Sustainable Transportation Planning

Task 5.2 Final Summary Report

January 31, 2014

LIVABILITYLANE

building smarter communities together

Eugene

NORTH AMERICAN Sustainable Transportation Council

STC

Acknowledgments

Author

Kurt Yeiter
Senior Transportation Planner
City of Eugene

For the City of Eugene

Rob Inerfeld
Transportation Planning Manager
City of Eugene

For the North American Sustainability Council

Peter Hurley
Policy & Program Director
North American Sustainable Transportation Council

Kelly Rodgers
Program Manager (former)
North American Sustainable Transportation Council

Disclaimer

The work that provided the basis for this publication was supported by funding under an award with the U.S. Department of Housing and Urban Development. The substance and findings of the work are dedicated to the public. The author and publisher are solely responsible for the accuracy of the statements and interpretations contained in this publication. Such interpretations do not necessarily reflect the views of the Government.

About the Lane Livability Consortium

The information summarized in this report was prepared at the request of a coalition of local public, nonprofit, and educational agencies and organizations called the Lane Livability Consortium. These entities are working together through the Lane Livability Consortium to find new ways to advance community growth and prosperity in the Eugene-Springfield metropolitan area. The Lane Livability Consortium was established in 2010 in order to apply for and receive a Sustainable Communities Regional Planning Grant from the U.S. Department of Housing and Urban Development. The Consortium's efforts are funded through the Regional Planning Grant and with leveraged resources contributed by local partner agencies. Work through the Consortium commenced in 2011 and will conclude in 2014.

Partner agencies include City of Eugene, City of Springfield, Lane County, Eugene Water and Electric Board, Housing and Community Services Agency of Lane County, Lane Council of Governments, Central Lane Metropolitan Planning Organization, Lane Transit District, Oregon Department of Transportation, St. Vincent de Paul Society of Lane County, University of Oregon Sustainable Cities Initiative, and the University of Oregon Community Planning Workshop.

The primary focus of the Consortium is to identify opportunities for greater impacts and linkages among our region's core plans and investments related to land use, transportation, housing, and economic development. Other Consortium initiatives include work on public engagement, scenario planning, use of data for decision-making, regional investments, organizational capacity building, and catalytic projects.

For additional tools and resources related to this and other topics and projects supported by the Lane Livability Consortium, visit the Livability Lane Toolkit webpage:

www.livabilitylane.org/toolkit

LIVABILITYLANE Toolkit

Table of Contents

Appendices:

Sustainable Transportation Planning (Task 5.2) Final Summary Report

Kurt Yeiter, Senior Transportation Planner, City of Eugene
January 28, 2014

Sustainability is our capacity as a community to grow and change, to more deeply understand the inter-relationships of our human, economic, and natural systems, and to make the decisions today that ensure our viability and resilience for tomorrow.

The Lane Livability Consortium

1.1. Introduction and Purpose Statement

In 2000, the Eugene City Council adopted Resolution 4618, which states, in part, *"The concept of sustainability guides city policy and actions. The City of Eugene is committed to meeting its current needs without compromising the ability of future generations to meet their own needs. The City will ensure that each of its policy decisions and programs are interconnected through the common bond of sustainability as expressed in these principles. The cumulative and long term impacts of policy choices will be considered as we work to ensure a sustainable legacy."*

The City of Eugene is in the process of updating its Transportation System Plan (TSP), a comprehensive 20-year strategy for public investments in transportation that will accommodate growth while meeting state and local goals for a better environment and reduced greenhouse gas (GHG) emissions. In meeting the intent of Council Resolution 4618, several questions naturally arise: What does a sustainable transportation system look like? What should the city's first steps be to get on the path toward sustainable transportation?

To answer these questions, the City of Eugene partnered with the North American Sustainable Transportation Council to use the Council's Sustainable Transportation Analysis & Rating System (STARS), an integrated planning framework for transportation plans and projects. STARS helps planners, communities and decision-makers establish desired outcomes, evaluate the impacts of transportation plans and projects, identify innovative strategies and improve decision-making.[1] It is an objective of the City to use triple bottom line sustainability principles throughout the transportation planning process and to have them fully integrated in the TSP's DNA, rather than merely acknowledge sustainability at the back end after the plan was written.

[1] STARS website: http://www.transportationCouncil.org

The purpose of Lane Livability Consortium (LLC) Task 5.2 is to help develop a tool that will integrate sustainability into the development of local and regional transportation plans, using STARS as a reference framework and the Eugene Transportation System Plan as a test case for implementation.

1.1.1. Background

1.1.1.1. The Eugene Transportation System Plan

In Oregon, every city, county, and the state is required to have a Transportation System Plan (TSP). Every TSP needs to coordinate with the other TSPs of nearby cities and counties, as well as the state's. Historically, long-range transportation system plans for Eugene and its neighboring City of Springfield were developed as part of a single regional planning effort. The last substantial update to the Eugene-Springfield metropolitan area transportation system plan ("TransPlan") was adopted in 2002. [2]

The current update of Eugene's Transportation System Plan will result in the first comprehensive transportation plan customized specifically for Eugene.

The City of Eugene formed a Transportation Community Resource Group (TCRG) comprised of community members that have met nine times so far and provided input on the development of the Transportation System Plan.

The TCRG is an expansion of the dialog started by the Community Resource Group formed for Envision Eugene[3], the City's comprehensive land use planning effort, but the TCRG is focused on transportation issues. The original Community Resource Group was joined by other transportation advocacy groups; representatives of school districts, industry, and freight; and representatives of state and local regulatory agencies and emergency services. The TCRG is an open discussion group numbering more than 150 people and a core group of regular attendees numbering about 40.

One of the transportation goals developed by the TCRG is to "*Advance regional sustainability by providing a transportation system that improves economic vitality, environmental health, social equity, and well-being*." This advisory group also stressed the importance of providing transportation services to economically disadvantaged and people most in need, reducing greenhouse gas emissions, and maintaining freight services. The TCRG supported the incorporation of the Sustainable Transportation Analysis and Rating System (STARS) framework

[2] http://lcog.org/transplan.cfm
[3] http://www.eugene-or.gov/index.aspx?NID=779

into the planning process to help with decision making and prioritization of transportation projects. TCRG members and the TSP's Technical Advisory Committee attended a two day STARS training in October 2011. STARS influenced the development of draft goals, objectives, and metrics for the Transportation System Plan. The Lane Livability Consortium allowed the North American Sustainable Transportation Council to remain involved in the development of the goals, objectives and policies; development of evaluation criteria and a list of projects to be evaluated; and the screening of the project list according to these criteria.

1.1.2. The North American Sustainable Transportation Council and the STARS program[4]

The North American Sustainable Transportation Council (Council) was founded in 2009 by transportation planners, project managers, and sustainability professionals to improve the performance of transportation plans and projects. The Council drew inspiration from the Leadership in Energy and Environmental Design (LEED) and the Living Building Challenge, planning and certification systems that are transforming the building construction industry by rewarding projects for higher levels of performance.

The Council developed the Sustainable Transportation Analysis & Rating System, or STARS, to provide a road map for planners and communities seeking a more effective and systemic approach to achieve their transportation and livability goals. STARS is a flexible framework for communities to set and achieve triple bottom line sustainability goals for transportation investments. A copy of the Sustainable Transportation Analysis & Rating System Pilot Plan Application Manual, Version 1.0 is available as Appendix H.

State Departments of Transportation, regional agencies, cities, and counties are wrestling with how to improve access within seriously constrained budgets, while helping achieve economic, environmental, and equity goals. They need practical tools to compare their transportation projects and plans using a national best practices standard, which STARS provides. STARS evaluates improved *access* rather than simply improved *mobility*. That is, STARS recognizes the value in people having access to work, school, goods and services, even if they do not have to travel far to do so. Travelling, or mobility, is a means to accessing these places, not an end in itself. A focus on access enables STARS users to find solutions to transportation problems that might otherwise be overlooked with a traditional focus on moving more people farther, faster. Appendix A contains the methodology that STARS has developed for evaluating access.

[4] Derived from the STC website: http://www.transportationCouncil.org

STARS promotes plans and projects that are likely to achieve multiple goals. Though STARS credits are organized into distinct categories, the STARS framework allows users to optimize the areas of shared benefit across categories. As a result, the performance measures selected are often crosscutting, serving multiple goals. STARS encourages the use of a few manageable but powerful measures of sustainability.[5]

One of the key concepts developed and tested through Eugene's use of STARS is that of "heavy lifter" objectives and performance measures. "Heavy lifter" objectives and measures are the relatively few which provide multiple economic, environmental and social benefits. The following heavy lifter criteria evolved in the Eugene review of projects:

- Improves city-wide mode split, as reported as percentage of commute trips taken by pedestrians, cyclists, & transit.
- Reduces fatalities & injuries. Addresses known safety concern areas, provides safe & attractive pedestrian &/or bicycle facilities, and addresses areas that are otherwise considered unsafe.
- Limits impacts on areas with greater proportions of low income, minority, youth &/or elderly population than the city as a whole.
- Improves access to typical daily destinations within a 20-minute walk, bicycle trip, or bus ride.
- Reduces the duration or level of access along key transit corridors & in core commercial areas.
- Improves the likelihood of employees walking, biking, or riding transit to major employment centers.
- Benefits to other 7 objectives compared to the costs (public, private, & social) of the project.
- Affects (increases) mode split &/or (decreases) VMT. Reduces congestion &/or improves system level operation efficiency & reduces GHG emissions.
- Increases the functionality or quality of habitat areas.

Another example of a "heavy lifter" is reducing vehicle miles traveled (VMT), which was assumed within the Eugene criteria listed above. Reducing VMT often results in:

- Healthier people, as more people walk and cycle;
- A healthier local economy, as less money is exported to other regions for fuel;
- A healthier environment, as less carbon pollution is dumped into the atmosphere; and
- Less demand for crowded roads, as people use healthier options and drive less.

Using the STARS work with the Eugene Transportation System plan as a practical test case, the work sponsored by the Lane Livability Consortium Task 5.2 helped hone STARS as a tool to integrate sustainability in the development of local and regional transportation plans.

[5] STARS is informed by The Natural Step principles of sustainability (http://www.naturalstep.org)

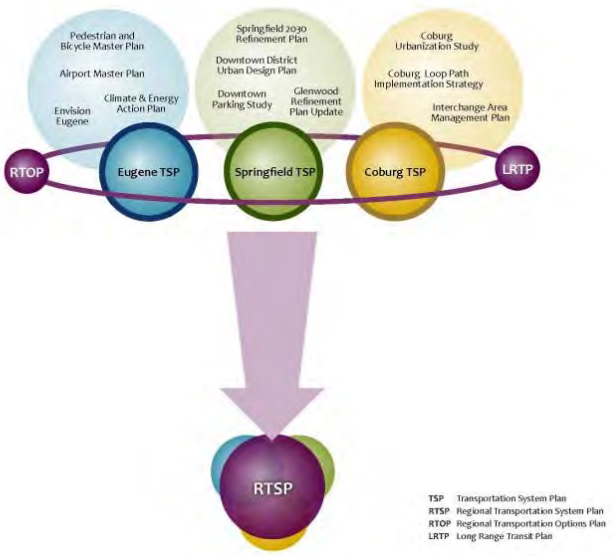
1.2. Public Involvement

The City of Eugene formed a Transportation Community Resource Group (TCRG), an open-invitation committee comprised of approximately 120 community members, and an interagency Technical Advisory Committee to provide input on the development of the Transportation System Plan. The TCRG met nine times in 2011. The Technical Advisory Committee met four times. Both the TCRG and Technical Advisory Committee participated in an online survey and a full day sustainable transportation workshop hosted by the North American Sustainable Transportation Council in September 2011. All background reports, meeting materials and summaries of decisions were posted on an interactive website (www.EugeneTSP.org). The website allowed for public input on a map, blog, and by email. Email messages were sent to the TCRG every 4-8 weeks during 2013 to keep members informed of progress. The TCRG met on February 11, 2014, at which point the TCRG finished their review of the projects.

The TCRG developed draft goals and objectives for the Eugene Transportation System Plan. The goals and objectives were based on the outcomes of the STARS training workshop. The TCRG reviewed and expanded the list of potential transportation projects that would be subject to a sustainability evaluation pursuant to the process recommended by STARS. Lists and maps of the projects to be scored were posted to the project website, distributed and discussed at several neighborhood meetings (these meetings were coordinated with review of the Envision Eugene land use plan), the Eugene Planning Commission and Sustainability Commission, the Eugene Area Chamber of Commerce, and other community groups. The Technical Advisory Committee then helped develop scoring criteria and data needs to use in project assessment.

In May 2013, the City's Transportation System Plan project manager participated in the Lane County Network for Immigrant Integration, a community conversation with many organizations and agencies that work with and serve immigrant communities throughout Lane County. The community conversation increased and strengthened communication and trust between the Latino immigrant community and the organizations and institutions that both serve and outreach to them. Staff heard directly from the Latino immigrant community placed in several small groups of 4-6 about their experiences accessing transportation services and information. The transportation discussion blended with the topics of education, health care, and civic engagement, which were also part of the Network for Immigrant Integration events.

During this period, the City's Transportation System Plan project staff also participated in development of the City of Springfield's Transportation System Plan[6]; Central Lane Metropolitan Planning Organization Regional Transportation Plan[7] and Regional Transportation Options Plan; Lane Transit District's Long Range Transit Plan, Regional Scenario Planning Technical Advisory Committees, including subcommittees focused specifically on Health and Equity issues. Staff also participated in other Lane Livability Consortium grant tasks, including Tasks 2 (Latino Engagement), 3 (Sustainability Baseline Assessment), 5.1 (Triple Bottom Line Assessment Tools and Methods), and 6 (Equity Opportunity Analysis).



A public telephone survey, "Travel Barriers and Benefits," was conducted in January 2014 (see Appendix F for survey results).

Resources provided by the Lane Livability Consortium allowed the City to retain the North American Sustainable Transportation Council for participation in the development of the project list, evaluation criteria, project screening, and participation in Task 5.1's development of a triple bottom line tool. The Council's new Multimodal Quality Score was evaluated by the City in conjunction with the University of Oregon's Leadership in Sustainability class.

1.3. Activities and Products

1.3.1. Development of the STARS-Plan

Quoting from the LLC contract, "The purpose of Task 5.2 is to develop a tool that will integrate sustainability into the development of local and regional transportation plans. Necessarily, this task is coordinated with Task 3, Sustainability Assessment of Regional Plans, and Task 5.1, Triple Bottom Line Assessment Tools and Methods, and others to lesser degrees."

[6] http://www.centrallanertsp.org/SpringfieldTSP/Home
[7] http://www.centrallanertsp.org

The City of Eugene has been using the innovative Sustainable Transportation Analysis and Rating System (STARS) for its update of the transportation system plan. STARS is a flexible framework for communities to set and achieve triple bottom line goals for transportation investments. Similar in concept to the LEED certification program in the construction industry, applying STARS to transportation planning processes can meaningfully improve the environmental, economic, and social performance of transportation projects and plans, and influence the transportation design and construction choices that follow the adopted plans. The STARS-Plan program provides a triple-bottom line filter for the creation of transportation plans and prioritization of projects and programs specifically crafted to achieve measurable objectives.

Through Consortium Task 5.2, the City of Eugene contracted with Council to provide direction while the City applied the Sustainable Transportation Analysis and Rating System (STARS-Plan) to the Eugene Transportation System Plan. This iterative process allowed the City to provide practical feedback to Council, resulting in an upgraded transportation planning tool available to use both within Lane County and to other jurisdictions around the country.

The City of Eugene transportation system plan produced draft goals, objectives and policies, and identified possible triple bottom line performance measures that may be indicators for sustainable transportation system performance. The public workshops and training that led to these products revealed a need for better messaging, educational materials and approach, and collaboration with decision makers.

1.3.2. Participation with STARS Expert Advisory Panels

The North American Sustainable Transportation Council utilizes an expert advisory panel comprised of public and private sector transportation and sustainability planners and consultants from cities, metropolitan governments, and academics in the Pacific Northwest and California. City staff participated on the STARS-Plan Expert Advisory Panel, a collective of 18 agency personnel, consultants, and academics that advised the North American Sustainable Transportation Council on development of the STARS-Plan guidebook. The expert advisory panel met by conference call weekly between February and March 2013. City staff also attended three training workshops in Portland hosted by Council.

1.3.3. Use of draft STARS Plan goals and objectives to develop local performance measures

At a full day STARS workshop in September 2011, the Transportation Community Resource Group and Technical Advisory Committee, together, discussed what a sustainable transportation system would look like, the trade-offs and mutual benefits between seemingly

divergent projects (e.g., arterial roadway capacity enhancements and creating a more complete bicycle network). Goals and objectives for the Transportation System Plan were drafted. There was widespread agreement on the principles that the existing transportation infrastructure was a valuable resource that must be maintained and made more efficient, that safety and equity were vital attributes to our transportation system, that climate change is a serious threat, that reliable freight movement is important to the local economy, and, that above all else, the Transportation System plan must support the growth strategy outlined by Envision Eugene, the city's emerging comprehensive land use plan. The Technical Advisory Committee further refined the evaluation criteria based on the availability of data. The Council again refined the criteria language with the consultant team, which was then reviewed by the project management team. A draft of the City of Eugene Transportation System Plan Project Evaluation and Prioritization, together with suggested edits by STARS staff, is included in Appendix G.

1.3.4. Local and regional data availability

Criteria were developed to assess the sustainability of individual projects for the Eugene Transportation System Plan. Data sets were assigned to each criterion. Attempts to collect all the data and assign the data to specific projects, a task that is then multiplied by hundreds of projects, proved too formidable a task for city resources. Several attempts were made to bundle or simplify the data gathering process, but the results were not informative. The data did not provide sufficient or clear guidance for decision makers to compare or contrast projects using a triple bottom line approach.

In the end, a subgroup of the Technical Advisory Committee and the consultant team scored the projects based on their technical expertise and knowledge of local circumstances (e.g., traffic counts, accident histories, local demographics and geography, projected growth, etc.). Emphasis was placed on the "heavy lifter" actions (discussed above) that provided the most benefit, such as reductions in Vehicles Miles Traveled. Smaller construction projects, which did not score well or accurately under the original criteria, were bundled so their cumulative effects were more accurately represented.

1.3.5. Survey and interviews to gather qualitative data about transportation issues and behaviors

As described in Council's memorandum of December 2012 contained in Appendix B, a survey is a good mechanism to ensure that a diverse group of stakeholders provide their opinions in a way that helps to influence key decisions, to measure success of plan implementation, and to monitor user satisfaction of the transportation system. While not required to be statistically valid, survey managers should endeavor to get as many responses from as broad a group of stakeholders as possible. Outreach to traditionally underrepresented groups is particularly

critical to an effective survey tool. Responses should mirror community demographics. Although there had been public outreach and web surveys of people actively involved in the preparation of Eugene's Transportation System Plan before the advent of the Lane Livability Consortium, these lacked the broad perspective advocated by Council and did not establish a base case from which future changes in attitude and perspective could be monitored.

Toward these ends, the City hired DHM Research from Portland, OR, to conduct a telephone survey (see Appendix F for survey results). DHM has Spanish speaking interviewers and access to cell phone numbers to broaden the pool of respondents. The survey captured 500 interviews, with populations spread throughout all five planning sub-regions in Eugene and two sub-regions in Springfield. The respondents will be checked against the demographics for their sub-area. The margins of error for each sub-region are:

For Eugene - 381 completes/5 regions; margin of error = 11.2% by region

For Springfield – 119 completes/2 regions; margin of error = 12.7% by region

To refine our knowledge of local transportation habits and to monitor user satisfaction, the survey includes a broad range of questions about travel behaviors, with a focus on pedestrian and bicycle proclivities: what is working well, what isn't working well, what influences choices to not travel by automobile, and what suggestions do the respondents have for improvements. The survey mechanism and preliminary results are included as part of Appendix F.

1.3.6. Coordination with Other Lane Livability Consortium Tasks

Throughout the process, there was coordination with work on other Lane Livability Consortium Tasks. For instance, the demographic data collected in Equity and Opportunity Assessment (LLC Consortium Task 6) was used to inform criteria of equality and social impacts of the proposed projects.

In addition, partners working on LLC Task 5.1, which focused on preparing Triple Bottom Line Assessment Tools and Methods, were consulted and evaluated the framework being developed as part of the update to the Eugene TSP. This coordination is described in more detail below.

1.3.6.1. Integration of concepts developed through Triple Bottom Line assessment tools and methods in Task 5.1.

The University of Oregon Sustainable Cities Initiative (SCI) was tasked with building upon existing tools entities can use that provide a framework for considering environmental, economic, and equity outcomes in policy and decision making. STARS-Plan was one of the programs evaluated by SCI. SCI staff participated in STARS workshops and as experts informing

the STARS guidelines. SCI member Terry Moore evaluated the City of Eugene's use of STARS, as summarized in the memo dated December 27, 2013 (see Appendix E).

The memorandum from Terry Moore summarizes the complexities of the approach attempted for the Eugene TSP, confirms the difficulties with data encountered, and offers remedies, some of which were already incorporated into the Eugene approach to project evaluation and prioritization.

It is satisfying that Mr. Moore acknowledges that the Eugene TSP utilized a valid triple bottom line approach. Some of the recommendations by Mr. Moore to augment the TSP project evaluation, such as utilizing the (draft) Oregon Mosaic[8] or other cost-benefit model, may be outside the scope of the City's current transportation update plan to incorporate. Mr. Moore's assessment has been shared with the North American Sustainable Transportation Council to inform future updates of the STARS-Plan program.

1.3.7. Oregon Leaders in Sustainability

An issue in transportation planning is that many modes, serving different purposes or users, often compete for the same space. In the past, methods of measuring a street's effectiveness have focused on only automobile travel times and periods of delay. Standards recognized nationally by state and federal Departments of Transportation, such as V/C or LOS, address only automobile delay. National movements to create a better methodology that is more inclusive of other modes of travel and the users' actual experience have, to now, been unsatisfactory. To address these issues, in 2012, the North American Sustainable Transportation Council (Council) developed a methodology for assessing travel time reliability (see Appendix D).

In addition to addressing issues of travel time, the Council through the development of STARS has focused on developing new methods to assess the quality of bicycle, pedestrian, and transit facilities and service. "Complete Streets" policies often do not provide practical direction that can be used by local decision makers on a project-by-project basis. If all modes – cars, buses, bikes, emergency vehicles, freight, and pedestrians -- are to be accommodated on all streets all the time, the rights-of-way become impractically immense. Some tools, like the National Highway Capacity Manual's Multimodal Level of Service[9] calculator are complicated and the results do not always reflect the traveler's experience or perception. In 2013, the North American Sustainable Transportation Council (Council) developed a Multi-Modal Network

[8] http://www.oregon.gov/ODOT/TD/TP/pages/lcp.aspx
[9] http://www.nap.edu/catalog.php?record_id=14175

Quality Score (MMNS) to measure the quality of the bicycle and pedestrian network within a broader geographic area, like a neighborhood or downtown (see Appendix C).

During Winter term 2013, students from the University of Oregon's Oregon Leaders in Sustainability (OLIS) class used local streets to evaluate the STARS program and its fledgling MMNS, and report their findings to Council. Eugene staff served in a mentoring role for this project. The results, *Designing Streets for Alternative Transportation* (December 2013), indicated that MMNS did not provide meaningful feedback on street design elements that the students felt most effectively promote travelling by foot or bicycle. The OLIS study shifted emphasis to single streets to focus on specific design details that were not relevant to the MMNS system; hence the final report did not evaluate MMNS effectiveness on broader networks that the MMNS tool was designed for.

1.4. Summary and Conclusion

The City of Eugene is updating its long-term comprehensive Transportation System Plan (TSP). The City engaged the North American Sustainable Transportation Council's STARS (Sustainable Transportation Analysis and Rating System) program as a means of evaluating the sustainability of its transportation choices. The Lane Livability Consortium (Task 5.2) allowed this relationship to continue, to inform the City's TSP, to have the Eugene TSP experiences help inform the development of STARS, and to help make the STARS program available to use within Lane County and to other jurisdictions around the country.

As described in the University of Oregon's Sustainable Cities Initiative (SCI) report, "*Pragmatic Decision-Making with the Triple Bottom Line*" (October 2013, a product of Task 5.1):

> *As consumers and shareholders increased their interest in the social and environmental effects that accompanied the production of goods and services, some businesses acknowledged a need to look beyond profit as they evaluated their performance. TBL recognizes that decisions affect not only a company's profit, but also the broader economy, society, and the natural environment. TBL is often referred to as the "three P's" of Profit, People, and Planet, or as the "three E's" of Economy, (Social) Equity, and Environment. *****
>
> *At a minimum, TBL is a reminder that decisions typically have multiple costs and benefits. Identifying significant economic, social, and environmental impacts helps ensure that decisions are well informed.*

Pragmatic Decision-Making offers these guiding principles:

1. Serve the needs of decision-makers, stakeholders, and the general public
2. Reflect values, goals and objectives
3. Quantify direct costs and benefits
4. Identify other major costs and benefits
5. Who benefits and who pays?
6. Develop rough estimates, but highlight uncertainties
7. Express costs and benefits in meaningful units
8. Help decision-makers balance priorities
9. Integrate TBL methods into all phases of decision-making
10. Monitor outcomes

As confirmed in the memorandum by Terry Moore (December 27, 2013, a product of Task 5.1), the City's use of STARS-Plan satisfied these criteria, to varying degrees. The use of interactive websites, creation of a large advisory Transportation Community Resource Group (TCRG) and a technical advisory committee, and community outreach helped identify issues and create goals and objectives that reflect community values under a triple bottom line lens. The universe of projects to be evaluated and the evaluation criteria also reflect community goals and objectives. Rough estimates were created to determine how well projects meet the objectives, identify who pays and who benefits, and to prioritize projects. The evaluation showed that some criteria were more relevant to the uniquely Eugene circumstance than others (e.g., there are not huge expanses of virgin habitat at risk from transportation system improvements). Triple bottom line methods were incorporated into the entire process by using the STARS guidelines. A new regional survey creates a foundation that enables monitoring implementation of the final plan.

The project evaluation process was perhaps less successful in analyzing the cost-benefit values of potential projects. Monetizing all the costs and benefits, as recommended by SCI, proved to be too complex a process for this local TSP. There is also the problem of comparing apples to oranges (e.g. comparing public health to time saved in commute) that is difficult to quantify in equal terms, and the data provided by monetizing the effects may not prove to be helpful to decision makers. In describing the complexities of a cost-benefit analysis, however, Mr. Moore's memo may indicate that the approach taken for the Eugene TSP was appropriate for this plan, for the current decisions, needed at this time.

Appendix A

Access Score Memo

North American Sustainable Transportation Council

December 3, 2012

Evaluating *Access to Key Destinations*

North American Sustainable Transportation Council (STC)
December 3, 2012

Purpose

The purpose of this memo is to establish a method for evaluating the *Access to Key Destinations* measure found the STARS-Plan Access & Mobility credit.

Access & Mobility's first goal is to:

- Increase people's ability to meet most of their daily needs without having to drive. [1]

The first objective associated with that goal is:

- To improve safe, attractive, and affordable access to work, school, goods, and other key destinations by walking, bicycling, and transit.

The STC has provided two measures to evaluating how well plans and projects meet this objective: one is by measuring vehicle miles traveled (VMT) and the other is **"percent of population within an x-minute walk, bike, or transit trip of key destinations**." For brevity, we'll call this the *Access to Key Destinations* measure.

The transportation industry has fairly well established methods to evaluate VMT; therefore, the STC does not have additional recommendations for calculating VMT.

Recommendations

The STC recommends two methods for calculating Access to Key Destinations. The first is an Access Score, which is derived from the City of Portland's Accessibility methodology for evaluating 20-minute neighborhoods. The rationale and methods employed by Walk Score is very similar.

The second is a method developed by Fehr & Peers. This method uses a GIS vector-based method to calculate the ideal walkshed from key destinations and compares it to the actual walkshed on the ground, accounting for connectivity and barriers.

Option 1 - Access Score

Access Score is largely derived from The City of Portland's method for evaluating "20-minute neighborhoods," a concept where residents are able to meet most of their daily needs within a 20-minute walk. That is, it is a function of access (to goods and services) and walkability (connected and comfortable streets).

According to the City of Portland, 20-minute neighborhoods have three basic characteristics:

- A walkable environment

[1] STARS Pilot Plan Application Manual, Version 1.0, Appendix A, page 61.

- Destinations that support a range of daily needs (i.e., shops, jobs, parks, etc.)
- Residential density close to services.

To perform an Access Score analysis, the City of Portland evaluates the following factors:

- **Distance and design:** how far people need to travel to reach destinations, and the extent to which street connectivity, sidewalks and other conditions facilitate walking. Access to frequent-service transit was also considered as a factor in providing options to reach destinations.
- **Destinations:** the presence of nearby businesses (grocery stores, restaurants, and retail) and public facilities (schools and parks).

Note: An updated version of Walk Score uses a similar method for its calculations.[2] This version of Walk Score is backed by research from Dr. Larry Frank that is being funded by the Robert Wood Johnson Foundation through an Active Living Research grant.

Rationale

Moudon[3] and Cervero & Ewing[4] provide much of the research that underpins the City of Portland's methodology.

Intersection density and street connectivity are among the variables most highly correlated with walkability. In addition to these two factors, the City also accounted for pedestrian barriers, such as freeways, and the presence of sidewalks. The City also included transit as a destination in its analysis.

According to the City: "Specific types of local destinations most highly correlated with walking include grocery stores, retail stores, and eating and drinking establishments, particularly when such destinations were clustered together. In addition to these types of destinations, this analysis included parks and elementary schools, as elements that community members consider to be essential local services."[5]

Density is a key factor in amount of services available to residents. "Density is needed to support the local retail services that are key components of walkable neighborhoods. Neighborhoods with a wide-range of services within walking distance of residents require higher residential densities than are typically found where the car is the dominant mode of travel. It appears from the literature that 12-18 households per acre (often achieved in older neighborhoods with a mix of houses and low-rise multifamily housing) is the minimum density needed to support a commercial district with the retail uses used in this analysis. As an example of this relationship, a retail industry standard is that 10,000 people are needed to support a full-service supermarket."

[2] Walk Score includes walking routes and distances to amenities; road connectivity metrics such as intersection density and block length; and score for individual amenity categories (i.e. types of destinations)
[3] Moudon, A. et al. (2006). *Operational definitions of walkable neighborhood: Theoretical and empirical insights*
[4] Ewing, R. & Cervero, R., (2010). *Travel and the built environment*
[5] Walk Score rates the following amenities: grocery, commercial, schools, entertainment

Access Score – Data
Below are the input layers needed to perform the calculation.

- **Grocery stores**: full-service grocery stores (walking distance 1/4, 1/2, 1 mile)
- **Commercial type 1**: convenience stores, beer, wine & liquor stores – NAICS codes 4451 (except those in full service grocery) and 4453 (walking distance 1/4, 1/2, 1 mile)
- **Commercial type 2**: clusters of restaurants, specialty grocery stores, health and personal services, brewpubs, bakeries, bars, dry cleaning and laundry – NAICS codes 4452, 4461, 7221, 7222, 7224, 8123, 31212, 311811 (number of occurrences by square 1/4 mile grid cell)
- **Parks Access**: (walking distance 1/4, 1/2 & 1 mile – source, Parks Bureau [except school grounds])
- **Public Elementary Schools**: (walking distance 1/4, 1/2, 1 mile)
- **Street intersections**: proxy for street connectivity (number of occurrences by square ¼ mile grid cell)
- **Sidewalks**: (area coverage percentage by square 1/4 mile grid cell)
- **Frequent Service Transit Stop Proximity**: frequent service every 15 minutes (or better) during peak hours (walking distance 1/4, 1/2, 1 mile)

The City of Portland estimated that it takes 20 minutes for a person to walk one mile. However, people generally are more likely to walk ¼ mile to ½ mile to reach destinations. The City used these ranges to establish the above weights in its analysis.

Access Score – How to Calculate
The City of Portland's Access Score calculation method is described below:

Step 1 – Define the Analysis Area Boundaries
The analysis begins by defining the analysis area boundaries. This can be done analytically in GIS (e.g., defining a major activity center and defining the boundary as a one-mile radius from the activity center) or it can be based on existing neighborhood boundaries or other geometries. In general, the analysis area should be at approximately 2 miles across such that the center of the analysis area considers the full 20-minute walk area. When choosing the boundary it is also important to consider the conditions at the edge of the boundary. For example, it may be prudent to extend the boundary to ensure that major retail areas, parks, or schools are captured in the analysis. If they are excluded, they may lead to an unreasonably low score at the edge of the analysis area.

Step 2 – Walkshed Calculation using ArcGIS Network AnalystThe next step is to calculate the walkshed (using ArcGIS Network Analyst) around all grocery stores, commercial type 1, parks, elementary schools, and high frequency transit stops within the study area. The City of Portland removed walking routes with slopes greater than 20 percent (using Lidar Slope data) and freeways and ramps, since pedestrians are generally not allowed on those facilities. Off-street trails and paths should be included in the calculation. To aid in the access score

calculation, distance increments were defined at ¼, ½ and 1 mile. Those categories were assigned the values 1 -3 when assessing the access score within the neighborhood (ranging from a value of 3 for ¼ mile to 1 for 1 mile)—see below for how the access score is computed.

Step 3 – Quarter Mile Grid and Spatial Analysis
Next, the analysis area is broken into 2640' x 2640' (quarter-mile square) grid cells. Within each grid cell, the number of commercial type 2 and intersections are tallied. Also, the sidewalk percent area of each grid cell is tabulated.

Step 4 – Computing the Index Score

The access index score is calculated by assigning ordinal values for each of the input variables described above. This is performed for both the network analyst (walkshed) computed variables and the quarter-mile grid square variables. The values are defined below. For the quarter-mile grid cell analysis, the breakpoint between values were identified using the Jenks (Natural Breaks) classification method. Zero values were excluded. The Jenks method was used to avoid manipulating results as much as possible. The value breakpoints used in Portland are shown below.

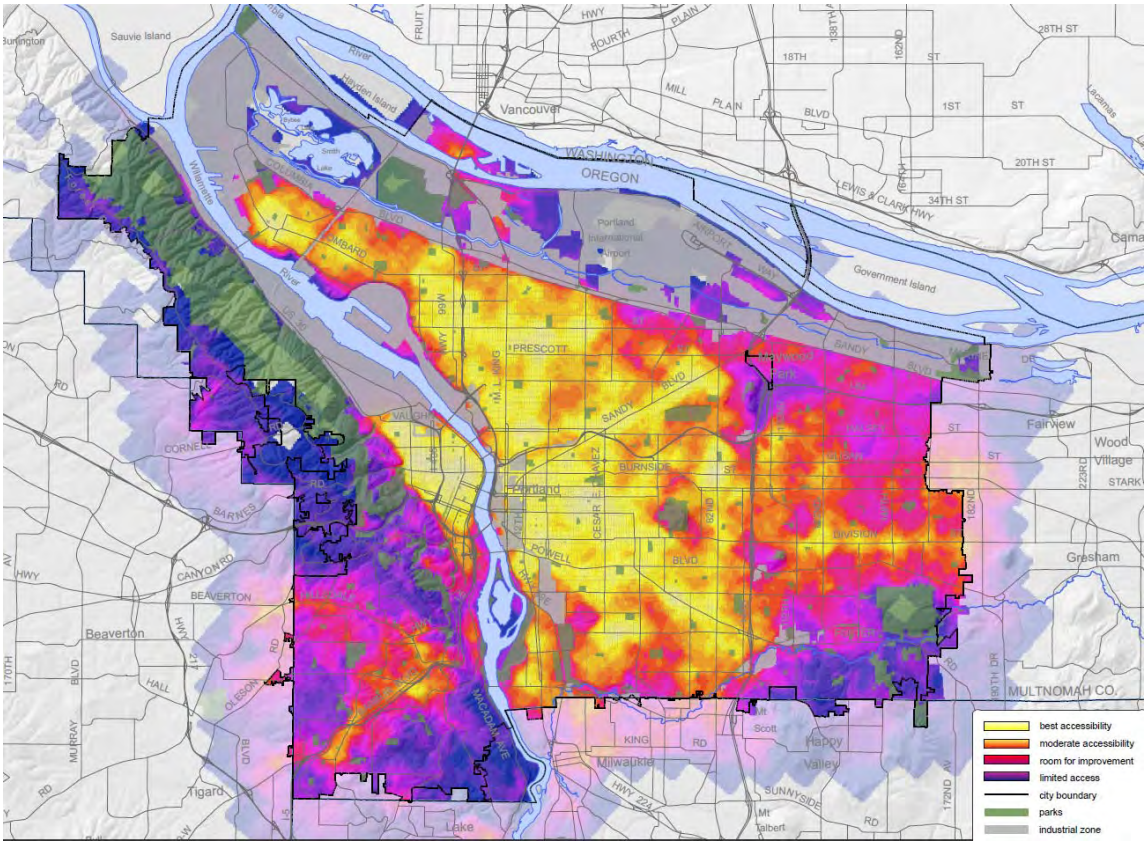
Categories and distance/concentration values[6]

- Grocery stores: 1/4 mile = **3**, 1/2 mile = **2,** 1 mile = **1**
- Commercial type 1: 1/4 mile = **3**, 1/2 mile = **2,** 1 mile = **1**
- Commercial type 2 occurrences: 50-170 / **3**, 13-49 / **2**, 1-12 / **1**
- Parks access points: 1/4 mile = **3**, 1/2 mile = **2,** 1 mile = **1**
- Elementary Schools: 1/4 mile = **3**, 1/2 mile = **2,** 1 mile = **1**
- Intersections: 45-114 = **3**, 18-44 = **2**, 1-17 = **1**
- Sidewalk percent area of grid cell: 4.2-15% = **3**, 1.6 – 4.1% = **2**, 0.1-1.5% = **1**
- Frequent service stop proximity: 1/4 mile = **3**, 1/2 mile = **2,** 1 mile = **1**

After the values are defined, the user should have a series of five walkshed analyses, each with bands of access assigned a 1-3 value and each of the quarter-mile grid cells should have values of 1-3 for commercial type 2, intersections, and sidewalks.
Next, the scores are combined. The network and grid cell datasets were then converted to raster datasets in preparation for creating the combined output raster dataset in Spatial Analyst. Each input was given equal weight in the latest version of the analysis. The output raster cell size chosen was 200' x 200'. The initial output raster dataset was run through the Neighborhood Statistics tool in Spatial Analyst for smoothing.

Access Score Results
The map below shows the results of the 20-minute neighborhood assessment for all of the City of Portland.

[6] Walk Score calls this "distance decay"



Assessment of Method

Other factors commonly considered in making a walkable environment are not included: width of sidewalk, traffic volumes on streets, tree canopy cover, etc. However, as the research shows, intersection density proves to be among the most important factors in walkability. MMLOS is as an additional measure in STARS used to capture these other factors in walkability.

Bikeability is not assessed as part of this methodology. MMLOS provides a means for assessing bikeability, as does Furth's low-stress bicycle network[7]. STARS may consider including an additional measure for bikeability or work with Walk Score to incorporate bikeability into the same analysis since Walk Score does have a Bike Score.

This approach elegantly combines access to key destinations and connectivity into a single, simple measure. The access score method is appropriate for larger scales (citywide, subarea), but it may be too generic for localized analysis since it cannot identify small sidewalk gaps or areas where new connections would be beneficial.

Strengths – simple input data, simple aggregation method, simple analysis method.

[7] Mekuria, M., Furth, P, & Nixon, H. (2012). *Low stress bicycling and network connectivity*. Report 11-19, Mineta Transportation Institute.

Weaknesses – this method requires a fair amount of analysis—five network analyst walkshed assessments, three quarter-mile grid cell assessments, and a procedure to combine all the results. Some areas may not have the expertise or budget to perform this type of assessment. The walkshed is highly simplified, while barriers are considered, issues like energy expended (hills less than 20% grade) are not included. This would generally not impact a citywide analysis, but would impact a more focused local analysis. Intersection density is easy to measure, but another measure like route directness might speak better to connectivity. Sidewalk coverage data may be missing in many communities.

Data requirements. Most of the data are easy to come by, with the following exceptions:

- NAICS coded parcel level commercial building information – grocery stores are easy enough to identify by hand, the Commercial Type 1 and 2 may need to be collapsed in some areas. Using generic retail land use designations may be sufficient.
- Sidewalk % of a grid cell. Most areas do not have sidewalk area, not to mention sidewalk coverage. However, developing a work-around with larger geographies (TAZs or larger raster cells), while less accurate, could work
- Frequent Transit Service: many areas do not have frequent transit service. This definition may need to be relaxed in some areas.

Option 2 – Circular/Network Buffer Method

Providing access to residents, employment centers, retail areas, and social services is a key element of the STARS analysis. To determine the access provided by the current and planned transportation system, Fehr & Peers used ArcGIS Network Analyst to perform a simple assessment of the extent of access by model from key destinations. Three modes were the focus of the access analysis: walk, bicycle, and transit.

