

# Spot Improvement Annual Report

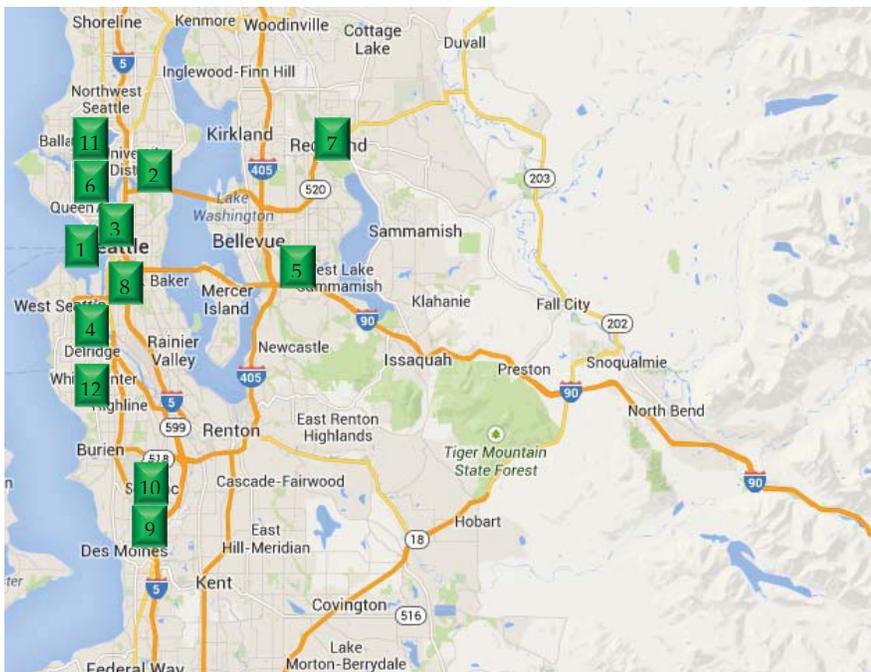
Year 2013

By King County Metro's  
Transit Systems & Traffic Engineering group (TRANSYTE)

The spot improvement program is one of the capital program investments that will help maintain or improve bus travel times and reliability in order to improve the quality and attractiveness of transit. The 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 program improvements may include bus lanes, on-street parking management, bus stop spacing program, traffic signal retiming, traffic signs, roadway channelization, transit signal queue jumps, and transit signal priority.

*Spot Improvement Program supports Strategy 5.1.3 – Improve transit speed and reliability*



## Spot Improvements 2013 Projects



### Bus lanes

1. Broad St Bus Lane
2. Pacific St Bus Lane

### Channelization & Parking Improvements

3. Dexter Ave / 7<sup>th</sup> Ave / Denny Way Bike Weave
4. SW Genesee St
5. Bellevue College
6. Fremont Ave

### Signal Improvements

7. B-Line Flashing Yellow Arrows
8. 6<sup>th</sup> Ave S & Seattle Blvd
9. Pacific Hwy & S 204<sup>th</sup>/208<sup>th</sup> St
10. Pacific Hwy & S 188<sup>th</sup> St

### Others

11. Railroad Crossing Improvements
12. Delridge Ave SW Route change

*Estimated Savings from the above improvements:*

- 4,400+ ANNUAL PLATFORM HOURS
- 55,000+ HOURS OF ANNUAL PERSON-DELAY

## Broad Street Bus Lane



RapidRide D-Line in the westbound bus lane

### Problem Statement

Rapid Ride D-Line coaches often experienced delay through the Belltown area due to traffic congestion and the awkward jog that outbound coaches must do on Broad Street between 3<sup>rd</sup> and 1<sup>st</sup> Ave.

