

Appendix D Policy Analysis and Evaluation Criteria Report



TRANSPORTATION 2040

February 12, 2010

Policy Analysis and Evaluation Criteria Report

Integrated Analysis for Developing a Preferred Transportation Alternative

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1. SUMMARY

1.1 Overview

The Puget Sound Regional Council (PSRC) is updating the region's long-range transportation plan, **Transportation 2040**. The update involves a formal analysis of a range of plan alternatives, followed by a deliberative process that develops and selects a preferred alternative, which then becomes a defining element of the updated plan. This report contains the alternative analysis, which integrates quantitative analysis (land use and travel modeling) with qualitative assessment (policy analysis). VISION 2040, the region's growth strategy, is the organizing framework for the evaluation; its goals, objectives, and policies have guided the development of evaluation criteria and the organization of policy analysis.

The purpose of this integrated analysis report (analysis of VISION 2040 policy and transportation evaluation criteria) is to present evaluative information regarding the alternatives studied in the central Puget Sound Regional Transportation Plan (Transportation 2040) and Environmental Impact Statement (EIS). The ultimate purpose of the evaluation is to inform PSRC's development of a preferred transportation alternative and further development of a draft transportation plan that becomes the detailed transportation element of the region's growth, transportation, and economic development strategy, VISION 2040. Eventually, the evaluation criteria contained in this report may also be used to (1) help evaluate approaches for the federal congestion management process, (2) provide a consistent framework for refining approaches to prioritizing investments within the regional plan, and (3) provide some guidance to the Transportation Improvement Program (TIP) programming decisions.

The policy analysis and criteria include both quantitative and qualitative measures. The criteria are primarily the quantitative assessments that relate to a series of goals set forth in VISION 2040. In the absence of a comprehensive weighting of the measures, judgment will be key to the development of a preferred alternative.

The organization of the report is as follows. This first section provides a general overview of the evaluation approach and summarizes results. This is followed by a detailed assessment of the plan alternatives against the VISION 2040 multicounty planning policies. The report presents the full results of applying the evaluation criteria.

In addition to this integrated evaluation report, PSRC is conducting an environmental review under the State Environmental Protection Act (SEPA). While much of the information in this report has aided in that analysis, the SEPA review will serve other purposes as well (such as identification of specific potential environmental impacts and appropriate avoidance and mitigation measures) and is not the subject of this report.

1.2 VISION 2040 and the Evaluation Framework

VISION 2040 provides the regional policy framework that the transportation plan should help to implement. Multicounty planning policies adopted in VISION 2040 provide guidance, commitments, targets, and additional direction applicable to the development of the region's transportation system. As the primary policy statements for implementing the Regional Growth Strategy, the multicounty planning policies have been designed to support the concentration of growth within the region's designated urban growth area and to limit development in resource and rural areas. The multicounty planning policies provide an integrated framework for addressing the environment, development patterns, housing, economic development, transportation, and other public services and facilities. Transportation alternatives were initially screened and then fully analyzed for the degree to which they support the overarching goals of the six major multicounty planning policy sections. VISION 2040 policies have been further organized into policy focus areas to streamline the analysis of transportation alternatives. This process and the policy focus areas are described in greater detail in Section 2 of this report.

1.3 Transportation Objectives and Measures

PSRC, through the plan update scoping process, has identified six overarching objectives that should be advanced by the preferred transportation alternative.

To assess transportation alternatives against the objectives and VISION 2040 policy focus areas, this report outlines specific measures that will aid the comparison of alternatives to each other and to a common baseline. These measures fall under the following seven criteria categories:

- Improve the mobility of people and goods in the central Puget Sound region.
- Create an efficient land use pattern for the provision of infrastructure, facilities, and services.
- Promote economic prosperity.
- Protect the natural environment.
- Promote an overall high quality of life.
- Distribute transportation benefits and costs equitably.

- Mobility
- Finance
- Growth Management (the objectives of the Regional Growth Strategy)
- Economic Prosperity (the objectives of the Regional Economic Strategy)
- Environmental Stewardship
- Quality of Life
- Equity

1.4 Advisory Input and Involvement

The policies contained in VISION 2040 are adopted public policy for the region, and the evaluation process for analyzing transportation plan alternatives follows from this adopted public policy. The integrated quantitative measures of the alternative's effectiveness—the evaluation criteria—also have been framed by VISION 2040 policy. Early in the development of the evaluation criteria, numerous technical and policy committees in the region were identified as instrumental in providing feedback on the sufficiency of the criteria and the approach.

- Regional Staff Committee (RSC)
- Regional Project Evaluation Committee (RPEC)
- Transportation Enhancements Committee (TEC)
- Regional Technical Forum (RTF)
- Transportation Operators Committee (TOC)
- Seattle-Tacoma-Everett FTA Caucus (STEC)
- Bicycle Pedestrian Advisory Committee (BPAC)
- Special Needs Transportation Committee (SNTC)
- Regional Traffic Operations Committee (RTOC)
- Pricing Task Force (PTF)
- Environmental Planning Group (EPG)
- Commute Trip Reduction Working Group (CTRWG)
- Congestion Management Process (CMP) Advisory Committee
- Congestion Management Process Working Group (CMPWG)
- Transportation 2040 Working Group (T2040 WG)
- Statewide Freight Data System Working Group (SFDS)
- Regional Freight Mobility Roundtable (RFMR)
- FAST Corridor Partnership (FAST)
- Alternatives Technical Group (ATG)

- Transit Operators Program (TOP)
- TDM Steering Committee (TDM)

A key message from many of the groups was that where quantitative measures are not sufficient, it is necessary to provide qualitative measures to adequately address areas of policy interest. This requirement is reflected in the approach outlined in this report: Quantitative measures will support a more complete discussion of areas of policy focus, guided by the interests outlined in the adopted VISION 2040, comments received during the plan update scoping process, and numerous staff and policy-maker committee meetings held since scoping was completed.

1.5 Alternative Screening and Evaluation Process

PSRC staff worked closely with staff from agencies around the region, and with groups of elected and civic leaders, to develop the draft transportation plan alternatives that are being analyzed during the environmental review and plan development processes. Development of the draft alternatives began by defining a Baseline Alternative that includes both existing transportation facilities plus future transportation investments that can be implemented with funds available through currently authorized transportation revenue instruments. Delineation of other draft alternatives occurred through the addition to the baseline of different transportation tolling/pricing strategies. Guided by the VISION 2040 goals and policies, the analysis results, and professional judgment, additional near-term strategies (system management, transit, and demand management strategies) were added to each alternative, and long-term strategies for investments in capital expansion were identified as well. The alternative development process and the definitions of the alternatives are contained in other elements of the EIS. Analysis of the plan alternatives is a multi-step process that involves the following tasks:

1. An initial screening of the draft alternatives prior to their release by the Transportation Policy Board and the Executive Board for formal analysis under SEPA. This initial screening involves assessing the draft alternatives against a limited set of the VISION 2040 policy focus areas, based on the assumptions (projects, programs, and discrete elements) that define each alternative.
2. The technical analysis of alternatives using the PSRC integrated land use and travel models, as well as tools to measure air quality impacts and user benefit impacts.
3. An assessment of alternatives using measures that are part of the Transportation 2040 Evaluation Criteria, described in more detail in Section 3 of this report. These measures were produced as a result of the technical analysis.
4. A comprehensive policy analysis designed to assess the ability of each alternative to support the policies contained in VISION 2040. The policy analysis approach is contained in Section 2 of this report and makes use of the criteria measures (Section 3) wherever appropriate. In addition to criteria measures, the policy analysis draws on other model statistics (such as those listed following the description of the criteria in Section 3) as appropriate.
5. An analysis of environmental impacts under the formal SEPA review process. Transportation alternatives are being evaluated for the degree to which they are consistent with or improve upon the environmental impacts depicted in the VISION 2040 EIS.

Analysis of the alternatives is designed to produce information that is useful to the development of a preferred transportation alternative and a draft transportation plan.

1.6 Preferred Alternative Development Process

With the publication of the Draft EIS, the complete results on the Baseline Alternative and Alternatives 1 through 5 were made available for review, including comparisons of alternatives through the policy analysis and evaluation criteria. The various boards and committees of PSRC, as well as other agencies, had an opportunity to deliberate on the development of a preferred alternative for the updated plan. This process pulled from aspects of more than one alternative analyzed under SEPA. PSRC staff reported recommendations from the various committees to regional decision-makers to inform their final deliberation on a preferred alternative as a defining element of the Transportation 2040 draft plan and final environmental impact analysis. A policy analysis of the Preferred Alternative alongside the draft alternatives is included in the following section.

1.7 Summary of Results

VISION 2040 is the organizing framework for evaluating the alternatives. The Regional Growth Strategy and the goals, objectives, and policies in VISION 2040 were used in the organization of the policy analysis (Section 2) and guided the development of the evaluation criteria (Section 3). The following two tables summarize this more detailed analysis. The evaluation criteria are a way to measure progress toward achieving VISION 2040. The evaluation criteria were developed to address the overarching goals of the transportation planning process. Individual metrics were developed to quantify different aspects of each evaluation criterion.

Some of the metrics represent a different means to measure transportation benefits (or impacts) than has been commonly used in the past. An example is vehicle miles traveled (VMT), which is commonly used as a proxy for measuring congestion or air quality impacts. In these metrics, we are directly measuring congestion as a function of travel time savings and directly measuring the cost of emissions as a function of vehicle speeds and distance, so there is no need to use VMT as a proxy measure for these other metrics. In fact, reporting VMT would produce a duplicative effect of measuring both the proxy metric and the actual metric, based on the same underlying data.

Many of the criteria measures are estimated in monetary values so they can be included in a benefit-cost result. These measures are reported as annual benefits (positive values) and costs (negative values) for the plan horizon year 2040 in millions of year 2008 dollars. All monetary values are additive except for the Economic Prosperity benefits, which are a subset of the region benefits already reported in the other measures. Other criteria measures are reported in the following summary table with directional measures as follows: “0” indicates no significant change, “-” indicates negative or undesirable change, “+” indicates positive or desirable change.

The advantages of the benefit-cost approach are that both benefits and costs can be combined to assess the potential economic consequences of a particular transportation alternative. The disadvantage is that non-monetizable measures, such as growth management or economic prosperity, cannot be directly included. The full set of evaluation criteria recognizes the advantages of the benefit-cost method but combines this with other quantitative and qualitative measures to provide a more comprehensive assessment of each alternative. Also, some additional and legacy metrics are included at the end of this section of the report.

Policy Focus Area	Alternative						Preferred Constrained)	Full Preferred
	Baseline	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5		
Minimize disruption of natural ecological processes and wildlife corridors (<i>Environment</i>)	•	•						
Minimize development pressure in rural and natural resource areas (<i>Environment</i>)	•	•			•	•		
Water quality should be better than standards (<i>Environment</i>)	•	•				•		
Air quality should be better than standards and minimize greenhouse gas emissions (<i>Environment</i>)						•	•	•
Minimize non-renewable energy use (<i>Environment</i>)		•	•	•	•	•	•	•
Regional transportation investments should support the <i>Regional Growth Strategy</i> ; jobs-housing balance in the counties should be improved (<i>Development Patterns</i>)	•	•	•	•	•	•	•	•
Create a high degree of connectivity in street network to accommodate walking, biking, and transit (<i>Development Patterns</i>)						•	•	•

Policy Focus Area	Alternative						Preferred Constrained)	Full Preferred
	Baseline	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5		
The region's built and natural environments should promote health (<i>Development Patterns</i>)					•	•	•	•
Support an efficient flow of people, goods, services, and information—particularly to and within designated regional growth centers (<i>Economy</i>)				•		•	•	•
Support businesses, ports, and agencies involved in trade-related activities. System should improve connections and support for manufacturing/industrial centers (<i>Economy</i>)				•		•	•	•
Support established and emerging industry clusters (<i>Economy</i>)			•	•		•	•	•
Place a high priority for maintenance, preservation, and safe operation of the existing transportation system (<i>Transportation</i>)	•	•	•	•	•	•	•	•
Emphasize existing capacity and demand management strategies to reduce need for capital improvements (<i>Transportation</i>)		•				•	•	•
Make costs of transportation more explicit to user (<i>Transportation</i>)					•	•	•	•
Emphasize non-single occupant vehicle (SOV) travel investments; offer a variety of transportation choices (<i>Transportation</i>)						•		
Transit and non-SOV modes account for an increased proportion of trips (<i>Transportation</i>)		•	•	•	•	•	•	•
Improve mobility/accessibility (<i>Transportation</i>)				•	•	•	•	•
Make commercial movement more reliable and efficient (<i>Transportation</i>)				•	•	•	•	•
Create a sustainable, user-oriented, and balanced transportation system (<i>Transportation</i>)						•	•	•

Evaluation Criteria	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Preferred (Constrained)	Full Preferred
Mobility							
<i>M1. Travel Time Savings</i>	\$1,850	\$2,510	\$3,440	\$2,890	\$3,560	\$5,020	\$6,390
<i>M2. Improved Reliability Benefits</i>	\$290	\$410	\$1,000	\$1,140	\$1,290	\$1,070	\$1,180
<i>M3. Vehicle Operating and Ownership Benefits</i>	-\$93	-\$189	-\$125	\$200	\$13	\$73	\$213
<i>M4. Other User Benefits</i>	\$17	\$38.	\$77	-\$15	-\$457	\$89	\$34
Finance							
<i>F1. Facility Operating Cost</i>	-\$360	-\$160	-\$300	-\$510	-\$1,030	-\$1,570	-\$2,600
<i>F2. Capital Cost</i>	-\$640	-\$2,310	-\$1,670	-\$1,650	-\$1,700	-\$1,560	-\$2,770
<i>F3. Operating Revenues</i>	\$180	\$257	\$2,940	\$3,660	\$7,100	\$3,500	\$5,360
<i>F4. Influence of Finance on the Economy</i>	-\$134	-\$363	-\$46	\$44	\$138	\$224	\$103
Growth Management							
<i>GM1. Population</i>	⊗	⊗	⊗	⊗	⊗	⊗	⊗
<i>GM2. Employment</i>	⊗	⊗	⊗	⊗	⊗	⊗	⊗
<i>GM3. Jobs to Housing Balance</i>	⊗	⊗	⊗	⊗	⊗	⊗	⊗
<i>GM4. Population and Jobs in Centers</i>	⊗	⊗	⊗	⊗	⊗	⊗	⊗
Economic Prosperity							
<i>EP1. Benefits to Low- and High-wage Employment</i>	\$382	\$441	\$555	\$431	\$370	\$1,060	\$1,380
<i>EP2. Benefits to Cluster Employment</i>	\$56	\$116	\$179	\$142	\$49	\$297	\$373
<i>EP3. Benefits to Freight-Related Employment</i>	\$55	\$86	\$97	\$81	\$52	\$171	\$226
Environmental Stewardship							
<i>ES1. Vehicle and Stationary Emission Benefits</i>	-\$14	-\$35	\$19	\$31	\$94	\$38	\$72
<i>ES2. Impervious Surfaces</i>	⊗	-	-	⊗	⊗	-	-
<i>ES3. Agriculture and Natural Resource Lands</i>	⊗	-	⊗	⊗	⊗	⊗	⊗
<i>ES4. Energy Usage from Vehicle and Building Use</i>	⊗	⊗	+	+	+	+	+
Quality of Life							
<i>QL1. Accident Cost Savings</i>	-\$94	-\$177	-\$52	\$1	\$168	-\$26	\$32
<i>QL2. Nonmotorized Travel</i>	⊗	-	⊗	+	+	+	+
<i>QL3. Redundancy (Roads and Transit)</i>	⊗	⊗	⊗	⊗	⊗	⊗	⊗
Equity							
<i>E1. Geographic Distribution of Benefits</i>	+	⊗	+	-	⊗	⊗	⊗
<i>E2. Income Distribution of Benefits</i>	⊗	⊗	⊗	-	-	⊗	⊗
<i>E3. Benefits to Personal and Commercial Users</i>	⊗	⊗	⊗	-	-	⊗	⊗
<i>E4. Benefits to Environmental Justice Populations</i>	+	+	+	+	+	+	+

All comparisons to the 2040 Baseline:

\$\$ in millions in the year 2040; positive values are benefits, negative values are costs; all monetary values are additive except for the Economic Prosperity benefits, which are benefits to a subset of the region.

⊗ is no significant change, - is negative change, + is positive change.

2. VISION 2040 POLICY ANALYSIS PROCESS

The adoption of the VISION 2040 Regional Growth Strategy in April 2008 set forward a series of growth policies that will be advanced by all the transportation alternatives evaluated for the Transportation 2040 Regional Transportation Plan. Multicounty planning policies adopted in VISION 2040 provide guidance, commitments, targets, and additional direction applicable to the development of the region's transportation system. As the primary policy statements for implementing the Regional Growth Strategy, the multicounty planning policies have been designed to support the concentration of growth within the region's designated urban growth area and to limit development in resource and rural areas. The multicounty planning policies provide an integrated framework for addressing the environment, development patterns, housing, economic development, transportation, and other public services and facilities. Transportation concepts and potential alternatives will be screened for the degree to which they support the overarching goals of the six major multicounty planning policy sections, which have been further consolidated into four policy focus areas outlined in the following subsections. These policy focus areas and the associated questions have been used to conduct both an initial screening of the draft plan alternatives (to ensure that each alternative is generally consistent with VISION 2040) and a more detailed phase of the analysis in the spring and summer of 2009, as the planning process continued and the Draft EIS was prepared.

The policy evaluation framework outlined in this section describes the overarching goal of each VISION 2040 policy focus area and lists a set of questions that the policy analysis would answer for each of the transportation plan alternatives. Quantitative measures (evaluation criteria) developed for each alternative are referenced in the framework to indicate how policy analysis will be informed by the analytical process. The evaluation criteria are defined in detail in Section 3 of this report.

2.1 Environment

A core principle of VISION 2040 is maintaining and improving both the natural and built environments. Land use, transportation, air quality, and human health are interconnected and therefore require integrated planning, regulations, and implementation actions. The overarching goal of the environmental section of VISION 2040 is as follows:

"The region will care for the natural environment by protecting and restoring natural systems, conserving habitat, improving water quality, reducing greenhouse gas emissions and air pollutants, and address potential climate change impacts. The region acknowledges that the health of all residents is connected to the health of the environment. Planning at all levels should consider the impacts of land use, development patterns and transportation on the ecosystem."

Policy focus: System should minimize disruption of natural ecological processes and wildlife corridors

Q. How much new or expanded physical infrastructure is involved in selected areas?

Q. How are we replacing and retrofitting infrastructure?

Q. How are projects distributed?

The majority of ecological damage occurs with habitat loss through land development. Initial development actions, including clearing, grading, and change in land surface, have the most impact. New development has significantly higher potential impacts than redevelopment. Development in or near pristine areas has a far greater impact than development in already-developed areas.

Transportation networks contribute significantly to the transformation of land and are a key factor in the fragmentation and isolation of habitat. Further, transportation-related pollutants are a primary source of damage to ecosystems. Development of new transportation facilities has the potential to directly and indirectly affect vegetation, wetlands, and habitat within the central Puget Sound region, including:

- Direct impacts through removal of existing vegetation, fill of wetlands, alteration of land forms, and fragmentation of habitat areas for construction of transportation system projects, including new or expanded road, rail, and air transportation facilities.
- Corresponding direct impacts on wetlands through fill or altered surface water flows and introduction of pollutants.
- Indirect loss of vegetation, wetland, and habitat areas through promotion of additional urban development and conversion of undeveloped urban land to urban uses.
- Disturbance of wildlife through loss of habitat and degraded remaining habitat.

Most individual transportation projects are likely to be expansions of existing facilities, such as constructing new lanes on highways and new or longer runways at airports. Consequently, clearing and removal of vegetation and grading of land for these projects is likely to occur primarily in areas that have already been disturbed through construction of existing facilities and adjacent urban development, rather than in areas of remaining undisturbed natural vegetation and land forms. Habitat and environmentally sensitive features in urbanized areas are typically of lower value than those in relatively undisturbed rural and natural resource areas. Nevertheless, reconstruction or retrofit of these facilities would provide an opportunity to minimize current impacts to or restore ecological processes, wildlife habitat, and environmentally critical areas.

With improved accessibility, adverse effects on designated rural areas and natural resource lands such as agriculture and forest lands are possible. These areas function as both passive and active open space for both recreational and aesthetic uses, provide habitat, and serve important ecological functions.

Increased residential and commercial development activity on rural parcels adjacent to designated agricultural and natural resource lands may change their character and also negatively affect adjacent agricultural and forest areas with additional noise, light, glare, and visual and aesthetic changes.

Increased accessibility to rural residential and other parcels adjacent to designated agricultural and forest lands could increase land values and possibly create pressure to convert adjacent natural resource lands to rural residential, commercial, or urban uses.

However, all of the action alternatives by design focus the great majority of transportation improvements into existing urban areas, with little capacity expansion outside the designated urban growth area. Consequently, accessibility to these areas is not greatly improved.

To test whether such improvements that do exist in the alternatives have any impact on rural and natural resource open space, a set of approximately 11,000 parcels outside the urban area and adjacent to designated agricultural and forest lands was assembled in the UrbanSim land use forecasting model.

Criterion ES3 – Ability to Retain Open Space in Section 3 compares the possible increased development activity on these parcels in response to improved accessibility provided by the alternative transportation systems.

Compared to the base year 2006, approximately 4,800 additional residential units were developed regionwide in the Baseline Alternative on rural parcels adjacent to resource lands between 2000 and 2040. While Alternatives 1 through 5 all result in somewhat fewer units (ranging from 15 fewer to 278 fewer), overall development levels don't vary significantly, with reductions ranging from -0.1% to -2.3% compared to the Baseline Alternative. The Preferred Alternative results in the fewest residential units in proximity to natural resource lands, with a range of 370 to 420 fewer units compared to the Baseline Alternative.

The scale of change in non-residential square footage on these parcels in the alternatives is similar. Under the Baseline Alternative, non-residential square footage decreases marginally compared to 2006. Growth in non-residential square footage ranges from 0.8% to 3.0% higher than the Baseline Alternative. The amount of non-residential square footage on parcels adjacent to natural resource lands ranges from a decrease of approximately 60,000 square feet compared to the 2006 base year, to an increase of approximately 52,000 square feet. The Preferred Alternative performs similarly, with a range of a 1% lower to 2% higher than the Baseline Alternative.

While regionwide the differences between the alternatives aren't significant, they do represent more activity and associated trip making that may affect the character and function of rural and natural resource areas. This has some potential to create pressure for conversion to more intense uses.

While all of the alternatives focus the great majority of improvements and new capacity within the designated urban growth area, Alternatives 2 and 3 include rural highway widening projects that have some potential to increase development pressure within the rural area. Alternative 1, with the least amount of additional infrastructure and increased capacity, shows the smallest increase in non-residential square footage compared to the Baseline Alternative, and the second fewest new residential units. Alternatives 2 and 3 seem to be more supportive of non-residential uses in these areas, increasing non-residential square footage quite similarly by approximately 3% over the Baseline Alternative. Like Alternatives 2 and 3, the Preferred Alternative includes rural highway widening projects that have some potential to disrupt or increase development pressure within the rural area.

While potential for conversion and loss of rural and natural resource lands exists, analysis of a change in development activity on rural parcels adjacent to designated natural resource lands in all of the alternatives does not indicate a disproportionately large change in development activity compared to rates of change if no additional capacity or accessibility is provided, as in the Baseline Alternative.

Alternative 1:

- Little to no additional development of freeway or fixed rail infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Investments largely confined to existing rights of way.
- Little to no additional pressure on rural or natural resource lands. Minimal disturbance of high value ecological processes and wildlife corridors by new transportation facilities.
- Residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage decreases slightly from 2006 levels.
- Some opportunity to retrofit existing facilities to minimize current impacts to ecological processes and wildlife corridors.

Alternative 2:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Investments on US 2, SR 18, and SR 704 have potential to put pressure on rural corridors connecting urbanized areas. Potential for disturbance of adjacent rural and natural resource areas with high-value ecological processes and wildlife corridors.
- Despite some improvements in the rural area, residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage increases slightly from 2006 levels.
- Widespread expansion provides opportunity to retrofit existing facilities to minimize current impacts to ecological processes and wildlife corridors.

Alternative 3:

- Moderate development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Investments on SR 18 and SR 704 have potential to put pressure on rural corridors connecting urbanized areas. Adjacent rural areas may have high-value environmental functions and habitat areas.
- Despite some improvements in the rural area, residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage increases slightly from 2006 levels.

- Widespread expansion provides opportunity to retrofit existing facilities to minimize current impacts to ecological processes and wildlife corridors.

Alternative 4:

- Minimal development of additional freeway infrastructure.
- Extensive development of additional arterial roadway and fixed rail infrastructure.
- Moderate development of fixed rail infrastructure.
- Little to no additional pressure on rural or natural resource lands. Minimal disturbance of high-value ecological processes and wildlife corridors by new transportation facilities.
- Residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Little change in non-residential square footage compared to 2006 levels.
- Some opportunity to retrofit existing facilities to minimize current impacts to ecological processes and wildlife corridors.

Alternative 5:

- Little to no development of additional freeway infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Extensive development of fixed rail infrastructure.
- Little to no additional pressure on rural or natural resource lands. Minimal disturbance of high-value ecological processes and wildlife corridors by new transportation facilities.
- Residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage decreases slightly from 2006 levels.
- Some opportunity to retrofit existing facilities to minimize current impacts to ecological processes and wildlife corridors.

Preferred Alternative:

- Moderate to extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Investments on US 2, SR 18, and SR 704 have potential to put pressure on rural corridors connecting urbanized areas. Potential for disturbance of adjacent rural and natural resource areas with high-value ecological processes and wildlife corridors.
- Despite some improvements in the rural area, residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage increases slightly from 2006 levels.
- Widespread expansion provides opportunity to retrofit existing facilities to minimize current impacts to ecological processes and wildlife corridors.

Findings:

The alternatives represent a range of potential impacts to natural ecological processes and wildlife habitat, from minimal to moderate. Many potential impacts may be addressed through mitigation at the project development level.

Current conditions of habitat loss/fragmentation, impervious surface, pollution, and alterations of processes will be similar for all alternatives. Much of the region's transportation system is already in place, and the most common type of improvements for all alternatives involve the replacement or expansion of existing facilities within the urban area.

While new or expanded transportation facilities can result in increases in impervious surfaces, these activities provide opportunities to improve the environmental performance for facilities that were built before many of today's environmental protections were in place. Although all of the alternatives assume the continued operation

of the existing transportation system, only a portion would be improved during the 30-year planning horizon for Transportation 2040. The existing effects of habitat fragmentation, including impacts to species and ecosystems from water quality impairment and changes in hydrology, would continue unless additional mitigation measures are put in place.

Of particular concern will be whether proposed freeway widening projects that traverse or are adjacent to rural, natural resource, and habitat areas will further disrupt natural ecological processes or wildlife present in those areas. Forecast land development modeled in UrbanSim indicated a similar, fairly low amount of growth in designated rural areas throughout the region in each of the alternatives. Analysis of development on rural parcels adjacent to designated natural resource lands does not indicate a disproportionately large change in activity compared to change in the region if no additional capacity or accessibility is provided, as in the Baseline Alternative. Once again, overall intensities of use on these parcels seem to be consistent with rural development standards.

The Baseline Alternative and Alternative 1 have the least capital investment and are therefore least likely to cause additional disruption of ecological processes and wildlife habitat. These alternatives contain primary commitments to maintaining and preserving existing infrastructure and provide opportunities to correct conditions associated with existing facilities that may interfere with habitat areas or ecological processes. These alternatives seem to best satisfy the objective of this policy area, provided infrastructure investments do not occur near environmentally sensitive areas without adequate mitigation. While the Preferred Alternative contains moderate amounts of rural roadway improvement and development projects, the analysis shows little difference in the amount of residential units and non-residential square footage compared to the Baseline Alternative and Alternative 1. The primary concern might be the potential for open space and habitat fragmentation and disruption, which would require mitigation.

Policy focus: Minimize development pressure in rural and natural resource areas

Q. How much new pressure is put on urban fringe, rural, and natural resource areas?

Q. Are investments in new rural highways or freeways being avoided? If they are proposed, are appropriate rural development regulations in place to prevent inappropriate urban development?

The location, character, capacity, and efficiency of the transportation system will influence land use patterns and the future rate of conversion of undeveloped land. Detailed conversion of undeveloped land associated with each alternative cannot be reliably quantified at this time. However, the influence of alternatives can be assessed on a qualitative basis. In general, transportation system changes that would promote relatively dispersed, low-density urban development would result in a correspondingly greater pressure to convert undeveloped rural and natural resource lands to urban uses. Conversely, transportation systems that would promote higher urban densities and concentrate jobs, population, and housing in existing urban areas and urban centers would consume less undeveloped land and place less pressure on rural and natural resource lands. As seen in the previous discussion of the “ecological processes” policy focus, forecast land development modeled in UrbanSim indicated a similar, fairly low amount of growth in designated rural areas throughout the region in each of the alternatives. Analysis of development on rural parcels adjacent to designated natural resource lands does not indicate a disproportionately large change in activity compared to change in the region if no additional capacity or accessibility is provided, as in the Baseline Alternative. It does not appear that any of the alternatives place undue conversion pressure on natural resource lands. **Refer to Criterion ES3 – Ability to Retain Open Space** in Section 3.

Alternative 1:

- Little to no additional development of freeway or fixed rail infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Investments are largely confined to existing rights of way.
- Little to no additional pressure on rural or natural resource lands.
- Residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage decreases slightly from 2006 levels.

Alternative 2:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Greater emphasis on regional transit services that support longer commutes has the potential to place development pressure on natural resource and rural areas.
- Investments on US 2, SR 18, and SR 704 have potential to put pressure on rural corridors connecting urbanized areas. Without adequate land use controls, there is a potential for the introduction of incompatible land uses or activity near rural and natural resource areas.
- Despite some improvements in the rural area, residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage increases slightly from 2006 levels.

Alternative 3:

- Moderate development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Investments on SR 18 and SR 704 have potential to put pressure on rural corridors connecting urbanized areas. Without adequate land use controls, there is a potential for the introduction of incompatible land uses or activity near rural and natural resource areas.
- Despite some improvements in the rural area, residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage increases slightly from 2006 levels.

Alternative 4:

- Minimal development of additional freeway infrastructure.
- Extensive development of additional arterial roadway and fixed rail infrastructure.
- Greater emphasis on regional transit services that support longer commutes has the potential to place development pressure on natural resource and rural areas.
- Little to no additional pressure on rural or natural resource lands caused by development of new roadway transportation facilities.
- Residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Little change in non-residential square footage compared to 2006 levels.

Alternative 5:

- Little to no development of additional freeway infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Extensive development of fixed rail infrastructure.
- Greater emphasis on regional transit services that support longer commutes has the potential to place development pressure on natural resource and rural areas.
- Little to no additional pressure on rural or natural resource lands caused by development of new roadway transportation facilities.
- Residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage decreases slightly from 2006 levels.

Preferred Alternative:

- Moderate to extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Investments on US 2, SR 18, and SR 704 have potential to put pressure on rural corridors connecting urbanized areas. Potential for disturbance of adjacent rural and natural resource areas with high-value ecological processes and wildlife corridors.

- Despite some improvements in the rural area, residential development on parcels adjacent to designated agricultural and forest lands decreases marginally over the Baseline Alternative, suggesting no disproportionate pressure to urbanize compared to the other alternatives.
- Non-residential square footage increases slightly from 2006 levels.
- Widespread expansion provides opportunity to retrofit existing facilities to minimize current impacts to ecological processes and wildlife corridors.

Findings:

The alternatives represent a range of potential impacts to natural resource and rural areas, from minimal to moderate. Alternative 2 and the Preferred Alternative contain the most extensive packages of roadway and transit infrastructure and would likely have the most impact on natural resource and rural areas. Conversely, Alternatives 1 and 5 contain very little additional infrastructure development and would likely put less pressure on rural and natural resource areas. Many potential impacts may be addressed through mitigation at the project development level. Of particular concern will be whether proposed freeway widening and extension projects in Alternative 2, Alternative 3, and the Preferred Alternative that provide greater accessibility to rural and natural resource areas will impose inappropriate conversion pressure. Forecast land development modeled in UrbanSim, however, indicated a similar, fairly low amount of growth in designated rural areas throughout the region in each of the alternatives, including the Preferred Alternative. An analysis of development on rural parcels adjacent to designated natural resource lands does not indicate a disproportionately large change in activity compared to change in the region if no additional capacity or accessibility is provided, as in the Baseline Alternative. It does not appear that any of the alternatives place undue conversion pressure on rural areas or natural resource lands.

The Baseline Alternative, Alternative 1, and Alternative 5 have the least capital investment outside of core urban places and are therefore least likely to place development pressure on rural and natural resource areas. These Alternatives seem to best satisfy the objective of this policy area, provided infrastructure investments do not occur near rural areas and natural resource lands without adequate protections in place to prevent conversion to urban uses.

Policy focus: Water quality should be better than standards

Q. How much new physical infrastructure (impermeable surfaces)?

It is assumed that the same amount of population and employment growth through the year 2040 will occur in each alternative. Overall amounts of new residential, civic, and commercial structures to accommodate this growth are likewise assumed to be similar across the alternatives. Similar amounts of new impervious surfaces will be associated with these new structures.

Differences in impacts to water quality can be estimated from the amount of new physical transportation infrastructure associated with each alternative. Future development of new or expanded arterial roadways, freeways, rail facilities, and other components of the transportation infrastructure will produce a corresponding increase in the extent of impervious surface area. This would result in increased stormwater runoff from the area affected by the projects and, depending upon the stormwater management provisions incorporated into specific transportation projects, potential long-term changes in the volume and timing of runoff to streams and other water bodies within the region.

Motor vehicles and other transportation equipment deposit a variety of pollutants, primarily hydrocarbons and certain types of metals, on roadway surfaces (and along other transportation facilities) where they can be picked up by runoff. Similarly, they produce a variety of airborne pollutants that can be washed out of the atmosphere and carried in stormwater runoff. Consequently, each alternative can affect water quality by increasing the extent of pavement and other transportation infrastructure, and by increasing vehicle miles traveled (VMT) and the corresponding airborne emissions.

The extent and location of the transportation system also will influence the amount and distribution of undeveloped land converted to urban uses and existing urbanized uses developed to a higher intensity. Both types of land use changes will result in additional changes in impervious surface area and runoff patterns.

Estimates of Baseline Alternative impervious surfaces generated in the UrbanSim model indicate approximately 101,893 acres of impervious surfaces from building footprints, lane miles, and park and ride lots. Refer to **Criterion ES2 – Impervious Surfaces (Water Quality)** in Section 3. A comparison of the action alternatives indicates little variation in the overall amount of impervious surfaces compared to the Baseline Alternative. Alternatives 1 and 5 produce slightly less overall impervious surfaces, while Alternatives 2, 3, and 4 produce slightly more. The overall variation is very slight, less than 1%.

Alternative 1:

- Little to no additional development of freeway or fixed rail infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Investments largely confined to existing rights of way.
- Slightly less additional impervious surfaces compared to the Baseline Alternative, with potential to generate marginally less stormwater runoff than the Baseline Alternative.
- Minimal opportunity to retrofit existing facilities to minimize and/or mitigate current stormwater runoff impacts.

Alternative 2:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Potential for creation of slightly more impervious surfaces compared to the Baseline Alternative, which would generate some additional stormwater runoff.
- Widespread expansion provides opportunity to retrofit existing facilities to minimize and/or mitigate current stormwater runoff impacts.

Alternative 3:

- Moderate development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Potential for creation of slightly more impervious surfaces compared to the Baseline Alternative, which would generate some additional stormwater runoff.
- Moderate expansion provides some opportunity to retrofit existing facilities to minimize and/or mitigate current stormwater runoff impacts.