Circular/Network Buffer - Data

The analysis requires the following GIS data:

- Roadway centerline file with roadway functional classification and speed limits
- Bicycle lanes, trails, and paths
- Transit routes and stops
- Sidewalk coverage (ideally GIS data, alternatively a general estimate using aerial photos, drive-by surveys, or streetview imagery can also work)
- Population and employment (at TAZ/census block level)
- Transportation disadvantaged population (population under the age of 18, over 70, and incomes less than $15,000) at TAZ or census block level

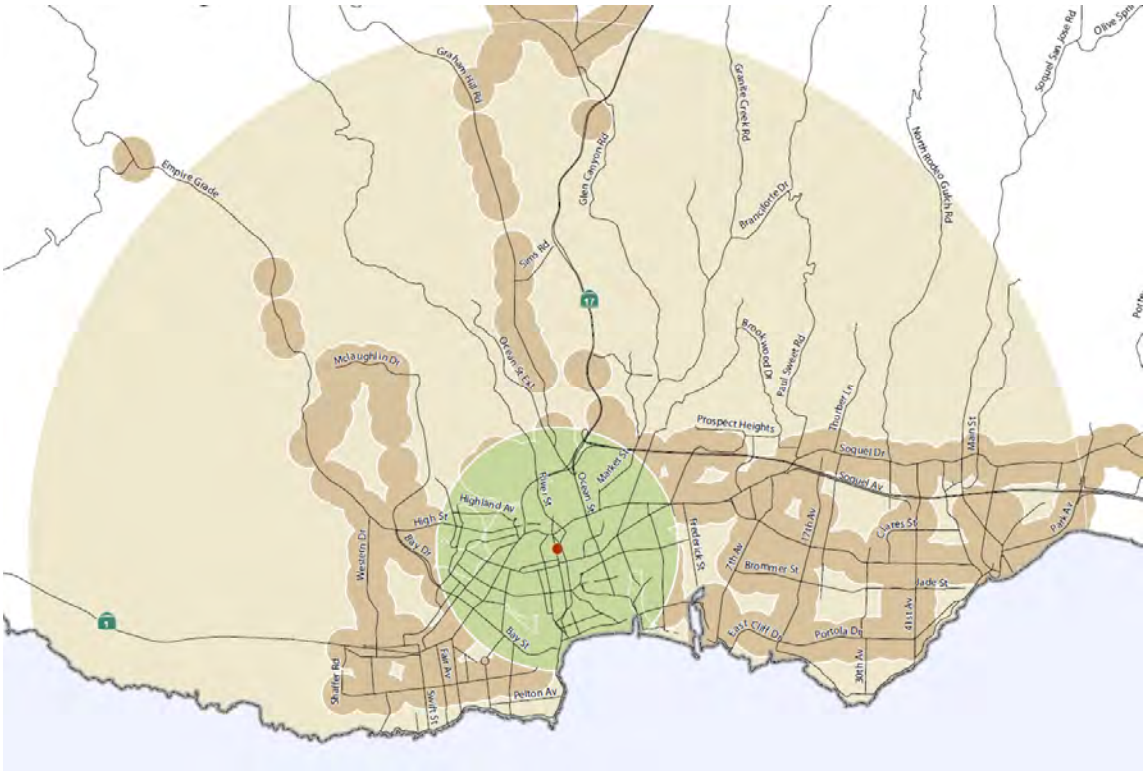
In addition to the GIS and demographic data, STARS users must identify a number of key destinations. Ideally, these destinations would surface as a result of surveys where community members and members of the transportation disadvantaged sub-group identify important destinations. These destinations are generally centered on job centers,

retail/service centers, community resources (parks, schools, medical centers), and colleges/universities.

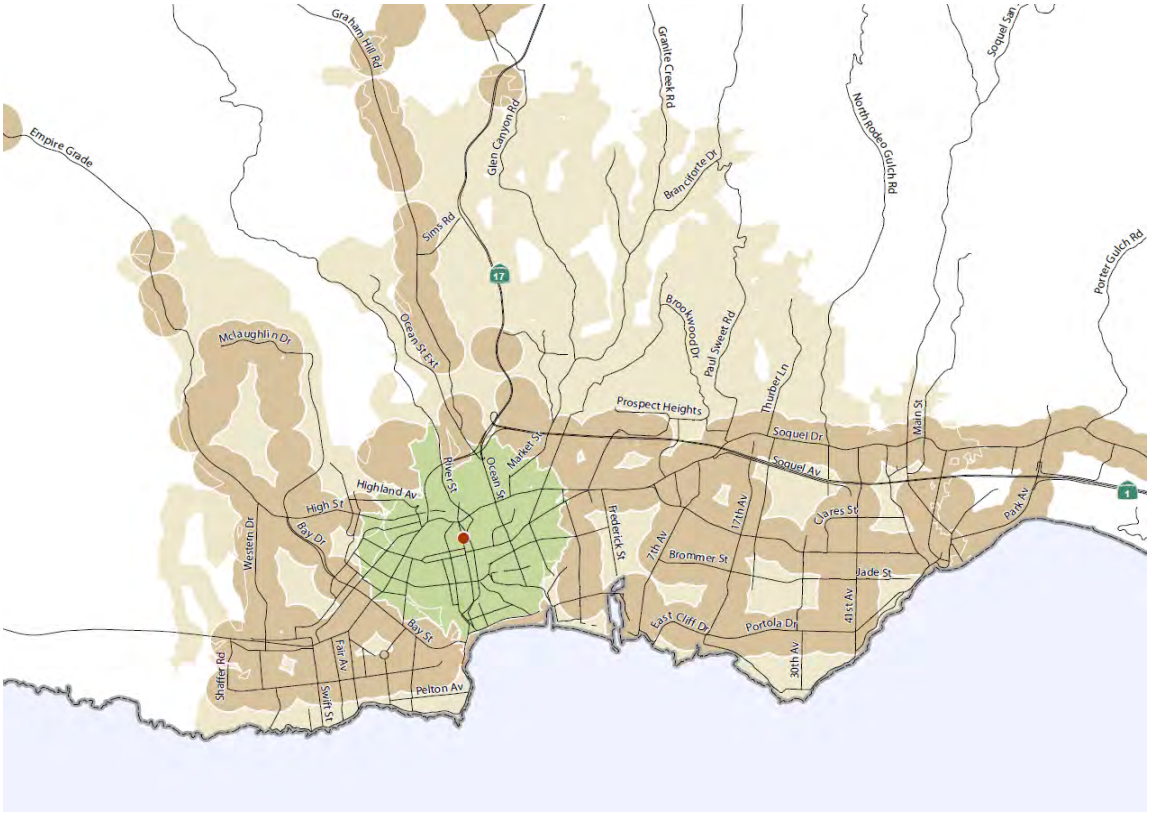
Circular/Network Buffer - Methods

With these key destinations defined, a GIS network analysis was performed for each destination and for each mode. Two types of analyses were performed: circular buffer and network buffer.

In the circular buffer, a circle was drawn around each key destination at the distance one could travel under ideal conditions for a given mode. For example, it was assumed that under ideal conditions, a person can walk at 3.5 feet per second (a standard value used in traffic engineering and transportation planning). In 30 minutes, a person walking at this pace could cover 6,300 feet if there were no delays and no barriers to travel. A similar circular buffer was defined for bicycles, assuming an average speed of 10 miles per hour. Note that a similar circular buffer was not developed for transit since transit service is highly dependent on stop locations. A map of the circular buffers for one of the key destinations is shown on the following page.



Network buffers were also developed for each key destination and for each mode. The network buffers are based on the actual travel paths and include barriers and bottlenecks. For the walk mode, it is assumed that people can walk on any non-freeway facility; however, the walking speed is adjusted based on the prevalence of sidewalk facilities. In a hypothetical area with no sidewalk facilities, the walking speed in the analysis is reduced by 50%. In areas with 50% sidewalk coverage, the walk speed is reduced by 25%. For the bicycle network buffer, travel is also allowed on any non-freeway street, however travel speed is reduced by 50% for roads with speeds in excess of 35 miles per hour that have no dedicated bicycle facilities (bicycle lanes or paths). Slope data can also be used to modify the network buffers. For example, pedestrian travel can be scaled to reduce presumed walking speed from 3.5 feet per second to no travel on slopes greater than 20%. Bicycle travel can be adjusted so that speed is scaled to zero on slopes greater than 10% unless there is a dedicated bicycle facility present. Transit network buffers were based on a five-minute walk speed to and from stops and a 20-minute travel time on the routes. A map of the network buffer is shown on the following page.



Circular/Network Buffer Results

The network buffer data can be used to calculate a variety of access measures from the TAZ/census block data. The key measures include:

- Population within the circular buffer (for each mode except transit)
- Population within the network buffer (for each mode)
- Underserved population – this is the difference in population between the circular and network buffers and represents the potential population that could reach the key destination by active transportation mode if the system were improved
- Proportion of countywide population within the circular and network buffers (showing the general coverage of pedestrian, bicycle, and transit service relative to the larger population)
- Proportion of countywide transportation disadvantaged population within the circular and network buffers

The application of these access calculations is to quantify how access improves (by measuring the increase in population within the network buffers or the decrease in the underserved population) through programs and policies that either expand the non-auto transportation network or increase population in areas with high quality active and transit infrastructure. This type of analysis can be important in identifying how certain projects advance targets or for project prioritization.

Page left blank intentionally

Appendix B

Integrated Process: STARS-recommended use of surveys

North American Sustainable Transportation Council

December 3, 2012

Integrated Process: STARS-recommended use of surveys

Sustainable Transportation Council
December 3, 2012

Purpose

The purpose of this memo is to establish when and how to use a triple bottom line survey in the remainder of City of Eugene's TSP update and during implementation. A key element of the STARS-Plan Integrated Process credit is ensuring that a diverse group of stakeholders provide their opinions in a way that helps to influence key decisions. This can be accomplished through a variety of outreach and engagement strategies. Integrated Process Action 3 (p. 18) outlines some of these strategies, which includes surveys.

Recommendations

The STC recommends conducting ongoing outreach through mailed and digital surveys to gain community feedback in three stages:

1. Near the beginning of the planning process (completed)
2. During alternative development and selection
3. Monitoring system user satisfaction (implementation)

Surveys need not be statistically valid. They should be posted on agency websites, mailed to residents and businesses, and completed as part of on-board transit surveys. While not required to be statistically valid, users should endeavor to get as many responses from as broad a group of stakeholders as possible. Outreach to traditionally underrepresented groups is particularly critical to an effective survey tool. Responses should mirror community demographics.

Additionally, STARS users may consider interviews with certain community members, particularly those who do not engage in conventional outreach processes. Representatives from transportation-disadvantaged communities may especially benefit from one-on-one conversations. Having organizations representing the transportation disadvantaged take the lead in outreach can effectively expand the conversation.

Alternative Development & Selection

Survey those who have previously provided comments, as well as those mentioned above, on:

- Potential alternative package outcome priorities and themes
- Their preferred alternative(s) based on a summary of alternatives analysis results.

Share the results of the surveys with decision-makers, respondents and the general public in a manner that helps to influence decisions.

Monitoring System User Satisfaction
Regularly ask the full breadth of transportation system users what is working well for them, what isn't working well and what suggestions they have for improvements. This could include both surveys and input maps (as you are now doing). Share the results of these surveys with advisory groups and decision-making bodies to influence decisions.

Questions to Ask

Respondent information

- Where does respondent live?
- What are respondent's demographic characteristics, including age, race and ethnicity, gender, physical ability, languages spoken, income, and household characteristics?

Access Needs

- Where are respondent's trip origins and key or frequent destinations, both current and desired?
    - For what purposes?
    - How and where would they like to see access improved? Ask them to be as specific as possible.
- What are respondent's current and desired future (five to twenty years) modes of travel to the key destinations mentioned above?

Barriers to Access

- What barriers to access (physical, financial, safety, time, reliability, lack of information, etc.) does the respondent experience?
- What are respondent's perceptions of safety, by mode, by time of day, by and location?

Equity

- How have transportation investments positively or negatively impacted the respondent or respondent's community, or have investments had no impact? Are there accumulated impacts?

Priorities and Projects

- What three priorities does the respondent want the plan to achieve? List potential outcomes, such as reduce greenhouse gas emissions, increase walking and bicycling, expand transit use, reduce auto travel time or increase auto trip reliability, keep money in the local economy by reducing fuel consumption, improve freight travel time and/or reliability, etc.)
- What suggestions does the respondent have for projects and programs? Where?

Outreach Methods

- What are the best methods for the respondent to continue to participate?

Appendix C

Evaluating Multimodal Level of Service (MMLOS)

North American Sustainable Transportation Council

December 3, 2012

Evaluating *Multimodal Level of Service (MMLOS)*

North American Sustainable Transportation Council (STC)

December 3, 2012

Purpose

The purpose of this memo is to establish a method for evaluating the *Multimodal Level of Service (MMLOS)* measure found the STARS Access & Mobility credit.

MMLOS aims to assess the quality of bicycle, pedestrian, and transit facilities and service.

MMLOS is a measure in one objective under the second Access & Mobility goal in STARS-Plan. That goal is to "Improve the convenience and quality of trips…" and the objective is:

- "To improve the quality of walk, bicycle, car/vanpool, and transit trips."[1]

Recommendations

There are many methods published to quantify MMLOS, including those from the Transportation Research Board published in the *Highway Capacity Manual 2010*, and others from the Florida Department of Transportation and the City of Fort Collins, CO that will not be described in this memo. This document focuses on a method developed by Fehr & Peers to calculate MMLOS in a way that is less data intensive than others and which focuses on identifying projects that can improve MMLOS.

Background

When MMLOS is typically defined, it tends to be focused on bicycle and pedestrian modes. Transit LOS is often not evaluated by local jurisdictions and many transit agencies have separate methods to track quality of service. For now, STC is focusing MMLOS on pedestrian and bicycle modes, however, transit LOS may be added at a later date. Note that many transit agencies already define localized performance measures.

MMLOS has been around for many years. However, only recently has it begun to be more widely discussed and applied. The most recent version of the *Highway Capacity Manual (HCM)* (Transportation Research Board, 2010) has pushed the adoption of MMLOS by developing a new analysis methodology that places bicycle and pedestrian LOS on equal footing with auto LOS. Fehr & Peers has extensively tested the 2010 HCM MMLOS methodology and has decided to not recommend its implementation until more details are worked out. Principal weaknesses of the HCM method include:

[1] STARS Pilot Plan Application Manual, Version 1.0, Appendix A, page 61.

- Data intensive – requires detailed input data that are often beyond the means of local jurisdictions, particularly for large area applications. Examples include percent occupancy of on-street parking and spacing of objects within the landscape buffer.

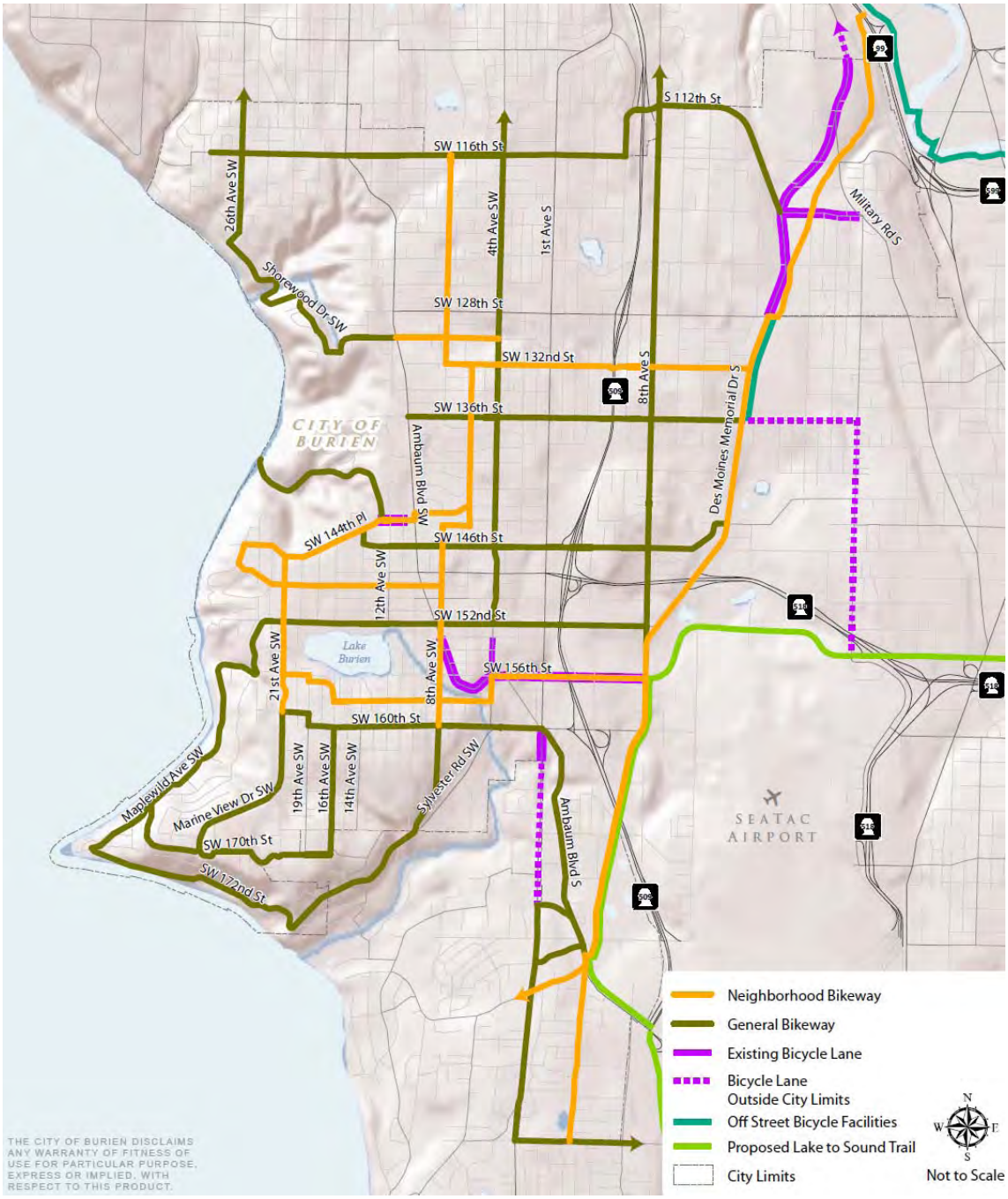
- Blind to adjacent land uses – experience has shown that the quality of bicycle and pedestrian facilities is often influenced by the adjacent land uses. For example, in retail focused areas, wider sidewalks with more street furniture are often called for in local plans. The HCM does not consider the adjacent land uses.

- Not focused on developing/evaluating improvements – the 2010 HCM methods for bicycle and pedestrian LOS are heavily influenced by the speed, volume, and proximity of adjacent traffic. While these are important factors in determining pedestrian/ bicyclist comfort, they dominate the HCM calculations. In some instances, road diets, sidewalk additions, or landscape buffer installations do not have a meaningful influence on the HCM MMLOS. In other cases, according to the HCM MMLOS methodology, growth in traffic volumes negate any benefit of improved pedestrian or bicycle infrastructure, making it difficult to compare the benefits of active transportation infrastructure investments.

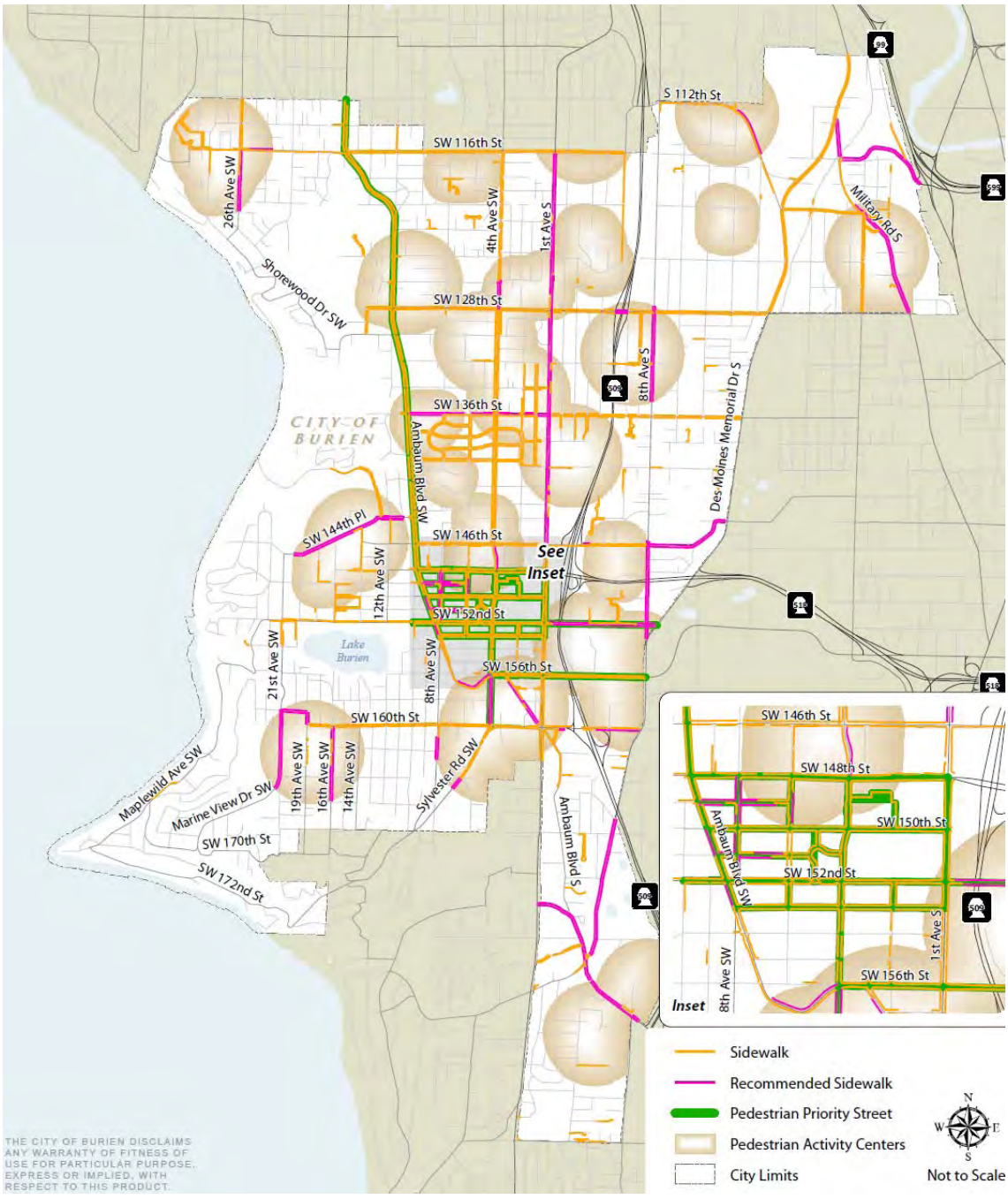
To supercede these limitations, STC recommends an alternative MMLOS method that takes some of the quantitative elements of the HCM and combines them with a more design/environment based assessment to evaluate MMLOS.

The method generally works as follows:

1. Define a hierarchy of streets/corridors based on mode. For example, bicycle priority streets, transit priority streets, vehicle priority streets, etc. This helps to address the biggest weakness of many MMLOS methods, which do not help to balance the needs of multiple modes within the same right of way. In general, this "layered network" concept is to accommodate all modes with basic infrastructure on nearly all streets, but to prioritize certain modes on specific street networks to reduce conflicts between modes. For example, this hierarchy helps to justify the reduction of auto LOS on a bicycle priority street where a road diet is being proposed. See the examples from the City of Burien, Washington on the following pages.



Burien Bicycle Priority Network



Burien Pedestrian Priority Network

2. With a complete network of transportation facilities defined, identify appropriate design standards for given areas and given street typologies. For example, it may be appropriate to define a sidewalk standard that is 12 feet wide with street trees and provision for café seating in a downtown area. On low volume suburban residential streets, the standard may call for a sidewalk

on only one side of the street. Note that many jurisdictions have already defined citywide or subarea pedestrian and bicycle design standards.

3. Combine the design standards identified above with recommended best practices from AASHTO, FHWA, NACTO, and professional practice regarding appropriate crossing distance intervals, crossing treatments, and traffic volumes/speeds on low-stress bicycle streets. By combining best practices recommendations and design standards, a rating system can be defined. See an example from Burien, Washington below.

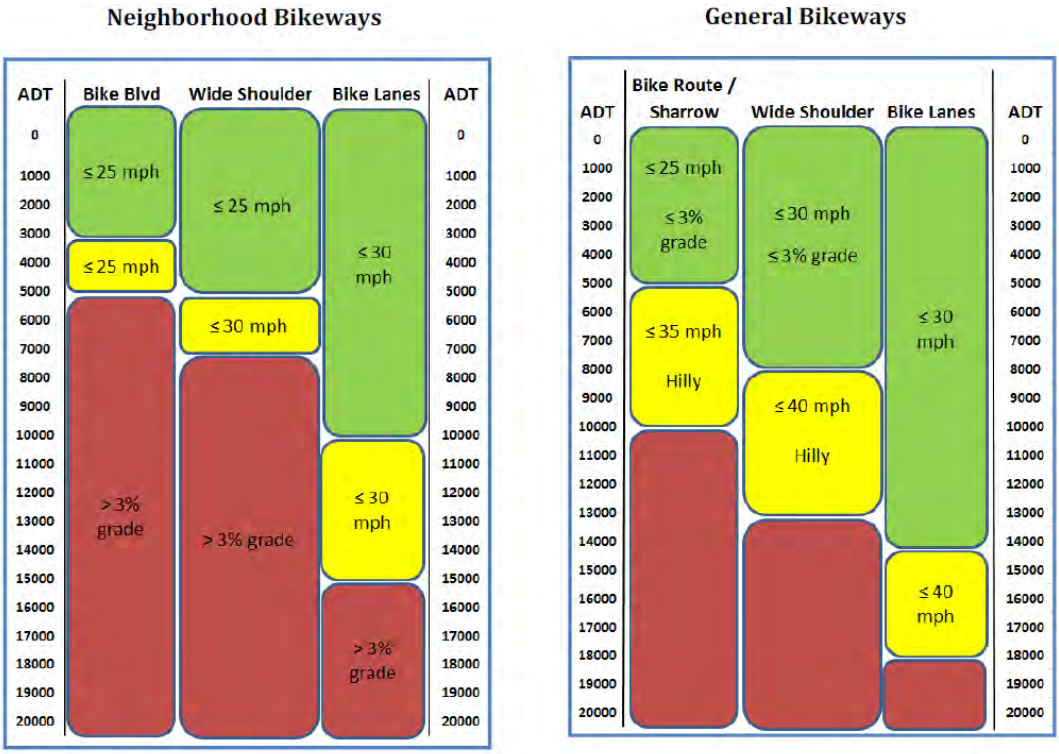


Table 5. Bicycle Intersection and Stop Frequency LOS

LOS	Unsignalized Intersections	Stop Frequency (Neighborhood Bikeways Only)
	Adequate crossing of arterial or collectors along bikeways	< One stop per 1/4 mile
	Marked, but insufficient crossing of arterial or collector along bikeway	Stops spaced at 1/8 to 1/4 mile
	No marked/controlled crossings of arterial or collector along bikeway	>One stop per 1/8 mile

Bicycle LOS Thresholds as Defined in Burien

Pedestrian Priority Area LOS – Sidewalk Requirements

LOS	Along Transit Priority Corridors	Pedestrian Activity Centers	Downtown Burien
	Sidewalk and Buffer	Arterial/Collector – Sidewalk on Both Sides	Meets Downtown Standards
	Sidewalk	Wide Shoulder	Sub-standard Sidewalk
	No Sidewalk	Congested Roadway	No Sidewalk

Pedestrian Non-Priority Area LOS – Sidewalk Requirements

LOS	Other Roadway Segments
	Arterial – Sidewalk on Both Sides
	Arterial – Sidewalk on One Side
	Arterial – No Sidewalk

Crossing Requirements

LOS	Pedestrian Priority Areas	Other Areas
	Appropriately designed crossing every 300 feet in pedestrian activity area[a] or downtown	Appropriately designed crossings at existing marked crosswalks
	Crosswalks present every 600 feet	Crosswalks present
	No crosswalks present	No crossings within 600 feet

[a] Pedestrian activity areas are those areas within a quarter mile of schools, an eighth mile of neighborhood parks, or within a quarter mile of food banks.

Pedestrian LOS Thresholds as Defined in Burien

4. Using the LOS definitions described above, performance goals/thresholds can be set. For example, it may be a goal that a community have no red pedestrian or bicycle priority routes within five years of plan implementation. Alternatively, it could be the goal of the city to have a green bicycle facility every half mile in each direction of principal travel to ensure good bicycle circulation across the city.

5. Develop a prioritized project list based on the LOS performance goals and the requirements to meet those goals. The list can be further prioritized based on other performance indicators, such as equity considerations, expanding access to population or employment, or to advance mode split targets.

6. The MMLOS system is designed to be easy to monitor over time to track progress. Since it is often based on adopted design standards and modal plans, it is also simple to update and keep current.

Page left blank intentionally

Appendix D

Evaluating Travel Time Reliability

North American Sustainable Transportation Council

December 3, 2012

Evaluating *Travel Time Reliability*

North American Sustainable Transportation Council (STC)

December 3, 2012

Purpose

The purpose of this memo is to establish a method for evaluating the *Travel Time Reliability* measure found the STARS-Plan Access & Mobility credit.

Travel Time Reliability aims to reduce travel time variations such that people can more predictably time their departure to ensure arrival at a given time. Travel time reliability is particularly important for transit and rideshare modes since more people may be likely to select these modes if they are reliable.

Travel Time Reliability is a measure in two objectives under the second Access & Mobility goal in STARS-Plan. That goal is to "Improve the convenience and quality of trips…" and the two objectives are:

- "To improve travel time and/or travel time reliability for pedestrian and bicycle trips between key origins and destinations," and
- "To improve travel time reliability and speed consistency for transit, car/vanpool, and freight trips between key origins and destinations."[1]

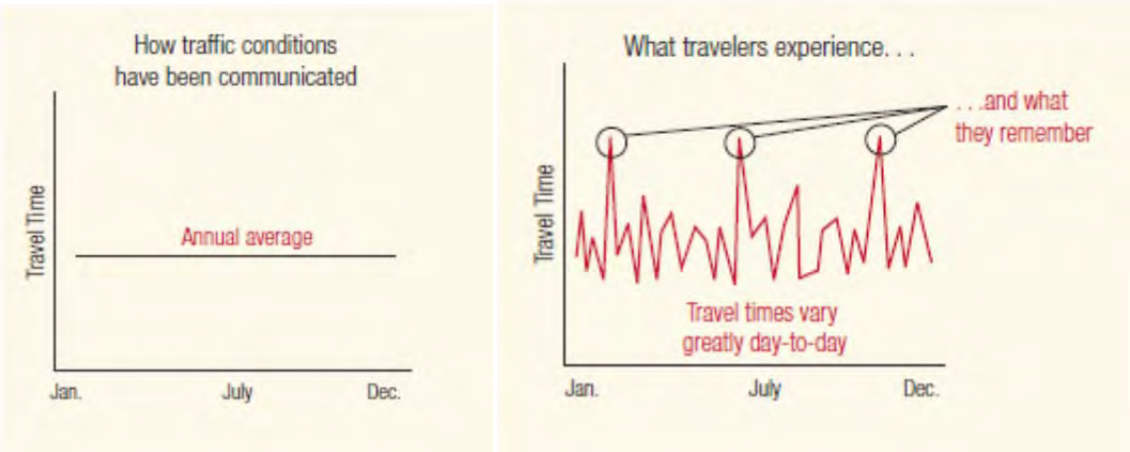
Recommendations

The STC recommends two methods for calculating Travel Time Reliability. One method relies on output from a standard travel demand forecasting model (3-step or 4-step) and is well suited for plan evaluation or large corridors. The other method directly calculates travel time reliability using a traffic simulation model and is well suited to project level analyses with robust analysis budgets.

Background

Travel time reliability is generally regarded as an important measure of transportation service quality. Travel time reliability matters since being late to work, an appointment, or for a delivery have substantial repercussions for travelers and businesses. Literature from the Federal Highway Administration (FHWA) and many academic journals cite travel time reliability as a more important measure than average travel time between destinations because people must try to plan around the unpredictable nature of travel. The figures below from FHWA's Travel Time Reliability: *Making it There on Time, All the Time* document summarizes the importance of travel time reliability.

[1] STARS Pilot Plan Application Manual, Version 1.0, Appendix A, page 61.

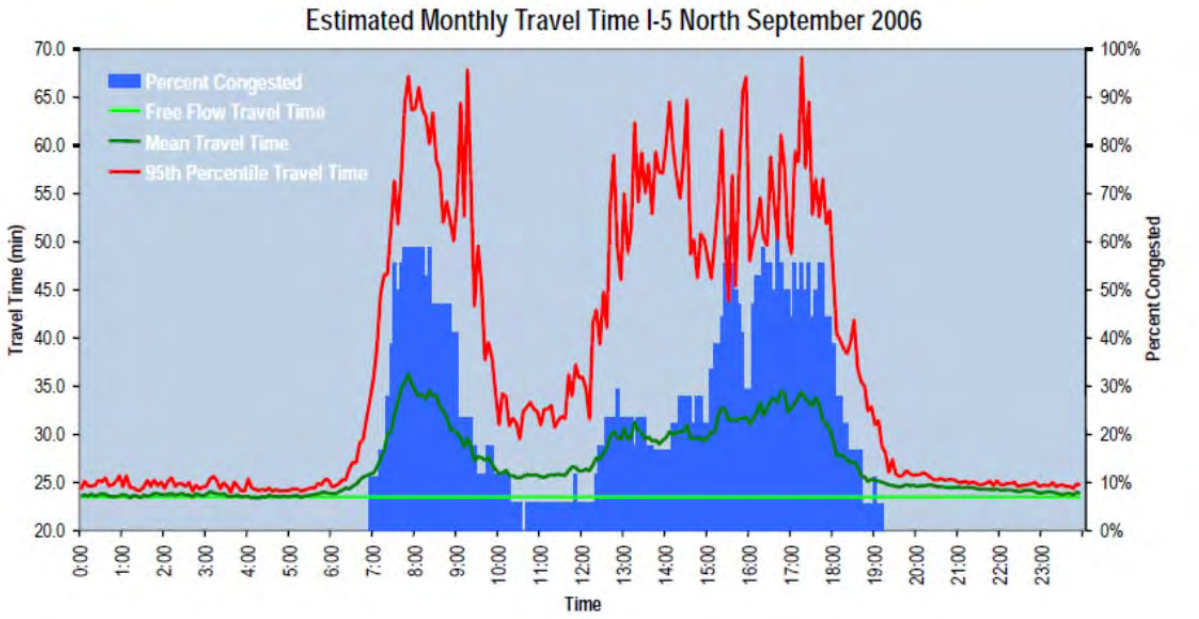


The literature suggests several methods to communicate travel time reliability, but the most common measure is known as the Planning Time Index. The Planning Time Index represents the total amount of time a traveler should allow to ensure an on-time arrival[2]. As an example, a Planning Time Index of 1.75 would mean that for a driver to reliably make it to a destination that is typically 20 minutes away, they should leave 35 minutes (20 x 1.75 = 35) in advance. The Planning Time Index is based on long term travel times (minimum of one year of observation is required), and represents the 95th percentile travel time for a person to make it to their destination by a given mode. In general, Planning Time Indices only apply to vehicle and transit modes, since other modes (walking, biking) do not tend to have as much travel time variability. The Planning Time Index covers both changes in intensity of recurring congestion and non-recurring congestion events (collisions, weather); however, non-recurring events have a much larger impact on increasing the Planning Time Index.

Calculating Travel Time Reliability with a Travel Demand Forecasting Model

While there are many examples of how to calculate travel time reliability by observing the Planning Time Index, there are few applications where this index is predicted for planning purposes. Recently, the Transportation Research Board funded research on travel time reliability. Through this effort, the researchers determined that travel time reliability is closely linked to congestion levels. This is not a surprising result since recurring delay is not present on uncongested roadways and non-recurring congestion disrupts traffic to a much smaller degree when the traffic flow is relatively light. The figure below showing sample data from Portland highlights the link between traffic congestion and travel time reliability. For reference, the difference between ratio of the 95th percentile travel time and the mean travel time is the Planning Time Index.

[2] *Travel Time Reliability: Making it There on Time, All the Time*, FHWA, http://ops.fhwa.dot.gov/publications/tt_reliability/brochure/ttr_brochure.pdf



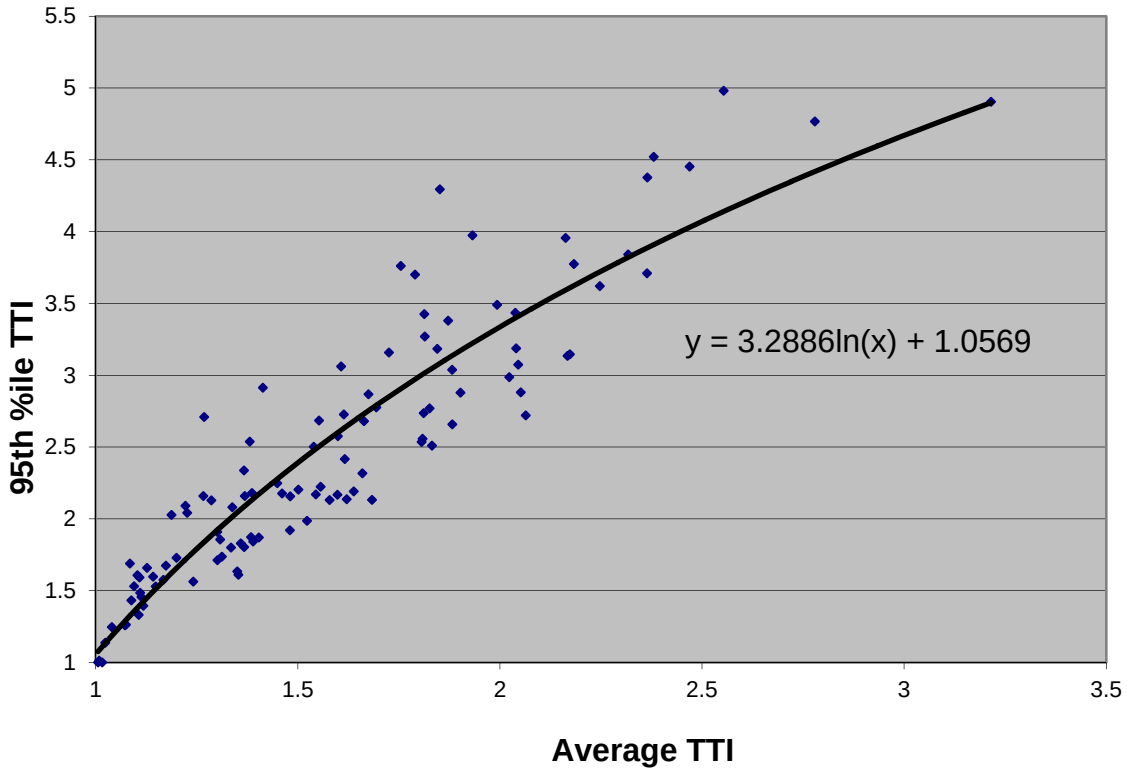
Source: *Using Travel Tine Reliability Measures to Improve Regional Transportation Planning and Operations*, Lyman and Bertini, Presented at the 87th Annual TRB Annual Meeting, 2008.

The Transportation Research Board research, carried out by Richard Margiotta from Cambridge Systematics, found the following relationship between the Average Travel Time Index and the 95th Percentile Travel Time Index[3]:

$$\textbf{95th Percentile Travel Time Index} = 3.29 \times \ln(\textbf{Average Travel Time Index}) + 1.06$$

This relationship is plotted on the following page. What the graph shows is that as congestion increases, the 95th percentile Travel Time Index increases at an accelerating rate. In other words, travel time reliability decreases rapidly as congestion increases.

[3] Travel Time Index is another measure of traffic congestion. Travel Time index is the ratio of congested travel time to free-flow travel time. The Planning Time Index is the ratio of the 95th percentile Travel Time Index to the average Travel Time Index.



Source: *Developing and Predicting Travel Time Reliability*, Margiotta, R. Presented at ITS Georgia, 2009.

The relationship shown above provides for a means to predict travel time reliability using a travel demand forecasting model.

Step 1 – Determine free flow speed from travel demand forecasting model. This is typically coded in the model as a speed limit.

Step 2 – Determine peak commute period congested travel speed from the travel model. Note that some travel models do not output reasonable congested travel speeds. Validation of the model output is recommended.

Step 3 – Calculate the Travel Time Index by taking the ratio of the Step 2 output to the Step 1 output.

Step 4 – Calculate the 95th Percentile Travel Time index using the formula above.

Step 5 – Calculate the Planning Time Index by taking the ratio of the Step 4 output to the Step 2 output.

Any improvement to the Planning Time Index can be interpreted to represent an improvement in travel time reliability.

Calculating Travel Time Reliability with a Traffic Simulation Model

The Planning Time Index can be calculated directly using a traffic simulation model since it captures the dynamics of traffic flow and directly outputs travel speed. To calculate the Planning Time Index in a traffic simulation model, several runs of the model are required with some variation in input traffic flows.

Step 1 – Based on existing traffic count data calculate or estimate the typical daily traffic flow variation. An example would be to perform a work week traffic count and identify the high, medium, and low traffic volumes that were observed.

Step 2 – Run the traffic simulation model with the high, medium, and low traffic count data (or with future traffic forecasts scaled by the high and low factors)

Step 3 – Using the output of the traffic simulation model runs, identify the 95th percentile travel speed and the mean travel speed. Use these data to calculate the Planning Time Index.

Page left blank intentionally

Appendix E

Comment on the Eugene's Transportation System Plan in the Context of Triple-Bottom-Line Evaluation Methods

Terry Moore

December 27, 2013

DATE: 27 December 2013

TO: Kurt Yeiter, City of Eugene
cc: Rob Zako, SCI

FROM: Terry Moore

SUBJECT: COMMENT ON THE EUGENE'S TRANSPORTATION SYSTEM PLAN IN THE CONTEXT OF TRIPLE-BOTTOM-LINE EVALUATION METHODS

This memorandum is a supplement to the several research products related to "Triple-Bottom-Line" (TBL) evaluation methods that the Sustainable Cities Institute (SCI) at the University of Oregon produced as part of the efforts of the Lane Livability Consortium to create a "Regional Prosperity Economic Development Plan." In particular, SCI was asked to comment on draft products for the Transportation System Plan of the City of Eugene in the context of TBL evaluation methods.

