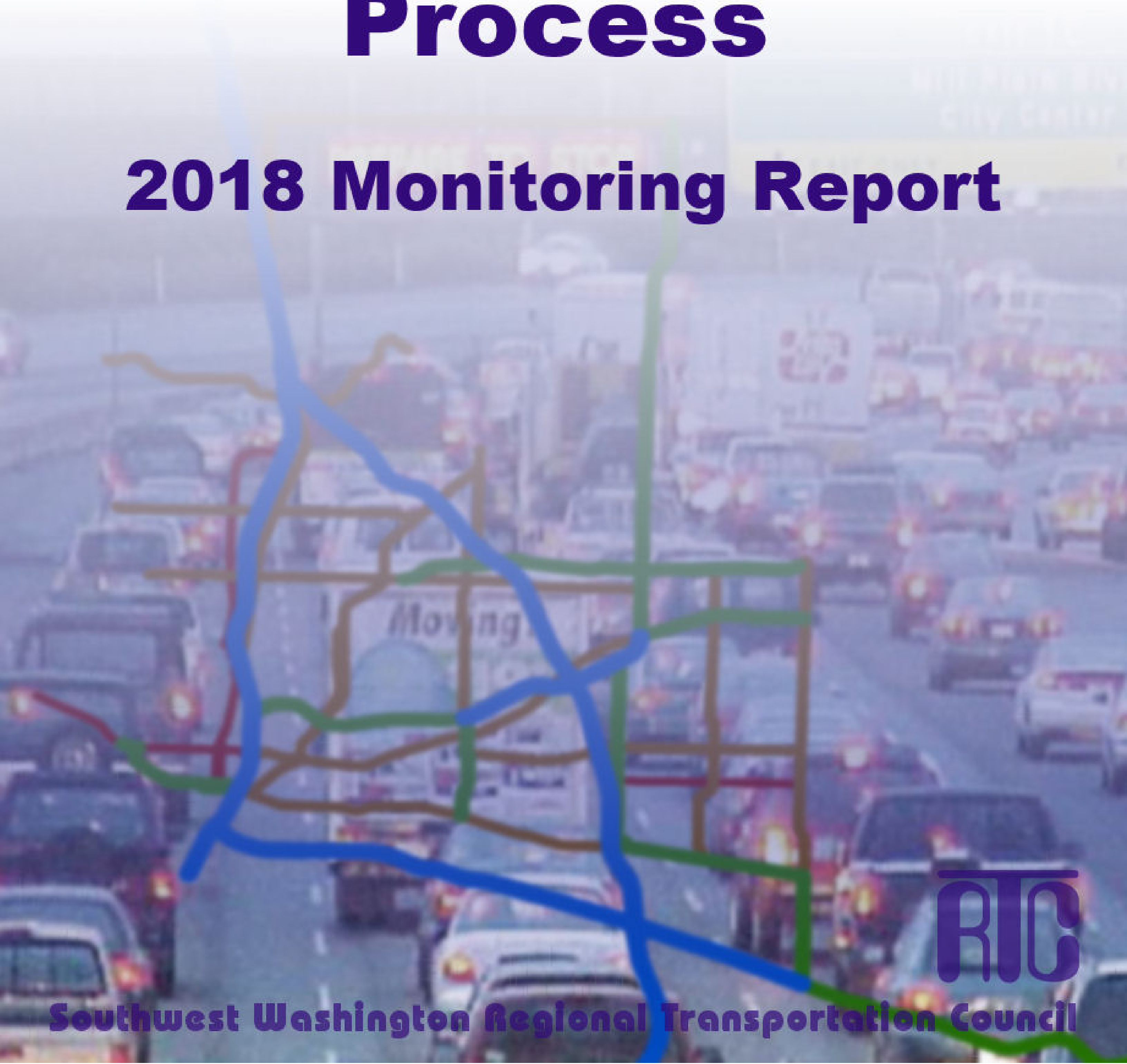
Congestion Management Process

2018 Monitoring Report



RTC

Southwest Washington Regional Transportation Council

Congestion Management Process
2018 Monitoring Report

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Skamania County
Klickitat County
City of Vancouver
City of Camas
City of Washougal
City of Battle Ground
City of Ridgefield
City of La Center
Town of Yacolt
City of Stevenson
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City of Bingen
City of Goldendale
C-TRAN
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Port of Camas-Washougal
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14th Legislative District
17th Legislative District
18th Legislative District
20th Legislative District
49th Legislative District

Clark County, Washington

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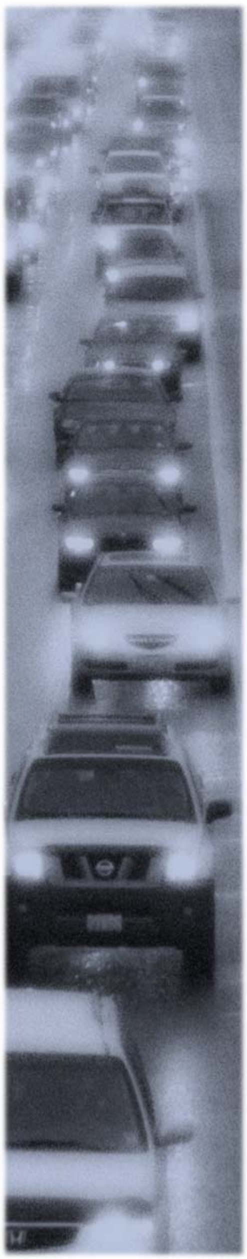


Congestion is defined as the level at which transportation system performance is no longer acceptable due to traffic interference resulting in decreased speeds and increased travel times. Traffic congestion is an inherent result of a healthy economic urban area. It is important to note that high traffic volumes that may result in congestion can also be a sign of growth and economic vitality. While it may be impossible to totally remove all congestion, congestion needs to be managed in order to provide a reliable transportation system for users.

The ability to increase highway capacity as a means to relieve congestion is limited by constrained financial resources as well as by physical and natural environmental factors. Therefore, the prime consideration should be improvement to key bottlenecks and the operation and management of the transportation system.

The *Congestion Management Process: Monitoring Report* offers information to Southwest Washington Regional Transportation Council[1] (RTC) for implementing a Congestion Management Process (CMP). The CMP is a way to:

- Monitor, measure and diagnose the causes of congestion on the regional transportation system;
- Evaluate and recommend strategies to manage regional congestion; and
- Evaluate the performance of strategies put in practice to manage or improve congestion.

Background

The CMP is required to be developed and implemented as an integral part of the regional planning process in Transportation Management Areas, regions with more than 200,000 people.

Federal regulation 23 CFR 450.320(c)[2] identifies the required components for a CMP:

1. Methods to monitor and evaluate the performance of the multimodal transportation system, identify the causes of recurring and non-recurring

[1] *http://www.rtc.wa.gov/*
[2] *http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&rgn=div5&view=text&node=23:1.0.1.5.11&idno=23*

High traffic volumes that may result in congestion can also be a sign of growth and economic vitality.

congestion, identify and evaluate alternative strategies, provide information supporting the implementation of actions, and evaluate the effectiveness of implemented actions.

2. Definition of congestion management objectives and appropriate performance measures to assess the extent of congestion and support the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods. Since levels of acceptable system performance may vary among local communities, performance measures should be tailored to the specific needs of the area and established cooperatively by the State(s), affect MPO(s), and local officials in consultation with the operators of major modes of transportation in the coverage area.

3. Establishment of a coordinated program for data collection and system performance monitoring to define the extent and duration of congestion, to contribute in determining the causes of congestion, and evaluate the efficiency and effectiveness of implemented actions. To the extent possible, this data collection program should be coordinated with existing data sources (including archived operational/ITS data) and coordinated with operations managers in the metropolitan area.

4. Identification and evaluation of the anticipated performance and expected benefits of appropriate congestion management strategies that will contribute to the more effective use and improved safety of existing and future transportation systems based on the established performance measures. The following categories of strategies, or combination of strategies, are some examples of what should be appropriately considered for each area:

   a. Demand management measures, including growth management and congestion pricing

   b. Traffic operational improvements

   c. Public transportation improvements

   d. ITS technologies as related to the regional ITS architecture, and

   e. Where necessary, additional system capacity

5. Identification of an implementation schedule, implementation responsibilities, and possible funding sources for each strategy (or combination of strategies) proposed for implementation.

6. Implementation of a process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures. The results of this evaluation shall be provided to decision makers and the public to provide guidance on selection of effective strategies for future implementation.

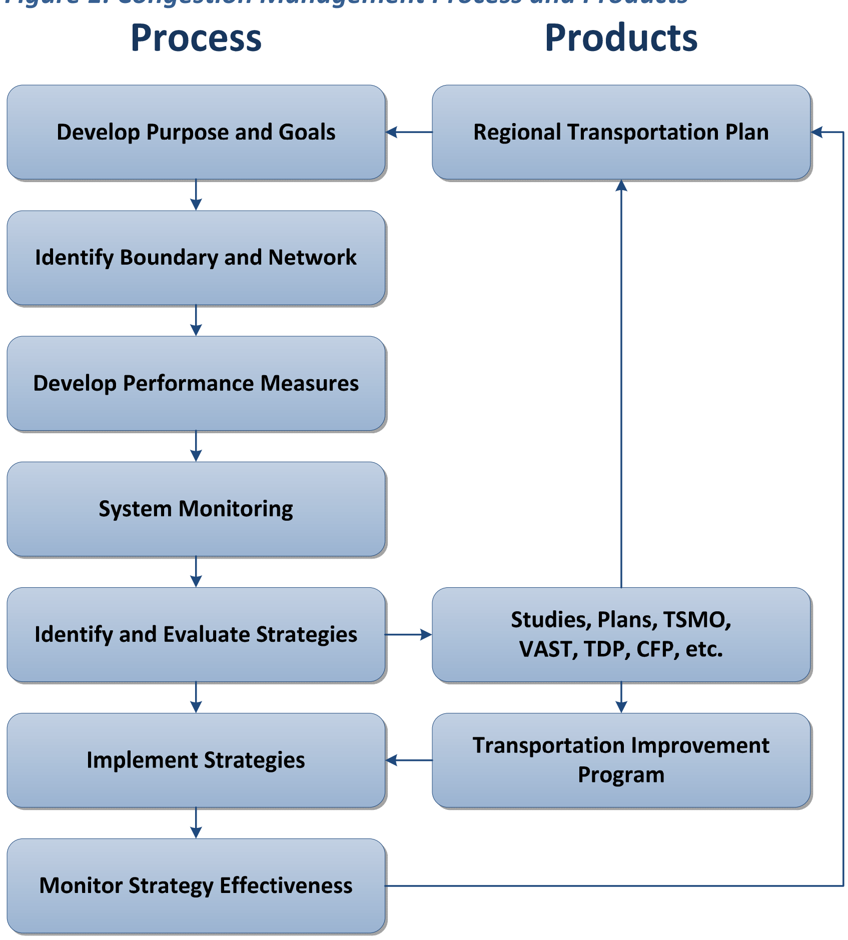
Overall Process

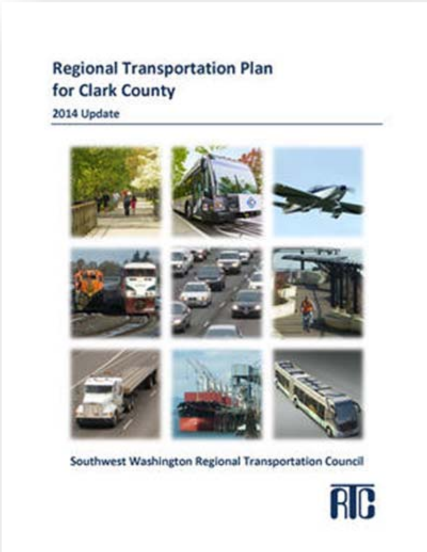
The overall Congestion Management Process used by Southwest Washington Regional Transportation Council incorporates the following steps:

- Develop purpose, goals and objectives
- Identify boundary and network
- Develop performance measures
- Monitor system performance
- Identify and evaluate strategies
- Implement strategies
- Monitor strategy effectiveness

The integration of the Congestion Management Process into the overall MPO planning process is displayed in the following figure.

Figure 1: Congestion Management Process and Products





The process begins with the development of purpose, goals, and objectives that will be used to guide the overall Congestion Management Process. These purpose, goals, and objectives support those contained in the Regional Transportation Plan[3]. The boundary and network are identified to focus efforts on the regionally significant corridors. Performance measures are developed to help ensure that the program is achieving the desired goals. System Monitoring is performed to measure system performance. System monitoring is then used to identify system deficiencies. Identified system deficiencies are utilized to identify potential strategies.

Strategies are further analyzed through regional and local studies, plans, and programs. Strategies are then incorporated into the Regional Transportation Plan. Project and strategies identified through the Congestion Management Process and contained in the Regional Transportation Plan are then programmed and implemented through the Transportation Improvement Program[4] based on selection criteria and funding allowances. The overall Transportation Improvement Program selection criteria prioritize projects and programs identified through the Congestion Management Process. As part of the annual Congestion Management Process, the congestion trends and effectiveness of implemented projects are analyzed based on performance measures.

Purpose, Goals and Objectives

The purpose of the CMP is to establish a process that provides for effective management and operation of the transportation system in congestion management corridors to provide travel reliability.

Transportation projects and strategies identified in the CMP should meet the goals for the region's long-range transportation planning process as listed in the Regional Transportation Plan (RTP) for Clark County. These RTP goals include:

[3] *http://www.rtc.wa.gov/programs/rtp/clark*
[4] *http://www.rtc.wa.gov/programs/tip/*

Economy

Support economic development and community vitality.

Safety and Security

Ensure safety and security of the Transportation System.

Accessibility and Mobility

Provide reliable mobility for personal travel and freight movement as well as access to locations throughout the region and integrity of neighborhoods accomplished through development of an efficient balanced, multi-modal regional transportation system.

Management and Operations

Maximize efficient management and operation of the transportation system through transportation demand management and transportation system management strategies.

Environmental

Protect environmental quality and natural resources and promote energy efficiency.

Vision and Values

Ensure the RTP reflects community values to help build and sustain a healthy, livable, and prosperous community.

Finance

Provide a financially-viable and sustainable transportation system.

Preservation

Maintain and preserve the regional transportation system to ensure system investments are protected.

The following objectives were used to guide the development of RTC's Congestion Management Process:

- Focus upon congestion,
- Emphasize regional travel perspective,
- Support the local and regional transportation decision-making process,
- Increase public awareness of congestion issues and tradeoffs.

Development type, density, and location influence regional travel patterns and transportation access influences land use and development.

Congestion Management Boundary and Network

Congestion Management Network

The boundary of the Vancouver/Clark County Congestion Management System includes the major inter-regional corridors and major arterial corridors connecting cities to the base congestion management network, (I-5, SR-14, SR-501, SR-502, SR-503, and La Center Road). Congestion management corridors connect Battle Ground, Ridgefield, and La Center to Vancouver and the CMP's base network.

The first step in defining the congestion management network was to identify a set of candidate facilities and corridors. Only regionally-significant corridors were considered as candidates for the network. Regionally significant corridors were defined as facilities that are part of the Regional Transportation System as identified in the Regional Transportation Plan (RTP).

The initial congestion management network was refined from the list of candidate corridors. Using federal guidelines to include facilities with "existing or potential recurring congestion," professional judgment was used to identify corridors with existing congestion and those likely to become congested.

The scope of the congestion management network includes 31 regionally-significant transportation corridors within the Clark County, Washington region as listed in Table 2 (Page 12) and illustrated on Map 1 (Page 13).

Corridor Concept

An important step in defining the congestion management network is to define the basic unit for describing the network and performing analyses. For the Vancouver/Clark County congestion management network, transportation corridors were selected as the congestion management unit.

The congestion management corridors can be made up of more than one transportation facility. A single corridor can include multiple roadways where there are parallel facilities that serve the same travel shed. Data is reported for individual roadways even if they are grouped into one congestion management corridor. The endpoints for each corridor represent locations where the characteristics of the corridor change significantly.

Individual corridors, where appropriate, are made up of more than one facility.

Each roadway within a corridor is further divided into a series of segments. A segment is the portion of roadway between major intersections or interchanges. To allow for consistent operational analysis, corridor segments were developed such that the capacity and number of lanes remain the same within each segment.

Land Use

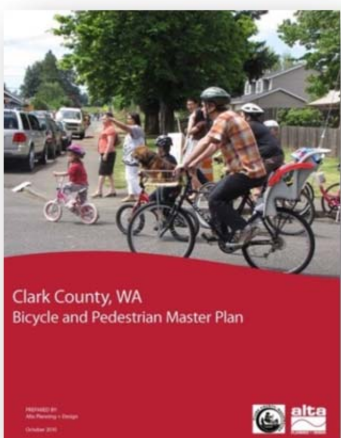
Land use and transportation are interrelated, in that land use and travel interact with each other. The type of development, the density, and its location in the urban landscape influence travel patterns. On the other hand the level of access to and from the transportation facility to the adjacent land use can affect the development patterns.

In order to better understand RTC's regional Congestion Management Network, it is important to have some understanding of the land use surrounding the congestion management corridors. Map 2 (Page 14) illustrates the Congestion Management Corridors and a generalized map of the comprehensive land use within the region.

For the purpose of travel demand modeling, future forecasts of population and employment resulting from the comprehensive land use plan have been developed. Table 1 illustrates the 2016 population and employment for Clark County along with the 2040 forecast that has been adopted for use in the long-range Regional Transportation Plan.

Table 1: Population and Employment

	2016	2040
Population	461,010	600,361
Employment	155,000	241,499



Multimodal

In addition to the road network it is important not to overlook modes such as walking, bicycling, and transit and to the degree that they can be improved to help mitigate congestion.

The Clark County Bicycle and Pedestrian Master Plan[5] provides a 20-year vision and implementation strategy for active modes. The C-TRAN website[6] provides information on the existing and 20-year future plan[7] for the regional transit system.

The CMP supports bicycle, pedestrian, and transit systems along and adjacent to the CMP network.

Transit Service

The region's Public Transportation Benefit Authority (C-TRAN) provides transit services within Clark County and to Portland, Oregon. C-TRAN also provides connections with neighboring transit service providers in Portland, Oregon, Skamania County, and Cowlitz County. Map 3 (Page 8) illustrates fixed bus routes

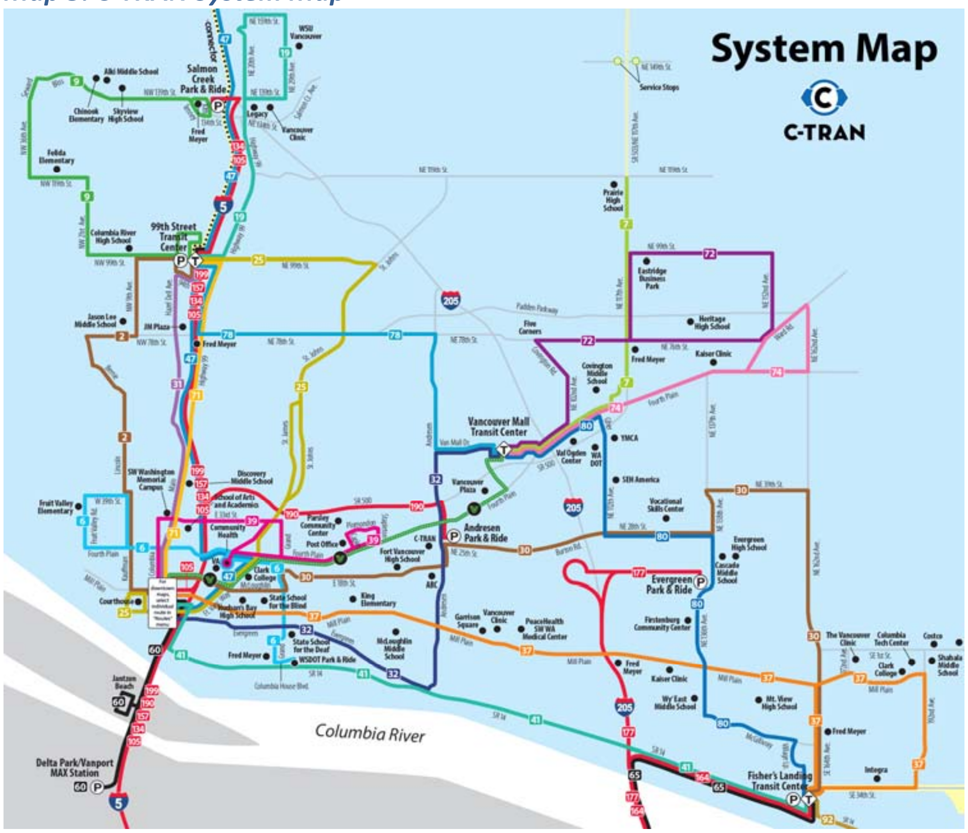
[5] *http://www.clark.wa.gov/planning/bikeandped/docs.html*
[6] *http://www.c-tran.com/*
[7] *http://www.c-tran.com/about-c-tran/reports/c-tran-2030*

The regional travel model estimates approximately 47% of households and 68% of employment are within ¼ mile of PM peak period fixed route transit service.

within Clark County. In addition to fixed route service, C-TRAN provides connector service to their fixed route system from the cities of Camas, La Center, and Ridgefield. The regional travel model estimates approximately 48% of the households and 72% of employment are currently within walking distance of transit. By 2035, those within walking distance to transit will decline to 41% of the households and 56% of employment.

C-TRAN also provides paratransit service for those unable to ride C-TRAN's fixed bus service, through their C-VAN service.

Map 3: C-TRAN System Map



Relationship to Regional Plans

The CMP is one of the federally required components of the regional transportation planning process. It is integrated with the Regional Transportation Plan (RTP) and the Transportation Improvement Program (TIP), and other regional plans and processes. For example, a TIP selection criterion rewards projects for consistency with the CMP.

Preservation and Maintenance

One of the region's goals is to ensure that sufficient money is available to preserve and maintain the transportation system that the region has already built. Agencies and jurisdictions have set standards for preserving and maintaining their existing transportation system. As the transportation system ages, preservation and maintenance costs are likely to take up a greater percentage of available transportation revenues.

Transportation Demand Management (TDM)

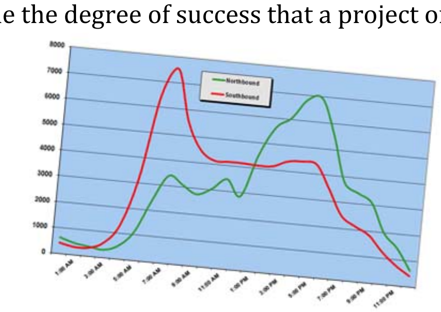
Transportation Demand Management (TDM) programs focus on reducing travel demand, particularly at peak commute hours. TDM strategies can make more efficient use of the current roadway system and can reduce vehicle trips. It is important for the region to support Transportation Demand Management strategies that help the region make the best use of the existing road system.

Transportation Systems Management and Operations (TSMO)

The focus of RTC's Transportation Systems Management and Operations program is on low-cost, quickly implemented transportation improvements that aim to optimize the existing transportation network. Examples include low-cost technology-based strategies and physical improvements that improve operation of the transportation system. It is important for the region to support Transportation Systems Management and Operations that enhance the existing transportation system. RTC has an adopted Regional Transportation Systems Management and Operations Plan.

Performance Measures

Performance measures are used to determine the degree of success that a project or program has had in achieving its stated goals. In other words, performance measures are a way to track progress. Performance measures are used to track the region's progress in reducing and managing congestion. For the purpose of this report, both system wide and peak period performance measures are utilized.



There are a number of performance measures that the region would like to use or expand but there are limitations due to current availability of data. The following section identifies the data elements that are collected and analyzed. Chapter II includes the measurement of these performance measures.

Data Elements

We use performance measures to track the region's progress in reducing and managing congestion.

Data is collected on the following elements: traffic counts, travel time, automobile occupancy, and transit. In addition, RTC compiles and collects other measures of system performance such as highest volume intersections, Columbia River bridge volumes, and park and ride usage.

The collected data serves as the basis for developing performance measures. Performance measures in the Congestion Management Process are categorized according to the region's overall transportation goals. It is also important to note that performance measures are collected and analyzed under the Regional Transportation Plan, Transportation Improvement Program, and other regional programs.

Performance Measures

Economy

- Truck Percentage
- Vehicle Volumes
- Columbia River Traffic Volumes

Safety and Security

- Collision Factors

Accessibility and Mobility

- Population Compared to Transit
- Employment and Population within 1/3 mile of Transit
- Transit Seat Capacity Used

Management and Operations

- Volume to Capacity Ratio
- Average Speed
- Speed vs. Posted Speed
- Intersection Delay
- Park and Ride Capacity
- Vehicle Occupancy Rates
- On-time Transit Performance
- Busiest Intersections

Environmental

- Vanpool Usage
- Transit Ridership
- Park & Ride Usage

Vision and Values

- Comprehensive Land Use
- County Bicycle and Pedestrian Plan

Finance

- None. Covered in RTP and TIP

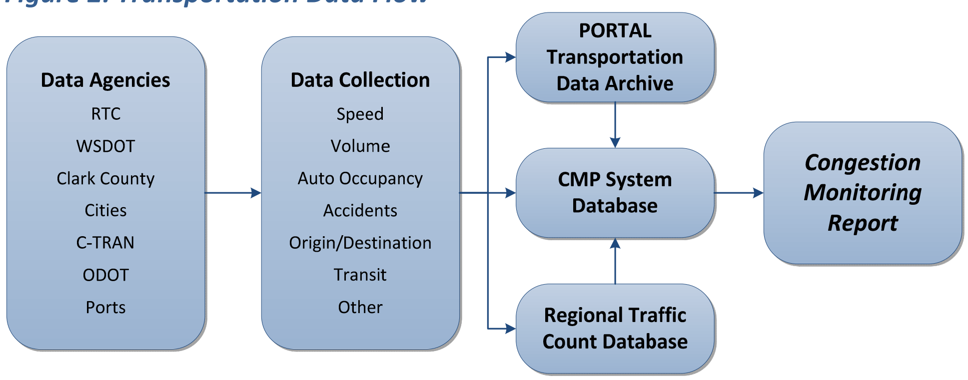
Preservation

- None. CMP Supports Preservation as a Primary Strategy

Data Collection

RTC is the lead agency for the collection of traffic congestion data. Some of the data is regularly collected by other transportation agencies within the Clark County region. RTC organizes a process for collecting all of the data. The flow for the collection of transportation data is illustrated in Figure 2.

