Section 2

Modes

Modes

Modes are the different ways that people and goods travel, including vehicles, freight, transit, bicycling & walking.

The City of Seattle's Comprehensive Plan and Transportation Strategic Plan make it clear in their goals, policies and objectives that the historic emphasis on moving cars (at the expense of improving other modes) is over. Today, the goal of Seattle's transportation professionals is to 'move people and goods,' a small but important distinction that recognizes our inability to build our way out of traffic congestion without investing in transit and non-motorized transportation.

Creating Balance

Decades of investment focused on maximizing vehicle capacity has created an imbalanced transportation system. By creating incentives for driving at the expense of transportation choices, these investments have put in place artificial barriers for walking, biking, and taking transit. Achieving a balanced transportation system will require a very strong emphasis on removing these barriers over the next several decades. Providing viable alternatives to driving alone is also critical to achieving the goals of the Mayor's Climate Action Plan and the shared vision of Seattle as a sustainable city.

Despite current and expected growth in population and jobs within Seattle, much of the basic street infrastructure is not likely to change very much. The potential for new freeways, highways and major arterials is extremely limited, while widening existing streets is increasingly difficult, expensive, and disruptive to existing neighborhoods and businesses. The City simply will not be able to build its way out of traffic congestion. Therefore, as more Seattle residents, employees, and commerce need to get around town, the City will have to use its public rights-of-way much more efficiently than it has in the past.

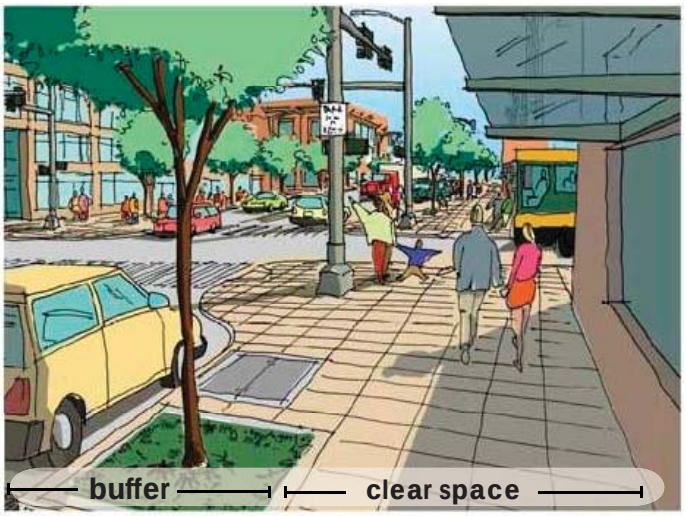
There is a strong and growing desire for people in the city to rethink the ways we live, work and shop. The Comprehensive Plan introduced many new concepts when it was developed well over a decade ago, with many citizens unfamiliar with the concept of "urban villages." Now, many people whose neighborhoods weren't designated as urban villages are asking to become one - a recognition that even single-family areas can be a part of vibrant neighborhoods, places where as walk out

the front door, they can run into their neighbors on the sidewalk, access important neighborhood services, or enjoy a great variety of places to go and things to see and do - all conveniently close to home.

Walking

In the University Area, walking is one of the primary ways people get around. **Of those people living in the urban center, more walk to work than drive alone** – 35% vs. 30%. Nearly one in four of all peak period trips to and from the University of Washington are made on foot.

Of the 47 projects recommended in this study, 28 are targeted to improve conditions for people who walk. These projects will widen sidewalks, add trail connections, improve street crossings, increase safety and reduce the wait at signals. Projects range from adding curb bulbs at intersections to developing a new trail connection from the University Campus to the Burke-Gilman Trail. Taken together, the projects will improve pedestrian safety, and make walking more convenient and enjoyable for more people.



Evaluating walking

This study established a set of performance measures and thresholds for pedestrians including:

- Width of the walking space (clear space)
- Distance between walkers and moving vehicles (buffer space)
- Ease of crossing the street at intersections, including how long people have to wait to cross and how many vehicles make right and left turns across the crosswalk
- Safety (collision history)

Figure 3: Pedestrian Sidewalk Deficiencies (2007)

Based on 5 factors of pedestrian safety and comfort, the University Area Transportation Action Strategy has identified various deficiencies within the pedestrian transportation network, represented above.

Walking conditions today

In general, the University Area has a relatively high-quality environment for pedestrians. Almost all streets have sidewalks on both sides and pedestrian crossings are well marked. Many corridors, such as University Way, have sidewalk widths that are appropriate to the foot traffic they serve. On the other hand, there are also many places where sidewalks don't meet 'acceptable' thresholds and where crossings could be improved. **Figure 3** shows the areas where pedestrian facilities are not adequate.

Sidewalks and traffic buffers

A good pedestrian environment includes adequate space to walk and pass as well as a separation, or buffer, from moving vehicles. Just as roads have been widened to accommodate more car traffic over the years, now Seattle's sidewalks need to be widened to encourage and serve more pedestrians. The walking space should be clear of objects and be at least six feet wide in order to be accessible, with wider sidewalks in busier areas. The areas occupied by tree pits and street furniture are not counted within the six foot minimum.

