SEATTLE BICYCLE MASTER PLAN

City of Seattle

2007

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Acknowledgements

Mayor Greg Nickels

This Bicycle Master Plan is a City of Seattle document. It has been prepared by the Seattle Department of Transportation, in coordination with multiple city agencies and other community, regional, and state organizations.

Guidance and support for the development of this Plan was also provided by the Bicycle Master Plan Citizens Advisory Board (see members listed below).

Approved May 22, 2007 by the Seattle Bicycle Advisory Board.

The City of Seattle would like to thank the individuals who participated in the Citizens Advisory Board and assisted in the development of this Plan.

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EXECUTIVE SUMMARY#

The Seattle Bicycle Master Plan defines a set of actions, to be completed within 10 years, to make Seattle the best community for bicycling in the United States. By increasing support for bicycling, the city will make its transportation system more environmentally, economically, and socially sustainable. Seattle is currently in a unique position to make major improvements to bicycling in the city as a result of several concurrent initiatives:

Bikeway: A generic term for any road, street, path, or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

(Source: American Association of State Highway and Transportation Officials Guide for the Development of Bicycle Facilities, 1999)

The city established a Complete Streets Policy in April 2007 and is implementing this policy.

A major new funding source is now in place to construct new bikeways—the "Bridging the Gap" transportation funding initiative passed by Seattle voters in late 2006—it provides dedicated funding over the next nine years for bicycle lanes, multi-use trails, and other safety improvements.

Seattle is currently undertaking a major initiative to meet or beat the global warming pollution reduction target of the Kyoto Protocol.

The Plan is a visionary, yet practical, action strategy to make Seattle a world-class city for bicycling. It provides the framework and actions needed to create a Bicycle Facility Network and develop the supporting facilities and programs necessary to make bicycling a viable choice for a wide variety of trips. Improving the convenience and safety of bicycling in the city will provide cost-effective, healthy, and convenient transportation for residents who bicycle. It will also increase social interaction on streets, offer alternatives to driving on congested roadways, and reduce pollution—public benefits that will make Seattle an even better place to live.

Bicycling in Seattle

Every day, approximately 6,000 Seattle residents use a bicycle as their primary mode of transportation to work[1]. Thousands more bicycle to school, to access transit, to visit friends, to go shopping, or to improve their health[2].

Between 1992 and 2000, the total number of bicyclists entering and leaving the Central Business District during the morning peak period increased by 57%[3].

Approximately 1,800 bicyclists use the Burke-Gilman Trail on a typical weekday, and 2,200 bicyclists use the trail on a typical Saturday[4].

Bicycling is already a popular mode of transportation in Seattle. While many residents and visitors currently bicycle, there are many more people who would bicycle if new bicycle

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[1] *U.S. Census 2000.*

[2] *Approximately 11 percent of bicycle trips are for the purposes of earning a living or going to school; 89 percent of bicycle trips are for other purposes. Source: US DOT, National Household Travel Survey, 2001.*

[3] *Counts were taken between 6:30 and 9:00 a.m. at 29 Downtown entry points on a typical Wednesday in September in 1992 and 2000.*

[4] *Moritz, B. and Cascade Bicycle Club. Burke-Gilman/Sammamish River Trail Survey, 2005. Counts taken from 7 a.m. to 7 p.m.#*

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lanes, signed bicycle routes, trails, and improved roadway crossings were provided throughout the city. Seattle currently has approximately 25 miles of bicycle lanes and 40 miles of multi-use trails. However, with over 2,000 miles of roadways throughout the city, there are many gaps that need to be filled. Over the four-year period between 2002 and 2005, there were 1,088 police-reported bicycle crashes in the city. It is likely that more bicycle crashes occurred that were not reported to police.

This Plan is critical for the following reasons:

Bicycling is an affordable mode of transportation that provides physical activity, produces no pollution, and supports social interaction.

As a vehicle, the bicycle is very efficient in its use of public space.

Bicycling supports healthy lifestyles.

Although Seattle has made great progress by building a trail network that is a model for cities throughout the world, Seattle lacks a connected system of bicycle facilities. Bicyclists face barriers, such as freeways, roadway crossings, and topography in many parts of the city. Many people would choose to bicycle if they had a connected network of comfortable, safe bicycle facilities throughout the city.

Unsafe behaviors from both motorists and bicyclists increase the chances of injuries on roadways.

Existing and emerging policies support improving and connecting bicycle facilities. There is a growing amount of public support for more bicycling and better bicycle facilities, as reflected by support for the city's Complete Streets Policy and voters supporting "Bridging the Gap."

Goals and Objectives of the Plan

The City of Seattle Bicycle Master Plan was created to achieve two goals:

Goal 1. Increase use of bicycling in Seattle for all trip purposes. Triple the amount of bicycling in Seattle between 2007 and 2017[5].

Goal 2. Improve safety of bicyclists throughout Seattle. Reduce the rate of bicycle crashes by one third between 2007 and 2017[6].

The city has identified four principal objectives (provided below) to achieve the goals of the Plan. The objectives are supported by 38 specific actions that will be accomplished over the next ten years, as well as a number of strategic performance measures that will enable the city to monitor progress over time. A summary of each objective is provided below. For more detailed information on the objectives, actions and performance measures, please refer to the full Master Plan report (see http://www.seattle.gov/transportation/bikemaster.htm).

Objective 1: Develop and maintain a safe, connected, and attractive network of bicycle facilities throughout the city. One of the most important outcomes of this Plan is a

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[5]Tripling the amount of bicycling is contingent upon the completion of key connections in the Bicycle Facility Network. The Plan identifies 20 capital projects to make these key connections (see Chapter 3). The amount of bicycling is measured by counting bicyclists at a consistent sample of locations in the city.

[6]The rate of bicycle crashes is the number of police-reported bicycle crashes in a year divided by the number of bicyclists counted at the sample locations.#

detailed assessment of Seattle's transportation system resulting in specific recommendations for new bicycle facilities throughout the city. The Plan map (see inset: Recommended Bicycle Facility Network) identifies the location and initial facility recommendation for a system that encompasses approximately 450 miles. This system extends to all parts of the city and will be designed to meet the needs of all types of bicyclists. The system will include bicycle lanes and other facilities on arterial roadways, a citywide bicycle route system, and completion of the Urban Trails and Bikeways System. A number of non-arterial streets with low traffic volumes and speeds complete the gaps in this system. (These are not shown on the Recommended Bicycle Facility Network map.) The Plan will also result in bicycle safety improvements at roadway crossings and improvements to the maintenance of the bicycle network.

Bicycle Facility Network Summary

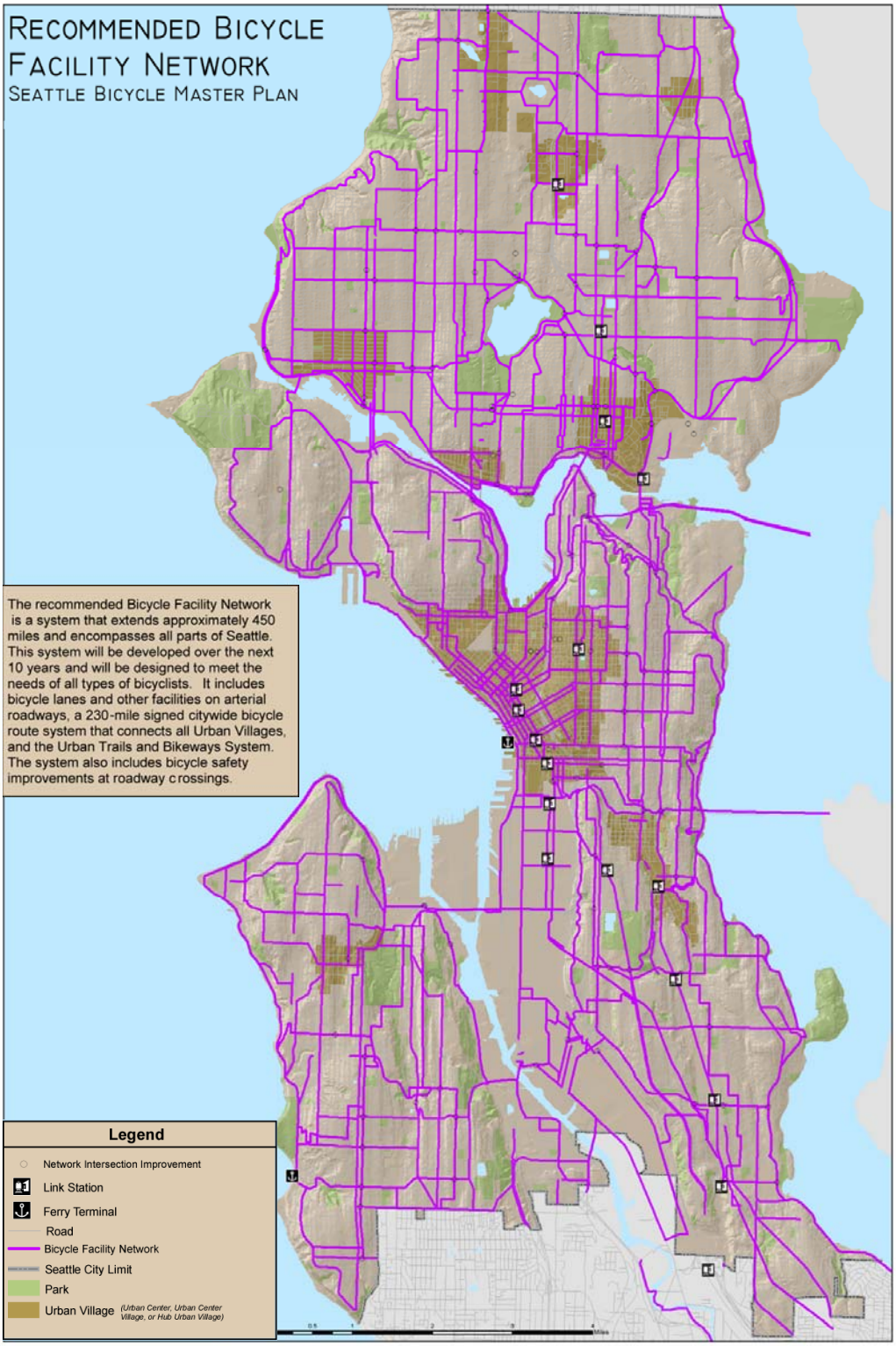
Miles of Recommended Facilities			
Facililty Type	*Existing*	*Short-Term 2007-2009(includes existing)*	*Total 2007-2016(includes existing)*
Bicycle lanes/climbing lanes	*25.5*	*63.7*	*143.3*
Shared lane pavement markings	*0.3*	*54.2*	*110.5*
Bicycle boulevards	*0.0*	*7.6*	*18.1*
Other on-road bicycle facilities	*2.2*	*4.2*	*46.1*
Signed local street connections	*0.0*	*28.6*	*75.9*
Multi-use trails	*39.4*	*41.9*	*58.2*
Other off-road bicycle facilities	*0.2*	*1.0*	*2.6*
TOTAL NETWORK	67.6	201.2	454.7

Objective 2: Provide supporting facilities to make bicycle transportation more convenient. In order for bicycling to be a fully viable form of transportation in Seattle, other programs and facilities are needed to complement the Bicycle Facility Network. This includes integrated bicycle and transit services, adequate bicycle parking at all destinations, showers at employment centers, convenient repair services, and coordination with a variety of other essential components of a multi-modal transportation system. Partnerships will be needed with area transit agencies and other service providers to accomplish these actions.

Objective 3: Identify partners to provide bicycle education, enforcement, and encouragement programs. As the Bicycle Facility Network is built and more people are encouraged to ride, new programs will be needed to educate bicyclists and motorists about how to co-exist safely in the roadway environment. Partnerships will be needed between SDOT, the Seattle Police Department (SPD), the Bicycle Advisory Board, the Bicycle Alliance of Washington, and Cascade Bicycle Club in order to accomplish this objective.

Objective 4: Secure funding and implement bicycle improvements. In order to implement this Plan, it will be necessary to include bicycle accommodations in all future transportation projects, secure grant funding, train staff, integrate the recommendations of the Plan into city policies and regulations, and coordinate with other jurisdictions in the region. In addition, new roadway design treatments will need to be evaluated for their effectiveness, and performance measures will be used to monitor progress over time.

Finally, it will be important to reassess priorities and update this Plan in future years as new needs and opportunities are identified.



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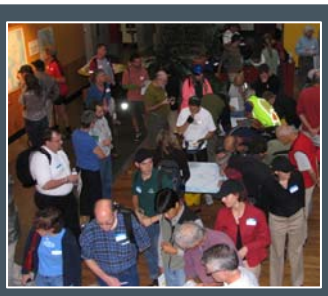
Public Outreach

This Plan is the product of extensive public outreach, background research, inter-agency coordination, and detailed field work. There is a very high level of public interest in the Plan, as shown by the large turnout at public meetings. Previous plans and initiatives from the Seattle Department of Transportation (SDOT) and organizations representing parks and recreation, public transit, freight mobility, land use, open space, trails, pedestrian access, and regional coordination were reviewed and incorporated within the recommendations for this Plan. The foundation of the network plan was a detailed field inventory of over 600 miles of Seattle roadways (including all arterial streets where bicycles are permitted).

Public Involvement in the Seattle Bicycle Master Plan



More than 450 people attended the first public meeting at the University of Washington in August 2006.
More than 330 people attended the public meetings in Ballard and Columbia City in December 2006.
Nearly 1,600 people responded to the online Bicycle Master Plan survey.
More than 100 people e-mailed comments to SDOT during the planning process.
More than 180 people provided almost 500 comments on the draft Bicycle Master Plan.
Representatives of the Cascade Bicycle Club, Bicycle Alliance of Washington, Seattle Bicycle Advisory Board, other organizations, and neighborhood residents attended monthly meetings of the Citizens Advisory Board (CAB) during the planning process.

Characteristics of the Bicycle Network

This Plan recommends a 450-mile network of bicycle facilities that, when implemented, will put more than 95 percent of Seattle's residents within one-quarter mile of a bicycle facility (see Recommended Bicycle Facility Network Map). The network of bicycle facilities will provide access across the rivers, waterways, freeways, and rail corridors that are currently barriers to bicycling in the city, and create hundreds of miles of new bike lanes, bike routes, trails, and transit connections. The recommended Bicycle Facility Network and supporting actions will serve all types of bicyclists—from new bicyclists to experienced riders. Components of the Bicycle Facility Network include:

Bicycle facilities on arterial roadways—these facilities will provide direct access to transit stations, offices, businesses, residences, and other destinations. This category includes bicycle lanes, climbing lanes, shared lane markings, and paved shoulders throughout the city.

Roadway crossing improvements—this category includes safety improvements to key intersections, particularly in locations where trails and signed bicycle routes cross arterial roadways. Crossing improvements may include new traffic signals, pedestrian signal heads, curb extensions, median crossing islands, and other types of improvements.

A citywide Signed Bicycle Route System—this system of routes will connect all Urban Villages in Seattle. Signed routes will extend along multi-use trails, bicycle boulevards, non-arterial streets with low traffic speeds and volumes, and lower volume arterial streets with bicycle lanes.

A completed Urban Trails and Bikeways System—this system, adopted in the SDOT Transportation Strategic Plan (TSP), includes multi-use trails and streets with bicycle lanes that together form an interconnecting system.

Innovation

The city embraces an innovative approach to improving bicycle transportation. Seattle is already widely recognized for its outstanding trail system, and the city will continue to serve as a national leader through the rapid implementation of this complete, connected, citywide bicycle network. The Plan also includes the following innovations:

Shared lane markings to indicate the proper direction of bicycle travel, encourage bicyclists to ride away from parked car doors, and to increase drivers' expectations to see bicyclists on roadways.
Climbing lanes on hills to provide designated space for bicyclists on uphill slopes and to encourage bicyclists to move away from parked car doors and share motor vehicle lanes on downhill slopes.
Bicycle boulevards to provide a high-quality bicycle experience for people with a wide variety of skills and ability to ride in traffic.
A comprehensive bicycle route signage system that shows distances to major destinations.
New bicycle safety treatments, such as warning signs, pavement markings, and traffic controls where multi-use trails and bicycle routes cross arterial roadways.
Bicycle and pedestrian bridges to make critical connections across barriers.
Exploration of new bicycle detection technologies at signalized intersections.
Support for using new technologies for counting and surveying bicyclists.

Implementation Plan

This Plan is designed to be implemented. The recommendations are realistic and achievable because they are based on detailed field work and close agency and public coordination. In most cases, the facilities and actions identified in the Plan will require additional traffic analysis and neighborhood involvement in order to ensure proper implementation. The Plan identifies a variety of partnerships to develop and maintain bicycle facilities, support the education of motorists and bicyclists about bicycle safety, and encourage more people to bicycle for utilitarian and recreation purposes.

Keys to Successful Plan Implementation

Continue institutional commitments to improving bicycle transportation.
Devote adequate staff resources to implementing the Plan.
Provide sustained funding for projects and programs.
Learn from implementing projects and adjust approaches, as necessary.

It is anticipated that three full-time staff will be needed to implement the Plan recommendations within the ten-year timeframe. The pre-2007 staffing of the Program will not be adequate because the volume of work recommended in this Plan is a significant increase over previous years.

Short-Term Implementation (2007 to 2009)

Within the next three years, the Plan recommends the installation of 133.6 miles of new bicycle facilities. Facility recommendations during this period may ultimately vary because many are tied closely to repaving projects. The city will use funding from the "Bridging the Gap" initiative and other sources to focus immediately on a number of key on-street bicycle facilities, including 55 roadway crossing improvements, 28.6 miles of signed bicycle routes, 7.6 miles of new bicycle boulevards, 53.9 miles of shared lane markings, and 38.2 miles of bicycle lanes and climbing lanes on arterial roadways. The city will also construct a key bicycle and pedestrian bridge (the Thomas Street Overpass) and add an additional two miles to the Urban Trails and Bikeways System. Partnerships for bicycle and pedestrian safety education, enforcement, encouragement, and bicycle transit access improvements will also be developed in this short-term period.

Medium-Term Implementation (2010 to 2012)

From 2010 through 2012, the city will reconfigure arterial roadways and will install many additional miles of bicycle lanes, climbing lanes, and shared lane markings. Seattle will also complete the Signed Bicycle Route System, complete the majority of the bicycle boulevards recommended in this Plan, install additional roadway crossing improvements, construct additional sections of the Urban Trails and Bikeways System, and finish an online bicycle wayfinding system. In addition, the Plan will be updated during this time period to reflect new priorities that arise.

Long-Term Implementation (2013 to 2016)

During the latter stage of implementation of the 10-year timeframe for this Plan, Seattle will complete the Urban Trails and Bikeways System, roadway crossing improvements, and the majority of bicycle facilities on arterial roadways. Major construction projects to provide bicycle and pedestrian bridges and bicycle facilities in constrained roadway corridors are likely to be designed during this long-term timeframe. The completion of new bicycle and pedestrian bridges and major roadway reconstruction projects are visionary projects that are likely to occur further in the future, but they are identified as important needs in this Plan.

The level of investment that will be required in order to implement this Plan is relatively modest in comparison to other transportation facilities. The estimated cost to implement this Plan over 10 years is approximately $240 million (based on 2007 dollars)[7]. The Plan cost includes approximately $35.7 million for on-road bicycle facilities, $7.0 million for roadway crossing improvements, $63.7 million for multi-use trail facilities (includes the Burke-Gilman Trail missing link), $80.6 million for major capital projects (e.g., bicycle and pedestrian bridges), $46.5 million for bicycle facility maintenance, and $5.9 million for other projects (e.g., bicycle parking, bicycle maps, bicycle education, etc.).

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[7] *The $240 million cost does not include potential right-of-way acquisition, utility revisions, and other project mobilization costs. Since agreements have already been reached with railroads and utilities, completion of the Urban Trails System does not generally require the costs associated with acquiring additional right-of-way. Therefore, these additional costs would be for projects at spot locations, so they are relatively small.*

Plan Outcomes

Outcomes of implementing this Plan over the next 10 years include:

Bicycle facilities on 62 percent (295 miles) of Seattle's arterial streets.
A 230-mile system of signed bicycle routes, connecting all parts of Seattle.
A signed route within ¼ mile of 72 percent of Seattle's schools.[8]
50 percent more (19 additional miles of new) multi-use trails.
A bicycle facility within ¼ mile of 95 percent of Seattle residents.

This Plan not only establishes the vision, but also very practical steps that are needed in the future to ensure that Seattle will become a world-class city for bicycling. This Plan is an important first step - much work lies ahead. By providing the necessary human and financial resources to accomplish this Plan, Seattle could very well exceed its current goals for increasing the use and safety of bicycling. It will therefore be important in the future to measure progress, reassess priorities, and strive to further increase the use and safety of bicycle transportation as the city moves forward with the implementation of this Bicycle Master Plan.

[8] *Within the context of the city's upcoming Pedestrian Master Plan, additional connector bicycle routes may be added to bring all schools to within ¼ mile of a roadway with bicycle route signs.*

Chapter 1. Introduction

Bicycling is a popular activity in Seattle. Every day, approximately 6,000 people in Seattle's workforce use a bicycle as their primary mode of transportation[1]. Thousands more bicycle to school, to access transit, to visit friends, to go shopping, and to improve their health[2]. The membership of the Cascade Bicycle Club provides clear evidence of the popularity of bicycling throughout the Puget Sound Region – the club's 7,200 members make it one of the largest regional bicycle clubs in the nation. In addition, Seattle is home to the Bicycle Alliance of Washington, one of the most effective statewide advocacy groups in the U.S.

Between 1992 and 2000, the total number of bicyclists entering and leaving Downtown Seattle during the morning peak period (6:30 a.m. to 9:00 a.m.) increased by 57%[3].

The City of Seattle has been a national leader in the development of urban trail systems, improving bicycle access across key barriers (most notably bridges) and in improving bicycle access to transit. SDOT was one of the first city transportation departments in the country to establish a bicycle program, which has been going strong for over 35 years.

These successes have led to a great deal of support for bicycling among Seattle's residents and elected leaders. Seattle residents passed the "Bridging the Gap" initiative in November 2006 to provide $365 million over nine years for street repaving, seismic repairs for bridges, pedestrian and bicycle improvements, and transit projects. Of this funding, approximately $3 million per year will be directly available for bicycle lanes, multi-use trails, and other safety improvements, beginning in 2007. The guiding principle of the city's Complete Streets policy, adopted in April 2007, is "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."

The Burke-Gilman Trail is one of the most popular trails in the U.S. Approximately 1,800 bicyclists use the trail on a typical weekday, and 2,200 bicyclists use the trail on a typical Saturday.[4]

However, there are many challenges to bicycling in Seattle. Although Seattle has made great progress by building a trail network that is a model for cities throughout the world, Seattle lacks a connected system of bicycle facilities. Bicyclists face barriers, such as freeways, roadway crossings, and topography in many parts of the city. Many people would choose to bicycle if they had a connected network of comfortable, safe bicycle facilities throughout the city.

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[1] *U.S. Census 2000.*
[2] *Approximately 11 percent of bicycle trips are for the purposes of earning a living or going to school; 89 percent of bicycle trips are for other purposes. Source: US DOT, National Household Travel Survey, 2001.*
[3] *City of Seattle downtown bicycle counts, 1992, 1995, and 2000.*
[4] *Moritz, B. and Cascades Bicycle Club. Burke-Gilman/Sammamish River Trail Survey, 2005. Counts taken from 7 a.m. to 7 p.m.*

Bicycling is an important part of Seattle's transportation system for many reasons:

- Bicycling is an affordable mode of transportation, requiring only a fraction of the cost that it takes to own and operate a motor vehicle. The American Automobile Association estimates that the average American spends nearly $8,000 per year to own and operate an automobile, while bicyclists typically spend less than $200 per year.[5]
- Bicycling instead of driving a car can help to improve the environment by reducing greenhouse gases that contribute to global warming, and reducing the amount of pollution in our air and water.
- As a vehicle, the bicycle is very efficient in its use of public space. For example, there is space for approximately 10 to 12 bicycle parking spaces in one automobile parking space.[6]
- Unsafe behaviors from both motorists and bicyclists increase the chances of injuries on roadways. Because bicyclists' needs have historically been underserved, the current transportation system does not function well for bicyclists and precipitates conflicts between motorists and bicyclists. In cities that have effectively accommodated bicyclists, these conflicts tend to dissipate.
  Bicycling provides an opportunity for routine physical activity – which is increasingly important given the sedentary lifestyles of many Seattle residents. Recent health studies have shown up to a 50% reduction in Type 2 diabetes among people who engage in moderate physical activity – such as bicycling to work - on a regular basis.[7]

This Plan envisions a comprehensive network of on-and off-street bicycle facilities that connects all parts of Seattle, providing residents and visitors with convenient access to transit stations, workplaces, parks, commercial areas and many other destinations throughout the city. Within the next three years, the Plan recommends the implementation of 133 miles of new bicycle facilities. Within the next ten years, the Plan will create a 450-mile network of bicycle facilities, ultimately putting nearly all of Seattle's residents within one-quarter mile of a bicycle facility. The Plan also recommends a wide variety of partnerships to develop and maintain bicycle facilities, further support bicycle safety education, and encourage more people to bicycle for utilitarian and recreation purposes.

Bicycling serves a wide variety of community goals that fall under the jurisdiction and missions of many city departments and projects. Bicycling supports:

- Public health
- Quality of life/livability
- Environmental health
- Transportation choice
- Accessibility
- Recreation

--City of Seattle Bicycle Advisory Board, 2002

[5] *As estimated by the League of American Bicyclists.*
[6] *Pedestrian and Bicycle Information Center, "Bicycle Parking: Costs," Available online: www.bicyclinginfo.org/de/park_costs.cfm.*
[7] *Journal of the American Medical Association, October 1999, based on a study by the Harvard School of Public Health.*

This Plan comes at an important time in Seattle's history. On November 7th, 2006, Seattle voters passed a comprehensive transportation levy that will provide a significant source of funding for transportation maintenance and improvements over the next nine years. This funding will help to accelerate the implementation of this Plan, including the development of capital projects that support bicycle mobility.

More than 450 people attended the first Bicycle Master Plan public meeting.

Citizens have shown significant interest in this Plan and have provided considerable feedback during the planning process. Attendance at public meetings exceeded 750 people over the course of three public meetings held between August and December 2006. In addition, more than 1,600 city residents submitted comments during the six-month planning process. Input from these citizens, recommendations from other key planning efforts, and a thorough inventory and analysis of the city's existing transportation system combine to form the basis of this Bicycle Master Plan. A list of public comments on the Draft Plan and the city responses to these comments is included in the Public Comments and Responses Spreadsheet, which is part of the Compendium of Supporting Materials for this Plan.

Implementing this Plan over the next 10 years will provide:

- Bicycle facilities on 62 percent (295 miles) of Seattle's arterial streets
- A 230-mile system of signed bicycle routes, connecting all parts of Seattle
- 50 percent more (19 miles of new) multi-purpose trails
- Partnerships to improve bicyclist safety and increase bicycling throughout Seattle

The level of investment that will be required in order to implement this Plan is relatively modest in comparison to other transportation facilities. The estimated cost to implement this Plan over 10 years is approximately $240 million (based on 2007 dollars). The Plan cost includes approximately $35.7 million for on-road bicycle facilities, $7.0 million for roadway crossing improvements, $63.7 million for multi-use trail facilities (includes the Burke-Gilman Trail missing link), $80.6 million for major capital projects (e.g., pedestrian and bicycle bridges), $46.5 million for bicycle facility maintenance, and $5.9 million for other projects (e.g., bicycle parking, bicycle maps, bicycle education, etc.).

Plan Background

Seattle's network of bicycle facilities has developed over time. The city adopted its first Bicycle Master Plan in 1972. The oil shortages of 1973 and 1979 boosted interest in bicycling. Railroad downsizing starting in the 1970s provided an opportunity for the city to develop multi-purpose trails along abandoned railroad corridors. In the late 1970s through the 1990s, the city focused on securing rights-of-way and constructing this system of trails, which became extremely popular among residents and visitors to the city. Significant portions of the Burke-Gilman, Alki, I-90, and Duwamish Trails were constructed during this period. New trails offered opportunities for people to become more comfortable riding a bicycle for utilitarian and recreation trips, however it soon became clear that improvements would also be needed to the roadway system in order to connect bicyclists directly to their destinations. The city's first

The city's first Bicycle Master Plan was adopted in 1972.

Bicycling Guide Map and the Spot Improvement Program were established during this period.

More recently, the city has focused more of its attention on developing an on-road network of bicycle facilities to complement the multi-purpose trail network. This Plan is a direct result of the need to improve bicycle access on Seattle's roadway system. Seattle currently has approximately 40 miles of multi-purpose trails, and 25 miles of on-road bicycle lanes. The city's current network of trails and bike lanes is complemented by a number of other facilities, including bicycle route signs, bicycle parking, and bicycle racks on buses. There are also several miles of other on-road bicycle facilities, including wide outside lanes, rush hour bikeways, bus/bike lanes, and paved shoulders (see Table 1: Existing Bicycle Facilities).

Table 1. Existing Bicycle Facilities

Facility Type	Miles[1]
Bicycle lanes/climbing lanes	*25.5*
Shared lane pavement markings	*0.3*
Bicycle boulevards	*0.0*
Other on-road bicycle facilities[2]	*2.2*
Multi-use trails	*39.4*
Other off-road bicycle facilities[3]	*0.2*
TOTAL NETWORK	*67.6*

1 For on-road bicycle facilities, total miles represent roadway centerline miles with bicycle facilities (e.g. bicycle lanes on both sides of the roadway are not counted separately.)

2 Other on-road bicycle facilities include wide outside lanes, edgelines, paved shoulders and peak hour bus/bicycle only roadways. Key corridors for short-term study and corridors where an improvement is needed, but the facility is unknown are also counted in this category.

3 Other off-road bicycle facilities include sidepaths, one-way bike-on-sidewalk pairs and pedestrian/bike-only bridges.

Bicycle racks and lockers, a BikeStation®, and bicycle racks on buses are all part of the existing system of facilities that support bicycling. Some have been provided by the city or other public agencies, while others have been provided by private entities. Over 2,300 sidewalk bicycle racks have been installed in business districts since September of 1993, and bicycle parking requirements are included in the Seattle Municipal Code (23.49.019). More detail about the existing bicycling conditions in Seattle is provided in Appendix A: Existing Conditions for Bicycling.

Plan Development

The Plan was developed by gathering and analyzing public input, meeting with the Bicycle Master Plan Citizens Advisory Board (CAB), coordinating with city staff, other local agencies, and reviewing previous plans for bicycle facilities. In addition, the planning process included extensive field analysis of Seattle's existing transportation network to determine locations where bicycle facilities can be integrated into the existing street network. Over 600 miles of roadways were analyzed, including all of Seattle's arterial roadways.

The project team analyzed over 600 miles of roadways in the field during summer 2006.

Public input during the planning process was a critical part of identifying bicycling needs throughout the city, and was gathered through several methods, including:

- Monthly meetings with a Citizens Advisory Board (CAB), which included representatives of the Seattle Bicycle Advisory Board, Cascade Bicycle Club, Bicycle Alliance of Washington, and neighborhood residents.
- Three public meetings (450 people attended a meeting at the University of Washington on August 29, 2006; 215 people attended a meeting in Ballard on December 5, 2006; 110 people attended a meeting in Columbia City on December 7, 2006).
- An online Bicycle Master Plan questionnaire (over 1,500 people provided responses between August and September 2006).
- Meetings with representatives of surrounding jurisdictions that were coordinated through the Puget Sound Regional Council (PSRC) (August 29, 2006 and December 6, 2006).
- Review by Seattle District Councils (December 2006 and January 2007).
- Additional comments submitted by citizens to SDOT (over 300 letters and e-mails during the planning process).
- Presentations, upon request, to the Freight Mobility Advisory Committee, Southeast Seattle Transportation Plan Core Community Team, North Seattle Industrial Association and Manufacturing Industrial Council.

The SDOT Bicycle and Pedestrian Program consulted with a variety of other SDOT divisions, city and transit agencies, and other groups throughout the planning process. Those meetings were also important for identifying the best strategies for integrating bicycle infrastructure improvements into the city's overall multi-modal transportation network (see Appendix B: List of Public Meetings Held During the Planning Process).

Plan Updates

This Plan is a living document and updates will be necessary in the future to assess progress, take advantage of emerging opportunities and re-evaluate priorities as needed. As new sections of the bicycle facility network are developed and new technologies are adopted, bicycling mode share will likely increase and travel patterns will change. Priorities will shift and new opportunities will become apparent. These changes will be reflected in yearly updates to the list of short-term projects. Updates to the full Bicycle Master Plan will occur every five years, as a part of the Transportation Strategic Plan Update.

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Chapter 2. Goals, Objectives and Policy Framework

Goals and Objectives

The two primary goals of this Bicycle Master Plan are:

Goal 1: Increase use of bicycling in Seattle for all trip purposes. Triple the amount of bicycling in Seattle between 2007 and 2017[1].

Goal 2: Improve safety of bicyclists throughout Seattle. Reduce the rate of bicycle crashes by one third between 2007 and 2017[2].

These goals essentially encompass all activities of the city related to bicycling and provide the underpinning for all of the Plan recommendations. Many of the Bicycle Facility Network improvements within the Plan can be achieved easily by making improvements using the Complete Streets approach (e.g., incorporating bicycle facilities into roadway reconstruction projects, repaving projects, etc.). The Plan also targets substantial capital investments at key locations within the network that may require additional funding and public support. Both short-term and long-term projects are necessary to create the accessible, connected network of bicycle facilities that is critical for attracting additional bicyclists and making bicycle trips safer.

Seattle will develop a continuous, complete network of bicycle facilities to make it safer and easier for more people to bicycle throughout the city.

The city has identified four principal objectives for achieving the goals of the Plan. Chapters 3 through 6 describe the objectives in detail. Strategic performance measures are also tied to each principal objective to monitor progress in implementing each recommendation. Monitoring of performance measures will occur periodically. Some will be measured on a yearly basis while others will be measured over longer periods of time depending on the availability of source data. More detail on performance measures is provided in Chapter 7.

Objective 1: Develop and maintain a safe, connected, and attractive network of bicycle facilities throughout the city. One of the most important outcomes of this Plan is a detailed assessment of Seattle's transportation system, resulting in recommendations for new facilities types throughout the city. This Plan identifies the location and initial design concept for a system that encompasses over 450 miles. This system extends to all parts of the city and will be designed to meet the needs of all types of bicyclists. The system will include bicycle lanes and other facilities on arterial roadways, a citywide bicycle route system, and

[1] *Tripling the amount of bicycling is contingent upon the completion of 20 critical bicycle connections. The amount of bicycling is measured by counting bicyclists at a consistent sample of locations in the city.*
[2] *The rate of bicycle crashes is the number of police-reported bicycle crashes in a year divided by the number of bicyclists counted at the sample locations and by the average motor vehicle traffic volumes measured throughout the city in a year.*

completion of the Urban Trails and Bikeways System. The Plan will also result in bicycle safety improvements at roadway crossings, and improvements to the maintenance of the bicycle network. For more information on this objective, see Chapter 3.

Bikeway: A generic term for any road, street, path, or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

(Source: American Association of State Highway and Transportation Officials Guide for the Development of Bicycle Facilities, 1999)

One strategic performance measure has been established to measure progress towards this objective:

- Percentage of Bicycle Facility Network completed.

Objective 2: Provide supporting facilities to make bicycle transportation more convenient. In order for bicycling to be a fully viable form of transportation in Seattle, other programs and facilities are needed to complement the Bicycle Facility Network. This includes integrated bicycle and transit services, adequate bicycle parking at all destinations, showers at employment centers, convenient repair services, and coordination with a variety of other essential components of a multi-modal transportation system. Partnerships will be needed with area transit agencies and other service providers to accomplish these actions. For more information on this objective, see Chapter 4.

Three strategic performance measures have been established to measure progress towards this objective:

- Number of bicycle racks installed through the SDOT Bicycle Rack Program.
- Percentage of estimated 2017 bicycle parking demand met by current bicycle racks and lockers at transit stations in Seattle (recommended for consideration by Sound Transit and KC/METRO).
- Number of bicycles carried on KC/METRO and Sound Transit buses (recommended for consideration by KC/METRO and Sound Transit).

Objective 3: Identify partners to provide bicycle education, enforcement, and encouragement programs. As the Bicycle Facility Network is built and more people are encouraged to ride, new programs will be needed to educate bicyclists and motorists about how to co-exist safely in the roadway environment. Partnerships will be needed between SDOT, the Seattle Police Department (SPD), the Seattle Bicycle Advisory Board (SBAB), the Bicycle Alliance of Washington (BAW), and Cascade Bicycle Club (CBC) in order to accomplish this objective. For more information on this objective, see Chapter 5.

Two strategic performance measures have been established to measure progress towards this objective:

- Number of Seattle Bicycling Guide Maps distributed
- Number of Seattle residents participating in pedestrian or bicycle safety education programs or events (recommended for consideration by Seattle area bicycle advocacy organizations).

Objective 4: Secure funding and implement bicycle improvements. In order to implement this Plan, it will be necessary to include bicycle accommodations in all future transportation projects, secure grant funding, train staff, integrate the recommendations of the Plan into city policies and regulations, and coordinate with other jurisdictions in the region. In addition, new roadway design treatments will be evaluated for their effectiveness, and performance measures will be monitored to measure progress over time. Finally, it will be important to reassess priorities and update this Plan in future years as new needs and opportunities are identified. For more information on this objective, see Chapter 6.

SDOT crew member adds markings at a Chief Sealth Trail crossing.

Three strategic performance measures have been established to measure progress towards this objective:

- Percentage of targeted SDOT staff who participate in training on bicycle planning, design, and engineering issues.
- Amount of grant funding applied for and obtained for bicycle programs.
- Number of Bicycle Spot Improvements completed.

Policy Framework

Bicycling is consistently supported in numerous city, regional, and state policies as not only an important element of Seattle's multimodal system, but as an element of achieving sustainable growth and encouraging healthy communities:

Destination 2030 is the Puget Sound region's transportation vision that lays out policies and strategies for meeting its commitment to the state's Growth Management Act. The plan calls for creating a regionally integrated network of bicycle and pedestrian facilities linked to urban centers and transit facilities and seeks to have non-motorized trips account for 20% of all trips within the region by 2030.

"Walking and bicycling can be practical alternatives to driving, especially for short trips. They can also contribute greatly to neighborhood quality and vitality, and help achieve city transportation, environmental, open space, and public health goals."

--Seattle Comprehensive Plan, January 2005

Seattle's Comprehensive Plan is the guiding vision for the city and includes the establishment of the Urban Village Land Use Strategy and the Urban Trails System. The plan seeks to facilitate walking and bicycling as viable transportation choices "in, around, and between urban centers and villages."

The SDOT Transportation Strategic Plan (TSP) provides direction for the accelerated provision and maintenance of a comprehensive bicycle network through improved safety and access to urban villages, schools, and the Urban Trails System, as well as through bicycle education and promotion. A key goal of the TSP is the routine accommodation of bicycle facilities as a component of all SDOT reconstruction, channelization, resurfacing, and paving projects, as well as other capital investments that affect Seattle's right-of-way.

By increasing the convenience and safety of bicycling in the city, the Bicycle Master Plan will help achieve the following principles laid out in the TSP:

- Make the best use of the streets we have to move people, goods and services.
- Increase transportation choices.
- Make transit a real choice.
- Encourage walking and biking—they're the easy, healthy way to get around.
- Improve our environment.
- Connect to the region.
- Make the most of transportation investments.

Seattle's Climate Action Plan is a commitment by the city to meet or exceed the Kyoto protocols for reducing greenhouse emissions. Among the top recommendations put forth by Mayor Nickels' Green Ribbon Commission is a significant expansion of Seattle's bicycle facilities, including a completed Urban Trails System and regulations or incentives for bicycle parking, lockers, and showers in new development.

"Since motor vehicle emissions are the single largest source of climate pollution in Seattle, the city must do even more to provide climate-friendly transportation choices such as public transit, biking and walking — and to encourage greater use of those alternatives."

--Seattle Climate Action Plan, September 2006

Complete Streets is a policy adopted by the City of Seattle in April 2007 that codifies the routine accommodation of bicycles as a part of all roadway system improvements.

These policies and strategies have guided the development of the Bicycle Master Plan, and will play an important role in building support for its full implementation.

"Seattle's Complete Streets Policy - Guiding Principle: "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."

--City of Seattle Complete Streets Policy, April 30, 2007, Ordinance Number 122386.

Coordination with Other Modes

Bicycle mobility improvements are an important component of creating an efficient, safe multi-modal transportation system in Seattle. As part of the vision for a multi-modal transportation system, the Bicycle Master Plan recommendations have been compiled with consideration for the needs of pedestrian, transit, freight, and automobile modes. The type of bicycle facility provided in each roadway corridor depends on available space, the role of the roadway in the overall Bicycle Facility Network, and the designation of the roadway relative to other modes of travel in Seattle.

There are a number of corridors in the Bicycle Facility Network where bicyclists must share the roadway with transit vehicles. Buses and bicycles are able to co-exist on roadways when they give each other space when passing and make predictable movements. Recommended bicycle facilities in transit corridors, such as bicycle lanes, climbing lanes, and shared lane markings help indicate the roadway space that is needed for bicyclists and improve the predictability of their movements, resulting in positive effects on motor vehicle and transit operations. Special attention will be paid to the city's Urban Village Transit Network (UVTN) corridors where transit service must be fast, frequent, and reliable. Minimum performance thresholds have been established for UVTN corridors to monitor transit speed and reliability and to make adjustments as needed.

Most of the recommended bicycle facilities can be developed by painting new lines or markings in the roadway or narrowing existing travel lanes. These actions are likely to have minimal impacts on other modes. In several corridors, bicycle facilities will be provided by removing existing travel lanes, which may potentially impact transit service (depending on bus frequency, intersection and bus stop spacing, traffic volume, on-street parking, overall roadway width, etc.). Therefore, it will be particularly important to coordinate bicycle facility recommendations with transit service improvements as Seattle's Urban Village Transit Network is developed. Urban Village Transit Network roadways (including the proposed Streetcar Network) should be designed to meet or exceed performance thresholds for a reasonable level of speed and reliability for transit service while maintaining safe conditions for bicyclists. Appendix C: Key Locations for Coordinating Bicycle Facility Design with Future Rapid Transit Service includes a map showing these locations.

Development of the on-road bicycle facility recommendations tried to minimize bicycle facilities on major truck streets. The exceptions are critical links in the recommended citywide bicycle system (see Appendix D: Key Locations for Coordinating Bicycle Facility Design with Freight Transportation). These facilities will undergo thorough traffic engineering review for compatible operation with trucks during the design process.

In order to give full consideration to the needs of other transportation modes, the Bicycle Master Plan process included meetings with other SDOT divisions as well as a wide variety of agencies and organizations representing these modes. The planning process also included a thorough review of numerous relevant city and regional planning documents, including the policies cited in the previous section and the documents listed below:

- Seattle Transit Plan (including the Urban Village Transit Network)
- Freight Mobility Strategic Action Plan
- Open Space 2100 Plan
- Puget Sound Regional Council Destination 2030 Plan
- Seattle Right-of-Way Improvements Manual
- Relevant sections of Title 11 of the Seattle Municipal Code (the Traffic Code)
- Subarea and Corridor Plans (e.g., Center City Circulation Report, Southeast Transportation Study, South Lake Union Transportation Study, University Area Transportation Study, Northgate Coordinated Transportation Investment Plan)
- Bicycle Facility Reviews and Maps (e.g., Seattle Bike Map, Left by the Side of the Road Puget Sound Regional Bicycle Network Study (Cascade Bicycle Club), Seattle Bicycle Facilities Collaborative Report, Urban Trails Plan, PSRC Regional Bicycle and Pedestrian Implementation Strategy for the Central Puget Sound Region

Objective 1: Develop and maintain a safe, connected, and attractive network of bicycle facilities throughout the city.

Providing a network of bicycle facilities throughout Seattle is fundamental to achieving the goals of this Plan. Additional bike lanes, roadway crossing improvements, multi-use trails, and other facilities are needed in some areas of the city in order for bicyclists to reach key destinations and encourage more Seattleites to bicycle.

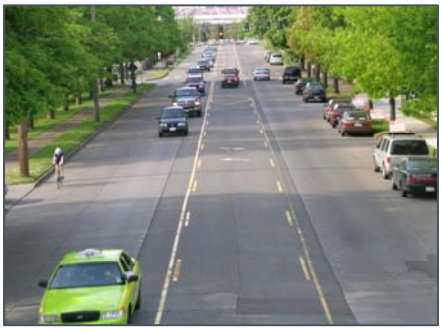
Figure 1: Conceptual Map of Major Bicycle Destinations and Key Bicycle Corridors show some of the most important existing and future corridors for bicycling in Seattle[1]. While some of these corridors have existing bicycle facilities, some are in need of physical improvements to ensure they adequately accommodate bicycle travel. The interconnected network of on- and off-road bicycle facilities recommended in this Plan will serve these critical corridors, as well as many other parts of the city.

Wayfinding signs will be installed on the lower level of the West Seattle Bridge as part of a citywide wayfinding system.

To achieve the goal of tripling the amount of bicycling in Seattle between 2007 and 2017, several key projects in areas with high bicycling demand will need to be completed (see Figure 1: Major Bicycle Destinations and Key Bicycle Corridors). These key connections include:

Lower-Cost Projects

- Redesign the existing bicycle lanes on Dexter Avenue N.
- Make wayfinding and spot intersection improvements on the West Seattle Low Level Bridge.
- Install bicycle lanes on Delridge Way SW.
- Create an Interurban bicycle boulevard to Green Lake and Burke-Gilman Trail.
- Install bicycle lanes, shared lane markings, and signs to improve the connections between Capitol Hill and the UW Campus.
- Install shared lane markings on 2nd Avenue and 4th Avenue to provide a north-south connection



Delridge Way SW offers an opportunity for bicycle lanes to be striped.

