Final Report

Washington County

Transportation Futures Study

Exploring options • Informing choices

WASHINGTON COUNTY OREGON

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1 INTRODUCTION

1.1 Description and Purpose

Washington County has a history of a strong economy, community growth, and a wonderful quality of life, which are in part a result of forward-thinking plans and significant investments in the county's multimodal transportation system.

In 2013 the Oregon State Legislature allocated funding to Washington County for a transportation study to evaluate the long-term transportation strategies and investments needed to sustain the county's economic health and quality of life. In 2014, Washington County initiated the Transportation Futures Study (the "Study").

Why now?

With the adoption of the Urban and Rural Reserves Washington County and its cities have a better understanding of where future urban growth will occur. This Study presents an opportunity to examine the types of transportation investments that will best serve the cumulative growth in population and support employment growth in the region. The Study is intended to inform county residents, business owners, and elected officials on strategic investments that may be resilient to growth, to support economic health and quality of life, and to identify other trade-offs inherent in major investments. Outcomes of the Study highlight areas of agreement, areas where there is divergence in opinion, and priorities for further evaluation and refinement of local and regional plans.

Purpose of the Study

The Washington County Transportation Futures Study will evaluate long-term transportation strategies and investments needed to sustain the county's economic health and quality of life in the coming decades.

The purpose of this report is to share the Study findings and solicit input, which are summarized in the public outreach document and shared with the Board of County Commissioners, Washington County Coordinating Committee (see Chapter 2), and others.

This chapter summarizes the general approach to the Study, the Study's five phases, and an overview of the Study report structure.

What's in this Chapter?

1.2 Study Approach

As a precursor to the Study, the county solicited public comments on the Study approach and outreach program. The resulting approach focused on identifying alternative transportation investments and evaluating how well they address the county's future challenges in meeting the needs for mobility, connectivity, safety, efficiency, health, equity, and other values important to the community.

A set of community values derived from previous studies and planning efforts (e.g., Washington County Transportation System Plan) were used as guidance in the Study. The importance of the community values were confirmed by the Study Advisory Committee and by over 300 open house participants. Figure 1-1 summarizes the Study community values. These value statements were integrated in the Study (see Chapter 6, Evaluation Framework) as input to define the performance measures in the evaluation of the future Transportation Investment Packages (see Chapter 7).

Figure 1-1: Community Values

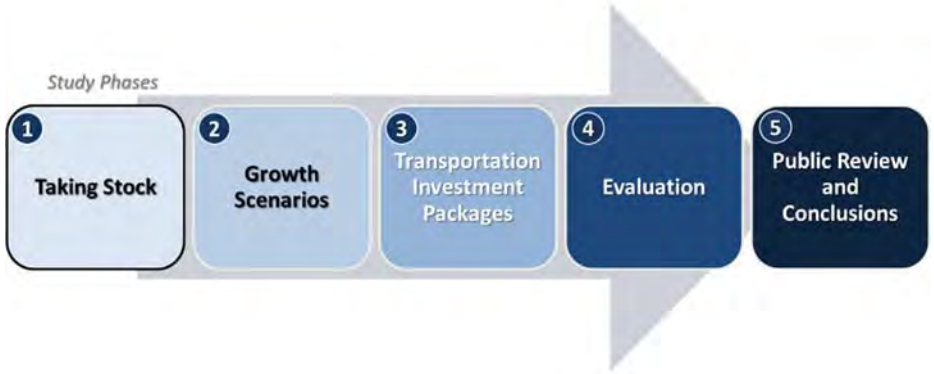
Washington County community members value a transportation system that…

CONNECTIVITY	Provides easy access to destinations essential for daily needs, goods, services, and activities.
EFFICIENCY	Promotes efficient and reliable movement of people, goods, and services.
TRANSPORTATION OPTIONS	Encourages viable transportation options, including private automobiles, transit, bicycling, and walking.
LAND USE	Promotes community design that reflects the unique needs and desires of urban, rural, and suburban communities, including compact, multi-modal, and vibrant communities in urban areas.
SOCIAL EQUITY	Ensures all people benefit from transportation investments, and that no group or neighborhood bears an unfair share of negative impacts.
ENVIRONMENTAL SUSTAINABILITY	Protects air, climate, water, open space, and other natural resources from the impacts of growth and transportation.
STRATEGIC INVESTMENT	Uses public funds wisely and protects investments by maintaining the current transportation system and using technology to improve efficiency.
ECONOMIC VITALITY	Supports job growth and strong urban and rural economies.
SAFETY	Ensures all travelers get to their destinations safely.
HEALTH	Encourages citizens to become more active and healthy by providing alternative transportation modes.

1.3 Phases of the Study

The five major phases of the Study are illustrated in **Error! Reference source not found.** and briefly described here.

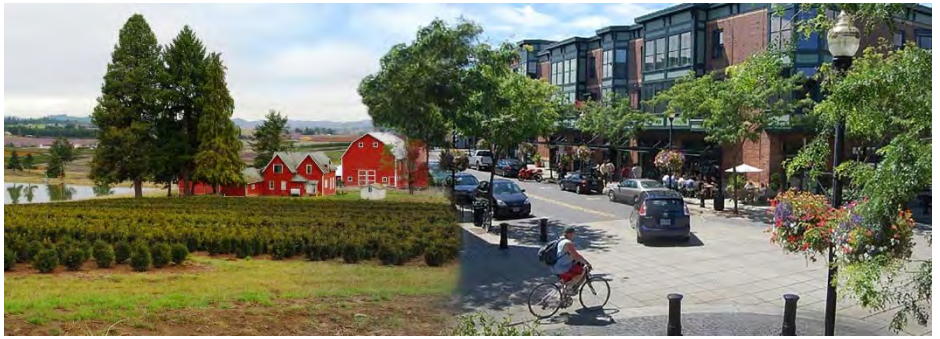
Figure 1-2: Phases of the Study



The **first phase**—"Taking Stock"—captured lessons learned from the past 30 years of land use and transportation policy and investment decisions, and also reviewed the trajectory of current plans for how they will guide the cities and county for the next 40-50 years. Chapter 3 summarizes the Taking Stock phase of the Study.

The **second phase** involved the development of two plausible future growth scenarios to test the resiliency of transportation investment ideas. Scenario 1 projects future growth based on existing trends, while Scenario 2 assumes stronger growth in economic activity, leading to a higher number of future residents and greater employment in the county.

Both growth scenarios use adopted land use plans, in which much of the future growth is focused on downtowns and centers and on industrial areas, and they assume that the areas newly added to the Urban Growth Boundary (UGB) and Urban Reserves develop during the Study horizon. The agricultural character and economy in rural areas and rural reserves are anticipated to remain strong. Chapter 4 summarizes the future growth scenarios from Phase 2 work.



Washington County's diverse rural and urban uses.

Phase 3 solicited input on the types of conceptual transportation investments to study and bundled the collected ideas into three transportation investment "packages" that provide alternative approaches to addressing future needs. Each of the packages included a full range of transportation investment approaches for a complete transportation system, including vehicular capacity, transit, bicycle, pedestrian, freight, and transportation technology. The level of investment varies by package; all of the packages were evaluated and tested against both of the future growth scenarios. Chapter 5 summarizes each of the transportation investment packages.

In **Phase 4** the transportation investment packages are evaluated against criteria that are based on the community values: connectivity, efficiency, transportation options, social equity, environmental sustainability, strategic investment, economic vitality, safety, and health. Chapters 6 and 7 summarize Phase 4 efforts to define the evaluation methodology and summarize results.

The results of these evaluations are the basis for a broad community discussion in **Phase 5**, which provides an understanding of areas of agreement and those issues for which divergent viewpoints predominate.

1.4 Structure of the Report

The Washington County Transportation Futures Study Report is organized in seven chapters, as listed in Table 1-1.

Table 1-1: Report Structure and Study Phases

	Report Chapters	Appendix (separate, supporting Summary/Technical Reports)
1	**Introduction** (this section)	
2	**Stakeholder Engagement and Community Outreach** – *outlines the structure and roles of the Study advisory committees (elected officials, technical staff, and community members), and various elements of public outreach and input to the Study process*	**A**
3	**Taking Stock: Past and Current Conditions** – provides a *historical "look back" on key decisions, policies, and projects that have shaped Washington County*	**B**
4	**Future Growth Scenarios** – *summarizes the major "drivers of change" to Washington County's future transportation system and outlines the two future land use/growth scenarios*	**C**
5	**Transportation Investment Packages** – *summarizes three Transportation Investment Packages, each of which build upon the future, multimodal planned investments as identified in local and regional plans; plus a summary of the three sensitivity tests of transportation technology, congestion pricing, and freight consolidation facilities*	**D**
6	**Evaluation Framework** – *details the analytical approach and key measurements used to evaluate the three Transportation Investment Packages*	**E**
7	**Evaluation Results** – *summarizes the key findings of the evaluation in the comparison of the Transportation Investment Packages*	**F**

Stakeholder Engagement and Community Outreach

Chapter 2

Washington County Transportation Futures Study
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2 STAKEHOLDER ENGAGEMENT AND COMMUNITY OUTREACH

2.1 Overview

The Study's Stakeholder Engagement and Community Outreach Program aimed to actively seek public input at key milestones of the Study, provide meaningful engagement opportunities, and involve potentially impacted groups and individuals.

The outreach program included frequent meetings with a number of committees to advise on development of Study products, as well as broad outreach to the general public.

This chapter summarizes the tools and activities used to engage the public and stakeholders. A summary of comments received can be found in Appendix A.

See Appendix A for the summary report on Stakeholder Engagement and Public Outreach

What's in this Chapter?

2.2 Stakeholder and Committee Engagement

Various committees and groups, including several existing boards and committees, helped shape the Study. Each group had varying levels of responsibility to review and provide input to the Study.

After soliciting nominations from the public, the **Board of County Commissioners** (BCC) appointed a **Study Advisory Committee** (SAC), which was composed of community members with a depth of knowledge and interests in diverse areas including business, industry, agriculture and forestry, freight, transit and active transportation, equity and health, economic development, energy, community livability, and natural environment. The SAC served as a forum to explore how the Study's approach, strategies, and analysis meet transportation needs and reflect community values. The group played an advisory role and provided input to the Study team on Study products at key milestones.

The Washington County Coordinating Committee **Transportation Advisory Committee** (WCCC TAC) and the **Planning Directors** in Washington County provided input to the Study and review of work products. Both groups were composed of senior staff representatives from local governments.

The **Health & Equity Work Group** advised on the development of health and equity measures and the assessment of potential benefits and burdens to the community, with a focus on historically under-represented communities. The group was composed of members from non-profit organizations specializing in health, cultural, housing, and transportation issues; as well as some Washington County agency staff with knowledge of health and equity measures associated with transportation initiatives.

The **BCC** and **Washington County Coordinating Committee (WCCC)**, which includes the county's mayors, a county commissioner, and appointed officials, were briefed at key milestones, and will review the findings and take input on next steps.

County staff coordinated with staff from state and regional agencies such as the Port of Portland, ODOT, TriMet, Metro, DLCD, and from adjacent cities and counties to seek input on trends and alternatives that cross county lines and involve other jurisdictional authority.

2.3 Community Outreach

The Study Team conducted a variety of public outreach activities and provided opportunities for public comment. Public outreach activities centered on three key points.

- **Outreach Point #1: Taking Stock and Community Values**
  In this first outreach point, the public was introduced to the Study, and the public provided input on community values to shape the Study and evaluation framework.
- **Outreach Point #2: Transportation Investments**
  The public reviewed draft lists of potential multi-modal transportation investments and provided additional ideas for the Study. The team used public input to develop the final transportation investment packages for study in the evaluation phase.
- **Outreach Point #3: Evaluation Results and Trade-offs**
  In this final outreach period, an online open house and random-sample polling were conducted to gain important public feedback on the Study evaluation and trade-offs between transportation investment packages.

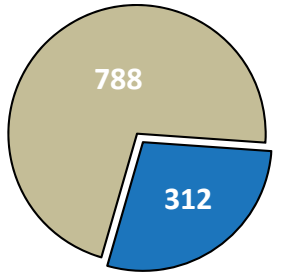
Ongoing Outreach

In addition to targeted outreach during the three key points, the Study Team engaged the public on an ongoing basis to get their input on key concerns, community values, and transportation investment ideas to consider in the Study. The team used:

- **Meetings and briefings** with dozens of groups and organizations at key milestones, including neighborhood groups, business and economic associations, citizen involvement committees, active transportation and environmental organizations, rural and farm-related organizations, government agency staff, and partners, among others.
- **Targeted outreach to underserved populations**. The team partnered with the Center for Intercultural Organizing (now Unite Oregon) and Centro Cultural de Washington County to provide guidance and conduct outreach activities with low-income and non-native English speaking populations. Outreach activities included hosting informational booths at cultural events, conducting stakeholder interviews with ethnic minorities, hosting Spanish-language conversation groups, and using Spanish-language social media. The Study Team also partnered with Pacific University to learn about the concerns of rural populations. This effort resulted in a report: *Taking Stock of Rural Washington County*.

COMMUNITY VALUES

Spring 2015 Online Open House Participants



Survey Submittals

- The **Study website** was the primary portal for providing information and hosting online open houses. Members of the public could comment anytime through an interactive commenting tool.
- A **video** was developed to describe the Study context and purpose, and was updated to explain trade-offs between investment strategies. Shorter videos were used to provide information about the Study and promote commenting opportunities.
- **Emails** to stakeholders at key milestones.
- **Media releases** and meetings with reporters to garner interest in the Study.
- **Newspaper and online advertising** prior to key outreach points to increase participation levels.
- Outreach to cities, agencies, and organizations to include information about the Study and open houses in their **newsletters, email blasts, and online calendars**.
- **Social media outreach** through the cscoounty's Facebook and Twitter accounts.
- **Informational materials** to explain key concepts and outcomes, including fact sheets, postcards, and PowerPoint presentations.

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Taking Stock: Past and Current Conditions

Chapter 3

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See Appendix B for the full report: "Taking Stock"

What's in this Chapter?

3 TAKING STOCK: PAST AND CURRENT CONDITIONS

3.1 Statewide and Regional Planning Policy Influence

Washington County, its 16 cities, and special service districts have a rich history of proactive long-range planning and implementing strategic solutions that address complex community issues. As the second most populous county in the state, Washington County has been on the leading edge of many of the development issues that have shaped the state and the region since the adoption of Oregon's nationally recognized land use planning program in 1973. Being a leader has created numerous opportunities and challenges related to the key building blocks of a community–land use, housing, employment, transportation, and public facilities.

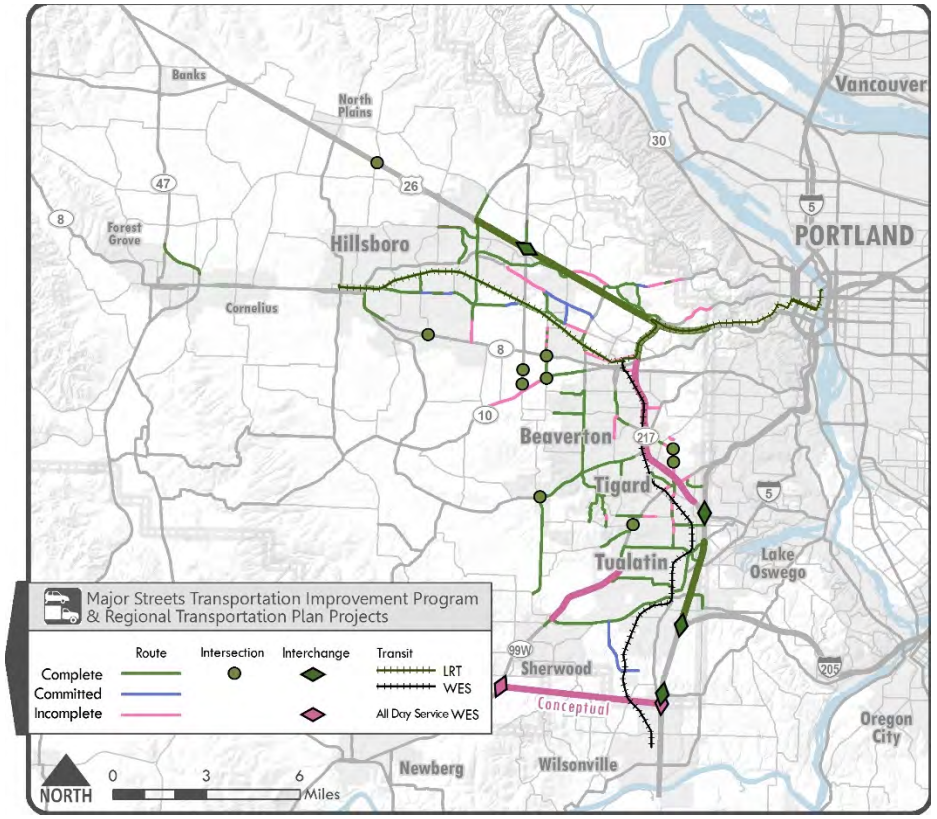
When Senate Bill 100 created the statewide land use program in 1973, there were approximately 177,000 residents in Washington County. Today there are approximately 551,000 residents. The transitioning character of the county–from a more rural to urban environment–is the direct result of local and regional land use and transportation decisions. Examples of these decisions include the establishment of the Metro Urban Growth Boundary (UGB) in 1979, adoption of local comprehensive and community plans to enable efficient development of land and infrastructure needed for the residential growth and high tech and apparel industries in the 1970s and 1980s, voter-approved transportation funding initiatives such as the Traffic Impact Fee (now Transportation Development Tax) and the Major Streets Transportation Improvements Program (MSTIP), and the opening of the Westside MAX line in 1998, coupled with new land use policy and regulations for compact, mixed-use development around MAX stations that implemented Metro's 2040 Growth Concept.

Influential planning efforts that helped set the direction of how the county and its cities would manage the growth during this period included the Western Bypass and the Land Use, Transportation and Air Quality (LUTRAQ) Studies.

The LUTRAQ Recommended Alternative included a package of roadway– both local roadway and regional connectors–and transit improvements, along with improved Transportation Demand-Management (TDM) programs. The recommended arterial network is mostly in place, having been constructed through MSTIP. However, key highway improvements to Highway 217 and Highway 99W that were recommended in the LUTRAQ study have not been constructed (see **Figure 3-1**).

Taking Stock: Past and Current Conditions

Figure 3-1: Status of LUTRAQ Recommended Alternative



LUTRAQ

In 1992, 1000 Friends of Oregon began a study to evaluate if relocating land uses, supported by an expanded transit system, could result in a viable transportation alternative for the study area that would not require major expansion of the existing road system or construction of major new highway corridors. The study was called LUTRAQ, short for "making the Land Use, Transportation and Air Quality connection." LUTRAQ introduced new mixed-use land use patterns within Washington County that tended to cluster jobs, residences, and shopping near transit lines. Ultimately, the LUTRAQ alternative was incorporated into the Western Bypass Study and was one of the alternatives evaluated and compared under that study. While development patterns have become more compact as envisioned in LUTRAQ, growing north/south travel demand and the lack of transportation facilities to address this pattern, also acknowledged in the LUTRAQ alternative, is a continuing issue that impacts both urban and rural roads.

These decisions and planning efforts have changed the face of Washington County from a traditional suburban environment, as exhibited in residential areas such as Oak Hills and Cedar Hills, to a more urban setting, as exemplified by the Platform District and Orenco Station in Hillsboro, the Round in Beaverton, and the Eddyline Bridgeport in Tualatin. On the employment front, major employers such as Intel, Nike, Columbia Sportswear, SolarWorld, and numerous other high technology and manufacturing businesses have transformed the county into a world-class economic force. At the same time the county's agricultural sector has remained strong, exhibiting a growth in ornamentals and landscape materials and, more recently in the western portion of the county, an expanding winery industry.

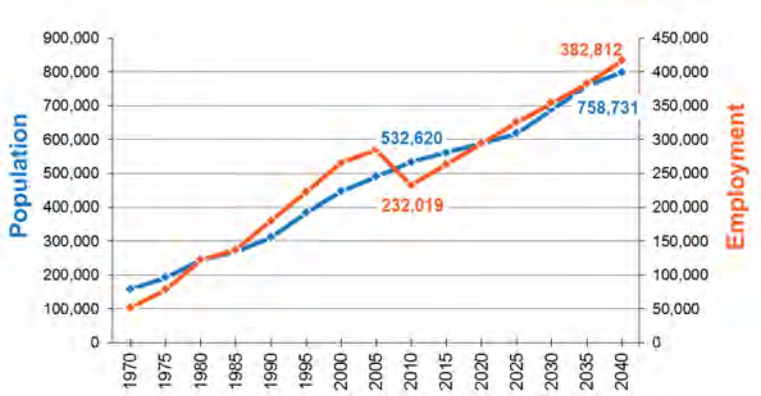
3.2 How the County Has Changed

Over the past 30 years, Washington County and its transportation needs have changed. The number of people living and working in the county and the region grew much faster than predicted as the economy expanded. **Figure 3-2** shows how the county's population has steadily increased from less than 200,000 in 1970 to over 530,000 in 2010, and projected to reach nearly 760,000 by year 2040. County-wide employment has rebounded from the 2007-2008 recession, and is expected to grow at a steady rate, exceeding 380,000 by year 2040.

3.2.1 How We've Grown

The county continues to prosper in resource-based economic sectors, but also the high tech and apparel industries. The founding of Tektronix in 1946 and related industries are considered the birth of the "Silicon Forest" and the seeds of the county's high technology and apparel industry. Intel's first facility opened in Aloha (1976) and Nike's World Headquarters opened in Beaverton (1972). As these and other firms expanded the need for nearby supporting services and housing for their employees began the steady growth curve that characterized the next two and a half decades, during which the county has become increasingly urban.

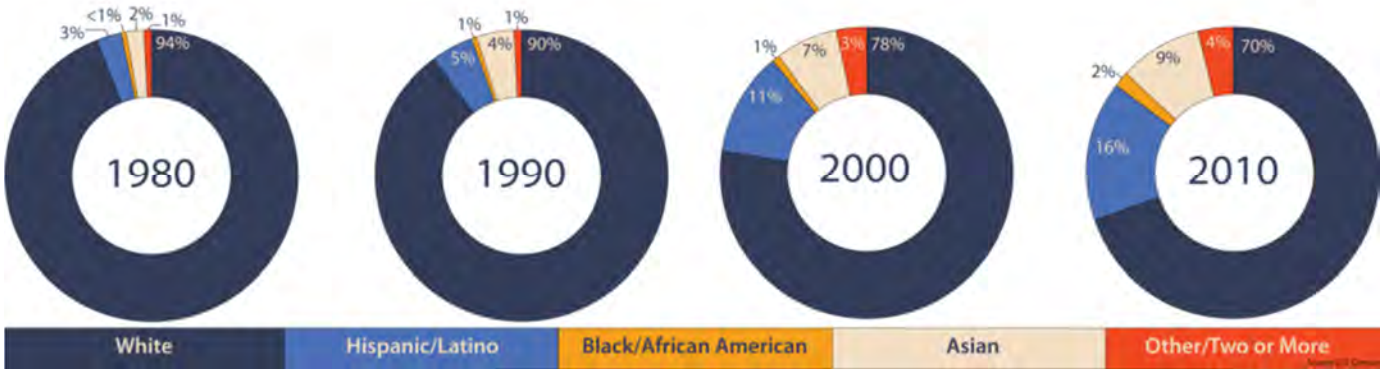
Figure 3-2: Washington County Population and Employment



3.2.2 Who We Are

Washington County's population profile has changed significantly over the past several decades. The county as a whole has become much more ethnically diverse (see **Figure 3-3**). As the economy has changed, incomes have led to greater disparity between low-income and affluent people, consistent with national trends. This fact, combined with an overall aging population, has increased demand for affordable housing and accessible transportation options.

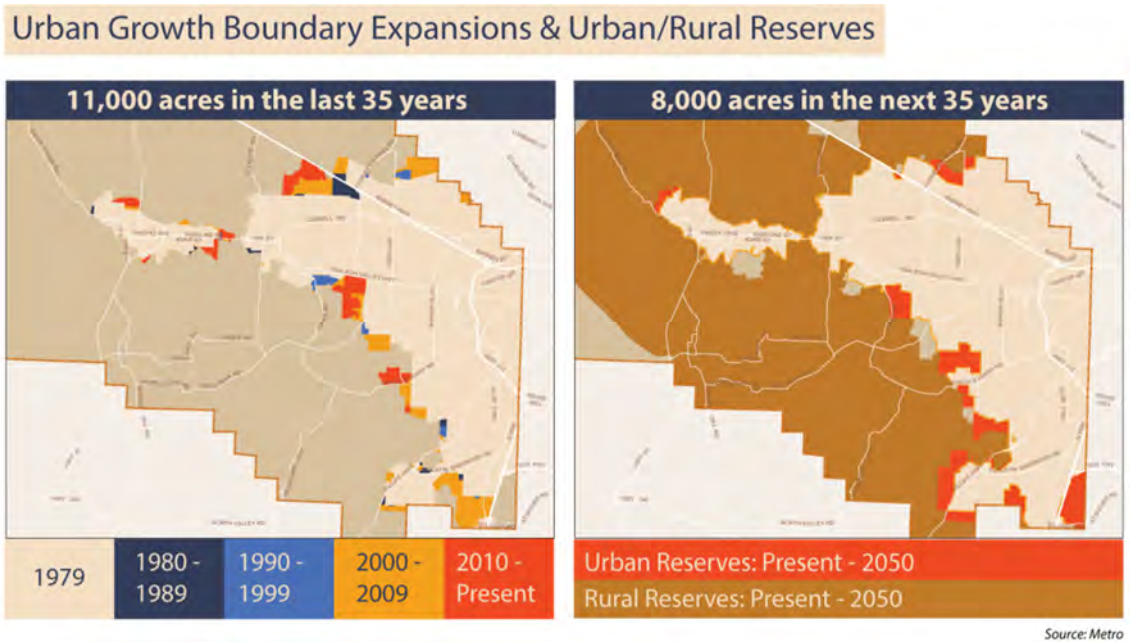
Figure 3-3: Washington County Race and Ethnicity



3.2.3 Where We Live

Washington County jurisdictions have adopted and revised their land use plans to plan for growth. Local plans reflect community values and provide a range and variety of housing types. New developments have been focused within neighborhood and community centers and along major transportation corridors within the Metro UGB. New areas were added to the UGB in 2002, including North Bethany, River Terrace, and portions of South Cooper Mountain. These areas are primarily planned for urban residential use, and in accordance with Metro's Urban Growth Management Functional Plan, regional goals, as well as county goals related to compatibility. Land within the current UGB is approximately 125 square miles. As shown in **Figure 3-4**, another 13 square miles of unincorporated, rural Washington County are designated as urban "reserve" for potential future urban use.

Figure 3-4: Washington County Future Growth Areas



3.2.4 Where We Work

Washington County is home to over 232,000 jobs, many of which can be found in high concentration employment areas within urban centers and corridors such as the Tualatin-Sherwood Corridor, Tanasbourne-AmberGlen, Hillsboro North, and Washington Square areas. In rural Washington County, agriculture, forestry, and tourism contribute significantly to the regional and state economy. Safe, reliable, and efficient freight connectors for the transport of goods are a key component of the county's economic growth plan. In addition, for Washington County employers, having safe and efficient

access to the regional labor market is just as important as moving goods or services.

3.2.5 How We Travel

Over the past 30 years the region has grown and travel patterns have changed. What was once a bedroom community to Portland Washington County is now an important employment center attracting trips from across the region. In 2010 nearly half of Washington County residents worked outside the county and nearly half of employees that work within Washington County lived outside the county, accounting for bi-directional commute patterns.

Today there is substantially more daily travel demand. East-west travel demand between Portland/Clark County and Washington County doubled, while north-south travel demand, especially between areas north of US 26 and south to Sherwood, Tualatin, and into Clackamas County grew by over 150 percent. In some locations Washington County's transportation system has been pushed to its limits, and conditions are anticipated to worsen. Older arterial streets and highways have limited space to add or expand facility connections for safer pedestrian and bicycle travel. Increasing congestion leads to more traffic through existing neighborhoods, putting cars and trucks on rural roads that were not designed to carry these levels of traffic, and the resulting cut-through traffic creates safety problems and degrades quality of life in the community.

Traffic delay has direct negative impacts on the ability to travel, produce goods, services and jobs with greater fuel consumption, higher vehicle emissions and higher delivery costs.

3.3 Observations From Taking Stock

Key observations made during the Taking Stock phase helped inform later phases of the Study and are summarized here.

Land Use & Community

Historical growth in Washington County has met or exceeded local and regional population and employment forecasts from the 1980s, resulting in greater demand to expand transportation infrastructure at a faster pace.

