Congestion Management Process

2013 Monitoring Report

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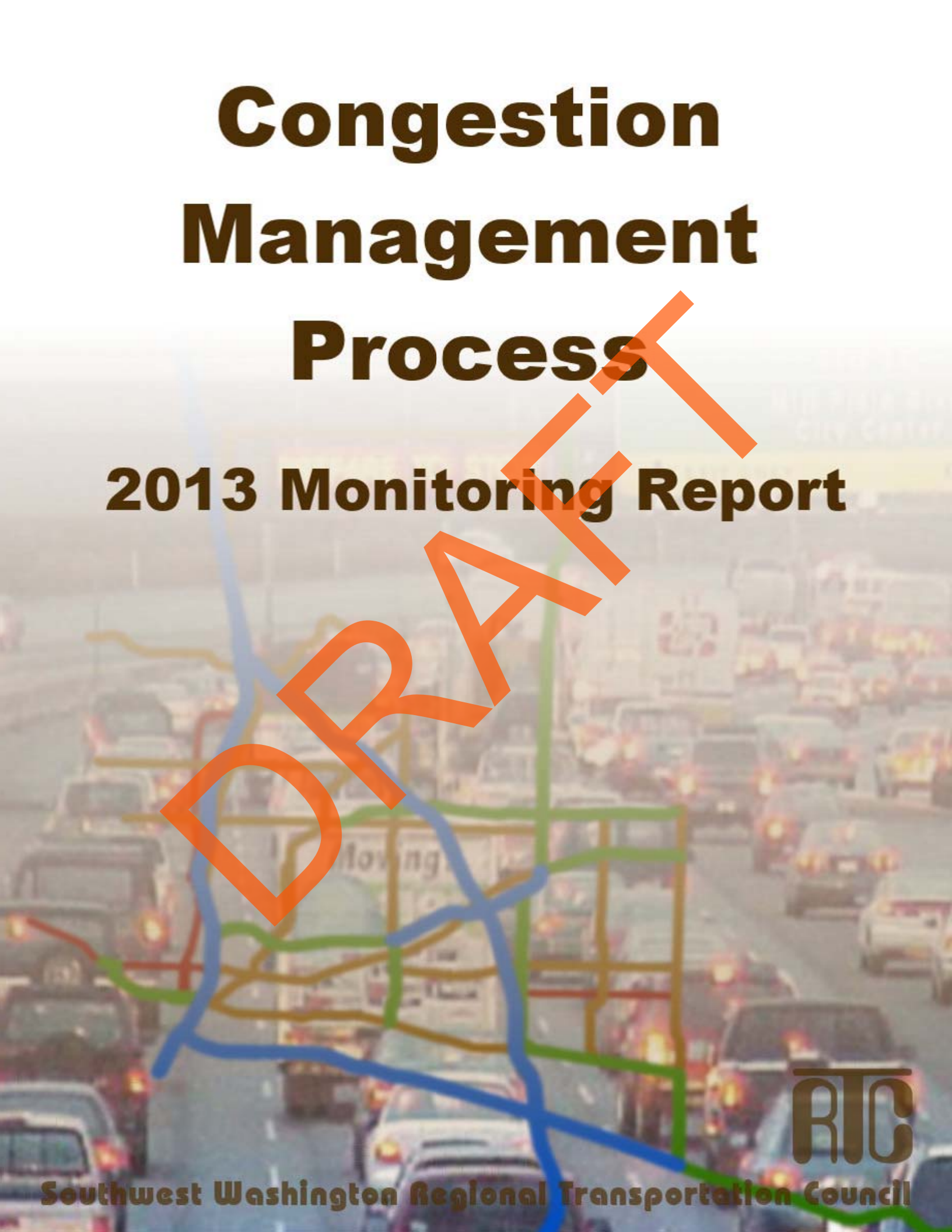

RTC

Southwest Washington Regional Transportation Council

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Congestion Management Process
2013 Monitoring Report

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Klickitat County
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Clark County, Washington

Published: June 2014

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Preparation of this Report was funded by Surface Transportation Program (STP) funds and local funds from RTC member jurisdictions.

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Chapter 1: Introduction

Traffic congestion can be defined as a condition where the volume of users on a transportation facility exceeds or approaches the capacity of that facility. Congestion can be characterized by heavy volumes, increased travel time, delay, travel time uncertainty, reduced travel speed, increase of traffic crashes, or other characteristics. 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 the operation and management of the existing and future transportation system.

The *Congestion Management Process: Monitoring Report* offers information to Southwest Washington Regional Transportation Council[1] (RTC) for consideration in implementing a Congestion Management Process (CMP). The CMP was formerly known as a Congestion Management System and was intended by Federal law to be a systematic, transparent way for transportation planning agencies to identify and manage congestion, using performance measures to direct funding towards strategies that most effectively address congestion. The CMP is intended to augment the previous effort and be integrated in the overall regional transportation planning process.

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.

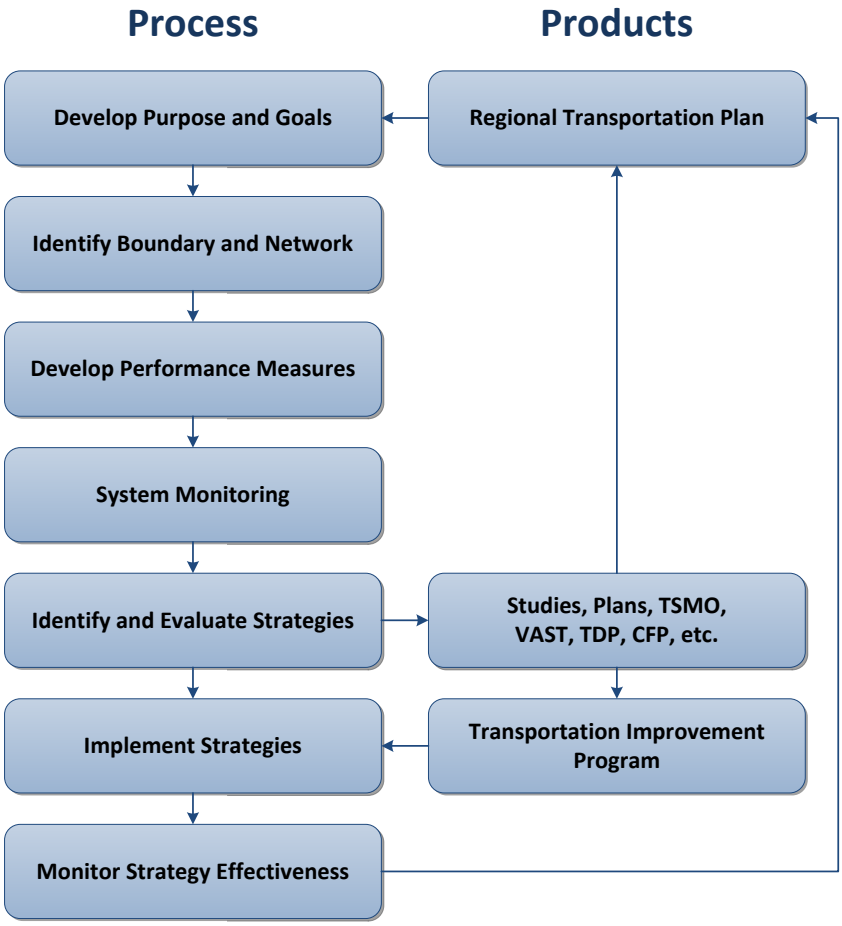
Overall Process

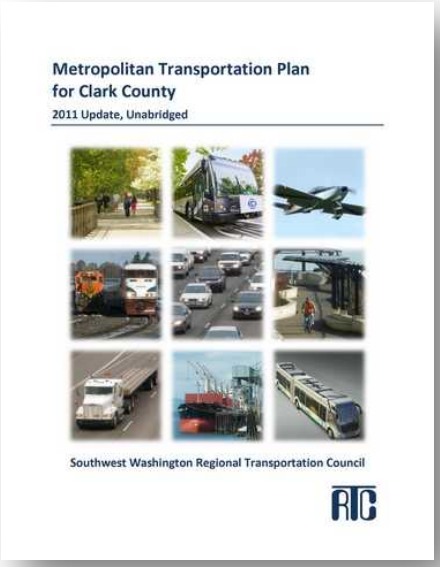
The overall Congestion Management Process used by Southwest Washington Regional Transportation Council incorporates the following steps:

- 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

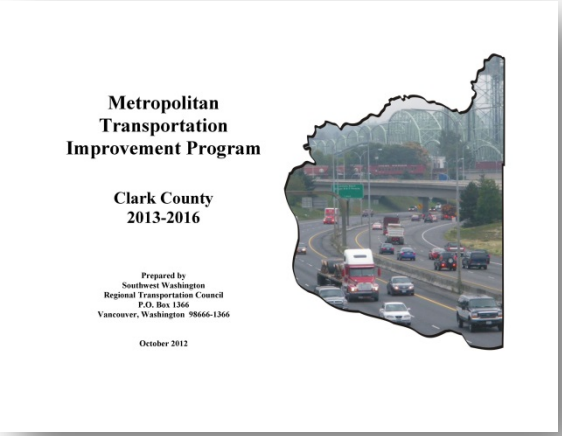




The process begins with the development of purpose, goals, and objectives that will be used to guide the overall Congestion Management Process. These purpose, goals, and objectives support those contained in the Regional Transportation Plan[3]. The boundary and network are identified to focus efforts 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.

