incomes for the MSA, the county, and the study area. Real incomes increased in all three areas, but that increase was less rapid in the study area. Households in the Metro South study area earned more than the MSA average but less than the average for St. Louis County.

Table 3-6: Average Household Income

	1989		*1999*		
	Actual	**Equivalent**	**Actual**	**Change**	**% Change (vs. 1989 Equiv)**
Metro South	$ 42,092	$ 56,403	$ 59,932	$ 3,529	6.3%
St. Louis County	$ 48,321	$ 64,750	$ 68,486	$ 3,735	5.8%
MSA	$ 39,068	$ 52,351	$ 57,595	$ 5,244	10.0%

Notes: "Equivalent" indicates the Year 1999 equivalent value of 1989 incomes adjusting for inflation. Source: Consumer Price Index.
The Census measures income from the last full year before the Census year. Thus, income information for the 2000 Census is based on 1999 earnings, etc.

Average household incomes within in the study area varied widely by geographic area. Table 3-7, "Average Household Income by Subarea," shows the 1999 average income in each of the six subareas shown on Figure 3-3. Western and southern portions of the study area (Subareas 4 and 5) tend to be wealthier; northern and eastern tracts tend to have lower average household incomes.

Table 3-7: Average Household Income by Subarea

Area	Average Income
Subarea 1	$ 52,655
Subarea 2	$ 42,801
Subarea 3	$ 49,182
Subarea 4	$ 69,394
Subarea 5	$ 78,048
Subarea 6	$ 59,165

Although much of the study area saw increased incomes in real dollars during the 1990s, some areas north of I-270/I-255, as well as the area between Tesson Ferry Road and I-55 (south of I-270/I-255), saw significant decreases. This trend indicates that the level of transit dependency may be increasing in these sections if incomes –which were already lower than the study area median—continue to decline. Declining incomes may also mean it is harder for homeowners in these subareas to keep their houses in good repair, an issue that may in time develop into a need for planned redevelopment and incentives for repairs.

2) Employment

An economic expansion and a significant reduction in the nation's unemployment rate characterized the 1990s. As Table 3-8, "Labor Force," shows, this change was also evident in the St. Louis region. The MSA's unemployment rate declined during the decade. Meanwhile, St. Louis County maintained its relatively low unemployment rate. The study area saw its already low unemployment rate shrink even more. The number of workers leaving the workforce compared to those entering it between 1990 and 2000, may explain some of this reduction in the unemployment rate.

Table 3-8: Labor Force

Study Area	**In Labor Force** *Employed*	*Unemployed*	*Unemp. Rate*	**Not in Labor Force**	**Non-Participation Rate**
1990	89,141	3,407	3.8%	45,244	32.8%
2000	90,258	2,892	3.1%	49,960	34.9%
% Change	1.9%	-32.0%		11.0%	
St. Louis County	**In Labor Force** *Employed*	*Unemployed*	*Unemp. Rate*	**Not in Labor Force**	**Non-Participation Rate**
1990	509,177	13,253	4.5%	241,930	31.7%
2000	505,972	12,324	4.6%	259,554	33.4%
% Change	-0.6%	-7.0%		7.3%	
MSA	**In Labor Force** *Employed*	*Unemployed*	*Unemp. Rate*	**Not in Labor Force**	**Non-Participation Rate**
1990	1,164,557	44,509	6.3%	625,830	34.1%
2000	1,259,177	37,731	5.5%	664,825	33.9%
% Change	8.1%	-15.2%		6.2%	

The rate of new workers entering the workforce was much lower in the study area than in the MSA. The growth in the number of study-area residents not participating in the labor force is also a factor. Non-participation rates—a measure of the number of residents over the age of 18 who are neither working nor looking for a job—were slightly higher in the study area than in the county or in the MSA. The non-participation rate grew faster in the study area than in the region. The aging population of the study area may explain this trend, since retirees are included in non-participation figures.

Table 3-9, "Study Area Employment by Industry, Year 2000," shows the breakdown of jobs by industry held by Metro South study area residents (regardless of where they work), by St. Louis County residents, and by residents of the entire MSA in 2000. As shown, retail, manufacturing, and health services were the largest categories for study area residents, as well as residents of the MSA as a whole.

Table 3-9: Study Area Employment by Industry, Year 2000

	Study Area		*St. Louis County*		*MSA*	
Industry	**Workers**	**Share of Total**	**Workers**	**Share of Total**	**Workers**	**Share of Total**
Agriculture	166	0.2%	1,146	0.2%	8,406	0.7%
Construction	5,646	6.3%	24,817	4.9%	78,396	6.3%
Manufacturing	10,921	12.1%	64,212	12.7%	178,594	14.4%
Wholesale	3,899	4.3%	21,290	4.2%	46,613	3.7%
Retail	11,093	12.3%	57,061	11.3%	144,623	11.6%
Transportation (TCU)	4,664	5.2%	27,141	5.4%	72,298	5.8%
Information	3,505	3.9%	19,021	3.8%	40,182	3.2%
Finance (FIRE)	8,460	9.4%	45,603	9.0%	95,848	7.7%
Professional	8,895	9.9%	56,101	11.1%	118,256	9.5%
Education	7,584	8.4%	48,073	9.5%	106,774	8.6%
Health Services	10,210	11.3%	61,367	12.2%	150,746	12.1%
Arts and Entertainment	6,935	7.7%	38,345	7.6%	100,647	8.1%
Other Services	4,840	5.4%	24,398	4.8%	63,535	5.1%
Public Administration	3,364	3.7%	16,675	3.3%	47,652	3.8%
Total Employment	**90,182**		**505,250**		**1,252,570**	

Retail is the largest single employment category in Metro South, comprising about 12 percent of all regional jobs and a slightly higher percentage in the Metro South area. This is significant because these jobs tend to pay low wages and, consequently, are more prone to be filled by groups that are more transit-dependent. Manufacturing jobs are the second highest number in the Metro South area, followed by health services.

Table 3-10, “Study Area Residents’ Employment by Occupation, Year 2000,” shows by broad categories the types of jobs held by study area residents, whether they work within the area or outside it, and compares these break-downs with St. Louis County and the region. (This table differs from the previous Table 3-9 in that it emphasizes the occupation of study-area residents rather than the industry they work in.) South St. Louis County is commonly regarded as more of a pool of blue- or pink-collar workers than other areas of St. Louis County. This characterization may be less true than generally assumed. Many study-area residents are employed in occupations that require significant skill or training. Compared with the MSA, the Metro South area has a greater-than-MSA average share of residents employed in managerial and professional roles and less than MSA average share of lower-skilled occupations such as construction and transportation. The implication of this high proportion of white collar categories among study-area residents is that transit also needs to appeal to potential middle class riders living in the area whose work may be elsewhere along the MetroLink system.

Table 3-10: Study Area Residents' Employment by Occupation, Year 2000

	Study Area		*St. Louis County*		*St. Louis MSA*	
Occupation	**Workers**	**Share of Total**	**Workers**	**Share of Total**	**Workers**	**Share of Total**
Management, professional, and related	34,294	38.0%	210,366	41.6%	430,637	34.4%
Service	11,006	12.2%	63,158	12.5%	185,432	14.8%
Sales and office	27,992	31.0%	148,738	29.4%	352,074	28.1%
Agriculture	47	0.1%	513	0.1%	2,380	0.2%
Construction	7,299	8.1%	32,105	6.4%	110,045	8.8%
Production and transportation	9,444	10.5%	50,370	10.0%	172,002	13.7%
Total	**90,182**		**505,250**		**1,252,570**	

There are about 54,000 jobs located within the study area. About 70 percent of them are located north of I-270 / I-255. They are concentrated in an approximately two-mile-wide band down the center of the northern half of the area. In addition, more than 12,000 jobs (22 percent of all study area jobs) are located within two miles of South County Center. The area has a jobs-to-housing ratio of 0.74, which is decidedly jobs-poor.[6] There are fewer jobs in the study area than there are households, which indicates that the area exports a large number of workers to other parts of the region. (St. Louis County as a whole has a ratio of 1.51.)

Employment growth is the single most important factor that will influence the shape and scale of population and household growth and change. This relationship of employment to population growth applies to the region, the county, and the study area. Employment is likewise the primary measure of regional economic progress. These relationships are relevant to the determination of broad market demand for office and industrial facilities built to accommodate businesses and institutions responding to that economic progress.

Maintaining the current level of employment in the study area will depend first on a successful process of replacement of older office, industrial, and retail space as it ages and becomes less competitive. However, without some new and effective catalyst or stimulus for economic growth and change, any substantial growth beyond current levels is not foreseen.

The greatest opportunity to realize net new employment growth would be to aggressively capitalize on the opportunity to develop new office facilities near MetroLink stations. This is because of the unique association that can be established between the highly desirable but expensive office center in Clayton and less expensive office facilities that could be positioned at MetroLink sta-

[6] A more balanced jobs-housing ratio for a suburban context such as South County would be in the range from 1.00 to 1.25 jobs per household.

tions. These areas would be close to a good labor pool while having easy transit access to, and strong operational linkages with, the Clayton area business community.

If St. Louis County and other local governments would take an active role in fostering a continuous process of redevelopment, especially associated with the development of MetroLink stations in the study area, employment could grow from about 55,000 jobs to 60,000 jobs by 2025, a net gain of 5,000 jobs, or 9 percent. Again, most of this gain would be in office positions with retail growth providing a smaller component.

Based on projected employment growth, the region could realize a net gain of some 17.0 million square feet of office space, an almost 17 percent increase in the present office inventory. St. Louis County, with approximately half of all jobs in the region now, will likely capture about 40 percent of projected future net job growth, about 84,000 jobs. Of these, about 39,500 jobs will be in the office sector.

The Clayton area should experience market demand sufficient to generate more than two million net square feet of office inventory by 2025. This assumes that the Clayton area could capture 30 percent of the County's office employment growth in that period.

Nevertheless, the Clayton area has limited site capacity to accommodate major new developments, especially as the City of Clayton seems highly unlikely to permit expansion of the boundaries of the downtown business district. This circumstance will require development to follow a very expensive process of using a finite area more intensely through rebuilding, redevelopment and replacement of the older and obsolete portions of the office inventory.

With potential new transit service, the study area could gain the potential to capture some of the overflow demand for Clayton office space. This could present an opportunity for attracting office developments to sites around stations. Stations within the study area could be especially attractive for spillover office users with labor and operational ties to the office core in the Clayton business community. In addition, sites associated with stations could be expected to capture the great majority of new office space created to replace a portion of the existing inventory in the study area as it ages and becomes increasingly less competitive.

Together these two sources of demand suggest that some 925,000 square feet of offices could be accommodated at or near potential MetroLink stations in the study area. At a modest average suburban density of a 0.5 FAR (floor area ratio), this projection would require about 42.5 acres of developable land.

The Demand Projections report projected that the study area will attract approximately 120,000 square feet of net new retail space.[7] At the same time at least 25 percent (1.5 million square feet) of its existing retail inventory will be replaced as it ages and becomes obsolete.

3) Transit Dependence

A major factor in the choice of travel mode, especially for transit, is the availability of private vehicles. As a general rule, the fewer vehicles available to a household, the more likely members of that household are to use transit or non-motorized (walking, bicycling) modes of transportation. Households with *no* available vehicles are, obviously, the most likely to use alternate modes. Table 3-11, "Vehicle Availability," shows the number of vehicles available to households. The study area and St. Louis County both saw a slight increase from 1990 to 2000 in zero-car and one-car households and a decrease in households with more automobiles. In contrast, the MSA as a whole saw a significant decrease in zero-car households and slight increases in households with vehicles available.

Table 3-11: Vehicle Availability

	Vehicles Available			
	0	**1**	**2**	**3+**
Study Area				
Households, 1990	3,860	23,145	29,752	11,764
Share of 1990 Households	5.6%	33.8%	43.4%	17.2%
Households, 2000	4,372	26,784	31,140	12,275
Share of 2000 Households	5.9%	35.9%	41.8%	16.5%
Household Change	512	3,639	1,388	511
% Change	13.3%	15.7%	4.7%	4.3%
St. Louis County				
Households, 1990	22,617	125,521	164,941	67,031
Share of 1990 Households	6.0%	33.0%	43.4%	17.6%
Households, 2000	25,831	143,608	169,635	65,238
Share of 2000 Households	6.4%	35.5%	42.0%	16.1%
Change	3,214	18,087	4,694	(1,793)
% Change	14.2%	14.4%	2.8%	-2.7%

[7] *Demand Projections: Potential for Private Investment in Response to a South County MetroLink Extension*, Development Strategies, April, 2003.

Table 3-11: Vehicle Availability

	Vehicles Available			
	0	**1**	**2**	**3+**
St. Louis MSA				
Households, 1990	100,461	310,880	361,693	151,699
Share of 1990 Households	10.9%	33.6%	39.1%	16.4%
Households, 2000	91,446	348,086	402,654	170,233
Share of 2000 Households	9.0%	34.4%	39.8%	16.8%
Change	(9,015)	37,206	40,961	18,534
% Change	-9.0%	12.0%	11.3%	12.2%

The implications of these data above are that, in the study area, there is a specific set of households that might be dependent on transit for commuting and other trip purposes. A comprehensive understanding of demographic and land-use data can be used to help identify the spatial distribution of those households. Figure 3-4, "Transit Dependence," is an initial attempt at such an analysis, showing Census block groups that display characteristics often associated with transit dependency.

These characteristics of transit dependency include a high number of households in poverty (as defined by the 2000 U.S. Census[8]) and a high number of households with no or only one available automobile. The population most likely to be transit dependent is more evident north of I-255/I-270, but many locations to the south also include noteworthy pockets of potentially more transit dependent populations.

Table 3-12, "Low Vehicle Ownership," is keyed to the subareas shown on Figure 3-3 and adds further insight into potential transit dependency by indicating the share of households in each subarea that have access to no or only one vehicle. As has been the trend with many of the demographic factors examined in this report, households in southern and western portions of the study area tend to have access to a larger number of vehicles. As with the previous figures, these data suggest that residents in the northern and eastern portions of the study area might have a greater need for transportation alternatives to private automobiles.

[8] The Census Bureau uses a set of income thresholds that vary by family size and composition to determine who is poor. If a family's total income is less than that family's threshold, then that family, and every individual in it, is considered poor. These levels do not vary by geography but there is a sliding scale for various household sizes and the number of related children. For example, the poverty level for a family of four with two children, a very typical unit, was slightly below $17,000 at the time of the 2000 U.S. Census.

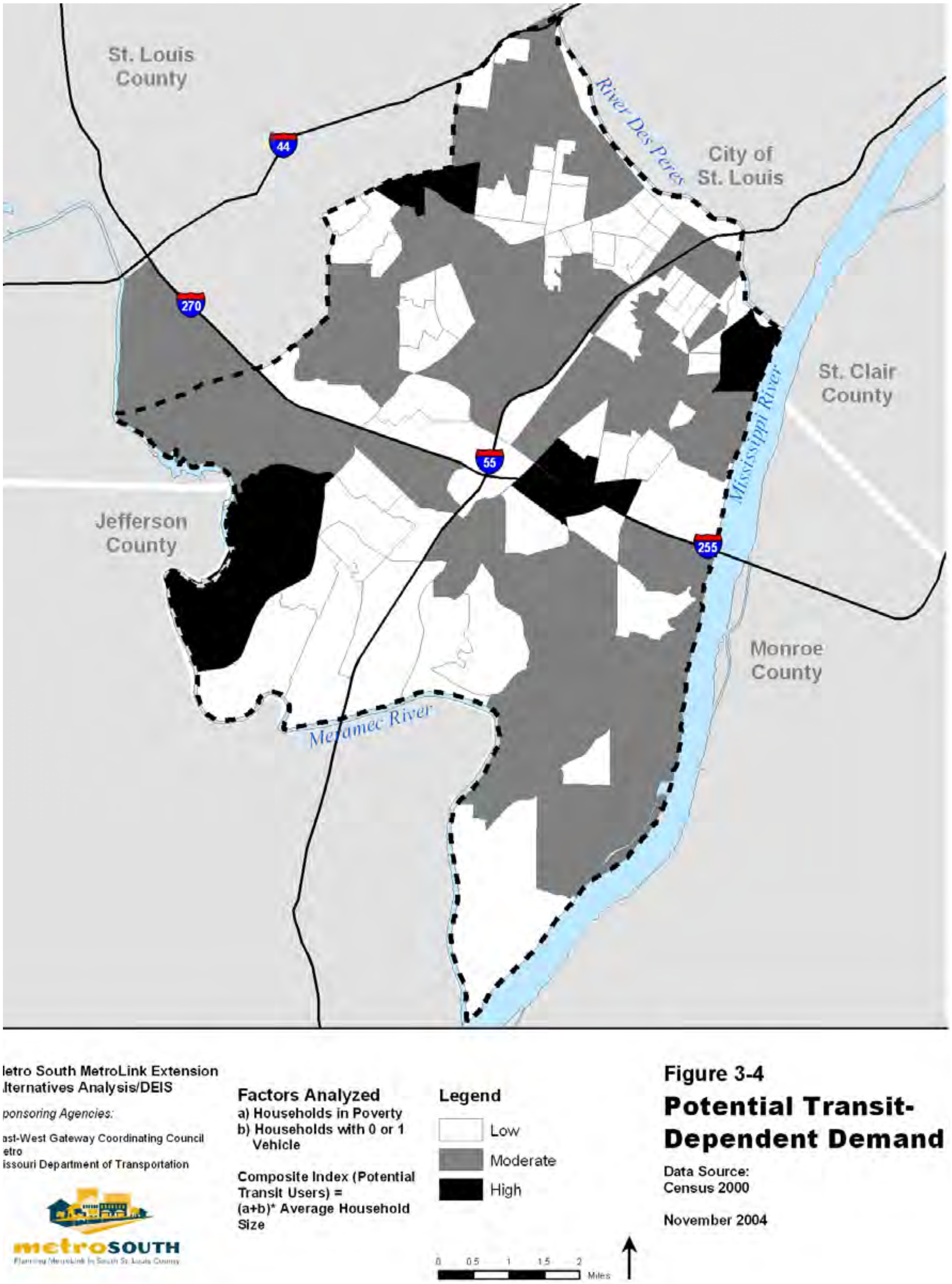


Figure 3-4
Potential Transit-Dependent Demand

Table 3-12: Low Vehicle Ownership
(Households with 0 or 1 Vehicle)

	Total Households	Low Vehicle Ownership	Share of Subarea
Subarea 1	21,856	11,107	50.8%
Subarea 2	7,183	3,726	51.9%
Subarea 3	6,120	2,913	47.6%
Subarea 4	18,932	5,941	31.4%
Subarea 5	9,616	3,188	33.2%
Subarea 6	10,913	4,281	39.2%

3.1.3 Housing

Based on market demand, the study area could receive a net increase of 3,000 units in its housing inventory. In addition, as many as 5,000 to 7,000 replacement units will be required by 2025 if the overall inventory is to remain physically sound and competitive.

The study team estimates that, with appropriate policies and incentives in place, new transit service could attract about 2,700 of these 9,000 total new or replacement units to the area around new transit stations, about 30 percent of the anticipated total increase.[9]

To realize these projections, St. Louis County and local municipalities would need to make aggressive use of their redevelopment tools. Also, a variety of existing and new incentives may be needed to attract developer interest. Promoting such development could also require the constant interaction with residents regarding the need to systematically replace older, obsolete housing and to do so at higher densities in some instances. Development around MetroLink stations could offer an opportunity to accommodate this process of adaptation and change. Assuming an average density of 12 dwelling units (du) per acre, locating these 2,700 units would require a total of 225 acres of developable land.

3.1.4 Environmental Justice Considerations

In compliance with Executive Order 12898 on Environmental Justice (February 11, 1994), each federal agency or its authorized agent must determine whether its programs, policies, or actions would have disproportionately high and adverse human health and environmental effects upon low-income and minority populations. If disproportionately high and adverse impacts would

[9] *Demand Projections: Potential for Private Investment in Response to a South County MetroLink Extension,* Development Strategies, April, 2003.

result from the proposed project, mitigation measures or alternatives must be developed to avoid or reduce the impacts, unless the agency determines that such measures are not practicable.

The purpose of this section is to document the analysis conducted in support of environmental justice considerations. Recipients of federal assistance for transportation-related projects are also required to demonstrate compliance with all applicable civil rights standards, as defined in amended Title VI of the Civil Rights Act of 1964.

In 2000, all but 7,500 of the 178,355 residents of the Metro South study area were white (95.8 percent). Asians, numbering 2,700 residents (1.5 percent), comprised the largest group within the non-white category. African-Americans were 0.7 percent of the study area. This South St. Louis County pattern sharply contrasts with the higher proportions of African-American population in St. Louis County (18.9 percent) and in the overall MSA (18.2 percent). During the 1990s, the Metro South study area became marginally more racially diverse. However, as Table 3-13, "Race," shows, this increased diversity remains very modest – 2.5 percent of the overall study-area population.

Hispanics are an important subgroup in many metropolitan areas and are responsible for the recovery of population in many cities after years of loss. The number of Hispanic residents did increase sharply (57.9 percent) in the St. Louis region. However, there were only 2,100 Hispanics in the study area, and their increase of only 29.9 percent between 1990 and 2000 was well below that for the region.[10]

The EWGCOG study team used 2000 U.S. Census data to rank order all census block groups[11] in the MSA according to median household income and percentage of the population that identifies with a racial or ethnic minority. For each measure the census block groups were grouped into five groups ("quintiles"), from those with the lowest median income (or minority percentage) to those with the highest. The block groups with the lowest median incomes or the highest minority population are of particular concern in evaluating environmental justice impacts, because impacts in these areas will fall disproportionately on protected populations. In the Metro South study area, only one block group is in the lowest quintile for median income, and none are in the highest quintile for minority population. The single lower-income

[10] In a similar vein, the study area is seeing a considerable influx of immigrants from Bosnia. While estimations of the scale of this trend remain anecdotal, it may prove worthwhile documenting where such newcomers are locating within the study area to see whether any of the alternatives developed later in the study may tap into what may be another potential pool of transit demand.
[11] A block group is defined by major streets and geographic boundaries, and typically includes four to ten city blocks.

Table 3-13: Race

	1990		*2000*		*Change*	
Metro South	**Population**	**%**	**Population**	**%**	**Population**	**%**
White	169,927	98.3%	170,827	95.8%	900	0.5%
Black	888	0.5%	1,330	0.7%	442	49.8%
American Indian	333	0.2%	297	0.2%	(36)	-10.8%
Asian	1,431	0.8%	2,726	1.5%	1,295	90.5%
Pacific Islander	N/A	N/A	35	0.0%	N/A	N/A
Other	273	0.2%	604	0.3%	331	121.2%
Multiple Races	N/A	N/A	1,427	0.8%	N/A	N/A
Total	**172,852**		**178,355**		**5,503**	
Hispanic	1,645	1.0%	2,137	1.2%	492	29.9%

	1990		*2000*		*Change*	
County	**Population**	**%**	**Population**	**%**	**Population**	**%**
White	836,603	84.2%	781,316	76.9%	(55,287)	-6.6%
Black	139,044	14.0%	192,348	18.9%	53,304	38.3%
American Indian	1,732	0.2%	1,983	0.2%	251	14.5%
Asian	13,899	1.4%	21,534	2.1%	7,635	54.9%
Pacific Islander	N/A	N/A	437	0.0%	N/A	N/A
Other	2,251	0.2%	4,517	0.4%	2,266	100.7%
Multiple Races	N/A	N/A	14,180	1.4%	N/A	N/A
Total	**993,529**		**1,016,315**		**22,786**	
Hispanic	9,491	1.0%	14,517	1.4%	5,026	53.0%

	1990		*2000*		*Change*	
MSA	**Population**	**%**	**Population**	**%**	**Population**	**%**
White	1,986,599	81.3%	2,037,397	78.3%	50,798	2.6%
Black	422,234	17.3%	473,691	18.2%	51,457	12.2%
American Indian	5,726	0.2%	6,697	0.3%	971	17.0%
Asian	22,808	0.9%	35,940	1.4%	13,132	57.6%
Pacific Islander	N/A	N/A	878	0.0%	N/A	N/A
Other	6,732	0.3%	12,873	0.5%	6,141	91.2%
Multiple Races	N/A	N/A	36,131	1.4%	N/A	N/A
Total	**2,444,099**		**2,603,607**		**159,508**	
Hispanic	25,036	1.0%	39,525	1.5%	14,489	57.9%

block group identified is near Kenrick Plaza, north of Watson Road. None of the alternatives under analysis is physically located within this block group. Three of the Build alternatives would provide a MetroLink station that is conveniently located within walking distance of this block group.

Economic and social disparities between white and non-white populations are often sharp in many U.S. metropolitan areas. *Where We Stand* reports that, among 30 peer regions, St. Louis had the 11th highest "rate of disparity between African-Americans and whites on an index of 15 health, housing, and economic variables."[12] Given the dominant presence of white residents in the Metro South study area, such disparities are not as apparent as in other parts of the region. Economic development, labor force, income, and affordable housing issues in the study area will likely remain more closely related to class than to race.

3.2 Community Facilities and Services

The description of study-area community facilities and services consists of sections on (1) service areas for schools and fire protection, (2) activity centers, (3) land-use and economic development issues, and (4) hazardous waste sites.

3.2.1 Service Areas

The study area is unique within St. Louis County in that only a small proportion of its total area is within independent municipalities. South St. Louis County is largely unincorporated; only nine small municipalities are located within the study area. These municipalities and their population are Bella Villa, 687; Grantwood Village, 883; Green Park, 2,666; Lakeshire, 1,375; Mackenzie, 137; Marlborough, 2,235; St. George, 1,288; Shrewsbury, 6,644; and Wilbur Park, 475. The total of 16,400 is about 8 percent of the total for South St. Louis County.

Because most of the study area is unincorporated, it is subject to the zoning and subdivision regulations of St. Louis County. This makes the area subject to potentially highly-unified planning oversight from the County for issues such as stabilization of older residential areas and renewal of older commercial corridors. This less fragmented political situation should make coordinating land-use planning with potential transit implementation both easier to align with county priorities and less complex to implement.
School districts and fire protection districts provide some definition to the unincorporated communities of Affton, Lemay, Mehlville, and Oakville. School and fire districts are financed at the local level, primarily through taxes on real estate and personal property.

There are five school districts in the study area: Affton, Bayless, Hancock Place, Lindbergh, and Mehlville. The Affton, Bayless, and Hancock Place School Districts primarily serve the northern portion of the study area; the

[12] *Where We Stand*, 82.

Mehlville and Lindbergh Districts serve the southern areas. Mehlville has the greatest number of students, 12,000. Affton serves about 2,700 students and Bayless about 1,500.

The majority of the area is served by the three fire protection districts of Mehlville, Affton, and Lemay. Four smaller districts cover relatively minor portions of the area. The Lemay Fire Protection District covers the northeast section of the area. The Affton Fire Protection District serves an area extending along both sides of Gravois Road between Union Road and Watson Road from Grant Road east of the City of St. Louis limits. The Mehlville Fire Protection District encompasses the remainder of the study area and extends from Grantwood Village south to the Sunset Hills area. None of these three large districts are operated by study-area municipalities.

3.2.2 Activity Centers

Although the study area has limited high-density development and commercial activity, which generally occurs along extended corridors, there are a few areas that can be characterized as distinct activity centers. These are:

- General American Office Park on Tesson Ferry Road in the southwest quadrant of the area below the I-270 / I-255 corridor
- St. Anthony's Medical Center on Tesson Ferry Road in the southwest quadrant of the area below the I-270 / I-255 corridor
- Westfield Shopping Town / South County Center on Lindbergh Boulevard in the geographic center of the study area north of the I-270 / I-255 corridor and the I-55 corridor
- Grant's Farm on Gravois Road in the northwest quadrant of the area
- St. Louis Community College on Lemay Ferry Road on the southern edge of the area near the I-55 corridor
- Area high schools at various locations through the study area mainly to the north of the I-270 / I-255 corridor

3.2.3 Land-Use and Economic Development Issues

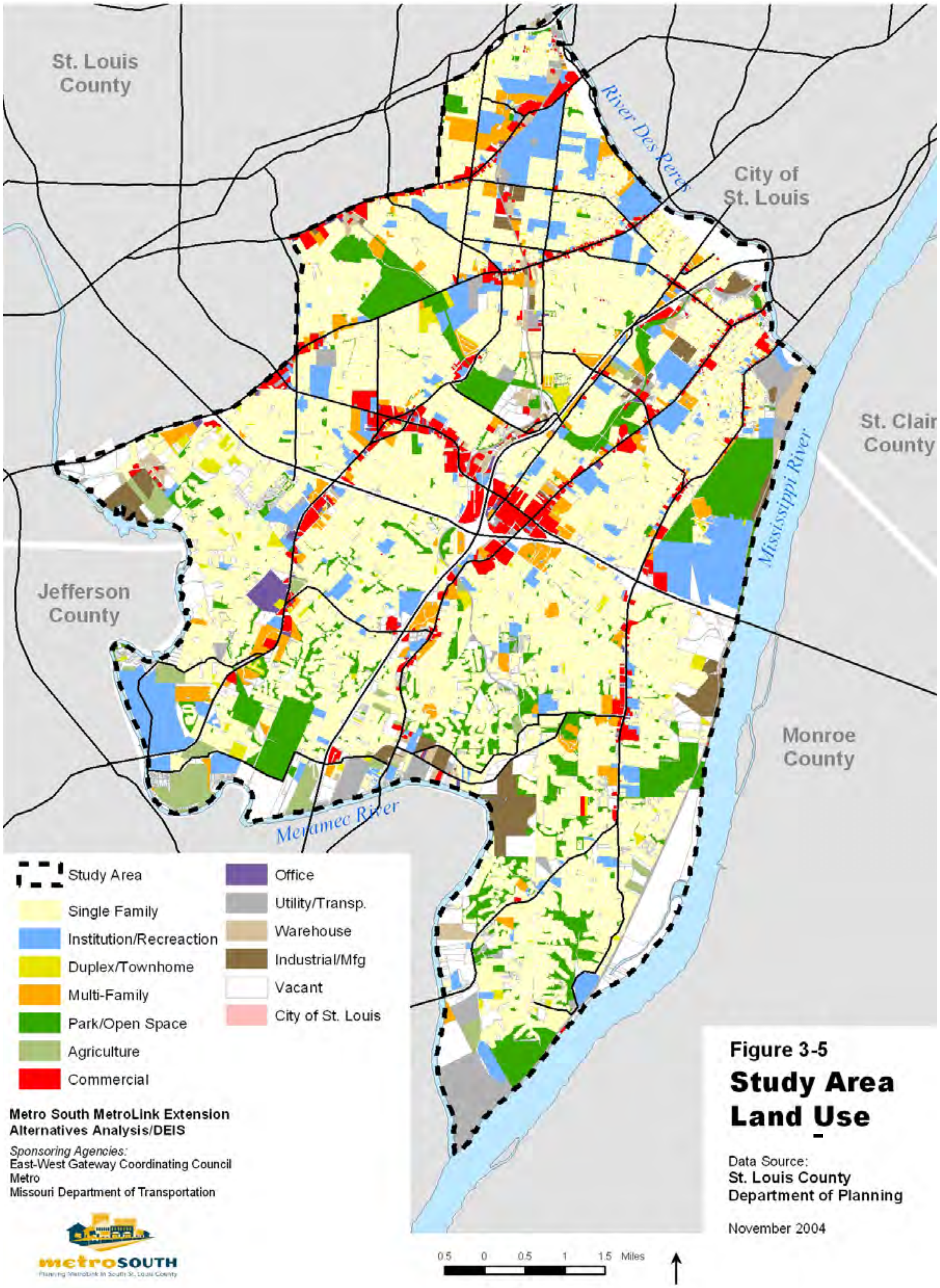
The study area covers 41,000 acres, of which 78 percent have been developed. Of that, approximately 60 percent is residential, 21 percent is non-residential, and 19 percent is in road and utility rights-of-way. An additional 22 percent is either vacant, open space, or dedicated to special-use categories such as agriculture or cemeteries. Table 3-14, "Land-Uses by Type," lists land-uses, their acreages, and percentages of the total study area. Figure 3-5, "Study Area Land-Uses," shows the distribution of these land-uses.

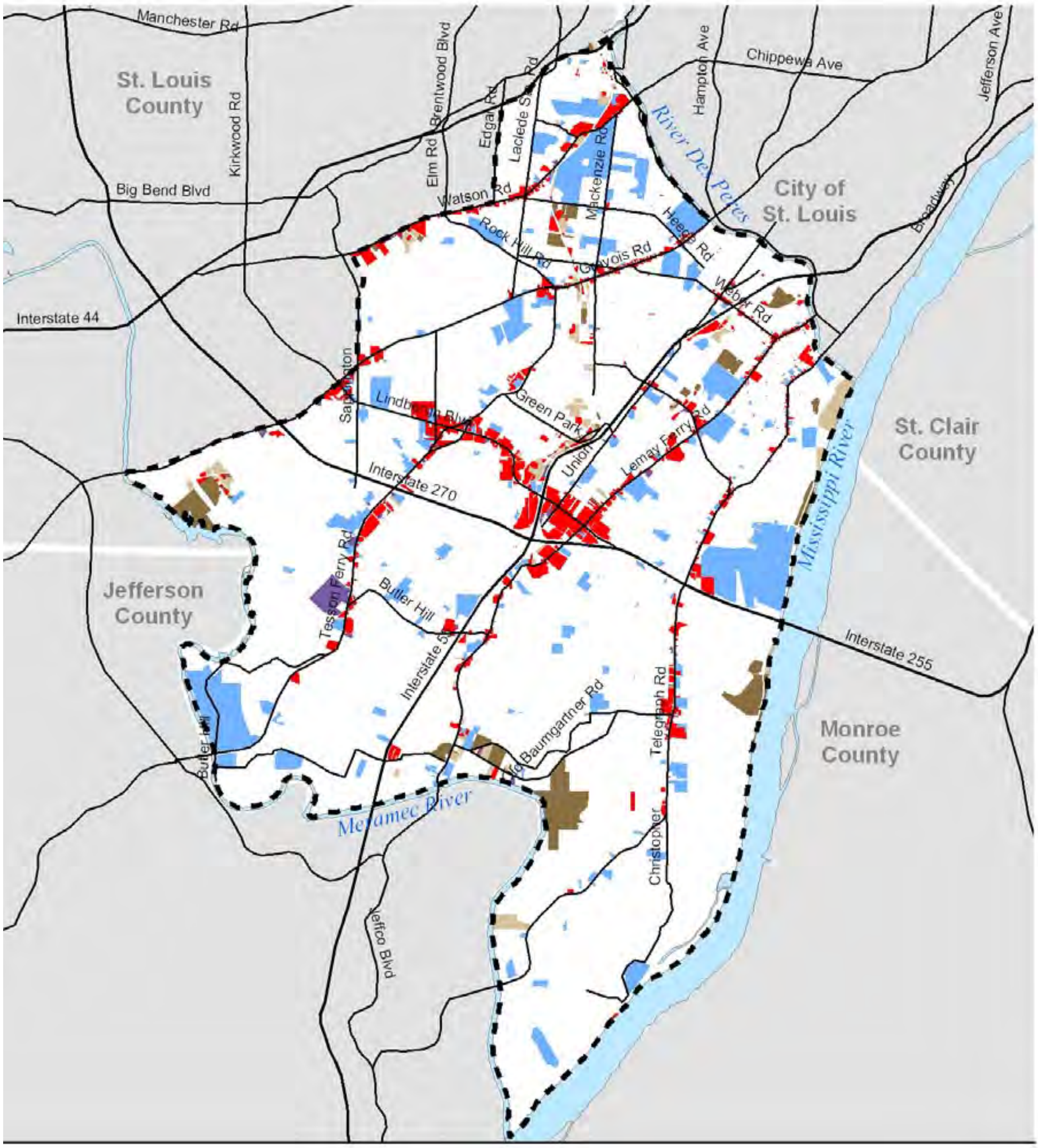
Residential development –in particular, single family detached housing (17,200 acres, or 54 percent of all developed land) – is the dominant land-use in the study area. The multi-family category covers about 1,900 acres (6 percent). The scarcity of other housing types, such as duplexes and townhouses, is apparent (only 455 acres or 1.4 percent). This scarcity of single family attached housing was cited in the Affton Community Plan as a potential barrier to homeownership for young moderate-income households. Such a shortage is apparently typical of the entire study area.

As Figure 3-6, "Employment Related Land-Uses," shows, commercial land tends to be along several key roads. Such commercial development is especially predominant along Lindbergh Boulevard and the roads converging on the Westfield Shoppingtown South County Center near I-55. Gravois Road, Watson Road, Laclede Station Road and much of Tesson Ferry Road near Lindbergh Boulevard are also important commercial corridors.

Table 3-14: Land-Uses By Type

Use Type	Acreage	Share of Developed Acreage	Share of Total Acreage
Residential	**19,115**	**60.1%**	**46.7%**
Single Family	17,203	54.1%	42.0%
Duplex/Townhome	455	1.4%	1.1%
Multi-Family	1,457	4.6%	3.6%
Institutional	**2,336**	**7.3%**	**5.7%**
School	450	1.4%	1.1%
Recreation	711	2.2%	1.7%
Other Institution	1,175	3.7%	2.9%
Industrial	**2,267**	**7.1%**	**5.5%**
Manufacturing	778	2.4%	1.9%
Warehousing	476	1.5%	1.2%
Utilities	855	2.7%	2.1%
Transportation	158	0.5%	0.4%
Commercial	**1,659**	**5.2%**	**4.1%**
Office	190	0.6%	0.5%
Other Commercial	1,469	4.6%	3.6%
Other Developed	**6425**	**20.2%**	**15.7%**
Road/Utility ROW	5933	18.7%	14.5%
Parking	83	0.3%	0.2%
Unknown	409	1.3%	1.0%
Subtotal: Developed Land	**31,802**	**100%**	**77.6%**
Special Categories	**9,155**		**22.4%**
Cemeteries	1,110		2.7%
Park	1,811		4.4%
Common Ground	1,335		3.3%
Agriculture	683		1.7%
Vacant	4,216		10.3%
Grand Total	**40,957**		**100%**


St. Louis County
River Des Peres
City of St. Louis
St. Clair County
Mississippi River
Jefferson County
Monroe County
Meramec River
Study Area
Single Family
Institution/Recreaction
Duplex/Townhome
Multi-Family
Park/Open Space
Agriculture
Commercial
Office
Utility/Transp.
Warehouse
Industrial/Mfg
Vacant
City of St. Louis
Metro South MetroLink Extension
Alternatives Analysis/DEIS
Sponsoring Agencies:
East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation
metroSOUTH
0.5 0 0.5 1 1.5 Miles
Figure 3-5
Study Area Land Use
Data Source:
St. Louis County
Department of Planning
November 2004



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ast-West Gateway Coordinating Council
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metroSOUTH
Planning MetroLink in South St. Louis County

Study Area
Commercial
Office
Institution/Recreaction
Warehouse
Industrial/Mfg

0.5 0 0.5 1 1.5 Miles

Figure 3-6
Employment-Related Land Uses

Data Source:
St. Louis County Department of Planning

November 2004

What is notable within the area is the relatively low proportion of non-commercial, employment uses. About 4,800 acres (15 percent of developed land) are in non-commercial employment uses but, of this total, only 190 acres (0.5 percent of developed land) are in office employment. By comparison, the office category accounts for 1.2 percent of developed land countywide.[13] Other noteworthy overall land-use characteristics of the study area include the number of acres in cemeteries (1,100 or 3 percent) and open space (3,150 acres or 10 percent).

An important characteristic is the lack of significant expanses of vacant, developable land throughout the study area. Only 4,200 acres (13 percent) of the area are classified as vacant in the county land-use database and much of this area may not be developable due to slopes, wetlands, and floodplains. Only 1,671 of these 4,200 acres are in large (more than 20 acres) parcels. Their location is mostly on the periphery of the study area at locations not likely to be served by any of the alternatives.

Farmlands. Table 3-14 shows that less than 2 percent of the land area in the study area is devoted to agricultural use. These farmlands are located at the periphery of the study area (see Figure 3-5), and not in close proximity to any of the alternative alignments, and are unlikely to be affected directly or indirectly by any transportation improvements considered in this study.

Station area land use. Appendix B includes maps of the areas around each of the proposed station sites, including current land uses. The station areas include a mix of residential, commercial, transportation, institutional and other uses. The station area plans in Appendix B also include tables that show the number of residential households and the number of jobs within a half-mile walking distance around each station, for both current conditions and projected (year 2025) conditions.

Current and projected land use is an important consideration when forecasting potential transit ridership, and in evaluating potential secondary effects of new investment in transit services. These issues are discussed in more detail in Chapter IV (Transportation Impacts) and in Chapter V (Environmental Consequences).

3.2.4 Hazardous Waste Sites

The Missouri Department of Natural Resources' Hazardous Waste Program provided a coordinated response concerning the location of hazardous waste

[13] Land-use categories were defined based on land-use codes in the St. Louis County Assessor's database. The database provides relatively few codes for office-type commercial uses.

sites and facilities at or near the Metro South study area. Table 3-15, "Hazardous Waste Sites," shows these locations.

Although the data was compiled by the Missouri Department of Natural Resources, no warranty is made by the department as to the accuracy of the data and related materials. Field investigation of the alignment and station locations associated with the alternatives will determine whether these registered Missouri hazardous waste generator facilities, temporary storage and disposal facilities and tanks, Superfund, Federal Facilities and Voluntary Clean-Up sites are located within affected areas.

3.3 CULTURAL RESOURCES

The description of study area cultural resources consists of sections on 1) historic and archaeological resources, and 2) parklands and recreation and conservation areas. These types of resources may be Section 4(f) and Section 6(f) resources. These are federal statutory terms that encompass areas requiring special protection and including historic sites and publicly-owned parks, recreation areas, and wildlife or waterfowl refuges.

Table 3-15: Hazardous Waste Sites

Site	Address / Location Remarks
Voluntary Clean-Up Sites	
Stupp Brothers	3800 Weber Road
Mid-States Paint	9315 Watson Industrial Park
White Rodgers	9797 Reavis Barracks Road
Costco Wholesale	4245 Bi-State Industrial Drive (I-270 and 55)
Muelfarth Auto Salvage	238 E. Arlee Avenue
La Petit Academy	111 Cliff Cave Road
Temporary Storage and Disposal Facilities	
Ashland Chemical	7710 Polk St., St. Louis, MO 63111
Astaris LLC (Carondolet)	8201 Idaho Ave., St. Louis, MO 63111
St. Louis Shipping	611 Marceau, St. Louis, MO 63111
Superfund Sites	
Shrewsbury FMGP	4118 Shrewsbury Ave. at I-44
Federal Facilities	
Jefferson Barracks Air National Guard Base and Post Dumping Grounds	This is located approximately 12 miles south of downtown St. Louis, in St. Louis County, Missouri. It is bounded to the north by Kingston Road, and to the east by the Mississippi River.

3.3.1 Historic and Archeological Resources

A state search of the National Register of Historic Places was performed for St. Louis County and the City of St. Louis. Table 3-16, "Historic Sites," lists those sites found within the Metro South study area. Figure 3-7, "National Register of Historic Places," identifies the locations of these sites within the study area**.**

The majority of the historic sites lie around the edges of the area and are unlikely to be affected by any of the alternatives. The alternative closest to an historic site appears to be that of the orange alternative along the northerly border of the study area and the Louis Auguste Benoist House. Field investigations of the alignment and station locations of the alternatives will determine whether these historic sites are located within affected areas.

Federal law (the National Historic Preservation Act and Section 4(f) of the Department of Transportation Act) protects not only properties that are listed on the National Register of Historic Places, but also those places that are eligible for listing on the Register. Any site or building that is closely associated with an important event or person in American history, and certain buildings more than 50 years old that preserve a distinctive architectural style are eligible. Industrial sites, historic districts and archaeological sites may also be eligible for listing.

Regulations implementing the National Historic Preservation Act (NHPA) establish procedures for determining whether properties are eligible for the National Register, and procedures for coordinating with state historic preservation officials on such determinations and procedures for minimizing or mitigating any impact to historic or archaeological sites. These procedures, developed under Section 106 of NHPA, include:

- Determining the area of potential effect around the proposed project, based on direct property takings, and the negative impacts of noise, visual (setting) impacts, traffic, and changes in access.

