City of Seattle Department of Transportation

TRANSIT MASTER PLAN

FINAL SUMMARY REPORT

ADOPTED 2012
AMENDED 2016

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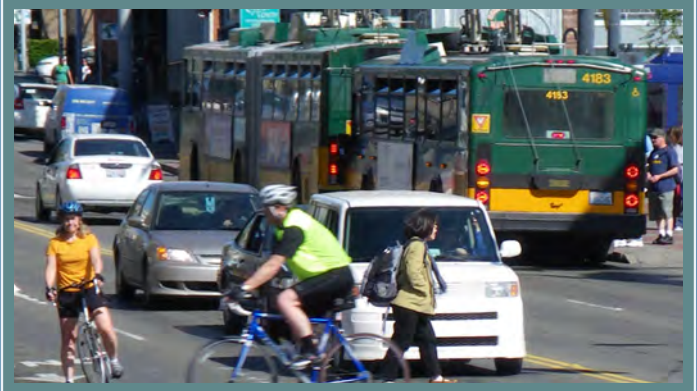

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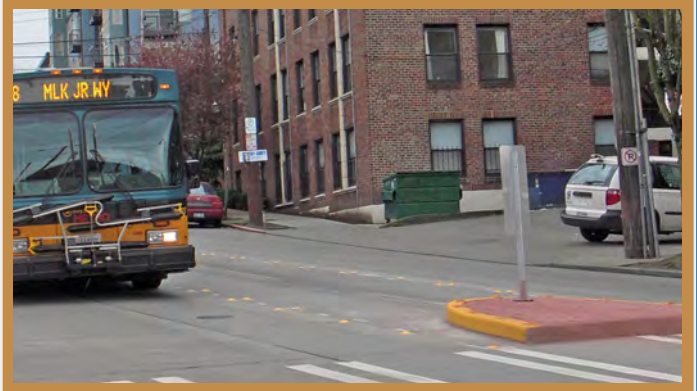

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PRIORITY STRATEGIES

The Seattle Transit Master Plan (TMP) recommends strategies, projects, and policies that will make Seattle a more affordable, cleaner, vital, equitable, and enjoyable place to live and do business. Among the many recommendations made in the TMP, the six major initiatives that arise as near-term priorities are outlined in this section.

The City of Seattle plays an important role in building capital improvements that allow buses to provide fast and reliable service, as well as provide safe access to transit stops and stations.

Image from SDOT

Redesigning the 3rd Avenue Transit Mall would make this key downtown corridor more efficient for buses and a more comfortable, attractive place to walk and wait for the bus.

Image from Flickr user Oran Viriyincy

1. Continue Implementation of Priority Bus Corridors

The Seattle Department of Transportation's (SDOT) Transit Program builds capital projects and implements programs to improve transit speed and reliability in Seattle's busiest bus corridors. SDOT projects also help make transit stops and stations easier and safer to access. The TMP recommends 16 bus corridors throughout the city that merit speed, reliability, and transit stop upgrades. However, funding for this important work may be diminished with the expiration of the Bridging the Gap levy in 2015. To ensure continued implementation of transit priority projects, the City should:

- **Renew and increase funding** so more priority bus corridor projects can be implemented more quickly.
- **Continue strong partnerships with Metro** to enhance speed and reliability where service investments are greatest and most passengers benefit.
- **Engage partnerships with neighboring cities** to ensure that transit quality improvements continue outside city limits.

2. Develop Center City Transit to Support Downtown Growth and Vitality

In the next 20 years, Center City jobs and population are expected to increase by 60 percent. Meanwhile, there is no room to widen streets or increase capacity for automobiles. Accommodating growth in the Center City will require space-efficient, sustainable modes of transportation, particularly transit, walking, and cycling, to provide needed access and mobility. Priority TMP projects that will help support a growing economy and residential population include:

- **Connect the existing South Lake Union and First Hill streetcar lines** to create a highly visible and effective Center City circulation system. The City has received a Federal Transit Administration (FTA) grant to further study the best alignment for the "Center City Connector."
- **Engage businesses and community members to redesign the Third Avenue Transit Mall,** making it a safer, cleaner, more functional, and engaging civic space.
- **Use a "transit first" approach** that prioritizes throughput for transit, bicycles, and pedestrians on downtown streets where space is limited.
- **Create strong bicycle and pedestrian connections** between the Central Waterfront and key transit stops and stations on First Avenue, Third Avenue, and the Downtown Seattle Transit Tunnel.

Creating a transit station at or near Colman Dock would help ferry passengers make easy transit connections to destinations in the Center City and elsewhere in Seattle.

Image from Nelson\Nygaard

Dexter Avenue is a major corridor for bicycle access to the Center City and an important transit corridor.

Image from SDOT

3. Plan, Fund, and Build Priority High Capacity Transit Projects

The Transit Master Plan identifies five corridors where investment in higher capacity modes of transit—such as rapid streetcar, bus rapid transit, or light rail—are needed to support population and job growth while maintaining the quality and character of local neighborhoods. In addition to the Center City Connector, two corridors through downtown that have immediate potential and deserve further study and investment are:

- **Capitol Hill – Downtown – Waterfront, via Madison Street**
  - **Partner with King County Metro** to further evaluate operational and design alternatives to improve service quality and reliability on this busy route.
  - **Create a Central Waterfront transit station** that provides an easy transit transfer to bus and rail transit for Washington State Ferry and West Seattle Water Taxi passengers.
- **Ballard – Fremont – South Lake Union – Downtown**
  - **Partner with Sound Transit** to further evaluate mode, alignment, and design alternatives. This corridor is identified in Sound Transit's Long Range Plan as a potential future high capacity transit corridor.
  - **Develop a coordinated transit-land use strategy** that allows for compact and vibrant growth in this corridor while maximizing the value of this future investment.

4. Enhance Walk-Bike-Ride Access where Needs are Greatest

Many of Seattle's low-income residents, seniors, and other vulnerable populations live in neighborhoods distant from the urban core; many of these areas were annexed by the City and had not been originally constructed with full sidewalks. Improving sidewalks, adding bicycle facilities, and providing safe crossing treatments near bus stops can help more Seattleites use transit with a sense of safety and security. The TMP recommends that the City:

- **Increase coordination between the Transit, Bicycle, and Pedestrian Master Plans,** including development of a "Mobility Corridor" approach that focuses on developing integrated mobility solutions in the city's most traveled corridors.
- **Ensure the Capital Improvement Plan recognizes transit access as a priority** pedestrian and bicycle project need. Updates of the Bicycle and Pedestrian Master Plans offer good opportunities to incorporate connectivity to transit stops and hubs as a criterion for prioritizing projects.
- **Develop Transit Community land use policies** that incorporate best practices for developing compact neighborhoods that promote walking, biking, and transit for more types of trips.

The TMP recommends that Seattle partner with transit providers to create a comprehensive system of maps and signs that provide consistent transit, pedestrian, and bicycle navigation.

Image from Flickr user Oran Viriyincy

Local funding from Bridging the Gap has been used to enhance transit stops and bike/pedestrian facilities along key transit corridors, such as this boarding island and bike lane treatment along Dexter Avenue (prior to completion of the bus shelter).

Image from Nelson\Nygaard

5. Improve Transit Information and System Usability

Transit service offerings for Seattle residents are improving and changing every year. New light rail, bus rapid transit, and streetcar lines are being added to complement or replace historic bus services. These improvements mean more choices and more trips that involve multiple modes and/or service providers. To ensure that transit system legibility is keeping pace with new transit offerings, the City should:

- **Lead the development of an inter-agency design working group** to develop transit wayfinding and transit facility design standards.
- **Use high-quality, tactile transit station** design as the nucleus of great Transit Communities.
- **Work with Metro and Sound Transit to open source data,** allowing private innovators to create new applications and tools that enhance user information.
- **Expand efforts to provide electronic schedule information at bus stops.**

6. Pursue Funding to Enhance Transit Service and Facilities

Transit agencies nationwide, including Sound Transit and King County Metro, are struggling to overcome declining tax revenues and uncertain state and federal funding support. In addition to organizing land uses to make transit more efficient, Seattle needs to grow funding to provide the level of service and capital investment required to support growth and provide high quality service that attracts people away from private auto use. To secure funding, the City should:

- **Renew and seek new local funding sources** to implement TMP capital and service priorities.
- **Work with partners to lobby for new transit funding mechanisms** such as tax increment financing, dedication of tolling revenues, and other locally- or regionally-based transit funding sources.
- **Create partnerships and leverage private investment** to help fund priority capital investments.
- **Continue to aggressively seek federal and state grants,** in coordination with other transit agencies, to maintain, improve, and expand Seattle's transit service and facilities.

SERVING SEATTLE'S UNDERREPRESENTED POPULATIONS

The TMP is a framework for a transportation system where mobility and access is provided equally and affordably to all residents. A central theme of the plan is that access to high-quality transportation is a basic right. All people, regardless of income or ability, need transportation services that include good mobility, equal access to opportunities, and affordable cost. People should not need to own a car to access services, jobs, and recreation. Even stakeholders with a primary interest in development of high-quality, high-frequency corridor transit service also noted the important social and human service aspects of transit that is delivered by providing good fixed-route coverage and paratransit service. Social equity considerations were fundamental in understanding Seattle's transit needs and developing TMP recommendations.

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1 INTRODUCTION

The City of Seattle Transit Master Plan (TMP) is a 20-year plan that identifies the types of transit facilities, services, programs, and system features that will be required to meet Seattle's transit needs through 2030. Building from an extensive market analysis, review of future growth patterns, and evaluation of transit needs, the TMP identifies capital investment priorities needed to establish a network of top quality, frequent transit services that meets the travel needs of most Seattle residents and workers. The TMP evaluates and recommends preferred transit modes for high priority corridors and sets a framework for implementing corridor-based transit improvements in close coordination with other modal needs. The plan was developed with feedback from King County Metro and Sound Transit, the agencies that provide most transit service in the City of Seattle and whose partnership is critical to creating a seamless, fully integrated, and user-friendly Seattle transit system.

South Lake Union Streetcar

Image from SDOT

WHY A MASTER PLAN FOR SEATTLE?

MEETING CITY GOALS

The Seattle Transit Master Plan (TMP) is a 20-year plan designed to help meet Seattle's goals, including the development of a transit system that supports the mobility needs of Seattle residents and businesses and that serves as a backbone of sustainable urban growth. The TMP defines the critical role that transit plays in meeting city goals related to sustainability, equity, economic productivity, and livability. The plan recommends projects, strategies, and funding options to improve transit quality and delivery; as it is implemented, it will help to knit together the city's urban villages into an accessible network of great neighborhoods. Since all transit trips begin with walking or biking, the TMP considers important pedestrian and bicycle linkages to local and regional transit services and identifies ways to improve accessibility. The TMP recommends a heightened level of coordination for multimodal investments in Seattle under which pedestrian, bicycle, and transit investments are made simultaneously to optimize benefits in the City's most important mobility corridors.

FOCUS ON IMPLEMENTATION

The Seattle Transit Master Plan (TMP) updates and expands upon the 2005 Seattle Transit Plan. It identifies near-term and long-term strategies to improve the quality of transit options and increase transit mode share throughout the city. Serving as a blueprint for transit, the plan provides a vision for Seattle's transit network through 2030 and beyond and identifies transit capital, operational, and programmatic investments. The TMP establishes a strong policy framework for transit, in many cases confirming policy language already established in the 2005 Seattle Transit Plan, the Transportation Strategic Plan, and other approved plans. Building upon the 2005 plan, the TMP details specific capital projects that will improve transit speed and reliability in high ridership bus corridors citywide and develop rapid streetcar lines in several of Seattle's most promising transit corridors.

To a degree, the City of Seattle's own success dictates the need for the Transit Master Plan. The Seattle Department of Transportation's (SDOT) transit program has delivered capital improvements in key city transit corridors using funds from Bridging the Gap (BTG), grants, partnerships with King County Metro, and through a local improvement district that funded the starter line of a proposed streetcar network. BTG is a nine-year local transportation levy for maintenance and multimodal transportation improvements passed in 2006. BTG funds street and traffic signal improvements that increase the speed and reliability of bus travel in corridors that carry the most transit trips and connect Seattle's urban villages. Design and construction of improvements is already underway or complete in corridors around the city, including: Rainier Avenue, West Seattle, Ballard-Uptown, Third Avenue, and Market/45th Streets. The South Lake Union Streetcar is a 1.3 mile modern streetcar line that connects the rapidly developing South Lake Union Urban Center to the downtown retail core and regional transit system. Since opening in December 2007, the South Lake Union line has seen double-digit ridership percentage growth in each year of operation. The City is in the final design stages for the First Hill Streetcar, which will connect First Hill to Capitol Hill and transit connections in the International District.

Building upon these projects, the TMP outlines a capital investment program to be funded through other future sources and leverages opportunities with other projects and investments. The TMP will ensure continued progress toward a top quality, Frequent Transit Network for Seattle residents.

KEY OUTCOMES

The TMP lays out an aggressive plan for transit capital and program improvements that can start immediately, but may take 20 years or more to realize in full. Further, the plan addresses a number of other important outcomes identified through the work of the Transit Master Plan Advisory Group (TMPAG), a group of stakeholders that worked closely with SDOT and the consultant team to develop the TMP. The following TMP outcomes were prioritized by the TMPAG:

- Identify the city's most important transit corridors that carry high ridership today and have the greatest potential to serve transit needs that will emerge as Seattle's population and job base grows.
- Make transit more competitive with the private auto by enhancing transit speed and reliability and increasing service frequency in priority bus transit corridors. These corridors represent the City's most immediate opportunity to provide meaningful improvements in service quality for passengers.
- Expand the Seattle rail system. This was a strong sentiment among stakeholders as well as members of the public that responded to the TMP survey. Residents were attracted to the reliability and ride quality of rail and emphasized that Seattle should speed the development of its rail system.
- Improve Center City circulation. Many stakeholders want Seattle to prioritize expansion of the Center City streetcar, improve wayfinding and real-time information at transit stops, make right-of-way modifications to improve bus speed and efficiency, and improve coordination of transfers.
- Leverage transit investments to support urban development, enhance placemaking, and achieve environmental goals.
- Elevate the integration of transit capital development with the expansion of walking and biking infrastructure. In particular, use TMP priority transit corridors to guide multimodal corridor investment (see Chapter 5: Mobility Corridors) where corridor access, placemaking, and linear mobility investments are made simultaneously, using a "transit project" as the means to holistically transform a corridor.
- Coordinate with Metro and Sound Transit to create a seamless, fully integrated, and user-friendly network of transit services.
- Develop design standards for transit stops and stations to make the user experience safe, comfortable, enjoyable, and convenient.
- Develop or enhance education and financial incentive programs that support transit use in Seattle.
- Identify transit funding options for implementing TMP priorities while helping support existing local transit services.
- Create performance measures to allow the City to monitor TMP implementation and changes in transit performance levels and quality.

CHANGING TRANSIT LANDSCAPE

In 2010, the King County Council formed the Regional Transit Task Force (RTTF) to develop a policy framework to guide service investments or, if necessary, service reductions. The RTTF identified short-term and long-term objectives for transit service investment and developed policy guidance for service implementation based on those objectives. Among the most important for Seattle was the elimination of a formula approach to expending new operating dollars in three King County geographic subareas.[1] The new policy no longer identifies specific formulas for adding, reducing and managing service, but rather emphasizes that service reduction and service expansion decisions be made based on the following priorities:

1. Emphasize productivity due to its linkage to economic development, land use, financial sustainability, and environmental sustainability
2. Ensure social equity
3. Provide geographic value throughout the county

By approving a temporary $20 vehicle license fee in August 2011 to supplement declining operating revenues, the King County Council prevented dramatic cuts to transit service in late 2011 and 2012 that would have been necessary to deal with operating fund shortfalls. This funding measure allowed Metro to avoid deep service cuts in 2012, but does not fully address longer-term financial challenges. In light of continued funding challenges, the City should consider expanding its role in funding service operations and capital development, the tradeoffs of which are discussed in Chapter 6 (Funding and Performance Measurement).

Approval of the $20 vehicle license fee carried the condition that the Downtown Seattle Ride Free Area (RFA) be eliminated in 2012. Elimination of the RFA will require significant changes to downtown transit fare collection and creates opportunities for Metro and the City of Seattle to rethink how transit operates in downtown. Elimination of the RFA will require a number of mitigation measures to ensure that new fare payment and boarding policies do not create undo congestion and transit delay. Mitigations on surface streets and in the Downtown Seattle Transit Tunnel may include further restrictions on vehicular traffic, increases in bus zone capacity, and changes to bus bay assignments. Elimination of the RFA could provide an opportunity for King County Metro, in partnership with the City of Seattle and Sound Transit, to consider more significant restructuring of bus route operations in downtown Seattle and enhancements to passenger amenities, information, and fare payment technology.

1 The 40/40/20 funding split refers to a King County policy that was developed by Metro Transit to balance transit operating funds between Seattle, which had a well developed transit system, and the remainder of the county, where transit services were more limited. Specifically, "40/40/20" referred to the percentage split of new transit operating funds between South King County (40%), East King County (40%), and Seattle/Shoreline (20%).

CITY OF SEATTLE'S ROLE IN TRANSIT DELIVERY

Many large U.S. cities are served by transit providers that operate under separate governance from the municipality. Seattle is unique, however, in the active role SDOT takes in planning, funding, and delivering transit for its residents, visitors, and employees. The City's role in transit delivery includes funding and building capital transit speed and reliability projects, maintaining a current transit plan, and providing policy representation on regional transit boards and committees. The City allocates time and resources to the following transit programs and activities:

Funding

Seattle generates capital funding for transit corridor improvements through the Bridging the Gap funding package. SDOT regularly pursues federal, state, and other grants and partnerships for transit capital improvements. SDOT has successfully partnered with King County Metro to secure federal funding for RapidRide corridor improvements and other transit projects. The City also subsidizes transit service on the Seattle Streetcar and a number of frequent services provided by Metro and currently provides partial funding for the downtown Seattle Ride Free Area (RFA).

Bridging the Gap funds multimodal improvements along important transit and bicycle/pedestrian corridors.

Image from Nelson\Nygaard

Planning and Policy

SDOT maintains an active transit plan and has planning, policy, and design staff to support policy coordination with Metro and Sound Transit as well as development of bus corridor improvements, station area planning, and the Seattle Streetcar program.

The Transit Master Plan is a five-year update to the 2005 Seattle Transit Plan.

Image from Nelson\Nygaard

Seattle Streetcar

SDOT owns and contracts with King County Metro to operate the South Lake Union streetcar, which provides frequent transit service between Westlake Plaza and South Lake Union. SDOT is also designing and building the First Hill Streetcar, which was approved by voters in 2008 as part of Sound Transit's ST2 package. The First Hill Streetcar will connect the diverse and vibrant neighborhoods of Capitol Hill, First Hill, and the Chinatown/International District, while serving medical centers (Harborview, Swedish, and Virginia Mason) and universities (Seattle Central Community College and Seattle University).

In 2008, SDOT released the Seattle Streetcar Network Development Report, which proposed four new streetcar lines. The First Hill line, included in the Sound Transit ST2 plan, is now in the final design stages.

Image from Flickr user Dan Haneckow

Transit Priority Corridor Improvement Program

Bridging the Gap and a vehicle licensing fee provide funding for street, signal, bus stop facility, and ITS improvements that will increase bus speeds and improve passenger comfort in key corridors. SDOT is currently improving four corridors, two of which are planned Metro RapidRide lines. All four are part of the backbone of the Metro system, are identified as TMP Priority Bus Corridors, and are critical elements of the Seattle Frequent Transit Network. Routes that serve these corridors carry high numbers of transit trips, connect Seattle's most populous neighborhoods, and are key routes to support sustainable growth. These corridor projects include West Seattle, Ballard–Uptown, Rainier/Jackson, and NW Market/45th Street.

SDOT's investments in key transit corridors are aimed at improving transit speed/reliability and pedestrian access conditions along the corridors and at major stations. In 2011, SDOT installed nine raised bus stop platforms with passenger amenities and buffered bike lanes on Dexter (above) in conjunction with street resurfacing funded by Bridging the Gap.

Image from Nelson\Nygaard

Station Area Planning and Permitting

SDOT and the Seattle Department of Planning and Development (DPD) are the lead departments in access and land use planning, development review, and permitting for light rail station areas on the existing Sound Transit Central Link line and planned University and North Link extensions. A key focus of DPD activities in recent years has been to update Neighborhood Plans in areas where stations have been built, including areas along Martin Luther King, Jr. Way S and on Beacon Hill, and areas where RapidRide lines are planned, such as along Aurora Avenue. Rezoning, however, has lagged somewhat in taking full advantage of the opportunity to leverage transit-oriented development in station neighborhoods.

Notice of proposed land use action for developing a 4-story mixed-use building on Rainier Avenue near the Mt. Baker Link station. No parking is proposed.

Image from Nelson\Nygaard

CHALLENGES FOR TRANSIT IN SEATTLE

In addition to immediate challenges related to transit funding, Seattle faces obstacles to achieve the TMP outcomes described in the previous section. Several of those challenges are summarized below:

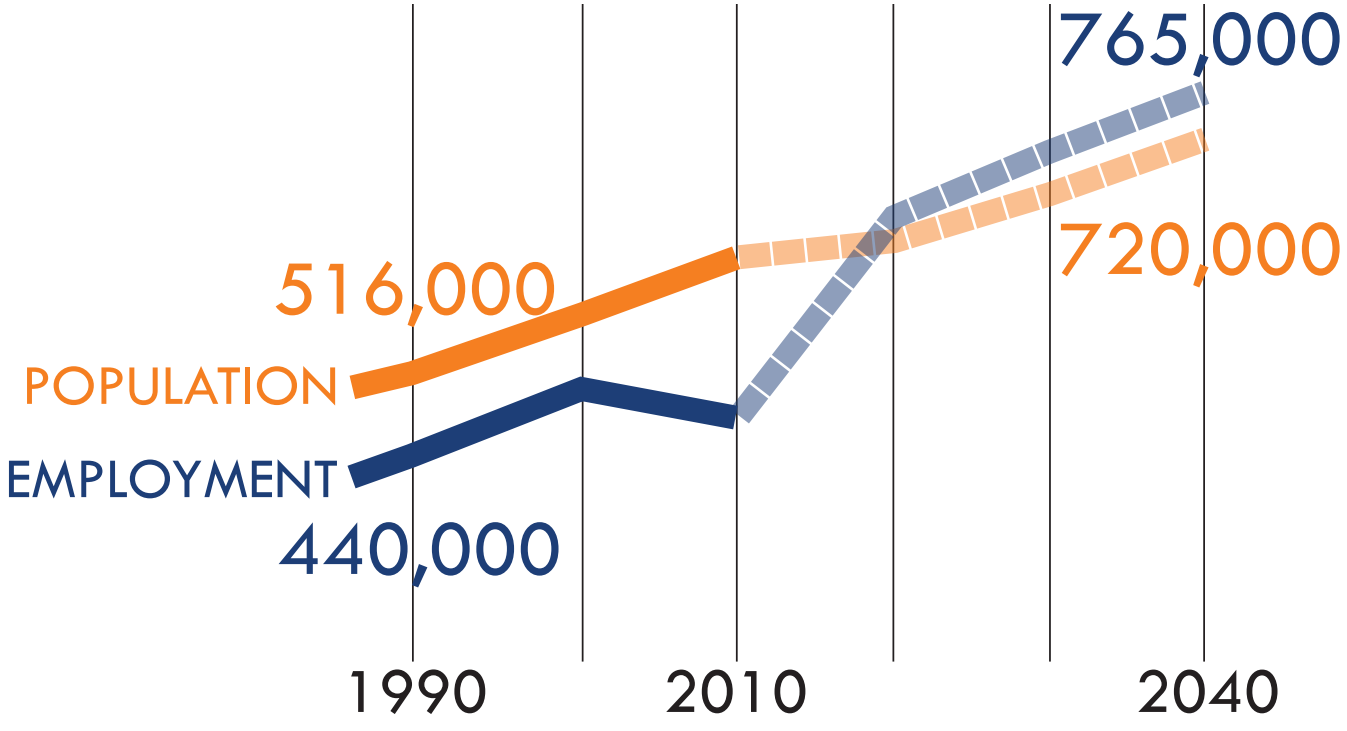
- **Difficult Choices About Use of Limited Street Space:** Seattle is growing rapidly. The city is expected to add over 200,000 residents and as many jobs by 2030. Because of this growth, walking, biking, and riding transit are the ways Seattle can accommodate and move more people in the same amount of space. However, decisions about how to allocate limited street right-of-way require tradeoffs and inevitable conflict. Timing traffic signals to prioritize moving a bus filled with 60 passengers through an intersection rather than prioritizing 15 single-occupant vehicles is good policy, but in practice requires difficult discussions with drivers and freight haulers.

  Stakeholders and members of the public who provided input to the TMP continually stressed the need for fast and reliable transit. Moving buses through congested business districts and transportation bottlenecks (such as at freeway ramp locations or at the outskirts of downtown) more quickly and reliably requires difficult changes to right-of-way allocation that could impact other street users. For example, removal of street parking for transit lanes in neighborhood business districts can dramatically improve transit reliability. Yet, business owners may see this as a threat to business access, despite the opportunity to bring many more pedestrians and transit riders to their storefronts.

  The City must develop clear policies that optimize use of limited rights-of-way for mobility, helping people understand that private automobiles are not the priority mode for accessing or moving within dense urban neighborhoods. Projects that favor automobile travel over transit in the Center City or other urban neighborhoods challenge the City's ability to make walking, biking, and transit the best choices for travel in Seattle.

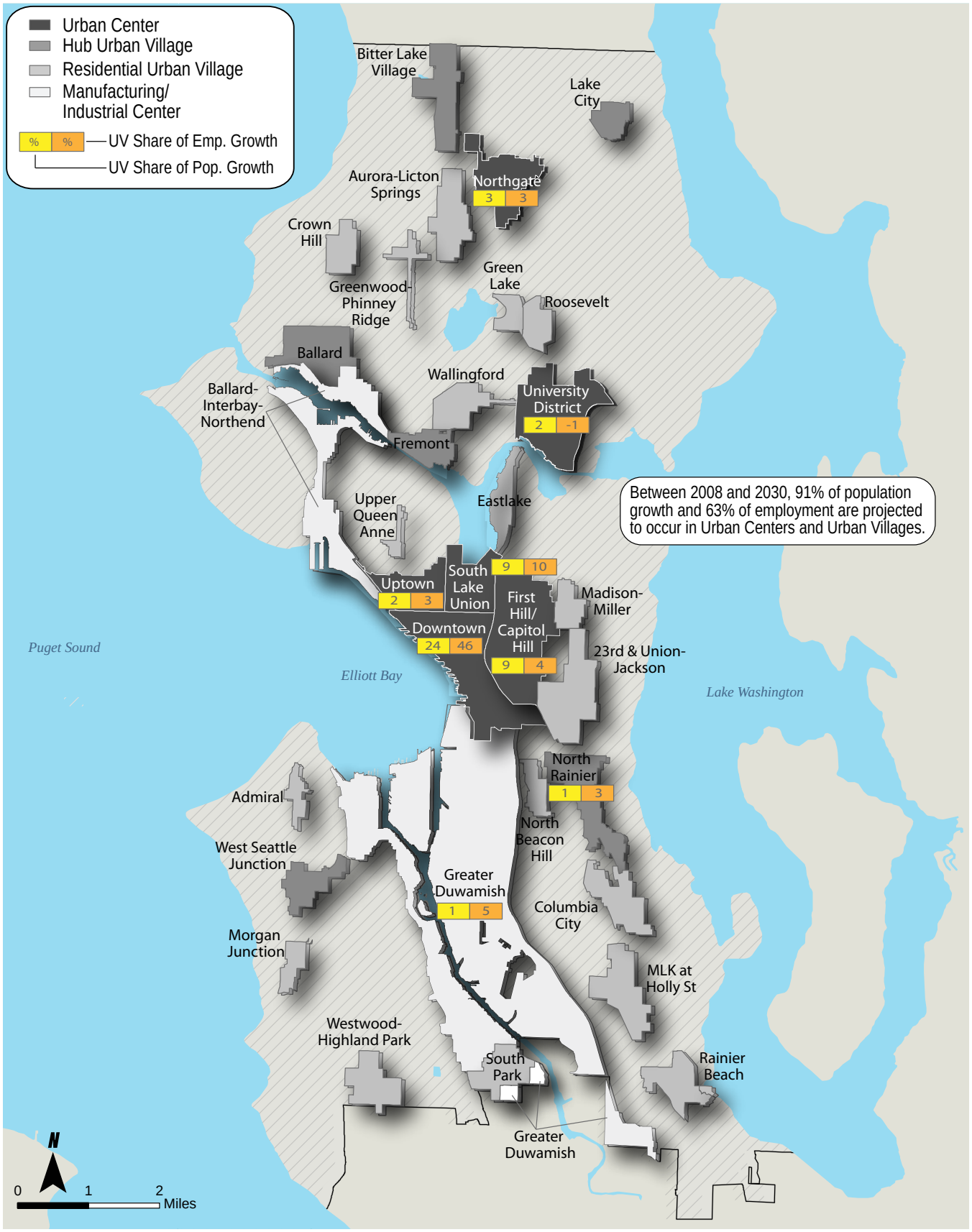
- **Growing Funding for Transit Operations and Capital:** After years of growth in transit operating revenues, an economic downturn has severely diminished Puget Sound transit agencies' ability to grow service, as illustrated in Figure 1-3. It is likely that transit funding will cycle up and down several times during the course of this plan; however, it is clear that the next five to ten years will present transportation funding challenges greater than

FIGURE 1-1 SEATTLE POPULATION AND EMPLOYMENT GROWTH



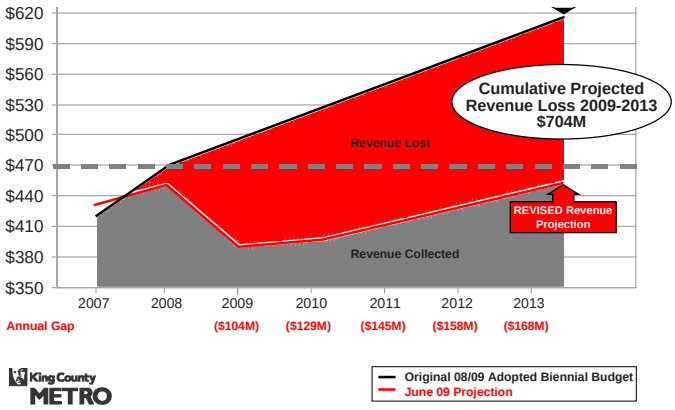
Source: Seattle Transit Communities, Seattle Planning Commission, 2010.

FIGURE 1-2 PROJECTED GROWTH IN SEATTLE URBAN CENTERS AND VILLAGES, 2008-2030



44% of population growth and 63% of job growth between 2008 and 2030 is expected to occur in the Center City and adjacent neighborhoods including Uptown, First Hill/Capitol Hill, and South Lake Union.

FIGURE 1-3 KING COUNTY METRO – SALES TAX REVENUE SHORTFALL



Source: King County Metro

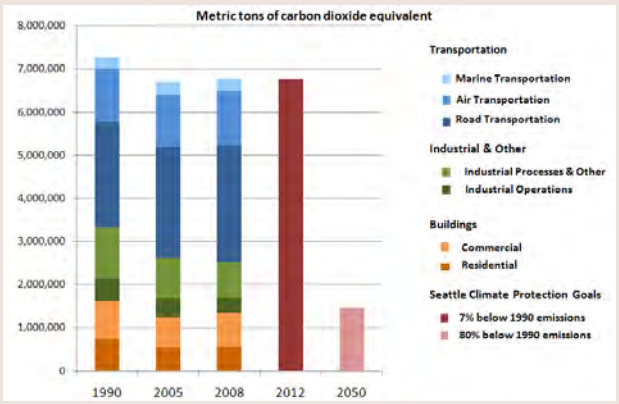
those experienced in the last decade. At the local level, Bridging the Gap funds will expire at the end of 2015. Without an aggressive strategy to address the need for increased transit capital and operating funds, the City and its partner transit agencies will struggle to fully implement the TMP and shift more people to riding transit. Chapter 6 (Funding and Performance Monitoring) sets forth a strategy for the City of Seattle to take a more active role in funding transit operations and developing capital projects in priority transit corridors.

- **Accommodating Growth Gracefully and Sustainably:** The City of Seattle and its residents are committed to addressing climate change, reducing energy consumption, and improving public health, while continuing to expand the local economy. Transit plays a key role in moving more people in less space. It also brings communities together in new ways by organizing development more efficiently and creating new opportunities for people to travel around the city in a convenient, safe, social, and fun way. Implementing the TMP will help Seattle to grow in size, vitality, and accessibility. The TMP proposes that existing infrastructure be made more efficient, inviting, and accommodating. Moreover, the TMP calls for strategic infrastructure investments that are critical to support local economic development and manage growth in a sustainable manner. Plan implementation would be a dramatic environmental achievement, one that reduces the environmental footprint of the population even as its physical presence expands.
- **Serving Seattle's Underrepresented Populations:** The TMP is a framework for a transportation system where mobility and access is provided equally and affordably to all residents. A basic tenet of the plan is that transportation is a right. All people, regardless of income or ability, need transportation services that include good mobility, equal access to opportunities, and affordable cost. People should not need to own a car to have mobility and access to services, jobs, and recreation. Even stakeholders who

SEATTLE'S COMMITMENT TO SUSTAINABILITY

Seattle has demonstrated its commitment to sustainability by reducing carbon emissions, increasing energy efficiency, and improving recycling rates even as the City and economy have grown. The charts below provide examples of the City's commitment.

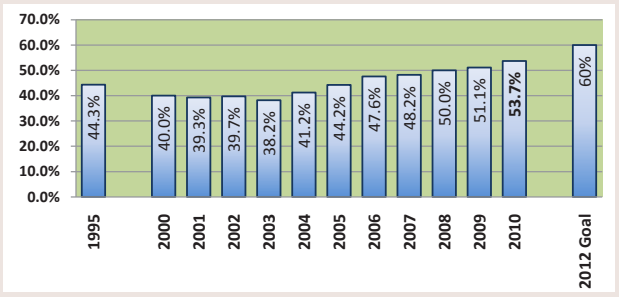
Citywide GhG Emissions by Sector



The City reduced its overall carbon emissions to 7% of 1990 levels as of 2008, meeting the City's 2012 goal (shown in the dark red bar). The City's goal for 2050 is to reduce emissions to 80% of 1990 levels. In addition, by 2005 Seattle City Light had purchased carbon offsets to match its greenhouse gas emissions, allowing it to meet a goal of net zero emissions.

Source: City of Seattle, Climate Protection Initiative Progress Report, 2009

City of Seattle Recycling Rate through 2010



Since 2003, Seattle's recycling rate has increased each year, working towards a recycling goal of 60% by 2012.

Source: City of Seattle, Recycling Rate Report, 2010

stressed the importance of high-quality, high-frequency corridor transit service also noted the important social human service aspects of transit that is delivered by providing good fixed-route coverage and paratransit service. Figures 1-4 and 1-5 illustrate two of the metrics used in assessing social equity as part of the TMP—an index of transit reliance and auto ownership rates in Seattle, shown at the Census block group level. Social equity considerations were fundamental in understanding Seattle's transit needs and developing TMP recommendations.

- **Developing a well-integrated, complete system in an environment with multiple non-City operators:** Seattle residents generally have access to high quality transit in most urban neighborhoods and major travel corridors. Most local transit services are provided by diesel bus or electric trolley bus. However, recent ongoing construction of regional light rail transit by Sound Transit and the development of Seattle Streetcar lines in South Lake Union and on First Hill/Capitol Hill (nearing construction) demonstrate that the transit landscape in Seattle is changing. It is imperative that the City of Seattle take an assertive role in coordinating the design and development of intermodal facilities and station access projects. Chapter 5 (Places: Access and Connections) sets a policy framework and identifies priority projects to improve the intermodal experience for transit travelers in Seattle.

Downtown is the heart of the region that captures 60% of the state's economic energy.

In the next half century, Downtown is expected to expand dramatically to the east (First Hill), north (South Lake Union, Denny Triangle) and south (SODO). This expansion will double downtown employment and quadruple residential occupancy. Reliance on auto access to and through Downtown limits the person capacity of available right of way. Improved transit access to the Center City and Seattle's urban village neighborhoods is critical to support the City's economic growth.

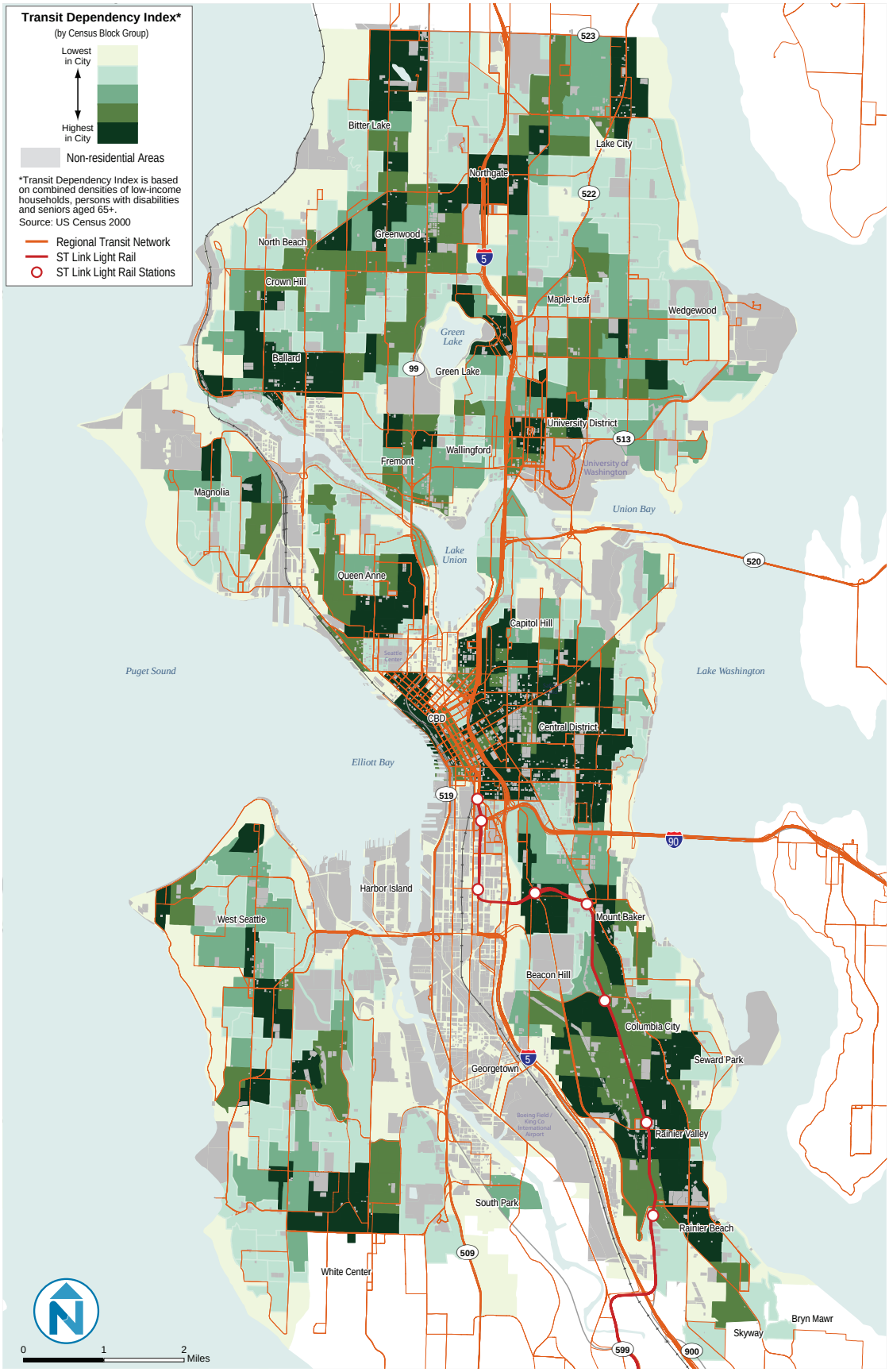
TRANSIT AND CLIMATE CHANGE

The update to the Seattle Climate Action Plan currently under development identifies four types of impacts on GhG emissions from the recommended transit investments of the Transit Master Plan:

- **Reduced vehicle miles traveled (VMT) from private vehicles.** Improved bus and rail service reduce emissions by encouraging travelers to shift some trips from driving to transit.
- **Increased and decreased energy consumption from transit vehicles.** Service expansions require additional electricity for rail and trolley bus operations and new diesel fuel consumption for diesel bus operations. At the same time, the conversion of some diesel bus services to electric operations and service changes that make some routes more efficient reduce energy consumption.
- **Increased emissions from construction.** Building new transit facilities and vehicles uses materials that are energy-intensive to produce, resulting in significant up-front emissions.
- **Reduced VMT due to land use change.** Expanding high-capacity transit will change how Seattle uses land in the coming decades, with more homes and businesses able to locate in compact, walkable neighborhoods near high-frequency transit modes. The impact of land use changes could generally be expected to significantly increase the GhG reduction potential of transit expansion.

Viewed in isolation, transit-related GhG emission reductions justify only a fraction of the cost of high capacity transit (HCT) investment. The main reason to invest in HCT corridors in Seattle is that they provide benefits for mobility, transportation choice, and livable neighborhoods. The mobility benefits of these investments are necessary for the City to effectively pursue other transportation-sector strategies for GHG reduction—some of which are very efficient on a cost-per-ton basis—including land use and transportation demand management strategies.

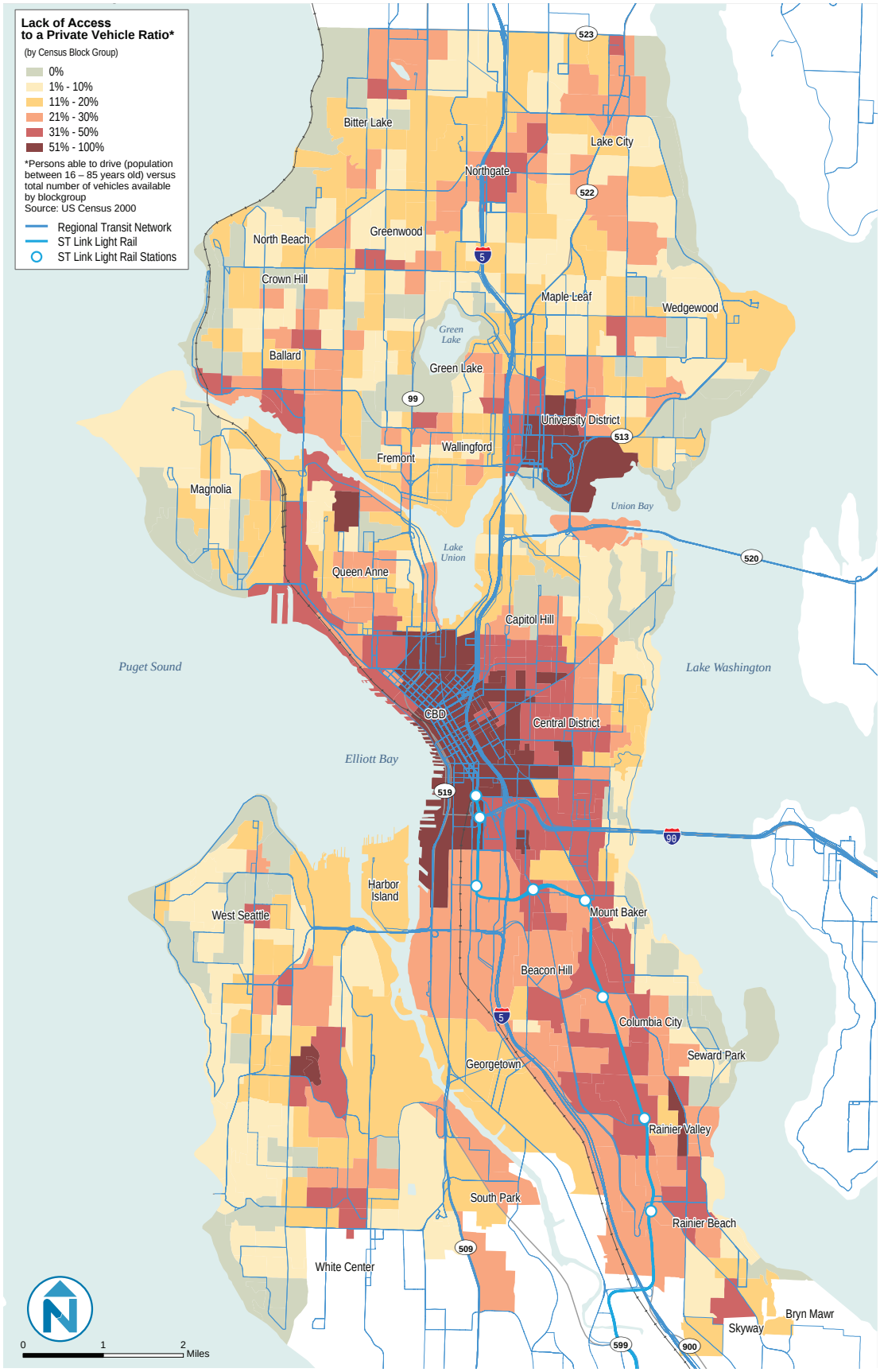
FIGURE 1-4 AUTO OWNERSHIP



This map shows the parts of the city in which residents are more likely to be reliant on transit as their primary means of transportation. This includes individuals that rely on transit because they are physically unable to drive and those that do not own a private automobile.

Source: King County, ESRI, US Census 2008

FIGURE 1-5 TRANSIT RELIANCE INDEX



This map shows the overall ratio of population to private vehicles, providing an indicator of auto ownership. It reflects people who are unable to own an automobile, those who chose to live without a car, and multi-adult households that have just one car.

Source: King County, ESRI, US Census 2008

HOW TRANSIT BENEFITS SEATTLE

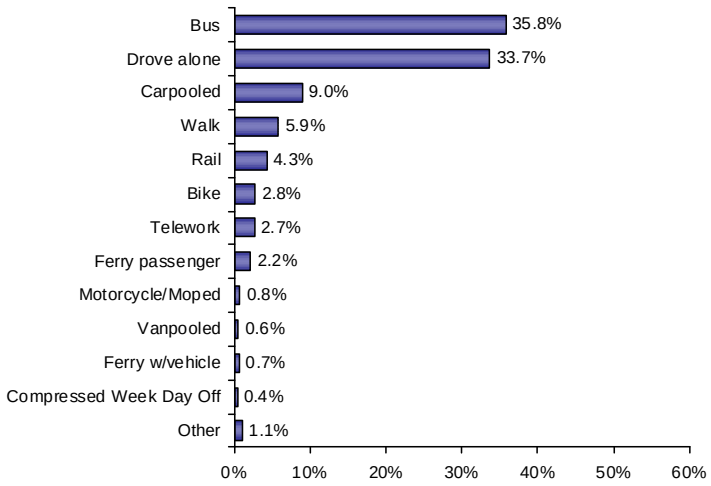
Seattleites use transit more frequently than residents of any other city in the Northwestern United States. Transit is particularly important for providing access to jobs and services in the Center City, but it also moves people between neighborhoods to attend school, shop, recreate, or simply explore the city. Seattle benefits from transit in ways that extend beyond basic mobility. This section summarizes some of the benefits Seattle residents and businesses receive from transit and illustrates the increasing need for and value of transit in a growing city.

Transit Supports Center City Growth and Prosperity

Transit Provides Safe, Convenient, and Reliable Access for Center City Jobs

Today, the Center City and directly adjacent neighborhoods have 230,000 jobs, expected to grow to 360,000 by 2030.[1] Transit provides safe, convenient, and reliable access for Center City employees from around the region. On a typical weekday, buses, trains, and ferries deliver 42% of Center City commuters starting work between 6 am and 9 am to their jobs. Without transit, Seattle's Center City economy would not be viable.

FIGURE 1-6 CENTER CITY COMMUTE MODE SHARE, % OF TRIPS BY MODE FOR EMPLOYEES STARTING WORK BETWEEN 6 AM AND 9 AM, 2010



Nearly 36% of Center City commuters rode the bus in 2010, the highest share of any mode. Only about 34% of commuters drove to work alone.

Source: Commute Seattle, Commuter Mode Split Survey Results, March 2011

Transit Provides Mobility for a Growing Number of Center City Residents

According to Puget Sound Regional Council (PSRC) projections, the Center City will grow to from 50,000 to approximately 80,000 residents by 2030. More transit capacity and more frequent service will be needed to provide mobility between Center City neighborhoods for new and existing residents and to ensure they have access to employment in Seattle and around the region.

Estimates show that by 2030, transit will need to carry an additional 8,000 people per hour into and within the Center City during the morning peak period (6 am to 9 am).[2] This is equivalent to approximately 150 additional buses per hour on downtown streets, and would require the equivalent of two new bus-only lanes.[3] Alternatively, if this demand was met using rail vehicles, 20 two-car or 10 four-car rail vehicles would be required (assuming 160 passengers per car).[4]

Transit Makes Room for Historic and Productive Development

If this projected demand was met instead by building new roadway capacity instead of adding transit capacity, there would be demand for an estimated 5,000 additional vehicles during each hour of the morning rush hour traveling to or from the Center City.[5] This does not include increases in traffic already assumed from growth. In perspective, seven or eight new lanes of arterial streets would be needed just to compensate for this increment of growth accommodated by transit.[6]

Given the assumption that all additional 2030 transit trips to the Center City would be made in private vehicles, new parking capacity would be required—approximately 15,000 additional parking spaces at a cost of $240 million. These new parking spaces would require the equivalent of about eight 10-story parking garages covering an entire downtown Seattle block.[7]

Transit Makes Seattle a Better Place to Visit

Approximately nine million annual visitors spend $5 billion in Seattle and King County, including nearly $500 million on local transportation and gas. Tourism revenue supports jobs for more than 49,000 people in the region.[8] Transit supports Seattle's tourism economy, helping make the city an attractive destination for regional, national, and international visitors.

Over half of these visitors arrive in Seattle by air, train, or means other than a private car. Many may prefer not to rent a car and want convenient access to major tourist destinations. International visitors —about 22% in 2009 —have high expectations that there will be quality public transportation to get around the city.

Out-of-state visitors who pay taxes in their destination state represent not only an economic benefit for Seattle, but also an unambiguous gain for the state.[9] Visitors who remain in the Seattle area are more likely to spend money locally. Visitors stay an average of over five nights, spending over $200 per day.[10]

There is limited ability to expand already congested arterial streets in downtown Seattle.

Source: Flickr user Oran Viriyincy

Endnotes for this section are provided following Chapter 6 of the TMP Summary Report.

Transit Supports Events at Seattle Center, Waterfront, and Stadiums

Transit supports Seattle's ability to host multiple large events in the Center City and the University District while allowing people to go about their daily lives. Seattle's many sporting and entertainment events enhance quality of life in Seattle and support business activity and jobs:

- Seattle Center attracts 12 million visitors per year, generating $1.15 billion in business activity and $387 million in labor income for King County.[11]
- Waterfront attractions are a major draw for visitors. The Seattle Aquarium had over 835,000 visitors in 2009, including about 535,000 state residents and 300,000 out-of-state visitors.[12]
- Seattle's stadiums attract large numbers of people to sporting and other special events. Safeco Field seats over 47,000 people and CenturyLink Field and Husky Stadium both seat up to 72,000 people. A 2002 survey (predating Link service) found that 25% to 30% of those who attended events at the SODO stadiums used non-auto modes of transportation.[13] In 2008, Sounder trains served an average of nearly 2,500 passengers for 26 sporting events. The Link Stadium Station has additional tracks to store trains for post-game departures.[14]

Transit reduces the need for long-term auto storage, making space for more productive economic uses. Parking garages do not add visual interest, contribute to an attractive walking environment, or increase pedestrian activity and "eyes on the street."

Image from Flickr user Eric Kornblum

Attractions and events at Seattle Center are a draw for both Seattle residents and visitors.

Image from Flickr user Transcendental

Link light rail service from SeaTac to downtown Seattle and Amtrak Cascades service to Union Station offer travelers convenient transit connections to the Center City.

Image from Flickr user Michael @ NW Lens

Link and Sounder trains provide train service to SODO special events from the Stadium and King Street Stations. Without transit, professional sporting events would create more significant traffic delays and require more parking.

Image from Flickr user Oran Viriyincy

King County Metro operates 14 electric trolley bus routes using 70 miles of two-way trolley wire and 159 vehicles.

Image from Nelson\Nygaard

Transit supports sustainable, healthy, and equitable growth

Transit Encourages Compact Development

Numerous studies demonstrate that people living in compact communities where they can easily walk to basic services and recreation drive less than people living in more "sprawling" areas. Higher residential and employment densities and integrated land uses are associated with lower per capita miles driven.[15] The 2010 U.S. Census shows that residents living in larger multifamily buildings increased far faster than any dwelling type and single family living is declining as a percent of all residents. Concurrent with this trend, and as the overall number of housing units increased by 30,000, total average daily vehicle trips declined in Seattle.

Compact Development has Environmental and Public Health Benefits

Compact development reduces carbon emissions, lowers particulate levels, decreases water pollution, and reduces overall land consumption. Studies show that people living in compact neighborhoods drive 40-50% less miles annually than suburban neighbors. A report by the Urban Land Institute explores the connection between driving and CO_2 emissions and conservatively assumes that a 100% reduction in miles driven is associated with a 90% reduction in CO_2 emissions.[16]

Transit and Clean Energy Make Seattle's Neighborhoods Cleaner and Quieter

A person riding transit in Seattle produces lower per-passenger emissions than a driver or passenger of a private vehicle. Electric transit vehicles have even lower per-passenger greenhouse gas (GhG) emissions than a diesel bus. Implementing TMP-recommended corridors and electrifying some of the city's existing diesel bus corridors would reduce GhG emissions by about 2,700 metric tons annually.[17] Electrification of all diesel Metro bus routes within the city of Seattle would reduce GhG emissions by about 62,000 metric tons annually.[18] Electric trolley bus service has the additional benefits of being quiet and providing fast acceleration on steep Seattle hills. SDOT should work to increase the number of electrified transit routes.

Transit Makes Seattle More Affordable

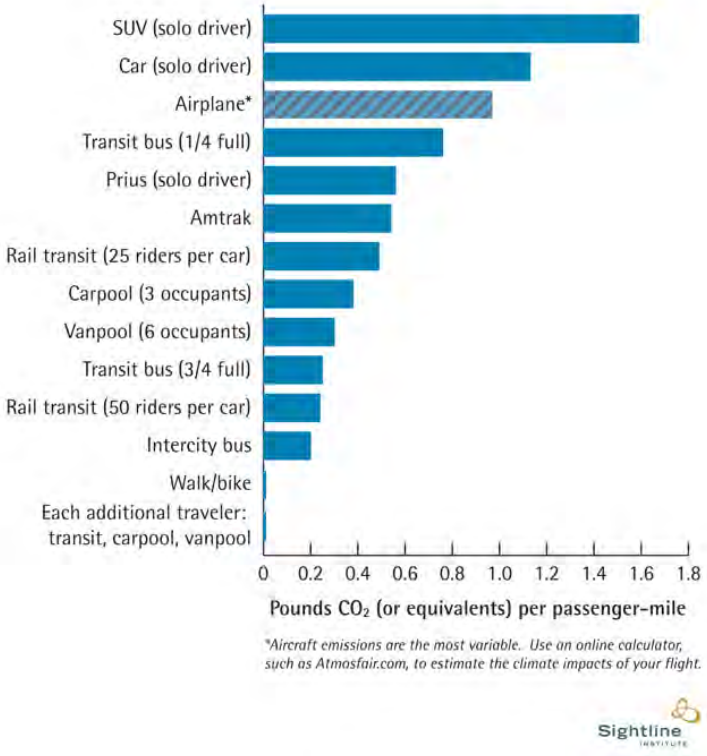
According to research by the Center for Neighborhood Technology (CNT), households in cities where jobs and services are readily accessible by transit are better able to respond to gas price increases.[19] Access to transit helps reduce household transportation costs, saving families money and helping make Seattle a more affordable place to live. CNT's research shows that transportation costs can range from 15% of household income in compact, accessible neighborhoods to over 28% in locations with auto-oriented land patterns and limited access to public transit.

Transit Boosts Seattle's Economy and Creates Jobs

Reducing household spending on fossil fuels allows money to be spent in economic sectors that return a stronger benefit to the local economy. TMP transit corridor and service recommendations would reduce private vehicle gasoline consumption in Seattle by over a million gallons annually.[20] At $3.50 a gallon, local residents could save millions of dollars annually by increasing spending power on local goods and services.

Operating transit services and investing in transit and street infrastructure projects create local jobs. A recent report by Smart Growth America analyzed stimulus-funded infrastructure projects and found that each dollar spent on public transportation created 31% more jobs and resulted in 70% more job hours than a dollar spent building roads. Investments in improving/maintaining existing streets generated 16% more jobs per dollar than building new roads.[21]

FIGURE 1-7 GHG EMISSIONS PER PASSENGER MILE



Average emissions per passenger mile are lower for transit than for passenger vehicles (assuming one or two occupants). Electric-powered transit offers Seattle a low-emissions transportation option.

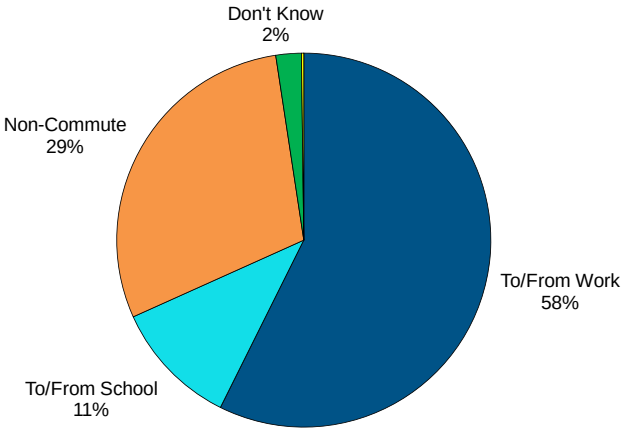
Source: Sightline Institute

Transit Provides Mobility for Everyone

Transit is not just for commuting; about 32% of regular riders use Metro for all of their transportation needs. About 40% of households in Metro's West Subarea (Seattle, Shoreline, and Lake Forest Park) have a regular Metro rider. Regular riders make an average of 25 trips per month, compared to two trips per month for infrequent riders.

Although transit is heavily used for commuting and school trips (about 70% of trips among regular riders), a large share of transit trips serve non-commute purposes at all times of the day.

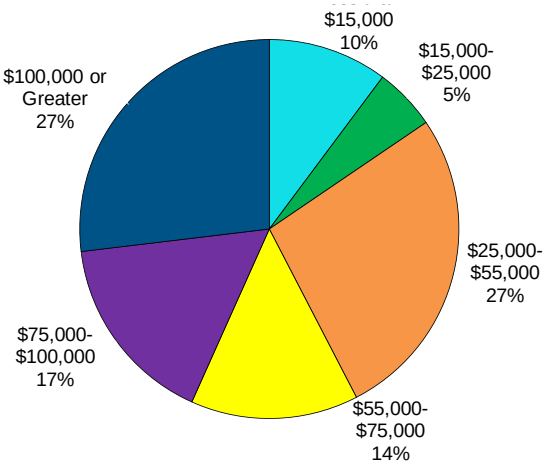
FIGURE 1-8 WHY PEOPLE RIDE METRO TRANSIT



In the West Subarea, 58% of regular Metro riders use transit for commuting, while 29% use it for non-commute purposes.

Source: Metro, 2009 Rider/Non-Rider Survey

FIGURE 1-9 HOUSEHOLD INCOME OF METRO TRANSIT RIDERS (SYSTEMWIDE)



In many cities, transit use is associated with lower-income levels, however transit riders in Seattle are distributed across a wide range of income levels. Frequent riders are less affluent than infrequent riders (median income of about $67,000 compared to about $73,000).

Source: Metro, 2009 Rider/Non-Rider Survey

TRANSIT INVESTMENT FRAMEWORK

The Transit Master Plan Summary Report is organized around the five areas of transit investment and policy development shown in the graphic below.

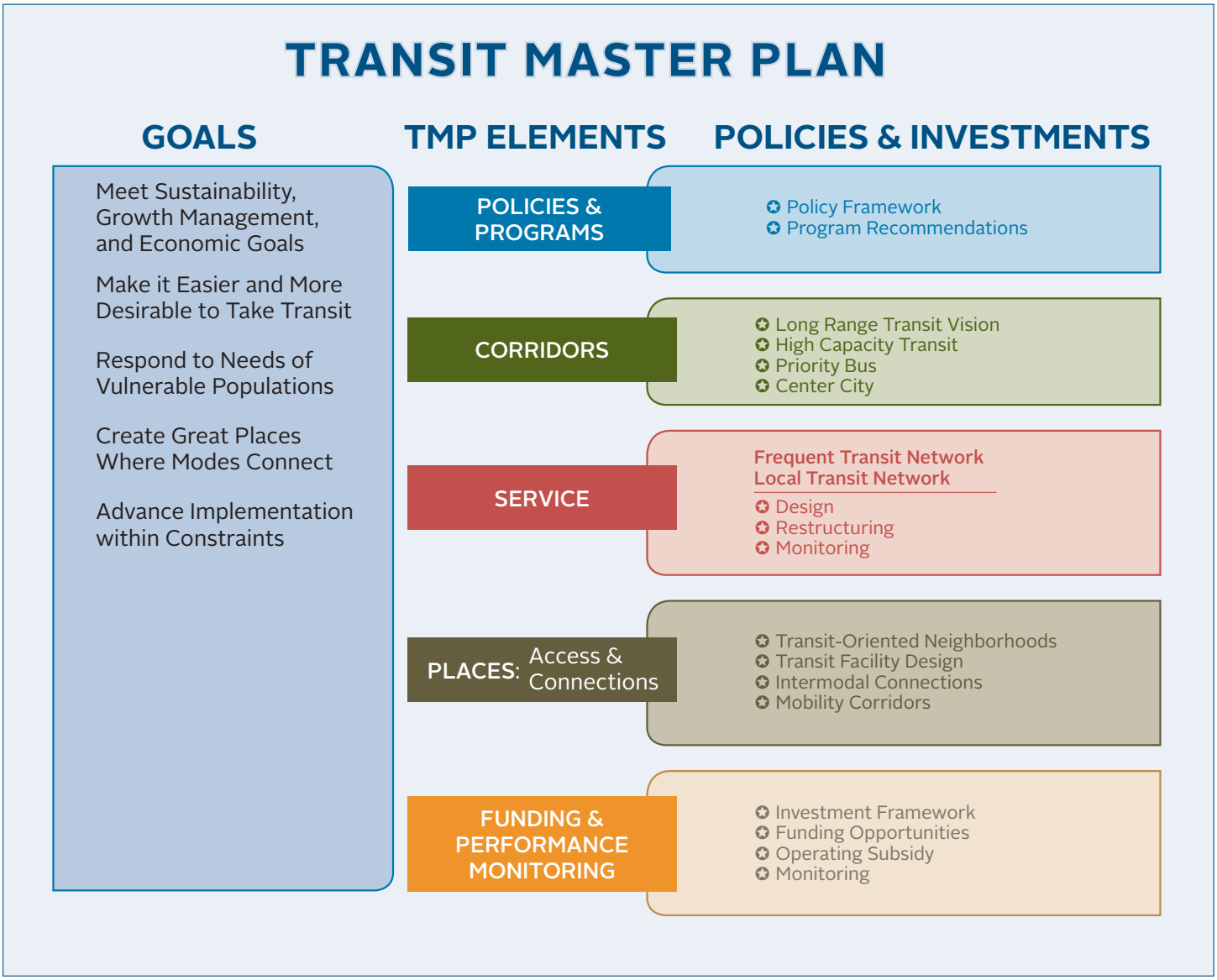


Image from Nelson\Nygaard

2 POLICIES AND PROGRAMS

The Transit Master Plan (TMP) vision is for a Seattle served by a network of high quality, frequent transit routes that connect urban villages, urban centers, and manufacturing and industrial districts. The service network that supports this is delivered by appropriately scaled bus and rail modes, connecting residents and workers to the regional transit system via transportation centers that are well integrated with urban village life. All points of transit access, from a stop in a residential neighborhood to a light rail station, are accessible for people of all abilities. To support the TMP vision, Seattle should adopt and implement policies, programs, and investment priorities to make it easier and more desirable for people to take transit.

A TRANSIT SUPPORTIVE POLICY FRAMEWORK

VISION AND GOALS

The TMP vision is for Seattle to develop the Complete Transit System—a network of high-quality, frequent transit routes that connect urban villages, urban centers, and manufacturing and industrial districts. The service network that supports the vision is the Frequent Transit Network. The Frequent Transit Network is a network of top-quality services provided by bus and rail modes, connecting residents and workers to the regional transit system via transportation centers that are well integrated with urban village life. All points of transit access, from a stop in a residential neighborhood to a light rail station, will be accessible for people of all abilities. Bicycling also becomes a favored mode for accessing the Frequent Transit Network.

Further, to support the Complete Transit System, Seattle must adopt and implement policies, programs, and investment priorities that result in a high-quality transit system to make it easier and more desirable for people to take transit. "Quality" is defined as fast and reliable service that is safe, comfortable, and accessible for all users, providing the greatest degree of mobility and access possible with the appropriate technology.

Consistent with broader transportation system goals, the TMP will guide the City of Seattle in developing a Complete Transit System that:

- Makes riding transit easier and more desirable, bringing more people to transit for more types of trips
- Uses transit to create a transportation system responsive to the needs of people for whom transit is a necessity (e.g., youth, seniors, people with disabilities, low income populations, people without autos)
- Uses transit as a tool to meet Seattle's sustainability, growth management, and economic development goals
- Creates great places at locations in neighborhoods where modes connect to facilitate seamless integration of the pedestrian, bicycle, and transit networks
- Balances system implementation with fiscal, operational, and policy constraints

The TMP directs the Seattle Department of Transportation (SDOT) to make capital and service investments to help achieve this vision and goals. A strong set of policies will ensure that capital investments are optimized to create a more sustainable, economically resilient, and equitable city.

This chapter outlines the policy framework needed to deliver the TMP vision for a Complete Transit System in Seattle.

THE COMPLETE TRANSIT SYSTEM FOR SEATTLE

INVESTING IN THE COMPLETE TRANSIT SYSTEM

The TMP focuses on delivering fast, frequent, and reliable transit service between the city's urban villages and urban centers. However, the development of the Complete Transit System requires public and private investments and policies to enhance access to transit, improve customer information, create more consistent and usable stop amenities, enhance on-board passenger comfort, and ensure transit is safe and secure. To develop the **Complete Transit System**, Seattle must make investments and set policies at a variety of scales:

Local land use defines the market demand for transit. How land uses are oriented to the street, how much parking is provided, and the mix of uses within buildings all impact how effectively transit can serve residents, workers, and visitors in an area.

This public space in Portland is on a frequent streetcar line and at the center of a high-density, mixed use neighborhood.

A network of transit routes is needed to meet people's travel needs. No one transit route serves all the places people want to travel in a city. Effective urban transit requires a system of routes and places for connection that make transferring easy and convenient.

Light rail intersects the bus mall in downtown Denver providing easy, at-grade transfers to a frequent bus shuttle.

FIGURE 2-1 RELATIONSHIP BETWEEN COMPLETE TRANSIT SYSTEM ELEMENTS AND TMP SECTIONS

The Complete Transit System will:	*Implementation strategies indicated in color-coded TMP sections.* Corridors	Service	Places	Funding and Monitoring
Put the Passenger First • Make transit easy to use • Create a safe environment for transit passengers • Make transit universally accessible • Make transit comfortable	Section 3		Section 5	
Make Transit a Convenient Choice for Travel • Provide mobility to a wide range of destinations • Facilitate fast and reliable operations • Increase ridership by integrating other modes and making access safe and easy • Invest in infrastructure where it can attract the most users		Section 4		
Use Transit to Build Healthy Communities • Make transit facilities central to community gathering places • Increase walking and bicycling to support increased physical activity and improve health outcomes • Seamlessly integrate transit, urban development, and the public realm • Provide access to daily needs and services on foot, by bicycle, or on transit • Employ best practices in transit-oriented design				
Improve Transit Service and Quality Through Partnerships • Optimize regional transit service investments • Work with neighboring jurisdictions where transit markets cross borders • Collaborate and share assets • Build political alliances	Section 3	Section 4		Section 6
Reduce Environmental Impacts of Personal Mobility • Use transit to meet environmental targets • Use energy responsibly • Consider lifecycle costs of transit infrastructure				

Streets and corridors are where most Seattle transit operates, along with other modes and transportation uses, such as parking. Making transit faster and more reliable often requires difficult tradeoffs in right-of-way allocation.

Places where people access, wait for, connect between, learn about, and experience transit routes must be great places. These places range from a bus stop in a residential neighborhood, to an arterial crossing in a commercial district where two major bus routes intersect, to a station where bus and rail transit modes connect and pedestrians and cyclists access the system.

Public space constructed as part of the Federal Courthouse in downtown Seattle provides seating and shade for transit passengers waiting for one of many routes that stop in front of the building.

All images from Nelson\Nygaard

TRANSIT SUPPORTIVE PROGRAMS

While capital and service improvements are a necessary focus of City transit investments and policy development, there is great opportunity to leverage the value of the existing system and services. Educating the public and providing incentives for residents and workers to change their travel patterns to transit and other environmentally friendly modes is an important part of the equation. The TMP recommends continued development and funding of programs that support transit use through improved pedestrian safety, better customer information and education, service enhancements, facility improvements, and strengthened policies—land use designations, zoning and development standards—that can be used during development review to achieve transit-supportive urban form and development patterns.

STRATEGY: INVEST IN PROGRAMS THAT BUILD TRANSIT RIDERSHIP

Many of the most cost effective ways to build transit ridership and create mode shift are not direct service or capital investments, but development of supportive programs. SDOT should identify resources to develop programs and policy initiatives that would improve transit use in the city. The TMP recommends that programmatic funds be identified and allocated to a suite of programs that improve access to transit service, improve customer knowledge, overcome major safety obstacles to transit access and use, improve transit supportive policies, and leverage Seattle's investments through partnerships with transit providers.

A combination of investment in programs that are already in place, development of new programs, and use of staff time to develop transit supportive policies is recommended. The strategies and programs listed in this chapter should be priorities for the City of Seattle.

Strategy PP1: Develop a Safe Routes to Transit (SR2T) Program

The goal of a SR2T program is to reduce physical barriers to transit use, making access to public transit easier and more convenient. The program should be designed to improve pedestrian, bicycle, and motor vehicle movement around high volume transit stops and stations. (The TMP provides facility design guidelines and multimodal transit access policies and strategies in Chapter 5). SR2T could also provide an opportunity for neighborhoods to submit projects for funding

SEATTLE MULTIMODAL TRANSPORTATION POLICY FRAMEWORK

The Seattle Department of Transportation (SDOT) is developing a multimodal transportation system that supports all Seattle residents' mobility needs. SDOT is striving to shift the focus of the transportation system from one that is auto-oriented toward a system of facilities, programs, and services that makes walking, biking, and taking transit easier and the preferred means of travel for most trips. Increasing travel choices is good for people—it generally saves money, time, and frustration and can increase physical activity. Getting more people walking, biking, and taking transit means fewer vehicle emissions and cleaner air. And with fewer people driving alone, it also means that transit and freight can get around more efficiently.

Important plans and documents that support and complement the TMP include:

- **The Seattle Comprehensive Plan** identifies an Urban Village Strategy to promote job and housing growth in concentrated centers that can be efficiently accessed and connected by a multimodal transportation system, including high quality, frequent transit. The Comprehensive Plan sets mode shift goals that promote a transition to non-single occupant vehicles. A major update to the Seattle Comprehensive Plan is underway. Elements of the Plan will be updated incrementally through 2015. TMP recommendations will be considered as one element in a framework for sustainable growth.
- **The Transportation Strategic Plan (TSP)** provides more detailed policy and investment direction for preservation, maintenance, and development of Seattle's multimodal transportation system. The TSP is currently being updated with a shifting focus from an auto-oriented approach to one that makes walking, biking, and taking transit easier, safer, and more enjoyable.
- **The Seattle Transit Plan** was developed in 2005 to support the creation of transit connections between urban villages. This concept was referred to as the Urban Village Transit Network (UVTN). The plan focused heavily on service policy and performance measurement. The TMP will replace the Seattle Transit Plan, providing more detailed direction for capital investments over the next five years and through 2030. The UVTN remains an organizing concept of the TMP, but the term UVTN is dropped in favor of a more detailed approach to corridor development; the TMP uses the Frequent Transit Network as the organizing framework for transit service in Seattle.
- **The Seattle Pedestrian Master Plan** and **Bicycle Master Plan** were developed in 2009 and 2007, respectively, following completion of the 2005 Seattle Transit Plan. The TMP has been developed with close attention to project priorities and policies established in these companion modal plans. The TMP recommends an approach to transit projects that is complemented by coordinated pedestrian and bicycle access and parallel mobility investments. The Bicycle Master Plan is being updated in 2012 to reflect rapidly changing best practices in urban bikeway design.
- **Chapter 3 of the Transit Master Plan Briefing Book** describes Seattle's transit, transportation, and land use policy framework in greater detail.

CASE STUDIES AND BEST PRACTICES

Case studies and best practices related to these strategies and programs are described in Chapter 7 of the Transit Master Plan Briefing Book. Specifically, see:

- 7-14 to 7-16: Local Government Standards for Transit Agencies
- 7-17 to 7-20: City-Based Transportation Demand Management Strategies
- 7-26 to 7-27: Transit-Supportive Policies and Programs (Transit First Policy)

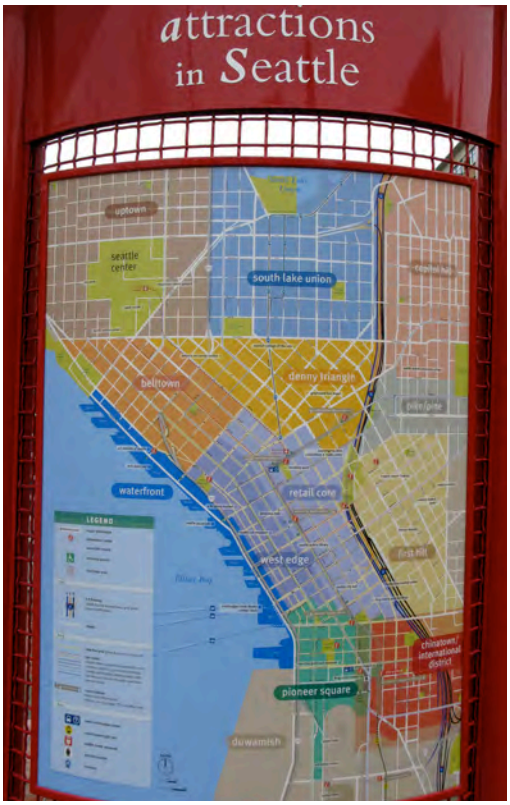
consideration each year. Funding for a SR2T program could leverage local match funds from neighborhood groups or private developers interested in improving transit access around station areas or in priority bus corridors. A SR2T program could be structured to complement development incentives in transit station areas or priority corridors. Activities could include the following:

- Secure bicycle storage at transit stations and stops
- Safety enhancements for pedestrian and bicycle access to transit hubs, stations, and stops
- Removal of pedestrian and bicycle barriers near transit stations
- System-wide transit enhancements to accommodate bicyclists or pedestrians
- Provide clear wayfinding to key transfer points and transit information (preferably real-time) to facilitate convenient transfers at these locations

Strategy PP2: Develop Transit Information and Wayfinding Standards

Challenging topography, multiple transit providers, and recently introduced rail transit modes have created significant variability in public information for accessing transit and navigating a complex network of services in Seattle. The TMP (see Chapter 5) identifies guidelines and design standards for enhancing public information and wayfinding. SDOT should build on the work of the TMP and develop a detailed set of standards to govern transit wayfinding in Seattle and to coordinate with other modal and neighborhood-specific wayfinding programs. This effort would:

- Develop design standards and specifications for wayfinding improvements including intermodal transfers, pedestrian access to transit, and bicycle access to transit. These improvements could include simplified maps and signs to help orient transit users and others toward facilities in specific areas (e.g., Center City, near a rail station, in an urban village commercial district)
- Develop an interagency working group and facilitate coordination between Sound Transit, Metro, and other transit operators regarding public information provided at intermodal hubs such as King Street Station, Downtown Seattle Transit Tunnel stations, and transfer points
- Ensure transit information is included in Center City and neighborhood wayfinding programs targeting pedestrians and cyclists
- Develop standards for providing real-time transit information and ORCA card readers at key stops and/or transfer points



Maps at existing downtown wayfinding kiosks depict transit routes and stations. Downtown and transit wayfinding maps and directional signage could be integrated and expanded in scope to help passengers and pedestrians more easily navigate to transit facilities and other destinations.

Image from Flickr user Oran Viriyincy

NEW YORK CITY DOT SAFE ROUTES TO TRANSIT

The New York City Department of Transportation (NYCDOT) Safe Routes to Transit Program is comprised of three programs that work to improve access to transit facilities, with an emphasis on pedestrian access:

- Bus stops under the Els (elevated subway structures)
- Subway/sidewalk interface
- Sidewalks to buses

For additional information, see the TMP Briefing Book, page 7-46.

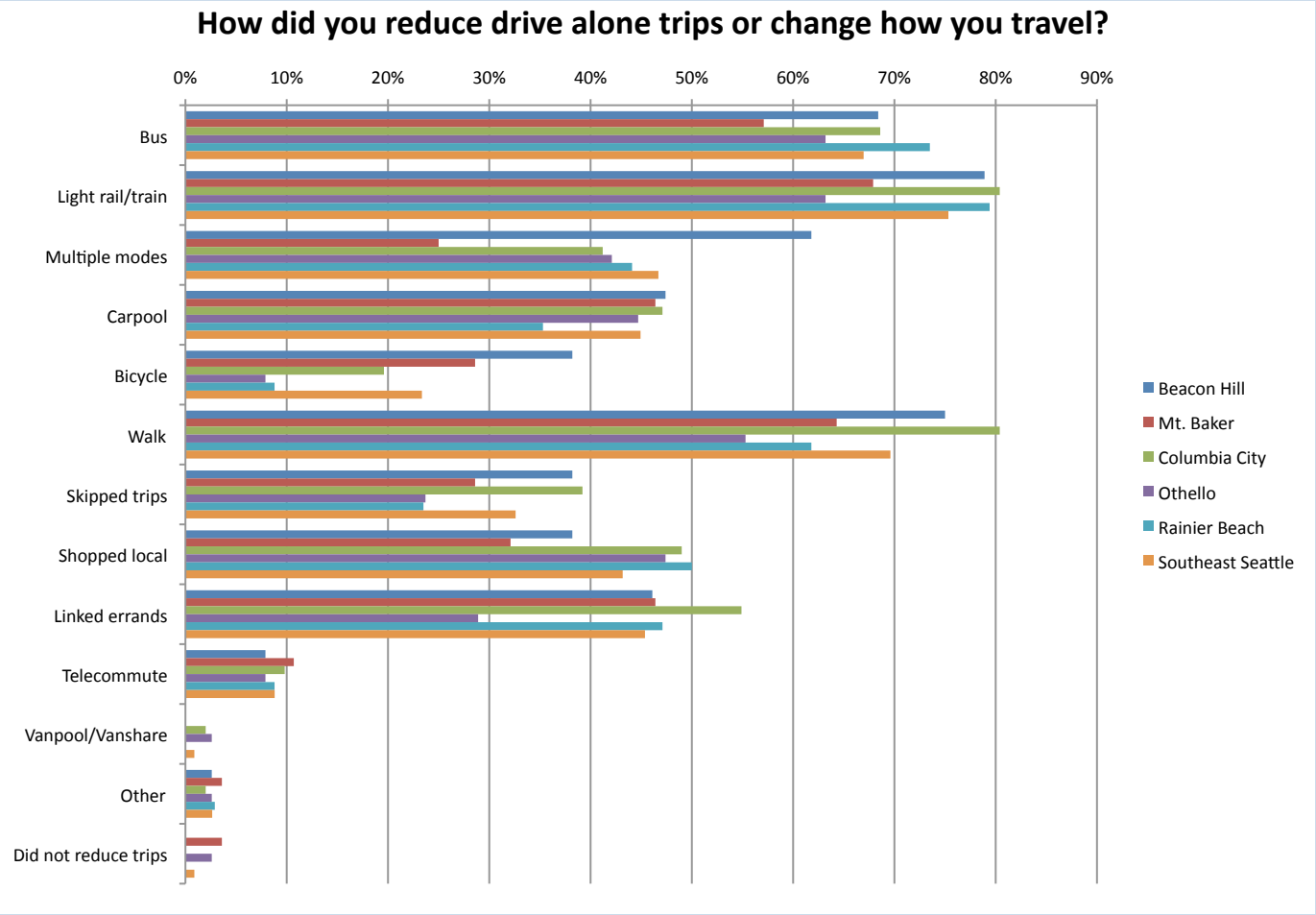
KING COUNTY METRO IN MOTION AND PORTLAND SMARTTRIPS

Residential and Commercial Trip Reduction Programs

King County Metro In Motion

King County Metro's recent Georgetown In Motion program targeted 6,000 employees and 600 households over 16 weeks with transportation options materials, incentives, and on-the-ground outreach. For households, the program typically sees a 10% direct mail response rate and a 6% pledge rate. Employees are more challenging to reach, particularly in areas consisting primarily of small employers. Georgetown In Motion utilized a multi-faceted approach consisting of email, direct mail, door-to-door employer visits, and distributing marketing materials in locations employees visit for lunch or coffee.