[1] *Figure 1 is a conceptual map showing existing and future bicycle connections throughout Seattle. Major activity centers include hub urban villages, Sound Transit station areas, major parks, and major neighborhood commercial areas. Key connections represent bicycle transportation corridors between activity centers. Examples of these connections include a new bicycle facility on SR-520, a trail connection between the Chief Sealth Trail and Downtown, and the completed Ship Canal Trail. The colors of the lines in each corridor represent the quality of existing bicycle connections. Line thickness indicates general levels of existing or anticipated bicycle activity in major corridors. In general, a corridor is considered to have "good" bicycling conditions if it is served by an existing bicycle lane, trail, or low-volume non-arterial street for a majority of its length. "Fair" corridors have these types of facilities for a portion of their lengths but may also have several barriers to bicycle connectivity. "Poor" corridors have limited or no bicycle facilities and may have significant barriers to bicycle connectivity. "No bicycle facility" means that there is currently no bicycle accommodation in the corridor.*

through Downtown Seattle (includes removing the existing bicycle lane on 2nd Avenue).
- Install bicycle lanes on Alaskan Way in Downtown Seattle (when Alaskan Way is reconstructed)
- Provide good bicycle connections to and work with local transit agencies to provide adequate bicycle parking at all light rail and other major transit hubs.
- Complete the citywide Signed Bicycle Route System.
- Install or upgrade traffic signals to improve bicycle crossings at all intersections identified for signal improvements in the Plan.
- Provide bicycle access to and from the ferry when the Colman Dock Ferry Terminal is reconstructed.

The next phase of the Chief Sealth Trail will be to extend the trail across I-5 to downtown.

Higher-Cost Projects

- Provide a bicycle facility connection between Downtown Seattle and the UW Campus via Eastlake Avenue N.
- Complete the Ship Canal Trail, including connections to the Fremont Bridge and Ballard Bridge.

"The most useful thing that the city can do to encourage bicycling in Seattle is to create and maintain a connected system of bicycle lanes and trails that get people where they need to go throughout the city."
-- Seattle Resident

- Construct a Chief Sealth Trail Crossing of I-5 between S Spokane Street and S Lucile Street (and provide a trail on the east side of I-5 between the Chief Sealth Trail and the I-90 Trail).
- Construct the Burke-Gilman Trail section between 11th Avenue NW and 17th Avenue NW.
- Construct a new bicycle and pedestrian bridge across I-5 between Wallingford and the University District.
- Provide a bicycle facility connection between the I-90 Trail and Downtown Seattle.
- Construct multi-purpose trail connections from the SR-520 Bridge to the UW Campus and to Downtown Seattle as a part of the bridge reconstruction project.
- Improve the bicycle lanes on Alaskan Way S/E Marginal Way S between S Spokane Street and Downtown, and complete the E-3 Busway Trail between S Spokane Street and Downtown.
- Either rehabilitate the existing Ballard Bridge or add a new bicycle and pedestrian bridge adjacent to the Ballard Bridge.

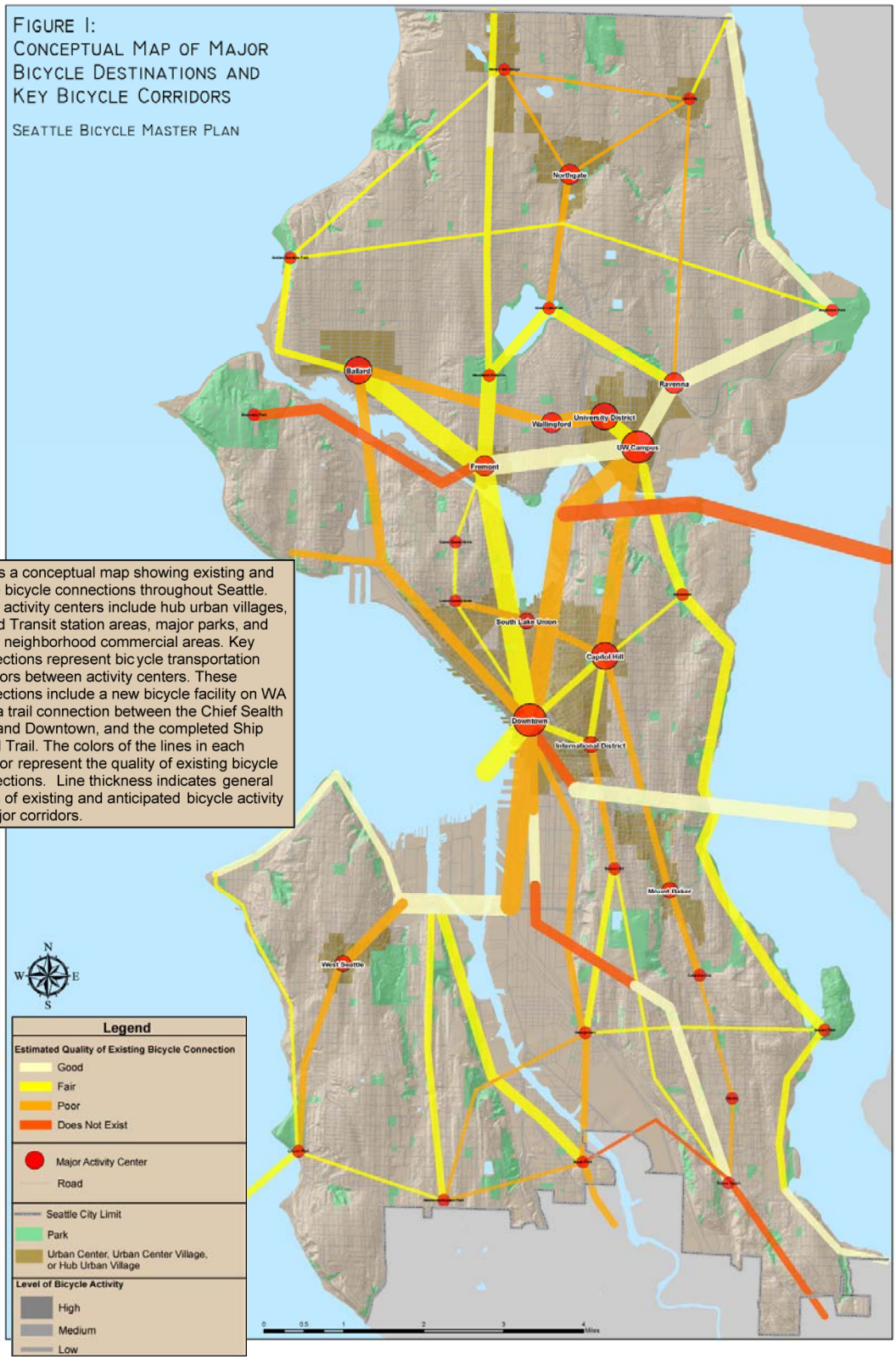
Bicycle access onto and off the Ballard Bridge should be improved.

Further Evaluation of Bicycle Facility Recommendations

The projects that are recommended in this chapter will require additional evaluation during the implementation process to determine if there are other factors that may either help or hinder their development. Additional traffic analysis will be needed in some cases to determine the optimum design for specific locations. Like other public projects, neighborhood involvement will also be an important part of the evaluation process. Some locations shown on the map may be determined, after more detailed analysis, to require different or more costly improvements and, therefore, may become longer-term projects. However, for every project, the first assumption will be that the bicycle facilities, as shown in the Bicycle Master Plan, will be implemented. If the city decides not to proceed with implementing the Bicycle Master Plan recommendation on a particular roadway, it will

document the reason for this decision. The burden is on the city to explain why it is not implementing a recommendation in the Plan.

Figure 1. Conceptual Map of Major Bicycle Destinations and Key Bicycle Corridors



Bicycle Facility Network Definition

Implementation of this Plan will establish a 450-mile network of bikeways throughout the city of Seattle. This Bicycle Facility Network is composed of all of the locations throughout the city where specific improvements have either already been made or are proposed in the future to accommodate bicycles. Subsets of the complete Bicycle Facility Network include bicycle lanes and other facilities on arterial roadways, the Urban Trails and Bikeways System, and the Signed Bicycle Route System.

Almost all Bicycle Facility Network segments will have some type of visible cue (i.e. a bike lane, a bike route sign, a pavement marking, a trail, etc.) to indicate that special accommodations have been made for bicyclists. While the network will provide primary routes for bicycling, it is important to note that, by law, bicyclists are permitted to use *all* roadways in Seattle (except limited access freeways or where bicycles are otherwise prohibited). Therefore, the Bicycle Facility Network will serve as a core system of major routes that can be used to safely access all parts of the city and other parts of the transportation system.

Portions of the Bicycle Facility Network identified as "short-term" are recommended to be implemented in the next three years. Other segments of the network will require a longer period to implement due to their higher complexity (see Table 2: Miles of Facilities Recommended for Bicycle Facility Network on next page). The completed Bicycle Facility Network will connect all parts of the city and will provide a bicycle facility within one-quarter mile of 95% of all Seattle residents (see Figure 2: Recommended Bicycle Facility Network page 17).

Descriptions of recommended bicycle facility types are provided in Appendix E: Bicycle Facility Descriptions. These facilities include:

Facilities for network segments:

- Bicycle lanes
- Climbing lanes
- Shared lane markings
- Multi-use trails
- Bicycle boulevards
- Shared roadways
- Bridge facilities

Facilities for roadway crossings:

- Signalized intersections (adding traffic signals)
- Pedestrian crosswalk signals (with appropriate elements to facilitate bicycle crossings)
- Curb extensions
- Median crossing islands
- Overpasses and underpasses
- Warning signs

The Recommended Bicycle Facility Network Map shows all facilities in the Bicycle Facility Network, in detail (North Seattle and South Seattle Bicycle Facility Network maps are enclosed in binder pocket — see separate documents).

An important subset of the Bicycle Facility Network is a 230-mile system of signed bicycle routes. This system includes local routes that connect destinations such as urban villages, transit stations, major parks, and other destinations within the City of Seattle; and regional routes that connect Seattle with other communities in the Puget Sound Region.

Table 2. Miles of Facilities Recommended for Bicycle Facility Network

	Miles of Bicycle Facilities[1]		
Facility Type	***Existing***	***Short-Term Recommended[2]***	***Total Recommended[3]***
Bicycle lanes/climbing lanes	25.5	63.7	143.3
Shared lane pavement markings	0.3	54.2	110.5
Bicycle boulevards	0.0	7.6	18.1
Other on-road bicycle facilities[4]	2.2	4.2	46.1
Signed local street connections[5]	0.0	28.6	75.9
Multi-use trails	39.4	41.9	58.2
Other off-road bicycle facilities[6]	0.2	1.0	2.6
TOTAL NETWORK	*67.6*	*201.2*	*454.8*

[1]For on-road bicycle facilities, total miles represent roadway centerline miles with bicycle facilities (e.g., bicycle lanes on both sides of the roadway are not counted separately).

[2]Short-term bicycle facilities include existing and short-term projects scheduled for 2007-2009.

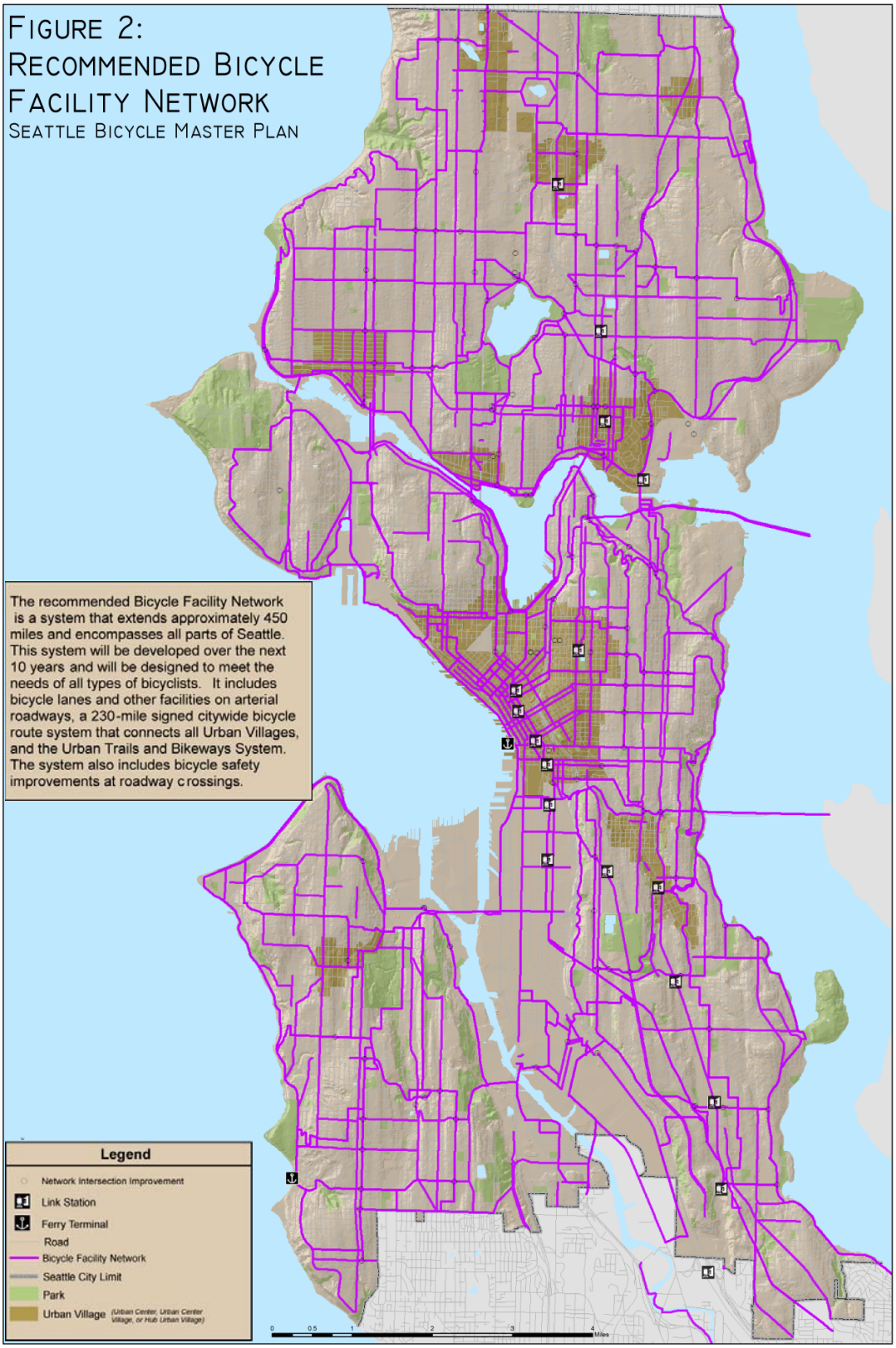
[3]Total recommended miles include the existing, previously planned, short-term categories, as well as other medium- and long-term recommendations in the 10-year timeframe, 2007-2016.

[4]Other on-road bicycle facilities include wide outside lanes, edgelines, paved shoulders, and peak hour bus/bicycle only roadways. Key corridors for short-term study and corridors where an improvement is needed, but the facility is unknown are also counted in this cateogry.

[5]Signed local street connections include shared roadways with bicycle route signs but no other designated bicycle facilities. The recommended Signed Bicycle Route System is approximately 234 miles, including 50 miles of bike lanes/climbing lanes, 32 miles of shared lane pavement markings, 14 miles of bicycle boulevards, 7 miles of other on-road bicycle facilities, 47 miles of multi-use trails, 2 miles of other off-road facilities, and 82 miles of non-arterial streets without any other type of bicycle facility.

[6]Other off-road bicycle facilities include sidepaths, one-way bike-on-sidewalk pairs, and pedestrian/bicycle-only bridges.

Figure 2. Recommended Bicycle Facility Network (see next page)



A Network to Meet the Needs of Different Types of Bicyclists

The proposed Network includes a variety of facility improvements that respond to the many different issues faced by bicyclists. Some parts of the Network will be located along independent corridors that are separated from roadways. Other parts of the network will require motorists and bicyclists to coexist in the same right-of-way. Even among "on-road" bikeways, there are a variety of different design treatments that will be used, depending on whether the roadway is a quiet neighborhood street versus a busy arterial street.

"I like to bicycle on arterial roads because they are most direct." —Seattle resident

"I would love to bike to the store and to other errands, but the traffic, even here in West Seattle, scares me. Also I have two small children, and I really don't want to jeopardize them…I really like the idea of making bike boulevards on quiet residential streets." —Seattle resident

"I generally ride 17 to 20 miles per hour, and appreciate on-street facilities that don't force me into being a pedestrian or make me stop all the time." —Seattle resident

There are important reasons for providing a mix of bicycle facility types:

- Seattle is a built environment with a finite number of corridors that can accommodate multi-purpose trails. Consequently, bicyclists need access to the roadway system in order to create an interconnected system and to be able to reach all desired destinations.

- Different types of bicycle facilities are appropriate in different situations, depending on surrounding land use characteristics, available right-of-way space, traffic volume, traffic speed and composition, on-street parking, roadway grade, etc.

- Depending upon an individual bicyclist's level of experience, some types of bikeways are preferred over others. For example, new bicyclists tend to prefer off-road multi-purpose trails and quiet neighborhood streets. More experienced bicyclists usually prefer on-road bicycle facilities such as bike lanes, wide curb lanes, paved shoulders, etc. Sometimes, more experienced bicyclists avoid using trails because they are crowded with other users.

For these reasons, the Bicycle Facility Network is composed of a variety of different facility types that can realistically be implemented and will appeal to bicyclists with varying levels of experience.

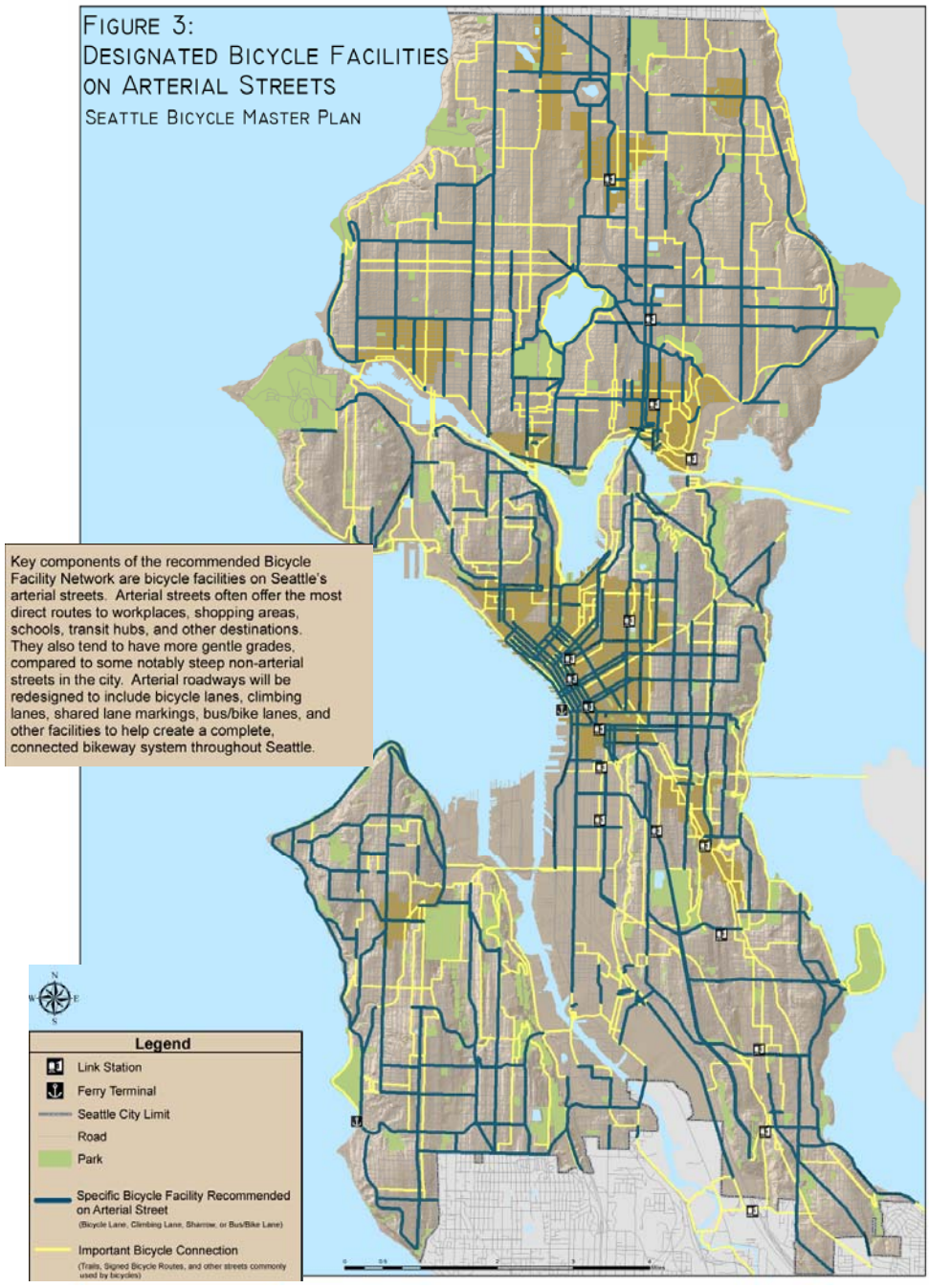
Action 1.1: Provide bicycle facilities on designated arterial streets.

Seattle's arterial streets offer the most direct routes to workplaces, shopping areas, schools, transit hubs, and other destinations. They also tend to have gentle grades, compared to some notably steep non-arterial streets in the city. A lack of bicycle facilities on the city's arterial street system prevents more people from making trips by bicycle and makes conditions less comfortable for bicyclists now. This action helps to fulfill Seattle's Complete Streets policy by ensuring that safe and comfortable bicycle travel is facilitated.

Bicycle lanes have already been striped on 25 miles of Seattle streets.

This Plan recommends bicycle lanes or climbing lanes on 143.3 miles of arterial roadways throughout Seattle. In addition to bike lanes or climbing lanes, the city will implement other types of on-road bikeways, including shared lane markings, paved shoulders, shared bus-bike lanes, and other facilities. In total, designated bicycle facilities are recommended on 295 miles of arterial roadways in the city (see Figure 3: Designated Bicycle Facilities on Arterial Streets). Facility types are defined in Appendix E: Bicycle Facility Descriptions.

Figure 3. Designated Bicycle Facilities on Arterial Streets



As a part of the detailed analysis that was completed during this Plan, typical roadway cross-sections were developed that indicate the proper placement of bicycle facilities in a variety of roadway design configurations. Appendix F: Guidance for Retrofitting Seattle Streets to Create Dedicated Bicycle Facilities provides illustrations, photographs, and lists of considerations for incorporating bicycle facilities in common curb-to-curb roadway cross-sections in Seattle.

There are several roadways in the city where the existing bicycle lanes have less than the optimal width (e.g., sections of Dexter Avenue N, Martin Luther King, Jr. Way S, 12th Avenue E). These locations will be improved with the new types of treatments

identified on the Recommended Bicycle Facilities Map and in Appendix F (e.g., narrow existing travel lanes to provide more space for bicycle lanes, utilize climbing lanes and shared lane markings, post "Look for Bicycles" when opening doors signs near parking regulation signs, etc.).

Shared lane markings have been installed on S Jackson Street.

Climbing lanes have been installed on E Union Street to allow slower bicyclists riding uphill to be in a bicycle lane and encourage faster bicyclists riding downhill to move further from parked cars and share the travel lane.

Action 1.2: Complete the Urban Trails and Bikeways System.

The Urban Trails and Bikeways System was originally adopted as the "Urban Trails System" in the SDOT Transportation Strategic Plan (2005). This system provides a spine network of high-quality bicycle facilities, many of which are on separated rights-of-way from motorized traffic. A map of this system is included in the existing conditions report (see Figure A.6: Urban Trails and Bikeways System on next page). SDOT should complete the Urban Trails and Bikeways System, as it includes a number of key components of the Bicycle Facility Network, such as completing the Burke Gilman Trail missing links, the Chief Sealth Trail, gaps in the Duwamish Trail system, the Interurban Trail bicycle boulevard, the Ship Canal Trail extension, the Mountains to Sound Greenway Trail between the I-90 Trail and Downtown Seattle, and the SR 520 Trail and its connections to Eastlake Avenue , Lakeview Avenue, Montlake Avenue, and Melrose Avenue.

Seattle currently has approximately 40 miles of multi-use trails.

Wherever possible, the City will preserve the maximum amount of green space when a trail corridor is developed and will add trees and landscaping to existing trail corridors (except for utility corridors).

This Plan recommends changing the name of this previously-adopted system from "Urban Trails System" to "Urban Trails and Bikeways System" to improve public understanding that the system utilizes some facilities other than multi-use trails, including sidewalks for pedestrians and bicycle boulevards and streets with bicycle lanes for bicyclists. This name change should be reflected in all future Seattle documents.

Figure 4. Urban Trails and Bikeways System

Action 1.3: Install a Signed Bicycle Route System.

The Bicycle Facility Network map identifies approximately 234 miles of signed bike routes that link all major destinations in Seattle. The signed route system will be a trunk route network connecting major destinations throughout the city. Appropriate sign design and placement will be critical to the success of the signage program. Signage for one to two routes will be tested in the short term after the Plan is adopted. Based on the results of this pilot program, the remainder of the network will be implemented. As new bicycle route signs are installed on each route, outdated signs will be removed. Signs should be catalogued and replaced immediately if missing or damaged.

The Signed Bicycle Route System will provide:

- Connections between Seattle's Urban Villages
- Signs directing bicyclists to all new Sound Transit rail stations
- A signed bicycle route within ¼ mile of 72 percent of Seattle's schools
- A signed bicycle route within ¼ mile of 88 percent of Seattle's parks

This important subset of the Bicycle Facility Network includes local routes that connect key parks, transit stations, urban villages, schools[2], and other destinations within the City of Seattle as well as regional routes that connect Seattle with other communities in the Puget Sound Region. These routes will indicate locations where bicycling conditions are favorable and which connect directly to major destinations throughout the city. Names of major activity centers (e.g., Urban Village Centers, other transportation hubs, and regional parks) will be the specific destinations listed on the bicycle route signs (see the major activity center names on Figure 1: Major Bicycle Destinations and Key Bicycle Corridors). The signed bicycle routes will also draw attention to bicycling as an efficient form of transportation (see Figure 4a: Recommended Signed Bicycle Route System on page 24).

Bicycle route signs will be installed to connect Urban Villages throughout Seattle. They will also show bicyclists how to access nearby destinations.

Signed bicycle routes utilize multi-use trails, bicycle boulevards, non-arterial roadways with low traffic volumes and speeds, and low-volume arterial roadways with bicycle lanes.

This bicycle boulevard in Berkeley, CA is designated by both signs and pavement markings. (Photos by Michael Moule)

The system currently includes 18 miles of planned bicycle boulevards. Bicycle boulevards are non-arterial streets that are designed to allow bicyclists to travel at a consistent, comfortable speed along non-arterial roadways and to cross arterials conveniently and safely. Other non-arterial roadways in the signed bicycle route system could also be developed into bicycle boulevards in the future because they are already comfortable for a wide range of bicyclists. The following actions should be considered in order to develop a typical non-arterial street into a bicycle boulevard:

[2] *Signed connections from the trunk bicycle routes to schools will require detailed study and are beyond the scope of this Plan. Many signed bicycle routes between the recommended trunk routes and schools as well as school walking routes may be identified through the Pedestrian Master Plan process.*

- Install pavement markings and signs to indicate that the roadway is a bicycle boulevard.
- Provide safe and convenient arterial crossings using traffic signals or other geometric improvements.
- Use traffic control or traffic calming to reduce conflicts with other non-arterial cross-streets.
- Slow motor vehicle traffic on the bicycle boulevard using traffic calming treatments.
- Limit the amount of motor vehicle traffic on the bicycle boulevard by managing traffic movements in the surrounding area.

The complete signed route system will utilize many roadways and multi-purpose trails that are already excellent places to ride, but it also includes several locations that should be improved prior to being designated. It will be particularly important to address safety concerns in locations where signed bike routes cross busy roadways. In some cases, a temporary detour may be appropriate. When partial or temporary bicycle routes are signed, they should have logical endpoints that allow the bicyclists to continue on their journey.

"Make sure that the City of Seattle works closely with King County Parks and other regional jurisdictions on trail system connectivity and standard signage." --Seattle resident

There will also be many feeder streets that connect between the trunk network and important local destinations, such as transit stations, schools, and commercial districts. Signs will be posted throughout the city to direct bicyclists to the trunk bicycle routes. Pavement markings may be used to supplement signs in some locations. Guidelines for the design and placement of signs and markings are provided in Appendix G: Bicycle Route Signage and Wayfinding Protocol.

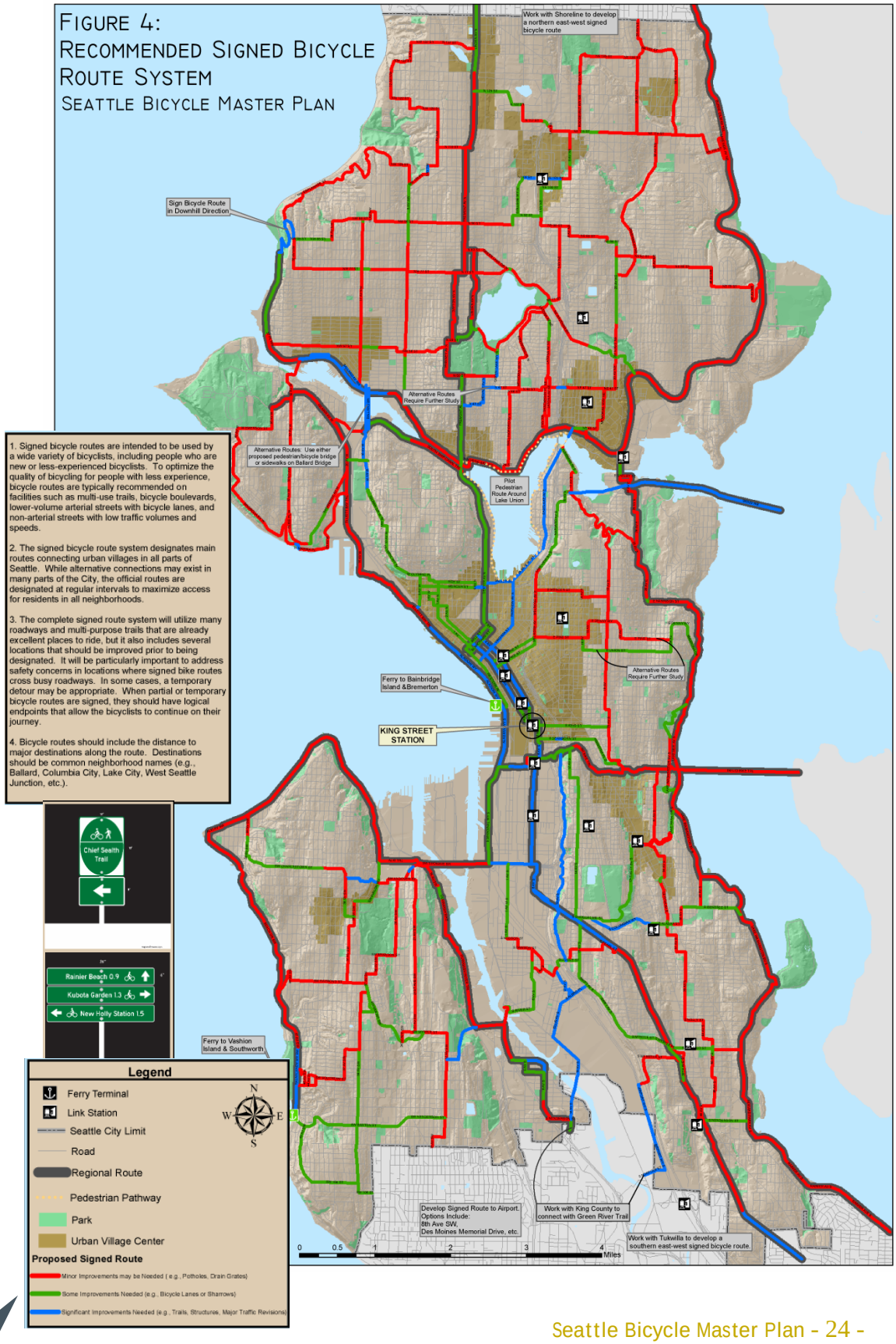
Action 1.4: Improve bicycle safety and access at arterial roadway crossings.

Improvements are needed at arterial roadway crossings in the Bicycle Facility Network to provide bicyclists with continuous, safe routes between destinations. Seattle has a number of streets that carry high-speed, high-volume traffic, such as 15th Avenue NW and Rainier Avenue S. Many other arterial streets are also challenging to cross, particularly during peak travel periods. In order to make it possible for bicyclists to travel throughout the city, there needs to be opportunities to cross major streets. Recommended improvements include treatments such as traffic signals, median crossing islands, curb extensions combined with signs, and/or markings (see crossing improvements on North Seattle and South Seattle Bicycle Facility Recommendations Maps—separate documents). These crossings must also be safe and accessible for pedestrians.

Space is limited for bicyclists waiting to cross W Nickerson Street to the Fremont Bridge.

A bicyclist uses an existing pedestrian crosswalk signal to cross Stone Way N.

Figure 4a. Recommended Signed Bicycle Route System



While the recommended facility network map (see folded in binder) identifies many critical needs, it does not represent a complete inventory of the city's intersections. The city should evaluate the Bicycle Facility Network for other potential bicycle crossing improvements. The first priority will be to improve intersections where existing bicycle facilities cross arterial roadways. Other key crossings should be considered as each new segment of the bicycle network is implemented. In addition, all future roadway improvement projects should address bicycle crossing needs as a routine part of the design process. Specific design guidelines for bicycle crossing improvements are provided in Appendix H: Roadway Crossing Design for Bicycles.

A median crossing islands helps bicyclists on the Burke-Gilman Trail cross 30th Avenue NE.

Action 1.5: Improve complex corridors and focus areas in the Bicycle Facility Network.

Bicycle improvements are proposed in a number of complex corridors and focus areas throughout the city (e.g., areas with right-of-way constraints, potential conflicts between multiple user groups, and multiple alternatives for providing bicycle facilities). In some cases, several alternative design treatments have been proposed to address the complex issues along these routes. The alternative that is ultimately chosen will depend on a variety of factors, including additional design development, cost, public input, trade-offs among other modes of transportation within the same corridor, or future development projects that provide new opportunities to improve bicycling conditions.

Eastlake Avenue E is a critical connection between the University of Washington and Downtown Seattle. Further study is needed to improve bicycle conditions on this roadway.

In other portions of the Network, one type of bicycle facility is proposed in the short term, but a different facility is proposed in the future when a roadway or bridge reconstruction project occurs or when bicycle demand increases.

For routes in the Network where complex issues are at play, circled numbers are included on the Bicycle Facilities Recommendations Map that correspond with a more detailed explanation in Appendix I: Bicycle Facility Recommendations for Key Corridors and Focus Areas.

Action 1.6: Make key operational improvements to complete connections in the Bicycle Facility Network.

There are many spot locations in the Bicycle Facility Network where bicycle access should be improved by making changes to roadway operations. The following is a list of general operational improvements that will be made by the city to complete bicycle connections:

Supplement "Dead End" and "Do Not Enter" signs, as appropriate, to indicate that bicycle and pedestrian access is allowed. Add the words "Except Bicycles and Pedestrians" (or other indication that bicycle and pedestrian access is permitted) to "Dead End" and "Do Not Enter" signs that only apply to motor vehicles. Many of these streets should only prohibit access to motor vehicles because they often lead to connector paths for bicyclists and pedestrians. Examples of locations for this improvement include:

- 25th Avenue S and S Massachusetts Street
- S Henderson Street at access to short Duwamish Trail segment at 10th Avenue S
- 17th Avenue S, 18th Avenue S, and 19th Avenue S to I-90 Trail
- 20th Avenue NE at Ravenna Park
- 17th Avenue NW to connector trail between NW 88th Street and NW 90th Street
- Melrose Avenue E and Melrose Connector Trail

Redesign traffic diverters to allow more convenient bicycle access. The city should redesign traffic diverters to accommodate the pass-through of bicycles. This includes providing curb cuts of adequate width (meeting ADA and AASHTO guidelines). Example locations where diverters should be improved for bicycle access include:

- 42nd Avenue S and S Morgan Street
- E Republican Street and 17th Avenue E
- Broadway E and E Edgar Street

A bicycle-only left-turn pocket has been provided in the median at the intersection of 8th Avenue NW and NW 77th Street to help bicyclists cross 8th Avenue NW.

Provide bicycle turn pockets at key intersections. Left-turn pockets allow bicyclists to wait in a designated space for a gap in traffic before turning left. These pockets are particularly beneficial on roadways with relatively high traffic volumes and significant bicycle turning movements. Locations with raised medians provide good opportunities to add pockets. A bicycle left-turn pocket is currently used at 8th Avenue NW and NW 77th Street in Seattle.

Improve bicycle access at pedestrian crosswalk signals. The design of pedestrian crosswalk signals should be changed in order to improve their convenience for bicyclists. Many of the pedestrian crosswalk signals that have been installed to improve arterial roadway crossings are difficult for bicyclists to use because they must dismount and become pedestrians in order to use the push button and receive the WALK signal. Further, crosswalks with pedestrian signal heads are provided only on one side of the street at these crossings. Therefore, bicyclists crossing from one side of the roadway cannot use the signal without crossing to the opposite side of the street. In order to improve bicycle access, SDOT has established a program to test installing signals and crosswalks on both sides of non-arterial roadways at selected intersections with pedestrian crosswalk signals. Motorist movements at these intersections are also restricted to left- and right-turns only to prevent cut-through traffic. At these intersections, detection is needed for bicyclists in locations that can be accessed from the street. This detection should be *in addition to* accessible pedestrian push buttons that are provided for pedestrians. Currently, push-buttons for bicyclists are acceptable on non-arterial streets. As technological improvements increase the accuracy and feasibility of electronic bicycle detection methods (e.g., video, inductive loops, infrared, etc.), they will be preferred.

"Most often crossing light activation buttons cannot be reached by a person on a bike. Buttons or electronic detection (in the case of arterial streets) should be placed in locations that are conducive to a safe and convenient crossing for all users." --Seattle resident

Change the timing of traffic signals to accommodate bicyclists.

Traffic signal timing should consider all modes including bicycling. Therefore, all traffic signals should facilitate safe bicycle crossings. This includes providing a minimum green time and a minimum yellow time to ensure that bicyclists are able to clear intersections, per the AASHTO *Guide for the Development of Bicycle Facilities* (1999 or latest edition). This is critical on the Signed Bicycle Route System. Signal timing changes must also be coordinated with transit on Urban Village Transit Network Roadways. It is important to ensure that adjusted signal timing for bicycle crossings also facilitates safe pedestrian crossings.

Lack of detection on the street requires bicyclists to cross on the sidewalk.

Explore new technologies to detect bicyclists at traffic signals.

In the future, explore new detection technologies such as infrared or video sensors that can tell the difference between bicycles and motor vehicles. This can help improve bicycle detection at actuated signalized intersections and make it possible to detect bicyclists at pedestrian crosswalk signals.

A bicycle box has been installed on N Roy Street to help bicyclists make left turns onto Queen Anne Avenue N.

Explore innovative timing and designs for bicycles at traffic signals.

This includes modifying pedestrian crosswalk signals to have separate push-buttons or sensors to detect bicyclists, pedestrians, and motor vehicles. This allows the traffic signal to stop arterial traffic for a shorter amount of time for bicyclist crossings than for pedestrian crossings. Separate crossing signals are provided for bicycles and pedestrians at these intersections. The City of Tucson, AZ has successfully used this signal design. Bicycle boxes should also be considered at signalized locations with high numbers of left-turning bicyclists (e.g., Roy Street at Queen Anne Avenue N). The design of all types of traffic signals should not confuse pedestrians and should comply with the Americas with Disabilities Act.

This bicycle box is in Victoria, BC. The color green will be used for bicycle boxes in Seattle.

Improve bicycle accommodations on bridges.

Bicycle accommodations on bridges need to be improved as well as on their approaches and access ramps. In the short term, bicycle access should be improved using signage, marking, maintenance, and other spot improvements. In the long term, bridges should be replaced with new facilities or retrofitted with facilities that provide full bicycle access (e.g., bicycle lanes or wide sidewalks - minimum 10 feet wide). Bridges are critical for providing bicycle connectivity throughout Seattle. Critical bridges for bicyclists include:

- Ballard Bridge
- 14th/16th Street Bridge
- Montlake Bridge
- Fremont Bridge
- Aurora Bridge
- West Seattle Low Level Bridge
- All bridges across I-5

Explore the possibility of using "Bicyclists Allowed Use of Full Lane" signs. These signs should be considered in high-traffic areas, such as Downtown Seattle, to remind motor vehicle drivers of the legal right of bicyclists to use the roadway. Guidelines for use of these signs, including number of travel lanes, speed limits, and other roadway factors will need to be developed. The signs have been used in San Francisco.

"Bicyclists Allowed Use of Full Lane" signs have been installed in San Francisco.

Explore the possibility of using "Share the Road" with bicycles signs. There are places where "Share the Road" signs may help alert motorists to the presence of bicyclists. For example, these signs could be posted in the Elliott Avenue W and 15th Avenue W corridor.

Continue to provide alternative bicycle access during road or trail construction projects. Detour routes for bicyclists should continue to be provided as a part of all construction projects that affect bicycle access, regardless of whether or not the roadway is in the Bicycle Facility Network.

"Detours must be created with the safety of the cycling community as well as cars and trucks in mind."
—Seattle resident

Allow bicyclists to use public hill-climb assists. Bicyclists should be allowed to use public hill-climb assists, such as elevators and escalators that are incorporated into buildings and other structures in areas with steep terrain. Opportunities for elevators are limited, but may be useful for improving access in a few parts of the Bicycle Facility Network. For example, bicyclists will be allowed to utilize the elevators that will serve the Beacon Hill light rail station to avoid major hills in the area.

"Provide advance green for bike crossings along with bike boxes at lane heads especially in high-traffic, high-bike-density areas." --Seattle resident

Investigate potential improvements for bicycle access through the Seattle Pedestrian Master Plan. SDOT will develop a Pedestrian Master Plan in 2007-2008, and this Plan is an appropriate place to examine several issues related to bicycle access. These issues include:

- Pedestrian crosswalk signal design (i.e., improve access for both pedestrians and bicyclists).
- Curb ramp design (For multi-use trails, curb ramps will be as wide as the width of the trail. For standard sidewalks that are commonly used by bicyclists, further evaluation is needed for curb ramp design).
- Additional locations for pedestrian pathways with bicycles permitted (e.g., potential pathways through parks, improvements to stairs).
- Designation of street sections for bicycle and pedestrian use only.

Action 1.7: Provide wayfinding guidance through complicated connections in the Bicycle Facility Network.

Wayfinding signs and pavement markings should be provided to help bicyclists navigate through complicated sections of the Bicycle Facility Network (in addition to official Signed Bicycle Routes). There are a number of locations in the city where it is necessary to use non-arterial streets, alleys, or sidewalks to connect between existing or proposed bicycle facilities. While many of these complicated connections are

Pavement markings can help guide bicyclists along complicated routes.

shown on the Seattle Bicycling Guide Map, there are currently no signs or markings along the actual connection to facilitate wayfinding. The city will install a combination of signs and markings to guide bicyclists through these connections. Examples include:

Signage and pavement markings will be added to improve wayfinding along the West Seattle Low Level Bridge.

- The connection between the existing bicycle lanes on Delmar Drive E and the existing multi-purpose trail on the southwest side of the Montlake Bridge.
- Connections to the I-90 Trail.
- Connections to the Magnolia Bridge.
- Connections from neighborhood streets in West Seattle to the Low Level Bridge Trail.
- Connections from northeast Seattle neighborhoods to the Burke-Gilman Trail.

Action 1.8: Improve the quality and quantity of bicycle facility maintenance. Bicycle facility maintenance will be improved by establishing clear maintenance responsibilities and continuing to involve the public in identifying maintenance needs. Maintenance agreements between SDOT and other city agencies should be renegotiated to take advantage of the strengths of each agency. In addition, there are also opportunities to utilize volunteers to assist with some maintenance tasks. These actions will improve the efficiency and quality of bicycle maintenance in the city.

Renegotiate the 1987 maintenance agreement between SDOT and Seattle Department of Parks and Recreation (DPR). The maintenance agreement should be updated to reflect the many new facilities that have been completed. The renegotiated agreement should continue to divide maintenance responsibilities along the same lines as in the past, i.e., DPR will be primarily responsible for trails that also serve as linear parks or greenways; SDOT will be primarily responsible for other trails. The SDOT Street Maintenance Division should be part of the team that renegotiates this agreement.

Negotiate a maintenance agreement between SDOT and Seattle City Light on maintenance of trails in utility corridors. The maintenance agreement should build on the principles agreed to in previous agreements to construct trails in City Light rights-of-way. The SDOT Street Maintenance Division should be part of the team that negotiates this agreement.

Encourage bicycle organizations and other community groups to assist with minor maintenance activities. The city will work with bicycle organizations, community groups, civic organizations, and businesses to provide periodic upkeep along trail corridors and bicycle facilities on bridges. This will help improve bicycle facility safety, reduce maintenance costs, and build goodwill with neighborhood residents.

"It is all well and good to create bike lanes and wide shoulders. If they are full of debris and unsafe, it's worse than if they weren't there...keep them clear." –Seattle resident

Continue to respond to citizen complaints and maintenance requests. The current Bike Spot Safety program accepts maintenance complaints and requests from citizens. It uses these requests to make short term improvements and to set maintenance priorities. SDOT should continue and expand this program to identify problems that need immediate attention, to identify recurring problems at particular locations, and to set major maintenance priorities.

Routine maintenance is needed to control vegetation along trails.

Consider different types of weather conditions when developing and maintaining bicycle facilities. Weather and seasonal issues will be considered in the development and maintenance of bicycle facilities within reasonable limits. For example, slip-resistance will be a factor considered in the selection of pavement markings for bicycle facilities, and roadway and trail sweeping may be done more frequently in the fall when leaves can cover some facilities. Drainage will also be addressed in the design of all bicycle facilities.

If bicyclists notice glass or debris on a roadway, they should report it promptly to SDOT, either by calling the Street Maintenance Dispatcher at (206)386-1218 or by filling out a request online at http://www.seattle.gov/transportation/potholereport.htm so that SDOT can clean it up.

The tables below provide general guidance on the frequency of multi-purpose trail and on-road bicycle maintenance activities, though maintenance needs will vary for different types of facilities and different locations (see Table 3 and Table 4). SDOT, Seattle Public Utilities, and Seattle Department of Parks and Recreation are responsible for specific activities.

