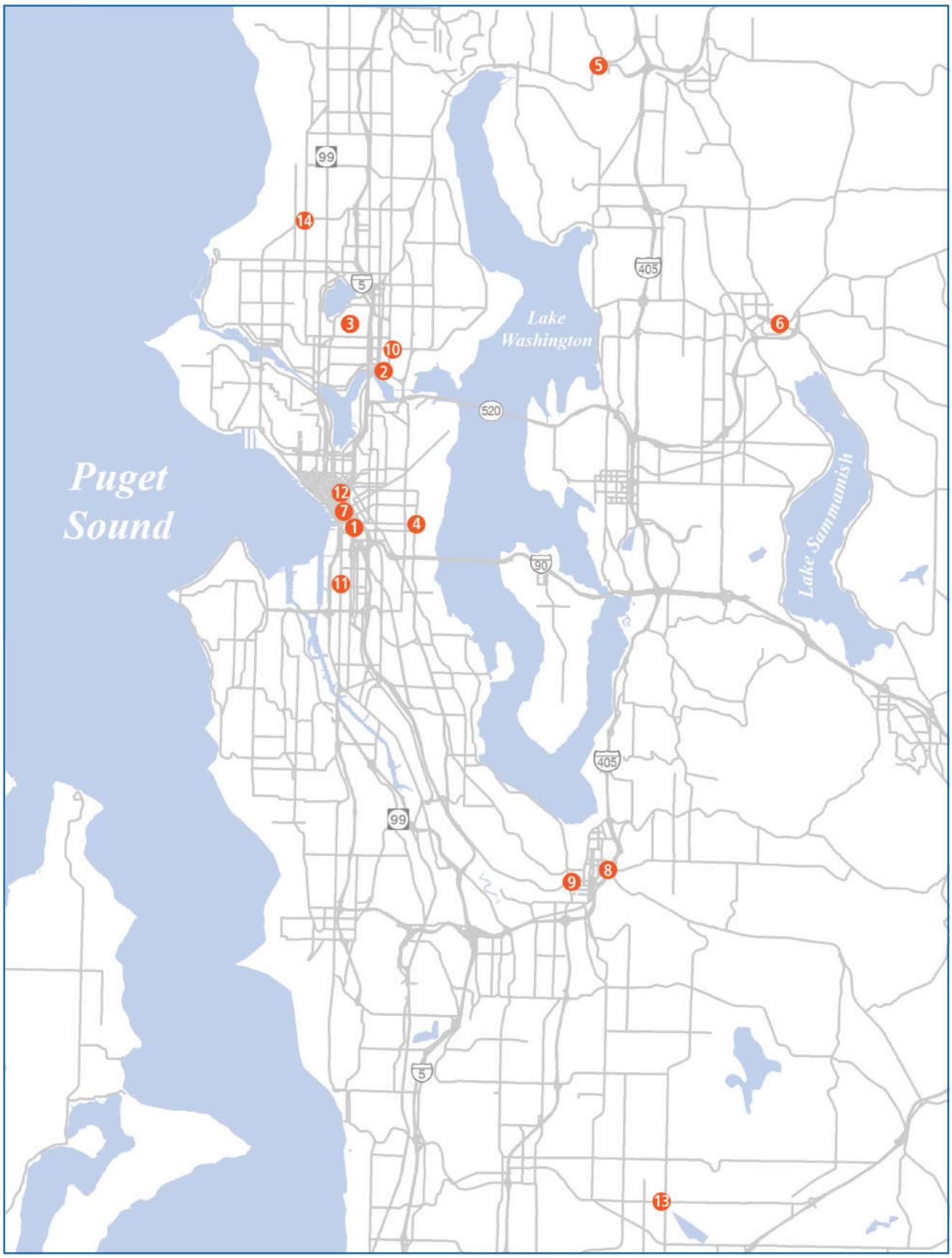
2018 Annual Hot Spot Improvements Report

King County Metro | Speed & Reliability

King County



Spot Improvements Program
2018 Annual Report

This annual report describes the spot improvements that were implemented in 2018 through partnerships with the cities of Seattle, Kent, Bothell, Redmond, Renton, as well as Snohomish County. Spot improvements at 14 locations benefited 263,000 riders along 72 bus routes.

The Spot Improvements Program consists of low-cost capital investments aimed at improving bottleneck conditions that affect bus travel times and reliability, resulting in increased attraction to public transit as a travel mode of choice. The Spot Improvements Program supports the adopted ***King County Metro Transit Strategic Plan for Public Transportation 2011 – 2021*** (Strategy 5.1.3: Improve Transit Speed and Reliability). The 14 spot improvements in 2018 utilized the following set of transit supportive toolboxes identified in the ***Speed and Reliability Guidelines and Strategies*** report.

- Bus Operations: Established no-parking restriction at the front of the bus zone on Greenwood Avenue near 104th Street to provide easier merge for bus operators.
- Traffic Control: Improved queue jump operations at 2 locations. Implemented protected phase at 3 locations to help improve bus operations and safety. Made signal timing adjustments at 5 locations to reduce transit delay.
- Infrastructure: Improved signage at 2 locations to help with bus turn movements
- Transit Lane: Increased transit-only hours on Third Avenue to 6am-7pm and included weekends so transit-only hours are every day.