Background

The Lane Livability Consortium received a grant from the U.S. Department of Housing and Urban Development (HUD) to support the creation of a Regional Prosperity Economic Development Plan. Among the many tasks funded by that grant was an investigation of evaluation tools for making regional, multi-jurisdictional decisions about large infrastructure investments. In particular, the Consortium was interested in the use of a "Triple-Bottom-Line" (TBL) framework for decisionmaking, Task 5.1 of its work plan.

The Consortium contracted with the Sustainable Cities Institute (SCI) at the University of Oregon to assist in defining and illustrating the application of TBL evaluation techniques. SCI received a matching grant from the Oregon Transportation Research and Education Consortium (OTREC) and created several products. The City of Eugene has those products. Of most relevance to the topic of this memorandum are (1) *Pragmatic Decision-Making with the Triple Bottom Line* (15 Dec 2013), and (2) *Sustainable Transportation Decision-Making* (OTREC, Aug 2013).

In October 2013, SCI (Rob Zako and Terry Moore) agreed to provide the City of Eugene (Kurt Yeiter) with a this memorandum. In particular, this memorandum addresses (1) the extent to which the efforts on the City's Transportation System Plan (TSP) to date are consistent with TBL principles, and (2) other issues related to the TSP's evaluation of projects and programs.

Do the TSP documents and process reflect TBL principles?

Yes.

Over two years ago the City began discussions with staff at the North American Sustainable Transportation Council about its process for the evaluation of transportation plans called STARS (Sustainable Transportation Analysis and Rating System). STARS technical material explicitly calls STARS a TBL evaluation technique.

Both STARS and the City approached the development and evaluation of the City's TSP broadly (a TBL perspective) rather than narrowly (e.g., at the extreme, an exclusive focus on auto

mobility without reasonable attempts to incorporate other positive and negative effects, both short-run and long-run). The City made substantial efforts to measure performance in the categories of (1) Safety and Health, (2) Social Equity, (3) Access and Mobility (all modes), (4) Community Context (operationalized as consistency with City goals adopted in other, non-transportation documents), (5) Economic Benefit, (6) Cost Effectiveness, (7) Ecological Function, and (8) Climate and Energy. Categories 2, 5, and 7/8 link directly to the TBL categories (Equity, Economy, Environment); the other four TSP categories fit under one or more of the three TBL categories.

Issues related to implementing TBL principles and techniques

The work of SCI provides a good discussion of aspects of TBL evaluation that are difficult to evaluate. STARS and the TSP run into those difficulties, as all evaluation frameworks inevitably do. I discuss the important ones below.

The TSP uses a top-down, hierarchical framework for decisionmaking. Few broad *goals* each have a few *objectives*, which each have or become *criteria*, which each have one or more *measurements*. That framework is found throughout the professional literature of planning, economics, and decision science. It is logical in theory; it is difficult to implement fully in practice.

Goals and Criteria

There is rarely disagreement with the statement that (1) goals should be about things (outcomes) that stakeholders care about, and (2) potential actions should be evaluated against how well they deliver those things. In other words, there should be a close correspondence between goals and criteria.

Good analysis requires that every outcome of importance be considered (the evaluation is comprehensive) and that each outcome be counted (measured) only once (the criteria are mutually exclusive. That's the theory.

The seven performance categories of the TSP (above) arguably meet the requirement of comprehensiveness (anything anyone cares about can probably be fit into one of the categories). They do not meet the requirement of mutual exclusivity (usually more difficult). They overlap. Improving health and safety (1), access and mobility (3), and ecological function (7) have economic benefits (5). Cost-effectiveness (6) requires a full evaluation of all benefits. That overlap contributes to the problems of ranking (below).

Measurement

Everyone agrees about the value of *evidence-based decisionmaking*. It is not enough for any participant in a public decisionmaking process to simply assert a conclusion: (1) it must be supported by some kind of evidence, and (2) measurements of outcomes are usually preferred to measurements of opinions about outcomes.

- There are more potentially relevant measurements than there are resources or time.

- People have different perceptions about what measurements are most relevant or important.
- Some measurements have existing sources of data, others do not.
- For planning projects, most of what is relevant is about future performance and forecasting, not measurement. In the jargon of policy evaluation, desired future outcomes are forecasted by collecting, evaluating, and making assumptions about measurements of the historical values of variables deemed to be causes of past outcomes.

The TSP references the STARS jargon of "Heavy lifters": a few measurements that the STARS program believes are correlated with several different outcomes that STARS cares about. First, this is an example of an attempt to simplify the measurement problems I just noted. Second, though STARS asserts these measurements as heavy lifters, there is nothing approaching rigorous evaluation or professional consensus in the literature about these measurements, and a lot to suggest that any few measurements are unlikely to capture all the things that stakeholders and the public care about, and the degree to which they care.

Consolidating criteria into rankings and decisions

The theory and steps are clear: (1) measure everything that is significant to stakeholders in the decisionmaking, (2) determine the collective relative importance of each measurement (its *value* or *weight*), (3) multiply each measurement (step '1') by its weight (step '2') to get its *score*, and (4) add the scores for each measurement (positive and negative) to get an overall score for the project or program being evaluated. In the jargon of benefit-cost analysis, the positive and negative measurements are *benefits* and *costs* that are weighted by their estimated dollar values, and their overall score is expressed as *net present value* or a *benefit-cost ratio.*

Even if people could agree (they usually cannot) that they have measured well (in the previous step) everything of importance, all evaluation systems falter as they try to consolidate the measurements into an overall ranking.

STARS (and, by extension, the TSP) tries to address this problem, at least in part, by reference to "heavy lifters": presumably, they matter more. At the other extreme, benefit-cost analysis tries to address the problem by denominating as many impacts (benefits or costs) as possible in dollars. ODOT is trying to address this problem with Mosaic, which suggests using benefit-cost analysis for measurements that can reasonably be evaluated in dollars, and then comparing the net benefits of that subset of impacts to other impacts not denominated in dollars.

That last method is the one I support. It also addresses a question you asked me in an email about using benefit-cost analysis. In your email to me (5 December 2013) you noted that:

- Your matrix of criteria became huge and unwieldy, and that you had to simplify (my TBL research suggests that is a common outcome). I made some comments about this above.
- That you had not scored the "cost-benefit criteria." That title suggests criterion 5, Economic Benefit, but the language you quoted is from criterion 6, Cost Effectiveness:

"Does the project or program benefit the other seven categories compared to the costs (public, private, and social) of the project or program?"

Regarding the second point, you asked: "If there were a way to simply assess or rank projects for cost-benefit purposes, I'd love to hear it." A few comments:

- Per my comments above, your eight categories of criteria overlap. In benefit-cost analysis for transportation, many of the benefits and costs you describe in other categories (e.g., safety, mobility, air quality) would be quantified and monetized as part of the benefit-cost measure. Your criterion 6 seems, on the surface, to be a double count: some of the benefits are being measured as part of other criteria, and now you presumably want to divide those benefits by some measure of cost to get a measure of cost-effectiveness ("bang for the buck").
- I do not intend this to sound glib, but a definitive text on benefit-cost analysis for transportation project (American Association of State Highway and Transportation Officials, *The User and Non-User Benefit Analysis for Highways*, September 2010; I am one of the co-authors) is about 450 pages long. There are a lot of tricky technical issues related to your question. I already mentioned the issue of double counting. Another is about what should go into the numerator and denominator of a benefit-cost ratio or cost-effectiveness measure: e.g., (1) dis-benefits (e.g., air pollution increases) belong in the numerator, not in the denominator as a cost, and (2) costs in the denominator are best limited to direct budgetary expenditures. If you follow those two principles, then you are getting a measure that is something like "value of measurable net benefits per dollar of budgetary expense."
- Less academically, the best treatment of this topic that I have seen by a public agency was at the Puget Sound Regional Council. ODOT's Mosaic project provides some detail, but the main point is that PSRC tried to get all the monetizable benefits[1] into a single, monetized measure of "project efficiency." That measure could then be divided by project costs (ideally, the present discounted value of public expenditures for planning, construction, operation, and maintenance over the life of the project) to get a measure of "cost-effectiveness." Then, decisionmakers still have to weigh qualitatively the cost-effectiveness against other measures of project impact (e.g., equity).

Dealing with small projects or programs

You asked about dealing with large projects that have more benefits than small ones. Several considerations and partial answers:

- There is a lot in the professional literature about this topic. The most obvious point: a big project with a benefit-cost ratio of 1.01 can have substantially more net benefits than a small project with a benefit-cost ratio of 1.50. If. however, the big project cost 100 times

[1] E.g., mobility (congestion relief measured by travel time), safety (reductions in injuries, fatalities, and property damage), air quality (value of carbon and pollutants).

more, and if there were 100 similar small projects, then doing 100 small projects would deliver 50 times the net benefits of the large project. Thus, thinking in terms of cost-effectiveness is critical here. I think that is what you are trying to do in the TSP, and that you are on the right track.

- More subtle and complicated is the evaluation of "portfolios" of projects. Some projects are substitutes for others; some only make sense if others happen first; some are doing different things to serve different populations. Moreover, investment decisions might be more easily understood and sold if they consist of a group of investments consistent with a theme (e.g., a theme of connecting primary bike or ped routes, or of reducing congestion in a key economic corridor). Thus, it may be better to think in terms of packages of projects and programs than in terms of individual ones. Again, I think I see these ideas in the draft TSP material you sent me.

Dealing with multiple modes

My opinion is that multi-modal measurements are not likely to work well for decisionmaking. By multi-modal measurements I mean attempts to either (1) create an overarching measurement of some objective (e.g., a single measurement of, say, "accessibility" for an entire regional transportation system, not by mode) or (2) add up or compare individual modal measures or some objective (e.g., compare "mobility" by auto to "mobility" by transit). The modes are too different in their objectives, functions, and budgets. For example, increasing walking trips is unlikely to make a big (or even measurable) change in automobile trips, VMT, and congestion. But walkable neighborhoods are an important component of quality of life, and are correlated with other measures of economic activity and value.

Highways, cars, and trucks will continue to be the dominant mode for moving people and freight in all but the largest and densest US cities. But improvements to walking, biking, and transit are also desired. Comparing those improvements to highway improvements on highway criteria requires these modes to deliver outcomes that are not the ones they are primarily designed to deliver.

My recommendation is to use criteria and measurements to comparisons *within* modes, not *across* modes. That method allows, for example, one to rank bike improvements based on, say, how cost-effectively the alternatives complete a primary bike system. I would leave the decision about what percent of the transportation budget to allocate to different modes as a separate decision: one that technical information can help inform, but that has other considerations as well.

This idea is consistent with a draft TSP document you sent me suggesting that bike and pedestrian projects will be adopted separately in the Pedestrian and Bicycle Master Plan and then incorporated by reference into the TSP.

Page left blank intentionally

Appendix F

Survey: Barriers to Active Transportation Survey

DHM Research

January 2014

Eugene-Springfield Metropolitan Area
Travel Barriers and Benefits Survey

PREPARED FOR:

CITY OF EUGENE

January 2014

PREPARED BY:

DHM RESEARCH

(503) 220-0575 • 239 NW 13th Ave., #205, Portland, OR 97209 • www.dhmresearch.com

1. | INTRODUCTION AND METHODOLOGY

Davis, Hibbitts & Midghall, Inc. (DHM Research) conducted a telephone survey of residents in the cities of Eugene and Springfield, Oregon. The objective of the survey was to determine public perceptions and behaviors of travel barriers and benefits in these cities.

Research Design: Between January 12 and 15, 2014, DHM Research conducted a telephone survey of 500 residents of Eugene and Springfield, Oregon. Of those interviews, 380 were conducted in Eugene and 120 in Springfield. The survey took an average of 10 minutes to administer. The sample size is sufficient to assess opinions generally, and allows a review by multiple subgroups including age, gender, and other demographics.

Respondents were contacted randomly using multiple samples including listed, cell phone, and voter samples. In gathering responses, a variety of quality control measures were employed, including questionnaire pre-testing and validations.

For a representative sample, quotas were set by age, gender, and geographic area. In the annotated questionnaire, results may add up to 99% or 101% due to rounding.

Statement of Limitations: Any sampling of opinions or attitudes is subject to a margin of error. The margin of error is a standard statistical calculation that represents differences between the sample and total population at a confidence interval, or probability, calculated to be 95%. This means that there is a 95% probability that the sample taken for this study would fall within the stated margins of error if compared with the results achieved from surveying the entire population.

For a sample size of 500, the margin of error for each question falls between +/-2.6% and +/-4.4%, at the 95% confidence level. The reason for the difference lies in the fact that, when response categories are relatively even in size, each is numerically smaller and thus slightly less able – on a statistical basis – to approximate the larger population.

DHM Research: DHM Research has been providing opinion research and consultation throughout the Pacific Northwest and other regions of the United States for over three decades. The firm is non-partisan and independent and specializes in research projects to support public policy-making. www.dhmresearch.com

Regions within Eugene and Springfield are referenced throughout the report. The map below shows five regions within Eugene and two within Springfield. Within Eugene:

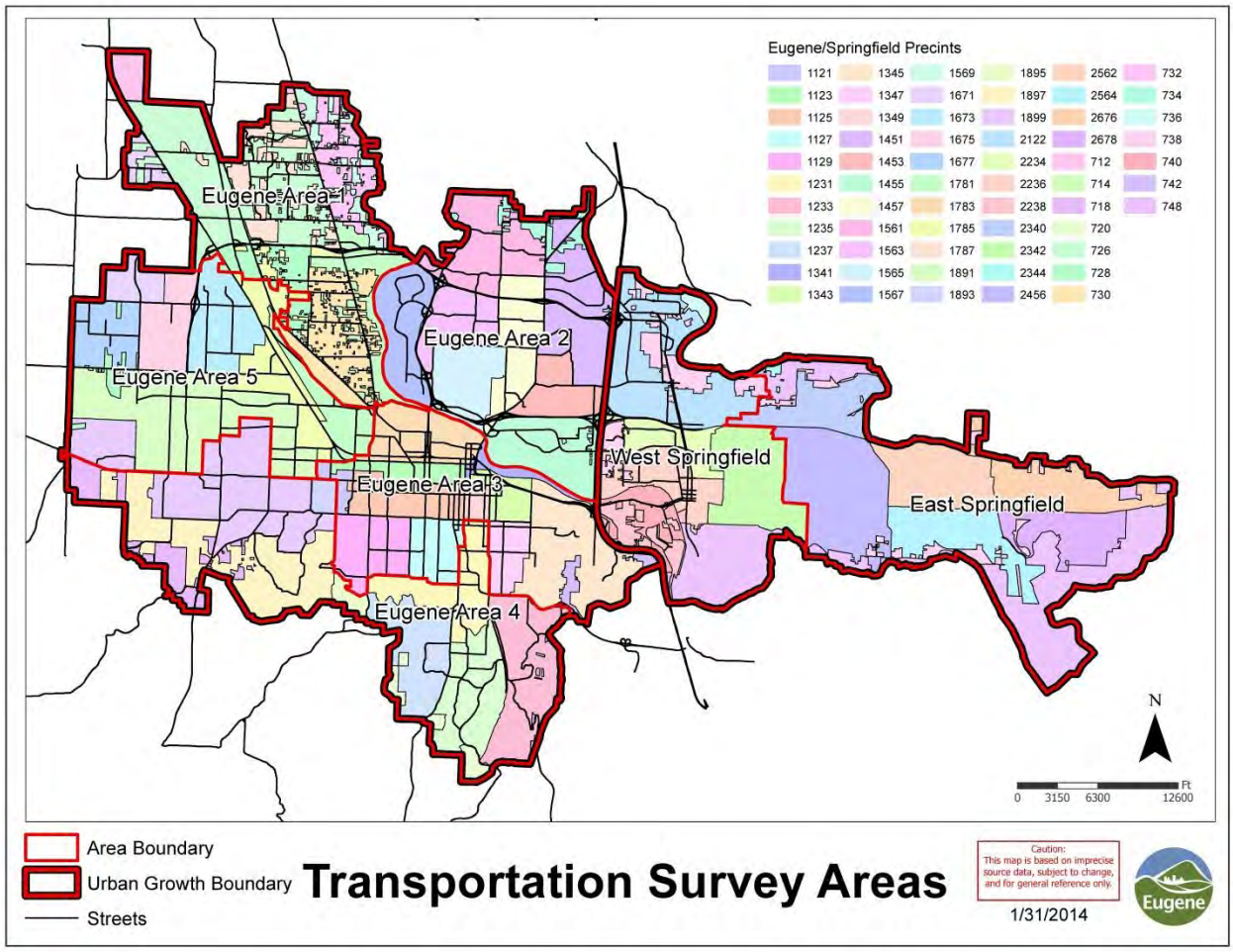
Area 1 – River Road-Santa Clara

Area 2 – NE Eugene

Area 3 – Central Eugene

Area 4 – South Hills

Area 5 – West Eugene/Bethel/Danebo



2. | SUMMARY & OBSERVATIONS

Poverty and homelessness are the top issues residents of Eugene and Springfield would like their local government leaders to do something about. Improving road conditions is the top transportation issue they would like leaders to address.

- 22% want their local government to address the poverty and homelessness in the area.
- Thinking specifically about transportation, improving road conditions is the top issue (18%).
    - Other transportation issues include expanding the bus system (12%), improving traffic congestion (8%), and increasing bike accessible areas (7%).

Driving alone is the most frequently used mode of transportation followed by driving with others in the household.

- 75% drive alone in their personal vehicle weekly or more often, with half (50%) doing so on a daily basis.
    - 63% report driving alone as their most frequent mode of transportation.
- Top reasons for driving alone include needing a car for work or errands throughout the day (30%) and the freedom that driving alone provides (27%).
- Other modes of transportation respondents use frequently include:
    - 46% - Driving in personal vehicle with other household members
    - 20% - Walking
    - 16% - Biking
    - 14% - Sharing a ride with others outside of their household
    - 13% - Taking the bus

Price of gasoline and information about health or environmental benefits are the most influential factors in getting someone to use alternatives to driving alone.

- 51% said that higher gas prices have a great deal or some influence on their decision to use alternatives to driving alone.
- 43% said that information about health or environmental benefits were influential in their decision to use alternatives to driving alone.

The top reason people bike and walk as a form of transportation is for the health benefits.

- 50% of those who bike for transportation purposes do so because it is good for their health; 49% of those who walk for transportation purposes also do so for the health benefits.
- Other common reasons people bike and walk for transportation purposes include enjoying the activity (32% bike and 24% walk), saving money (26% bike and 11% walk), and environmental purposes (21% bike and 11% walk).
- Locations most frequented by people in Eugene and Springfield who bike and walk include shopping (51% people who bike, 66% people who walk), work (42% people who bike, 20% people who walk), and school (21% people who bike, 12% people who walk).

There is a desire among some residents to bike or walk more often for transportation purposes.

- 43% of those who bike monthly of less often agree that they would prefer to bike more for transportation purposes. Of these:
    - 80% agree they would bike more often if there were better weather in the area.
    - 79% agree they would bike more often if bike lanes or paths were available or better connected.
    - 71% agree they would bike more often if they felt safer on the roads.
- 33% of those who walk monthly or less often agree they would like to walk more for transportation purposes. Of these:
    - 86% agree they would walk more often if the stores and services they use were closer to where they live.
    - 69% agree they would walk more often if there were better weather in the area.
    - 54% agree they would walk more often if sidewalks in their area were better connected.

3. | KEY FINDINGS

3.1 | Important Issues

Respondents were asked, unprompted, what they felt were the most important issues in the Eugene-Springfield area that they would like their local government leaders to address (Q1).

Table 1
Most Important Issues

Response Category	Eugene N=369	Springfield N=131
Poverty/homelessness	**24%**	**16%**
Road infrastructure	11%	7%
Jobs/unemployment	11%	6%
Education funding	8%	9%
Education—general	5%	5%
Wasteful spending/inappropriate use of funds by government	5%	2%
Crime	3%	5%
Traffic	3%	3%
All other responses	2% or less	4% or less
None/Nothing	9%	10%
Don't know/refused	15%	18%

Source: DHM Research, Jan 2014

In both Eugene (24%) and Springfield (16%) **poverty and homelessness** was the number one issue. Overall, other top mentions included **road infrastructure** (10%), **jobs and unemployment** (9%), and **education funding** (8%).

Respondents were then asked, more specifically, what transportation issues they would like their local government leaders to address (Q2).

Table 2
Transportation Issues

Response Category	Eugene N=369	Springfield N=131
Improve road conditions	19%	16%
Expanding bus transportation system	14%	9%
Improve traffic congestion	9%	5%
Increasing bike accessible areas/bike lanes	9%	2%
Cancel the EmX planning	6%	4%
Improve mass transit	4%	3%
Bicycle safety	4%	3%
All other responses	2% or less	3% or less
Don't see any problems/issues	11%	12%
None/Nothing	7%	12%
Don't know/refused	9%	14%

Source: DHM Research, Jan 2014

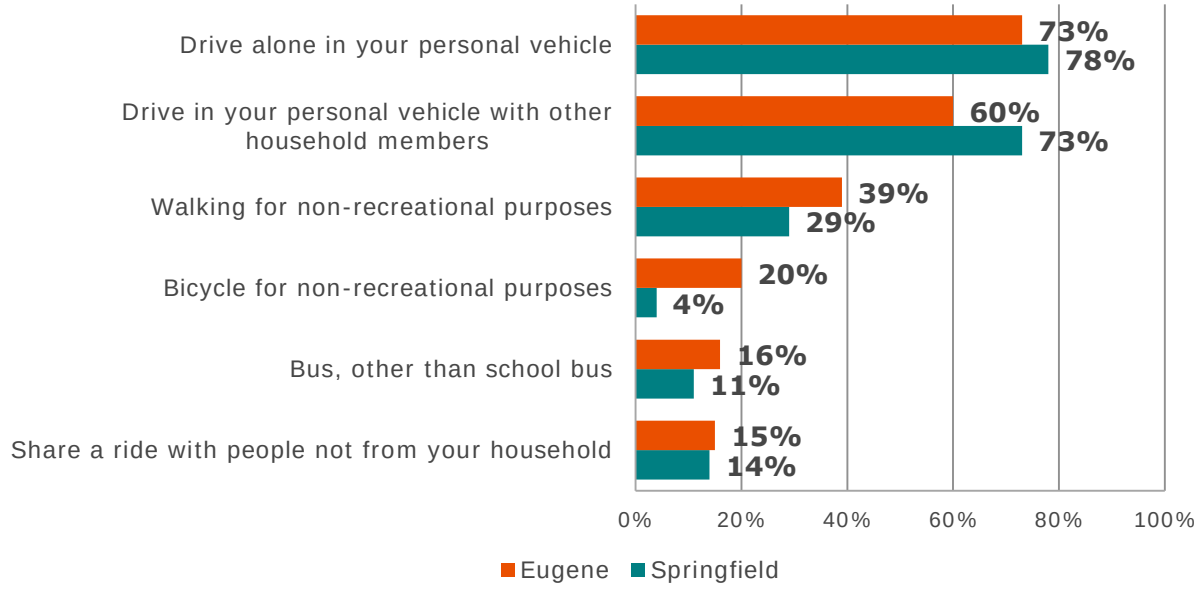
Both Eugene (19%) and Springfield (16%) residents agreed that they would like their local government leaders to **improve road conditions**. Other transportation issues were **expanding the bus system** (12%), **improving traffic congestion** (8%), and **increasing access for bikes** (7%).

By Area:
Improving road conditions was the top answer in all regions within Eugene and Springfield with the exception of those living in the NE Eugene Region who were most likely to mention **expanding the bus system** (21%). Respondents in the South Hills Region showed equal concern for **improving road conditions** (16%), **expanding the bus system** (17%), and **increasing bike accessibility** (17%).

3.2 | Travel Behavior

Respondents were asked how often they used various modes of travel for transportation purposes (Q3-Q9).

Chart 1
Travel Behavior - Weekly or More Often



Source: DHM Research, Jan. 2014

Overall, one in four (75%) **drive alone in their personal vehicle** weekly or more often, with half (50%) doing so on a daily basis. This was followed by **driving in personal vehicle with other household members** (63%). **Walking** (36%), **biking** (16%), **taking the bus** (14%), and **sharing a ride with others outside of their household** (15%) distantly followed.

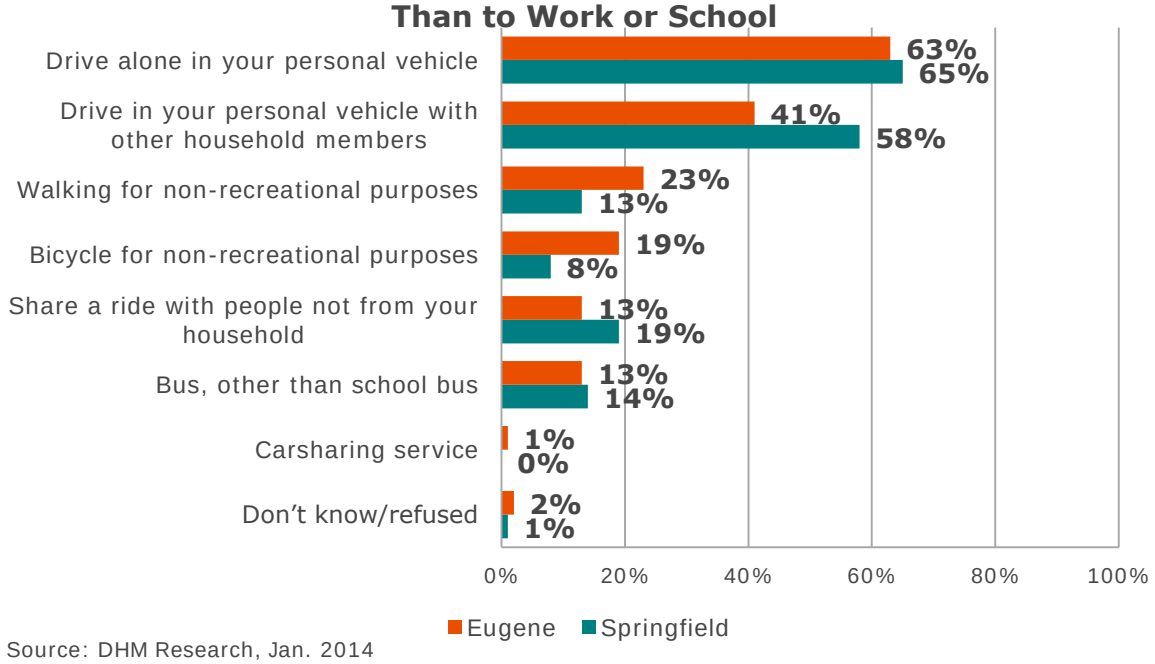
Table 3
Bicycle Monthly or More Often - Demographics

Bicycle (monthly or more often)		
Gender	Male	58%
	Female	42%
Age	18-34	53%
	35-54	29%
	55+	15%
Income	<$25K	35%
	$25-<$50K	12%
	$50K-<$75K	20%
	$75K+	21%
Area	Eugene	88%
	Springfield	11%

Source: DHM Research, Jan 2014

Next, respondents were asked to think about trips that they take, other than to work or school, and indicate the mode of transportation they most frequently use. They could indicate up to three modes (Q10).

Chart 2
Most Frequently Used Mode of Transportation Other Than to Work or School



Source: DHM Research, Jan. 2014

Overall, six in ten (63%) **drive alone in their personal vehicle** most frequently. This is followed by **driving in personal vehicle with other household members** (46%). **Walking** (20%), **biking** (16%), **sharing a ride with others outside of their household** (14%), and **taking the bus** (13%), distantly followed.

By Area: Springfield residents (58%) were more likely than those from Eugene (41%) to **drive in their personal vehicle with others household members**. Eugene residents

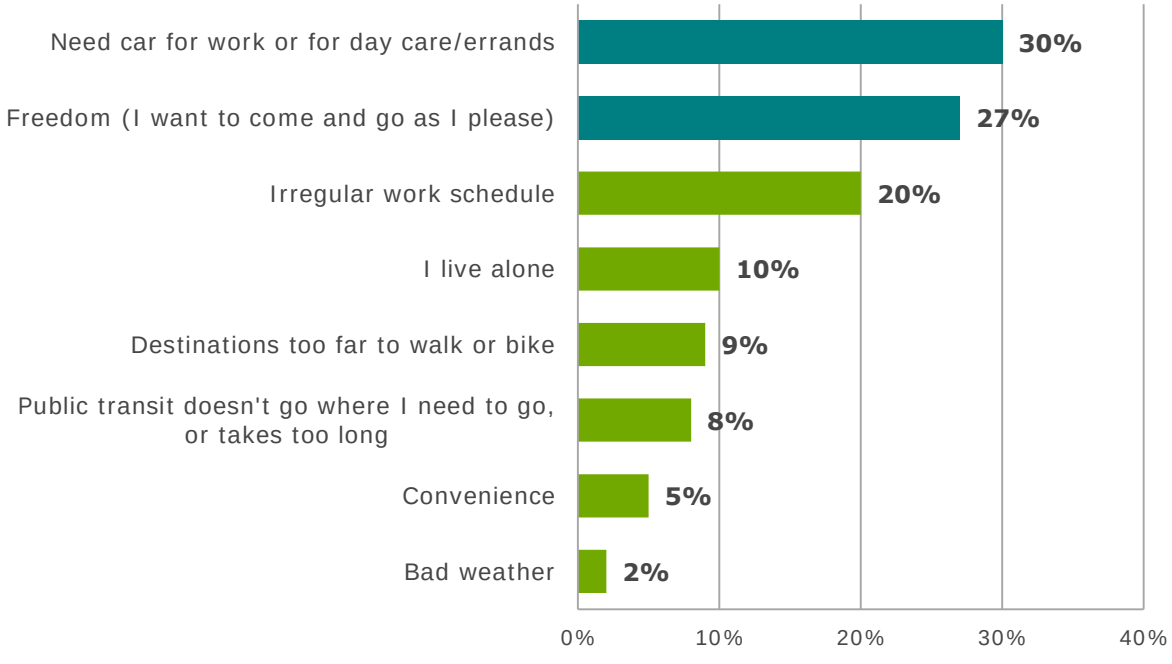
were more likely than those from Springfield to **walk** (23% vs, 13%) and **bicycle** (19% vs. 8%) as a form of transportation.

Within Eugene, residents living in the Central Eugene Region (51%) and the West Eugene/Bethel/Danebo Region (53%) were the least likely to **drive alone in their personal vehicle**. Those living in the Central Eugene Region were also more likely **bike** (32%) and **walk** (32%) as a form of transportation than those living in the River Road-Santa Clara Region (9% and 16% respectively) and the NE Eugene Region (16% and 17% respectively). Springfield residents living on the east side (23%) of the city were more likely than those living on the west (5%) to use the **bus** as a form of transportation.

Demographic Differences: Younger respondents, ages 18-34, are more likely than those older to use the **bus** (18-34: 22%; 35-54: 7%; 55+: 9%). Those from households making $50K or less were also more likely to use the **bus** (<$25K: 22%; $25K-$50K: 15%; $50K+: 5%) and **walk** (<$25K: 27%; $25K-$50K: 25%; $50K+: 13%) as a form of transportation. Those age 55 and older (70%) were more likely than those ages 18-34 (57%) to **drive alone**. Respondents from households making less than $25K per year were less likely than those from higher income households to **drive alone** (<$25K: 49%; $25K-$50K: 64%; $50K-$75K: 76%; $75K+: 80%) and **drive with other household members** (<$25K: 26%; $25K-$50K: 46%; $50K-$75K: 58%; $75K+: 66%).

Respondents who drive alone as a form of transportation were asked, unprompted, for the reasons they drive alone (Q11).

Chart 3
Reasons to Drive Alone



Source: DHM Research, Jan. 2014

Top reasons for why respondents drive alone included **needing a car for work or errands throughout the day** (30%) and the **freedom** that driving alone provides (27%). One in

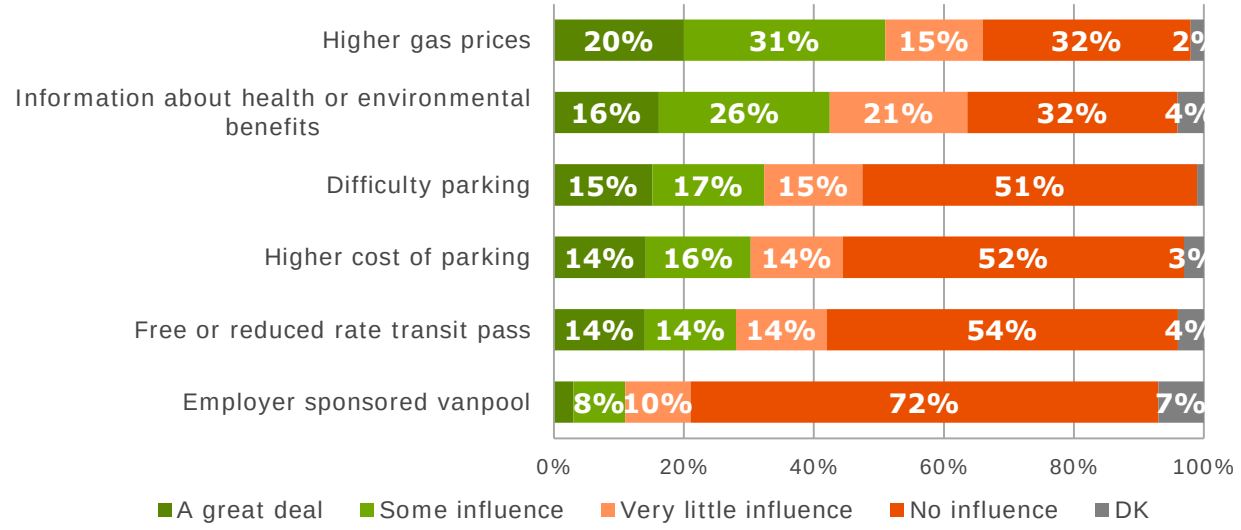
five residents also mentioned an **irregular work schedule** (20%) as a reason they drive alone.

By Area: No differences between Eugene and Springfield exist. Due to the reduced sample size, differences within regions in Eugene and Springfield are not presented.

Demographic Differences: Respondents under the age of 55 were more likely than those who are older to cite an **irregular work schedule** as a reason they drive alone (18-34: 30%; 35-54: 23%; 55+: 8%). No other demographic differences exist.

Respondents who use transportation options other than driving alone monthly or more frequently were asked how much influence various factors had on their decision (Q12-Q17).

Chart 4
Influence on Using Alternatives to Driving Alone



Source: DHM Research, Jan. 2014

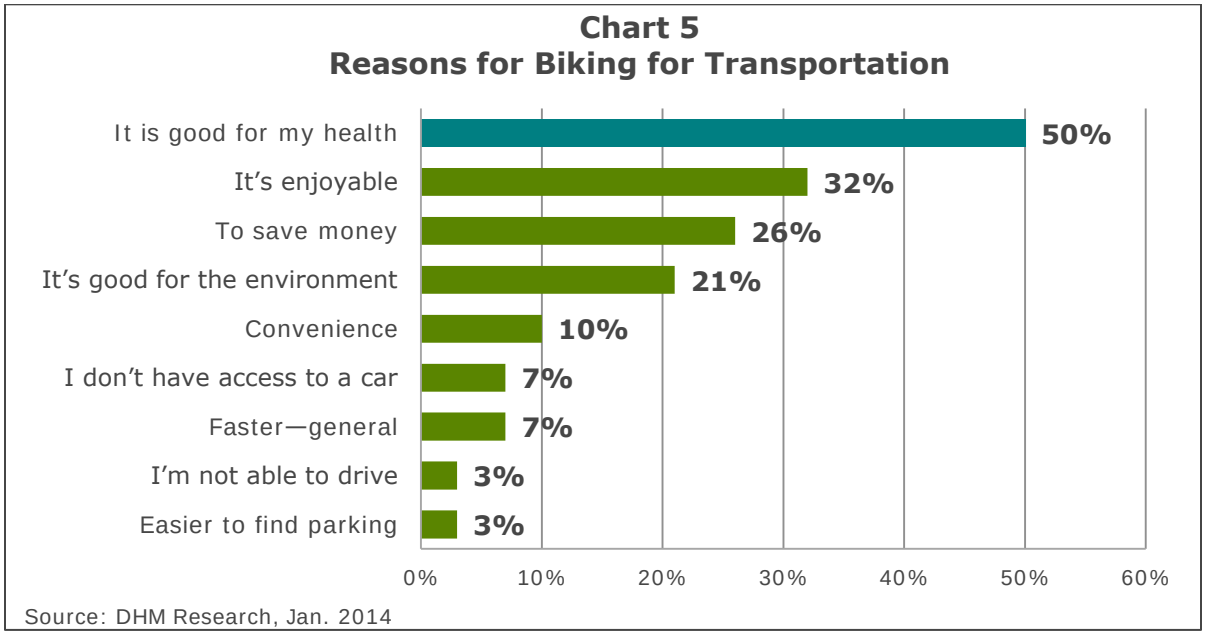
Half (51%) reported that **higher gas** prices had a great deal (20%) or some (31%) influence on their decision to use alternatives to driving alone. Four in ten (43%) said that **information about health or environmental benefits** had a great deal (16%) or some (26%) influence on their decision to use alternatives to driving alone. The second tier of influencers included **difficulty parking** (32%), **higher cost of parking** (30%), and **free or reduced rate transit pass** (28%). The **employer sponsored vanpool** was the least influential with 72% reporting it had no influence on their decision to use alternatives to driving alone. Other items that influenced decisions mentioned by respondents included **convenience, health benefits, and saving money.**

By Area: All influencers were consistent by area with the exception of **information about health or environmental benefits.** Respondents in Eugene (46%) were more likely than those in Springfield (33%) to say this had a great deal or some influence on their decision. Within Eugene, those in the South Hills Region (62%) were more likely to be influenced by this than all other regions (38-43%) with the exception of the Central Eugene Region (47%).

Demographic Differences: For all influencers, those ages 18-34 were more likely than those over the age of 55 to say each had a great deal or some influence on their decision to use alternatives to driving alone. National research has shown that younger residents are generally less attached to their vehicles than those who are older. Not surprisingly, those who bike (60%) as a form of transportation were more likely than those who use other modes (33%-43%), with the exception of walking (48%), to have been influenced by **information about health or environmental benefits**. Those who ride the bus (55%) were more likely than those who use other modes (24-38%) to have been influenced by free **or reduced transit pass**. Respondents from households making less than $25K a year (44%) were more likely than those who make more (23%-27%) to be influenced by **the higher cost of parking**.

3.2 | Biking

Respondents who bike monthly or more often were asked, open-ended, why (Q19).

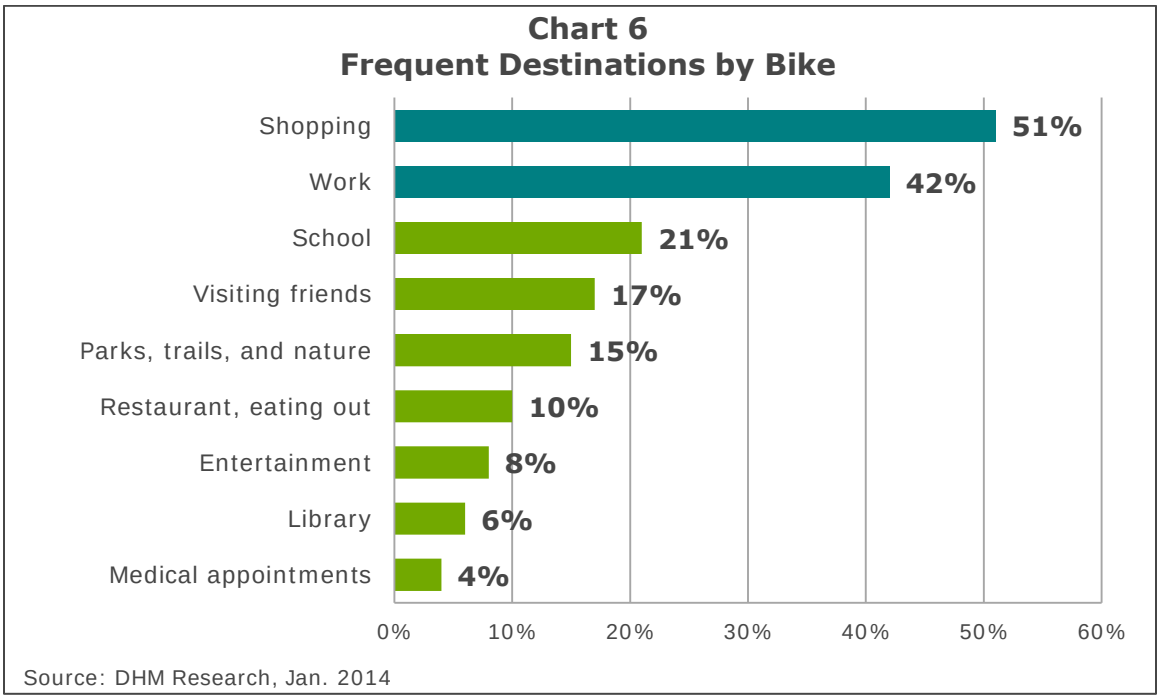


The top reason respondents gave for biking as a form of transportation was that **it was good for their health** (50%). One in three (32%) bike because **it is enjoyable**. Other reasons respondents' bike as a form of transportation included **to save money** (26%), **environmental benefits** (21%), and **convenience** (10%). All other reasons were mentioned by less than 10% of respondents.