Success of the program was enhanced by sponsor participation throughout the neighborhood, and the presence of 15 in-store-displays at locations such as coffee shops, restaurants, and the post office. The response from participants indicates that a diverse distribution of program materials is most effective in reaching employees. More people heard about the program from a friend or co-worker than any other source (except for direct mail to households), indicating that word of mouth is a key strength to the program.



Results from four previous In Motion programs in Southeast Seattle demonstrated a 24% to 50% decrease in driving alone and a 20% to 50% increase in transit usage. As illustrated in the chart, transit and walking were the most widely used to replace drive-alone trips.

Source: Southeast Seattle In Motion Report

Portland (OR) SmartTrips

In Portland, the City Bureau of Transportation conducts several types of SmartTrips programs to reduce drive-alone trips and encourage use of walking, biking, transit, carpooling, and car sharing:

- **SmartTrips** neighborhood programs focus on a particular sector of the city comprising about 20,000 households. The City provides residents with targeted information for each desired mode of transportation. The City organizes activities such as "Ten Toe Walks," "Senior Strolls," and bicycle rides and classes in the target area. Based on follow-up surveys, SmartTrips results in a 9% to 13% decrease in drive-alone car trips by all area residents with a corresponding increase in other modes. The program costs about $10 per person in the target area, including staff time.

- **SmartTrips Business**, formerly SmartTrips Downtown, is an ongoing program available to all employers in the city. It provides information to employees, consults with employers on benefit and tax options, and will install a free bicycle rack in front of any business.
- **SmartTrips Welcome** is a relatively new initiative that targets new residents in particular neighborhoods, but is also available to all residents. It allows residents to request materials, which are delivered by bicycle.

The City of Portland organizes a series of Ten Toe Express walks focused around SmartTrips target neighborhoods.

Image from Mark McClure, portlandneighborhood.ning.com

Strategy PP3: Increase Support for Traveler Education Programs

Traveler education programs provide promotional information and resources to residents and employees to help them bicycle, walk, take transit, or carpool to their destination. Data on travel patterns presented in the Urban Mobility Plan Briefing Book (2008), page 3A-12, clearly illustrate that transit is a less attractive option for non-work trips in most Seattle neighborhoods. Therefore, promotional information and resources provided for non-work trips must be distinct from information provided for work trips. The sidebar on pages 2-6 and 2-7 highlight how programs in King County and the City of Portland have made this distinction.

Existing efforts to promote alternatives to single-occupant vehicle travel (SOV) in Seattle include:

- **King County Metro In Motion** focuses on two or three neighborhoods each year, providing free informational materials, targeted outreach, and organized activities to help residents discover their transportation options. The existing In Motion program has a residential focus, but Metro is piloting an employer program in the Georgetown neighborhood (see sidebar on page 2-6). The In Motion programs have been successful at shifting trips to non-single occupancy vehicle modes. However, research shows that program benefits decline each year following implementation, and the optimal cycle for a neighborhood to receive the program is every five years. Current funding is not sufficient to provide this level of outreach.
- **Way to Go, Seattle!** similarly provides incentives, tools, and centralized information to encourage residents and employees to drive less.
- **SDOT** has secured Regional Mobility Grant funding to conduct marketing and encouragement programs upon completion of improvements along NW Market/45th and Rainier Avenue to help increase transit ridership.

The TMP recommends that the City:

- Work with Metro to expand funding and reach of the In Motion program with a goal of reaching key neighborhoods every five years
- Work with Metro In Motion or Way to Go, Seattle! to increase outreach to employment centers with large clusters of small to mid-sized employers

UNIVERSAL TRANSIT PASSES

Universal transit passes are an effective means to reduce the number of car trips in an area; reductions in car mode share of 4%- 22% have been documented, with an average reduction of 11%. By removing barriers to using transit, including the need to search for cash for each trip, people become much more likely to take transit for both work and non-work trips.

Employers can provide monthly and annual transit passes as well as electronic vouchers in any amount on a regional ORCA card.

Image from Orcacard.com

Strategy PP4: Invest in Transportation Demand Management Programs that Increase Transit Use

The City of Seattle, King County, and Seattle businesses and institutions already support a strong suite of transportation demand management (TDM) programs. For example:

- The Downtown Transportation Alliance (a partnership between the Downtown Association, Metro, and the City of Seattle) supports Commute Seattle, an initiative that provides one-stop shopping for transportation resources in downtown Seattle
- The Duwamish Transportation Management Association (TMA) improves transportation options for employees in the Duwamish Business Community
- The City's Transportation Management Program requires developers to prepare a Transportation Management Plan (TMP) to reduce the potential traffic and parking impacts

FIGURE 2-2 IMPACT OF SELECTED EMPLOYER-BASED TDM STRATEGIES

Strategy	Details	Employee Vehicle Trip Reduction Impact
Parking Charges[1]	Previously Free Parking	20-30%
Information Alone[2]	Information on Available SOV- Alternatives	1.4%
Services Alone[3]	Ridematching, Shuttles, Guaranteed Ride Home	8.5%
Monetary Incentives Alone[4]	Subsidies for carpool, vanpool, transit	8-18%
Services + Monetary Incentives[5]	Example: Transit vouchers and Guaranteed Ride Home	24.5%
Cash Out[6]	Cash benefit offered in lieu of accepting free parking	17%

1 Based on research conducted by Washington State Department of Transportation.

2,3 Schreffler, Eric. "TDM Without the Tedium," Presentation to the Northern California Chapter of the Association for Commuter Transportation, March 20, 1996.

4 Washington State Department of Transportation.

5 Schreffler (1996).

6 Donald Shoup (1997), "Evaluating the Effects of California's Parking Cash-out Law: Eight Case Studies," Transport Policy, Vol. 4, No. 4, 1997, pp. 201-216. http://www.commuterchallenge.org (accessed November 2, 2007).

ECO PASS PROGRAM: CITIES OF DENVER & BOULDER

The greater Denver area Regional Transportation District provides both employee and residential annual Eco Passes at deeply discounted rates, good for all area transit services, on the condition that a pass is purchased for every employee or for every resident within a condo community, apartment building, or neighborhood association (i.e., there is universal enrollment). The cost per pass varies depending on size of the company or residential area and proximity to high quality transit service. The cost to the company or residential community per annual Eco Pass varies between $7.50 and $120, which is only 0.6% and 9%, respectively, of an Adult Express Pass purchased by an individual.

on surrounding neighborhoods and develop transit supportive provisions. There is no specific trigger for a TMP; rather, the TMPs are attached as conditions for approval of land use permits depending on the proposed use, the size of the project, and the level of congestion in the area.

Still, further investment in TDM remains among the most cost effective ways to support growth in transit ridership and encourage Seattle residents and workers to get out of their cars and try walking, biking, and transit. Figure 2-2 identifies the effectiveness of various employer-based TDM strategies. TDM programs that could be particularly effective in Seattle, and would add to the suite of programs already in place, include the following:

- Work with Commute Seattle and transit agency partners to improve transit pass programs for employees of smaller firms that are not required to provide employee transportation benefits. This could include an expanded universal transit pass program that would leverage the highly discounted rates afforded to larger organizations to provide free or discounted transit benefits to employees of these smaller employers. A relatively small amount of City funding would be required. This program could be implemented through Commute Seattle or by building specific TMAs.
- Develop programs that help employees realize the true cost of parking, thus making transit more price-competitive with driving. Parking cash out can be an effective employer-based strategy that allows an employer to charge employees for parking while giving employees a bonus or pay increase to offset the cost of parking. Employees may use this increase to pay for parking or may choose an alternative mode and "pocket" the difference. Other similar employer-based financial incentive programs include: allow employees to purchase individual days of parking on a pro-rated basis comparable to monthly rates; provide a few discounted days of parking each month for employees who usually commute using a non-SOV mode (under a similar program, City employees are able to park at the SeaPark garage twice per month at a discounted rate); offer lower parking rates to carpools and vanpools; and offering cash in lieu of free parking to provide a choice for employees.
- Create a residential transit pass program for neighborhoods and residential buildings to extend the benefits of discounted transit passes beyond major employers. Several U.S. transit agencies, including the Regional Transportation District serving Denver and Boulder, now provide opportunities for residential neighborhoods or large, multi-unit residential buildings to purchase discounted bulk transit passes. Most programs of this type require that a pass be provided for every residential unit in the neighborhood or building.
- Expand TMAs to other urban centers such as the U-District, Northgate, and other areas with a high concentration of employment and demonstrated interest from the private sector.

Chapter 5 of the TMP (see Transit-Oriented Neighborhoods Strategy 6 on page 5-9) includes several complementary TDM policies. In addition, an in-depth discussion of TDM best practices, including program recommendations specific to Seattle's Center City, is provided in Chapter 7 of the Urban Mobility Plan Briefing Book (2008).

YOUTH ACCESS TO TRANSIT

Our youth are particularly reliant on transit to get around, and will become the transit riders and proponents of tomorrow – but only if they are served well by transit today. The City should work to expand access to ORCA cards for students through partnerships with schools, Metro, and Sound Transit. The City should also continue to encourage route designs that serve student needs and passenger information systems that meet the high expectations of today's tech-savvy teenagers.

Franklin High School students boarding a Metro bus

Image from Oran Viriyincy

Strategy PP5: Explore a "Transit Streamline Program Agreement" with King County Metro

SDOT is positioned to make significant speed and reliability improvements in transit corridors where King County Metro operates transit services. These improvements have the potential to create operating and capital cost savings for Metro by delaying the need to add more buses to the fleet and could lead to operating savings due to reductions in running time variability and operating speed improvements. (See the Portland-TriMet Streamline Program sidebar on this page). For example, in a case where the net benefit of City capital investments results in a travel time savings equal to or greater than the route headway, operating cost savings from reducing the need for a vehicle and operator could be guaranteed for reinvestment back into the route or a route of the City's selection. Similarly, if City capital investments in bus layover facilities reduce recovery time (i.e., layover time) sufficient to allow reallocation of resources, these service hours would be reinvested locally. This program would require a clear memorandum of understanding between SDOT, Metro, and possibly other neighboring jurisdictions. Specifically, the program would address opportunities to:

- Reinvest travel time savings resulting from City capital transit corridor improvements in Seattle transit routes
- Reinvest travel recovery time savings resulting from City investments in bus layover facilities in the Center City
- Leverage Metro operating funds with a local match for service investment

Strategy PP6: Develop and Strengthen Transit Supportive Zoning Overlays

Transit-supportive overlay zoning should be expanded beyond light rail station areas (where Station Area Overlay zones are used) to transit-supported urban villages, urban centers, and commercial corridors. This expansion should be coordinated with Department of Planning and Development (DPD) work on a new Transit Communities land use and zoning strategy and regional efforts being led by Puget Sound Regional Council (PSRC) to develop model transit overlay ordinance language. A shift to a corridor-focused strategy for allocating future growth should also be addressed in the Comprehensive Plan update. Recommended elements of effective overlay zones could include expansion of policies that require or incentivize:

- Increased development capacity
- Zoning setbacks in redevelopment corridors where additional right of way may be needed to support transit, bicycle, or pedestrian facilities (e.g., Fifth Avenue near Seattle Center)
- Improved building frontages at transit stations or stops on High Capacity Transit or Priority Bus Corridors, including promoting the active use of building frontages for passenger shelter and providing ground floor windows
- Limitations on auto-oriented uses such as vehicle sales or repair

PORTLAND-TRIMET STREAMLINE PROGRAM

The City of Portland (OR) and TriMet, the regional transit agency, conducted a joint program of capital investments in transit priority treatments and service improvements, focused on TriMet's Frequent Service routes. Beyond the benefits for passengers—increased bus frequency, reduced travel times, increased schedule reliability, and improved branding and passenger information—the goal of the program was to demonstrate that the operational efficiency savings resulting from the improvements would cover the program capital costs. An initial study of the program,* prior to implementation of more aggressive thresholds for activating transit signal priority, found that:

- Round trip travel times on the streamlined routes declined by slightly less than a minute, while travel times on non-streamlined routes increased by over one minute for routes in the city and over two minutes for suburban routes.
- On-time performance of streamlined routes declined by less than half as much as non-frequent service routes.

Although there were no short-term cost savings, the study projected that TriMet could defer purchasing (and operating) additional buses to serve the streamlined routes by 8 years, resulting in longer-term operating and capital cost savings.

* http://www.nctr.usf.edu/jpt/pdf/JPT%209-3S%20Koonce.pdf

- Outdoor seating for restaurants and pedestrian-oriented accessory uses, such as flower, food, or drink stands
- Requirements that paved areas contain pedestrian amenities such as benches, drinking fountains, and other design elements (e.g., public art, planters, kiosks, overhead weather protection) and provide physical separation from driving lanes with landscaping or planters
- Review/enhancement of existing requirements for short- and long-term bicycle parking
- Consideration of adopting maximum parking limits (minimum parking requirements have already been reduced or eliminated)
- Restrictions on accessory parking and surface parking in front of buildings (commercial parking is already restricted)
- Limitations on driveways that cross sidewalks where pedestrians access transit

STRATEGY AREA:
TRANSIT SUPPORTIVE POLICIES AND PROGRAMS

Strategy PP1: Develop a Safe Routes to Transit (SR2T) Program

- **Policy PP1.1:** Identify funding to create and sustain a safe routes to transit program that makes strategic investments to improve safe access to transit
- **Policy PP1.2:** Engage transit agency and neighborhood partners to build program support and identify investment priorities

Strategy PP2: Develop Transit Information and Wayfinding Standards

- **Policy PP2.1:** Develop design standards and specifications for wayfinding improvements including intermodal transfers, pedestrian access to transit, and bicycle access to transit
- **Policy PP2.2:** Develop an interagency working group and facilitate coordination between Sound Transit, Metro, and other transit operators regarding public information provided at intermodal hubs and key transfer points
- **Policy PP2.3:** Develop standards for coordination of pedestrian and bicycle wayfinding
- **Policy PP2.4:** Ensure transit information is included in Center City and neighborhood wayfinding programs targeting pedestrians and cyclists
- **Policy PP2.5:** Develop standards for providing real-time transit information and ORCA card readers at key stops and/or transfer points

Strategy PP3: Increase Support for Traveler Education Programs

- **Policy PP3.1:** Work with Metro to expand funding and reach of the In Motion program with a goal of reaching key neighborhoods every five years
- **Policy PP3.2:** Work with the Metro In Motion program and/or Way to Go, Seattle! to increase outreach to employment centers with large clusters of small to mid-sized employers

Strategy PP4: Invest in Transportation Demand Management Programs that Increase Transit Use

- **Policy PP4.1:** Work with Commute Seattle and transit agency partners to improve transit pass programs for employees of smaller firms
- **Policy PP4.2:** Develop programs that help employees realize the true cost of parking
- **Policy PP4.3:** Create a residential transit pass program for neighborhoods and residential buildings
- **Policy PP4.4:** Expand TMAs to other urban centers and areas with a high concentration of employment and demonstrated private sector interest

Strategy PP5: Explore a "Transit Streamline Program Agreement" with King County Metro

Strategy PP6: Develop and Strengthen Transit Supportive Zoning Overlays

- **Policy PP6.1:** Expand transit-supportive overlay zoning beyond light rail station areas
- **Policy PP6.2:** Coordinate with PSRC effort to develop model transit overlay ordinance language
- **Policy PP 6.3:** Coordinate expansion of transit-supportive overlay zoning with Comprehensive Plan update

Image from Nelson\Nygaard

3 CORRIDORS

High ridership transit corridors serve dense neighborhoods, connect many and diverse land uses, have strong demand generators at their termini, and operate over direct routes that allow high levels of speed and reliability. The TMP included an in-depth process to study travel corridors in the city that delivered the greatest potential benefits by combining these features. Further, the study developed a broad set of evaluation measures, grouped under five evaluation "accounts" that included: Community, Economy, Environment and Human Health, Social Equity, and Efficiency. These measures were used to identify corridor capital investment priorities, including a top tier of modes recommended for high capacity transit (HCT) and 16 additional bus corridors where SDOT will prioritize speed and reliability improvements. The TMP is consistent with King County Metro's 2011 Strategic Plan for Public Transportation, which calls for the agency to invest resources in corridors that have the highest potential to generate ridership, as well as to serve regional equity and environmental goals.

A LONG-RANGE VISION FOR SEATTLE'S HIGH CAPACITY TRANSIT NETWORK

WHAT IS HIGH CAPACITY TRANSIT?

High capacity transit (HCT) refers to transit corridors that deliver service with high levels of capacity, frequency, and design quality linked by effective transfer facilities. HCT consists of both rubber-tired (e.g., bus rapid transit or BRT) and rail modes and fills a need for service between Link light rail and local bus service. A more detailed description of HCT for Seattle is provided on page 3-8.

WHY DOES SEATTLE NEED A LONG-RANGE VISION FOR HIGH CAPACITY TRANSIT?

The Transit Master Plan (TMP) articulates a long-range vision for a Seattle where most residents can walk or bike to high-quality, high-capacity transit and where a network of routes moves residents, visitors, and workers swiftly between major neighborhoods. The TMP is structured to help City staff and elected officials implement the vision and measure progress toward its achievement. A clear, long-range vision provides a tool to:

- Build consensus for action and priorities among local stakeholders and partner agencies
- Guide investment of limited resources to achieve the greatest benefit
- Develop a phased implementation approach for Seattle-focused high capacity transit (HCT) corridors that support the system of urban centers and villages set forth in the City's Comprehensive Plan
- Meet key City economic, environmental, equity, and livability goals, such as a significant reduction in greenhouse gas (GhG) emissions

WHAT WOULD IT TAKE TO REALIZE THE VISION IN 40 YEARS?

Realizing the vision will require sustained action by the City to:

- Develop new local funding sources to support both transit operations and significant transit corridor capital investments
- Provide initiative, staff capacity, and funding support for leading design and construction of rail and bus rapid transit (BRT) projects in priority citywide corridors
- Coordinate with Sound Transit (ST) to prioritize study and construction of HCT in western Seattle neighborhoods in the ST long-range mass transit plan
- Continue to funnel growth to key urban centers and urban villages served by the long-range HCT network

LONG-RANGE HCT VISION: TARGETED TO SERVICE QUALITY

The long-range HCT network illustrated in Figure 3-1 goes beyond the existing regional vision for Link light rail and the Seattle Streetcar Network Concept for Center City neighborhoods. It defines a citywide network of bus rapid transit and rail corridors that will deliver transit service with high levels of capacity, frequency, and design quality linked by effective transfer facilities.

THE LONG RANGE HCT VISION GUIDES

The Long-Range HCT Vision can help to guide Seattle's land use and transportation investments and policy decisions to ensure that they are supportive of the Transit Master Plan. The Vision guides the City to:

- **Coordinate with partner agencies:** The Vision communicates Seattle's priorities for transit corridor connections to regional transit agencies.
- **Phase and prioritize investments:** The Vision ensures that major transit capital investments in Seattle move the City toward a clear goal, even as investments are phased toward full system development.
- **Focus all development around transit-oriented neighborhood principles (see Chapter 5):** The Vision recognizes where growth is planned and guides transit investments to meet future needs.
- **Coordinate modal investments:** The Vision informs the City's other modal investments by implementing the Bicycle and Pedestrian Master Plans and supporting seamless transfers where major transit facilities meet.

THE LONG RANGE HCT VISION INSPIRES

The Vision is a means for Seattle to come together around building the transit system that will help the City attain its economic, environmental, equity, and human health goals. Achieving the Vision is a powerful tool for fostering an economically healthy, low-carbon city. Specifically, a high quality HCT network will inspire:

- **A new mobility paradigm where walking, bicycling, and taking transit are the most convenient ways to travel for most trips in the city:** Seamless connections to the regional transit system will make transit the best option for Seattleites accessing other Puget Sound communities and for workers and visitors traveling to Seattle.
- **Most new development designed and constructed based on transit-oriented neighborhood principles:** Pedestrian-friendly transit nodes are the focal point of neighborhood centers and community interaction.
- **Low-carbon neighborhoods centered around transit nodes:** Transit helps Seattle achieve emissions reduction goals. It helps to shape development patterns that reduce the number and distance of driving trips.
- **A healthy, active lifestyle for Seattle residents of all ages:** Increased levels of walking, bicycling, and transit trips allow residents of all ages to incorporate physical activity into their daily routines.

FIGURE 3-1 SEATTLE LONG-RANGE HIGH CAPACITY TRANSIT VISION

TRANSIT CORRIDOR EVALUATION PROCESS

It will take decades to achieve Seattle's long range vision for transit. The TMP is a 20-year plan, designed to deliver near-term priorities for transit system investment. The TMP employed an outcome-based evaluation process to determine where and how to invest limited transit funding.

HOW THE TMP DETERMINED CORRIDOR INVESTMENT PRIORITIES

The TMP used an outcome-based process called multiple account evaluation (MAE) to identify capital and transit service investments that support the TMP goals. Figure 3-2 shows the evaluation accounts used to prioritize corridor investments. The MAE process provided a powerful tool to engage stakeholders in developing a set of corridor investment priorities. It also helped the City to make investment decisions in line with economic, environment, health, and community development goals. The evaluation led to the prioritization of five corridors that are poised for high-capacity transit investments, and 16 corridors where significant investments in rubber-tired transit improvements are merited. The MAE process identified a clear set of priorities for City transit investment that serve as a foundation for TMP recommendations.

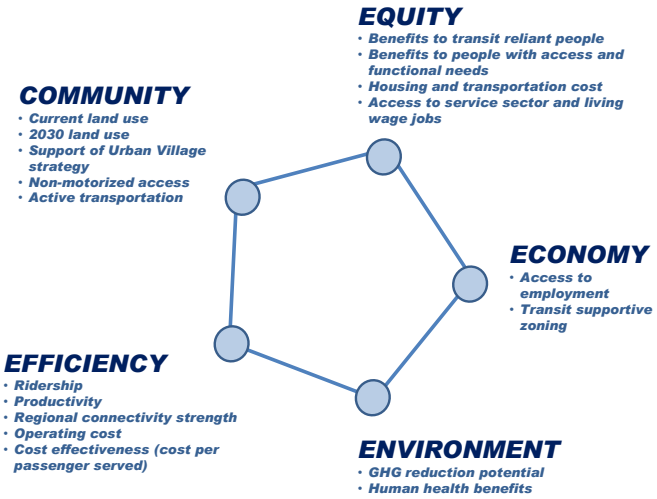
PUBLIC AND STAKEHOLDER PARTICIPATION

Three key groups were instrumental in developing the TMP and the corridor evaluation process:

- **Transit Master Plan Advisory Group (TMPAG):** The TMPAG included 25 members appointed by the Mayor and City Council. The group met monthly and provided detailed input at every phase of the corridor evaluation process.
- **City/County/Regional Interagency Technical Advisory Team (ITAT):** The ITAT included technical staff from SDOT and a number of other City departments, the Seattle Planning Commission, King County Metro Transit and Roadway Division, Sound Transit, Puget Sound Regional Council, and Public Health – Seattle and King County.

Image from Nelson\Nygaard

FIGURE 3-2 ACCOUNTS USED IN MULTIPLE ACCOUNT EVALUATION PROCESS



- **City of Seattle Executive Steering Committee (ESC):** The ESC was an executive leadership team that provided high-level direction to the TMP technical team.

The project team also briefed the Seattle City Council, the Office of the Mayor, the Seattle Planning Commission, the Pedestrian Advisory Board, the Bicycle Advisory Board, the Freight Advisory Board, Seattle Center, Puget Sound Regional Council, and several neighborhood groups.

The public participated in developing the plan by participating in focus groups, completing an online survey that received over 12,000 responses, and providing comments at various stages of the planning process.

In a series of workshops, the ITAT and TMPAG helped to determine desired outcomes for the TMP. The most important outcomes identified by these groups—and supported through the public focus groups and the survey—were used to develop an evaluation framework for developing investment priorities. Both groups provided detailed input that influenced the evaluation measures used to prioritize corridors for transit investment.

Following release of the draft TMP Summary Report in September 2011, SDOT held a series of five public open houses in Seattle to share information about the report and provide the public with an opportunity to engage with the project team and provide feedback. In addition, SDOT and several other City departments held a meeting attended by over 160 people from historically underrepresented communities. The Summary Report was revised based on public as well as stakeholder and agency feedback.

CORRIDOR EVALUATION APPROACH AND STAGES

Corridors were evaluated against 16 criteria (a number of which had multiple sub-criteria) organized under the five evaluation accounts shown in Figure 3-2. The results were reviewed with the ITAT, TMPAG, and ESC at each stage, and their feedback was used to refine the analysis and methods.

Stage I: Screening For Demand Potential

The Stage I corridor evaluation analyzed transit corridors based on the Urban Village Transit Network (UVTN) to determine their potential to generate ridership. A detailed market analysis (see Chapter 2 of the TMP Briefing Book) also guided selection of initial corridor alternatives. Based on current and future land use and demographic characteristics, corridors least likely to deliver significant return on transit investments within the plan timeframe were screened out during this phase. The Stage I process narrowed the evaluation to a set of 15 priority corridors.

Stage II: Multiple Account Evaluation

The 15 Stage I corridors were evaluated against performance measures within each MAE account as illustrated in Figure 3-3. The measures were weighted for relative importance by ITAT, TMPAG, and ESC. The reviewers also assigned a weight to each account.

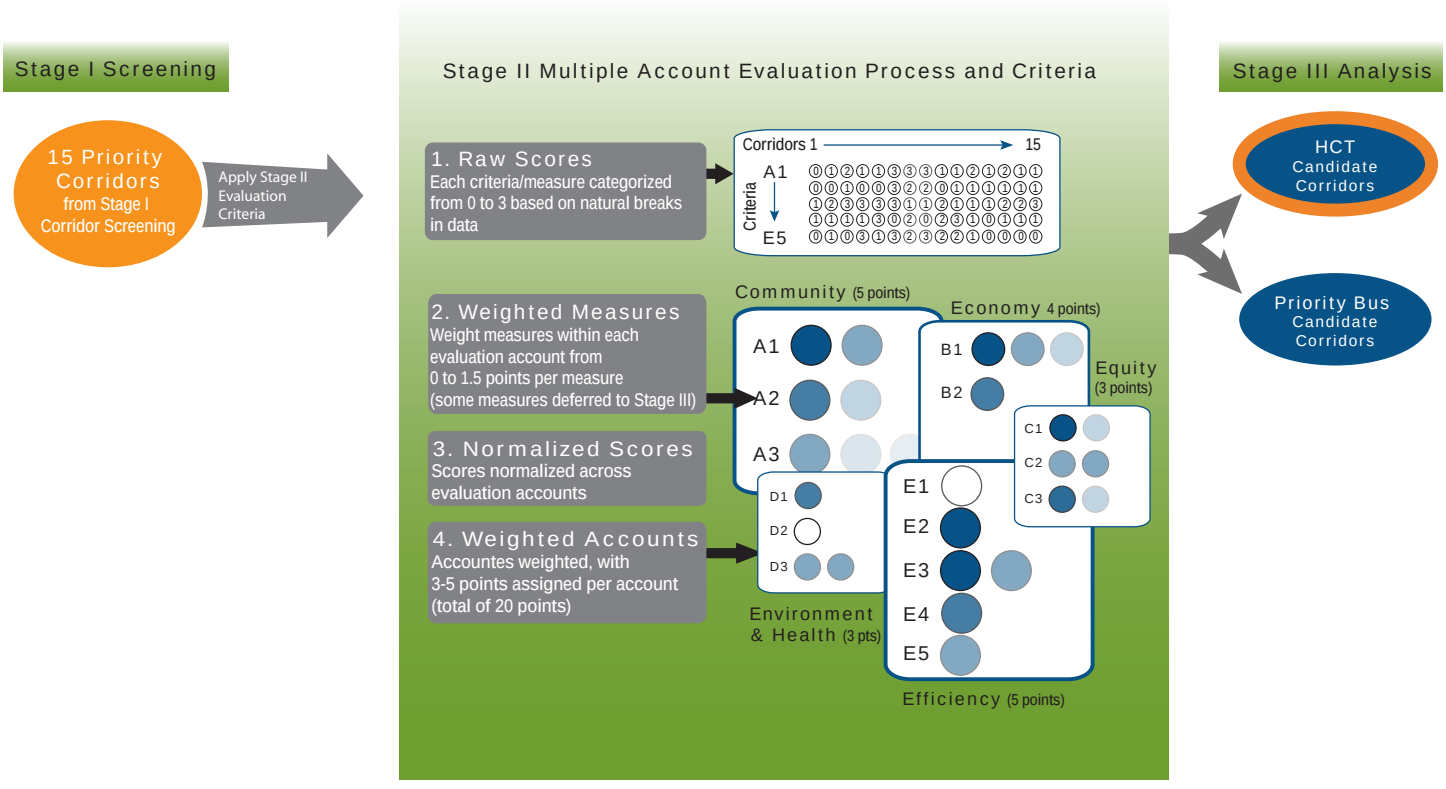
Stage III: High Capacity Corridor and Priority Bus Corridor Analyses

Based primarily on the Stage II evaluation, the corridors were prioritized into two tiers for more detailed analysis of potential transit investments:

- **High Capacity Transit (HCT) Candidate Corridors:** The top tier of corridors was evaluated for rail, bus rapid transit (BRT), and enhanced bus mode options and for more detailed alignment considerations. Operating plans and planning level capital cost estimates were developed for each of these corridors.
- **Priority Bus Corridors:** The remaining corridors were evaluated for speed and reliability capital improvement opportunities and for service enhancements.

Additional factors considered included the viability of the corridor for high-capacity transit (e.g., grade, availability of right-of-way) and potential overlap with current and planned Link light rail or other major transit investments..

FIGURE 3-3 MULTIPLE ACCOUNT EVALUATION PROCESS



PRIORITY INVESTMENTS IN THE FREQUENT TRANSIT NETWORK

WHAT IS THE FREQUENT TRANSIT NETWORK?

The Frequent Transit Network (FTN) is a vision for a network of transit corridors that connect the City's urban centers and villages with high-quality transit service within a short walk for most residents. This chapter identifies priorities for corridor capital investments, while Chapter 4 describes FTN service characteristics.

The FTN builds upon the city's Urban Village Transit Network (UVTN)—a service investment concept used in the 2005 Seattle Transit Plan. The UVTN provided a framework for measuring transit performance on important arterial corridors, but it gave limited direction for how the City should invest capital resources in operable, end-to-end transit corridors. The FTN replaces the UVTN by developing a program of coordinated transit corridor capital investments, with project-level detail on how to implement speed and reliability improvements. The TMP Briefing Book, page 4-16, provides a map of the UVTN, while pages 4-34 to 4-36 of the TMP Briefing Book illustrate UVTN performance measures.

Chapter 4 (Service) provides a detailed description of the service design principles, service levels, and performance characteristics of the Frequent Transit Network (FTN).

PRIORITY CORRIDOR CAPITAL INVESTMENTS: BUILDING THE FREQUENT TRANSIT NETWORK

Making capital investments in priority transit corridors that develop and enhance the FTN is a key focus of the TMP. Investments in the 15 citywide corridors and additional Center City corridors identified through the TMP have the highest potential benefits to Seattle and its residents.

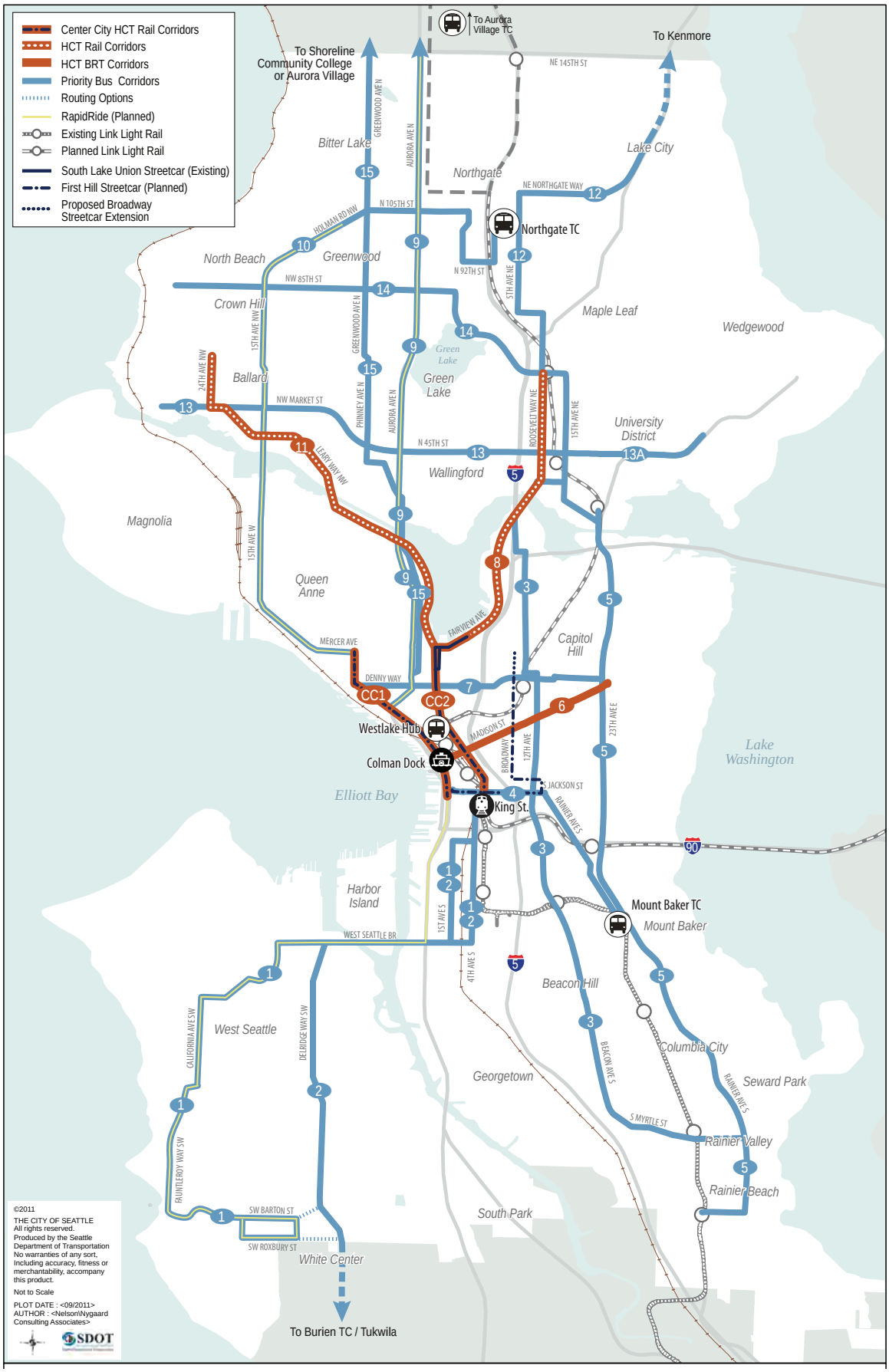
Priority corridor investments in the FTN fall into three general categories, summarized below and illustrated in Figure 3-4. The following three sections describe each category of corridors in detail.

- **High Capacity Transit Corridors:** These represent the top tier of citywide corridors that were evaluated for suitability for rapid streetcar and BRT modes.
- **Priority Bus Corridors:** The remaining citywide corridors were considered for transit priority and infrastructure improvements, assuming rubber-tired transit would continue to be the dominant mode.
- **Center City Corridors:** These corridors include a focus on Center City circulation, broadly benefiting transit service operating in and through downtown, and serve critical connections between many of Seattle's densest neighborhoods.

In addition to these corridors investments, priority investments in the FTN include:

- **Support Link light rail**, which serves important regional connections but is not funded or developed by the City.
- **Eliminate or reduce impacts of traffic bottlenecks** where they impact transit operation (i.e., constrained arterials entering downtown, bridge entries, and freeway ramp locations).
- **Coordinate with neighboring jurisdictions** to ensure that transit speed and reliability improvements on Seattle streets are carried across city boundaries. This is particularly important in corridors where predominant travel demands are between northern, southern, or eastern Seattle neighborhoods and neighboring jurisdictions.

FIGURE 3-4 PRIORITY CORRIDORS FOR CAPITAL INVESTMENTS



HIGH CAPACITY TRANSIT CORRIDORS

High Capacity Transit in Seattle

For Seattle, high capacity transit consists of both rail and rubber-tired transit modes that can provide residents with high-quality transit service, consistent with the design principles and FTN service levels (see Chapter 4). The HCT corridors identified in the TMP fill a key service need between Link light rail and local bus service. Seattle's HCT service will be distinguished by the following factors:

- Seattle HCT provides locally-focused service for transit markets within the city of Seattle and surrounding areas. Link light rail focuses on regional connectivity and longer-distance trips; by design, it is more of an intercity commuter rail model of transit operation than an urban light rail service.
- Seattle HCT operates primarily on local streets using a combination of exclusive and shared right-of-way. Link light rail uses exclusive right-of-way with full or partial grade separation.

DIFFERENTIATING LINK LIGHT RAIL FROM SEATTLE HCT

Much of the existing and planned Sound Transit Link light rail system has attributes of a rapid rail system (e.g., fully exclusive and grade-separated right of way and off-board fare payment), providing fast regional connections with limited stops. The segment of Central Link in Southeast Seattle that operates on MLK Jr Way is a notable exception since it operates in the street right-of-way and crosses intersections at grade, yet even here stop spacing is wide. The Link service design model compares to BART in the San Francisco Bay Area or SkyTrain in Vancouver, B.C. Light rail systems in places like Portland and San Diego share some similar features to Link, but operate on-street (both in mixed traffic and exclusive lanes) in the most urban areas of their service areas. The HCT or urban rail modes evaluated in the TMP would use a similar model, operating in existing street rights-of-way, with longer stop spacing, and mix of priority treatments to gain advantage over traffic.

The San Diego Trolley (photo) and Portland MAX system operate on-street in the most urban parts of their service areas.

Image from Nelson\Nygaard

THE HCT MODES

Seattle's HCT corridors have the potential to be served by multiple modes. However, steep topography or constrained rights-of-way limit the available mode options for some corridors. The Transit Master Plan considers three high-capacity modes, plus an enhanced bus service, for developing transit corridors in Seattle:

- **Rapid Streetcar** is the rail mode considered for HCT corridors. It uses longer articulated or coupled street-running vehicles and is envisioned to operate like the European street tram systems described in the sidebar on pages 3-10 and 3-11. Rapid streetcar achieves faster operating speed and greater reliability through longer spacing between stops and more extensive use of exclusive right-of-way than is typical of U.S. streetcar lines that emphasize Center City circulation. Rapid streetcar stations would be on-street and would be designed to include high volume shelters, real-time passenger information, level boarding, off-board fare payment, and enhanced station amenities. Rapid streetcar would have higher capacity trains, greater priority over traffic, and operate at higher speeds compared with a local streetcar circulator, such as the South Lake Union streetcar.
- **Local Streetcar** is the rail mode considered for Center City corridors and functions as an urban circulator. It has relatively short distances between stops and operates primarily in mixed traffic.
- **Bus Rapid Transit** is one of the two bus modes considered for HCT corridors. BRT combines a rubber-tired transit vehicle with the operating characteristics of a rapid streetcar, including longer stop spacing and use of exclusive right-of-way. BRT stations similarly include real-time passenger information, level boarding, off-board fare payment, and enhanced station amenities. BRT vehicles are often "branded" or stylized to distinguish them from buses providing local service, and they may have features such as multiple, wide doors to increase boarding capacity. King County Metro's RapidRide service falls into a "light" category of BRT service with less extensive priority features, but it does include branded, stylized vehicles and some well-developed station features. BRT may be implemented using diesel or electric trolley buses.
- **Enhanced Bus** assumes a more basic level of improvements and priority features for existing transit service, with increased hours of operation and frequency comparable to BRT, but generally operating in mixed traffic. As with BRT, diesel or electric trolley buses could be used.

The TMP Briefing Book, Section 6, provides a more in-depth discussion of transit modes.

The T3 tram line is one of four tram lines in Paris that exemplify the Rapid Streetcar mode. Typical of European street trams, it uses articulated, higher-capacity trains and exclusive right-of-way. Although Paris historically had an extensive network of street trams, predating its Metro system, its modern tram lines have all been constructed since the 1990s.

Image from Wikimedia Commons user Pline

The South Lake Union Streetcar is an example of the local streetcar mode.

Image from Nelson\Nygaard

Los Angeles MTA operates the Orange and Silver line BRT services, branded as "Metro Liner." They have silver vehicles that utilize exclusive right-of-way and receive priority at intersections. These services are designed to look and operate like Metro Rail services; the Orange line has exclusive off-board fare payment and all-door boarding, which is also planned for the Silver Line. The Silver line primarily runs along a freeway right-of-way while the Orange line utilizes an old rail right-of-way, which has implications for access and land use integration (discussed in Chapter 5).

Image from Los Angeles Metro Transportation Library and Archive

Los Angeles MTA offers a 26-route network of Metro Rapid bus service, distinguished by red and silver low-floor vehicles (left). Metro Rapid service is characterized by longer stop spacing, transit priority features, and clearly branded enhanced stations. It is differentiated from Metro Local service, which uses similar vehicles (right), but Metro Local buses are painted orange and are not exclusively low-floor vehicles.

Image from Los Angeles County MTA (left) and Flickr user LA Wad (right)

INTRODUCING THE RAPID STREETCAR MODE VIA EUROPEAN STREET RAMS

Modern streetcar development in the United States is often characterized by low-speed urban circulators designed to make short connecting trips in dense urban districts. It is not surprising, then, that people's vision of "streetcars" is of a mode designed more like the South Lake Union streetcar than the urban tram lines over which U.S. travelers to Europe marvel. The rapid streetcar mode considered in the TMP models the European street tram more than the Portland or South Lake Union streetcars.

COMPARING RAPID STREETCAR TO LOCAL STREETCAR CIRCULATORS

"Rapid streetcar" is a term coined to differentiate the high-capacity transit rail mode identified in the Seattle TMP from modern U.S. streetcar lines that typically serve downtown circulation, are low speed, and operate in mixed traffic with limited priority over general traffic. These lines consequently have short stop spacing and operate at relatively low average speeds.

Cities are attracted to the lower capital costs of building streetcar lines relative to light rail; lighter weight streetcar vehicles require less extensive street reinforcement and utility relocation. Although they operate at much lower speeds in urban environments, streetcar vehicles are capable of traveling at a comparable speed to light rail—44 miles per hour for vehicles manufactured by United Streetcar. Design features of Rapid Streetcar that differentiate it from local streetcar models include:

- Use of dedicated rights-of-way, where conditions allow
- Provision of high levels of traffic signal priority and other transit priority treatments to allow transit to bypass general purpose traffic in intersections and congested parts of the transit corridor where rail cars mix with traffic
- Use of larger or coupled vehicles to accommodate high passenger loads
- A higher level of station investment design and amenity development
- A higher level of investment in station access and wayfinding

These features produce a traveler experience that is more comparable to what Americans think of as urban light rail. The following European street tram examples are instructive as to the potential for Rapid Streetcar in Seattle.

EUROPEAN STREET TRAMS AS A MODEL FOR SEATTLE

Dozens of mid- and large-sized European cities have built new surface-running tram lines in the last decade; the mode has become popular due to its modest cost compared with subways and popularity with riders. These European trams provide context for the Rapid Streetcar mode identified for HCT corridors in the TMP. European trams that have longer spacing between stops and make use of exclusive right-of-way are able to attain higher average speeds than is typical of U.S. streetcar systems. Many lines carry large passenger volumes. Several examples of such tram lines or systems are described below.

*Nice**

The Nice T1 tram line uses Alstom Citadis 302 5-section trains that are about 100 feet long and hold up to 56 seated and 144 standing passengers. (The Citadis trains include versions with up to seven sections that are about 130 feet long and hold 70 seated and 230 standing passengers). The nearly 5.5 mile line, which opened in 2007, replaced four bus lines and carries about 90,000 passengers per day. Trains run from 5 am to 2 am seven days per week. During peak service hours of 8 am to 9 pm, Nice T1 trams run every five minutes on weekdays, every six minutes on Saturdays, and every 10 minutes on Sundays.

As illustrated in the photo, trams in Nice are visibly branded and operate in dense urban neighborhoods, including traveling through busy pedestrian plazas and crossing at-grade intersections with high volumes of pedestrians and cyclists. A strength of the European Street Tram/Rapid Streetcar model is that it puts transit where people are and want to be, breaking down the challenge of directing people to grade-separated stations that can be challenging to reach.

Lyon†

The modern tramway network in Lyon consists of four lines, all built since 2001, and complements the city's four-line metro system. The simple fact that a network of four lines covering 31 miles of the city was built in a 10 year time frame is instructive. The ability to contextually integrate tram lines into the existing urban fabric allows for relatively rapid development. The nine-mile T3 line, completed in 2006, initially used the 5-section Citadis train, although 7-section Citadis 402 trains have been ordered. The line runs at a maximum speed of 43 mph and averages 23 mph; some of the line operates in relatively low-density areas where higher speeds are attainable. An extension of the T4 line is planned. The Lyon tramway is designed to complement intercity and regional transit systems as well as the higher capacity Lyon Metro system. Following the completion of a four line metro system in the 1970s and 1980s, the city has transitioned to the development of a surface tramway system as the more cost effective way to serve mobility needs.

* Wikipedia, http://fr.wikipedia.org/wiki/Lignes_d%27azur; http://en.wikipedia.org/wiki/Tramway_de_Nice. Lignes d'Azur. http://www.lignesdazur.com/ftp/lignes_FR/tram%20horaires%20%2821%2004%2010%29.pdf

† Wikipedia, http://en.wikipedia.org/wiki/Lyon_tramway

APPLICABILITY OF THE EUROPEAN MODEL TO THE U.S.

European trams operate the type of high-quality service—high frequency and high speed—that is proposed in the TMP. While U.S.-based streetcar manufacturers such as United Streetcar have not yet produced longer articulated or coupled vehicles, or expressed interest in doing so, they likely would be able to license designs from other manufacturers and produce the vehicles given sufficient demand. There are few existing U.S. examples of Rapid Streetcar lines, although portions of the Portland, San Diego, and San Francisco light rail systems operate in a similar fashion. Further, a number of cities are exploring streetcar development projects that cover longer distances and provide a much higher level of priority for streetcar vehicles.

T1 tram in Nice's Place Girabaldi, where the tram runs without overhead wires, using batteries for a short section.

Image from Wikimedia Commons user Myrbella

A train on Lyon's T2 tram line.

Image from Wikimedia Commons user Alain Caraco

THE HCT CORRIDORS

The three citywide corridors selected for full modal evaluation and two Center City corridors included in the TMP high-capacity transit evaluation are highlighted in Figure 3-6. The citywide HCT corridors are:

- Central Area - First Hill - Downtown, via Madison (Corridor 6)
- Roosevelt - University District - South Lake Union - Downtown, via Eastlake (Corridor 8)
- Loyal Heights - Ballard - Fremont - South Lake Union – Downtown, via Westlake (Corridor 11)

The Center City Connector corridors (CC1 and CC2) are discussed in the Center City Priorities section of this chapter (see page 3-46).

FIGURE 3-5 CORRIDORS EVALUATED FOR HIGH CAPACITY TRANSIT

Modal Evaluation

Corridor 6 (Capitol Hill – Downtown, via Madison) was evaluated only for BRT and enhanced bus service, since rail is not feasible due to steep grades. Corridors 8 and 11 were evaluated for all three modes. Center City corridors were evaluated for local streetcar and enhanced bus service.

The table at right illustrates the modes evaluated for each corridor along with the preferred mode, selected based on the evaluation results and detailed corridor evaluation presented below.

HCT CORRIDOR EVALUATION RESULTS

Figure 3-7, Figure 3-8, Figure 3-9 provide more detailed descriptions of the three citywide HCT corridors. Metrics developed as part of the HCT corridor evaluation are shown in Figure 3-10 for all three corridors and each mode, along with a brief explanation of each metric.

FIGURE 3-6 HCT CORRIDOR MODE OPTIONS AND PREFERRED MODE

Corridor	Rapid Streetcar	BRT	Enhanced Bus
6 - Central Area - First Hill - Downtown, via Madison	Not Evaluated	Preferred	Evaluated
8 - Roosevelt - University District - South Lake Union - Downtown	Preferred	Evaluated	Evaluated
11 - Ballard – Fremont – South Lake Union – Downtown	Preferred	Evaluated	Evaluated

HCT AND BICYCLE-STREETCAR INTEGRATION

The design of HCT corridors on urban streets requires addressing tradeoffs between transit, motor vehicles, and bicycles. This chapter provides conceptual street cross-sections for TMP-recommended rail corridors, however context-sensitive, block-by-block design will be required to ensure that high volumes of bicyclists along parts of these corridors can be safely accommodated.

Best Practices for Bicycle-Streetcar Integration and Design

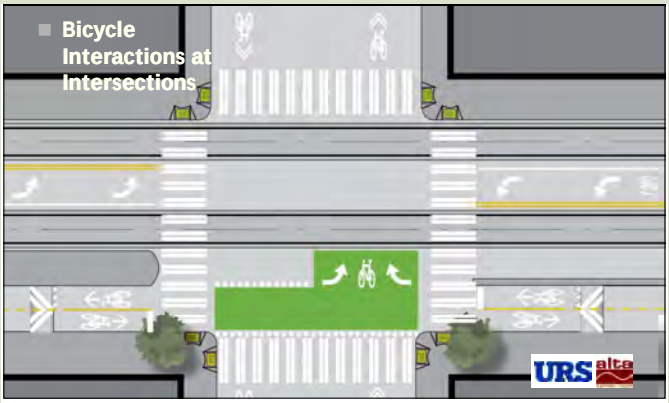
The best practices for bicycle and streetcar integration include:

- A left-side track and platform alignment is optimal for reducing conflicts
  - If a right-side track alignment is used, provide adequate dedicated spaces for bicycles and place stations outside of the bicycle travel path
- Center running tracks allow for median stops that minimize bicycle as well as pedestrian conflicts
- Crossings designed so that cyclists cross tracks at an angle near 90 degrees to reduce risk of a tire catching in the track; use pavement markings to reinforce the intended crossing angle
- A "Copenhagen left" turn (jughandle) can be used to help cyclists cross tracks and other traffic; a bicycle-only signal can be implemented in conjunction with this type of turn
- Clearly delineated pedestrian and bicycle space, such as "channelized" travel paths for each mode to help prevent conflicts
- Separated facilities such as cycle tracks (Montreal, Vancouver B.C., and Washington D.C.) or parallel bikeways (The Netherlands)
- Warning signage to alert cyclists, pedestrians, and transit passengers to potentially dangerous situations

Seattle First Hill Streetcar Proposed/Conceptual Design

In Seattle, a two-way cycle track along Broadway (right) is the proposed bicycle facility design for the First Hill Streetcar, which will connect First Hill, Capitol Hill, the International District, and Pioneer Square. The design includes bike boxes (shown in green) to facilitate safe turns.

Source: Association of Pedestrian and Bicycle Professionals, "Integrating Bicycles with Streetcars" (Webinar), April 20, 2011.



A cycle track is the proposed bicycle facility for the First Hill Streetcar project.

Source: URS; Alta Planning

IMPLEMENTATION STRATEGIES

STRATEGY AREA: IMPLEMENTING HIGH CAPACITY TRANSIT CORRIDORS

Corridor 6: Central Area – First Hill – Downtown

- **Strategy HCT 6.1:** Collaborate with King County Metro regarding service design options, routing alternatives, and federal funding opportunities.
- **Strategy HCT 6.2:** Coordinate with Metro to develop a Very Small Starts Application (or alternative funding source) for a first phase of this project (or for the complete project if viable within funding limits).
- **Strategy HCT 6.3:** Coordinate vehicle specifications with Metro's electric trolley bus procurement process.
- **Strategy HCT 6.4:** Develop conceptual and detailed design of BRT facilities.
- **Strategy HCT 6.5:** Conduct outreach to corridor neighborhoods to discuss the benefits and tradeoffs of BRT implementation and related potential service restructuring.
- **Strategy HCT 6.6:** Use SDOT funds to develop in-lane, intersection TSP, and station improvements (as necessary to supplement potential federal funding).
- **Strategy HCT 6.7:** Ensure major development projects in the corridor consider station area placement and design needs.
- **Strategy HCT 6.8:** Use redevelopment as an opportunity to set back development from the street by 20 feet, providing additional right-of-way for transit lanes and passenger waiting areas on sidewalks.
- **Strategy HCT 6.9:** Adopt Frequent Transit Network branding.
- **Strategy HCT 6.10:** Conduct traffic analysis of various right-of-way configurations in corridor, particularly at major intersections including Boren, Broadway, 12th and 23rd. Traffic analysis should consider emergency vehicle access needs, various right-of-way configurations, and alternative lane configurations in downtown. Waterfront turn-around options will be studied through the Central Waterfront process.

For all corridors, detailed evaluation of right-of-way design for each corridor segment would be required as a next phase of study.

Corridor 8: Roosevelt – University District – South Lake Union – Downtown

For all corridors, detailed evaluation of right-of-way design for each corridor segment would be required as a next phase of study.

- **Strategy HCT 8.1:** Fund and conduct an alternatives analysis study to confirm rapid streetcar as the preferred mode and to position the project for federal funding. This should follow the completion of a full funding grant agreement for Corridor 11 (Loyal Heights - Ballard - Fremont - South Lake Union - Downtown).
- **Strategy HCT 8.2:** Conduct a detailed study of terminus locations, including: 1) development of a southern terminal that is integrated with the International District Station and does not require transferring passengers to cross a major arterial street, and 2) consideration of northern terminus options and phasing, including a terminus at the Brooklyn Station, a terminus at the Roosevelt Station (as shown in the corridor map included in Figure 3-9), or a terminus at Northgate.
- **Strategy HCT 8.3:** Conduct outreach to corridor neighborhoods to discuss corridor design options and tradeoffs.
- **Strategy HCT 8.4:** Integrate South Lake Union streetcar service in corridor operation and design.
- **Strategy HCT 8.5:** Increase station spacing on Westlake between Valley and Westlake Center and add traffic signal priority to reduce travel times. Extend platforms to accommodate 2-car trains.
- **Strategy HCT 8.6:** Design the downtown segment between Westlake and King Street/International District hubs to maximize travel speeds, increasing the value of the line as fast inter-neighborhood transit service and an effective connector between major downtown multimodal hubs.
- **Strategy HCT 8.7:** Study in detail the impacts and benefits of various design options for rapid streetcar service on 4th and 5th Avenues, including various two-way and couplet designs, detailed bicycle facility design, replacement of any lost bicycle capacity, bicycle crossing safety, traffic impacts and transit reliability impacts of traffic chokepoints, and tradeoffs between mixed traffic and dedicated operations.
- **Strategy HCT 8.8:** Conduct traffic analysis of various right-of-way configurations in corridor, particularly on 4th and 5th Avenues in down-town, on Eastlake Avenue, and for various right-of-way configurations on Roosevelt and 11th Avenue NE.
- **Strategy HCT 8.9:** Develop a detailed operating plan that considers opportunities for replacement of existing corridor bus service and restructuring opportunities in northeast Seattle.

Corridor 11: Loyal Heights – Ballard – Fremont – South Lake Union – Downtown

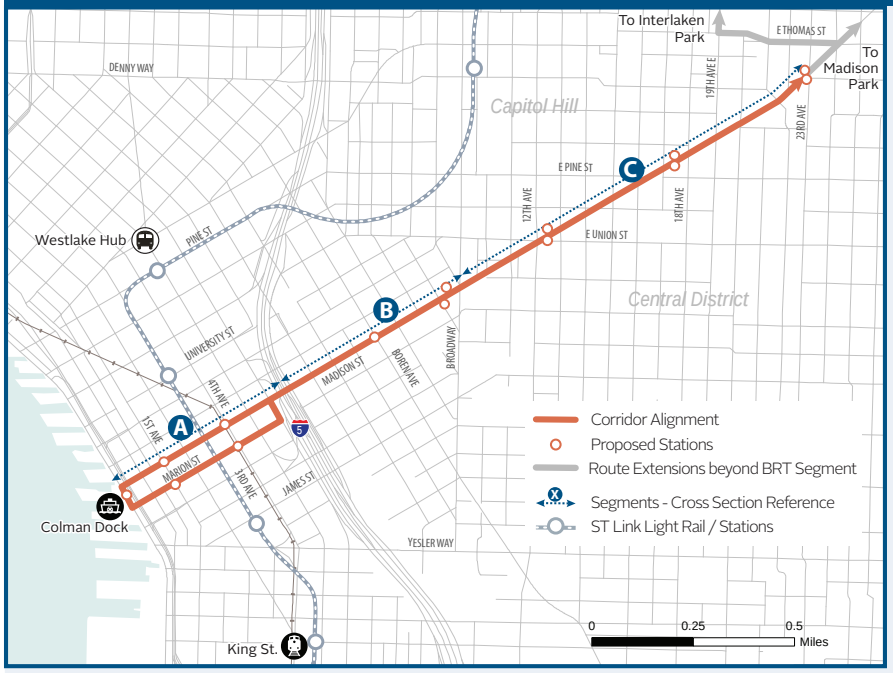
A potential rail extension to Ballard is included in the Sound Transit (ST) long-range plan and, if the ST Board adopts such an extension in a future system plan, ST has the exclusive statutory authority to develop and operate that extension.

- **Strategy HCT 11.1:** Prioritize project development and construction of Corridor 11 before Corridor 8.
- **Strategy HCT 11.2:** Partner with Sound Transit to evaluate transit alternatives for this corridor.
- **Strategy HCT 11.3:** Target a full funding grant agreement with the Federal Transit Administration by 2014.
- **Strategy HCT 11.4:** Conduct a detailed study of terminus locations, including: 1) development of a southern terminal that is integrated with the King Street/International District Station and does not require transferring passengers to cross a major arterial street, and 2) consideration of northern terminus options and phasing, including a terminus at N 85th Street, a terminus at N 65th Street (as shown in the corridor map included in Figure 3-10), or a terminus in the center of Leary Ave NW and NW Market Street.
- **Strategy HCT 11.5:** Conduct outreach to corridor neighborhoods to discuss corridor design options and tradeoffs.
- **Strategy HCT 11.6:** Continue to operate South Lake Union streetcar service to Fred Hutchinson and extend this service to the existing International District Station. This would provide improved headways on the South Lake Union to South Downtown segment.
- **Strategy HCT 11.7:** Increase station spacing on Westlake between Valley and Westlake Center and add traffic signal priority to reduce travel times. Extend platforms to accommodate 2-car trains.
- **Strategy HCT 11.8:** Design the downtown segment between Westlake and King Street/International District hubs to maximize travel speeds, increasing the value of the line as fast inter-neighborhood transit service and an effective connector between major downtown multimodal hubs.
- **Strategy HCT 11.9:** Study in detail options for crossing the Ship Canal, which could include various design and operational alternatives for use of the existing Fremont Bridge (likely first phase), rebuilding the existing Fremont Bridge to accommodate all modes, and the development of a new high bridge to cross the Ship Canal (likely in the vicinity of 3rd Avenue W).
- **Strategy HCT 11.10:** Study in detail the impacts and benefits of various design options for rapid streetcar service on 4th and 5th Avenues, including various two-way and couplet designs, detailed bicycle facility design, replacement of any lost bicycle capacity, bicycle crossing safety, and transit reliability impacts of traffic chokepoints, and tradeoffs between mixed traffic and dedicated operations.
- **Strategy HCT 11.11:** Conduct traffic analysis of various right-of-way configurations in corridor, particularly on 4th and 5th Avenues in downtown, at the intersection of Nickerson and Fremont, north of the Fremont Bridge, and on Leary and Ballard Avenues.
- **Strategy HCT 11.12:** Develop a detailed operating plan that considers opportunities for replacement of existing corridor bus service and restructuring opportunities in northwest Seattle.
- **Strategy HCT 11.13:** Expand City priorities and programs for incentivizing and implementing transit-oriented neighborhood development along the corridor.

For all corridors, detailed evaluation of right-of-way design for each corridor segment would be required as a next phase of study.

FIGURE 3-7 CORRIDOR 6 PROJECT SHEET: CENTRAL AREA-FIRST HILL-DOWNTOWN

Corridor 6 Overview



Length: 2.1 miles

Major Stations: Colman Dock, 1st Ave, 3rd/4th Ave, Boren Ave, Broadway, 12th Ave, 18th Ave, 23rd Ave

Average Stop Spacing: 1,500 feet

Key Connections:

- Colman Dock
- 3rd Ave Transit Spine
- First Hill Streetcar
- Bus Square on 3rd Ave

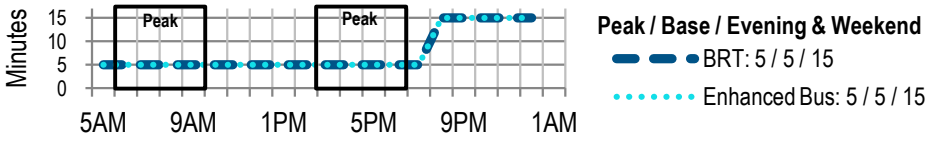
Potential Service Restructuring

- Route 11 (Madison Park via 19th) and Route 12 (Interlaken) are folded into this concept.
- Under both the BRT and Enhanced Bus options, the route splits east of 23rd with one leg using John/Thomas to 19th and Interlaken Park while the other leg continues on Madison to Madison Park.

Operating Plan

Headway by Mode

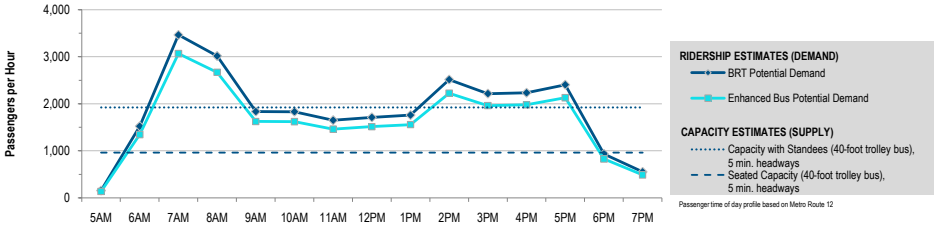
The operating plan for Corridor 6 assumes five minute peak and off-peak headways for both BRT and enhanced bus options, given the vehicle capacity analysis shown below.



Vehicle Capacity Requirements

The graphic at right shows a time-of-day profile of potential ridership demand for each mode compared to capacity (supply) for different vehicle-mode options. It illustrates where demand exceeds standing capacity.

Planned headways were adjusted based on the analysis. Longer, higher capacity vehicles are not feasible on Madison due to steep grades.



Preferred Mode

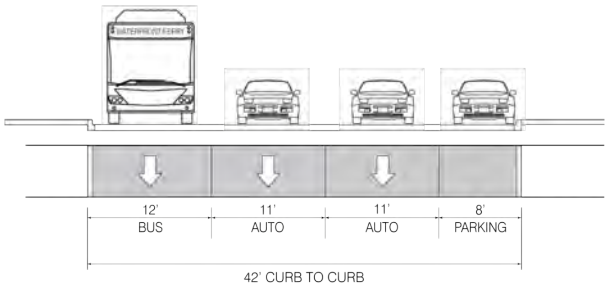
- BRT is the recommended mode for Corridor 6.

Implementation Actions

- Detailed implementation actions are described on page 3-14.

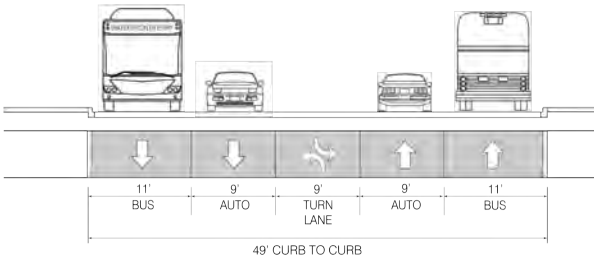
Sample Cross-Sections

Segment A



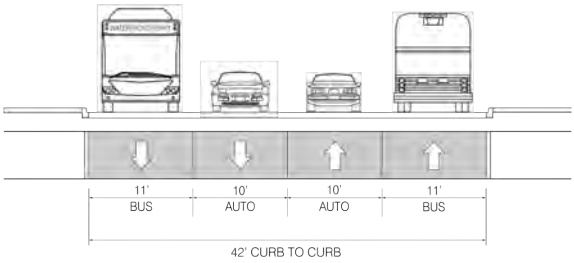
Madison/Marion, Alaskan Way to 6th: The Madison/Marion Couplet is a primary option; a 2-way Madison is also feasible (keeping 1-way general auto traffic). Parking removal would be required on Marion and Madison to provide dedicated lane operations. No substantial engineering issues are anticipated with shared-lane operation on Madison, but dedicating a travel lane for exclusive BRT could increase traffic delay for general purpose traffic.

Segment B



Madison, I-5 to Broadway: This segment features lanes as narrow as nine feet for cars. Frequent signalized cross-streets, alleys, and driveways are likely to keep speeds down. BRT is shown in curb lanes that could be used for business access as well as BRT, or if buses with left-side doors are used in conjunction with shared-lane operation, center platforms could also be used in this segment.

Segment C



Madison, Broadway to 23rd: The easternmost Madison segment is 42' curb-to-curb and has no left turn lanes, which places a premium on space for automobiles. Exclusive BRT could be harder to implement within the existing cross-section for this reason. The diagonal nature of Madison (which leads to many intersections and odd traffic movements) and the frequency of signals will keep speeds low in this segment.

Note: All cross sections are representative of a possible design option for a corridor segment. Right-of-way widths, utility constraints, and competing street use needs vary in each of the representative segments.

FIGURE 3-8 CORRIDOR 8 PROJECT SHEET: ROOSEVELT - UNIVERSITY DISTRICT - SOUTH LAKE UNION - DOWNTOWN

Corridor 8 Overview

Length: 6.1 miles

New Track Length: 7.6 single-track miles (rail)

Stations: Roosevelt Way/12th Ave NE - 65th St, Ravenna Blvd, 50th St, 45th St, Campus Pkway, Eastlake Ave E - Fuhrman Ave, Lynn St, Aloha St; Westlake Ave - Mercer St, Denny Way, Westlake Hub, 4th/5th Ave - Union/University St, Madision/Marison St, James St, King Street Hub

Average Stop Spacing: 1,700 feet

Key Connections:

- King Street Hub
- Financial District Station

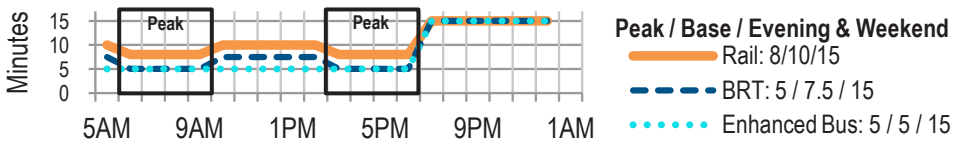
Potential Service Restructuring

- The SLU Streetcar would be folded into the Rapid Streetcar concept.
- Route 70 would be discontinued under all mode options.
- For all modes, Routes 66/67 would operate every 15 minutes throughout the day between UW and Northgate and Route 66 would be converted into Route 67 trips to better serve campus.

Operating Plan

Headway by Mode

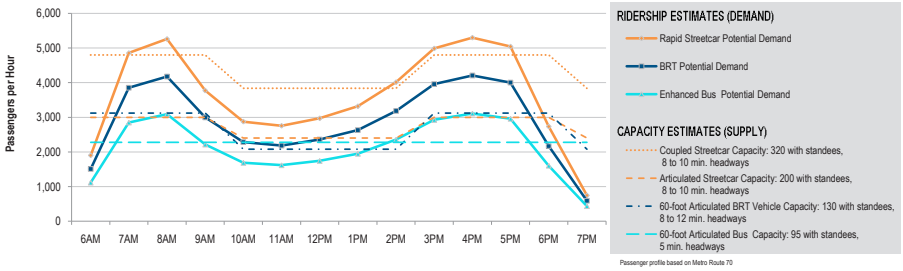
The operating plan for Corridor 8 assumes eight minute peak headways for rail, but five minute headways for bus options, given the vehicle capacity analysis shown below. 7.5 minute off-peak headways are assumed for the BRT option and five minutes for the enhanced bus, compared to 10 minutes for rail.



Vehicle Capacity Requirements

The graphic at right shows a time-of-day profile of potential ridership demand for each mode compared to capacity (supply) for different vehicle-mode options. It illustrates where demand exceeds standing capacity.

Planned headways were adjusted based on the analysis, which suggests higher capacity rail vehicles (coupled or articulated streetcars) will be required.



Preferred Mode

- Rail is the recommended mode for Corridor 8, based on the vehicle capacity needs illustrated in the chart above.

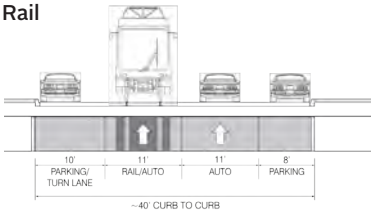
Implementation Actions

- An alternatives analysis (AA) process would be required to secure federal funding for the corridor and analyze alternative alignment options.
- Detailed implementation actions are described on page 3-14.

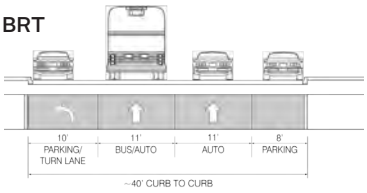
Sample Cross-Sections

Segment A

Rail



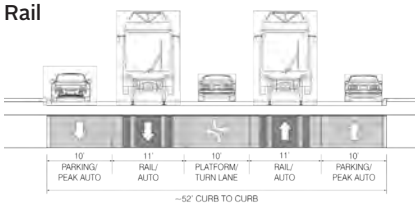
BRT



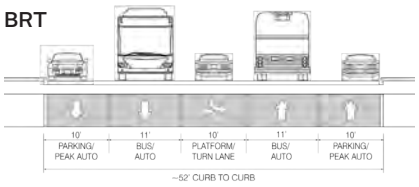
Roosevelt/11th-12th Couplet: Rail could operate in mixed traffic or a dedicated lane. Sound Transit 65th Street LINK LRT station is along 12th, straddling 66th Street, so the Corridor 8 alignment would serve it best by turning around on 66th Street with a terminal station on 66th.

Segment B

Rail



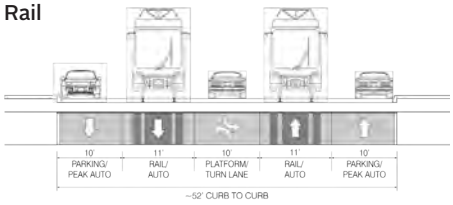
BRT



University Bridge: University Bridge is not expected to have the same traffic congestion issues as Fremont, so a basic retrofit to place rail tracks on the inside lanes is recommended.

Segment C

Rail



BRT

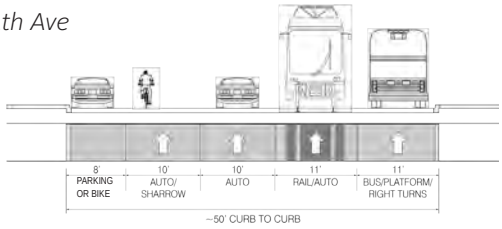
Operates in exclusive lanes on Fairview Ave and Virginia St/Stewart St

Fairview/Eastlake Ave. E: Between the existing SLU terminus and the University Bridge, Fairview and Eastlake are consistently 5 lanes wide, and the center-platform/center station configuration should work well. Transit could operate in mixed traffic or a dedicated lane. Few issues are anticipated assuming current peak-direction parking restrictions on Eastlake are continued.

Segment D1

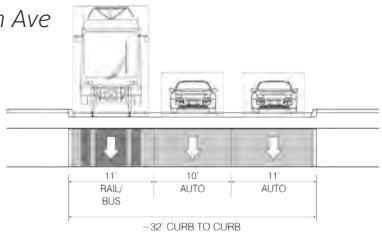
Rail

4th Ave



4th Avenue: Rail operates in two eastern lanes using a "weave" pattern to allow curb stations and right turn movements for traffic.

5th Ave

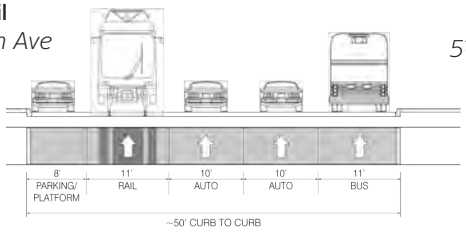


5th Avenue: Rail operates in western lane with buses.

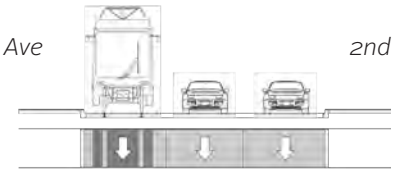
Segment D2

Rail

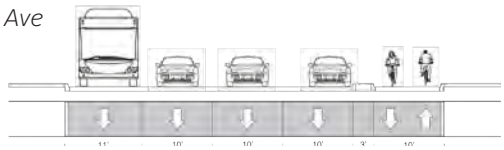
4th Ave



5th Ave



2nd Ave



BRT Operates in exclusive lanes on 3rd Avenue

4th Avenue: Rail operates in western lane to reduce conflicts with regional bus traffic.

2nd Avenue: Two-way cycle track could be evaluated to mitigate loss of bike lane segments on 4th Ave.

Note: All cross sections are representative of a possible design option for a corridor segment. Right-of-way widths, utility constraints, and competing street use needs vary in each of the representative segments.

FIGURE 3-9 CORRIDOR 11 PROJECT SHEET: LOYAL HEIGHTS-BALLARD-FREMONT-SOUTH LAKE UNION-DOWNTOWN

Corridor 11 Overview

Length: 7.0 miles

New Track Length: 10.6 single-track miles (rail)

Stations: 24th Ave NW - NW 65TH St, Leary/Ballard Ave - NW Market St, 15th Ave NW, 8th Ave NW, 3rd Ave NW, Fremont Ave N, Westlake Ave N - Nickerson St, Galer St, Mercer St, Denny Way, Westlake Hub, 4th/5th Ave - Union/University St, Madision/Marison St, James St, King Street Hub

Average Stop Spacing: 2,400 feet

Key Connections:

- Pioneer Square Station
- Westlake Hub
- King Street Hub
- Financial District Station

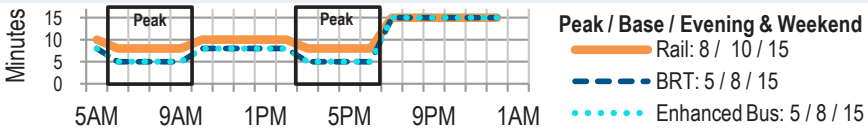
Potential Service Restructuring

- **Streetcar and BRT options:** Route 17 would operate on Dexter between Nickerson and downtown Seattle, replacing Route 28 in that segment.
- **Enhanced Bus option:** Route 17 would remain unchanged.
- **All Options:** Route 28 truncated to only serve areas north of the 45th/Leary stop.

Operating Plan

Headway by Mode

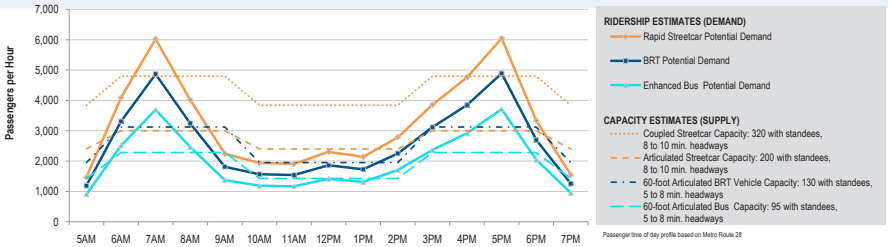
The operating plan for Corridor 11 assumes eight minute peak headways for rail, but five minute headways for bus options, given the vehicle capacity analysis shown below. Eight minute off-peak headways are assumed for the bus options, compared to ten minutes for rail.



Vehicle Capacity Requirements

The graphic at right shows a time-of-day profile of potential ridership demand for each mode compared to capacity (supply) for different vehicle-mode options. It illustrates where demand exceeds standing capacity.

Planned headways were adjusted based on the analysis, which suggests higher capacity rail vehicles (coupled or articulated streetcars) will be required.



Preferred Mode

- Rail is the recommended mode for Corridor 11, based on the vehicle capacity needs illustrated in the chart above.

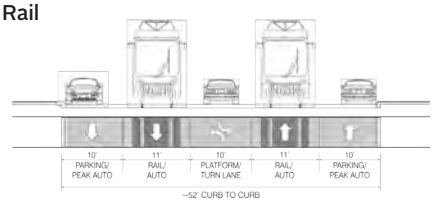
Implementation Actions

- Coordinate with Sound Transit (ST) to conduct a planning study to identify transit mode and alignment alternatives for this corridor, A potential rail extension to Ballard is included in the ST long-range plan and, if the ST Board adopts such an extension in a future system plan, ST has the exclusive statutory authority to develop and operate that extension.
- Detailed implementation actions are described on page 3-15.

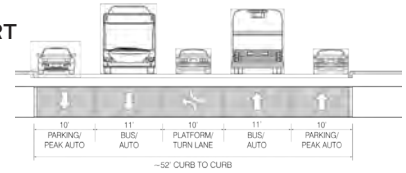
Sample Cross-Sections

Segment A

Rail



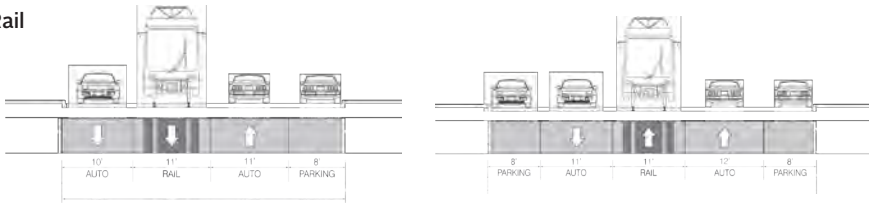
BRT



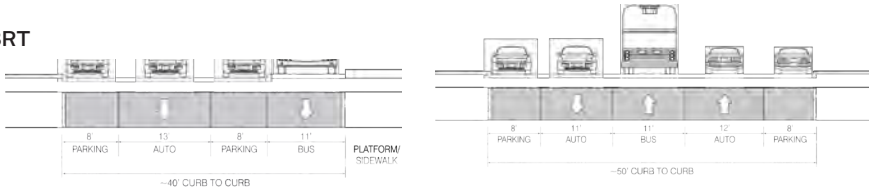
24th Avenue NW: This neighborhood collector is low-volume and has a 3-lane section with bike lanes and parking on both sides. Adding rail to the auto lanes is not expected to have a substantial impact, but the center platform station in the vicinity of 64th Street could benefit from parking removal to allow cars to pass stopped transit vehicles.

Segment B *Ballard Ave* *Leary Ave*

Rail



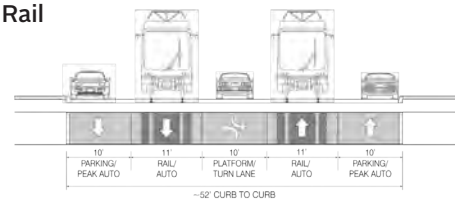
BRT



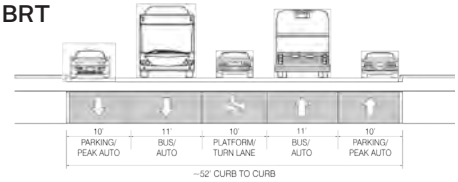
Ballard/Leary Couplet: Traffic on Ballard Avenue and Leary Way would remain 2-way (with the exception of the northernmost block of Ballard Ave, which is one-way just S. of Market); rail would operate a 1-way couplet. There are no signals and few traffic impacts would be expected. Signalization/sequencing for rail on the short segment of Market between Leary Avenue and 24th Ave. NW would require further analysis.

Segment C

Rail



BRT

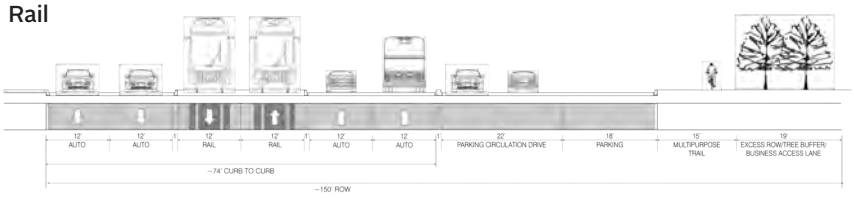


Fremont to 15th Avenue: The Fremont bridge can accommodate a streetcar in mixed traffic. There are several alternatives to simply adding streetcar tracks to the existing bridge, including replacing the Fremont Bridge with a wider span, adding a second adjacent span, or continuing the streetcar line to the west on Nickerson and adding a new transit and non-motorized bridge near Seattle Pacific University. The cost of a new bridge is not likely to be offset by substantial travel time savings associated with either an exclusive crossing or the alternative Nickerson alignment; however, it would provide benefits for bikes, pedestrians, and buses.