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

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.

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

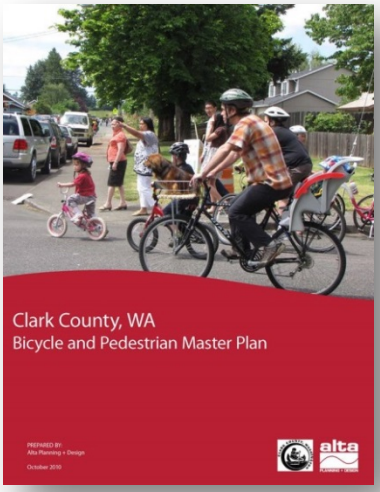
Land use and transportation are interrelated, in that land use and travel interact with each other. The type of development, the density, and its location in the urban landscape influence travel patterns. On the other hand the level of access to and from the transportation facility to the adjacent land 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 2010 population and employment for Clark County along with the 2035 forecast that has been adopted for use in the long-range Regional Transportation Plan.

Table 1: Population and Employment

	2010	2035
Population	425,363	641,800
Employment	126,500	256,200



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 the CMP network.

[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.

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 15) illustrates fixed bus routes within Clark County and their frequency of service. 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 47% of the households and 68% of employment within Clark County is within ¼ mile of PM peak period fixed route service.

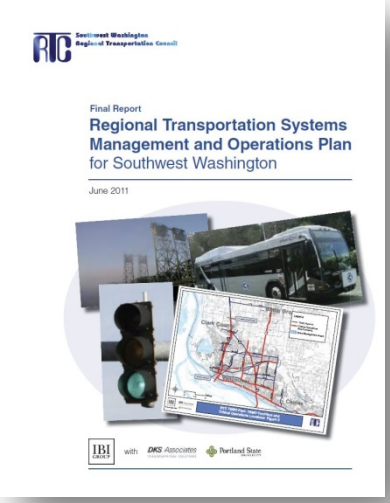
C-TRAN also provides paratransit service for those unable to ride C-TRAN's fixed bus service, through their C-VAN service.

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)

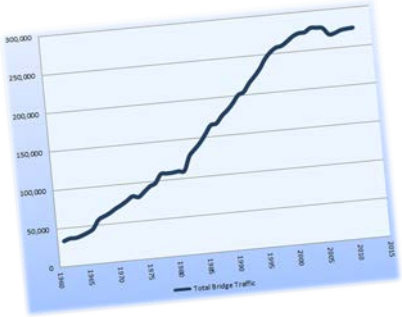
Transportation Demand Management (TDM) programs focus on reducing travel demand, particularly at peak commute hours. TDM strategies can make more efficient use of the current roadway system and can reduce vehicle trips. It is important for the region to support Transportation Demand Management strategies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

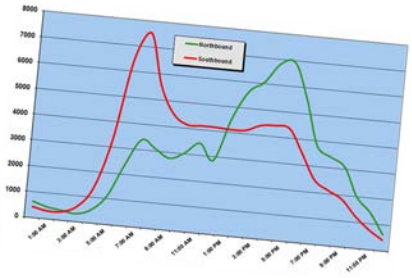
transportation improvements that aim to optimize the existing transportation network. Examples include low-cost technology-based strategies and physical improvements that improve operation of the transportation system. It is important for the region to support Transportation Systems Management and Operations 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

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.

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

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

- High Accident Locations

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

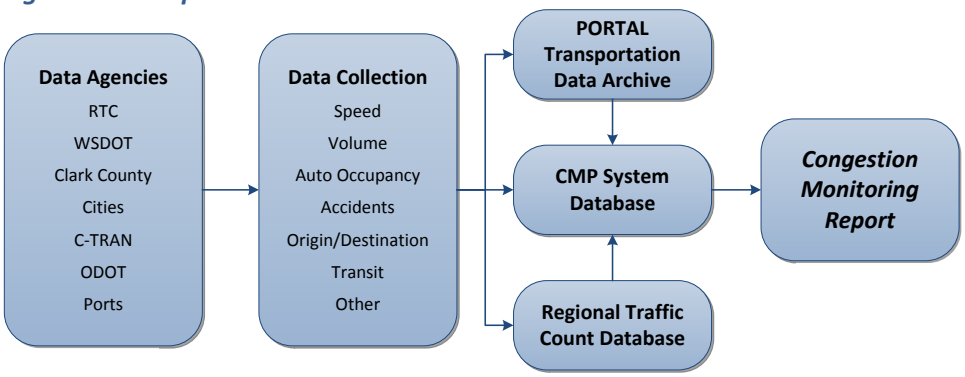
Preservation

- 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 use the automated PORTAL data collection process.