Figure 2: Transportation Data Flow



Intelligent Transportation Systems (ITS) technology is automating the collection of data. In addition, the region has initiated a transportation data archive system called PORTAL to enhance data availability, ease its retrieval, and assist with the analysis of transportation data to support performance monitoring. RTC anticipates that many of the performance measures will begin to use the automated PORTAL data collection process.

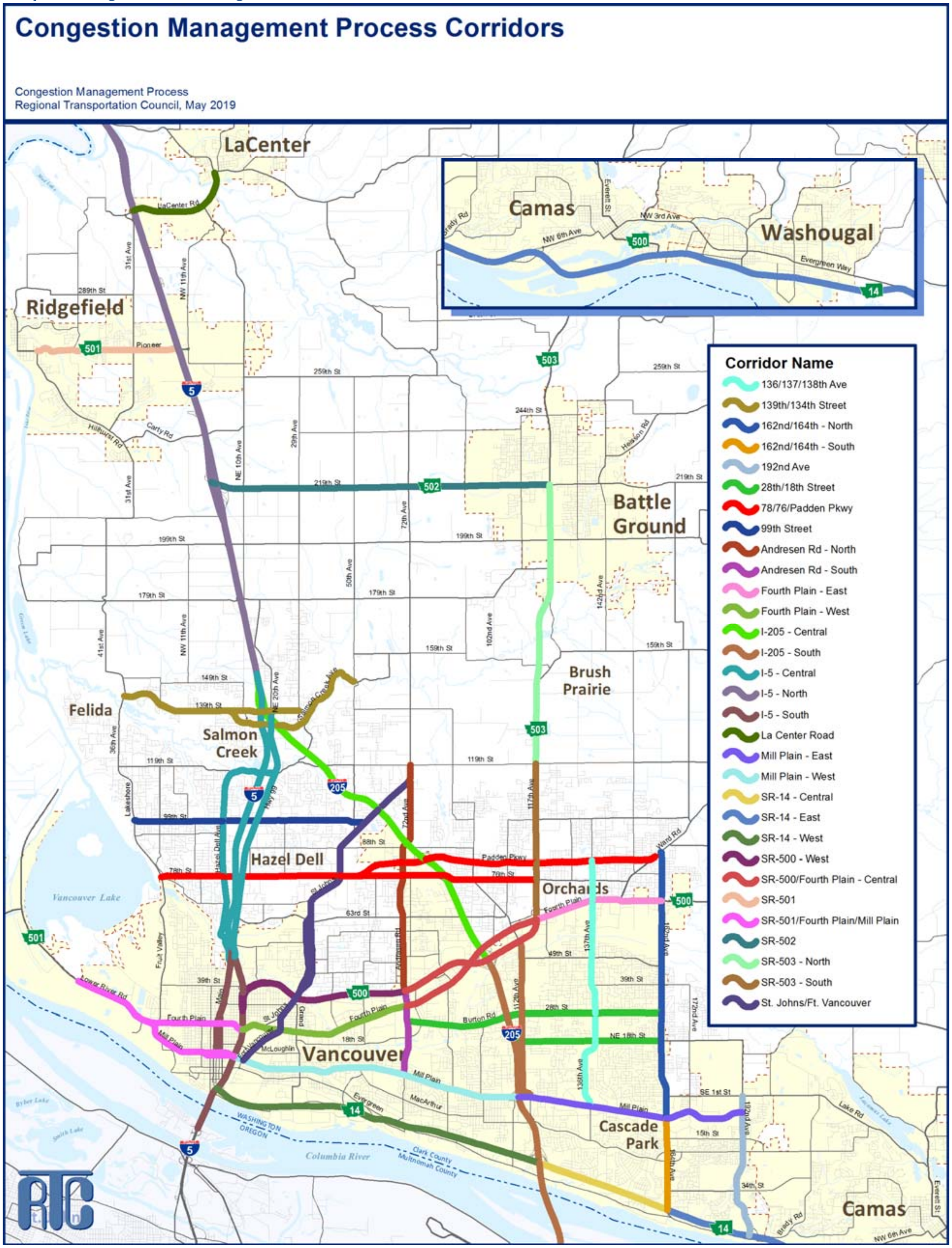
Data Analysis and System Performance

Transportation data is analyzed and validated for use in the Congestion Management Process. The collected data is then applied to develop system performance measures for the transportation corridors. System performance data is then illustrated through text, tables, and maps. The system performance data and maps are then used to identify system deficiencies and needs.

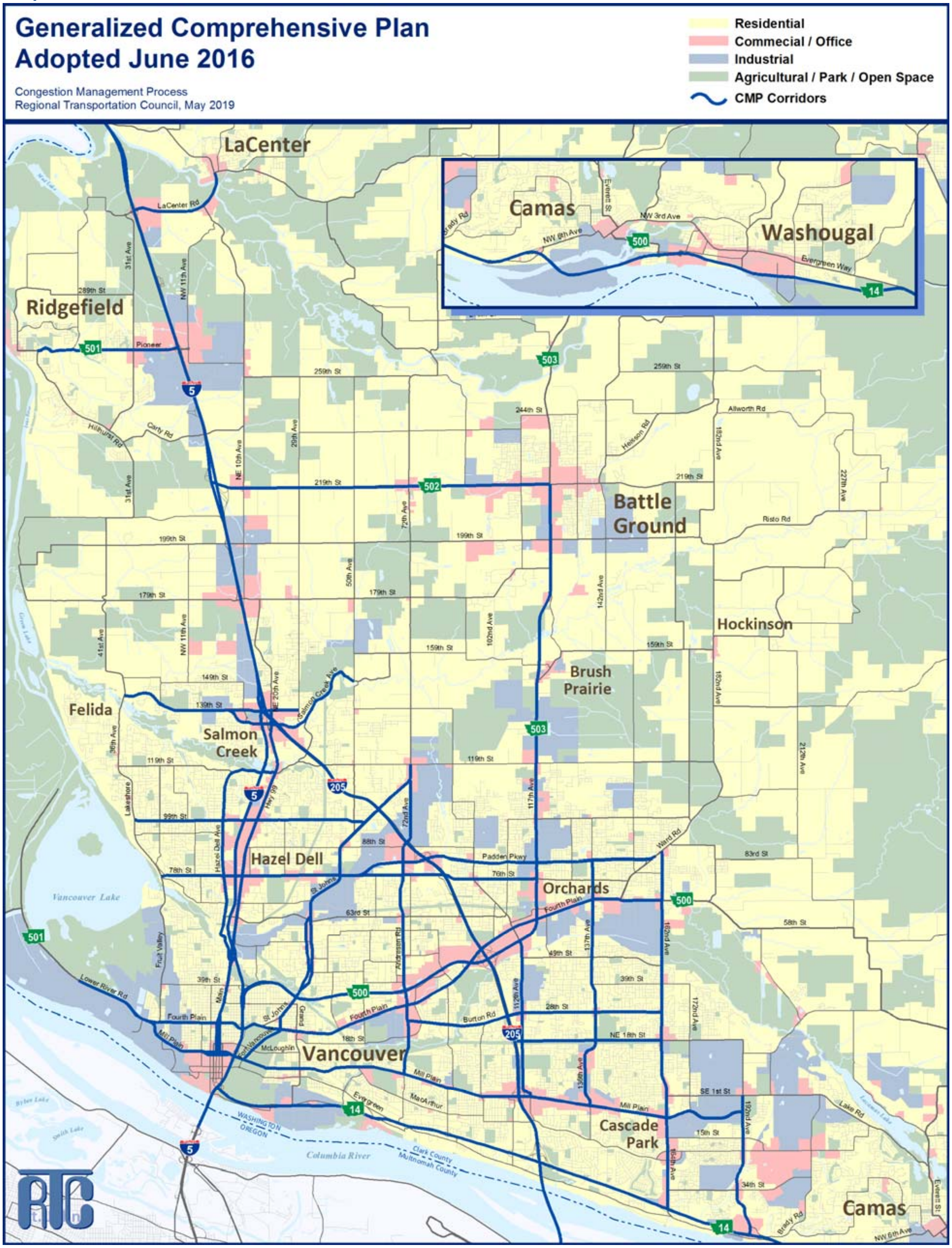
Table 2: Corridors in the Congestion Management Network

Corridor Name	Facilities	Endpoints	
I-5 North	I-5	County Line	I-205 Junction
I-5 Central	I-5, Highway 99, Hazel Dell Avenue	I-205 Junction	Main Street
I-5 South	I-5, Main Street	Main Street Interchange	Jantzen Beach
I-205 Central	I-205	I-5 Junction	SR-500
I-205 South	I-205, 112th Avenue	SR-500	Airport Way
Saint Johns	Saint Johns Road, Saint James Road, Fort Vancouver Way	NE 72nd Avenue	Mill Plain Boulevard
Andresen North	Andresen Road / NE 72nd Avenue.	119th Street	SR-500
Andresen South	Andresen Road	SR-500	Mill Plain Boulevard
SR-503 North	SR 503	SR-502	119th Street
SR 503 South	SR 503	119th Street	Fourth Plain, SR-500
137th Avenue	136th, 137th, 138th Aves.	Padden Parkway	Mill Plain Boulevard
162nd Avenue North	162nd, 164th Avenues	Ward Road	Mill Plain Boulevard
164th Avenue South	164th Avenue	Mill Plain Boulevard	SR-14
192nd Avenue	192nd Avenue	SE 1st Street	SR-14
SR-14 West	SR-14	I-5	I-205
SR-14 Central	SR-14	I-205	164th Avenue
SR-14 East	SR-14	164th Avenue	Evergreen Highway
SR-501, Fourth Plain	SR-501, Mill Plain, Fourth Plain	I-5	NW 26th Street
Mill Plain West	Mill Plain Boulevard	I-5	I-205
Mill Plain East	Mill Plain Boulevard	I-205	192nd Avenue
Fourth Plain West	Fourth Plain	I-5	Andresen Road
SR-500 West	SR-500	I-5	Andresen Road
Fourth Plain, SR-500 Central	SR-500, Fourth Plain	Andresen Road	SR 503
Fourth Plain East	Fourth Plain	SR-503	162nd Avenue
78th Street, Padden Parkway	78th Street, 76th Street, Padden Parkway	Lakeshore Avenue	Ward Road
99th Street	99th Street	Lakeshore Avenue	Saint Johns Boulevard
28th Street, 18th Street	28th Street, Burton Road, 18th Street	Andresen Road	164th Avenue
134thStreet, 139th Street	134th Street, 139th Street, Salmon Creek Avenue	NW 36th Avenue	WSU Entrance
SR-502	SR-502	I-5	SR-503
SR-501	SR-501	I-5	9th Street *(Ridgefield)*
La Center Road	La Center Road	I-5	East Fork Lewis River

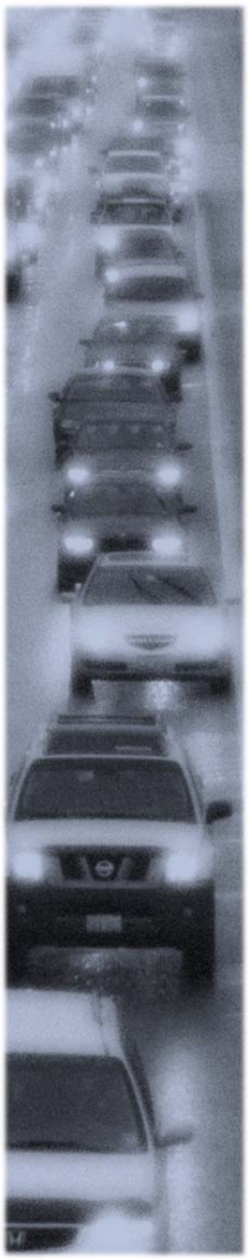
Map 1: Congestion Management Network



Map 2: Land Use



Chapter 2: System Monitoring



Chapter 2 contains a narrative and visual display of the system performance measures contained in the Congestion Management Process.

System monitoring is described in two sections. The first, **System Performance Measures**, consists of data compiled for measuring system performance at the corridor level. It is comprised of data that supports the analysis of the Congestion Management System. The second, **Areas of Concern**, uses shorter segment transportation data, with supporting data[8] provided online, to identify specific segments with congestion concerns related to volume-to-capacity ratio and speed.

There are many causes of traffic congestion including bottlenecks, traffic incidents, bad weather, construction, poor signal timing, and other events. The source of congestion can vary from one corridor to another, such that the strategies to improve capacity must be tailored to each corridor.

This report measures and quantifies average weekday morning and evening peak period "congestion" consistently across the congestion management corridors, through the use of performance measures.

System Performance Measures

Volumes: Vehicle Volumes

AM and PM peak hour vehicle volumes were compiled from the regional traffic count database[9]. Volumes represent traffic counts within each corridor and provide a good comparison of the relative difference in travel demand among the congestion management corridors.

Peak hour traffic volumes for the congestion management corridors are delineated by four volume range categories. These categories are intended to provide a regional picture of travel flows for the Clark County region.

PM peak hour trends are similar to AM peak hour; although, most congestion management corridors carry higher volumes during the PM Peak.

[8] *http://www.rtc.wa.gov/programss/cmp/*
[9] *http://www.rtc.wa.gov/data/traffic/*

AM and PM peak hour vehicle volumes were compiled from the regional traffic count database.

Map 4 (Page 28): During the PM peak, I-5, I-205 and SR-14 display volumes greater than 3,000 vehicles per hour. Within the region, facilities carrying more than 1,500 vehicles in the PM peak hour include segments of SR-14, SR-500, SR-503, Mill Plain, Fourth Plain, Padden Parkway, 134th Street, Andresen Road, 112th Avenue, 162nd Avenue, 164th Avenue, and 192nd Avenue.

Volumes: Highest Volume Intersections

Table 3 displays the highest volume intersections in 2018 based on the total number of vehicles entering an intersection on an average weekday. At-grade intersections along SR-500, Mill Plain, SR-503, and Padden Parkway dominate the list.

Table 3: Highest Volume Intersections

Rank	East/West	North/South	Volume
1	Fourth Plain	SR-500/SR-503	72,000
2	Mill Plain Blvd.	Chkalov Drive	71,000
3	Padden Parkway	SR-503	64,000
4	SR-500	54th Avenue	63,000
5	Mill Plain Blvd.	136th Avenue	61,000
6	State Route 500	NE 42nd Avenue	58,000
7	Mill Plain Blvd.	SE 164th Avenue	57,000
8	Fourth Plain Blvd.	Andresen Road	55,000
9	NE 78th Street	Highway 99	54,000
10	Padden Parkway	Andresen Road	53,000
11	SR-502	SR-503	52,000
12	Mill Plain Blvd.	NE 120th Avenue	50,000

The Interstate Bridge reached capacity during peak hours in the early 1990s.

Volumes: Columbia River Bridge Volumes

The Interstate Bridge (I-5) carried approximately 33,500 vehicles a day in 1961. Volumes had increased to over 108,000 vehicles a day by 1980. With the opening of the Glenn Jackson Bridge (I-205) in late-1982, total Columbia River crossings had increased to 144,000 vehicles a day by 1985. Glenn Jackson Bridge traffic volumes began to exceed Interstate Bridge traffic volumes on a daily basis in 1999. Total bridge crossings have declined twice since 1961, in 1974 (oil embargo) and 2006-2008 (recession). The Glenn Jackson Bridge had its first vehicle volume decline ever in 2008. Currently total Columbia River crossing are averaging over 300,000 vehicles a day. Table 4 shows the historical growth in Columbia River bridge crossings since 1980.

Both Columbia River bridges are suffering daily congestion during morning and evening peak periods. The Interstate Bridge had reached capacity during peak hours in the early-1990s, and the Glenn Jackson Bridge in the mid-2000s. With both Columbia River bridges at capacity in the peak periods, peak spreading has occurred. Peak spreading leads to a flattening and longer peak period as trips shift to times immediately before and after the peak demand. The impact of this type of congestion means that the peak period can last three or more hours.

Table 4: Average Weekday Traffic across the Columbia River

Year	I-5	I-205	Total
1980	108,600	N/A	108,600
1990	95,400	87,100	182,500
2000	126,900	132,100	259,000
2010	126,700	145,500	272,200
2018	138,400	165,100	303,500

Capacity: Corridor Capacity Ratio

The corridor capacity ratio is an aggregation of the volume/capacity ratios for the individual general-purpose segments that make up a facility within a corridor. The corridor capacity ratio is calculated for both the AM and PM peak hours and for the peak directions of travel within a corridor. For each segment in a corridor, the volume/capacity ratio, vehicle miles traveled, and vehicle miles traveled weighted by volume/capacity ratio (the product of the volume/capacity ratio and vehicle miles traveled) for the peak hour are calculated. The corridor capacity ratio is the sum of the weighted link ratios.

The corridor capacity ratio is an indicator of congestion. The higher the ratio, the more traffic congestion a driver is likely to experience. A corridor with capacity ratio above 0.90 is very congested and a corridor capacity ratio between 0.80 and 0.89 will feel congested.

The highest volume to capacity ratio corridors includes the following:

1. I-5: Main Street to Jantzen Beach(AM) – >1.00
2. Main Street, Ross St. to Mill Plain (AM) – 0.97
3. I-205, Padden to Airport Way (AM) – >0.95
4. SR-14, I-205 to 164th Av. (PM) - >0.93
5. SR-503, Fourth Plain to NE 119th St. (PM) – >0.87

Figure 3: Highest Volume to Capacity Ratio Corridors

Map 5 (Page 29): Much of the AM period congestion can be attributed to the demand for crossing the two Interstate bridges into Oregon. The AM periods show congestion along major facilities such as I-5 South, Main Street, I-205 South, and SR-14 Central.

Map 6 (Page 30): In the PM period, the worst congestion is shown along some of the busiest corridors including I-5 South, I-205, SR-14 Central, SR-500, SR-503, and Fourth Plain East. In the PM period the I-5 and I-205 Columbia River bridges limit vehicle flow from Oregon, which benefits the congestion levels on the Washington side of the Columbia River.

Map 7 (Page 31): In addition to existing corridor capacity ratio, the 2035 PM corridor capacity ratio was calculated using the regional travel forecasting model (2016 RTP forecast model version). The 2035 model shows that the full funding of planned transportation improvements positively impact future corridor capacity.

Speed: Auto Travel Speed

Slow corridor travel speed can be an indicator of delay and congestion.

Travel time data is collected annually. The data is collected using global positioning system (GPS) units and by driving corridors as many times as possible during peak periods (6:30-8:30 AM and 4:00-6:00 PM). Travel speed is computed from the travel time data. It consists of utilizing the travel time and distance to calculate the average travel speed in the peak period for through movements.

Slow corridor travel speed can be an indicator of delay and congestion. Better progression and coordination between signals will improve overall travel time, reliability, and safety. The lowest speed corridors include:

1. I-5: Main Street to Jantzen Beach (AM) – 14 mph
2. Main Street, I-5 to Mill Plain (AM)– 16 mph
3. Andresen Road, Mill Plain to SR-500 (PM) – 17 mph
4. Highway 99, Ross St. to 139th St. (PM) – 17 mph
5. Mill Plain, Fourth Plain to I-5 (PM) – 18 mph

Figure 4: Lowest Speed Corridors

Map 8 & 9 (Pages 32-33): Corridor travel speeds continues to decline. One concern is regional facilities that have a travel speed below 20 mph, which may encourage trips to divert to alternate routes and through neighborhoods. During the AM period, I-5 South displays an average speed below 15 mph, and is resulting in traffic diverting to other corridors and neighborhood streets.

In the PM period, corridors with travel speed below 20 mph include Highway 99, Main Street, 112th Avenue, Andresen South, SR-503 South, 164th Avenue, Fourth Plain-Port, Mill Plain-Port, Mill Plain East, Fourth Plain West and East, and Burton Road.

Speed: Speed as Percent of Speed Limit

Travel speed was converted to a percent of posted speed limit for each of the congestion management corridors. This was intended to provide another measure of the delay along the corridor.

As development occurs along the corridors, travel speed often decreases because of congestion, multiple driveways, and additional traffic signals. One of the difficulties is in balancing access to land uses and maintaining the throughput travel speed.

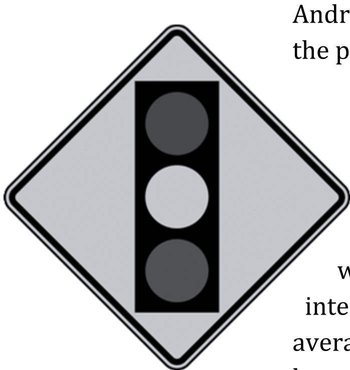
The speed percentages for the freeway facilities are generally between 95% and 105% of the posted speed limit. While facilities with multiple signalized intersections and driveways are generally between 60% and 80% of the posted speed limit. When speeds drop below 50% of the posted speed limit, it is an indication of congestion or poor traffic management. The lowest speed percentage or worst performing corridors compared to posted speed limit include:

1. I-5, Main St. to Jantzen Beach (AM) – 25%
2. I-205, SR-500 to Airport Way (AM) – 39%
3. Highway 99, Ross St. to 139th St. (PM) – 44%
4. SR-14, I-205 to 164th Av. (PM) – 44%
5. SR-500, I-5 to Andresen Rd. (PM) – 45%

Figure 5: Lowest Speed Percentage Corridors

Map 10 (Page 34): In the AM period, I-5 South (25%) I-205 South (39%), SR-14 Central (49%), Main Street (51%), and SR-503 South (51%) all operate significantly below the posted speed.

Map 11 (Page 35): In the PM period, SR-500 West (44%), 164th Avenue (47%), and Andresen Road South (48%), and SR-503 South (49%) operated significantly below the posted speed limit.



Speed: Intersection Delay

The delay at an intersection, for the through movement, was recorded as part of the PM travel time. Delay time represents the period of time travel speed was below 5 mph due to the intersection control. The delay time at an intersection was averaged for the multiple travel time runs. Intersections with an average delay time of greater than 45, 60, and 90 seconds were identified as a location of delay along a corridor. This delay is only calculated for through movement on the congestion management corridor and does not include delay associated with left turns or cross street traffic.

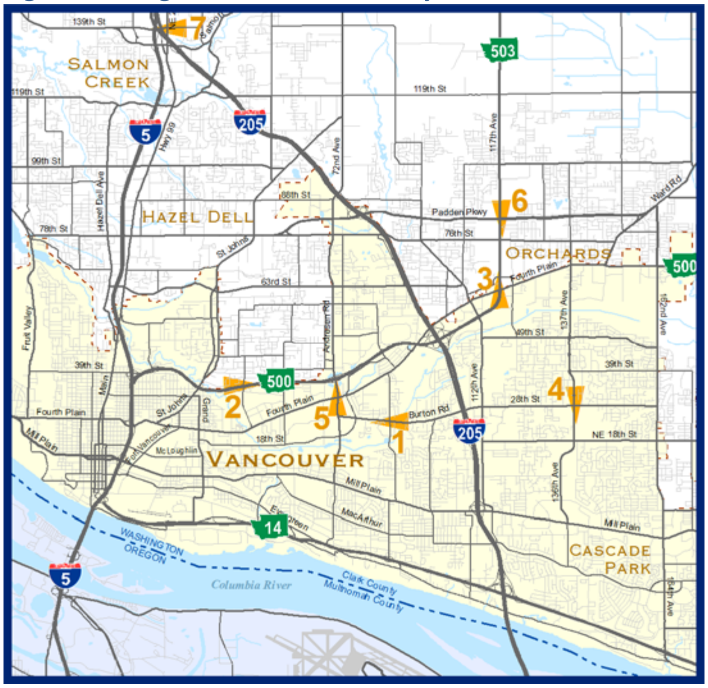
The goal of signal coordination is to get the greatest number of vehicles through a corridor with the fewest stops in the safest and most efficient manner. The higher volume movement is generally favored over lower volume movements. In this situation, the benefit gained by traffic on the higher volume approach exceeds the degradation in operations experienced by the lower volume approach and the overall intersection operations are improved.

Map 12 (Page 36): Generally, intersections that displayed a 45 second or greater delay, for the average through movement on a CMP corridor, were located where two major arterials intersect. Map 12 displays the location of the 57 intersections that demonstrated this characteristic. Of these intersections, 22 had at least one direction with an average delay between 60-89 seconds and 13 had at least one direction with an average delay greater than 90 seconds. Delay at these intersections adds to the overall travel time and increases congestion at these locations.

The longest delays are at the following intersections:

1. Burton Rd./NE 86th Av. (Westbound) – 194 seconds
2. SR-500/42nd Av. (Eastbound) – 167 sec.
3. Fourth Plain/SR-503/SR-500 (Northbound) – 154 seconds
4. NE 28th St./NE 138th Av. (Southbound) – 139 seconds
5. Fourth Plain Blvd./Andresen Rd. (Northbound) – 133 seconds
6. Padden Parkway/SR-503 (Southbound) – 127 Seconds
7. NE 139th St./NE 20th Av. (Westbound) – 125 Seconds

Figure 6: Longest Intersection Delay



In addition to intersection delay, delay can also occur at freeway off-ramps, where high volumes of traffic are loaded onto the arterial system. This can create a significant problem when traffic backs onto the freeway. Locations known to experience this characteristic in the PM peak include northbound I-205 off-ramp to SR-14, Mill Plain, and SR-500. In the AM peak, backups can occur on SR-500, Fourth Plain, Mill Plain, and SR-14 ramps to I-5 South, and Padden Parkway, SR-500, 18th Street, Mill Plain, and SR-14 ramps to I-205 South.

Occupancy: Vehicle Occupancy

Average automobile occupancy is calculated by observing passenger cars at a given location and the number of people in each vehicle. The number of people divided by the number of passenger cars is the average automobile occupancy for that location. Trucks, buses, and other commercial vehicles are excluded from average automobile occupancy. Data is collected for the AM and PM time periods.