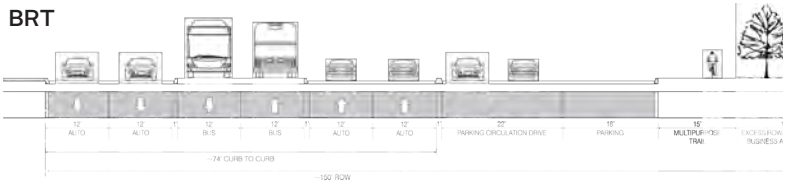
36th Avenue NW and Leary: Center-running/ center platform on 36th, Leary Way, and potentially Nickerson are all straightforward.

Segment D

Rail



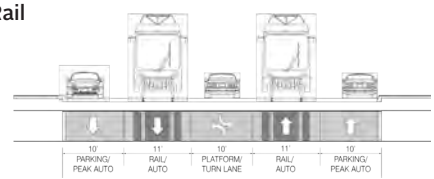
BRT



Westlake, Valley to Nickerson: Westlake has very wide ROW in this segment, and could support an exclusive guideway configuration to optimize safety, speed/ reliability and traffic operations. Redesigning the public space east of the current Westlake Alignment (mostly parking) would provide sufficient space for a rail guideway without sacrificing the traffic capacity on Westlake. There is opportunity for a joint multi-use path project, along with numerous possible ROW configurations.

Segment E

Rail



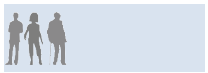
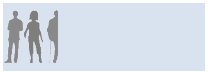
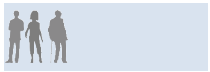
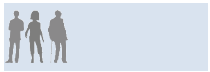
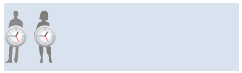
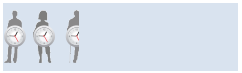
BRT

Operates in exclusive lanes on Aurora Avenue,Wall St / Battery St, and 3rd Avenue

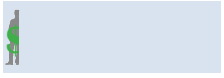
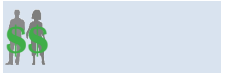
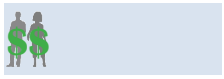
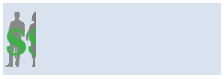
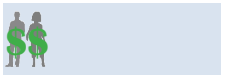
Westlake: This segment would operate in the path of the existing SLU streetcar and would be double tracked. This could use a new center median alignment as shown below (preferred) or utilize the existing southbound track with a new northbound track on the eastern curb. Terry track could be maintained for the SLU streetcar.

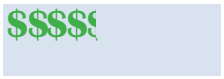
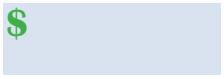
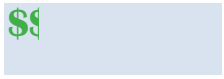
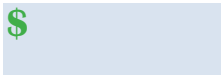
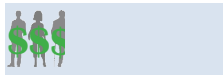
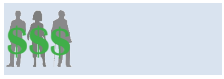
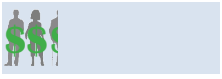
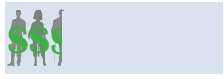
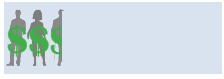
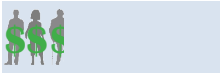
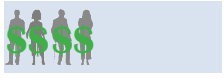
Note: All cross sections are representative of a possible design option for a corridor segment. Right-of-way widths, utility constraints, and competing street use needs vary in each of the representative segments.

FIGURE 3-10 HCT CORRIDOR EVALUATION RESULTS

	Corridor 6: Madison	Corridor 8: Eastlake	Corridor 11: Ballard
Weekday riders (2030) and Net New Riders			
Ridership potential in 2030 is based on service improvements and projected land use changes. • Weekday riders (2030) estimated from Fall 2009 stop/route-level boardings assigned to each corridor. Center City ridership potential based on comparable urban rail circulators (Portland, Seattle SLU Streetcar, Tacoma, Memphis, and San Francisco).[1] • Net new weekday riders equal 2030 estimate of potential ridership minus current (2009) ridership estimate for the corridor.			
Rail	**N/A**	 **up to 25,000 Riders (Net New Riders - 10,700 Riders)**	 **up to 26,000 Riders (Net New Riders - 12,500 Riders)**
BRT	 **up to 14,000 Riders (Net New Riders - 6,200 Riders)**	 **up to 20,000 Riders (Net New Riders - 7,500 Riders)**	 **up to 21,000 Riders (Net New Riders - 9,500 Riders)**
Enhanced Bus	 **up to 12,500 Riders (Net New Riders - 4,500 Riders)**	 **up to 15,000 Riders (Net New Riders - 4,300 Riders)**	 **up to 16,000 Riders (Net New Riders -6,400 Riders)**
Productivity (Weekday Riders per Revenue Hour)			
Efficiency with which provided transit capacity is utilized. • Productivity equals weekday ridership divided by weekday revenue hours. A "revenue hour" includes time when a transit vehicle is available to carry passengers. It includes layover time, but excludes "deadhead" time such as when a bus travels to the start of a route. • Weekday hours of revenue service calculated through development of corridor-specific operating plan.			
Rail	**N/A**	 **170 Riders/Hour**	 **175 Riders/Hour**
BRT	 **125 Riders/Hour**	 **95 Riders/Hour**	 **105 Riders/Hour**
Enhanced Bus	 **75 Riders/Hour**	 **50 Riders/Hour**	 **65 Riders / Hour**

Notes: Additional detail on evaluation results and methodology is provided in Appendix B. (1) It was assumed that BRT would realize 75% of the full ridership potential and that enhanced bus service would realize 50% of the full ridership potential.

	Corridor 6: Madison	Corridor 8: Eastlake	Corridor 11: Ballard
Annual Operating Cost (Operating Cost per Boarding Ride)			
Cost to deliver service on the proposed line, annually and for a single boarding ride. • Annual operating cost based on the number of hours of revenue service, calculated through development of corridor-specific operating plan, multiplied by the 2011 operating cost for each mode: Bus: $135, Electric Trolley: $129, Rapid Streetcar: $187. • Operating cost per boarding ride is the cost to deliver a single boarding ride: weekday operating cost/weekday boardings.			
Rail	**N/A**	 **$8.9 million ($1.10)**	 **$9.1 million ($1.10)**
BRT	 **$4.6 million ($1.05)**	 **$8.1 million ($1.35)**	 **$8.0 million ($1.25)**
Enhanced Bus	 **$6.1 million ($1.70)**	 **$11.4 million ($2.65)**	 **$10.4 million ($2.15)**
Net Operating Cost per Net New Ride (Accounts for Service Restructuring and Consolidation Opportunities)			
Operating cost to deliver a new boarding ride considering potential cost savings. • Calculated as planned weekday operating cost minus weekday operating cost savings, divided by the number of net new boarding rides projected for 2030. • Analysis of cost savings is conceptual; actual reinvestment of savings from restructuring would be based on the Metro Transit Strategic Plan for Public Transportation.			
Rail	**N/A**	 **$0.65**	 **$1.85**
BRT	 **$2.25**	 **$1.60**	 **$2.20**
Enhanced Bus	 **$4.00**	 **$5.65**	 **$4.55**

	Corridor 6: Madison	Corridor 8: Eastlake	Corridor 11: Ballard
Total Capital Costs (and Cost per Mile)			
Cost to construct the project, including planning and engineering, vehicles, complementary infrastructure/ roadway improvements, and contingency costs. • Rail mode would use a "rapid streetcar" vehicle larger than the South Lake Union or First Hill streetcar vehicles. BRT mode would use electric trolley buses. Enhanced bus assumes new vehicle fleet.			
Rail	**N/A**	 **$278 million ($46.0 million per mile)**	 **$335 million ($47.9 million per mile)**
BRT	 **$87 million ($42.2 million per mile)**	 **$88 million ($14.6 million per mile)**	 **$132 million ($18.9 million per mile)**
Enhanced Bus	 **$20 million ($9.8 million per mile)**	 **$28 million ($4.6 million per mile)**	 **$18 million ($2.5 million per mile)**
Annualized Cost per Rider (Operating and Capital)			
Value of investment over time, including cost of operation and annualized cost of capital investment, fleet replacement, and maintenance. • Annualized operating and capital cost per rider equals annual operating cost plus annualized capital costs divided by annual boarding rides. • Operating cost adjusted for inflation by 3% annually. Infrastructure life held constant. Assumed vehicle life: Streetcar: 30 years, Electric Trolley: 15 years, Bus: 12 years.			
Rail	**N/A**	 **$2.75**	 **$2.95**
BRT	 **$2.40**	 **$2.55**	 **$2.60**
Enhanced Bus	 **$2.65**	 **$4.10**	 **$3.45**

	Corridor 6: Madison	Corridor 8: Eastlake	Corridor 11: Ballard
End-to-End Travel Time Savings (Average Savings per Ride, including In- and Out-of-Vehicle Time)			
In-vehicle travel time savings (compared to current service) for a passenger riding between two terminus stations. • Projected 2030 corridor travel time with current road design - estimated travel times under each mode, alignment, and design.			
Average in-vehicle travel time savings plus out-of-vehicle waiting time savings. • In vehicle travel time savings average estimated length of passenger ride + out of vehicle time savings (reduced wait time resulting from improved frequency). Note: applies to comparing modes, but not corridors.			
Rail	**N/A**	**15 Minutes (average 9 minutes)**	**11 Minutes (average 8 minutes)**
BRT	**8 Minutes (average 8 minutes)**	**15 Minutes (average 10 minutes)**	**11 Minutes (average 9 minutes)**
Enhanced Bus	**1 Minutes (average 3 minutes)**	**2 Minutes (average 3 minutes)**	**2 Minutes (average 3 minutes)**
Annual GhG Savings			
Annual reduction in greenhouse gas emission equivalents from reduced vehicle miles traveled and net change in transit emissions. Emissions savings from reduced VMT based on an assumed rate of displaced light duty vehicle trips per new transit rider, average trip length by corridor, average fuel economy, and resulting fuel savings. Emissions savings from net change in transit emissions equals planned service minus existing service (based on conceptual operating plans). Emissions factors applied based on mode (diesel bus, electric trolley bus, and streetcar).			
Rail	← Emissions Decrease Increase → **N/A**	← Emissions Decrease Increase → **-1315** **-250**	← Emissions Decrease Increase → **-1764** **-223**
BRT	**-258** **+11**	**-918** **-267**	**-1338** **-245**
Enhanced Bus	**-189** **+11** **MT CO2e**	**-522** **-266** **MT CO2e**	**-900** **+1315** **MT CO2e**

Investments in priority bus corridors provide faster travel speeds, a more comfortable wait, and easier connections to other transit lines.

Image from Nelson\Nygaard

PRIORITY BUS CORRIDORS

MAXIMIZING INVESTMENTS IN PRIORITY BUS CORRIDORS

Priority bus corridors represent the most immediate opportunity for the City to make dramatic and meaningful improvements in development of the Frequent Transit Network. These corridors were not selected for detailed analysis for high capacity transit modes, but they complement HCT corridor investments and merit both capital and service-quality improvements. This chapter focuses on capital investments in Priority Bus Corridors while Chapter 4 discusses the service aspect.

Value of Investments in Speed and Reliability

Priority bus corridors are the cornerstone of Seattle's transit system. Investing in speed and reliability improvements and dramatically improved passenger amenities and facilities in these corridors yields not only direct benefits for passengers and transit operators, but complements HCT investments. Benefits include:

- **Travel time savings for riders:** Implementing corridor improvements that mitigate the impact of congestion on buses and make them more reliable leads to transit that is more competitive with the automobile and provides a heightened passenger experience on- and off-vehicle.
- **Reduced impacts of delay on transit operating and capital costs:** Travel time savings can improve transit's bottom line if the time savings avoid the need to add runs and purchase additional vehicles to keep up with delay caused by increased traffic congestion.
- **Improved access to local and regional HCT:** The bus network facilitates access to high capacity service in Seattle and connections to regional destinations. Bus corridor improvements are also investments in future potential HCT corridors.

Service Investments in Priority Bus Corridors

The Frequent Transit Network describes the service characteristics to support capital investments in Priority Bus Corridors. Developing a Frequent Transit Network aligned with capital investments in Priority Bus Corridors will maximize the impact of the capital investments in the corridors. Key service attributes of the FTN include:

- **Convenience:** Frequent transit service, operating every 15 minutes or better, 18-24 hours per day, allows passengers to take a bus without consulting a schedule and enables choices to increase transit use and/or reduce dependence on a car.
- **Branding:** Marketing the frequent transit network as a distinct service offering ensures that passengers connect high service quality with all service elements, including routes, vehicles, stops, and printed and electronic transit information.
- **Legibility:** A branded FTN provides a high-quality core route system with wider coverage than rail and other high-capacity service.

Chapter 4 describes the service attributes of the FTN in more detail and also provides information about branding.

The TMP Briefing Book, pages 5-27 to 5-29, provides additional discussion and examples of branding elements, including frequent service networks in other cities.

INVESTMENT PHASING PRINCIPLES

Given limited resources for transit investments for the City and its partners, transit improvements will need to be implemented in phases. Principles for making investment phasing decisions include:

- **Leverage:** Consider the ability for a corridor project to complement and/or enhance projects currently underway or planned by the City's partners, e.g., Link and RapidRide corridors.
- **Demand:** Invest where need is greatest. The corridor evaluation process provides detailed modeling of potential ridership and related benefits.
- **Anticipated Growth:** Invest in transit where the greatest growth is planned, allowing developers to make design and construction decisions based on the knowledge that the neighborhood will have high-quality, permanent transit infrastructure.
- **User Benefits:** Investments that lead to significant travel time benefits will attract the most new riders and merit priority.
- **Grant Opportunities:** Include partnership and grant funding opportunities as important inputs when developing project implementation schedules.

These priorities are implicit in the TMP recommendations and should serve as guidelines as the TMP is used to make decisions about project priority.

BUS IMPACTS ON PAVEMENT

The weight and repetitious patterns of transit vehicles can cause significant wear on asphalt and Portland cement pavement. This is particularly true where bus routes are consistently heavily loaded (exceeding 150% of loaded capacity) and/or on streets that have thin pavement layers. A study* conducted by the University of Washington and the City of Seattle determined that a fully loaded Metro Breda bus (now retired dual-mode buses used in the Downtown Seattle Transit Tunnel) exceeded legal axle loads and would exert four times as much damage on pavement as a similar bus that met legal axle loads. However, these impacts accounted for less than a quarter of pavement damage on a given street. SDOT should consider the following to minimize impacts of transit on street pavement conditions:

Image from SDOT

- Coordinate with transit providers to ensure that bus acquisition standards meet legal axle loads and/or minimize pavement impacts
- Work with Metro to provide frequent service that better distributes passenger loads across buses in high demand corridors, thereby reducing pavement impacts
- Develop thick and durable pavement designs for FTN and high volume bus corridors
- Use Portland Cement Concrete (PCC) paving materials (or other highly durable materials) on transit streets or at high volume transit stops/stations
- On asphalt streets, install PCC pads at bus pullouts or curb stops that have high bus volumes

* Chinn, Esther and De Bolt, Peter. Washington State Transportation Commission, Heavy Vehicles vs. Urban Pavements, 1993.

PRIORITY BUS CORRIDORS

Figure 3-11 lists the priority bus corridors along with planned RapidRide service. The corridors are illustrated in Figure 3-12.

FIGURE 3-11 PRIORITY BUS CORRIDOR SUMMARY

Corridor	Description	Planned RapidRide Corridors Service
1	West Seattle - Downtown via Fauntleroy/California	RapidRide C-Line
2	Burien TC - Downtown via Delridge	
3	Othello – U-District via Beacon Ave and Broadway	
4	Mount Baker – Downtown via Rainier Ave	
5	Rainier Valley – U-District via Rainier Ave and 23rd Ave	
7	Queen Anne/Magnolia – South Lake Union – Capitol Hill via Denny	
9	Aurora Village to Downtown via SR 99	Rapid Ride E-Line
10	Northgate – Ballard – Downtown	Rapid Ride D-Line
12	Lake City – Northgate – U District	
13	Ballard – U District - Laurelhurst via Market St and 45th St	
14	Crown Hill – Greenlake – U District	
15	Phinney Ridge – Greenwood – Broadview	

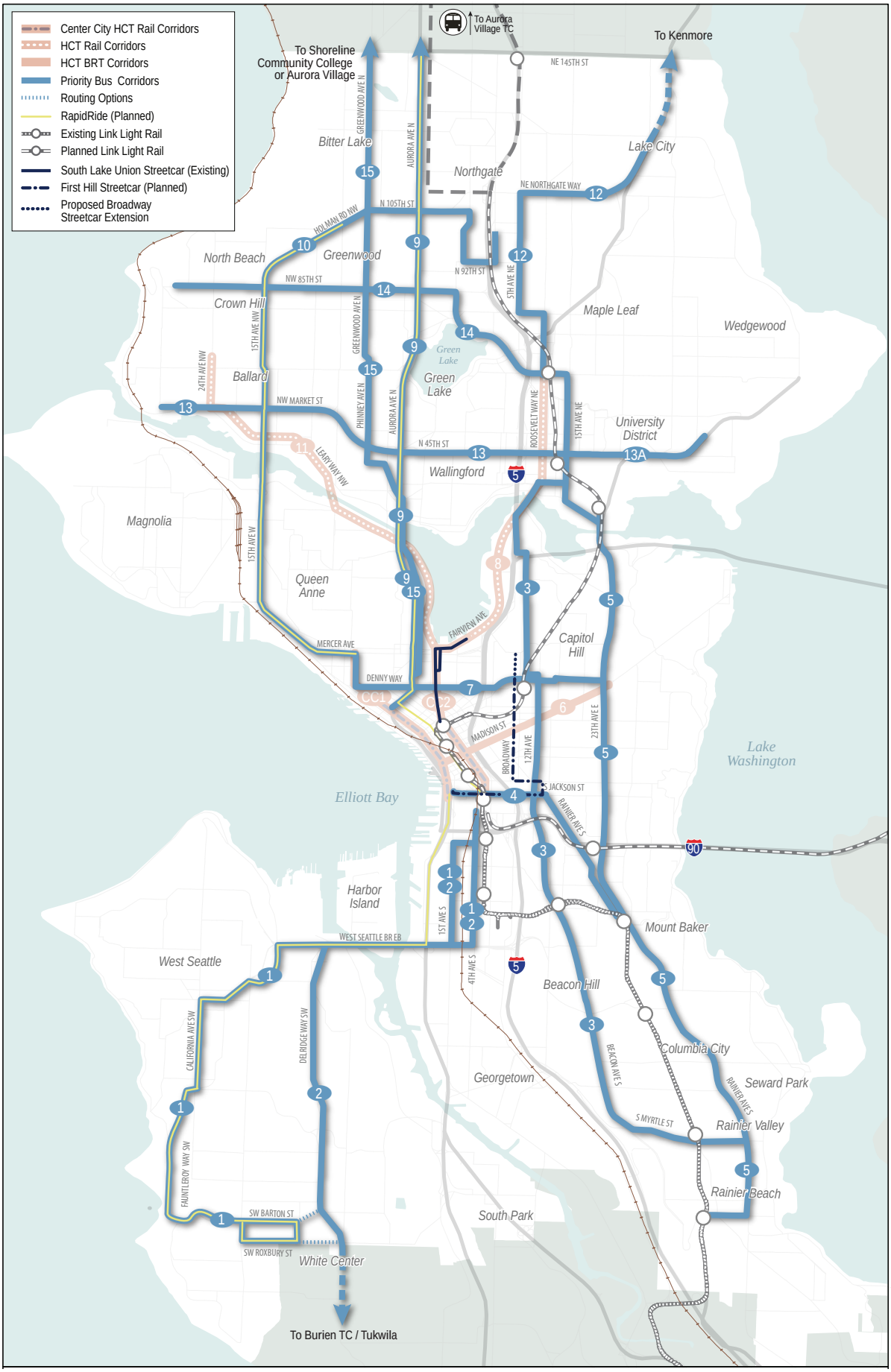
Note: Does not include Corridors 6, 8, and 11, which were evaluated for high-capacity modes (see High Capacity Transit section).

IMPLEMENTATION STRATEGIES

STRATEGY AREA: IMPLEMENTING PRIORITY BUS CORRIDOR IMPROVEMENTS

- **Strategy PBC 1:** Develop a coordinated approach to corridor development that integrates other modal plans (see more detailed recommendation in Mobility Corridors section of Chapter 5).
- **Strategy PBC 2:** Set targets to design and implement three corridors every two years starting in 2012.
- **Strategy PBC 3:** Focus early investments in completing RapidRide Corridors (Corridors 1, 9, and 10) and Market/45th Street and Rainier/Jackson improvements already underway by SDOT to include all additional TMP-recommended corridor design and access elements. Work with Metro to target completion by 2015.
- **Strategy PBC 4:** Target Corridor 5, Corridor 7, and Center City Priority Corridors as high priority corridors for development (see Figure 3-14).
- **Strategy PBC 5:** Focus next investments on high demand corridors that do not require major system restructuring (Corridors 2, 13, 14, 15).
- **Strategy PBC 6:** Share responsibility with Metro to continue to refine plans to reduce inefficiencies and reinvest operating funds to: 1) meet FTN service targets; 2) develop restructuring plans around North Link, RapidRide, and other higher capacity services; 3) refine TMP system design proposals; and 4) simplify downtown operations.

FIGURE 3-12 PRIORITY BUS CORRIDORS



BUILDING TRANSIT CORRIDORS - A TOOLBOX

This section provides an overview of a toolbox of corridor treatments and interventions that was developed to guide capital improvements in priority transit corridors. The toolbox was used in a planning-level assessment of improvement options for each of the priority bus corridors. Estimated travel time improvements were incorporated into revised ridership estimates.


Transit Signal Priority


Queue Jump Lanes

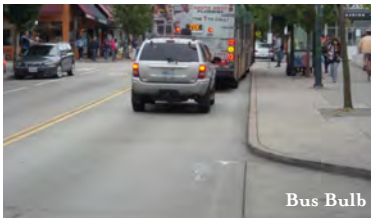
BAT Lanes


Transit Priority Streets


Bus-Bike Treatments

All images from Nelson\Nygaard

Treatment	Definition	Constraints	Effectiveness[1]
Roadway Treatments			
Transit signal priority (TSP)	At traffic signals, buses communicate with the traffic signal system to provide a green signal indication to an approaching bus. Delay for buses may be reduced at intersections as a result.	Less effective when signals are operating at capacity.	Up to 10% reduction in signal delay.
Queue Jump Lanes	At signalized intersections, a bus is provided with a lane, adjacent to general-purpose traffic, and an advanced green signal indication to bypass congested areas. Buses "jump" the queue of waiting cars.	Lane must be as long as the typical queues. TSP makes these much more effective, particularly if there is no far-side receiving lane. May increase pedestrian crossing times.	5-25% reduction in travel times at a signal.
Dedicated Bus Lanes (Business Access and Transit or BAT Lanes)	A lane is reserved for exclusive use by buses. It may also be used for general-purpose traffic right-turn movements onto cross streets and for access to adjacent properties. This treatment would speed bus travel times.	Conflicts with right-turn and delivery vehicles. Strong opposition from businesses that may lose on-street parking.	5-25% reduction in travel times.
Dedicated Bus Median Lanes	A median lane is reserved for exclusive use by buses. This treatment speeds bus travel times.	Conflicts with left-turn vehicles. Signalization challenges.	5-25% reduction in travel times.
Contra-flow lanes	A contra-flow bus lane is a dedicated lane of an otherwise one way street reversed for buses and other mass transit. It is typically used to get around bottle-necks or access limited access facilities.	Loss of roadway capacity. Pedestrian safety considerations. Signalization challenges.	Varies based on access needs.
Transit Priority Streets	A street that is dedicated to transit or is designed primarily as a transit corridor. Leading examples include 3rd Ave. in Seattle, the Portland (OR) Transit Mall, and Nicollet Mall or Marquette/2nd in Minneapolis.	Loss of roadway capacity. Limited number of streets in geographically constrained areas.	Highly effective strategy for moving high volumes of buses in urban centers. Effectiveness peaks at 80-100 buses per hour per lane.
Limited or time prohibited general public (GP) turning movements:	GP turning movements are restricted at all times or during peak periods. May be implemented with queue jump or dedicated bus curb lanes.	Impacts on other roadways from diversion of GP traffic/turning movements.	Highly effective means to implement peak period queue jump lanes or transit only lanes.
Innovative bus-bike treatments	Treatments to provide bicycles with safe routes along high-volume transit corridors, manage bicycle-transit vehicle interactions, and allow bicycles to share transit lanes. Examples include shared lane markings, colored pavement, and bicycle-only signals.	Highly contextual and must be considered within balance of person travel delay/benefit for specific street or corridor conditions.	Difficult to measure impacts on transit, but can reduce transit delay on busy bicycle corridors and improve bicycling experience.
Trolley Bus-Specific Treatments			
Electrification	Convert a diesel bus corridor to electric trolley buses by adding wire in missing segments.	Most cost-effective where overhead wire already exists on part of a route.	Effective in increasing use of zero-emissions electric fleet.
Enhanced Trolley Wire Switching	Allows an electric trolley bus route to more efficiently branch into two routes.	N/A	Effective in increasing use of zero-emissions electric fleet.
Trolley Passing Wire	Allows an electric trolley bus to operate limited stop service.	N/A	Effective in increasing use of zero-emissions electric fleet.


Bus Bulb


Boarding Island

Off Board Fare Payment

Treatment	Definition	Constraints	Effectiveness[1]
Stop Treatments			
Curb extensions/ Bus Bulbs/Boarding Platforms	Sidewalks are extended into the street so that buses would stop in the lane of traffic. This prevents buses from getting trapped by passing vehicles, unable to return to the flow of traffic. The delays from merging back into lane may be minimized as a result.	Only applicable where an on-street parking lane exists. Impacts to traffic flow must be taken into accounted.	Depends on traffic. 8 seconds per stop is the assumed.[2]
Boarding Islands	A transit access point constructed in a lane that allows buses to use the faster moving left-lane of a roadway. It also removes side friction caused by right-turning vehicles, parking maneuvers, and delivery vehicles.	Pedestrian safety and ADA access requirements. Effects on overall traffic due to taking an additional lane.	Varies based on access needs. At 5th & Jackson, it saves approximately 1 minute per run.
Level Boarding Platforms	A boarding platform that is level with the bus to enable easier and faster boarding, particularly for passengers with mobility impairments, using wheelchairs, or bringing a stroller on-board the bus.	Most applicable to BRT and rail systems where vehicle and platform design is standardized.	Varies depending on number of wheelchair and assisted boardings. Can provide significant time benefit.
Defined Platform Loading Locations	Defining the locations where doors will open allows passengers to wait in nearest proximity to their bus and can reduce dwell times.	May be most effective in a proof-of-payment system where passengers may board through any door.	Saves less than 1 second per boarding passenger.
Defined Bus Loading Positions	Defining the platform loading locations at a stop can reduce dwell times by allowing passengers to more quickly find/walk to their bus and ensure that a bus is correctly positioned to be able to depart before a bus in front of it.	Most effective with "platooned" bus arrivals (e.g., buses timed to leave a common origin point at the same time).	Effectiveness decreases as the number of loading locations at a stop increases.
Bus stop consolidation	Reducing the number of stops on a route, particularly where spacing is less than a stop every 3 blocks, can result in travel time savings.	ADA and elderly/disabled access. Grades must be accounted for in this.	2-20% of overall run time (4% in recent Line 28 consolidation), up to 75% of dwell time.
Off board fare payment	Fare payment typically delays the loading and unloading of buses, as only one door may be used. Off-board fare payment may speed boarding and allow full utilization of all doors.	Capital and O&M expense of off-board payment machines. Passenger safety at night.	Saves 1 second per boarding passenger.
Vehicle Treatments			
Low-floor, Wide-Door Vehicles	Low-floor vehicles (including in conjunction with level boarding platforms) allow passengers to board more quickly without climbing steps, particularly for passengers with mobility challenges. Wheelchair lifts on low-floor vehicles operate more quickly and with fewer mechanical problems. Wide-door vehicles allow large volumes of passengers boarding at a stop to enter and exit vehicles more efficiently.	Wide-door vehicles are most effective if implemented in conjunction with prepaid fare payment.	Varies depending on number of wheelchair and assisted boardings.
On-Vehicle Perimeter Seating	On heavily loaded routes, increases standing capacity, makes more efficient use of seating capacity, and allows passengers to exit the vehicle more quickly, reducing dwell times.	More appropriate for shorter-distance routes.	Varies with passenger loads.

Transit Toolbox Notes and Sources

1 The measures of effectiveness are derived from data found in the Transit Capacity Quality of Service Manual, unless a specific local measure is cited

2 King County Metro, Stop Spacing Program Description, 7/7/2011

Bus Corridor Project Summary Sheets

Corridor 1: West Seattle - Downtown

Corridor Length: 10.5 miles

Key Connections:

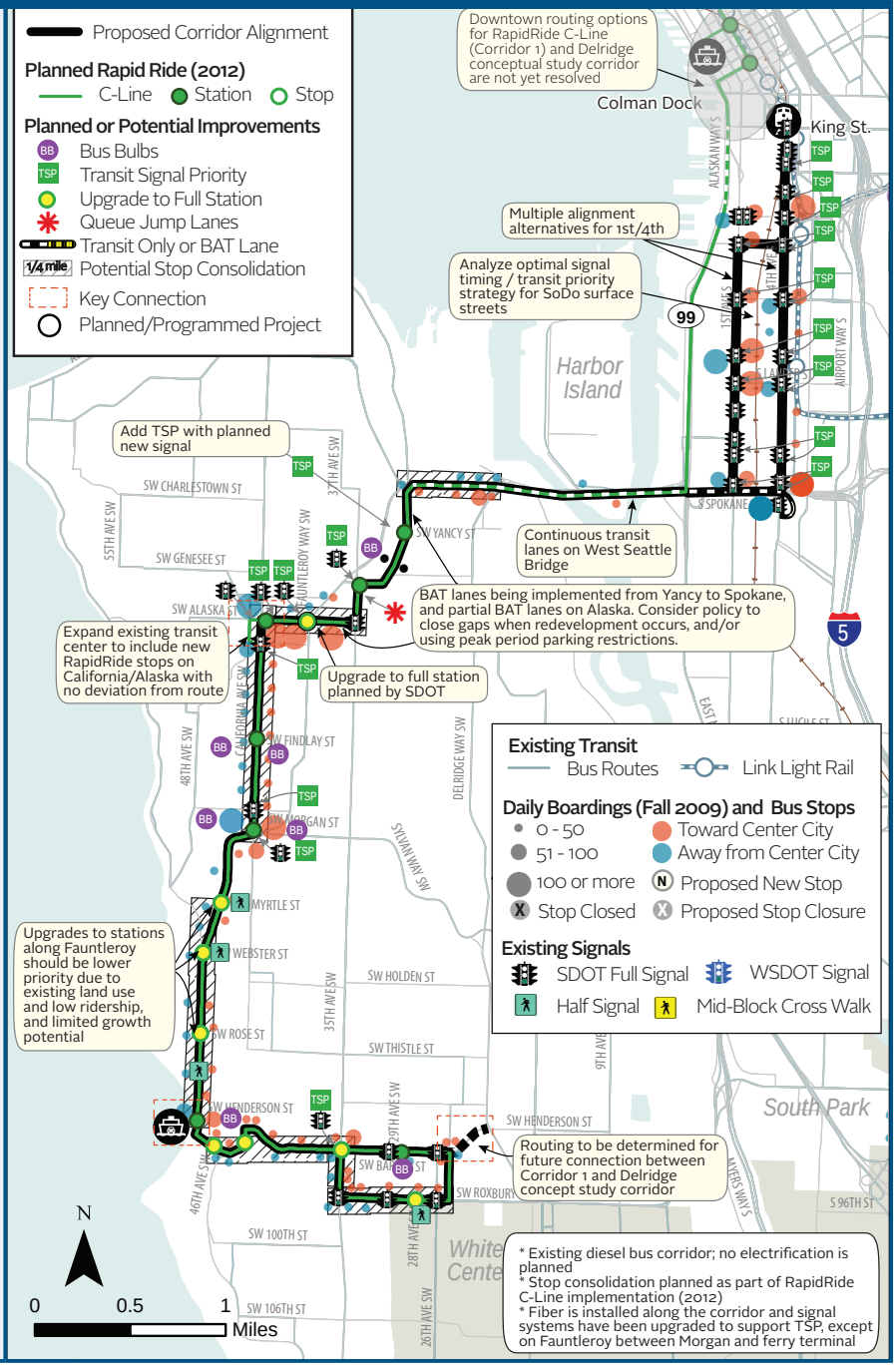
- King Street Hub
- Alaska Junction
- Fauntleroy Ferry Terminal
- Delridge RapidRide (Proposed)

Neighborhoods Served:

- White Center
- Fauntleroy
- West Seattle Junction
- SODO
- Downtown

Key Improvements

- Bus Bulbs
- Transit Lanes
- Station Upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 2: Burien - White Center - Delridge - Downtown Seattle

Corridor Length: 7.5 miles (within Seattle)

Key Connections:

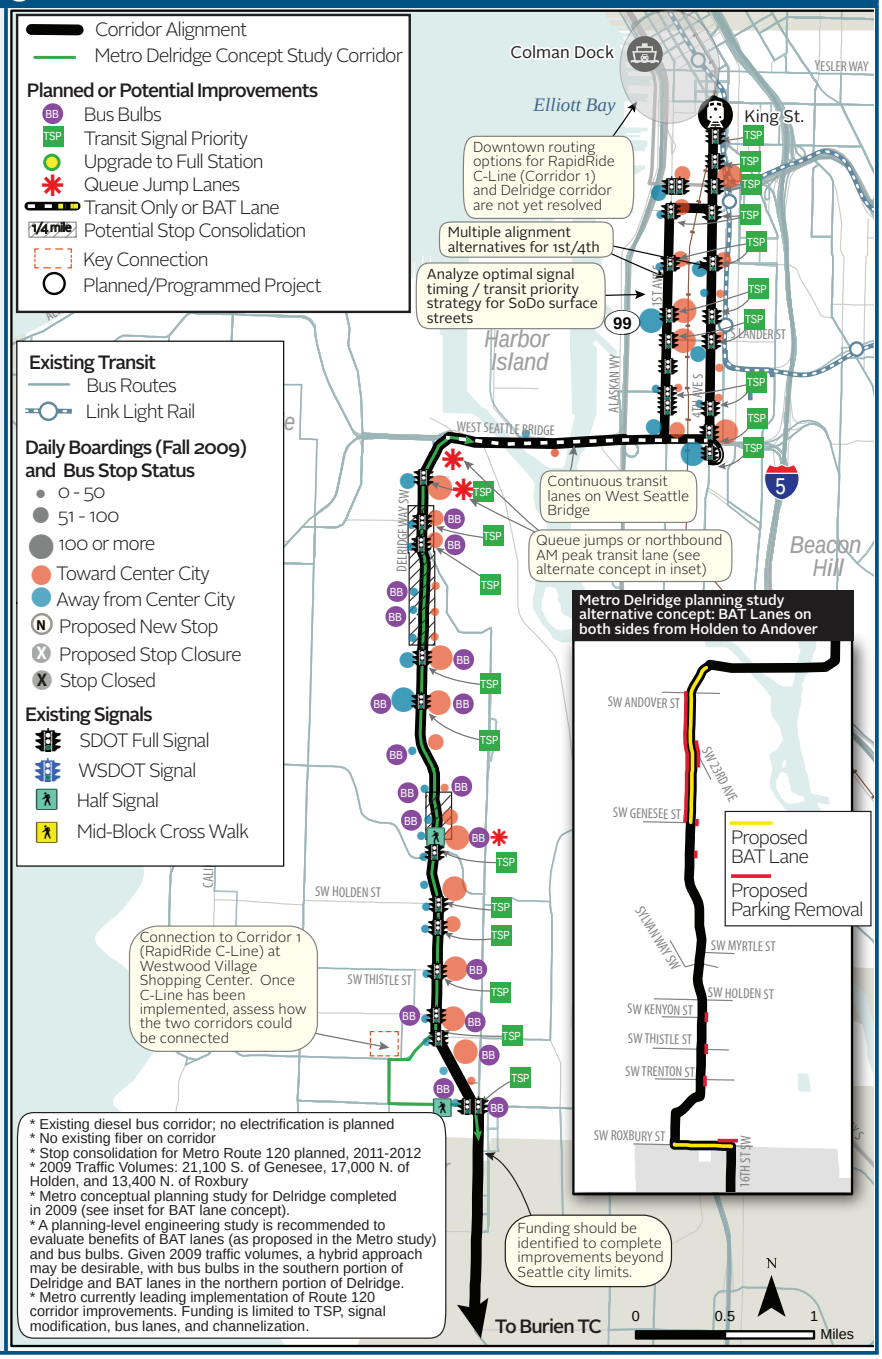
- King Street Hub
- RapidRide C-Line
- Burien Park & Ride

Neighborhoods Served:

- White Center
- Delridge
- SODO
- Downtown

Key Improvements

- Bus Bulbs
- Transit Lanes
- Station Upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 3: Othello – U-District via Beacon Ave, 12th Ave, and Broadway

Corridor Length: 10.4 miles

Key Connections:

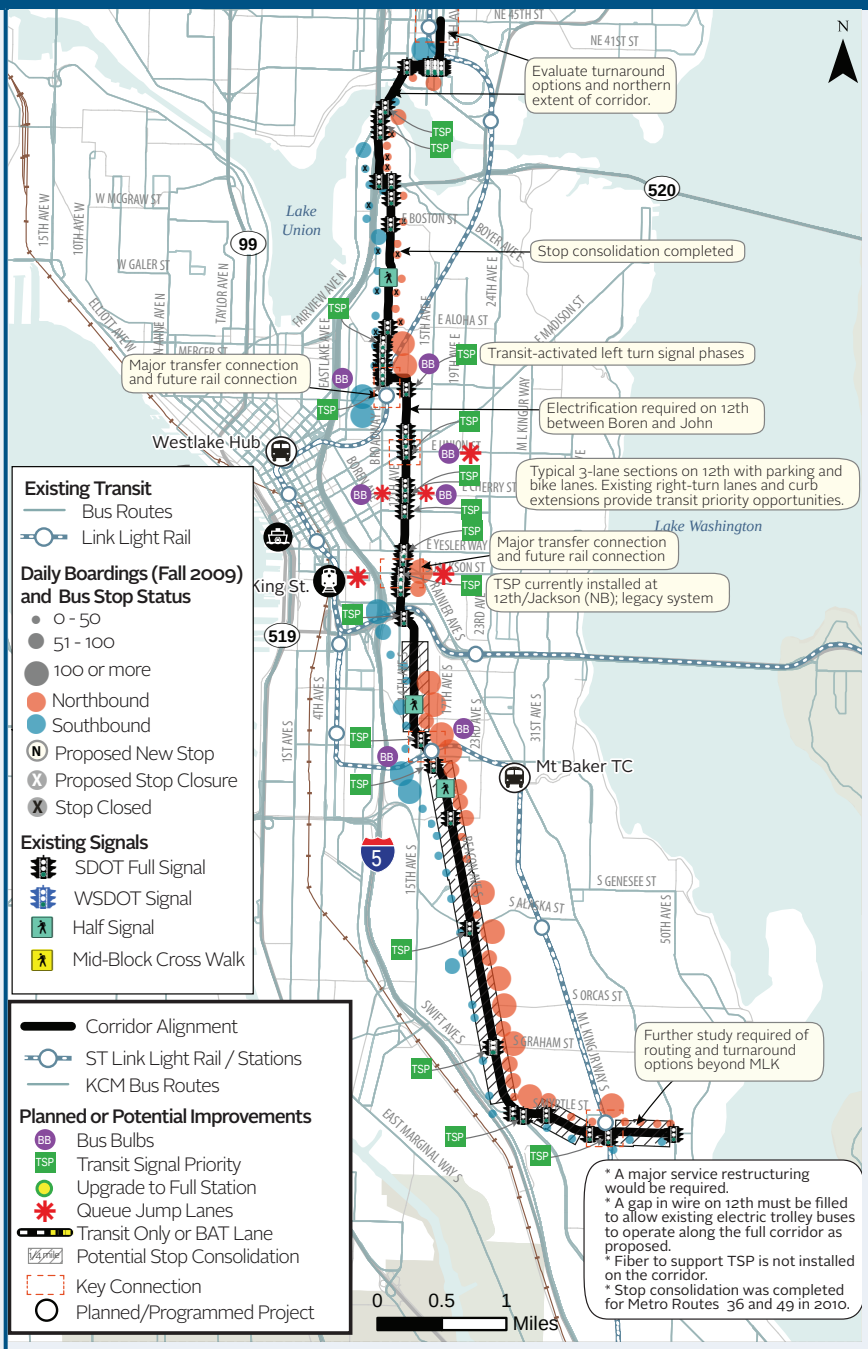
- University Link station (planned)
- Capitol Hill Link station (planned)
- Jackson Street: connections to Corridor 4 and other bus routes
- Beacon Hill Link station
- Othello Link station

Neighborhoods Served:

- University District
- Capitol Hill
- Central District (West)
- Downtown (East)
- Beacon Hill
- Rainier Beach

Key Improvements

- TSP (requires fiber installation)
- Electrification on 12th Avenue
- Bus Bulbs
- Station Upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 4: Mount Baker – Downtown via Rainier Ave

Corridor Length: 2.7 miles

Key Connections:

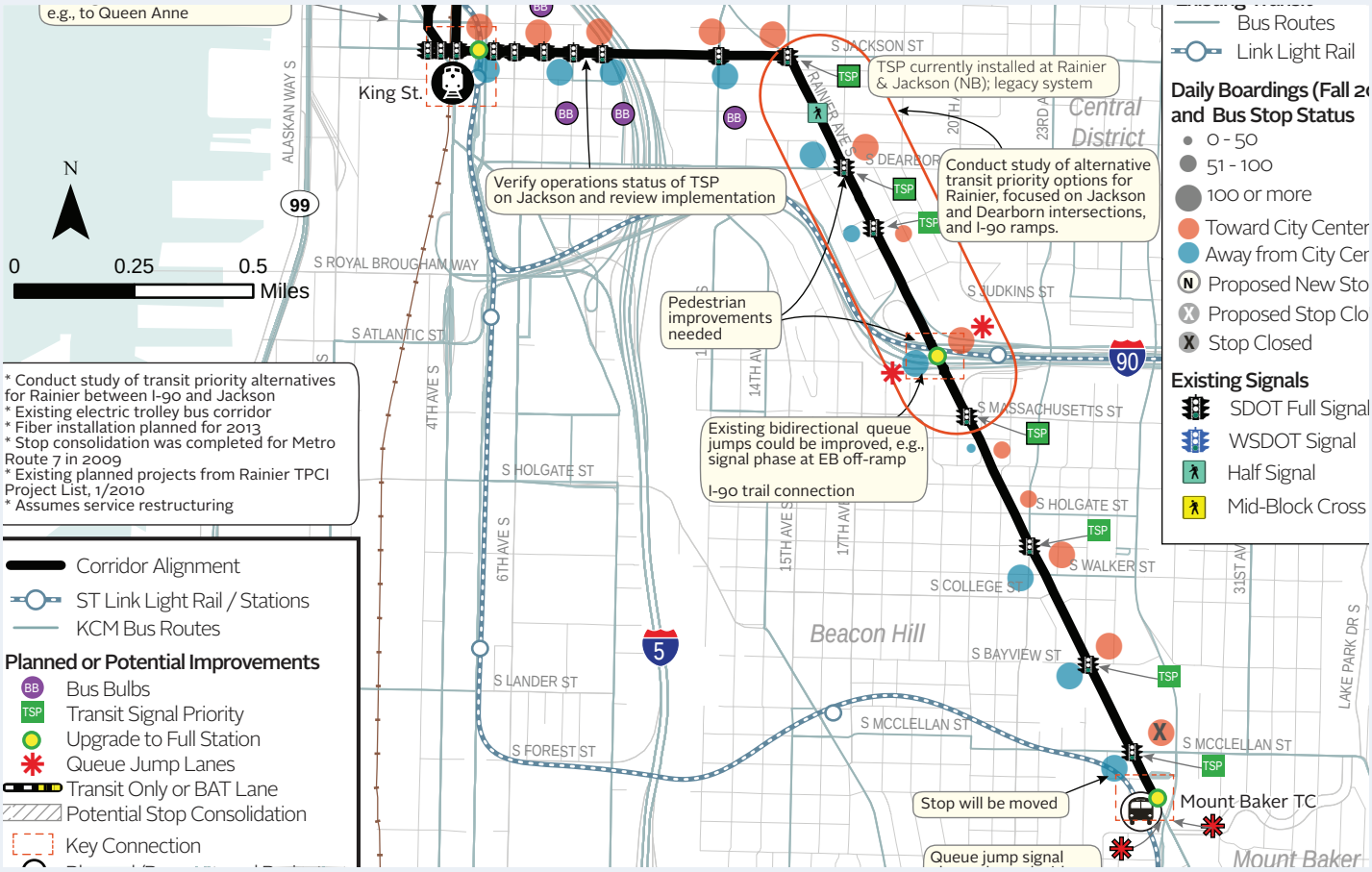
- King Street Hub
- East Link Rainier station (planned)
- Mount Baker TC / Link station

Neighborhoods Served:

- Central Area (West)
- Downtown (East)
- Beacon Hill
- Othello

Key Improvements

- TSP (requires fiber installation)
- Electrification on 12th Avenue
- Bus Bulbs
- Station Upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 5: Rainier Valley – U-District via Rainier Ave and 23rd Ave

Corridor Length: 9.6 miles

Key Connections:

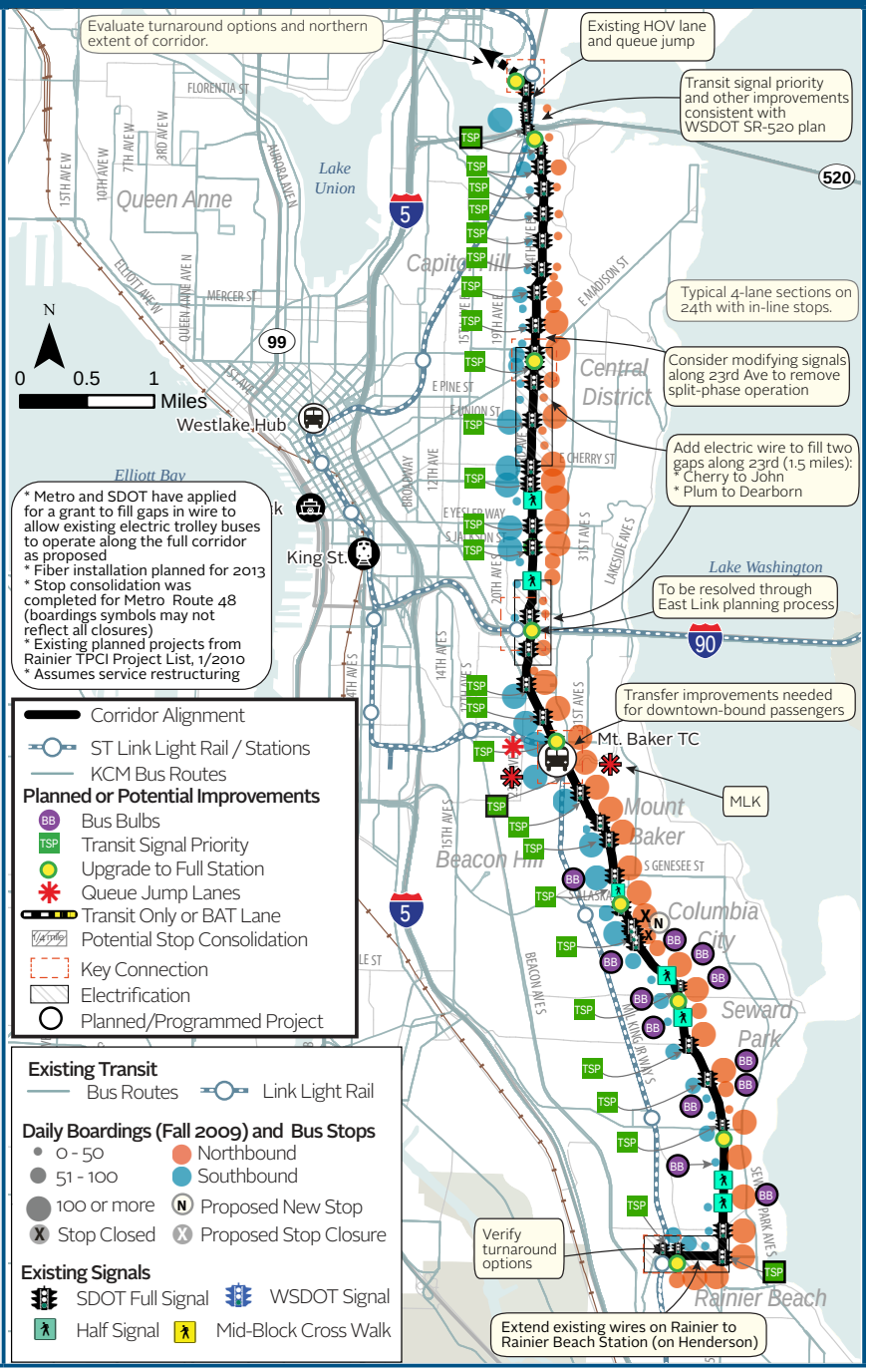
- University Link station (planned)
- Corridor 6 (Madison)
- East Link Rainier station (planned)
- Mount Baker TC/ Link station
- Rainier Beach Link station

Neighborhoods Served:

- University District
- Capitol Hill
- Central District
- Rainier Valley

Key Improvements

- TSP (requires fiber installation)
- Electrification on 23rd Avenue
- Bus bulbs (currently planned for south portion of corridor)
- Station Upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

A corridor profile for Corridor 6 can be found in the HCT section

Corridor 7: Queen Anne – South Lake Union – Capitol Hill via Denny

Corridor Length: 5.0 miles

Key Connections:

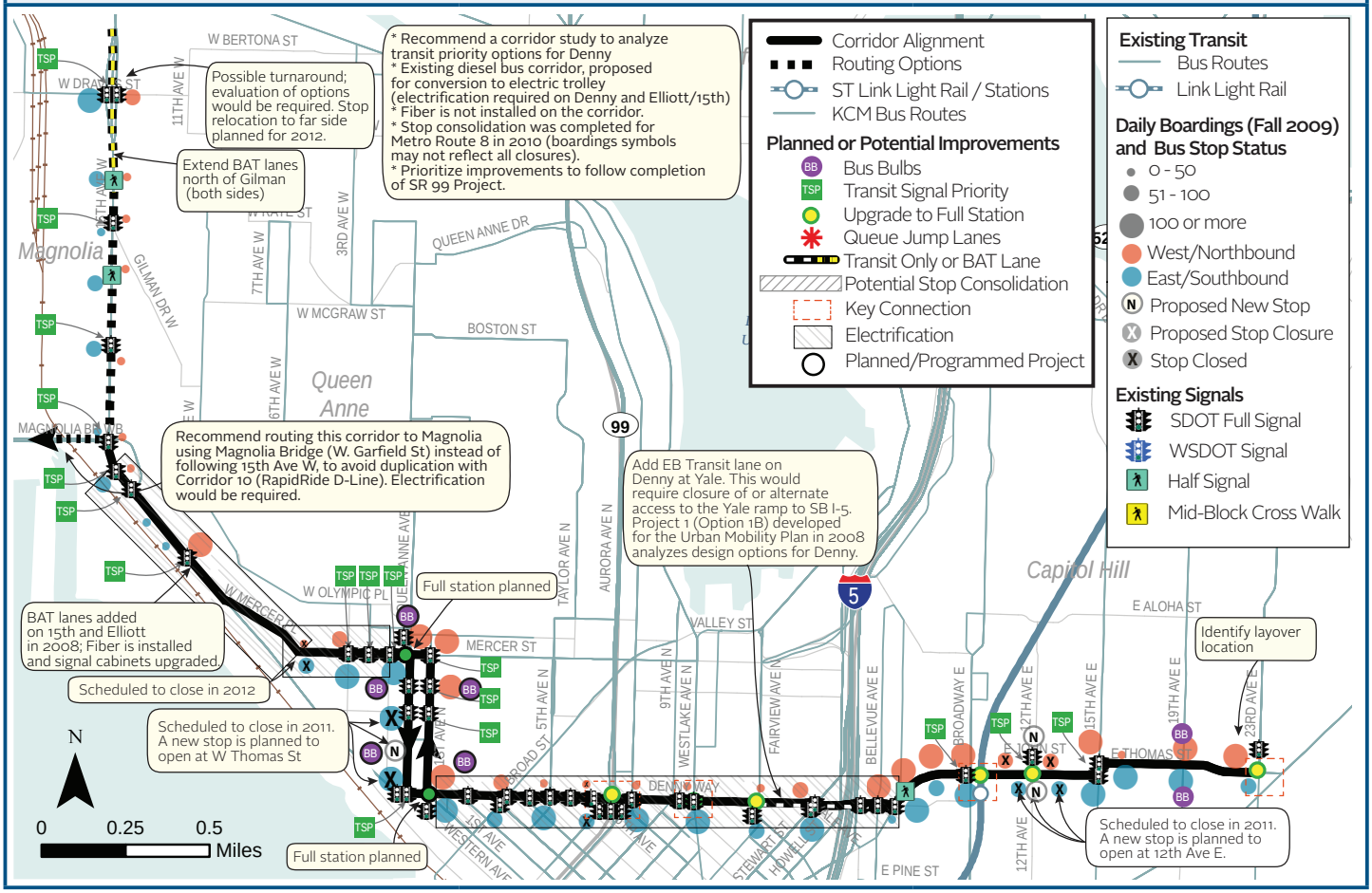
- Direct routing to Magnolia urban village or transfer connections
- North-south transfer opportunities along Denny
- Capitol Hill Link station (planned) and Corridor 3 cross-town line
- Corridors 5 (cross-town) and 6 (Madison) at 23rd Ave

Neighborhoods Served:

- Queen Anne
- South Lake Union
- Capitol Hill

Key Improvements

- TSP (requires fiber installation)
- Electrification



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 9: Aurora Village - Downtown via Aurora Avenue

Corridor Length: 8.2 miles (within Seattle)

Key Connections:

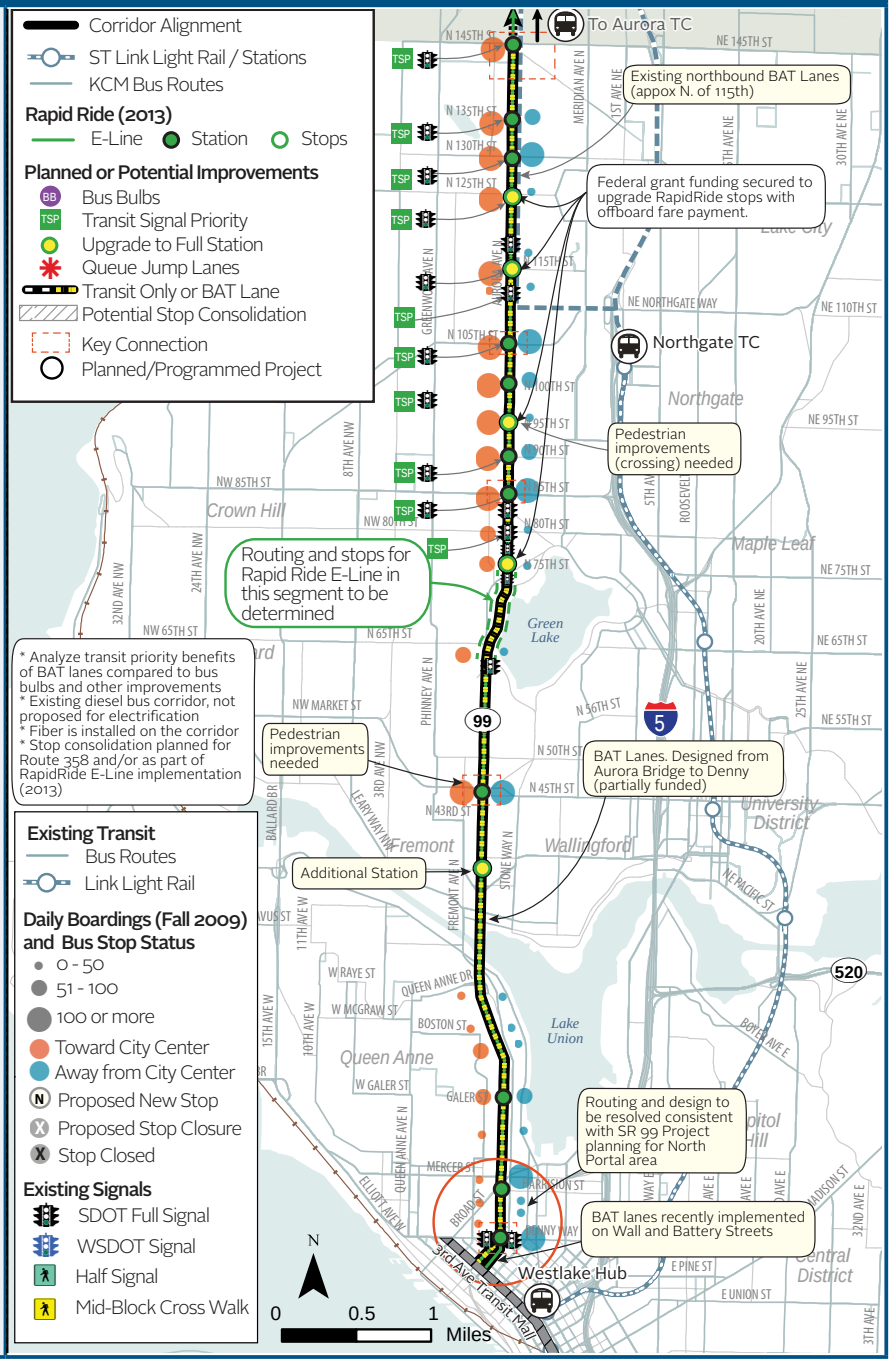
- Aurora Village TC (outside of Seattle)
- Corridor 10 at 105th Street
- Corridor 14 at 85th Street
- Corridor 13 at 45th Street
- Westlake Hub

Neighborhoods Served:

- Bitter Lake and Greenwood (west) and Northgate (east)
- Phinney Ridge and Fremont (west) and Green Lake and Wallingford (east)
- Queen Anne
- South Lake Union
- Downtown

Key Improvements

- TSP (fiber is already installed)
- BAT lanes
- RapidRide station upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor profiles for Corridors 8 and 11 can be found in the HCT section

Corridor 10: Northgate - Ballard – Downtown via Northgate Way, Holman Road, and 15th Avenue

Corridor Length: 10.7 miles

Key Connections:

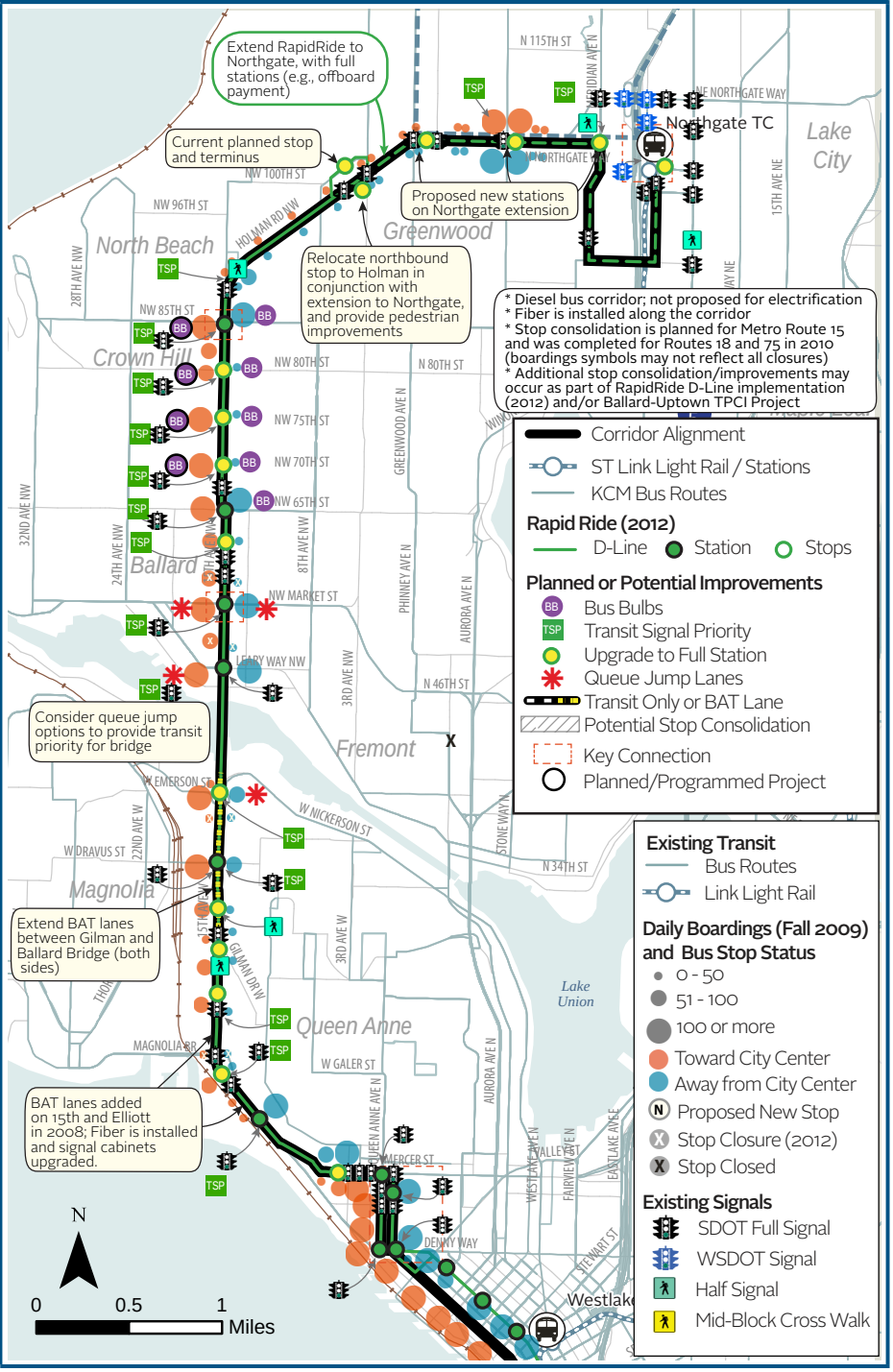
- Northgate TC
- Corridor 14 at 85th Street
- Corridor 13 at 45th Street
- Corridor 7 at Denny Way
- Westlake Hub

Neighborhoods Served:

- Northgate
- Bitter Lake/Greenwood/Crown Hill
- Ballard
- Queen Anne/Interbay
- Downtown

Key Improvements

- TSP (fiber is already installed)
- Bus bulbs
- BAT lanes (extend existing) and queue jumps
- Rapid Ride station upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 12: Lake City – Northgate – U District via Northgate Way and 5th Avenue

Corridor Length: 7.7 miles

Key Connections:

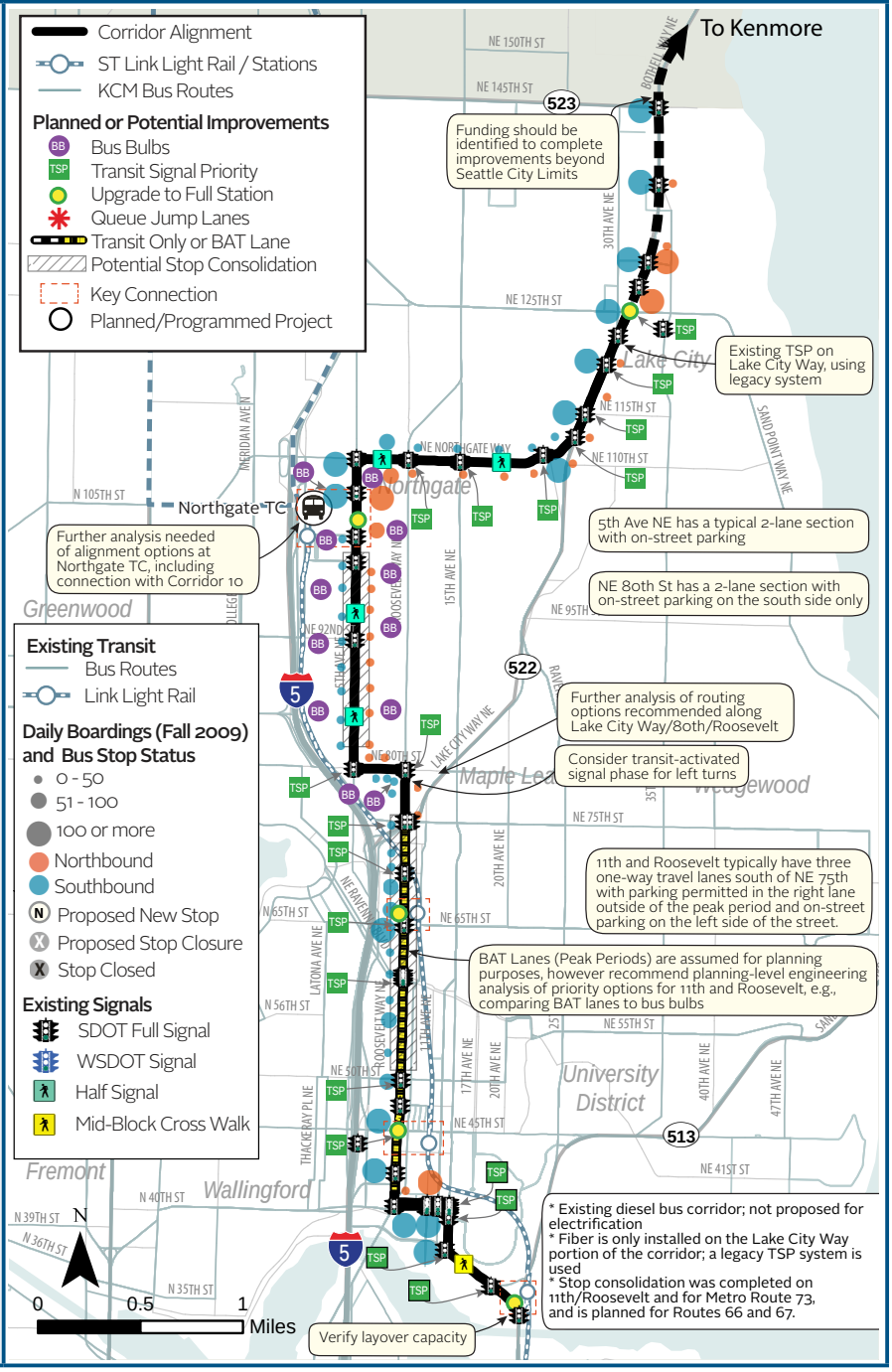
- Northgate Transit Center (future Link station)
- Roosevelt Link Station (future) and bus Corridor 14 at NE 65th Street
- Brooklyn Link Station (future) and bus Corridor 13 at NE 45th Street
- HCT Corridor 8 (Downtown via Eastlake) along 11th/Roosevelt
- Bus Corridors 3 and 5 in University District

Neighborhoods Served:

- Lake City
- Northgate
- Roosevelt
- University District

Key Improvements

- TSP (fiber is only installed along Lake City Way)
- Bus bulbs
- Stop consolidation



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 13: Ballard – U-District – Laurelhurst via Market and 45th Streets

Corridor Length: 5.4 miles

Key Connections:

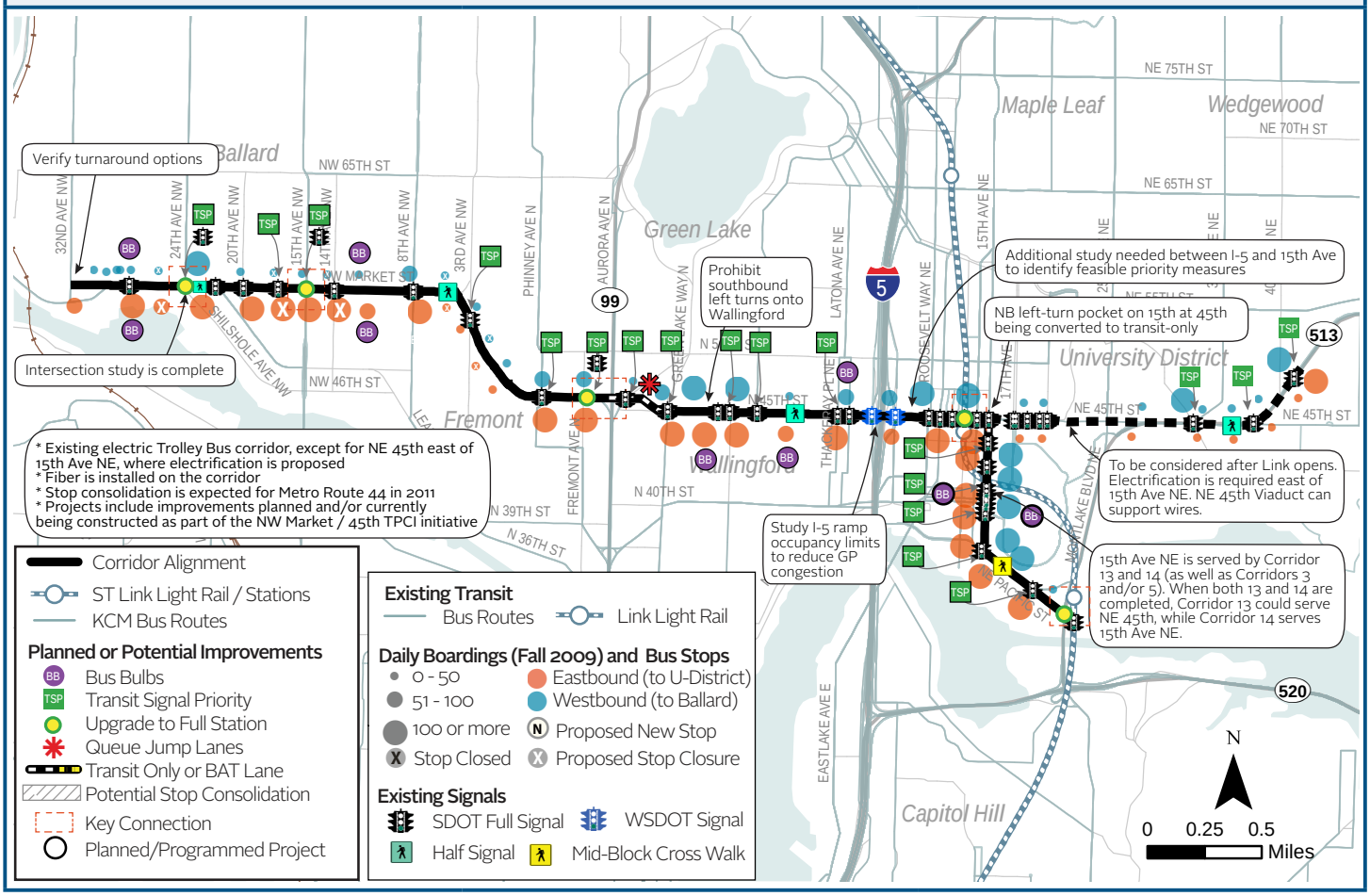
- HCT Corridor 11 at 24th Ave NW
- Bus Corridor 10 at 15th Ave NW
- Bus Corridors 15 at Phinney
- Bus Corridor 9 at Aurora
- HCT Corridor 8 and Bus Corridors 3, 5, 12, and 14 in the U-District

Neighborhoods Served:

- Ballard
- Phinney Ridge, Fremont, Wallingford
- University District

Key Improvements

- TSP (fiber is installed)
- Bus bulbs
- Station upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 14: Crown Hill – Greenlake – U District via NE 85th Street and 15th Avenue NW

Corridor Length: 6.6 miles

Key Connections:

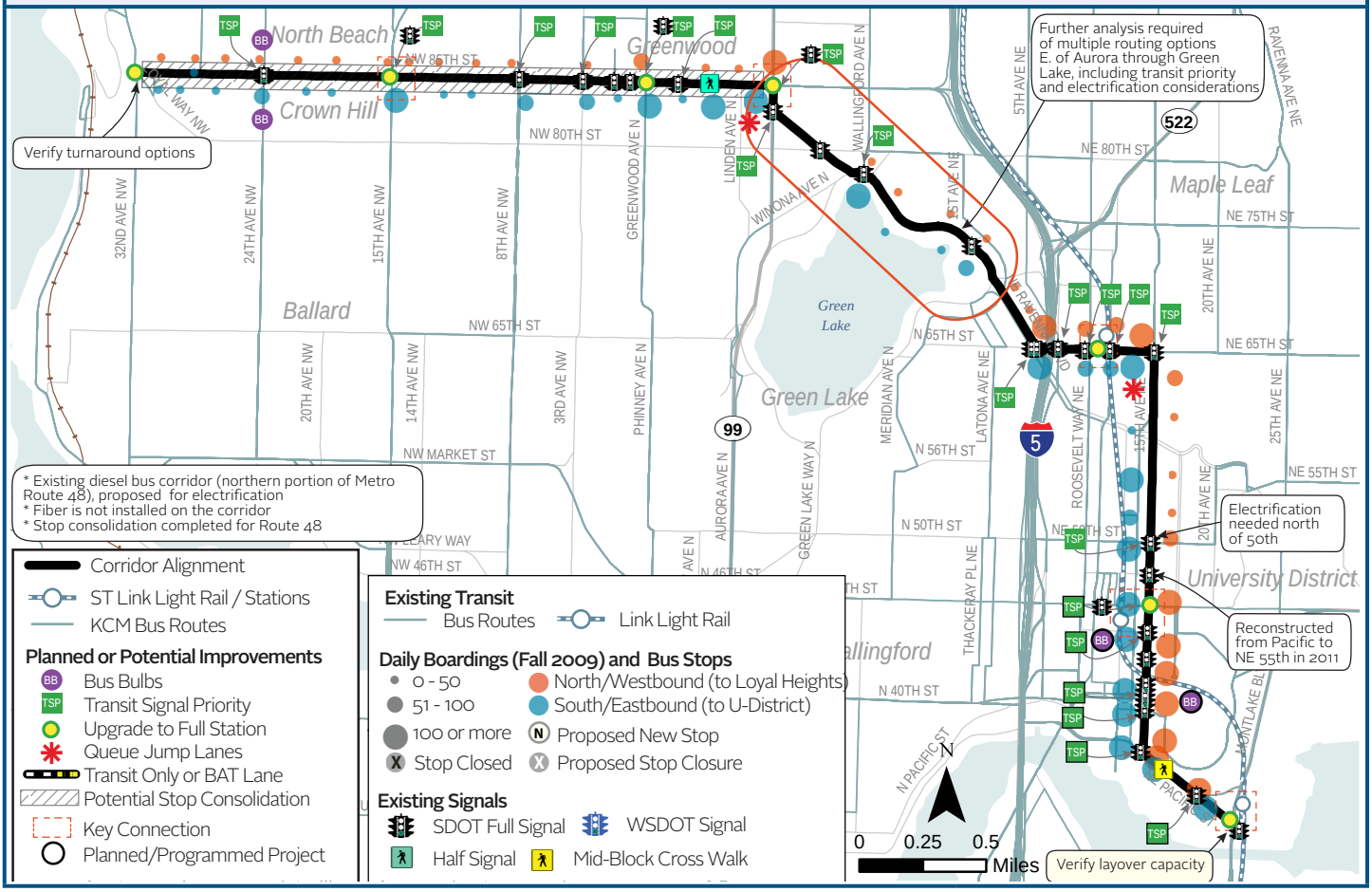
- Corridor 11 (15th Ave NW)
- Corridor 15 (Greenwood)
- Corridor 9 (Aurora)
- Corridosr 3, 5, 8, and 12 (University District)

Neighborhoods Served:

- Crown Hill / North Beach
- Greenwood
- Green Lake
- University District

Key Improvements

- TSP (fiber is not installed)
- Bub Bulbs
- Electrification



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

Corridor 15: Phinney Ridge – Greenwood – Broadview

Corridor Length: 9.1 miles (within Seattle)

Key Connections:

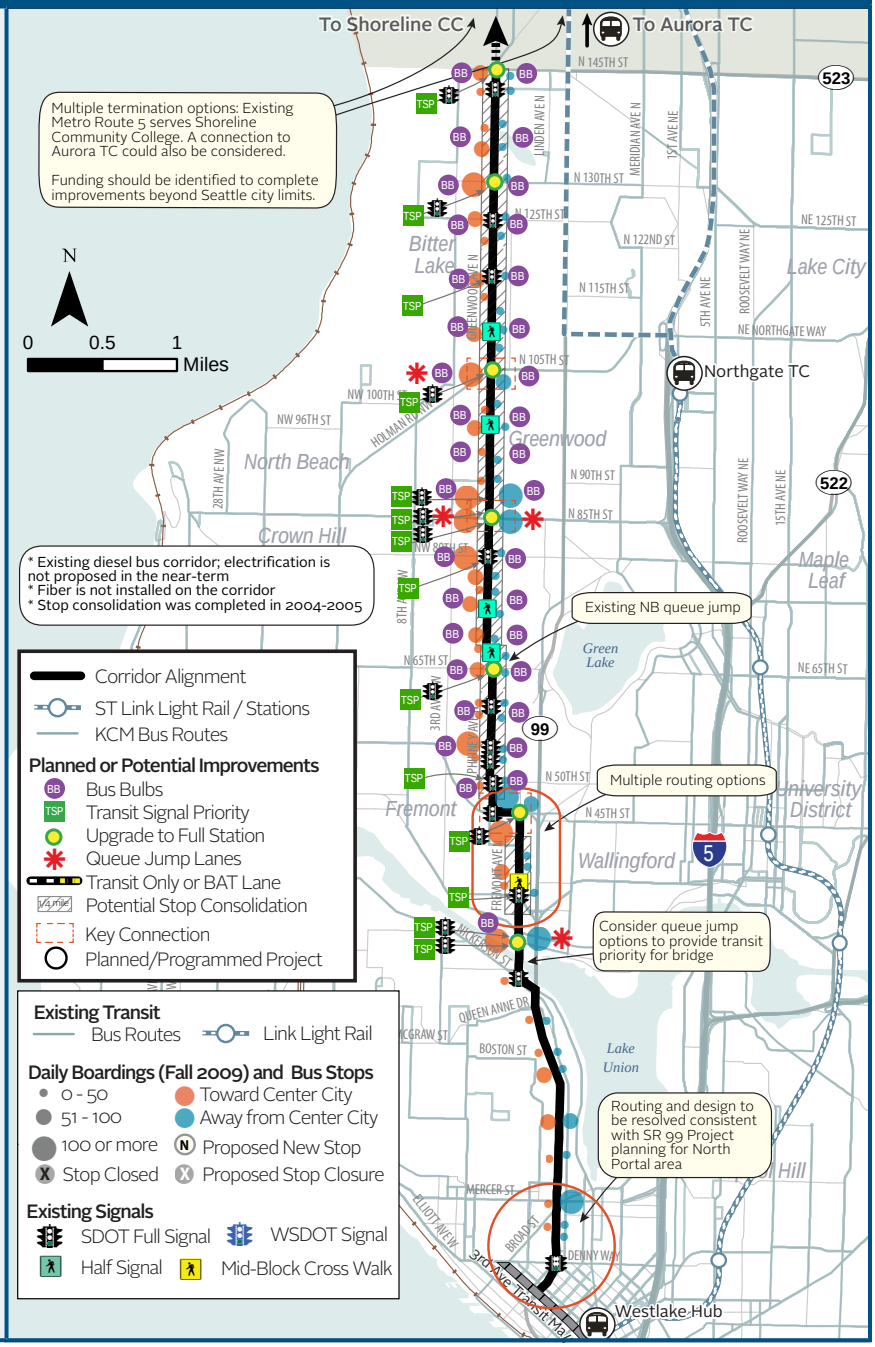
- Shoreline Community College and/or Aurora Village TC
- Corridor 10 at 105th Street
- Corridor 14 at 85th Street
- Corridor 13 at 45th Street
- Westlake Hub

Neighborhoods Served:

- Broadview, Bitter Lake, and Greenwood
- Phinney Ridge and Fremont
- Queen Anne and Westlake
- South Lake Union
- Downtown

Key Improvements

- Bus Bulbs
- TSP (fiber installation required)
- Station Upgrades



Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

FIGURE 3-13 PRIORITY BUS CORRIDOR EVALUATION RESULTS AND KEY IMPROVEMENTS/ACTIONS

Corridor	Description	2030 Weekday Riders	Net New Riders[1]	Productivity (2030 Riders per Hour)[2]	Capital Costs[3]	Capital Costs per Mile	Travel Time Improvement[4]	Net GhG Reduction[5]
1	West Seattle - Downtown via Fauntleroy/California	up to 6,600	up to 1,900	up to 40	$3.6 million	$0.3 million	16%	400 MtCO2e
2	Burien TC - Downtown via Delridge	up to 7,900	up to 2,300	up to 70	$5.2 million	$0.7 million	20%	340 MT CO2e
3	Othello – U-District via Beacon Ave and Broadway	up to 11,100	up to 3,900	up to 60	$20.0 million	$1.9 million	15%	820 MtCO2e
4	Mount Baker – Downtown via Rainier Ave	up to 11,000	up to 5,700	up to 100	$0.7 million	$0.3 million	13%	310 MtCO2e
5	Rainier Valley – U-District via Rainier Ave and 23rd Ave	up to 17,200	up to 3,600	up to 70	$24.8 million	$2.6 million	19%	700 MtCO2e
7	Queen Anne/Magnolia – South Lake Union – Capitol Hill via Denny	up to 14,700	up to 4,200	up to 80	$38.6 million	$7.7 million	22%	1,710 MtCO2e
9	Aurora Village to Downtown via SR 99	up to 12,400	up to 3,900	up to 80	$1.0 million	$0.1 million	18%	650 MtCO2e
10	Northgate – Ballard – Downtown	up to 16,900	up to 4,400	up to 70	$4.2 million	$0.5 million	12%	810 MtCO2e
12	Lake City – Northgate – U District	up to 4,600	up to 1,300	up to 40	$5.1 million	$0.7 million	20%	200 MtCO2e
13	Ballard – U District - Laurelhurst via Market St and 45th St	up to 8,900	up to 1,400	up to 80	$15.1 million	$2.8 million	20%	150 MtCO2e
14	Crown Hill – Greenlake – U District	up to 7,400	up to 1,100	up to 60	$57.0 million	$8.6 million	19%	1,150 MtCO2e
15	Phinney Ridge – Greenwood – Broadview	up to 9,600	up to 2,300	up to 60	$9.3 million	$1.0 million	18%	420 MtCO2e

Notes: All metrics are for corridor extent within Seattle city limits. [1] Relative to current ridership levels. [2] Productivity is 2030 Weekday Riders per Revenue Hour, [3] Does not include planned/programmed improvements or vehicle costs. [4] Estimated end-to-end travel time savings from capital improvements (including planned/programmed, such as RapidRide), relative to existing bus service. [5] GhG emissions savings from reduced VMT ( ) and from transit (; e.g., electric trolley buses replacing diesel buses).