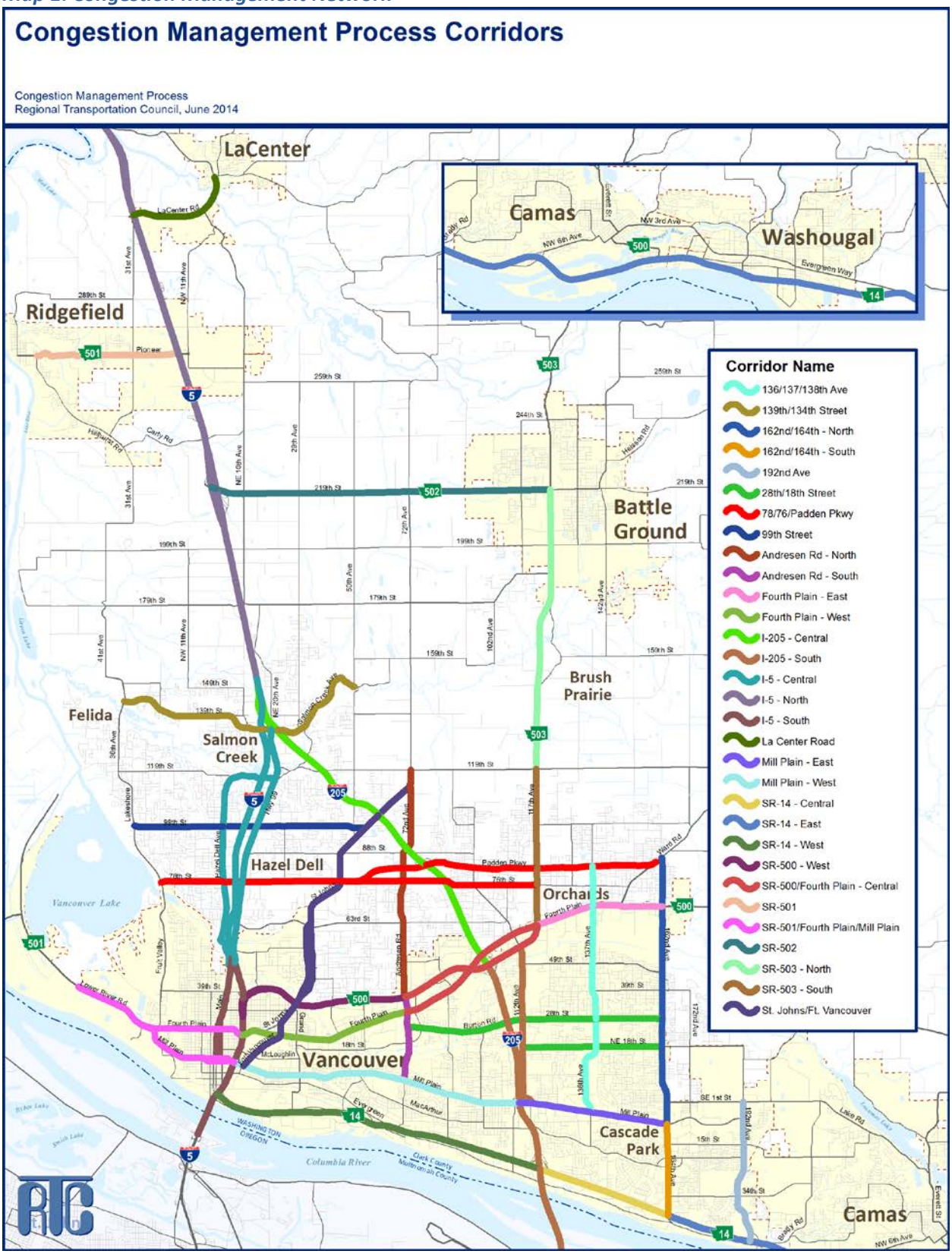
Data Analysis and System Performance

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.

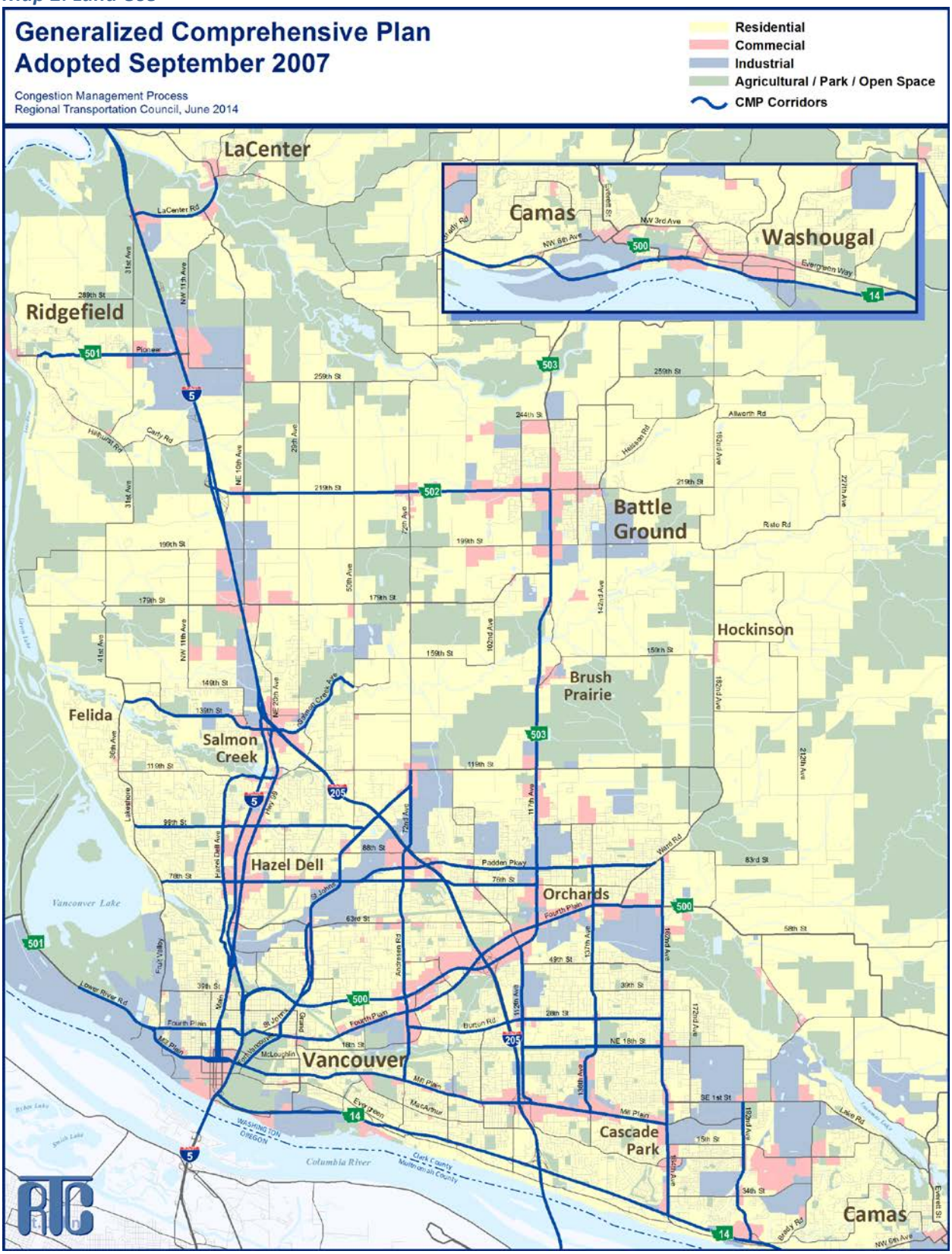
Table 2: Corridors in the Congestion Management Network

Corridor Name	Facilities	Endpoints	
I-5 North	I-5	County Line	I-205 Interchange
I-5 Central	I-5, Highway 99, Hazel Dell Avenue	I-205 Interchange	Main Street
I-5 South	I-5, Main Street	Main Street Interchange	Jantzen Beach
I-205 Central	I-205	I-5 Interchange	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	164th 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
134th 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