Table 5: Average Automobile Occupancy by Time of Day

Facility Type	AM	PM
Freeway *	1.11	1.17
Arterial	1.12	1.25

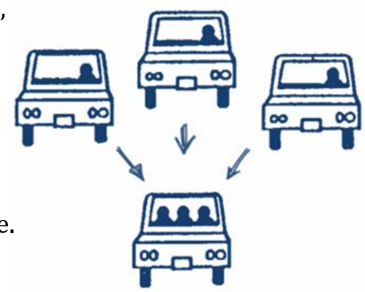
** Freeway includes I-5, I-205, SR-14, and SR-500*

The AM time period displays a lower average automobile occupancy, with the AM average automobile occupancy at 1.11 persons per vehicle. The PM average automobile occupancy rate is approximately 1.21 persons per vehicle.

It may be that the AM peak period is more of a traditional commute time, while the PM peak period likely has a greater percentage of discretionary trips such as shopping where drive-alone trips are less prominent.

Occupancy: Carpool and Vanpool

Carpools and vanpools are modes that mitigate congestion and increase vehicle occupancy in the peak periods. Carpools and vanpools form when a group of people commute together. Carpools are generally informal, including 2 or more people, while vanpool arrangements are generally more formal and include 5 or more people. C-TRAN owns, maintains, manages, insures, and licenses a fleet of vans which are available to commuter groups. In 2018, C-TRAN had twenty-three vanpools in service.

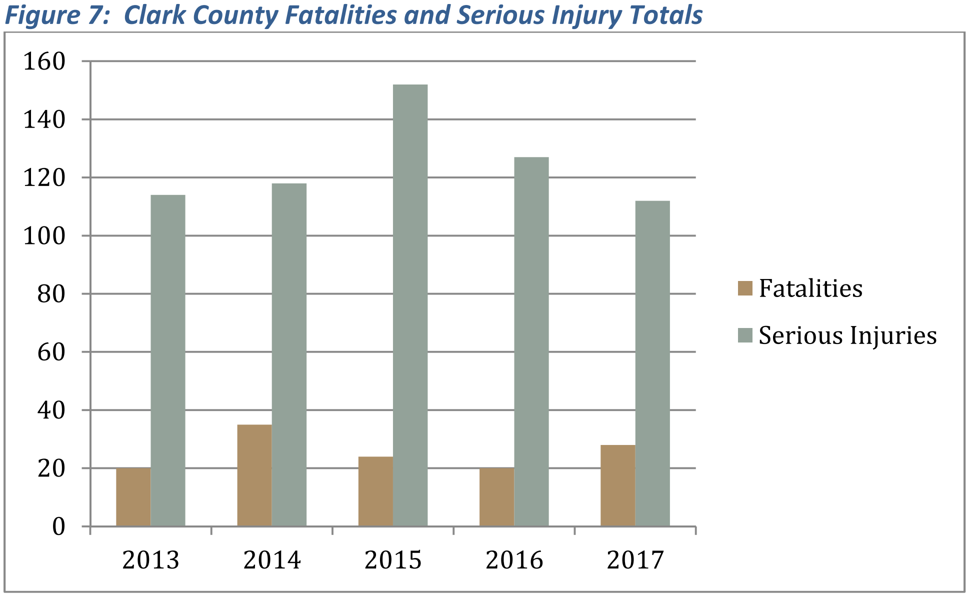


Safety: Collisions

Safety for all modes of travel is an important component of the regional transportation planning process. Congestion often occurs as a result of collisions or other incidents that temporarily reduce a road's capacity. As such, the region has adopted MAP-21 Safety Targets. RTC has agreed to plan and program projects so that our region contributes towards the accomplishment of Washington State's Strategic Highway Safety Plan, Target Zero.

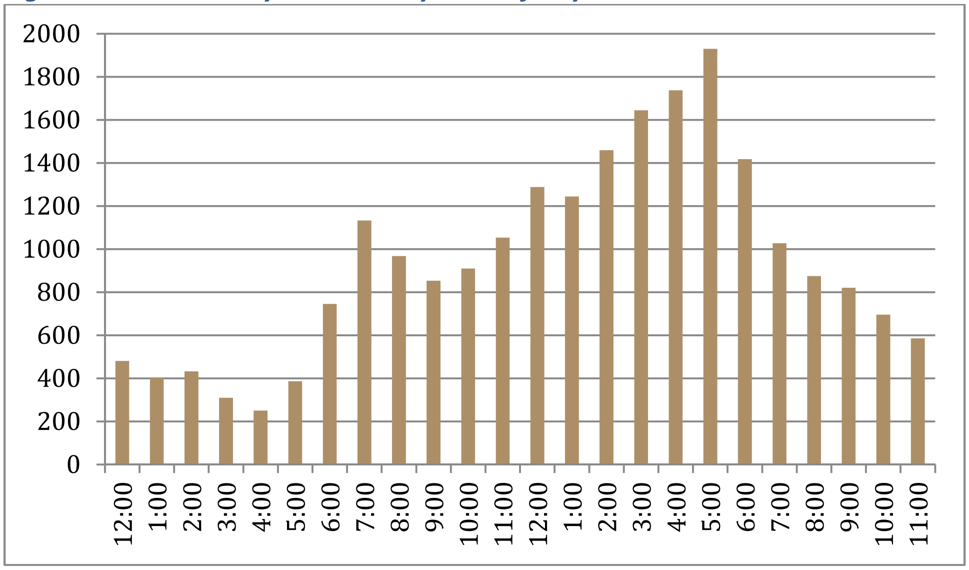
Over the last several years the trend for serious injuries has been declining, with fatalities shows no clear pattern.

Figure 7: Clark County Fatalities and Serious Injury Totals



The overall number of collisions seems to directly correlate with times of higher traffic volumes. When collisions and other incidents occur in the peak hours, it can generate significant traffic congestion. The following displays the number of collisions by time of day between years 2014 and 2018:

Figure 8: Clark County Collisions by Time of Day



Clark County traffic safety priorities are set based upon the most frequently cited contributing factors for fatalities between years 2015-2017. Table 6 lists the statewide priority factors with Clark County numbers:

Table 6: Clark County Priority Collision Factors

Collission Factors	Total Fatalities	Percent	Total Serious Injuries	Percent
Impaired Driver	38	52.8%	67	17.0%
Run off the Road	22	30.6%	99	25.2%
Speeding	20	27.8%	113	28.8%
Young Driver 16-25	25	34.7%	153	38.9%
Distracted Driver	22	30.6%	108	27.5%
Intersection Related	19	26.4%	140	35.6%

Trucks: Truck Percentage

Traffic counts are collected at several locations where vehicles are classified according to the number of axles. This provides a measure of trucks as a percentage of all vehicles traveling on the roadway. Trucks are defined as vehicles with more than two axles, such as typical tractor/trailer rigs, traveling on the roadway during the peak period. It is important to note that trucks often travel outside of peak periods to avoid congestion.

Map 13 (Page 37): Overall, I-5 Central & North, I-205 North, Pioneer Street (Ridgefield) and Mill Plain and Fourth Plain west of I-5 display the highest percentage of truck volumes during the PM peak period, with truck percentages greater than 7 percent.

In the AM period, the percentage of trucks is generally higher, with Mill Plain and Fourth Plain west of I-5 averaging over 15% trucks during the morning commute. While St. Johns Road averages over 10% trucks.

The State Freight and Goods Transportation System classify roadways according to the annual gross freight tonnage they carry. This system designates I-5, I-205, and portions of SR-14 as the highest tonnage facilities T1- (More than 10 million tons). Many of the principal arterials and other state highways are designated as T2 facilities, which carry 4 to 10 million tons

Transit: Transit System Ridership

Table 7 provides 2018 annual C-TRAN patronage by type of service. Between 2013 and 2018 several transit service revisions were made and regular fare increases were implemented. Between 2013 and 2018 total ridership decreased by 4.2%.

In January 2017, C-TRAN implemented their first Bus Rapid Transit line along the Fourth Plain corridor between Vancouver Mall and downtown Vancouver. C-TRAN is currently analyzing a Bus Rapid Transit line along the Mill Plain corridor.

Approximately 83% of C-TRAN system ridership was made up of urban fixed route patrons, followed by commuter service that carried 12% of the total riders and C-VAN carried 4% of the total riders. Events, Connector, and Vanpool usage is approximately 1% of the total ridership.

Table 7: 2018 C-TRAN Ridership by Type of Service

Service Type	Annual Riders	Percent
Urban/Local	5,148,300	82.7%
Commuter	725,264	11.7%
C-VAN	257,655	4.1%
Events/Other	35,874	0.6%
Connector	9,437	0.2%
Vanpool	44,222	0.7%
Total	**6,220,752**	**100.0%**

Transit: Transit Seat Capacity Used

Transit seat capacity used includes transit riders divided by the transit capacity at a defined location. Transit seat capacity represents the percentage of seats that are occupied during the two-hour peak period. C-TRAN uses an automated ridership collection system on their vehicles. RTC compiled this data at a specific location in each corridor to calculate bus capacity based on the vehicle size and frequency of service. This process has allowed for the estimation of transit patronage and capacity for congestion management corridors.

Map 14 (Page 38): Generally, in the PM Peak period, the number of available seats is higher to accommodate the greater transit demand. The majority of the corridors with transit service utilize more than 50% of the available seat capacity during the PM Peak period.

Transit: Park and Ride Capacity

Park and Ride capacity and daily average usage include lots owned or leased by C-TRAN. In addition to the capacity shown in Table 8, there are WSDOT maintained or informal park and ride and park and pool facilities located throughout the County. Clark County Park and Ride capacity and usage for C-TRAN served facilities are shown in Table 8.

Table 8: Clark County Park and Ride Capacity and Usage in 2017

Facility	Lot Capacity	Lot Usage	Occupancy
99th Street	609	366	60%
Evergreen	267	42	16%
Salmon Creek	472	251	53%
Andresen/Living Hope	100	99	99%
Fisher’s Landing	761	503	66%
Columbia House	34	30	87%
Total	**2,243**	**1,291**	**58%**

Transit: Transit On-Time Performance

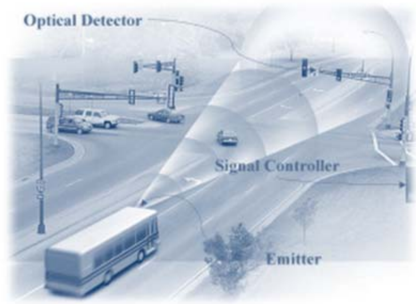
Traffic congestion, station dwell time, wheel chair boardings, congestion, and other factors can impact transit vehicles’ ability to maintain a schedule.

C-TRAN’s 2018 On-Time Performance Report shows that routes that cross the Columbia River into Oregon had the lowest on-time performance due to delays associated with congestion (44% to 61%). For routes within Clark County average on-time performance is generally much higher at 62% to 84%.

In September 2016, C-TRAN modified local bi-state transit service in the I-5 corridor. All local routes now turn around in Downtown Vancouver with riders transfering to Route 60 (Delta Park Limited) for local transit service into Oregon

(Jantzen Beach and Delta Park). Commuter routes continue to serve destinations in Oregon.

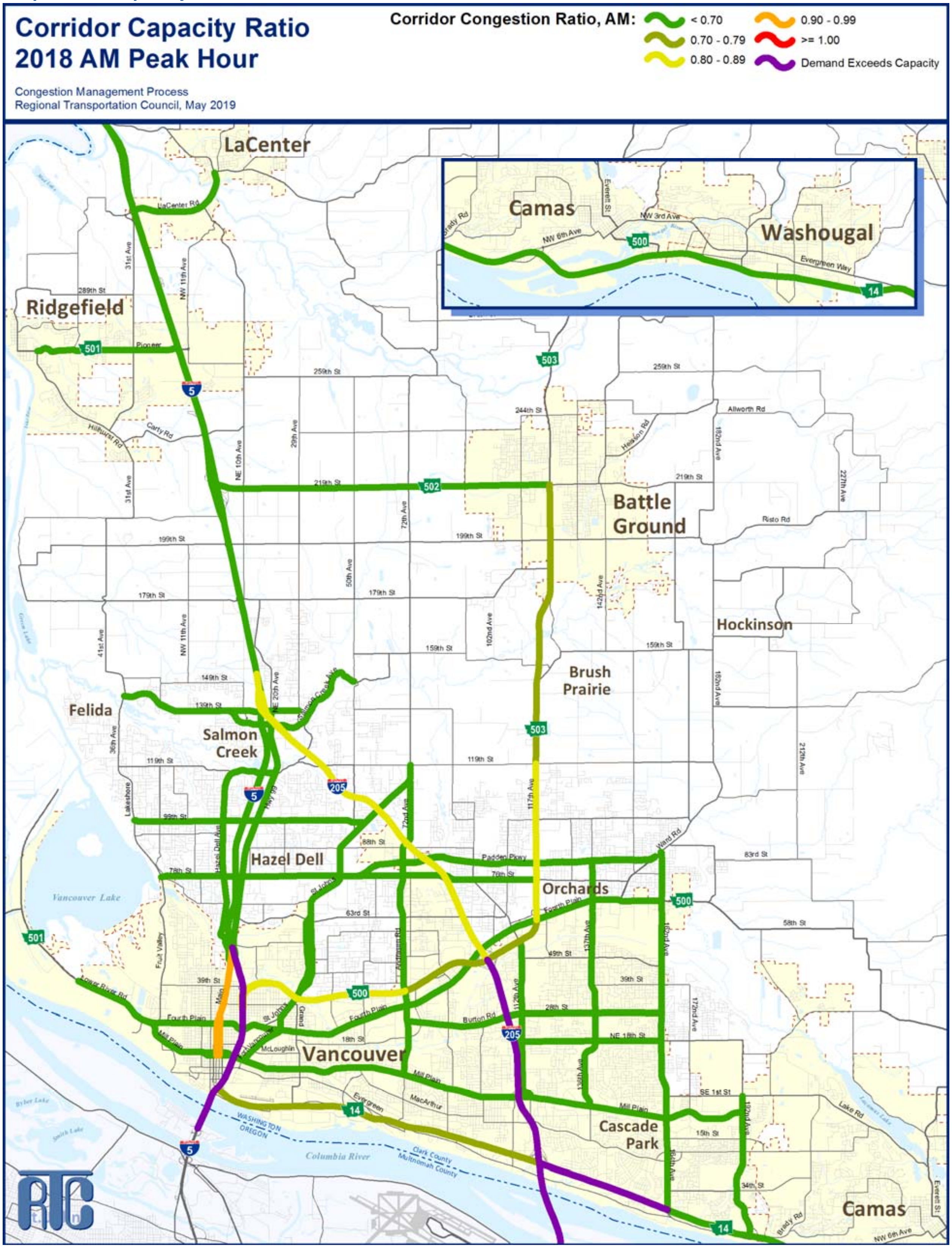
In January 2017 C-TRAN replaced Route 4 with C-TRAN's first Bus Rapid Transit (BRT) service along the Fourth Plain corridor, between Vancouver Mall and Downtown Vancouver. This new BRT route is called The Vine.



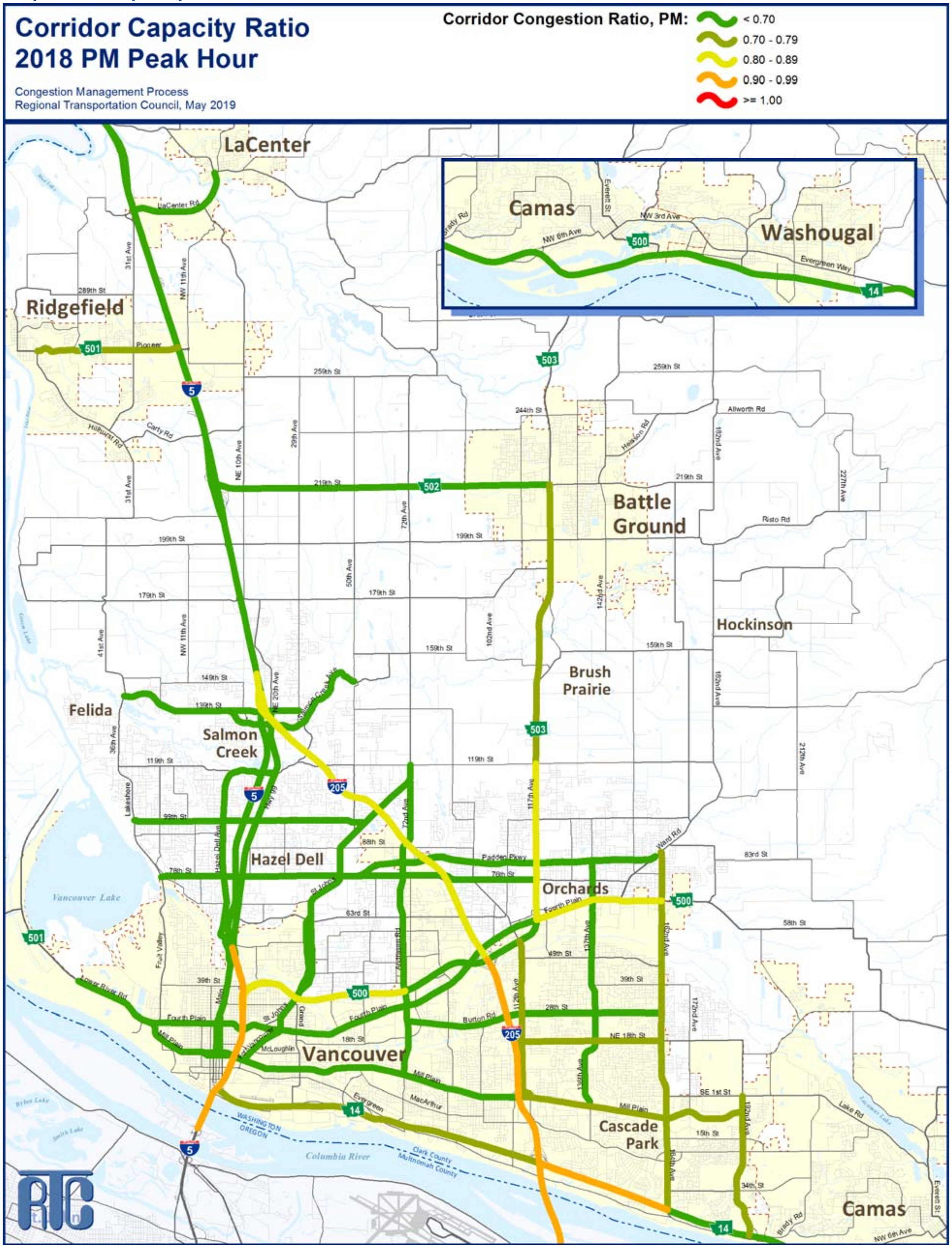
C-TRAN is moving forward to implement Transit Signal Priority on Mill Plain and Highway 99, after a pilot project showed improvements to corridor travel time and on-time performance without negatively impacting roadway traffic. Transit Signal Priority allows busses to communicate with traffic signals and allow additional green time for buses where needed.

Map 4: PM Vehicle Volumes

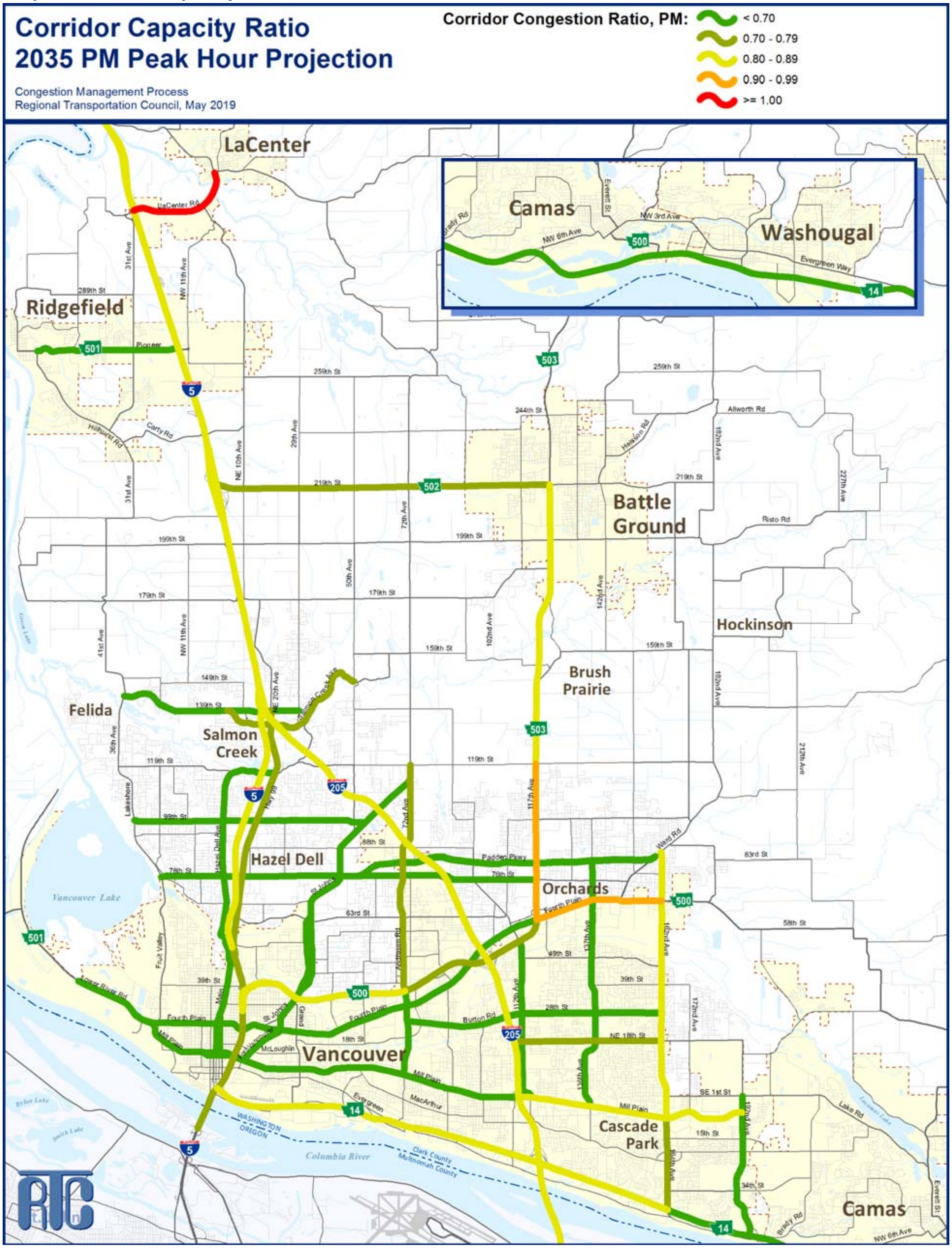
Map 5: AM Capacity Ratio



Map 6: PM Capacity Ratio



Map 7: 2035 PM Capacity Ratio



Map 8: AM Corridor Travel Speed

Map 9: PM Corridor Travel Speed

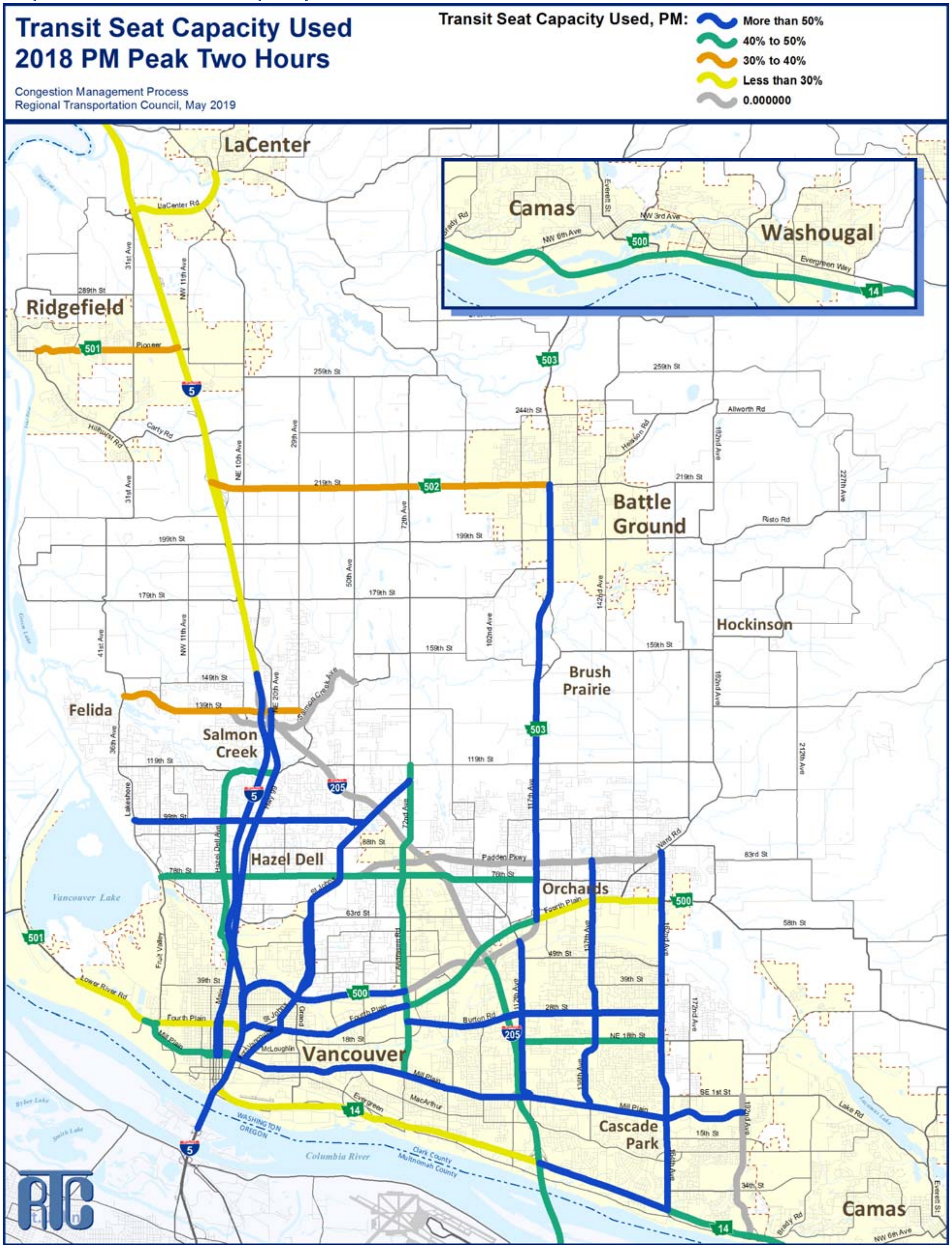
Map 10: AM Speed as a Percent of Speed Limit

Map 11: PM Speed as a Percent of Speed Limit

Map 12: PM Intersection Delay

Map 13: PM Truck Percentage

Map 14: PM Transit Seat Capacity Used



Areas of Concern

Using the individual CMS corridor segment data, areas of concerns were identified. Areas of concern are defined as segments within an individual corridor with a volume-to-capacity (V/C) ratio greater that 0.9 or a travel speed 50% or less of the posted speed limit.