### Assessment

King County Metro has been requesting a new traffic signal installed at the 3<sup>rd</sup> Ave & Denny Way intersection, which would allow outbound coaches to avoid the jog on Broad Street altogether. However, due to the amount of traffic on Denny and the proximity of the intersection to Denny Way & Broad St intersection, SDOT would not approve a new signal at that intersection. As an alternative, SDOT offered to look at installing a Bus/BAT line on Broad Street. On-street parking utilization was low and overall roadway width was adequate to accommodate the new lane.

### The Fix

Parking was removed on the north side of Broad Street between 3<sup>rd</sup> Ave and 1<sup>st</sup> Ave and a Bus lane was installed. The other lanes were shifted to accommodate the new lane.

### Resolution

Rapid Ride D-Line, Magnolia routes, trolley routes, and Ballard express routes all benefit from the bus lane. This improvement benefits over 330 weekday trips and over 8,000 weekday riders.

### Acknowledgements

Jonathan Dong, SDOT  
Adrian Verdugo, SDOT

## Pacific Avenue Bus Lane



Sound Transit bus operated by King County gets a queue jump via the new bus-only lane.

### Problem Statement

A 3+HOV lane was provided in the eastbound direction of Pacific Street approaching Montlake Blvd. The HOV lane was intended to provide a bypass of heavy congestion that occurs in the area. However, the usefulness of the lane was limited by the high amount of HOV lane violators. A violation count performed by King County Metro showed that about 50% of the vehicles using the lane were violators.

### Assessment

The 3+HOV lane is an unusual operation on a city street; there are no other HOV lanes on City of Seattle streets. King County Metro proposed to SDOT to convert the HOV lane to Bus-Only operation. This change in operation would reduce the amount of vehicles in the lane, and bus-only restrictions would be easier to enforce than HOV restrictions.

### The Fix

The University of Washington was consulted about the proposal, and agreement was reached with the proposed solution. The 3+HOV signs and markings were removed from the lane and new bus-only signs were installed. BUS ONLY lane markings were installed later.

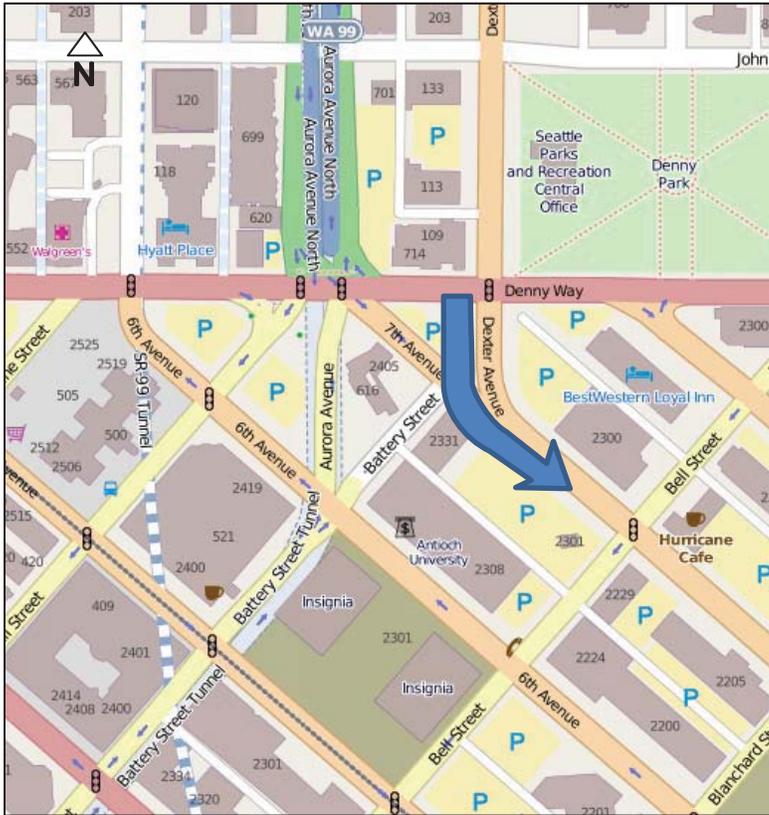
### Resolution

The improved lane operation helps reduce delay to over 330 weekday transit trips and over 6,800 weekday riders. SDOT and King County Metro are continuing to monitor the operation of this lane. Although violations have been significantly reduced, they are still occurring with high frequency and additional measures are being considered to reduce violations.

