

BUS ON SHOULDER FEASIBILITY STUDY:

Final Report – Study Recommendations

Prepared for: Southwest Washington Regional Transportation Council

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STUDY RECOMMENDATIONS

This BOS Feasibility Study provides an evaluation on the application of BOS in the study corridors and potentially for a BOS pilot project for implementation. It evaluates potential geometric and operational constraints, and (2) identifies opportunities (locations and time periods) for implementing BOS. BOS operations are recommended on SR-14 from I-205 to 164th Avenue and on segments of I-205 from SR-14 to I-84. The recommended segments require relatively little modification of the exiting roadway. These recommendations provide the basis for moving forward with the implementation of BOS segments on SR-14 and I-205.

The legal framework is in place on the Washington side, making SR-14 ideal for a pilot study. BOS in Oregon does not currently have authority to operate buses in the freeway shoulder and would have to be addressed prior to implementation.

In addition, there are several segments in the corridors that have promise in showing additional operational and reliability benefits for transit by completing gaps and expanding the BOS concepts. These additional segments would require a level of investment outside the scope of this study, but should be considered for further evaluation by policy makers.

RECOMMENDED BOS CONCEPTS

The BOS workshop, held in December 2016, developed a set of BOS concepts framed within the scope of the study that focused on minimal and low cost BOS options for SR-14 and I-205. Minimal cost options, target what can be done with roadway signing and minor striping of the existing roadway. Low cost or low capital options, emphasis signing, more significant striping, merge/diverge adjustments and other minor modifications to complete gaps at key locations. The workshop outcome successfully identified bus on shoulder concepts for SR-14 and I-205 as shown on Figure 17, with implementation of the BOS concepts recommended in the following three categories:

- Proposed Pilot Project**
 - SR-14 eastbound and westbound between 164th Ave. and I-205
- Recommended**
 - I-205 northbound and southbound between SR-14 and Airport Way
- Not Recommended at This Time – Subject to Further Review**
 - I-205 southbound from Airport Way exit to eastbound Airport Way entrance
 - I-205 southbound from I-84 eastbound exit to westbound entrance
 - I-205 southbound from I-84 westbound entrance to I-84 westbound exit

FIGURE 1: BOS CONCEPTS



SR-14 WESTBOUND

While both minimal and low cost options were developed for Westbound SR-14 from I-205 to 164th, the low cost option is recommended. Compared to the minimal cost options, it offers improved bus movement and reliability with minor restriping that:

- Restripes shoulder at the east end of SR-14 to allow buses to stay out of the traffic lane and move directly onto the shoulder from the bus only onramp from 164th Avenue.
- Extends westbound BOS approximately 1,000 feet to the west by restriping collector / distributor road shoulder between the I-205 NB exit and the entrance ramps to westbound SR-14.

SR-14 EASTBOUND

A minimal cost option from I-205 to 164th is recommended for SR-14 eastbound.

STUDY TEAM OBSERVATIONS

WSDOT and C-TRAN have cooperated on a thorough examination of SR-14 from I-205 to 164th and identified it as an excellent location for a BOS pilot project. The SR-14 concept:

- Has no intermediate interchanges
- Has suitable freeway shoulders
- Has an existing WB bus only on-ramp at 164th
- Serves as a queue jump to I-205 SB
- A pilot project evaluation will provide performance measurement and allow proof of concept for consideration of other corridors

The agencies are collaborating on the development of a letter of understanding for operating rules and shoulder maintenance as well as the required design analysis documentation for pilot project approval and implementation. An SR-14 pilot project can also provide insight to how BOS operation could apply to other freeway corridors in the bi-state region.

I-205 SOUTHBOUND

There are some geometric constraints on segments of I-205 southbound where shoulders are less than 10 feet or dual lane ramps prevent BOS operations. This limits recommended BOS operations to only portions of I-205. The identified BOS corridor on I-205 southbound is from SR-14 to I-84 and consists of the following segments:

RECOMMENDED

- Segment 1, SR-14 entrance to 1,000 feet before Airport Way

NOT RECOMMENDED AT THIS TIME - SUBJECT TO FURTHER REVIEW

- Segment 2, Airport Way Exit to Airport Way eastbound entrance
- Segment 3, I-84 eastbound exit to I-84 westbound entrance
- Segment 4, I-84- westbound entrance to I-84 westbound exit

I-205 NORTHBOUND

Geometric constraints and programmed construction of northbound auxiliary lanes from I-84 EB and WB to Killingsworth limit opportunities for BOS in the northbound direction to the following segment.

RECOMMENDED

- Segment 1, Airport Way Entrance to 1,000 feet before SR-14 Exit

STUDY TEAM OBSERVATIONS

The northbound and southbound segments that cross the Glenn Jackson Bridge are straightforward sections for the implementation of BOS; there are no intermediate interchanges and there are adequate freeway shoulders for the full length of the bridge. Southbound segments 2, 3 and 4 meet technical criteria established to identify feasible BOS sections. However, they are located in a more complex portion of I-205 with multiple interchanges and several two lane onramps where buses would have to leave and get back on the shoulder. While many regions have successfully operated non-continuous BOS segments with similar characteristics, the three southbound segments may need further examination of operational and safety issues as well as a more detailed policy review on the question of BOS service in the corridor.