Corridor	Key Capital Improvements and/or Implementation Actions
1	• Transit lanes on West Seattle Bridge (not included in cost or travel time improvement) and Alaskan Way limited access roadway and SoDo surface streets • BAT lanes • Upgrade RapidRide stops to full stations, e.g, with offboard payment
2	• Transit lanes on West Seattle Bridge (not included in cost or travel time improvement) and Alaskan Way limited access roadway and SoDo surface streets • Stop consolidation for Metro Route 120 (planned for 2011-2012) • Further evaluation of BAT lanes vs. bus bulbs, or a hybrid approach
3	• Evaluation of turnaround options at north and south ends of the corridor • Electrification needed on 12th Ave and NE 11th/Roosevelt N. of Campus Pkwy • TSP and bus bulbs (some existing) on 12th, a new transit street • Key connections at several Link stations
4	• Through-route corridor to north, e.g. to Queen Anne • Existing planned improvements on Rainier and Jackson • Conduct study of priority options for Rainier south of Jackson
5	• Electrification needed to fill two gaps on 23rd and to connect Rainier to Rainier Beach Link station • Existing planned improvements on Rainier • TSP on 24th Ave
7	• Consider through-routing to Magnolia using Magnolia Bridge, to avoid duplication with Corridor 10 (RapidRide D-Line) • Recommend corridor study to analyze transit priority options for Denny • Electrification on Denny and Elliott/15th
9	• Upgrade RapidRide stops to full stations (grant funding already secured) • BAT lanes, already designed from Aurora Bridge to Denny; evaluate priority benefits relative to bus bulbs and other improvements • Routing/design of southern extent consistent with SR 99 Project for North Portal
10	• Extend RapidRide to Northgate with full stations • TSP with queue jumps at key congested intersections • Consider queue jump options for Ballard Bridge
12	• Peak period BAT lanes on 11th/Roosevelt couplet, bus bulbs on 5th Ave, and TSP on Northgate Way/Lake City Way • Further analysis of alignment options at Northgate TC • Identify funding to complete improvements outside of Seattle city limits
13	• Existing planned improvements on Market/45th and Roosevelt/11th couplet (bus bulbs, TSP, bus lane, etc.) • Verify turnaround options on west end and alignment options on east end, including after Link opens and to avoid duplication with Corridor 14
14	• Electrification needed north of 50th St • TSP with queue jumps as key congested intersectons • Existing planned improvements south of 50th
15	• Multiple termination options on north end • Identify funding to complete improvements outside of Seattle city limits • TSP and Bus Bulbs on Greenwood • Routing/design of southern extent consistent with SR 99 Project for North Portal

Bus Corridor Metrics and Methodology Notes

The following metrics were evaluated for each of the priority bus corridors.

- 2030 Weekday Ridership: Estimated from Fall 2009 stop/route-level boardings assigned to each corridor.
- Net New Riders:
  - 2030 estimate of potential ridership - current (2009) ridership estimate for the corridor.
- Productivity: Efficiency with which provided transit capacity is utilized.
  - Productivity = weekday ridership / weekday revenue hours.
  - Weekday hours of revenue service calculated through development of corridor specific operating plan.
- Capital Costs: Cost to implement transit priority improvements, based on typical costs, including allowances for engineering and contingency costs. Does not include vehicle costs.
  - Capital Costs per Mile = total capital costs / corridor miles
- Travel Time Improvement: Estimated end-to-end time savings per identified capital or other efficiency improvement (including both potential and currently planned and funded improvements). Unit travel times savings was based on local SDOT or King County Metro experience. If local estimates were not available, industry-standard estimates were applied.
- Greenhouse Gas Reduction: Annual reduction in GhG equivalents from reduced VMT and net change in transit emissions (see HCT results for methodology details)

The conceptual operating plans developed to calculate these metrics assumed the following minimum headways over a service span of 5 a.m. to 1 a.m. (20 hours), which approximately correspond to RapidRide service levels. The operating plans were limited to the corridor as evaluated in the TMP and to service within Seattle.

Period	Weekday	Weekend
Peak	10	15
Off-Peak	15	15
Late Evening	30	30

Additional detail on methodology is provided in Appendix B.

CENTER CITY PRIORITY CORRIDORS

CENTER CITY CONDITIONS AND CHALLENGES

When the City developed the Center City Circulation Report in 2003, the Center City area was growing despite a recession. The City was faced with challenges of accommodating many more jobs and residents with the existing and constrained set of transportation facilities. Much of the growth predicted has occurred, yet transit service levels are generally unimproved (with the exception of Central Link). In particular, areas such as South Lake Union have seen tremendous growth, but few improvements in regional transit connectivity. One local success is rapidly increasing ridership on the South Lake Union Streetcar (see sidebar). The Denny Triangle, Downtown Commercial Core, South Downtown, and South Lake Union are targeted for continued high levels of employment growth. Significant residential growth is expected in Belltown, Denny Triangle, First Hill, and South Lake Union. Now in another recession period, these neighborhoods are seeing strong growth, reflecting the fact that even in a recession, downtown Seattle is a great place to live and do business.

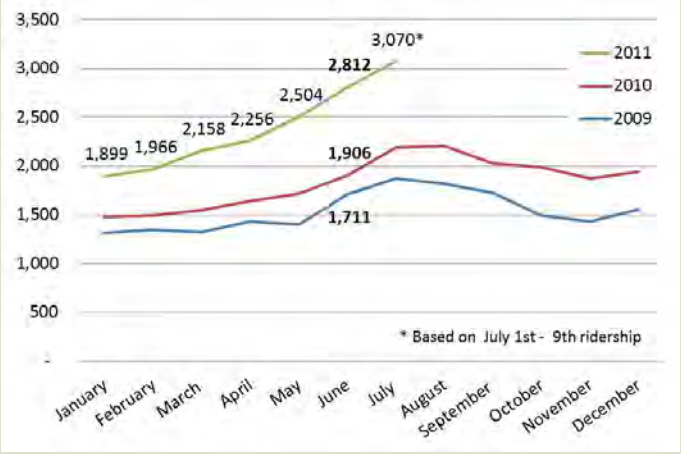
To allow the City to grow, fast, frequent, and reliable transit must connect the Center City and its neighborhoods. The City must lead hard tradeoff decisions that prioritize high-capacity and/or low-impact modes, such as transit and bicycles. Physically, the City can only accommodate its planned growth through a highly efficient transportation system with transit as its backbone.

Meeting the expanded travel demand that will accompany growth planned in downtown is accompanied by many mobility and access challenges:

- **Land use:** The Center City is expected to take on roughly 50% of the city's total population and job growth over the next 20 years. This is both a challenge and an opportunity for transit development, since the level of growth demands a shift away from auto-oriented mobility. This is a fact of simple reality driven by geometric constraint.
- **Geography:** Seattle's center resembles an hourglass where both people and goods funnel through heavily-trafficked north-south corridors into a narrow downtown core bounded by Puget Sound, Lake Washington, and I-5. Buses, trucks, ferry passengers, automobiles, bicyclists, and pedestrians must cross and enter the Center City at limited bridge and ferry terminal access points. Steep hills limit transit mode and vehicle options in the east-west direction.
- **Right-of-way constraints:** Approximately 700 local and regional buses travel in the north-south direction through downtown during a single commute peak hour. Bus operations in Downtown Seattle Transit Tunnel will be increasingly constrained as tunnel capacity is given over to rail operations. Dedicating surface right-of-way to transit requires balancing the needs of all modes, including motor vehicles, freight, and bicycles.
- **Transit service quality:** Buses are overloaded on a number of transit corridors despite frequent peak service. Travel times on cross-town bus routes and connections from inner-city neighborhoods are among those most impacted by congestion.
- **Electric trolley bus network efficiency:** The existing infrastructure investment in a quiet, low-emission transit mode is a significant asset; however, expanding the system will require adding wire and restructuring service (including changes to route interlining).
- **Wayfinding:** The Center City transit network consists of a wide variety of transit modes, providers, and facilities. Rail modes include Link and the Seattle Streetcar. Diesel and trolley buses are operated by Metro, Sound

SOUTH LAKE UNION STREETCAR RIDERSHIP GROWTH

Ridership on the South Lake Union Streetcar grew in 2010. There were over half a million riders in 2010, a 15% increase over 2009, and 25% greater than ridership in 2008, the first full year of operation. The gains were driven largely by increased weekday trips. Average weekday ridership was over 1,800, peaking at over 2,200 in August 2010. The month with the highest increase over 2009 was November with an increase of 128%. Significant job gains in the district caused by Amazon expansion have fueled these increases. South Lake Union businesses have responded by providing private funding to add peak period runs on the streetcar.



Source: Seattle Transit Blog

Transit, and service providers from surrounding counties. Rail and bus modes are vertically separated between surface streets and the Transit Tunnel. Transit legibility is challenging and must be addressed at a system level to optimize service investments in the Center City.

CENTER CITY SERVICE DESIGN PRINCIPLES

TMP recommendations for Center City transit investments are based on analysis and principles that make downtown transit easy to understand and use for both infrequent and regular riders, including:

- Operate routes on the same street in both directions. If this is not possible, operate service in a limited set of linear corridors. Limit turning movements from linear corridors to make transit service more predictable.
- Avoid running couplet service more than one block apart.
- Operate common service types and destinations on the same streets and/or at common stops. For example, regional service on 2nd and 4th Avenues, service to common sectors of the City (e.g., NW Seattle) stop on the same block, etc.
- Develop a strong, high-capacity Center City circulation system that connects all major multimodal hubs (Westlake, Colman Dock, and King Street/International District) to limit the need for regional bus throughput and increase the usability of regional high capacity transit.

OPTIMIZING KEY CENTER CITY TRANSIT CORRIDORS

Specific Center City transit enhancements to make transit more user-friendly and improve operational efficiency are discussed in several categories and illustrated in Figure 3-14.

3rd Avenue Transit Mall

The following steps would help simplify transit routing through downtown and would facilitate (though not ensure) the shift of bus volumes from the Downtown Transit Tunnel to 3rd Avenue. They would need to be accompanied by strong branding and clear customer information and signage.

- Eliminate turns where feasible (between Stewart and Yesler) to create a linear transit mall. This configuration would:
  - Allow downtown passengers to board with certainty that buses would not turn off of 3rd Avenue
  - Eliminate conflicts with pedestrians at the city's highest-volume pedestrian intersections
- Route all north-south running rapid, frequent, and local buses serving Seattle on the Transit Mall to the extent possible; regional services would use 2nd and 4th Avenues as a north-south transit corridor.

Throughout much of the day, passenger queues to board buses on 3rd Avenue in the vicinity of Pike and Pine Streets are overwhelming to through pedestrians. To maintain a vital business environment and function effectively for transit

Third Avenue Transit Mall

Image from Nelson\Nygaard

passengers, the 3rd Avenue Transit Mall requires significant investment. Streetscape studies have been undertaken to revitalize the corridor, but a more complete, transit-focused study is needed to develop a coordinated set of improvements that elevate 3rd Avenue as a centerpiece of Seattle's public space, an effective circulation corridor for downtown transit passengers, a hub for city and regional transit customers, and a great place to work, shop, and enjoy the city.

Trolley Bus Improvements

Figure 3-14 illustrates proposed Center City improvements to the Trolley Bus network. These include:

- **Denny:** Electrify this corridor to provide quiet, zero emissions transit service on one of Metro's busiest diesel bus routes. The new wire between 1st and 3rd Avenues would also have the benefit of allowing more efficient routing of trolley routes from Queen Anne to downtown via the 3rd Avenue Transit Mall.
- **Madison:** Extend wire from 1st Avenue to the Waterfront to enhance connections to Colman Dock from First Hill/ Capitol Hill.
- **Yesler:** Add wire on Yesler between 2nd Avenue and 9th Avenue E, and on 9th Avenue from Yesler to Jefferson to reduce turning movements off of 3rd Avenue and improve connections to Harborview Medical Center.

These improvements are discussed as part of the comprehensive network of existing and planned trolley bus corridors in the next chapter.

Center City Priority Bus Corridors

Several key bus corridors illustrated in Figure 3-14 provide access into the Center City. These include:

- **Pike and Pine:** Primary east-west pedestrian and transit corridor linking downtown Seattle and the Westlake Transit Hub with Capitol Hill
- **Yesler and Jefferson:** East-west transit corridor that provides important direct service to Downtown and First Hill from Harborview Medical Center, Yesler Terrace, and dense residential neighborhoods
- **Jackson:** East-west transit corridor into downtown from the south, serving the King Street hub
- **Seattle Center East:** Most direct bus corridor serving the main Seattle Center entrance on 5th Avenue North and dense, high ridership markets in Belltown, Denny Triangle, Uptown, and Queen Anne

Figure 3-15 highlights these corridors and accompanying summary tables identify planned improvements and additional corridor enhancement opportunities. In addition to the four Center City priority bus corridors, Madison Street is an east-west corridor included among the 15 TMP priority corridors, and identified for high capacity transit. It is described in the HCT section of this chapter (see page 3-16 for the Corridor 6 summary sheet).

Center City Connector (CC1 and CC2) Alternatives

The Center City Connector corridors shown in Figure 3-14 would operate through the heart of downtown Seattle, connecting Lower Queen Anne, Uptown, and South Lake Union neighborhoods to the north with the King Street Station and International District Multimodal Hub on the south end of downtown. Figure 3-16 and accompanying tables on page 3-54 illustrate the two alternatives in more detail, including various alignment options.

- **CC1:** Queen Anne to King Street Station via 1st Avenue
- **CC2:** Westlake Center to King Street Station, an extension of the existing South Lake Union Streetcar, along 4th and 5th Avenues or using Pike/Pine to 1st Avenue

The City applied for federal funding to conduct an Alternatives Analysis (AA) of the proposed Center City Connector corridors, shown in detail in Figure 3-16, to determine, in detail, the benefits, costs, and impacts of each alignment. In October 2011 the City received a $900,000 grant to conduct this study, called the "Seattle Center City Connector Transit Alternatives Analysis."

Although the Center City Connector corridors can be considered as standalone corridors, their full benefits would be realized as the unifying connections of an integrated streetcar circulator system connecting with the planned and funded First Hill streetcar line at King Street Station and potentially connecting all three of Seattle's multimodal transportation hubs: King Street and International District Stations, Colman Dock, and Westlake Center.

FIGURE 3-14 CENTER CITY TRANSIT CORRIDORS

ACCOMMODATING TRANSIT OPERATIONAL NEEDS IN THE CENTER CITY

Layover

Layover is the uncomely truth about bus operations. No matter the degree to which layover operations are made, more efficient, high-frequency services depend heavily on a ready supply of idle buses/operators to ensure reliable operations. Buses standing still are not all that attractive, nor are they human-scale, but they are a very necessary part of transit operations. The conundrum is how to accommodate bus layover in a way that meets urban design goals without locating them so far away from passenger activity areas that it increases operating costs or decreases reliability.

Layover locations should be at logical anchor points. For the Center City these anchor points will tend to be at the north and south fringes:

- North of downtown, in particular, special care must be given to ensure that the location of layover does not work to isolate South Lake Union from downtown, but instead to help transit integrate the two areas.
- In the south end of downtown, the best layover locations offer greater efficiency and connectivity by serving the King Street/International District multimodal hub rather than stopping just short of it in the northern parts of Pioneer Square.

Off-street layover can often be provided with creative design in mixed-use facilities. Potentially higher costs for developing such facilities are often worth the trade-off in terms of urban design benefits.

On-street layover opportunities should be accommodated, but only where appropriate, such as through use of peak hour parking restrictions. The City should coordinate with Metro to identify and support low-impact opportunities for on-street layover. Usually this means no more than two buses at any one location. From an urban design perspective, a string of buses along a curb is like a giant fence or barrier to the urban form and pedestrian environment and should be avoided.

Signal Systems

In the development of corridors for the Frequent Transit Network (discussed in depth in Chapter 4), extensive focus has been given to the implementation of aggressive transit signal priority. Along a corridor, this strategy is relatively straightforward. In the Center City, a number of factors make the addition of transit signal priority a far more complex undertaking, including:

- The presence of very high pedestrian volumes
- A grid of one way streets
- High peak hour turning volumes to access the freeway system
- The Third Avenue Transit Mall
- Regular major special events at the north and south edges of the Center City
- Uncertain traffic re-distribution patterns brought about by access points for SR 99

A signal system designed to offer transit priority in this environment needs to offer the ability to adapt to current traffic conditions, including high pedestrian volumes. Adaptive traffic control systems require extensive communication networks, centralized computing and communications resources, and staffing to watch the system. As a result, such a system to serve downtown will have a very high capital cost in the range of $10 million.

To date, adaptive systems have been considered for downtown, but not acted upon based on the relatively high cost and the concern of creating a less friendly pedestrian environment. Even so, the current system operates on a fixed-time basis and it may be possible to optimize signal timing for certain times of the day without increasing pedestrian delay, e.g., in the early hours of the AM peak. The potential benefits that might be derived from applying an adaptive signal system are not fully known, but it merits further consideration as a potential tool to improve transit performance in the margins—if it appears the benefits can outweigh the costs and the potential to increase pedestrian delay.

A string of buses parked along a curb is like a giant fence and acts as a barrier to street fronting building uses.

Image from Nelson\Nygaard

Signal system improvements that move buses more efficiently along the 3rd Avenue Transit Mall would benefit many passengers and could adjust to various traffic patterns at different times of day.

Image from Nelson\Nygaard

STRATEGY AREA: ACCOMMODATING TRANSIT OPERATIONS IN THE CENTER CITY

TOCC-1: The City and Metro should jointly identify areas (not specific sites) where development of off-street layover facilities is needed, keeping in mind the balance between serving areas and operational efficiency.

TOCC-2: The City should aggressively seek joint development opportunities to establish off-street layover.

TOCC-3: The City and Metro should continue to work together to maintain an inventory of appropriate on-street layover locations.

TOCC-4: The City should undertake a detailed study of implementing of adaptive signal technology on the downtown signal system, including evaluating cost, benefits to transit, and potential to reduce pedestrian delay.

CONVENTIONAL VS. ADAPTIVE SIGNAL SYSTEMS

Conventional Signal Timing

- **Actuated-Uncoordinated "Free" Signal Timing:** Each intersection in a corridor responds to its own need with no regard to traffic operations at adjacent intersections. The traffic signal controller adjusts the amount of time served to each phase of the intersection based on the number of vehicles detected by detector loops or video detection at that intersection.
- **Coordinated Signal Timing with Time-of-Day Plans:** Signal timing along a corridor or within a network is coordinated between controllers based upon static signal timing plans. These plans are developed based on a sample of the average traffic volumes for particular times and days of the week. The time-of-day plans result in a common cycle length for a group of coordinated signals, offset starting points between adjacent signals, a sequence of phases, and an allocation of cycle time (splits) for each phase at each signal.

Adaptive Signal Timing

- **Adaptive Signal Timing:** Adaptive signal control systems continually refine the timings at every intersection within a corridor or network, cycle-by-cycle, as traffic conditions change. Adaptive systems monitor traffic conditions using vehicle detectors for all approaches, and often for all movements, of the intersections within the corridor. These systems adjust the signal timing based on the real-time traffic flow in the corridor.

Center City Priority Bus Corridor: **Pike/Pine**

Corridor Overview

- Primary east-west pedestrian and transit corridor linking downtown Seattle and the Westlake Transit Hub with Capitol Hill (as identified in City of Seattle Center City Access Strategy and Metro Transit Strategic Plan and Transit Blueprint)

Key Connections

- Westlake and Convention Place DSTT Stations
- Third Avenue Transit Mall
- First Hill Streetcar

Primary Routes and Potential Restructuring

- KCM Routes 10, 11, 14, 43, 49
- Some of these routes turn between Pike/Pine and Third Avenue. These routes should be revised to operate common routings the length of Pike/Pine as far west as First Avenue

Completed Improvements

- Pike/Pine Transit Access Improvement Project (2009) included the following improvements:
  - Updated signal equipment with greater potential for transit signal priority
  - In-lane bus stops and coordinated pedestrian improvements
- Bus stops have been consolidated and re-spaced for better service and operations

Corridor Enhancement Opportunities*

- Continue to implement access and transit priority treatments to avoid transit delay at congested intersections or corridor segments
- Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities

Center City Priority Bus Corridor: **Jefferson/Yesler**

Corridor Overview

- East-west bus corridor that provides important direct service to Downtown and First Hill from Harborview Medical Center, Yesler Terrace, and dense residential neighborhoods

Key Connections

- Pioneer Square DSST Station
- Third Avenue Bus Mall
- First Hill Streetcar

Primary Routes and Potential Restructuring

- KCM Routes 3, 4
- Reroute service from James to Yesler west of 9th Ave (reflected in map)
- Consider terminating route service at new Central Waterfront Transit Station (to be shared with Madison BRT), providing connections to Colman Dock

Completed Improvements

- Some bus stops have been consolidated and passenger facilities upgraded
- The City of Seattle is investing heavily in improved midday service in the corridor

Corridor Enhancement Opportunities*

- Electrification of Yesler (2nd to 9th) and 9th (Yesler to Jefferson) to reduce turning movements off of Third Avenue and to avoid freeway-related congestion on James Street
- Enhance pedestrian access, particularly around medical center and at key intersections
- Provide in-lane bus stops
- Provide transit signal priority with new interconnected traffic controllers and vehicle detection where needed
- Add transit-only lanes or peak period parking restrictions in congested segments of the corridor, particularly where I-5 ramps create peak period traffic congestion
- Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities

Center City Priority Bus Corridor: **Seattle Center East**

Corridor Overview

- Most direct bus corridor serving the main Seattle Center entrance on 5th Avenue N. and dense, high ridership markets in Belltown, Denny Triangle, Uptown, and Queen Anne

Key Connections

- Third Avenue Transit Mall
- Westlake DSTT station
- King Street Station
- International District Station

Primary Routes and Potential Restructuring

- KCM Routes 3, 4, and 16
- These routes should be consolidated to follow a single pathway to the south end of Downtown and serve the same downtown bus stops

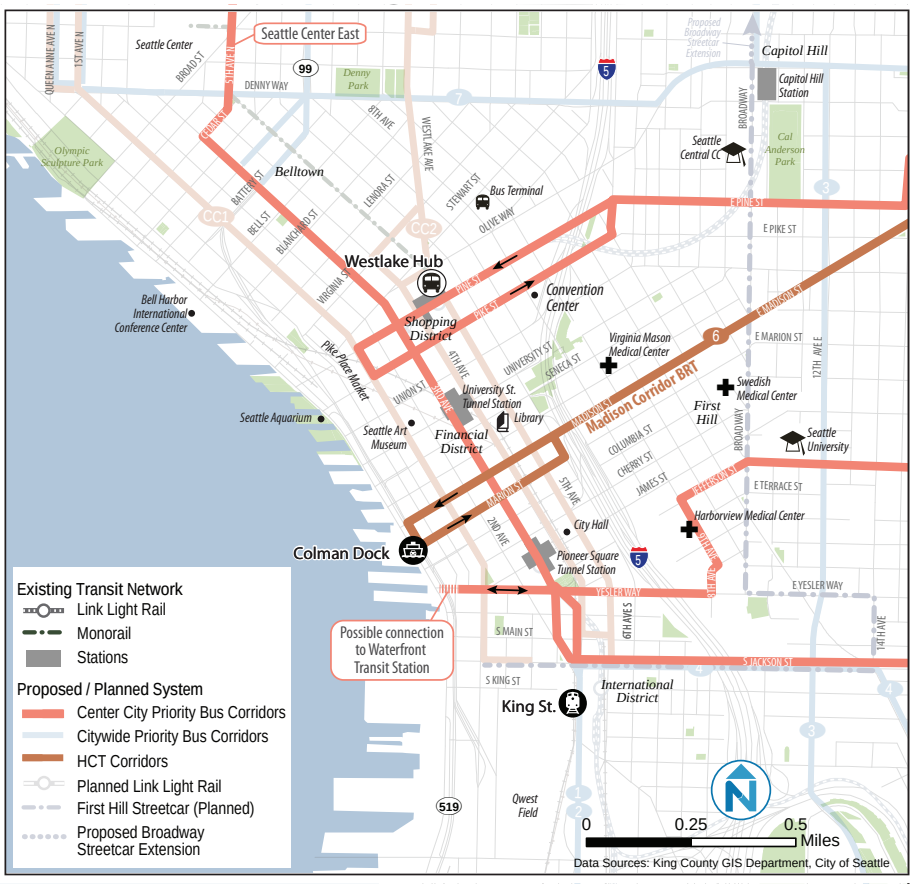
Completed Improvements

- Third Avenue Transit Mall has been designated transit-only during peak hours
- Some bus stops have been consolidated and passenger facilities upgraded
- City of Seattle investments help provide better weekday and evening frequency on Routes 3 and 4

Corridor Enhancement Opportunities*

- Extend Third Avenue transit-only restrictions north to Denny Way
- Extend hours of Third Avenue transit-only restrictions
- Engage in comprehensive effort to improve the Third Avenue streetscape and pedestrian/bus rider experience
- Maintain a smooth Third Avenue street surface for a higher-quality bus experience
- Continue to implement access and transit priority treatments to avoid transit delay at congested intersections or segments
- Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities

FIGURE 3-15 CENTER CITY PRIORITY BUS CORRIDORS



Center City Priority Bus Corridor: **Jackson**

Corridor Overview

- East-west transit corridor into downtown from the south, serving the King Street hub

Key Connections

- International District / Chinatown DSST Station
- King Street Station
- Third Avenue Transit Mall
- First Hill Streetcar (multiple stations)

Primary Routes and Potential Restructuring

- KCM Routes 7, 14, 36

Completed Improvements

- Phase 1 of the Rainier/Jackson Transit Priority Corridor project included new shelters, lighting, and bus bulbs to convert all bus stops on Jackson to an in-lane configuration
- The City of Seattle is investing heavily in improved evening and weekend service on Route 7

Planned Improvements

- Phase 2 of the Rainier/Jackson Transit Priority Corridor project will include electronic real-time schedule information at key bus stop locations.
- Streetcar service to be introduced west of 14th Ave

Corridor Enhancement Opportunities*

- Provide transit signal priority with new interconnected traffic controllers and vehicle detection where needed
- Add transit-only lanes or peak period parking restrictions in congested segments of the corridor
- Improve bus stop facilities with real-time schedule information, off-board fare payment equipment, and other amenities

In addition to planned corridor improvements

Priority bus corridors refer to corridor-level speed and reliability improvements, not operating plans for individual routes. Potential improvements and recommendations are conceptual in nature. Implementation of priority bus corridors would require more detailed evaluation/analysis of current conditions, coordination between SDOT and partner agencies, and community involvement.

CC1 Alternative: Lower Queen Anne to Downtown

Corridor Overview

Length: 2.3 miles

New Track Miles: 4.5 single-track miles (rail)

Major Stations: King Street Hub, S Jackson St - 2nd Ave S, 1st Ave - Yesler Way, Madision/Marison St, Seneca St, Pike St, Virginia St, Bell St, Queen Anne Ave N / 1st Ave N - Denny Way, Harrision St (or Mercer/Roy St)

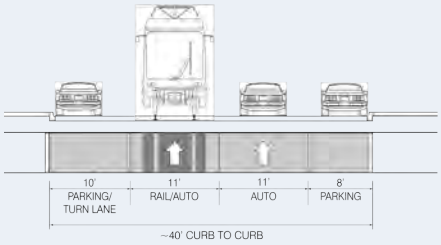
Average Stop Spacing: 1,900 feet

Key Connections:

- King Street Hub
- Financial District Station
- Pioneer Square Station
- Colman Dock
- RapidRide C (future)

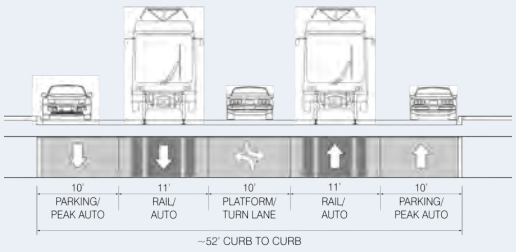
Sample Cross-Sections

Rail



Lower Queen Anne Couplet: North of Denny, rail would operate in a couplet formation and could operate in mixed traffic or dedicated lanes. Multiple options are available for a turnaround/terminus.

Rail



1st Avenue: 1st Avenue has sufficient curb-to-curb width to accommodate 5 lanes. This would allow a center median dedicated or shared lane operation. Center-running rail and center platform stations would benefit traffic circulation on the downtown 1-way street grid all the way from Cherry to Denny. Stations are proposed at somewhat frequent intervals in the downtown core because this portion of the transit line could double as a 'waterfront circulator' in addition to being a high-capacity connection between Lower Queen Anne and Pioneer Square. Interlining/connecting the 1st Avenue line with the First Hill line at Jackson/Occidental would provide expanded circulation options.

CC2 Alternative: Lower Queen Anne to Downtown

Corridor Overview

Length: 1.1 miles (new segment only)

New Track Length: 2.4 signal-track miles (rail)

Stations: King St Hub, 4th/5th Ave - James St, Madison St, University St, Union St, Westlake Hub, Westlake Ave - Virginia St, Blanchard St, Denny Way, Thomas/Harrision St, Republican St, Mercer St, Valley St - Terry Ave/Boren Ave, Fairview Ave N - Aloha St

Average Stop Spacing: 1,100 feet

Key Connections:

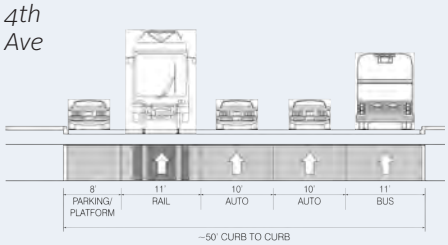
- King Street Hub
- Financial District Station
- Pioneer Square Station
- Westlake Hub

Service Restructuring:

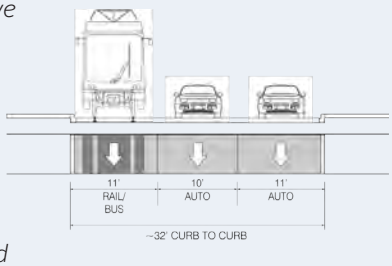
- Rail placement on 4th and 5th would be designed to limit impact on regional bus service.

Sample Cross-Sections

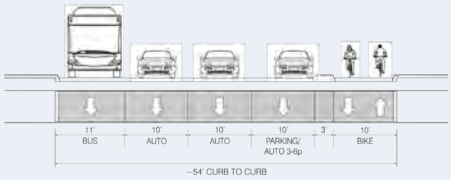
4th Ave



5th Ave



2nd Ave



4th/5th Couplet: 4th will remain an important regional bus corridor; it has significant turning volumes at some cross-streets. Placing a rail circulator/streetcar line on the west side of 4th replaces conflicts with regional buses and I-5-bound turning traffic. An option to mitigate impacts to the 4th Ave bicycle lane is to construct a two-way 'cycle track' on 2nd Ave. Northbound rail would return to the existing SLU alignment via Virginia.

5th Avenue is only 3 lanes wide in the northern part of downtown; rail is proposed for the west curb lane (right turning vehicles could delay rail vehicles at some locations).

FIGURE 3-16 PROPOSED CENTER CITY CONNECTOR ALTERNATIVES AND CORRIDOR ALIGNMENT OPTIONS

Note: All cross sections are representative of a possible design option for a corridor segment. Right-of-way widths, utility constraints, and competing street use needs vary in each of the representative segments.

Center City Connector Evaluation Results

FIGURE 3-17 CENTER CITY CONNECTOR EVALUATION RESULTS

Please refer to pages 3-22 to 3-25 for an explanation of methodology. Additional detail on evaluation results and methodology is provided in Appendix B.

IMPLEMENTATION STRATEGIES

STRATEGY AREA: IMPLEMENTING THE CENTER CITY CONNECTOR

- **Strategy CC1.1:** Submit application for Federal Transit Administration support to complete an Alternatives Analysis of Center City Connector alignment options (submitted in July 2011; the City was awarded a $900,000 planning grant to conduct this study in October 2011). The alternatives analysis study will be used to evaluate/confirm streetcar as the preferred mode and develop a preferred alignment option for connecting South Downtown (and the First Hill Streetcar) with South Lake Union and or Lower Queen Anne (and the South Lake Union Streetcar).
- **Strategy CC1.2:** Ensure that the study of alternatives clearly distinguishes the travel market needs for Center City circulation and inter-neighborhood travel and Center City access.
- **Strategy CC1.3:** Optimize opportunity to connect Center City Multimodal Hubs, including Westlake, Colman Dock, and King Street/International District.
- **Strategy CC1.4:** Ensure Center City Connector and other Center City transit projects consider and address circulation and mobility needs of the Central Waterfront.
- **Strategy CC1.5:** Develop a business plan using the assumption that locally generated funds will be needed to support both capital development (expect 50% match requirement on possible federal funding) and ongoing operating funds. The business plan should include consideration of the private sector role in project development.
- **Strategy HCT CC1.6:** Begin outreach to Center City neighborhoods and business community.

STRATEGY AREA: ENHANCE CENTER CITY TRANSIT SERVICE AND USABILITY

- **Strategy CC2.1:** Conduct an integrated streetscape and operations study for the 3rd Avenue Transit Mall (Denny to Jackson). Study outcomes would include a 3rd Avenue transit mall that operates more effectively as a linear circulator in downtown, serves key city transit routes, and is reconstructed as a centerpiece of Seattle's downtown pedestrian environment.
- **Strategy CC2.3:** Further restrict auto traffic on the 3rd Avenue Transit Mall during midday times and north of Stewart as required by increasing bus volumes.
- **Strategy CC2.3:** Implement strategic electric trolley wire projects to improve trolley bus routing and reduce the number of and/or impacts of turning movements on the 3rd Avenue Transit Mall in downtown Seattle.
- **Strategy CC2.4:** Implement speed and reliability projects to enhance operations on four priority center city bus corridors: Pike/Pine, Yesler/James/Jefferson, Jackson, and Queen Anne/SPU.
- **Strategy CC2.5:** Work with transit providers to implement off-board fare payment in conjunction with elimination of the Ride Free Area and Rapid Ride implementation.
- **Strategy CC2.6:** Work with Metro and Sound Transit to improve passenger wayfinding and information on all major transit streets in the Center City.
- **Strategy CC2.7:** Work with Metro, Sound Transit, and Community Transit to reroute regional bus services with high volumes of passengers bound for South Lake Union or north Downtown through South Lake Union via Mercer and Fairview (following completion of Mercer project).
- **Strategy CC2.8:** Upgrade downtown traffic signal systems to increase transit throughput on downtown streets.

Image from Oran Viriyincy

4 SERVICE

Ensuring delivery of high-quality transit service is of paramount interest to the City of Seattle. Transit service in Seattle is largely funded and operated by King County Metro Transit and Sound Transit, but the City has established a role in funding transit service, mostly in the form of subsidizing additional runs on overcrowded bus routes. Given Metro's large service area and financial challenges, the City should prepare to play an increasingly active role in funding service over the next 20 years.

The City's primary transit service objective is to ensure mobility in Seattle. In times of economic recession, the City may need to focus on maintaining current service levels on high ridership routes. In better times, resources should be dedicated to expanding the Frequent Transit Network.

Achievement of TMP goals will require continued work between SDOT and its transit agency partners, exemplified by recent partnerships that have shaped the RapidRide program, operation of Seattle Streetcar, stop consolidation on Metro routes operating in Seattle, and simplification of downtown transit pathways.

SEATTLE TRANSIT SERVICE PRIORITIES

Transit service in Seattle is largely funded and operated by King County Metro Transit and Sound Transit. The Seattle Department of Transportation (SDOT) manages local streets and transportation facilities and is best positioned to improve transit service by making capital investments that speed buses, improve reliability, and improve access to transit stops and stations. However, ensuring delivery of high-quality service is a priority for the City of Seattle, and the City has established a role in funding transit service by subsidizing additional service on high ridership or overcrowded bus routes. Given Metro's large service area and financial challenges, the City should prepare to play an increasingly active role in funding service over the next 20 years.

- The City's primary transit service objective is to ensure mobility in Seattle. During periods when transit revenues are in decline, the City may need to focus on maintaining service on high ridership routes. In better economic times, resources should be dedicated to expanding the Frequent Transit Network (FTN).
- The second City objective is to develop and expand the FTN to provide high-quality, high-frequency service between urban villages and urban centers for at least 18 hours per day and to reinforce walking, biking, and riding transit as the preferred modes of travel for in-city trips.
- A third City service objective is to develop the local transit network to effectively feed and support the FTN and to take advantage of high capacity rail a––-nd bus services. Local service should not run in parallel to FTN routes for long distances, unless those services are part of route combinations that provide FTN service and/ or there are topographical or other barriers that impact access.

Effective partnerships with Metro and Sound Transit must be in place at the staff and executive level to ensure these objectives are achieved. These partnerships will support successful inter-agency collaboration, exemplified by recent efforts that have shaped the RapidRide program, operation of Seattle Streetcar, stop consolidation on Metro routes operating in Seattle, and simplification of downtown transit pathways.

THE FREQUENT TRANSIT NETWORK

What is the Frequent Transit Network?

The Frequent Transit Network (FTN) guides service priorities in Seattle and gives direction for where capital investment would provide the greatest community benefit. The FTN should offer frequent, reliable service on designated corridors connecting urban villages and urban centers throughout the day, every day. Figure 4-1 illustrates the FTN that is in place today, with additional elements envisioned by 2030. The FTN will be developed with both bus and rail technologies. Whether an FTN corridor is to be served by bus or rail, the network should be developed to provide a consistently high standard of capacity, reliability, frequency, and customer service amenities. Seattle must continue to work with King County Metro to deliver the FTN vision and realize its value by fostering supportive land use development and high-quality pedestrian access.

The FTN represents the service element of the Complete Transit System and provides a guide for the City in:

- **Mobility Corridor Development:** Guides where the City should make coordinated transit, access, and land use investments (as described in the Mobility Corridors section of Chapter 5 on page 5-22). These corridors are the primary connections—and carry the most travelers—between key destinations and neighborhoods in Seattle.
- **Intersection and Signal Management:** Guides how signals and rights-of-way are managed in FTN corridors. Since these corridors carry the highest volume of transit riders and have the greatest potential to capture more non-auto users, signal management at intersections should favor transit vehicles; on-street parking uses should be reduced in the interest of moving full, high-capacity buses through congested commercial districts; and integrated solutions should be sought to allow transit and bicycles to safely coexist.
- **Service Investment:** Guides where the City should invest limited operating funds. FTN corridors were developed through an extensive evaluation of travel patterns, for all trip types, within and to and from the City of Seattle. This work is summarized in the Transit Master Plan Briefing Book, Chapter 2. Arguably, the urban village connections made by the FTN are the most important travel connections for all modes.

Service Design Principles for the Frequent Transit Network

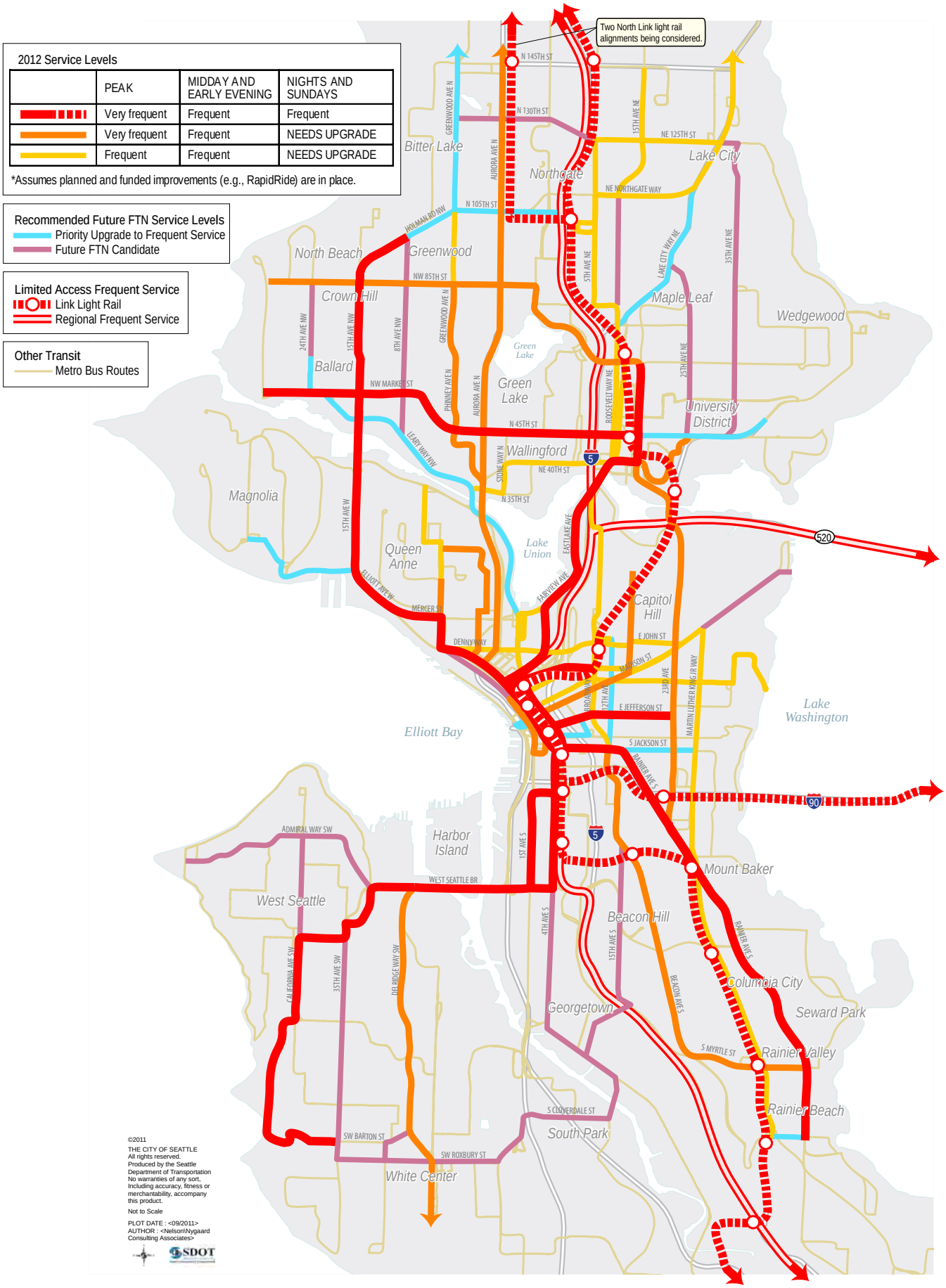
The following service principles were used to guide transit investment priorities for the Transit Master Plan (TMP):

- **Demand Driven:** Invest in transit where overall travel market demand is high
- **Direct:** Provide direct connections between urban villages and centers
- **Connected:** Develop a frequent service grid and create high-quality places for people where lines intersect
- **Simple:** Design for transparency and ease of use

In conjunction with the corridor evaluation process (see discussion in Chapter 3), these principles were used to design the network of corridors recommended for capital investment, service investment, and restructuring.

Appendix C provides background on development of the FTN map and the classification of the FTN corridors.

FIGURE 4-1 FREQUENT TRANSIT NETWORK



The diagrams in Figure 4-2 illustrate three basic concepts in transit network design: a point-to-point, a grid, and a radial (aka "hub-and-spoke") model.

While a point-to-point model may provide the most direct connections between the most destinations, in a radial or grid model, fewer lines are required. Fewer vehicles and operators are needed, allowing providers to deliver more frequent service on some or all routes and overall trips that are shorter, even factoring in transfers.

While in practice, most transit systems combine different models, the radial pattern predominates in Seattle. Radial bus and rail routes are overlaid with a number of point-to-point type services. Long radial routes have the best frequency and highest ridership but not always because people want to travel to the Center City. Crosstown routes, such as Metro's Route 48 (see sidebar), also have very strong ridership. The TMP proposes service restructuring that moves Seattle transit toward a more grid-oriented design. This is best illustrated by the proposed FTN investments that link services between the Rainier Valley and the University District and between Beacon Hill, Capitol Hill, and the University District. Rather than traveling to downtown, routes would be modified to cross multiple FTN lines that offer convenient transfers to downtown (Link light rail, Madison BRT, and east-west priority bus routes). While some downtown-bound passengers would need to connect (transfer) to Link, others would have direct connections that did not previously exist (e.g., Rainier Valley to Central District and Beacon Hill to First Hill/Capitol Hill).

Certain sectors of the City are better suited to a FTN grid than others. In the north, a grid is achievable and many important elements are planned or in place. In the south, challenges are much greater due to topography; physical barriers such as I-5, Boeing Field, and the railroads; and disconnected land use patterns. An important decision for developing a better grid pattern in south Seattle involves the routing of West Seattle RapidRide and Delridge bus services through SODO. The TMP recommends that strong consideration be given to routing these services to not use an SR 99 approach, but rather to use a pathway on 4th Avenue (some segments of 1st may need to be used as well to allow bi-directional access to Spokane). Although speed and reliability challenges need to be resolved, a focus of Chapter 3 (Corridors), this routing decision allows for the development of a high-quality connection between 4th Avenue, the E-3 Busway, and SODO stations. It recognizes the diverse demand patterns of residents; most trips (of all types, not just transit trips) made by southeast and southwest residents do not go downtown, but rather are oriented to other south Seattle neighborhoods and to Burien, Tukwila, Renton, and other southern neighboring cities (see Figure 4-3).

Performance Characteristics of the Frequent Transit Network

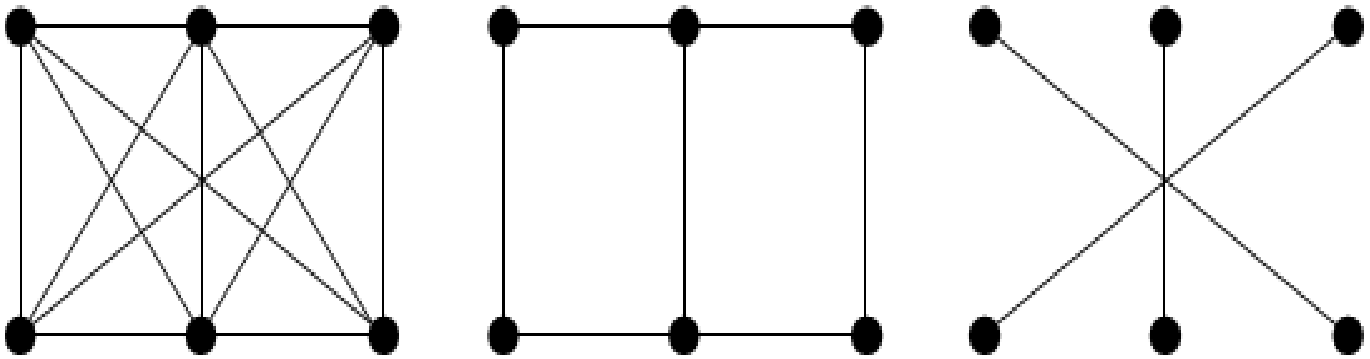
To meet City goals to increase transit mode share, the Frequent Transit Network must be:

- **Fast and Reliable:** Operate transit on arterial streets/transit priority streets where it will be most rapid and reliable; make improvements that speed transit and make transit travel more competitive with automobile travel.
- **Frequent:** Connect urban centers and urban villages with 15 minute or better, all day service.

In addition to implementing the capital projects specified for FTN corridors (see Chapter 3), a top priority for the City of Seattle is to work with Metro and other regional transit providers to deliver the following level of service on all FTN corridors:

- **Frequent All Day:** 15 minute or better service frequency all day
- **Long Hours:** 18- to 24-hour service span (6 a.m. to midnight, or later)
- **Every Day:** 7 day per week service

FIGURE 4-2 TRANSIT NETWORK DESIGN CONCEPTS



Point-to-Point **Grid** **Radial**

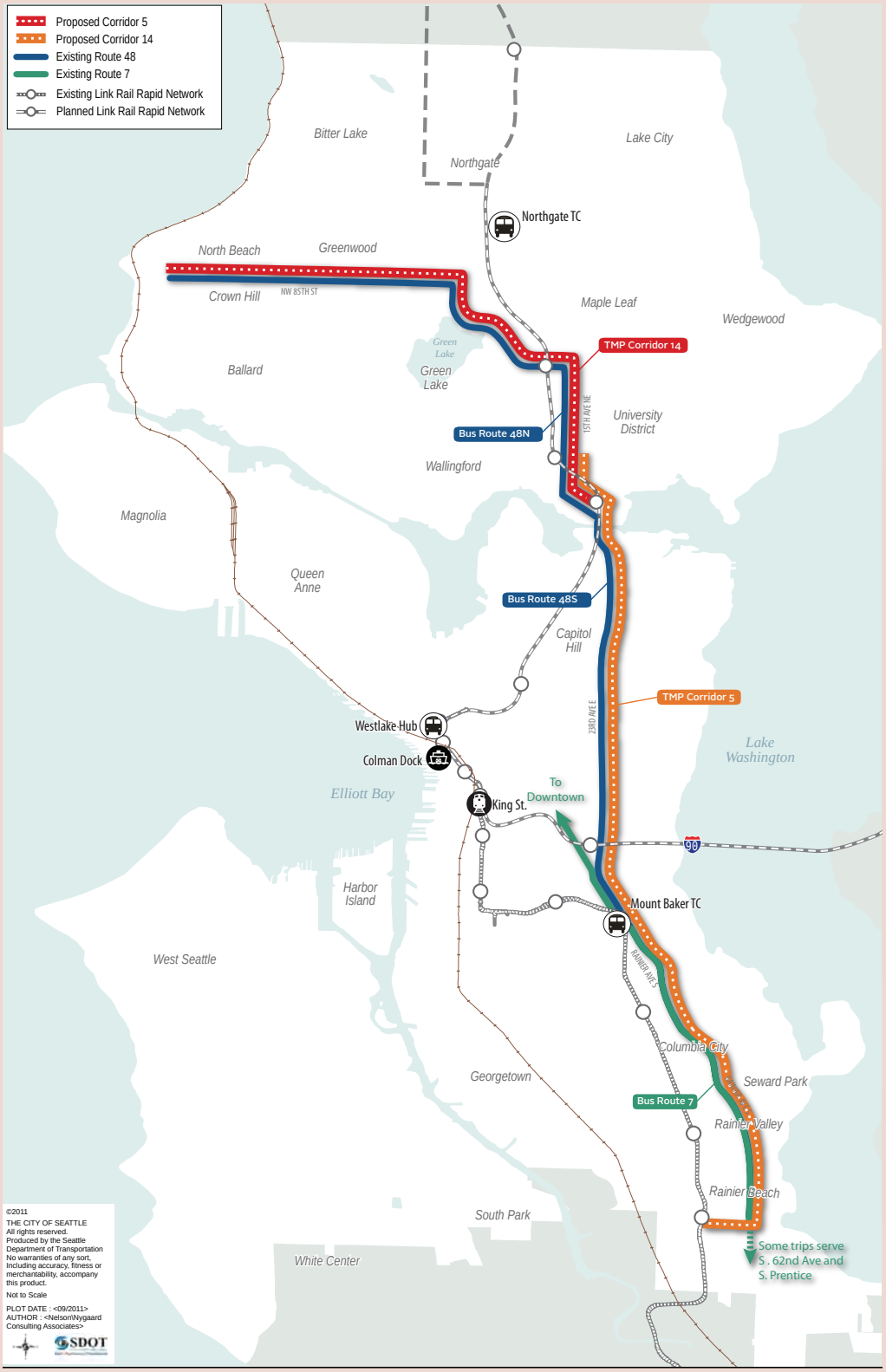
Source: Nelson\Nygaard

KING COUNTY METRO ROUTE 48

King County Metro's Route 48 is an example of a successful crosstown bus route. Route 48 effectively operates as two crosstown routes (48N and 48S) that seamlessly interline in the U-District, running from Mount Baker to Loyal Heights via the U-District.

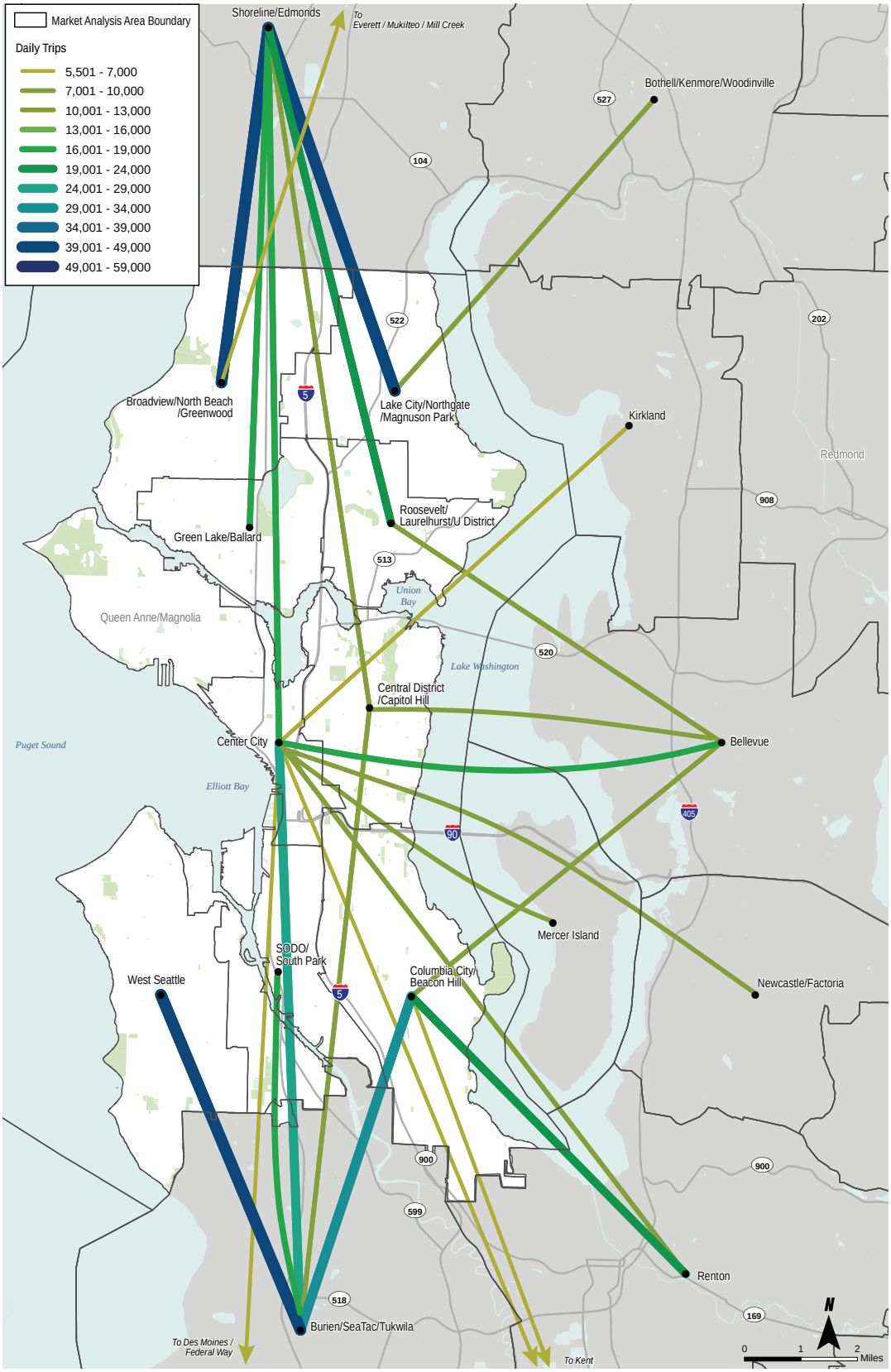
As the highest ridership route in the county, Route 48 illustrates that demand for non-CBD services can be strong when service is direct and operates at high frequency. The fact that Route 48 allows riders to travel through the U-District without transferring is likely a limited part of its success. The route could operate as successfully and more reliably as two separate lines or as longer east-west and north-south crosstown services.

The TMP recommends a Frequent Transit Network priority corridor that connects the southern segment of Route 48 between the U-District and Mount Baker with the southern segment of Route 7 between Mount Baker and the Rainier Valley light rail station. It recommends a second FTN priority corridor serving the northern portion of Route 48 and, further, recommends that both portions of the route be converted to electric trolley.



Route 48 Restructuring - DRAFT

FIGURE 4-3 MAJOR ORIGIN-DESTINATION TRAVEL PAIRS BETWEEN SEATTLE AND REGION (ALL OTHER TRIPS, 2008)

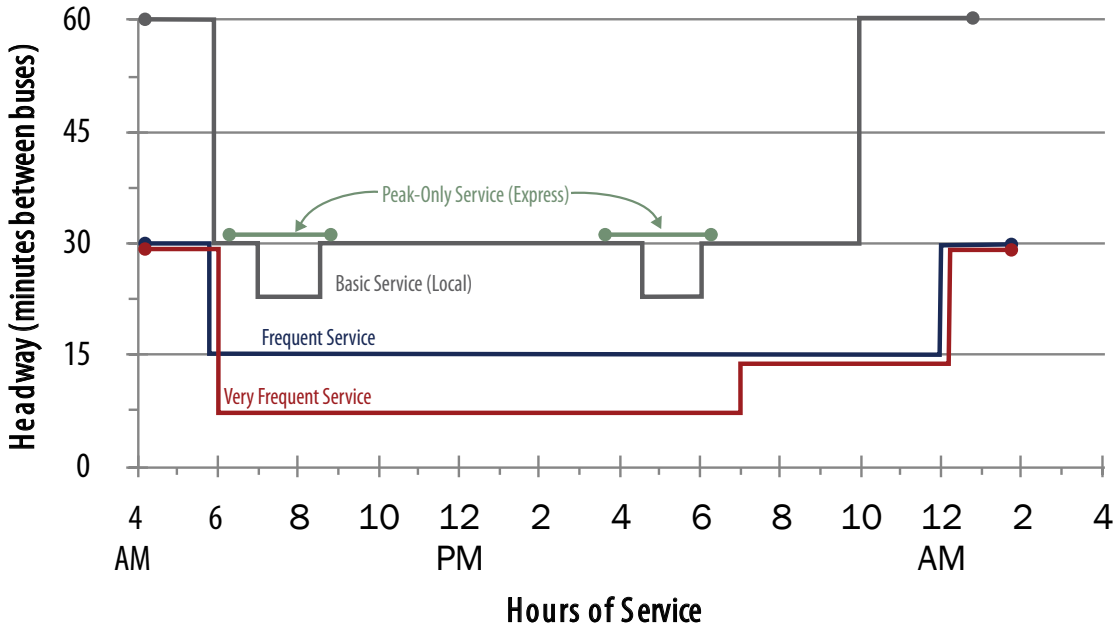


An examination of non-work travel shows that West Seattle and South Seattle residents travel frequently to and from destinations in Burien, Sea-Tac, Renton, and Tukwila.

Data Source: City of Seattle

Several FTN corridors already have headways that are better than every 15 minutes. Others will merit or require this level of service to meet projected ridership demands. Figure 4-4 illustrates target service levels over the course of the day for FTN (Frequent and Very Frequent) and Local services.

FIGURE 4-4 SERVICE TARGETS FOR THE FREQUENT TRANSIT NETWORK



Achieving Frequent or Very Frequent Service levels on the *FTN* is a key objective for Seattle, but will require incremental improvements and increased funding.

Source: Nelson\Nygaard

The TMP modeled future ridership demand to determine which routes are most likely to require additional service to meet increased demands. These corridors present opportunities for Seattle to fund additional service during peak hours or throughout the day. Figure 4-5 provides guidance as to where service subsidies might be in greatest need due to high passenger loads, particularly following speed and reliability improvements recommended in Chapter 3. (Note, however, that all TMP corridors are priority corridors.)

FIGURE 4-5 FREQUENT NETWORK CORRIDORS PRIORITIZED FOR CITY SERVICE SUBSIDY

Priority Based on Estimated Passenger Loading	Corridor
Highest Priority for Investment	5 Rainier Valley – U-District (Rainier/23rd)
	10 Northgate – Ballard – Downtown (15th Ave)
	7 Capitol Hill – South Lake Union – Queen Anne (Denny)
	Center City Priority Bus Corridors (Jackson, Pike/Pine, Queen Anne to Seattle Pacific University, and Yesler/9th/Jefferson)
	9 Aurora Village – Downtown (Aurora)
	3 Othello – U-District (Beacon/Broadway)
	4 Mount Baker – Downtown (Rainier/Jackson)
	15 Greenwood - Downtown
	13 Ballard – U-District (Market/45th)
	2 Burien TC/Delridge – Downtown
	14 Crown Hill – Greenlake – U-District
	1 West Seattle – Downtown (Fauntleroy)
	12 Lake City – Northgate – U-District

Note: Based on planning-level analysis, actual conditions will vary. Priority is relative to RapidRide service levels.

Services that Comprise the Frequent Transit Network

The FTN is mode neutral. Key modes that deliver FTN service are:

Image from Nelson\Nygaard

Light Rail (Rapid Transit): Rapid transit is defined by services that operate completely or largely in their own rights-of-way, separated from interaction with other modes of transportation. Link light rail is the only transit service in Seattle that fits this category. However, Seattle's long range vision for transit identifies a number of corridors that are candidates for future rapid transit.

Image from Nelson\Nygaard

Priority Corridor Bus (Diesel and Electric Trolley Bus): Bus service operating on major arterial roadways is the foundation of Seattle transit service, carrying a majority of daily transit trips in Seattle.

Image from Wikimedia Commons user Ludek

Rapid Streetcar: This is a high-capacity urban rail mode that uses streetcar vehicles, which are lighter than light rail vehicles, operating in existing street rights-of-way. Priority over vehicular traffic is provided wherever possible, and traffic operations and stop spacing are designed and managed to achieve a high level of speed and reliability. There is no rapid streetcar service currently in Seattle. However, the TMP recommends two such lines: Loyal Heights – Ballard – Fremont – South Lake Union – International District and Roosevelt – U District – South Lake Union –International District. Rapid Streetcar is a promising mode for building out other proposed corridors in the Seattle long-range HCT vision, particularly where passenger demand is consistently higher than what a frequent bus can handle.

Image from Nelson\Nygaard

Local Streetcar: The South Lake Union Streetcar and First Hill Streetcar (future) target short circulation trips in the Center City and adjacent neighborhoods. Although local streetcars provide frequent service, they have very different characteristics than the other modes—they are not designed with speed in mind and therefore do not operate in transit-only lanes or with priority over traffic.

Image from Nelson\Nygaard

Bus Rapid Transit: BRT is a high-capacity rubber-tired mode designed with features similar to light rail, ranging from distinctly branded buses and stops to exclusive rights-of-way. Boston's Silver Line (shown above) is an example of "full" BRT, with more aggressive priority treatments and station-like stops. King County Metro's RapidRide could be said to fall into a "light" category, where buses primarily operate in mixed traffic and transit priority is focused on points of congestion.

BRT typically uses diesel-powered vehicles, however electric trolley buses could also be used. The TMP recommends one such line, on Madison from Capitol Hill to Colman Dock. It would be limited to 40-foot buses due to the topography of the corridor.

CRITERIA FOR EXPANSION OF THE FREQUENT TRANSIT NETWORK

As Seattle land use patterns change over time, the City should continue to work with Metro to ensure that any further investment in the FTN service meets the following criteria:

- **Demand** – ridership and land use patterns suggest demand for all day (at least 18 hours) service with headways of 15 minutes or better between 6 a.m. and 9 p.m., or later
- **Permanence** – dense and diverse land use patterns guarantee strong ridership support over time
- **Connections** - direction linkages between urban villages and urban centers
- **Linkages** – intersections with other FTN routes
- **Simplicity** – direct route design that supports network transparency

These criteria are supported by the King County Metro Transit Strategic Plan for Public Transportation and Service Guidelines. Metro's Strategic Plan calls for Metro to "Manage the transit system through service guidelines and performance measures." Metro's objectives for developing an all-day network of top-quality service align with the FTN objectives. The Strategic Plan indicates Metro will design its services to meet the following objectives:

- Support regional growth plans
- Respond to existing ridership demand
- Provide productive and efficient service
- Ensure social equity
- Provide geographic value through a network of connections and services throughout King County communities

Under each objective, thresholds are established to guide adjustment of service levels. For more information see http://metro.kingcounty.gov/planning.

Branding the Frequent Transit Network

The FTN concept is the basis for leveraging broad public-public and public-private partnerships needed to improve and better market a diverse network of high-frequency services. It provides an opportunity to create a recognizable subset of services that communicates quality, comfort and convenience. Branding the FTN is most importantly an opportunity to communicate that the City's highest quality transit route network is a permanent, integrated part of city infrastructure.

Seattle's transit network is saturated with brands, including those used by multiple transit agencies, those used for specific modes (e.g., Link, Seattle Streetcar), and those used for service families (e.g., RapidRide). Link, Seattle Streetcar, and RapidRide brands are all suggestive of a minimum level of service (frequency), but what about the rest of the Metro bus system that provides comparable service levels? Seattle residents, workers, and visitors would benefit most from a unifying service quality brand that crosses multiple providers and service families.

Transit branding can apply to many elements of a transit route or system, but is most effective when applied to all:

Vehicles are effectively used to brand the Hop, Skip, and Jump family of service in Boulder, Colorado.

Image from Nelson\Nygaard

Branding elements in this prototype stop and shelter installed by STM in Montreal clearly identify the transit agency, differentiate service types through use of color, and incorporate transit maps on the stop pole.

Image from STM

Public information signs in Portland include wayfinding to major transit services.

Image from Flickr user NedRichards

Transit signage on the Portland (OR) Transit Mall is prominent and distinct from other types of signage and clearly identifies the agency and service types and routes at the stop.

Image from Nelson\Nygaard

Transit branding can also be applied very pointedly or broadly to elements of a city's transit system:

SINGLE ROUTE: Cleveland's Health Line BRT is an example of single service with a unique set of features, route design, branding, and public information.

Image from Nelson\Nygaard

SERVICE FAMILY: RapidRide, King County Metro's enhanced corridor bus service, is an example of a brand that will be applied to a subset of bus service.

Image from Nelson\Nygaard

NETWORK: Portland's Frequent Network is a brand that is applied to all services, rail or bus, to connote a minimum level of service quality.

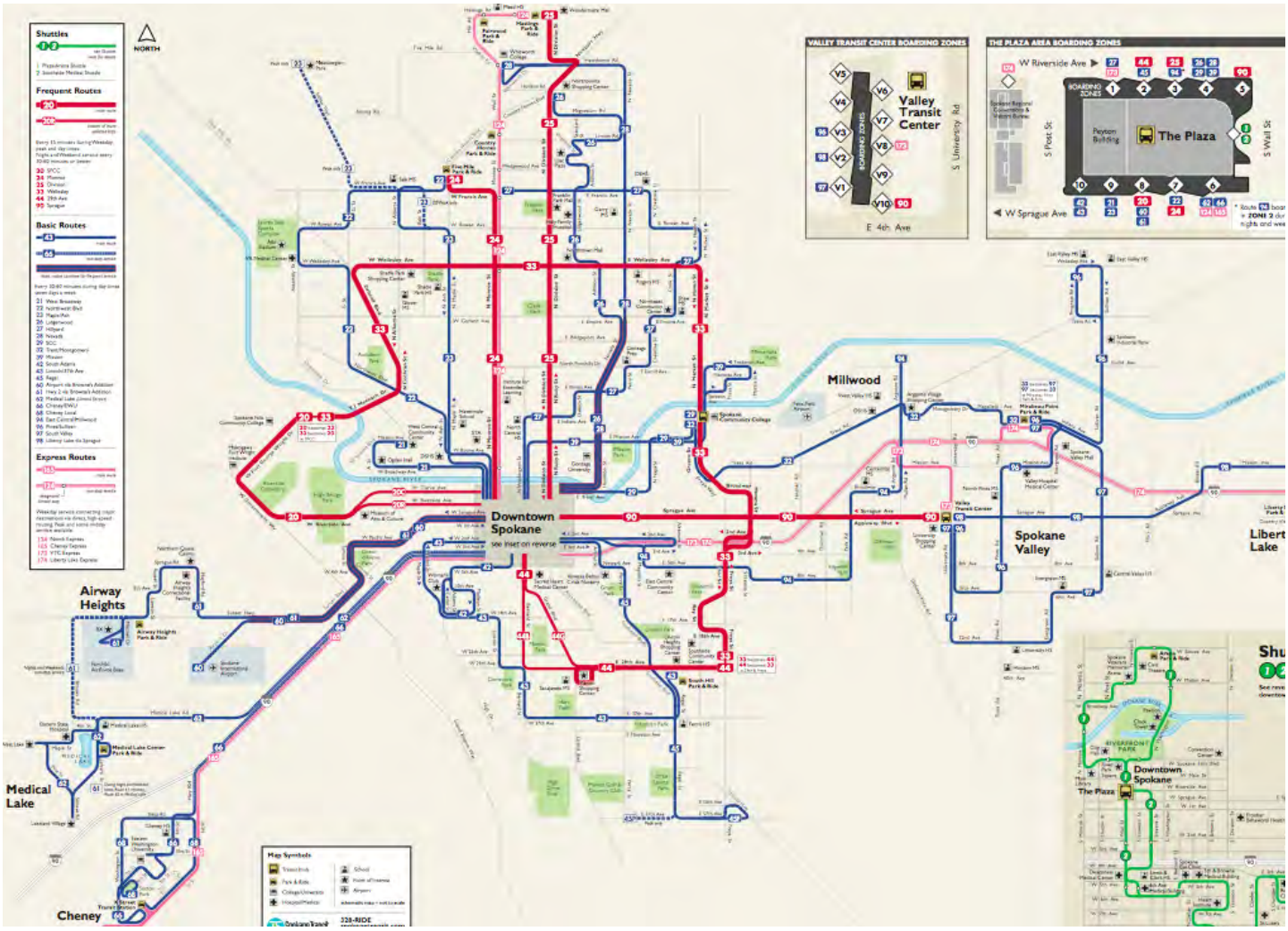
Image from Nelson\Nygaard

Consider an on-line transit trip planner. When a customer enters an origin and destination in the system, they almost always choose to sort their results (if the trip planner doesn't already do so for them) by shortest travel time. System branding can help communicate which services are most likely to be fast, frequent, and reliable. Key principles and steps for using branding to improve ridership on the Seattle transit system include:

- Emphasizing clear information and branding of connections over vehicle or service types, including:
  - An easy to use map of the FTN emphasizing connections between major nodes (Figure 4-6 provides an example from Spokane). TriMet in Portland also effectively maps its Frequent Network (see Figure 4-8.)
  - Providing route level maps that simply communicate direct connections between key destinations and major transfer points. King County Metro's map of the RapidRide A-Line in Figure 4-7 employs this technique.
- Marketing a network of services and creating a brand that is used in all public information, including:
  - Vehicles (can be a very subtle brand that overlays existing provider or service brands)
  - Facilities (e.g., stations, stops, and other amenities)
  - Signage
  - Schedules and on-line transit information
  - Advertising and public information

Metropolitan areas with a single agency that oversees regional transit operations, such as Minneapolis, Portland, and Montreal, have greater incentive to develop a strong network brand. Since these agencies are paying for all services, they work hard to avoid duplicative services and market the value of a strong network (see sidebar, page 4-13).

FIGURE 4-6 EFFECTIVE MAPPING SAMPLE



Source: Spokane Transit

FIGURE 4-7 SAMPLE ROUTE-LEVEL MAP

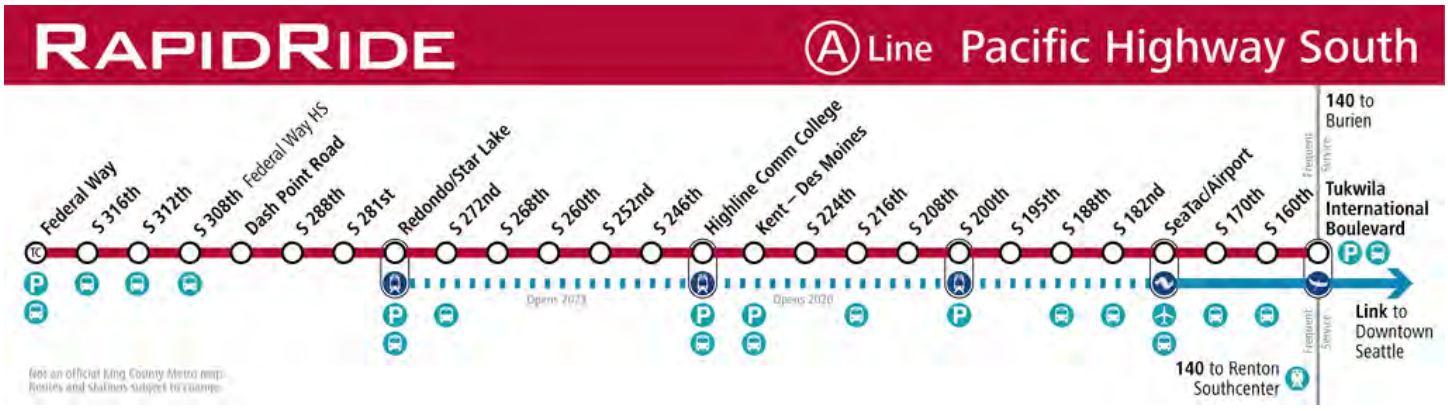


Image from Oran Viriyincy

SERVICE BRANDING

Transit branding can be employed to help communicate aspects of service quality (e.g., speed, reliability, frequency, and span of service) on an individual route or a network of routes. In some cases, a brand communicates all of these aspects. For high-capacity transit services that are commonly known to operate at high frequency all day, branding is often tied to speed or some other aspect of service. For example, the Link brand connotes the broader function of the light rail system—to connect major urban centers around the Puget Sound region. Branding of bus services in urban areas, where many routes service multiple functions and geographies and operate with varying levels of service, is most effective when tailored to communicate the key service-quality attributes. In the case of Seattle's core network of bus routes, which include most of the electric trolley system, "frequency" is the most important aspect of the network to communicate. Customers are more sensitive to wait time than on-board travel time. This is particularly true for short trips. Therefore, Seattle and King County Metro should focus branding efforts on "frequency."

TriMet in Portand, Metro Transit in Minneapolis, and STM in Montreal have built very strong brands around a frequent service network. Translink in Vancouver, BC uses a Frequent Transit Network as a guiding developmental component of their citywide transportation plan, although their service brands do not use frequency as a primary theme. In each of these cases, the "frequent" brand also connotes a core set of services where the greatest investment is made to improve reliability, comfort, passenger amenities, and travel time (or at least priority over congestion).

The examples offered in Figure 4-8 are integrated elements of each agency's marketing plan, but none are a dominant brand for a particular type of service.

FIGURE 4-8 EXAMPLES OF FREQUENT SERVICE NETWORK BRANDING

TriMet (Portland, OR) – Frequent Service

Brand Logo

Stops

System Map

Source: TriMet

Metro Transit (Minneapolis) – High Frequency Service

Brand Logo

Stops

System Map

Source: Metro Transit

STM (Montreal) – Reseau 10 Minutes Max

Brand Logo

Source: STM

Stops

Image from STM

System Map

Source: CAT Bus

ELECTRIC TROLLEY BUS BRANDING ELEMENTS

Certain attributes of Seattle's electric trolley bus system could provide attractive branding elements, such as zero-emissions operations. On the other hand, Metro should avoid the use of "green" operations as a dominant brand because it does not apply to the entire system of frequent bus service within Seattle. The following examples show how other agencies have incorporated "green" branding on their bus fleets. An approach for Metro and the City of Seattle may involve a much more subtle sub-brand that stresses zero-emissions and/or low noise attributes, but does not involve full bus wraps or significantly different paint schemes.

The Pittsburgh Port Authority is branding its new diesel-electric hybrid buses as "Clean Green," with green paint and a leaf design.

Image from Flickr user Herrvebah

Branded electric bus in Minneapolis.

Image from Flickr user fihrdad fog

A compressed natural gas (CNG) electric hybrid in San Diego.

Image from Flickr user SoCalMetro (used with permission)

Hybrid-electric bus in Columbus, Ohio.

Image from Flickr user gsbrown99

STRATEGY AREA: IMPLEMENTING THE FREQUENT TRANSIT NETWORK

- **FTN 1:** Partner with Metro and other regional transit providers to deliver the following level of service on all Frequent Transit Network corridors:
  - 15 minute or better service frequency all day (between 6 a.m. and 9 p.m., or later)
  - 18- to 24-hour service span (6 a.m. to midnight, or later)
  - 7 day per week frequent service
- **FTN 2:** Develop local funding sources to support additional service subsidy (see also Chapter 6 - Funding).
- **FTN 3:** Target any City transit operating funds/subsidies to meet or surpass minimum service levels on routes that comprise the Frequent Transit Network, particularly where Frequent Transit Network corridors regularly exceed loading standards.
- **FTN 4:** Work with Metro to develop performance agreements that ensure service hours gained through City capital investments will be reinvested in routes serving the Frequent Transit Network in Seattle.
- **FTN 5:** Work with Metro to develop a transit system restructuring study, or studies, for all Seattle bus routes (and possibly key services extending beyond Seattle).
- **FTN 6:** Use a Multiple Account Evaluation (MAE) approach (see Chapter 3) to reassess priorities for expansion of the Frequent Transit Network every 5 years.
- **FTN 7:** Work with Metro to develop a late-night service program on top of performing Frequent Transit Network routes. (Secondary to establishment of minimum service levels – FTN 1).
- **FTN 8:** Manage operations of arterial transit streets to provide priority to transit vehicles carrying high passenger volumes.
- **FTN 9:** Set policies that encourage all land uses with high transit trip generation to locate within ½ mile of a Frequent Transit Network route.
- **FTN 10:** Provide input to Metro on specifications for the new Electric Trolley Bus fleet and consider funding vehicle features that support Frequent Transit Network design and service levels and enhance ride quality and passenger comfort.
- **FTN 11:** Coordinate FTN service level standards and operations with relevant land use codes.

SEATTLE ELECTRIC TROLLEY BUS SYSTEM

Overview

Public transit is an emblematic element of every great city. New York has its subway, Toronto its streetcar system, and Vancouver its SkyTrain metro system. All these systems combine function, quality, and brand appeal to deliver a compelling service that is widely used by residents and visitors alike. No one element of Seattle's transit system delivers greater mobility, access to important local destinations and transit friendly neighborhoods, or holds more potential to elevate the quality and appeal of transit than the electric trolley bus system operated by King County Metro. If there were personal ads for transit, the electric trolley bus would have an attractive line in the Seattle papers.

> "Always there but quiet, hill climber, environmentally friendly, seeks hilly Seattle neighborhood for diligent service."

Seattle's electric trolley bus (ETB) system is an important tool to deliver City goals related to mobility, environmental protection, and quality of life.