### Acknowledgements

Dongho Chang, SDOT  
Jonathan Dong, SDOT  
Celeste Gilman, University of Washington

## Dexter Avenue, 7<sup>th</sup> Avenue, & Denny Way Bike Weave



New bike lane and bus-only lane markings near the southbound bus stop

### Problem Statement

After a new bike lane treatment was installed in 2010 at the intersection of Dexter Ave, Denny Way, and 7th Ave, bus drivers and transit safety officers complained about an awkward weave that occurred between bikes in the bike lane and buses accessing the southbound bus zone. Under this configuration, buses were not allowed to continue in the curb lane between the bus stop and a right turn at Bell Street; this required buses to cross the bike lane up to three times within this area.

### Assessment

King County Metro and SDOT collaborated on a design to fix the weaving problem. An initial design was developed that would install a bus stop island, similar to the others on Dexter. Although this would have been an elegant solution, it proved to be too expensive to complete as a stand-alone project. Also, Service Planning staff had indicated that Routes 26 & 28 may move to Battery/Wall Streets after the Highway 99 North Portal project is complete, which would mean that the island could be abandoned after only a few years of operation.

### The Fix

An alternative lower-cost plan was developed to solve the weaving problem using only paint line adjustments and some parking removal. The lane configuration of Dexter Avenue and 7th Avenue was modified so that buses only have to cross the bike lane once, and then can continue in the curb lane all the way to Bell Street. Also, the southbound right turn lane on Dexter Avenue approaching Denny Way was extended, which allows buses to bypass right turn queues that tend to build up during the PM peak.

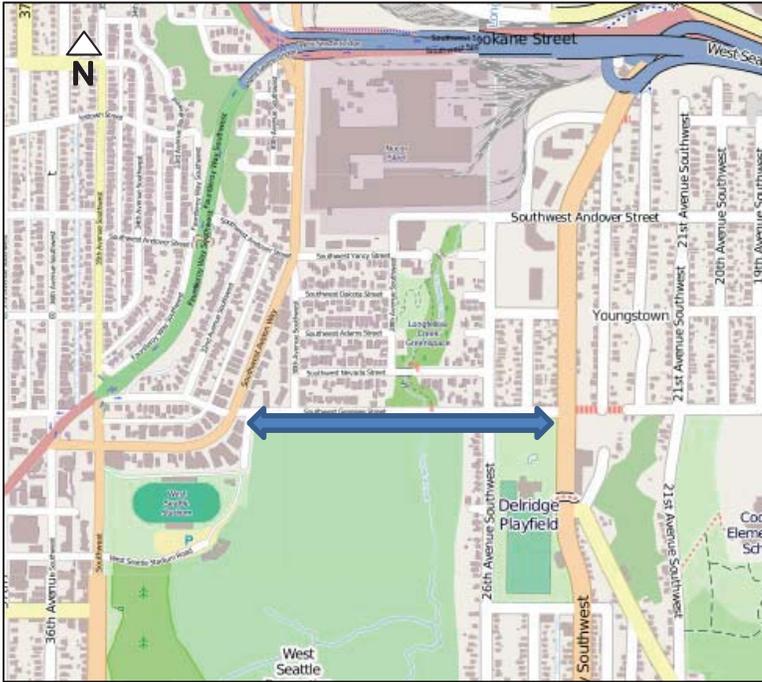
### Resolution

The alternative channelization plan significantly reduces the number of bike-bus conflict points and eliminates bus delay related to waiting for gaps in bicycle and general traffic in adjacent lanes. Metro's safety department has noted an improvement in the operating environment through this area.