The distance between where people walk and moving traffic is the buffer space, which is generally a combination of parked cars and/or planting strips. When parking is not allowed during peak hours on busy streets, removing the parking lane and turning it into a travel lane removes an important safety buffer for pedestrians, which must be balanced against the need for more capacity for vehicles during the peak travel times.

Almost all of the heavily traveled streets in the study area provide adequate clear walking space; most, however, do not have enough buffer space, usually due to a lack of planting strips or limits to on-street parking.

Crossing the street

Delay: Walking should be convenient without unnecessary delays. If, for example, a person walking a mile catches a red light at every intersection, a 15-20 minute walk could easily lengthen into a 30-40 minute walk. Most of the signalized intersections in the study area have complete signal cycles under two minutes, meaning that the light turns green in each direction about once every minute. Where there is a separate signal phase for vehicles turning left, the total cycle time can be longer.

Overall, twelve intersections fail to meet acceptable thresholds for pedestrian delay; 5 are on Brooklyn Ave NE - a "Neighborhood Green Street" which has higher expectations for pedestrian comfort, while 4 are located along Roosevelt Way - a major north/south arterial that creates barriers for east/west pedestrian travel. While few opportunities were identified to reduce

pedestrian delay at these locations, the *Action Strategy* used this analysis to help prioritize other pedestrian improvements along these corridors.

Pedestrian-vehicle conflicts: Pedestrians must use care while in a crosswalk to avoid left and right turning vehicles, even with a "walk" signal. "Pedestrian-vehicle conflict" is a measure of the number of vehicles turning across the crosswalk during the time pedestrians have a walk signal. Twelve intersections, located across the study area fail to meet conflict thresholds, which vary based on the type of street.

Safety: Compared to other urban areas in the city, the University Area is a relatively safe place to walk. Crossing the street, however, is still a challenging part of a pedestrian's journey and safety concerns are real. Between 2004 and 2006, 46 pedestrians in the study area were hit by vehicles and one was killed, all while crossing a street. More than half of the collisions (24 out of 46) occurred at busy intersections at the junction of two major roadways. About one in four collisions happened at a mid-block location rather than at an intersection. Three intersections had three collisions each:

- NE 45th St at 11th Ave NE
- NE 45th St at Roosevelt Way NE
- Roosevelt Way NE at NE 65th St

Burke-Gilman Trail

The Burke-Gilman Trail is a major transportation corridor for bicyclists and pedestrians. Volumes are particularly concentrated near the University of Washington, where the trail forms a loop around the east and south edges of the University, allowing access to many parts of the campus. Staircases, pedestrian bridges, and smaller trails connect from campus buildings to the Burke-Gilman Trail.

The evaluation of the Burke-Gilman Trail focused on identifying locations where conflicts may occur where the trail crosses a road. Another focus was identifying where there are missing or poor connections between the trail and major destinations. A potential study of Burke-Gilman Trail by the University of Washington may take a comprehensive look at trail issues and make specific recommendations for improvements to the trail.

Pedestrian Master Plan

Having completed the Seattle Bicycle Master Plan, SDOT is now in the midst of a Pedestrian Master Plan process, which will define actions to make Seattle the most walkable city in the nation. The plan will use the principles of the "5 E's", Education, Engineering,

Enforcement, Encouragement and Evaluation, to:

- Get more people walking.
- Reduce the number and severity of crashes involving pedestrians.
- Engage all of Seattle in a meaningful dialogue about what is needed to create and connect walkable urban villages with important destinations.

Bicycling

Bicycle use is high throughout the study area with the highest use near the University of Washington campus and on the Burke-Gilman Trail. According to the University, **approximately 4,000 students and staff bicycle to campus**. The City recently completed the Seattle Bicycle Master Plan for the entire city. The project team used the plan's recommendations and added greater detail to key projects for the University Area.

Bicycle features are included in 23 of the recommended projects. These projects add bicycle lanes and sharrows, improve trail crossings, create better connections and increase bicyclist safety.

