Portland Region
2016 Traffic Performance Report

Oregon Department of Transportation
Region 1

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Oregon Department of Transportation

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Executive Summary

Purpose of this report

This 2016 Traffic Performance Report provides information on the health of the region's freeway system. It establishes a baseline for long-term monitoring that will enable Oregon Department of Transportation (ODOT) to better understand the urban freeway traffic mobility conditions of the system.

Advancements in traffic data collection methods have enabled ODOT to systematically collect, store, evaluate, and monitor traffic conditions on all of its freeway corridors in the metro area. Key traffic performance areas that relate to urban mobility are:

1. **Congestion and bottlenecks**
2. **Reliability**
3. **Safety**

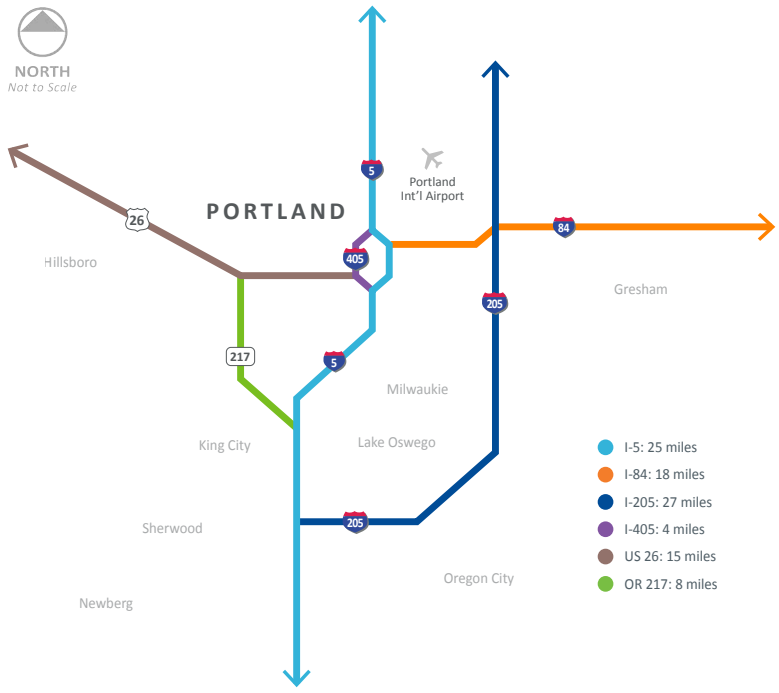
By monitoring key transportation performance indicators, ODOT can identify problems, and effectively manage the system to better enable the movement of people, goods and services.

This report covers the 2013-2015 time period and will be updated as new data become available.

Traffic congestion and bottlenecks in the metro area grew along with population

The Portland region grew by 30,761 people from July 2014 to July 2015, according to the U.S. Census Bureau,[1] ranking the region 19th on the list of U.S. metro areas with the greatest number of new residents.[2] Jobs and the economy also grew; in 2015, Portland outpaced the national average for metro areas in job growth. Portland added 35,800 new jobs from September 2014 to September 2015, for a total of 1.1 million jobs.[3] The region's infrastructure is now tasked with accommodating additional traffic as more residents travel for work and daily activities and more businesses need to move goods and services on the highway system.

There are six freeway corridors in Region 1:



TIME PERIOD REPORTED

TRAVEL TIME, SPEED AND RELIABILITY indicators are reported for **PEAK PERIODS.**

These time periods include enough time to capture the current peak periods and account for future growth into shoulder peak periods to allow for year-to-year tracking of congestion.

MEASURING PERFORMANCE

Performance measures indicate the variety of **CHALLENGES** facing the region's freeway system:

INCREASED CONGESTION, DELAY & CRASHES

Encroachment of **CONGESTION** into the **MID-DAY PERIOD**

DEGRADED travel time **RELIABILITY**

Data for the region's six freeways show increasing congestion, decreasing travel speeds, greater delays and unreliable trip times. Traffic congestion in the Portland region can now occur at any hour of the day, including holidays and weekends; it is no longer only a weekday peak hour problem. In 2013, 11.3 percent of all travel in the Portland metro region took place in congested conditions. This increased to 13.7 percent in 2015.

This traffic congestion is directly affecting freight in the region. The increasing congestion is moving into the mid-day hours. In the past, freight relied on the congestion-free mid-day hours to move goods and services in the region. As the mid-day becomes more unreliable, freight is having more problems meeting delivery schedules, and the cost of shipping is increasing.

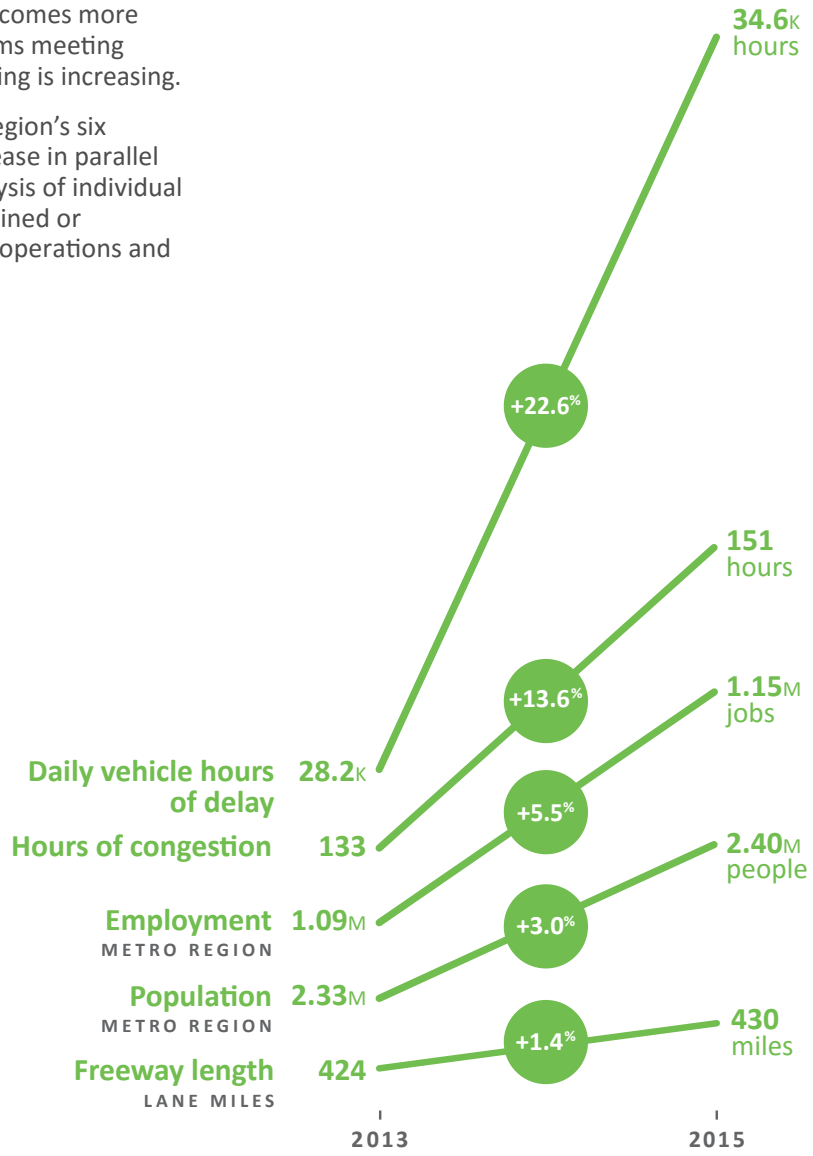
Overall, the number of crashes for the region's six freeway corridors has continued to increase in parallel with growing congestion. However, analysis of individual corridors shows the crash trend has declined or stabilized after construction of targeted operations and safety projects.

WHILE THE POPULATION HAS GROWN BY 3.0%,

HOURS OF CONGESTION HAVE INCREASED 13.6%,

AND DAILY VEHICLE HOURS OF DELAY HAVE INCREASED 22.6%.

THERE HAS BEEN JUST OVER 1% GROWTH IN FREEWAY LANE MILES



Regional growth
Percent change from 2013-2015
Sources: U.S. Census, Oregon Employment Department, Metro, ODOT corridor total (OR 217 removed due to construction activities)

Corridor-level performance

The traffic data indicate the region's travel speeds and travel time reliability are systematically getting worse. The following are the performance indicators for the 2013-2015 time period.

Region's corridors with slowest average weekday speed (mph)

Source: FHWA NPMRDS

Average Speeds				
Corridor Location	Time of Day	2013	2015	Change
I-405 SB	PM	31.9	29.0	-2.9
I-405 NB	PM	33.8	30.2	-3.6

I-405's average speed for the PM period is the lowest in the region.

I-5 NB	PM	36.4	31.5	-4.9
I-5 SB	PM	42.3	38.2	-4.1

I-5's average speed for the PM period is among the lowest in the region, with a significant degradation of speed from 2013 to 2015.

I-205 NB	PM	42.6	35.4	-7.2

I-205's average speed for the PM period is among the lowest in the region, with the largest degradation of speed from 2013 to 2015.

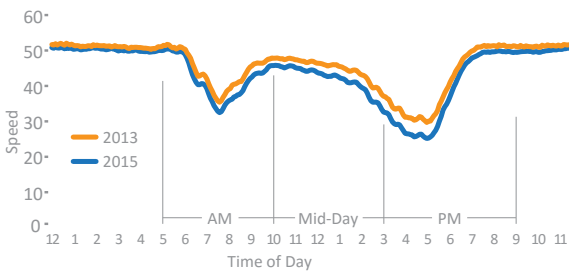
OR 217 SB	PM	32.4	35.3	+2.9

OR 217 SB's average speed for the PM period is among the lowest in the region, but it has shown a slight improvement in speed. This is a result of the Active Traffic Management implementation project in 2014.

Weekday system speed by time of day

2013 vs. 2015

Source: FHWA NPMRDS



Region's top recurring bottlenecks

These are the most severe recurring bottlenecks for each corridor

Source: FHWA NPMRDS

Bottleneck location	2013	2015	Change
I-5 NB I-5 Interstate Bridge ▸ Capitol Hwy *11.5 Miles*	1:30-7:30 PM *6.0 hrs*	1:30-7:30 PM *6.0 hrs*	--
I-5 SB Rose Quarter ▸ Rosa Parks Way *3.0 Miles*	7:45-9:30 AM *1.75 hrs* 12:30-6:00 PM *5.5 hrs*	7:45-9:45 AM *2.0 hrs* 11:00 AM-6:15 PM *7.25 hrs*	*+2.0 hrs*
I-84 EB I-205 ▸ I-5 *6.0 Miles*	1:00 PM-7:00 PM *6.0 hrs*	12:30-7:00 PM *6.5 hrs*	*+0.5 hrs*
I-205 NB Abernethy Bridge ▸ I-5 *8.5 Miles*	— —	3:15-6:15 PM *3.0 hrs*	*+3.0 hrs*
I-205 NB Glenn Jackson Bridge ▸ Powell *5.8 Miles*	3:30-6:30 PM *3.0 hrs*	2:45-6:30 PM *3.75 hrs*	*+0.75 hrs*
I-205 SB Division ▸ Glenn Jackson Bridge *5.3 Miles*	2:30-6:00 PM *3.5 hrs*	2:30-6:00 PM *3.5 hrs*	--
I-405 SB I-5 ▸ Fremont Brg. *3.5 Miles*	2:30-6:15 PM *3.75 hrs*	2:15-6:15 PM *4.0 hrs*	*+0.25 hrs*
US 26 EB Vista Ridge Tunnel ▸ OR 217 *4.9 Miles*	7:00-9:15 AM *2.25 hrs* 12:00 PM-7:00 PM *7.0 hrs*	6:15-11:59 AM *5.75 hrs* 12:00 PM-7:45 PM *7.75 hrs*	*+4.25 hours*
OR 217 SB Hall Blvd ▸ US 26 *3.5 Miles*	1:00-6:15 PM *5.25 hrs*	12:00-6:15 PM *6.25 hrs*	*+1 hour*
OR 217 NB Denney Rd ▸ I-5 *3.5 Miles*	7:15-9:00 AM *1.75 hrs* 3:00-6:30 PM *3.5 hrs*	7:15-9:00 AM *1.75 hrs* 3:00-6:30 PM *3.5 hrs*	-- --

BUFFER TIME

is a measure of **RELIABILITY;** it is the **EXTRA TIME** or cushion a traveler should **ADD TO THEIR TRIP** to ensure

ON-TIME ARRIVAL.

INCREASING BUFFER TIME equates to **RELIABILITY GETTING WORSE.**

Region's reliability

Travel time reliability summary

Source: FHWA NPMRDS

Corridors with least reliable travel*

Corridor location	Time of day	Travel time buffer (minutes) 2013	2015	Change	% Change
I-5 NB	PM	35.5	38.4	+2.9	8.2%
I-5 SB	PM	34.0	46.1	+12.1	35.6%
I-205 NB	PM	31.2	43.4	+12.2	39.1%
I-405 NB	PM	3.7	6.7	+3.0	81.1%
I-405 SB	PM	4.4	6.2	+1.8	40.9%
US 26 EB	PM	16.2	17.8	+1.6	9.8%
OR 217 SB	PM	7.6	8.1	+0.5	6.6%

Corridors with most significant increases in PM buffer time*

Corridor location	Time of day	Travel time buffer (minutes) 2013	2015	Change	% Change
I-5 SB	PM	34.0	46.1	+12.1	35.6%
I-205 NB	PM	31.2	43.4	+12.2	39.1%
I-405 NB	PM	3.7	6.7	+3.0	81.1%
I-405 SB	PM	4.4	6.2	+1.8	40.9%
US 26 WB	PM	2.0	5.4	+3.4	170%

Corridors with largest increases in mid-day buffer time*

Corridor location	Time of day	Travel time buffer (minutes) 2013	2015	Change	% Change
I-5 NB	Mid-Day	10.0	14.5	+4.5	45.0%
I-205 NB	Mid-Day	4.0	8.1	+4.1	102.5%
I-205 SB	Mid-Day	4.2	9.6	+5.4	128.6%
US 26 EB	Mid-Day	3.7	7.0	+3.3	89.2%
OR 217 SB	Mid-Day	2.1	5.0	+2.9	138.1%

**Selection based on buffer time weighted for length of corridor*

Corridor with improved buffer time* and reliability

Corridor location	Time of day	Travel time buffer (minutes) 2013	2015	Change	% Change
I-84 EB	PM	12.0	6.8	-5.2	-43.3%

Reliability on I-84 EB has shown a decrease in both average and buffer travel time during the PM peak. This is due to the auxiliary lane extension project constructed in 2014 at the I-84 EB exit ramp to I-205 NB.

Corridor that experienced sustainable reliability

Corridor location	Time of day	Travel time buffer (minutes) 2013	2015	Change	% Change
OR 217 SB	PM	7.6	8.1	+0.5	+6.6%

OR 217 SB PM travel time has decreased and the buffer time change is among the lowest in the region.

This is the result of the Active Traffic Management (ATM) project that was deployed in 2014. The purpose of the ATM is to manage the recurring congestion to improve the safety and reliability of the corridor.

Corridor-level improvements linked to recent projects

ODOT has recently been implementing cost-effective improvements that reduce crashes, delay and relieve congestion at recurring bottleneck on the freeway system.

ODOT's RealTime[4] strategy is a toolbox of active traffic management technologies designed to improve safety and reliability by providing variable speed, queue warning and traveler information to manage congestion.

ODOT has built auxiliary lanes as low-cost improvements to address safety and operations problems at specific localized bottlenecks.

The auxiliary lanes will not provide long-term capacity relief to congestion problems, but they will improve safety at the bottleneck location.

REALTIME IMPROVES PERFORMANCE

After one year of operations, the RealTime results have shown a reduction of total crashes along OR 217, including severe crashes, all while improving trip reliability.

Travel Time RELIABILITY IMPROVEMENT

10%

TOTAL CRASHES down by 21%

AUXILIARY LANE IMPROVES PERFORMANCE

A recurring bottleneck occurred at the I-84 EB ramp exit from the Halsey exit to the I-205 NB entrance. The queue from the exit to I-205 NB blocked the mainline through traffic. This queue on I-84 EB extended back to the I-205 SB exit and beyond.

ODOT extended the existing auxiliary lane at the Halsey Street exit to the I-205 NB exit. The outside auxiliary lane provides space and isolates the queue to the I-205 NB exit from the mainline through traffic.

Daily VEHICLE HOUR DELAY reduced by 10%

EASTBOUND CRASHES reduced by 14%

PM Peak IMPROVED 5% TRAVEL TIME AND SPEED

PM RELIABILITY {BUFFER TIME} IMPROVED 43%

Upcoming projects to address bottlenecks and safety hotspots

Auxiliary lane and RealTime projects are planned to improve reliability and safety at bottleneck locations.

These projects will not eliminate congestion on an entire corridor, but are expected to improve performance of the targeted segment.

In addition, two large-scale projects are being planned to improve safety and reliabilty, and increase capacity at specific locations.

Auxiliary lanes

- **A** I-205 SB from I-84 to Washington/Stark Street
- **B** I-205 NB from I-84 to Killingsworth Street
- **C** I-5 SB from Lower Boones Ferry Road to I-205
- **D** OR 217 SB from Beaverton-Hillsdale Highway to OR 99W, and collector/distributor road from Allen and Denney interchanges
- **E** OR 217 NB auxiliary lanes between OR 99W and Scholls Ferry Road

RealTime signs and active traffic management (ATM)

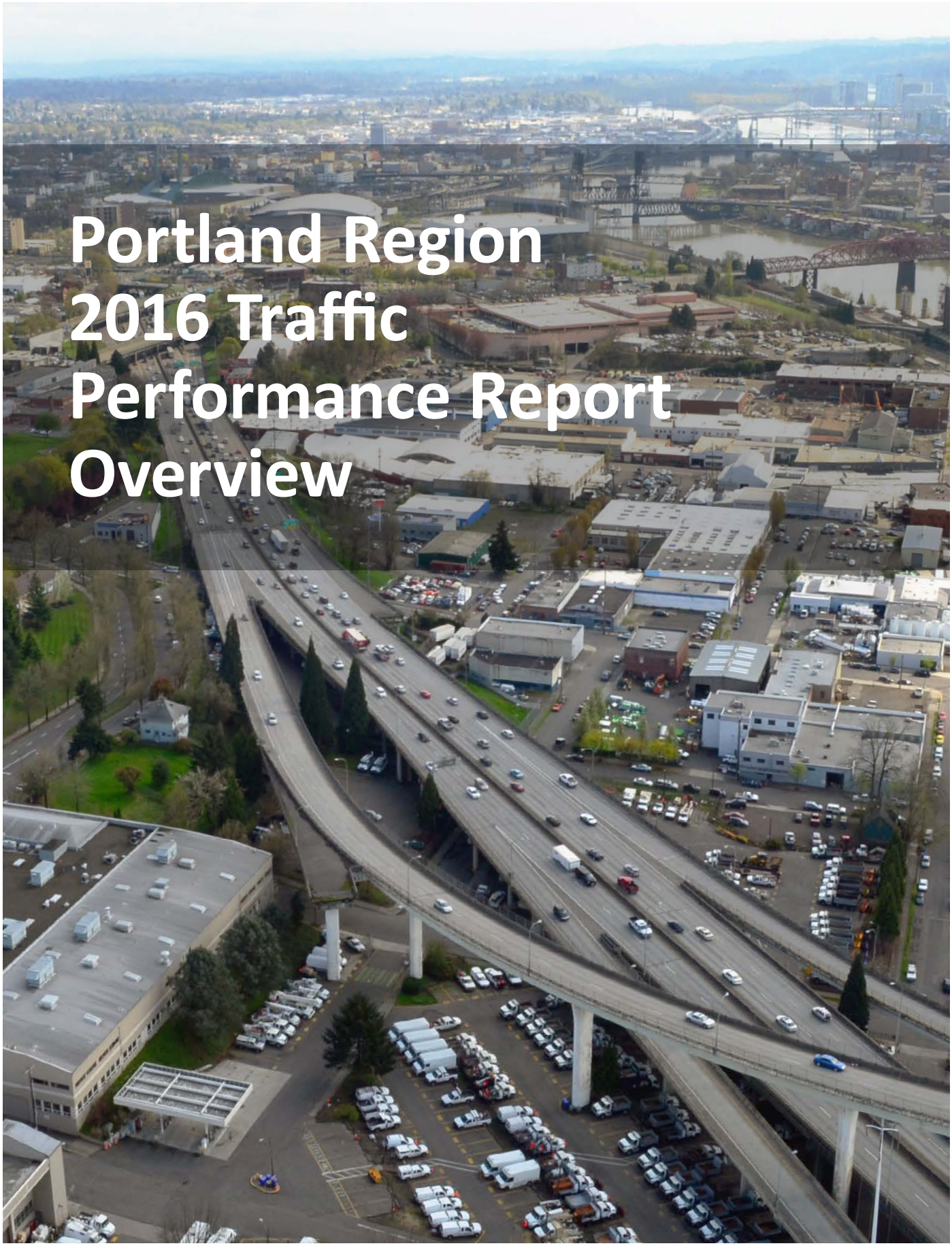
- **F** US 26, I-84, and I-5, projects are expected to improve safety and operations on the freeway

Larger-scale projects planned to improve reliability and safety

- **G** I-205 from Stafford Road to OR 213 widening (including widening of the Abernethy Bridge)
- **H** I-5: Rose Quarter (Broadway/Weidler Interchange and vicinity) safety and reliaibilty improvements

These projects are currently in the environmental review and preliminary design phases.

Portland Region 2016 Traffic Performance Report Overview



Congestion

Performance indicators region-wide are compiled data from all freeway corridors. This is an overview of how the regional system is performing, not indicative of individual corridor performance.

Overall, congestion indicators ARE GETTING WORSE. As congestion increases in the AM and PM, PEAK PERIODS ARE SPREADING INTO THE MID-DAY.

