



Bridge Rehabilitation and Replacement Program
(BRRP)

SEPA TRAFFIC SUMMARY REPORT

NE 45th Street Viaduct
West Approach Replacement Project
Phase 2 – Final Design



January 4, 2010

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1. PROJECT OVERVIEW

The NE 45th Street Viaduct West Approach Replacement project will reconstruct the western approach to the structure during the summer of 2010. The community and stakeholders were presented with the option of either constructing the west approach replacement over an 18 month period keeping one lane open in each direction, or compressing the construction to a period of up to 4 summer months with a full closure of the viaduct facility between 21st Avenue NE and Montlake Boulevard NE. Overwhelming support was given to the option to construct with a full closure of the facility with the shorter construction period. The full closure is anticipated to occur between UW commencement (June 12, 2010) and the first UW home football game (September 11, 2010), but construction activities not requiring a full closure may take place outside of this date range.

This report has been developed to support the project's SEPA review and summarizes the proposed construction strategies, traffic impacts, proposed detour routes and mitigation strategies for a full closure of the NE 45th Street Viaduct. No other roadway changes other than the closure and detour routes are proposed by the project at this time.

Strategies for the traffic control during construction of the NE 45th Street Viaduct replacement include considerations for pedestrian and bicycle travel, auto and truck traffic, as well as consideration of emergency response, transit service and truck/delivery traffic. This report is organized to summarize the existing conditions under each traffic mode, anticipated impacts based on modeling and survey results, and measures to be implemented to mitigate the anticipated impacts.

2. BACKGROUND

The NE 45th Viaduct, located in the University District between 22nd Avenue NE and Montlake Boulevard NE, provides a vital link between Interstate 5 and the Laurelhurst neighborhood. **Figure 1** shows the project vicinity. The NE 45th Viaduct also serves the University of Washington, University Village Shopping Center, and Seattle Children's Hospital medical campus. The multi-span structure was originally built in 1938 and over the years has been retrofitted and replaced in various sections. Even with these previous projects, portions of the existing structure are still sub-standard to current City of Seattle design, structural and seismic standards. The existing viaduct provides three lanes of traffic and a 5-foot pedestrian pathway on the south side. During peak periods and special University events, congestion affects the traffic operations along the viaduct.

NE 45th Street provides east/west connections between the University District, the University of Washington and the University Village Shopping Center. The University of Washington main campus lies just to the south of NE 45th Street.

To the west of the viaduct, higher density residential and a few institutional buildings are located north of NE 45th Street.

A mix of retail-oriented businesses, some institutional buildings, apartments, hotels and senior housing are located on 25th Avenue NE between NE 45th Street and NE 55th Street; 25th Avenue NE in this section is predominately a commercial street. The Burke Gilman Trail crosses 25th Avenue NE at the south leg of the NE Blakely Street signalized intersection.

Figure 1. Project Vicinity



3. PEDESTRIANS

Pedestrian mobility has been measured by evaluating pedestrian facility, walking space, and pedestrian volumes.

3.1 Existing Conditions

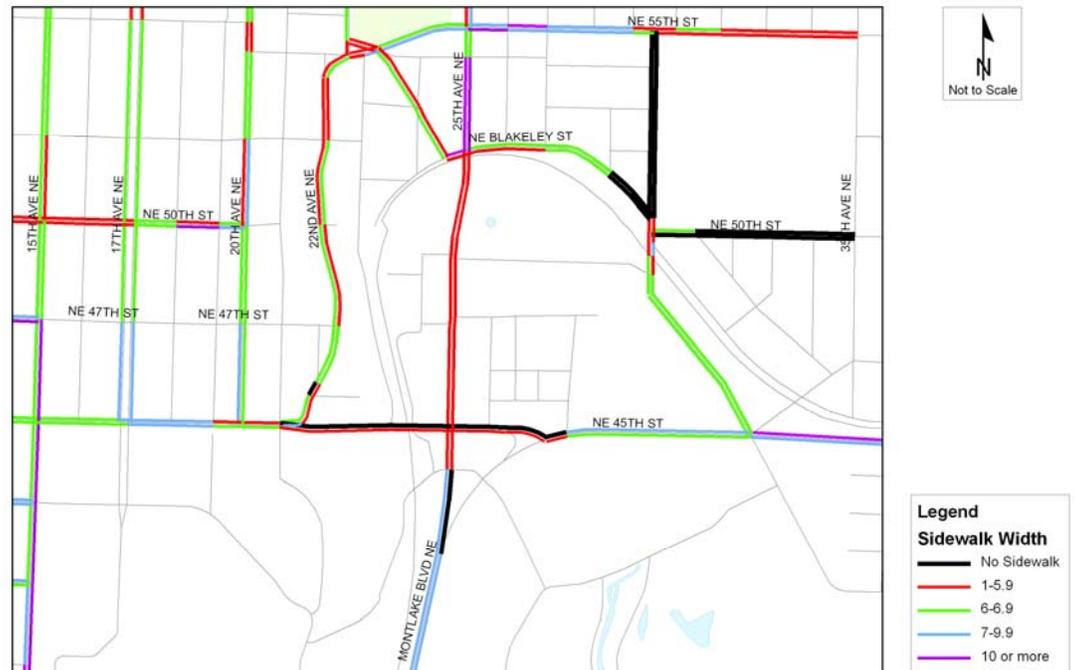
3.1.1 Walking Space

This project will address sidewalk issues along the south side of 45th Street, between 18th Avenue and the existing main span of the viaduct.

Figure 2 documents the sidewalk widths in the viaduct vicinity. Along NE 45th Street, the sidewalk along the south side of the viaduct road segment is 5 feet wide and there is no sidewalk along the north side. Between 19th and 21st Avenues NE, the sidewalk along the north side is less than 6 feet wide. Along the south side between 19th and 21st Avenue NE, the sidewalk is 6 to 7 feet wide. Along 25th Avenue NE, both sides of the street have widths less than 6 feet.

The City’s Right-of-Way Improvement Manual (Chapter 4.2 Design Criteria) classifies NE 45th Street and 25th Avenue NE as regional connectors and recommends a minimum width of 6 feet for the sidewalk and 4 feet for the planting strip. The majority of the traffic study area has deficient pedestrian zones with sidewalk widths less than 10 feet.

Figure 2. Existing Walking Space Widths

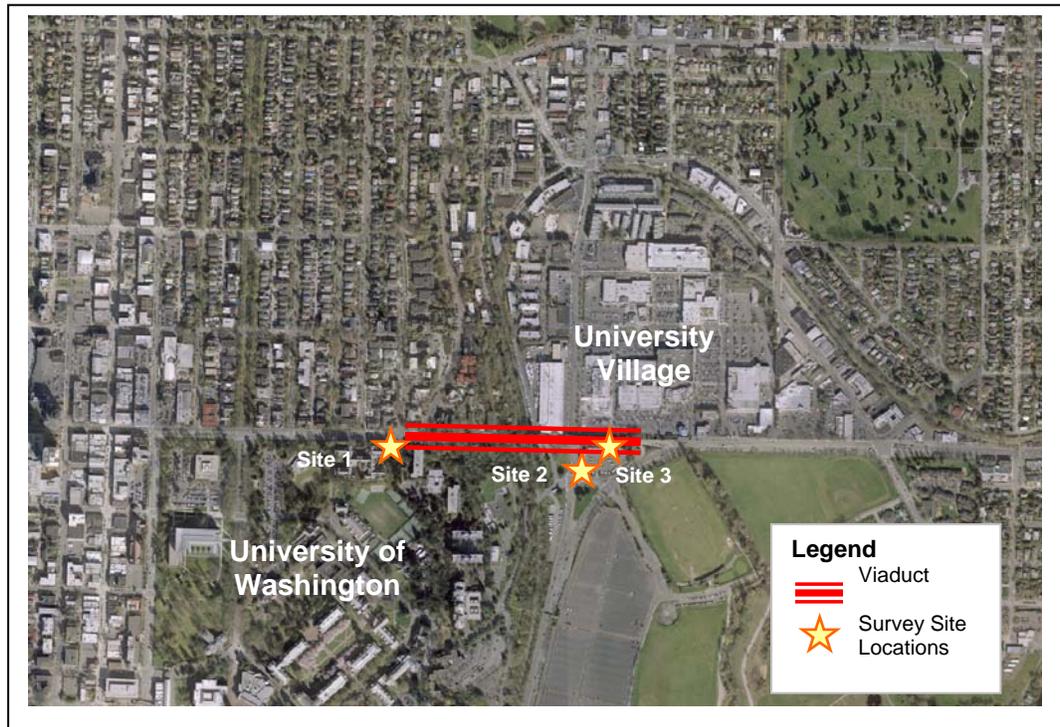


3.1.2 Pedestrian Volumes

A pedestrian count survey was conducted to better understand existing pedestrian travel and origins and destination patterns in the vicinity of the NE 45th Street Viaduct. The survey team noted the number of pedestrians passing the site and asked respondents about their trip origin and destination. The survey locations were selected to best capture pedestrians who directly or indirectly used the viaduct. **Figure 3** maps the survey locations which include:

- Site 1: The west end of the NE 45th Viaduct on the south side of NE 45th Street near 22nd Avenue NE
- Site 2: The northeast corner of the NE 44th Street/25th Avenue NE intersection
- Site 3: The pathway underneath the east end of the viaduct, where it forks between the bus stop on Montlake Boulevard, the University Village and Montlake Boulevard

Figure 3. Pedestrian Count Survey Location



The pedestrian survey was conducted during three, 2-hour periods to capture the peak hour counts for the morning, midday and afternoon.

For the morning, the survey was conducted between 8:00 AM and 10:00 AM; in the midday, between 11:30 AM and 1:30 PM; and for the afternoon, between 4:00 PM and 6:00 PM.

The survey was taken on Monday, December 8, 2008 during the winter holiday season and the beginning of finals week at the University of Washington. Because of these seasonal factors, the pedestrian counts were expected to be somewhat higher than a

typical day. During this time of the year, the University Village shopping center attracts more shoppers than normal to the area. Also, it was assumed that students and workers at the University of Washington would have more of a presence at the beginning of finals weeks rather than later in the week when finals are wrapping up. Another factor considered was that many students use the University Village shopping center as a location to study and socialize while they are still on campus. **Table 1** summarizes the peak hour volumes for all three survey locations.

Table 1. Peak Hour Pedestrian Volumes

Site #	Location	AM Peak Hour	Midday Peak Hour	PM Peak Hour
1	West End of the Viaduct	17	29	56
		9:00 – 10:00	11:30 – 12:30	4:30 – 5:30
2	Pathway underneath East End of the Viaduct	40	101	135
		8:45 – 9:45	12:30 – 1:30	4:45 – 5:45
3	Northeast corner of NE 44th St/25th Ave NE Intersection	44	116	111
		8:00 – 9:00	12:15 – 1:15	5:00 – 6:00

3.1.3 Pedestrian Volume Findings

Site 1: West End of the Viaduct

The survey data indicate that the highest pedestrian use of the viaduct occurred during the PM peak period. The PM peak hour was between 4:30 and 5:30 PM when 56 pedestrians traveled in both directions along the viaduct. Out of the three survey time periods, the morning period showed the fewest number of pedestrians. The AM peak hour was between 9:00 and 10:00 AM with 17 pedestrians counted. During the midday period, the pedestrian counts were fairly steady with roughly 7 pedestrians crossing every 15 minutes. The midday peak hour was between 11:30 AM and 12:30 PM with 29 pedestrians. Using a trend line developed from these pedestrian counts, the daily pedestrian count was estimated to be about 490 pedestrians.

Site 2: Northeast Corner of NE 44th St / 25th Ave Intersection

Among the three survey locations, the northeast corner of the intersection at NE 44th Street/25th Avenue NE had the highest pedestrian counts during the morning and midday periods. During the AM peak hour, 44 pedestrians were counted between 8:00 to 9:00 AM. During the midday peak hour, 116 pedestrians were counted from 12:15 to 1:15 PM.