Evaluating bicycling

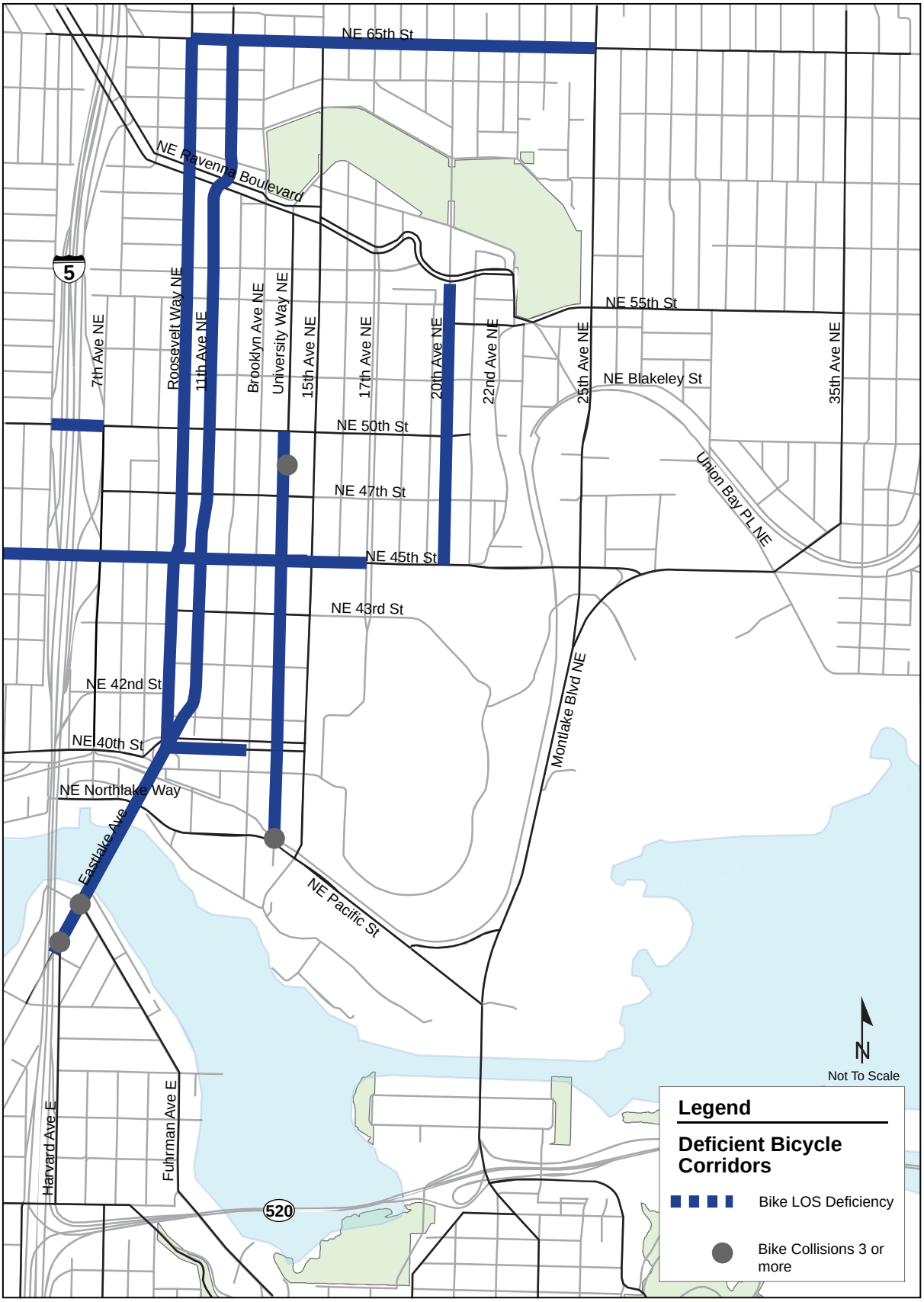
A bicyclist is more likely to ride on a street when the rider feels safe. While some experienced riders don't mind "mixing-it-up" with heavy traffic, most bicyclists prefer a street or corridor where traffic volumes and speeds are lower, and/or where space is set aside for bicycles.

The Bicycle Level of Service (BLOS) index measures the comfort level of a street for bicyclists. The BLOS includes daily traffic, speed limits, amount of on-street parking and the number and width of travel lanes. The project team applied the BLOS to each of the bicycle corridors in the study area as designated in the Seattle Bicycle Master Plan. In addition, the project team conducted a safety evaluation based on bicycle-vehicle collisions reported between 2004 and 2006.

Other than the Burke-Gilman Trail and the bicycle lanes on the University Bridge and along Ravenna Blvd NE, there are few dedicated facilities in the study area for bicyclists. While the Bicycle Master Plan will go a long way to bringing these new facilities, a bicycle 'network' that connects to the area's major destinations does not yet exist.

Figure 4 shows the bicycle corridors that fall below the acceptable BLOS, as well as locations where three or more bicycle-vehicle collisions occurred in the last three years.

Figure 4: Bicycle Network Deficiencies (2007)



Based on national Bicycle Level-of-Service (BLOS) methodology, the Action Strategy located deficiencies within the bicycle network for the University Area as designated by the Bicycle Master Plan. Facilities located on the University of Washington campus and on off-street corridors such as the Burke Gilman Trail were not analyzed.

Bicycling conditions today

With the exception of the Burke Gilman Trail, vehicles and bicycles in the University Area generally share the same roadways. Bicyclists generally ride along the edge of the roadway or along the side of a row of parked cars. About half of the study area streets commonly used by bicyclists were rated below the acceptable threshold for street adequacy. The two lowest rated streets are NE 45th Street and NE 50th Street, where there are high levels of bicyclist discomfort and high levels of bicycle-vehicle conflicts.

Street adequacy: Conflicts between vehicles and bicycles can occur where riders need to cross the stream of traffic to make left turns, where off-street pathways cross streets, where the roadway is not wide enough to comfortably accommodate both modes, or where vehicles are moving at a much higher speed than bicyclists.