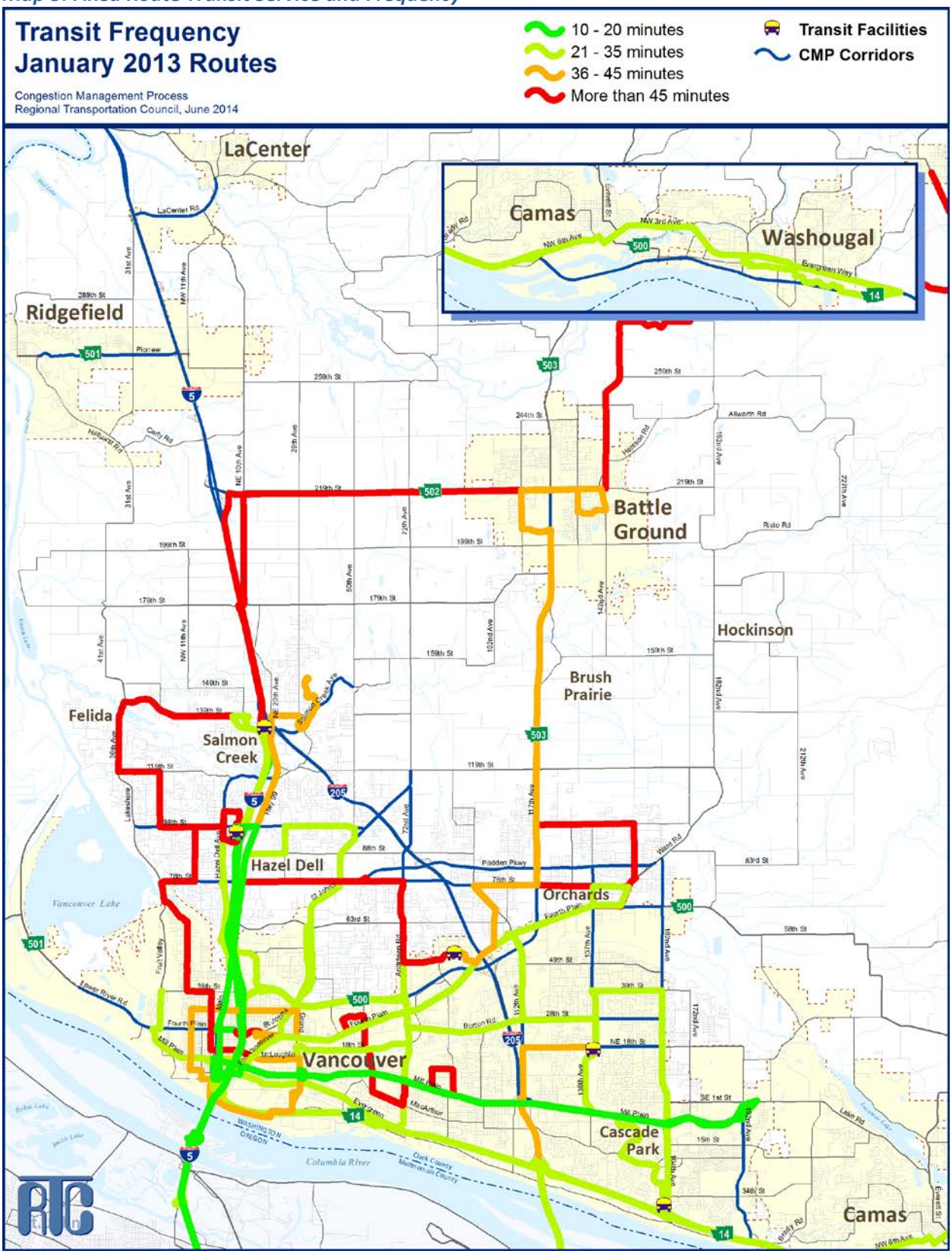
Map 1: Congestion Management Network



Map 2: Land Use



Map 3: Fixed Route Transit Service and Frequency



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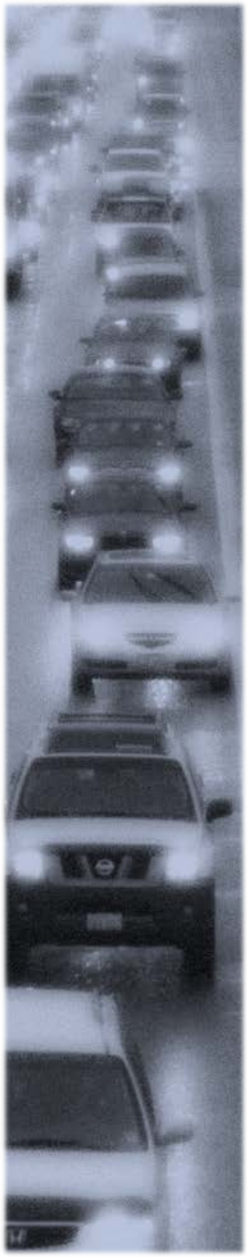
Chapter 2: System Monitoring



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 AM and PM 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.

Map 4: During the PM peak, I-5 and I-205 and portions of SR-14 and SR-500 display volumes greater than 3,000 vehicles per hour. Within the region, facilities carrying

[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.

more than 1,500 vehicles in the PM peak hour include segments of SR-14, SR-500, SR-503, Mill Plain, Fourth Plain, Andresen Road, 164th Avenue, 192nd Avenue, Padden Parkway, and 134th Street.

The corridors with the highest peak hour volume difference (at least 500 additional vehicles) between the AM and PM peak include: portions of I-5, Mill Plain Boulevard, Fourth Plain Boulevard and Main Street. Main Street is an AM higher peak where the Main Street corridor is used as an alternative to the congested I-5 corridor.

Volumes: Highest Volume Intersections

Table 3 displays the highest volume intersections in 2013 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	Mill Plain	Chkalov Drive	74,000
2	Fourth Plain	SR-500	72,000
3	SR-500	54th Avenue	62,000
4	Mill Plain	136th Avenue	62,000
5	SR-500	42nd Avenue	58,000
6	Padden Parkway	SR-503	57,000
7	78th Street	Highway 99	54,000
8	Fourth Plain	Andresen Road	53,000
9	Padden Parkway	Andresen Road	53,000
10	Mill Plain	120th Avenue	51,000
11	Mill Plain	164th Avenue	51,000
12	134th Street	20th Avenue / Hwy 99	50,000
13	Mill Plain	123rd / 124th Avenue	48,000
14	SR-502	SR-503	47,000

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

Volumes: Columbia River Bridge Volumes

A good indicator of change to bi-state travel is the amount of vehicle travel across the Columbia River bridges (I-5 and I-205). Table 4 shows the historical growth in Columbia River bridge crossings since 1980.

The Interstate Bridge 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 in late-1982, total Columbia River crossings had increased to 144,000 vehicles a day by 1985. In 2013, daily Columbia River crossings peaked at 278,663.

The Interstate Bridge reached capacity during peak hours in the early 1990s. Glenn Jackson Bridge traffic volumes began to exceed the Interstate Bridge traffic volumes on a daily basis in 1999. Since 1961, average total bridge crossings have only decreased in two periods (1974 and 2006-2008).

Table 4: Average Weekday Traffic across the Columbia River

Year	I-5	I-205	Total
1980	108,600	N/A	108,600
1985	91,400	52,600	144,000
1990	95,400	87,100	182,500
1995	116,600	106,100	222,700
2000	126,900	132,100	259,000
2005	132,600	145,900	278,500
2010	126,700	145,500	272,200
2013	130,511	148,152	278,663

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.

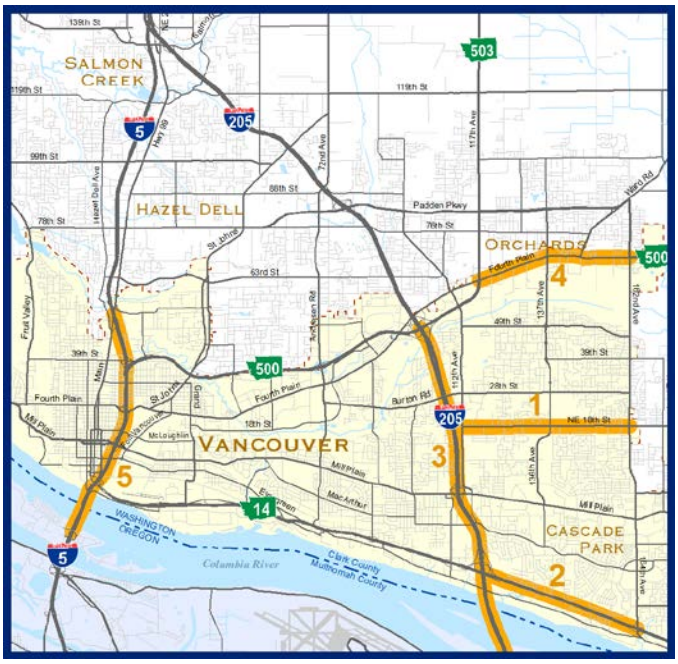
The corridor capacity ratio is a good indicator of congestion, except where a bottleneck causes the demand to exceed capacity. At the bottleneck traffic will slow down and a backup will occur. The result is that fewer vehicles are able to get through the bottleneck, while the corridor capacity ratio appears to improve. This

scenario occurs on the I-5 Columbia River Bridge most weekday mornings, where the demand significantly exceeds the capacity.

The five highest volume-to-capacity ratio corridors include:

18th Street: 112th to 162nd Avenue (PM) – 1.01
SR-14: I-205 to 164th Avenue (PM) – 1.00
I-205: Airport Way to SR-500 (AM) – 0.93
Fourth Plain: SR-503 to 162nd Avenue (PM) – 0.92
I-5: Jantzen Beach to Main Street (PM) – 0.89

Figure 3: Highest Volume to Capacity Ratio Corridors



Map 5: Both the AM and PM periods show congestion along major facilities such as I-5 South, I-205, SR-14 Central, and SR-500 West. Much of the AM period congestion can be attributed to the demand for crossing the two Interstate bridges into Oregon. Generally, the PM period displays higher corridor congestion than that experienced in the AM period.

Map 6: In the PM period, additional congestion is shown along SR-503 South, Fourth Plain East, and 18th Street.

Map 7: In addition to existing corridor capacity ratio, the 2035 PM corridor capacity ratio was calculated using the regional travel forecasting model (2011 RTP forecast model version). The model shows where future corridor congestion will occur even with planned transportation improvements. Generally, the 2035 RTP shows a worsening of congestion. With PM congestion in the I-5, I-205, SR-502, SR-503, Main Street/Highway 99, Andresen, 162nd/164th Avenue, Mill Plain, Fourth Plain East, 18th Street, Burton Road, 134th Street, and La Center Road Corridors. The 2035 model shows that planned transportation improvements positively impact future corridor capacity.

Slow corridor travel time is an indicator or congestion.