- Within the area of potential effect, inventory all buildings and sites that may be eligible for listing on the Register. For each site, determine whether the property is eligible for listing, using rules developed by the Department of the Interior.

- For each property found to be eligible for listing, assess the significance of any potential impacts to determine whether there is an "adverse effect."

- With historic preservation officials, assess whether it is feasible to avoid the adverse effect, to minimize the magnitude of the effect, or otherwise mitigate the adverse effect.

- In many cases, the coordinating parties will develop a memorandum of agreement describing procedures and methods that will be used to avoid, minimize or mitigate historic impacts.

The historic inventory and eligibility determinations can only be made for the selected alternative (proposed action), which will not be identified until after completion of this DEIS. For these reasons, the Section 106 process is usually conducted through the preliminary engineering and final design phases of the project. Any adverse effects (or efforts required to avoid such effects) will be reported in the Final EIS for this project.

3.3.2 Parklands and Conservation Areas

Parklands enjoy special federal projection under Section 4(f) of the Department of Transportation Act and in some cases by Section 6(f) of the Land and Water Conservation Act. These protections are further described in Chapter 7, Section 4(f) Analysis.

Table 3-16: Historic Sites

Name	Address	Location
Alswell	98 Alswell Circle	Sunset Hills Vicinity
Jefferson Barracks Historic District	Lindbergh, Telegraph, and Broadway	10 mi. S of St. Louis
Jefferson Barracks National Cemetery	2900 Sheridan Rd.	Mehlville
Joseph Sappington House	10734 Clearwater Dr.	Affton
Louis Auguste Benoist House	7802 Genesta St.	Affton
Robert Koch Hospital	4101 Koch Rd.	Oakville Vicinity
White Haven	9060 Whitehaven Dr.	Grantwood Village
William Long Log House	9385 Pardee Rd.	Crestwood

As shown on Figure 3-8, “Parks,” the Metro South study area includes a large number of St. Louis County and City of St. Louis parks. Of the county’s 72 park sites, 22 (30 percent) totaling 2,133 acres are located in the area. They range in size from Gravois Creek Park (less than one acre) to Jefferson Barracks Park with 425 acres. In addition to Jefferson Barracks, there are six other large parks that exceed 100 acres. Future parkland expansion within the study area includes the development of the Lower Meramec Linear Park, eastward along the Meramec River, and the expansion of Grant's Trail.

Parkland within the area that is under the control of the City of St. Louis includes the River Des Peres Park, along the south side of the river, and the Cyrus Crane Willmore Park, on the north side of the river.

In addition, there are three conservation areas within the study area noted by the Missouri Department of Conservation. These one-acre sites are generally fishing lakes affiliated with identified parklands: Bee Tree Lake (Bee Tree Park), Suson Park Lakes and the Gravois Creek Conservation Area along the easternmost end of Grant's Trail. A list of St. Louis County and City of St. Louis parks is in Table 3-17, "Parklands."

3.4 Natural Resources

The description of study area natural resources consists of sections on 1) air quality, 2) noise and vibration, 3) wildlife resources, 4) water resources like wetlands and floodplains, and 5) geologic and soil resources.

3.4.1 Air Quality

The Federal Clean Air Act Amendments (CAAA) of 1990 directs the EPA to implement strong environmental policies and regulations that would ensure cleaner air quality. "Primary" standards have been established to protect the public health, while "Secondary" standards are intended to protect the nation's welfare, and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare. According to Title 1, Section 101, Paragraph F of the Amendments, "No federal agency may approve, accept or fund any transportation plan, program or project unless such plan, program or project has been found to conform to the applicable State Implementation Plan (SIP) in effect under this act."

On May 12, 2003, the St. Louis Metropolitan area met the then current federal standards for ozone pollution. However, in 2004, the region will be subject to tighter ozone standards that the region, currently, would not meet. Since mobile sources are the single highest source of volatile organic compounds (VOCs) contributing to the region's air quality challenges, any enhancements to the region's transportation system that could potentially reduce the vehicle miles traveled (VMT) are of interest. All transportation improvement alternatives must be subject to an air quality analysis and conformity determination as required by the Federal Clean Air Act Amendments of 1990. This analysis

Metro South MetroLink Extension
Alternatives Analysis/DEIS

Sponsoring Agencies

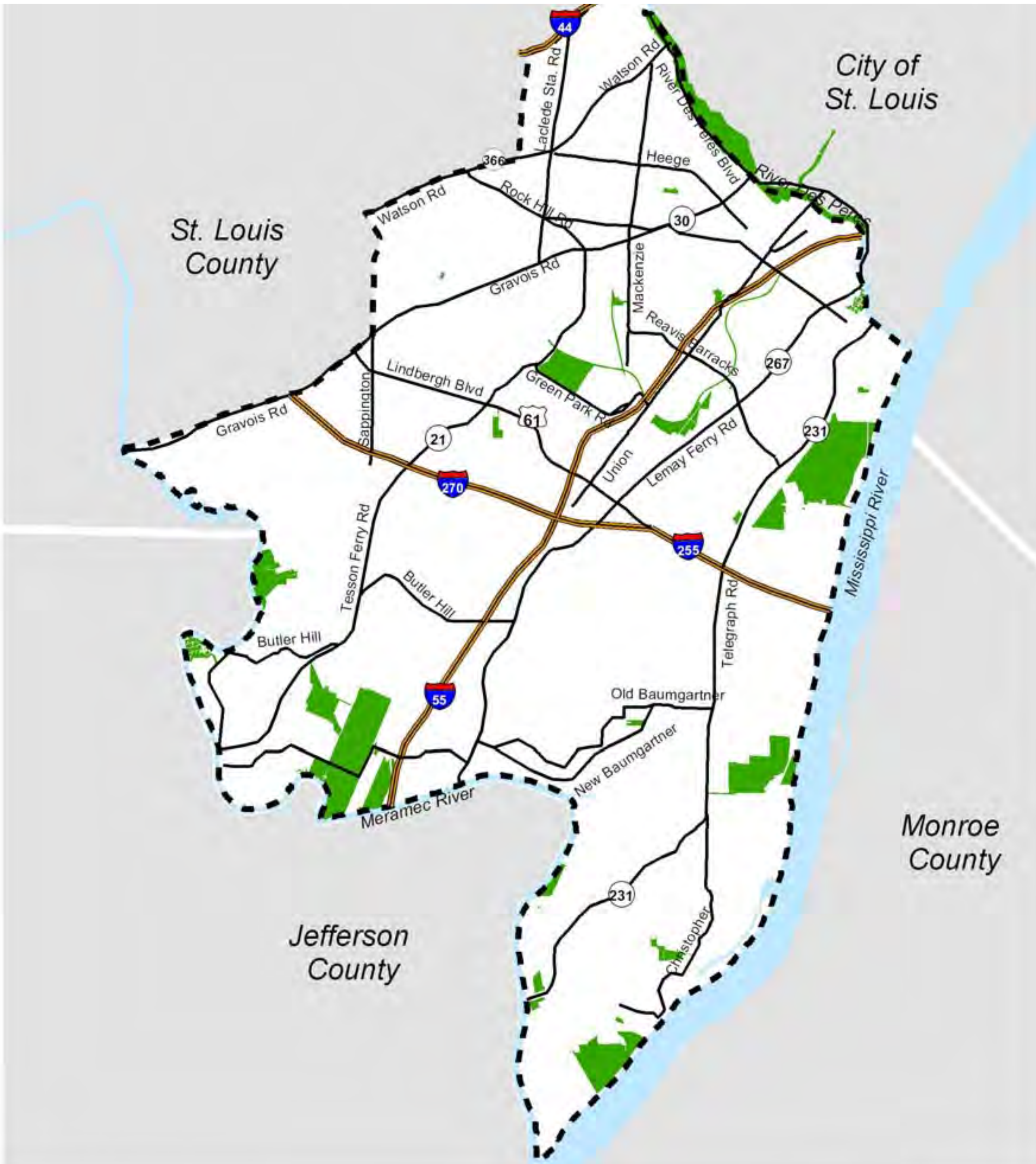
East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation

metroSOUTH

Figure 3-7
National Register of Historic Places

Data Source:
East-West Gateway Coordinating Council

Date: November 2004



Metro South MetroLink Extension
Alternatives Analysis/DEIS

Sponsoring Agencies

East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation

metroSOUTH

Study Area
Rivers
Park
Interstate
Major Roadway
4f Park Number
6f/4f Park Number

0 0.25 0.5 1 1.5 2 Miles

Figure 3-8
Parks

Data Source:
St. Louis County Department of Planning

Date: November 2004

must demonstrate that the transportation improvement alternatives do not adversely affect attainment of the National Ambient Air Quality Standards (NAAQS) for the region and the study area, or they cannot be implemented.

3.4.2 Noise and Vibration

In accordance with FTA guidelines, consideration must be given to minimizing the noise impacts of a transportation project. FTA criteria for whether the increase in noise levels is objectionable depend on the level of transit noise relative to existing community noise levels, and on the noise sensitivity of the land-uses located near the project site.

FTA analysis procedures recognize certain classes of land-use as being sensitive to the kind of noise and vibration impacts that might result from transit projects. One such class includes places where people sleep at night, and therefore exhibit a particular nighttime sensitivity. This class includes houses, apartments, hospitals, dormitories, hotels and similar uses. Residences make up the bulk of the study-area land-use. A second class includes activities that are sensitive to daytime noise, such as libraries, schools, and churches, and in some cases cemeteries, lecture halls, and conference centers. Certain medical or manufacturing processes may be particularly sensitive to vibration impacts. Because of the large numbers of sensitive properties over the study area, FTA procedures call for identification of noise-sensitive properties in relationship to their proximity to the transportation alternatives under study. These properties will be identified in noise and vibration sections of Chapter 5, "Environmental Consequences."

3.4.3 Wildlife Resources

Wildlife resources include all species of animals that may exist in the study area, along with vegetation and other habitat characteristics. Of particular concern are threatened, endangered, or sensitive species. Impacts to endangered or threatened species are regulated under Section 7 of the Endangered Species Act of 1973, as amended (16 USC 1531 *et seq.*). This statute provides for the conservation of endangered and threatened species of fish, wildlife, plants, and the critical habitat in which they live.

Except for records in the Meramec and Mississippi Rivers, there are no rare/endangered/threatened/candidate species within the study area. Below is a list of current heritage records in or near the study area. All listed species are in the Meramec or Mississippi Rivers.

- Pink Mucket
- Scaleshell

- Sheepnose
- Spectaclecase
- Elephantear
- Ebonyshell
- Brown Bullhead
- Black Sandshell
- Rock Pocketbook
- Ghost Shiner
- Mississippi Silvery Minno
- Hickorynut
- Mesic bottomland forest
- Purple Loosestrife
- Garlic Mustard
- Enigmatic Cavesnail
- A Marsh Elder

3.4.4 Water Resources

1) Wetlands

The protection of wetlands is required under Section 404 the Clean Water Act and by Executive Order 11990. The study area is located within the watershed of the Mississippi and Meramec Rivers. The highest concentration of wetland areas lies along the Meramec River. There is another concentration of wetland areas just west of the Mississippi River, east of the Union Pacific railroad tracks, near Christopher Road. Along Gravois Creek, which parallels the old Missouri Pacific Railroad right-of-way, the wetlands are predominantly near Green Park, as well as in the area between Union Road and Lemay Ferry Road. These wetlands, as well as other less notable wetland areas, are shown on Figure 3-9, "Wetlands."

2) Floodplains

The Federal Emergency Management Agency (FEMA) requires floodways to be designated to identify those areas where development should be avoided to prevent increasing upstream flood elevations. Development of these floodways is restricted by federal regulations and would be prohibited if the development would impact the flood levels by more than one foot over the existing flood levels.

The one-hundred-year and five-hundred-year floodplains that FEMA has identified within the Metro South study area are illustrated on Figure 3-10, "Floodplains: 100 & 500 Year." The most significant floodplain areas are those along the Meramec River and the floodplain along the Mississippi River, located just south of River Des Peres and north of Jefferson Barracks

County Park, and south of Cliff Cave County Park in the Oakville area. Other prominent floodplain areas are located along Gravois Creek and along River Des Peres between Gravois Creek and the Mississippi River. The most significant creek-related floodplain south of Interstate 255 is the Mattese Creek floodplain, along which the Burlington Northern Railroad right-of-way runs.

3.4.5 Geologic and Soil Resources

Rolling topography, hills and the occasional deep ravines characterize the Metro South study area. Theses landforms are illustrated by the slope analysis in Figure 3-11, "Slope Analysis." Relatively steep bluffs at the eastern edge of the study area define the line between the alluvial plain of the Mississippi River Valley and the rolling hills to the west. The southern part of the study area includes the alluvial plain of the Meramec River that is bordered by steep hills and some bluffs.

In general, sequential beds of Pennsylvania age shale, sandstones, siltstones, and limestone with seams of coal and clay typify the Metro South study area. Two layers of glacially derived loess overlie the bedrock. The upper Peoria loess is relatively thin low-clay silt and has Roxana loess below. Some challenging geological characteristics to note include beds of shale and the alluvial materials in the Mississippi River Valley. The alluvium in the valley is over 100 feet thick and consists of stratified sand, silt and clay with beds of gravel and lenses of organic material.

Another feature of note is the karst plain, which is primarily located between Jefferson Barracks County Park on the north, the Mississippi River on the east, and Telegraph Road and Christopher Drive on the west, as shown on Figure 3-12, "Karst Topography." The karst plain contains sinkholes and has limited stormwater drainage, which, together, present challenges for transportation improvements.

Metro South MetroLink Extension
Alternatives Analysis/DEIS

Sponsoring Agencies

East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation

metroSOUTH
Planning MetroLink in South St. Louis County

- Study Area
- Interstate
- Major Roadway
- Rivers
- Wetland

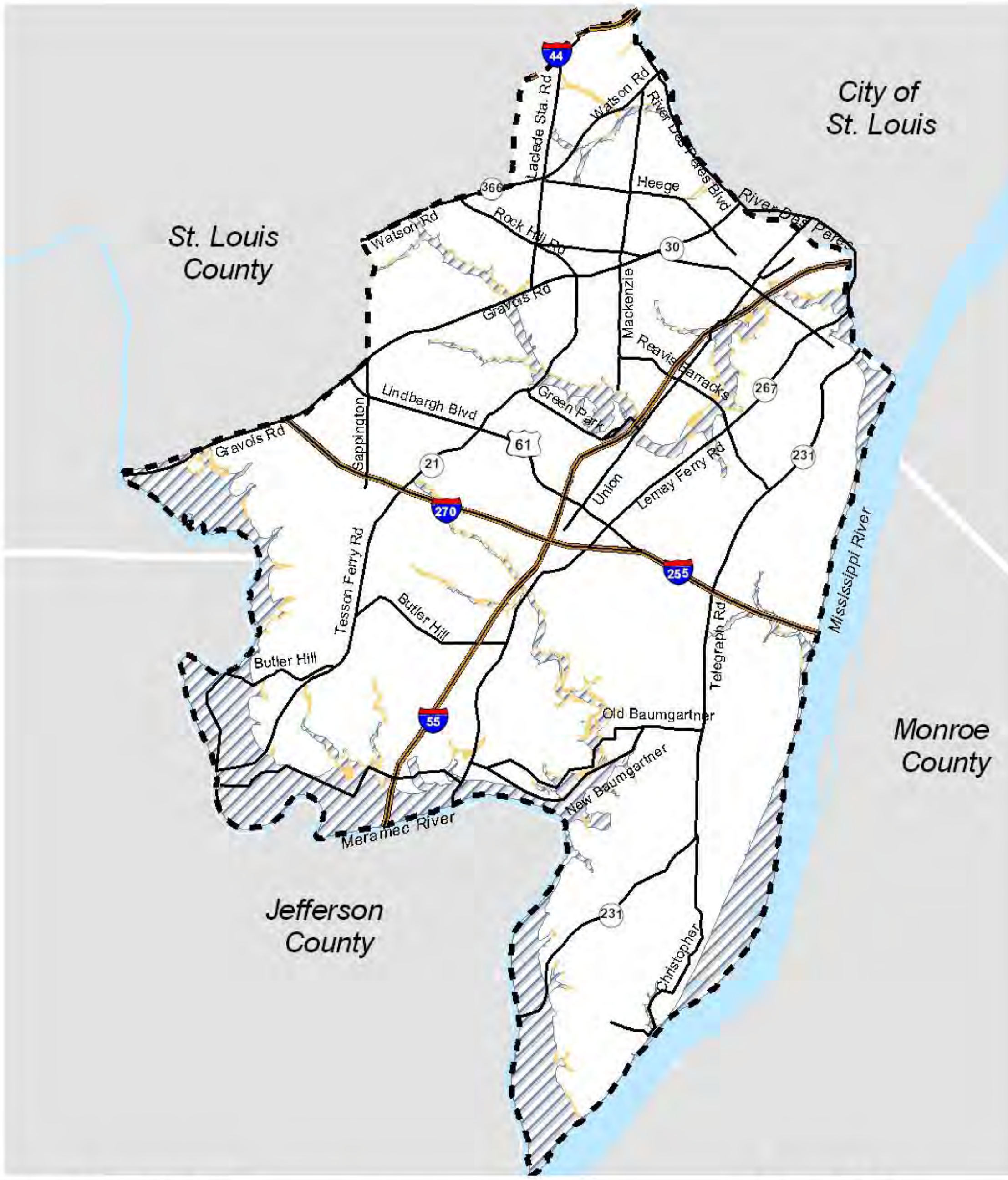
0 0.25 0.5 1 1.5 2 Miles

Figure 3-9

Wetlands

Data Source:
St. Louis County Department of Planning

Date: November 2004



Metro South MetroLink Extension
Alternatives Analysis/DEIS

Sponsoring Agencies

East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation

metroSOUTH
Planning MetroLink in South St. Louis County

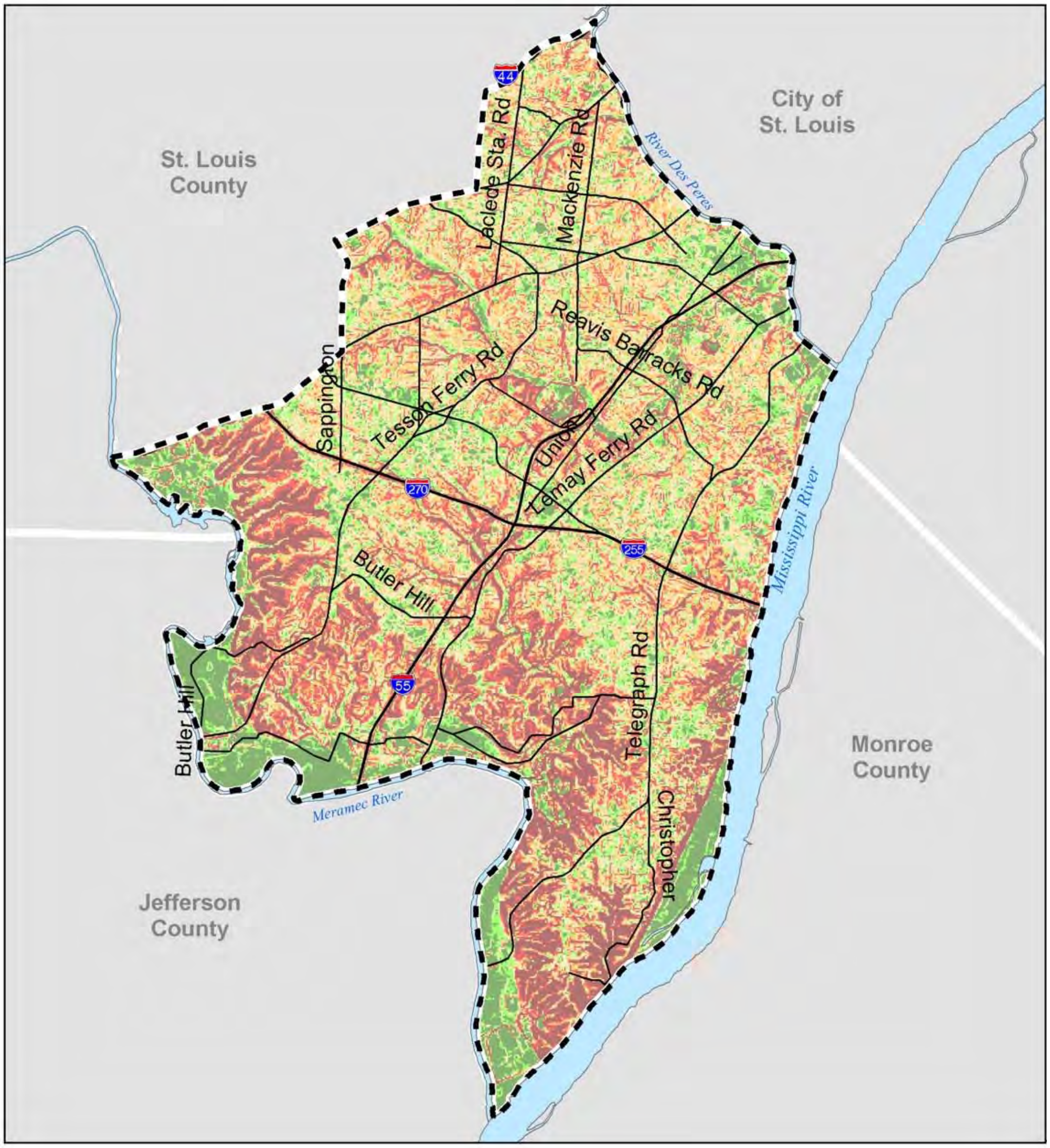
Interstate
Major Roadway
Rivers
FEMA100
FEMA500
Study Area

0 0.25 0.5 1 1.5 2 Miles

Figure 3-10
Floodplains:
100 & 500-Year

Data Source:
St. Louis County
Department of Planning

Date: November 2004



Metro South MetroLink Extension
Alternatives Analysis/DEIS

Sponsoring Agencies:

East-West Gateway Coordinating Council
Metro
Missouri Department of Transportation

metroSOUTH
Planning MetroLink in South St. Louis County

Legend
0 - 1.49%
1.5 - 3.49%
3.50 - 4.0%
4.1 - 7.0%
7.1 - 9.9%
10 - 14.9%
Over 15 % Slope

0 0.5 1 2 Miles

Figure 3-11

Slope Analysis

Data Source:
St. Louis County Department of Planning

Date: November 2004

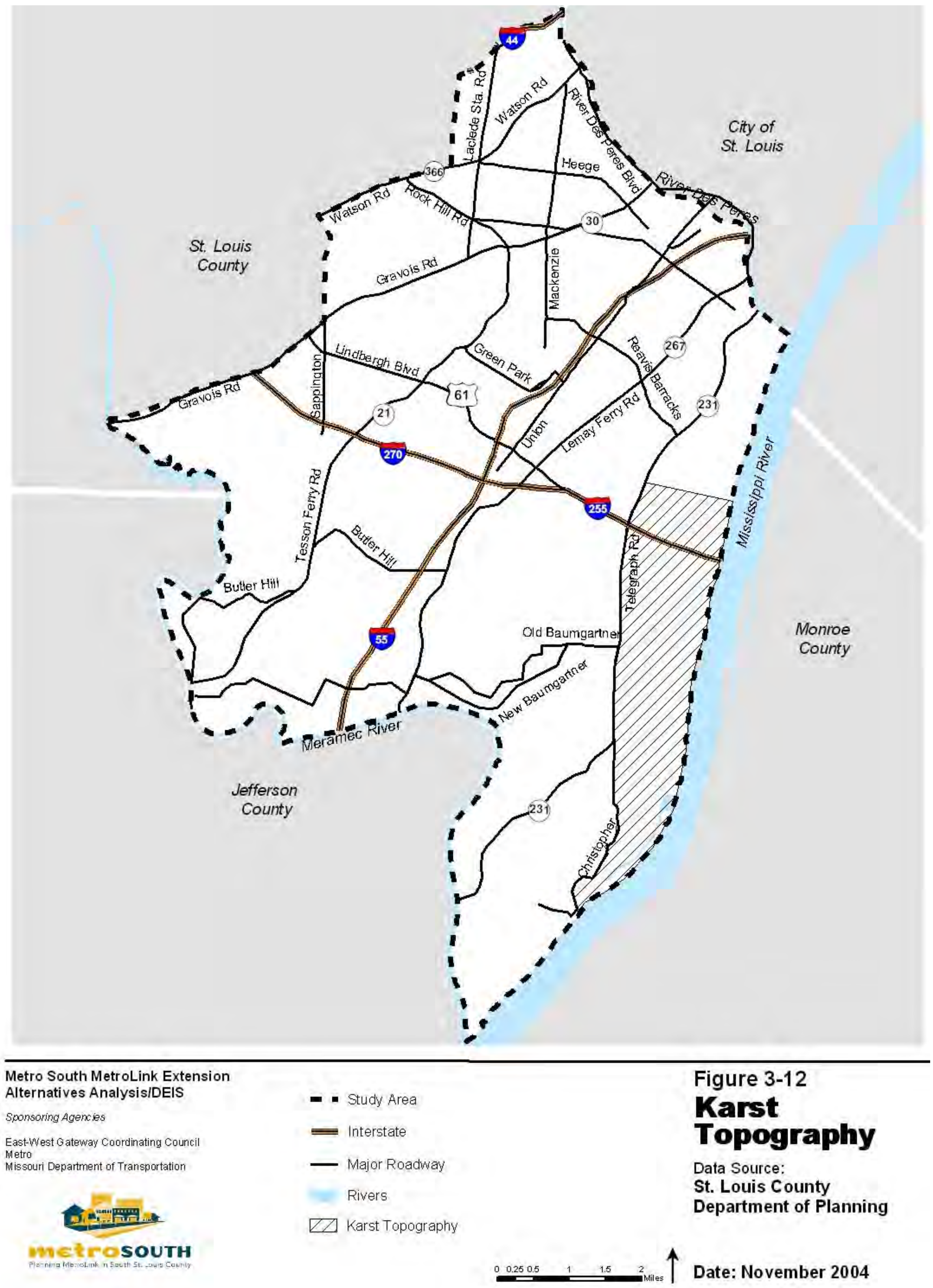


Figure 3-12
Karst Topography

Data Source:
St. Louis County Department of Planning

Date: November 2004

4.0 TRANSPORTATION IMPACTS

This chapter presents a discussion of the transportation impacts that are anticipated to result from each of the alternatives. The first section is the forecast of the transit ridership that is predicted to result from the introduction of light rail transit into the study area. The second section identifies the travel time savings that would result from implementing each of the alternatives, one of the principal measures of transportation system benefits. The third section is a discussion of light rail transit ridership and land-use recognizing the interaction that may take place as development and land-use policies adapt to take advantage of transit improvements. The fourth section is a description of the local traffic impacts of light rail transit. These impacts will occur as a result of traffic activity at new stations and traffic interruptions where the light rail transit lines cross roadways at-grade. More detailed descriptions of the methodology that was used to produce the ridership and transportation impacts analysis is included as Appendix D.

4.1 RIDERSHIP FORECASTS

4.1.1 Travel Demand Models

Introduction

Transportation planners produce estimates of future-year transit ridership (also called ridership "projections" or "forecasts") using mathematical models. These models are complex systems of formulas that relate the number of trips made and travel choices to variables such as population, travel time and costs. The formulas have been developed based upon many years of research into travel behavior. Much of this research was sponsored or supported by the U.S. Department of Transportation. The Federal Transit Administration (FTA) and the Federal Highway Administration continue to play an important role in establishing the standards for conducting travel analysis on federally-funded projects.

This section presents a general overview of the travel forecasting process in relatively non-technical terms, with the intent that the average reader (with no training in transportation planning techniques) can understand the origins of the ridership and user benefit numbers, and the input factors that affect those forecasts.

The EWGCOG Regional Travel Demand Model

FTA regulations and guidelines require that the ridership forecasts for a major capital project such as the Metro South study be developed in a manner consistent with official regional transportation planning. In the St. Louis metropolitan area, regional transportation planning is done by EWGCOG, working in cooperation with Metro and the Missouri and Illinois Departments of Transportation. EWGCOG maintains the travel demand forecasting models for the region, and develops the forecasts of population and employment that are key inputs into these models. These models are used to develop the long-range transportation plans for the region and are updated to reflect new data, such as U.S. Census data and changes in the transportation system.

The EWGCOG travel models include a subset of models that are specifically designed to forecast transit system ridership changes. These models are used for major transportation corridor studies that involve transit system improvements. For the Metro South study, these models were tested and adjusted to ensure that they could accurately describe current travel conditions in the Metro South corridor. Even with these adjustments, the models use travel data and population and employment forecasts that are consistent with those used for regional transportation planning purposes. All Metro South forecasts use a base year of 2005, with a long-range forecast year of 2025.[1]

The EWGCOG models follow a general structure that is standard across the country. While the structure is standard, the actual coefficients used in the formulas were developed to replicate travel decisions made by St. Louis area travelers, evidenced by travel surveys, census data, and traffic counts. This model structure is often called the "four-step" travel analysis model, because it can be broken into four distinct and sequential modeling processes: a) trip generation, b) trip distribution, c) mode choice, and d) network assignment. These steps are described further below:

Trip Generation: Trip generation is an estimate of the number of person trips produced in or attracted to each part of the metropolitan area.[2] Within each traffic zone, the number of trips produced is determined based on inputs such as the number of households of a particular size or the number of jobs located there. The person trips generated are organized by trip purpose, such as home-to-work trips and home-to-shopping. The trip generation rates used in the model were determined based on surveys and other data that reflect actual travel behavior in the St. Louis area. The trip purposes modeled fall into four general categories:

[1] The forecasts were done during 2004, so the 2005 conditions represent a short-term projection of population and other conditions.
[2] The metropolitan area is divided into hundreds of traffic zones for this analysis.

- Home-based trips for work (one end of the trip is a home, the other end is the work location),
- Home-based trips for all other purposes (one end of the trip is home, the other end is a shopping center, medical office, school, or other destination),
- Non-home-based trips (neither end of the trip is a home), and
- Commercial trips (taxi, limo, other trips not by transit or personal vehicle). Truck trips that are made to pick up or deliver freight or for similar purposes are not modeled as person trips, but instead are dealt with separately as part of the highway models.

Trip generation for the Metro South analysis is based on EWGCOG's regional trip generation rates and land-use forecasts. These inputs were adjusted only where necessary to account for known changes in development that could significantly affect travel patterns.

Table 4-1, "Projected Trip Generation, 2005 and 2025," shows the estimated number of trips generated each weekday in the St. Louis metropolitan area in the base and forecast years.

Table 4-1: Projected Trip Generation, 2005 and 2025
Average weekday person trips, entire metropolitan area

Trip Categories	Number of Trips		Change, 2005-2025
	2005	2025	
Home Based Trips to Work	2,278,500	2,343,000	+3%
Home Based Trips for All Other Purposes	3,027,200	3,732,800	+23%
Non Home Based Trips	1,870,400	2,423,800	+30%
Subtotal (Person Trips)	7,176,100	8,499,600	+18%
Commercial Vehicle Trips	873,600	not est.	
Total	8,049,700	n/a	n/a

Source: Manuel Padron & Associates, Metro South 2025 Ridership Forecasting and Methodology Report" June 2004. Figures are rounded.

Trip Distribution: In the second step of the process, the trips generated (produced) in each traffic zone are distributed among all of the potential destination (attraction) zones. This model step is often called a "gravity model" because the form of the mathematical equation is similar to that used to calculate the attraction of gravity between heavenly bodies. That is, trips are distributed to each possible destination according to its relative attractiveness and are inversely proportioned to the distance between them.

For example, the number of home-based-work trips produced in Zone A is related to the number of households there. These home-based-work trips would be distributed to attraction (destination) zones in roughly proportion to the number of jobs in each zone, and in inverse proportion to the travel time from Zone A to the attraction zone. The coefficients of the formula used are based on actual travel patterns in the St. Louis area.

The trip distribution process follows the EWGCOG regional model, except that the model uses the trip generation inputs to reflect local changes, as described above. Table 4-2, “Destination of Trips from St. Louis County, 2005” shows the overall distribution of trips produced (generally, the home end of the trip) in St. Louis County, to all other counties and the City of St. Louis. Similarly, Table 4-3, “Origin of Trips into St. Louis County, 2005” shows trips into St. Louis County from other parts of the region.

Table 4-2: Destination of Trips from St. Louis County, 2005
(production end of trip in St. Louis County)

	Trip Attraction (Destination)	Weekday Trips	Share
1	Within St. Louis County	756,400	75%
2	To St. Louis City	189,700	19%
3	To St. Charles County	22,600	2%
4	To Jefferson County	12,300	1%
5	To Madison County	11,000	1%
6	To St. Clair County	7,700	1%
7	To Franklin County	2,600	<1%
8	To Monroe County	1,300	<1%
Total		1,003,600	100%

Source: Manuel Padron & Associates, “MetroSouth 2025 Ridership Forecasting and Methodology Report,” June 2004

Table 4-3: Origin of Trips into St. Louis County, 2005
(attraction end of trip in St. Louis County)

	Trip Production (Origin)	Weekday Trips	Share
1	Within St. Louis County	756,400	71%
2	From St. Charles County	96,900	9%
3	From St. Louis City	85,700	8%
4	From Jefferson County	63,300	6%
5	From Madison County	29,100	3%
6	From St. Clair County	22,800	2%
7	From Franklin County	12,800	1%
8	From Monroe County	5,600	<1%
Total		1,072,600	100%

Source: Manuel Padron & Associates ,"Metro South 2025 Ridership Forecasting and Methodology Report," June 2004

Mode Choice: The previous steps result in a set of trip tables that show the number of people traveling from each travel zone to all other travel zones for a particular trip purpose. Mode choice models predict how many travelers in each case will choose to take transit or will choose to drive. The EWGCOG mode choice model breaks the choices down further – for example, transit riders are further divided into those who:

- walk to a bus stop to take local bus service, with possible transfer to other transit services ("walk to local")
- walk to a MetroLink or other "premium," limited-stop, separate-guideway transit service or station ("walk to premium")
- drive to a MetroLink or other premium service transit station ("drive to station")

Automobile trips are similarly divided into drive alone, 2-person carpool, and 3-or-more-person carpool. This subdivision of the major modes is done through a modeling process called "nesting" of mode choice models.

The model projects the choice among available modes based on characteristics of the travel choices – such as travel time and cost – and characteristics of the traveler – such as income. There are different model coefficients for each trip purpose.

The mode-choice analysis requires the calculation of the "best" transit path from each origin zone to each destination zone. The best path is determined by searching through the computer representation of the transit network to find the path that is most attractive in terms of travel time and cost, and which corresponds to the transit sub-mode in question (starts with a walk to local transit service, for example). For this analysis, different parts of the trip may be weighted differently: time spent waiting for a bus to arrive, for example, is perceived as less attractive than time spent traveling on the bus. This process of building up transit routings from one zone to another is sometimes called "tree skimming" or "network skimming."

Table 4-4, "Mode Distribution of Trips, 2005 and 2025," shows the total number of person trips, and the proportion of trips, made by each mode in the 2005 base year and the 2025 projection year. The 2025 projection includes the MetroLink extension that is now under construction to the Shrewsbury-Lansdowne I-44 station, but no further extension into the Metro South area. The transit trips that are shown in Table 4-4 are "linked trips." That is, a single transit trip from the origin zone to the destination zone may involve several transit links – with one or more bus-to-bus or bus-to-rail transfers. Therefore, there may be several transit vehicle boardings, but only a single overall "trip."

Table 4-4: Mode Distribution of Trips, 2000 and 2025
Average weekday person trips, entire metropolitan area, all trip purposes

Trip Mode	**2000 Trips**		**2025 Trips**	
	Number	**Percent**	**Number**	**Percent**
Auto: Drive Alone	4,023,400	59.9%	4,900,000	57.6%
Auto, shared ride: 2-person	1,444,200	21.5%	1,897,000	22.3%
Auto, shared ride: 3+-person	1,127,500	16.8%	1,549,200	18.2%
Subtotal (person trips by auto)	**6,595,100**	**98.2%**	**8,346,200**	**98.2%**
Transit: Walk to local service	90,500	1.3%	95,900	1.1%
Transit: Walk to premium service	14,800	0.2%	23,700	0.3%
Transit: Drive to station	13,600	0.2%	33,500	0.4%
Subtotal (person trips by transit)	**118,900**	**1.8%**	**153,100**	**1.8%**
TOTAL	**6,714,000**		**8,500,000**	

Source: Manuel Padron & Associates, "MetroSouth 2025 Ridership Forecasting and Methodology Report," June 2004 (2005 trips not available for this analysis)

Network Assignment: For transit ridership forecasting, the assignment process is relatively straightforward. The transit trips that result from the mode share analysis are assigned to the "best" transit paths (calculated for the mode share analysis). Trips from all over the metropolitan area are combined, and the transportation analyst can then determine the volume of riders on each link of the transit system and the number of boardings at each point. The results of this analysis are discussed in Section 4.1.2.

The transit assignment process reflects the specific service limits designed into the transit system. This means, for example, that if a station does not provide parking spaces, no park-and-ride users will be assigned to that station. Walk access to stations will likewise be limited to those origin zones within a reasonable walking distance (approximately one-half mile).

4.1.2 Transit Ridership Measures

Change in total systemwide transit trips

This measure is important because it indicates how each transportation alternative achieves certain transportation and environmental objectives. This measure shows the degree to which the alternative causes a shift of trips from automobile to transit. The reduction in the number or length of automobile trips contributes to transportation and environmental goals by reducing congestion on area highways, reducing automobile-related air pollution, and reducing the amount of space required for parking lots or parking structures.

The transit-trips measure looks at the total number of origin-destination trips made by transit, as defined in the mode-share model discussed above, for each alternative. That is, transit trips include walk-to-local-transit, walk-to-premium-transit, and drive-to-station-transit, and exclude automobile and shared-ride trips. The transit trips for each alternative are then compared to the transit trips for the Transportation System Management (TSM) alternative.

These transit trips are called "linked trips" because they count the entire origin-destination journey as one trip, perhaps made up of several links (for example, walk, bus, MetroLink, walk again). If a trip contains several transit links, there may be several "boardings." Each time the traveler gets on a new transit vehicle, he or she is counted as a boarding.

FTA rules require that the TSM alternative usually be used as the basis for comparison of transit ridership. The TSM Alternative consists of mobility improvements that attempt to serve the study Purpose and Need without constructing a fixed transit guideway. Use of this base provides a more equitable comparison of the benefits of the Metro South study with all of the other transit improvement projects across the country that are competing for federal transit funding.

It is noteworthy that a traveler who shifts his mode of travel from bus (in the hypothetical TSM case) to MetroLink (with one of the Build alternatives) is not counted as a new transit trip under this measure. These trips will be documented in the MetroLink boardings measure, and any travel time benefits will be captured in the travel time savings measure (both discussed below).

Table 4-5, "Systemwide Linked Transit Person Trips," shows the systemwide transit ridership (linked trips) for each Metro South alternative. These ridership figures are further divided by trip purpose.

Table 4-5: Systemwide Linked Transit Person Trips

Weekday linked trips

Alternatives	**HB Work**	**HB Non-Work**	**Non-HB**	**Total**
No Build	61,500	56,400	34,300	**152,200**
TSM	61,900	56,600	34,500	**153,000**
Purple	61,800	56,500	34,400	**152,700**
Change from TSM	*0*	*-100*	*-100*	***-200***
Blue [1] (Watson)	61,800	56,500	34,400	**152,700**
Change from TSM	*0*	*-100*	*-100*	***-200***
Blue (Butler Hill)	65,500	59,400	35,300	**160,200**
Change from TSM	*3,600*	*2,800*	*800*	***7,200***
Orange (Butler Hill)	65,200	59,600	35,500	**160,300**
Change from TSM	*3,300*	*3,000*	*1,000*	***7,300***
Orange (Reavis Barracks)	64,600	58,800	35,100	**158,500**
Change from TSM	*2,700*	*2,200*	*600*	***5,500***

LRT running times for the Blue Alignment to Watson station is within 30 seconds of the Purple Alignment. Hence, it was not modeled and the reported results are taken from the Purple Alternative. All figures rounded after totaling

Table 4-5 shows that the systemwide transit ridership is projected to decline slightly with the Purple and Blue Watson alternatives, compared to the TSM. These declines are likely due to bus reroutings to serve rail stations under these alternatives, which may negatively affect certain trips to destinations on the old routing. These affects are largely offset by benefits to other riders, and the slight negative balance is not considered to be significant.

The two alternatives that provide new light rail service all the way to Butler Hill (Orange Butler Hill and Blue Butler Hill) result in the greatest increase in systemwide transit ridership. While there is no significant difference in the overall ridership between these two alternatives, the Blue alternative attracts more home-to-work trips, and the Orange serves more non-work and non-home-based trips.

MetroLink Boardings

A transit passenger is counted as a "boarding" when he gets on a bus or light rail vehicle. There will often be more than one boarding per transit trip, so the total number of boardings is higher than the total number of trips. The boardings measure is useful to determine design factors, such as the number of parking spaces required, and to determine the potential impacts related to the movement of passengers in the vicinity of stations.

The extension of MetroLink service into the South County service area can be expected to divert some bus riders to light rail. Therefore, one can expect that the number of bus boardings will decline, even as the total transit trips increases. The diversion of bus riders to rail in the South County area may be offset to some degree by increases in bus boardings due to the increased number of transit riders (some of whom will use buses to connect to MetroLink).

Table 4-6, "Systemwide Weekday Boardings," shows the results of the transit assignment analysis. The second and third columns of this table show the systemwide bus boardings under each Metro South alternative, both in Illinois and Missouri, and compare the boardings to those for the TSM alternative. The fourth column shows the total of MetroLink boardings under each alternative, also compared to the TSM.

The columns on the right side of Table 4-6 divide the MetroLink boardings between the two service lines. One line goes from Lambert to Scott/Shiloh via downtown St. Louis, and the other goes from the terminus of the Cross-County line to Emerson Park via downtown. The terminus of the Cross-County line is Shrewsbury-Lansdowne I-44 station in the No-Build and TSM case, and may be Watson, Butler Hill or Reavis Barracks under the Build alternatives.

Table 4-6 shows that the Blue alternative to Butler Hill results in the largest number of MetroLink boardings, and also has the highest number of diversions from the bus system.

Table 4-6: Systemwide Weekday Boardings

	Bus Service		MetroLink Lines					
				Existing	Cross-County Seg. I	Metro South Build Alternatives		
	Illinois	Missouri	MetroLink Totals	Lambert to Scott/Shiloh	Shrewsbury to Emerson Park	Kenrick to Emerson Park	Butler Hill to Emerson Park	Reavis-Barracks to Emerson Park
Year 2005 Base	14,100	123,900	38,500	38,500				
No Build	12,500	130,000	83,100	42,500	40,600			
TSM	12,400	132,300	83,000	42,500	40,500			
Change from No Build	*-100*	*2,300*	*-100*	*0*	*-100*			
Purple	12,500	132,000	83,200	42,400		40,800		
Change from TSM	*100*	*-300*	*200*	*-100*		*300*		
Blue (Watson)	12,500	132,000	83,200	42,400		40,800		
Change from TSM	*100*	*-300*	*200*	*-100*		*300*		
Blue (Butler Hill)	12,500	131,100	92,600	43,100			49,500	
Change from TSM	*100*	*-1,200*	*9,600*	*600*			*8,900*	
Orange	12,500	131,900	92,100	43,000			49,100	
Change from TSM	*100*	*-400*	*9,100*	*500*			*8,500*	
Orange (Reavis Barracks)	12,400	131,600	90,100	43,000				47,100
Change from TSM	*0*	*-700*	*7,100*	*500*				*6,500*

Tables 4-7a and 4-7b, "MetroLink Boardings by Station, 2025," show the projected boardings at each station on the Cross-County line under each of the Metro South alternatives. These tables show the boardings at stations on the Cross-County extension now under construction to Shrewsbury-Lansdowne I-44 station in Shrewsbury, as well as any new stations proposed as part of the Metro South alternative.

These tables show passengers who enter each station on a weekday. There will be approximately the same number of passengers leaving each station over this period of time. Where parking is provided (or proposed) at a station, the number of passengers who drive to the station is shown separately from those who walk or transfer from bus or other mode. Also, because these boardings account for only a portion of the total MetroLink system, these numbers cannot be compared directly to those in Table 4-6.

