

South Downtown TRANSIT PRIORITY PATHWAYS



CITY OF SEATTLE
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Transit Priority Pathways

The objective of this project is to evaluate transit pathways connecting Southwest King County and West Seattle transit routes to the downtown Seattle transit spine along 3rd Avenue. This study evaluated potential connections for the transit pathways along 4th Avenue, the South Downtown (SODO) Busway or 5th Avenue, and 6th Avenue. All of the pathways propose alternate routing for inbound and outbound pathways. For outbound pathways, all buses would connect along Lander Street to either 4th Avenue or 1st Avenue. This would require a new on-ramp to the Spokane Street Viaduct. Inbound pathways provide routing for buses on either 4th Avenue or their respective pathways.

This project was conducted at the same time as King County Metro evaluates and selects a dedicated transit connection to replace the current transit routing which today uses the Alaskan Way Viaduct's Columbia Street and Seneca Street connections to downtown. The focus of King County Metro's evaluation is to recommend a short-term

pathway to be implemented when the Alaskan Way Viaduct is closed for demolition in 2016 and potentially a long-term solution. This City of Seattle sponsored project evaluates pathways that could be implemented in a mid- to long-term time frame.

The pathways presented in this study would serve the stadium district and other neighborhoods such as Pioneer Square and the International District. A focus for this project was to improve transit connections, bus travel efficiency, and the attractiveness of transit to encourage increased ridership. All pathways would provide a bus stop near the Stadium District light rail Station, King Street Station (Amtrak and Sounder), and the future Greyhound bus station.

The pathways proposed in this study were evaluated based on estimated travel times (a summary and methodology is provided at the back of this study) and an estimate of probable cost based on recent bid item pricing, similar construction costs, or reported construction estimates.

This study demonstrates that transit pathways on 4th Avenue, 5th Avenue, and 6th Avenue are viable with trade-offs and potentially costly infrastructure investments. It also compares these pathways travel times to surface Alaskan Way routes. The travel time assessment demonstrates that routes on Alaskan Way are slightly faster. Generally, this is because the pathways are shorter and travel through less traffic signals.

The information in this study will be used to support the City of Seattle in improving the quality and effectiveness of transit service in the south end of Seattle.



The SODO Busway (5th Avenue) provides a transit corridor for both transit and light rail through the south downtown area.

Project Overview Map



4th Avenue Pathway

This pathway would use 4th Avenue to connect from Spokane Street to the 3rd Avenue Transit Spine in Downtown Seattle. Transit priority improvements include existing all-day transit lanes, the addition of new peak period or all-day transit lanes, and signal priority such as a transit queue jump at the 4th Avenue/Royal Brougham intersection. Providing transit lanes on 4th Avenue and 1st Avenue would result in some peak period or all-day on-street parking loss. Approximately 285 to 295 on-street parking spaces would be impacted depending on whether buses are routed outbound on 1st Avenue or 4th Avenue. For outbound (southbound) transit trips, Lander Street could be used to connect to 1st Avenue and the direct access ramp to the Spokane Street Viaduct for routes traveling to West Seattle. Routing buses on Lander Street with its current configuration is not recommended because of frequent blockage due to the BNSF at-grade rail crossing.

Spot Improvements

A. Provide southbound through movement queue jump for existing bus lane: The number of traffic lanes on 4th Avenue is restricted to two-lanes in each direction immediately south of Royal Brougham Way because of the ramp connections. To improve transit service through this narrow roadway section, the southbound signal could be modified to provide a transit queue jump. Southbound buses would use the existing center bus lane and continue ahead of general purpose traffic.

B. Provide over crossing of railroad along Lander Street between 4th Avenue and 1st Avenue: The existing railroad track crossing Lander Street between 1st Avenue and 4th Avenue would unacceptably delay buses. This delay could be eliminated with the construction of an overpass, which could be limited in size to reduce costs.

C. Provide direct ramp connection from 4th Avenue to Spokane Street Viaduct: The travel time and reliability of outbound (southbound) buses on 4th Avenue traveling to West Seattle would be improved with a direct connection to the Spokane Street Viaduct—this would eliminate the need for a Lander Street connection for transit.



4th Avenue provides bus lanes for short sections northbound from Jackson Street to Washington Street and southbound from Jackson Street to Royal Brougham Way. Providing a transit queue jump at the 4th Avenue / Royal Brougham Way intersection would permit southbound buses to stay in the bus lane through this intersection and could improve bus speed and reliability through the stadium areas.



