

Preparation of a Phoenix Metropolitan Area Regional Transportation Plan Using Performance-Based Planning

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ABSTRACT

HDR Engineering and DKS Associates worked with the Maricopa Association of Governments to help prepare an update of the Phoenix Metropolitan Area's Regional Transportation Plan (RTP). The team evaluated the transportation needs of the region for the next twenty years and helped developed a plan that identifies the multimodal investments necessary to maintain mobility for the region's residents and visitors. The RTP resulted in a project list that will be used for a possible extension of the County's ½ cent sales tax for transportation, which is due to expire in 2005. The proposed extension will be considered by the voters in Maricopa County in November 2004. Because the population of the region is expected to roughly double during the next twenty years, the challenges presented by the planning process were significant. The team worked with a Transportation Policy Committee composed of elected officials, business leaders, and other community representatives to define and evaluate a variety of different approaches to meeting the long-term mobility needs of the region. Three different test scenarios were evaluated: a freeway emphasis; an emphasis on major arterials; and an emphasis on transit. The results of the analysis helped guide the development of a hybrid alternative that drew the best from each of the test scenarios to meet the needs of each part of the region. The development and evaluation of alternatives met a state requirement that the plan be developed using a performance-based planning process.

OVERVIEW

The Maricopa Association of Governments' (MAG) Regional Transportation Plan (RTP) is a comprehensive, performance based, multi-modal and coordinated regional plan, covering the period through Fiscal Year (FY) 2026. The RTP will provide a blueprint for future transportation investments in the region for the next several decades. The MAG Planning Area includes all of Maricopa County, Arizona (See Figure 1). The MAG Region is geographically situated in the south-central interior region of Arizona, and encompasses an area of 9,223 square miles. The MAG Region contains the City of Phoenix, 24 other incorporated cities and towns, five Native American communities and a large area of unincorporated land. The region is located in the Sonoran Desert with elevations generally ranging from 500 to 2,500 feet above sea level. In 2002, Maricopa County contained approximately 60 percent of the population in Arizona, as well as eight of the nine cities in Arizona with populations greater than 100,000 people.

On October 8, 1985, the voters of Maricopa County approved Proposition 300 to establish a one-half cent sales tax for construction of controlled-access highways. The one-half cent tax was approved for a period of 20 years and ends on December 31, 2005. The tax has been instrumental in the development of the regional freeway network, but many transportation needs remain. One of MAG's objectives in developing a new RTP was to also create a project list that could be used in a renewal of the sales tax.

Work to prepare the RTP began in December of 2000, representing the most extensive transportation plan update by MAG since the mid-1980s. The planning process established goals, objectives and performance measures; extensively evaluated the long-range population trends of the region; analyzed economic and land use development patterns; analyzed the current condition of the regional transportation system; assessed transportation needs over the next 20 years; and identified transportation investments that will best meet the present and future needs of the region. An extensive public involvement and outreach program was pursued throughout the planning effort.

The RTP was developed under the direction of the Transportation Policy Committee (TPC). The TPC is a public/private partnership established by MAG and charged with finding solutions to the region's transportation challenges. The Committee consisted of 23 members, including a cross-section of MAG member agencies, community business representatives, and representatives from transit, freight, the Citizens Transportation Oversight Committee, and ADOT.

For the past several decades, the MAG Region has been one of the fastest-growing metropolitan areas in the United States, among those with populations of more than one million people. In April of 2000, Maricopa County had a resident population of 3,072,149. This was a population growth of approximately 44 percent, or 950,000 people in the decade from 1990 to 2000.

MAG Interim Socioeconomic Projections indicate that this high growth rate is expected to continue. By 2030, Maricopa County is projected to double in population over the 2000 base population, with an anticipated total of 6.24 million people. This means that the region will

experience a growth of approximately one million people during each decade. By 2025, Maricopa County is projected to nearly double its reported 2000 employment total. This means that employment within the region will grow by approximately 575,000 jobs each decade.

The transportation planning process benefited greatly by incorporating broad-based public input, which was received as the result of an extensive public involvement process that included an aggressive public outreach effort. During the development of the RTP, MAG talked to thousands of people in an effort to identify public issues and concerns regarding future transportation needs. As part of this process, MAG held 150 public input opportunities, 173 stakeholder opportunities, and 117 agency meetings to solicit input from the public, community groups, business associations, transportation stakeholders, elected and appointed leaders, city planners, municipal technical staffs, transportation councils, and the region's Native American Communities.