Table 4-7a: MetroLink Boardings by Station, 2025
No-Build, TSM, Purple/Blue-Watson Alternatives

Cross County Station	**No-Build**		**TSM**		**Purple & Blue-Watson**	
	walk/ transfer	**drive**	**walk/ transfer**	**drive**	**walk/ transfer**	**drive**
Skinker	1890		1890		1870	
University City	1000		1010		1010	
Forsyth	910		910		910	
Clayton	5410		5410		5440	
Richmond Hts.	1050		1050		1040	
Brentwood/I-64	1130	2210	1130	2210	1130	2210
Maplewood	800		800		830	
Sunnen	1110		1110		1090	
Lansdowne/I-44	1710	1890	1710	1760	1490	1720
Watson	--	--	--	--	410	40
Weekday total	**15,010**	**4,100**	**15,020**	**3,970**	**15,200**	**3,970**
	19,110		**18,980**		**19,170**	
Metro South stations only	--		--		440	

Items may not sum to totals because of rounding.

Table 4-7b: MetroLink Boardings by Station, 2025
Blue-Butler Hill, Orange-Butler Hill, and Orange-Reavis Alternatives

Cross County Station	**Blue-Butler Hill**		**Orange- Butler Hill**		**Orange- Reavis**	
	walk/ transfer	**drive**	**walk/ transfer**	**drive**	**walk/ transfer**	**drive**
Skinker	1950		1950		1930	
University City	1120		1130		1090	
Forsyth	1000		980		990	
Clayton	5740		5730		5700	
Richmond Hts.	1130		1160		1110	
Brentwood/I-64	1290	2190	1320	2200	1260	2210
Maplewood	890		880		840	
Sunnen	1320		1330		1230	
Lansdowne/I-44	1390	1600	1730	1720	1650	1720
Watson	410					
Gravois	780	250				
Green Park	250					
Gravois-Hampton			550		430	

Cross County Station	Blue-Butler Hill		Orange- Butler Hill		Orange- Reavis	
	walk/ transfer	drive	walk/ transfer	drive	walk/ transfer	drive
Morganford			80		60	
Bayless			80		70	
Reavis Barracks			400	360	320	2810
Lindbergh	350		260			
Butler Hill	120	3260	110	2870		
Weekday total	**17,700**	**7,310**	**17,700**	**7,150**	**16,700**	**6,730**
	25,000		**24,800**		**23,400**	
Metro South stations only	5,410		4,670		3,680	

4.1.3 Parking Demand at Stations

At stations that offer parking for park-ride patrons (Watson, Gravois, Reavis Barracks, Butler Hill) the total demand for parking spaces was estimated using the ridership forecasts shown in Tables 4-7a and 4-7b. To get an estimate of the number of parking spaces required, the total number of persons arriving by automobile (drive mode) was adjusted to reflect carpooling (auto occupancy), kiss-riders,[3] and turnover of parking spaces during the day. An average auto occupancy of 1.05 was used for work trips, and 2.25 for non-work trips. For all trip purposes, the analysis assumed a kiss-ride share of 10 percent, and that 20 percent of spaces would turnover and be available for use by another parker later in the day.

Table 4-8, "Estimated Weekday Parking Demand," shows the results of the parking demand analysis. These figures represent average weekday demand (number of parking spaces used) during the peak hour of accumulation. Because these are average figures, there will be many days when the demand exceeds this number.

[3] A "kiss-rider" is a transit passenger who is driven to the transit station or bus stop by a family member or friend and dropped off, so the automobile is not parked at the station.

Table 4-8: Estimated Weekday Parking Demand

Build Alternative	Purpose	Park–and-Ride Station			
		Watson	**Gravois**	**Reavis Barracks**	**Butler Hill**
Purple	Work trips	23			
	Non-work trips	14			
	Parking spaces	**20**			
Blue Watson	Work trips	23			
	Non-work trips	14			
	Parking spaces	**20**			
Blue Butler Hill	Work trips	190	190		1,760
	Non-work trips	60	60		1,510
	Parking spaces	**150**	**150**		**1,690**
Orange Butler Hill	Work trips			180	1,530
	Non-work trips			180	1,340
	Parking spaces			**180**	**1,480**
Orange Reavis Barracks	Work trips			1,590	
	Non-work trips			1,220	
	Parking spaces			**1,480**	

4.2 TRAVEL TIME SAVINGS

Travel time savings – also known as transportation system user benefits (TSUB) – is one of the principal measures used by FTA to evaluate transit projects that are proposed for federal funding. To ensure consistency in how this measure is calculated, FTA developed a computer program called SUMMIT that all applicants for federal New Starts transit funding must use. SUMMIT examines the travel times and passenger volumes that are used in the regional travel demand forecasting model and produces a calculation of user benefits that meets FTA requirements.

Travel time savings for FTA purposes includes the improvement in total trip time for existing transit users realized as a result of the proposed transit improvements. The trip time for each transit user with the improved system is compared to the transit travel time for the same trip under the TSM (baseline) alternative.[4] Existing transit users – those using the system in the TSM alternative – are credited with the full difference in travel time from origin to destination. New transit users – those who are attracted to use transit as a result of the proposed improvement – are assigned one-half of the difference in travel time, consistent with the theory of "consumer surplus."[5]

For the TSUB measure, travel time is totaled over an entire year. The annual figures are equal to approximately 300 times the weekday total: there are 252 non-holiday weekdays in an average year, and the remaining 113 days (weekends, holidays) produce ridership equivalent to about 48 weekdays, in most transit systems. In St. Louis, the annual systemwide ridership (all transit modes) is 312 times the average weekday rate. This higher-than-average figure reflects the fact that many people use Metro (especially MetroLink) for non-work trips and special events on weekends.

The annual travel time savings, or TSUB, calculated for each of the Metro South alternatives is presented in Table 4-9, below. These benefits were calculated using the FTA's SUMMIT model, and applying Metro's actual annual-to-weekday ratio of 312. These numbers may change as the project is refined and improved in the future, but are useful to compare how well the study alternatives meet certain transportation goals.

Table 4-9: Transportation System User Benefits (TSUB), 2025
Travel Time Savings compared to TSM

Alternative	**Annual User Benefit (person-hours)**
No-Build	not meaningful
TSM	0
Purple to Watson	-41,000
Blue to Watson	-41,000
Blue to Butler Hill	2,662,000
Orange to Butler Hill	2,490,000
Orange to Reavis Barracks	1,876,000

[4] Under some circumstances, an alternative other than the TSM can be used as the baseline for the New Starts analysis, but the assumption throughout this DEIS is that the TSM is the baseline.
[5] The "consumer surplus" theory is based on the premise that some improvement in travel time is required to shift an auto user over to transit. Any travel time savings in addition to this amount is "surplus" and thus is counted as a benefit to the user. On average, one-half of the travel time is needed as inducement to shift a user to transit, and the other half, then, is counted as user benefit.

The Purple and Blue-Watson alternatives produce negative user benefits, using the FTA methodology. This means that some transit trips take longer with the proposed MetroLink extension to Watson under either of these alternatives, than they would with the bus improvements included in the TSM alternative. While some transit users would benefit, the total benefit for these users is not enough to offset the negative impact on travel time to others.

The Blue-Butler Hill and Orange-Butler Hill alternatives have similar user benefits, although they serve different neighborhoods along the route from Shrewsbury-Lansdowne I-44 station to the point where the alignments join north of Lindbergh station. The Orange-Reavis Barracks alternative has lower benefits, reflecting the fact that it does not serve as many users. These travel time savings are substantial, representing approximately 40 minutes each way for passengers using the proposed MetroLink extensions beyond Lansdowne.

4.3 Ridership And Land-Use

4.3.1 Introduction

The configuration of the transportation system and the patterns of land-use in that area are closely interrelated characteristics, with each influencing the other. The projected ridership on the light rail transit system is based on the assumption that the land-use patterns in the study area will remain essentially unchanged. This static situation is unlikely to remain if, as planned, the community develops programs to take advantage of light rail transit service and to foster other community goals, such as sustainable development.

The extension of high-quality transit service, such as MetroLink, into a community offers an opportunity to shape future development through the use of zoning and other tools. With careful planning, this development can be achieved in a manner that consumes less land and other resources, and takes advantage of the mobility offered by new transit services. This type of development is sometimes referred to as “transit-oriented development” (TOD). This change in land-use will, in turn, result in an improved market for transit, and further increases in ridership.

The purpose of the analysis presented in this section is to consider the potential impact of new land-use policies on rail transit ridership in the Metro South area. This will ensure that transit investment and zoning decisions are more fully informed. It should be noted, however, that these ridership forecasting methods do not comply with FTA requirements for all potentially federally funded projects. One of these rules is that the total number and distribution of trips be the same for all alternatives, including the TSM and No-Build. However, if TOD is successful, it will result in an increase in the number of trips produced or attracted near transit stations. This analysis, then, is presented for information purposes, and is not used in the comparative evaluation of alternatives for FTA purposes.

4.3.2 Transit-Oriented Development

TOD is intended to create a more sustainable community by creating a high quality densely developed urban environment that is attractive to residents and marketable to tenants. Characteristics of a TOD area are close proximity of housing to the transit station, mixed uses that complement each other, dense development that allows interaction among these lands uses, the availability of a safe and pleasant walking environment, and improved community services. These factors allow a lessening in automobile dependency with walking being the preferred mode for short trips and transit being a frequent mode for longer trips. Encouragement for TOD can come in the form of lessened parking supply, density bonuses, public assumption of infrastructure costs, tax rebates, streamlined development processes, and sympathetic local planning and zoning provisions.

The Metro South study team investigated the potential for TOD around each of the proposed station sites. This investigation included identification of vacant land, as well as properties that now have a low intensity of use and are potential candidates for redevelopment over the next 20 years. The study team then estimated the number of additional housing units that could be accommodated within one-half mile of the station, or the number of jobs in new commercial development within one-half mile, following the TOD principles.

Not all stations areas have the land or conditions required for new TOD. Watson station (with the Blue and Purple alternatives), Gravois station (with the Blue Butler Hill alternative) and Butler Hill (Blue Butler Hill and Orange Butler Hill alternatives) each have characteristics that would be favorable for residential development. These stations could realize an additional 300-400 housing units each within a half-mile with TOD policies. Butler Hill and Lindbergh stations (both on the Blue Butler Hill and Orange Butler Hill alternatives) have the greatest potential for new jobs within a half-mile under these scenarios.

The number of new residents and jobs within a half-mile of station sites would result in increases in transit ridership over the base case. To estimate the magnitude of this increase, the Metro South study team used a ridership model that was developed at the national level (the TCRP H-1 model) to examine similar ridership effects at light rail stations.[6] This model showed significant

[6] For a complete description of the model and report, see: Parsons Brinckerhoff Quade &

increases in ridership related to TOD development, and also produced higher ridership forecasts for the base (non-TOD) case than did the FTA-approved model used by EWGCOG. A second analysis was performed using the same model form as developed for the national model, but with model coefficients that represented St. Louis area experience. This also produced base case results different from the approved model, but showed increases in ridership resulting from the TOD changes.

The ridership impact of TOD is shown in Table 4-10, "Boardings with and without Transit-Oriented Development." The left columns show the land-use forecasts (housing and jobs within a half-mile of stations) used to produce the base ridership forecasts, as reported in Section 4.1. The right columns show the housing and jobs within one-half mile of stations with TOD policies in place, and show the percentage increase in boardings calculated from the TCRP H-1 model (averaging the results from national and local coefficients). This percentage increase in boardings is applied to the non-TOD boardings as forecast by the FTA-approved model.

Douglas, J. Zupan, R. Cervero, *TCRP Report 16: Transit and Urban Form*, Washington, D.C., Transportation Research Board, National Research Council, 1996.

Table 4-10: Boardings
With and Without Transit Oriented Development, 2025

Alternative	Forecast Assuming No TOD (Stations beyond Lansdowne)			Forecast with TOD (Stations beyond Lansdowne)			
	Housing Units within ½ mile	Jobs within ½ mile of stations	Estimated Weekday Boardings	Housing Units within ½ mile	Jobs within ½ mile of stations	Percent increase in rider-ship	Estimated Weekday Boardings
No-Build	na	na	na	na	na	na	na
TSM	na	na	na	na	na	na	na
Purple Watson	1,070	2,580	430	1,230	4,330	+9.7%	480
Blue Butler Hill	6,220	9,150	5,410	7,230	12,900	+8.0%	5,840
Blue Watson	1,070	2,580	430	1,230	4,330	+9.7%	480
Orange Butler Hill	8,690	5,770	4,670	9,020	8,160	+4.0%	4,860
Orange Reavis Bar-racks	6,720	2,030	3,680	6,720	2,030	0	3,680

Source: Robert Cervero, "St. Louis MetroLink South Ridership Forecasts," August 2004 (Appendix E)

4.4 LOCAL TRAFFIC IMPACTS

Introduction: There will be traffic impacts associated with the light rail expansion. These will be related to 1) the addition of traffic to local streets that provide access to the light rail stations and any park-and-ride lots, 2) traffic delays where the transit line crosses existing streets at-grade. The traffic impact at the stations and park-and-ride lots is largely a peak-period phenomenon where riders and park-and-ride lot users access the stations during the morning peak period and head home from the station during the evening peak period. These are typically drivers who would ordinarily be on the road during these periods. Their travel path is now directed along a new, shorter route to the station rather than the former longer route to their workplace. The grade crossing impact is an all-day occurrence but its effect would be felt most acutely in the peak period. The delay that might result from traffic that must stop at a grade crossing is very similar in affect to having traffic stop at a new roadway intersection. However, as noted in Table 4-12, the only gated grade crossing that is proposed with any of the alternatives involves a non-through street that serves only local abutters and only minor impacts are expected.

Traffic Impacts at Stations: The increased traffic activity that would affect roadways in the area of the new light rail transit stations is related to: 1) new traffic entering and leaving station parking areas, 2) new local traffic entering and leaving passenger drop-off areas, and 3) bus traffic diverted from previous routes to serve light rail stations. Not every station has parking areas; parking areas have been located where space is available and where adequate access can be built. Table 4-11, "Traffic Impact Issues at Stations," reviews the traffic impact issues at the station sites.

Table 4-11 Traffic Impact Issues at Stations

Stations	Traffic Impact Issues
Purple Alternative	
Watson	Park and ride traffic volumes are projected to be less than 5 percent of total traffic volume in the PM peak period on Watson Road.
Blue Alternative to Butler Hill	
Watson	Park and ride traffic volumes are projected to be less than 5 percent of total traffic volume in the PM peak period on Watson Road.
Gravois	Park and ride traffic volumes are projected to be less than 3 percent of total traffic volume in the PM peak period on Gravois Road
Green Park	Local drop-off (kiss-ride) and bus transfer activity only.
Lindbergh	Local drop-off (kiss-ride) and bus transfer activity only.
Butler Hill	Traffic volume projections for Butler Hill Rd. where it crosses I-55 indicate that 39 percent of the PM peak period traffic volumes will be for station access. Other adjacent locations are projected to have a maximum station-access volume of 10 percent of total peak hour traffic.
Blue Alternative to Watson	
Watson	Park and ride traffic volumes are projected to be less than 5 percent of total traffic volume in the PM peak period on Watson Road.
Orange Alternative to Butler Hill	
Gravois-Hampton	Park and ride traffic volumes are projected to be less than 5 percent of total traffic volume in the PM peak period on Gravois and Germania.
Morganford	Local drop-off (kiss-ride) and bus transfer activity only.
Bayless	Local drop-off (kiss-ride) and bus transfer activity only.
Reavis Barracks	Park and ride traffic volumes are projected to be less than 5 percent of total traffic volume in the PM peak period on Reavis Barracks Road.
Lindbergh	Local drop-off (kiss-ride) and bus transfer activity only.
Butler Hill	Traffic volume projections for Butler Hill Rd. where it crosses I-55 indicate that 38 percent of the PM peak period traffic volumes will be for station ac-

Stations	Traffic Impact Issues
	cess. Other adjacent locations are projected to have a maximum station-access volume of 10 percent of total peak hour traffic.
Orange Alternative to Reavis Barracks	
Gravois-Hampton	Park and ride traffic volumes are projected to be less than 5 percent of total traffic volume in the PM peak period on Gravois and Germania.
Morganford	Local drop-off (kiss-ride) and bus transfer activity only.
Bayless	Local drop-off (kiss-ride) and bus transfer activity only.
Reavis Barracks	Traffic volume projections for Reavis Barracks Rd. where it crosses I-55 indicate that 23 percent of the PM peak period traffic volumes will be for station access. Other adjacent locations are projected to have a maximum station-access volume of 8 percent of total peak hour traffic.

Traffic Impacts at Grade Crossings: The impact of a grade crossing is that traffic on either side of the crossing is stopped and forms into queues while the grade crossing gate is down and the transit vehicles pass by. The vehicles in the queue thus experience some delay, and, depending on the volume of traffic affected, the queue may interfere with cross streets and access drives. The light rail transit system is primarily a grade-separated system, with a limited number of grade crossings. The only gated grade crossing is at a location where the gate will be down for a short period of time, and where the roadway volumes are relatively light. Table 4-12, "Traffic Impact Issues at Grade Crossings," shows the grade-crossing impacts of the alternatives.

Table 4-12: Traffic Impact Issues at Grade Crossings

Grade Crossings	Traffic Impact Issues
No-Build Alternative	No grade crossings
TSM Alternative	No grade crossings
Purple Alternative	No grade crossings
Blue Watson	No grade crossings.
Blue Butler Hill Union Road (south of Lindbergh near South County Center mall)	Union Road is not a through street beyond the grade crossing, serving only local abutters. As a result, the traffic volume will be low, and the traffic impacts will be minor.

Grade Crossings	Traffic Impact Issues
Orange Butler Hill	
Morganford Rd, outbound of Gravois-Hampton station	Morganford is one of several radial roadways from south St. Louis County into the City of St. Louis. While the light rail line crosses at-grade, the train movement will be coordinated with the traffic signals and no protective gates are anticipated. As a result, only traffic turning south or west, which can only be accomplished during a "protected turn" phase, will experience any delays, and this is not expected to result in overall traffic tie-ups or extended periods of delay.
Union Road (south of Lindbergh near South County Center mall)	Union Road is not a through street beyond the grade crossing, serving only local abutters. As a result, the traffic volume will be low, and the traffic impacts will be minor.
Orange Alternative to Reavis Barracks	
Morganford Rd, outbound of Gravois-Hampton station	Morganford is one of several radial roadways from south St. Louis County into the City of St. Louis. While the light rail line crosses at-grade, the train movement will be coordinated with the traffic signals and no protective gates are anticipated. As a result, only traffic turning south or west, which can only be accomplished during a "protected turn" phase, will experience any delays, and this is not expected to result in overall traffic tie-ups or extended periods of delay.

5.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents a description of the potential environmental impacts of each of the alternatives. This analysis considers impacts on both the human, or built, environment, and the natural environment. The discussion below focuses on those impacts that will allow decision makers to differentiate among the alternatives.

5.1 IMPACTS ON THE BUILT ENVIRONMENT

The built environment – sometimes called the human environment – refers to areas that have already been transformed by human activity. These areas include the places where we live and work and the facilities and services that make our communities what they are today. This DEIS, in keeping with the requirements of NEPA, is concerned with impact both to the built environment, as described in this section of the DEIS, and to the natural environment as described in Section 5.2.

5.1.1 Land-Use Impacts

Introduction

A stated goal of the Metro South study was to investigate ways that new light rail transit service could support established community planning goals regarding economic development, community stabilization and redevelopment. New light rail transit services can be part of a package of zoning changes and development incentives that can encourage desirable land-use development around light rail transit stations. These land-use policies and actions are the key to the success of such new development patterns, commonly termed Transit-Oriented Development (TOD).

The Metro South investigations regarding tying light rail transit implementation to these goals essentially asked two questions:

- Whether the light rail transit facility – particularly in stable neighborhoods – will be compatible with community conservation and enhancement goals, and

- Whether there are opportunities to encourage beneficial land-use changes near light rail transit stations by adoption of TOD-oriented land-use and zoning policies.

Regulatory Context

Land-use is regulated largely through zoning, which is under local (municipal or county) control. State and federal laws and programs, however, may have a considerable influence on development decisions (wetlands regulations, for example).

The establishment of transit-supportive zoning and land-use policies is one of the criteria established by Congress to evaluate new transit projects that are competing for federal New Starts funding. Although there are currently no TOD specific regulations in effect today within Metro South, much of the land-use work associated with this study assumed such practices would be in place by the time of actual implementation of any LPA.

Potential Land-Use Effects

Of prime importance to the land-use investigations of the study was determining the number of jobs and households that each of the alternatives might directly serve. "Directly serve" means providing direct pedestrian access to jobs and households and this was defined as those jobs and households within one-half mile of a candidate station.

Estimations of such direct service were made for the existing land-uses around candidate stations, the likely 2025 land-uses based on the official projections for the region as they apply to Metro South and potential 2025 TOD development based on more direct intervention by local jurisdictions to enable and promote redevelopment of targeted areas around some of the stations. The station area plans presented in Appendix B show the current land use around each station site, as well as potential redevelopment sites within one-half mile of stations where those sites exist. The following sections summarize the methodology used to estimate these different indicators of the land-use impacts of the alternatives studied in this DEIS.

Existing Land-Use Mix. For the half-mile buffer surrounding each LRT station, the regional geographic information system (GIS) and the tax assessor's database were employed to estimate the existing acreage for each of five basic land-use types and the number of households and jobs. The five land-use types are: single-family residential, multi-family residential, retail-commercial services, office employment, and other employment. The conversion of employment acreages to jobs was based on assumed density, floor area ratio, and square feet per employee for each of the three main employment categories – retail-commercial, office, and other.

Base Year 2025 Projections. To avoid having applicants inflate the results of the land-use impacts of implementing light rail transit, New Starts guidelines require alternatives to be evaluated and compared based on a region's official growth projections rather than any presumed land-use changes tied to specific station locations. (Because the projections do not assume any light rail transit service, in effect this is the land-use equivalent of a "no-build" alternative.) To establish such a baseline for 2025, the latest regional land-use allocation model (LUAM) projections provided by EWGCOG were used. For each station, the LUAM results by traffic zone were reviewed and adjusted to represent the expected 2025 level of jobs and households for the five land-use categories within one-half mile of the stations.

Year 2025 Transit-Oriented Development Potential

In accord with the goals to use light rail transit implementation as a spur to economic development and community revitalization, the TOD potential of each alternative was also estimated and compared. This was done in three stages: 1) overall estimation of the additional growth or economic development shifts that light rail transit implementation could bring to Metro South; 2) identification of "opportunity sites" –properties currently vacant or primed for redevelopment--around stations and 3) assignment of land-uses and appropriate intensity of such uses to these opportunity sites based on the station's location and context.

1. Transit Induced Development Shifts: The Metro South area is primarily a built-up and stable area. In contrast to other areas in the region such as Clayton, which has experienced much recent development and is likely to continue to intensify, Metro South is not expected to change much. Nevertheless, light rail transit implementation would make Metro South more attractive to potential employers and new residents, including employers who may find space increasingly unavailable or unaffordable in centers such as Clayton. Furthermore, given the 25-year time horizon of the study, it can be assumed that a certain number of businesses and residential properties within the study area will become obsolete and will need to be replaced. Light rail transit station areas could be expected to attract a proportion of this redevelopment and replacement.

As part of the land-use investigations for the Metro South study, a market assessment was done to determine a realistic and achievable estimation of the total future residential and employment development that could be attracted to light rail transit stations in Metro South.[1] This assessment concluded that ap-

[1] *Demand Projections: Framework for Consideration of the Potential for Private and Public Investment in Response to a South County MetroLink Extension,* prepared by Development Strategies Inc., April 2003.

proximately 2,700 households, 440 commercial jobs and 4,100 office jobs could be drawn to stations should light rail transit be implemented in Metro South.

2. Identification of Opportunity Sites. Opportunity sites are the areas around each candidate station that are most likely to experience redevelopment (changes in uses or increased intensity of current uses) over the next two decades to meet demand for additional development space or residential units. These sites were identified based on criteria such as: presence of vacant or underutilized properties, commercial sites whose original tenants have been replaced by less viable uses, development of advanced age and at presumed end of their useful investment life, and sites and small areas surrounded by or adjacent to such conditions. For stations that are within stable residential neighborhoods, no opportunity sites were designated. But a number of candidate stations within largely non-residential areas had sites likely to redevelop due to age or changing market conditions that were examined for their TOD potential. See Appendix B for station area plans.

3. Future Land-Use Mix. For stations not targeted for significant future redevelopment, the adjusted LUAM-based 2025 data were not altered and these totals were carried over into the TOD scenario for the overall alternative. In some cases, the 2025 LUAM-based data represented no changes from the year 2000 number of jobs or households.

For the stations determined to have redevelopment potential, the opportunity sites were assigned to one of the five land-use categories with the overall mix dependent on location, accessibility and context. Most changes in land-uses involved commercial sites in excess of likely future demand for such space; other changes were redevelopment of multi-family sites at higher densities. In a few cases, it was assumed that multi-family housing would replace some of the existing single-family housing by 2025, but single-family areas were otherwise left unchanged.

Once a future land-use-mix was established, two sets of calculations were performed. First, the full buildout redevelopment capacity was estimated assuming the use of 100 percent of the land-use capacity that would be allowed by transit-supportive zoning. Second, for each station, the likely level of absorption of such capacity by 2025 was estimated. These estimations used the overall transit induced increment estimated in the April 2003 market study as a control total and divided the estimated totals for residential and non-residential land-uses among the various stations with TOD potential. This was based on the likely context and the marketability of each site. (This analysis showed most station areas with redevelopment potential would have additional capacity for further growth beyond 2025.)

Once the total 2025 developed TOD acreage for each of the five land-uses within one-half mile of candidate stations was estimated, these acreages were converted into jobs and households and this increment was used to adjust the baseline totals within the half-mile area established through application of the LUAM data.

Station area land-uses including potential TOD development areas are illustrated in the station area plans included as Appendix B. These plans include brief descriptions of current conditions as well as the key actions that would need to be taken to promote the TOD opportunities depicted. Table 5-1 presents a summary of the relationship of each station to its nearby land-uses and where such uses will remain essentially the same as today or change. The potential number of jobs and households that could be added near light rail transit stations through implementation of TOD policies is totaled for each alternative. The Blue alternative to Butler Hill offers the greatest potential for additional households and jobs near light rail transit stations.

Table 5-1: Land-Use Impacts

Alternatives	Land-Use Impacts
No-Build	-none
Transportation Systems Management	-none identified
Purple Alternative	
Watson Station	-Station compatible with moderate-scale locally-oriented mixed-use area -Alignment and station location do not impede frontage access along Watson Rd. -Station design minimizes impacts of park-and-ride and bus transfer on Watson Rd. frontage properties -Significant TOD opportunity because of current marginal commercial uses
Total Potential Additional Development with TOD Policies	**160 additional households** **1,750 additional jobs**
Blue Alternative to Butler Hill	
Watson Station	-Station compatible with moderate-scale locally-oriented mixed-use area -Alignment and station location do not impede frontage access along Watson Rd. -Station design minimizes impacts of park-and-ride and bus transfer on Watson frontage properties -Significant TOD opportunity because of current marginal commercial uses
Gravois Station	-Could help in restoring local “Main Street” qualities to Gravois -Serves numerous nearby residential areas – multi- and single-family -Opportunity for new mixed use development on Gravois with TOD policies

Alternatives	Land-Use Impacts
Green Park Station	-Serves existing employment and nearby neighborhoods to south and west -No TOD opportunity sites identified for this station area at the request of the town officials
Lindbergh Station	- Potential for new regional-scale, office-based TOD on both sides of Lindbergh Blvd. -Serves South County Center shopping mall but is off mall-owned properties -Location under Lindbergh Blvd. makes access from both sides of Lindbergh very easy
Butler Hill Station	-Potential mixed-use TOD centered on station with structured park-and-ride and built in commercial/services -Potential joint development of currently vacant areas south of Butler Hill Rd. -Elevated station can take advantage of existing topography changes south of Butler Hill Rd.
Total Potential Additional Development with TOD Policies	**1,000 additional households** **3,700 additional jobs**
Blue Alternative to Watson	
Watson Station	-Station compatible with moderate-scale locally-oriented mixed-use area -Alignment and station location do not impede frontage access along Watson Rd. -Station design minimizes impacts of park-and-ride and bus transfer on Watson Rd. frontage properties -Significant TOD opportunity because of current marginal commercial uses
Total Potential Additional Development with TOD Policies	**160 additional households** **1,750 additional jobs**
Orange Alternative to Butler Hill	
Gravois-Hampton Station	-Serve revitalizing local neighborhoods -Can be focus of moderate station related commercial redevelopment; no TOD opportunity sites identified due to surrounding existing single-family residences -Existing bus transfer center can easily be shifted to be integrated with LRT; this relocation would displace small group of households on Germania
Morganford Station	-Serves existing, stable, relatively-dense urban residential neighborhood -No TOD opportunity sites identified
Bayless Station	-Serves existing residential neighborhood -Minor redevelopment on commercial areas between Union and I-55 -No TOD opportunity sites identified
Reavis Barracks Station	-Serves expanded park-and-ride facility on west side of I-55 (via pedestrian bridge) and new facility on east side -Serves existing residential areas, but no TOD anticipated
Lindbergh Station	- Potential for new regional-scale, office-based TOD on both sides of Lindbergh Blvd. -Serves South County Center shopping mall but is off mall-owned properties -Location under Lindbergh Blvd. provides unconstrained access from

Alternatives	Land-Use Impacts
	both sides of Lindbergh
Butler Hill Station	-Potential mixed-use TOD centered on station with structured park-and-ride and built-in commercial/services. -Potential joint development of currently vacant areas south of Butler Hill Rd.. -Elevated station can take advantage of existing topo changes south of Butler Hill Rd.
Total Potential Additional Development with TOD Policies	**330 additional households** **2,400 additional jobs**
Orange Alternative to Reavis Barracks	
Gravois-Hampton Station	-Serve revitalizing local neighborhoods -Can be focus of moderate station related commercial redevelopment; no TOD opportunity sites identified -Existing bus transfer center can easily be shifted to be integrated with LRT; this relocation would displace small group of households on Germania.
Morganford Station	-Serves existing, relatively-dense urban residential neighborhood -No TOD opportunity sites identified
Bayless Station	-Serves existing residential neighborhood -Minor redevelopment on commercial areas between Morganford and I-55 -No TOD opportunity sites identified
Reavis Barracks Station	-Serves expanded park and ride facility on west side of I-55 (via pedestrian bridge) and new facility on east side. -Serves existing residential areas, but no TOD anticipated. -Larger, structured park and ride possible if line does not continue further south to Butler Hill.
Total Potential Additional Development with TOD Policies	**0 additional households** **0 additional jobs**

5.1.2 Acquisitions and Displacements

A displacement involves the full acquisition of a property and is defined as an area within which occupants of residential and nonresidential units would be displaced by the project and would be expected to relocate. A partial acquisition occurs when a small area of a property is acquired, but full use of the property and dwelling structures would remain. In an effort to make the property acquisition process as equitable as possible, regulations including the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended (42 U.S.C. § 4601 *et seq.*), have been developed to ensure adequate consideration and compensation for the persons whose property is required for the project. The Uniform Act, as well as Missouri state laws, requires that just compensation be paid. The appraisal of fair market value is the basis of determining just compensation to be offered the owner for the property to be acquired. Families or businesses displaced must also be given financial assistance in finding and moving to new quarters.

While conceptual engineering for each alternative has been designed to minimize impacts to existing homes and businesses, some property takings, both full and partial, are required. For purposes of this study, if elements of the project require right-of-way that is within 15 feet of a principal structure, it is assumed that the structure must be eliminated and is considered a full taking. The entire real estate parcel would be purchased in this case. If the right-of-way is not within 15 feet of a principal building, it is assumed that the use will continue, and only the required land area will be acquired as a partial taking.

Table 5-2, "Acquisitions and Displacement Impacts," shows the impacts associated with each of the alternatives.

Table 5-2: Acquisition and Displacement Impacts

Alternatives	Residential Property Impacts	Commercial Property Impacts	Parkland and Open Space Impacts	Other Property Impacts
No-Build	• None	• None	• None	• None
Transportation Systems Management	• None	• None	• None	• None
Purple Alternative				
Shrewsbury to Watson Line Segment	• 3 residential displacements • 0.9 acres from 3 property owners	• 4 commercial displacements • 3.0 acres along Chippewa St.	• 1.7 acres along River Des Peres Blvd.	• 0.75 acre from Resurrection Cemetery • 1.2 acres from MoDOT
Watson Station	• None	• 4 commercial displacements • 9.7 acres of commercial property for station, parking and access	• None	• None
Total	• 3 displacements • 0.9 acres	• 8 displacements • 12.7 acres	• 1.7 acres of parkland	• 0.75 acre of cemetery • 1.2 acres from MoDOT
Blue Alternative to Butler Hill				
Shrewsbury to Watson Line Segment	• 4 residential displacements • 2.0 acres from 4 property owners	• 3 commercial displacements • 1.9 acres from businesses along the BNSF RR	• None (City of St. Louis property in street layout not counted as parkland)	• 1.8 acres from BNSF RR
Watson Station	• None	• 3 commercial displacements	• None	• 0.5 acre from BNSF RR

Alternatives	Residential Property Impacts	Commercial Property Impacts	Parkland and Open Space Impacts	Other Property Impacts
		• 8.0 acres of commercial property for station, parking and access		
Watson to Gravois Line Segment	• 6 residential displacements • 2.4 acres from 31 property owners	• 3 commercial displacements • 3.0 acres from businesses along the BNSF RR	• None	• 6.5 acres from BNSF RR
Gravois Station	• 4 multi-family properties (60 dwelling units) for station access from Tesson Ferry Rd. • 11.4 acres for station access from Reavis Rd.	• 3 commercial displacements • 6.4 acres of commercial property for station, parking and access	• None	• 0.6 acre from BNSF RR
Gravois to Green Park Line Segment	• 1.0 acres of common ground from Tesson Creek Estates	• 1 commercial displacement along Reavis Park Dr. • 5.4 acres from businesses along the BNSF RR	• 0.03 acre from Grant's Trail	• 5.3 acres from BNSF RR
Green Park Station	• None	• 2.4 acres of commercial property station and access	• None	• 0.2 acre from BNSF RR
Green Park to Lindbergh Line Segment	• 1 residential displacement • 0.2 acre of common ground from Cedarberry subdivision • 1.0 acre from 2 property owners	• 2 commercial displacements on Lin Valle Dr. • 0.9 acre of commercial property in Green Park • 0.9 acre of commercial property through strip mall north of Lindbergh Blvd.	• None	• 1.0 acre from BNSF RR • 0.5 acre from MoDOT
Lindbergh Station	• None	• 9 commercial displacements • 7.5 acres of commercial	• None	• None

Alternatives	Residential Property Impacts	Commercial Property Impacts	Parkland and Open Space Impacts	Other Property Impacts
		property for station and access		
Lindbergh to Butler Hill Line Segment	• 1 residential displacement • 2 multi-family properties (80 dwelling units) • 8.1 acres from 5 property owners	• 1.2 acres of commercial property along I-55 corridor	• None	• 0.01 acre from BNSF RR • 4.8 acres from MoDOT
Butler Hill Station	• None	• 7.2 acres of commercial property for station, parking and access	• None	• None
Total	• 12 residential displacements • 6 multi-family properties (140 dwelling units) • 25.1 acres from 42 property owners	• 24 commercial displacements • 45.8 acres of commercial property	• 0.03 acre of parkland	• 15.9 acres from BNSF RR • 5.3 acres from MoDOT
Blue Alternative to Watson				
Shrewsbury to Watson Line Segment	• 4 residential displacements • 2.0 acres from 4 property owners	• 3 commercial displacements • 1.9 acres from businesses along the BNSF RR	• None	• 1.8 acres from BNSF RR
Watson Station	• None	• 3 commercial displacements • 8.0 acres of commercial property for station, parking and access	• None	• 0.5 acre from BNSF RR
Total	• 4 residential displacements • 2.0 acres from 4 property owners	• 6 commercial displacements • 9.9 acres of commercial property	• None	• 2.3 acres from BNSF RR
Orange Alternative to Butler Hill				
Shrewsbury to Gravois-Hampton Line Segment	• 2 residential displacements • 0.8 acre from 2 property own-	• 0.02 acre of commercial property from Walgreens	• 8.8 acres along River Des Peres Blvd. • Requires relo-	• 0.9 acre from St. Marcus cemetery needed for

Alternatives	Residential Property Impacts	Commercial Property Impacts	Parkland and Open Space Impacts	Other Property Impacts
	ers		cation of bike trail along River Des Peres Blvd.	roadway relocation
Gravois-Hampton Station	• 10 residential displacements • 2.0 acres from 10 property owners for station and access	• 1 commercial displacement • 1.2 acres of commercial property for station and access	• None	• None
Gravois Hampton to Morganford Line Segment	• None	• None	• None	• 2 lanes of Germania St.
Morganford Station	• None	• None	• None	• 2 lanes of Germania St.
Morganford to Bayless Line Segment	• 0.4 acre from 2 property owners	• None	• None	• 2 lanes of Germania St. • 3.6 acres from MoDOT
Bayless Station	• None	• 1 commercial displacement • 1.5 acres of commercial property for station and access	• None	• 0.2 acre from MoDOT • 0.04 acre from UPRR
Bayless to Reavis Barracks Line Segment	• 3 multi-family properties (12 dwelling units) • 1.5 acres from 4 property owners	• None	• None	• 6.6 acres from MoDOT
Reavis Barracks Station	• 1 residential displacement • 5.6 acres for station, parking and access	• None	• None	• 0.3 acre from MoDOT

Reavis Barracks to Lindbergh Line Segment	• 1.0 acre from 2 property owners	• 0.9 acre of commercial property through strip mall north of Lindbergh Blvd.	• None	• 6.2 acres from MoDOT
Lindbergh Station	• None	• 9 commercial displacements • 7.5 acres of commercial property for station and access	• None	• None
Lindbergh to Butler Hill Line Segment	• 1 residential displacement • 2 multi-family properties (80 dwelling units) • 8.1 acres from 5 property owners	• 1.2 acres of commercial property along I-55 corridor	• None	• 0.01 acre from BNSF RR • 4.8 acres from MoDOT
Butler Hill Station	• None	• 7.2 acres of commercial property for station, parking and access	• None	• None
Total	• 14 residential displacements • 5 multi-family properties (92 dwelling units) • 19.4 acres from 25 property owners	• 11 commercial displacements • 19.5 acres of commercial property	• 8.8 acres along River Des Peres Blvd.	• 0.9 acre from St. Marcus cemetery • 21.7 acres from MoDOT • 0.04 acre from UPRR • 0.01 acre from BNSF RR
Orange Alternative to Reavis Barracks				
Shrewsbury to Gravois-Hampton Line Segment	• 2 residential displacements • 0.8 acre from 2 property owners	• 0.02 acre of commercial property from Walgreens	• 8.8 acres along River Des Peres Blvd.	• 0.9 acre from St. Marcus cemetery needed for roadway relocation
Gravois-Hampton Station	• 10 residential displacements • 2.0 acres from 10 property owners for station and access	• 1 commercial displacement • 1.2 acres of commercial property for station and access	• None	• None
Gravois Hampton to Morganford Line Segment	• None	• None	• None	• None
Morganford Station	• None	• None	• None	• None

Morganford to Bayless Line Segment	• 0.4 acre from 2 property owners	• None	• None	• 3.6 acres from MoDOT
Bayless Station	• None	• 1 commercial displacement • 1.5 acres of commercial property for station and access	• None	• 0.2 acre from MoDOT • 0.04 acre from UPRR
Bayless to Reavis Barracks Line Segment	• 3 multi-family properties (12 dwelling units) • 1.5 acres from 4 property owners	• None	• None	• 6.6 acres from MoDOT
Reavis Barracks Station	• 1 residential displacement • 5.6 acres for station, parking and access	• None	• None	• 0.3 acre from MoDOT
Total	• 11 residential displacements • 3 multi-family properties (12 dwelling units) • 10.3 acres from 18 property owners	• 2 commercial displacements • 2.7 acres of commercial property	• 8.8 acres along River Des Peres Blvd.	• 0.9 acres from St. Marcus cemetery • 7.1 acres from MoDOT • 0.04 acre from UPRR

Note:In all cases, acreage of residential and commercial properties includes land associated with displaced residences and businesses.

5.1.3 Community Impacts

Community Facilities

Community facilities include buildings and lands that are used by the public for shared community purposes or for government functions. They may be publicly or privately owned. Examples include schools, libraries, municipal offices, churches, meeting halls, and voting locations. Some facilities, such as parks and playgrounds, are considered under separate impact categories.

Most commonly, these facilities are impacted directly by acquisition of land or buildings for the transportation right-of-way. Where only part of a property is needed for the project, but that taking reduces the land or building area such that it is no longer feasible to operate the facility, the impact is considered a constructive taking, and treated as a total acquisition for this analysis. Impacts that disrupt the delivery of services, or that divide facilities from the community that uses them, are discussed under “Community Services” or “Community Cohesion,” below.

None of the buildings to be acquired (including constructive acquisitions) under any of the alternatives are community facilities as defined here.

Community Services

Community services may be impacted by project alternatives even if there is no acquisition of community facilities. Examples include projects that change street layouts that disrupt school bus routes or district boundaries, interfere with trash pickup or affect fire or police services.

Each of the alternatives results in some changes to roadways, driveways or sidewalks that have some impact to travel within communities. These potential impacts are discussed under Community Cohesion, below. None of these changes, however, is significant enough to interfere with community services.

Community Cohesion

Table 5-3, "Community Cohesion Impacts" shows the community cohesion impacts associated with the alternatives. Impacts to community cohesion typically relate to a diminishing of access routes that tie one part of the community to another.

Table 5-3: Community Cohesion Impacts

Alternatives	Community Cohesion Impacts
No-Build	none
Transportation Systems Management	none identified
Purple Alternative	
Shrewsbury to Watson Line Segment	Removal of existing businesses along Route 366 (Chippewa Avenue/Watson Road) between Creighton Drive and Mackenzie Road (Route P) eliminates the buffer between the Villanova neighborhood and Route 366. Villanova Plaza subdivision consists of single-family homes; the rear property lines of the homes along North Villanova run adjacent to the rear property lines of the CarX, Becker Specs Optical/Outpatient Eye Surgery Center, and Jiffy Lube, all located on the southeast side of Route 366 between Creighton Drive and Mackenzie Road. Because these businesses will be taken to accommodate the new light rail tracks, they will no longer buffer the neighborhood from Watson Road and these services will not be as close. The new tracks will be visible from the backyards of these homes. The tracks will run parallel to River Des Peres and then cross over Route 366 to then head under Mackenzie Road (Route P).

Blue Alternative to Butler Hill	
Shrewsbury to Watson Line Segment	Modifications to the street network within the Villas at Kenrick will eliminate north-south access at the east end of the development. These Villas are located off Trianon Parkway west of Route 366 behind the shops in the Kenrick Plaza area. There are three parallel east-west streets serving the Villas: Westover Colony Lane, Woodlawn Colony Lane, and Whitehall Colony Lane as you enter the Villas. Currently, Westover Colony Lane turns at the east end of the property (adjacent to the Burlington Northern Railroad), providing a north-south connection between these three east-west streets. To accommodate the new tracks, this north-south portion of Westover Colony Lane will be narrowed to accommodate the proposed light rail tracks and retaining wall. This will modify the access throughout the community. Westover Colony, Woodlawn Colony, and Whitehall Colony Lanes will still be connected in the central and western ends of the development by Westover Colony Lane. The north-south portion of Westover Colony Lane may be reduced to one-way traffic only
Green Park to Lindbergh Line Segment	Tracks will bisect the existing cluster of retail and hotel uses, eliminating east-west access between establishments located on the north side of Lindbergh Boulevard just east of I-55. Currently the Holiday Inn, Mattress Giant, Marshalls, and JC Penney Home Store have access to Lindbergh Boulevard via two access points: one near Mattress Giant just one block east of I-55 and the other near the JC Penney Home Store just one additional block further east of I-55. Eastbound traffic on Lindbergh Boulevard may only access this retail area via the JC Penney Home Store entrance where there is a break in the jersey barrier in the median of Lindbergh Boulevard. As an exit for customers, this access point provides access to either east or westbound Lindbergh Boulevard as well as southbound access to Crescent Drive. The access point near Mattress Giant is right-in/right-out for westbound Lindbergh Boulevard traffic only. The new tracks will bisect the parking lot located among these establishments. This will isolate the Holiday Inn and Mattress Giant with only the right-in/right-out access to westbound Lindbergh Boulevard. Motorists desiring to head east on Lindbergh Boulevard after exiting these establishments would have to travel over I-55 to Rusty Road (just east of the Burlington Northern Railroad) to turn around and backtrack on eastbound Lindbergh Boulevard. Eastbound motorists desiring to access the Holiday Inn and Mattress Giant would have to enter the existing access point at the break in the jersey barrier near the JC Penney Home Store to turn around in the lot and exit to westbound Lindbergh Boulevard unless an additional break was made in the barrier. However, an additional break in the barrier would be located very close to the I-55 on/off ramps just west of the Holiday Inn desired access point. Another possible access point would be at the stoplight located on Union Road just north of Lindbergh Boulevard.