Table 3. Multi-Purpose Trail Maintenance Activities[a]

Activity	Spot Maintenance	Routine Maintenance
Improve drainage	• Unplug individual drains (Seattle Public Utilities). • Repair trails after land slides.	• Clean all culverts, catch basins, and drainage structures on a regular schedule as needed (Seattle Public Utilities).
Trim vegetation	• Cut or remove vegetation that falls or grows onto trails (Seattle Public Utilities has certain responsibilities; other responsibilities will be established through agreement between SDOT and Seattle Department of Parks and Recreation).	• Trim all vegetation within 3 feet of either side of all trails up to 10 feet above the ground; trim additional vegetation to improve sight distances near intersections. (Responsibility to be established through agreement between SDOT and Seattle Department of Parks and Recreation.)
Replace pavement	• Fill potholes. • Remove surface irregularities.	• Replace pavement (every 10 to 20 years, but will vary significantly depending on conditions). • This Plan needs to be updated based on a sidewalk management system that will be used to estimate budget needs for pavement rehabilitation (scheduled to be completed in 2009).
Replace signs	• Replace missing or damaged warning, regulatory, or wayfinding signs.	• Replace signs based on manufacturer recommendations related to reflectivity and readability (every 15 to 20 years).
Inspect structures	• Address structural problems.	• Include trail structures in the same inspections schedule as all other structures in the city; if structure is deteriorating, it should be added to the citywide schedule for structure repair/replacement.
Clean trash and debris	• Enlist the help of bicycle and pedestrian organizations, neighborhood groups, and other	• A schedule needs to be developed for working with bicycle organizations and other groups on

	citizens to help clean broken glass and other sharp objects, loose gravel, leaves, and other debris.	trash and debris removal.
Provide adequate lighting	• Replace burned-out and broken lighting fixtures.	• Maintain lighting for trail-roadway crossings

a. The University of Washington owns and maintains the Burke-Gilman Trail between I-5 and NE 45th Street.

Table 4. On-Road Bicycle Facility Maintenance Activities

Activity	Spot Maintenance	Routine Maintenance
Sweep bicycle lanes and other on-road bicycle facilities	• Perform spot sweeping if debris collects in bicycle lanes after major rain storm. • Perform spot sweeping if sand is left in bicycle lanes after a snow/ice storm.	• Sweep bicycle lanes (two times per year). • Key roadways in the bicycle facility network that experience a large amount of debris should be given consideration for higher frequency sweeping. • If adjacent travel lanes are swept mechanically, sweepers should reach as close to the curb as possible and make sure material is not deposited in the bicycle lanes.
Repair and replace pavement	• Fill potholes. • Remove surface irregularities.	• Resurface bicycle facilities as a part of street repaving projects. • Give consideration to repaving Bicycle Facility Network streets more frequently (include bicycle facilities as a factor in determining the city repaving schedule).
Improve drainage	• Unplug individual drains (Seattle Public Utilities).	• Include bicycle facilities in all routine roadway drainage improvements.
Replace signs	• Replace missing or damaged warning, regulatory, or wayfinding signs.	• Replace signs based on manufacturer recommendations related to reflectivity and readability (every 15 to 20 years).
Replace pavement markings	• Replace faded or damaged pavement markings that cause confusion for bicyclists or other roadway users.	• Conduct annual replacement program to replace bicycle pavement markings based on a regular basis, as needed. • Replace bicycle pavement markings when roadways are resurfaced
Ensure bicycle detection at traffic signals	• Respond to citizen complaints about loops that do not detect bicycles.	• Test sensitivity of inductive loops at each approach to all intersections in the city with actuated signals, including left-turn lanes, to ensure that bicycles can be detected.
Provide adequate lighting	• Replace burned-out and broken lighting fixtures.	• Lighting is evaluated on a spot basis.

Action 1.9: Fix spot maintenance problems on existing city streets and bikeways.

Making maintenance improvements on existing on and off road bicycle facilities should be given high priority. Spot improvements, such as removing of specific surface irregularities, filling seams between concrete pavement sections, and facilitating safe railroad crossings should be made on an as-needed basis (see Tables 3 and 4, above). SDOT should address these maintenance problems in conjunction with utility providers (e.g., utility providers may have responsibility for utility pole covers, steel plates, etc.). Public feedback is critical for identifying maintenance issues.

Widen congested trail segments. The city will apply the FHWA Shared Use Path Level of Service methodology[3] to congested multi-use trail segments to identify sections that are congested and should be widened. Special attention should be given to trail sections with high use by both pedestrians and bicyclists, since these two types of trail users have different speeds and characteristics. Trail widening is often a major capital project.

Remove unused bollard receptacles at trail entrances. Bollard receptacles at trail entrances that are no longer going to be used should be removed. These bollard receptacles are of special concern at night. The placement and design of bollards on trails should also avoid potential conflicts between different modes.

Fill seams between concrete pavement sections of streets. There are many streets in the city where the concrete seam is located at or near the most appropriate place for bicyclists to ride (typically on the right side of the outside travel lane near the on-street parking). This can create a problem, particularly for bicyclists with narrow, road bike tires. Several streets that have this issue are important connections in the city's bicycle network. In some cases, this seam is located in a marked bicycle lane. In the short-term, these seams should be filled on the most important streets for bicycle connectivity. As streets are repaved in the future, seams should be located away from where bicyclists would typically ride. Examples include:

- Renton Avenue S, south of Rainier Avenue S.
- W Emerson Street transition to Ballard Bridge access ramp.
- Montlake Avenue NE near Montlake Bridge
- E John St and E Olive Way from Bellevue Avenue E to 15th Avenue E.

This seam on Renton Avenue S is approximately one inch wide in some places.

"Please fix roads that have parallel gaps in the pavement. There are a lot of roads that are made of concrete with big gaps running parallel to traffic." —Seattle resident.

Make physical improvements to improve railroad crossings. Multi-purpose trails and roadways should be designed to allow bicyclists to cross railroad lines perpendicular to the rails (or as close to perpendicular as possible). This may include adding pavement to the roadway shoulder area, modifying

Inactive railroad tracks on Alaskan Way S where flange fillers have been used.

[3] *The FHWA Shared Use Path Level of Service methodology determines the level of comfort on a trail from a bicyclist's perspective. The model uses trail width, total number of users, and percentage of different user types to estimate the amount of delay that bicyclists will experience in passing other trail users.*

striping and markings, and posting warning signs. Flange fillers are another possible treatment to improve safety on rail lines that are still in place but no longer active. Top priorities for railroad crossing improvements should be along multi-purpose trails and signed bicycle routes, but all roadways should be designed to provide bicyclists with safe rail crossing opportunities.

Repave roadways that have poor pavement condition and provide critical connections in the Bicycle Facility Network. There are a number of roadways in need of repaving throughout the city. Several of these roadways are critical to the Bicycle Facility Network but currently have particularly poor pavement condition. Examples of important bikeway connections that should be repaved in the short-term include:

- Dexter Avenue N between Mercer Street and the Fremont Bridge.
- Montlake Avenue NE near the Montlake Bridge.
- Lake Washington Boulevard S.
- Beach Drive SW.
- Sand Point Way NE.
- Airport Way S.

Improve the quality of street surfaces by reducing the problem presented by steel plates. The city's Standard Specifications and Traffic Control Manual require that whenever steel plates are used, they are shimmed and textured with a no-skid surface to reduce slipping hazards. The locations of these plates should also be highlighted by paint so that bicyclists can prepare to cross them. Further, city inspectors are required to monitor the installation of steel plates by both city work crews and contractors to ensure that all plates meet these guidelines. Inspectors must adhere to this requirement and do rigorous inspections.

Remove drainage grates with drain openings parallel to the direction of travel. Grates will be replaced, as needed, when streets are repaved and bicycle facilities are added as part of Seattle's Complete Streets policy. Of particular importance are drain grates located in curb lanes without parking. Citizens are also encouraged to contact the Pedestrian and Bicycle Program with problem grates.

"Please emphasize clearing broken glass off of streets, sidewalks, and bike paths." --Seattle resident

Action 1.10. Prioritize bicycle facility development and maintenance to maximize the use and safety benefits of these investments.

Several factors will be considered to prioritize bicycle facility development and maintenance in accordance with the Transportation Strategic Plan. The bicycle improvements that will be made first will be those that serve high volumes of users, improve safety, are cost-effective, and improve geographic equity. Prioritization criteria will be developed and may include the following:

User volumes

- Improve conditions in corridors where there is high potential to increase bicycle trips
- Increase the connectivity and safety of the Urban Trails System, Signed Bicycle Route Network, and other parts of the Bicycle Facility Network

Safety

- Improve bicycle conditions (by providing facilities that make bicycle and motorists behavior more predictable) in areas with high numbers of police-reported crashes
- Improve bicycle conditions proactively in locations where there is a high potential risk of crashes

Cost-effectiveness

- Implement bicycle facilities as a part of other projects, such as roadway repaving and reconstruction
- Make improvements that have been identified as important bicycle facilities in previous plans
-

Geographic equity

- Provide facility connections in areas where bicycle lanes and trails are missing or disconnected
- Implement projects that have been identified as important bicycle facilities by the public

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Objective 2: Provide supporting facilities to make bicycle transportation more convenient.

This chapter describes the actions that will be necessary to improve support facilities to make bicycling efficient and convenient to all Seattle residents. In order for bicycling to be a fully viable form of transportation in Seattle, other programs and facilities are needed to complement the Bicycle Facility Network. This includes integrated bicycle and transit services, adequate bicycle parking at all destinations, showers at employment centers, convenient repair services, and coordination with a variety of other essential components of a multi-modal transportation system.

Connections between Bicycling and Transit

Consistent with the trend in other North American cities over the past twenty years, an increasing linkage has developed in Seattle and King County between bicyclists and transit agencies. While Seattle is served by a number of transit agencies, it is the relationship with King County Metro Transit (KC/METRO) and the newer regional Sound Transit agencies that most define the connection between bicycles and transit in the city. Details on the history of bicycle and transit integration in Seattle and opportunities for improving bicycle access to the KC/METRO and Sound Transit systems are discussed in Appendix J: Bicycle and Transit Integration in Seattle.

Approximately 10,000 bicycles were loaded on King County Metro buses per week throughout the region in August 2002.

Sound Transit TOTAL Access Policy
In 1999, Sound Transit adopted general policies guiding development of service supporting bicycle access to regional transit service. Based on a concept of TOTAL Access (see below), the policies are intended to ensure that the unique characteristics of bicycling and long-haul high-capacity transit are utilized in an efficient manner that accommodates an increasing number of trips accessed by bike.

"Sound Transit is committed to encouraging and providing bicycle access and has adopted a policy of total access for cyclists on transit vehicles and at stations."
--Sound Transit website

T: To the transit system
O: On the vehicles
T: Through and across barriers created by the system
A: At the stations
L: Low-cost, effective and efficient

The actions in this section describe how bicycle access can be improved through a number of transit initiatives. Strengthening the connection between bicycling and transit will increase the utility of both transportation modes in Seattle.

Action 2.1: Improve bicycle storage facilities at transit stations.

Bicycle parking improvements are needed at transit stations. This includes providing bicycle racks and lockers at existing transit stations and reserving adequate space during transit station construction to provide future bicycle racks and lockers. The following specific actions will be undertaken:

Provide sufficient space for bicycle storage at transit stations and multimodal hubs. SDOT will work with Sound Transit and KC/METRO to provide bicycle parking at existing transit stations and multi-modal hubs in downtown Seattle, such as Westlake, Colman Dock, King Street Station. These parking facilities should include both short-term and long-term parking and should meet the City of Seattle bicycle parking design standards. SDOT will help participate in the purchase of bicycle racks and lockers at these transportation centers. The PSRC studied transit hub locations in 2002 to determine bicycle parking demand, and this demand should be accommodated. Where space is limited, local transit agencies should consider the opportunities for high-capacity bicycle parking at stations. This type of facility utilizes space efficiently by allowing bicycles to be stacked on two levels.

Adequate bicycle parking at transit hubs will help increase the attractiveness of bicycling in Seattle.

Bicycle parking needs should be considered at heavily-used bus stops. This will require a separate study to determine if additional bicycle parking is needed at certain bus stops. This study could be conducted as a partnership between SDOT and KC/METRO.

Provide sufficient space for bicycle storage at future transit stations. As transit systems develop in the future, bicycle parking demand should be evaluated using the PSRC Regional BikeStation Project methodology to determine the amount of space that is needed for bicycle racks and lockers. Space for bicycle parking should be included in station designs from the onset of a project.

The Montlake BikeStation project, scheduled for completion in late 2007, will provide lockers for a total of 54 bicycles and rack space for 42 bicycles.

Action 2.2: Continue to fund and promote the use of staffed bicycle facilities.

SDOT and KC/METRO provide funding support for the BikeStation Seattle® transportation center on 3rd Avenue S in Pioneer Square. This facility provides support services to bicyclists, including secure, staffed bicycle parking and resources for repairs, maps, and other information. It is located near the King Street Transit Hub, making it easy for bicyclists to make trips by linking bicycling and transit. Additional locations for staffed bicycle parking stations have been identified by PSRC in conjunction with the city and local transit agencies – funding and implementation of these facilities should continue to be pursued.[1]

Bikestation Seattle® provides secure, staffed bicycle parking and other support services for bicyclists.

[1] *The Puget Sound Regional Council Destination 2030 (2001) early action strategy includes six commuter bicycle stations in the region. Two of these bicycle station locations are in the City of Seattle: the King Street Station and the Montlake Flyer stop on SR-520.*

Action 2.3: Improve bicycle access to transit stops, stations, and ferries.
SDOT, KC/METRO, and Sound Transit should increase efforts to work together in order to improve bicycle access to the transit system. This includes improving bicycle access to transit stops and stations, providing bicycle storage at stations, and accommodating bicycles on transit vehicles and ferries.

The new bicycle facilities that will be developed as a part of the Bicycle Facility Network will help improve the ability of bicyclists to connect to transit throughout the city. In particular, the signed bicycle route system recommended in this Plan includes connections from main bicycle routes to all existing and future Sound Transit light rail stations and other transit hubs. These bicycle facility improvements will increase accessibility within the catchment area for the transit system.

To complement this effort, coordination will be needed between SDOT and all local transit agencies to improve bicycle access and route information in order to make the transition between modes as seamless as possible. Specifically, the following actions are needed:

Integrate bicycle route information into transit route maps and signs. SDOT should partner with KC/METRO to distribute bike route maps at all locations where transit information is provided. Additionally, KC/METRO and SDOT should work together to develop wayfinding signs that provide information on nearby bike routes.

Improve bicycle access and egress to and from rail stations. SDOT should work with Sound Transit to improve bicycle access to trains in King Street Station and in other future rail stations.

Provide bicycle access in proposed streetcar corridors. The streetcar corridors under construction between Westlake Center and Lake Union include and intersect critical roadways for bicycle connectivity north of Downtown Seattle. As the city further develops its streetcar network, potentially with operations along the curb lane, there will be increased challenges for bicyclists to avoid the rail flangeway on these streets. Streetcar streets must be designed to facilitate bicycle travel in as safe a manner as possible. In addition, bicycles should be allowed on board streetcar vehicles so that bicyclists can bypass roadways with tracks. Where possible, on-road bicycle facilities should be incorporated into roadway redevelopment projects associated with streetcar development in South Lake Union and other locations.

Design roadways so that bicycles and bus transit co-exist safely and efficiently. Bikes and bus transit must be seen as compatible and not subject to design trade-offs. Bicycle lanes should not be removed under the assumption that this will improve bus service; if high-capacity transit is desired, a shared bus/bike facility should be considered. The E-3 Busway is an example where facilities for buses, light-rail transit, and bicycle and pedestrian access co-exist.

Improve bicycle access and egress to and from Washington State Ferry terminals. SDOT will strengthen efforts to further coordinate with Washington State Ferries. These efforts should:

- Improve bicycle access and egress to and from the Colman Dock Ferry Terminal when the electronic fare system is established. This includes providing designated bicycle waiting space and boarding space (e.g., striped lanes, pathways, and/or waiting areas to be used only for bicyclists). In addition, the loading procedure for bicycles could be modified to reduce conflicts between motor vehicles and bicyclists as they approach the loading area.

- Improve bicycle waiting areas and other facilities at the Fauntleroy Ferry Terminal to increase the safety and convenience of bicycle access and egress to and from ferries.

"One of the largest daily bicycle access points to Downtown Seattle is through Colman Dock—there are literally hundreds of bicyclists that use the ferry on a daily basis." – Seattle resident

Action 2.4: Accommodate more bicycles on transit vehicles.

In cities where transit service is fully integrated with bicycle travel, bicyclists are able to bring their bicycles on board transit vehicles in order to use them when they disembark at their destination. While Seattle has one of the more bicycle-accessible transit systems in the nation, growth in the popularity of this "Bike & Ride" service has led to the identification of new service and facility needs. Some options include installing high-capacity bicycle racks on buses, increasing bus service frequency, accepting bicycles on buses at more bus stops, allowing bicycles on board light rail vehicles, and improving bicycle access on ferries.

Install racks that can hold three bicycles on the front of all buses.

KC/METRO has installed bike racks on the front of all its buses, allowing two bicyclists to load their bicycles on the bus at the same time. However, two-bicycle racks are often filled during rush hours and on rainy days. KC/METRO and other bus companies serving Seattle have already begun to add capacity for bicyclists by installing racks with space for three bicycles on their buses. KC/METRO should also consider providing additional space for bicycles on board buses that are used in the proposed Bus Rapid Transit (BRT) system. This may be done by providing special buses with additional rack capacity or allowing seats to flip up and increase storage space for bicycles during times with low ridership. Local transit agencies should also consider allowing bicyclists to ride free on some heavily-traveled roadway corridors that do not have bicycle facilities.

King County Metro bus bicycle racks currently have room for two bicycles.

Increase the frequency of bus service in corridors where bicycle-on-bus capacity is perceived as a problem. Even with bicycle racks that hold three bicycles, some high-bicycle-use corridors may have filled racks during peak hours. Lack of space for bicycles on the bicycle racks can be mitigated if buses arrive more frequently. The Transit Now initiative adopted in King County may offer opportunities to increase the frequency of bus service in these corridors.

Facilitate safe and efficient bicycle loading onto transit vehicles in Downtown Seattle.

SDOT will work with KC/METRO to explore the possibility of allowing bicyclists to load their bicycles on buses within the Downtown Ride Free Area. While it may not be possible to allow bicyclists to load at all bus stop locations, there may be specific stops where bicycle loading can be permitted. Important considerations include bus headways, street slopes, and stop locations relative to bicycle facilities. In addition, safe and efficient bicycle access to Sound Transit vehicles should be facilitated in the Downtown Seattle Transit Tunnel. In all cases, signage should be provided to indicate when and where bicyclists may or may not load their bicycles.

Bicyclists may load and unload their bicycles at any KC/METRO bus stop, except within the Ride Free Area in downtown Seattle, between 6 AM and 7 PM. This is a safety policy to reduce the potential of cyclists being between two buses in heavy downtown traffic. Consideration should be given to modifying this policy to allow bicyclists to board at certain designated stops in the Downtown area.
(These could be stops located near bicycle route map kiosks.)

Accommodate bicycles on board Light Rail Transit and other regional transit vehicles. Sound Transit access policy for bicycles includes accommodating bicyclists on transit vehicles and at transit stations. This applies to Link light rail, Sounder trains, and Sound Transit Express buses. The existing Link light rail system requires bicyclists to remain with their bicycles at all times on board Link trains. Bicyclists may not block stairs or aisles. They must yield priority seating to passengers with disabilities or senior citizens. Train operators may require bicyclists to wait for the next train due to overcrowding. Sound Transit should continue efforts to develop on board facilities to secure bicycles on light rail vehicles and to make bicycle access safe, convenient, and reliable whenever possible.

MAX light rail cars in Portland, OR have designated space for hanging bicycles.

Continue to count and report bicycle-on-transit ridership. Bike-on-bus ridership should continue to be counted and recorded by KC/METRO with the purpose of tracking ridership growth over time. In addition, Sound Transit should begin to conduct bike-on-bus counts. The methodology used to count bicycles should count individual boardings. Bicyclist boardings should also be counted on a regular basis on the light rail system when service begins.

Approximately 10,000 bicycles were loaded on KC/METRO buses per week throughout the region in August 2002.

Improve bicycle access on the Washington State Ferry System. The city should work with Washington State Ferries to improve bicycle access on the ferries that serve Seattle. This includes providing racks, hooks, or other storage devices on the ferries to utilize space as efficiently as possible and to minimize risk of damage to bicycles and motor vehicles. SDOT should also work with Washington State Ferries to address issues related to bicycle loading and unloading.

Allow bicycles on streetcars. SDOT should work with local transit agencies to allow bicycles on board streetcars. Bicycles may be stored on the transit vehicles with bicycle hooks, bicycle racks, or in designated bicycle space.

Encourage the use of bicycle racks on taxis. Taxi companies are encouraged to install bicycle racks on their vehicle fleets to provide bicyclists with the option to use this private transportation service. This would extend the ability of bicyclists to reach destinations throughout Seattle.

Bicycle Storage

Bicycle parking facilities are currently provided by local agencies in response to public requests and through the development process. The city provides bicycle racks through the SDOT Rack Program, and local transit agencies provide bicycle lockers at several transit hubs. Short- and long-term bicycle parking facilities are also required by the Seattle Municipal Code based on the size and type of new developments. In general, short-term parking is provided in commercial areas and in front of public buildings where bicycles are usually parked less than several hours. Long-term parking is generally provided at workplaces, residential areas, and transit access points where bicycles are usually parked for a day or longer. The actions below should be taken to improve bicycle storage in Seattle.

Action 2.5: Increase the availability of bicycle parking throughout the city.

Secure bicycle parking located in close proximity to building entrances and transit entry points is essential in order to accommodate bicycling. Secure bicycle parking helps to reduce the risk of bicycle damage and/or theft.

SDOT's Bicycle Spot Improvement Program includes funding to provide bicycle racks on public property adjacent to commercial buildings, multi-family dwellings, and schools throughout the city. Through this program, racks are installed at the request of citizens, and business or property owners or managers (see Bicycle Rack Location Criteria on the following page). The Seattle Municipal Code requires a minimum number of bicycle parking spaces for different types of land uses. When new buildings are constructed or properties undergo other major changes, bicycle racks and lockers are included as a condition of development. Several strategies are needed to increase the availability of bicycle parking in Seattle.

City of Seattle Bicycle Rack Location Criteria

- *Racks are installed in public space within city of Seattle limits, usually on a sidewalk with six or more feet of clear sidewalk space remaining.*
- *Racks are placed at convenient, usable locations in close proximity to building entrances without impeding pedestrians.*
- *Racks are placed with adequate clearance from curb ramps and crosswalks, street furniture, driveways, and parked cars.*
- *Racks can be installed in bus stops or loading zones only if they do not interfere with boarding or loading patterns and there are no alternative locations.*
- *Racks on private property are usually paid for by the property owner. City racks are not available for purchase, but Bicycle Program staff can help property owners choose appropriate racks and installation locations.*

Continue to provide bicycle racks through the Bicycle Spot Improvement Program. Bicycle Spot Improvement Program funding should be increased so that more bicycle racks can be installed upon the request of citizens. In addition, this program should continue to be advertised through the bicycle program website, city brochures, and other sources to increase awareness of opportunities for installing new bicycle parking throughout the city.

Re-establish a proactive bicycle rack installation program. A proactive bicycle rack installation program should be re-established to provide additional bicycle parking in Urban Villages, particularly on commercial and high-density residential blocks of Urban Village areas. Schools, libraries, and community centers should also be targeted for bicycle rack installation. It will be important to work closely with adjacent property owners to make sure that racks are properly located and do not interfere with loading zones and other business related activities.

Strengthen legislation to require more bicycle racks and lockers as a part of new developments. Currently, the city's bicycle parking requirements are included in Title 23 of the Seattle Municipal Code. Changes to this code were made in December 2006[2] (see Appendix K: City of Seattle Bicycle Parking Requirements).

[2] *Land Use Code Ordinance 122311, Adopted December 21, 2006*

The Code requires a minimum number of off-street bicycle parking spaces to be provided by office, retail, hotel, and residential developments in the Downtown Area[3]. It also sets minimum bicycle parking requirements for a wide variety of land uses in other parts of the city.

The changes listed in Table 5 should be made to the Seattle Municipal Code bicycle parking requirements. Table 5 includes recommendations that are above and beyond the requirements of the current Land Use Code (updated in December 2006).

Table 5. Recommended Changes to Existing Bicycle Parking Requirements

Within Downtown Seattle	
Existing Requirement[a,b]	*Recommended Requirement*
Structures containing 250,000 square feet or more of office gross floor area shall include shower facilities and clothing storage areas for bicycle commuters. One shower per gender shall be required for every 250,000 square feet of office use.	Structures containing 100,000 square feet or more of office gross floor area shall include shower facilities and clothing storage areas for bicycle commuters. One shower per gender shall be required for every 100,000 square feet of office use.
Outside Downtown Seattle	
Existing Requirement[c]	*Recommended Requirement*
1 long-term bicycle parking space for every 12,000 square feet of medical service, eating and drinking establishment, general sales and services, and entertainment building floor area.	1 long-term bicycle parking space for every 4,000 square feet of medical service, eating and drinking establishment, general sales and services, and entertainment building floor area/1 long-term bicycle parking space for every 2,000 square feet of medical service, eating and drinking establishment, general sales and services, and entertainment building floor area in Urban Center or Station Area Overlay District.
1 long-term bicycle parking space for every 4,000 square feet of heavy sales and services building floor area.	1 long-term bicycle parking space for every 2,000 square feet of heavy sales and services building floor area/1 long-term bicycle parking space for every 1,000 square feet of heavy sales and services building floor area in Urban Center or Station Area Overlay District.
1 long-term bicycle parking space for every elementary school classroom.	4 long-term bicycle parking spaces for every elementary school classroom.
2 long-term bicycle parking spaces for every middle school classroom.	6 long-term bicycle parking spaces for every middle school classroom.
1 long-term bicycle parking space for every 4 units of multi-family housing.	4 long-term bicycle parking spaces for every 4 units of multi-family housing.
1 long-term bicycle parking space for every 20 residents at congregate residences.	4 long-term bicycle parking spaces for every 20 residents at congregate residences.

[a] *Existing requirements for Downtown Seattle reflect the Seattle Municipal Code adopted in April 2006.*
[b] *The Downtown bicycle parking regulations do not apply to the Pike Market Mixed Zone.*
[c] *Existing requirements for outside of Downtown Seattle reflect changes to the Seattle Municipal Code adopted in the commercial code section of the Land Use Code Ordnance 122311 (December 2006).*

[3] The Downtown bicycle parking regulations do not apply to the Pike Market Mixed Zone.

Continue to utilize the PSRC bicycle parking demand estimation methodology to determine the amount of bicycle storage needed at transportation facilities. Sound Transit currently requires space for at least 40 long-term bicycle parking spaces to be provided at all rail transit facilities. More bicycle parking can be required based on area bicycle volumes and travel patterns, topography, nearby residential and employment density, proximity to the Urban Trails and Bikeways System and other existing and planned bicycle facilities, projected transit ridership, etc. In 2002, PSRC developed a methodology to estimate the potential demand for bicycle parking at transit hubs. This methodology should be used to establish appropriate requirements for rail and bus transit hubs, major transfer points, BikeStations, and park and ride lots in the city.

Bicycle racks have been provided at the South Park Library.

Increase the amount of bicycle parking provided at public parks, schools, community centers, and libraries. SDOT will work with the Seattle Parks and Recreation Department, Seattle Public Schools System, and Seattle Public Libraries to ensure that adequate bicycle parking is provided at important public destinations. These destinations include city parks, schools, community centers, and libraries.

Consider installing covered, on-demand, longer-term bicycle parking. SDOT will work with local transit agencies and the Seattle Parks and Recreation Department to examine the possibility of installing covered, on-demand, longer-term bicycle parking. Public agencies do not need to administer this bicycle parking program. Unlike locker facilities, this type of bicycle parking facility also has the advantages of not needing to be rented, not requiring keys, and not being a potential receptacle for trash. Certain types of covered, on-demand bicycle parking facilities can be locked with a padlock provided by the bicyclist.

Provide incentives for operators of private parking facilities to add secure, high-quality bike parking. It will be important for the city and transit agencies to maintain bicycle racks and lockers[4] and use enforcement to deter misuse of these facilities. Abandoned bikes and locks can make existing racks unusable. Other racks can be obstructed by planters, news boxes and other street furniture.

"Required bicycle parking shall be provided in a safe, accessible and convenient location. Bicycle parking hardware shall be installed according to its manufacturer's instructions and the Seattle Department of Transportation design criteria, allowing adequate clearance for bicycles and their riders. Directional signage shall be installed when bike parking facilities are not clearly visible from the street or sidewalk. When any covered automobile parking is provided, all required long-term bicycle parking shall be covered. When located off-street, bicycle and automobile parking areas shall be separated by a barrier or painted lines."

--Seattle Municipal Code, 23.49.019

[4] *While the city will participate in helping to fund bicycle lockers, it does not currently manage or maintain bike lockers and is not likely to manage them in the future. Currently, only Metro provides lockers in the city.*

Action 2.6: Require office development and redevelopment projects to include shower and locker facilities.

The city should amend its development ordinance to strengthen existing requirements for shower and locker facilities based on employment densities (see Table 5, above, for specific recommendations). For employees who are considering bicycling to work, such facilities make it possible to shower and change into work clothes after the commute.

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Objective 3: Provide bicycle education, enforcement, and encouragement programs through partnerships.

Bicyclists waiting at the intersection of Dexter Avenue and Mercer Street.

The Bicycle Facility Network is designed to provide safe, convenient access for bicyclists to travel to destinations throughout Seattle. Like facilities for other transportation modes, this network of bicycle facilities must be used appropriately to be effective. For example, bicycle facilities are designed under the assumption that bicyclists ride the correct direction on streets and stop at red traffic lights. It is also assumed that motorists yield to bicyclists when turning and do not drive or park in designated bicycle lanes.

Therefore, it is not acceptable for bicyclists or motorists to disregard traffic rules. Breaking these laws puts bicyclists and other roadway users at risk and is inconsistent with the city's overarching goal of increasing safety. Efforts must be made to encourage, among motorists and bicyclists alike, a culture of respect and shared usage that welcomes new riders to Seattle's roads and trails. The education, enforcement, and encouragement programs recommended in this chapter are intended to help grow the number of bicyclists while also increasing safe and appropriate behavior by bicyclists and all other roadway users in Seattle.

Community partners can offer programs, such as this helmet workshop.

Bicyclist Rights and Responsibilities

Bicyclists have the legal right under Washington State law to travel on all roadways other than limited-access roadways (and other locations that are specifically signed to prohibit bicycle travel). Bicyclists share the same responsibility as drivers to operate safely and respectfully in the roadway environment and obey all traffic laws. The bicycle facilities recommended in this Plan are intended to improve bicyclist safety and increase the number of people who bicycle in Seattle. However, bicyclists are not limited to using roadways with designated bicycle facilities.

Bicycle Program Background

Bicycle education, enforcement and encouragement programs have been an important part of the bicycling experience in Seattle for many years. These programs have been implemented by various organizations and agencies in order to improve bicycle safety and encourage more bicycling throughout the city.

"Education of cyclists and drivers is also important. Many cyclists do not ride with consideration for the traffic laws, and many motorists are not aware of how to drive safely around bicyclists." --Seattle Resident

As the Bicycle Facility Network is built and more people are encouraged to bicycle, new programs will be needed to educate bicyclists and motorists about how to co-exist safely in the roadway environment. Drivers should be expected to treat bicyclists as legitimate users of the road and operate safely around bicyclists. Unsafe behavior by either bicyclists or drivers should be targeted through education and enforcement efforts. In addition, programs will be needed to promote bicycling as a fun, healthy form of transportation in the city.

Bicycle rodeos can teach children bicycle skills and good bicycling behavior.

As the agency responsible for planning, building, maintaining and operating Seattle's transportation infrastructure, SDOT is primarily focused on the "physical" elements of the Bicycle Network. However, the city recognizes that education, enforcement and encouragement programs are also essential activities in order to achieve the goals of this Plan. For that reason, this chapter addresses activities that are needed in order to support existing programs, as well as programs that will be needed in the future to support bicycle transportation in Seattle.

Partners for Bicycle Programs

Bicycle education, enforcement, and encouragement programs are offered by a wide variety of agencies and organizations in Seattle. Appendix L: Partners for Bicycle Programs lists a sample of some of the groups that either already have a role in providing bicycle programs for Seattle residents, or could make good partners for the city in the future.

"Strong efforts aimed at encouraging changes in travel behavior, and educating system users about basic safety and traffic laws, need to be made regularly to have an effect and create mutual respect among all roadway users. Successfully raising public and government awareness about the importance of bicycle and pedestrian transportation, as well as how to best implement regional and local networks and safely use them, will rely upon ongoing collaboration between citizen interest groups and government agencies."

--Regional Bicycle and Pedestrian Implementation Strategy for the Central Puget Sound Region

The actions listed below are recommended to improve bicycle education, enforcement and encouragement in Seattle.

Action 3.1: Educate Seattle transportation system users about new bicycle facility types.

The city will provide Seattle residents with information about the purpose of new bicycle facility treatments (e.g., bicycle boulevards, shared lane markings, etc.) and safe behaviors for using these facilities. SDOT will work with the Seattle Police Department (SPD) to educate users about the new facilities, including the following strategies:

- Develop web pages and disseminate information about each treatment.
- Install temporary orange warning flags, flashing lights, or cones at locations where new facilities are installed, where appropriate.
- Increase police patrols for a period of time as roadway users adjust their behavior after a new facility is installed.

Orange flags warn roadway users that 3rd Avenue is restricted to buses and bicycles only during rush hours.

Action 3.2: Promote bicycle and pedestrian education and encouragement in Seattle through partnerships with community organizations.

The city will contract with a team of organizations to offer bicycle and pedestrian education and encouragement programs in Seattle. While bicycle safety issues are important, these programs must also focus on pedestrian safety, including pedestrian interactions with bicyclists and motor vehicle drivers. These programs can be offered at community centers, libraries, schools, community festivals, and other public venues. For programs that target children, youth specific curricula and age-appropriate language should be used to explain concepts and safety issues. Key components of bicycle safety

education programs are included in Appendix M: Key Components of Bicycle Education Programs. Examples of services that could be offered through this program include:

- Hands-on bicycle and pedestrian safety training for children and adults.
- Bicycle commuter classes.
- Bicycle "ambassadors" at intersections in all parts of Seattle who can provide helmets and bicycle lights, assist with bicycle maintenance, and remind bicyclists about laws and safe behaviors.
- Media outreach to promote bicycling and increase awareness of bicycle safety, including billboards, direct mail, television and radio advertisements, etc.
- A "Share the Road" campaign to increase safe travel behavior and respect between all types of roadway users.
- Community rides in all parts of Seattle that are comfortable for less-experienced bicyclists
- Outreach to lower-income and minority populations that are typically under-represented in the Seattle bicycle community.
- "Drive with Care" campaign targeted to improve motorist behavior around bicyclists (similar to City of Chicago).
- Outreach through Seattle Public Utilities newsletters and bills.
- Work with businesses to develop programs that encourage their employees and customers to bicycle.

Bicycle ambassadors can provide helmets and bicycle lights, assist with bicycle maintenance, and remind bicyclists about laws and safe behaviors.

While contributing to bicycle and pedestrian programs within its own jurisdictional boundaries, the City of Seattle expects PSRC and other localities to contribute to a regional effort to improve bicycle safety. This regional effort should include education of pedestrians, bicyclists, and motorists; enforcement of laws related to pedestrians and bicyclists; and promotion of bicycling and walking as convenient transportation options. Bicyclists, motorists, and pedestrians are not confined to any particular jurisdiction, so all citizens in the region should receive these education, enforcement, and encouragement messages. In addition, the programs can be delivered more cost-effectively on a regional basis. For example, with a regional strategy, the organizations that provide hands-on bicycle and pedestrian safety training can use the same equipment in multiple jurisdictions. Billboards, brochures, and other media messages can also be produced in greater quantities at a lower unit cost if they are distributed regionally.

Example materials from StreetSmart, a public safety program of the District of Columbia, Maryland, and Virginia.

Action 3.3: Increase enforcement of bicyclist and motorist behavior to reduce bicycle and motor vehicle crashes.

The Seattle Department of Transportation will work with the Seattle Police Department to enforce laws that reduce bicycle/motor vehicle crashes and increase mutual respect

between all roadway users. This enforcement program will take a balanced approach to improving behaviors of both bicyclists and motorists.
Motorist behaviors that will be targeted include:

- Turning left and right in front of bicyclists.
- Passing too close to bicyclists.
- Parking in bicycle lanes.
- Opening doors of parked vehicles in front of bicyclists.
- Rolling through stop signs or disobeying traffic signals.
- Harassment or assault of bicyclists.

A motorist turning too closely in front of bicyclists is exhibiting dangerous behavior.

Bicyclist behaviors that will be targeted include:

- Ignoring traffic control (particularly traffic signals).
- Riding the wrong way on a street.
- Riding with no lights at night.
- Riding without helmets.
- Riding recklessly near pedestrians on sidewalks.

Wrong-way riding increases the risk of bicycle crashes and should be targeted through law enforcement efforts.

Bicyclist safety is a shared responsibility between all roadway users. Enforcement priorities should be established through a collaborative process involving SDOT, SPD, the Bicycle Advisory Board, the Bicycle Alliance of Washington, and the Cascade Bicycle Club.

Action 3.4: Support efforts to obtain funding for bicycle education and enforcement programs.

SDOT will work with local organizations to pursue additional funding for bicycle safety education and enforcement programs (see list of existing programs offered by local organizations in Appendix L: Partners for Bicycle Programs). By providing support to grants and other funding applications, the city can help organizations that conduct education and enforcement to increase their resources and reach more Seattle residents.

Action 3.5: Update and distribute the Seattle Bicycling Guide Map.

As new bikeways are added to the network over the next ten years, regular updates will be needed to the Seattle Bicycling Guide Map to ensure that bicyclists are aware of new routing options and to reflect changes in the bicycle route network. The maps can be distributed in paper form, be posted online as a .pdf document, and may also be used as the basis for a web-based bicycle route-finding program (see the following action). Similarly, agencies that produce regional bicycle maps and other information of interest to bicyclists should be encouraged to update information relating to Seattle bicycle improvement efforts. In addition, SDOT should work with transit agencies such as KC/METRO, Sound Transit, and Washington State Ferries to distribute the maps.

The Seattle Bicycling Guide Map will be used as a basis for developing an on-line wayfinding tool. For more information, visit our website at: http://www.seattle.gov/transportation/bikemaster.htm

Action 3.6: Develop an online bicycle route wayfinding program.

An online bicycle route wayfinding program should be developed by the PSRC, with support from SDOT, to help bicyclists determine preferred routes to destinations throughout Seattle and the Puget Sound Region. This program would allow bicyclists to enter their origin and destination and generate an optimal route to follow, given their experience level, time-sensitivity, willingness to ride on steep hills, or other potential factors.

This online program could also include tourist destinations, park amenities, transit access information, school locations, and other information that may be useful to bicyclists as it becomes available to integrate easily into a web-based format. The online .pdf version of the current Bicycling Guide Map is consistently one of the most visited web resources on the SDOT website, illustrating the significant demand for this type of program.

"Implement a computerized wayfinding program." -- Seattle resident

Action 3.7: Encourage bicycling by displaying bicycle route system maps in key Downtown and Urban Village locations.

Downtown Seattle and the Urban Village Centers are important hubs in the city's Signed Bicycle Route system. Many routes in the system connect bicyclists between neighborhoods to the Downtown Area. Downtown is an important destination for commuters, recreational bicyclists, tourists, and many potential bicyclists. In addition, the Signed Bicycle Route System connects all Urban Villages, so these key locations should have easy-to-understand information for bicycle wayfinding. Bicycle route system kiosks should be displayed at key locations in the Downtown area, Urban Villages, and other key destinations throughout the city such as along the Burke-Gilman Trail in Gas Works Park and at BikeStation Seattle®.

Action 3.8: Promote bicycling as an alternative to driving alone through Transportation Demand Management (TDM) Programs.

Bicycling should continue to be promoted as a non-polluting, healthy form of transportation through Transportation Demand Management (TDM) programs, such as Commute Trip Reduction programs, the SDOT Way To Go Program, and the Healthy Streets Initiative.

The Washington State Commute Trip Reduction (CTR) Law requires employers to work with employees to reduce the number and length of drive-alone commute trips made to the worksite. The city and SDOT support this law and encourage all commuters to use alternatives to driving alone to work. Employees are encouraged to ask their employers to take actions to improve bicycling as a part of their CTR programs, including:

- Provide bicycle parking facilities.
- Provide bicycle maps, brochures, and other promotional materials.
- Hold a "bicycle commute challenge" for employees who commute the most days by bicycle.
- Develop agreements with local bicycle shops to provide reduced price items for companies with CTR programs.

SDOT's Way To Go Program includes a variety of initiatives intended to improve livability by reducing automobile usage for non-work trips. Since improving conditions for bicycling will help achieve this goal, bicycling should be emphasized as a viable mode of travel in Way To Go initiatives, such as the Commuter Cash program and the One Less Car Challenge.

Action 3.9: Expand Safe Routes to Schools to encourage children to walk and bicycle to school.

The city should build on its existing efforts to work with the Seattle Public Schools, public health organizations, parent associations, and local walking and bicycling advocacy groups to develop safe bicycle and pedestrian routes to Seattle schools. These routes could be identified as a part of local Safe Routes to Schools programs and could be improved in conjunction with the implementation of the City of Seattle Pedestrian Master Plan.

Objective 4: Secure funding and implement bicycle improvements.

Implementation of this Plan will be a collaborative effort between a variety of city departments and agencies and several outside organizations. SDOT will lead this effort, so all SDOT staff should be aware of the Plan recommendations and seek to implement them as a part of their regular work. The SDOT Pedestrian and Bicycle Program will provide technical expertise on issues related to bicycling and ensure that implementation of the Plan moves forward.

Key divisions within SDOT for planning and implementing bicycle improvements include:

- Traffic Management
- Street Maintenance
- Capital Projects and Roadway Structures
- Major Projects
- Policy and Planning

Progress on implementing the Plan will be monitored on an annual basis with the goal of completing most of this Plan by 2016.

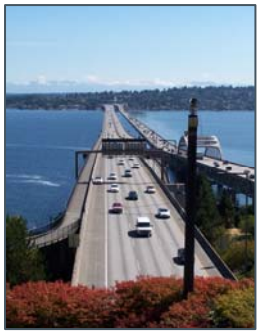
Every transportation project offers an opportunity to implement a piece of this Master Plan. Therefore, institutionalizing bicycle improvements will be essential for successful implementation of this Plan. Seattle's Transportation Strategic Plan states that bicyclists' needs should be considered in the planning, design, construction, and maintenance of all transportation projects in the city.

Action 4.1: Provide bicycle facilities as a part of all transportation projects.

In accordance with the City of Seattle's Complete Streets Policy, the city will to the maximum extent possible:

- Accommodate bicycles as a part of all new roadway projects.
- Provide bicycle facilities as a part of all bridge projects (replacement and major retrofit), on the bridge structure and on bridge access ramps and approaches.
- Incorporate requirements for bicycle facilities in the city Right-of-Way Improvements Manual, standard specifications, and standard plans.
- Actively seek opportunities to provide bicycle lanes, shared lane markings, and other on-road bicycle facilities as a part of repaving projects. (This includes roadways in the Bicycle Facility Network as well as other roadways.)
- Develop trails in conjunction with the installation of underground cable, water, sewer, electrical, and other public or private efforts that utilize or create linear corridors.
- Continue to develop trails in railroad corridors no longer needed for railroad purposes. Where appropriate, develop trails adjacent to trails (e.g. sections of the Elliott Bay and Burke Gilman Trails). Continue to develop trails along utility corridors (e.g. Chief Sealth Trail).

A bicycle lane was striped on Roy Street when the roadway was repaved.



The I-90 bridge trail was constructed as part of the bridge project. A similar trail will be provided on the SR-520 Bridge when it is replaced..

- Leverage other types of projects that could potentially include bicycle facilities (e.g., building construction, property redevelopment, utility maintenance, etc.).
- Provide special appropriations or funding to fill in key gaps in the Bicycle Facility Network.
- Fix potholes, surface hazards, sight distance obstructions, and other maintenance problems on a regular basis.

Routine accommodation of bicycles should also apply to Washington State DOT, Washington State Ferries, Port of Seattle, KC/METRO, and Sound Transit projects within the city.

City of Seattle Complete Streets Policy
Ordinance Number 122386, Adopted by Seattle City Council on April 30, 2007

Guiding Principle: 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.

Full text of the Complete Streets Policy is available online from the City of Seattle Legislative Information Service: http://clerk.ci.seattle.wa.us/~public/CBOR1.htm

Action 4.2: Dedicate funding for high-priority bicycle project planning and implementation.

The city should take advantage of existing funding provided through the general fund, "Bridging the Gap" initiative and other public and private sources, and dedicate portions of this funding to critical bicycle projects. Some of the most significant connections that are needed in Seattle, such as bicycle and pedestrian bridges and multi-purpose trails, will not be implemented through routine roadway repaving and reconstruction projects and will instead require an independently-funded capital improvement. In addition, there are a number of street retrofit projects that are important bicycle routes but hard to fund from traditional sources and in need of a separate, dedicated funding source. The city may be able to obtain funds for these projects by pursuing federal and state grants, seeking special appropriations or including them in future levy and bond initiatives.

Examples of these projects include (note that this list is similar higher-cost project list as provided at the beginning of Chapter 3):

- Re-construct Linden Avenue North between N 130th and N 145th Streets. with bike lanes, sidewalks and new pavement.
- Provide a bicycle facility connection between Downtown Seattle and the UW Campus via Eastlake Avenue N.
- Construct a Chief Sealth Trail Crossing of I-5 between S Spokane Street and S Lucile Street (and provide a trail on the east side of I-5 between the Chief Sealth Trail and the I-90 Trail).
- Construct the Burke-Gilman Trail section between 11th Avenue NW and 17th Avenue NW.
- Construct a new bicycle and pedestrian bridge across I-5 between Wallingford and the University District.
- Provide a bicycle facility connection between the I-90 Trail and Downtown Seattle.
- Construct multi-purpose trail connections from the SR 520 Bridge to the UW Campus and to

Funding should be set aside to extend the I-90 Mountains to Sound Greenway Trail into Downtown Seattle.

Downtown Seattle as a part of the bridge reconstruction project.

- Improve the bicycle lanes on Alaskan Way S/E Marginal Way S between S Spokane Street and Downtown and complete the E-3 Busway Trail between S Spokane Street and Downtown.
- Either Rehabilitate the existing Ballard Bridge or add a new bicycle and pedestrian bridge adjacent to the Ballard Bridge.

Action 4.3: Establish a bicycle facility grant match reserve fund.

The city will develop a bicycle facility grant match reserve fund. This source would make it possible for the city to have matching funds available to take advantage of state and federal grants, even if other city funding sources are not available. To develop this fund, the city could set aside a certain percentage (e.g., 5 percent) of money from current bicycle projects and raise funds from private individuals and organizations. The fund would be secured by the time the "Bridging the Gap" funding initiative is completed. After this investment period, the annual interest from the match reserve fund (3 to 4 percent) will be used to implement bicycle facility maintenance improvements.