Site 3: Pathway Under the East End of the Viaduct

The pathway underneath the east end of the viaduct had the highest pedestrian counts in the PM peak period but had similar pedestrian volumes as the NE 44th Street/25th Avenue NE intersection location. 135 pedestrians were counted during the PM peak hour between 4:45 and 5:45 PM.

3.1.4 Origins and Destinations Findings

Site 1: West End of the Viaduct

The most common origin or destination for pedestrians at Site 1 was the University Village shopping center followed by the University District areas west of 15th Avenue NE. The viaduct provides the most direct connection between these two locations. The participant response rate at Site 1 was 73%.

In the eastbound direction, 68% of all the pedestrian trips were to the University Village shopping center. The remaining trips were scattered along NE 45th Street and 25th Avenue NE where many businesses and some student housing and apartments are located.

In the westbound direction, 48% of all surveyed pedestrians ended their trips west of 15th Avenue NE. Only 33% indicated that their trip origin or destination was the north side of the university campus. The remaining 19% of the pedestrians indicated their trip would be north of NE 45th Street, where the university Greek houses are located. For the pedestrian trips west of 15th Avenue NE, 42% of these trips were related to bus stop access along University Avenue or 15th Avenue NE.

Many of those surveyed volunteered additional comments about the reason for their trips. Among the comments, one person reported that the viaduct was the safest and most gradual route between the University District and the shopping center. Another respondent indicated that they used the viaduct because there was poor transit service to the University Village shopping center from Capitol Hill and Downtown areas. He took a bus to University Way and 15th Avenue NE near NE 45th Street and then walked to the University Village shopping center. A few indicated that their trip origin or destination was as far west as the Wallingford Neighborhood or east as the Laurelhurst area.

Site 2: Northeast Corner of NE 44th St / 25th Ave Intersection

The findings at this location were similar to Site 3 as reported in the following section.

Site 3: Pathway Under the East End of the Viaduct

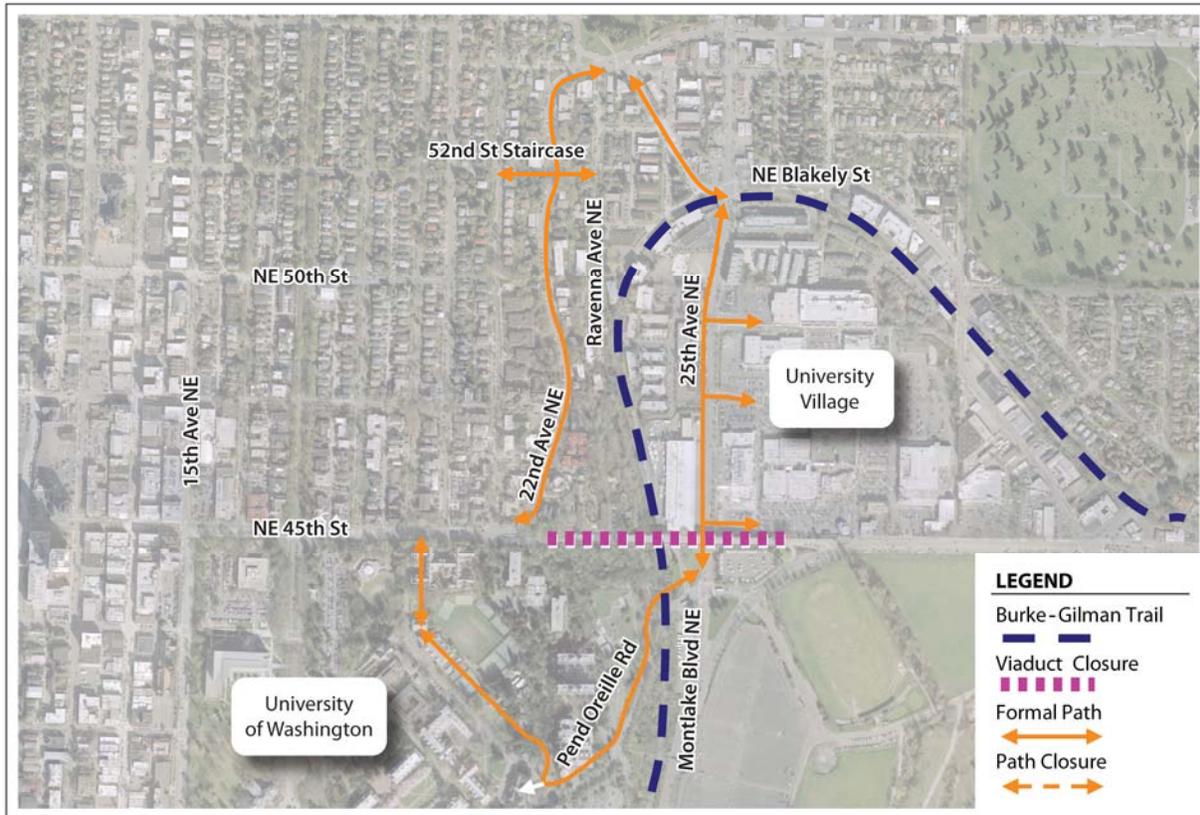
At the two survey locations underneath the viaduct, many pedestrians reported travel between the east side of the university campus and the University Village shopping center, to and from the bus stop on Montlake Boulevard and, to a lesser extent, the bus stop on 25th Ave NE. During the midday, most pedestrian travel at the intersection of NE 44th Street/25th Avenue NE was related to students and workers going to the University Village for lunch. During the PM peak period, more pedestrians reported going to the bus stops on 25th Avenue NE and Montlake Boulevard from the University Village shopping center while in the AM peak period, more pedestrians were coming from the bus stops to the shopping center. None of the pedestrians surveyed indicated that they would use the viaduct when coming from west of 25th Avenue NE.

3.2 Anticipated Impacts to Pedestrian Traffic

A full closure of the NE 45th Street Viaduct would temporarily eliminate the direct connection between the University District and the University Village shopping center. Pedestrians and cyclists who would normally use the pedestrian path on the south side of the viaduct would need to take longer routes along other formal pathways.

Figure 4 shows the other pathways or trails for pedestrian connections with a full closure of the viaduct. A formal pedestrian detour route would depend upon the origin and destination of the walk. For pedestrians who are walking between the University of Washington and University Village, they can use the sidewalks on Pend Oreille Road, NE 44th Street and 25th Avenue NE. For pedestrians coming from the University District or areas just northeast of the viaduct to the University Village, the only formal walking detour would be the sidewalk along the east side of 22nd Avenue NE, which connects back to the sidewalks along Ravenna Place NE and 25th Avenue NE. SDOT is currently repairing the staircase along the NE 52nd Street alignment and construction will be complete before the viaduct is closed for construction. The NE 52nd Street staircases will provide a connection from 20th Avenue NE to Ravenna Avenue NE and thus to the Burke Gilman Trail and 25th Avenue NE via NE 51st Street. These existing options provide alternative routes for pedestrians while the viaduct is closed. ADA pedestrian traffic will likely use 22nd Avenue NE, between NE 45th Street and NE 55th Street and along NE 55th Street, between Ravenna Boulevard and 25th Avenue NE.

Figure 4. Pedestrian Connections with a Full Closure of the Viaduct



3.3 Proposed Mitigation

Existing pedestrian routes provide alternative routes for pedestrians while the viaduct is closed. ADA pedestrian traffic will likely use 22nd Avenue NE, between NE 45th Street and NE 55th Street and along NE 55th Street, between Ravenna Boulevard and 25th Avenue NE.

SDOT is currently constructing the NE 52nd Street staircase to help facilitate local pedestrian movements. This Early Action Project will be completed in 2009, prior to construction of the NE 45th Street Viaduct Project.

4. BICYCLES

4.1 Existing Conditions

Separate bicycle facilities do not exist along either NE 45th Street or 25th Avenue NE, but bicycles can and do travel in travel lanes. Nearby, the Burke Gilman Trail that runs under the NE 45th Street Viaduct provides regional bike and pedestrian connections from the University District west

Also, the City does not identify designated bicycle routes through this project corridor, but adjacent streets provide alternative routes around the viaduct, including shared roadway facilities through the University of Washington Campus and on 22nd Avenue NE. Bicyclists can use these existing alternate bike routes.

4.3 Proposed Mitigation

Bicycle detours will primarily rely on the existing local street network and connections to the Burke Gilman Trail via the UW campus. No specific detour for bicycle traffic will be designated, although bicycle traffic will be accommodated along the 22nd Avenue NE detour route, which provides an adequate bicycle route with reasonable grades. SDOT may implement sharrow pavement markings along 22nd Avenue NE to highlight the bicycle routing during the construction closure.

5. TRANSIT

5.1 Existing Conditions

The University District has many bus routes that provide connections to City destinations and the region. King County Metro is the primary transit provider within the study area, although Sound Transit and Community Transit also provide transit service to the University District. The majority of the routes in the study area are oriented to serve the University of Washington. Only King County Metro Route 25 goes along the NE 45th Street Viaduct itself.

Table 2 summarizes the bus service in the study area and **Table 3** provides the daily and peak hour bus volumes by route. **Figure 6** shows the location of the transit routes. From the west side of campus, the routes generally enter the campus at 15th or 17th Avenues NE, before the viaduct study area. East of the campus, most transit routes from the north or east use either NE 45th Street or 25th Avenue NE to access the east entrance to the University, at the Pend Oreille Road access. Routes 68, 243 and 372, which travel along 25th Avenue NE between NE Blakeley Street and Pend Oreille Road before accessing entering the campus at Pend Oreille Road. Routes 65 and 75 also travel along NE 45th Street between the viaduct and Union Bay Place NE accessing the campus via NE 44th Street to Pend Oreille Road.

Table 2. Bus Services Provided in the Vicinity of NE 45th Street Viaduct

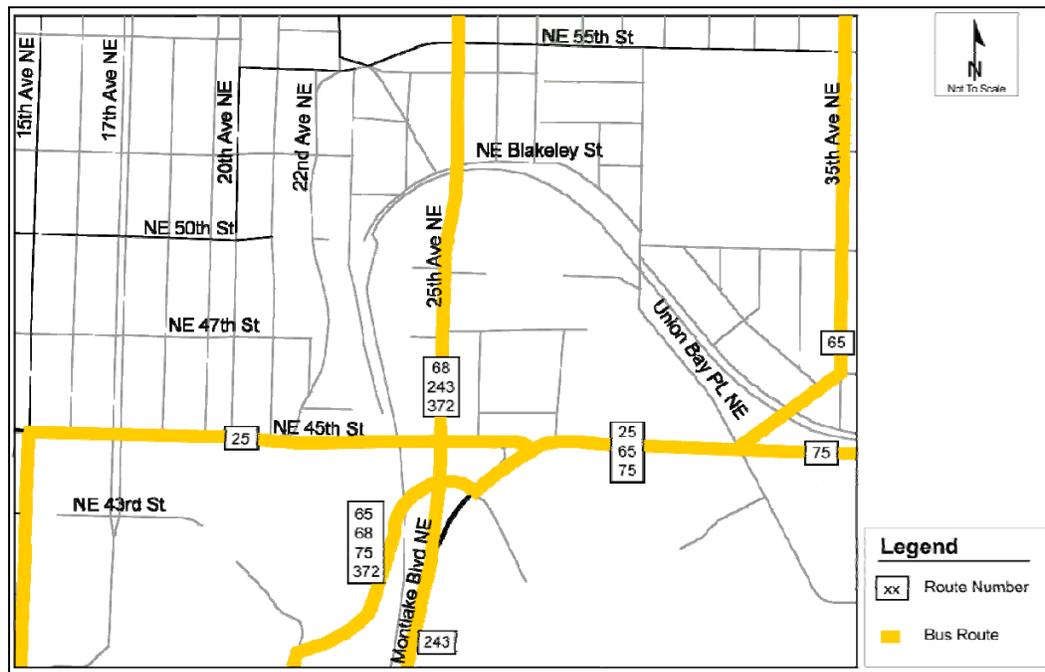
Route	Destinations	Service Frequency				
		Midday	Peak	Evening	Saturday	Sunday
25	Laurelhurst, University District, Downtown	30 minutes	30 minutes	N/A	N/A	N/A
65	Lake City, Wedgwood, University District	30 minutes	30 min, 15 min peak direction	60 minutes	30 minutes	30 minutes
68	Northgate, Ravenna, University District	30 minutes	30 minutes	N/A	30 minutes	N/A
75	Ballard, Northgate, University District	30 minutes	15 minutes	60 minutes	30 minutes	30 minutes
243	Jackson Park, Ravenna, Bellevue	N/A	20 min peak direction	N/A	N/A	N/A
372	University District, Kenmore, Woodinville	30 minutes	30 min, 15 min peak direction	60 minutes	N/A	N/A

Source: Metro Online Home Page. 18 June 2008 <<http://transit.metrokc.gov/>>.

