

Measure 4: Pedestrian Activity at Bus Zones

Monitoring Objectives

The purpose of monitoring pedestrian activity at bus zones is to quantitatively assess pedestrian congestion at critical bus stops within the Seattle downtown core. In particular, the study focused on the impacts that transit tunnel closure had on pedestrian congestion at or near bus stops on surface streets. This portion of the study aims to answer the following key questions:

- How crowded are bus stops five months after tunnel closure?
- Have the mitigation measures taken to address pedestrian congestion proved to be effective?
- Are there ongoing pedestrian congestion issues that warrant further study or mitigation?

Methodology

The studies for pedestrian activity at bus zones have focused on two elements of pedestrian congestion: pedestrian crowding and pedestrian flow.

Pedestrian crowding is applicable to waiting and queuing areas, and is based on the average space available per person. The *Transit Cooperative Research Program (TCRP) Transit Capacity and Quality of Service Manual* specifies criteria for Level of Service (LOS) designations ranging from A to F for queuing and waiting areas (Part 7, Chapter 3). In addition to these national guidelines, Metro applied its own criteria to the amount of space available per person in bus stop waiting areas.

Pedestrian flow is applicable to the movement through the bus zone and is based on the number of pedestrians passing per minute passing through a walkway of limited width. The *2000 Highway Capacity Manual* specifies criteria for LOS designations of A through F for walkways. In addition to these criteria, pedestrian level of service will be further evaluated using procedures outlined in *Urban Spaces for Pedestrians* by Pushkarev and Zupan (1975),

Refer to Volume 1 of the *Performance Report on Surface Streets in the Seattle Central Business District* for a more detailed description of the pedestrian survey methodology and criteria used for pedestrian level of service assessment.

To measure the pre-tunnel closure conditions, an initial pedestrian congestion study was conducted at 19 selected bus zones in spring, 2005¹. These results were reported in Volume 1. In the first after-tunnel closure study, conducted in fall, 2005, 25 bus zones were studied, including newly installed bus stops². These results were reported in Volume 2. Based on these results, five of these locations were selected for further study, to be reported in Volume 3. These five zones were monitored to see if the level of service could be improved. The data presented in this third volume are the results of this follow-up study. The results from this follow study were compared with the fall, 2005 conditions, following tunnel closure. Figure 9 shows the 25 bus stops that were surveyed in the fall, 2005; the 5 zones that were identified for additional evaluation are highlighted.

All of the data collection for the follow-up study was conducted on Tuesday, February 28 and Thursday, March 2. Additional pedestrian counts may be collected to measure conditions after the tunnel is re-opened.

¹ Pedestrian Congestion Study, Existing Conditions Analysis. 7-18-2005

² Pedestrian Congestion Study, Fall 2005 Conditions Report, 11-23-2005

Figure 9. Bus Stops Surveyed for Pedestrian Congestion Counts



Follow-up Studies for Selected Zones

Figure 10 summarizes the results of the follow-up studies at the five zone selected for further monitoring, as they relate to pedestrians walking through the bus zones. Figure 11 summarizes the results of the after-closure and follow-up studies as they relate to pedestrians waiting at the bus stops. In the next subsection, the various factors affecting changes in the conditions are discussed in more detail.

Figure 10. Walking Pedestrian Rank and Level of Service by Bus Stop (*Map ID# corresponds to locations shown on Figure 9*)

Location				Fall 2005 (after closure)		February 2006 (follow-up study)	
Map ID #	Bus Stop #	Dir	On-street/Cross-street	Pushkarev & Zupan Rank	HCM LOS	Pushkarev & Zupan Rank	HCM LOS
2	590	NB	3rd Ave./Pine St.	Impeded	A	Impeded	A
4	315	SB	2nd Ave./University St.	Impeded	A	Impeded	A
6	690	NB	4th Ave./Union St.	Constrained	C	Impeded	A
7	860	NB	5th Ave./James St.	Impeded	A	Impeded	A
18	300	SB	2nd Ave./Pike St.	Impeded	A	Unimpeded	A

All five of these bus stops now operate at acceptable levels of service during the evening peak 15 minutes. Two of the bus stop locations have shown some improvement in levels of service since the fall 2005 study.