The success of each implementation was made possible with the support of cities and their willingness to make operational changes within their roadway infrastructures and traffic signal systems to benefit transit riders.

For additional information regarding this program, please contact Matthew Crane at 206.263.9134 or MCrane@KingCounty.gov.

Irin Limargo
Supervisor, Speed and Reliability Unit
Capital Planning Section
King County Metro

Table of Contents

South Jackson Street and 4th Avenue

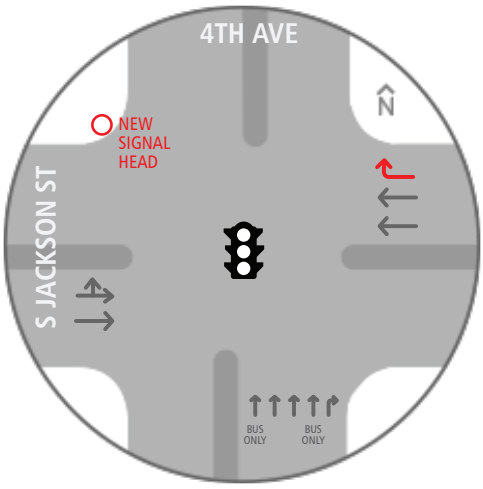
Routes: 1, 2, 7, 13, 14, 36, 49, 62, 70

1

ISSUE

Buses heading westbound on Jackson Street were experiencing consistent delay in excess of one minute in the AM peak period when making the westbound right turn from S Jackson Street onto 4th Avenue. This was caused by heavy pedestrian crossing volumes and the conflicting eastbound left protected turn, which left little time for buses and general purpose traffic to make the turn.

Peak frequency is 36 buses/hour.



IMPROVEMENTS

Traffic Signals - A new four-section signal display was installed to provide a protected westbound right turn on Jackson Street so that buses and general purpose traffic could clear the intersection. To provide enough time for the new right turn signal, the signal sequence was adjusted to make the eastbound left turn to 4th Avenue yield to westbound traffic during the AM peak period.

On average, each inbound morning trip saved 43 seconds in travel time at this intersection, which was a 50 percent reduction in transit delay.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

43 SECONDS DELAY SAVED

: 43

ROUTE BENEFIT

9 ROUTES

DAILY PASSENGER BENEFIT (PER 1000)

27,500 PASSENGERS

Acknowledgements:
John Marek (SDOT), Jonathan Dong (SDOT)

SDOT Seattle Department of Transportation

King County

NE Pacific Street and University Way

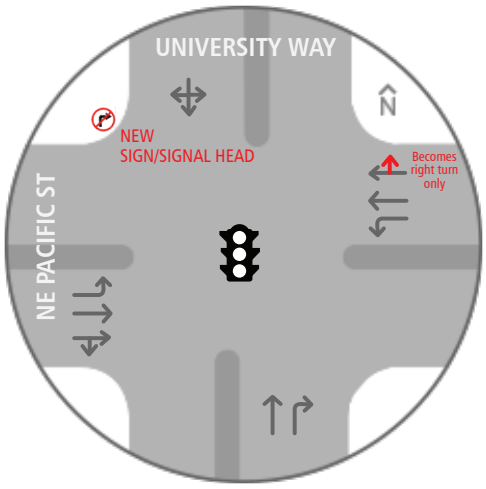
Routes: 45, 71, 73, 373

2

ISSUE

King County Metro operators raised concerns of fast-moving bicyclists at the northeast corner of Pacific Street & University Way. Buses making a westbound right turn must traverse the Burke-Gilman trail crossing while bicyclists and pedestrians are also given a "Walk" indication. Bicyclists were observed riding westbound at high speed, increasing potential for conflicts.

Peak frequency is 11 buses/hour.



IMPROVEMENTS

Traffic Signals, Channelization - A new signal head and large blank-out sign were installed to indicate that traffic is only permitted to make a right turn on a green arrow. The signal sequence was adjusted to separate the westbound right-turn traffic from the crosswalk movement, and the travel lane that was previously a shared through-right turn lane was converted to a right-turn only lane.

The number of potential conflicts between bikes and turning buses have been reduced. Metro operators have reported operational improvements at the intersection due to the separated maneuvers between pedestrians/bicyclists and buses.