Table 3. Bus Volumes of the Routes in the Vicinity of NE 45th Street Viaduct

Route	Destinations (Inbound, Outbound)	Daily			PM Peak Hour		
		In	Out	Total	In	Out	Total
25	Laurelhurst, University District, Downtown	20	22	42	2	2	4
65	Lake City, Wedgwood, University District	40	41	81	2	4	6
68	Northgate, Ravenna, University District	26	24	50	2	2	4
75	Ballard, Northgate, University District	51	48	99	4	4	8
243	Jackson Park, Ravenna, Bellevue	3	3	6	0	3	3
372	University District, Kenmore, Woodinville	34	36	70	2	4	6

Figure 6. Transit Routes Serving in the Vicinity of NE 45th Street Viaduct



King County Metro’s standards call for the agency to provide transit shelters at bus stops that have 50 or more boardings per day. There is high transit use and activity throughout the University area. For the traffic study area, bus shelters are provided at the following high activity locations:

- NE 45th Street (eastbound), far side of 17th Avenue NE
- NE 45th Street (westbound), far side of Union Bay Place NE
- 25th Avenue NE (northbound), far side of NE 47th Street
- 25th Avenue NE (southbound), far side of NE 47th Street
- Mountlake Boulevard NE (northbound), near side of NE 45th Street
- Mountlake Boulevard NE (southbound), far side of NE 45th Street

Bus stops are located along NE 45th Street and 25th Avenue NE. Along 25th Avenue NE, there are two stops in the southbound direction and one in the northbound direction on the far side of the main driveway into the University Village shopping center. Along NE 45th Street between 17th Avenue NE and the Mountlake Boulevard NE, two bus stops are located in each direction between 17th and 20th Avenue NE. Another bus zone in the eastbound direction is located on the near side of the NE 45th

Street/Montlake Boulevard NE intersection. Between Montlake Boulevard NE and Union Bay Place NE, two bus stops exist in the westbound direction but there are none in the eastbound direction. One bus zone is located on either side of Montlake Boulevard NE just southwest of the NE 45th Street/Montlake Boulevard NE intersection.

5.2 Anticipated Impacts to Transit

Currently King County Metro operates Route 25 along the NE 45th Street Viaduct. This route serves as a connection between Laurelhurst and Seattle Children's Hospital to the University District and Downtown.

Route 25 will be detoured during the viaduct closure, which could add several additional minutes to the existing bus travel time. In addition to the impacts on Route 25, all other bus routes in the surrounding area could have an increase in transit times due to the additional detoured traffic from the viaduct closure, especially for bus routes along 15th Avenue NE and NE Pacific Street.

5.3 Proposed Mitigation

King County Metro Route 25 will need to be rerouted during the construction closure. Metro will need to alert riders in advance and provide alternate routing and bus stop locations. Options for transit routing include travel via the UW campus roadway network or to reroute via minor arterial routes to the north. SDOT will need to coordinate closely with Metro to designate an alternative route.

Currently King County Metro staff indicate that they would like to reroute Route 25 through Pend Oreille Road, Stevens Way, and Memorial Way on the University Campus to or from NE 45th Street. The University of Washington has identified a proposed transit stop enhancement on campus that could benefit transit and overall traffic circulation at the NE 40th Street campus entrance. If Metro reroutes through the University campus, this enhancement could provide a benefit to affected transit riders during construction and improve traffic circulation through campus.

6. VEHICLES

6.1 Existing Conditions

Currently, the viaduct carries an average daily weekday traffic volume of 20,700 vehicles. Only 4 percent of the daily weekday traffic is considered heavy vehicles. Traffic along this corridor is most congested in the PM peak period. During the PM peak hour, the eastbound and westbound traffic on the viaduct is almost balanced.

Existing queues on the viaduct stem from adjacent intersections operating inefficiently along the NE 45th Street corridor. Field visits indicate that the eastbound queues onto the viaduct in PM peak hour originate from the NE 45th Street/Montlake Boulevard NE intersection and the NE 45th Street/University Village south driveway intersection.

6.1.1 Fall-Spring Level of Service Conditions (2008)

The following section describes the existing traffic conditions on the NE 45th Street Viaduct during the fall-spring terms when student enrollment is highest at the University of Washington.

Traffic Volumes

The majority of the traffic counts were collected in February of 2008. In the study area, southbound and westbound are generally the peak travel directions during the morning. Northbound and eastbound are typically the peak travel directions during the evening. The NE 45th Street Viaduct carried 1,400 vehicles during the AM peak hour and 1,600 vehicles during the PM peak hour. The highest traffic volumes in the area occur on Montlake Boulevard NE north of NE Pacific Place with 2,800 vehicles during the AM peak hour and 3,880 vehicles during the PM peak hour.

Intersection Level of Service

To measure the performance of the existing roadway network, select intersections that would be affected by the viaduct closure during the AM and PM peak hours were analyzed. The analysis included 8 intersections during the 2008 AM peak hour and 19 intersections during the PM peak hour. Overall, most intersections operated with greater delays in the PM peak hour than the AM peak hour.

In the 2008 AM peak hour, the Level of Service (LOS) analysis for the intersections found that the NE 45th Street/Union Bay Place NE intersection had the longest average delays with a LOS D. The other 7 intersections had an LOS of C or better in the AM peak hour. **Figure 7** shows the 2008 fall-spring AM peak hour levels of service and delay at selected study intersections.

In the 2008 PM peak hour, the LOS analysis for signalized intersections found 2 intersections with a LOS E and the longest average delays: NE Pacific Street/Montlake Boulevard NE and NE 45th Street/Union Bay Place NE. All other signalized intersections had a LOS D or better in the PM peak hour. Of the 3 un-signalized intersections, the intersection of NE 54th Street/Ravenna Avenue NE had a LOS E for the southbound left turn movement.

6.1.2 Summer Traffic Volumes and Level of Service Conditions (2009)

This section describes the 2009 summer traffic conditions with the NE 45th Street Viaduct.

Traffic Volumes

In the fall-spring term, the University of Washington has 62,000 students enrolled, but in the summer the enrollment drops to 35,000 students resulting in lower traffic volumes. Summer traffic volumes on the roadways around the campus are generally 10 to 35 percent lower due to a decrease in University activities and absences due to vacation travel.

Table 4 compares the AM peak hour traffic volumes for the fall-spring period with those of the summer and **Table 5** similarly compares the PM peak hour traffic volumes.

Table 4. Comparison of AM Peak Hour Traffic Volumes Between the Fall-Spring Period and the Summer Period

Street	Location	Fall-Spring Count	Summer Count	Diff	% Diff
NE 45th St	East of 15th Ave NE	1,790	1,190	-600	-34%
NE 45th St	East of Montlake Blvd NE	2,840	2,810	-30	-1%
NE Ravenna Blvd	East of 15th Ave NE	NA	260	NA	NA
NE 65th St	East of 15th Ave NE	NA	950	NA	NA
15th Ave NE	South of NE Ravenna Blvd	NA	310	NA	NA
NE Pacific St	East of 15th Ave NE	1,990	1,450	-540	-27%
Montlake Blvd NE	North of NE Pacific PI	2,800	2,760	-40	-1%
Pend Oreille Rd	West of 25th Ave NE	420	180	-240	-57%

Table 5. Comparison of the PM Peak Hour Traffic Volumes Between the Fall-Spring Period and the Summer Period

Street	Location	Fall-Spring Count	Summer Count	Diff	% Diff
NE 45th St	East of 15th Ave NE	2,010	1,620	-390	-19%
NE 45th St	East of Montlake Blvd NE	3,280*	2,980	-300	-9%
NE Ravenna Blvd	East of 15th Ave NE	700	560	-140	-20%
NE 65th St	East of 15th Ave NE	1,390	1,300	-90	-6%
15th Ave NE	South of NE Ravenna Blvd	750	610	-140	-19%
NE Pacific St	East of 15th Ave NE	2,280	1,800	-480	-21%
Montlake Blvd NE	North of NE Pacific Pl	3,880*	3,830	-50	-1%
Pend Oreille Rd	West of 25th Ave NE	530	340	-190	-36%

Intersection Level of Service

The lower traffic volumes in the summer generally lead to better intersection operations compared to the fall-spring. To analyze the summer traffic conditions, AM and PM peak hour counts at 19 select intersections in September 2009 were conducted.

Similar to the fall-spring period, during the summer most intersections operate with greater delays in the PM peak hour than the AM peak hour. In the 2009 AM peak hour, the intersection LOS analysis found that the NE 45th Street/Union Bay Place NE intersection had the longest average delays with a LOS D. During the morning commute, southbound Montlake Boulevard NE experiences heavy congestion with many drivers traveling to the SR 520 interchange. Southbound traffic backs up from the interchange on Montlake Boulevard NE to north of NE Pacific Place. The intersection LOS analysis shows the Montlake Boulevard NE intersections with NE Pacific Street and NE Pacific Place operating with a LOS C and B, respectively. Please note that the intersection delay calculations do not include the congestion from the SR 520 interchange blocking southbound traffic on Montlake Boulevard NE, and that these two intersections often perform much worse than calculated. The other 16 signalized and un-signalized intersections had a LOS C or better in the AM peak hour. **Figure 9** shows the 2009 summer AM peak hour intersection LOS and delay.

In the 2009 summer PM peak hour, the intersection LOS analysis found that no intersection operates at a LOS E or worse, which is an improvement from the fall-spring period when 3 intersections operate at a LOS E. The following 3 signalized intersections

operate at a LOS D: NE Pacific Street/Montlake Boulevard NE, NE 45th Street/Union Bay Place NE, and NE 65th Street/25th Avenue NE. The other 16 signalized and un-signalized intersections had a LOS C or better in the PM peak hour. **Figure 10** shows the 2009 existing summer PM peak hour intersection LOS and delay.