Alternative 4:

- Minimal development of additional freeway infrastructure.
- Extensive development of additional arterial roadway and fixed rail infrastructure.
- Moderate development of fixed rail infrastructure.
- Potential for creation of slightly more impervious surfaces compared to the Baseline Alternative, which would generate some additional stormwater runoff.
- Minimal expansion provides some opportunity to retrofit existing facilities to minimize and/or mitigate current stormwater runoff impacts.

Alternative 5:

- Little to no development of additional freeway infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Extensive development of fixed rail infrastructure.
- Little to no additional impervious surfaces created.
- Slightly less additional impervious surfaces created compared to the Baseline Alternative, with potential to generate marginally less stormwater runoff than the Baseline Alternative.
- Minimal opportunity to retrofit existing facilities to minimize and/or mitigate current stormwater runoff impacts.

Preferred Alternative:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Potential for creation of slightly more impervious surfaces created compared to the Baseline Alternative, which would generate additional stormwater runoff.

- Widespread expansion provides opportunity to retrofit existing facilities to minimize and/or mitigate current stormwater runoff impacts.

Findings:

The alternatives are likely to create a range of new impervious surfaces through transportation infrastructure, and indirectly through the intensity and distribution of new development. Consequently, they also represent a range of potential water quantity and quality impacts through the generation and flow of stormwater. Overall, however, the UrbanSim model estimated only marginal differences in the creation of impervious surfaces between the alternatives. Resulting impacts on water quality would therefore be quite similar. Potential impacts may be addressed through mitigation at the project development level.

When compared to the Baseline Alternative, Alternatives 2, 3, and the Preferred Alternative (both Constrained and Full) increase impervious surfaces, particularly associated with the addition of new and expanded roadways.

Alternatives that create little additional roadway infrastructure—such as the Baseline Alternative, Alternative 1, and Alternative 5—would likely have the least effect on water quantity and quality and best meet the objectives of this policy area. They could likely satisfy the objective of maintaining high-quality water sources in the region through minimizing the creation of additional impervious surfaces and mitigating their impact. It should be noted, however, that improvements to existing road facilities can lead to improved means of containing and treating runoff from existing surfaces, which can result in improvements in water quality.

Policy focus: Air quality should be better than standards, and greenhouse gas emissions should be minimized

Q. What emissions levels are produced?

Q. How much greenhouse gases are produced?

All of the alternatives must meet relevant federal and state air quality conformity requirements. If regional budgets for carbon monoxide (CO) and for ozone precursors (volatile organic compounds [VOCs] and nitrogen oxides [NO_x]) are exceeded, there is risk that federal air quality standards could be violated. If this happens, the region is subject to economic and health risks associated with air pollution. Additionally, if federal air quality conformity requirements are violated, federal law dictates that the region, including cities and counties, cannot receive federal funding for any roads, freeways, or other transportation projects that add capacity.

In 2007, both the Governor and the Washington State Legislature took actions to address global climate change, establishing targets and state legislation for greenhouse gas emissions reduction (RCW 80.80.020) and steps to mitigate potential climate change impacts. Transportation alternatives that result in increased burning of fossil fuels and related increases in carbon dioxide (CO₂) will produce additional greenhouse gases and likely have an adverse impact on global climate change.

Criterion ES1 – Vehicle and Stationary Emission Benefits (Air Quality) in Section 3 displays specific emissions modeled for each alternative.

In addition to modeling, the transportation literature demonstrates that transportation demand management (TDM) programs have a direct positive impact on mobile source greenhouse gas emissions by aiming to decrease the proportion of single-occupant vehicles, reduce VMT, shift trips to off-peak periods, and remove trips from the system altogether. Research outlining the cost-efficiency of the Federal Congestion Mitigation Air Quality program has shown that these strategies, particularly regional rideshare and vanpool programs as well as other TDM programs, are among the most cost-effective transportation strategies for reducing vehicle emissions¹. When analyzing results from the air quality modeling, potential emissions reduction benefits from these difficult to quantify strategies should be considered.

¹ Kuzmyak, John, 2002. Appendix E: Cost-Effectiveness of Congestion Mitigation and Air Quality Strategies. *Special Report 264: The Congestion Mitigation and Air Quality Program - Assessing 10 Years of Experience*, 275-419. Transportation Research Board – Washington D.C.

Optimizing traffic signal timing is considered a low-cost, high-benefit approach to reducing congestion. Signal timing strategies include the minimization of stops, delays, fuel consumption, and air pollution emissions and the maximization of the traffic progression through the system².

It has also been shown that providing travelers with better information pre-trip and en route allows them to make decisions to avoid congested facilities. Surveys performed in Seattle, Washington, and Boston, Massachusetts, indicated that 50% of travelers changed their travel route and 45% changed their departure time as a result of better traveler information. In addition, 5% to 10% of travelers changed their travel mode based on better traveler information³. On a daily basis, the adjusted travel behavior reduced VOCs by 498 kilograms (25%) and reduced NO_x by 25%.

A simulation study conducted in Seattle, Washington, indicated that integrating traveler information with arterial traffic and incident management systems could reduce emissions by 1% to 3%, lower fuel consumption by 0.8%, and improve fuel economy by 1.3 kilograms (1.5%)⁴, and reduced CO by 5,032 kilograms (33%)⁵. Alternatives that emphasize management of the transportation system—such as Alternative 5—would likely provide additional fuel economy, reduce VMT, and yield air quality benefits.

Recent case studies and pilot projects have also indicated significant air quality and greenhouse gas reduction benefits associated with improvements to bicycle and pedestrian infrastructure and programs. For example, in November 2007, the Federal Highway Administration reported that increased bicycle and pedestrian safety and mobility improvements in four pilot communities reduced total VMT by an estimated 156.1 million miles over the course of a year. Based on the VMT reductions reported, a savings of more than \$23 million in fuel costs, and a reduction of 67,000 metric tons of CO₂ emissions were projected⁶. Alternatives that contain similar bicycle and pedestrian infrastructure, support, and service elements may realize additional air quality benefits not captured in the model.

Alternative 1:

- Little to no additional development of freeway or fixed rail infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Scope of infrastructure investments provides minimal opportunity for VMT growth.
- Minimal opportunity for additional VMT reduction through bicycle and pedestrian improvements.
- Expansion of traveler information investments, including integrated multimodal information and route guidance, has the potential to reduce VMT.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Increases of CO, NO_x, VOC, and PM_{2.5} emissions compared to the Baseline Alternative.
- No reduction of greenhouse gas emissions. Increased CO₂ emissions compared to the Baseline Alternative.
- Annual emissions benefits decrease by \$15.5 million.

Alternative 2:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Scope of infrastructure investments provides extensive opportunity for VMT growth.
- Moderate opportunity for additional VMT reduction through bicycle and pedestrian improvements.
- Maintenance of existing TDM programs and minor expansion where feasible to support capacity expansion projects.
- Greatest increases of CO, NO_x, VOC, and PM_{2.5} emissions compared to the Baseline Alternative.

² Sunkari, Srinivasa. *The Benefits of Retiming Traffic Signals*. ITE Journal, 2004.

³ *Air Quality Benefit Study of the SmarTraveler Advanced Traveler Information Service*. Prepared by TechEnvironmental, Inc., 1993.

⁴ Wunderlich, Karl, James Bunch, and James Larkin (SAIC, Battelle, Mitretek, and Volpe). *ITS Impacts Assessment for Seattle MMDI Evaluation: Modeling Methodology and Results*. Prepared for Federal Highway Administration, U.S. DOT, 1999.

Where is footnote info?

⁶ FHWA Interim Report to the U.S. Congress on the Nonmotorized Transportation Pilot Program SAFETEA-LU Section 1807, November 2007.

- No reduction of greenhouse gas emissions. Greatest increase of CO₂ emissions compared to the Baseline Alternative.
- Annual emissions benefits decrease by \$46.8 million.

Alternative 3:

- Moderate development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Scope of infrastructure investments provides moderate opportunity for VMT growth.
- Moderate opportunity for additional VMT reduction through bicycle and pedestrian improvements.
- Minor to moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.
- Little change in CO, NO_x, VOC, and PM_{2.5} emissions compared to the Baseline Alternative.
- Reduction of greenhouse gas emissions. Decrease of CO₂ emissions compared to the Baseline Alternative.
- Annual emissions benefits increase by \$16.2 million.

Alternative 4:

- Minimal development of additional freeway infrastructure.
- Extensive development of additional arterial roadway and fixed rail infrastructure.
- Moderate development of fixed rail infrastructure.
- Scope of infrastructure investments provides minimal opportunity for VMT growth.
- Moderate opportunity for additional VMT reduction through bicycle and pedestrian improvements.
- Minor to moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.
- Decrease or little change in CO, NO_x, VOC, and PM_{2.5} emissions compared to the Baseline Alternative.
- Reduction of greenhouse gas emissions. Decrease of CO₂ emissions compared to the Baseline Alternative.
- Annual emissions benefits increase by \$29.5 million.

Alternative 5:

- Little to no development of additional freeway infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Extensive development of fixed rail infrastructure.
- Scope of infrastructure investments provides minimal opportunity for VMT growth.
- Extensive opportunity for additional VMT reduction through bicycle and pedestrian improvements.
- Expansion of traveler information investments, including integrated multimodal information and route guidance, has the potential to reduce VMT.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Greatest decrease in CO, NO_x, VOC, and PM_{2.5} emissions compared to the Baseline Alternative.
- Greatest reduction of greenhouse gas emissions. Decrease of CO₂ emissions compared to the Baseline Alternative.
- Greatest annual emissions benefits. Increase by \$96.1 million.

Preferred Alternative:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Scope of infrastructure investments provides opportunity for VMT growth.
- Extensive opportunity for additional VMT reduction through bicycle and pedestrian improvements.
- Expansion of traveler information investments, including integrated multimodal information and route guidance, has the potential to reduce VMT.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Second greatest decrease in CO, NO_x, VOC, and PM_{2.5} emissions compared to the Baseline Alternative.

- Second greatest reduction of greenhouse gas emissions. Decrease of CO₂ emissions compared to the Baseline Alternative.
- Second greatest annual emissions benefits. Increases range from \$38 million to \$72 million.

Findings:

The relative emphasis in each alternative on investing in general purpose roadway infrastructure would have a direct relationship with growth in VMT and resulting vehicle emissions. In general, those alternatives with more emphasis on developing roadways and freeways—Alternatives 2 and 3—have the potential to increase the growth in VMT and associated vehicle-related emissions. Alternatives that are more focused on maximizing system efficiency (including investments in TDM) without significant capital expansion—such as Alternatives 1, 3, 4, and 5—have the potential to reduce VMT and emissions. The Preferred Alternative is a hybrid of these emphases.

Alternatives that contain a greater emphasis on bicycle and pedestrian infrastructure, support, and service elements may realize additional air quality and greenhouse gas reduction benefits. Alternative 1 contains the least of these types of services and improvements, while Alternative 5 and the Preferred Alternative place the most emphasis on encouraging nonmotorized transportation. The Baseline Alternative and Alternatives 2, 3, and 4 have a minor to moderate emphasis on nonmotorized transportation.

All of the Transportation 2040 alternatives remain below the motor vehicle emissions budgets for the two pollutants for which the region is in maintenance status. Emission trends compared to the 2006 base year show a decrease for the criteria pollutants but an increase for CO₂. Since CO₂ emissions from mobile sources are more directly related to the amount of carbon in the fuel and the amount of fuel burned, the trend for these emissions is different than that of the other pollutants. The criteria pollutants are more affected by vehicle emissions control technologies and improvements in fuel combustion; since carbon is the main component of petroleum fuels, CO₂ emissions are less affected by these technologies and more so by improvements to the fuel economy of vehicles and lowering the carbon content of fuels.

Alternative 2 shows the largest increase in emissions compared to the Baseline Alternative for all pollutants. Alternative 1 also shows an increase of emissions of all pollutants compared to the Baseline Alternative, and Alternatives 3 and 4 show a mix of increases and decreases, depending on the pollutant. Alternative 5 shows the largest decrease in emissions for all pollutants, followed closely by the Preferred Alternative.

Alternative 5 has the lowest percentage of single-occupant vehicle (SOV) trips, and the highest percentage of transit and bike/walk trips. The Preferred Alternative performs similarly, with slightly higher SOV trips and lower transit and bike/walk trips. Alternative 2, on the other hand, has the highest percentage of SOV trips and the lowest percentage of bike/walk trips; the share of transit trips in Alternative 2 is lower than in Alternatives 1, 3, 4, and 5, but is equivalent to the transit share of trips in the Baseline Alternative. These mode share differences correlate to the emissions results.

In terms of total VMT, Alternative 5 has the lowest VMT and Alternative 2 the highest among the alternatives. The Full Preferred Alternative produces the second lowest VMT, followed by the Preferred Alternative (Constrained), and then Alternative 4.

Alternative 5 results in the largest reduction of criteria pollutants and greenhouse gases and would likely best meet the objectives of this policy focus area. The Preferred Alternative demonstrates the next best performance of the alternatives, with slightly higher VMT and emissions.

Policy focus: Non-renewable energy use should be minimized

Q. What are energy requirements?

Q. What are vehicle energy costs?

Q. How much new physical infrastructure is involved?

Q. What relative proportion of energy is used based on development pattern?

All of the Transportation 2040 alternatives would provide additional transportation infrastructure, including roadway, transit, and other investments that will have an impact on energy consumption, both in terms of construction and operations. Many of these investments would provide more alternatives to driving alone, which could result in more efficient energy consumption. It is important to note that the analysis is not able to quantify the impacts from all of these investments; some may produce a higher level of energy consumption, while others may result in lower energy consumption.

The energy analysis conducted for the Transportation 2040 alternatives consisted of both energy consumption from buildings (residential, commercial, and industrial) and from on-road mobile sources.

Since approximately 90% of energy consumption typically occurs during operation of the building (e.g., heating and cooling), the analysis does not incorporate estimates of construction-related energy use or the embodied energy of materials, which are imprecise or difficult to obtain. Instead, the analysis is based on data from recent surveys conducted by the U.S. Energy Information Administration to estimate annual building-related electricity and fuel use.

PSRC uses the U.S. Environmental Protection Agency's draft MOVES software to estimate greenhouse gas emissions from on-road mobile sources. The MOVES software also estimates mobile source energy rates, and this method was used to estimate energy consumption from the total VMT in each of the Transportation 2040 alternatives.

The mobile source energy consumption does not include energy from transit vehicles. At this time, PSRC's travel demand models do not adequately represent all transit vehicle miles on the transportation network. As such, the impact from transit on energy consumption is not represented in the quantified analyses. Each of the Transportation 2040 alternatives contains different levels of transit investment for light rail, commuter rail, and bus service. Electric light rail and commuter rail vehicles have a higher rate of energy consumption per mile than do buses, but total ridership and the number of miles traveled by the vehicles may result in lower overall energy consumption.

Alternative 1:

- No significant difference perceivable in overall energy use compared to the Baseline Alternative.
- No significant difference perceivable in energy use related to residential or commercial structures.
- Very little change in mobile source energy use compared to the Baseline Alternative.

Alternative 2:

- No significant difference perceivable in overall energy use compared to the Baseline Alternative.
- No significant difference perceivable in energy use related to residential or commercial structures.
- Slight increase (1.06%) in mobile source energy use compared to the Baseline Alternative.

Alternative 3:

- Decrease in overall energy use compared to the Baseline Alternative.
- No significant difference perceivable in energy use related to residential or commercial structures.
- Decrease (-4.32%) in mobile source energy use compared to the Baseline Alternative.

Alternative 4:

- Decrease in overall energy use compared to the Baseline Alternative.
- No significant difference perceivable in energy use related to residential or commercial structures.
- Decrease (-5.13%) in mobile source energy use compared to the Baseline Alternative.

Alternative 5:

- Decrease in overall energy use compared to the Baseline Alternative.
- No significant difference perceivable in energy use related to residential or commercial structures.
- Largest decrease (-11.00%) in mobile source energy use compared to the Baseline Alternative.

Preferred Alternative:

- Decrease in overall energy use compared to the Baseline Alternative.
- No significant difference perceivable in energy use related to residential structures.
- Largest decrease (-11.00%) in energy use related to non-residential structures.
- Second largest decrease (-10.00%) in mobile source energy use compared to the Baseline Alternative.

Findings.

Since all of the alternatives include the same number of households and employment, only modest variation among estimates of stationary energy consumption might be expected, and this largely proves to be the case. For evaluative purposes, stationary energy use can be considered equivalent among all six alternatives, with the exception of an 11% decrease in energy use related to non-residential structures in the Preferred Alternative.

What slight variation exists is largely a reflection of differences in non-residential building between the alternatives; businesses consume more energy than do homes. Alternatives with less non-residential—and particularly, less industrial—floor area, such as Alternative 2 and the Preferred Alternative, show less total building-related energy consumption, despite higher relative levels of residential consumption. At the aggregate level, however, the differences are so slight as to be regarded within the margin of modeling error.

As would be expected, the differences among the alternatives related to energy consumption are similar to the differences in carbon dioxide emissions described for Air Quality and Climate Change.

Compared to the Baseline Alternative, Alternatives 3, 4, and 5 and the Preferred Alternative (both Constrained and Full) result in less overall energy consumption. The differences for Alternatives 3, 4, and 5 and the Preferred Alternative are mostly attributable to less energy consumption associated with vehicle use.

While it appears that any of the alternatives could meet the objectives of this policy focus area, the Preferred Alternative has the lowest energy consumption from stationary and mobile sources.

2.2 Development Patterns (including Housing and Employment)

The Development Patterns section of VISION 2040 reflects key elements of the Regional Growth Strategy, with a focus on the continued growth of designated regional centers and sub-regional centers. It also reemphasizes preserving rural lands and not allowing development to diminish rural character and scale. The overarching goal of the development patterns policies is as follows:

"The region will focus growth within already urbanized areas to create walkable, compact, and transit-oriented communities that maintain unique local character. Centers will continue to be a focus of development. Rural areas and natural resource lands will continue to be vital parts of the region."

The Housing section of VISION 2040 responds to the Growth Management Act's requirements for providing sufficient housing for all economic segments of the region's population. The housing section's overarching goal is as follows:

"The region will preserve, improve and expand its housing stock to provide a range of affordable, healthy and safe housing choices to every resident. The region will continue to promote fair and equal access to housing for all people."

Policy focus: Regional transportation investments should support the Regional Growth Strategy

Q. Are levels of investment and new services aligned with designated regional growth centers, high-growth regional geographies?

Q. Do investments serve and support designated regional growth centers? Are centers connected to one another and to surrounding areas?

Q. Do investments offer a variety of transportation choices in and between regional growth centers?

Policy focus: Jobs-housing balance in counties should be improved

Q. Has balance improved?

Q. Are employment centers in all four counties well served?

The VISION 2040 Regional Growth Strategy was built around the concept that additional transportation infrastructure and services are to be provided to areas that accept an increased share of the region's growth. The Regional Growth Strategy focuses on preserving and developing compact urban communities, directing employment and housing growth into centers, and redeveloping underutilized urban land with the assumption that appropriate transportation investments would be developed to serve anticipated growth.

Formally designated by PSRC, 27 regional growth centers play a unique and important role as locations of the region's most significant business, governmental, and cultural facilities. These centers are located in either Metropolitan Cities or Core Cities. Regional growth centers are areas of higher-intensity development and contain a mix of land uses and services. Major regional investments in transportation projects, services, and programs and other infrastructure should be prioritized for Metropolitan Cities and Core Cities and these regional growth center locations.

Many secondary hubs and concentrations of development also serve important roles as places for concentrating jobs, housing, shopping, and recreational opportunities. These are often the downtowns or city centers of Larger Cities. Town centers in Small Cities can also provide a mix of housing and services and serve as focal points for communities. Regional policies call for developing and focusing resources in central places in cities and towns of all sizes.

Alternative 1:

- Population and employment distribution consistent with Regional Growth Strategy. Little change compared to the Baseline Alternative. Slightly less population growth in Core Cities. Slightly more employment in Outlying Urban and Rural Areas.

- While supportive of population and employment growth in regional growth centers, achieves slightly less population (-3.9%) than the Baseline Alternative.
- Supportive of employment growth in manufacturing industrial centers (MICs).
- No observable improvement to regional jobs-housing balance.
- Core high-occupancy vehicle (HOV) highway investments improve service to Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. Primarily provides access to and between centers.
- Minimal high-capacity transit investment linking and within designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and service to and within designated regional growth centers.
- Connected network of separated bicycle track/paths within Metropolitan and Core Cities.
- Significant investment in expanding employer-based and other TDM strategies in all regional growth centers.

Alternative 2:

- Population and employment distribution consistent with Regional Growth Strategy. Little change compared to the Baseline Alternative. Slightly more employment in Outlying Urban and Rural Areas.
- While supportive of population and employment growth in regional growth centers, achieves slightly less population (-2.6%) than the Baseline Alternative.
- Supportive of employment growth in MICs.
- No observable improvement to regional jobs-housing balance.
- Extensive amount of major highway investments improve connections between and within Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. Primarily provides access to and between centers.
- Extensive high-capacity transit investment linking and within designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and service to and within designated regional growth centers.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Focus existing and limited expansion of TDM programs in regional growth centers within Metropolitan Cities.

Alternative 3:

- Population and employment distribution consistent with Regional Growth Strategy. Little change compared to the Baseline Alternative. Slightly less population growth in Core Cities. Slightly more employment in Outlying Urban and Rural Areas (+4%).
- More supportive of population and growth in regional growth centers than the Baseline Alternative (+5.1%); less supportive of employment growth (-3.5%).
- Highly supportive of employment growth in MICs compared to the Baseline Alternative (+16.1%).
- No observable improvement to regional jobs-housing balance.
- Moderate amount of major highway investments improve connections between and within Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. Primarily provides access to and between centers.
- Moderate high-capacity transit investment linking and within designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and service to and within designated regional growth centers.
- Continuous network of bicycle facilities linking and within all regional growth centers and MICs.
- Moderate investment in employer-based, transit-supportive, and other programs in regional growth centers within Metropolitan and Core Cities.

Alternative 4:

- Population and employment distribution consistent with Regional Growth Strategy. Little change compared to the Baseline Alternative. Slightly more employment in Outlying Urban and Rural Areas. Least supportive of employment growth in Urban Core.
- More supportive of population and growth in regional growth centers than the Baseline Alternative (+4.3%); less supportive of employment growth (-7.8%).
- More supportive of employment growth in MICs compared to the Baseline Alternative (+20.7%).
- No observable improvement to regional jobs-housing balance.

- Minor highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. Primarily provides access to and between centers.
- Moderate high-capacity transit investment linking and within designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and service to and within designated regional growth centers.
- Continuous network of bicycle facilities linking and within all regional growth centers and MICs.
- Moderate investment in employer-based, transit-supportive, and other programs in regional growth centers within Metropolitan and Core Cities.

Alternative 5:

- Population and employment distribution consistent with Regional Growth Strategy. Little change compared to the Baseline Alternative. Slightly more employment in Outlying Urban and Rural Areas (+2%).
- Supportive of population and employment growth in regional growth centers.
- Supportive of employment growth in MICs.
- No observable improvement to regional jobs-housing balance.
- Minor highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. Primarily provides access to and between centers.
- Extensive high-capacity transit investment linking and within designated regional growth centers.
- Extensive bus transit investment acting as feeder service to high-capacity transit stations and service to and within designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between and within designated regional growth centers and MICs.
- Significant investment in expanding employer-based and other TDM strategies in all regional growth centers.

Preferred Alternative:

- Population and employment distribution consistent with Regional Growth Strategy. Little change compared to the Baseline Alternative.
- More supportive of population and growth in regional growth centers than the Baseline Alternative (+4.0% to 8.2%); less supportive of employment growth (-6.0% to no change).
- Supportive of employment growth in MICs similar to Baseline Alternative (-2.5% to +1.3%).
- No observable improvement to regional jobs-housing balance.
- Highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. Primarily provides access to and between centers; 87% of highway and arterial investments are within or directly serve Metropolitan or Core Cities.
- Extensive high-capacity transit investment linking and within designated regional growth centers.
- Extensive bus transit investment increases service by approximately 100%, providing core, frequent service to high-capacity transit stations and employment centers and service to and within designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between and within designated regional growth centers and MICs.
- Significant investment in expanding employer-based and other TDM strategies in all regional growth centers.

Findings:

Support for the Regional Growth Strategy can be initially assessed through an examination of the distribution of projects and programs relative to regional geographies that will likely experience higher shares of regional growth, and to designated regional growth centers and MICs. To varying degrees, all of the alternatives focus a variety of investments in high-growth regional geographies (Metropolitan, Core, and Large Cities), designated regional growth centers, and MICs. Most alternatives—Alternatives 2, 3, 4, and 5 and the Preferred Alternative—offer a wide variety of expanded transportation choices and alternatives in and between regional growth centers and MICs, while Alternative 1 is more limited. In Alternatives 2 and 3 and the Preferred Alternative, proposed roadway widening projects that traverse or are adjacent to rural areas may impose additional conversion pressure, which may need to be mitigated.

When looking at the interaction of the transportation systems with land development simulated by the UrbanSim land use forecasting model, no alternative induced disproportionate levels of population and housing growth outside the urban growth area. Under all alternatives, population growth concentrates overwhelmingly in the existing urban growth area, highly consistent with the Regional Growth Strategy.

In the Baseline Alternative, at the regional level, population is distributed in a pattern largely consistent with the distribution among regional geographies in the Regional Growth Strategy. At the regional level, few appreciable differences are observable in population distribution across the alternatives. However, slightly less growth in Core Cities is seen in Alternatives 1 and 3.

There is no appreciable difference between the alternatives in how regional population growth is distributed between counties. Development patterns among regional geographies differed by county, but are still largely consistent with the Regional Growth Strategy.

While all alternatives are highly supportive of population growth in regional growth centers, some do slightly better than others. In the Baseline Alternative, between 2006 and 2040 population in regional growth centers was projected to grow by 170,000 (139%). Alternatives 3 and 4 and the Preferred Alternative supported slightly more population growth in regional growth centers: 5.1%, 4.3%, and a range of 4.0% to 8.2%, respectively.

While all alternatives are highly supportive of employment growth in both regional growth centers and MICs, some do slightly better than others. In the Baseline Alternative, between 2006 and 2040 employment in regional growth centers was projected to grow by 475,000 jobs (83%). Employment was projected to grow by over 22,000 jobs in MICs. Alternatives 3 and 4 and the Preferred Alternative supported somewhat less employment growth in regional growth centers: -3.5%, -7.8%, and a range of -6% to no change, respectively. All action alternatives increased projected employment growth in MICs compared to the Baseline Alternative, with the exception of the Preferred Alternative, which demonstrated a range of +1.2% to -2.5%. Alternatives 3 and 4 were the most supportive of employment growth in MICs compared to the Baseline Alternative, increasing growth by 16.1% and 20.7% respectively. However, this was a percentage change over a somewhat small base change in the Baseline Alternative compared to 2006 employment (22,000 jobs), so the overall number of additional jobs was marginal.

While Alternatives 3, 4, and 5 and the Preferred Alternative were all somewhat more successful in directing population growth to the region's urban core (Metropolitan, Core, and Larger Cities), Alternative 5 was most successful of the three in directing employment growth to these areas. While all of the alternatives were highly supportive of population growth in regional growth centers, Alternatives 3 and 4 and the Preferred Alternative were most successful. Alternatives 1 and 5 were most consistent for employment growth in regional growth centers and MICs.

All of the action alternatives appear to be consistent with and support the Regional Growth Strategy.

Policy focus: There should be a high degree of connectivity in street network to accommodate walking, biking, and transit

Q. What types of investments are made in nonmotorized transportation? How much is added and where?

Connectivity refers to the directness of links and the density of connections in a path or road network. A well-connected road or path network has many short links, numerous intersections, and minimal dead-ends (cul-de-sacs). As connectivity increases, travel distances decrease and route options increase, allowing more direct travel between destinations, creating a more accessible and resilient system. During the 1960s through the 1990s, roadway design practices favored a poorly connected hierarchical network, with numerous cul-de-sacs that connect to a few major arterials. This increases the amount of travel required to reach destinations, concentrates traffic onto fewer roads, and creates barriers to nonmotorized travel. A connected road network emphasizes accessibility by accommodating more direct travel with traffic dispersed over more roads.

When choosing whether to bicycle or walk, studies have shown that people largely consider three factors: initial considerations, trip barriers, and destination barriers⁷. For walking, the most significant barriers are related to safety (perceived and actual), access, and aesthetics. Safety is also a barrier for bicyclists, but they are more influenced by the existence of facilities, system continuity, and access to transit than are pedestrians⁸. All of these factors play a part in enhanced connectivity.

Alternative 1:

- Minimal investment in arterial roadways somewhat improves street connectivity.
- Connected network of separated bicycle track/paths in Metropolitan and Core Cities work towards implementing “complete streets” policies, including transit-oriented pedestrian design, in all jurisdictions.

Alternative 2:

- Extensive investment in arterial roadways greatly improves street connectivity.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.

Alternative 3:

- Moderate investment in arterial roadways greatly improves street connectivity.
- Continuous network of bicycle facilities linking all regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in all jurisdictions.

Alternative 4:

- Minimal investment in arterial roadways somewhat improves street connectivity.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in all jurisdictions.

Alternative 5:

- Minimal investment in arterial roadways somewhat improves street connectivity
- Repurposing of some arterial capacity supports safe and convenient biking and walking within urban places
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in all jurisdictions.

Preferred Alternative:

- Extensive investment in arterial roadways greatly improves street connectivity.
- Repurposing of some arterial capacity supports safe and convenient biking and walking within urban places.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in all jurisdictions.

Findings:

The range of draft alternatives represents different levels of investment in arterial roadways, sidewalks, and bicycle paths, all of which provide greater local connectivity and directly support the viability of walking and bicycling to meet local transportation needs.

Investments resulting in greater local connectivity in Alternatives 3 and 4 are modest, while in the Baseline Alternative and Alternatives 1 and 2 there is less emphasis on local connectivity as a primary transportation

⁷ Bridging the Gaps: How the Quality and Quantity of a Connected Bikeway Network Correlates with Increasing Bicycle Use, Mia Birk and Roger Geller, Presentation, Transportation Research Board Annual Meeting, 2006

⁸ Metro, A Profile of the Regional Bicycle System in the Portland Metropolitan Region, 2007

strategy. Alternative 5 contains extensive nonmotorized and transit investments and focuses on complete streets policies to rebalance roadway programming. The Preferred Alternative has a combination of extensive arterial roadway investments, nonmotorized investments, and transit investments, and it focuses on complete streets policies to rebalance roadway programming.

The Preferred Alternative addresses this policy objective most directly as a primary mobility strategy and would likely best improve connectivity.

Policy focus: Minimize development pressure in rural areas

Q. How much new pressure is put on urban fringe, rural, and natural resource areas?

Q. Are investments in new rural highways or freeways being avoided? If they are proposed, are appropriate rural development regulations in place to prevent inappropriate urban development?

Refer to previous discussions of “ecological processes” and “natural resource lands” policy focuses. The location, character, capacity, and efficiency of the transportation system will influence land use patterns and the future rate of conversion of undeveloped land. Detailed conversion of undeveloped land associated with each alternative was estimated through the UrbanSim land use development model. The rural population increase in all alternatives was estimated at approximately 48,000, less than 40% of maximum levels contained in Regional Growth Strategy guidance. Employment growth in all alternatives was estimated at approximately 29,000 jobs, very similar to guidance contained in the Regional Growth Strategy.

In general, transportation system changes that would promote relatively dispersed, low-density urban development would result in a correspondingly greater pressure to convert undeveloped rural and natural resource lands to urban uses. Conversely, transportation systems that would promote higher urban densities and concentrate jobs, population, and housing in existing urban areas and urban centers would consume less undeveloped land and place less pressure on rural and natural resource lands.

Alternative 1:

- Little to no additional development of freeway or fixed rail infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Investments largely confined to existing rights of way.
- Estimated rural development levels consistent with guidance in the Regional Growth Strategy.
- Little to no additional pressure on rural or natural resource lands.
- Less population growth in rural areas than Regional Growth Strategy.
- Employment growth in rural areas consistent with Regional Growth Strategy.

Alternative 2:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Greater emphasis on regional transit services that support longer commutes has the potential to place development pressure on natural resource and rural areas.
- Estimated rural development levels consistent with guidance in the Regional Growth Strategy.
- Investments on US 2, SR 18, and SR 704 have potential to put some additional pressure on rural corridors connecting urbanized areas. Without adequate land use controls, there is a potential for the introduction of incompatible land uses or activity near rural and natural resource areas.
- Less population growth in rural areas than Regional Growth Strategy.
- Employment growth in rural areas consistent with Regional Growth Strategy.

Alternative 3:

- Moderate development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Estimated rural development levels consistent with guidance in the Regional Growth Strategy.
- Investments on SR 18 and SR 704 have potential to put some additional pressure on rural corridors connecting urbanized areas. Without adequate land use controls, there is a potential for the introduction of incompatible land uses or activity near rural and natural resource areas.
- Less population growth in rural areas than Regional Growth Strategy.

- Employment growth in rural areas consistent with Regional Growth Strategy.

Alternative 4:

- Minimal development of additional freeway infrastructure.
- Extensive development of additional arterial roadway and fixed rail infrastructure.
- Greater emphasis on regional transit services that support longer commutes has the potential to place development pressure on natural resource and rural areas.
- Estimated rural development levels consistent with guidance in the Regional Growth Strategy.
- Little to no additional pressure on rural or natural resource lands by new roadway transportation facilities.
- Less population growth in rural areas than Regional Growth Strategy.
- Employment growth in rural areas consistent with Regional Growth Strategy.

Alternative 5:

- Little to no development of additional freeway infrastructure.
- Minimal development of additional arterial roadway infrastructure.
- Extensive development of fixed rail infrastructure.
- Greater emphasis on regional transit services that support longer commutes has the potential to place development pressure on natural resource and rural areas.
- Estimated rural development levels consistent with guidance in the Regional Growth Strategy.
- Little to no additional pressure on rural or natural resource lands by new transportation facilities.
- Less population growth in rural areas than Regional Growth Strategy.
- Employment growth in rural areas consistent with Regional Growth Strategy.

Preferred Alternative:

- Extensive development of additional arterial roadway, freeway, and fixed rail infrastructure.
- Greater emphasis on regional transit services that support longer commutes has the potential to place development pressure on natural resource and rural areas.
- Estimated rural development levels consistent with guidance in the Regional Growth Strategy.
- Investments on US 2, SR 18, and SR 704 have potential to put some additional pressure on rural corridors connecting urbanized areas. Without adequate land use controls, there is a potential for the introduction of incompatible land uses or activity near rural and natural resource areas.
- Less population growth in rural areas than Regional Growth Strategy.
- Employment growth in rural areas consistent with Regional Growth Strategy.

Findings:

Estimated rural development levels in all alternatives were consistent with guidance in the Regional Growth Strategy.

The alternatives represent a range of potential impacts to rural areas, from minimal to moderate. Alternative 2 and the Preferred Alternative contain the most extensive packages of roadway and transit infrastructure and would likely have the most impact on rural areas. Conversely, Alternative 1 contains very little additional infrastructure development and would likely put less pressure on rural and natural resource areas. Further analysis, as previously discussed in the “ecological processes” and “natural resources” policy focuses, suggests that development on rural parcels adjacent to designated natural resource lands is not disproportionately large compared to change in the region if no additional capacity or accessibility is provided, as in the Baseline Alternative. It does not appear that any of the alternatives place undue conversion pressure on rural lands. Many potential impacts to rural development may be addressed through mitigation at the project development level.