TRANSIT BENEFITS

BIKE / BUS SAFETY	DAILY BIKE/PED BENEFIT (PER 1000)	ROUTE BENEFIT	DAILY PASSENGER BENEFIT (PER 1000)
IMPROVE BUS/BIKE/PED CONFLICTS	2,800 BIKES/PEDS	4 ROUTES	5,500 PASSENGERS

Acknowledgements:
Jonathan Dong (SDOT)

SDOT Seattle Department of Transportation

King County

N 56th Street and Kirkwood Place

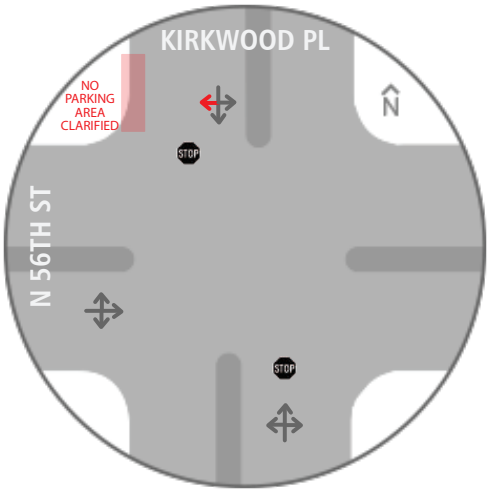
Route: 62

3

ISSUE

Buses heading southbound on Kirkwood Avenue were experiencing difficulty turning right onto 56th Street due to vehicles parked close to the intersection. A Metro bus stop used to be at this corner, but it has since been relocated. Parking is allowed on Kirkwood Avenue, but not within 30 feet of a stop-controlled approach.

Peak frequency is 8 buses/hour.



IMPROVEMENTS

Traffic Sign - A "No Parking Within 30 Feet" sign was added below the Stop sign to reinforce to people driving that they are not allowed to park near the approach to 56th Street.

Based on a recent site visit, the added sign has resulted in increased compliance by people driving to not park near 56th Street, which has allowed for buses to safely make the turn.

TRANSIT BENEFITS

EASIER TURN

ROUTE BENEFIT

1 ROUTE

DAILY PASSENGER BENEFIT (PER 1000)

3,800 PASSENGERS

Acknowledgements:
Fred Perez (SDOT), Jonathan Dong (SDOT)

SDOT Seattle Department of Transportation

King County

Yesler Way and MLK Jr Way

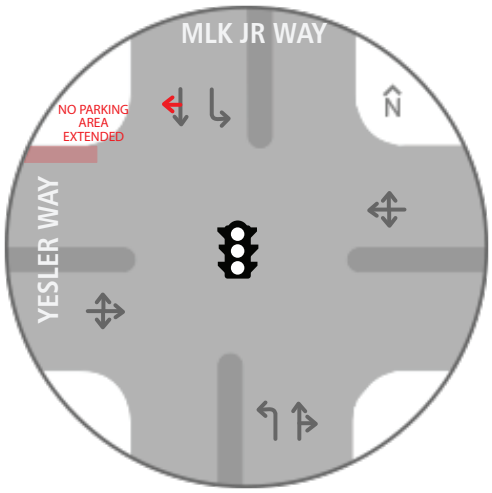
Route: 8

4

ISSUE

Buses making the southbound right turn from MLK Jr Way to Yesler Way were experiencing difficulty making the turn due to cars parked close to the intersection.

Peak frequency is 6 buses/hour.



IMPROVEMENTS

Traffic Sign - The No Parking zone was lengthened through the relocation of the parking sign pole and the installation of red curb paint to visually identify the extent of the No Parking area.

Based on a recent site visit, the additional parking restriction has resulted in an easier turn for Route 8 buses. Bus operators no longer report concerns at this intersection.

TRANSIT BENEFITS

EASIER TURN

ROUTE BENEFIT

1 ROUTE

DAILY PASSENGER BENEFIT (PER 1000)

8,500 PASSENGERS

Acknowledgements:
Julie Erickson (SDOT), Fred Perez (SDOT)

SDOT Seattle Department of Transportation

King County

SR 522 and 98th Avenue NE - Bothell

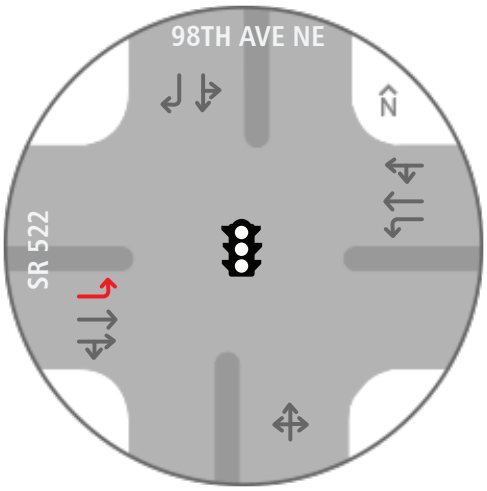
Routes: 312, 372, 522

5

ISSUE

Buses heading eastbound on SR 522 making a left turn to 98th Avenue NE experienced delay due to a very short protected green light at the intersection. At times, this green time would only allow one or two vehicles to clear the intersection per cycle.

Peak frequency is 15 buses/hour.



IMPROVEMENTS

Traffic Signals - Worked with the City of Bothell to update the signal timing plan in order to provide additional green time for the eastbound left movement.