Figure 9. Existing Summer AM Peak Hour Intersection Level of Service (2009)

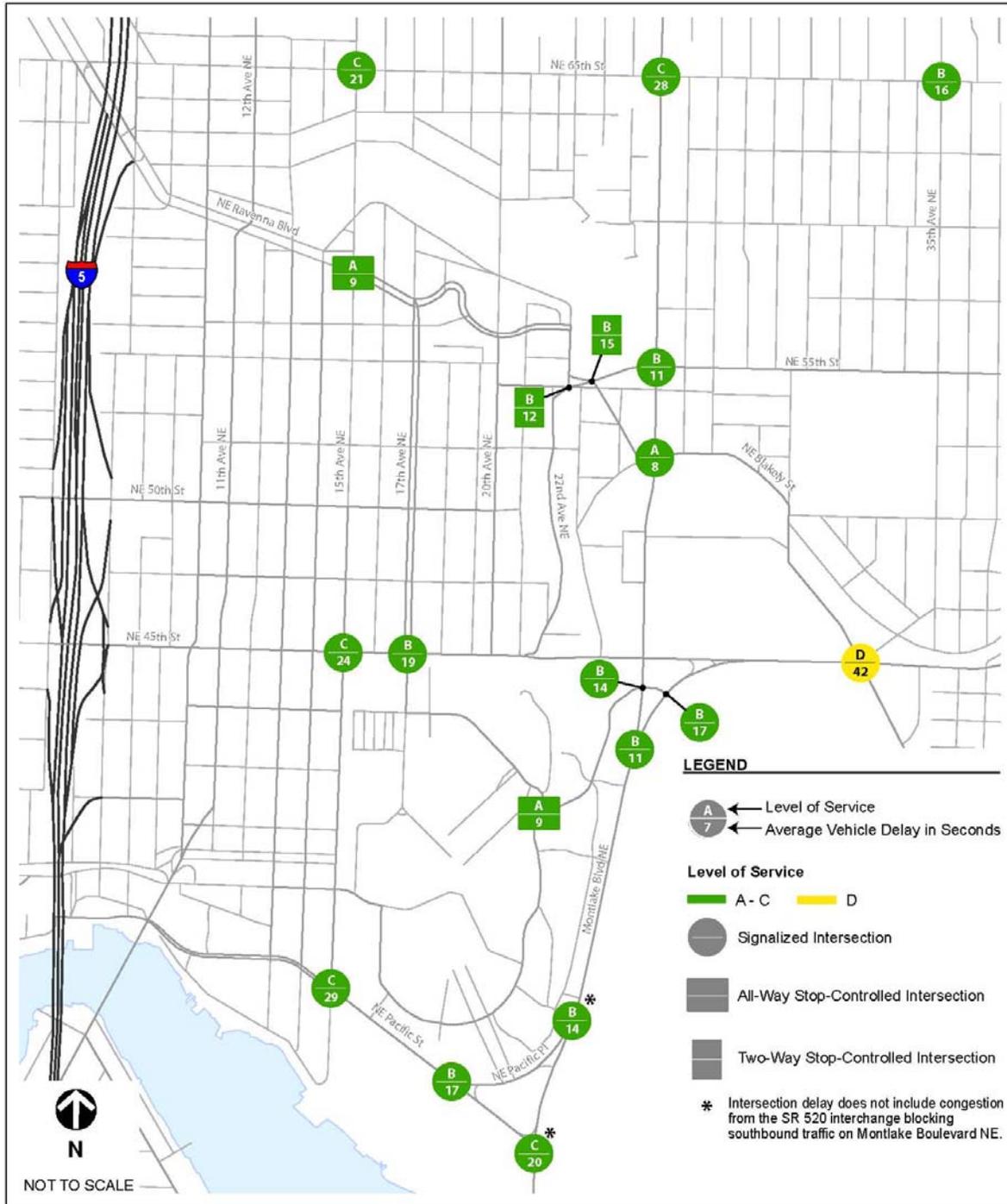
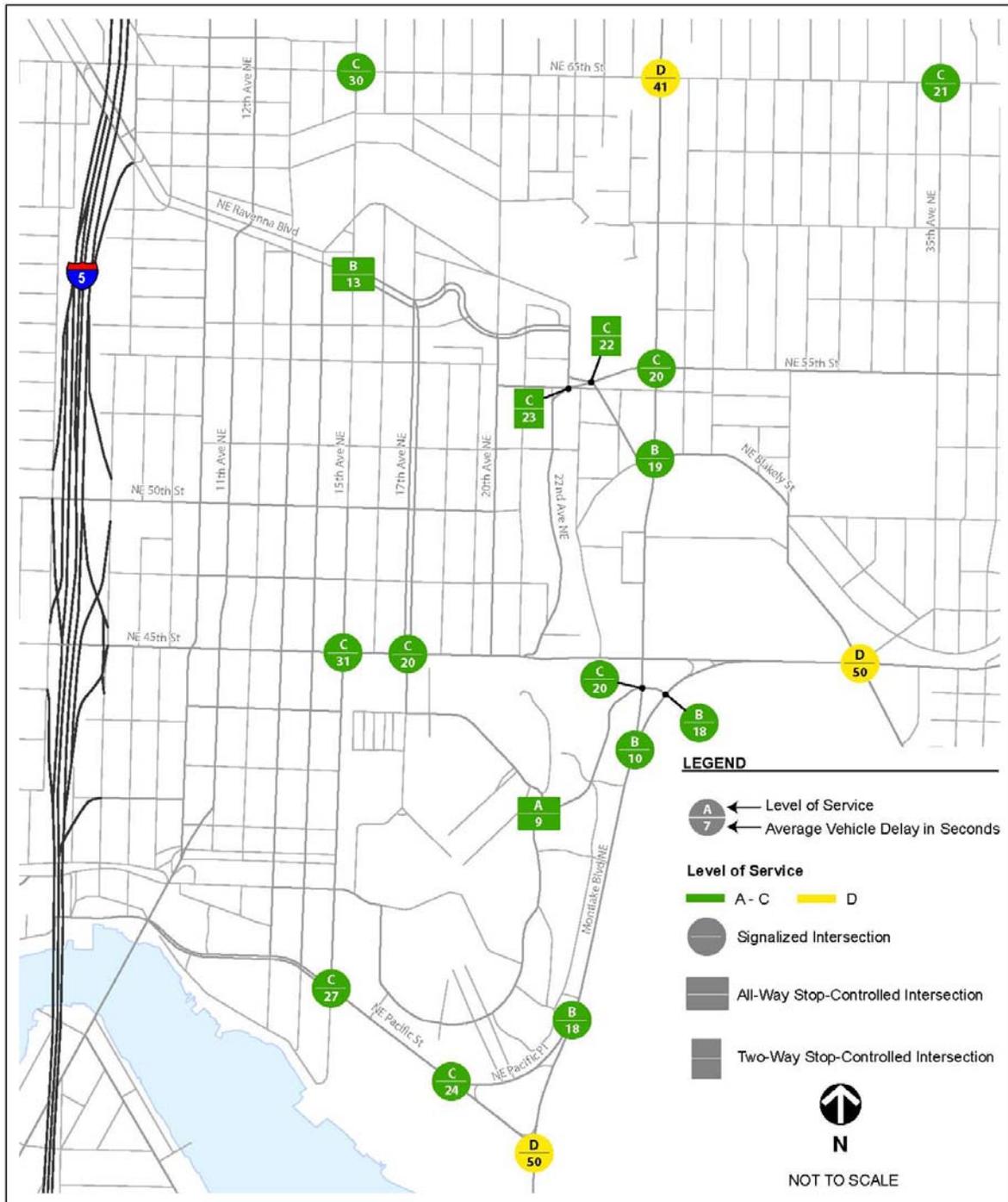


Figure 10. Existing Summer PM Peak Hour Intersection Level of Service (2009)



6.1.3 Traffic on University of Washington Campus

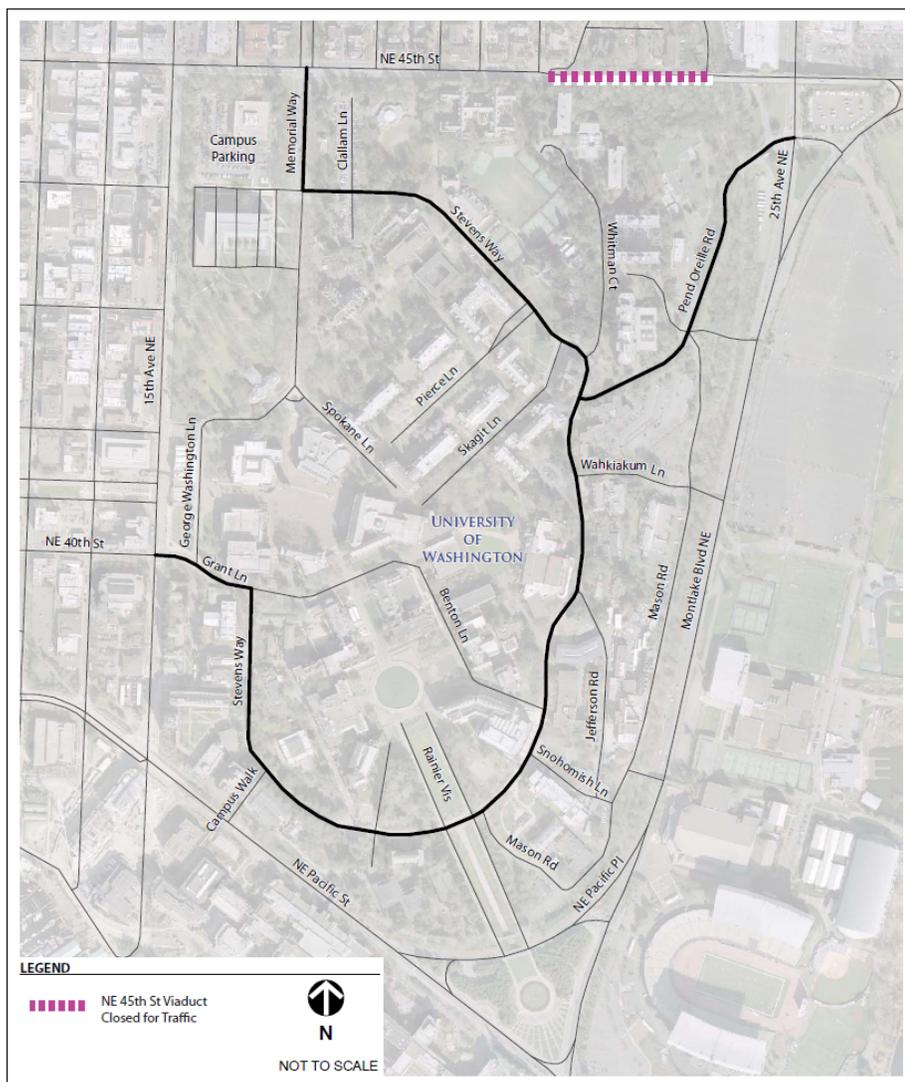
Figure 11 provides an overview of the campus street network. Stevens Way, the main roadway on campus, provides the only route through the UW campus and connects to all the major access points. Pend Oreille Road intersects Stevens Way at a T-intersection with an all-way stop. Stevens Way has one lane in each direction with multiple pedestrian crossings and a speed limit of 20 miles per hour. Most bus routes on campus use Stevens Way.

Access to the University of Washington campus occurs at three locations:

- NE 45th Street/ Memorial Way/17th Avenue NE intersection
- NE 40th Street/ 15th Avenue NE intersection
- Pend Oreille Road /25th Avenue NE intersection

Memorial Way provides an access point to the north and is the closest connection to NE 45th Street and the western end of the viaduct. Pend Oreille Road, providing access to the east, is the closest connection to the eastern end of the viaduct. The NE 40th Street/15th Avenue NE intersection provides access to locations west of the campus. There is no vehicular access to the campus from the south.

Figure 11. University of Washington Campus Street Network



Traffic Volume Comparison Between Summer and Fall

Fall Traffic Volumes

The University of Washington’s 2007 Annual Campus Traffic Count Report provided the data for the fall traffic volumes at the three access locations. The University collected the traffic count data for the week of October 8, 2007. The traffic count data for the NE 45th Street Viaduct volumes came from the traffic counts conducted during the first couple of weeks in February 2008 by Fehr & Peers.

In 2008 the viaduct segment of NE 45th Street carried about 20,700 vehicles per weekday. The eastbound and westbound volumes were fairly balanced with 10,200 vehicles westbound and 10,500 vehicles eastbound. Of the three campus access points, Memorial

Way south of NE 45th Street had the highest average daily traffic with 8,093 vehicles and 655 vehicles in the PM peak hour in October 2007. Pend Oreille Road had the next highest with 6,570 vehicles of which 517 traveled during PM peak hour. The access point at the NE 40th Street/15th Avenue NE intersection had the lowest with 6,310 average daily vehicles and 531 PM peak hour vehicles.

Summer Traffic Volumes

Fehr & Peers conducted traffic counts at these three University of Washington campus entrance locations in July 2009. The average daily traffic volumes are shown in **Table 6**.

Table 6 also compares the daily traffic volumes between the fall and summer periods. As expected, the summer traffic volumes on the campus streets are lower than the fall volumes. The traffic volume reductions in the summer vary by location and direction. The summer traffic on Memorial Way is about 24 percent lower than the fall traffic volumes, while Pend Oreille Road and NE 40th Street are about 16 to 17 percent lower.