By Area: Due to the reduced sample size (Eugene, N=124; Springfield, N=15), there were no significant differences by area.

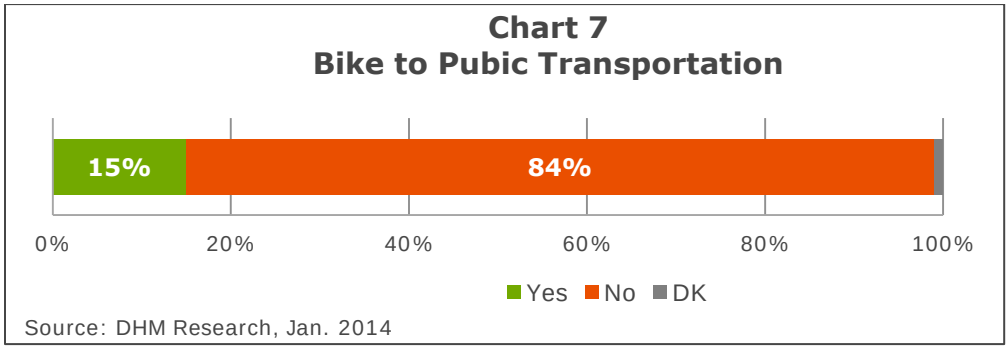
Demographic Differences: Women (29%) were more likely than men (15%) to bike because of the **environmental benefits**. Reasons respondents bicycle as a form of transportation showed no other significant differences among demographic subgroups.

Respondents who used a bike most frequently as a form of transportation were asked where they typically go most often (Q20). Due to small sample size (N=79), analysis by area and demographic subgroups are not presented for this question.



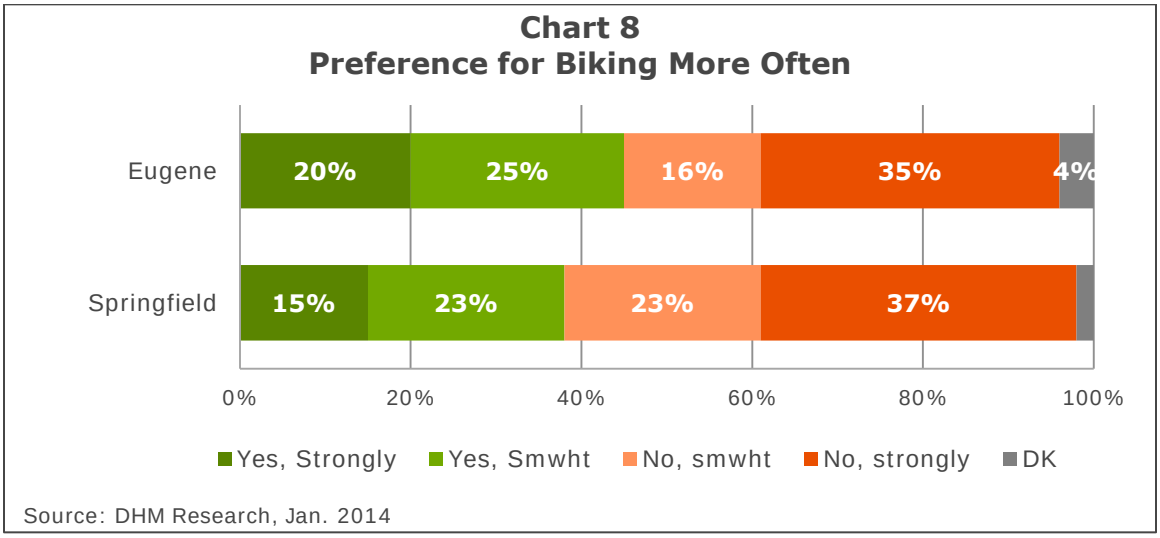
The most frequent destination for half (51%) of respondents was to go **shopping**. This was followed most closely by **work** (42%). Other destinations respondents frequently travel by bike included **school** (21%), **visiting friends** (17%), **parks, trails, and nature** (15%), and **restaurants** (10%). All other destinations were frequented by less than 10% of participants.

Respondents who used a bike most frequently as a form of transportation were asked if they ride their bike to or from public transportation (Q21). Due to small sample size (N=79) analysis by area and demographic subgroups are not presented for this question.



Most respondents have not biked to or from public transportation. Overall, 15% have biked to or from public transportation while more than eight in ten (84%) have not.

Respondents who biked monthly or less often were asked if they would prefer to bike more often for transportation purposes (Q22).



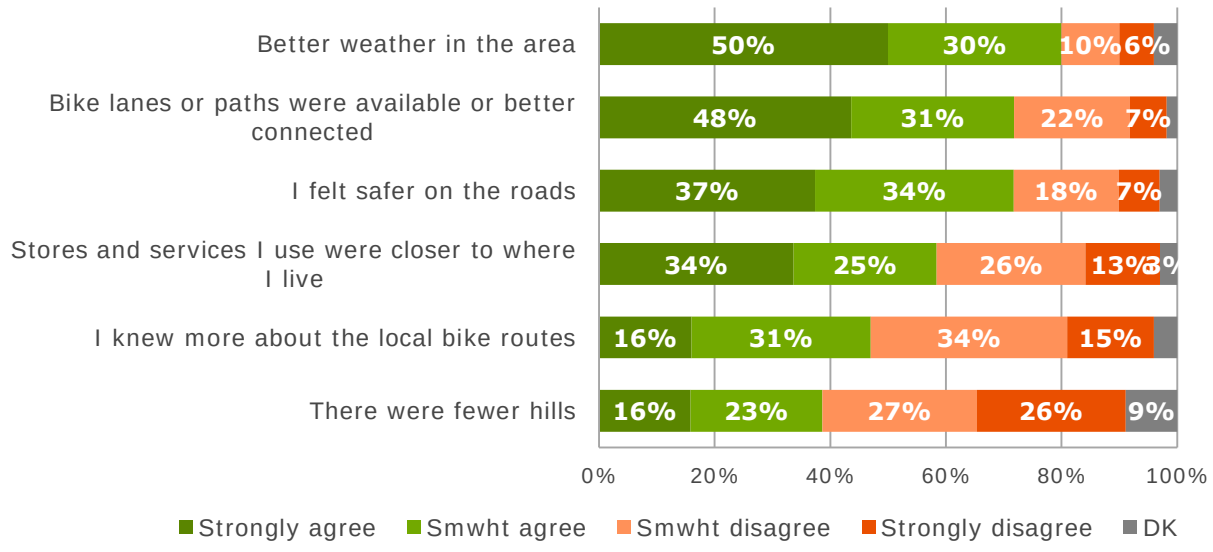
Overall, four in ten (43%) would prefer to bike more often for transportation purposes, with 19% who felt this way strongly. Just over half (53%) have little or no desire to bike more often.

By Area: No significant differences in preference to bike more often exist by area.

Demographic Difference: Respondents under the age of 55 are more likely to have a desire to bike more often than those who are older (18-34: 52%; 35-54: 50%; 55+: 25%). Respondents who live in households making more than $75K per year (61%) were more likely than those making less (32%-44%) to show a preference for biking more often than they currently do.

Those who would like to bike more for transportation purposes were read a list of reasons why people may bike more. They were asked to rate their agreement with each of the following statements (Q23-Q28).

Chart 9
Reasons to Ride a Bike More



Source: DHM Research, Jan. 2014

Weather in the area (80%, strongly or somewhat agree) is the number one deterrent to riding a bike more for transportation. This is followed closely by **availability and connectivity of bike lanes** (79%), **feeling safe on the roads** (71%), and **proximity of stores and services** (59%). Less important items include **knowledge of local bike routes** (47%) and **hills in the area** (39%).

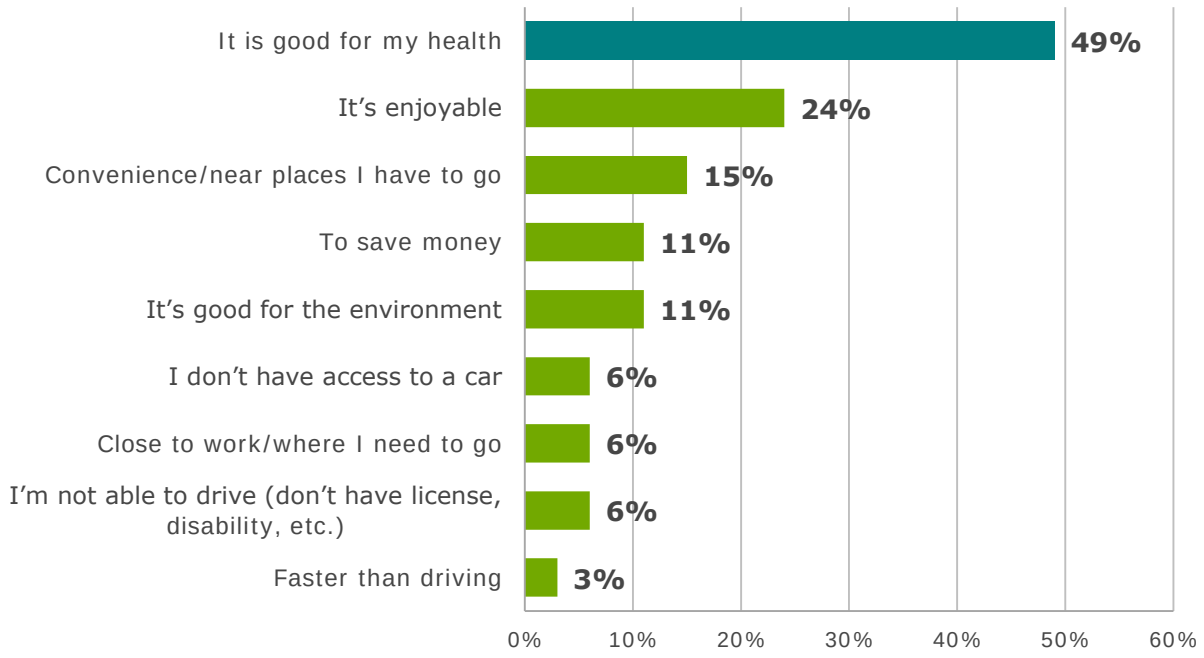
By Area: Due to small sample sizes within the regions in Eugene and Springfield, analysis by area is not presented.

Demographic Differences: Variables that would encourage respondents to bike more often were consistent across demographic subgroups.

3.3 | Walking

Respondents who walk monthly or more often were asked, unprompted, why (Q30).

Chart 10
Reasons for Walking for Transportation



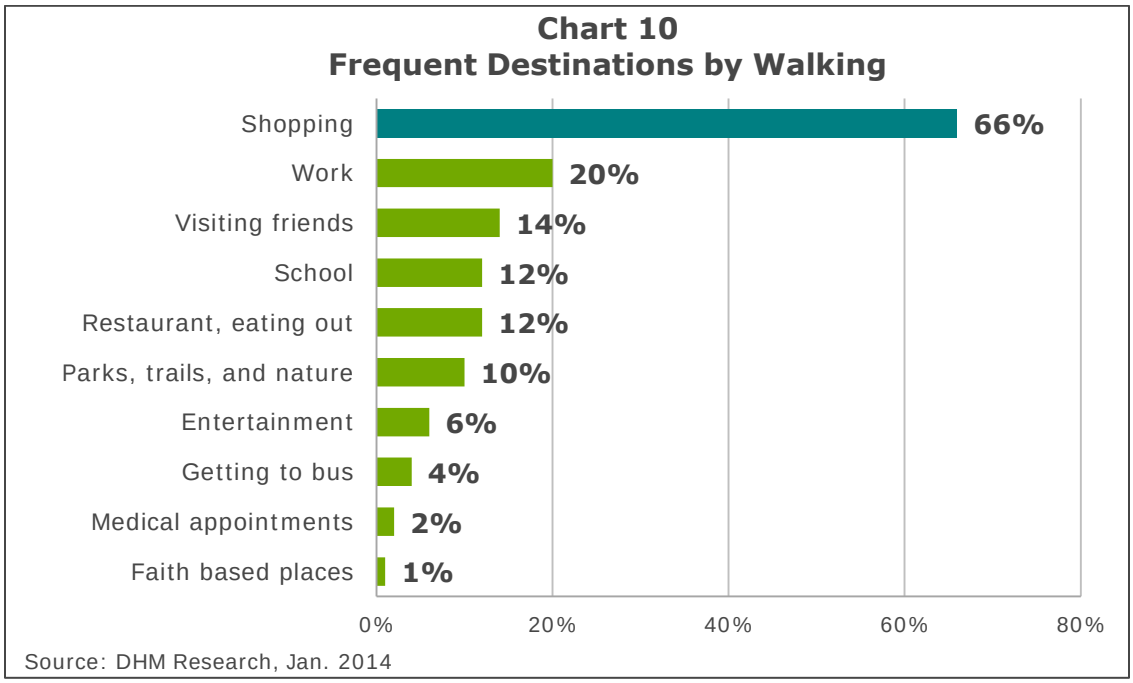
Source: DHM Research, Jan. 2014

By far, the top reason for walking as a form of transportation was for **health benefits** (49%). Second tier items included it **being enjoyable** (24%), **convenience** (15%), **saving money** (11%), and **environmental purposes** (11%).

By Area: Results are similar by area with the exception of **saving money**. Respondents from Eugene (14%) were more likely than those from Springfield (4%) to walk as a form of transportation because they wanted to save money. No other differences by area exist.

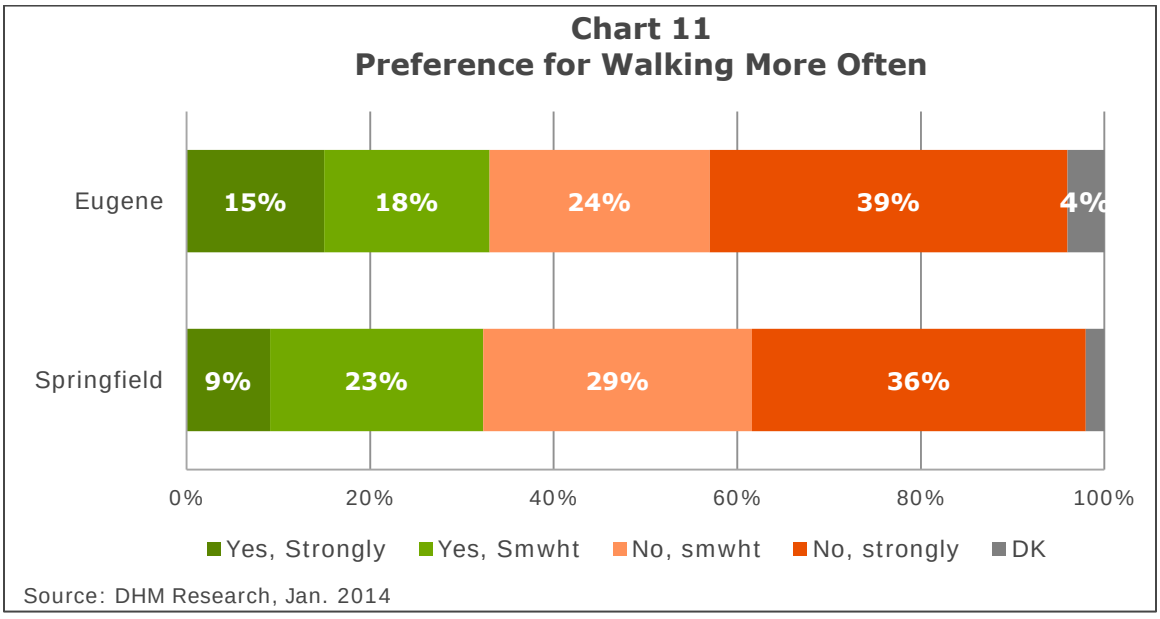
Demographic Differences: Reasons respondents walk for transportation were consistent across demographic subgroups.

Respondents who walk most frequently as a form of transportation were asked where they typically go most often (Q31). Due to small sample size (N=102), analysis by area and demographic subgroups are not presented for this question.



Similar to those who bike for transportation, the most frequent destination for those who walk was **shopping** (66%). This was distantly followed by **work** (20%), **visiting friends** (14%), **school** (12%), **restaurants** (12%), and **parks, trails, and nature** (10%). All other destinations were frequented by less than 10% of respondents.

Respondents who walked monthly or less often were asked if they would prefer to walk more often for transportation purposes (Q32).



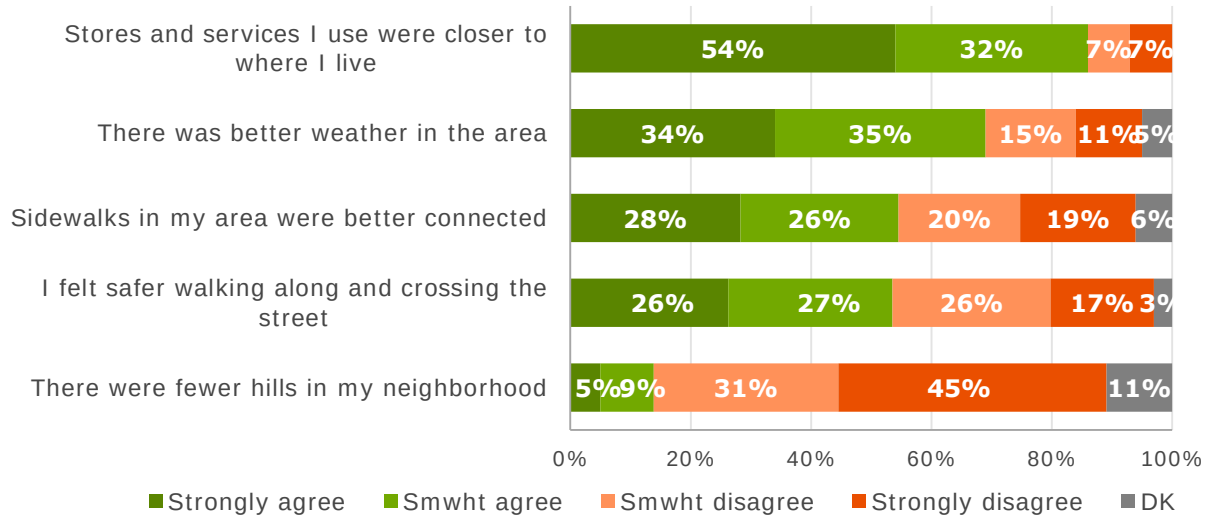
Overall, one in three (33%) would prefer to walk more often for transportation purposes, with 13% who felt this way strongly. Nearly two in three (63%) have little or no desire to walk more often.

By Area: There was no significant difference between Eugene and Springfield overall. Within Springfield, Those living in West Springfield (45%) were more likely than those living in East Springfield (21%) to express a desire to walk more for transportation purposes.

Demographic Differences: Respondents ages 35-54 (42%) are more likely than both those younger (29%) and older (27%) to express a desire to walk more for transportation purposes. No other demographic differences exist.

Those who would like to walk more for transportation services were read a list of reasons why people may walk more. They were asked to rate their agreement with each of the following statements (Q33-Q37).

Chart 12
Reasons to Walk More



Source: DHM Research, Jan. 2014

Respondents were most likely to agree that they would walk more if the stores and services they used were **closer to where they live** (54% strongly agree, 32% somewhat agree). Other barriers to walking more often included **weather** (69%), **better connected sidewalks** (54%), and **safety** (53%). The barrier that had the lowest impact were **hills** (14%).

By Area: Due to small sample sizes within the regions in Eugene and Springfield, analysis by area is not presented.

Demographic Differences: Variables that would encourage respondents to walk more often were fairly consistent across demographic subgroups.

4.1 | ANNOTATED QUESTIONNAIRE – EUGENE REGIONS[1]

Travel Barriers and Benefits research
Dates fielded; N=500, Eugene N=380, Springfield N=120
10 minutes; margin of error +/-4.4%
DHM Research

Hello, I'm _____ from DHM Research a public opinion research company. I am not trying to sell you anything. We're conducting a survey about issues that concern individuals in your area. May I speak to _____? **[SPEAK TO NAME ON LIST. IF UNAVAILABLE, SCHEDULE CALL BACK]**

1. What are the most important issues in the Eugene-Springfield area you would like your local government leaders to do something about? **(OPEN – COLLECT UP TO THREE RESPONSES)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Poverty/homelessness	24%	25%	24%	25%	30%	14%
Road infrastructure	11%	13%	9%	13%	11%	7%
Jobs/unemployment	11%	9%	12%	8%	9%	16%
Education funding	8%	7%	5%	3%	16%	11%
Education—general	5%	5%	5%	4%	4%	5%
Wasteful spending/inappropriate use of funds by government	5%	5%	4%	1%	4%	9%
Crime	3%	5%	4%	3%	1%	5%
Traffic	3%	5%	1%	3%	1%	4%
All other responses	3% or less	5% or less	5% or less	4% or less	3% or less	7% or less
None/Nothing	9%	4%	12%	8%	9%	12%
(DON'T READ) Don't know/refused	15%	16%	17%	17%	9%	18%

2. Thinking specifically about transportation in the Eugene-Springfield area, what are the most important transportation issues you would like your local government leaders to do something about? **(OPEN – COLLECT UP TO THREE RESPONSES)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Improve road conditions	19%	21%	12%	29%	16%	14%
Expanding bus transportation system	14%	9%	21%	13%	17%	7%
Don't see any problems/issues	11%	12%	14%	8%	8%	13%
Improve traffic congestion	9%	11%	11%	7%	7%	13%
Increasing bike accessible areas/bike lanes	9%	8%	5%	9%	17%	4%

[1] Caution should be used when examining regions within Eugene. Due to small sample size, many differences between the regions are not statistically significant. Please refer to the detailed report for significant regional differences.

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Cancel the EmX planning	6%	7%	7%	8%	3%	8%
Improve mass transit	4%	4%	5%	5%	5%	1%
Bicycle safety	4%	1%	1%	8%	4%	5%
All other responses	2% or less	4% or less	3% or less	5% or less	5% or less	5% or less
None/Nothing	7%	7%	8%	1%	17%	4%
(DON'T READ) Don't know/refused	9%	13%	8%	7%	7%	12%

TRAVEL BEHAVIOR

Typically, how frequently do you use each of the following ways to travel? Daily, Several times a week but not every day, Several times a month, A few times a year, or Never?

Response Category	Daily	Several times a week but not every day	Several times a month	A few times a year	Never	DK
3. Drive alone in your personal vehicle						
Eugene, N=369	47%	26%	7%	2%	17%	0%
Area 1, N=76	51%	25%	8%	4%	12%	0%
Area 2, N=76	58%	18%	3%	1%	20%	0%
Area 3, N=76	36%	30%	12%	1%	20%	1%
Area 4, N=76	49%	34%	8%	1%	8%	0%
Area 5, N=76	43%	21%	5%	1%	29%	0%
4. Drive in your personal vehicle with other household members						
Eugene, N=369	20%	40%	12%	6%	22%	0%
Area 1, N=76	30%	32%	18%	5%	14%	0%
Area 2, N=76	24%	46%	7%	3%	20%	1%
Area 3, N=76	11%	37%	18%	12%	22%	0%
Area 4, N=76	17%	47%	11%	4%	21%	0%
Area 5, N=76	22%	38%	5%	5%	29%	0%
5. Share a ride with people not from your household (example: Carpool or Vanpool)						
Eugene, N=369	1%	14%	30%	16%	39%	0%
Area 1, N=76	1%	14%	20%	13%	51%	0%
Area 2, N=76	1%	12%	34%	12%	41%	0%
Area 3, N=76	0%	17%	38%	14%	30%	0%
Area 4, N=76	1%	13%	25%	22%	37%	1%
Area 5, N=76	1%	14%	30%	17%	37%	0%
6. Bus, other than school bus. This includes EmX (pronounced: MX) express bus service						
Eugene, N=369	6%	10%	13%	20%	51%	0%
Area 1, N=76	4%	11%	4%	12%	70%	0%
Area 2, N=76	1%	4%	12%	21%	62%	0%
Area 3, N=76	9%	12%	13%	32%	34%	0%
Area 4, N=76	7%	11%	25%	20%	38%	0%
Area 5, N=76	8%	13%	9%	12%	57%	1%

Response Category	Daily	Several times a week but not every day	Several times a month	A few times a year	Never	DK
7. Carsharing service, for example Flex car, Zipcar, or Car2Go						
Eugene, N=369	0%	0%	0%	2%	96%	1%
Area 1, N=76	0%	0%	0%	0%	97%	3%
Area 2, N=76	0%	0%	0%	1%	97%	1%
Area 3, N=76	0%	0%	0%	7%	91%	3%
Area 4, N=76	0%	0%	1%	1%	97%	0%
Area 5, N=76	1%	0%	0%	0%	99%	0%
8. Bicycle for non-recreational purposes such as to work, shopping, errands, picking up cleaning, etc.						
Eugene, N=369	8%	12%	13%	10%	56%	1%
Area 1, N=76	3%	12%	11%	8%	67%	0%
Area 2, N=76	5%	5%	16%	12%	61%	1%
Area 3, N=76	16%	20%	14%	13%	36%	1%
Area 4, N=76	9%	12%	16%	9%	54%	0%
Area 5, N=76	7%	11%	9%	5%	68%	0%
9. Walking for non-recreational purposes such as to work, shopping, errands, picking up cleaning, etc.						
Eugene, N=369	16%	23%	15%	12%	34%	0%
Area 1, N=76	5%	20%	11%	20%	45%	0%
Area 2, N=76	5%	24%	16%	14%	39%	1%
Area 3, N=76	30%	32%	11%	8%	20%	0%
Area 4, N=76	16%	18%	24%	9%	33%	0%
Area 5, N=76	20%	21%	14%	8%	37%	0%

10. Now thinking specifically about trips you take other than to work or school, in a typical week, which of the following forms of transportation do you most frequently use? This could include running errands, grocery shopping, getting to public transportation, recreation, etc. **(COLLECT UP TO THREE MOST FREQUENT MODES)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Drive alone in your personal vehicle	63%	67%	68%	51%	74%	53%
Drive in your personal vehicle with other household members	41%	54%	42%	34%	37%	45%
Walking for non-recreational purposes such as shopping, errands, etc.	23%	16%	17%	32%	25%	25%
Bicycle for non-recreational purposes such as shopping, errands, etc.	19%	9%	16%	32%	21%	11%

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Share a ride with people not from your household (example: Carpool or Vanpool)	13%	8%	16%	14%	11%	14%
Bus, other than school bus. This includes EmX (pronounced: MX) express bus service	13%	12%	9%	17%	12%	17%
Carsharing service, for example Flex car, Zipcar, or Car2Go	1%	0%	0%	3%	3%	1%
(DON'T READ) Don't know/refused	2%	1%	3%	3%	0%	3%

11. **(IF Q10= 1 DROVE ALONE)** What are the reasons that you drive alone? **(DO NOT READ, PROBE: Are there any other reasons? COLLECT UP TO THREE)**

Response Category	Eugene N=232	Area 1 N=51	Area 2 N=52	Area 3 N=39	Area 4 N=56	Area 5 N=40
Need car for work or for day care/errands	31%	47%	29%	33%	20%	28%
Freedom (I want to come and go as I please)	27%	25%	23%	28%	25%	35%
Irregular work schedule	19%	16%	19%	15%	20%	33%
I live alone	11%	8%	13%	10%	16%	5%
Destinations too far to walk or bike.	9%	12%	2%	15%	11%	5%
Public transit doesn't go where I need to go, or takes too long	8%	6%	4%	13%	7%	13%
Convenience	5%	4%	4%	5%	7%	5%
Bad weather	3%	0%	0%	8%	4%	3%
All other responses	2% or less	2% or less	4% or less	3% or less	2% or less	0%
(DON'T READ) Don't know/refused	3%	2%	0%	5%	4%	3%

(IF Q4 or 5 or 6 or 7or 8 or – Q9= 1 or 2 or 3 MONTHLY OR MORE OFTEN) Thinking back to when you first started using alternatives to driving alone in the Eugene- Springfield region, how much influence did each of the following have in your decision, a great deal of influence, some influence, very little influence, or no influence **(ROTATE)**?

Response Category	A great deal	Some influence	Very little influence	No influence	DK
12. Information about health or environmental benefits					
Eugene, N=343	17%	29%	20%	30%	4%
Area 1, N=73	15%	26%	22%	33%	4%
Area 2, N=72	11%	32%	22%	32%	3%
Area 3, N=70	17%	30%	26%	24%	3%

Response Category	A great deal	Some influence	Very little influence	No influence	DK
Area 4, N=68	32%	29%	12%	24%	3%
Area 5, N=72	11%	26%	17%	39%	7%
13. Free or reduced rate transit pass					
Eugene, N=343	13%	15%	15%	53%	4%
Area 1, N=73	14%	16%	7%	59%	4%
Area 2, N=72	14%	7%	15%	57%	7%
Area 3, N=70	14%	19%	17%	46%	4%
Area 4, N=68	21%	19%	15%	44%	1%
Area 5, N=72	6%	11%	19%	60%	4%
14. Employer sponsored vanpool					
Eugene, N=343	3%	7%	9%	73%	8%
Area 1, N=73	5%	11%	8%	66%	10%
Area 2, N=71	1%	4%	7%	76%	11%
Area 3, N=70	1%	9%	10%	73%	7%
Area 4, N=68	3%	9%	10%	75%	7%
Area 5, N=72	4%	6%	8%	75%	7%
15. Difficulty parking					
Eugene, N=343	17%	16%	14%	52%	1%
Area 1, N=73	14%	15%	15%	53%	3%
Area 2, N=72	15%	17%	15%	53%	0%
Area 3, N=70	24%	13%	10%	51%	1%
Area 4, N=68	21%	24%	16%	40%	0%
Area 5, N=72	11%	13%	14%	61%	1%
16. Higher cost of parking					
Eugene, N=343	13%	18%	14%	53%	2%
Area 1, N=73	14%	14%	12%	58%	3%
Area 2, N=72	14%	15%	15%	54%	1%
Area 3, N=70	17%	20%	17%	44%	1%
Area 4, N=68	10%	26%	12%	50%	1%
Area 5, N=72	10%	14%	11%	61%	4%
17. Higher gas prices					
Eugene, N=343	19%	31%	15%	34%	2%
Area 1, N=73	27%	33%	11%	27%	1%
Area 2, N=72	14%	32%	17%	38%	0%
Area 3, N=70	19%	26%	13%	40%	3%
Area 4, N=68	16%	38%	18%	26%	1%
Area 5, N=72	21%	28%	14%	36%	1%

18. A. Is there anything else that influenced your decision to start using alternatives to driving alone? **(IF YES, SPECIFY.)**

Response Category	Eugene N=343	Area 1 N=73	Area 2 N=72	Area 3 N=70	Area 4 N=68	Area 5 N=72
Convenience	5%	4%	4%	11%	6%	0%
Exercise/health benefits	4%	1%	1%	6%	9%	4%
Economical/save money	3%	5%	1%	4%	4%	1%
Don't have a vehicle	2%	1%	3%	1%	1%	1%
Environmental issues/factors	2%	0%	1%	3%	1%	4%
Enjoy biking	2%	0%	1%	3%	3%	1%
All other responses	2% or less	1% or less	3% or less	1% or less	3% or less	3% or less
No/Nothing /None	67%	78%	74%	57%	56%	76%
(DON'T READ) Don't know/refused	0%	0%	0%	0%	0%	0%

B. **(If Q18A = YES)** How much did it influence your decision?

Response Category	Eugene N=116	Area 1 N=18	Area 2 N=20	Area 3 N=31	Area 4 N=30	Area 5 N=18
A great deal	60%	56%	60%	61%	60%	61%
Some influence	27%	22%	35%	26%	30%	17%
Very little	7%	11%	0%	6%	10%	11%
No influence	2%	0%	0%	3%	0%	11%
(DON'T READ) Don't know	3%	11%	5%	3%	0%	0%

19. **(IF Q8 = 1 or 2 or 3 MONTHLY OR MORE OFTEN)** Why do you bicycle for transportation? **(DO NOT READ LIST. ACCEPT UP TO THREE RESPONSES)**

Response Category	Eugene N=124	Area 1 N=19	Area 2 N=20	Area 3 N=38	Area 4 N=28	Area 5 N=20
It is good for my health	51%	53%	55%	39%	61%	55%
It's enjoyable	34%	26%	30%	37%	43%	20%
To save money	25%	21%	30%	26%	32%	10%
It's good for the environment	20%	11%	20%	24%	25%	15%
Convenience	8%	0%	5%	11%	11%	10%
Faster—general	7%	11%	5%	5%	4%	15%
I don't have access to a car	7%	5%	15%	8%	0%	10%
Easier to find parking	3%	0%	5%	3%	7%	0%
I'm not able to drive (don't have license, disability, etc.)	2%	0%	5%	3%	0%	5%
All other responses	2% or less	0%	5% or less	5% or less	4% or less	5% or less
(DON'T READ) Don't know/refused	2%	11%	0%	0%	0%	5%

BIKING

20. **(IF Q10=6 BIKE)** When riding your bike for transportation, not for recreation or exercise, what types of places do you typically go most often **(DO NOT READ LIST, ACCEPT UP TO THREE RESPONSES)**?

Response Category	Eugene N=69	Area 1 N=7	Area 2 N=12	Area 3 N=24	Area 4 N=16	Area 5 N=8
Shopping	54%	29%	58%	50%	63%	63%
Work	45%	43%	25%	54%	50%	38%
School	21%	14%	33%	25%	13%	13%
Visiting friends	17%	0%	17%	17%	19%	25%
Parks, trails, and nature	14%	29%	25%	13%	0%	25%
Restaurant, eating out	10%	0%	0%	8%	13%	38%
Entertainment	8%	0%	8%	4%	19%	0%
Library	5%	0%	0%	8%	0%	13%
Medical appointments	4%	0%	8%	0%	6%	13%
All other responses	3% or less	0%	0%	4% or less	6% or less	13% or less
(DON'T READ) Don't know/refused	6%	29%	0%	0%	13%	0%

21. **(IF Q10=6 BIKE)** Do you ride your bicycle to or from public transportation, like to the bus or EmX (pronounced: MX)?

Response Category	Eugene N=69	Area 1 N=7	Area 2 N=12	Area 3 N=24	Area 4 N=16	Area 5 N=8
Yes	16%	14%	8%	13%	19%	38%
No	83%	71%	92%	88%	81%	63%
(DON'T READ) Don't know	1%	14%	0%	0%	0%	0%

22. **(IF Q8= 3 or 4 or 5 MONTHLY OF LESS OFTEN)** Would you prefer to bike more often for transportation purposes than you currently do? Is that strongly or somewhat?

Response Category	Eugene N=292	Area 1 N=65	Area 2 N=67	Area 3 N=48	Area 4 N=60	Area 5 N=63
Yes, strongly	20%	18%	16%	23%	20%	27%
Yes, somewhat	25%	28%	21%	25%	32%	21%
No, strongly	35%	38%	43%	25%	27%	37%
No, somewhat	16%	14%	15%	25%	15%	11%
(DON'T READ) Don't know	4%	2%	4%	2%	7%	5%

(IF Q22= 1 or 2 YES) Next, I'm going to read you some reasons that people may bike more as a form of transportation. Please tell me if you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with each statement. I would bike more for transportation if…

Response Category	Strong Agree	Smwt Agree	Smwt Disagree	Strong Disagree	DK
23. I felt safer on the roads					
Eugene, N=132	39%	34%	18%	7%	3%
Area 1, N=30	43%	33%	13%	7%	3%
Area 2, N=25	32%	32%	24%	8%	4%
Area 3, N=23	30%	52%	9%	9%	0%
Area 4, N=31	29%	42%	19%	6%	3%
Area 5, N=30	63%	7%	23%	3%	3%
24. Bike lanes or paths were available or better connected					
Eugene, N=132	49%	32%	11%	6%	2%
Area 1, N=30	47%	33%	13%	3%	3%
Area 2, N=25	32%	40%	20%	8%	0%
Area 3, N=23	65%	17%	13%	4%	0%
Area 4, N=31	42%	42%	3%	6%	6%
Area 5, N=30	60%	23%	10%	7%	0%
25. There were fewer hills					
Eugene, N=132	16%	21%	25%	26%	11%
Area 1, N=30	13%	20%	33%	20%	13%
Area 2, N=25	4%	28%	28%	20%	20%
Area 3, N=23	22%	26%	22%	26%	4%
Area 4, N=31	26%	29%	16%	23%	6%
Area 5, N=30	13%	3%	30%	43%	10%
26. Stores and services I use were closer to where I live					
Eugene, N=132	35%	23%	26%	14%	3%
Area 1, N=30	33%	40%	23%	0%	3%
Area 2, N=25	44%	8%	24%	20%	4%
Area 3, N=23	26%	17%	35%	22%	0%
Area 4, N=31	39%	23%	29%	6%	3%
Area 5, N=30	33%	23%	17%	23%	3%
27. I knew more about the local bike routes					
Eugene, N=132	15%	34%	31%	15%	5%
Area 1, N=30	10%	37%	47%	3%	3%
Area 2, N=25	20%	24%	20%	28%	8%
Area 3, N=23	13%	39%	39%	9%	0%
Area 4, N=31	13%	35%	32%	13%	6%
Area 5, N=30	23%	33%	13%	23%	7%

Response Category	Strong Agree	Smwt Agree	Smwt Disagree	Strong Disagree	DK
28. Better weather in the area					
Eugene, N=132	49%	31%	11%	5%	3%
Area 1, N=30	33%	40%	17%	7%	3%
Area 2, N=25	76%	24%	0%	0%	0%
Area 3, N=23	39%	35%	22%	0%	4%
Area 4, N=31	45%	42%	6%	3%	3%
Area 5, N=30	57%	10%	13%	17%	3%

29. Is there anything else that would encourage you to bike more as a form of transportation? **(IF YES, SPECIFY.)**

Response Category	Eugene N=132	Area 1 N=30	Area 2 N=25	Area 3 N=23	Area 4 N=31	Area 5 N=30
Incentives—from work or a state tax break	5%	7%	4%	4%	6%	3%
If I had a better bike/if I had a bike	4%	0%	8%	4%	6%	0%
More bike accessible areas/bike lanes	3%	3%	0%	4%	6%	0%
If there was better lighting on bike routes/directional signals	3%	7%	8%	0%	0%	0%
Time—general	3%	7%	0%	0%	3%	3%
All other responses	2% or less	3% or less	4% or less	4% or less	6% or less	7% or less
No/Nothing/None	63%	60%	64%	70%	61%	60%
(DON'T READ) Don't know	0%	0%	0%	0%	0%	0%

WALKING

30. **(IF Q9=1 or 2 or 3 MONTHLY OR MORE OFTEN)** Why do you walk for transportation? **(DO NOT READ LIST. ACCEPT UP TO THREE RESPONSES)**

Response Category	Eugene N=199	Area 1 N=27	Area 2 N=34	Area 3 N=55	Area 4 N=44	Area 5 N=42
It is good for my health	50%	44%	62%	36%	57%	57%
It's enjoyable	26%	19%	32%	25%	27%	24%
Convenience/near places I have to go	14%	4%	9%	25%	11%	12%
To save money	14%	7%	24%	18%	14%	2%
It's good for the environment	10%	11%	9%	13%	11%	5%
Close to work/where I need to go	7%	7%	0%	13%	5%	7%
I'm not able to drive (don't have license, disability, etc.)	6%	4%	0%	7%	9%	7%
I don't have access to a car	5%	4%	0%	4%	5%	14%
Faster than driving	3%	4%	3%	4%	2%	0%
All other responses	2% or less	4% or less	3% or less	2% or less	2% or less	2% or less
Don't know/refused	5%	11%	6%	0%	7%	5%

31. **(IF Q10=7 WALK)** When walking for transportation, not for recreation or exercise, what types of places do you typically go most frequently **(DO NOT READ LIST, ACCEPT UP TO THREE RESPONSES)**?

Response Category	Eugene N=85	Area 1 N=12	Area 2 N=13	Area 3 N=24	Area 4 N=19	Area 5 N=19
Shopping	66%	42%	77%	71%	58%	74%
Work	18%	8%	0%	33%	26%	5%
Visiting friends	15%	33%	0%	25%	5%	11%
School	14%	0%	8%	33%	11%	0%
Restaurant, eating out	12%	0%	15%	13%	26%	0%
Parks, trails, and nature	10%	17%	15%	8%	0%	16%
Entertainment	7%	0%	8%	4%	11%	11%
Getting to bus	3%	0%	8%	4%	0%	5%
Medical appointments	2%	0%	8%	0%	0%	5%
Faith based places	1%	0%	0%	4%	0%	0%
All other responses	2% or less	0%	8% or less	0%	5% or less	5% or less
(DON'T READ) Don't know/refused	6%	17%	0%	0%	11%	11%

32. **(IF Q9=3 or 4 or 5 MONTHLY OF LESS OFTEN)** Would you prefer to walk more often for transportation purposes than you currently do? Is that strongly or somewhat?