Figure 11. Standing Pedestrian Level of Service for Full Bus Stop Area and Critical Loading Zone (*Map ID# corresponds to locations shown on Figure 9*)

Location			Fall 2005 (after closure)				February 2006 (follow-up study)			
			Full Zone		Critical Zone		Full Zone		Critical Zone	
Map ID #	Bus Stop #	On-street/Cross Street	HCM LOS	King County Rank	HCM LOS	King County Rank	HCM LOS	King County Rank	HCM LOS	King County Rank
2	590	3rd Ave./Pine St.	A	Constrained	A	Constrained	A	Desirable	A	Constrained
4	315	2nd Ave./University St.	A	Desirable	B	Constrained	A	Desirable	A	Desirable
6	690	4th Ave./Union St.	A	Desirable	A	Desirable	A	Desirable	A	Desirable
7	860	5th Ave./James St.	B	Constrained	C	Uncomfortable	A	Desirable	A	Constrained
18	300	2nd Ave./Pike St.	A	Desirable	B	Constrained	A	Desirable	B	Constrained

In the full pedestrian waiting area, all of the bus stops are now operating at LOS A under HCM or “Desirable” under the King County system of measurement. In the critical loading area, all bus stops are operating with LOS B and “Constrained” conditions or better, with two of the stops showing some improvement since the fall, 2005 study.

Summary Observations

Generally, the maximum number of pedestrians observed waiting at bus stops in the downtown core has been reduced since the initial tunnel closure period. As transit customers have become more familiar with the new surface street routings and as schedule reliability has improved, customers are experiencing shorter wait times at these bus stops, thereby reducing the maximum numbers of patrons waiting for a bus.

For the five locations for which additional monitoring was performed, an updated status report for each is provided below:

- **Zone 590 (NB Third Ave & Pine St):** During the fall 2005 study, constrained waiting conditions were recorded for the full bus zone area. The follow-up study expanded the pedestrian waiting area to include some of the area adjacent to the Macy's store loading dock, at the north end of the bus zone, because transit passengers were observed waiting in this area in the few weeks after tunnel closure. However, when the follow up study was conducted, the number of waiting passengers was found to be lower, and few people were observed waiting in the loading dock area. This bus stop now operates with desirable waiting conditions for the full bus zone.
- **Zone 315 (SB Second Ave & University St):** Levels of service for waiting pedestrians within the critical loading zone have improved at this location. This could be attributable to the removal of the bus shelter side panels, which has improved pedestrian circulation within the zone and has encouraged people to utilize the full bus zone while waiting for their bus to arrive.
- **Zone 690 (NB Fourth Ave & Union St):** A pedestrian count was not conducted at this location as part of the follow-up study, however the level of service was re-calculated to reflect the removal of the temporary construction fencing that had been constraining though pedestrian movement. The level of service for through pedestrians is now adequate.
- **Zone 860 (NB Fifth Ave & James St):** This bus stop has shown a significant improvement in pedestrian waiting level of service, compared to the constrained waiting conditions and uncomfortable crowding in the critical loading zone that were observed just after tunnel closure. These early conditions were partly attributable to the fact that many transit routes that serve this bus zone originate in the north downtown core area, and these buses were caught in delays on Stewart Street. Since reliability has improved for these routes, the number of people observed waiting at this stop has been reduced by almost 50%.
- **Zone 300 (SB Second Ave & Pike St):** This bus stop continues to experience constrained conditions within the critical loading zone, while the total bus zone waiting area operates with desirable conditions. To help mitigate this condition, the rear panels of the bus shelters could be removed to improve pedestrian circulation; however this measure would also reduce quality of shelter available to waiting transit customers during periods of inclement weather. At this time, no further action is planned.

With the completion of this follow up study, no additional pedestrian counts are presently planned for the balance of the tunnel closure period. This can change if new bus stop related problems are identified. It is anticipated that some additional counts will be taken to measure conditions at bus stops when the tunnel re-opens.