PLAN DEVELOPMENT

The RTP was developed through a performance-based process that followed a specific methodology and evaluated the Plan relative to a range of performance measures. The process that was applied in the preparation of the RTP utilized both performance-based planning and the application of performance measures in the evaluation of modeling scenarios.

Performance-Based Planning

As indicated in Figure 2, the methodology for developing the RTP included the following components: 1) Goals and Objectives, 2) Needs Assessment, 3) Evaluation Methodologies, 4) Scenario Evaluation, 5) Scenario Refinement, and 6) Phasing and Funding.

Goals and Objectives

A number of goals and objectives were developed as part of the RTP planning process. These goals and objectives provided the structure for developing options and evaluating scenarios. Performance measures were also identified and linked with specific goals and objectives, so that the evaluation process reflected key regional issues and concerns. The four primary goals developed for the RTP included the following: 1) System Preservation and Safety, 2) Access and Mobility, 3) Sustaining the Environment, and 4) Accountability and Planning. As illustrated in Table 1, each of the four goal areas was given more definition with one or more specific objectives.

Needs Assessment

A series of background studies were conducted for the RTP, including area transportation studies, corridor assessments, specific modal analyses, and a number of other regional planning studies. Transportation needs and deficiencies identified in these studies were assessed as part of the RTP process. In addition, projects identified by MAG member agencies have been tabulated and considered in the assessment of transportation needs in the region.

Evaluation Methodologies

The methodology for assessing system performance and evaluating scenarios utilized a set of twenty-nine performance measures. As illustrated in Table 1, the performance measures were developed to reflect specific goals and objectives. During the "Alternatives Stage" of the RTP process, the performance measures were used to provide information on the advantages and

disadvantages of different approaches for meeting future travel needs, and to assess the relative strengths and weaknesses of the modeling scenarios. This was done within the overall context of regional transportation goals and objectives. The results of this assessment provided input into the RTP “Final Draft Stage.”

Scenario Evaluation

The RTP process included the development of transportation system modeling scenarios, which were evaluated by using performance measures. Three scenarios were used each one placing an emphasis on a different transportation mode:

- freeways,
- streets and
- transit.

A core set of projects was included in all three of the scenarios. The scenarios were structured to reflect consistent levels of future funding and project eligibility. The primary goal was to provide a basis for analyzing the performance of potential plan components.

Scenario Refinement

The overall analysis of the scenarios provided insights into the tradeoffs associated with different transportation investment strategies, as well as the performance of system components. Using the results of the evaluations, a hybrid scenario was defined. After further modeling and evaluation, the hybrid resulted in the “Final Draft Stage” scenario, providing the basis for the RTP.

Phasing and Funding

The “Final Draft Stage” not only looked at how the Plan would be funded, but also identified the phasing of projects included in the Plan. Project phasing priorities were based on revenue streams and other factors such as traffic volumes, congestion, system continuity, and project readiness.

Costs and Revenue Estimates

As part of the planning process, overall revenue and cost estimates considered to be reasonable for planning purposes were prepared. In addition, bonding strategies, which can have a major effect on the phasing of plan development, were assumed. To recognize the uncertainties associated with projecting costs and revenues over a 20-year period, contingency factors were applied. It is important to note, however, that cost and revenue uncertainties can only be resolved once detailed engineering studies are completed and economic conditions are revealed over time. Periodic adjustments and updating of the RTP will be needed to respond to changing conditions and new information.

Title VI and Environmental Justice

MAG has been committed to ensuring that communities of concern as defined and included in the Title VI Act of 1964, Executive Order 12898 addressing environmental justice, and other federal directives have been specifically considered during the transportation planning and programming process. These laws ensure that such populations benefit equally from the transportation system without shouldering a disproportionate share of its burdens. Communities of concern include minority populations, low-income populations, aged populations, mobility disability populations, and female head of household populations.

Each of the three major components of the RTP (freeways/highways, transit and arterial roads) were analyzed separately in the environmental justice analysis to assess the distribution of benefits of projects included within the RTP. The analysis of Plan improvements showed that communities of concern benefited from the RTP at about the same level, or in some cases at a higher level, than the census tracts not identified as communities of concern.