Volume-to-capacity Ratio

The volume-to-capacity ratio identifies road segments where current volumes are approaching road capacity. This limitation on road capacity leads to congestion.

Map 15 (Page 40): Prominent volume-to-capacity ratio areas of concern in the AM peak period are associated with the bottlenecks at the two interstate bridges. The AM period shows a high volume-to-capacity ratio with related poor system performance on portions of I-5, Main Street, I-205, SR-14, and SR-500.

Map 16 (Page 41): In the PM period, additional volume-to-capacity ratio areas of concern showed up. The PM period shows congestion on portions of I-5, I-205, SR-14, SR-500, SR-503, Mill Plain, Fourth Plain, 134th Street, 112th Avenue, and Andresen Road.

Speed

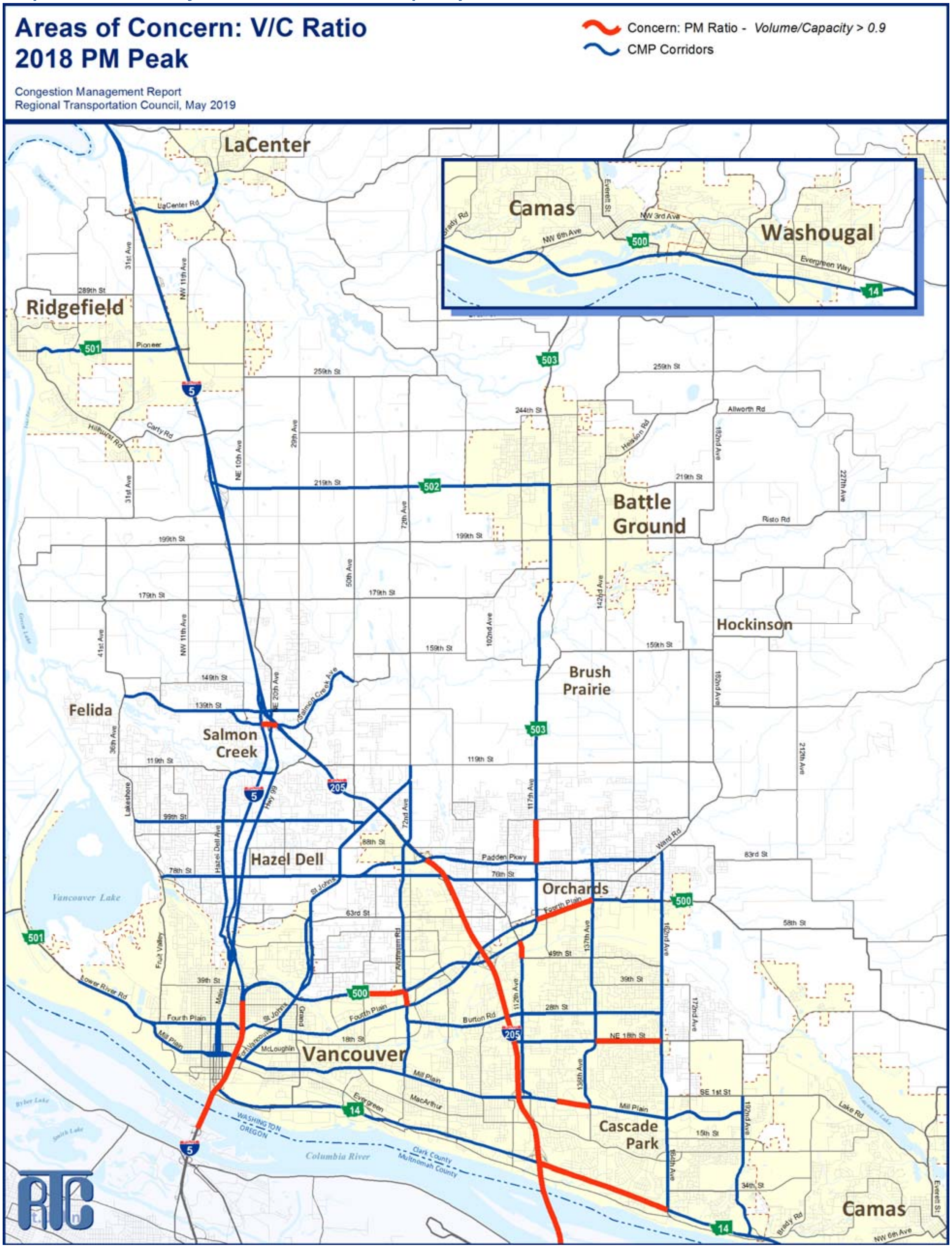
A travel speed lower than 50% of the posted speed limit is an indicator of delay, which can result in congestion. Often these speed areas of concern occur at major bottle necks or locations with multiple traffic signals in close proximity or at a high volume intersection.

Map 17 (Page 42): In the AM period, speed areas of concern occur along portions of I-5, I-205, SR-14, SR-500, SR-503, Main Street, Highway 99, St. Johns, Andresen, 112th Avenue, 162nd Avenue, 192nd Avenue, Mill Plain, Fourth Plain, 78th Street, Padden Parkway, 134th Street, and 139th Street.

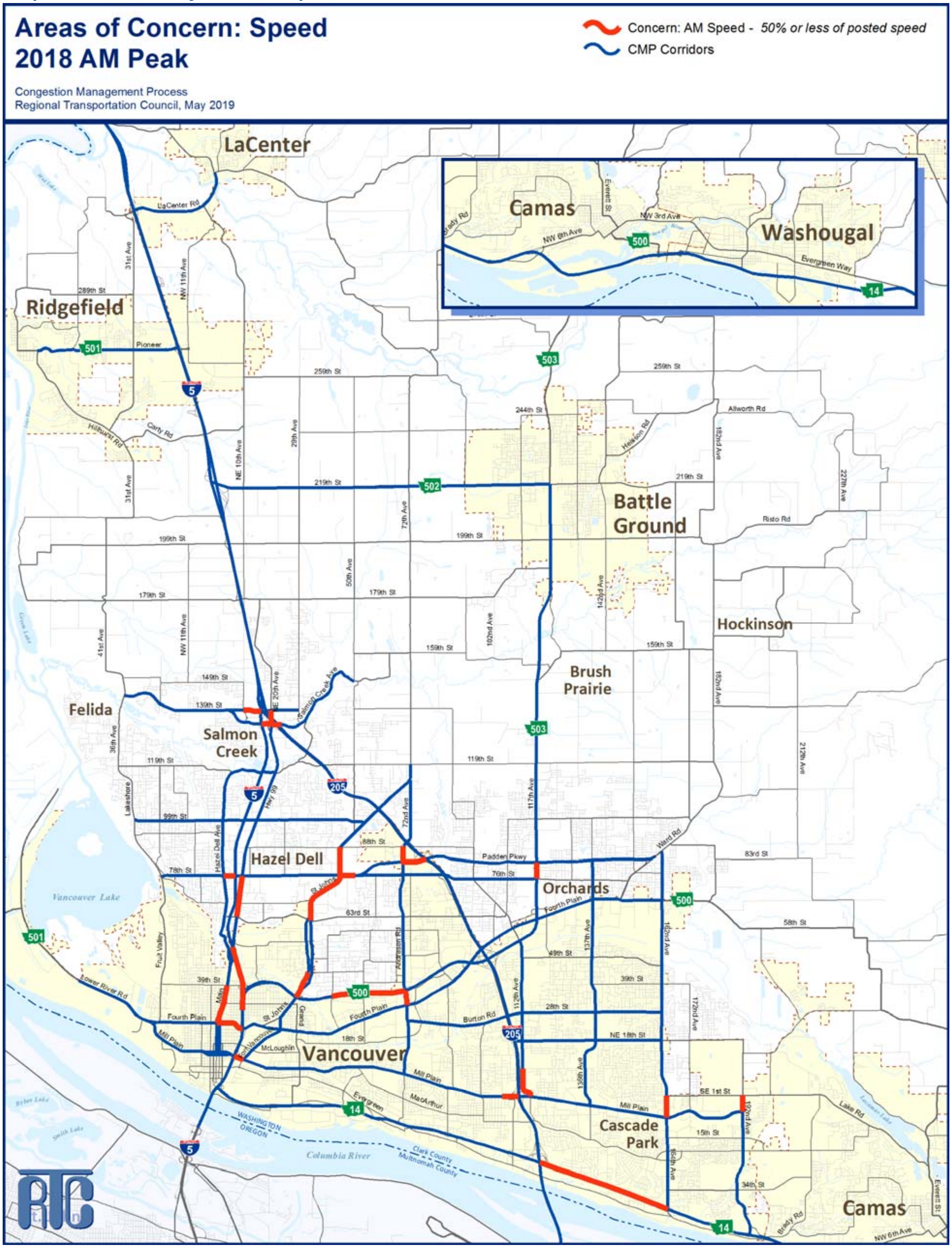
Map 18 (Page 43): In the PM period, speed areas of concern occur along portions of most of the congestion management system in the Vancouver Urban Area.

Map 15: AM Areas of Concern: Volume-to-capacity Ratio

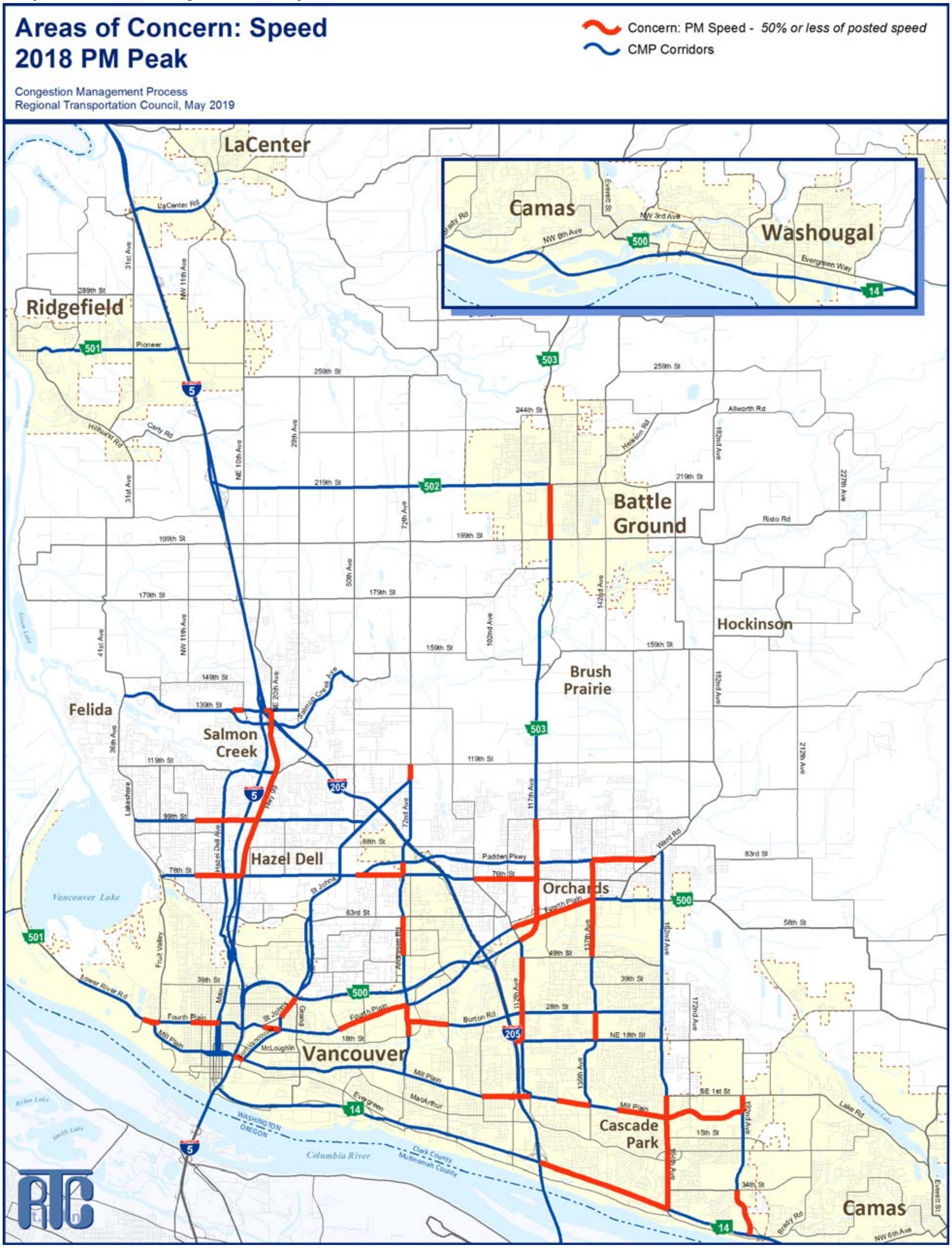
Map 16: PM Areas of Concern: Volume-to-capacity Ratio



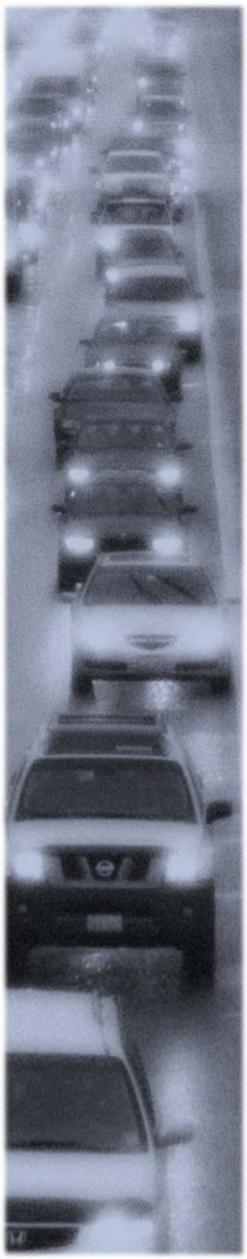
Map 17: AM Areas of Concern: Speed



Map 18: PM Areas of Concern: Speed



Chapter 3: Strategies



Because each roadway corridor has its own characteristics, congestion management efforts must be tailored to meet the needs of a roadway. Transportation professionals must employ a variety of strategies to effectively manage congestion.

Transportation Planning Efforts

RTC is involved in a number of transportation planning efforts intended to address the impacts of traffic congestion. The following is a list of current transportation planning efforts:

The Regional Transportation Plan[10] for Clark County (RTP) is the most prominent planning document. The plan is designed to be a guide for the effective investment of public funds for regional transportation needs over a twenty-year period. The region uses a wide range of data to develop a regional travel demand forecasting model. Using the model, the region can identify where future congestion is most likely to occur. The Regional Transportation Plan was adopted in March 2018.

The Transportation System Management and Operations Plan[11] (TSMO), was updated and adopted by the RTC Board in September 2016. TSMO focuses on low-cost, quickly implemented transportation improvements that aim to utilize existing transportation facilities more efficiently. TSMO combines advanced technologies, operational policies and procedures, and existing resources to improve coordination and operation of the multimodal transportation network.

The C-TRAN 20-year Transit Development Plan[12] was adopted in 2010 and updated in 2016. This planning process is designed to build upon existing service and develop future operating scenarios for public transit. The plan incorporates the recommendations of the High Capacity Transit System Plan.

The CTR program is intended to improve transportation system efficiency, conserve energy, and improve air quality by decreasing the number of commute trips made by people driving alone. The City of Vancouver is implementing their CTR plan through Destination Downtown[13].

[10] *http://rtc.wa.gov/programs/rtp/clark/*
[11] *http://rtc.wa.gov/programs/vast/docs/tsmoReport2016.pdf*
[12] *http://www.c-tran.com/about-c-tran/reports/c-tran-2030*
[13] *http://www.cityofvancouver.us/ced/page/destination-downtown*

The 2018 Human Services Transportation Plan for Clark, Skamania, and Klickitat Counties[14] summarizes the transportation needs for people who, because of disability, low income, or age, face transportation challenges. It also identifies the transportation activities to respond to these challenges.

Operational Studies. RTC and WSDOT are conducting operational studies to analyze near-term operational and system management improvements for freeways (I-5, I-205, SR-14, and SR-500) in the Vancouver region that could serve to make the transportation system operate more efficiently and predictably. In addition, WSDOT is analyzing the SR-500/Fourth Plain intersection looking at near term strategies to operations at the County's busiest signalized intersection. These studies should be completed in 2019.

Identify and Evaluate Transportation Strategies

The information and data contained in the System Monitoring chapter is used to identify appropriate congestion management strategies for the region. The identification and selection of strategies for a particular segment or corridor should be tied to the specific congestion issue. RTC will work collaboratively with member agencies to identify and advance appropriate strategies for managing congestion.

Strategies are detailed in the CMP Toolbox. The intent of the CMP Toolbox is to provide a reference for the development of alternative strategies for consideration in corridor development in relationship to the Regional Transportation Plan.

Objectives of Strategies

Reducing congestion in the region will require accomplishing the following objectives:

- Preservation and maintenance of the existing system
- Improving system performance through operation and management strategies
- Where possible, shifting trips to other modes
- Addition of auto capacity at key bottlenecks

CMP Toolbox

One of the components of RTC's Congestion Management Process is a toolbox of congestion reduction and mobility strategies. The intent of this toolbox is to encourage ways to deal with congestion and mobility issues prior to traditional

[14] *http://rtc.wa.gov/programs/hstp/*

roadway widening projects. Prior to adding single occupant vehicle (SOV) capacity, agencies and jurisdictions should give consideration to the various strategies identified in this section. Usually, multiple strategies are applicable within a corridor, while other strategies are intended to be applied region-wide.

The CMP toolbox strategies were assembled to provide a wide range of strategies that could be used to manage congestion. They are arranged so that the strategies are considered in order from first to last. Even with the addition of capacity, many of the strategies can be implemented with the project to ensure the long-term management of a capacity project.

System Preservation and Maintenance

Essential for continued transportation mobility is the preservation and maintenance of the existing roadway, bridge, ports, rail, transit, bicycle, pedestrian, and other systems.

Safety Improvements

It is vital that the region builds and maintains a transportation system that provides a safe and secure means of travel by all modes. The type of safety improvement is dependent on the need at each location.

Preservation and maintenance of existing systems is essential to mobility.

Transportation Demand Management

Transportation Demand Management: Options such as alternative work hours, telecommuting, ridesharing, and other options can remove, shift, or combine trips to reduce overall demand during peak periods. Many of these strategies can be successfully implemented through a Commute Trip Reduction (CTR) program.

Transit Improvements

Bus Route Coverage

Provides better transit accessibility to a greater share of the population.

Bus Frequencies and Transit Amenities

Makes transit more attractive to use.

Park-and-Ride Lot

In conjunction with express bus service, can encourage the use of transit for longer distance commute trips.

High Capacity Transit

Provides a higher transit service to maximize transit usage within urban corridors.

Bicycle and Pedestrian Improvements

New Sidewalks and Bicycle Lanes, Separated Pathways, and Trails

Provides better pedestrian and bicycle accessibility to a greater share of the population. Also increases the perception of pedestrian and bicycle safety.

Bicycle Amenities

Bicycle racks, lockers, and other bicycle amenities at transit stations and other trip destinations increases security and provides incentives for using bicycles.

Pedestrian-Oriented Development

Building setback restrictions, streetscape, and other pedestrian oriented development can be codified in zoning ordinances to encourage pedestrian activity.

Bicycle and Pedestrian Safety

Maintaining lighting, signage, striping, traffic control, and other safety improvements can increase bicycle and pedestrian usage.

Transportation System Management and Operations

Traffic Signal Coordination

This improves traffic flow and minimizes stops on arterial streets.

Incident Management System

Is an effective way to alleviate non-recurring congestion. Primarily applicable on freeways.

Ramp Metering

This allows freeway to maintain flow rates, resulting in improved operations and reducing congestion on freeways.

Highway Information Systems

These systems provide travelers with real-time information that can be used to make trip and route decisions.

Advanced Traveler Information Systems

This provides data to travelers in advanced by computer or to other devices.

Access Management

Left Turn Restrictions

Turning vehicles can impede traffic flow and are more likely to be involved in collisions.

Consolidation or Relocation of Driveways

In some situations, increasing or improving access to property can improve traffic flow and reduce collisions.

Interchange Modification

Modification of interchanges can reduce weaving and improve traffic flow.

Minimum Intersection/Interchange Spacing

Appropriate spacing of intersection/interchanges can reduce number of conflict points and merge areas, resulting in fewer incidents and better traffic flow.

Collector-Distributor Roads

Collector-distributor roads are used to separate interchange traffic from through traffic at closely spaced interchanges, resulting in fewer incidents and better traffic flow.

Land Use

Mixed-Use Development

This can allow many trips to be made in an area by walking rather than use of a vehicle.

Infill and Densification

This takes advantage of existing infrastructure, rather than requiring new infrastructure to be built.

Transit Oriented Development

Allows improved pedestrian access from transit to housing and businesses.

The CMP provides information to help guide the investment of transportation funding toward improving congestion.

Parking Enforcement

Enforcement of existing regulations can improve traffic flow in urban areas.

Location Specific Parking Ordinances

Parking requirements can be adjusted for factors such as availability of transit, mix of land use, and pedestrian oriented development that reduces the need for on-site parking.

Carpool/Vanpool Parking

Preferential, reduced, or free parking for carpool/vanpool can provide an incentive and reduce parking demand.

Roadway Improvements

Geometric Design Improvements

Addition of turn lanes at intersections, roundabouts, improved sight distance, auxiliary lanes, and other geometric improvements can reduce congestion by removing bottlenecks.

Upgrade Roads to Urban Standards

Upgrading from rural roads to urban standards with improved geometry, bicycle lanes, sidewalks, and transit amenities can improve traffic flow for all modes.

Grade Separation

Upgrade high volume intersection to an interchange or grade separated facility can significantly reduce traffic delay and reduce congestion.

Road Widening to Add Travel Lanes

Can increase capacity and remove congestion.

Strategy Implementation

RTC's Congestion Management Process provides a tool for monitoring the region's traffic congestion. The CMP provides information to help guide the investment of transportation funding toward improving congestion. Information developed through the Congestion Management Process will be applied through the RTC regional transportation planning process.

In coordination with WSDOT, C-TRAN, and local agencies, RTC utilizes the Congestion Management Process to identify transportation system needs. This effort is supported by regional studies, local capital facility plans, regional transportation model, and other planning efforts which all feed into the development of the Regional Transportation Plan[15] (RTP). Needs are developed

[15] *http://www.rtc.wa.gov/programs/mtp/*

based on a planning level analysis that considers how various strategies can address congestion prior to adding capacity. Identified congestion needs are then incorporated into Regional Transportation Plan recommendations. Project sponsors then must give consideration to the various strategies from the CMP Toolbox as projects move forward to implementation.

Local project priorities are then submitted to RTC and prioritized through the regional Transportation Improvement Program[16] (TIP) which selects priority projects for implementation. For purpose of selecting projects to fund through the TIP process, additional points are awarded to a project that:

- Are Located on the CMP Network
- Addresses Congestion
- Incorporates Alternative Modes
- Incorporates Transportation System Management Alternatives

Monitor Strategy Effectiveness

This report contains data that allows for the continuing development and updating of information to track the performance of the regional transportation system and implemented strategies.

In assessing the degree to which the CMP strategies address congestion issues, projects are tracked through the project implementation process and results are reported back to regional technical committees. As part of the project implementation process, all regionally selected projects are required to complete a before and after analysis that identifies project goals and outcomes.

Strategy Corridor Analysis

This section displays the linkages between transportation infrastructure improvements and corridor performance. System infrastructure improvements often impact the operation within a corridor. Sometimes a project removes a localized bottleneck, while other projects have corridor-wide impacts.

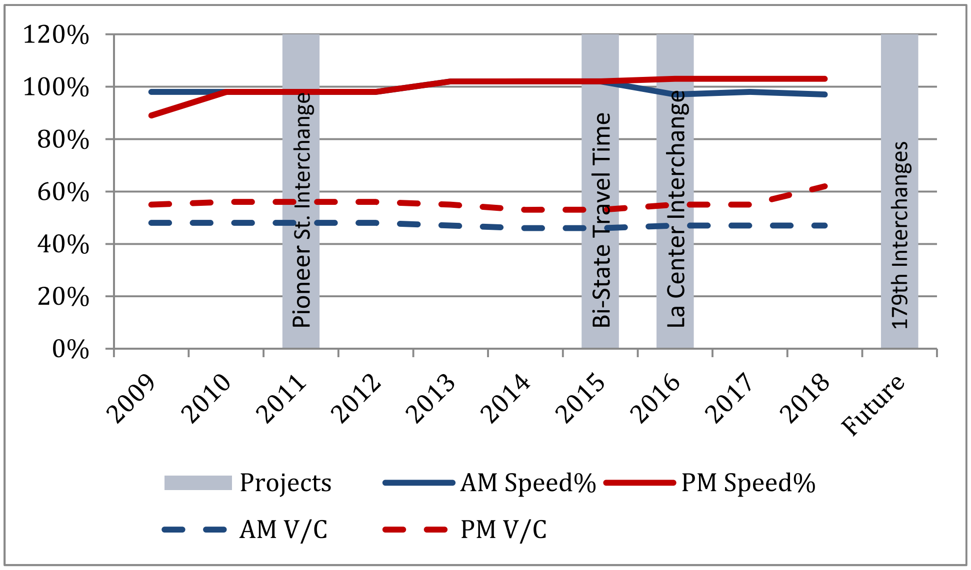
The following graphs show overall corridor travel speed compared to posted speed limit and volume to capacity ratio in comparison to implemented and future infrastructure improvements. This analysis is for each facility as a whole, and is not necessarily an indicator of individual bottlenecks. Roadways are likely to experience corridor-wide congestion when average travel speed falls under 60 percent of posted speed limit or when average volume to capacity ratio is greater than 90 percent.