Source: FHWA NPMRDS

Regional	2013	2014	2015	*2013 vs 2015* % Change
Daily Vehicle Miles Traveled (Weekday Average Rounded to Millions)	8.6	8.6	8.7	+0.5%
Congestion Indicators (Weekday Average)				
Hours of Congestion (Daily Hours)	132.8	144.3	150.8	+13.6%
Daily Vehicle Hours Delay (Daily Vehicle Hours)	28,238	32,555	34,629	+22.6%
AM Peak Travel Time (Minutes)	228.7	233.6	237.5	+3.9%
AM Peak Speed (MPH)	48.8	48.3	47.5	-2.7%
Mid-day Travel Time (Minutes)	211.6	215.7	217.3	+2.7%
Mid-day Speed (MPH)	52.7	51.9	51.5	-2.3%
PM Peak Travel Time (Minutes)	264.2	277.0	284.8	+7.8%
PM Peak Speed (MPH)	42.2	40.9	40.0	-5.2%
Reliability Indicators (Weekday Average)				
Buffer Time AM Peak (Minutes)	63.4	74.8	80.6	+27.1%
Buffer Time Mid-day Peak (Minutes)	41.2	58.4	68.6	+66.5%
Buffer Time PM Peak (Minutes)	177.2	203.0	213.6	+20.5%

Declining Conditions *Improving Conditions*

Daily Vehicle Miles Traveled (DVMT)

DVMT is the cumulative number of miles traveled by all motorists on freeways. DVMT can be used as a measure of throughput. Generally, throughput will begin to decline as the system breaks down and drivers' tolerance for congestion is reached.*

Daily Vehicle Hours Delay (DVHD)

The DVHD for regional trips has increased by 22.6 percent. This indicates that trips in the region are taking longer.*

Mid-day

Mid-day travel times and speeds indicate an increase in congestion within the regional system.

Reliability Indicators

Regional trip reliability in the PM peak is the worst, exceeding AM and mid-day reliability by about three times. For the region, travel has become more unreliable as the buffer time needed to ensure on-time arrival is increasing.

** Note: DVMT and DVHD for OR 217 are not included in this Performance Overview due to construction activities*

Hours of Congestion (HOC)

HOC for the regional level is based on the cumulative HOC reported at each corridor. HOC has grown by 13.6 percent.

Peak Period Travel Times

Average speeds and travel times are general measures of congestion. Speeds decreasing (travel times increasing) indicate that it is taking longer for people to travel through the corridors. For the region, both AM and PM congestion has worsened. Generally, PM traffic conditions have deteriorated more than the AM.

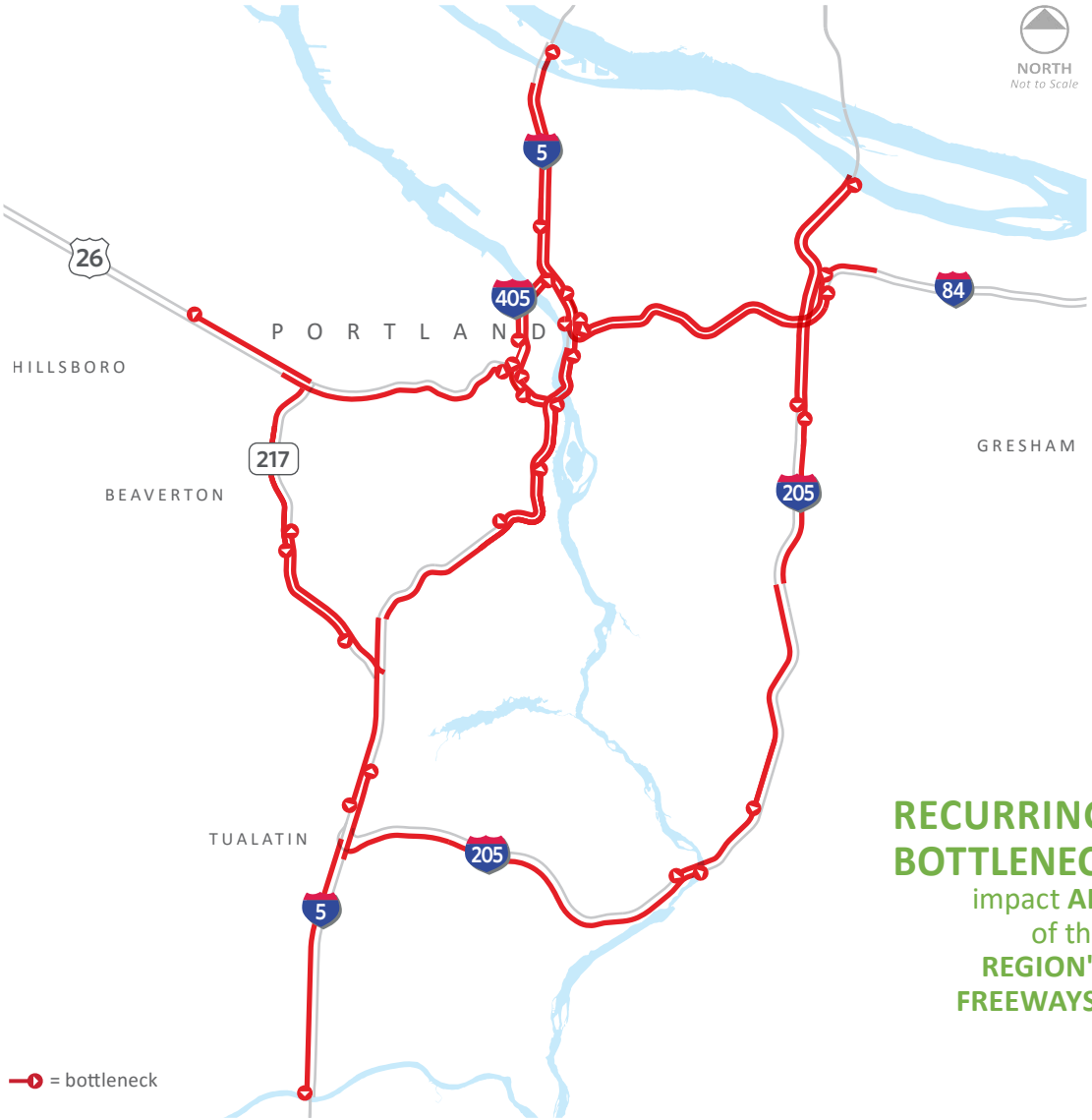
RELIABILITY

The reliability indicator represents the **EXTRA TIME** (buffer time) motorists must add to their travel time **TO ENSURE ON-TIME ARRIVAL.**

As reliability indicators increase, motorists need to **ADD MORE BUFFER TIME** into their travel time.

Bottlenecks

Bottlenecks
2015
Source: FHWA NPMRDS



RECURRING BOTTLENECKS impact **ALL** of the **REGION'S FREEWAYS.**

Recurring bottlenecks are freeway segments where traffic congestion regularly occurs; areas where motorists expect and routinely experience travel delays and slow speeds.

In 2015, recurring bottlenecks impacted all of the region's freeways, some impacting AM travel, some affecting PM traffic, and some impacting both AM and PM commute periods.

AM AND PM PEAK BOTTLENECKS cause **MAJOR DELAYS** and **INCREASE CRASH RATES.**

The number of **BOTTLENECKS** has **INCREASED BY** 13% in the last **2 YEARS.**

Total bottlenecks
2013 vs. 2015
Source: FHWA NPMRDS

Freight

Interstate Freight Routes

The major freight routes in Portland region are the interstate freeways: I-5, I-205, I-405 and I-84.

I-5 carries the highest freight volume, ranging from 13,600 to 17,800 trucks per day. It is the major north-south corridor for long-haul freight movement. In the northern corridor, it serves Port of Portland facilities and Portland International Airport. In the southern corridor, it serves the Tualatin-Wilsonville industrial area.

I-205 carries the second highest freight volume, ranging from 7,900 to 13,100 trucks per day. It also functions as a north-south corridor for long-haul freight movement. In the northern corridor, it serves the Portland International Airport and the Columbia industrial area. In the southern corridor, it serves the Oregon City and Clackamas industrial areas.

I-405 has freight volumes ranging from 5,900 to 10,000 trucks per day. It functions as an inter-urban freight route for the west side and US 30 industrial areas.

I-84 has freight volumes ranging from 6,500 to 7,800 trucks per day. It is the only interstate for east-west freight movement in the state. It serves the Troutdale industrial area, Port of Cascade Locks, Port of Hood River, and adjacent states.

Freeway Freight Routes

US 26 and OR 217 are the two freeways that provide freight access to Washington County.

US 26 has freight volumes ranging from 1,500 to 6,000 trucks per day. It provides the east-west freight connection from the interstate system to western Washington County. Due to the location of high-tech industries in the Hillsboro area, freight from these industries are low-volume but high-value commodities.

US 26 is restricted from hauling hazardous material at the Vista Ridge Tunnel. Trucks carrying hazardous material are required to use OR 217 or Cornelius Pass Road.

OR 217 provides a north-south freeway freight route connecting Washington County freight to US 26 and I-5. It has freight volume of about 4,300 trucks per day.

The major freight routes are also the most congested corridors, experiencing the highest level of delays and unreliable travel time.

Congestion Impacts on Freight

Congestion and travel delay due to deficiencies in the transportation system are impacting businesses throughout the state, threatening their national and international competitiveness.[5] Business operators are nearing the limits of what a business can do to overcome transportation congestion before it becomes a severe issue.

Many business owners report that they have changed to staggered shifts, added evening and overnight operations, and are increasing operation during off-peak hours, with some delivery shifts now starting as early as 2 a.m.[6] This results in increased labor expenses, as operators need to hire additional drivers to cover the new shifts.

CONGESTION AFFECTS THE REGION'S ECONOMY, resulting in **REDUCED ECONOMIC COMPETITIVENESS** because businesses are **UNABLE TO RELIABLY MOVE** their goods and services.

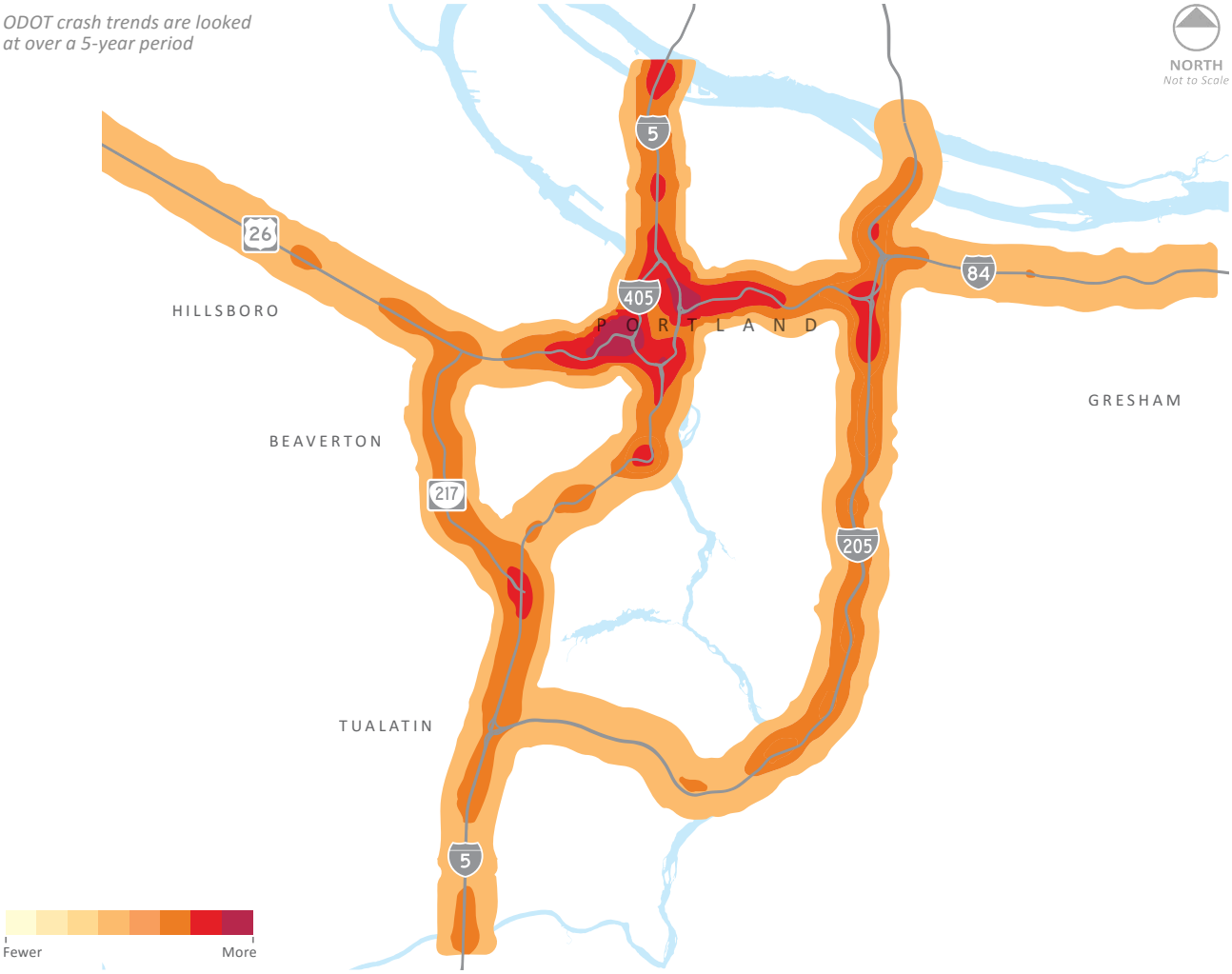
TRUCKS ARE THE MAIN LINK in the system, **CONNECTING BUSINESSES** throughout the state to the **GLOBAL MARKETPLACE** and providing the **"LAST MILE" CONNECTION** to inter-modal facilities.[7]

Safety

Crashes

2011-2015
Source: ODOT

ODOT crash trends are looked at over a 5-year period



Freeway high-crash hotspots exist in areas with major system-to-system interchanges and at entrance and exit ramps with high-traffic volumes at interchanges.

The majority of these crashes tend to be rear-end and side-swipe crashes, in stop-and-go traffic conditions caused by recurring bottlenecks.

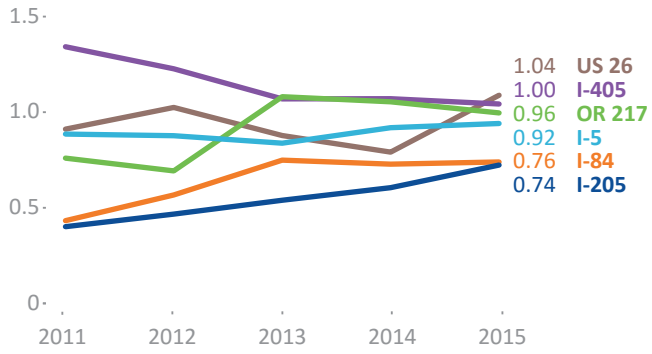
The Safety Priority Index System (SPIS) is a method for identifying high-crash locations on state highways based on crash frequency, rate, and severity. Specific SPIS sites are identified in the Corridor sections of this report.

Freeway crash hotspots are directly related to areas of high congestion and recurring bottleneck locations. Crashes have declined or stabilized at locations where targeted improvements have been made to address operations and safety problems. Examples are two recent projects on I-84 EB and OR 217. In these two corridors, there has been a 14-18 percent reduction in crashes.

Freeway crash HOTSPOTS are correlated to areas of high congestion and recurring bottleneck locations.

Freeway crash rates by corridor

2011-2015, crashes per million vehicle miles
Source: ODOT

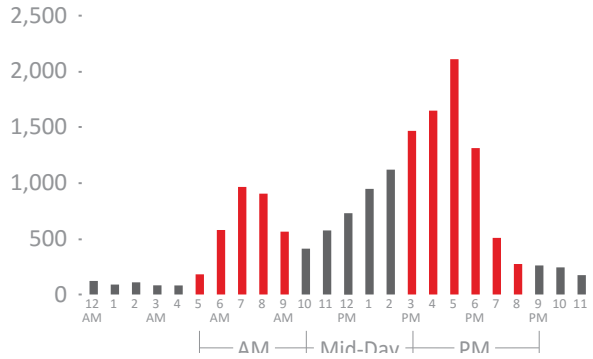


Freeway crash rates are found to be higher near closely spaced interchanges; short entrance-and-exit ramps; and areas with insufficient space for merging, limited sight distance, and narrow shoulders. Corridors with increasing levels of congestion have also had increasing crash rates.

Corridors with closely spaced entrances and exits have HIGHER CRASH RATES on average.

Crashes increase during rush hour

2011-2015, total crashes by time of day
Source: ODOT

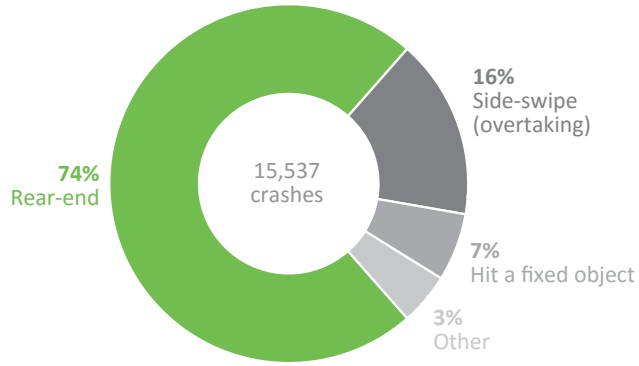


More cars and congestion on the road correlate to more crashes. Crashes are more than twice as likely to occur during peak travel times. As congestion increases and reliability degrades, the number of crashes will rise proportionally.

CRASH FREQUENCY INCREASES during congested peak periods.

Crashes by type

2011-2015
Source: ODOT



Rear-end and side-swipe crashes account for 90 percent of total crashes on the freeway, this is directly related to the stop-and-go conditions during congested peak periods.

Most REAR-END and SIDE-SWIPE CRASHES generally happen at recurring bottleneck locations.

Corridors

The performance of each corridor is described in detail in this section.

Congestion and bottlenecks

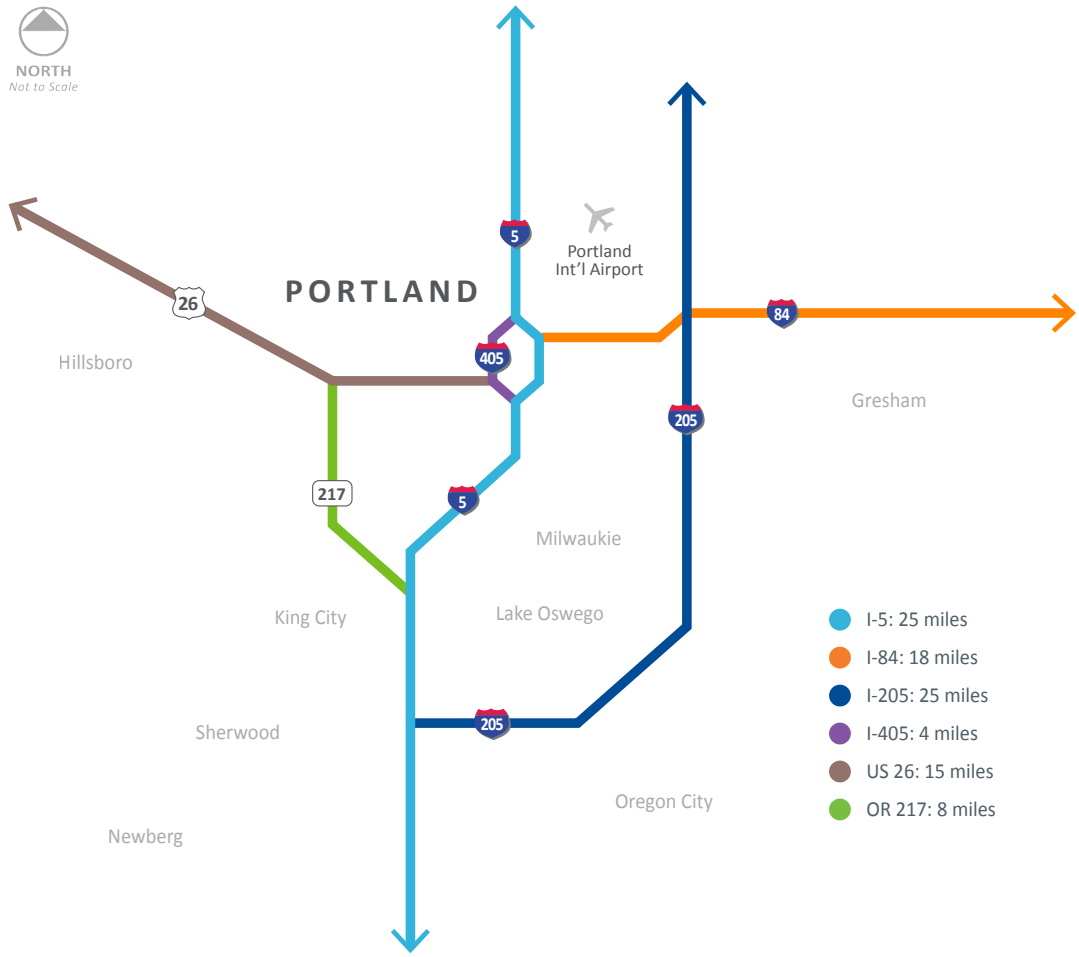
- Hours of congestion
- Vehicle hours of delay
- Travel time
- Speeds
- Recurring bottlenecks

Reliability

- AM
- Mid-day
- PM

Safety

- Crash frequency
- Crashes by time of day
- Crashes by type



I-5 Corridor Dashboard

Introduction

I-5 is the major spine running north and south through the center of the region. It carries the highest number of vehicles and has direct connections to all other regional freeways except US 26. I-5 is the longest corridors in the region at 27 miles in length and provides one of two routes over the Columbia River.