### Acknowledgements

Carol McMahan, SDOT  
Adrian Verdugo, SDOT

## SW Genesee St Lane Width



SW Genesee St with removed parking and shifted centerline

### Problem Statement

With the Fall 2012 service change, the new Route 50 began operating on SW Genesee St between Delridge Way & Avalon Way. This portion of Genesee had narrow travel lanes and there was not adequate width for oncoming buses or other large vehicles to pass.

### Assessment

Parking was allowed on the south side of Genesee St for almost the entire length between Delridge Way and Avalon Way. Prior to the September 2012 service change, King County Metro requested SDOT to restrict parking in selected locations, and consider additional improvements along the remainder of Genesee St. SDOT investigated the parking utilization and conducted outreach to the adjacent residents. It was determined that the on-street parking was not well utilized and most residents had alternative on-site parking or parking available on other streets.

### The Fix

The selected parking restrictions were installed before the September 2012 service change, while SDOT considered changes along Genesee. Based on the sub-standard lane width and low parking usage, SDOT implemented parking resections along the entire length of Genesee between Delridge and Avalon Way. In 2013, the center line was shifted to redistribute the lane width between the two lanes.

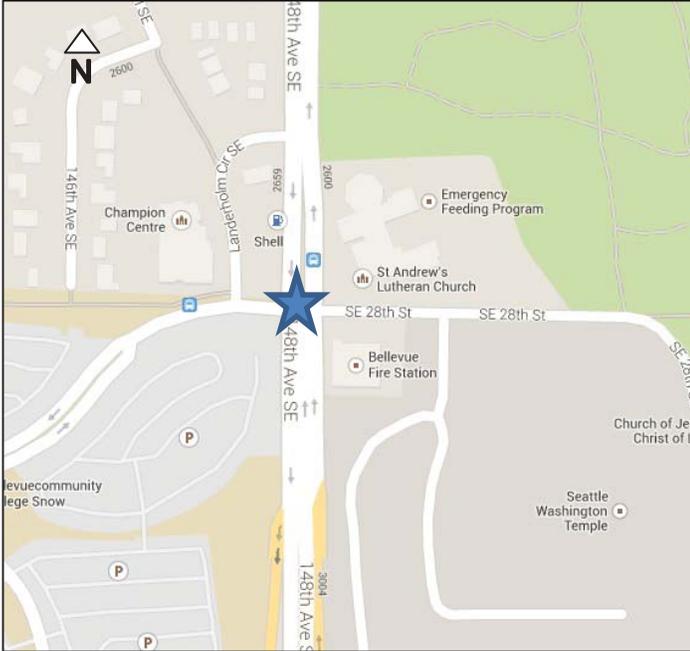
### Resolution

Route 50 coaches now enjoy 12.5' lanes in both directions along SW Genesee St. This results in faster, safer, and more reliable operation for over 70 weekday trips. King County Metro is continuing work with SDOT to modify the intersection of Delridge Way & Genesee St that will eventually allow 40' coaches on the Route 50.

### Acknowledgements

Reiner Blanco, SDOT  
Jonathan Dong, SDOT

## Bellevue College



A bus in the outside turn lane making a wide turn to stay in-lane through the whole maneuver.

### Problem Statement

The eastbound right turn on SE 28<sup>th</sup> Street to 148<sup>th</sup> Ave SE is a double turn lane. There have been a higher than normal number of collisions between buses and cars in this intersection. Buses using the outside turn lane and cars using the inside turn lane have collided due to the geometry of the intersection.

### Assessment

King County Metro and City of Bellevue assessed the current conditions and found that many of the buses were crossing the white line with their rear tire while going through the intersection. Also, cars were changing lanes from the inside lane to the outside lane within the intersection. The combination of these maneuvers has caused a number of collisions between the buses and general purpose vehicles.