Reduced delay by 12 seconds for buses waiting multiple cycles to make the left turn movement.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

12 SECONDS DELAY SAVED : 12

ROUTE BENEFIT

3 ROUTES

DAILY PASSENGER BENEFIT (PER 1000)

7,600 PASSENGERS

Acknowledgements:
Eddie Low (City of Bothell)
Robert C. Westlake (Snohomish County)

City of Bothell

Snohomish County

King County

Redmond and Avondale Way

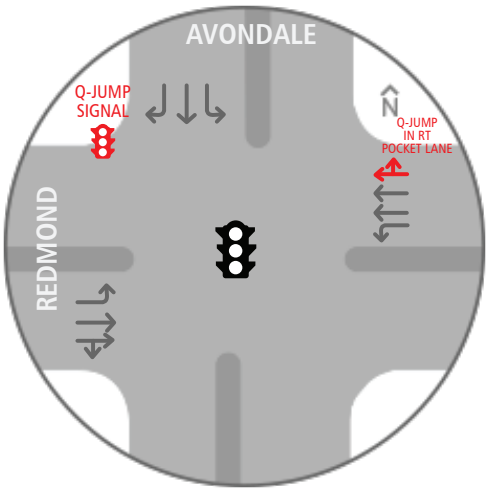
Route: 545

6

ISSUE

Buses heading westbound on Redmond are able to use a queue jump to bypass queues that build up at Avondale Street. Buses were not being sensed by the queue jump detector upstream. As a result, operators would avoid using the queue jump and would use the middle through lane instead.

Peak frequency is 15 buses/hour.



IMPROVEMENTS

Traffic Detection - Worked with the City of Redmond to increase the sensitivity of the detection for the queue jump.

Buses are using the queue jump more frequently due to increased detection sensitivity. This has reduced transit delay by 7 seconds for buses that had previously waited in the queue and occasionally missed a cycle.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)	ROUTE BENEFIT	DAILY PASSENGER BENEFIT (PER 1000)
7 SECONDS DELAY SAVED : 7	1 ROUTE	4,200 PASSENGERS

Acknowledgements:
Bruce Newman (City of Redmond), Buff Brown (City of Redmond)

3rd Avenue Corridor (Washington to Stewart)

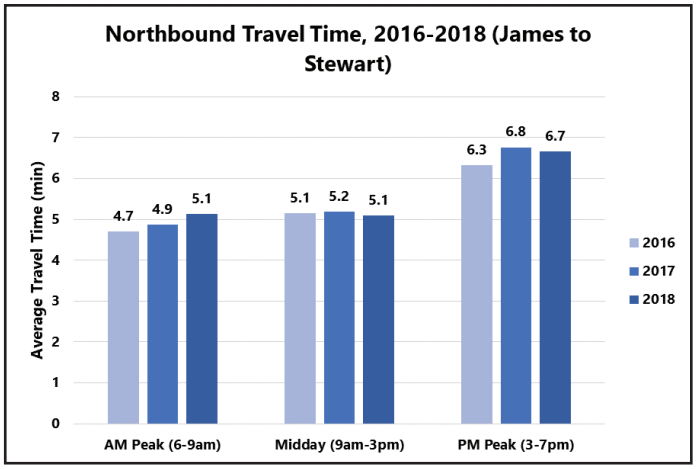
Routes: C-Line, D-Line, E-Line, 1, 2, 3, 4, 5, 5E, 7, 13, 14, 15E, 17E, 18E, 19, 21, 24, 26E, 27, 28E, 29, 33, 36, 37E, 40, 55, 56, 57, 62, 70, 116E, 118E, 119E, 120, 124, 125, 131, 132, 304, 355

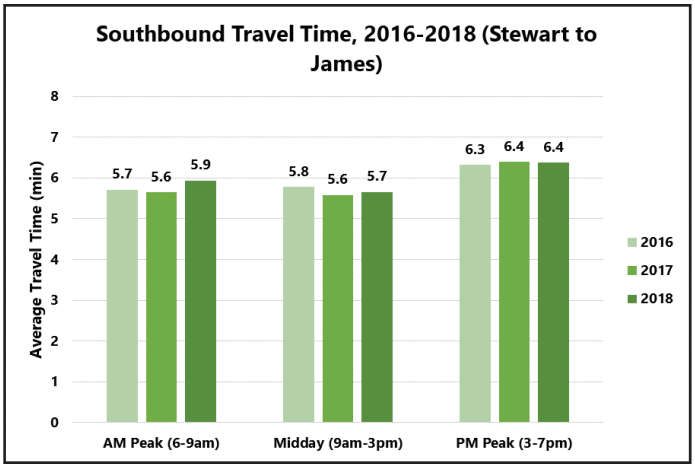
ISSUE

Transit service on Third Avenue has grown over the past several years to accommodate the rapid growth of the region. The corridor will be a critical transit spine for local and regional service in Seattle, as construction activities related to the Washington State Convention Center (WSCC), closure of the Convention Place Station (CPS), and the end of joint bus-rail operations in the DSTT are ongoing in 2019. This will increase the number of buses on downtown surface streets. Therefore, maintaining transit reliability and speed is very important for both near-term projects and longer-term transit service needs.