I-5 is an international link from Canada to Mexico carrying major freight and through traffic to all of the major cities on the West Coast. Many of the long distance trips are picking up or dropping off freight from the industrial areas in the region. This long-distance connection is especially critical for Portland region and statewide businesses who rely on this long-distance travel to fulfill daily business needs.

Recent/Current Improvements

Auxiliary lane

- I-5 SB and NB: Elligsen Road to I-205 (completed in 2012). This project eliminated a freight bottleneck at the I-205 interchange.
- I-5 SB: Carman Drive to Lower Boones Ferry Road Exit (completed in 2012). This project was the first step in a three-phase plan to address three separate bottlenecks on I-5, extending from Carman Drive to I-205. Already, this first phase has reduced the duration of congestion by one hour.

Upcoming Improvements

Auxiliary lane

- I-5 SB: Lower Boones Ferry Road to I-205 Exit (in design and funded for construction in 2018)
- I-5 NB Lower Boones Ferry Exit: widen ramp to accommodate two-lane exit (in design and funded for construction in 2018)

Active Traffic Management

- I-5 NB and SB: Wilsonville to Tigard
- I-5 NB and SB: I-405 to Interstate Bridge (expected in 2018-2021)

Widening

- I-5 Broadway/Weidler Interchange : widening I-5 to 3-lanes in each direction from I-84 to I-405 (future project, environmental review and preliminary design are underway)

I-5 corridor highlights

Congestion and bottlenecks

Free-flow speed on I-5 is calculated to be 60 mph with an equivalent travel time of 25 minutes for both NB and SB.

The most congested conditions in 2015 occurred during the PM peak. In the NB direction, the average travel time for the corridor increased from 41 minutes in 2013 to 48 minutes in 2015. In the SB direction, the average travel time for the corridor increased from 36 minutes in 2013 to 39 minutes in 2015. In the NB direction, between Marquam Bridge and the Interstate Bridge, there are four recurring bottlenecks with differing durations that overlap and extend from 6:30 a.m. to 7:30 p.m.

In the SB direction, the most significant recurring bottleneck is at the Rose Quarter (Broadway) with congestion extending back to Rosa Parks Way. This bottleneck begins in the AM and extends into the mid-day and PM, totaling over nine hours of congestion during the day, which poses significant problems for freight.

Reliability

Reliability on the I-5 corridor degraded between 2013 and 2015. For both directions of I-5 in the AM peak, mid-day, and PM peak, both the average travel time and buffer time increased. This means that trips are taking longer for all time periods reported. I-5 NB and SB during the PM experiences some of the most unreliable travel times in the region. I-5 SB during the PM and I-5 NB during the mid-day has one of the largest buffer travel time increases in the region.

Reliable Travel Time on I-5 NB during 2015 PM Peak

Distance: 27 miles — Free-flow travel time: 25 min.

Average Travel Time	+	Buffer Travel Time	=	Reliable Travel Time
47.6 minutes		38.4 minutes		86.0 minutes

FREIGHT RELIABILITY

As congestion creeps into the mid-day, truckers find it challenging to deliver goods and services on time. I-5 is a primary north-south interstate freight route. The loss of reliability during the day makes it difficult for interstate travel and delivery of goods resulting in increases in trucking costs. I-5 truck volume accounts for 10 to 17 percent of total traffic, with a daily volume of 13,600 to 17,800 trucks, the highest truck volumes in the Portland region.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-5 NB	2013	25	30.8	10.2	41.0	29.2	10.0	39.1	41.3	35.5	76.7
	2015		32.7	11.5	44.2	30.6	14.5	45.1	47.6	38.4	86.0
I-5 SB	2013	25	30.6	9.9	40.4	28.9	7.9	36.8	35.5	34.0	69.5
	2015		32.1	10.6	42.7	29.9	11.1	41.1	39.2	46.1	85.4

Source: FHWA NPMRDS

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

Safety

The crash trend is directly related to congestion and the reliability of the corridor. Overall, the number of crashes for I-5 has been increasing. Crashes by time of day are concentrated during the mid-day through PM peak periods, which also are the most unreliable travel periods. The majority of the total crashes on I-5 are rear-end (72 percent) and side-swipe/overtaking (18 percent), which are typical of congested conditions.

I-5 Corridor Dashboard

Source: FHWA NPMRDS

I-5 | Corridor		2013	2014	2015	2013 vs 2015 % Change
Daily Vehicle Miles Traveled (Weekday Average Rounded to Thousands)	NB	1,327	1,305	1,222	-7.9%
	SB	1,451	1,408	1,387	-4.4%
Congestion Indicators (Weekday Average)					
Hours of Congestion (Daily Hours)	NB	14.4	15.6	15.7	+9.0%
	SB	15.4	15.3	15.5	+0.6%
Daily Vehicle Hours Delay (Daily Vehicle Hours)	NB	5,451	6,604	6,440	+18.1%
	SB	4,930	5,782	6,095	+23.6%
AM Peak Travel Time (Minutes)	NB	30.8	32.1	32.7	+6.2%
	SB	30.6	31.2	32.1	+4.9%
AM Peak Speed (MPH)	NB	48.7	46.7	45.9	-5.7%
	SB	49.1	48.1	46.8	-4.7%
Mid-day Travel Time (Minutes)	NB	29.2	30.1	30.6	+4.8%
	SB	28.9	29.7	29.9	+3.5%
Mid-day Speed (MPH)	NB	51.5	49.8	49.0	-4.9%
	SB	52.0	50.5	50.1	-3.7%
PM Peak Travel Time (Minutes)	NB	41.3	45.9	47.6	+15.3%
	SB	35.5	38.4	39.2	+10.4%
PM Peak Speed (MPH)	NB	36.4	32.7	31.5	-13.5%
	SB	42.3	39.1	38.2	-9.7%
Reliability Indicators (Weekday Average)					
Buffer Time AM Peak (Minutes)	NB	10.2	10.7	11.5	+12.7%
	SB	9.9	9.0	10.6	+7.1%
Buffer Time Mid-day Peak (Minutes)	NB	10.0	13.7	14.5	+45.0%
	SB	7.9	10.1	11.1	+40.5%
Buffer Time PM Peak (Minutes)	NB	35.5	39.9	38.4	+8.2%
	SB	34.0	44.8	46.1	+35.6%
Safety Indicators					
Annual Crashes	NB	495	536	556	+12.0%
	SB	483	493	564	+17.0%

Declining Conditions *Minor change (+/_ 2% or less)* *Improving Conditions*

Daily Vehicle Miles Traveled (DVMT)

DVMT has been decreasing on I-5 and congestion has been getting worse. This potentially indicates that the corridor is at or over capacity.

Daily Vehicle Hours Delay (DVHD)

The DVHD for the I-5 corridor has increased between 2013 and 2015 for both NB (18 percent) and SB (24 percent) directions. This indicates that trips on I-5 are taking longer.

Mid-day

Mid-day travel time and speed indicate a slight increase in congestion on I-5 in both directions.

Reliability Indicators

Trip reliability NB and SB in the PM has the worst reliability. The AM and Mid-day are similar but Mid-day has the higher growth.

Hours of Congestion (HOC)

HOC at the corridor level is measured at the worst bottleneck in the freeway corridor. The HOC on I-5 NB and SB measured at their worst bottlenecks are relatively similar. There has been some growth in HOC for NB whereas SB was unchanged.

AM

AM travel time and speed indicate increasing congestion on I-5 in both directions.

PM

PM travel time and speed indicates increasing congestion on I-5 in both directions. NB speed and travel times are worse than SB, indicating a higher level of congestion in that direction.

Safety Indicators

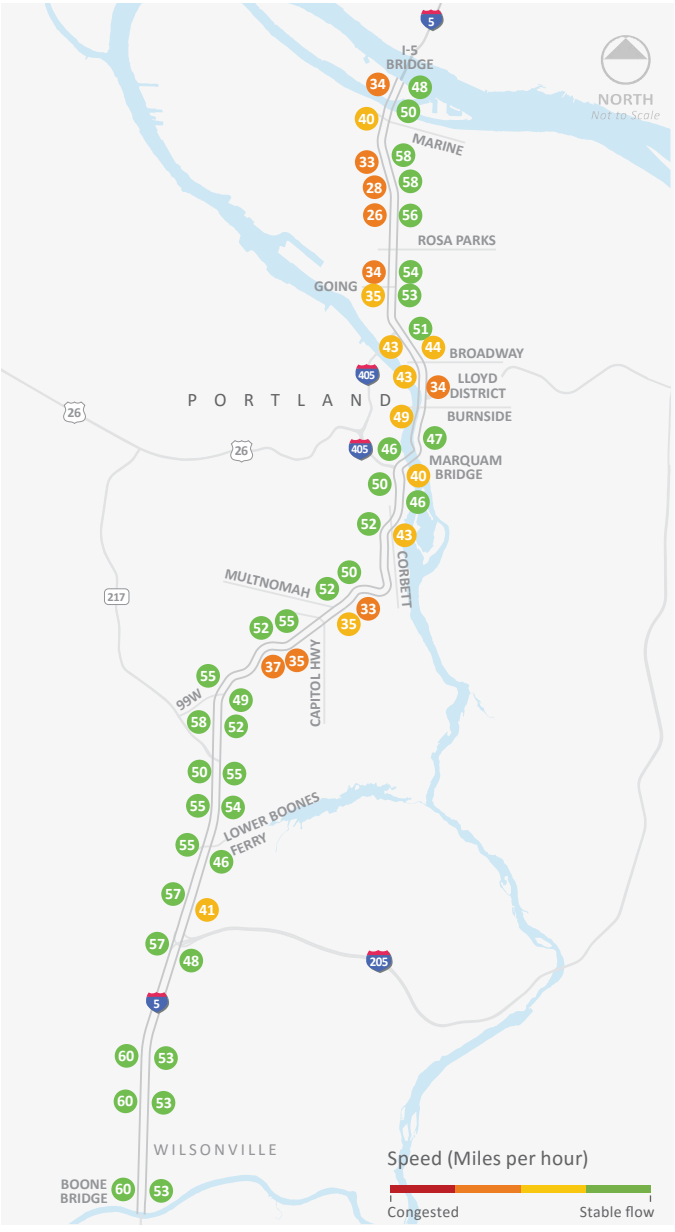
Crashes NB and SB are comparable and the percentage change over time is similar. From 2013 to 2015, the number of crashes has been on an upward trend for both directions.

2015 average speed (mph)

AM weekday

5:00 a.m. to 10:00 a.m.

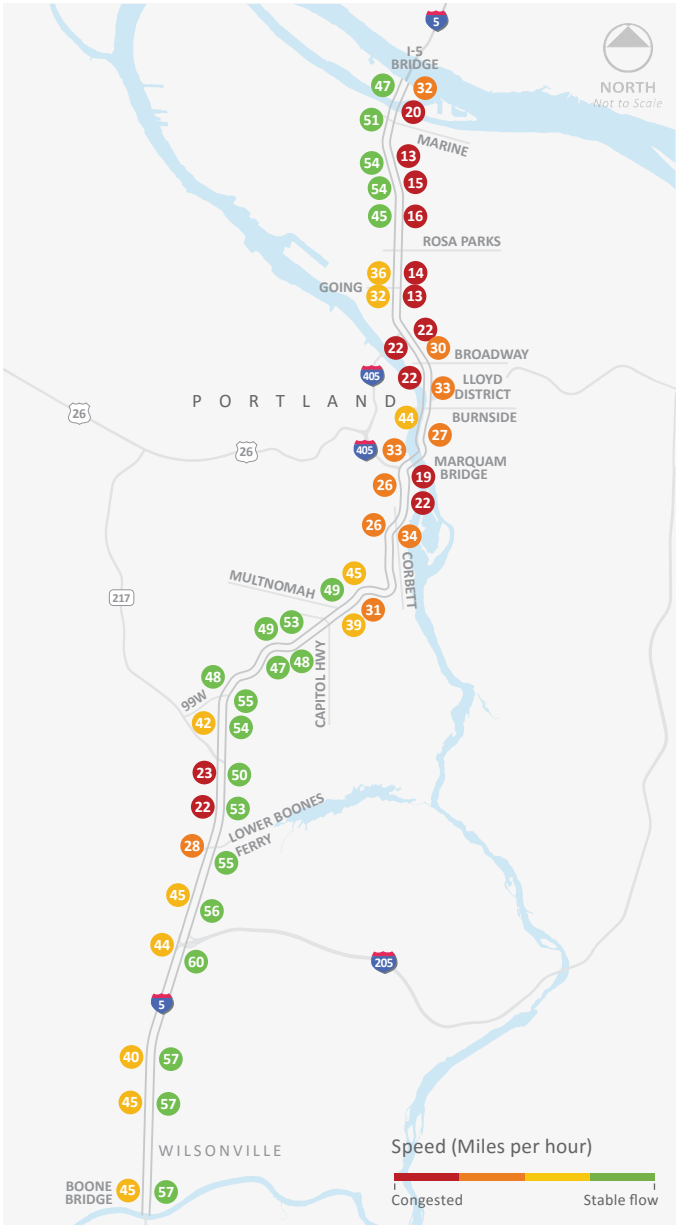
Source: FHWA NPMRDS



PM weekday

3:00 p.m. to 9:00 p.m.

Source: FHWA NPMRDS



AM WEEKDAY

SB direction slows from the City Center to the Interstate Bridge.

NB direction slows from I-405 to OR 99W/Capitol Highway and Lower Boones Ferry Road to I-205.

PM WEEKDAY

SB direction slows in two general areas: Multnomah Boulevard to Rosa Parks Way and Wilsonville through OR 99W.

NB direction slows from the Interstate Bridge to Capitol Highway.

I-5 Corridor Dashboard

I-5 bottlenecks

I-5 corridor has 12 recurring bottlenecks. The number of bottlenecks has increased from 11 to 12 from 2013 to 2015, and the duration of congestion has increased for 9 of the 12 bottlenecks.

One of the most severe bottlenecks is the NB PM bottleneck at the Interstate Bridge. This bottleneck's queue extends 11.5 miles south, overlapping and blending with the other four NB PM bottlenecks.

In the SB direction, the most severe recurring bottleneck is located at the Rose Quarter (Broadway). This bottleneck lasts for 2 hours in the AM and 7 hours in the PM with a queue of three miles. The Rose Quarter (Broadway) also has a significant NB AM bottleneck, which begins in the AM and extends into the PM.

Duration of bottlenecks

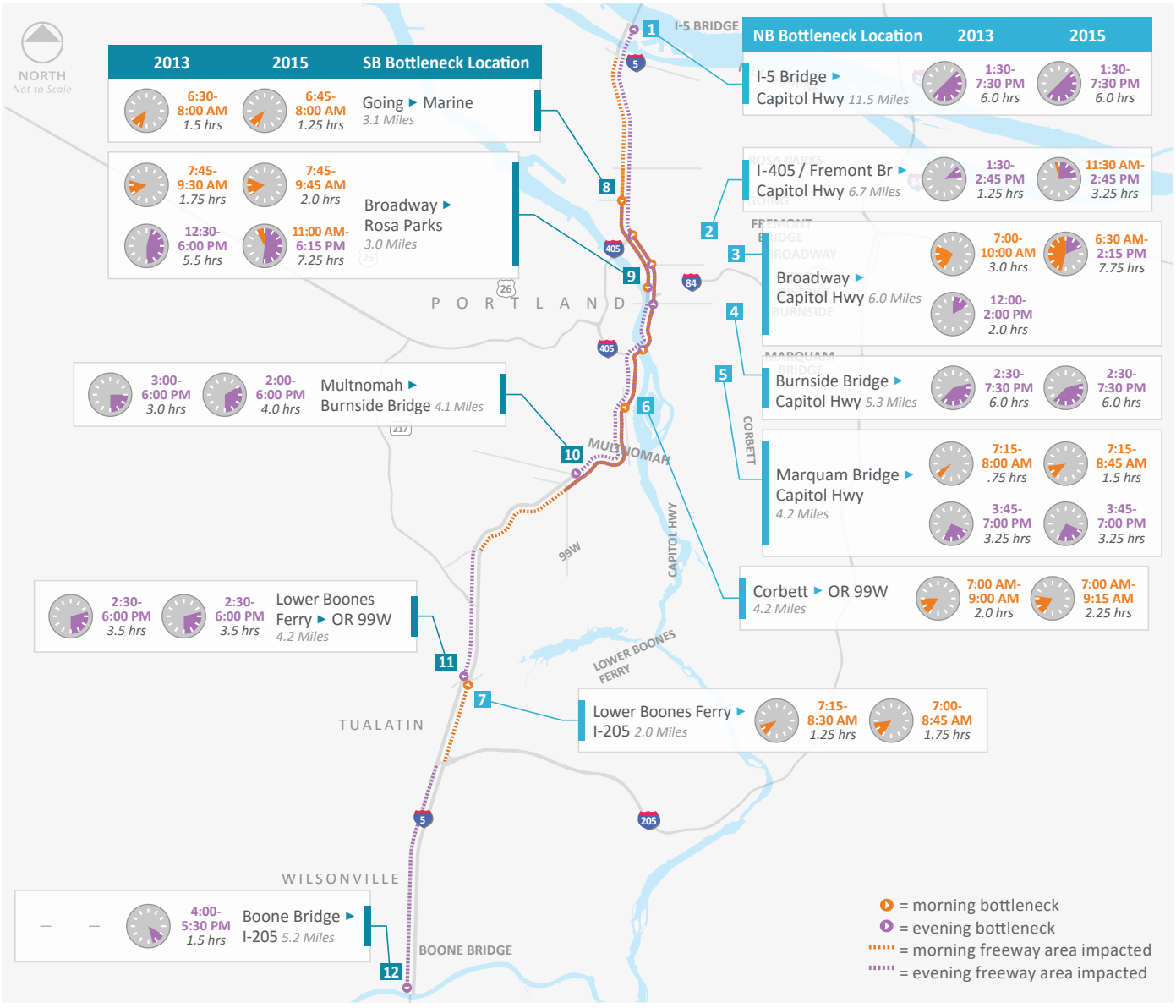
2013 vs. 2015

Source: FHWA NPMRDS

Total bottlenecks

2013 vs. 2015

Source: FHWA NPMRDS

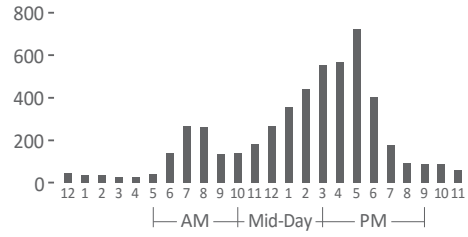


I-5 safety

I-5 had a total of 5,144 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe/overtaking crashes, which mainly occurred in the PM peak commute period. These types of crashes are typically the result of congestion. There were 23 Top 10 percent SPIS sites along the corridor, most of which were located in the northern section from the Marquam Bridge to the Interstate Bridge where congestion is highest. The I-5 corridor crash rate was 0.92 crash per million vehicle miles traveled, which is higher than the 2014 statewide average crash rate of 0.73 on interstate freeways in urban cities.

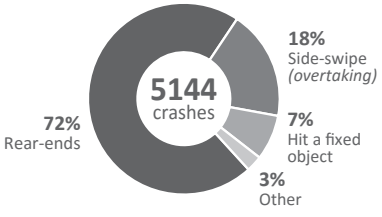
Total crashes by time of day

2011-2015
Source: ODOT



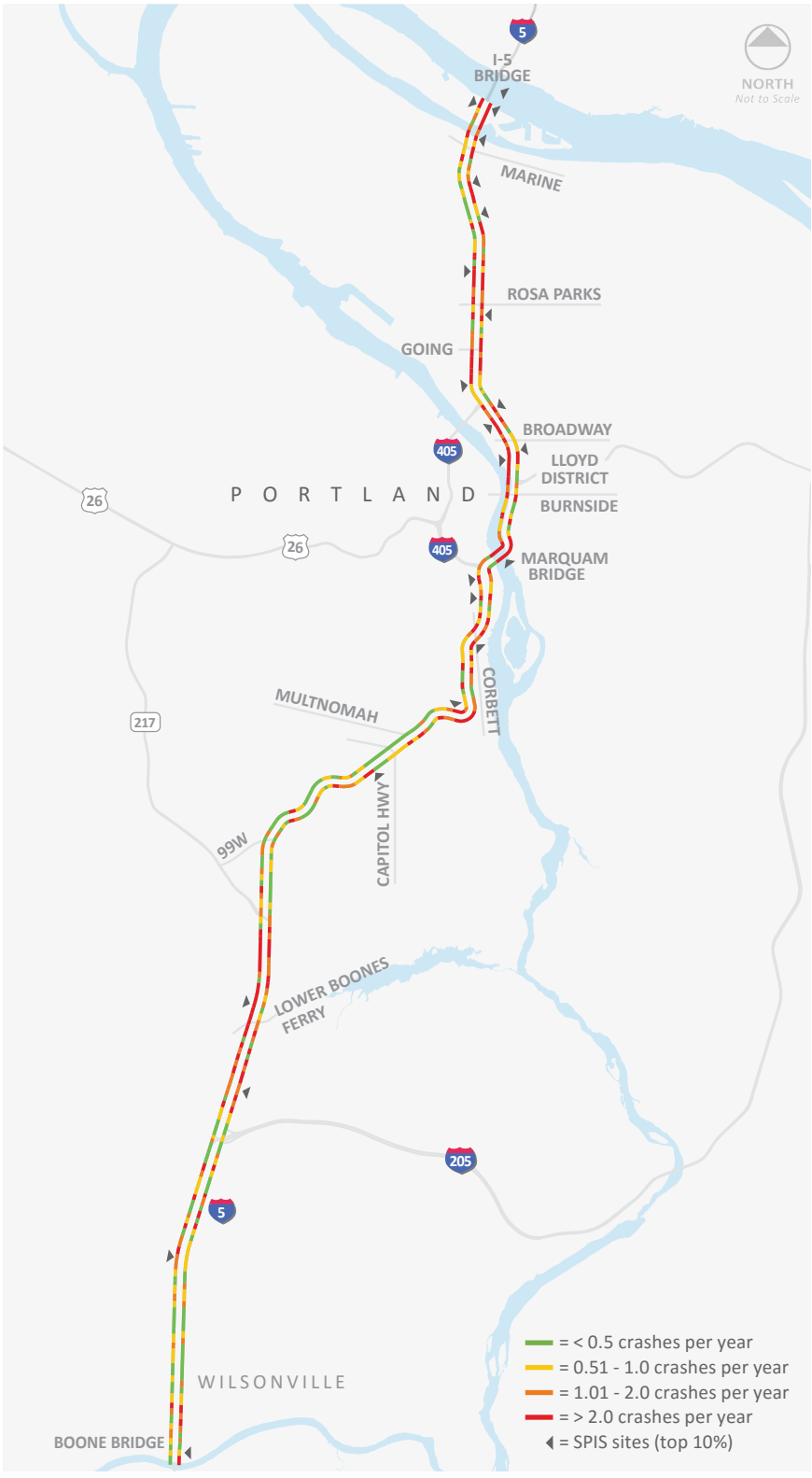
Type of crash

2011-2015
Source: ODOT



Crash frequency per 10th of a mile

2011-2015
Source: ODOT



I-84 Corridor Dashboard

Introduction

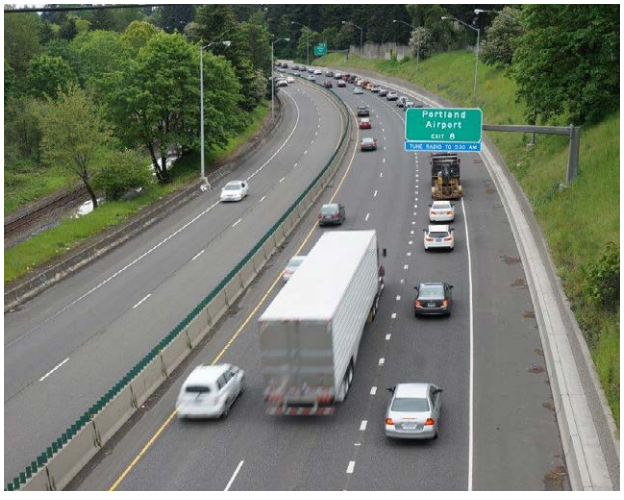
I-84 is the only interstate east-west route in the Portland region connecting downtown to the Columbia River Gorge, Central and Eastern Oregon, and other states east of Oregon. I-84 is the primary access point to the regional job-rich lands of the Columbia Corridor. The Columbia Corridor is the single largest industrial area in the state of Oregon. It covers 22,600 acres, or 28 square miles. The Corridor stretches 18 miles along the Columbia River from the Rivergate Industrial District on the Willamette River to the Troutdale Industrial District on the Sandy River.