Lindbergh Station	Access from Lindbergh Boulevard on Crescent Drive will be closed. Currently Crescent Drive provides access to such businesses as Honey Baked Ham and Mattress Firm that are located adjacent to Lindbergh Boulevard on either side of Crescent Drive, as well as the Toys R Us and Circuit City that are set back with their shared parking lot providing an additional access point to Lindbergh Boulevard. (Note: Honey Baked Ham and Mattress Firm will be removed for the LRT right-of-way.) Crescent Drive ends as a cul-de-sac at a small office park. When Crescent Drive is closed to Lindbergh Boulevard it will be extended between the Colonial Wood Condominiums and the Dialysis Center to connect to Union Road. This will provide access to these establishments for westbound Lindbergh Boulevard motorists via Union Road. Access via the Toys R Us/Circuit City parking lot will still be available to the eastbound Lindbergh traffic.
Lindbergh to Butler Hill Line Segment	The relocated entrance to Oakbrook Gardens apartments modifies access to Butler Hill Road. Because two apartment units will be taken to accommodate the new light rail right-of-way, the portion of Clayridge Drive that provided access to these units as well as the main entrance to the complex will be relocated. Currently, Clayridge Drive is one block east of I-55 off Butler Hill Road. Relocated Clayridge Drive will still provide access to Butler Hill Road just one block further east where there is stub from an existing road within Oakbrook Gardens. Relocated Clayridge Drive would access Butler Hill Road directly east of Midamerica Lane on the west side of Butler Hill Road.
Blue Alternative to Watson	
Shrewsbury to Watson Line Segment	Modifications to the street network within the Villas at Kenrick will eliminate north-south access at the east end of the development. These Villas are located off Trianon Parkway west of Route 366 behind the shops in the Kenrick Plaza area. There are three parallel east-west streets serving the Villas: Westover Colony Lane, Woodlawn Colony Lane, and Whitehall Colony Lane as you enter the Villas. Currently, Westover Colony Lane turns at the east end of the property (adjacent to the Burlington Northern Railroad), providing a north-south connection between these three east-west streets. To accommodate the new tracks, this north-south portion of Westover Colony Lane will be narrowed to accommodate the proposed light rail tracks and retaining wall. This will modify the access throughout the community. Westover Colony, Woodlawn Colony, and Whitehall Colony Lanes will still be connected in the central and western ends of the development by Westover Colony Lane. The north-south portion of Westover Colony Lane may be reduced to one-way traffic only

Orange Alternative to Butler Hill	
Reavis Barracks Station	The pedestrian walkway over I-55 near Reavis Barracks connects the neighborhood to the west of I-55 to the area to the east of I-55. This walkway provides access to the existing commuter lot on the west side of I-55 to the proposed station on the east side of I-55. This commuter lot is currently accessed by Spokane Drive from Reavis Barracks Road. The neighborhood, adjacent to I-55, is primarily single-family homes on the south side of Reavis Barracks Road and a multi-family apartment complex on the north. The pedestrian walkway would provide seemingly direct walking access to Bierbaum Elementary School on the east side of Union Road. Pedestrians could then walk north along Union Road to access the amenities at all four quadrants of the Union Road and Reavis Barracks Road intersection. These amenities include Holy Trinity Lutheran Church (SE quadrant), US Bank (SW quadrant), Najjar Car Care service center (NW quadrant), and a Shell gas/service station (NE quadrant). Immediately behind the gas station at the northeast quadrant is a strip mall that includes Prime Time Child Care Academy, South County Auto Parts, Pennie's Restaurant, V&E Pet Grooming, 19th Hole Lounge, Nail Tek, Denny & Company Family Hair Care, Universal Thrift, Hancock Fabrics, and a snow cone stand.
Reavis Barracks to Lindbergh Line Segment	Tracks will bisect an existing cluster of retail and hotel use, eliminating east-west access between establishments located on the north side of Lindbergh Boulevard just east of I-55. Currently the Holiday Inn, Mattress Giant, Marshalls, and JC Penney Home Store have access to Lindbergh Boulevard via two access points: one near Mattress Giant just one block east of I-55 and the other near the JC Penney Home Store just one additional block further east of I-55. Eastbound traffic on Lindbergh Boulevard may only access this retail area via the JC Penney Home Store entrance where there is a break in the jersey barrier in the median of Lindbergh Boulevard. As an exit for customers, this access point provides access to either east or westbound Lindbergh Boulevard as well as southbound access to Crescent Drive. The access point near Mattress Giant is right-in/right-out for westbound Lindbergh Boulevard traffic only. The new tracks will bisect the parking lot located among these establishments; this will isolate the Holiday Inn and Mattress Giant with only the right-in/right-out access to westbound Lindbergh Boulevard. Motorists desiring to head east on Lindbergh Boulevard after exiting these establishments would have to travel over I-55 to Rusty Road (just east of the Burlington Northern Railroad) to turn around and backtrack on eastbound Lindbergh Boulevard. Eastbound motorists desiring to access the Holiday Inn and Mattress Giant would have to enter the existing access point at the break in the jersey barrier near the JC Penney Home Store to turn around in the lot and exit to westbound Lindbergh Boulevard unless an additional break was made in the barrier. However, an additional break in the barrier would be located very close to the I-55 on/off ramps just west of the Holiday Inn desired access point. Another possible access point would be at the stoplight located on Union Road just north of Lindbergh Boulevard.

Lindbergh Station	Access from Lindbergh Boulevard on Crescent Drive will be closed. Crescent Drive provides access to such businesses as Honey Baked Ham and Mattress Firm that are located adjacent to Lindbergh Boulevard on either side of Crescent Drive, as well as the Toys R Us and Circuit City that are set back with their shared parking lot providing an additional access point to Lindbergh Boulevard. (Note: Honey Baked Ham and Mattress Firm will be removed for the LRT right-of-way.) Crescent Drive ends as a cul-de-sac at a small office park. When Crescent Drive is closed to Lindbergh Boulevard it will be extended between the Colonial Wood Condominiums and the Dialysis Center to connect to Union Road. This will provide access to these establishments for westbound Lindbergh Boulevard motorists via Union Road. Access via the Toys R Us/Circuit City parking lot will still be available to the eastbound Lindbergh traffic.
Lindbergh to Butler Hill Line Segment	The relocated entrance to Oakbrook Gardens apartments modifies access to Butler Hill Road. Because two apartment units will be taken to accommodate the new light rail right-of-way, the portion of Clayridge Drive that provided access to these units as well as the main entrance to the complex will be relocated. Currently, Clayridge Drive is one block east of I-55 off Butler Hill Road. Relocated Clayridge Drive will still provide access to Butler Hill Road just one block further east where there is stub from an existing road within Oakbrook Gardens. Relocated Clayridge Drive would access Butler Hill Road directly east of Midamerica Lane on the west side of Butler Hill Road.
Orange Alternative to Reavis Barracks	
Reavis Barracks Station	The pedestrian walkway over I-55 near Reavis Barracks connects the neighborhood to the west of I-55 to the area to the east of I-55. This pedestrian walkway is providing access to the existing commuter lot on the west side of I-55 to the proposed station on the east side of I-55. This commuter lot is currently accessed by Spokane Drive from Reavis Barracks Road. The neighborhood, adjacent to I-55, is primarily single-family homes on the south side of Reavis Barracks Road and a multi-family apartment complex on the north. The pedestrian walkway would provide direct walking access to Bierbaum Elementary School on the east side of Union Road. Pedestrians could then walk north along Union Road to access the amenities at all four quadrants of the Union Road and Reavis Barracks Road intersection. These include Holy Trinity Lutheran Church (SE quadrant), US Bank (SW quadrant), Najjar Car Care service center (NW quadrant), and a Shell gas/service station (NE quadrant). Immediately behind the gas station at the northeast quadrant is a strip mall that includes Prime Time Child Care Academy, South County Auto Parts, Pennie's Restaurant, V&E Pet Grooming, 19th Hole Lounge, Nail Tek, Denny & Company Family Hair Care, Universal Thrift, Hancock Fabrics, and a snow cone stand.

5.1.4 Cultural Impacts

Introduction

Cultural impacts refer to the potential use or devaluing of buildings, lands, or sites that have particular historical or archaeological value to the nation or the St. Louis region.

Regulatory Context

The U.S. Department of the Interior (National Park Service) maintains the National Register of Historic Places. The Register lists buildings and sites that have particular historical value because of association with important events or people, because they preserve historical architectural or engineering styles or industrial processes, or because they contain archaeological artifacts that may be important to understanding the history of the region. Sites may be nominated by local agencies or interest groups, and are placed on the list if they satisfy the criteria established by the Department of the Interior. Under Section 106 of the National Historic Preservation Act, if a federal agency finds that one of its projects would adversely affect a property that is listed on, or eligible for listing on, the National Register, it must initiate a coordination process with the designated State Historic Preservation Officer. This Section 106 coordination process is intended to identify ways in which the adverse effect may be avoided, minimized, or mitigated. Projects that may disturb Native American burial grounds or other culturally important sites are also subject to Section 106 review and coordination, and may have additional requirements imposed by federal law.

If the impact to any historic property constitutes a “use” (or constructive use), that use is also subject to Section 4(f) of the Department of Transportation Act. Section 4(f) impacts are discussed further in Chapter 7.

Resources Impacted

National Register of Historic Places: There are no sites on the National Register of Historic Places that are affected by any of the alternatives. The closest National Register site to any of the alternatives is the Louis Auguste Benoist House at 7802 Genesta Street in Affton which is several hundred feet from the Shrewsbury to Gravois-Hampton Line Segment of the Orange alternatives.

Potential Non-Register Historic Resources: There have been two resources that have been identified as possibly eligible for listing on the National Register during the study of the project area, the agency coordination process, and the community involvement process. The first is a 1941 residence on Germania Street that would be taken as part of the Gravois-Hampton station under the Orange alternatives. The second is the River Des Peres Drainage Channel, which has received engineering awards that suggest it may be eligible for listing as a historical industrial design. If one of the Orange alternatives is selected as the preferred alternative, a determination of eligibility will be undertaken before completion of the Final Environmental Impact Statement.

Archaeological Resources: There are no known archaeological sites in areas that will be disturbed by the construction of any of the alternatives. If any previously unknown archaeological sites should be encountered during construction, there are established procedures of the preservation of the resources.

5.1.5 Economic Impacts

Introduction

A major transportation investment such as the one contemplated for the Metro South area will have many financial and economic implications. Many of these financial considerations, such as the impact on the Metro operating budget, impacts on taxpayers, and comparison to other public investment, are important to the public policy decisions for this project. These financial issues are discussed in Chapter 6 of this DEIS.

The economic impacts that are described in this section are the potential changes in property values near new MetroLink stations. These impacts could affect the ability of homeowners to sell their homes, to refinance their homes to raise funds for improvements to the property, or to make other investments. In a similar manner, commercial property values will have impacts on redevelopment, rehabilitation, and even on the type of businesses that locate near MetroLink.

Regulatory Context

Redevelopment and other investment in property is controlled by zoning regulations established by the County or the municipality where the property is located. The level of property investment is also sensitive to interest rates, which are impacted by the Federal Reserve. This DEIS analysis does not assume any changes in zoning or interest rates.

Potential Impacts

Metro South project staff conducted an extensive review of the academic studies that addressed the land value impacts of new light rail transit services. The results of these studies varied widely. Stations in less densely populated areas in smaller urban areas or areas with low overall market demand showed very modest impacts on land values following transit implementation. In contrast, more urbanized areas, especially those in strong real estate markets and with severe congestion problems, realized property value increases of 10 percent or more in the decade or longer after transit implementation.

Based on this prior research and incorporating a conservative judgment of the future nature of Metro South real estate markets, the following procedures were adopted for evaluating potential property value impacts in the Metro South area:

- Residential property values are forecast to increase by 5 percent in areas within a one-half-mile walking distance of a MetroLink station.
- Residential properties that abut the light rail line and those within one-quarter mile of the entrance to new park-and-ride lots will experience noise, vibration, traffic and similar impacts that will tend to counter any increase in property values, and no increase in value was calculated for these properties.
- Commercial property values are forecast to increase by an average of 8 percent within one-half-mile of stations. Business are not adversely affected by noise and traffic the way residences are, so no exclusion of close-in commercial properties is warranted.

Property assessments for all properties within one-half-mile of stations were obtained from public records and used to calculate the property value impacts of the alternatives. The results of this analysis are presented in Table 5-4, "Property Value Impacts." The two longest alternatives – The Blue alternative to Butler Hill and the Orange alternative to Butler Hill – have the greatest projected property value impacts.

Table 5-4: Property Value Impacts

Alternatives	Change in Property Value for Property within ½ mile of New MetroLink Stations (2004 dollars)
No-Build alternative	No change
TSM alternative	No change
Purple alternative	Commercial property: + $2.2 million Residential property: + $3.9 million
Total	**$ 6.1 million**
Blue Alternative to Butler Hill	Commercial property: + $10.7 million Residential property: + $17.5 million
Total	**$ 28.2 million**
Blue Alternative to Watson	Commercial property: + $2.2 million Residential property: + $3.0 million
Total	**$ 5.2 million**
Orange Alternative to Butler Hill	Commercial property: + $9.4 million Residential property: + $20.1 million
Total	**$ 29.5 million**
Orange Alternative to Reavis Barracks	Commercial property: + $1.5 million Residential property: + $14.2 million
Total	**$ 15.7 million**

These rising property values are driven, in large part, by the improvements in the accessibility of the areas around stations to other destinations in the St. Louis metropolitan area. That is, some of the benefits of improved efficiency and reduced travel times are expressed as increased rents and sales values of these properties. This increased efficiency is a net benefit to the area. However, rising rents and prices may be seen as a negative effect by some residents and businesses. Over time, some households may move away from station areas to seek lower rents or home prices, and some businesses may move or go out of business rather than pay higher rents. They will be replaced by households and businesses that are able and willing to pay more for the advantage of being located near a MetroLink station.

5.1.6 Safety and Security Impacts

Introduction

Potential safety and security impacts include:

- Traffic safety, collisions, derailments, fires. These concerns include, in particular, potential injuries to passengers, occupants of automobiles, and pedestrians and cyclists that might occur in a collision.

- Protection of passengers from crime and terrorism. While most crime on transit property is relatively minor, recent terrorist attacks against transit passengers in Europe and Asia have increased fears of such attacks on U.S. transit systems.
- Fear of increased crime in neighborhoods near light rail transit stations. While this is a common fear, there is no clear evidence that new light rail transit stations cause an increase in local crime rates.
- Security-sensitive sites, such as water supplies, nuclear power plants, and chemical factories, may be affected if a new transportation facility alters its perimeter control, making it easier for criminals to approach the site without being detected. No such sites are located along any of the alternative alignments.

Regulatory context

A host of state and federal regulations and requirements govern the construction and operation of bus and rail transit systems. These include building codes, fire safety requirements for materials used in light rail transit cars, traffic control devices, and many others. Many of these requirements must be addressed in the final design and operation of any light rail transit improvement, but do not have a direct affect on the issues addressed in this DEIS.

Among the safety regulations that may have environmental effects are those of the Federal Railroad Administration (FRA). The FRA regulations can control the design and operation of light rail transit services operating in railroad corridors. The FRA's safety regulations, in particular, prohibit light rail services (such as MetroLink) from operating on the same tracks as heavier freight and passenger railroad trains. In the event of a collision between trains of such different design, there could be disproportionate damage to the light rail transit vehicles and consequent danger to the passengers and crew. Because of safety concerns the BNSF Railway has insisted that MetroLink trains operating in a railroad corridor must be both elevated 10-15 feet above and separated horizontally by 36 feet from its tracks.

The Missouri Department of Transportation's Multimodal Division has certain oversight responsibilities for railroad safety that would otherwise be regulated by FRA. Most important of these is approval of railroad grade crossing design and operations. Several of the light rail alternatives include at least one grade crossing.

Potential safety and security impacts

Traffic, collision, fire. Each of the alternatives has been designed to minimize danger from these sources. When operating in or along streets, the light rail line will be separated by a low barrier wall. The light rail lines are largely grade-separated to avoid traffic conflicts at intersections. The two grade crossings planned – at Morganford on the Orange alternatives and at Union Road on the Orange-Butler Hill and Blue-Butler Hill alternatives – would not result in major safety problems. Morganford is a low-speed crossing, controlled by traffic lights, and Union Road is a dead-end road with little traffic at the point where it is crossed by the proposed light rail extension. Union Road would be protected by gates, lights, and bells. In addition to protection of the public, safety measures have been incorporated into light rail transit systems to protect transit passengers. As a result, the injury rate to transit passengers is very low compared to traveling the same distance by automobile.

Crime affecting passengers. A recent study sponsored by the National Academies of Science[2] observed that transit crime tends to be less serious than other crimes that may be committed in the city (although serious crimes do occur). There is scant evidence, and some of it conflicting, that compares the rate of transit crime to other urban settings. The study also noted that, if the public perceives crime on transit to be a problem, this perception can lead to declines in ridership. Crime is therefore an important issue, and one that is addressed for the entire transit system through such measures as police presence, design of stations, communications, and other methods. Notably, Metro Security statistics show that crime rates on St. Louis area transit services are significantly lower than the rate for such crimes in the metropolitan area as a whole. Below are a few statistics that show the low crime rate that occurs on the MetroLink system.

- In FY 2003, MetroLink carried nearly 15 million passengers with the average weekday ridership of 44,539.
- The fare evasion rate in 2003 was 0.37%.
- There are a total of 28 MetroLink stations along the entire alignment, of which 16 have park-and-ride lots and spaces. Metro has a total of 7,112 parking spaces along its alignment. Less than 30 auto thefts were report at MetroLink parking lots in 2003.
- About five robberies occurred along the MetroLink alignment in 2003.
- Less than 15 assaults occurred on the MetroLink system in the year 2003.
- MetroLink reported less than 65 burglaries in the year 2003.

Similarly, the threat of terrorism on or affecting transit systems is being addressed nationally by federal agencies working in cooperation with local and state authorities. There is little reliable research that would support any conclusions about the likelihood of terrorism on new transit services, although the national anti-terrorism program is particularly alert to this threat, because of

[2] Jerome A. Needle and Renee M. Cobb, "Improving Transit Security," Transit Cooperative Research Program Synthesis #21, 1997.

recent international incidents. An additional concern is related to the types of facilities or neighborhoods that abut the line. As noted above, there are no sensitive security targets, such as power plants and water supplies, along any of the alternatives. Freight rail lines and highways, such as those that parallel the light rail alignments, have not been terrorism targets in this country.

Crime affecting neighborhoods. There is a common concern among neighbors that criminals will use new transit services to come to their neighborhoods to victimize local residents and businesses. There is scant evidence to support this perception, at least to the degree that is often alleged. A survey of police authorities in Massachusetts suburban communities where commuter rail stations are located indicated no general problem with crime against persons, homes, or businesses.[3] Crimes against automobiles parked at light rail transit stations (auto theft, theft from vehicles, vandalism) are similar to those found at other similar-sized parking facilities, such as shopping malls and movie theatres.

5.1.7 Navigation Impacts

Portions of River Des Peres in the study area may technically be navigable, and thus under the jurisdiction of the U.S. Coast Guard and U.S. Army Corps of Engineers for bridges and other construction. However, there are no private landowners along the navigable portions of the river, and there is no commercial use of the waterway. Recreational use of the waterway is severely inhibited by the condition of the waterway (artificial channelization and collected debris) and the fact that it often collects the combined overflow of storm and sanitary sewers.

The Orange alternatives will cross River Des Peres twice each. These bridges will provide horizontal and vertical clearance that is at least as great as the existing street and highway bridges. Therefore there will be no greater restriction of any possible future use of the waterway than already exists.

5.1.8 Environmental Justice Considerations

Introduction

Environmental justice is a concept that emphasizes fair treatment for all population groups whose environment may be affected by federal projects. In the past, lower-income and minority neighborhoods have often been the location of locally-undesirable projects such as landfills and sewage processing facilities. This can happen without any overt discriminatory intent by project planners and decision makers. It is therefore important to look at the actual result

[3] Massachusetts Bay Transportation Authority, *Final Environmental Impact Report, Transportation Improvements in the Greenbush Line Corridor,"* 2001, p. V-26.

of project decisions, not just motive. Environmental justice analysis is included in the DEIS to ensure that this issue is not overlooked, and that the negative impacts of the project do not fall disproportionately on low-income or minority areas.

Regulatory Background

Executive Order 12898, issued by President Clinton in 1994, requires federal agencies to consider environmental justice in all of their decisions.

Potential impacts

Project analysts obtained 2000 U.S. Census information, and rank ordered all Census block groups in the St. Louis Metropolitan Statistical Area according to median household income and percentage minority (black, Hispanic, Asian, Native American, other) population. A Census block group is smaller than a census tract, and typically has a population of about 1,500 people. There may be several block groups in a census tract.

Block groups that were in the lowest 20 percent of all block groups in the metropolitan area in terms of median household income were considered as low-income areas for environmental justice purposes. Likewise, all block groups that are in the highest 20 percent of block groups in the metropolitan area in terms of percentage minority population were considered as minority areas for this analysis.

None of the minority block groups in the metropolitan area are located within the Metro South study area. There is one low-income block group located within the Metro South study area, located near the Kenrick Seminary in the southern end of Shrewsbury, bounded by Watson Road, Trianon Parkway, and Laclede Station Road. This block group is located across Watson Road from Watson station, proposed as part of the Purple and Blue-Watson alternatives. None of the transportation alternatives are physically located within this block group, and this area therefore is not subject to direct negative impacts such as noise, housing displacements, or visual impacts. Most of this block group would be within walking distance of Watson station, and its residents would realize a transportation benefit from the MetroLink service proposed as part of those two alternatives.

This analysis demonstrates that there is no differential negative environmental impacts on low-income or minority areas, and that all of the project alternatives satisfactorily address the environmental justice concerns as required in Executive Order 12898.

5.1.9 Parkland and Open Space Impacts

Introduction

Parks and other open space may be impacted in several ways. The most direct impact would be the acquisition of park or open space property to be incorporated into the light rail right-of-way or station area. In some cases, there may be a constructive taking, even though no actual land area is taken. This might occur when the noise, vibration, light, or other impacts of an adjacent transportation facility prevent a park or open space property from being used for its intended purpose, or where access to the park or open space is blocked by the new transportation facility. Impacts that do not prevent use of the park or open space are also described under other impact categories, such as Noise or Visual Impacts.

In this section, land is considered to be open space only if it is permanently dedicated as open space. Any buildings on the property would be used for recreation or visitor services. Such land may be owned by the public, including parks, playfields, and conservation areas. Privately owned open space includes cemeteries, land subject to conservation easements, and golf courses. Land that is vacant, but potentially developable, is not considered open space; nor is land that is part of a residential lot, office park, other commercial lot, sewage/drainage easement or highway or railroad right-of-way even if it is landscaped.

Regulatory context

Parks and recreation areas in public ownership are given special protection under federal law, popularly known as “Section 4(f).” Section 4(f) requires certain findings before any such land can be used for a federally-funded transportation project. These requirements are discussed further in Chapter 7, “Section 4(f) Evaluation.”

Park or recreation property acquired or improved using federal Land and Water Conservation (LAWCON) funds cannot be converted to other uses without the approval of the U.S. Secretary of the Interior. This requirement is sometimes referred to as “Section 6(f).” There are no such properties used under any of the Metro South alternatives.

Resources Impacted

Table 5-5, “Parkland and Other Open Space Impacts,” describes the potential park and open space impacts of the project alternatives.

Table 5-5: Parkland and Other Open Space Impacts

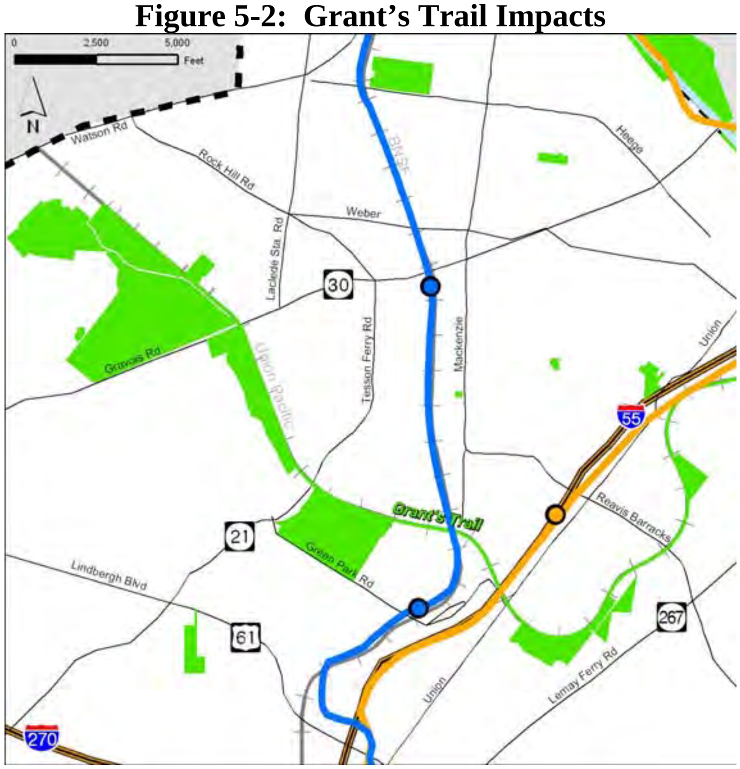
Alternatives	Parkland Impacts	Cemeteries and Other Open Space Impacts
No-Build	no impact	no impact
Transportation Systems Management	no impact	no impact
Purple Alternative		
Shrewsbury to Watson Line Segment	Alignment would use land from River Des Peres Park, south of River Des Peres Blvd., between Murdoch Ave and Chippewa St. (Watson Rd) (1.7 acres). Embankment and aerial structure would have visual impact for park users and block views of park from neighbors.	The right-of-way would run between Watson Road and Resurrection Cemetery, requiring property takings from the cemetery (0.7 acres). The right-of-way would be within 20 feet of an existing columbarium at the northern side of the cemetery.
Total	**1.7 acres**	**0.7 acres**
Blue Alternative to Butler Hill		
Shrewsbury to Watson Line Segment	Alignment requires a very small part (less than 2000 square feet) of City of St. Louis land that is part of River Des Peres park parcel. This property was apparently once part of Devon-shire Street and is now used as a driveway by a residence that would be acquired for the Blue alternative.	None: The light rail right-of-way is on the west side of the BNSF tracks and does not require takings from the cemetery.
Watson to Gravois Line Segment	None	None: The light rail right-of-way is on the west side of the BNSF tracks and does not require takings from the cemetery.
Gravois to Green Park Line Segment	Alignment crosses Grant's Trail on a bridge. Easement for crossing and for footprint of two bridge piers re-quired.	
Total	**<0.1 acres**	

Blue Alternative to Watson		
Shrewsbury to Watson Line Segment	Alignment requires a very small part (less than 2000 square feet) of City of St. Louis land that is part of River Des Peres park. This property was apparently once part of Devonshire Street and is now used as a driveway by a residence that would be acquired for the Blue alternative.	None: The light rail right-of-way is on the west side of the BNSF tracks and does not require takings from the cemetery.
Total	**<0.1 acres**	
Orange Alternative to Butler Hill		
Shrewsbury to Bayless Line Segment	Alignment would require a substantial portion (8.8 acres) of River Des Peres Park, on the south side of the river from Lansdowne Ave. to Gravois Rd., on the northern bank near Morganford Rd., and on the southern bank at Carondelet Blvd.	The location of the light rail right-of-way between the River Des Peres Blvd and the river requires shifting the roadway south, taking a strip of land along the north side of the New St. Marcus Cemetery (0.9 acres).
Reavis Barracks to Lindbergh Station Line Segment	Alignment crosses Grant's Trail at Greenpark Road. MetroLink would be on a bridge next to I-55 crossing, with bridge piers in street layout of Greenpark Road. No land requirements.	
Total	**8.8 acres**	**0.9 acres**
Orange Alternative to Reavis Barracks		
Shrewsbury to Bayless Line Segment	Alignment would require a substantial portion (8.8 acres) of River Des Peres Park, on the south side of the river from Lansdowne Ave. to Gravois Rd., on the northern bank near Morganford Rd., and on the southern bank at Carondelet Blvd.	The location of the light rail right-of-way between the River Des Peres Blvd and the river requires shifting the roadway south, taking a strip of land along the north side of the New St. Marcus Cemetery (0.9 acres).
Total	**8.8 acres**	**0.9 acres**

Figure 5-1 shows the impacts that each of the alternatives have on the River Des Peres Park. Figure 5-2 shows the impacts that the Blue and Orange alternatives have on Grant's Trail at Greenpark Road.

Figure 5-1: River Des Peres Park Impacts

Figure 5-2: Grant's Trail Impacts



5.2 IMPACTS ON THE NATURAL ENVIRONMENT

5.2.1 Air Quality Impacts

Introduction.

Improving the quality of the air is a national priority. Improvements to transit services and facilities, which are designed to attract travelers out of their cars and onto transit, are generally considered to have a beneficial affect on air quality. However, the impact of new transit services on air quality is often complex, and requires consideration of several different impact mechanisms, including:

- Reduced automobile emissions. Some portion of the ridership on the new transit service will be travelers who would have used an automobile (as the driver or passenger) to get to their destinations. That automobile trip would have generated a certain quantity of emissions of air pollutants. The travel forecasting models provide information on how many trips of what length would be diverted from automobile to transit under each of the transportation alternatives and analysts can use this information to project the resulting reduction in emissions.

- Additional transit vehicle emissions. The operation of new or additional transit service may result in an increase in emissions of air pollutants – either directly as exhaust from diesel buses, or indirectly to produce the electrical power to propel light rail trains. Generally, transit services have lower emissions per passenger mile than automobiles, SUVs, vans, pickups and other personal vehicles. These transit emissions must be used to offset any improvements in automobile emissions to get a net regional emissions impact. This regional-level analysis is often called “macro-scale” air quality analysis.

- Changes in traffic patterns. Changes in traffic patterns and volumes, particularly near station entrances, can result in local traffic queues and delays. Large numbers of vehicles idling in queues and in stalled traffic can result in carbon monoxide “hot spots,” where local carbon monoxide concentrations exceed health standards. Evaluation of these potential hot spots is often called a “micro-scale” analysis.

This section will address potential impacts to regional emissions from transportation sources (a “macro-scale” analysis). This section does not present a micro-scale analysis because such analysis is only possible when a fairly advanced level of engineering is completed, including intersection and driveway design. A full micro-scale analysis will be reported in the Final EIS for this project. It should be noted that with modern emission controls on automobiles, carbon monoxide hot-spots are rare, and can usually be eliminated through intersection design. Because of this, the micro-scale analysis is not very useful in assessing the overall impacts of the project, or in choosing among the various project alternatives.

The macro-scale air quality analysis looks at several transportation-related pollutants, including:

- Carbon dioxide, or CO2, is a normal component of the atmosphere, and in outdoor settings is not poisonous or life-threatening to plants or animals. However, it is the most common of the "greenhouse gases" that are associated with global warming. CO2 is an unavoidable by-product of the burning of fossil fuels, such as gasoline in automobiles, diesel fuel in trucks or buses, or coal to produce electricity.

- Carbon monoxide, or CO, is a less benign combustion product. In high concentrations, it can lead to a number of ailments in humans and animals through its ability to hinder the transfer of oxygen to the brain and other tissues. People with heart or lung disease are particularly vulnerable. CO combines with oxygen to become CO2, so the major concentrations of CO are at congested intersections and near road-ways.

- Volatile organic compounds, or VOCs, are mainly hydrocarbon compounds that result from the incomplete combustion of fossil fuels, evaporation of fuel in storage, and other processes. VOCs are one of the chemical precursors of ozone (O3), one of the components of "smog" that has serious impacts on human health.

- Nitrogen oxides (NOx) are another combustion by-product that can lead to formation of ozone. NOx is also involved in the formation of acid rain. NOx forms readily when fuel is burned at high temperature and under pressure, such as in a diesel engine.

- Particulate Matter (PM) is the fine solid (non-gaseous) material that may be emitted from engines or power plants, or may be the end result of chemical reactions of other emissions. Larger particulate matter may be visible as soot or smoke. Smaller particulate matter is a significant concern because it stays suspended in the air and passes more readily into the lungs of humans and animals. EPA has specific regulations for particulate matter that is smaller than 10 microns in diameter (PM-10), and additional restriction on PM less than 2.5 microns in size (PM-2.5). Personal vehicles (highway vehicles used for commuting and personal travel, including automobiles and small gasoline-powered trucks) do not directly emit a significant amount of PM.

- Ozone, or O3, is not emitted directly by transportation sources, but is a product of further photochemical reactions with transportation emissions. Ozone in the stratosphere may have some benefits by blocking ultraviolet rays from the sun, but closer to the earth's surface, ozone has a number of negative health impacts when breathed. Ozone concentrations are used as an indicator of air quality.

Regulatory environment

The U.S. Environmental Protection Agency (EPA) regulates air quality and emissions under the Clean Air Act. EPA has established standards for the maximum concentration of major pollutants. Areas of the country that exceed these standards are found to be in "Non Attainment" of standards on one or more pollutants. In these areas, state air quality planners must develop long-term strategies to reduce emissions and to bring the areas into compliance with the air quality requirements. These plans and strategies are presented in the State Implementation Plan.

St. Louis County is within the St. Louis area air quality district that has been found to be in Non Attainment on the 8-hour ozone standard and the PM 2.5 standard. These standards were added by EPA in 2000 after St. Louis (and many other metropolitan areas) had largely met previous air quality standards after decades of emission controls and regulation.

The Non-Attainment status means that the states involved must continue to implement emissions controls and other measures to reduce concentrations of air pollutants through the State Implementation Plan (SIP). It also means that the transportation plan and program must be developed to comply with the SIP, and any new transportation project must be part of the plan and program that has been shown to comply.

The analysis of regional emissions and the transportation plan and program is done on a regional basis, not project-by-project. The purpose of the DEIS analysis of air quality is not to substitute for these regional analyses, but to provide a basis for comparing the transportation alternatives on this measure. Generally, an alternative that results in a net decrease of regional emissions of the criteria pollutants would help the transportation plan and program conform with air quality goals. An alternative that does not result in decreased emissions of all pollutants could nevertheless be part of a conforming plan and program if other elements are included to offset or mitigate emissions.

Impacts on Air Quality

Reduced Auto Travel. The reduction in automobile emissions was calculated using the following methodology:

- The increase or decrease in person-miles of travel by transit was calculated as a part of the ridership forecasting effort reported in Chapter 4.

Each increased person-mile of travel by transit is approximately equal to one fewer person-mile of travel by automobile or other personal vehicle because the total number of trips is the same in all alternatives. Person miles of travel by transit are reported in the ridership documents in the Appendix D.

- The change in person miles of travel can be converted to a change in vehicle miles of travel by dividing by the average number of occupants per vehicle. For work trips, an auto occupancy of 1.05 persons per vehicle was used; for non-work trips, the occupancy rate is 2.25. This reflects existing travel patterns, where most people drive alone to work, but travel in larger groups for non-work trips.

- Each vehicle mile of travel added or subtracted results in a change in emissions, according to a vehicle emissions model developed by the EPA. This model, called MOBILE6, evaluates emissions for particular climate conditions and for a fleet of vehicles that includes vehicles built in different years. As new cars have lower emissions than older cars, the average emissions will change over time. For comparison purposes, the initial analysis used a 1999 base year.[4] The emission factors used reflected a weighted average of automobiles and small gasoline-powered trucks (SUVs, pickups, vans).[5] The Missouri Department of Natural Resources projected certain emissions for the 2014 vehicle fleet.[6] These lower emission factors will be evaluated in a separate step.

- Annual tons of each pollutant were calculated by using an annual-to-weekday factor of 312, and converting grams to U.S. short tons, to conform to the most commonly-used terms.

The results of this analysis are presented in Table 5-6, "Emissions Impacts of Change in Personal Vehicle VMT." This table shows that the TSM, Purple, and Blue-Watson alternatives each result in a slight increase in emissions from automobiles and other personal vehicles. This occurs because these alternatives change the mix of non-work and work trips. This results in a small change in automobile VMT because the different trip purposes have different auto occupancy (average number of persons per vehicle) characteristics. Each of the Build alternatives incorporates the basic bus system changes of the TSM; the Purple and Blue-Watson alternatives do not offer enough improvement in transit service quality to overcome the increased VMT from the shift

[4] Emission factors were derived from Robert J. Shapiro, "Conserving Energy and Preserving the Environment: The Role of Public Transportation," 2002, as reported by the American Public Transportation Association at www.apta.com/research/stats/energy/emissions.cfm.
[5] Emission factors for personal vehicles in 1999 were: CO_2, 453 grams per vehicle mile; CO, 21.5 gm/veh-mi; NO_x, 1.6 gm/veh-mi; VOC, 2.1 gm/veh-mi.
[6] Redesignation Demonstration and Maintenance Plan for the Missouri portion of the St. Louis Ozone Nonattainment Area, 2002.

of ridership with the TSM bus changes. The Blue-Butler Hill and two Orange alternatives, on the other hand, result in a net reduction of automobile use and consequently, a reduction in emissions from this source.

Table 5-6: Emissions Impacts of Change in Personal Vehicle VMT

	Alternative						
	No-Build	**TSM**	**Purple**	**Blue Watson**	**Blue Butler Hill**	**Orange Butler Hill**	**Orange Reavis Barracks**
Daily Transit Passenger-mi (000-metro area)							
Work	510	505	506	506	581	585	560
Non-Work	464	470	469	469	538	549	521
Total	**974**	**975**	**974**	**974**	**1119**	**1134**	**1081**
Vehicle-Miles equiv. (000)	692	690	690	690	793	801	765
Change from No. Build	-	+2	+2	+2	-101	-109	-73
Annual change VMT(000)	-	+620	+590	+590	-31,400	-34,100	-22,900
Emissions at 1999 rates (tons/yr)							
CO2 (453 gm/vehicle)	-	+310	+300	+300	-15700	-17000	-11400
CO (31.5 gm/vehicle)	-	+15	+14	+14	-740	-810	-540
NOx (1.6 gm/vehicle	-	+1	+1	+1	-55	-60	-40
VOC (2.1 gm/vehicle	-	+1	+1	+1	-73	-79	-53
Emissions at 2014 rates (tons/yr)							
NOx (0.548 gm/veh.mi)	-	+0	+0	+0	-19	-21	-14
VOC (0.635 gm/veh.mi)	-	+0	+0	+0	-22	-24	-16

Transit Vehicle Emissions. Each of the Build alternatives includes a significant increase in transit service compared to the No-Build alternative. Each of the alternatives includes a substantial increment in bus service and the Build alternatives include additional light rail transit service.

The amount of additional service provided under each alternative was calculated based on service assumptions presented in "Task VI Draft Operating Plans for Detailed Alternatives," August 2004, included as a support document.

The emissions factors for buses and light rail transit vehicles were based on 1999 national averages.[7] For electric-powered vehicles, the emission factors reflect the national average for electric power generation plants. In Missouri, electric power generation uses coal as a fuel more than the national average (83 percent of production versus 56 percent nationally), and uses gas, nuclear and hydroelectric correspondingly less.[8] However, because of regional grids for distributing power loads, increased demand for power is likely to tap into a wider generating area, and thus is more likely to reflect the national average than the current mix of generation in Missouri. National figures for emissions per kilowatt hour were converted into LRT vehicle miles by using Metro-Link's average consumption of 6.96 kilowatt hours per vehicle mile, as reported to FTA (2001 figures).

The emissions relating to transit vehicle operations are shown in Table 5-7, "Emissions Impacts of Transit Operations." Table 5-8 shows the net air quality impact of each alternative after taking into account the personal vehicle emissions in Table 5-6 and transit emissions in Table 5-7.

Adjusting for the transit emissions, the Blue-Butler Hill, Orange-Butler Hill and Orange-Reavis Barracks alternatives still show net air quality benefits on all pollutants. The TSM, Purple, and Blue-Watson show increased emissions of each pollutant. The total scale of air quality impacts, however, is small, whether positive or negative. The VOC and NOx net emissions represent a small fraction – less than one-tenth of one percent (0.1%) – of the total emissions of these pollutants in the St. Louis area, and a small percent of the reductions required to achieve attainment of the standards for these pollutants.

2014 Emission Rates. Over the last 30 years, the controls on vehicle emissions have become more restrictive, and new emission control technology has reduced the tailpipe emissions for recent model years substantially compared to vehicles built in earlier years. By 2014, the average vehicle emission rate for VOCs and NOx will be about one-third of what it was for the average vehicle in 1999. The weighted average emission rates of light-duty vehicles (cars, pickups, etc.) for VOC in 2014 are projected to be 0.635 grams/vehicle mile and for NOx, 0.548 grams per vehicle mile – compared to 2.1 gm/veh-mi and 1.6 gm/veh-mi, respectively, in 1999.

[7] Shapiro, op cit.
[8] U.S. Dept. of Energy, 1999.

Table 5-7: Emissions Impacts of Transit Operations

	Alternative						
	No-Build	**TSM**	**Purple**	**Blue Watson**	**Blue Butler Hill**	**Orange Butler Hill**	**Orange Reavis Barracks**
Transit Buses							
Bus-miles (000/yr)	17,400	18,400	18,200	18,200	17,900	17,800	17,800
Change from No- Build	0	+1,010	+820	+820	+560	+460	+480
Bus Emssions(tons/yr)							
CO2 (2390 gm/bus-mi)	-	+2,660	+,2170	+2,170	+1,480	+1,220	+1,260
CO (11.6 gm/bus-mi)	-	+13	+11	+11	+7	+6	+6
NOx (11.9 gm/bus-mi)	-	+13	+11	+11	+7	+6	+6
VOC (2.3 gm/bus-mi)	-	+3	+2	+2	+1	+1	+1
LRT (MetroLink)							
Veh-mi (000/yr)	6,510	6,510	6,590	6,680	7,540	7,800	7,320
Change from No- Build	0	0	180	170	1,030	1,290	810
LRT Emissions (tons/yr)							
CO2 (4300 gm/veh-mi)	-	0	+840	+810	+4,910	+6,130	+3,850
CO (12.3 gm/veh-mi)	-	0	+2	+2	+14	+18	+11
NOx (0.12 gm/veh-mi)	-	0	+0	+0	+0	+0	+0
VOC (0.96 gm/veh-mi)	-	0	+0	+0	+1	+1	+1

With the lower emission rates, the reduction of vehicle miles by personal vehicle will have a smaller benefit, in terms of total pollutants eliminated. However, even with the lower emission rate for these pollutants in the 2014 fleet, the emissions reductions for automobile more than offset any increases from transit operations for the Blue-Butler Hill, Orange Butler-Hill and Orange-Reavis Barracks alternatives. These figures are shown in Table 5-8. These alternatives will show a net air quality benefit, and will contribute to a transportation plan and program that supports air quality attainment objectives.