Action 4.4: The SDOT Bicycle and Pedestrian Program should provide the necessary staff expertise and commitment to implement this Master Plan within the timeframe identified.

This Master Plan envisions a considerable acceleration in the pace of bicycle facility construction throughout the city. SDOT will hire three additional staff members in order to administer programs, design projects, monitor progress, conduct public outreach, and perform other new tasks related to implementation of this Bicycle Master Plan.

Action 4.5: Continue to make minor improvements for bicycling through the Bicycle Spot Improvement Program.

The SDOT Pedestrian and Bicycle Program currently constructs low cost improvements to enhance bicycle safety and convenience through the Bicycle Spot Improvement Program. This program has become a national model that has been emulated by many city and state DOT's around the country. SDOT should continue to make the following types of improvements through this program:

- Surface improvements (patch potholes, fill seams between concrete panels in the street, replace drain grates, etc.).
- Signing and striping (bicycle lane striping and stenciling, motor vehicle warning signs at trail crossings, etc.).
- Access improvements (adjust electronic detection for bicyclists at traffic signals, traffic island modification, etc.).
- Sidewalk bicycle rack installation.
- Other low cost bicycle improvements as appropriate.

SDOT field crew installs a bicycle lane marking.

SDOT has installed over 2,300 bicycle parking racks on sidewalks in business districts since September 1993.

Action 4.6: Continue to receive regular input and guidance from the Seattle Bicycle Advisory Board.

The Seattle Bicycle Advisory Board should continue to provide regular input and guidance to the Pedestrian and Bicycle Program on bicycle issues. This will include monitoring the progress of implementation.

"It is the intent of the City Council to create the Seattle Bicycle Advisory Board which shall advise the City Council, the Mayor, and all the departments and offices of the City on matters related to bicycling, and the impact which actions by the City may have upon bicycling, and shall have the opportunity to contribute to all aspects of the City's planning processes insofar as they may relate to bicycling."

--City of Seattle Resolution 25534, May 16, 1977

Action 4.7: Provide bicycle planning and facility design training for appropriate SDOT project-level staff and consultants, and encourage staff from other agencies to attend.

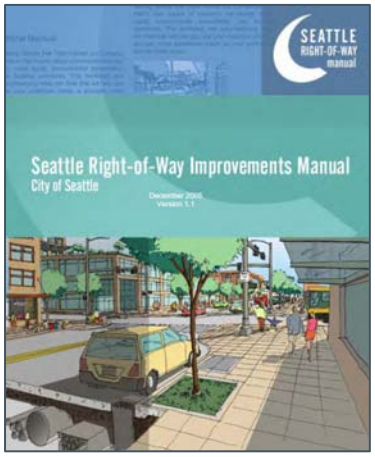
Staff and consultants working on projects that affect bicycle access, directly or indirectly, should be strongly encouraged to attend training sessions on bicycle planning and facility design. Staff at other agencies, such as Seattle Department of Parks and Recreation, KC/METRO, Sound Transit, Washington State Ferries, etc. should be invited as well. Training includes attending conferences such as Pro-Walk/Pro-Bike, courses offered through professional organizations such as ITE as well as formal and informal (sack lunch presentation) sessions delivered by the Pedestrian and Bicycle Program and/or consultants with an expertise in bicycle and pedestrian planning and engineering. Periodic training may focus on particular topics of importance, such as intersection design, trail design, or innovative design treatments.

Action 4.8: All divisions of SDOT should consult the Bicycle Master Plan when working on projects.

All SDOT divisions should consult this Plan to ensure that the recommended facilities and maintenance practices are implemented in accordance with this Plan and the city's Complete Streets Policy. For roadway repaving and reconstruction projects, the Bicycle Master Plan recommendation represents the first alternative that should be considered. However, further study and additional public involvement may ultimately result in an even better strategy to provide bicycle access. The SDOT Pedestrian and Bicycle Program should be consulted when technical guidance is needed on bicycle issues.

In addition, the Bicycle and Pedestrian program staff should review other city planning documents, including the Seattle Transit Plan, Freight Mobility Strategic Action Plan and the Pedestrian Master Plan (anticipated in 2008) when proposing implementation of the Bicycle Facility Network.

Action 4.9: Integrate the recommendations of the Bicycle Master Plan into other city ordinances, plans, and guidelines.



The recommendations of this Plan should be integrated into other city policy documents. This includes updating the Right-of-Way Improvements Manual, Transportation Strategic Plan, city ordinances, design guidelines, and other written policies (see Appendix N: Integration of Bicycle Recommendations into other Transportation Plans and Guidelines).

The SDOT Right-of-Way Improvements Manual will be updated with all bicycle design guidelines that are included in this Plan. All new bicycle design standards will be similarly incorporated into the SDOT Standard Specifications.

SDOT will redefine the city's bicycle classifications based on the systems identified in this plan. The Transportation Strategic Plan currently classifies bicycle facilities into urban trails and bicycle streets. These classifications of roadways and trails should be revised to include:

- Bicycle Facility Network
- Signed Bicycle Routes

Action 4.10: Coordination within SDOT and between SDOT and other agencies and organizations where necessary to implement the Bicycle Master Plan.

The SDOT Pedestrian and Bicycle Program should be included in the scoping and review of all plans, projects and programs that may provide opportunities to promote and implement recommendations of this Plan. In general, this includes most SDOT initiatives. Likewise, the Bicycle and Pedestrian Program should consult other SDOT modal programs and agencies when implementing its policies, plans, and programs.

Implementation of this Plan will require significant coordination between SDOT and other organizations. The roles of key partners are discussed in relation to specific recommendations in previous sections of this Plan, and are summarized below:

- Seattle Department of Parks and Recreation (trail development and maintenance of trails in parks).
- Seattle City Light (maintenance of trails in utility corridors)
- Seattle Public Utilities (drainage).
- Department of Planning and Development (bicycle parking and shower requirements).
- Puget Sound Regional Council (regional non-motorized planning, administration of federal and state funding for grant funded projects, regional wayfinding coordination, regional strategy for bicycle parking at transit hubs, incorporation of more detailed questions about bicycle and pedestrian trips in the regional transportation survey; and bicycle promotion).
- Transit Agencies (bicycle access to stations, space for bicycle storage at stations, bicycle facilities on transit vehicles, and bicycle-on-transit counts).
- Advocacy Organizations (bicycle education and encouragement).
- Seattle Police Department (enforcement of bicyclist and driver behavior).
- Health Agencies (encouragement and outreach to underserved populations; consultation regarding effective promotion, assessment, evaluation, and safety).
- Washington State DOT (WSDOT).

Action 4.11: Update the Bicycle Master Plan on a regular basis.

As the Plan recommendations are implemented, priorities for bicycle improvements may change and new needs and opportunities may be identified. The Bicycle Master Plan will be updated on a regular basis as a part of all Transportation Strategic Plan Updates (typically every five years). In addition, the list of short-term projects for implementation should be revised by SDOT on an annual basis, within the framework of the overall Bicycle Master Plan.

The Citizens Advisory Board provided feedback throughout the planning process for this Bicycle Master Plan. Public input is essential for future plan updates.

Action 4.12: Evaluate new bicycle facility treatments.

New bicycle treatments should be evaluated to determine their effectiveness. Brief studies of these facility treatments should be done in the first three years after the Plan is adopted, and the results of these evaluations will be used to refine, adjust, and guide the future use (or discontinuation) of these treatments. This includes evaluating the following facilities (potential evaluation measures are shown in parenthesis):

- Shared lane and bicycle lane markings (evaluate their use by bicyclists, placement relative to parked cars and vehicles in travel lanes, maintenance needs, effects of any travel lane rechannelization and/or narrowing on the safety and comfort of all roadway users).
- Signage and wayfinding (assessment by stakeholders, use by bicyclists, interpretation of signs, effectiveness of sign and/or pavement marking placement).
- Roadway crossing treatments (use of right-of-way space, effectiveness of warning and regulatory signs, effectiveness of pavement markings).
- Bicycle boulevards (use by bicyclists, use of right-of-way space, change in traffic speeds, and effectiveness of pavement markings).

The brief studies should include behavioral observations (of bicyclists and other roadway users) and user surveys to gauge public understanding of and satisfaction with the new facilities. Results from these studies should be incorporated into Plan updates.

Action 4.13: Monitor progress using performance measures.

An important aspect of evaluating progress in implementing this Plan is to establish performance measures that are reported on a periodic basis. Measures are described in Chapter 7 to quantify the overall goals of the Plan and objectives described in each chapter. Several new performance measures have been established. For each of these new performance measures, SDOT will collect the data necessary to establish baseline measurements in 2007. It will be important to have adequate funding to collect the data required for these performance measures.

The performance measures should be evaluated on a bi-annual basis to ensure that they are the most appropriate, cost-effective measures for assessing progress towards the Plan goals. Performance monitoring will be led by the SDOT Policy and Planning Division, with support from the SDOT Pedestrian and Bicycle Program. Monitoring should be reported to the Seattle Bicycle Advisory Board on a periodic basis, depending upon the schedule for data collection.

SDOT's performance measures should be coordinated and integrated with external bicycle transportation monitoring efforts, such as a "Bicycle Plan Implementation Report Card". Outside groups may monitor progress on the Bicycle Master Plan goals (bicycle use and safety), facility network development, and people's perceptions of bicycling (from both bicyclists and non-bicyclists). These groups may gather this information through online surveys and random-phone surveys.

Bikeway Implementation Strategies

The following are implementation strategies for bikeways that are recommended in this Plan (See Bicycle Facility Network recommendations maps in binder):

Construct or Reconstruct

This category includes construction and reconstruction of roadways, multi-purpose trails, bridges, and pedestrian/bicycle overpasses and underpasses. Construction refers to projects that develop facilities that did not previously exist; reconstruction refers to changes to existing facilities.

In accordance with the Seattle Complete Streets Policy, bicycles should be accommodated any time a new road is constructed or an existing road is reconstructed. Seattle roadways should be designed according to the bicycle facility design guidelines in Appendix E: Bicycle Facility

Sections of the Chief Sealth Trail were constructed in December 2006.

Descriptions, Appendix F: Guidance for Retrofitting Seattle Streets to Create Dedicated Bicycle Facilities, and Appendix H: Roadway Crossing Design for Bicycles. This may involve adding pavement to the side of existing two-lane roadways that have informal parking in gravel areas adjacent to the roadway to provide shoulders or bicycle lanes and on-street parking pockets in appropriate locations. Since Seattle is a built environment, opportunities to provide this type of treatment are limited and will typically be found in the far northern and southern parts of the city where roadways have not been developed with curb and gutter.

All new or replacement bridges should be consistent with the complete streets ordinance (Council Bill # 115861) to accommodate bicycles with bicycle lanes on both sides of the bridge, or in some cases, a separated multi-purpose path . If the bridge is in a developed area or an area that may experience high pedestrian use in the future, separate facilities should be provided for bicyclists and pedestrians.

The current Federal law for bicycle and pedestrian access on bridges was established in the Transportation Equity Act for the 21st Century (TEA-21) and re-affirmed by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). This law states:
"In any case where a highway bridge deck is being replaced or rehabilitated with Federal financial participation, and bicyclists are permitted on facilities at or near each end of such bridge, and the safe accommodation of bicyclists can be provided at reasonable cost as part of such replacement or rehabilitation, then such bridge shall be so replaced or rehabilitated as to provide such safe accommodations." (23 U.S.C. Section 217)

While opportunities to develop new multi-purpose trail corridors are limited by the existing built environment of the city, there are a number of gaps in existing trails and important trail extensions that should be completed as a part of this Plan. In addition, several new corridors have been identified for new trails to be constructed.

Add Pavement Markings

Some roadways can accommodate new bicycle lane stripes, bicycle lane markings, or shared lane markings without any other changes. While there are a limited number of locations throughout the city where it is possible to simply add striping or markings, this is a relatively low-cost treatment that can often be done quickly.

Travel Lane Narrowing

Some Seattle streets have travel lanes that can be narrowed to provide additional space for on-road bicycle facilities. Travel lanes can be narrowed during repaving projects or by grinding out existing markings and replacing them with new markings.

Repaving projects provide a clean slate for revising pavement markings. Consistent with the city's Complete Streets Policy, during road repaving projects, the roadway should be restriped to create bicycle lanes and shoulders (in some cases the city can narrow travel lanes to a minimum 10-foot width, depending on traffic speeds and composition). In addition, if a roadway does not have a curb and gutter and the roadway edge is relatively flat with few obstructions, the total pavement width can be widened to include paved shoulders or bicycle lanes. Accessible curb ramps must be added for pedestrians during repaving projects.

Grinding projects involve removing existing lane stripes as well as providing new striping for bicycle lanes, shared lane markings, or edgelines. Since there are many roadways that

will not be repaved in the next several years, existing markings will need to be removed through grinding in order to create the recommended bicycle facilities.

Lane Rechannelization

There are a number of streets in Seattle where space for bicycle lanes or other on-road bicycle facilities could be provided by removing existing travel lanes. This treatment is recommended for roadways where it is desirable to improve pedestrian crossings at multiple locations, add bicycle lanes and climbing lanes, and reduce rear-end and turning crashes. Travel lane rechannelization often involves converting an existing four-lane roadway to a two-lane roadway with a center-turn lane. This allows bicycle facilities to be installed as well as raised median islands or a crossing island. This treatment reduces bicycle and pedestrian crossing distance and exposure to vehicular traffic, and has been shown to improve motor vehicle flow and reduce rear-end and left-turning crashes when used in appropriate locations.

Rainier Avenue S was converted from a four-lane roadway to one travel lane in each direction, a center-turn lane, and bicycle lanes.

Removing travel lanes may or may not require tradeoffs between travel modes within a roadway corridor. An engineering and policy analysis must be conducted to evaluate the impact of removing travel lanes on all modes. This includes considering factors such as:

- Pedestrian crossing opportunities and safety.
- Transit capacity and performance (additional transit operational analysis is needed for UVTN corridors).
- Bicycle network connectivity.
- Peak-hour motor vehicle capacity.
- Access to adjacent businesses.
- Opportunity to reduce crashes of all types.
- Opportunity to reduce vehicle travel speeds, thereby reducing injury severity to pedestrians and bicyclists involved in collisions.
- Roadway substructure (if part of the roadway that was formerly a median or streetcar lane is reconfigured to carry heavy trucks, there may be additional maintenance costs).

In UVTN corridors, transit speed and reliability is a priority consideration due to its existing and/or planned ability to move large numbers of people.

Consolidate On-Street Parking to One Side of the Roadway

Consolidating on-street parking to one side of the street provides additional space for bicycle lanes or climbing lanes. Since available on-street parking is limited in many neighborhoods, this action is recommended only in areas where significant excess capacity exists and where it does not cause too many people to have to cross the road to reach their parked cars.

Remove On-Street Parking from both Sides of the Roadway

Removing existing on-street parking provides additional space for bicycle lanes or climbing lanes. In some cases, parking removal is also needed to complete multi-purpose trails. This action is relatively rare. It is used only when the parking is under-utilized or it is long-term commuter parking (as opposed to residential or retail parking). The SDOT Transportation Strategic Plan (TSP) identifies strategies for managing parking wisely (see pages 93-98 of the TSP).

Allow Full-Time On-Street Parking

It is not possible to provide on-street bicycle facilities when on-street parking is restricted during peak hours, because the correct riding position for bicyclists changes depending on the presence of parked cars. Allowing full-time on-street parking can sometimes make it possible to provide bicycle lanes, climbing lanes, or shared lane markings adjacent to parked cars. In order to use this strategy, traffic patterns must be studied to determine if it is feasible to lift parking restrictions. An engineering analysis is needed for UVTN corridors to determine potential impacts to transit speed and reliability.

Curb extensions were constructed on SW Juneau Street to slow motor vehicles.

Calm Traffic on the Street

In order to create bicycle boulevards, non-arterial roadways will typically require traffic calming treatments to slow motor vehicle speeds and make bicycling conditions more comfortable. These treatments may include traffic circles, chicanes, traffic diverters, and other measures. Detailed information regarding the SDOT traffic control program can be found online at http://www.seattle.gov/transportation/trafficcircles.htm.

Speed cushions are used on Beach Drive SW to slow traffic on this popular bicycle route.

Post Bicycle Route Signs

This Plan recommends that the City of Seattle remove its existing signed bicycle routes and develop a new signage system to provide more direct bicycle connections between key destinations in the city. This new signage system should continue to be updated in the future to ensure that the signs are as effective as possible at helping people find destinations. The new signed bicycle route system is discussed in Chapter 3.

Cost Estimates

Rough cost estimates for implementing this Plan are provided in Appendix O: Cost Estimates. In many cases bicycle facility improvements can be provided as a part of larger transportation projects, such as a roadway corridor reconstruction project. The cost estimates for this Plan include both construction and design (see Appendix O: Cost Estimates).

Implementation Schedule

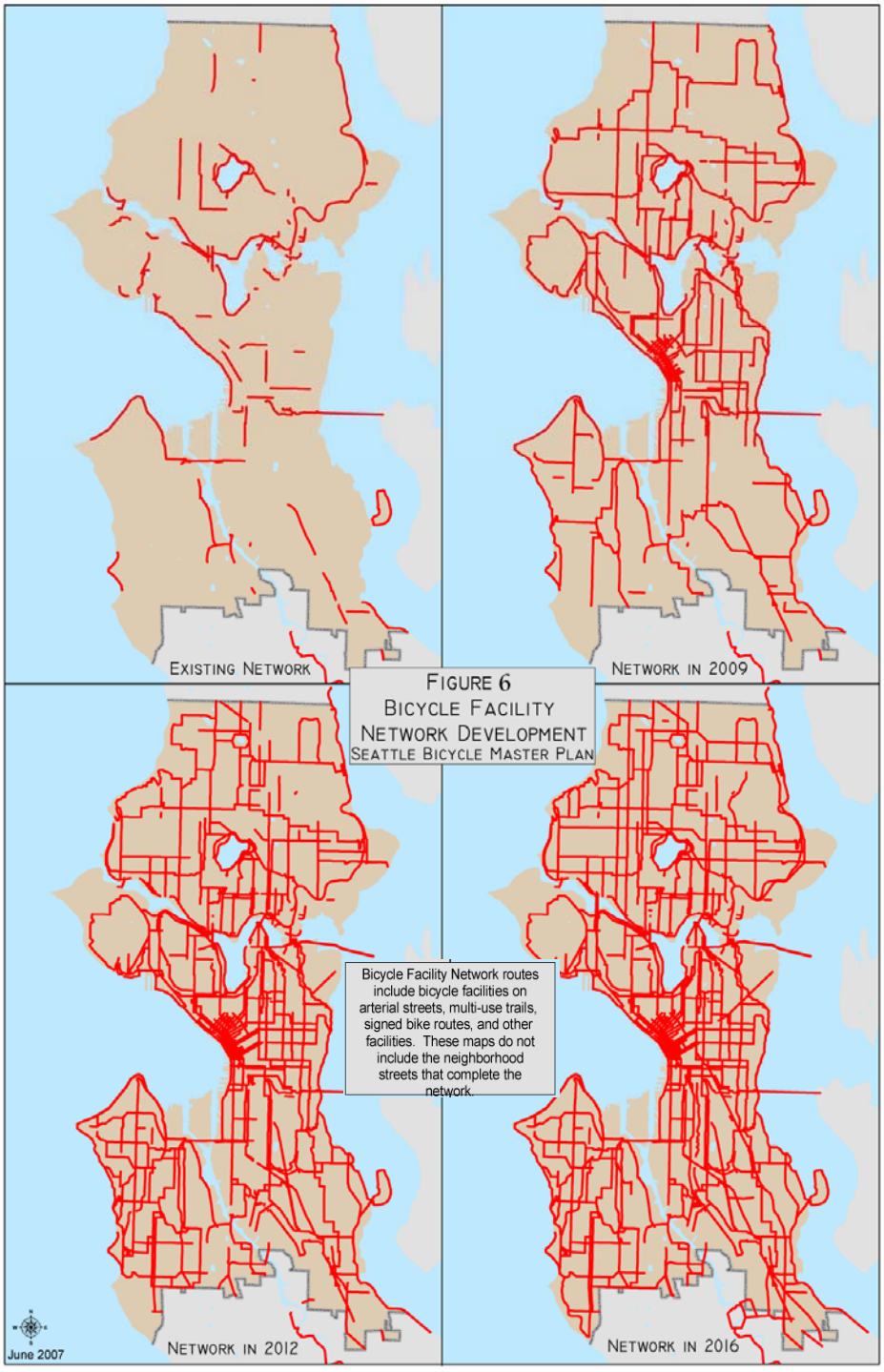
A majority of the Bicycle Master Plan recommendations will be implemented over the next 10 years. This includes recommendations for bicycle facilities, programs, and institutionalization. The implementation table summarizes the timing of the major recommendations of this Plan (see Table 6: Implementation Schedule).

Bicycle Facility Phasing

The bicycle facility improvements that are identified in this Plan will be constructed over the next 10 years. Some improvements will be made immediately after the Plan is adopted, while others will take longer to design and develop (see Figure 5: Bicycle Facility Network Development). Therefore, the recommendations are divided into four phasing categories (identified in the GIS database of Bicycle Facility Network recommendations):

- Short-Term (0 to 3 years after Plan adoption)
- Medium-Term (0 to 6 years after Plan adoption)
- Long-Term (0 to 10 years after Plan adoption)
- Future (0 to more than 10 years after Plan adoption)

Figure 6. Bicycle Facility Network



While a project may be included in the medium- or long-term category, the city should take advantage of opportunities that arise in the short-term to develop the project (e.g., grant funding, leveraging other projects, etc.). This is why all phasing categories begin immediately after the Plan is adopted.

Short-Term Recommendations (completed by 2009)

Short-term projects will help create early successes that will help build momentum for other recommendations of the Plan. Many of these projects will be completed where it is relatively easy to add bicycle lanes, climbing lanes, and shared lane markings to roadways. Wherever possible, bicycle route signs should be posted during this time period (for some routes, new signals and other crossing improvements will be needed before the signs can be installed). Short-term projects will also include several bicycle facilities that are more challenging to implement in places where critical Bicycle Facility Network gaps exist.

Medium-Term Recommendations (completed by 2012)

Medium-term projects tend to include more complex bicycle facility improvements as a part of capital projects. These include many projects that require repaving or reconstruction of roadways, as well as some re-striping projects. Many of the Urban Trails should be completed within the medium-term timeframe.

Long-Term Recommendations (completed by 2016)

Long-term projects are capital projects that will require several years to program in the budget, design, and construct. These include Urban Trails that have not been funded or designed and some new bicycle and pedestrian bridges.

Future Recommendations (completed beyond the 10 year planning horizon)

There are several critical connections in the Bicycle Facility Network that will require significant planning, design, public involvement, capital investment, and construction time. These future category projects include new bicycle and pedestrian bridges, bicycle facilities that will be built as part of larger bridge rehabilitation or replacement projects and major roadway reconfigurations.

Future Vision

This Plan not only establishes the vision, but also very practical steps that are needed in the future to ensure that Seattle will become a world-class city for bicycling. This Plan is an important first step - much work lies ahead. By providing the necessary human and financial resources to accomplish this Plan, Seattle could very well exceed its goals to triple the amount of bicycling and reduce the bicycle crash rate by one-third. It will, therefore, be important in the future to measure progress, reassess priorities, and strive to further increase the use and safety of bicycle transportation as the city moves forward with the implementation of this Bicycle Master Plan.

Possibilities that have been suggested by citizens and should be considered as bicycling increases throughout the city are listed below:

- Increasing the number of neighborhood roadways designated as bicycle boulevards.
- Reconfiguring roadways with fewer travel and/or narrower lanes and more space for bicycle facilities.
- Making intersection improvements to allow bicyclists on non-arterial streets to safely cross arterial streets.
- Focusing on bridges so that over time, all bridges provide safe, convenient access for bicycles.

- Installing new types of bicycle facilities at intersections (more bicycle boxes, bicycle turn pockets, traffic signals for bicycles only, and special signal phasing for bicyclists).
- Providing more bicycle and pedestrian bridges and underpasses across freeways and other major roadways (this increases the number of route choices that are available to bicyclists)
- Converting on-street parking into space used for bicycle facilities.
- Encouraging commercial businesses to front on multi-purpose trails.
- Providing high-capacity bicycle parking in more retail areas, parks, schools, and public buildings such as libraries and community centers.
- Creating staffed bicycle facilities offering high-capacity parking, repairs, and rentals at more transit hubs.
- Ensuring that all new commercial, office, and industrial buildings are equipped with lockers and showers for bicyclists.

Implementing the recommendations of the Bicycle Master Plan is an important first step in an ongoing commitment that will help establish these future possibilities.

Table 6. Implementation Schedule (Part 1)

1. BICYCLE FACILITIES	SDOT	Implementation Schedule						
Recommendations	**Partners**	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6-10	Future Years
Short-Term Bicycle Facilities for Segments and Roadway Crossings	**W, PR, B**							
Medium-Term Bicycle Facilities for Segments and Roadway Crossings	**W, PR, B**							
Long-Term Bicycle Facilities for Segments and Roadway Crossings	**W, PR, B**							
Urban Trails and Bikeways Network	**PR, W, B**							
Signed Bicycle Routes	**B, PR, PS**							
Routine Bicycle Facility Maintenance	**W, PR**	(See Maintenance Text and Table)						
Spot Bicycle Facility Maintenance	**W, PR**	(Make Spot Improvements As Needed)						
Negotiate/Renegotiate Maintenance Agreements	**PR, L**							
Volunteer Assistance with Maintenance	**BC, C, BU, S**	(Assistance with Maintenance As Needed)						
Track Citizen Complaints and Maintenance Requests	**PR, L**							

B = Seattle Bicycle Advisory Board
BC = Bicycle Clubs/Advocacy Organizations
BU = Seattle businesses
C = Community volunteer groups
EO = Elected officials
F = Washington State Ferries
G = City of Seattle government agenicies (all levels)
HE = Local health organizations
L = Seattle City Light
M = King County Metro Transit (METRO)
N = Neighboring municipalities
O = Outside contractors
PD = Seattle Metropolitan Police Department
PR = City of Seattle Parks and Recreation Department
PS = Puget Sound Regional Council
S = Seattle Public and Private Schools
ST = Sound Transit
T = Seattle tourism organizations
W = Washington State Department of Transportation (WSDOT)

Table 6. Implementation Schedule (Part 2)

2. SUPPORTING BICYCLE FACILITIES	SDOT	Implementation Schedule						
Recommendations	**Partners**	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6-10	Future Years
Provide Bicycle Racks and Bicycle Lockers	**M, ST, BU, S**							
Strengthen Bicycle Parking Requirements	**EO, BU**							
Fund and Promote Staffed Bicycle Facilities	**BU, PS, ST, M**							
Improve Bicycle Access to Transit	**ST, M, F, PS**							
Improve Bicycle Storage at Transit Stations	**ST, M, PS**							
Accommodate More Bicycles on Transit	**M, ST, F**							

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Table 6. Implementation Schedule (Part 3)

3. BICYCLE PROGRAMS	SDOT	Implementation Schedule						
Recommendations	**Partners**	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6-10	Future Years
Support Efforts to Obtain Funding for Programs	**BC, B, T, HE**							
Update and Distribute Bicycle Map	**BC, PR, BU, T, M, ST, F, HE**							
Increase Enforcement Related to Bicycling	**PD**							
Develop Online Bicycle Route Wayfinding System	**PS, BC**							
Promote Bicycling through the Way To Go Program	**BC, HE**							
Provide Bicycle Safety Education/Training	**BC, HE, N, PS, S**							
Donate and Sell Bicycle Helmets	**BC, BU, HE**							
Provide Bicycle Commuter Assistance	**BC, BU**							
Expand Safe Routes To Schools Programs	**S, BC, HE**							
Provide Websites for Bicycle Education and Promotion	**BC, HE**							
Organize and Promote Bicycle to Work Day	**BC, BU, HE, C, M, ST, F, W**							
Promote Bicycling in Regional TDM Programs	**BC, HE**							
Organize and Promote Bicycle Saturdays and Sundays	**PR, HE, BC**							

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PD = Seattle Metropolitan Police Department
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Table 6. Implementation Schedule (Part 4)

4. PLAN FUNDING AND IMPLEMENTATION	SDOT	Implementation Schedule						
Recommendations	**Partners**	Year 1	Year 2	Year 3	Year 4	Year 5	Years 6-10	Future Years
Establish Dedicated Bicycle Funding Sources	**EO, B**							
Add Staff to SDOT Pedestrian and Bicycle Program	**EO, B**							
Continue to implement Bicycle Spot Improvement Program	**B**							
Utilize Contractors for Bicycle Projects	**O**							
Receive Oversight from Bicycle Advisory Board	**B**							
Offer Bicycle Planning and Facility Design Training	**W, M, N, ST, PS, O**							
Review Bicycle Master Plan Recommendations for all Projects	**O**							
Consult Pedestrian and Bicycle Program on all Projects	**O**							
Integrate Plan Recommendations into Other Guidelines	**EO, G**							
Update Bicycle Master Plan	**O, BC**							
Evaluate New Bicycle Facility Treatments	**O, B**							
Monitor Progress Using Performance Measures	**B, O**	(See individual performance measures for data collection timing)						
Prepare Bicycle Benchmarking Report	**B, O, BC**							
Reconsider Performance Measures	**B, O**							

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BU = Seattle businesses
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EO = Elected officials
F = Washington State Ferries
G = City of Seattle government agenicies (all levels)
HE = Local health organizations
L = Seattle City Light
M = King County Metro Transit (METRO)
N = Neighboring municipalities
O = Outside contractors
PD = Seattle Metropolitan Police Department
PR = City of Seattle Parks and Recreation Department
PS = Puget Sound Regional Council
S = Seattle Public and Private Schools
ST = Sound Transit
T = Seattle tourism organizations
W = Washington State Department of Transportation (WSDOT)

Chapter 7. Performance Measures

As described in Chapter 6, several performance measures should be monitored to determine the amount of progress being made toward achieving the goals and objectives of the Plan. The measures summarized in Table 7 and described below are intended to quantify the overall goals of the Plan and objectives described in the previous chapters. These performance measures will be reviewed and updated every two years to ensure that the city continues to use the best available metrics to assess Plan implementation. Performance monitoring will be led by the SDOT Policy and Planning Division, with support from the SDOT Pedestrian and Bicycle Program.

Table 7. Bicycle Master Plan Performance Measures

	Performance Measure	Baseline Measurement	Performance Target	Data Collection Frequency	Data Collection Responsibility
Goal 1	Number of bicyclists observed at counting locations throughout Seattle	To be counted in 2007	Triple the number of bicyclists between 2007 and 2017	Every two years	SDOT, Volunteer groups, Bicycle advocacy organizations
Goal 2	Number of reported bicycle crashes per total number of bicyclists counted and annual traffic volumes	To be calculated in 2007	Reduce the bicycle crash rate by one third between 2007 and 2017	Every two years	SDOT, Law enforcement agencies, Volunteer groups, Bicycle advocacy organizations
Objective 1	Percentage of Bicycle Facility Network Completed	65 miles of existing facilities	Provide 450 miles of recommended facilities by 2017 (includes existing)	Every two years	SDOT Policy and Planning Division & SDOT Pedestrian and Bicycle Program
Objective 2	Number of bicycle racks installed through the SDOT Bicycle Parking Program	Approximately 3,000 existing bicycle racks	Provide 6,000 racks by 2017 (includes existing)	Every two years	SDOT Pedestrian and Bicycle Program
Objective 3	Number of Seattle Bicycling Guide Maps distributed	23,338 maps distributed in 2005	150,000 bicycle maps to be distributed between 2007 and 2017	Every year	SDOT Pedestrian and Bicycle Program or its designated representative
Objective 4	Percentage of targeted SDOT staff who participate In training on bicycle issues	To be counted in 2007	100% of targeted staff participating in training every year	Every year	SDOT Pedestrian and Bicycle Program
	Number of bicycle project grant applications applied for and obtained for bicycle programs	To be tracked in 2007	At least one grant application for every available funding opportunity	Every year	SDOT Policy and Planning Division
	Number of Bicycle Spot Improvements Completed	To be counted in 2007	Depends on needs & priorities set each year	Every year	SDOT Pedestrian and Bicycle Program

a. This table does not include the performance measures recommended for consideration by non-city agencies or organizations.

Performance Measure Framework

This Plan establishes two types of performance measures. The performance measures used to monitor progress towards the goals will quantify long-term trends in bicycle use and safety. The performance measures related to the objectives are strategic—they will calculate the amount of progress that has been made toward specific 2017 performance targets.

Several of the performance measures have been used previously by SDOT, while others are new. For each new performance measure, SDOT will collect the data necessary to establish baseline measurements in 2007.

A few of the performance measures listed below are recommended for organizations other than SDOT to consider. These measures are important metrics for tracking progress on this Plan, but they will not be included in official SDOT performance reports.

Long-Term Performance Measures

Long-term performance measures monitor progress towards the goals of increasing bicycle use and improving bicycle safety.

Goal 1: Increase use of bicycling in Seattle for all trip purposes.

Triple the amount of bicycling in Seattle between 2007 and 2017[1].

Long-Term Performance Measure 1.1 (New): Number of bicyclists observed at counting locations throughout Seattle. Bicycle counts should be taken at up to 30 locations throughout the city every other year to benchmark the amount of bicycling in the city. Count locations could include Downtown entry points, locations on each of the city's major trails, arterial roadways with bicycle lanes or shared lane markings, and intersections of arterial roadways with existing or planned bicycle facilities. SDOT should continue to support and work with the Cascade Bicycle Club on counts, especially the ones done on Bike to Work Day and on the Burke Gilman Trail. The official counts for this performance measure should be taken around the same date each year, on the same day of the week, and under similar weather conditions. In other cases, one-time before and after counts should be taken to measure increases in bicycle use related to a specific bicycle lane, shared lane marking, or trail project.

Additional bicycle counts may be obtained by requiring bicycles to be included in current, manual traffic counts. This data set would not represent all bicycle activity throughout Seattle, but would begin to provide some basic data on the use of bicycle facilities. Counts may also include observations of important bicyclist behaviors, such as wearing helmets, riding on the correct side of the street, obeying traffic controls, and using lights at night. The city will need the assistance of local bicycle advocacy and other organizations to take these counts. In addition, pneumatic tubes should be used to reduce the labor required to count bicyclists on trails. Bicycle counting technologies, such as video and infrared detection should be explored for counts in all types of locations, and the city should move toward adopting these technologies.

[1] *Tripling the amount of bicycling is contingent upon the completion of key connections in the Bicycle Facility Network. The Plan identifies 20 capital projects to make these key connections (see Chapter 2). The amount of bicycling is measured by counting bicyclists at a consistent sample of locations in the city.*

- Data Collection Responsibility: SDOT, Volunteer groups, Seattle area bicycle advocacy organizations.
- Data Collection and Reporting Frequency: Every Two Years.

Photo taken by Amber Trillo

Long-Term Performance Measure 1.2 (Recommended for PSRC consideration): Bicycle mode split. Bicycle mode split should be documented every five years through the Puget Sound Regional Travel Survey. Documenting mode shift from personal automobile use to bicycle use is an important benchmark for demonstrating that the City of Seattle is achieving its pollution reduction goals and meeting the Kyoto Protocol. PSRC should improve the survey and reporting methodology to capture an accurate sample of bicycling trips and to report data for each jurisdiction in the region separately. This will allow the City of Seattle to benchmark progress towards shifting single-occupant vehicle trips to bicycle trips.

- Data Collection Responsibility: PSRC.
- Data Collection and Reporting Frequency: Every Five Years.

Goal 2: Improve safety of bicyclists throughout Seattle.
Cut the rate of bicycle crashes by one third between 2007 and 2017[2].

Long-Term Performance Measure 2.1 (New): Number of police reported bicycle crashes per total number of bicyclists observed during the bi-annual bicycle count. This measure would compare bicycle crash trends (as reported in police records) in terms of bicycle exposure. Exposure would approximate the bi-annual bicycle counts at up to 30 locations throughout the city. Note that police-reported crashes do not represent all bicycle collisions[3].

- Data Collection Responsibility: SDOT, Law enforcement agencies, Volunteer groups, Seattle area bicycle advocacy organizations.
- Data Collection and Reporting Frequency: Every Two to Five Years.

Strategic Performance Measures

Strategic performance measures calculate the amount of progress that has been made toward specific 2017 performance targets.

Objective 1: Develop and maintain a safe, connected, and attractive network of bicycle facilities throughout the city.

Strategic Performance Measure 1.1 (New): Percentage of Bicycle Facility Network completed. This measure will track progress toward completing the entire

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[2]The rate of bicycle crashes is the number of police-reported bicycle crashes in a year divided by the number of bicyclists counted at the sample locations.
[3]A study by Stutts and Hunter of a sample of cases collected at eight hospital emergency rooms in three states, showed that only 56 percent of the pedestrians and 48 percent of the bicyclists were successfully linked to cases reported on their respective state motor vehicle crash files[a]. This study looked at only the most serious crashes (involving emergency room treatment). We can assume that less-severe crashes were accurately reported at an even lower rate.
Source: Stutts, J.C. and W.W. Hunter. "Police-reporting of Pedestrians and Bicyclists Treated in Hospital Emergency Rooms," Transportation Research Record No 1635, Transportation Research Board, 1998. P. 88-92.

recommended 450-mile Bicycle Facility Network by 2017. An additional option that will be considered is tracking the percentage of network miles completed for different facility types (e.g., bicycle lanes, climbing lanes, shared lane markings, multi-purpose trails, and bicycle boulevards). This performance measure builds on SDOT's existing measure of the number of bicycle lane miles created each year.

- Data Collection Responsibility: SDOT Policy and Planning Division and SDOT Pedestrian and Bicycle Program.
- Data Collection and Reporting Frequency: Every Two Years.

Objective 2: Provide amenities that make bicycle transportation more convenient.

Strategic Performance Measure 2.1 (Existing): Number of bicycle racks installed through the SDOT Bicycle Parking Program. This measure will monitor progress towards providing short-term bicycle parking near key destinations throughout Seattle by 2017. It is estimated that 11,000 racks are needed to meet the estimated demand for bicycle parking in key areas of the city (this estimate of 11,000 includes the approximately 3,000 racks that are currently available in the city)[4]. SDOT installed 61 racks in 2005.

- Data Collection Responsibility: SDOT Pedestrian and Bicycle Program.
- Data Collection and Reporting Frequency: Every Two Years.

Strategic Performance Measure 2.2 (Recommended for Sound Transit and KC/METRO consideration): Percentage of estimated 2017 bicycle parking demand met by current bicycle racks and lockers at transit stations in Seattle. Sound Transit and KC/METRO should provide SDOT with the number of bicycle parking spaces available at each transit stop and station in Seattle. Bicycle parking demand for 2017 should be estimated using the PSRC Regional BikeStation Project methodology.

- Data Collection Responsibility: Sound Transit, KC/METRO.
- Data Collection and Reporting Frequency: Every Two Years.

Strategic Performance Measure 2.3 (Recommended for KC/METRO and Sound Transit consideration): Number of bicycles carried on KC/METRO and Sound Transit buses. KC/METRO should obtain more complete, year-round data on bike-on-bus boardings. For example, KC/METRO should count bicycle-on-bus boardings each month, and provide SDOT with these counts. This measure would include all routes served by KC/METRO throughout the region, and would not be exclusive to the City of Seattle.

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[4] *The city will double the number of bicycle racks available to 6,000 racks by 2017. However, it is estimated that 11,000 racks are needed. The estimated need for 11,000 bicycle racks is based on the following assumptions: 1) An average of one bicycle rack is needed per 100 feet of arterial roadway block face in all Urban Village Centers (includes Hub Urban Villages, Urban Centers, and Urban Center Villages). This average of one rack per 100 feet of arterial roadway block face overestimates the number of bicycle racks by counting arterial roadway sidewalks that may be too narrow to install bicycle racks or may have lower bicycle parking demand, but underestimates the number of bicycle racks by not including racks on adjacent non-arterial streets in commercial districts with higher bicycle parking demand. 2) An average of 10 bicycle racks are needed per public school (includes administration buildings, resource centers, etc., and varies depending on the size and location of the school). 3) An average of five bicycle racks are needed per private school (varies depending on the size and location of the school and students living within bicycling distance). 4) An average of five bicycle racks are needed per community center (varies depending on the size and location of the community center). 5) An average of three bicycle racks are needed per library (varies depending on the size and location of the library). Since approximately 3,000 bicycle racks are already in place, 8,000 racks will need to be installed between 2007 and 2017 to meet the estimated demand. Therefore, the city should consider looking for ways to fund, locate, and install additional racks.*

- Data Collection Responsibility: KC/METRO.
- Data Collection and Reporting Frequency: Every Year.

Objective 3: Partner with organizations to develop bicycle education, enforcement, and encouragement programs.

Strategic Performance Measure 3.1 (Existing): Number of Seattle Bicycling Guide Maps distributed. This measure will monitor progress toward improving bicycle wayfinding and encouraging people to use the city's bicycle facilities. The SDOT Pedestrian and Bicycle Program should continue to track the number of bicycle maps that are distributed. This currently includes paper maps, but in the future should include the number of times online maps are accessed. 150,000 Bicycling Guide Maps should be distributed between 2007 and 2017. 23,338 maps were distributed in 2005[5].

- Data Collection Responsibility: SDOT Pedestrian and Bicycle Program or its designated representative.
- Data Collection and Reporting Frequency: Every Year.

Strategic Performance Measure 3.2 (Recommended for Seattle area bicycle advocacy organizations consideration): Number of Seattle residents participating in pedestrian or bicycle safety education programs or events. Seattle area bicycle advocacy organizations should track the number of participants in education or encouragement activities (e.g., Bike to Work Day, bicycle commuter classes, bicycle safety training, bicycle camps, etc.), for inclusion in the Bicycle Benchmarking Report. The number of participants in these bicycle activities should triple between 2007 and 2017.

- Data Collection Responsibility: Seattle area bicycle advocacy organizations, Volunteer groups.
- Data Collection and Reporting Frequency: Every Year.

Objective 4: Secure funding and implement bicycle improvements.

Strategic Performance Measure 4.1 (New): Percentage of targeted SDOT staff who participate in training on bicycle planning, design, and engineering issues. This measure will help indicate the level of internal training that is provided on bicycle issues. The following types of staff should receive bicycle training: planners, designers, project managers, staff working on projects with signs and paint, staff working on signals, crew chiefs, and field crews. SDOT should take advantage of everyday opportunities to provide these targeted staff with bicycle training. This includes Complete Streets training, Pedestrian and Bicycle Program presentations, field demonstrations of products (e.g., pavement markings, multi-use trail ramps, and bollards), ProWalk/ProBike conference sessions, mobile workshops, walking audits, and out-of-town expert presentations. 100 percent of targeted SDOT staff should receive some type of training every year.

[5] *The number of bicycle maps distributed by the city is typically higher during the year after a revised version of the map is published. A good goal for distribution is an average of 15,000 maps per year.*

- Data Collection Responsibility: SDOT Pedestrian and Bicycle Program.
- Data Collection Reporting Frequency: Every Year.

Strategic Performance Measure 4.2 (New): Amount of grant funding applied for and obtained for bicycle programs. The SDOT Policy and Planning Division should continue to track the amount of bicycle project funding that SDOT applies for and obtains through grant sources. This measure has been collected internally in the past.

- Data Collection Responsibility: SDOT Policy and Planning Division.
- Data Collection and Reporting Frequency: Every Year.

Strategic Performance Measure 4.3 (Existing): Number of Bicycle Spot Improvements Completed. This measure will track SDOT's responsiveness to public requests for bicycle spot improvements. SDOT completed 49 spot bicycle and pedestrian improvements in 2005 (bicycle and pedestrian improvements were reported together).

- Data Collection Responsibility: SDOT Pedestrian and Bicycle Program.
- Data Collection and Reporting Frequency: Every Year.

Bicycle spot improvements can fix pavement problems.

Existing Conditions for Bicycling

Introduction

This appendix provides a general overview of bicycling in Seattle today. Its two main sections describe the current conditions in Seattle related to bicycle usage and bicycle safety. Information about bicycle counts, bicycle trip purposes, and bicycle mode shares compared with other cities is presented in the bicycle usage section. The bicycle safety section discusses bicycle crash data, existing bicycle facilities, gaps in the city's bikeway network, and barriers to bicycling.

Information about the existing conditions for bicycling in Seattle provides the basis for the specific improvements recommended in the Plan.

Bicycle Usage

One of the two central goals of the Plan is to increase the amount of bicycling throughout Seattle. While many residents of Seattle already bicycle, there is significant potential to increase the frequency of their bicycle trips. In addition, a portion of Seattle residents who do not currently bicycle can be encouraged to ride.

Bicycle Counts

While there is relatively little data available on the total number of bicycle trips throughout the city on any given day, the Seattle Department of Transportation has occasionally conducted counts of bicyclists during the morning peak period (6:30 to 9:00 a.m.). In July 2001, 427 bicyclists were counted on the Burke-Gilman Trail at Stone Way N. Over 280 bicyclists were observed during the morning peak at the south end of the Dexter Avenue bicycle lanes in September 2000. Between 1992 and 2000, the total number of bicyclists entering and leaving the Central Business District area during the morning peak period increased by 57% (see Figure A-1).

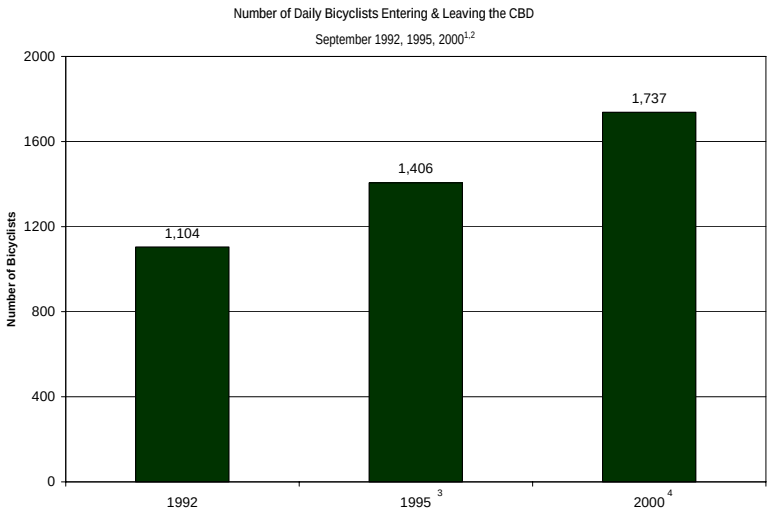


Figure A-1. Downtown Bicycle Counts, 1992-2000.