Land use planning over time has responded to changing community values and economic conditions by providing varied housing types and focusing new development into neighborhood and community centers and along major transportation corridors.

Mobility & Accessibility

There is now more emphasis on providing multimodal transportation options and solutions (transit, bicycle, and pedestrian) within the growing community. Major transit investments in the Westside MAX and within frequent-service transit corridors support higher density residential and mixed use areas.

Roadway improvements are critical as the county and cities respond to the mobility needs of residents, business, and industry. Further transportation system improvements are needed for many reasons: to increase access to employment areas, ease employee commuting and freight delivery, and provide important multimodal safety features.

In previous planning efforts, the need to enhance north-south circulation within Washington County has been identified. Plan implementation has been slow to materialize. Deferred attention to the north-south circulation issue has led to increased volumes on undersized roads in existing neighborhoods and rural areas.

Environmental Sustainability & Health

Community livability remains a critical design feature to consider as transportation solutions are developed. There is increased focus on health and social equity issues as factors to consider when transportation projects are proposed.

Funding

Coordinated county and city transportation financing through the MSTIP and Transportation Development Tax (TDT) programs exemplifies a successful approach to funding needed improvements and the value of intergovernmental collaboration. However, it's clear that additional funding is needed to achieve long-term transportation goals.

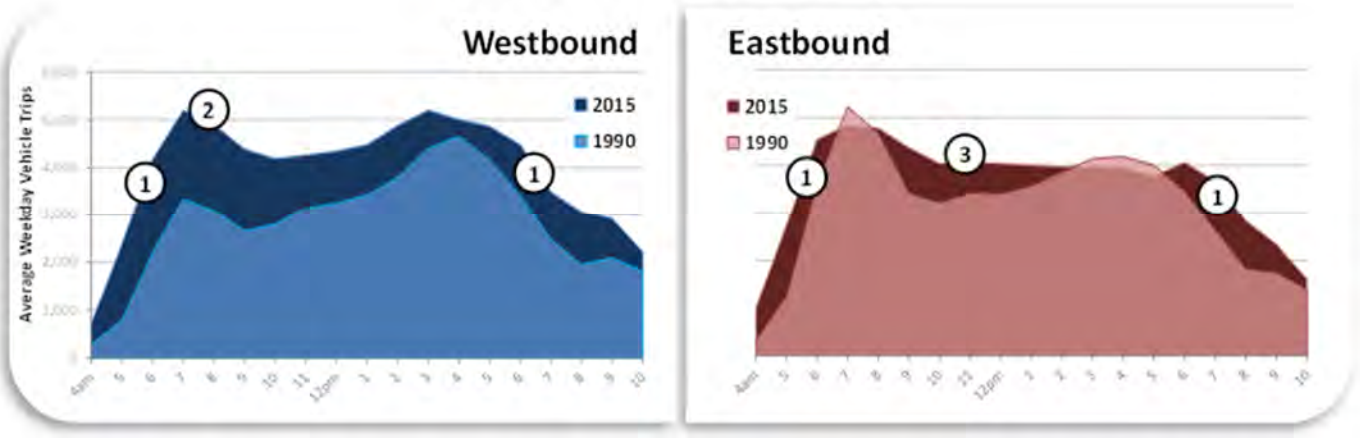
Reliability

Traffic congestion is adversely impacting industries, businesses, and commuters by making major routes like US 26 less efficient, less reliable, and much less predictable.

Figure 3-5 summarizes the 25-year history of traffic on US 26 through the Vista Ridge tunnels. The peak period travel demands typically equal or exceed the capacity of the tunnels, resulting in long delays. The figure illustrates three key traffic characteristics affecting travel reliability: (1) congestion is growing in each direction of travel, expanding or "spreading" both the morning and evening peak periods; (2) the emergence of the westbound "reverse commute" to Washington County now matches the traditional eastbound commute; and (3) significant growth in eastbound mid-day congestion now directly affects the ability of shippers to consistently deliver Washington County goods to important regional destinations on time.

Almost 30 years ago, the region embarked on a new direction in transportation and land use planning for the Washington County area. Washington County continues to grow. Knowing its history, and by "taking stock", the county is poised to examine the challenges expected over the next several decades, investigate the transportation investments options (as outlined in the Study), and chart its future direction.

Figure 3-5: Traffic History on US 26 at Vista Ridge Tunnels



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Future Growth Scenarios

Chapter 4

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4 FUTURE GROWTH SCENARIOS

4.1 Background

The Study evaluated transportation investments relative to two alternative visions (referred to as scenarios) for how the county might grow in the next 40 - 50 years. The future scenarios reflect differing factors that are likely to influence the amount of growth in population and jobs, and land development patterns in the county. **Figure 4-1** illustrates the Study's two growth scenarios for the 40- to 50-year planning period, or horizon, and the three transportation investment packages.

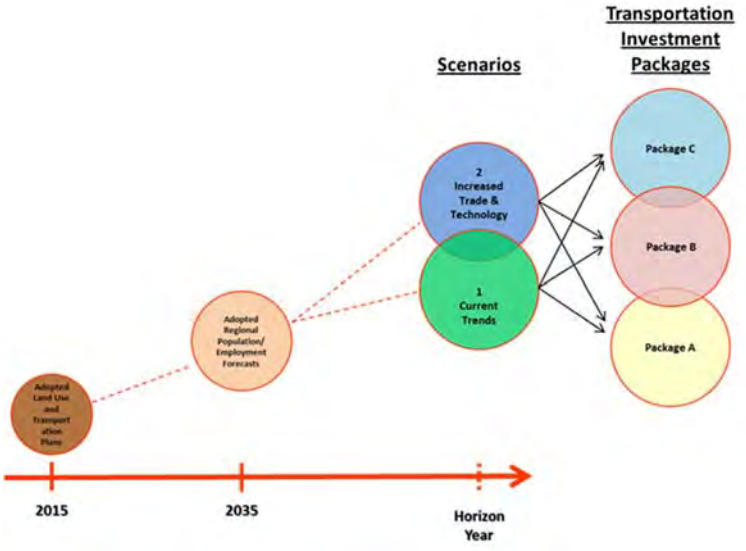
As a fundamental underpinning, the Study assumed urban Washington County and its cities will continue to grow as described in various adopted community and transportation system plans throughout the county. These plans anticipate that most growth will occur as infill of mixed land uses in established urban centers. Plans also call for the continued protection of Washington County's rural areas for agriculture and forest use.

The scenarios included growth for the four-county region. Within Washington County, the growth allocations were based on input from local jurisdictions, consistent with adopted land use plans and concept plans for areas recently added to the UGB and Urban Reserve areas.

See Appendix C for the full report: "Future Drivers Impacting Transportation"

What's in this Chapter?

Figure 4-1: Study Growth Scenarios



This section describes the development of the two future growth scenarios, first by defining the *drivers of change* likely to affect Washington County's future conditions, then by highlighting the two future growth scenarios, and finally by summarizing the general travel patterns reflecting the future growth scenarios.

4.2 Drivers of Change

To develop the two future growth scenarios, the Study team engaged planning and economics experts and conducted extensive research to consider and broadly describe what factors could plausibly influence land use and transportation in Washington County over the long term. The Study Team worked closely with regional demographics and economics analysts, and with local agencies' staff to develop the population and employment growth scenarios. See Appendix C for the full summary of the Study's process to identify the key drivers of change.

4.3 Future Growth Scenarios

The purpose of developing scenarios is to understand what potential changes are most likely or *plausible*, so decision-makers can strategically plan for transportation investments resilient to uncertain future conditions. Both of the growth scenarios used in the Study assume a 40 to 50 year planning horizon and development consistent with local adopted plans and development of the *Urban Reserves*, areas identified for future urban development that are currently outside the UGB. Both scenarios also expect that rural areas will remain agricultural, and there will be increased tourism and recreation in rural parts of Washington County.

Washington County's dramatic growth rate during the past 40 years is expected to slow down in the future, but it will continue to be above the national average. The two scenarios developed for the Study to reflect the possible future growth in the county consist of:

Scenario 1 – "Current Trend": a continuation of recent forecast trends by Metro (the Metropolitan Planning Organization (MPO) for the greater Portland region).

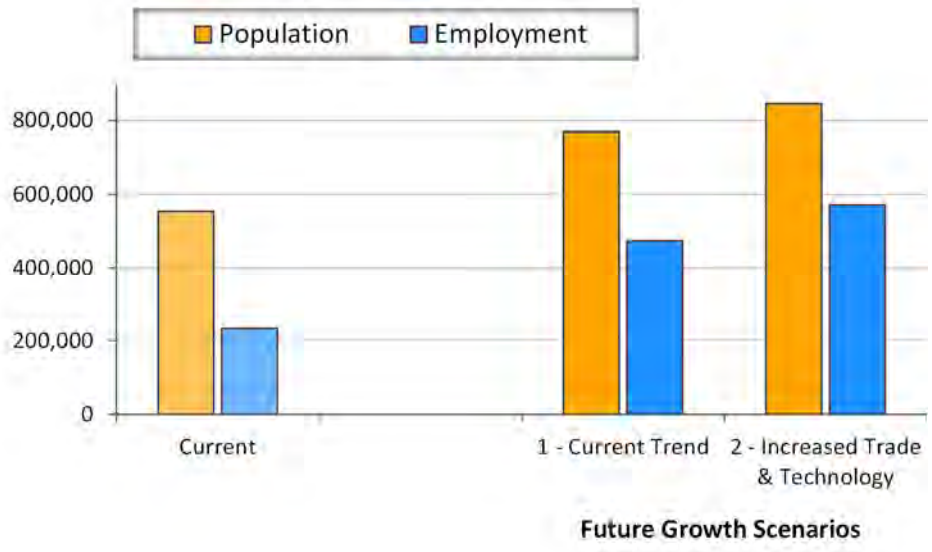
Scenario 2 – "Increased Trade and Technology": a future moving in the direction of more growth (population and employment) based on more technology-focused industry in the county, and increased global trade.

The future demographic and land use assumptions that are forecasted to have implications on transportation are described in broad terms below for each of the two future growth scenarios:

Population

- Under Scenario 1, Washington County's population is projected to grow by 216,000 people, or an increase of 41% compared to 2015 population (see **Figures 4-2** and **4-3**). This growth is equivalent to doubling the populations of Hillsboro, Beaverton, and Tigard.
- Under Scenario 2, Washington County's population is projected to grow by 292,000 people, an increase of 55% compared to 2015 population (see **Figures 4-2** and **4-4**). This growth is equivalent to doubling the populations of Hillsboro, Beaverton, Tigard, Sherwood, Tualatin, and Wilsonville.

Figure 4-2: Future Growth Scenarios Population and Employment



Employment

- Scenario 1 doubles the County's current employment, from 234,000 to 475,000 (see **Figures 4-2** and **4-3**).
- Scenario 2 results in 144% growth in Washington County employment compared to 2015 (see **Figures 4-2** and **4-4**). Scenario 2 assumes that due to increased global trade there will be more employment in high tech manufacturing, warehousing, and transportation than under Scenario 1. The employment in high tech manufacturing is higher wage than the average.

Age

- Demographers agree there will be a higher percentage of older Americans in the future, and more multi-generational households. The millennial generation will overtake the baby boomers as the largest generation cohort, and will be entering retirement years during the timeline of the Study.

Household Size

- With an aging population and declining fertility rates, trends suggest the average household size will be smaller in the future. Smaller household sizes, combined with more retirees, mean there will be a smaller number of vehicles per household in the future.

Income

- Economists generally agree there will be less individual wealth in the future, but also there will be a broader gap between low and high income groups. Under both scenarios, there will be more low-paying service jobs, and a higher share of low income households during the timeline of the Study.
- Scenario 2 assumes greater average income growth than Scenario 1, with more high wage technology jobs (due to strong regional economic growth) and more low-paying service jobs.

Urbanization

- Consistent with adopted plans, the downtowns, main streets, and town centers are envisioned as vibrant, walkable, and transit-supportive.
- Today, the urbanized portion of the county, which is approximately 127 square miles, has approximately 4,150 persons per square mile. The Study assumed the Urban Reserves in Washington County (which amount to approximately 13 square miles) are brought into the UGB and developed during the timeline of the Study.
- Under Scenario 1, Washington County's population increases to nearly 5,500 persons per square mile (33% more dense than currently), and under Scenario 2, it increases to 6,000 persons per square mile (45% more dense). By comparison, the City of Portland, without Forest Park, is nearly 137 square miles and has an estimated population (2014) of 619,360, which amounts to a density of 4,520 persons per square mile.

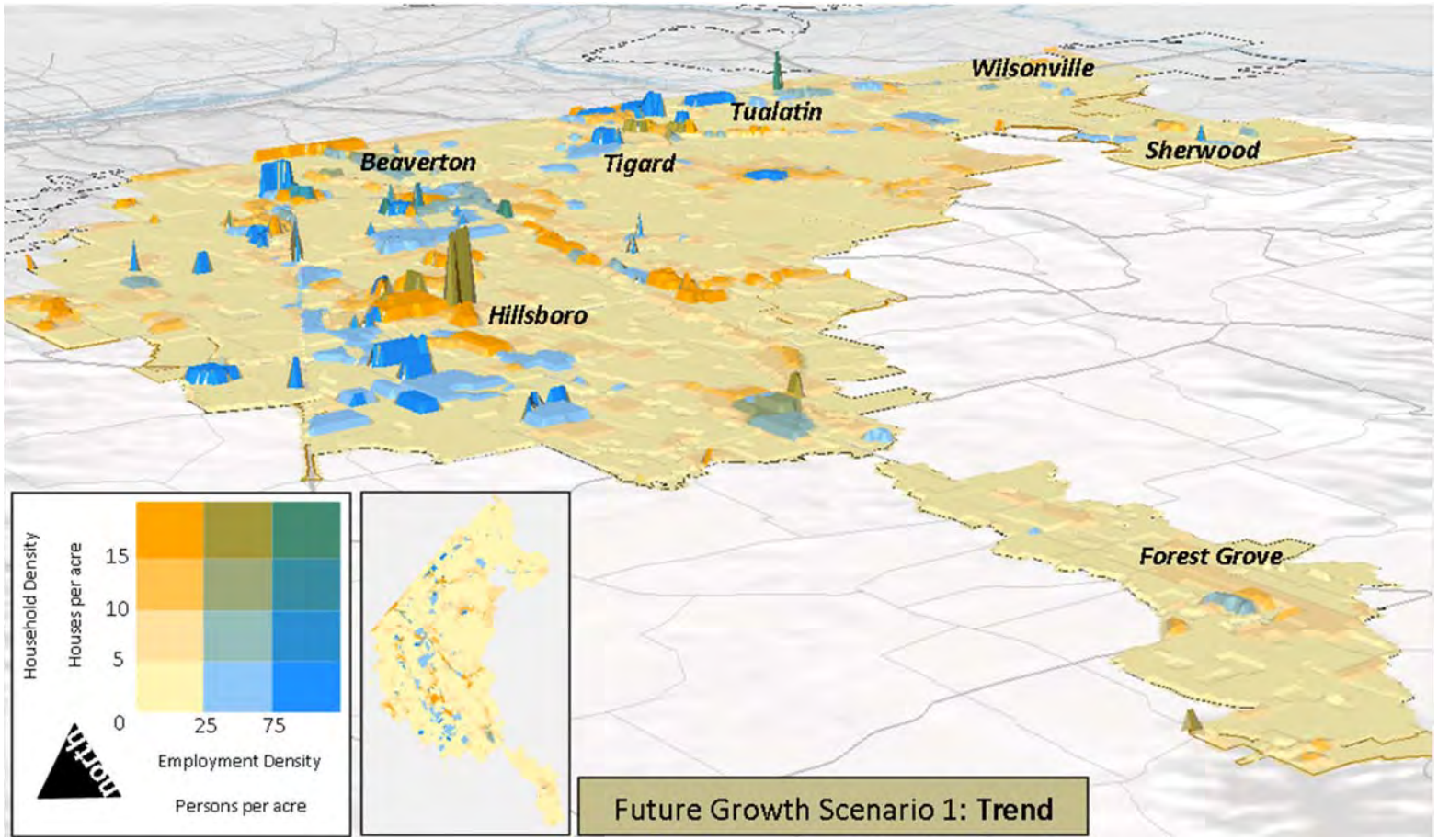
Rural Areas

- Rural areas will be preserved for farm and forestland with limited commercial or residential growth by rural reserve designation and zoning.

Satellite Cities

- The Study assumed the small cities outside but within commuting distance of the metro area, such as Newberg, McMinnville, Canby and Scappoose will grow. The Study also assumes there will be increased demand for single-family housing and home prices will continue to rise. With more demand for single-family housing, particularly under Scenario 2, these cities will see steady population increases. It is anticipated that people living in these cities will commute to jobs in Washington County and other parts of the metro area.

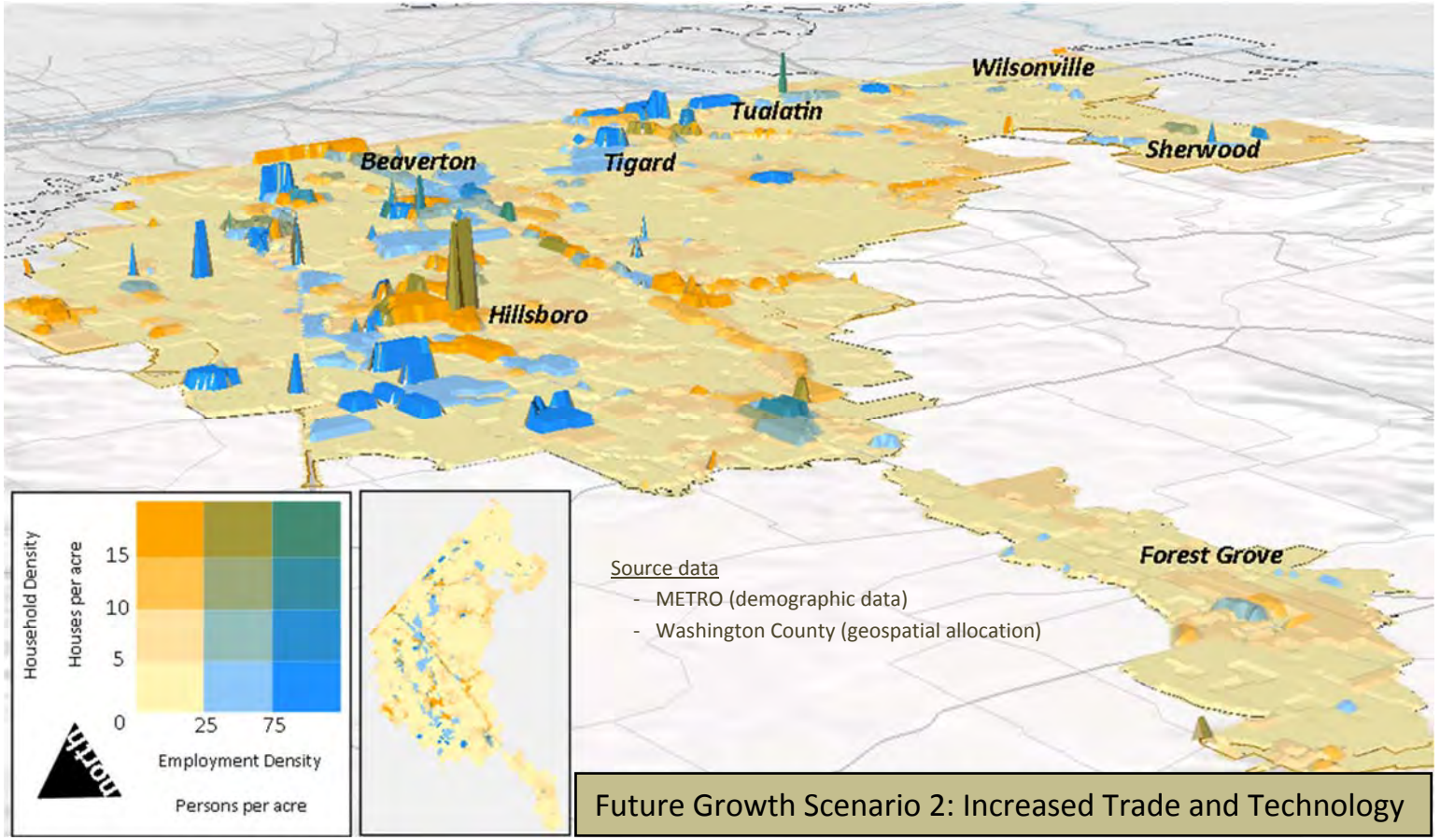
Figure 4-3: TREND Future Population and Employment



For geographic context the future population and employment growth under Scenario 1 – (Trend) is mapped in Figure 4-3. The map illustrates concentrated levels of population growth in South Hillsboro and Orenco Station areas as examples, and employment growth in the Beaverton, Tigard, and Hillsboro industrial areas, and the Hillsboro civic center.

Figure 4-3 illustrates Future Growth Scenario 2 (Increased Trade and Technology), which significantly increases employment density in the North Hillsboro industrial area, and increases population density in the city central areas, South Hillsboro, and along key transportation corridors like Highway 99W and TV Highway.

Figure 4-4: INCREASED TRADE & TECHNOLOGY
Future Population and Employment



Future Growth Scenario 2: Increased Trade and Technology

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Transportation Investment Packages

Chapter 5

Washington County
Transportation Futures Study
Exploring options • Informing choices

See Appendix D for the summary report of what is adopted in local and regional Transportation System Plans

5 TRANSPORTATION INVESTMENT PACKAGES

5.1 Development of Transportation Investment Packages

Adopted local and regional transportation system plans, which are envisioned to meet the next 20 to 25 years of growth, establish the launching point for this Study. Building on adopted plans, this Study was designed to evaluate how to meet the needs for the next 40 to 50 years of growth, as described in the previous chapter. With help from the public, the Study Advisory Committee and local and regional agency partners identified and evaluated over 100 transportation investments concepts. Investment concepts were bundled into three distinctive transportation investment packages for the purpose of evaluation.

5.2 Transportation Investment Concepts

The Study presented a unique opportunity to imagine potential long-term futures and examine how future transportation investments can best support the county's economic health and quality of life over the next 40 to 50 years.

The following categories of strategies and investments were identified by the public, the Study Advisory Committee, and local and regional agency partners as important to include in the Study.

CONGESTION RELIEF STRATEGIES and tools to help reduce the number of vehicle or shift trips to less congested locations or times of day, including:

- Parking management (i.e., paid parking and limited parking hours) in new mixed-use areas
- Employer-sponsored transit incentives
- Increased car, bike, and ride-sharing programs
- Implementation of a road-user charge based on how many miles a person drives (as an alternative to the gas tax)
- Turning some freeway lanes into tollways and/or "managed lanes" where drivers pay a charge to use the lane
- Increased telecommuting

EMERGING TECHNOLOGIES that are changing the way we travel, improving safety and traffic flow, including:

- More electric vehicles – including cars, bicycles, freight, and transit
- Driverless and connected vehicles
- Interconnected traffic signals
- Integrated mobility, real-time information, and mobility hubs
- Increased online shopping

ENHANCED BIKING AND WALKING FACILITIES, including:

- Protected bicycle and pedestrian facilities on all major roads accessing major mixed-use and employment centers
- Improved connectivity, reduced travel speeds, and crossing priority in mixed-use areas
- Separated bicycle express routes

Transportation Investment Packages

ENHANCED TRANSIT to provide affordable travel options, including:

- More bus routes and connector shuttles to serve residential and employment areas
- Communications upgrades and adaptive signals in key corridors countywide that provide for transit priority
- Upgrade Westside Express Service (WES) to all-day service, and extend WES to Salem
- Extend high capacity transit to Forest Grove and Sherwood
- Add Bus Rapid Transit on TV Highway and Beaverton-Hillsdale Highway
- Amber Glen/Evergreen streetcar to connect employment and residential areas
- Express MAX service to downtown Portland and Portland International Airport (Blue and Red lines)
- Improved bus service coordination with transit providers in adjacent counties
- Dedicated transit lanes on throughways to support express transit services
- More park-and-rides

IMPROVING ARTERIAL ROADWAYS

- Widen Cornelius Pass Road between US 26 and US 30
- Connect and widen arterials parallel to I-5 and US 26 and upgrade with new transit and protected bicycle and pedestrian facilities
- Connect and improve existing rural roads with passing lanes for trucks and bikes for travel between Hillsboro, Forest Grove, and Sherwood
- Add arterial crossings of US 26 and I-5
- Add new arterial between Forest Grove, and Hillsboro and between Highway 99W and I-5
- Improve access management along key section of TV Highway and Highway 99W
- Redesign selected major intersections as roundabouts or grade-separated

IMPROVING THROUGHWAYS

- Construct new limited access road between Hillsboro, Sherwood, and I-5/ I-205
- Add new interchange in/near Wilsonville to access I-5 and I-205
- Widen Highway 217
- Widen US 26 from Brookwood Pkwy to Highway 217
- Widen I-5 from Highway 217 past Wilsonville
- Widen I-205 between I-5 and Oregon City
- Prioritize new capacity for transit and freight
- Provide dedicated truck on-ramps at key locations
- Build a new connection to US 30 and Columbia Boulevard from Germantown and Kaiser Roads via a new road (at grade or tunnel) and a new bridge across the Willamette River

IMPROVING MOVEMENT OF GOODS BY TRUCK, including:

- Expand capacity on arterials to better accommodate trucks as an alternative to freeway travel
- Construct freight ramp meter bypass lanes at key locations
- Expand capacity on throughways and give priority to freight
- Dedicate truck lanes on US 26, I-5, Highway 217 and new north-south limited access roadway with dedicated on-ramps at key locations
- Develop new freight consolidation facilities that improve access for Washington County goods

5.3 Bundling Transportation Investments into Packages

Investment concepts were bundled into three distinctive transportation investment packages for the purpose of evaluation. The packages were designed to test varying policy options and resiliency to future growth in order to identify key trade-offs. The packages were broadly categorized as:

A. *Current policies, new technologies, and enhanced transit investments and demand management strategies (Package A – Section 5.4)*
B. *Extension of current policies with a focus on arterial capacity expansion (Package B – Section 5.5)*
C. *Beyond current policies with a focus on capacity expansion of highways (Package C – Section 5.6)*

Each package includes a set of assumptions about future investments in technology, demand management, transit, bike and pedestrian facilities, local roadways, and regional facilities (see Appendix D).

All three packages of investments exceed existing revenue forecasts and will require additional revenue sources over the 40- to 50-year horizon. The evaluation process may help inform priorities in the near and long term. Cost was intentionally not included as a constraint in selecting the type of investments to consider, but is part of the Study evaluation. Study findings may indicate that different combinations of Packages A, B, and C are worth further refinement and action.

The remainder of the chapter summarizes the packages. Specific modeling assumptions are described in more detail in Appendix D.

5.4 Package A: Current Plans, New Technologies, Enhanced Transit Investments, and Demand Management Strategies

Package A assumes the investments in technology, bike and pedestrian facilities, transit, local roadways, and regional facilities as envisioned in current adopted plans are fully implemented. In addition, with a longer time horizon, Package A assesses a policy direction focusing on enhanced transit and demand management programs. The enhanced transit investments are beyond those envisioned in Metro's adopted Climate Smart Strategy. Since Packages B and C build upon Package A, there is more detail in this section to help set context. Key assumptions for Package A are described below.

Technology

Many disruptive technologies, that is, technologies that displace established ones and significantly change the way a system operates, are emerging in transportation, and they are affecting more than just how people get around; they are also affecting land use, how people shop, and where they are choosing to work and live. The nexus of "big data," increased communications, more powerful computing power, and increased use of sensors is being applied to vehicles, infrastructure, and our transportation systems to create many new efficiencies and opportunities, including improved safety, better customer service, enhanced mobility, and more reliable travel.

New technologies may lead to increased capacity, safety, and efficiency of the existing road network. To assess this potential effect, the Study tested a variation of Package A that included a 20% or 40% increase in capacity on major roadways and throughways.

Automated and Connected Vehicles

Automated vehicles (AVs) use technologies such as ground penetrating radar (GPR), radar, and lidar to sense their environment and navigate roads with varying degrees of human input (at one end of the spectrum, no human input

is required for fully automated, or driverless, vehicles). Connected vehicles, on the other hand, rely on two-way communications, through vehicle-to-infrastructure (V2I), vehicle-to-vehicle (V2V), and vehicle-to-pedestrian (V2P) data transmissions. The freight industry is forecasted to save millions of dollars by platooning vehicles and improving fuel efficiency, and also potentially by eliminating the driver, which represents the industry's most expensive cost. For public transportation agencies, everything from service coverage to vehicle types to labor requirements stands to change with the adoption of these technologies.