Table 5-8: Net Emissions Impacts
(Tons/year)

	Alternative						
	No-Build	**TSM**	**Purple**	**Blue Watson**	**Blue Butler Hill**	**Orange Butler Hill**	**Orange Reavis Barracks**
1999 Vehicle Fleet	-						
CO2	-	+2970	+3300	+3270	-9290	-9670	-6340
CO	-	+28	+27	+27	-720	-790	-530
NOx	-	+14	+12	+12	-48	-54	-34
VOC		+4	+4	+4	-70	-76	-51
2014 Vehicle Fleet							
NOx		+14	+11	+11	-11	-14	-7
VOC		+3	+3	+3	-19	-21	-14

5.2.2 Noise and Vibration Impacts

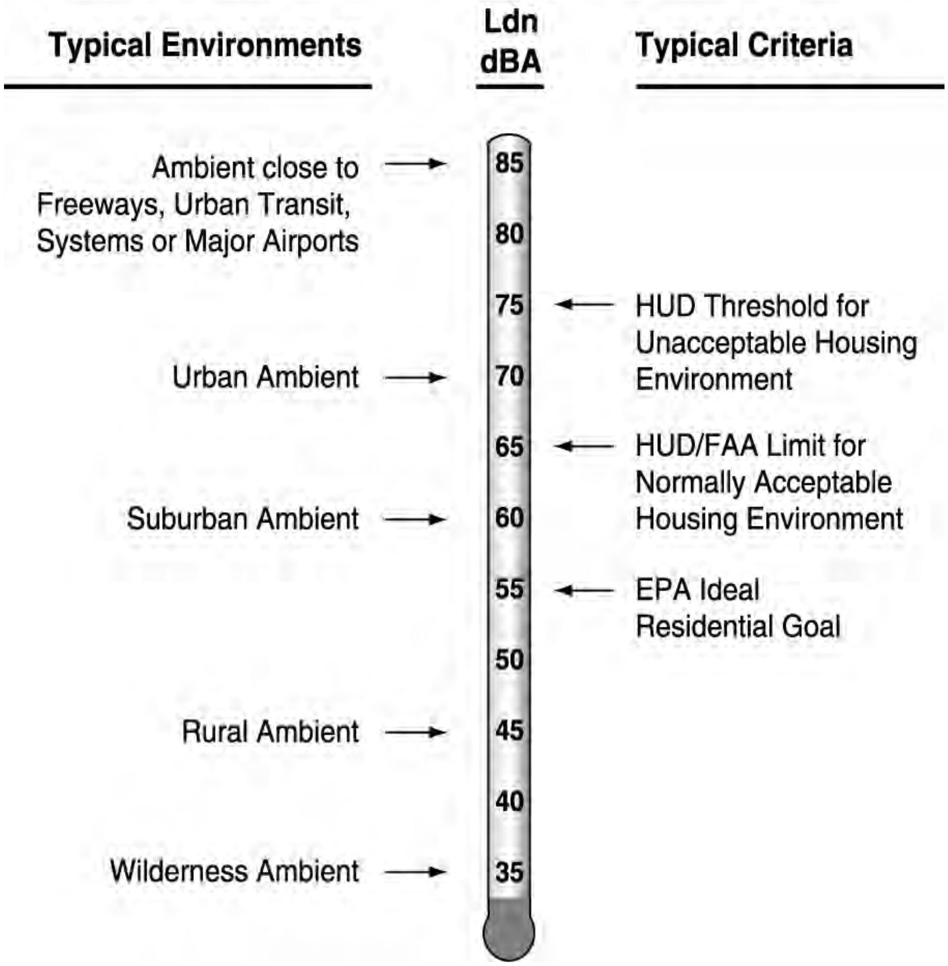
Noise Impacts

Noise Basics: Noise is typically defined as unwanted or undesirable sound. Sound is characterized by small air pressure fluctuations above and below the atmospheric pressure. The basic parameters of environmental noise that affect human subjective response are 1) intensity or level, 2) frequency content, and 3) variation with time. The first parameter is determined by how greatly the sound pressure fluctuates above and below the atmospheric pressure, and is expressed on a compressed scale in units of decibels. By using this scale, the range of normally encountered sound can be expressed by values between 0 and 120 decibels. On a relative basis, a 3-decibel change in sound level generally represents a barely noticeable change outside the laboratory. A 10-decibel increase in sound level would typically be perceived as a doubling in the loudness of a sound.

The frequency content of noise is related to the tone or pitch of the sound, and is expressed based on the rate of the air pressure fluctuation in terms of cycles per second (called Hertz and abbreviated as Hz). The human ear can detect a wide range of frequencies from about 20 Hz to 17,000 Hz. However, because the sensitivity of human hearing varies with frequency, the A-weighting system is commonly used when measuring environmental noise to provide a single number descriptor that correlates with human subjective response. Sound levels measured using this weighting system are called "A-weighted" sound levels, and are expressed in decibel notation as "dBA." The A-weighted sound level is widely accepted by acousticians as a proper unit for describing environmental noise.

Because environmental noise fluctuates from moment to moment, it is common practice to condense all of this information into a single number, called the “equivalent” sound level (Leq). Leq can be thought of as the steady sound level that represents the same sound energy as the varying sound levels over a specified time period (typically 1 hour or 24 hours). Often the Leq values over a 24-hour period are used to calculate cumulative noise exposure in terms of the Day-Night Sound Level (Ldn). Ldn is the A-weighed Leq for a 24-hour period with an added 10-decibel penalty imposed on noise that occurs during the nighttime hours (between 10 P.M. and 7 A.M.). Many surveys have shown that Ldn is well correlated with human annoyance, and therefore this descriptor is widely used for environmental noise impact assessment. Figure 5-3 provides examples of typical noise environments and criteria in terms of Ldn. While the extremes of Ldn are shown to range from 35 dBA in a wilderness environment to 85 dBA in noisy urban environments, Ldn is generally found to range between 55 dBA and 75 dBA in most communities. The 55dBA to 75dBA range spans between an ideal residential environment and the threshold for an unacceptable residential environment according to U.S. federal agency criteria.

Figure 5-3: Examples of Typical Outdoor Noise Exposure



Transit Noise Criteria: Noise impact for this project is based on the criteria defined in the U. S. Federal Transit Administration (FTA) guidance manual Transit Noise and Vibration Impact Assessment (FTA Report DOT-T-95-16, April 1995). The FTA noise impact criteria are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. Although higher transit noise levels are allowed in neighborhoods with high levels of existing noise, smaller increases in total noise exposure are allowed with increasing levels of existing noise.

The FTA Noise Impact Criteria group noise sensitive land-uses into the following three categories:

Table 5-9: Land-Use Categories for Noise Impact

Land-Use Category	Description
Category 1	Buildings or parks where quiet is an essential element of their purpose.
Category 2	Residences and buildings where people normally sleep. This includes residences, hospitals, and hotels where nighttime sensitivity is assumed to be of utmost importance.
Category 3	Institutional land-uses with primarily daytime and evening use. This category includes schools, libraries, churches and active parks.

Ldn is used to characterize noise exposure for residential areas (a Category 2 land-use). For other noise sensitive land-uses, such as outdoor amphitheaters (an example of a Category 1 land-use) and school buildings (an example of a Category 3 land-use), the maximum 1-hour Leq during the facility's operating period is used.

There are two levels of impact included in the FTA criteria. The interpretation of these two levels of impact is described below:

Table 5-10: Levels of Noise Impact

Impact	Severe impact
In this range of noise impact, sometimes referred to as moderate impact, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land-uses affected, existing outdoor-indoor sound insulation, and the cost effectiveness of mitigating noise to more acceptable levels.	Severe noise impacts are considered "significant" as this term is used in the National Environmental Policy Act (NEPA) and implementing regulations. Noise mitigation will normally be specified for severe impact areas unless there is no practical method of mitigating the noise.

The noise impact criteria are shown in graphical form in Figure 5-4. Along the horizontal axis of the graph is the existing noise exposure and the vertical axes show the additional noise exposure from the transit project that would cause either moderate or severe impact. The future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by the transit project. Figure 5-5 shows the noise impact criteria for Category 1 and 2 land-uses in terms of the allowable increase in the cumulative noise exposure.

Figure 5-4: FTA Noise Impact Criteria

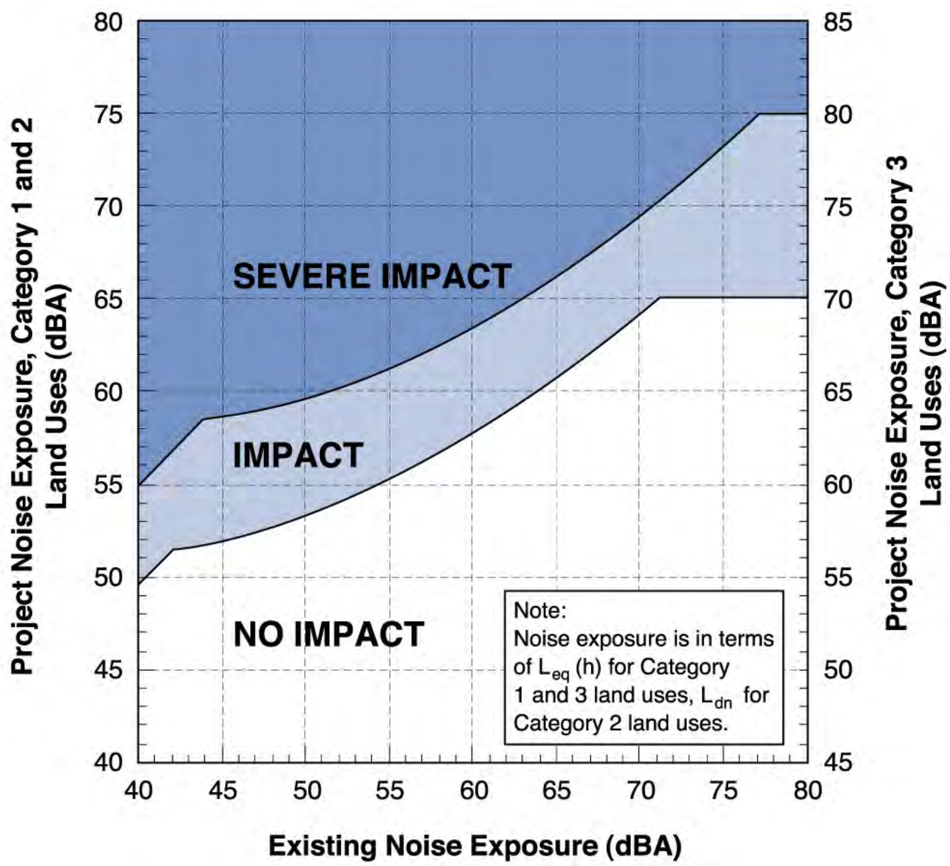
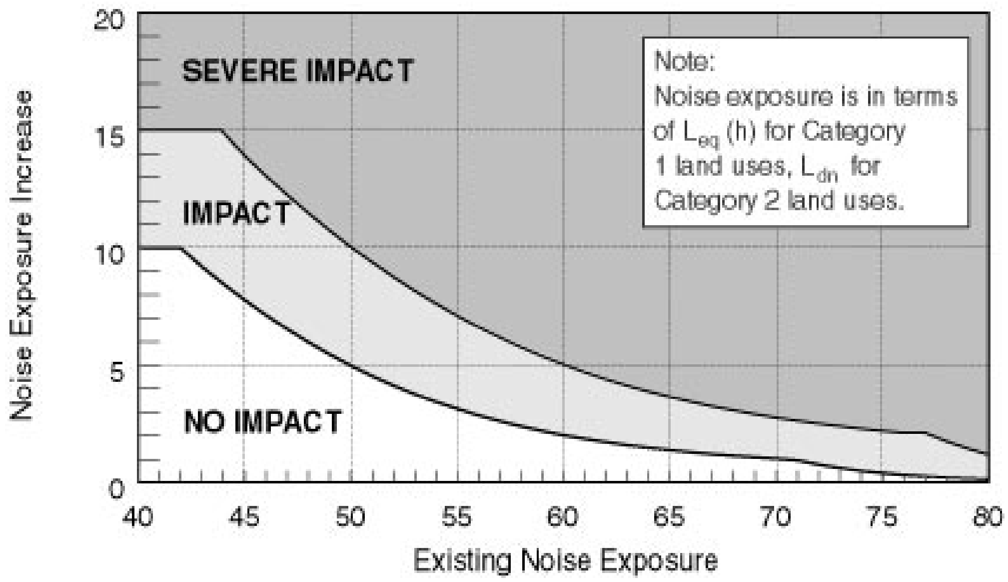


Figure 5-5: Increase in Cumulative Noise Levels Allowed by FTA Criteria



Existing Noise Levels: Noise-sensitive land-use along the project corridor alternatives was first identified based on preliminary alignment drawings, aerial photographs, and visual surveys. Areas adjacent to the Metro South MetroLink Extension alternatives include commercial land-use, single- and multi-family residences, along with institutional land-uses (such as churches and schools). Adjacent uses are currently exposed to noise from traffic on Interstate 55, the BNSF Railway, and traffic on other local roads.

Existing ambient noise levels in the above areas were characterized through direct measurements at selected sites near the proposed alignment alternatives during the period from May 12 through May 14, 2004. Estimating existing noise exposure is an important step in the noise impact assessment since the thresholds for noise impact are based on the existing levels of noise exposure. The measurements included eight short-term (1-hour) measurements of the A-weighted sound level at representative noise-sensitive locations. All of the measurement sites were located in noise-sensitive areas, and were selected to represent a range of existing noise conditions along each of the project alternatives.

At each site, the measurement microphone was positioned to characterize the exposure of the site to the dominant noise sources in the area. For example, microphones were located at the approximate setback lines of the receptors from adjacent roads, and were positioned to avoid acoustic shielding by landscaping, fences or other obstructions. The results of the existing ambient noise measurements are summarized below in Table 5-11, "Existing Ambient Noise Measurement Results."

Table 5-11: Existing Ambient Noise Measurement Results

Site No.	Measurement Location Description	Start of Measurement		Meas. Duration (hrs)	Noise Exposure (dBA)	
		Date	Time		Ldn*	Leq
N1	Latter Day Saints Church - Loughborough and River Des Peres Blvd	5/12/04	14:00	1	57	59
N2	Holiday Inn at I-55 and Butler Hill Rd	5/13/04	06:00	1	72	74
N3	Corner of Germania and Sharp	5/13/04	13:00	1	65	67
N4	Corner of Westover Colonial Lane and Whitehall Colonial Lane	5/13/04	14:00	1	56	58
N5	Corner of Larry-Del Drive and Delma Drive	5/14/04	07:00	1	48	50
N6	End of Tesson Creek Estates Drive	5/14/04	08:00	1	47	49
N7	Zion United Methodist Church	5/14/04	11:00	1	76	78
N8	Holiday Inn at I-55 and Lindbergh Boulevard	5/14/04	13:00	1	69	71

- The Ldns were estimated using methods contained in Appendix C of the FTA Guidance Manual, based on the Leq measurements at each location.

Noise Impact Assessment Methodology: Noise impact contours were calculated based on noise measurements of the St. Louis MetroLink vehicles, the operating plan developed for the Metro South project, and the prediction model specified in the FTA guidance manual. Significant factors are summarized below:

- **Vehicle and Rail Characteristics:** Based on the vehicle noise measurements, the predictions assume that a two car 178-foot long vehicle operating at 40 mph on ballast and tie track with continuous welded rail (CWR) generates a maximum noise level of 77 dBA at a distance of 50 feet from the track centerline.

- **Operating Times and Headways:** The operating times of the Metro South MetroLink Extension Project will be between 3:30 AM and 1:30 AM. The operating plan for LRT service specifies peak-hour headways of 10 minutes and off-peak base period headways of 15 minutes. The noise impact analysis, however, assumed more frequent service, and therefore provides a more conservative margin of accounting for impacts.[9] Two-car trains will operate throughout the day.

- **Times of Base Period Service and Peak Period Service:** Peak hour operations will occur between 6:00 AM and 9:30 AM and between 3:45 PM and 6:00 PM, and base service will occur during all other time periods.
- **Average Number of Cars:** The average number of cars per train will be two throughout the week
- **Vehicle Operating Speeds:** Vehicle operating speeds are based on speed profiles included in the operating plan. The maximum speed along the corridor is 55 mph.

Noise Impacts: The significant impacts of this project relate to residences as a Category 2 land-use. The Category 2 noise impacts are distributed along all of the alternatives as shown in Table 5-12, "Distribution of Noise Impacts."

Table 5-12: Distribution of Noise Impacts

Alternatives	Noise Impacts on Category 2 (Nighttime Sensitivity) Land-Uses Number of Residential Households Impacted	
	Impacts	**Severe Impacts**
No-Build	0	0
Transportation Systems Management	0	0
Purple Alternative		
Shrewsbury to Burlington Northern RR Segment	6	3
Total	**6**	**3**
Blue Alternative to Butler Hill		
Shrewsbury to Watson Segment	0	5
Watson to Heege Segment	11	0
Heege to Gravois Segment	6	0
Gravois to Reavis Segment	0	0

[9] These higher frequency corresponds to peak headways of 7.5 minutes, and off-peak headways of 10 minutes. These headways were at one time included in Metro's operating forecasts.

Alternatives	Noise Impacts on Category 2 (Nighttime Sensitivity) Land-Uses Number of Residential Households Impacted	
	Impacts	**Severe Impacts**
Reavis to Green Park Segment	0	0
Green Park to I-55 Segment	1	0
I-55 to I-255 Segment	1	6
I-255 to Butler Hill Segment	3	8
Total	**22**	**19**
Blue Alternative to Watson		
Shrewsbury to Watson Segment	0	5
Total	**0**	**5**
Orange Alternative to Butler Hill		
Shrewsbury to Chippewa Segment	0	3
Chippewa to Gravois Segment	9	0
Gravois to Morganford Segment	10	0
Morganford to I-55 Segment	0	0
I-55 to Bayless Segment	0	0
Bayless to Green Park Segment	0	24
Green Park to I-255 Segment	1	6
I-255 to Butler Hill Segment	3	8
Total	**23**	**41**
Orange Alternative to Reavis Barracks		
Shrewsbury to Chippewa Segment	0	3
Chippewa to Gravois Segment	9	0
Gravois to Morganford Segment	10	0
Morganford to I-55 Segment	0	0
I-55 to Bayless Segment	0	0

Alternatives	Noise Impacts on Category 2 (Nighttime Sensitivity) Land-Uses Number of Residential Households Impacted	
	Impacts	**Severe Impacts**
Bayless to Reavis Barracks Segment	0	24
Total	**19**	**27**

Comparison of the Alternatives: Table 5-13, "Comparison of Noise Impacts," shows the total number of impacts associated with each of the alternatives. As would be expected, the longer alternatives have the greater number of noise impacts. The Orange alternative to Butler Hill has the greatest number of noise impacts and the greatest number of severe noise impacts.

Table 5-13: Comparison of Noise Impacts

Alternatives	Number of Residential Households Impacted		
	Impacts	**Severe Impacts**	**Total Impacts**
No-Build	0	0	0
Transportation Systems Management	0	0	0
Purple alternative	6	3	9
Blue alternative to Butler Hill	22	19	41
Blue alternative to Watson	0	5	5
Orange alternative to Butler Hill	23	41	64
Orange alternative to Reavis Barracks	19	27	46

Noise Mitigation: Potential mitigation measures for reducing noise impacts from LRT operations are described below.

- <u>Noise Barriers</u> **-** This is a common approach to reducing noise impacts from surface transportation sources. The primary requirements for an effective noise barrier are that 1) the barrier must be high enough and long enough to break the line-of-sight between the sound source and the receiver, 2) the barrier must be of an impervious material with a minimum surface density of 4 lb/sq. ft. and 3) the barrier must not have any gaps or holes between the panels or at the bottom. Because numerous materials meet these requirements, the selection of materials for noise barriers is usually dictated by aesthetics, durability, cost, and maintenance considerations. Depending on the proximity of the barrier to the tracks and on the track elevation, light rail transit system noise barriers typically range in height from four to eight feet. Such noise barriers can reduce the Ldn noise levels next to the rail line by as much as 8 to 10 dBA.

- Building Sound Insulation - Sound insulation of residences and institutional buildings to improve the outdoor-to-indoor noise reduction has been widely applied around airports but has seen only limited application for transit projects. Although this approach has no effect on noise in exterior areas, it may be the best choice for sites where noise barriers are not feasible or desirable, and for buildings where indoor sensitivity is of most concern. Substantial improvements in building sound insulation (on the order of 5 to 10 dBA) can often be achieved by adding an extra layer of glazing to the windows, by sealing any holes in exterior surfaces that act as sound leaks, and by providing forced ventilation and air-conditioning so that windows do not need to be opened.

- Relocation of Crossovers or Special Trackwork at Crossovers - Because the impacts of LRT wheels over rail gaps at track crossover locations increase LRT noise by about 6 dBA, crossovers are a major source of noise impact when they are located in sensitive areas. These crossovers can be relocated away from noise-sensitive sites, or replaced with alternative devices designed to minimize noise and vibration.

- LRT Speed Reductions in Sensitive Areas - Speed reductions will always lower community noise levels, but they are not often implemented for noise control because of the negative impact on the LRT operating schedule.

- Grade Separation or Closure of Grade Crossings – One of the largest components of noise is the bells and whistles used for safety reasons at grade crossings. Elimination of this noise would reduce the noise impact near grade crossings. Grade crossing noise can be eliminated by grade separations (elevated structures or underpasses), or by closure of grade crossings.

FTA states that in implementing noise impact criteria, severe impacts should be mitigated unless there are no practical means to do so. At the moderate impact level, more discretion should be used, and other project-specific factors should be included in the consideration of mitigation. These other factors can include the predicted increase over existing noise levels, the types and number of noise-sensitive land-uses affected, existing outdoor-to-indoor sound insulation and the cost-effectiveness of mitigating noise to more acceptable levels.

Because specific engineering and design information is not available at the DEIS stage of the project, specific noise mitigation recommendations cannot be made. Specific mitigation measures will be determined in later stages of the project.

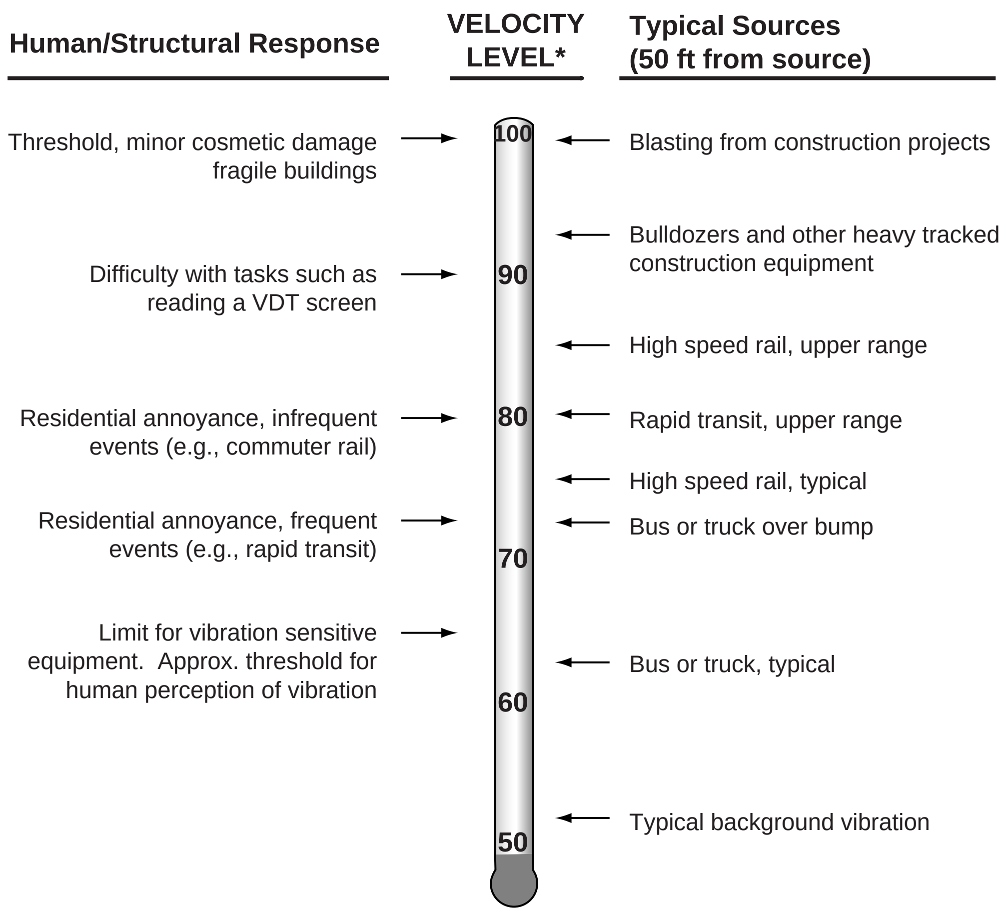
Vibration Impacts

Ground-Borne Vibration Basics: Ground-borne vibration is the oscillatory motion of the ground about some equilibrium position that can be described in terms of displacement, velocity, or acceleration. Because sensitivity to vibration typically corresponds to the amplitude of vibration velocity within the low-frequency range of most concern for environmental vibration (roughly 5-100 Hz), velocity is the preferred measure for evaluating ground-borne vibration from transit projects.

The most common measure used to quantify vibration amplitude is the peak particle velocity (PPV), defined as the maximum instantaneous peak of the vibratory motion. PPV is typically used in monitoring blasting and other types of construction-generated vibration, since it is related to the stresses experienced by building components. Although PPV is appropriate for evaluating building damage, it is less suitable for evaluating human response, which is better related to the average vibration amplitude. Thus, ground-borne vibration from light rail transit trains is usually characterized in terms of the "smoothed" root mean square (rms) vibration velocity level, in decibels (VdB), with a reference quantity of one micro-inch per second. VdB is used in place of dB to avoid confusing vibration decibels with sound decibels.

Figure 5-6 illustrates typical ground-borne vibration levels for common sources as well as criteria for human and structural response to ground-borne vibration. As shown, the range of interest is from approximately 50 to 100 VdB, from imperceptible background vibration to the threshold of damage. Although the approximate threshold of human perception to vibration is 65 VdB, annoyance is usually not significant unless the vibration exceeds 70 VdB.

Figure 5-6: Typical Ground-Borne Vibration Levels and Criteria



** RMS Vibration Velocity Level in VdB relative to 10^{-6} inches/second*

Vibration Criteria: The FTA ground-borne vibration impact criteria are based on land-use and train frequency, as shown in Table 5-14, "Ground-Borne Vibration and Ground-Borne Noise Impact Criteria." There are some buildings, such as concert halls, recording studios and theaters, which can be very sensitive to vibration but do not fit into any of the three categories listed in Table 5-14. Due to the sensitivity of these buildings, they usually warrant special attention during the environmental assessment of a transit project. Table 5-15, "Ground-Borne Vibration and Noise Impact Criteria for Special Buildings," gives criteria for acceptable levels of ground-borne vibration for various types of special buildings.

It should also be noted that Tables 5-14 and 5-15 include separate FTA criteria for ground-borne noise, the "rumble" that can be radiated from the motion of room surfaces in buildings due to ground-borne vibration. Although expressed in dBA, which emphasizes the more audible middle and high frequencies, the criteria are set significantly lower than for airborne noise to account for the annoying low-frequency character of ground-borne noise. Because airborne noise often masks ground-borne noise for above ground (i.e. at-grade or elevated) rail systems, ground-borne noise criteria are primarily applied to subway operations where airborne noise is not a factor.

Table 5-14: Ground-Borne Vibration and Ground-Borne Noise Impact Criteria

Land-Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB[3]	65 VdB[3]	-[4]	-[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	80 VdB	35 dBA	43 dBA
Category 3: Institutional land-uses with primarily daytime use.	75 VdB	83 VdB	40 dBA	48 dBA

Source: Federal Transit Administration, April 1995
“Frequent Events” is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
[2]“Infrequent Events” is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
[3] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.
[4]Vibration-sensitive equipment is not sensitive to ground-borne noise.

Table 5-15: Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)		Ground-Borne Noise Impact Levels (dB re 20 micro Pascals)	
	Frequent Events[1]	Infrequent Events[2]	Frequent Events[1]	Infrequent Events[2]
Concert Halls	65 VdB	65 VdB	25 dBA	25 dBA
TV Studios	65 VdB	65 VdB	25 dBA	25 dBA
Recording Studios	65 VdB	65 VdB	25 dBA	25 dBA
Auditoriums	72 VdB	80 VdB	30 dBA	38 dBA
Theaters	72 VdB	80 VdB	35 dBA	43 dBA

Source: Federal Transit Administration, April 1995
[1]"Frequent Events" is defined as more than 70 vibration events per day. Most transit projects fall into this category.
[2]"Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
[3]If the building will rarely be occupied when the trains are operating, there is no need to consider impact.

Existing Vibration Levels: The only significant sources of vibration within the project area are freight trains on the BNSF Railway. Vibration levels from light rail vehicles are generally much lower than those generated by freight trains.

The vibration analysis for this project focused on assessing the project corridor alternatives using the FTA general assessment procedure. By using the known input force characteristics of the St Louis Metro LRT vehicle, and general information regarding the propagation characteristics of ground in the project area, a vibration impact contour was generated in order to determine potential impacts along the project corridor alternatives.

Vibration Impact Assessment Methodology: The potential vibration impact from LRT operation was assessed on an absolute basis using the FTA criteria. Vibration impact contours were calculated based on vehicle vibration measurements of the St. Louis MetroLink vehicles, information regarding the vibration propagation characteristics of the soil in the project area, the operating plan established as part of this study and the prediction model specified in the FTA guidance manual. The following factors were used in determining potential vibration impacts along the Metro South MetroLink Extension Project:

- **Vehicle and Rail Characteristics:** Vibration source levels were based on measurements made on the St. Louis MetroLink light rail vehicles operating on the existing light rail system.

- **Vibration Propagation Through Soil:** Vibration propagation characteristics of the soil were based on previous work conducted in the St. Louis area.

- **Operating Speeds:** Vehicle operating speeds are based on speed profiles derived from the operating plans. The maximum speed along the corridor is 55 mph.

- **Variations in Soil Characteristics:** A safety factor was included in the vibration impact contour calculations to account for localized differences in soil characteristics.

Vibration Impacts: Most vibration impacts associated with the project (1107 of 1109) affect residences as Category 2 land-uses. There are two Category 3 impacts at institutional land-uses. There are no Category 1 land-uses affected where there is a special sensitivity to vibration. The impacts are distributed along the alternatives as shown on Table 5-16, "Distribution of Vibration Impacts."

The number of residential households affected is large, particularly in comparison with the number of residences affected by noise (see Table 5-13). This occurs for several reasons:

- Vibration impacts are measured in terms of each event (a train passing by), without regard to other vibration sources. The number of impacted properties would be the same, even in a more rural setting.

- Train noise, to be an impact, must stand out from the background noise. Because of the highway and railroad line near the alternative alignments, the background noise levels are quite high, and therefore there are relatively few places where the train noise is an impact. In a more rural setting, there would be many more noise impacted properties, and this number could be higher than the number of vibration impacted properties in the same setting.

- Vibration impact thresholds are set at the level that may cause annoyance to occupants of a house at night. This vibration level is very low – lower than vibration from sources such as slamming doors or children running up the stairs, and several orders of magnitude lower than is required to cause physical damage to the house. The low threshold means that a large number of properties are affected.

Table 5-16: Distribution of Vibration Impacts

Alternatives	Vibration Impacts	
	Category 2 (Nighttime Sensitivity) Properties	**Category 3 (Daytime Sensitivity) Properties**
No-Build	**0**	**0**
Transportation Systems Management	**0**	**0**
Purple Alternative		
Shrewsbury to Watson Segment	3	0
Total	**3**	**0**
Blue Alternative to Butler Hill		
Shrewsbury to Watson Segment	12	0
Watson to Heege Segment	36	0
Heege to Gravois Segment	54	0
Gravois to Reavis Segment	0	0
Reavis to Green Park Segment	11	0
Green Park to I-55 Segment	19	0
I-55 to I-255 Segment	34	0
I-255 to Butler Hill Segment	108	0
Total	**274**	**0**
Blue Alternative to Watson		
Shrewsbury to Watson Segment	12	0
Total	**12**	**0**
Orange Alternative to Butler Hill		
Shrewsbury to Chippewa Segment	7	0
Chippewa to Gravois Segment	0	0

Alternatives	Vibration Impacts	
	Category 2 (Nighttime Sensitivity) Properties	**Category 3 (Daytime Sensitivity) Properties**
Gravois to Morganford Segment	39	0
Morganford to I-55 Segment	175	0
I-55 to Bayless Segment	19	0
Bayless to Green Park Segment	141	1
Green Park to I-255 Segment	39	0
I-255 to Butler Hill Segment	108	0
Total	**528**	**1**
Orange Alternative to Reavis Barracks		
Shrewsbury to Chippewa Segment	7	0
Chippewa to Gravois Segment	0	0
Gravois to Morganford Segment	39	0
Morganford to I-55 Segment	175	0
I-55 to Bayless Segment	19	0
Bayless to Reavis Barracks Segment	50	1
Total	**290**	**1**

Comparison of Alternatives: Table 5-17, "Comparison of Vibration Impacts," shows the total number of impacts associated with each of the alternatives. As would be expected, the longer alternatives have greater numbers of vibration impacts. The Orange alternative to Butler Hill has the greatest number of vibration impacts.

Table 5-17: Comparison of Vibration Impacts

Alternatives	Category 2 (Nighttime Sensitivity) Properties Affected	Category 3 (Daytime Sensitive) Properties Affected	Magnitude of Vibration Effects on Properties
No-Build	0	0	none
Transportation Systems Management	0	0	none
Purple alternative	3	0	very few properties, low impact
Blue alternative to Butler Hill	274	0	low
Blue alternative to Watson	12	0	very few properties, low impact
Orange alternative to Butler Hill	528	1	low
Orange alternative to Reavis Barracks	290	1	low

This preliminary vibration analysis shows that, under each build alternative, the total number of dwelling units impacted by vibration is very high, particularly in comparison with the number of dwelling units impacted by noise. There are several reasons for this result:

- A large number of multi-family buildings located close to the right-of-way. Where vibration was found to affect any part of a building, all dwelling units in that building were counted as impacted.

- No adjustment was made for buildings to be acquired to build the light rail line or stations. These buildings, and the dwelling units contained in the buildings, will be counted as displaced by the construction; to count the same units as impacted by vibration would double-count impacts. As more information is known about the extent of property acquisition required, the vibration impact numbers will be reduced.

- General assessment is less precise. As more detailed engineering is done, it will be possible to get more accurate calculations of the vibration-propagation characteristics of the ground, and to more accurately measure the distances between source and impact. Also, detailed design can incorporate vibration-reducing elements. The initial general assessment procedures tends to estimate “on the high side” to avoid missing potential impacts.

FTA, after consultation with local officials, has determined that the vibration assessment procedures used in the above analysis are appropriate for this stage of environmental analysis. These procedures are useful to identify general environmental impacts and to compare project alternatives on these impacts. More detailed methods will be used in preliminary engineering and design to refine, reduce or mitigate vibration impacts, and these results will be reported in the Final Environmental Impact Statement and design documents. Because of the scale of the vibration impacts identified by the initial screening methods, development of vibration mitigation and reassessing the scale of vibration impacts must be a major focus of the preliminary engineering/FEIS phase of the project, if any of the build alternatives are selected for further development.

Vibration Mitigation: Potential mitigation measures for reducing vibration impacts from LRT operations are described below.

- <u>LRT Speed Reductions in Sensitive Areas</u> - Speed reductions will always lower ground-borne vibration levels, but they are not always feasible because of the negative impact on the LRT operating schedule.

- <u>Ballast Mats</u> - A ballast mat consists of a pad made of rubber or rubber-like material placed on an asphalt or concrete base with the normal ballast, ties and rail on top. The reduction in ground-borne vibration provided by a ballast mat is strongly dependent on the frequency content of the vibration and design and support of the mat.

- <u>Tire Shred or Recycled Rubber Chip Underlay</u> - A 12-inch-thick resilient layer of recycled rubber chips placed beneath the sub-ballast layer of standard open ballast and tie track could be incorporated into the track design. This mitigation method would provide results similar to ballast mats, and would also be strongly dependent on the frequency content of the vibration.

- <u>Floating Slabs</u> - Floating slabs consist of thick concrete slabs supported by resilient pads on a concrete foundation; the tracks are mounted on top of the floating slab. Most successful floating slab installations are in subways, and their use for at-grade track is less common. Although floating slabs are designed to provide vibration reduction at lower frequencies than ballast mats, they are expensive.

- <u>Relocation of Crossovers or Special Trackwork</u> - Because the impacts of wheels over rail gaps at track crossover locations increases vibration by about 10 dBA, crossovers are a major source of vibration impact when they are located in sensitive areas. Crossovers could be relocated away from sensitive receptors or replaced with trackwork designed to minimize vibration impacts.

- Property Acquisitions or Easements – Additional options for avoiding vibration impacts (and noise impacts also) are for the transit agency to purchase residences likely to be impacted by train operations or to acquire easements for such residences by paying the homeowners to accept the future train vibration conditions. These approaches are usually taken only in isolated cases where other mitigation options are infeasible, impractical, or too costly.

Vibration impacts that exceed FTA criteria are considered to be significant and to warrant mitigation, if reasonable and feasible. At a minimum, mitigation would require the installation of ballast mats. However, more extensive mitigation may be required to adequately reduce the vibration levels to below the FTA vibration impact criterion. In addition, localized speed reductions may reduce vibration levels to below the FTA vibration impact criterion. Vibration mitigation will be addressed in more detail during final design.

Because specific engineering and design information is not available at the DEIS stage of the project, specific vibration mitigation recommendations cannot be made. Specific mitigation measures will be determined in later stages of the project.

5.2.3 Water Quality Impacts

Special Designations for Water Quality: None of the streams located within the study area meet the criteria for any of the following designations:

- Used for a public water supply
- A losing stream
- Designated for cold-water sport fishery
- Designated “Outstanding National Resource Waters”
- Designated “Outstanding State Resource Waters”
- A Wild and Scenic River

The entire length of Gravois Creek is designated as a “Metropolitan No-Discharge Stream”. According to 10 CSR 20-7, this means that “No water contaminant except uncontaminated cooling water, permitted stormwater discharges in compliance with permit conditions and excess wet-weather bypass discharges not interfering with beneficial uses” can be discharged to watersheds of streams listed as “Metropolitan No-Discharge Streams.”

Section 303(d) Waters: The Missouri Clean Water Commission has compiled a list of waters designated under Section 303(d) of the Federal Clean Water Act. The list identifies lakes and stream subsections that do not meet state water quality standards. Portions of the following streams have been listed on the Missouri Section 303(d) impaired waters list.

- River Des Peres. The impaired section of River Des Peres has been listed for low Dissolved Oxygen resulting from urban non-point sources.

- Mississippi River. The Mississippi River is listed as impaired due to habitat loss, with no potential impairment source identified.

The impaired sections of these streams are not located in the vicinity of this project.

Operating Permit: In compliance with the Missouri Clean Water Law, a Missouri State Operating Permit authorizing the discharge of storm water and certain non-storm water discharges from land disturbance sites associated with the project must be obtained. The permit contains requirements and guidelines that stipulate conformance to state and DNR-approved city and county water pollution control programs. The permit requires good site management practices in land disturbance areas to prevent solid waste entry into waters of the state. The permit requires adherence to federal and state regulations concerning the transport, use, and storage of fuel and other substances regulated by federal law, in order to prevent pollution of storm water, waters of the state, and groundwater. The permit further requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) to ensure the design, implementation, management, and maintenance of Best Management Practices in order to reduce the amount of sediment and other pollutants in storm water discharges associated with the land disturbance activities, and to comply with the Missouri Water Quality Standards. The Best Management Practices shall conform to concepts and methods provided in Environmental Protection Agency (EPA) and Missouri Department of Natural Resources (MoDNR) published guidelines.

Water Quality Certification Program: Part of the Section 404 permit issued by the U.S. Army Corps of Engineers requires the project to meet the criteria of the Section 401 water quality certification program in Missouri. Section 401 of the Clean Water Act requires all permits issued by the federal government for activities affecting Waters of the U.S. to be certified by the state in which the discharge is to occur to insure that the activity will comply with the water quality standards of Missouri. The MoDNR is the state agency that sets water quality standards in Missouri.

5.2.4 Wetland and Waterways Impacts

Regulatory Jurisdiction: Section 404 of the Clean Water Act [33 U.S.C. § 1344] prohibits the discharge of dredged or placement of fill material into "Waters of the U.S." unless exempted by law or permitted in writing by the Corps of Engineers. Operating in conjunction with Section 401 [33 U.S.C. § 1341] and other statutes, Section 404 is a Federal statute that implements federal regulatory policies concerning the protection of wetlands and other waters of the U.S. as specified in various orders and regulations. The St. Louis Districts of the Corps of Engineers maintain jurisdiction over the water resources in the area in which the Metro South study area is located.

Identification of Wetlands and Ponds: Wetlands and ponds within the project vicinity were identified via field investigations and readily available published data. Published data reviewed to identify wetlands within the project area included:

- United States Fish and Wildlife Service National Wetland Inventory (NWI) maps
- United States Geological Survey (USGS) Topography Maps
- United States Department of Agriculture (USDA) Soil Conservation Service Survey Maps and Hydric Soils Lists

These data were combined with field investigations looking for hydrophytic vegetation, hydric soils, and wetland hydrology to determine areas exhibiting wetland characteristics. Routine wetland delineation forms from the 1987 Corps of Engineers' Wetland Delineation Manual were completed for each site along with photo-documentation of each site. Delineation forms and photo-documentation of NWI-mapped wetland sites which no longer exhibit wetland characteristics were also prepared.

One pond and six potential wetland sites were identified within the study corridor. There were also two NWI mapped sites which no longer exhibit wetland characteristics. The pond is located within a former quarry. Four of the six wetland sites were in the Palustrine Class of the Cowardin Classification System. The other two wetland sites, occurring within the channel of River Des Peres, were in the Riverine Class.

The Palustrine Class includes all nontidal wetlands dominated by trees, shrubs, persistent emergent plants, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 percent. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than eight hectares (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water-depth in the deepest part of the basin less than two meters (6.6 feet) at low water; and (4) salinity due to ocean-derived salts less than 0.5 percent.

The Palustrine System wetlands that occur within the study corridor include Emergent and Unconsolidated Bottom. The Emergent class is characterized by erect rooted, herbaceous hydrophytes, excluding mosses and lichens. This vegetation is present for most of the growing season in most years. Perennial plants usually dominate these wetlands. All water regimes are included except subtidal and irregularly exposed. In areas with relatively stable climate conditions, Emergent Wetlands maintain the same appearance year after year. The Unconsolidated Bottom class includes all ponds and deepwater habitats with at least 25 percent cover of particles smaller than stones, and a vegetative cover less than 30 percent. Water regimes are restricted to subtidal permanently flooded, intermittently exposed and semi-permanently flooded. Unconsolidated bottoms are characterized by the lack of large stable surfaces for plant and animal attachment.

The Riverine wetlands are wetlands that are contained in a channel except those dominated by trees, shrubs, and persistent emergents.

Dominant vegetation observed in wetland areas were: Rice Cutgrass *(Leersia oryzoides)*, Broad-Leaf Cattail *(Typha latifolia)*, Narrow-Leaf Cattail *(Typha angustifolia)*, Reed Canary Grass *(Phalaris arundinacea)*, and Swamp Smartweed *(Polygonum hydropiperoides).*

Identification of Lakes, Rivers and Streams: Lakes, rivers, and streams within the project vicinity were identified via field investigations and readily-available published data, including:

- USGS Topography Maps
- USGS Digital Orthophoto Quadrangle Maps (aerial photography)

In general, any channel with an ordinary high-water mark (OHWM) was considered a jurisdictional Water of the U.S. and was identified for this project, whether or not the channel carried flow on a perennial basis. Forty streams within the project area were identified. These streams included three perennial streams and their unnamed tributaries. The three perennial streams were:

- Mattesse Creek
- Gravois Creek
- River Des Peres.

No lakes were identified in the vicinity of this project.

The Water Resources Council developed a hierarchical classification of hydrologic drainage basins in the United States. Each hydrologic unit is identified by a unique hydrologic unit code (HUC) consisting of two to eight digits based on the four levels of classification in the hydrologic unit system. The study corridor lies within two watersheds. North of I-270, the project area lies within the Cahokia-Joachim watershed (HUC 7140101) which drains into the Mississippi River. South of I-270, the project area lies within the Meramec watershed (HUC 7140102) which drains into the Mississippi River.