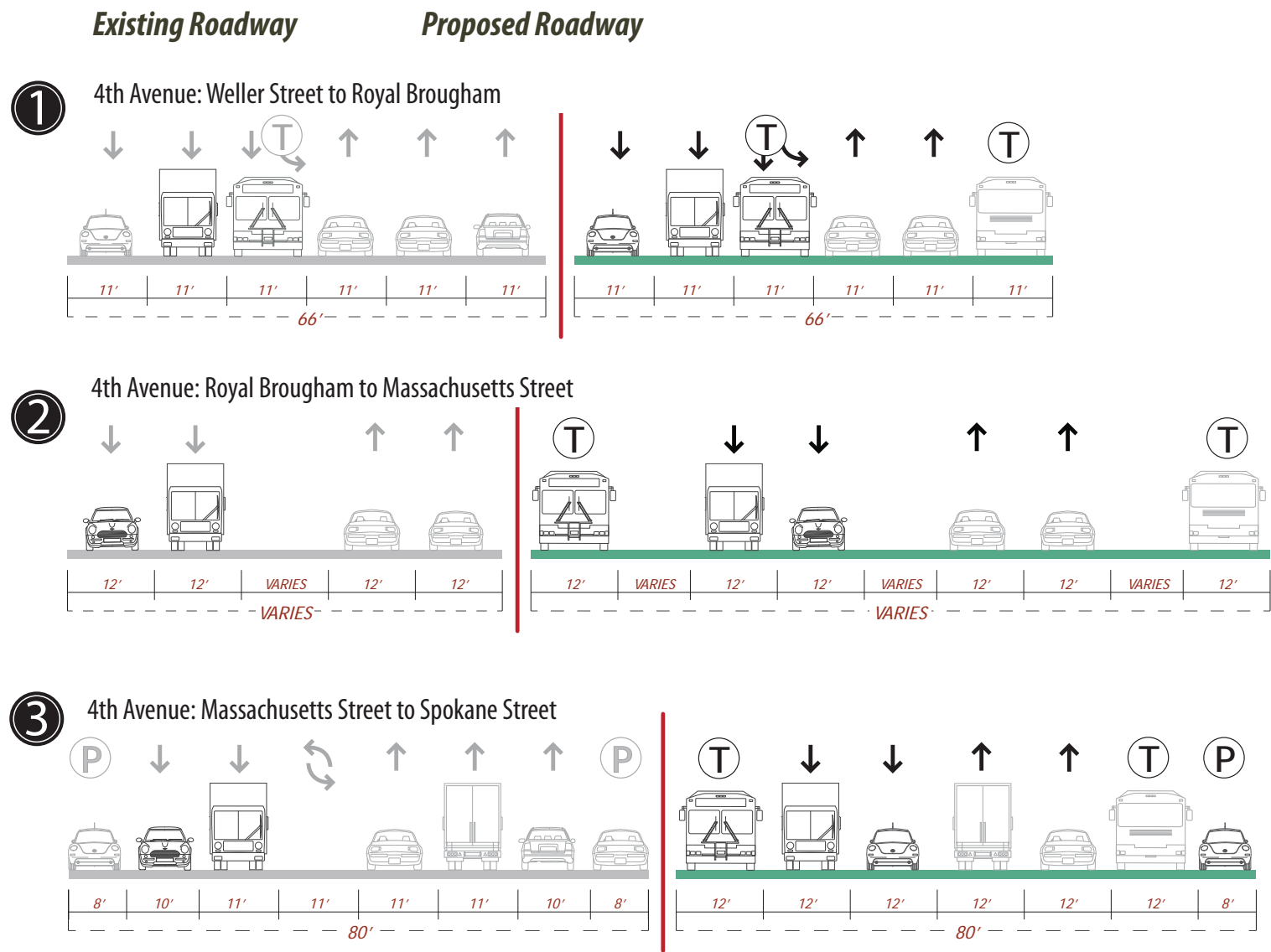
Spot Improvements

- A

Provide southbound through movement queue jump for existing bus lane.
- B

Provide over crossing of railroad along Lander Street between 4th Avenue and 1st Avenue.
- C

Provide direct ramp connection from 4th Avenue to Spokane Street Viaduct



4th Avenue Pathway (Continued)

Other Improvements

4th Avenue through Edgar Martinez Drive Interchange

Providing continuous bus lanes on 4th Avenue would be challenging because of the ramps to Edgar Martinez Drive and support columns in the area; these features limit 4th Avenue to two lanes northbound and southbound between Royal Brougham Way and Massachusetts Street.

Continuous bus lanes on 4th Avenue could potentially be constructed on the back side of the existing sidewalks. This design concept would require pedestrians to cross the bus lanes near Edgar Martinez Drive and again at Royal Brougham Way. It would also require acquisition of right of way, including some property from King County Metro's Atlantic/Central Base. It is likely that during non-peak periods, bus travel would be faster on 4th Avenue compared to this bus lane configuration. During events at the arena, the northbound bus lane would provide buses some relief from congestion. However, buses would still be subjected to delays at Royal Brougham Way because of the high east-west pedestrian crossing volumes. Alternatively, bus lanes could likely be provided by reconfiguring the Edgar Martinez Drive interchange with 4th Avenue.



Looking north from Edgar Martinez Drive. A bus lane could be constructed west of the 4th Avenue ramp to Edgar Martinez Drive.



A northbound and southbound bus lane could be accommodated through this narrow roadway section by going outside of the existing roadway alignment.



Looking south along 4th Avenue from the east. The Edgar Martinez Drive support columns would require a northbound bus lane to be provided along the edge of Metro's bus facility. The existing sidewalk could be retained in place.



Looking north along 4th Avenue from the east. A bus lane could be provided along the back side of the sidewalk. However, during non-peak periods, this bus lane configuration is likely to be slower than staying on 4th Avenue.

4th Avenue Pathway (Continued)

Other Improvements

1st Avenue Ramp to Spokane Street Viaduct

The recent improvements on 1st Avenue will provide a direct access on-ramp connection to the Spokane Street viaduct for outbound buses. Because of this ramp connection, alternative outbound routes for all pathways could use Lander Street to connect to 1st Avenue.