Response Category	Eugene N=225	Area 1 N=57	Area 2 N=53	Area 3 N=29	Area 4 N=50	Area 5 N=45
Yes, strongly	15%	12%	8%	24%	16%	20%
Yes, somewhat	18%	19%	23%	10%	16%	20%
No, strongly	39%	40%	43%	38%	38%	29%
No, somewhat	24%	26%	21%	28%	20%	31%
(DON'T READ) Don't know	4%	2%	6%	0%	10%	0%

(IF Q32=1 or 2 YES) Next, I'm going to read you some reasons that people may walk more as a form of transportation. Please tell me if strongly agree, somewhat agree, somewhat disagree, or strongly disagree with each statement. I would walk more for transportation if

Response Category	Strongly Agree	Smwt Agree	Smwt Disagree	Strongly Disagree	DK
33. Stores and services I use were closer to where I live					
Eugene, N=74	61%	28%	5%	6%	0%
Area 1, N=18	78%	22%	0%	0%	0%
Area 2, N=16	31%	44%	13%	13%	0%
Area 3, N=10	70%	0%	10%	20%	0%
Area 4, N=16	69%	31%	0%	0%	0%
Area 5, N=18	61%	33%	6%	0%	0%
34. Sidewalks in my area were better connected					
Eugene, N=74	33%	22%	21%	18%	5%
Area 1, N=18	56%	11%	17%	11%	6%
Area 2, N=16	19%	31%	31%	13%	6%
Area 3, N=10	20%	30%	20%	30%	0%
Area 4, N=16	25%	19%	25%	19%	13%
Area 5, N=18	44%	22%	11%	22%	0%
35. I felt safer walking along and crossing the street					
Eugene, N=74	25%	27%	24%	20%	4%
Area 1, N=18	28%	39%	17%	17%	0%
Area 2, N=16	31%	19%	38%	13%	0%
Area 3, N=10	30%	10%	30%	20%	10%
Area 4, N=16	6%	31%	19%	38%	6%
Area 5, N=18	33%	33%	17%	11%	6%
36. There were fewer hills in my neighborhood					
Eugene, N=74	5%	7%	28%	47%	14%
Area 1, N=18	0%	0%	33%	50%	17%
Area 2, N=16	0%	0%	31%	56%	13%
Area 3, N=10	0%	20%	50%	30%	0%
Area 4, N=16	13%	13%	19%	44%	13%
Area 5, N=18	11%	6%	11%	50%	22%

Response Category	Strongly Agree	Smwt Agree	Smwt Disagree	Strongly Disagree	DK
37. There was better weather in the area					
Eugene, N=74	34%	33%	18%	9%	5%
Area 1, N=18	28%	33%	17%	17%	6%
Area 2, N=16	56%	25%	0%	13%	6%
Area 3, N=10	30%	30%	20%	10%	10%
Area 4, N=16	25%	38%	31%	6%	0%
Area 5, N=18	33%	39%	22%	0%	6%

38. Is there any other reason that you would walk more as a form of transportation? **(IF YES, SPECIFY.)**

Response Category	Eugene N=74	Area 1 N=18	Area 2 N=16	Area 3 N=10	Area 4 N=16	Area 5 N=18
Health/to be healthier	9%	11%	6%	10%	6%	11%
Physical fitness/exercise	6%	0%	13%	10%	0%	6%
Safety	5%	11%	6%	0%	0%	6%
Economical/to save money	4%	6%	13%	0%	0%	0%
Time	3%	6%	0%	0%	6%	0%
For enjoyment	2%	11%	0%	0%	0%	0%
If where I had to go was closer	2%	0%	6%	0%	0%	6%
All other response	1% or less	6% or less	6% or less	0%	6% or less	6% or less
No/Nothing/None	59%	39%	50%	80%	75%	56%
(DON'T READ) Don't know/refused	0%	0%	0%	0%	0%	0%

DEMOGRAPHICS

These last few questions are to make sure we have talked to a representative portion of the community. They are very important, and remember that all of your answers are confidential and not associated with your name in any way.

39. What best describes your working status?

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Employed full or part time (Employed)	50%	46%	45%	51%	58%	51%
Student full or part time (Student)	10%	11%	7%	22%	5%	4%
Homemaker (Unemployed)	3%	5%	4%	1%	1%	5%
Unemployed, retired (Unemployed)	28%	28%	37%	17%	26%	28%
Other (Unemployed)	8%	9%	7%	8%	8%	11%
(DON'T READ) Refused (Unemployed)	1%	1%	1%	0%	1%	1%

40. How many people currently live in your household? **(Record number)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
1	23%	13%	24%	28%	24%	22%
2	34%	32%	43%	37%	26%	30%
3	18%	22%	14%	20%	22%	14%
4	16%	17%	13%	9%	20%	22%
5 or more	8%	14%	4%	7%	7%	9%
(DON'T READ) Refused	1%	1%	1%	0%	1%	1%
Mean	2.5	3.0	2.3	2.3	2.6	2.7

41. **(IF Q40>1)** How many people under age 18 live in your household?

Response Category	Eugene N=279	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
None	66%	55%	72%	89%	56%	53%
1	15%	17%	12%	7%	21%	21%
2	13%	18%	14%	2%	16%	17%
3	3%	8%	2%	0%	4%	5%
4	2%	2%	0%	0%	4%	3%
5 or more	0%	0%	0%	2%	0%	0%
(DON'T READ) Refused	0%	0%	0%	0%	0%	0%

42. How many bikes does you household currently have? **(Record number)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
None	20%	17%	26%	20%	16%	20%
1	18%	21%	17%	18%	16%	20%
2	23%	20%	24%	25%	24%	20%
3	14%	18%	8%	16%	13%	16%
4	9%	11%	12%	8%	11%	8%
5 or more	14%	12%	11%	12%	20%	16%
(DON'T READ) Refused	2%	1%	3%	1%	1%	1%
Mean	2.4	2.3	2.0	2.6	2.7	2.4

43. How many vehicles does you household currently have? **(Record number)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
None	9%	0%	11%	16%	3%	14%
1	28%	25%	24%	28%	37%	25%
2	38%	42%	42%	32%	41%	38%
3	16%	22%	17%	18%	11%	11%
4	5%	5%	1%	3%	7%	9%
5 or more	3%	4%	4%	4%	1%	1%
(DON'T READ) Refused	1%	1%	1%	0%	1%	1%
Mean	1.9	2.2	1.9	1.8	1.9	1.8

44. Which of the following categories includes your annual household income before taxes?

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Below $25,000	28%	16%	18%	42%	36%	26%
Between $25,000-$49,000	18%	25%	20%	17%	13%	17%
Between $50,000-$74,000	18%	28%	17%	9%	18%	18%
Between $75,000-$100,000	14%	16%	20%	11%	13%	13%
More than $100,000	9%	8%	8%	12%	8%	7%
(DON'T READ) Don't Know/ Refused	13%	8%	17%	9%	12%	18%

45. In what year were you born? _____ **(collect open end)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
18-24	16%	11%	16%	24%	18%	11%
25-34	24%	17%	16%	41%	25%	22%
35-54	29%	36%	30%	16%	32%	32%
55-64	7%	7%	8%	5%	5%	9%
Over 65	23%	28%	28%	11%	20%	24%
(DON'T READ) Refused	2%	3%	3%	4%	0%	3%

46. Gender **(By observation)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Male	48%	41%	41%	50%	57%	49%
Female	52%	59%	59%	50%	43%	51%

47. Did we reach you on a cell phone today? **(record from sample)**

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
Yes	36%	18%	29%	63%	37%	26%
No	64%	82%	71%	37%	63%	74%

48. Which of the following best describes your ethnicity?

Response Category	Eugene N=369	Area 1 N=76	Area 2 N=76	Area 3 N=76	Area 4 N=76	Area 5 N=76
White/Caucasian	84%	82%	83%	83%	89%	82%
African American/Black	1%	0%	0%	1%	0%	3%
Hispanic/Latino	2%	1%	3%	3%	1%	1%
Asian/Pacific Islander	2%	1%	3%	4%	0%	0%
Native American/American Indian	3%	4%	5%	1%	0%	4%
Other	6%	8%	5%	5%	4%	7%
(DON'T READ) Refused	3%	4%	1%	3%	5%	4%

4.2 | ANNOTATED QUESTIONNAIRE – SPRINGFIELD REGIONS[2]

Travel Barriers and Benefits research
Dates fielded; N=500, Eugene N=380, Springfield N=120
10 minutes; margin of error +/-4.4%
DHM Research

Hello, I'm _____ from DHM Research a public opinion research company. I am not trying to sell you anything. We're conducting a survey about issues that concern individuals in your area. May I speak to _____? **[SPEAK TO NAME ON LIST. IF UNAVAILABLE, SCHEDULE CALL BACK]**

1. What are the most important issues in the Eugene-Springfield area you would like your local government leaders to do something about? **(OPEN – COLLECT UP TO THREE RESPONSES)**

Response Category	Springfield N=131	East N=60	West N=60
Poverty/homelessness	16%	22%	10%
Education funding	9%	13%	3%
Road infrastructure	7%	7%	8%
Jobs/unemployment	6%	7%	5%
Education—general	5%	3%	7%
Crime	5%	3%	7%
Traffic	3%	5%	0%
Wasteful spending/inappropriate use of funds by government	2%	2%	2%
All other responses	4% or less	7% or less	5% or less
None/Nothing	10%	7%	13%
(DON'T READ) Don't know/refused	18%	18%	18%

2. Thinking specifically about transportation in the Eugene-Springfield area, what are the most important transportation issues you would like your local government leaders to do something about? **(OPEN – COLLECT UP TO THREE RESPONSES)**

Response Category	Springfield N=131	East N=60	Wrest N=60
Improve road conditions	16%	12%	20%
Don't see any problems/issues	12%	12%	13%
Expanding bus transportation system	9%	8%	10%
Improve traffic congestion	5%	5%	5%
Cancel the EmX planning	4%	7%	2%
Improve mass transit	3%	3%	3%
Bicycle safety	3%	3%	2%
Increasing bike accessible areas/bike lanes	2%	0%	3%
All other responses	3% or less	3% or less	3% or less
None/Nothing	12%	10%	15%
(DON'T READ) Don't know/refused	14%	17%	12%

[2] Caution should be used when examining regions within Springfield. Due to small sample size, many differences between the regions are not statistically significant. Please refer to the detailed report for significant regional differences.

TRAVEL BEHAVIOR

Typically, how frequently do you use each of the following ways to travel? Daily, Several times a week but not every day, Several times a month, A few times a year, or Never?

Response Category	Daily	Several times a week but not every day	Several times a month	A few times a year	Never	DK
3. Drive alone in your personal vehicle						
Springfield, N=131	58%	20%	3%	3%	14%	2%
East, N=60	58%	17%	3%	2%	18%	2%
West, N=60	57%	23%	3%	5%	10%	2%
4. Drive in your personal vehicle with other household members						
Springfield, N=131	33%	40%	8%	2%	17%	0%
East, N=60	38%	33%	7%	2%	20%	0%
West, N=60	27%	47%	10%	2%	15%	0%
5. Share a ride with people not from your household (example: Carpool or Vanpool)						
Springfield, N=131	2%	12%	18%	23%	45%	0%
East, N=60	0%	8%	20%	17%	55%	0%
West, N=60	3%	17%	15%	30%	35%	0%
6. Bus, other than school bus. This includes EmX (pronounced: MX) express bus service						
Springfield, N=131	4%	7%	10%	23%	55%	2%
East, N=60	5%	8%	12%	22%	52%	2%
West, N=60	3%	5%	8%	23%	58%	2%
7. Carsharing service, for example Flex car, Zipcar, or Car2Go						
Springfield, N=131	0%	0%	0%	3%	97%	0%
East, N=60	0%	0%	0%	2%	98%	0%
West, N=60	0%	0%	0%	3%	97%	0%
8. Bicycle for non-recreational purposes such as to work, shopping, errands, picking up cleaning, etc.						
Springfield, N=131	0%	4%	7%	11%	76%	2%
East, N=60	0%	3%	5%	8%	82%	2%
West, N=60	0%	5%	10%	13%	70%	2%
9. Walking for non-recreational purposes such as to work, shopping, errands, picking up cleaning, etc.						
Springfield, N=131	8%	21%	17%	14%	39%	0%
East, N=60	12%	17%	13%	10%	48%	0%
West, N=60	5%	25%	22%	18%	30%	0%

10. Now thinking specifically about trips you take other than to work or school, in a typical week, which of the following forms of transportation do you most frequently use? This could include running errands, grocery shopping, getting to public transportation, recreation, etc. **(COLLECT UP TO THREE MOST FREQUENT MODES)**

Response Category	Springfield N=131	East N=60	West N=60
Drive alone in your personal vehicle	65%	62%	68%
Drive in your personal vehicle with other household members	58%	63%	52%
Share a ride with people not from your household (example: Carpool or Vanpool)	19%	23%	15%
Bus, other than school bus. This includes EmX (pronounced: MX) express bus service	14%	23%	5%
Walking for non-recreational purposes such as shopping, errands, etc.	13%	13%	12%
Bicycle for non-recreational purposes such as shopping, errands, etc.	8%	8%	7%
Carsharing service, for example Flex car, Zipcar, or Car2Go	0%	0%	0%
(DON'T READ) Don't know/refused	1%	2%	0%

11. **(IF Q10= 1 DROVE ALONE)** What are the reasons that you drive alone? **(DO NOT READ, PROBE: Are there any other reasons? COLLECT UP TO THREE)**

Response Category	Springfield N=85	East N=37	West N=41
Need car for work or for day care/errands	29%	24%	34%
Freedom (I want to come and go as I please)	27%	30%	24%
Irregular work schedule	22%	30%	15%
I live alone	8%	3%	12%
Destinations too far to walk or bike.	8%	14%	2%
Public transit doesn't go where I need to go, or takes too long	8%	11%	5%
Convenience	6%	5%	7%
Bad weather	1%	0%	2%
All other responses	4% or less	3% or less	5% or less
(DON'T READ) Don't know/refused	3%	3%	2%

(IF Q4 or 5 or 6 or 7or 8 or – Q9= 1 or 2 or 3 MONTHLY OR MORE OFTEN) Thinking back to when you first started using alternatives to driving alone in the Eugene- Springfield region, how much influence did each of the following have in your decision, a great deal of influence, some influence, very little influence, or no influence **(ROTATE)**?

Response Category	A great deal	Some influence	Very little influence	No influence	DK
12. Information about health or environmental benefits					
Springfield, N=124	14%	19%	25%	39%	3%
East, N=56	11%	16%	23%	46%	4%
West, N=57	18%	21%	28%	30%	4%

Response Category	A great deal	Some influence	Very little influence	No influence	DK
13. Free or reduced rate transit pass					
Springfield, N=124	17%	11%	13%	56%	3%
East, N=56	21%	14%	9%	54%	2%
West, N=57	12%	7%	18%	58%	5%
14. Employer sponsored vanpool					
Springfield, N=124	3%	9%	14%	68%	6%
East, N=56	4%	13%	16%	64%	4%
West, N=57	2%	5%	12%	72%	9%
15. Difficulty parking					
Springfield, N=124	11%	20%	19%	49%	1%
East, N=56	14%	16%	20%	50%	0%
West, N=57	7%	25%	18%	49%	2%
16. Higher cost of parking					
Springfield, N=124	16%	12%	17%	49%	6%
East, N=56	20%	11%	11%	54%	5%
West, N=57	12%	12%	23%	46%	7%
17. Higher gas prices					
Springfield, N=124	25%	30%	15%	27%	3%
East, N=56	25%	29%	13%	32%	2%
West, N=57	25%	32%	18%	21%	5%

18. A. Is there anything else that influenced your decision to start using alternatives to driving alone? **(IF YES, SPECIFY.)**

Response Category	Springfield N=124	East N=56	West N=57
Convenience	4%	7%	0%
Economical/save money	4%	4%	4%
Don't have a vehicle	3%	4%	2%
Enjoy biking	1%	0%	2%
Exercise/health benefits	0%	0%	0%
Environmental issues/factors	0%	0%	0%
All other responses	2% or less	2% or less	2% or less
No/Nothing /None	77%	70%	84%
(DON'T READ) Don't know/refused	0%	0%	0%

B. **(If Q18A = YES)** How much did it influence your decision?

Response Category	Springfield N=29	East N=17	West N=9
A great deal	69%	71%	67%
Some influence	27%	29%	22%
Very little	4%	0%	11%
No influence	0%	0%	0%
(DON'T READ) Don't know	0%	0%	0%

19. **(IF Q8 = 1 or 2 or 3 MONTHLY OR MORE OFTEN)** Why do you bicycle for transportation? **(DO NOT READ LIST. ACCEPT UP TO THREE RESPONSES)**

Response Category	Springfield N=15	East N=5	West N=9
It is good for my health	43%	20%	56%
To save money	28%	0%	44%
Convenience	22%	40%	11%
It's good for the environment	21%	0%	33%
It's enjoyable	14%	20%	11%
I'm not able to drive (don't have license, disability, etc.)	8%	20%	0%
Faster—general	7%	0%	11%
I don't have access to a car	7%	0%	11%
Easier to find parking	0%	0%	0%
All other responses	7% or less	20% or less	11% or less
(DON'T READ) Don't know/refused	0%	0%	0%

BIKING

20. **(IF Q10=6 BIKE)** When riding your bike for transportation, not for recreation or exercise, what types of places do you typically go most often **(DO NOT READ LIST, ACCEPT UP TO THREE RESPONSES)**?

Response Category	Springfield N=10	East N=5	West N=4
Shopping	33%	40%	25%
Work	22%	20%	25%
School	22%	20%	25%
Visiting friends	22%	20%	25%
Parks, trails, and nature	22%	0%	50%
Library	12%	20%	0%
Restaurant, eating out	11%	0%	25%
Entertainment	11%	20%	0%
Medical appointments	0%	0%	0%
All other responses	0%	20% or less	0%
(DON'T READ) Don't know/refused	0%	0%	0%

21. **(IF Q10=6 BIKE)** Do you ride your bicycle to or from public transportation, like to the bus or EmX (pronounced: MX)?

Response Category	Springfield N=10	East N=5	West N=4
Yes	12%	20%	0%
No	88%	80%	100%
(DON'T READ) Don't know	0%	0%	0%

22. **(IF Q8= 3 or 4 or 5 MONTHLY OF LESS OFTEN)** Would you prefer to bike more often for transportation purposes than you currently do? Is that strongly or somewhat?

Response Category	Springfield N=123	East N=57	West N=56
Yes, strongly	15%	12%	18%
Yes, somewhat	23%	21%	25%
No, strongly	37%	40%	34%
No, somewhat	23%	25%	21%
(DON'T READ) Don't know	2%	2%	2%

(IF Q22= 1 or 2 YES) Next, I'm going to read you some reasons that people may bike more as a form of transportation. Please tell me if you strongly agree, somewhat agree, somewhat disagree, or strongly disagree with each statement. I would bike more for transportation if…

Response Category	Strong Agree	Smwt Agree	Smwt Disagree	Strong Disagree	DK
23. I felt safer on the roads					
Springfield, N=47	32%	33%	21%	9%	5%
East, N=19	26%	37%	16%	11%	11%
West, N=24	38%	29%	25%	8%	0%
24. Bike lanes or paths were available or better connected					
Springfield, N=47	46%	28%	14%	11%	0%
East, N=19	42%	32%	21%	5%	0%
West, N=24	50%	25%	8%	17%	0%
25. There were fewer hills					
Springfield, N=47	14%	25%	30%	26%	5%
East, N=19	11%	21%	37%	21%	11%
West, N=24	17%	29%	25%	29%	0%
26. Stores and services I use were closer to where I live					
Springfield, N=47	31%	30%	26%	9%	4%
East, N=19	47%	21%	26%	5%	0%
West, N=24	17%	38%	25%	13%	8%
27. I knew more about the local bike routes					
Springfield, N=47	16%	23%	44%	14%	2%
East, N=19	16%	21%	53%	11%	0%
West, N=24	17%	25%	38%	17%	4%
28. Better weather in the area					
Springfield, N=47	51%	28%	4%	9%	7%
East, N=19	47%	32%	0%	11%	11%
West, N=24	54%	25%	8%	8%	4%

29. Is there anything else that would encourage you to bike more as a form of transportation? **(IF YES, SPECIFY.)**

Response Category	Springfield N=47	East N=19	West N=24
More bike accessible areas/bike lanes	9%	11%	8%
Time—general	5%	11%	0%
If I had a better bike/if I had a bike	2%	5%	0%
Incentives—from work or a state tax break	0%	0%	0%
If there was better lighting on bike routes/directional signals	0%	0%	0%
All other responses	7% or less	5% or less	8% or less
No/Nothing/None	62%	53%	71%
(DON'T READ) Don't know	0%	0%	0%

WALKING

30. **(IF Q9=1 or 2 or 3 MONTHLY OR MORE OFTEN)** Why do you walk for transportation? **(DO NOT READ LIST. ACCEPT UP TO THREE RESPONSES)**

Response Category	Springfield N=61	East N=25	West N=31
It is good for my health	45%	48%	42%
It's enjoyable	18%	16%	19%
Convenience/near places I have to go	18%	16%	19%
It's good for the environment	12%	12%	13%
I don't have access to a car	7%	12%	3%
I'm not able to drive (don't have license, disability, etc.)	6%	12%	0%
Faster than driving	5%	8%	3%
To save money	4%	8%	0%
Close to work/where I need to go	3%	0%	6%
All other responses	5% or less	4% or less	3% or less
(DON'T READ) Don't know/refused	9%	8%	10%

31. **(IF Q10=7 WALK)** When walking for transportation, not for recreation or exercise, what types of places do you typically go most frequently **(DO NOT READ LIST, ACCEPT UP TO THREE RESPONSES)**?

Response Category	Springfield N=17	East N=8	West N=7
Shopping	67%	63%	71%
Work	27%	25%	29%
Restaurant, eating out	13%	13%	14%
Parks, trails, and nature	13%	13%	14%
Visiting friends	7%	13%	0%
Getting to bus	7%	13%	0%
School	0%	0%	0%
Entertainment	0%	0%	0%
Medical appointments	0%	0%	0%
Faith based places	0%	0%	0%
All other responses	7% or less	13% or less	14% or less
(DON'T READ) Don't know/refused	6%	0%	14%

32. **(IF Q9=3 or 4 or 5 MONTHLY OF LESS OFTEN)** Would you prefer to walk more often for transportation purposes than you currently do? Is that strongly or somewhat?

Response Category	Springfield N=93	East N=43	West N=42
Yes, strongly	9%	5%	14%
Yes, somewhat	23%	16%	31%
No, strongly	36%	37%	36%
No, somewhat	29%	40%	17%
(DON'T READ) Don't know	2%	2%	2%

(IF Q32=1 or 2 YES) Next, I'm going to read you some reasons that people may walk more as a form of transportation. Please tell me if strongly agree, somewhat agree, somewhat disagree, or strongly disagree with each statement. I would walk more for transportation if

Response Category	Strongly Agree	Smwt Agree	Smwt Disagree	Strongly Disagree	DK
33. Stores and services I use were closer to where I live					
Springfield, N=30	39%	40%	11%	10%	0%
East, N=9	22%	56%	22%	0%	0%
West, N=19	47%	32%	5%	16%	0%
34. Sidewalks in my area were better connected					
Springfield, N=30	18%	35%	18%	22%	7%
East, N=9	11%	33%	22%	22%	11%
West, N=19	21%	37%	16%	21%	5%
35. I felt safer walking along and crossing the street					
Springfield, N=30	28%	29%	32%	11%	0%
East, N=9	33%	22%	33%	11%	0%
West, N=19	26%	32%	32%	11%	0%

Response Category	Strongly Agree	Smwt Agree	Smwt Disagree	Strongly Disagree	DK
36. There were fewer hills in my neighborhood					
Springfield, N=30	3%	14%	40%	39%	3%
East, N=9	0%	0%	78%	22%	0%
West, N=19	5%	21%	21%	47%	5%
37. There was better weather in the area					
Springfield, N=30	33%	39%	7%	17%	3%
East, N=9	44%	22%	11%	22%	0%
West, N=19	26%	47%	5%	16%	5%

38. Is there any other reason that you would walk more as a form of transportation? **(IF YES, SPECIFY.)**

Response Category	Springfield N=30	East N=9	West N=19
Health/to be healthier	11%	33%	0%
Physical fitness/exercise	7%	0%	11%
Safety	4%	11%	0%
If where I had to go was closer	3%	0%	5%
Economical/to save money	0%	0%	0%
Time	0%	0%	0%
For enjoyment	0%	0%	0%
All other response	3% or less	0%	5% or less
No/Nothing/None	71%	56%	79%
(DON'T READ) Don't know/refused	0%	0%	0%

DEMOGRAPHICS

These last few questions are to make sure we have talked to a representative portion of the community. They are very important, and remember that all of your answers are confidential and not associated with your name in any way.

39. What best describes your working status?

Response Category	Springfield N=131	East N=60	West N=60
Employed full or part time (Employed)	57%	55%	58%
Student full or part time (Student)	5%	8%	2%
Homemaker (Unemployed)	5%	5%	5%
Unemployed, retired (Unemployed)	27%	27%	28%
Other (Unemployed)	6%	5%	7%
(DON'T READ) Refused (Unemployed)	0%	0%	0%

40. How many people currently live in your household? **(Record number)**

Response Category	Springfield N=131	East N=60	West N=60
1	14%	8%	22%
2	35%	33%	38%
3	19%	23%	15%
4	20%	23%	17%
5 or more	10%	12%	8%
(DON'T READ) Refused	0%	0%	0%
Mean	2.8	3.0	2.6

41. **(IF Q40>1)** How many people under age 18 live in your household?

Response Category	Springfield N=112	East N=55	West N=47
None	59%	55%	66%
1	15%	18%	11%
2	20%	22%	17%
3	6%	5%	6%
4	0%	0%	0%
5 or more	0%	0%	0%
(DON'T READ) Refused	0%	0%	0%

42. How many bikes does you household currently have? **(Record number)**

Response Category	Springfield N=131	East N=60	West N=60
None	20%	22%	18%
1	16%	13%	18%
2	26%	23%	30%
3	17%	22%	12%
4	13%	15%	10%
5 or more	9%	5%	12%
(DON'T READ) Refused	0%	0%	0%
Mean	2.2	2.1	2.2

43. How many vehicles does you household currently have? **(Record number)**

Response Category	Springfield N=131	East N=60	West N=60
None	6%	7%	5%
1	21%	22%	22%
2	44%	40%	48%
3	22%	23%	20%
4	5%	5%	5%
5 or more	2%	3%	0%
(DON'T READ) Refused	0%	0%	0%
Mean	2.1	2.2	2.0

44. Which of the following categories includes your annual household income before taxes?

Response Category	Springfield N=131	East N=60	West N=60
Below $25,000	27%	30%	23%
Between $25,000-$49,000	22%	23%	22%
Between $50,000-$74,000	18%	17%	18%
Between $75,000-$100,000	9%	7%	12%
More than $100,000	6%	7%	5%
(DON'T READ) Don't Know/ Refused	18%	17%	20%

45. In what year were you born? _____ **(collect open end)**

Response Category	Springfield N=131	East N=60	West N=60
18-24	6%	12%	0%
25-34	30%	32%	28%
35-54	34%	25%	40%
55-64	10%	12%	10%
Over 65	19%	20%	20%
(DON'T READ) Refused	1%	0%	2%

46. Gender **(By observation)**

Response Category	Springfield N=131	East N=60	West N=60
Male	47%	43%	50%
Female	53%	57%	50%

47. Did we reach you on a cell phone today? **(record from sample)**

Response Category	Springfield N=131	East N=60	West N=60
Yes	32%	42%	22%
No	68%	58%	78%

48. Which of the following best describes your ethnicity?

Response Category	Springfield N=131	East N=60	West N=60
White/Caucasian	88%	88%	88%
African American/Black	0%	0%	0%
Hispanic/Latino	3%	7%	0%
Asian/Pacific Islander	1%	0%	2%
Native American/American Indian	3%	2%	5%
Other	4%	3%	5%
(DON'T READ) Refused	0%	0%	0%

! LJLJŜyŘλÈ D

wŜØλŜø 2ŦűKŜ

9dzƎŜyŜ ¢NlꞏyãLJ2Núlꞏűλ2y{èăűŜY tflꞏy

tN2ĉŜŎű 9Ølꞏfdzlꞏűλ2yꞏlꞏyŘ tNλ2NλűλÎlꞏűλ2yꞏtN2ŎŜăă

North Americ an Sustainable Transportation Council

Wlꞏyđzlꞏ№ÈΣ нлмп

Eugene Public Works
Engineering

Memorandum

Date: March 2, 2014

From: Kurt Yeiter, Senior Transportation Planner

Subject: Review of the Eugene Transportation System Plan Project Evaluation and Prioritization Process by the North American Sustainable Transportation Council

An extensive process for listing, evaluating, and prioritizing projects for the Eugene Transportation System Plan was summarized in a memorandum by Kittleson and Associates, dated January 8, 2014. The process used relied heavily on the Sustainable Transportation Analysis and Rating System (STARS) guidelines prepared by the North American Sustainable Transportation Council and the Council's advice and counsel. The North American Sustainable Transportation Council critiqued the end result and offered suggestions, as shown in their comments on the attached memorandum. These comments will be reviewed and addressed as the Transportation System Plan proceeds through further layers of review.

DRAFT MEMORANDUM

Eugene Transportation System Plan

Project Evaluation Approach

Date:	January 8, 2014	Project #:10296
To:	Kurt Yeiter, City of Eugene Eugene PMT, TAC, and TCRG	
Cc:	Terra Lingley and Kristin Hull, CH2M Hill	
From:	Julia Kuhn, Kittelson & Associates, Inc.	

This memorandum describes the approach used to categorize and evaluate projects that may become the key elements of the recommended Transportation System Plan (TSP). The overall approach and categorization result from the TSP goals and objectives, and Eugene's commitment to creating a plan that supports its sustainability goals including the sustainability Triple Bottom Line (TBL; environment, equity, and economy).

The following goals developed during Phase 1 of the TSP guide this process:

- **Goal 1:** Create an integrated multimodal transportation system that is safe and efficient; supports local land use and economic development plans; reduces reliance on single-occupancy automobiles; and enhances community livability.
- **Goal 2:** Advance regional sustainability by providing a transportation system that improves economic vitality, environmental health, social equity, and well-being.
- **Goal 3:** Strengthen community resilience to changes in climate, increases in fossil fuel prices, and economic fluctuations through adaptations to the transportation networks.
- **Goal 4:** Distribute the benefits and impacts of transportation decisions fairly and address the transportation needs and safety of all users, including youth, the elderly, people with disabilities, and people of all races, ethnicities and incomes.

Consistent with the TBL and the TSP goals, the City's priorities for the transportation system (in no particular order) are:

- Safety
- Quality of the transportation facilities (ensuring comfortable environments for all modes within the overall transportation network)
- Supporting Envision Eugene's Key Transit Corridors and planned densities.
- Completing networks for all modes
- Prioritize projects and programs which contribute to achieving multiple benefits, also known as optimizing for multiple objectives. ~~Understanding the tradeoffs associated with transportation project and network decisions~~

The categorized project list supports the above priorities and suggests timeframes for implementation based on complexity, likely available funding (including potential funding sources), and staff assessment of probable timelines. The five project priority categories include:

- 20 year projects,
- Beyond 20 year projects,
- Projects to complete upon development,
- Studies, and
- Operational projects.

In addition to the project lists, policy statements comprise an essential component of the TSP and will guide the City in future decision-making efforts as they relate to project prioritization, understanding trade-offs, and helping the city to progress toward achieving triple bottom line objectives. These policy statements are not evaluated in this memo but rather will be used to support the implementation of the TSP. Appendix A of this memo includes a preliminary list of policy concepts that may be included in the TSP.

Further discussion about each of the five project categories, and a description of how bicycle and pedestrian facilities will be handled, is provided below. A list of projects included in each category follows.

Bicycle and Pedestrian Projects

Specific bicycle and pedestrian projects are not proposed for inclusion in the TSP, with one primary exception as described below. Instead, the recently completed Pedestrian and Bicycle Master Plan (PBMP) will be adopted separately and incorporated by reference as part of the TSP. The TSP will reference the general types of pedestrian and bicycle projects and policies included in the PBMP and may specifically reference some of the key projects/policies, but the project list and priorities will be detailed in the PBMP. Further, the TSP will describe the relationship between the two documents and articulate that the PBMP represents the pedestrian and bicycle elements of the TSP. Supporting

Comment [PH1]: How will you determine which projects to prioritize across modes if bike/ped projects are not included in the TSP?

text/policies can provide the city the flexibility to update the PBMP over time without having to amend the TSP.

The potential for a grade-separated pedestrian/bicycle overcrossing of the Beltline Highway may be evaluated using TSP criteria and included explicitly in the TSP. This, the most expensive pedestrian and bicycle project being contemplated, fulfills a major gap in the existing pedestrian and bicycle system, and requires coordination with the street system and careful consideration of potential land use impacts.

Many of the projects identified in the TSP project lists will include pedestrian and bicycle components as part of the overall improvement and therefore be included in the TSP.

20 Year Projects and Upon Development Projects

Most of the projects in the 20 year and "upon development" categories provide incremental, local changes, and while they will improve specific areas, very few "move the dial" on achieving greenhouse gas reduction targets or other city-wide priorities. These projects will be evaluated by bundling them together to show the city-wide benefit of systematically implementing them over the 20 year planning horizon. Cost estimates and transportation modeling for the 20 year projects will help inform the evaluation discussions.

Projects that are to be completed upon development are those that are likely needed as properties in the urban growth boundary develop or redevelop. The timing of these projects is uncertain and they are unlikely to be advanced by the city in the absence of specific private development activities. Typically, these projects address only localized multimodal transportation needs associated with newly developing or redevelopment areas. These projects will be included in the transportation modeling and the cost estimating but most are not of the scale/nature that will inform the evaluation discussions.

The list of "upon development" projects reflects City staff's current understanding of likely priorities in these areas. At the time that specific land use applications are submitted, additional or different provisions may be required as conditions of approval based on the specifics and timing of the actual development application. Further, the projects in this category may be funded through a variety of sources, such as urban renewal, proportionate sharing (based on level of anticipated impact of a specific development), etc.

Comment [PH2]: Not sure what this means. Perhaps rephrase.

Projects Beyond 20 Years

Projects beyond 20 years are still important to consider, as they are the larger more complex projects, or projects that could address future transportation issues that are not yet problematic. This provides a clear path for the City to work towards beyond the immediate plan priorities. Inclusion of projects in the beyond 20 year category provides the city flexibility to re-evaluate priorities and to pursue a variety of funding opportunities that may arise over the life of the TSP. In terms of projects beyond 20 years, the regional land use and transportation model may be used to provide a sensitivity analysis on the

traffic benefits/impacts of a new river crossing in Eugene. No other beyond 20 year projects will be modeled.

Study Projects

Study projects are those that need further analysis prior to identifying a specific project for implementation and inclusion within the TSP.

Operational Projects

Operational projects are typically intersection-related improvements that are individually lower in cost than other projects being contemplated and generally do not require right-of-way acquisition. The TSP is not all-inclusive of the operational projects the city will pursue over the life of the TSP. Rather, these projects represent those that the city can pursue to improve the operational efficiency of specific intersections and roadways. Further, a list of Transportation System Management and Options (TSMO) strategies will be included in the TSP to assist city staff and policy makers in future discussions regarding capital funding/project priorities.

Comment [PH3]: Portland has come to realize some traditional intersection projects have unintended negative consequences for bicyclists and pedestrians, such as lengthening the time between walk signals and lengthening crossing distances and making the intersection feel less safe. Does Eugene have guidelines/standards to prevent this?

Comment [PH4]: Does this include an expanded TDM program?

PROJECT EVALUATION CRITERIA

Evaluation criteria are used to differentiate and identify ~~trade-offs~~strengths and weaknesses among feasible ideas and determine how well a project meets TSP multiple objectives. To be most effective, these criteria should be measurable and well-defined. This ensures a common understanding of each criterion's meaning, and allows for a clear comparison among different ideas. The TSP criteria listed in Appendix B are organized by project objective, nested into the following eight categories:

1. Safety and health
2. Social equity
3. Access and mobility for all modes
4. Community context
5. Economic benefit
6. Cost effectiveness
7. Climate and energy
8. Ecological function

Evaluation questions are provided for each objective. Each project is evaluated in response to these questions to determine how it meets the objective. The following rating scale is used.

Evaluation Results Rating Scale

●	The project idea addresses the criterion and/or makes substantial improvements in the criteria category
◒	The project idea partially addresses the criterion and/or makes moderate improvements in the criteria category
○	The project idea does not support the intent of, provides minor or incidental benefit and/or negatively impacts the criteria category
N/A	The project idea neither meets nor does not meet intent of criterion. The project idea has no effect, or criterion does not apply

Comment [PH5]: I recommend that you break out one or two "negative impact" scales. There's a substantial difference between a project that provides minor benefit and one that has negative impacts on a criteria. They should not be lumped together.

NEXT STEPS

Draft project lists, by category, will be discussed with the TCRG in February 2014 for refinement/revision. A more detailed evaluation of the 20 year projects that result from this meeting(s) will inform discussions about ~~trade-offs~~achieving multiple benefits and a recommended set of projects for inclusion into the TSP by project category.

The project lists are shown below. A preliminary assessment of the 20 year projects relative to the evaluation criteria follows the lists.

PROJECTS WITHIN 20 YEARS

West Eugene EmX
The West Eugene EmX extension along West 6th, 7th, and 11th Avenues is funded and underway.
River Road
Improve frequent transit service and multimodal travel along River Road
Include a new corridor terminus with bus transfers and auto and bike parking near River Road and Randy Pape Beltline Interchange
Coburg Road
Improve frequent transit service and multimodal travel along Coburg Road and transit connections to Springfield
Investigate transit route options for access into downtown via or around the Ferry Street Bridge
MLK
Improve or maintain frequent transit service and multimodal travel along Martin Luther King Jr. Boulevard to Centennial Boulevard in Springfield
30th/Amazon
Provide continued improvements to transit (frequency, service hours, transfers) to achieve frequent transit service and improved multimodal travel in this corridor between downtown and Lane Community College, including 30th Avenue.
Beltline Expressway Management Plan Recommendations[1]
Provide improvements to Beltline Highway, Delta Highway and arterial street system in the vicinity as documented in the Beltline Facility Plan (adoption pending Spring/Summer 2014).
Urbanization of Existing Streets[2]
Upgrade Bertelsen from 18th Avenue to Bailey Hill Road
Upgrade Bethel from Highway 99 to Roosevelt
Upgrade the north/south section of County Farm Loop
Upgrade W 11th from Terry to Green Hill
Upgrade Hunsaker Lane/Beaver Street (county has STP-U funding for a planning/preliminary design study for this project
Upgrade Jeppesen Acres Road from Gilham to Providence
Other Projects
Reconstruct Franklin Boulevard as a multi-way boulevard between Walnut Street and Onyx Street
Add lanes on the Randy Pape Beltline from Roosevelt to W 11th and provide intersection improvements at the Beltline/W 11th and Beltline/Roosevelt intersections
Provide grade-separated crossing of the Beltline Highway for pedestrian and bicycle travel in the vicinity of York or Park
Add center turn lane on Martin Luther King Boulevard between Parkway West and Centennial Loop West

[1]Specific improvements will be incorporated into draft TSP once the Facility Plan has been finalized and adopted. These projects are evaluated using the criteria established for the Beltline Facility Plan and are not evaluated using the TSP criteria.

[2]These types of projects may include new pedestrian facilities, bicycle facilities, turn/travel lanes, curb/gutter, drainage treatments needed to align with current city standards and/or policies. Often, these types of projects are referred to as "urban upgrades".

Comment [PH6]: Why use different criteria for this project?

PROJECTS BEYOND 20 YEARS

Urbanization of Existing Streets[1]
Upgrade Summit Drive from Fairmont to Floral Hill Drive
Upgrade Van Duyn Road from Western Drive to Harlow Road
Intersection Projects
Provide improvements to address safety and congestion at the Highway 99/Roosevelt Blvd. intersection
Beltline Corridor
Improve frequent transit service along the Randy Pape Beltline corridor – with a possible Crescent Avenue route.
River Crossings
Address an aging Ferry Street Bridge structure (replace in kind, no expansion)
NW Expressway
Provide improvements to provide facilitate freight along the NW Expressway corridor

[1]These types of projects may include new pedestrian facilities, bicycle facilities, turn/travel lanes, curb/gutter, drainage treatments needed to align with current city standards and/or policies. Often, these types of projects are referred to as "urban upgrades".

PROJECTS TO COMPLETE UPON DEVELOPMENT

Local Connectivity
Connect Hyacinth Street between Irvington Drive and Lynnbrook Drive
Provide connection between Gilham Road and County Farm Road
Extend W 13th Avenue from Bertelsen to Dani Street
Provide connection between Enid and Awbrey
Extend Colton Way south past Royal Ave to connect with the future extension of Legacy
Extend Legacy South past Royal Ave to connect to Roosevelt Blvd. (Roosevelt extension)
Construct collectors and other facilities within Crow Road area needed to serve future demand/development
Urbanization of Existing Streets[1]
Upgrade Arrowhead Street from Irvington Drive to Barstow Ave
Upgrade Awbrey Lane from Prairie Rd to Hwy 99W
Upgrade Bailey Hill Road south from Warren Street to the UGB
Upgrade Beacon Drive East from River Rd to Scenic Drive
Upgrade County Farm Loop West to east section
Upgrade Dillard Road from 43rd Avenue to UGB
Upgrade Fox Hollow Road South from Donald to UGB
Upgrade Prairie Road from Maxwell to Beltline
Upgrade River Loop #1 from River Rd to Dalewood St
Upgrade River Loop #2 from River Rd to Burlwood Street
Upgrade Royal Ave from Terry St to Greenhill Rd
Upgrade Scenic Drive between River Loop #2 to Beacon Drive East
Upgrade Spring Creek Drive from River to Scenic Drive
Upgrade Wilkes Drive from River Rd to River Loop #1
Upgrade Willow Creek Road south from 18th Avenue to UGB
EWEB Property Improvements
Provide improvements to facilitate the EWEB Riverfront Development, which may include: -Intersection improvements at 4th Avenue/Coburg Road: Signalize westbound right-turn movements on 4th Avenue and northbound through movements on Coburg Road (southbound movements would remain unsignalized) -Provision of a relocated highway-railroad crossing, in alignment with the existing 8th Street improvements including track panels, lights, gates, audible warning devices, and upgraded railroad track detection as required by ODOT Rail and/or Union Pacific Railroad -Relocation of the existing signal closest to the 8th Avenue/Hilyard Street intersection to align with the relocated railroad crossing at the existing 8th intersection -Provision of a northbound right-turn lane that will offer storage for vehicles queued on Hilyard Street during train passage. -Provide a new street connection from the overall site to High Street, about 100 feet north of 5th.