[16] *http://www.rtc.wa.gov/programs/tip/*

I-5 North, County Line to I-205 Junction

Neither speed nor capacity indicates potential corridor-wide congestion. Corridor improvements are reflective of the need for improved access to the Corridor. Future corridor improvements include the reconstruction of the 179th Street interchange.

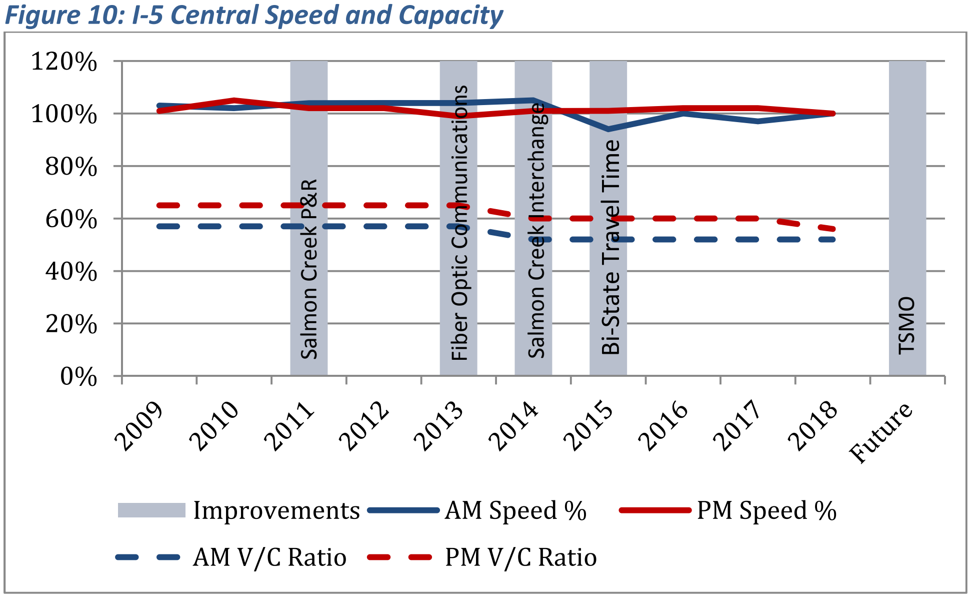
Figure 9: I-5 North Speed and Capacity



I-5 Central, I-205 Junction to Main Street

Neither existing speed nor capacity indicates potential corridor-wide congestion. The southern portion of this corridor can be impacted by morning congestion from the I-5 South corridor. Future corridor improvements include variable speed limits and dynamic ramp metering.

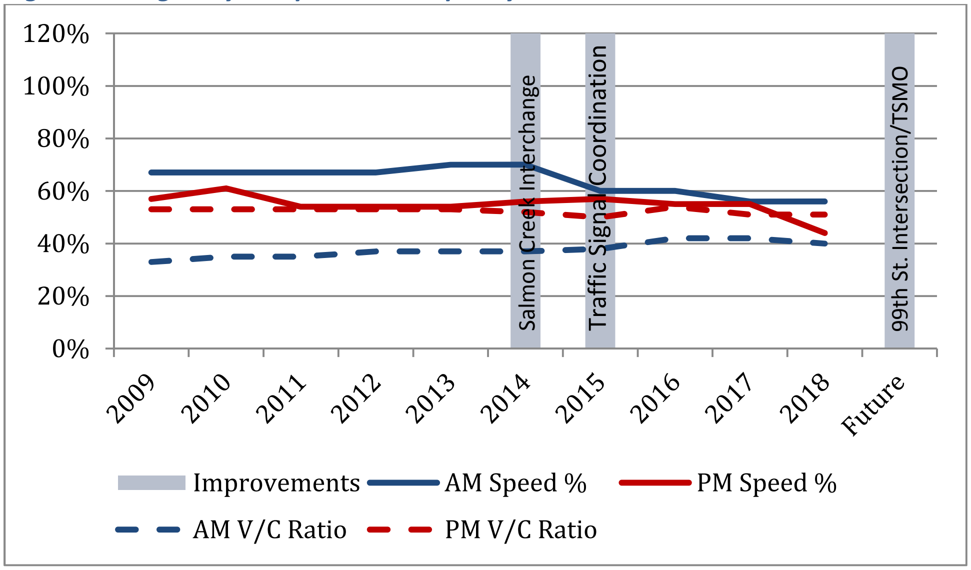
Figure 10: I-5 Central Speed and Capacity



Highway 99, 139th Street to I-5

The morning and evening speeds indicates potential corridor-wide congestion. Future corridor enhancements include select road improvements, TSMO, and transit projects.

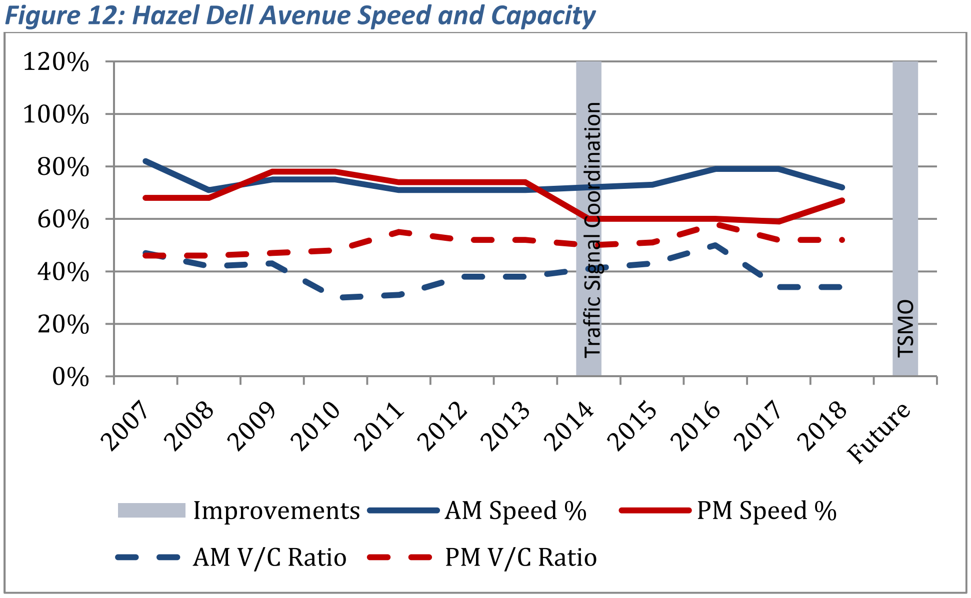
Figure 11: Highway 99 Speed and Capacity



Hazel Dell Avenue, Highway 99 to 63rd Street

Neither existing speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include TSMO projects.

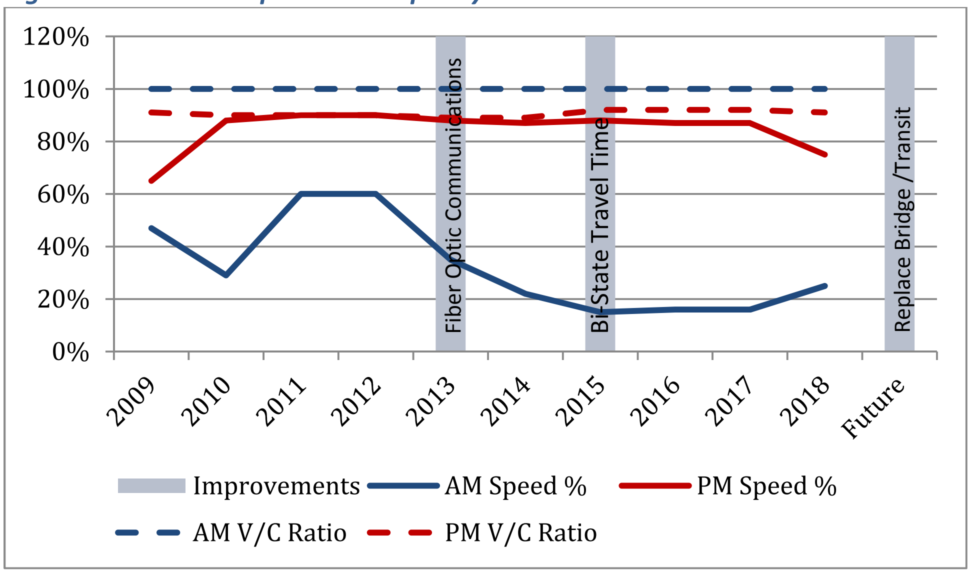
Figure 12: Hazel Dell Avenue Speed and Capacity



I-5 South, Main Street to Jantzen Beach

Morning speed and capacity indicate a pattern of corridor-wide congestion. Evening speed indicates potential congestion. Future corridor improvements include a new I-5 Bridge, interchanges, bus on shoulder, and active traffic management. Recent active traffic management has shown positive results in the morning hours.

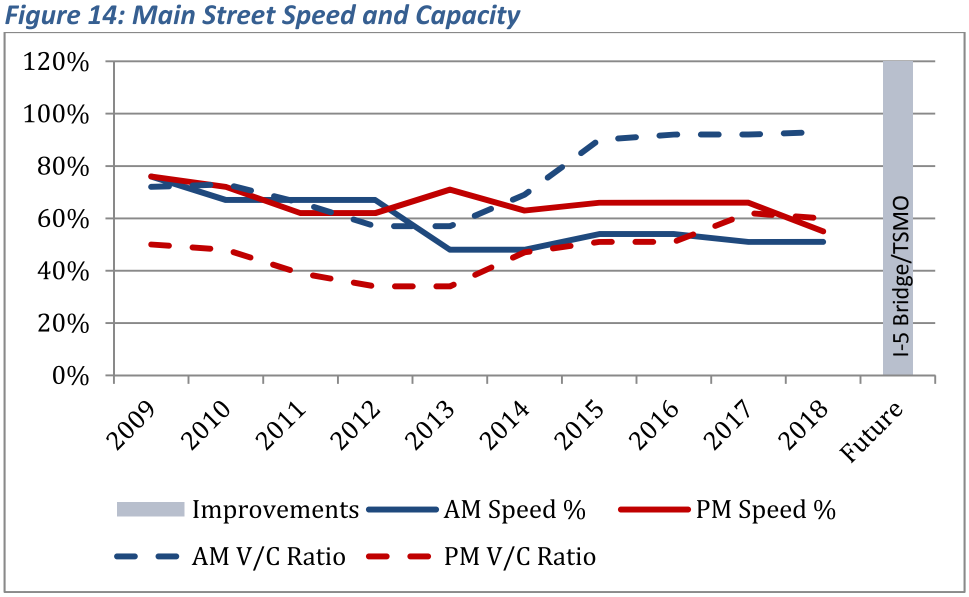
Figure 13: I-5 South Speed and Capacity



Main Street, I-5 to Mill Plain

Morning and evening speed and evening capacity indicates a pattern of corridor-wide congestion, as trips divert from the congested I-5 corridor. Future corridor improvements include I-5 Bridge replacement and TSMO projects.

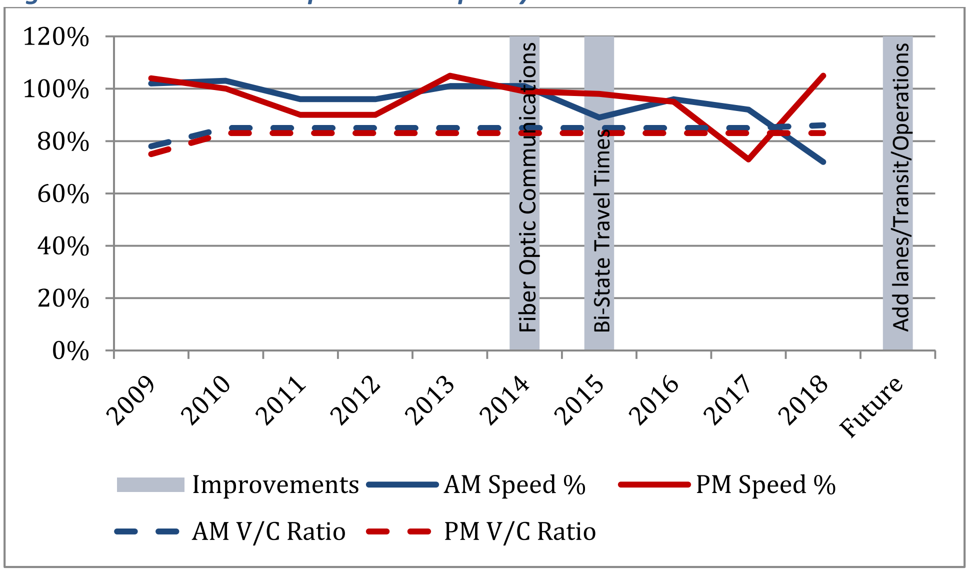
Figure 14: Main Street Speed and Capacity



I-205 Central, I-5 to SR-500

Corridor data indicates a busy corridor that is near capacity. Over the last few years, the morning and evening speed variation indicate a corridor that is at maximum capacity. Future corridor improvements include additional auxiliary lanes, transit, operational, and interchange projects.

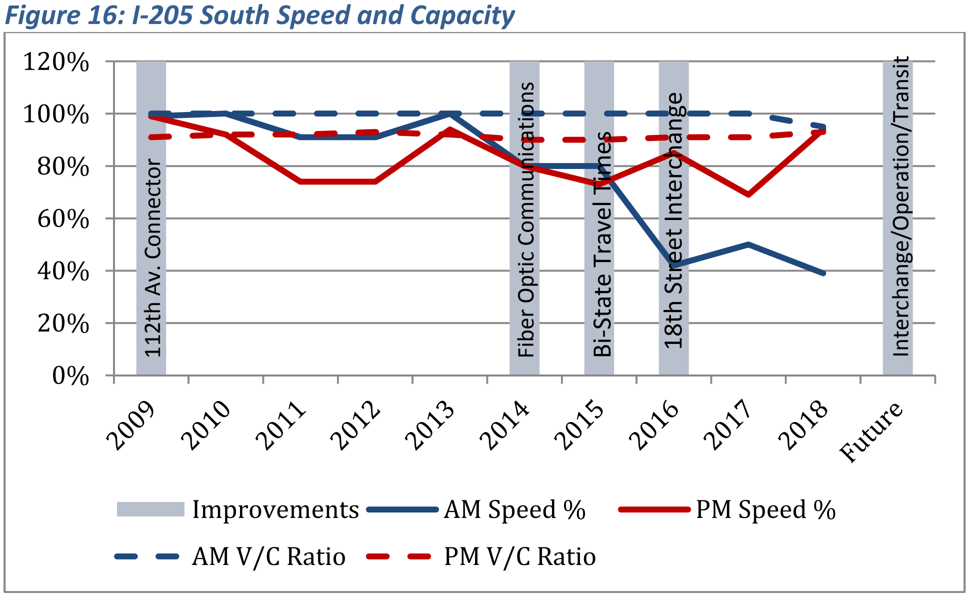
Figure 15: I-205 Central Speed and Capacity



I-205 South, SR-500 to Airport Way

Morning speed and capacity indicate significant congestion. While evening speed and capacity indicate corridor is at capacity. Future corridor improvements include interchange modifications, transit, and operational projects.

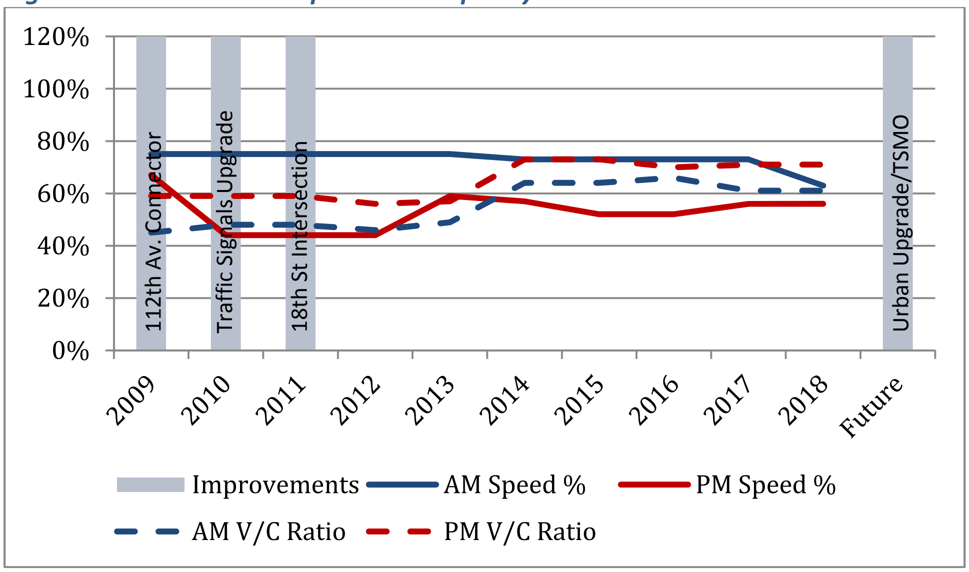
Figure 16: I-205 South Speed and Capacity



112th Avenue, SR-500 to Mill Plain

Evening speed indicates potential corridor-wide congestion. Future corridor improvements include urban road upgrades and TSMO projects.

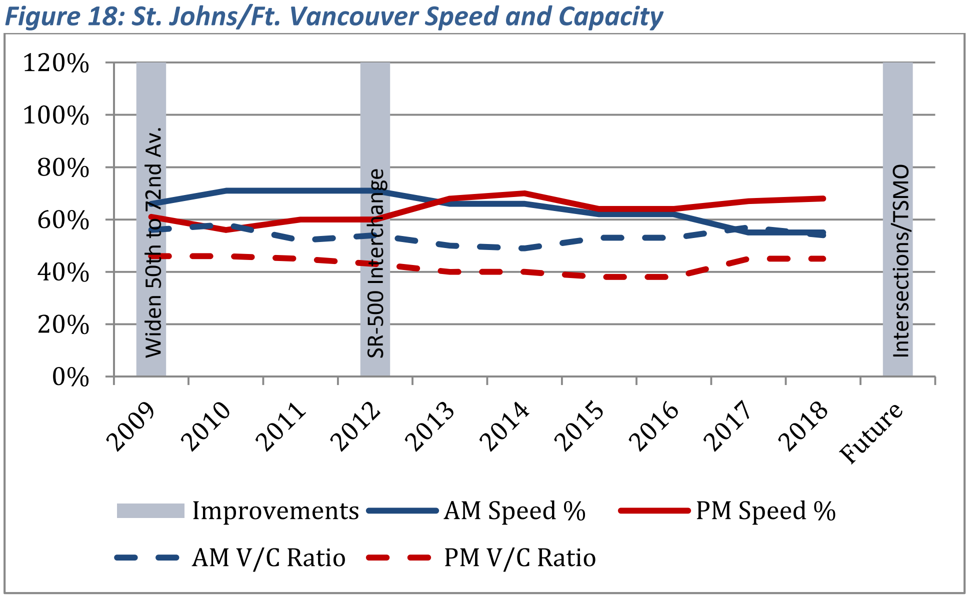
Figure 17: 112th Avenue Speed and Capacity



St. Johns/Ft. Vancouver, 72nd Avenue to Mill Plain

Neither existing speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include intersection and TSMO projects.

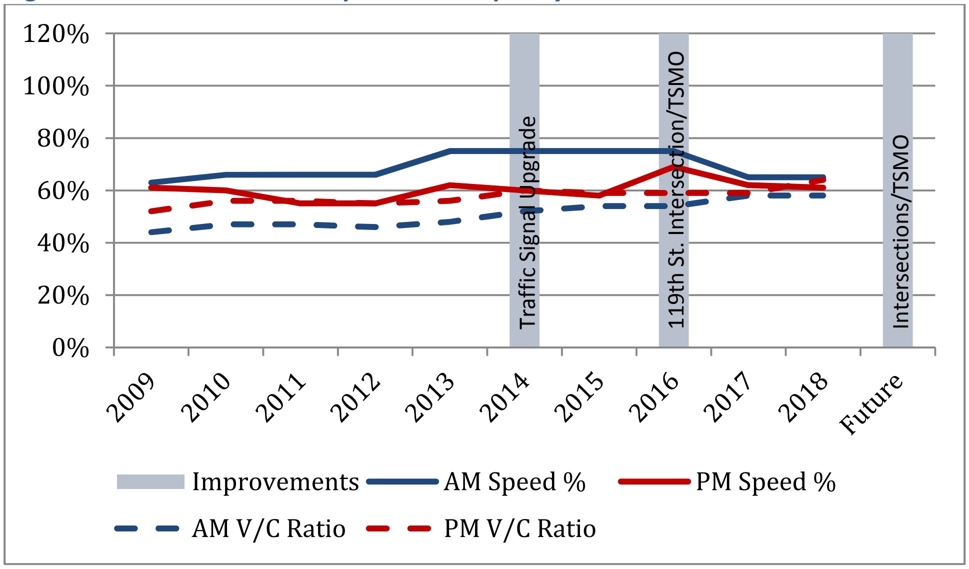
Figure 18: St. Johns/Ft. Vancouver Speed and Capacity



Andresen North, 119th Street to SR-500

Neither speed nor capacity indicates corridor wide congestion. Future corridor improvements include intersection and TSMO projects.

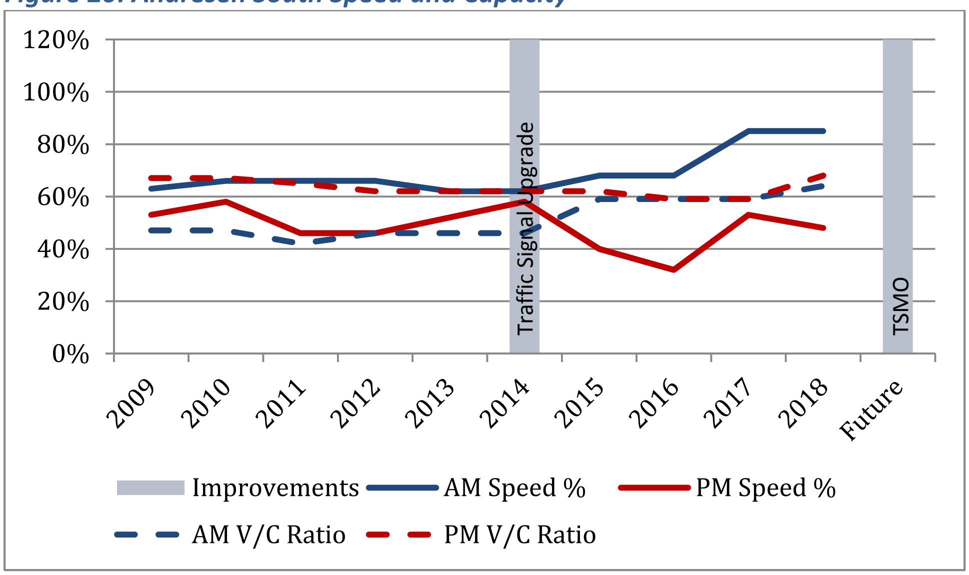
Figure 19: Andresen North Speed and Capacity



Andresen South, SR-500 to Mill Plain

Evening speed indicates congestion in the corridor. Future corridor improvements include TSMO projects.

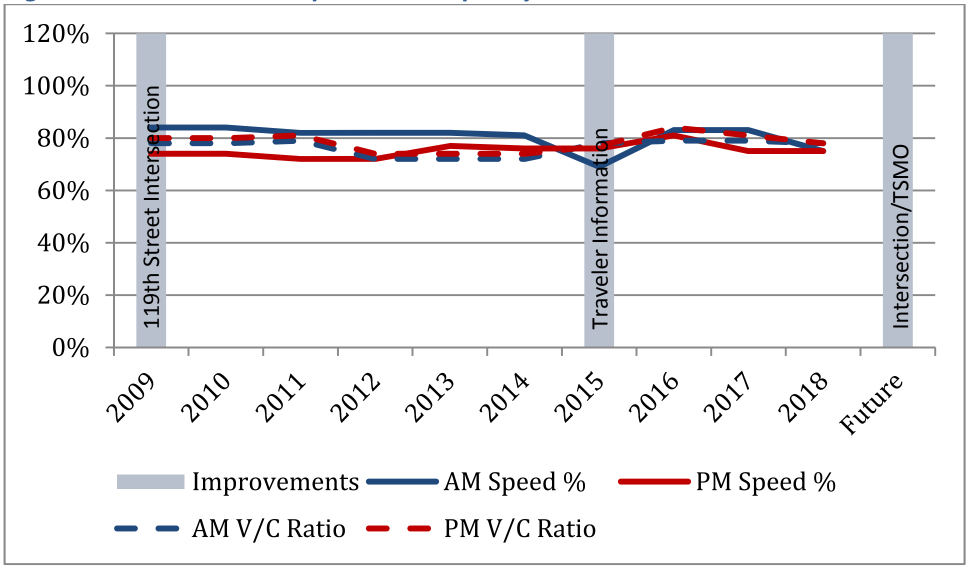
Figure 20: Andresen South Speed and Capacity



SR-503 North, SR-502 to 119th Street

Corridor data indicates a very busy corridor that is near capacity. Future corridor projects include SR-502/SR-503 Intersection improvement and TSMO projects.

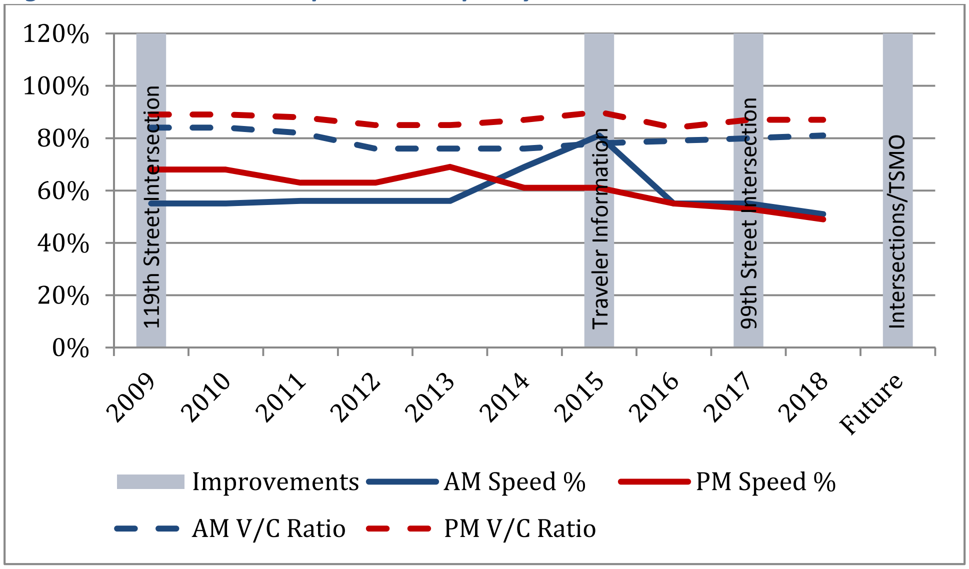
Figure 21: SR-503 North Speed and Capacity



SR-503 South, 119th Street to Fourth Plain

This is a busy corridor that indicates corridor-wide congestion associated with capacity and speed. Future corridor improvements include Fourth Plain intersection improvements, drainage, access management, and TSMO projects.