TRANSIT BENEFITS

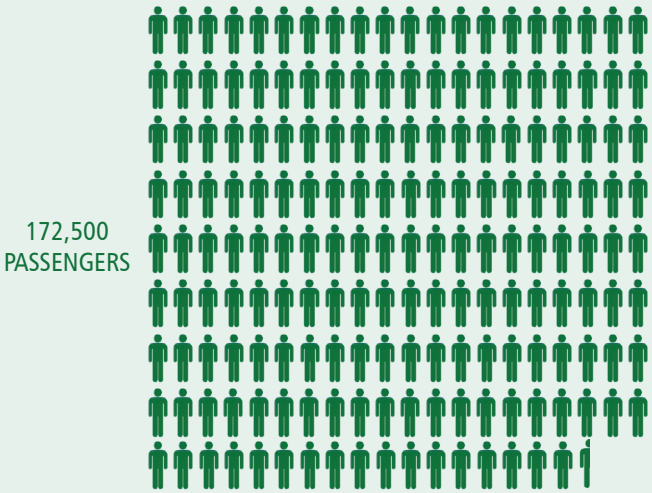
Transit travel times in both directions were mostly similar to or lower than 2017 travel times. This helped to avoid a continuation of a trend of increasing travel time since 2016.





ROUTE BENEFIT

DAILY PASSENGER BENEFIT (PER 1000)



IMPROVEMENTS

Traffic Signals, Traffic Signs, Channelization - Worked with the City of Seattle to implement the following changes to the corridor:

- Expand transit-only hours to be 6am to 7pm every day
  - Update power-up times of overhead "Do Not Enter" blank-out signs
  - Update and standardize signage (using larger 36" wide retroreflective signs)
  - Permitted commercial vehicles are allowed full access from 9am to 3pm every day
  - Special exceptions to passenger loading made on Pike/Pine and Yesler/Washington blocks
- Left turns off of Third Avenue (i.e. north/south left turns) are prohibited 24/7, except transit
- Install "Bus Only" pavement markings at the beginning of each block in each lane and both directions

Extensive monitoring in October 2018 found that there are many non-transit vehicles still present on the corridor during the PM peak period. It is expected that further design changes to the corridor and/or increased enforcement will be deployed in 2019 in address this issue.

The average travel time in both directions along the 3rd Avenue corridor remained similar to or slightly better than 2017. The improvements have helped to mostly prevent a continuation of a pattern of increasing transit travel times. In addition, travel time reliability (i.e. the variation in travel time) has stabilized since 2017, even as the number of peak-period bus trips and riders on 3rd Avenue has increased by 44 trips and 2,000 people per day, respectively. Further changes to the corridor to deter general purpose traffic violations in 2019 could help further improve travel time and/or travel time reliability.

The number of northbound trips that lasted longer than 11 minutes decreased by 65% compared 2017 conditions.

Acknowledgements:
Jonathan Dong (City of Seattle), Carter Danne (City of Seattle), Chris Evans (City of Seattle), Fred Perez (City of Seattle), Candida Lorenzana (City of Seattle)

SDOT Seattle Department of Transportation

King County

Bronson Way N and Houser Way N

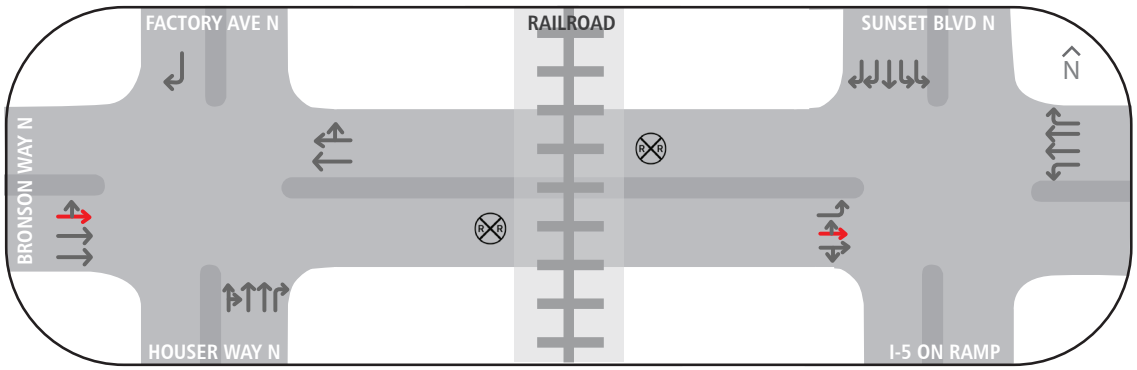
Routes: 105, 143, 143E

8

ISSUE

Eastbound buses on Bronson Way N at Houser Way N were delayed for several cycles or more because the Sunset Blvd N and Houser Way N intersections are close together and traffic was backing up between them.

Peak frequency is 8 buses/hour.



IMPROVEMENTS

Traffic Signals - Worked with the City of Renton to adjust the signal timing to provide for better eastbound traffic flow along Bronson Way. The timing adjustments were made to help buses travel more easily through the closely-spaced intersections of Houser Way and Sunset Boulevard. However, since there is an active railroad crossing between these two intersections, Metro buses must continue to stop at the crossing before proceeding. Therefore, the eastbound green time was extended such that it is more likely that a bus will be able to make it all the way through both intersections.