Impacts on Wetlands and Ponds: Occasional roadside ditches throughout the project area exhibited wetland characteristics. In general, these roadside ditches were not considered wetlands unless a jurisdictional "Water of the U.S." passed through the ditch (those cut in upland areas). Ditches that received runoff solely from the road were not evaluated as wetlands.

The one isolated pond within the study corridor is along the Blue Butler Hill alternative, but will not be impacted based on its location. The pond was at the base of an approximately 50-foot tall quarry wall, with MetroLink running along the top of the quarry wall.

On January 9, 2001 the U.S. Supreme Court ruled that federal authority under the Clean Water Act does not extend to "isolated," intrastate waters. The decision known as the SWANCC ruling, does not allow the Corps of Engineers to use it's "migratory bird rule" to extend its jurisdiction over these waters (including isolated wetlands). That rule asserted that section 404 of the Clean Water Act covers isolated waters that could be used as habitat by migratory birds that are the subject of international treaty. In general, a water body or wetland is under the jurisdiction of the Corps of Engineers under the Clean Water Act if it is part of the "Waters of the U.S." These waters include ponds and wetlands that are adjacent to, located within a floodplain of, or otherwise hydrologically connected to tidal waters, interstate lakes, ponds or rivers, or perennial streams that flow into these waters. Waters (including wetlands) that are determined to be isolated are therefore outside of the jurisdiction established under Section 404 of the Clean Water Act and other federal law. Other than the quarry pond described above, no isolated wetlands or ponds were identified within the project area.

The majority of wetlands impacted are small, poor quality wetlands. These wetlands provide limited wildlife and fish habitat. These wetlands provide limited groundwater recharge and little aesthetic value. The most prevalent wetland function lost due to destruction of these wetlands would be sediment/nutrient retention and flood storage (water detention/retention).

Total wetland impacts are summarized below in Table 5-18, "Wetlands Impacts." The Orange alternative to Reavis Barracks and the Orange Alternative to Butler Hill both have five areas of wetlands impact, the most of any of the alternatives.

Table 5-18: Wetlands Impacts

Alternatives	Impacts
No-Build	None
Transportation Systems Management	No impacts identified
Purple Alternative	No impacts identified
Blue Alternative to Butler Hill	
Station 260+00	Impact on emergent wetland
Total	**1 area of impact**
Blue Alternative to Watson	No impacts identified
Orange Alternative to Butler Hill	
Station 124+00	Impact on Riverine wetland located within the channel of River Des Peres
Station 211+00	Impact on Riverine wetland located within the channel of River Des Peres
Station 232+00	Impact on emergent wetland
Station 311+50	Impact on emergent wetland
Station 314+00	Impact on emergent wetland
Total	**5 areas of impact**
Orange Alternative to Reavis Barracks	
Station 124+00	Impact on Riverine wetland located within the channel of River Des Peres
Station 211+00	Impact on Riverine wetland located within the channel of River Des Peres
Station 232+00	Impact on emergent wetland
Station 311+50	Impact on emergent wetland
Station 314+00	Impact on emergent wetland
Total	**5 areas of impact**

Impacts on Lakes, Rivers, and Streams: A total of 41 potential USACE jurisdictional Waters of the U.S. were identified in the project area. Streams impacted by the various alternatives include USGS blue-line perennial and intermittent streams and other intermittent streams identified during field investigations. Most of the unnamed streams are intermittent streams. Natural channels included any channels with natural materials in the substrate, including streams that have been re-channelized as a result of surrounding development. Concrete-lined channels were considered artificial. Existing channels currently in culverts were not included in calculating stream impacts. All streams in the study area have been impacted to some extent by surrounding development.

Stream crossings are shown by alternative in Table 5-19 “Stream Impacts.” This table shows the streams by alternative, location, and name. There are two types of impact – transverse and longitudinal. Transverse impacts are crossings of a stream; longitudinal impacts occur when the alignment extends along a stream. Sixty-two of the sixty-six impacts are of the transverse type. As would be expected, the longer alternatives have a greater number of impacts. The Orange alternative to Butler Hill has the greatest number of stream impacts.

Table 5-19: Stream Impacts

Alternatives	Transverse Impacts	Longitudinal Impacts
No-Build	0	0
Transportation Systems Management	0	0
Purple Alternative		
Station 63+00	Crossing of Unnamed Tributary of River Des Peres	
Total	**1 area of impact**	**0**
Blue Alternative to Butler Hill		
Station 63+50	Crossing of Unnamed Tributary of River Des Peres	
Station 98+50	Crossing of Unnamed Tributary of River Des Peres	
Station 121+00	Crossing of Unnamed Tributary of River Des Peres	
Station 143+00		Along Unnamed Tributary of River Des Peres

Alternatives	Transverse Impacts	Longitudinal Impacts
Station 143+50	Crossing of Unnamed Tributary of River Des Peres	
Station 220+50		Along Unnamed Tributary of Gravois Creek
Station 230+50		Along Unnamed Tributary of Gravois Creek
Station 260+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 263+00	Crossing of Gravois Creek (perennial stream)	
Station 306+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 317+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 317+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 333+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 334+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 361+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 380+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 388+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 393+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 393+50	Crossing of Unnamed Tributary of Mattese Creek	
Station 412+00	Crossing of Mattese Creek (perennial stream)	
Station 430+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 450+00	Crossing of Unnamed Tributary of Mattese Creek	
Total	**19 Areas of Impact**	**3 Areas of Impact**
Blue Alternative to Watson		
Station 63+50	Crossing of Unnamed Tributary of River Des Peres	
Station 98+50	Crossing of Unnamed Tributary of River Des Peres	
Total	**2 Areas of Impact**	**0**

Alternatives	Transverse Impacts	Longitudinal Impacts
Orange Alternative to Butler Hill		
Station 57+50	Crossing of Unnamed Tributary of River Des Peres (perennial stream)	
Station 106+50	Crossing of Unnamed Tributary of River Des Peres	
Station 124+00	Crossing of River Des Peres	
Station 161+00	Crossing of Unnamed Tributary of River Des Peres	
Station 211+00	Crossing of River Des Peres (perennial stream)	
Station 231+50	Crossing of Unnamed Tributary of River Des Peres	
Station 261+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 287+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 306+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 313+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 314+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 340+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 352+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 385+00		Along Unnamed Tributary of Gravois Creek
Station 391+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 397+00	Crossing of Gravois Creek (perennial stream)	
Station 397+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 414+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 445+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 451+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 479+50	Crossing of Unnamed Tributary of Mattese Creek	
Station 499+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 507+00	Crossing of Unnamed Tributary of Mattese Creek	

Alternatives	Transverse Impacts	Longitudinal Impacts
Station 510+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 512+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 530+50	Crossing of Mattese Creek (perennial stream)	
Station 548+00	Crossing of Unnamed Tributary of Mattese Creek	
Station 568+00	Crossing of Unnamed Tributary of Mattese Creek	
Total	**27 Areas of Impact**	**1 Area of Impact**
Orange Alternative to Reavis Barracks		
Station 57+50	Crossing of Unnamed Tributary of River Des Peres (perennial stream)	
Station 106+50	Crossing of Unnamed Tributary of River Des Peres	
Station 124+00	Crossing of River Des Peres (perennial stream)	
Station 161+00	Crossing of Unnamed Tributary of River Des Peres	
Station 211+00	Crossing of River Des Peres (perennial stream)	
Station 231+50	Crossing of Unnamed Tributary of River Des Peres	
Station 261+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 287+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 306+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 313+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 314+00	Crossing of Unnamed Tributary of Gravois Creek	
Station 340+50	Crossing of Unnamed Tributary of Gravois Creek	
Station 352+00	Crossing of Unnamed Tributary of Gravois Creek	
Total	**13 Areas of Impact**	**0**

Operational and Secondary Impacts: Operational impacts would be minimal in comparison to conditions already existing within the study corridor. Once the areas disturbed during construction re-establish vegetative ground cover, siltation barriers may be removed and no further construction-related impacts are expected.

Secondary impacts are not easily quantified. These impacts are usually associated with, but not the direct result of, the proposed project. Secondary impacts can be associated with change of land-use or activity near the wetlands, but not the result of direct filling or draining of these areas. Alternatives constructed along the alignment may have both direct impacts (siltation) and indirect impacts (increased adjacent construction which may cause wetlands and ponds to be drained or filled).

Applying Best Management Practices could minimize these impacts. For example, proper installation and maintenance of siltation barriers down gradient of any proposed excavation or clearing can minimize these impacts.

5.2.5 Wildlife Habitat and Ecosystem Impacts

Plant Communities: Missouri is divided into six major Natural Divisions, based on geological history, soils, bedrock geology, topography and presettlement vegetation patterns. The study area is located entirely within the Ozark Border Division. This Division is located between the Ozark and Glaciated Plains Division, but the majority of the flora is similar to the Ozarks. Within this natural division, distinct natural plant communities occur. Virtually no undisturbed plant communities exist within the study area. Maintained areas were dominated by fescue *(Festuca* spp.). Other areas along riparian corridors and the existing railroad tracks were dominated by Bush Honeysuckle (*Lonicera maackii*). This species was introduced from Manchuria and Korea in 1855. It is one of the most aggressive exotic plants that has naturalized in urban areas.

Other common plant species include, but are not limited to, the following:

Pin oak (*Quercus palustris*)	White oak (*Quercus alba*)
Shingle oak (*Quercus imbricaria*)	Box elder (*Acer negundo*)
American elm (*Ulmus americana*)	Multiflora rose (*Rosa multiflora*)
Silver maple (*Acer saccharinum*)	Smooth sumac (*Rhus glabra*)
Partridge pea (*Cassia fasciculata*)	Poison ivy (*Toxicodendron radicans*)
Tall goldenrod (*Solidago altissima*)	Kentucky bluegrass (*Poa pratensis*)
Eastern Redcedar (*Juniperus virginiana*)	

Wildlife and Aquatic Species: The types of habitats discussed above define the habitats available to both plants and animals within the study corridor. Plants (as primary producers) define the habitats available for animals. Common bird species found in the study corridor include, but are not limited to, the following:

Mourning dove (*Zenaida macroura*)	Killdeer (*Charadrius vociferus*)
Northern cardinal (*Richmondena cardinalis*)	House sparrow (*Passer domesticus*)
Common grackle (*Quisealus quiscula*)	

Common mammal species include, but are not limited, to the following:

Virginia opossum (*Didelphis virginiana*)	Raccoon (*Procyon lotor*)
Eastern cottontail (*Sylvilagus floridanus*)	House mouse (*Mus musculus*)
Fox squirrel (*Sciurus niger*)	

Missouri's aquatic communities are divided into four principal faunal regions and 16 divisions, based primarily on fish species abundance and distribution. The study area is within the Prairie Faunal Region. Three basic types of aquatic systems occur within the study area: lotic (streams), lentic (ponds) and transitional zones (wetlands). Some of the streams within the study area have gravel bottoms and riffle/pool complexes, but most of the streams are low-gradient streams with soft bottoms and fine to coarse grained sediments. The only pond within the study limits is located within a former quarry. Wetlands that occur within the study area are Palustrine emergent and unconsolidated bottom.

The common reptiles and aquatic species include, but are not limited to, the following:

Northern water snake (*Nerodia sipedon*)	Red-eared slider (*Trachemys scripta*)
Common garter snake (*Thamnophis sirtalis*)	Black Bullhead (*Ictalurus melas*)
Eastern American Toad (*Bufo americanas*)	Northern leopard frog (*Rana pipiens*)
Fathead Minnow (*Pimephales promelas*)	Northern Crayfish (*Orconectes virilis*)
Red shiner (*Notropis lutrensis*)	Common shiner (*Notropis cornutus*)
Green sunfish (*Lepomis cyanellus*)	Common Carp (*Cyprinus carpio*)
Midland Smooth Softshell (*Trionyx muticus muticus*)	
Western Painted Turtle (*Chrysemys picta bellii*)	

Impacts on Vegetation: Effects to the upland vegetation habitat would be directly proportional to the amount of vegetation cleared during construction of any of the alternatives. All construction activities will be designed to minimize the amount of clearing required. Since the alternatives generally follow the existing right-of-way for either I-55, existing railroad tracks, or River Des Peres, no major areas of previously undisturbed vegetation will be impacted.

Impacts on Wildlife and Aquatic Fauna: All the species that occur within the habitats found in the study area will be affected proportional to the amount of habitat displaced. The relatively slight acreage variation among the alternative alignments is unlikely to result in a significant variance in impacts to wildlife and aquatic fauna.

The existing wildlife habitat is already significantly fragmented within the heavily urban landscape of the project area. Additional habitat fragmentation from any option would be minimal due to construction primarily along existing road and railroad alignments.

The project may include use of elevated lighting structures for safety/visibility reasons. These lighting structures may inadvertently illuminate areas other than the MetroLink corridor. Since the corridors are currently lighted for considerable portions by surrounding developments, it is unlikely there would be any new adverse impact to birds or other wildlife.

Impacts to aquatic species will be minimal, in part because the majority of streams in the study area are intermittent. Perennial streams will be bridged or spanned, resulting in minimal impact to those streams. In general, the wetland areas that will be impacted during construction are of poor quality and provide little habitat. Wetland mitigation will replace the lost wetland habitat.

There are areas on the Mississippi River side of the study area that been identified as having karst geology, which is characterized by subterranean features created by water movement. Features like caves, springs, and sinkholes are present within the areas of karst geology. Fauna within the cave habitat associated with karst features may be impacted by changes to the water quality within these habitats. The project alternatives do not affect the known areas of karst geology and habitat.

Measures to Mitigate Impacts to Habitat and Wildlife: To minimize potential impacts to aquatic species, best management practices for maintaining water quality will be observed during project design and construction. These practices would include the following:

- No channel modification or stream relocation would occur unless conditions of the State Channel Modification Guidelines are met.
- Grading and seeding of disturbed areas will be done as soon as possible to minimize erosion.
- Disturbance to stream banks and riparian areas would be avoided where possible.
- Stream flows would not be interrupted and all temporary in-channel fills that have the potential to impound water would be contained within culverts.

In addition, recommendations presented in the Missouri Department of Conservation "Management Recommendations for Construction Projects Affecting Missouri Karst Habitat" will be followed if such habitat should unexpectedly be encountered.

5.2.6 Floodplain Impacts

Construction in floodplains is a potential problem for several reasons. Such construction reduces water flow and the ability of the floodplain to store water in flood conditions, and therefore may exacerbate flood damage in the areas upstream and downstream of the obstruction. Further, floods may disrupt train service and damage light rail transit facilities. Rising floodwaters may mix with fuel from automobiles, sewage or other materials that pollute the floodwaters.

Regulatory context

The Federal Emergency Management Agency (FEMA) delineates floodplains and regulates construction in floodplains and the flood insurance program. FEMA identifies the "100-year" floodplain and the "500-year" floodplain, corresponding to the flood levels under conditions that could be expected to occur once every 100 or 500 years. These floodplains are identified on Flood Insurance Rate Maps (FIRM).

The U.S. Army Corps of Engineers regulates and fill or construction in floodways. Floodways are defined by hydrological calculations, but generally are the channels in which water flows under flood conditions, and excluding the flat, out-wash plain that may be covered with water at the peak of the flood.

Potential floodplain impacts

In general, floodplain impacts will be minimized by constructing tracks and other structures so that they are at least one foot higher in elevation that the

100-year floodplain elevation. This will avoid disruption of service and damage to facilities and vehicles, and minimizes potential pollution of flood waters.

Where the proposed alignment of an alternative crosses through a floodplain, flood storage capacity impacts and water flow impacts will be minimized through appropriate design efforts, including:

- Use of retaining walls and bridge structures, instead of embankments, to minimize flood storage impacts,
- Regrading or excavation of existing fill to create compensatory flood storage in the same area, and
- Use of appropriate materials and construction techniques to minimize erosion and water damage.

The potential floodplain impacts of each alternative are presented in Table 5-20, "Floodplain Impacts."

Table 5-20: Floodplain Impacts

Alternatives	Floodplain Impacts
No-Build Alternative	None
TSM Alternative	None
Purple Alternative	
Shrewsbury to Watson Line Segment	Small area of 100-year floodplain extends across Lansdowne Ave. Proposed alignment is on aerial structure over Lansdowne, therefore the only impacts to the floodplain may be for bridge piers. The area along River Des Peres Blvd. is in the 500-year floodplain. Design requirements limit the alignment to be a minimum of 1 foot above the 100-year flood elevations.
Watson Station	No impacts.
Total	**0.06 acres**
Blue Alternative to Butler Hill	
Shrewsbury to Watson Lone Segment	Small area of 100-year floodplain extends across Lansdowne Ave. Proposed alignment is on aerial structure over Lansdowne, therefore the only impacts to the floodplain may be for bridge piers.
Watson Station	No impacts.
Watson to Gravois Line Segment	Small area of 100-year floodplain for Tributary to Mackenzie Creek near alignment. Alignment is proposed at elevation ~505±. 100-year floodplain

Alternatives	Floodplain Impacts
	elevation is listed as 466 on FEMA FIRM.
Gravois Station	No impacts.
Gravois to Green Park Line Segment	Proposed alignment is on aerial structure over Gravois Creek floodplain area, therefore the only impacts to the floodplain may be for bridge piers.
Green Park Station	No impacts.
Green Park to Lindbergh Line Segment	No impacts.
Lindbergh Station	No impacts.
Lindbergh to Butler Hill Line Segment	The proposed alignment crosses the Mattese Creek 100-year floodplain at approximately Sta. 412+00. FEMA FIRM lists the 100-year floodplain elevation as 452. The proposed alignment in this area is at elevation 455±. The proposed alignment crosses the West Tributary to Mattese Creek 100-year floodplain at approximately Sta. 430+00. FEMA FIRM lists the 100-year floodplain elevation as 464. The proposed alignment in this area is at elevation 500±.
Butler Hill Station	No impacts.
Total	**3.71 acres**
Blue Alternative to Watson	
Shrewsbury to Watson Line Segment	Small area of 100-year floodplain extends across Lansdowne Ave. Proposed alignment is on aerial structure over Lansdowne, therefore the only impacts to the floodplain may be for bridge piers.
Watson Station	No impacts.
Total	**0.06 acres**
Orange Alternative to Butler Hill	
Shrewsbury to Gravois-Hampton Line Segment	A small area of the River Des Peres 100-year floodplain extends across Lansdowne Ave. Proposed alignment is on aerial structure over Lansdowne, therefore the only impacts to the floodplain may be for bridge piers. The area along River Des Peres Blvd. is in the 500-year floodplain of River Des Peres. Design requirements limit the alignment to be a minimum of 1 foot above the 100-year flood elevations. Alignment crosses the River Des Peres 100-year floodplain at approximately Sta. 45+00. FEMA FIRM lists the 100-year floodplain elevation as 425. The proposed alignment is at elevation 435±. Alignment crosses a drainage channel of River Des Peres on aerial structure at approximately Sta. 58+00.

Alternatives	Floodplain Impacts
	Alignment crosses the River Des Peres 100-year floodplain at approximately Sta. 107+00. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment is at elevation 428±. The proposed alignment crosses over the River Des Peres channel on an aerial structure at elevation 435±, therefore the only impacts to the floodplain may be for bridge piers.
Gravois-Hampton Station	The station area is located in both the 100- and 500-year floodplains of River Des Peres. The proposed alignment and station are both on aerial structure at elevation 451±, therefore the only impacts to the floodplain may be for bridge piers. FEMA FIRM lists the 100-year floodplain elevation as 421.
Gravois Hampton to Morganford Line Segment	Much of the proposed alignment is located within the 100-year floodplain of River Des Peres. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment ranges from elevation 423 to 424, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation.
Morganford Station	The station area is located within the 100-year floodplain of River Des Peres. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment at the station is elevation 423±, with the station platform being 3' 2½" above this.
Morganford to Bayless Line Segment	The proposed alignment adjacent to Germania St. is located within the 100-year floodplain of River Des Peres. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment ranges from elevation 422 to 423, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation. The proposed alignment crosses over the River Des Peres channel on an aerial structure at elevation 450±, therefore the only impacts to the floodplain may be for bridge piers. The proposed alignment crosses the 100-year floodplain of River Des Peres at approximately Sta. 227+00. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment ranges from elevation 434 to 460, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation. The proposed alignment crosses the 100-year floodplain of Gravois Creek at approximately Sta. 263+00. FEMA FIRM lists the 100-year floodplain elevation as between 432 and 433. The proposed alignment is at elevation 450±, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation.
Bayless Station	The station area is located within the 100-year floodplain of Gravois Creek. FEMA FIRM lists the 100-year floodplain elevation as 433. The proposed alignment is at elevation 450±, which falls within the parameters of designed the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation.
Bayless to Reavis Barracks Line Segment	The proposed alignment crosses the 100-year floodplain of Gravois Creek from approximately Sta. 281+00 to Sta. 288+00. FEMA FIRM lists the 100-year floodplain elevation as between 436 and 427. The proposed alignment ranges between elevations 437 and 446, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year

Alternatives	Floodplain Impacts
	floodplain elevation. In all instances, the proposed alignment is at or above the 1-foot minimum. The proposed alignment crosses the 100-year floodplain of Gravois Creek from approximately Sta. 310+00 to Sta. 318+00. FEMA FIRM lists the 100-year floodplain elevation as between 438 and 439. The proposed alignment ranges between elevation 442 and 472. The proposed alignment is on an aerial structure over Union Road, therefore the only impacts to the floodplain may be for bridge piers.
Reavis Barracks Station	No impacts.
Reavis Barracks to Lindbergh Line Segment	The proposed alignment crosses the 100-year floodplain of Gravois Creek from approximately Sta. 390+00 to Sta. 399+00. FEMA FIRM lists the 100-year floodplain elevation as between 456 and 458. The proposed alignment ranges between elevation 480 to 485. The proposed alignment is on an aerial structure over Grant's Trail and Green Park Road and over Gravois Creek, therefore the only impacts to the floodplain may be for bridge piers.
Lindbergh Station	No impacts.
Lindbergh to Butler Hill Line Segment	The proposed alignment crosses the Mattese Creek 100-year floodplain at approximately Sta. 531+00. FEMA FIRM lists the 100-year floodplain elevation as 452. The proposed alignment in this area is at elevation 455±. The proposed alignment crosses the West Tributary to Mattese Creek 100-year floodplain at approximately Sta. 549+00. FEMA FIRM lists the 100-year floodplain elevation as 464. The proposed alignment in this area is at elevation 500±.
Butler Hill Station	No impacts.
Total	**12.96 acres**
Orange Alternative to Reavis Barracks	
Shrewsbury to Gravois-Hampton Line Segment	A small area of the River Des Peres 100-year floodplain extends across Lansdowne Ave. Proposed alignment is on aerial structure over Lansdowne, therefore the only impacts to the floodplain may be for bridge piers. The area along River Des Peres Blvd. is in the 500-year floodplain of River Des Peres. Design requirements limit the alignment to be a minimum of 1 foot above the 100-year flood elevations. Alignment crosses the River Des Peres 100-year floodplain at approximately Sta. 45+00. FEMA FIRM lists the 100-year floodplain elevation as 425. The proposed alignment is at elevation 435±. Alignment crosses a drainage channel of River Des Peres on aerial structure at approximately Sta. 58+00. Alignment crosses the River Des Peres 100-year floodplain at approximately Sta. 107+00. FEMA FIRM lists the 100-year floodplain elevation as 421.

Alternatives	Floodplain Impacts
	The proposed alignment is at elevation 428±. The proposed alignment crosses over the River Des Peres channel on an aerial structure at elevation 435±, therefore the only impacts to the floodplain may be for bridge piers.
Gravois-Hampton Station	The station area is located in both the 100- and 500-year floodplains of River Des Peres. The proposed alignment and station are both on aerial structure at elevation 451±, therefore the only impacts to the floodplain may be for bridge piers. FEMA FIRM lists the 100-year floodplain elevation as 421.
Gravois Hampton to Morganford Line Segment	Much of the proposed alignment is located within the 100-year floodplain of River Des Peres. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment ranges from elevation 423 to 424, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation.
Morganford Station	The station area is located within the 100-year floodplain of River Des Peres. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment at the station is elevation 423±, with the station platform being 3' 2½" above this.
Morganford to Bayless Line Segment	The proposed alignment adjacent to Germania St. is located within the 100-year floodplain of River Des Peres. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment ranges from elevation 422 to 423, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation. The proposed alignment crosses over the River Des Peres channel on an aerial structure at elevation 450±, therefore the only impacts to the floodplain may be for bridge piers. The proposed alignment crosses the 100-year floodplain of River Des Peres at approximately Sta. 227+00. FEMA FIRM lists the 100-year floodplain elevation as 421. The proposed alignment ranges from elevation 434 to 460, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation. The proposed alignment crosses the 100-year floodplain of Gravois Creek at approximately Sta. 263+00. FEMA FIRM lists the 100-year floodplain elevation as between 432 and 433. The proposed alignment is at elevation 450±, which falls within the parameters of designing the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation.
Bayless Station	The station area is located within the 100-year floodplain of Gravois Creek. FEMA FIRM lists the 100-year floodplain elevation as 433. The proposed alignment is at elevation 450±, which falls within the parameters of designed the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation.
Bayless to Reavis Barracks Line Segment	The proposed alignment crosses the 100-year floodplain of Gravois Creek from approximately Sta. 281+00 to Sta. 288+00. FEMA FIRM lists the 100-year floodplain elevation as between 436 and 437. The proposed alignment ranges between elevation 437 to 446, which falls within the parameters of

Alternatives	Floodplain Impacts
	design the proposed alignment a minimum of 1 foot above the 100-year floodplain elevation. The proposed alignment crosses the 100-year floodplain of Gravois Creek from approximately Sta. 310+00 to Sta. 318+00. FEMA FIRM lists the 100-year floodplain elevation as between 438 and 439. The proposed alignment ranges between elevation 442 and 472. The proposed alignment is on an aerial structure over Union Road, therefore the only impacts to the floodplain may be for bridge piers.
Reavis Barracks	No impacts.
Total	**10.02 acres**

5.2.7 Wild and Scenic River Impacts

Wild and Scenic Rivers receive particular protections under federal law. This program is intended to preserve water quality, water flow, scenic beauty, and wildlife characteristics of designated rivers. Rivers may be designated either by Congress or by the Legislature and Governor of the state where the river is located.

There are no such rivers in the study area.

5.2.8 Threatened and Endangered Species Impacts

A request was sent to the U.S. Fish and Wildlife Service on September 22, 2004 for information on (1) any federally listed plant and animal species, including species proposed for listing and those judged likely to be proposed in the near future, which are know to occur in the project area and (2) any critical habitats and significant natural features which are know to occur in the project area. The Fish and Wildlife service responded on October 6, 2004, that it had been determined that no federally listed species or designated critical habitat occurs within the project area.

A similar request was made to the Missouri Department of Conservation. The Department of Conservation replied on September 23, 2004, determining that there were no records of any species or habitats with federal restrictions in the project area and determining that there were no species or habitats with state restrictions in the project area. This finding was verified again on May 26, 2005. Concerns and management recommendations raised by the Department of Conservation focused on the karst geology in portions of the project area and the protection of groundwater resources.

5.2.9 Hazardous Waste Site Impacts

Information from the Missouri Department of Hazardous Waste Program has indicated that there is a Superfund Site at 4118 Shrewsbury Avenue and a Post Dumping Ground within the Jefferson Air National Guard Base. The alternatives under consideration avoid such major waste sites. Information from the Hazardous Waste Program also indicates that there are numerous sites where there are underground fuel tanks or use of listed hazardous materials. The presence of such activities is to be expected within any developed area. The number of such sites that are within 100 feet of the potential alignment under each of the alternatives is shown in Table 5-21.

Table 5-21: Sites Using Hazardous Material or with Underground Tank

Alternatives	Number of Sites within 100 feet
No-Build	none
Transportation Systems Management	none
Purple Alternative Watson	6 sites
Blue Alternative to Butler Hill	5 sites
Blue Alternative to Watson	3 sites
Orange Alternative to Butler Hill	1 site
Orange Alternative to Reavis Barracks	none

Once a final alignment has been identified and the related property acquisition requirements have been defined, a due diligence survey will be undertaken as part of the property acquisition process. This due diligence investigation will involve regulatory records research, investigation of the site history, a site inspection, and possibly geotechnical investigations and environmental sampling at the site. Hazardous waste site issues that are discovered will be identified and rectified as part of the land acquisition process. Despite these due diligence efforts, it remains possible that hazardous waste sites will be encountered unexpectedly during construction. If this is the case there are established procedures for handling the issue.

5.2.10 Visual Impacts

Introduction

Visual, or aesthetic, impacts are changes in the environment that can be perceived visually by residents, employees, visitors and other people in or traveling through the project vicinity. Almost any project that involves new construction will have some visual impact. The questions of whether the impact is negative or positive, significant or insignificant, are subjective and often difficult to reach agreement on. The types of visual impacts of transportation projects that have sometimes been found to be significant include:

- Where the project blocks or interferes with the view of or from a resource of aesthetic significance. Examples of aesthetic resources in this category could include significant historic buildings or sites, national landmarks, and parks known for their view of natural beauty.
- Where the project is of such scale and design that it significantly changes the nature or setting of an important visual resource. For example, a project that required cutting of trees that transforms a wooded glen into an open transportation corridor.
- Where the project design is incompatible with neighboring land-uses, and creates a discordance or discontinuity in the landscape or urban streetscape.

While some of these impacts are related to the location of the project in relationship to visual resources, others depend directly on detailed features of the project's design. The Metro South alternatives have, to date, been subjects of planning and environmental analysis, but no such detailed design has been done for any of the alternatives. Nonetheless, it is expected that the design of any MetroLink extension will closely follow the style and design features of the existing MetroLink system built in the early 1990s. Figure 5-7 shows parts of the existing light rail system, including a typical at-grade section, elevated guideway, and embankment.

The typical visual features of a station include platforms rising a few feet above ground level, with canopies and stairs and ramps leading up to the platforms. Stations may have a drop-off area and landscaped parking lot. Platform and walkway lighting will include lighting inside the canopies and on poles no higher than 20 feet. Lighting for parking areas will generally be on taller poles to provide light over a wider area from each pole.

In a typical at-grade section, tracks will be placed on crushed-rock ballast rising approximately a foot higher than surrounding grades. Power to the trains will be supplied by catenary wire, supported by poles down the center or on each side of the right-of-way. Along the right-of-way, there will be numerous enclosures and small buildings to house signal and communication equipment or transformers.

Elevated sections are generally built to allow at least 18 feet of clearance under the structure for street or highway traffic. The elevated sections are typically made of concrete beams spanning between distinctive Y-shaped vertical supports. A double-track elevated structure is approximately 30 feet wide.

The light rail line may be on an embankment where the tracks rise from grade to an elevated structure. In addition, where the light rail line is running adjacent to freight railroad tracks, the light rail may be on an embankment to create approximately 12 feet of vertical separation between the light rail and freight tracks, as required by the railroad. These embankment sections will have features similar to the at-grade sections, but on top of a ridge of fill that rises 12 feet higher than the current railroad grades. The sides of the embankment are steep, rising 12 feet in height and 24 feet horizontally. The side slope is stabilized with grass or crushed rock on the surface. To reduce the land area required for the side slope, the embankment sections may include vertical retaining walls that rise part of the height of the embankment. Retaining walls are typically built of cast-in-place concrete, precast concrete, or masonry block.

Regulatory requirements

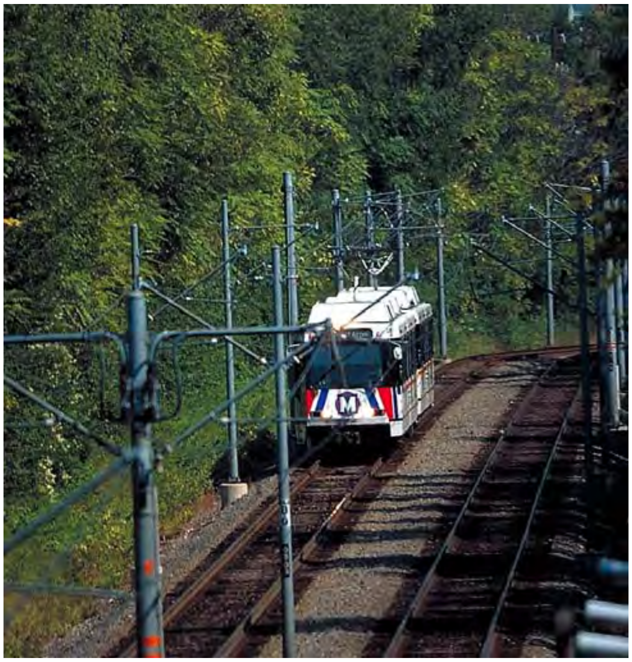
There are no generally applicable regulatory standards for visual effects. However, if the visual impacts of the project significantly alter the setting of a historic property or public park, this impact may trigger the special procedures dictated by the National Historic Preservation Act or Section 4(f) of the Department of Transportation Act.

Resources affected

With two exceptions, the scale and design of any MetroLink extension will be compatible with the inner suburban setting in the Metro South area. These two exceptions are:

- Embankment adjacent to residential areas along the Blue Butler Hill alignment. From Watson station, south to a point on I-55, north of the Lindbergh station, the Blue alternative follows the BNSF railroad alignment, running on a parallel embankment. This embankment would be 12 feet higher than the existing railroad tracks to meet BNSF requirements for a vertical separation of the services. In some places, the existing railroad is already raised above the surrounding land. As a result, the MetroLink embankment/retaining wall on top of the BNSF

Figure 5-7: Visual Elements of Existing MetroLink



Typical At-Grade Section

Typical Embankment Section

Typical Elevated Guideway

Figure 5-8: Visual Impact of Design Elements

a. Near Mackenzie Road (Purple alternative)

b. Germania (Orange alternatives)

(continued) embankment could be as much as 30 feet above the surrounding land. This is the height of a two-story house with pitched roof. In some places, the massiveness of this wall-like structure will affect the setting of and view from residential property. Area residents have objected to this visual impact in public meetings and other public outreach conducted by the Metro South project team. Figure 5-8 shows a rendering of an embankment section superimposed on a photograph of a portion of the Purple alignment.

- Aerial structure across or along the River Des Peres Park. The Orange and Purple alternatives encroach on portions of the park, and would have shadow and access impacts on the park and its users. These impacts are addressed as parkland impacts in Section 5.1.9. In addition, the light rail track, catenary power lines, and structures would be visible to park users. These light rail features are of the same character and scale as other features that are visible from the park, including adjacent residential, commercial, and Metropolitan Sewer District buildings, roadways that go through the park, street and highway bridges and ramps, lighting and other structures. The light rail line would add marginally to the amount of visual intrusion on the park, and the cumulative effect of the visual intrusions may be more significant than any one contributor (see Cumulative Effects discussion in Section 5.4). The park was created when the River Des Peres drainage channel was constructed in the 1930s to replace an often-polluted backwater area, and has co-existed with the surrounding buildings and structures since the beginning. For these reasons, the visual impacts of the light rail line and structures, including cumulative impacts, are considered to have only a moderate effect on the park.

Table 5-22: Visual Impacts

Alternatives	Visual Impacts
No-Build	None
Transportation Systems Management	None identified.
Purple Alternative	
Shrewsbury to Watson Line Segment	Aerial structure in and along River Des Peres Parkway creates moderate visual impact. Aerial/embankment/at-grade sections next to Resurrection Cemetery have similar visual impact as existing roadway.
Watson Station	No visual impacts to commercial/industrial area.
Blue Alternative to Butler Hill	
Shrewsbury to Watson Line Segment	Embankment along west side of railroad right-of-way creates wall effect, with loss of vegetated screening. Residential properties in Villas at Kenrick af-

Alternatives	Visual Impacts
	fected.
Watson Station	No visual impacts to commercial/industrial area.
Watson to Gravois Line Segment	Retaining wall and embankment have visual impacts to approximately two dozen homes on west side of railroad right-of-way. Wall averages 12 feet in height, up to 20 feet where grade rises to cross over intersecting streets on a bridge.
Gravois Station	Minor visual impacts to area with redevelopment potential.
Gravois to Green Park Line Segment	Retaining wall and/or embankment have visual impacts to residential areas on west side of railroad.
Green Park Station	Minor visual impacts in area of mixed commercial and residential development.
Green Park to Lindbergh Line Segment	Minor visual impacts as alignment passes under the railroad grade and runs parallel to I-55, then in below-grade cut through existing commercial development on Lindbergh.
Lindbergh Station	No significant visual impact, as station is located in developed commercial area next to Interstate highways.
Lindbergh to Butler Hill Line Segment	Minor visual impact of aerial structures over highways and minor embankment running alongside I-55.
Butler Hill Station	Located in a developing commercial area, station should be visually compatible with surrounding uses, including highway.
Blue Alternative to Watson	
Shrewsbury to Watson Line Segment	Embankment along west side of railroad right-of-way creates wall effect, with loss of vegetated screening. Residential properties in Villas at Kenrick affected.
Watson Station	No visual impacts to commercial/industrial area.
Orange Alternative to Butler Hill	
Shrewsbury to Gravois-Hampton Line Segment	Elevated transit structure along northern portion of River Des Peres Blvd., and across the river at Gravois Rd. will have moderate visual impacts on park users.
Gravois-Hampton Station	Modest visual effects from elevated station, located near urban arterial and near existing transit transfer station.
Gravois Hampton to Morganford Line Segment	Light rail line would operate in street right-of-way. No significant visual impact.
Morganford Station	Modest platforms and walk-in design of station minimize any modest visual effect.
Morganford to Bayless Line Segment	The elevated structure over the River Des Peres and I-55, and embankment along I-55, are smaller in scale and no more intrusive in design than street and highway structures in the vicinity, and has no additional visual impact of significance.
Bayless Station	This station is located on embankment between I-55 and a railroad right-of-way, and has no significant additional visual impact.
Bayless to Reavis Barracks Line Segment	The elevated structure and embankment along I-55 do not have significant visual impacts.
Reavis Barracks Station	Station is located adjacent to I-55, and has no additional visual impact. Station parking and drop off would change view of existing field, but would be compatible with other commercial, multi-family and institutional uses in the vicin-

Alternatives	Visual Impacts
	ity.
Reavis Barracks to Lindbergh Line Segment	The line would run in a cut section along I-55, and then under Lindbergh, and would have no significant visual impact.
Lindbergh Station	The station would be located below grade in a heavily developed commercial area. Bus transfer and drop off would be at the existing surface level. The station would not have any significant visual impact.
Lindbergh to Butler Hill Line Segment	The line would run along I-55 in a cut section and would have no significant visual impact.
Butler Hill Station	The MetroLink line would cross Butler Hill Rd. on an elevated structure into an elevated station on the south side of Butler Hill. The station and parking are visually compatible with the commercial development in this area, and with future development expected here.
Orange Alternative to Reavis Barracks	
Shrewsbury to Gravois-Hampton Line Segment	Elevated transit structure along northern portion of River Des Peres Blvd., and across the river at Gravois Rd. will have moderate visual impacts on park users.
Gravois-Hampton Station	Modest visual effects from elevated station, located near urban arterial and near existing transit transfer station.
Gravois Hampton to Morganford Line Segment	Light rail line would operate in street right-of-way. No significant visual impact.
Morganford Station	Modest platforms and walk-in design of station minimize any modest visual effect.
Morganford to Bayless Line Segment	The elevated structure over the River Des Peres and I-55, and embankment along I-55, are smaller in scale and no more intrusive in design than street and highway structures in the vicinity, and has no additional visual impact of significance.
Bayless Station	This station is located on embankment between I-55 and a railroad right-of-way, and has no significant additional visual impact.
Bayless to Reavis Barracks Line Segment	The elevated structure and embankment along I-55 do not have significant visual impacts.
Reavis Barracks Station	Station is located adjacent to I-55, and has no additional visual impact. Station parking and drop off would change view of existing field, but would be compatible with other commercial, multi-family and institutional uses in the vicinity.

5.2.11 Energy Impacts

Introduction

Energy impacts would result for similar reasons and causes as air quality impacts, discussed above. These causal mechanisms include:

- Reduced fuel (primarily gasoline) used for automobile and light truck travel, as some riders would switch to using transit.

- Additional fuel (primarily diesel fuel) used for increased bus service that is part of the alternatives under consideration.
- Increased consumption of electric power for operation of MetroLink trains and stations. Nationally, most electricity (51 percent) is generated by burning coal, and in Missouri, coal is the predominant fuel source (over 80 percent of electricity generated in Missouri).
- Energy used in construction of guideways, stations, vehicles, and parking facilities. This is discussed under "construction impacts."

Regulatory environment

The conservation of energy and the reduction of reliance on foreign energy sources are national priorities. The fuel efficiency of automobiles and small trucks is regulated by the EPA. However, there are no specific standards for energy impacts of transit improvement projects such as this one.

Resources impacted

The potential energy use and savings of the project during operation are based upon the vehicle miles of travel by various modes, as calculated in the air quality analysis, and the fuel efficiency of those modes. The energy use factors used in this analysis for each mode were:

- Personal vehicle travel includes travel by passenger automobile, van, pickup truck, or SUV. The U.S. Department of Energy (DOE) reports an average fuel efficiency of 20 miles per gallon, for vehicles owned and used by the average American household in 1994. Since 1994, the average fuel efficiency of passenger automobiles has improved somewhat because of replacement of older cars with newer, more efficient models. However, this improvement has been offset by the increased share of trucks and SUVs in the vehicle fleet. The energy use projections in this document use 20 miles per gallon as the average fuel consumption figure for personal travel. The fuel used is almost entirely gasoline, with an energy content of 125,000 British Thermal Units (BTUs) per gallon. Energy comparisons also assume a 10 percent loss of energy in the refining process and delivery of fuel to the user. The total energy consumption is 6,940 BTUs per vehicle mile for personal vehicles.
- Bus fuel efficiency is based on Metro's recent experiences in fuel purchases and bus miles, as reported to FTA. Metro's actual bus fuel efficiency in 2001 was 3.4 bus miles per gallon of diesel fuel. Diesel fuel has an energy content of 139,500 BTUs per gallon, with a 10 percent energy loss in refining and shipment. The total energy consumption is 45,600 BTUs per bus mile.

- MetroLink fuel efficiency is also based on figures reported to FTA. MetroLink vehicles used 6.96 kilowatt hours of electricity per revenue vehicle mile (a typical train set is made up of two vehicles).[10]. One kilowatt hour is equivalent to 3400 BTUs, and there is a 66 percent loss of energy in electrical generation and transmission. The total energy consumption is 69,600 BTUs per vehicle mile for light rail transit.

Table 5-23, "Energy Impacts 2025," shows the projected change in energy consumption for each mode, measured in gallons of fuel or kilowatt hours, as well as the net equivalent energy consumed at the source, in BTUs. The TSM, Purple, and Blue-Watson alternatives result in an increase in personal vehicle miles of travel, bus miles, and light rail transit vehicle miles, and therefore result in a net increase in energy consumption for operations. The Blue-Butler Hill, Orange-Butler Hill, and Orange-Reavis Barracks all result in a decrease in personal vehicle miles that more than offsets the increase in transit energy use.

Table 5-23 also shows the gasoline equivalent of the energy expended or saved. The Blue-Butler Hill alternative, for example, results in an energy savings equivalent to 860,000 gallons of gasoline a year, or the gasoline that might be used by 860 households, driving an average of 20,000 miles per year.

Table 5-23: Energy Impacts 2025

	Alternative						
	No-Build	**TSM**	**Purple**	**Blue Watson**	**Blue Butler Hill**	**Orange Butler Hill**	**Orange Reavis Barracks**
Personal Vehicles							
Δ annual veh.miles (000)	-	+620	+590	+590	-31,420	-34,100	-22,930
Δ fuel use (000 gal.gasoline)	-	+30	+30	+30	-1,570	-1,710	-1,150
Δ BTUs (billions/yr)	-	+4	+4	+4	-220	-240	-160
Transit Buses							
Δ annual veh.miles (000)	-	+1,010	+824	+824	+564	+462	+477
Δ fuel use (000 gal. diesel)	-	+300	+240	+240	+170	+140	+140
Δ BTUs (billions/yr)	-	+47	+38	+38	+26	+22	+22

[10] This power consumption is measured at the substation along the light rail alignment.