The largest cited improvement for both AVs and connected vehicles is safety, but other improvements include improved traffic circulation, increased road capacity and throughput, and improved trip reliability. The level of ride sharing and the competitiveness of public transportation will be significant factors in determining how much congestion increases.

Alternate Fuel Vehicles

Regulations and policies at the federal and state level are encouraging alternate fuel vehicles—with a significant focus on electric power. Electric vehicles require significant infrastructure investments, which is encouraged through the Climate Smart Strategy. The Statewide Transportation Strategy forecasts a fairly rapid adoption of electric vehicles such that they account for 23% of new car sales in 2035, and Oregon Department of Environmental Quality anticipates new vehicle fuel efficiencies of 89 miles per gallon by 2035.

Sharing Economy

The last few years have seen a dramatic increase in the level of peer-to-peer sharing of everything from vehicles to houses to tools. In the transportation industry, ride sharing (carpooling), car sharing, and transportation network companies (or TNCs, e.g., Uber and Lyft) provide examples of how technology has enabled new forms of mobility.

These sharing services are reducing the need to own as many vehicles, which has the potential to affect Washington County's parking requirements. It's unclear, however, if and how car sharing and TNCs are affecting Vehicle Miles Traveled (VMT). The sharing economy works best in more dense urban areas, which is in line with the trend of greater urbanization and higher density in parts of Washington County.

Active Traffic Management

Active traffic management (ATM) is the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions. ATM strategies include but are not limited to dynamic speed displays (speed limits or speed advisories), lane use control, temporary shoulder use, junction control (dynamic lane allocation in interchange areas), and dynamic signing and rerouting. Some of these strategies are currently in place in Washington County, particularly in the Highway 217 corridor, and the use of ATM technologies will be expanding in the US 26 corridor soon.

A key technological aspect of ATM for Washington County is smart traffic signals, or adaptive signal control. Adaptive signal control "continuously monitors arterial traffic conditions and the queuing at intersections, and dynamically adjusts the signal timing to optimize" traffic flow, according to the objectives of the jurisdiction. Washington County currently has adaptive signal control in place in some areas, and its use is expanding.

Real-Time Transportation Information

Oregon already has a government-funded real-time traveler information program. Many states are making this data available for the private sector to use, and many private companies are collecting and disseminating their own transportation data and information.

Washington County is sharing information on road incidents, work zones, and weather closures among other information it collects.

Integrated Corridor Management

The vision of integrated corridor management (ICM) is that transportation networks will realize significant improvements in the efficient movement of people and goods through integrated, proactive management of existing infrastructure along major corridors. Through an ICM approach, transportation professionals manage the corridor as a multimodal system and make operational decisions for the benefit of the corridor as a whole.

Demand Management

Transportation Demand Management (TDM) programs will become more instrumental to how residents and employees plan day-to-day travel. The number of people traveling by public and private transit, biking, and walking is anticipated to grow, even as autonomous private vehicles become more commonplace.

Public comments included the request to consider the effect of increased road use charges and tolling as a demand management tool. Pricing urban transportation has dual advantages: (1) it promotes efficient use of transportation capacity, and (2) it helps fund improvements to the system. Taxes placed on the purchase of motor fuels are a mainstay of highway finance. But Oregon is evaluating charges based on VMT that could become a replacement to the current fuel tax.

The mainstream thinking about road user charges focuses on them as a replacement for the fuel tax. In that case a mileage fee will have little influence on the performance of the surface transportation system. The revenue opportunity will be largely the same as under fuel-tax financing, as will be the tax/fee burden on various different categories of road users. At the margin, drivers of fuel efficient vehicles will pay more under a mileage fee than under the status quo.

But any fee that carefully tracks mileage by vehicle, even if it is used only as a substitute for a gas tax, creates a technology that allows greater opportunities to link fees directly with locations and times of day where travel costs (traffic volume, capacity burdening, pollution, etc.) are greatest. This could be in the form of local option fees or fees that vary with the degree of traffic congestion.

A recent study (performed by ECONorthwest) for the greater Orlando region in Florida compared: (1) a flat-rate mileage fee, along with a mileage fee that varied by time of day and location (addressing traffic congestion) to (2) a fuel tax baseline condition. The mileage fee with a variable rate did the most to address congestion (person-hours of travel in the region drops by almost 15%) and produces sizable revenues ($3 million per average weekday or $850 million per year for the Orlando region). Variable fees reduce the immediate need for building new highway capacity, and revenues that are generated where travel demand is high tells the road operator that there is a high willingness to pay for improvements to this portion of the network.

Package A assumes increased trip reduction strategies beyond those existing today, consistent with increased urban density and changing technologies, including increased street connectivity; expanded parking management programs; integrated mobility including more car, bike, and ride-sharing services; and increased telecommuting, transit pass, and reduced fare programs.

Transit

Package A assumes an expanded transit grid network with transit priority on arterials and extensions to the existing high capacity transit (HCT) system, along with improved circulators and connectors services, such as South Metro Area Transit (SMART), as defined in the Climate Smart Strategy. TriMet's Westside and Southwest Service Enhancement Plans, which collectively cover TriMet's entire service district within Washington County, as well as the Climate Smart Strategy outside Washington County are assumed to be fully

implemented. TriMet's Service Enhancement Plans anticipate future transit service within the following corridors:

- 170th Avenue south of Elmonica MAX station;
- Century Boulevard (including present-day 229th and 231st avenues and a future bridge over Rock Creek) from Gordon Faber Recreation Complex to the South Hillsboro plan area;
- Brookwood Parkway/Avenue from Fair Complex or Hawthorne Farm MAX station to the South Hillsboro/ Witch Hazel area;
- Evergreen Road/Parkway, Shute Road, and Butner Road in north Hillsboro;
- Horizon Boulevard and Barrows Road in the Progress Ridge area of south Beaverton;
- Durham Road in Tigard; and
- Tualatin-Sherwood Road (line 97 initiated in 2016).

For many of the corridors listed above, significant development and infrastructure investment would need to occur before TriMet provides new service. For example, a route along the Century Boulevard corridor would likely be prompted by major development in South Hillsboro and construction of the Century Boulevard Bridge over Rock Creek.

The Study Team received input from the community that the Study should test how enhanced transit can meet the county's travel demand in the future. Therefore, the Study Team bundled many of the transit concepts into Package A. The following concepts were suggested for, and included in, the Study:

- demand for HCT between Forest Grove and Hillsboro via an extension of MAX,
- bus rapid transit (BRT) along TV Highway with express service to Portland along Beaverton-Hillsdale Highway,
- upgrades to WES, including all-day service with an extension to Salem, and
- a more urban level of transit service, such as a streetcar, in the Amber Glen area of Hillsboro.

Bike and Pedestrian Facilities

All roadways in the urban area, with the exception of freeways, are bicycle and pedestrian routes. With few exceptions, within the urban area sidewalk and bike lane installation is required by development when roadways are reconstructed for a development or a capital project. Meanwhile, in the rural area, the pedestrian and bicycle system consists of roadway shoulders and paved or unpaved off-street trails. Sidewalks and bike lanes are not required in the rural area. In the urban area, planned investments are anticipated to complete 60% of the collector and arterial on-street biking and walking network with a 6-foot bike lane or buffered bike lane and sidewalks over the next 20 years. Package A assumes completing the bike/pedestrian network on all urban arterials and collectors. Adopted plans also encourage improved connectivity with more direct, efficient, comfortable and attractive walking environment and supportive amenities within urban centers.

Local Roads

The county's roadway system includes a wide variety of roadway types–from major urban boulevards to gravel rural roads. Local and regional plans call for providing an integrated multimodal network of complete streets that improve travel options, making new connections and adding capacity to major roadways. Arterials provide general mobility for travel within the Washington County. Correctly sized arterials at appropriate intervals allow through-trips to remain on the arterial system, thereby discouraging use of collector or local streets for cut-through traffic. Arterials streets link major commercial, residential, industrial, and institutional areas. In Washington County, the following planned investments will result in some improved connections and added capacity:

- New three-lane roadway between I-5 and Highway 99W,

- New overcrossings on Highway 217 and US 26,
- Widening of Tualatin-Sherwood Road to five lanes,
- Extension of 124th Avenue/Basalt Creek Parkway from Tualatin-Sherwood Road to Grahams Ferry Road, and
- Local street connections in future Urban Reserves.
- Arterial street upgrades designed to accommodate use by all travel modes, including automobiles, bicycles, freight delivery vehicles, transit vehicles, and pedestrians of all ages and abilities.
- Arterial streets with reduced speeds in town centers to support adopted plans for walkability and bikeability area.

Regional Facilities

The following planned investments to expand regional facilities help reduce traffic bottlenecks (as reflected in adopted regional financially constrained transportation plans).

- Extension of the existing I-5 auxiliary lane between Nyberg and Lower Boones Ferry Road
- Northbound and southbound auxiliary lanes on Highway 217 between Allen Boulevard and Highway 99W
- Connection of the Allen-Denney interchanges as a split diamond interchange on Highway 217

Figures 5-1, 5-2, and **5-3** on the following pages illustrate, on a map of the region, the bicycle/pedestrian, roadways and freight, and transit improvements for the Package A transportation investments, which include adopted planned investments.

Representative arterial on-street bicycle lane and sidewalk improvement projects under Package A include:

- ✓ **West Union Road** – linking north Beaverton and north Hillsboro
- ✓ **173rd/170th Avenues –** linking Beaverton from TV Highway to Union Road
- ✓ **Beaverton-Hillsdale Highway** – linking Beaverton and Hillsdale (Portland)
- ✓ **72nd Avenue –** linking Tigard Triangle with Bridgeport Village
- ✓ **Sunset Boulevard –** linking to southern Sherwood
- ✓ **124th Avenue –** linking Tualatin and north Wilsonville
- ✓ **TV Highway –** linking Hillsboro, Cornelius, and Forest Grove

Figure 5-1: Investment Package A – Bicycle and Pedestrian

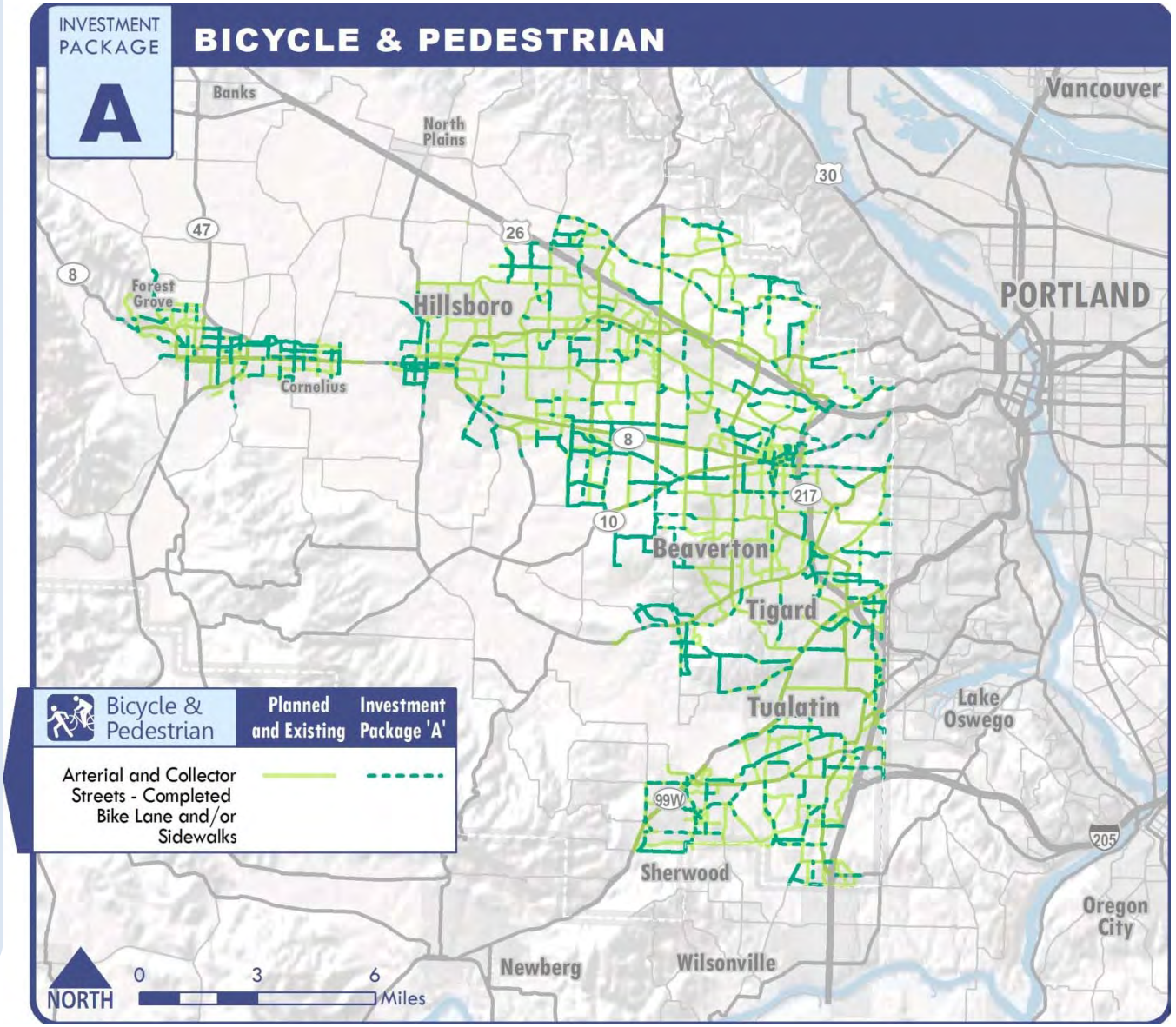
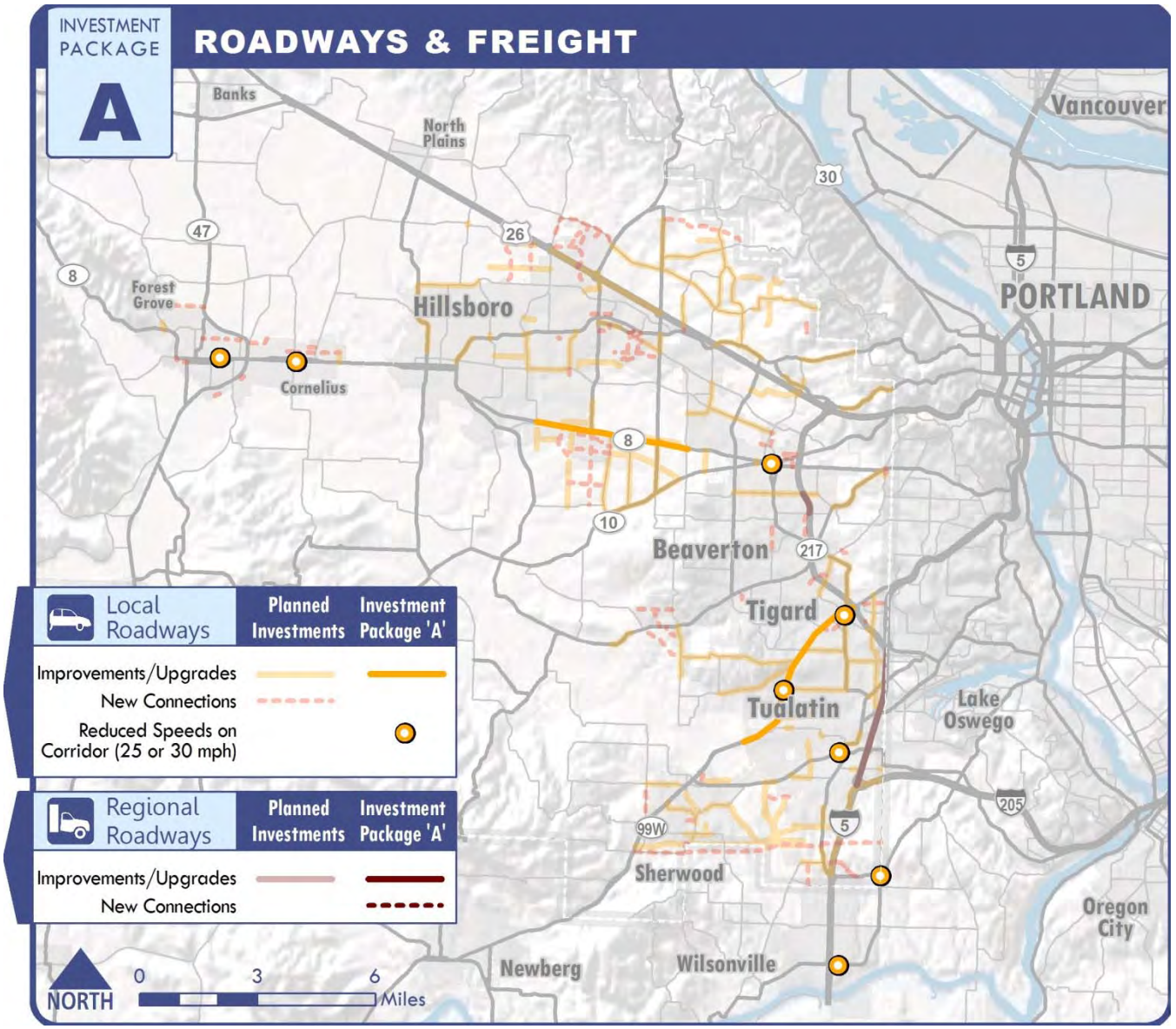


Figure 5-2: Investment Package A – Roadways and Freight

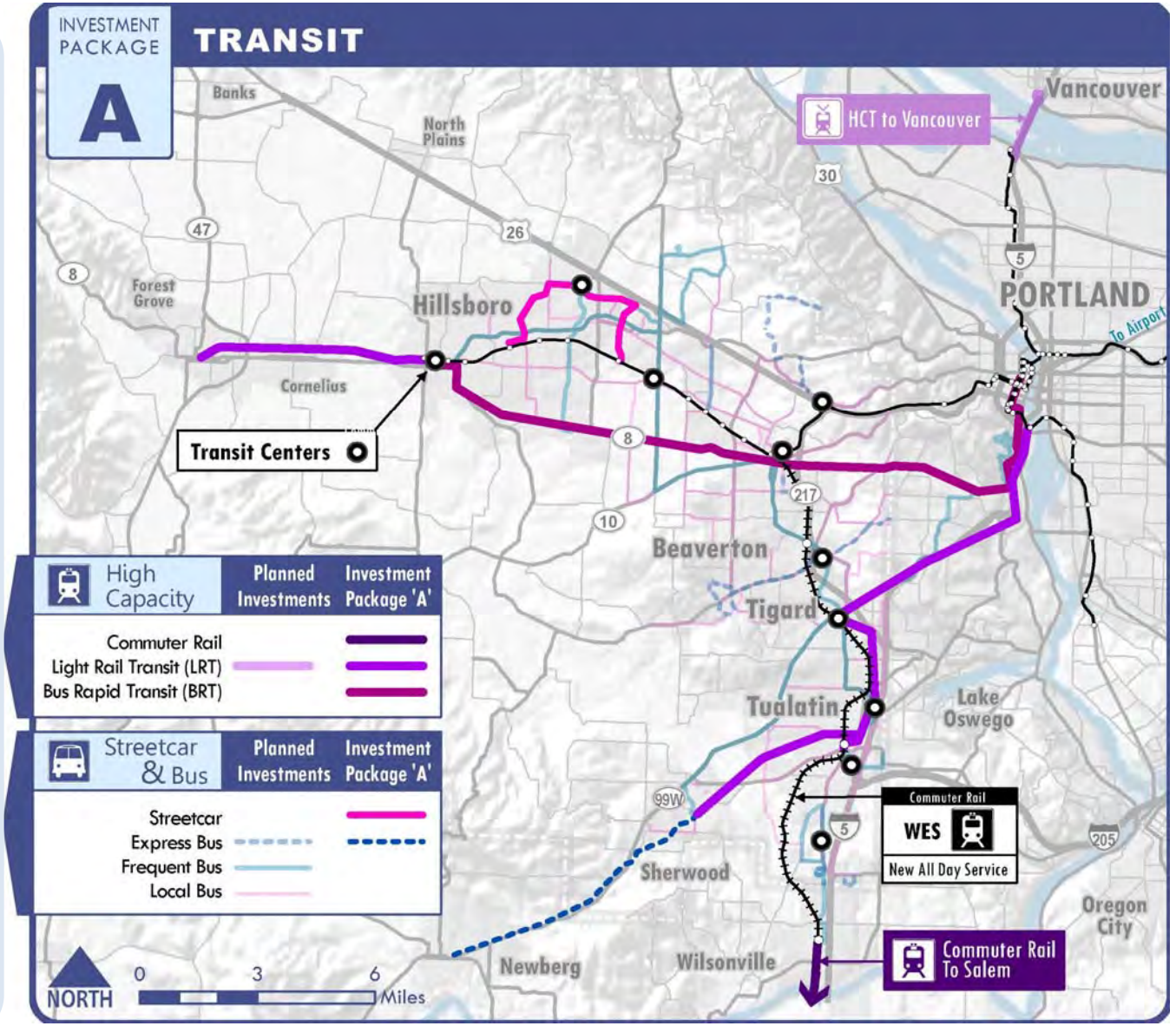


Package A includes targeted investments to improve a**ccess management along Highway 99W and TV Highway**

Figure 5-3: Investment Package A – Transit

In addition to the transit system Planned Investments, Package A includes several noted transit projects:

- ✓ **MAX Light Rail Transit (LRT) Extension** – Hillsboro to Cornelius/Forest Grove
- ✓ **TV Highway BRT** – linking Hillsboro, Beaverton, Hillsdale, and Portland
- ✓ **Streetcar** – serving AmberGlenn/Tanasbourne with links to MAX and Intel



5.5 Package B: Focused Investment in Arterial/Collector Street Connectivity and Inter-city Express Bus Systems

Package B builds on Package A. As an alternative approach to meet long-term travel demand, **Package B** assesses policy direction focusing on adding local roadway capacity through improved connectivity and access management; new transit routes along corridors not envisioned in adopted plans; addition of separation on-street between bicyclists and drivers; and widening Highway 217, in addition to the other assumptions in Package A. Therefore, the following additional investments in transit, bike/and pedestrian facilities, local roadways, and regional facilities are included in Package B:

Transit

The Study Team received input from community members that there is a lack of adequate north-south connectivity, especially connecting new residential areas like South Hillsboro, South Cooper Mountain, and River Terrace to employment areas in North Hillsboro and the southeast county. Therefore, the Study tested the future demand for a new route between Sherwood and North Hillsboro as well as a route connecting Beaverton and Lake Oswego.

Bike and Pedestrian Facilities

Achieving regional active transportation performance targets will require attracting a wider range of users. A variety of factors limit bicycling by interested but concerned cyclists, including adjacent vehicle speeds (>35 mph), adjacent vehicle volumes (>3,000 Average Daily Traffic (ADT)), and freight conflicts. The Study Team received input from community members that more separation between vehicle and bicycle travel through enhanced bicycle facility design would be one way to potentially attract a wider range of users. The Washington County Transportation System Plan identifies Enhanced Major Street Bikeways on select urban arterial or collector roadways that are planned to have buffered bike lanes or cycle tracks on one or both sides of the road. The Study evaluated the implications of completing the Enhanced Major Street Bikeway.

Local Roadways

The Study Team also received input from community members that there is a lack of adequate north-south connectivity, especially connecting future residential areas like South Hillsboro, South Cooper Mountain, and River Terrace to future employment areas in North Hillsboro and the southeast county. Many of the travel corridors traverse rural roadways, which were originally designed and built to accommodate only local and agricultural-related traffic. A variety of agricultural resources and communities are located along these rural routes. Now these corridors may host urban traffic, farm equipment, and commercial freight traffic, and in the future will have even more travel demand.

Additionally, community members raised concerns about the impact on livability of cut-through traffic in neighborhoods and town centers. This is especially true in areas that lack alternative routes and/or are not properly designed to accommodate all modes. They can easily become bottlenecks for motor-vehicle travel and hazardous and intimidating for cyclists and pedestrians. Depending on the severity of the problems, the impacts to all modes can cause problems that

ripple throughout the transportation system, causing vehicle delay and intimidating barriers for bicycle and pedestrian travel. Therefore, the Study tested the future demand for the following additional investments:

- Add crossings of regional facilities spaced approximately 1 mile apart, where reasonable, to improve access to centers and address congestion at interchanges.
- Upgrade a select number of major intersections.
- Widen arterials in rural areas to allow for passing lanes and reduce conflict with bikes.
- Expand the arterial grid network, where reasonable, in Urban Reserves and undesignated areas with multimodal capacity, thus allowing for future urbanization of these areas and connections between urban centers. This expansion includes arterials around Cooper Mountain and on Cornelius Pass Road between US 26 and US 30.

Regional Facilities

In addition to the investments in Package A, Package B includes increased capacity to six lanes on Highway 217, improved access management along TV Highway and Highway 99W, and freight priority access to I-5 and US 26 at selective interchanges on I-5 and US 26.

Figures 5-4, 5-5, and **5-6** on the following pages illustrate, on a map of the region, the bicycle/pedestrian, roadways and freight, and transit improvements for the Package B transportation investments (bold lines), illustrating how they build upon the investments in Package A (faded lines).