1. In each year, bicycle counts were performed on a Wednesday morning in late September from 6:30 a.m. to 9:00 a.m. In 1992 and 2000,
2. 29 locations covering virtually all access points into and out of downtown Seattle were covered. Although reasonable efforts were made to minimize double counting, it is impossible to identify bicyclists that crossed the cordon boundary more than once.
3. In 1995, the count focused on 13 of the most important corridors identified in the 1992 study. The 1,406 figure, therefore, is an estimate of the total number of bicyclists, extrapolated from those locations.
4. For 2000, data does not include counts for the 2nd and Broad Street station between 8:00 and 8:30 a.m. This probably resulted in undercounting by approximately 10 to 15 bicyclists.

Citywide data on bicycle commuting to work is provided by the US Census. In 2000, 1.88% of Seattle residents reported bicycling as their primary mode of transportation to and from work[1]. Some parts of Seattle have particularly high levels of bicycle commuting. Over five percent of residents commute to work by bicycle in parts of the University District, Wallingford, Fremont, Ballard, and Capitol Hill (see Figure A-2). While Seattle's overall census bicycle commute mode share is significantly higher than the national average (0.47%), it is similar to cities such as San Francisco (1.92%) and Portland (1.76%), and is far below world cities, such as Copenhagen (34%)[2].

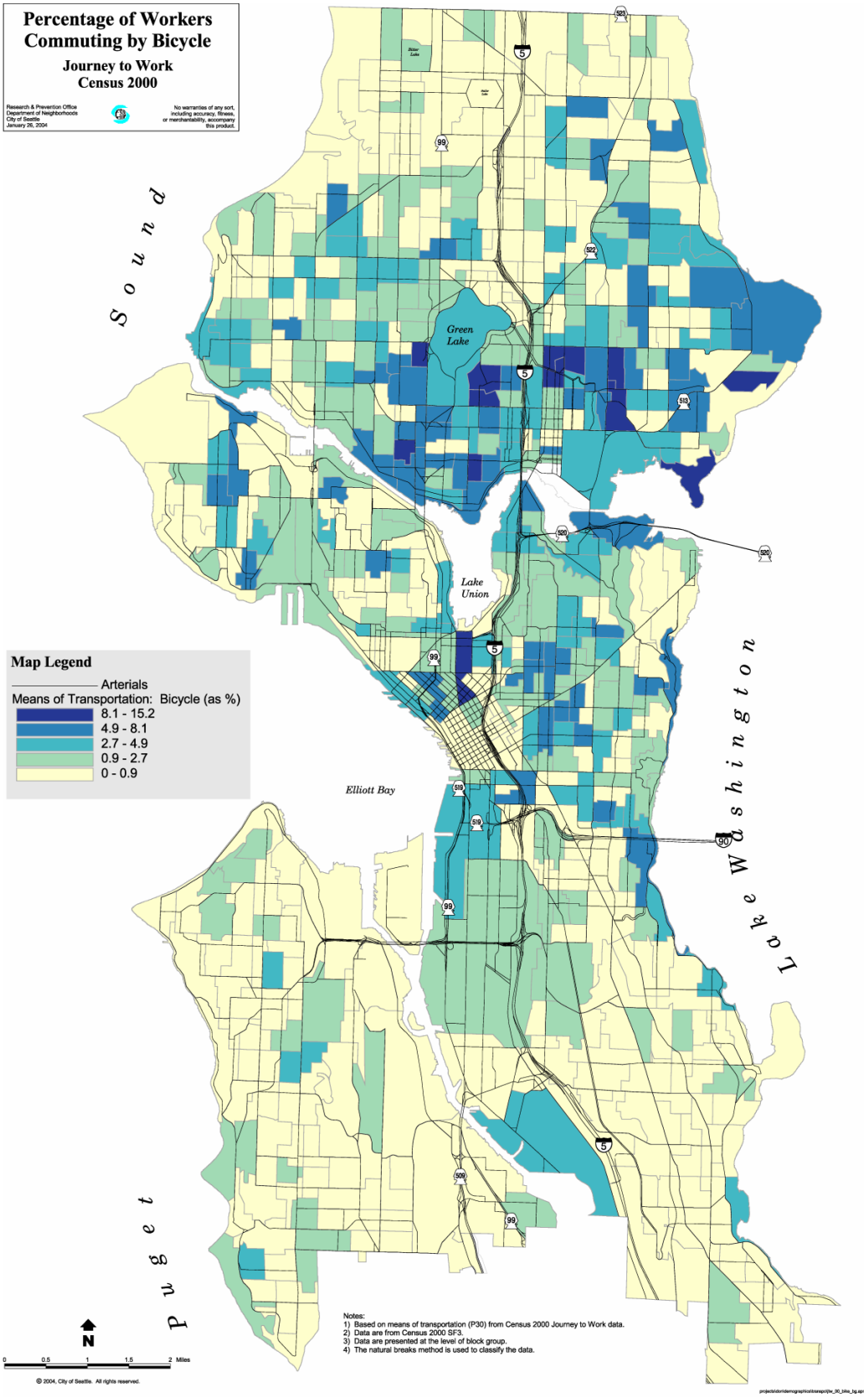
The US Census does not capture trips made for recreational, social, or shopping purposes or trips made by children under age 16, so it undercounts many other bicycle trips being made in all of Seattle's neighborhoods. It is estimated that more than 1 in 3 Seattle residents rides a bicycle during summer months[3].

[1] The Census long form was used to gather journey to work data in 2000. This form is given to approximately 1 in 6 households. It asks respondents to identify the mode of transportation that they used most often during the previous week. The form is distributed in late March/early April. Therefore, people who bicycled to work only once during the week or only bicycle to work during the summer were not captured.

[2] "The City of Cyclists," Presentation given by Brian Hanson, Senior Advisor, City of Copenhagen, March 2007.

[3] The Bureau of Transportation Statistics National Survey of Pedestrian and Bicyclist Attitudes and Behaviors (2002) found that 27.3% of US residents over age 16 bicycled at least once during the previous survey month in the Summer of 2002. This figure does not capture occasional bicyclists who did not bicycle in the past month, but may have bicycled sometime during the summer. In addition, US Census commute data show that the City of Seattle has a much higher bicycle commute to work mode share than the country as a whole, so the percentage of people who bicycled at least once during the previous survey month is also likely to be higher. Therefore, it is fair to assume that more than 1 in 3 (33.3%) of Seattle residents ride a bicycle during summer months.

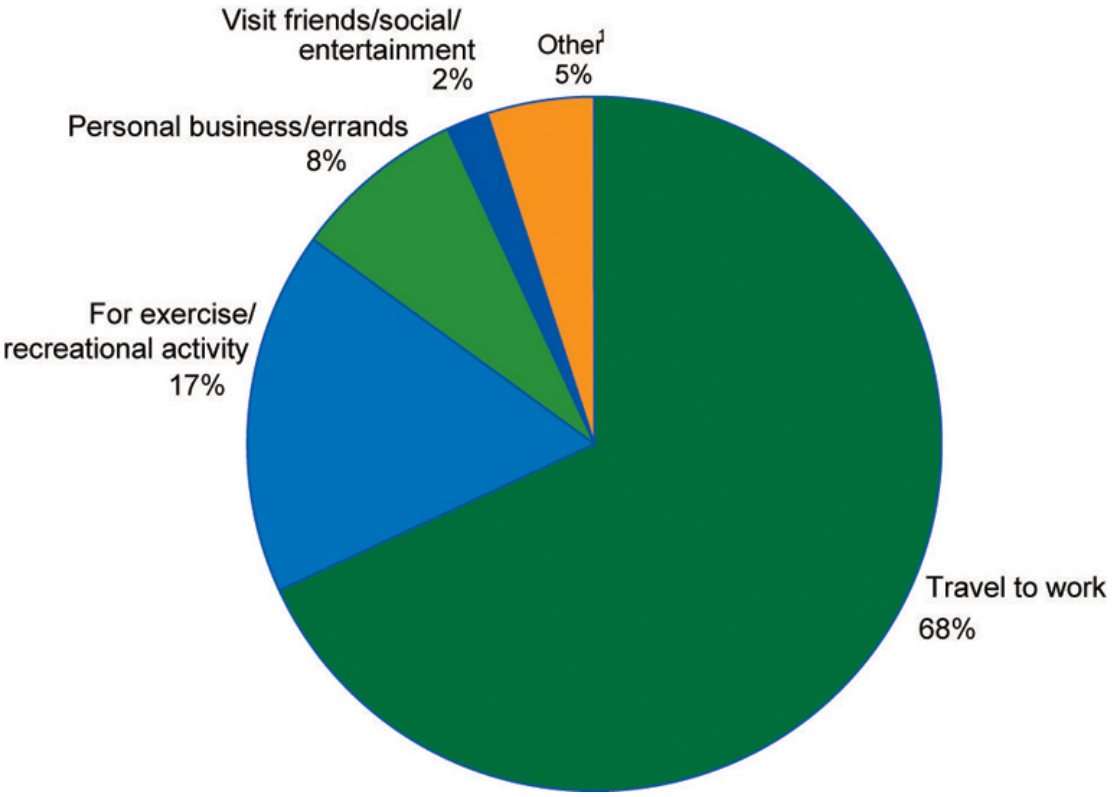
Figure A-2. Seattle Bicycle Commuting



Bicycle Trip Purposes

Seattle residents bicycle for a variety of transportation purposes. The online Bicycle Master Plan questionnaire asked respondents to report the purpose of their last bicycle trip. 68% of respondents bicycled to or from work, followed by 17% for exercise/recreational activity, and 8% for personal business/errands (see Figure A-3). While this survey was unscientific, it was completed by over 1,500 respondents, showing that many people in Seattle enjoy bicycling for recreation and find bicycling useful for transportation.

Figure A-3. Primary Purpose of Respondent's Last Bicycle Trip
(Source Seattle Bicycle Master Plan Online Questionnaire, August through September 2006)



1. Other includes travel to school, travel to bus/ferry/train, and travel to carpool/vanpool.

Bicycle Trip Potential

Seattle, like many other cities in the United States, has great potential for increasing the amount of bicycling by residents. Approximately 16% of Seattle households do not own a motor vehicle, in addition, 14% of Seattle residents are under age 16[4]. Therefore, nearly 30% of Seattle residents are not able to drive a motor vehicle.

There are many opportunities to make trips by bicycle in Seattle. According to the National Household Travel Survey, 48 percent of all trips are less than three miles, within comfortable bicycling distance for many people[5]. In Seattle, many activity destinations are distributed in urban village centers and neighborhoods in all parts of the city. This means that most Seattleites are within bicycling distance of grocery stores, retail centers, work, school, parks, and transit connections.

Bicycle Safety

One of the most critical factors required to realize the full potential for bicycling in Seattle is to ensure that conditions are safe for bicycling. Therefore, improving the safety of bicyclists is also a central goal of this Plan. A safe bicycling environment is essential for making bicycle trips more convenient and for preventing crashes and injuries. It is also critical for making residents who are not experienced bicyclists feel comfortable enough to try bicycling. However, the existing physical conditions for bicycling in many areas of the city require improvement.

Bicycle Crashes

Over the four-year period between 2002 and 2005, there were 1,088 police-reported bicycle crashes in the City of Seattle (an average of 272 per year)[6]. Bicycle crashes have occurred in all parts of the city, but tend to be concentrated in areas with higher bicycle use (see Figure A-4: Police-Reported Bicycle Crashes, 2002-2005). Information about the causes and characteristics of these crashes will help the city make physical improvements and also partner with other organizations to utilize education and enforcement programs to improve the safety of bicyclist and driver behavior.

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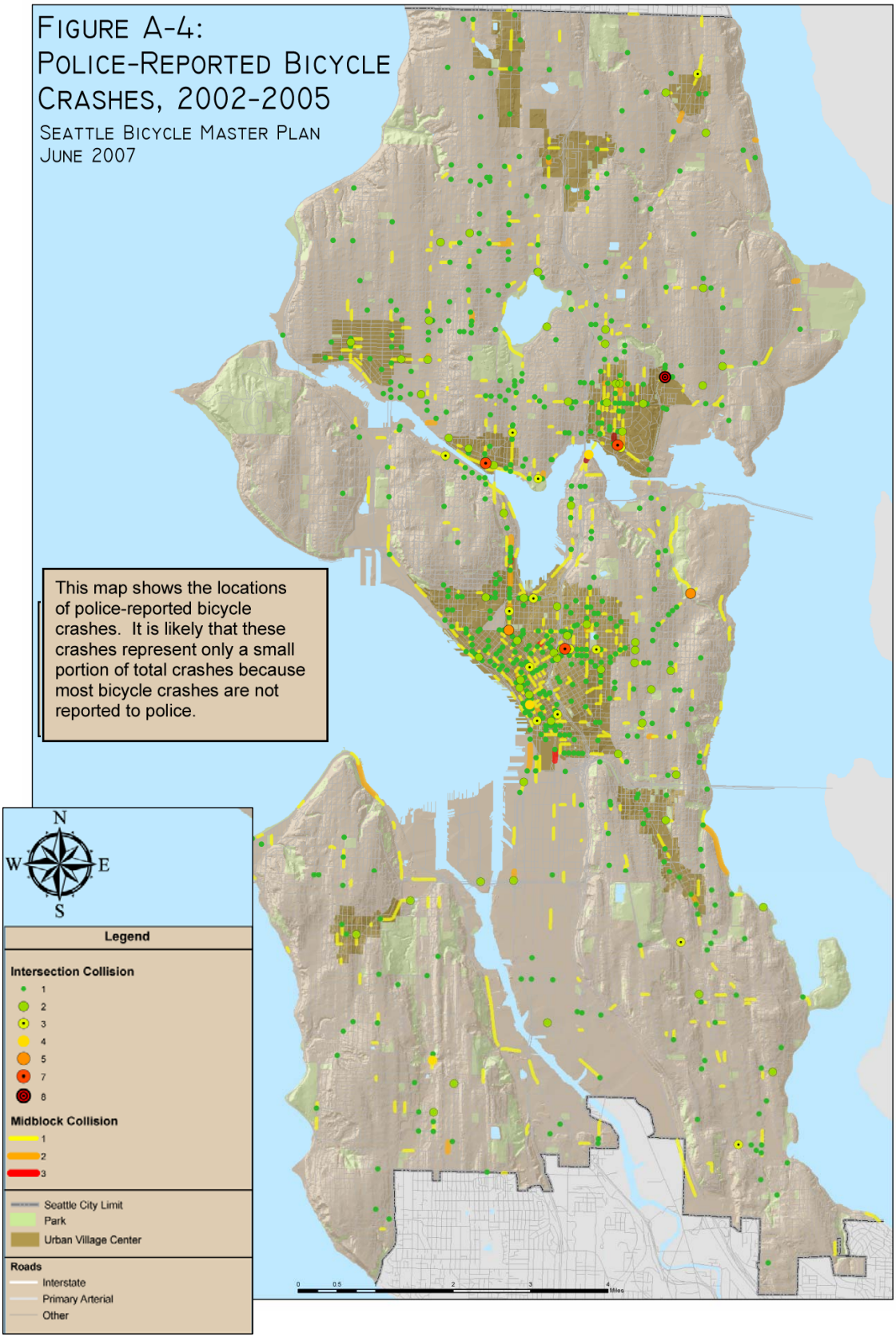
[4] *U.S. Census 2000.*

[5] *U.S. Department of Transportation, Bureau of Transportation Statistics. National Household Travel Survey, 2001.*

[6] *A study by Stutts and Hunter of a sample of cases collected at eight hospital emergency rooms in three states, showed that only 56 percent of the pedestrians and 48 percent of the bicyclists were successfully linked to cases reported on their respective state motor vehicle crash files. This study looked at only the most serious crashes (involving emergency room treatment). We can assume that less-severe crashes were accurately reported at an even lower rate. Good sources on police-reported bicycle and pedestrian crashes include:*
a) Stutts, J.C. and W.W. Hunter. "Police-reporting of Pedestrians and Bicyclists Treated in Hospital Emergency Rooms," Transportation Research Record No 1635, Transportation Research Board, 1998. P. 88-92.
b) Aultman-Hall, L and J. LaMondia. Developing a Methodology to Evaluate the Safety of Shared-Use Paths: Results from Three Corridors in Connecticut, Connecticut Transportation Institute, Connecticut Department of Transportation, Joint Highway Research Advisory Council, JHR 04-297, Project 02-2, May 2004. Available Online: http://www.engr.uconn.edu/ti/Research/jhr04-297_02-2.pdf.

Figure A-4. Police-Reported Bicycle Crashes, 2002-2005



The police-reported bicycle crashes showed several other trends, including:

- Crashes were more common on weekdays than on weekends. The average weekday had 70% more bicycle crashes than the average weekend day.
- More crashes occur during the afternoon peak period than other parts of the day—the most common hour for bicycle crashes is between 5:00 p.m. and 6:00 p.m.
- Most (approximately 90%) of the reported bicycle crashes involved an injury to the bicyclist. It is also likely that many less severe bicycle crashes were not reported to police.
- There were two bicycle fatalities over the four-year period.
- Approximately 21% of reported bicycle crashes occurred under dark, dawn, or dusk lighting conditions.
- Bicycle crashes peaked during summer months. 65% of crashes occurred during the six months from May to October; 35% of crashes occurred over the last six months.

Existing Bicycle Facilities

Since the adoption of Seattle's first Bicycle Master Plan in 1972, the city has developed approximately 39 miles of multi-use trails and 26 miles of striped bicycle lanes (see Table A-1: Existing Bicycle Facilities).

Facility Type	***Miles***[1]
Bicycle lanes/climbing lanes	25.5
Shared lane pavement markings	0.3
Bicycle boulevards	0.0
Other on-road bicycle facilities[2]	2.2
Multi-use trails	39.4
Other off-road bicycle facilities[3]	0.2
TOTAL NETWORK	*67.6*

[1]For on-road bicycle facilities, total miles represent roadway centerline miles with bicycle facilities (e.g., bicycle lanes on both sides of the roadway are not counted separately).

[2]Other on-road bicycle facilities include wide outside lanes, edgelines, paved shoulders, and peak hour bus/bicycle only roadways. Key corridors for short-term study and corridors where an improvement is needed, but the facility is unknown are also counted in this cateogry.

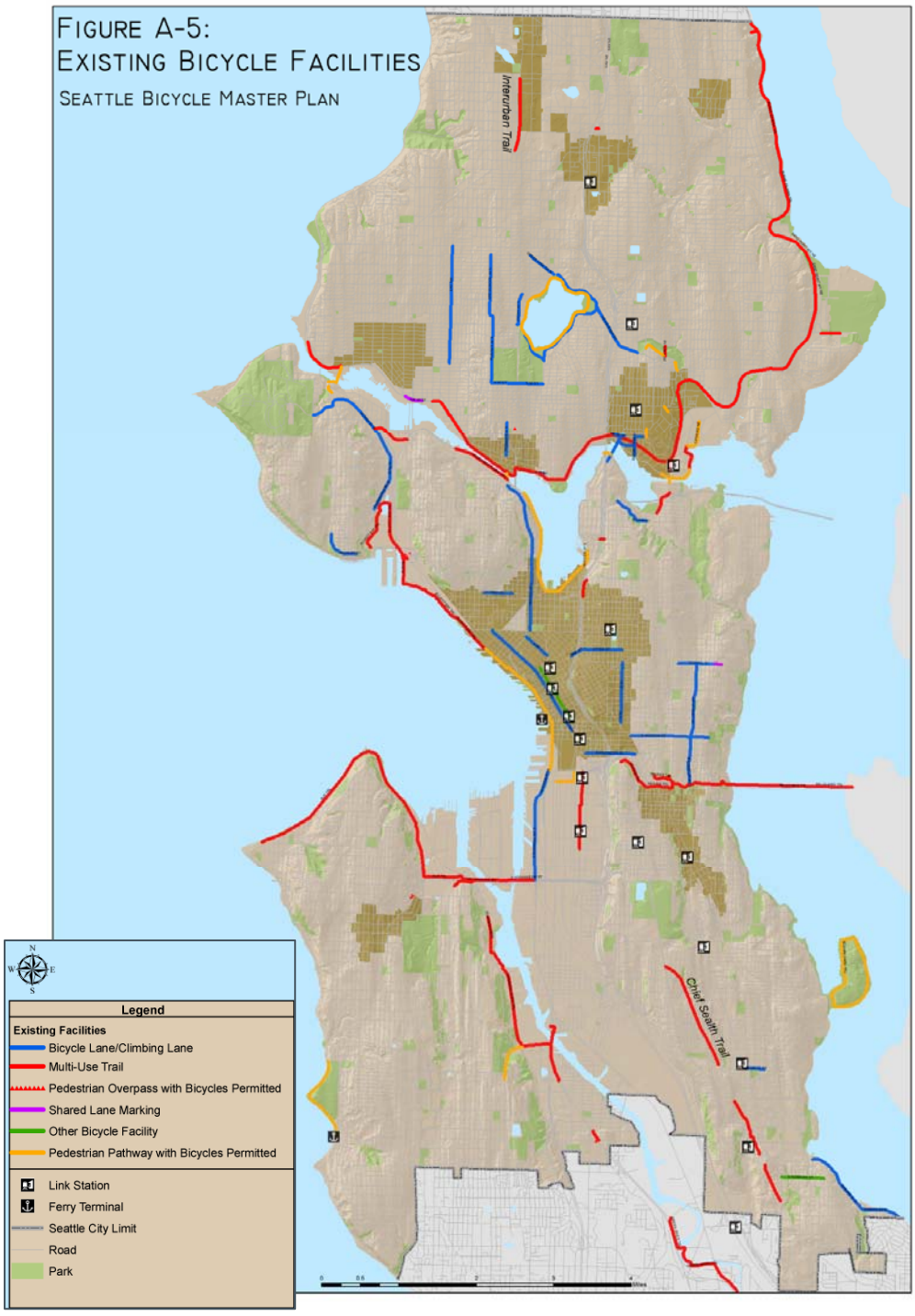
[3]Other off-road bicycle facilities include sidepaths, one-way bike-on-sidewalk pairs, and pedestrian/bicycle-only bridges.

Major components of the city's existing bicycle system include:

- Multi-Use Trails, such as the Burke-Gilman Trail, Elliott Bay Trail, I-90 Trail, Alki Trail, Duwamish Trail, Interurban Trail, and Chief Sealth Trail.
- Bicycle lanes on streets such as NE Ravenna Boulevard, Dexter Avenue N, Fremont Avenue N, Martin Luther King, Jr. Way E, S Jackson Street, and Rainier Avenue S.
- Non-arterial streets throughout the city with low traffic volumes and speeds.
- Facilities complementing the existing bikeways include bicycle route signs, bicycle parking racks and lockers, and bicycle racks on buses.

While many bicycle lanes, trails, and supporting facilities have been developed, there is not an interconnected network of bicycle facilities throughout the city (see Figure A-5: Existing Bicycle Facilities). Some urban villages—the commercial and activity centers of many neighborhoods—are not connected to other parts of the city by bicycle facilities. In addition, there are no existing bicycle facilities within some urban villages to provide access to shopping, restaurant, workplace, and other destinations. There is also a lack of bicycle connectivity between homes and schools, parks, and recreation centers.

Figure A-5. Existing Bicycle Facilities:



While there is not a complete network of bicycle facilities throughout the city, the SDOT Transportation Strategic Plan (2005) recommends a citywide Urban Trails System (See Figure A-6: Urban Trails and Bikeways System). The Urban Trails System includes a spine network of existing and proposed high-quality bicycle facilities, many of which are on separated rights-of-way from motorized traffic. This Bicycle Master Plan recommends changing the name of the Urban Trails System to the Urban Trails and Bikeways System.

Figure A-6. Urban Trails and Bikeways System
(source: Transportation Strategic Plan)

Non-Arterial Roadways

The most common types of bikeways available in Seattle are non-arterial roadways. Many non-arterial roadways are neighborhood streets with low traffic volumes and low traffic speeds, making them comfortable places to bicycle. However, non-arterial roadways are often difficult to use as routes because many run into dead ends, go up very steep hills, or cross major arterial roadways at difficult intersections. Bicycling outside of a small neighborhood area almost always requires using parts of arterial roadways. In a few areas of the city, there are non-arterial routes that can be used to access important destinations. Yet, the optimal route to use given topography and traffic may require many turns, making it difficult to follow because few of these routes are designated by bicycle route signs or markings.

Multi-Use Trails

Seattle has approximately 40 miles of multi-use trails, which are utilized by many bicyclists. These trails are provided only in some parts of the city, and the existing built environment of the city presents limited opportunities to develop new trail corridors. In addition, parts of the existing trail system are very difficult to access because there are no connector paths between nearby neighborhood streets and the main trail. There are also several other challenges to bicycling on the existing trail system:

- Difficult arterial roadway crossings (e.g., Burke-Gilman Trail at 25th Avenue NE, I-90 Trail at 23rd Avenue S and Martin Luther King Jr. Way S, etc.).
- Poor pavement quality, overgrown brush, and other maintenance problems (particularly on older sections of the Burke-Gilman, Alki, and Duwamish Trails).
- Overcrowding and pedestrian crossings on popular sections of trail (e.g., Burke-Gilman Trail near the University of Washington).
- Critical gaps in several trail systems (e.g., Burke-Gilman Trail through Ballard and parallel to Seaview Avenue; I-90 Trail between I-5 and Downtown; Duwamish Trail between W Marginal Way and the Low Level Bridge; and Chief Sealth Trail between S Myrtle Street and S Kenyon Street and from Renton Avenue S into Renton).

Arterial Roadways

There are currently several types of bicycle facilities provided on Seattle's arterial roadways. Bicycle lanes are the most common type, marked on 25 miles of streets. Most of the existing bicycle lanes are on the right side of the travel lanes, with the exception of 2nd Avenue (Downtown) and NE Ravenna Boulevard. There are also several miles of arterial roadways with paved shoulders, wide outside lanes, and shared lane markings. 3rd Avenue (Downtown) is currently closed to all through vehicles except buses and bicycles during peak hours.

Seattle's arterial roadways are critical for bicycle access. The arterial streets are public rights-of-way that typically provide continuous connections between neighborhoods and key destinations to all parts of Seattle. They are often the most direct and least hilly routes that are available for many trips. However, arterial streets often carry higher-volume, higher-speed traffic than other non-arterial streets. Because many of these busy arterial streets do not currently have bicycle lanes or other on-street bicycle facilities (to provide designated space for bicyclists and/or a visible indication that bicyclists should be expected on the roadway), they can be uncomfortable to ride on or avoided by bicyclists completely. In a few cases, there are nearby multi-use trail or non-arterial street routes that can be used as alternatives to a busy arterial street. However, even if these non-arterial roadway facilities are nearby, they may have difficult roadway crossings for bicyclists to negotiate, and may not provide bicyclists with access to the key destinations located on the arterial roadway.

Roadway Crossings

Roadways like Aurora Avenue N, 35th Avenue SW, and Rainier Avenue S are multi-lane roadways that can be very difficult for bicyclists to cross. Signalized intersections, pedestrian crosswalk signals, median crossing islands, and bicycle and pedestrian overpasses/underpasses are all facilities that help bicyclists, as well as other users, cross these roadways. Even with traffic controls, some intersections are still difficult for bicyclists to negotiate because of turning vehicles (e.g. Burke-Gilman Trail at 25th Avenue NE; downtown street crossings of the 2nd Avenue bicycle lanes). As the citywide network of bicycle facilities is developed, it is critical to have safe and convenient crossings of streets at locations with high traffic volumes and high traffic speeds.

Bridge Crossings

Other existing barriers to bicycling include bridge crossings:

- Bridges across the Ship Canal, including the approaches to each bridge (e.g., Ballard Bridge, University Bridge, Aurora Bridge, etc.)
- Bridges and underpasses across I-5 (e.g., N 92nd Street, NE 50th Street, NE 45th Street, S Jackson Street, S Dearborn Street, S Holgate Street, S Lucile Street)
- Bridges over railroad tracks (e.g., 1st Avenue S, 4th Avenue S, Airport Way S)
- Bridges across the Duwamish River, including the approaches to each bridge (Low Level Bridge, 1st Avenue S Bridge, 14th Avenue/16th Avenue S Bridge)

These bridges, including their approaches and access ramps are critical for long-term improvements to bicycle access throughout the city.

Signed Bicycle Routes

Several signed bicycle routes were established by the city in the 1980s. Routes such as the Magnolia Loop and Ballard Route were designated by bicycle route signs. Signs on many of these routes have not been maintained in recent years, and this Plan recommends replacing these existing signs with new bicycle route signs and a citywide wayfinding concept.

Supporting Bicycle Facilities

Seattle also has supporting bicycle facilities, such as bicycle racks, bicycle lockers, and bicycle racks on buses. Racks are located in many office buildings, commercial areas, and near colleges and universities. Some have been added at transit stations, in parks, and along trails. The city has one staffed bicycle facility—Bikestation Seattle®. This facility provides secure bicycle parking, bicycle repair, and bike rentals.

Bicycle Facility Issues by Location

The section below serves as an initial summary of bicycle facility issues in each part of the city. These projects will be included on a needs list for prioritization along with other projects identified in the plan. These critical bicycle facility issues are based on field evaluations from several groups[7], consultant team field work, and public comments provided through the online questionnaire and the Bicycle Master Plan public meeting (a more detailed summary of the public comments is provided at the end of this Appendix).

[7] Cascade Bicycle Club. *Left by the Side of the Road: Puget Sound Regional Bicycle Network Study: Assessment and Recommendations*, 2003; Seattle Bicycle Advisory Board Bikeability Reports, 2006.

Downtown Seattle/South Lake Union

- Installation of bike lanes on Alaskan Way between the Elliott Bay Trail and East Marginal Way.
- Improving the existing bicycle lanes on Alaskan Way/East Marginal Way S.
- Improving bicycle access between Downtown and the stadium areas and light rail stations to the south.
- Crossings of Denny Way, particularly access from Dexter Avenue N bicycle lanes to Downtown.
- Access between Downtown and the University of Washington via Eastlake Avenue E, Fairview Avenue N, Virginia Street, Stewart Street, and Howell Street as well as via Melrose Avenue E, Lakeview Boulevard E, and Harvard Avenue E.
- Providing a north-south bicycle facility through Downtown.
- Improving east-west access on Bell Street/Blanchard Street, Pine Street/Pike Street, Spring Street/Seneca Street.
- Conflicts with turning vehicles, particularly with the 2nd Avenue left-side bicycle lane.
- Conflicts with buses.
- Improving north-south access through South Lake Union on Westlake Avenue N.
- Developing connected bicycle facilities on all sides of Lake Union.

Capitol Hill/First Hill/International District

- I-5 crossings into Downtown (Denny Way, Olive Way, Pine Street, Pike Street, Spring Street, Seneca Street, Yesler Way, S Jackson Street, S Dearborn Street).
- Connection to University of Washington via Harvard Avenue (Melrose Avenue E/Lakeview Boulevard E should be discussed as a bigger "idea" – see separate comments on the potential for this route).
- Improvements to Broadway E.
- Improvements to the Arboretum Bypass route.
- Crossings of Boren Avenue.
- Improving the existing Martin Luther King, Jr. Way E bicycle lanes.
- Identifying and improving east-west routes.
- Improving the condition of Lake Washington Boulevard.

Magnolia/Queen Anne

- Improving the Dexter Avenue N Bike Lanes.
- Improving the condition of the Elliott Bay Trail.
- Providing better bicycle access on the Magnolia Bridge.
- Providing bicycle access in the Elliott Avenue/15th Avenue W Corridor from the Ballard Bridge to Downtown.
- Improving access to Upper Queen Anne.
- Providing a trail section to complete the connection between 32nd Avenue W, W Galer Street, and W Marina Place.
- Providing east-west access through Lower Queen Anne on N Roy Street and N Mercer Street.
- Providing east-west access on W Dravus Street.

West Seattle

- Connection to Low Level Bridge via Delridge Way SW.
- Bicycle lanes on Delridge Way SW.
- Bicycle access on 35th Avenue SW.
- Crossings of 35th Avenue SW.
- Improvements to Alki Trail.
- Improvements to Beach Drive SW.
- Improved access to the Fauntleroy Ferry (to Vashion Island and Southworth).
- Bicycle connections through the West Seattle Greenbelt.
- Signage and wayfinding to and across Low Level Bridge.
- Identifying and improving east-west routes.
- Bicycle lanes and wayfinding signage along SW Avalon Way, SW Admiral Way, California Avenue SW, and Harbor Avenue SW.

South Park/Georgetown

- Improving bicycle access from Downtown to Georgetown via Airport Way S and 6th Avenue S.
- Improving bicycle access from Downtown to South Park via 1st Avenue S, E Marginal Way S, and W Marginal Way S.
- Improving bicycle access across the Duwamish River between Georgetown and South Park via the 14th/16th Avenue S Bridge and 1st Avenue S Bridge.
- Improving bicycle access up the hill from South Park to West Seattle.

Southeast Seattle

- Completing the Chief Sealth Trail from Gazelle Street south to the city limits.
- Extending the Chief Sealth Trail north across I-5 to Downtown.
- I-5/1-90 crossings (S Albro Place, S Lucille Street, S Holgate Street, S Columbian Way, and 12th Avenue S).
- Improving the condition of Lake Washington Boulevard S.
- Bicycle access on Rainier Avenue S.
- Crossings of Rainier Avenue S.
- Bicycle access and wayfinding to new Sound Transit Stations.
- Development of a new multi-use trail in the I-5 corridor.
- Completing the Mountains to Sound Greenway, including the multi-use trail connection across the I-5 and I-90 interchange.
- Constructing a new crossing over the railroad tracks at Military Road S.
- Identifying and improving east-west routes.

Ballard/Fremont

- Completing the Burke-Gilman Trail to Golden Gardens Park.
- Improving bicycle access to and across the Ballard Bridge.
- Improving bicycle access to and across the Fremont Bridge.
- Identifying and improving east-west routes between Ballard and Fremont.
- Improving condition of bicycle crossing and removing restrictions to crossing the Locks.
- Crossings of 15th Avenue NW, 8th Avenue NW, and Aurora Avenue N.
- Crossings of NW Leary Way, NW Market Street, and NW 65th Street.

Wallingford/University District/Ravenna

- I-5 crossings between Wallingford and the University District (NE 45th Street, NE 50th Street, NE Ravenna Boulevard, NE 65th Street, NE 70th Street, NE 80th Street).
- Providing a new pedestrian/bicycle crossing of I-5 between NE 45th Street and NE 50th Street.
- North/south bicycle access on Roosevelt Way NE/11th Avenue NE.
- Improving bicycle access to and across the University Bridge (particularly crossing the exit ramps on the north side of the bridge).
- Improving bicycle access to and across the Montlake Bridge (particularly crossing roadways on both ends of the bridge).
- Reducing bicycle and pedestrian conflicts and roadway crossing conflicts on the Burke-Gilman Trail (particularly at 25th Avenue NE, and at NE Pacific Street/UW Medical Center Parking Lot).
- Improving access between the Burke-Gilman Trail and Green Lake via NE Ravenna Boulevard (particularly improving access on the southeast end of this linkage)
- Bicycle access on Stone Way N.
- Improving crossings of NE 45th/46th Street and NE 50th Street.

Northwest Seattle

- Completing the Interurban Trail north into Shoreline.
- Providing a bicycle boulevard from southern terminus of the Interurban Trail to Green Lake Area.
- Identifying and improving east-west routes.
- Access to Golden Gardens park from northwest Seattle neighborhoods.
- Crossings of Greenwood Avenue N and Aurora Avenue N.
- Work with Shoreline and Puget Sound Regional Council to extend and improve bicycle lanes between Seattle and Shoreline, and into Edmonds to connect bicyclists to the Edmonds-Kingston ferry route.

Northeast Seattle

- Access to Burke-Gilman Trail from northeast Seattle neighborhoods.
- Burke-Gilman Trail maintenance improvements.
- Identifying and improving east-west routes between Ballard and Fremont.
- Crossings of I-5 (N 130th Street, N 117th Street, N 92nd Street).
- Crossings of Lake City Way NE, NE Northgate Way, and NE 125th/130th Avenue.

Public Comment Summary

Public comments were provided through a variety of sources during the planning process. Public meetings, an on-line survey and comments submitted via email were received, recorded, and taken into consideration during the planning process. At the meetings, citizens were given the opportunity to provide comments in a variety of ways, including talking with members of the project team, writing on comment cards, completing an online survey (using an on-site computer), and marking on a number of maps. The online survey was administered via the SDOT website during the summer months of 2006.

The maps available for comment included:

- Citywide Preliminary Bicycle Facility Recommendations
- North Seattle Preliminary Bicycle Facility Recommendations
- South Seattle Preliminary Bicycle Facility Recommendations
- Downtown Seattle Bicycle Facilities
- Seattle Bicycle Map
- Large-Scale, Site-Specific Maps:
    - I-5 crossings between NE 40th Street and NE 50th Street
    - Green Lake
    - University Bridge
    - Connection to new Sound Transit Station at Rainier Avenue S, Martin Luther King Jr. Way S, and S McClellan Street
    - Rainier Avenue S crossing at S Dearborn Street
    - Ballard Bridge
    - Fauntleroy Way
    - I-5 crossing at S Lucille Street and access through the surrounding areas

Online Survey Responses

1584 Respondents
62% Male, 38% Female
Average Age: 41 years

1. Based on your experience, which Seattle streets are best for bicycling? (Be as specific as possible about location, for example: NE Ravenna Boulevard between University Way NE and East Greenlake Way N)
    - Dexter Avenue - 427
    - Lake Washington Boulevard - 245
    - Ravenna Boulevard – 220
    - 8th Avenue – 147
    - Eastlake Avenue – 80

2. Which Seattle streets are worst for bicycling? Please be as specific as possible.
    - 15th Avenue – 174
    - Rainier Avenue – 133
    - Eastlake Avenue –119
    - Westlake Avenue – 116
    - Lake Washington Blvd– 108

3. What are the best off-street routes (paved trails or sidewalks) in Seattle?
    - Burke-Gilman Trail – 920
    - I-90 Trail – 201
    - Myrtle Edwards Trail– 165
    - Alki Trail – 113
    - Elliot Bay Trail – 75
    -

4. What are the worst off-street routes (paved trails or sidewalks) in Seattle?
    - Burke-Gilman Trail – 270
    - Alaskan Way Trolley Trail – 30
    - Greenlake Pathway – 30
    - Ballard Bridge – 21
    - Duwamish Trail – 15

5. On which streets would you like to see bicycle lanes or other bicycle facilities? (Please be specific.)

- Eastlake Avenue – 91
- Westlake Avenue – 56
- Lake Washington Boulevard – 46
- Rainier Avenue – 42
- Stone Way – 30

6. At which locations would you like to see spot improvements? (For example a bridge, railroad crossing or intersection. Please be specific.)

- Ballard Bridge – 119
- Burke-Gillman Trail – 46
- Fremont Bridge – 40
- Montlake Bridge – 10
- Alaskan Way – 10

7. At which locations would you like to see additional bicycle parking (racks or lockers) provided? (Please provide a neighborhood, address, intersection, business name, transit station or shopping district.)

- Downtown – 44
- Montlake – 30
- University District – 30
- Westlake Mall – 20
- Pike Place Marke – 10

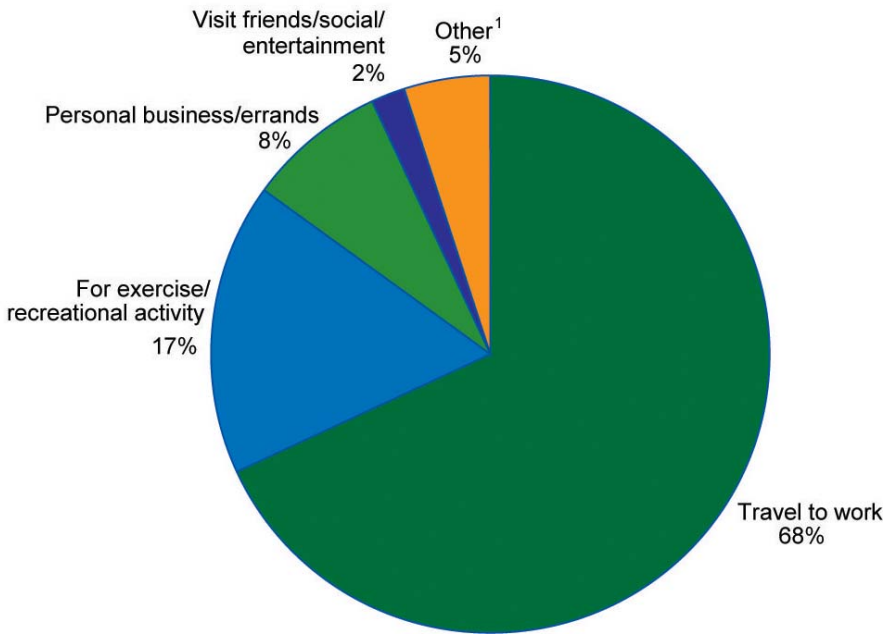
8. On which routes do you think it is important to provide bike route signs?

- All/Any – 70
- Dexter Avenue– 25
- Burke-Gilman Trail – 20
- Downtown (various) – 20
- Lake Washington Bicycle Route – 20

9. Which locations do you think would benefit from signs with directional information? (For example a particular bridge access point, trail access point, or highway crossing. Please be specific.)

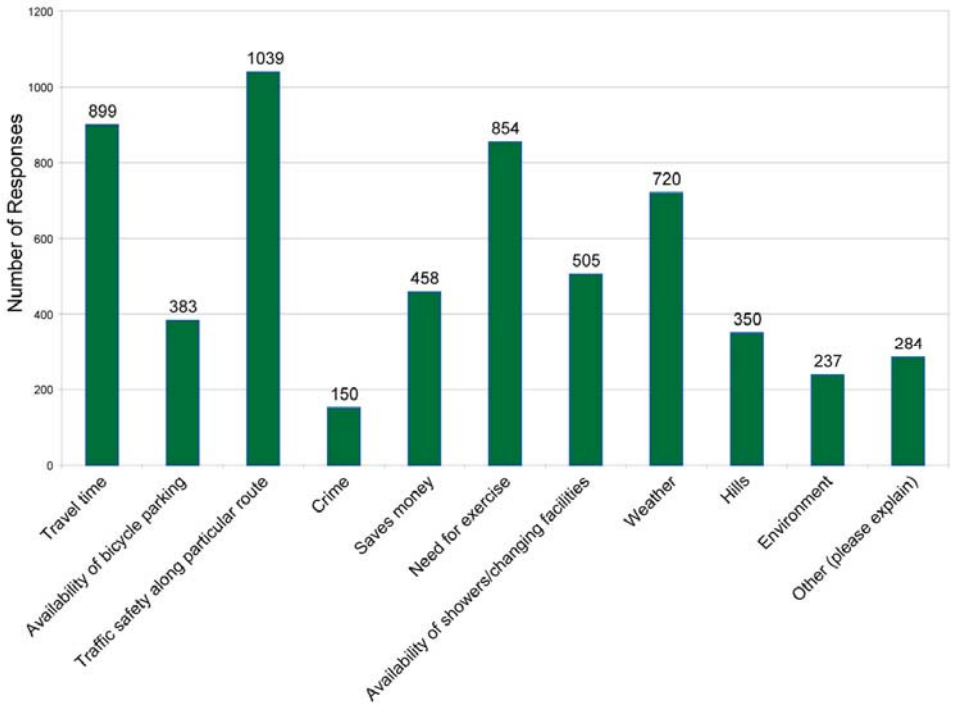
- Ballard Bridge – 50
- Burke-Gillman Trail – 20
- Fremont Bridge – 20
- I-90 Trail – 20
- West Seattle Bridge – 10

10. What was the primary purpose of your last bicycle trip? (Please circle only one answer.)

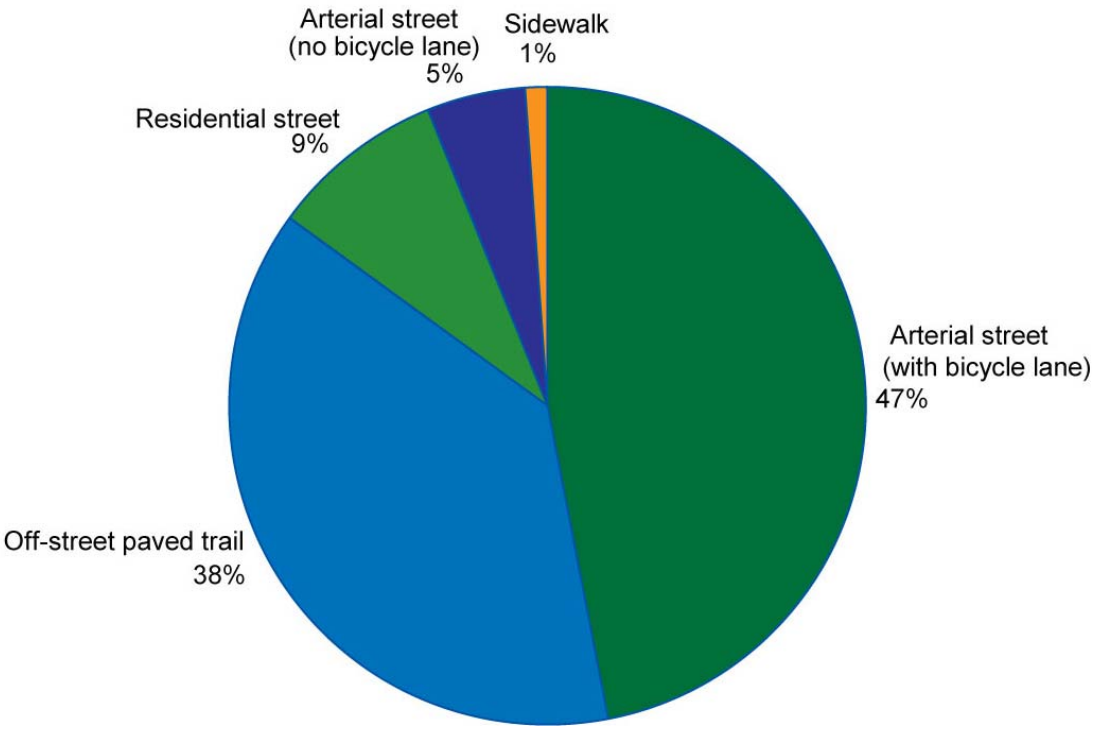


1. Other includes travel to school, travel to bus/ferry/train, and travel to carpool/vanpool.

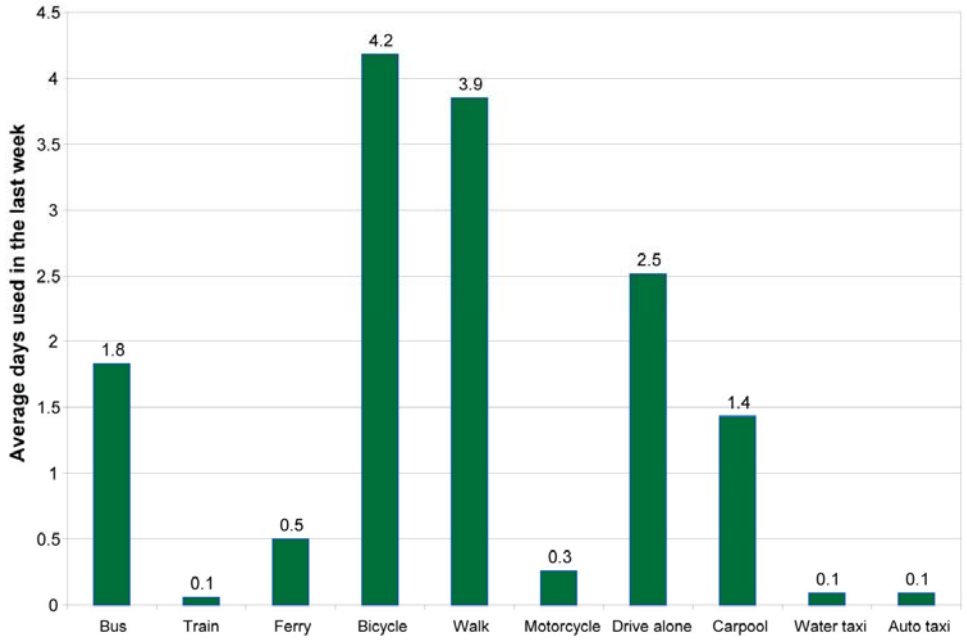
11. Which of the following factors plays a role in whether or not you ride your bike to your destination? (Circle as many as apply.)