PLAN ELEMENTS

Freeways and Highways

The RTP includes a component for freeways and highways in the MAG Region through Fiscal Year (FY) 2026. In total, \$9.0 billion, or 57.3 percent, of the regional funding identified in the RTP is specifically allocated to projects in this element.

New Freeway Corridors: Funding for new freeway and highway corridors in the Plan totals \$3.7 billion. These new corridors will provide approximately 490 additional new lane miles to the network.

Freeway/Highway Improvements: Funding for widening and other improvements to the existing regional freeway/highway network totals an additional \$4.4 billion. These improvements include an additional 530 lane-miles of general purpose lanes and 300 lane-miles of HOV lanes, covering essentially the entire existing system, including the loop elements now under construction. A number of bottleneck segments on the freeway system are also addressed in the RTP. Improvements to Grand Avenue and other highways are also funded. In addition to new travel lanes, a series of new interchanges with arterial streets on existing freeways is included within the RTP. Also, improvements at freeway-to-freeway interchanges to provide direct connections between HOV lanes have been included. Together, these improvements total \$396 million.

Maintenance and Operations: The RTP also provides funding for maintenance on the freeway system, directed at litter pickup, landscaping, freeway management functions and noise mitigation. Together these components total \$515 million.

Streets

The RTP includes a component for major arterial streets in the MAG Region through Fiscal Year (FY) 2026. In total, \$1.5 billion, or 9.3 percent, of the regional funding identified in the RTP is allocated to projects in this element. While MAG is responsible for developing the RTP, local jurisdictions are primarily responsible for design, right-of-way acquisition, and construction and maintenance of arterial facilities as identified in the RTP.

The RTP provides regional funding for widening existing streets, improving intersections, and constructing new arterial segments. The continued implementation of Intelligent Transportation Systems (ITS) and dust control measures (for air quality purposes) are also included and funded. Operations and maintenance, which are funded locally, are also part of the RTP.

A total of \$1.5 billion from regional revenue sources is allocated to the arterial network in the

Plan for major capacity improvements and new connections, new/widened arterials, intersection improvements, and ITS.

Major Capacity Improvements and New Connections: The continuity of the regional arterial street network is vital to efficient travel patterns. Major capacity enhancements in certain areas also make connectivity options more viable.

New/Widened Arterials: As growth extends into new areas, widening and extension of the basic mile arterial street network will be needed in order to keep up with growing traffic volumes.

Intersection Improvements: Congestion on the arterial street network is often caused by inadequate intersection capacity. The Plan calls for a number of intersection improvements, which enhance traffic flow and reduce congestion.

Intelligent Transportation System (ITS): The Plan allocates funding for improvements as identified in the regional ITS Plan.

Dust Control Measures: The Plan incorporates funding for measures to reduce PM-10 emissions generated by vehicle travel, including street sweepers and paving.

Transit

The RTP provides for a range of transit facilities and services throughout the region. In total, \$5.0 billion, or 31.7 percent of the regional funding identified in the RTP is allocated to projects in this element. The transit sub-modes include: 1) regional bus, 2) high capacity transit, and 3) other transit.

The RTP calls for a full range of transit services in the region. A regional bus grid is funded, including operating costs, to ensure that reliable service is available on a continuing basis. In addition, light rail corridors are constructed to provide a high-capacity backbone for the transit network. Other transit services are included to provide a full range of options, such as paratransit and rural transit service.

Regional Bus: Regional transit services include both arterial grid and express type services that are designed to provide regional connections. Routes are designed to connect activity centers, transportation nodes, or residential areas across jurisdictional boundaries. Regional bus service consists of three categories of service: Supergrid routes, which are arterial grid routes that provide a regional connection function; Arterial Bus Rapid Transit (BRT) Routes, which operate as overlays on corridors served by local fixed route service, but provide higher speed services by operating with limited stops; and Freeway BRT Routes, which use existing and proposed high occupancy vehicle (HOV) facilities to connect remote park-and-ride lots with major activity centers, including core downtown areas.