Speed: Auto Travel Speed

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.

Travel time along arterials is directly connected to delay at signalized intersections. Better progression and coordination between signals will improve overall travel time, speed, and safety. Grade-separated facilities generally show speed near the posted speed limit. Slow corridor travel time is an indicator of delay and congestion. Usually, the PM period displays lower corridor speed than that experienced in the AM period.

The five lowest speed corridors include:

Main Street, I-5 to Mill Plain (AM) – 15 mph
Andresen, Mill Plain to SR-500 (PM) – 18 mph
Mill Plain, I-205 to 164th Avenue (PM) – 19 mph
Fourth Plain: Andresen Road to SR-503 (PM) – 19 mph
I-5: Main Street to Jantzen Beach (AM) – 19 mph

Figure 4: Lowest Speed Corridors

Map 8 & 9: Corridor travel speed continues to be a problem. As development occurs, corridor travel speed continues to decline. One concern is regional facilities that have a travel speed below 25 mph, which may encourage trips to divert to alternate routes. During the AM period, I-5 South, Main Street, Hazel Dell Avenue, Andresen South, SR-503 South, 136th/137th/138th Avenues, and 18th Street display average speeds below 25 mph.

Travel time along arterials is directly connected to delay at signalized intersections.

In the PM period, corridors with travel speed below 25 mph include Main Street, Highway 99, Andresen, 112th Avenue, 136th/137th/138th Avenues, 164th Avenue, Mill Plain, Fourth Plain, 78th/76th Street, 18th Street, 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 on arterials.

The speed percentages for the freeway facilities are generally close to 100% of the posted speed limit. While facilities with multiple signalized intersections and driveways are generally between 65% and 80% of the posted speed limit. The five lowest speed percentage or worst performing corridors compared to posted speed limit include:

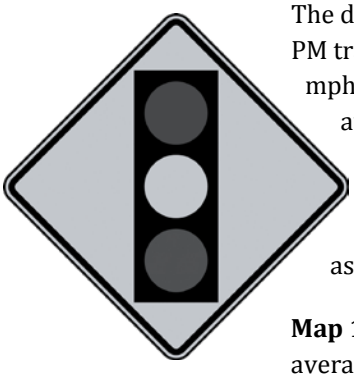
1. I-5, Main St. to Jantzen Beach (AM) – 35%
2. Main St., Ross St. to Mill Plain (AM) – 48%
3. Fourth Plain, SR-503 to 162nd Avenue (PM) – 49%
4. Mill Plain, I-205 to 164th Avenue (PM) – 50%
5. Andresen Rd., Mill Plain to SR-500 (PM) – 53%

Figure 5: Lowest Speed Percentage Corridors

Map 10: In the AM period, I-5 South, Main Street, SR-503 South, SR-14 Central, Andresen Road South, and 136th/137th/138th Avenues operate at less than 65% of the posted speed.

Map 11: In the PM period, Highway 99, 112th Avenue, Andresen, 136th/137th/138th Avenue, 164th Avenue, 192nd Avenue, Fourth Plain, Mill Plain East, SR-500 West, 78th/76th Street, and Burton Road all operate at less than 65% of the posted speed.

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 is 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.

Map 12: 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 46 intersections that demonstrated this characteristic. Of these intersections, 23 had an average delay between 60-89 seconds and 3 had 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. Fourth Plain & SR-500/SR-503, PM northbound – 129 seconds
2. Fourth Plain & Andresen, PM northbound – 128 seconds
3. Padden Parkway & Andresen, PM northbound – 98 seconds
4. Mill Plain & Ft. Vancouver, PM southbound – 83 seconds
5. Fourth Plain & NE 162nd Avenue, PM eastbound – 81 seconds

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, SR-500, and eastbound SR-14 off-ramp to 164th Avenue. In the AM peak, backups can occur on SR-500 and SR-14 ramps to I-5 South, and Padden Parkway, SR-500, 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

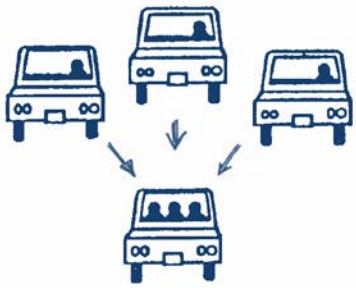
** Freeway includes I-5, I-205, SR-14, and SR-500*

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 2013, C-TRAN had thirty-three vanpools in service.



Safety: Safety

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 completed a *2014 Safety Management Assessment for Clark County*[10]. The 2014 Safety Management Assessment for Clark County includes a number of recommendations to help the region meet safety goals.

Collision rates can be an effective tool to measure the relative safety at a particular intersection. Collision rate is the average number of collisions per year divided by the annual number of million vehicles entering an intersection.

Map 13: Illustrates high collision intersection with above and below average collision rates, for intersections that had 20 or more collisions between years 2009 and 2011.

[10] *http://rtc.wa.gov/reports/safety/SafetyMgmt2014.pdf*

Trucks: Truck Percentage

unts are collected at several locations where vehicles are classified ng to the number of axles. This provides a measure of trucks as a ntage of all vehicles traveling on the roadway. Trucks are defined as icles 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 14: Overall, I-5, I-205, SR-14 East, SR-501 (Pioneer), SR-502, SR-503, and Fourth Plain/Mill Plain west of I-5 display the highest percentage of truck volumes during the PM peak period with truck percentages greater than 4 percent. I-5 North has a truck percentage near 12%.

In the AM period, the percentage of trucks is generally higher. I-5 North, and Fourth Plain/Mill Plain west of I-5 all have percentages above 8.9%.

Transit: Transit System Ridership

Table 6 provides 2013 annual C-TRAN patronage by type of service. Between 2010 and 2013 minor transit service revisions were made and fare increases were implemented. With changes, total ridership decreased by 3.1% between 2012 and 2013. Similar to the 3.8% decrease experienced by Portland's TriMet.

Approximately 83% of C-TRAN system ridership was made up of urban fixed route patrons, followed by commuter service that carried 11% of the total riders and C-VAN that carried 4% of the total riders. Vanpool usage has increase to 1% of the total ridership.

Table 6: 2013 C-TRAN Ridership by Type of Service

Service Type	Annual Riders	Percent
Urban/Local	5,416,261	83.4%
Commuter	724,127	11.2%
C-VAN	231,021	3.6%
Events/Other	35,639	0.5%
Connector	17,223	0.3%
Vanpool	67,031	1.0%
Total	**6,491,302**	**100.0%**

Over the years, ridership has responded to adjustment in service hours and fares. In 2000, the legislature repealed the Motor Vehicle Excise Tax, and C-TRAN had to reduce transit service. In 2005, C-TRAN restructured transit fares to increase the proportion that fare revenue contributes to service costs. In 2006, with passage of a voter approved sales tax increase, C-TRAN restored services lost after the 2000 cuts.

C-TRAN ridership has generally grown at a rate higher than the county's overall population growth rate.

Table 7 compares growth in Clark County population with changes to C-TRAN system ridership during the same period. The average annual growth rate in Clark County population since 1985 has ranged from 0.8% to 4.4% per year depending on the time period. Over the same time period, C-TRAN ridership's growth rate has generally been higher than the population growth rate.

Table 7: Historical Population and Patronage Growth

Year	Population	Annual Growth Rate	System Passenger Trips	Annual Growth Rate
1985	206,744	---	1,765,423	---
1990	238,053	3.0%	2,840,724	12.2%
1995	291,000	4.4%	4,327,291	10.5%
2000	345,238	3.7%	5,437,084	5.1%
2005	391,500	2.7%	5,812,417	1.4%
2010	425,363	1.7%	6,552,570	2.5%
2013	435,500	0.8%	6,491,302	-0.3%

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 type and frequency of service. This process has allowed for the estimation of transit patronage and capacity for congestion management corridors.

Map 15: Generally, in the PM Peak period, the number of available seats is higher to accommodate the greater transit demand. In the PM period, 21 corridors utilize more than 50% of the available seat capacity. Of those corridors, eight use more than 75% of the transit seat capacity, while five corridors utilize 90% or more of the transit seat capacity. Generally, corridors with 90% or greater use of seat capacity often experience standing riders.

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 is shown in Table 8.