The Blue, Red, and Green light rail lines run adjacent to I-84 between I-5 and I-205, and the Union Pacific Railroad parallels the corridor, providing alternative travel modes for goods and people.

	EB	WB
Number of entrances and exits in EB/ WB directions		
Exit	14	7
Entrance	10	11

Recent/Current Improvements

- I-84 EB restriping: I-5 split to provide two lanes to I-5 SB and one lane to I-5 NB (completed in 2013).
- I-84 EB auxiliary lane: Halsey Street Exit to I-205 NB Exit (completed in 2014). Construction has resulted in a smoother traffic flow and reduced the back-ups on I-84 EB from the I-205 NB Exit to the I-205 SB Exit. The auxiliary lane helped eliminate a localized recurring bottleneck.



Upcoming Improvements

Auxiliary lane

Three auxiliary lane projects on I-205 at the I-84 interchange would alleviate congestion and queuing that currently spill onto I-84:

- I-205 NB: I-84 EB entrance to the Killingsworth Street Exit (in design development)
- I-205 SB: I-84 EB entrance to the Washington Street/Stark Street Exit (in design development)
- I-205 NB: Powell to I-84 (in design, but not funded)

Active Travel Management

- I-84 WB and EB: I-5 to I-205 (under construction and will be deployed in 2018)

I-84 corridor highlights

Congestion and bottlenecks

Free-flow speed on I-84 is calculated to be 61 mph with an equivalent travel time of 17 minutes each direction for both EB and WB.

The section on I-84 between I-5 and I-205 experiences the most congestion. In this section, congestion is directional, with WB congestion occurring in the AM and EB occurring in the PM. The most congested conditions in 2015 occurred on I-84 EB during the PM peak from 12:30 p.m. to 7:00 p.m. (6.5 hours).

In the EB direction, the average travel time for the corridor was 23 minutes; this was a decrease from 2013 to 2015 due to the new auxiliary lane.

In the WB direction, the average travel time for the corridor increased to 25 minutes in 2015 in the AM. There is a bottleneck from I-5 to I-205 between 6:30 a.m. to 10:00 a.m. and a second bottleneck at the I-205 split to 122nd that lasts from 3:45 p.m. to 7:00 p.m.

Reliability

Reliability on I-84 WB has degraded between 2013 and 2015 for the AM, mid-day, and PM periods. This means that WB trips are taking longer for all time periods reported.

Reliability on I-84 EB has shown a decrease in both average and buffer travel time during the PM peak. Buffer time reliability for I-84 EB during the AM and mid-day has remained the same. This is the only corridor that has maintained or decreased buffer travel time in the region.

Reliable Travel Time on I-84 EB during 2015 PM Peak

Distance: 18 miles — Free-flow travel time: 17 min.

Average Travel Time	+	Buffer Travel Time	=	Reliable Travel Time
23.3 minutes		6.8 minutes		30.1 minutes

FREIGHT RELIABILITY

As congestion creeps into the mid-day, truckers find it challenging to deliver goods and services on time. I-84 is a primary east-west interstate freight route. From 2013 to 2015, reliability for I-84 WB has gotten worse during the day, making it difficult for interstate travel and delivery of goods.

I-84 truck volume accounts for five to 20 percent of total traffic, with a daily volume of 6,500 to 7,800 trucks. It carries the fourth highest truck volume in the Portland region, providing long haul access for interstate east-west connections.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-84 EB	2013	17.3	18.4	1.2	19.5	19.2	1.9	21.0	24.6	12.0	36.6
	2015		18.5	1.6	20.1	19.3	2.5	21.8	23.3	6.8	30.1
I-84 WB	2013	17.3	23	7.5	30.6	19.4	4.3	23.7	20.0	6.7	26.7
	2015		24.6	9.3	33.9	19.9	5.3	24.9	20.7	7.0	27.6

Source: FHWA NPMRDS

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

Safety

The crash trend is directly related to congestion and the reliability of the corridor. The number of crashes for I-84 WB has been increasing, but EB crashes decreased. Crashes by time of day are concentrated during the AM and PM peak periods, which also are the most unreliable travel periods. The majority of crashes on I-84 are rear-end (72 percent) and side-swipe/overtaking (16 percent), which are typical of congested conditions.

I-84 Corridor Dashboard

Source: FHWA NPMRDS

I-84 | Corridor		2013	2014	2015	2013 vs 2015 % Change
Daily Vehicle Miles Traveled (Weekday Average Rounded to Thousands)	EB	784	836	834	+6.4%
	WB	757	792	789	+4.2%
Congestion Indicators (Weekday Average)					
Hours of Congestion (Daily Hours)	EB	8.1	10.0	12.0	+48.2%
	WB	13.3	13.9	13.8	+3.8%
Daily Vehicle Hours Delay (Daily Vehicle Hours)	EB	2,674	2,532	2,391	-10.6%
	WB	2,496	2,864	3,039	+21.8%
AM Peak Travel Time (Minutes)	EB	18.4	18.8	18.5	+0.5%
	WB	23.0	23.9	24.6	+7.0%
AM Peak Speed (MPH)	EB	57.6	56.4	57.1	-0.9%
	WB	46.0	44.3	43.1	-6.3%
Mid-day Travel Time (Minutes)	EB	19.2	19.4	19.3	+0.5%
	WB	19.4	19.7	19.9	+2.6%
Mid-day Speed (MPH)	EB	55.2	54.6	54.7	-0.9%
	WB	54.5	53.7	53.2	-2.4%
PM Peak Travel Time (Minutes)	EB	24.6	23.2	23.3	-5.3%
	WB	20.0	20.4	20.7	+3.5%
PM Peak Speed (MPH)	EB	43.1	45.5	45.4	+5.3%
	WB	52.8	51.8	51.2	-3.0%
Reliability Indicators (Weekday Average)					
Buffer Time AM Peak (Minutes)	EB	1.2	1.6	1.6	+33.3%
	WB	7.5	8.5	9.3	+24.0%
Buffer Time Mid-day Peak (Minutes)	EB	1.9	2.3	2.5	+31.6%
	WB	4.3	4.6	5.1	+18.6%
Buffer Time PM Peak (Minutes)	EB	12.0	6.5	6.8	-43.3%
	WB	6.7	5.5	7.0	+4.5%
Safety Indicators					
Annual Crashes	EB	177	170	153	-14.0%
	WB	252	260	299	+19.0%

Declining Conditions *Minor change (+/_ 2% or less)* *Improving Conditions*

Daily Vehicle Miles Traveled (DVMT)

DVMT increased on I-84 in both directions in 2015, and congestion has been getting worse.

Daily Vehicle Hours Delay (DVHD)

The DVHD for the I-84 corridor between 2013 and 2015 decreased for the EB and increased for the WB traffic. This indicates that WB trips on I-84 are taking longer and trips on EB are less delayed.

Mid-day

Mid-day travel times and speeds indicate a slight increase in congestion on I-84 WB and no change in the EB.

Reliability Indicators

Trip reliability is worst during AM and PM peak in the WB direction. Trip reliability in the EB during the PM has improved significantly since 2013.

Hours of Congestion (HOC)

HOC at the corridor level is measured at the worst bottleneck in the freeway corridor. I-84 WB at the bottleneck has a longer HOC than the EB. EB has a higher growth in HOC than WB.

AM

AM travel times and speeds indicate increasing congestion on I-84 in the WB direction. EB travel time and speed indicates no change from 2013 and 2015. WB speed and travel time are worse than EB, indicating a higher level of congestion in that direction.

PM

PM travel times and speeds indicate increased congestion on I-84 in WB and decreased congestion EB. WB speeds and travel time are worse than EB indicating a higher level of congestion in the WB direction.

Safety Indicators

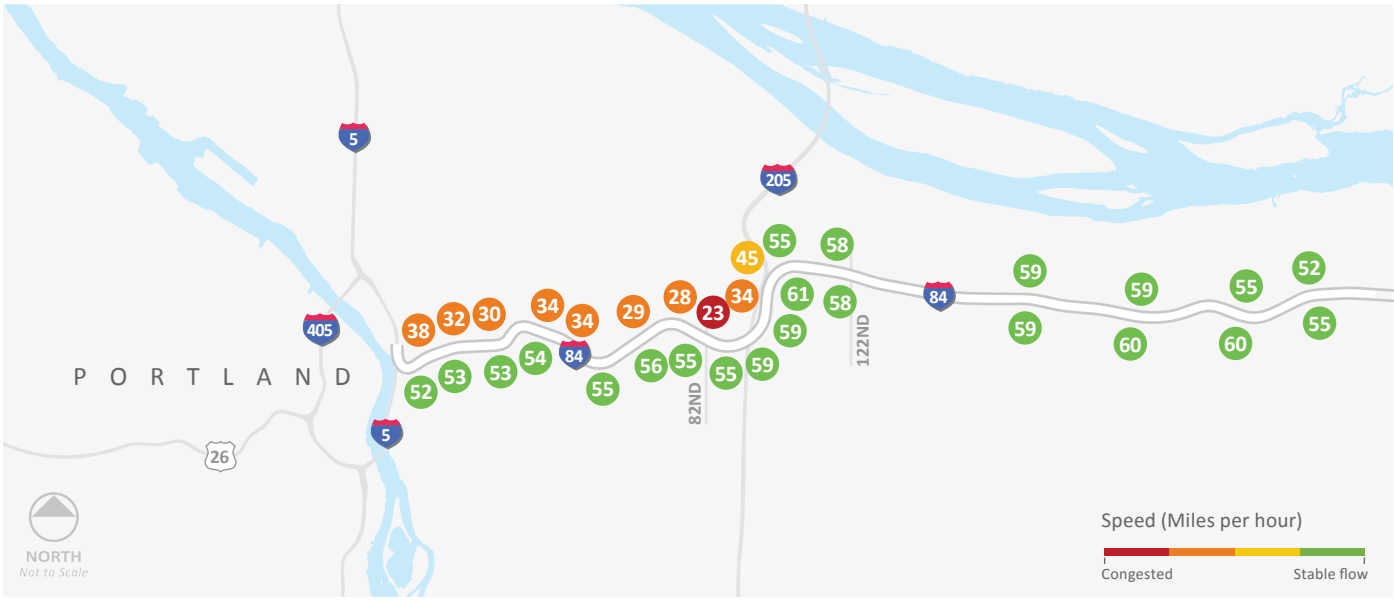
The number of crashes in the WB direction is over 60 percent higher than the EB direction. From 2013 to 2015, the number of EB crashes decreased by 14 percent and the number of WB crashes increased by 19 percent.

2015 average speed (mph)

AM weekday

5:00 a.m. to 10:00 a.m.

Source: FHWA NPMRDS



AM WEEKDAY

WB direction slows from the City Center to I-205.

PM weekday

3:00 p.m. to 9:00 p.m.

Source: FHWA NPMRDS

PM WEEKDAY

EB direction slows from I-205 to I-5.

WB direction slows from I-5 to 33rd Avenue and at the I-205 split.

I-84 Corridor Dashboard

I-84 bottlenecks

The I-84 corridor has three recurring bottlenecks affecting the section between I-5 and I-205. The number of bottlenecks has not changed from 2013 to 2015 while the duration of congestion has increased for all three bottlenecks. However, due to the auxiliary lane project on I-84 EB, there has been a travel time reduction in the I-84 EB project section.

Duration of bottlenecks

2013 vs. 2015

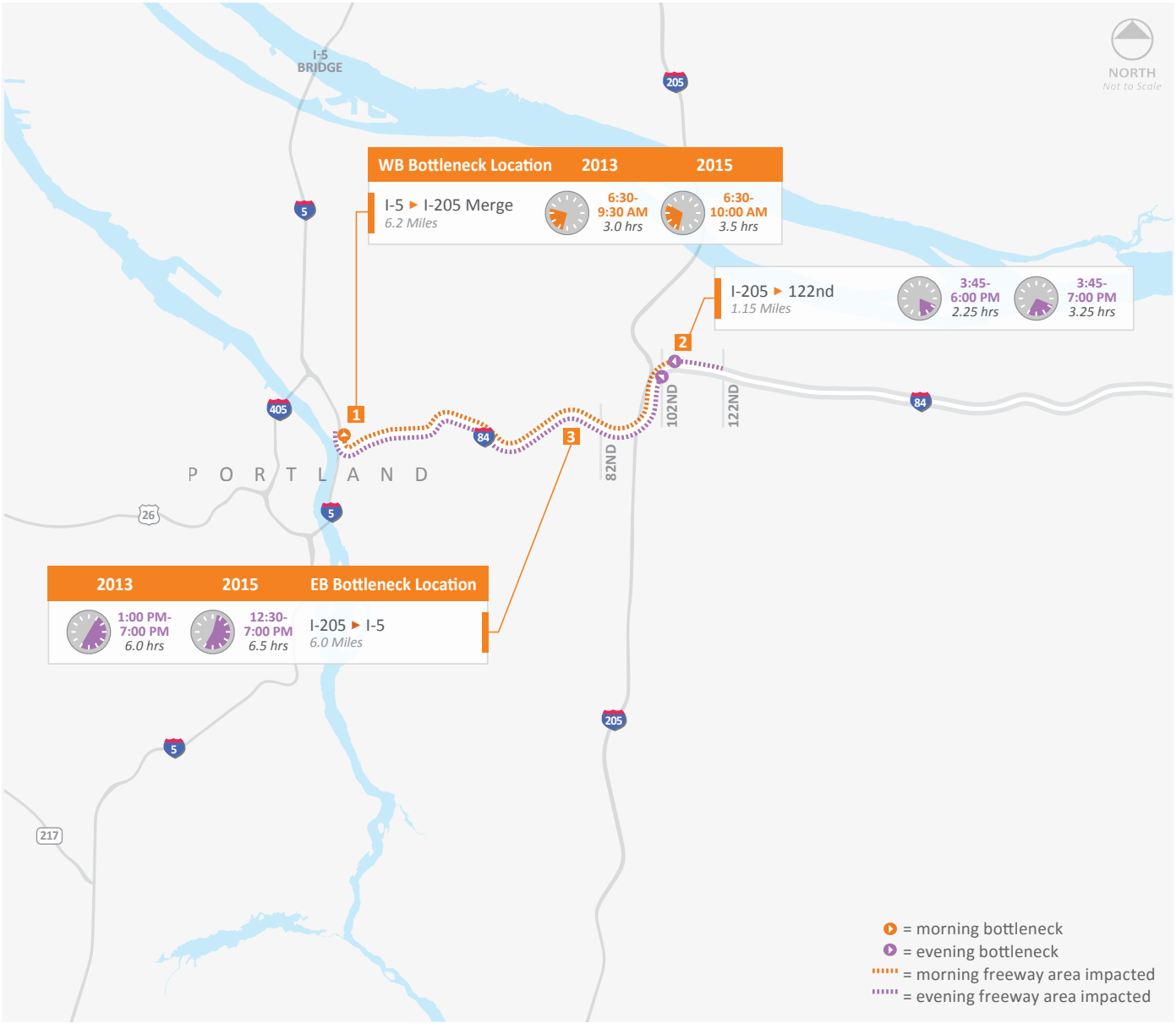
Source: FHWA NPMRDS

In the EB direction between I-5 and I-205, there is one recurring bottleneck from 12:30 p.m. to 7:00 p.m. In the WB direction, there is a bottleneck from I-5 to I-205 between 6:30 a.m. to 10:00 a.m. and a second bottleneck at the I-205 split to 122nd Avenue that lasts from 3:45 p.m. to 7:00 p.m.

Total bottlenecks

2013 vs. 2015

Source: FHWA NPMRDS

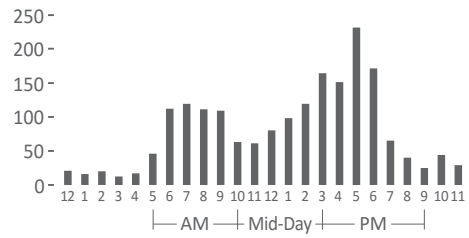


I-84 safety

I-84 had a total of 1,943 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe/overtaking crashes, which mainly occurred in the AM and PM peak commute period. These types of crashes are typically the result of congestion. There were eight Top 10 percent SPIS sites along the corridor, most of which were located in the section between I-5 and I-205 where congestion is highest. The I-84 corridor's crash rate was 0.76 crash per million vehicle miles traveled, which is higher than the 2014 statewide average crash rate of 0.73 on interstate freeways in urban cities.

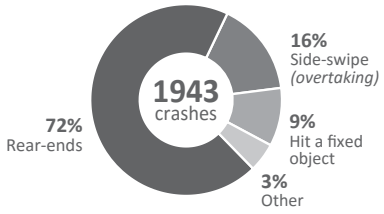
Total crashes by time of day

2011-2015
Source: ODOT



Type of crash

2011-2015
Source: ODOT



Crash frequency per 10th of a mile

2011-2015
Source: ODOT

I-205 Corridor Dashboard

Introduction

I-205 is one of the longest corridors in the region, at 25 miles in length, providing one of two routes over the Columbia River in the Portland metro region. I-205 continues north and connects back to I-5 near Salmon Creek, Washington.

I-205 connects the East Portland metro area to the Tualatin/Sherwood industrial area, Clackamas industrial area, and Portland International Airport, making it a corridor of economic importance in the Portland region and state of Oregon.

I-205 from the Willamette River to I-5 was constructed as a four-lane interstate. ODOT has widened the freeway to six lanes from I-5 to Stafford Road. The only remaining four lane section is from Stafford Road to OR 99E. A project is planned to widen this section to six lanes.

The Red and Green light rail lines run adjacent to I-205 from Gateway Transit Station to the airport and from Gateway to Clackamas Town Center, respectively.

Recent/Current Improvements

- Sunnyside Road/Sunnybrook Boulevard split diamond interchange (constructed 2002)
- Connections to the new Sunrise Expressway (constructed 2014)
- Columbia SB entrance ramps widened to three lanes; the widening increased the capacity at the ramp to accommodate the high freight volume from Columbia Boulevard (constructed 2016)

Upcoming Improvements

Auxiliary lane

- I-205 NB: I-84 EB entrance to the Killingsworth Exit (in design development)
- I-205 SB: I-84 EB entrance to the Washington Street/ Stark Street Exit (in design development)
- I-205 NB: Powell entrance to the I-84 EB Exit (future project, 2021)

Active Traffic Management

- I-205 NB: and SB Glenn Jackson Bridge to Sunnyside Road
- I-205 NB and SB Abernethy Bridge area

Widening

- Abernethy Bridge widening, both directions: OR 43 to OR 213 (future project, environmental process underway)
- I-205 widening, both directions: Stafford Road to OR 43 (future project, environmental process underway)

I-205 corridor highlights

Congestion and bottlenecks

Free-flow speed on I-205 is calculated to be 61 mph with an equivalent travel time of 25 minutes for both NB and SB directions.

The most congested conditions in 2015 occurred during the PM peak, with the average speed being among the lowest in the region. The average 2015 PM travel time for the corridor was 42 minutes, an increase of seven minutes from 2013. In the SB direction during the PM peak, the average travel time for the corridor was 34 minutes, an increase of three minutes from 2013 to 2015.