	Alternative						
	No-Build	**TSM**	**Purple**	**Blue Watson**	**Blue Butler Hill**	**Orange Butler Hill**	**Orange Reavis Barracks**
Light Rail Vehicles							
Δ annual veh.miles (000)	-	0	+176	+170	+1,034	+1,292	+812
Δ electric use (000 kwh)	-	0	+1,220	+1,180	+7,200	+8,990	+5,650
Δ BTUs (billions/yr)	-	0	+12	+12	+72	+90	+57
Annual Energy Impact							
Δ BTUs (billions)	-	+51	+55	+54	-120	-125	-81
Δ Gasoline equivalent (000 gal/yr))	-	+370	+390	+390	-860	-900	-580

Δ = Change from No-Build

5.2.12 Soils and Geology Impacts

Agricultural Soils

The federal Farmland Protection Policy Act (7 USC 4201 *et seq.*) protects undeveloped agricultural lands and soils that could be affected by federal projects. The Metro South study area is so thoroughly developed with residential and commercial uses that there are no substantial areas of agricultural use nor are any areas likely to be available for agricultural use in the future. Less than 2 percent of land area in the study area is in agricultural use, and none of this area is directly or indirectly affected by the alternatives (see figure 3-5). Impacts to agricultural soils are therefore not a significant issue related to any of the alternatives.

Unique Topography or Landscapes

Rolling topography, hills, and occasional steep ravines characterize much of the Metro South study area. The alluvial plain of the Mississippi River to the east and the alluvial plain of the Meramec River to the south are bordered by bluffs and some steep hills. These areas are on the borders of the Metro South study area and are not affected by any of the alternatives. The karst plain is a landscape feature of note that is bordered by Christopher Drive and Telegraph Road on the west, Jefferson Barracks County Park on the north, and the Mississippi River on the east and on the south. The karst plain area is on the easterly border of the study area and is not affected by any of the alternatives.

Importation of Structural Fill

Most construction projects involve a need for structural fill. All of the alternatives will create some demand for structural fill as part of their construction.

The Blue alternative to Butler Hill will create a very large demand for structural fill because of the extensive lengths of embankment along the alignment of the existing railroad right-of-way. The source of structural fill that will be needed to construct these embankments is typically commercial gravel pits. In a metropolitan area like St. Louis it can be assumed that there is sufficient commercial gravel pit capacity to supply the structural fill needs of the project. It is very unlikely that there would be a need for significant expansion of existing gravel pits or the demand for the establishment of new gravel pits in order to supply the needs of the construction of the Blue alternative to Butler Hill.

5.3 Construction Period Impacts

Construction period impacts for the light rail transit system are the same as those that would occur during the construction of any facility. Construction impacts are temporary in nature but can nonetheless be significant over the relatively short period of their occurrence. The most readily recognizable construction impacts would typically be noise, dust, and traffic interruptions. In general, the magnitude of the construction impacts would be roughly proportional to the length of the alternatives. Because the light rail project is a linear project of significant length, there will be opportunities to make use of the construction area for moving materials from one area to another and for storing materials within the project construction area that would not typically be available on a construction project occupying a single site. Possible construction impacts and the methods generally used to mitigate them include:

Noise from Construction Equipment: Construction equipment such as backhoes, front end loaders, and dump trucks are all noise generators. In addition to engine noise, this equipment has back up beepers which must be loud for safety purposes. The typical mitigation for such impacts is to restrict the construction hours of operation when work is taking place near a noise sensitive area. Back up beepers are always necessary but construction approaches that do not require excessive truck backing up can be emphasized.

Noise from Blasting: Controlled use of explosives may be necessary to beak up rock for removal. The typical mitigation for such impacts is to restrict the construction hours of operation when work is taking place near a noise sensitive area.

Noise from Pile Driving: Pile foundations may be needed for bridge foundation or certain high retaining walls. The typical mitigation for such impacts is to restrict the construction hours of operation when work is taking place near a noise sensitive area.

Dust from Earthwork: Equipment movement over exposed earth and excavating, unloading, or moving earth material can all generate dust. Mitigation measures for such impacts are to limit the extent of exposed earth and to re-vegetate a construction area as soon as possible. Dust is typically controlled by wetting down exposed materials, cleaning trucks periodically, covering over loads on board the trucks, and periodically sweeping areas in the vicinity of the construction site.

Erosion and Siltation: Exposed earth or imported earth material is subject to erosion from stormwater and from wind and, if uncontrolled, can result in the siltation of streams and wetlands. Erosion is typically prevented by limiting the extent and duration of exposure and re-vegetating an area as soon as possible. Siltation is typically prevented by controlling the runoff from the site by the use of detention basins, perimeter haybales, perimeter silt fences, or a combination of these approaches. Such measures will be designed and detailed in the construction plans and implemented by the contractor during construction to minimize the effects of erosion. In addition, the project will need water quality approval from the State of Missouri under Section 401 of the Clean Water Act, as well as a National Pollutant Discharge Elimination System (NPDES) stormwater permit.

Traffic: Construction activity creates a short term, concentrated influx of traffic at a construction site. This traffic consists mainly of delivery vehicles for fill material, concrete, reinforcing steel, structural steel, and other construction materials arriving and departing throughout the work day and construction worker vehicles arriving in the morning and departing in the evening. Typical mitigation measures are limitations on the hours of work or the hours of delivery to avoid peak period traffic and limitations on the routes of delivery to avoid congested areas.

Parking: Construction activity creates a short term demand for parking for construction workers at specific construction sites. The typical mitigation measures are to require some provision for working parking spaces as part of the temporary construction site.

5.4 CUMULATIVE AND SECONDARY IMPACTS

Cumulative Impacts: The cumulative impacts of the project are the direct or indirect impacts of the proposed action considered in addition to other activities in the project area and considered over time. The reason for considering impacts cumulatively is that even though a project may not in itself be found to have immediate significant environmental consequences it may act along with other activities or may act over a long period of time to contribute to creating significant environmental consequences in an area.

In order to account for cumulative impacts, the environmental consequences of the project have been considered in relation to other existing activities and other foreseeable planned activities in the project area. The project alternatives have been developed not in isolation but as an integral part of a multi-modal transportation system for the project area. The project alternatives have been reviewed and evaluated not as isolated conditions but as conditions superimposed on existing activities in the project area.

The specification of the No-Build alternative is a response to the need to consider impacts cumulatively. The No-Build has been developed and specified to include all foreseeable transportation and other development activities in the area. Comparison of the light rail alternatives to the No-Build alternative as a base case allows the environmental consequences of the light rail project to be considered as an addition to other ongoing transportation improvements in the project area.

The evaluation of the specific impacts of the alternatives takes a cumulative and a long range viewpoint. Traffic impact analysis evaluates the effect of the project as a cumulative impact on existing traffic conditions that are projected well into the future. Air quality impact analysis considers the impact of the alternatives in a regional context and projects them well into the future. Noise impact analysis includes the affect of project generated noise in relation to noise from all other sources as determined through ambient noise measurements. The cumulative visual impacts in sensitive areas such as parks are specifically addressed in the visual impacts section. Other areas of impact analysis are similarly based on recognition of impacts other than direct project impacts that affect resources in the study area.

The impact analysis incorporates recognition of environmental resources that have been identified as of particular concern by environmental resource agencies. These resources have typically been reduced or threatened as a result of cumulative impacts from past activities over a long period of time. Such resources in an urban area typically subject to long term degradation are wetlands, endangered and threatened species, special wildlife habitats, parklands, and open space. Such resources have been given special consideration because any additional impact from the project, although perhaps relatively minor in and of itself, could have a significant affect given the past cumulative degradation of the resource by unrelated development in the past.

The cumulative impacts of the selected alternative may be reduced or mitigated by design features or treatments that will be developed during the preliminary engineering and design phases of the project. The Final EIS will evaluate the effects of these mitigating measures and will include a reassessment of environmental impacts including cumulative impacts.

Secondary Impacts: Secondary impacts are separated in distance and time from the project itself. They are impacts that do not result directly from the project but can be traced to the project as part of their root cause. The most commonly considered secondary impact of an infrastructure project such as the light rail transit project is secondary residential and commercial development. The project does not directly include any residential or commercial development but the project does create conditions that will encourage such development to take place.

Secondary residential and commercial development is not an unwanted consequence of the light rail transit project; it is a desired result of the project. The desirable transportation related development and redevelopment of areas in the vicinity of the light rail transit stations are not a part of the project but will be encouraged as a follow on activity to the project to take advantage of the new mobility conditions that the project will create.

5.5 Irreversible and Irretrievable Commitment of Resources

Some commitments made as a result of the project can never be undone. Once the action has been taken there is no way to return to conditions as they formerly were. In this sense, the decision to proceed with the project results in irreversible and irretrievable losses of resources. The inevitable loss of such resources associated with the project should be given special consideration in the decision making process.

One set of irretrievable and irreversible commitment of resources are those of the many materials of construction. Construction materials provided for this specific project and this specific place are not directly reusable and will have only limited value as recycled material at some future time. The energy and labor necessary to provide these materials will be lost forever. Construction materials and the energy and labor to produce them are not, at present, scarce resources; the commitment of these resources to the Metro South project would not preclude other projects. Therefore, the commitment of these resources would not have a major influence on the decision to build any of the Metro South alternatives.

The irreversible and irretrievable commitment of land to the project is a decision that has greater consequences. Although the land as physical space will not be lost, the use of the land for any other purpose than as a light rail transit right-of-way would be unlikely in the foreseeable future. Once that land is devoted to transportation use, it can be considered lost to any other use within any normal planning horizon. An example of this loss of a right-of-way to conversion to other uses is that of former freight railroad rights of way that have been very slow to convert to other uses despite the loss of their original purpose. A long linear right-of-way, once assembled, is a land-use that is not typically converted to non-transportation land-uses. Recognizing the permanency of the land-use change and recognizing the competing needs for land in the project area, the alignments of the alternatives have been chosen to make maximum use of land that is already in transportation use, is closely associated with transportation use, or is located in seams between unrelated areas of land-uses.

Resources associated with the land such as wetlands and wildlife habitat are also irreversibly and irretrievably lost as a result of the use of the land for transportation purposes. Although the unique nature and location of the resources within the light rail transit right-of-way will be lost, mitigation for the loss of these resources can be provided by the replication of wetland or habitat at a nearby location. These replicated resources will eventually replace the natural resources and their function.

5.6 Relationship of Local Short-Term Uses vs. Long-Term Productivity

The transportation improvements described and analyzed in this document are intended to improve the long-term productivity in the St. Louis metropolitan area by improving mobility, increasing economic development, and offering lower-cost and lower-impact transportation options. The benefits of major infrastructure improvements are long-term in nature, because these services will affect the activities and choices of area residents for many decades to come.

Providing the long-term productivity improvements of a major transportation system unavoidably requires the use of resources. One of the most obvious of the uses of resources is the need to acquire and relocate residences and businesses to create a continuous right-of-way through the heavily built-up areas in the Metro South study area. Elements of the natural environment, such as wetlands, may also be impacted in the short term. The impacts to these resources, and others, have been described in detail in this chapter of the DEIS. Chapter 6, "Evaluation," provides a comparative evaluation of the transportation alternatives, and provides further comparisons of the long-term benefits and potential impacts of each of the alternatives.

6.0 EVALUATION OF ALTERNATIVES

This chapter discusses the evaluation of the DEIS alternatives on a wide range of criteria. In addition to the environmental consequences that are the focus of NEPA, these criteria also include issues such as equity, financial feasibility, travel benefits, and land-use and development objectives. Each of the evaluation measures is discussed briefly, and the results are presented in an evaluation matrix. This chapter addresses the CEQ regulations on preparing an EIS, which requires a comparative evaluation of alternatives.

6.1 EVALUATION CRITERIA

The evaluation of alternatives presented in this chapter was designed to comply with both the National Environmental Policy Act (NEPA) requirements and FTA procedures. In previous chapters, the environmental impacts of all of the DEIS alternatives were analyzed, using equivalent methods and levels of detail, as required under NEPA. Those environmental impacts are incorporated into the criteria presented in this section, along with additional criteria for the evaluation of alternatives that address FTA requirements or local goals and objectives. These criteria were structured around the presentation of objectives in Chapter 1, "Purpose and Need."

In addition to the NEPA and FTA requirements, the availability of detailed information about the alternatives, based upon conceptual engineering, was a key consideration in developing the evaluation criteria. Some criteria may not be possible to quantify accurately until additional engineering is undertaken and, in these cases, the evaluation measures can only be estimated and small differences among alternatives may not be significant.

The evaluation criteria and measures that are discussed below have been developed to best determine the comparative advantages and disadvantages of each alternative. Unless otherwise indicated, each build or TSM alternative has been evaluated on each measure in terms of the projected change or difference from the No-Build alternative. The identification number for each measure (for example, 1.01) corresponds to the indicators in Table 6-1, "Detailed Alternative Evaluation Criteria".

Table 6-1: Detailed Alternative Evaluation Criteria

	Criteria	Blue Butler 8.5 mi/5 stations	Blue Watson 1.1 mi/1 station	Orange Reavis 6.9 mi/4 stations	Orange Butler 11.0 mi/6 stations	Purple 1.5 mi/1 station	No-Build
1.00	**Access to Opportunity**						
1.01	***Projected Ridership***						
a.	Systemwide Transit Linked Trips (vs No Build)	8,048	626	6,298	8,092	626	N/A
b.	***Systemwide MetroLink Boardings (vs No Build)***	9,588	132	7,068	8,960	132	N/A
c.	Study Area MetroLink Boardings	5,412	443	3,681	4,698	443	N/A
1.02	Daily Passenger Miles (MetroLink + Bus vs No Build)	137,989	-6,626	100,405	149,711	-6,626	N/A
1.03	Number of Major Attractions Served	2	0	2	3	0	N/A
1.04	Connectivity to Future Southside Extension	Medium	Low	High	High	Low	N/A
1.05	Low Income Households Served within ½ mile of station	141	21	208	294	21	N/A
1.06	***Zero-car Households Served within ½ mile of station***	291	62	463	521	62	N/A
1.07	Number of Park n Ride Spaces Required	1,990	20	1,480	1,660	20	N/A
1.08	Number of New Signalized Intersections	0	0	2	2	0	N/A
1.09	Reduction in Vehicle Miles Traveled (VMT)	64,965	-14,954	40,204	107,400	-14,954	N/A
2.00	**Economic Development**						
2.01	Existing Households Served within 1/2 mile of Station	6,131	1,073	6,712	8,602	1,073	N/A
2.02	***Year 2025 Households (Official Projections) within ½ mile of station***	6,221	1,073	6,720	8,688	1,073	N/A
2.03	Year 2025 Households within 1/2 mile of Station based on Transit Oriented Development (TOD)	7,231	1,231	6,720	9,021	1,231	N/A
2.04	Existing Employment within 1/2 mile of Station	7,948	2,047	2,193	5,657	2,047	N/A
2.05	***Year 2025 jobs (Official Projections) within 1/2 mile of Station***	9,153	2,583	2,028	5,765	2,583	N/A
2.06	Year 2025 Jobs within 1/2 mile of Station based on Transit Oriented Development (TOD)	12,855	4,332	2,028	8,161	4,332	N/A
2.07	***Total Potential of Identified TOD Sites (includes areas to develop after Year 2025)***						
a.	***Households:***	2,122	240	72	613	240	N/A
b.	***Employment:***	11,890	2,838	114	8,005	2,838	N/A
2.08	Applicability of Existing Local Codes, Authority and Incentives for Public/Private Partnerships	Med	Low	Low	Med-Low	Low	N/A
3.00	**Preserving Neighborhoods**						
3.01	Residential Right-of-Way required (in acres)	24.9	2.0	10.3	19.2	0.9	N/A
3.02	Commercial Right-of-Way required (in acres)						
a.	Commercial (in acres)	46.9	10.0	3.5	20.3	12.7	N/A
b.	BNSF Railroad (in acres)	15.9	2.3	0.0	0.0	0.0	N/A
c.	MoDOT (in acres)	5.3	0	11.6	20.7	1.2	N/A
3.03	Parkland Right-of-Way required (in acres)	0.03	0	8.8	8.8	1.7	N/A
3.04	Compatibility of Local Plans and/or Codes to Support TOD concepts	Med	Low	Low	Med-Low	Low	N/A
3.05	Residential Property Benefits (in millions)	$17.5	$3.0	$14.2	$20.1	$3.9	N/A

Table 6-1: Detailed Alternative Evaluation Criteria (continued)

	Criteria	Blue Butler 8.5 mi/5 stations	Blue Watson 1.1 mi/1 station	Orange Reavis 6.9 mi/4 stations	Orange Butler 11.0 mi/6 stations	Purple 1.5 mi/1 station	No-Build
3.06	Business Property Benefits (in millions)	$10.7	$2.2	$1.5	$9.4	$2.2	N/A
3.07	Increase in Housing Choice	8%	4%	0%	3%	4%	N/A
3.08	***Business Displacements***	27	6	3	12	8	N/A
3.09	Job Displacements	685	142	50	475	190	N/A
3.10	***Residential Displacements***	18	4	19	22	3	N/A
3.11	Walkability Index ("Pedestrian Friendliness")	32	43	40	36	43	N/A
3.12	Parking Demand/Parking Supply	1.0	0.02	0.32	1.0	0.02	N/A
3.13	Traffic Impact Analysis (cars driving to station)	3,512	37	2,807	3,230	37	N/A
3.14	Noise Impacts (number of noise sensitive properties affected) - all are residences	23	6	27	42	6	N/A
3.14A	Vibration Impacts	Low	Low	Low (1 institutional)	Low (1 institutional)	None	N/A
3.15	***Visual Impacts (Will communities' aesthetic character change?)***	Moderate-Severe along RR	Moderate along RR	Minimal along I-55 Moderate along Germania	Minimal along I-55 Moderate along Germania	Minimal along Villa Nova Neighborhood	N/A
3.16	Number of Hazardous Material Sites Affected	5	3	0	1	6	N/A
3.17	Natural Environmental Impacts:						
a.	Number of Streams Crossed	10	1	6	12	1	N/A
b.	Habitat Affected (acres)	0	0	0	0	0	N/A
c.	Upland/Vegetated	19.9	0	0	8.5	0	N/A
d.	Riparian/Stream	0.4	0.2	0	0	0.2	N/A
e.	Wetlands (within a 100' footprint)	0.27	0	0	0	0	N/A
f.	Floodplain Affected (acres)	3.71	0.06	10.02	12.96	0.06	N/A
g.	Navigable Waters Affected (number/acres)	0	0	0	0	0	N/A
h.	Cultural, Archeological, Historic Resources (NRHP)	0	0	0	0	0	N/A
i.	Endangered/Threatened Species (natural heritage site)	none	none	none	none	none	N/A
j.	Cemetery Impacts (acres)	0.0	0.0	0.9	0.9	0.7	N/A
3.18	Community Cohesion (impact on)	Medium	Low	None	Low	Low	N/A
3.19	Environmental Justice						
a.	Number of low-income or minority census block groups negatively impacted	0 (1 adj. EJ block group)	0 (1 adj. EJ block group)	0	0	0 (1 adj. EJ block group)	N/A
b.	Statistical diff. between impacted and benefited block groups?	N/A	N/A	N/A	N/A	N/A	N/A
4.00	**Performance & Cost**						
4.01	Systemwide Transit Facility Impacts	Medium	Low	Medium	Medium	Low	N/A
4.02	Length of Line (in miles)	8.51	1.12	6.88	11.01	1.45	N/A
4.03	Average Speed (study area in mph)	36.3	33.6	29.4	31.7	29.9	N/A
4.04	***Systemwide Annual Travel Time Savings (hours)***	2,840,000	-43,500	2,000,000	2,650,000	-43,500	N/A
4.05	***Total Capital Costs (in millions 2010 dollars)***	$667.8	$86.8	$323.4	$617.6	$106.9	N/A
4.06	***Capital Costs/Mile (in millions)***	$78.5	$77.5	$47.0	$56.1	$73.7	N/A
4.07	***Capital Cost/Passenger Mile***	$0.96	$7.73	$0.61	$0.84	$11.46	N/A

Table 6-1: Detailed Alternative Evaluation Criteria (continued)

	Criteria	Blue Butler 8.5 mi/5 stations	Blue Watson 1.1 mi/1 station	Orange Reavis 6.9 mi/4 stations	Orange Butler 11.0 mi/6 stations	Purple 1.5 mi/1 station	No-Build
4.08	***Annual Operating & Maintenance Costs***						
a.	Annual Systemwide O&M Costs (Bus) in millions 2010 dollars	$161.2	$163.9	$161.5	$161.0	$163.9	$159.6
b.	Annual Systemwide O&M Costs (Rail) in millions 2010 dollars	$61.8	$56.4	$60.3	$63.4	$56.4	$55.8
c.	Total Systemwide O&M Costs (Bus and Rail) in millions 2010 dollars	$223.0	$220.3	$221.8	$224.4	$220.3	$215.4
d.	***Annual O&M Costs (Bus and Rail) for Metro South Extension in 2010 dollars***	$7.6	$4.9	$6.4	$9.0	$4.9	$0.0
4.09	Systemwide Cost Effectiveness ($/hr saved)	$19.4	Negative	$13.1	$19.7	Negative	N/A
4.10	***Ease of Implementation based on ROW ownership***	Low	Low	Med-High	Med-High	High	N/A

6.1.1 Access to Opportunity

1.01 Projected Ridership

Transit ridership was estimated using a travel demand model that complies with FTA guidelines, as described in Chapter 4. Improvements in travel time, service quality, or cost will lead to increased ridership. Higher forecasted ridership is an indicator that an alternative would be successful in improving and expanding access to jobs and other opportunities. Three ridership measures are presented in Table 6-1, "Evaluation Matrix":

- The first measure represents the change in total systemwide transit ridership under each alternative, as calculated by the regional travel demand model. (See Chapter 4 for an explanation of this model. Table 4-5 presents the systemwide ridership projections.) This measure conforms to FTA procedures for assessing ridership, and is used by FTA to evaluate candidate transit projects under the New Starts funding program. Under this measure, a transit rider is counted once for each trip, even though that trip may consist of several transit segments, such as a feeder-bus-plus-MetroLink trip. The systemwide transit ridership for each alternative is compared to that for the TSM alternative,[1] and the increase or decrease in total weekday transit trips is reported in Table 6-1.

- The second measure of ridership is the change in daily boardings on the MetroLink system, including any extension beyond Shrewsbury that is included as part of the alternative.[2] These boardings are reported in Table 4-6, "Systemwide Weekday Boardings," in Chapter 4. Measure 1.01(b) in Table 6-1 reports the change in boardings compared to the TSM alternative.

- The third measure (item 1.01(c)) compares the boardings that are made at new MetroLink stations in the Metro South area for each of the alternatives. The TSM and No-Build alternatives do not include any new rail stations, so this measure is zero for these alternatives. These boardings are reported in Chapter 4, Table 4-7. When comparing these boardings to other ridership measures, it is important to note that, for trips between the Metro South area and

[1] The TSM is the presumed baseline alternative for this comparison for evaluation measures that are related to New Starts criteria, under FTA rules. This baseline alternative may be changed (to the No-Build, for example) with FTA approval if that is shown to provide a more useful and equitable comparison.

[2] Chapter 2, "Alternatives," describes the MetroLink operating plan that is assumed for all alternatives. Under this plan, one MetroLink line operates between Shiloh-Scott in Illinois and Lambert Airport in Missouri; the other operates between Emerson Park in East St. Louis and Shrewsbury-Lansdowne I-44 (or as extended under the Metro South alternatives).

other parts of the region, only the inbound trip (to downtown, for example) would be counted under this measure. The return trip (from downtown to the Metro South area) would not include a boarding at a Metro South station, so would not be counted.

1.02 Passenger Miles

The total number of miles that passengers will travel on the system is also estimated by the travel demand model. The measure reported in Table 6-1 shows the change in total systemwide daily transit passenger-miles on MetroLink and bus services for each alternative compared to the TSM alternative. These figures are based on calculations presented in the support document, “Metro South 2025 Ridership Forecasting and Methodology Report,” June 2004, Table 8-3. An increase in passenger miles is an indicator that passengers are making longer trips and thereby expanding access to opportunity.

1.03 Number of Major Attractions Served

Major attractions in the Metro South study area were identified in the existing conditions report.[3] Attractions include key destinations such as employment centers, shopping malls, and large high schools. The more attractions served, the greater the likelihood that the system will provide benefit to riders.

1.04 Connectivity to Future Southside Connection

The long range system plan and previous corridor studies include a future “Southside” MetroLink corridor from downtown, southwest through the City of St. Louis to the Metro South area roughly along the I-55 alignment (see the discussion of regional context in Chapter 1). A connection to the Southside alignment would enhance the overall system efficiency and, the closer this connection is to the Shrewsbury-Lansdowne I-44 station, the less the duplication or overlap in service coverage. Alternatives that include a direct connection to the I-55 corridor rate “high” on this measure, while those that end at Watson, and therefore do not connect at all to the I-55 corridor, rate “low.”

1.05 Low-Income Households Served

This measure, derived from U.S. Census Data, shows the number of households with income below the Census-defined poverty level that are within one-half mile (walking distance) of new Metro South stations. This measure uses Census Tract data. (Where only part of a census tract is within one-half mile, the number of households was estimated in proportion to the area included.) This is one of the “New Starts” criteria, and is not applicable to the No-Build or TSM alternatives because these alternatives do not include new

[3] East-West Gateway Council of Governments, “Metro South Existing Conditions Report,” July 2003.

rail stations. This criterion recognizes that lower-income households do not have the same range of travel choices available to them, and are therefore more dependent upon transit service. Projects and project alternatives that direct transit service to these households support public policy goals.

1.06 Zero-Car Households Served

The measure is also derived from U.S. Census Data and shows households within one-half mile of stations that do not own a car (also pro-rated by area included within the half-mile). As with the previous measure, this criterion recognizes that households that do not own a car do not have the same range of travel choices available to them, and are therefore more dependent upon transit service. Projects and project alternatives that direct transit service to these households support public policy goals.

1.07 Number of Park-and-Ride Trips Served

This measure is represented by the number of parking spaces that are projected at each station to meet park-and-ride demand, as determined by the regional travel demand model presented in Chapter 4. This demand is translated into total parking space requirements for each alternative, which are reported in Table 6-1. Park-and-ride demand represents expansion of access opportunities into areas that would otherwise be poorly served by transit.

1.08 Number of New Signalized Intersections

This is determined by an analysis of the traffic patterns around stations. Since signalized intersections interrupt traffic flow, the fewer new signals, the better. Project alternatives may result in new signalized intersections where traffic patterns are altered (such as by major park-and-ride entrances).

1.09 Reduction in Systemwide VMT by Automobile

The reduction in systemwide average weekday automobile (or other personal vehicle) vehicle miles of travel (VMT) is determined from data provided by the travel demand model. Since higher VMT is a major cause of traffic delays, energy use and pollution, the greater the reduction in VMT, the better. All VMT changes are relative to the TSM alternative. The energy and air quality measure implications of reduced automobile VMT are reported in Chapter 5 of this DEIS.

6.1.2 Economic Development

2.01 Existing Households Served (within 1/2 mile of station)

The number of households (measured by dwelling units) within walking distance (one-half mile) of new MetroLink stations is an indicator of how each alternative might influence economic activity in the corridor. The number of single-family dwellings is determined from geographic data maintained by EWGCOG, while the Assessors' data is used to calculate the number of units for multi-family dwellings.

2.02 Year 2025 Households Served (Official Projections)

This measure looks at the number of dwelling units within walking distance of new stations, according to land-use projections for the year 2025. This measure is calculated from EWGCOG's Land-Use Allocation Model (LUAM) projections for areas that lie within a one-half mile radius of new stations.

2.03 Year 2025 Households Served by Transit Oriented Development (TOD) or Redevelopment

As discussed in Chapter 5, a key part of the Metro South study includes an analysis of the potential for changes in development density and uses in opportunity sites near new transit stations. This development is generally known as transit-oriented development, or TOD, and is supported by proposed changes in zoning and land-use policies. This measure adjusts the LUAM projections of households within one-half mile of stations to reflect the additional dwellings that are projected under the TOD land-use policy changes.

2.04 Existing Employment Served (within ½ mile of stations)

This measure shows the number of jobs that are located within one-half mile of new MetroLink stations, and reflects the ability of an alternative to influence economic activity. The measure is calculated from Assessors' base data for square footage of commercial space, multiplied by factors for the number of employees per 1000 square feet, for various commercial uses. This measure is one of FTA's New Starts criteria.

2.05 Year 2025 Jobs Served (Official Projections)

This measure is based on LUAM projections of jobs in 2025 within one-half mile of stations. LUAM projects jobs by traffic analysis zone; where a zone lies partially within the half-mile radius, and partially outside this line, the job projections were allocated in proportion to the land area within the two parts of the analysis zone.

2.06 Year 2025 Jobs Served (TOD Redevelopment)

This measure is based on LUAM projections, adjusted for the half-mile radius around new stations, plus the results of recommended TOD land-use changes, as described in Chapter 5.

2.07 Total Transit Oriented Development/Redevelopment Potential

This measure reflects the total capacity of "opportunity sites" around stations, in terms of additional households or jobs in excess of existing levels. These opportunity sites are those areas within one-half mile of stations that are vacant or underused (with a potential for redevelopment), as described in Chapter 5. This build-out capacity includes development that may not occur until after 2025.

2.08 Applicability of Existing Local Codes, Authority and Incentives for Public/Private Partnerships

This is a qualitative (high-medium-low) assessment of whether existing zoning, economic incentives, partnering arrangements with private landowners and developers, and other land-use policies are conducive to encouraging new economic development in the area served by each alternative.

6.1.3 Preserving Neighborhoods and Environment

3.01 Private Residential/Vacant Right-of-Way (ROW) required

The acquisition of privately-owned residential property for the transit right-of-way is undesirable for several reasons: it is upsetting to individual property owners; it negatively affects outdoor activities and possibly parking; it reduces opportunities for new residential development or expansion of existing residences; and it potentially reduces the number of transit users within walking distance of the station. This measure reports the total number of acres of residential property to be acquired for each alternative, as determined by measurements taken from the plan and profile drawings. This measure is related to 3.10, below (residential displacements).

3.02 Commercial Right-of-Way Required

The acquisition of commercial property has a negative effect on commercial activity and jobs in the area, and particularly near new stations. Commercial takings are measured in acres of land, as determined by measurements taken from the plan and profile drawings.

3.03 Parkland Right-of-Way Required (in acres and number of parcels affected)

Parkland impacts, in acres, are determined by measurements taken from the plan and profile drawings. When ROW is taken from parklands, it directly impacts the amount of space available for public use. Federal law states that parklands cannot be used for transportation projects unless there is a finding that there are no prudent or feasible alternatives and that all possible planning has been done to minimize impacts (see Chapter 7).

3.04 Compatibility of Local Plans and/or Codes to Support TOD Concepts

This is a qualitative assessment of whether local zoning codes include provisions for mixed-use development at reasonable densities, as envisioned in the TOD redevelopment projections. This measure is used to evaluate projects that are proposed for New Starts funding.

3.05 Residential Property Benefits

This measure calculated the projected increase of the market value (in current dollars) of residences and residential property within one-half mile of a station, except for those residences that are directly adjacent to LRT line or station, or along major traffic approaches. These calculations are discussed in Chapter 5, and are presented in Table 5-6.

3.06 Business Property Benefits

Similar to measure 3.05, the measure projects the increase in market value of commercial property within one-half mile of a station, without adjustment for abutting properties. See Table 5-6.

3.07 Increase in Housing Choice

This measure shows the increase in the share of housing units available, within one-half mile of stations, that are in multi-family (apartment) or townhome developments. This measure reflects the ability of residents and potential transit users to choose from a greater range of housing types. The measure calculates the difference – between 2025 projections with TOD, and the base case – in the percentage share of multi-family housing among all housing units within one-half mile of new stations.

3.08 Business Displacements

Some businesses must be displaced to provide right-of-way for the new transit alternatives. While some of these businesses may be relocated in the area, some may close or relocate elsewhere. The goal is to minimize the business displacements. The measure is the number of businesses that would be displaced for the ROW or stations.

3.09 Job Displacements

This measure is the estimated number of jobs (using estimates of jobs per thousand square feet of business floor area) that are displaced, because of the business displacements shown in measure 3.08.

3.10 Residential Displacements

Displacement of households from residential displacement is a negative impact, running counter to many project objectives. This measure reflects the estimated number of dwelling units that would be displaced for new right-of-way or station areas.

3.11 Walkability Index

This is a numerical scale that reflects the quality of the pedestrian environment in new station areas, based on the existence of sidewalks and other pedestrian amenities, and the potential for improvement in walking amenities. The calculation of this measure is described in more detail in a Technical Memorandum included as Appendix F. The number included in Table 6-1 is the average score for station sites on each route.

3.12 Parking Demand/Parking Supply

Where the demand for parking at transit stations exceeds the available supply nearby residential and commercial areas may be impacted by on-street parking. This measure was calculated by comparing the parking requirements that are determined by the four-step travel demand model to the available area for station parking. For the larger park-and-ride stations, the parking supply is sized to match the demand (resulting in a ratio of 1.0), which takes into account the use of structured parking to accommodate the parking requirements. At other station sites, the parking demand is lower than the supply.

3.13 Traffic Impact Analysis

This measure reflects the increase in morning and afternoon peak period vehicles on roadways and intersections in the vicinity of station access points. Traffic mitigation plans may be developed during later phases of the project development process to reduce the impacts of these additional vehicles on traffic flow and delay.

3.14 Noise and Vibration Impacts

This measure shows the number of noise-sensitive properties for which projected noise levels exceed the FTA-defined noise impact level. Noise-sensitive properties include both residential and non-residential uses, but for the Metro South alternatives, all properties actually impacted by noise are residences. These impacted houses or apartment buildings are generally less than 50 or 100 feet from the proposed light rail tracks. The number includes some houses that would be acquired for right-of-way purposes. A description of the noise impact analysis methods and results is included in Chapter 5.

The second measure presents a qualitative assessment of the vibration impacts. While a large number of residences and other sensitive properties have some vibration impact (see Chapter 5), the magnitude of the impact to each property is well below any potential damage level.

3.15 Visual Impacts

This is a qualitative measure of the degree to which the aesthetic character of the neighborhood may be changed for the worse. The major visual issues concern the length and height of new aerial structures, and embankments and retaining walls that are visible from nearby residential areas or public park areas.

3.16 Number of Hazardous Material Sites Affected

This is determined by an analysis of the location of hazardous sites, as recorded in the GIS database, and comparing these with the plan and profile drawings. The project seeks to minimize the number of hazardous material sites impacted.

3.17 Natural Environmental Impacts

Impacts to the natural environmental were evaluated in Chapter 5. The measures presented here summarize those impacts, in comparison to the No-Build alternative:

a. Number of Streams Crossed: This is determined from an analysis of the GIS data, in conjunction with the plan and profile drawings. The project seeks to minimize the number of permanent streams and watercourses impacted.

b. Habitat Affected (acres): Habitats are areas that are allowed to grow in their natural state and are large enough to support natural vegetation and sustaining populations of mammals, birds, and other animals. All of the alternatives are located in developed areas, and no habitat impacts were found.

c. Upland/Vegetated: This is determined from an analysis of the GIS data, in conjunction with the plan and profile drawings. The project seeks to minimize the impact on naturally vegetated areas.

d. Riparian/Stream: Impacts to lands bordering streams were determined from an analysis of the GIS data, in conjunction with the plan and profile drawings. The project seeks to minimize the impact on land bordering streams and watercourses.

e. Wetlands: This is determined from an analysis of the GIS data and field inspection, in conjunction with the plan and profile drawings. The measure reported here represents the number of acres of the wetlands that are shown in the National Wetlands Inventory within 50 feet of the center of the proposed right-of-way (100-foot wide impact area). Mitigation is available to reduce the impacted area substantially, although more precise delineation of wetland boundaries may change the wetland area affected. The project seeks to minimize the impact on wetland areas.

f. Floodplain Affected (acres): This is determined from an analysis of FEMA flood plain, in conjunction with the plan and profile drawings, again using a 100-foot wide impact area. The project seeks to minimize the impact on floodplains.

g. Navigable waters: As indicated in Chapter 5, no impacts to navigation are expected. The project seeks to minimize the impact on navigable waterways.

h. Cultural, Archeological, Historic Resources: This is determined from an analysis of the GIS data, in conjunction with the plan and profile drawings. The project seeks to minimize the number of cultural, archaeological and historic sites impacted. No sites on the National Register of Historic Places are affected, and no known eligible sites are impacted. One possible site was identified, and additional inventory will be required once a preferred alternative is selected (see Chapter 5).

i. Endangered/Threatened Species: No endangered species habitats have been identified in the project area. The project seeks to minimize the impact on endangered or threatened species.

3.18 Community Cohesion

This is a qualitative assessment (low, medium, high) that is based on the following considerations:

- Will the alignment create a new barrier that tends to divide one part of a community or neighborhood from other parts? This is determined from an analysis of the plan and profile drawings. The project seeks to minimize the impacts on the community.
- Is there an impact on pedestrian access or mobility? This is determined from an analysis of the plan and profile drawings. The project seeks to minimize the impacts on the community.

3.19 Environmental Justice

Environmental justice concerns are described more fully in Chapter 5. This measure reflects two issues:

a. Are there environmental justice areas that are adversely affected by the project alternatives? An environmental justice area is defined as a Census block group that is in the lowest 20 percent of all block groups in the metropolitan area in terms of median household income, or in the highest 20 percent in terms of percentage minority population. Only one such block group was found in the study area, and it is not directly impacted by any project alternative.

b. Are the benefits and impacts of the project distributed equitably? Because there are no environmental justice communities negatively affected (the one such community benefits from improved transit service), this measure is not applicable. It should be noted that any extension in the Metro South corridor is part of a regional strategy of providing improved transit services to low income and minority populations in an equitable manner.

6.1.4 Performance and Cost

4.01 Systemwide Transit Facility Impacts

This is a qualitative assessment of the impact that each alignment will have on existing MetroLink facilities, lines or future extensions. Examples include potential impacts on the capacity of systemwide communications and train control centers. The magnitude of this impact is related to the additional miles of track and additional light rail trains placed in operation. The project seeks to maximize the efficiency of MetroLink system.

4.02 Length of Line

The length of each alignment determined from the plan and profile drawings. Generally speaking, a shorter alignment translates into lower cost and quicker journey times, if other factors are equal.

4.03 Average Speed

This is a New Starts criterion used to measure systemwide improvements in transit operations. The measure shows the average revenue service speed (including station stops) of the entire MetroLink system, derived from the operations model. Generally speaking, higher average speeds translate into improved operating efficiency.

4.04 Annual User Travel Time Benefits

This is a precisely defined measure of the travel time benefit realized by transit users under each alternative. The measure is calculated from the regional travel demand model using a computer program provided by FTA (see Chapter 4). These benefits, also called Transportation System User Benefits (TSUB), are measured in person-hours per year.

4.05 Total Capital Costs

This measure calculates the total cost of designing and building the project in 2010 dollars, in accordance with the cost methodology described in Chapter 2. The project seeks to provide the most cost-effective design that meets the project purpose and need.

4.06 Capital Costs/Mile

The capital cost per mile is determined by dividing the overall capital cost in 2010 dollars by the alignment length. The project seeks to provide the most cost-effective design that meets the project purpose and need.

4.07 Capital Cost/Passenger Mile

The measure of capital costs per passenger mile is determined by dividing the annualized capital cost by the annual incremental number of passenger miles. Annualized capital costs are calculated by converting the initial capital costs into an equivalent series of annual payments, using factors for economic lifetime and discount (interest) rates set by FTA. Generally speaking, a lower overall cost per passenger mile is a measure of increased efficiency.

4.08 Annual Operating and Maintenance (O&M) Costs

a. Annual O&M costs (Bus): The annual bus O&M costs are calculated using the cost model adopted by Metro to determine annual operating budgets. The project seeks to increase Metro's overall efficiency through economies of scale.

b. Annual O&M costs (Rail): The annual light rail O&M costs are calculated using the cost model adopted by Metro to determine annual operating budgets. The project seeks to increase Metro's overall efficiency through economies of scale.

4.09 New Starts "Cost Effectiveness" Measure

This metric, one of the New Starts criteria, divides the total annualized cost for each alternative by the total annual TSUB benefit to derive a cost-per-user-benefit-hour. The total annualized costs are the sum of:

- The annualized capital cost, reflecting the expected economic life of each component of the capital cost in accordance with accepted guidelines, and an accepted discount rate that represents the time value of money.
- The annual operations and maintenance costs.

This annualized costs and benefits are calculated as increments above the cost and benefits of the TSM alternative (used as the New Starts baseline alternative), as required by FTA regulations. A lower cost effectiveness number reflects a more desirable project, either because the costs are lower, or the benefits are higher. FTA has established thresholds for cost effectiveness that projects must meet to be recommended for New Starts funding. Two of the alternatives fail to provide user benefits, and therefore would not meet any threshold. At this early stage of project development, the remaining alternatives appear to come in under the current maximum cost effectiveness number for a project to be considered (currently $25.00 per hour), but above the highest project recommendation category (currently $10.00 per hour).

4.10 Ease of Implementation

This qualitative measure is intended to reflect the ability to move the project forward on a predictable schedule, based on potential right-of-way acquisition and use problems. An alternative that uses a high percentage of right-of-way that is currently under public control would rate higher on this measure. If property is already publicly owned, or controlled (such as existing roadway, flood control areas, or highway rights-of-way) there are fewer potential barriers to implementation, and the project is more likely to proceed on budget and schedule. There are particular concerns with meeting the requirements of private railroad companies in utilizing rail rights-of-way, and with the potential complexity of acquiring private property.

6.1.5 Summary Evaluation Measures

The 65 evaluation measures above represent the full range of issues that will be considered in identifying a locally preferred alternative (LPA) to move into implementation. They include a number of measures that are very similar in their nature and impact; this list also includes some measures for which all of the alternatives have similar effects, so that the measure is not very useful in distinguishing one alternative from another.

To make it easier to focus in on those criteria that are most representative of the larger group of measures, the study team identified 14 to be focused on for comparison of the alternatives. These 14 criteria are:

1) Projected Ridership (see measure 1.01)
2) Zero-car Households Served (1.06)
3) 2025 Projected Households within ½ Mile of Stations (2.02)
4) 2025 Employment within ½ Mile of Station (2.05)
5) Transit Oriented Development Potential (2.07)
6) ROW/Implementation Control (4.10)
7) Business Displacements (3.09)
8) Residential Displacements (3.10)
9) Visual Impacts (3.16)
10) Total Capital Costs (4.05)
11) Capital Costs/Route Mile (4.06)
12) Capital Costs/Passenger Mile (4.07)
13) Annual Operations and Maintenance Cost (4.08)
14) New Starts Cost Effectiveness (4.09)

Each alternative was rated on each of these summary criteria as “strongly unfavorable,” “somewhat unfavorable,” “neutral,” “somewhat favorable,” or “strongly favorable” in comparison to each other. These ratings and comparisons are displayed in a graphic form in Table 6-2.