Table 8: Clark County Park and Ride Capacity and Usage in 2013

Facility	Lot Capacity	Lot Usage
99th Street	610	396
Evergreen	279	27
Salmon Creek	467	287
BPA Ross	200	63
Andresen/Living Hope	60	52
Fishers Landing	560	506
Total	**2,176**	

Transit: Transit On-Time Performance

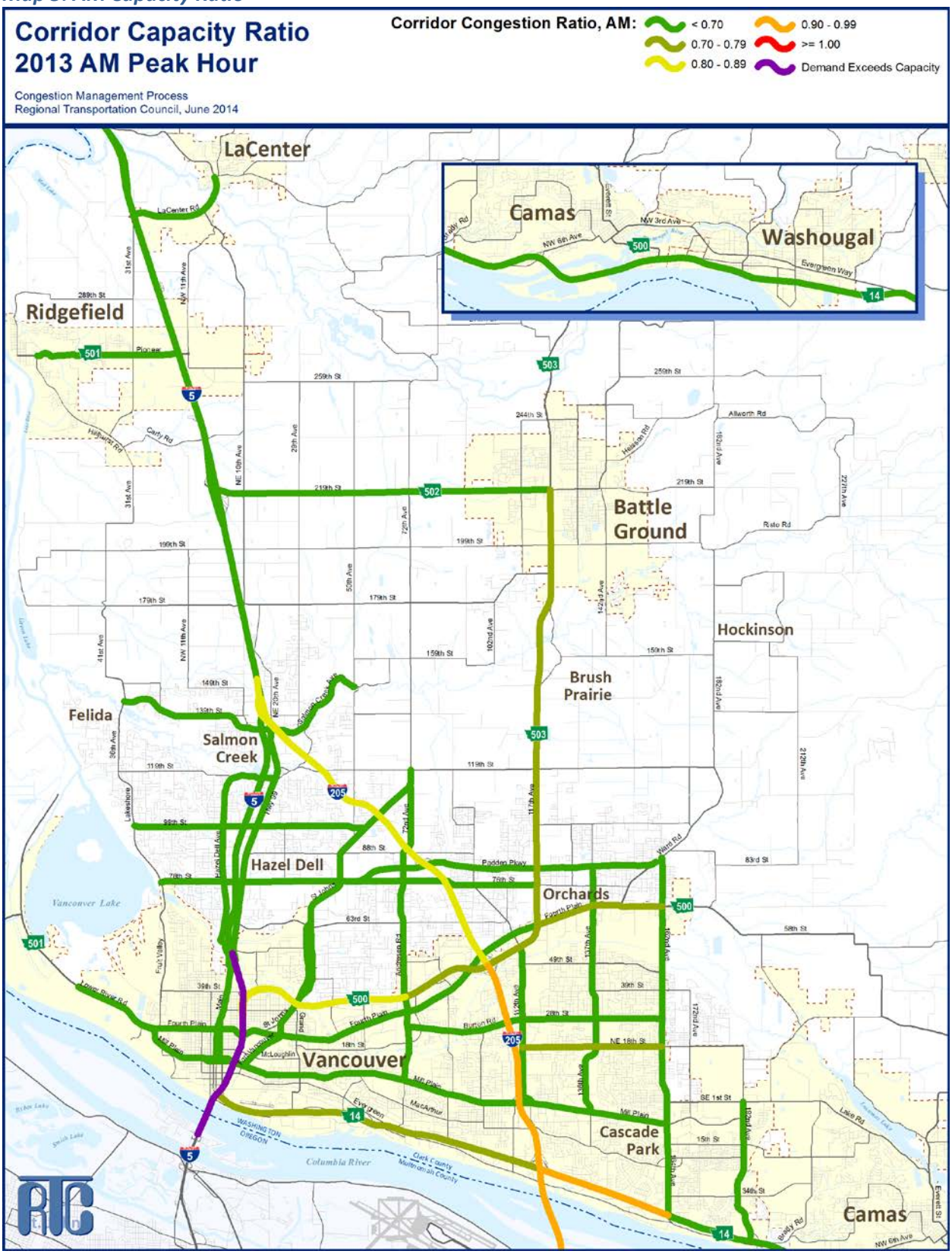
Traffic congestion, station dwell time, wheel chair boardings, and other factors can impact transit vehicles' ability to maintain a schedule.

To improve on-time performance, C-TRAN tested a pilot project in 2013 to implement Transit Signal Priority along 22 signals in the Mill Plain corridor. This Transit Signal Priority project allowed buses to communicate with traffic signals and allow additional green time where needed. C-TRAN evaluated its performance and found that this technology showed improvements to corridor travel time and with on-time performance without negatively impacting roadway traffic. C-TRAN is moving forward to implement a similar technology in the Highway 99 corridor.

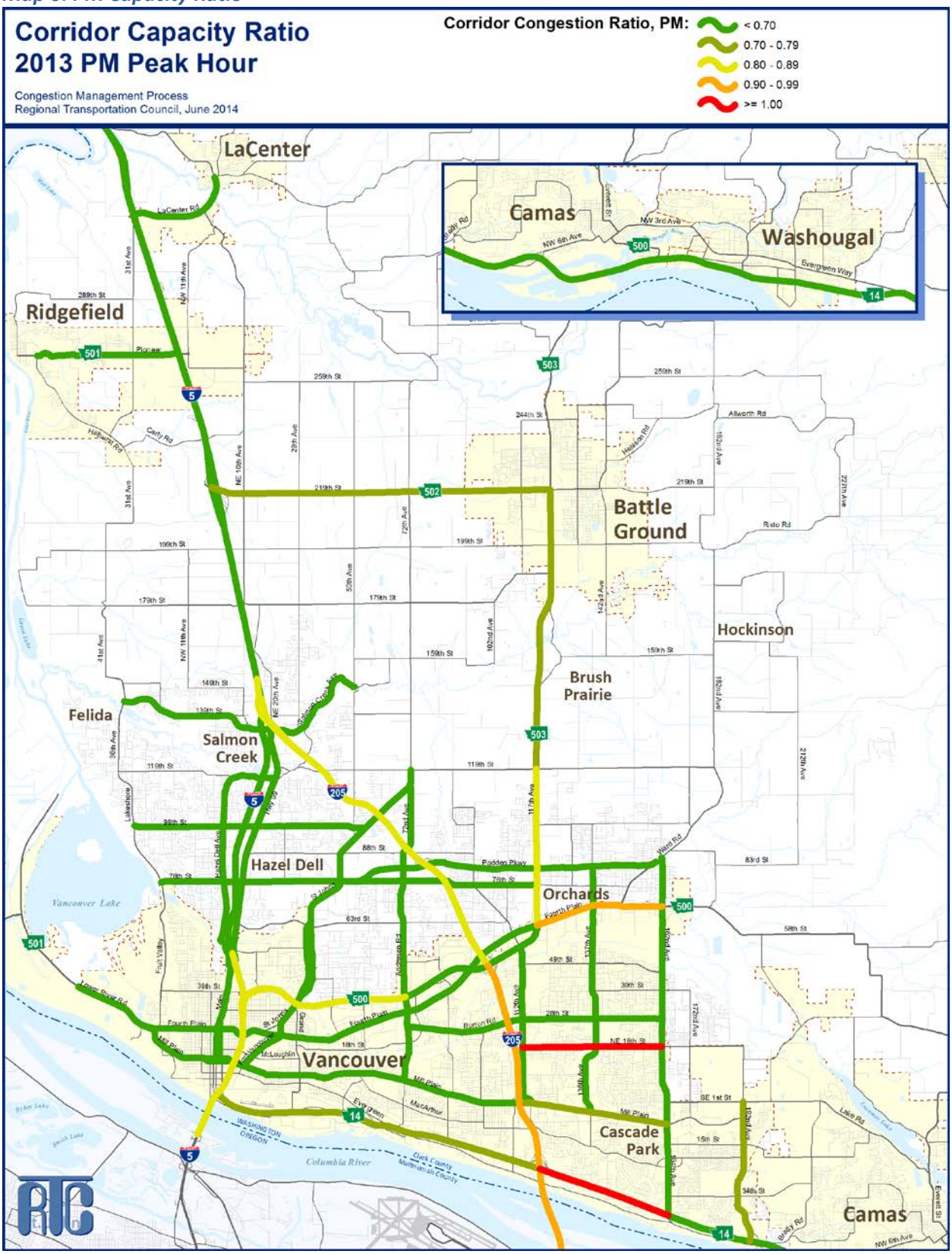
C-TRAN's 2013 On-Time Performance Report showed five routes with the lowest on-time performance: Route 19 (Salmon Creek), Route 30 (Burton), Route 38 (Mill Plain/192nd), Route 71 (Highway 99), and Route 72 (Orchards). These routes are experiencing a number of issues which create problems for meeting on-time reliability. In addition all express routes experience on-time performance issues associated with congestion.