To meet City and County targets for climate change, growth, and reduction of vehicle miles traveled, Seattle's transit network must be capable of absorbing far more ridership than it currently accommodates. This will require transit to carry many more people in Seattle and serve a broader range of trip types for residents and visitors. The City and King County Metro must continue to partner to ensure Seattle can gracefully support planned growth with safe, comfortable, clean, and effective mobility for all its residents. Maintenance, enhancement, and expansion of the electric trolley bus system can help to meet this goal.

An Abbreviated History

As part of a broad effort to modernize Seattle's transportation system in 1939, a special commission proposed the replacement of a number of streetcar, cable car, and bus routes with a 110 mile electric trolley bus system. With swift action to launch the system, 235 trolley buses were operating by the following year. Two to three decades later, the 110 mile system was still in place, but faced competition with modern diesel buses, which could be operated cheaply given the low cost of fuel.[1]

When North Seattle was annexed in the 1950s, 40,000 new residents were promised transit service. Seattle Transit, the city's then-private transit company, was in dire financial straits and could not bear the costs required to extend trolley wire infrastructure to the new northern city limits. Instead, many of the overhead power lines were dismantled and trolleys were replaced with diesel buses. Figure 4-9 illustrates the extent of the electric trolley bus system in 1963, prior to the annexation of North Seattle.

By 1970, the system had diminished to 32 route miles.

When Metro (then the Municipality of Metropolitan Seattle) inherited the trolley bus system in 1973, it successfully retained federal grant funds to restore aging infrastructure and replace the vehicle fleet.

Figure 4-10 illustrates the extent of the King County Metro electric trolley bus system as it operates in 2011.

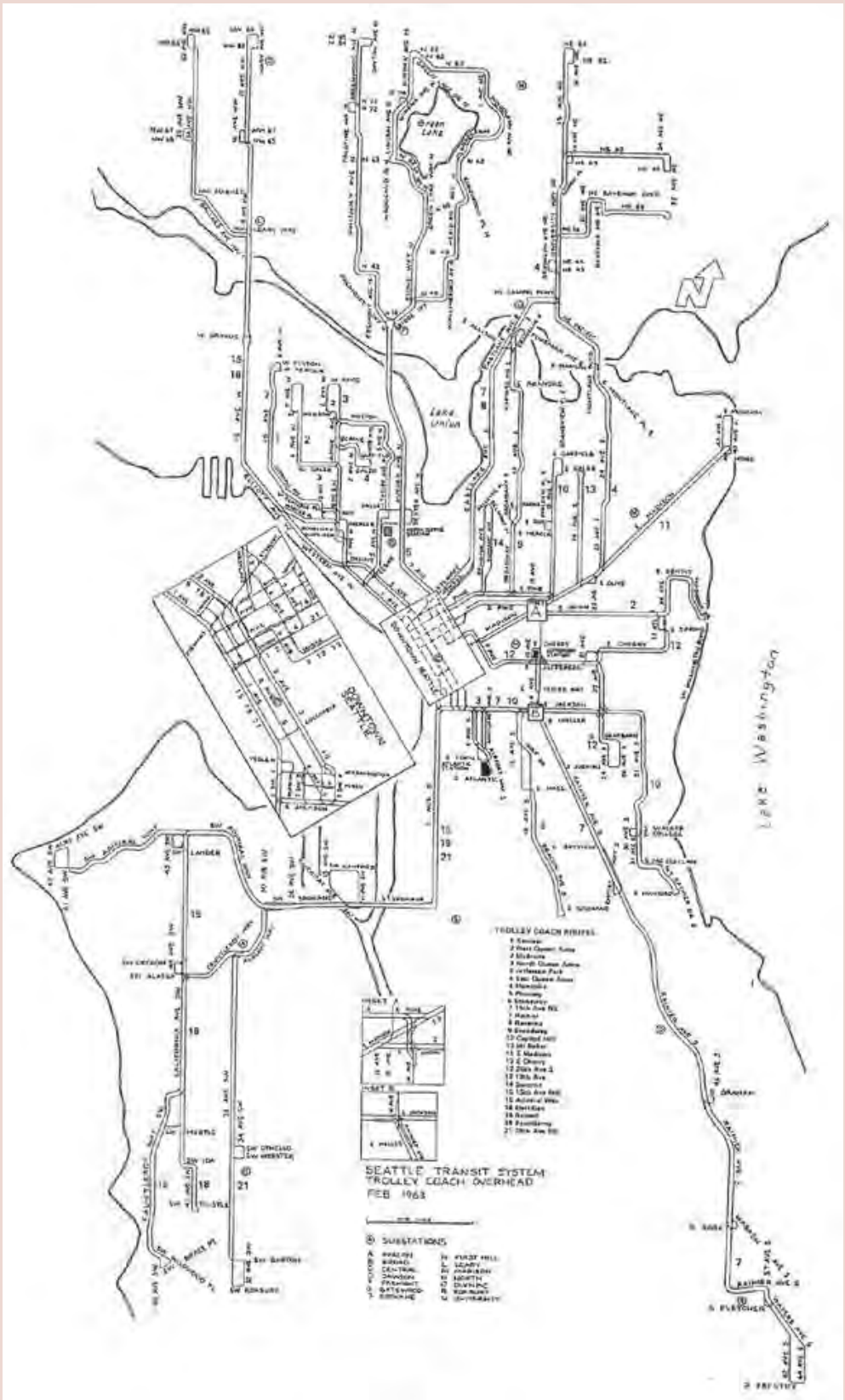
Today, King County operates 14 different ETB routes on 70 miles of streets. The 159 vehicle ETB fleet includes both standard forty-foot and articulated coaches. Electric bus routes carry approximately 23% of Metro riders countywide while consuming approximately 15% of service hours.

1 *King County Trolley Bus Evaluation Report.* May 2011. King County Metro.

Earlier (left) and current generation (right) electric trolley buses. By 2015, Metro will have replaced its entire ETB fleet with modern vehicles. This investment in vehicles itself will improve customer experience on many Seattle bus routes.

Images from Flickr user Oran Viriyincy

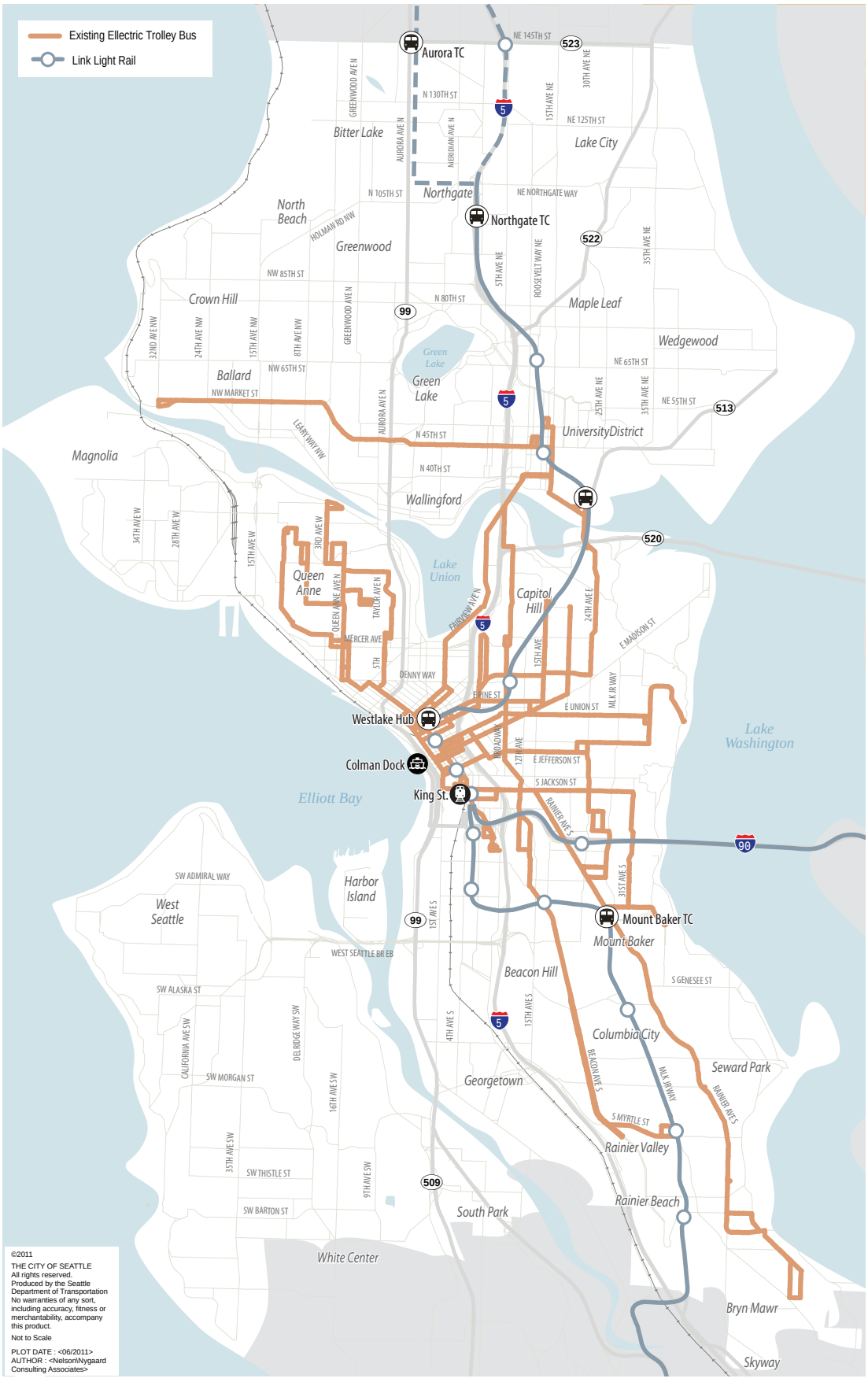
FIGURE 4-9 1963 ELECTRIC TROLLEY BUS NETWORK PRIOR TO NORTH SEATTLE ANNEXATION



Proposed by a special commission in 1939 as part of an effort to modernize Seattle's transportation system, a 235 trolley bus system was launched and operating 110 miles of two-way service by the following year.

Source: King County Metro

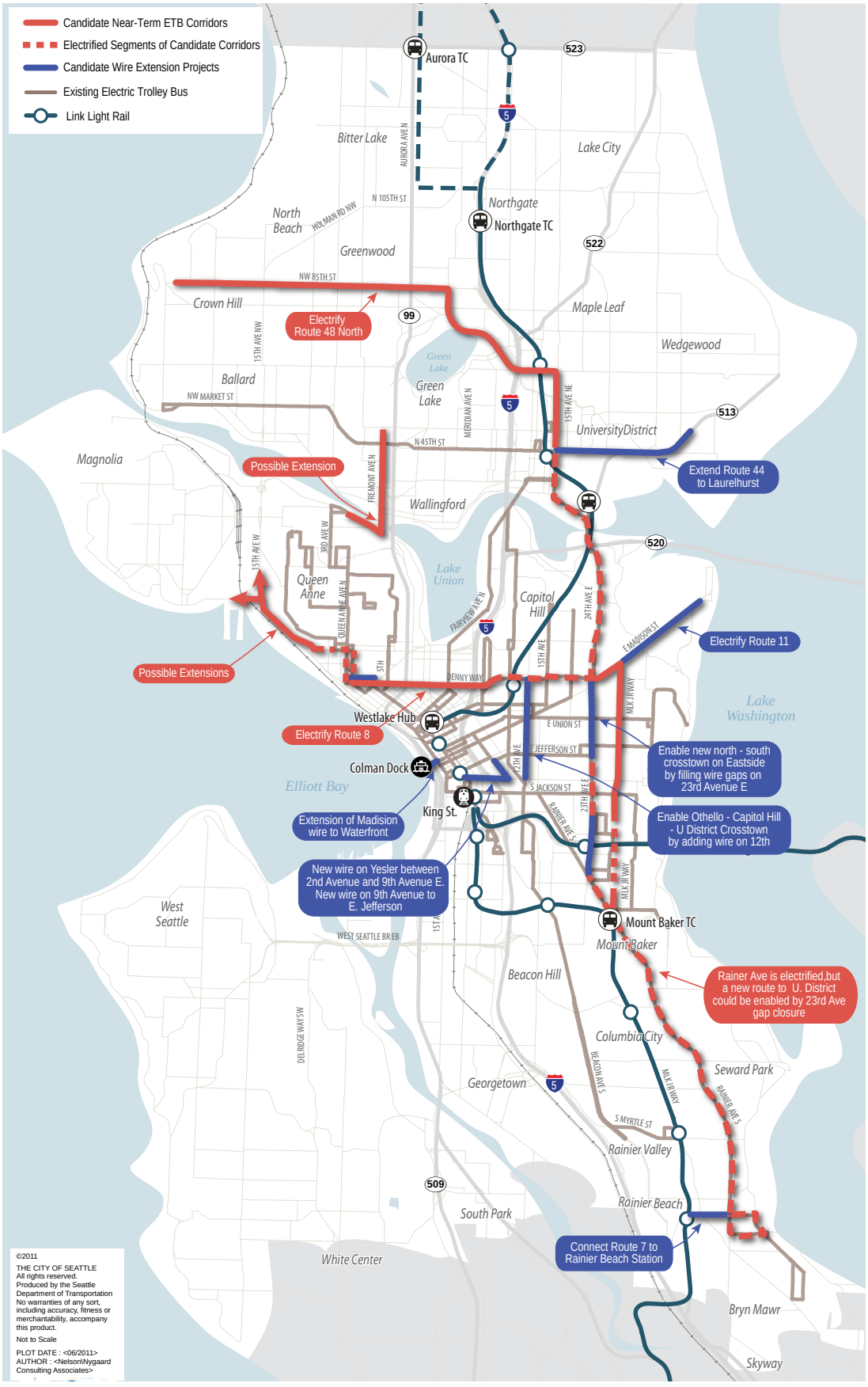
FIGURE 4-10 2011 ELECTRIC TROLLEY BUS NETWORK



Today King County operates 14 different ETB routes on 70 miles of two-way trolley wire. The 159 vehicle ETB fleet includes both standard forty-foot and articulated coaches.

Source: SDOT

FIGURE 4-11 PROPOSED ELECTRIC TROLLEY BUS NETWORK IMPROVEMENTS



This map illustrates a number of potential electric trolley system projects included in the TMP. Projects range from short wire additions that would allow existing routes to be restructured to full electrification of existing Metro diesel routes. Some may be reasonable short-term priorities, while others are dependent on other corridor planning and development decisions. Potential longer-term electrifications include several frequent, non-freeway routes not shown on the map.

Source: SDOT

WHY IS THE ELECTRIC TROLLEY BUS IMPORTANT TO SEATTLE?

Arguably, an electric trolley bus is just another vehicle type used to deliver urban transit service. A vehicle itself does not make or break the value or quality of service provided by a transit route or system. However, a number of factors distinguish and emphasize the value of electric trolleys in Seattle.

- **Hilly terrain:** Seattle's unique topography includes a number of ridges and land forms that drop quickly to the water bodies that surround the City. The electric trolleys provide rapid acceleration and quiet operation on steep grades that cannot be matched by diesel or diesel electric hybrid vehicles.
- **Great neighborhoods:** Seattle is famous for its livable neighborhoods; quiet operations provided by electric trolleys allow high levels of transit service in dense mixed-use neighborhoods without the downside of noise and emissions created by diesel coach operations. Electric buses are the quietest mode of motorized street-level public transit.
- **Rapid urban growth:** Seattle is projected to grow rapidly over the next 20 years, with most of the population and job growth projected to occur in the Center City areas and other urban centers where current electric trolley service is most extensive.
- **Strong environmental values:** The City and County are national leaders in environmental protection and have set aggressive goals for reducing greenhouse gas emissions. Seattle's power company, City Light, provides GhG-neutral electricity, allowing electric transit in Seattle to provide clear emission reduction compared with diesel operations. Regardless of power source, electric buses are approximately 1.9-2.4 times as energy efficient as diesel buses.[1]
- **Ease of navigation:** Transparency and ease of navigation has always been an argument in favor of rail transit. Fixed rail tracks running in the street right-of-way are easy to recognize and signal to passengers that there will be a train coming soon. Overhead wires used to power ETBs provide a similar benefit. Since trolleys run in neighborhoods that host many of the City's visitor attractions, this benefit, combined with high-quality information, can help to draw visitors and infrequent riders to transit.
- **Additional funding:** Despite higher operating and capital costs compared to diesel or diesel electric bus options (discussed below), the availability of FTA fixed guideway funding for the electric trolley system helps King County Metro provide more service per increment of locally generated funding. A recent analysis by King County shows that on an annual life cycle cost basis, which includes both operating and capital cost elements, using trolley buses to operate the existing network is $3.7 million cheaper each year.[2]

1 Metro Trolley Expansion Program FEIS; also The Trolleybus in Edmonton: A Step Toward Better Public Transit and a Cleaner Environment, Kevin Brown, 2001

2 *King County Trolley Bus Evaluation Report.* May 2011. King County Metro.

Electric Trolley Bus Fleet Replacement

A recent decision by King County Metro to replace its entire electric trolley fleet with modern coaches by 2014 sets the stage for Seattle and King County to elevate the function and perception of the ETB system. Matching the fleet improvements with operational enhancements, access improvements, and better passenger facilities will leverage greater value from investments in new vehicles.

Specifications for these vehicles will be developed by King County Metro by early 2012. It is important that new vehicles include the following features:

- Modern BRT rail-like vehicle appearance.
- Low floors and extra doors (3-4 doors vs. 2-3 doors, depending on vehicle length) for faster boarding. This could be particularly valuable as Metro and other providers migrate toward off-board fare payment. (Many ETB routes will be top candidates for implementing full or partial off-board fare payment).
- Off-wire capability to allow rerouting around street closures.
- ORCA "smart card" readers at all doors to allow all-door boarding for pass holders.
- Passive restraint wheelchair system.

If these features are not included in the Metro-funded specifications, the City of Seattle should consider providing supplemental funding to ensure this significant investment in passenger vehicles aligns with City priorities for service quality and access. Figure 4-12 shows features of ETB used in other cities.

FIGURE 4-12 POSSIBLE VEHICLE ENHANCEMENTS

Three Door Boarding

EMTU low-floor trolleybus in São Paulo provides three door boarding.

Image from Wikimedia Commons user Ailton Florencio

Battery Operations

A Translink electric trolley bus in Vancouver, B.C. This is a 40' New Flyer vehicle with battery auxiliary power allowing off-wire operations.

Image from Wikimedia Commons user Bobanny

Rail Style Vehicle

Irisbus Cristalis trolleybus in Lyon, France.

Image from Wikimedia Commons user Momox de Morteau

Open Interior Layout for Greater Capacity

Photo of interior configuration of Irisbus Cristalis 60 foot articulated electric trolley bus.

Image from Wikimedia Commons user tompagenet

Advanced Pole Technology

Wellington NZ carbon fiber poles reduce "jumping" wires or dewirements. This vehicle is produced by Designline Vehicles.

Image from Wikimedia Commons user tompagenet

BUS FEATURES

These photos highlight important features for enhancing the comfort, capacity, and accessibility of buses. These features are relevant to both ETB expansion and buses generally. They include:

- Low-floor vehicles for level boarding and streamlined wheelchair access
- Automated stop announcements, both visual and audible
- Seats that fold up to accommodate wheelchairs
- Perimeter seating and a wider aisle
- Seats that fold up to accommodate standing room passengers, as well as plentiful bars and grips to hold onto
- Boarding at multiple, wide door, with fare payment readers available at all doors
- Interior maps illustrating the route, stops, and travel times

FIGURE 4-13 FEATURES FOR ENHANCING BUS COMFORT, CAPACITY, AND ACCESSIBILITY

Accessible wheelchair boarding from multiple doors on a bus in Rome.

Image from Nelson\Nygaard

Perimeter seating on an articulated bus. Image from Flickr user Dennis Tsang

Requiring off-board ticket purchases and/or providing on-board electronic card readers speeds boarding times.

Flickr user Monica Arellano-Ongpin

Rail-like route strip maps, exemplified by this concept for Metro Route 48, would make it easier for new riders and visitors to use the bus system.

Image from Oran Viriyincy (via Flickr)

STRATEGY AREA: ENHANCING THE ELECTRIC TROLLEY BUS SYSTEM

- **ETB1:** Work with Metro to ensure that the 2014-15 vehicle procurement includes the state-of-the-art features referenced in Figures 4-12 and 4-13.
- **ETB2:** Pursue grant funding opportunities and develop partnerships with Metro and others to continue expanding the system until and unless new zero-emissions technology becomes widely available, reliable, and affordable.
- **ETB3:** Ensure that SDOT and other City processes for permitting electric transit infrastructure helps facilitate trolley system development.
- **ETB4:** Collaborate with Metro to consider an electric trolley sub-brand that stresses the zero-emissions and/or low noise attributes of ETB service.

SEATTLE LOCAL TRANSIT NETWORK

Local Transit Network

King County Metro provides a network of fixed-route bus services to lower-density areas of Seattle that are not directly served by the FTN. Referred to as the Local Transit Network (LTN) in this plan, this includes routes that provide access to the FTN, express service from neighborhoods to downtown, and neighborhood circulation. The LTN is also supplemented by demand responsive public transportation services and private and institutionally operated shuttles that provide services targeted at specific populations.

The LTN is not a key focus of this plan, since the City's limited transit resources will be focused on the development of the FTN. However, the City should support Metro actions to:

- Maintain a basic or "lifeline" level of LTN service to within ½ mile of most Seattle residents. This level of service is defined by a minimum of 60 minute frequencies for 15 hours per day. If a route cannot support this level of service, then redeployment and/or provision of alternative service concepts should be considered.
- Restructure LTN services as new FTN services come on line (e.g., the opening of the University Link and North Link will provide an opportunity to eliminate duplicative downtown-bound services and redeploy services to better feed Sound Transit light rail stations or FTN corridor stations).
- The extent of LTN service will change over time, becoming a smaller share of the City's overall system as:
  - New rapid transit lines are implemented and replace express routes (less LTN service, more FTN service).
  - The FTN expands.
  - New local service or private shuttles are added to support new rapid transit lines.
  - Demand grows for local services feeding rail stations or transportation centers, allowing them to be upgraded to FTN service.
  - Service consolidation occurs to improve service efficiency and effectiveness.

Coverage rather than speed is the goal for the LTN. Stop spacing as close as 600 feet can be acceptable in some cases, but transit access improvements are, like the FTN, critical to maximizing its usefulness. The City should consider the elevated need for access to LTN stops in prioritizing pedestrian and bicycle investments.

Local Transit Network Priorities

The City should focus efforts to improve the LTN—through funding or policy—on areas with the highest ridership and those areas that do not have convenient walking access to the FTN. The TMP recommends that the City focus on LTN improvements in two areas: (1) partnering with Metro on strategic restructurings that allow service hours to be redeployed within the LTN and (2) enhancing service in areas with limited FTN access.

- **Restructuring Opportunities:** The following are areas where the City should work with Metro to continue to refine or restructure the LTN in conjunction with completed or upcoming FTN service improvements:
  - **Southeast Seattle:** Many LTN routes in this area have been restructured to provide connections with Link light rail stations between Mt. Baker and Rainier Valley. However, challenging topography and wide light rail stop spacing make it challenging for many residents to access light rail.
  - **University District/North Seattle:** Sound Transit University Link (Husky Stadium) and North Link (Roosevelt, Northgate) extensions will open in 2016 and 2021, respectively. Both will provide opportunities to redeploy LTN service to feed this high-capacity link to the Center City. Opening of the Northgate station, in particular, will provide opportunity to discontinue downtown-bound, peak-only express bus service. Service redeployment in this section could be allocated to improve LTN service in neighborhoods, such as Pinehurst, that don't have convenient walk access to the current or planned FTN.
  - **NE Seattle:** The planned opening of RapidRide lines D (Northgate – Ballard – Downtown) and E (Aurora Village – Downtown) will present an opportunity to consider service restructuring in NE Seattle. In particular, this is an opportunity to consider enhancing services that intercept FTN corridors on Aurora Ave, Lake City Way, and 15th Ave NE and eliminating expensive express bus services to downtown.
- **Priority Areas for LTN Investment:** The following are areas of the city where FTN services are more than a ½ mile walk and, therefore, LTN routes should be considered for increased service levels through reallocation from lower-productivity LTN routes. LTN routes must also have the following characteristics to be considered for added service: (1) be well utilized and (2) be designed to provide access to the FTN and/or multimodal hubs.
  - West Seattle: north of Alaska Junction and along 35th Ave SW
  - Georgetown/South Park
  - Magnolia
  - NE Seattle: east of 25th Ave NE and north of NE 45th Street
  - North Seattle: east-west services in the vicinity of N 125th Street and N 145th Street

The TMP Briefing Book, pages 4-9 and 4-10, illustrates the bus network in Seattle.

STRATEGY AREA: IMPLEMENTING THE LOCAL TRANSIT NETWORK

- **LTN 1:** Encourage Metro and other regional transit providers to deliver at minimum the following level of service on well-utilized Local Transit Network corridors that connect effectively to the Frequent Transit Network:
  - 60 minutes frequency or better
  - 15 hour service span or longer
  - 7 day per week service

  Where supported by demand, increased frequency should be provided at peak hours.
- **LTN 2:** Develop local funding sources to support additional service subsidy (see also Chapter 6 - Funding) or directly pay for local neighborhood service. City funds should be directed to the most cost effective means of delivering LTN service, which could include buying Metro service or funding other delivery mechanisms for neighborhood shuttle services.
- **LTN 3:** Focus any City resources available for LTN investment on routes with the highest ridership and/or those areas that lack convenient walking access to the FTN.
- **LTN 4:** Work with Metro to restructure LTN services to more effectively connect with FTN services, allowing simultaneous service changes.
- **LTN 5:** Work with Metro and other human service transportation providers to reduce spatial or temporal gaps in the transportation system for people with special mobility needs.
- **LTN 6:** Multimodal hubs, major transit stations, and priority access nodes should be designed to provide high-quality bus intermodal connections to minimize the penalty associated with connecting from a local route to an FTN service.
- **LTN 7:** Work with major institutions and employers to facilitate use of employer-funded, high-occupancy shuttles to provide access to major transit hubs or rail stations.
- **LTN 8:** Maintain oversight of the accessible taxi program; ensure the fleet has an adequate number of accessible taxis, that procedures are in place to prioritize use by persons with disabilities, and that there is good customer service.
- **LTN 9:** Work with providers to ensure that public, institutional, and private transportation services deliver convenient connections between the FTN and residences and facilities that serve seniors and persons with disabilities.
- **LTN 10:** Collaborate closely with King County Metro to test new transportation approaches, such as neighborhood circulators or shopping shuttles that may better serve older adults and persons with disabilities in a more cost-effective manner than public paratransit or full-sized buses, allowing reallocation of unproductive, expensive services.

ADA Paratransit, Social and Human Service Transportation

King County Metro Transit offers a variety of services for people with special transportation needs. These include Metro's Access Transportation service, which responds to the federal Americans with Disabilities Act (ADA) requirements and its Community Transportation Program described in more detail in the TMP Briefing Book, page 4-3, and summarized in the sidebar on page 4-27. Dozens of other non-profit and privately funded organizations provide transportation services to Seattle residents with special transportation needs. The City plays a key role in managing its street system so that cars, vans, and shuttle buses used by these providers can move efficiently and reliably through the City.

During 2009, a total of 1.15 million ADA paratransit trips were provided at an average cost of $38 per trip (compared to a fixed route boarding cost per trip of $3.90). About 30% of paratransit passengers are able to use fixed-route transit for at least some of their trips; however, they are often prevented from using the bus because of barriers that keep them from accessing the nearest bus stop or station. It is in the best interest of both customers and public agencies that provide paratransit to encourage and facilitate the use of fixed-route services by all riders who are capable of boarding standard buses.

Access vehicle on 24th Avenue E

Image from Nelson\Nygaard

Left: In 2006, Sound Transit received a federal grant to implement Talking Signs, a wireless communication system that provides audible landmark identification and wayfinding assistance. Right: A tactile sign facilitates wayfinding within a TriMet MAX station.

Left: Image from Flickr user Sound Transit, used with permission.

Right: Image from Nelson\Nygaard

Despite the range of transportation options already available to citizens of Seattle, existing public transit and/or paratransit services cannot meet all mobility needs. What are the most significant needs or gaps that, if addressed, could improve mobility for all users, particularly older adults and persons with disabilities? Some of these are outlined below:

- **Lack of Knowledge and Information:** There is a need to improve how people access route and schedule information. Customers and social service agency staff need to understand the range of services offered, as well as their limitations or eligibility factors, if any. It is important that information be available electronically (online), in print, and by telephone. All materials should also be available in accessible formats.
- **Spatial or Geographic Gaps:** Key origins and destinations utilized by persons with disabilities or seniors are not located on the FTN or have challenging physical conditions for travelers to reach a bus stop. In addition to Metro operated Community Transportation Program services, programs such as Safe Routes to Transit can help overcome these challenges.
- **Temporal Gaps:** Transit service hours may not be adequate; there may be lengthy waits to schedule service, or a long time on the vehicle, especially if the trip requires multiple transfers.
- **Facility Siting:** Facilities that support special needs populations are not always located where there is existing public transportation. Land use policies that encourage such facilities to locate near high quality transit access are critical.
- **Lack of Safe and Accessible Pedestrian Access to Transit:** Amenities may be missing that prevent or hinder people from traveling to and from transit stops and their destinations, such as missing or damaged sidewalks, lack of curb cuts, lack of signalized intersections, or not enough time for people who move more slowly to cross streets.

The City of Seattle should consider the following strategies and partnership opportunities to enhance travel options and quality for people with special transportation needs:

- Make enhancements to fixed-route public transportation operations and planning such as additional bus operator training, incorporating travel needs of older people in route planning, stop placement and facility design, and

coordination with other agencies and transportation providers.

- Improve access to information by fully integrating the needs of older adults, persons with disabilities, and non-English speaking people in planning and design of transit facilities, offering fully accessible public information options, and employing state of the art technology that aids disabled residents in navigating streets and accessing transit facilities.
- Provide enhancements to public transportation vehicles such as low-floor buses, kneeling buses, wider doors, improved interior circulation, additional stanchions and grab bars, ergonomic seating designed for older riders, and accessibility features either required or encouraged by ADA, such as ramps, larger letters on head signs, and stop announcements.
- Provide programs to help older people take advantage of existing services, such as information and assistance programs to connect older people with appropriate services and outreach and training programs.
- Expand supplementary services including flexible route and community transportation services, ADA complementary paratransit, non-ADA demand-responsive services, taxi subsidy programs, and volunteer driver programs.
- Apply universal design strategies at transit facilities, bus stops, and on streets and sidewalks in the immediate vicinity of transit facilities and stops.
- Support information programs that help policy makers recognize the range of benefits to make transportation improvements such as: keeping people healthy, improving affordability of transportation, maintaining independence, improving public health, and reducing costs to public agencies responsible for implementing ADA paratransit.

These actions are critically important, but they are not the only actions needed. Other important actions include assuring supportive services to caregivers who provide transportation, encouraging further development of unsubsidized private transportation services, increasing the availability of accessible taxicabs, and coordinating with non-emergency medical transportation provided under Medicaid and Medicare.

Private Shuttles and Transportation

Seattle has many private companies and institutions that provide shuttle or bus service in the city or to and from the city to major employment sites. These providers carry a small number of daily passengers compared with public transportation, but fill important niches or special services. In many cases, comparable trips are available on the public transit system, but employers want a faster, more private, or exclusive service for their employees or students. The City's role in supporting such services should be limited to ensuring vehicles have access to customers at the curb or at major transit nodes.

- Allow shuttles to access curb space for pick up and drop off.
- Encourage facility designs at rail stations and transportation centers that include pick-up/drop-off space for private shuttles.
- Consider establishing a fee for use of curb space by private shuttle operators that charge a fee for use of their vehicles.

Operating shuttle services is a cost to hospitals and universities that may support their core missions. In the long run, development of high-quality, high-capacity public transit will provide the greatest benefit to Seattle's major companies and institutions.

Shuttles utilize passenger loading zones designated by the City to board and off-board passengers.

Image from Nelson\Nygaard

KING COUNTY COMMUNITY TRANSPORTATION PROGRAM

King County's Community Transportation Program provides services to people with special transportation needs. The program includes a range of transportation and education programs that go beyond regular bus service and complementary paratransit service required by the federal Americans with Disabilities Act (ADA). The program works to provide services that are more flexible and responsive to the needs of persons with disabilities. The Community Transportation Program services include:

- **Enhanced Access Transportation Service:** provides expanded level of service for ADA paratransit customers, including a larger service area, door-to-door service (vs. curb-to-curb), and additional reservation options.
- **Taxi Scrip Program:** low-income King County residents age 18 to 64 who have a disability or are age 65 and over can buy up to six books of taxi scrip each month from Metro at a 50 percent discount.
- **Transit Instruction Program:** provides free training services to teach persons with disabilities and seniors how to ride regular public transit.
- **The Hyde Shuttle:** provides a free van service for seniors 55 or older and people with disabilities living in Central or Southeast Seattle.
- **Community Access Transportation (CAT):** program to find innovative uses of retired Access and vanpool vehicles that includes:
  - **Advantage Vans:** Social and human service agencies agree to provide a minimum number of rides to Access users each month. In exchange, Metro provides an operating grant (with a minimum ride threshold) emergency response, vehicle maintenance and repairs, driver training, and technical assistance to participating agencies.
  - **CAT Vanworks:** Metro pays the monthly cost of a standard Vanpool agreement on behalf of local agencies that have a number of clients who are eligible for Metro's ADA Paratransit Program (Access Transportation) and are traveling to work sites.

Image from Nelson\Nygaard

5 PLACES: ACCESS AND CONNECTIONS

Creating urban village neighborhoods that are compact, walkable, and accessible to the region by transit is a key goal of the Seattle Comprehensive Plan and the Puget Sound Regional Council's Vision 2040 Plan. Transit-oriented neighborhoods have proven to be more economically and environmentally sustainable and resilient, to produce less automobile travel, and are a core strategy for reducing greenhouse gases. By design, transit-oriented neighborhoods encourage people to walk and bicycle for local trips. The high-frequency, all-day service and seamless connections provided on the Frequent Transit Network encourage transit mobility for longer trips. The basic principles of transit-oriented neighborhood design are captured in the "6D" principles that are the focus of the this section. These principles guide detailed policies and strategies related to (1) intermodal facility design and (2) station and stop access by foot and bicycle.

TMP recommendations for both policy areas are summarized in this chapter.

TRANSIT-ORIENTED NEIGHBORHOOD DESIGN

The key principles for designing transit-oriented neighborhoods in Seattle are referred to as the "6Ds" and are widely accepted by cities and transit providers in North America.[1] These principles are the organizing element for achieving the City's goal of creating transit-oriented urban village neighborhoods that are compact, walkable, and accessible to the region by transit. Such neighborhoods have proven to be more economically and environmentally sustainable and resilient, and encourage people to walk and bicycle for local trips by design.

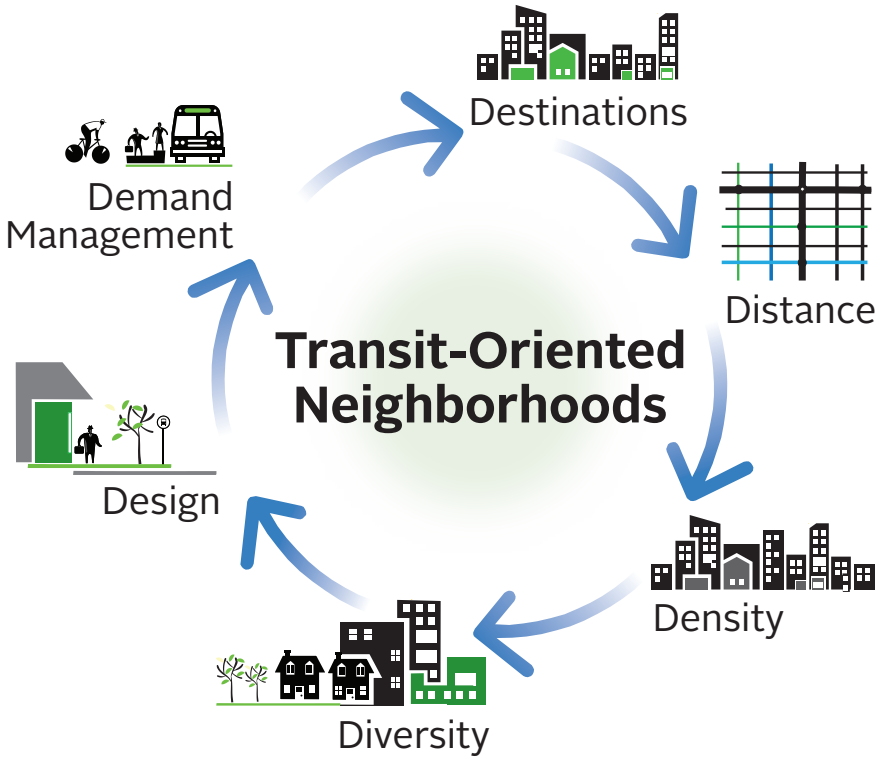
The following 6Ds of transit-oriented neighborhood design are most effective when applied in concert, as illustrated in Figure 5-1, although various principles apply differently at varying scales of geography. For example, density and diversity must be considered at the neighborhood scale, while design principles can apply to a specific station, stop, or site.

- **Destinations:** Align major destinations along a reasonably direct corridor so that they can be efficiently served by frequent transit.
- **Distance:** Provide an interconnected system of pedestrian routes so that people can walk to transit service quickly and conveniently from the places they live, work, shop, and play.
- **Density:** Concentrate higher densities as close to frequent transit stops and stations as possible to minimize walking distances to more destinations for more people.
- **Diversity:** Provide a rich mix of pedestrian-friendly uses to facilitate street-level activity throughout the day and night, increase affordability, and enliven the public realm.
- **Design:** Design high-quality, pedestrian-friendly spaces that invite walking and bicycling.
- **Demand Management:** Provide attractive transportation alternatives to driving.

1 The six "D" factors are frequently written about and presented by experts in the Transit-Oriented Development field, including Reid Ewing who has frequently lectured on "Successful Transit-Oriented Developments and the 6Ds".

An update of the Seattle Comprehensive Plan was underway at the time this plan was published. Comprehensive Plan revisions will define the official land use framework for development of transit-oriented neighborhoods.

FIGURE 5-1 6D'S OF TRANSIT-ORIENTED NEIGHBORHOOD DESIGN



The circle illustration of the D factors emphasizes that they are interrelated and are most effective when applied in coordination and at each applicable scale for each factor.

Source: Nelson\Nygaard

Image from Nelson\Nygaard

Strategy 1
Destination Accessibility: Coordinate land uses and the transit network

People choose to travel by transit more often when transit provides fast and direct access to their destinations. A destination could be work, home, school, a shopping or entertainment center, a civic institution, or anywhere else someone might wish to travel. The key to maximizing transit access to the city's key destinations is to ensure that most development occurs along the Frequent Transit Network (creating transit "corridors") and especially in urban villages and at arterial crossings where high frequency transit lines intersect (creating "priority access nodes").

Policy ToN1.1: Locate transit intensive land uses in urban villages and along priority transit corridors so they can be efficiently served by frequent transit.

- Locate major destinations as anchors at both ends of transit corridors and at priority access nodes.
- Avoid pressure for transit to make time-consuming route diversions from main arterial corridors by selecting locations for land uses that generate high travel demand that are within walking distance of Frequent Transit Network (FTN) stations or stops.
- Avoid long gaps between destinations by discouraging "leap frog" development or development far from established developed areas.
- Avoid locating major destinations in cul-de-sacs: select locations that can be accessed from multiple directions.

Policy ToN1.2: Direct most development within urban villages, urban centers, and along the FTN.

- Use zoning and public investment to encourage development along FTN corridors. Strategies for directing development toward transit corridors may include:
  - Building community centers, schools, courthouses, and other civic buildings along transit corridors.
  - Investing in the public realm to help catalyze development along transit corridors. For examples of transit-supportive public realm investments, see the 'Best Practices for Station and Stop Access' section on page 5-32.
  - Identifying partners for "location efficient" programs (such as mortgages) that account for reduced transportation expenditures in locations accessible to jobs and services.

Policy ToN1.3: Design transit nodes, stations, and corridors to maximize their value to neighborhoods.

- Develop standards to define how far a transit corridor extends from the rail or bus line itself.
- Consider the walking network and topography when designing standards for a quarter-mile walkshed from a transit corridor.
- Avoid unnecessary setbacks at major destinations.

Seattle has many areas where the local street grid is disconnected by water, freeways, and other man made barriers. Making most efficient use of the limited connective corridors means moving more people on transit.

Image from SDOT

Strategy 2
Distance: Create a transit-supportive urban structure & street network

A key to making transit, bicycling, and walking more attractive is minimizing distance between destinations by providing direct connections at the neighborhood scale. The relationship between street design and modal network planning defines the quality of the traveler experience and the viability of alternative options that influence where people choose to live, whether they own a car, and how they travel for different types of trips. These policies and strategies directly support the multimodal transit access policies at the end of this chapter (see page 5-36).

Policy ToN2.1: Provide a fine-grained pedestrian and bicycle network that connects to transit.

- Create dense networks of streets, stairways, and paths so that pedestrians and cyclists have multiple direct paths of travel.
- Minimize walking and cycling distances to transit by creating complete sidewalk networks and encouraging bicycle and pedestrian "cut-throughs" or alleys where roadways do not exist.
- Encourage mid-block connections through superblock developments, and where warranted, ensure safe mid-block street crossings.
- Design station areas so that vehicular traffic is dispersed along multiple streets rather than concentrated on a few wide, and typically congested, roadways.

Policy ToN2.2: Orient transit facilities towards the street.

- Locate transit facilities in accessible locations.
- Ensure that transit stops and station entrances are clearly visible from the street and pedestrian and bicycle access is direct and convenient (see the Transit Facility Guidelines on page 5-10 for more information).

A number of other City of Seattle plans and documents provide detailed policy guidance related to the strategies discussed in this chapter. These documents include:

- Land Use Code
- Design Guidelines, such as the Downtown and Citywide Design Guidelines, and the Seattle Right-of-Way Improvements Manual (ROWIM)
- Seattle Transit Communities (November 2010)
- Seattle Bicycle Master Plan and Pedestrian Master Plan

The South Lake Union area is growing rapidly and, if upzone proposals are approved, will be set to accommodate much more job and residential growth over the next 20 years.

Image from Nelson\Nygaard

Strategy 3
Density: Concentrate and intensify activities near transit

A sufficient density of residents, jobs, and services helps to establish a market for transit service, and increased density increases ridership, supporting higher frequency of service. While the form of development will vary from neighborhood to neighborhood, having as much development as possible concentrated near frequent transit stops and stations will shorten walking distances to more places for more people.

However, density on its own is not enough. To maximize the usefulness of density for supporting transit, Seattle must pair density with each of the remaining "D" principles highlighted in this section. Combined with density, these strategies not only help to support transit; they also support the development of walkable, low-carbon neighborhoods.

Policy ToN3.1: Use zoning to focus the highest densities closest to transit corridors and nodes.

- Concentrate the highest density of homes, jobs, and services around the immediate station or stop area (less than 1/4 mile) to create shorter walking distances and allow for multiple trip purposes to be served easily on foot and by transit.
- Scale down or "taper" densities farther from the station area (1/2 mile to 1 mile) to match the character of surrounding neighborhoods.
- Plan for densities that match the type and frequency of transit provided.
- Consider establishing target residential densities for transit nodes and corridors.
- Consider establishing thresholds for commercial, retail, and employment densities.

Policy ToN3.2: Use land near transit nodes and corridors as efficiently as possible.

- Make roadways near transit nodes and corridors only as wide as necessary to meet vehicle and transit circulation needs and provide bicycle access.
- Promote strategies to reduce off-street surface parking and other low-density land uses near transit nodes and corridors.
- Encourage housing development that uses space efficiently near transit nodes and corridors, balancing the goals of maximizing the number of housing units and providing a range of unit sizes and types appropriate for both families and smaller households.

Policy ToN3.3: Plan for density that responds to the character of existing development.

- Plan for buildings of a similar scale and character to existing structures to ensure successful integration of land use intensification.
- Prioritize increased density near existing activity centers, such as schools, shopping centers, job centers, or medical facilities.
- Encourage appropriate transitions between the immediate station and the surrounding neighborhoods through transitional tapering of building heights and use of landscaping and context-appropriate building design.

Policy ToN3.4: Identify opportunity sites for increased densities on the FTN.

- Identify corridors and stations that are priorities for densification.

- Work with owners of vacant and likely redevelopment parcels in station areas and priority transit corridors to encourage infill development.
- Encourage partnerships with transit agencies to catalyze TOD projects through property acquisition and/or redevelopment.
- Ensure public agencies do not hold property where redevelopment is feasible.
- Explore the potential of converting existing surface parking lots into future redevelopment sites.
- Focus development at the best-connected transit nodes.
- Encourage development opportunity at modal interchanges and station areas.
- Encourage the location of major destinations at the intersection of transit lines.

The building façade on the Olive 8 building (at Olive and 8th) in downtown Seattle is well designed to provide shelter for waiting transit passengers outside the pedestrian zone and away from main building entrances.

Image from Nelson\Nygaard

Providing pedestrian pathways and stairways as part of superblock developments creates permeability, adds visual interest, puts more eyes on the street, and aids access to transit.

Image from Nelson\Nygaard

Strategy 4
Diversity: Encourage a mix of uses

A rich diversity of land uses and high quality places that attract pedestrians are part of any transit-friendly neighborhood. It is equally important that public space and privately-managed space is developed to create diverse uses.

Policy ToN4.1: Mix residential, employment, recreation, and commercial uses in station areas and along the FTN.

- Promote a fine-grained mix of uses with highly active ground-floor uses.
- Encourage a balance of housing and services with a mix of types, tenures, and price points.
- Collaborate with Seattle Parks and Recreation to integrate park and open space development with the FTN.

Policy ToN4.2: Mix employment and residential development within nodes and corridors to spread travel demand throughout the day.

- Provide a mix of residential and commercial land uses along transit corridors and in neighborhoods.
- Combine a variety of everyday uses into high activity employment centers.

Intermodal connection points are excellent foci for public art and public space projects.

Image from Seattle DOT

Strategy 5
Design: Create great places for people

Policy ToN5.1: Provide gathering spaces that encourage pedestrians to linger, such as plazas, squares, and parks.

- Include elements such as benches, low walls, and landscaping in large public open spaces to help create human-scale public spaces and improve personal security.
- Encourage uses that activate public spaces around transit facilities, such as food carts, vendors, sidewalk cafes, and plaza spaces with seating.
- Integrate public art into transit neighborhoods to bring a sense of liveliness to public spaces, encourage dialogue, and express the unique culture of Seattle's neighborhoods.
- Provide a range of seating types based on the type of public space and the likely users. Seating types should include long-term seating such as chairs with backs and arms as well as informal elements such as benches, steps, fountains, and planter boxes that invite people to enjoy the public realm.

Policy ToN5.2: Improve the relationship between the public and private realms along FTN corridors.

- Develop a building typology that Includes, but is not limited to, building design elements such as entries and building orientation, street-level interest including street-level windows and transparency, pedestrian-oriented uses, and facade modulation.

Policy ToN5.3: Use design review to encourage off-street parking facilities that minimize the impact of parking on the pedestrian realm.

- Develop design standards for off-street parking along the FTN to ensure parking facilities reflect the human-scaled nature of transit corridors. Design review should be attentive to the following objectives:
  - Locate off-street parking away from the street in the rear of the building or below grade.
  - Screen surface parking lots along the street with landscaping or architectural elements to reduce their visual impact.
  - Wrap multi-level parking garages in active retail or commercial uses to screen parking from the street and increase street-level activity.
  - Minimize driveway access to off-street parking facilities by focusing access via alleys or side streets.
  - Establish maximum curb cut widths for driveways and parking facility entrances and provide sidewalk-level curb cuts to ensure a continuous level walking plane.
  - Design surface parking lots to include dedicated provisions for pedestrian circulation, including internal walkways and pedestrian priority paving treatments.
  - Encourage development of gridded street and block pattern when existing large parking lots are redeveloped to help enhance pedestrian access and enable streetscape treatments.
- Provide secure bicycle parking in all new structured parking facilities.

Policy ToN5.4: Design on-street parking to complement the pedestrian realm.

- Use on-street parking to buffer pedestrians from traffic, creating a more pleasant walking environment.
- Reduce sidewalk clutter by providing multi-space parking meters in new/replacement installations, and develop a "pay by cell phone" payment system.
- Provide an additional 2 feet of width for on-street parking adjacent to bike lanes in order to mitigate car door conflicts with cyclists and create a 2.5 foot wide buffer between the bike lane and vehicle travel lane, where ROW is sufficient.
- Provide bicycle parking to reduce demand for vehicle access.

ENHANCING TRANSIT THROUGH BIKE-SHARING

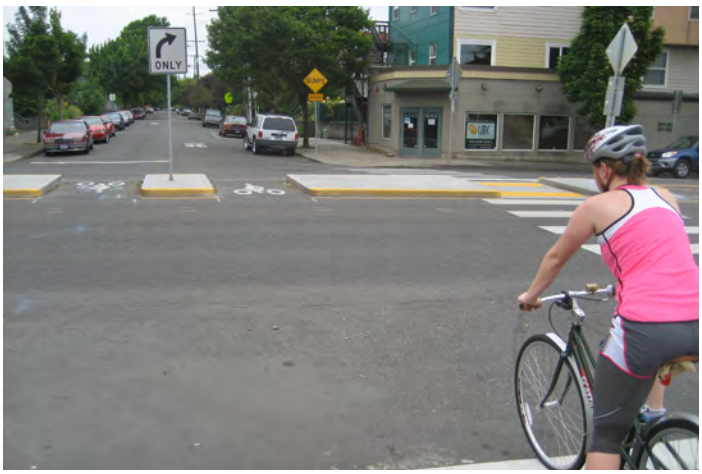
Bike-sharing is a form of public transportation consisting of public bicycle rental stations located throughout a downtown, city, or region. Bike-sharing is intended to facilitate short, urban trips, make active transportation options more readily available, and enhance urban vitality. Bike share systems naturally supplement all types of transit service. Bike-sharing offers a last-mile connection to and from transit. With bike share stations located within walking distance of most key destinations, residents, employees, and visitors can achieve a car-free existence within Seattle when coupled with high-quality transit options. Successful systems have been deployed in Minneapolis, Denver, and Washington D.C., among many other U.S. cities. Cities like New York City and Portland are moving closer to implementation.

King County Metro is currently conducting a feasibility study and developing a business plan for a regional bike share system centered in Seattle. Initial deployment is slated to occur in South Lake Union, the University District, Center City, Capitol Hill, and Sand Point area, offering direct connections to various transit options along the Frequent Transit Network.

See Figure 5-11 to see the stop/station location types that could support a bike share station and other end of trip amenities.

Nice Ride in Minneapolis

Image from Nelson\Nygaard



Low-cost neighborhood greenways (bicycle boulevards) connecting to transit or running in parallel to major transit arterials provide cyclists safe routes to transit and reduce bicycle and transit conflicts by creating separated facilities.

Image from Nelson\Nygaard

Strategy 6
Demand Management: Provide incentives and disincentives

Success in shifting more trips in Seattle to walking, biking, and transit will require development of high-quality alternatives and educational programs to ensure customers have access to the information needed to change their travel habits. Transportation demand management (TDM) includes positive measures, such as end of trip facilities, educational programs (see page 2-8 in Chapter 2 for examples), and the development of additional modal alternatives (e.g., bike sharing). These measures will need to be coupled with disincentives to private vehicle use.

Policy ToN6.1: Manage parking demand effectively and maximize utilization of parking supply along transit corridors.

- Use restricted parking zones (RPZs) to manage spillover parking at transit stations and major destinations.
- Use demand-based on-street parking pricing to free up space for short-stay visitors in business and retail districts.
- Expand parking wayfinding and real-time parking information (such as e-Park, the City's electronic parking guidance system) to reduce the amount of circling for parking in the Center City and other dense neighborhoods.
- Partner with private parking operators to market the availability of short-term off-street parking opportunities through the expansion of e-Park.
- Prioritize parking at rail stations and multimodal hubs for high-occupancy vehicle (HOV) access, taxis, and drop-off activity.
- Prioritize parking for HOVs in areas where autos are the primary form of transportation.
- Locate drop-off zones as close to transit facility entrances as possible.
- Develop district-wide shared parking facilities, create brokerages that minimize the need for excessive parking structures, and encourage park once policies and programs in mixed-use districts.

Policy ToN6.2: Reduce auto-dependency by providing transit supportive services and programs.

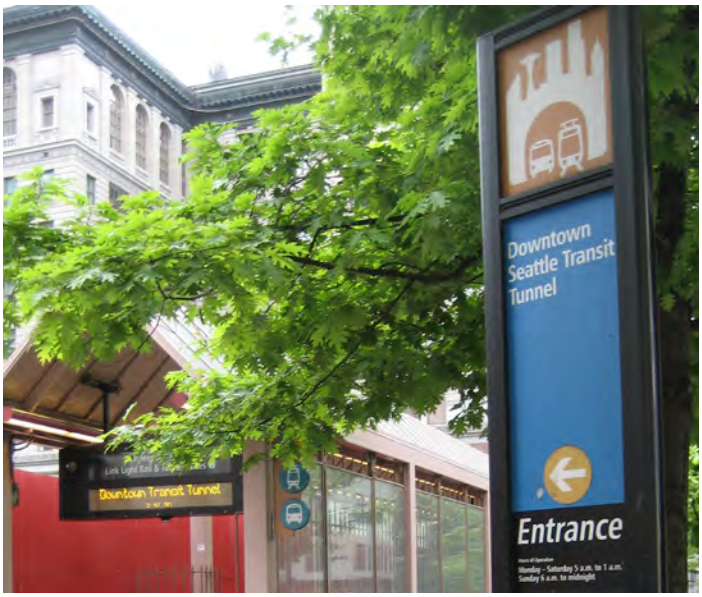
- Promote car-sharing to reduce the need for auto ownership in Seattle neighborhoods.
- Promote bike-sharing to improve transit access and extend the range of transit trips.

Policy ToN6.3: Use transit priority measures to increase transit speed and reliability.

- Employ transit priority measures, such as dedicated lanes, queue jumps, signal priority, level boarding, and others included in the TMP toolbox to improve transit reliability.
- Ensure that transit performance (e.g., delay and throughput) is a criterion in evaluating the performance of streets and intersections.

Policy ToN6.4: Consider measures to calm traffic in areas where significant amounts of traffic might be diverted onto residential neighborhood streets due to transit priority treatments.

- Integrate vertical and horizontal deflection treatments like speed humps, chicanes, and choke points to manage vehicle speeds on auto cut-through routes.
- Limit or eliminate neighborhood cut-through traffic by introducing traffic diversion treatments like half-closures and diverter median islands where community consensus exists and is supported by traffic engineering judgment. These measures could be coordinated with the design of neighborhood greenways that cross a priority transit corridor.



Wayfinding directs passengers to the Downtown Seattle Transit Tunnel.

Image from Nelson\Nygaard

Tunnel identification signage could be improved to better direct casual users and visitors to the tunnel.

Image from Nelson\Nygaard

FACILITY DESIGN GUIDELINES

IMPORTANCE OF FACILITY DESIGN?

The influence of transit facilities does not stop at a station platform. Systematically integrating facility design guidelines is a critical exercise for improving the quality of transit access and building transit-oriented neighborhoods. Transit facilities represent the public's interface with transit service in Seattle; incorporating elements of thoughtful design to improve the transit experience sends the message that transit is a priority. Likewise, transit facilities are loci of intermodal connections, thus facility design plays a critical role in ensuring transfers are seamless and effortless.

Placemaking should be integrated into every design choice to ensure the transit experience is synonymous with navigating through great places. Seattle's network of transit facilities should create a safe, comfortable, inviting, and interesting space at each trip end. Transit facilities and their surrounding environs should be thought of as urban living rooms that fully integrate land use and urban design, encouraging people to stay.

Design guidelines provide the values and strategic vision for multimodal investment in transit environments. As Seattle's transit network develops and matures, transit facilities must represent the needs of all transit users. Whether it is a transfer to another mode or route, or a last-mile connection on foot or by bicycle, transit facilities must ensure these movements are clear, tactile, secure, and protected from the weather. The following sections highlight the key elements of transit facility design.

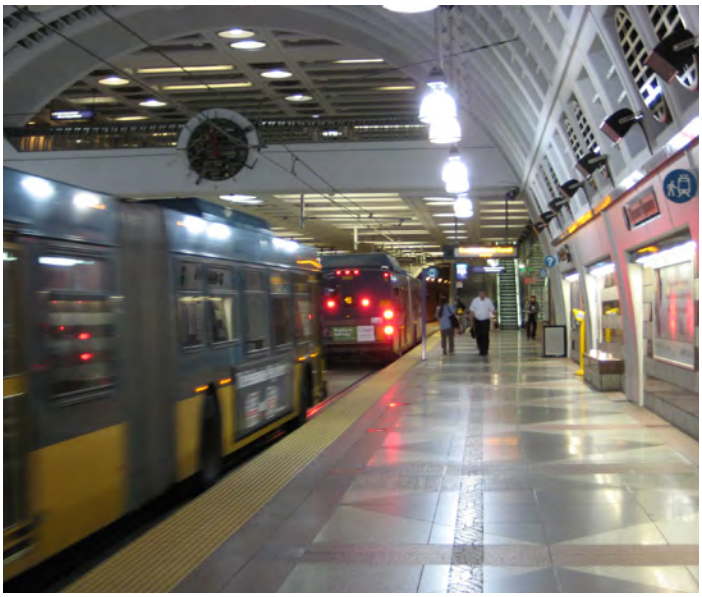
WAYFINDING AND PASSENGER INFORMATION

An effective transit system ensures that all stages of trip-making are effortless and deliberate. Wayfinding is a powerful tool to integrate convenience and system understanding into the transit experience. In general, transit wayfinding signs should:

- Be prioritized where passengers make multimodal connections
- Be integrated with wayfinding to key destinations
- Provide consistency in design and tone
- Be easily understood by and deliver information to visitors, new transit passengers, the everyday commuter, and those just passing by

Signage types range from stop and station identification, destination, amenity, and access routing signage. Integrating intermodal connections such as feeder routes and bike share stations into wayfinding will make last-mile connections seamless and legible.

Visual and audible announcements and passenger information are critical to enhancing comfort and convenience for all users, but are particularly important for users with sight or hearing impairments. Real-time passenger information should be integrated into station and stop design, acting as a supplement to static wayfinding and customer information.



Clearly defined queueing and pedestrian waiting areas improve pedestrian flow, user comfort, and boarding efficiency.

Image from Nelson\Nygaard

Recent stop improvements along the 3rd Avenue Transit Mall increased stop capacity for passenger queuing and waiting.

Image from Seattle DOT

LEGIBLE SPACES: FACILITY IDENTITY AND FUNCTION

Great transit facilities create spaces that are deliberate and easy to navigate. Subtle design decisions can help transit facilities blend into the urban context of their location and promote the identity of Seattle's diverse neighborhoods, cultural centers, and historic background.

Transit facilities should be designed to limit visual clutter and barriers to pedestrian movement, and preserve permeability. These spaces should also maintain sightlines and allow direct and efficient lines of movement. This can be accomplished through architectural techniques such as the use of transparent features and opening up spaces using daylight as an intuitive wayfinding feature. Passenger waiting areas, including street furniture and transit equipment such as ticket vending machines and shelter support beams, should be designed to limit conflicts with pedestrian flows and optimize passenger waiting capacity.

SPATIAL CAPACITY

Transit facility design must carefully balance the needs of unobstructed pedestrian flow and the comfort of waiting passengers. This is especially important along Seattle transit corridors that have limited pedestrian rights-of-way. Bottlenecks and circuitous pedestrian routing should be avoided through thoughtful design and placement of street furniture and transit amenities, like benches, shelters, and ticket vending machines. A potential solution for alleviating impacts of passenger queuing volumes on pedestrian flow is to reclaim street space for transit use. Design interventions include bus bulb outs and extended passenger plazas.

Electronic lift for mobility devices.

Image from Nelson\Nygaard

Public art reinforces a sense of ownership and pride.

Image from Flickr user orcmid

UNIVERSAL ACCESSIBILITY

Providing transit services that are universally accessible expands personal mobility, independence, and transportation affordability. Discrimination by design must be actively avoided as transit facilities are built or reconstructed. Several considerations should be made as transit facilities are designed, including:

- Minimal level changes in multi-floor facilities and direct access to elevators and escalators, where applicable
- Direct ramp access and blended curb/sidewalk transitions at the street interface
- Deliberate tactility at conflict zones or abrupt edges
- Level boarding
- Obstacle-free connections to dial-a-ride, taxis, pickup and drop-off points, and park-and-ride lots

Information should also be provided in audio, visual, and tactile formats and consider cultural and language differences as well as accommodate those with restricted mobility and visual ability.

SAFETY AND SECURITY

Transit facilities should be open, well-lit, and constantly monitored to ensure the transit experience is comfortable at all hours of the day. Incorporating crime prevention through environmental design principles (CPTED), sometimes also referred to as defensible design, into transit facility design increases both real and perceived safety. These principles include: ensuring spaces are visible to others and well lit, delineating public and private space, managing access portals, and ensuring facilities are regularly maintained and cleaned.

Natural surveillance through transparent design and active streetscapes maximizes visibility and deters the threat of crime. Lighting plays a central role in maintaining pleasant transit environments. Natural lighting and illumination factor into passenger safety, transparency, monitoring, and facility legibility. Lighting should be consistently distributed throughout transit spaces and the exterior public realm so that navigating spaces is enjoyable and stress-free. Public art should be used to create a sense of pride and a community asset.

Facility design should allow transit police ease of access and open views of station property. Where natural surveillance is infeasible, the use of CCTV (closed circuit TV surveillance) should be considered to reinforce the intolerance of criminal activity at transit stations.

Station and stop amenities, such as benches, shelters, leaning bars, and pedestrian-scale lighting improve the passenger experience.

Source: Nelson\Nygaard

PASSENGER COMFORT

A comfortable transit environment in Seattle requires protection from the elements and targeted investment in passenger amenities. Weather protection can be achieved through free-standing shelters, awnings, and overhangs integrated into adjacent building design, and even landscaping and natural canopies. Passive and active cooling and heating systems increase passenger comfort. Nighttime illumination should be evenly distributed under transit shelters to maximize visibility and passenger comfort levels.

The quality of the transit experience is greatly influenced by the level of amenities at waiting areas. Minimum amenities at stops and stations should include comfortable seating and leaning areas, shelters, information kiosks, wayfinding, real-time passenger displays (where appropriate), clocks, trash receptacles, and bike parking. Enhanced amenities at high capacity transit stations should include landscape and streetscape design, retail, restrooms, bike share stations and secure bike parking, and pedestrian-scaled lighting.

FACILITY DESIGN GUIDELINES

LEGIBILITY

- **Policy FD1.1:** Maximize ease of navigation by providing direct travel paths, strengthening pedestrian sightlines, and limiting visual and physical barriers to movement.
- **Policy FD1.2:** Integrate passive lighting design to improve visibility and reinforce that each facility is a transparent space.
- **Policy FD1.3:** Integrate Seattle's history, diverse cultures, and neighborhood identity in the design of all transit facilities. Transit facilities must seamlessly mold into the urban context of their location.
- **Policy FD1.4:** Actively pursue the design of shared spaces that fully integrate an open transit environment into the urban fabric and create great transit neighborhoods.

WAYFINDING AND PASSENGER INFORMATION

- **Policy FD2.1:** Ensure that wayfinding is predictable in design and information dissemination.
- **Policy FD2.2:** Develop consistent sign design aesthetics using distinct sign types, color schemes, fonts, and symbology.
- **Policy FD2.3:** Facilitate multimodal connections by directing passengers between modes.
- **Policy FD2.4:** Expand the scope of transit wayfinding to guide passengers and pedestrians toward station portals, major destinations, bicycle routes, major attractors, and other multimodal connections. Integrated wayfinding should emphasize making intermodal connections simple and quick.
- **Policy FD2.5:** Coordinate with public transit service providers to develop universal transit wayfinding sign guidelines.
- **Policy FD2.6:** Avoid visual conflicts with advertising, commercial, and other informational sign types.

SPATIAL CAPACITY

- **Policy FD3.1:** Ensure sidewalks accommodate enough space for a variety of pedestrian activities, such as sitting/leaning, standing/queuing, and walking.
- **Policy FD3.2:** Encourage building façade designs that allow waiting passengers to step out of the active zone while providing something to lean or sit on and offering protection against the elements.
- **Policy FD3.3:** Consider expanding existing passenger facilities where transit facilities have limited passenger waiting capacity, high boardings, and/or significant pinch points that limit passenger movement.
- **Policy FD3.4:** Eliminate passenger/pedestrian bottlenecks by locating passenger amenities outside of passenger queuing areas and pedestrian walkways. See section 4.11 of the Seattle Right-of-Way Improvements Manual (ROWIM) for details.

UNIVERSAL ACCESSIBILITY

- **Policy FD4.1:** Reduce the incidences of barriers and vertical obstructions.
- **Policy FD4.2:** Limit construction of multi-level transit facilities. If unavoidable, provide elevators, ramps with well designed railings, and/or escalators to facilitate fast and efficient movement of persons with disabilities.
- **Policy FD4.3:** Ensure all transit facilities incorporate adequate curb ramp, facility ramp, and tactile surface design, as detailed in the forthcoming Public Right-of-Way Accessibility Guidelines (PROWAG section R308), published by the United States Access Board.
- **Policy FD4.4:** Provide information in a variety of media types to cater to the needs of the visual, hearing, developmental, and mobility-impaired.

SAFETY AND SECURITY

- **Policy FD5.1:** Integrate crime prevention through environmental design (CPTED) principles into all transit facility design processes. These principles include: ensuring spaces are visible to others and well lit, delineating public and private space, managing access portals, and ensuring facilities are regularly maintained and cleaned.
- **Policy FD5.2:** Collaborate with law enforcement and emergency response agencies to ensure facilities are effectively monitored. Monitoring should be increased with increased boarding activity.
- **Policy FD5.3:** Use technology such as CCTV to continually monitor transit facilities.
- **Policy FD5.4:** Introduce public art installations, soothing music, and other amenities to signal to transit users that transit facilities are community assets and gathering places.
- **Policy FD5.5:** Ensure transit facilities are well-lit with pedestrian-scaled LED lighting during early morning and evening service.

PASSENGER COMFORT

- **Policy FD6.1:** Balance the provision of station and stop amenities without jeopardizing optimal pedestrian flow and the comfort of waiting passengers.
    - **Policy FD6.2:** Provide continuous protection from inclement weather conditions by providing shelters, awnings, overhangs, and canopies.
    - **Policy FD6.3:** Offer a variety of seating and leaning amenities located within passenger waiting areas and outside of pedestrian walkways.
- **Policy FD6.4:** Design transit facilities to be pleasant gathering places using verdant landscaping features, public art installations, and cultural/historical influenced design.
- **Policy FD6.5:** Activate transit spaces by introducing auxiliary uses into the design of transit facilities, such as parks and green space, food service (e.g., food carts), or context-appropriate retail establishment.

Mt. Baker light rail station and transit center is an example of an important intermodal connection point that has many challenges for pedestrians accessing transit, passengers transferring between modes, and transit operators that require more space for vehicle layover. The TMP recommends a comprehensive station access and station area design study be conducted.

Image from Nelson\Nygaard

MAKING TRANSIT CONNECTIONS IN SEATTLE

Exchange points, or intermodal connections, are the interface between transit services and the public realm; therefore, ensuring connections are seamless is a key requirement to encourage new ridership. Intermodal exchanges must provide safe, comfortable, and efficient transfers between transportation modes. Based on the facility design policies described earlier in this chapter, passengers should feel comfortable navigating between modes at a transfer facility. The level of integrated facility design depends on the type of transfer facilities.

TYPES OF TRANSFER FACILITIES AND KEY DESIGN ELEMENTS

Seattle has a number of different types of places where passengers transfer; each requires special design features to ensure intermodal connections are seamless. They include:

- **Multimodal Hubs:** Regional intermodal transfer centers that are designed to accommodate substantial passenger volumes, facilitate effortless transfer between modes (including Frequent and High Capacity Transit), and are the city's most significant intermodal connection points. These facilities are often the termini of several transit lines. Multimodal hubs are primarily located in the Center City and areas with transit-supportive land use, and are prime locations for transit-oriented development. Multimodal hubs typically contain the following design elements:
  - Fully enclosed stations or waiting areas, including real-time information displays, pedestrian-scale lighting, transparent shelters, and ORCA readers
  - On- and/or off-street bus layover space
  - Taxi and pick-up/drop-off zones
  - Restricted access for non-transit modes

FIGURE 5-2 THOMAS/HARRISON MOBILITY HUB

The Thomas/Harrison Mobility Hub is planned for the site of the future Aurora Avenue RapidRide Station. A linear east-west connection area is needed to facilitate transfers off of key north-south transit corridors just north and south of the Center City, as is illustrated along Aurora between Thomas and Harrison in the Westlake Transportation Hub Strategy. Short-term improvements can be implemented ahead of future development, such as a temporary bike station.

Source: Via Architecture and Heffron Transportation

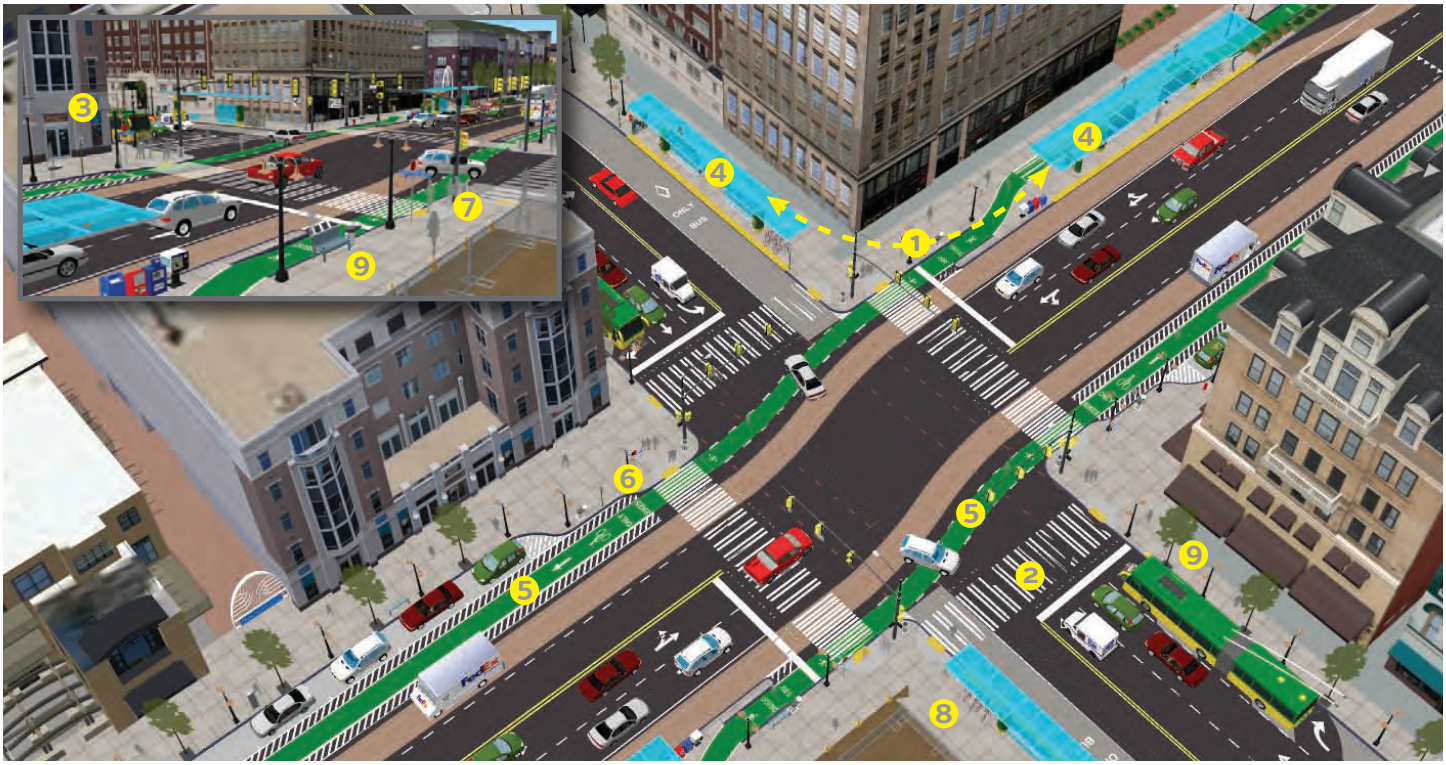
  - Enhanced pedestrian and bicycle access features within a 1/2-mile radius of the facility for walking and up to three miles for biking

- **Transportation Centers:** Central locations, primarily centered in hub urban villages, where a variety of transportation linkages convene. Transportation centers often concentrate several transit lines with high rates of transfers. These facilities are also supplemented by bike facilities, car-sharing and taxi bay facilities, destination amenities for bicyclists making regional trips, and high-quality passenger amenities. Figure 5-2 illustrates such a facility along Aurora between Thomas and Harrison.
- **High Capacity Transit Stations:** Standalone rail and bus station facilities designed to facilitate intermodal connections between light rail, rapid streetcar, BRT, and Center City streetcar boarding and alightings. The nature and level of passenger amenities at each station varies.
- **Priority Access Nodes:** Crossing points of two or more FTN corridors, many of which are located outside urban villages or urban centers. Many of these locations are currently relatively auto-oriented arterial street crossings and represent opportunities to improve access and connections between transit, pedestrians, and bicycle users. The most vital design considerations for this type of facility include (numbers correspond to Figure 5-3):

1. Strong visual connections between modes and transit facilities supplemented by wayfinding and real-time transit information
2. High visibility intersection improvements that ensure safe and prioritized pedestrian and bicycle crossings
3. Active street environments oriented toward the street
4. Enhanced shelters with level boarding and high passenger amenities
5. Bike-transit facility integration, including high visibility bicycle treatments
6. Repurposing underutilized street space for design features, such as curb extensions and buffer zones
7. Universal design, including tactile/textured design
8. Visible, covered bike parking, secure bike parking (where appropriate), and bike share station (where appropriate)
9. Investment in placemaking features, street furniture, and green infrastructure

Specific transit facility typology recommendations are summarized in Figure 5-4 and illustrated in Figure 5-5.

FIGURE 5-3 DESIGN ELEMENTS AT CONCEPTUAL PRIORITY ACCESS NODE



This conceptual view of a priority access node illustrates what an intersection of priority transit corridors might look like. Design elements at priority transit corridors, annotated in the text above, signal to all street users that this is a major transit facility.

Source: Nelson\Nygaard

PRIORITIES FOR TRANSFER AND INTERMODAL FACILITY DEVELOPMENT

When developing new transfer facilities or improving existing intermodal connections, the City should utilize the Facility Design Guidelines developed earlier in this Chapter. This will ensure connections are made as efficiently and effortlessly as possible. Key priorities to ensure connections are made include:

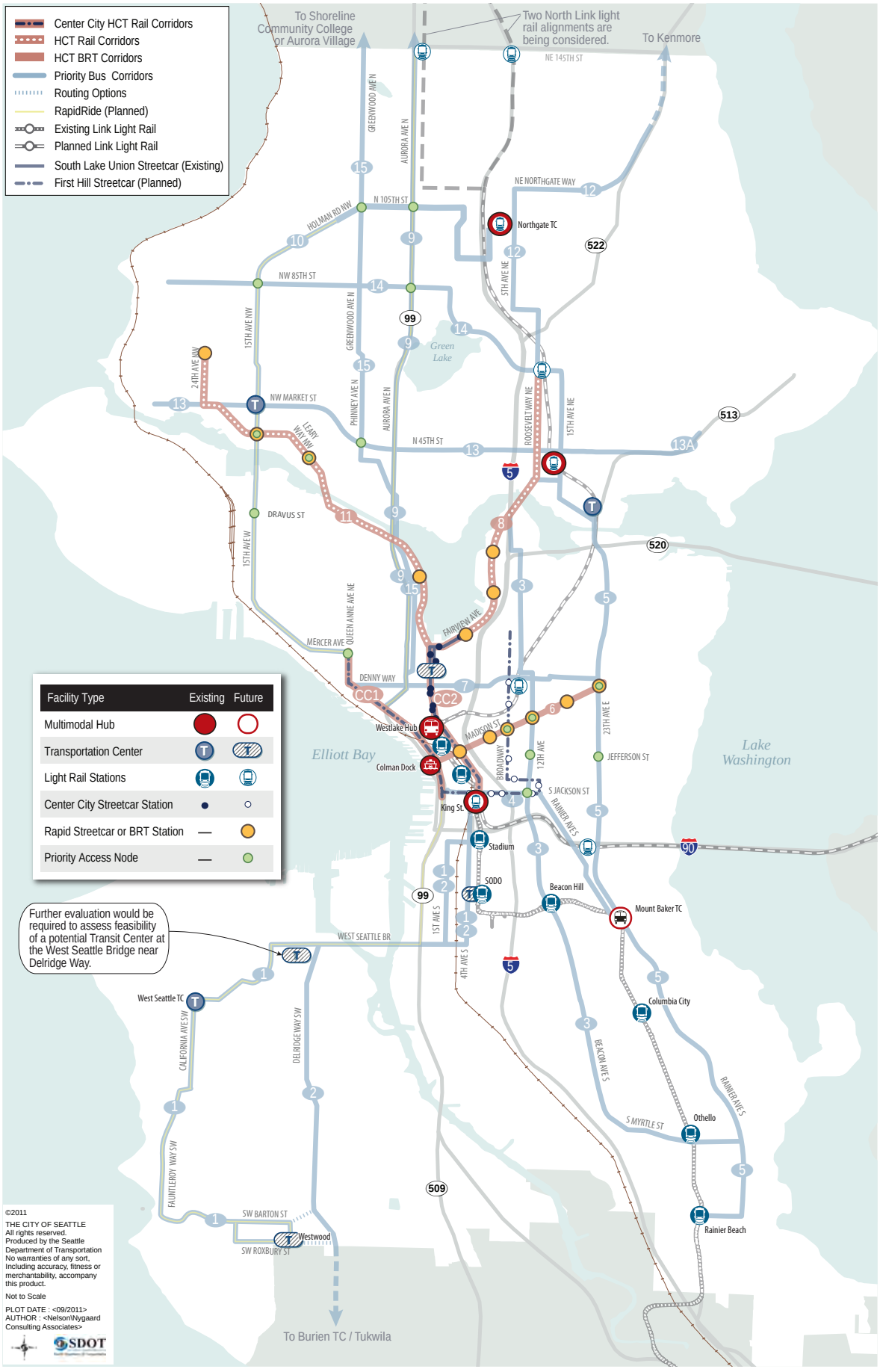
- Managing traffic flow to prioritize pedestrian, bicycle, and transit movement in the vicinity of intermodal transit facilities
- Ensuring transit facilities are designed to accommodate existing and future passenger and transit vehicle volumes
- Enhancing pedestrian and bicycle connections between transit modes through crossing facilities, priority signals, pedestrian lighting, Universal Design features, and appropriate bicycle parking types for each facility
- Providing clear wayfinding and widely available transit information (preferably real-time) to reinforce intermodal connections

FIGURE 5-4 TRANSIT FACILITY TYPOLOGIES

Facility Type	Existing or Proposed Future (Relates to Figure 5-5)	Facility Location	20-Year Plan Improvements
Multimodal Hub	Existing	King Street Station/International District	Improve pedestrian connections between King Street and International District Station, to 4th Avenue bus stations, and to CenturyLink Field North Lot development.
		Colman Dock Ferry Terminal	New Madison Street Bus Terminal East of Alaskan Way (or on Western); Improved Pedestrian Crossings of Alaskan Way and overpass to First Avenue. These elements are to be planned and integrated as part of the Central Waterfront design process.
		Westlake	Continue to implement Westlake Hub access, circulation, information, and placemaking improvements. http://www.seattle.gov/transportation/westlakehub.htm
		45th and Brooklyn / University District	Station access study recommended to finalize intermodal design, terminal bus routings, and integration of future surface rail.
		Northgate	Station access and intermodal study recommended; increase terminal capacity to allow for proposed Priority Bus Corridor restructuring; develop pedestrian and bicycle connection to west side of Interstate-5.
	Future	Mount Baker	Station access and intermodal study recommended as high priority; increase trolley bus terminal capacity to allow for proposed bus corridor restructurings; improve wayfinding.
Transportation Center	Existing	Ballard (Market & 15th)	Develop design plan that includes fully-featured stations, improved pedestrian and bicycle access, and development of public space to humanize this largely auto-oriented intersection.
		Husky Stadium	This facility is designed and curb space is highly limited.
		West Seattle Transit Center	Move Alaska Junction Station and transfer function to California to eliminate RapidRide diversion (SW Edmunds/44th Avenue SW/ SW Alaska).
		Mount Baker	Upgrade to Multimodal Hub (see recommendations above).
	Future	SODO Link Station/Lander Street	Develop east-west linear transfer facility that prioritizes pedestrian movements between 4th Avenue, the E-3 Busway Station, and the Lander Street light rail station. Assumes approach to downtown from West Seattle uses 4th Avenue S. at least north of Lander.
		South Lake Union	Develop full urban BRT station for RapidRide and other services using Aurora between Thomas and Harrison; include features described for Primary Access Node; develop linear connections to Westlake/Streetcar with pedestrian improvements and wayfinding.
		Westwood	Establish as clear terminus point for RapidRide C and establish co-located Delridge service connection point.