12. When making a bicycle trip, which of the following do you prefer to use? (Circle only one answer.)



13. Enter how many days, during the last week, that you used each of the following types of transportation? (Enter 0-7 for each mode. It's ok if your grand total is greater than seven.)



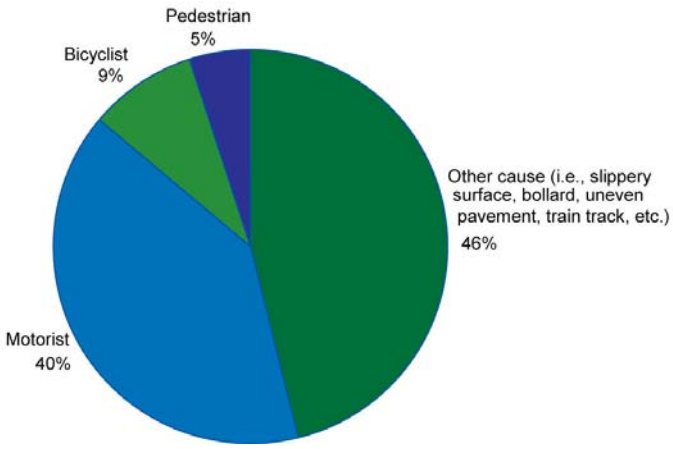
14. Do you have an automobile available to you for trip making?

- Yes - 92%
- No - 8%

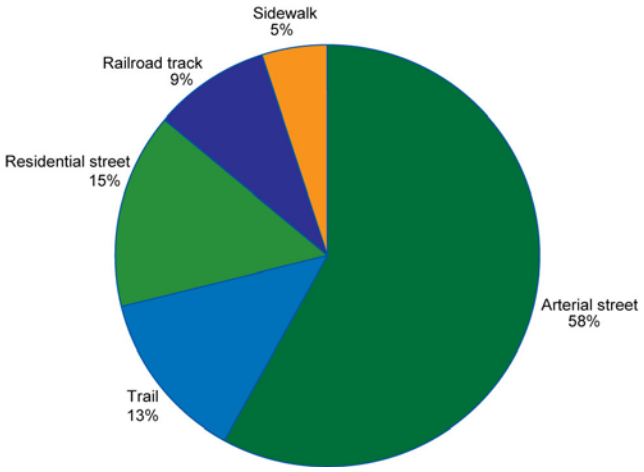
15. In the last week, did you take your bike on the following modes of public transportation?

	Yes	No
Bus	20%	80%
Ferry	9%	91%
Train	1%	99%

16. If you have been involved in a crash while riding your bike in the City of Seattle, please circle the responses below indicating who (or what) else was involved in the crash. (Question 19 allows you to provide information about additional crashes, if applicable.)



17. If you have been involved in a crash while riding your bike in the City of Seattle, please circle the response below indicating the type of facility where the crash occurred. (Question 19 allows you to provide information about additional crashes, if applicable.)



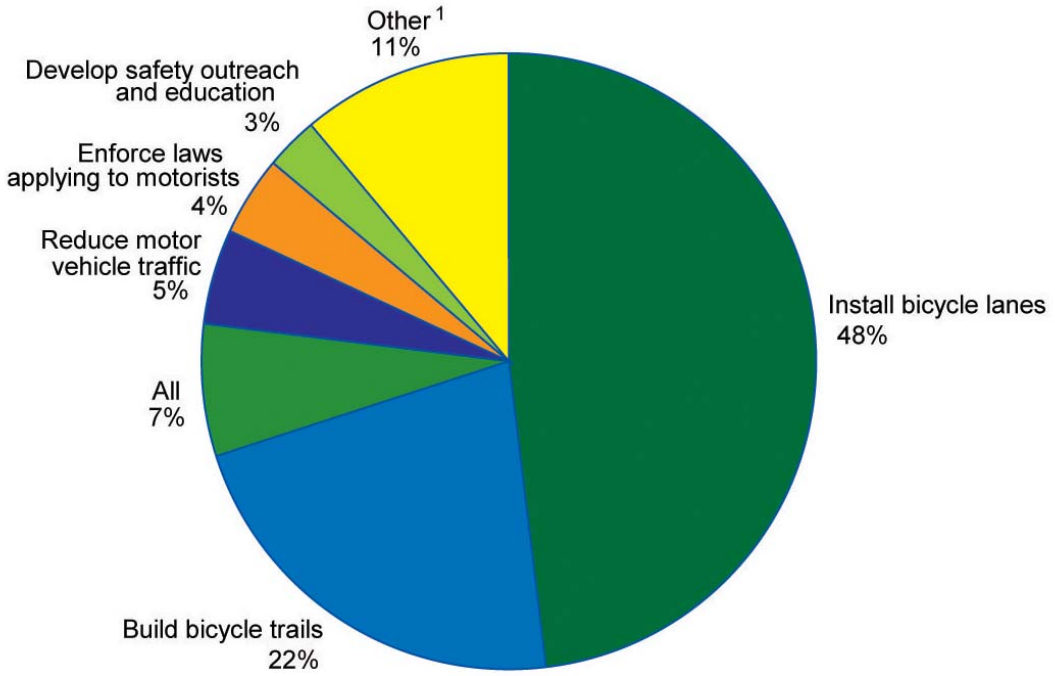
18. If you indicated in the previous question that you have been involved in a bicycle crash in the City of Seattle, please provide the location of that crash. (Question 19 allows you to provide information about additional crashes, if applicable.)

Summary not available.

19. If you would like to provide information about additional bicycle crashes, please describe the incidents below. If possible, include who (or what) else was involved in the collision, the type of facility where it occurred, and the location of the collision.

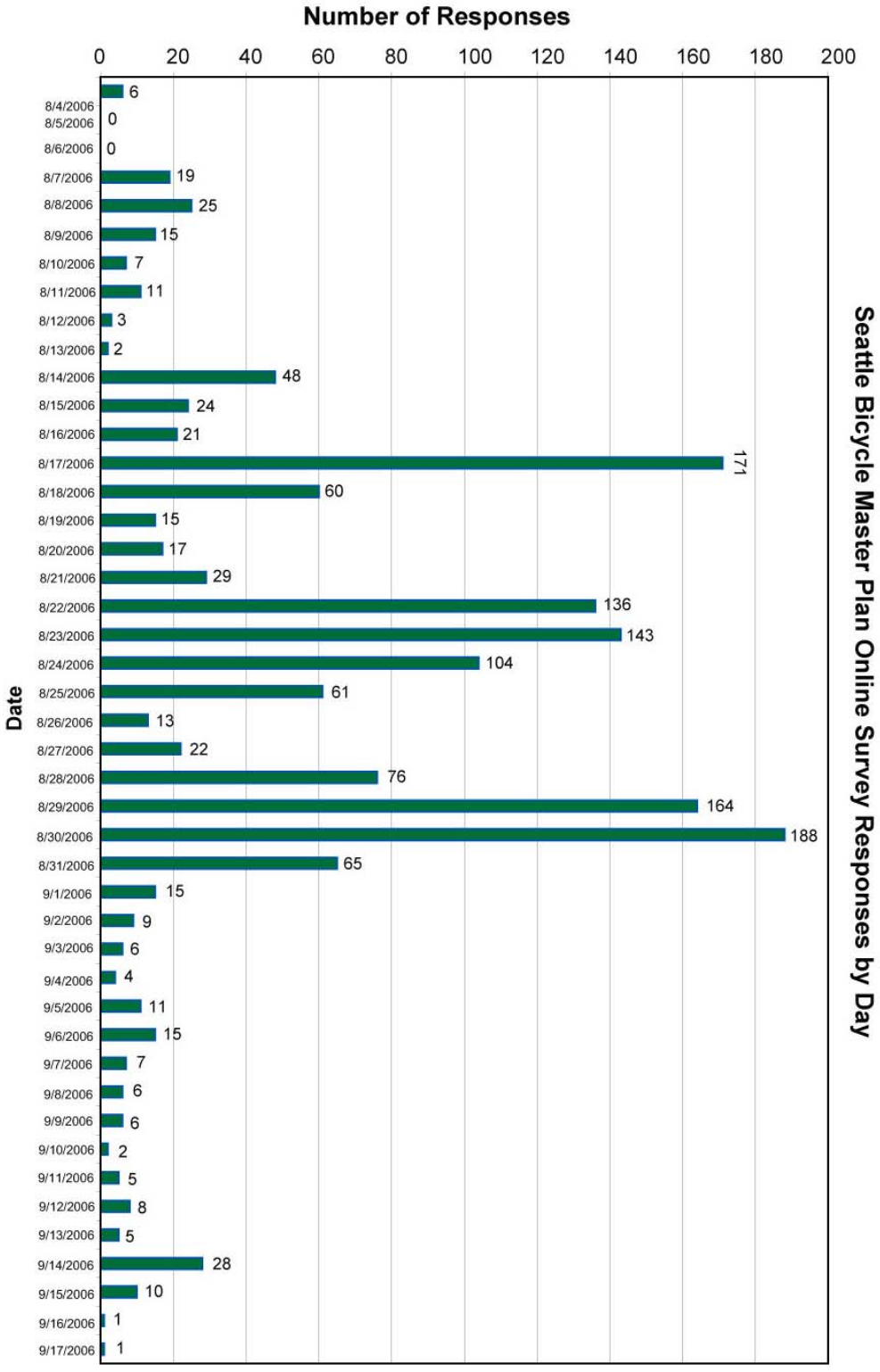
Summary not available.

20. Which of the following factors do you think would do the most to encourage bicycling in the City of Seattle? (Please circle only one.)



1. Other includes Enforce laws applying to bicyclists, Provide bicycle parking, Reduce crime, Nothing, and Don't know.

This graph shows the number of responses submitted to the city each day during the survey period.



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Appendix B.

List Meetings Held During the Planning Process

June 13, 2006:	SDOT Internal Staff Kick-Off Meeting
June 14, 2006:	Citizens Advisory Board Kick-Off Meeting
June 15, 2006:	SDOT Traffic Engineering Meeting
July 12, 2006:	Citizens Advisory Board Meeting
July 13, 2006:	SDOT Traffic Engineering Meeting
August 29, 2006:	Puget Sound Regional Council Meeting
August 29, 2006:	Public Meeting for Gathering Input (University of Washington)
August 30, 2006:	SDOT Policy and Planning Staff Meeting
August 30, 2006:	Citizens Advisory Board Meeting
September 20, 2006:	Citizens Advisory Board Meeting
October 17, 2006:	Freight Mobility Access Committee Meeting
October 17, 2006:	Seattle Department of Parks and Recreation Meeting
October 17, 2006:	SDOT Traffic Engineering Meeting
October 18, 2006:	Seattle Internal Staff Update Meeting
October 18, 2006:	Citizens Advisory Board Meeting
November 13, 2006:	SDOT Policy and Planning Staff Meeting
November 13, 2006:	SDOT Pedestrian Staff Meeting
November 14, 2006:	SDOT Traffic Engineering Meeting
November 15, 2006:	SDOT and KC/METRO Transit Meeting
November 15, 2006:	Citizens Advisory Board Meeting
December 5, 2006:	Public Meeting on Draft Plan (Ballard)
December 6, 2006:	Puget Sound Regional Council Meeting
December 7, 2006:	Public Meeting on Draft Plan (Columbia City)
December 8, 2006:	SDOT Policy and Planning Staff Coordination
December 12, 2006:	Queen Anne Neighborhood
December 14, 2006:	Public Access Television Roundtable discussion on Bike Master Plan
December 21, 2006:	Department of Neighborhoods District Coordinators Meeting
December 27, 2006:	KC/METRO Transit Meeting

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Key Locations for Coordinating Bicycle Facility Design with Future Rapid Transit Service

Figure C.1. Roadways for Bicycle and Transit Coordination

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Appendix D.

Key Locations for Coordinating Bicycle Facility Design with Future Rapid Freight Transportation

Figure D.1. Roadways for Bicycle and Freight Coordination

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Appendix E.

Goals and Objectives

Bikeway: A generic term for any road, street, path, or way which in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

(Source: American Association of State Highway and Transportation Officials Guide for the Development of Bicycle Facilities, 1999)

This appendix provides general descriptions of the types of bicycle facilities recommended for the Seattle Bicycle Facility Network. There are two main categories of facilities: facilities for network segments and facilities for roadway crossings. Additional detail is provided for these facilities in Appendix F: Guidance for Retrofitting Seattle Streets to Create Dedicated Bicycle Facilities and Appendix H: Roadway Crossing Design for Bicycles.

Facilities for Network Segments

The Bicycle Facility Network includes a variety of on- and off-road bicycle facilities. On-road bicycle facilities serve several purposes, including designating roadway space for bicyclists, channelizing motor vehicles and bicyclists, making bicyclist movements more predictable, indicating the proper direction for bicyclists to travel on the roadway, and indicating the optimal location on the street for riding at mid-block locations and when approaching intersections. Off-road bicycle facilities, including multi-purpose trails, provide a space for bicyclists to be physically separated from roadway traffic. The specific type of facility that is recommended on each segment of the network depends on a wide range of factors including:

- Surrounding land uses and connectivity to destinations
- Existing right-of-way space
- Number of travel lanes
- Travel lane width
- Traffic volume
- Traffic speed
- Traffic composition (presence of buses and large trucks)
- Presence of on-street parking
- Pedestrian activity

Bicycle facilities recommended for on-road and off-road segments in the Bicycle Facility Network are described below.

On-Road Bicycle Facilities

Bicycle Lanes

A bicycle lane is a portion of the roadway that has been designated by striping, signing[1], and/or pavement markings for the preferential use of bicyclists. The minimum width for a bicycle lane next to parked cars is five feet (four feet if next to a curb). Bicycle lanes include a bicycle pavement marking with an arrow to indicate that bicyclists should ride in the same direction as adjacent motor vehicle traffic. These facilities are recommended for arterial roadways in Seattle. Bicycle lanes can provide the following benefits:

[1] *The National Committee on Uniform Traffic Control Devices (NCUTCD) voted unanimously, at the January 20th, 2006 committee meeting, to allow jurisdictions the flexibility to designate bicycle lanes without bicycle lane signs (R3-17) – striping will be sufficient to designate bicycle lanes.*

- Increase the comfort of bicyclists on roadways
- Increase the amount of lateral separation between motor vehicles and bicycles
- Indicate the appropriate location to ride on the roadway with respect to moving traffic and parked cars, both at mid-block locations and approaching intersections
- Increase the capacity of roadways that carry mixed bicycle and motor vehicle trafficIncrease predictability of bicyclist and motorist movements
- Increase drivers' awareness of bicyclists while driving and when opening doors from an on-street parking space

When on-street parking exists, bicycle lanes should be designed so that bicyclists are encouraged to ride far enough away from parked cars so that they are not at risk of being struck by opening doors. Further, bicycle lanes should not be placed between parked cars and the curb, for the following reasons:

- Motor vehicles entering the arterial roadway from a side street must cross through bicycle traffic to view arterial roadway traffic around the parked cars. This takes driver attention away from bicyclists and blocks bicyclists.
- Drivers of motor vehicles crossing or turning from or to the road with bicycle lanes are primarily focused on motor vehicle traffic on the roadway. Bicyclists in the bike lanes are not in their primary line of sight.
- To make a left turn, bicyclists must merge into the travel lanes from behind a line of parked cars, creating a situation with poor sight lines between motorists and bicyclists. If parking is fully-utilized, this may not even be possible.
- Motor vehicle passengers are not accustomed to looking for bicyclists when they open their doors on the right side of the vehicle.
- If the facility is a two-way bicycle pathway, bicyclists are encouraged to ride in the opposite direction of adjacent motor vehicle traffic, making them vulnerable to motor vehicle drivers who only look to their left when turning right from a side street.
- Roadway space is not used efficiently. Roadways with on-street parking require some space for car doors to open safely. When one line of cars is moved away from the curb to make room for the bicycle facility, several feet of shy distance (e.g., lateral space) are needed on both sides of that line of parked cars, rather than just on the drivers' side. Overall, more roadway space is needed for car doors to open, so less space can be used for other purposes.

Shared Lane Markings

Shared lane markings are bicycle symbols that are placed within a vehicular travel lane of the roadway. Unlike bicycle lanes, they do not designate a particular part of the roadway for the use of bicyclists. The bicycle symbols used in shared lane markings include chevrons pointing in the direction of motor vehicle traffic to indicate that bicyclists should also ride in this direction. Shared lane markings have the following benefits:

- Provide a visible cue to bicyclists and motorists that bicycles are expected and welcomed on the roadway
- Indicate the most appropriate location to ride on the roadway with respect to moving traffic and parked cars
- Can be used on roadways where there is not enough space for standard width bicycle lanes
- Connect gaps between other bicycle facilities, such as a narrow section of roadway between road segments with bicycle lanes

Shared lane markings will be used most commonly on arterial roadways. However, the city may experiment with and develop a protocol for using these markings on non-arterial roadways.

Climbing Lanes

Climbing lanes are a hybrid bicycle facility that includes a five-foot bicycle lane on one side of the roadway (typically in the uphill direction) and a shared lane marking on the other side of the roadway. This allows slower-moving, uphill bicyclists to have a designated bicycle lane space and allows motor vehicles to pass more easily. It also allows faster-moving, downhill bicyclists to have a shared-lane marking, which alerts motorists to expect faster-moving bicyclists in the travel lane, further from parked cars. The bicycle lane and shared lane markings also indicate the proper direction for bicyclists to travel on either side of the street. This type of facility is particularly applicable in Seattle because of its topography and because it can be used on streets where there is not enough space for standard width bicycle lanes on both sides.

Bicycle Boulevards

Bicycle boulevards are non-arterial streets that are designed to allow bicyclists to travel at a consistent, comfortable speed along low-traffic roadways and to cross arterials conveniently and safely. This is achieved by introducing treatments that allow bicyclists to travel along the bicycle boulevard with minimal stopping while discouraging motor vehicle traffic. Traffic calming and traffic management treatments such as traffic circles, chicanes, and diverters are used to discourage motor vehicles from speeding and using the bicycle boulevard as a cut-through. Quick-response traffic signals, median islands, or other crossing treatments are provided to facilitate bicycle crossings of arterial roadways.

The city should look to other jurisdictions for examples of bicycle boulevard marking and signing. There is currently no national consensus or best practice for identifying bicycle boulevards. Some jurisdictions utilize signs only, markings only, or a combination of each. It is recommended that a prototype design be developed and evaluated along a two- to three-block section of roadway in Seattle.

Streets with a series of calming features work well as bike routes. Cars have to slow down to **bicycle speed.**

Shared Roadways

Shared roadways are regular streets without any designated bicycle facilities. Many non-arterial roadways with low traffic volumes and low speeds are already good places for bicyclists to ride because they are quiet streets. Roadway striping and markings are not necessary to make these streets comfortable for most bicyclists to use. Many of Seattle's arterial roadways are also currently shared roadways, but appropriate facilities described above should be added to the arterial roadways to make them more comfortable for bicycling.

Other On-Road Bicycle Facilities

Paved Shoulders

Paved shoulders provide space on the outside of the roadway for bicycle and pedestrian use[2]. There is no minimum width for paved shoulders; however a width of at least four feet is desirable so that bicyclists can use them and be safely passed by a vehicle driving in the adjacent travel lane. On some undeveloped roadways (many of which are in the far northern and southern parts of Seattle), paved shoulders can be provided to make important bicycle connections. In some locations, reconstructing the roadway with shoulders can also include pavement for an on-street parking lane or parking pockets. Paved shoulders also improve safety for motor vehicles and prevent pavement damage at the edge of the travel lanes.

In locations where it is not feasible to add pavement at the edge of a roadway to create a paved shoulder, the city may consider experimenting with striping a dashed shoulder to identify the space where motorists should be prepared to see pedestrians and bicyclists. This treatment can be combined with traffic calming devices such as chicanes to encourage slower vehicular speeds. Motorists would share a 14- to 18-foot center lane area (this width is typical on neighborhood streets with parking on both sides) while a three- to five-foot shoulder on the edges would allow for motorists to pull aside to pass. This treatment would be appropriate for lower volume roadways that do not allow parking on or near the shoulder and do not have sidewalks for pedestrians.

Wide Outside Lanes

Wide outside travel lanes are typically designed to be 13- to 15-feet wide. This width allows most motor vehicles to pass cyclists within the travel lane, which is not possible in more typical 10- to 12-foot wide travel lanes. Wide outside travel lanes on arterial roadways are generally acceptable for experienced cyclists, but less-experienced bicyclists may not feel comfortable on this type of facility. These travel lanes do not provide the benefit of having a striped area that is exclusively for the use of bicyclists, a feature that bicyclists with all levels of riding experience have reported as desirable[3]. Wide outside lanes also do not have markings to indicate where bicyclists should be positioned when passing through an intersection with a right-turn lane.

Bus/Bike Only Roadways

Currently, 3rd Avenue in Downtown Seattle is open to buses and bicycles but closed to through-motor vehicles during peak travel periods. In the future, if additional roadways are identified for priority use by transit, the city should work with transit agencies to ensure that the roads are also open to bicycles. It is preferable to have wide outside lanes on these roadways to create safe bus and bicycle passing opportunities.

Shared Bus/Bike Lanes

More exclusive bus lanes are likely to be added to Seattle roadways as the region's transit systems expand. In appropriate locations, these lanes can create car- and truck-free space for both transit vehicles and bicycles. When bus/bike-only lanes are developed, it is desirable for the lanes to be wide enough for buses and bicyclists to pass each other

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[2] The City may consider testing new paving materials for roadways (including shoulders). These paving materials should be monitored to determine if they are appropriate for bicycle facilities. While pervious and semi-pervious materials may be desirable, the selection of the material needs to be project-specific and based on analysis of traffic, local drainage, and other engineering factors. At this time the semi-pervious materials used by the City may be tested on shoulders, but they are not appropriate for multi-use trails.

[3] Landis, Bruce W. et.al. "Real-Time Human Perceptions: Toward a Bicycle Level of Service" Transportation Research Record 1578, Transportation Research Board, Washington, DC 1997.

comfortably in the lane. The locations and design of shared bus/bike-only lanes will need to be evaluated on a case-by-case basis.

Off-Road Bicycle Facilities

Multi-Use Trails

Multi-use trails (also referred to as shared-use paths) are an important component of Seattle's bicycle transportation system. These facilities can provide a high-quality bicycling experience because they are separated from motor vehicle traffic and often provide an opportunity for extended landscaping and territorial views of the city. Multi-purpose trails are usually paved and should be a minimum of 10-feet wide. Minimum width may be reduced to eight feet where physical or right-of-way constraints are severe. Trail widths of 12, 14, and even 16 feet are appropriate in high-use urban situations.

Sidepaths

Sidepaths are essentially trails that are located on the side of a roadway. However, sidepaths are often located only on one side of a road and are intended to provide two-way bicycle and pedestrian travel. Sometimes this type of facility is the only option in a narrow roadway corridor. Sidepaths can function well if some of the following key design features can be achieved:

- Sufficient width is available to build a facility with at least a five-foot buffer between the outside travel lane and edge of pathway (a 42-inch vertical barrier is also acceptable).
- The path can be located in an area where conflicts with crossing roadways (which may or may not be signalized) can be minimized. Paths work particularly well where they are parallel to expressways and railroad rights-of-way because they are limited access in nature. However, paths parallel to expressways must be designed carefully – grade separation is preferred at freeway interchanges.
- Crossings of free flow ramps can be avoided, minimized, or made sufficiently safe.

Sidewalks

Sidewalks may be useful for bicycling for a number of reasons:

- Bicycle access is needed but bicycle volumes and/or pedestrian volumes are expected to be low.
- In situations where right-of-way is constrained or there are traffic safety concerns (high speeds, high volumes, lots of trucks) it may be appropriate as a sidewalk may be the only option, especially if bicyclists are traveling up a steep hill. However, bicyclists should not travel faster than the design speed of the sidewalk (which is often the speed of a typical jogger).
- They can be designed to accommodate separated, one-way bicycling on each side of the road so that bicyclists can safely and easily transition to and from the road at each end of the segment. Sidewalk bike routes should not result in bicyclists riding opposed to motor vehicle traffic when they re-enter the street.
- Sidewalks should be a minimum width of six feet for one-way bicycle travel and a minimum of eight feet if two-way travel can be expected.

Due to limited opportunities for alternative facilities and other considerations, this plan recommends considering the use of sidepath and sidewalk facilities for bicycling in a

limited number of specific locations. Special attention will be required in the design process to ensure user safety on sidepaths and sidewalks.

One type of facility that is not recommended in this Plan is a bicycle lane or path at the edge of an arterial roadway between parked cars and the curb. Several reasons for discouraging the use of this type of facility are provided under the description of bicycle lanes.

Further Study Required

There are a number of roadways that have poor conditions for bicycling, but do not have straightforward opportunities to include bicycle facilities by striping narrower lanes, removing lanes, adding shoulders, or making other physical improvements due to right-of-way constraints and traffic volumes. Some of these roadways represent critical connections between major destinations in the Bicycle Facility Network. In order to make recommendations on how to improve these roadways for bicyclists, the city will need to conduct additional, detailed studies that are beyond the scope of this plan.

Transitions Between Different Bicycle Facility Types

Due to existing roadway conditions, surrounding land uses, available right-of-way, and other characteristics, it is often necessary to use different bicycle facilities to provide bicycle access within the same bikeway corridor. It is important for the city of Seattle to provide transitions between different facilities. These transitions can be made safer and more understandable for bicyclists and motorists with appropriate treatments, such as spot directional signs, warning signs, pavement markings, curb cuts, etc. An example of a transition treatment could be shared lane markings and appropriate warning signs on a facility where a bicycle lane ends and the roadway continues. Transitions should be provided as a part of the bicycle facility design process.

Appendix F.

Guidance for Retrofitting Seattle Streets to Create Dedicated Bicycle Facilities

The Master Plan recommends a variety of facilities including off-road trails, on-road facilities for low-volume and low-speed neighborhood streets, and on-road facilities for higher-volume and higher-speed streets (Seattle's arterial streets). This guidance addresses the third category, Seattle's arterial streets[1].

The Master Plan recommends preliminary cross sections for more than 250 miles of arterial roadway segments in the Bicycle Facility Network through a planning-level analysis of Seattle roadways. Detailed descriptions of the bicycle facility types used in these cross sections are in Appendix E. The Master Plan proposes minimum-width configurations that may be permissible depending on roadway characteristics. It may not be appropriate or desirable to implement minimum width cross sections in all situations. Engineering judgment will be required to assess the final design of each roadway cross section. Implementing some of these facilities will require a change to the existing roadway configuration.

This guidance is provided as a tool to help the designer accomplish the following tasks:

- Review the recommended cross section set forth in the Bicycle Master Plan.
- Optimize the final proposed cross section dimensions.
- Develop an optimum cross section for roadway segments not included within the Bicycle Master Plan.
- Obtain the necessary city, state, and federal approvals for the design (as appropriate).

Bicycle Facility Decision-Making Process

Table F-1 illustrates the decision-making process that a designer should follow to develop the most suitable bicycle facility recommendation for any arterial roadway in Seattle. This table focuses on selecting the most suitable cross section for providing bicycle access, given specific roadway and traffic characteristics. Intersection considerations are discussed later in this guidance, but are not included in the table. Below is a description of the decision-making process shown in Table F-1.

Target Bicycle Facility Type

These guidelines provide key design considerations for a wide variety of Seattle's arterial street cross sections, in order to identify potential solutions that serve a wide variety of users (both motorized and non-motorized) in the most efficient way possible. For most arterial roadways where on-road bicycle facilities are proposed, the target bicycle facility type is the bicycle lane. A bicycle facility recommendation has been developed for more than 250 miles of arterial roadways in Seattle through the Master Plan process.

Analysis

There are two main steps in the analysis phase. First, analyze the physical space of the roadway cross section and assess the generic traffic characteristics (ADT, parking utilization, sidewalk presence, etc). The designer should consider which elements of the existing roadway could potentially be modified to provide space for the target bicycle facility. The following questions should be asked:

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[1] *Non-arterial streets are not included here, but complete streets principles apply to non-arterial streets, as well. As discussed in other sections of the plan, the city will develop signed bicycle routes and bicycle boulevards, and is open to other creative ideas for non-arterial streets in the future.*

- Can any existing lanes be narrowed?
- Can any existing lanes be removed (consider travel lanes, center-turn lanes, and parking lanes)?
- Can the existing pavement be widened, or can the curbs be moved?
- Can medians or planting strips (buffers) be narrowed?

Second, the designer should consider the effect changes in the existing cross section will have on the following operational or environmental factors:

- Pedestrian needs (buffers and sidewalk widths).
- Roadway capacity.
- Traffic volume and speed.
- Roadway grade.
- On-street parking demand.
- On-street parking turnover.
- Heavy vehicle traffic (trucks and buses).
- Horizontal alignment (curved roadway sections).
- Physical space (i.e. constrained by a steep grade, structure, or waterway).

Analysis is critical for selecting the most suitable bicycle facility given the constraints of each corridor. This phase is discussed in greater detail in the remaining sections of this appendix.

Alternatives

If analysis finds that the target bicycle facility type is feasible, the project can move forward to implementation. If there are constraints that would prevent the target facility from being achieved, alternatives should be developed with the goal of improving bicycle safety and access to the highest degree possible, given the constraints of the particular corridor.

The process of developing alternative designs should always be informed by the recommendations of the Bicycle Master Plan, which identifies a facility type for all segments of the proposed bicycle network. Other alternatives should be explored as well, again with the goal of improving bicycle safety and access, and providing the most suitable bicycle facility given operational and environmental constraints within the corridor. If the city decides not to proceed with implementing the Bicycle Master Plan recommendation on a particular roadway, it will document the reason for its decision to choose a different alternative. The burden is on the city to explain why it is not implementing a recommendation in the plan.

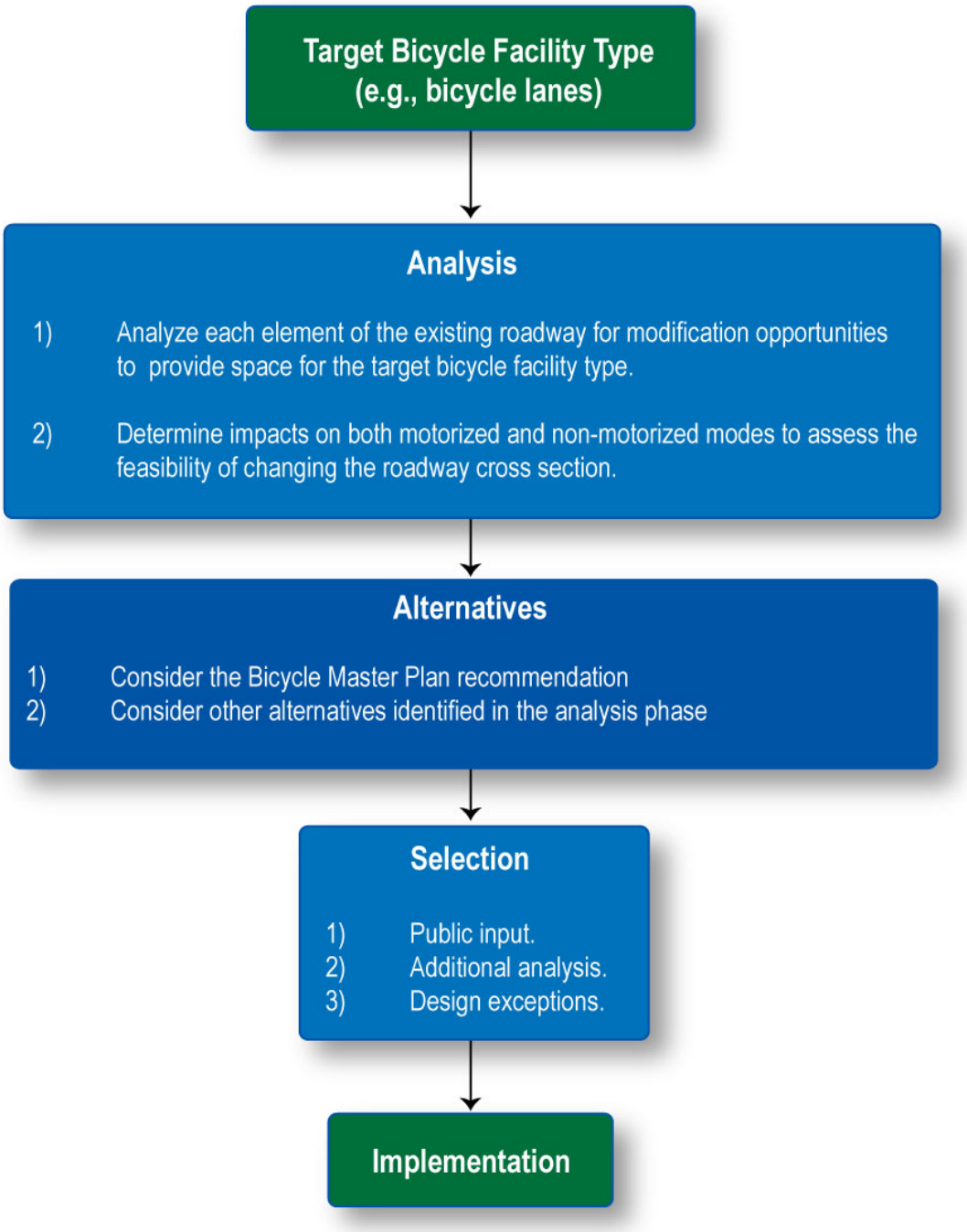
Selection

Obtain public input on several alternative bicycle facility cross sections. Public input may make it necessary to conduct additional analysis. Identification of design exceptions should be made during this phase. If design exceptions are not likely to be approved, different alternatives should be chosen.

Implementation

Implement the optimal bicycle facility identified through this decision-making process.

Table F.1. Summary of Bicycle Facility Decision-Making Process



Bicycle Facility Design Guidelines

While the goal of this document is to help engineers and designers develop roadway designs that meet all of the requirements set forth by city, state, and federal guidance, it is understood that there is a need to allow flexibility to develop safe and efficient roadway designs that serve a wide range of users. This need is acknowledged in both the Washington State Department of Transportation (WSDOT) Design Manual and in the Seattle Right-of-Way Improvement Manual (ROWIM)[2]. Both documents provide a detailed explanation of the required design deviation process[3]. It is likely that design deviations will be required to implement some bicycle facilities.

These guidelines are a supplement to local and national bicycle and roadway facility planning and design standards and guidelines. **These guidelines are not a design standard, and should not be used as such. Application of this guidance requires the use of engineering judgment when retrofitting Seattle streets to provide bicycle facilities.**

When using this guidance, the designer is encouraged to consult the latest versions of the following documents:

- American Association of State Highway Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, 1999.
- *Manual on Uniform Traffic Control Devices, 2003.*
- City of Seattle Right-of-way Improvement Manual (ROWIM).
- Washington State, City, and County Design Standards for the Construction of Urban and Rural Arterials and Collectors.
- *A Policy on Geometric Design of Highways and Streets* (Green Book), 2004, AASHTO.
- *Standard Plans for Road, Bridge, and Municipal Construction (*Standard Plans*),* WSDOT, M 21-01.
- Washington State DOT Design Manual, WSDOT, M22-01.
- Washington State DOT Right of Way Manual, WSDOT, M26-01.

Analysis of Roadway and Traffic Characteristics to Determine Bicycle Facilities

The initial part of the analysis process is to identify a theoretical cross section and determine if that section will fit within the existing roadway width based on operational and environmental factors. If the existing roadway can not accommodate the desired cross section, consideration should be given to roadway widening. When considering potential widening, estimated project costs, and impacts to properties and utilities should be evaluated.

Careful consideration should also be given to potential impacts to pedestrian facilities. Reductions in sidewalk width below five feet and reductions or elimination of the buffer between the road and a sidewalk are not recommended. In locations with higher pedestrian volumes, sidewalks wider than five feet are needed. In many situations, roadway widening may be ruled out due to a combination of the above impacts. Therefore, the remainder of this guideline applies to retrofit projects (i.e., projects that are constrained by the existing paved, or curb to curb widths).

Analysis is critical for determining the most suitable roadway retrofit design to improve bicycle accommodation. As shown in Table F-1, the analysis phase in the bicycle facility decision-making process involves two main steps. First, the designer should consider which

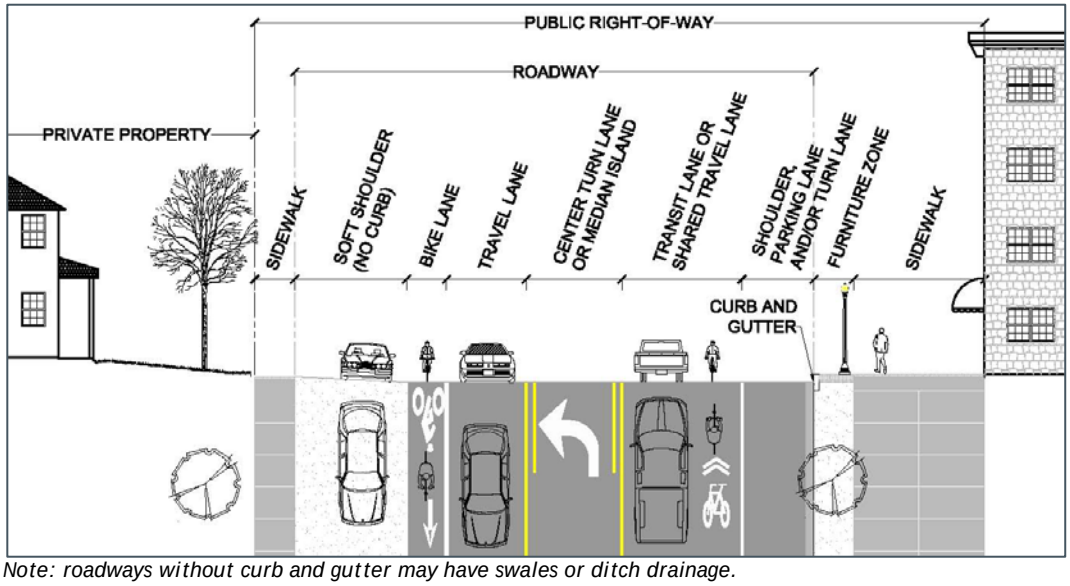
[2] *WSDOT Design Manual, June 2005, Forward; ROWIM, Section 1.1*
[3] *WSDOT Design Manual, Chapter 330; ROWIM, Section 2.6*

elements of the existing roadway could potentially be modified to provide space for bicycle facilities. Second, the designer should consider operational and environmental factors that affect the potential to modify the roadway. The details of these steps are discussed below.

Roadway Cross Section Elements

While these guidelines focus on strategies that will provide better bicycle access within the roadway, the needs of bicyclists must be balanced within the context of the multi-modal needs of Seattle's transportation system. Individual roadway cross section elements can either be added, removed, or the dimensions can change (see Figure F-1, below). These changes must adhere to roadway engineering guidelines. As previously stated, these guidelines primarily deal with retrofit projects, therefore cross section elements outside of the existing paved, or curb to curb width are not addressed.

Figure F-1. Example Roadway Cross Section Elements



Note: roadways without curb and gutter may have swales or ditch drainage.

Travel Lane

Seattle streets are classified as arterials or non-arterials (neighborhood streets). The non-arterials are generally lower volume roadways with pavement widths varying between 20 feet and 40 feet. Centerline striping is not provided on non-arterials and bicycles most commonly share the travel way with motor vehicles. Bicyclists are allowed to operate within all travel lanes in Seattle unless expressly prohibited by law (i.e. on I-5).

The following discussion relates to roadways classified as arterials.

Design Criteria:

ROWIM[4]: Through traffic lane width - 11 feet
Curb lane width - 12 feet
Bus only lane width - 12 feet
Wide outside lane (vehicle/bicycle) width - 14 feet

WSDOT: 11 feet minimum width; varies based upon speed and road classification

AASHTO: 10 feet minimum width; 11-12 feet preferred on higher speed, free-flowing, principal arterials.[5]

Design Considerations:

AASHTO provides flexibility in the establishment of lane width by discussing the merits of reduced lane width for interrupted-flow operating conditions and constrained conditions. In addition, AASHTO states that "local practice and experience regarding lane widths should also be evaluated.[6]" The consideration of narrow travel lanes should also take into account truck and bus volumes.

On constrained roadways where bicycle lanes are not possible, it is preferable to provide as wide an outside lane as possible to facilitate sharing and to minimize the need for motorists to cross a centerline or to encroach upon adjacent travel lanes.

Shared Lane Markings within Travel Lanes [7]

Shared lane markings (SLM) may be applied within an existing travel lane. They will most often be utilized in constrained locations where bicycle lanes are not feasible.

Design Criteria:

The shared lane marking shall be as shown in the ROWIM, Figure 4-18. At locations where parking is allowed adjacent to the travel lane, the center of the marking should be located a minimum of 11 feet from the curb face or edge of the road.

At locations where parking is not allowed adjacent to the travel lane, the center of the marking should be located three feet from curb face where there is not a gutter pan, two feet from the gutter joint where there is a gutter pan, or two feet from the edge of the pavement where there is not a curb.

Design Considerations:

Shared lane markings may be considered in the following situations:

- On constrained roadways that are too narrow to stripe bicycle lanes.
- To delineate space within a wide outside lane where bicyclists can be expected to ride.
- On multi-lane roadways where bicyclists can be expected to travel within the outside lane and motorists should be prepared to change lanes to pass bicyclists.
- On roadways where it is important to increase motorist awareness of bicyclists.
- On roadways where bicyclists frequently ride the wrong way.
- On roadways where bicyclists tend to ride too close to parked cars.

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[4] *ROWIM - 4.6.2 Design Criteria*
[5] *AASHTO Green Book, 2004, pg. 472*
[6] *AASHTO Green Book, 2004, pg. 473*
[7] *For further discussion on the shared lane marking treatment, read the Shared Lane Marking Memorandum dated June 1, 2007. This memorandum is part of the Compendium of Supporting Materials available from the city.*

More detailed information about shared lane markings is provided in the Shared Lane Marking Memorandum, which is part of the Compendium of Supporting Materials available from the city.

Experimentation:
Because the shared lane marking has not been incorporated into the MUTCD, the city will consider testing several applications of the marking. These studies should measure before and after behavior of motorists and bicyclists in conjunction with marking placement and possible supplemental signs. The intended outcome of these tests is the development of specific protocols for the use of shared lane markings under the following potential conditions:

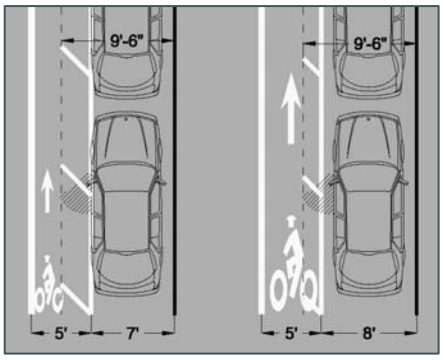
- Lateral placement of the marking in travel lanes of various widths where there is no parking.
- Lateral placement of the marking in travel lanes of various widths adjacent to parking.
- Placement of shared lane marking beneath parked cars on roadways where the parking lane becomes a peak hour travel lane designated for shared use with bicyclists.
- Utilize the shared lane marking to indicate the transition between bicycle lanes and shared lanes.
- Appropriate motor vehicle volumes, speeds, lane widths, and number of travel lanes for using shared lane markings on arterial roadways.
- Appropriate motor vehicle volumes, speeds, and lane widths for using shared lane markings on non-arterial roadways.
- Use of shared lane markings on the opposite side of the street as climbing lanes.
- Placement of shared lane markings within travel lanes on steep descents or ascents.
- Frequency of shared lane markings in the travel lane (i.e. how often bicyclists and motorists travel over the markings).
- Use of smaller, circular dots with inscribed bicycle symbols in place of shared lane markings on certain types of roadways.

Bicycle Lane

Bicycle lanes provide exclusive space for bicyclist to operate within the roadway.

Design Criteria:
Curb or adjacent to parking:
ROWIM: 5 feet, minimum width
WSDOT : 5 feet, minimum width
AASHTO: 5 feet, minimum width

No curb or parking:
ROWIM: 4 feet, minimum width
WSDOT : 4 feet, minimum width
AASHTO: 4 feet, minimum width



Buffered Bicycle Lane

Design Considerations:
The minimum width for a bicycle lane adjacent to a parking lane is five feet. A bicycle lane adjacent to the edge of the road without a curb may be four-feet wide. A six-inch-wide solid white line is recommended for designated bicycle lanes. In locations with on-street parking, two stripes should be used to define a bicycle lane: one six-inch stripe between the travel lane and the bicycle lane, and one four-inch stripe between the bicycle lane and

the parking lane. These stripes should be dashed in areas where motorists can be expected to merge across the bicycle lane. The design of bicycle lanes wider than six feet should be used with caution, as they can appear to be vehicular travel lanes to motorists.