Figure 5-4: Investment Package B – Bicycle and Pedestrian

Representative arterial on-street, buffered bicycle lane, and sidewalk improvement projects under Package B include:

- ✓ **West Union Road** – linking north Beaverton and north Hillsboro
- ✓ **173rd/170th and 185th Avenues** – linking Beaverton and Hillsboro from Farmington Road to and across US 26
- ✓ **Highway 99W** – linking Tigard and Sherwood
- ✓ **Tualatin-Sherwood Road** – linking Tualatin and Sherwood
- ✓ **Sunset Boulevard** – linking to southern Sherwood
- ✓ **TV Highway** – linking Beaverton and Hillsboro

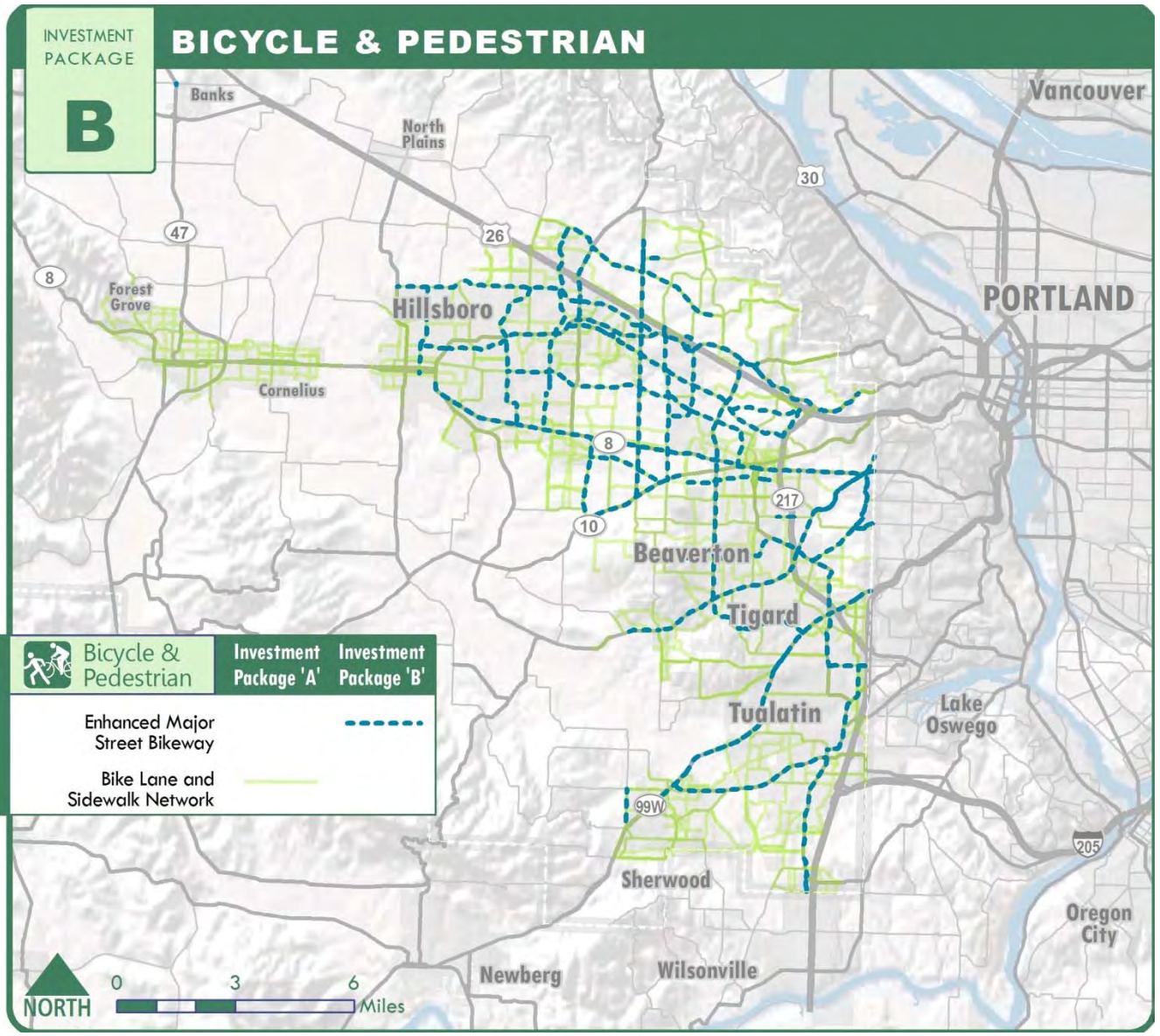
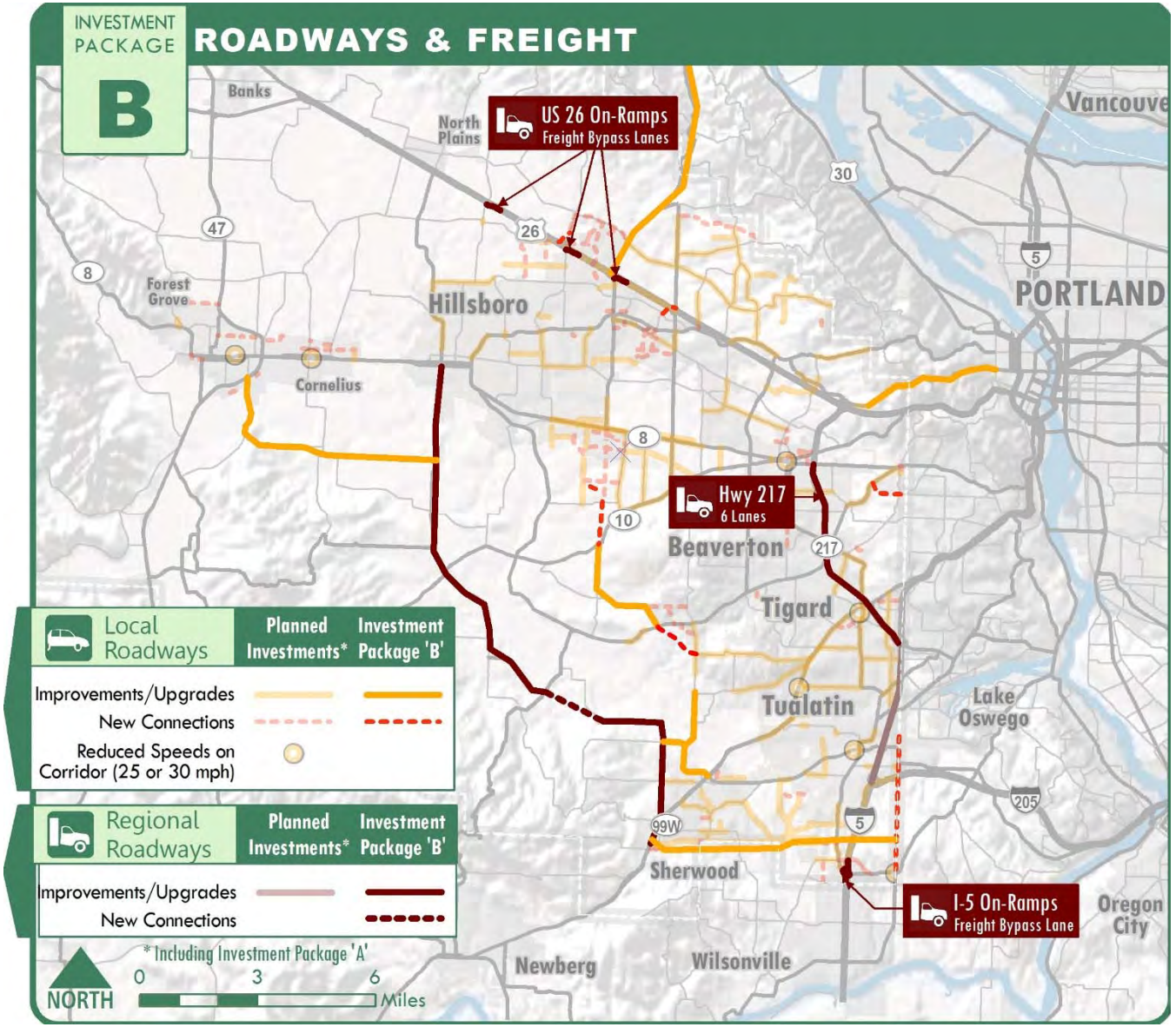


Figure 5-5: Investment Package B – Roadway and Freight



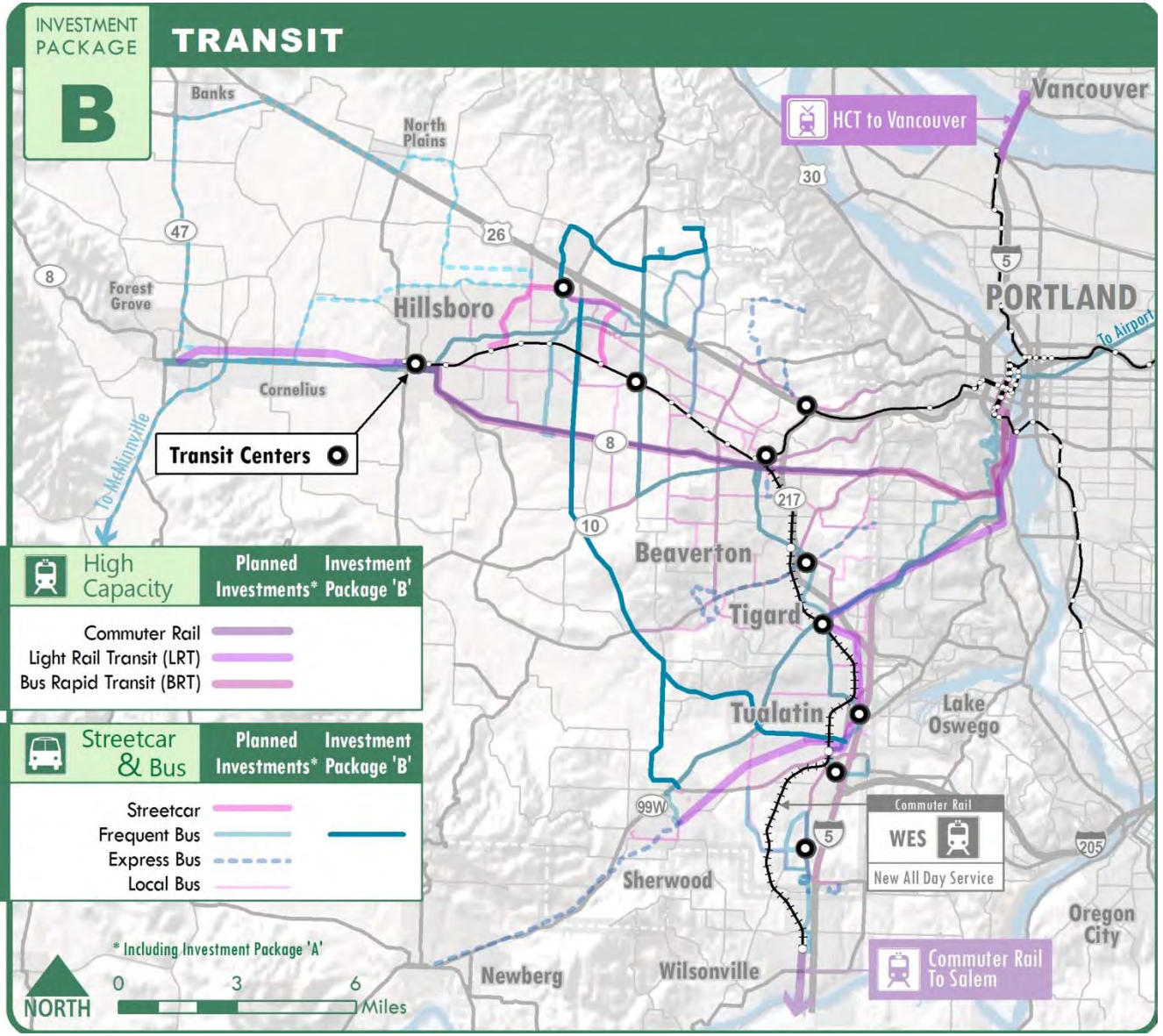
Package B includes these notable county arterial system investments:

- ✓ **Freeway on-ramp truck bypass lanes at selective interchanges** on US 26 and I-5
- ✓ **Widen Highway 217** – from Beaverton to I-5
- ✓ **Highway 219** – safety enhancements (passing lanes)
- ✓ **Local arterial street upgrades** – on (1) Cornelius Pass Road (north of US 26) and (2) around Cooper Mountain
- ✓ **Improve and widen the Southern Arterial**, between Sherwood and 65th Avenue

Figure 5-6: Investment Package B – Transit

Package B includes transit system Planned Investments and Package A investments, plus the following westside bus system enhancements:

- ✓ **Expanded frequent bus service** – linking Tigard/Sherwood and Beaverton/Hillsboro, with connecting service to new developments in River Terrace, South Cooper Mountain, and South Hillsboro



5.6 Package C: Focused Investment in Highways and High Capacity Transit System Expansion

Package C assesses policy direction focusing on additional highway capacity that is not currently in the adopted plans, and requires changes to the existing policies, such as roadway expansion in rural reserves. While Package B focuses on arterial expansion and limited widening of highways, Package C focuses on new and expanded highways as investment priorities in an effort to direct traffic away from existing arterials, and provide alternative access opportunities to the north, south and east. This option includes the investments in Package A and proposes the following additional investments:

Transit

The Study Team received input from community members that there is demand for more east-west capacity as well as for express services, especially to the Portland airport. Additionally, community members made it clear that any new roadway capacity needs to be in conjunction with new transit service. Therefore, the Study includes new express transit services using new capacity on regional roadways as well as along new roads connecting Wilsonville and Hillsboro, and Hillsboro and North Portland, supported by additional park-and-ride facilities.

Bike and Pedestrian Facilities

As an alternative to on-street separation in Package B, Package C includes new bike highways in dedicated right-of-way within adopted regional trail corridors to attract a wider range of users.

Local Roadways

As an alternative to Package B, Package C focuses primarily on regional facilities. Therefore, there are limited investments in local roadways in Package C except where new arterials are inconsistent with existing policies such as in rural reserve areas (e.g., Hillsboro-Forest Grove Connector). Package C does include upgraded arterials that access new regional facilities.

Regional Facilities

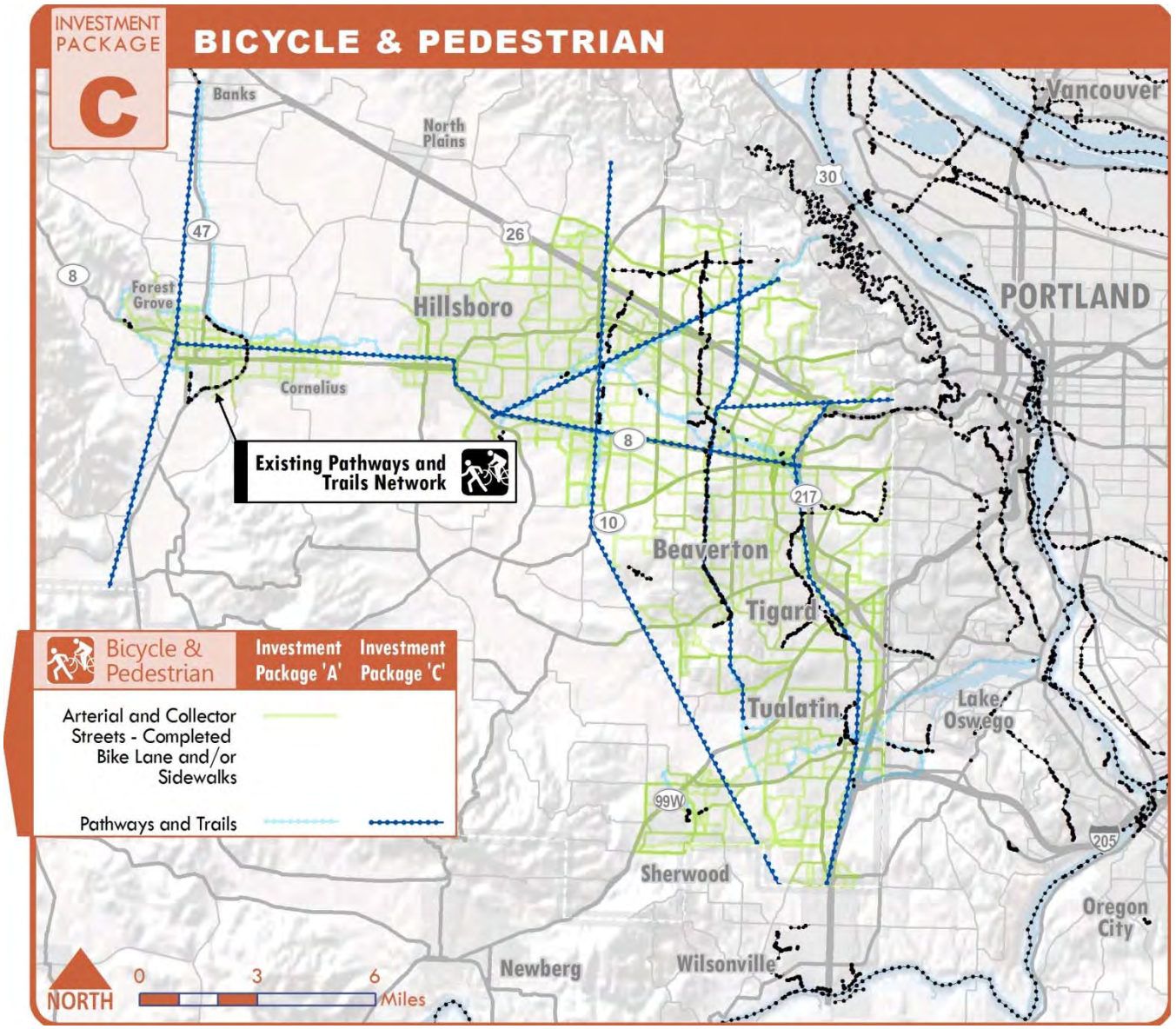
The Study Team received significant amount of input from community members that there is a lack of adequate north-south connectivity, especially connecting new residential areas like South Hillsboro, South Cooper Mountain, and River Terrace to employment areas in North Hillsboro and the southeast county. Of particular interest for freight movement and commuters was improving access to North Portland, the Portland airport, Clark County, and I-5. Based on input from the community on how to improve connectivity, the following are included in Package C:

- A new south-north limited access road from I-5 and I-205 to US 26 through the rural areas. A variation is included for this facility through the urban area within Hillsboro.
- A new limited access facility between US 26 and Columbia Boulevard in North Portland for access to the airport and Clark County.
- Additional widening of regional throughways beyond current plans to provide access around Portland: on US 26 to US 30, on Highway 217 and on I-5 from Highway 217 south and connecting to I-205 to Oregon City, including the widening of Boone Bridge.

The regional throughway lane widening in Package C is assumed to be for priority use by transit, freight, and high-occupancy (HOV) vehicles. Managed lanes are a strategy designed to take advantage of drivers' willingness to pay for travel-time savings as they travel on major highway corridors and could be priced. Package C does not assume pricing on these facilities.

Figures 5-7, 5-8, and **5-9** on the following pages illustrate the bicycle/pedestrian, roadways and freight, and transit improvements for the Package C transportation investments (bold lines), as well as the investments in Package A (faded lines).

Figure 5-7: Investment Package C – Bicycle and Pedestrian



Representative multi-use pathways and trails under Package C include separate pedestrian-bicycle facilities along the following corridors:

- ✓ **Yamhelis Westsider Trail** – linking Gaston and Forest Grove
- ✓ **Pearl Kealer** – linking Sherwood and Hillsboro/Beaverton
- ✓ **Turf to Surf** – linking Beaverton, Hillsboro, Cornelius, and Forest Grove

Figure 5-8: Investment Package C – Roadways and Freight

In addition to Package A investments, Package C includes these notable regional roadway and freight system investments:

- ✓ **Freeway widening with managed lanes** – on (1) US 26, between North Plans and Highway 217, (2) Highway 217 between US 26 and I-5, and (3) I-5, between Wilsonville and downtown Portland
- ✓ **New limited-access parkway connector** – including the (1) Northern Connector, linking north Hillsboro (by tunnel) to Columbia Boulevard in north Portland, (2) North-South parkway, linking Sherwood and Hillsboro, and (3) Southern Arterial, linking Sherwood and I-5
- ✓ **New intercity connector** – linking Forest Grove and Hillsboro

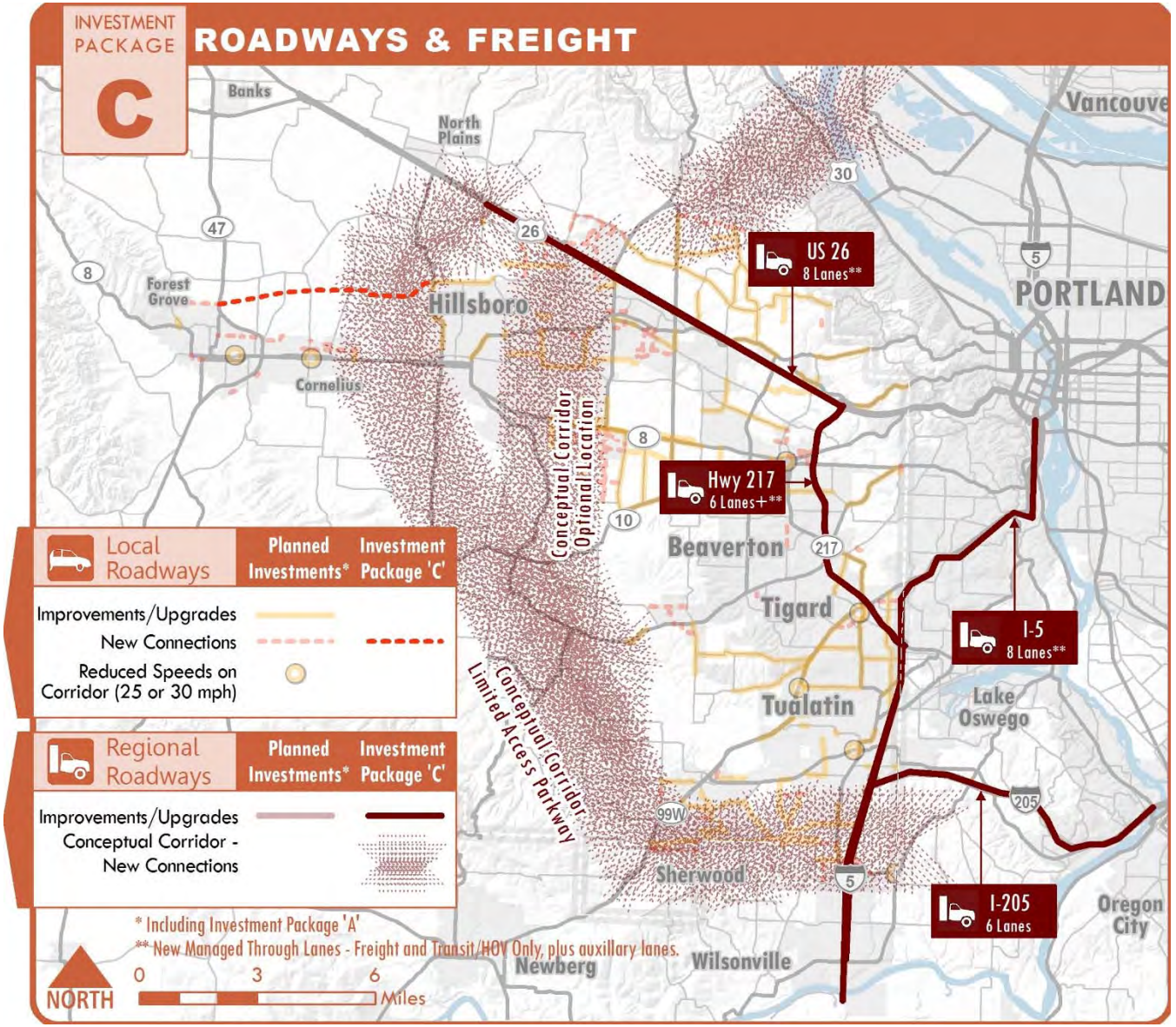
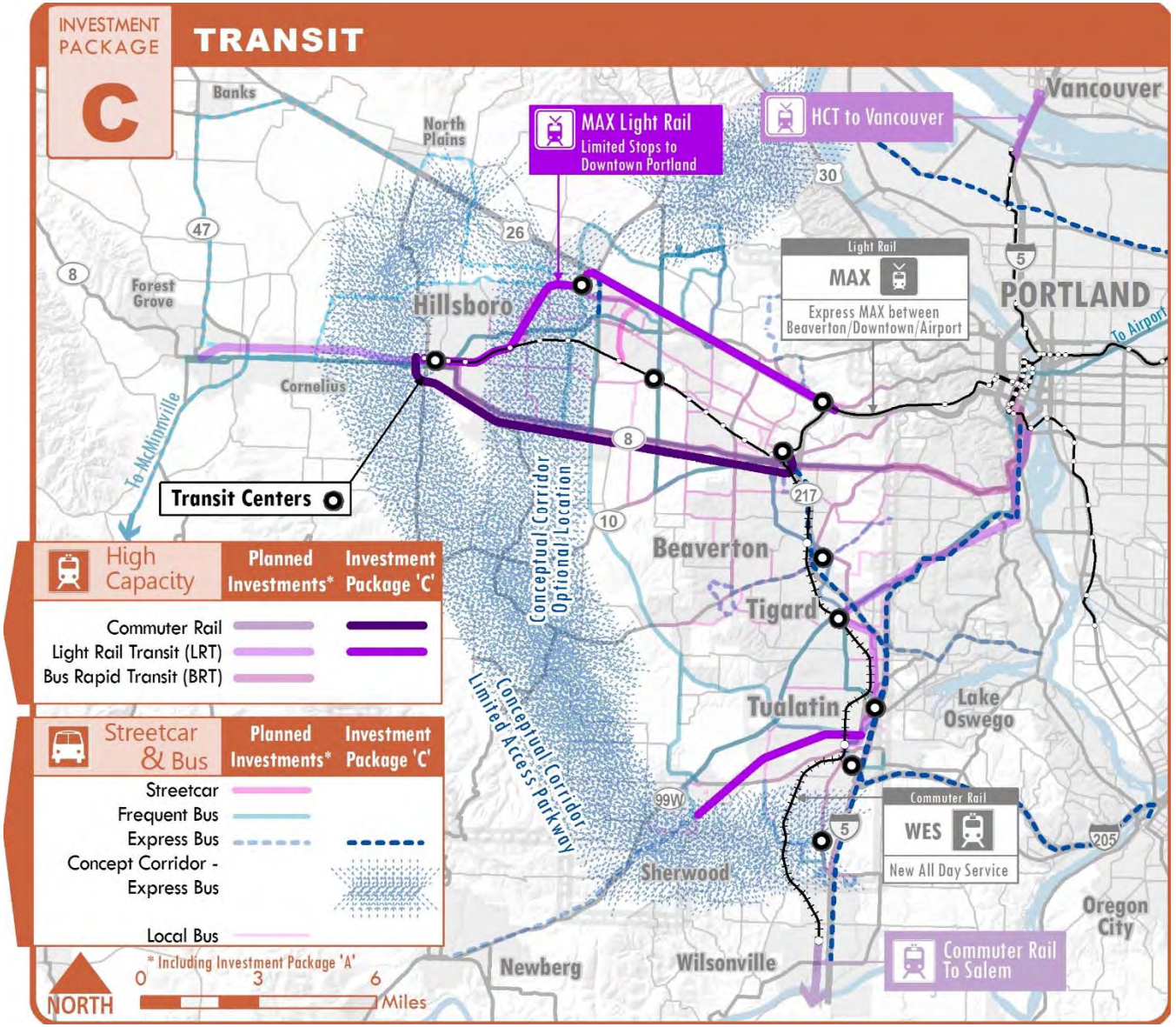


Figure 5-9: Investment Package C – Transit



Package C expands the westside transit system as defined under Package A, with notable HCT and bus service through:

- ✓ **MAX expansion** – between (1) Hillsboro and Portland with new alignment along US 26, and (2) between Tualatin and Sherwood
  - ✓ **WES extension** – linking Beaverton and Hillsboro
  - ✓ **Express bus service** – linking (1) Tualatin, Sherwood, and Hillsboro (along new North-South Parkway), (2) Tualatin and Oregon City along I-205, (3) Hillsboro and North Portland (along new Northern Connector), and (4) Wilsonville and Portland (along I-5 in new HOV lanes)

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Framework
Evaluation Framework

Chapter 6

Washington County
Transportation Futures Study
Exploring options • Informing choices

The full Evaluation Framework Report is contained in Appendix E.

What's in this Chapter?

6 EVALUATION FRAMEWORK

This section summarizes the approach (framework) used to evaluate the three transportation investment packages under the two growth scenarios.

Policymakers have choices about future transportation investments. To make a good choice, they need information about how the investment packages perform with respect to things people in their communities care about. A good evaluation addresses the following questions:

- What potential impacts do people care about (*values*), and what is the relative importance of each?
- How are these impacts measured (*performance measures* and *evaluation criteria*)?
- How big are the impacts, and how do they differ across groups and locations (*evaluation results)*?

This evaluation framework describes performance measures used to evaluate the performance of transportation investment packages. It provides detail on their high-level assumptions, principles, and methods.

6.1 Impact Categories and Their Evaluation Measures

The *primary purpose* of any transportation system is to provide good transportation. Broadly, an urban transportation system should do a good job of enabling all people to reach desired destinations safely, reliably, cheaply, and with reasonable amounts of travel time.

But any transportation investment or policies will have effects on more than transportation. Some of those effects can be positive (e.g., on the economy), and some are negative (e.g., on the environment). Thus, policymakers must also consider *secondary impacts*.

The impact categories considered in this evaluation are:

- **Direct Transportation Impacts**
  - Safety
  - Mobility
  - Reliability
  - Cost
- **Secondary Transportation Impacts**
  - Environmental Sustainability
  - Land Use and Community
  - Health
- **Distributional Impacts**
  - Social Equity

Each impact category is evaluated by specific measures (usually one to five) that planners and stakeholders believe capture some essential aspect of what people want to achieve in that category. Since the Study is about transportation futures, all the measures of concern are really *forecasts* of future performance (usually from some forecasting model).

The selection of measures is not a simple task. One could brainstorm a list of hundreds of measures for use in this Study. The team relied on two principles to narrow the list of possible measures:

1. **Comprehensiveness and mutually exclusivity**. Measuring all effects on all people, at all relevant places, and at all relevant times isn't practical. Evaluators must develop a framework that captures

the most significant effects. They must be sure that the categories and measures used in this evaluation do not double-count impacts. Decision-makers cannot accurately compare choices if their benefits are double-counted, and especially if they are unaware that double-counting is occurring.

2. **Consolidation.** The number of measures can grow rapidly as categories expand to subcategories and as investment packages are evaluated against different assumptions about driving forces (scenarios). The evidence of experience is clear: People can manage lists of about six to ten items before the list starts becoming confusing. The challenge is how to consolidate multiple measures, in different units, into some overall evaluation of performance by each alternative on the broader measurement category/ evaluation criterion.

Ultimately, 7 categories of impacts and 19 measures across all categories were selected. **Figure 6-1** lists the impact categories and their evaluation measures.

For this Study, economic vitality is inferred for the primary transportation-performance measurements and is not evaluated with separate measurements. For example, travel-time benefits can directly reduce labor and shipping costs, and indirectly reduce the need to compensate employees to induce them to stay despite uncomfortable commutes. System reliability allows households and freight users to plan more accurately and can reduce costs associated with scheduling. Great infrastructure supports vibrant, walkable urban districts. The travel performance benefits are what allow the economy to perform better; they allow growth to occur. Shorter travel times, higher reliability, fewer crashes: All of these allow people and freight to move better, which makes an economy work better and grow.

Social Equity

Social equity is treated as an overarching assessment in the Study. Early on, the community expressed interest in understanding whether future transportation investments (and their benefits, by proxy) were distributed equitably among county residents, by some form of socioeconomic stratification. With available and relevant U.S. Census data (population and income), the Study identified and mapped lower income areas of the county.

