# King County Metro Transit

# Montlake Triangle New Bus Zone Traffic Analysis

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***Prepared for:***
**King County Council**

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## Analysis Purpose

DKS was tasked with performing an operational analysis of the Montlake Triangle area to estimate the impacts of adding a new northbound bus stop near Alaska Airlines Arena at "Hec" Edmundson Pavilion on northbound general purpose traffic on Montlake Boulevard NE. Figure 1 shows the proposed bus stop location. The concern was whether northbound buses stopping in-lane would create queuing problems and travel time delay northbound on Montlake Boulevard NE.

The traffic analysis was completed using an existing Vissim microsimulation model (Vissim is described in Appendix B), which was recently calibrated to traffic conditions around the Montlake Triangle for the PM peak hour. The proposed new stop would serve routes 65 and 78 and have capacity to accommodate two 60-foot buses. The model included eight buses per hour split between routes 65 and 78 at the new stop.

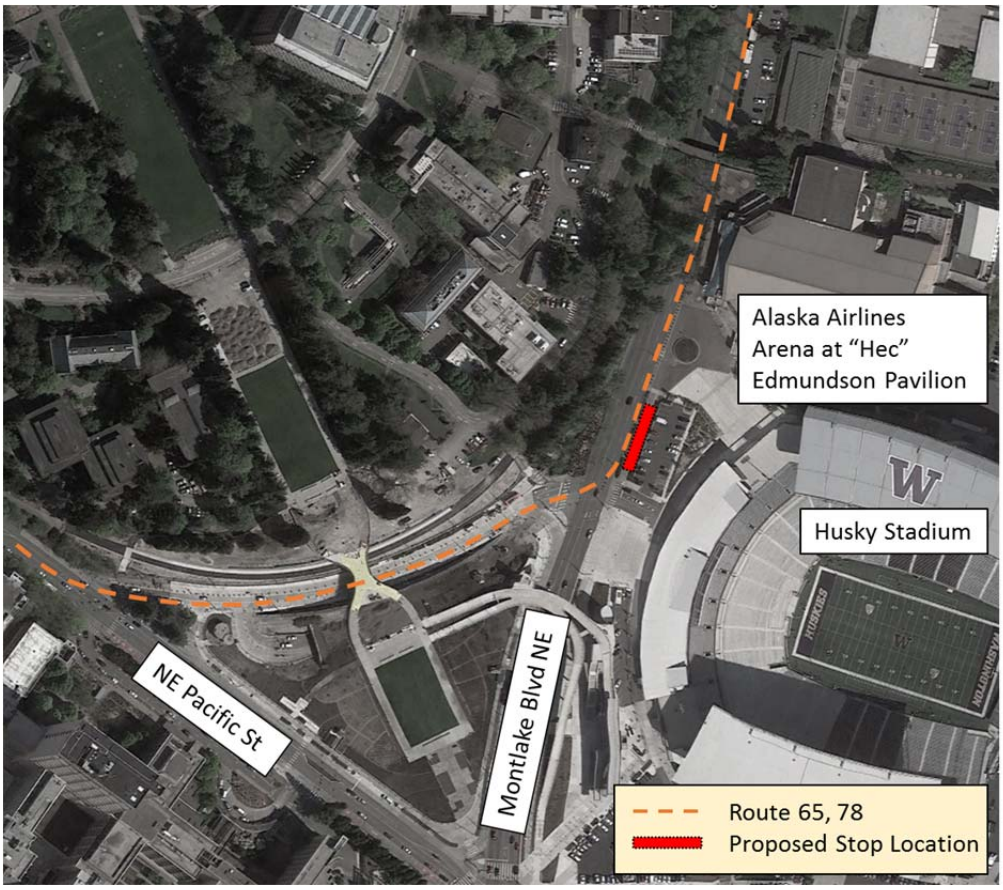


*Figure 1: Proposed Stop Location*

## Results and Conclusion

Travel times were measured from the intersection of Boyer Avenue E/24th Avenue E to the intersection of Montlake Boulevard NE/Walla Walla Road as shown in Figure 2.