### The Fix

After meeting with the City of Bellevue and discussing options, it was decided that there needed to be more separation between the two turning lanes to discourage lane changing in the intersection. King County Road Services installed a painted island with raised pavement markers between the turn lanes to encourage vehicles in the outer turn lane to make wider turns and to encourage vehicles in the curb lane to stay in the curb lane.

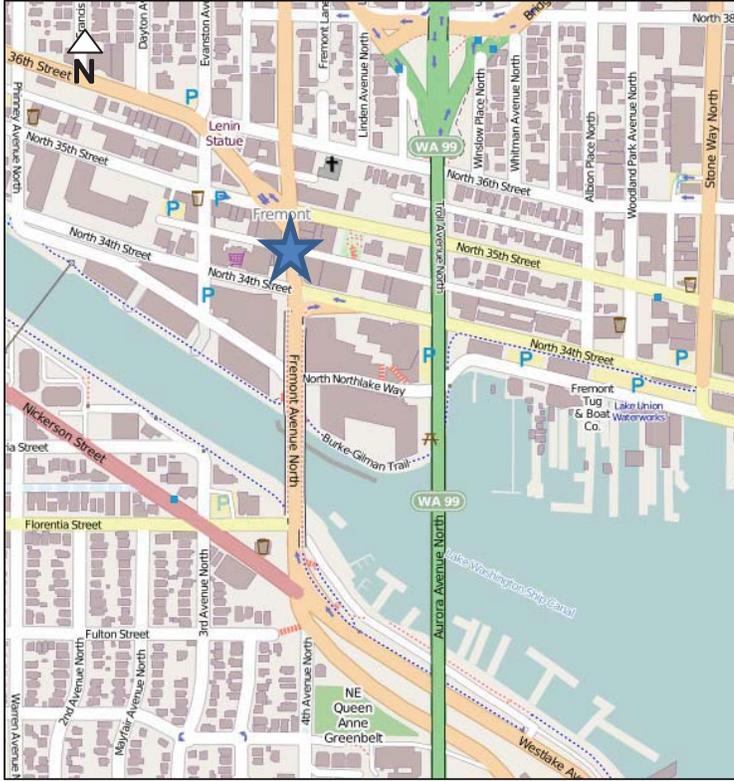
### Resolution

Buses passing through this intersection are now making a wider turning maneuver while being guided by the painted island and this will hopefully reduce the number of bus and general purpose traffic collisions that are occurring in the intersection. This improvement helps over 190 trips per weekday.

### Acknowledgements

Raid Tirhi, City of Bellevue  
Rick Thibodeau, King County Road Services

## Fremont Avenue N between 34<sup>th</sup> & 35<sup>th</sup> Ave



On-street parking removed on the northbound side of Fremont Ave approaching N 35<sup>th</sup> Street.

### Problem Statement

In the northbound and southbound direction of Fremont Avenue N between 35th and 34th Street, a handful of on-street parking spaces were making it difficult for coaches to maneuver in and out of the busy bus stops near the center of Fremont. The effective length of the southbound bus zone was limited due to the on-street parking. After the Fall 2012 service change, the volume of buses travelling on Fremont Ave was significantly increased.

### Assessment

King County Metro staff worked with SDOT to evaluate potential parking restrictions along both sides of Fremont Ave. SDOT & Metro contacted adjacent businesses to gauge the impact of proposed parking restrictions. One of the 30-minute commercial load zones on the southbound side would have to be relocated.

### The Fix

The proposed parking restrictions were put into place in Fall of 2013. In addition, parking signage and curb paint in the area was updated to make it more visible and easier to understand. The 30-minute load zone was relocated to N 35<sup>th</sup> Street.

### Resolution

The new parking restrictions help Routes 26, 28, 31, 32, and 40 negotiate this part of Fremont Avenue and ensure consistent running times even during periods of traffic congestion. Over 400 bus trips per weekday benefit from these changes.