Of particular concern may be whether proposed freeway widening and extension projects in Alternatives 2 and 3 and the Preferred Alternative that provide greater accessibility to rural areas will impose inappropriate conversion pressure.

The Baseline Alternative and Alternatives 1, 4, and 5 would most likely best implement this policy objective.

Policy focus: The region's built and natural environments should promote health

Q. How do land use patterns, environmental factors, transportation systems, and other infrastructure affect health?

Q. To what degree does the system promote environmental health (minimize emissions/pollutants and carcinogens), active living and wellness (increased opportunities for nonmotorized transportation), and safety?

Over the last several decades, many public health concerns have changed. Both locally and nationally, chronic diseases such as diabetes and asthma have increased, as have obesity and heart disease. These diseases have been shown to have direct relationships with exposure to air pollutants and amount of physical activity.

The public health community has recognized that social and physical environments are important aspects of health-promotion strategies. Land use patterns that support a variety of travel choices contribute significantly to improving accessibility and mobility. Supportive land use patterns include the appropriate placement, intensity, configuration, and proximity of housing, jobs, stores, and schools. Land use patterns are shaped by and include roads, rails, pathways, trails, sidewalks, and other public transportation infrastructure. The region's transportation systems can be designed to support alternatives to the automobile, to reduce emissions that cause pollution, to minimize disruptions to neighborhoods, to create community connections, to provide amenities that improve mental well-being, and to contribute to a visually stimulating environment. All these actions help enhance individual health and contribute to healthy communities.

Compact development patterns that are well served by transit and well connected with a high density of pedestrian and bicycle infrastructure provide enhanced opportunities to walk and bike to meet daily needs. Such patterns also decrease trip distances, are safer for pedestrians and cyclists, and produce fewer auto-related emissions and pollutants.

Green Spaces. Green spaces include natural areas, parks, gardens, and bicycle and pedestrian trails and paths. People frequent green space areas to access recreational opportunities, reconnect with the natural environment, escape from the stress of their daily lives, and interact socially. Research has shown a positive relationship between the amount of green space in the living environment and physical and mental health and longevity (Groenewegen et al., 2006). Safe and well-marked access between green space areas is important to promoting physical activity and sense of well-being in a natural environment⁹.

Fitness. Many health professionals have concluded that regular walking and cycling are the only realistic way that the population as a whole can get the daily half hour of moderate exercise which they consider the minimum level needed to keep reasonably fit. In a 1996 report, the U.S. Surgeon General concurred, citing walking and bicycling as two types of physical activity that are the easiest to adopt and adhere to over the long term. In the *American Journal of Public Health*, it was reported that 43% of people with safe places to walk within 10 minutes of home met recommended activity levels, while just 27% of those without safe places to walk were active.¹⁰

Safety. The incidence of fatal and non-fatal injuries as a result of traffic crashes is closely related to VMT, automobile speed, and traffic volumes. The design of the roadway and street network plays a role in these travel characteristics. Several studies show a relationship between a reduction in VMT to a reduced number of fatal and non-fatal traffic crashes. A study published in the ITE Journal on the Web found that pedestrian crash rates were primarily a function of traffic speed. An increase in the average speed from 20 to 30 miles per hour (mph) was associated with 7.6 times the risk of pedestrian injury (Peterson et al., 2000).

⁹ SR 520 Health Impact Assessment

¹⁰ And while the benefits of physical activity are well established, attaching monetary value to levels of physical activity is more difficult. Active Living Leadership, a national project supported by the Robert Wood Johnson Foundation, and Fifty-Plus Lifelong Fitness, developed an online tool that addresses this challenge. The free Physical Inactivity Cost Calculator estimates the costs of physical inactivity using a scientific formula based on medical care, workers' compensation, and lost productivity data to estimate financial costs related to physical inactivity. The cost can be calculated for a community or a business. Users answer six general demographic questions and the calculator responds by providing an estimate of funds lost due to physically inactive populations. The tool was used to calculate inactivity costs for several jurisdictions around the Puget Sound region. Physical inactivity costs per person ranged from a low of \$840 in Bremerton to \$2,158 in Sammamish. In both those communities, potential savings per year if as little as 5% of inactive people became physically active were \$1,181,767 and \$2,450,964.

Mental Health. The mental health benefits of reduced stress are well documented. Research has shown that the way people travel can increase stress levels. A number of studies have looked at the relationship between driving and stress. An Irvine, California-based study of people with longer commutes predicted increased blood pressure and self-reports of feeling “tense” and “nervous”¹¹. Another study looked at government employees commuting to work in the Washington, D.C. area. The drivers who experienced traffic congestion on a regular basis had higher blood pressure and decreased work performance compared to those who experienced less frequent congestion¹².

The stress of driving can manifest itself in other negative ways, such as aggressive driving and road rage. Examples of aggressive driving include tailgating, frequent honking, verbal exchanges, and socially unacceptable hand gestures. A study by the Surface Transportation Policy Project found that aggressive driving was a factor in 56% of fatal crashes. Comparing results for 70 metropolitan areas, the study found that higher rates of transit use, higher rates of commuting by foot, and fewer miles of highway travel per capita all predicted lower rates of aggressive driving death rates¹³. Apart from the environmental benefits and cost savings, carpools, vanpools, buses, trains, and telecommuting are all preferable from an emotional standpoint¹⁴.

Social Capital. Health professionals also point to the importance of “social capital” in maintaining good health. Social capital can be defined as “the formal and informal social networks, trust, reciprocity, and civic engagement that develop through community interactions.”¹⁵ Social capital is gained through bonding, within homogenous groups, and bridging, within the myriad of places, spaces, and buildings that make up the public realm. People form social capital through formal and informal networks.

Alternative 1:

- Minimal high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Connected network of separated bicycle track/paths in Metropolitan and Core Cities.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in all jurisdictions.
- -3.1% fewer walk trips than Baseline Alternative.
- 0.7% increase in bike trips compared to Baseline Alternative.
- -\$94 million in annual accident reduction benefits compared to Baseline Alternative.

Alternative 2:

- Extensive high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in Metropolitan cities.
- -4.7% fewer walk trips than Baseline Alternative.
- -0.1% fewer bike trips than to Baseline Alternative.
- -\$177 million in annual accident reduction benefits compared to Baseline Alternative.

¹¹ Design, Community, & Environment, Dr. Reid Ewing and Lawrence Frank and Company, Inc, Dr. Richard Kreutzer; Understanding the Relationship Between Health and the Built Environment; Prepared for Leadership in Energy and Environmental Design for Neighborhood Development Core Committee, May 2006

¹² Ibid

¹³ Ibid

¹⁴ Los Angeles Times article, Martin Miller, October 6, 1997 in print edition S-1, accessed on-line 4/13/03

¹⁵ Design, Community, & Environment, Dr. Reid Ewing and Lawrence Frank and Company, Inc, Dr. Richard Kreutzer; Understanding the Relationship Between Health and the Built Environment; Prepared for Leadership in Energy and Environmental Design for Neighborhood Development Core Committee, May 2006

Alternative 3:

- Moderate high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities linking all regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in Metropolitan cities.
- -1.6% fewer walk trips than Baseline Alternative.
- 0.3% increase in bike trips compared to Baseline Alternative.
- -\$52 million in annual accident reduction benefits compared to Baseline Alternative.

Alternative 4:

- Moderate high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in Metropolitan cities.
- 0.5% increase in walk trips compared to Baseline Alternative.
- 0.4% increase in bike trips compared to Baseline Alternative.
- \$1 million in annual accident reduction benefits compared to Baseline Alternative.

Alternative 5:

- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in all jurisdictions.
- 9.0% increase in walk trips compared to Baseline Alternative.
- 1.2% increase in bike trips compared to Baseline Alternative.
- \$168 million in annual accident reduction benefits compared to Baseline Alternative.

Preferred Alternative:

- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investment increases service by approximately 100%, providing core, frequent service to high-capacity transit stations and employment centers and service to and within designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Work towards implementing complete streets policies, including transit-oriented pedestrian design, in all jurisdictions.
- 0% to 2.0% increase in walk trips compared to Baseline Alternative.
- Range of 3.8% to 5.1% increase in bike trips compared to Baseline Alternative.
- Range of -\$26 to \$32 million in annual accident reduction benefits compared to Baseline Alternative.

Findings:

The five alternatives represent different approaches to providing transportation services, emphasizing different amounts of new general purpose freeway capacity, arterial roadway development, high-capacity transit, support for local bus connections, and bicycle and pedestrian infrastructure. As discussed previously for the air quality policy focus, emissions associated with the transportation system would vary across the alternatives, with different impacts to human health. Alternative 5 and the Preferred Alternative would greatly reduce emissions. Other alternatives, including Alternative 2, might result in little change from current emissions levels. The impacts of the

alternatives to human health would also vary based upon the proximity of projects to population concentrations. Alternatives with greater emphasis on non-SOV travel investments—such as Alternatives 4 and 5 and the Preferred Alternative—would likely reduce VMT and associated emissions and yield positive health benefits.

Alternatives with the greatest emphasis on investment in trails and walkways will have more positive impacts on regional parks and open space and provide people with more opportunities to enjoy the natural world, reduce stress, interact with their community, and be physically active. Alternative 1 has the least investment in trails; Alternatives 2, 3, and 4 have a moderate level of investment; and Alternative 5 and the Preferred Alternative have the highest level of investment.

Alternatives with a greater emphasis on providing a more complete local street network and more integrated bicycle and pedestrian infrastructure—such as Alternatives 4 and 5 and the Preferred Alternative—would likely encourage more active transportation, providing health benefits. Improved local connections also create a greater sense of community by allowing people to move more easily and safely around their neighborhoods outside of vehicles, encouraging social interaction and opportunities to build social capital.

Alternatives showing longer trip distances in congested conditions, such as the Baseline Alternative and Alternative 1, will likely contribute to increased levels of stress and negative mental health conditions. Alternatives with more transit and walk trips and fewer VMT—such as Alternatives 3, 4, and 5 and the Preferred Alternative—will likely provide less stress-reducing transportation choices in conjunction with reduced injuries and fatalities for all roadway users.

Alternatives resulting in increased VMT and traffic volume, such as Alternatives 2 and 3, will likely result in an increase in collision rates. Those with lower VMT and traffic volumes—such as Alternatives 3, 4, and 5 and the Preferred Alternative—are more likely to increase safety.

On the whole, Alternatives 4 and 5 and the Preferred Alternative would most likely promote the conditions that would protect and enhance human health.

2.3 Economy

The economic policies focus on creating a prosperous and sustainable regional economy. They incorporate new focus areas, based on the Regional Economic Strategy. The policies are organized around the topics of business, people, and places. This new structure maintains many of the existing policies, but streamlines them while now addressing many new topics. The overarching goal of the Economy section of VISION 2040 is as follows:

"The region will have a prospering and sustainable regional economy by supporting businesses and job creation, investing in all people, sustaining environmental quality, and creating great central places, diverse communities, and high quality of life."

Policy focus: Transportation investments should increase choices and improve workforce mobility and job access near population concentrations

Q. Has mobility and access to jobs improved? What service is added and where?

The region's diverse communities and natural setting are assets that make it a magnet for growth. As the region's economy grows, it must sustain and respect both environmental quality and each community's distinctive identity. This is accomplished by ensuring an adequate supply of housing with good access to employment centers to support job creation. It also requires using public resources and incentives wisely to help implement the Regional Growth Strategy. The strategy focuses a significant share of economic growth in designated centers, seeks to bolster the region's designated MICs, and advances a closer balance between jobs and housing. The Regional Growth Strategy recognizes that designated regional growth centers and MICs currently contain over one-third of the region's current employment. Providing these critical employment centers and other areas of population concentration with an expanded variety of transportation choices will improve workforce mobility and job access.

In addition to simply providing transportation options, it is important to ensure that the traveling public understands how to efficiently do so in a manner that meets their needs. Studies have shown that the presence of marketing and education campaigns can greatly factor into transit and alternative mode use, sometimes increasing the “effectiveness of other TDM strategies by as much as 3%”¹⁶. Additionally, telework has been shown to produce both benefits to employers in terms of employee retention, recruiting, and productivity as well as have an impact on the transportation system. Increasing the use of telework in the region would also result in increased job access as well as ancillary transportation benefits. This section evaluates how the alternatives provide access to transportation improvements and services that link and serve concentrations of employment. It also evaluates how the alternatives provide better traveler information to help support the region’s economic strategy and improve regional mobility. Specific mobility improvements derived from the regional travel demand model—such as changes to travel time, trip distance, and mode choice—are evaluated in the separate Transportation policy section.

Alternative 1:

- Core HOV highway investments improve service to Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Minimal high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Connected network of separated bicycle track/paths in Metropolitan and Core Cities.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Comprehensive regional telework education, outreach, technical assistance, and financial assistance program.

Alternative 2:

- Extensive amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Maintenance of existing TDM programs and minor expansion where feasible to support capacity expansion projects and use of telework.

Alternative 3:

- Moderate amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers, and MICs.
- Moderate high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities linking all regional growth centers and MICs.
- Minor to moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.
- Moderate investment in telework expansion program, including outreach, technical assistance, and financial assistance program.

¹⁶ Victoria Transport Policy Institute. TDM Marketing: Information and Encouragement Programs. <http://www.vtpi.org/tdm/tdm23.htm>. Accessed March 2009.

Shadoff, John, 1996. *Transportation Demand Management; A Guide for Including TDM Strategies in Major Investment Studies and in Planning for Other Transportation Projects*, Office of Urban Mobility, WSDOT.

Alternative 4:

- Minor amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Moderate high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Minor to moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.
- Moderate investment in telework expansion program, including outreach, technical assistance, and financial assistance program.

Alternative 5:

- Minor highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Comprehensive regional telework education, outreach, technical assistance, and financial assistance program.

Preferred Alternative:

- Large amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Targeted arterial investments improve connections and local circulations throughout urban growth areas and in designated regional growth centers and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investments increase service by approximately 100%, providing core, frequent service to high-capacity transit stations and employment centers and service to and within designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Comprehensive regional telework education, outreach, technical assistance, and financial assistance program.

Findings:

To varying degrees, all of the alternatives focus a variety of investments near the region's primary population and employment concentrations: Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. All of the alternatives—with the exception of Alternative 1—offer a wide variety of expanded transportation choices and alternatives to, between, and within regional growth centers and MICs, which would enhance job accessibility.

The alternatives also contain varying levels of investment in employer- and residential-based non-SOV supportive TDM programs that further support accessibility to housing and employment by increasing the efficiency of the transportation system. Strategies that include significant investment in these programs, as well as efforts to increase the use of telework more explicitly, also support improved access to employment and housing.

Alternatives 1 and 5 and the Preferred Alternative contain the most extensive user information and TDM programs. Alternative 2, followed by the Preferred Alternative, provides the most new capital infrastructure that would directly serve and link existing and planned residential and employment centers. Alternatives 3 and 4 provide moderate to minor amounts of new infrastructure and traveler information programs. Alternative 5 and the Preferred Alternative also contain an extensive amount of non-highway-related transportation infrastructure that would directly serve residential and job centers.

With its maintenance and minor improvement of existing highway infrastructure and extensive provision of a variety of transportation options regionwide, combined with extensive TDM, TSM, and roadway pricing policies, **the Preferred Alternative would likely do most to improve workforce mobility and job access to both existing and planned population and employment concentrations.**

Policy focus: Support for businesses, ports, and agencies involved in trade-related activities

Q. Are levels of investment and new services aligned with designated freight routes, ports, and warehousing and distribution areas?

Q. What benefits accrue to freight?

Policy focus: System should improve connections and support for manufacturing/industrial centers

Q. Are levels of investment and new services aligned with MICs and regional geographies with MICs?

Transportation infrastructure and services that support reliable freight and goods movement are also important to implementing the Regional Growth Strategy. Efficient transportation is central to maintaining a strong regional economy. This means investing in strategic projects and programs that support the movement of freight and goods as well as facilities and services that improve access to job locations and residential access to nearby goods and services.

The region has seven designated MICs, which include the region's largest ports and other high concentrations of manufacturing and industrial activity. The region's transportation system should serve these areas.

MICs are primarily located in either Metropolitan Cities or Core Cities. Two MICs (South Kitsap Industrial Area and Frederickson) are located in Unincorporated Urban Growth Areas in Kitsap and Pierce counties, respectively. A portion of Payne Field is located in unincorporated Snohomish County, adjacent to the City of Everett. Major regional investments for transportation and other infrastructure should be prioritized for Metropolitan Cities and Core Cities and Unincorporated Urban Growth Areas with these MIC locations.

Alternative 1:

- Freight Action Strategy ("FAST") Corridor grade separation projects.
- Core HOV highway investments improve service to Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Minimal high-capacity transit investment linking MICs.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving MICs.
- Smallest total benefits for commercial vehicle travel.
- \$55 million increase over Baseline Alternative in annual user benefits to zones with freight-related employment concentrations.

Alternative 2:

- FAST Corridor grade separation projects.
- SR 167 extension and SR 509 extension have distinct benefits to freight operators.
- SR 704 provides new link from western Pierce County to Frederickson.
- Extensive amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities and MICs.
- Minimal high-capacity transit investment linking MICs.

- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving MICs.
- Continuous network of bicycle facilities within and between all MICs.
- \$86 million increase over Baseline Alternative in annual user benefits to zones with freight-related employment concentrations.

Alternative 3:

- FAST Corridor grade separation projects.
- SR 167 extension, SR 509 extension, and SR 18 widening have distinct benefits to freight operators.
- SR 704 provides new link from western Pierce County to Frederickson.
- Moderate amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Minimal high-capacity transit investment linking MICs.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving MICs.
- Continuous network of bicycle facilities linking all MICs.
- Largest total benefits for passenger vehicle travel.
- \$97 million increase over Baseline Alternative in annual user benefits to zones with freight-related employment concentrations. Highest increase of action alternatives.

Alternative 4:

- FAST Corridor grade separation projects.
- Minor amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Minimal high-capacity transit investment linking MICs.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving MICs.
- Continuous network of bicycle facilities within and between all MICs.
- Smallest total benefits for passenger vehicle travel.
- \$81 million increase over Baseline Alternative in annual user benefits to zones with freight-related employment concentrations.

Alternative 5:

- FAST Corridor grade separation projects.
- Minor highway investments improve connections between and serve Metropolitan, Core, and Large Cities and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated MICs.
- Largest total benefits for commercial vehicle travel.
- \$52 million increase over Baseline Alternative in annual user benefits to zones with freight-related employment concentrations.

Preferred Alternative:

- FAST Corridor grade separation projects.
- SR 167 extension and SR 509 extension have distinct benefits to freight operators.
- SR 704 provides new link from western Pierce County to Frederickson.
- Extensive amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.

- Extensive bus transit investments increase service by approximately 100%, providing core, frequent service to high-capacity transit stations and employment centers and service to and within designated regional growth centers and MICs.
- Continuous network of bicycle facilities within and between all MICs.
- Range of \$171 million to \$226 million increase over Baseline Alternative in annual user benefits to zones with freight-related employment concentrations.

Findings:

All of the preliminary draft alternatives include a package of FAST Corridor freight/general purpose roadway grade separation projects to enhance reliability and efficiency in specific freight corridors. Alternatives 2 and 3 and the Preferred Alternative contain freeway widening or extension projects that have been identified as providing particular benefit to freight operators. To varying degrees, all of the alternatives focus a variety of investments in Metropolitan, Core, and Large Cities and MICs. Alternatives 2 and 5 offer a wide variety of expanded transportation choices and alternatives in and between MICs. Alternatives 1, 3, and 4 offer more limited transportation choices to MICs. The Preferred Alternative satisfies the objective of supporting the region's MICs.

The distribution of mobility benefits across user classes varies across the alternatives. Each action alternative provides greater benefits to both passenger and commercial users when compared to the Baseline Alternative. Generally, the action alternatives provide more mobility benefits—per trip and total—to commercial users than to passenger vehicles. The Preferred Alternative results in the largest total benefits for commercial vehicle travel, while Alternative 1 results in the smallest. The Preferred Alternative also results in the largest increase in annual user benefits to zones with freight-related employment, while Alternative 5 results in the smallest increase over the Baseline Alternative.

While Alternatives 3 and 5 would likely support businesses, ports, and agencies involved in trade-related activities and improve connections and support for MICs, the Preferred Alternative shows the largest overall support and benefits for these users and areas.

Policy focus: Support for established and emerging industry clusters

Q. Are levels of investment and new services aligned with industrial clusters?

Industry clusters are geographically concentrated sets of competing and complementary industries that operate in similar markets. They are linked by their buyer-supplier relationships and by their shared reliance on regional universities and other resources.

The central Puget Sound Regional Economic Strategy identified 15 industry clusters key to supporting and growing the region's economy. The clusters were found to be strongly correlated with the region's designated regional growth centers and, to an even stronger extent, to the cities within which the centers reside.

The individual clusters have differing distribution patterns. For example, the Aerospace cluster is strongly associated with designated MICs, as is the Logistics and International Trade cluster, to a lesser degree. The Life Sciences and Clean Technology clusters are concentrated in designated regional growth centers, particularly in centers in Metropolitan Cities. The Information Technology cluster has a regional center focus and strong concentrations in both Metropolitan and Core Cities, although this cluster is more widely spread than the others throughout the urban growth area.

The Regional Economic Strategy emphasizes that multimodal transportation improvements and regional solutions to infrastructure were top opportunities for growing the economy. It also indicates that providing infrastructure can be more important than providing financial incentives for economic growth.

Alternative 1:

- Core HOV highway investments improve service to Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Minimal high-capacity transit investment linking designated regional growth centers.

- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Connected network of separated bicycle track/paths in Metropolitan and Core Cities.
- Support for strong employment growth in designated regional growth centers and MICs.
- Robust population and job growth in designated regional growth centers.
- Robust job retention and moderate job growth in MICs.
- \$56 million increase over Baseline Alternative in annual user benefits to zones with industry cluster-related employment concentrations.

Alternative 2:

- Extensive amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Support for strong employment growth in designated regional growth centers and MICs.
- Robust population and job growth in designated regional growth centers.
- Robust job retention and moderate job growth in MICs.
- \$116 million increase over Baseline Alternative in annual user benefits to zones with industry cluster-related employment concentrations.

Alternative 3:

- Moderate amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs
- Moderate high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities linking all regional growth centers and MICs.
- Support for strong employment growth in designated regional growth centers and MICs.
- Robust population and job growth in designated regional growth centers.
- Robust job retention and moderate job growth in MICs.
- \$179 million increase over Baseline Alternative in annual user benefits to zones with industry cluster-related employment concentrations.

Alternative 4:

- Minor amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Moderate high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Support for strong employment growth in designated regional growth centers and MICs.
- Robust population and job growth in designated regional growth centers.
- Robust job retention and moderate job growth in MICs.
- \$142 million increase over Baseline Alternative in annual user benefits to zones with industry cluster-related employment concentrations.

Alternative 5:

- Minor highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers.

- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Support for strong employment growth in designated regional growth centers and MICs.
- Robust population and job growth in designated regional growth centers.
- Robust job retention and moderate job growth in MICs.
- \$49 million increase over Baseline Alternative in annual user benefits to zones with industry cluster-related employment concentrations.

Preferred Alternative:

- Extensive amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investments increase service by approximately 100%, providing core, frequent service to high-capacity transit stations and employment centers and service to and within designated regional growth centers and MICs.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Support for strong employment growth in designated regional growth centers and MICs.
- Robust population and job growth in designated regional growth centers.
- Robust job retention and moderate job growth in MICs.
- Largest increase, ranging from \$297 million to \$373 million, over Baseline Alternative in annual user benefits to zones with industry cluster-related employment concentrations.

Findings:

Support can be initially assessed through an examination of the distribution of projects and programs relative to regional geographies and designated regional growth centers and MICs. To varying degrees, all of the alternatives focus a variety of investments in Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. These are the locations of many of the region's identified industry clusters. Most alternatives—Alternatives 2, 3, 4, and 5 and the Preferred Alternative—offer a wide variety of expanded transportation choices and alternatives in and between regional growth centers and MICs, while Alternative 1 is more limited. Modeling demonstrated that all alternatives support robust population and employment growth in regional growth centers and support job retention and moderate job growth in MICs. Development in areas where industry clusters are known to be located can be assumed to be to their benefit. The transportation literature also suggests that positive local economic impacts can be attributed to enhanced investment in bicycle infrastructure¹⁷. Alternatives that emphasize these investments may support some additional amount of local economic activity.

The following Transportation section provides more detailed data on commute distances and times, non-work travel distances and times, delay, and travel mode choice for different income groups.

The Preferred Alternative yields by far the most benefits to zones with high concentrations of industry cluster-related employment and could likely satisfy the objective of supporting the 15 industry clusters that lie at the heart of the Regional Economic Strategy. **The Preferred Alternative would likely best support businesses, ports, and agencies involved in trade-related activities and improve connections and support for MICs.**

2.4 Transportation

The region's long-range transportation strategy is to establish a coordinated multimodal transportation system that is integrated with and supportive of regionwide growth management planning objectives. To support the regional vision for focusing growth within the designated urban growth area, especially in identified centers, transportation facilities and programs must contribute to establishing a balanced transportation system that provides enhanced travel options. The transportation policies focus on creating a cleaner, more efficient

¹⁷ *Bicycle-Related Industry Growth in Portland*. Portland, OR Author? (2006).

transportation system, reducing congestion, and providing guidance to the region's metropolitan transportation plan, *Destination 2030*. The overarching goal of the Transportation section of VISION 2040 is as follows:

"The region will have a safe, cleaner, integrated, sustainable, and highly efficient multimodal transportation system that supports the regional growth strategy, promotes economic and environmental vitality, and contributes to better public health."

Policy focus: High priority for maintenance, preservation, and safe operation of existing system

Q. How much investment is devoted to maintenance, preservation, and safe operation?

Federal, state, and regional policy all call for a high priority for maintaining, preserving, and safely operating existing transportation infrastructure before dedicating resources to develop new capacity.

Findings:

A core assumption in each of the alternatives is that full funding of maintenance, preservation, and safe operation of existing assets and facilities would occur prior to allocation of funds or resources for capacity expansion.

In addition, some of the alternatives—such as Alternatives 1 and 5 and the Preferred Alternative—contain a heavy emphasis on transportation system management (TSM) techniques and the provision of expanded bicycle and pedestrian infrastructure and systems. Alternatives that emphasize improvements to management and operation of the transportation system have been shown to improve system safety¹⁸.

Research has also shown that roadways can be operated more safely, and conflicts between motorists and other users reduced, if more people walked or rode bikes on well-maintained facilities. Investments that increase the numbers of people walking and bicycling appear to be an effective route to improving the safety of people walking and bicycling¹⁹.

All Alternatives include a commitment to placing a high priority for maintenance, preservation, and the safe operation of the existing system. Alternatives 1 and 5 and the Preferred Alternative heavily emphasize TSM and bicycle and pedestrian infrastructure, and Alternatives 3, 4, and 5 and the Preferred Alternative include a higher emphasis on TSM through tolling. Only the Preferred Alternative puts heavy emphasis on both TSM and pedestrian infrastructure as well as a higher emphasis on TSM through tolling.

Policy focus: Existing capacity and demand management strategies should be emphasized to reduce need for capital improvements

Q. How much investment is devoted to demand and system management?

TSM and TDM strategies influence how different travel modes operate and provide incentives for individuals to modify how, when, and where they travel. Specifically, TDM strategies aim to increase transit ridership, vehicle occupancy, walking, and bicycling and reduce the duration of some trips, often by moving them to off-peak periods or eliminating them altogether. Together, TSM and TDM strategies can increase the capacity and efficiency of transportation facilities without the need to add major new infrastructure.

As part of the Transportation 2040 alternatives, construction, Intelligent Transportation System (ITS), and operations are considered in each alternative. Because the PSRC travel demand model is not sensitive to ITS technologies, PSRC used ITS Deployment Analysis System (IDAS) to screen and to produce performance measure results that can be used to enhance the PSRC travel model to reflect the effects of ITS deployments. Traveler information, arterial and limited freeway management, and incident management were examined using IDAS.

¹⁸Sunkari, Srinivasa. *The Benefits of Retiming Traffic Signals*. ITE Journal, 2004.

¹⁹ *Injury Prevention* (2003).

Alternative 1:

- Significant investment in, and expansion of, employer-based Commute Trip Reduction programs and employer tools and program delivery organizations designed to encourage telework, non-SOV commuting, and flexible schedules or compressed work weeks.
- Implementation of residential marketing, education, and incentive program.
- Creation of new ridematching facilitation and commute tracking platform.
- Focus on increasing the use of vanpools in the region—58% increase over baseline vanpool investment and policy changes aimed at facilitating VanShare connections.
- Significant expansion of guaranteed ride home services.
- Implement land-use changes and regional parking management program, including new incentives and mechanisms to expand carsharing and promote ridesharing.
- Parking surcharge of 10% to 20% in Growth and Transportation Efficiency Centers (GTECs).
- Connected network of separated bicycle track/paths in Metropolitan and Core Cities and policy changes requiring end of trip facilities within GTECs.
- Minimal capital improvements.
- Significant investments in regional arterial signal coordination, including center to center commutation and adaptive and responsive signal control.
- Deploy integrated corridor management on routes to balance/redistribute demand.
- Active traffic management deployed on freeways.
- Expand incident management and response.
- Expand and integrate traveler information, including route guidance.
- Implement transit signal priority.

Alternative 2:

- Maintenance of existing Commute Trip Reduction programs and little to no additional investment in employer tools.
- Implementation of residential marketing, education, and incentive program.
- Creation of new ridematching facilitation and commute tracking platform.
- Small (17%) increase in vanpool investment over the Baseline Alternative and policy changes aimed at facilitating VanShare connections.
- Incentivize carshare expansion in GTECs.
- Implement regionally coordinated aspects to existing parking management plans focused on encouraging carpool and vanpool parking off-street and short-term users on-street.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Some investment in regional arterial signal coordination.
- Deploy integrated corridor management on routes to balance/redistribute demand.
- Expand incident management and response.
- Expand and integrate traveler information.
- Implement transit signal priority.

Alternative 3:

- Expansion of Commute Trip Reduction programs and modest investment in employer tools and program delivery organizations to support the expansion of telework and flexible work schedules.
- Implementation of residential marketing, education, and incentive program.
- Creation of new ridematching facilitation and commute tracking platform.
- Modest increase in the expansion of vanpool—41% increase in vanpool investment over the Baseline Alternative and policy changes aimed at facilitating VanShare connections.
- Modest expansion of guaranteed ride home services.
- Incentivize carshare expansion in GTECs.
- Encourage land-use changes and implement regional parking management program, including new incentives and mechanisms to expand carsharing and promote ridesharing.
- Parking surcharge of 5% in GTECs.
- Continuous network of bicycle facilities linking all regional growth centers and MICs and incentives for incorporating end of trip facilities into building design in GTECs.

- Moderate investments in regional arterial signal coordination, including some center to center commutation and adaptive and responsive signal control.
- Deploy integrated corridor management on routes to balance/redistribute demand.
- Deploy active traffic management on freeways.
- Expand incident management and response.
- Expand and integrate traveler information.
- Implement transit signal priority.

Alternative 4:

- Expansion of Commute Trip Reduction programs and modest investment in employer tools and program delivery organizations to support the expansion of telework and flexible work schedules.
- Implementation of residential marketing, education, and incentive program.
- Creation of new ridematching facilitation and commute tracking platform.
- Modest increase in the expansion of vanpool—41% increase in vanpool investment over the Baseline Alternative and policy changes aimed at facilitating VanShare connections.
- Modest expansion of guaranteed ride home services.
- Incentivize carshare expansion in GTECs.
- Encourage land-use changes and implement regional parking management program, including new incentives and mechanisms to expand carsharing and promote ridesharing.
- Parking surcharge of 5% in GTECs
- Continuous network of bicycle facilities within and between all regional growth centers and MICs and incentives for incorporating end of trip facilities into building design in GTECs.
- Moderate investments in regional arterial signal coordination, including some center to center commutation and adaptive and responsive signal control.
- Deploy integrated corridor management on routes to balance/redistribute demand.
- Deploy active traffic management on freeways.
- Expand incident management and response.
- Expand and integrate traveler information.
- Implement transit signal priority.

Alternative 5:

- Significant investment in, and expansion of, employer-based Commute Trip Reduction programs and employer tools and program delivery organizations designed to encourage telework, non-SOV commuting, and flexible schedules or compressed work weeks.
- Implementation of residential marketing, education, and incentive program.
- Creation of new ridematching facilitation and commute tracking platform.
- Focus on increasing the use of vanpools in the region—58% increase over baseline vanpool investment and policy changes aimed at facilitating VanShare connections.
- New incentives and mechanisms to expand carsharing and promote ridesharing.
- Implement land-use changes and regional parking management program.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Policy changes requiring end of trip facilities within GTECs.
- Extensive investments in regional arterial signal coordination, including center to center commutation and adaptive and responsive signal control.
- Deploy integrated corridor management on routes to balance/redistribute demand.
- Deploy active traffic management on freeways.
- Expand incident management and response.
- Expand and integrate traveler information including route guidance.
- Implement transit signal priority.

Preferred Alternative:

- Significant investment in, and expansion of, employer-based Commute Trip Reduction programs and employer tools and program delivery organizations designed to encourage telework, non-SOV commuting, and flexible schedules or compressed work weeks.
- Implementation of residential marketing, education, and incentive program.
- Creation of new ridematching facilitation and commute tracking platform.
- Focus on increasing the use of vanpools in the region—58% increase over baseline vanpool investment and policy changes aimed at facilitating VanShare connections.
- New incentives and mechanisms to expand carsharing and promote ridesharing.
- Implement land-use changes and regional parking management program.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Policy changes requiring end of trip facilities within GTECs.
- Extensive investments in regional arterial signal coordination, including center to center commutation and adaptive and responsive signal control.
- Deploy integrated corridor management on routes to balance/redistribute demand.
- Deploy active traffic management on freeways.
- Expand incident management and response.
- Expand and integrate traveler information including route guidance.
- Implement transit signal priority.

Findings:

The Baseline Alternative, five draft alternatives, and the Preferred Alternative include a wide range of emphasis on TDM and TSM strategies. Alternatives 1 and 5 and the Preferred Alternative are largely designed around high levels of management strategies and assume a significant increase in investment in TSM and TDM from all levels of government and the private sector. Alternative 2 relies very little on additional TSM or TDM improvements, focusing on low-cost strategies. Alternatives 3 and 4 assume the availability of some additional funding and incorporate corresponding program expansion and improvement at the employer and residential level, particularly in high-density areas. Due to the unique nature of all of these programs and strategies, potential benefits they may offer are not captured in the quantitative analysis provided by the regional travel demand model.

Alternatives 1 and 5 and the Preferred Alternative place the most emphasis on TDM and TSM strategies as approaches to managing and operating the region's transportation system and would likely best meet the policy objective of maximizing existing capacity to reduce need for capital improvements.

Policy focus: System makes costs of transportation more explicit to user

Q. How are transportation tolls and fees transparently tied to use of the system?

When the costs of transportation (including a user's time, environmental, and other resource costs) are explicit to the users (in the form of tolls, fares, tariffs, or other charges), then measures of demand for transportation services are unbiased, and operating revenues are available to support the continuation or enhancement of transportation services.

Alternative 1:

- Toll funding has minimal application; little of system cost explicit to users.
- Revenues used to operate tolled facilities.
- Toll rates are set to maximize efficiency.

Alternative 2:

- Toll funding has minimal application; little of system cost explicit to users.
- Revenues used to fund highway expansion in tolled corridors.
- Toll rates are set to maximize revenues.

Alternative 3:

- Toll funding has moderate application; some system cost explicit to users.
- Revenues used to fund highway and some transit expansion in tolled corridors.
- Toll rates are set to maximize revenues.