Further, the Regional Travel Demand Model used in the Study includes socioeconomic variables that are limited to household size and income in the estimation of future trip-making in Washington County. Model outcomes were summarized with respect to these designated lower income areas. As noted later under Distribution of Impacts (see Section 6.2), these lower income areas, or Socioeconomic Groups, are used to gauge social equity.

Figure 6-1: Impact Categories and Their Evaluation Measures

Impact Category	Description and Measures
Mobility 	Everyone's time has value, and users prefer to reach destinations sooner rather than later. Congestion, needing to travel longer distances, or taking slower routes can increase travel time. **Measures:** *Travel time benefits*: Travel time benefits measure the time that it takes users to get from place to place. This Study evaluated this impact using average travel time for different types of trips. *Transit coverage*: Transit coverage is an important aspect of both reducing VMT and increasing equity. The Study measured transit coverage by calculating the volume of Washington County lands within ¼-mile access to existing and planned bus stops, and ½-mile radius of existing and planned HCT stations. The Study weighted these figures by frequency of service.
Accessibility 	*Active transportation accessibility*: Residents expect to have access to active transportation options for both commuting and recreation. This Study measured active transportation accessibility by calculating the volume of Washington County lands within ¼-mile access to existing and planned network of sidewalks, bikeways, and multi-use paths. The Study weighted these figures by facility type (e.g., multi-use paths and separated bicycle facilities are rated higher by preference for active transportation utility). *Labor force access to jobs in Washington County*: Ideally, residents can live close to where they work. The Study measured labor force access to jobs by calculating the percent of households that could travel to a job in under 30 minutes by car and by transit.

Impact Category	Description and Measures
Reliability 	Users value travel time predictability so they can plan their time efficiently. On corridors where travel time varies by more than a handful of minutes from day to day, research suggests that users often plan for the longer travel time scenario to avoid arriving at their destination late. For users that cannot be late to their destination (such as shippers), reliable travel time is often more critical than the actual duration of time. **Measures:** *Travel time reliability for motorists*: The Study measured travel time reliability by the difference in future travel speed for the same trip in uncongested (free-flow) traffic and congested traffic during the PM peak two-hour period. *Trip reliability for transit users*: The Study measured travel time reliability by the ratio of future transit demand and transit vehicle capacity. *Freight reliability to Port of Portland*: The Study measured freight reliability by the future traffic volume-to-capacity ratio (v/c) of 11 key highway and freeway links that serve as important portals or internal connectors servicing Washington County freight movements.

Impact Category	Description and Measures
Safety 	Users want to minimize the risk of injury or death. Safety is a critical feature of the transportation system. **Measures** *Risk of crash*: The number of crash fatalities is an important measure of safety. Research shows a correlation between auto speed and crash severity: the risk of a fatality increases significantly when vehicle speeds get above 30 to 40 mph. Therefore, the evaluation measured the risk of crash fatality by the vehicle miles traveled (VMT) above 40 mph. Fatality rates vary by roadway type. Thus, the evaluation segmented VMT calculations by roadway type (freeway, arterial and collector), then factored the VMT of each segment by average Oregon fatality rates for that roadway type to equalize impacts. *Potential crash exposure*: The public also cares about the risk of non-fatal crashes. Research shows that the risk of all crashes (fatal and non-fatal) increases in accordance with the volume of auto travel. Thus, this evaluation measured the potential risk of crash exposure using total VMT.

Impact Category	Description and Measures
Environmental Sustainability 	Environmental sustainability is an important measure of quality of life. Transportation investments can impact environmental sustainability in a number of ways, many of which have long-term negative consequences. **Measures:** *Greenhouse gas (GHG) emissions*: The burning of fossil fuels generates GHG emissions that contribute to global climate change. Within the transportation system, vehicle engine operations are the primary generator of GHG emissions. Thus, this Study measured the impact on GHG emissions by the volume of auto VMT. *Impacts to natural resources*: This Study defines "natural resources" specifically as critical habitat, riparian areas, and wetland areas. These resources support habitat and important ecosystem services. To measure the impact on these resources, the Study calculated the acres of significant natural areas that that would be negatively impacted from impervious surfaces due to transportation investments. The Study used Metro's inventory of significant natural areas as defined in Metro's Urban Growth Management Functional Plan, Title 13, and data from Washington County to define the coverage of natural resource areas. *Efficiency of vehicle trips*: VMT per person trip was used in the Study to gauge Washington County's transportation performance and compare it to similar measures of the region. Higher VMT per person-trip indicates low transit, walk, and bike mode share and longer auto trips. The Portland/Vancouver metro area has experienced a historical decline in the rate of VMT per-person trip, largely due to policy-based plans that encourage urban, mixed-use, and higher density centers and regional investments in HCT and strong bicycle-pedestrian systems development.

Impact Category	Description and Measures
Land Use and Community 	Transportation investments can affect local community character by changing behavior. If investments increase travel speeds, congestion, air quality, and noise levels in areas where people live, work, and recreate, they can have a negative impact on quality of life. Transportation investments should complement other land use and community plans. **Measures:** *Cut-through traffic*: Congestion on highways and arterials causes some drivers to divert onto smaller local collector and neighborhood streets. These alternate routes often cut through residential neighborhoods and community centers, negatively impacting the livability and character of the neighborhoods by giving them a vehicle-oriented feel. Limiting cut-through traffic is important to maintaining livability. This Study measured the impact on cut-through traffic by comparing traffic demand on the collector street system under uncongested network conditions and congested conditions. *Consistency with land use plans*: The Study qualitatively measured consistency with land use plans by comparing changes to multimodal connections, cut-through traffic, vehicular traffic speeds, and congestion under the transportation investments to planned conditions in urban and rural areas. *Mode split*: Adopted policies support the relative increase of transit and active transportation trips to support land use goals. This Study measures the share of trips made by each mode (auto, transit, and active transportation).

Impact Category	Description and Measures
Health 	Health is a secondary category of impact, but one of the most important to both policymakers and the public at large. Broadly, one could include a range of sub-categories under health impacts: environmental, economic equality, and human health. This Study places environmental impacts in its own category. It considers impacts to economic equality under the broader discussion of how the impacts across categories are distributed among populations. Thus, this Study narrowly defines health as impacts to human health. **Measures:** *Local air quality*: The burning of fossil fuels generates particle emissions that contribute to a reduction in local air quality and an increase in respiratory illnesses. In the transportation system, stop-and-go traffic under congested conditions generally produces the highest rate of particle emissions. Therefore, this Study measured air quality by the volume of auto vehicle hours of delay (VHD). *Transit and active transportation*: The replacement of auto trips with transit and active transportation trips supports better air quality and more physical activity. This Study measures transit and active transportation by the volume of trips in each mode. *Trip length*: This Study evaluated the potential for additional active transportation trips by calculating the number of short auto trips (less than 3 miles).

Impact Category	Description and Measures
Cost 	Users want transportation system benefits delivered in a cost-effective manner. Capital investments, operations and maintenance, and policy changes all entail costs. In addition, users incur private costs for the transportation system. **Measures:** *Capital costs*: Relative costs of highway, road, transit, and pedestrian-bicycle facility costs for each package.

6.2 Distribution of Impacts

Policymakers want to know more than just the *average* impacts on the county as a whole; they want to know the effects on sub-areas of the county or certain groups in the county (e.g., by income or mode of transportation). The Study considered the distribution of impacts using the following segmentations:

- **Subarea** – geopolitical subareas were defined, as shown in **Figure 6-2**, and used to illustrate the potential distributional impacts of the investment packages.
- **Transportation Demand Management** – noted employment and mixed-use activity centers in Washington County where adopted plans designate future parking and/or transit fare subsidy programs are noted and mapped (see **Figure 6-3**). These TDM areas are used to evaluate the distributional impacts of key Study evaluation measures.
- **Socioeconomic Groups –** lower income population areas in Washington County are mapped in **Figure 6-4** and used to measure and evaluate the social equity distributional impacts of several key Study measures.
- **Employment Centers –** Washington County's notable employment centers are mapped in **Figure 6-5**, and used to measure the distributional impacts of key evaluation measures focused on access to jobs.
- **Mode** – distributional impacts by travel mode are noted specifically for auto (drivers/passengers), trucks (freight), and transit (riders), particularly when comparing the relative performance of each investment package relating to travel time and reliability.
- **Cutline** – corridor-level performance measures are summarized at key cut-line locations (a cross-section of multiple, parallel streets or highways) to summarize and compare distributional impacts of transit, auto, and truck travel demand estimates from each of the investment packages.
- **Trip Type –** in comparing the investment packages, the one distinguishing trip type of significant variation is the home-based work trip compared to other trip types.
- **Region** – for selective performance measures the distribution of impacts is a simple comparison of the Washington County and greater region averages. Those performance measures where a *region* distribution of impacts is notable among the investment packages include *mode share* and *VMT per-person trip* rates.

Figure 6-2: Study Subareas

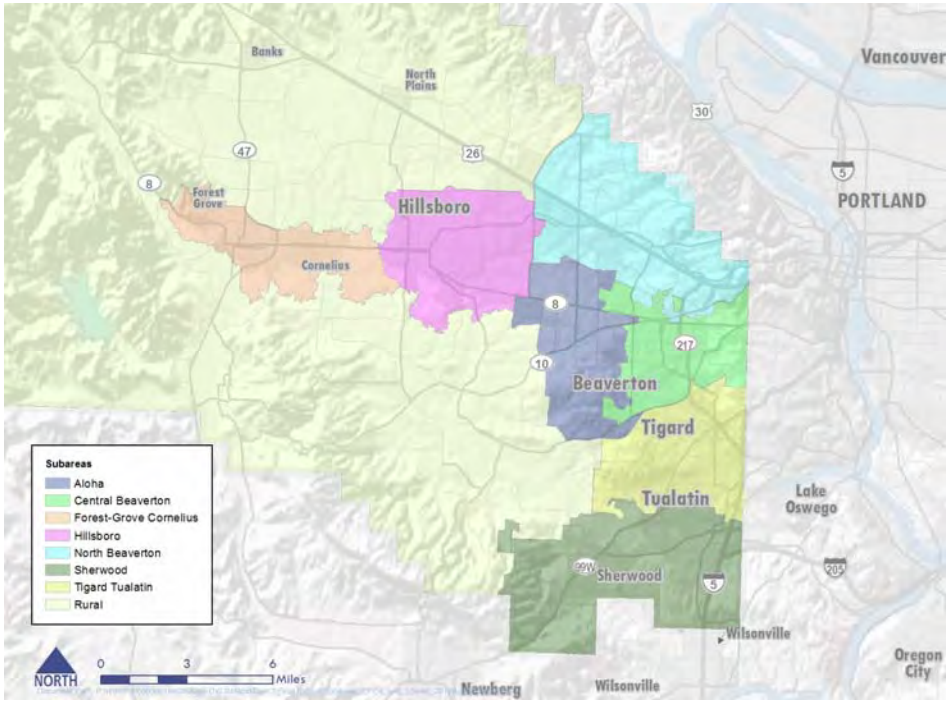


Figure 6-3: Study TDM Areas

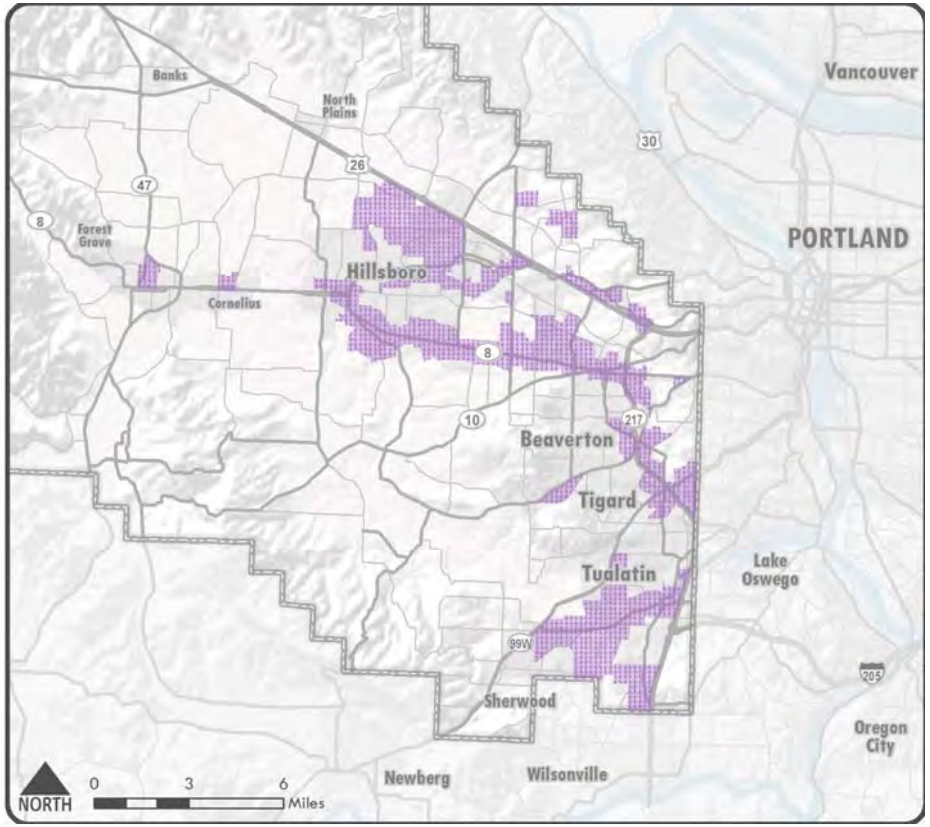


Figure 6-4: Lower Income Areas

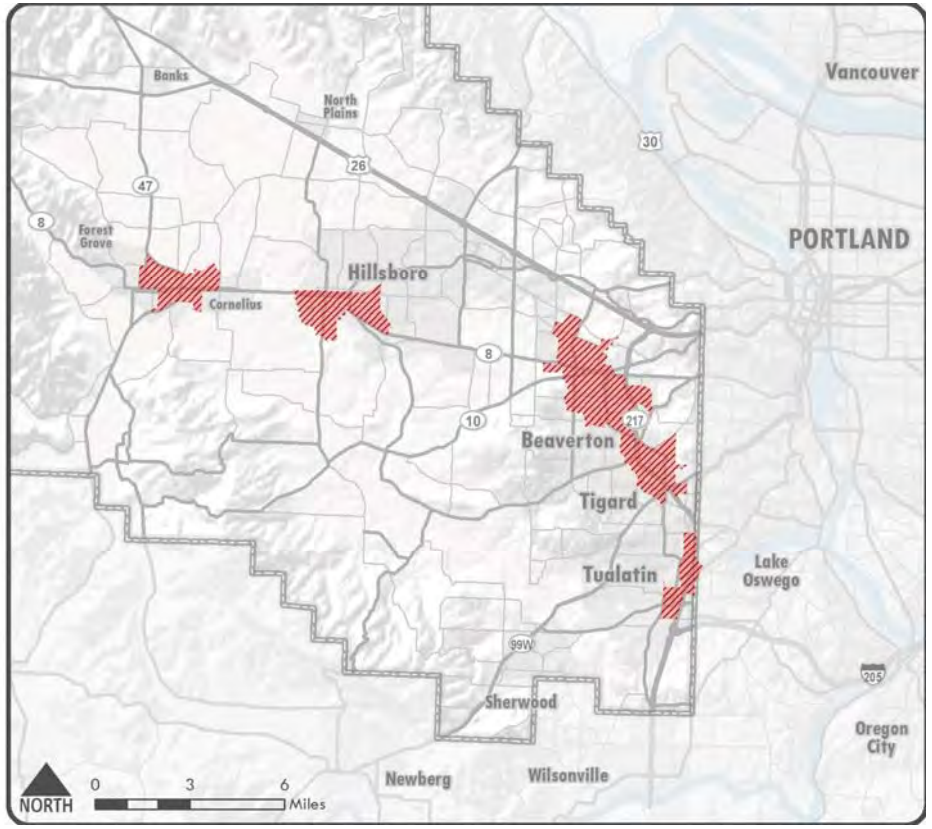
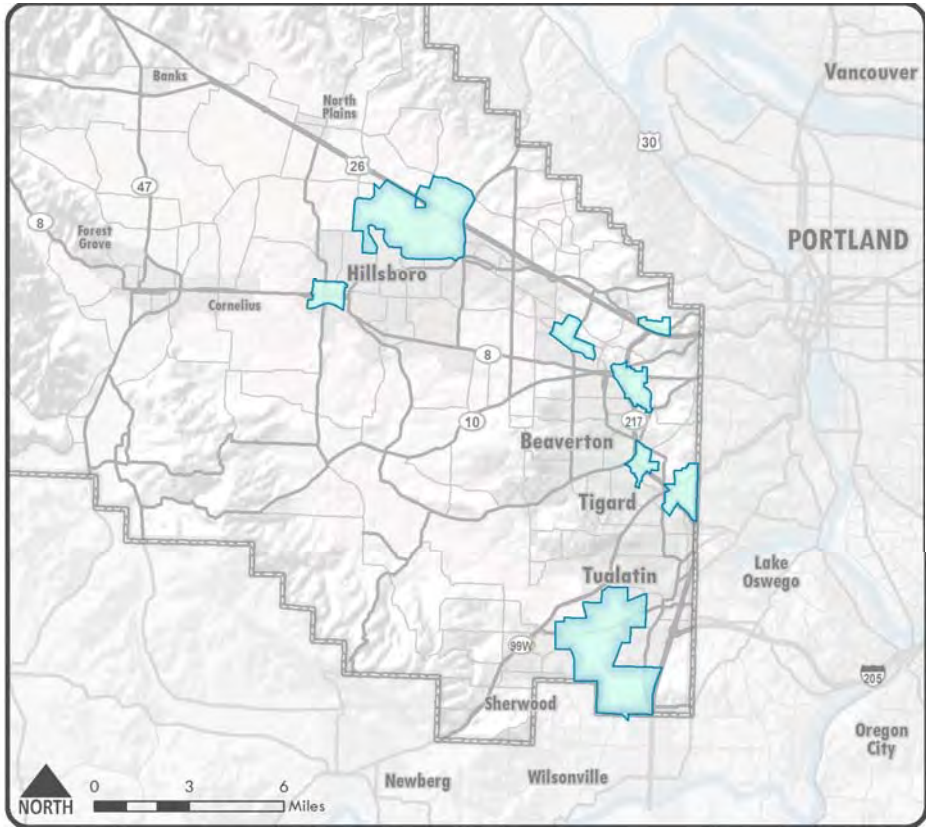


Figure 6-5: Employment Centers



Results

Evaluation Results

Chapter 7

Washington County Transportation Futures Study

Exploring options • Informing choices

7. SUMMARIZING THE STUDY FINDINGS

This chapter presents the results of the evaluation of the investment packages described in Chapter 5, for each of the evaluation measures described in Chapter 6, including the implications of the higher growth scenario.

The findings are organized in two sections:

- Future Travel Patterns
- Evaluation Findings

The evaluation findings are organized in relation to the values important to the community introduced in Chapter 1. For more detail on the evaluation see Appendix F.

The findings are based on the results from the regional travel demand model supplemented by qualitative analysis and research. Study findings show trends and distinctions between the three investment packages (as defined in Chapter 4). Specific transportation facilities were not modeled separately.

See Appendix F for the full report: "Complete Evaluation Measures Report"

What's in this Section?

7.1 Future Travel Patterns

7.1.1 Land Use and Future Growth Scenarios

The majority of Washington County is rural; of the 727 total square miles, 605 square miles are rural. The urban area is anticipated to expand 13 square miles for a total of 135 square miles over the next 40 to 50 years. The location, mix, and density of land use development shapes the volume, multimodal profile, and distributional pattern of future travel within the county and region.

The Study's *Trend* growth scenario is described in detail in Chapter 4. The *Trend* growth scenario assumes further development of housing and employment within the county's existing centers and in newer developments such as South Hillsboro, South Cooper Mountain, River Terrace, and the North Hillsboro and south county employment zones.

Figures 7-1 and **7-2** map the existing and future residential and employment location and density, respectively, assuming the Study's *Trend* growth scenario. Also noted in **Figure 7-1** are the areas with a higher concentration of lower income households.

Social Equity

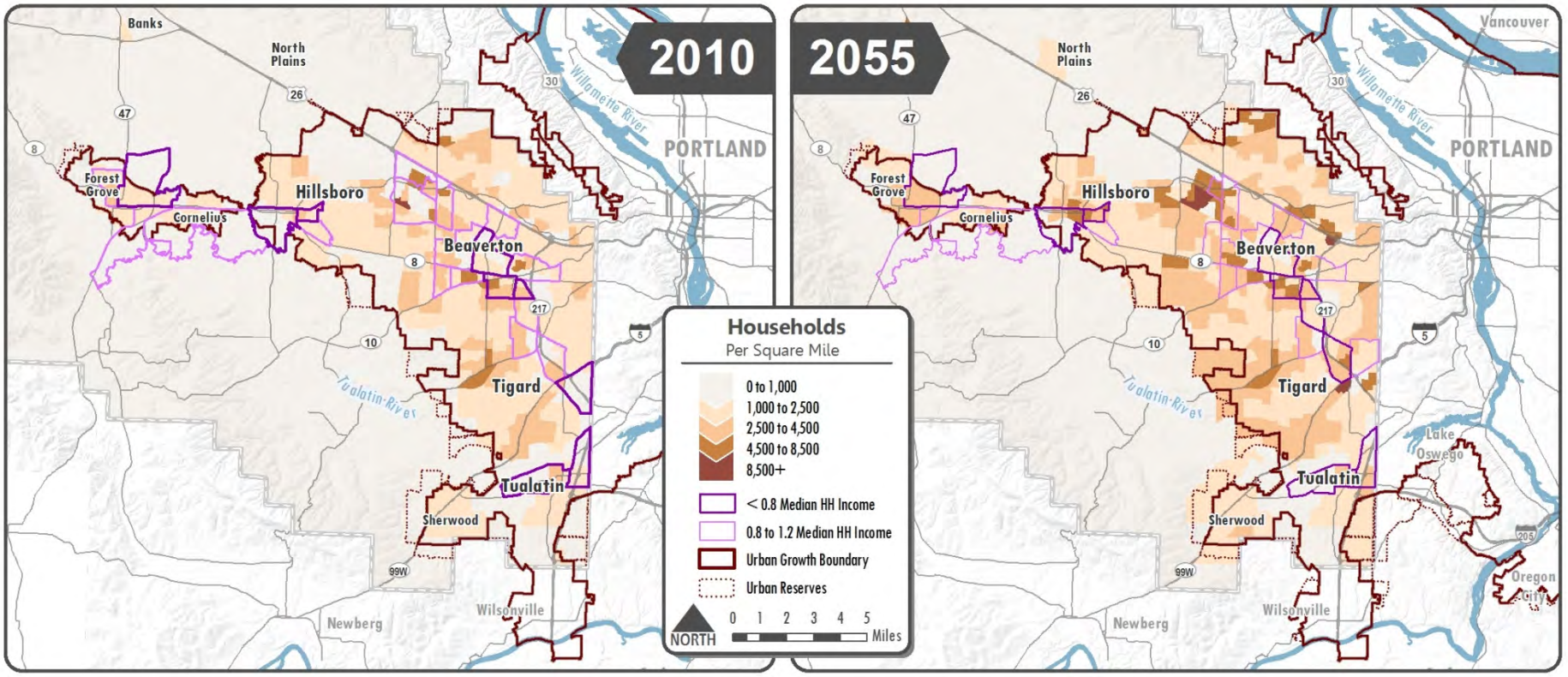
Social equity is a community value (see Chapter 1) and is applied as an overarching performance measure in the Study to indicate whether all people benefit from the future transportation investments considered. As shown in **Figure 7-1**, lower income residents in Washington County are expected to be generally located near several of the city centers (using present-day patterns as a proxy for future populations of concern). Lower income households are well-served by planned HCT and bus transit, and bicycle and pedestrian system investments (see Section 7.2, Evaluation Findings) in each package, more than the countywide average. Planned investments improve the access of lower income households to transit, active transportation (pedestrian and bicycle) facilities, and Washington County

jobs. The Study assumes that lower income housing will be available in sufficient supply within the centers and corridors well served by existing and future transit investments.

Comparing Growth Scenarios

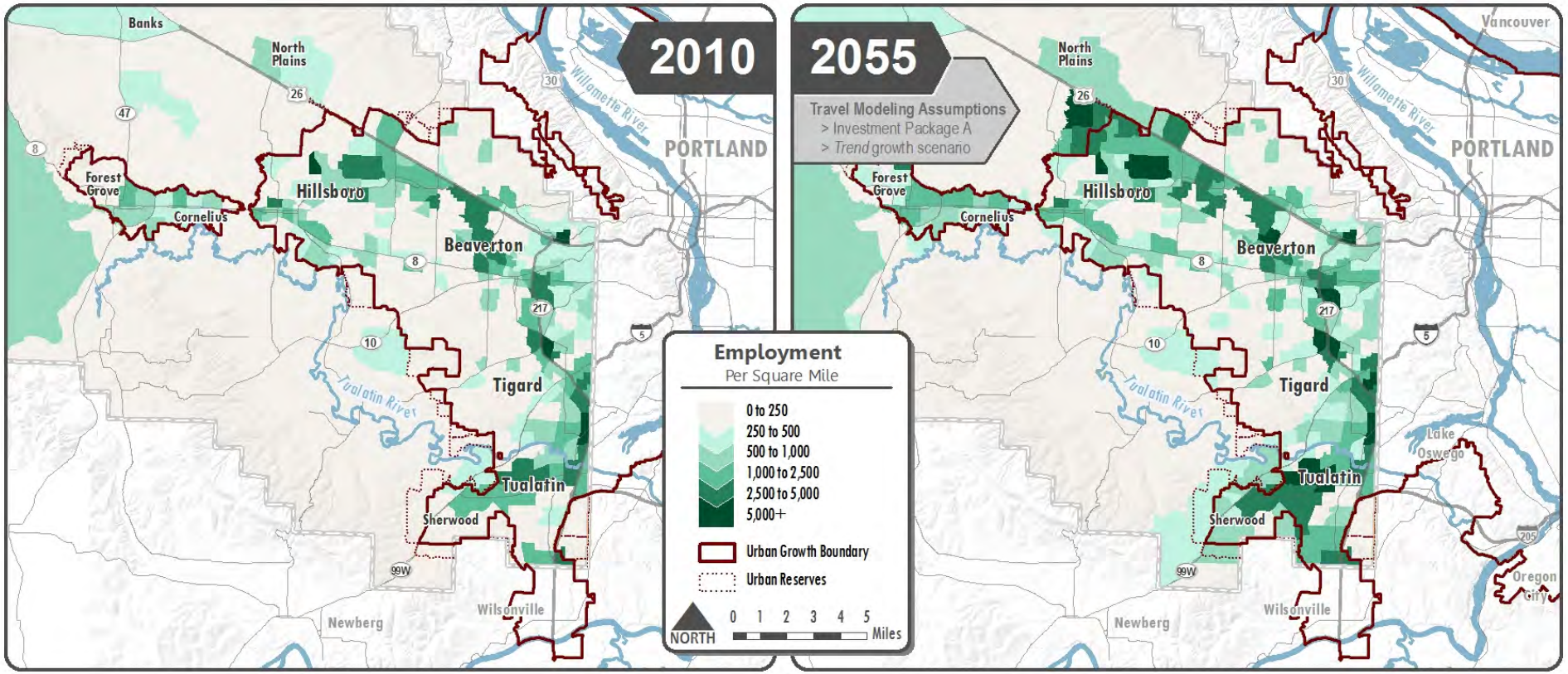
The *Trend* growth scenario results in housing growth throughout the county with more intense growth in centers, in new development areas like South Hillsboro, South Cooper Mountain, and River Terrace, and within designated Urban Reserves, as well as more intensified employment growth in all of the county's employment centers, especially North Hillsboro. By comparison, the *Increased Trade and Technology* growth scenario increases population (by 9%) and employment (by 13%) compared to the *Trend* growth scenario.

Figure 7-1: Existing and Future Residential Density



- **The County could expect an increase in population of 41-55% depending on growth scenario.**
- **This is like adding the population of another Hillsboro, Beaverton, and Tigard—or more.**

Figure 7-2: Existing and Future Employment Density



- **The County could expect an increase in employment of 100-145% (*Trend Scenario* vs. *Increased Trade and Technology* scenario).**
- **Intensified employment growth in North Hillsboro, along the Highway 217 corridor, and South County.**

7.1.2 Future Travel Characteristics

Vehicle Miles Traveled

Washington County's cities and employment centers will become more urban, dense, and walkable. Adopted land use plans support development patterns that are successful in reducing auto trips by providing a greater mix and density of land use and services. More destinations will be closer to homes, so that people travel shorter distances and can walk, bike or take transit rather than drive.