Safety: City records show a concentration of bicycle-vehicle collisions occur near the intersection of Eastlake Avenue E/Fuhrman Avenue E, near the south end of the University Bridge. These collisions are related to bicyclists moving across traffic lanes to turn left onto Harvard Avenue E. Other high collision locations include the Burke-Gilman Trail crossings near the intersection of NE Pacific Street/University Way NE and at Blakeley Street/25th Avenue NE.

Bicycle Master Plan

The Seattle Bicycle Master Plan has created a vision for the University Area. The plan's major goals are to:

* Increase use of bicycling in Seattle for all trip purposes. Triple the amount of bicycling in Seattle by 2017

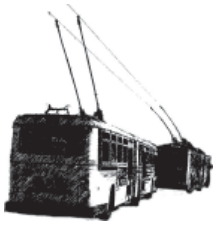
- Improve safety of bicyclists throughout Seattle. Reduce the rate of bicycle crashes by one-third by 2017

To achieve these goals, the Bicycle Master Plan has established a carefully planned set of projects to create a complete bicycle network throughout the city and has established policies to make bicycling more convenient, to promote bicycling and educate bicyclists, and to secure funding to implement the plan.

Figure 5: Bicycle Master Plan - Recommended Facilities

Most of the 2007 Bicycle Master Plan projects are not specifically called out in the Action Strategy: they are assumed to be "implemented" by the Action Strategy's 2030 timeframe. However, the Action Strategy does provide recommendations to refine and/or address unresolved issues and project alternatives identified by the Bicycle Master Plan, as well as other multi-modal projects that provide benefits to bicyclists.

Transit



The University Area enjoys one of the highest levels of transit ridership in the region. King County Metro, Community Transit, Sound Transit and the University of Washington collectively operate 51 transit routes within the area. The University of Washington's U-PASS program, which provides all students, faculty, and staff with a bus pass (unless they actively opt out), has increased ridership on King County Metro routes to the point where U-Pass trips account for nearly percent10% of all of Metro's riders. **Nearly 40% of students and staff commute to the UW campus by bus**.

Evaluating transit

The Seattle Transit Plan establishes five performance measures and benchmarks (or goals) for the Urban Village Transit Network (UVTN) corridors:

- **Frequency**: Every 7 to 15 minutes depending on route
- **Span of Service**: 16 to 24 hours a day
- **Passenger Loading**: Averaged over the day, most passengers should find a seat
- **Reliability**: Trips should be no more than 3 minutes late
- **Speed**: On average, busses should travel at greater than 50% of the posted speed limit

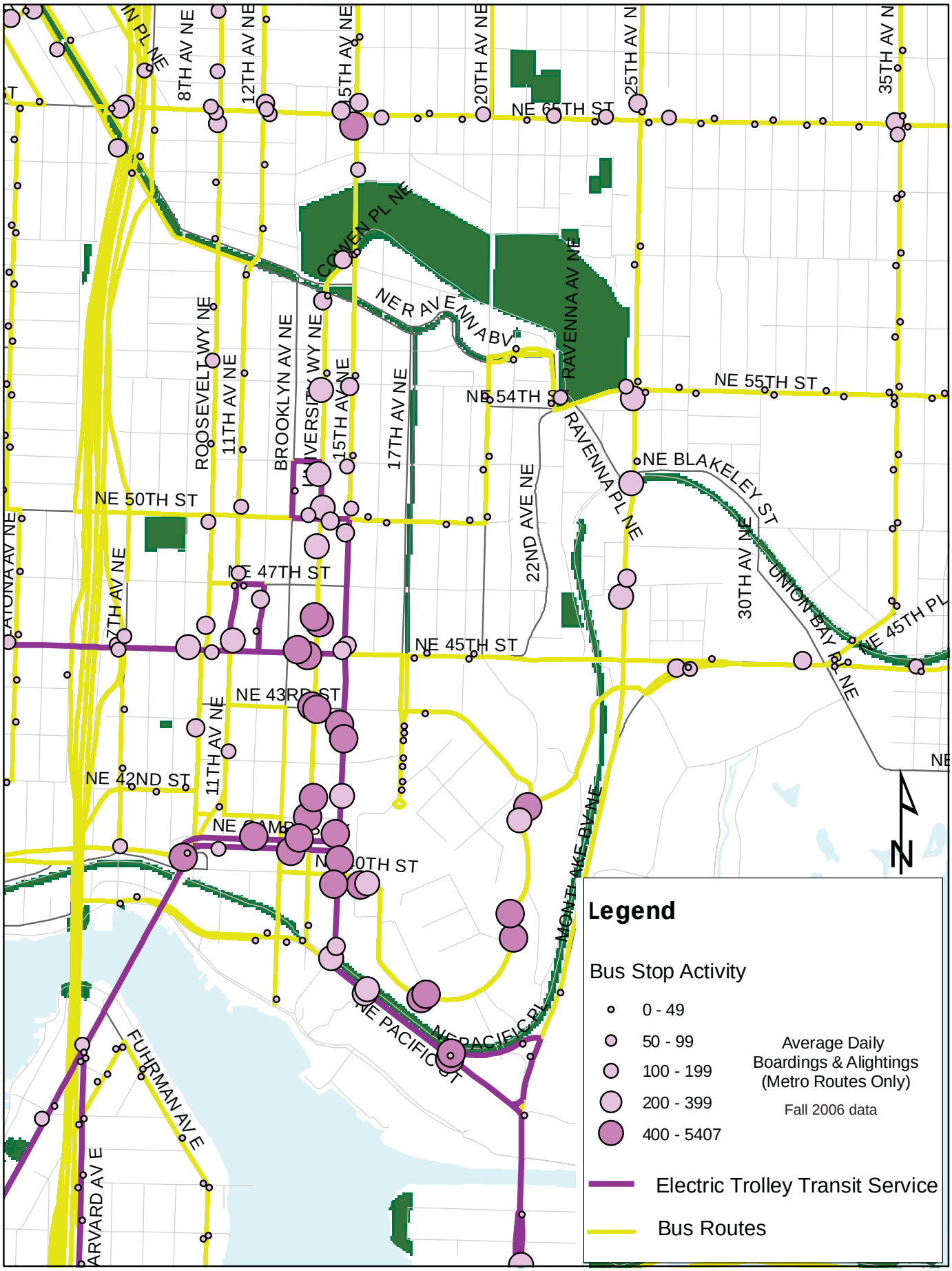
In the University Area, all bus routes currently operate on UVTN corridors. These corridors, which are identified in **Figure 6**, include:

- 15th Avenue NE
- NE Pacific Street
- University Way NE
- Eastlake Avenue
- Roosevelt Way NE
- 11th/12th Avenue NE
- 35th Avenue NE
- NE 65th Street
- NE 42nd Street
- NE Campus Parkway
- Stevens Way and Pend Oreille Rd (University of Washington campus)

Transit conditions today

Meeting the UVTN thresholds requires cooperation between the transit operators and the City. While King County Metro, Community Transit and Sound Transit are responsible for setting service hours and schedules, the ability of the buses to meet speed and reliability thresholds depends significantly on the operating conditions of city streets. Furthermore, when buses are consistently delayed in traffic, it costs more to provide frequent service as each bus takes longer to make a round trip.

Figure 6: Existing Transit Routes and Stop Activity



Speed & Reliability: The project team focused on projects to improve street operating conditions for buses that will improve transit speed and reliability. **Figure 7** show the transit corridors that fail to meet the UVTN travel speed thresholds.

When buses operate mixed with high volumes of traffic, slow speeds, plus delays while waiting to merge back into traffic, slow bus service. When buses stop to drop off and pick up passengers in the traffic lane, it speeds transit but slows other traffic, as drivers must wait behind the bus or create more congestion by changing lanes to avoid the delay.

Three primary transit corridors in the study area, NE 45th Street, NE Pacific Street and 15th Avenue NE, have very low travel speeds for buses. Other corridors with deficient speeds are Roosevelt Way NE and 11th/12th Avenue NE. Montlake Boulevard NE, although a designated UVTN corridor, has only limited transit service, so its very slow travel speeds do not affect many riders.