Alternative 4:

- Toll funding has extensive application; much of system cost explicit to users.
- Revenues used to fund highway, arterial, nonmotorized, and transit expansion systemwide.
- Toll rates are set to maximize efficiency.

Alternative 5:

- Toll funding has extensive application; most of system cost explicit to users.
- Revenues are used to fund highway, arterial, nonmotorized, and transit expansion systemwide.
- Toll rates are set to maximize efficiency.

Preferred Alternative:

- Toll funding has extensive application; most of system cost explicit to users.
- Revenues are used to fund highway, arterial, nonmotorized, and transit expansion systemwide.
- Toll rates are set to maximize efficiency.

Findings:

The alternatives were all designed with some aspect of tolling as a revenue generator, a TSM tool, or both. Alternatives 1 and 2 assume very little revenue derived from tolling. Alternatives 3, 4, and 5 and the Preferred Alternative assume much more extensive applications of tolling that would be highly explicit for users. Depending upon the alternative, the application of toll-generated revenues would be limited to the construction and operation of specific projects (Alternatives 1, 2, and 3), or more widely available for a variety of transportation projects and programs either in a specific corridor or regionwide (Alternatives 4 and 5 and the Preferred Alternative).

Alternatives 4 and 5 and the Preferred Alternative have the most extensive application of explicit pricing strategies for users.

Policy focus: Investment emphasis is not on single occupant vehicle (SOV) travel

Policy focus: System offers a variety of transportation choices

Q. Are levels of investment/new services distributed across a variety of transportation modes/choices?

Q. To what degree are levels of investment/new services in non-SOV modes/infrastructure?

The region's aggressive, long-range growth management and transportation goals depend on providing more efficient and effective public transportation services. To provide for the future mobility of the growing number of people living and working in the region, regional policies prioritize investments in transportation projects, programs, and services that produce greater efficiency, reduce trips, and provide more choices—such as transit, ferry services, trails, bicycle lanes, and passenger rail. Evolving from an automobile-dependent region to one where numerous travel options are available and attractive requires ongoing investment in public transportation, rideshare, demand-response systems and services, and TDM programs.

Alternative 1:

- Moderate investment in expanding and supporting bus transit.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Extensive investment in TSM technologies and techniques to actively manage transportation infrastructure.
- Connected network of separated bicycle track/paths in Metropolitan and Core Cities.
- Minimal capital improvements, including little investment in general purpose highway capacity.

Alternative 2:

- Moderate investment in expanding and supporting bus transit.
- Extensive investment in high-capacity transit.
- Maintenance of existing TDM programs and minor expansion where feasible to support capacity expansion projects.
- Minimal investment in TSM.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- Extensive investment in general purpose highway capacity.

Alternative 3:

- Moderate investment in expanding and supporting bus transit.
- Minimal investment in high-capacity transit.
- Minor - moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.
- Moderate investment in TSM.
- Continuous network of bicycle facilities linking all regional growth centers and MICs.
- Extensive investment in general purpose highway capacity.

Alternative 4:

- Moderate investment in expanding and supporting bus transit.
- Moderate investment in high-capacity transit.
- Minor to moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.
- Moderate investment in TSM.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.

Alternative 5:

- Extensive investment in expanding and supporting bus transit.
- Extensive investment in high-capacity transit.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Extensive investment in TSM technologies and techniques to actively manage transportation infrastructure.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Little investment in general purpose highway capacity.

Preferred Alternative:

- Extensive investment in expanding and supporting bus transit.
- Extensive investment in high-capacity transit.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Extensive investment in TSM technologies and techniques to actively manage transportation infrastructure.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- Extensive investment in general purpose highway capacity.

Findings:

Alternatives 1, 4, and 5 do not rely upon non-SOV strategies to provide greater mobility, while Alternatives 2 and 3 rely upon a mix of non-SOV and general purpose roadway investments, which would largely support SOV travel.

The Preferred Alternative represents a hybrid of extensive non-SOV investments along with provision of significant new highway and arterial capacity in the core of the urban growth area, many identified as critical infrastructure for freight and goods movement.

Each of the alternatives also contains a mix of TDM strategies that promote the use of non-SOV modes. Alternatives 1 and 5 and the Preferred Alternative focus on significantly expanding these programs, while Alternative 2 proposes minimal new investment. Alternatives 3 and 4 contain a moderate expansion of TDM. Impacts that these programs have on the transportation network vary by strategy and by application, yet research has shown that TDM strategies, in combination with alternative mode investments, are often some of the most cost-effective approaches for increasing the efficiency of the transportation network.

Similarly, Alternatives 1 and 5 and the Preferred Alternative place great emphasis on TSM investments, which benefit both SOV and non-SOV users. Alternative 2 contains a minimal TSM component, while Alternatives 3 and 4 make moderate use of TSM investments.

All of the alternatives provide some level of additional transit service. Alternatives 1 and 3 focus on moderate expansion of bus transit, Alternatives 2 and 5 and the Preferred Alternative combine moderate to extensive new bus service with extensive investments in rail or high-capacity transit, and Alternative 4 provides moderate investment in both bus and rail transit.

Alternative 5 and the Preferred Alternative put great emphasis on developing an extensive and integrated network of nonmotorized facilities to provide additional travel options.

With its mix of extensive investment in bus and rail transit, significant investment in TDM and TSM programs and technologies, and extensive investment in nonmotorized programs and infrastructure, Alternative 5 places the least emphasis on supporting SOV travel and would likely provide the most comprehensive mix of new transportation choices. While the Preferred Alternative also contains all of these non-SOV-related improvements and strategies, its more extensive highway and arterial investments place relatively more emphasis on SOV travel.

Policy focus: Transit and non-SOV modes account for an increased proportion of trips

Q. How will people travel?

Investments in a wide array of transit, carpool, and nonmotorized facilities and services are present in all of the alternatives. The alternatives incorporate a variety of TDM strategies focused on increasing the use of non-SOV modes through education, promotion, and incentives. Research has shown that by educating the traveling public about available transportation alternatives and providing incentives to utilize transit and rideshare, the region can increase the share of trips made by non-SOV modes. Model statistics, displayed in Section 3 of this report, demonstrate the different mode shares of trip making among the alternatives. Note that because travel demand models are often insensitive to factors that may influence trip-making behavior, these data may not reflect the full effects of TDM strategies and programs present in the alternatives.

Alternative 1

- Significant investment in employer- and residential-based outreach, education, and incentive programs designed to increase public transportation, bicycle, and pedestrian mode share.
- Aggressively expand ridesharing through the creation of new ridematching facilitation tools and significant investment in vanpool expansion.
- Non-SOV work trip share of 31.8% of total work trips, compared to Baseline Alternative share of 30.5% (2006 share was 24.7%).
- Little to no change in non-SOV non-work trip share compared to the Baseline Alternative share of 61.4% (2006 share was 62.8%).
- Total average daily transit boardings increase over 2006 by 133%.
- Transit work trips increase by 136% over 2006, rising to a 16.7% share of work trips.

- Transit non-work trips increase by 132% over 2006, rising to a 2.3% share of non-work trips, with little difference between alternatives.
- The carpool work trip share was similar to the 2006 share, varying little between the alternatives.
- The carpool non-work trip share decreased by approximately 3% compared to the 2006 share, but varied little between the alternatives.
- Walk/bike work trip shares increased slightly compared to 2006, but there was little variation among the action alternatives.
- Walk/bike non-work trip shares increase slightly compared to 2006, but with the exception of Alternative 5, the action alternatives varied little from the Baseline Alternative.

Alternative 2

- Maintain existing employer-based TDM programs and implement basic residential-based outreach, education, and incentive program.
- Encourage ridesharing by creating new ridematching platform and slightly increase vanpools over the baseline investment.
- Non-SOV work trip share decreases to 29.5% of total work trips, compared to the Baseline Alternative share of 30.5% (2006 share was 24.7%).
- Little to no change in non-SOV non-work trip share compared to the Baseline Alternative share of 61.4% (2006 share was 62.8%).
- Total average daily transit boardings increase over 2006 by 105%.
- Transit work trips increase by 115% over 2006, rising to 15.1% share of work trips.
- Transit non-work trips increase by 94% over 2006, rising to 2.0% share of non-work trips, with little difference between alternatives.
- The carpool work trip share was similar to the 2006 share, varying little between the alternatives.
- The carpool non-work trip share decreased by approximately 3% compared to the 2006 share, but varied little between the alternatives.
- Walk/bike work trip shares increased slightly compared to 2006, but there was little variation among the action alternatives.
- Walk/bike non-work trip shares increase slightly compared to 2006, but with the exception of Alternative 5, the action alternatives varied little from the Baseline Alternative.

Alternative 3

- Expand employer-based TDM programs and implement residential-based outreach, education, and incentive program.
- Increase ridesharing by creating new ridematching platform and moderately increasing vanpools over the baseline investment.
- Non-SOV work trip share increases to 31.5% of total work trips, compared to the Baseline Alternative share of 30.5% (2006 share was 24.7%).
- Little to no change in non-SOV non-work trip share compared to the Baseline Alternative share of 61.4% (2006 share was 62.8%).
- Total average daily transit boardings increase over 2006 by 115%.
- Transit work trips increase by 128% over 2006, rising to 16.2% share of work trips.
- Transit non-work trips increase by 99% over 2006, rising to 2.0% share of non-work trips, with little difference between alternatives.
- The carpool work trip share was similar to the 2006 share, varying little between the alternatives.
- The carpool non-work trip share decreased by approximately 3% compared to the 2006 share, but varied little between the alternatives.
- Walk/bike work trip shares increased slightly compared to 2006, but there was little variation among the action alternatives.
- Walk/bike non-work trip shares increase slightly compared to 2006, but with the exception of Alternative 5, the action alternatives varied little from the Baseline Alternative.

Alternative 4

- Expand employer-based TDM programs and implement residential-based outreach, education, and incentive program.
- Increase ridesharing by creating new ridematching platform and moderately increasing vanpools over the baseline investment.
- Non-SOV work trip share increases to 32.5% of total work trips, compared to the Baseline Alternative share of 30.5% (2006 share was 24.7%).
- Little to no change in non-SOV non-work trip share compared to the Baseline Alternative share of 61.4% (2006 share was 62.8%).
- Total average daily transit boardings increase over 2006 by 122%.
- Transit work trips increase by 138% over 2006, rising to 16.9% share of work trips.
- Transit non-work trips increase by 103% over 2006, rising to 2.1% share of non-work trips, with little difference between alternatives.
- The carpool work trip share was similar to the 2006 share, varying little between the alternatives.
- The carpool non-work trip share decreased by approximately 3% compared to the 2006 share, but varied little between the alternatives.
- Walk/bike work trip shares increased slightly compared to 2006, but there was little variation among the action alternatives.
- Walk/bike non-work trip shares increase slightly compared to 2006, but with the exception of Alternative 5, the action alternatives varied little from the Baseline Alternative.

Alternative 5

- Significant investment in employer- and residential-based outreach, education, and incentive programs designed to increase public transportation, bicycle, and pedestrian mode share.
- Aggressively expand ridesharing through the creation of new ridematching facilitation tools and significant investment in vanpool expansion.
- Non-SOV work trip share increases to 34.8% of total work trips, compared to the Baseline Alternative share of 30.5% (2006 share was 24.7%).
- Little to no change in non-SOV non-work trip share compared to the Baseline Alternative share of 61.4% (2006 share was 62.8%).
- Total average daily transit boardings increase over 2006 by 153%.
- Transit work trips increase by 168% over 2006—the largest increase of any alternative, rising to 19.1% share of work trips.
- Transit non-work trips increase by 136% over 2006, rising to 2.4% share of non-work trips, with little difference between alternatives.
- The carpool work trip share was similar to the 2006 share, varying little between the alternatives.
- The carpool non-work trip share decreased by approximately 3% compared to the 2006 share, but varied little between the alternatives.
- Walk/bike work trip shares increased slightly compared to 2006, but there was little variation among the action alternatives.
- Walk/bike non-work trip shares increase by 3.5% compared to 2006; with a 14.6% share, this is the highest of the alternatives.

Preferred Alternative:

- Significant investment in employer- and residential-based outreach, education, and incentive programs designed to increase public transportation, bicycle, and pedestrian mode share.
- Aggressively expand ridesharing through the creation of new ridematching facilitation tools and significant investment in vanpool expansion.
- Non-SOV work trip share ranges from 32.9% to 34.9% of total work trips, compared to the Baseline Alternative share of 30.5% (2006 share was 24.7%).
- Little to no change in non-SOV non-work trip share compared to the Baseline Alternative share of 61.4% (2006 share was 62.8%).
- Total average daily transit boardings increase over 2006 by 160%.

- Transit work trips increase by between 144% and 165% over 2006—the second largest increase of any alternative, rising to between 17.4% and 19.% share of work trips.
- Transit non-work trips increase by a range of 133% to 147% over 2006, rising to 2.5% share of non-work trips. There is little difference between alternatives.
- The carpool work trip share was slightly higher than the 2006 share, ranging between 9.1% and 9.4% of work trips. This was also slightly higher than the other alternatives, which otherwise varied little.
- The carpool non-work trip share decreased by approximately 3% compared to the 2006 share, but varied little between the alternatives.
- Walk/bike work trip shares increased slightly compared to 2006, but there was little variation among the action alternatives.
- Walk/bike non-work trip shares increase slightly compared to 2006, but with the exception of Alternative 5, the action alternatives varied little from the Baseline Alternative.

Findings.

Compared to shares observed in 2006, all of the alternatives increased the share of non-SOV work trips by between 5% and 10%. Alternative 5 and the Preferred Alternative are heavily focused on increasing transit use, ridesharing (carpool and vanpool), and nonmotorized transportation, and result in the highest shares of non-SOV work trips—increasing the share over 10%, compared to 2006 (the Preferred Alternative ranges between 32.9% and 34.9%). This represents an avoidance of nearly 200,000 daily SOV trips compared to Alternative 2, which accounted for the highest number of SOV trips among the alternatives. Alternative 2 increased the share of regional non-SOV work trips by 5%, the lowest increase of the alternatives. The Baseline Alternative increased non-SOV work trip share by just under 6%. Alternatives 1, 3, and 4 all slightly increased the shares of non-SOV work trips compared to the Baseline Alternative. Strategies and projects in Alternatives 3, 4, and 5 and the Preferred Alternative seem to best promote the use of non-SOV modes.

Taken together, little change in any of the alternatives was observed in the share of non-SOV non-work trips compared to shares observed in 2006. Shares of individual non-SOV modes did vary slightly among the alternatives, most noticeably in walk/bike share in Alternative 5. While the overall non-SOV non-work shares changed only marginally, they accommodated as much as 2.8 million additional daily trips compared to 2006.

Average daily transit boardings more than doubled in all of the alternatives compared to 2006 boardings. Growth ranged from an increase of 105% in both the Baseline Alternative and Alternative 2, to as much as 160% increase in the Preferred Alternative, highest of the alternatives. Alternative 5 demonstrates the next highest increase (153%), followed by Alternatives 1, 4, and 3 (133%, 122%, and 115% respectively).

Carpool work trips also increased, ranging from a 37% increase in Alternative 1 to a 54% increase in Alternative 4. The Preferred Alternative ranged between a 48% and 52% increase. There was little difference in growth of non-work carpool trips across the alternatives, all of which grew approximately 28% to 31%.

Walk/bike work trip growth compared to 2006 ranged from a low of 56% in the Baseline Alternative, to a high of 82% in both Alternatives 1 and 5. The Preferred Alternative ranged between a 71% and a 73% increase. Growth in non-work walk/bike trips compared to 2006 ranged from a low of 54% in Alternative 2 to a high of 79% in Alternative 5, with the Preferred Alternative in the middle of the overall range at between 61% and 65%. Alternative 5's highest overall work and non-work trip walk/bike shares of 6.8% and 14.6% represent 100,000 daily work trips and over 1,000,000 non-work trips.

While all of the alternatives result in higher non-SOV travel shares, Alternatives 1 and 5 and the Preferred Alternative accommodate the highest overall proportions of both work and non-work trips by non-SOV modes.

Policy focus: Improved mobility/accessibility

Q. Does the region have improved mobility?

Improved mobility and accessibility can be evaluated through a number of measures, including total volumes of trips, VMT, trip times and distances, vehicle speeds, and delay.

Mobility measures were also designed to evaluate the primary benefits to transportation system users of each transportation alternative. Benefits were defined as travel time savings, reliability benefits, vehicle operating cost savings, and other user costs. Both the benefits and costs are measured as a monetary value so they can be combined to produce a benefit-cost result.

Alternative 1

- Approximately 40% growth in total daily trips compared to 2006, similar to growth in the Baseline Alternative.
- Average total daily VMT increases 34% compared to 2006; per capita VMT is 21.4, a 5% reduction from 2006.
- Average work trip times are forecast to increase from 36 minutes in 2006 to 38 minutes in 2040.
- Non-work trip times remain steady at 18 minutes.
- Work trip lengths remain stable in all alternatives.
- Non-work trip lengths decline by 1 to 2 miles in all alternatives compared to 2006.
- Total travel times for work and non-work trips will remain fairly constant, at about 21 minutes.
- Arterial speeds are predicted to drop from 22 mph in the base year to between 20 and 21 mph for all the alternatives in 2040. Differences between the alternatives in peak and off-peak hours are not significant.
- When compared to 2006 freeway speeds of 41 mph, average freeway speeds would decline to 38 mph.
- Average daily freeway hours of delay increase by 67% compared to 2006.
- Average daily arterial hours of delay increase by 58% compared to 2006.
- Total average daily hours of delay increase by 61% compared to 2006.
- Greater mobility benefits than the Baseline Alternative (\$2 billion).

Alternative 2

- Approximately 40% growth in total daily trips compared to 2006, similar to growth in the Baseline Alternative.
- Average total daily VMT increases 39% compared to 2006; per capita VMT is 22.2, a 1% reduction from 2006.
- Average work trip times are forecast to increase from 36 minutes in 2006 to 38 minutes in 2040.
- Non-work trip times remain steady at 18 minutes.
- Work trip lengths remain stable in all alternatives.
- Non-work trip lengths decline by 1 to 2 miles in all alternatives compared to 2006.
- Total travel times for work and non-work trips will remain fairly constant, at about 21 minutes.
- Arterial speeds are predicted to drop from 22 mph in the base year to between 20 and 21 mph for all the alternatives in 2040. Differences between the alternatives in peak and off-peak hours are not significant.
- When compared to 2006 freeway speeds of 41 mph, average freeway speeds would decline to 39 mph.
- Average daily freeway hours of delay increase by 63% compared to 2006.
- Average daily arterial hours of delay increase by 58% compared to 2006.
- Total average daily hours of delay increase by 60% compared to 2006.
- Greater mobility benefits than the Baseline Alternative (\$2.8 billion).

Alternative 3

- Approximately 40% growth in total daily trips compared to 2006, similar to growth in the Baseline Alternative.
- Average total daily VMT increases 31% compared to 2006; per capita VMT is 20.9, a 7% reduction from 2006.
- Average work trip times are forecast to increase from 36 minutes in 2006 to 38 minutes in 2040.
- Non-work trip times remain steady at 18 minutes.
- Work trip lengths remain stable in all alternatives.
- Non-work trip lengths decline by 1 to 2 miles in all alternatives compared to 2006.
- Total travel times for work and non-work trips will remain fairly constant, at about 21 minutes.
- Arterial speeds are predicted to drop from 22 mph in the base year to between 20 and 21 mph for all the alternatives in 2040. Differences between the alternatives in peak and off-peak hours are not significant.
- When compared to 2006 freeway speeds of 41 mph, average freeway speeds increase to 45 mph in the year 2040. These speeds are 30% to 35% higher than the Baseline Alternative, and 25% to 30% higher than Alternatives 1 and 2.
- Average daily freeway hours of delay decrease by 20% compared to 2006.

- Average daily arterial hours of delay increase by 68% compared to 2006.
- Total average daily hours of delay increase by 39% compared to 2006.
- Greater mobility benefits than the Baseline Alternative (\$4.4 billion).

Alternative 4

- Approximately 40% growth in total daily trips compared to 2006, similar to growth in the Baseline Alternative.
- Average total daily VMT increases 28% compared to 2006; per capita VMT is 20.4, a 10% reduction from 2006.
- Shorter trip time than the Baseline Alternative.
- Average work trip times are forecast to increase from 36 minutes in 2006 to 41 minutes in 2040.
- Non-work trip times remain steady at 18 minutes.
- Work trip lengths remain stable in all alternatives.
- Non-work trip lengths decline by 1 to 2 miles in all alternatives compared to 2006.
- Total travel times for work and non-work trips will remain fairly constant, at about 21 minutes.
- Arterial speeds are predicted to drop from 22 mph in the base year to between 20 and 21 mph for all the alternatives in 2040. Differences between the alternatives in peak and off-peak hours are not significant.
- When compared to 2006 freeway speeds of 41 mph, average freeway speeds increase to 45 mph in the year 2040. These speeds are 30% to 35% higher than the Baseline Alternative, and 25% to 30% higher than Alternatives 1 and 2.
- Average daily freeway hours of delay decrease by 24% compared to 2006.
- Average daily arterial hours of delay increase by 81% compared to 2006.
- Total average daily hours of delay increase by 46% compared to 2006.
- Greater mobility benefits than the Baseline Alternative (\$4.2 billion).

Alternative 5

- Approximately 39% growth in total daily trips compared to 2006, similar to growth in the Baseline Alternative.
- Average total daily VMT increases 18% compared to 2006; per capita VMT is 18.9, a 16% reduction from 2006.
- Average work trip times are forecast to increase from 36 minutes in 2006 to 42 minutes in 2040.
- Non-work trip times decrease to 16 minutes.
- Work trip lengths remain stable in all alternatives.
- Non-work trip lengths decline by 1 to 2 miles in all alternatives compared to 2006.
- Total travel times for work and non-work trips will remain fairly constant, at about 20 minutes.
- Arterial speeds are predicted to drop from 22 mph in the base year to between 20 and 21 mph for all the alternatives in 2040. Differences between the alternatives in peak and off-peak hours are not significant.
- When compared to 2006 freeway speeds of 41 mph, average freeway speeds increase to 48 mph in the year 2040. These speeds are 30% to 35% higher than the Baseline Alternative, and 25% to 30% higher than Alternatives 1 and 2.
- Average daily freeway hours of delay decrease by 52% compared to 2006.
- Average daily arterial hours of delay increase by 60% compared to 2006.
- Total average daily hours of delay increase by 23% compared to 2006.
- Greater mobility benefits than the Baseline Alternative (\$4.2 billion).

Preferred Alternative:

- Approximately 39% growth in total daily trips compared to 2006, similar to growth in the Baseline Alternative.
- Average total daily VMT increases between 25% and 29% compared to 2006; per capita VMT ranges from 19.9 to 20.6, an 8% to 12% reduction from 2006.
- Average work trip times are forecast to remain unchanged compared to 2006 at 36 to 37 minutes in 2040.
- Non-work trip times decrease to 17 minutes.
- Work trip lengths remain stable in all alternatives.
- Non-work trip lengths decline by 1 to 2 miles in all alternatives compared to 2006.
- Total travel times for work and non-work trips will remain fairly constant, at about 20 to 21 minutes.

- Arterial speeds are predicted to drop or remain steady from 22 mph in the base year to between 20 and 22 mph for all the alternatives in 2040. Differences between the alternatives in peak and off-peak hours are not significant.
- When compared to 2006 freeway speeds of 41 mph, average freeway speeds increase to between 47 and 49 mph in the year 2040. These speeds are 30% to 35% higher than the Baseline Alternative, and 25% to 30% higher than Alternatives 1 and 2.
- Average daily freeway hours of delay decrease by between 32% and 50% compared to 2006.
- Average daily arterial hours of delay increase by 34% to 55% compared to 2006.
- Total average daily hours of delay increase by 6% to 25% compared to 2006.
- Greatest overall mobility benefits ranging from \$6.2 to \$7.8 billion).

Findings:

Total Trips: There is no significant difference across alternatives in the total number of trips forecast for the year 2040, or for the number of vehicles owned. From a baseline forecast of 19.2 million person trips, the other alternatives vary by at most 33,000 trips—less than one half of one percent. From a forecast of 3.7 million vehicles owned in the Baseline Alternative, the action alternatives differ by at most 15,000 total vehicles—again, less than one half of one percent.

Vehicle Miles Traveled (VMT): Total daily VMT is forecast to grow in the year 2040 under each alternative. Total daily VMT will increase from 79 million miles in the base year of 2006 to between 94 million and 110 million miles. Total regional VMT was projected to grow the least (18%) in Alternative 5 and the most (39%) under Alternative 2. The range of VMT growth in the Preferred Alternative was the second least. Since 1990, the region's per capita VMT has remained fairly stable, at about 23 miles per day. Results of the travel demand model for the plan alternatives show this trend may bend over the coming 30 years. Per capita daily VMT is forecast to drop from 22.5 miles in the base year (2006) for all the alternatives.

Alternative 5 would result in the greatest per capita VMT reduction (16%), dropping from the current 22.5 miles to 18.9 miles. The Preferred Alternative followed with a reduction of 9% to 12%. Alternative 2 would show only a very slight reduction in per capita VMT, dropping from 22.5 to 22.2 miles (1%). All the other alternatives would reduce per capita VMT between 5% and 10% by the year 2040.

Trip Times: With the exception of the Preferred Alternative, which remains stable, average work trip times are forecast to increase under all the alternatives, from 36 minutes in 2006 to between 38 and 42 minutes in 2040. Alternatives 1 through 5 will all perform better (reduce work trip times) than the Baseline Alternative. Non-work trip times are predicted to remain steady at 18 minutes, with the exceptions of Alternative 5, where non-work trip times would decrease to 16 minutes, and the Preferred Alternative, where trip times decrease to 17 minutes. Total travel times for work and non-work trips will remain fairly constant, at about 21 minutes.

When all trips are combined, trips in the Baseline Alternative would take the longest (22 minutes), and Alternative 5 and the Preferred Alternative would produce the shortest trip times (20 minutes).

Trip Lengths: The length of an average work trip is forecast to remain stable under all plan alternatives, at about 13 miles in 2040. Non-work trips will decrease under all the alternatives, from an average of 6 miles in 2040 to 4 miles for Alternative 5, and 5 miles for the other alternatives, including the Preferred Alternative. Total length for all trips will not change significantly from the base year, remaining at between 6 and 7 miles in the year 2040.

Speeds: Arterial speeds are predicted to drop from 22 mph in the base year to between 20 and 21 mph for all the alternatives in 2040. Similarly, differences between the alternatives in peak and off-peak hours are not significant, with all peak hour speeds at 22 to 23 mph, and non-peak speeds between 25 and 28 mph. In contrast, freeway travel speeds are forecast to vary considerably across the alternatives, with some showing decreased speeds from 2006 and others producing higher freeway speeds.

Alternatives 3 through 5 and the Preferred Alternative show strong gains in speed on the freeway system. When compared to 2006 freeway speeds of 41 mph, average freeway speeds in the Baseline Alternative and Alternatives

1 and 2 would decline to 35, 38, and 39 mph respectively. Alternatives 3 through 5 would result in considerable gains in freeway speeds, to 45 and 48 mph in the year 2040. The highest freeway speed (49 mph) is found in the Preferred Alternative. These speeds are 30% to 35% higher than the Baseline Alternative and 25% to 30% higher than Alternatives 1 and 2.

Delay: In the base year (2006) the region experienced 281,000 hours of daily freeway delay and 560,000 hours of delay on the arterials, for a total of 841,000 hours per day. By the year 2040 total delay on freeways and arterials is forecast to increase for all the alternatives, ranging from between 6% and 25% (Preferred Alternative) to 72% (Baseline Alternative). Delay on arterials will grow by between 34% and 66%. The range of arterial delay growth (34% to 55%) is seen in the Preferred Alternative.

When looking at delay, there are significant differences between the alternatives. The Baseline Alternative would generate the most daily freeway delay (513,000 hours). Alternative 1 is next highest, with 469,000 hours of freeway delay, and Alternative 2 would result in 458,000 hours. Alternatives 3 and 4 would perform significantly better, reducing daily freeway delay from current levels (281,000 hours) to between 224,000 and 214,000 hours. These freeway delay figures represent reductions from 2006 levels of 20% for Alternative 3 and 24% for Alternative 4.

The best performing alternative on the measure of freeway delay is Alternative 5. This alternative would reduce average daily freeway delay by 52% below current levels, to 136,000 hours in 2040. The Preferred Alternative displays similar performance, with a range of average daily freeway delay of between 32% and 50% below current levels. When compared with the Baseline Alternative, both Alternative 5 and the Preferred Alternative would experience reductions in all four measures: VMT, VHT, freeway delay, and arterial delay.

Mobility Benefits: Each of the action alternatives produces greater mobility benefits in aggregate than the Baseline Alternative. Total user benefits range from \$2 billion to \$7.8 billion. The Preferred Alternative yields the greatest overall mobility benefits, ranging between \$6.2 billion and \$7.8 billion, followed by Alternative 3 (\$4.4 billion), Alternative 4 (\$4.2 billion), Alternative 5 (\$4.17 billion), Alternative 2 (\$2.8 billion), and Alternative 1 (\$2.0 billion).

The Preferred Alternative yields the greatest mobility benefits attributable to travel time savings (\$5.0 billion to \$6.4 billion). Alternative 5 yields the greatest travel reliability benefits (\$1.3 billion). The Preferred Alternative results in the greatest vehicle operating cost savings (up to \$213 million). Alternative 5 has the highest costs to users (least benefits) associated with paying tolls (-\$457 million in 2040). Refer to Criteria M1 through M4 – Annual Transportation Mobility Benefits.

When looking at improvements to VMT reduction, trip times, trip lengths, speeds, and delay, the Preferred Alternative appears to best improve regional mobility and accessibility.

Policy focus: Commercial movement more reliable and efficient

Q. Are levels of investment/new services aligned with designated freight routes, ports, and warehousing/distribution areas? Is freight movement improved?

Refer to the previously described “Support for businesses, ports, and agencies involved in trade-related activities,” “System should improve connections and support for manufacturing/industrial centers,” and “Support for established and emerging industry clusters” policy focus areas for a discussion of how the levels and distribution of projects, programs, and services are aligned with freight generation and service areas. The following section examines benefits of the range of alternatives to commercial users of the region’s transportation system.

Alternative 1:

- \$799 million in time savings benefits to commercial users.
- \$202 million in travel reliability benefits to commercial users.
- -\$85 million in operating and ownership costs savings to commercial users.
- \$3 million in other costs savings to commercial users.

Alternative 2:

- \$983 million in time savings benefits to commercial users.
- \$254 million in travel reliability benefits to commercial users.
- -\$51 million in operating and ownership costs savings to commercial users.
- \$7 million in other costs savings to commercial users.

Alternative 3:

- \$1.8 billion in time savings benefits to commercial users.
- \$569 million in travel reliability benefits to commercial users.
- -\$130 million in operating and ownership costs savings to commercial users.
- \$37 million in other costs savings to commercial users.

Alternative 4:

- \$1.9 billion in time savings benefits to commercial users.
- \$635 million in travel reliability benefits to commercial users.
- -\$7 million in operating and ownership costs savings to commercial users.
- \$45 million in other costs savings to commercial users.

Alternative 5:

- \$2.3 billion in time savings benefits to commercial users.
- \$748 million in travel reliability benefits to commercial users.
- -\$110 million in operating and ownership costs savings to commercial users.
- \$39 million in other costs savings to commercial users.

Preferred Alternative:

- \$1.9 billion to \$2.2 billion in time savings benefits to commercial users.
- \$588 million to \$638 million in travel reliability benefits to commercial users.
- -\$68 million to \$50 million in operating and ownership costs savings to commercial users.
- \$44 million to \$53 million in other costs savings to commercial users.

Findings:

All plan alternatives will include investments in the region's roadway system, which will have positive impacts on freight and goods mobility. Criteria M1 through M4 – Annual Transportation Mobility Benefits display the annual benefits (in millions of 2008 dollars) that would accrue to commercial users in three categories (light trucks, medium trucks, and heavy trucks) from the plan alternatives (in terms of change from the Baseline Alternative). All categories of system users will receive benefits under each of the alternatives. Overall commercial-related benefits increase, as a share of total benefits, with Alternatives 3, 4, and 5 and the Preferred Alternative. Whereas commercial benefits would account for about 50% of total benefits with Alternatives 1 and 2, the share of benefits to commercial users would increase to 54% in Alternative 3, 64% in Alternative 4, 63% in Alternative 5, and decrease to between 37% and 40% of total user benefits. While the Preferred Alternative would produce the greatest overall user benefit, Alternatives 4 and 5 would have the greatest benefits to freight users.

The Preferred Alternative, along with Alternatives 3, 4, and 5, appear to yield the greatest reliability and mobility benefits for freight.

Policy focus: Sustainable, user-oriented, and balanced transportation system

Q. Are levels of investment/new services distributed across a variety of transportation modes/choices?

Q. Are investments based on people/goods movement rather than vehicle throughput?

Quality transportation is about personal mobility and the movement of freight and goods. It places a priority on an effective system, rather than on a specific mode of transportation. Cars, buses, bicycles, streetcars, walking, and trains are all modes of transportation. Developing particular facilities should not be the end goal; rather, the result

should be improved personal mobility and creating a user-oriented transportation system. Convenience, safety, travel time, flexibility, options, and cost are key features of a user-oriented system.

Sustainable transportation involves the efficient and environmentally sensitive movement of people, information, goods, and services, with attention to health and safety. It includes the design of walkable cities and bikeable neighborhoods, as well as using telework and other travel options. Sustainable transportation minimizes the environmental impacts of transportation, including reducing air pollutants and greenhouse gases. It relies on cleaner, renewable resources for energy and on dependable financing mechanisms.

A sustainable, user-oriented transportation system should be affordable. In 2003, according to the Bureau of Labor Statistic's Consumer Expenditure Survey, the combined expenditure on housing and transportation for the average income family in the United States reached the second-highest level in 20 years, 52%, second only to the combined share in 2002 at 52.2% (the survey did not capture more recent rising gasoline and housing prices). Food, apparel, and housing are tracked as basic necessities, but transportation is not. For 28 major U.S. Metropolitan Statistical Areas, the Seattle area ranked 12th for the percentage of household expenditures on transportation. Lower-income households are hardest hit²⁰.

A household's ability to replace vehicle use with walking and biking translates into a lower portion of its budget going to transportation, which is especially important in places where housing costs are becoming increasingly unaffordable. Investments that improve affordable travel options and land use accessibility tend to provide consumer savings, increase transportation affordability, and support equity objectives. National data show that there is an inverse relationship between household spending on transportation and housing: households that spend more on transportation spend less on housing, and vice versa²¹.

Alternative 1:

- Core HOV highway investments improve service to Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Minimal high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers and MICs.
- Connected network of separated bicycle track/paths in Metropolitan and Core Cities.
- FAST Corridor grade separation projects.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.
- Least total mobility benefits to areas in region with high concentrations of minority residents and people in poverty.

Alternative 2:

- Extensive amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers and MICs.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers and MICs.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- FAST Corridor grade separation projects.
- SR 167 extension and SR 509 extension have distinct benefits to freight operators.
- SR 704 provides new link from western Pierce County to Frederickson.
- Maintenance of existing TDM programs and minor expansion where feasible to support capacity expansion projects.

²⁰ Center for Neighborhood Technology and Surface Transportation Policy Project, Driven to Spend: Pumping Dollars Out of Our Households and Communities, www.transact.org, 2005.

²¹ Ibid

Alternative 3:

- Moderate amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Moderate high-capacity transit investment linking designated regional growth centers.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers and MICs.
- Continuous network of bicycle facilities linking all regional growth centers and MICs.
- FAST Corridor grade separation projects.
- SR 167 extension, SR 509 extension, and SR 18 widening have distinct benefits to freight operators.
- SR 704 provides new link from western Pierce County to Frederickson.
- Minor to moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.
- Largest total mobility benefits to areas in region with high concentrations of minority residents and people in poverty.