Table 6-2: Detailed Alternative Evaluation Criteria

	Criteria	Blue Butler	Blue Watson	Orange Reavis	Orange Butler	Purple	No-Build
1.00	**Access to Opportunity**						
1.01	***Projected Ridership***						
a.	***Systemwide Transit Linked Trips (vs No Build)***	●	○	◕	●	○	**N/A**
b.	***Systemwide MetroLink Boardings (vs No Build)***	●	○	◕	●	○	**N/A**
c.	***Study Area MetroLink Boardings***	●	○	◕	●	○	**N/A**
1.06	***Zero-car Households Served within ½ mile of station***	◑	◔	◕	●	◔	**N/A**
2.00	**Economic Development**						
2.02	***Year 2025 Households (Official Projections) within ½ mile of station***	◑	◔	◕	●	◔	**N/A**
2.05	***Year 2025 jobs (Official Projections) within 1/2 mile of Station***	●	◑	◔	◕	◑	**N/A**
2.07	***Total Potential of Identified TOD Sites (includes areas to develop after Year 2025)***						
a.	***Households:***	●	◑	◔	◕	◑	**N/A**
b.	***Employment:***	●	◑	◔	◕	◑	**N/A**
3.00	**Preserving Neighborhoods**						
3.08	***Business Displacements***	○	◕	●	◔	◑	**N/A**
3.10	***Residential Displacements***	◑	◕	◔	○	●	**N/A**
3.15	***Visual Impacts (Will communities' aesthetic character change?)***	◔	◑	◕	◕	●	**N/A**

○	◔	◑	◕	●
Unfavorable		**Neutral**		**Favorable**

Table 6-2: Detailed Alternative Evaluation Criteria (continued)

	Criteria	Blue Butler	Blue Watson	Orange Reavis	Orange Butler	Purple	No-Build
4.00	**Performance & Cost**						
4.04	***Annual Travel Time Savings (hours)***	●	○	◑	◕	○	**N/A**
4.05	***Total Capital Costs (in millions 2010 dollars)***	**$630.0-$700.0**	**$82.5-$91.0**	**$307.0-$339.5**	**$575.0-$635.5**	**$101.5-$112.0**	**N/A**
4.06	***Capital Costs/Mile (in millions)***	**$74.5-$82.5**	**$73.5-$81.5**	**$44.5-$49.5**	**$52.0-$58.0**	**$70.0-$77.5**	**N/A**
4.07	***Capital Cost/Passenger Mile***	**$1,750-$1,950**	**$390-$430**	**$950-$1,050**	**$1,570-$1,750**	**$480-$530**	**N/A**
4.08	***Annual Systemwide Operating & Maintenance Costs***						
d.	***Annual O&M Costs (Bus and Rail) for Metro South Extension in 2010 dollars***	**$7.0-$8.0**	**$4.5-$5.0**	**$6.0-$6.8**	**$8.5-$9.5**	**$4.5-$5.0**	**N/A**
4.10	***Ease of Implementation based on ROW ownership***	○	○	◕	◕	●	**N/A**

○	◔	◑	◕	●
Unfavorable		**Neutral**		**Favorable**

In open houses that were held in late August 2004, participants were asked to rank which of the representative 14 evaluation criteria they thought were most important. Eighty-four comment forms were received and Table 6-3 shows each of the criteria and the percentage of respondents that chose it. A summary of the open houses is contained in Appendix G.

Table 6-3: Evaluation Criteria Ranked by Respondent Choice

Criteria	Percentage based on Respondents Choice
Projected Ridership	39%
Residential displacements	39%
Capital costs	28%
Business displacements	25%
Visual impacts	22%
Zero car households served	21%
Capital costs/mile	19%
Operating and maintenance costs	19%
Ease of Implementation (ROW)	19%
2025 households served	18%
Capital costs/passenger mile	17%
2025 jobs served (official projections)	13%
Transit Oriented Development potential	13%
Annual travel time savings	12%

6.2 Comparative Evaluation of Alternatives

6.2.1 Introduction

Previous chapters and sections of this DEIS have provided information on the environmental effects and other characteristics of the alternatives. This previous information has been organized by impact category or evaluation measure.

This section presents a summary evaluation that has been organized alternative-by-alternative.

The project also conducted meetings with various municipalities, city councils, and business organizations to gather their input on the criteria used to evaluate the build alternatives. A summary of these meetings can be found in Appendix G.

At this point in the development of the Metro South project, no alternative has been selected for implementation. The discussion below, therefore, presents the advantages and disadvantages of each alternative, relative to the others. It is not intended to reach any conclusion about which alternative is preferred.

6.2.2 No-Build Alternative

The No-Build alternative is the base against which the environmental effects of each of the other alternatives are measured. It nonetheless remains as one of the alternatives that may be chosen through the EIS and alternatives analysis process. It is the default choice if no action is taken to implement any of the TSM or build alternatives within a reasonable period of time.

By definition, the No-Build has no negative environmental effects in excess of those that would occur had this project not been undertaken. It also has none of the benefits, and achieves none of the goals and objectives set out in Chapter 1 of this DEIS.

The No-Build alternative would not incur any additional operating or maintenance costs in excess of the projected costs of the existing and programmed transit system. The capital costs of the No-Build would be limited to costs already spent or committed for planning, environmental studies, and conceptual engineering for this project.

6.2.3 Transportation Systems Management (TSM)

The TSM alternative involves very little new construction, and some increment in the amount of bus services provided and the routes operated. As a result, the TSM alternative is not significantly different from the No-Build in terms of its environmental impacts.

One of the premises of the TSM alternative is that it includes measures primarily intended to optimize the efficiency and effectiveness of the transportation system, as much as can reasonably be done for less investment than a fixed guideway. This optimized system can then provide a baseline of comparison for the build alternatives, a comparison that is important to the New Starts funding program.

The TSM alternative, however, fails to optimize transit service in the Metro South corridor. In particular, the TSM alternative results in only a slightly higher transit ridership than the No-Build alternative. The TSM alternative includes a substantial amount of new bus service, and this increase in service may lead to additional riders on some parts of the system. However, the redirection of bus service to new and expanded routes results in a greater loss of riders on other parts of the system. The TSM alternative also requires an investment of $25 - $30 million for capital outlays and an ongoing increase in annual operating costs of $4.5 - $5.0 million.

6.2.4 Purple Alternative

The Purple alternative is a minimal expansion of the light rail system adding just one station. It has the advantage of moving the terminal station of the system beyond the Shrewsbury-Lansdowne I-44 station, where the potential for a terminal station is limited because of surrounding land-uses and lack of roadway access. At the new Watson station, the terminal station is compatible with surrounding land-uses and can be readily accessed from arterial roadways. The Watson station area presents opportunities for transit-related development with substantial office space for transit-oriented employees and area available for multi-family housing for transit-oriented residents.

The capital and operating costs and negative environmental effects of this alternative are relatively low, reflecting the fact that this alternative is short and requires relatively little right-of way. However, the fact that there is only one station added to the system limits its overall effectiveness. The alternative does very little to increase overall system ridership and is actually counterproductive in increasing daily passenger miles on the transit system and in reducing overall VMT in the region. In terms of system efficiency and effectiveness the Purple alternative ranks very low in comparison to the longer alternatives. Because there is no reduction in the overall VMT, this minimal expansion of the system does nothing to further regional goals of lower energy use and improved air quality.

The Purple alternative requires the use of a small section of the River Des Peres Park. Federal law prohibits the use of significant parkland for federally-funded transportation projects if there is a feasible and prudent alternative. The Blue-Watson alternative provides the same benefits as the Purple alternative, without requiring any significant parkland. Therefore, the Purple alternative could proceed with federal funding only if the Blue alternative is found to be infeasible or imprudent. This issue is discussed further in Chapter 7.

6.2.5 Blue Alternative to Watson

The Blue alternative to Watson is similar to the Purple alternative in that it is relatively short and adds only one station to the system. The Watson station provided through the Blue alternative would have the same beneficial characteristics of the Watson station provided under the Purple alternative – namely, compatible surrounding land-uses, reasonable roadway access, a transit service opportunity for local residents, and the promise of acting as a catalyst to substantial potential transit oriented development. Like the Purple alternative it offers little in terms of overall system efficiency and effectiveness.

The route from the Shrewsbury-Lansdowne I-44 station to the new Watson station is what distinguishes the Blue alternative to Watson from the Purple alternative. The Blue alternative takes a shorter route along the existing freight railroad right-of-way, whereas the Purple alternative follows the parkway and roadway system. Following the railroad right-of-way has the advantage of being a shorter route and of isolating the light rail transit from the street system. The disadvantage of following the railroad right-of-way is that the incompatibility between freight rail cars and light rail transit cars must be addressed by providing a substantial separation between the two types of rail cars. The LRT tracks must not only be horizontally separated from the freight rail tracks by a wide distance but must be vertically separated by building the light rail tracks on an embankment. This embankment extends horizontally into adjacent properties requiring some strips of land-taking, including private residential property. This embankment rises above the surrounding area providing a visual intrusion into the area.

6.2.6 Blue Alternative to Butler Hill

The Blue alternative to Butler Hill is an 8.5-mile-long MetroLink extension with five new stations. It follows a logical route that bisects the study area and follows the freight rail right-of-way for about two thirds of its route and follows the I-55 right-of-way for the final third of its route. This alternative effectively serves key areas of the Metro South area, and attracts significantly more riders than the shorter alternatives. Compared to the Orange alternative to Butler Hill, the Blue alternative to Butler Hill serves fewer households but more jobs; overall, the ridership for the two alternatives is comparable.

The use of existing transportation rights-of-way (railroad and highway) means that this alternative avoids some of the displacements and community impacts that a different route might entail. The use of the BNSF right-of-way, however, also presents potential problems. The vertical and horizontal separation that is imposed by the railroad results in an embankment that can have negative visual impacts in residential areas. Further, negotiating the terms of an agreement with the railroad – covering financial terms, operating restrictions, and assumption of liability – would be problematic, and may make this alternative infeasible. The BNSF has stated that they cannot support the use of their corridor for MetroLink.

This alternative has the highest capital cost of the alternatives. It also has slightly higher user benefits and slightly lower operating costs, so that its cost effectiveness is comparable to the Orange alternative to Butler Hill. The other environmental effects of the Blue-Butler Hill alternative are comparable to, or slightly lower than those of the Orange-Butler Hill alternative, except that the Blue alternative has higher impacts in the area of business displacements and visual impacts (because of the potential barrier effect of the embankment).

6.2.7 Orange Alternative to Butler Hill

The Orange alternative to Butler Hill is the longest of the alternatives. It is 11 miles long and provides six new stations. It follows the River Des Peres corridor for the first third of its route and follows the I-55 corridor for the last two thirds of its route. Because of its length, it provides substantial service benefits but also creates substantial negative impacts.

The Orange alternative to Butler Hill provides better service to residential areas than the Blue alternative to Butler Hill. In particular, the Orange alternative serves more low-income and zero-car households than the Blue alternative, and has a greater overall reduction in VMT by automobile. Overall ridership is slightly less than the Blue-Butler Hill alternative, but its cost effectiveness is approximately the same.

A key advantage of both of the Orange alternatives is that they utilize right-of-way that is now under the control of the Missouri Department of Transportation (MoDOT), rather than land under the control of a railroad. MoDOT is a cooperating agency on the Metro South project, and it is reasonable to expect that the agreements necessary to allow use of part of the I-55 property can be developed relatively easily. The railroad, on the other hand, has a number of requirements that must be met before any agreement to use railroad property can even be considered.[4] The Orange alternative to Butler Hill requires a smaller capital investment than the Blue-Butler Hill alternative. The Orange alternative also requires less commercial and residential real estate for its right-of-way and stations. The Orange alternative involves greater floodplain, parkland and cemetery impacts.

The Orange alternatives both require use of a portion of the River Des Peres park as a right-of-way (or easement for an aerial structure) from Shrewsbury-Lansdowne I-44 station to the I-55 corridor. While careful planning could make the MetroLink extension part of an overall improvement to the park, federal law (Section 4(f)) prohibits use of the parkland at all if there is a feasible and prudent alternative. These alternatives also impact a possible historic building, which has the same protections as parkland under Section 4(f). The extensive alternatives analysis identified many alternatives, and eliminated as ineffective, infeasible, or imprudent many alternative routes that could have avoided the parkland impacts. Of the alternatives that cleared this process, only the Blue alternatives avoid the use of significant parkland from River

[4] Unlike most private property, land-used by the railroad cannot generally be acquired by eminent domain.

Des Peres Park and impact to historic properties. These Blue alternatives may be found infeasible because of their use of railroad property.

6.2.8 Orange Alternative to Reavis Barracks

This alternative shares many of the benefits and potential liabilities as the Orange alternative to Butler Hill. It is 6.9 miles in length, and serves four new stations.

The Orange-Reavis Barracks alternative is substantially less expensive to build and operate than the Orange-Butler Hill alternative, thus resulting in a more positive cost-benefit ratio since ridership is only somewhat lower. The shorter alternative serves many of the same transit-dependent populations as the longer alternative, although its overall ridership is less. The Orange-Reavis Barracks alternative does not extend as far into the Metro South market area, and its park-and-ride spaces at stations will not attract as many new transit riders as the longer alternatives. The environmental effects are smaller, but so are the potential transportation benefits of the extension.

The Orange-Reavis Barracks alternative has the same problem with Section 4(f) parkland and historic properties as the Orange-Butler Hill alternative does.

6.3 Next Steps in the Evaluation of Alternatives

The East-West Gateway Council of Governments, acting as the St. Louis Metropolitan Planning Organization in cooperation with regional transportation agencies, must select a preferred alternative before the project can be moved into preliminary engineering, and before the environmental impact analysis process can be completed.

The preferred alternative may be one of the alternatives presented in this DEIS. The preferred alternative may be a modification of one of the DEIS alternatives, provided that the modification is within the scope of the alternatives examined in the DEIS. For example, it may be desirable to combine elements of different alternatives, or to modify an alternative in a manner that reduces its environmental impact. The preferred alternative will be described in the Final Environmental Impact Statement (FEIS) for this project.

7.0 SECTION 4(F) EVALUATION

This chapter presents an evaluation of the potential effect of alternatives on properties that are protected under Section 4(f) of the Department of Transportation Act (now at 49 U.S.C. §303) and Section 6(f) of the Land and Water Conservation Act (16 U.S.C. 460l-8(f)(3)). These federal laws impose special requirements for projects that may impact certain park, conservation, recreation, wildlife habitat and historic properties. These restrictions may affect the feasibility or desirability of certain alternatives, so it is appropriate to present these considerations in the DEIS, although the restriction may not apply until a single project proposal is presented for implementation later in the process.

7.1 REGULATORY CONTEXT

7.1.1 Section 4(f)

Introduction

Section 4(f) was included as part of the act creating the U.S. Department of Transportation in 1966. The restrictions and protections provided by this part of the act are still called "Section 4(f)" even though the statute has been re-codified and section numbers have been changed. These protections are now part of federal law at Title 49, U.S. Code, Section 303. This act applies to any project that receives federal transportation funding, or otherwise requires the approval of an agency within the Department of Transportation, or acting on the authority of the Secretary of Transportation. Section 4(f) provides additional protection for certain resources, which are:

- public parks owned by a government body or authority ("publicly owned")
- publicly-owned recreation areas
- publicly-owned wildlife or waterfowl refuges
- significant historical sites (including archaeological resources) regardless of ownership

These resources are referred to as "Section 4(f) resources" or simply "4(f)" properties. To be protected, a public park, recreation area, or wildlife/waterfowl refuge must be determined to be "significant" for park, recreation or refuge purposes by the government agency that has jurisdiction over the land. This designation, which is subject to review by the U.S. Secretary of Transportation, applies to the entire resource, not just the part affected by the transportation project.

The protection for Section 4(f) resources is provided by the requirement that the Secretary of Transportation (or designee) may not approve any project that "uses" a Section 4(f) resource unless he or she determines that:

- there is no "prudent and feasible" alternative to such use, and
- all possible planning has been done to minimize the harm resulting from such use.

FTA and the Federal Highway Administration have promulgated regulations that provide additional guidance and requirements for evaluating potential impacts to 4(f) properties. These regulations are included in Title 23 of the Code of Federal Regulations, Section 771.135. Many of the key terms are defined in the regulations.

"Use" as defined by Section 4(f) regulations

According to the FTA regulations, use of a 4(f) property can be permanent, an adverse temporary use, or a constructive use.

Permanent use. A permanent use occurs when land from the protected resource is incorporated into the right-of-way (or other land requirements) of the transportation project.

Temporary use. A temporary impact to Section 4(f) resources can occur when land from the resource is used for construction, then returned to its original use. To be a "use" that triggers the 4(f) protections, such temporary occupation must be <u>adverse.</u> A temporary occupation is not considered adverse, and therefore not subject to 4(f), if all of the following conditions are met:

- land from the resource is occupied on a temporary basis, generally less than the time required for construction of the full project, and where no change in the ownership of the land occurs,
- the scope of the work is minor, so that the nature and magnitude of the impacts to the resource are minimal,
- there are no permanent adverse physical impacts to the resource,
- the land is fully restored to a condition at least as good as what existed prior to construction, and

- there must be a written agreement of the government agencies having jurisdiction over the resource with regard to meeting these requirements.

In all cases, adverse impact is defined in terms of the values to the public that are protected by Section 4(f). For example, to be adverse, the impacts to a public recreation area must interfere with recreation.

Constructive use. Constructive use occurs when land from the protected resource is not taken, but when the other impacts of the project seriously interfere with the characteristics of the 4(f) property that are being protected (e.g., the recreational uses). Examples included in the FTA regulations include noise levels that interfere with campground use, interfering with views of a significant historical building, or restricting access to a resource that is enjoyed by the public.

Prudent and Feasible Alternatives

An alternative is prudent and feasible if meets the study Purpose and Need, unless there are unique or unusual factors that prevent the use of the alternative, or that the cost, social, economic, community disruption or environmental impacts of the alternative reach "extraordinary magnitudes."[1]

The determination of prudence and feasibility is made on a case-by-case basis. There are no simple formulas for questions such as, "How much more must an alternative cost before it is considered not to be prudent?"

Planning to Minimize Harm

It is important to note that mitigating the impact on 4(f) resources is not sufficient to satisfy the federal requirements. To use 4(f) properties for a transportation project, the proponent must show both that there are no prudent and feasible alternatives and that planning for mitigation has been done.

7.1.2 Section 6(f)

Federal Land and Water Conservation Act (LAWCON) funds are often used to purchase or improve lands that are used for parks, conservation, recreation, or similar purposes. Under Section 6(f) of the act, any federal project that would convert any part of a property improved with LAWCON funds to another use must be approved by the Secretary of the Interior. To be approved, the project must demonstrate that equivalent land or facilities have been replaced elsewhere adjacent to the impacted property. This program is administered by the National Park Service, part of the Department of the Interior.

[1] 23 C.F.R. §771.135(a)(2)

No properties purchased or improved with LAWCON funds are affected by any of the study alternatives.

7.1.3 Other Regulations

The National Historic Preservation Act (Section 106, in particular) also protects significant historic properties that may be affected by federal projects, or any project requiring approval of a federal agency. Section 106 applies to any action that may adversely affect a property that is listed on or eligible for listing on the National Register of Historic Places. Section 106 regulations require a coordination process among the federal agency responsible for the action and state, local, tribal, and federal historic preservation agencies.[2]

The Section 106 coordination process generally occurs during the preliminary engineering and later phases of project development. The steps to be followed by the responsible federal agency in cooperation with the historic preservation agencies include:

- determination of an Area of Potential Effect,
- development of an inventory of potential eligible properties,
- determination of eligibility of properties for listing on the National Register,
- determination of whether any effect on such properties is adverse,
- evaluation of methods to avoid, minimize and mitigate any adverse effect, and
- agreement on procedures to be followed for historic preservation or recording of information.

If there is no adverse effect found through this Section 106 process, then there is no “use” of the property for Section 4(f) purposes. However, a finding of adverse effect through the Section 106 process does not necessarily mean that there is a Section 4(f) use.[3]

[2] 36 C.F.R. Part 800
[3] 23 C.F.R. §771.135(p)(5)

7.2 SECTION 4(F) RESOURCES AFFECTED

7.2.1 Public Parks and Recreation Areas

Chapter 3 of the DEIS presents an inventory of all public parks and recreation areas in the study area. Chapter 5 of the DEIS indicated that of these 50 or so parks and recreation areas, two – the River Des Peres park, and the Grant's Trail recreation path – are used by one or more of the study alternatives.

River Des Peres Park Description

River Des Peres Park is a three-mile-long linear park, totaling 145 acres, that parallels the River Des Peres Drainage Channel and is located in the far southwest sector of the City of St. Louis. (See Figure 7-1.) The park is owned by the City of St. Louis, which has 105 parks providing some 3,000 acres of parkland for the 62-square-mile city. The park is served by a four-lane roadway, River Des Peres Boulevard, and by a paved, linear trail located to the west of River Des Peres Boulevard.

The park's northern boundary is Lansdowne Avenue, and its southern boundary is Morganford Road. The park is interrupted by two major arterial roadways: six-lane Chippewa Street (old US Route 66) and six-lane Gravois Avenue (State Highway 30). River Des Peres Boulevard and the trail extend on structure over Chippewa, and the roadway accesses the arterial with a grade-separated interchange.

The park includes a children's playground about one-half mile south of Chippewa and another children's playground, plus a baseball, softball, and two soccer fields, a functioning comfort station, parking, and a park maintenance building, all of which are located midway between Gravois and Morganford. (Three closed comfort stations lie north of Gravois.) In addition to specimen trees throughout the park, a limestone rock outcropping, probably artificially enhanced, is located about six-tenths of mile north of Gravois. While River Des Peres Boulevard may be said to serve a regional transportation purpose, River Des Peres Park is primarily a local neighborhood park for nearby residents.

The present park began to take shape in the early 1930s following the development of the River Des Peres Drainage Channel from 1924 through 1933. River Des Peres Boulevard was implemented by city ordinance in 1943 (with a separate legal boundary description). The linear trail was developed in the area north of Gravois in the 1980s. A trail extension south of Gravois is currently (fall 2004) nearing completion as an outgrowth of the 1998 River Des Peres Beautification Plan, and will include a pedestrian bridge over the River Des Peres Drainage Channel near Morganford.

Figure 7-1: River Des Peres Park and Drainage Channel

The River Des Peres Drainage Channel is a 270-foot-wide open-cut storm drainage channel located adjacent to the east side of the park, and extending well beyond both ends of the park. Its development involved a major reworking of the original River Des Peres stream channel; its legal boundary description was created by city ordinance in 1924. It includes two nine-foot-wide underground sanitary sewerage tunnels; and its side-slopes were paved with limestone rubble as Federal Emergency Relief Administration and Works Project Administration projects in the 1930s. The Metropolitan St. Louis Sewer District (MSD) took title to the drainage channel when the district was created in 1956. The American Society of Civil Engineers designated the River Des Peres drainage works a National Historic Civil Engineering Landmark on October 27, 1988 for the calculations, the large-scale trench dewatering methods, and the soil stabilization procedures employed to build it.

River Des Peres, or river of the fathers, is named for two Jesuit priests -- Gabriel Marest and Francois Pinet, who founded a mission about 1670 at the mouth of the river on the Mississippi for the Kaskaskia and Tamaroa Indians, as well as for the French settlers in nearby Cahokia, Illinois. The mission was abandoned by 1703, decades before the 1764 founding of St. Louis.

Land and Water Conservation funding was not used in River Des Peres Park, according to correspondence with the City of St. Louis Parks & Recreation Department.

Grant's Trail Description

Grant's Trail is a recreation path for bicyclists, pedestrians, and other users. It was created in 1997 and is still being improved. It is located on a former Union Pacific Railroad right-of-way, running through south St. Louis County from a point on Hoffmeister Street near I-55, south and west past the historic Ulysses S. Grant Farm. The trail runs past two other County parks: Union Park and Clydesdale Park. There are a number of natural areas adjacent to the trail. The total length of the trail is 8 miles, of which the easternmost 6 miles are currently paved. The trail is under a long-term lease to the St. Louis County parks department, which operates the trail.

As a former railroad right-of-way, the trail is crossed frequently by streets, highways, and other rail lines. There are both at-grade and grade-separated intersections with streets, with both I-55 and the BNSF Railway crossing over the bike trail on bridges.

While the trail property is owned by a private non-profit corporation, Trailnet, Inc., the long-term lease by the County brings this park under the Section 4(f) restrictions.

Potential use of parklands by alternatives

No-Build. The No-Build alternative would have no impact on either park.

TSM. The TSM alternative would have no direct impact on either park, and any change in bus frequency or routing that affects routes through the parks would not rise to the level of constructive use, as the impact is similar to that caused by existing traffic on the streets that run through or across the parks.

Blue alternatives. Because of the location of the Shrewsbury-Lansdowne I-44 station and tail tracks, any extension of MetroLink across Lansdowne Street will infringe on some City of St. Louis property on the south side of Lansdowne. The Blue alternatives will unavoidably take a very small amount (0.03 acres, or less than 2000 square feet) of City property that is adjacent to and associated with the City property that has been developed as parklands. The City property that would be incorporated into the right-of-way is not parkland; it is a paved driveway that is used for access to a house that would be also taken for the right-of-way. The City property was apparently once part of the street layout of an extension of Devonshire Street, cut off when the railroad was raised on an embankment.[4]
The noise and visual impact of the MetroLink extension, adjacent to the River Des Peres Park, are no different from, and no greater magnitude than the im-

[4] The improved part of Devonshire Street is outside the limits of the City of St. Louis, now part of Shrewsbury.

Figure 7-2: BNSF bridge over Grant's Trail near Green Park.

pacts of the railroad, street, and houses that are now at the edges of the park. Therefore, there is no constructive use of the parkland.

Section 4(f) regulations allow government agencies (such as the City of St. Louis) with responsibility to manage land for multiple purposes to treat different parts of their property separately. Therefore, the City can make a determination about the significance of the River Des Peres parkland (a 4(f) resource), without including the street layout used as a driveway (not a protected resource). The City property required for the right-of-way, therefore, is not part of the 4(f)-protected parklands.

The Blue-Butler Hill alternative crosses Grant's Trail just west of I-55, and just north of the proposed Green Park station. The BNSF Railway crosses Grant's Trail on a bridge at this point (see Figure 7-2), and the MetroLink extension would be on a parallel bridge, just east of the BNSF. As proposed, the MetroLink bridge would rest on two piers that would line up with the BNSF structure, both within the Grant's Trail property.

Purple alternative. The Purple alternative is designed to avoid or reduce the impact to residential areas and the BNSF right-of-way by moving the MetroLink extension farther east after it crosses Lansdowne Street. This takes the alignment into the River Des Peres park property, just west of the River Des Peres Boulevard from Lansdowne Street to Chippewa Street (Watson Road).

A total of 1.7 acres of parkland would be permanently incorporated into the right-of-way.

Orange alternatives. Each of the Orange alternatives would incorporate a sizable portion (8.8 acres) of the River Des Peres park into the right-of-way. The Orange alternatives run through or adjacent to park property along the drainage channel from Lansdowne Street to Gravois. From Lansdowne, the Orange alternatives would cross River Des Peres Boulevard, across park property, then run along the river (between the river and River Des Peres Boulevard), then cross the river at Gravois Road, avoiding Willmore Park on the northeast side of the river.

The Orange-Butler Hill alternative crosses Grant's Trail where the trail and Greenpark Road cross under I-55, between the proposed Reavis Barracks and Lindbergh stations. The MetroLink extension would be on a bridge parallel to I-55, over both Greenpark Road and the trail. The trail is already compromised at this point by the at-grade crossing of Greenpark Road. The bridge piers necessary to carry MetroLink over the trail could be located within the street layout, with no additional impact to the Section 4(f) protected parklands. (See Figure 7-3).

Figure 7-3: Grant's Trail passing under I-55 at Greenpark Road

7.2.2 Wildlife/Waterfowl Refuges

There are no publicly-owned wildlife or waterfowl refuges located close enough to any of the study alternatives to be impacted, so there is no use of any of these Section 4(f)-protected resources.

7.2.3 Historical and Archaeological Resources

In order to be protected as a significant historical resource under Section 4(f), a property must either be listed on the National Register of Historic Places (the Register), or be eligible for listing on the Register.

As described in Chapter 3, there are several historical sites in the study area that are listed on the Register. None of these listed sites is directly or indirectly affected adversely by any of the study alternatives.

To be eligible for listing on the Register, a candidate site must have certain characteristics. A listed property may be a building, a site, or a district (or combination of buildings and sites). It must be associated with an era, event, or person that is important in American history, or it must preserve important distinctive architectural or industrial design features that represent America's past. Properties must also be at least 50 years old.

It is not known at this time how many potentially eligible sites are located within the potential right-of-way of any study alternatives, or close enough to be adversely affected by them. This information will be developed as more detailed design work is done for the preferred alternative, which has not yet been selected. However, at least one property owner has suggested that his house – located on Germania Street, and potentially taken for the Gravois-Hampton station on the Orange alternatives – would be eligible for the Register because of its distinctive architectural design, dating from the 1940s. In addition, the River Des Peres Drainage Channel has received engineering awards that suggest it may be eligible for listing as a historical industrial design. The channel is also impacted by the Orange alternatives.

7.3 Alternatives and Mitigation

As indicated above, before any transportation project that uses Section 4(f) resources can be approved for federal funding, the U.S. Secretary of Transportation must find that there are no prudent and feasible alternatives that would avoid the resources, and that all possible planning has been done to minimize the harm to the protected property. No preferred alternative has been identified, so it is premature to make any such findings at this time. However, the ability of each alternative to receive such a finding is important to evaluating and designing the alternatives.

Both of the alternatives that go deep into the Metro South study area (Blue-Butler Hill and Orange Butler-Hill) cross the 4(f)-protected Grant's Trail. In fact, almost any alternative that extends into the southern part of the study area must cross the trail. The shorter alternatives (Purple, Blue-Watson, and Orange-Reavis-Barracks) do not extend far enough south to cross Grant's Trail, but also serve a much smaller service area. Thus while the impact to Grant's Trail by crossing it on a bridge is very small, the lost ridership and service benefits are very important in determining whether the project meets its basic Purpose and Need. This is evidence to support a finding by the Secretary of Transportation that the alternatives that avoid impacts to Grant's Trail are not prudent.

The impacts on the River Des Peres Park are a different matter. Here, the Orange alternatives have a significant impact on the park (the direct use of more than eight acres of parkland), while the Blue alternatives entirely avoid any use of significant parkland at River Des Peres. Thus, the selection of one of the Orange alternatives could be supported within the requirements of Section 4(f) only if the Blue alternatives are found to be infeasible or imprudent. Such a finding could be based on one or more of the following factors:

- The Blue alternatives require the use of BNSF right-of-way, which would require an agreement with BNSF on design and operation of the MetroLink extension. Past experience suggests that such an agreement may be impossible to achieve, if restrictions required by the railroad impose restrictions on MetroLink that would make it infeasible.
- The embankment and retaining wall along BNSF property (required to provide the physical separation from freight operations required by BNSF) creates a significant visual impact on residential neighbors and creates a barrier that results in some community disruption.
- The Blue alternatives do not serve important residential, particularly transit-dependent residential, neighborhoods in the City of St. Louis and in St. Louis County near I-55.

The planning done to date has incorporated efforts to minimize harm to Section 4(f) properties, including:

- elimination of preliminary alternatives that would have located the MetroLink extension within the Grant's Trail right-of-way, running parallel to the trail for a mile
- locating the Orange alternative alignments alongside the park property already used for the River Des Peres Boulevard, and crossing the river at locations selected to minimize parkland takings

- locating the crossings of Grant's Trail at points where the trail is already crossed by railroad or highway structures, and providing for a grade-separated (bridge) crossing to avoid further impacts to use of the trail

Additional measures may be included to minimize harm to 4(f) properties as the preferred alternative is carried through preliminary engineering.

8.0 SUPPLEMENTARY INFORMATION

This chapter includes a list of reference materials and documents, a list of the people responsible for the preparation of the DEIS, and a list of agencies and other parties who will receive a copy of the DEIS.

8.1 REFERENCES

Statutes and Regulations

Civil Rights Act of 1964, amended Title VI

Department of Transportation Act of 1966 (49 USC 303(f))

Endangered Species Act of 1973, as amended

Executive Orders 11988 (floodplain management), 11990 (protection of wetlands), and 12898 (environmental justice)

Federal Clean Air Act Amendments (CAAA) of 1990

Federal Clean Water Act

Federal Department of Transportation Act (49 USC 303), Section 4(f)

Land and Water Conservation Act, Section 6(f)

National Ambient Air Quality Standards

National Environmental Policy Act (NEPA), Title 40 of the United States Code, Sections 4321 through 4347

National Historic Preservation Act

Notice of Intent to prepare an EIS for the Metro South project, Federal Register, Vol. 68, page 37891 (June 25, 2003)

U.S. Environmental Protection Agency (EPA) Clean Air Act

Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended

Metro South Support Documents

Demand Projections: Framework for Consideration of the Potential for Private and Public Investment in Response to a South County Metro-Link Extension, Development Strategies (April 2003)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Existing Conditions Report (July 2003)

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Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Purpose and Need (July 2004)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Report on Preliminary Alternatives Development and Analysis (July 2004)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Preliminary Alternatives Operating Plan Concepts (February 2004)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Preliminary Alternatives Evaluation Methodology (March 2004)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Task VI Definition of Detailed Alternatives (February 2005)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Detailed Alternatives Evaluation Methodology Report (July 2004)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Cost Methodology and Estimates (January 2005)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Social, Economic and Environmental Impacts (February 2005)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Noise and Vibration Analysis (February 2005)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Transportation Impact Assessment (January 2005)

Metro South MetroLink Extension Alternatives Analysis/Draft Environmental Impact Statement: Summary Evaluation of Alternatives (February 2005)

Data Sources

Affton Community Plan (June 2002)

Affton-Gravois Business Corridor Study (October 1998)

Code of Federal Regulations, Title 23, Part 771

Council on Environmental Quality (CEQ) Code of Federal Regulations, Title 40, Parts 1500 through 1508

East-West Gateway Council of Governments (EWGCOG), Cross-County Corridor MTIA (1994-1997)

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East-West Gateway Council of Governments (EWGCOG), *Legacy 2025: The Transportation Plan for the Gateway Region* (March 2002)

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East-West Gateway Council of Governments (EWGCOG), Proposed Transportation Improvement Program (2004-2008)

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Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), St. Louis County Panels 304, 312, 315, 316, 405 and City of St. Louis Panel 40

Metro, *Cross-County Preliminary Feeder Bus Plan* (2001)

Missouri Department of Transportation (MoDOT), *I-55/River Des Peres Study* (2003)

Missouri Department of Transportation (MoDOT), *Shrewsbury Planning Study* (2003)

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Oakville Community Area Study (April 1998)

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St. Louis County Assessor's Database

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U.S. Department of the Interior, National Register of Historic Places

U.S. Federal Transit Administration (FTA) Guidance Manual Transit Noise and Vibration Impact Assessment (FTA Report DOT-T-95-16, April 1995)

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Parsons Brinckerhoff Quade & Douglas, J. Zupan, R. Cervero, *TCRP Report 16: Transit and Urban Form*, Washington D.C., Transportation Research Board, National Research Council (1996)

Robert J. Shapiro, "Conserving Energy and Preserving the Environment: The Role of Public Transportation," (2002), as reported by the American Public Transportation Association at www.apta.com/research/stats/energy/emissions.cfm

8.2 List of Preparers and Reviewers

The following individuals were directly involved in the preparation and review of the DEIS in the capacity indicated.

Name/Title	Education/Experience	Responsibility
Federal Transit Administration		
Mark Bechtel *Community Planner*	▪ BS Secondary Education and Environmental Sciences ▪ MS City and Regional Planning ▪ 27 years of experience	Review
Joan Roeseler, AICP *Director, Planning and Program Development* *FTA Region VII* *Kansas City, Missouri*	▪ BS Business Administration ▪ MS Regional and Community Planning ▪ 28 years of experience	Review
East-West Gateway Council of Governments		
Donna Day *Division Manager*	▪ BEng, Civil Engineering ▪ MS, Physical Geography ▪ 26 years of experience	Project Manager Coordination/Review Public Involvement
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Missouri Department of Transportation		
Jeanne Olubogun *Transportation Planning Coordinator*	▪ BS, Civil Engineering ▪ 17 years of experience	Coordination/Review Public Involvement
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Metro		
Bob Innis *Transit System Development Planner*	▪ BA, Government ▪ 10 years of experience	Coordination/Review Public Involvement
Gary Smith *Transit System Development Planner*	▪ BS, Urban and Regional Planning ▪ 26 years of experience	Coordination/Review Public Involvement

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Kenneth Kinney *Senior Project Manager*	▪ BA, Economics ▪ MA, International Relations ▪ 28 years of experience	Project Manager-Land Use
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Mark Grossenbacher, PE *Deputy Project Manager*	▪ BS, Civil Engineering ▪ 20 years of experience	Coordination/Review Public Involvement
Ramanbir Bhatia *Community Planner*	▪ MA, Urban Planning ▪ BA, Planning ▪ 2 years of experience	Socio-Economic Analysis/Projections
Brian Comer, AICP *Senior Planner*	▪ BA, Political Science ▪ MS, Community and Regional Planning ▪ 7 years of experience	GIS Mapping/Analysis
Don Hilderbrandt, FASLA *Urban Design Principal*	▪ Master of Landscape Architecture ▪ Bachelor of Landscape Architecture ▪ 43years of experience	Land Use/Urban Design Station Area Plans
David Holden *Community Planning Principal*	▪ Master Landscape Architecture ▪ Diploma Landscape Design ▪ PhD History ▪ 28 years of experience	Land Use Station Area Plans Public Involvement
Gary Perkins, ASLA *Senior Landscape Architect*	▪ BS, Agriculture ▪ MS, Landscape Architecture ▪ 21 years of experience	Station Area Plans Public Involvement
Ben Sussman *Community Planner*	▪ MCRP, Urban and Regional Planning ▪ BS, Science, Technology and Society ▪ 6 years of experience	GIS Mapping/Socio-Economic Analysis

Name/Title	Education/Experience	Responsibility
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Jacobs Civil Inc.		
Chris Barber, CEng. MICE *Senior Project Manager*	▪ BS, Civil Engineering ▪ 29 years of experience	Project Manager Public Involvement
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Molly Salmieri *Transportation Planner*	▪ BS, Community and Regional Planning ▪ 5 years of experience	GIS Mapping/Analysis
Don Smith *Senior Project Manager, Senior Environmental Planner*	▪ BS, Biology ▪ MS, Biology ▪ 31 years of experience	DEIS Preparation

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ABNA Engineering, Inc.		
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Development Strategies, Inc.		
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Linda Moen, PE *President*	▪ BS, Civil Engineering ▪ 20 years of experience	Roadway Improvements
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Maggie Campbell Jackson	▪ MBA ▪ 24 years of experience	Public Involvement
IT Spatial		
Chris Nunno *Program Manager/Professional Services Manager*	▪ BS, Electrical Engineering ▪ MS, Electrical Engineering ▪ 17 years of experience	3-D Corridor Animation
Kwame Building Group, Inc.		
Ed Jameson *Estimator*	▪ BS, Construction ▪ 32 years of experience	Cost Estimating
Manuel Padron & Associates		
Chris Adkins *Associate*	▪ BA, Public Administration ▪ 13 years of experience	Ridership Forecast
Bruce Emory *Vice President*	▪ BS, Civil Engineering ▪ MS, Civil Engineering ▪ 35 years of experience	Bus Operating Plan Operating Costs
Parsons		
Booth Babcock, AICP *Project Manager* *(until November 2004)*	▪ BA, Sociology ▪ MA, Geography ▪ 7 years of experience	TSM Alternative Build Alternative Operations Plan
Ken Briers *Railroad Operations Analyst*	▪ BS, Transportation ▪ 35 years of experience	Operations Plan
Harvey Flechner *Operations Manager*	▪ BSCE, MCRP ▪ 37 years of experience	Operations Plan
Winn Frank *Senior Project Manager*	▪ BSBA, Transportation MBA, Marketing ▪ 39 years of experience	Operations Plan
Robert Rooney *Railroad Operations Analyst*	▪ BS, Management ▪ 30 years of experience	Operations Plan
Richard Smith, PE *Transportation Engineer* *(until September 2004)*	▪ BS, Civil Engineering ▪ MS, Civil Engineering ▪ 8 years of experience	TSM

Name/Title	Education/Experience	Responsibility
Carl Wood *Principal Rail Operations and Facilities Planner*	▪ BS, Russian and Linguistics ▪ MBA, Transportation and Physical Distribution ▪ 30 years of experience	Operations Plan
Sarah J. Siwek & Associates		
Don Camph *Senior Vice President*	▪ BSEE, Massachusetts Institute of Technology ▪ M. Public Policy, University of Michigan ▪ 30 years of experience	Financial Analysis
Shannon & Wilson, Inc.		
James Dutt *Environmental Scientist*	▪ BA, Geology ▪ BS, Environmental Science ▪ 5 years of experience	Natural Resources
Russell W. Schwab, R.G. *Environmental Scientist*	▪ BS, Geology ▪ MS, Environmental Management ▪ 16 years of experience	Natural Resources
Vector Communications Corporation		
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Atia Thurman *Consultant*	▪ BSW, Bachelor of Social Work ▪ MSW, Master of Social Work ▪ 4 years of experience	Public Involvement

8.3 DISTRIBUTION LIST

The following Federal, State and local officials, agencies, community groups/organizations, and individuals have been sent a copy of this DEIS.

Federal Agencies

Advisory Council on Historic Preservation
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Council on Environmental Quality
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Federal Emergency Management Agency
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General Services Administration, Public Buildings Service
Region 6
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U.S. Department of Agriculture
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U.S. Department of Commerce
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U.S. Department of Energy
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U.S. Department of Health & Human Services
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U.S. Department of Housing and Urban Development
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Missouri Federal Assistance Clearinghouse
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Local Agencies

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City Hall
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Mr. Larry Salci
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7826 Wimbledon Drive
Marlborough, MO 63119-5405

Mr. Bert Gates, Mayor
City of Shrewsbury
5200 Shrewsbury Avenue
St. Louis, MO 63119-4398

Elected Officials

Governor Matt Blunt
State of Missouri
P.O. Box 809-A
Jefferson City, MO 65102

Senator Christopher Bond
United States Senate
274 Russell Office Building
Washington, D.C. 20510

Senator James Talent
United States Senate
493 Russell Office Building
Washington, D.C. 20510

Representative Russ Carnahan
United States House of Representatives, 3rd District
1232 Longworth House Office Building
Washington, DC 20515

Senator Harry Kennedy
State of Missouri, District 1
State Capitol Building
Room 226
Jefferson City, MO 65101

Senator Michael Gibbons
State of Missouri, District 15
State Capitol Building
Room 221
Jefferson City, MO 65101

Rep. Fred Kratky
State of Missouri, District 65
Missouri House of Representatives
201 West Capitol Avenue, Room 101C
Jefferson City, MO 65101

Rep. Michael Vogt
State of Missouri, District 66
Missouri House of Representatives
201 West Capitol Avenue, Room 109E
Jefferson City, MO 65101

Rep. Jim Lembke
State of Missouri, District 85
Missouri House of Representatives
201 West Capitol Avenue, Room 110A
Jefferson City, MO 65101

Rep. Kathlyn Fares
State of Missouri, District 91
Missouri House of Representatives
201 West Capitol Avenue, Room 207B
Jefferson City, MO 65101

Rep. Patricia Yaeger
State of Missouri, District 96
Missouri House of Representatives
201 West Capitol Avenue, Room 116A1
Jefferson City, MO 65101

Rep. Walt Bivins
State of Missouri, District 97
Missouri House of Representatives
201 West Capitol Avenue, Room 408B
Jefferson City, MO 65101

Rep. Thomas Villa
State of Missouri, District 108
Missouri House of Representatives
201 West Capitol Avenue, Room 402
Jefferson City, MO 65101

Councilman Kurt Odenwald
St. Louis County Council, District 5
41 South Central Avenue
Clayton, MO 63105

Councilman John Campisi
St. Louis County Council, District 6
41 South Central Avenue
Clayton, MO 63105

Alderman Matt Villa
City of St. Louis, Ward 11
City Hall, Room 230
1200 Market Street
St. Louis, MO 63103

Alderman Fred Heitert
City of St. Louis, Ward 12
City Hall, Room 230
1200 Market Street
St. Louis, MO 63103

Alderwoman Donna Baringer
City of St. Louis, Ward 16
City Hall, Room 230
1200 Market Street
St. Louis, MO 63103

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St. Louis, MO 63129

Tesson Ferry Branch
9920 Lin-Ferry Drive
(Lindbergh and Tesson Ferry)
St. Louis, MO 63123

Weber Road
4444 Weber Road
(between Gravois and Morganford-Union)
St. Louis, MO 63123

Other locations:

Affton Chamber of Commerce
10203 Gravois Road
Affton, MO 63123
314-849-6499

South County Chamber of Commerce
6921 S. Lindbergh (Holiday Inn)
St. Louis, MO 63125
314-894-6800

Lemay Chamber of Commerce
744 Lemay Ferry Road
St. Louis, MO 63125
314-631-2796

Affton White-Rodgers Community Center
9801 Mackenzie Road
Affton, MO 63123
314-638-2100