### Acknowledgements

Reiner Blanco, SDOT  
Julie Erickson, SDOT  
Fred Perez, SDOT

## Flashing Yellow Left Turn Arrows along B-Line in Redmond



Flashing yellow arrow signal light installed at all the subject intersections, plus relevant signage.

### Problem Statement

Along the main roadway, the intersections of NE 40<sup>th</sup> St and 148<sup>th</sup> Ave NE, NE 40<sup>th</sup> St and 150<sup>th</sup> Ave NE, NE 40<sup>th</sup> St and 152<sup>nd</sup> Ave NE, and NE 90<sup>th</sup> St and 160<sup>th</sup> Ave NE all had protected-only left turn movements. Since Transit Signal Priority has been implemented, the wait time for turning vehicles had increased due to the shortened light cycles.

### Assessment

King County Metro staff contacted the City of Redmond with concerns about these intersections. After performing analysis of the intersections, the City of Redmond concluded that protected-permissive left turn phasing could be installed while meeting safety requirements. Protected-permissive phasing would also allow faster bus movement through the intersections, as well as reduced delay for general traffic.

### The Fix

The City of Redmond installed the new signal phasing and optimized the signal timing. New protected-permissive phasing was implemented using flashing yellow arrow displays. New signage was placed at each intersection to inform drivers of the change.

### Resolution

The flashing yellow arrows have reduced the amount of time vehicles spend waiting at the intersection in all directions. Vehicles waiting to turn left can proceed when there is a gap in the oncoming flow of traffic. The delay for Rapid Ride B-Line and other bus routes making through movements has also been reduced by preventing left turn lane spill-over and less green time devoted to left turns. Over 225 weekday trips benefit from these changes.

### Acknowledgements

Bruce Newman, City of Redmond

## 6<sup>th</sup> Avenue S and Seattle Blvd Video Detection Installation



Buses leaving the base successfully pass through the intersection on the first cycle.

### Problem Statement

Buses leaving the Atlantic and Central Bases were often delayed when trying to turn left onto Seattle Boulevard from 6<sup>th</sup> Avenue South, due to the signal operation at this intersection. It would typically take multiple signal cycles for the buses to get through the intersection and continue on to their routes.

### Assessment

Recurring delays were occurring due to the short green time available for vehicles approaching northbound on 6<sup>th</sup> Avenue S. A broken loop detector was not able to accurately gauge how long the vehicle queue was, and would not allow a green light to be extended to allow all the waiting vehicles to get through. The signal's coordination with the other signals along Seattle Boulevard and Airport Way S was also causing long waits for the vehicles on 6<sup>th</sup> Avenue S because the signal would have to wait for a defined point in the signal coordination cycle. Replacing the loop in the roadway would be costly and it would not likely last long due to the poor pavement condition.

### The Fix

Video detection was proposed at this intersection for all directions, so that queue lengths could be determined properly. The coordination of this signal with other signals along Seattle Boulevard and Airport Way S was also reworked to allow for a shorter wait time for traffic in the side streets. There was minimal disruption to traffic during installation. The improvements were implemented in Spring 2013.

### Resolution

The video detection and the new signal coordination have reduced the wait time for vehicles waiting northbound on 6<sup>th</sup> Avenue S. Vehicles are now able to cross the intersection in one cycle, significantly reducing delays for both bus and general traffic. Over 300 weekday revenue & deadhead trips benefit from this improvement.

### Acknowledgements

Chris Faulkner, SDOT

## Pacific Highway S & S 204<sup>th</sup>/208<sup>th</sup> St Left Turn Changes



New signal display at the subject intersections

### Problem Statement

At both these intersections, the northbound and southbound left turn movements were previously a protected-only movement. Vehicles turning left had to wait significantly long times for the protected left turn phase, and enough green time had to be provided to the protected left turn phase to clear out all of the queued vehicles. Rapid Ride A-Line coaches on Pacific Highway S were delayed when these signals provided protected-only left turn phases.