Map 4: PM Vehicle Volumes

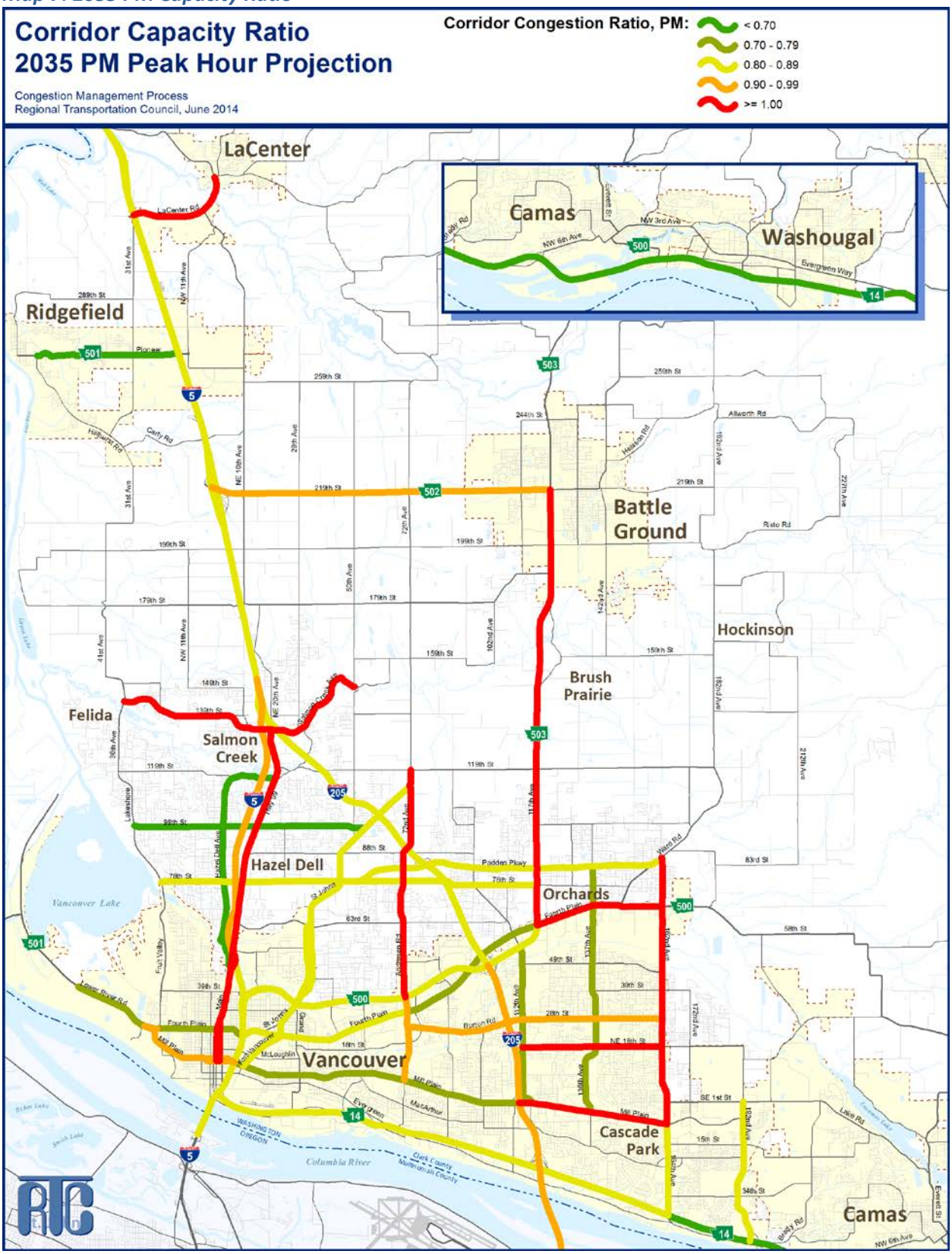
Map 5: AM Capacity Ratio



Map 6: PM Capacity Ratio



Map 7: 2035 PM Capacity Ratio



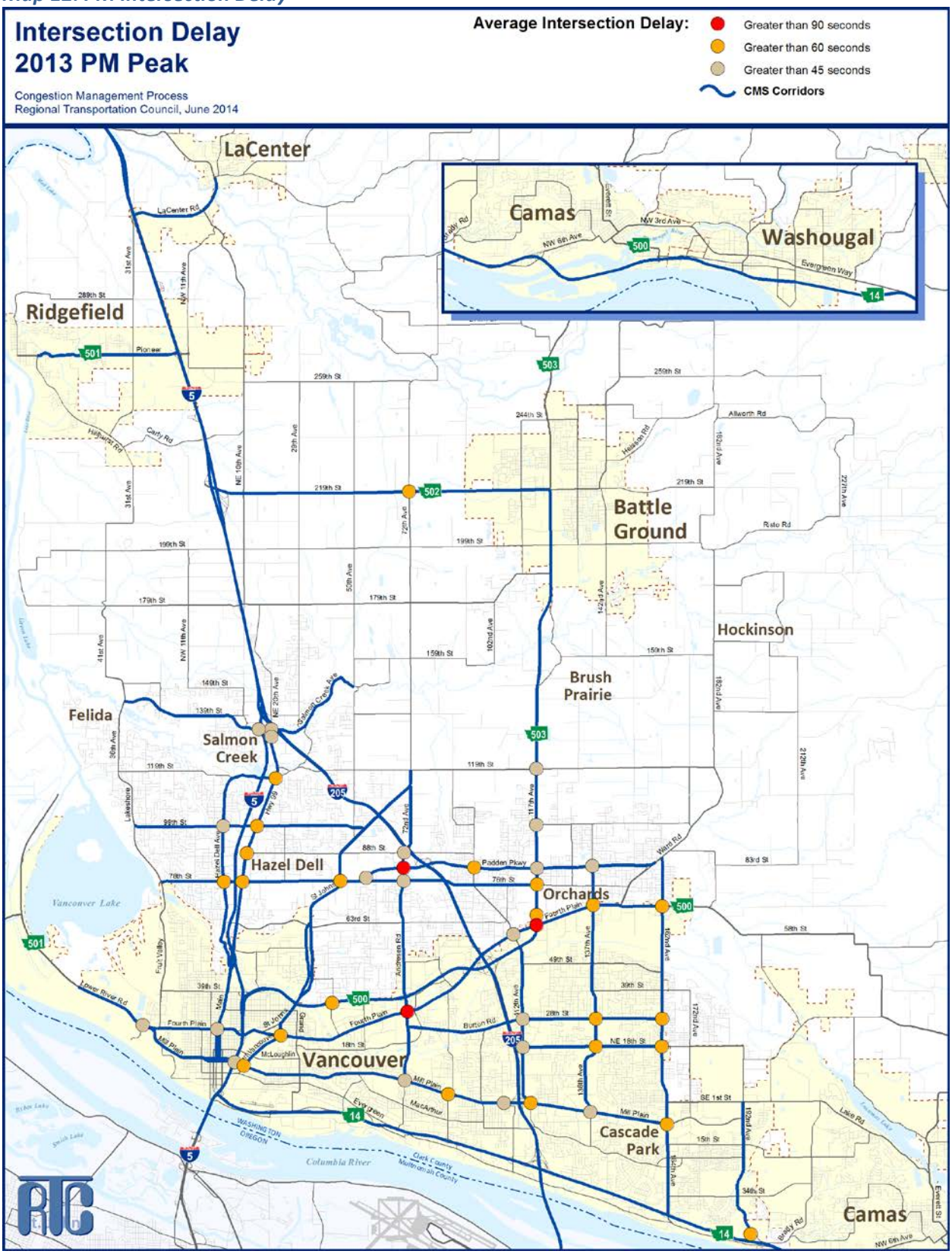
Map 8: AM Corridor Travel Speed

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

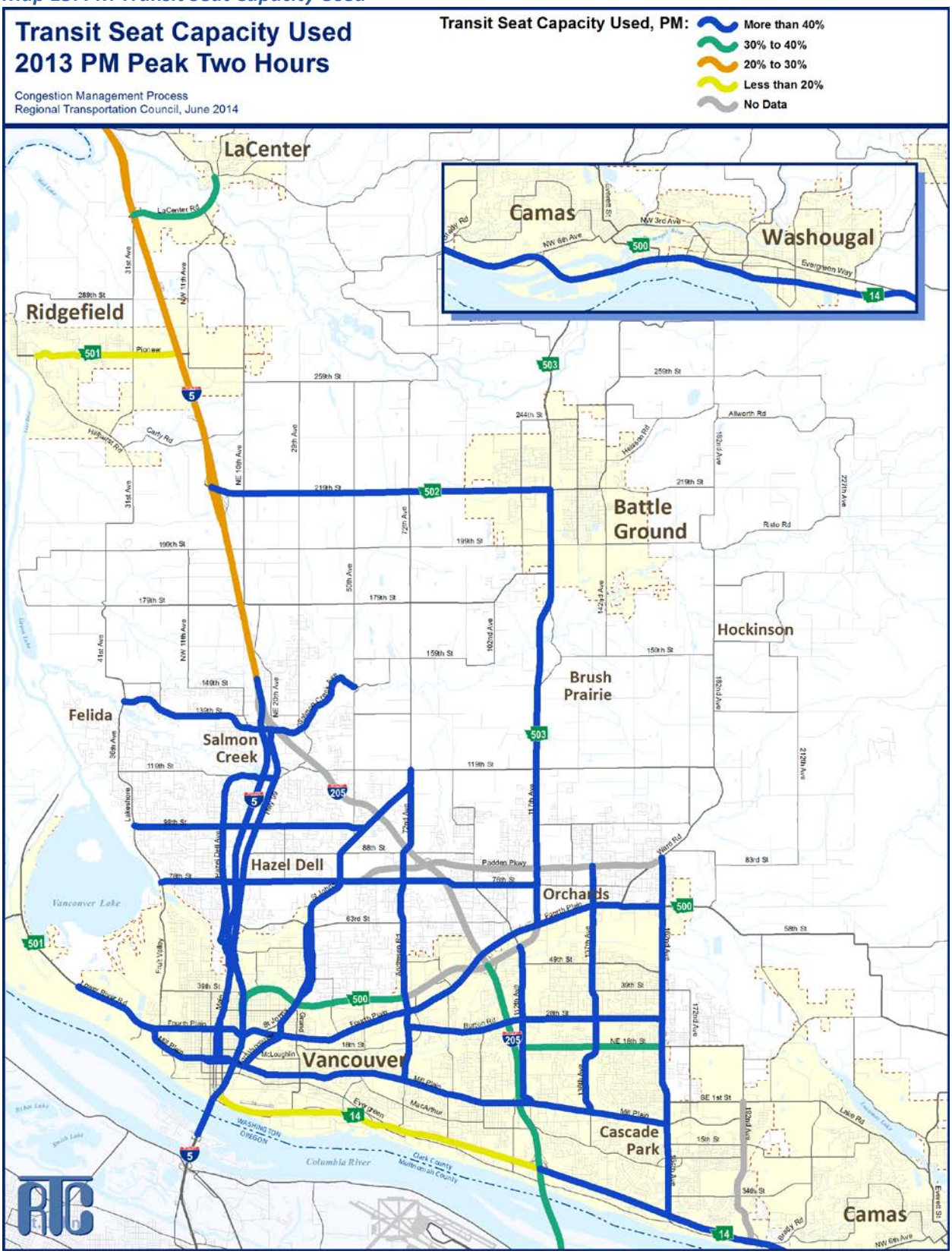
Map 12: PM Intersection Delay



Map 13: High Collision Intersections

Map 14: PM Truck Percentage

Map 15: 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 60% 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 16: Prominent volume-to-capacity ratio