Reduced delay for coaches waiting multiple cycles to make the thru movement. Recent field observations have noted that buses are now able to move through the intersections of Sunset Blvd and Houser Way in one cycle.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

5 SECONDS DELAY SAVED : 5

ROUTE BENEFIT

3 ROUTES

DAILY PASSENGER BENEFIT (PER 1000)

900 PASSENGERS

Acknowledgements:
Flora Lee (City of Renton)

CITY OF RENTON WASHINGTON

King County

S 3rd Street & Rainier Avenue S

Routes: F Line, 101, 106, 107, 167, 169

9

ISSUE

Southbound buses at 3rd Street and Rainier were getting stuck in heavy queues in the right most lane. The intersection was not clearing the queue of traffic with every cycle and buses were waiting multiple cycles to get through the intersection.

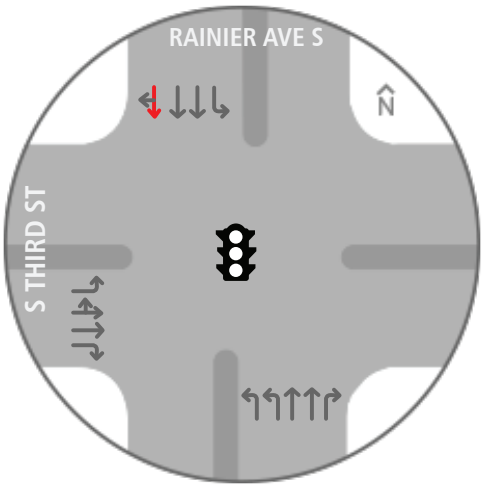


Photo courtesy Google Streetview

IMPROVEMENTS

Traffic Signals - Worked with the City of Renton to change the channelization to allow southbound traffic to use the curb lane. This reduces the vehicle queues at the intersection and reduces delays for buses making the left turn from 2nd Avenue.

Average delay was reduced by 10 seconds per bus (an 18% improvement).

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

10 SECONDS DELAY SAVED : 10

ROUTE BENEFIT

6 ROUTES

DAILY PASSENGER BENEFIT (PER 1000)

8,700 PASSENGERS

Acknowledgements:
Chris Barnes (City of Renton)

CITY OF RENTON WASHINGTON

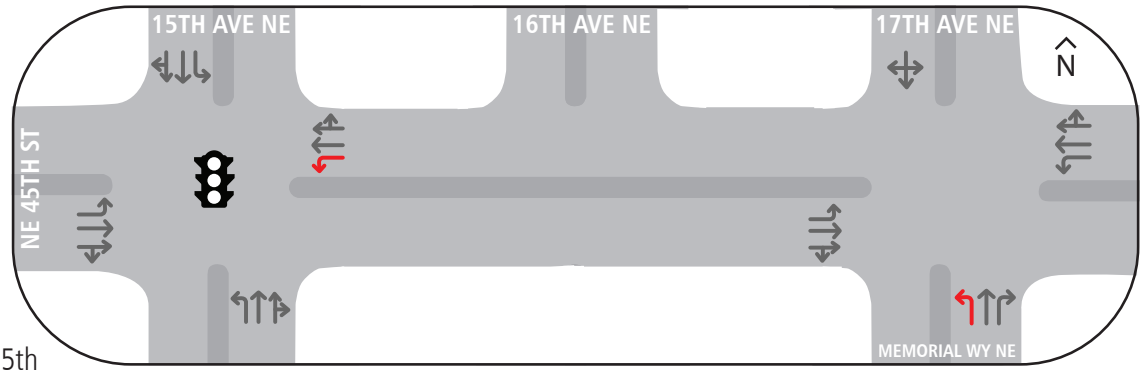
King County

15th-17th Avenue NE and NE 45th Street

Routes: 48, 271, 277, 540

10

ISSUE



Buses coming out of layover on 17th Avenue make a northbound left turn at 45th Street and then another left turn at 15th Avenue. Buses on this path were delayed for several cycles on NE 45th St westbound approaching 15th Ave NE. The westbound queue on NE 45th St would also propagate back to 17th Avenue, further delaying buses attempting to make a northbound left maneuver from Memorial Way NE onto NE 45th St westbound.

Peak frequency is 8 buses/hour.

IMPROVEMENTS

Traffic Signals, Channelization - Worked with the City of Seattle to lengthen the westbound left turn pocket and extend the green time for the westbound left turn at 15th Avenue to help clear the queue.

In 2019, an additional signal timing change will be made at the 17th Avenue intersection, which is expected to further reduce transit delay in this area.