### Assessment

The City of SeaTac studied the intersection to see if the protected-only left turn could be effectively and safely converted to a protected-permissive left turn. This would reduce delay for vehicles trying to make a northbound or southbound left turn at these intersections, and increase the amount of green time available for north-south movements.

### The Fix

The protected-permissive operation was accepted by all involved agencies and new protected-permitted left turn signal phases and additional signage were installed to show the new operation.

### Resolution

Protected-permissive phases reduce queuing and delays to RapidRide A-Line coaches travelling along Pacific Highway S, as well as the general vehicle traffic.

### Acknowledgements

Susan Sanderson, City of SeaTac  
Rick Thibodeau, King County Road Services

## Pacific Highway S & S 188<sup>th</sup> St Video Detection Installation



Southbound left turn signals changing to yellow after allowing all vehicles through the light

### Problem Statement

The heavy traffic going southbound on Pacific Highway S turning eastbound onto S 188<sup>th</sup> Street creates a long queue at that traffic signal. Metro buses as well as general purpose traffic were getting stuck at the intersection because of a short left turn phase. Many vehicles had to wait for multiple cycles to get through the intersection.

### Assessment

It was determined that the detection at this intersection was damaged, and the detection system needed to be replaced. When deciding between different options, video detection was chosen due to its lower cost and minimal disruption it creates when installing.

### The Fix

King County Road Services installed video detection cameras for the southbound left turn lanes. This camera is able to detect the amount of cars waiting to turn left, and can adjust the amount of green time provided.

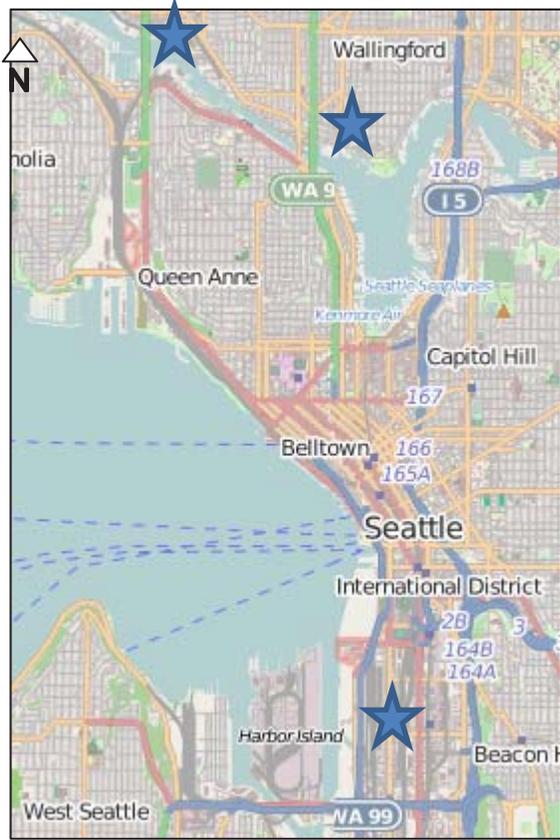
### Resolution

After the installation of the video detection, the signal has been able to accurately gauge the amount of traffic waiting to turn left on to S 188<sup>th</sup> Street from Pacific Highway S. This has reduced the delay for both buses and general purpose traffic and allows for traffic to flow more smoothly. The need to recall the left turn phase each cycle has also been disabled due to the vehicle detection being replaced. Over 290 daily trips on Rapid Ride A-Line and Routes 180 and 156 benefit from this improvement.

### Acknowledgements

Susan Sanderson, City of SeaTac  
Rick Thibodeau, King County Road Services

# Railroad Crossing Improvements



TRACKS OUT OF SERVICE sign exempts buses from needing to stop at this abandoned railroad crossing.