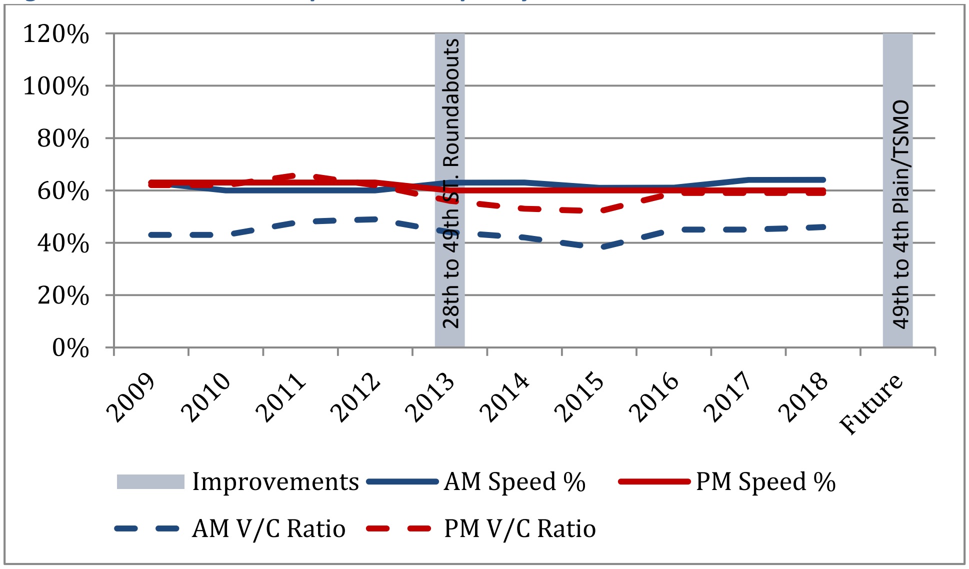
Figure 22: SR-503 South Speed and Capacity



137th Avenue, Padden Parkway to Mill Plain

Neither speed nor capacity indicates corridor wide congestion. Future corridor projects include road improvements between 49th Street and Fourth Plain and TSMO improvements.

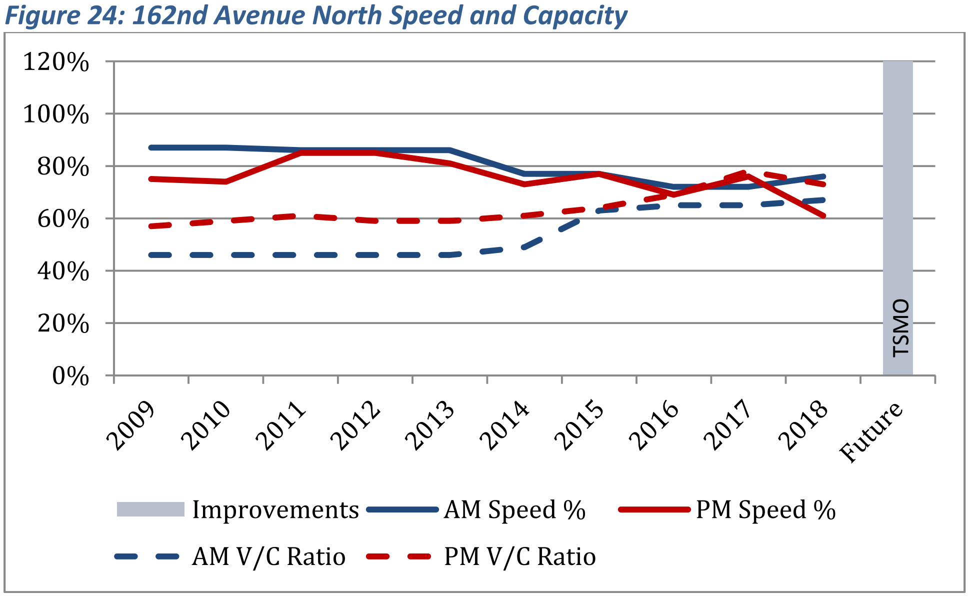
Figure 23: 137th Avenue Speed and Capacity



162nd Avenue North, Ward Road to Mill Plain

This is an increasingly busy corridor that is approaching capacity. Speed does not indicate corridor wide congestion. Future corridor improvements include TSMO projects.

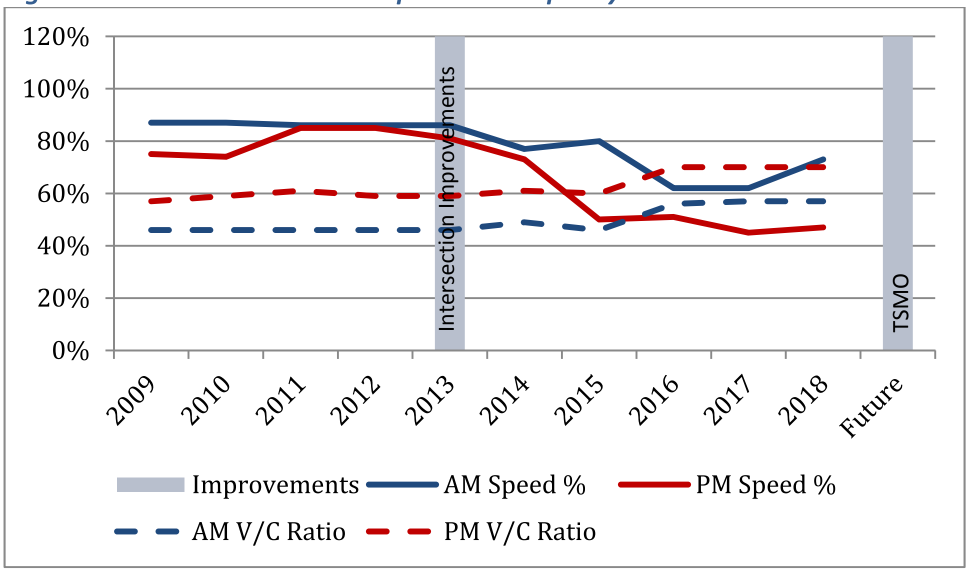
Figure 24: 162nd Avenue North Speed and Capacity



164th Avenue South, Mill Plain to SR-14

Since 2015, evening speed has shown a sharp decline indicating substantial congestion. Future corridor improvements include TSMO projects.

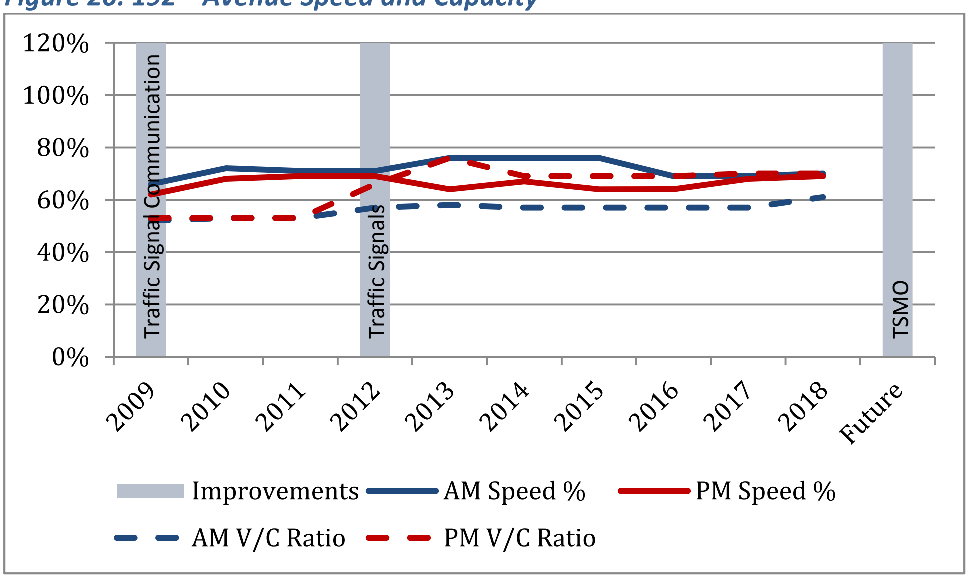
Figure 25: 164th Avenue South Speed and Capacity



192nd Avenue, SE 1st Street to SR-14

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include TSMO projects.

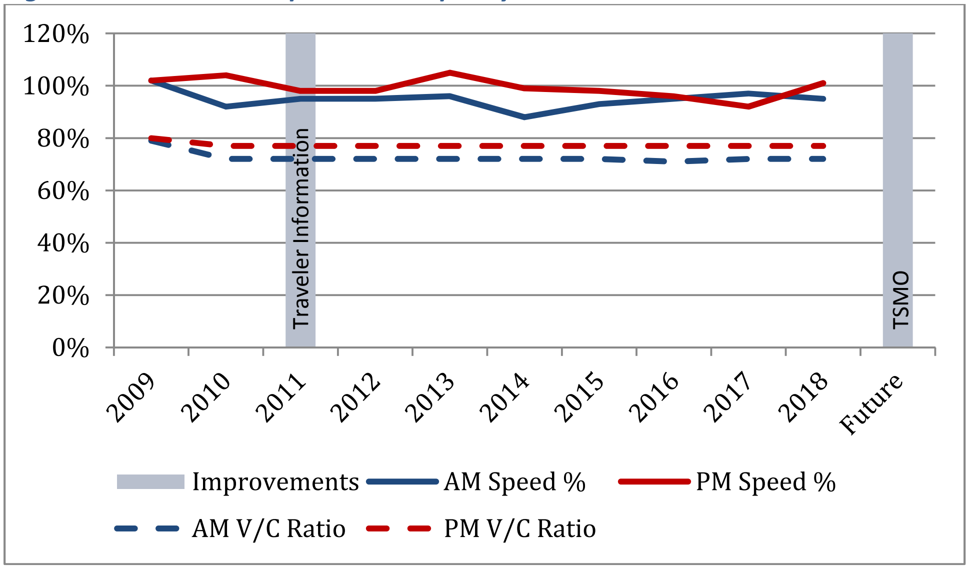
Figure 26: 192nd Avenue Speed and Capacity



SR-14 West, I-5 to I-205

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include TSMO projects.

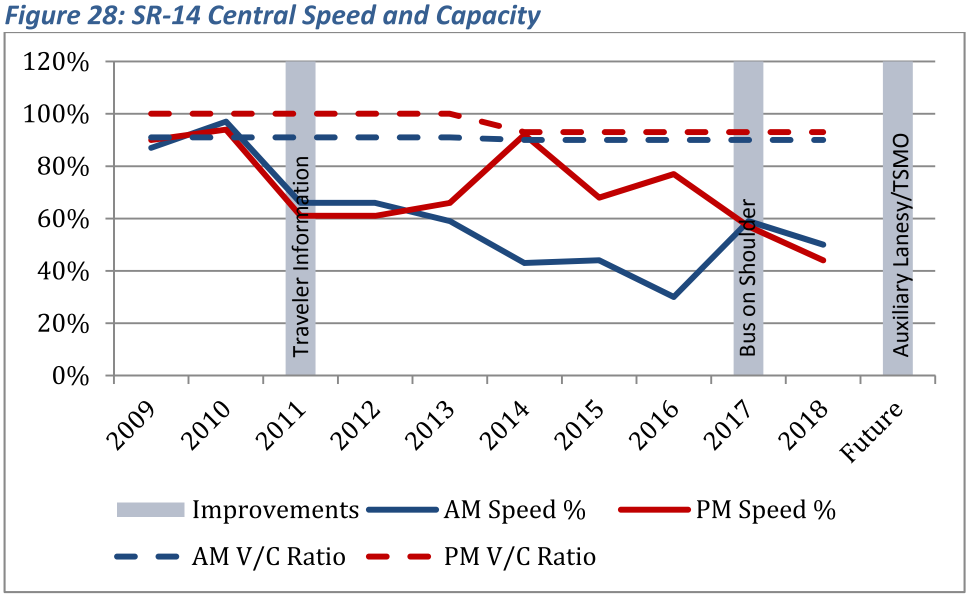
Figure 27: SR-14 West Speed and Capacity



SR-14 Central, I-205 to 164th Avenue

Both speed and capacity indicate both morning and evening corridor-wide congestion. Future corridor improvements include auxiliary lanes, interchange reconfiguration, and TSMO projects.

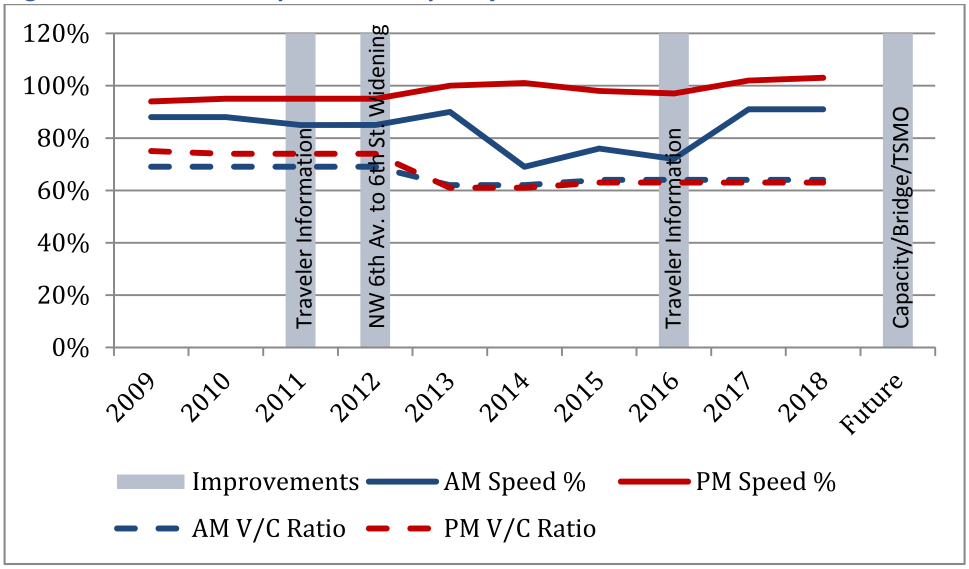
Figure 28: SR-14 Central Speed and Capacity



SR-14 East, 164th Avenue to County Line

Neither speed nor capacity indicates potential corridor-wide congestion. This corridor can be impacted by morning congestion backup from I-205. Future corridor improvements include added access and capacity, replacement of West Camas Slough Bridge, and TSMO projects.

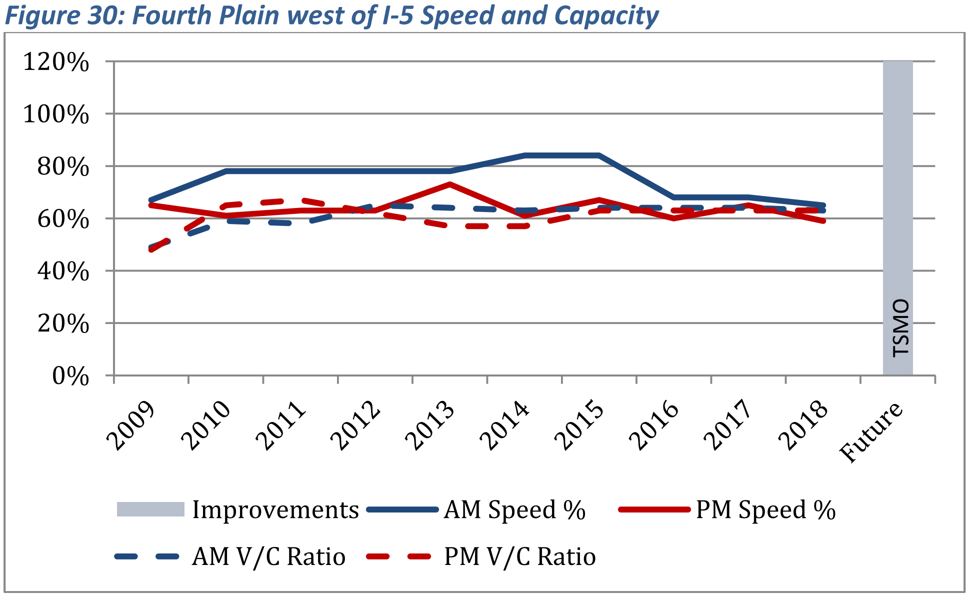
Figure 29: SR-14 East Speed and Capacity



Fourth Plain, I-5 to Port of Vancouver

Evening speed indicates potential congestion. Future corridor improvements include TSMO projects.

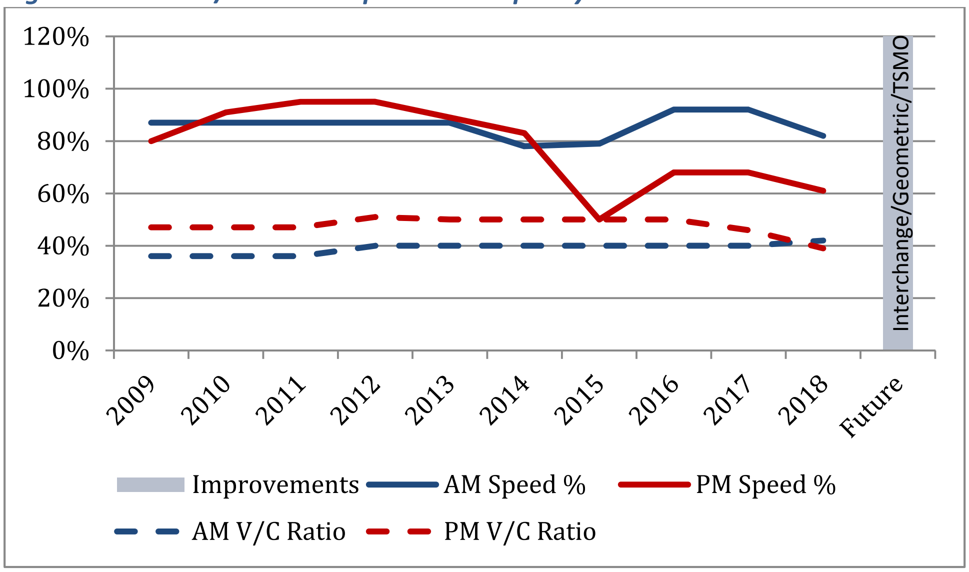
Figure 30: Fourth Plain west of I-5 Speed and Capacity



SR-501/Mill Plain, I-5 to Fourth Plain

Neither speed nor capacity indicates corridor wide congestion. The decrease in speed in 2015 was due to the construction of an apartment complex in the corridor. Future corridor improvements include both road and interchange modifications to improve freight movement.

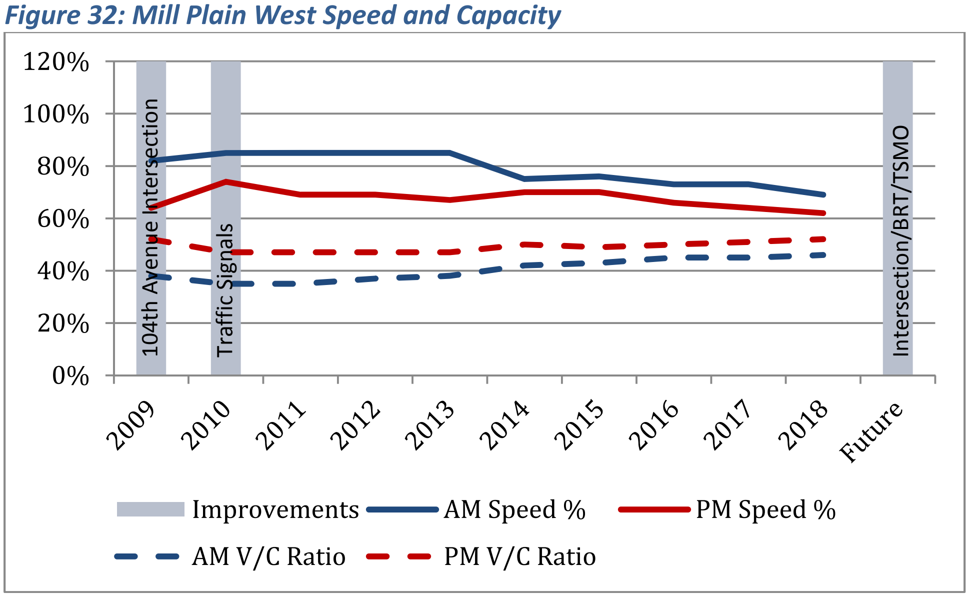
Figure 31: SR-501/Mill Plain Speed and Capacity



Mill Plain West, I-5 to I-205

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include 104th/105th Intersection realignment, BRT, and TSMO projects.

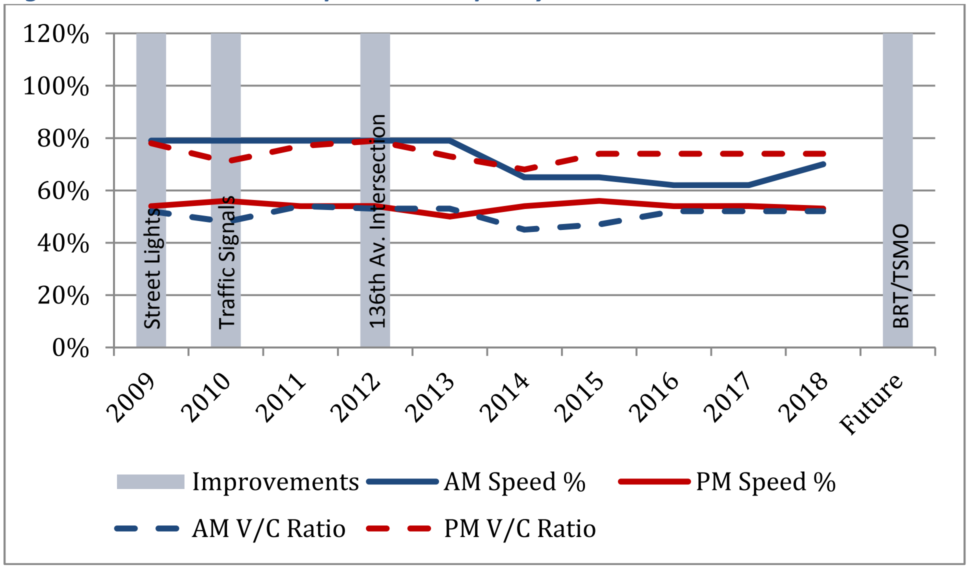
Figure 32: Mill Plain West Speed and Capacity



Mill Plain East, I-205 to 192nd Avenue

Evening speed indicates potential corridor-wide congestion. Future corridor improvements include BRT and TSMO projects.

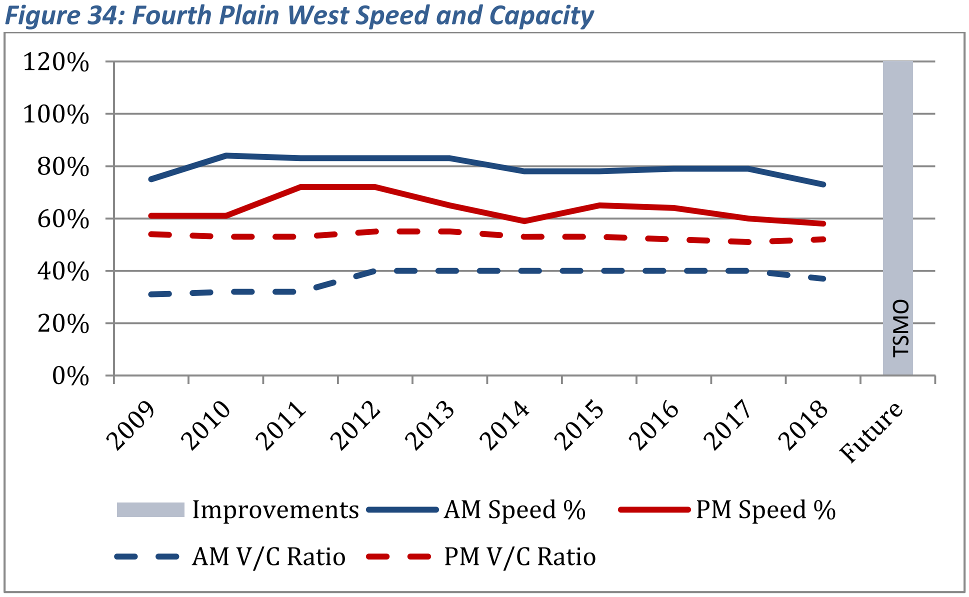
Figure 33: Mill Plain East Speed and Capacity



Fourth Plain West, I-5 to Andresen Road

Evening speed indicates potential corridor-wide congestion. Future corridor improvements include road diet near I-5 and TSMO projects.