High Capacity Transit: The RTP includes a 57.5-mile Light Rail Transit (LRT) system, which incorporates the 20-mile minimum-operating segment (MOS) as designated in the Central Phoenix/East Valley Major Investment Study (MIS); a five-mile extension to Metrocenter; a five-mile extension to downtown Glendale; an 11-mile extension along I-10 west to 79th Avenue; a 12-mile extension to Paradise Valley Mall; a two-mile extension south of the MOS on Rural

Road to Southern Avenue; and a 2.7-mile extension from the east terminus of the MOS to Mesa Drive. The technology on the latter segment has not been determined. The RTP also provides for the continued investigation of commuter rail options for the region.

Other Transit Services: Other transit services provided in the RTP include rural/non-fixed route transit, commuter vanpools, and paratransit transportation.

Other Transportation Modes and Programs

The RTP includes a full range of transportation modes and transportation functions. In addition to roadways and transit, the Plan covers needs that address airport facilities, freight, bicycle and pedestrian travel, and special transportation functions. Operational aspects of the transportation system are also addressed in the areas of demand management, system management and safety.

CONCLUSIONS

In the development of an update to the Regional Transportation Plan for the Phoenix Metropolitan Area, the Maricopa Association of Governments and a team of consultants used an innovative approach to examining alternatives and reaching a regional consensus on a Plan. MAG led a formal process in which three distinctly different Plan scenarios were modeled and analyzed and compared to a baseline future-year condition that included only existing and committed projects. Although each of the scenarios included an identical core set of projects, the additional projects in each gave the scenarios a different modal orientation: one emphasized freeway expansion, one emphasized street expansion and the third emphasized transit expansion.

The analysis of the modeling scenarios was based on a set of twenty-nine performance measures designed to reflect how the scenarios would do in meeting four broad goals and eleven specific objectives. The goals, objectives, performance measures, and alternatives were all developed in a process that involved the MAG Board, a Transportation Policy Committee (TPC), numerous workshops with technical staff and significant opportunities for public input. The analysis of the baseline condition and the three modeling scenarios allowed the TPC and MAG to formulate a hybrid alternative that combined the best elements from each of the alternatives.

The use of the three modeling scenarios allowed MAG and the TPC to consider alternative means of addressing the mobility challenges of the future without having to demonstrate a commitment to one approach from the beginning. The process allowed for information about the relative performance potential of each scenario and of individual projects before a commitment to draft set of projects had to be made. The result was a Plan that provided excellent overall performance while also providing a balance among modes, among parts of the region and without discrimination against any disadvantaged populations. Because of the way that the Plan was developed, it not only has broad regional support, it also satisfies a state mandate that the Plan be developed using a performance-based planning process.

Source: Majority of text extracted from MAG Regional Transportation Plan – Executive Summary, November 25, 2003.