Facility Type	Existing or Proposed Future (Relates to Figure 5-5)	Facility Location	20-Year Plan Improvements
Light Rail Station	Existing	Rainier Beach, Othello, Columbia City, Mount Baker, Beacon Hill, SODO, Stadium, International District, Pioneer Square, University, Westlake	Comprehensive light rail station access and wayfinding program to improve visibility of rail station entrances, improve intermodal connections, and increase legibility of pedestrian and bicycle approaches to stations. Promote redevelopment of undeveloped properties in station areas (public and private holdings) to improve pedestrian facilities, walking experience, and placemaking. In the case of Rainier Beach, ensure adequate facilities and pedestrian accommodation for end-of-line operation for Rainier Avenue Corridor FTN service. See other summary recommendations under Multimodal Hub or Transportation Center.
	Future	Capitol Hill, Husky Stadium, Brooklyn Roosevelt, Northgate, North Seattle (TBD); I-90	City should play an active role in facilitating intermodal design at Capitol Hill, University District, Roosevelt, and Northgate Stations.
Rapid Streetcar / BRT Station	Future	Multiple locations (see Figure 5-5)	Develop to include: High capacity shelters at all stations, level boarding platforms, transit information for all routes serving area, real-time passenger information, off-board fare payment (where route appropriate), stop and area lighting, passenger/disabled waiting beacon (for late night boardings), seating, curb bulbs where appropriate, fully improved intersections including curb ramps, crossing markings, pedestrian signals (sufficient pedestrian crossing time), bicycle parking (covered if possible), pedestrian access improvements within ½-mile radius of station.
Center City Streetcar Station	Existing		Consolidate stations on Westlake when Rapid Streetcar is constructed (see Figure 5-5).
	Future	Multiple locations (see Figure 5-5)	Develop to include: Shelters, level boarding platforms, transit information for all routes serving area, real-time passenger information, off-board fare payment (where route appropriate), seating, curb bulbs where appropriate, fully improved intersections including curb ramps, crossing markings, pedestrian signals (sufficient pedestrian crossing time), bicycle parking (covered if possible), pedestrian access improvements within ½-mile radius of stations.
Priority Access Node	Future	Aurora & 85th Street, Aurora and 105th, Greenwood and 105th Street, Greenwood and NW Market, 15th Ave NW and 85th Street; 15th Ave NW and Leary, 3rd Ave NW and Leary, 15th Ave NW and Dravus, 1st Ave/Queen Anne and Mercer, Aurora and Denny, Madison and Broadway, Madison and 12th, Madison and 23rd, Jefferson and 12th, Jefferson and 23rd, Jackson and 12th	Develop to include: High capacity shelters at all stations, standard-height curb boarding platforms, transit information for all routes serving area, real-time passenger information, off-board fare payment (where route appropriate), stop and area lighting, passenger/disabled waiting beacon (for late night boardings), seating, curb bulbs where appropriate, fully improved intersections including curb ramps, crossing markings, pedestrian signals (sufficient pedestrian crossing time), bicycle parking (covered if possible). Develop a plan and improvements for ½-mile radius pedestrian access and for intersecting and parallel bicycle facility improvements (pedestrian and bike improvements coordinated through master plans). See Figure 5-3 for Sample Priority Access Node Design Features.

FIGURE 5-5 KEY PROPOSED INTERMODAL FACILITIES



ACCESSING TRANSIT IN SEATTLE

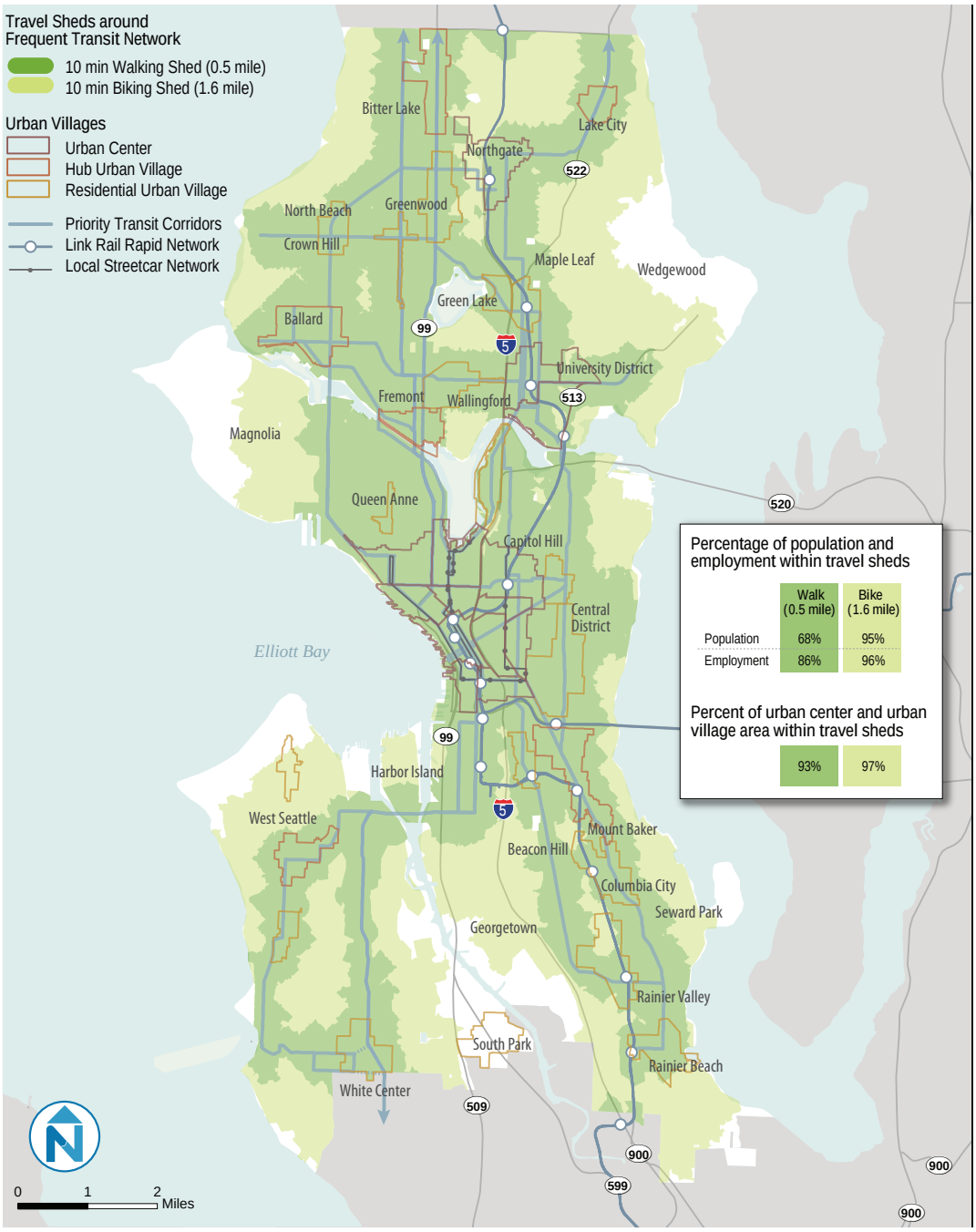
WHY IS ACCESS TO TRANSIT IMPORTANT?

The world's great transit cities ensure access to transit is a central and integrated element of the transportation system and city form. Depending on the trip type and transit mode being accessed, transit customers should be afforded a variety of attractive modal access options ranging from walking, bicycling, urban and neighborhood circulators, and, to a lesser extent, automobiles.

The quality of the overall transit experience and ridership levels greatly depends on whether accessing a transit line is comfortable, direct, and fast. That being said, developing attractive options that support transit use will not only improve the transit experience, but they will also extend the reach of the transit network.

Perhaps, the most critical reason for enhancing connections to transit is that it encourages transit use for a variety of trip types. Providing world-class access to modes that support both inter-neighborhood and regional trips is a critical step in reinforcing the notion that transit is seamless.

FIGURE 5-6 FREQUENT TRANSIT NETWORK AND MULTIMODAL CATCHMENT AREA



The priority Frequent Transit Network corridors detailed for improvement in this plan have an extensive reach. Assuming a 10-minute walk shed (people are willing to walk farther for high-quality transit), 68% of Seattle residents and 86% of employees are within walking distance of a corridor. Extending access to a 10-minute bicycle radius increases access to 95% of residents and 96% of workers. Note: a 10-minute walk and bike shed roughly equates to a ½-mile walk or 1.6 mile bike ride.

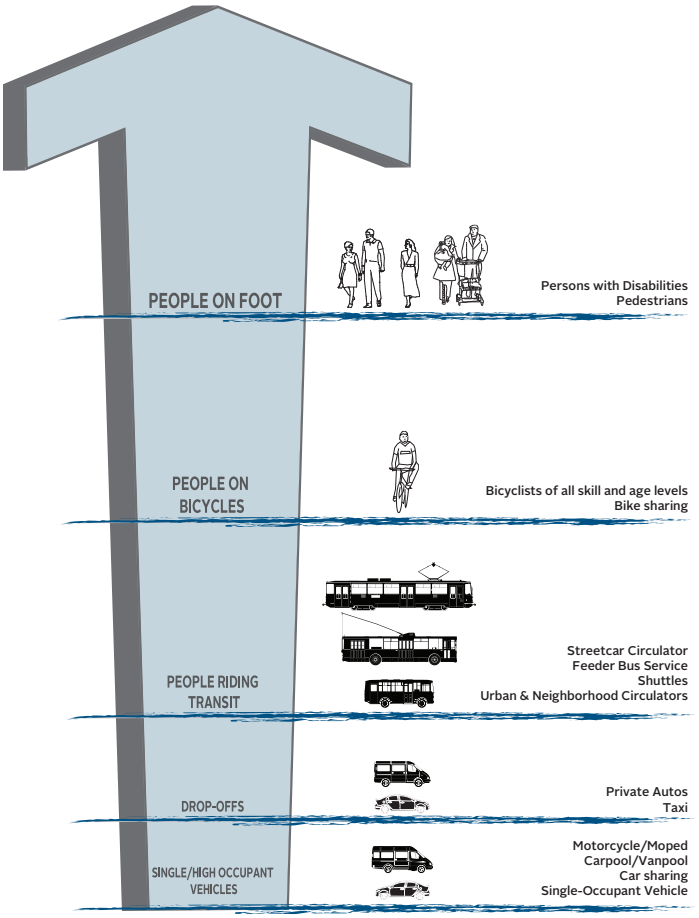
Source: Nelson\Nygaard

ACCESS HIERARCHY

Because almost every transit trip is preceded and followed by a walking or bicycling trip, emphasis should be placed on improving conditions for non-motorized access. The quality of bicycle and pedestrian access to transit is largely dependent on factors controlled by the City of Seattle. The City should develop access principles that prioritize transit access investments as the TMP's recommended priority transit corridors are implemented.

Figure 5-7 illustrates that access modes, such as walking, bicycling, high capacity transit, and feeder/shuttle routes provide the most spatially and cost efficient means to get people to transit. The multimodal access hierarchy provides overarching guidance when making design decisions in transit corridor or station plans. City investments in transit corridors should be based on the general access priorities represented in this graphic. When balancing station area and stop access improvements as well as difficult right-of-way trade-offs, there should be a strong policy reason to deviate from the design principles implied by the hierarchy.

FIGURE 5-7 ACCESS HIERARCHY



MOBILITY CORRIDORS

The TMP's 15 priority corridors represent the most vital transit and general travel corridors for intra-city trips and were developed based on a detailed market analysis of all trip-making in Seattle to and from neighboring cities. Coordinated transit capital improvements to be made in each corridor provide a strategic opportunity to implement a multimodal investment approach. Given each corridor has many bicycle and pedestrian infrastructure needs, there is the opportunity to implement a more fully integrated set of capital improvements that optimize efficiency and return on investments from various capital programs. The TMP recommends the adoption of a *Mobility Corridor* strategy that would integrate recommendations from the City's separate Pedestrian, Bicycle, Transit, and future Freight Master Plans into coordinated, multimodal investments in the city's most critical travel corridors (or specific geographic subareas), where budgets allow.

This approach will build upon the City's Complete Streets policy (2007), which directs SDOT to "design, operate, and maintain Seattle's streets to promote safe and convenient access and travel for all users—pedestrians, bicyclists, transit riders, and people of all abilities, as well as freight and motor vehicle drivers." A *Mobility Corridor* approach represents a change in how Complete Streets are implemented by integrating projects from the City's modal plans within broadly defined travel corridors and holistically considering tradeoffs between individual projects and modes.

WHAT IS A MOBILITY CORRIDOR?

As illustrated in Figure 5-8, a *Mobility Corridor*'s sphere of influence consists of:

- The priority FTN corridor's mainline
- All current and unrealized transit access portals
- Any adjacent parallel streets or private redevelopment parcels that could provide alternative routing for bicycle travel
- Intersecting street connections that require focused investment in pedestrian and bicycle facilities

FIGURE 5-8 MOBILITY CORRIDOR SPHERE OF influence

The *Mobility Corridor* concept encompasses the priority transit corridor main line, any intersecting transit exchanges (or priority access nodes), and parallel streets that could be used as an alternative route for bicyclists and pedestrians. This graphic represents a conceptual view of a balanced approach to corridor development.

Source: Nelson\Nygaard

WHY IS A MOBILITY CORRIDOR APPROACH NEEDED?

Network connectivity and compact development forms surrounding Center City Link light rail and Sounder commuter rail stations generally support and encourage pedestrian, bicycle, and transit travel. However, transit access along many of the proposed FTN corridors and at light rail station areas in southeast and north Seattle (future) is not mature; higher levels of investment in bicycle and pedestrian infrastructure and directional wayfinding are needed. Finer-grained planning for, and investment in, multimodal access infrastructure must occur to better connect people to high quality transit service.

Seattle's current Bicycle and Pedestrian Master Plans guide 20-year investments in bicycle and pedestrian network development. Many of the corridor and spot improvements proposed in these plans are critical to create safe, convenient access to the existing and proposed transit network. A Mobility Corridor approach would enhance access concurrently with transit speed and reliability improvements.

HOW WOULD A MOBILITY CORRIDOR APPROACH WORK?

A *Mobility Corridor* approach would better coordinate TMP priority corridor development with the Bicycle and Pedestrian Master Plan recommendations as well as the needs of single-occupant vehicles, high-occupancy vehicles, taxis, and freight.

As mobility corridors are identified and further developed, the City is encouraged to conduct fully integrated corridor studies that help balance corridor priorities and trade-offs.

Realistically, funding availability may dictate when improvements are made and for what mode. Lack of funds for multimodal solutions (e.g., sidewalks along a transit project) should not, however, prevent implementation of a project that is worthy on its own merits.

The Mobility Corridor designation could help policymakers, planners, and urban designers ensure that priority transit corridor improvements are inclusive of multimodal priorities and consider level of service or quality of service thresholds for alternative transportation modes. A Mobility Corridor pilot project could help demonstrate the effectiveness of an integrated multimodal corridor project and help to build public support for increased funding and balanced right-of-way allocation priorities.

WHAT ARE THE LIKELY BENEFITS AND OUTCOMES?

The City could expect the following benefits and outcomes should a holistic *Mobility Corridor* approach be fully developed and adopted:

- Clearly establish urban centers and urban villages on the FTN as vital, convenient, and sustainable places to live in Seattle
- Improve the transportation efficiency and throughput of both people and goods, while also improving priority transit corridor access
- Present an opportunity to be substantially more effective in shifting SOV mode share than with a transit-only project

Coordinated planning, joint design, and construction of pedestrian, bicycle, and transit projects will:

- Reduce construction disruptions and costs (one project vs. multiple)
- Create efficiencies in planning, design, and implementation
- Reduce future design complexities of integrating other modal improvements
- Allow for more effective resolution of difficult right-of-way tradeoffs and the inclusion of parallel roadways/routes for consideration in creating key active transportation connections

To realize these benefits, the City should develop a coordinated investment plan that synchronizes recommended investments from the four modal plans (transit, pedestrian, bicycle, and freight). Annual review of five-year updates to other modal plans should consider the *Mobility Corridor* investment framework.

FIGURE 5-9 CONCEPTUAL MOBILITY CORRIDOR EXAMPLE: BIKE AND STREETCAR INTEGRATION

This conceptual graphic illustrates design elements that could be considered in the development of a rapid streetcar corridor. The TMP recommends that SDOT approach bus and HCT corridor transit projects in coordination with pedestrian and bicycle improvement programs. A coordinated set of multimodal projects implemented simultaneously have much greater and immediately noticeable benefit to users than a piecemeal approach to corridor improvements.

Source: Nelson\Nygaard

MOBILITY CORRIDOR DESIGN AND PERFORMANCE

MODAL INTEGRATION

- **Policy MC1.1:** Development of *Mobility Corridors* should integrate principles of context sensitive Complete Street design that are unique to conditions found in each corridor.
- **Policy MC1.2:** Transit vehicles should be given priority (in design and operation) over other modes of personal motor vehicle traffic in primary transit corridors and in any corridor where FTN service levels are provided.
- **Policy MC1.3:** Mobility should be measured in terms of "aggregate person delay" rather than vehicular level of service, which does not distinguish between single-occupant vehicles, a full bus, and a wave of cyclists.
- **Policy MC1.4:** *Mobility Corridor* carrying capacity should be measured in terms of person throughput rather than vehicle throughput.
- **Policy MC1.5:** Locating layover facilities on intersecting streets should be prioritized in *Mobility Corridor*s with limited right-of-way. The City should consider incentives to accommodate capacity for transit layovers in new development where appropriate.

TRANSIT

- **Policy MC2.1:** Ensure transit priority lane treatments take precedence over general purpose travel lanes and auto storage on priority transit corridors.
- **Policy MC2.2:** Implement Transit Signal Priority (TSP) along transit corridors to provide transit vehicles with precedence at signalized intersections, while considering cross-street pedestrian and traffic demand.
- **Policy MC2.3:** Design linear transit facilities that minimize conflicts and pinch points with other roadway users and facilitate in-lane stops.
- **Policy MC2.4:** Corridors with limited right-of-way should not accommodate layover zones along the linear transit facilities.

PEDESTRIAN

- **Policy MC3.1:** Pedestrians should be afforded the highest priority in corridor space allocation to maintain an attractive public realm that connects to transit facilities.

  Mobility Corridor design should reflect the fact that even if a transit facility is located within a reasonable walking distance of a person's origin and destination, the walking environment will influence their choice to use transit.
- **Policy MC3.2:** Expand the pedestrian realm and use public space projects to increase pedestrian and waiting passenger capacity at stops and stations.

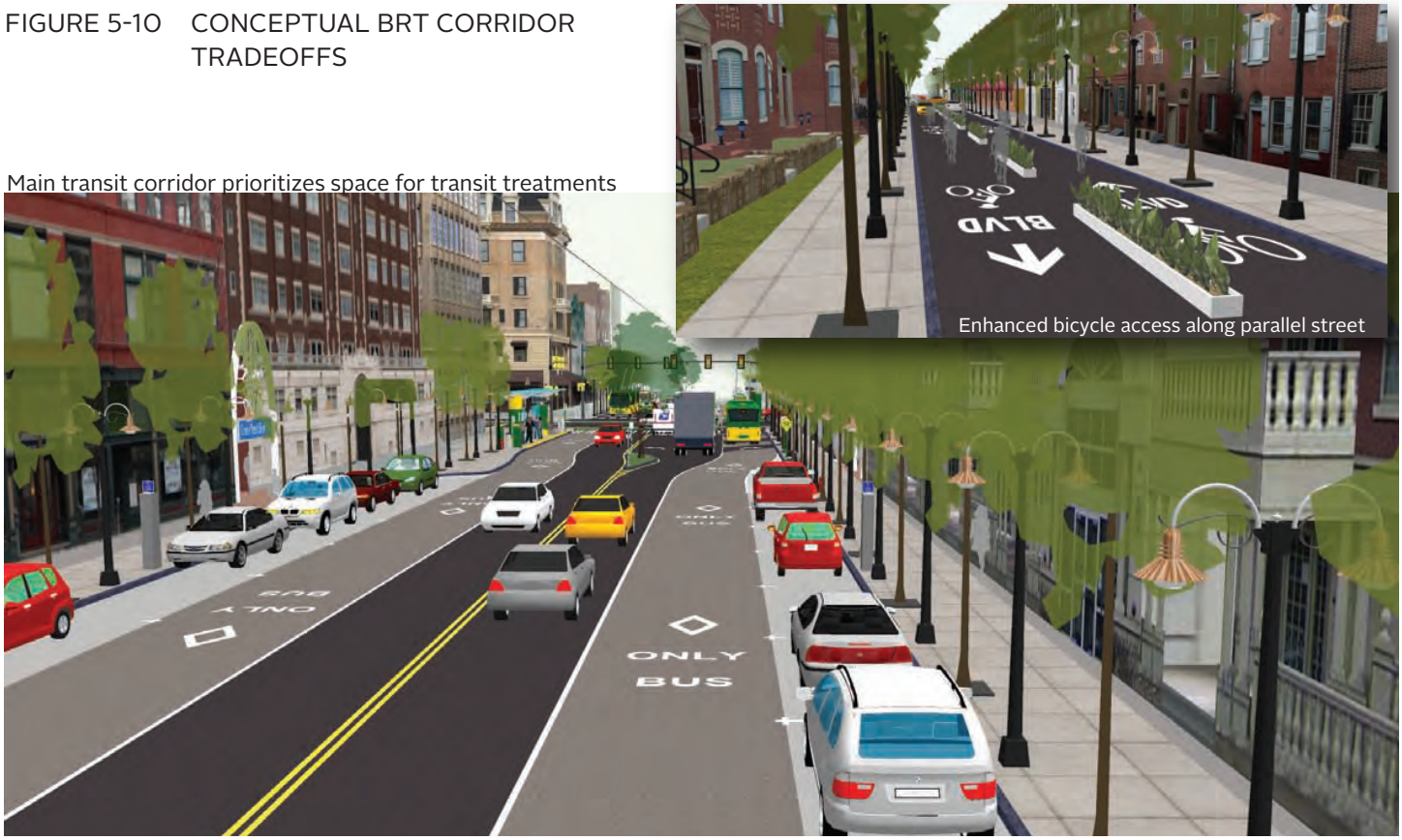
CYCLISTS

- **Policy MC4.1:** Provide high-quality bike facilities along parallel priority transit corridors and on strategic streets that link into the *Mobility Corridor*.
- **Policy MC4.2:** If the right-of-way is too constrained to provide a bike facility along the transit mainline, consider developing high-quality bike facilities, like neighborhood greenways, along parallel streets. Facility selection/design should consider whether alternative routes allow cyclists to conveniently and directly access services and destinations located on the mainline street.
- **Policy MC4.3:** Bike-share stations (or the capacity to develop them) should be integrated into the design of transit stops and stations in areas targeted for bike-share implementation. If sidewalk capacity is constrained, consider parking removal to accommodate a bike-share station on the street.

AUTOS, FREIGHT, TAXI

- **Policy MC5.1:** Repurpose on-street parking spaces, where necessary, for expanded sidewalks and pedestrian spaces, bicycle facilities and on-street bicycle parking corrals, and dedicated transit lanes.
- **Policy MC5.2:** Any decisions to remove on-street parking supply for use by transit should consider the net change in local business access, measured in terms of person capacity and change in pedestrian volumes, and role of on-street parking in calming traffic and buffering pedestrians from traffic.
- **Policy MC5.3:** Where a limited pedestrian buffer exists, consider using recessed on-street parking as a pedestrian buffer between the sidewalk and moving traffic.
- **Policy MC5.4:** Space-constrained corridors designated as Major Truck Streets should allow freight to use transit lanes.
- **Policy MC5.5:** To the extent that they would not interfere with transit reliability and travel time, taxis should be allowed access to transit lanes (except on Major Truck Streets).
- **Policy MC5.6:** In neighborhood commercial corridors with transit-only curb lanes and no on-street parking, it might be necessary to provide "cutout" loading bays and allow delivery vehicles to merge into transit lanes in order to access the loading bays. Provision of taxi parking bays should also be considered near major destinations, transportation centers, and multimodal hubs.

FIGURE 5-10 CONCEPTUAL BRT CORRIDOR TRADEOFFS



Constrained priority transit corridors, such as this conceptual BRT corridor, require difficult decisions given trade-offs related to pedestrian space, bike facility development, preserving general purpose travel lanes, and parking supply.

Source: Nelson\Nygaard

STATION AND STOP LOCATION TYPES

Seattle's network of transit stops, stations, and major intermodal transfer facilities (which are described on pages 5-16 to 5-19 earlier in this chapter) is characterized within a station/stop location typology that represents where these transit facilities are typically located. Representative station and stop location types are illustrated on this page and page 5-29. Figure 5-11 provides a matrix that indicates each location's function and provides guidance for the types of access features and amenities that should be provided.

These location types describe street classifications where station and stop types are typically located, nodes where several priority transit corridors intersect, and/or nodes where local and regional intermodal connections can be made (including Multimodal Hubs, Transportation Centers, and a variety of high capacity transit stations). Urban transit stops should, under most circumstances, have an in-lane configuration to reduce delay for transit vehicles and passengers.

Image from Nelson\Nygaard

RESIDENTIAL STREET

Residential streets are loci of basic local bus service stops. Increased investment in stops along residential streets should be based on boarding activity. 32nd Avenue NW is an example of a residential street that carries transit service.

Image from Nelson\Nygaard

TRANSIT ARTERIAL (TRANSIT WAY)

Transit arterials are regional and local service thoroughfares that pass through a variety of land use and traffic environments. Transit arterials accommodate both streetcar stations and/or local and regional bus stops. Arterial conditions and boarding activity varies greatly. Depending on the orientation of adjacent buildings, these stop locations may provide awnings that are integrated into the design of adjoining building frontage.

Image from Nelson\Nygaard

TRANSIT ARTERIAL (NEIGHBORHOOD COMMERCIAL CENTER)

Transit stations and stops located in Neighborhood Commercial Centers are oriented toward retail and commercial office access and accommodate both streetcar stations and local bus stops. Passenger amenities and pedestrian design should be elevated in this location type, including bus bulbouts, more prominent crosswalk markings, and expanded stop capacity due to wider sidewalks.

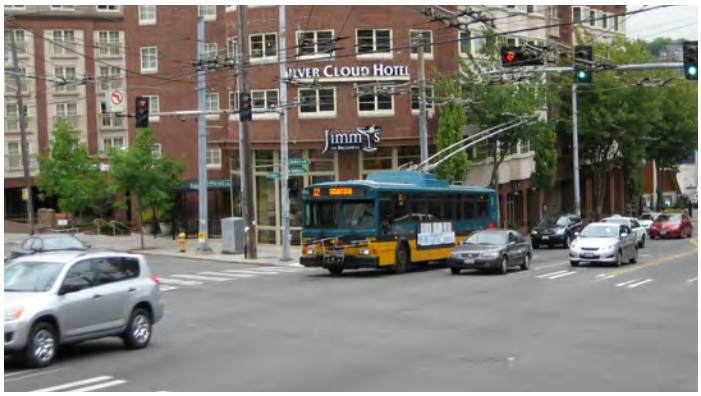


Image from Nelson\Nygaard

PRIORITY ACCESS NODE

A priority access node is a crossing point of FTN lines that occurs outside an urban village or urban center where a full transportation center is merited. Stop and station design allows for level boardings and provides sleek enhanced shelters with greater emphasis on real-time transit information. Access to priority access nodes is enhanced through high-quality bike connections and pedestrian infrastructure.

Image from Nelson\Nygaard

RAIL STATION

Rail stations—including Link light rail, rapid streetcar or street circulator stations—provide local intermodal connections. Due to high levels of passenger activity, rail stations merit very high investment in passenger amenities and placemaking. Stations should be equipped with enhanced transit shelters, real-time passenger displays, information, and payment technology. People can make bike-share connections or even connect to a local bus service from rail station locations.

Image from Nelson\Nygaard

CENTER CITY PRIMARY TRANSIT STREET/ TRANSIT MALL

Given the high pedestrian volumes and demand for transit, the 3rd Avenue Transit Mall merits a high level of investment in passenger facilities and information. Given the relatively narrow width of this street, important transit passenger amenities and connections are provided on intersecting streets and are integrated into the Downtown Seattle Transit Tunnel Stations and Multimodal Hubs. Connections to bike-share stations and other multimodal facilities should be provided and supported by high-quality wayfinding.

Image from Flickr user Oran Viriyincy

MULTIMODAL HUB

Multimodal hubs are the centerpiece for regional intermodal connections. Regional rail and express bus service terminate at these locations or provide connections to rubber-tired circulators and other local connecting services. Multimodal hubs offer the highest levels of investment in passenger amenities, pedestrian infrastructure, and bicycle access and storage.

FIGURE 5-11 APPROPRIATE ACCESS INVESTMENTS BY TRANSIT ACCESS LOCATION TYPE

Station/Stop Location Type			Station/Stop Access Needs		
Transit Access Location Type	Access Orientation	Pedestrian Volumes	Pedestrian Access Facilities	Shelter Design and Level of Investment	Pedestrian Wayfinding and Passenger Information
Residential Street	Human	Low	Full sidewalk coverage, intersection crossings	• Basic shelter with benches	• Neighborhood wayfinding and stop ID signs • Route map • Schedule
Transit Arterial (Transit Way)	Human	Low - Med	$	• Basic shelter with benches or shelters integrated into building design	• Neighborhood and access routing wayfinding and stop ID signs • Route map • Schedule • System information and map
	Auto	Low - Med			
Neighborhood Commercial Center	Human	Med - High	Expanded sidewalks, inter-block connectivity, intersection and mid-block crossings	• Basic shelter with benches or shelters integrated into building design • Bus bulb outs	• Destination and access routing wayfinding and stop ID signs • Route map • Schedule • System information and map
	Auto	Med			
Priority Access Node	Human	High	$$	• Moderate to high investment • Enhanced shelter with level-boarding platform design, benches, LED lighting, real-time passenger displays • Bus bulb outs	• Destination and access routing wayfinding and station/stop ID signs • Multimodal connections including rail, bus, and bike-share • Route map • Schedule • System information and map • Real-time transit information
	Auto	High			
Center City Primary Transit Street / Transit Mall	Human	High		• Moderate to high investment • Enhanced shelter with level-boarding platform design, benches, LED lighting, real-time passenger displays • Bus bulb outs	• Destination and access routing wayfinding and stop ID signs • Multimodal connections including rail, bus, and bike-share • Route/schedule/system information kiosks • Real-time transit information
	Auto	Med - High		• Moderate to high investment • Enhanced shelter with benches, lighting, real-time passenger displays • Bus bulb outs	
Rail Station	Human	Med - High	Expanded sidewalks, high-visibility crossings, pedestrian priority signals, grade-separated treatments	• High investment • Enhanced shelter with level-boarding platform design, benches, LED lighting, real-time passenger displays • Curb extensions	• Destination and access routing wayfinding and station ID signs • Multimodal connections including rail, bus, bike-share, carshare • Route/schedule/system information kiosks • Real-time transit information
	Auto	Low - Med			
Multimodal Hub	Human	High - Very High			

Note: In the Access Orientation column, Human connotes street environments designed for safe, comfortable, low-speed movement by all modal users, buildings generally oriented to the street, and where pedestrian/bicycle crossings and facilities are generally complete. Auto connotes a street environment designed primarily for higher-speed auto conveyance and access, where buildings are generally set back from the street and designed for access from surface parking lots, and where pedestrian/bicycle crossings and facilities may be lacking or incomplete. In addition, Bicycle access needs greatly depend on contextual considerations such as traffic conditions, land use environment, topography, availability of right-of-way, among many others. Actual facility choice should ensure integration with the surrounding traffic environment and with the broader mobility corridor function.

Station/Stop Access Needs					
Transit Access Location Type	Bicycle Access Needs	Bicycle Storage Needs	Local Circulator or Last- Mile Shuttle Needs	Kiss-n-Ride or Auto Drop-Off Needs	Example
Residential Street	• Sharrows • Bike lanes	• None/Low • Short-term: Inverted-U racks	None	None	32nd Avenue NW
Transit Arterial (Transit Way)		• Low - Med • Short-term: Inverted-U rack/curb extension integration	Neighborhood circulators and bike-share stations (only where transit arterials link into major activity centers like Urban Villages)		Madison Street
	• Sharrows • Bike lanes • Bike boulevards (parallel and intersecting)				Rainier Avenue
Neighborhood Commercial Center		• Med - High • Short-term: Inverted-U rack/curb extension integration and covered oasis at high volume stops/stations			Queen Anne
					University District (25th Avenue)
Priority Access Node	• Sharrows • Bike lanes • Bike boulevards • Cycle tracks/side paths		Urban/neighborhood circulators and bike share stations		Madison /Broadway
					Aurora Avenue N/N 45th Street
Center City Primary Transit Street / Transit Mall	• Sharrows • Bike lanes • Cycle tracks			Taxi and drop-off bays on intersecting streets	3rd Avenue, Olive
Rail Station	• Sharrows • Bike lanes • Cycle tracks • Shared-use paths • Bicycle priority signals • Grade-separated crossings • Accessible elevators and/or escalators, and stairway wheel troughs	• Very High • Short-term: Inverted-U rack/curb extension integration and covered oasis at high volume stops/stations • Long-term: Bike lockers, remote key access bike storage, and/or bike station	Urban Circulators and bike share stations	Taxi and drop-off bays on public streets	Mt. Baker Station, Othello, etc.
Multimodal Hub					King Street Station, Westlake

Jamison Square in Portland provides a vibrant living room for locals, visitors, and people waiting to catch the streetcar which stops on either side of the square.

Image from Nelson\Nygaard

BEST PRACTICES FOR STATION AND STOP ACCESS

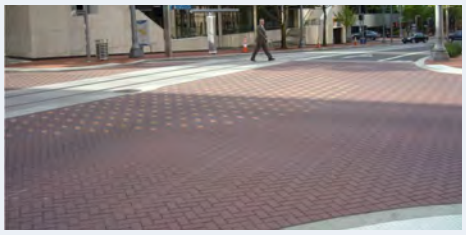
The pedestrian and bicycle environment is the foundation for good access to public transit. Improving its quality can attract new riders, increase ridership among existing passengers, and improve the overall travel experience. Investments in priority FTN corridors should embody principles of complete street design without compromising a street's ability to maintain a high level of transit performance.

Great transit streets feature:

- **Active sidewalks:** Wide sidewalks with engaging street furniture that connect to pedestrian-oriented land uses
- **Parallel and connecting bicycle facilities:** Low stress, comfortable bike facilities that feed directly into priority transit corridors
- **Transit imprint/permanence:** Reinforcing the idea that high-quality transit options are available on a particular street through visual cues, like rail tracks and other physical elements of linear transit facilities, as well as station, stop, and kiosk branding
- **Visible crossings:** Pedestrians should feel comfortable crossing the street to access stations/stops and land uses that line a transit street
- **Managed speeds:** Features such as signal progressions, raised medians, and pedestrian refuges limit speeding
- **Clear linkages to destinations:** Wayfinding and clear sightlines direct pedestrians to transit streets, stations, and stops
- **Universal design applications:** Measures that ensure travel along transit streets is effortless for people of all ages and abilities
- **Verdant landscaping and stormwater design:** Using green features to soften hardscapes and provide an incentive for people to stay in a location

Transit streets will only be effective in attracting ridership if access to transit is easy and comfortable. Figure 5-12 provides a toolbox of best practices in bicycle and pedestrian access to transit. Treatments and facilities represent street design elements that could be used to implement *Mobility Corridors*, multimodal transit access, and transit-oriented neighborhood design policies.

FIGURE 5-12 BEST PRACTICES IN BICYCLE AND PEDESTRIAN ACCESS TO TRANSIT

Feature	Elements
Pedestrian Access	
Active Sidewalks and Frontage	
 **Minneapolis Nicollet Mall** Image from Nelson\Nygaard	An active transit environment includes: • Buildings and streetscapes that activate the environment, such as sidewalk cafes and parks • Transparent building facades with windows at street level • Removal of imposing blank walls • Land uses that attract pedestrians include pubs, grocery stores, and parks
Visual Interest and Route Diversity	
 **An activated alley connection in Pasadena, CA** Image from City of Pasadena	Attract people on foot through: • Engaging pedestrian access routes • Diversity in land use and shop types, architecture styles, landscape designs, and people
Distinctive Sidewalk Treatments	
 **Pearl District in Portland, OR** Image from Nelson\Nygaard	• Provide unique sidewalk surfaces that act as placemaking elements and add interest to the walking environment • Direct foot traffic to ground floor entrances and extend the pedestrian realm from the sidewalk to the building
Enhanced Crossings	
 **Intersection improved through NYC Safe Routes to Transit program** Image from NYC DOT	Provide a variety of crossing treatments at intersections and at mid-block locations to improve perceived safety and motorist yield compliance. Effective countermeasures and crossing improvements at transit stations include: • Priority signal phases for pedestrians • Protected crossings, like raised median refuges • High visibility crosswalk markings • Tactile/textured crosswalk design

Feature	Elements
Placemaking and Street Furniture	
 **Portland Transit Mall** Image from Nelson\Nygaard	The intent of placemaking is to create places where you want to stay with clear connections to transit. This can be accomplished by: • Providing a sense of order to the pedestrian realm • Clearly delineating pedestrian and furniture zones • Integrating street furniture, including benches, landscaping, planters, trees, and public art, among other features • Creating usable places for people to rest, to reflect, to have a sense of refuge, to meet and greet, and to see and be seen
Pedestrian Wayfinding	
 **Distinctive pedestrian wayfinding and branding in Minneapolis, MN** Image from Nelson\Nygaard	Transit streetscapes should be inherently easy to navigate on foot. Pedestrian wayfinding in transit corridors should orient pedestrians toward transit, neighborhood context, and other destinations through: • Street signs • Maps • Unique treatments, such as historical displays and public art
Bicycle Access	
Direct, Low Stress Bike Facilities	
 **A neighborhood greenway parallel to a frequent service bus line corridor in Portland, OR** Image from Nelson\Nygaard	A variety of parallel and connecting bicycle facilities should be offered to appeal to cyclists of all skill levels. These include: • Neighborhood Greenways • Cycle tracks • Separated off-street bike paths and multi-use trails • Colored and buffered bike lanes
Bike/Transit Integration	
 **Cycle track/bus stop facility in Vancouver BC** Image from Flickr user Paul Krueger	The transit-bicycle interface is being improved using: • Colored pavement markings at key junctures, such as intersections and turn zones where cars need to cross a bike lane • Bike boxes, which allow bicyclists to wait ahead of vehicular traffic and increase awareness of bicyclists' presence along a corridor, have been implemented extensively in Portland, Oregon • Integrating bike facilities, including conventional bike lanes, cycle tracks, and sidepaths into rail corridor design • Supporting cycle track development with bicycle signalization • Bike facility development alongside rail tracks must be carefully designed to mitigate the potential for wheel-in-track accidents; bike lanes are commonly striped to direct bicyclists' wheel path perpendicular to a rail track crossing

Feature	Elements
On-board Amenities  An on-board rack on a Community Transit bus Image from Flickr user Oran Viriyincy	On-board accommodations for bicyclists are becoming better integrated into vehicle design. The following are leading examples of opportunities to better accommodate bicycle commuters: • Bus vehicles can be equipped with up to three front-loading racks • BRT and light rail vehicles can accommodate bike hangers and a variety of other on-board bicycle rack applications • Full commuter rail cars are being dedicated to bicycle access (as is the case with Massachusetts Bay Transportation Authority's commuter rail Bike Coach)
Destination Amenities  A key access Bike & Ride facility in Portland, OR Image from TriMet	Developing facilities that allow people to store bikes out of the weather and to shower and change at workplaces can help overcome this barrier. A good way to encourage commuting in rainy areas is to provide spaces where cyclists have access to facilities at the end of their commute where they can dry off, store clothes, and shower. Ideally, such facilities will provide secure bike parking and be protected from the weather. Using regulations or incentive programs, cities can play a part in encouraging or mandating the inclusion of these resources in all new office buildings. Other innovative trip end amenities include:: • Secure key access bike parking • Full service bike stations • Bike-share stations oriented toward short last-mile connections • TDM districts that encourage bicycling by providing changing rooms, showers, and lockers
Bicycle Wayfinding  Bicycle wayfinding in Chicago, IL Image from Flickr user Joel Mann	Wayfinding signs are an important strategy for linking bike facilities to transit. Wayfinding is moving beyond orientation toward destinations and districts by integrating transit hubs and other intermodal transit facilities into the broader wayfinding system.
Bicycle Station Access to Transit  Wheel troughs (bicycle runnels) installed on rail station stairways in Malmo, Sweden Image from Nelson\Nygaard	Bicycle access is increasingly being integrated into transit facility and stairway design. Bicycle enhancements at stations include wheel troughs or ramps. Seattle's topography requires stairs to be used for cyclists to access various transit facilities. Many stairways in the Center City need to be retrofitted for bicycles to facilitate east-west connections to the 3rd Avenue Transit Mall.

MULTIMODAL TRANSIT ACCESS POLICIES AND STRATEGIES

The previous sections set the framework for enhancing transit access throughout Seattle's transit system—most notably along the TMP's priority FTN corridors. The *Mobility Corridor* framework will integrate bicycle and pedestrian facilities and spot improvements into each corridor's initial planning and design phase, which will vastly improve transit access. The following short list of strategy areas and policies links into the *Mobility Corridor* concept by guiding network and facility design decisions throughout the full extent of each vital travel corridor.

Strategy 1
Enhance pedestrian connections within station areas and along priority transit corridors

Ridership is shown to increase where sidewalk networks are complete and pedestrians are afforded with high visibility crossings. When a strong pedestrian network is in place, people are typically willing to walk a half-mile, or roughly 10 minutes, to access transit.

Policy TA1.1: Develop an interagency working group to facilitate coordination between Sound Transit, Metro, and other transit operators to develop design standards for transit facilities and access to transit.

- Facilitate creation of the interagency working group.
- Develop consistent design standards for facilities, wayfinding, branding, and bicycle and pedestrian access.

Policy TA1.2: Build out the sidewalk network within each *Mobility Corridor's* sphere of influence.

- Identify gaps in sidewalk connectivity, informed by the Pedestrian Master Plan, to reprioritize programmed sidewalk development and maintenance.
- Develop a program to focus investment in sidewalk maintenance and reconstruction where pedestrian facilities have degraded.

Policy TA1.3: Expand pedestrian sidewalk capacity along corridors with high existing or anticipated pedestrian demand.

- Use treatments like curb extensions, bus bulb outs, or even road diets to expand the width of pedestrian facilities.
- Develop a transit placemaking program that converts underutilized parking spaces into urban living room spaces or parklets fully furnished with benches, tables, landscaped planters, and barriers. This could be modeled after San Francisco's popular Pavement to Parks Program.

Policy TA1.4: Install high visibility crosswalk treatments to ensure safe and comfortable crossings within *Mobility Corridors*.

- Focus higher levels of investment in crossing facilities at multimodal hubs, rail stations, and priority access nodes.
- Identify locations where existing crossings do not influence optimal stop and yield compliance by motorists.

Policy TA1.5: Reduce travel distances for pedestrians connecting into transit facilities.

- Strategically locate bus stops to minimize walking distances between intermodal connections.
- Develop mid-block crossings with curb extensions, where appropriate.

Policy TA1.6: Prioritize pedestrian movements at intersections using priority signal treatments.

- Install leading pedestrian intervals and pedestrian-only scramble phases at locations with high pedestrian volumes and high auto turn volumes. Pedestrian scramble phases force a red phase for motorized traffic at each intersection leg while pedestrians at each crossing may advance in any direction—including diagonally.
- Extend pedestrian phases to provide enough crossing time for pedestrians of all ages and abilities.

Policy TA1.7: Integrate the highest level of Universal Design principles into all pedestrian design decisions to improve access for the visually, acoustically, and mobility-impaired.

- Design curb ramps to facilitate, not hinder, wheelchair movement.
- Carefully select tactile pavement treatments to ensure persons with disabilities are not burdened by vertical friction.
- Utilize blended transitions where possible.
- Make sidewalks safer and more comfortable for all walkway users by limiting driveway cuts, leveling grades, and reducing cross-slopes at driveway interfaces.

Policy TA1.8: Create usable places for a variety of activities, including rest, refuge, social exchanges, and viewing the urban environment.

- Invite foot traffic by installing pedestrian furnishings, such as seating, weather protection, water fountains, trash receptacles, street trees, and other landscaping and stormwater design elements.
- To the greatest extent possible, locate pedestrian furnishings in the sidewalk's furniture zone to reduce sidewalk clutter and facilitate a barrier-free walking environment.

Pedestrian facilities, such as high visibility crossings, innovative lighting features, curb extensions, and pedestrian short cuts can enhance access to transit.

Source: Nelson\Nygaard

Policy TA1.9: Provide clearly visible and consistent way-finding signage between transit facilities and all pedestrian access approaches.

- Wayfinding signage should identify key destinations and districts or neighborhoods of interest.
- Wayfinding signage should direct pedestrians between intermodal connections.

Good bicycle wayfinding directs cyclists to major intermodal transfer locations.

Image from Nelson\Nygaard

Seattle BikePort provides a convenient resource for bike/transit commuters arriving via the King Street/International District Station.

Image from Nelson\Nygaard

Strategy 2
Develop high-quality primary and supplemental bicycle facilities that link into and along transit corridors and station areas

Networks of low stress and highly visible bicycle facilities, such as separated bicycle paths, neighborhood greenways, cycle tracks, and buffered bike lanes are a critical component for bike/transit integration. Such investment in the bicycle environment will vastly extend transit's reach. The bicycle catchment area for transit access is far more extensive than walking or even some connecting transit service networks. Bicyclists are typically willing to travel between 3 and 4 miles to transit—roughly a 20-minute ride when accounting for intersection delay.

Policy TA2.1: Integrate high-quality, low-stress bike facilities into linear *Mobility Corridor* design.

- Develop cycle tracks, buffered bike lanes, and conventional bike lanes alongside linear transit facilities, as determined feasible by SDOT.
- If a priority transit facility cannot safely accommodate a dedicated or other on-street bicycle facility, a parallel bike facility, such as a neighborhood greenway, should be developed as an alternative transit access route.
- Integrate bicycle facilities into station and stop design to limit conflicts with transit vehicles and boarding and alighting passengers.

Policy TA2.2: Develop high-quality, low-stress bike connections that parallel and/or intersect priority transit corridors.

- The City should develop low-stress neighborhood greenways that intersect priority transit corridors at major destinations or adjacent to priority access nodes.

Policy TA2.3: Install bike-share stations at all multimodal hubs, rail stations, priority access nodes, and major neighborhood transit destinations to facilitate the last-mile connection to employment sites, retail centers, and residences.

- Develop bike-share stations at existing and proposed light rail and streetcar stations, respective of demand, as well as at major frequent bus stops.

Policy TA2.4: Supplement each priority transit corridor with supporting bicycle infrastructure and end-of-trip facilities at priority access nodes.

- Establish bicycle parking guidelines for station and stop locations based on boarding activity, transit passenger facility usage, and the local land use environment.
- Provide well-lit, secure long-term bicycle parking, such as bike lockers, key access parking rooms, and full service bike stations at multimodal hubs and rail stations.
- Work with regional transportation agencies to investigate integration of ORCA cards for accessing a BikeLink locker.
- Install covered, well-lit, and highly visible short-term bicycle parking at stations and bus stops.
- Shower, changing, and locker facilities should be located at or near major multimodal hubs.
- Integrate bicycle access into the design of elevated stations, such as bicycle accessible elevators and/or escalators, and wheel troughs on stairways.

Many transit providers are replacing single-bicycle lockers, such as these, with card-accessed lockers that are transparent and less likely to be abused. (Page 7-55 of the TMP Briefing Book provides a description of such facilities).

Image from Nelson\Nygaard

Where there is no sightline connection between modes, clear wayfinding is critical.

Image from Nelson\Nygaard

Policy TA2.5: Provide clearly visible and consistent wayfinding signage between transit facilities and all bicycle access approaches.

- Wayfinding signage should identify key bike facilities, destinations, and districts or neighborhoods of interest.
- Wayfinding signage should carry cyclists between transit alighting areas and bicycle parking facilities.

Policy TA2.6: Integrate bicycles on transit vehicles using exterior front-loading racks and on-board bike hangers.

- Encourage Sound Transit and King County Metro to invest in front-loading bike racks that hold up to three bicycles on all bus vehicles.
- Encourage Sound Transit and King County Metro to redesign Sounder, Link, and RapidRide vehicles to increase on-board bicycle carrying capacity.

Strategy 3
Facilitate connections to high-quality and frequent transit service through local bus routes and highly visible transit information and branding

Feeder and shuttle service provides an attractive last-mile option for those that live beyond a comfortable walking distance. Although feeder service significantly increases transit's catchment area, it must be reasonably competitive with auto travel times in order to be successful. Connections between transit modes must be seamless; this is a key function of transit facilities in Seattle. Transit information, wayfinding, and branding will make intermodal connections user-friendly and legible, while offering a more appealing transit experience.

Policy TA3.1: Ensure that transfers are efficient and seamless.

- Develop east-west linear connection hubs in SODO at Lander Street and in South Lake Union at Aurora between Harrison and Thomas to facilitate transfer movements. Closely locate major transfer pair stops to facilitate and further reinforce the ease of making transfers.
- Clearly market the benefits of priority transit corridors as efficient transit options for Center City and inter-neighborhood circulation to and from multimodal hubs.
- Lay out intermodal transit facilities in such a way that allows alighting passengers to quickly orient themselves toward intermodal connections.

Policy TA3.2: Provide a wealth of transit information to reinforce system legibility and user comprehension for new and existing customers.

- Install real-time information displays along the Center City Transit Mall and at rail stations and multimodal hubs.
- Facilitate coordination by the interagency working group (see TA1.1) to provide consistent wayfinding and public information at intermodal hubs and key transfer points to ensure legible and effortless connections.

Image from SDOT

6 FUNDING & PERFORMANCE MONITORING

As this plan is being written, every sector of transportation is faced with significant funding challenges. Declining gas tax revenues are leading to diminished funds for roadway capital improvements, operations, and maintenance. These declines also affect federal transit funding. Operating revenues, which are a local responsibility for urban transit agencies in Washington State, are also down significantly due to declining sales tax receipts during the current economic downtown. It is hard to predict the future of transit funding, but one thing is certain—there are real and significant challenges ahead, not only to expand service, but also to maintain current service levels and quality. Achieving the 20-year plan for transit set forth in the TMP will be challenging in this funding context. Success will require new local funding sources, stronger partnerships with public transportation providers, and increased involvement of private sector partners to fund and expand Seattle's transit service offerings.

The TMP transit investment framework will support the ability of the City and its partners to develop a high-quality network of frequent transit ser-vices that connect its urban centers and villages and meet the mobility needs of its workers and residents.

Image from Nelson\Nygaard

TRANSIT FUNDING FRAMEWORK

Implementing the Seattle Transit Master Plan will require a significant and sustained effort by local, regional, and state agencies to identify, secure, and efficiently utilize new sources of funding. The long-term contribution of new facilities and services in fulfilling community goals will depend upon stable funding and diligent monitoring. The City plays a key role in evaluating transit in Seattle, including: (a) project and program implementation, (b) service performance, and (c) adaptive management of plan implementation and service delivery.

Regional, state, and federal funding sources for transit (including funding for both capital and operations) are, and appear likely to continue to be, increasingly scarce and competitive. Transit agencies, including King County Metro Transit, are shifting policies that govern how they allocate service to models based on performance, typically measured by ridership and productivity. Capital funding programs, such as the Federal New Starts and Small Starts programs (discussed in further detail in this chapter) require project sponsors, including cities and transit agencies, to demonstrate that new rail and bus projects will meet criteria for cost-effectiveness. Moreover, federal agencies, including the U.S. Department of Transportation (DOT), U.S. Environmental Protection Agency (EPA), and U.S. Housing and Urban Development (HUD), now partner to ensure that grant programs meet coordinated mobility, housing, and environmental goals.

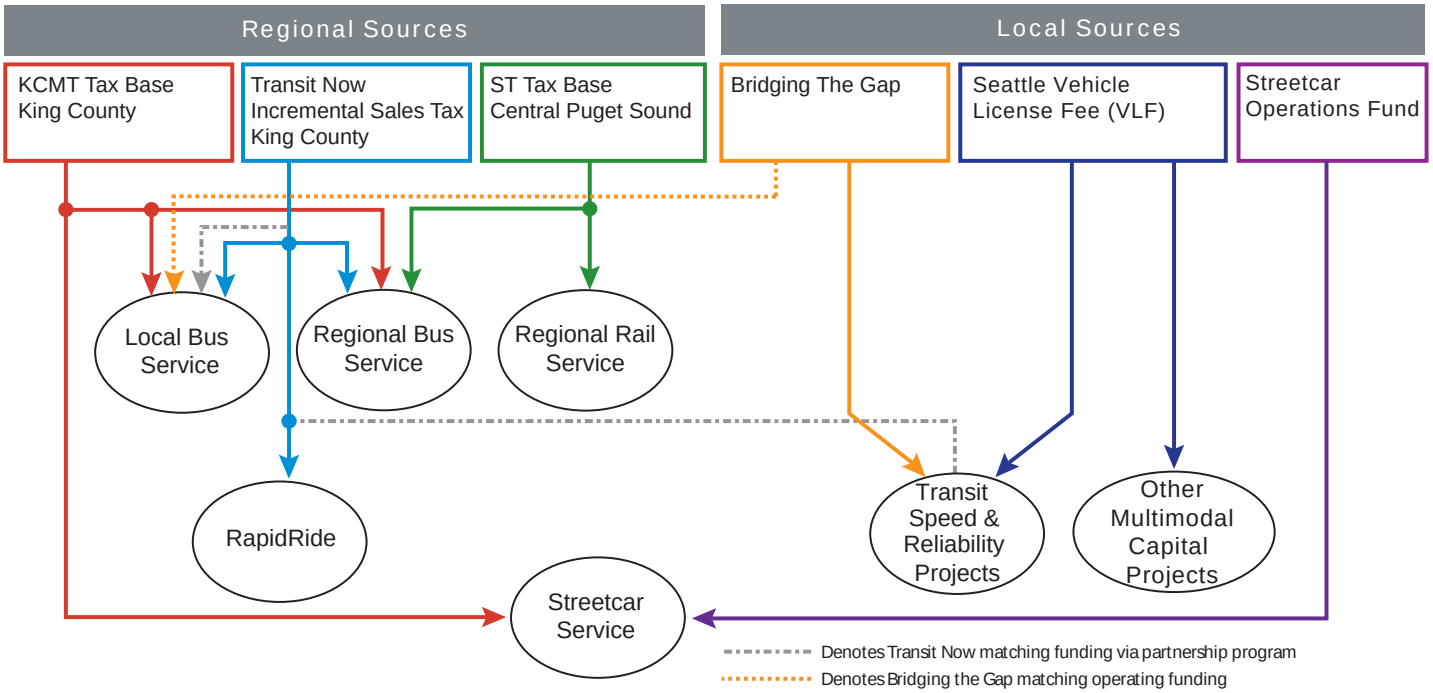
Early successes from the TMP are critical to ensure future projects and services garner needed funding. When transit customers, voters, employers, and elected officials see meaningful improvements to the system, they are more apt to lend support for future funding measures. To this end, early and aggressive implementation of TMP Priority Strategies increases the viability of other TMP projects and strategies being implemented.

Metro and Sound Transit funds are directed by regional policy to support a variety of transit capital and operating needs. These policies support the City's transit investment needs, but the amount of funding available and allocated by policy may be insufficient for Seattle to accommodate growth projected in the Comprehensive Plan. Flexibility to respond to current funding available from Metro and Sound Transit is a key building block of the TMP investment framework (see Chapter 1, page 1-17). As these sources wax and wane, it is necessary for the City to reprioritize where it directs local funds. For example, in a challenging economy, the City may choose to direct more funds to maintain current service levels on high ridership routes. When Metro sales tax receipts are strong, the limited funds the City of Seattle has available for transit may be better spent on capital projects.

The TMP embraces the concept of opportunity. Over the life of this plan, new opportunities will arise which were not previously anticipated. The multiple account evaluation approach taken by the TMP (see Chapter 3) should be used to guide the City as it explores new opportunities for implementation.

Since there will never be sufficient funds to meet all of Seattle's transit needs, there must be a priority hierarchy established to guide funding allocations in a way that ensures

FIGURE 6-1 MAJOR LOCAL AND REGIONAL (METRO AND SOUND TRANSIT) FUNDING SOURCES



continued progress toward City goals. Inevitably, these decisions will need to be made in the context of challenging trade-offs. The investment framework establishes criteria to ensure that competing goals are balanced.

The investment framework must be a dynamic allocation process that continually re-evaluates each investment decision and establishes a priority for that decision in the coming year or two years. The TMP is updated every five years, allowing the City to reassess how capital and operating investments support the opportunities and challenges of the day.

CAPITAL FUNDING NEEDS AND OPTIONS

Certain TMP projects, including proposed streetcar, rapid streetcar, and bus rapid transit (BRT) lines, require high levels of up-front capital investment. Capital costs are expenses associated with the design and construction of a new transit line, development of supportive facilities such as stations or maintenance facilities, and purchase of vehicles.

Although rail modes have higher capital costs, they provide increased vehicle capacity and lower operating costs per passenger compared to bus operations. BRT invests in exclusive right-of-way and transit priority treatments in return for more reliable service. Rail modes require unique maintenance facilities, necessitating additional land acquisition and construction costs.

STRATEGY AREA: IMPLEMENTING AN INVESTMENT FRAMEWORK

IF -1: Local investments should be viewed in the context of the regional transit (Metro and Sound Transit) funding picture, including Metro and Sound Transit investments in service and capital.

IF -2: Limited City transit funds should be used to leverage other regional, state, or federal funds whenever possible.

IF -3: Decisions to fund transit must be viewed in light of future obligations, not just the current period.

IF -4: The multiple account evaluation approach should be used to maintain balance between City goals.

IF-5: The City should carefully track the returns on its investments in transit operations and capital projects.

IF -6: The City should maintain flexibility to respond to future opportunities.

IF -7: The investment/funding process must be re-evaluated on a periodic basis, ideally a one- or two-year interval.

IF -8: City funding for transit should be prioritized toward developing long-term capital projects and service subsidies that improve transit speed, reliability, and capacity in FTN corridors.

CAPITAL COST TO IMPLEMENT HIGH CAPACITY TRANSIT (HCT) AND BUS PRIORITY CORRIDORS

The total capital cost to implement the Frequent Transit Network (FTN) improvements included in this plan is in the range of $0.9 to $1.1 billion (2011 dollars). This includes a total of about $850 million for capital improvements to implement recommended HCT corridors and $150 to $300 million for the capital improvements needed to implement speed, reliability, electrification, and access improvements in Priority Bus Corridors. In addition to trolley wires and substations where electrification is proposed, these bus capital improvements include priority treatments, such as bus stop and crosswalk bulb-outs, off-board pay stations, and enhanced traffic signal systems that facilitate transit priority and/or queue jumps. Estimated capital costs to implement HCT or bus priority improvements in each corridor are detailed in Figure 6-2.

FIGURE 6-2 ESTIMATED CAPITAL COSTS FOR HCT AND PRIORITY BUS CORRIDORS

Corridor	Corridor Description	Preferred Mode	Capital Costs** Millions of Dollars (2011)	Capital Costs** Millions of Dollars (2011) per Mile
HCT Corridors				
6	Colman Dock – Capitol Hill/23rd Ave via Madison	BRT	$87.0	$42.2
8	Roosevelt–U-District – South Lake Union-Downtown via Eastlake Ave	Rail	$278.0	$46.0
11	Loyal Heights–Ballard–Fremont–South Lake Union–Downtown	Rail	$335.0	$47.9
CC1/CC2	Center City Connector Alternatives: Lower Queen Anne–King Street Station via 1st Ave (CC1) or South Lake Union–Westlake–King Street Station (CC2) *	Rail	$124.3	$55.0
Subtotal: Capital Costs for HCT Elements			$824.3	
Priority Bus Corridors				
1	West Seattle – Downtown	Bus	$3.6	$0.3
2	Burien TC/Delridge – Downtown	Bus	$5.2	$0.7
3	Othello – U-District	Bus	$20.0	$1.9
4	Mount Baker – Downtown	Bus	$0.7	$0.3
5	Rainier Valley – U-District	Bus	$24.8	$2.6
7	Queen Anne – South Lake Union – Capitol Hill	Bus	$38.6	$7.7
9	Aurora Village – Downtown	Bus	$1.0	$0.1
10	Northgate – Ballard – Downtown	Bus	$4.2	$0.5
12	Lake City – Northgate – U District	Bus	$5.1	$0.7
13	Ballard – U-District – Laurelhurst	Bus	$15.1	$2.8
14	Crown Hill – Greenlake – U District	Bus	$57.0	$8.6
15	Phinney Ridge – Greenwood – Broadview	Bus	$9.3	$1.0
Subtotal: Capital Costs for Priority Bus Corridors			$181.0	
Total Capital Costs for all HCT and Bus Priority Corridors in TMP			**$1,009**	

* The City has submitted a grant application to fund an Alternatives Analysis (AA) of two Center City Connector alternatives. The cost included in Figure 6-2 is the higher of the two alternatives and assumes that only one option would be selected for construction.

** HCT capital costs include vehicles, which are not included in priority bus corridor costs.

CAPITAL FUNDING OPTIONS

Funding to implement the capital improvements recommended in this plan will come from a variety of sources:

- **Local** taxes and fees, including property, sales, parking, and business and occupation taxes; vehicle license fees; and private funds through partnerships
- **Regional** sources, including Sound Transit
- **State** sources, including Washington State Department of Transportation (WSDOT) programs and other state appropriations
- **Federal** sources through the Puget Sound Regional Council (PSRC) and nationwide discretionary sources

FEDERAL FUNDING OPTIONS

Most federal funding for transit capital improvements comes through congressional appropriations to the Surface Transportation Act (STA). The City of Seattle is recognized by the Federal Transit Administration as a transit operator (i.e., currently operates the Monorail and South Lake Union Streetcar) and is eligible to directly receive federal grant funds for transit projects.

Federal Transit Administration (FTA) Capital Grants

Federal Transit Administration grants are a primary funding source for transit capital investments. Potential funding sources for TMP investments include:[1]

- **FTA Section 5307 Urbanized Area Grant Program:** Formula funding based on population density and provision of transit services
- **FTA Section 5309 Bus, Bus Facility, and New/ Small Starts Program:** Competitive grant program for large projects and vehicle procurements
- **FTA Section 5339 Planning, Engineering:** Funding available to assist in the planning and engineering process of selecting an appropriate modal application for a particular corridor[2]

In October 2011, the FTA awarded a $900,000 grant to the City of Seattle under the 5339 program to conduct an alternatives analysis to examine the benefits, costs, and impacts of implementing an urban circulator connecting the Lower Queen Anne, Uptown, and South Lake Union neighborhoods with King Street Station and the International District Multimodal Hub. Figure 3-16 of the TMP provides a map that illustrates

1 On-going attention must be given to these funding sources to ensure the additional transit investments made by Seattle are recognized in the locally adopted funding allocation. If, for example, the City makes a speed and reliability investment in a corridor that results in a 25% gain in passenger-miles travelled, the marginal addition of Federal funds must be value-captured in ensuing years and re-invested to further TMP goals. This does not necessarily mean the money needs to pass directly to Seattle.

2 The City presently has a pending application for the Center City Connector Corridor, but the TMP identified three other corridors (two potential rail, one potential BRT) that could also be applicable to this funding source.

FUNDING OPPORTUNITY DIFFERS BY MODE

The mix of potential funding sources for HCT and bus priority investments differs by mode as each has features and benefits that are attractive to different funding constituencies.

STREETCAR AND RAPID STREETCAR

Streetcar projects typically rely on a wide range of funding sources with strong variation even within different projects and phases in the same city. "Rapid streetcars" with aggressive right-of-way treatments will be stronger candidates for federal Small Starts funds than local circulators. However, the FTA has adjusted its evaluation process to make Small Starts more accessible to urban circulator projects, which would include Seattle Streetcar extensions in the Center City. Relying on local funding can avoid competition with other projects seeking federal funds or restrictions on their use. Key local sources of capital funds include local improvement districts (LIDs) and parking revenue bonds.

Chapter 3 describes the rapid streetcar mode, including a discussion of European street trams that operate more like a rapid streetcar than typical modern streetcars in the U.S.

Relative to the other modes, streetcar and rapid streetcar have high potential to attract both private and public sector funding. The evolution of the Portland Streetcar provides an example of innovative local funding for streetcar development. Portland relied on local funding sources in the three phases of its Westside Streetcar system (city parking bonds [28%], tax increment financing [21%], and a LID [19%]) and only applied for New Starts funding for the Eastside Streetcar loop scheduled to open in 2012.

BUS RAPID TRANSIT

Bus Rapid Transit projects typically rely on a greater level of federal funding than streetcar or other local bus facility projects. The split between federal, state and local dollars varies between projects, but federal funds typically make up more than half of capital costs. BRT lines in Pittsburg, Las Vegas, Kansas City, Eugene, and Cleveland have all been implemented with approximately 80% of capital funding coming from federal sources. Many BRT projects utilize FTA 5309 Bus, Bus Facility, and New/Small Starts funding—Small Starts was created specifically to fund less capital-intensive projects ,such as BRT. Although most BRT projects receive substantial federal funding, selected BRT projects have been implemented almost exclusively with state and local funds:

- **Orange Line in Los Angeles** was largely funded through a countywide sales tax, although some vehicle and station capital costs funded through New Starts.
- **Silver Line in Boston (**Phase 1 –Washington Street) was built entirely with state and local funds**.**

possible alignment options; streetcar and bus modes will both be analyzed.

There are a number of other federal sources that can be utilized for transit capital. These funds, mostly channeled through Puget Sound Regional Council in support of identified regional transportation priorities include: Federal Highway Administration flexible funding, Surface Transportation Program funds, Congestion Mitigation and Air Quality funds, Job Access Reverse Commute program funds, and FTA Section 5317 New Freedom funds. New Freedom funds targets projects and programs that overcome existing barriers facing Americans with disabilities seeking integration into the work force and full participation in society.

New Starts/Small Starts/Very Small Starts

The Federal Transit Administration's New Starts program is the federal government's primary financial resource for supporting locally planned, implemented, and operated major transit capital investments. The New Starts program funds fixed guideway transit projects including: commuter rail, light rail, heavy rail, bus rapid transit, streetcars, and ferries. New Starts projects have three phases: (1) evaluation of alternatives leading to the selection of a locally preferred alternative, (2) preliminary engineering during which design and environmental issues are addressed, and (3) final engineering during which final construction plans are developed. The process can be lengthy, taking seven to well over 10 years from initiation of an alternatives analysis (AA) to execution of a full funding agreement. Projects must have a total capital cost over $250 million and local match requirements are 20% of that total cost; in recent years the FTA has been pushing recipients to pay closer to a 50% local match.

The Small Starts Program was established in the last federal transportation spending bill—the Safe, Accountable, Flexible, Efficient, Transportation Equity Act–A Legacy of Users (SAFETEA-LU)—for projects with smaller capital budgets. The intent of the program was to speed implementation of simpler, less capital-intensive projects. To qualify for Small Starts projects, requests must be less than $75 million in federal funding and have a total project cost under $250 million. The project must be a fixed guideway for at least 50% of the project length in the peak period, and/or be a corridor-based bus project with the following minimum elements:

- Substantial Transit Stations
- Signal Priority/Pre-emption (for Bus/LRT)
- Low Floor/Level Boarding Vehicles
- Special Branding of Service
- Frequent Service - 10 min peak/15 min off peak
- Service offered at least 14 hours per day

Very Small Starts provides further expedited review processes for projects that have capital budgets under $50 million in total and less than $3 million per mile. Projects must also meet criteria related to performances and design, such as:

- Include full transit stations
- Use signal priority/pre-emption
- Use low floor / level boarding vehicles
- Employ special branding of service
- Have frequent service levels of 10 min peak/15 min off peak
- Provide service at least 14 hours per day
- Have existing corridor ridership exceeding 3,000/day

This new category was established to foster the development of less capital-intensive transit systems, such as BRT and streetcar systems. This program is an expansion of the FTA New Starts Program, which is the capital funding program for major transit corridor infrastructure.

The New Starts and Small Starts/Very Small Starts programs should be viewed as opportunities for funding TMP HCT corridors including:

- Center City Connector Streetcar
- Loyal Heights – Ballard – Fremont – Downtown Rapid Streetcar
- Roosevelt – U-District – Downtown Rapid Streetcar
- Madison BRT line

Other Federal Capital Grants (e.g., U.S. DOT, FTA, DOE)

Federal grant programs may be available periodically to fund transit projects. The U.S. DOT/FTA TIGGER (Transit Investments for Greenhouse Gas and Energy Reduction) grant program, which expires in 2012, funded transit projects that reduce energy use. In 2011, King County Metro and the City of Seattle applied for a $7 million TIGGER grant to close a gap in overhead trolley wire on 23rd Ave between Jackson and Madison Streets. The grant application directly supports TMP-identified projects in that corridor. The City has received other recent FTA grants, including a major grant to rehabilitate King Street Station in 2010.

Housing and Urban Development Funds

While not a traditional source of support for transportation projects, funds from the U.S. Department of Housing and Urban Development (HUD) have been used to support planning and design work on transit projects. Grants require a local match.

LOCAL FUNDING OPTIONS

Many recent capital projects in the United States have relied largely, if not solely, on local funding for construction and operations. In a number of cities around the country, avoiding complex requirements associated with federally funded

BRIDGING THE GAP (BTG)

Created to address an increasing unfunded backlog of transportation infrastructure maintenance projects, the Phase One BTG property tax levy was passed by Seattle voters in 2006. The levy stipulated that no more than $365 million in additional property tax revenue be used over nine years (2006-2015) to:

- Reduce the infrastructure maintenance backlog
- Pave and repair Seattle streets
- Repair seismically vulnerable bridges
- Improve pedestrian and bicycle safety (by developing and implementing components of the Pedestrian and Bicycle Master Plans) and create safe routes to schools
- Increase transit speed and reliability

The property tax increase is complemented by a commercial parking tax.

The BTG levy set funding requirements by transportation improvement category: according to the levy, no less than 67% of funding may be spent on maintenance, no less than 18% on pedestrian and bike safety projects, and no more than 15% on enhanced transit service. Over the first three years of the program (2007-2010), funding matched these targets: 73% of total revenues were spent on maintenance, 18% on pedestrian and bike safety projects, and 9% on transit projects.

Transit improvements supported by the BTG levy include 43,600 annual transit service hours, and transit-related street improvements in six high volume transit corridors.

Although the current economic downturn has caused a decline in actual revenues, BTG progress has remained on track, partly because funding has been augmented by revenues from the $20 VLF authorized by the Seattle City Council in 2010 (for details, see sidebar for a discussion of the Seattle Transportation Benefit District).

BTG will need to be renewed by voters in 2015 to maintain the current level of investment in transit service and infrastructure.

Sources: **Bridging the Gap: 2010 Annual Report**

BTG funds pedestrian safety projects that improve transit access, such as the crossing illustrated in these before and after photos along Beacon Avenue.

Images from SDOT

construction projects has allowed for more cost effective and rapid construction and implementation of service.

The following are some of the potential local sources of funding for constructing transit projects called for in this plan. Some sources also have potential to raise operating funds.

Vehicle License Fees (VLF)

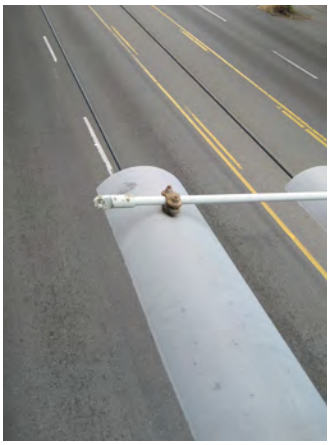
As a transportation benefit district, Seattle is authorized to impose up to a $100 total annual vehicle license fee with voter approval, an additional $80 beyond the current $20 VLF (see the Transit Benefit District sidebar on page 6-8). In November 2011 Seattle voters rejected a $60 annual VLF put on the ballot

A local improvement district (LID) could be a key capital funding source for expanding the Seattle streetcar network.

Image from Nelson\Nygaard

Filling two gaps in trolley wire on 23rd Avenue (1.5 miles) would enable an electrified crosstown priority bus corridor between Rainier Beach and the University District. The photo shows existing wire on Rainier Avenue that would be utilized for this route (corridor 5). Chapter 3 provides a more detailed description of this and other TMP corridors.

Image from Nelson\Nygaard



by the Seattle City Council. The measure would have provided approximately $100 million for transit projects over 10 years (out of a total of over $200 million).

Proceeds of Surplus Property

Recently, the City was able to sell a piece of surplus property known as "the rubble yard." While infrequent, the proceeds from such opportunities could be directed to project development, environmental analysis and documentation, project design, and right-of-way acquisition. Using these sources to get HCT projects to "shovel ready" status greatly enhances the City's ability to leverage federal funding sources.

Local Improvement Districts (LIDs)

A local improvement district is a geographic area in which real property is taxed to defray all or part of the costs of a public improvement. The distinctive feature of a special assessment is that its costs are apportioned according to the estimated benefit that will accrue to each property. In Washington, LIDs are governed by Chapter 35.43 of the Revised Code of Washington (RCW). It is within the local jurisdiction's discretion to determine the benefits and benefit area of a project financed by a local improvement district.

The basic principle of a LID is that it creates an assessment charge for those property owners who receive special benefits from an improvement beyond the general benefits received by all residents of the community.

For example, the expansion of the Seattle streetcar network is anticipated to lead to positive changes in property values along the new lines. Increased property valuation is expected from the enhancement of the local transportation network, connections with regional transit systems, improved neighborhood economics and livability, and increased property exposure and demand. These expected increases in property value can garner private sector support for the formation of a LID.

SEATTLE TRANSPORTATION BENEFIT DISTRICT: VEHICLE LICENSE FEES

Transportation benefit districts were created through a 2005 Washington State Legislature statute as a way for local agencies and governments to fund transportation-related improvements. The legislation authorizes the use of various taxes and fees to fund transportation improvements within the district. It allows funding for operation of facilities and programs, including public transportation.

Funding sources that may be used without voter approval include an up to a $20 annual vehicle license fee (VLF) and a transportation impact fee on commercial and industrial buildings. Subject to voter approval, the following additional revenue sources are available:

- Property taxes (one-year excess levy or an excess levy for capital purposes)
- Sales and use tax (up to 0.2%)
- Annual VLF of up to an additional $80 ($100 total) per vehicle registered in the district
- Vehicle tolls

The legislation also authorizes a district to form a local improvement district (LID) to help fund a specific transportation improvement. The district can impose a special assessment within the LID and issue bonds to help fund the improvement.

In 2010, the Seattle City Council authorized the creation of a transportation benefit district in the city of Seattle under this state authority. In May 2011, the City Council enacted a $20 annual VLF (voter approval was not required). The VLF was expected to raise $4.4 million in 2011 and $6.8 million in 2012. These revenues have been budgeted to support SDOT for a variety of transportation-related programs and projects, such as bridge maintenance, intersection improvements, street maintenance, and bicycle and pedestrian improvements.*

In November 2011, Seattle voters rejected a $60 VLF measure that was expected to raise $204 million for transportation projects and programs in the City over 10 years.

Notes: * In June 2011, the Citizens Transportation Advisory Committee III (CTAC III), a semi-governmental advisory group appointed by the Mayor and City Council to recommend new approaches for transportation funding in Seattle, recommended that the $20 VLF be maintained through at least 2013.

Sources: http://apps.leg.wa.gov/rcw/default.aspx?cite=36.73 and http://www.seattle.gov/stbd/

LEVERAGING DEVELOPMENT RIGHTS

Various cities, including Seattle, have used transit facility development to leverage private investment. In some cases, this investment has stimulated redevelopment along the corridor, increasing transit ridership and fare revenues as well as expanding the tax base. In other cases, development rights associated with specific properties, including transportation maintenance facilities, expressly served as the mechanism to fund transit projects. For example:

- **In Portland,** 10 years after the south portion of its Transit Mall was completed in 1978, every dollar of original capital cost was responsible for $30-$50 of public and private nearby redevelopment**.** (1) In 2004, Bechtel Corporation constructed the Red Line light rail service to the Portland International Airport in exchange for development rights on a large land area near the airport, now the Cascade Station retail development.
- **In Washington, D.C.,** a 2011 study by the Washington Metro Area Transportation Authority (WMATA) showed that $235 billion in property value is located within 800 meters of Metrorail stations in the Washington D.C. metro area. This land accounts for only 4% of regional land area, but 28% of the region's property tax revenue. The WMATA estimates that proximity to Metrorail stations increases property values between 7% and 9%. (2)
- **In Vancouver, B.C.,** a recent analysis found that vacancy of office space with direct access (within 0.5 km) to Rapid Transit Stations is less than half the rate for the rest of the office space market. (3)
- **In Seattle,** the maintenance base for the South Lake Union streetcar is on a 32,000 square foot site with 9,000 square feet of usable space in the maintenance facility building, including 2,000 square feet of space located on a second level. An analysis conducted for the City of Seattle analyzed development potential for both commercial and residential development and concluded that selling residential development rights would have the highest yield, between $2.7 to $3.4 million. (4) The city plans to sell air rights and surplus property at the facility once the real estate market recovers.

Sources:(1) http://trimet.org/about/history/portlandmall.htm. (2) WMATA, "Transit Ridership Trends and Markets," 2009. (3) Jones, Lang, LaSalle (2011). Rapid Transit Office Index, /On-Point/ Canadian Research. p. 1. (4) South Lake Union Capital Financing and Operating and Maintenance Plan, April 2005.

The South Lake Union streetcar maintenance base is shown above, outlined in red.

Source: Google Maps

Value capture through tax increment financing, a tool used commonly to fund rail capital in other cities, is not legal in Washington State.

LIDs should be a primary consideration for developing financing programs for the HCT projects in the TMP.

General Obligation Bonds

Bonds are a primary source of funds for constructing capital improvement projects. Voter-approved bonds are sold to fund street and other transportation projects. Transportation projects can be grouped in "bond packages" which go before the public for voter approval, or are issued separately. General obligation bonds can be supported through the city's property tax base or through the transit district's tax base. Bonds can be backed with incremental increases in universally applied city taxes, such as those on sales and property.

Bonding is a tool typically used for high-cost capital projects, such as rail lines. In the context of the TMP, it may be most appropriate to support HCT projects.

Other Local Sources of Capital Funding

Other local options for funding capital improvements not currently being utilized by the City of Seattle include:

- **Chapter 35.95.040 RCW:** Authorizes cities to levy an excise tax (further defined in Chapter 82.04 RCW) with a cap of an equivalent of $1 per month per household. In Seattle, this could generate up to $3 million per year.
- **Chapter 35.95A RCW:** Authorizes cities to establish an authority to construct and operate fixed guideway systems that are not "light rail." From the RCW, this *"means a transportation system that utilizes train cars running on a guideway, together with the necessary passenger stations, terminals, parking facilities, related facilities or other properties, and facilities necessary and appropriate for passenger and vehicular access to and from people-moving systems, not including fixed guideway light rail systems."* Funding for these "fixed guideway" systems is authorized with a 2.5% motor vehicle excise tax, a vehicle license fee up to $100 per vehicle and a property tax levy up to $1 per thousand of assessed value. This refers to the now dormant monorail authority. Establishing the authority and its taxing authority requires a public vote. This must be investigated further, but it is possible that a rapid streetcar has enough uniquely distinguishing features that could allow it to be defined as something other than a light rail system.

Joint Development and Sale of Land or Development Rights

Joint development (in conjunction with transit facilities), land sales, or sale of development rights above transit maintenance bases are often used as part of capital funding packages. Encouraging development along a transit line helps increase ridership and fare revenue, and lease or sale proceeds can be used to develop a revenue stream for transit operations.

This source can lead to significant financing leverage, but is highly situational and requires detailed exploration at the project level.

STRATEGY AREA: FUNDING CAPITAL INVESTMENTS

CI-1: Focus investments where they maximize efficiency.

CI-2: Establish or expand staff responsibilities for development of new transit funding opportunities.

CI-3: Leverage opportunities to enhance transit capital investments through closely coordinated capital projects and funding development opportunities with Metro and Sound Transit. Ensure transit capital development program staffing is sufficient to take full advantage of available capital funds.

CI-4: Actively pursue opportunities for use of non-dedicated city funds, such as proceeds of surplus property sales, to advance corridor development, environmental, design, and right of way acquisition for HCT corridor projects to bring them to construction ready status.