1st Avenue Utility Poles

Utility poles located close to the edge of the curb on the west side of 1st Avenue pose a collision risk to buses travelling in the curb lane. These utility poles could be relocated to avoid collisions with bus mirrors. There are approximately 18 utility poles which may require relocation for outbound buses on 1st Avenue. Alternatively, the bus lane could be widened to provide additional space for buses to avoid these utility poles; a widened bus lane could be provided by eliminating the two-way left-turn lane or removing east side parking and allocating the space to the bus lane and other travel lanes.



5th Avenue Pathway

This pathway would use the SODO Busway (5th Avenue) to connect from Spokane Street to the 3rd Avenue Transit Spine in Downtown Seattle. Transit priority improvements include existing all-day transit lanes and the addition of new peak period or all-day transit lanes. Providing transit lanes on 4th Avenue and 1st Avenue would result in some peak period or all-day on-street parking loss. For inbound (northbound) transit trips, the route could follow either 4th Avenue or 5th Avenue. To connect from the SODO (E3) Busway to Seattle Boulevard, a previous conceptual engineering study proposed constructing an at-grade crossing of the light rail tracks and a new ramp to the Seattle Boulevard/5th Avenue intersection. An alternative route would be to exit the SODO Busway at Royal Brougham and connect to Seattle Boulevard via 6th Avenue. For outbound (southbound) transit trips, Lander Street could be used to connect to 1st Avenue and the direct access ramp to the Spokane Street Viaduct for routes traveling to West Seattle. Routing buses on Lander Street with its current configuration is not recommended because of frequent blockage due to the BNSF at-grade rail crossing.



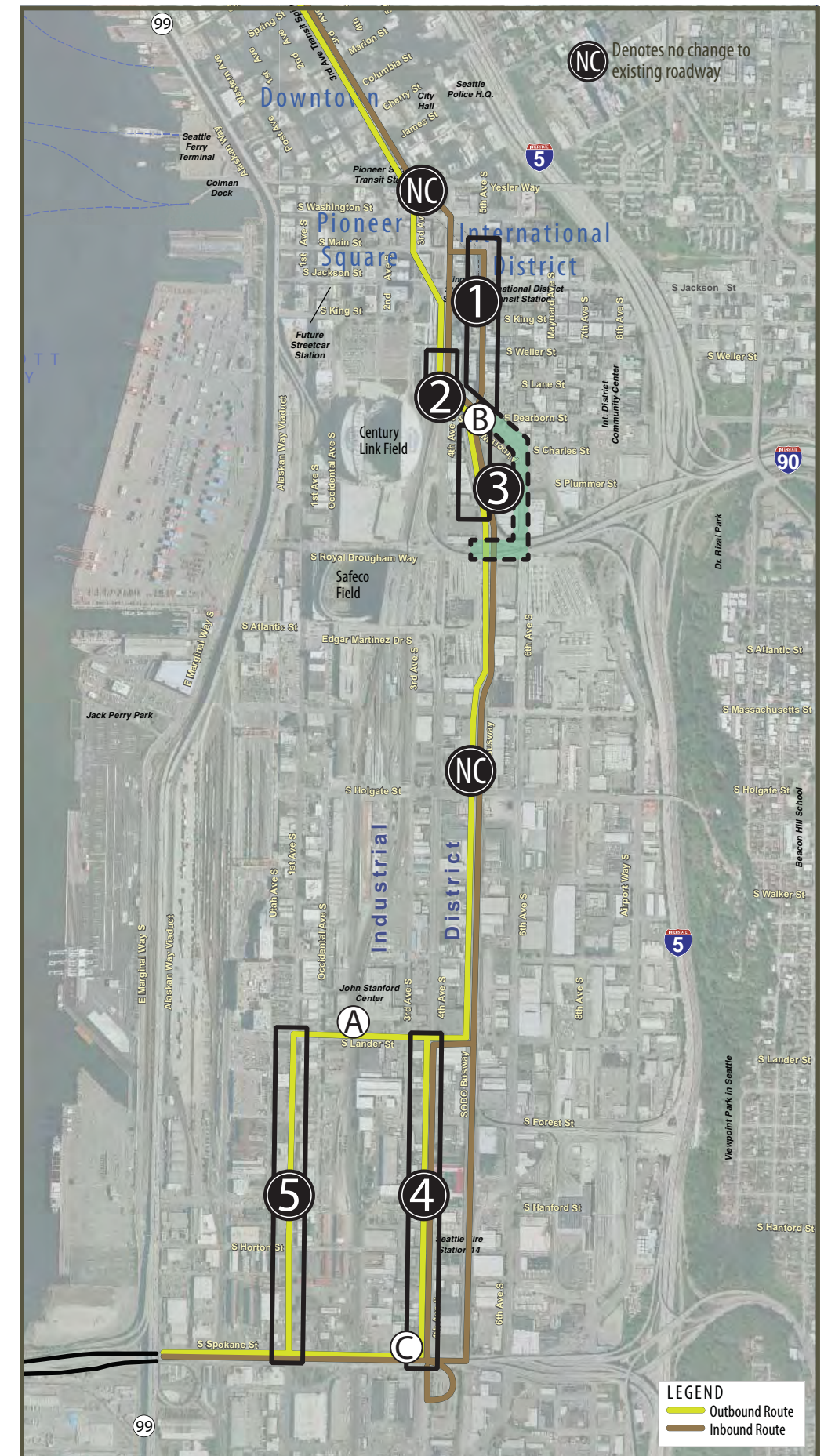
Peak period or all-day bus lanes could be provided along 5th Avenue between Seattle Boulevard and Main Street by restricting or removing parking and minor paint line modifications.