In the NB direction, the most severe recurring bottleneck was at the Glenn Jackson Bridge. This bottleneck lasts from 2:45 p.m. to 6:30 p.m. The second most severe NB bottleneck was at the Abernethy Bridge. This bottleneck has developed over the past couple years and is quickly growing. It lasts from 3:15 p.m. to 6:15 p.m.

In the SB direction, the most significant recurring bottleneck extended from Division Street to the Glenn Jackson Bridge. This bottleneck lasts from 2:30 p.m. to 6:00 p.m.

Reliability

Reliability on the I-205 corridor has degraded between 2013 and 2015. For both directions of I-205 in the AM peak, mid-day, and PM peak, both the average travel time and buffer time have increased. Trips are taking longer for all time periods reported. I-205 NB during the PM experiences some of the most unreliable travel times and largest buffer travel time increase in the region. I-205 NB and SB during the mid-day have some of the largest buffer time increases in the region.

Reliable Travel Time on I-205 NB during 2015 PM Peak

Distance: 25 miles — Free-flow travel time: 25 min.

Average Travel Time	+	Buffer Travel Time	=	Reliable Travel Time
42.4 minutes		43.4 minutes		85.8 minutes

FREIGHT RELIABILITY

As congestion creeps into the mid-day, truckers find it challenging to deliver goods and services on time. I-205 is a primary north-south interstate freight route. The loss of reliability during the day makes it difficult for interstate travel and delivery of goods, resulting in increases in trucking costs.

I-205 truck volume accounts for six to nine percent of total traffic, with a daily volume range of 7,900 to 13,100 trucks. It carries the second highest truck volumes in the Portland region, providing an alternative north-south interstate route to I-5 on the east side.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-205 NB	2013	24.6	28.2	6.4	34.5	26.8	4.0	30.8	35.2	31.2	66.4
	2015		28.8	8.0	36.8	27.7	8.1	35.8	42.4	43.4	85.8
I-205 SB	2013	24.6	29.2	9.9	39.2	27.0	4.2	31.2	30.8	21.7	52.5
	2015		31.1	11.9	43.0	27.9	9.6	37.5	33.8	24.7	58.5

Source: FHWA NPMRDS

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

Safety

The crash trend is directly related to congestion and the reliability of the corridor. Overall, the number of crashes for I-205 has been increasing. Crashes by time of day are concentrated during the AM and PM peak periods, which also are the most unreliable travel periods. The majority of the total crashes on I-205 are rear-end (70 percent) and side-swipe/overtaking (18 percent), which are typical of congested conditions.

I-205 Corridor Dashboard

Source: FHWA NPMRDS

I-205 | Corridor		2013	2014	2015	2013 vs 2015 % Change
Daily Vehicle Miles Traveled (Weekday Average Rounded to Thousands)	NB	1,305	1,276	1,339	+2.6%
	SB	1,247	1,212	1,337	+7.2%
Congestion Indicators (Weekday Average)					
Hours of Congestion (Daily Hours)	NB	7.4	8.5	9.8	+32.4%
	SB	6.8	9.3	10.0	+47.1%
Daily Vehicle Hours Delay (Daily Vehicle Hours)	NB	3,770	4,724	5,468	+45.0%
	SB	2,925	3,762	4,462	+52.6%
AM Peak Travel Time (Minutes)	NB	28.2	29.1	28.8	+2.1%
	SB	29.2	30.4	31.1	+6.5%
AM Peak Speed (MPH)	NB	53.3	51.5	52.0	-2.4%
	SB	51.3	49.3	48.2	-6.0%
Mid-day Travel Time (Minutes)	NB	26.8	27.3	27.7	+3.4%
	SB	27.0	27.7	27.9	+3.3%
Mid-day Speed (MPH)	NB	56.0	54.9	54.2	-3.2%
	SB	55.6	54.2	53.8	-3.2%
PM Peak Travel Time (Minutes)	NB	35.2	39.2	42.4	+20.5%
	SB	30.8	33.3	33.8	+9.7%
PM Peak Speed (MPH)	NB	42.6	38.3	35.4	-16.9%
	SB	48.6	45.0	44.4	-8.6%
Reliability Indicators (Weekday Average)					
Buffer Time AM Peak (Minutes)	NB	6.4	7.1	8.0	+25.0%
	SB	9.9	11.5	11.9	+20.2%
Buffer Time Mid-day Peak (Minutes)	NB	4.0	5.3	8.1	+102.5%
	SB	4.2	6.6	9.6	+128.6%
Buffer Time PM Peak (Minutes)	NB	31.2	34.1	43.4	+39.1%
	SB	21.7	24.2	24.7	+13.8%
Safety Indicators					
Annual Crashes	NB	405	381	476	+18.0%
	SB	297	371	430	+45.0%

Declining Conditions *Minor change (+/_ 2% or less)* *Improving Conditions*

Daily Vehicle Miles Traveled (DVMT)
DVMT increased on I-205 in both directions in 2015 and congestion has been worsened.

Daily Vehicle Hours Delay (DVHD)
The DVHD for I-205 corridor has grown by 45 percent in the NB and 53 percent in the SB between 2013 and 2015. Trips on I-205 NB and SB are taking significantly longer.

Mid-day
Mid-day travel times and speeds indicate a slight increase in congestion on I-205 in both NB and SB directions.

Reliability Indicators
The NB and SB PM trips have the worst reliability. Trip reliability is best in the corridor for the AM and mid-day peak in the NB direction of I-205.

Hours of Congestion (HOC)
The HOC on I-205 NB and SB as measured at their worst bottlenecks, are relatively similar. The growth in HOC for NB and SB is also a similar.

AM
AM travel times and speeds indicate an increase in congestion on I-205 in both directions.

PM
PM travel times and speeds indicate an increase in congestion on I-205 in both directions. The average NB speed for the PM in the corridor is 35 mph and worse than SB, indicating higher level of congestion in that direction.

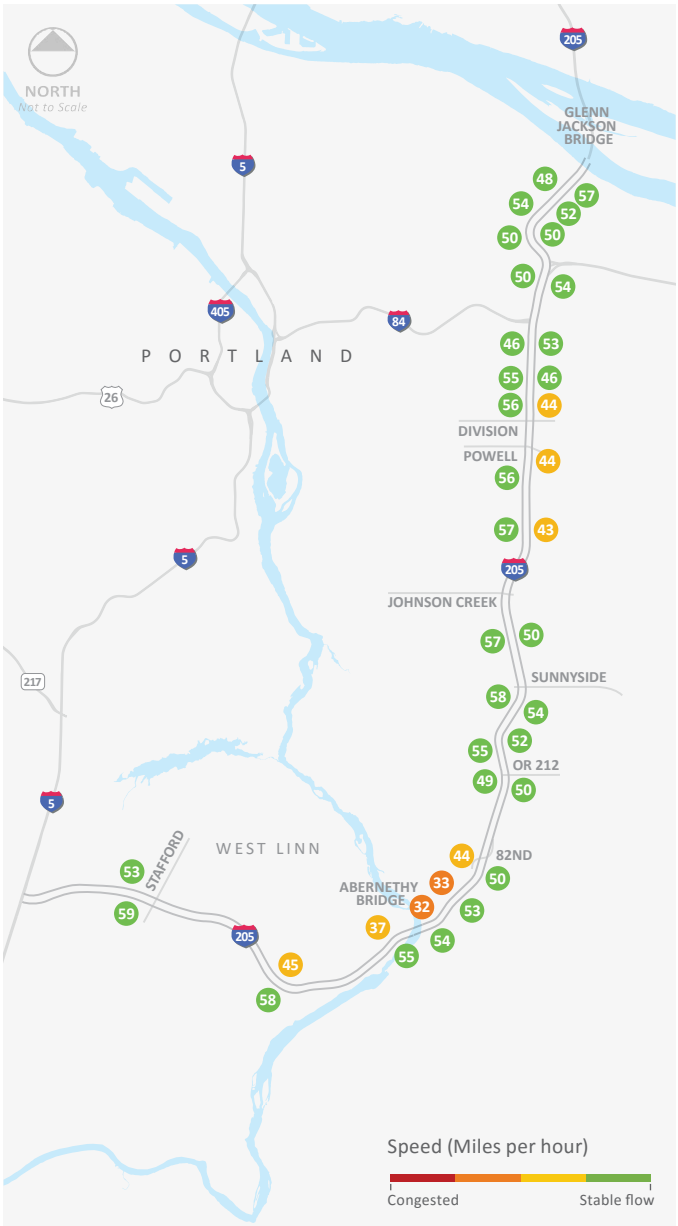
Safety Indicators
Crashes in the NB direction are more than the SB direction. From 2013 to 2015, the number of NB crashes has increased by 18 percent and the number of SB crashes has increased by 45 percent.

2015 average speed (mph)

AM weekday

5:00 a.m. to 10:00 a.m.

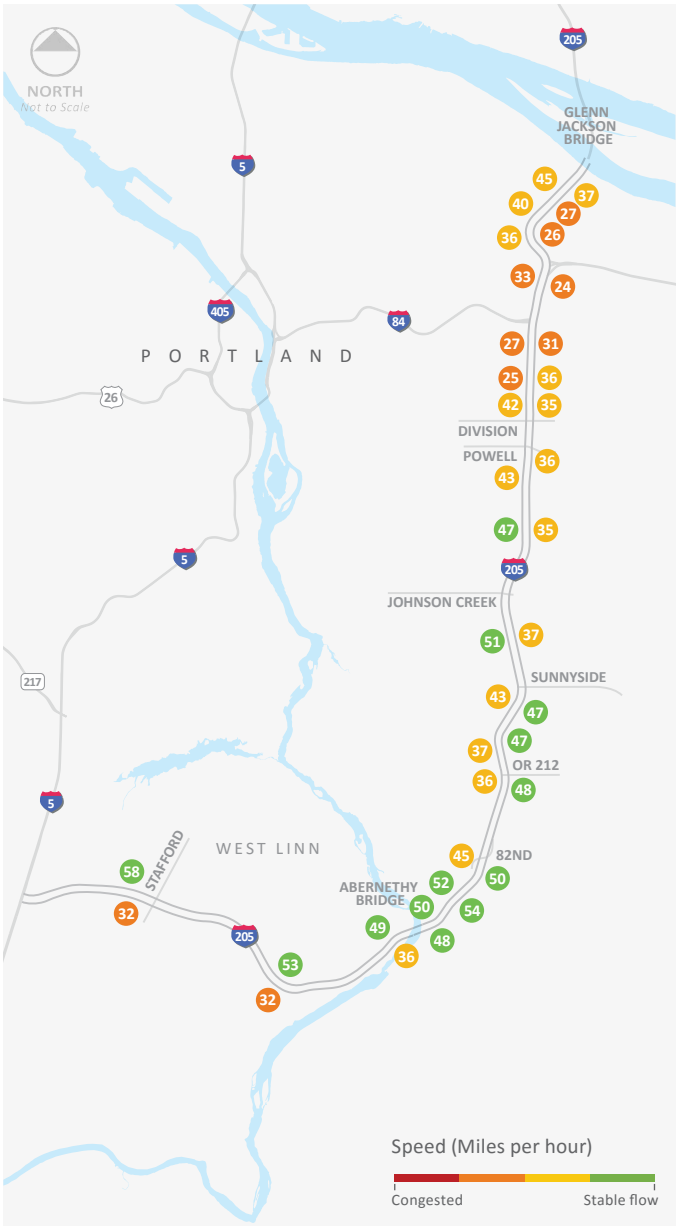
Source: FHWA NPMRDS



PM weekday

3:00 p.m. to 9:00 p.m.

Source: FHWA NPMRDS



AM WEEKDAY

SB direction slows from West Linn to 82nd Avenue.

NB direction slows from Division Street to Johnson Creek Boulevard.

PM WEEKDAY

SB direction slows in two general areas: Powell Boulevard to Glenn Jackson Bridge and 82nd Avenue through Sunnyside Road.

NB direction slows in two general areas: Abernethy Bridge to I-5 and Glenn Jackson Bridge to Sunnyside.

I-205 Corridor Dashboard

I-205 bottlenecks

The I-205 corridor has six recurring bottlenecks. The number of bottlenecks has increased from four to six from 2013 to 2015. The two new bottlenecks are on I-205 NB in the PM from Abernethy Bridge to I-5 and on I-205 SB in the PM from OR 212 to Johnson Creek Boulevard. The duration of congestion has increased for all the bottlenecks from 2013 to 2015. In the NB direction, the most severe recurring bottleneck is at the Glenn Jackson Bridge. This bottleneck extends back to Powell Boulevard and exists from 2:45 p.m. to 6:30 p.m. The second most severe bottleneck northbound is at the Abernethy Bridge. It has a queue that extends to I-5 and lasts from 3:15 p.m. to 6:15 p.m. In the SB direction, the most significant PM recurring bottleneck extends from Division Street to the Glenn Jackson Bridge. This bottleneck has a queue of 5.3 miles and lasts from 2:30 p.m. to 6:00 p.m. The auxiliary lane will improve the safety and operations at the bottleneck.

Duration of bottlenecks

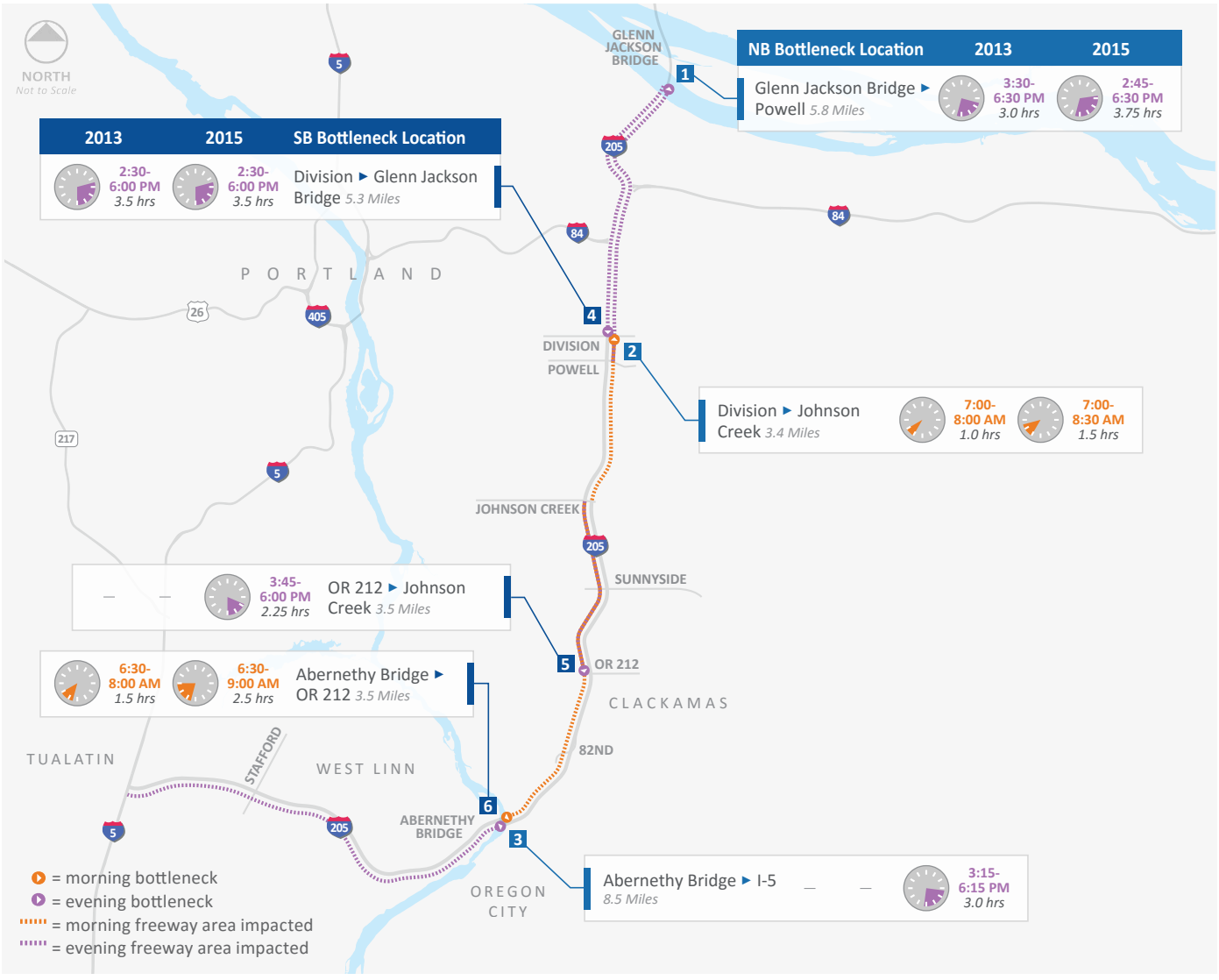
2013 vs. 2015

Source: FHWA NPMRDS

Total bottlenecks

2013 vs. 2015

Source: FHWA NPMRDS

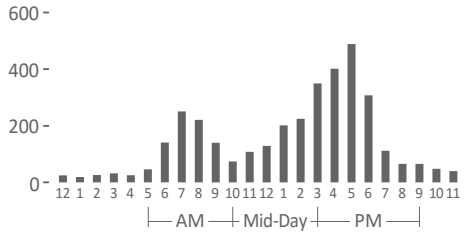


I-205 safety

I-205 had a total of 3,559 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe/ overtaking crashes, which mainly occur in the AM and PM peak commute period. These types of crashes are typically the result of congestion. There were 14 Top 10 percent SPIS sites along the corridor, most of which were located in areas of high congestion. The I-205 corridor crash rate was 0.74 crash per million vehicle miles traveled, which is slightly higher than the 2014 statewide average crash rate of 0.73 on interstate freeways in urban cities.

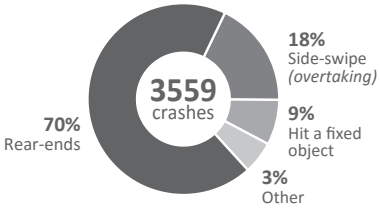
Total crashes by time of day

2011-2015
Source: ODOT



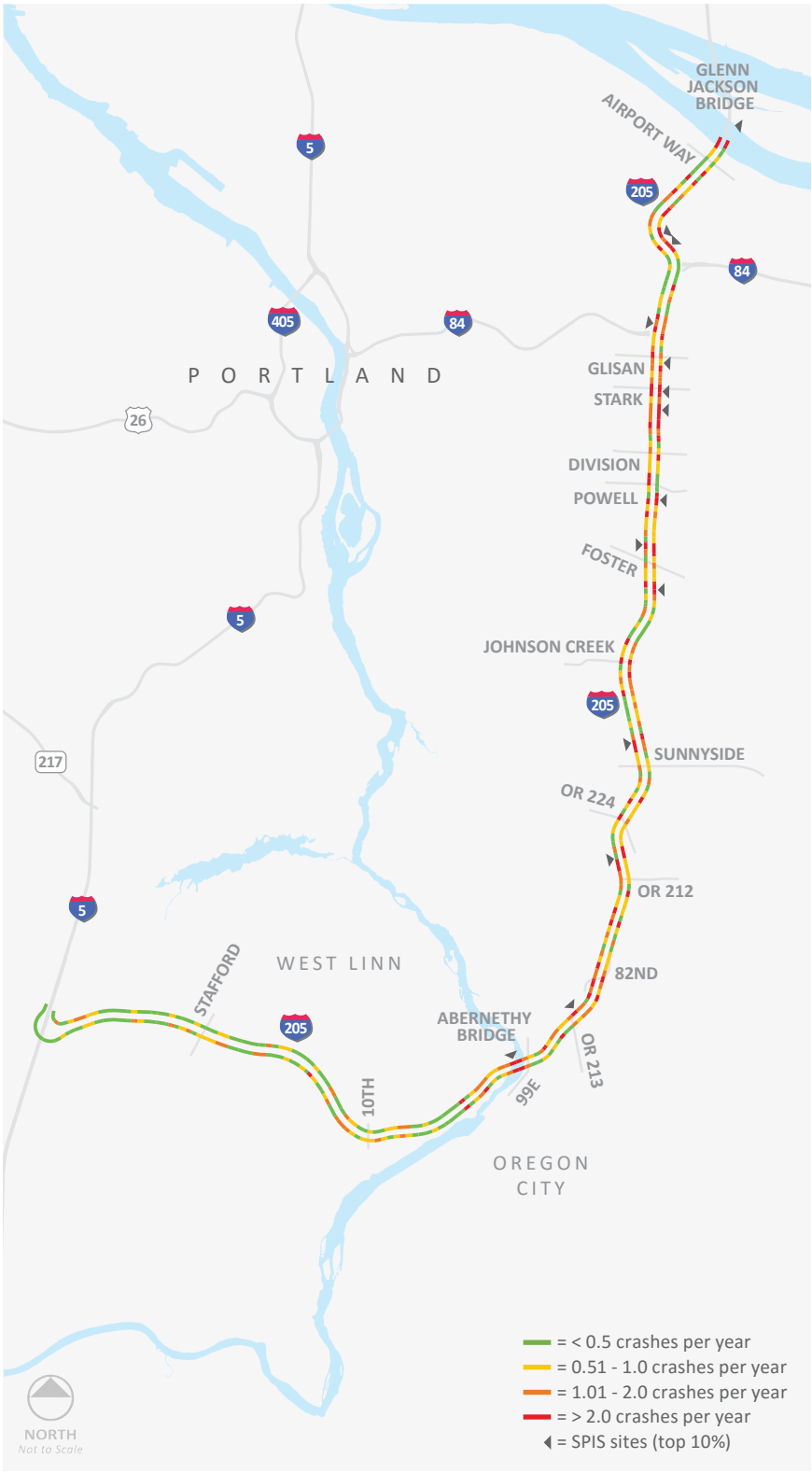
Type of crash

2011-2015
Source: ODOT



Crash frequency per 10th of a mile

2011-2015
Source: ODOT



I-405 Corridor Dashboard

Introduction

I-405, also known as the Stadium Freeway, is the west-side inner loop to I-5, which is on the east side of the Willamette River. It is the shortest interstate freeway in Portland with a total length of 4.2 miles in the densest part of downtown. Most of the freeway was built below-grade, with 15 overhead structures spanning the freeway and it has eight interchanges which result in very short and closely spaced merge and diverge areas. Due to these constraints, the posted speed is 50 mph, which is 5-10 mph below other corridors in the Portland region.