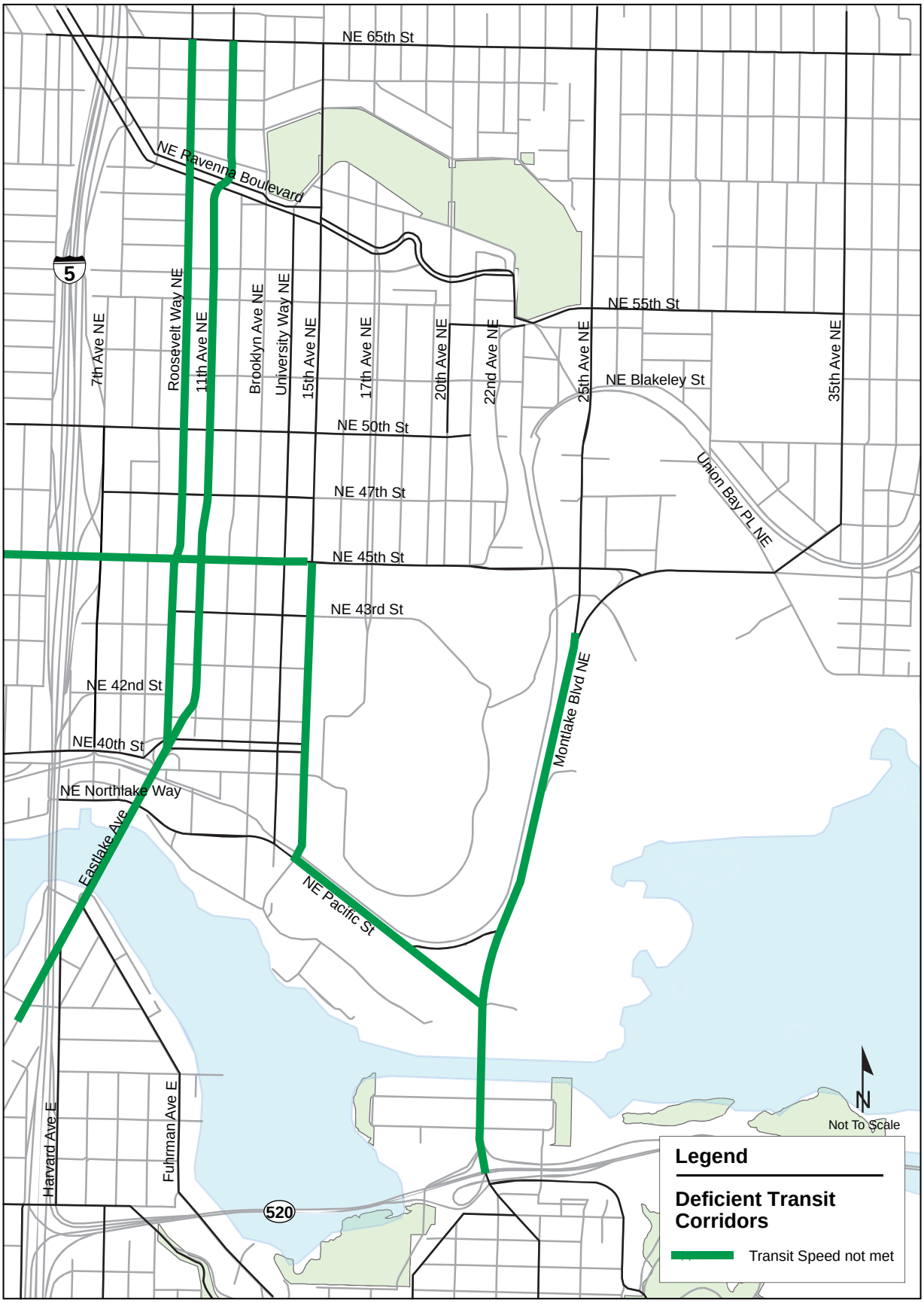
For a passenger waiting for a bus, service reliability is an important factor. To be reliable, buses should arrive within a few minutes of their posted schedule. Reliability issues are normally related traffic conditions, such as traffic congestion and crashes. In many cases, transit agencies will adjust the posted schedule to match anticipated traffic conditions. Of the UVTN corridors in the University area, nine fail to meet the transit reliability threshold. The worst corridor in terms of transit reliability is NE 45th St where traffic congestion and slow travel speeds affect the ability of buses to get to their stop locations on-time.

Future transit conditions

By 2030, the North Link Light Rail extension is expected to be constructed providing frequent, fast, reliable light rail service and the opportunity to reconfigure bus service to bring passengers to and from the three University Area stations. The North Link Final Supplemental EIS estimates a reduction in travel time between the University District and downtown Seattle from 22 minutes (currently by bus) to 8 minutes when light rail operation begins. The FSEIS also projects daily light rail boarding as 3,500 riders at the Roosevelt Station, 11,500 at the Brooklyn Station, and 21,500 at the University of Washington Station.

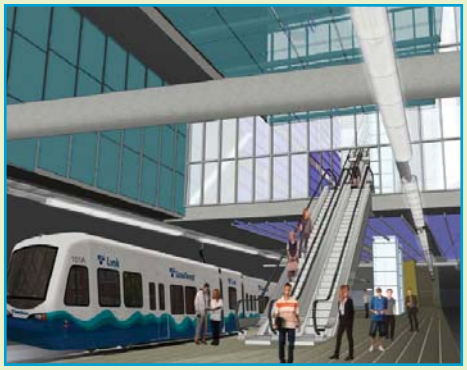
By 2030, however, without additional improvements, the travel speeds on roadways serving as primary bus transit corridors are projected to operate poorly, with several transit corridors having average travel speeds below 10 mph. These corridors include NE Pacific Street, NE 45th Street, 7th Avenue NE and 15th Avenue NE.

Figure 7: Transit Speed Deficiencies (2007)



The Action Strategy used the speed & reliability performance measures from the Seattle Transit Plan to analyze transit operations in the University Area.

Sound Transit



Preliminary design for the underground platform level at Husky Stadium Station.

Central Link

The first phase of development for Sound Transit's light rail system (Link) is set to begin operation from Sea-Tac airport to Westlake Station in 2009. As part of this first phase, there will be no major changes to transit (bus) routes operated by King County Metro in the greater University Area.

University Link

The second phase of Link light rail will bring service to the southern portion of the University Area, with new underground stations on Capitol Hill (Broadway between John St and Denny St) and at Husky Stadium (Montlake Blvd and Pacific St). Construction is set to begin in 2008 with the start of service expected in 2016.

Sound Transit 2

An extension of light rail north of Husky Stadium Station (North Link) has been planned as part of a larger "Sound Transit 2" package, which would include expanded light rail, Bus Rapid Transit (BRT), 'Sounder' commuter rail, and a new streetcar line from King Street Station to Capital Hill.