The transit delay for coaches starting their route was reduced by 10 seconds in the AM peak and 8 seconds in the PM peak. This helps the routes to maintain schedule adherence at the very beginning of the route, avoiding delay that could propagate through the remainder of the trip.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

8 - 10 SECONDS DELAY SAVED : 8 -10

ROUTE BENEFIT

3 METRO ROUTES
1 SOUND TRANSIT ROUTE

DAILY PASSENGER BENEFIT (PER 1000)

6,000 PASSENGERS

Acknowledgements:
Jonathan Dong (City of Seattle), John Marek (City of Seattle), Greg Yee (City of Seattle)

SDOT Seattle Department of Transportation

King County

1st Avenue S and S Lander Street

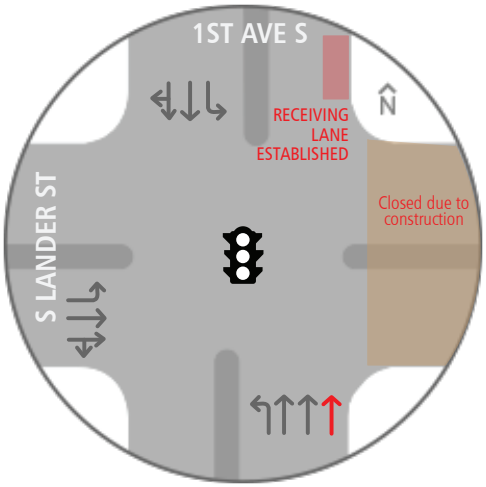
Routes: 21, 37, 50, 116, 118, 119

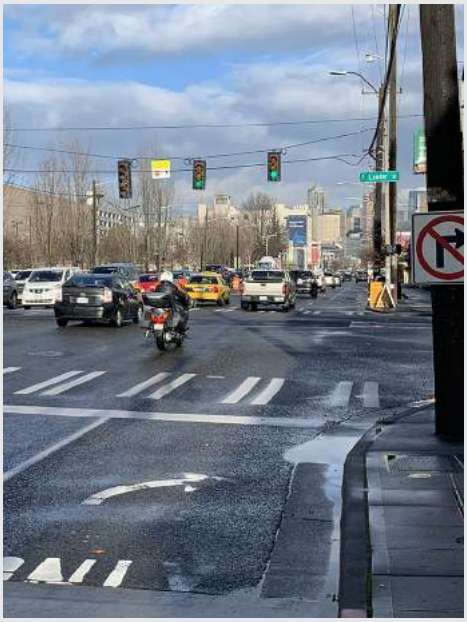
11

ISSUE

Northbound buses on 1st Avenue South at South Lander Street had difficulty merging into traffic after leaving the near side stop due to heavy general purpose traffic volumes.

Peak frequency is 8 buses/hour.





IMPROVEMENTS

Channelization - Worked with the City of Seattle to install a receiving lane and merge area on the north side of the intersection.

This change reduced transit delay by at least 5 seconds for coaches traveling through the intersection. It also has helped to minimize potential conflicts in merging with northbound traffic on 1st Avenue.

TRANSIT BENEFITS

IMPROVE SAFETY

BUS DELAY IMPROVEMENTS (IN SEC)

5 SECONDS DELAY SAVED : 5

ROUTE BENEFIT

6 ROUTES

DAILY PASSENGER BENEFIT (PER 1000)

7,300 PASSENGERS

Acknowledgements:
Nicholas Sharpe (Seattle DOT)

SDOT Seattle Department of Transportation

King County

6th Avenue & Pike Street

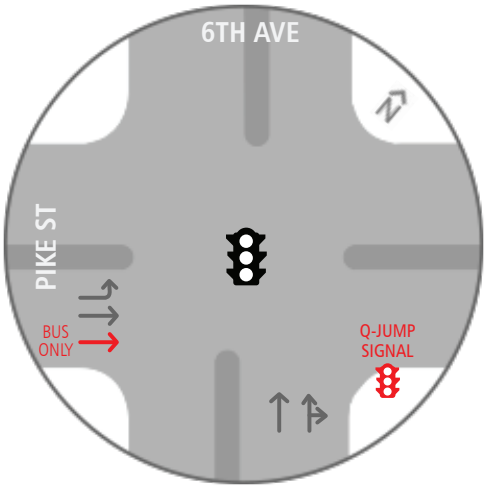
Routes: 76, 77E, 308, 312E, 316, 522

12

ISSUE

The queue jump detection zone (video detection) at the 6th/Pike intersection was located in front of the bus stop flag. This frequently resulted in the queue jump signal not being activated, since buses would typically wait at the bus zone after picking up passengers. Subsequent observation of the signal operation in this area found that most buses arriving at the bus zone had sufficient time to load passengers before the next green light was given for Pike Street. This meant that an "accidental" activation of the queue jump signal by a bus still loading passengers would be rare.

Peak frequency is 28 buses/hour.



IMPROVEMENTS

Traffic Signals, Detection - Worked with the City of Seattle to extend the length of the queue jump detection zone to include the area behind the bus stop flag.

More buses are now using the queue jump, which reduced delay for coaches by 9 seconds during the PM peak period. Utilization of this queue jump allows these buses to maneuver over to the northern through lane on approach to the I-5 Express Lanes on-ramp.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

9 SECONDS DELAY SAVED : 9

ROUTE BENEFIT

6 METRO ROUTES
1 SOUND TRANSIT ROUTE

DAILY PASSENGER BENEFIT (PER 1000)

5,600 PASSENGERS

Acknowledgements:
Jonathan Dong (City of Seattle) , Laura Wojcicki (City of Seattle), John Marek (City of Seattle)

SDOT Seattle Department of Transportation

King County

132nd Avenue SE & SE 256th Street

Route: 168

13

ISSUE

The eastbound right lane is used by both vehicles heading straight and turning left onto 132nd Ave SE. Traffic backs up, creating congestion for eastbound transit traffic on SE 256th St, a condition that will worsen as traffic grows.