I-405 connects I-84, US 26, US 30, and I-5. I-405 is heavily affected by traffic on I-5 and US 26, and as a result, is regularly congested. This effect is felt beyond I-405; any trips on the freeway system from the western metro area to the east side must use this route; for example, those traveling from Hillsboro to Portland International Airport.

The corridor has the second highest crash rate, this is caused by high volumes of traffic weaving in short distances. Due to the limited right-of-way and constrained geometry, congestion and safety improvements are challenging.

Recent/Current Improvements

- I-405 SB auxiliary lane: Everett Street entrance to US 26 WB (completed in 2003)
- I-405 SB ITS improvement (advisory speeds): US 26 to I-5 SB (deployed in 2011)

Upcoming Improvements

Active Traffic Management

- I-405 ATM in both directions: I-5 Marquam Bridge to I-5 Fremont Bridge

I-405 corridor highlights

Congestion and bottlenecks

Free-flow speed on I-405 is calculated to be 56 mph with an equivalent travel time of five minutes for both NB and SB directions.

The most congested conditions in 2015 occurred during the PM peak. In both the NB and SB directions during the PM peak, the average travel time for the corridor is nine minutes, an increase of one minute from 2013 to 2015. Because this is a short corridor, the travel time degradation and duration may not seem significant, but it is a severely congested corridor. The average speed NB and SB in the PM peak drops to 30 mph.

In the NB direction, the most severe recurring bottleneck is at the Fremont Bridge to the US 26 entrance. This bottleneck extends back 2.2 miles and lasts from 2:00 p.m. to 6:30 p.m. In the SB direction, the most significant recurring bottleneck extends from I-5 Hood Street to the Fremont Bridge. This bottleneck has a queue of 3.5 miles and lasts from 2:15 p.m. to 6:15 p.m.

Reliability

Reliability on the I-405 corridor has been degrading from 2013 to 2015. For both directions of I-405 in the AM peak, mid-day, and PM peak, both the average travel time and buffer time have increased. This means that trips are taking longer for all time periods reported.

I-405 NB and SB during the PM is among the corridors with unreliable travel time and also is among the corridors with the largest buffer time increase in the region.

Reliable Travel Time on I-405 NB during 2015 PM Peak

Distance: 4 miles — Free-flow travel time: 5 min.

Average Travel Time	+	Buffer Travel Time	=	Reliable Travel Time
8.5 minutes		6.7 minutes		15.2 minutes

FREIGHT RELIABILITY

As congestion creeps into the mid-day, truckers find it challenging to deliver goods and services on time. I-405 is an urban interstate connector, linking I-5, US 26 (Sunset Highway), US 26 (Ross Island Bridge) and US 30. The loss of reliability during the day makes it difficult for interstate travel and delivery of goods resulting in increases in trucking costs.

I-405 truck volume accounts for six to eight percent of total traffic, with a daily volume range of 5,900 to 10,000 trucks. I-405 has the third highest truck volume in the Portland region.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
I-405 NB	2013	4.6	5.2	0.6	5.7	5.2	0.7	5.9	7.6	3.7	11.3
	2015		5.3	1.0	6.3	5.4	1.3	6.7	8.5	6.7	15.2
I-405 SB	2013	4.6	5.6	1.1	6.7	5.3	0.7	6.1	8.0	4.4	12.5
	2015		5.8	1.3	7.1	5.5	1.4	6.8	8.8	6.2	15.0

Source: FHWA NPMRDS

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

Safety

The crash trend is directly related to congestion and the reliability of the corridor. Overall, the number of crashes for I-405 has held steady due to capacity constraints by downstream bottlenecks on I-5 and US 26. Crashes by time of day are concentrated during the PM peak period, which is the most unreliable travel period. The majority of the total crashes on I-405 are rear-end (71 percent) and side-swipe/overtaking (22 percent), which are typical of congested conditions.

I-405 Corridor Dashboard

Source: FHWA NPMRDS

I-405 | Corridor		2013	2014	2015	2013 vs 2015 % Change
Daily Vehicle Miles Traveled (Weekday Average Rounded to Thousands)	NB	159	157	148	-6.9%
	SB	164	161	158	-3.7%
Congestion Indicators (Weekday Average)					
Hours of Congestion (Daily Hours)	NB	13.8	14.6	15.8	+14.5%
	SB	13.2	14.3	15.1	+14.4%
Daily Vehicle Hours Delay (Daily Vehicle Hours)	NB	634	702	713	+12.5%
	SB	829	908	931	+12.3%
AM Peak Travel Time (Minutes)	NB	5.2	5.2	5.3	+1.9%
	SB	5.6	5.6	5.8	+3.6%
AM Peak Speed (MPH)	NB	49.6	49.0	48.0	-3.2%
	SB	45.9	45.5	44.4	-3.3%
Mid-day Travel Time (Minutes)	NB	5.2	5.3	5.4	+3.8%
	SB	5.3	5.4	5.5	+3.8%
Mid-day Speed (MPH)	NB	49.3	48.1	47.8	-3.0%
	SB	48.1	47.0	46.9	-2.5%
PM Peak Travel Time (Minutes)	NB	7.6	8.0	8.5	+11.8%
	SB	8.0	8.5	8.8	+10.0%
PM Peak Speed (MPH)	NB	33.8	32.0	30.2	-10.7%
	SB	31.9	30.0	29.0	-9.1%
Reliability Indicators (Weekday Average)					
Buffer Time AM Peak (Minutes)	NB	0.6	0.7	1.0	+66.7%
	SB	1.1	1.0	1.3	+18.2%
Buffer Time Mid-day Peak (Minutes)	NB	0.7	1.0	1.3	+85.7%
	SB	0.7	1.1	1.4	+100%
Buffer Time PM Peak (Minutes)	NB	3.7	5.3	6.7	+81.1%
	SB	4.4	5.5	6.2	+40.9%
Safety Indicators					
Annual Crashes	NB	94	94	93	-1.0%
	SB	77	78	82	+6.0%

Declining Conditions *Minor change (+/- 2% or less)* *Improving Conditions*

Daily Vehicle Miles Traveled (DVMT)

DVMT has been decreasing on I-405 and congestion has been getting worse. This potentially indicates that the corridor is at or over capacity.

Daily Vehicle Hours Delay (DVHD)

The DVHD for the I-405 corridor has increased between 2013-2015 for both NB and SB (over 12 percent). This indicates that trips are taking longer.

Mid-day

Mid-day travel times and speeds indicate a slight increase in congestion on I-405 in both directions.

Reliability Indicators

Trip reliability in the PM in both directions is significantly worse than the AM or mid-day.

Hours of Congestion (HOC)

HOC at the corridor level is measured at the worst bottleneck on the freeway corridor. HOC for both NB and SB are significantly long at 15 to 16 daily hours in 2015. They increased by about 15 percent from 2013 to 2015.

AM

AM travel times and speeds indicate a slight increase in congestion on I-405 in the SB and NB direction. AM travel time and speeds are similar to the mid-day period.

PM

PM travel times and speeds indicate increasing congestion on I-405 in both directions. The average NB and SB speed for the PM in the corridor is 30 mph.

Safety Indicators

Slightly more crashes occur in the NB direction than the SB direction. From 2013 to 2015, the number of NB crashes held steady at -1 percent and the number of SB crashes has increased by 6 percent.

2015 average speed (mph)

AM weekday

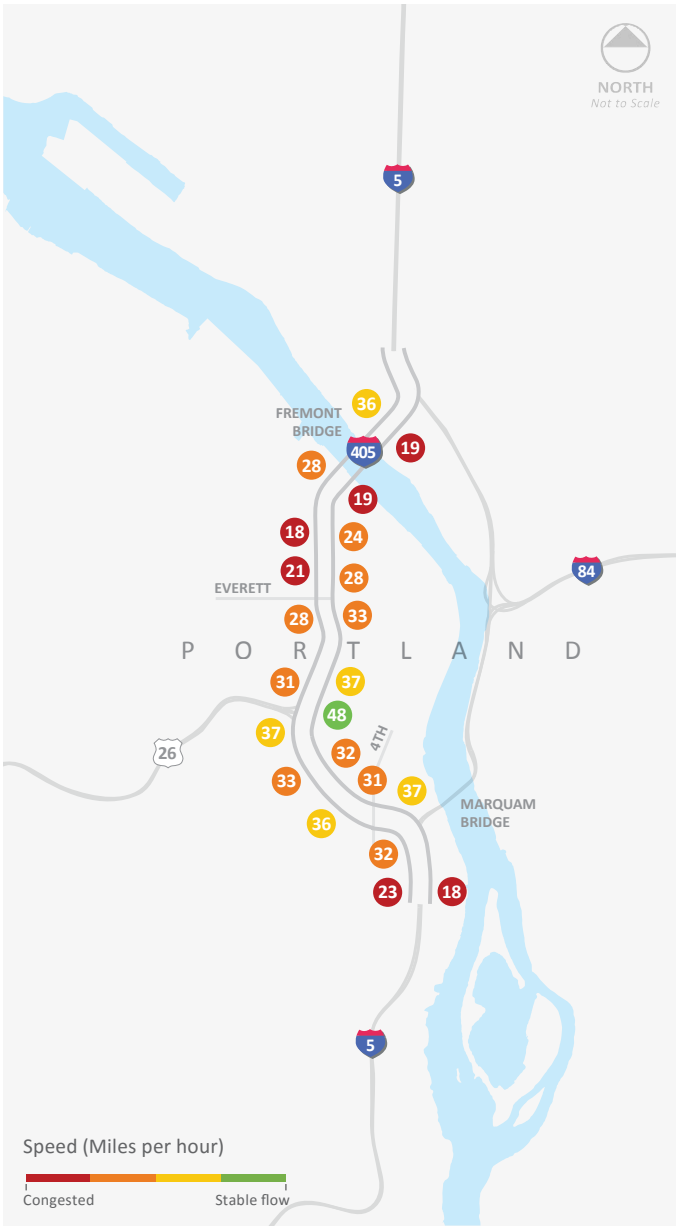
5:00 a.m. to 10:00 a.m.

Source: FHWA NPMRDS

PM weekday

3:00 p.m. to 9:00 p.m.

Source: FHWA NPMRDS



AM WEEKDAY

SB direction slows from US 26 (exit to Ross Island) to the Fremont Bridge.

NB direction slows from US 26 to Marquam Bridge and at the Fremont Bridge.

PM WEEKDAY

SB direction slows from I-5 to Fremont Bridge.

NB direction slows from Fremont Bridge to I-5.

I-405 Corridor Dashboard

I-405 bottlenecks

The I-405 corridor has six recurring bottlenecks. The number of bottlenecks has not changed from 2013 to 2015, but the duration of congestion has increased for all the bottlenecks.

In the SB direction, the most significant recurring bottleneck extends from I-5 (SW Hood Avenue) all the way up I-405 to the Fremont Bridge. This bottleneck has a queue of 3.5 miles and lasts from 2:15 p.m. to 6:15 p.m. In the NB direction, the most severe recurring bottleneck is from the Fremont Bridge to the US 26 entrance. This bottleneck extends back 2.2 miles and lasts from 2:00 p.m. to 6:30 p.m.

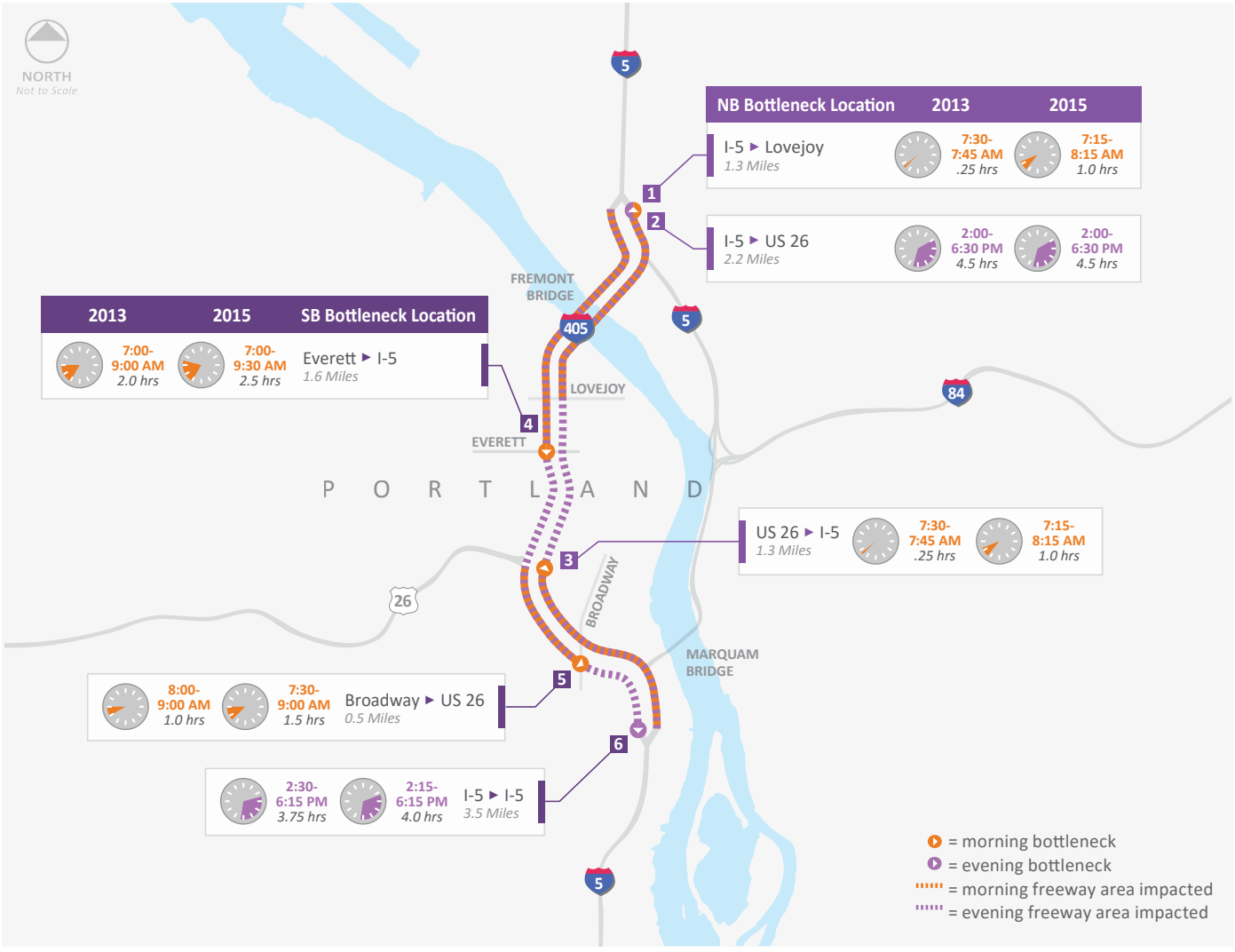
These bottlenecks affect the other downstream bottlenecks because of their intensity, duration and length of queue. The length of queue is very important on this short urban freeway because of the five big system-to-system interchanges: I-405 at I-5 (Marquam Bridge), I-405 at US 26 (Ross Island Bridge), I-405 at US 26 (Sunset Highway), I-405 at US 30, and I-405 (Fremont Bridge) at I-5.

Duration of bottlenecks

2013 vs. 2015
Source: FHWA NPMRDS

Total bottlenecks

2013 vs. 2015
Source: FHWA NPMRDS

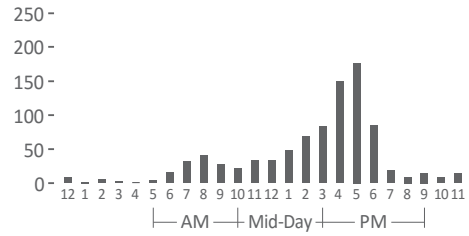


I-405 safety

I-405 had a total of 912 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe/overtaking crashes, which mainly occur in the PM peak commute period. These types of crashes are typically the result of congestion. There were 10 Top 10 percent SPIS sites along the corridor, of which six were located in the NB direction. The I-405 corridor crash rate was 1.00 crash per million vehicle miles traveled, which is higher than the 2014 statewide average crash rate of 0.73 on interstate freeways in urban cities.

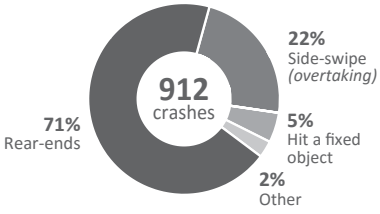
Total crashes by time of day

2011-2015
Source: ODOT



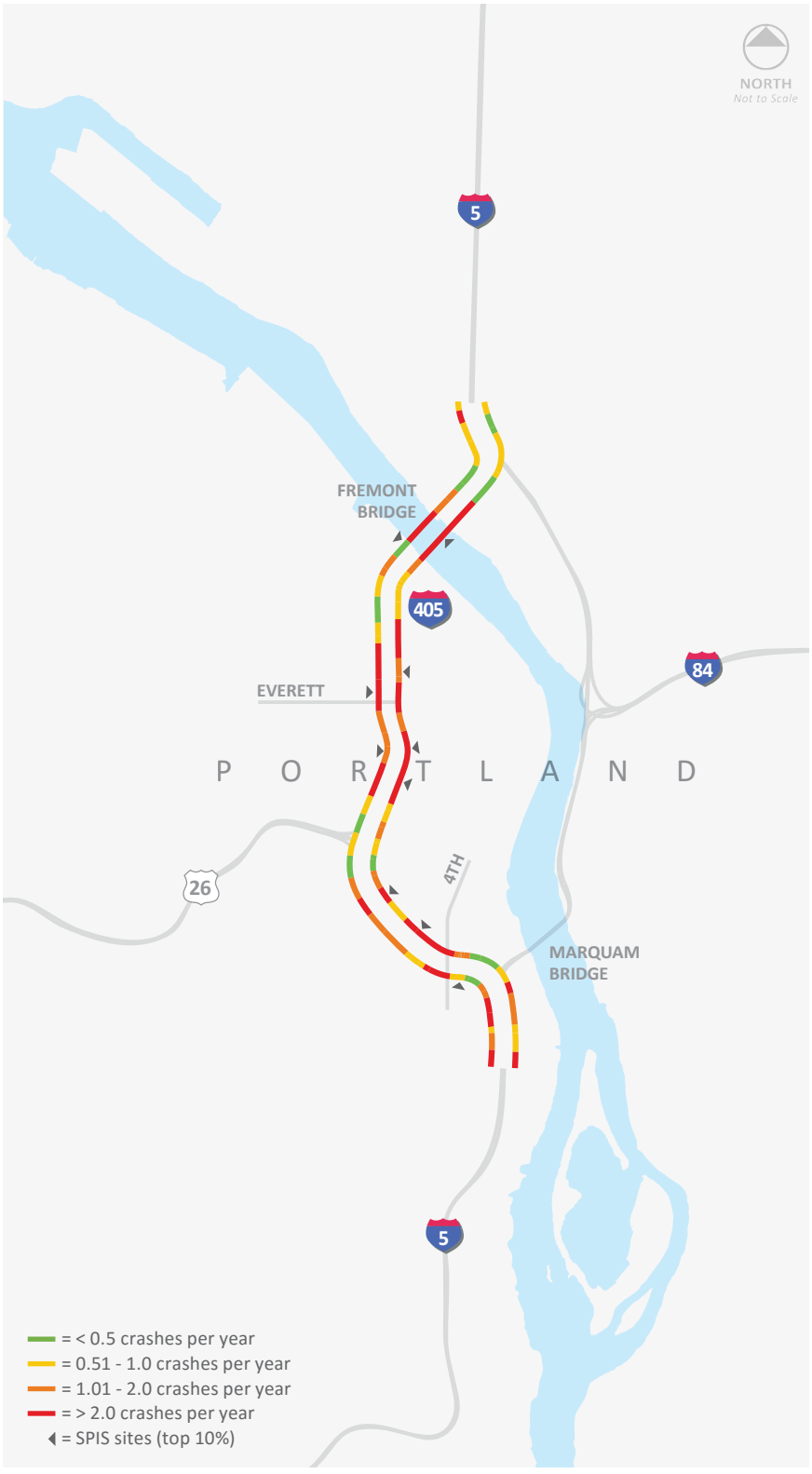
Type of crash

2011-2015
Source: ODOT



Crash frequency per 10th of a mile

2011-2015
Source: FHWA NPMRDS



US 26 Corridor Dashboard

Introduction

US 26 provides the only major east-west route from the Willamette River and downtown Portland to Beaverton, Hillsboro, and the Oregon Coast. The corridor is approximately 15 miles from I-405 to the Brookwood Parkway interchange.

US 26 is severely congested near the I-405 interchange and Vista Ridge Tunnel. The Vista Ridge Tunnel is the busiest tunnel in Oregon: 12 percent busier than I-5's six-lane Interstate Bridge and 2 percent busier than I-205's Glenn Jackson Bridge. The tunnel is closed to hazardous materials, forcing trucks hauling these materials to other routes. This tunnel is a major bottleneck for the west side of the Portland Metropolitan area, which is the economic engine of the region.

The Silicon Forest is the nickname for the concentration of high-tech companies located in Hillsboro and Beaverton. In 2015, Washington County exported $9.9 billion of goods, with the majority of exports consisting of computer and electronic projects. Growth has occurred in Washington County, with 8.4 percent population growth in the last five years and 4.8 percent employment growth, resulting in increasing pressure on US 26 and the surrounding transportation system.[8] The Blue and Red light rail lines run adjacent to US 26 from downtown Portland to the Sunset Transit Station.