Spot Improvements

A. Provide over crossing of railroad along Lander Street between 4th Avenue and 1st Avenue: The existing railroad track crossing Lander Street between 1st Avenue and 4th Avenue could delay outbound buses. This delay could be eliminated with the construction of an overpass, which could be limited in size to reduce costs.

B. E3 Busway to Fifth Avenue/Seattle Boulevard/Airport Way: The primary pathway would require a new ramp connection from the SODO Busway (known as the E3 Busway) up to the Seattle Boulevard/Airport Way/5th Avenue intersection.

C. Provide direct ramp connection from 4th Avenue to Spokane Street Viaduct: The travel time and reliability of outbound (southbound) buses on 4th Avenue traveling to West Seattle would be improved with a direct connection to the Spokane Street Viaduct—this would eliminate the need for a Lander Street connection.



Spot Improvements

- A

Provide over crossing of railroad along Lander Street between 4th Avenue and 1st Avenue.
- B

Provide direct bus ramp connection from SODO Busway to Seattle Boulevard.
- C

Provide direct ramp connection from 4th Avenue to Spokane Street Viaduct

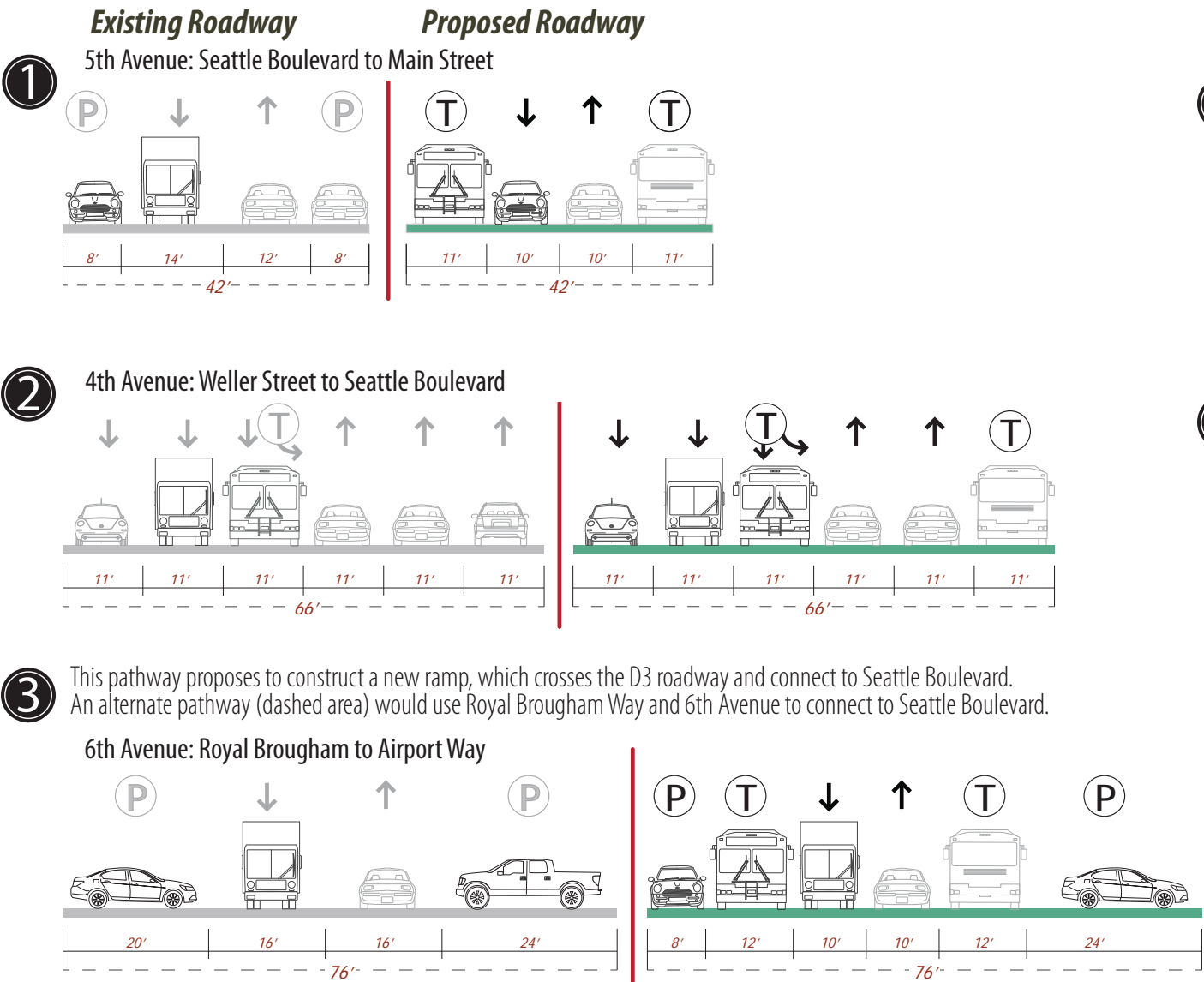
Anticipated Travel Time	Inbound (Minutes)	Outbound
Primary Pathway	16.0	14.9
Alternative Pathway (1st Avenue outbound)	16.9	17.4
Alternative Pathway (6th Avenue north of Royal Brougham)	16.5	17.4