Peak frequency is 2 buses/hour.

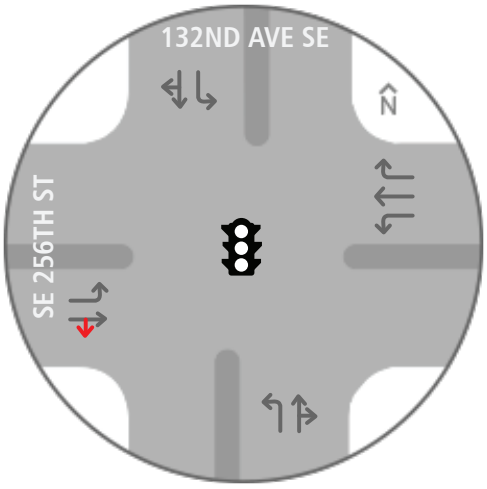


Photo courtesy of Google Streetview

IMPROVEMENTS

Traffic Signals - Worked with the City of Kent to increase the green time for the eastbound approach.

15-second improvement in travel time in the PM peak.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)	ROUTE BENEFIT	DAILY PASSENGER BENEFIT (PER 1000)
15 SECONDS : 15	1 ROUTE	800 PASSENGERS

Acknowledgements:
Rob Brown (City of Kent), April Delchamps (City of Kent), Mike Sorenson (City of Kent)

Greenwood Avenue N & N 104th Street

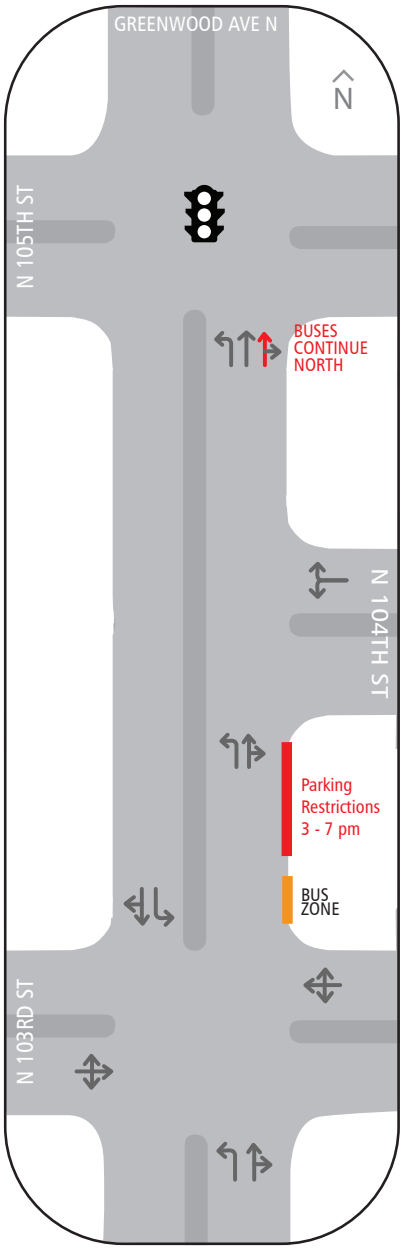
Routes: 5, 355E

14

ISSUE

Northbound buses during the PM peak were delayed from departing the bus zone at far-side 103rd Street (Zone 6710) due to traffic congestion in the adjacent through lane. The bus zone is a pull-out style so buses had to merge back into the through lane to proceed northbound. North of 104th Street the street channelization widens to two through lanes, and these buses continue north on Greenwood via the curb lane.

Peak frequency is 8 buses/hour.



IMPROVEMENTS

Traffic Signs - Worked with the City of Seattle to establish a no parking zone between 103rd and 104th Street during the PM peak (3-7pm). This allows buses to continue northbound through to merge into traffic instead of needing to pull out into the adjacent travel lane. In the future, the bus zone will be relocated to near-side 104th Street to avoid restricting parking on the block.

Travel time in the PM peak was improved by 36 seconds.

TRANSIT BENEFITS

BUS DELAY IMPROVEMENTS (IN SEC)

36 SECONDS DELAY SAVED : 36

ROUTE BENEFIT

2 ROUTES

DAILY PASSENGER BENEFIT (PER 1000)

4,100 PASSENGERS

Acknowledgements:
Matt Beaulieu (City of Seattle), Fred Perez (City of Seattle)

SDOT Seattle Department of Transportation

King County

For more information, please contact
Matthew Crane
206-263-9134
MCrane@KingCounty.gov

King County

Metro Transit | Capital Planning | Speed & Reliability

Matthew Crane
Program Manager, Hot Spot Improvements
MCrane@KingCounty.Gov
206.263.9134

Irin Limargo
Supervisor
Irin.Limargo@KingCounty.Gov
206.477.5809