Recent/Current Improvements

- Highway widening to six lanes in both directions: Murray Boulevard to Cornell Road (completed in 2006)
- Highway widening to six lanes both directions: Cornell Road to 185th Avenue (completed in 2012)
- Interchange improvement: Brookwood Parkway/ Helvetia Road (completed in 2015)

Upcoming Improvements

Widening

- Highway widening to six lanes both directions: 185th Avenue to Cornelius Pass (under construction for 2018)

Active Traffic Management

- OR 217 to I-405, both directions (under construction and will be deployed in 2018)

US 26 corridor highlights

Congestion and bottlenecks

Free-flow speed on US 26 is calculated to be 61.5 mph with an equivalent travel time of 15 minutes for both EB and WB directions.

The most congested conditions in 2015 occurred in the EB during the AM and PM. In the EB direction in the AM, the average travel time for the corridor is 22 minutes; this is an increase of two minutes from 2013 to 2015. In the EB PM, the average travel time for the corridor is 21 minutes; with a one minute decrease from 2013 to 2015.

In the EB direction, the most severe recurring bottleneck is from the Vista Ridge Tunnel to OR 217. This bottleneck occurs in both AM and PM periods from 6:15 a.m. to 7:45 p.m. for a 13.5-hour period.

In the WB direction, there is one new bottleneck that extends from Cornell Road to OR 217. This bottleneck occurs in the PM and lasts from 4:30 p.m. to 6:15 p.m.

Reliability

Reliability on the US 26 corridor has degraded from 2013 to 2015. For both directions of US 26 in the AM peak, mid-day, and PM peak, both the average travel time and buffer time have increased. This means that trips are taking longer for all time periods reported.

US 26 EB during the PM is the among the top corridors with unreliable travel time. Westbound PM travel experiences some of the most significant increases in buffer time in the region. US 26 EB during the mid-day has one of the largest increases in mid-day buffer time.

Reliable Travel Time on US 26 WB during 2015 PM Peak

Distance: 15 miles — Free-flow travel time: 15 min.

Average Travel Time	+	Buffer Travel Time	=	Reliable Travel Time
19.7 minutes		17.8 minutes		37.5 minutes

FREIGHT RELIABILITY

As congestion creeps into the mid-day, truckers find it challenging to deliver goods and services on time. US 26 is the primary east-west connector to I-5 from the west side. Hazardous material cargo is restricted on US 26 at the Vista Ridge Tunnel. The loss of reliability during the day makes it difficult for interstate travel and delivery of goods, resulting in increases in trucking costs.

US 26 truck volume accounts for approximately four percent of total traffic, with a daily volume range of 5,000 to 6,000 trucks. US 26 provides east-west freight connections to I-405 and I-5 interstate freight routes.

Travel Time *(in minutes)*

	Year	Free-flow	AM Peak			Mid-day			PM Peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
US 26 EB	2013	14.6	20.3	8.8	29.0	17.0	3.7	20.7	20.6	16.2	36.8
	2015		21.8	13.3	35.0	17.4	7.0	24.4	19.7	17.8	37.5
US 26 WB	2013	14.6	17.1	2.7	19.5	15.7	0.9	16.6	16.4	2.0	18.3
	2015		16.7	4.5	21.2	15.7	1.7	17.4	17.4	5.4	22.8

Source: FHWA NPMRDS

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

Safety

The crash trend is directly related to congestion and the reliability of the corridor. More crashes occur on US 26 EB than WB, but the growth in WB crashes has been greater. Crashes by time of day are concentrated between 6:00 a.m. to 7:00 p.m., which is the most unreliable travel period. The majority of the total crashes on US 26 are rear-end (80 percent) and side-swipe/overtaking (11 percent), which are typical of congested conditions.

US 26 Corridor Dashboard

Source: FHWA NPMRDS

US 26 | Corridor		2013	2014	2015	2013 vs 2015 % Change	
Daily Vehicle Miles Traveled (Weekday Average Rounded to Thousands)	EB	703	723	747	+6.3%	
	WB	751	730	728	-3.1%	
Congestion Indicators (Weekday Average)						
Hours of Congestion (Daily Hours)	EB	13.2	13.4	13.5	+2.3%	Declining
	WB	2.8	4.4	4.8	+71.4%	Declining
Daily Vehicle Hours Delay (Daily Vehicle Hours)	EB	3,139	3,244	3,555	+13.3%	Declining
	WB	1,389	1,434	1,534	+10.4%	Declining
AM Peak Travel Time (Minutes)	EB	20.3	20.9	21.8	+7.4%	Declining
	WB	17.1	16.5	16.7	-2.3%	Improving
AM Peak Speed (MPH)	EB	44.3	42.9	41.2	-7.0%	Declining
	WB	52.5	54.4	53.8	+2.5%	Improving
Mid-day Travel Time (Minutes)	EB	17.0	17.2	17.4	+2.4%	Declining
	WB	15.7	15.8	15.7	0.0%	—
Mid-day Speed (MPH)	EB	52.8	52.1	51.8	-1.9%	Minor change
	WB	57.1	56.9	57.2	+0.2%	Minor change
PM Peak Travel Time (Minutes)	EB	20.6	19.7	19.7	-4.4%	Improving
	WB	16.4	16.9	17.4	+6.1%	Declining
PM Peak Speed (MPH)	EB	43.6	45.5	45.6	+4.6%	Improving
	WB	54.8	53.1	51.5	-6.0%	Declining
Reliability Indicators (Weekday Average)						
Buffer Time AM Peak (Minutes)	EB	8.8	13.6	13.3	+51.1%	Declining
	WB	2.7	3.1	4.5	+66.7%	Declining
Buffer Time Mid-day Peak (Minutes)	EB	3.7	7.3	7.0	+89.2%	Declining
	WB	0.9	1.5	1.7	+88.9%	Declining
Buffer Time PM Peak (Minutes)	EB	16.2	20.8	17.8	+9.9%	Declining
	WB	2.0	4.3	5.4	+170.0%	Declining
Safety Indicators						
Annual Crashes	EB	364	341	437	+20.0%	Declining
	WB	120	135	203	+69.0%	Declining

Declining Conditions *Minor change (+/- 2% or less)* *Improving Conditions*

Daily Vehicle Miles Traveled (DVMT)

DVMT increased on US 26 EB while DVMT decreased WB in 2015.

Daily Vehicle Hours Delay (DVHD)

The DVHD for the US 26 corridor increased between 2013 and 2015 by 13 percent in the EB and 10 percent in the WB. This indicates that EB and WB trips on US 26 are taking longer.

Mid-day

Mid-day travel times and speeds indicate no significant change in congestion on US 26 in both EB and WB directions.

Reliability Indicators

Trip reliability in the EB AM and EB PM have the worst reliability. EB mid-day has noticeably declined.

Hours of Congestion (HOC)

HOC at the corridor level is measured at the worse bottleneck in the freeway corridor. US 26 EB has a longer duration of congestion than WB. The WB has had more growth in duration.

AM

AM travel times and speeds indicate an increase in congestion on US 26 in the EB direction and a slight decrease in congestion for US 26 WB. EB speed and travel times are worse than WB, indicating a higher level of congestion in that direction.

PM

PM travel times and speeds indicate increased congestion on US 26 WB and decreased congestion in EB. EB speed and travel times are worse than WB, indicating a higher level of congestion in that direction.

Safety Indicators

Significantly more crashes occur in the EB direction than the WB direction. From 2013 to 2015, the number of EB crashes increased by 20 percent and the number of WB crashes increased by 69 percent.

2015 average speed (mph)

AM weekday

5:00 a.m. to 10:00 a.m.

Source: FHWA NPMRDS

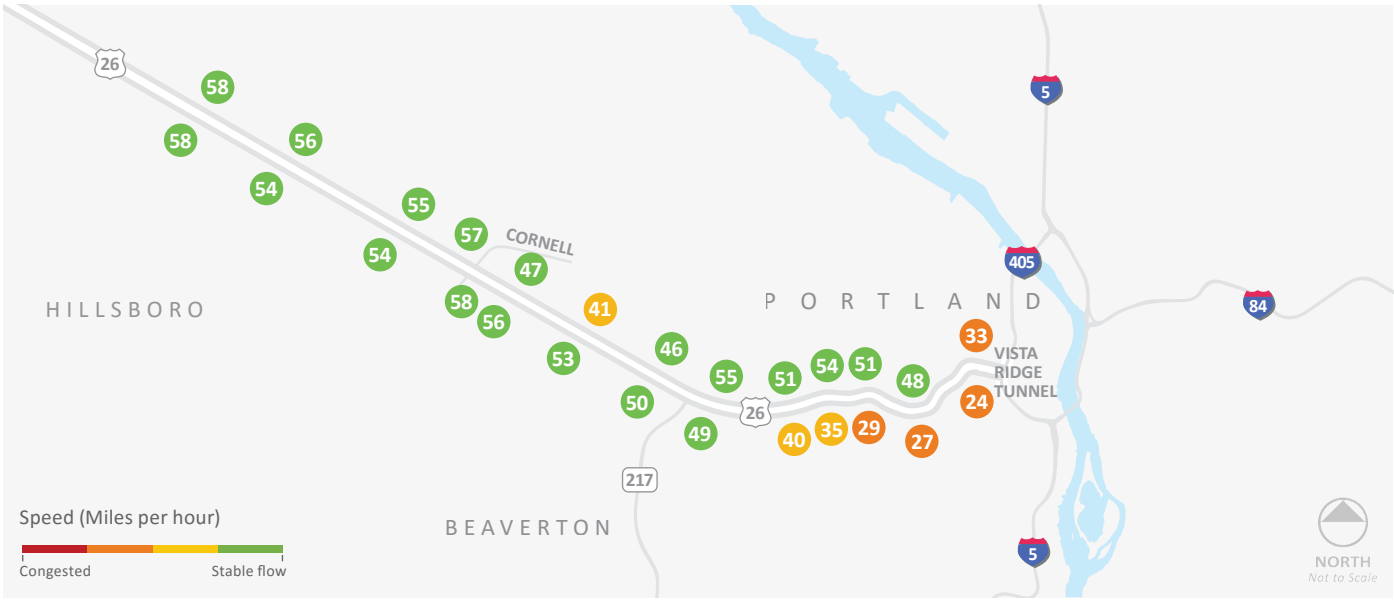
AM WEEKDAY

EB direction slows from I-405 to OR 217.
WB direction slows at the Vista Ridge Tunnel.

PM weekday

3:00 p.m. to 9:00 p.m.

Source: FHWA NPMRDS



PM WEEKDAY

EB direction slows from I-405 to OR 217.
WB direction slows at the Vista Ridge Tunnel and at Cornell Road.

US 26 Corridor Dashboard

US 26 bottlenecks

US 26 corridor had three recurring bottlenecks in 2015. The number of bottlenecks increased from two bottlenecks in 2013 to three bottlenecks in 2015. The duration of congestion has increased for all the bottlenecks.

The most severe bottleneck is in the EB direction in both the AM and PM. This bottleneck extends from I-405 to OR 217 and lasts for 13.5 hours during the day. This is one of the worst bottlenecks in the region in terms of intensity, duration, and length of queue.

In 2015, a new bottleneck was identified in the WB direction at Cornell Road. This bottleneck extends to OR 217 and lasts from 4:30 p.m. to 6:15 p.m.

Duration of bottlenecks

2013 vs. 2015

Source: FHWA NPMRDS

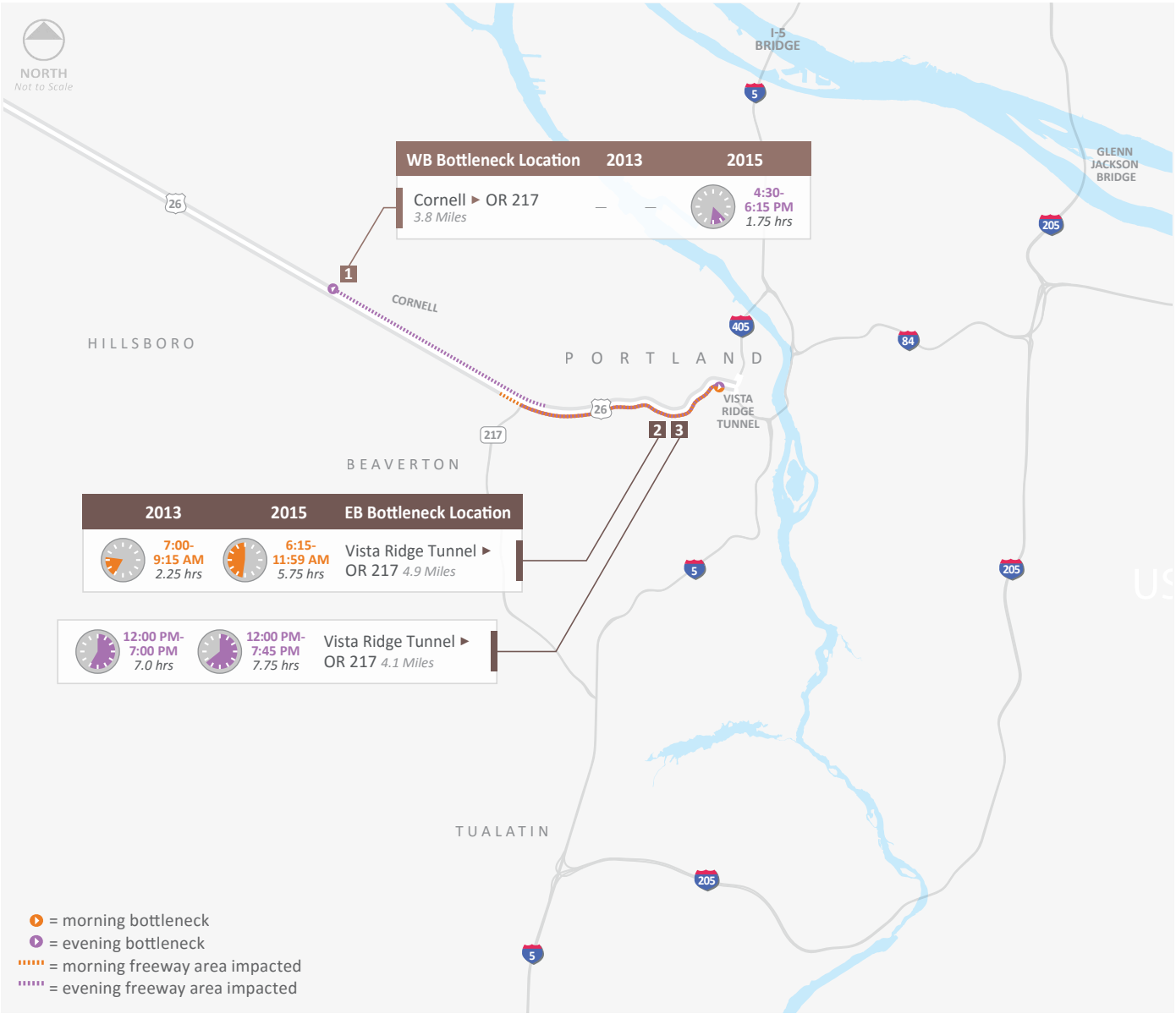
Total bottlenecks

2013 vs. 2015

Source: FHWA NPMRDS

2013 2 bottlenecks

2015 3 bottlenecks

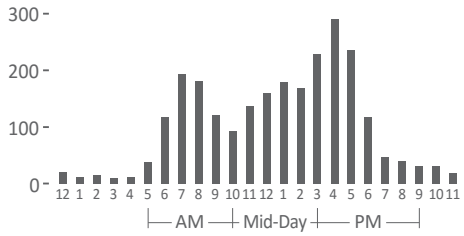


US 26 safety

US 26 had a total of 2,639 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe/overtaking crashes, which mainly occur in the period from 6:00 a.m. to 7:00 p.m. These types of crashes are typically the result of congestion. There were three Top 10 percent SPIS sites along the corridor, all of which were located in the EB direction at the tunnel where congestion is substantially higher. The US 26 corridor crash rate was 1.04 crashes per million vehicle miles traveled, which is higher than the 2014 statewide average crash rate of 0.89 on freeways/expressways in urban cities.

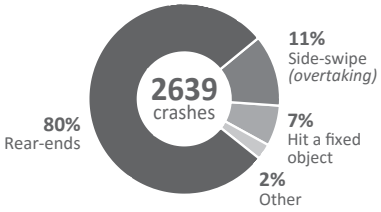
Total crashes by time of day

2011-2015
Source: ODOT



Type of crashes

2011 to 2015
Source: ODOT



Crash frequency per 10th of a mile

2011-2015
Source: ODOT

OR 217 Corridor Dashboard

Introduction

OR 217 serves as a connection between US 26 (Sunset Highway) and I-5. OR 217 is approximately 7.5 miles in length. It connects Tualatin, Tigard, Beaverton, and Hillsboro.

OR 217 has nine closely spaced interchanges, which contribute to conflicts between entering and exiting traffic, particularly during peak commute times. ODOT has successfully developed auxiliary lanes in the region to improve the safety and operations in merging and weaving areas. OR 217's crash rates and congestion were higher than regional averages for similar types of facilities.

Recent/Current Improvements

- OR 217 NB: Canyon Road to US 26 (completed in 2012). This project widened OR 217 NB from two-lanes to three-lanes plus an auxiliary lane. As a result, this segment of OR 217 NB is no longer a recurring bottleneck location.
- Shoulder widening (2014) allowed disabled vehicles to be pulled out of traffic, thus reducing the number of secondary crashes and reducing incident delay.
- OR 217 NB and SB Active Traffic Management (ATM): I-5 to US 26 (completed 2014).

Active Traffic Management

ODOT deployed its first full ATM system in the summer of 2014 consisting of variable speed, traveler information, queue warning, and updated ramp metering to improve safety and reliability within the OR 217 corridor. After a full year of implementation the OR 217 Active Traffic Management project reported preliminary crash data showing a 21 percent reduction in the number of total crashes, and overall travel time data indicating a 10 percent decrease in travel time variability.

Upcoming Improvements

Auxiliary lanes

- OR 217 SB: Auxiliary Lane extension from Beaverton-Hillsdale Highway to OR 99W with a collector-distributor road from Allen Boulevard to Denney Road (future project, in design)
- OR 217 NB: Auxiliary Lane extension from OR 99W to Scholls-Ferry Road (future project, in design)

OR 217 corridor highlights

Congestion and bottlenecks

Free-flow speed on OR 217 is calculated to be 59.2 mph with an equivalent travel time of eight minutes for both NB and SB directions.

The most congested conditions in 2015 occurred during the PM peak. In the SB direction, the average travel time for the corridor is 13 minutes; this is a decrease of one minute from 2013 to 2015. In the NB direction, the average travel time for the corridor is 11 minutes; this is an increase of one minute from 2013 to 2015.

In the NB direction between I-5 and Denney Road, there are two recurring bottlenecks, one in the AM and one in the PM. The AM bottleneck lasts from 7:15 a.m. to 9:00 a.m. and the PM lasts from 3:00 p.m. to 6:30 p.m.

In the SB direction there are three recurring bottlenecks, one in the AM and two in the PM. The AM bottleneck is at OR 99W and lasts from 6:45 a.m. to 9:00 a.m. In the PM, there are two bottlenecks that overlap to extend from Hall Boulevard to US 26 with a combined duration from 12:00 p.m. to 7:00 p.m.

Reliability

Reliability on OR 217 SB during the PM is among the worst for reliability not only for the corridor but also the region. However, from 2013 to 2015, it had the lowest rate of change, whereas other corridors in the region have degraded at a significantly higher rate. This is attributed to ATM deployment in the corridor.

Mid-day reliability SB on OR 217 has degraded substantially, with buffer times longer than the AM buffer time.

Reliable Travel Time on OR 217 SB during 2015 PM Peak

Distance: 8 miles — Free-flow travel time: 8 min.

Average Travel Time	+	Buffer Travel Time	=	Reliable Travel Time
12.8 minutes		8.1 minutes		20.9 minutes

FREIGHT RELIABILITY

As congestion creeps into the mid-day, truckers find it challenging to deliver goods and services on time. Because of the hazardous material restriction on US 26 at the Vista Ridge Tunnel, OR 217 is the west-side connector for US 26 to I-5 SB. The loss of reliability during the day makes it difficult for regional travel and delivery of goods, resulting in increases in trucking costs. OR 217 truck volume accounts for four percent of total traffic, with a daily volume of 4,300 trucks.

Travel time *(in minutes)*

	Year	Free-flow	AM peak			Mid-day			PM peak		
			Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]	Average	Buffer [A]	Total [B]
OR 217 NB	2013	7.6	10.2	2.2	12.4	8.6	0.8	9.4	10.3	2.2	12.5
	2015		10.0	3.4	13.5	8.6	1.3	9.9	10.7	3.1	13.8
OR 217 SB	2013	7.6	10.4	3.0	13.3	9.5	2.1	11.6	13.9	7.6	21.5
	2015		10.1	4.2	14.3	9.6	5.0	14.6	12.8	8.1	20.9

Source: FHWA NPMRDS

A. Buffer time is the extra time (or time cushion) that travelers should add to their average travel time to ensure on-time arrival.

B. Total or reliable travel time is the addition of average travel time with buffer travel time. This is the time travelers should allot for on-time arrival at their destination in 19 out of 20 weekdays (95 percent of the time).

Safety

The crash trend is directly related to the congestion and reliability of the corridor. More crashes occur on OR 217 SB than NB, but the growth in SB crashes has been decreasing. Crashes by time of day are concentrated between 6:00 a.m. to 6:00 p.m., which is the most unreliable travel period. The majority of the total crashes on OR 217 are rear-end (80 percent) and side-swipe/overtaking (12 percent), which are typical of congested conditions.