[1]These types of projects may include new pedestrian facilities, bicycle facilities, turn/travel lanes, curb/gutter, drainage treatments needed to align with current city standards and/or policies. Often, these types of projects are referred to as "urban upgrades".

STUDY PROJECTS

11th and 13th Avenues
If 6th and 7th Avenues become too congested to accommodate West Eugene EmX Service, study the need for re-routing along 11th and 13th Avenues
Local Connectivity
Extend Beaver Street north to Wilkes Drive (which is outside Urban Growth Boundary). Would be joint project with County and would require an exception to Oregon's Statewide Planning Goals if provided as a street serving all modes; a goal exception would not be required if it is only a pedestrian and bicycle facility or located inside the UGB.
Improvements to North-South Travel/Circulation south of Downtown
Evaluate north/south circulation options on the Oak/Pearl and Hilyard/Patterson couplets
River Crossings
Study ways to increase capacity over the Willamette River to address bridge crossing congestion issues.
University of Oregon
Explore ways to provide better multimodal connections between the University of Oregon/Franklin Boulevard area and the Autzen Stadium/Duck Village/Chase Gardens area
I-105 Ramps
Analyze options to address weaving, operational and safety considerations at the I-105 southbound off-ramp onto W 6th Avenue

The Beltline Facility Plan is currently underway and should be completed prior to the TSP adoption. The Facility Plan includes recommendations to the Beltline Highway, Delta Highway and adjacent arterial street system to improve safety and the long-term functionality of the Highway between River Road and Coburg Road. This study is a precursor to the National Environmental Policy Act (NEPA) process for the implementation of future projects. The recommendations from the Facility Plan will be incorporated by reference into the TSP.

OPERATIONAL PROJECTS

A sample of possible operational projects is listed below.

NW Expressway
Provide intersection improvements at the NW Expressway and Beltline ramp termini intersections
Arterial Corridor Management
Upgrade traffic signals along key corridors and at key intersections to implement Transportation System Management and Operations (TSMO) strategies that increase the efficiency of the arterial system.
Other Projects
Convert 8th to two-way between High and Washington
Complete conversion of Lawrence Street to 2-way between 6th and 13th
Complete conversion of Charnelton to 2-way for the entire length
Safety improvements at Fifth and Seneca

20 YEAR PROJECT TYPE EVALUATION

A draft evaluation of the 20 year project types is shown below. Appendix B provides further details on the evaluation criteria.

20-Year Project Evaluation

Project	Safety & Health	Social Equity	Access & Mobility for All Modes	Community Context	Economic Benefit	Cost Effectiveness	Climate & Energy
Improve frequent transit service and multimodal travel along key corridors							
River Road	●	●	●	●	●	◐	●
Coburg Road							
MLK							
30th/Amazon							
Urban Upgrades							
Bertelsen	○	○	◐	●	○	◐	○
Bethel (Hwy 99 to Roosevelt)							
County Farm Loop (north-south)							
W 11th (Terry to Greenhill)							
Hunsaker Lane/Beaver Street							
Jeppesen Acres Road (Gilham to Providence)							
Other Projects							
Reconstruct Franklin Blvd	○	○	●	●	●	●	○
Beltline Improvements (Roosevelt – W 11th)	◐	○	●	●	●	◐	○
Pedestrian/Bike Bridge over Beltline	◐	●	◐	●	○	○	◐
Add center turn lane on Martin Luther King Boulevard between Parkway West and Centennial Loop West	○	○	○	●	●	●	○
Operational Projects							
Implement TSMO and Other Operational Improvements	◐	○	○	●	●	●	●
Pedestrian and Bicycle Master Plan							
Implement PBMP Priorities	●	●	●	●	●	●	●

Note: Ecological Benefit has not been assessed at this time.

Rating Scale:

- ● The project idea addresses the criterion and/or makes substantial improvements in the criteria category
- ◐ The project idea partially addresses the criterion and/or makes moderate improvements in the criteria category
- ○ The project idea does not support the intent of, provides minor or incidental benefit and/or negatively impacts the criteria

category

APPENDIX A – POLICY CONCEPTS

In addition to the goals, objectives, and project lists, the TSP will contain a set of policies. A policy is a statement adopted to provide a consistent course of action, moving the community towards attainment of its goals. The policies describe how the City will make future decisions. The following list reflects topics that could be addressed by policies in the TSP.

- Implement the Frequent Transit Network described in the Regional Transportation System Plan. Coordinate the Frequent Transit Network with Envision Eugene's Key Transit Corridors.
- Recommend a corridor-study approach to the key transit corridors in which multiple modes and access management, as well as future growth and urban design, can be addressed comprehensively. Incremental improvements may take place, but a comprehensive approach is preferred. In this context, "access management" includes physical barriers, such as median islands, that prohibit left turns from the travel lanes.
- Recognize the Pedestrian and Bicycle Master Plan (PBMP) as the guiding document for pedestrian and bicycle improvements and programs.
- Provide/support good bicycle and pedestrian connections to frequent transit lines.
- Introduce a "Complete Streets Network" by providing safe access by all modes between residences and employment, shopping, transit, and to meet daily needs. [Or use 20-minute neighborhood characterization.] Prioritize projects and programs that improve access near Key Transit Corridors and between residences, employment centers, and daily services.
- Work with emergency responders to keep Response Routes functional.
- Support better utilization of Northwest Expressway as a freight corridor and to provide improved general access to the River Road/Santa Clara neighborhoods.
- Roundabouts will be considered as a generally preferred design option *early* in a design process. The actual design and review process and roundabout standards can be developed administratively. [Note: this does not mean that we will necessarily implement roundabouts, but this policy acknowledges that roundabouts are in our toolbox and the public should not be surprised if they are installed.
- LOS-type standards that are used as a development review tool must be balanced and inclusive to address multiple modes of travel and quality of life issues that auto-focused LOS standards do not capture. Develop standards for planning, project evaluation and development review that are linked to the multimodal TSP outcomes.
- Evaluate best practices for demand and system management, transit, bicycle and pedestrian investments, prior to evaluating roadway capacity increases.
- In project development and evaluation, use the TSP's evaluation criteria.
- Cross-over easements (from property to property) should be considered in future code amendments to facilitate access management and minimize the need for as many driveways.
- Support multimodal access into the downtown and other concentrated employment areas through the use of Transportation Management Associations and other innovative techniques that reduce demand for automobile travel at times of peak congestion.

Formatted: Bullets and Numbering

- Review the parking code so that automobiles are not favored over other modes (when facilities for other modes are present). Example: reduce or eliminate the requirement for a minimum number of parking spaces along Key Transit Corridors. Develop parking management guidelines that reflect the true cost of parking.
- Improve multimodal connections between neighborhoods and the frequent transit network. [example: bike-share facilities and bike lockers at transit stations]
- Support and incorporate the Eugene Airport Master Plan into the TSP.
- Support more frequent, higher speed passenger rail between Eugene and Portland, Seattle, and Vancouver, BC. Retain a passenger rail station in downtown Eugene.
- Support freight by rail.
- Support ongoing improvements to the Amtrak Station, such as:
  - Provide transit service closer to Amtrak Station
  - Add two rail sidings to benefit freight and passenger rail.
- Reduce dependence on single-occupant automobile travel. Provide options and choice for those who do not, cannot, or choose not to own or drive a vehicle alone.
- Improve route directness, crossing frequency and travel time for pedestrians and bicyclists.
- -Priority shall be given for safety improvements that reduce fatalities and injuries, starting with the most vulnerable (pedestrians, bicyclists and transit users).
- Support reasonable and reliable travel times for freight and movement of goods in the Eugene-Springfield region. (existing TSP policy)
- Promote intermodal linkages for connectivity and ease of transfer among all transportation modes [existing TSP policy], including intermodal transfers for freight (e.g., air, rail, and trucks).
- Use technologies to provide dependable, real time freight scheduling and corridor congestion management (e.g., messages to smart phones about expected delays, alternate routes).
- Use technologies and services to reduce reliance on privately owned automobiles (e.g., bike share, car share, ride share, telecommute).
- Explore methods of removing crashed and stalled vehicles from travel lanes more quickly.
- Re-evaluate street design standards to promote complete multi-modal street networks and provide context sensitive design options.
- Consider methods to finance filling gaps in the sidewalk network (ex: to connect new development to the broader street network and transit, gaps in developed areas with limited potential to provide sidewalks in the near term, etc.).
- Explore alternate measures to the standard Levels of Service (LOS and V/C) to describe function of streets, such as reducing time of delay, total corridor (rather than intersection) travel times, and average travel delay (rather than peak hour/peak 15 minutes).
- Support County improvements to 30th Avenue and Gonyea Road (outside of the UGB).
- Support the Regional Transportation Options Program.

Formatted: Bullets and Numbering

APPENDIX B – EVALUATION CRITERIA

Comment [PH7]: Articulate why some of the criteria are highlighted green

1. Safety and Health

Project Objectives	Evaluation Criteria
1. Double the percentage of pedestrian, bicycle, and transit trips by the year 2035.	Will the project or program substantively improve city-wide mode split, as reported as percentage of commute trips taken by pedestrians, cyclists, and transit?
2. Improve community health by increasing physical activity as part of the transportation system.	Is the project or program likely to increase walking or bicycling?
3. Support the reduction in quantities of harmful airborne pollutants associated with transportation.	What is the project or program's ability to reduce airborne pollutants, based on available LRAPA1 data on criteria pollutants?
4. Improve safety and security for all users, especially for the most vulnerable; strive for zero fatalities.	What is the project's ability to reduce fatalities and injuries? Will the project address known safety concern areas, provide safe and attractive pedestrian and/or bicycle facilities, and address areas that are otherwise considered unsafe? (Combined assessment)

Comment [PH8]: You may want to consider adding "How much" at the outset of all the questions. I realize that's inherent in the scoring, though it sends a more powerful and clearer message when you explicitly ask to quantify level of benefit.

Comment [PH9]: Can you get to non-commute trips, which are the vast majority of trips?

2. Social Equity

Project Objective	Evaluation Criteria
1. Use future transportation investments to reduce or eliminate disparities between neighborhoods in access, economic benefits, safety, and health.	What impacts does the project or program have on areas with greater proportions of low income, minority, youth and/or elderly population than the city as a whole?

3. Access and Mobility for All Modes

Project Objective	Evaluation Criteria
1. Foster neighborhoods where 90 percent of	Does the project or program improve access to

[1] LRAPA, Lane Regional Air Protection Agency measures particulate matter (PM2.5) and ozone.

Eugene residents can meet most daily needs without relying heavily on an automobile.	typical daily destinations within a 20-minute walk, bicycle trip, or bus ride?
2. Improve the comfort and convenience of travel, especially for walking, bicycling, carpooling, and riding transit.	Does the project or program improve the comfort, safety, or convenience for walking, cycling, carpooling, or riding transit? This could include filling a gap in a sidewalk or bicycle facility, a carpool program to reach new customers, or improving safety or comfort while waiting for the bus.
3. Maintain a network of Emergency Response Streets to facilitate prompt emergency response.	Does the project improve roadway network connectivity for Emergency Response Streets?
4. Complete safe, comfortable, and direct sidewalk and bikeway networks between key destinations, transit stops, and residential areas.	Does the project idea add bicycle and pedestrian facilities linking key destinations, transit stops, and in residential areas?
5. Support Lane Transit District's efforts to provide high-capacity, frequent transit service, on the Frequent Transit Network.	Does the project add or enhance frequent transit to primary transit network, connect to primary transit network, or facilitate the ability to implement or add transit on identified future and existing transit routes? Does the project reduce or remove delays on existing transit service? Does the project increase the reliability of existing or future transit service?

4. Community Context

Project Objective	**Evaluation Criteria**
1. Ensure consistency between transportation investments and all relevant adopted and accepted local plans, such as: - Envision Eugene, - A Community Climate and Energy Action Plan for Eugene, - Airport Master Plan, - Long Range Transit Plan, - Pedestrian and Bicycle Master Plan, etc.	Yes/No – Is project consistent with current planning efforts?

5. Economic Benefit

Project Objective	Evaluation Criteria
1. Support redevelopment priorities by promoting compatible transportation investments along key transit corridors and in core commercial areas, including downtown.	Does the project or program reduce duration or level of delay for pedestrians, bicyclists and transit riders, or increase twenty minute multi-modal access along key transit corridors and near core commercial areas?
2. Encourage infrastructure and programs that allow residents to reduce expenditures on fuel and vehicle use.	Does the project or program reduce vehicle miles traveled and/or improve speed consistency?
3. Support predictable travel times between key origins and destinations for high priority trips such as transit and regional freight movement.	Does the project or program improve travel time reliability along key transit and freight corridors (as applicable)?
4. Increase access to employment centers via foot, bike, and transit, while improving the quality of the traveling experience.	Does the project or program improve the likelihood of employees walking, bicycling, or riding transit to major employment centers?
5. Support access and visibility of businesses that rely on drive-by traffic by balancing congestion with economic development goals.	Does the project or program remove a large percentage of potential customers for a major commercial center? Does the project or program make it prohibitively difficult to access commercial areas by all modes?

6. Cost Effectiveness

Project Objective	Evaluation Criteria
1. Optimize benefits relative to public, private, and social costs over the plan's time horizon.	Does the project or program benefit the other seven categories compared to the costs (public, private and social) of the project or program?
2. Maximize the efficiency and life of the current transportation system.	To what extent does the project or program use and take advantage of existing network, preserve or maintain existing facilities, or modernize existing facilities to function more optimally?
3. Favor transportation investments that have potential funding for both implementation and ongoing	How competitive is the project or program to receive funding from existing funding sources

maintenance.	and potential future funding sources?

7. Climate and Energy

Project Objective	**Evaluation Criteria**
1. Focus on transportation programs and projects that help to: a. reduce total community-wide fossil fuel use by 50% by 2030 b. reduce vehicle miles traveled per capita by 10% by the year 2020 c. reduce community-wide greenhouse gas emissions 10% below 1990 levels by 2020	What is the potential magnitude for the project or program to affect mode split (away from cars) and/or reduce VMT? What is the potential magnitude for the project or program to improve speed consistency (without substantially reducing travel time) and thereby reduce GHG emissions?

8. Ecological Function

Project Objective	**Evaluation Criteria**
1. Improve water quality and lower the rate of stormwater runoff from transportation infrastructure.	What is the net change in impervious surface area (e.g., total width of facility, including sidewalks or other impervious features) associated with the project? Does project incorporate mitigation, such as runoff detention and filtration opportunities?
2. Reduce the urban heat island caused by paving that absorbs and re-radiates heat.	What is the amount of net additional paved surface? Does the project incorporate mitigation, such as additional tree canopy? What is the ROW availability and potential impacts to landscaping strips? Is the increase able to be mitigated?
3. Foster transportation investments that avoid damaging and improve habitat areas, where possible.	Does the project or program increase or decrease the functionality or quality of habitat areas?

Page left blank intentionally

City of Eugene
Transportation System Plan

Legend

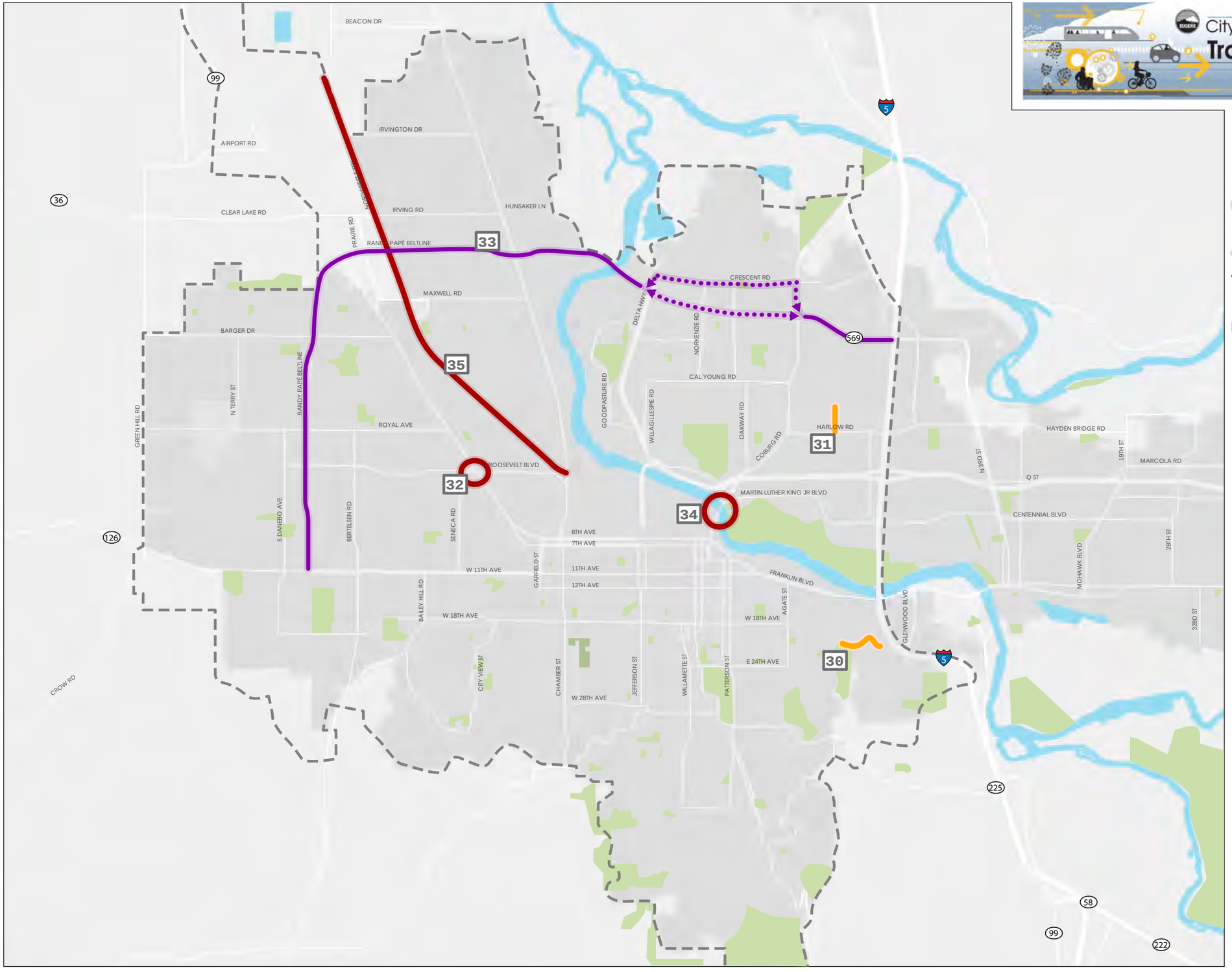
- Urbanization of Existing Streets
- Pedestrian/Bicycle Project
- Roadway Project
- Transit Project
- Transit Project
- Specific route to be determined
- Major Streets
- Eugene City Limits
- Urban Growth Boundary
- Water Body
- Parks

N

0 .25 .5 1.0
Miles

NOTE:
All new alignments are conceptual. Actual alignments will be determined during project development.

FIGURE 1
Projects Within 20 Years
Transportation System Plan
Eugene, OR



City of Eugene
Transportation System Plan

Legend

- Urbanization of Existing Streets
- Roadway Project
- Roadway Project
- Transit Project
- Specific route to be determined
- Major Streets
- Eugene City Limits
- Urban Growth Boundary
- Water Body
- Parks

N

0 .25 .5 1.0
Miles

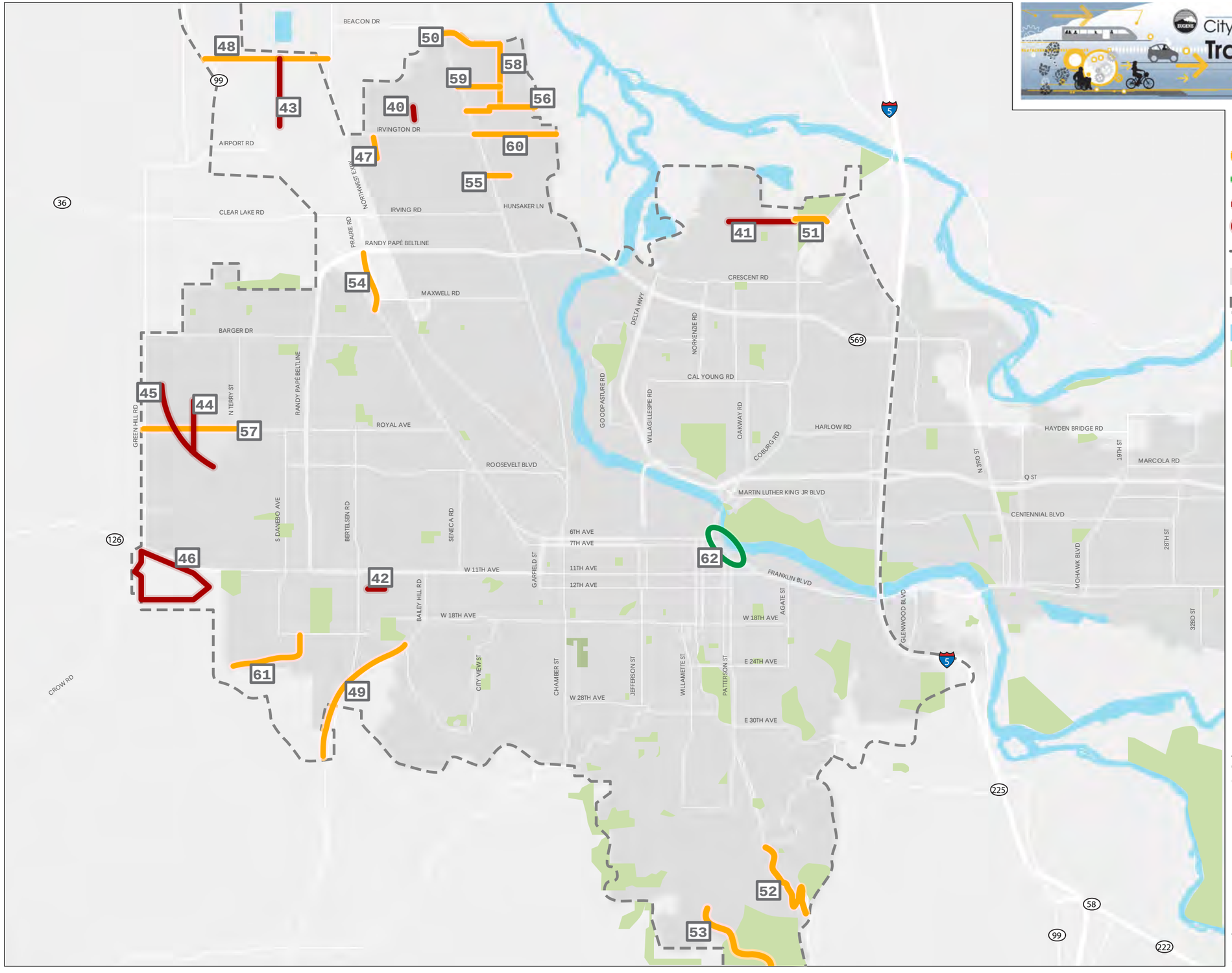
NOTE:

All new alignments are conceptual. Actual alignments will be determined during project development.

Currently, there are no projects 19-29; these project numbers are being held in reserve in case more TSP projects are added.

FIGURE 2
Projects Beyond 20 Years

Transportation System Plan
Eugene, OR



City of Eugene
Transportation System Plan

Legend

- Urbanization of Existing Streets
- Planned Development Improvements
- Local Connectivity
- Local Connectivity
- Major Streets
- Eugene City Limits
- Urban Growth Boundary
- Water Body
- Parks

N

0 .25 .5 1.0
Miles

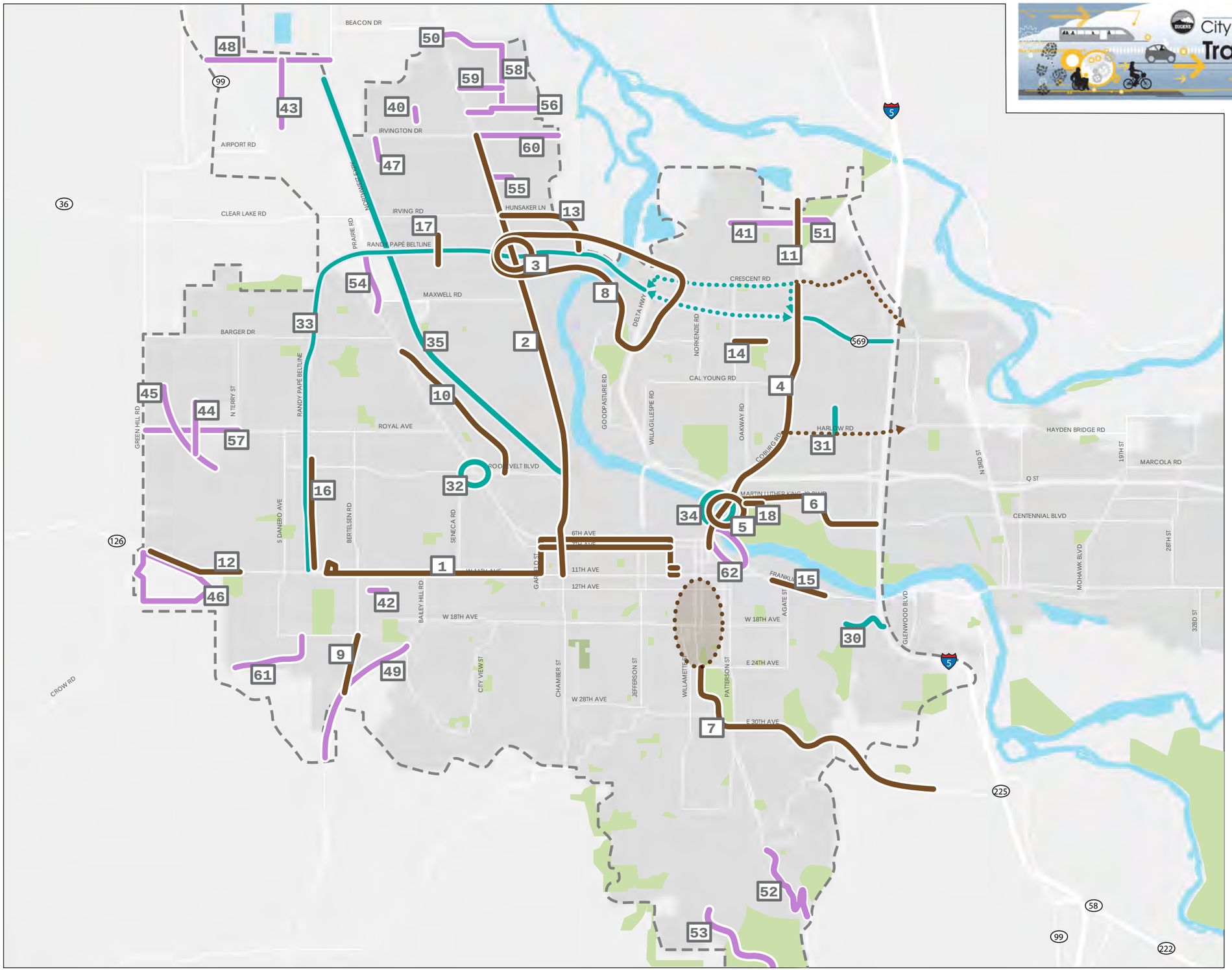
NOTE:

All new alignments are conceptual. Actual alignments will be determined during project development.

Currently, there are no projects 36-39; these project numbers are being held in reserve in case more TSP projects are added.

FIGURE 3
Projects to be Completed Upon Development

Transportation System Plan
Eugene, OR



City of Eugene
Transportation System Plan

Legend

- Projects within 20 years
- Projects beyond 20 years
- Projects to be completed upon development
- Specific route to be determined
- Major Streets
- City Limits
- Urban Growth Boundary
- Water Body

N

0 .25 .5 1.0
Miles

NOTE:

All new alignments are conceptual. Actual alignments will be determined during project development.

Currently, there are no projects 19-29 or 36-39; these project numbers are being held in reserve in case more TSP projects are added.

FIGURE 4
Combined Projects
Transportation System Plan
Eugene, OR

Appendix H

STARS

Sustainable Transportation Analysis & Rating System
Pilot Plan Application Manual, Version 1.0

North American Sustainable Transportation Council

January 10, 2012

STARS

Sustainable Transportation Analysis
& Rating System

Pilot Plan Application Manual

Version 1.0
January 10, 2012

A framework for integrating sustainability into transportation plans

STARS-Plan is one of a family of STARS tools developed by the North American Sustainable Transportation Council (STC), a registered non-profit organization, and the Portland (OR) Bureau of Transportation. If you have questions about STARS, please contact Peter Hurley at 503.823.5007 and peter.t.hurley@portlandoregon.gov or Kelly Rodgers at 503.442.7165 and Kelly@transportationcouncil.org.

Acknowledgements

This STARS-Plan Manual is the result of an intensive collaboration among the non-profit organization sponsoring STARS, the North American Sustainable Transportation Council (STC), representatives from local, state, and federal public agencies, and representatives from the private sector. In particular, the Santa Cruz County Regional Transportation Commission and Portland Bureau of Transportation have been instrumental in providing time and funding to create this transportation planning sustainability framework.

STARS-Plan Expert Advisory Panel

Grace Blakeslee	Santa Cruz County Regional Transportation Commission
Margi Bradway	Oregon Department of Transportation (ODOT)
Bill Bryant	Seattle Department of Transportation (SDOT)
Angela Dluger	Federal Transit Administration (FTA)
George Dondero	Santa Cruz County Regional Transportation Commission
Matthew Egge	Los Angeles Metro
Heidi Guenin	Upstream Public Health
Peter Hurley	Portland Bureau of Transportation
Tom Kloster	Portland Metro
Bob Leiter	San Diego Association of Governments
Cris Liban	Los Angeles Metro
Aileen Loe	California Department of Transportation
Kelly Niemeyer	City of Gresham (OR)
Deena Platman	Portland Metro
Brian Smith	Washington Department of Transportation (WSDOT)
Lainie Smith	Oregon Department of Transportation (ODOT) Region 1
Paul Smith	Portland Bureau of Transportation
Kurt Yeiter	City of Eugene (OR)

STARS-Plan Expert Advisory Panel Participants

Sine Adams	Parsons Brinckerhoff
Theresa Carr	CH2M HILL
Denver Igarta	Portland Bureau of Transportation
Antoinette Quagliata	Federal Transit Administration (FTA)
Kelly Rodgers	North American Sustainable Transportation Council
Mariah VanZerr	CH2M HILL

Table of Contents

Chapter 1: Introduction
STARS and Sustainable Transportation

Photo: Greg Raisman

Introduction

What is STARS?

STARS-Plan is part of an integrated family of STARS tools to advance sustainability in surface transportation. STARS (the Sustainable Transportation Analysis & Rating System) is an integrated planning framework for transportation plans, projects, and programs. Based on sustainability principles[1], STARS gives planners, citizens and decision-makers the ability to evaluate the full life cycle of transportation plans and projects, identifying innovative options and improving decision-making.

Since the use of transportation projects (e.g., the vehicles moving along it) often has more lasting consequences than the construction phase, the decision of what to build can be more important than how it is constructed. This "upstream" approach to transportation investments distinguishes STARS from other rating systems that are centered on the design and construction phases.

STARS requires users to set and achieve clearly stated goals and objectives, many of which are quantitative in nature. Rather than comply with a list of standards, STARS asks users to adopt goals and a small number of measurable objectives, and then evaluate strategies to achieve those goals and objectives. In cases where data is limited, STARS may provide a prescriptive list of actions that are known to achieve the objective at hand.

STARS promotes improved "access" rather than simply improved transportation mobility. That is, STARS encourages a mix of transportation and land use strategies to meet the needs of residents and businesses for access to people and places, goods, services, and information. This shift in focus enables users to conceive of solutions to transportation problems that might otherwise be overlooked with a traditional focus on moving vehicles.

State DOTs, regional agencies, cities, and counties are wrestling with how to improve access within seriously constrained budgets, while helping achieve economic, environmental and equity goals. They need practical tools to compare their transportation projects, programs, and plans using a national best practices standard, which STARS provides.

What is STARS-Plan?

STARS-Plan is one of a suite of tools in the STARS system designed to help transportation planners and decision-makers achieve triple bottom line sustainability outcomes through regional and local transportation plans. Currently, three STARS tools have been developed: STARS-Project for transportation projects, STARS-Plan for transportation plans, and the STARS Safety, Health, and Equity Tool (see Figure 1).

[1] STARS is informed by The Natural Step principles of sustainability

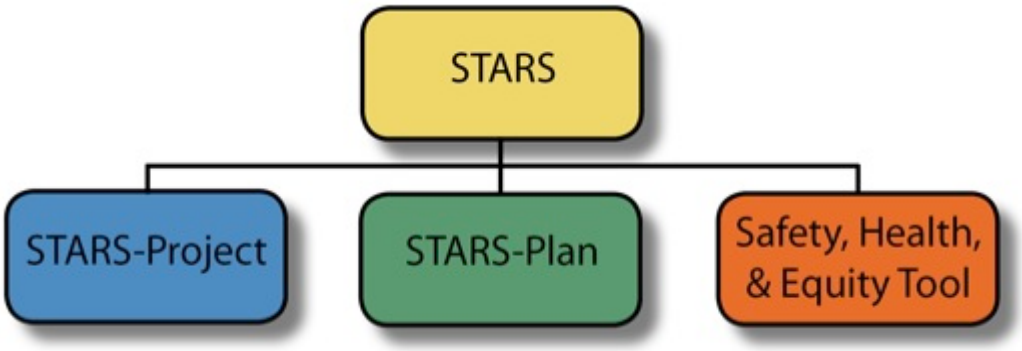


Figure 1: STARS products

STARS-Plan offers a clear and focused framework for communities to establish sustainable performance measures to forecast and verify the extent to which plans are meeting their goals and objectives. As a result, STARS-Plan helps streamline and simplify decisions about programs and projects, based on demonstrated outcomes over the short, medium, and long term.

STARS-Plan promotes programs and projects likely to achieve multiple goals. While STARS is organized into credit categories each with its own set of goals, objectives, and measures, such as Access and Mobility and Climate and Energy, strategies to improve one credit area (e.g. improving walkability for Access and Mobility) also produces benefits in another (e.g. reducing greenhouse gas emissions for Climate and Energy and increasing physical activity in Safety and Health). The STARS framework has been developed with an eye toward optimizing the areas of shared benefit. As a result, the performance measures selected are often crosscutting, serving multiple goals. As a result, STARS-Plan encourages using a few manageable, but powerful, measures for addressing sustainability in transportation plans (see "The Best and Worst" on page 8.)

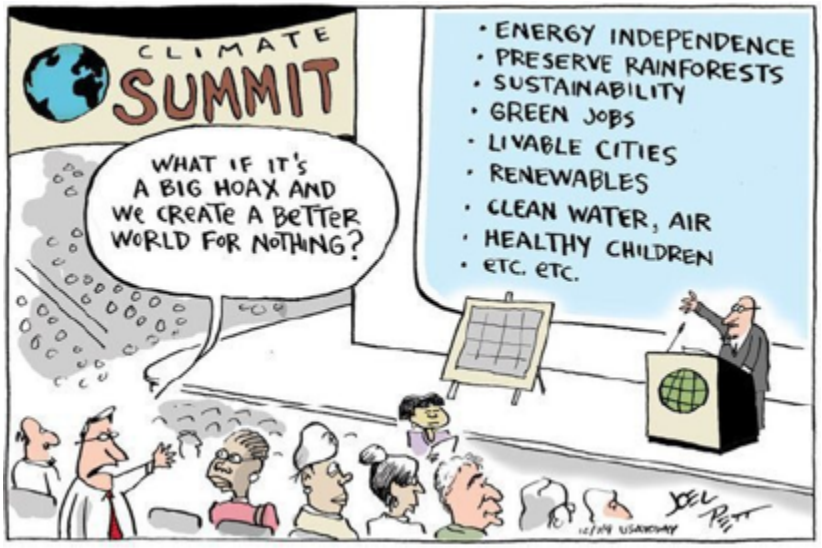


Figure 2: Multiple benefits

Source: Joel Pett

Background

STARS began in July 2008 when Portland Bureau of Transportation policy staff invited a dozen transportation and sustainability professionals to discuss how to shift transportation from moving vehicles to providing people with more and better choices, while reducing energy use and climate pollution in a financially constrained era. Many in the group were frustrated that transportation lagged the energy and building sectors in adopting sustainability and climate-friendly practices. The group drew inspiration from Leadership in Energy and Environmental Design (LEED™) and the Living Building Challenge,™ a product of the International

Living Building Institute, planning and certification systems that are transforming the building construction industry by rewarding projects for increasingly higher levels of performance.

In developing STARS, the group recognized that transportation is a means to an end, not an end in itself. People travel to access employment, education, goods, and services. People do not always need to travel to achieve these objectives. They may work at home or take classes or find information on the web. For example, there are multiple means to gain access to work: driving alone, carpooling, taking transit, bicycling, walking, working at home, and telecommuting. It was this realization that prompted STARS to focus on access, rather than only transportation mobility[2].

In 2010, the STC worked with the Santa Cruz County Regional Transportation Commission to develop the first twelve STARS-Project "core credits," including credits for Integrated Process, Access, Climate and Energy, and Cost Effectiveness Analysis. The STC contracted with five private sector firms to develop the core credits, and several volunteer technical advisors and peer reviewers helped refine the credits. The first version of the Project Application Manual was released in November 2010.

> "The more time I spend working, the more I want that work to make a difference. I made a promise to myself a few years back to make my plans and projects do more to help people and nature. STARS is a powerful guiding "North Star" helping me determine whether and how much I'm keeping that promise."
>
> *-Peter Hurley, Chair,*
> *North American Sustainable Transportation Council*

In 2011, with the support of the Santa Cruz Regional Transportation Commission, the STC pursued the development of a sustainability framework and credit rating system for transportation plans, called STARS-Plan. An Expert Advisory Panel, drawn from transportation practitioners from local, state, and federal levels of government, provided guidance for STARS-Plan. This Manual is the result of the first phase of STARS-Plan.

Where We Are and Where We Are Going

STARS-Plan is being developed in three phases (see Figure 3). This report is the result of the first phase, where a series of discussions with the Expert Advisory Panel helped inform the STARS-Plan framework. At this time, STARS-Plan consists of credit categories, goals, and objectives.

The second phase of STARS-Plan will establish the requirements and methods needed to meet the goals and objectives outlined in the credit framework. In addition to identifying strategies and methods, future iterations of STARS-Plan will likely require that users develop a low-capital/construction alternative that is more focused on operations. That is, one alternative will focus on transportation demand management, transportation system management, and transit operations improvements. These strategies are known to take effect quickly and are less expensive than many build scenarios.

The third phase involves training transportation planners to use STARS-Plan and developing a certification process to rate transportation plans using the STARS framework. This phase will include a training program for people to develop the capacity to certify plans.

[2] For further discussion on accessibility and merits of managing transportation to achieve multiple benefits, see Todd Litman's article *Are Vehicle Travel Reduction Targets Justified? Evaluating Mobility Management Policy Objectives Such As Targets To Reduce VMT And Increase Use Of Alternative Modes,* October, 2009. Victoria Transport Policy Institute

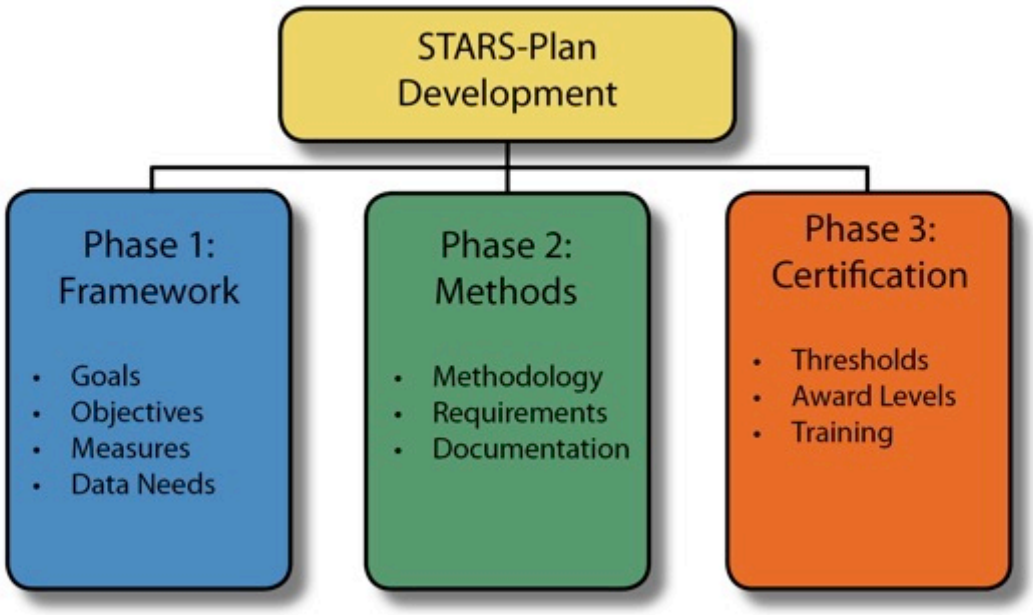


Figure 3: STARS-Plan Development

What is Sustainable Transportation?