A buffered bicycle lane can encourage bicyclists to ride away from the opening doors of parked vehicles by adding pavement markings to the bicycle lane. This treatment could be particularly useful to delineate the "dooring area" where:

- Bicycle lanes are adjacent to a seven- or eight-foot-wide on-street parking area.
- Bicycle lanes are adjacent to high-turnover parking.
- There are a high number of dooring complaints or crashes in a particular location.

Buffered bicycle lanes may also be considered on steep roadways where higher bicycle speeds can be expected and where more severe dooring crashes can be expected. Bicycle lanes may be accompanied by signs reminding drivers to "look for bikes"[8] when opening their doors.

Center Turn Lane

Center turn lanes remove turning vehicles from through travel lanes. This can improve roadway capacity and potentially allow for fewer through travel lanes.

Design Criteria:
AASHTO: 10 to 16 feet[9]

Design Considerations:
The width of the center turn lane should be based upon traffic volume. Careful consideration should also be given to the determination of whether a continuous center turn lane is more advantageous than a dedicated left turn lane. For roadways where turning movements can be restricted to a few locations, it may be more beneficial to provide medians or crossing islands and dedicated left turn pockets. AASHTO recommends continuous two-way left turn lanes be a minimum width of 11-feet.

Dedicated Turn Lane

Similar to center turn lanes, dedicated turn lanes remove turning vehicles from through travel lanes to improve roadway capacity and safety, and potentially allow for fewer through travel lanes.

Design Criteria:
ROWIM: 12 feet
WSDOT: 11 feet minimum width; varies based upon speed and road classification
AASHTO: 9 feet minimum width (arterial design speed less than 40 mph)[10]

Design Considerations:
The width of the turn lane should be based upon traffic volume and speed. Careful consideration should also be given to the determination of the length of the turn lane as it is often necessary to drop bicycle lanes or narrow travel lanes to install a dedicated turn lane. Where bicycle lanes are dropped to provide a dedicated turn lane, they should be dropped prior to the turn lane. Where bicycle lanes are present at a dedicated turn lane,

[8] Sign based on transportation alternatives design for warning patrons of taxi cabs to look before opening their car door - http://www.transalt.org/cabs/
[9] AASHTO Green Book, 2004, pg 338
[10] *AASHTO Green Book, 2004, pg 478*

they shall be located to the left of right turn lanes and to the right of left turn lanes (i.e. a one way street with a left-side bike lane).

Parking Area

Design Criteria:

ROWIM:	8 feet[11] minimum width 10 feet on a bus route
WSDOT:	8 feet
AASHTO:	7 feet minimum width (non-arterial streets primarily accommodating passenger vehicles) 8 feet minimum width (arterial street) 10 to 12 feet[12] (for use as possible through lane)

Design Considerations:

A seven-foot parking area adjacent to bicycle lanes or wide outside lanes in lieu of the eight-foot minimum may be used where space is constrained. The addition of a bicycle lane or a wide outside lane alleviates the primary AASHTO concern of sideswiping. Research[13] has found that parked vehicles can be held closer to the curb or edge of the roadway with the use of a seven-foot striped parking line.

If bus bulbs are installed for in-lane bus stops, they would be installed in the parking area. Bus bulbs shall not extend into the bicycle lane. Bicycle lanes can still be provided on these streets as the bus would stop in the bicycle lane at the bus stop allowing the bicyclist to pass the bus by using the left part of the right-most travel lane. Alternatively, some bicyclists may choose to stop and wait for the bus.

Some streets in Seattle have a soft surface shoulder located adjacent to the roadway that allows parking. Soft surface shoulders where parking is allowed that are narrower than 7' should be widened or parking should be restricted to improve safety along a roadway. If parking is allowed, an edgeline should be installed to encourage motorists to park off the roadway. The roadway edgeline stripe is recommended to be a 4-inch-wide solid white line. The designer should consider the following options in locations where parked vehicles continue to encroach on the travel way:

- Increase the edgeline (parking line) width to six-inches.
- Provide parking regulation signs notifying drivers to park off the pavement (i.e. "NO PARKING ON PAVEMENT").
- Reconstruct the shoulder with curb and gutter to define the parking area.

Shoulders

Shoulders are located adjacent to a number of roadways in Seattle. Shoulder areas provide an opportunity for improvements to the roadway cross section but can create sub-optimal conditions for bicyclists in certain situations.

Design Criteria:

ROWIM:	5 feet (non arterial[14])
WSDOT:	8 feet (parking allowed)
AASHTO:	varies

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[11] *This would require a ROWIM policy change to allow for 7-foot parking on all bicycle routes.*
[12] *AASHTO, pg. 478*
[13] *How Pavement Markings Influence Bicycle and Motor Vehicle Positioning: A Case Study in Cambridge, MA. Ron Van Houten and Cara Seiderman. TRB January 2005.*
[14] *ROWIM- Section 4.6.2*

Design Considerations:
Shoulders that have a poorly-maintained pavement edge are not desirable for bicyclists operating close to the edge of the roadway (a common practice for bicyclists riding on roadways with narrow travel lanes).

Elimination or reduction of the shoulder may be considered under the following circumstances:

- To provide space for an enhanced bicycle facility (wider travel lane or bicycle lane).
- In locations where there is excess parking capacity.
- In locations where the shoulder is greater than seven-feet wide.

If a shoulder is designated as a bicycle lane, it must be at least four-feet wide.

Factors that should be Considered when Selecting Bicycle Facilities

Many of the factors previously mentioned (e.g., capacity, traffic volume and speed, on-street parking turnover, heavy truck volumes, etc.) are taken into consideration when determining an optimal cross section for a retrofit project. The relationship between these factors and cross section elements is a key step in the analysis process to determine an optimal cross section. Capacity, speed, volume, heavy vehicles, grades, and parking directly relate to the need for, and dimension of cross section elements. These factors are further discussed below to provide guidance to the designer to achieve increased modal balance within the constrained cross section, and provide the best possible bicycle facility.

Roadway Capacity

Roadway capacity is considered when examining the number and type of vehicular travel lanes. If a reduction in the number of travel lanes is desired, a traffic analysis should be performed to determine if that option is feasible.

Traffic Volume and Speed

Roadways with higher vehicular speed and volumes are less comfortable for cyclists, and are therefore in more need of dedicated bicycle facilities. Excess capacity can also result in higher traffic speeds. Some roads may benefit from the fewer travel lanes or conversion of travel lanes to turning lanes. Reducing traffic volume and/or speed can also allow for the installation of narrower travel lanes and turn lanes.

Heavy Vehicles

Heavy vehicles (trucks and buses) may require additional operating space on roadways. Additionally, frequent passing of bicyclists by heavy vehicles in a narrow cross section may create conflicts. The AASHTO Guide cites "if substantial truck traffic is anticipated, additional lane width may be desirable."[15] The use of travel lanes below 11-feet wide is not recommended on streets with a high percentage of heavy vehicles. This guidance recommends a threshold of 10% of the ADT or greater.

Road Grade

Road grade has the largest affect on bicyclist operating speed. On steep ascents, bicyclists may be slowed to the speeds of pedestrians. On steep descents, bicyclists may exceed motor vehicle speeds. On hilly streets, the designer can accommodate bicyclists by utilizing a climbing bicycle lane in the uphill side of the road. On downhill sections,

[15] *AASHTO Green Book, 2004, Pg 476*

bicyclists can be directed to share the lane with motorist. This technique can be used on constrained rights-of-way to reduce the total width required to accommodate bicyclists in the roadway cross section. Careful consideration should be given to placing bicycle lanes adjacent to parking on portions of roadways with steep descents (See Bicycle Lane discussion).

Generally steep is defined as being a roadway segment that is at least 300 feet in length with a minimum grade of four percent (4%).

On-Street Parking Demand

Providing ample on-street parking is often considered an important need by the general public, and efforts to reduce or eliminate it can be met with strong opposition. However, the reduction or elimination of parking should be considered in areas where bicyclists are constrained to riding too close to parked vehicles or where enhanced bicycle facilities are desirable. In locations where there is excess parking capacity, consideration should be given to the following options:

- consolidate parking to one side of road.
- remove parking completely where there is no demand or sufficient off street capacity.
- remove parking temporarily where there is a need for additional throughput capacity (i.e. - peak hour bike lane, bus lane, and/or travel lane).

On-Street Parking Turnover

High parking turnover can affect the safety of all roadway users. Bicyclists are vulnerable roadway users in part because they often ride adjacent to parked vehicles. When riding within the area of an opening door, the bicyclists is in danger of being struck and injured. Existing law[16] requires a motorist to not open a door into moving traffic; nonetheless, the designer should consider this potential hazard in the design process. To reduce the incidence of "dooring" the designer may consider reducing or eliminating parking, providing a buffered bicycle lane, or adding dooring warning signs (See Bicycle Lane discussion).

Bicycle Facility Continuity Considerations at Intersections

Continuity of bicycle facilities at intersections takes into consideration the cross section elements and design factors mentioned above. Intersection treatments may vary depending on the approaching cross section. Conversely, bicycle treatments at closely spaced intersections may determine the cross section between nodes. Under ideal circumstances a standard bicycle lane would be accommodated at the approach to an intersection. However, with the frequent need for dedicated turn lanes at intersections, the roadway cross section can become constrained. The following designs offer options for accommodating bicycles in these constrained locations. These designs are considered experimental and it is recommended that Seattle conduct additional experimental studies before widespread implementation.

Pocket Lane Striping, Berkeley, California

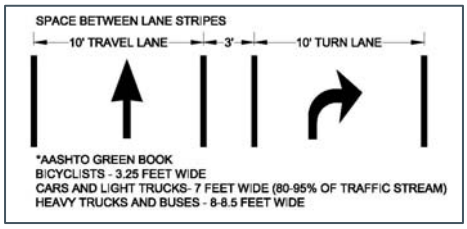
Pocket Lane

Pocket lanes are used when there is not sufficient space to install a bicycle lane at the approach to an intersection. Pocket lanes provide for a continuous bicycle facility through an intersection. They can encourage

[16] *Washington Code §46.61.620. Opening and closing vehicle doors – "No person shall open the door of a motor vehicle on the side adjacent to moving traffic unless and until it is reasonably safe to do so and can be done without interfering with the movement of other traffic, nor shall any person leave a door open on a side of a vehicle available to moving traffic for a period of time longer than necessary to load or unload passengers."*

motorists to drive more slowly, and maintain a consistent traveling path. The striped pocket lane encourages through bicyclists to stay to the left of right-turning vehicles, and the lane enables bicyclists to bypass stopped vehicles. Pocket lanes should be a minimum of three-feet wide and should not be marked as bicycle lanes (e.g., should not include the bicycle symbol pavement marking). Pocket lanes are not recommended on roadways with high speeds or high heavy vehicle volumes (10% of ADT or greater).

Shared Bicycle/Right Turn Lane



Shared bicycle/right turn lanes are used when there is not sufficient space to install a bicycle lane at the approach to an intersection. The shared bicycle/right turn lane encourages bicyclists to remain to the left of right turning traffic by striping a dashed bicycle lane on the left side of the right turn lane. This maintains the visual continuity of the bicycle lane while still allowing adequate shared space for bicycles and turning vehicles. As an alternative to a dashed bike lane, a shared lane marking may be placed on the left side of a right turn lane to indicate that this space is shared between through bicyclists and right-turning vehicles.

Generic Examples of Roadway Cross Sections

The graphics in this section depict common city of Seattle roadway cross sections. The basic cross sections are identified by a single letter. Variations of these basic cross sections are identified with a number following the letter. Each cross section includes additional considerations that should supplement the considerations that have already been discussed earlier in the document.

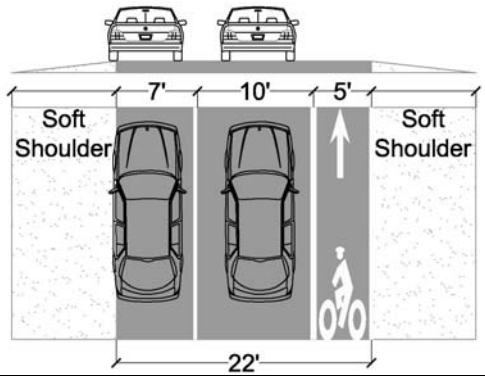
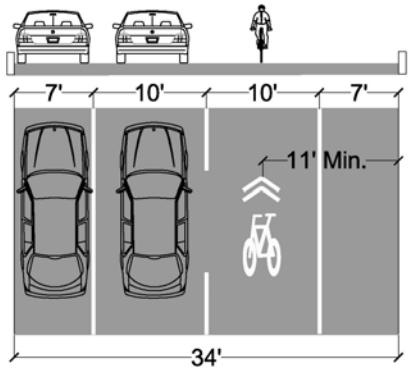
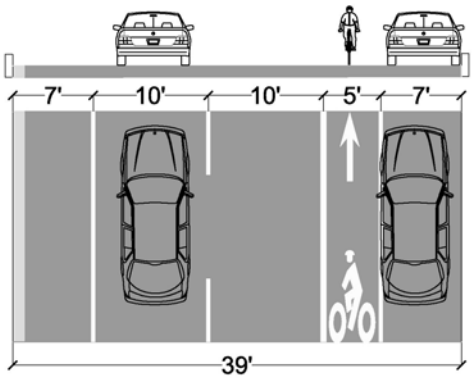
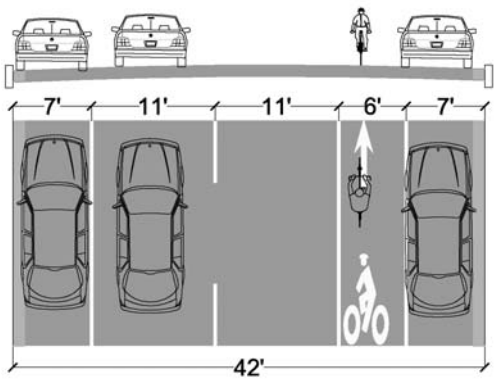
Each of the cross sections is uniquely lettered to correspond to a designation on the Preliminary Cross Section Map (the map is part of the Compendium of Supporting Materials available from the city). This map provides an initial concept for the cross section of all roadways in the recommended Bicycle Facility Network. The cross sections shown on the Preliminary Cross Section Map are not final recommendations; they are a starting point for considering alternative bicycle facilities on specific roadways.

As previously stated, the cross sections are based on a planning level analysis, which generally ruled out a widening option. Therefore, the cross sections are geared toward *minimum widths* that may be permissible. As projects move toward implementation, the designer is encouraged to follow the process outlined in these guidelines and to consult the reference documents. The designer should also consider the example variations (letter followed by number) when developing cross section alternatives. For example, the minimum-width recommendation for roadways with two travel lanes, two bicycle lanes, and two lanes of parking is cross section L. As additional variables such as modified travel lane requirements or additional road width become available for that cross section, alternative striping patterns are detailed as permutations L-1, and L-2.

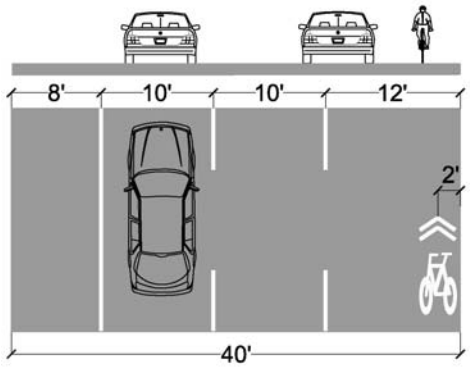
In addition to the design process outlined above, final design will require field confirmation of the following elements to assure a complete understanding of the existing conditions:

- parking.
- roadway width.
- curb presence and location.
- Drainage.
- bus stop locations and lengths.
- any other situation that may affect the implementation of a desired cross section, such as pavement condition, reversible or variable traffic patterns, etc.

Constrained Cross Sections One Way Streets

	**A** **Bicycle Lane** **One Way One Lane with Soft Shoulders – 22'** Additional Considerations: • If parking allowed on shoulder – width of shoulder should equal or exceed seven feet.
	**B** **Shared Lane** **One Way Two Lane with Parking – 34'** Additional Considerations: • It may be advisable to place the shared lane marking in the left lane if the predominant flow of bicycle traffic is in the left lane; placement of the marking in the left lane would follow the practice of locating the center of the marking from the curb face or pavement edge. • For other placement considerations, read the Shared Lane Marking Memorandum dated June 1, 2007.
	**C** **Bicycle Lane** **One Way Two Lane with Parking – 39'** Additional Considerations: • It may be advisable to utilize a buffered bicycle lane in locations with high parking turnover. • On steep descending grades, it may be more appropriate to utilize a shared travel lane in place of a bicycle lane.
	**C-1** **Bicycle Lane** **One Way Two Lane with Parking – 42'** Additional Considerations: • It may be advisable to utilize a buffered bicycle lane in locations with high parking turnover. • On steep descending grades, it may be more appropriate to utilize a shared travel lane in place of a bicycle lane.

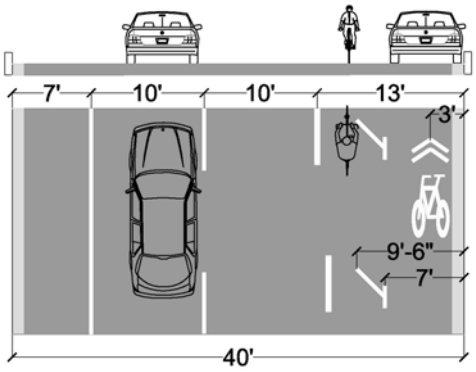
Constrained Cross Sections One Way Streets (Continued)



C-2

Shared Lane
Three Lane – 40'
Additional Considerations:

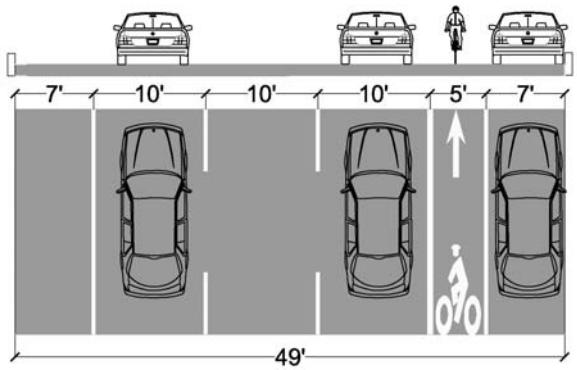
- If parking is allowed except at rush hour – utilize design C-3 instead.
- For other placement considerations, read the Shared Lane Marking Memorandum dated June 1, 2007.



C-3

Off Peak Bicycle Lane
Two Lane with Peak Hour Restrictions – 40'
Additional Considerations:

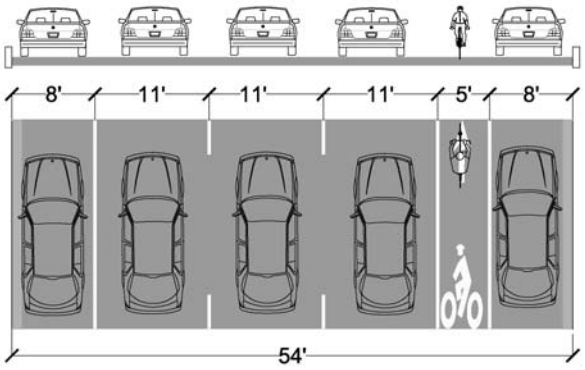
- This should only be utilized on roadways where parking is restricted in the curb parking lane during rush hour.
- The frequency of the tee marking is experimental. It is suggested that the spacing be no more than every 30 feet, with 15 feet as minimum spacing.



D

Bicycle Lane
One Way Three Lane with Parking – 49'
Additional Considerations:

- It may be advisable to utilize a buffered bicycle lane in locations with high parking turnover.
- On steep descending grades, it may be appropriate to utilize a shared travel lane in place of a bicycle lane.

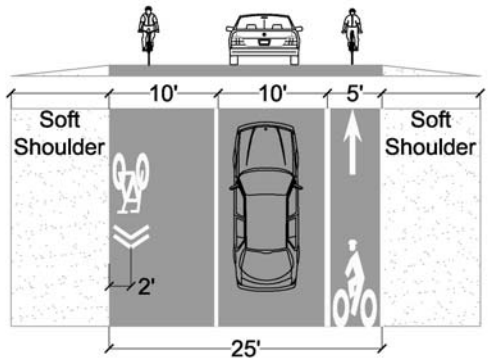
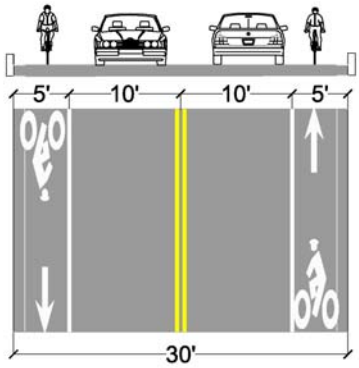
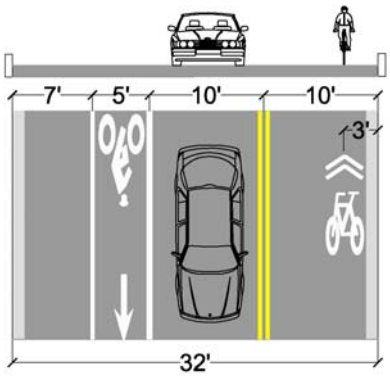
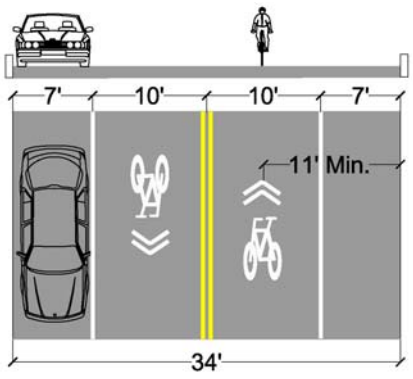


D-1

Bicycle Lane
Three Lane with Parking – 54'
Additional Considerations:

- It may be advisable to utilize a buffered bicycle lane in locations with high parking turnover.
- On steep descending grades, it may be more appropriate to utilize a shared travel lane in place of a bicycle lane.

Constrained Cross Sections Two Way Streets

	**E** **Climbing Lane** **Two Lane – 25'** Additional Considerations: • If parking is allowed on soft shoulder – width of the soft shoulder should equal or exceed 7 feet. • The bicycle lane should be placed on the uphill portion of the roadway. • For other placement considerations, read the Shared Lane Marking Memorandum dated June 1, 2007. • Equal dimensioned shared lanes are preferred over bicycle lanes on flat sections of roadway (see example H-1).
	**F** **Bicycle Lane** **Two Lane – 30'** Additional Considerations: • If the roadway has no curb and parking is allowed on a soft shoulder – width of the soft shoulder should equal or exceed seven feet.
	**G** **Two Lane with Parking – 32'** Additional Considerations: • It may be advisable to utilize a buffered bicycle lane in locations with high parking turnover. • The bicycle lane adjacent to parking should be placed on the uphill portion of the roadway. • For other placement considerations, read the Shared Lane Marking Memorandum dated June 1, 2007. • Equal dimensioned shared lanes are preferred over bicycle lanes on flat sections of roadway (see example H-1).
	**H** **Two Lane with Parking – 34'** Additional Considerations: • Use of shared lane marking is optional if it is desired to provide a bicycle facility. • For other placement considerations, read the Shared Lane Marking Memorandum dated June 1, 2007.

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Appendix G.

Bicycle Route Signage and Wayfinding Protocol

Bicycle route signs will be posted on designated roadways and trails to direct bicyclists to major destinations throughout Seattle. Pavement markings will also be used to assist with wayfinding in some locations. The general protocol for locating signs and markings is described below. Several routes will be signed during the first year after this plan is adopted, and modifications will be made to this protocol based on this experience.

General

- Use standard city and regional sign designs developed as a part of this Plan (see Figure G.1: Bicycle Wayfinding Sign Designs).
- Follow Manual on Uniform Traffic Control Devices (MUTCD) standards for sign installation, such as minimum height of signs above ground and horizontal placement from edge of the roadway or trail.
- Keep the regional route sign separate from the city route sign on all segments that are both regional and city routes (e.g., combined signs will not be used, though two different types of signs may be on the same post).
- City route signs should include a directional arrow, destination, and distance.
- When city route signs (e.g., "blades") are used, the sign listing the closest destination should be on top, and the furthest destination should be on the bottom. A maximum of three directional subplate signs should be used on any single bicycle route sign.
- Destinations on signs should be named using common neighborhood names (e.g., Urban Villages and Urban Centers), major transit hubs, and regional parks.
- While a route may extend the length of the city, it should not list all destinations on a single signpost; instead, it should show important intermediate destinations.
- Reduced-size signs can be used as route confirmation signs on regional routes. These smaller signs may be placed lower to the ground or on different types of poles than the regular-size signs.
- Regional route signs can be installed on the same or separate posts as the city route signs.
- Install signs on feeder streets between nearby destinations (e.g., schools, transit hubs, parks, Urban Village Centers, etc.) and city or regional bicycle routes. These feeder streets may have signs to indicate the distance and direction to the destination, and the distance and direction to the bicycle route. Pavement markings may be used on feeder streets in place of or in conjunction with these signs.

Bicycle Routes on Trails

- Post bicycle route signs at all major decision points along the trail (feeder trail intersections, forks in the trail, etc.).
- Provide bicycle route confirmation signs at the following locations:
    - After all roadway crossings (local streets and arterials).
    - Every one-third to one-half mile, depending on the segment length, sight distance, and need for confirmation signs.
- Install street name signs at all locations where trails intersect streets. This type of sign should have a sign blade for both the street name and the trail name.

Bicycle Routes on Streets

- Post bicycle route signs at all turns or decision points along the route.
- Use circular dot bicycle pavement markings with an arrow (or other markings) on non-arterial streets to indicate turns along an on-street route where signs may be difficult to see because of parked cars or vegetation (optional: use bike-in-arrow markings to indicate turns).
- Use the following guidelines to install route confirmation signs and communication that bicyclists are still on the correct route:
    - Provide bicycle route confirmation signs every one-third to one-half mile on straight segments of the route, depending on the locations of crossings with other bicycle routes, locations of primary arterial roadway crossings, sight distance, and the overall frequency of street crossings.
    - Locate bicycle route confirmation signs near crossings of other bicycle routes and primary arterial roadway crossings on straight segments of bicycle routes.
    - Use pavement markings to complement confirmation signs, where appropriate.
- Install spot signage to show bicyclists how to access and cross bridges, travel through complicated areas, and connect through gaps between existing sections of bicycle facilities (this signage does not need to be part of a signed route).

Sign designs for bicycle wayfinding on city streets and on Urban Trails and Bikeways System routes were developed during the Bicycle Master Plan process. These designs are shown in Figure G.1: Bicycle Wayfinding Sign Designs. The Seattle Department of Parks and Recreation is working with SDOT to develop brown signs for routes on Olmsted Boulevards.

Figure G.1. Bicycle Wayfinding Sign Designs

Examples of wayfinding signs for city routes

Examples of wayfinding signs for regional routes

Roadway Crossing Design for Bicycles

This appendix includes guidelines for bicycle roadway crossings. Two main categories of crossings are discussed: multi-use trail crossings of roadways and bikeway crossings of arterial roadways.

Traffic Control and Right-of-Way Assignment for Multi-Use Trail Crossings

This section describes the policy for traffic control and right-of-way assignment for trail/roadway crossings. There are two primary categories of trail crossings. The first type of crossing is where the trail crosses at least one street at an intersection of two or more streets. The second type of trail/roadway crossing is mid-block (e.g., typically at least 30 to 50 feet from an intersection).

Trail Crossings at Intersections

When trails cross roadways at intersections, the trail should generally be assigned the same traffic control as the parallel roadway (i.e., if the adjacent roadway has a green signal, the trail should also have a green/walk signal). This applies at intersections with all types of traffic control. The AASHTO Bicycle Guide describes these types of intersections as "adjacent path crossings" (see Figure H-1: Example of an adjacent path intersection depicting typical vehicle movements across the path, below).

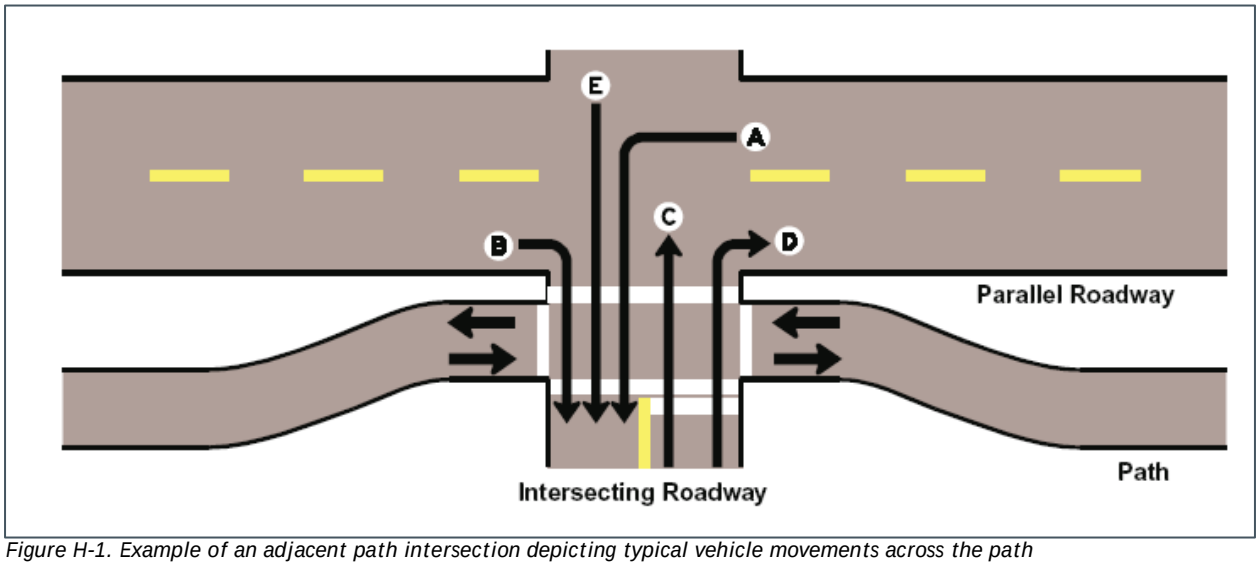

Figure H-1. Example of an adjacent path intersection depicting typical vehicle movements across the path
Source: AASHTO Guide for the Development of Bicycle Facilities, 1999.

Signalized Intersections

At signalized intersections, if the parallel roadway has signals that are set to recall to green every cycle, the pedestrian signal heads for the trail should be set to recall to walk. The walk interval should be maximized within the green interval:

WALK interval = Green Interval - Flashing Don't Walk Interval

As required by the Manual on Uniform Traffic Control Devices (MUTCD), the walk signal for any trail shall not conflict with a protected left- or right-turn interval. The trail signal should change to a walk or green signal as soon as the protected turn phase ends. Therefore, when the trail crosses the intersection parallel to a major street that has a long

green interval with a protected turn phase, trail users should still see WALK signals for a significant portion of each signal cycle.

Consideration should be given to providing a leading pedestrian interval at trail crossings (i.e., three seconds of green/walk signal time are given to trail users before any potentially-conflicting motor vehicle movements are given a green signal). This allows pedestrians and bicyclists to have a head start into the roadway to become more visible to turning traffic.

Where the signals for the parallel roadway are actuated, the trail crossing will also need to be actuated. For trail crossings, the minimum WALK interval should be 10 seconds. The USE PED SIGNAL sign (R9-5) should be used at trail crossings at signalized intersections. Countdown pedestrian signals should be installed at all signalized trail crossings as signal heads are replaced.

4-way Stop-controlled Intersections

Intersections with 4-way stops should generally be avoided. However, if trails cross at intersections with four way stops, additional stop signs should be added as needed to ensure that there is at least one appropriately-placed STOP sign at each trail approach.

Consideration should be given to removing stop signs for the trail and the parallel roadway leaving the intersection 2-way stop controlled for the intersecting roadway. An engineering study should be conducted before removing or adding any stop signs.

2-way Stop-controlled Intersections

At intersections with STOP signs controlling only one of the approaches, the trail should be assigned the same right-of-way as the parallel street. Stop signs should not be placed on the trail approaches to the intersecting roadway if the parallel street has no stop signs. The trail should have the same control as the parallel street.

If the two streets have the same roadway classification, and the stop signs face the intersecting street that is parallel to the trail, consideration should be given to reversing the stop sign placement, giving the right-of-way to the trail and the parallel street. An engineering study should be conducted before reversing the stop sign placement. Appropriate warning signs and markings should be placed on the trail and roadway.

Mid-block Trail Crossings

At mid-block trail crossings, traffic control should generally be one of the following:

- Traffic Signal.
- Stop signs facing the trail.
- Stop signs facing the roadway.
- Yield signs facing the trail.
- Yield signs facing the roadway.

The decision of whether or not to use a traffic signal at a mid-block trail crossing should be primarily based on the installation criteria and procedures for pedestrian traffic signals found in SDOT's Director's Rule 04-01. All trail users (including bicyclists) should be included in calculating the "pedestrian volume" for the warrant procedure outlined in Rule 04-01. When a trail crossing meets the warrants outlined in Rule 04-01, there may be other reasons why a signal is not necessary at the crossing. Engineering judgment should be applied in making the final decision of whether or not to install a signal.

Where a decision has been made not to install a traffic signal at a mid-block trail crossing, STOP or YIELD signs should be used to assign the right-of-way to the trail or the roadway.

The assignment of priority at a shared-use path/roadway intersection should be assigned with consideration of the following:

- The relative importance of the trail and the roadway.
- The relative volumes of trail and roadway traffic.
- The relative speeds of trail and roadway users.

The City of Seattle has four classifications of streets:

- Principal Arterials.
- Minor Arterials.
- Collector Arterials.
- Access Streets (residential and commercial).

As part of the Seattle Bicycle Master Plan, two classifications of signed routes are proposed; regional signed routes and local signed routes. Major trails in the city will be included in the signed route system. As such, there are three proposed classifications for trails:

- Regional Trails (trails that are part of regional signed routes).
- Local Through Trails (trails that are part of the local signed route system).
- Minor Trails (other trails including short connectors and trails in small parks).

The street and trail classifications described above make it possible to quantify the relative importance at each trail/roadway crossing. The following guidelines should be used to assign right-of-way:

- Regional Trails are effectively principal arterials for bicyclists, but trail user speed is generally lower than that on *Principal Arterial* streets. Therefore, *Regional Trails* should generally be given priority over *Minor Arterials*, *Collector Arterials*, and *Access Streets*. However, if the traffic volume on the street being crossed exceeds the traffic volume on the trail by 20% or more, the street should be given priority.

- Local Through Trails are like minor arterials for bicyclists, but trail user speed is generally lower than that on *Minor Arterial* streets. Therefore, *Local Through Trails* should generally given priority over *Collector Arterials* and *Access Streets*. Again, if the traffic volume on the street being crossed exceeds the traffic volume on the trail by 20% or more, the street should be given priority.

- Minor Trails have roughly the same importance as Access Streets. Therefore, *Minor Trails* should normally not be given priority over any classification of *Arterial*. Where *Minor Trails* cross *Access Streets*, the priority should be assigned to the facility that has the most volume.

When new trails are built, they are often built in segments; so the initial trail user volume is often low. Thus, based on the guidelines above, the right-of-way will likely be initially assigned to the streets that the trail crosses. However, as trail volumes grow over time, the appropriate assignment of right-of-way may shift. To ensure the appropriate right-of-way assignment, trail/roadway crossings should be evaluated every few years.

Once priority has been assigned, the least restrictive control that is appropriate should be placed on the lower priority approaches. STOP signs should not be used where YIELD signs would be acceptable. The acceptability of YIELD signs depends primarily on sight distance, which should be evaluated through an engineering study using standard engineering practices.

Pavement Markings

All trail crossing areas should be marked with a crosswalk according to the rules set forth in SDOT Director's Rule 04-01.

Advanced "TRAIL XING" word pavement markings should be utilized at all crossings where the trail crossing is determined to be unexpected.

Trail Warning Signs

All signs related to pedestrian/bicycle activity should be fluorescent yellow-green. It is recommended that the trail crossing warning sign be utilized at all trail crossings that are uncontrolled for motorists. The crossing sign at the trail shall be supplemented with the downward arrow subplate (see Figure H-2: Trail Warning Signs).

Figure H-2. Trail Warning Signs

Advanced Warning Signs

It is recommended that advanced warning signs be used at most crossing locations, especially those locations with restricted sight distance or areas where it is determined that the trail crossing would be unexpected. Advanced warning signs might not be used in highly urbanized situations where there are short blocks or where two or more marked crosswalks are close together. It is recommended that all advanced warning signs include the "distance ahead" subplate (W16-2a) or the "AHEAD" subplate (W16-9p).

The subplates in Figure H-3: Advanced Warning Sign Subplates should be added to advanced warning signs. Figure H-4: Example Trail-roadway Crossing with Trail Yield Treatment shows the crossing from a trail user's perspective.

Figure H-3. Advanced Warning Sign Subplates

Figure H-4. Example Trail-roadway Crossing with Trail Yield Treatment

Bicycle Routes on Streets

Appropriate Arterial Crossing Treatments for Bikeways

The following treatment should be used for appropriate crossing treatment when a signed bike route or bicycle boulevard crosses an arterial street.

There are six possible design treatments that are recommended (see descriptions in previous section):

- Mark crosswalk, no other improvements needed.
- Curb extensions into the parking lane to narrow the crossing width for bicyclists and pedestrians.
- Raised median placed in center turn lane.
- Raised median island created by tapering out the parking lane.
- Traffic signal (possibly with curb extensions if on-street parking exists).
- Raised island with 2-step traffic signal with off-set crosswalk markings (short section of trail down the center of the median separates the crosswalks by at least 15 feet).

The feasibility of installing these facility types at a given location should be determined by the criteria and guidelines for pedestrian crossing safety established in the SDOT Director's Rule 04-01 available at: http://www.seattle.gov/transportation/crosswalkrule.htm.

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Appendix I.

Bicycle Facility Recommendations for Key Corridors and Focus Areas

The table below includes detailed descriptions of recommendations in key corridors and focus areas of the Bicycle Facility Network. Each row corresponds with a numbered location on the Bicycle Facility Recommendations Map.

Map Number	Text Note
1	Identify additional connections from Northeast Seattle neighborhoods to the Burke-Gilman Trail between Magnuson Park and the north city limit.
2	Consider adding a traffic signal to facilitate bicycle crossings at Sand Point Way NE & NE 78th Street.
3	Improve bicycle access at the entry point to north side of Magnuson Park--NE 78th Street.
4	Improve bicycle access at the entry point to south side of Magnuson Park--NE 65th Street.
5	Identify best connection between trail on east side of UW Campus and Burke-Gilman Trail (across Union Bay Place NE).
6	Planned intersection reconfiguration at Ravenna Ave NE & Ravenna Place NE.
7	Identify best north-south bicycle facility connection between University District and NE 65th Street (possible corridors include Roosevelt Way NE, 11th/12th Avenue NE, Brooklyn Avenue NE, and 15th Avenue NE).
8	Significant public demand exists for constructing multi-use trail between Brooklyn Avenue NE and Ravenna Place NE through Ravenna Park.
9	Consider alternatives for north-south route connectivity across Lake City Way NE and NE 75th Street between I-5 and 15th Avenue NE (possible corridors include Roosevelt Way NE, 12th Avenue NE, 14th Avenue NE, and 15th Avenue NE).
10	Two alternatives for crossing I-5 in the vicinity of NE 80th Street: Either reconstruct NE 80th Street crossing of I-5 to include bicycle lanes in accordance with the Complete Streets policy if the bridge is modified OR construct new bicycle and pedestrian bridge across I-5 in the vicinity of NE 80th Street.
11	Three alternatives for north/south connections through the University District: 1) If Roosevelt Way and 11th Avenue NE remain as one-way streets, switch the full time parking to the left side of the street, restripe lanes, and consider a peak-hour bike lane. 2) If Roosevelt Way and 11th Avenue NE become 2-way streets, consider installing climbing lanes on one of the roadways or install a northbound bike lane on one road and a southbound bike lane on the other road. 3) If either of these alternatives is not feasible, add shared lane markings to Brooklyn Avenue NE.
12	In the short-term, install bike lanes, climbing lanes, and shared lane markings on NE 45th Street. In the short-term, stripe bike lanes on 5th Avenue NE and 7th Avenue NE between NE 45th Street and NE 50th Street to allow bicyclists to utilize the NE 50th Street Bridge to cross I-5. In the long-term, construct a new bicycle and pedestrian bridge across I-5 at NE 47th Street.
13	Redesign interchange between the north end of the University Bridge, Eastlake Avenue NE, and NE Campus Parkway to resolve right-turn conflicts.
14	Construct an overpass in the area between N 41st Street and N 43rd Street; this may include reconstructing the existing overpass at N 41st Street or building a new structure.
15	Install bike lanes on both sides of N 34th Street/N Northlake Place between Fremont Avenue N and Stone Way N. An alternative would be to install an eastbound bicycle lane and shared lane markings in the westbound curb lane. A contraflow bike lane should be provided on the one-way section of N Northlake Place.
16	The sidewalks on the Aurora Bridge should be used as a one-way couplet. Higher rails should also be considered for the Aurora Bridge sidewalks. Give special attention to sweeping and maintaining the Aurora Bridge sidewalks.

17	Redesign intersection of Ballard Avenue NW and 17th Avenue NW to manage speeds and make movements more predictable. This intersection is being addressed in the context of the Burke-Gilman Trail extension project through Ballard.
18	Identify best east/west connections through the Ballard neighborhood (NW 56th Street/NW 57th Street/NW 58th Street).
19	In the future, reconstruct Seaview Place NW with a bicycle climbing lane.
20	Two alternatives for east-west connections through lower Queen Anne: 1) If Roy Street and Mercer Street remain as a one-way couplet, install one-way bike lanes on the north side of each roadway. 2) If Roy Street and Mercer Street are converted to two-way streets, bike lanes should go on both sides of Roy Street. In either case, a bicycle and pedestrian bridge should be constructed on the north side of Mercer Street between 6th Avenue N and Dexter Avenue N (over Aurora Avenue N).
21	Construct multi-use trail as a part of the SR-520 reconstruction project between 10th Avenue E and Montlake Boulevard NE and also from Montlake Boulevard NE to the east across Lake Washington. This project should incorporate trail connections to destinations in surrounding areas, including the University of Washington, new light rail transit service, Montlake Flyer station, and Montlake and Madison Park neighborhoods.
22	Identify best east/west connection between Melrose Avenue E and Broadway E.
23	Improve bicycle facilities on N Denny Way Bridge and Minor Avenue Bridge across I-5. Utilize both bridges to make connections between South Lake Union and Capitol Hill.
24	Restripe the bicycle facility on Martin Luther King, Jr. Way so that it has a bike lane on the east side (northbound) and a shared lane marking on the west side (southbound). This facility could operate as a couplet with the bicycle boulevard on 27th Avenue. Two alternatives would be to provide climbing lanes on the uphill portions of Martin Luther King, Jr. Way or to remove the center turn lane (except for turning pockets at key intersections) and stripe bike lanes on both sides of Martin Luther King, Jr. Way.
25	Adjust pedestrian/bicycle signal response time at the intersection of the I-90 Trail & Martin Luther King, Jr. Way and the I-90 Trail & 23rd Avenue S intersection. The signals should allow trail users to cross very soon after pushing the call button.
26	Provide wayfinding signs to direct bicyclists between the 6th Avenue bike lanes and the Dexter Avenue bike lanes. Bicyclists should be instructed to turn right from 6th Avenue to Blanchard Street, and then left on 7th Avenue to Dexter Avenue. This is a better route than having bicyclists turn right from 6th Avenue to Battery Street to access Dexter Avenue.
27	Work with Sound Transit, Washington State DOT, King County Transit, and other partners to acquire abandoned railroad right-of-way to continue existing E-3 Busway Trail south between S Forest Street and Spokane Street.
28	Study east/west connections across I-5 at Spokane Street. These connections could be made in conjunction with extending the Chief Sealth Trail across I-5 toward Downtown Seattle.
29	When the bicycle and pedestrian bridge overpass is reconstructed across Martin Luther King, Jr. Way S. and Rainier Avenue S at Mount Baker Boulevard, it should be wide enough to accommodate both bicycle and pedestrian traffic comfortably and safely.
30	Repaving and drainage improvements are needed for much of the length of Lake Washington Boulevard and Lakeside Avenue.
31	Median crossing islands or a full median should be added to SW Admiral Way between SW Olga Street and the West Seattle Bridge (along with bicycle lanes). This should be accomplished by removing parking from the west side of Admiral Way.
32	The connection between SW Andover Street and the West Seattle Bridge is provided by a sidewalk bikeway on the southeast side of Delridge Way SW. This connection should be improved.
33	Identify best shared roadway connection between SW Morgan Street and SW Juneau Street through the new development in the vicinity of 32nd Avenue SW.

34	Restripe existing parking edgelines to 7 feet from the curb face and install shared lane marking 11 feet from the curb face on SW Admiral Way.
35	Restripe existing parking edgelines to 7 feet from the curb face and install shared lane marking 11 feet from the curb face on Beach Drive SW.
36	In the short-term, provide a wide outside lane on S Cloverdale Street/Myers Way S. In the long-term, the SR-509 interchange ramps should be reconfigured and bicycle lanes should be provided on S Cloverdale Street/Myers Way S.
37	Connection between 14th Avenue S and W Marginal Place S should be improved. Improvement possibilities include providing a multi-use trail on the east side of the intersection of 14th Avenue S and W Marginal Place S, paving shoulders on 14th Avenue S between S Henderson Street and W Marginal Place S, and adding a bicycle lane to the southbound left-turn pocket on 14th Avenue S.
38	In the long-term, bicycle facilities should be provided as a part of the 16th Avenue S bridge crossing. This is a critical connection in the bicycle network.
39	When the bicycle and pedestrian bridge overpass is reconstructed across SR-99 at S Henderson Street, it should be built to regional trail standard width to accommodate both bicycle and pedestrian traffic comfortably and safely.
40	Study potential locations to construct a crossing of I-5 to connect the Chief Sealth Trail towards Downtown Seattle. The crossing could be at any location between S Spokane Street and S Snoqualmie Street. The precise location of the pedestrian/bicycle overpass/underpass across I-5 at the west end of the future Chief Sealth Trail extension should take advantage of topography and existing infrastructure.
41	Identify the connection between the Othello Sound Transit Station and Chief Sealth Trail, either on S Myrtle Street or S Willow Street.
42	Long-term connections are needed to provide bicycle access to the Boeing Access Road Sound Transit Station at the I-5 & Ryan Way interchange. This includes potential improvements to Airport Way S, S Ryan Way, Pacific Highway S, and S 112th Street.
43	Before installing shared lane markings on Renton Avenue S, use saw cut or other form of reconstruction to eliminate the concrete joint that is located in the place where bicyclists would ride comfortably.
44	Shared lane markings should be provided on both sides of Bell Street and Blanchard Street because bicyclists split evenly between turning left and right from these streets.
45	Provide a short section of sidepath on the east side of Martin Luther King, Jr. Way S. between Renton Avenue S and S Walden Street to allow bicyclists to utilize a route between York Park and the Mount Baker Sound Transit Station.
46	One of two options should be implemented on 3rd Avenue NW between NW 103rd Street and NW 105th Street to provide bicycle access through this key area for connectivity in Northwest Seattle: 1) A sidepath should be constructed on the east side of the roadway or 2) the roadway should be reconstructed to include bicycle lanes on both sides of the roadway and parking should be consolidated to formalized parking bays on the periphery of the roadway in several locations.
47	NW 58th Street is closed to traffic for periods during the day due to school activity. While there is an existing signalized intersection where NW 58th Street crosses 15th Avenue NW, it may not be an ideal roadway for the east-west bicycle route through Ballard because of the street closure and the fact that it is north of the commercial area.
48	A new traffic signal (pedestrian crosswalk signal or signalized intersection) should be considered at the intersection of NW 57th Street & 15th Avenue NW. This signal would provide access for an east-west bicycle route through Ballard that uses NW 57th Street in the vicinity of 15th Avenue NW. This signal should be coordinated with the existing full signal at NW 58th Street & 15th Avenue NW.