Estimates of Probable Cost	Lower	Upper
Base Pathway		
Providing transit lanes and revised signage	\$2.7 million	\$3.7 million
¹ Ramp Connection to Seattle Boulevard	\$23 million	\$31 million
4th Avenue connection to Spokane Street	\$20 million	\$27 million
Alternate Pathway		
² Lander Street Over Crossing		\$150 million

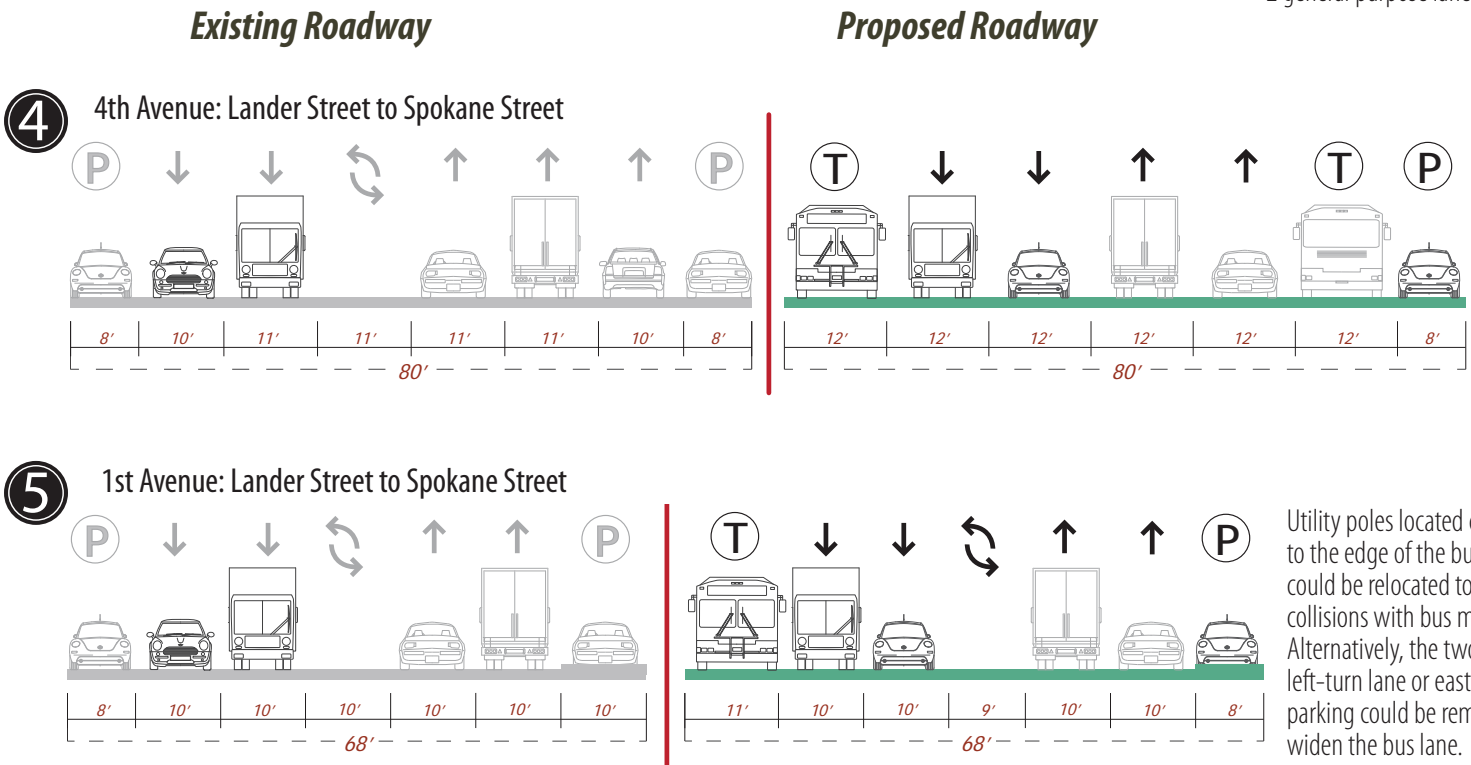
These planning level cost estimates do not include right of way costs.

¹ Project 10 – E3 Busway to Fifth Avenue/Airport Way; Seattle Urban Mobility Projects, Phase 1.