Alternative 4:

- Minor major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Moderate high-capacity transit investment linking designated regional growth centers and MICs.
- Moderate bus transit investment acting as feeder service to high-capacity transit stations and supporting and serving designated regional growth centers and MICs.
- Continuous network of bicycle facilities within and between all regional growth centers and MICs.
- FAST Corridor grade separation projects.
- Minor to moderate investment in TDM programs and strategies, including expanding employer and residential programs, guaranteed ride home and vanpooling, encouraging land-use change, and implementing regionally coordinated parking management.

Alternative 5:

- Minor highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs.
- Extensive high-capacity transit investment linking designated regional growth centers.
- Extensive bus transit investment acting as feeder service to high-capacity transit stations, and supporting and serving designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between designated regional growth centers and MICs.
- FAST Corridor grade separation projects.
- Significant investment in TDM strategies, including the expansion of employer- and residential-based commuter programs and tools, vanpools, guaranteed ride home services, as well as implementing land-use change and parking management.

Preferred Alternative:

- Extensive amount of major highway investments improve connections between and serve Metropolitan, Core, and Large Cities; designated regional growth centers; and MICs. Primarily provides access to and between centers. Eighty-seven percent (87%) of highway and arterial investments are within or directly serve Metropolitan Cities and Core Cities.
- Extensive high-capacity transit investment linking and within designated regional growth centers and MICs.
- Extensive bus transit investment increases service by approximately 100%, providing core, frequent service to high-capacity transit stations and employment centers and service to and within designated regional growth centers.
- Extensive and integrated network of nonmotorized facilities (segregated bicycle tracks/paths and pedestrian routes) and transit linkages between and within designated regional growth centers and MICs.
- Significant investment in expanding employer-based and other TDM strategies in all regional growth centers.

- FAST Corridor grade separation projects.
- SR 167 extension and SR 509 extension have distinct benefits to freight operators.
- SR 704 provides new link from western Pierce County to Frederickson.
- Maintenance of existing TDM programs and minor expansion where feasible to support capacity expansion projects.

Findings:

Most alternatives—Alternatives 2, 3, 4, and 5 and the Preferred Alternative—offer a wide variety of expanded transportation choices and alternatives throughout the region, while the Baseline Alternative and Alternative 1 are more limited.

Roadway investments range from extensive capital expansion programs in Alternatives 2 and 3 and the Preferred Alternative, to minor investments in Alternatives 1, 4, and 5 to improve key connections. These are improvements to an already extensive regional highway and arterial system.

All of the action alternatives contain some form of expanded transit service, from moderate bus service expansion in Alternative 1 to extensive bus transit and high-capacity transit investment in Alternatives 2 and 5 and the Preferred Alternative. Moderate mixes of new bus and rail transit are included in Alternatives 3 and 4.

TDM and TSM strategies are incorporated into the preliminary alternatives by varying degrees based on the design philosophy of each. Alternatives 1 and 5 and the Preferred Alternative are heavily focused on maximizing the efficiency of the existing system, and as such contain high-cost TDM and TSM strategies. Alternative 2 is focused on capital expansion and less on managing the system and system demand. The Preferred Alternative also includes a large amount of capital expansion. Alternatives 3 and 4 fall in the middle, assuming moderate additional revenues will be available to expand programs in the higher-density areas of the region. The full effectiveness of these programs may not be captured in the quantitative analysis provided by the regional travel demand model.

Bike and pedestrian investments range from limited connected networks of bicycle and pedestrian infrastructure in Alternative 1, to the extensive and integrated network of segregated bicycle tracks/paths, pedestrian routes, and transit linkages between designated regional growth centers and MICs throughout the region found in Alternative 5 and the Preferred Alternative.

All of the preliminary draft alternatives include a package of Freight Action Strategy (“FAST Corridor”) freight/general purpose roadway grade separation projects to enhance reliability and efficiency in specific freight corridors. Alternatives 2 and 3 and the Preferred Alternative contain freeway widening or extension projects that have been identified as providing particular benefit to freight operators.

When looking at improvements to convenience, safety, travel time, flexibility, travel options, and cost relative to available revenues, the Preferred Alternative best meets these key features of a user-oriented system.

Through an emphasis on improvement to the connectivity of local streets, paths, and bike facilities, the Preferred Alternative would most directly encourage the design of walkable cities and bikeable neighborhoods. It contains a focus on using telework and other TDM and TSM investments to encourage travel options and efficient use of existing infrastructure and services before investment in additional capital infrastructure. Alternative 5 is most effective in minimizing the environmental impacts of transportation, including reducing air pollutants and greenhouse gases. The Preferred Alternative follows Alternative 5 on these measures. It relies on cleaner, renewable resources for energy and on dependable, user-generated toll finance mechanisms.

On balance, the Preferred Alternative is most likely to produce a sustainable, user-oriented, and balanced transportation system.

3. EVALUATION CRITERIA

The evaluation criteria represent an accessible and comparative means of measuring progress toward the policy objectives set forth in VISION 2040. The criteria are not the only means through which VISION 2040 has guided the development and evaluation of transportation alternatives. VISION 2040 policies were also used as a screen during the development of transportation plan alternatives, and the Transportation 2040 environmental review process includes a broad range of other quantitative and qualitative information about the growth and environmental consequences of transportation choices. The evaluation criteria were developed, however, to address the overarching goals of the transportation planning process. The criteria measures are grouped into seven categories:

1. Mobility
2. Finance
3. Growth Management
4. Economic Prosperity
5. Environmental Stewardship
6. Quality of Life
7. Equity

Individual metrics were developed to quantify different aspects of each evaluation criterion. The descriptions of the criteria include the name of the measure, the unit of measurement (and data source, where applicable), the rationale for why the measure is meaningful (as well as what other metrics are related, where applicable), and a brief discussion of the results.

Some metrics represent a different means to measure transportation benefits (or impacts) than has been commonly used in the past. An example is vehicle miles traveled (VMT), which is commonly used as a proxy for measuring congestion or air quality impacts. In these metrics, we are directly measuring congestion as a function of travel time savings and directly measuring the cost of emissions as a function of vehicle speeds and distance, so there is no direct need to use VMT as a proxy measure for these other metrics. In fact, reporting VMT would produce a duplicative effect of measuring both the proxy metric and the actual metric, based on the same underlying data.

Many of the criteria measures are estimated in monetary values so they can be included in a benefit-cost result. The advantages of the benefit-cost approach are that both benefits and costs can be combined to assess the potential economic consequences of a particular transportation alternative. The disadvantage is that non-monetizable measures, such as growth management or economic prosperity, cannot be directly included. The full set of evaluation criteria set forth herein recognizes the advantages of the benefit-cost method but combines this with other quantitative and qualitative measures to provide a more comprehensive assessment of each alternative. Also, we are including some additional and legacy metrics at the end of this section of the report.

Measures are produced through the application of PSRC's integrated land-use and transportation models, the direct inputs to these models (the geodatabase representing transportation networks), or the economic accounting of modeled data in a benefit-cost analysis software program. An overview of these tools can be found at http://www.psrc.org/assets/1819/models_overview_0309.pdf. More detailed documentation of these tools is also available on the PSRC website, <http://www.psrc.org/data/models>. Benefit-cost analysis in particular relies upon monetary equivalents of numerous other measures, such as the value of time saved. Where available, these values are taken directly from direct observations or estimates derived from existing models, such as the travel demand models. In other cases these values are taken from the large body of economic literature available on the subject. More on the PSRC benefit-cost analysis methods can be found at <http://www.psrc.org/data/models/benefit-cost-analysis/>.

Each step in any analysis process entails some elements of uncertainty, whether in underlying forecasts about economic performance, model specification, or other key assumptions. The point of these measures, however, is comparative analysis, and to this end the data were generated in a manner that is consistent across each alternative. As a reporting convention, many of these measures are presented as changes from the 2040 Baseline conditions. It is important to remember that the Baseline is a plausible state of the world in the future. The Baseline was designed to

represent conditions given that transportation investments and policies are constrained by current law, and reasonable expectations about new available revenues that do not represent substantial new authority. As a consequence of an iterative design process, the Baseline does include some select investments that are likely beyond the reach of currently authorized revenues sources, but these were kept to a minimum and are expected to be funded through the extension of current practices and policies.

3.1 Mobility

Mobility measures are designed to capture the primary benefits to transportation system users of each transportation alternative. In this context, benefits are defined as travel time savings, reliability benefits, vehicle operating cost savings, and other user costs. Both the benefits and costs are measured as a monetary value so they can be combined to produce a benefit-cost result. There are four mobility metrics: (a) travel time savings, (b) improved reliability, (c) operating cost, and (d) other user costs.

Measure:	M1. Travel Time Savings							
Unit:	The dollar value of the travel time savings by mode and vehicle type (based on Benefit-Cost Analysis).							
Rationale:	There have been many studies of travel-time savings that have established that the value of travel time saved is closely linked to the wage rate of passengers in autos and transit vehicles, and the wages paid to drivers plus the time cost of cargo inventory for commercial vehicles. All else being equal, those alternatives where the value of travel time savings is highest will be preferred. The travel time savings are a measure of consumer surplus, where time savings are valued at the values of time that are used in the travel demand model. Consumer surplus is the difference between the maximum that consumers would be willing to pay for a good and what they actually do pay. This measure does not include nonmotorized benefits.							
Discussion:	In total, Alternatives 3 and 5 provide greater travel time benefits (about \$3.5 billion each in year 2040) than the other alternatives (ranging between \$1.8 billion and \$2.9 billion each). The Preferred Alternative (Full Plan) provides the most benefits to SOV travel (\$2.2 billion). The Preferred Alternative (Full Plan) provides the most benefits to HOV travel (\$530 million). The Preferred Alternative (Full Plan) provides the most benefits to transit travel (\$1.5 billion). Alternative 5 provides the most benefits to commercial travel (\$2.25 billion).							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		\$1.85 billion	\$2.51 billion	\$3.44 billion	\$2.89 billion	\$3.56 billion	\$5.02 billion	\$6.39 billion

Measure:	M2. Improved Reliability Benefits							
Unit:	The dollar value of changes in travel time variability by mode and vehicle type (based on Benefit-Cost Analysis).							
Rationale:	Users of the transportation system value travel time reliability as well as time savings for a typical trip. Greater predictability in travel time reduces the costs associated with the scheduling of activities. Changes in travel time variability (cost risk) can be converted into a time certainty equivalent (where a user is indifferent between a known increment of time and a distribution of probable travel time risks) and then valued the same as travel time savings. All else being equal, those alternatives where the value of reliability benefits is highest will be preferred.							
Discussion:	<p>In total, Alternatives 3, 4, and 5 and the Preferred Alternative (Constrained and Full Plan) provide greater improved reliability benefits (between \$1 billion and \$1.3 billion each in year 2040) than Alternative 1 (\$290 million) and Alternative 2 (\$410 million).</p> <p>The Preferred Alternative (Full Plan) provides the most benefits to SOV travel (\$470 million). Alternative 5 provides the most benefits to HOV travel (\$80 million). Alternative 5 provides the most benefits to commercial travel (\$750 million).</p>							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		\$290 million	\$410 million	\$1.00 billion	\$1.14 billion	\$1.29 billion	\$1.07 billion	\$1.18 billion

Measure:	<i>M3. Vehicle Operating and Ownership Benefits</i>							
Unit:	The dollar value of vehicle operating and ownership cost savings by mode and vehicle type <i>(based on Benefit-Cost Analysis)</i> .							
Rationale:	The operation and ownership of vehicles involves real resource costs (maintenance, fuel, oil, etc.) that are associated with using the transportation system. Alternatives that result in less reliance upon the use of vehicles will demand less economic resources, all else being equal. There is an extensive literature for vehicles of all types that relates changes in network use characteristics to vehicle cost savings. However, these savings can in part be offset by changes in household wealth associated with the changing value of vehicles as demand for vehicles increases or decreases compared to some baseline condition.							
Discussion:	Alternative 2 sees the largest losses in user benefits associated with rising vehicle operation and ownership costs. The Preferred Alternative (Full Plan) sees the largest gains as vehicle operation and ownership costs decline compared to the Baseline.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		-\$93 million	-\$189 million	-\$125 million	\$200 million	\$13 million	\$73 million	\$213 million

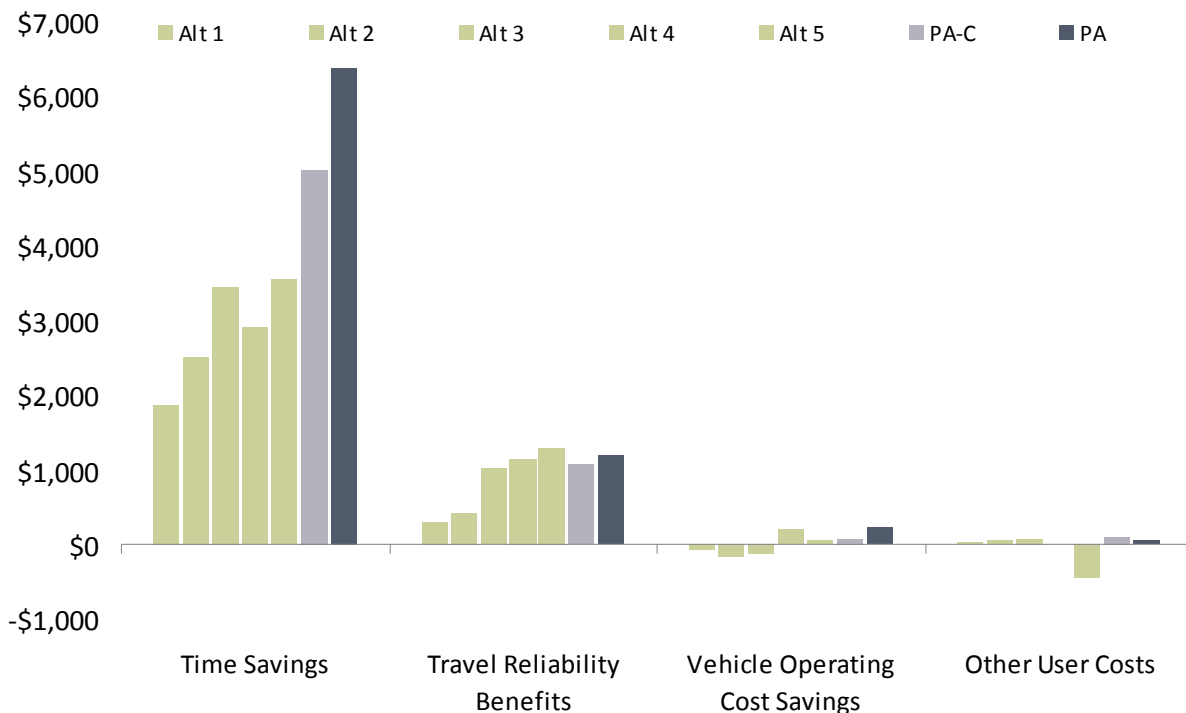
Measure:	M4. Other User Benefits							
Unit:	The dollar value of changes in user benefits from paying user fees, beyond the actual cash payments (based on Benefit-Cost Analysis).							
Rationale:	The paying of user fees can involve real resource costs (changes in travel behavior toward a less preferred mode, route, time of travel, etc.) that exceed the user fee cash payments. Alternatives that result in larger losses in user benefits (consumer surpluses) associated with tolling are less desirable than alternatives with minimal such losses, all else being equal. Actual cash payments of user fees are treated as both a cost to the user and a benefit to the operator, and a correct accounting of these fees is important to understanding the usefulness of the investments to society as a whole.							
Discussion:	Alternative 5 has the highest costs to users (least benefits) associated with paying tolls: -\$470 million in 2040. These costs are losses in well-being that result from living with less preferred choices when faced with toll payments. Other alternatives have costs that range between -\$15 million and \$89 million.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		\$17 million	\$38 million	\$77 million	-\$15 million	-\$457 million	\$89 million	\$34 million

Annual Transportation Mobility Benefits (Change from 2040 Baseline)

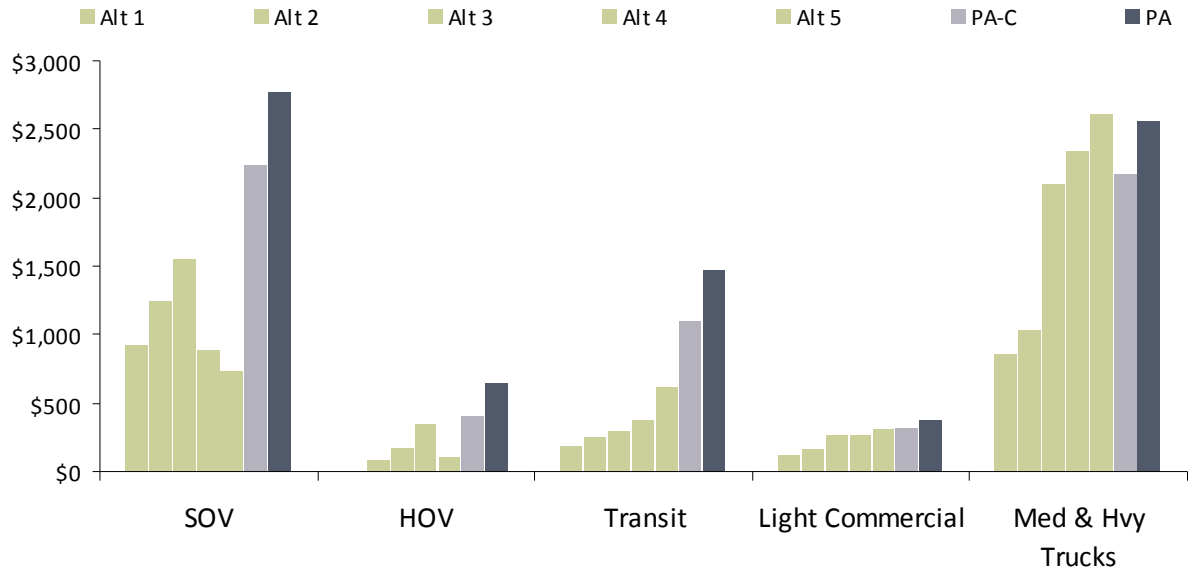
(millions of 2008 dollars)							
Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Time Savings							
SOV	\$836	\$1,152	\$1,123	\$364	\$581	\$1,682	\$2,203
HOV	\$28	\$115	\$183	\$224	\$108	\$309	\$530
Transit	\$181	\$261	\$297	\$370	\$618	\$1,096	\$1,469
Commercial	\$799	\$983	\$1,837	\$1,931	\$2,252	\$1,928	\$2,187
Total	\$1,845	\$2,511	\$3,440	\$2,889	\$3,559	\$5,016	\$6,390
Travel Reliability Benefits							
SOV	\$126	\$175	\$387	\$422	\$461	\$425	\$474
HOV	-\$36	-\$21	\$45	\$79	\$80	\$52	\$66
Transit	NA	NA	NA	NA	NA	NA	NA
Commercial	\$202	\$254	\$569	\$635	\$748	\$588	\$638
Total	\$293	\$408	\$1,001	\$1,136	\$1,290	\$1,065	\$1,178
Vehicle Operating and Ownership Costs Savings							
SOV	-\$52	-\$111	\$3	\$165	\$103	\$105	\$120
HOV	-\$11	-\$23	-\$55	\$38	\$19	\$29	\$33
Transit	\$1	-\$1	\$2	\$4	\$19	\$6	\$10
Commercial	-\$29	-\$55	-\$73	-\$3	-\$109	-\$68	\$50
Total	-\$92	-\$189	-\$124	\$204	\$32	\$73	\$213
Other User Costs Savings							
SOV	\$11	\$28	\$35	-\$63	-\$402	\$31	-\$31
HOV	\$2	\$4	\$5	\$3	-\$95	\$15	\$13
Transit	NA	NA	NA	NA	NA	NA	NA
Commercial	\$3	\$7	\$37	\$45	\$39	\$44	\$53
Total	\$17	\$38	\$77	-\$15	-\$457	\$89	\$34
Total User Benefits	\$2,062	\$2,768	\$4,394	\$4,214	\$4,424	\$6,242	\$7,815

Annual Mobility Benefits by Type Relative to 2040 Baseline

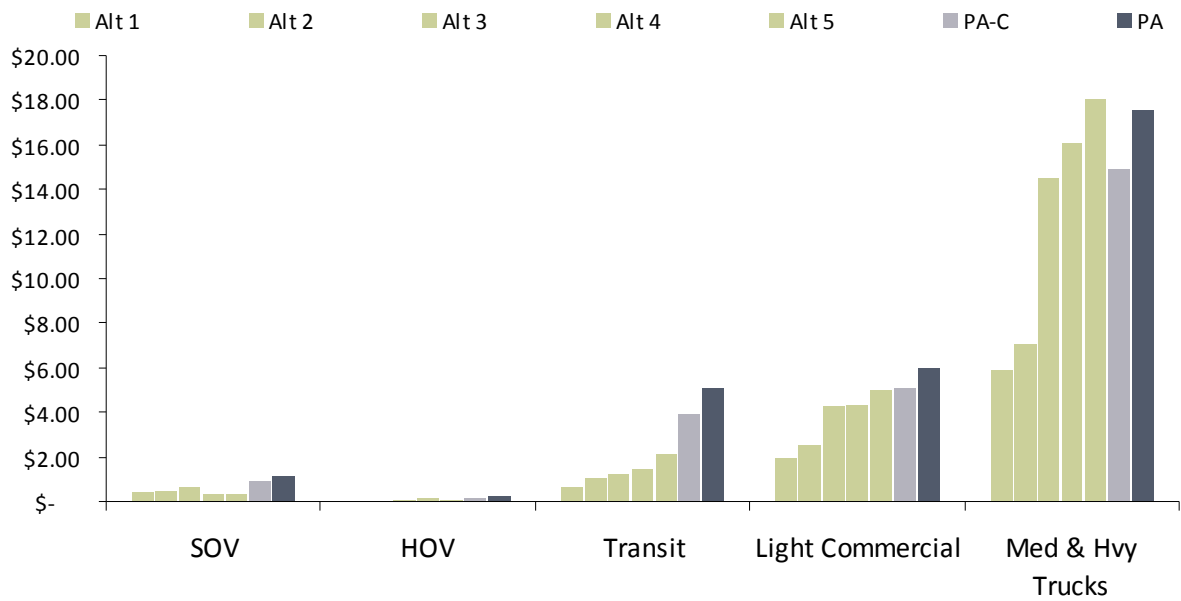
(benefits in millions of dollars per year)



Annual Mobility Benefits Relative to the 2040 Baseline
(millions of 2008 dollars)



Mobility Benefits per Trip Relative to the 2040 Baseline



3.2 Finance

In addition to the mobility metrics, there are measures of transportation system costs that are categorized under the Finance criteria. These include (a) facility operating cost, (b) capital cost, (c) operating revenues, and (d) the influence of finance on the economy. Two additional metrics also identify benefits measured as a monetary value: emissions costs savings and accident cost savings, listed under Environmental Stewardship and Quality of Life. All of these measures can be included in an estimate of a benefit-cost result.

Measure:	F1. Facility Operating Cost							
Unit:	The costs for operating the transportation investments (beyond the Baseline) included in the alternative.							
Rationale:	Economic resources are required to operate transportation system facilities and services. These resources are most usefully compared to the various benefits that result from the facilities and services. For any given set of benefits, the alternatives with lower operating costs will be preferred.							
Discussion:	Compared with the Baseline, the Preferred Alternative (Full Plan) has the highest facility operating costs in 2040. These are dominated by increases in transit operations. The Preferred Alternative (Constrained Plan) has the next highest additional facility operating costs, while Alternative 2 has the lowest additional facility operating costs.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		-\$360 million	-\$160 million	-\$300 million	-\$550 million	-\$1.01 billion	-\$1.57 billion	-\$2.60 billion

Measure:	F2. Capital Cost							
Unit:	The capital costs for implementing the transportation investments (beyond the Baseline) included in the alternative.							
Rationale:	Economic resources are required to make capital improvements to transportation system facilities and services. These resources are most usefully compared to the various benefits that result from the facilities and services. For any given set of benefits, the alternatives with lower capital costs will be preferred.							
Discussion:	Compared with the Baseline, the Preferred Alternative (Full Plan) has the highest costs associated with capital investments in transportation systems; these are estimated at \$2.8 billion (per year) in 2040. Alternatives 3, 4, and 5 have annual capital costs that are fairly similar in magnitude (\$1.7 billion in 2040), but vary considerably in the type of investment they support. Of all the action alternatives, Alternative 1 has the lowest annual capital cost at approximately \$640 million in 2040.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		-\$640 million	-\$2.31 billion	-\$1.67 billion	-\$1.65 billion	-\$1.70 billion	-\$1.56 billion	-\$2.77 billion

Measure:	F3. Operating Revenues							
Unit:	The revenues generated as part of the operations of the transportation improvements or programs.							
Rationale:	Revenues raised through payments made by users of the transportation system can contribute to the financing of transportation investments. Alternately, these revenues can offset other existing taxes and fees. Operating revenues are both a cost to the user and a benefit to the operator, so a correct accounting of these revenues is important to understanding the usefulness of the investments to society as a whole.							
Discussion:	Compared with the Baseline, Alternative 5 generates the highest operating revenues (over \$7 billion from tolling the complete road network) in 2040. Alternatives 3 and 4 involve tolling large portions of the highway networks and generate between \$3 billion and \$4 billion in annual revenues in 2040. Alternatives 1 and 2 include networks of High Occupancy Toll Lanes that generate more modest tolling revenues. The Preferred Alternative generates between \$3.5 billion (Constrained Plan) and \$5.4 billion (Full Plan) in annual operating revenues.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		\$182 million	\$257 million	\$2.9 billion	\$3.7 billion	\$7.1 billion	\$3.5 billion	\$5.4 billion

Measure:	<i>F4. Influence of Finance on the Economy</i>							
Unit:	These are the value of economic displacement in dollars that results from increases in general taxes to pay for the transportation investments included in the alternative.							
Rationale:	When transportation funds are not generated from user fees, broader tax instruments must be implemented to finance investments. These broader tax instruments have potential consequences on economic activity by distorting non-transportation-related economic decisions and displacing productive economic activity. This measure will estimate the magnitude of this economic displacement as a consequence of the non-user-fee financing requirements for each alternative.							
Discussion:	Compared to the Baseline, Alternative 2 requires the most new revenue that is not generated from direct fees for use of the transportation system. As a result, it is estimated that Alternative 2 will result in the largest economic displacement (-\$363 million per year in 2040) associated with new taxes. Alternative 5 relies less on tax instruments than even the Baseline Alternative, and as a result provides the opportunity to lessen economic displacement by about \$138 million in 2040.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		-\$134 million	-\$363 million	-\$46 million	\$44 million	\$138 million	\$103 million	\$224 million

FINANCIAL SUMMARY 2010-2040

(millions of year 2008 constant dollars)

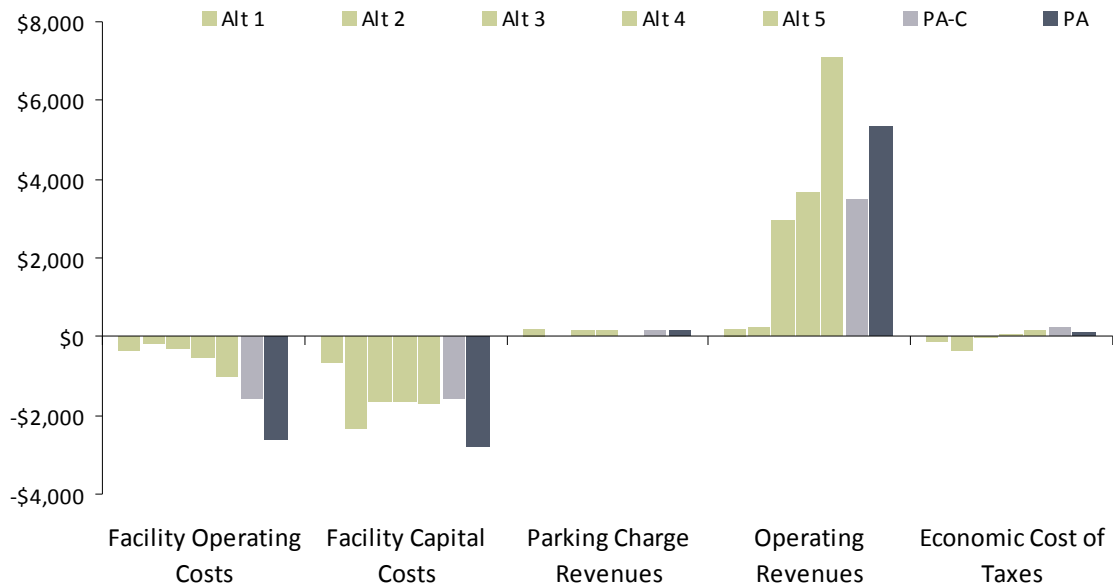
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Counties	\$ 15,100	\$ 15,400	\$ 18,200	\$ 15,300	\$ 16,000	\$ 15,400	\$ 15,700	\$ 16,500
Cities	\$ 25,300	\$ 26,800	\$ 28,500	\$ 26,600	\$ 27,700	\$ 27,400	\$ 26,700	\$ 27,400
Local Transit	\$ 41,600	\$ 47,400	\$ 45,200	\$ 47,700	\$ 50,400	\$ 50,300	\$ 57,300	\$ 62,100
Sound Transit	\$ 32,400	\$ 33,200	\$ 42,100	\$ 33,800	\$ 39,200	\$ 56,600	\$ 39,900	\$ 58,500
State Ferries	\$ 8,200	\$ 8,200	\$ 8,200	\$ 8,200	\$ 8,200	\$ 8,200	\$ 8,200	\$ 8,200
State Highways	\$ 14,200	\$ 22,600	\$ 50,100	\$ 45,000	\$ 36,000	\$ 22,800	\$ 36,500	\$ 45,500
Passenger-Only Ferries	\$ 500	\$ 1,300	\$ 800	\$ 1,000	\$ 1,300	\$ 1,300	\$ 500	\$ 1,300
ITS/Operations	\$ 300	\$ 2,900	\$ 1,300	\$ 1,600	\$ 1,600	\$ 2,900	\$ 1,600	\$ 2,900
Demand Management	\$ 600	\$ 1,800	\$ 600	\$ 1,200	\$ 1,200	\$ 1,800	\$ 1,500	\$ 1,800
Regional Non-motorized	\$ 100	\$ 200	\$ 200	\$ 200	\$ 200	\$ 600	\$ 300	\$ 500
Toll System	\$ -	\$ 600	\$ 1,000	\$ 3,200	\$ 3,000	\$ 3,700	\$ 3,000	\$ 3,700
Other Total	\$ 1,300	\$ 6,700	\$ 3,900	\$ 7,100	\$ 7,300	\$ 10,300	\$ 6,800	\$ 10,200
TOTAL	\$ 138,100	\$ 160,300	\$ 196,200	\$ 183,700	\$ 184,800	\$ 191,000	\$ 191,100	\$ 228,400

Annual Transportation Finance (Change from 2040 Baseline)

	(millions of 2008 dollars)						
Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Facility Operating Costs	-\$326	-\$161	-\$302	-\$514	-\$1,030	-\$1,565	-\$2,595
Facility Capital Costs	-\$641	-\$2,312	-\$1,673	-\$1,652	-\$1,703	-\$1,558	-\$2,767
Economic Cost of Taxes	-\$134	-\$363	-\$46	\$44	\$138	\$224	\$103
Parking Charge Revenues	\$184	-\$1	\$146	\$141	-\$6	\$144	\$143
Operating (User) Revenues	\$182	\$257	\$2,942	\$3,658	\$7,098	\$3,497	\$5,358

Annual Revenues and Costs Relative to the 2040 Baseline

(millions of 2008 dollars)



3.3 Growth Management

Growth management measures have been defined to assess the degree to which each transportation alternative meets or exceeds the regional guidance for distribution of population and employment within the region set forth in the VISION 2040 Regional Growth Strategy. VISION 2040's Regional Growth Strategy provides specific numeric guidance for a future development pattern with fewer environmental impacts and a more compact regional urban form. VISION 2040 provides guidance for the distribution of growth to *regional geographies*, which are defined by the idea that different types of cities and unincorporated areas will play distinct roles in the region's future. These evaluation criteria are designed to measure the degree to which the transportation alternative produces a growth pattern that exceeds the minimum guidance. There are four growth management measures: (a) population in regional geographies, (b) employment in regional geographies, (c) balance of jobs to housing in regional geographies, and (d) population and jobs in regional growth centers and jobs in MICs.