Table 6. Fall and Summer Daily Traffic Count Volumes on University Campus (Vehicles per Day)

Volumes	Memorial Way South of NE 45th Street			Pend Oreille Road West of 25th Ave NE			NE 40th Street East of 15th Ave NE		
	IB*	OB**	Both	IB*	OB**	Both	IB*	OB**	Both
Daily Fall Volume Based on 2007 Counts by UW	4,050	4,050	8,100	3,610	2,960	6,570	3,560	2,750	6,310
Daily Summer Volumes Based on 2009 Counts	3,220	2,910	6,130	2,910	2,540	5,450	2,300	2,990	5,290
Difference	-830	-1,140	-1,970	-700	-420	-1,120	-1,260	240	-1,020
Percent Difference	-20%	-28%	-24%	-19%	-14%	-17%	-35%	9%	-16%

* IB means inbound traffic movement

** OB means outbound traffic movement

Due to the decrease in University activities and absences due to vacation travel, a 15 percent reduction in traffic along NE 45th Street for the summer traffic volumes was estimated. Currently, approximately 20,700 vehicles are on the NE 45th Street Viaduct each day in the fall or winter. With full closure during the summer construction period, the daily traffic to be rerouted is estimated at

17,600 vehicles, or approximately 85 percent of the regular daily traffic present in the fall.

6.2 Anticipated Impacts to Vehicle Traffic

Diversion of Vehicles Due to NE 45th Street Viaduct Closure for Construction

The basis for calculating the changes in traffic volumes on the streets surrounding the NE 45th Street construction site was the Seattle travel demand forecasting model (Seattle Model). As a part of the NE 45th Street Viaduct project, Fehr & Peers coded the streets on the University of Washington campus and the lanes added to the detour routes by the on-street parking restrictions on 15th Avenue NE, NE 65th Street, and 25th Avenue NE. This model was re-validated with the existing AM and PM peak hour counts. After the re-validation was completed, the network link of NE 45th Street between 21st Avenue NE and Montlake Boulevard NE was removed from the enhanced Seattle Model and the model was re-run. The traffic that used the NE 45th Street Viaduct was re-assigned to the street network in the enhanced model.

The model results suggest that the traffic diversion would be roughly 55 percent oriented to the north and 35 percent oriented south of NE 45th Street and that approximately 10 percent of the trips would reroute out of the area or not be made at all.

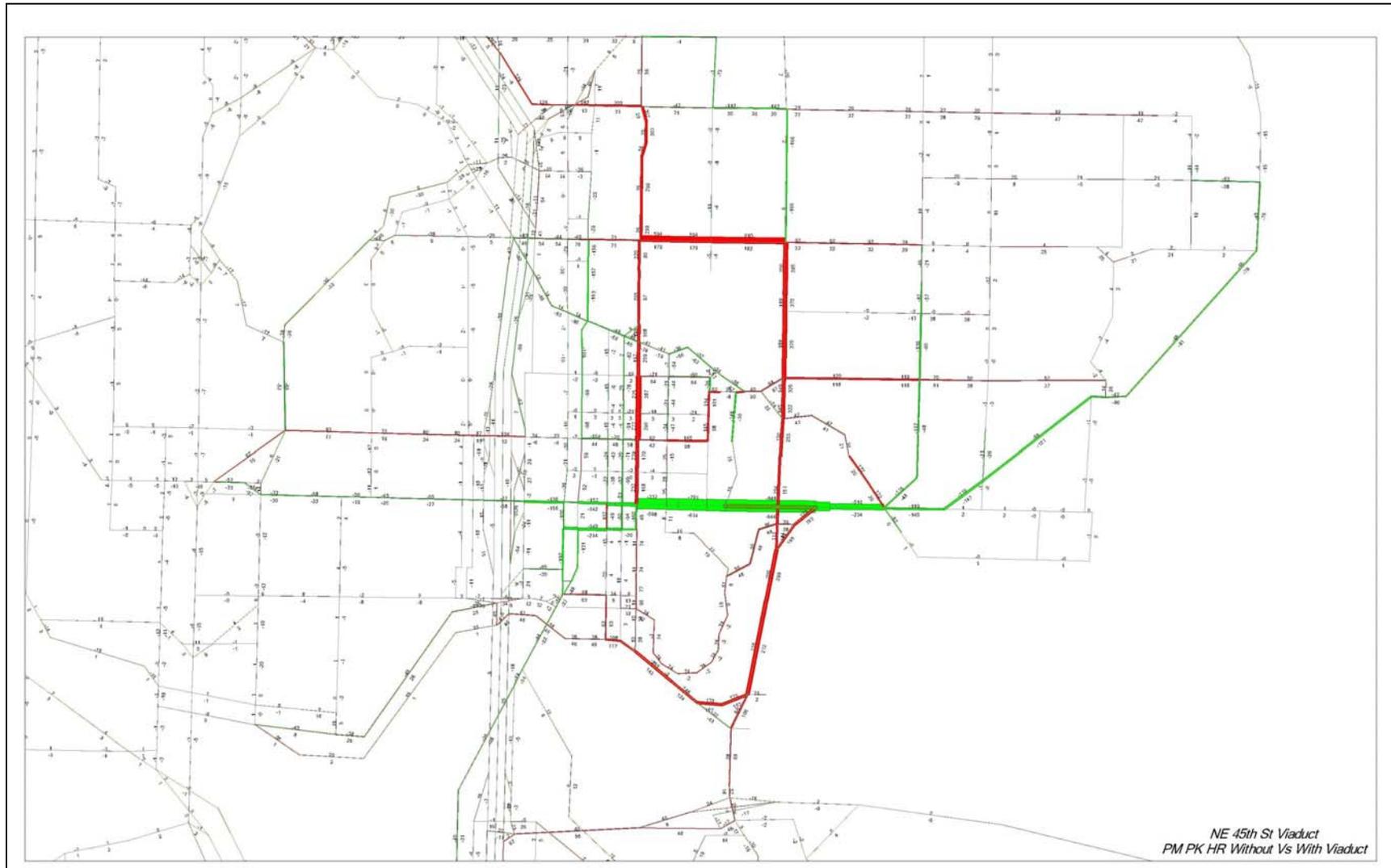
Figure 12 illustrates the expected trip distribution with the NE 45th Street Viaduct closure during the PM peak hour. The network links with green indicate where traffic will reduce and the links with red show where traffic will increase with the NE 45th Street Viaduct closure. The traffic diversion during the AM peak hour is similar with the PM peak hour. Many of the diverted trips to Montlake Boulevard NE and NE 55th Street would have destinations between the University District and University Village area. The diversions to NE 65th Street and NE 75th Street would connect trips between the University District, and the Ravenna, Wedgwood and Sand Point neighborhoods.

Other observations from the analysis include:

- The construction impacts from a full closure of the NE 45th Street Viaduct could increase delays at several intersections, with the longest delays at already congested locations. Overall, those intersections where traffic diversion is expected would see intersection delays increase and temporary traffic management modifications would be needed.

- In the summer, traffic volumes on the streets surrounding the University of Washington would be lower by 15 to 35 percent. The increased traffic volumes due to the NE 45th Street Viaduct construction could offset the reduction of the summer traffic reductions.

Figure 12. PM Peak Hour Trip Distribution with Viaduct Closure



6.2.1 2010 Summer Traffic conditions With Viaduct Closure

This section describes the 2010 summer conditions with the NE 45th Street Viaduct closed between 21st Avenue NE and Montlake Boulevard NE.

Traffic Detour Strategies

During construction, NE 45th Street would be closed to all traffic between 21st Avenue NE on the west and the intersection with Montlake Boulevard NE on the east. The following arterials will be designated as detour routes for vehicles during the construction period:

- 15th Avenue NE between NE Pacific Street and NE 65th Street
- 25th Avenue NE between Montlake Boulevard NE and NE 65th Street
- Montlake Boulevard NE between NE 45th Street and NE Pacific Place
- NE Pacific Place between Montlake Boulevard NE and NE Pacific Street
- NE Pacific Street between 15th Avenue NE and NE Pacific Place
- NE 65th Street between 15th Avenue NE and Sand Point Way NE

Figure 13 shows the proposed detour routes for the construction closure of NE 45th Street. These designated arterials are intended to carry the majority of the traffic rerouted due to the construction closure. To provide full-time two lane operation for each direction to accommodate the additional traffic demand, on-street parking along these detour segments would be restricted during the AM and PM peak periods as follows:

- 15th Avenue NE between NE 40th Street and NE 65th Street
- NE 65th Street between 15th Avenue NE and 25th Avenue NE
- 25th Avenue NE between NE 65th Street and NE 55th Street

Temporary signing will be required along these streets.

Temporary dynamic message signs (DMS) will give motorists advance notice of the impending viaduct closure (days and weeks ahead of the closure) and advance notice of the detours – information for both time and location. Proposed locations for the dynamic message signs (DMS) are shown in **Figure 13**. At these locations, motorists can receive notices about the upcoming construction and closure and detour directions during the closure itself.

Figure 13. Detour Routes and Traffic Control Signs for the NE 45th Street Viaduct Construction



6.2.2 Traffic Volume Changes without the NE 45th Street Viaduct

No traffic growth was assumed for the one year between the 2009 summer counts and the summer of 2010 when the viaduct will be closed. The key findings from this modeling exercise include:

- This modeling analysis shows that 55 to 65 percent of the traffic diverted by the viaduct closure will use the east/west detour routes NE 65th Street and NE Pacific Street/NE Pacific Place during the 2010 AM and PM peak hours.
- The majority of the drivers that chose routes other than the assigned detour routes are forecasted to use Ravenna Boulevard NE, NE 54th Street, the University of Washington campus streets, and SR 520/Montlake Boulevard NE.
- The increased traffic volumes on the campus streets is expected to be at or below fall-spring levels.

Intersection Level of Service

AM Peak Hour

The viaduct closure will result in higher traffic volumes on 15th Avenue NE, 25th Avenue NE, NE Pacific Street, Montlake Boulevard NE, NE 65th Street, NE Ravenna Boulevard, and NE 54th/55th Street, which in turn, will cause the intersections along these streets to experience longer delays. However, predicted levels of service and delays that would be experienced by the drivers in the summer of 2010 would be about same as those in the remainder of the year when the NE 45th Street is open for traffic. For the intersection level of analysis, the signal timing was optimized for locations where the travel patterns changed significantly with the viaduct closure.

One interesting finding is that in the 2010 AM peak hour, all intersections evaluated in the study area with NE 45th Street Viaduct closure would perform similarly to the normal summer condition in 2009. This analysis found little degradation of LOS or delay with the closure. This is because the intersections in the study area in general have sufficient capacity to accommodate the lower traffic volumes during the summer AM peak hour, even with the viaduct closure. Only the intersection of NE 45th Street/Union Bay Place NE intersection will operate at LOS D with or without the viaduct.

Note that the two intersections at Montlake Boulevard NE/NE Pacific Street and Mountlake Boulevard NE/NE Pacific Place are forecast to operate at LOS C and B, respectively, with only minor increases in delay. These two intersections will likely perform worse than the analysis shows because the calculations do not include the congestion from the SR 520 interchange that blocks southbound traffic on Montlake Boulevard NE. The remaining study intersections are forecast to operate at LOS C or better in the AM peak hour.

Figure 14 shows the 2010 summer AM peak hour intersection LOS with the viaduct closure.