How sustainability applies to transportation investments is not very well understood and infrequently attempted. The following definition from the Centre for Sustainable Transportation provides guidance for understanding sustainable transportation, and informs the STARS framework:

- Allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health, and with equity within and between generations.
- Is affordable, operates efficiently, offers choice of transport mode, and supports a vibrant economy.
- Limits emissions and waste within the planet's ability to absorb them, minimizes consumption of non-renewable resources, limits consumption of renewable resources to the sustainable yield level, reuses and recycles its components, and minimizes the use of land and the production of noise.

The Natural Step and the Triple Bottom Line

In developing the STARS framework, developers relied on the principles of The Natural Step to help define sustainability. Developed by Dr. Karl Henrik-Robert and vetted by an international community of scientists, The Natural Step identifies three basic conditions that must be met if we want to maintain the essential natural resources, structures and functions that sustain human society, and a fourth condition that recognizes the ability of human beings to meet their basic needs. The below are known as The Natural Step's Four System Conditions:

In a sustainable society, nature is not subject to systematically increasing:

- Concentrations of substances extracted from the earth's crust;
- Concentrations of substances produced by society;
- Degradation by physical means;
- And, in that society, people are not subject to conditions that systemically undermine their capacity to meet their needs

STARS recommends using The Natural Step (TNS) as a means to understand sustainability and as a framework for defining an end state, or ultimate, sustainable transportation system. Embedded in the sustainability definition above are concepts from The Natural Step. STARS uses a "backcasting" approach recommended by The Natural Step to identify which strategies help users meet their goals. Rather than relying exclusively on a forecasting method employed by many planning agencies, backcasting involves setting a vision and goals for the future, and then identifying the strategies and steps to take in order to reach those goals (see Figure 4: Backcasting). For each of the objectives, STARS asks users to establish targets through a backcasting process.

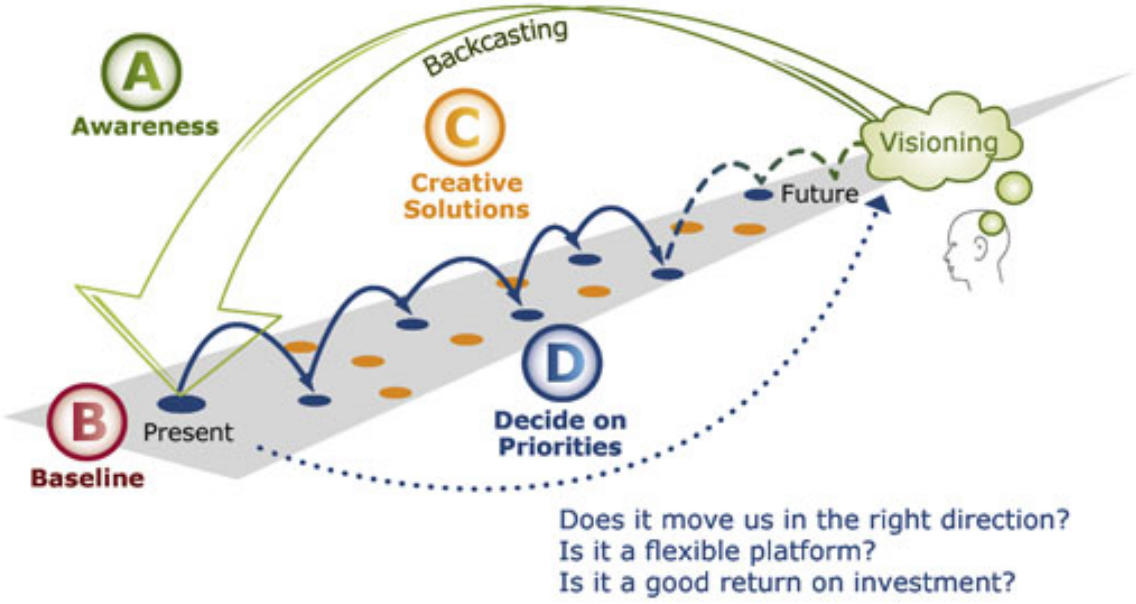


Figure 4: Backcasting

Source: The Natural Step, www.naturalstep.org/~natural/applying-abcd-method

While The Natural Step is valuable for understanding sustainability, STARS uses a Triple Bottom Line[3] framework to organize and implement sustainability into transportation plans and projects. The Triple Bottom Line organizes the benefits and impacts of decisions according to three categories: social equity, environmental quality, and economic prosperity (see Figure 5). Frequently, these categories are summarized as People, Planet, and Prosperity. As an implementing framework, STARS uses the Triple Bottom Line to identify goals, objectives, and performance measures for each credit category.

[3] The Triple Bottom Line was popularized by John Elkington in his book, *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*.

Why Use STARS-Plan's Triple Bottom Line Framework

STARS-Plan is a clear and focused sustainability framework designed for use in regional and local transportation plans. STARS-Plan uses the Triple Bottom Line to identify key goals and objectives that best achieve multiple bottom line outcomes (see Figure 6). Each STARS goal and objective notes how it affects the Triple Bottom Line in the spreadsheet in Appendix B.

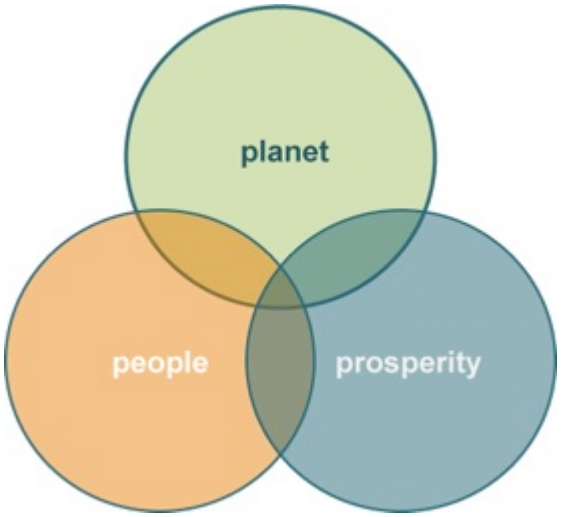


Figure 5: The Triple Bottom Line

The key is optimizing for all three dimensions of the Triple Bottom Line, and not "balancing" them. Often "balancing" sustainability discussions result in choosing several measures or strategies that benefit only one dimension of the Triple Bottom Line, with the idea that, in total, they address all three aspects. This approach results in trade-offs among the three dimensions, and does not recognize the interrelation of people, planet, and prosperity. STARS, on the other hand, recommends *3D Thinking*: what measures and strategies benefit all three dimensions of the Triple Bottom Line?

For example, STARS uses *vehicle miles reduced* as a key measure, because it relates to all three aspects of the Triple Bottom Line. For people, a reduction in vehicle miles traveled means that people are using other modes to meet their needs, and likely walking, bicycling, or taking transit. Choosing one of these modes is healthier and also reduces the amount of money people spend on vehicle expenses. Reducing vehicle miles traveled also benefits the environment: less driving means less greenhouse gas emissions and other pollutants are being generated (which also benefits people). Finally, in economic terms, a reduction in vehicle miles traveled translates to money otherwise spent on fuel is available to invest in the local economy. This amount of money can be substantial; economist Joe Cortright found that the "Green Dividend" of driving an average of four miles a day less in the Portland, Oregon metro area resulted in $2.6 billion dollar reinvestment on an annual basis.[4]

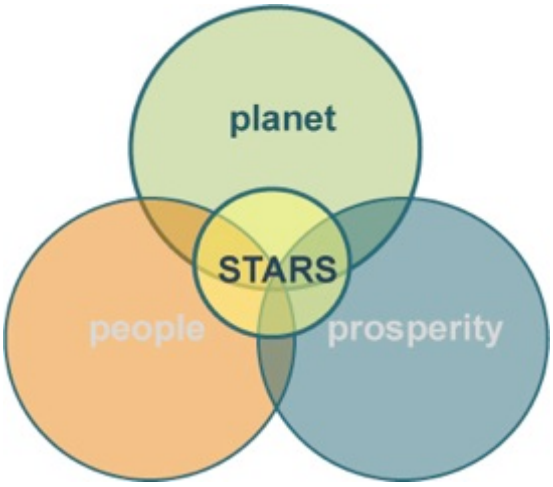


Figure 6: STARS and the Triple Bottom Line

How STARS-Plan is Structured

Credit Categories and Functions

The eight credit categories are: Integrated Process, Community Context, Access & Mobility, Safety & Health, Economic Benefit, Cost Effectiveness, Climate Pollution & Energy Use, and Ecological Function. STARS-Plan has one credit for each credit area rather than a suite of credits for each credit category (e.g. Access & Mobility has

[4] The Green Dividend report is available from the CEOs for Cities website: http://www.ceosforcities.org/work/portlands_green_dividend

only credit AM1 and Safety & Health has only credit SH1). To achieve a credit an applicant must take, or agree to, the goals or specific actions listed in the credit. There may be several goals under each credit.

Most of the credits are organized in a similar fashion: they have goals, objectives, and performance measures. For example, under the Access & Mobility credit, there are goals to *improve people's ability to meet most of their daily needs without having to drive* and *improve the convenience and quality of trips, especially walk, bicycle, and transit trips*. For each goal, STARS users must meet objectives that are generally quantified through performance measures (see Figure 7). See Appendix A for the entire STARS framework (credit categories, goals, objectives, and performance measures).

Figure 7: STARS Credit Structure

Integrated Process is a credit that explains how to lay the foundation for STARS; it is uniquely organized because it does not have a set of goals associated with it, but a list of required elements. Community Context is another credit category that is not organized like the remainder of the credits. Each community brings a different perspective and struggles with unique issues. As a result, STARS has created a category where the particular issues of the community may be addressed.

In some cases, agencies may not have a robust enough data set to evaluate the objectives. In these cases, surrogate measures are identified where data may be limited. The next phase of STARS-Plan will identify under what conditions these surrogate measures are accepted.

While STARS-Plan provides goals and objectives, specific guidance about *how* to set objectives will be developed in future iterations of STARS-Plan. However, one key element for setting objectives is to examine existing policy in the local area. For example, many states and local jurisdictions have established climate action plans, which may provide direction for setting targets.

"We have limited resources, so it was great to use STARS-Plan to avoid reinventing the wheel on many issues."

-Rob Inerfeld, City of Eugene, Oregon

Performance Measures

The STARS approach is largely based on performance measures; that is, it is outcome-oriented. STARS-Plan helps planners, community members and decision-makers prioritize projects and programs that best achieve community sustainability outcomes based on a small set of key performance measures. Performance measures can be generally categorized as leading (or output) or lagging (or outcome) measures. Leading measures are predictive in nature, and are often the result of model outputs. Lagging measures are the measure of the actual change or outcome.

The Best and the Worst

The measures STARS most highly recommends are those that address the three spheres of the Triple Bottom Line: people, planet, and prosperity. Four measures stand above the crowd as the most optimized. These optimized measures tend to show up in several places in STARS-Plan, as a testament to their importance. At the same time, we have identified three other common measures fail the test of clearly improving all three elements of the Triple Bottom Line, and tend to lead to unsustainable outcomes.

STARS recommends prioritizing the following four measures in transportation plans and projects:

1. **Reduce Vehicle Miles Traveled (VMT).** Reducing VMT frequently involves providing more and better transportation options and improving land use so that frequent origins and destinations are closer. Reducing VMT improves prosperity by reducing private vehicle use and therefore retaining in the local economy approximately 75% of money no longer spent on fuel and vehicle wear and tear. Reducing VMT improves prosperity by shifting trips that don't need to drive, preserving scarce roadway capacity for trips that do need to drive. Reducing VMT helps people by (usually) increasing walking, bicycle and transit use, all of which increase physical activity and therefore health. Reducing VMT often means reducing air pollution and its consequent health impacts. Reducing VMT improves environmental health by reducing greenhouse gas emissions.

2. **Prioritized Funding for Improvements to Areas That Have Reported Fatalities and Injuries.** Reducing fatalities and injuries clearly helps people. Reducing fatalities and injuries improves prosperity by reducing unanticipated congestion, which can wreak havoc on trip reliability for freight and other high value trips. Reducing unanticipated congestion also reduces braking, acceleration and idling, all of which reduce fuel consumption and therefore greenhouse gas emissions.

3. **Improve Travel Time Reliability.** Surveys reveal that, for high value trips (e.g. freight and commute), predictable/reliable travel times are often more valuable to users than improvements to average travel time. Improving travel time reliability helps prosperity by creating more reliable freight trips. Improving travel time reliability helps people by allowing them to avoid wasting time by leaving early in order to deal with unpredictable trip times.

4. **Improve Speed Consistency**. Improving speed consistency can help reduce fuel consumption. It is a measure based on speed, braking and acceleration. Improving speed consistency helps prosperity by retaining money in the local economy by reducing fuel consumption, as well as helping the planet by reducing greenhouse gas emissions.

We recommend avoiding using the following three measures in transportation plans and projects:

1. **Vehicle Level of Service (LOS).** A road receives a high LOS when there is little or no delay compared with posted speed, even during the heaviest use periods. A road with a high LOS often indicates that the road has excess capacity for much the day. Higher posted speeds also may not be the optimum speed for fuel efficiency, especially as more vehicles incorporate hybrid technology, which have lower fuel efficiency at common highway speeds. A high LOS can be an indicator of inefficient use of expensive roadway capacity and of inefficient posted speed.

2. **Volume-to-Capacity Ratio (V/C).** Closely related to vehicle LOS, and problematic for the same reasons. Vehicle LOS and V/C are primarily focused on a single mode, unlike the "Three Best" measures, all of which are multimodal. Even transit, which is a vehicle and counted in Vehicle LOS and V/C, is undervalued when a bus carrying 20 or 40 or 60 people is counted the same as a car with one person in it.

3. **Vehicle Delay/Hours of Congestion**. Vehicle delay suffers from the same problems as the previous two measures: focusing on vehicles rather than people and an over-reliance on posted speed, which may be unrealistic for congested urban areas during peak periods and is often not the optimum speed for fuel efficiency. Vehicle delay/hours of congestion frequently focuses on recurring congestion, which is more predictable and more avoidable for freight trips, than non-recurring congestion caused by crashes and other incidents, which is often a major cause of congestion and is more difficult to plan around.

Where in the Transportation Plan Process is STARS Used?

STARS-Plan should be used at the beginning of the planning process, as well as integrated throughout the planning process. Full integration is particularly important if the user wishes to be STARS-Plan certified. It is possible to use STARS-Plan as a guiding framework for aspects of the transportation plan. STARS-Plan allows for this modularity, although using individual components of STARS-Plan disqualifies the user from receiving certification.

Vision

Understanding the definition of sustainability presented in STARS-Plan, and required through the Integrated Process credit, is integral to crafting a vision that is grounded in sustainability.

Goals, Objectives, and Performance Measures

STARS-Plan recommends a backcasting process to identify which goals, objectives, and performance measures will best help the agency achieve the vision identified in the planning process.

Data and Modeling

STARS-Plan identifies specific data needs and model outputs used to assess the plan. A conversation about data and modeling is most beneficial at the outset of the planning process, in order to understand what data is available and what data or modeling limitations the agency has.

Evaluation

The objectives in the STARS-Plan are used to assess the performance of plan alternatives. STARS-Plan supporting strategies and measures help users explore how to best meet the goals and objectives.

Scale for STARS-Plan

STARS-Plan is intended to apply to local Transportation System (TSPs), Regional Transportation Plans (RTPs), and modal plans (e.g., a bicycle master plan). STARS-Plan is not intended to apply to state-level policy plans or programming decisions, such as State Transportation Improvement Plans (STIPs).

Timeframe for STARS-Plan

Transportation plans (RTPs and TSPs) generally have a 20 or 25-year time horizon. While this is an appropriate horizon for a transportation planning effort, many strategies can happen more quickly and have significant impacts. As such, STARS-Plan also recommends evaluation at the five to ten-year timeframe. Additionally, because many state and local governments have developed policies and goals for greenhouse gas reductions with a 2050 time horizon, STARS-Plan also recommends users to evaluate strategies out to 2050.

In summary, STARS-Plan recommends planning for two (required) and one (optional) "design years:"

- Short: Five to ten years from plan adoption
- Medium: 20 to 25 years from plan adoption
- Long: the year 2050

Note that STARS recognizes the difficulty in obtaining data for the year 2050. Agencies should obtain what data is available, and also look qualitatively at trends. STARS users should ask: "What will the community look like in 2050? What infrastructure and services will we need?"

Becoming a STARS 1.0 Certified Pilot Plan

STARS Plan 1.0 is designed to apply to transportation plans in the early stages of development and integrated throughout the process. As a planning tool, STARS is intended to inform how transportation plans are developed, before alternatives have been devised. That is, STARS asks users to build alternatives considering the goals and objectives through a backcasting process, and then again, to evaluate those alternatives based on the objectives and performance measures. The certification system and a training program will be developed in Phase 3 of STARS-Plan. In general, the following six steps outline the certification system as the STC intends to develop it.

1. Ask Questions

- Ask what problems you have for your transportation plan area. Problems with recurring congestion, insufficient multi-modal options, insufficient construction or operating funds and lack of public support are indicators of potential STARS candidate projects.
- Ask what goals you have for your transportation plan area. Improving the sustainability of the transportation system, providing people more and better travel options, integrating transportation and land use, identifying low cost improvement strategies and meeting energy and climate goals may all signify potential STARS candidate projects.
- Ask where in the process your plan is. As noted above, STARS is most effective the earlier it is applied in the plan development process, though plans later in the development process may still find STARS provides valuable decision-making information.

2. Contact the North American Sustainable Transportation Council (STC)

- Contact Peter Hurley to start the conversation. Peter is a Portland Bureau of Transportation Project Manager and Chair of the STC. He can be reached at 503.823.5007 or peter.t.hurley@portlandoregon.gov.

- After discussing the questions above, you'll talk with the STC about each of the credits in this manual, discussing how each might apply to your plan, and identifying which credits you may want to apply. The conversation will start to identify data issues, methodology questions, priority goals and objectives and priority credits.
- Decide whether the plan is likely to benefit from STARS and whether STARS is likely to benefit from the plan.

3. Agree on Responsibilities to Become a STARS 1.0 Candidate Pilot Plan

- The plan agency and the STC will sign an informal written agreement outlining which credits the plan intends to pursue, the responsibilities of each party and designating the plan a "STARS 1.0 Candidate Pilot Plan." This will usually involve a low-cost financial partnership between the organizations.

4. Apply the Credits

- Most plans will start with a STARS training for their project team (and, perhaps, decision-makers).
- All plans will offer educational materials and presentations on sustainability through a workshop or a series of integrated meetings, conducted by the STC, in collaboration with project team members, decision-makers and/or the Plan Stakeholder Committee.
- Submit a "pre-analysis proposal" to the STC, outlining what methods you intend to use for each credit you consider. This would allow the STC to work with you to address issues, before spending a significant amount of time and money on actions that the STC may consider insufficient.
- Integrate credits into your planning process. Credit application will occur primarily by the project team. The STC will be available to address interpretation questions.
- The project team will document issues and benefits that arise during credit application.

5. Documentation

- The project team will provide documentation to the STC how each credit was applied, which will be described in Phase 2 of STARS-Plan. The STARS development team found using "Basecamp" as a common website to post comments, questions and draft documents to be a valuable tool; the project may wish to use it or a comparable tool to communicate with the STARS team.
- The STC will collaborate with the agency on reviewing the documentation and how well the agency is meeting the goals and objectives. It is expected that this will be an iterative process.
- In order to be certified, the agency must adopt goals, objectives, performance measures and targets for the primary measures: *reduce VMT*, *improvements to number of areas that have reported fatalities and injuries*, *improve travel time reliability*, and *improve speed consistency*.

> "We want the STARS process to enrich our City's plan and I believe that if we each enhance our Transportation System Plans and the STARS process we will advance our profession and make our communities more livable, enjoyable and sustainable. I hope others join us and make this a living process."
>
> *-John Dorst, City of Gresham, Oregon*

6. Celebrate!

- At this point you should have a more sustainable plan with greater public support. Celebrate!

Glossary

Employment Centers: Are places of employment that include industrial and manufacturing, institutional (e.g., medical, educational), shopping centers, and other uses that may be appropriate to the community. STARS users may define the employment centers in their community.

Goals: Are general, directional (increase, decrease) statements that guide the plan, defined in accordance with sustainability principles. An example is Safety & Health Goal 2: *"Improve multimodal safety, especially for the most vulnerable users."*

Hydromodification: To alter the hydrology of a stream. Transportation, and urban development, can change the hydrology by increasing the amount of impervious surfaces which results in increased volumes of stormwater runoff and increased speed of stormwater runoff, as well as increasing levels of pollution (including increased temperature) in the stormwater. These actions impact streams and other bodies of water that receive the stormwater runoff.

Key Destinations: Include employment centers, places of worship, shopping destinations, educational facilities, social services, medical centers, and any other places of frequent visitation by populations in the community. STARS users able to define what places are key destinations, but should include consideration of all the above.

Methods: Are the evaluation methods used to assess how objectives and performance measures. They include information about data needs, model inputs and outputs, and other methods for evaluating the objectives.

Objectives: Are the means to achieving the goals. Objectives are quantified through performance measures (see below) and have a target amount of improvement and timeframe in which the objective will be achieved. An example is the Safety & Health objective for Goal 2 is *"Decrease fatalities and injuries for all travel modes."*

Pedestrian: While everyone is a pedestrian, not everyone walks. Walkable/rollable and accessible are used interchangeably as a reminder that a pedestrian network must accommodate all of its users including persons using mobility devices. Consider walking as shorthand for "walking/rolling."[5]

Performance Measures: Are the units of measure; also called measures of effectiveness. Some measures are leading; that is, they are predictive of outcomes (e.g., improved network connectivity is likely to increase active mode share). Others are lagging; that is, they measure outcomes directly (e.g., active mode share measures the result: how many people are walking, bicycling, or taking transit).

Primary Measures: Are the primary performance measures that achieve many objectives. These measures are the "heavy-lifters;" they represent the primary outcomes desired and often address multiple aspects of the Triple Bottom Line. They are: *reduce vehicle miles traveled*, *improvements to number of areas that have reported fatalities and injuries, improve travel time reliability*, and *improve speed consistency*.

Speed consistency: A measure of variation in fuel consumption between key origins and destinations based on speed, braking, and acceleration. Recommended by STC as one of the "Best" measures to show triple bottom line benefits. See pages 8 and 9 for "Best and Worst" measures.

[5] Willamette Pedestrian Coalition, 2011. Getting Around on Foot Action Plan.

Speed efficiency: Is the optimum speed profile that reduces vehicle acceleration and deceleration, which in turn improves fuel efficiency, reduces greenhouse gas (GHG) emissions, and has the added benefit of potentially reducing crashes.

STARS-Plan Design Years: In order to reflect performance in the short, medium and long-term, STARS recommends that projects use three design years: a year between 5-10 years from the start of plan implementation, a year between 20-25 years from the start of plan implementation, and 2050, the year commonly used for state and federal greenhouse gas reduction goals. Of these, a year between 5-10 and a year between 20-25 years are required. The year 2050 is optional.

Strategies: Are actions, programs, or other methods that help users achieve their goals and objectives. For example, in order to meet vehicle mile reduction targets, STARS users may explore using strategies of improved network connectivity or network completeness to aid in people's ability to walk more and drive less.

Targets: Are the quantified goals for performance measures, set by the STARS user and approved by the North American Sustainable Transportation Council (if pursuing certification). An example is the STARS performance measure: *Reduce vehicle miles traveled* and example targets could be reduction of 15% by 2022, 40% by 2032, and 80% by 2050.

Transportation-disadvantaged: Elderly, youth, people without cars, people experiencing poverty, people of color, people who experience language barriers, and people with disabilities often have constrained travel choices.

Vulnerable Users: Users who are injured or killed in greater proportion than the rest of the population. They may be vulnerable because of the mode they are using (e.g., bicycling) or because of their demographic characteristics (e.g. the elderly).

"STARS Plan has provided the RTC with a comprehensive view of what is involved in constructing and evaluating a sustainable transportation plan, and helped to communicate this information to the public and decision makers. Also, we expect the strong multimodal focus within the context of sustainable outcomes to advance the community conversation about transportation from a mode specific discussion to one focused on specific outcomes."

- Grace Blakeslee,
Santa Cruz Regional Transportation Commission, California

Chapter 2: The STARS Framework
Credit Categories, Goals, Objectives, and Measures

Photo: Michael @ NW Lens

Photo: Kelly Rodgers

Credit Category
Integrated Process

Integrated Process is a credit that establishes the foundation upon which the other credits are developed. Without undertaking the steps outlined in Integrated Process, STARS-Plan users will not be able to complete the remainder of the STARS credits.

Since Integrated Process is a procedural credit, it does not have a set of goals, objectives, and measures associated with it. Instead, Integrated Process requires users to undertake a series of actions.

Integrated Process	
Action	
IP Action 1 **Interdisciplinary Project Team**	Develop an interdisciplinary team; early engagement with full team
IP Action 2 **Acquire Baseline Data**	Collect data sources related to goals, objectives, and measures
IP Action 3 **Community Engagement**	Engage with community through committees, surveys, and other outreach efforts
IP Action 4 **Sustainability Education**	Educate project team and stakeholders about sustainability and equity
IP Action 5 **Backcast to Set Targets**	Use a backcasting process to establish targets for objectives

Table 1: Integrated Process Summary

Integrated Process Action 1: Interdisciplinary Project Team

Sustainability issues are more likely to be integrated effectively into a plan when members of the project team have expertise in the various issue areas. Users must assemble an interdisciplinary team so that a diversity of issues are addressed, and early in the project. STARS recommends an integrated kick-off meeting will all team members present.

Methods and Data

In addition to the typical project team members, consider including members with expertise in:

- Ecology
- Landscape architecture
- Public health
- Public involvement with transportation-disadvantaged populations
- Bicycle and pedestrian safety

Integrated Process Action 2: Acquire Baseline Data

STARS users must ensure they have the data needed to evaluate the projected performance of plan alternatives. Data availability and quality varies tremendously between agencies. STARS-Plan recognizes this by requiring the use of the best available data. Given the significant impact of the recent economic downturn on travel behavior, data should be fresh (since 2008) or adjusted to reflect current travel volumes and patterns. The following describe the data needs for the credits. Further information about data is described under the relevant credits.

User survey

Understanding the way people use, and want to use, the transportation system, is critical to developing a responsive plan. At the outset of the planning effort, STARS-Plan requires a substantive effort toward a statistically significant survey of system users. A similar survey should be used in the medium- and long-term STARS-Plan Design Years to ascertain how users perceive progress toward plan goals. For details about what should be included in the user survey, see IP Action 2, Community Engagement, below.

Transportation-disadvantaged populations

Because a substantial proportion of the population do not have regular, affordable access to a private vehicle, it is important to have basic information on the needs of transportation-disadvantaged people when deciding how to best distribute the benefits and burdens of transportation projects and programs. STARS-Plan requires identifying who is choice constrained, where they travel to and from and what their priorities are (see "User Survey," above). STARS-Plan requires that responses from transportation-disadvantaged people are equal to or greater than their proportion of the plan area population.

> For the purposes of STARS, "'Equity' means all people have full and equal access to opportunities that enable them to attain their full potential."[1]

When planning for future STARS design years, consider the population trends for transportation-disadvantaged groups, which may be different than those of the general population.

Transportation-disadvantaged populations include:

- People who do not own a car
- People of color
- People experiencing poverty

- People with disabilities
- People experiencing language barriers
- Elderly
- Youth

Mode share
Mode share is the percentage of trips taken by each mode, based on a geographic area (e.g. Transportation Analysis Zone).

Vehicle miles traveled
Vehicle Miles Traveled (VMT) is a key measure of economic, environmental and community health. VMT is a fundamental indicator of the effectiveness of transportation and land use policies and practices. Collect data by the smallest available geographic area.

Multimodal travel time
STARS-Plan recommends acquiring mean travel time data for all modes (walk, bicycle, transit, freight, carpool/vanpool, drive alone), between key origins and key destinations.

Travel time reliability
Travel time reliability is a basic consideration when people choose whether and how to travel. STARS-Plan recommends acquiring data for all modes (walk, bicycle, transit, freight, carpool/vanpool, drive alone), between key origins and key destinations. Reliability measures the variability of trip times, including the impact of non-recurring congestion resulting from crashes and weather.

Speed consistency and speed efficiency
Speed consistency measures the variability of trip speeds: reducing braking and acceleration can improve safety and reduce fuel consumption. Speed efficiency is the optimum speed profile that reduces braking and acceleration, which reduces fuel consumption and greenhouse gas (GHG) emissions, and has the added benefit of potentially reducing crashes and improving travel time reliability.

Fatalities and injuries
Establish fatality and injuries rates and locations, by mode.

Criteria pollutants
Collect data for criteria pollutants.

Public, private, and social costs and benefits
The STARS Cost Effectiveness credit requires an evaluation of public, private, and social costs and benefits of the life cycle of the plan. Benefits and costs of plan alternatives will be acquired in subsequent credits.

Pavement index, routine maintenance costs, deferred costs (streets); asset age, service call schedule (transit)
These data areas are required for the Cost Effectiveness credit.

Sensitive lands
STARS-Plan recommends identifying local, state, and federally defined sensitive areas.

Stormwater volumes, flow, and water quality
STARS recommends that users collect baseline information about stormwater volumes, flow, and water quality.

Tree canopy
STARS-Plan recommends that users calculate tree canopy coverage in the rights-of-way

Integrated Process Action 3: Community Engagement

Another part of Integrated Process is ensuring that a diverse group of stakeholders provide input into the goals and objectives for the plan and provide comments on the alternatives. These objectives can be accomplished through a variety of outreach and engagement strategies. The particular strategy will depend on the needs of the community.

Methods and Data
Because different groups have different transportation needs, it is important to have basic information on transportation-disadvantage people when deciding how best reduce disparities in the transportation system. STARS requires identifying who is transportation-disadvantaged, where they travel to and from and what their priorities are (see "User Survey" below).

Below are two ways that STARS recommends engaging with the community, although the particular outreach strategy will depend on the needs of the community:

Community Stakeholder Committee
STARS-Plan recommends forming a diverse, interdisciplinary and ongoing Plan Stakeholder Committee (PSC). This stakeholder group should include, among others, technical staff, local interest groups, user groups, representatives from each transportation-disadvantaged group and neighborhood representatives. Elected officials are encouraged to serve as ex-officio members of the PSC to hear from, and interact with, other members. Ideally, the PSC should to be engaged in all stages of the plan, including providing recommendations at key decision points. However, the particular form of engagement may differ depending on the needs of the community.

Surveys
STARS-Plan recommends conducting ongoing outreach through mailed and digital surveys to gain community feedback, first near the planning process begins, secondly during plan alternative development, and finally at the analysis and selection stages. If the outreach performed is extensive, this may substitute for having a Plan Stakeholder Committee. STARS users may consider interviews with certain community members, particularly those who do not typically join committees. Representatives from transportation-disadvantaged communities may especially benefit from one-on-one conversations.

Surveys should include the information below.

The User Survey should address:

Respondent information

- Where does respondent live?
- What are respondent's demographic characteristics, including age, race and ethnicity, gender, physical ability, languages spoken, income, educational attainment, and household characteristics?

Access Needs

- Where are respondent's trip origins and key or frequent destinations, both current and desired?
    - For work? For basic daily needs?
    - What destinations are inaccessible?
- What are respondent's modes of travel, both current and desired?
    - How long does it take?
    - Is it reliable?
    - How much does it cost?
    - What route does respondent travel?
    - How would respondent prefer to travel, ideally?

Barriers to Access

- What barriers and opportunities to access (physical, financial, safety, time, reliability, lack of information, etc.) does the respondent experience?
- What are respondent's perceptions of safety, by mode, by time of day, by and location?

Equity

- How have transportation investments positively or negatively impacted the respondent or respondent's community, or have investments had no impact? Are there accumulated impacts?

Suggestions and Feedback

- What goals and priorities does the respondent want the plan to achieve in terms of access to destinations and services, types of modes for traveling, economic benefits, and the environmental improvements?
- What suggestions does the respondent have for projects and programs to be considered?

Outreach Methods

- What are the best options for the respondent to continue to participate in developing the project?

Integrated Process Action 4: Sustainability Education

A key part of Integrated Process is ensuring that a diverse group of stakeholders have the opportunity to learn about sustainability and how it applies to transportation.

> "Sustainability is a community value in Eugene, as is resiliency against changes in climate and higher fuel prices. It is important, then, that our new transportation plan be truly effective in these endeavors. STARS-Plan provides a well-reasoned framework for this purpose."
>
> *-Kurt Yeiter, City of Eugene, Oregon*

Educate the project team, stakeholders, and perhaps the wider community on sustainability and how sustainability applies to transportation plans. This important step helps get people "on the same page" regarding the vision and outcomes for the plan. STARS-Plan recommends that a core group of the Plan Stakeholder Committee (see below), project staff, and decision-makers participate in a sustainability workshop to learn how sustainability principles can be applied to transportation plans, and the basic elements of STARS-Plan. Plan staff may also want to incorporate sustainability education into materials provided to the general public.

Methods and Data

Integrating sustainability and equity into the plan process may be accomplished through a workshop at the outset of the process (recommended) or as a series of dedicated meetings throughout the process. The STC will provide materials to be used for the workshop.

Integrated Process Action 5: Backcast to Set Targets

Backcasting is a powerful tool to establish goals, objectives, and measures. Recommended by The Natural Step, backcasting is used by STARS-Plan to answer the question "What outcomes do we want from our transportation system in future years?" STARS-Plan requires the project management team and/or the Plan Stakeholder Committee to use backcasting to establish at least one goal and measureable objective for the primary performance measures: *reduce VMT*, *improvements to number of areas that have reported fatalities and injuries*, *improve travel time reliability*, and *improve speed consistency*.

Methods and Data

First, establish which credits, goals, and objectives to pursue. Then, determine what baseline data is available and collect missing data, if necessary. Establish targets for each of the STARS design years, using existing policy guidance if available.

Case Study: Transportation System Plan for Eugene, Oregon

The City of Eugene is studying its current transportation system and how it could change to better meet the long-term needs of Eugene's residents, businesses, and visitors. The result of this study will be a Transportation System Plan that will include all transportation modes, including freight, pedestrian and bicyclists, personal vehicles, transit, rail networks, airport, and pipelines. The Transportation System Plan will then be included in the city's comprehensive plan (Envision Eugene) as the section dedicated to transportation issues. The plan will look at ways to maintain the extensive infrastructure invested extensive in their street and sidewalk/shared path networks and continue to improve the efficiency of their street network.

Early in the planning process, The City of Eugene recruited a diverse stakeholder group, the Transportation Community Resource Group (TCRG), to review, evaluate, discuss and comment on project information throughout the project. The TCRG will develop recommendations for the project management team and, ultimately, City Council consideration.

Photo: CH2MHill

The City of Eugene hosted two sustainability workshops that were consistent with the STARS-Plan Integrated Process Action 2. The first workshop with city staff and other agency partners; the second workshop included participants from the TCRG. In both cases, participants discussed sustainability frameworks that applied to transportation projects, learned how the Triple Bottom Line influenced STARS, and provided feedback on appropriate goals and objectives for the plan.

Photo: Ryan Snyder

Credit Category
Access & Mobility

STARS is designed to support the creation and use of a balanced and efficient transportation system. This means that, over time, roughly the same number of trips would be taken by each of the major modes (walking, bicycling, bus and rail transit, carpool and vanpool, and driving alone).

Because, in most parts of North America, driving alone dominates the other modes and leads to an unbalanced transportation system, the STARS Access & Mobility goals are designed to reward improvements to, and use of, non-drive alone modes equal to or greater than improvements to driving alone. In most cases numerous capital and programmatic improvements over many years will be required to achieve a balanced transportation system.

1. Increase people's ability to meet most of their daily needs without having to drive	
Objective	Measure
To improve safe, attractive, and affordable access to work, school, goods, and other key destinations by walking, bicycling, and transit	% of population within a x-minute walk, bike, or transit trip of key destinations VMT
2. Improve the convenience and quality of walk, bicycle, transit, car/vanpool, and freight trips	
Objective	Measure
A. To improve travel time reliability and speed consistency between key origins and destinations for transit, car/vanpool trips, and freight trips	Travel time reliability
	Speed consistency
B. To improve travel time and/or reliability for pedestrian and bicycle trips between key origins and destinations	Travel time
	Travel time reliability
C. To improve the quality of walk, bicycle, car/vanpool, and transit trips	MMLOS grade
	Address user survey

Table 2: Access & Mobility Credit Summary

Access & Mobility Goal 1

Increase people's ability to meet most of their daily needs without having to drive	
Objective	**Measure**
To improve safe, attractive, and affordable access to key destinations by walking, bicycling, and transit	% of population within a x-minute walk, bike, or transit trip of key destinations
	VMT

***Surrogate Measure**: If VMT is not available, mode share and route directness could substitute.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Objective		
% of population within a x-minute walk, bike, or transit trip of key destinations	5- 10	
	20 - 25	
	Year 2050	
VMT	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Photo: Dan Burden

Discussion
The first measure, *% of population within a x-minute walk, bike, or transit trip of key destinations*, reflects how well the community meets the concept of the "20-minute neighborhood," a term used by Portland's Bureau of Planning and Sustainability[6] and also discussed at the City of Eugene. The 20-minute neighborhood is a neighborhood where residents are able to meet their daily needs within a 20-minute walk of their home.

[6] Portland Bureau of Planning and Sustainability's 20-minute neighborhood map

Twenty minutes was picked as a reasonable distance that people would be willing to travel, and approximates a ½ mile walking distance. Creating a 20-minute (more or less) neighborhood requires mixed-use development such that residences live near the services they need and a well-connected transportation network. STARS users may choose a different timeframe, such as a five-minute or 30-minute neighborhood, and may also choose what percentage of the population lives within this neighborhood boundary. In both cases, users must justify their decisions using the Triple Bottom Line criteria.

The second measure, reducing vehicle miles traveled, is one of the most important goals for a community to achieve. Reducing VMT can produce numerous economic, environmental and social benefits, including:

- Keeping money in the local economy by reducing fuel expenditures for system users as they need to drive less;
- Improving health by increasing physical activity through more walk, bike and transit trips;
- Reducing climate pollution and improving air quality;
- Supporting a better mix of nearby jobs, housing, schools, parks and shopping.

VMT measures a reduction in driving, and embedded in it are several factors: it means people are using a different mode/taking fewer driving trips, are not taking the trip, and that they are taking shorter trips (presumably largely because of the proximity of attractive destinations). Restated as measures, it represents a shift in *mode share* and improved *route directness*, and *improved proximity* to destinations. (Embedded in mode share is the quality of the network – a result of improved network quality is an increase of mode share). It could be one of those factors, or a combination of all three. A problem with VMT is that if it is a reflection of only one of those factors, it may not necessarily represent improved access. VMT also has a number of assumptions built into it, from a modeling perspective.

> "The STARS framework will provide the strategic tools to rethink how we design, build and operate transportation projects. The challenges inherent in addressing climate change, improving access and economic goals are huge, but if we succeed – the rewards are even greater."
>
> *-George Dondero*
> *Santa Cruz County Regional Transportation Commission*

If VMT data are not available, agencies can use mode share plus route directness. Active mode share is a lagging indicator that measures an outcome; that is, the actual number of people walking, bicycling, and taking transit (versus a measurement of the conditions that encourage walking). Mode share can be difficult to model.

Route directness measures a trip as the crow flies versus the actual route available to reach the destination. This measure accounts not only for network connectivity, but also connectivity as it relates to destinations.

Access & Mobility Goal 2

Improve the convenience and quality of walk, bicycle, transit, and car/vanpool trips	
Objective	Measure
A. To improve travel time reliability and speed consistency between key origins and destinations for transit, car/vanpool trips, and freight trips	Travel time reliability
	Speed consistency
B. To improve travel time and/or reliability for pedestrian and bicycle trips between key origins and destinations	Travel time
	Travel time reliability
C. To improve the quality of walk, bicycle, car/vanpool, and transit trips	MMLOS grade
	Address user survey

***Surrogate Measure**: For objective A, if data does not exist for reliability, measures for incidents or non-recurring congestion (clearance time, incident response time) may substitute. If speed consistency data are not available, person-hours of delay may substitute.*

Caltrans' Performance Measures for Rural Transportation Systems indicate that most agencies will have a Travel Demand Model that will account for travel times, speeds, and delay. Note that this will be further developed in Phase 2 of STARS-Plan.

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Objective A		
Travel time reliability	5- 10	
	20 - 25	
	Year 2050	
Speed consistency	5- 10	
	20 - 25	
	Year 2050	
Objective B		
Travel time	5- 10	
	20 - 25	
	Year 2050	
Travel time reliability	5- 10	
	20 - 25	
	Year 2050	
Objective C		
Multimodal Level-of-Service (MMLOS)	5- 10	
	20 - 25	
	Year 2050	
Address user survey	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
Travel time and travel time reliability are two measures that reflect improved convenience of trips. From the Caltrans' *Smart Mobility* report, multimodal travel reliability is described as "predictability of travel time for users of all modes, allowing for routine differences based on time and day." Speed consistency is the consistent speed of the trip (fewer starts and stops).

Photo: Charlie Zegeer

Regarding reliability and speed consistency (objectives A and B), objectives and forecasts should recognize and evaluate that non-recurring congestion often creates as much or more delay than recurring congestion and can often be reduced more quickly and more cost effectively than recurring congestion, significantly improving trip reliability and speed consistency. For more information, see Chapter 3: Strategies and Resources (TBD).