OR 217 Corridor Dashboard

Source: FHWA NPMRDS

OR 217 | Corridor		2013	2014	2015	2013 vs 2015 % Change	
Daily Vehicle Miles Traveled (Weekday Average Rounded to Thousands)	NB	---	---	---	---	—
	SB	---	---	---	---	—
Congestion Indicators (Weekday Average)						
Hours of Congestion (Daily Hours)	NB	11.9	12.5	12.3	+3.4%	
	SB	12.5	12.5	12.5	0.0%	—
Daily Vehicle Hours Delay (Daily Vehicle Hours)	NB	---	---	---	---	—
	SB	---	---	---	---	—
AM Peak Travel Time (Minutes)	NB	10.2	9.8	10.0	-2.0%	
	SB	10.4	10.0	10.1	-2.9%	
AM Peak Speed (MPH)	NB	44.5	46.0	44.9	+0.9%	
	SB	43.5	45.2	44.5	+2.3%	
Mid-day Travel Time (Minutes)	NB	8.6	8.6	8.6	0.0%	—
	SB	9.5	9.4	9.6	+1.1%	
Mid-day Speed (MPH)	NB	52.3	52.6	52.7	+1.0%	
	SB	47.8	48.1	47.1	-1.5%	
PM Peak Travel Time (Minutes)	NB	10.3	10.5	10.7	+3.9%	
	SB	13.9	12.9	12.8	-7.9%	
PM Peak Speed (MPH)	NB	43.9	43.2	42.1	-4.1%	
	SB	32.4	34.9	35.3	+9.0%	
Reliability Indicators (Weekday Average)						
Buffer Time AM Peak (Minutes)	NB	2.2	3.5	3.4	+54.5%	
	SB	3.0	4.6	4.2	+40.0%	
Buffer Time Mid-day Peak (Minutes)	NB	0.8	1.1	1.3	+62.5%	
	SB	2.1	3.8	5.0	+138.1%	
Buffer Time PM Peak (Minutes)	NB	2.2	3.2	3.1	+40.9%	
	SB	7.6	8.9	8.1	+6.6%	
Safety Indicators						
Annual Crashes	NB	121	132	125	+3.0%	
	SB	191	168	156	-18.0%	

Declining Conditions *Minor change (+/- 2% or less)* *Improving Conditions*

Daily Vehicle Miles Traveled (DVMT)
DVMT for OR 217 is not included due to construction activities.

Daily Vehicle Hours Delay (DVHD)
DVHD for OR 217 is not included due to construction activities.

Mid-day
Mid-day travel times and speeds indicate no significant change in congestion on OR 217 in both NB and SB directions.

Reliability Indicators
Trip reliability SB during AM, Mid-day, and PM peak is worse than NB. Buffer time is highest in the SB PM and SB mid-day buffer time has grown the most, surpassing AM buffer time.

Hours of Congestion (HOC)
HOC at the corridor level is measured at the worse bottleneck in the freeway corridor. There is no significant change in the SB and a slight change in the NB from 2013 to 2015.

AM
AM travel times and speeds indicate decreased congestion on OR 217 in both directions. SB and NB travel and speed are slightly better indicating a lower level of congestion.

PM
PM travel times and speeds indicate an increase in congestion on OR 217 in NB direction and a decrease in congestion in the SB direction. SB speed and travel time are significantly worse than NB, indicating higher level of congestion in that direction.

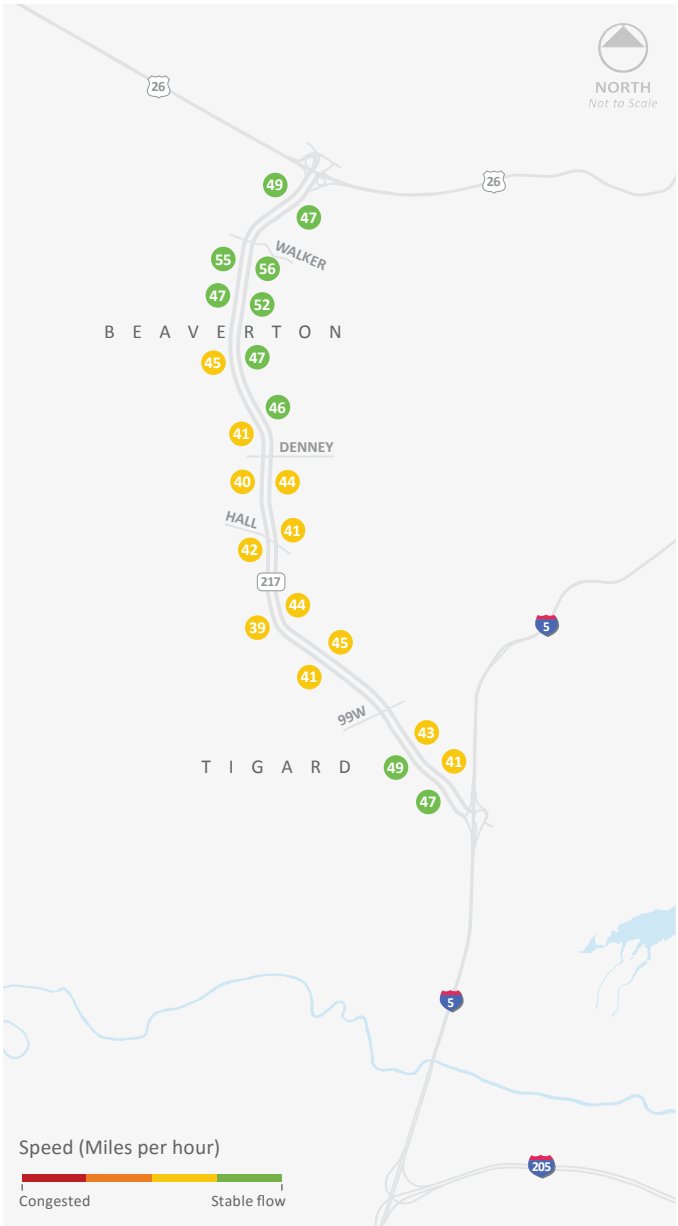
Safety Indicators
Substantially more crashes occur in the SB direction than the NB direction. From 2013 to 2015, the number of NB crashes had a slight increased of 3 percent and the number of SB crashes decreased by 18 percent.

2015 average speed (mph)

AM weekday

5:00 a.m. to 10:00 a.m.

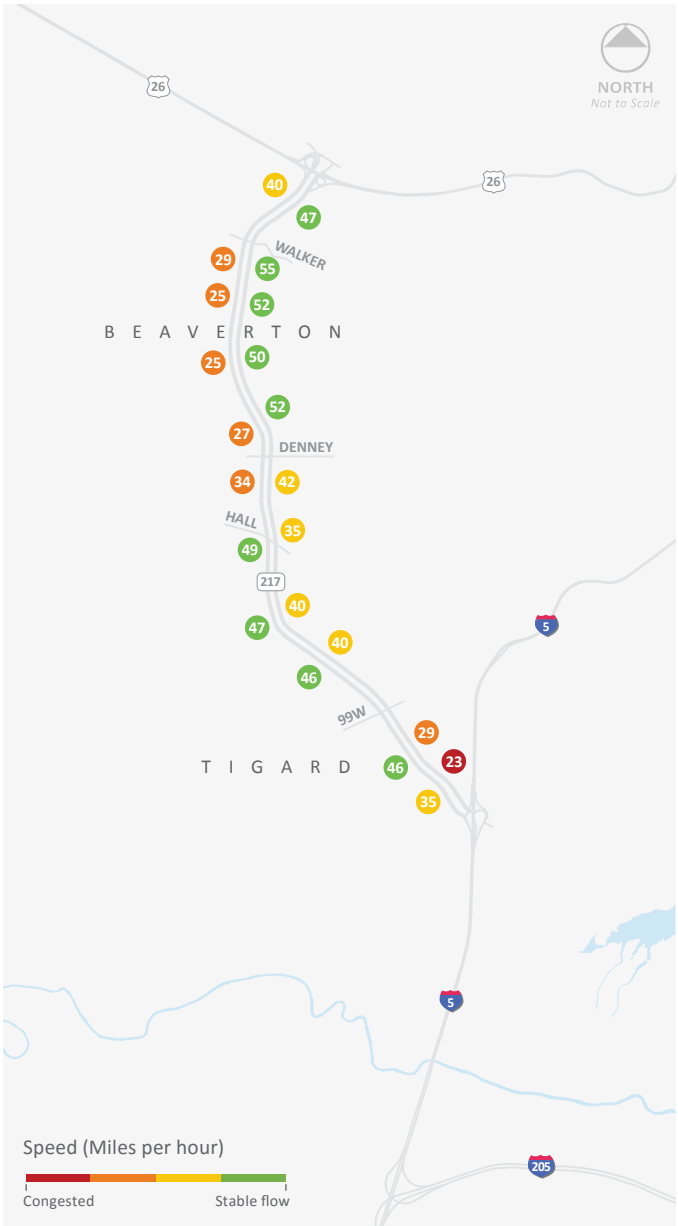
Source: FHWA NPMRDS



PM weekday

3:00 p.m. to 9:00 p.m.

Source: FHWA NPMRDS



AM WEEKDAY

SB direction slows from OR 99W to Beaverton-Hillsdale Highway.

NB direction slows from Denney Road to I-5.

PM WEEKDAY

SB direction slows in two general areas: Hall Boulevard to US 26 and I-5 to 72nd Avenue.

NB direction slows from Denney Road to I-5.

OR 217 Corridor Dashboard

OR 217 bottlenecks

OR 217 has five recurring bottlenecks. The number of bottlenecks has not changed from 2013 to 2015, but the duration of congestion has increased for three of the five bottlenecks.

In the NB direction, the most severe recurring bottleneck is at Denney Road to I-5 during the PM. This bottleneck has a queue of 3.5 miles and lasts from 3:00 p.m. to 6:30 p.m.

In the SB direction, the most severe recurring bottleneck extends from Hall Boulevard to US 26 during the PM. This bottleneck has a queue of 3.5 miles and lasts from 12:00 p.m. to 6:15 p.m. In the AM, a recurring bottleneck exists at OR 99W to Walker Road that lasts from 6:45 a.m. to 9:00 a.m.

Duration of bottlenecks

2013 vs. 2015

Source: FHWA NPMRDS

Total bottlenecks

2013 vs. 2015

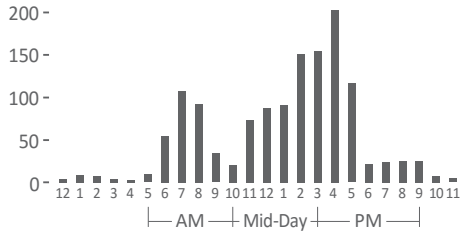
Source: FHWA NPMRDS

OR 217 safety

OR 217 had a total of 1,340 crashes in the five-year study period. The vast majority of crashes were rear-end and side-swipe/overtaking crashes, which mainly occur in the period from 6:00 a.m. to 6:00 p.m. These types of crashes are typically the result of congestion. There were two Top 10 percent SPIS sites along the corridor, all of which were located in the SB direction. The OR 217 corridor crash rate was 0.96 crash per million vehicle miles traveled, which is higher than the 2014 statewide average crash rate of 0.89 on freeways/ expressways in urban cities.

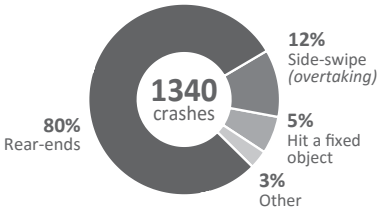
Total crashes by time of day

2011-2015
Source: ODOT



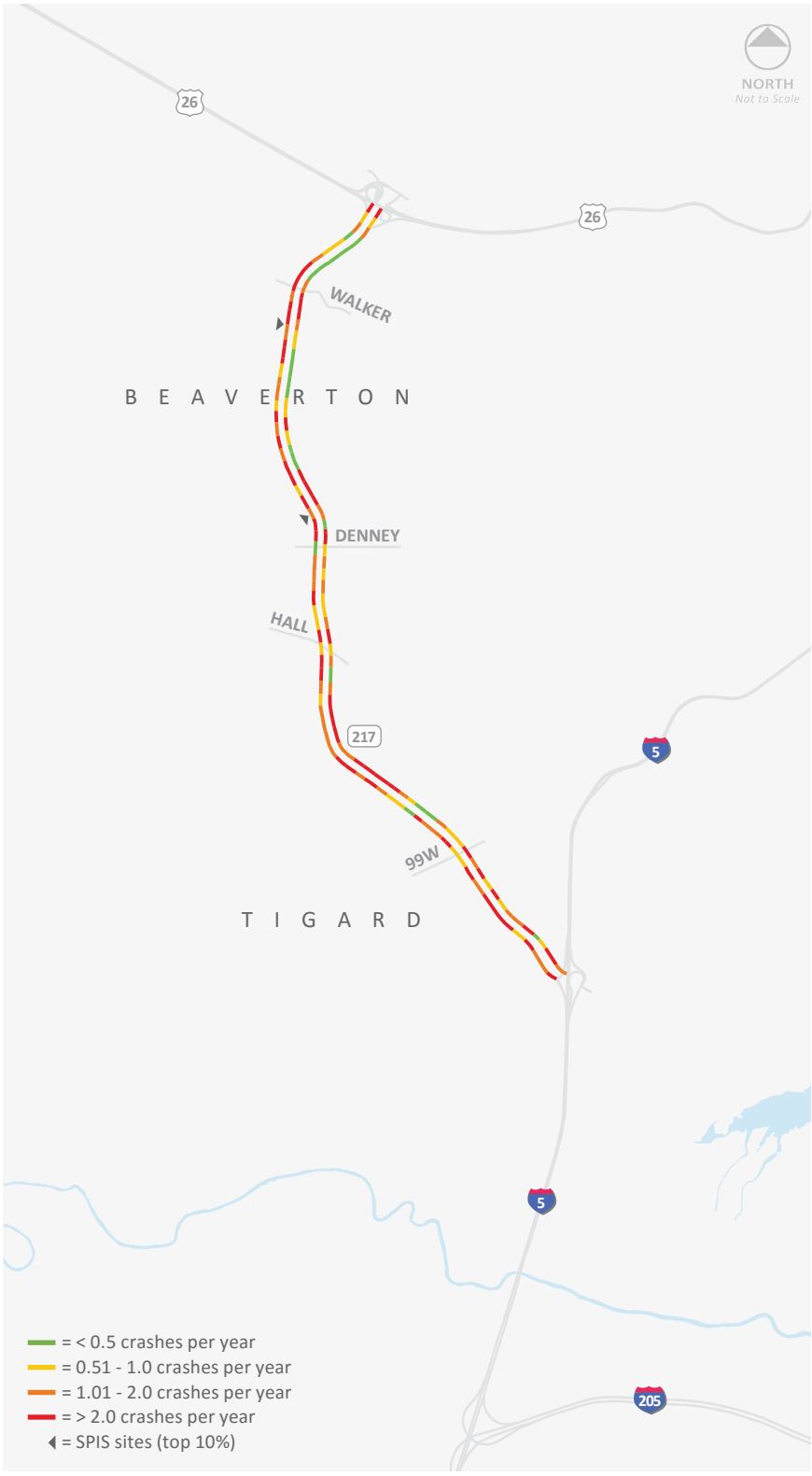
Type of crashes

2011 to 2015
Source: ODOT



Crash frequency per 10th of a mile

2011-2015
Source: ODOT



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Glossary of Terms

System Performance Analysis

For this report, the system performance analysis analyzed the regional and corridor operations over time. ODOT typically uses a three year time frame for operations and five year time frame for safety.

Regional
The regional traffic Performance Overview provides a region-wide cumulative performance evaluation of all six freeway corridors.

Corridor
The corridor traffic Performance Overview provides details on the individual freeway corridor performance.

System Performance Measures

The system measurement is the basic data components upon which performance indicators are derived.

Time of Day

The time of day has been divided into four traffic analysis time periods. The AM, Mid-day and PM time periods include adequate time to capture the current peak periods and account for future growth into shoulder peak periods to allow for year-to-year tracking of congestion.

AM Peak Period
5:00 a.m. to 10:00 a.m.–duration of five hours in the AM.

Mid-day Peak Period
10:00 a.m. to 3:00 p.m.–duration of five hours in the Mid-day.

PM Peak Period
3:00 p.m. to 9:00 p.m.–duration of six hours in the PM.

Off-Peak Period
12:00 a.m. midnight to 5:00 a.m.–duration of five hours for free-flow calculation.

Travel Time and Speed

The travel times and speeds for each of the selected time periods were derived using five-minute interval data for the 24-hour workday (non-holiday weekday).

Average Travel Time
The average travel time on a route is determined during a specific time interval. For example, the travel time to work refers to the total number of minutes that it usually took a person to get from home to work each day.

Average Speed
Speed is the inverse of travel time. The average weekday speed is calculated by using the segment length and dividing by the average travel time, reported in miles per hour (mph).

Free-flow Speed and Travel Time
The free-flow speed and travel time are used as a benchmark for the uncongested traffic conditions for the corridor. Although free-flow speed is not technically a reported performance metric, it is used as one of the empirically estimated values when calculating vehicle-hours of delay and hours of congestion.

95th Percentile Travel Time
The 95th percentile generally represents a reasonable upper boundary on expected motorist travel time. For commuters it means 19 out of 20 workday trips in a month will take no more than the planned time. The 95th percentile vehicular travel times, in minutes, are estimated for each five-minute interval of the 24-hour workday (non-holiday weekday) tallied for the reported time periods.

Corridor Performance Indicators

Using these measurements from the traffic data, key traffic indicators can be defined and used to evaluate the freeway system performance. These indicators are grouped into the following categories:

Congestion and Delay Indicators

Congestion
Congestion is relatively easy to recognize—roads filled with cars, trucks, and buses. In the transportation realm, congestion usually relates to an excess of vehicles on a portion of roadway at a particular time resulting in speeds that are slower—sometimes much slower—than normal or "free flow" speeds.

Hours of Congestion (HOC)
HOC is the duration of traffic congestion (in time) capturing the average number of hours per workday (non-holiday weekday) that the motorist will experience congestion. Region wide HOC is based on the cumulative HOC reported for each corridor. For the corridors, the HOC reported is based on the location of the worse congestion or bottleneck of that corridor.

Daily Vehicle Hours of Delay (DVHD)
DVHD is all travel delay experienced by motorists on the roadway in an average weekday, reported in vehicle hours. DVHD is estimated for each five-minute interval of the 24-hour workday (non-holiday weekday). Free-flow travel time (FFTT) was used as the congestion threshold for estimating DVHD.

Daily Vehicle Miles Traveled (DVMT)
DVMT is the cumulative number of miles traveled by all motorists on freeways. DVMT can be used as a measure of throughput. Generally, throughput will begin to decline as the system breaks down and the tolerance to congestion is reached. DVMT was estimated for each 5-minute interval of the 24-hour workday (non-holiday weekday).

Percentage of Freeway System Impacted Across All Hours of the Day
Percent of total freeway centerline miles that drop below 75 percent of the free-flow speed.

System Speed by Time of Day
Graph of average speed (mph) by time of day for 24-hour workday (non-holiday weekday).

Bottleneck Indicators

Recurring Bottlenecks
Recurring bottlenecks are defined as areas where traffic begins to slow from free-flow to average workday (non-holiday weekday) speeds that drop below 75 percent of the free-flow speed. In these areas of bottleneck the traffic demand exceeds the capacity of the roadway.

Bottleneck Duration
The bottleneck duration is the number of hours per day (non-holiday weekday) that the average speeds fall below 75 percent of free-flow speed.

Bottleneck Length
Bottleneck length is the total length in miles in which the bottleneck extends; where the average workday (non-holiday weekday) speeds fall below 75 percent of free-flow speed.

Reliability Indicators

Buffer Travel Time
Buffer time is the extra time (time cushion) that travelers should add to their average travel time to ensure on-time arrival in 19 out of 20 workdays (95 percent of the time).

Reliable Travel Time
Total or reliable travel time as defined in this report is the addition of average travel time and buffer travel time. This is the total time travelers should allot for on-time arrival at their destination.

Safety Indicators

ODOT crash trends are analyzed over a five-year period. Crashes were analyzed for each freeway mainline corridor, excluding those occurring at ramps and interchange locations.

SPIS
The Safety Priority Index System (SPIS) is a method for identifying high-crash location on state highways based on crash frequency, rate and severity. Top 10 percent locations are typically identified for targeted project improvements.

Annual Crashes
The total crashes that occur on each freeway corridor for each year.

Crash Rate
The crash rate is expressed as the number of crashes per million vehicle miles traveled.

$$\text{Crash Rate} = \frac{(\text{number of crashes} \times 1{,}000{,}000)}{(\text{length in miles} \times \text{average daily traffic} \times \text{number of days})}$$

Crash Frequency
The crash frequency is an indicator of how often crashes occur by time of day or by location.

Data Sources

FHWA NPMRDS
The Federal Highway Administration (FHWA) acquired a National Performance Management Research Data Set (NPMRDS) of average travel times for use in performance measurement. The NPMRDS vehicle probe data is obtained from a number of sources including mobile phones, vehicles, and portable navigation device.

PORTAL
PORTAL is the official Archived Data User Service (ADUS) for the Portland Metropolitan region as specified in the Regional ITS Architecture. PORTAL provides a centralized, electronic database that facilitates the collection, archiving, and sharing of data and information for public agencies within the region. The data stored in PORTAL includes 20-second granularity loop detector data from freeways in the Portland metropolitan region, arterial signal data, travel time data, weather data, incident data, variable message data, truck volumes, transit data and arterial signal data.

Transportation Project Specific Terms

Active Traffic Management (ATM)
Active traffic management is the ability to dynamically manage recurring and nonrecurring congestion based on prevailing traffic conditions. Focusing on trip reliability, it maximizes the effectiveness and efficiency of the facility.

Auxiliary Lane
An auxiliary lane typically provides a direct connection from one interchange ramp to the next. The lane separates slower traffic movements from the mainline, helping smooth the flow of traffic and reduces the potential for crashes.