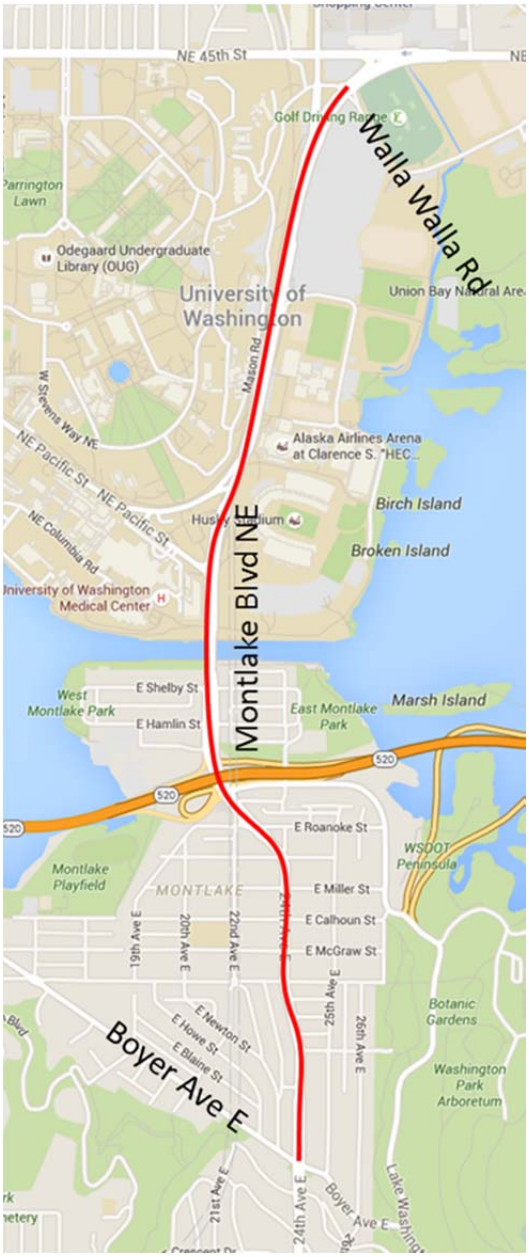


*Figure 2: Travel Time Segment*

The analysis showed negligible impact to northbound transit travel times as shown in Table 1. The 30-second increase in transit travel time can be attributed to the loading/unloading delay in the new stop. Table 2 shows the overall intersection delay and level of service (LOS) at the intersections of Montlake Blvd NE/NE Pacific St and Montlake Blvd NE/NE Pacific Pl (level of service is further defined in Appendix A). Intersection delay values changed very little with no change in level of service. The three-second decrease in intersection delay at

Montlake Blvd NE/NE Pacific Pl from the No-Build scenario to the Build scenario can be attributed to variations in the model runs.

Even with the addition of the new bus stop, there was no increase in travel time for general purpose traffic. Queuing for northbound traffic on the south side of the intersection of Montlake Blvd NE/NE Pacific Pl exists, but is not excessive. This provides opportunity for vehicles to merge into the left lane if a bus is serving the stop on the north side of the intersection. General purpose traffic will have some increased friction traveling through the intersection when a bus is present at the stop with some vehicles queuing behind the bus while waiting to merge left to pass the bus. Even with the increased friction through the intersection, the model shows that installing the new transit stop would have very little to no impact on traffic operations at the Montlake Triangle.

*Table 1: Northbound Travel Times*

| Travel Mode | No-Build Travel Time (minutes) | Build Travel Time (minutes) |
|---|---|---|
| **General Purpose** | 8.7 | 8.7 |
| **Transit** | 11.3 | 11.8 |

*Table 2: Intersection LOS/Average Delay per Vehicle*

| Travel Mode | No-Build LOS/Delay (seconds) | Build LOS/Delay (seconds) |
|---|---|---|
| **Montlake Blvd NE/NE Pacific St** | D/52 | D/52 |
| **Montlake Blvd NE/NE Pacific Pl** | F/119 | F/116 |

# Appendix A: Level of Service

As used in this study, level of service (LOS) is a measurement of average vehicle delay in seconds per vehicle for a signalized intersection. LOS is separated into several letter grades depending on the expected delay at the intersection. Table 3 shows the breakdown of the delay values. LOS is a useful measure of effectiveness for intersections as it can describe the overall delay that can be expected at an intersection or identify specific movements or approaches that experience high amounts of delay.

*Table 3: Level of Service Values*

| LOS | Intersection Delay (seconds/vehicle) |
|---|---|
| **A** | ≤ 10 |
| **B** | 10 - 20 |
| **C** | 20 – 35 |
| **D** | 35 – 55 |
| **E** | 55 – 80 |
| **F** | ≥ 80 |

# Appendix B: Vissim Microsimulation Software

Vissim is a microsimulation software used to model multimodal facilities. Vissim models individual vehicles and their interactions with one another within a predefined study area. Since Vissim models individual vehicles, it captures the effects of small changes in lane geometry, intersection layouts, or intersection timing.

Typically, an existing conditions model is created based on existing lane geometry and signal timing. The existing conditions model is calibrated to field conditions like transit and general purpose travel times through a study area. The model is also calibrated to match existing turning movement counts. This calibration is completed so the model matches as closely as possible how drivers behave in that specific corridor. Once the existing conditions model is calibrated, future No-build and Build models are created. The future No-Build model serves as a baseline for comparison to the future Build model.

Each model is run several times (20 runs per model in this study during the PM peak hour) and average measures of effectiveness are collected and documented for the multiple model runs. Each model run uses the same turning movement volumes at each intersection, but each run feeds the vehicles into the system differently. This gives some variability between runs for congestion levels not unlike variations in congestion day-to-day. Since the same model is run several times, travel times and delays are averaged across all runs to give statistically significant results. The measures of effectiveness generated from Vissim for this study included general purpose travel time, transit travel time, and intersection delay.