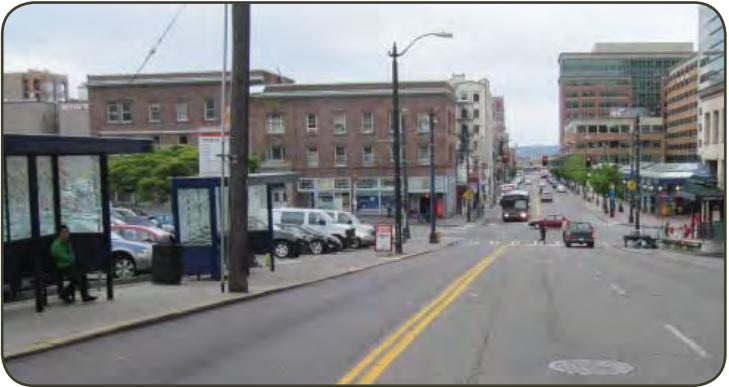
² Cost estimate furnished by others; includes a 4-lane structure with 2 transit lanes and 2 general purpose lanes.



All roadway widths are approximations based on aerial imagery and some sample field measurements.



Utility poles located close to the edge of the bus lane could be relocated to avoid collisions with bus mirrors. Alternatively, the two-way left-turn lane or east side parking could be removed to widen the bus lane.



Vehicles traveling northbound on 5th Avenue must turn right at Jackson Street. This provides limited vehicle conflicts for buses for one block of 5th Avenue north of Jackson Street.



Connecting the SODO Busway to Seattle Boulevard would likely have some property impacts and require either a structure or fill section to accommodate the proposed two-lane bus only roadway.

6th Avenue Pathway

This pathway would use 6th Avenue to connect from Spokane Street to the 3rd Avenue Transit Spine in Downtown Seattle. Transit priority improvements include existing all-day transit lanes and the addition of new peak period or all-day transit lanes. For northbound (inbound) transit trips, the route could follow either 4th Avenue or 6th Avenue. For outbound (southbound) transit trips, Lander Street could be used to connect to 1st Avenue and the direct access ramp to the Spokane Street Viaduct (for routes to West Seattle) or 4th Avenue (with a new ramp connection to the Spokane Street Viaduct. Routing buses on Lander Street with its current configuration is not recommended because of frequent blockage due to the BNSF at-grade rail crossing. Providing transit lanes would result in some peak period or all-day on-street parking loss.

Spot Improvements

- A. Provide over crossing of railroad along Lander Street between 4th Avenue and 1st Avenue:** The existing railroad track crossing Lander Street between 1st Avenue and 4th Avenue could delay outbound buses. This delay could be eliminated with the construction of an overpass, which could be limited in size to reduce costs.
- B. Provide direct ramp connection from 4th Avenue to Spokane Street Viaduct:** The travel time and reliability of outbound (southbound) buses on 4th Avenue traveling to West Seattle would be improved with a direct connection to the Spokane Street Viaduct—this would eliminate the need for a Lander Street connection.



Future redevelopment along 6th Avenue north of Royal Brougham Way could provide opportunities to improve the roadway environment for transit and pedestrians.

Also, 6th Avenue provides a close connection to King County Metro's south base operations and multiple bus routes, the new Greyhound Station, and Link Light Rail's Stadium Station.

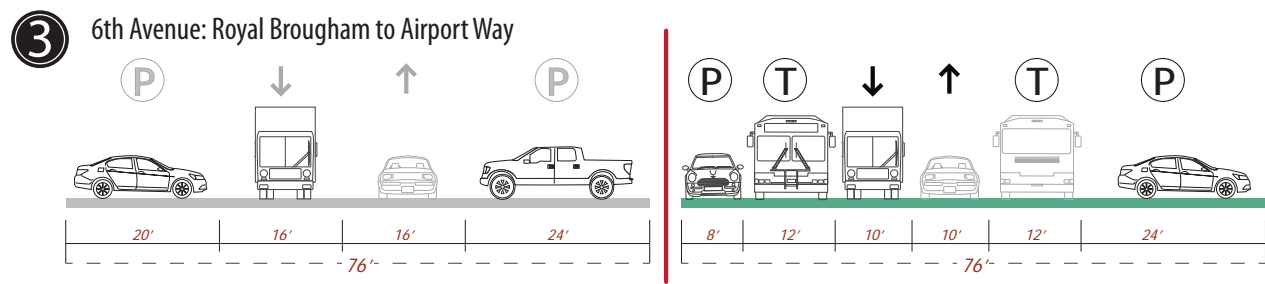
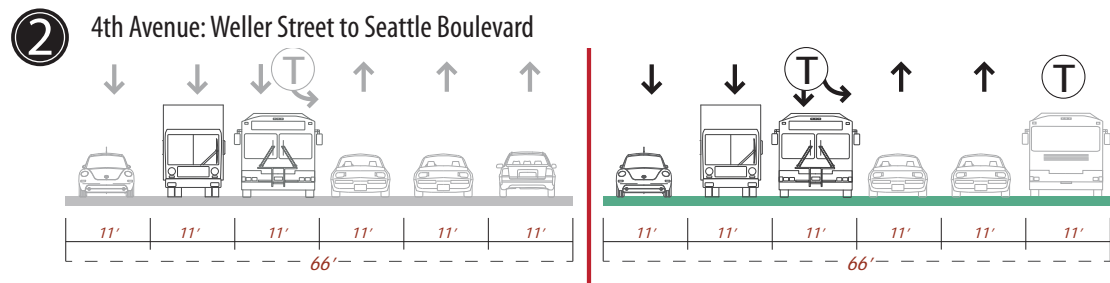
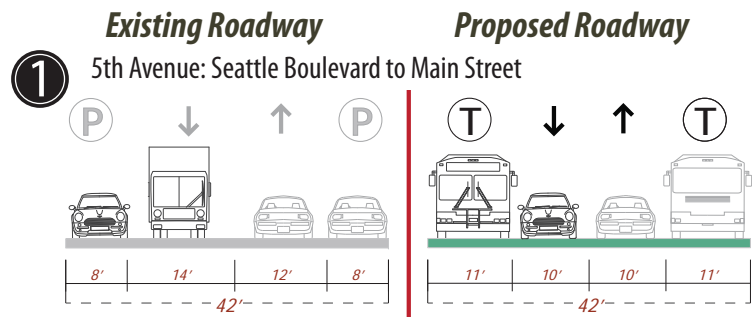