CI-5: Work closely with Metro to capture and reinvest in the FTN operating cost savings that accrue as a result of capital projects funded by the City.

CI-6: Link transit capital investments directly to the land use goals they are intended to support. This will be crucial to make City projects competitive at the Federal level.

CI-7: Foster a cooperative relationship with all granting and regional transit agencies to better coordinate capital funding requests, particularly for transit electrification projects, at the state and federal level.

CI-8: Support expanded funding mechanisms for the City, such as new funding authority for Transportation Benefit Districts.

CI-9: Develop an ongoing and stable source of revenue to support transit capital and operations in the ity of Seattle.

FUNDING TRANSIT OPERATIONS

Transit operations include on-going expenses, such as operator and administrative labor, fuel/energy costs, and basic vehicle maintenance. In contrast to capital funding, transit operations in urban areas receives limited federal support and is largely financed through local sources. In Seattle, the primary local financing mechanism for transit operations is a local option sales tax, which comprises 62% of King County Metro Transit's operating revenues. In response to recent declines in revenue, Metro and other transit agencies have instituted service reductions and fare increases. Seattle voters have also passed several recent initiatives to fund specific capital projects and service improvements through increases in dedicated transit sales taxes. Declines in sales tax receipts have extended implementation timelines and/or decreased the scope of planned transit service enhancements.

COST TO OPERATE NEW TRANSIT SERVICE IN PRIORITY CORRIDORS

The primary benefit of HCT services proposed in the TMP is a significantly lower operating cost per passenger and per passenger mile. Nevertheless, operating the HCT corridors will require new resources, particularly where the alignments do not provide an opportunity to replace existing bus service.

Figure 6-3 shows the projected annual cost of operating the preferred mode for new and improved transit service in each corridor recommended for HCT service. (For the Center City Connector, the table lists higher operating cost of the two alternatives). Operating costs range from about $4 million to $9 million annually for each corridor. The projected total cost to operate new HCT service in all five corridors is in the range of $25-$35 million per year. Note that these cost estimates do not include cost savings from changes to existing routes, which may represent up to 33% of the total annual operating cost for all HCT corridors. The ability to reinvest current bus operating dollars varies significantly from corridor to corridor. For example, the Madison corridor could be operated with redeployment of existing bus service resulting in little to no new operating costs. The Loyal Heights – Ballard – Fremont – Downtown corridor, on the other hand, could require significant new operating resources.

FIGURE 6-3 ESTIMATED ANNUAL OPERATING COST FOR HCT OPTIONS

HCT Corridor	Corridor Description	Mode *	Annual Operating Cost (2011)**
6	Colman Dock to 23rd Ave via Madison	BRT	$4.6M
8	Roosevelt–U-District–Downtown via Eastlake Ave	Rail	$8.9M
11	Loyal Heights–Ballard–Fremont–South Lake Union–Downtown	Rail	$9.1M
CC1/CC2	Center City Connector: Lower Queen Anne–King Street Station via 1st Ave or South Lake Union–Westlake–King Street Station	Rail	$5.1M †
Total Annual Operating Cost for all HCT Corridors			$27.8M

* Multiple modes were evaluated for each corridor, but the operating cost for the preferred mode is highlighted here.
** Annual Cost shown does not include projected operating cost savings for changes to existing routes, which may be up to 33% of total annual operating costs for all corridors.
† The City has applied for federal funding to conduct an Alternatives Analysis (AA) of the proposed Center City Connector corridors. The highest operating cost is included in the table and assumes that only one of the corridors would be constructed.

SOUND TRANSIT FUNDING

Although Sound Transit operates express bus, commuter rail, and light rail service around the Puget Sound region, the hub of the current and planned Link light rail system is downtown Seattle. Sound Transit's tri-county transit system was established with voter approval of the "Sound Move" ten-year regional transit package in 1996. The "Sound Move" ballot measure authorized a 0.4% sales tax and 0.3% motor vehicle excise tax levied within the Sound Transit District to fund the initial bus, commuter rail, and light rail transit projects.* Sound Transit 2 (ST2) was approved by voters in 2008. It includes a sales tax increase (0.5%) on purchases made within the Sound Transit District and was projected at the time to raise approximately $18 billion in local funds from 2008 to 2023.

Sound Transit's 2011 Adopted Budget of approximately $1.1 billion is supported by roughly $844 million in revenues collected within the Sound Transit District: a 0.9% retail sales and use tax (about 64% of total revenue), a 0.3% motor vehicle excise tax (about 7% of revenue), a 0.8% rental car tax (about 0.2% of revenue), farebox revenues (about 5% of revenue), interest earnings (about 1% of revenue), and miscellaneous revenue (about 2% of revenue). Remaining revenues come from federal grants.

* http://www.soundtransit.org/Documents/pdf/about/Chronology.pdf

The TMP proposes using 2nd and 4th Avenues downtown for regional buses, including those operated by Sound Transit, and streamlined regional bus access to I-5 from north of downtown.

Image from Nelson\Nygaard

KING COUNTY METRO TRANSIT OPERATING FUNDING

King County Metro Transit operates bus service to, from, and within the City of Seattle. The agency's 2011 operating budget of $548.8 million is funded by the following sources: approximately 61% comes from a share of the retail sales tax collected in the service area (about $337.1 million) and 23.6% comes from ridership revenue (about $129.5 million); remaining revenues are collected from other operations revenue (3.1%), property tax revenues originally dedicated to King County ferry services (3.4%), and other funds. In 2012 and 2013 this funding source will be supplemented by a "Congestion Reduction Charge" of a $20 vehicle license fee levied on each vehicle licensed in King County for each of the next two years. The fee is projected to generate approximately $25 million per year to supplement Metro's other revenue sources.

RapidRide is funded by sales taxes under the voter-approved TransitNow program.

Image from Nelson\Nygaard

Sponsorship of streetcar stops and vehicles is a modest, but viable, source for future streetcar and HCT system expansion.

Image from Nelson\Nygaard

OPERATIONS FUNDING OPTIONS

FEDERAL FUNDING FOR OPERATIONS

Federal transit funding directed to urban areas is primarily for capital projects. However, several federal funding programs have potential application for funding elements of transit operations commonly considered operations, such as vehicle preventative maintenance.

FTA 5307: Seattle receives money from these programs for maintenance of the Monorail and Streetcar, which the FTA considers to be operations. These funds are allocated by the Puget Sound Regional Council (PSRC) using a formula based on the percentage of transit trips served. A small share (less than 10%) of Seattle Streetcar operating revenues are derived from federal grants for preventive maintenance.

Congestion Mitigation and Air Quality (CMAQ) Program: Funds under this program are limited to three years of operating support.

LOCAL AND REGIONAL FUNDING OPTIONS

Regional Transit Agency Contributions

To the extent a new transit service overlays or replaces existing or planned future services, some portion of the operating cost can be transferred from the bus service that it replaces. Seattle already receives regional support to operate the South Lake Union Streetcar. In 2010, King County Metro assumed responsibility for 75% of streetcar operating costs.[1]

Operating Endowment

One-time revenues (such as from land sales) or regular revenue streams (such as from the sale of naming rights or leases) can be used to create a fund that contributes to transit operating costs. Seattle established a South Lake Union Streetcar Operating Fund, to consist of both public and private sources. The city loaned initial operating funds, which will be repaid from sponsorship revenue over time.

Naming Rights/Sponsorships

A number of streetcar and bus circulators have expanded upon traditional transit advertising revenues by allowing sponsorship of different elements of the system. While advertising is a traditional funding source for regional transit agencies, they have not made as extensive use of sponsorships and more innovative private funding opportunities as city-owned streetcar or circulator systems. Seattle's South Lake Union Streetcar sponsor names are featured at stops and on individual streetcars. Sponsorship revenues were about $500,000 annually in 2008 and 2009.

STRATEGY AREA: FUNDING OPERATION OF SERVICES

OS-1: Operating supplements should be used to bring parts of the FTN up to frequency and span of service targets established in Chapter 4. This may mean supplementing operations on routes where Metro Service Guidelines suggest a lower level of service or where Metro has insufficient funding to address all gaps between service standards and actual service levels.

OS-2: Operating supplements may need to be used to protect FTN service standards and/or to ensure continued availability of local network service to Seattle residents if Metro is forced to reduce service due to financial distress.

OS-3: The City should consider the most cost-effective use of operating supplements, including evaluating use of alternative service methods and providers.

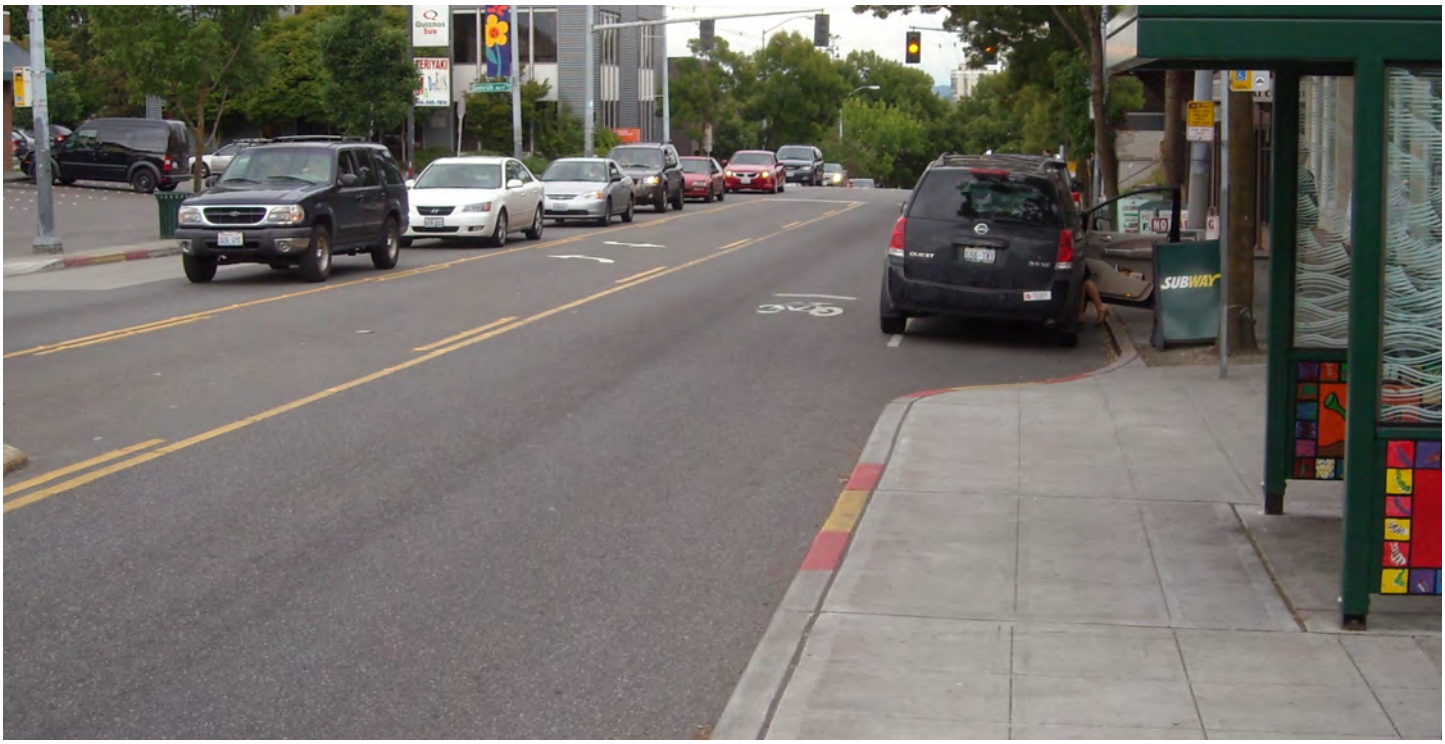
OS-4: The City should coordinate with Metro to establish a policy for providing alternative mobility services where standard fixed route operations are not productive.

OS-5: The City should establish a cap on subsidy for alternative services. A suggested guideline is that the amount of funds used to support alternative strategies is no more than 5% of the City's total investment in transit in any given year.

OS-6: The City should do early outreach with the private sector and public agency partners to develop sustainable operating finance plans for streetcar and rapid streetcar system expansion.

OS-7: The City should consider changes to its sign code to allow opportunity for private funding for transit and bike share through station sponsorships.

1 Seattle 2010 Proposed Budget; Draft Memorandum of Understanding, South Lake Union Streetcar Financing, http://www.cityofseattle.net/transportation/docs/slu18FINAL%20Financing%20Appendix%20C.pdf.



Bus bulbs are a capital improvement that can help meet multiple TMP performance measures: they improve speed/reliability by allowing buses to stop in the travel lane to board passengers and provide additional right-of-way to construct shelters and allow passengers to wait outside of the sidewalk zone.

Image from Nelson\Nygaard

POTENTIAL LOCAL AND REGIONAL FUNDING OPTIONS FOR CAPITAL OR OPERATIONS

New and innovative sources will be needed to realize TMP goals and deliver all the projects and improvements included in the Plan. This section describes potential new funding sources that include: local funds generated within the Seattle Transportation Benefit District (governed by the Seattle City Council), transit impact fees, and regional funding options requiring legislative authorization and voter approval.

LOCAL FUNDING OPTIONS

GENERAL FUND REVENUE

The City may opt to dedicate a share of City general fund resources to fund transit service or capital improvements. Because capital improvements are typically easier to finance through state and federal grants and/or regional funding packages, the City may choose to dedicate any available general fund revenues to transit operations.

PARKING METER REVENUE

Parking meter revenue is a source of local revenue to consider using to support capital improvements in the TMP, and/or operation of expanded service in TMP priority corridors. Other cities , such as San Francisco and Portland, have found it easier to build support for extending metering to new hours and/or new areas, and transitioning to demand-based parking pricing if a portion of meter revenues are dedicated to access and mobility improvements in the same neighborhood or business district in which they are collected.

TOLLING LOCAL STREETS AND ROADWAYS WITHIN THE TRANSPORTATION BENEFIT DISTRICT

The Seattle City Council, acting as the Board of Directors of the Seattle Transportation Benefit District, has state authority to seek voter approval to levy tolls on any non-state highway in the City to support transit and other transportation improvements in the City. In 2011, the Council opted to pursue voter approval of a $60 Vehicle License Fee, reserving its tolling authority for future use (for more on this package see “Seattle Transportation Benefit District” on page 6-8).

REGIONAL FUNDING OPTIONS

Sound Transit is proceeding with implementation of Link Light Rail, Sounder Commuter Rail extensions, and ST Express Bus facilities and service expansion as authorized by regional voter approval of ST2 in 2008. However, there are many high priority transit projects in the regional transportation plan (Transportation 2040) that do not, as yet, have full funding from federal, state, regional or local sources. To expedite completion of the highest priority regional, access and mobility projects, including some of the HCT and Priority Bus Corridor projects in this plan, regional leaders may seek new legislative authority to put another regional transportation funding

package before voters in the Central Puget Sound Region. Potential sources of revenue for a regional transportation funding package include:

- Tolls (corridor tolls, congestion pricing, or cordon tolls)
- Off-street parking fees
- Vehicle miles traveled fees or tolls
- Local option sales tax on gas
- Development fees based on the number of new vehicle trips generated by new projects

All of these sources would require legislative approval to be levied at the local, regional, or state level as a source of funding for transit (see Funding Sources Requiring Legislative Approval). As new funding sources, or by way of expansion of existing regional authority, these sources could fund and/or finance construction and operation of FTN services.

TOLLING STATE HIGHWAYS

Market-based road pricing can contribute to transit operating cost and has two primary benefits for transit operations:

1. Pricing revenues can be used to fund increased levels of transit service.
2. Alleviating congestion reduces transit travel times and operating cost, increasing the buying power of existing operating revenues.

These benefits have been demonstrated internationally (e.g., London) but have not yet been applied on a wide scale in the U.S. The Seattle Variable Tolling Study identified variable tolling as a potential transit revenue source.[1]

There are currently two tolled facilities in Washington State (SR-16 Tacoma Narrows Bridge, and the SR-167 HOT Lane), but in neither case are toll revenues dedicated to fund transit service.

Toll revenues have been used to fund transit operations in other states, including New York and California, where state law requires nearly 60% of toll revenue in the I-15 corridor in San Diego County to be used for transit service in the same corridor.

In particular, Seattle could push for changes in state law to allow for some portion of revenue from upcoming toll collection on SR 99, SR 520, and possible future toll collection on I-5 and I-90 to be used to fund transit operations. Strengthening affordable regional transit in conjunction with toll projects helps reduce impacts of tolling on low-income travelers.[2]

1 http://www.cityofseattle.net/transportation/docs/FINAL%20Tolling%20Study%20report%20revised%206.25.10.pdf
2 http://apps.leg.wa.gov/rcw/default.aspx?cite=47.56.820

OFF-STREET PARKING FEES

In addition to the commercial parking tax, the City may seek legislative authority to levy a graduated, per-space fee on private off-street parking spaces associated with commercial and mixed-use development with revenues dedicated to funding transit and other multimodal transportation improvements. To ease the burden of the new fee and encourage priced parking, the fee might be structured to permit a full or partial exemption for any employer and/or property owner who charges market rates for parking, or otherwise passes on the full cost of owning, maintaining, and operating parking facilities to users.[3]

LOCAL-OPTION SALES TAX ON GAS

Fuel taxes are an important source of revenue for transit in many states. Gas taxes have multiple benefits of (1) raising a substantial amount of revenue, (2) encouraging transit ridership by raising the out-of-pocket cost of each additional mile driven, and (3) rewarding drivers that reduce pollutant emissions by driving less and using more fuel-efficient vehicles. The Washington state Constitution restricts the use of gas tax revenue to the construction and maintenance of roads, so a straight gas tax is not a viable funding option for the TMP. The sale of gas is also exempted from local sales and use taxes in Washington State. However, the City and other interested partners may advocate for the legislature to remove this exemption to permit local governments and/or regional agencies to levy a sales tax on gas (if it is not done statewide) at current rates. If this is done, the local, regional, or state taxing authority may dedicate a share of sales taxes collected on gas to transit capital improvements and transit operations. From a driver's perspective, application of the sales tax to gasoline would be comparable to increasing the gas tax or other components of the variable cost of fuel.

VEHICLE MILES TRAVELED (VMT) OR CARBON TAX

Both of these tax sources are under careful study at the state and federal levels as future funding sources for transportation projects and programs including transit. In both cases, there is attention being given to the potential for local jurisdictions to also utilize new revenue to fund local transportation projects or services. At the federal level, it seems less likely a fee based only on how many miles are driven will be implemented, although VMT may be a part of the taxing formula. Appearing more likely is a tax that is based on use of carbon. The debate on how to rescue the Federal Highway Trust Fund and how much to expend on transit and non-motorized transportation could take years to resolve. The City should continue to

3 Any fee should be assessed to property-owners and/or employers on a graduated basis that is inversely proportional to the amount they charge for parking, or the amount they currently offer to commuters as a cash alternative to parking ("parking cashout"). Such a fee would be graduated so that property owners would be exempted if (a) they or their tenants charge a per-space user fee for parking, or (b) they unbundle parking from the lease of commercial space and all tenants certify that they pass the full-cost of parking on to their employees, or offer all of their employees the option of taking cash in-lieu of a parking subsidy.

monitor federal, state, and regional actions relative to these new funding sources.

IMPACT FEES

Transit Impact Fees

The City may establish a transit impact fee to capture the cost of providing transit facilities and service to meet the need for access and mobility generated by new development. Levying such a fee would require completing a study establishing an essential nexus between the fee and the public costs of accommodating the additional transit trips generated by the development or the impacts of those trips on transit operations. This may require modifications to State Environmental Policy Act (SEPA) or Growth Management Act (GMA) rules.

Multimodal Transportation Impact Mitigation Fees

As a complement or alternative to transit impact fees, the City may work with other local government partners to secure legislative authorization to enact a multimodal transportation impact mitigation fee based on the number of automobile trips generated by new development (this would require a change to State Environmental Policy Act (SEPA) rules for the definition and mitigation of environmental impacts of development projects. To levy a fee on auto trip generation, the City would have to complete a study establishing an essential nexus between the proposed use of fee revenue and the environmental impact of auto trips generated (demonstrating how investments in transportation demand management, transit, and other multimodal transportation projects and programs would reduce vehicle trips, effectively mitigating the projected impact of the new project).

SAN FRANCISCO TRANSIT IMPACT FEE & PROPOSED AUTO TRIPS GENERATED (ATG) FEE

San Francisco's Transit Impact Development Fee (TIDF) assesses a fee on all non-residential development in the city, recognizing transit's role and added value in serving development. The fee is two-tiered currently $9.07 or $11.34 per square foot (indexed for inflation), based on the level of transit demand attributable to each of the six land use categories defined in the ordinance. The TIDF generates a modest amount of revenue to fund transit service improvements—slightly over $2 million collected in 2008 and nearly $120 million in fees and earned interest between 1981 and 2008.

The San Francisco County Transportation Authority recently studied the option to implement a similar impact mitigation fee on ATG by new development, payment of which would permit development projects to fully mitigate the air quality impacts of their project (avoiding the need for further environmental analysis), while providing the County with funding to implement a package of multimodal transportation investments, including transit projects designed to reduce vehicle trips.

Source: Auto Trip Generation Study: Final Report, San Francisco County Transportation Authority, October, 2008

STRATEGY AREA: DEVELOPMENT OF NEW FUNDING SOURCES

NFS-1: Work at the state level to develop new sources of funding for King County Metro. There may be opportunities within new legislation to leverage City funds as part of Metro's total investment package.

NFS-2: Advocate to ensure new state revenue sources are not constrained to roadway development, operations, and maintenance. The state legislature will begin discussions in the 2012 session on Transportation Revenue Enhancement. A major focus will be on funding state initiatives, but local jurisdictions are advocating for new funding opportunities at the local level.

NFS-3: Look for opportunities to run pilot tolling programs as a way to continue development of tolling as a new revenue source.

NFS-4: Use the SR 99 Tolling Committee process as a forum to consider broader uses of toll revenues and consider tolling as a transportation management as well as a capital finance tool.

NFS-5: Push for changes in State law to allow a share of revenue from upcoming toll collection on SR 99, SR 520, and possible future toll collection on I-5 and I-90 to be used to fund transit operations.

NFS-6: Look for opportunities to create public-private partnerships to support the development of the HCT corridors.

NFS-7: Consider dedicating a share of meter revenues collected within each of the frequent transit corridors identified in the TMP to transit capital improvements and/or operations within the same corridor.

NFS-8: Evaluate the revenue potential of Transit Impact Fees and Multimodal Transportation Impact Mitigation Fees on new development and conduct a nexus study to determine if warranted.

NFS-9: Collaborate with other local and regional agency stakeholders to seek legislative approval to permit local governments and/or regional agencies to levy a sales tax on gas with eligibility to spend revenue on transit projects and services.

Revenue from toll collection is a potential new funding source for transit operations, but would require changes in state law.

Image from WSDOT

A share of parking meter revenues collected within a frequent transit corridor could be used to fund capital improvements and/or operations within the same corridor.

Image from SDOT

PERFORMANCE MONITORING

The Seattle Transit Plan (2005) was developed in support of the Urban Village strategy adopted in the Seattle Comprehensive Plan. The priority network of transit routes developed in the Seattle Transit Plan has been revised, improved, and replaced by the Frequent Transit Network in the Transit Master Plan. Part of the previous plan was the Urban Village Transit Network monitoring program, a complex monitoring and evaluation methodology designed to track progress and to identify gaps in the network. This work was an important foundational effort for the City, but, in practice, the monitoring program has been cumbersome and fallen behind due to challenges collecting and evaluating data on a regular basis. Further, the complexity of the scoring mechanism has been such that public interest and transparency is low. Given resource constraints, the monitoring report has not been a high priority for SDOT in recent years. This suggests the usefulness of the tool has run its course and that it is time to re-evaluate how the City monitors and measures transit system effectiveness, progress toward investments identified in the TMP, and weaknesses or gaps that require City or partner agency action.

The newly adopted King County Metro Strategic Plan has established a network evaluation and operating performance standards system, which will be employed on a regular basis. The operating performance evaluation is based on a set of corridors, which correspond with the FTN corridors in the TMP. Metro performance standards relate to ridership, on-time performance, headway management, and productivity. A route-level report is published every quarter with about a one quarter lag. In terms of network design and effectiveness, measures, such as percentage of population within reach of high frequency service, percentage of vulnerable populations within reach of high frequency service, and percentage of jobs within reach of high frequency service have been established. In addition, standards for "service families" that establish the span of service by time period and the frequency required in that time period have been adopted, as have evaluation tools that identify gaps between standards and actual service levels.

STRATEGY AREA: PERFORMANCE MONITORING MEASURES

PM-1: City monitoring of performance on the FTN should take advantage of Metro's performance monitoring and evaluation system to track performance and progress of the FTN and avoid overlapping or duplicative monitoring efforts. The Metro performance monitoring data should be supported with additional TMP monitoring as described below. A table showing how the measures interact is included in Figure 6-4.

PM- 2: Measure progress in improving access between neighborhoods through transit access and travel time improvements, and in units of time saved for each transit person trip. This would be measured by travel and access times for transit trips between urban centers and villages, compiled annually. Access time is the amount of time required to reach and wait for a transit vehicle; wait time is reduced by improvements to frequency. The total time would be divided by corridor ridership.

PM-3: Measure progress on transit mode split by FTN corridor. This would be stated as the ratio of transit ridership to vehicle average daily trip (ADT) at two or more locations on each corridor in the FTN and compared over time.

PM-4: Ensure transit and bicycle modal investments are working together to increase the share of both modes. This would be measured by comparing bicycle volumes to transit ridership counts at strategic locations on each corridor in the FTN This would require installation of permanent bicycle counting systems at several locations throughout the city.

PM-5: Measure capital investment per transit person trip and establish a historical trace of investment efficiency. For each FTN corridor, divide corridor capital investment (Metro, Sound Transit, plus Seattle) by corridor ridership, compiled annually.

PM-6: Measure the effectiveness of City of Seattle transit operating investments. For each corridor in the FTN divide Seattle's operating investment by corridor ridership, compiled annually, and compared over time.

PM-7: Measure TMP Implementation Progress:

- Three Priority Bus Corridors implemented every 2 years
- Ballard/Fremont HCT corridor implemented in 5 to 8 years
- City Center Connector implemented in 4 to 6 years
- Eastlake University District HCT corridor implemented in 15 years or less
- Madison HCT corridor opened in conjunction with the new Alaskan Way roadway (following Viaduct demolition)

The Metro network evaluation report will be published every two years.

The strength of this measurement tool should be used to evaluate the performance of the Seattle FTN. However, as robust as this monitoring and evaluation tool is, it does not directly address Seattle's mobility goals. It is suggested, that, as with transit investment, the monitoring of Seattle's transit network take on a more supplemental approach rather than a global evaluation that would duplicate Metro's performance monitoring system. What is missing from Metro's evaluation are measures of connectivity and effectiveness with regard to improving transit mode competitiveness and quality of connections with other modes.

Seattle's monitoring and evaluation should focus on measures directly designed to assess progress on Seattle's goals that are not measured by Metro. The recommended monitoring system suggests that measures be established that clearly evaluate effectiveness in terms of the number of transit trips benefitted. Ideally, the monitoring system would yield information that indicates which investment was more effective in terms of supporting additional transit ridership. Further, the monitoring system recommends measures which track progress of implementing the FTN.

FIGURE 6-4 RELATIONSHIP BETWEEN TMP AND KING COUNTY METRO PERFORMANCE MONITORING

TMP Performance Monitoring Need	King County Metro Performance Monitoring System	Seattle TMP Performance Monitoring
Put the Passenger First • Make transit easy to use • Create a safe environment for transit passengers • Make transit universally accessible • Make transit comfortable • Transit responsive to the needs of people for whom transit is a necessity (e.g., transit-dependent individuals, youth, seniors, people with disabilities, low income populations)	Metro Measures produced at Seattle level. • All public transportation ridership in King County (rail, bus, paratransit, rideshare) • Population within ¼-mile walk access to a transit stop or 2-mile drive to a park-and-ride • % low income population within ¼- mile walk access to transit • % minority population within ¼-mile walk access to transit • Transit mode share by market	• TMP Implementation Progress *Note that many of the elements are incorporated through the integrated design standards for the FTN. Measuring implementation progress will also measure progress in this policy area.*
Make Transit a Convenient Choice for Travel • Provide mobility to a wide range of destinations • Facilitate fast and reliable operations • Increase ridership by integrating other modes and making access safe and easy • Invest in infrastructure where it can attract the most users	• % population at 15 dwelling units per acre within ¼-mile walk access of frequent service • On-time performance or headway maintenance by time of day • Load factor • Service hours and service hour change per route • Ridership and ridership change per Route • Boardings per revenue hour • Passenger miles per revenue mile	• Travel and access times for transit trips between urban centers and villages
Use Transit to Build Healthy Communities • Make transit facilities central to community gathering places • Increase walking and bicycling to support increased physical activity and improve health outcomes • Seamlessly integrate transit, urban development, and the public realm • Provide access to daily needs and services on foot, by bicycle, or on transit • Employ best practices in transit-oriented design	• Centers ridership • Transit rides per capita • Peak mode share at Commute Trip Reduction sites	• Ratio of transit ridership to Vehicle ADT • Bicycle volume compared to transit ridership
Improve Transit Service and Quality Through Partnerships • Optimize regional transit service investments • Work with neighboring jurisdictions where transit markets cross borders • Collaborate and share assets • Build political alliances	• Cost per boarding • Asset condition assessment indicators	• Total capital investment per transit person trip in FTN • Seattle's operating investment by FTN corridor divided by ridership • TMP Implementation Progress
Reduce Environmental Impacts of Personal Mobility • Use transit to meet environmental targets • Use energy responsibly • Consider lifecycle costs of transit infrastructure	• Public transportation energy use per passenger mile • Per capita vehicle miles traveled • Transit mode share	• Implementation of TMP priorities for Electric Trolley Bus system expansion

ENDNOTES

ENDNOTES

Chapter 1

1. Including Lower Queen Anne, South Lake Union, Belltown, Denny Triangle, Commercial Core, First Hill, Pioneer Square/International District, and Stadium District.

2. Based on an analysis of Seattle Travel Demand Model data.

Hypothetical Additional Transit Demand	2008	2030
New Passengers During Morning Peak (6:00 – 9:00 am) and Equivalent New Buses		
AM Peak transit trips to/within Center City	55,575	79,314
Hourly transit trips to/within Center City	18,525	26,438
Additional transit trips per hour	-	7,913
Demand can be met by:		
Additional buses per hour	-	150
OR Additional light rail trains per hour (two car trains)		20
OR Additional light rail trains per hour (four car trains)		10

3. Based on analysis of Seattle Travel Demand Model data and additional calculations. Additional buses per hour calculation is a rough estimate based on an estimated load of 40 passengers per bus and assuming 25% of new capacity needs are accommodated on existing services.

4. A maximum load factor of 2.0 during peak periods is assumed for rail; this is the assumption used in Appendix L (Operating Plan Summary) of the North Link Final Environmental Impact Statement. A seated capacity of 74 was assumed, thus there would be a maximum load of 148 passengers per vehicle. Assuming that 25% of new capacity needs can be accommodated on existing services, 5,935 new person trips per hour would need to be met using new service. Dividing 5,935 by 148 passengers per vehicle yields 40.1 vehicles. With two-car trains, 20 additional rail trips per hour would be required (5935/296=20.05). If four-car trains are used, 10 additional trips per hour would be required (5935/592=10.03).

5. Without additional transit service to meet the demand, there would be an increased number of people driving. If every AM peak transit trip to and within the Center City were replaced by a driving trip, there would be approximately 4,946 additional vehicles per hour. This assumes an average vehicle occupancy of 1.6 passengers per vehicle (based on PSRC Transportation 2040 Final Environmental Impact Statement, 2010). Assuming a vehicle flow rate of 1,900 vehicles per lane per hour, 2.6 additional highway lanes would be necessary to accommodate the increased number of vehicles, or 5.2 total lanes (2.6 in each direction). In reality, all of the traffic would not be on a single road, but would instead be spread out across many streets.

6. The table below lists the steps in this calculation.

Hypothetical Additional Vehicle Space Demand	2030	Source / Explanation
Additional AM Peak transit trips to/within Center City (2008-2030)	23,739	2008 Seattle Travel Demand Model
Additional hourly transit trips to/within Center City	7,913	AM Peak trips divided by 3
Additional hourly autos if additional transit riders drove instead	4,946	Assumes 1.6 persons per vehicle
Additional arterial street lanes to accommodate new cars (per direction)	7.1	Assumes capacity of 700 vehicles per lane per hour

7. There would be 23,739 additional transit trips to and within the Center City during the AM peak (6:00 AM to 9:00 AM). If served by private vehicles, there would need to be parking spaces for an additional 14,837 vehicles, assuming that each vehicle would need its own space and an average vehicle occupancy of 1.6 persons. With an average cost of $16,158 per space for a parking structure in Seattle, the construction cost of building parking spaces for those vehicles would be $239,734,226. Additional parking spaces would also require land. Assuming 325 square feet per space in a parking structure, there would need to be the equivalent of 7.72 ten-story parking garages taking up entire downtown Seattle blocks.

Hypothetical Additional Parking Demand	2030	Source / Explanation
Additional AM Peak transit trips to/within Center City (2008-2030)	23,739	2008 Seattle Travel Demand Model
Additional cars in AM Peak if additional transit riders drove instead	14,837	Assumes 1.6 persons per vehicle
Cost for parking spaces in structure	$239,734,226	Assumes parking structure cost of $16,158 per space
Area required for parking spaces (sq. ft)	4,821,984	Assumes 325 sq. ft. per space
Area required for 10 story parking garages (sq. ft.)	482,198	Parking area divided by 10
Land area of downtown Seattle block (sq ft)	62,500	Assumes block length of 250 feet
Number of city blocks needed for parking garages	7.72	Parking garage area divided by land area of downtown block

8. Visit Seattle, Visitor Impact To Seattle/King County, 2009. http://www.visitseattle.org/About-Us/Facts-And-Figures.aspx and http://www.visitseattle.org/getattachment/About-Us/Facts-And-Figures/visitor_expend.pdf;

9. http://www.experiencewa.com/industry/Research/Documents/R_WACountyImpactStudy_91-2009.pdf

10. Visit Seattle, op. cit.

11. http://www.seattlecenter.com/

12. Seattle Aquarium, Quick Facts, http://www.seattleaquarium.org/page.aspx?pid=816

13. Federal Highway Administration, Seahawks Stadium Case Study, http://ops.fhwa.dot.gov/publications/mitig_traf_cong/seahawks_case.htm

14. The Seattle Times, "Sports fans to find relief at Stadium light-rail stop," 7/11/2009. http://seattletimes.nwsource.com/html/localnews/2009284443_ststadium01m.html

15. Eran Leck, "The Impact of Urban Form on Travel Behavior: A Meta-Analysis," *Berkeley Planning Journal* 19 (2006), 37-58

16. Reid Ewing et al., *Growing Cooler: The Evidence on Urban Development and Climate Change* (Washington D.C.: ULI, 2007)

17. Based on TMP analysis (see Chapter 3 for results; additional detail on methodology is provided in Appendix B). Includes only transit-related emissions, not due to reductions in personal vehicle use.

18. Based on about 27 million diesel bus miles traveled within the city of Seattle, from the City of Seattle 2008 Greenhouse Gas Inventory.

19. Center for Neighborhood Technology, "$4 per Gallon Gas – Are We Ready?", http://www.cnt.org/repository/Published.Planetizen-$4perGallonGas.pdf

20. Transit Master Plan analysis

21. Smart Growth America, "Recent Lessons from the Stimulus: Transportation Funding and Job Creation," February 2011. http://www.smartgrowthamerica.org/documents/lessons-from-the-stimulus.pdf

Image from WSDOT

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Image from SDOT

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City of Seattle Department of Transportation

TRANSIT MASTER PLAN

Appendix B: Corridor Evaluation Methodology

April 2012

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APPENDIX B CORRIDOR EVALUATION METHODOLOGY

OVERVIEW

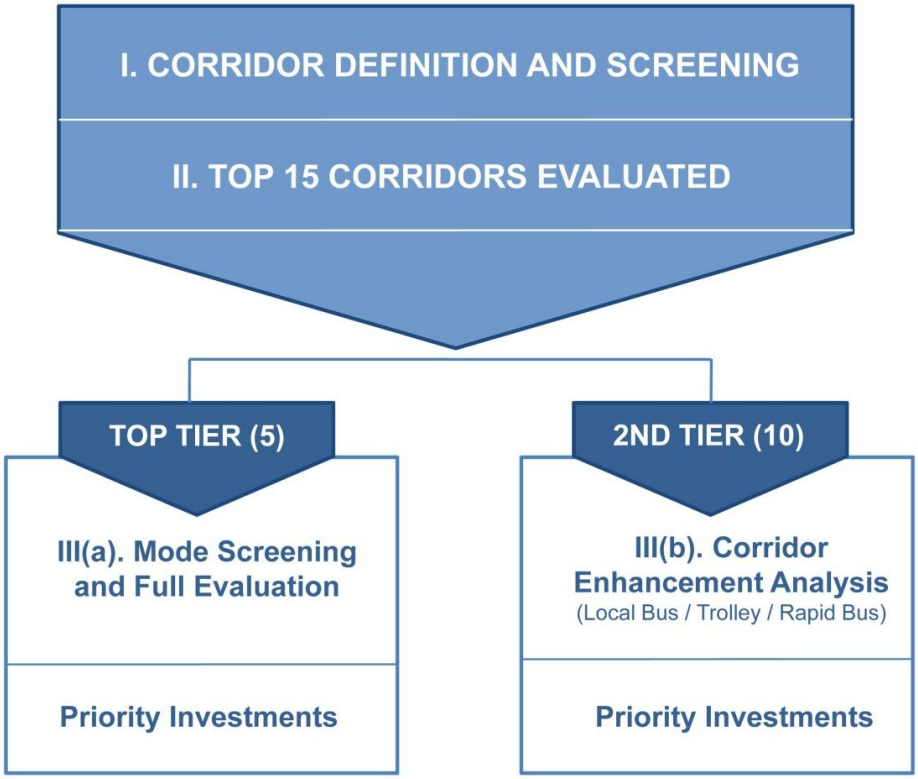
This appendix describes the evaluation process and results of the Seattle Transit Master Plan at each stage of corridor evaluation. This appendix supplements the summary of the corridor evaluation process provided on page 3-3 of the TMP Summary report. It provides the intermediate analysis presented to the TMP steering committees that was used to arrive at the final set of 15 citywide priority corridors illustrated in the TMP Summary Report (Figure 3-4). The contents of this appendix are based on the technical memoranda developed at each stage of evaluation.

TMP CORRIDOR EVALUATION FRAMEWORK

Figure B-1 illustrates the basic flow of three evaluation stages used to identify and evaluate corridors, resulting in prioritization of corridors into top tier and second tier corridors and development of capital investment recommendations for both tiers.

- **Stage I:** The Stage I process narrowed an initial set of potential corridors to 15 citywide priority corridors for more detailed analysis in Stage II, and developed a framework for prioritizing capital, operating, and supporting programmatic improvements to transit in those corridors. In addition, several Center City corridors analyzed in Stage I performed extremely well and were analyzed in a separate track from the citywide corridors.
- **Stage II:** In Stage II, a Multiple Account Evaluation (MAE) process was utilized to evaluate corridors in detail, and to prioritize the corridors.
- **Stage III:** Stage III of the evaluation analyzed mode options for the top priority corridors and conducted a detailed analysis of these corridors; enhancement options were also analyzed for the second tier corridors.

Figure B-1 TMP Evaluation Stages



The following sections describe each stage of the evaluation in more detail.

STAGE I CORRIDOR EVALUATION

This section outlines initial draft results of the Seattle Transit Master Plan (TMP) Stage I corridor screening process. The purpose of Stage I was to narrow the initial set of transit corridors for more detailed analysis.

Stage I Corridors

A broad set of travel corridors was identified for Stage I screening. Each corridor defines a set of associated market connections. These corridors represent the basic building blocks for corridor analysis. Figure B-2 illustrates these broad travel corridors.

To accurately assess corridor potential, more detailed pathways for transit were identified based on: (1) the UVTN corridors and performance, (2) King County Metro (KCM) route structure, (3) King County Metro Strategic Plan, RapidRide Planning and other service planning efforts, and (4) the City of Seattle street network and classifications. In practice, multiple iterations of the pathways were developed during the Stage I analysis. These pathways were identified to guide elements of the analysis that require measurement of land use or right-of-way conditions. Figure B-3 illustrates the pathway options (one or more) for each travel corridor.

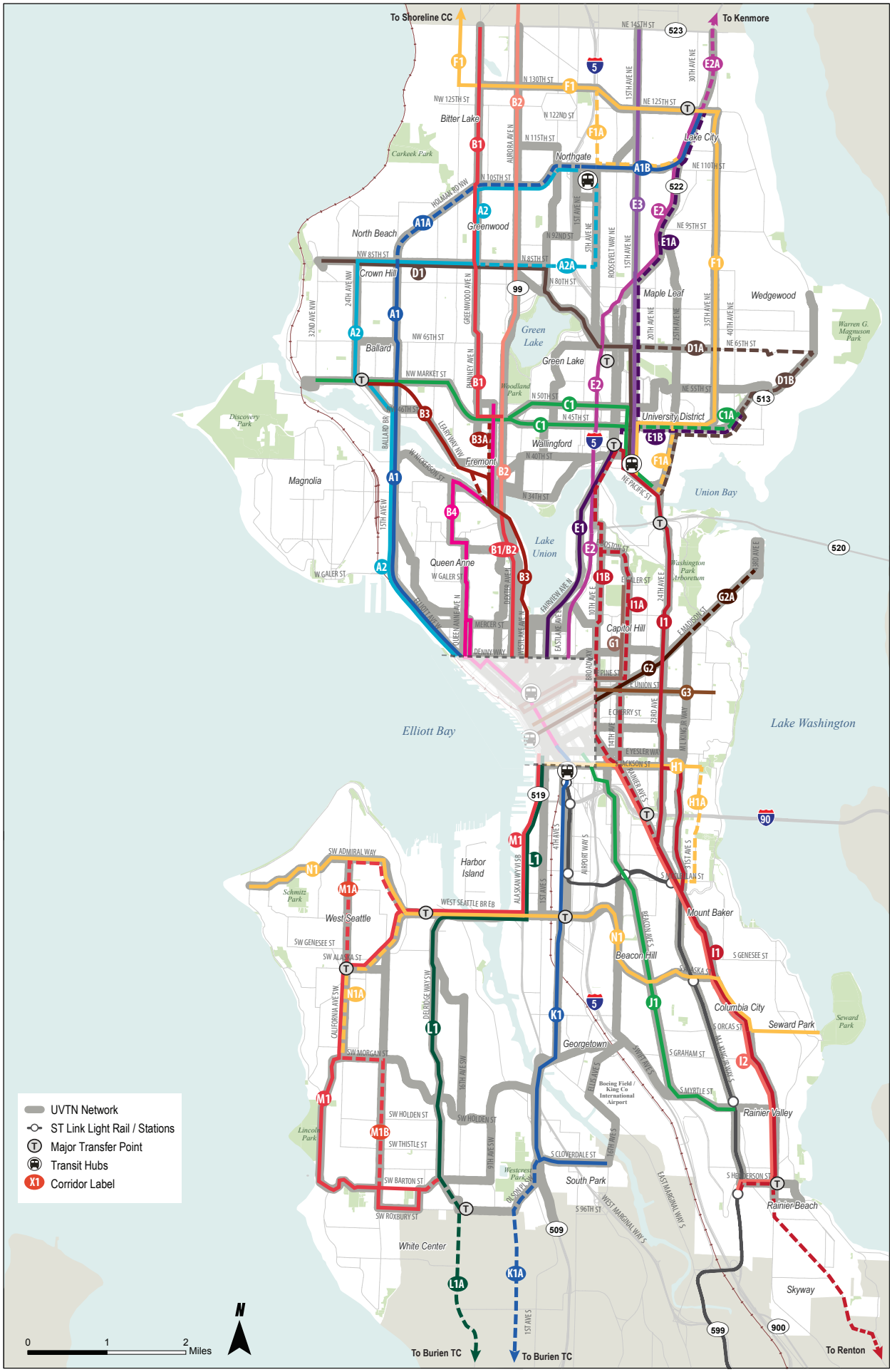
Corridors with built or funded light rail transit were treated as existing high capacity transit investments. However, local transit needs in or immediately parallel to these corridors were also considered because regional high capacity transit investments are not designed to serve short, local trip demands.

Figure B-2 Citywide Travel Corridors Evaluated

Source: City of Seattle

Nelson|Nygaard consulting associates

Figure B-3 Initial Corridor Pathways for Stage I Screening



Nelson\Nygaard consulting associates

Source: City of Seattle

Stage I Evaluation Criteria

Stage I evaluation criteria are heavily focused on corridor potential to generate ridership, primarily using current and future land use and demographic characteristics. This evaluation was used to screen out corridors that are least likely to deliver significant return on major transit investments within the plan timeframe (2030).

The Stage I evaluation used the criteria listed in Figure B-4.

Figure B-4 Stage I Corridor Evaluation Criteria and Measures

Evaluation Criteria	Measure	Methods
A. Existing ridership and productivity	Boarding rides in corridor	Peak and off-peak corridor level analysis of 2009 King County Metro route performance
B. Ridership potential (current land use)	2008 land use supportiveness	Evaluation of combined 2008 population + employment density in ¼-mile buffer around corridor
C. Future ridership potential (2030 land use)	2030 land use supportiveness	Evaluation of combined 2030 population + employment density in ¼-mile buffer around corridor
D. Benefits to vulnerable communities	Service to areas with higher than average concentrations of people with low incomes, people with disabilities, and people who depend on transit (whether by need or choice) Service to low car ownership areas (controlling for duplication noted above as a low income indicator)	Percentage share [within ¼-mile catchment] based on transit reliant index (seniors, youth, persons with disabilities, and low income populations) Percentage share [within ¼-mile catchment] based on auto availability index
E. Potential for travel time savings	Potential for travel time improvement (% change in corridor travel time) given physical conditions	Qualitative assessment that considers: (1) speed treatments completed in corridor to date and (2) traffic volumes vs. lane capacity
F. Anchor/generator strength	Presence of major institutions, high visitation cultural/recreational sites, large Commute Trip Reduction affected employers (>500 employees), and Transportation Management Plan affected buildings in corridor	Qualitative assessment of anchor and generator strength based on number and size of generators in corridor
	Presence of paid parking in corridor/parking cost	Areas/neighborhoods with paid on-street parking; average parking cost and percent of corridor with paid parking *(off-street parking price data is not available for the entire city)*
G. Urban and commercial centers	Presence of retail and neighborhood activities as nodes, main streets, or shopping centers	Identification and qualitative assessment of the number, size, and importance of these activity nodes, as distinct from the stand-alone attractors noted above

Screening Criteria Summary

The matrix and maps included in this section provide a summary of the individual criterion used to evaluate the full list of potential transit corridors and pathways presented in Figure B-3.

Figure B-5 Stage I Evaluation Summary Matrix

Scores	Assessment
0	Neutral
1	Slightly Beneficial
2	Moderately Beneficial
3	Significantly Beneficial

Path/Corridor	Length (Miles)	Description	A. Existing ridership in corridor	B. Ridership potential (2008 land use)	C. Future ridership potential (2030 land use)	D. Serves transit reliant and low-income population	D1. Service to transit reliant and low-income populations	D2. Service to low-car ownership areas (controlling for duplication with D1)	E. Potential for travel time savings	F. Anchor/generator strength	F1a. Presence of large CTR employers (>+250 employees)	F1b. Presence of major institutions and high visitation sites	F2. Presence of paid on-street or time-restricted parking (lineal % of corridor within a 300 foot buffer of parking)	G. Urban and Commercial Centers
A1	5.3	Ballard – Downtown	1	1	1	0.5	0	1	3	1.33	2	1	2	2
A1A	8.4	Northgate - Ballard –Downtown	1	1	1	1	1	1	2	1	1	1	1	2
A1B	10.2	Lake City – Northgate – Ballard – Downtown	1	1	1	1	1	1	2	1	1	1	1	2
A2	9.8	Northgate – Ballard –Downtown (via Greenwood/85th)	2	1	1	1.5	2	1	2	1	1	1	1	2
A2A	9.9	Northgate – Ballard –Downtown (via 5th/85th)	1	1	1	1	1	1	2	1	1	1	1	2
B1	8.4	Downtown to Aurora Village (or SCC) via Phinney/Greenwood	1	1	1	1	2	0	1	0.66	2	0	2	2
B2	10.9	Downtown to Aurora Village via Aurora	1	1	1	0.5	1	0	3	0.33	2	0	1	3
B3	4.7	Ballard - Fremont – Downtown (via Leary, Fremont Bridge or new bridge – Westlake or Dexter)	1	2	2	0.5	0	1	2	2.33	2	2	3	3
B3A	3.1	Fremont – Downtown (via Fremont Bridge – Westlake)	1	2	3	1	1	1	3	1.66	3	1	3	3
B4	4.9	Woodland - Queen Anne – Downtown (via Fremont Bridge)	3	2	2	1	1	1	2	2.33	2	3	3	3
C1	7.1	Ballard – U-District Crosstown	2	2	2	1.5	1	2	1	2.33	1	2	3	2
C1A	8.5	Ballard – U-District Crosstown with Sand Point extension (SCH)	2	2	1	1.5	1	2	1	1.66	1	2	3	2
D1	6.3	Loyal Heights – Green Lake – U District Crosstown	3	1	1	1.5	2	1	1	0.66	0	0	2	1
D1A	7.0	Loyal Heights – Green Lake – U District Crosstown (to U District via 65th)	1	0	0	1	2	0	1	0.33	0	0	1	1
D1B	10.0	Loyal Heights – Green Lake – U District Crosstown (to U District via Magnuson Park and Sound Point Way)	1	0	0	1	1	1	1	0.33	0	0	1	1
E1	3.8	U-District – Downtown (via Eastlake)	1	3	3	1.5	0	3	2	3	3	2	3	3
E1A	8.0	Lake City – U District – Downtown (via I-5)	3	2	2	1	1	1	2	2.33	2	2	3	2
E1B	5.3	SCH/Sand Point – U District – Downtown (via Eastlake)	1	3	3	1.5	0	3	2	2.33	3	2	3	2
E2	7.4	Lake City – Downtown (via I-5)	0	1	1	0.5	1	0	1	1.67	2	2	1	2
E2A	11.7	Kenmore – Lake City Downtown (via I-5)	0	1	1	0	0	0	3	1	1	2	1	2
E3	5.6	City Limits – Northgate – U District (via NE 15th Ave)	2	1	1	1	1	1	1	0.33	0	0	1	1
F1	10.4	SCC – Bitter Lake – Lake City – U District	0	1	0	1	1	1	1	0.33	1	1	1	1
F1A	11.4	SCC – Bitter Lake – Northgate – U District (via 5th Ave/Northgate Way/35th Ave)	1	0	0	1	1	1	1	1	0	1	1	1
G1	1.6	Pike/Pine – 15th Ave	2	2	2	2	2	2	1	2	2	2	2	3
G2	1.4	Madison (to MLK Jr Way)	2	2	2	3	3	3	1	2.33	1	2	3	3
G2A	2.7	Madison (to 42nd Ave)	1	1	1	1	1	1	1	1.66	0	2	3	2
G3	1.5	Seneca – Union	2	1	1	2.5	3	2	1	2	1	2	2	3
H1	2.0	Jackson Extension	3	2	2	3	3	3	2	2	2	2	2	3
H1A	3.9	Jackson Extension (to Mt. Baker Station)	3	1	1	2	2	2	2	1.67	1	2	1	2
I1	12.4	Rainier Beach – Central District – U District Crosstown	3	1	1	2	2	2	2	1.67	0	2	1	1
I1A	10.6	Rainier Beach – Central District – U District Crosstown (via Broadway)	2	1	1	2	2	2	2	1.67	1	2	1	2
I1B	10.4	Rainier Beach – Central District – U District Crosstown (via 12th / 15th)	2	1	1	2	2	2	2	2	1	2	2	2
I1C	16.7	Renton - Rainier Beach – Central District – U District Crosstown	2	1	0	2	2	2	2	0.67	0	2	0	1
I2	6.2	Rainier Beach – Downtown (via Rainier Ave)	3	0	0	3	3	3	3	1.67	1	2	1	3
J1	5.1	Othello Station - Downtown (via Beacon Ave)	2	1	1	2.5	2	3	2	0.67	0	1	0	1
K1	6.0	South Park – Georgetown - Downtown	0	0	0	0	0	0	2	0	3	0	0	0
K1A	9.9	Burien TC – South Park - Downtown	0	0	0	0	0	0	2	0	2	0	0	0
L1	5.3	Delridge – Downtown	1	0	0	1.5	2	1	2	0	0	0	0	0
L1A	9.8	Burien TC – White Center – Delridge – Downtown	2	0	0	1	2	0	2	0	0	1	0	0
M1	8.3	West Seattle – Downtown (via California and Avalon)	0	0	0	0.5	1	0	2	0.33	0	0	1	1
M1A	9.8	West Seattle – Downtown (via Fauntleroy – California - Admiral)	0	0	0	0.5	1	0	2	0.33	0	0	1	1
M1B	7.4	West Seattle – Downtown (via 35th Ave – California - Admiral)	1	0	0	1	2	0	2	0.66	0	0	2	1
N1	7.6	West Seattle – Columbia City Crosstown (Alki terminus via Admiral)	0	0	0	0.5	1	0	3	0	1	1	0	0
N1A	7.3	West Seattle – Columbia City Crosstown (WS terminus via California)	0	0	0	1	1	1	3	0.33	1	0	1	1
O1	4.6	Queen Anne - Denny Way (to 23rd Ave)	3	3	3	2.5	2	3	1	3	3	3	3	3

Notes: D is an average of D1 and D2. F is a weighting of F1 (2/3, a combined measure of F1a and F1b) and F2 (1/3). The overall average includes A, B, C, D, F, and G.

Figure B-6 Criterion A - Existing Ridership

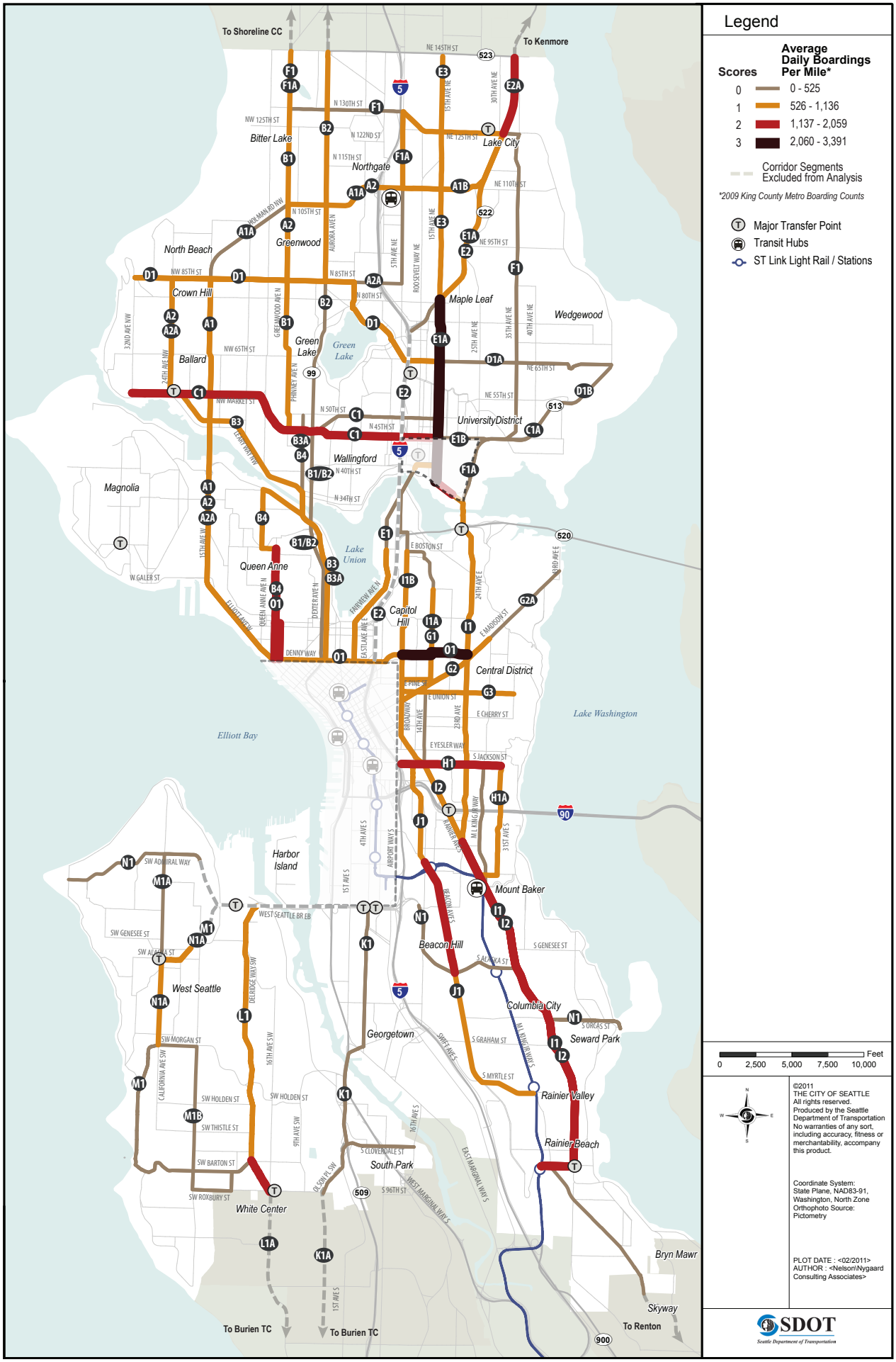


Figure B-7 Criterion B - Current Ridership Potential (2008 Land Use)

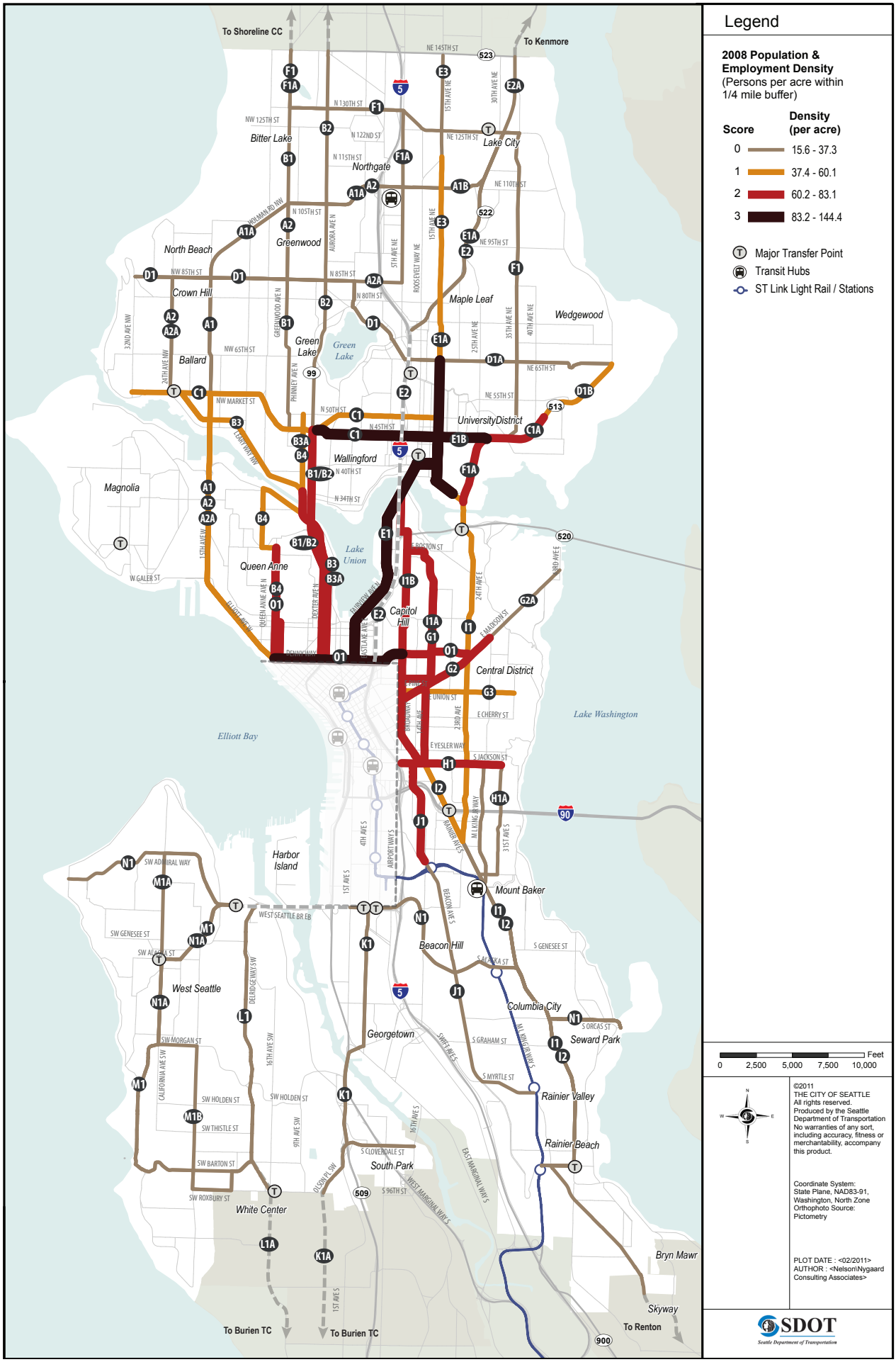


Figure B-8 Criterion C - Future Ridership Potential (2030 Land Use)

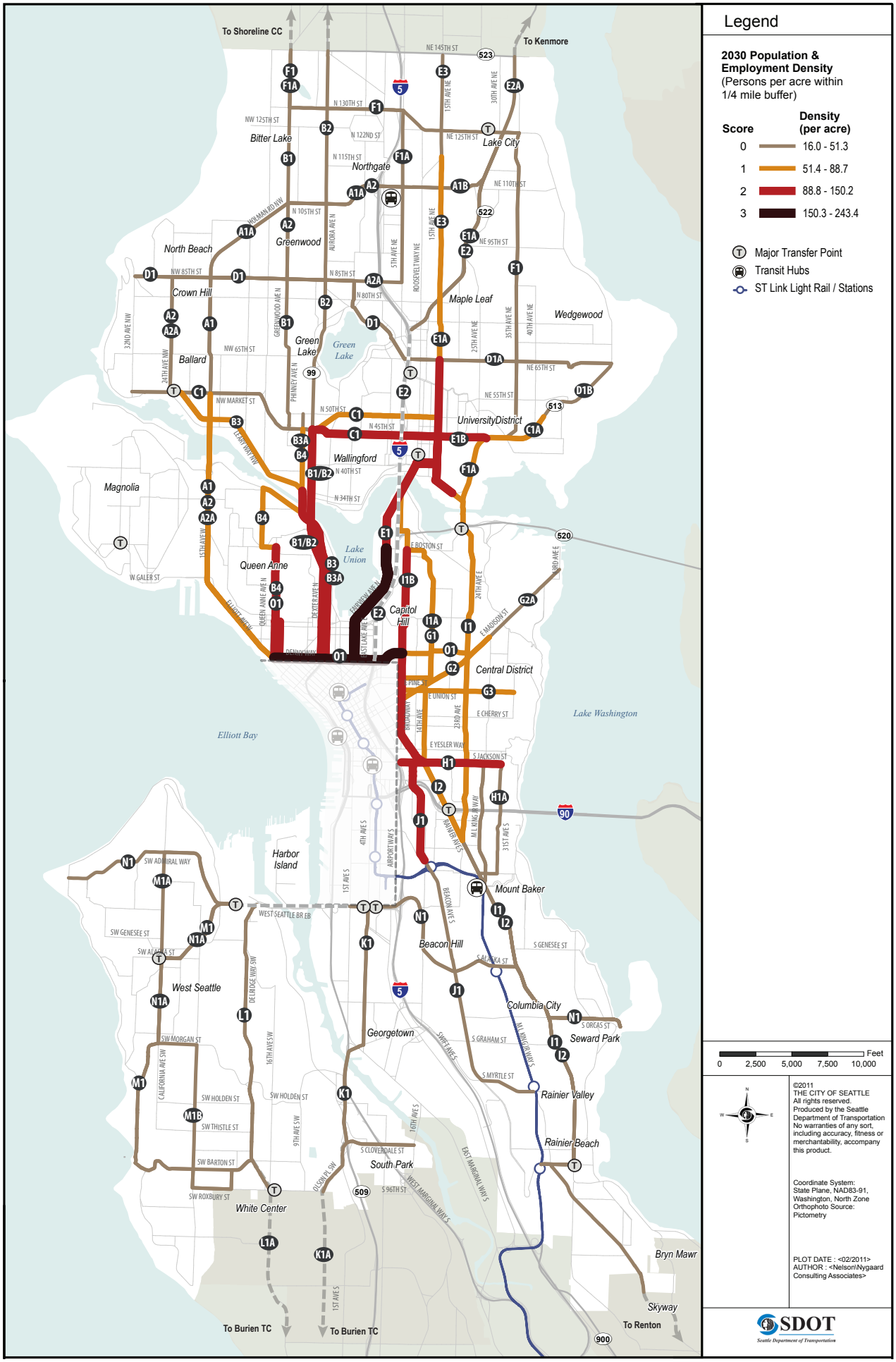


Figure B-9 Criterion D1 - Transit Reliant Index (2000)

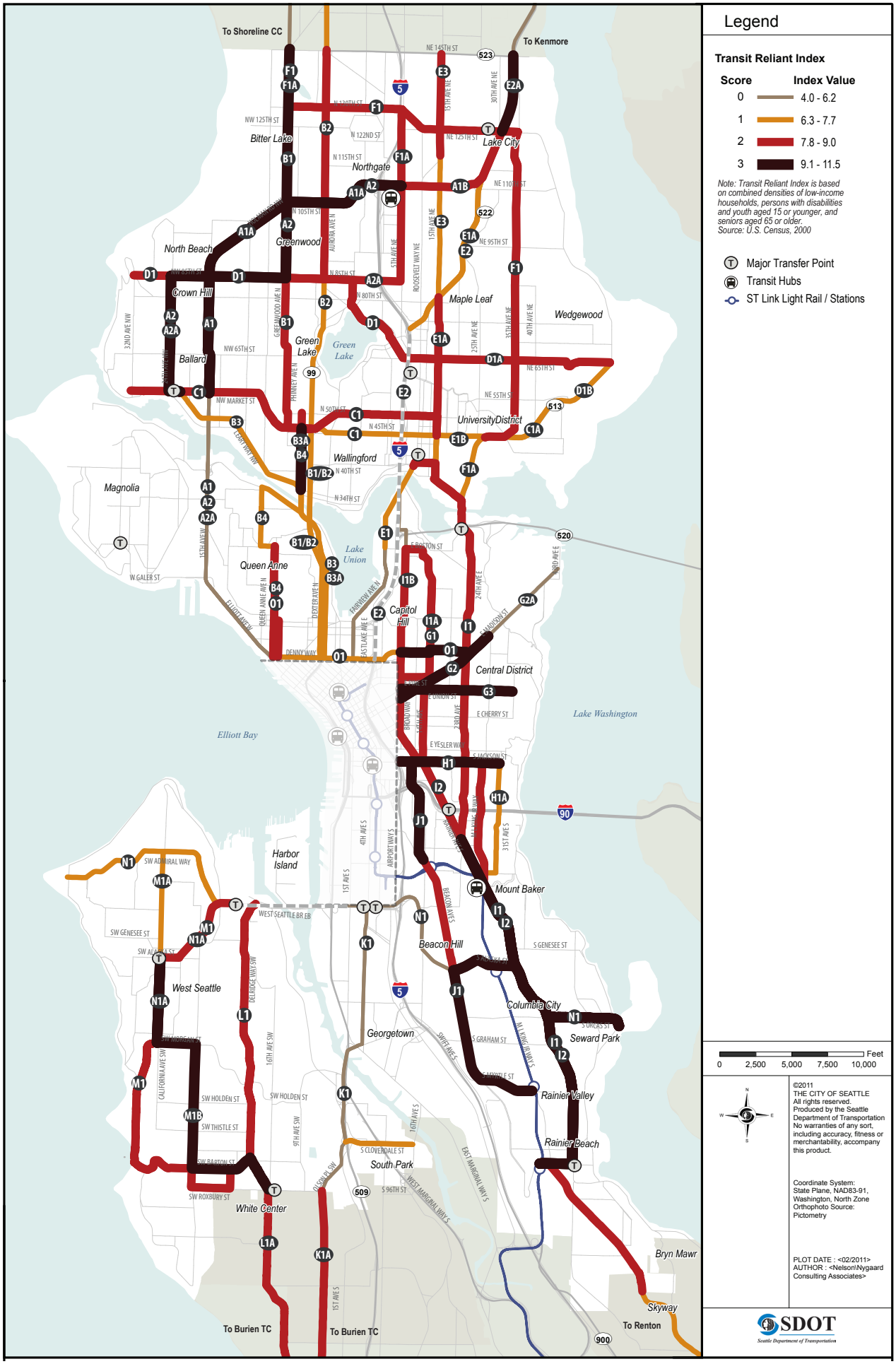
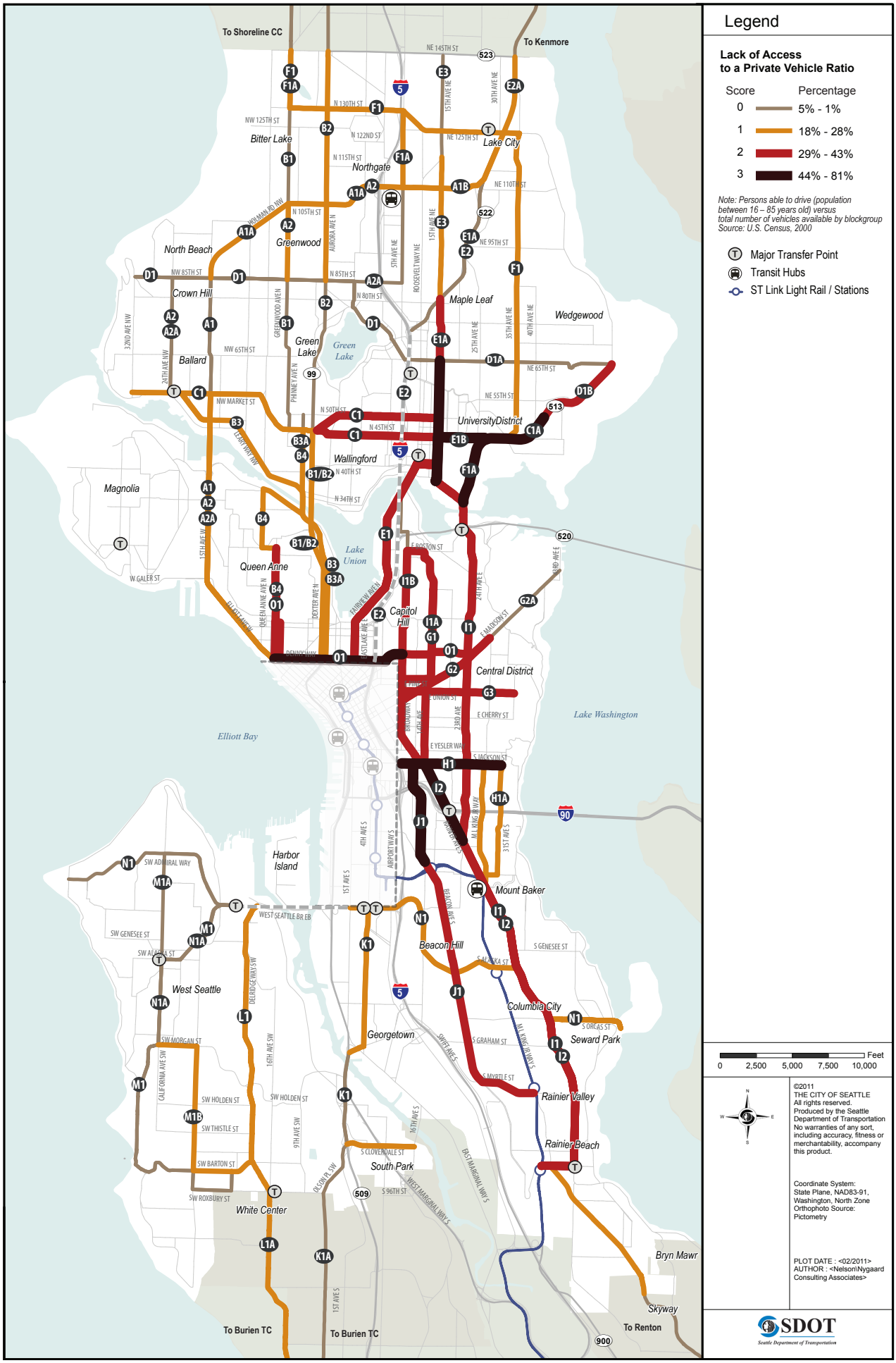


Figure B-10 Criterion D2 - Lack of Access to a Private Vehicle (2000)



Criterion E: Potential for Travel Time Savings

The only criterion not graphically represented was *Potential for Travel Time Savings*. This evaluation was qualitative and was completed based on information provided by the City regarding street classification and cross section (e.g., number of lanes and lane designations), current or funded investments in speed and reliability improvements, traffic volumes, and parallel street network capacity. Each corridor segment was given a score based on the following definitions and scores were averaged to create a corridor level score:

0 – Minimum potential for capital improvements (made in existing ROW) to increase transit travel time

1 – Minimum to moderate potential for capital improvements to increase transit travel time

2 - Moderate potential for capital improvements to increase transit travel time

3 – Significant potential for capital improvements to increase transit travel time

Figure B-11 Criterion F - Anchor/Generator Strength

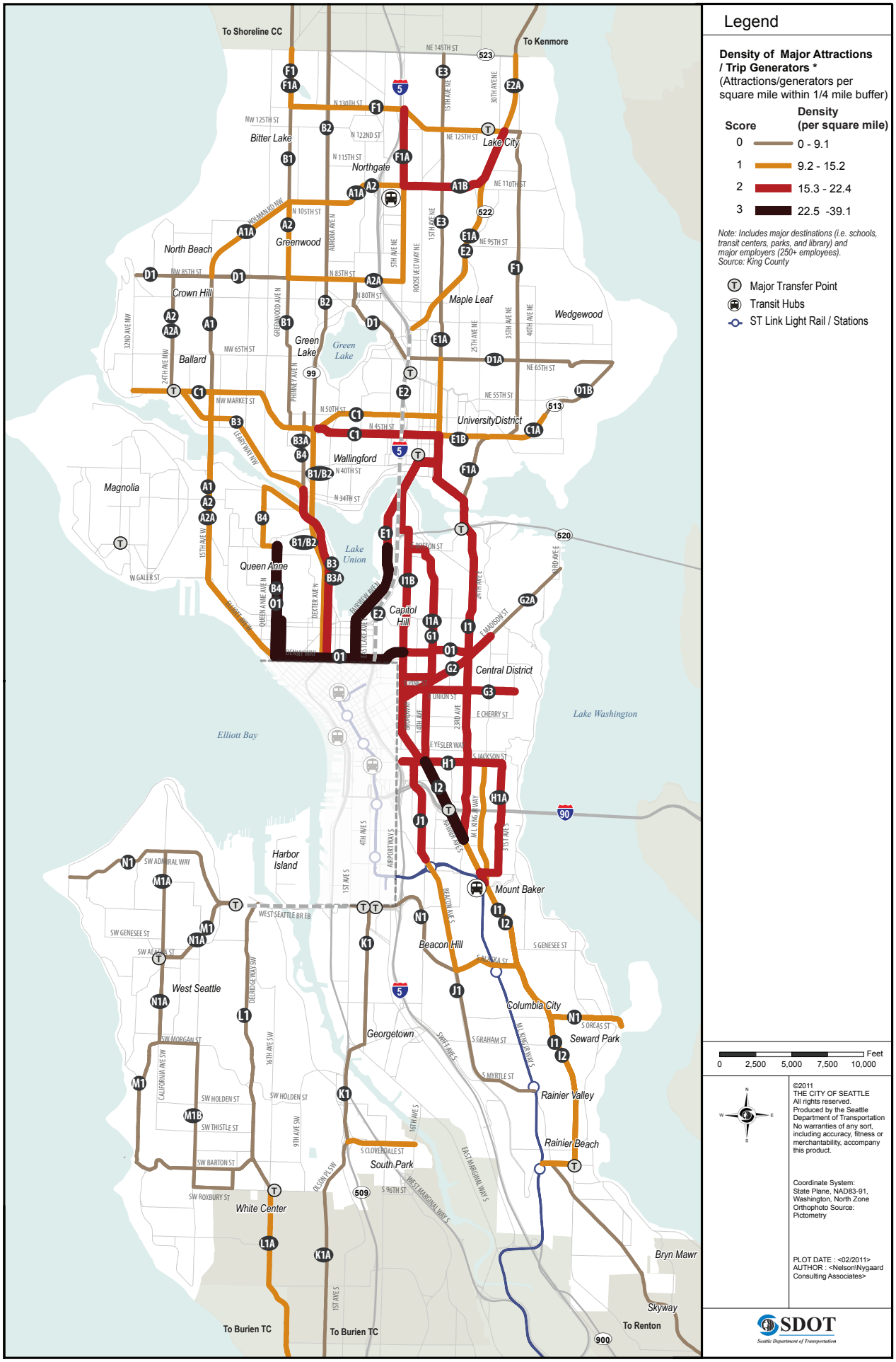


Figure B-12 Criterion F1 - Major Attractions

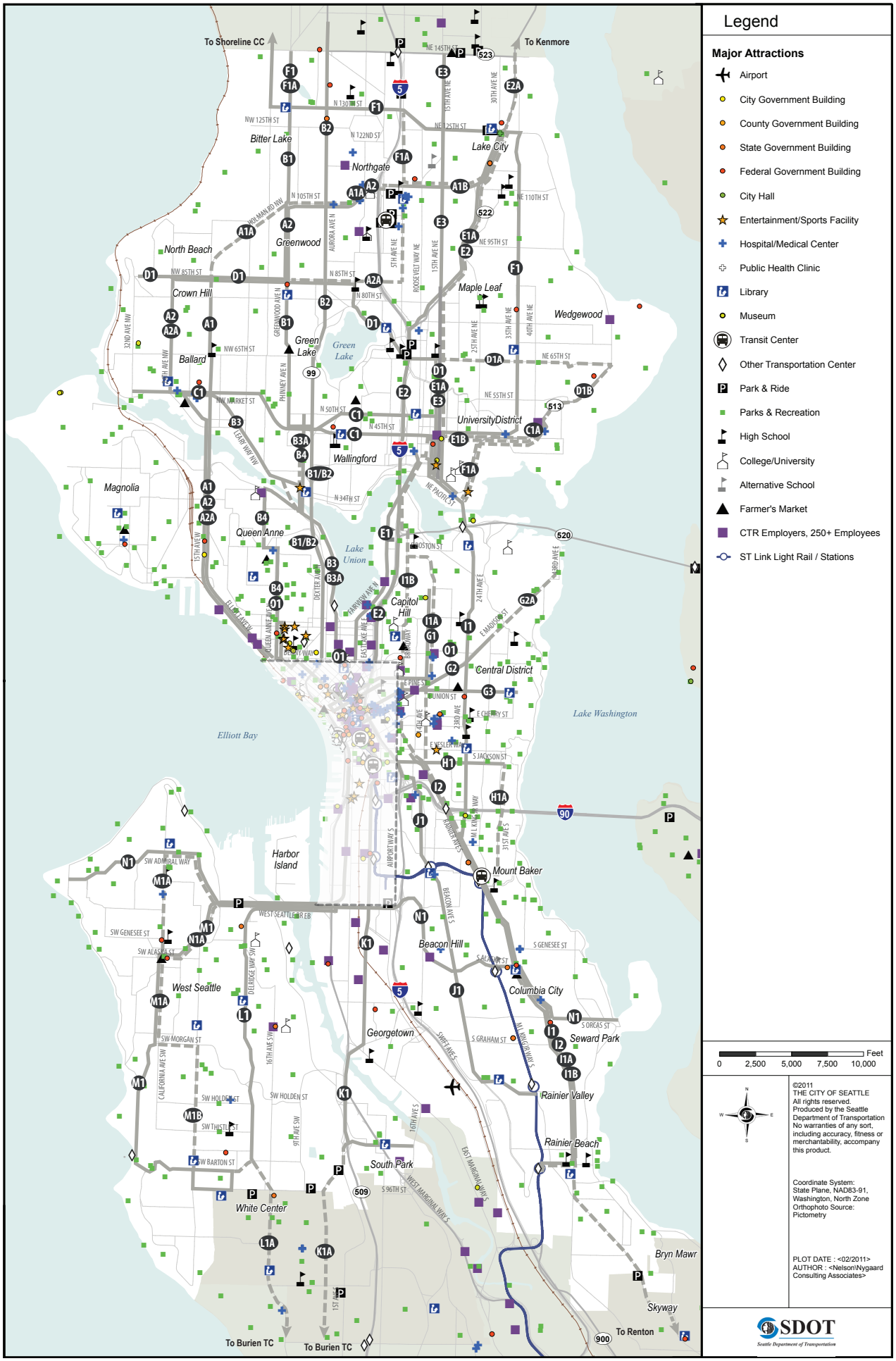
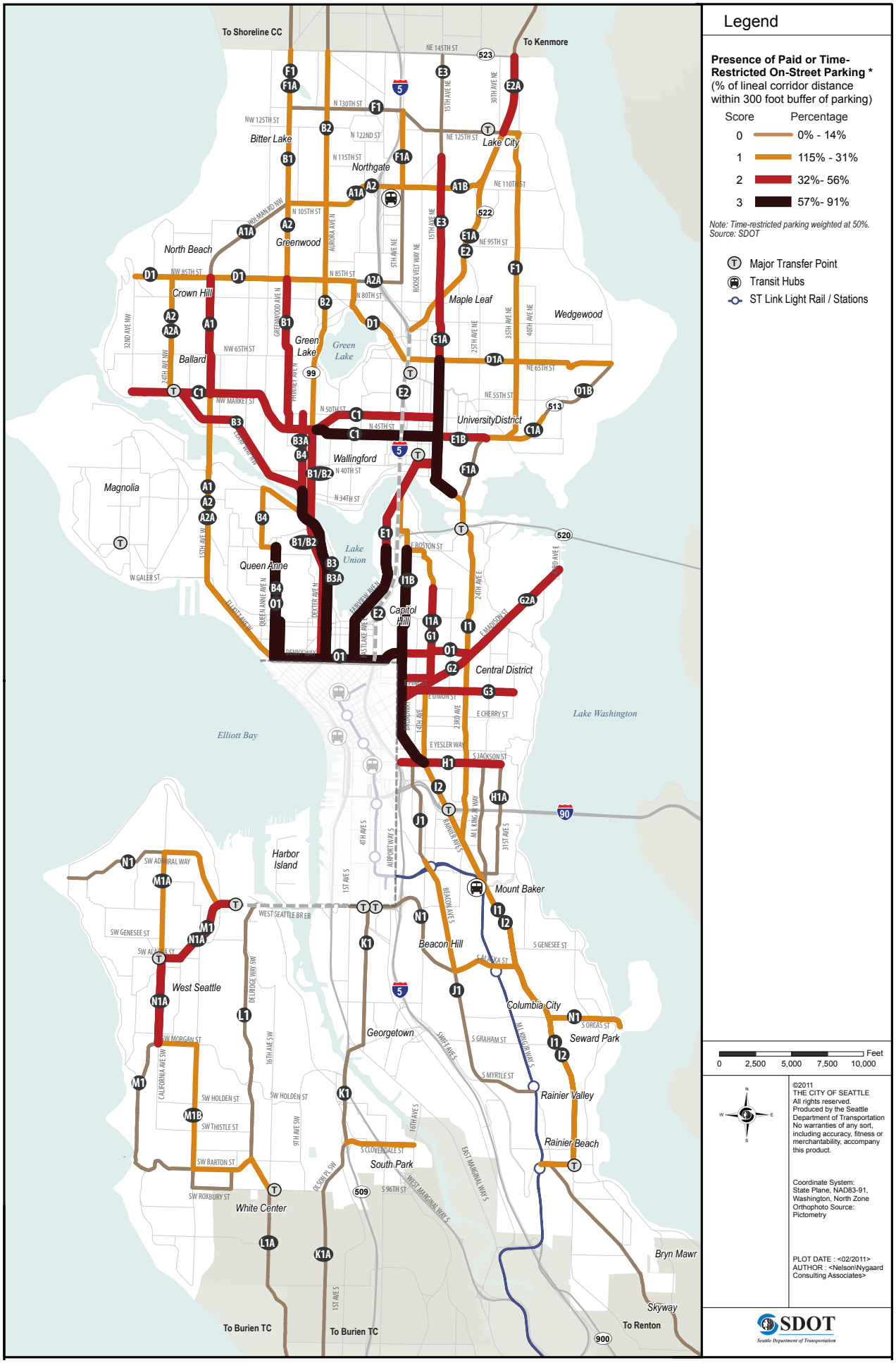