PM Peak Hour

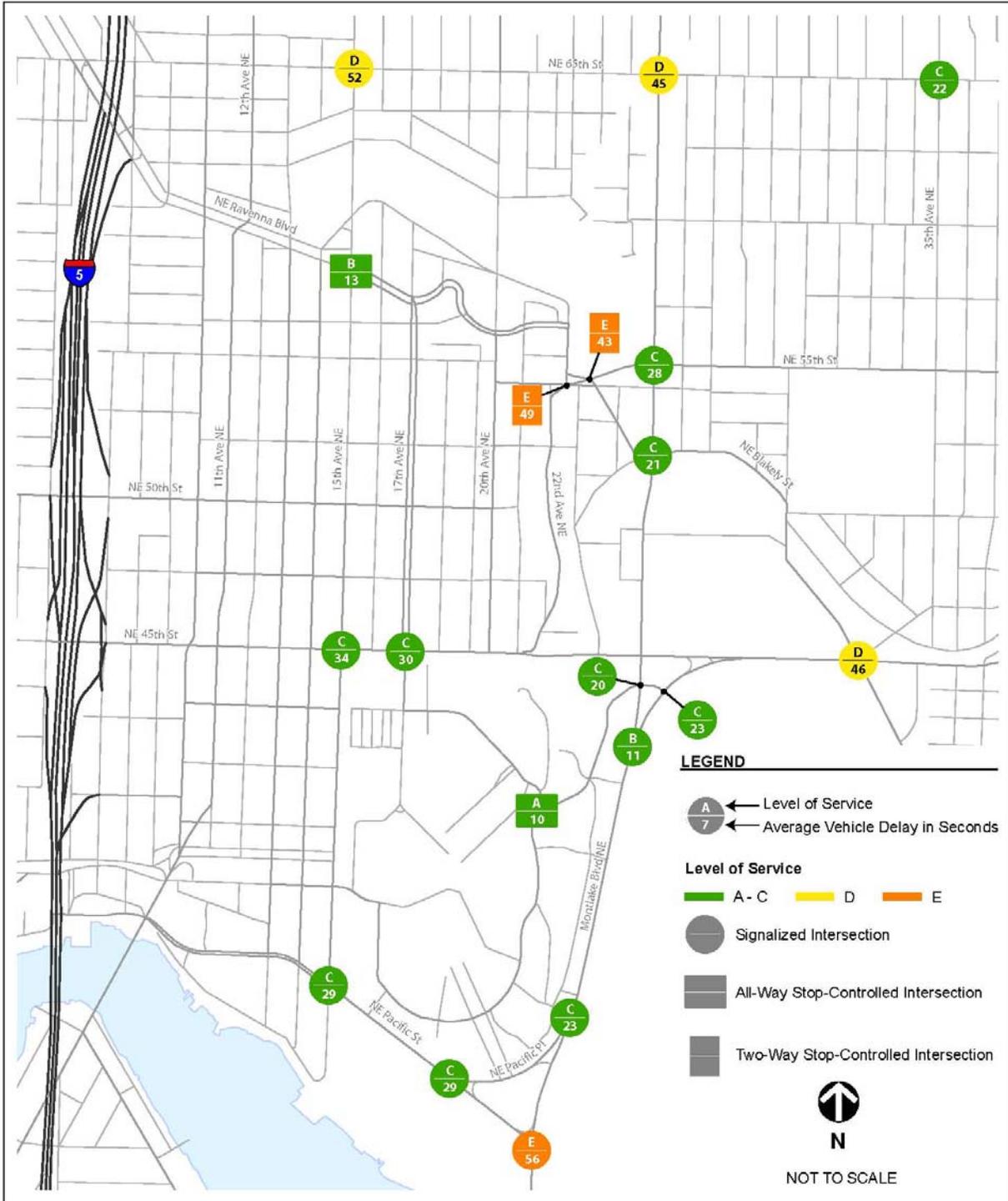
The traffic impacts of the NE 45th Street Viaduct closure are more pronounced during the PM peak hour when the traffic volumes are generally higher than the AM peak hour. However, the 2010 summer intersection levels of service and delays with the viaduct closure would be about same as those during the remainder of the year when the NE 45th Street Viaduct is open for traffic.

With the viaduct open, all of the study intersections performed at LOS D or better during the 2009 summer PM peak hour. With the viaduct closure in 2010, the following intersections are forecasted to perform at a LOS E:

- The Montlake Boulevard NE/NE Pacific Street intersection will change from LOS D to LOS E because some vehicles will use SR 520 and Montlake Boulevard NE as an alternative route to NE 45th Street.
- The two un-signalized intersections of Ravenna Avenue NE/NE 54th Street and Ravenna Place NE/NE 55th Street will have minor stop-controlled movements that are forecasted to change from a LOS C with the viaduct open to a LOS E with the viaduct closed. The increase in delay is due to east/west traffic diverting to Ravenna Avenue NE and NE 54th Street.
- The intersection of 15th Avenue NE/NE 65th Street will change from a LOS C to an LOS D with the viaduct closure. This is primarily due to the increased number of westbound vehicles making an unprotected westbound left-turn to southbound 15th Avenue NE. This movement is forecast to operate at LOS E with the viaduct closure.
- The 25th Avenue NE/NE 65th Street intersection will continue to operate at a LOS D with the closure. The remaining study intersections are forecasted to operate at a LOS C or better.

Figure 15 shows the 2010 summer PM peak hour intersection LOS with the viaduct closure.

Figure 15. Summer PM Peak Hour Intersection Level of Service with the Viaduct Closure (2010)



6.2.3 University of Washington

During construction of the NE 45th Street Viaduct, the City of Seattle will take extensive efforts to detour traffic from NE 45th Street to other arterials such as 15th Avenue NE, NE 65th Street, 25th Avenue NE and Pacific Street. However, it is possible that some of the drivers will not follow the detour routes and choose to drive alternative routes of their own, potentially including routes through the University of Washington campus.

This section describes the potential impacts from traffic diverted by the full closure of the NE 45th Street Viaduct during the summer of 2010 including those vehicles that may choose to re-route through the University of Washington main campus. The analysis was done with the enhanced Seattle travel demand model. This analysis discusses the potential increase in campus traffic volumes during the summer with the full closure option. Fehr & Peers counted vehicles on the campus streets in July 2009 after the University's summer session began and compared these summer traffic volumes with the previous traffic counts collected in the fall and winter of 2008.

Table 7 shows the actual PM peak hour volumes and the volumes generated by the enhanced Seattle Model at the following four locations: NE 45th Street at the viaduct, Memorial Way south of NE 45th Street, Pend Oreille Road west of 25th Avenue NE, and NE 40th Street east of 15th Avenue NE.

Table 7. PM Peak Hour Volumes of Actual Count and Enhanced Seattle Model

Street		2008 Actual Count (A)	Enhanced Seattle Model (B)	Difference (A) - (B)
NE 45th Street at Viaduct	Eastbound	750	650	100
	Westbound	790	830	-40
	Both Directions	1540	1480	60
Memorial Way south of NE 45th Street	Southbound	300	370	-70
	Northbound	350	400	-50
	Both Directions	650	770	-120
Pend Oreille Road west of 25th Ave NE	Eastbound	320	260	60
	Westbound	200	150	50
	Both Directions	520	410	110
NE 40th Street east of 15th Avenue NE	Eastbound	330	270	60
	Westbound	200	250	-50
	Both Directions	530	520	10

Table 8 identifies the changes in traffic volumes on the streets on the University of Washington campus with and without the NE 45th Street Viaduct.

Table 8. Changes in Vehicle Volumes to Streets on University of Washington Campus without NE 45th Street Viaduct

Street		PM Peak Hour Volumes With Viaduct (A)	PM Peak Hour Volumes Without Viaduct (B)	Difference (A) - (B)	Percent of NE 45th St Viaduct Volume
NE 45th Street Viaduct	Eastbound	650	0	-650	
	Westbound	830	0	-830	
	Both Direction	1,480	0	-1,480	
Memorial Way south of NE 45th Street	Southbound	370	380	10	2%
	Northbound	400	410	10	1%
	Both Direction	770	790	20	1%
Pend Oreille Road west of 25th Avenue NE	Eastbound	260	300	40	6%
	Westbound	150	260	110	13%
	Both Direction	410	560	150	10%
NE 40th Street east of 15th Avenue NE	Eastbound	270	270	0	0%
	Westbound	250	340	90	11%
	Both Direction	520	610	90	6%

The key findings from this modeling exercise include:

- The amount of traffic diverted from NE 45th Street to Memorial Way/ Pend Oreille Road/ Montlake Boulevard would be small.
- The eastbound traffic volumes on Stevens Way would increase by about 90 vehicles per hour, which is 11 percent of the westbound NE 45th Street traffic volume if the NE 45th Street Viaduct closed to traffic.

The increase in the traffic volume on Pend Oreille Road west of 25th Avenue NE is the greatest among the three campus entry locations. The magnitude of the increase without the NE 45th Street Viaduct at this location would be in a range of 10 to 13 percent of the NE 45th Street volume. The traffic increases at other campus entry locations would be in a range from 1 to 6 percent.

With the NE 45th Street Viaduct construction closure, additional traffic is expected to flow through the University of Washington campus. Fehr & Peers projects that approximately 10 to 13 percent of the NE 45th Street traffic could reroute via the University of Washington campus, but the traffic volumes on campus would remain at or below the Fall quarter levels. Therefore, the campus roadway network and traffic signal operation at City arterials should be sufficient to accommodate the additional traffic due to construction closure of NE 45th Street Viaduct.

For emergency response, Seattle Fire responders consider travel through the campus to be slow and not a preferred route, due to the high pedestrian volumes, many buses, narrow streets, and steep grades.

6.3 Proposed Mitigation

During construction, NE 45th Street would be closed to all traffic between 21st Avenue NE on the west and the intersection with Montlake Boulevard NE on the east. Currently, approximately 20,700 vehicles are on the NE 45th Street Viaduct each day in the fall or winter. With full closure and summer construction, the daily traffic to be rerouted is estimated at 17,600 vehicles, or approximately 85 percent of the regular daily traffic present in the fall. This reduction reflects summer vacation and lower University enrollment during the summer.

See Section 6.2.1 for a description of arterial streets that will be designated for the detour route during construction.

The detour is shown in **Figure 13**.

Dynamic message signs (DMS) will give motorists advance notice of the impending viaduct closure (days and weeks ahead of the closure) and advance notice of the detours – information for both time and location. Proposed locations for the dynamic message signs (DMS) are shown in **Figure 13**. At these locations, motorists can receive notices about the upcoming construction and closure and detour directions during the closure itself.

6.3.1 Reroutes: Eastbound

Traffic will be rerouted at multiple points, to divert the majority of the traffic to the designated detour route (see **Figure 13**) and to provide for local access to University Village, the University of Washington and to Greek Row and housing just north of the north campus entrance. Eastbound traffic on NE 45th Street would be detoured north or south on 15th Avenue NE with a first barricade on the east leg of NE 45th Street at 15th Avenue NE, and with local access allowed to the UW north campus entry at 17th Avenue NE or the Greek Row area. A second eastbound barricade would be located on the east leg of NE 45th Street at 17th Avenue NE, allowing for access to the University through the north portal and for local access to 16th through 20th Avenues NE to the north of NE 45th Street. A last detour route from NE 45th Street, just at the construction work zone, would divert traffic onto 20th Avenue NE via the local street network to continue north and east.

Although 22nd Avenue NE from NE 45th Street to NE 55th Street would not be used as a detour route for vehicles, the City would designate 22nd Avenue NE as the pedestrian and bicycle detour route, if construction of NE 45th Street would not interfere with pedestrian and bike access to the street. Eastbound traffic detoured north along 15th Avenue NE would be directed to continue north to NE 65th Street, then detoured east on NE 65th Street and south on 25th Avenue NE to Pend Oreille, then east to Montlake Boulevard, returning to the NE 45th Street route.

Eastbound traffic detoured south along 15th Avenue NE would continue south to NE Pacific Street, east on NE Pacific Place, then north onto Montlake Boulevard and to NE 45th Street.

These arterial legs of the detour are intended to carry the majority of the traffic rerouted due to the construction closure. Parking along these detour segments would be restricted during AM and PM Peak periods to provide a reasonable capacity for the additional traffic flows. This may require temporary signing and disabling parking pay stations or meters temporarily. **Figure 13** shows the proposed designated detour routing for the construction closure.

6.3.2 Reroutes: Westbound

Westbound traffic destined for NE 45th Street Viaduct would be rerouted from Sandpoint Way NE at NE 70th and 65th Streets. Traffic on Sandpoint Way NE south of NE 65th Street and on NE 45th Street near Seattle Children's Hospital and adjacent to University Village would be detoured either south via Montlake Boulevard and NE Pacific Street or to the north via Pend Oreille Street and 25th Avenue NE. Travelers could use multiple minor street or local street options to travel around the construction, however, none of these could sufficiently accommodate the diverted traffic and would not be signed as the preferred detour.