Spot Improvements

- A

Provide over crossing of railroad along Lander Street between 4th Avenue and 1st Avenue.
- B

Provide direct ramp connection from 4th Avenue to Spokane Street Viaduct



All roadway widths are approximations based on aerial imagery and some sample field measurements.



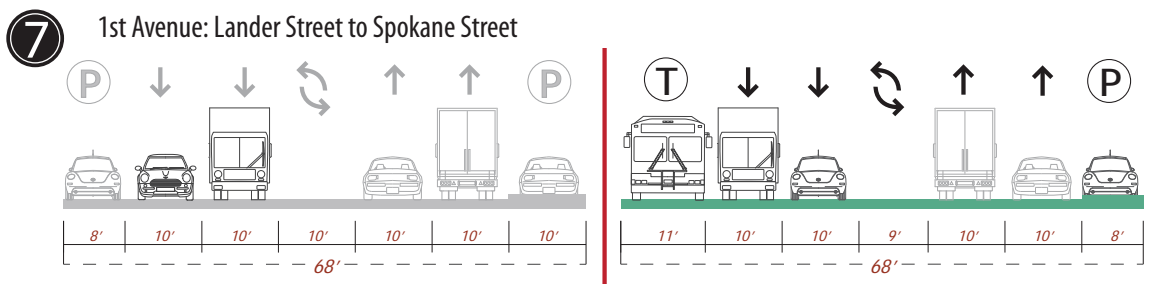
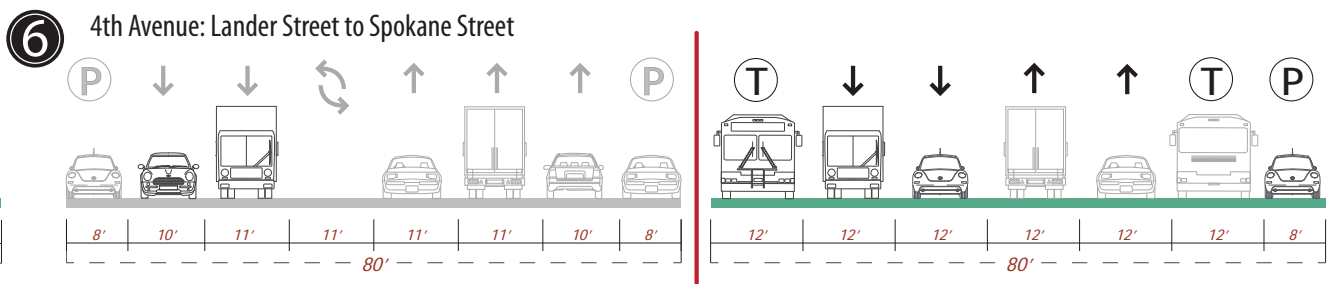
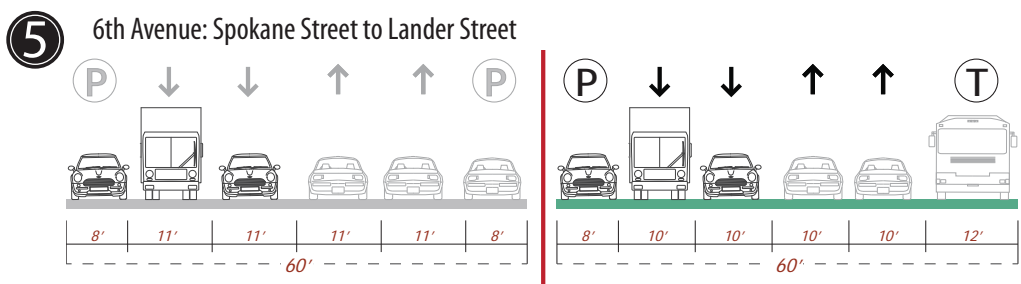
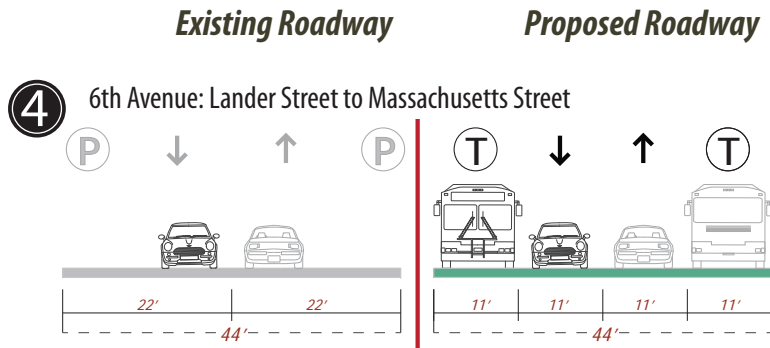
Improvements along 6th Avenue would require modification to existing on-street parking configurations to provide peak period or all-day bus lanes.