### Problem Statement

Federal safety rules currently require all bus drivers to stop at all railroad crossings to stop, look, and listen for approaching trains. At several locations, frequent bus routes crossed railroad crossings that were abandoned and had zero chance of a train approaching (at some crossings the tracks were physically disconnected or partially paved over). However, the stop, look, listen rule still applied at the abandoned crossings, causing needless stops and delay.

### Assessment

After lengthy discussions with cities, the Washington State Utilities & Transportation commission, and local representatives from several railroads, it was determined that these clearly abandoned railroad crossings could be posted with a TRACKS OUT OF SERVICE sign that would exempt bus drivers from having to stop at these crossings. Depending on the ownership of the tracks, either the railroad or city would be responsible for installing and maintaining the signs.

### The Fix

Three locations were identified in the City of Seattle that were no longer owned by any railroad and could have signage installed by SDOT. These locations are: Leary Way & 14th Ave NW, 35th St & Stone Way N, and S Lander St & S Occidental St. TRACKS OUT OF SERVICE signs have been installed at the first two locations, and will soon be installed at the third location.

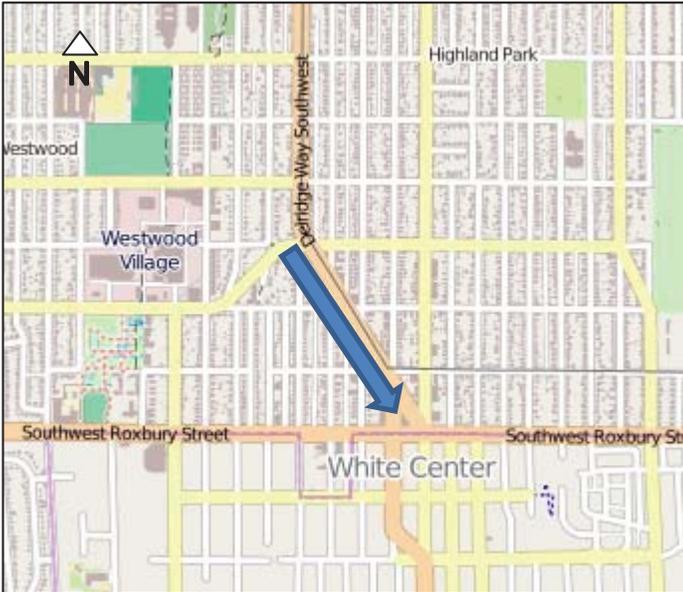
### Resolution

Buses will longer have to stop at these three abandoned railroad crossings. This equals over 500 avoided coach stops each weekday.

### Acknowledgements

Chris Eaves, SDOT  
Cathy Hunter, Washington State UTC

## Delridge Ave SW Route Change



Route 60 turning from the newly paved Delridge Way onto Roxbury with a protected signal

### Problem Statement

There were reports of safety concerns for operators making a southbound left turn from 16<sup>th</sup> Av SW to SW Roxbury Street.

### Assessment

At a meeting in the field with staff from SDOT and King County Metro, it was determined that due to the geometry of the 5-legged intersection at Delridge, 16<sup>th</sup> SW & Roxbury, it was difficult for drivers to make the southbound left turn and at the same time yield to opposing traffic and pedestrians. Many operators had to wait until the signal turned yellow to make the left turn.

### The Fix

Reroute the buses from coming southbound on 16<sup>th</sup> to come southbound on Delridge. This required reclassification of the section of Delridge between Roxbury and 17<sup>th</sup>. The SDOT Delridge Paving project would also construct new a concrete and asphalt roadway that would be suitable for bus traffic.

### Resolution

The new reroute of buses saved time for the Route 60 and provided a protected left turn without any vehicle or pedestrian conflict from southbound Delridge Way to eastbound Roxbury Street.

### Acknowledgements

Dongho Chang, SDOT  
Jonathan Dong, SDOT