Table 7-1 summarizes the future VMT per person-trip under each investment package and growth scenario, and compares the future rates to 2010, the most recent data. By 2055, assuming the *Trend* growth scenario and Investment Package A, overall VMT per person-trip declines in Washington County by 10%. This rate decreases another 3% under the *Increased Trade and Technology* growth scenario with the increased land use densities. A number of factors contribute to a future decline in Washington County's VMT per person-trip, including increased urbanization clustered in the county's centers; expanded parking management programs; and integrated mobility that improves access to transit and ride-sharing services, and universal and reduced fare programs.

People will have better access to travel options such as biking, walking, telecommuting, and transit and be able to make shorter trips to meet their daily needs, meaning the rate of *vehicle trips per person* will continue to decline over time.

Table 7-1: Daily Vehicle Miles Traveled per Person-Trip (Washington County)

2010	2055					
	Growth Scenarios					
	Trend Investment Package			***Increased Trade and Technology*** Investment Package		
	A	**B**	**C**	**A**	**B**	**C**
4.89	4.38	4.45	4.73	4.25	4.32	4.62

Source: Metro Travel Demand Model

Daily Person-Trips and Travel Patterns

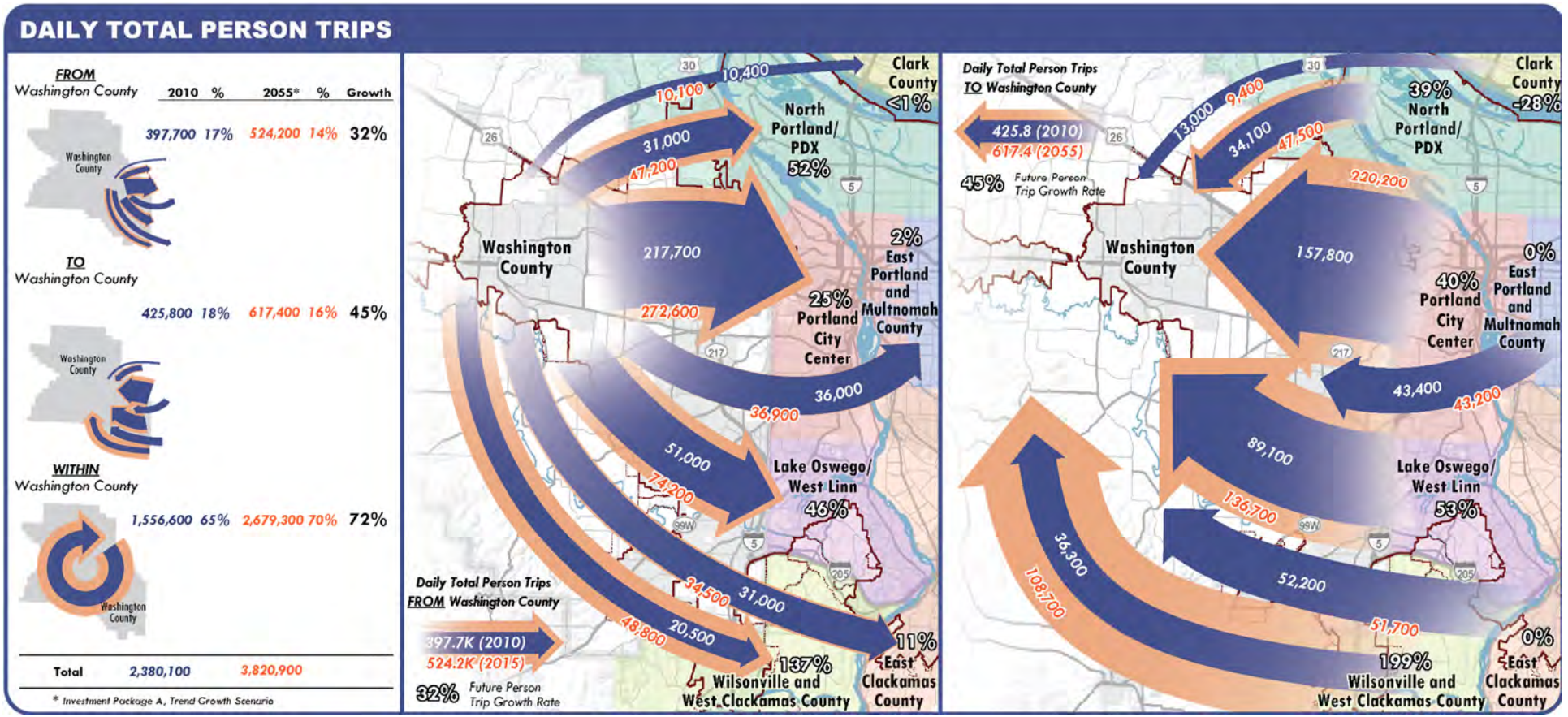
On a daily basis, there were over 2.38 million person trips per day in Washington County in 2010. This is expected to increase by about 60 in 2055 with Package A and assuming the *Trend* growth scenario.

Figure 7-3 summarizes the county's person-trip (auto, transit, walk and bicycle) patterns for years 2010 (current) and 2055, assuming the *Trend* growth scenario and Investment Package A.

Travel patterns within Washington County shift slightly in the future. The share of trips that stay within the county is expected to increase from 65% today to 72% in the future.

Today, trips attracted to Washington County from neighboring cities and counties (425,800) are slightly more than trips leaving Washington County (397,700). In the future, trips to Washington County will increase at a higher rate, and the majority of this trip growth is expected to originate from the Portland, Lake Oswego, and Wilsonville areas.

Figure 7-3: Daily Person-Trip Travel Patterns – Washington County



- **Total number of trips across all modes increases by over 60%.**
- **Share of trips that stay within the county is expected to increase from 65% today to 72%.**
- **More trips are expected *into* (425,800) than *out of* Washington County (397,700).**

Evaluations Results

As noted in Chapter 3, employment growth in Washington County since 1985 has resulted in a significant increase in commuter traffic *from* Portland, resulting in a more balanced, bi-directional commute, especially in the US 26 corridor. This trend is expected to continue into the future, increasing demand on routes to and from Portland and the rest of the region.

Daily Person-Trips by Mode Share

By 2055, the total number of trips will increase for all modes, as presented in **Table 7-2**. The Study found that auto trips increase almost 55% by 2055, but the proportion of auto to total trips declines. It is also expected that in this time frame, with increased urbanization and enhanced transit, the county will experience a nearly threefold increase in transit trips and nearly a doubling of walk and bike trips. As shown in **Table 7-2** differences in transit and roadway investments shift the numbers of trips by mode slightly from these amounts.

Table 7-2: Daily Person-Trips

		Washington County		
		Auto	*Transit*	*Walk-Bike*
2010		2,027,500	68,000	**193,600**
2055		*Trend Growth Scenario*		
	A	3,114,100	193,000	**361,400**
Investment Package:	B	3,130,300	196,000	**356,000**
	C	3,167,100	213,200	**345,200**

Source: Metro Travel Demand Model

City and county land use plans are expected to accommodate growth primarily in expanded and new urban, mixed-use and employment centers. Within these centers and along key HCT corridors, adopted plans also support the implementation of future parking management and transit, and other incentive programs associated with mixed-use and major employment areas (see Chapter 6).

As a direct result of these land use plans and policies, and the planned investments in transit, pedestrian, and bicycle facilities, the share of non-auto travel in Washington County's mixed-use centers will increase in the future. As **Table 7-3** indicates, the daily non-auto mode share for Washington County's centers will increase from 9.3% in 2010 to 14.2% in 2055, an overall increase of almost 55%, compared to a 32% increase countywide.

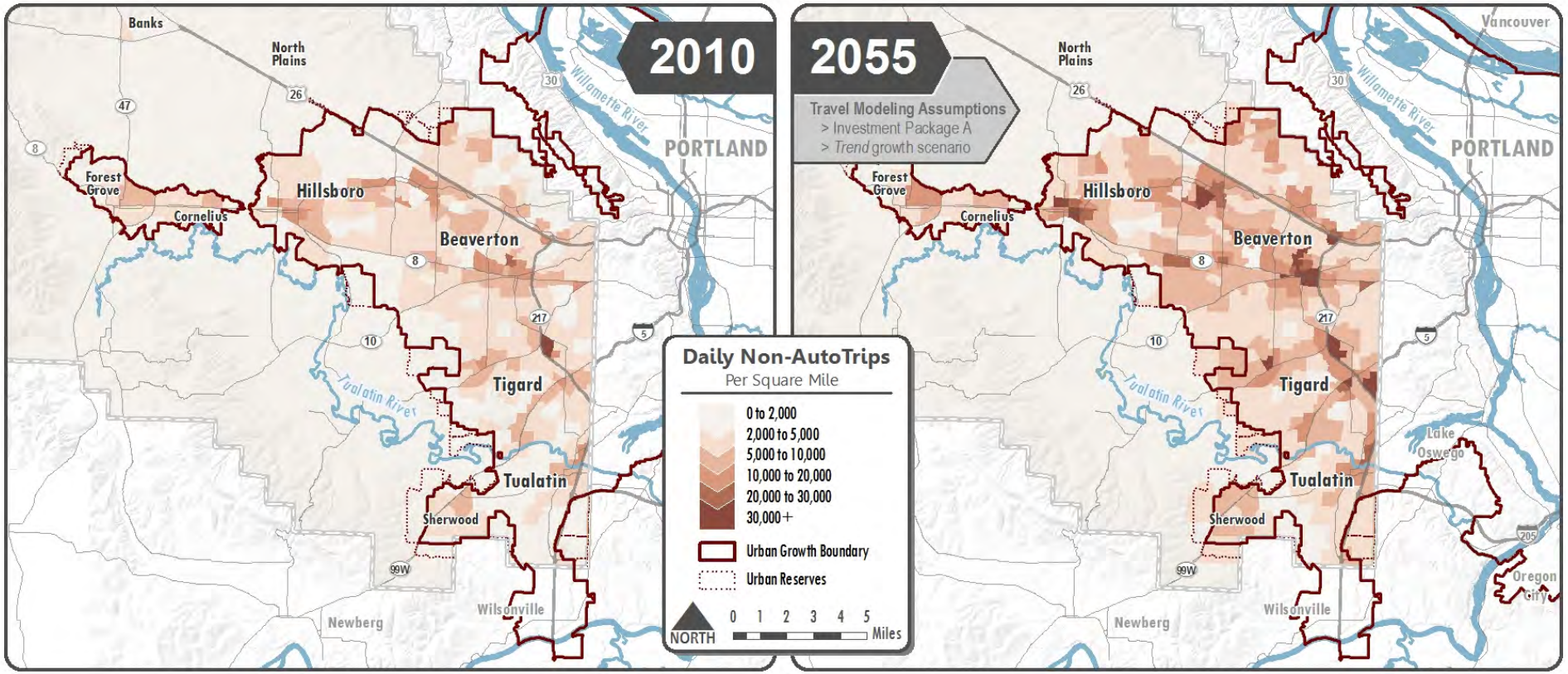
Table 7-3: Non-Auto Mode Share (percent)

	Washington County	
	Countywide	*TDM Areas*
2010	11.4%	9.3%
2055	15.1%	14.2%

Trend Growth Scenario & Investment Package A

Figure 7-4 illustrates the growth and concentration of non-auto travel within Washington County. The highest concentrations of non-auto trips occur in the county's mixed-use and employment centers.

Figure 7-4: Daily Non-Auto Trips – Washington County



7.2 Evaluation Findings

The notable findings from the evaluation of the investment packages are summarized in the following five sections: (1) System Performance by Travel Mode, (2) Land Use and Community, (3) Health and Safety, (4) Environmental Sustainability, and (5) Cost. In each section, the Study impact categories are noted that correspond to the Study *Evaluation Framework* as outlined in Chapter 6.

7.2.1 System Performance

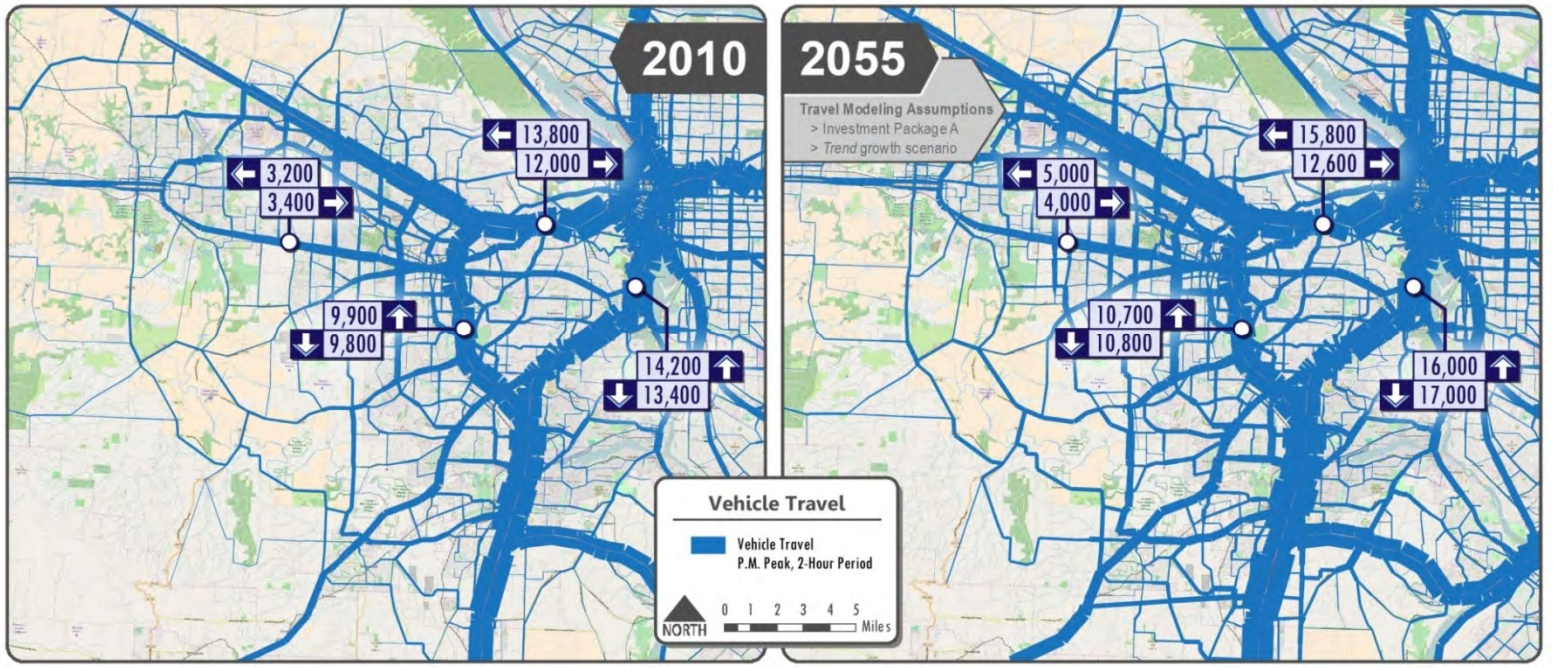
Mobility & Accessibility | Reliability

Roadway System Performance

Despite a shift to more non-auto travel, the future volume of vehicle trips will increase in Washington County by between 40% and 55%. As shown in **Figure 7-5,** significant traffic growth is expected on the county's highway, arterial, and collector street network during the PM peak, two-hour period.

Without additional roadway investments and demand management strategies beyond those planned, the county will experience increased traffic delay, reliability problems, and related effects such as cut-through traffic.

Figure 7-5: Vehicle Travel – PM Peak, 2-Hour Period



- **Expect an increase of 105% to 165% in vehicle hours of delay compared to today (with Trend scenario).**
- **Traffic on US 26, I-5, I-205, and Highway 217 will experience severe congestion most parts of the day.**
- **This congestion will overflow onto major roads resulting in more cut-through traffic on local streets.**

Future Traffic Congestion

Future auto trips will take longer than the average trip today. As shown in **Figure 7-6**, the future level of traffic delay, measured in vehicle hours of delay (or VHD) is expected to more than double for each roadway class in Washington County—for a total VHD of about 20,000 under Package A.

On the county's arterial streets and freeways, VHD increases over 145% under Package A compared to today. These conditions worsen with higher growth in the *Increased Trade and Technology* growth scenario by 15-18%. Moving freight during the PM peak period will become extremely challenging. Truck hours of delay increases over four-fold as the major portals in and out of Washington County experience the heaviest congestion, as shown in **Figure 7-7**. Focused investments in arterial expansion in Package B result in about a 5% reduction in VHD during the PM peak period compared to Package A. New throughway capacity investments in Package C reduce future PM peak VHD by 14%.

This increase in VHD will mean more drivers will travel at lower speeds and encounter heavier traffic congestion along Washington County's important highways and arterials, and traffic will spread to other hours of the day and other roads.

Figure 7-6: Vehicle Hours of Delay – Washington County – PM Peak 2-Hour Period

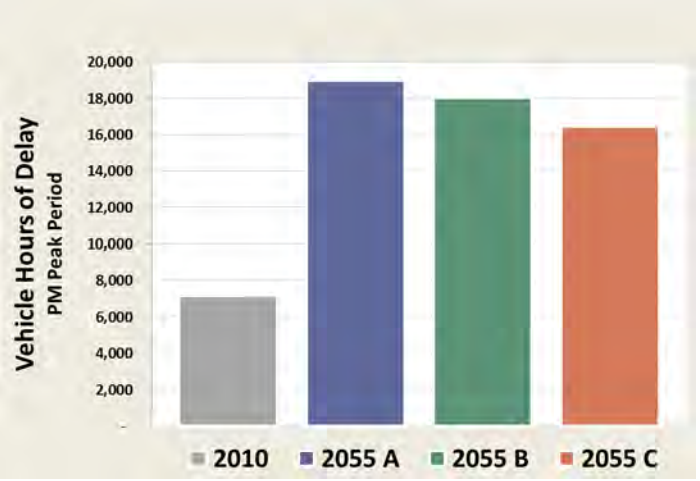
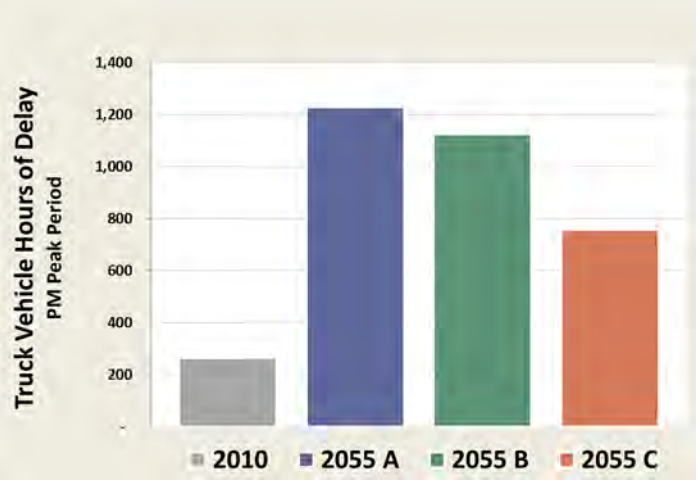


Figure 7-7: Truck Vehicle Hours of Delay – Washington County – PM Peak 2-Hour Period



- **The Study found vehicle hours of delay more than double and hours of truck delay increases over four-fold.**

Implications to Freight Reliability

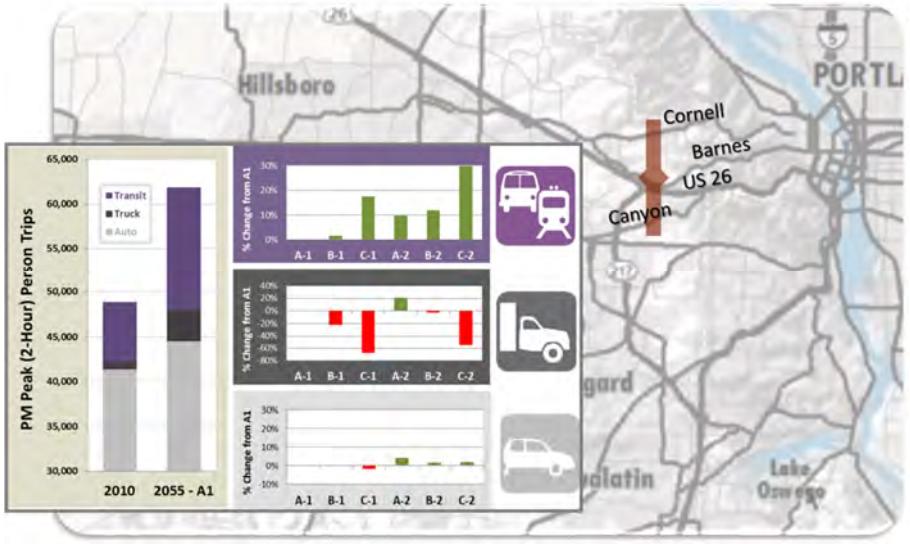
Freight shippers seek routes that are reliable and efficient for delivery of goods to market destinations. The future levels of traffic congestion on key highway and arterial routes during peak commuter periods spread to other times, particularly during midday, which is a critical time window for local and regional freight deliveries. Major freight portals into and out of Washington County reach capacity during midday in the future. These portals include the US 26 Sylvan Tunnel, Highway 217, I-5, and Cornelius Pass Road. When lanes fill up with traffic, management techniques such as congestion pricing can provide reliability benefits for freight.

Figure 7-7 summarizes truck VHD for 2010 and future travel conditions with each of the three investment packages. Truck VHD on the county's freeway system will increase over four-fold from 2010 to 2055 under Package A. New route options and added capacity on throughways with managed lanes for trucks, transit, and HOVs in Package C can improve reliability, resulting in a 57% reduction in PM peak VHD than Package A, but still more compared to double what it is today.

Preferential treatments for trucks at the highway on-ramps can also help but such treatments have limited value on congested highways.

Package C investments provide freight shippers more direct options with a new Northern Connector linking Washington County and the Port of Portland. The new Northern Connector links US 26 and US 30, spanning the Willamette River with a new bridge connection to Columbia Boulevard. The Northern Connector would provide a more direct and reliable freight route to the north and the Port of Portland, and would attract 60% of the trucks traveling on US 26 (and to a lesser degree, on Highway 217). **Figure 7-8** illustrates the significant shift in future truck traffic from US 26 to the new Northern Connector assumed in Package C.

Figure 7-8: Comparative Auto, Truck and Transit Travel: Sylvan Hills Corridor



- **A new "Northern Connector" between US 26 and US 30 with a new bridge across the Willamette River to Columbia Boulevard would attract 60% of the trucks traveling on US 26.**

Potential New Westside Freight Consolidation Facility

A major destination for the county's freight is Portland International Airport, where goods can be reloaded and consolidated for domestic and international distribution. The Study examined whether a new westside freight consolidation facility could better serve Washington County industry by avoiding much of the region's congested highways. Findings indicate that the feasibility of a consolidation facility depends on freight volume and shipping patterns. There is an insufficient quantity of local commodities to warrant a new distribution center in the immediate future. A study of future freight volumes and shipping patterns is needed to determine the feasibility of a new freight distribution center near the Hillsboro Airport or elsewhere.

Such a center could reduce freight shipments through heavily congested corridors, and help improve overall freight reliability in Washington County and the greater region.

Considering Congestion Pricing

Increased pricing is one way to reduce travel demand and prioritize available road capacity. While there are many ways to price transportation, two pricing strategies were tested in the Study: *tolling* and *road user charges*. Tolling on specified highways, in conjunction with *managed lanes* designated for priority use by transit, carpool, and trucks, can help better manage traffic flow but may create more cut-through traffic through neighborhoods as vehicles shift routes trying to avoid the tolls.

Mileage-based road user charges (VMT charges) could reduce person-hours of travel in the region by as much as 15%, especially if implemented as a *variable fee,* according to a study in Florida *(*Orlando Congestion Pricing Feasibility Study, EcoNorthwest, 2015). Variable fees can be established by policy and implemented through rates that vary by time of day and geographic location, with higher fees assessed to users driving in highly congested corridors within the county and region. Strategically crafted fee structures allow local government to limit or penalize neighborhood cut-through traffic.

Testing the Impact of Future Technology

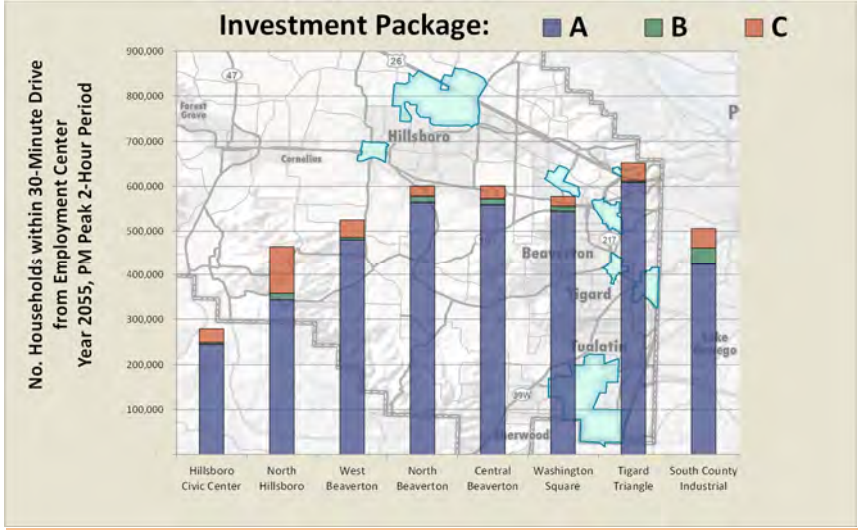
Future technology has the potential to improve the operational capacities of highway and arterial networks. Connected and autonomous vehicles could theoretically increase system capacities by allowing vehicles to travel more closely and safely together, and thus reduce traffic congestion (i.e., VHD) but may simultaneously increase VMT by increasing travel demand. The Study conducted an additional "what if?" examination of the Washington County roadway network assuming either a 20% or 40% increase in operational capacity due to autonomous and connected-vehicle enhancements. Future VHD in Washington County could drop between 11% and 22%, and the number of lane miles of roadways operating over capacity could drop from 155% to 55% as a result of these assumed technology advancements, especially on county arterials, though VMT increases.

Improving Access to Washington County Jobs

One measure of accessibility is the number of households that have access to major employment centers. **Figure 7-9** charts the number of households within a 30-minute drive to each of Washington County's eight large employment centers based on future, PM peak period travel times. Each of the three investment packages was evaluated.

Traffic congestion affects job access. Arterial street capacity improvements in Package B help improve job access to Beaverton, Tualatin and Wilsonville employment centers. Increases in area highway capacity under Investment Package C help improve access to job centers in North Hillsboro (24%) and south county industrial (9%). Higher growth in the *Increased Trade and Technology* scenario results in a higher number of households with access to jobs for each package due to the higher density of households. Low income areas were found to have the same access as the county average.