Figure B-13 Criterion F2 – Presence of Paid or Time-Restricted On-Street Parking



Legend

Presence of Paid or Time-Restricted On-Street Parking *
(% of lineal corridor distance within 300 foot buffer of parking)

Score	Percentage
0	0% - 14%
1	115% - 31%
2	32%- 56%
3	57%- 91%

Note: Time-restricted parking weighted at 50%.
Source: SDOT

- Major Transfer Point
- Transit Hubs
- ST Link Light Rail / Stations

Feet
0 2,500 5,000 7,500 10,000

Coordinate System: State Plane, NAD83-91, Washington, North Zone
Orthophoto Source: Pictometry

PLOT DATE : <02/2011>
AUTHOR : <Nelson\Nygaard Consulting Associates>

SDOT
Seattle Department of Transportation

Figure B-14 Criterion G – Commercial Centers

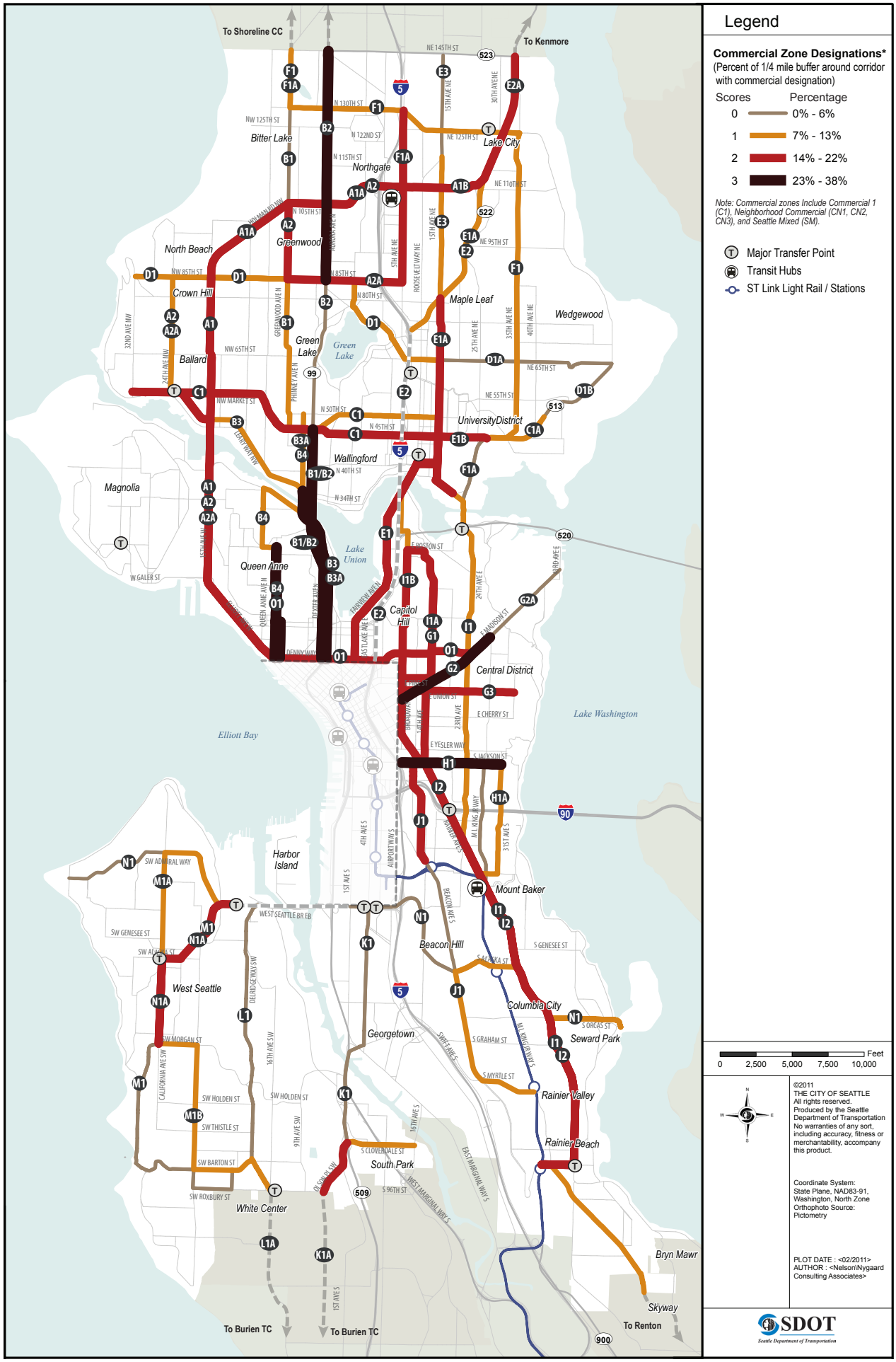
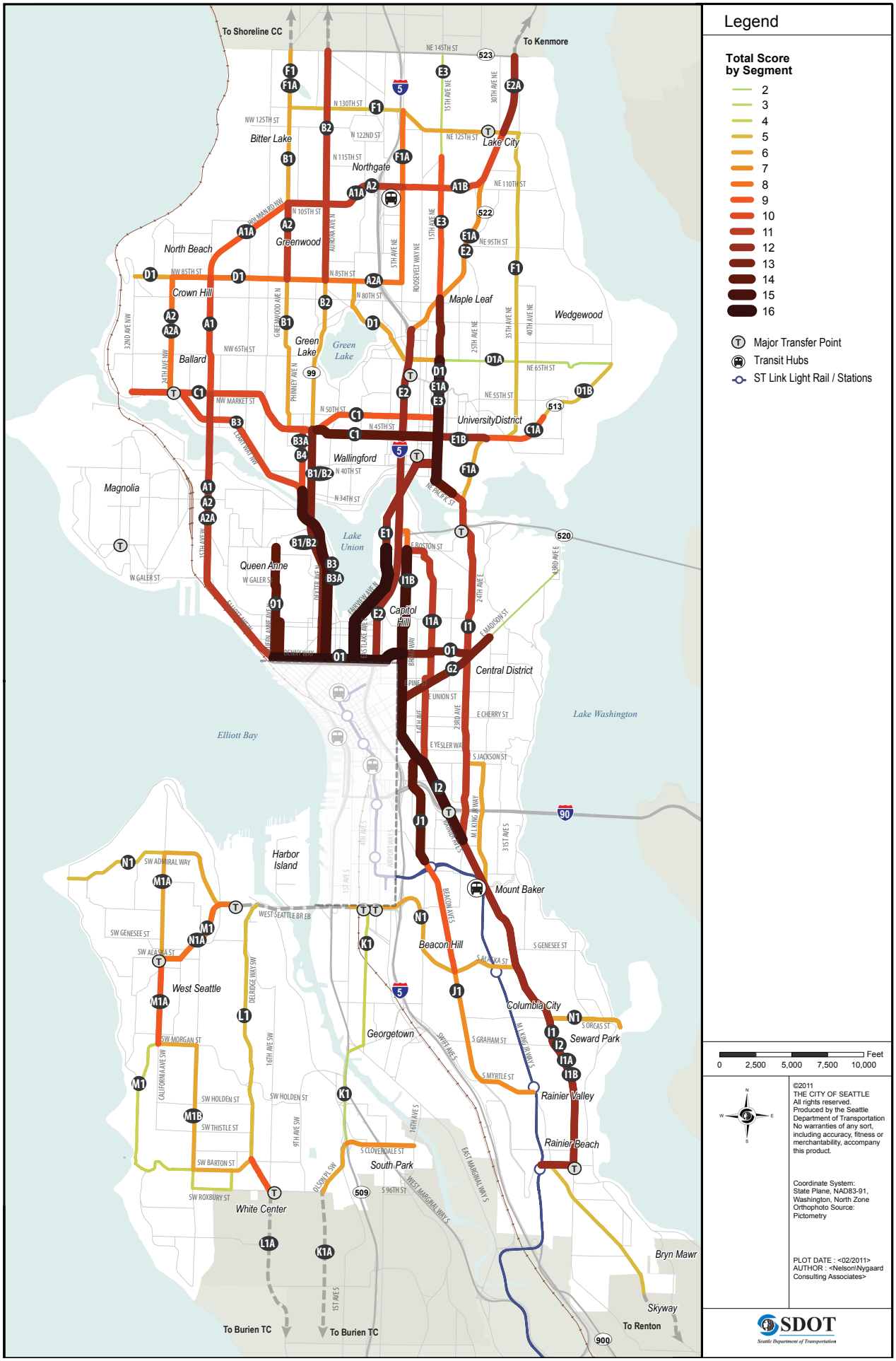


Figure B-15 Summary of Stage I Screening Criteria Scores



CORRIDORS SELECTED FOR STAGE II ANALYSIS

This section illustrates the citywide and Center City transit corridors that were selected for advancement to Stage II of the TMP corridor evaluation. As with any system planning exercise, adjustments to corridor extents and pathways were made throughout the evaluation process. The corridors proposed in the Stage I evaluation provided opportunities for a variety of operational configurations. The goal in Stage I was to identify corridor priorities for intermediate or high capacity transit investments and a second tier of bus corridors that merit investment in speed and reliability improvements. Exactly how and with what mode transit operates in these corridors (e.g. multiple overlapping bus routes, rail only, rail with local bus, etc.), was further evaluated in Stages II and III of the analysis. The corridor pathways illustrated in Figure B-16 and Figure B-17 served as a guide for evaluation and were/should not be considered as route plans.

Citywide Corridors

Figure B-16 illustrates proposed city-wide transit corridors recommended for Stage II evaluation. These corridors were developed based on data from the screening criteria illustrated above and an assessment of transit network conditions.

Center City Transit Network

As described in the TMP Summary Report (page 3-25), Seattle's Center City neighborhoods, and adjacent neighborhoods such as the Central District, Capitol Hill, and Queen Anne, have a unique set of characteristics that merit special treatment. Rather than including corridors serving the Center City in the citywide route network evaluation, a separate evaluation was conducted of the Center City transit network using Stage II and III evaluation criteria to develop recommendations such as improvements to routing, modal investments, transit speed and reliability treatments, passenger facility investments, system branding, etc., using a systems approach. This work was closely coordinated with the citywide corridors analysis, since many of those corridors enter or pass through the Center City and are critical to Center City transit circulation.

The following corridors were included in the Center City analysis:

- Jackson (KCM 14)
- Yesler (KCM 27)
- James/E. Cherry/E. Jefferson (KCM 3, 4)
- Seneca/E. Union (KCM 2)
- Pike/Pine/15th Ave (KCM 10)
- Queen Anne Ave (KCM 2, 13)
- 5th Ave/Taylor Ave/Boston (KCM 3, 4)

Two other corridors were considered as part of the Center City study, but also remained in the citywide corridor group are:

- **Madison**: This corridor provides a direct connection between the Colman Dock multimodal hub and First Hill/Capitol Hill. The City, King County and Sound Transit all have special interest in improving this important, high ridership transit connection.

- **Uptown/SLU/Capitol Hill**: This is considered as a longer corridor that runs from 23rd Ave E to Interbay and is the only cross-town routing north of downtown and south of the Ship Canal.

Figure B-17 illustrates the proposed Center City network study corridors.

Figure B-16 Corridors Proposed For Advancement to Stage II Analysis

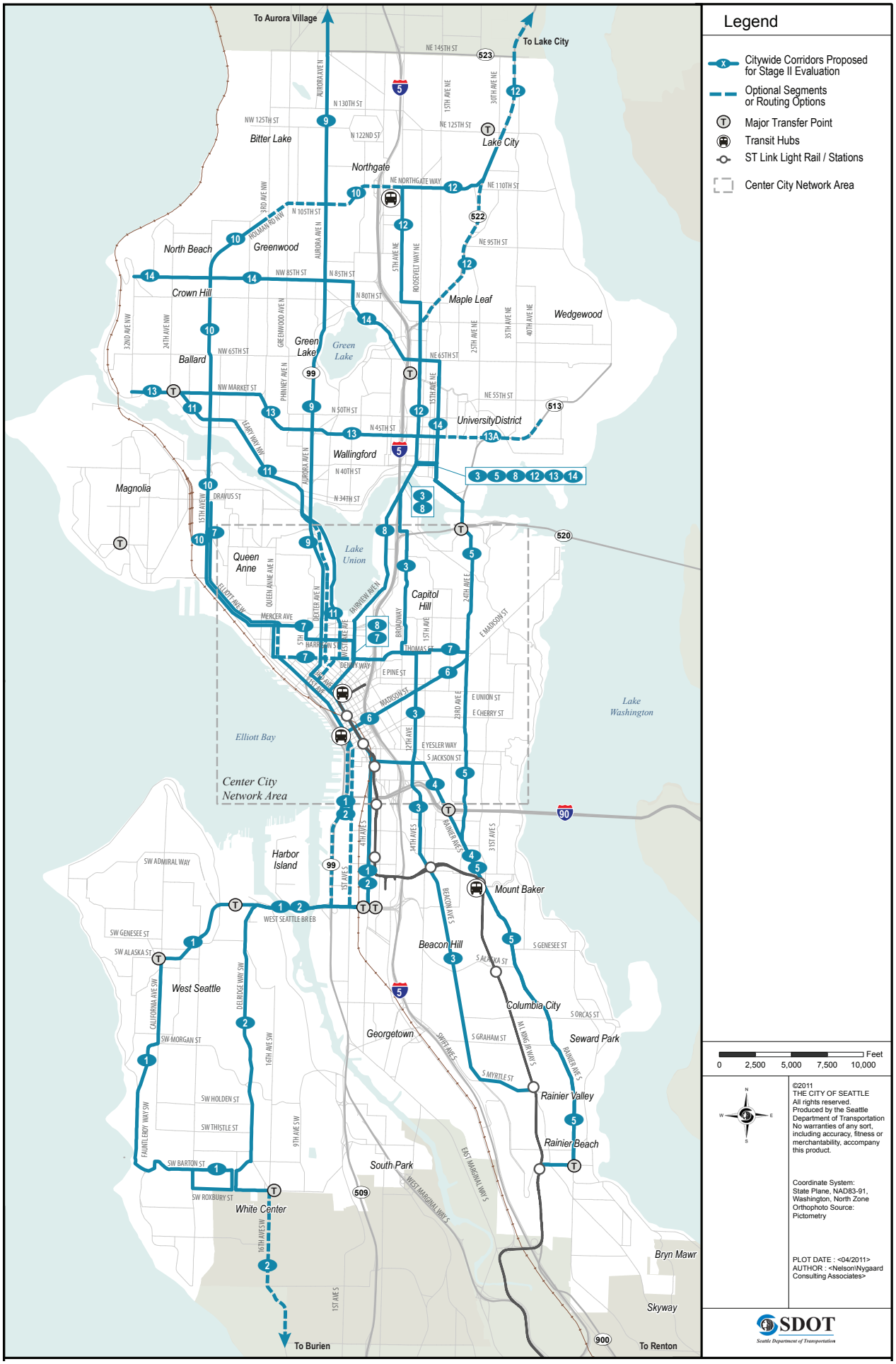
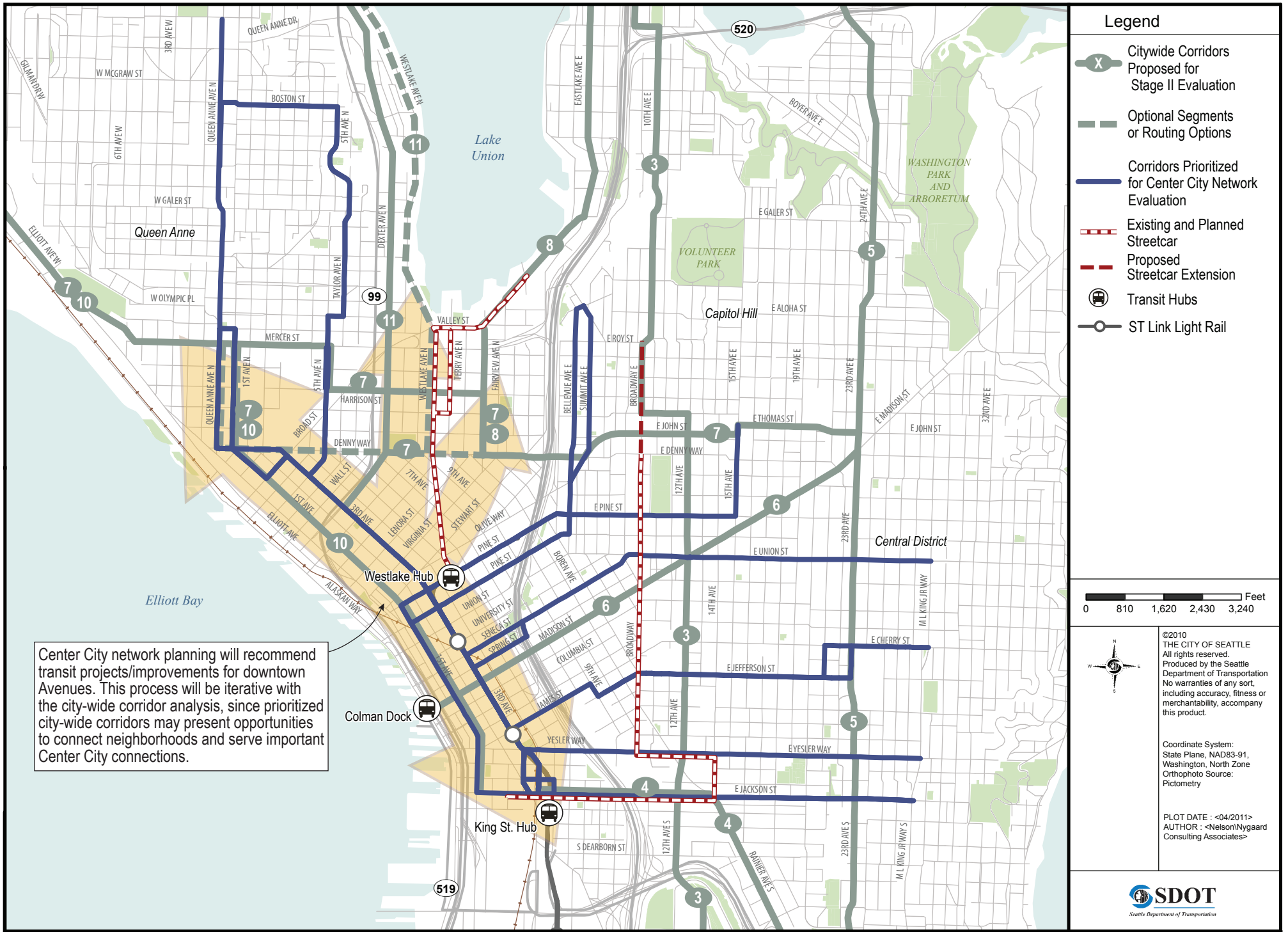


Figure B-17 Proposed Center City Network Corridors for Stage II Evaluation



STAGE II EVALUATION

Overview of Stage II and Multiple Account Evaluation Process

The intent of the Stage II analysis was to determine which of the 15 priority corridors shown in Figure B-16 should be evaluated for *high capacity transit investments* and which should be evaluated for *priority bus improvements*. A multiple account evaluation (MAE) approach was a primary tool employed in the Stage II process. Figure B-18 shows the five major evaluation accounts and 16 evaluation criteria.

Figure B-19 illustrates the role of the MAE process within the three-stage corridor evaluation process. The Stage II criteria were applied to the 15 priority corridors brought forward from the Stage I evaluation. As illustrated in the graphic:

- Raw scores were calculated for each criteria across all 15 corridors
- Based on stakeholder input, the scores were weighted and normalized
- Also based on stakeholder input, the accounts were weighted
- The results were used, along with consideration of other factors and analysis, to help determine which corridors should be analyzed for HCT or priority bus investments

While the Stage II technical evaluation summarized in this section was a major determinant of whether corridors were considered as *high capacity* or *priority bus* corridors in the Stage III analysis, other factors also came into play:

- **Ability for corridor rights-of-way to accommodate requirements of high capacity transit (e.g., right-of-way sufficient to provide dedicated transit lanes).** The Transit Master Plan focuses on investments that can be made in existing rights-of-way and, therefore, certain high demand corridors may not be viable candidates for dedicated transit lanes.
- **Relationship of the corridor travel markets to current Link light rail, planned Link light rail, or other significant transit investments.**

The chapters of the TMP Summary outline other key design principles and considerations.

The following sections describe the Stage II evaluation process and results in more detail.

Figure B-18 Stage II Corridor Evaluation Accounts and Criteria

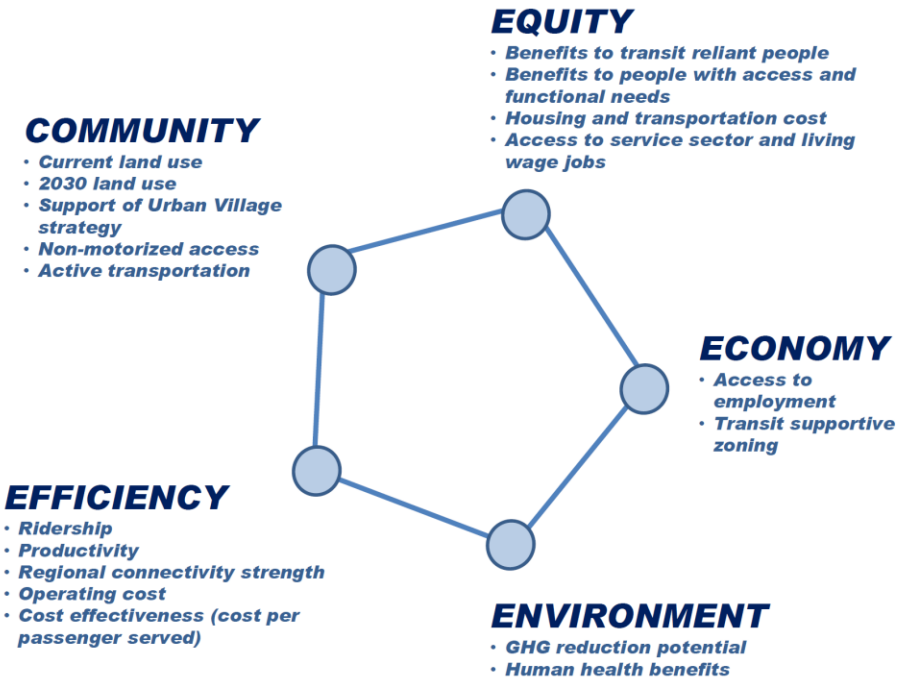
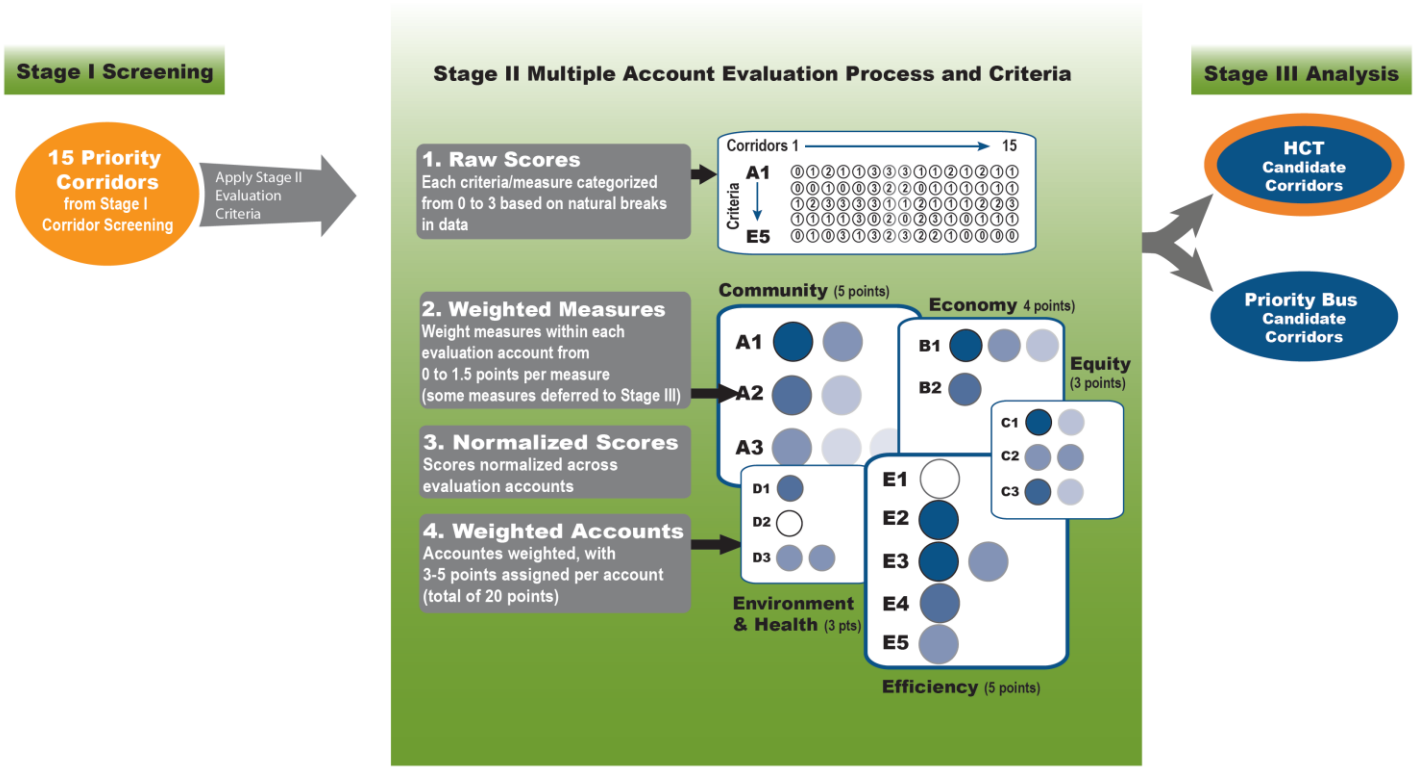


Figure B-19 MAE within Overall Corridor Evaluation Process



Detailed Stage II Evaluation Accounts and Criteria

Corridor performance was analyzed for each evaluation account. The accounts, evaluation criteria and specific measures and methods used in the Stage II analysis are identified in Figure B-20. The analysis was reviewed with technical partners and advisory groups, including the Interagency Technical Advisory Team (ITAT), the Transit Master Plan Advisory Group (TMPAG), and the Executive Steering Committee (ESC). Feedback from these groups helped to refine the evaluation methods and assign a weight to individual evaluation criterion in each evaluation account. Figure B-20 also documents the final weights assigned to Stage II criteria.

Figure B-20 TMP Evaluation Criteria, Methods, and Weights

COMMUNITY				
	Criteria	**Measure**	**Methods**	**Weight**
A1	Promotes compact, walkable, neighborhood development	Persons with walking access to corridor	2008 population density (per acre), calculated using a 1/4 mile walking distance buffer of the corridor	1.5
			2030 population density (per acre), calculated using a straight-line (not walk distance) buffer of the corridor	0.5
A2	Supports Urban Village Strategy	Provides Urban Village Growth Strategy priority connection	Weighted number of connections between Urban Villages and King County Activity Centers served by corridor, normalized by corridor length (per mile)	1
			Weighted number of Transit Community connections served by corridor, normalized by corridor length (per mile)	0.25
A3	Non-motorized access and active transportation	Likelihood to increase walking and biking	Potential pedestrian demand score (normalized) from Pedestrian Master Plan (PMP), assigned to points along the corridor and calculated as an average for the corridor	0.5
			Number of bike facility intersections—existing and planned "short-term" future facilities—along corridor, normalized by corridor length (per mile)	0.175
			Presence of bicycle facilities—total length of existing and planned "short-term" future facilities—calculated as density within a 1/4 mile straight-line buffer of corridor	0.075
			COMMUNITY ACCOUNT TOTAL	**4.0**

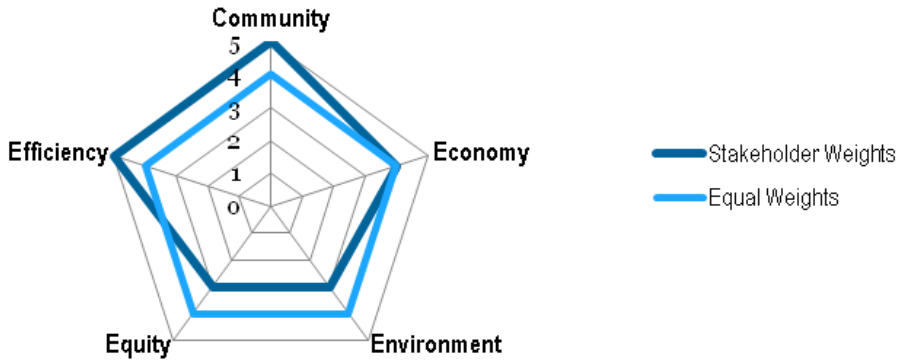
ECONOMY				
	Criteria	**Measure**	**Methods**	**Weight**
B1	Access to employment	Provides access to areas of high job density (current and future)	2008 employment density within 1/4-mile walking distance buffer of corridor	1.5
			2030 employment density within 1/4-mile straight-line buffer of corridor	0.5
		Commute Trip Reduction (CTR) affected employees	Number of CTR-affected employees within 1/4-mile straight-line buffer of corridor, normalized by lineal corridor mile	0.25
B2	Transit supportive zoning	Measures potential for transit to support commercial growth and access to small businesses and pedestrian-oriented commercial form	Percentage of weighted areas that overlap with commercial zoning (C1, C2, NC1, NC2, NC3) and pedestrian areas, within 1/4-mile straight-line buffer of corridor	1
			ECONOMY ACCOUNT TOTAL	**3.25**
EQUITY				
	Criteria	Measure	Methods	Weight
C1	Benefits to transit reliant people and people with access and functional needs	Provides service to populations reliant on transit or with access and functional needs	Transit Reliant Index based on the number of low income persons, youth (10-15), seniors 65+, persons with disabilities, and minorities within 1/4-mile walking buffer	1.5
			Metro Access (paratransit) boardings at the top 100 locations within 1/4-mile walking distance of corridor	0.25
C2	Corridor housing and transportation cost	Combined housing and transportation costs in corridor	Housing Costs:Number of households paying 40% or more of household income for housing costs (owner or rental costs), normalized by corridor area	0.5
			Transportation Costs: Average transportation cost for residents within 1/4-mile of corridor	0.5
C3	Access to service sector and living wage jobs	Provides access to areas with high concentrations of service sector and living wage jobs	Number of service sector jobs paying less than or equal to $1,250 within 1/4-mile walking buffer of corridor	0.75
			Number of service sector jobs paying $1,251 to $3,333 within 1/4-mile walking buffer of corridor	0.25
			EQUITY ACCOUNT TOTAL	**3.75**

ENVIRONMENT				
	Criteria	**Measure**	**Methods**	**Weight**
D1	GhG reduction potential	Reduction in vehicle miles traveled and related greenhouse gas equivalent (GhGe) emissions	Analyzes potential for GhG equivalent (GhGe) emissions reduction based on approach developed by American Public Transit Association to assess transit impacts on GhGe reductions (also assumed to proxy for particulate emissions generated by light duty vehicle operations)	1
D2	Vehicle lifecycle emissions	Measured at Modal Evaluation Stage (Stage III)	Requires corridor design information not available at this phase	*NA*
D3	Human health	Human health indicators	Obesity (2007), lineal corridor distance within Health Planning Zones where obesity rate >= 15% (Healthy People 2010 objective); obesity defined as BMI >= 30	0.5
			Physical activity (2007), lineal corridor distance within Health Planning Zones where 20% or more of the population did not participate in any leisure-time physical activity during the previous month (Healthy People 2010 objective)	0.5
			ENVIRONMENT ACCOUNT TOTAL	**2.0**

EFFICIENCY				
	Criterion	**Measure**	**Methods**	**Weight**
E1	Constructability	Measured at Modal Evaluation Stage (Stage III)	Requires corridor design information not available at this phase	*NA*
E2	Efficiency/ ridership	Boardings per corridor mile	Total daily corridor boardings normalized by corridor mile	1.5
E3	Productivity	Productivity	Boarding rides per revenue hour	1.5
		Regional connectivity strength	Transit demand between markets outside Seattle based on Phase I origin – destination analysis (size of transit origin – destination pairs served by route or one transfer at major hub)	0.5
E4	Operating cost	Operating cost per ride	Operating cost per boarding ride	1
E5	Cost effectiveness	Cost per new ride	Estimated additional operating cost per net new boarding ride (net new riders / net change in operating cost)	0.5
			EFFICIENCY ACCOUNT TOTAL	**5.0**

The ITAT, TMPAG, and ESC were also consulted to determine how individual evaluation accounts should be weighted in determining corridor priority. The direction received from these groups was to provide slightly higher weight to the Community and Efficiency accounts. This direction aligned with a major theme that emerged from ITAT and TMPAG meetings: committee members felt that criteria related to transit supportiveness of current land use, ridership potential (based on current levels of ridership), and cost effectiveness were the most important factors in prioritizing transit corridor investments. The final account weighting is represented in Figure B-21.

Figure B-21 TMP Evaluation Account Weights (Based on Total Score of 20)



Weighting Techniques Sampled

To evaluate the significance of applying weights, Nelson\Nygaard tested several weighting techniques. Figure B-22 summarizes each technique.

Figure B-22 Weighting Methods Tested

Method #1	Method #2	Method #3	Method #4
Natural Weights of All Criteria	**Normalized Accounts, No Account Weights Applied**	**Natural Criteria in Each Account, Account Weights Applied**	**Normalized Accounts, Account Weights Applied**
▪ This method totaled the score for all criteria based on the assigned weight for each criterion ▪ Total scores for each account were not normalized ▪ No weight was applied to evaluation accounts	▪ This method normalized the total score for each account (i.e., an account with a lesser total score was increased proportionately to equal the highest total account score, while the ratio of criteria weight within each account is maintained) ▪ No weight was applied to evaluation accounts	▪ This method used the natural (unadjusted) total score for each account ▪ Account weights applied	▪ This method normalized the total score for each account ▪ Account weights applied

Evaluation method #4 (Normalized Accounts, Account Weights Applied) was used in the analysis. This method was selected because it most directly represented the feedback provided by the ITAT, TMPAG, and ESC.

Overall, there were relatively minor differences between the results of each method. The most significant variation in corridor ranking between methods was a difference of one rank for a single corridor (e.g., a corridor was ranked 10 in one method and 9 in another). The two methods in which account weights were applied (methods #3 and #4) produced very similar results.

Ultimately, it was determined that—when considered with the viability of the corridor to support high capacity transit (e.g., grade, ROW constraints, etc.) and potential overlap with Sound Transit light rail investments—the varying approaches to assigning weights did not affect the outcomes of the analysis (e.g., corridors that would be evaluated for high capacity transit vs. priority bus in the Stage III evaluation).

Stage II Results

Each corridor was scored and weighted using the evaluation criteria, methods, and weights listed in Figure B-20 (above). The Stage II analysis results are presented in Figure B-23. Each corridor's rank from the Stage II analysis is provided along with a recommendation as to how each corridor would be evaluated in the Stage III analysis. This more detailed evaluation of corridors proceeded as follows:

- **HCT corridors** were analyzed for mode (rail, bus rapid transit, or enhanced bus service). Three citywide corridors (6, 8, and 11) were analyzed for high capacity transit (HCT). Two "Center City Connector" corridors (CC1 and CC2) were included with the HCT corridors in the modal evaluation. The Stage III modal analysis is described in the next section.
- **Priority bus corridors** were determined at the conclusion of Stage II and moved into a project definition stage. These corridors were analyzed for speed and reliability improvements based on a more detailed intersection-by-intersection review of each corridor conducted in conjunction with staff from the SDOT transit section. Corridor-level maps illustrating conceptual improvements for citywide priority bus corridors were developed and are provided on pages 3-18 to 3-23 of the TMP Summary Report. Analysis results for Priority Bus Corridors are included in Figure 3-13 of the Summary Report. Center City priority bus corridors and network enhancements are described, along with the Center City Connector corridors, on pages 3-25 to 3-30 of the Summary Report.

Figure B-23 Stage II Corridor Ranking

Evaluate For:			Corridor	Rank In Evaluation	Notes
Rail	Rapid Bus/BRT	Frequent Bus			
		✔	Corridor 7: Lower Queen Anne – South Lake Union – Capitol Hill (via Denny)	1	▪ Short distances between demand centers suggest frequency paramount to speed. ▪ Steep grades and constrained right of way. ▪ Very limited right-of-way opportunity forces mixed traffic operations. ▪ **STAGE III: Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Evaluate 7 and 7A alignments.**
✔	✔	✔	Corridor 8: U-District – Eastlake – Downtown	2	▪ Consider short extension to Eastlake. ▪ Consider long-term extension to Roosevelt Station. ▪ Long-term connection option to Seattle Center and Lower Queen Anne. Link will serve U-District to downtown effectively, but not U-District to the northern Center City neighborhoods where there is strong travel demand. ▪ **STAGE III: Evaluate for high capacity modes. Evaluate alternative operating segments. Evaluate market duplication with Link.**
	✔	✔	Corridor 6: Colman Dock/Downtown – First Hill – Madison (via East Madison)	3	▪ Short distances between demand centers suggest frequency paramount to speed. ▪ Steep grades and constrained right of way. ▪ **STAGE III ACTION: Evaluate as high capacity bus mode. Evaluate east end route/connection options.**
✔	✔	✔	Corridor 10: Northgate – Crown Hill – Ballard – Downtown (via Interbay)	4	▪ Ranks higher with connection to Northgate. ▪ **STAGE III: Evaluate for high capacity modes. Evaluate alternative operating segments. Compare with Corridor 11.**
	✔	✔	Corridor 9: Aurora Village – Downtown	5	▪ Good candidate for long-term future HCT (beyond 20 year horizon). ▪ High traffic volumes, regional significance for traffic, and State Highway designation are short- to mid-term constraints. ▪ **STAGE III: Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Candidate for future *rapid* service.**

Evaluate For:			Corridor	Rank In Evaluation	Notes
Rail	Rapid Bus/BRT	Frequent Bus			
	✔	✔	Corridor 5: Rainier Valley – U-District (via Rainier and 23rd Ave)	6	▪ Significant portion of corridor parallels Central Link light rail. ▪ **STAGE III**: **Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Candidate for future *rapid* service.**
✔	✔	✔	Corridor 11: Ballard – Fremont – Downtown (via Westlake or Dexter)	7	▪ Consider extension to Loyal Heights via 24th Avenue NE. ▪ **STAGE III**: **Evaluate for high capacity modes. Evaluate alternative operating segments. Compare with Corridor 10.**
		✔	Corridor 3: Othello – Capitol Hill – U-District (via Beacon and 12th Avenue East/Broadway)	8	▪ New north-south cross-town connection created by linking two high productivity trolley bus routes. ▪ **STAGE III**: **Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects.**
	✔	✔	Corridor 13: Ballard – U-District – Laurelhurst	9	▪ Scores higher with Laurelhurst extension. ▪ Direct routing between Fremont and Laurelhurst more viable once Link opens to U District station. ▪ **STAGE III**: **Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Candidate for future *rapid* service.**
	✔	✔	Corridor 4: Mount Baker – Downtown (via Rainier)	10	▪ Possible long-term future HCT (land use opportunity). ▪ **STAGE III**: **Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Focus potential land use opportunities to support future HCT.**
		✔	Corridor 15: Phinney Ridge – Greenwood – Broadview	11	▪ Frequent bus corridor. ▪ **STAGE III**: **Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects.**

Evaluate For:			Corridor	Rank In Evaluation	Notes
Rail	Rapid Bus/BRT	Frequent Bus			
		✔	Corridor 14: Crown Hill – Greenlake – U-District	12	▪ Frequent bus corridor. ▪ Important cross-town connections. ▪ **STAGE III: Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Evaluate Link connections.**
		✔	Corridor 12: Lake City – U-District	13	▪ Optional alignments score similarly. ▪ **STAGE III: Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Evaluate Link connections. Evaluate potential for rapid service in the SR 522 corridor.**
		✔	Corridor 2: White Center – Delridge – Downtown	14	▪ Rapid bus corridor. ▪ Important regional connections. ▪ **STAGE III: Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Candidate for future *rapid* service.**
		✔	Corridor 1: White Center – West Seattle – Downtown	15	▪ Rapid bus corridor. ▪ Long-term HCT potential. ▪ 35th Ave SW Corridor scores higher than Fauntleroy south of Morgan Junction. ▪ **STAGE III: Evaluate opportunity for speed, reliability, amenity, and facility enhancement projects. Candidate for future *rapid* or HCT service.**

STAGE III ANALYSIS (MODAL EVALUATION)

The Stage III analysis conducted an evaluation of mode options for high-capacity transit (HCT) corridors. This included three citywide corridors (6, 8, and 11) and two Center City Connector corridors. HCT corridors were analyzed for mode (rail, bus rapid transit, or enhanced bus service), feasibility, and cost.

The Stage III evaluation used the same set of evaluation accounts, criteria, and measures used in the Stage II evaluation (Figure B-20). However, in Stage III, conceptual operating plans and ridership estimates were developed for each HCT corridor and mode, allowing comparison of several criteria/measures across modes.

Figure B-24 describes the evaluation measures calculated in the Stage III corridor evaluation, including the purpose or intent of the measure and a brief summary of the methods used in the analysis.

Project sheets for the three HCT corridors that were evaluated are provided in Figures 3-7, 3-8, and 3-9 of the TMP Summary Report. Figure 3-10 illustrates the HCT corridor analysis results.

Project details and analysis results for the two Center City Connector corridors that were included with the HCT corridors in the full modal evaluation are provided in Figures 3-16 and 3-17 of the TMP Summary Report.

Figure B-24 Stage III Corridor Evaluation Measures

Metric	Purpose/Intent	Methodology
Weekday riders (2030)	• Ridership potential in 2030 based on service improvements and projected land use changes.	• Corridor 6, 8 and 11 ridership was estimated based on existing stop-level corridor ridership (2009), which was adjusted to account for projected 2030 land use changes (including planned upzone proposals not reflected in 2030 forecasts), increased mode share due to change in density, change in headway and travel time, unmet travel demand, and pedestrian access investments. • In Stage III, travel time sensitivity and mode factors were added to Stage II ridership analysis factors. • A peer-based method was used to estimate ridership potential for Center City corridors (CC1 and CC2). Productivity and ridership (per mile) on comparable urban rail circulators was adjusted (up or down) based on land use density, major generators, level of tourist visitation, system connectivity, and design speed/ priority. Portland, Seattle (SLU Streetcar), Tacoma, Memphis and San Francisco were used as relevant peers. It was assumed that BRT would attract 75% of the level of center city circulation ridership attracted by a rail circulator and that enhanced bus service would attract 50% (based on research into rail replacements of bus service). • For Corridors 8 and 11, the potential for increased Center City circulation ridership (vs. current services) was assessed by mode and alignment, based on the peer method described in the previous bullet. • For Corridor 6, Washington State Ferry passenger data for walk-on passengers' origin and destination and current mode of travel were reviewed to identify potential for a BRT service to shift mode of travel between Colman Dock and points along the corridor.
Net new weekday riders (2030)	• Potential for ridership growth over time and due to service improvements.	• Net new weekday riders = 2030 estimate of potential ridership (see above) - current (2009) ridership. • This accounts for growth due to land use changes and improved quality, capacity, and level of corridor transit service.
Productivity (weekday riders per revenue hour)	• Efficiency with which provided transit capacity is utilized.	• Productivity = weekday ridership / weekday revenue hours. • Weekday ridership estimated based on methods described above. • Weekday hours of revenue service calculated through development of corridor specific operating plan. • A "revenue hour" includes time when a transit vehicle is available to carry passengers. It includes layover time, but excludes "deadhead" time such as when a bus travels to the start of a route.

<table>
<tr><th>Metric</th><th>Purpose/Intent</th><th>Methodology</th></tr>
<tr><td>Operating cost per boarding ride</td><td>• Cost to deliver a single boarding ride on this proposed line.

NOTE: current Seattle electric trolley bus cost per boarding ride averages ~ $2.80.</td><td>• Operating cost per boarding ride = weekday operating cost / weekday boardings.
• Weekday hours of revenue service were calculated through development of corridor specific operating plans.
• Weekday operating cost was based on the cost per hour of service for specific modes (King County Metro 2011 estimates):
<table><tr><td>Cost Per Hour Bus</td><td>$135</td></tr><tr><td>Cost Per Hour Electric Trolley</td><td>$129</td></tr><tr><td>Cost Per Hour Rapid Streetcar</td><td>$187</td></tr></table></td></tr>
<tr><td>Net Operating Cost per Boarding Ride</td><td>• Operating cost to deliver a boarding ride considering potential cost savings from route restructuring.</td><td>• Net operating cost per boarding ride = planned weekday operating cost - weekday operating cost savings (identified below), divided by the number of boarding rides projected for 2030
• Proposed restructuring is described in the HCT and Center City Connector corridor sheets (Chapter 3 of TMP Summary Report). This analysis is conceptual; actual reinvestment of savings from restructuring would be based on the Metro Transit Strategic Plan for Public Transportation.</td></tr>
</table>

Metric	Purpose/Intent	Methodology
Total capital cost	• Cost to construct the project including planning and engineering, vehicles, complementary infrastructure/ roadway improvements, and contingency costs.	• The total capital cost for rail and BRT was based on cross sectional designs developed for each ROW segment in the corridor for relevant modes and a costing methodology developed by URS for rail and BRT projects. Total capital cost for enhanced bus was based on a corridor survey for opportunities to implement transit priority measures (e.g., TSP, bus bulbs, queue jumps, etc.). • The cost estimate was developed based on capital cost elements (including stations and vehicles), planning and engineering, and contracting fees and contingency. All corridor estimates included an allowance to expand or build a vehicle maintenance facility. Right-of-way acquisition was not included • Rail mode would use a 'rapid streetcar' potentially larger than the South Lake Union or First Hill streetcar vehicles but similar in operation to LRT. BRT mode would use electric trolley buses. Enhanced bus assumes new vehicle fleet. • Major capital project elements given special consideration (e.g., bridges). University and Fremont bridges would be used in their existing configuration, subject to a retrofit for rail. All intersections with new rail construction subject to modifications to improve drainage and vertical profile. Some portion of rail alignments would share right of way with auto lanes. • Stations sited for rapid transit network (usually ¼ to 1 mile), not like local bus stops. 1st Avenue (Corridor CC1) stations more frequent to reflect waterfront circulation function • In the case of Priority Bus Corridors, conceptual priority improvements were identified for each corridor. Costs were estimated based on similar, recent improvements.
Capital cost per mile	• Total capital cost divided by the length of the corridor.	• Capital cost per mile = total corridor capital cost by mode (as per above) divided by corridor length.
Travel time savings (end to end)	• In vehicle travel time savings (compared to current service) for a passenger riding between two terminus stations.	• Travel time savings (end to end) = projected 2030 corridor travel time with current road design - estimated travel times under each mode, alignment and design. • Assumes most aggressive outcomes are achieved within a range of transit priority treatment and TSP optimization. • Off board payment is assumed for all BRT and rail options reducing station delay to 20 seconds. • Where transit operates in mixed traffic a 10% penalty is applied to the non-intersection corridor segments. • Signal penalties applied range from 0.25 minutes where aggressive TSP is provided to 0.50 where signal priority is more limited. • Data is reported for peak period.

<table>
<tr><th>Metric</th><th>Purpose/Intent</th><th>Methodology</th></tr>
<tr><td>Travel time savings (in and out of vehicle)</td><td>• In vehicle travel time savings + out of vehicle time savings (reduced wait time resulting from improved frequency) at estimated average corridor trip length.

Note: This measurement is useful to compare modes, but not corridors.</td><td>• Travel time savings (in and out of vehicle) = in vehicle travel time savings * average estimated length of passenger ride + out of vehicle time savings (reduced wait time resulting from improved frequency).
• End to end travel time savings as estimated above for peak, base, and evening.
• Assumes average trip length is 65% of end-to-end trip (proxy based on ridership profiles).
• Out-of-Vehicle Time: Difference between ½ of existing headway and ½ of planned headway.
• Calculated based on hourly distribution of existing boardings.
• Data is reported for peak period.</td></tr>
<tr><td>Annualized operating and capital cost per rider</td><td>• Value of investment over time including cost of operation and annualized cost of capital investment, fleet replacement and maintenance.</td><td>• Annualized operating and capital cost per rider = annual operating cost + annualized capital costs / annual boarding rides.
• Weekday operating cost based on cost per hour of service for specific mode (King County Metro data reported to FTA) and service plan developed for corridor.
• Capital cost as described above.
• Assumes project life of 30 years.
• Infrastructure life held constant.
• Assumes vehicle replacement on the following schedule:
<table><tr><td>Diesel Bus</td><td>12 Years</td></tr><tr><td>Electric Trolley Bus</td><td>15 Years</td></tr><tr><td>Streetcar</td><td>30 Years</td></tr></table>• Assumes 3% inflation for operating costs.
• 2030 weekday ridership is assumed with a 325 annualization factor.
• Analysis does not include roadway surface and trackage life in the calculation. However, since rail tracks have a significantly longer life and lower annualized maintenance costs, including this consideration would improve benefit of rail investments. Inclusion is challenging given mix of dedicated and shared ROW types.</td></tr>
</table>

<table>
<tr><th>Metric</th><th>Purpose/Intent</th><th>Methodology</th></tr>
<tr><td>GhG Reduction</td><td>• Annual reduction in greenhouse gas emission equivalents from reduced vehicle miles traveled and net change in transit emissions

NOTE: Lifecycle analysis to be developed.</td><td>Emissions savings from reduced VMT:
• Based on analysis of new transit riders and assumed replacement of light duty vehicles at a rate of 0.47 per new transit rider.
• Average trip length calculated by corridor to estimate VMT reduction from each displaced light duty vehicle trip.
• Average miles per gallon of fuel consumed for light duty vehicle fleet used to calculate total fuel savings and calculated GhG reduction in metric tons.
Emissions savings from net change in transit emissions
• Net total emissions from transit vehicles = emissions from planned service (based on operating plan) – existing service (based on operating cost savings identified above).
• Emissions factors applied based on mode (diesel bus, electric trolley bus, and streetcar), derived from the 2008 Seattle Greenhouse Gas Inventory (Seattle bus vehicle miles and total emissions; electricity emissions per kilowatt hour) and National Transit Database (total kilowatt hours):
<table><tr><td>Diesel Bus</td><td>0.0023910 $MtCO_2e$ / Vehicle Mile</td></tr><tr><td>Electric Trolley Bus</td><td>0.0000999 $MtCO_2e$ / Vehicle Mile</td></tr><tr><td>Streetcar</td><td>0.0001722 $MtCO_2e$ / Vehicle Mile</td></tr></table></td></tr>
<tr><td>Hourly capacity requirements (estimated bidirectional demand by mode) and Capacity by vehicle type and headway</td><td>• Compares hourly demand for service in 2030 with hourly vehicle capacity (supply) provided by various vehicle types/sizes at operating plan headways.</td><td>• Hourly ridership demand based on methods described above estimated for peak, base, and evening periods.
• Hourly ridership demand compared to hourly vehicle capacity by type of vehicle and proposed headway (e.g., streetcar operating at 15 minute headways = 140*4 or a top capacity of 560 passengers per hour.
• Resulting graphic shows relationship between bidirectional hourly demand and vehicle capacity at planned headways.
• Vehicle capacity estimates are based on crush load capacity with standees (i.e., where demand and capacity lines meet, 2030 demand is met with standing load capacity full). Instances where the capacity line is 20% to 30% lower than the demand line is representative of a more comfortable load.
• Ridership by time of day from King Metro APC data for routes serving the corridor. For CC1 and CC2, ridership by time of day is from Portland Streetcar (Winter 2009).</td></tr>
</table>

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TRANSIT MASTER PLAN

Appendix C: Frequent Transit Network Methodology

April 2012

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APPENDIX C FREQUENT TRANSIT NETWORK METHODOLOGY

The Frequent Transit Network (FTN) guides transit service priorities in Seattle. A map and description of the FTN is a key element of TMP Chapter 4 (Service). This map (Figure 4-1 in the TMP Summary Report) is reproduced in Figure C-2 below. This appendix provides background on development of the FTN map and the classification of the FTN corridors that it illustrates.

FTN MAP METHODOLOGY

Frequent service is defined as operating at least every 15 minutes over a long span of service (18 hours), seven days a week. The FTN map identifies existing service corridors that meet the frequent service standards, and where gaps in frequent service coverage exist. It also recommends corridors that should be considered for future upgrades to frequent service levels.

It should be noted that the FTN represents a guiding principle or policy framework for City interest in transit service development. Actual service allocation and design decision are made by King County Metro Transit using its Service Guidelines (see below).

Existing Service Levels

The 2012 service levels table included in the FTN map (and reproduced in Figure C-1) assigns existing FTN corridors to one of three mapping categories based on frequency of service within three time of day categories (Peak, Midday/Early Evening, and Nights/Sundays). This analysis assumes that planned and funded improvements, such as RapidRide, are already in place.

The frequency categories are defined as follows:

- **Very Frequent**: Headways of less than 15 minutes (typically 5 to 10 minutes)
- **Frequent**: Headways of 15 minutes or less
- **Needs Upgrade**: Headways exceed 15 minutes for all or a portion of the time period, representing a gap in frequent service

The second and third tiers of service have very frequent or frequent service during peak and midday/early evening time periods, but have gaps in frequent service at night or on Sundays.

Figure C-1 2012 Service Levels

	PEAK	MIDDAY AND EARLY EVENING	NIGHTS AND SUNDAYS
	Very frequent	Frequent	Frequent
	Very frequent	Frequent	NEEDS UPGRADE
	Frequent	Frequent	NEEDS UPGRADE

Note: Assumes planned and funded improvements (e.g., RapidRide) are in place.

The starting point for development of the FTN map was an analysis of service frequency performed at the outset of TMP development and included in Chapter 2 of the TMP Briefing Book (see Figures 2-13 and 2-14), supplemented by Metro schedules. Corridors represented on the map were drawn from the existing Metro route network and corridors analyzed in the TMP.

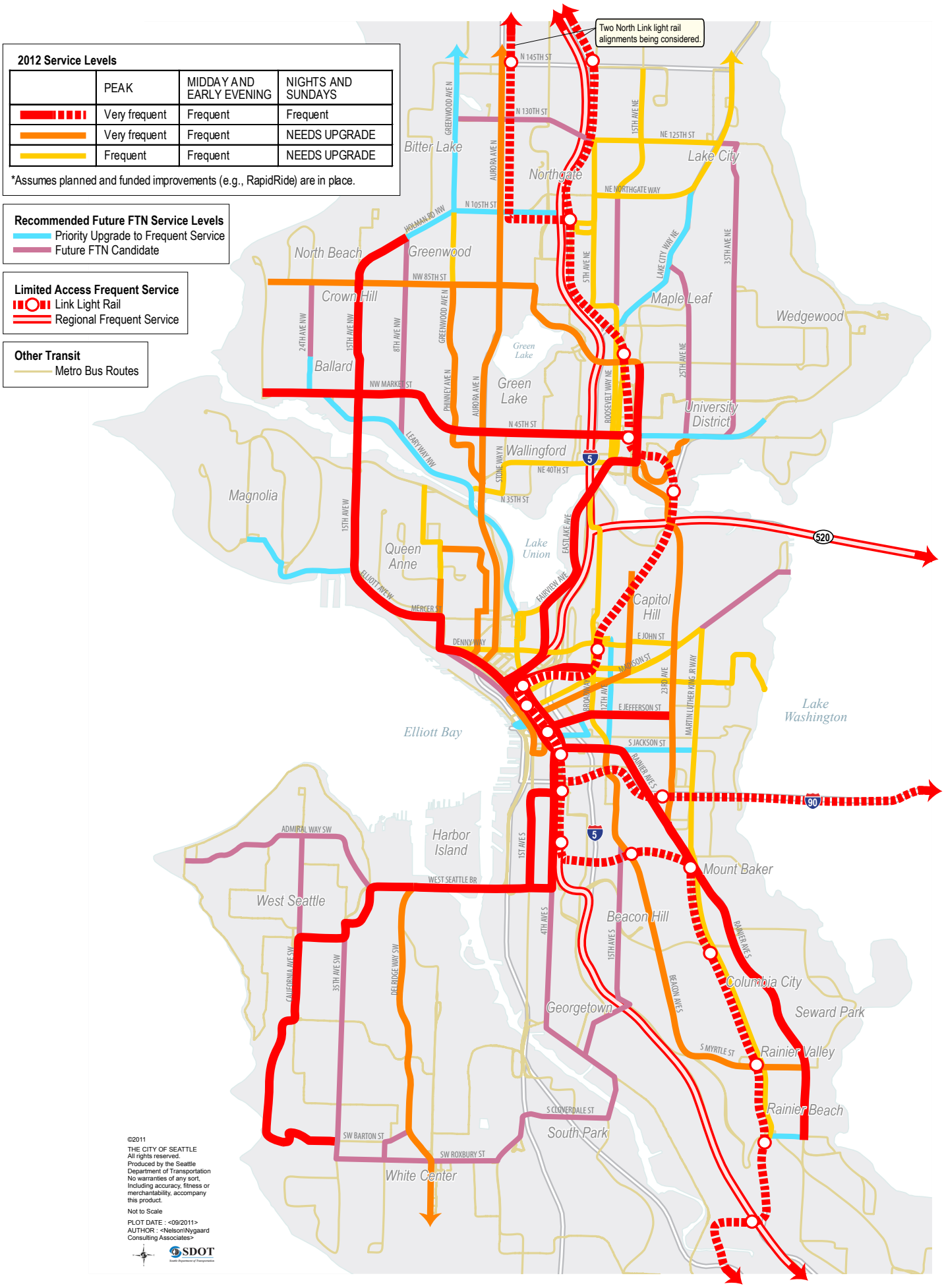
Recommended Future FTN Service Levels

Two categories of corridors were recommended for future upgrades to FTN service levels. These corridors were identified based on the TMP Stage I Corridor Evaluation, as described in the TMP Summary Report (Chapter 3, Page 3-3); Appendix B includes additional detail on the corridor evaluation process and results of the Stage I corridor evaluation. The categories are:

- **Priority Upgrade to Frequent Service**: These "priority upgrade" corridors primarily correspond to the citywide and Center City corridors that were identified through the Stage I corridor evaluation process and that are not already part of the FTN. Figure 3-4 and Figure 3-15 illustrate the TMP priority corridors citywide and for the Center City, respectively. Staff and/or the consulting team identified several additional corridor segments as priority upgrades based on refinement of (or alignment options for) the Stage I corridors in the Stage II and Stage III corridor evaluation (e.g., Magnolia and 24th Ave NW) or due to significant connectivity value for the FTN (e.g., Jackson between Rainier and MLK, part of the Jackson corridor evaluated in Stage I that was not included in the Rainier-Jackson TMP Priority Bus Corridor).
- **Future FTN Candidate**: Future FTN candidate corridors include selected corridors identified/analyzed in the TMP Stage I corridor evaluation. These corridors generally scored in the second quartile of corridors in terms of overall scores (see Appendix B, Figure B-5, Stage I Corridor Evaluation Scores) but did not rise into the top tier of 15 priority corridors that were advanced to the Stage II evaluation process. These corridors generally scored moderately well on some but not all evaluation measures. Several additional corridor segments were added to connect Stage I corridor segments to the overall Frequent Transit Network.

Appendix B provides more detail about the Stage I and Stage II corridor evaluation and how the evaluation criteria used in that evaluation are predictive of where transit service investments will best support existing mobility needs and future growth.

Figure C-2 Frequent Transit Network (reproduced from TMP Figure 4-1)



RELATIONSHIP TO KING COUNTY METRO SERVICE FAMILIES

King County Metro released a Service Guidelines document as a companion to its 2011-2016 Strategic Plan for Public Transportation. These guidelines are used to make decisions about service expansion/contraction and include a set of service families for categorizing its service offerings (see Figure C-3 below). Service families are defined primarily by the frequency and span of service. Whereas the King County service family designation represents an actual level of service, the Seattle FTN service classifications are designed to indicate aspirational service levels and level/type of capital investment. The two classifications serve different purposes and are mutually supportive.

Figure C-3 King County Metro Summary of Service Levels by Service Family

Service family	Frequency[6] (minutes)			Days of service	Hours of service[7]
	Peak[8]	Off-peak	Night		
Very frequent	15 or better	15 or better	30 or better	7 Days	16-20 Hours
Frequent	15 or better	30	30	7 Days	16-20 Hours
Local	30	30 - 60	--*	5-7 Days	12-16 Hours
Hourly	60 or worse	60 or worse	--	5 Days	8-12 Hours
Peak	8 Trips/day minimum	--	--	5 Days	Peak

Source: King County Metro Service Guidelines, Page SG-7

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Appendix D: Community Shuttles

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APPENDIX D COMMUNITY SHUTTLES

This appendix provides additional context to help the City implement Local Transit Network (LTN) strategies included in Chapter 4 of the Transit Master Plan Summary Report (pages 4-14 to 4-16). The LTN provides important local bus service that connects to the FTN, peak hour express service from neighborhoods to downtown, and neighborhood circulation services. In addition, demand-responsive public transportation and private and institutionally-operated shuttles provide targeted services that supplement the LTN.

One theme in the community open houses that SDOT conducted following publication of the draft TMP Summary Report (September 2011) was a desire for community-based shuttles that provide access to Link light rail or high frequency bus stops as well as more service that is not oriented around downtown and/or provides better neighborhood connectivity. The implementation of rail and BRT service in Seattle may provide an opportunity to offer this type of service.

Specific LTN strategies in the TMP that relate to this theme include to:

> *Direct city funds to the most cost-effective means of delivering LTN service, which could include funding Metro service or funding other delivery mechanisms for neighborhood shuttle services. (LTN 2)*
>
> *Collaborate closely with King County Metro to test new transportation approaches, such as neighborhood circulators or shopping shuttles that may better serve older adults and persons with disabilities in a more cost-effective manner than public paratransit or full-sized buses, allowing reallocation of unproductive, expensive services. (LTN 10)*

This appendix provides a case study of the successful Community Shuttle program that TransLink has implemented in Vancouver, BC. Community shuttles, sometimes described as neighborhood circulators, provide local transportation services to serve short trips within communities or to connect neighborhoods to major transit routes (rail or BRT stations or Frequent Transit Network service), shopping, employment, and other activities. Community shuttles often use smaller capacity vehicles, such as 20 to 25 passenger mini-buses, to provide local transit service that can significantly improve service frequency, hours of service, and geographic coverage within neighborhoods, including lower density residential neighborhoods or areas of challenging topography that are more difficult to serve with conventional fixed-route transit service.

While community shuttles may provide a cost-effective service delivery mechanism to enable more non-downtown-based service and improve neighborhood connections in Seattle, it is important to emphasize the cost effectiveness of such a service is largely a function of labor costs. If King County Metro operates the service and there is no special contracted rate for community shuttle operators, there would be little opportunity for cost savings.

CASE STUDY: COMMUNITY SHUTTLES, VANCOUVER, BC

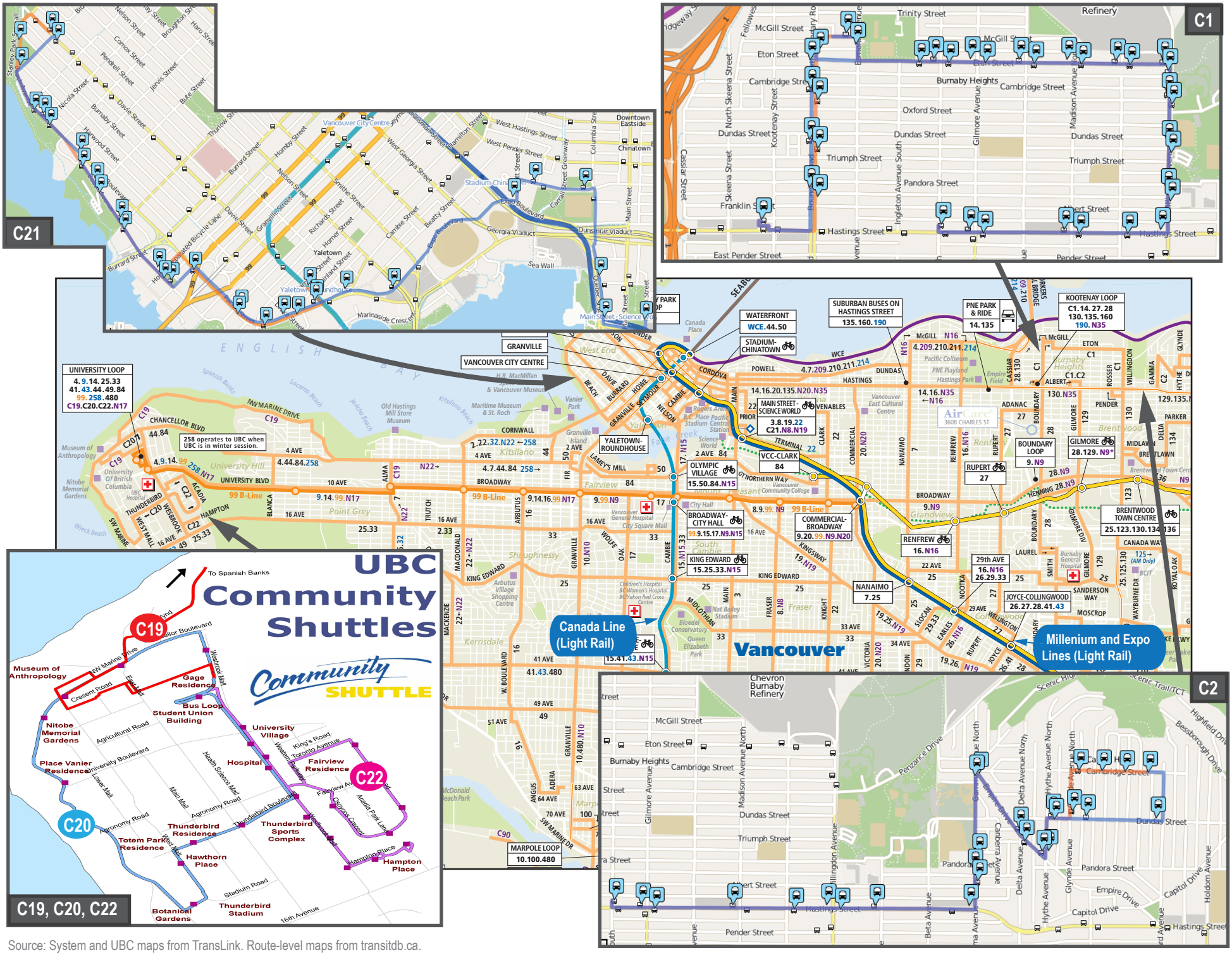
Community Shuttle Program Overview

TransLink, the transit provider for the Vancouver, BC region, has a community shuttle program that serves a number of neighborhoods in the city of Vancouver, as well as communities in outer suburban areas, including Richmond, North Shore, and Burnaby. The Community Shuttle program was initially created to provide more economical transit service to areas with low ridership; however in practice shuttle routes have been implemented in a variety of operating environments—quiet suburbs as well as dense, urban areas—and types of routes. In the city of Vancouver, community shuttles complement downtown transit service, provide feeder service from outer neighborhoods to downtown-bound rail or BRT service, and operate as circulators within the University of British Columbia (UBC) campus.

The Community Shuttle program is operated by Coast Mountain Bus Company (CMBC), a wholly-owned subsidiary of TransLink. CMBC operates 95% of the metro Vancouver region's bus service with a fleet of 1,052 conventional buses, 260 electric trolley buses, 133 community shuttle mini buses, and three SeaBus passenger ferries. As of February, 2012, CMBC operates 58 Community Shuttle routes; TransLink also oversees 12 contracted community shuttle routes.[1] Figure D-1 includes detailed maps of several shuttle routes, in relation to the transit system in the city of Vancouver. (An overview of these routes is provided in the last section of this chapter).

[1] Katherine McCune. CMBC. Personal Email communication. 21 February 2012.

Figure D-1 **Vancouver Transit System and Selected Community Shuttle Routes**



Source: System and UBC maps from TransLink. Route-level maps from transitdb.ca.

Operating Performance

The CMBC Community Shuttle program has increased considerably over the last decade as a result of TransLink's concerted effort to provide last-mile service and link outer suburban communities to the main transit service lines. Between 2005 and 2009, service hours increased by 72% and service kilometers increased by 63%. Contract community shuttle service hours increased by 59% during the same time period.[2]

Figure D-2 below compares service hours, operating cost, and operating cost per service hour for regular CMBC bus service to the community shuttle program (both operated by CMBC and contracted). Under the TransLink 2012 Base Plan, total annual bus and community shuttle service is projected to remain about the same through 2014.

Community shuttles are a lower-cost option for the Vancouver region to provide transit services to underserved areas. The operating cost per service hour is about 36% lower for CMBC-operated shuttles compared to regular bus service, and about 54% lower for contracted shuttle service. Factors that contribute to community shuttles' lower operating cost per hour include: [3]

- Labor costs are lower, due in part to the type of vehicles operated. Community shuttle drivers are part of a separate component of the bus union and have a different motor vehicle licensing requirement since no air brakes are used in shuttle vehicles.
- Community shuttles also tend to travel shorter distances, reducing maintenance costs to some degree.

Figure D-2 Vancouver, BC Bus Service Hours, Budget, and Operating Costs

	Service Hours (2009 Actual)	Operating Cost	Operating Cost per Service Hour
CMBC Regular Bus Service	4,241,928	$462,000,000 a	$109 (2012)
CMBC Community Shuttle	466,262	$33,000,000 a	$70 (2012)
Contract Community Shuttle	84,539	$5,187,000 b	$49.46 (2009)

Notes: (a) The TransLink annual report for 2009 does not break out operating cost for these services separately therefore the cost is estimated based on a 2012 cost per service hour provided by CMBC. (b) 2009 actual operating cost.

Source: 2009 Service Hours, 2009 Budget, and Contract Community Shuttle Operating Cost per Hour: TransLink 2009 Statutory Annual Report unless otherwise noted; 2012 Operating Costs per Service hour from Katherine McCune, Coast Mountain Bus Company

In general, the community shuttle program provides the Vancouver region with a cost-effective means of delivering transit service where conventional fixed route service is not feasible. For example, Route C21 (Yaletown / Burrard Station / Beach) serves approximately 35 passengers per service hour; daily boardings are about 1,700 on weekdays, 1,400 on Saturday, and 900 on Sunday.[4]

[2] TransLink. (2009) 2009 Statutory Annual Report.

[3] Katherine McCune. CMBC. Personal Email communication. 1 March 2012.

[4] Katherine McCune. CMBC. Personal Email communication. 1 March 2012.

Service Design Guidelines

Community shuttles in the metro Vancouver region typically link residential neighborhoods with transit exchanges where connections can be made to regional bus services and West Coast Express (commuter rail) or SkyTrain stations. The mission of TransLink Community Shuttle service is as follows:

> *A system of Community Shuttle (minibus) services in lower demand areas providing reliable, effective and cost-efficient access to local community activity centres as well as connections to the core transit network.*[5]

Specific criteria for community shuttle service are outlined below, based on TransLink's Transit Service Guidelines (2004).[6]

Density or other Neighborhood Characteristics

TransLink has established the following conditions for providing community shuttle service to new areas:

- Minimum density of 20 residents per hectare or 20 jobs per hectare (49 residents or jobs per acre) measured over a minimum developed area of 10 hectares (4 acres).
- There is a road and pedestrian access system that provides for safe access and efficient operation of community shuttle service.
- It is projected that the area would generate at least 175 total person trips (by auto, bike or bus) for each additional community shuttle hour that would be required to provide new service to the area. This is about half the level required for new bus service (250 total person trips). This metric is related to the minimum population density required to support a particular type of transit service, given that transit will attract only a given share of total trips.

At times, community shuttles are introduced where it is not cost effective or not physically possible to operate conventional buses. Consideration is also given to the socioeconomic characteristics of the community and other factors, such as the presence of travel demand management programs that may affect potential transit ridership. All service expansion is subject to availability of funding for expanded transit service hours.

Performance Efficiency Targets

TransLink uses an efficiency guideline to evaluate individual route performance. Community Shuttles should be at 25% capacity during weekday periods, 15% capacity during midday weekday periods, 10% capacity during evening periods, and 15% during the daytime on weekends.[7] Capacity is defined as the average percentage of seats occupied over the full length of the route in the peak direction. These efficiency guidelines take precedence over other guidelines, i.e., an increase in frequency would only be warranted if the route would still meet the capacity guidelines.

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[5] TransLink, Transit Service Guidelines, 2004. http://www.translink.ca/~/media/documents/bpotp/plans/transit_service_guideline/transit%20services%20guidelines%20public%20summary.ashx

[6] TransLink, Transit Service Guidelines, 2004.

[7] The guidelines for Community Shuttles were preliminary as of the 2004 Transit Services Guidelines and were to be adjusted in the future based on actual performance.

Threshold for Evolving into Standard Route

There are no specific thresholds for a community shuttle route to evolve into a standard route. However, conventional bus service may be substituted where demand exceeds the capacity of a community shuttle and/or it becomes more cost effective to operate conventional buses (as compared to more frequent shuttle service). CMBC operates several "hybrid routes" where either during the weekday peak periods a conventional 40-foot bus is used, or in some cases shuttles are used for the weekend service and conventional bus for weekday service.[8]

Stop Spacing

While conventional bus service in Vancouver has a minimum stop spacing guideline of about 800 feet (250 meters), community shuttle stop spacing is "flexible to serve local conditions."

Hours of Service

Figure D-3 below outlines the minimum service hours for the community shuttles—14 hours per weekday and 11 and 10 hours on Saturdays and Sundays, respectively.

Figure D-3 Hours of Service

	Weekdays	Saturdays	Sundays & Holidays
First Morning Service	7:00 am	8:00 am	9:00 am
Last Evening Service	9:00 pm	7:00 pm	7:00 pm

Source: TransLink Transit Service Guidelines Summary Report, 2004

Frequency

There is no specific frequency design guideline for community shuttle service, however the general guideline is that peak period and midday bus service should operate at least every 30 minutes. The efficiency target based on capacity levels (described above) would apply to frequency on community shuttles routes.

Vehicle Characteristics

TransLink community shuttle vehicles, shown in the photo below, are typically 30' long, have 20-25-passenger capacity, and operate on diesel fuel. Community shuttle routes are designated with a "C" before the route number (see Figure D-4) and are branded with a "Community Shuttle" logo (Figure D-5) that is also used in transit information materials.

[8] Katherine McCune. CMBC. Personal Email communication. 21 February 2012.

Figure D-4 Community Shuttle Vehicle Route Number

Community Shuttle routes are differentiated from conventional bus routes by the "C" prefacing the route number.

Image from Oran Viriyincy

Figure D-5 Community Shuttle Logo

Source: TransLink

Community Shuttle Route Examples

Figure D-1 (above) included several detailed community shuttle route maps in relation to an overall transit map of the city of Vancouver. Several examples of community shuttle routes, representing different types of service environments, are provided below:

- **C21 (Yaletown / Burrard Station / Beach):** Community Shuttle Route C21 provide east-west shuttle service in downtown Vancouver with service to Chinatown and connections to the Canada Line and Expo and Millenium SkyTrain systems. Service is available every 10 minutes on weekdays with service up to every five minutes during peak times and 15 minutes in the evening, running until midnight.[9] Service runs every 10 minutes on Saturdays and every 10-15 minutes on Sundays.

[9] Canada Public Transit Discussion Board. http://cptdb.ca/wiki/index.php?title=Coast_Mountain_Bus_Company_route_C21_%27Yaletown_/_Burrard_Station_/_Beach%27; TransLink schedules.

- **C19, C20, C22 (UBC Community Shuttles):** The University of British Columbia has three Community shuttle routes that provide bus service to students and faculty. All routes begin and terminate at the Student Recreation Centre and provide connections with existing bus services at the UBC Loop and service to UBC Hospital. UBC community shuttles generally have longer headways, averaging between 20 minutes to an hour daily. C20 is the primary campus loop route, with 20 minute service (30 minutes evenings and weekends). C22 connects campus residential areas to the main UBC campus with half hour service seven days a week. C19 runs hourly on weekends only, serving attractions on the UBC campus from western Vancouver. The community shuttles connect to conventional bus service to UBC, including the 99 B-Line BRT, several local bus routes, and night service.
- **C1 (Hastings/Gilmore/Kootenay Loop) and C2 (Capitol Hill/Hastings-Gilmore):** These two shuttle routes provide a neighborhood circulation function, serving the Capitol Hill and Vancouver Heights neighborhoods in northeastern Vancouver. Service is provided every half hour seven days a week, from about 6 am on weekdays (7:45 am Saturdays and 8:45 am Sundays) to 10 pm. A portion of both routes runs along Hastings Street, which is a major retail/commercial corridor for these neighborhoods, and has several Frequent Transit Network (FTN) routes to which shuttle passengers can connect.