FIGURE 1 MAG REGION

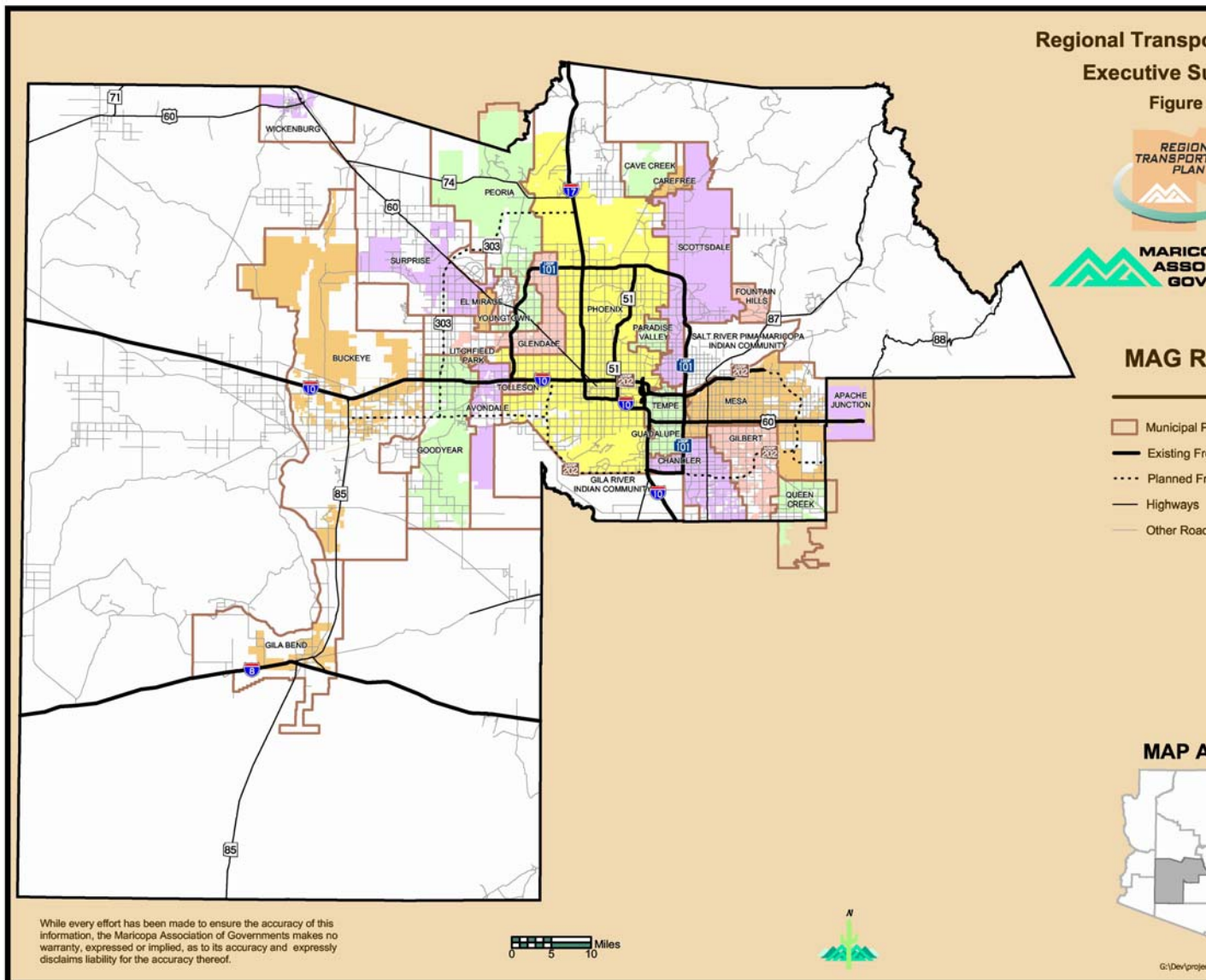


FIGURE 2 PLAN DEVELOPMENT PROCESS

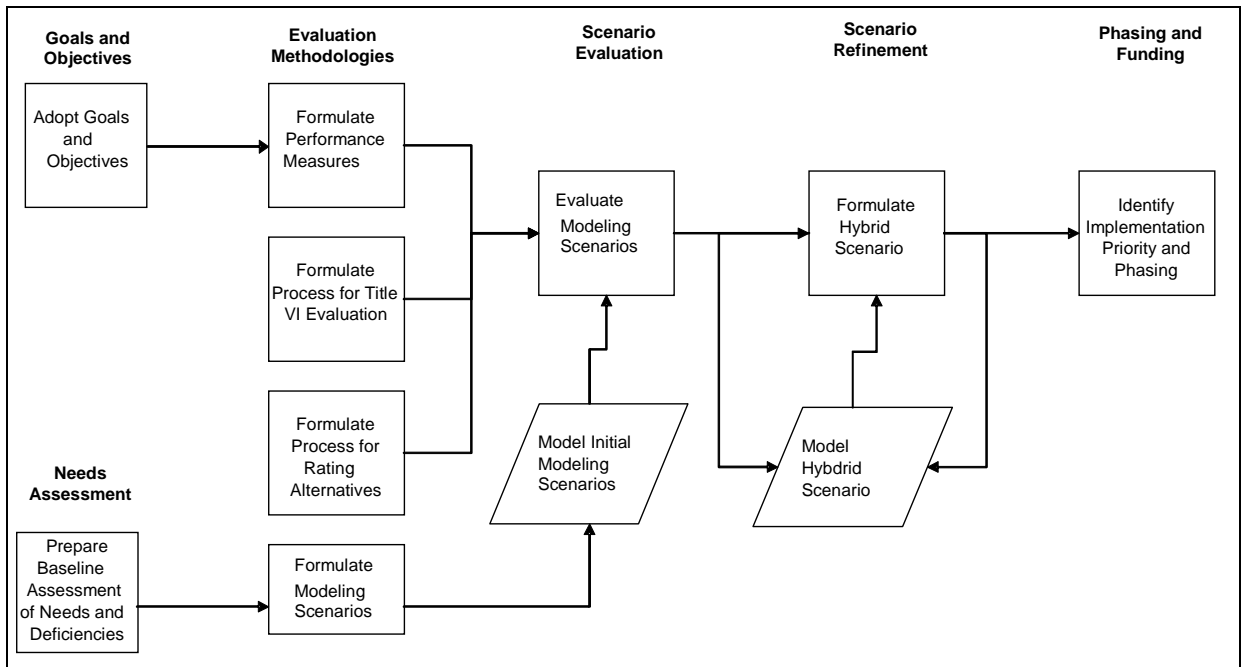


TABLE 1 EVALUATION PERFORMANCE MEASURES

Objective	Performance Measure
Goal 1: System Preservation and Safety	
<p>1A: Provide for the continuing preservation and maintenance needs of transportation facilities and services in the region, eliminating maintenance backlogs.</p> <p>1B: Provide a safe and secure environment for the traveling public, addressing roadway hazards, pedestrian and bicycle safety, and transit security.</p>	<p>Percent of freeway maintenance and preservation needs funded</p> <p>Number of Predicted Total Annual Accidents by Facility Type</p> <p>Predicted Average Annual Accident Rate by Facility Type</p>
Goal 2: Access and Mobility	
<p>2A: Maintain an acceptable and reliable level of service on transportation and mobility systems serving the region, taking into account performance by mode and facility type.</p>	<p>PM peak period Travel time between selected origins and destinations</p> <p>PM Peak period delay per lane mile by Facility Type</p> <p>PM Peak period delay by facility type</p> <p>Average PM Peak period speed by facility type and geographic location</p> <p>Number of major intersections at specific level of service during PM peak period/total number of intersections</p> <p>Lane Miles of freeways with level of service "E" or worse during PM peak period/Total number of lane miles</p> <p>Lane Miles with level of service "F" or worse during PM peak period</p>
<p>2B: Provide residents of the region with access to jobs, shopping, educational, cultural, and recreational opportunities and provide employers with reasonable access to the workforce in the region.</p>	<p>Percentage of persons within 30 and 60 minutes travel time of employment by auto and transit mode</p>
<p>2C: Maintain a reasonable and reliable travel time for moving freight into, through and within the region, as well as provide high-quality access between intercity freight transportation corridors and freight terminal locations, including intermodal facilities for air, rail and truck cargo</p>	<p>Average daily truck delay</p>