There are currently no BOS corridors in the Portland region. The BOS Feasibility Study Report documents operational guidelines, technical criteria, safety factors, and transit benefits to guide the future consideration of other freeway corridors for BOS operations

ADDITIONAL ANALYSIS

TRAVEL TIME

While the recommended segments on I-205 have a benefit to travel time and reliability and show additional promise as congestion in the corridor increases, BOS use is not available on I-84 west of I-205 because of constrained ROW. It should be noted, that commuter buses on I-205 will frequently reroute by using Sandy Boulevard and other parallel facilities into downtown Portland during times of heavy congestion in the I-205/I-84 corridor.

A more detailed examination of bus travel times between Fisher's Landing and downtown Portland should be conducted to better understand the tradeoffs between transit travel time to downtown via I-205/I-84 or I-205/Sandy, which is one of the alternate routes used by C-TRAN. This analysis would help guide decision-makers on the full range of routing options for commuter transit travel to Portland.

I-5 BOS SCAN ASSESSMENT FINDINGS

A high level assessment of BOS was conducted of I-5 southbound from 99th Street to the Interstate Bridge and is documented in Appendix A. The assessment focused on geometric opportunities and constraints and AM peak period travel speeds to determine the adequacy of southbound I-5 for possible BOS operations. The scan assessment found that implementing BOS on southbound I-5 would likely require investment levels beyond simple signing and striping. The following segments were identified for further feasibility evaluation. It should be noted that the corridor could accommodate improvements to either an outside or inside shoulder, but not both.

OUTSIDE (RIGHT) SHOULDER

- Segment A: 99th St. to 78th St.
- Segment B: Main St. to 39th St.

These segments would require restriping of the existing lanes to widen the outside (right) shoulder to 11.5 feet due to the adjacent barrier and over the longer term strengthening of the shoulder to increase the depth to a minimum of 7 inches.

INSIDE (LEFT) SHOULDER

- Segment C: 99th St. to SR-14

This segment would require widening and strengthening of the shoulder, along with restriping of the existing lanes to provide an inside (left) shoulder of 11.5 feet due to the adjacent barrier.

POLICY FRAMEWORK

WASHINGTON

The legal framework is already established in the State of Washington for BOS operations and this legal framework covers the SR-14 corridor. This authorization is derived from RCW 47.52.025 (Additional Powers - Controlling use of limited access facilities - High occupancy vehicle lanes - Definition) and RCW 46 61.165 (High Occupancy Vehicles lanes - Definition)

OREGON

Oregon does not have comparable language in the Oregon Revised Statutes (ORS) that expressly permits designation of a shoulder as a BOS lane. However, the legal framework does exist for ODOT to designate exclusive use of lanes for buses. It would first require ODOT support at the region and headquarters levels. If ODOT is interested in pursuing BOS, there are several possible pathways to proceed.

The Oregon Transportation Commission has broad authority to control operations of state highways, including use of shoulders. ODOT and the OTC should examine and make a determination whether a modification to allow use of the shoulder by transit vehicles may occur under Oregon Transportation Commission authority. If ODOT wanted to establish express legal authority for BOS, it could do so through: 1) an Oregon Administrative Rule or by amending the Oregon Revised Statute (ORS), which would require legislative action.

POTENTIAL NEAR TERM I-205 BOS EXTENSIONS

The following segments could accommodate BOS with additional investments beyond the Minimal or Low Cost investments evaluated by the Feasibility Study and were therefore outside the scope of this study. Although they are not recommended, they are included here because they would offer improved reliability and travel time for transit if BOS expansion in the corridor were to be considered.

I-205 (18TH STREET TO MILL PLAIN)

The shoulder is 10 feet wide; however, there is a barrier immediately adjacent to the shoulder for the majority of the segment length and bus on shoulder operations adjacent to a barrier require a minimum 11.5-foot-wide shoulder. As a result, the shoulder will need to be widened to accommodate BOS in this segment. With only one bus route (Route 177) using this segment of the corridor, along with heavy congestion on the 18th Street on-ramp limiting the reliability of the bus route, investment in BOS in this segment is not recommended as part of this initial feasibility evaluation.

SR-14 LOOP RAMP TO I-205 SOUTH

The cost of this segment to accommodate BOS was outside the scope of this study, however, the loop ramp from SR-14 Westbound to I-205 Southbound is congested during the AM peak period and buses would benefit from BOS on shoulder operations on the ramp to connect the recommended Westbound SR-14 BOS segment with Segment 1 of the recommended Southbound I-205 BOS across the Glenn Jackson Bridge.

The existing ramp would require widening to provide adequate shoulder width BOS operations. Given the relatively tight horizontal and vertical curvature of the ramp, the shoulder would have to be more than 10 feet to provide adequate site distance and accommodate the wide path of long buses traversing the loop ramp.

PROGRAMMED SR-14 IMPROVEMENT

Since the completion of the BOS Study, new funding has become available to expand SR-14 from 2 to 3 travel lanes in each direction between I-205 and 164th Avenue. Design of SR-14 improvement is programmed to occur over the next 2 years with construction in 2019 to 2021. SR-14 project design should be considered that accommodates the WB transit on ramp at 164th, the future/ongoing operation for transit use of the freeway shoulder on SR-14, the transition of BOS from SR-14 to the SB loop ramp to I-205 and widening of the ramp to accommodate use of ramp shoulder for transit vehicles. This would allow a continuous BOS lane from 164th on SR-14 west to the Airport Way Exit on I-205 south.