Measure:	<i>GM1. Population</i>						
Unit:	Number of persons within each of six regional geographies (<i>based on Land Use Model Forecasts</i>).						
Rationale:	A hallmark of VISION 2040 is its Regional Growth Strategy that provides specific numeric guidance to achieve a development pattern with fewer environmental impacts and a more compact urban form. VISION 2040 provides guidance for the distribution of growth to regional geographies, which are defined by the distinct roles they will play in the region's future. The Regional Growth Strategy focuses the majority of the region's employment and housing growth into both Metropolitan and Core Cities. The centers in these cities are intended to attract residents and businesses because of their proximity to services and jobs, a variety of housing types, access to regional amenities, high-quality transit service, and other advantages. Centers in Larger Cities also play an increasing role over time as places that accommodate growth. These centers provide local and regional services and amenities and will become more significant secondary job centers. At a smaller scale, locally identified city and town centers also serve similar roles for Small Cities, providing services and housing that support vital and active communities at intensities appropriate to smaller municipalities.						
Discussion:	No significant change across any of the alternatives. All of the action alternatives appear to be consistent with and support the Regional Growth Strategy.						
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C
		⊗	⊗	⊗	⊗	⊗	⊗

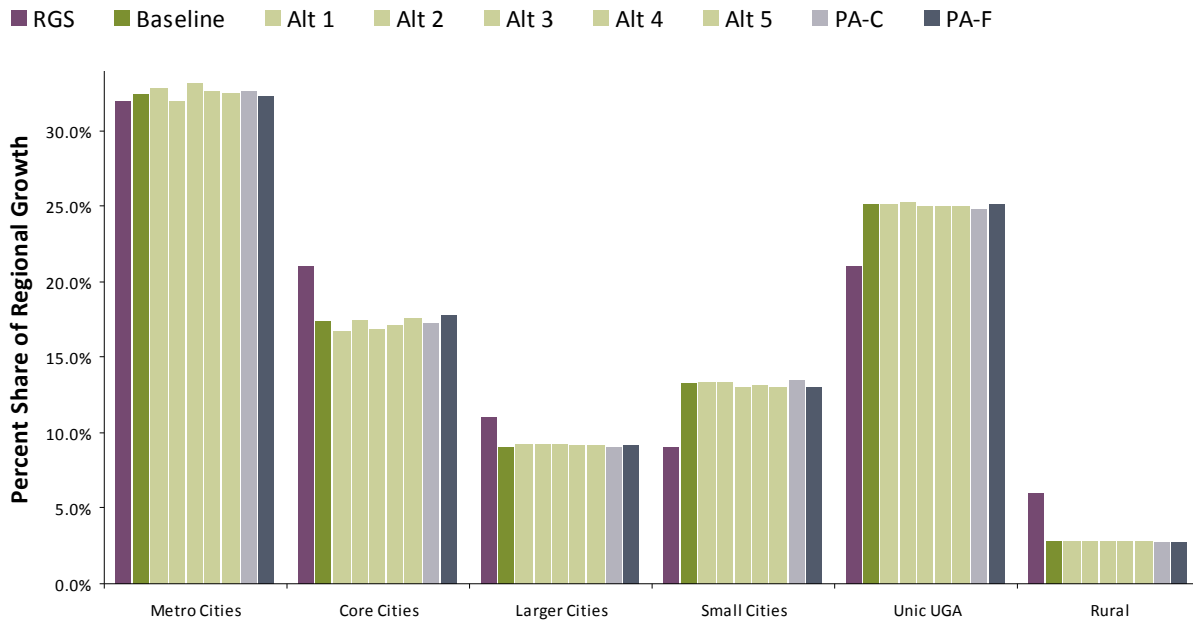
Measure:	<i>GM2. Employment</i>						
Unit:	Number of jobs within each of six <i>regional geographies</i> (<i>based on Land Use Model Forecasts</i>).						
Rationale:	Refer to rationale in GM1. Increased share of jobs in Metropolitan Cities and Core Cities in Kitsap, Pierce, and Snohomish counties is an important indicator of job opportunities and accessibility within those counties.						
Discussion:	No significant change across any of the alternatives. All of the action alternatives appear to be consistent with and support the Regional Growth Strategy.						
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C
		⊗	⊗	⊗	⊗	⊗	⊗

Population and Employment Growth in Regional Geographies
(2040 Baseline and Change from Baseline)

POPULATION	2000	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Metro Cities	955,100	1,500,600	8,500	-7,100	13,100	4,800	2,700	4,800	-1,200
Core Cities	580,100	873,100	-10,600	700	-8,500	-3,400	2,700	-2,100	7,000
Larger Cities	326,700	480,100	2,300	3,300	2,300	700	1,000	-100	300
Small Cities	258,600	482,200	900	1,900	-3,300	-1,400	-3,500	3,500	-4,500
Unic UGA	594,600	1,018,400	-400	1,800	-2,500	-1,000	-2,500	-4,900	200
Rural	484,600	532,700	-600	-700	-1,000	200	-300	-1,200	-1,800
Urban Core	1,861,900	2,853,800	200	-3,100	6,900	2,100	6,400	2,600	6,100
Outlying Urban	853,200	1,500,600	500	3,700	-5,800	-2,400	-6,000	-1,400	-4,300
Rural	484,600	532,700	-600	-700	-1,000	200	-300	-1,200	-1,800
TOTAL	3,199,700	4,887,100	100	-100	100	-100	100	0	0

EMPLOYMENT	2000	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Metro Cities	924,000	1,526,300	13,100	18,000	-14,500	-4,200	11,300	-9,900	17,700
Core Cities	521,000	833,200	-15,300	-28,100	16,200	-19,300	-14,500	4,800	-16,800
Larger Cities	121,000	181,700	1,500	7,400	-2,600	6,500	1,500	2,500	4,100
Small Cities	106,000	197,100	-2,400	-2,400	3,500	5,100	-3,100	5,100	1,600
Unic UGA	118,000	223,600	3,200	5,100	-3,100	11,200	3,000	-3,000	-4,700
Rural	65,000	93,600	100	200	1,000	1,000	500	1,200	-1,400
Urban Core	1,566,000	2,541,200	-700	-2,700	-900	-17,000	-1,700	-2,600	5,000
Outlying Urban	224,000	420,700	800	2,700	400	16,300	-100	2,100	-3,100
Rural	65,000	93,600	100	200	1,000	1,000	500	1,200	-1,400
TOTAL	1,855,000	3,055,500	200	200	500	300	-1,300	700	500

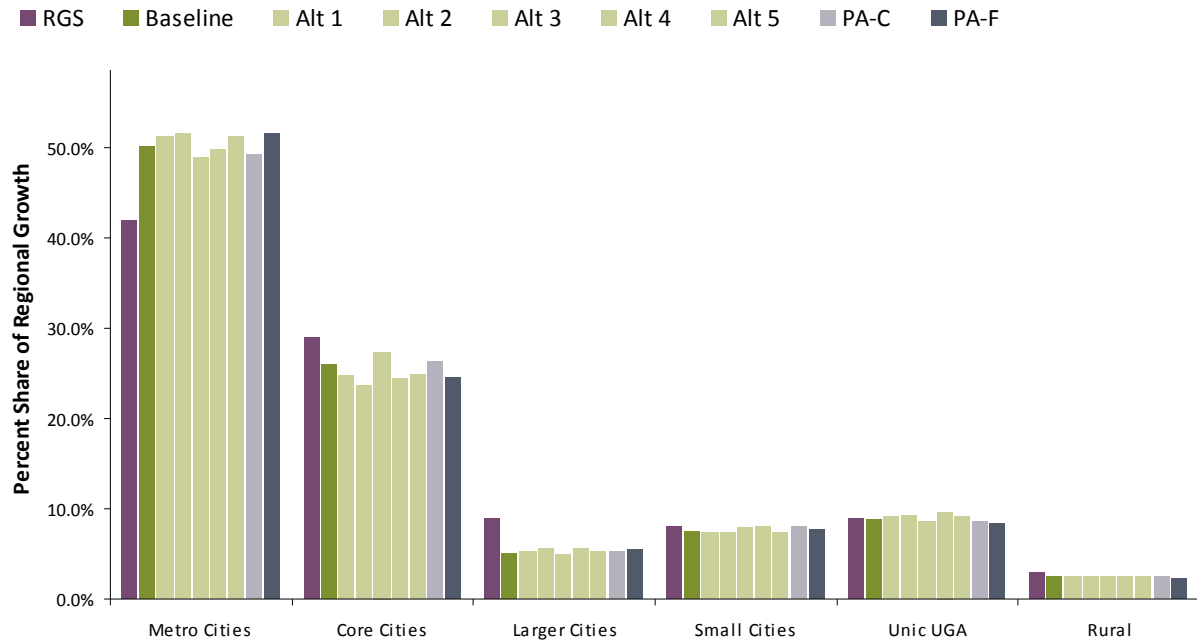
Share of Population Growth by Regional Geographies



Percent of Population Growth by Geography

	Growth Strategy	Baseline
Urban Core	64%	59%
Outlying Urban	30%	38%
Rural	7%	3%

Share of Employment Growth by Regional Geographies



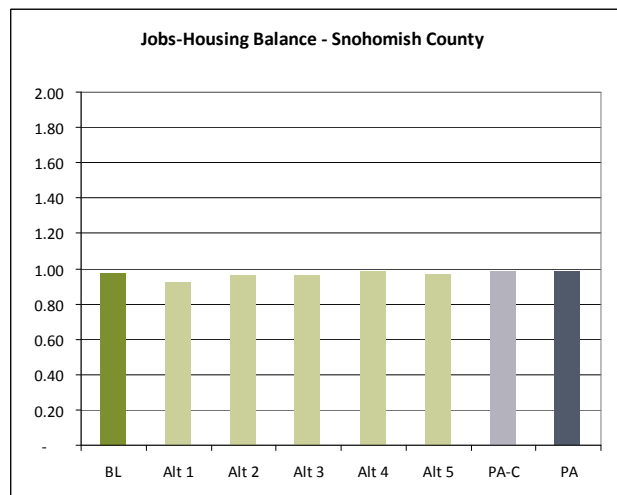
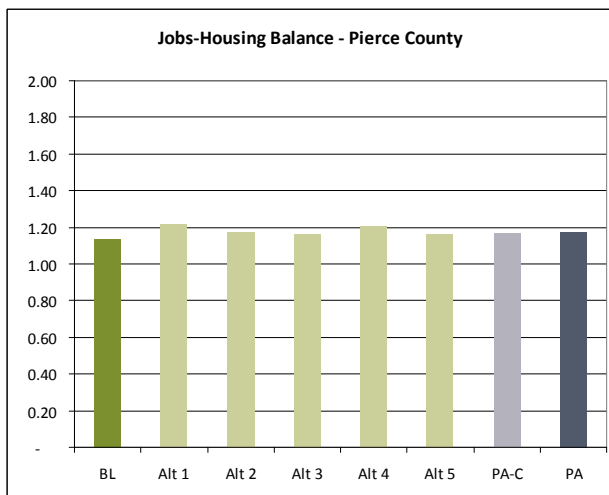
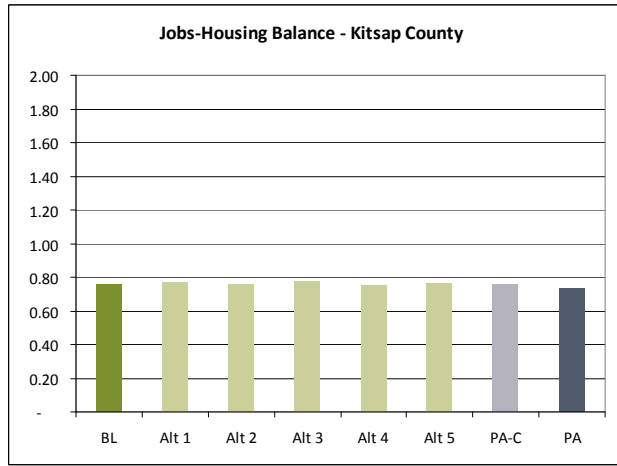
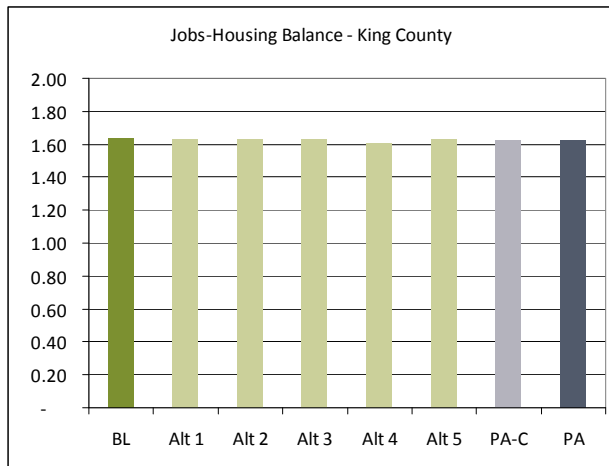
Percent of Employment Growth by Geography

	Growth Strategy	Baseline
Urban Core	80%	81%
Outlying Urban	17%	16%
Rural	3%	2%

Measure:	GM3. Jobs to Housing Balance							
Unit:	Ratio of jobs to persons by county (based on Land Use Model Forecasts).							
Rationale:	Refer to rationale in GM1. The VISION 2040 Regional Growth Strategy seeks improvement in jobs-housing balance within each county, as compared to the regional jobs-population ratio. A jobs-person ratio closer to the regional ratio would imply that residents have close and improved access to job locations, minimizing the need to make long work commutes, or to make lengthy trips to meet daily needs.							
Discussion:	There is no notable change in the county-level jobs to housing ratios across the alternatives.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	⊗	⊗	⊗	⊗	⊗	⊗

2040 Jobs to Housing Ratio

		BL	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
King	Housing Units	1,208,300	1,206,000	1,212,300	1,205,800	1,216,300	1,216,200	1,211,000	1,208,900
	Employment	1,979,600	1,962,000	1,973,200	1,967,300	1,954,200	1,979,100	1,961,900	1,964,600
	Emp/HU	1.64	1.63	1.63	1.63	1.61	1.63	1.62	1.63
Kitsap	Housing Units	172,100	168,600	172,400	170,200	169,600	170,700	174,000	172,400
	Employment	130,100	129,600	130,400	132,300	127,800	129,800	131,500	125,800
	Emp/HU	0.76	0.77	0.76	0.78	0.75	0.76	0.76	0.73
Pierce	Housing Units	456,800	457,200	447,300	458,800	447,400	451,900	455,000	451,600
	Employment	518,500	555,900	524,500	534,000	539,900	525,100	532,900	530,300
	Emp/HU	1.14	1.22	1.17	1.16	1.21	1.16	1.17	1.17
Snohomish	Housing Units	438,900	443,300	445,700	439,700	440,300	434,000	435,300	441,200
	Employment	427,300	408,400	427,600	422,500	434,000	420,200	429,900	435,500
	Emp/HU	0.97	0.92	0.96	0.96	0.99	0.97	0.99	0.99



Measure:	GM4. Population and Jobs in Centers							
Unit:	Number of population and jobs by county and within regional growth centers and Manufacturing and Industrial Centers (MICs) (based on Land Use Model Forecasts).							
Rationale:	Refer to rationale in GM1. The VISION 2040 Regional Growth Strategy seeks to support the further development of regional growth centers and MICs as a means of achieving its overarching development goals of fewer environmental impacts and a more compact urban form. The centers are intended to attract residents and businesses because of their proximity to services and jobs, a variety of housing types, and their access to regional amenities.							
Discussion:	No significant change across any of the alternatives. All of the action alternatives appear to be consistent with and support the Centers development objectives.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	⊗	⊗	⊗	⊗	⊗	⊗

Population and Employment Growth in Regional Centers
(2040 Baseline and Change from Baseline)

Alternative	2000	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Population in Regional Growth Centers	122,800	293,400	-6,600	-4,500	8,600	7,300	-200	5,000	10,100
Employment in Regional Growth Centers	573,600	1,049,900	12,600	-1,600	-16,900	-37,400	6,900	-34,600	3,900
Employment in Man/Ind Centers	172,900	195,700	700	700	3,700	4,700	700	2,200	-4,400



3.4 Economic Prosperity

Economic prosperity has been identified in the Regional Economic Strategy by a series of measures that can be tracked year to year. These measures are difficult to measure directly within the PSRC Integrated Modeling System because the current Puget Sound Economic Forecasting (PSEF) model, which predicts the regional population and employment, is not sensitive to individual transportation investments. That said, we propose to indirectly measure the potential impacts of the transportation alternatives on economic prosperity by measuring those parts of the transportation system that may tend to improve or degrade the economic vitality of the region. There are three areas where this indirect impact to the economy is measured: benefits to low-wage and high-wage employment sites, benefits to targeted cluster employment, and benefits to freight-related employment. In addition to these indirect measures of transportation's effects on land markets, the economy is sensitive to the net benefits of transportation improvements and different approaches to financing transportation (and other public) infrastructure. These are addressed under the Mobility and Finance criteria discussed previously. Benefits are calculated for geographic zones where employment in the target category as a percentage of total employment exceeds one standard deviation above the mean.

Measure:	EP1. Benefits to Low-wage and High-wage Employment							
Unit:	Changes in user benefits that accrue to parts of the region with high concentrations of existing low-wage and high-wage employment (based on Benefit-Cost Analysis).							
Rationale:	Investments in the transportation infrastructure that improve multimodal accessibility to high-wage and low-wage jobs will provide an improved ability to attract jobs in high-wage and low-wage job sectors from outside the region. This is measured as the user benefits (reductions in costs) associated with traveling from all other zones to zones of the region with high concentrations of jobs in high-wage and low-wage job sectors. Transportation alternatives with more travel benefits associated with zones with high-wage and low-wage employment compared to the Baseline indicates higher accessibility for these employment sectors and are preferred over alternatives with lower travel benefits.							
Discussion:	All action alternatives provide benefits to geographic areas with low-wage and high-wage employment concentrations as compared to the Baseline. On a per trip basis, the Preferred Alternative (Full Plan) provides the largest benefits to these geographies when compared with the per trip benefits to the region as a whole.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		\$382 million	\$441 million	\$555 million	\$431 million	\$370 million	\$1.0 billion	\$1.4 billion

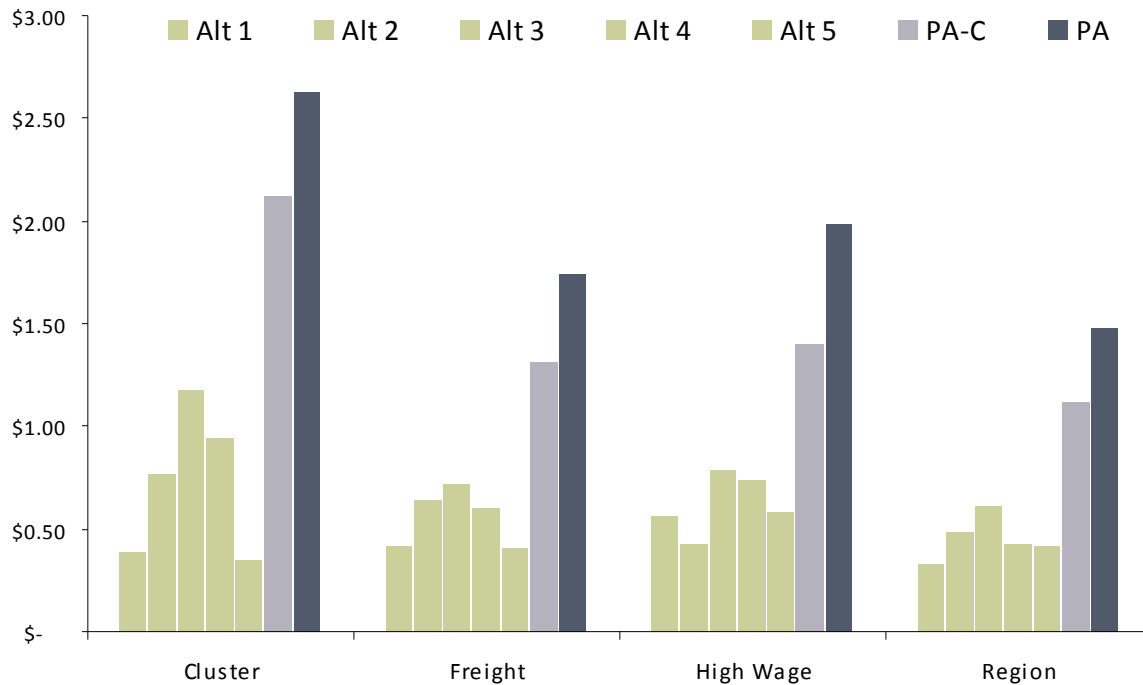
Measure:	EP2. Benefits to Cluster Employment							
Unit:	Changes in user benefits that accrue to parts of the region with high concentrations of employment in existing cluster industries <i>(based on Benefit-Cost Analysis)</i> .							
Rationale:	Investments in the transportation infrastructure that improve multimodal accessibility to the jobs located in targeted clusters will provide an improved ability to attract jobs in the targeted clusters from outside the region. This is measured as the user benefits (reductions in costs) associated with traveling from all other zones to zones of the region with high concentrations of jobs in the targeted clusters identified in the Regional Economic Strategy. This will lead to increased economic prosperity for the region. Transportation alternatives with lower costs of travel to zones with cluster employment compared to the baseline indicate higher accessibility for targeted employment sectors and are preferred over alternatives with higher costs of travel.							
Discussion:	All action alternatives provide benefits to geographic areas with cluster employment concentrations as compared to the Baseline. On a per trip basis, the Preferred Alternative (Full Plan) provides the largest benefits to these geographies. Alternative 4 results in the highest relative per trip benefits to areas with cluster employment concentrations when compared with the per trip benefits to the region as a whole.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		\$56 million	\$116 million	\$179 million	\$142 million	\$49 million	\$297 million	\$373 million

Measure:	EP3. Benefits to Freight-Related Employment							
Unit:	Changes in user benefits that accrue to parts of the region with high concentrations of existing freight-related employment (based on Benefit-Cost Analysis).							
Rationale:	Investments in the transportation infrastructure that improve accessibility to freight-related industries provide incentives for more freight to move through the central Puget Sound region. This can reduce costs and travel time for local distribution of goods, as well as improve the competition for intrastate and interstate movement of goods through our ports and borders. This will promote economic growth in the region. Key locations of freight-related employment include ports, intermodal terminals, warehouse and distribution centers, and regional MICs. Transportation alternatives with lower costs of travel to zones with freight-related employment compared to the Baseline indicates higher accessibility for freight movement and are preferred over alternatives with higher costs of travel.							
Discussion:	All action alternatives provide benefits to geographic areas with freight-related employment concentrations as compared to the Baseline. On a per trip basis, the Preferred Alternative (Full Plan) provides the largest benefits to these geographies. The Preferred Alternative (Full Plan) also results in the highest relative per trip benefits to areas with freight-related employment concentrations when compared with the per trip benefits to the region as a whole.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		\$55 million	\$86 million	\$97 million	\$81 million	\$52 million	\$171 million	\$226 million

Total Annual User Benefits to Zones with Employment Concentrations (Change from 240 Baseline)
Time Savings, Reliability, Vehicle Operating Costs

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
	(millions of 2008 dollars)						
Cluster Industries	\$ 56	\$ 116	\$ 179	\$ 142	\$ 49	\$ 297	\$ 373
Freight-Related	\$ 55	\$ 86	\$ 97	\$ 81	\$ 52	\$ 171	\$ 226
Low Wage	\$ 189	\$ 294	\$ 293	\$ 185	\$ 183	\$ 598	\$ 759
High Wage	\$ 193	\$ 147	\$ 262	\$ 246	\$ 187	\$ 463	\$ 625

Per Trip User Benefits (Change from the 2040 Baseline)



3.5 Environmental Stewardship

Environmental stewardship is measured based on the ability of the transportation alternatives to reduce pollution levels, reduce the runoff caused by impervious surfaces, and retain natural resource lands. Many studies have used VMT as a proxy for emissions, but we are measuring emissions directly by type of pollutant so we are not identifying VMT separately from emissions. Recent Washington state legislation indicates a desire for specific VMT reductions, in addition to greenhouse gas reductions. The environmental criteria are measured in four ways: (a) emission costs from vehicle and building use, (b) runoff from impervious surfaces, (c) ability to retain open space, and (d) energy usage from vehicle and building use.

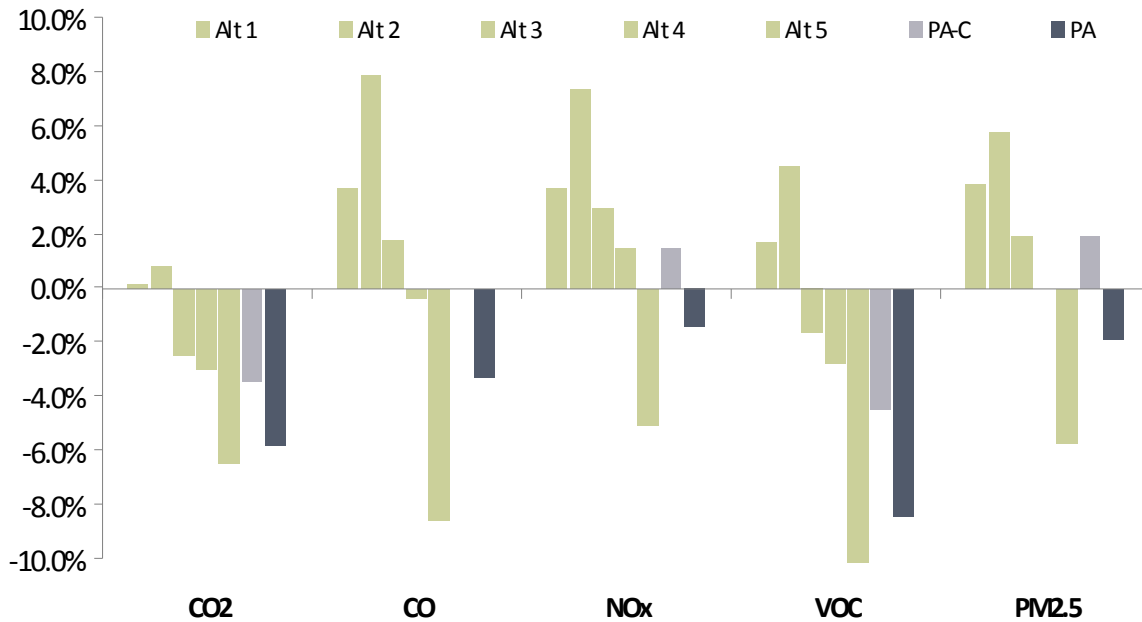
Measure:	ES1. Vehicle and Stationary Emission Benefits (Air Quality)							
Unit:	The dollar value of changes in vehicle emissions reported in annual amounts (based on Benefit-Cost Analysis).							
Rationale:	Vehicle and building use results in the production of various pollutants, each of which imposes costs in terms of property damage and human and environmental health. There has been extensive study of the effects of various pollutants on the mortality and morbidity of populations, and the damage done to plants and property. In addition, there are engineering models of the effect of traffic conditions and vehicle vintage on emissions per mile. Therefore, air pollution impacts generally can be monetized and directly incorporated in benefit-cost calculations. These estimates do not include emissions associated with construction or electric-powered vehicles. On the stationary side, we estimate emission of carbon dioxide (CO ₂) associated with building usage. All else being equal, those alternatives where emission costs are lowest will be preferred.							
Discussion:	Alternatives 3, 4, and 5 and the Preferred Alternative (Constrained and Full Plan) result in emission reduction benefits as compared to the Baseline. In 2040, Alternative 5 and the Preferred Alternative (Full Plan) generate less of all the measured pollutants than the Baseline, leading to an annual benefit that totals \$95 million and \$72 million respectively. Compared to the Baseline, Alternatives 3 and 4 and the Preferred Alternative (Constrained Plan) result in more of some pollutants and less of others. Alternatives 1 and 2 generate more pollutants than the Baseline, leading to negative emission reduction benefits (or higher emission costs).							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		-\$14 million	-\$35 million	\$19 million	\$30 million	\$95 million	\$38 million	\$72 million

2040 Emissions (annual tonnes of pollutants)

Alternative	2006	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
CO2	26,051,000	36,824,000	36,862,000	37,106,000	35,894,000	35,704,000	34,426,000	35,553,000	34,667,000
CO	497,400	387,800	402,200	418,200	394,600	386,300	354,600	387,600	374,900
NOx	57,900	13,700	14,200	14,700	14,100	13,900	13,000	13,900	13,500
VOC	34,500	17,800	18,100	18,600	17,500	17,300	15,900	17,000	16,300
PM2.5	1,770	520	540	550	530	520	490	530	510

Change in Annual Emission Benefits from 2040 Baseline Costs (millions of 2008 dollars)

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
(Benefits)							
CO2	-\$1.0	-\$7.0	\$23.0	\$28.0	\$60.0	\$34.0	\$54.0
CO	-\$5.0	-\$12.0	-\$3.0	\$1.0	\$13.0	\$0.0	\$5.0
NOx	-\$5.0	-\$10.0	-\$4.0	-\$2.0	\$7.0	-\$2.0	\$2.0
VOC	-\$2.0	-\$6.0	\$2.0	\$4.0	\$15.0	\$6.0	\$12.0
PM2.5	< \$1	< \$1	< \$1	< \$1	< \$1	< \$1	< \$1
Total	-\$14.0	-\$35.0	\$19.0	\$30.0	\$95.0	\$38.0	\$72.0

Percent Change in Emissions from 2040 Baseline


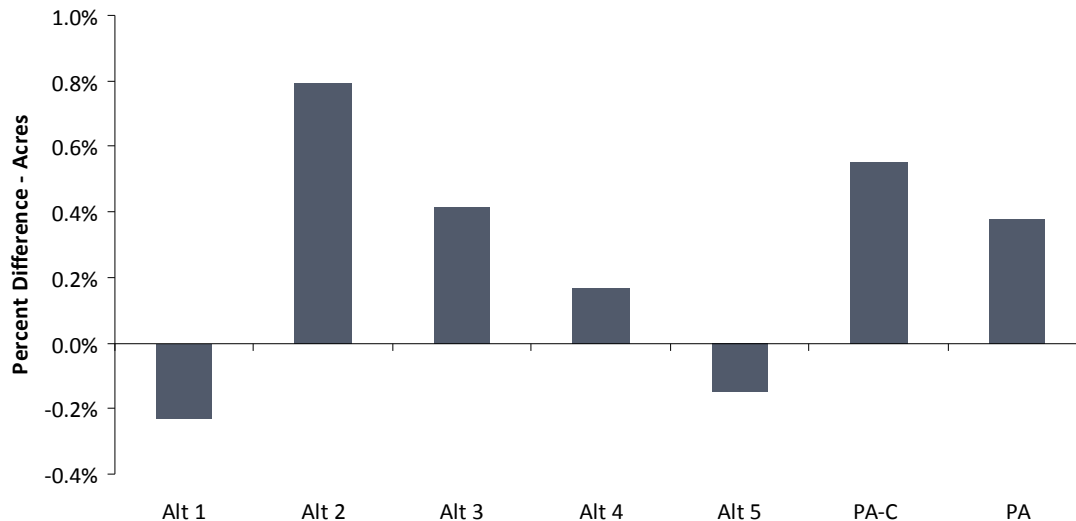
Measure:	ES2. Impervious Surfaces (Water Quality)							
Unit:	Number of lane miles of roadways, amount of square footage of buildings, and the number of parking spaces in park-and-ride lots (based on Land Use Model Forecasts and Transport Data).							
Rationale:	A key indicator of the health of the region's water resources is the amount of impervious surface in each basin, or across the region as a whole. The frequency and intensity of peak hydrological flows and the volume of stormwater runoff all increase when we build more roads, buildings, and parking lots. Higher levels of imperviousness are connected to elevated summer water temperatures and more polluted runoff entering streams and water bodies. The roads, buildings, and park-and-ride lots in each transportation alternative indicate whether there are greater amounts of impervious surfaces contributing to greater amounts of runoff. Those alternatives with lower amounts of impervious surfaces compared to the baseline will be preferred.							
Discussion:	When compared to the Baseline, Alternatives 2 and 3 and the Preferred Alternative (Constrained and Full Plan) include additional impervious surfaces, in particular associated with additions of new and expanded roadways. Alternatives 1, 4, and 5 include less significant measurable change from the Baseline (both positive and negative) in terms of impervious surfaces.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	-	-	⊗	⊗	-	-

Acres of Impervious Surface from Building Footprints, Lane Miles, P&R Stalls (Change From 2040 Baseline)

	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Building Footprints	84,558	(631)	(525)	(249)	(390)	(658)	(11)	(589)
Lane-Miles	28,582	289	1,257	568	490	260	591	900
P&R Stalls	539	80	168	151	92	226	47	118
TOTAL	113,679	(262)	901	470	192	(172)	627	429

Percent Difference in Impervious Surface from 2040 Baseline

Building Footprints - Lane Miles - P&R Lots

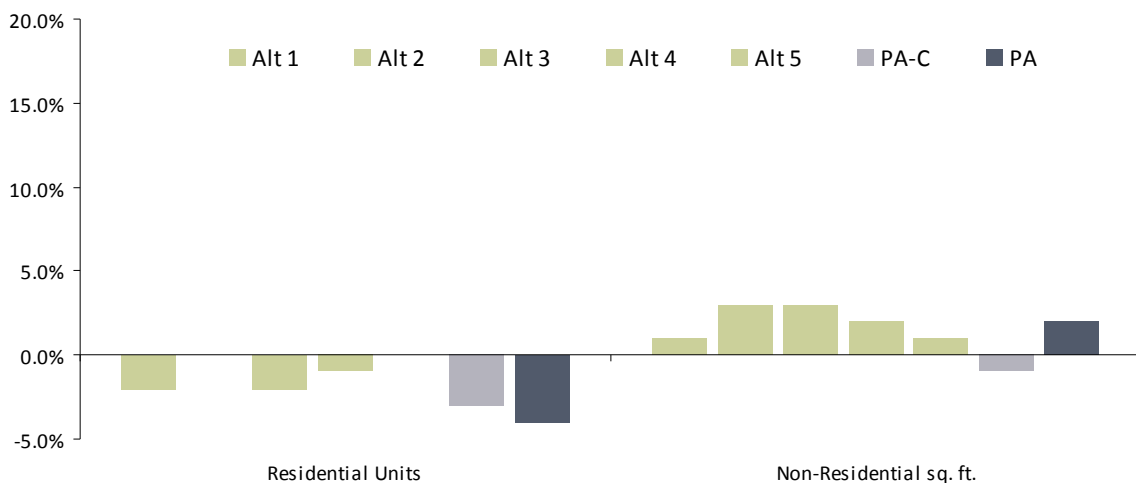


Measure:	ES3. Agriculture and Natural Resource Lands (Food Production and Open Space)							
Unit:	Development of land (measured as development of residential units and square footage of non-residential buildings) near agricultural and natural resource lands (based on Land Use Model Forecasts).							
Rationale:	The pressure to develop agricultural and natural resource lands will increase as the development on land nearby increases. This pressure will increase the potential to lose agricultural and natural resource lands to development. This potential reduction in natural resource lands is seen as a detriment to the environment. To the degree that the development of land near resource lands can be maintained at the levels in the Baseline transportation system, this will improve the region's ability to retain these resource lands. Those alternatives with less development of land near agricultural and natural resource lands will be preferred.							
Discussion:	Compared to the Baseline, most alternatives result in fewer residential units and more non-residential square footage on parcels near agricultural and natural resource lands. In percentage change terms, these differences largely cancel each other out for all action alternatives except for Alternative 2. Alternative 2 results in a measurable increase in non-residential square footage and very little decrease in residential units.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	–	⊗	⊗	⊗	⊗	⊗

Changes in Development from 2040 Baseline (Parcels in Proximity to Resource and Agricultural Lands)

Alternative	2006	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
(Change from 2040 Baseline)									
Residential Units	7,100	11,900	-180	-20	-280	-120	-30	-370	-420
Non-Residential sq. ft.	3,918,000	3,856,000	30,000	114,000	112,000	59,000	32,000	-40,000	71,000
(Percent Difference from 2040 Baseline)									
Residential Units			-2.0%	< 1%	-2.0%	-1.0%	< 1%	-3.0%	-4.0%
Non-Residential sq. ft.			1.0%	3.0%	3.0%	2.0%	1.0%	-1.0%	2.0%

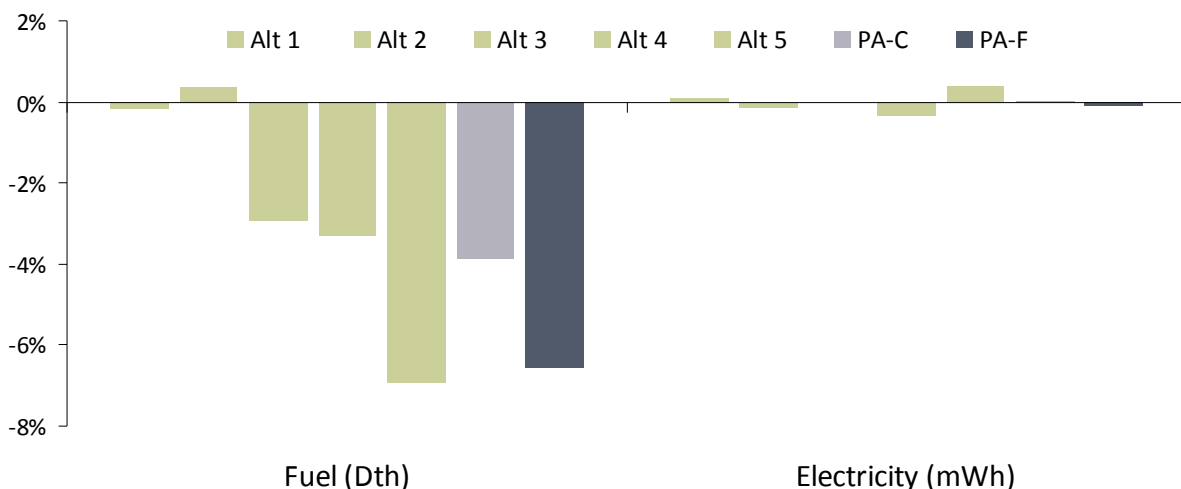
**Development on Parcels in Proximity to Resource and Agricultural Lands
(Change from 2040 Baseline)**



Measure:	ES4. Energy Usage from Vehicle and Building Use							
Unit:	A measure of the change in the energy resources (fuel and electricity) required to operate residential and non-residential structures and motor vehicles (based on Land Use Model Forecasts).							
Rationale:	Buildings and vehicles consume energy to operate. Fuel and electrical energy consumption for operation of residential and non-residential structures is estimated based on structure type, age, size, and other characteristics. Energy consumption contributes to greenhouse gases and other pollutants. All else being equal, alternatives that have lower energy requirements and less greenhouse gas emissions will be preferred. Energy is also consumed for the operation of vehicles. This estimate does not include energy use associated with construction or electric-powered vehicles.							
Discussion:	Compared to the Baseline, Alternatives 3, 4, and 5 and the Preferred Alternative (Constrained and Full Plan) result in less energy consumption from vehicle and building use. Alternatives 1 and 2 are largely unchanged from the Baseline. The differences for Alternatives 3, 4, and 5 and the Preferred Alternative are mostly attributable to less energy consumption associated with vehicle usage.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	⊗	+	+	+	+	+

	2006	Baseline 2040	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Fuel (Dth)									
Residential	85,234,500	133,705,100	133,641,500	133,703,500	133,633,400	133,615,900	133,624,300	133,638,000	133,685,400
Non-residential	49,099,400	64,809,700	64,402,400	63,186,500	63,561,800	64,319,000	64,550,400	66,149,500	64,211,100
Vehicles	257,571,800	327,848,500	327,431,300	331,336,900	313,669,400	311,034,400	291,781,800	306,040,100	294,005,200
Total	391,905,700	526,363,300	525,475,200	528,226,900	510,864,500	508,969,200	489,956,500	505,827,600	491,901,700
Electricity (mWh)									
Residential	11,522,400	19,096,100	19,094,900	19,098,100	19,092,800	19,098,900	19,090,000	19,084,900	19,092,500
Non-residential	876,500	1,161,900	1,182,800	1,132,800	1,158,100	1,089,300	1,251,900	1,181,900	1,144,100
Total	12,398,800	20,258,100	20,277,800	20,231,000	20,250,900	20,188,300	20,341,900	20,266,800	20,236,600

Fuel and Electricity Use for Vehicle and Buildings: Change From the 2040 Baseline



3.6 Quality of Life

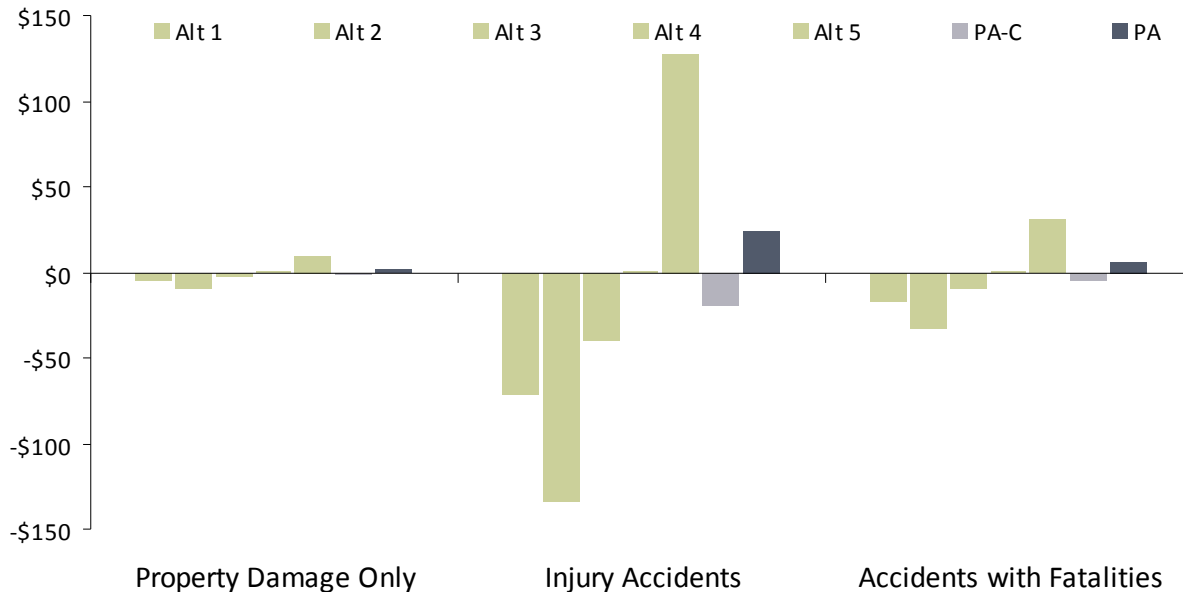
There are numerous ways that transportation planning can improve the quality of life for the region's population, including benefits related to safety, human health, and security. The safety measure is the most straightforward, because we can enumerate the number of roadway accidents by type and identify costs associated with these accidents. We do not estimate the number of walk, bike, or transit accidents. We measure health as the amount of walk and bike passenger miles traveled. Finally, we have identified redundancy metrics to measure security of the transportation system. In summary, the quality of life criterion has three measures: (a) accidents, (b) nonmotorized travel, (c) redundancy (related to roads, transit, and freight uses).