49	The proposed bicycle and pedestrian bridge on the west side of the Ballard Bridge should be installed at a location that takes advantage of existing topography. This bridge connection requires more detailed study in the future.
50	The left-turn "Bus Only" lane on the northbound exit ramp on the north side of the Aurora Bridge should be marked as "Bus and Bicycles Only". Providing bicycle access in this location will help provide bicycle connectivity into Fremont.
51	Reconfigure intersection of Aurora Avenue, Raye Lower Street, and 6th Avenue N to address bicycle, pedestrian, transit, and motor vehicle issues. Curb ramps should be provided/improved on the south end of the Aurora Bridge to provide better bicycle access.
52	Add bicycle lane to west side of Aurora Avenue (southbound) between Raye Lower Street and Dexter Way N to allow bicyclists that travel southbound on the Aurora Bridge sidewalk to connect to Dexter Way N. No bicycle lane is recommended on the east side of Aurora Avenue.
53	Redesign and reconstruct intersection of Fairview Avenue N and Fairview Avenue E to manage the speed of turning vehicles so that it is safer for bicyclists as well as pedestrians, transit vehicles, and automobiles.
54	Improve pedestrian crosswalk signal for bicycle sensitivity and direct bicycle crossing at intersection of Lake City Way NE and 20th Avenue NE.
55	Consider providing paved shoulders and including paved parking bays on the periphery of Ravenna Avenue NE in several locations. Potential bicycle lanes should be considered on this roadway, particularly in uphill sections.
56	Airport Way S between I-90 and Military Road S will be used in upcoming years to serve overflow traffic during I-5 reconstruction. When the roadway is reconstructed, the city should consider a combination of adding new shoulders, sidepaths, and/or wide outside lanes, as appropriate, to improve bicycle safety and access in this corridor. These improvements should address the problem of standing water that accumulates on Airport Way S when it rains.
57	35th Avenue SW between Avalon Way SW and SW Morgan Street is a high-priority connection that should be studied in the short-term. Potential alternatives that should be evaluated include removing a travel lane, consolidating parking to one side of the street, and/or installing raised median islands so that shared lane markings, climbing lanes, and/or bicycle lanes can be installed. Consideration should also be given to constructing a sidepath on the east side of the street in the blocks adjacent to the West Seattle Golf Course.
58	Eastlake Avenue E between the University Bridge and Fairview Avenue N is a critical connection between the University of Washington and Downtown Seattle. This constrained corridor is a very high-priority for improving bicycle connectivity. Potential bicycle facility recommendations should be considered along with other travel modes on a block-by-block basis in the corridor. Different bicycle treatments should be implemented under different options, including bicycle lanes, climbing lanes, and shared lane markings. If light rail tracks are installed, the tracks should be in the center of the roadway, which will require removing the existing median and restricting left-turn movements to particular intersections. Removing the median will require more pedestrian crosswalk signals to be installed. If there is no light rail in the Eastlake Corridor, bicycle lanes could be provided by removing the median island and center left-turn lane and restricting left turns to specific intersections or changing parking restrictions on some blocks. Other alternative actions to create bicycle facilities should include narrowing existing travel lanes and removing peak-hour parking restrictions so that bicyclists can ride more easily in the space to the left of parked cars and out of the door zone.
59	Provide new median cut-through and crosswalk on the west side of the intersection of NE Northgate Way & 8th Avenue NE. This will also require modifying the design of the pedestrian crosswalk signal at this intersection.
60	The city of Seattle has asked the Washington State DOT to study the connection between a proposed multi-use trail on the new bridge and the University of Washington, new Link Light Rail transit service, Montlake Flyer Station, and the Montlake and

	Madison Park neighborhoods as a part of the SR-520 Bridge project.
61	Bicycle cut-through across diagonal diverter at E Republican Street and 17th Avenue E should be improved to provide more convenient access for signed bicycle route.
62	Consider striping a centerline on sections of the Burke-Gilman Trail with very high user volumes, such as near the University of Washington and other locations where sight distance may be compromised.
63	Reconstruct trail bridge between 33rd Avenue W and 32nd Avenue W to accommodate both pedestrians and bicyclists.
64	Explore possible travel lane channelization improvements near the intersection of Gilman Avenue W and W Fort Street.
65	Add shared lane markings to south (downhill) side of W Emerson Place and improve conditions for bicyclists on the sidewalk on the north (uphill) side of W Emerson Place.
66	Provide bicycle access between Green Lake and North Seattle Community College by either installing shared lane markings on Wallingford Avenue N or designating Ashworth Avenue N as a non-arterial street commonly used by bicyclists.
67	Reconfigure intersection of E Green Lake Way N and W Green Lake Way N to address bicycle, pedestrian, transit, and motor vehicle issues.
68	Consider adding a traffic signal at Eastlake Avenue and Harrison Street; the two blocks of Harrison Street between Pontius Avenue and Eastlake Avenue are one-way, so they may need to be coupled with two blocks of Republican Street or Mercer Street.
69	Western Avenue and Elliott Avenue between Denny Way and Bell Street require additional study. It may be desirable to have bicycle facilities on these roadways to serve the new residential and commercial developments on the north side of Belltown, but they lead to difficult crossings of Denny Way.
70	Reconstruct Alaskan Way/E Marginal Way S with well-designed bicycle lanes on both sides. There is an existing bicycle lane on the east side of Alaskan Way/E Marginal Way S, but no bicycle lane on the west side of this roadway.
71	It is possible to provide bicycle lanes on SW Alaska Street if on-street parking is removed.
72	Study both the bicycle lane and multi-use trail alternatives in the Myers Way S corridor.
73	Conduct additional study to determine the best location to cross Fauntleroy Way SW between SW Avalon Way and SW Alaska Street.
74	Include bicycle facilities as a part of any future roadway and bridge reconstruction projects on S Lander Street and S Holgate Street. These two roadways are critical connections across the area south of Downtown Seattle and must provide safe and convenient bicycle access.
75	Improve wayfinding signage and pavement markings and make surface and other maintenance improvements on the West Seattle Low-Level Bridge Trail.
76	Consider providing a track or trough beside the stairs between the intersection of S Spokane Street and Airport Way S and Beacon Hill. This would make it much easier for bicyclists to travel with their bicycles up and down the hill.
77	The city recognizes that there are places where the use of "Share the Road" with bicycles signs should be explored. For example, these signs could be posted in the Elliott Avenue W and 15th Avenue W corridor.
78	Improve the intersection of S Dearborn Street & Rainier Avenue S to facilitate bicycle connectivity between the existing bicycle lanes on S Dearborn Street and the proposed Hiawatha Place S bicycle boulevard. This may include reconfiguring turning lanes, modifying signal phasing and timing, and making other facility improvements.
79	Requests have been made by citizens to improve lighting through Judkins Park to improve safety and security when accessing the I-90 Trail.

80	If properties are redeveloped with non-water-dependent land uses on Westlake Avenue N, the city should work with local businesses to explore the possibility of constructing new buildings close to Westlake Avenue (where the existing parking lots are). This would provide space along the waterfront area for public use, including a wide-surface multi-use trail.
81	Requests have been made by citizens to keep the locks open after 9 p.m. so that bicyclists can continue to cross the canal during the late evening and early morning hours.
82	Consider several alternatives for improving bicycle access across the rail yard north of Georgetown in the vicinity of Airport Way S and 6th Avenue S. These alternatives include: 1) Construct a multi-use trail on the west side of the Stacey Yard Bridge (Airport Way S) and widen the existing sidewalk on the west side of Airport Way S between the bridge and S Alaska Street; 2) Construct a new bicycle and pedestrian bridge across the rail yard at 6th Avenue S.
83	The proposed alignment of the pedestrian pathway with bicycles permitted in the area north of SW Hudson Street is conceptual.
84	The proposed alignment of the pedestrian pathway with bicycles permitted in the area south of SW Holly Street is conceptual.
85	Requests have been made by citizens and the Seattle Bicycle Advisory Board to provide bicycle lanes on Rainier Avenue S between 14th Avenue S and S Myrtle Street, but more detailed engineering study is needed to determine the feasibility of these facilities. Adding bicycle facilities to this section of Rainier Avenue S may require modifying or removing on-street parking in some locations.
86	Conduct engineering study to determine the feasibility of constructing a multi-use trail between the intersection of 24th Avenue S & S Bayview Street and the intersection of S McLellan Street and 26th Avenue S.
87	Conduct a detailed study of bicycle access to the south side of the Ballard Bridge and recommend specific safety and connectivity improvements. Consider and complete an engineering analysis for installing green bicycle lanes across the W Emerson Street exit ramp at the southwest end of the bridge.
88	The Seattle Department of Parks and Recreation is interested in working with SDOT to develop a signed route through Discovery Park and possibly some of the other larger Seattle parks.
89	The service road under the I-5 freeway between E Aloha Street and E Howe Street requires further study to determine if it can be developed into a multi-use trail.
90	Create a non-motorized connection between South Lake Union and Elliot Bay. This connection should include a safe, convenient crossing of Aurora Avenue, utilize the bicycle lanes on the Roy Street/Mercer Street one-way couplet, and utilize the new Thomas Street overpass.
91	Adding bicycle lanes to 3rd Avenue NW is a very long-term project that will require removal of on-street parking.
92	Construct a connector trail between 28th Avenue S and the I-90 Trail. This trail construction project recommendation will be passed on to Washington State DOT. The city will work with Washington State DOT on the project in the future.
93	The Seattle Department of Parks and Recreation is engaging in ongoing discussions to enable a broader range of bicyclists to travel between the Madison Valley and the University of Washington through the Arboretum, and to connect to points north, south, west, and (in the future) east across the reconstructed SR-520 Bridge.
94	There should be signage and/or markings on Denny Way between E Madison Street and Broadway E to direct bicyclists to the Capitol Hill light rail station.
95	Special attention should be given to bicycle safety and mobility between the north end of the First Avenue S Bridge and the Georgetown neighborhood, including the crossing of East Marginal Way S.
96	Look for opportunities to add multi-use trail facilities when any section of the I-5 corridor is reconstructed.

97	Make improvements to the Fairview Avenue N corridor between Virginia Street and Valley Street. At the south end of this corridor, the crossing of Denny Way should be improved. This crossing may be improved by providing better bicycle access through the intersection of Fairview Avenue and Denny Way. It may also be improved by providing a signalized intersection at the intersection of Denny Way, Virginia Street, and Minor Avenue N. From Downtown Seattle, bicyclists would cross Denny Way from Virginia Avenue to Minor Avenue, then use John Street to get back to the Fairview Avenue N corridor. The middle section of the Fairview Avenue N corridor should have shared lane markings on both sides of the roadway near the curb. These markings would be visible during peak travel periods when parking is restricted. At other times of day, bicyclists could use the remaining travel lane space adjacent to the parked cars. The north end of this corridor should include improving the intersections of Valley Street and Fairview Avenue N and Mercer Street and Fairview Avenue N as a part of the Mercer Street project. This area can also be improved for bicycle access by constructing a multi-use trail on the north side of the I-5 exit ramp to Mercer Street between Fairview Avenue N and Eastlake Avenue E.
98	Make improvements to the Eastlake Avenue E corridor between Howell Street/Stewart Street and Mercer Street. Howell Street should include shared lane markings between 8th Avenue and Yale Avenue. In the long term, the section of Howell Street and Eastlake Avenue E north of Yale Street and south of Stewart Street should include bicycle lanes to allow bicyclists to travel directly from Howell Street to Eastlake Avenue E. However, this is likely to require reconstruction of the roadway and addressing I-5 access ramp conflict points. In the short- to medium-term, the intersection of Yale Avenue and Denny Way should be improved to facilitate bicycle crossings. This would allow bicyclists traveling northbound from Downtown Seattle to turn left from Howell Street onto Yale Avenue, cross Denny Way to the alley between Pontius Avenue N and Yale Avenue N, turn right onto John Street, turn left on Yale Avenue N, turn right onto either Harrison Street or Republican Street, and finally turn left onto Eastlake Avenue N. For southbound bicyclists, Stewart Street should be improved to include either a wide bus/bike-only lane or a bicycle lane adjacent to a bus-only lane.
99	Further study is needed to assess the need and solution for connections between SW Spokane Street and Avalon Way and SW Spokane Street and Admiral Way.

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Appendix J.

Bicycle and Transit Integration in Seattle

KC/METRO has earned a reputation as being one of the most bicycle-friendly transit agencies in America, owing their early development and subsequent refinement of the Bike & Ride program. KC/METRO has been a pioneer in the specific development of the "Sportworks" transit vehicle bicycle carrier rack, and their decision to comprehensively equip their entire fleet of coaches has resulted in significant bus usage by bicyclists. For example, approximately 10,000 bicycles were loaded on KC/METRO buses per week throughout the region in August 2002.

In addition, KC/METRO has worked to improve the quantity and quality of bicycle parking at transit facilities throughout Seattle and King County, including funding (with the PSRC and the city of Seattle) the development of Bikestation® Seattle. This bicycle parking facility was the first staffed bicycle parking facility in Washington.

In 1996, residents of King, Pierce, and Snohomish Counties voted to fund the Sound Transit high-capacity regional bus and rail transit services. The Sound Transit system includes commuter rail service to King Street Station in Seattle; from Tacoma in the south and from Everett to the north, and regional express bus service linking activity centers throughout the region. The centerpiece of the system is the Link Light Rail System which is scheduled to open in 2009 and will serve a corridor from the University District to Sea-Tac Airport via the Downtown Seattle Transit Tunnel.

In 1999, Sound Transit adopted general policies guiding development of service supporting bicycle access to regional transit service. Based on a concept of TOTAL Access (see CALL-OUT BOX), the policies are intended to ensure that the unique characteristics of bicycling and long-haul high-capacity transit are utilized in an efficient manner that accommodates an increasing number of trips accessed by bike.

Sound Transit TOTAL Access Policy

"Sound Transit is committed to encouraging and providing bicycle access and has adopted a policy of total access for cyclists—on transit vehicles and at stations."

--Sound Transit website

T: To the transit system
O: On the vehicles
T: Through and across barriers created by the system
A: At the stations
L: Low-cost, effective and efficient

Both Sounder Commuter Rail and the Regional Express bus service have bicycle access systems and policies that are familiar around the United States. In the case of Link, there is significant interest in the manner in which the new system will accommodate bicyclists both on transit vehicles and at stations. SDOT should work with Sound Transit to evaluate the demand for bicycle parking at light rail stations and develop additional parking, as needed.

In 2000, the Puget Sound Regional Council conducted a study to determine the feasibility of creating larger, staffed bicycle parking facilities known as Bikestations at key locations on the Sound Transit and KC/METRO transit networks. A key component of the study was the development of a demand-assessment methodology that could predict potential bicycle parking demand at transit-related facilities. The study envisions development of high capacity Bikestations at several specific locations, including:

- King Street Station / Pioneer Square (currently open)
- Montlake Flyer Station – SR-520
- University of Washington
- Tacoma Dome Station
- Everett Station
- Overlake Park & Ride (programmed)
- Downtown Bellevue Transit Center (programmed)
- International District Transit Station

The study did not assess (with the exception of the International District facility) Link Stations. At the time, necessary information on projected volumes of users, on-vehicle carrying characteristics, and station design were unavailable. Recent approval of an extension of the initial Link segments to the University of Washington will bring LRT to an area of Seattle with the highest levels of both bike use and bike/transit access. In addition, a station is proposed near the Burke-Gilman Trail and the existing Montlake Flyer Stop – both centerpieces of bicycle commuting in the city of Seattle.

Recent voter approval of King County's Transit Now bond issue promises to increase bus service in a number of specific corridors, including development of Bus Rapid transit service with new vehicles and increased service frequency. This increase in transit capacity will bring more Bike & Ride space to key corridors such as SR-520, and reduce waiting times at locations where Bike & Ride capacity deficiencies occur, most notably at Montlake Station on SR-520.

In 2007, regional voters will be asked to approve the second major expansion phase of Sound Transit (ST 2). If approved, ST 2 will extend Link light rail to Northgate via the University of Washington and Roosevelt Avenue NE. Such an extension should establish significant demand for parking and storage facilities at all stations, with particular emphasis at the point of connection with the new SR-520 trail; Burke-Gilman Trail; and SR-520 Regional Express and Metro Bus Service. ST 2 also proposes an extension of light rail east across I-90, with a potential station at Rainier Avenue S.

Additionally, the city of Seattle is considering extensions of streetcar service in several areas, including Capitol Hill/First Hill (in part to compensate for the elimination of a First Hill Link station), Eastlake Avenue, the International District, and near the Seattle Center. While these plans are not as well developed at this point, development of the Westlake/South Lake Union streetcar has identified several issues for bicyclists, including the need for a center street rail location where utilization of bicycle-compatible crossing surfaces and flange fillers, and development of designs intended to reduce conflict between pedestrians, rail, motor vehicles, and bicyclists at high traffic crossing locations.

Appendix K.

City of Seattle Bicycle Parking Requirements

This appendix contains the existing bicycle parking requirements for the city of Seattle. The requirements for Downtown Seattle are contained in the Seattle Municipal Code, and the requirements for areas outside of Downtown are included in the Land Use Code. The Plan recommends updating these requirements to provide additional bicycle parking spaces.

Bicycle Parking Requirements: Downtown Seattle

Council Bill Number: 115524
Ordinance Number: 122054

An ordinance related to land use and zoning; revising regulations for Downtown Seattle; amending the scope of Design Review departures from Land Use Code requirements; repealing, amending and adding definitions; amending, repealing and re-codifying various provisions and maps of the City of Seattle Land Use Code, Title 23 of the Seattle Municipal Code; providing for penalties; adopting Downtown Amenity Standards; providing for conditions to bonus development, including Leadership in Energy and Environmental Design ("LEED") criteria; and amending the Official Land Use Map, SMC 23.32, to rezone portions of Downtown.

Date introduced/referred: March 20, 2006

Date passed: April 3, 2006
Status: Passed as Amended
Vote: 8-0 (Excused: Drago)
Date of Mayor's signature: April 12, 2006

Committee: Urban Development and Planning
Sponsor: STEINBRUECK

***

23.49.019 Parking quantity, location and access requirements, and screening and landscaping of surface parking areas.

The regulations in this section do not apply to the Pike Market Mixed zones.

E. Bicycle Parking

1. The minimum number of off-street spaces for bicycle parking required for specific use categories is set forth in Chart 23.49.019 A below. In the case of a use not shown on Chart 23.49.019 A, there is no minimum bicycle parking requirement. After the first fifty (50) spaces for bicycles are provided for a use, additional spaces are required at one half (1/2) the ratio shown in Chart 23.49.019 A. Spaces within dwelling units or on balconies do not count toward the bicycle parking requirement.

*Chart 23.49.019 A**

Use	Bicycle Parking Required
Office	1 space per 5,000 square feet of gross floor area of office use
Hotel	0.05 spaces per hotel room
Retail use over 10,000 square feet of gross floor area	1 space per 5,000 square feet of retail use
Residential	1 space for every 2 dwelling units

**After the first 50 spaces for bicycles are provided for a use, additional spaces are required at one-half the chart ratio values.*

2. Required bicycle parking shall be provided in a safe, accessible and convenient location. Bicycle parking hardware shall be installed according to its manufacturer's instructions, and the Seattle Department of Transportation design criteria, allowing adequate clearance for bicycles and their riders. Directional signage shall be installed when bike parking facilities are not clearly visible from the street or sidewalk. When any covered automobile parking is provided, all required long-term bicycle parking shall be covered. When located off-street, bicycle and automobile parking areas shall be separated by a barrier or painted lines.

3. Bicycle parking facilities for nonresidential uses shall be located on the lot or in a shared bicycle parking facility within one hundred (100) feet of the lot, except as provided in subsection 6 below.

4. Bicycle parking for residential uses shall be located on-site.

5. Co-location of bicycle parking facilities by more than one (1) use is encouraged.

6. For nonresidential uses, the applicant may make a payment to the City to fund public bicycle parking in the public right-of-way in lieu of providing required bicycle parking on- or off-site, if the Director determines that:

a. Safe, accessible, and convenient bicycle parking accessory to a nonresidential use cannot be provided on-site or in a shared bicycle parking facility within one hundred (100) feet of the lot, without extraordinary physical or financial difficulty.

b. The payment is comparable to the cost of providing the equivalent bicycle parking on-site, and takes in consideration the cost of materials, equipment, and labor for installation.

c. The bicycle parking funded by the payment is located within sufficient proximity to serve the bicycle parking demand generated by the project.

d. Any such payment shall be placed in a dedicated fund or account and used within five (5) years of receipt to provide the bicycle parking.

F. Bicycle Commuter Shower Facilities

Structures containing two hundred fifty thousand (250,000) square feet or more of gross office floor area shall include shower facilities and clothing storage areas for bicycle commuters. One shower per gender shall be required for every two hundred fifty thousand (250,000) square feet of office use. Such facilities shall be for the use of the employees and occupants of the building, and shall be located where they are easily accessible to parking facilities for bicycles.

Bicycle Parking Requirements: Outside of Downtown Seattle

The requirements below are taken from the commercial zoning code section of the Land Use Ordinance 122311, adopted on December 21, 2006.

23.54.015 Required parking.

K. Bicycle parking. The minimum number of off-street parking spaces for bicycles required for specified uses is set forth in Chart E. In the case of a use not shown on Chart E, there is no minimum bicycle parking requirement. The minimum requirements are based upon gross floor area of the use in a structure, or the square footage of the use when located outside of an enclosed structure, or as otherwise specified.

1. After the first fifty (50) spaces for bicycles are provided, additional spaces are required at one half (1/2) the ratio shown in Chart E, except for rail transit facilities; passenger terminals; and park and ride lots. Spaces within dwelling units or on balconies do not count toward the bicycle parking requirement.

2. Required bicycle parking shall be provided in a safe, accessible and convenient location. Bicycle parking hardware shall be installed so that it can perform to its manufacturer's specifications and any design criteria promulgated by the Director of Transportation, allowing adequate clearance for bicycles and their riders. Directional signage shall be installed when bike parking facilities are not clearly visible from the street or sidewalk. When any covered automobile parking is provided, all required long-term bicycle parking shall be covered. When located off-street, bicycle and automobile parking areas must be separated by a barrier or painted lines.

3. Long-term parking for bicycles shall be for bicycles parked four (4) hours or more. Short-term parking for bicycles shall be for bicycles parked less than four (4) hours.

4. Bicycle parking required for residential uses must be located on-site.

5. Bicycle parking facilities shared by more than one use are encouraged.

6. Bicycle parking facilities required for nonresidential uses shall be located on the lot or in a shared bicycle parking facility within one hundred (100) feet of the lot, except as provided in subsection 7 below.

7. Bicycle parking may be located in a facility within one hundred (100) feet of the lot that is not a shared bicycle parking facility, or the applicant may make a payment to the city to fund public bicycle parking in lieu of providing required on-site bicycle parking, if the Director determines that:

a. Safe, accessible and convenient bicycle parking accessory to a nonresidential use cannot be provided on-site or in a shared bicycle parking facility within one-

hundred (100) feet of the lot, without extraordinary physical or financial difficulty.

b. The payment is comparable to the cost of providing the equivalent bicycle parking on-site, and takes into consideration the cost of materials, equipment and labor for installation.

c. The bicycle parking funded by the payment is located within sufficient proximity to serve the bicycle parking demand generated by the project.

d. Construction of the bicycle parking funded by the payment is assured before issuance of a certificate of occupancy for the development.

* * *

Chart E* for Section 23.54.015 PARKING FOR BICYCLES			
		Bike Parking Requirements	
Use		Long-term	Short-term
Commercial Uses			
I.	General sales and services	1 per 12,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO1
II.	Heavy sales and services	1 per 4,000 sq ft	1 per 40,000 sq ft.
III.	Eating and drinking establishments	1 per 12,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO
IV.	Lodging	1 per 20 rentable rooms	2
V.	Entertainment	1 per 12,000 sq ft	1 per 40 seats and 1 per 1000 sq ft of non-seat area; 1 per 20 seats and 1 per 1,000 sq ft of non-seat area in UC/SAO
VI.	Medical services	1 per 12,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO
VII.	Offices and Research and Development Laboratories	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO	1 per 40,000 sq ft.
Transportation Facilities			
VII.	Rail transit facilities and Passenger terminals	At least 202	None
IX.	Principal use parking except Park and ride lots	1 per 20 auto spaces	None
X.	Park and ride lots	At least 202	None
Manufacturing			
XI.	Manufacturing	1 per 4,000 sq ft	None
Institutions			
XII.	Institutions not listed below	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO	1 per 40,000 sq ft.
XIII.	Child care centers	1 per 4,000 sq ft	1 per 40,000 sq ft.
XIV.	Museums	1 per 4,000 sq ft	1 per 4,000 sq ft

XV.	Community clubs or centers	1 per 4,000 sq ft	1 per 4,000 sq ft
XVI.	Religious facilities	1 per 12,000 sq ft	1 per 40 seats or 1 per 1000 sq ft of non-seat area
XVII.	Libraries	1 per 4,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO
XVIII.	Hospitals	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO	1 per 40,000 sq ft.
XIX.	Colleges	A number of spaces equal to ten (10) percent of the maximum students present at peak hour plus five (5) percent of employees.	None
XX.	Vocational or fine arts schools	A number of spaces equal to ten (10) percent of the maximum students present at peak hour plus five (5) percent of employees.	None
XXI.	Elementary schools	1 per classroom	None
XXII.	Secondary (Middle and High) schools	2 per classroom	None
Residential Uses			
XXIII.	Multi-family structures	1 per 4 units	None
XXIV.	Congregate residences	1 per 20 residents	None

1. If a use is not shown on this Chart E, there is no minimum bicycle parking requirement.
2. For the purposes of this chart, UC/SAO means Urban Centers or the Station Area Overlay District.
3. The Director in consultation with the Director of Transportation may require more bicycle parking spaces based on the following factors: Area topography; pattern and volume of expected bicycle users; nearby residential and employment density; proximity to Urban Trails system and other existing and planned bicycle facilities; projected transit ridership and expected access to transit by bicycle; and, other relevant transportation and land use information.

**After the first 50 spaces for bicycles are provided for a use, additional spaces are required at one-half the chart values.*

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Appendix L.

Partners for Bicycle Programs

The city recognizes that education, enforcement, and encouragement programs are essential activities in order to achieve the goals of this plan. This appendix lists a sample of groups that either already have a role in providing bicycle programs for Seattle residents, or they could make good partners for the city in the future.

Bike Works

Bike Works, located in the Rainier Valley area of Seattle, offers an Earn-A-Bike program that teaches students ages nine to 17 about bicycle repair. After completing eight class sessions, students are able to earn their own recycled bicycle (along with a new helmet and lock) by completing 24 hours of repairing community bicycles ("Earn-A-Bike time") outside of class. Adult mentors provide guidance, friendship, and assistance with repairs. Bike Works also offers several other programs, including:

- Bicycle rodeos.
- Summer bicycle camps.
- Neighborhood rides.
- Bicycle passports (youth log the number of miles that they bicycle and win prize incentives).

The Bicycle Alliance of Washington

The Bicycle Alliance of Washington advocates for bicyclists and bicycle-friendly cities, counties and state through legislation, policies and programming. The Alliance educates elected officials and decision makers about the importance of funding for safe bicycling routes and share the road legislation. Its programs include:

- Bike Buddy one on one mentoring for new bike commuters.
- Bicycle programs in partnership with KC/METRO Transit.
- KC/METRO Transit “Lost Bikes” program--helps people find bicycles that have been left on buses.
- Bicycle parking at park and ride lots.
- Bicycle parking and bike repair at Bikestation® Seattle.
- Safe Routes to School clearinghouse.
- Washington Center for Safe Routes, in partnership with Feet First.
- Bicycle maps and resources.
- Technical resources for trail development and other projects.
- Commuter classes including gear and bike purchase advice.
- “Get–Lit Washington” program—provides lights on bikes for low-income residents.
- Information on the organization website.

Cascade Bicycle Club

The Cascade Bicycle Club provides several education and encouragement programs to the local bicycling community. These programs include educating elected officials and agencies about building bicycle-friendly communities; teaching safe cycling to kids and adults; promoting bicycle commuting through individual and corporate programs; reviewing transportation plans; and working with schools on fitness programs and Safe Routes to Schools. The Cascade Bicycle Club Education Foundation offers programs and materials that are free or low-cost. Specific education, enforcement, and encouragement programs offered by Cascade Bicycle Club include:

- Bicycle commuter information.
- Bicycle commuting classes.
- Bicycle maintenance classes.
- Ride SMART Bicycle riding skills classes.

- Employer bicycle resources.
- Commuter Challenge.
- Bicycle to Work Day.
- Bicycle rodeos.
- Bicycle education for kids.
- Bicycle safety program materials.
- Bicycle camps.
- Bicycle map distribution.
- Helmet donations.
- Helmet sales.
- Bike to work month.
- Safe Routes to Schools.
- School fitness programs.
- Club rides.
- Information on the organization website.

Feet First

Bicycle organizations, schools, and other groups should work with pedestrian groups, such as Feet First to develop and promote coordinated bicycle and pedestrian safety education programs. Feet First already provides several types of programs, including:

- Safe Routes to Schools Clearinghouse.
- Pedestrian education (bicycling education should be coordinated with existing programs).
- Walking school buses (bicycling school buses should also be promoted).
- Technical assistance.

Public Health—Seattle & King County (PHSKC)

PHSKC was awarded a Kellogg Foundation "Food and Fitness" planning grant, which may provide opportunities to work with community partners on bicycle programs targeting underserved communities. The agency is part of the Physical Activity Policy Research Network at the Health Promotion Research Center of the University of Washington. This center looks for collaborative ways to seek grant funding for research projects related to physical activity. PHSKC also operates the following programs:

- Steps to Health.
- Maternal and child health.
- Physical activity promotion.
- Injury and Violence Prevention Program (directing the work of the King County Traffic Safety Coalition).

Seattle Public Schools

With the exception of Safe Routes to Schools programs at specific schools, Seattle Public Schools does not currently use a comprehensive bicycle and pedestrian safety education curriculum. There may be opportunities in the future to work with Seattle Public Schools to implement a bicycle and pedestrian safety education program for students, with a particular focus on the elementary and middle school years. Seattle private schools could also be encouraged to offer this program. This program would include both in-classroom lessons as well as hands-on bicycle and pedestrian skills training. Lesson handbooks, teachers' guidebooks, videos, handouts, and other resources for these programs have been developed in other communities throughout the United States. Safe Routes to Schools Program funding may present an opportunity to develop and implement a comprehensive pedestrian bicycle safety education program in all local schools.

Seattle Police Department

The Seattle Police Department (SPD) should continue to enforce bicycle-related traffic laws. Enforcing these laws will help improve the behavior of both motorists and bicyclists, and will increase the safety of bicyclists. The SDOT Bicycle Program Website provides a summary of regulations for bicycling and driving with bicyclists (see http://www.seattle.gov/Transportation/bikecode.htm). SPD should also issue a report with the number of warnings and infractions given to bicyclists and motorists annually.

Seattle Department of Parks and Recreation

The Seattle Department of Parks and Recreation (DPR) encourages bicycling by offering Group Health Bicycle Saturdays and Sundays. The Department closes Lake Washington Boulevard between Mount Baker Beach and Seward Park between 10 a.m. and 6 p.m. to provide bicyclists with a car-free experience on ten days during the year (see http://www.cityofseattle.net/parks/athletics/bikesatsun.htm).

Puget Sound Regional Council

The Puget Sound Regional Council (PSRC) recommends specific actions to promote bicycling in its *Regional Bicycle and Pedestrian Implementation Strategy for the Central Puget Sound Region* (2003). Agencies and organizations with a role in implementing the strategy are also identified. Actions include:

- Increase the use of print and broadcast media to educate the public about the positive economic, transportation system performance, social, health, and environmental impacts of bicycling and walking.
- Integrate bicycle and pedestrian safety laws and regulations into driver's education classes and driver's license testing.
- Produce materials on basic pedestrian and bicyclist safety laws, and distribute in a wide variety of venues.
- Develop and administer sustainable programs for bike riders of all ages to teach bicycle safety and hazard identification skills, build overall confidence, and teach cyclists how to effectively travel both on shared roadways and separated trails.
- Develop and implement "Safe Routes to School" programs to improve community opportunities to safely walk to schools.
- Produce, regularly update, and distribute maps of bicycle and pedestrian routes.
- Enforce bicycle and pedestrian safety laws among motorists, bicyclists, and pedestrians.

The city of Seattle supports these actions and encourages PSRC and other regional partners to assist with their implementation.

Other organizations that have played important roles in bicycle education, enforcement, and encouragement programs in Seattle include the King County Public Health Department, Washington State Department of Transportation, and Washington State Traffic and Safety Commission. These organizations are encouraged to expand upon their current efforts in partnership with the city in the future.

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Appendix M.

Key Components of Bicycle Education Programs

Topics that should be covered in bicycle safety education programs include:

- Wear a helmet.
- Obey stop signs and traffic signals.
- Ride in the same direction as adjacent motor vehicle traffic.
- Be as visible as possible and understand the heightened risks of bicycling at night.
- Ride on roadways versus riding on sidewalks. If it is necessary to ride on a sidewalk, keep speeds close to a typical jogging speed. Be aware of risks at intersections and always yield to pedestrians. Operate with extreme care near pedestrians.
- Ride away from parked cars (and their driver-side doors).
- Avoid pulling out from behind turning automobiles at an intersection. (This is particularly important when bicyclists are behind large vehicles, because it is extremely difficult for motorists from the opposing direction to see approaching bicyclists).
- Ride safely near large trucks, including understanding safety issues related to right-turns. To make right-turn movements, trucks often move left, opening up space along the curb to their right. It is important not to enter this space, because the truck will swing right again to make the turn. Visibility on the right side of a truck also tends to be more difficult for truck drivers.

Note that the safety topics included in each program will need to be tailored to a target audience. Education programs provided for children should use youth-specific curricula and age-appropriate language to explain concepts and safety issues. In addition, youth-based programs need to take into account that children under the age of eight or nine do not have fully-developed peripheral vision and cannot judge the speed of an approaching vehicle.

Head injuries cause about three-fourths of the 800 to 900 deaths resulting from bicycling-related accidents in the U.S. each year. According to a study conducted by the Harborview Injury Prevention and Research Center, helmets that meet federal CPSC standards can cut the risk of riders' head injuries by 85%.

Disobeying traffic controls is one of the most common causes of bicycle crashes in the city of Seattle. Bicyclists who do not stop at traffic signals or stop signs create a risk for themselves, pedestrians, motor vehicle drivers, and other users of the transportation system. Bicyclists who disregard traffic control may create public animosity towards all bicyclists, even if the majority of bicyclists follow the rules of the road.

Riding against traffic, either on the sidewalk or on the roadway, increases the risk of being involved in crashes at driveways or intersections because drivers turning right from intersecting streets typically only look left before they turn and do not see bicyclists approaching from the opposite direction.

Adult bicyclists are encouraged to ride on roadways rather than on sidewalks in Seattle. While the roadway is typically the safest location for most bicyclists to ride, it is generally acceptable for bicyclists to ride on the sidewalk if they travel at or below the design speed of the sidewalk (often the speed of a typical jogger). However, most bicyclists typically travel faster than this speed. Bicyclists on sidewalks do not approach intersections from the same areas as motor vehicle traffic, so they can be difficult for drivers to see,

particularly when they are traveling at high speeds. Further, bicycling on sidewalks can cause conflicts with pedestrians, particularly in busy commercial areas.

There are a few situations where it may be useful for bicyclists to ride on the sidewalk. These include:

- Bicyclists are traveling slowly (no faster than the design speed of a sidewalk, which is typically close to the speed of a slow jogger)—this includes child bicyclists.
- Bridges without on-road bicycle facilities.
- Locations where a bicyclist would need to cross a multi-lane roadway to ride in the same direction as traffic for a short distance (the crossing may be impractical and potentially less safe than riding in the opposite direction as traffic on the sidewalk).
- Short sections of one-way streets, especially where steep hills (downtown) make going around the block very impractical.

In these cases, bicyclists should ride in the same direction as vehicles in the adjacent roadway lanes, whenever possible.

It is imperative that bicyclists who chose to ride on the sidewalk in either direction be educated about the hazards associated with this practice. Bicyclists must always yield to pedestrians on sidewalks.

When riding at night, bicyclists must ride with front and rear lights to increase their visibility to drivers. Additionally, bicyclists should be encouraged to wear appropriate color clothing and other reflective materials to be even more visible.

While these critical safety issues are important for bicyclists to be aware of, drivers must also be targeted with these educational messages to increase their awareness of bicycle crash risks. Motorists should be instructed to look in both directions for bicyclists when turning at intersections, drive more slowly, and be aware of the potential for bicyclists riding at night.

Rules of the Road

For bicyclists:

- Follow the same laws that apply to motorists. Obey all traffic signals, signs, and lane markings. Always yield to pedestrians.
- Ride on the right side of the road with the flow of traffic—never against it.
- Always wear a properly fitting helmet.
- Ride predictably, assertively, and be alert. Use hand signals before turning.
- Be visible. If riding at night, use lights, reflectors, and bright clothing.
- Avoid riding on sidewalks, if possible. If it is necessary to ride on a sidewalk, keep speeds close to a typical jogging speed. Be aware of risks at intersections and always yield to pedestrians.

For motorists:

- Obey speed limits. Higher speeds result in greater injuries to cyclists and pedestrians.
- Obey signs, signals, and markings. Never run red lights.
- Always look for bicyclists when turning left or right.
- Pass bicyclists giving at least three feet of space. Slow down and do not pass if space does not allow.
- Do not use your horn in close proximity to bicyclists.
- Look for bicyclists when opening doors.
- Watch for children.
- Watch for bicyclists riding at night.

Safety messages should be targeted to drivers and bicyclists, including adults and children. Information about bicycle safety should be shared in the following ways:

- Seattle Bicycling Guide Map.
- Web sites.
- Signs on buses and bus shelters.
- Brochures available at parks, transit stations, stores, schools, etc.
- Public service announcements on radio and television.
- Roadside variable message signs.
- "Share the Road with Bicycles" bumper stickers and license plates.

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Appendix N.

Integration of Bicycle Recommendations into other Transportation Plans and Guidelines

Institutionalizing the Bicycle Master Plan requires integrating a number of its components into the policies and procedures of the city. Including the needs of bicyclists in documents such as the Transportation Strategic Plan, Right-of-Way Improvements Manual, Standard Specifications, city ordinances, design guidelines, and other written policies will increase the prominence of bicycle transportation improvements in the city's day-to-day business.

Recommendations for integrating specific elements of this plan into specific city policy documents are provided in the following table.

Table N.1. Specific Bicycle Master Plan Elements to Incorporate into City Policy Documents

Policy Document	Plan Element
Seattle Municipal Code; Land Use Code Ordinance	Recommended changes to existing bicycle parking requirements; Other land use code changes
City of Seattle Comprehensive Plan	Urban Trails and Bikeways System Map
Transportation Strategic Plan	Goals
	Objectives
	Performance Measures
	Bicycle Facility Network Map
	Arterial Streets with Recommended Bicycle Facilities Map
	Urban Trails and Bikeways System Map
	Signed Bicycle Route System Map
	Roadway Crossing Improvements Map
	Key Locations for Coordinating Bicycle Facility Design with Future Rapid Transit Service Map
	Revised bicycle classifications based on Bicycle Facility Network systems (Arterial Streets with Bicycle Facilities, Urban Trails and Bikeways System, and Signed Bicycle Routes)
SDOT Annual Report	Performance reporting (both "By the Numbers" and outcome measure reporting)
Right-of-Way Improvements Manual	Guidance for Retrofitting Seattle Streets to Create Dedicated Bicycle Facilities (Appendix F)
	Signage/Wayfinding Protocol (Appendix G)
	Bicycle Facility Design Guidance for Signed Bicycle Route Arterial Roadway Crossings (Appendix H)
	Geometric changes to improve arterial roadway crossings for bicycles (Appendix H)
Standard Specifications	Bicycle Facility Design Guidance for Bicycle Lanes, Climbing Lanes, Shared Lane Pavement Markings (Appendix E)
	Traffic Control and Right-of-Way Assignment for Multi-Purpose Trail Crossings (Appendix H)
	Pedestrian crossing signal upgrade policy to facilitate bicycle crossings (Appendix H)
	Bicycle wayfinding sign specifications (SP 600 series)

Complete Streets Checklist	Add reference to the bike facility network map and the Cross Section Map for bicycle facility development (opportunities for bicycle lanes, climbing lanes, and shared lane pavement markings) (Appendix F)
	Capital projects for bicycle improvements (e.g., roadway or bridge construction/reconstruction)
Annual Resurfacing Program	Cross Section Map for bicycle facility development (opportunities for bicycle lanes, climbing lanes, and shared lane pavement markings) (Appendix F)
Sign Management Program	All types, text, and locations of bicycle wayfinding signs (for Hansen GIS coding)
SDOT Bicycle Spot Improvement Program	Recommendations for spot maintenance and operational improvements
SDOT Signal Improvements List (Internal)	Traffic signal recommendations to facilitate safer bicycle crossings
Bicycle Facility Maintenance Policy Agreement with Seattle Department of Parks and Recreation	Renegotiate Agreement
Bicycle Facility Maintenance Policy Agreement with Seattle City Light	Negotiate Agreement
Seattle Bicycling Guide Map	Specific Recommendations Categories from the Bicycle Facility Recommendations Map
SDOT Website	Online Bicycle Route Wayfinding Program
SDOT Commute Trip Reduction Program	Recommendations to encourage employers to offer incentives for employees who bicycle
Multiple documents and standard practices, depending on the activity	Maintenance Activities Table

Appendix O.

Cost Estimates

The general (order of magnitude) cost estimates were developed for the main components of this plan. The estimated cost to implement this plan over 10 years is approximately $240 million (based on 2007 dollars). The plan cost includes approximately $35.7 million for on-road bicycle facilities, $7.0 million for roadway crossing improvements, $63.7 million for multi-use trail facilities (includes the Burke-Gilman Trail missing link), $80.6 million for major capital projects (e.g., bicycle and pedestrian bridges), $46.5 million for bicycle facility maintenance, and $5.9 million for other projects (e.g., bicycle parking, bicycle maps, bicycle education, etc.). The level of investment that will be required in order to implement this plan is relatively modest in comparison to other transportation facilities.

The general costs were developed by calculating rough quantities and applying unit costs (based on 2006 city of Seattle cost data). Costs were then translated into per mile or per facility costs, as explained in the spreadsheet associated with this appendix. For bicycle facilities that may be implemented with a larger project, the estimate represents the marginal cost required to develop the bicycle facility. For example, if bicycle lanes are added to a roadway during a repaving project, the estimate includes only the cost to implement the bicycle lanes (e.g., new pavement markings and bicycle related signs), but it does not include the new pavement.

Estimation of the costs involved several assumptions, including:

- Cost estimates assume that most on-road bicycle facilities will be added as a component of an overall project to improve the roadway for all types of users; few roadway projects will be done for the exclusive purpose of adding bicycle facilities.
- Costs are based on 2007 dollars. They may change due to future economic conditions.
- Costs assume that facility projects will be implemented by contractors through a bidding process. They may vary if projects are done in-house.
- Facility costs include construction and design.
- All construction projects include a contingency, typically estimated at 25 percent of the construction cost.
- Design and construction costs may vary depending on the actual construction project size (e.g., project limits) and overall cost. Implementation will likely be more costly if bicycle improvements are done as many small projects as compared to a smaller number of large projects.
- Regulatory and warning signs for bicycle lanes and on-street parking are included in the on-road bicycle facility costs. Bicycle wayfinding signs are also included in the on-road bicycle facilities category.
- Cost calculations assume that bicycle facility improvements are made on both sides of the street. Costs are generally over-estimated for the small portion of recommendations on one-way streets.
- Costs for roadway right-of-way acquisition are not included. These costs are not included in the estimates because specific projects are not yet defined. While roadway right-of-way acquisition costs are not included, they are a very small portion of overall costs because most improvements recommended in the plan will be made as retrofit projects within the existing roadway curb-to-curb width.
- Costs for new multi-use trail construction include pavement, drainage, erosion and sediment control, and grading; but not right-of-way acquisition. While trail right-of-way acquisition costs are not included, they are a very small portion of overall costs because most improvements recommended in the plan will be made as retrofit projects within the existing roadway curb-to-curb width.

- During the early design stages of projects, maintenance of traffic, mobilization, potential utility impacts, drainage, and property acquisition costs can be based on a percentage of total project cost. These costs are not included in the estimates because specific projects are not yet defined and those project limits are unknown. While these costs are not included, they are a very small portion of overall costs because most improvements recommended in the plan will be made as retrofit projects within the existing roadway curb-to-curb width.
- Costs for adding new pavement to create on-road bicycle facilities do not include curb and gutter, drainage, erosion and sediment control, and grading. These costs are not included in the estimates because specific projects are not yet defined and those project limits are unknown. While these costs are not included, they are a very small portion of overall costs because most improvements recommended in the plan will be made as retrofit projects within the existing roadway curb-to-curb width.

Background calculations for the general costs of this plan are contained in the Generalized Cost Estimates Spreadsheet, which is part of the Compendium of Supporting Materials available from the city.