Network Quality
A number of factors can influence the quality of the network, including the presence of sidewalks, street trees, benches, and lighting (objective C). The 2010 Highway Capacity Manual has updated level-of-service inputs for multiple modes (see Table 3 below). While these multimodal level-of-service (MMLOS) factors are improved over past years, they do not fully encompass the factors that produce a sense of comfort and safety for pedestrians and bicyclists. Other methods may substitute.

Bicycle Level of Service	Pedestrian Level of Service
ADT – Traffic volume	ADT – Traffic volume
Directional, Peak-to-Daily, and Peak Hour Factors	Directional, Peak-to-Daily, and Peak Hour Factors
Number of through lanes	Number of through lanes
Speed limit	Traffic speed
Percentage of traffic that is heavy vehicles	Buffer width
Surface conditioning rating	Sidewalk width
Width of outside lane	Width of outside lane
On-street parking permitted, percentage occupied	On-street parking permitted, percentage occupied
Pavement width to the right of the outside lane stripe	Pavement width to the right of the outside lane stripe
Parking width (to right of bike lane)	Existence and spacing of street trees

Table 3: Multimodal LOS factors

Note that MMLOS includes speed for both bicycle and pedestrian inputs. Speed is a critical issue for a sense of comfort, but also for safety, which is addressed in the Safety & Health credit below.

Another way to approach improving the quality of the transportation network is to ask the users where they feel improvements are needed. Integrated Process requires a user survey, where users describe what access barriers they face, where they feel unsafe, or make suggestions for improvements. STARS users must document how they have addressed concerns in the survey.

Photo: Kelly Rodgers

Credit Category
Safety & Health

In the U.S. in 2009, nearly 34,000 people were killed and over 2.2 million people were injured as a result of traffic crashes. Of those killed, over 4,000 were walking and 630 were riding a bicycle. Of those injured, 59,000 were walking and 51,000 were riding a bicycle.[7] Traffic crash injuries can result in severe and/or permanent health damage, affecting quality of life and at a great cost to individuals and societies; the cost of crashes in the U.S. is about $164 billion per year.[8]

The transportation system affects health every day. A transportation system that supports active transportation modes, such as walking, biking, and taking public transportation, provides many health benefits for individuals and for communities. Auto-oriented transportation systems are associated with low physical activity rates; physical inactivity costs the U.S. up to $76 billion a year.[9] In contrast, increasing rates of walking, biking, and public transportation use result in lower rates of chronic disease (including cancer, diabetes, stroke, and heart disease) and mortality.[10] In addition, as bicycle and pedestrian trips increase, bicyclists and pedestrians are less likely to be involved in collisions with motor vehicles.[11]

Nationwide, the costs of health impacts from transportation-related air pollutants "is between $40 billion and $64 billion a year."[12] The transportation system also impacts health through exposure to noise and stress, changes in accessibility of food, jobs, school, and other key destinations, and changes in the portion of household budgets spent on transportation and housing.

[7] National Highway Traffic Safety Administration statistics, 2010.
[8] American Public Health Association. (2009). *At the Intersection of Public Health and Transportation*. Washington, DC: American Public Health Association.
[9] American Public Health Association. (2009). *At the Intersection of Public Health and Transportation*. Washington, DC: American Public Health Association.
[10] Lee, V., Mikkelsen, L., Srikantharajah, J., Cohen, L. (2008). *Strategies for Enhancing the Built Environment to Support Health Eating and Active Living*. Oakland, CA: Prevention Institute.
[11] Jacobsen, P.L. (2003). Safety in numbers: More walkers and bicyclists, safer walking and bicycling. *Injury Prevention,* 9, 205--209.
[12] American Public Health Association. (2009). *At the Intersection of Public Health and Transportation*. Washington, DC: American Public Health Association.

1. Improve multimodal safety, especially for the most vulnerable users	
Objective	Measure
To decrease fatalities and injuries for all travel modes. Pedestrian and bicyclists fatalities and injuries will not be higher than their proportion of trips.	Prioritized funding for improvements to areas that have reported fatalities and injuries
2. Improve healthy by increasing physical activity by people using the transportation system	
Objective	Measure
To increase the percentage of walk, bicycle, and transit trips	Mode share
3. Improve air quality	
Objective	Measure
To decrease the quantities of harmful airborne pollutants	Criteria pollutants

Table 4: Safety & Health Credit Summary

Safety & Health Goal 1

Improve multimodal safety, especially for the most vulnerable users	
Objective	Measure
To decrease fatalities and injuries for all travel modes. Pedestrian and bicyclists fatalities and injuries will not be higher than their proportion of trips.	Prioritized funding to areas that have reported fatalities and injuries

***Surrogate Measure**: In the event that fatality and injury data are not available, crash rate data may substitute.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Improvements to number of areas that have reported fatalities and injuries	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Photo: Dan Burden

Discussion
Travel demand models cannot readily predict fatalities and injuries; they are derived from modeling crashes. As such, the STARS measure requires users to make improvements to areas where fatalities and injuries have been reported. Users will determine what type of safety improvements should be made, with community input.

One concern about using this measure is that pedestrian and bicycle injuries are often under-reported, leading to an inaccurate picture of actual safety conditions. Crash data is more readily available, although tends to favor reporting of automobile collisions rather than pedestrian and bicycle crashes. We encourage jurisdictions to increase reporting of bike and pedestrian crashes and injuries.

Speed

Another key issue to improve safety is speed suitability; that is, that streets are designed and speeds are set to maximize multimodal safety and are consistent with the surrounding neighborhood character. In fact, speed is a significant enough factor in safety and perceived safety that STARS users may wish to set an additional goal and objective for reducing vehicle speeds on certain multimodal facilities.

Two considerations for speed suitability are designing streets to their posted speed and setting a design speed that is consistent with neighborhood character – both of which should maximize multimodal safety. They are but address slightly different concerns and are measured differently. The first is making sure that streets are not overbuilt: an example is a street that is designed to handle traffic flow of 55 mph but the posted speed is 35 mph. In this situation, it is likely that speeding will be a problem. See

Figure 8 for an illustration.

Fatalities and injuries clearly impact the "people" part of the triple bottom line. A recent study has demonstrated that fatalities and injuries have an economic impact as well:

"Multiplying the total numbers of reported fatalities and injuries by the estimated costs of a fatality and an injury, the total crash costs in the urbanized (area) … is $299.5 billion. That figure is over three times the cost of congestion for the same year ($97.7 billion) reported in the Texas Transportation Institute's (TTI) annual *Urban Mobility Report*."

- Crashes vs. Congestion: What's the Cost to Society?[12]

The second issue, setting a design speed consistent with neighborhood character, is deciding if the design speed is appropriate for the land uses, goals for and character of the area. Is it appropriate to have a street designed for 35 mph when the surrounding land use includes residential development and schools and there is a goal of increasing walking and bicycling?

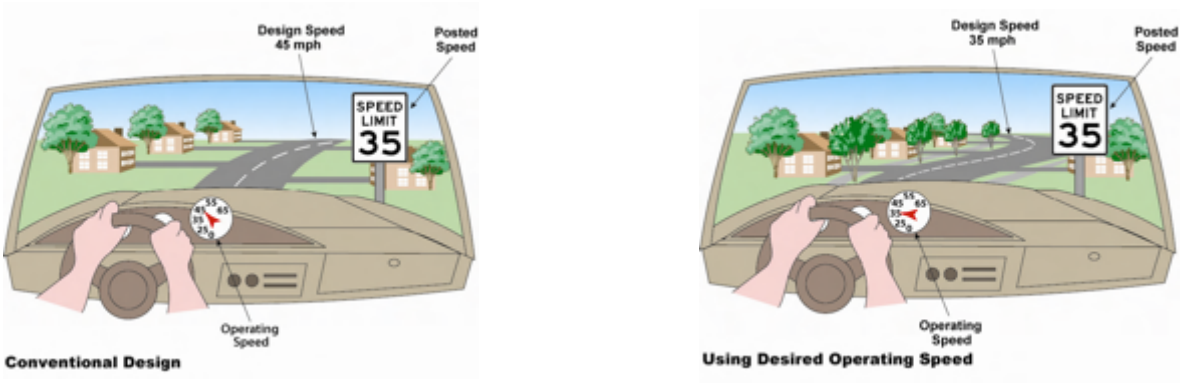


Figure 8: Posted speed, design speed, and operating speed

Source: The Smart Transportation Guidebook

[13] Cambridge Systematics (2011) for AAA. *Crashes vs. Congestion: What's the Cost to Society?*

On this second issue, Caltrans' *Smart Mobility* report challenges the use of "design speed:"

> Smart Mobility strongly suggests altering the conventional use of "design speed" as a means of determining acceptable design features for highways and conventional roadways. Design speed is normally determined almost entirely based on facility type, with deviations permitted only in response to the most extreme alignment constraints. A concept more in keeping with Smart Mobility principles is "speed suitability", which involves:
>
> - Determining a context-sensitive target speed for a new facility or a redesign, taking into consideration the adjoining activities, land use and place type and the multi-modal users of the facility, and
> - Designing the facility to enforce the target speed through physical design features and speed management techniques such as signal coordination.

Most agencies will at least have data on posted speed and average speed, using Caltrans' *Performance Measures for Rural Transportation Systems* guidebook as an indication of data availability.

Safety & Health Goal 2

Improve health by increasing physical activity by people using the transportation system	
Objective	Measure
To increase the percentage of walk, bicycle, and transit trips	Mode share

***Surrogate Measure**: VMT could be used as a surrogate measure if mode share data is not available.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Mode share	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
Active mode share is a lagging indicator that measures an outcome; that is, the actual number of people walking, bicycling, and taking transit (versus a measurement of the conditions that encourage walking). Mode share can be difficult to model. Vehicle miles traveled (VMT) is a similar measure, demonstrating a change from driving to taking other modes (or the trip not taken).

Photo: Dan Burden

Safety & Health Goal 3

Improve air quality	
Objective	Measure
To decrease the quantities of harmful airborne pollutants	Criteria pollutants

***Surrogate Measure**: If criteria pollutant data are not available, vehicle miles traveled and speed consistency (vehicle flow) could substitute since they are contributing factors to air quality conditions.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Criteria pollutants	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
This measure is adapted from the *Smart Mobility* report.

Photo: Dan Burden

Credit Category
Equity

Historically, some transportation investments have unfairly negatively impacted some groups, particularly low-income and minority populations, such as the construction and expansion of freeways through low-income and minority neighborhoods. At the same time, the benefits of transportation investments have not been fairly distributed among all populations, with the majority of transportation funding benefiting those who can afford to purchase and operate private vehicles. Generally, transportation projects have focused on improving travel time and safety for motorists with little regard to other users, although 9% of American households do not have access to a vehicle.[14] People experiencing poverty or language barriers, people of color, older adults, youth, and people with disabilities tend to experience a disproportionately small share of benefits from transportation investments. These groups are overrepresented in households without access to a vehicle. Other elements of the transportation system, such as lack of ADA compliance or safe street crossings also create extra barriers that may prevent these groups from experiencing the full benefit of transportation investments.

For the purposes of this credit, "'Equity' means all people have full and equal access to opportunities that enable them to attain their full potential."[15]

This credit ensures that transportation plans are designed to reduce disparities for transportation-disadvantaged populations and do not negatively impact those populations disproportionately. The objectives include an evaluation of Access & Mobility, Safety & Health, and Economic Benefit across population groups.

[14] 2010 American Community Survey 1 year estimates.
[15] King County, Washington. Ordinance 2010-0509.

1. Reduce disparities in healthy, safe access to key destinations for transportation-disadvantaged populations	
Objective	Measure
Demonstrate that planned investments reduce disparities in access, safety, health, and economic benefit between transportation-disadvantaged and non-transportation-disadvantaged populations	Percentage of plan spending on projects and programs in areas of key origins and destinations for transportation-disadvantaged populations
2. Demonstrate that planned investments do not disproportionately impact transportation-disadvantaged populations	
Objective	Measure
Demonstrate that transportation investments do not disproportionately impact transportation-disadvantaged populations from the construction or operation of the project	Transportation-related criteria pollutants
	Travel time reliability
	Traffic noise exposure

Table 5: Equity Credit Summary

Equity Goal 1

Reduce disparities in healthy, safe access to key destinations for transportation-disadvantaged populations	
Objective	**Measure**
Demonstrate that planned investments reduce disparities in access, safety, health, and economic benefit between transportation-disadvantaged and non-transportation-disadvantaged populations	Percentage of plan spending of projects and programs in areas of key origins and destinations for transportation-disadvantaged populations

***Surrogate Measure**: None.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Locations of projects and programs in areas of key origins and destinations for transportation-disadvantaged populations.	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
For Plan, users must demonstrate that the project list reduces disparity. (In STARS-Project, the objective is to ensure equitable benefits of access, safety, health, and economic benefit of the project). Demonstrating a reduction in disparity is by shown by selecting projects and programs in areas where transportation-disadvantaged populations live, work, shop, and other areas (i.e., key origins and destinations).

Photo: Trailnet

Equity Goal 2

Demonstrate that planned investments do not disproportionately impact transportation-disadvantaged populations	
Objective	Measure
Demonstrate that transportation investments do not disproportionately impact transportation-disadvantaged populations from the construction or operation of the project	Transportation-related criteria pollutants
	Travel time reliability
	Traffic noise exposure

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Transportation-related criteria pollutants	5- 10	
	20 - 25	
	Year 2050	
Travel time reliability	5- 10	
	20 - 25	
	Year 2050	
Traffic noise exposure	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
As required under the Integrated Process credit, STARS users will need to identify transportation-disadvantaged populations in the plan so they can identity how transportation investments affect them.

Travel time reliability should be calculated for multiple modes, and especially for transportation-disadvantaged populations.

Note that one area of impact that has historically been borne upon transportation-disadvantaged populations is poor air quality resulting from the operations of transportation systems. This issue is addressed under Safety & Health Goal 3.

Photo: Kelly Rodgers

Credit Category
Economic Benefit

1. Re-invest in the local economy	
Objective	Measure
To reduce expenses from fuel consumption and related vehicle use	VMT/ dollars
	Speed consistency
2. Improve economic access	
Objective	Measure
To provide practical and convenient access to employment centers by multiple modes	% of population within a 30-minute trip, by mode
3. Improve travel time reliability and speed consistency for high-value trips	
Objective	Measure
To improve travel time reliability and speed consistency for freight between representative origins and destinations	Travel time reliability
	Speed consistency

Table 6: Economic Benefit Credit Summary

Economic Benefit Goal 1

Re-invest in the local economy	
Objective	Measure
To reduce expenses from fuel consumption and related vehicle use	VMT/ dollars
	Speed consistency

***Surrogate Measure**: If speed consistency data are not available, person-hours of delay may substitute.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
VMT	5- 10	
	20 - 25	
	Year 2050	
Speed consistency	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.


Photo: Dan Burden

Discussion
Local economies benefit from less driving as money that would have been spent on fuel is available for other investment in the local economy. In addition, there is a financial benefit to the individual, who has more money to spend (or save) by not spending it on fuel and other vehicle-related expenses. Reducing fuel consumption is a result of reduced vehicle miles traveled and increased speed consistency (optimized vehicle flow).

Reducing vehicle miles traveled is one of the most important goals for a community to achieve. Reducing VMT can produce numerous economic, environmental and social benefits, including:

- Keeping money in the local economy by reducing fuel expenditures for system users as they need to drive less;
- Improving health by increasing physical activity through more walk, bike and transit trips;
- Reducing climate pollution and improving air quality;
- Supporting a better mix of nearby jobs, housing, schools, parks and shopping (sometimes described as "20 minute neighborhoods").

A vehicle miles reduction will translate to dollars re-invested in the local community (the "Green Dividend"). When Phase 2 of STARS-Plan is developed, the methodology for the green dividend will be applied so that STARS users can provide a VMT reduction measure and associated dollar amount.[16]

[16] The Green Dividend report is available from the CEOs for Cities website: http://www.ceosforcities.org/work/portlands_green_dividend

Economic Benefit Goal 2

Improve economic access	
Objective	Measure
To provide practical and convenient access to employment centers by multiple modes	% of population within a 30-minute trip, by mode

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
% of population within a 30-minute trip, by mode	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
This goal addresses how accessible employment centers are to the workforce by different modes of transportation.

Economic Benefit Goal 3

Improve travel time reliability and speed consistency for high-value trips	
Objective	Measure
To improve travel time reliability and speed consistency for freight between representative origins and destinations	Travel time reliability
	Speed consistency

Surrogate Measure: *If data does not exist for reliability, measures for incidents or non-recurring congestion (clearance time, incident response time) may substitute. If speed consistency data are not available, person-hours of delay may substitute.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Travel time reliability	5- 10	
	20 - 25	
	Year 2050	
Speed consistency	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Caltrans' *Performance Measures for Rural Transportation Systems* indicate that most agencies will have a Travel Demand Model that will account for travel times, speeds, and delay. Note that methods will be further developed in Phase 2 of STARS-Plan.

Discussion
From the *Smart Mobility* report, multimodal travel reliability is described as "predictability of travel time for users of all modes, allowing for routine differences based on time and day." Speed consistency is the consistent speed of the trip (fewer starts and stops). This objective includes reliability and consistency for freight.

Photo: Kelly Rodgers

Credit Category
Cost Effectiveness

STARS objectives reflect the overarching perspective that providing people attractive, affordable and more efficient travel by modes (e.g., transit, bicycle, walking) as options to driving alone is desired. These objectives can potentially be achieved in various ways, some of which would be more efficient than others. Thus, the purpose of this cost-effectiveness analysis credit is to encourage applicants to achieve the requirements of the credits *cost effectively* (i.e., so that the cost per unit of benefit for the proposed transportation investment is low relative to that cost for alternative transportation investments). Since the desired performance outputs of a transportation investment are measured as part of other credits, the technical focus of this credit is on *cost*: how it is defined, measured, and incorporated into a cost-effectiveness analysis credit.

Fundamental to the STARS philosophy and objectives is the belief that people making transportation investment decisions (1) should understand that current methods for evaluating and selecting transportation projects and program sometimes fail to consider well or entirely some important impacts of those projects, both positive ones (benefits) and negative ones (costs), and (2) should make better attempts to identify, measure, and consider those impacts.

It should be noted that getting the best regional transportation system of facilities and programs is *not a cost-minimization problem*; it is an optimization problem that requires balancing user benefits against user costs. In making choices about behavior, and about the purchase and consumption of goods and services, people are rarely trying to minimize cost—they are trying to optimize value (the best mix of benefit and cost).

1. Optimize benefits over the life-cycle of the project	
Objective	Measure
To optimize benefits relative to public, private, and social costs over the plan's time horizon	Compare benefits (e.g., reduced VMT, improve speed consistency) to costs
2. To prioritize the enhancement and maintenance of the existing system over system expansion	
Objective	Measure
A. Street network: 1. To maintain pavement condition on roadways to 75%	Pavement condition
2. Demonstrate cost of routine maintenance to useful life vs. cost of deferred maintenance	Routine costs Deferred maintenance costs

B. Transit: 1. To maintain average asset age no more than 50% of the useful life	Average asset age
2. To maintain average distance between service calls of 8,000 miles	Service calls

Table 7: Cost Effectiveness Credit Summary

Cost Effectiveness Goal 1

1. Optimize benefits over the life-cycle of the project	
Objective	Measure
To optimize benefits relative to public, private, and social costs over the plan's time horizon	Compare benefits (e.g., reduced VMT, improve speed consistency) to costs

Surrogate measure: *Agencies should collect as much of the data listed below as possible.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
This goal is adapted from STARS-Project's Cost Effectiveness Evaluation. In Phase 2 of STARS-Plan, the methodology will be adapted to transportation plans. For reference, the STARS-Project Cost Effectiveness Evaluation includes the following in its requirements:

1. Create the cost denominator for measures of cost effectiveness. For STARS the cost denominator has three components: (1) monetary life-cycle costs for the public sector (planning, design, construction, operation, maintenance, preservation, decommissioning), (2) out-of-pocket private costs for use of the facility (primarily vehicle, fuel, maintenance, and insurance for cars, trucks, and bikes, and fares for transit), and (3) the estimated monetized cost of changes in carbon dioxide (CO_2).

2. Import the Access and Carbon numerators from work done on the STARS credits. The guidance for the Access & Mobility, Safety & Health, and Climate Pollution & Energy Use credits describe how to create the performance measures for these topics that can serve as the numerators of the cost-effectiveness measures.

3. Create the cost-effectiveness measures. Use the data from steps 1 and 2.

Cost Effectiveness Goal 2

To prioritize the enhancement and maintenance of the existing system over system expansion	
Objective	Measure
A. Street network: 1. To maintain pavement condition on roadways to 75%	Pavement condition
2. Demonstrate cost of routine maintenance to useful life vs. cost of deferred maintenance	Routine costs Deferred maintenance costs
B. Transit: 1. To maintain average asset age no more than 50% of the useful life	Average asset age
2. To maintain average distance between service calls of 8,000 miles	Service calls

***Surrogate Measure**: Caltrans' Performance Measures for Rural Transportation Systems guidebook indicates that a pavement management system or pavement condition index is data most agencies will have. SCCRTC indicates that they have the following relevant data: Maintenance Backlog and Pavement Management Index.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Pavement condition (streets)	5- 10	
	20 - 25	
	Year 2050	
Routine costs vs. deferred maintenance costs (streets)	5- 10	
	20 - 25	
	Year 2050	
Average asset age (transit)	5- 10	
	20 - 25	
	Year 2050	
Service calls (transit)	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
This goal should address the on-going need to keep the existing system in good condition. Maintenance backlogs and pavement management address existing system condition.

These objectives are adapted from San Francisco's *Performance Assessment Report*. This report, which assesses progress made on their Transportation System Plan, and describes the methodology and data for their asset management measures, and how those measures relate to funding decisions (see page 40 of the document).

Photo: Laura Sandt

Credit Category
Climate & Energy

The STARS-Plan goals and objectives focus on three areas to reduce climate pollution and energy use. They are described in the table below. All of these objectives are important. Although vehicles are becoming more fuel efficient, the *Growing Cooler* report published in 2007 suggests that the benefits of these technological improvements are likely to be offset by growing VMT.[17] Implementing strategies to reduce trip length and the need to rely on vehicles for transport for many trips will be a crucial factor in reducing GHG emissions related to transportation.

Reduce greenhouse gas emissions and fossil fuel consumption	
Objective	Measure
A. To reduce fuel consumption	VMT
B. To improve speed consistency between origins and destinations, by multiple modes	Speed consistency
C. To reduce fossil fuel use for operations	Fuel consumption

Table 8: Climate & Energy Credit Summary

[17] "Growing Cooler: The Evidence of Urban Development and Climate Change," Reid Ewing, et al, 2007.

Climate & Energy Goal

Reduce greenhouse gas emissions and fossil fuel consumption	
Objective	Measure
A. To reduce fuel consumption	VMT
B. To improve speed consistency between origins and destinations, by multiple modes	Speed consistency
C. To reduce fossil fuel use for operations	Fuel consumption

Surrogate Measure: *If speed consistency data are not available, person-hours of delay may substitute.*

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
VMT	5- 10	
	20 - 25	
	Year 2050	
Speed consistency	5- 10	
	20 - 25	
	Year 2050	
Fuel consumption	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
VMT and speed consistency are cross-cutting measures. In addition to Climate & Energy, they also relate to Access & Mobility and Economic Benefit. Objective (C) is intended as a measure for operations, encouraging energy conservation or renewable energy strategies.

Speed consistency is also important. Improving speed consistency (traffic flow) can reduce vehicle acceleration and deceleration, which in turn improves fuel efficiency, reduces greenhouse gas (GHG) emissions, and has the added benefit of potentially reducing crashes.
While improving overall traffic flow and vehicle operations may reduce GHG emissions and generally improve safety, the "speed profile," or variety of operating speeds at different locations in the corridor, or under different traffic conditions, can also increase or decrease GHG emissions and fossil fuel consumption. The optimal speed profile for reducing braking and acceleration and improving fuel efficiency is called *speed efficiency*.

Improving speed consistency can also be a double-edged sword, by inducing more and longer trips. Thus, design considerations include:

- Reduce stop and go traffic to improve network flow and maintain consistent speeds that optimize overall vehicle fuel economy. Traffic calming measures (i.e. roundabouts, signal prioritization, etc.) that reduce stop and go traffic on local road networks can increase fuel economy, as might "Active Traffic Management" systems which modify traffic operations to maintain flow, while maintaining consistent speeds on highways can also achieve optimal fuel economy and lower levels of CO2 emissions per mile;[18]
- Build improvements that encourage use of alternative modes by improving travel speed consistency for carpools, transit, and non-vehicular modes. Historically, when transit travel times for a given trip origin and destination are 10 minutes or 25 percent or more above driving alone, (all other factors being equal), transit mode shares tend to be low;
- Reducing the impact of crashes and other non-recurring congestion;
- Improve travel predictability without inducing additional or longer drive-alone vehicle trips.

Finally, STARS-Plan asks users to consider reducing a project's long-term energy consumption by incorporating on-site renewable energy strategies or strategies that improve energy efficiency (objective C). These strategies can help achieve the overall greenhouse gas (GHG) reduction goal of the plan.

[18] U.S. Department of Transportation. Transportation's Role in Reducing U.S. Greenhouse Gas Emissions. 2010. http://ntl.bts.gov/lib/32000/32700/32779/DOT_Climate_Change_Report_-_April_2010_-_Volume_1_and_2.pdf. Accessed June 17, 2010.

Photo: City of Portland

Credit Category

Ecological Function

1. Improve or avoid habitat	
Objective	Measure
A. To avoid or minimize impacts to local, state, or federally defined sensitive areas	Amount and quality of area
B. To improve habitat in and adjacent to the right-of-way	Amount and quality of habitat
B. To increase the tree canopy in rights-of-way	Tree canopy
2. Improve water quality and stream flows	
Objective	Measure
To manage and treat stormwater volumes and flow on-site through LID practices	Post-development conditions relative to pre-development conditions

Table 9: Ecological Function Credit Summary

Ecological Function Goal 1

1. Improve or avoid habitat	
Objective	Measure
A. To avoid or minimize impacts to local, state, or federally defined natural areas	Amount and quality of area
B. To improve habitat in and adjacent to the right-of-way	Amount and quality of habitat
C. To increase the tree canopy in rights-of-way	Tree canopy

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Amount and quality of area	5- 10	
	20 - 25	
	Year 2050	
Amount and quality of habitat	5- 10	
	20 - 25	
	Year 2050	
Tree canopy	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.


Photo: Kelly Rodgers

Discussion
This goal suggests that STARS users prioritize transportation investments that produce ecological function benefits, including habitat restoration. Strategies to achieve this include pursuing joint projects with other agencies, such as other departments responsible for watershed health, stormwater management, and habitat restoration.

Objective A asks STARS users to avoid sensitive areas, as defined by local, state, and federal agencies.

Objective B asks STARS users to look for opportunities to improve habitat in the right-of-way (e.g., "green streets") or adjacent to the right-of-way. An example of the latter is a transportation agency building a bicycle

trail adjacent to a stream and coordinating with the watershed/habitat/park agency to perform restoration work.

Increasing the tree canopy, Objective C, has a number of co-benefits besides improving habitat, particularly for birds, in the right-of-way. Increasing the tree canopy reduces the urban heat island effect – where urban areas have higher temperatures due to the amount of dark surfaces. Additionally, trees help intercept rainwater and mitigate stormwater runoff. Street trees also improve the character of the pedestrian environment, helping to create a buffer from traffic on roadways and even more simply, providing cover for pedestrians. Street trees have also been known to improve property values.

Ecological Function Goal 2

Improve water quality and stream flows	
Objective	Measure
To manage and treat stormwater volumes and flow on-site through LID practices	Post-development conditions relative to pre-development conditions

Requirements and Documentation
To be determined. STARS asks users to set targets for each of the design years.

Measure	Design Year	Target
Post-development conditions relative to pre-development conditions	5- 10	
	20 - 25	
	Year 2050	

Methods and Data
To be determined. STARS-Plan recommends using backcasting to establish quantitative and/or qualitative measures that reflect community values on the performance of the transportation system in future years.

Evaluation methods will describe how to evaluate the performance of the plan in meeting the objective. For example, a travel reliability methodology would include specifying which inputs and outputs are required from the travel demand model.

Discussion
STARS users should examine how stormwater requirements are changing. The EPA and the states are evolving the municipal separate stormwater system (MS4) national pollutant discharge elimination system (NPDES) permit process through new rule making and changes to permits issued by states to municipalities. In the past, one of the focus areas of the NPDES MS4 permits was on requiring stormwater *quality* treatment for areas of *new* development. Stormwater *quantity* (flow control) was typically managed by municipalities to reduce flooding by focusing on matching post-development peak flows with pre-development peak flows.

Hydromodification is to alter the hydrology of streams. Transportation systems can change the hydrology of streams by increasing the amount of impervious surfaces, which results in increased volumes of stormwater runoff and increased speed of stormwater runoff (as well as creating increased levels of pollution, including higher temperatures).

The direction of the new NPDES MS4 permits includes requiring treatment for stormwater *quality and quantity* for both *new and redevelopment*, and *retrofits* for *existing* development. The management of stormwater *quantity* goes beyond flood control to also include reducing hydromodification in streams (erosion due to high flows). To reduce hydromodification, stormwater quantity management will shift from focusing on peak flow matching to attempting to match a full hydrograph pre- and post- development (matching both the volume and timing of release of water for a full storm or series of storms). The management of stormwater *quantity* is also seen as a way to reduce overall pollutant loads in stormwater by reducing the total amount of stormwater that is released to streams.

Amount of impervious surfaces was considered as a potential measure, since increased impervious areas are a source of increased stormwater volumes, flow, and pollutant loading. However, there may be cases where a

new street (and impervious surfaces) may improve connectivity, leading to more walk, bicycle, and transit trips – a desired STARS outcome. Other measures considered include *width of street* for similar reasons; a narrower street generates less runoff and often has other co-benefits of reducing speed and improving safety. However, the determinants of street width are numerous, making it a challenging measure to use for stormwater purposes.

Case Study: Neighborhood Greenways, Portland, Oregon

In 2007, the City of Portland adopted a Green Street policy to require and incorporate green street facilities in public and private development, recognizing the multiple policy objectives that green streets achieve, including:

- Handle stormwater on site through use of vegetated facilities;
- Provide water quality and flow control benefits and replenishes groundwater (if an infiltration facility);
- Create attractive streetscapes that enhance neighborhood livability by enhancing the pedestrian environment and introducing park-like elements into neighborhoods;
- Meet broader community goals by providing pedestrian and bicycle safety; and
- Serve as an urban greenway segment that connects neighborhoods, parks, recreation facilities, schools, main streets, and wildlife habitats.

This green street policy was integrated into the City's Transportation System Plan, as well as other planning documents governing infrastructure development. As a result, when the Portland Bureau of Transportation retrofits streetscapes for pedestrian crossings or traffic diversions, they are also required to manage stormwater, where feasible, to protect the downstream water bodies and pipe infrastructure.

Photo: City of Portland

The green street policy was taken a step further with Neighborhood Greenways. The Portland Bicycle Plan 2030 calls for the Portland Bureau of Transportation to partner with the stormwater agency, the Bureau of Environmental Services, to construct sustainable stormwater facilities along routes where there is a demonstrated need for stormwater retrofits. On other projects, the Bureau of Transportation coordinates with a non-profit organization, Friends of Trees, to promote tree planting along neighborhood greenways.

For more information:
Neighborhood Greenways
Portland Bicycle Plan 2030

Photo: Dan Burden

Credit Category
Community Context

Every community has issues unique to it. The Community Context credit is an open credit for STARS users to include additional goals and objectives that relate to the specific issues of the area. Community Context goals and objectives should demonstrate benefit to all three elements of the triple bottom line.

Goal	
Objective	Measure
TBD by STARS users	
TBD by STARS users	

Table 10: Community Context Credit Summary

Chapter 3: Strategies and Resources

Photo: Xue Liu

Note: STARS-Plan strategies and resources will be developed under Phase 2 of STARS-Plan.

Appendix A. STARS-Plan Framework (Credits, Goals, Objectives, and Measures)

Credit Category	Goal	Objectives	Measures
Access & Mobility	Improve people's ability to meet most of their daily needs without having to drive	To improve safe, attractive, and affordable access to work, school, goods, and other key destinations by walking, bicycling, and transit	% of population within a 30-minute walk, bike, or transit trip of key destinations **VMT**
	Improve the convenience and quality of trips, especially for walk, bike, transit, car/vanpool, and freight	To improve travel time and/or travel time reliability for pedestrian and bicycle trips between key origins and destinations To improve travel time reliability and speed consistency for transit, car/vanpool, and freight trips between key origins and destinations To improve the quality of walk, bicycle, car/vanpool, and transit trips	**Travel time reliability** **Speed consistency** Travel time MMLOS grade Address user survey
Safety & Health	Improve multimodal safety, especially for the most vulnerable users	To decrease fatalities and injuries for all travel modes. Pedestrian and bicyclist fatalities and injuries will not be higher than their proportion of total trips	**Prioritized funding for improvements to areas that have reported fatalities and injuries**
	Improve health by increasing physical activity by people using the transportation system	To increase the percentage of walk, bicycle, and transit trips	Mode share
	Improve air quality	To decrease the quantities of harmful airborne pollutants	Criteria pollutants

Credit Category	Goal	Objectives	Measures
Equity	Reduce disparities in healthy, safe access to key destinations for transportation-disadvantaged populations	To demonstrate that planned investments reduce or eliminate disparities in Access & Mobility, Economic Benefit, Safety & Health between transportation-disadvantaged and non transportation-disadvantaged populations	Percentage of plan spending on projects and programs in areas of key origins and destinations for transportation-disadvantaged populations
	Demonstrate that planned investments do not disproportionately impact transportation-disadvantaged populations	To demonstrate that transportation-disadvantaged communities do not experience disproportionate impacts from transportation construction or operations	Transportation-related criteria pollutants **Travel time reliability** Traffic noise exposure
Economic Benefit	Re-invest in the local economy	To re-invest in the local economy through reducing expenditures on fuel and related vehicle use	**VMT** / dollars **Speed consistency**
	Improve economic access	To increase practical and convenient access to employment centers by multiple modes	% of population within a 30-minute trip by mode
	Improve travel time reliability and speed consistency for high-value trips	To improve travel time reliability and speed consistency for freight between representative origins and destinations.	**Travel time reliability** **Speed consistency**
Cost Effectiveness	Optimize benefits over the life-cycle of the project	To optimize benefits relative to public, private and social costs over the plan's time horizon.	Compare benefits (e.g. reduced VMT, improved travel time reliability) to costs

Bold measures are primary measures

Credit Category	Goal	Objectives	Measures
	To prioritize the enhancement and maintenance of the existing system over system expansion.	To maintain pavement condition on roadways to 75% and demonstrate the cost of routine maintenance vs. deferred maintenance (street network) To maintain average asset age no more than 50% of the useful life and to maintain service calls to an average of 8,000 miles (transit)	Pavement condition Routine maintenance costs Deferred maintenance costs Average asset age Service calls
Climate and Energy	Reduce greenhouse gas emissions and fossil fuel consumption	To reduce fuel consumption To improve speed consistency between origins and destinations, by multiple modes To reduce fossil fuel use for operations	**VMT** **Speed consistency** Fuel consumption
Ecological Function	Avoid or improve habitat	To avoid or minimize impacts to local, state, and federally defined sensitive areas To improve habitat in or adjacent to the right-of-way To increase the percentage of tree canopy in rights-of-way	Amount and quality of area Amount and quality of habitat Tree canopy
	Improve water quality and stream flows	To manage and treat stormwater volumes and flow on-site through LID practices	Post-development conditions relative to pre-development conditions
Community Context	TBD by local agency and community		

Bold measures are primary measures

Appendix B. STARS-Plan Objectives and the Triple Bottom Line

Credit Category	Objectives	Measures	People	Prosperity	Planet
Access & Mobility	To improve safe, attractive, and affordable access to work, school, goods, and other key destinations by walking, bicycling, and transit	% of population within a 30-minute walk, bike, or transit trip of key destinations	**X**	**X**	**X**
		VMT	**X**	**X**	**X**
	To improve travel time and/or travel time reliability for pedestrian and bicycle trips between key origins and destinations To improve travel time reliability and speed consistency for transit, car/vanpool, and freight trips between key origins and destinations To improve the quality of walk, bicycle, car/vanpool, and transit trips	**Travel time reliability**	**X**		
		Speed consistency	**X**	**X**	**X**
		Travel time	**X**	**X**	**X**
		MMLOS grade	**X**		
		Address user survey	**X**		
Safety & Health	To decrease fatalities and injuries for all travel modes. Pedestrian and bicyclist fatalities and injuries will not be higher than their proportion of total trips	**Prioritized funding for improvements to areas that have reported fatalities and injuries**	**X**	**X**	**X**
	To increase the percentage of pedestrian, bicycle, and transit trips	Mode share	**X**	**X**	**X**
	To improve air quality	Criteria pollutants	**X**	**X**	**X**

Bold measures are primary measures

Credit Category	Objectives	Measures	People	Prosperity	Planet
Equity	Demonstrate that planned investments reduce or eliminate disparities in Access & Mobility, Economic Benefit, Safety & Health between transportation-disadvantaged and non transportation-disadvantaged populations	Percentage of plan spending on projects and programs in areas of key origins and destinations for transportation-disadvantaged populations	**X**		
	Demonstrate that transportation-disadvantaged communities do not experience disproportionate impacts from transportation construction or operations, taking into account accumulated impacts	Transoprtation-related criteria pollutants	**X**		**X**
		Travel time reliability	**X**		
		Traffic noise exposure	**X**		
Economic Benefit	To re-invest in the local economy through reducing expenditures on fuel and related vehicle use	**VMT** / dollars	**X**	**X**	**X**
		Speed consistency	**X**	**X**	**X**
	To increase practical and convenient access to employment centers by multiple modes	% of population within a 30-minute trip to employment centers, by mode	**X**	**X**	
	To improve travel time reliability and speed consistency for freight between representative origins and destinations.	**Travel time reliability**	**X**	**X**	**X**
		Speed consistency	**X**	**X**	**X**
Cost Effectiveness	To optimize benefits relative to public, private and social costs over the plan's time horizon.	Compare benefits (e.g. reduced VMT, improved travel time reliability) to costs	**X**	**X**	**X**

Bold measures are primary measures

Credit Category	Objectives	Measures	People	Prosperity	Planet
	To maintain pavement condition on roadways to 75% and demonstrate the cost of routine maintenance vs. deferred maintenance (street network)	Pavement condition		**X**	**X**
		Routine maintenance costs		**X**	**X**
	To maintain average asset age no more than 50% of the useful life and to maintain service calls to an average of 8,000 miles (transit)	Deferred maintenance costs		**X**	**X**
		Average asset age		**X**	**X**
		Service calls		**X**	**X**
Climate and Energy	To reduce fuel consumption	**VMT**	**X**	**X**	**X**
	To improve speed consistency between origins and destinations, by multiple modes	**Speed consistency**	**X**	**X**	**X**
	To reduce fossil fuel use for operations	Fuel consumption	**X**	**X**	**X**
Ecological Function	To avoid or minimize impacts to local, state, and federally defined sensitive areas	Amount and quality of area			**X**
	To improve habitat in or adjacent to the right-of-way	Amount and quality of habitat			**X**
	To increase the percentage of tree canopy in rights-of-way.	Tree canopy	**X**	**X**	**X**
	To manage and treat stormwater volumes and flow on-site through LID practices	Post-development conditions relative to pre-development conditions			**X**

Bold measures are primary measures

Appendix C. STARS-Plan Primary Measures

Measure	Objectives	Goal	Credit Category
VMT	To improve safe, attractive, and affordable access to work, school, goods, and other key destinations by walking, bicycling, and transit Re-invest in the local economy through reducing expenditures on fuel and related vehicle use To reduce fuel consumption	Improve people's ability to meet most of their daily needs without having to drive Re-invest in the local economy Reduce climate pollution and energy use	Access & Mobility Economic Benefit Climate Pollution & Energy Use
Travel time reliability	To improve travel time and/or travel time reliability for pedestrian and bicycle trips between key origins and destinations To improve travel time reliability and consistency for transit, car/vanpool, and freight trips between key origins and destinations To improve travel time reliability and consistency for freight between representative origins and destinations	Improve the convenience and quality of trips, especially for walk, bike, transit, car/vanpool, and freight trips Improve travel time reliability and consistency for high-value trips	Access & Mobility Economic Benefit

Bold measures are primary measures

Measure	Objectives	Goal	Credit Category
Speed consistency	To improve travel time reliability and consistency for transit, car/vanpool, and freight trips between key origins and destinations	Improve the convenience and quality of trips, especially for walk, bike, transit, car/vanpool, and freight trips	Access & Mobility
	To improve travel time reliability and consistency for freight between representative origins and destinations	Improve travel time reliability and consistency for high-value trips	Economic Benefit
	Re-invest in the local economy through reducing expenditures on fuel and related vehicle use	Re-invest in the local economy	Economic Benefit
	To improve speed consistency between origins and destinations, by multiple modes	Reduce greenhouse gas emissions and fossil fuel consumption	Climate Pollution & Energy Use
Prioritized funding for improvements to areas that have reported fatalities and injuries	To decrease fatalities and injuries for all travel modes. Pedestrian and bicyclist fatalities and injuries will not be higher than their proportion of total trips	Improve multimodal safety, especially for the most vulnerable users	Safety & Health

Bold measures are primary measures