Figure 7-9: Future Auto Travel Access to Washington County Employment Centers



- **Package C investments that increase freeway capacity help the most to improve access to key major employment centers in North Hillsboro, Tigard Triangle, and south county.**

Transit System Performance

Demand for transit services increases with the investments in all investment packages, with higher transit trips generated in the higher density mixed-use and employment areas shown in

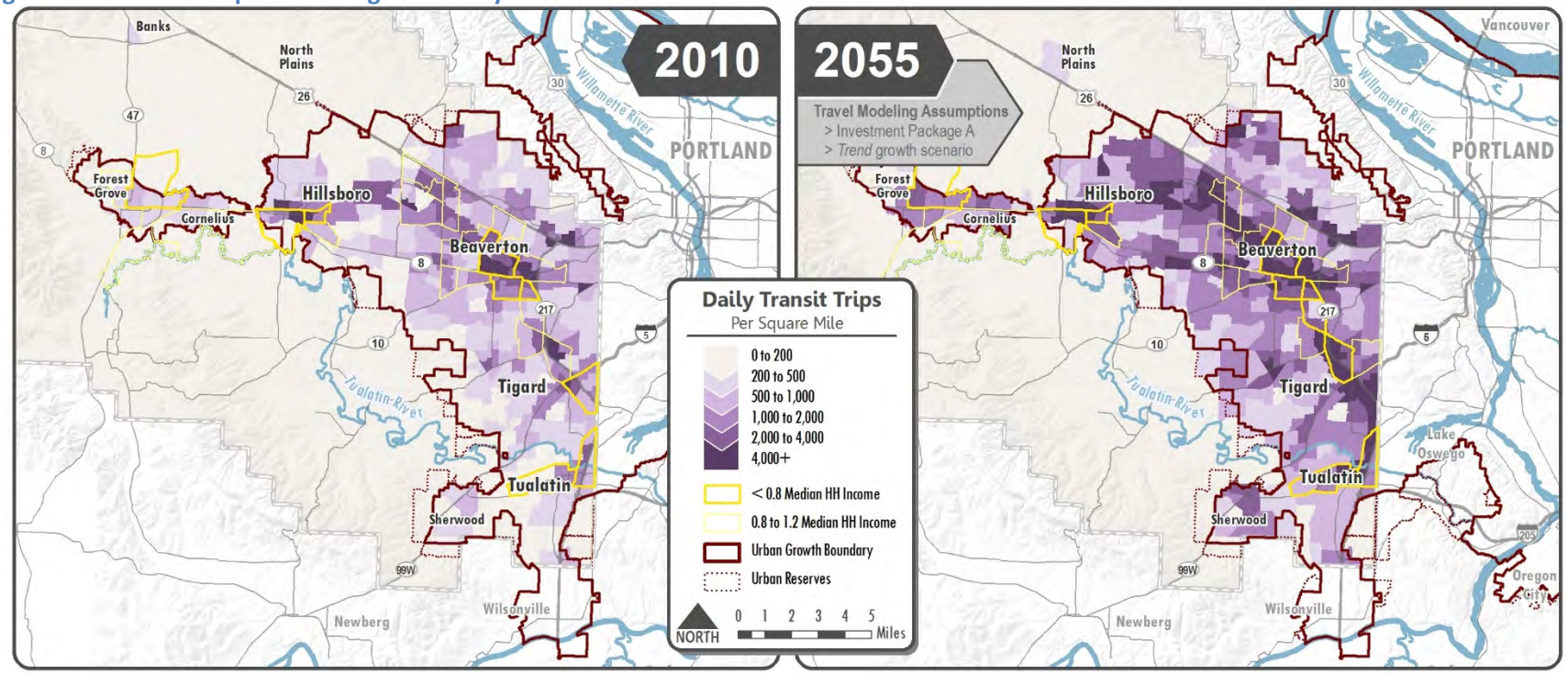
Figure 7-10**.**

Transit Ridership Demand

Future transit use is very responsive to additional investments. While demand for transit increases for trips within the county, the major transit market remains for trips to and from Portland where significant congestion on roadways make HCT travel times competitive and more reliable. Even with service as frequent as one train every three to six minutes, transit demand approaches capacity at peak times at some transit stations for the MAX Blue/Red line, and on HCT in SW Corridor and TV Highway.

Portland is Washington County's strongest transit market—with roughly 59% of all county transit trips in 2010. This market responds well to faster and more frequent transit service and improved access between Washington County and Portland.

Figure 7-10: Transit Trips—Washington County



- **Providing good access to MAX and bus stations can increase use of transit.**
- **Almost 80% of the households in the county will be within ¼ mile of transit service.**
- **Lower income households are well served by transit and use transit more than the countywide average.**

In 2010, nearly 12% of all trips in the PM peak period between Washington County and downtown Portland were MAX or TriMet bus riders. By 2055 that rate climbs to more than 23% with the planned transit investments in Package A. Total daily transit ridership in the corridor more than doubles by 2055. The added express HCT line along US 26 in Package C, coupled with increased station access, supports another 20% increase in corridor transit ridership. Without the parallel road capacity in Package C, transit demand could be higher. With more limited stops, the travel time between Hillsboro and downtown Portland on the new HCT line rivals the auto travel time into downtown Portland (see **Table 7-4)**.

There may also be demand for inter-city transit between Washington County (the Portland region) and neighboring cities in Yamhill and Columbia counties, though this demand could not be modeled.

Unlike the responsiveness to express service in the high demand corridors, the Study found that limited stop bus service, in lower density corridors, such as between Hillsboro and Sherwood, carried much less ridership.

Table 7-4: Major Transit Markets – Washington County

Washington County Daily Transit Trips	2010	2055 (A1)	2055 (C1)		Transit Trip Growth Rate from 2010	
					2055 (A1)	2055 (C1)
Internal (within)	23,300	90,500	95,800		288%	311%
To/from Portland	40,400	91,300	102,900		126%	155%
To/from Clackamas County	3,600	9,900	12,700		175%	253%

Transit Accessibility

Planned investments under Package A serve the county's mixed-use, higher density centers and corridors well, especially where multiple HCT routes cover or converge. These centers are also hubs to multiple bus routes. The combination of multiple and frequent route service and planned land use density directly increases transit ridership demand.

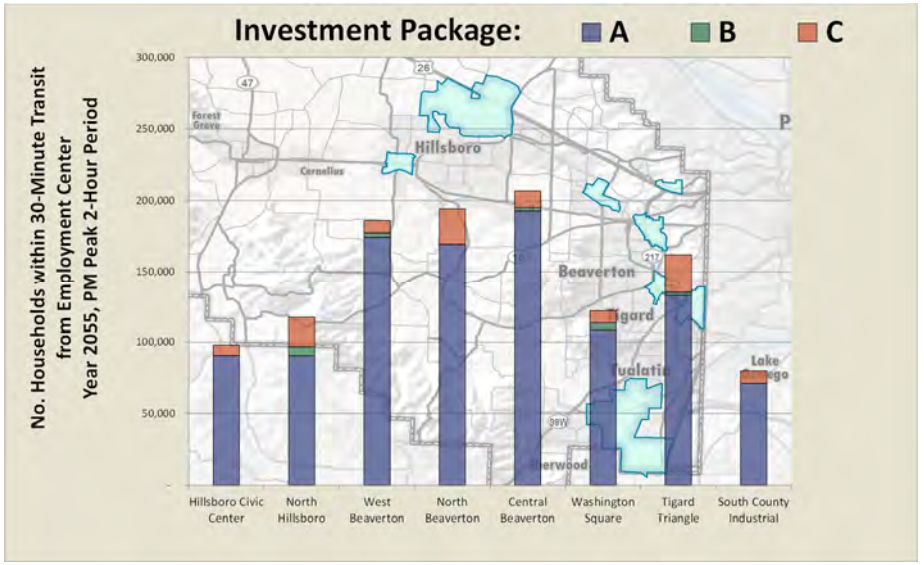
Figure 7-11 also maps existing and future transit ridership in the Study area. Higher future ridership is evident in the county mixed-use centers and employment corridors. Over 80% of the county's future population is within ¼-mile walking distance of a local bus or HCT service.

The transit investments in all packages serve lower income households. Low income households have a higher mode share for transit, at 6.1%, than the countywide average of 5.3% of daily trips.

Future transit investments under Package A provide access for over 30% of the county's future population via a 30-minute transit trip to jobs in key employment centers. The percent of low income households with transit access to jobs in county employment centers is slightly higher at 33%. Under the higher growth scenario, a higher concentration of households located in regional and urban centers increases the population with access to Washington County jobs via a 30-minute transit trip.

As shown in **Figure 7-11**, some employment centers are well served by transit adjacent to higher populations. Targeted transit investment along the US 26 and I-5 corridors under Package C improves access to jobs, especially in the North Hillsboro (19%), North Beaverton (13%), and Tigard Triangle (17%) employment centers. Investments in fixed-route transit within separated rights-of-way provide more direct and reliable access to jobs, because transit vehicles can avoid traffic congestion on streets and highways. The higher growth in the *Increased Trade and Technology* scenario results in 13% more households within a 30-minute transit trip to Washington County jobs.

Figure 7-11: Future Transit Access to Washington County Employment Centers



Bicycle-Pedestrian Network Performance

Within the three investment packages, the Study examined three strategies to improve transportation networks that would encourage more people to walk and bike: (1) a complete, on-street network of sidewalks and bike lanes (Package A); (2) more separation of bicycle facilities along busy arterials through buffered bicycle lanes or cycle tracks (Package B); and (3) more separated pathways and trails (Package C) designed to serve all trip purposes, not just recreational.

Planned investments in bicycle and pedestrian facilities on the county's arterials and collectors will significantly enhance access to households and jobs to meet increased demand; however, bicyclists and pedestrians will be mixing with increased levels of congested vehicle traffic.

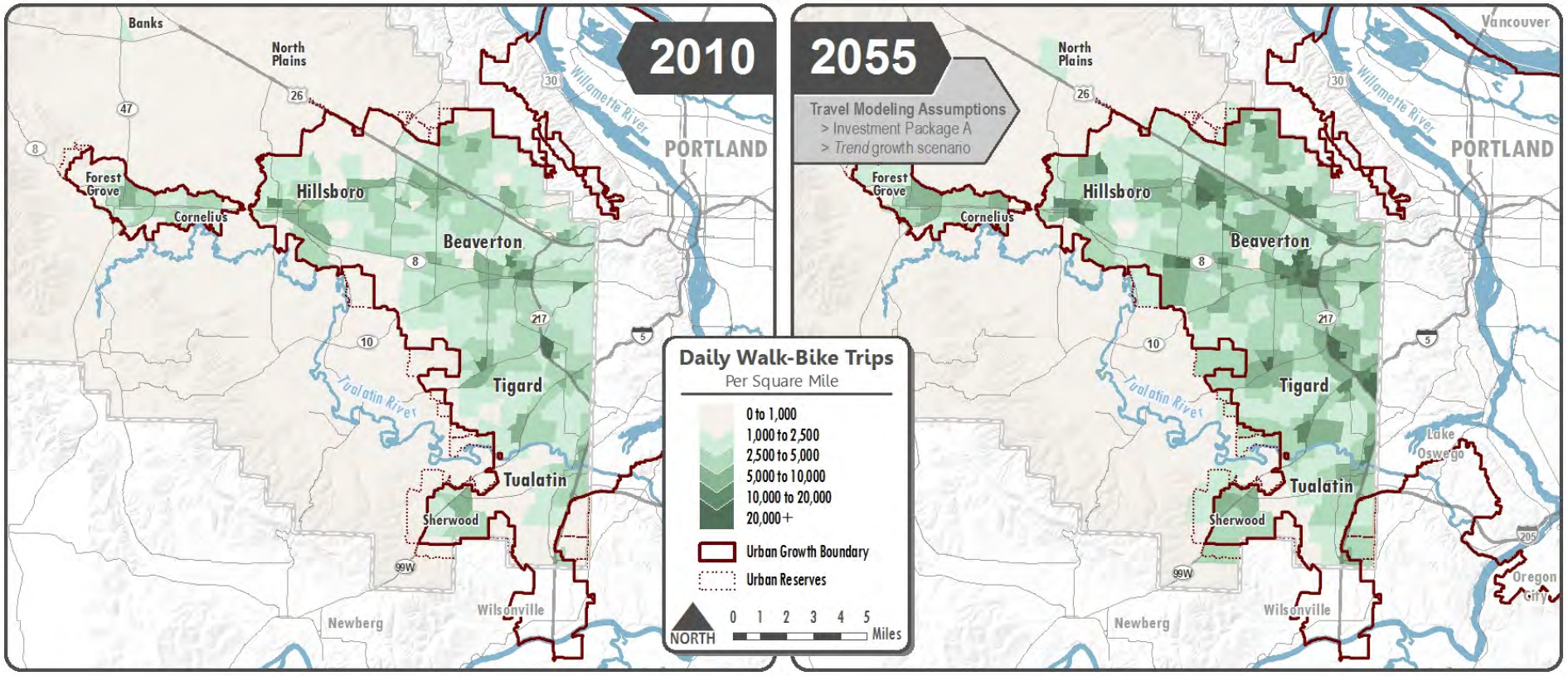
Investments in Washington County's road network incorporate complete street designs that include sidewalks, buffered bike lanes, and connections to the off-street trail network. Complete arterial and collector streets provide safer, more convenient facilities for cyclists and pedestrians, and expand connectivity to the network of pathways and trails. The combination of complete arterial and collector streets and connected pathways and trails provides Washington County residents increased walk and cycling mobility and access to key destinations and daily services.

The combination of pedestrian and bicycle system investments (and planned land use density) support future walk and bicycle travel demand. **Figure 7-12** maps existing and future walk and bicycle trips in the Study area. Higher walk and bicycle trip demand is evident in the county mixed-use centers and employment corridors. As shown, planned investments in pedestrian and bicycle system improvements serve Washington County well. By building out the on-street network of bike lanes and sidewalks, nearly 80% of households in the county are within a ¼-mile walk or bike ride from a "complete street.' Areas with a higher proportion of low income households are above the countywide average for access to pedestrian and bicycle facilities.

Protected bike lanes are one-way to improve bike safety; with the trade-off is that they need more road right-of-way.

The trail network may increase access to parks and natural areas, but does not provide the same level of direct access as the on-street network to other key destinations.

Figure 7-12: Walk and Bicycle Trips – Washington County



- **Almost 80% of the households in the county will be within ¼ mile of a complete street.**
- **Lower income households have better access to biking and walking facilities than the countywide average.**

7.2.2 Land Use and Community

Investments in the transportation system that support land use goals must balance between the mobility, accessibility, and livability goals of a community. Land use and community plans embrace a range of livability values to develop vibrant urban centers, reduce cut-through traffic, and support rural lifestyles and agriculture.

This section summarizes findings of *Land Use and Community* impacts in the county *Urban Centers*, along key *North-South Roadway* corridors, and along *Rural Roads*.

Urban Centers

Consistent with regional and local plans, all investment package scenarios assumed slower vehicle speeds within the regional and urban centers to promote walkability. Comprehensive pedestrian and bicycle investments provide a foundation for livable communities with increased active transportation and access to transit.

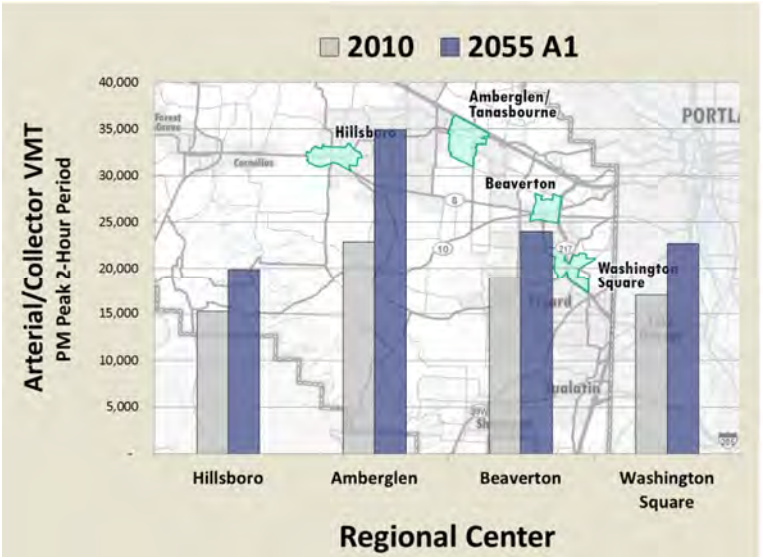
Aligning HCT service through dense urban corridors and centers helps accommodate both future growth scenarios with greater person-trip carrying capacity, lessening the vehicle traffic impact in urban centers.

Managing VMT in urban centers is important for livability. **Figure 7-13** shows the VMT on collector and arterial streets within each of the county's regional centers. Higher VMT within centers is an indicator of both growth and cut-through traffic. The chart compares 2010 and 2055 PM peak period VMT, assuming Package A arterial street and HCT transit investments. The most significant increase in VMT is in the Amberglen-Tanasbourne center, where VMT increases from 23,000 to 35,000 in 2055. **Figure 7-13** also compares future VMT in each center resulting from roadway and transit investments in Packages B and C.

Compared to Package A, arterial investments in Package B provide very little reduction in urban center VMT - a 1% to 4% reduction in three of the four urban centers.

Throughway investments in Package C, when managed to maintain mobility for freight, HOV, and transit, result in reduced traffic in all four urban centers ranging from 3% to 14%, depending on the location of the assumed North-South Parkway. As an example, the inner alignment of a North-South Parkway ("C-In") in Package C provides over four times the benefit of reduced VMT within the Hillsboro center than an outer alignment ("C-Out"). The other three urban centers see similar reductions in future VMT (between 3% and 7%) under Package C. HCT investments in Package C also contribute to reduced VMT, especially in the Hillsboro and Amberglen-Tanasbourne centers.

Figure 7-13: VMT in Urban Centers – Comparing Investment Packages



North-South Roadways

The level of traffic increases on north-south roadways as the county grows and travel demand increases between the southern and northern sections of the county. **Figure 7-14** provides an overview of the major roadways that serve north-south travel in Washington County. They include:

- Highway 217
- Northern Connector (Package C only)
- North-South Arterial upgrades (Package B only)
- North-South Limited Access Road (Package C only)
- Southern Arterial (three-lane in Package A, five-lanes in Package B and six-lane parkway in Package C)

Highway 217 is the primary north-south route in the county today and remains a critical throughway for north-south travel in the future in all packages. The Study showed that future travel demand will meet and exceed the capacity of Highway 217 during peak periods, even when new travel lanes and auxiliary lanes are added.

The Northern Connector in Package C provides a more direct route for freight. It also reduces cut-through traffic on rural roads in Multnomah and Washington counties.

Upgrading the North-South Arterial (Package B) helps reduce demand on adjacent roadways along the western edge of the UGB by carrying about 4,000 vph during the PM peak period. The benefits to adjacent arterials are highest immediately south of TV Highway.

A new higher-speed, limited access North-South Limited Access Road would help meet growing travel demand by carrying 6,000 vph during the PM peak period. The new route would attract more future traffic along east-west roads that intersect with the North-South Limited Access Road.

A new arterial connection between Highway 99W and I-5 helps serve the growing southern portion of the county reducing demand on Highway 99W and Tualatin-Sherwood Road in and through Sherwood and Tualatin. The Study findings show that I-5 south is a bottleneck in the future and that it worsens with a new roadway connection to I-5 included in Package C.

Figure 7-14: North-South Arterial and Throughway Connector Improvement Options Studied

Future travel estimates under Packages B and C were compared to Investment Package A to indicate the magnitude of impact new north-south roadways have on the county network. The following three figures summarize the comparative analysis, illustrating the *relative difference* in future travel.

Figure 7-15 compares Package B to A. **Orange** traffic volume bandwidths indicate the roadway routes where Package B investments result in higher future traffic than Package A. Conversely, **Blue** traffic volume bandwidths indicate the roadway routes where Package B investments result in lower

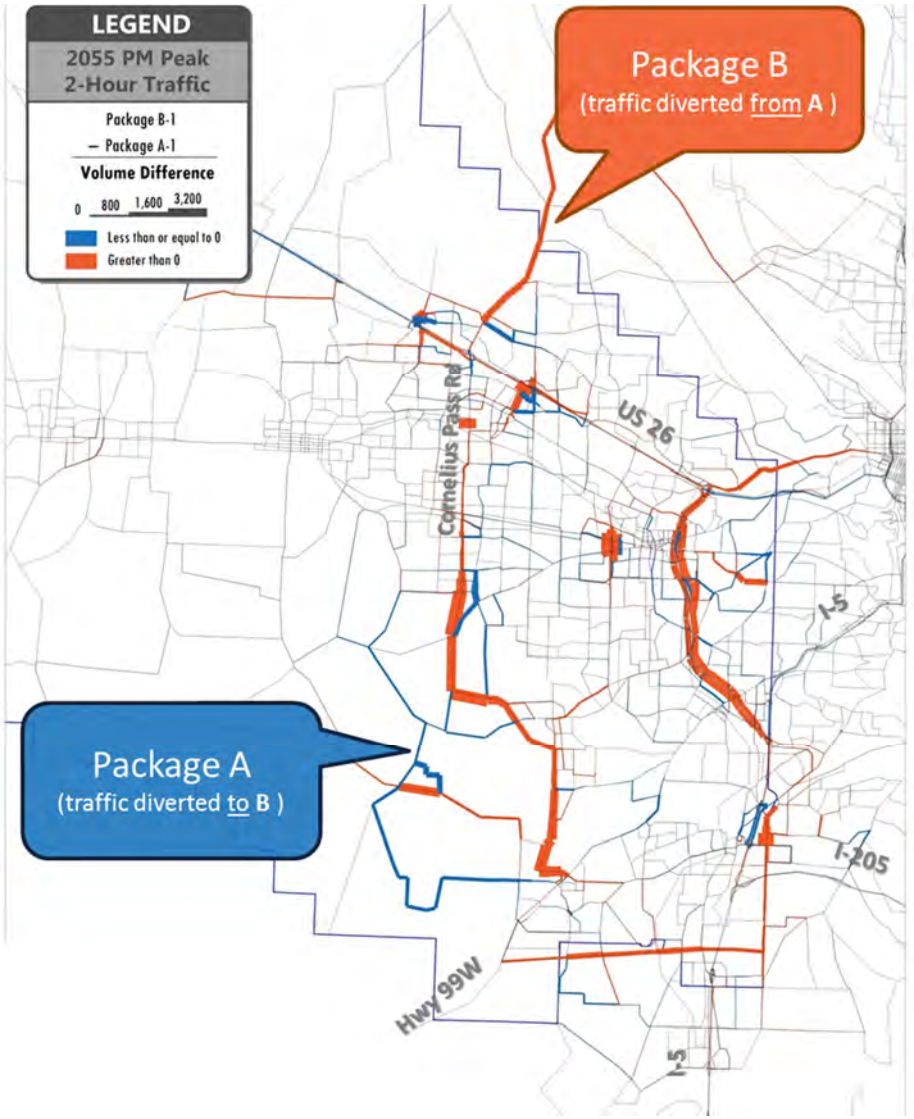
future traffic than Package A. As shown, the added capacity on Highway 217 will attract more traffic under Package B than A (traffic drawn from the neighboring and adjacent city and county arterial network). A new North-South Arterial improvement will also attract future traffic, drawing future traffic from neighboring routes like Kruger Road, Beef Bend Road, and Scholls Ferry Road. Other route improvements will attract greater traffic demand under Package B with capacity improvements to Cornelius Pass and the Southern Arterial.

Figure 7-16 compares Package C to A, assuming the "outer" alignment of a new North-South Limited Access Road. The widening of US 26, Highway 217, I-5, and I-205 under Package C results in more future traffic on each route, drawing traffic from the local city and county arterial network. Other significant findings include:

- New Northern Connector – drawing traffic from US 26, Germantown Road and Cornelius Pass Road
- Evergreen Parkway Extension – drawing traffic from Verboort Road, Cornelius-Schefflin Road, and Zion Church Road
- New North-South Limited Access Road – drawing traffic from Highway 99W (north of Sherwood), and rural routes like Elwert Road, Edy Road, Lebeau Road and Highway 219 (west of Laurel)
- New Southern Arterial expressway – drawing traffic from Highway 99W and Tualatin-Sherwood Road

Figure 7-17 compares Package C to A, assuming the "inner" alignment of a new North-South Limited Access Road. With an alignment nearer the UGB, this option of Package C will draw more traffic from nearby urban arterials and rural routes.

Figure 7-15: Comparison of Future Travel Demand – Package A vs. Package B with North-South Arterial Improvements



Evaluations Results

Figure 7-16: Comparison of Future Travel Demand – Package A vs. Package C with Outer North-South Parkway

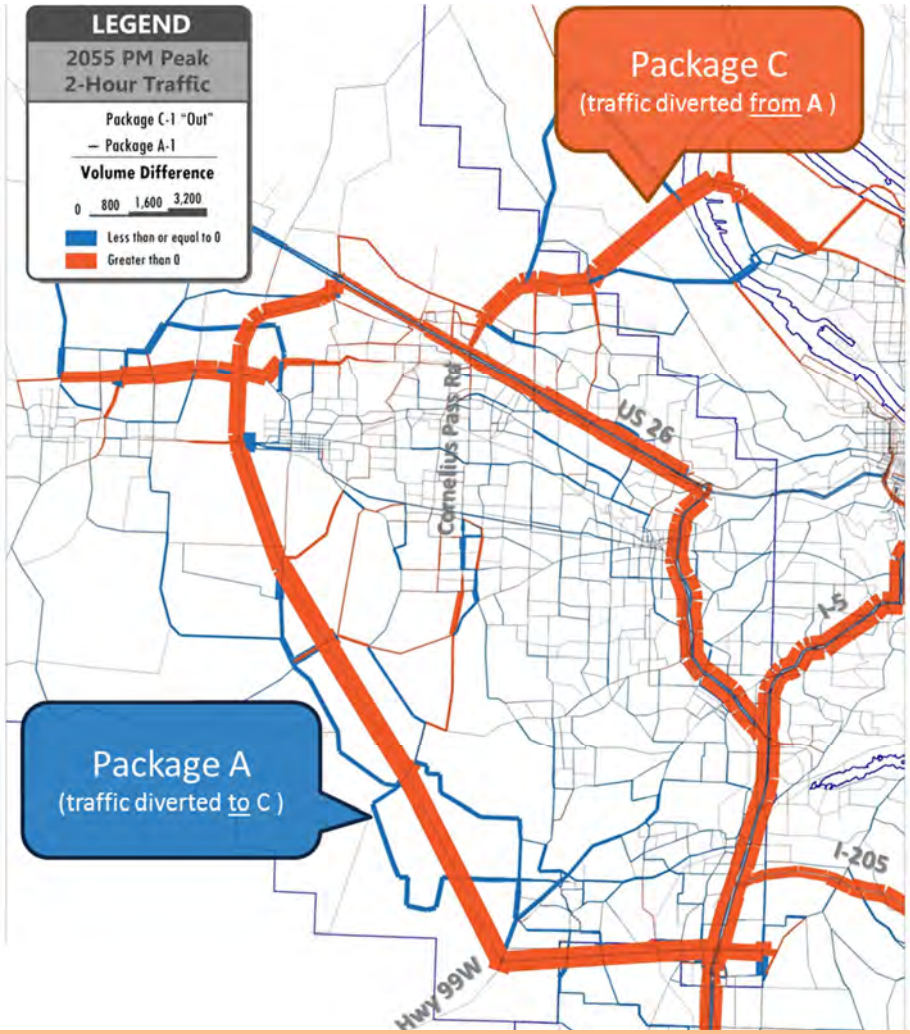
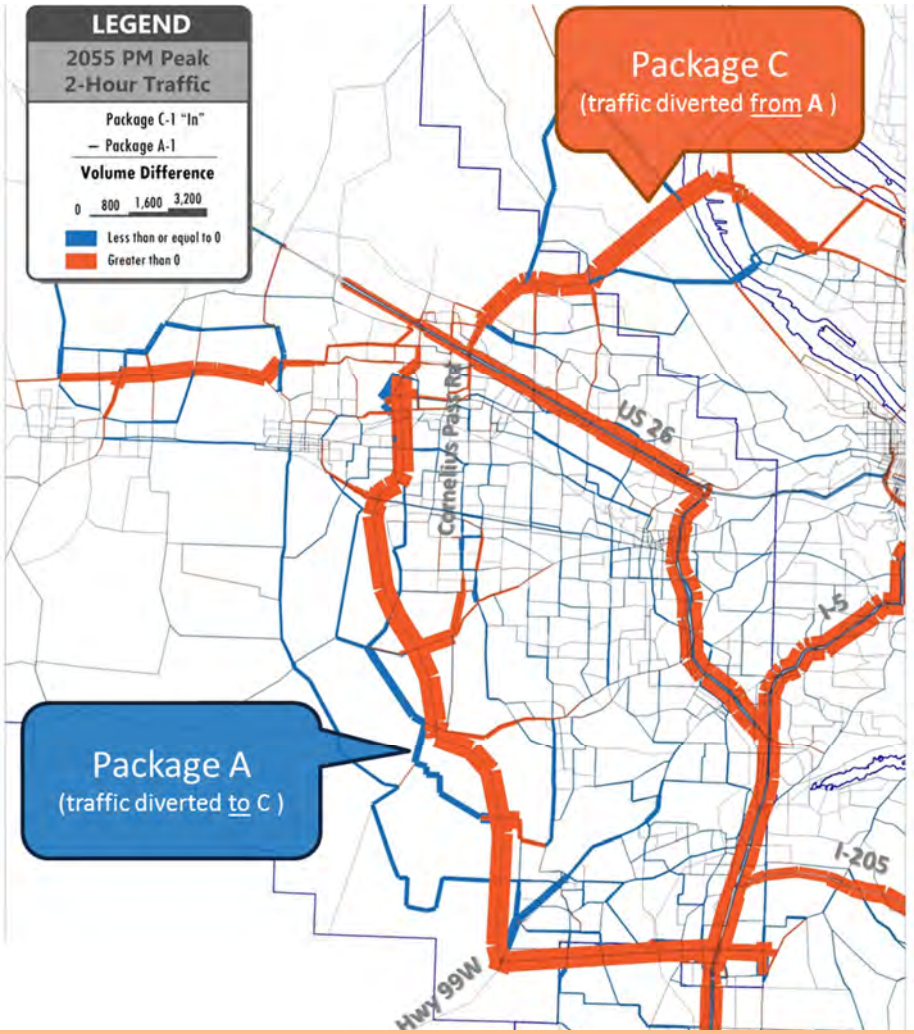


Figure 7-17: Comparison of Future Travel Demand – Package A vs. Package C with Inner North-South Parkway



- **Adding capacity to higher class facilities shifts traffic from lower class facilities**
  - **N-S connections reduce E-W congestion.**
  - **Reduces cut-through traffic and VHD.**
  - **Improves local air quality.**
  - **Increases VMT and GHG.**

- **Faster speeds with throughway investments increase risk of fatal crashes.**
- **Right-of-way with wider streets reduce land development potential.**
- **More VMT increases crash risk; technology potentially reduces impact.**
- **Farm impacts with new roads in rural areas.**

The Study looked at traffic volumes on roadways serving north-south travel along the western edge of the UGB while comparing the investment packages. **Figure 7-18** and **Figure 7-19** illustrate how traffic demand changes with the different investment packages on current roadways and new or improved roadways.