Measure:	QL1. Accident Cost Savings							
Unit:	The dollar value of changes in accident risk (based on Benefit-Cost Analysis).							
Rationale:	The costs of accident risk are determined by the probability of an accident, severity of accidents, and the costs that are incurred as a result of accidents. All of these factors are influenced by loadings and speeds on transportation facilities. The literature provides adequate guidelines on how to value mortality, morbidity, and property loss consequences of accidents. All else being equal, those alternatives where accident cost risks are lowest will be preferred.							
Discussion:	Accident cost savings in 2040 are greatest for Alternative 5 as compared to the Baseline. For Alternatives 1, 2, and 3 and the Preferred Alternative (Constrained Plan), there are expected increases in accident-related costs as compared to the Baseline conditions.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		-\$94 million	-\$177 million	-\$52 million	\$1 million	\$168 million	-\$26 million	\$32 million

Annual Accident Reduction Benefits Compared to the 2040 Baseline Costs (millions of 2008 dollars)

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
(Benefits)							
Property Damage Only	-\$5	-\$10	-\$3	\$1	\$9	-\$1	\$2
Injury Accidents	-\$71	-\$134	-\$39	\$0	\$127	-\$20	\$24
Accidents with Fatalities	-\$17	-\$33	-\$10	\$0	\$31	-\$5	\$6
Total	-\$94	-\$177	-\$52	\$1	\$168	-\$26	\$32

Accident Reduction Benefits Compared to the 2040 Baseline
(millions of 2008 dollars)

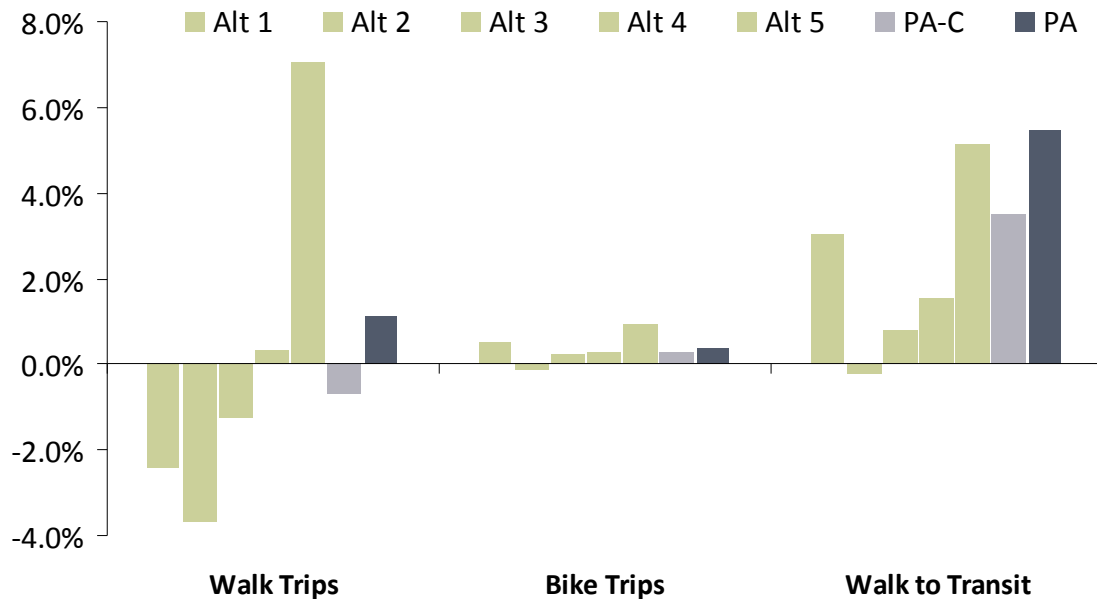


Measure:	QL2. Nonmotorized Travel							
Unit:	Number of walk and bike trips (based on Travel Model Forecasts).							
Rationale:	As growth patterns provide more housing near employment and vice versa and as more pedestrian and bicycle facilities are provided, there are more opportunities for travelers to choose walking and biking as a preferred mode of travel. This will improve the health and well-being of travelers who choose to walk and bike more often. All else being equal, alternatives providing greater opportunities for walking and biking will be preferred.							
Discussion:	When compared to the Baseline, there is a modest increase in nonmotorized travel in Alternative 4 and the Preferred Alternative (Constrained Plan), more sizable increases for Alternative 5 and the Preferred Alternative (Full Plan), and less nonmotorized travel in Alternative 2. There is a somewhat mixed result (with no significant change) for Alternative 3.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	-	⊗	+	+	+	+

Non-Motorized Travel (Daily Number of Trips)

Alternative	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
TOTAL TRIPS								
Walk Trips	2,111,300	2,039,900	2,002,300	2,074,500	2,121,900	2,321,000	2,091,039	2,144,926
Bike Trips	215,600	231,000	212,300	222,400	224,900	243,300	223,716	226,620
Walk to Transit	638,700	729,800	631,600	662,600	685,500	791,300	742,800	801,100

Change in Walk and Bike Trips as a Percent of Total Non-Motorized Trips from 2040 Baseline

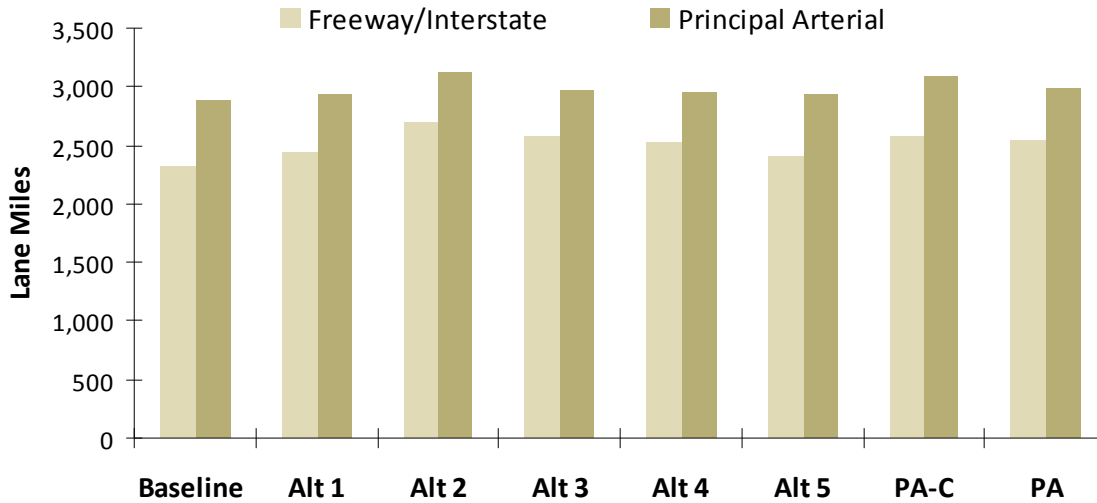


Measure:	QL3. Redundancy (Roads and Transit)							
Unit:	A Measure of freeway and arterial facility miles and rail and bus services (<i>based on Geodatabase and Travel Model</i>).							
Rationale:	Redundancy is a reflection of the substitute facilities available to support travel demand if an event causes facilities to be damaged or destroyed. This type of redundancy is envisioned to be important to three target markets: road users, transit users, and freight carriers. As a result, the redundancy measure will include the total amount of arterial and freeway lane miles for road users and the number of bus and rail service hours for transit users. These measures can indicate the capacity of the system to support these three types of users (road, transit, and freight) if specific elements of the systems were to fail.							
Discussion:	There are no significant changes across any of the alternatives.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	⊗	⊗	⊗	⊗	⊗	⊗

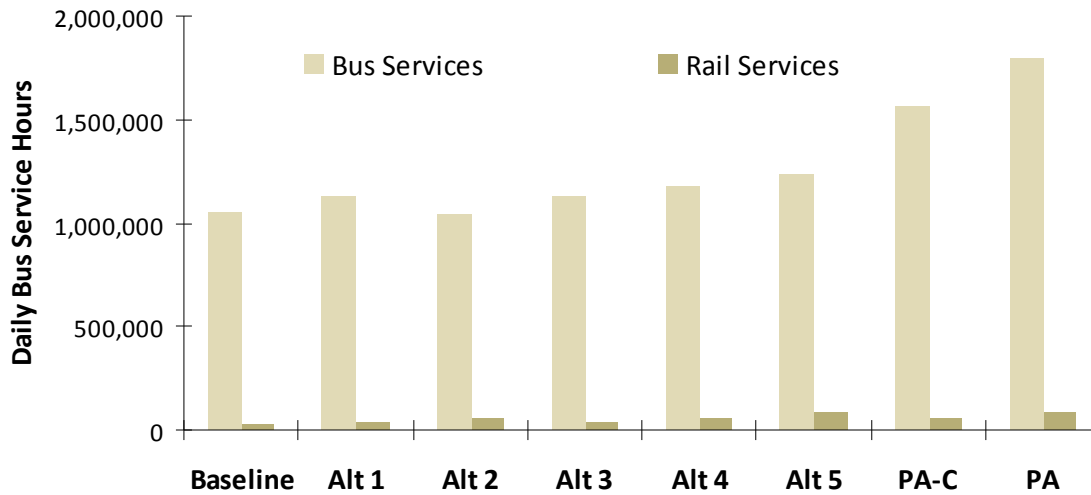
Lane Miles of Road Facilities and Hours of Transit Services in 2040 Alternatives

Alternative	2006	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Road Lane Miles									
Freeway/Interstate	2,212	2,325	2,438	2,703	2,570	2,526	2,405	2,578	2,538
Principal Arterial	2,788	2,879	2,937	3,125	2,964	2,957	2,943	3,096	2,985
Transit Service Hours									
Bus Services	810,000	1,050,000	1,134,000	1,043,000	1,131,000	1,181,000	1,239,000	1,562,000	1,800,000
Rail Services	2,000	33,000	42,000	54,000	42,000	54,000	84,000	54,000	84,000

Freeway and Principal Arterial Lane Miles in 2040 Alternatives



Bus and Rail Service Hours in 2040 Alternatives



3.7 Equity

Equity is an important criterion to many different audiences evaluating the transportation system. We have identified four key aspects of the equity criterion: (a) the distribution of impacts by geography, (b) the distribution of impacts by income of transportation system users, (c) distribution of benefits to freight and passenger vehicles, and (d) benefits of investments to environmental justice populations.

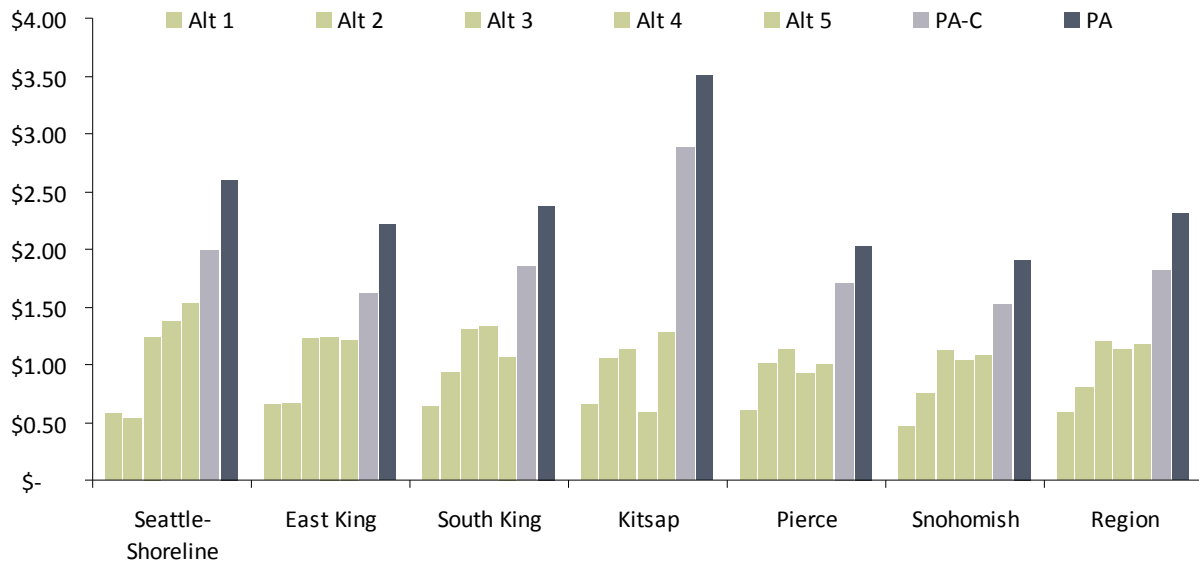
Measure:	<i>E1. Geographic Distribution of Benefits</i>							
Unit:	Measures of user benefits categorized by geographic areas (Snohomish County, Pierce County, Kitsap County, East King County, Seattle, and South King County) <i>(based on Benefit-Cost Analysis)</i> .							
Rationale:	Decision makers are interested in the way that benefits of transportation projects are distributed across the region. Some transportation improvements have very localized effects, while others distribute benefits more broadly. This distributional issue relates to who pays and who benefits from improvements.							
Discussion:	All action alternatives provide benefits to all sub-regional geographies as compared to the Baseline. On a per trip basis, Alternatives 1 and 3 result in the least disparity across sub-regional geographies. Alternative 4 results in notable differences by sub-region.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		+	⊗	+	-	⊗	⊗	⊗

Total Annual User Benefits (Change from 2040 Baseline)

Time Savings, Reliability, Vehicle Operating Costs

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
(millions of 2008 dollars)							
King	\$ 1,209	\$ 1,435	\$ 2,467	\$ 2,560	\$ 2,385	\$ 3,511	\$ 4,538
Seattle-Shoreline	\$ 380	\$ 365	\$ 843	\$ 918	\$ 988	\$ 1,315	\$ 1,686
East King	\$ 374	\$ 388	\$ 684	\$ 698	\$ 662	\$ 900	\$ 1,198
South King	\$ 456	\$ 682	\$ 940	\$ 944	\$ 735	\$ 1,297	\$ 1,653
Kitsap	\$ 146	\$ 237	\$ 251	\$ 127	\$ 273	\$ 630	\$ 755
Pierce	\$ 441	\$ 734	\$ 821	\$ 656	\$ 700	\$ 1,216	\$ 1,428
Snohomish	\$ 317	\$ 510	\$ 753	\$ 694	\$ 696	\$ 1,012	\$ 1,251

Per Trip User Benefits (Change from 2040 Baseline)



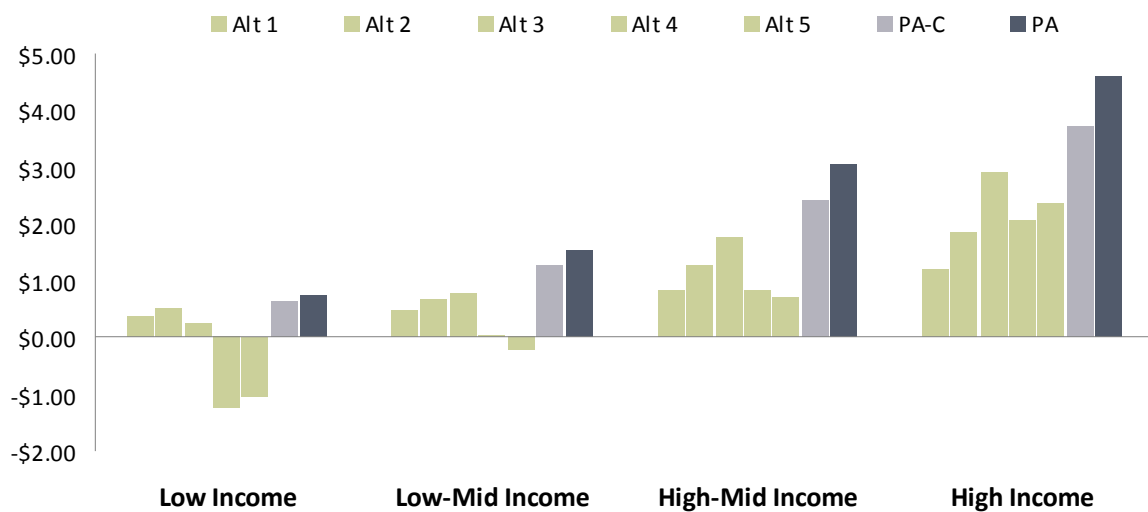
Measure:	E2. Income Distribution of Benefits							
Unit:	Measures of user benefits categorized by four different user income groups for drive-alone commute trips (based on Benefit-Cost Analysis).							
Rationale:	Decision makers are interested in the way that benefits of transportation projects are distributed across segments of society. Some transportation improvements have broad benefits to users of the transportation system, while others may distribute benefits more narrowly to users with either higher or lower values of time, and thus incomes. The four household income groups are < \$30,000, \$30,000 to \$55,000, \$55,000 to \$90,000, and > \$90,000. This distributional issue relates to who pays and who benefits from improvements.							
Discussion:	Alternatives 1, 2, and 3 and the Preferred Alternative (Constrained and Full Plan) provide benefits to all income groupings of drive-alone commuters as compared to the Baseline, although, as would be expected, the distribution of benefits varies across these alternatives. Alternatives 4 and 5 result in losses in direct benefits to lower-income groupings of drive-alone commuters.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	⊗	⊗	-	-	⊗	⊗

Total Annual Benefits by User Type (Change from 2040 Baseline)

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
USER BENEFITS (millions of 2008 dollars)							
Low Income	\$29	\$41	\$17	-\$92	-\$78	\$44	\$47
Low-Mid Income	\$53	\$82	\$88	\$5	-\$24	\$138	\$160
High-Mid Income	\$159	\$250	\$342	\$160	\$130	\$453	\$556
High Income	\$317	\$500	\$772	\$535	\$597	\$958	\$1,159

Per Worktrip Benefits by Income (Change from 2040 Baseline):

Reduced Travel Time , Unreliability, Vehicle Operating Costs and Other User Costs



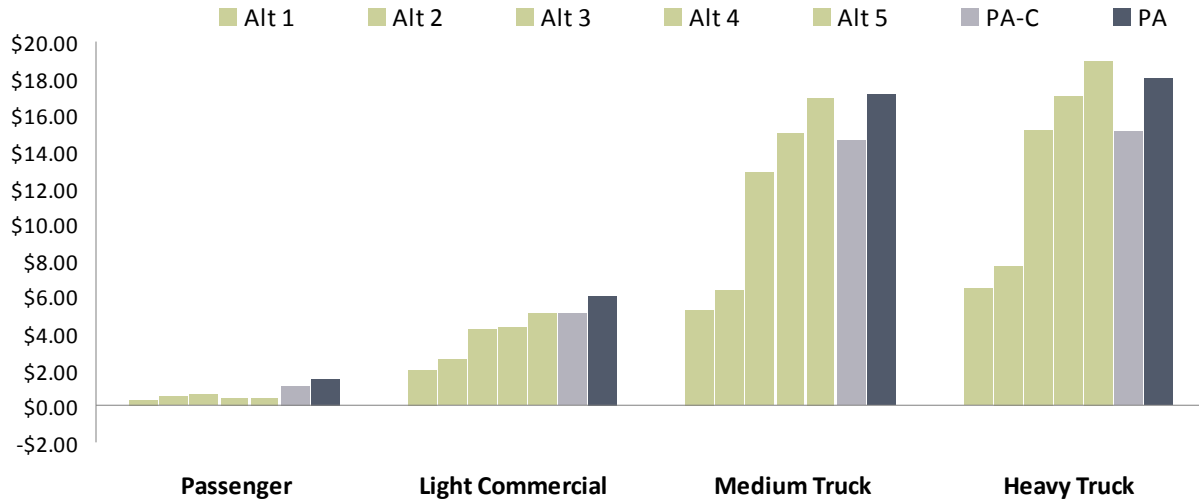
Measure:	<i>E3. Distribution of Benefits to Personal and Commercial Users</i>							
Unit:	Measures of user benefits categorized by different vehicle classes (personal and commercial vehicles) <i>(based on Benefit-Cost Analysis)</i> .							
Rationale:	Decision makers are interested in the way that benefits of transportation projects are distributed across classes of vehicles. Some transportation improvements have broad benefits to users of the transportation system, while others may distribute benefits more narrowly to specific users, such as freight vehicles. This distributional issue relates to who pays and who benefits from improvements. The different vehicle classes are passenger cars, light commercial vehicles, medium trucks, and heavy trucks.							
Discussion:	Alternatives 1, 2, and 3 and the Preferred Alternative (Constrained and Full Plan) provide benefits, as compared to the Baseline, to each grouping of passenger and commercial vehicles in a roughly proportional manner. Alternatives 4 and 5 result in a higher disparity across passenger and commercial user groups.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		⊗	⊗	⊗	-	-	⊗	⊗

Total Annual Benefits by User Type (Change from 2040 Baseline)

Alternative	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
USER BENEFITS	(millions of 2008 dollars)						
Passenger	\$1,130	\$1,673	\$2,100	\$1,459	\$1,388	\$3,747	\$4,886
Light Commercial	\$122	\$160	\$263	\$270	\$314	\$318	\$375
Medium Truck	\$358	\$430	\$867	\$1,012	\$1,138	\$987	\$1,154
Heavy Truck	\$499	\$602	\$1,182	\$1,322	\$1,478	\$1,177	\$1,399

Per Trip Benefits by User Type (Change from the 2040 Baseline):

Reduced Travel Time , Unreliability, Vehicle Operating Costs and Other User Costs



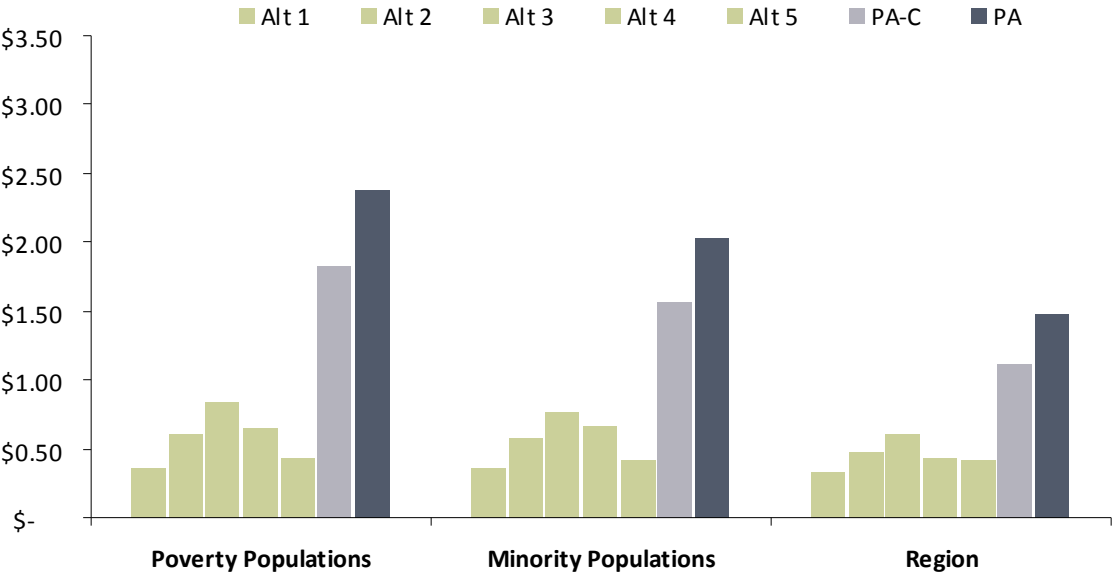
Measure:	E4. Benefits to Environmental Justice Populations							
Unit:	Measures of user benefits categorized by geographies that are correlated with observed concentrations of minority and low-income populations. Benefits are calculated for geographic zones where population in the target category as a percentage of total population exceeds one standard deviation above the mean. In addition, changes in travel time per personal trip are also reported for these selected geographies (based on Benefit-Cost Analysis).							
Rationale:	Decision makers are interested in the way that benefits of transportation projects are distributed across segments of society. Some transportation improvements have broad benefits to all users of the transportation system, while others may distribute benefits more narrowly. This distributional issue relates to whether specific vulnerable populations benefit from transportation improvements. Environmental justice guidelines define minority populations to include Black, American Indian and Alaskan Native, Asian, Native Hawaiian and Other Pacific Islander, and Hispanic people and low-income populations to include anyone who is at or below the U.S. Department of Health and Human Services poverty guidelines. The locations of environmental justice populations are based on current residential locations from the Census.							
Discussion:	All alternatives provide benefits to each grouping of minority populations and populations living in poverty as compared to the Baseline, although, as would be expected, the distribution of benefits varies across these alternatives. The Preferred Alternative (Constrained and Full Plan) results in the greatest benefits to these populations and the least disparity between these populations and the entire regional population as a whole.							
	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
		+	+	+	+	+	+	+

Total Annual User Benefits for Residents (Changes From 2040 Baseline)

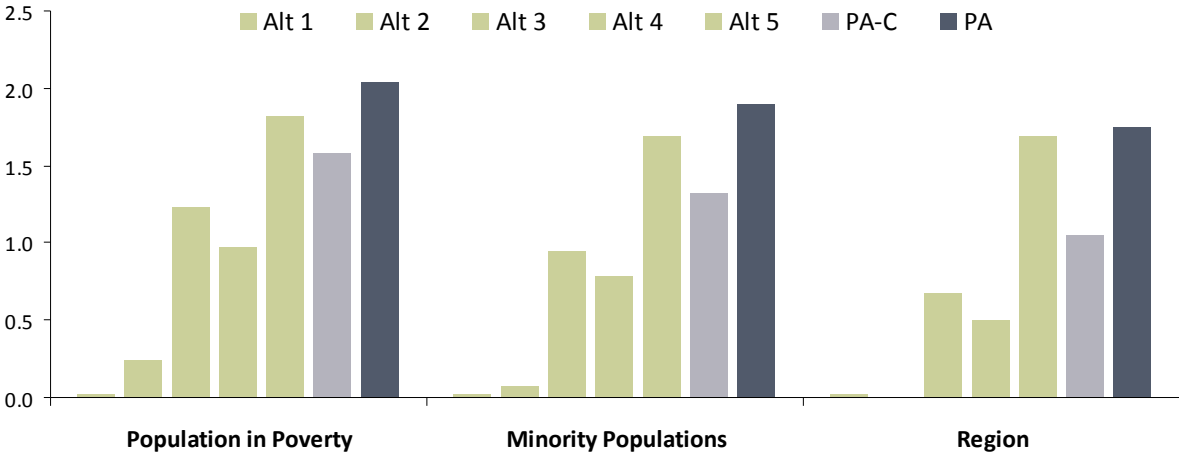
Time Savings, Reliability, Vehicle Operating Costs

Alternative	Alt 1		Alt 2		Alt 3		Alt 4		Alt 5		PA-C		PA	
(millions of 2008 dollars)														
Poverty Populations	\$	141	\$	244	\$	328	\$	252	\$	158	\$	692	\$	876
Minority Populations	\$	180	\$	290	\$	378	\$	320	\$	197	\$	747	\$	946

Changes in Total User Benefits Per Personal Trip from 2040 Baseline



Travel Time Savings (Minutes) Per Personal Trip Compared with the 2040 Baseline



3.8 Other Measures Used in Policy Analysis

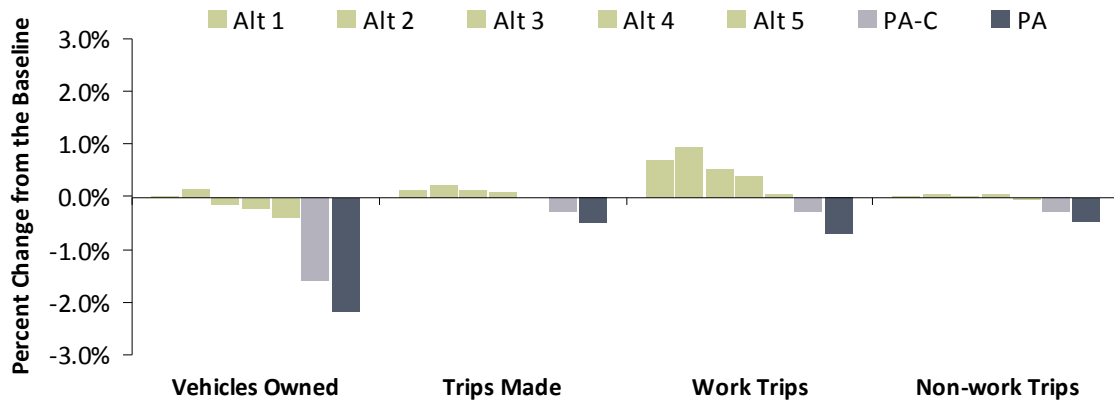
In addition to criteria measures, the policy analysis draws on other model statistics (such as those listed below) as appropriate, and builds on assessment of environmental impacts evaluated in the VISION 2040 Environmental Impact Statement (EIS). In the EIS, key measures regarding transportation system performance were used, which correlated with several criteria described previously.

Trip-Making Measures

This includes all vehicles used for personal use and all passenger trips and all modes.

Total Daily Travel (Vehicles Owned and Daily Person Trips Made by Households)

Scenario	2006 Base Year	2040 Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Vehicles Owned	2,587,000	3,841,000	3,842,000	3,847,000	3,836,000	3,833,000	3,826,000	3,759,000	3,759,000
Change from 2006		48%	49%	49%	48%	48%	48%	45%	45%
Work Trips Made	2,169,000	3,161,000	3,183,000	3,191,000	3,178,000	3,174,000	3,162,000	3,130,000	3,130,000
Change from 2006		46%	47%	47%	47%	46%	46%	44%	44%
Non-Work Trips Made	11,563,000	15,990,000	15,993,000	16,000,000	15,993,000	15,996,000	15,984,000	15,919,000	15,919,000
Change from 2006		38%	38%	38%	38%	38%	38%	38%	38%

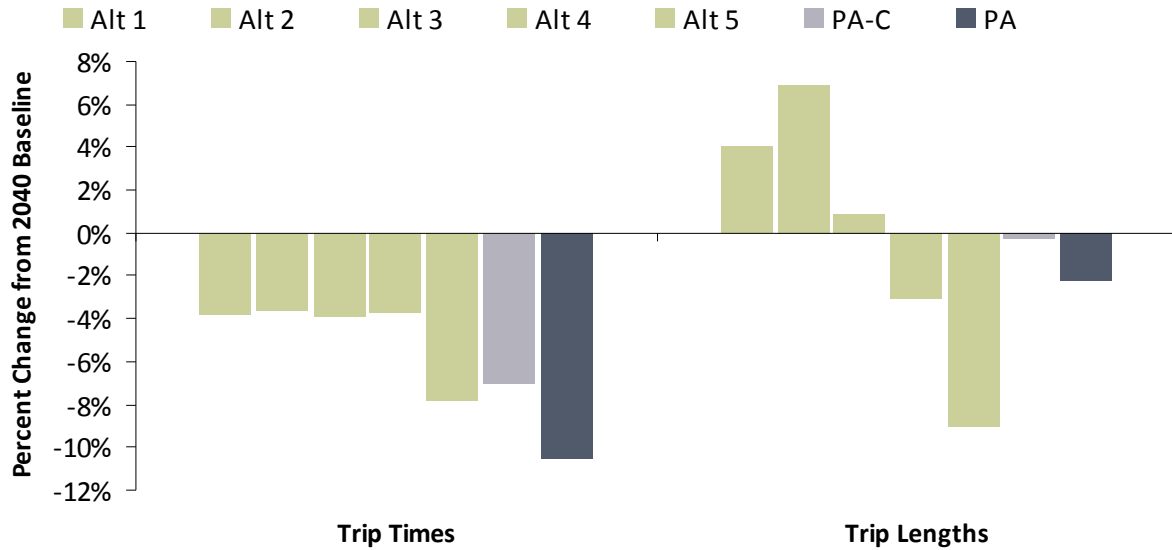


Trip Length Measures

This includes all passenger trips and all modes.