In November 2007, a proposal from Sound Transit to fund 'Sound Transit 2' was defeated as part of a larger regional transportation ballot measure known as the "Roads & Transit" package. In July 2008, Sound Transit board members approved a revised package that will go on the 2008 ballot, which still includes expanding light rail service through the University Area, with stations at Brooklyn Ave in the University District and near 65th Ave in the Roosevelt neighborhood. The *Action Strategy* assumes these light rail connections will be in place by the 2030 timeframe, with optimistic projections having service reach these areas as early as 2018.

Vehicles

Nineteen projects recommended in this plan are targeted primarily to drivers. Of these, fifteen are designed to help speed traffic and reduce delays, while four focus on safety.

The analysis of conditions for vehicles typically measures and evaluates traffic during the worst hour of the day which is normally during the evening commute (the "peak" period). During the PM peak hour, 4,900 vehicles travel on Montlake Boulevard NE; 3,200 vehicles cross the University Bridge; and 2,300 travel on NE Pacific Street. In addition to the daily congestion associated with peak travel, traffic is also particularly heavy during events such as football games and festivals.

Evaluating vehicles

There is a long-established methodology for the evaluation of vehicle traffic conditions. Traffic vehicle counts, signal timing and phasing, percentages of truck and bus traffic are all inputs into computer models which calculate the Level of Service (LOS) for arterials and at individual intersections. These LOS measures allow traffic engineers to identify existing problems and show what the effects would be of investing in roadway improvements. In addition to LOS, the project team also evaluated vehicle collisions between 2004 and 2006.

Vehicle conditions today

Along a few of the corridors in the University Area, traffic can be congested and slow-moving for many hours each day, although on others traffic moves smoothly off-peak and acceptably in the peak. Much of the congestion in the area is related to vehicles traveling to and from I-5 and SR 520. Congestion on these regional facilities can also worsen University Area traffic by backing up traffic onto city streets and diverting trips onto arterials. In the University Area, as elsewhere in the city, topography and water have limited the ability to construct a simple grid system of evenly spaced arterials, placing a larger burden on those streets that do connect across longer distances. In addition to Lake Washington, the Ship Canal, Lake Union and various small gulches, the University of Washington campus limits through routes to the edges of the campus. I-5 also creates an additional barrier, with widely spaced overpasses which tend to funnel through traffic.

Figure 8 shows the roads and intersections that fall below an acceptable LOS threshold during the evening peak hour and the locations where high numbers of vehicle collisions have occurred.

Freight Corridors: The NE Northlake Way – NE Pacific Street – Montlake Bridge Corridor is the only designated Major Truck Street in the University Area. Major Truck Streets serve as primary routes

for transporting goods within the City's street system. Freight movements along this corridor are largely related to maritime industries located along the north shore of Lake Union and in Ballard. During peak hours, this is a highly congested corridor with eastbound movements on NE Pacific Street operating at 6 mph.

Safety: Intersection collisions within the University Area are well below the average compared to other areas in the City. During 2004-2006, no intersections had more than five annual collisions, suggesting that slower travel speeds may reduce the number of collisions. Mid-block collisions between intersections, however, were higher than the 5 per year threshold and are a concern. Three mid-block locations along Montlake Boulevard and two locations along NE 45th Street had five or more collisions per year.