6.3.3 Additional Traffic Control Measures

Any additional traffic flowing along Ravenna Boulevard and NE 54th Street/NE 55th Street would exacerbate the existing operational and safety challenges at the multi-way intersection at NE 55th Street/22nd Avenue NE and Ravenna Boulevard. Temporary striping, signage, and curbing will be added to the intersection to improve the intersection operation and safety for motorists, pedestrians and cyclists, modeled after the University Area Transportation Action Strategy (UATAS) recommendation (UATAS Project #22, Burke Gilman Trail/NE 47th Street/University Village).

The added traffic on Pacific Street would make access to and from the University Hospital entrance and exit more difficult during the peak periods. A uniformed officer may be needed at this location.

It is important to operate the intersection of Pacific Place NE and Montlake Boulevard NE efficiently. Sound Transit has scheduled to initiate Husky Stadium light rail station construction in late 2009. The trucks will be hauling excavated soil from the Husky Stadium parking area east of Montlake Boulevard to SR 520. Those trucks would travel around the triangular area bounded by Pacific Street, Pacific Place and Montlake Boulevard. The trucks would make eastbound to southbound right turns at the Pacific Place/Montlake Boulevard intersection. The current plan shows that about 100 trucks per day would use this intersection in July 2010 with most of the truck traffic occurring between 9 AM and 3 PM. SDOT traffic engineers will monitor the intersection during the construction of NE 45th Street Viaduct and evaluate the feasibility of increasing the vehicle queue storage spaces on the eastbound approach on Pacific Place to Montlake if necessary.

6.3.4 Early Action Projects

Throughout the outreach efforts, community groups and citizens have encouraged the City to implement projects that were identified in the UATAS Report. In particular, those projects in locations where additional traffic is expected with the construction closures which heighten the need for improvements

With construction scheduled for summer 2010, the following UATAS recommended projects would be part of the mitigation for overall mobility during construction.

- Ravenna Avenue NE and NE 55th Street Improvements (temporary striping, signage, and curbing for protection of pedestrians, bicyclists, and motorists).
- Restriping the west leg of the Pacific Place/Montlake Boulevard intersection to increase vehicle storage spaces on the eastbound approach to intersection.
- Raised, colored crosswalk with revised traffic control at the Burke Gilman Trail crossing on Pend Oreille Road.

6.3.5 Parking

Parking should be restricted along the designated detour route to allow for full-time two lane operation for each direction of traffic along the detour route during the AM and PM peak periods on 15th Avenue NE, on NE 65th Street and on 25th Avenue NE. This would affect both businesses and residents along the detour routes. Parking would be allowed in off-peak hours. Parking may be restored for some hours of the day, based on traffic volumes through the construction period. Businesses along NE 65th Street will be most impacted during construction and should be included in the stakeholder outreach for the construction planning.

Table 9 provides a count of affected parking spots during the AM and PM peak hours in the project area. Fehr & Peers estimates that, if the City restricts on-street parking during AM and PM peak periods, 251 spaces in the AM period and 243 spaces would be restricted. The AM peak period was assumed to be for 3 hours from 6 AM to 9 AM and the PM peak period to be for 3 hours from 3 PM to 6 PM. On-street parking should be allowed during the midday period and night period. It is possible that the City may allow on-street parking in the mid-block segments of some blocks and restrict on-street parking at the approaches to the intersections

only. If this were implemented, the number of the restricted on-street parking spaces would be less than the numbers indicated.

Table 9. Number of On-Street Parking on Detour Routes Affected During NE 45th Street Viaduct Construction

Street	Block	Affected during PM Peak		Affected during AM Peak	
		Northbound or Eastbound		Southbound or Westbound	
		Regular	Load/unload	Regular	Load/unload
15th Avenue NE	NE 45th Street - NE 47th Street	17	1	7	1
	NE 47th Street - NE 50th Street	24	0	16	4
	NE 50th Street - NE 52nd Street	18	0	15	0
	NE 52nd Street - NE 55th Street	22	0	27	1
	NE 55th Street - NE 56th Street	8	0	9	0
	NE 56th Street - NE Ravenna Boulevard	12	0	11	0
	NE Ravenna Boulevard - Cowen Place NE	8	0	5	0
	Cowen Place NE - NE 62nd Street	0	0	0	0
	NE 62nd Street - NE 63rd Street	4	0	6	0
	NE 63rd Street - NE 65th Street	11	0	7	0
SubTotal		124	1	103	6
NE 65th Street	15th Avenue NE - 16th Avenue NE	3	0	5	0
	16th Avenue NE - 17th Avenue NE	5	0	7	0
	17th Avenue NE - 18th Avenue NE	3	0	2	0
	18th Avenue NE - 19th Avenue NE	6	0	4	0
	19th Avenue NE - 20th Avenue NE	0	0	3	0
	20th Avenue NE - 21st Avenue NE	3	0	7	0
	21st Avenue NE - 22nd Avenue NE	3	0	6	0
	22nd Avenue NE - Revenna Avenue NE	3	0	2	0
	Revenna Avenue NE - 23rd Avenue NE	6	0	5	0
	23rd Avenue NE - 24th Avenue NE	4	0	7	0
24th Avenue NE - 25th Avenue NE	4	0	3	0	
SubTotal		40	0	51	0
25th Avenue NE	NE 65th Street - NE 60th Street	24	0	25	0
	NE 60th Street - NE 57th Street	15	0	14	0
	NE 57th Street - NE 55th Street	7	0	12	0
	NE 55th Street - NE 54th Street	2	0	0	0
	NE 54th Street - NE Blakeley Street	11	0	21	0
	NE Blakeley Street - University Villiage N Drive way	14	0	12	0
	University Villiage N Drive way - NE 47th St	6	0	13	0
	NE 47th St - Pend Oreille Road/NE 44th Street	0	0	0	0
SubTotal		79	0	97	0
Grand Total		243	1	251	6

6.3.6 Advance Signing and Information

Detour signing primarily redirects traffic already at or near the closure of the facility. Advance signing and dynamic message signs can provide motorists and cyclists with information enough in advance to provide options to the traveler – to the designated detour route and to alternative, more local routes to arrive at the desired destination. For example, the detour signing would route motorists to the detour arterials and additional informational signing can direct motorists to the alternate access point for the University of Washington, the University Village or Seattle Children’s Hospital. An important strategy for the construction traffic management is to provide information on the detours, the points of access and a

broader travel path to the major destinations in the affected area. **Figure 13** shows recommended locations for advance signing and dynamic message signs to inform the motoring public and provide routing advice and direction.

SDOT Traffic Management can provide web-cam views of the major arterials in the construction vicinity to give an indication of congestion and to inform the route choice for motorists. Cameras on Montlake Boulevard and NE 65th Street can be made available to the public via the web to help inform the public.

6.3.7 Traffic Management

Real-time traffic management is recommended for the early hours and early days of the construction traffic closure to monitor and adjust the traffic signal operations and timing along the planned detour routes. SDOT Traffic Management staff at the Traffic Management Center will have video feeds and signal controller management for Montlake Boulevard and NE 65th Street corridors. It is recommended that additional Traffic Management staff hours be funded to provide for additional monitoring and refinement of the traffic strategies for the construction period.

Intersection traffic operations will need to be monitored throughout the construction and detour vicinity in order to respond to points of congestion that may arise. Temporary traffic control may be needed for the construction period, to be implemented by SDOT Traffic Management in coordination with the Contractor.

Construction traffic management for other public and private projects in the vicinity should be closely coordinated, to not allow any lane closures along the detour routes during the closure of the NE 45th Street Viaduct.

Signal timing and phasing may need to be temporarily modified at the key signals along the detour route where higher traffic volumes than normal would turn or pass through the intersection. The recommended signal timing change locations are discussed in 6.3.10.

6.3.8 Trip Reduction Efforts

With advance information about the construction closure and anticipated congestion along the planned detour routes, the public will want and need to know the current traffic conditions as well as know the alternatives for traveling in the corridor. SDOT outreach can include information about ridesharing, transit alternatives and routing for all travel in the vicinity. King County Metro, Sound

Transit and Community Transit all provide transit service to the University District and can assist travelers to select an appropriate bus route for their travel plans. King County Metro also coordinates ride-matching and van pool services that may help alleviate the travel demand and congestion during construction. Construction activity and closures should be included in the WSDOT traffic webpage.

6.3.9 Public Outreach

Stakeholder contacts have already begun with informational meetings about the viaduct replacement project and planned construction techniques. Outreach to stakeholders, employers, organizations and destinations will help inform the public about the anticipated construction traffic impacts and the planned traffic management during construction. Overall, with a full closure planned, the construction time period is anticipated to be shortened and can be contained within the summer quarter and early fall break period. Key stakeholders for continued outreach include: University of Washington, University Village, and Seattle Children's Hospital plus community groups, the University District Council, business districts, and residents. Trucking and delivery services/companies will also need up-to-date information about the detours, the congestion and alternate routes to ensure deliveries can be made in a timely manner.

6.3.10 Recommended Signal Timing Changes During the Viaduct Closure

The traffic analysis of 2010 summer with the viaduct closure assumes that SDOT will optimize signal timing at key signals along the detour routes.

During the viaduct construction, SDOT will implement the following temporary signal timing changes:

- The signal timing at NE 45th Street/15th Avenue NE intersection should be modified; increase lengths of the green phase for the eastbound left turn movement and the northbound left turn movement, and reduce lengths of the green phase for the eastbound and westbound through movements.
- The signal at NE 65th Street/15th Avenue NE intersection should be modified to increase the timing for the east/west through movements.

- The signal timing at NE Pacific Street/15th Avenue NE intersection should be modified to increase timing for the southbound left turn movement.
- The signal timing at NE 65th Street/25th Avenue NE intersection should be revised to increase timing for the northbound left turn movement.
- The existing signal at NE 45th Street/Montlake Boulevard NE will have the west leg disabled with construction and should be operating only for Montlake Boulevard NE and the pedestrian crossing of Montlake Boulevard NE.
- The signal timing at NE Pacific Street/Pacific Place NE intersection should be revised to increase timing for the southbound left turn and the southwestbound right turn movements.
- SDOT should monitor the signal at the Montlake Boulevard NE/NE 44th Street/Pend Oreille Road intersection. It may need to take action to accommodate more turning traffic and access to the detour on 25th Avenue NE. Before taking action, SDOT should consult the University of Washington.

Additional traffic control may be needed at intersections along the detour route including all-way stop control at 15th Avenue NE and NE Ravenna Boulevard. This location may need uniformed officer control during the peak periods to assist with the additional traffic through the intersection and to manage the queues that may develop.

7. EMERGENCY RESPONSE

7.1 Existing Conditions

The Seattle Fire Department serves the University District and Laurelhurst Neighborhood through Stations 17 and 30, shown on Figure 2.

Station 17 is located at 1050 NE 50th Street (between Roosevelt and 11th Avenues NE) and Station 38 at 5503 33rd Avenue NE. Station 17 would be the first responder for incidents on the west side of the viaduct and Station 38 would respond first for incidents to the east of the viaduct. Medic Unit response will come from Station 16 near Green Lake (6846 Oswego Place NE).