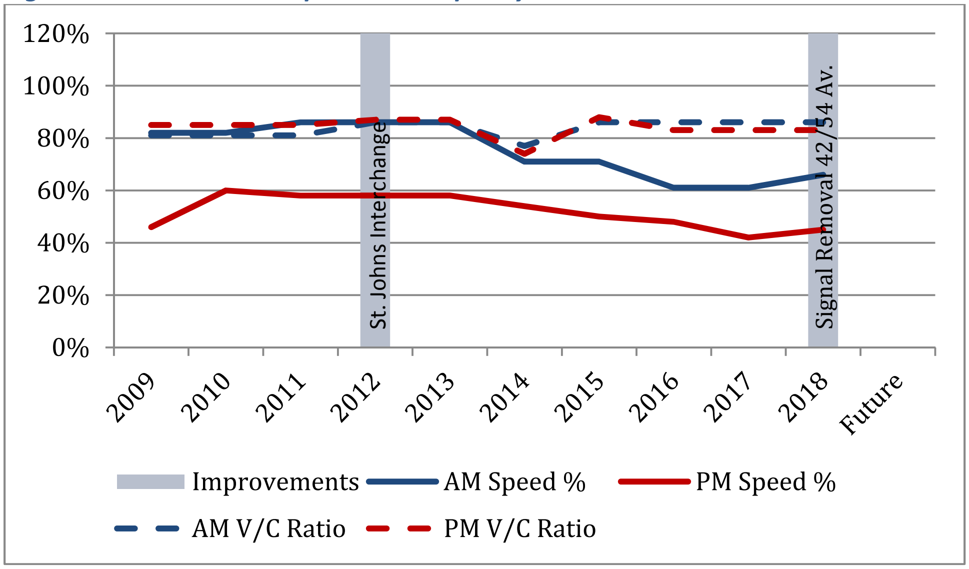
Figure 34: Fourth Plain West Speed and Capacity



SR-500 West, I-5 to Andresen Road

Evening speed indicate corridor-wide congestion. WSDOT removed signals at 42nd and 54th Avenue in November 2018.

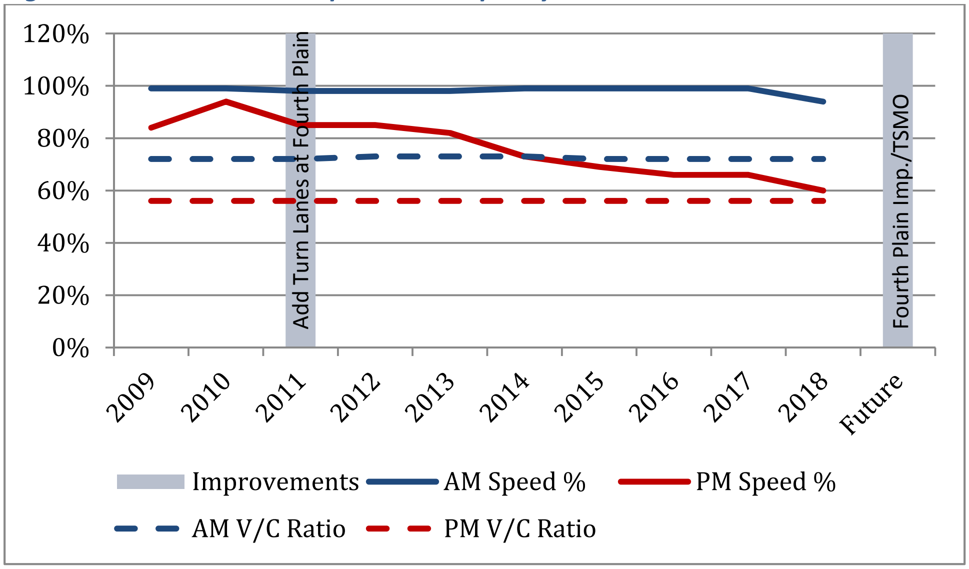
Figure 35: SR-500 West Speed and Capacity



SR-500 Central, Andresen Road to SR-503/Fourth Plain

Evening speed indicates the potential of congestion. Future corridor improvements include improvements at Fourth Plain, auxiliary lanes, and TSMO projects.

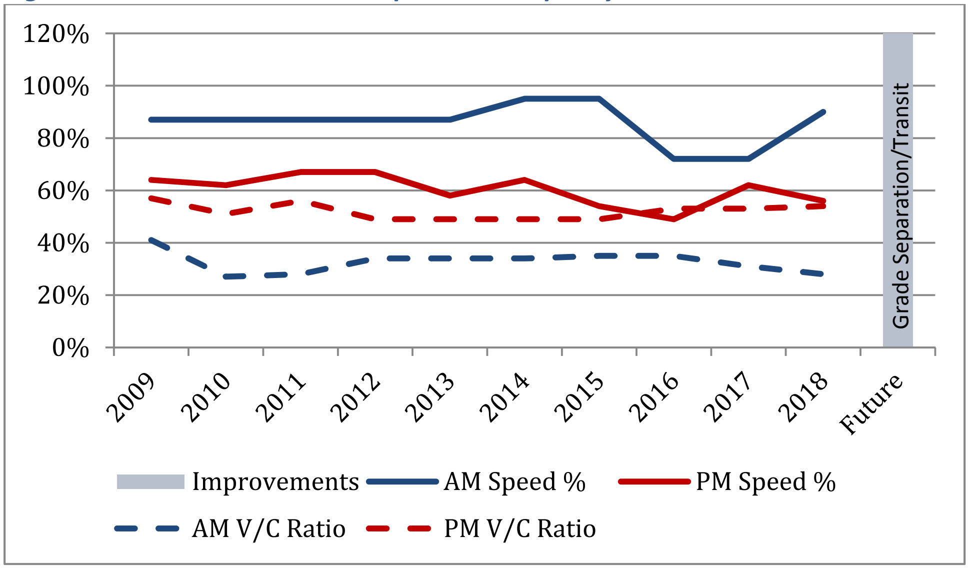
Figure 36: SR-500 Central Speed and Capacity



Fourth Plain Central, Andresen Road to SR-503

Evening speed indicates potential corridor-wide congestion. The Vine BRT construction impacted speed in year 2016. Future corridor improvements include intersection upgrade at SR-500/Fourth Plain and TSMO projects.

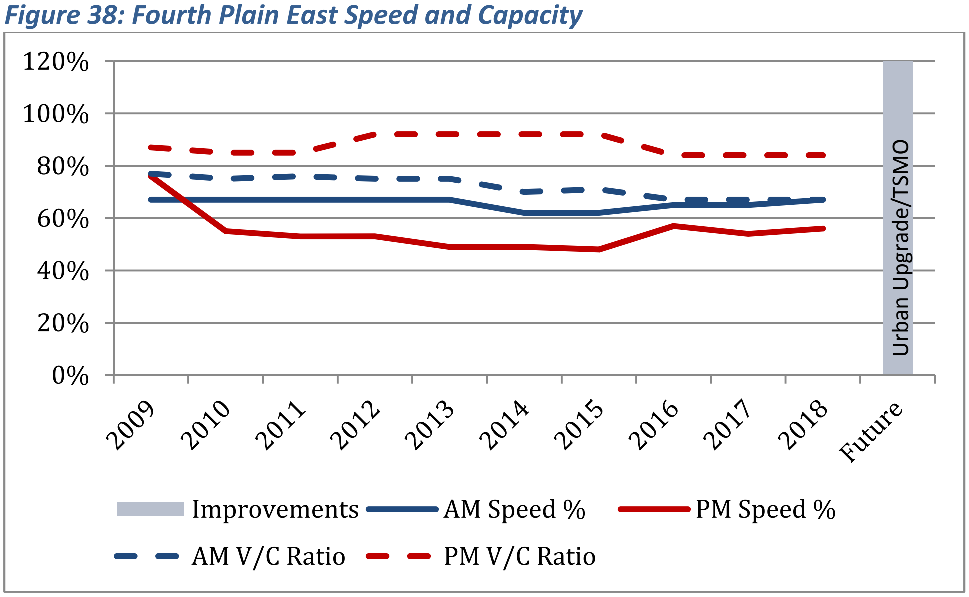
Figure 37: Fourth Plain Central Speed and Capacity



Fourth Plain East, SR-503 to 162nd Avenue

Both evening speed and capacity indicates corridor-wide congestion. In 2016, speed percentage improved as speed was lowered in the corridor. Future corridor improvements include intersection improvements at SR-503/Fourth Plain, transit, and TSMO projects.

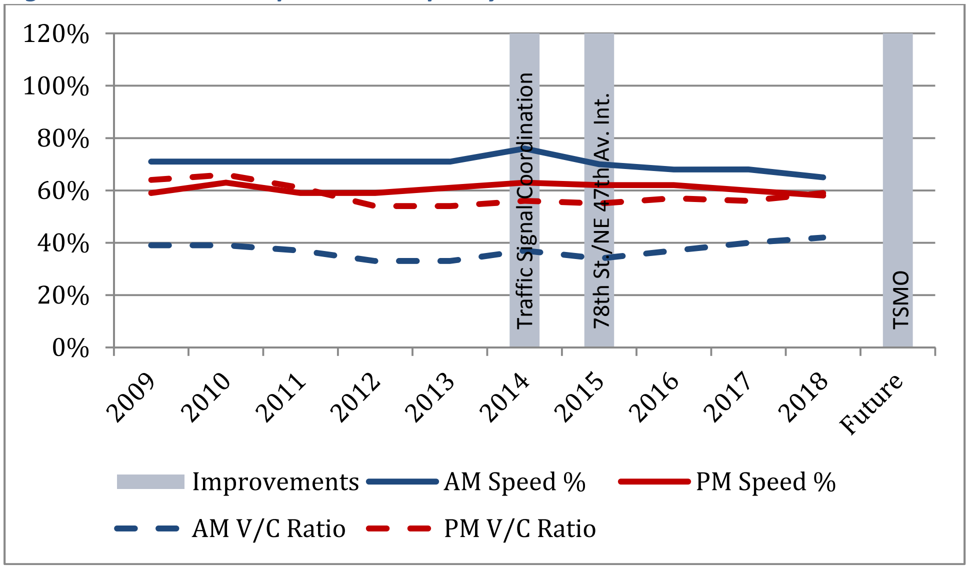
Figure 38: Fourth Plain East Speed and Capacity



78th Street, Lake Shore Avenue to SR-503

Evening speed indicates potential corridor-wide congestion. Future corridor improvements include TSMO projects.

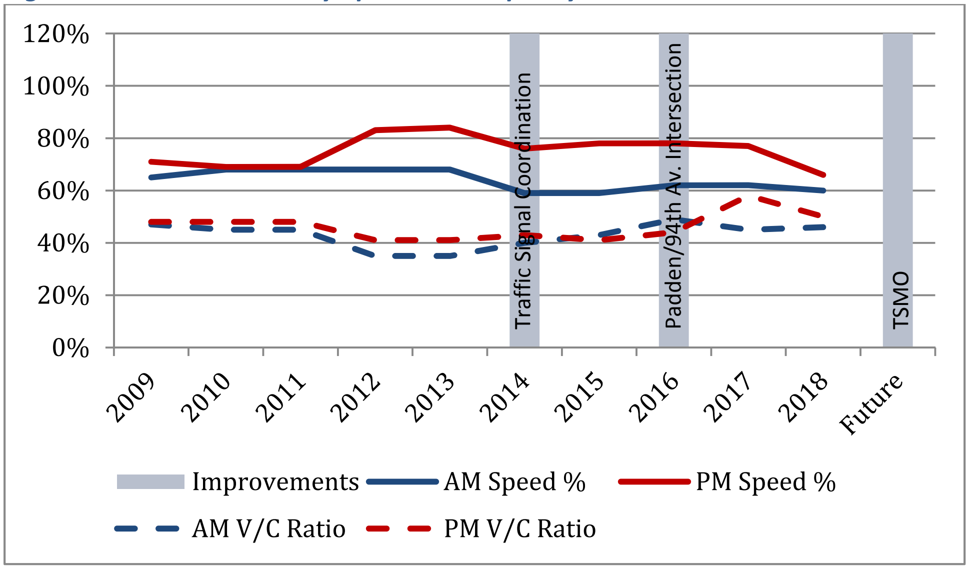
Figure 39: 78th Street Speed and Capacity



Padden Parkway, 78th Street to Ward Road

Neither speed nor capacity indicates potential corridor wide congestion. Future corridor improvements include TSMO projects.

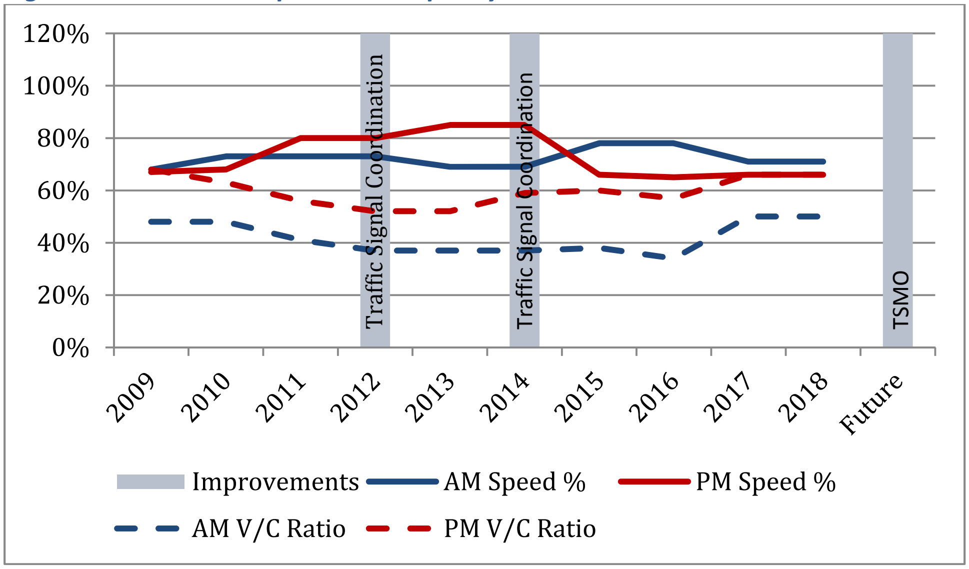
Figure 40: Padden Parkway Speed and Capacity



99th Street, Lake Shore Avenue to St. Johns Boulevard

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include TSMO projects.

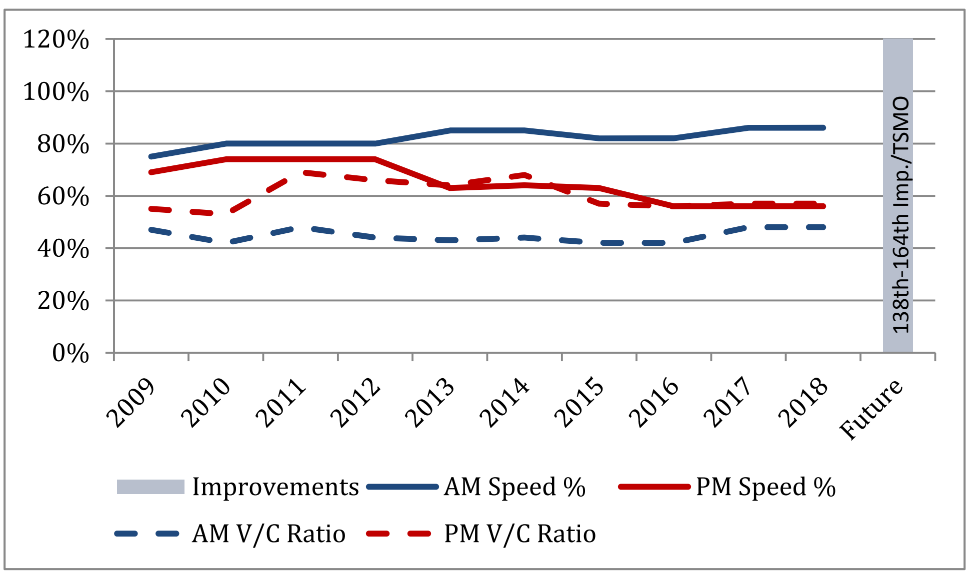
Figure 41: 99th Street Speed and Capacity



Burton Road, Andresen Road to 162nd Avenue

Evening speed indicates corridor wide congestion. Future corridor improvements include urban upgrade from 138th Av. to 164th Av. and TSMO projects.

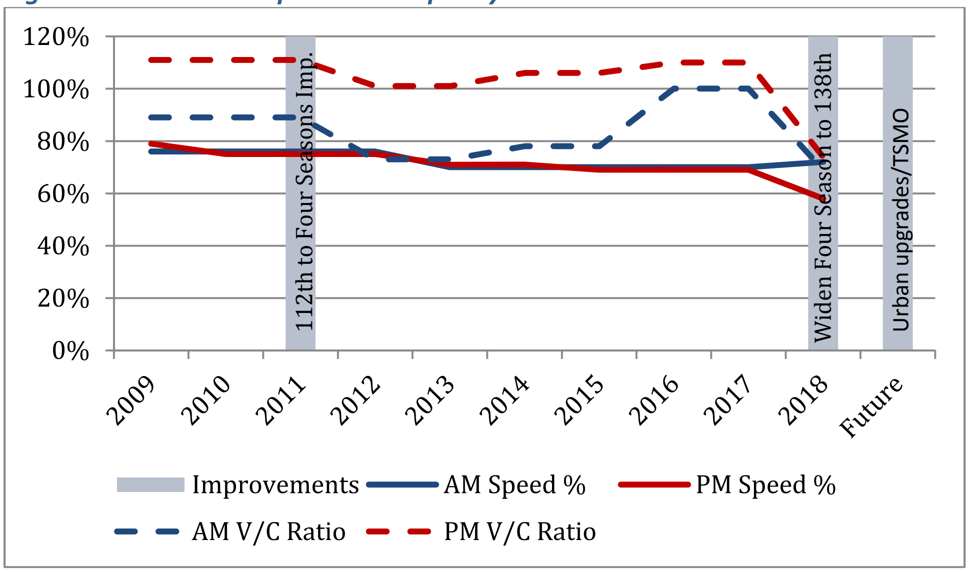
Figure 42: Burton Road Speed and Capacity



18th Street, I-205 to 162nd Avenue

Evening speed indicates corridor wide congestion. Future corridor improvements include improving 138th Avenue to 162nd Avenue, transit, and TSMO projects.

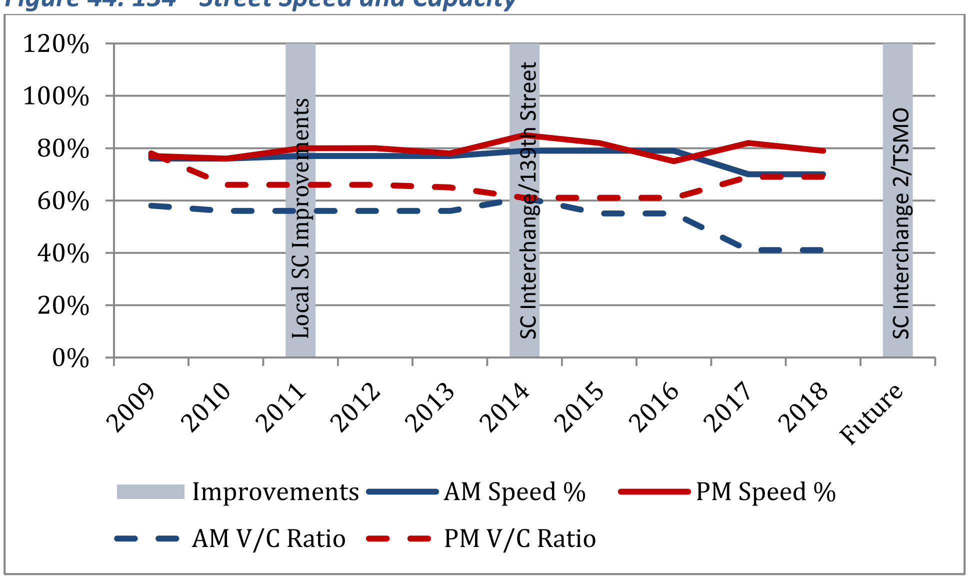
Figure 43: 18th Street Speed and Capacity



134th Street, 139th Street to 50th Avenue

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include Salmon Creek Interchange Phase 2, Salmon Creek Avenue improvements from WSU Entrance to NE 50th Avenue, and TSMO projects.

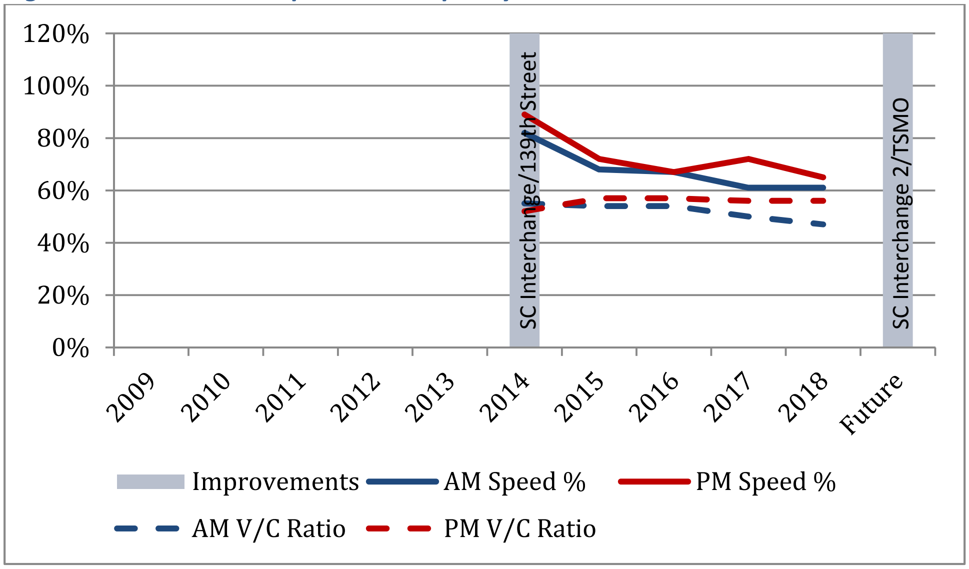
Figure 44: 134th Street Speed and Capacity



139th Street, NW 36th Avenue to NE 29th Avenue

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include Salmon Creek Interchange Phase 2 and TSMO projects.

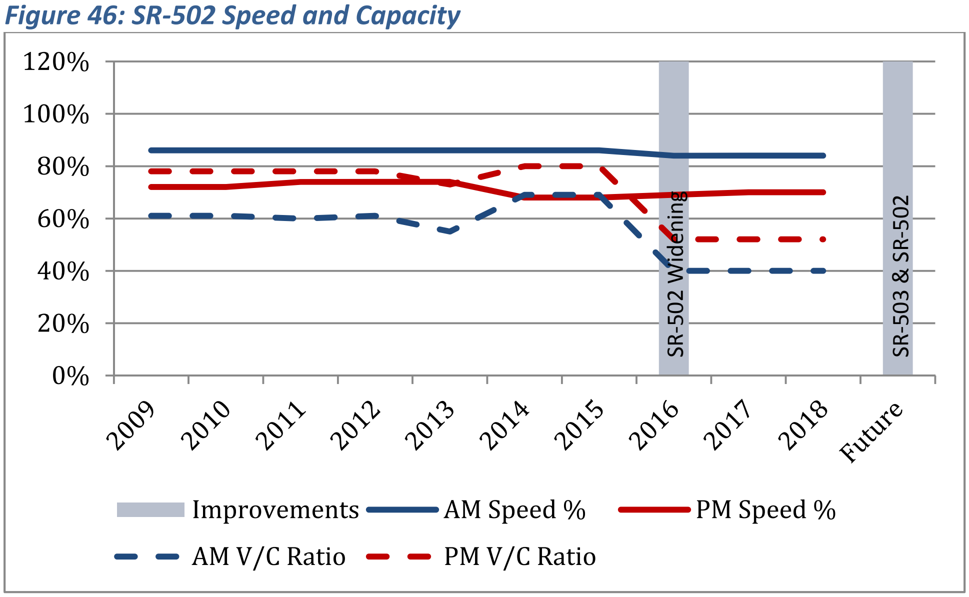
Figure 45: 139th Street Speed and Capacity



SR-502, I-5 to SR-503

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include SR-502/SR-503 Intersection improvements.

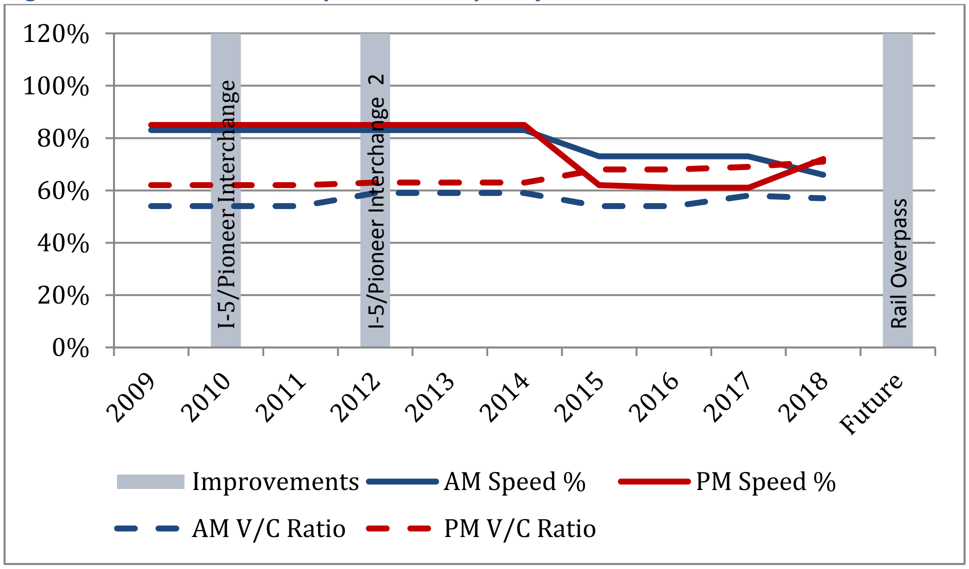
Figure 46: SR-502 Speed and Capacity



Pioneer Street (SR-501), I-5 to 9th Street

Neither speed nor capacity indicates potential corridor-wide congestion. Future corridor improvements include extension of Pioneer Street over the railroad tracks west of downtown Ridgefield.