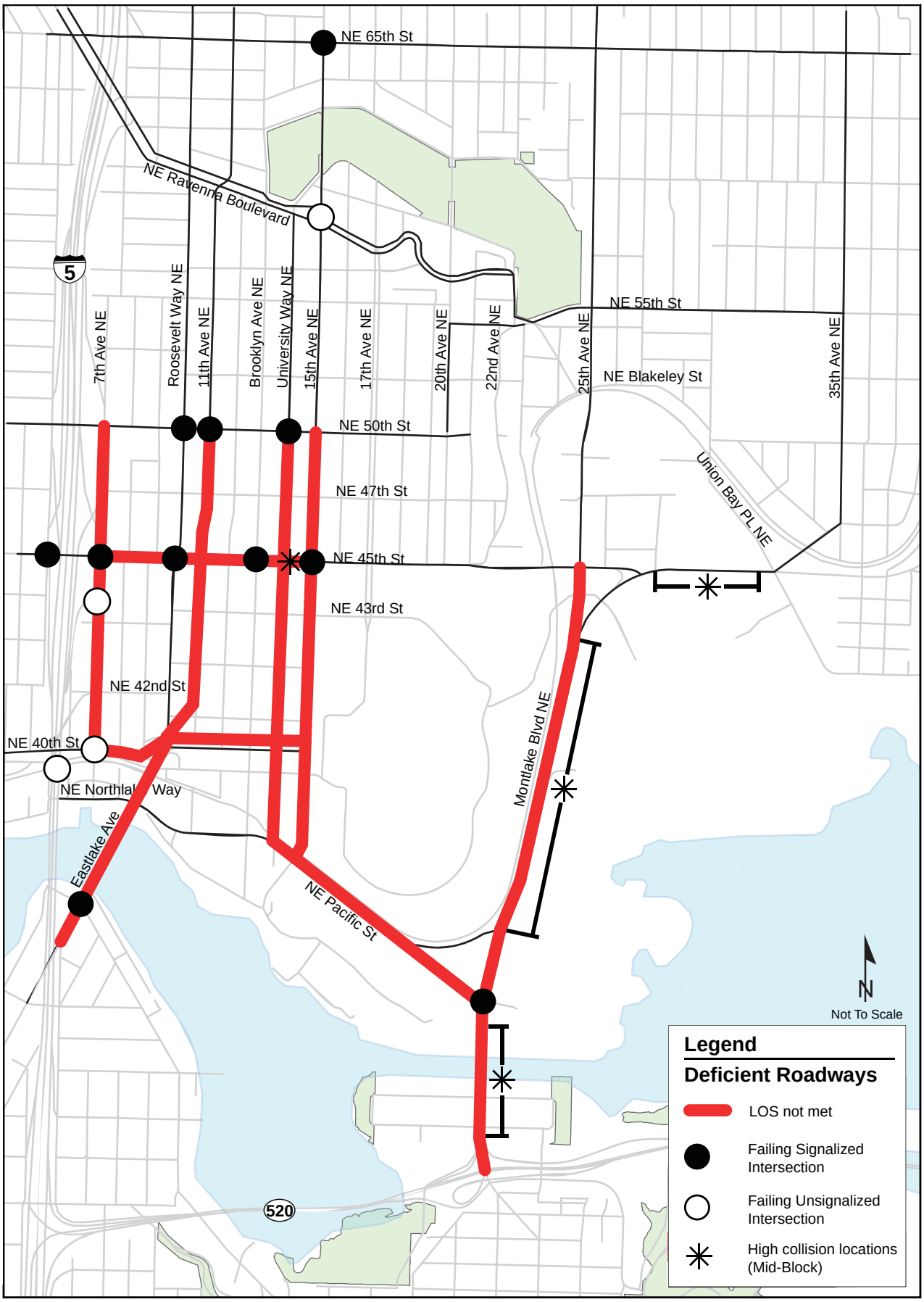
Travel Speeds: Congestion and pedestrian activity both contribute to relatively slow speeds on many streets within the study area. Montlake Boulevard in the southbound direction is the worst performing arterial with peak hour travel speeds averaging 3 mph – just under the average walking speed. In total, seven corridors operate below 10 mph in one or both directions during the evening peak hour:

- Montlake Boulevard from NE 45th Street to SR 520
- NE 40th Street from 15th Avenue NE to 7th Avenue NE
- NE Pacific St from University Way NE to Montlake Blvd
- University Way NE from NE Pacific Street to NE 50th St
- 7th Avenue NE from NE 40th Street to NE 45th St
- NE 45th Street from 7th Avenue NE to 15th Ave NE.
- 15th Avenue from NE 50th Street to NE Pacific St

Even during peak periods, 25th Avenue NE, 35th Avenue NE, NE Northlake Way and the sections of NE 45th Street east of 15th Avenue maintain an average travel speed of above 20 mph.

Intersections: Intersection operations and system-wide traffic congestion are strongly related. As the amount of traffic at an intersection increases, it becomes more difficult for an intersection to handle the traffic, to the point where the intersection "breaks down." When an intersection fails, drivers experience long delays, often waiting through two or three complete signal cycles. Impatient drivers may cut through adjacent residential areas creating neighborhood concerns. The analysis included all signalized intersections and unsignalized intersections where two arterial roadways meet. Some of the findings from the analysis of intersection operations are:

Figure 8: Vehicles Deficiencies (2007)



- Fifteen of the intersections studied operate below acceptable performance thresholds
- Five of the eight signals on NE 45th Street operate below the thresholds.
- During the PM peak hour, the all-way stop controlled intersections at NE 40th Street/7th Avenue NE and NE 40th Street/6th Avenue NE operate below thresholds
- Three out of the eight signals on NE 50th Street operate below thresholds
- The worst intersections include the signals at the I-5 ramps on NE 45th Street, Roosevelt Way/NE 45th St and the signal at NE Pacific St/Montlake Blvd NE

Future Vehicle Conditions

By using the City's traffic forecasting model, we can look ahead at future traffic conditions in 2030. The model includes changes in land use and employment and assumes Link light rail is operating and the SR 520 bridge replacement project is complete. Figure _-_ shows the University Area deficiencies in 2030.

Traffic will continue to grow within the University Area, particularly on streets that parallel corridors that operate below acceptable levels. In addition to the seven poor-performing corridors today, two additional corridors, NE Northlake Way and NE 50th St, are forecast to operate below the 10 mph threshold by 2030.

Intersection Operations

Traffic growth will continue to put pressure on intersection operations. The 2030 analysis shows nine new locations that are likely to operate below acceptable thresholds during the PM peak hour. Findings include:

- Along NE 45th St, the intersections at Union Bay Place/Mary Gates Memorial Drive and Montlake Boulevard NE will likely operate below thresholds.
- Brooklyn Ave NE will likely experience traffic growth, with deficient intersections at NE 50th St, NE 45th St, NE 43rd Street and Campus Parkway.
- Intersections at the junctions of heavily traveled streets such as NE Pacific St/15th Ave NE and NE 65th St/25th Ave NE will likely fall below thresholds.