Average Daily Trip Lengths (Times in Minutes, Lengths in Miles)

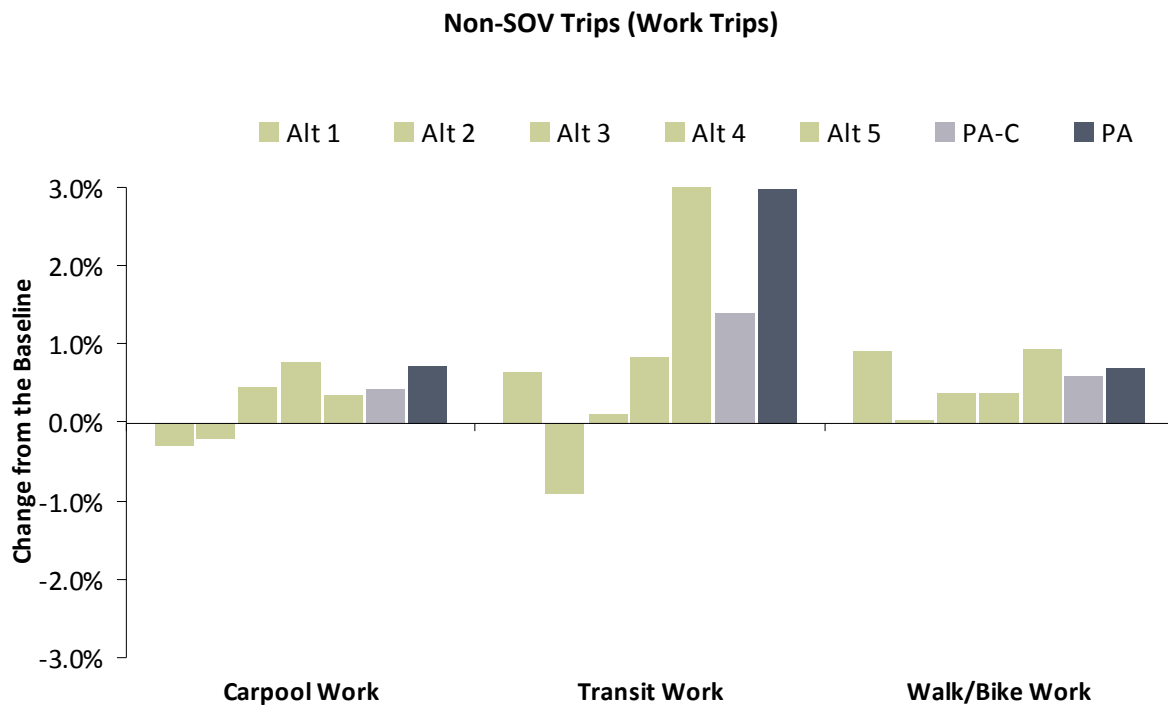
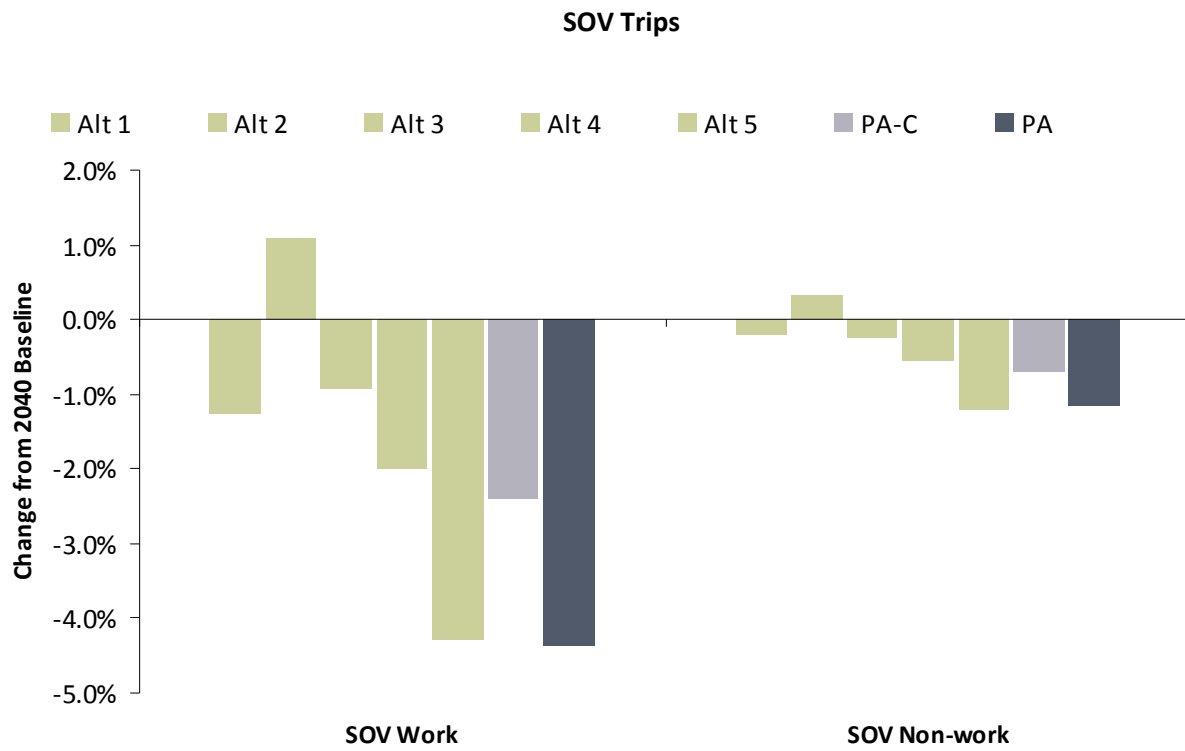
Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Trip Times									
Work	36	42	38	38	39	41	42	37	36
Non-work	18	18	18	18	18	18	16	17	17
Total	21	22	21	21	21	21	20	21	20
Trip Lengths									
Work	13	13	13	13	13	12	13	13	13
Non-work	6	5	5	5	5	5	4	5	5
Total	7	6	7	7	6	6	6	6	6
Percent Change from 2006 in Trip Times									
Work		16%	7%	5%	10%	14%	16%	4%	1%
Non-work		1%	-1%	0%	-2%	-4%	-10%	-5%	-9%
Total		6%	2%	2%	2%	2%	-3%	-2%	-5%
Percent Change from 2006 in Trip Lengths									
Work		-2%	-1%	0%	-2%	-6%	-5%	-4%	-3%
Non-work		-11%	-7%	-3%	-10%	-14%	-22%	-11%	-14%
Total		-8%	-4%	-1%	-7%	-10%	-16%	-8%	-10%



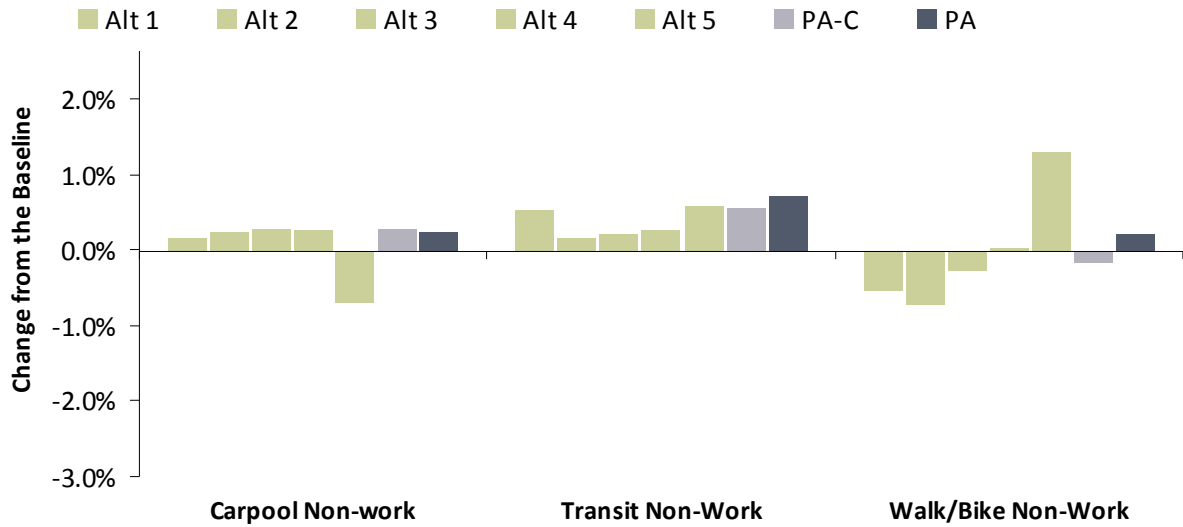
Modal Shares

This includes all passenger trips and all modes.

Average Daily Trips by Mode and Vehicle Type									
Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Work Trips by Mode (person trips)									
SOV	1,634,000	2,197,000	2,174,000	2,254,000	2,180,000	2,144,000	2,063,000	2,116,000	2,045,000
Carpool	193,000	273,000	265,000	269,000	289,000	298,000	284,000	286,000	294,000
Transit	225,000	507,000	532,000	483,000	514,000	536,000	603,000	550,000	597,000
Walk/Bike	119,000	186,000	216,000	189,000	198,000	199,000	216,000	204,000	206,000
Non-work Trips by Mode (person trips)									
SOV	4,199,000	6,094,000	6,065,000	6,148,000	6,056,000	6,007,000	5,904,000	5,965,000	5,885,000
Carpool	5,629,000	7,316,000	7,345,000	7,359,000	7,363,000	7,360,000	7,208,000	7,340,000	7,319,000
Transit	161,000	286,000	374,000	312,000	320,000	327,000	380,000	375,000	397,000
Walk/Bike	1,286,000	2,095,000	2,010,000	1,981,000	2,053,000	2,102,000	2,299,000	2,065,000	2,118,000
Total Person Trips	13,446,000	18,954,000	18,981,000	18,995,000	18,973,000	18,973,000	18,957,000	18,901,000	18,861,000
Commercial Trips (vehicle trips)									
Commercial Trips	163,552	238,964	238,964	238,964	238,964	238,964	238,964	238,964	238,964
Percent Change from 2006 in Work Trips									
SOV		34%	33%	38%	33%	31%	26%	29%	25%
Carpool		41%	37%	39%	50%	54%	47%	48%	52%
Transit		125%	136%	115%	128%	138%	168%	144%	165%
Walk/Bike		56%	82%	59%	66%	67%	82%	71%	73%
Percent Change from 2006 in Non-work Trips									
SOV		45%	44%	46%	44%	43%	41%	42%	40%
Carpool		30%	30%	31%	31%	31%	28%	30%	30%
Transit		78%	132%	94%	99%	103%	136%	133%	147%
Walk/Bike		63%	56%	54%	60%	63%	79%	61%	65%



Non-SOV Trips (Non-Work Trips)

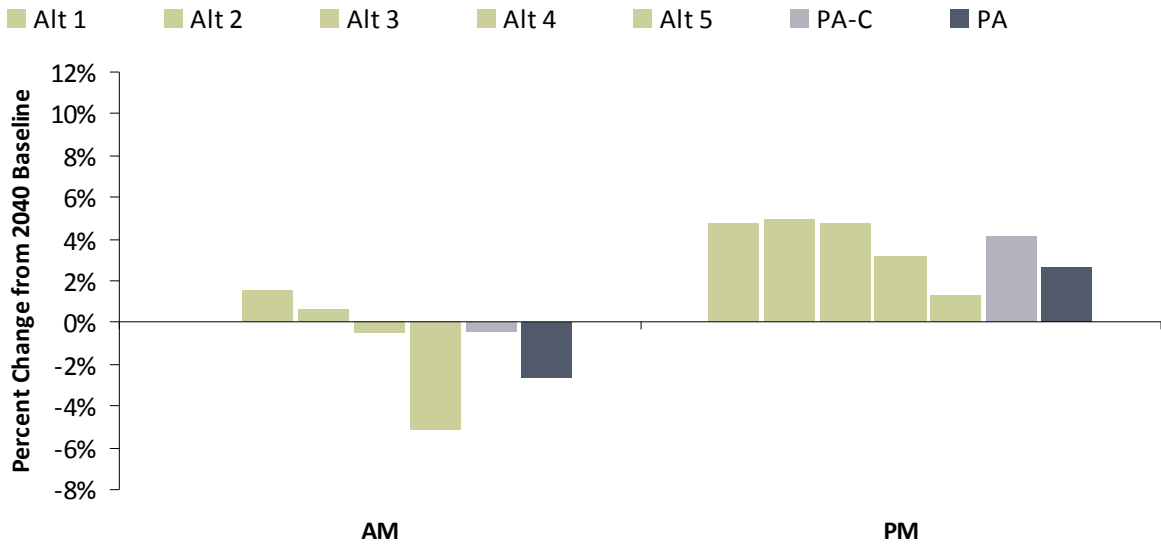


Auto Assignments

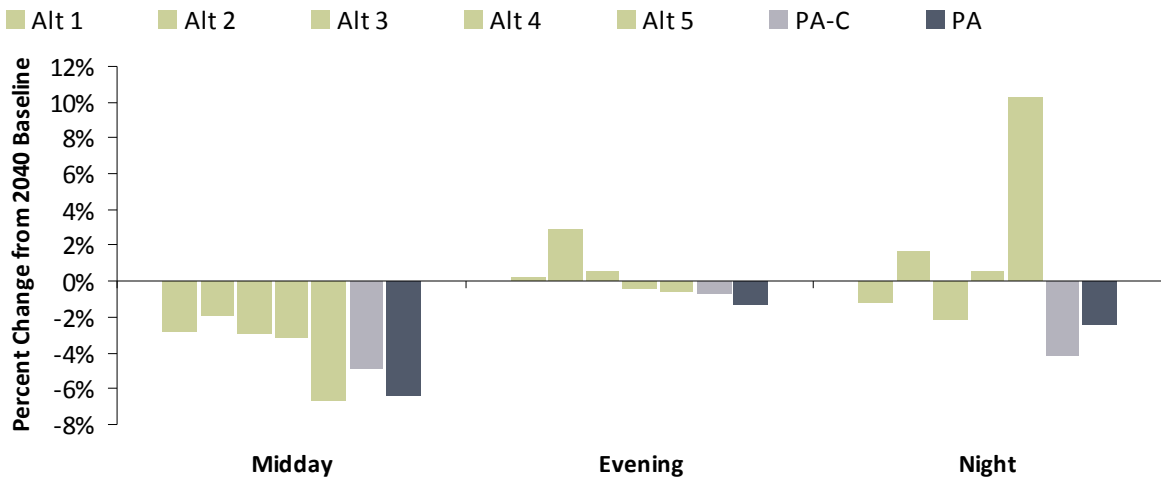
This includes all passenger trips for auto modes only (SOV and carpool).

Average Daily Vehicle Trips (Trips by Time Period)									
Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Vehicle Trips									
AM	1,469,000	1,984,000	1,985,000	2,014,000	1,997,000	1,974,000	1,882,000	1,976,000	1,932,000
Midday	3,277,000	4,742,000	4,609,000	4,653,000	4,604,000	4,596,000	4,424,000	4,514,000	4,442,000
PM	1,910,000	2,512,000	2,632,000	2,636,000	2,631,000	2,591,000	2,545,000	2,617,000	2,579,000
Evening	1,441,000	2,015,000	2,020,000	2,072,000	2,025,000	2,007,000	2,004,000	2,002,000	1,990,000
Night	594,000	916,000	904,000	931,000	897,000	921,000	1,010,000	878,000	893,000
Total	8,691,000	12,169,000	12,151,000	12,306,000	12,153,000	12,089,000	11,864,000	11,986,000	11,835,000
Change from 2006									
AM		35%	35%	37%	36%	34%	28%	35%	32%
Midday		45%	41%	42%	40%	40%	35%	38%	36%
PM		32%	38%	38%	38%	36%	33%	37%	35%
Evening		40%	40%	44%	41%	39%	39%	39%	38%
Night		54%	52%	57%	51%	55%	70%	48%	50%
Total		40%	40%	42%	40%	39%	37%	38%	36%

Peak Period Vehicle Trips

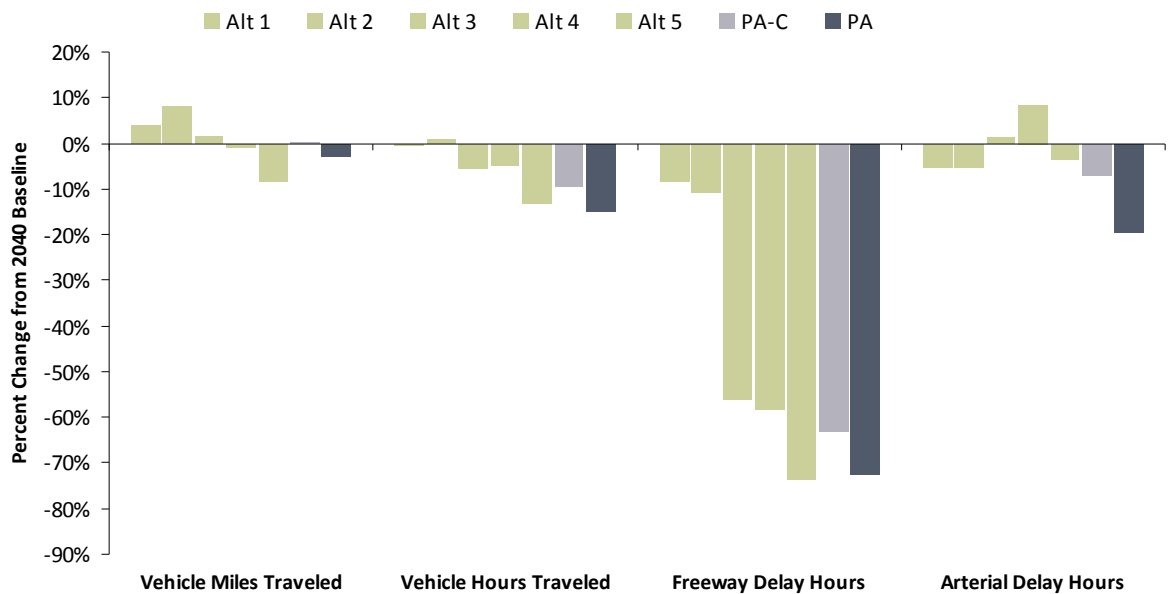


Off-Peak Period Vehicle Trips



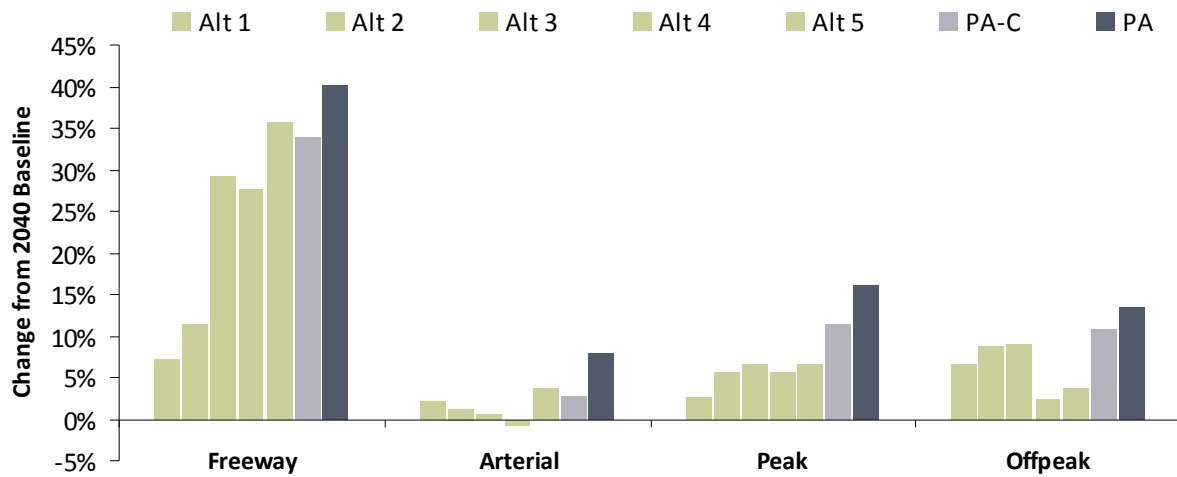
Auto Travel (Average Daily Vehicle Miles Traveled, Vehicle Hours Traveled, Delay Hours)

Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Vehicle Miles and Hours Traveled									
Vehicle Miles	79,457,000	102,519,000	106,647,400	110,481,000	104,058,500	101,642,700	94,063,000	102,538,700	99,511,400
VTM per Capita	22.5	20.6	21.4	22.1	20.9	20.4	18.9	20.6	19.9
Vehicle Hours	2,962,000	4,241,000	4,220,200	4,273,900	4,006,700	4,037,400	3,685,100	3,842,500	3,606,600
Vehicle Delay Hours									
Freeway	281,000	513,000	469,300	457,700	224,200	214,700	136,200	189,800	141,000
Arterial	560,000	932,000	883,900	883,700	943,000	1,011,400	897,300	865,500	749,000
Total Delay	841,000	1,445,000	1,353,200	1,341,400	1,167,300	1,226,100	1,033,500	1,055,300	890,000
Delay per Capita (minutes)	14.3	17.4	16.3	16.1	14.0	14.7	12.4	12.7	10.7
Change from 2006 in Vehicle Miles and Hours Traveled									
Vehicle Miles		29%	34%	39%	31%	28%	18%	29%	25%
VTM per Capita		-9%	-5%	-2%	-7%	-10%	-16%	-9%	-12%
Vehicle Hours		43%	42%	44%	35%	36%	24%	30%	22%
Change from 2006 in Vehicle Delay Hours									
Freeway		83%	67%	63%	-20%	-24%	-52%	-32%	-50%
Arterial		66%	58%	58%	68%	81%	60%	55%	34%
Total		72%	61%	60%	39%	46%	23%	25%	6%
Delay per Capita		21%	14%	13%	-2%	3%	-13%	-11%	-25%

Vehicle Miles Traveled, Vehicle Hours Traveled, and Hours of Delay

Auto Performance (Average Daily Speeds by Facility Type and Time Period)

Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Auto Speeds									
Freeway	41	35	38	39	45	45	48	47	49
Arterial	22	20	20	20	20	20	21	21	22
Peak	24	22	22	23	23	23	23	24	25
Offpeak	29	25	27	28	28	26	26	28	29
Change from 2006 in Speeds									
Freeway		-14%	-8%	-4%	11%	10%	17%	15%	21%
Arterial		-8%	-6%	-7%	-8%	-9%	-5%	-6%	-1%
Peak		-10%	-8%	-5%	-4%	-5%	-4%	0%	4%
Offpeak		-11%	-5%	-3%	-3%	-9%	-8%	-1%	1%

Average Auto Daily Speeds

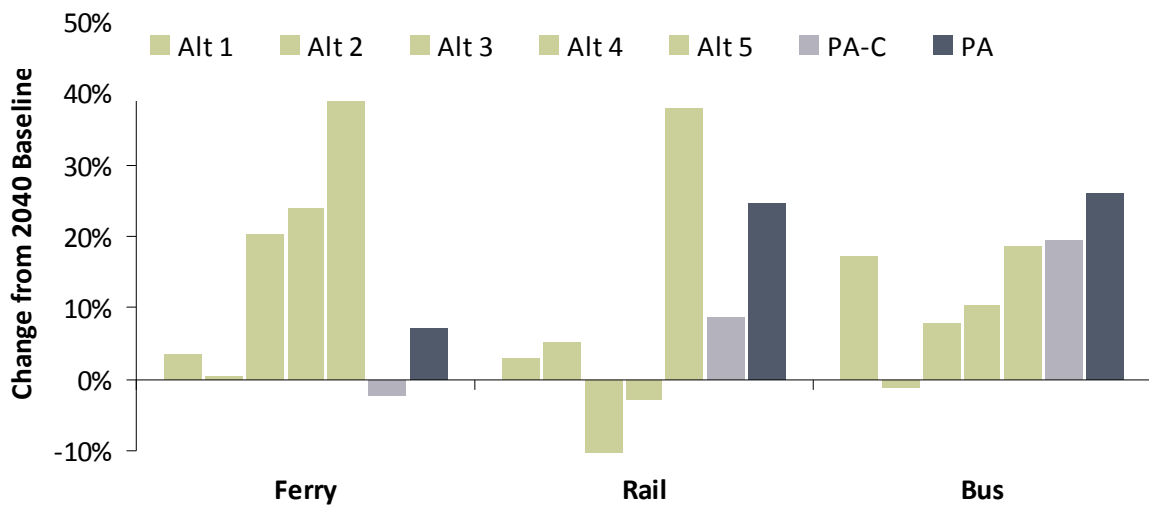


Transit Assignments

Transit Travel (Average Daily Boardings by Mode)

Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Transit Boardings									
Ferry	11,800	37,600	38,900	37,700	45,100	46,500	53,200	36,700	40,200
Rail	5,800	151,300	155,500	159,200	135,800	147,200	208,500	164,400	188,800
Bus	367,500	599,900	703,600	592,500	646,900	662,900	712,400	717,100	756,400
Total	385,100	788,800	898,000	789,400	827,800	856,600	974,100	918,300	985,400
Percent Change from 2006 in Transit Boardings									
Ferry		219%	230%	219%	282%	294%	351%	211%	241%
Rail		2509%	2581%	2645%	2241%	2438%	3495%	2734%	3155%
Bus		63%	91%	61%	76%	80%	94%	95%	106%
Total		105%	133%	105%	115%	122%	153%	138%	156%

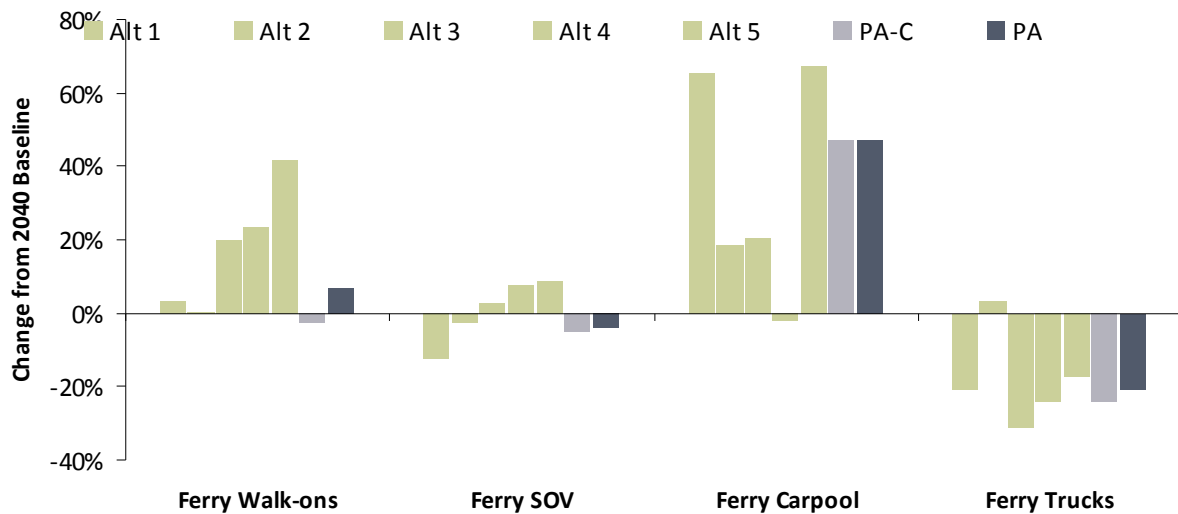
Transit Boardings



Ferry Travel (Average Daily Person Trips by Boarding Mode)

Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Auto and Transit Ferry Person Trips									
Ferry Walk-ons	11,800	37,600	38,900	37,700	45,100	46,500	53,200	36,700	40,200
Ferry SOV	17,400	22,300	19,500	21,700	22,900	24,000	24,200	21,200	21,400
Ferry Carpool	4,600	4,900	8,100	5,800	5,900	4,800	8,200	7,200	7,200
Ferry Trucks	1,900	2,900	2,300	3,000	2,000	2,200	2,400	2,200	2,300
Total	35,700	67,700	68,800	68,200	75,900	77,500	88,000	67,300	71,100
Percent Change from 2006 in Ferry Boardings									
Ferry Walk-ons		219%	230%	219%	282%	294%	351%	211%	241%
Ferry Drive-ons		26%	25%	28%	29%	30%	46%	28%	29%
Total		90%	93%	91%	113%	117%	146%	89%	99%

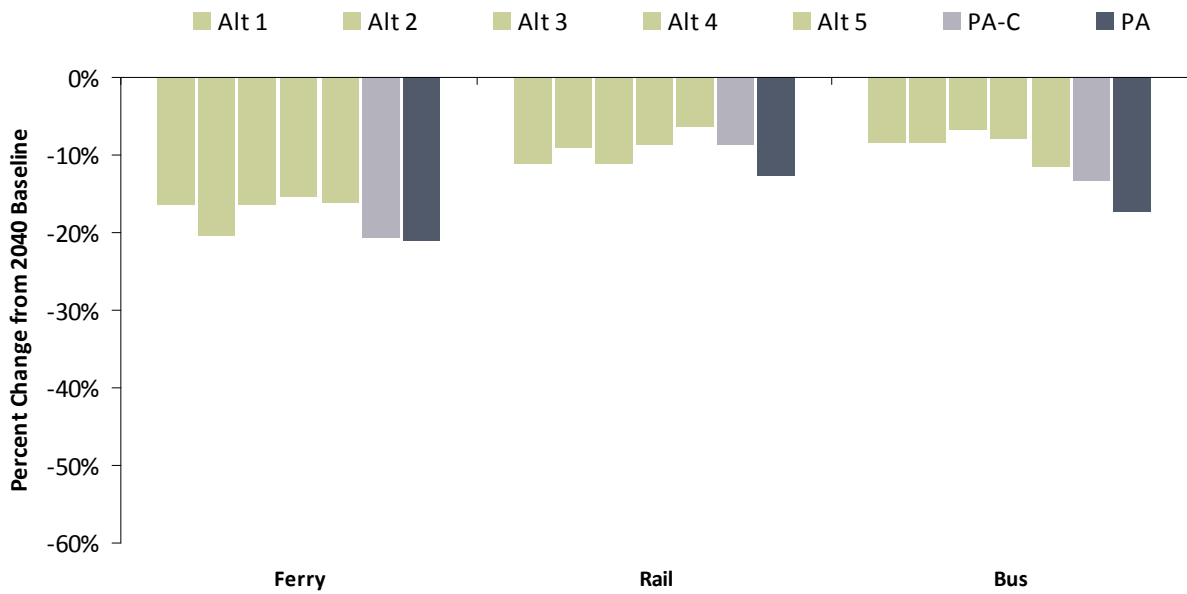
Ferry Boardings



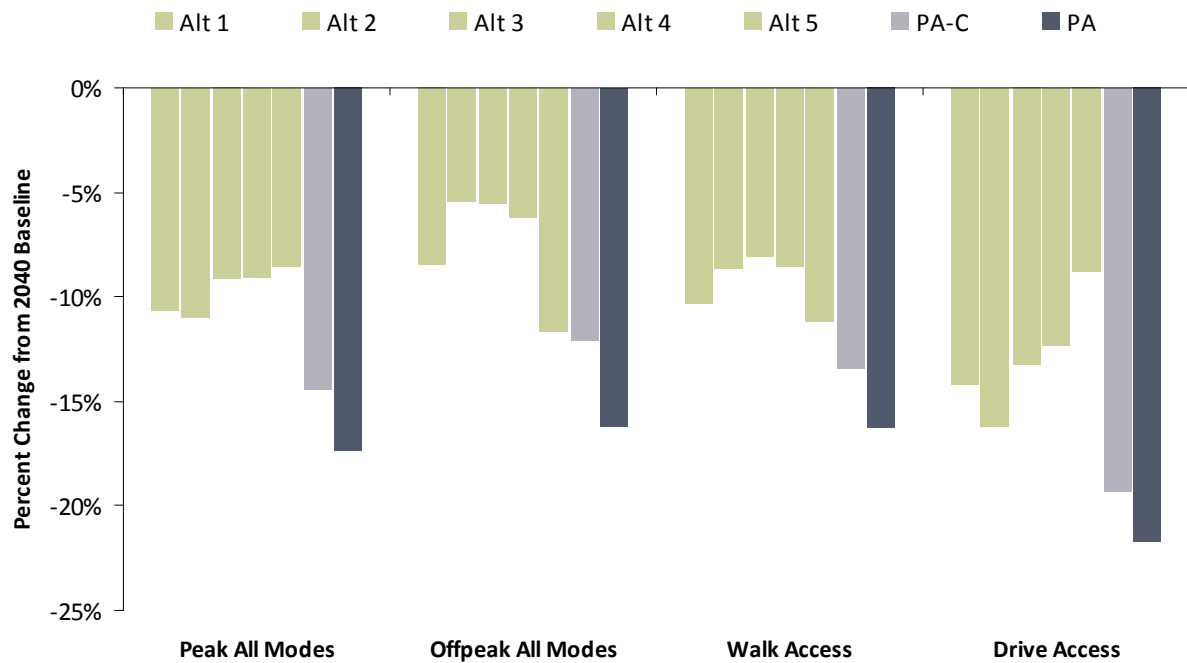
Transit Time (Average Daily by Mode and Peak/Offpeak Transit Travel Time in Minutes and Change from Baseline)

Scenario	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Transit Travel Time									
Ferry	131	146	122	116	122	123	123	116	115
Rail	110	70	62	64	62	64	66	64	61
Bus	56	58	53	53	54	54	52	51	48
Peak All Modes	61	70	63	62	64	64	64	60	58
Offpeak All Modes	55	55	50	52	52	52	49	48	46
Walk Access	56	61	54	55	56	55	54	52	51
Drive Access	68	86	73	72	74	75	78	69	67
Change from 2006 in Transit Travel Time									
Ferry		11%	-7%	-11%	-7%	-6%	-7%	-12%	-12%
Rail		-36%	-43%	-42%	-43%	-41%	-40%	-42%	-44%
Bus		5%	-4%	-4%	-2%	-3%	-7%	-9%	-13%
Peak All Modes		14%	2%	2%	4%	4%	4%	-2%	-6%
Offpeak All Modes		1%	-8%	-5%	-5%	-6%	-11%	-12%	-16%
Walk Access		7%	-4%	-2%	-1%	-2%	-5%	-7%	-10%
Drive Access		26%	8%	6%	9%	10%	15%	2%	-1%

Transit Travel Times by Mode



Transit Travel Times (Peak/Off-Peak, Walk/Drive Access)



Nonmotorized Trips

Non_Motorized Trips (Average Daily Walk, Bike, and Walk-to-Transit Trips by Purpose)

	2006 Base Year	Baseline	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	PA-C	PA
Walk, Bike and Walk to Transit Trips									
Work	265,100	538,200	572,000	508,200	540,700	557,200	627,200	571,100	609,700
Non-Work	1,447,000	2,381,400	2,383,500	2,293,100	2,373,200	2,428,900	2,679,000	2,440,300	2,515,500
Total	1,712,200	2,919,600	2,955,500	2,801,300	2,913,800	2,986,100	3,306,200	3,011,400	3,125,100
Change from 2006 in Non-motorized Trips									
Work		103%	116%	92%	104%	110%	137%	115%	130%
Non-Work		65%	65%	58%	64%	68%	85%	69%	74%
Total		71%	73%	64%	70%	74%	93%	76%	83%