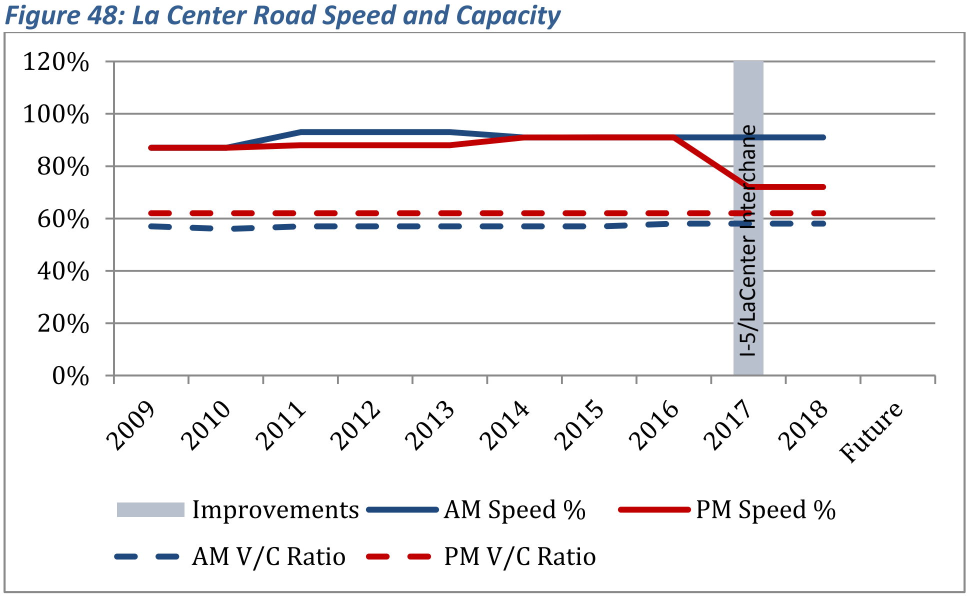
Figure 47: Pioneer Street Speed and Capacity



La Center Road, I-5 to East Fork of Lewis River

Neither speed nor capacity indicates potential corridor-wide congestion. No Future corridor improvements are planned.

Figure 48: La Center Road Speed and Capacity



Corridor Deficiencies

The corridor analysis shows that the region needs to continue to focus on operational improvements, and select capacity improvements, and address strong demand for bi-state travel. Table 9 identifies the corridors that should be the focus of capacity and speed reliability improvements:

Table 9: Corridors with Capacity and/or Speed Deficiencies

Corridor	Capacity	Speed	Need
Highway 99		X	Intersection Improvements, Transit, and TSMO
I-5 South	X	X	I-5 Bridge Replacement, Interchanges, Transit, TSMO
Main Street	X	X	I-5 Bridge Replacement, Transit, and TSMO
I-205 South	X	X	Interchange modifications, transit, and TSMO
112th Avenue		X	Urban Upgrade, intersections, and TSMO
Andresen South		X	Intersection Improvement and TSMO
SR-503 South	X	X	Intersection improvement, Access Management, and TSMO
164th Av. South		X	TSMO
SR-14 Central	X	X	Auxiliary lanes and TSMO
Fourth Plain to Port		X	TSMO
Fourth Plain West		X	Road diet and TSMO
Fourth Plain Central		X	Intersection improvement and TSMO
Fourth Plain East	X	X	Intersection improvements, transit, and TSMO
Mill Plain East		X	Transit and TSMO
SR-500 West		X	Remove signals
SR-500 Central		X	Grade Separation, auxiliary lanes, and TSMO
NE 78/76 Street		X	TSMO
Burton Road		X	Urban Upgrade and TSMO
18th Street		X	Urban upgrade, Transit and TSMO

Key Strategies

The implementation of the 20-year Regional Transportation Plan (RTP) is critical to support regional mobility and manage congestion. However, the lack of transportation revenue for the I-5 Bridge replacement along with other key highway bottlenecks, is contributing to worsening traffic conditions. The lack of progress on funding priority projects will result in delayed achievement of the Regional Transportation Plan benefits and increased future costs. The following are key projects to address congestion needs within Clark County:

Table 10: Key Congestion Needs

Identified Needs	In RTP	Funded
I-5 Interstate Bridge and Interchanges	✓	(P)
- I-5/Mill Plain Interchange (2026 Construction)		✓
- Bi-State Transit Expansion		
Freeway Operational Improvements (I-5, I-205, SR-14, SR-500)	✓	(P)
- Freeway Operational Study		✓
- Active Traffic Management I-5 Southbound (2020)		✓
- Active Traffic Management I-205		(P)
- Active Traffic Management SR-14		
I-205/SR-14 Interchange		
I-205, SR-500 to Padden Widening	✓	
I-205/Padden Parkway Interchange Reconstruction	✓	
I-205/Salmon Creek Interchange Phase II	✓	
SR-14, I-205 to 164th Av. Widening (2020 Construction)	✓	✓
Major Intersection Upgrade	✓	
- SR-500/SR-503/Fourth Plain		
- SR-503/Padden Parkway		
- Andresen Rd./Padden Parkway		
- Fourth Plain/Andresen		
Arterial Operational Improvements	✓	
- Highway 99, 78th St. to 139th St.		
- Main Street, I-5 to Mill Plain		
- 112th Avenue, 28th St. to SR-500		
- Andresen, Mill Plain to SR-500		
- 164th Avenue, SR-14 to Mill Plain		
- Mill Plain, 136th Av. to 192nd Av.		
- Fourth Plain, Port to SR-503		
- SR-503, Fourth Plain to 99th		
- 78th/76th Street, Lakeshore to SR-503		
- Burton Road, Andresen to 162nd Av.		
- 18th Street, I-205 to 162nd Av.		
County-Wide Transit Expansion	✓	(P)
- Mill Plain BRT		(P)
- Local Routes		
- I-5/Highway 99 BRT		
- I-205 Bi-State Transit		

Chapter 4: Bi-State

Clark County is situated in Southwest Washington State, across the Columbia River from Portland, Oregon. As a suburb of the Portland metropolitan area, significant population growth has occurred within Clark County, while substantial growth in employment has occurred throughout the Portland metropolitan area. This results in a large number of commuters traveling between Clark County and Portland. Approximately 31% of Clark County's workforce travels to the Portland metropolitan area for employment.

It is important to note that from 2008 through 2009 the economy was experiencing a significant recession, and traffic volumes did not fully recover until approximately 2013.

Bi-State Corridors

The demand between Clark County and Portland has placed significant pressure on the only two Columbia River Bridges (I-5 and I-205) between Clark County, Washington and Portland, Oregon.

The I-5 Interstate Bridge is a steel truss lift bridge that spans the Columbia River between downtown Vancouver and Portland. The northbound span was opened in 1917, and the southbound span was added in 1958, each span carries three lanes. This bridge and associated interchanges are a bottleneck to both auto and river traffic. Bridge lifts occur approximately 15 times per month in off peak periods, with each lift lasting approximately 10 minutes and often results in over an hour of traffic congestion. Due to peak period congestion, bridge lifts, and other incidents the Interstate Bridge experiences auto congestion for approximately seven hours a day.

The Glenn L. Jackson Memorial Bridge, or I-205 Bridge, is a segmental concrete bridge that spans the Columbia River between eastern Vancouver and eastern Portland. It is a twin structure with four lanes in each direction and a 9-ft wide bicycle and pedestrian path in between. The I-205 Bridge opened for traffic in December 1982. Due to peak period congestion and incidents the Glenn Jackson Bridge experiences auto congestion for approximately three hours a day.

The congestion associated with the two bi-state Columbia River Bridges, has resulted in significant congestion in three highway corridors, on the Washington State side of the Columbia River, during the morning commute:

- **I-5 South**: Main Street to Jantzen Beach
- **I-205 South**: SR-500 to Airport Way
- **SR-14 Central**: 192nd Avenue to I-205

Bi-State Traffic Volumes

The demand for bi-state travel has increased each year over the last five years. In 2018, over 300,000 vehicles crossed the two bi-state bridges on an average day, up from 278,000 vehicles in year 2013. This is an 8.9% increase in traffic over the last five years.

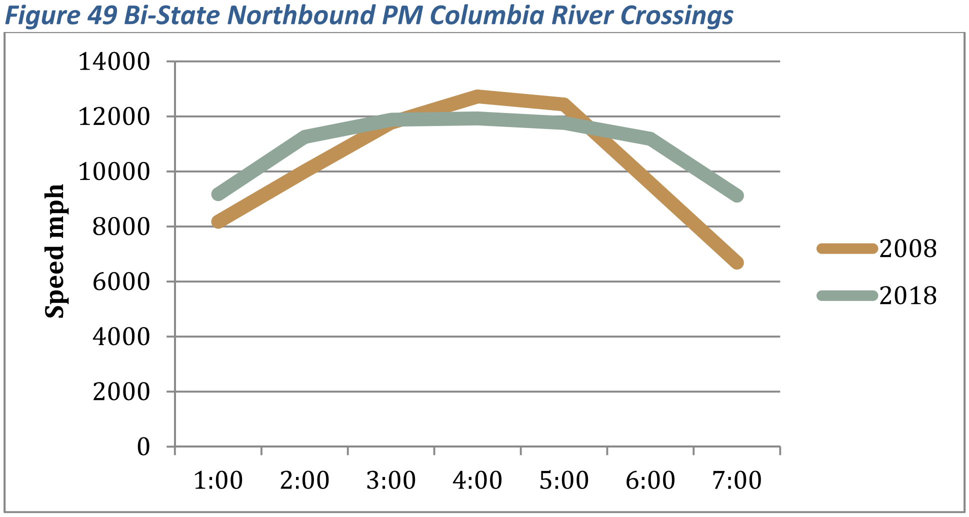
Table 11: 2013-2018 Columbia River Crossings

Year	I-5	I-205	Total	Growth
2013	130,511	148,152	278,663	**1.7%**
2014	132,592	151,735	284,327	**2.2%**
2015	135,696	158,409	294,105	**3.3%**
2016	135,496	162,031	297,527	**1.2%**
2017	135,000	162,932	297,932	**0.1%**
2018	138,374*	165,097	303,471	**1.8%**

**Due to Oregon I-5 Paving project, volumes were estimated in 2018.*

Without additional operational improvements, both Columbia River bridges are at capacity in the peak periods and peak spreading is occurring. Peak spreading leads to a flattening and longer peak period as trips shift to times immediately before and after the peak demand. This causes the peak hour to become a peak period. The following graphic displays peak spreading across the two interstate bridges, by comparing year 2007 to year 2017 volumes.

Figure 49 Bi-State Northbound PM Columbia River Crossings

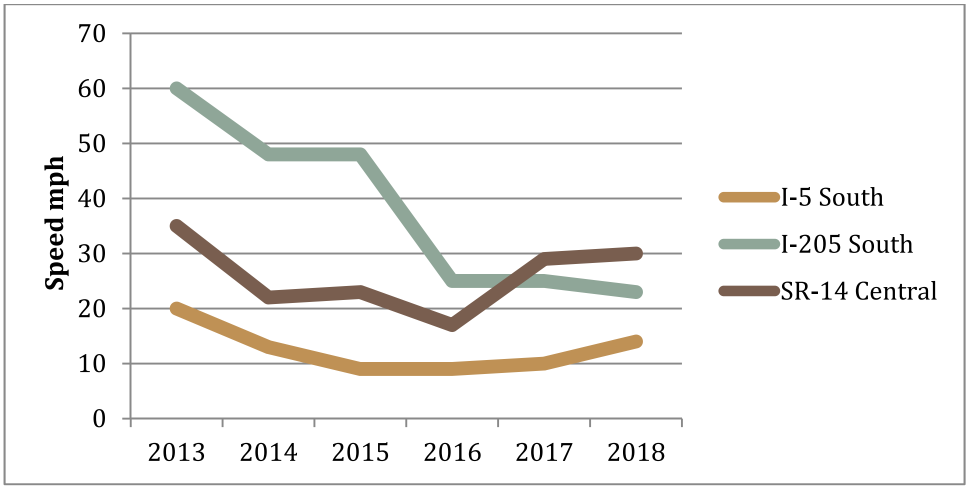


Bi-State Travel Speed

Using global positioning system (GPS) travel speeds are collected annually during peak periods along the congestion management corridors.

Bi-State corridor data shows that the morning speeds had a significant decrease from years 2013 to 2016, as traffic increased with economic recovery. Between years 2016 to 2018, both the I-5 southbound and SR-14 central corridors had improved speeds. Part of this improved speed may be attributed to more active traffic management in both corridors utilizing electronic signage and adjustments to the I-5/SR-14 ramp meter. Additional ramp metering and other active traffic management tools are programmed for implementation in the southbound I-5 corridor by 2020. Additional active traffic management tools are likely to be implemented in other freeway corridors in coming years.

Figure 50: Morning Bi-State Travel Speeds (2013 to 2018)



A review of ODOT and WSDOT data stations along both the I-5 and I-205 bi-state corridors between Vancouver and Portland shows traffic speeds throughout each corridor. This data is a good indicator of average annual speeds within each corridor segment, but may not reflect localized hot spots. Using October 2018 data, average corridor speeds were estimated by time of day.

Figure 49 shows significant degradation of speeds on I-5 between 6-9 a.m. on the Washington side of the Columbia River, while Oregon experienced a similar degradation of speed between 7-9 a.m. Overall the data shows approximately 4 hours of congestion in the I-5 corridor during the morning commute.

Figure 50 shows a significant decrease of speeds in both Washington and Oregon between 6-8 a.m. Speed took a sharper decline on the Washington side of the Columbia River in the 7 a.m. hour. Overall the data shows approximately 2.5 hours of congestion in the I-205 corridor during the morning commute.

Figure 51: I-5 Morning Southbound Average Speed

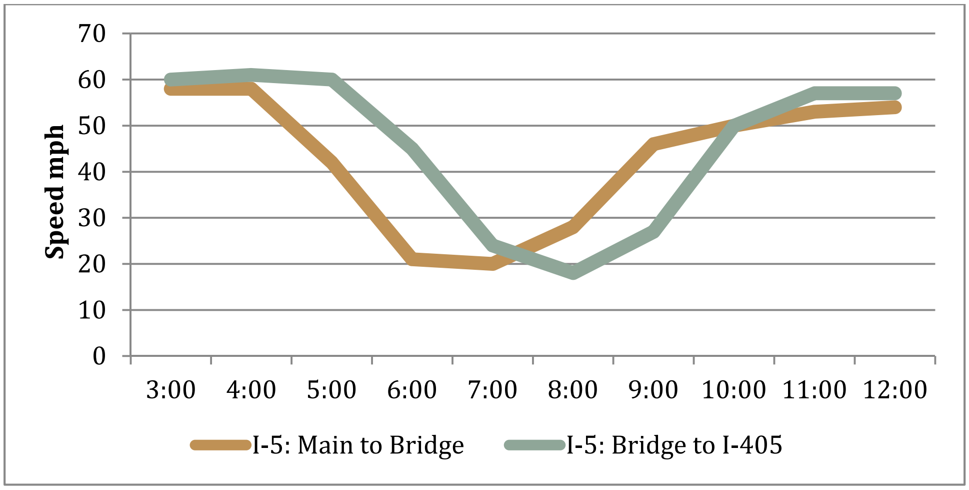


Figure 52: I-205 Morning Southbound Average Speed

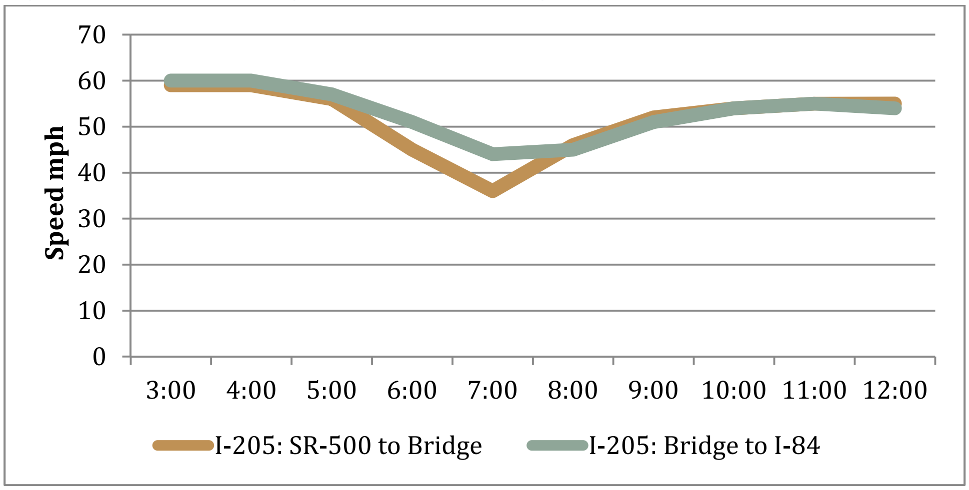
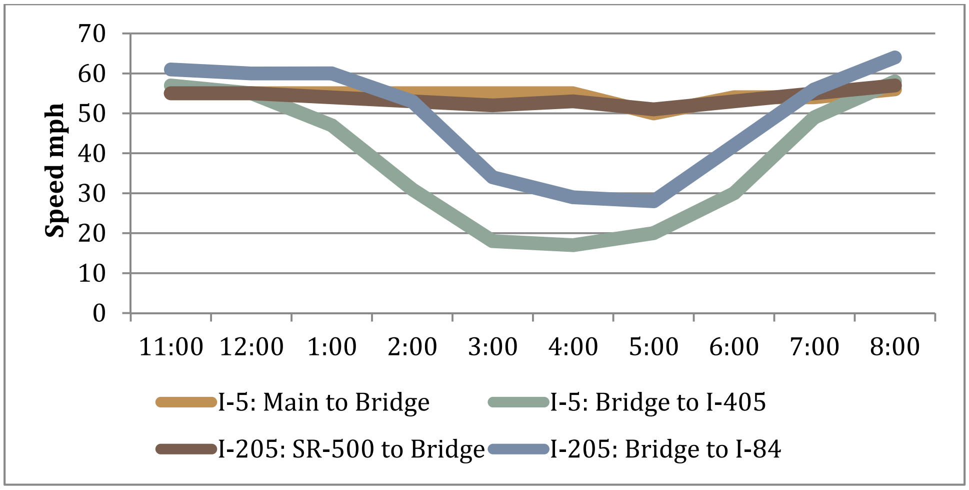


Figure 51: The evening peak has significant decline of speed occurring on the Oregon side of the Columbia River in both the I-5 and I-205 corridors. While the Washington side of the Columbia River only shows a minimal decrease in speed during the 5 p.m. hour. I-5 on the Oregon side of the Columbia River shows approximately 7 hours of congestion. I-205 on the Oregon side of the Columbia River shows approximately 4 hours of congestion.

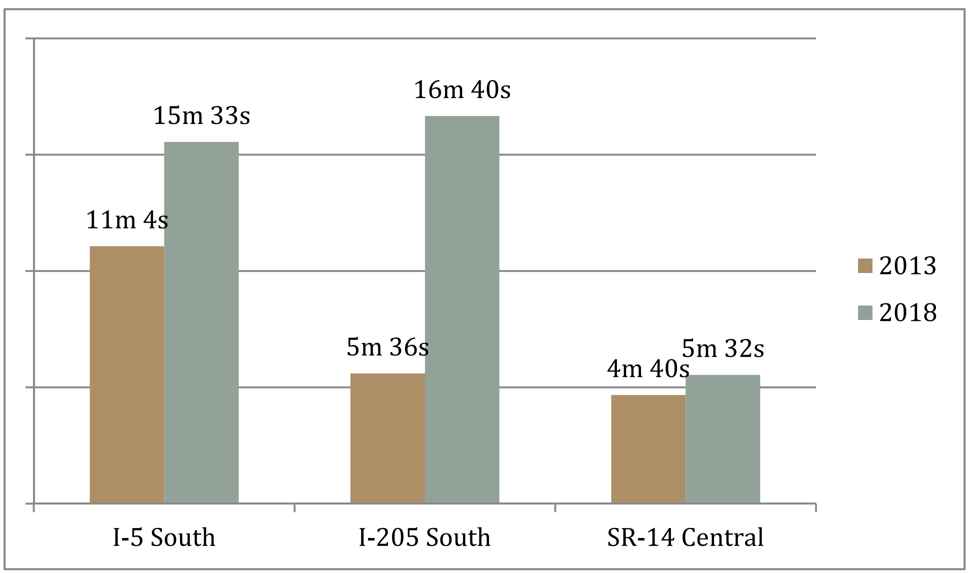
Figure 53: I-5 and I-205 Evening Northbound Average Speeds



Bi-State Travel Delay

Despite recent improved speeds, the average delay has increased in each of these bi-state corridors over the last 5 years. Between years 2013 and 2018 the morning delay has increased by 4.5 minutes in the I-5 South Corridor, and over 11 minutes in I-205 South corridor, and almost 1 minute in the SR-14 Central corridor.

Figure 54: Bi-State Morning Delay Growth (2011 to 2016)



Significant delay also occurs in both the I-5 and I-205 corridors heading from Oregon into Washington during the evening commute, with the majority of the delay occurring in Oregon.

I-205 & SR-14 Corridors - Washington

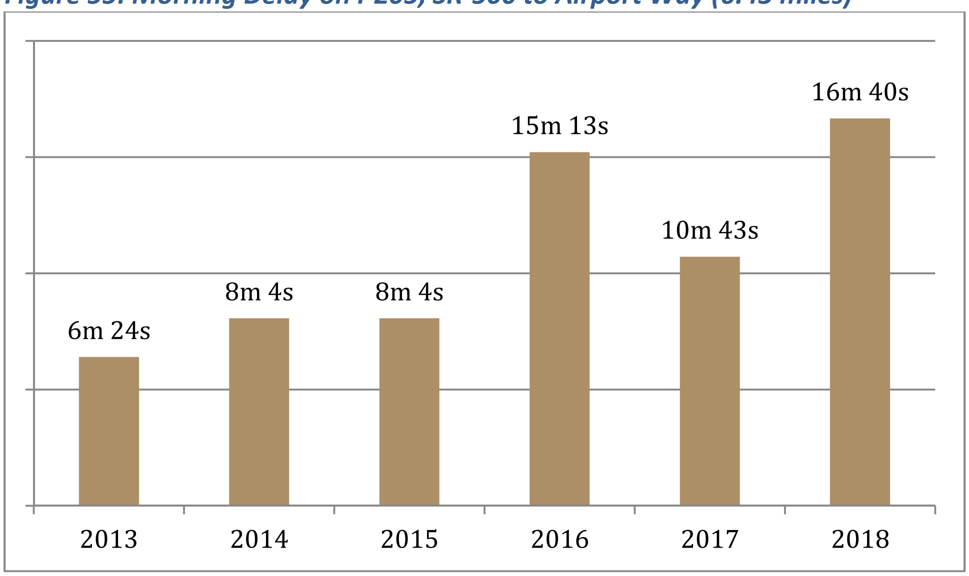
Interstate 205 is a 26.6 mile-long north-south loop highway which travels on the east side of the Portland and Vancouver region. The northern terminus is located in Salmon Creek and the southern terminus is in Tualatin. The I-205 corridor provides one of two bi-state routes between Portland and Vancouver, with a bridge over the Columbia River known as the Glenn Jackson Bridge. The Glenn Jackson Bridge was the last completed segment of the highway and opened in December 1982. Currently, the I-205 Glenn Jackson Bridge carries over 165,000 vehicles a day and has the highest volumes of any facility in Clark County.

State Route 14 is a 180.66-mile-long east-west state highway that runs along the north side of the Columbia River, opposite Interstate 84 to the south in Oregon. In Clark County SR-14 provides a connector between the cities of Camas/Washougal and Vancouver. The SR-14 segment from 192nd to I-205 is congested during peak hours and carries over 80,000 vehicles a day.

Travel time data is collected annually, by using global positioning system (GPS) units and by driving the corridor multiple times during the morning commute (6:30-8:30 AM) over several days.

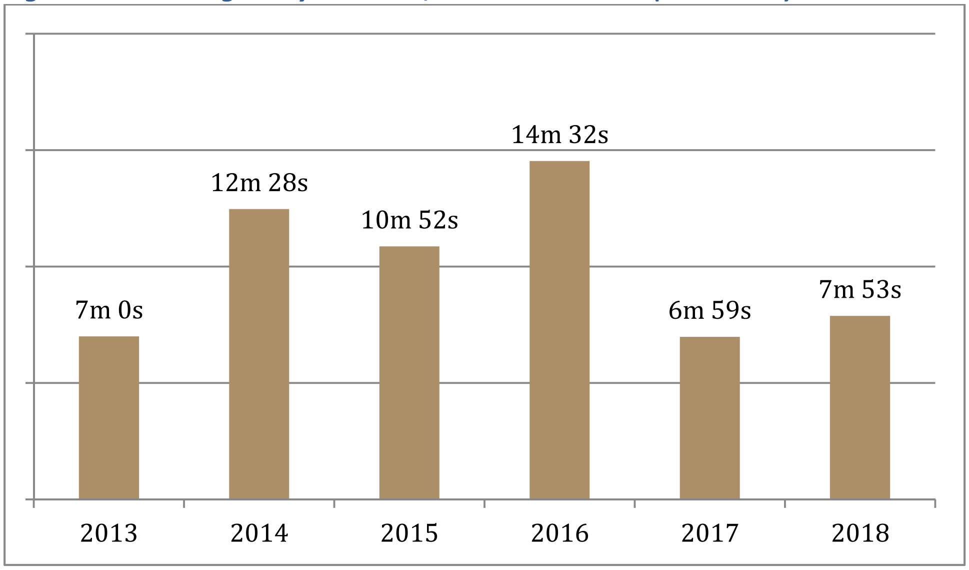
In the I-205 corridor, between 2013 and 2018 the probe vehicle data showed an increase in morning travel time between SR-500 and Airport way exits. This busy corridor appears to have reached saturation levels in 2016.

Figure 55: Morning Delay on I-205, SR-500 to Airport Way (6.43 miles)



In the SR-14 corridor, between 2013 and 2018 the probe vehicle data showed an increase in morning travel time between 192nd Avenue and I-205 exits, until year 2017. Over the last two years, active traffic management and bus on shoulder has resulted in better operating speeds.

Figure 56: Morning Delay on SR-14, 192nd AV to I-205 (4.16 miles)



C-TRAN has commuter service from the Fisher's Landing Transit Center (SR-14 at 164th Avenue) to downtown Portland (Route 164). C-TRAN began operating a SR-14 bus on shoulder project in October 2017. It lets commuter buses bypass congestion on SR-14 between I-205 and 164th by using the freeway shoulder anytime mainline traffic is below 35 mph. Buses can travel 15 mph faster than adjacent traffic with a maximum speed of 35 mph. Bus on Shoulder can improve both safety and reliability for transit without affecting freeway operations. The 2017 data was collected prior to implementation of bus on shoulder project. In 2018, the corridor experienced significant congestion on the Oregon side of the Columbia River, leading to a spike in travel time.

Figure 57: Morning Transit Delay-Fisher's Landing to Portland