<p>2D: Provide the people of the region with transportation modal options necessary to carry out their essential daily activities and support equitable access to the region's opportunities</p>	<p>Jobs within one-quarter mile distance of transit service</p> <p>Percentage of major arterial streets that have bike lanes</p> <p>Percentage of regional connectors funded as part of the number of miles of off-street bike/pedestrian system plan</p>
<p>2E: Address the needs of the elderly and other population groups that may have special transportation needs, such as non-drivers or those with disabilities</p>	<p>Percent of transit dependent population served</p>
Goal 3: Sustaining The Environment	
<p>3A: Identify and encourage implementation of mitigation measures that will reduce noise, visual and traffic impacts of transportation projects on existing neighborhoods</p>	<p>Per Capita VMT by facility type and mode</p> <p>PM Peak Person Hours of Travel per capita</p> <p>Transit PHT - PM Peak - per capita</p> <p>Per Capita Transit PMT - PM Peak - Daily</p> <p>Total transit ridership</p> <p>Transit Percent of Total Trips</p>
<p>3B: Encourage programs and land use planning that advance efficient trip-making patterns in the region</p> <p>3C: Make transportation decisions that are compatible with air quality conformity and water quality standards, the sustainable preservation of key regional ecosystems and desired lifestyles</p>	<p>Households within one-quarter mile of transit</p> <p>Transit share of travel (by transit sub-mode).</p> <p>Households within five miles of park-and-ride lots or major transit centers</p> <p>Amount of pollutant emissions by type (NAQS).</p>
Goal 4: Accountability and Planning	
<p>4A: Make transportation investment decisions that use public resources effectively and efficiently, using performance-based planning</p>	<p>Travel time benefits of transportation investments compared to the public costs</p>