Cutline #1: South of US 30

As shown in Cutline #1 of **Figure 7-18**, under Package B, traffic on Cornelius Pass and Germantown Road increases by 23% compared to Package A, due to the widening of Cornelius Pass Road. Under Package C, total cutline traffic more than doubles (138% growth) with the addition of the Northern Connector, while traffic on Cornelius Pass and Germantown Road decreases to levels similar to, or in the case of Germantown Road, less than today. These traffic levels increase only slightly with higher growth assumed under the *Increased Trade and Technology* scenario.

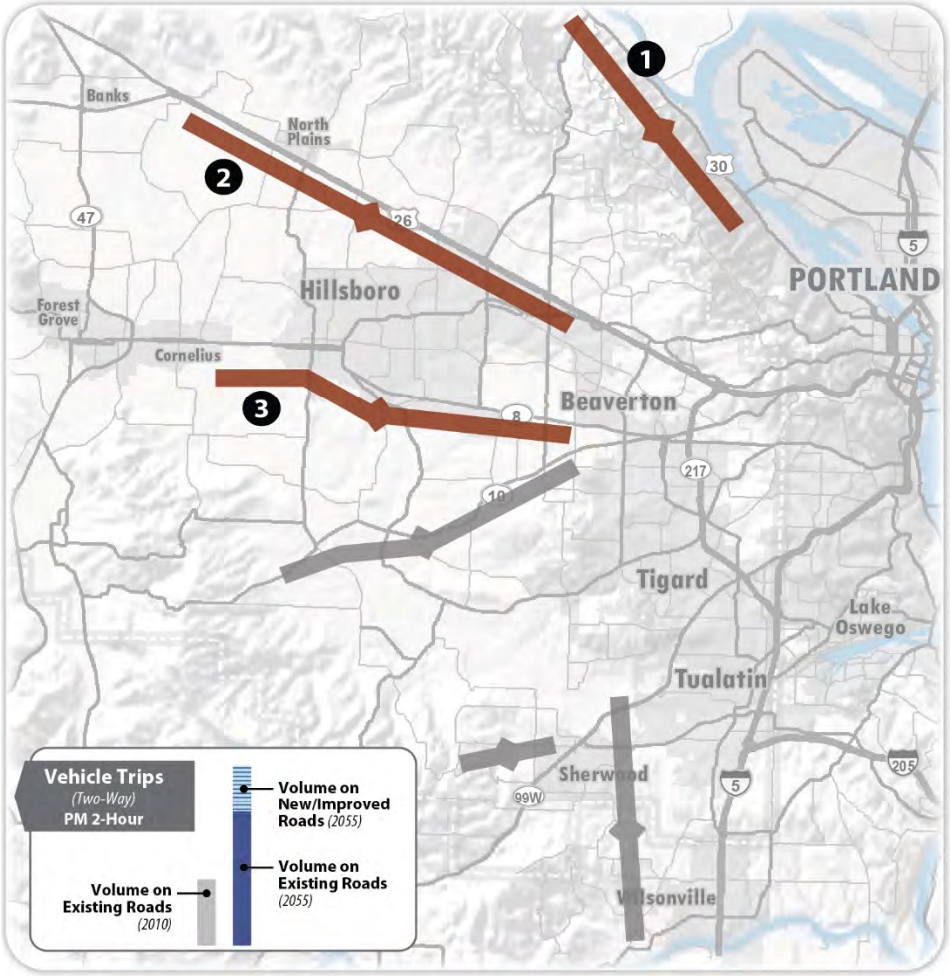
Cutline #2: South of US 26

South of US 26, between North Plains and 173rd Avenue, total future traffic on current and new roadways decreases by about 6% with Package B investments. Package C investments increase future traffic by 9 to 15% on current and new roadways compared to Package A. This trend holds with the higher growth scenario.

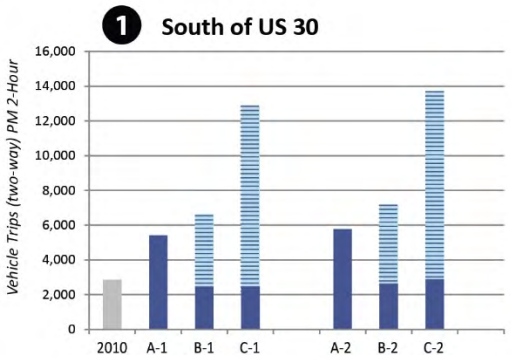
Cutline #3: South of TV Highway

South of TV Highway, between Highway 219 and 170th Avenue, future traffic on existing roads is similar between Packages A, B, and C (with an outer alignment). Package C with an inner alignment decreases future traffic on existing roadway routes by 15% compared to Package A. The upgrading of existing north-south arterials in Package B does not increase overall traffic across the cutline. Adding a new North-South Parkway increases total traffic by 26% to 31% compared to Package A.

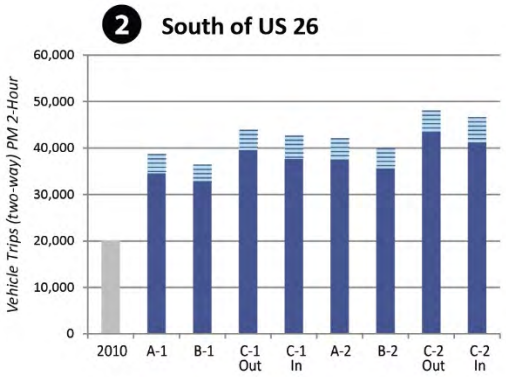
Figure 7-18: Traffic Volumes by Cutline - North



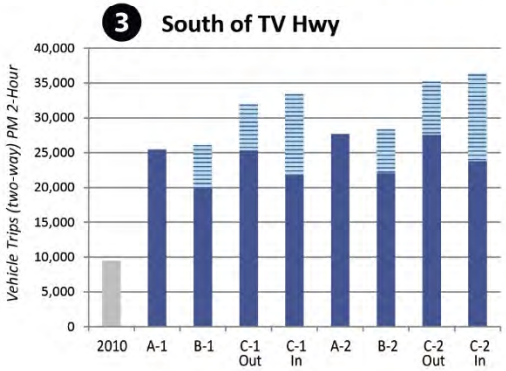
- A new Northern Connector attracts future traffic from US 26 and other routes, and minimizes future traffic growth on Cornelius Pass and Germantown Roads.
- A new North-South Parkway Arterial diverts future traffic from other north-south, urban and rural arterials, more so if located nearest to the UGB.



- *Cornelius Pass Road*
- *Germantown Road*
- *New Northern Connector*



North Plains Int., Gordon Rd, Glencoe Rd., Jackson School Rd., Meek Rd., Brookwood Int., Century Overcrossing, Cornelius Pass Rd., 185th, 173rd and New North-South Parkway



Highway 219, Minter BR. Rd., Rood Br. Rd., River Rd., Cornelius Pass Rd., 209th, 185th, 170th and New North-South Parkway

Cutline #4: South of Farmington Road

As shown in **Figure 7-19**, south of Farmington Road, volumes on existing roads are down 18% in Package B and 13% to 27% in Package C (depending on a new North-South Parkway alignment) compared to Package A. Total traffic increases 5% with Package B, 36% with Package C assuming an outer alignment of a parkway, and 50% with an inner alignment. Both the arterial investments in Package B or parkway investment in Package C would help reduce demand on current roadways while moving more traffic overall compared to Package A. The parkway investment is able to maintain reductions on current roadways even with the higher growth of Scenario 2.

Cutline #5: North of 99W

Just north of Highway 99W, investments in upgrading existing north-south arterials in Package B have the potential to maintain future traffic on current roadways comparable to existing levels, while being able to increase total traffic by 22%, with more concentrated future traffic growth onto the improved Roy Rogers Road. Investing in a North-South Limited Access Road increases total traffic by 88% on an inner alignment and 76% on an outer alignment, with 55% to 60% of that traffic on new roads.

Cutline #6: West of Grahams Ferry

Between Highway 99W and I-5, Package B generates traffic demand similar to Package A, while Package C increases total traffic by 25% compared to Package A. Package C does reduce demand on adjacent roadways such as Tualatin-Sherwood Road and Highway 99W north of the new North-South Limited Access Road by around 15%.

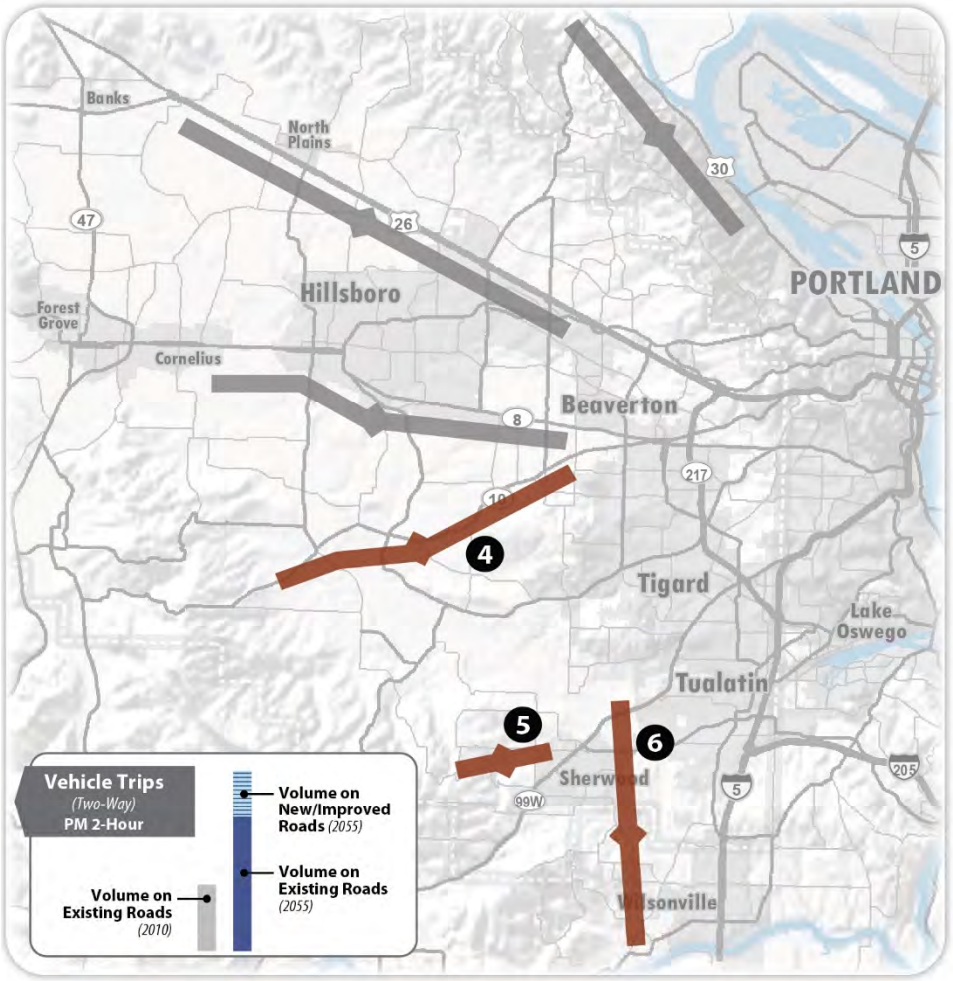
New north-south roadways will also impact other regional routes. I-5 through Wilsonville would likely see increased future travel under Package C (compared to Package A) due to a new North-South Limited Access Road and Southern Arterial expressway. Columbia Boulevard would also see increased traffic due to a new Northern Connector.

Rural Roads

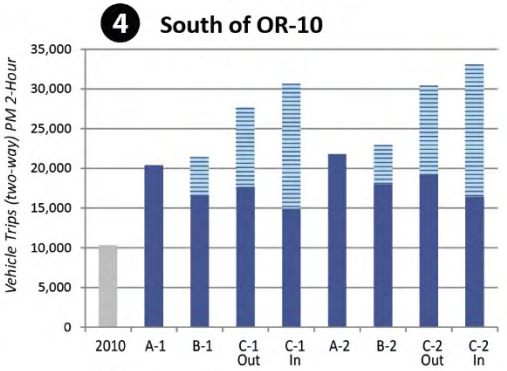
Increased traffic on rural roads with planned investments in Package A increase the conflict between agricultural needs, rural lifestyle, and urban traffic. Passing lanes and other safety improvements are assumed on these rural roads to mitigate these impacts. As indicated in **Figure 7-14**, new throughway investments in Package C through rural areas would conflict with adopted land use plans and regulations, though the new roads also reduce traffic and potential conflict on existing rural roads.

The arterial investments of Package B increase traffic on the upgraded roadways but hold traffic volumes on adjacent rural roadways close to existing levels. Highway 219 sees a 6% increase in traffic in Package B but a 44% to 59% reduction in traffic with the addition of the North-South Limited Access Road. North of Farmington the outer alignment provides a 44% reduction, while the inner alignment provides a 11% increase. South of Farmington the benefits to adjacent rural roads are similar with both alignments providing reductions on Highway 219 of 59% on the outer and 51% on the inner alignment option.

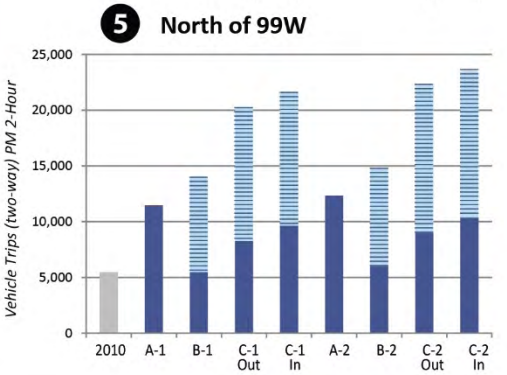
Figure 7-19: Traffic Volume by Cutline - South



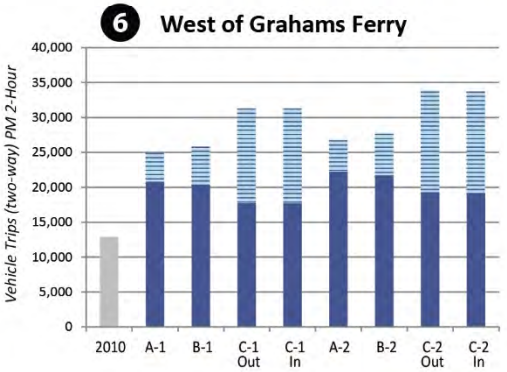
- A new North-South Arterial helps reduce future traffic growth on neighboring routes.
- A new North-South Parkway diverts more future traffic from neighboring routes.
- A new Southern Arterial with direct connection to I-5 reduces future traffic on Highway 99W and Tualatin-Sherwood Road.



OR 219, River Rd., Clark Hill Rd., Grabhorn Rd., Miller Hill Rd., 185th, 170th and New North-South Parkway



Elvert Rd., Edy Rd., Roy Rodgers Rd., and New North-South Parkway



Highway 99W, Tualatin-Sherwood Rd., Tonquin Rd., Tooze Rd., Bell Rd. and New Southern Arterial/Basalt Creek Parkway

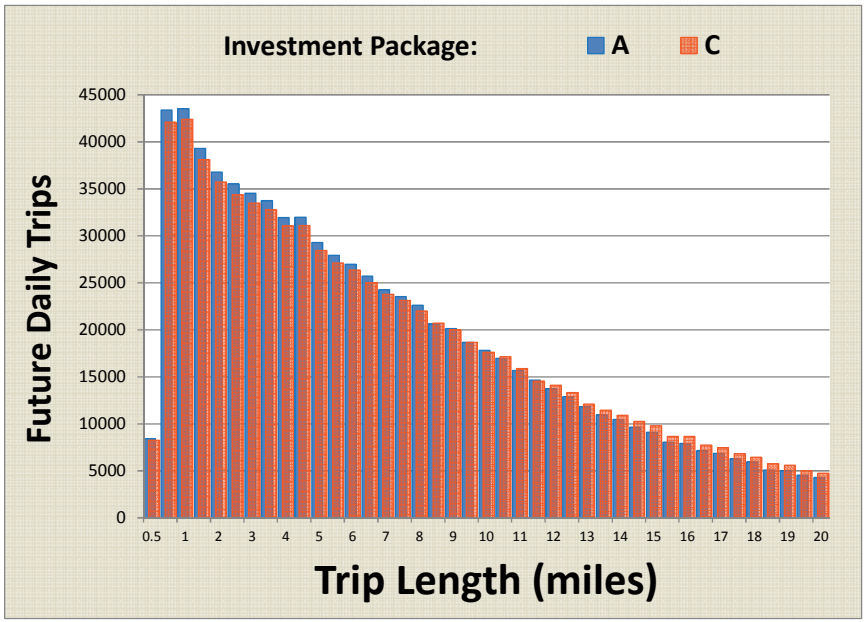
7.2.3 Health and Safety

Health

Bicycle and pedestrian travel in Washington County was shown to increase to almost 10% of daily trips from 7% today, and the total number of trips to almost double from 190,000 daily trips to 360,000 daily trips by 2055. This shift in future walk and bicycle travel brings additional health benefits for users as well as reduces vehicle trips. As physical activity goes up, related disease rates go down.

Future trip patterns in Washington County indicate a large potential to increase bike and walk trips. Studies have shown a willingness to travel up to 3 miles by bicycle for commute trips (Dill, Jennifer and John Gliebe, "Understanding and Measuring Bicycling Behavior: A Focus on Travel Time and Route Choice." Report No. OTREC-RR-08-03, Oregon Transportation Research and Education Consortium, December 2008). **Figure 7-20** shows the large number of trips that are less than 3 miles (which is the target for bike and walk use), totaling over 200,000 under Package A. The number of these trips less than 3 miles decreases, but only slightly, as trip lengths increase with the greater accessibility in Package C.

Figure 7-20: Daily Person-Trip Distribution – Washington County



- **Strategies that reduce vehicle miles traveled (VMT) result in greatest potential for increased health outcomes.**
- **As physical activity levels go up, related disease rates go down.**
- **Congestion negatively impacts air quality and safety.**

Safety

The more auto traffic a person is exposed to, the higher the risk of a crash. Additionally, research has found a correlation between auto speed and the severity of crashes. The risk of a fatality increases significantly when vehicle speeds exceed 30 to 40 mph. Investments in throughways result in the higher auto VMT (and a higher increase in VMT over 40 mph) indicating a higher crash exposure potential and a 27% greater risk of a fatality than without these investments (Package A). However, research indicates that it

is likely that advances in transportation technology will reduce the frequency and severity of crashes for all transportation users.

Growing traffic on arterials increases crash exposure for pedestrians and cyclists. Also, with more congestion there is the potential for more cut-through traffic, thus increasing crash exposure for pedestrians and cyclists along local neighborhood streets.

Investments that widen arterials with protected bike lanes that better separate cyclists from adjacent traffic are one way to improve bike safety. However, these improvements require more right-of-way and do not significantly reduce vehicular congestion.

Off-road pathways and trails, included in Package C, are other options to improve safety; but may raise added safety issues, such as those related to lighting and street crossing facilities. While many trail users prefer these routes for recreation and exercise, other users find them less attractive, because they do not provide direct access.

Improved bicycle and pedestrian amenities, protected crossings, bike racks and special signals within urban centers are assumed as part of all of the packages, as are reduced vehicle speeds in urban centers. Combined, these features help increase attractiveness and safety for cyclists and pedestrians.

7.2.4 Environmental Sustainability

Air Quality

Idling (internal combustion) engines stuck in traffic queues degrade air quality. VHD is the common summary measure of traffic delay. As noted earlier in **Figure 7-6**, VHD is highest across all roadway facilities without additional investments in roadways. The targeted arterial street capacity improvements tested would provide reductions in VHD. Highway capacity improvements in Package C showed the most reduction in VHD (14% countywide) when compared to Package A.

Impervious Surface and Habitat Impacts

All three investment packages will have some level of environmental impact. As shown in **Figure 7-21**, the combination of highway and arterial investments in Package C contributes to the largest impact on resource habitat in Washington County and surrounding areas.

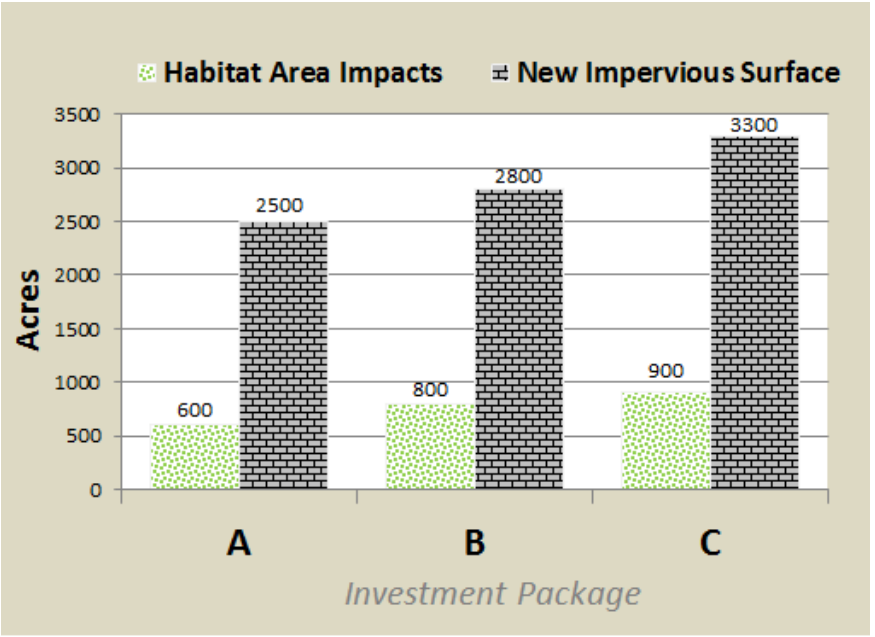
Increasing impervious surface areas negatively impacts water quality and other natural habitat, though there are effective mitigation treatments that are required to offset the impacts. **Figure 7-21** graphs the estimated area of new impervious surface for each of the investment packages. Similar to habitat impacts, investments in Package C contribute to the largest impact in the construction of new impervious surface.

Greenhouse Gas Emissions

GHG is created by the burning of fossil fuels and is one of the key measurements used to determine a transportation system's impacts on global climate change. VMT is a surrogate normally used to gauge the level of GHG emissions.

Targeted arterial capacity investments (Package B) have only a marginal impact on automobile travel and associated GHG emissions. Throughway capacity investments (Package C) increase auto travel and associated GHG emissions more than the arterial street investments. As noted earlier, the pricing of roadways as a transportation demand management (TDM) strategy can be used to reduce auto VMT and its associated GHG emissions, as could a shift to electric vehicles.

Figure 7-21: Relative Impact of Investment Packages on Resource Habitat and Impervious Surface



Note: Resource habitat and impervious surface estimates include impacts of Planned Investments in each package.

- **Poorer air quality with increased congestion and VHD mean poorer air quality.**
- **Increased impervious surface negatively impacts water quality and habitat.**

Advances in transportation technology are likely to significantly change the air quality and GHG emission characteristics of the vehicle fleet over the time frame of this Study. The Study acknowledges that electric vehicles will comprise a larger share of the overall fleet in the future, which will proportionately change the GHG emissions under each Investment Package.

7.2.5 Cost

Planning-Level Cost Estimates

Planning-level costs were estimated for roadway and transit capital improvements and required new rights-of-way (ROW) in each of the investment packages. The Study applied consistent costing methods as developed by Metro for the Regional Transportation Plan (RTP) (roadway, freeway, and bicycle-pedestrian facilities), and by TriMet (transit (LRT and BRT)). Capital and ROW cost estimates are reported in 2016 dollars.

Local Roadways Planning-level costs associated with the engineering, design, and construction of new or widened collector and arterial streets consistent with Washington County roadway standards.

Freeways/Parkways Planning-level costs associated with the engineering, design, and construction to widen existing freeways or build new limited-access roads consistent with Washington County and Oregon standards.

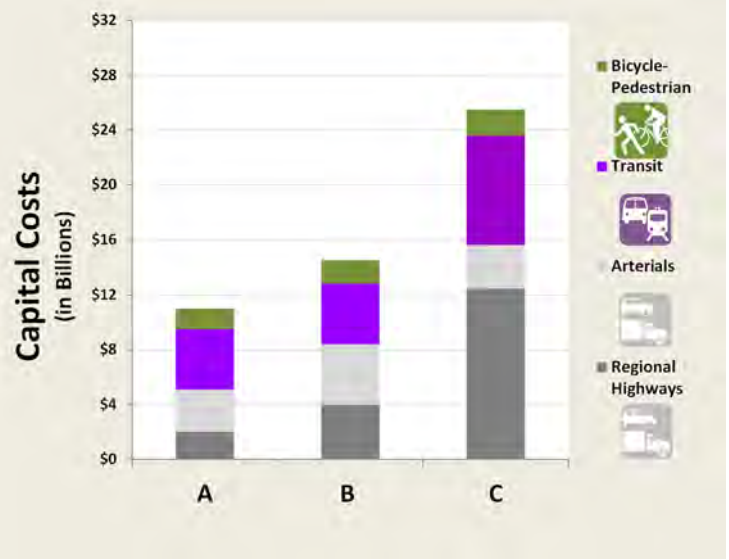
Right-Of-Way Planning-level costs associated with the new ROW for roadway and freeway projects are based on Metro RTP methods and land value. Land value varies by prevailing urban context (developed and undeveloped) and rural context.

Transit Planning-level capital costs for new light rail transit (LRT) and bus rapid transit (BRT) plus ROW costs based on prevailing corridor land use: new urban or suburban routes, or along existing rail or freeway corridors.

As summarized in **Figure 7-22**, all of the investments included in this Study have big price tags–ranging from $11 billion for enhanced transit and completing planned investments to almost $26 billion with new express HCT, highway capacity, and new limited-access roads and connectors within the county. Each of the investment packages includes the RTP financially constrained assumptions (approximately $3.2 billion) to fund Planned Investments within Washington County. These costs include a general estimate for ROW and per unit costs for like facilities, and do not include additional operating and maintenance costs.

The estimated costs substantially exceed current resources and would require coordination and cooperation across multiple agencies. Washington County has a history of partnering and leveraging resources to develop a multimodal arterial system and make key improvements in regional transit and highways.

Figure 7-22: Capital Improvement Costs of the Investment Packages



- **$11 billion to build planned investments, complete streets with bike and pedestrian facilities, and implement enhanced transit services.**
- **$26 billion to build new roadways and transit in exclusive ROW.**
- **These investments cost more than planned resources could fund.**

7.3 Summary

The Study evaluated each of the transportation investment options to see how well they meet a set of community values. These values were developed based on public input at the beginning of the Study. **Figure 7-23** summarizes the key findings on how the different investment options meet these community values.

Figure 7-23: Study Findings and Community Values

Community value	Projects that best support each community value
Safety and Health 	+ Self-driving cars + Improved signal coordination + Passing lanes and minor roadway improvements + Demand management to reduce VMT + Bicycle and pedestrian improvements such as protected bike lanes and off-road pathways and trails
Mobility and Accessibility 	+ New limited access roads and highway capacity + Express transit service and improved access + New arterials to improve connectivity + Expanded local bus network
Reliability 	+ New Northern Connector for freight reliability + Increased high capacity transit service frequency
Equity	+ New and expanded transit access + Completed bicycle and pedestrian network
Environmental Sustainability 	+ Enhanced transit and demand management to reduce vehicle trips and GHG emissions **+** New roadways that improve air quality by reducing traffic delay + Technology advancements in vehicle fleet to mitigate air quality impacts and GHG emissions
Land Use and Community 	+ New roadways that reduce cut-scscothrough traffic + Complete bicycle and pedestrian networks + Enhanced transit service
Cost 	+ Planned roadway improvements + Demand management + Improved signal coordination + Bicycle and pedestrian improvements + Enhanced transit service

Evaluations Results

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