The Seattle Police Department's North Precinct University District Station is located at 4534 University Way Northeast. The University of

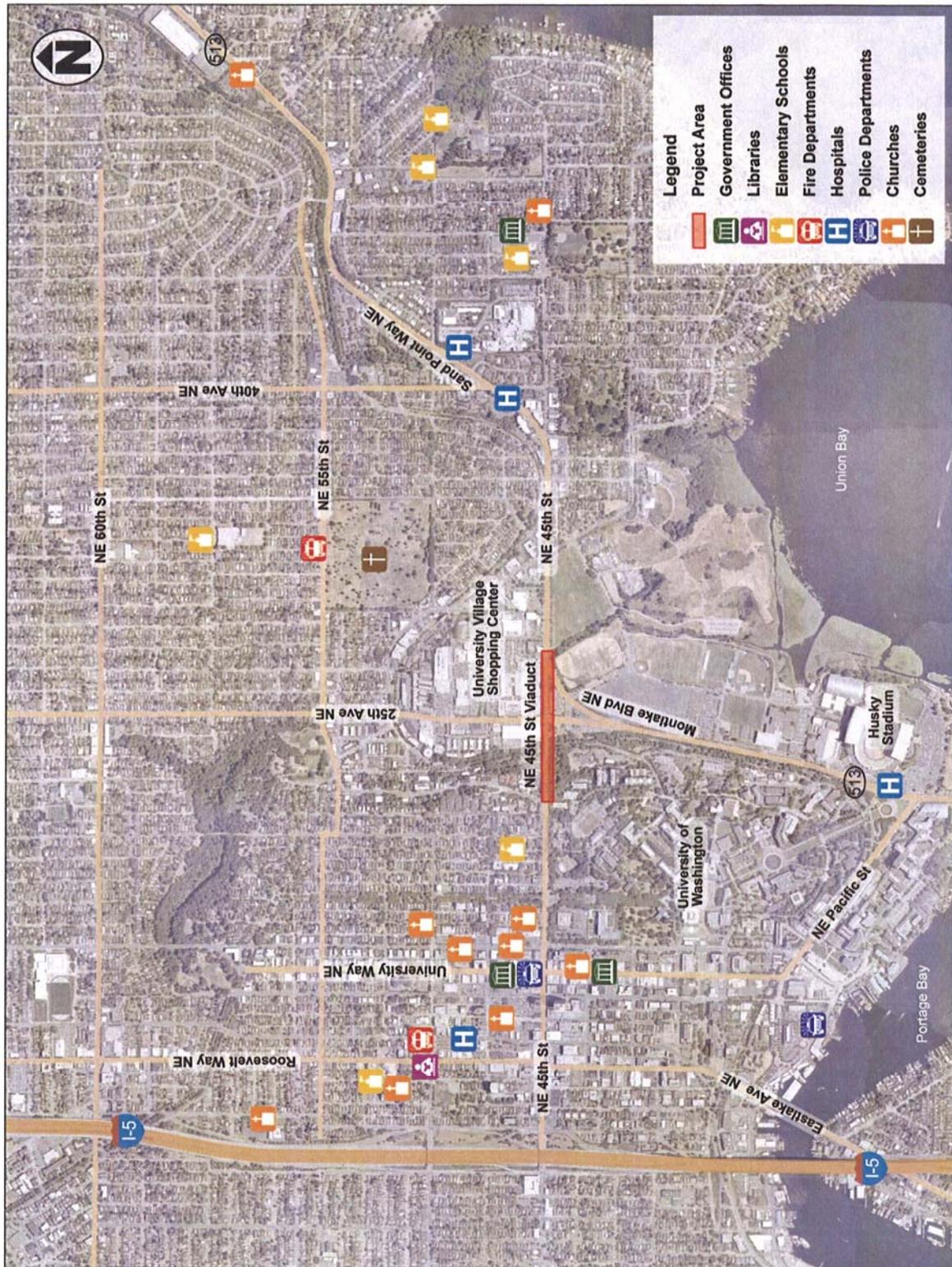
Washington Police Department provides law enforcement and performs police functions exclusively for the main campus of the University. Their police station is located at 1117 Northeast Boat Street. Police stations are shown on **Figure 16**.

Hospitals and medical offices located in the project study area include Children’s Hospital and Regional Medical Center, St. Jude Children’s Research Hospital and the University of Washington Medical Center. These are listed in **Table 10** and are shown on Figure 2.

Table 10. Medical Facilities in the NE 45th St Viaduct Project Study Area

Medical Facility	Address
Children’s Hospital & Regional Medical Center	4800 Sand Point Way NE
St. Jude Children’s Research Hospital	4738 11th Ave. NE
University of Washington Medical Center	1959 NE Pacific St.

Figure 16. Locations of Public Services Within the NE 45th St Viaduct Study Area



7.2 Anticipated Impacts

Seattle Fire Department staff have modeled fire response times under a full closure condition for construction of the NE 45th St. Viaduct project. Response times were modeled using VisiCAD for the proposed road closure under mid-day traffic conditions, considering the traveling speeds of the fire response apparatus as well as the geometrics of the arterial response routes. Two scenarios were modeled to illustrate the potential impact to response time: an incident at the west end of the viaduct and one at the east end of the viaduct.

Closure of NE 45th Viaduct with No Traffic Mitigation

The Seattle Fire Department employs the principle of redundant coverage, so that when a fire station whose direct responsibility for the area is on another call or otherwise delayed, the next station nearby must be able to provide necessary coverage. Therefore under both scenarios, even with the viaduct closed and no mitigation for the traffic system, Seattle Fire will retain its ability to provide Primary Response coverage—basic life support—with minor, but acceptable delays. Primary Response includes paramedic units with supporting water pumper vehicles.

Secondary Response—this includes the larger fire vehicles such as ladder trucks in addition to the above mentioned vehicles that make up Primary Response.—for a west end incident would not experience any difference in response times for engine, aid car (Medic Unit) or ladder truck responders. Secondary Response by the first ladder truck to an east end incident coming from Station 17 could take an additional 2.5 minutes to travel to the incident. Response time for a second engine to the incident would be delayed slightly less, by 2.25 minutes (Note that the SFD VisiCAD (computer aided dispatch) modeling is different from the travel demand modeling for the peak period, as used for general traffic forecasts and operations.) Similar delays may be expected for police and ambulance services that would normally travel these routes.

Closure of NE 45th Viaduct with Traffic Mitigation

Seattle Fire has indicated that the response routes to either the west or east side incident would follow arterial response routes north of NE 45th Street. With NE 45th Street closed at the viaduct, fire response would use arterial response routes to work through and around neighborhoods – not necessarily following the designated detour route for the construction project and would not be constrained by the project-defined detour route. In other words, Fire responders will use the most direct path available.

7.3 Proposed Mitigation

SDOT performed traffic modeling that took into account existing traffic counts in the region and developed the following traffic mitigation measures to be implemented to help off-set the increased traffic in the area with the Viaduct closed:

- Install Opticom systems at five signalized intersections on 25th Ave NE from Pend Oreille Way (signal for east entrance to UW campus) to NE 55th Street. These systems are connected to the signal controllers so when a fire department vehicle is coming toward the intersection, a sensor on the vehicles “tells” the signal to “go to green” therefore giving the fire department vehicles the right-of-way thru the intersection.
- Enhance parking restrictions along three arterials: 15th Ave NE, NE 65th Street and 25th Ave NE. These arterials will be the published detour routes for traffic when the Viaduct is closed. There are currently parking restrictions on these routes, so SDOT will look to enhance them for peak hour traffic and possibly daytime traffic as well.
- Close the Viaduct in the summer months. Student enrollment at the UW drops considerably in the summer term (to about 12,500) as compared to the other 9 months (40,000). The SDOT traffic model therefore shows reduced traffic in the region during the summer; this helps off-set the increased traffic volumes to the region with a Viaduct closure.

The Seattle Fire Department found that with the above mitigation measures, both Primary and Secondary response times will be within acceptable limits with the Viaduct closed in the summer months.

8. CONCLUSION

Before and during the construction of the west approach to the viaduct, several actions will need to be taken to minimize the potential impacts to drivers, pedestrians, transit operators, adjacent neighbors, and key stakeholders (University of Washington, University Village, Seattle Children’s Hospital, businesses, and residential neighborhoods). The City/Contractor must communicate early, clearly, and often with these stakeholders about when and how long the construction will take. The City will require the Contractor to provide clear signage, barricades, and flaggers to direct detours where needed for traffic and pedestrians.

Table 11 provides a summary of potential mitigation strategies during construction of the NE 45th Street Viaduct Project.

Table 11. Summary of Potential NE 45th Street Viaduct Construction Detour Management Actions

Proposed Actions	Location	Responsibility
Traffic Operations		
Dynamic message signs	Southbound on 15th Avenue NE north of NE 65th Street	Contractor
	Eastbound on NE 45th Street west of I-5	Contractor
	Northbound on Montlake Boulevard south of Pacific Place	Contractor
	Sandpoint Way east of 35th Avenue NE	Contractor
	Sandpoint Way north of NE 75th Street	Contractor
Detour signs	Eastbound NE 45th approaching 15th Ave NE	Contractor
	Northbound and southbound 15th Avenue NE between NE 45th Street and NE 65th Street	Contractor
	Eastbound and westbound NE 65th Street between 15th Ave NE and 25th Ave NE	Contractor
	Southbound and northbound 25th Ave NE between NE 65th Ave and Montlake Boulevard	Contractor
	Westbound NE 45th Street approaching Montlake Boulevard	Contractor
	Southbound and northbound Montlake Blvd between NE 45th Street and NE Pacific Place	Contractor
	Eastbound and westbound NE Pacific Street between NE Pacific Place and 15th Avenue NE	Contractor
	Northbound and southbound 15th Ave NE between NE 45th Street and NE Pacific Street	Contractor
"Local Access Only" signs	NE 45th Street between 16th Ave NE and 17th Ave NE, 17th Ave NE and 18th Ave NE, 19th Ave NE and 20th Ave NE	Contractor
	16th Ave NE north of NE 45th St	Contractor
	17th Ave NE north of NE 45th St	Contractor
	18th Ave NE north of NE 45th St	Contractor
	19th Ave NE north of NE 45th St	Contractor
20th Ave NE north of NE 45th St	Contractor	
Traffic Management		
Traffic condition monitoring	Detour routes	SDOT Traffic Management
Signal timing/phasing adjustments	NE 45th Street/15th Avenue NE	SDOT Traffic Management
	15th Avenue NE/NE 65th Street	SDOT Traffic Management
	NE 65th Street/25th Avenue NE	SDOT Traffic Management
	15th Avenue NE/NE Pacific Street	SDOT Traffic Management
	NE Pacific Place/Montlake Boulevard	SDOT Traffic Management

Table 11. Summary of Potential NE 45th Street Viaduct Construction Detour Management Actions

Proposed Actions	Location	Responsibility
	NE 45th Street / Montlake Boulevard	SDOT Traffic Management
	Montlake Boulevard/Pend Oreille Road	SDOT Traffic Management
Traffic camera images presented at Web site	Detour routes	SDOT Traffic Management
Special Intersection Traffic Monitoring with Uniform Officer	All-way stop at 15th Ave NE/NE Ravenna Blvd	SDOT/SPD
	UW Hospital Driveways on NE Pacific Street	SDOT/SPD
Restriping to Increase vehicle queue storage	Eastbound approach on NE Pacific Place at Montlake Boulevard	SDOT
Pedestrian/Bike Detour and Safety		
Restriping to delineate pedestrian spaces	NE 55th Street/22nd Avenue NE/Ravenna Boulevard / Ravenna Avenue NE/NE 54th St	SDOT
Pedestrian/bike detour route on 22nd Ave NE	22nd Avenue NE between NE 45th Street and NE 55th Street	SDOT
Raised, colored crosswalk with revised traffic control	Pend Oreille Road/ Burke Gilman Trail	SDOT/UW
Sharrow pavement markings	22nd Avenue NE between NE 45th Street and NE 55th Street	SDOT
Emergency Vehicle Response		
Opticom installation	25th Avenue NE/NE 55th Street	SDOT
	25th Avenue NE/NE Blakely Street	SDOT
	25th Avenue NE/NE 47th Street (U Village Drive)	SDOT
	25th Avenue NE/Pend Oreille Road	SDOT
	25th Avenue NE/Montlake Boulevard	SDOT
Transit Detour		
Bus stop enhancement	UW Campus: Stevens Way/NE 40th Street east of 15th Avenue NE	SDOT/UW
Route 25 detour through UW campus	Pend Oreille Road/Stevens Way/Memorial Way	SDOT/King Co Metro
Public Outreach		
Trip reduction efforts	Area-wide	SDOT
Public meetings	Area-wide	SDOT/Consultant
Stakeholder meetings	UW, Children's Hospital, U-Village, District Council, neighborhood associations	SDOT/Consultant
Coordination with Sound Transit	Husky Stadium area	SDOT - Sound Transit
On-Street Parking		
On-street parking restrictions (no parking peak period on both sides, may extend midday period.)	15th Avenue NE (Detour route)	SDOT
	NE 65th Street (Detour route)	SDOT
	25th Avenue NE (Detour route)	SDOT