Anticipated Travel Time	Inbound (Minutes)	Outbound
Primary Pathway	16.7	16.5
Alternative Pathway (1st Avenue outbound)	17.0	17.4

Estimates of Probable Cost	Lower	Upper
Base Pathway		
Providing transit lanes and revised signage	\$1.1 million	\$1.6 million
4th Avenue connection to Spokane Street	\$20 million	\$27 million
Alternate Pathway		
¹ Lander Street Over Crossing		\$150 million

These planning level cost estimates do not include right of way costs.

¹ Cost estimate furnished by others; includes a 4-lane structure with 2 transit lanes and 2 general purpose lanes.



Utility poles located close to the edge of the bus lane could be relocated to avoid collisions with bus mirrors. Alternatively, the two-way left-turn lane or east side parking could be removed to widen the bus lane.

Travel Times

Anticipated Travel Times

The adjacent table summarizes the estimated 2030 travel times for the proposed South Downtown (SODO) Transit Priority Pathways (outbound buses assumed to be using 4th Avenue), and the estimated bus travel times for buses on Alaskan Way. Travel times are presented as a range because most pathways have multiple routing configurations. Travel times also have two components; (1) *travel time*, the time it takes buses to travel the length of the pathway; and, (2) *delay*, the amount of traffic signal delay.

Generally, the 4th Avenue pathway is estimated to have a lower travel time compared to the 5th Avenue and 6th Avenue pathways. This is because these pathways are longer and travel through more intersections.

The potential for up to 7 minutes of additional delay from train operations across Lander Street between 1st Avenue and 4th Avenue are not included in these travel times. The Lander Street at-grade railroad crossings would cause significant schedule variation, which reduces bus route reliability for all alternative outbound routing.

Comparison of Travel Times

Alternative routes using surface Alaskan Way to connect from the Spokane Street Viaduct to the Downtown Seattle Transit Spine were analyzed by King County Metro. The travel times for pathways on Alaskan Way that use Columbia Street to access Downtown Seattle are faster than the 4th Avenue, 5th Avenue, and 6th Avenue pathways. This is because Alaskan Way routes are shorter and generally have less traffic signals that buses have to travel through.

Proposed Pathway	Direction					
	Inbound (minutes)			Outbound (minutes)		
	Total Route Time ¹	Bus Run Time ²	Signal Delay ³	Total Route Time ¹	Bus Run Time ²	Signal Delay ³
4th Avenue ⁴	15.6 ⁵	12.4	3.2	15.2 – 16.1	11.6 – 12.0	3.6 – 4.1
5th Avenue	16.0 – 16.9	12.8 – 13.5	3.2 – 3.4	14.9 – 17.4	11.1 – 12.9	3.8 – 4.5
6th Avenue	16.7 – 17.0	13.3 – 13.4	3.4 – 3.6	16.5 – 17.4	12.4 – 12.8	4.1 – 4.6
Two-Way Main Street	14.3			13.5		
Main Street/Washington Street	14.5			12.5		
Two-Way Columbia Street	13.2			10.4		
Columbia Street / Marion Street	13.4			11.4		

¹ Total Route Time = Bus Run Time + Signal Delay for each pathway's routes.

² Bus Run Time is the time for buses to travel the length of the corridor based on estimates of bus speed consistent with King County Metro studies in the area.

³ Signal Delay is the time buses would wait on average at signals along a route.

⁴ The 4th Avenue proposed pathway considered additional transit priority improvements, such as continuous bus lanes, compared to a previous King County Metro study.

⁵ Only one pathway was considered for the inbound 4th Avenue proposed pathway.

Anticipated Benefit of Transit Signal Priority

Transit signal priority (TSP) adjusts the signal displays at intersections to reduce travel time (delay) for buses. Coincidentally, vehicles traveling in the same direction with the bus could experience reductions in delay as well. Because the signal timings generally favor north-south movements the benefit of adding transit signal priority is small. It is estimated that travel times could reduce by approximately 1 to 2 minutes with a moderate to aggressive application of transit signal priority. Even with an anticipated reduction in signal delay for the 4th Avenue, 5th Avenue, and 6th Avenue pathways, the pathways using Alaskan Way would likely have faster travel times.

How Travel Times Were Developed

The above travel times were calculated using an estimate of bus speed along study area roadways and adding signal delay at signalized intersections as reported using intersection analysis software. Estimates of bus speed are consistent with speeds used for travel time estimates in a similar King County Metro study for the Downtown Southend Pathways. Where available, signal delays from the Downtown Southend Pathways Study were used; King County's study did not develop transit travel times for 4th Avenue, 5th Avenue or 6th Avenue between downtown and Spokane Street. For intersections where no signal timings were available, signal delays were assumed to be approximately 5 to 10 seconds at each intersection because buses normally traveled in the direction of the highest vehicle volumes. The estimates of travel times for this study are between the West Seattle Bridge, just east of Harbor Island, and the 3rd Avenue/Seneca Street intersection in Downtown Seattle.