areas of concern in the AM peak period are 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, I-205, SR-14, and SR-500.

Map 17: 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-502, SR-503, Fourth Plain, 18th Street, and 28th Street.

Speed

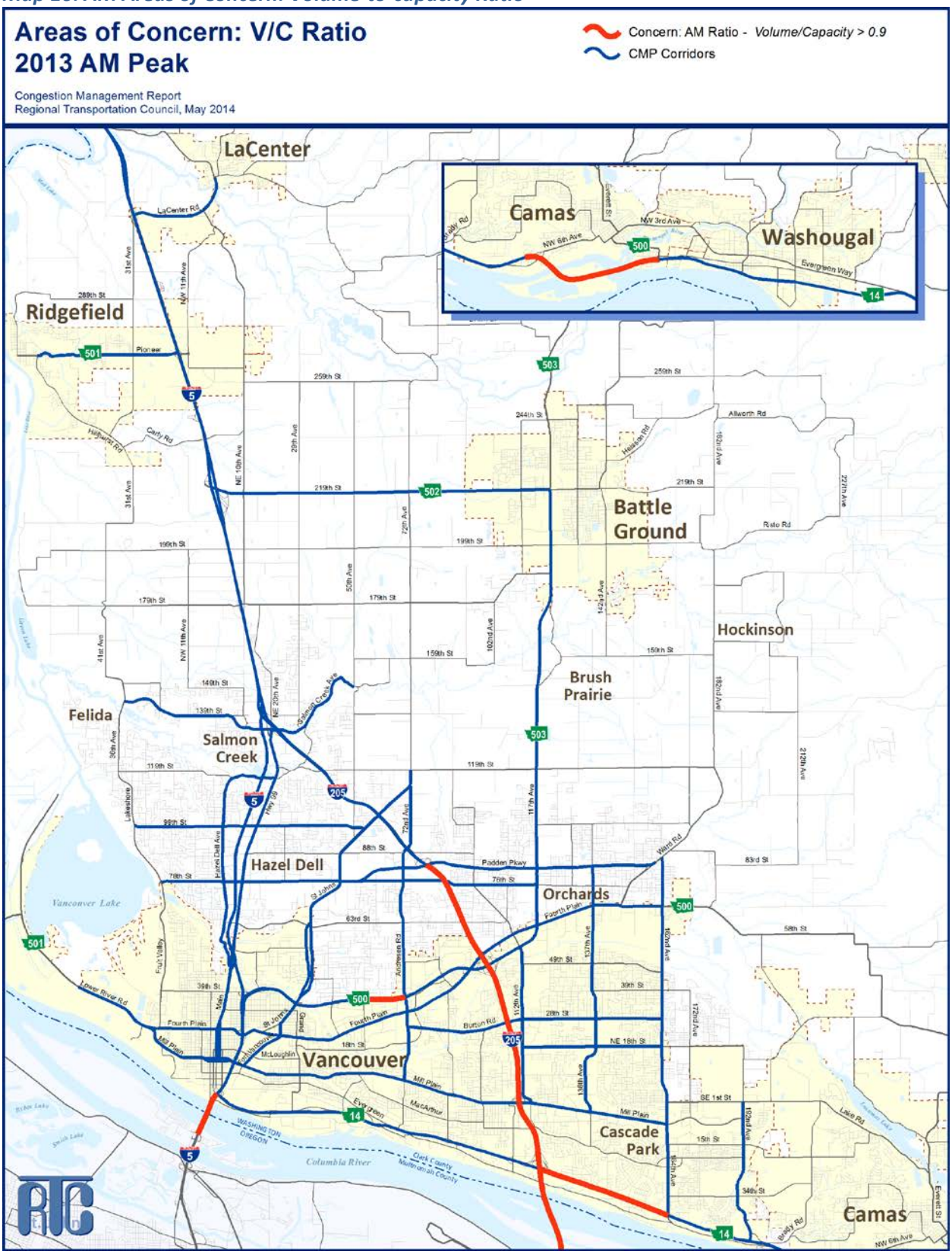
A travel speed lower than 60% of the posted speed limit is an indicator of delay, which can result in congestion.

Often these speed areas of concern occur at locations with multiple traffic signals in close proximity or with intersections experiencing delay of greater than 45 seconds.

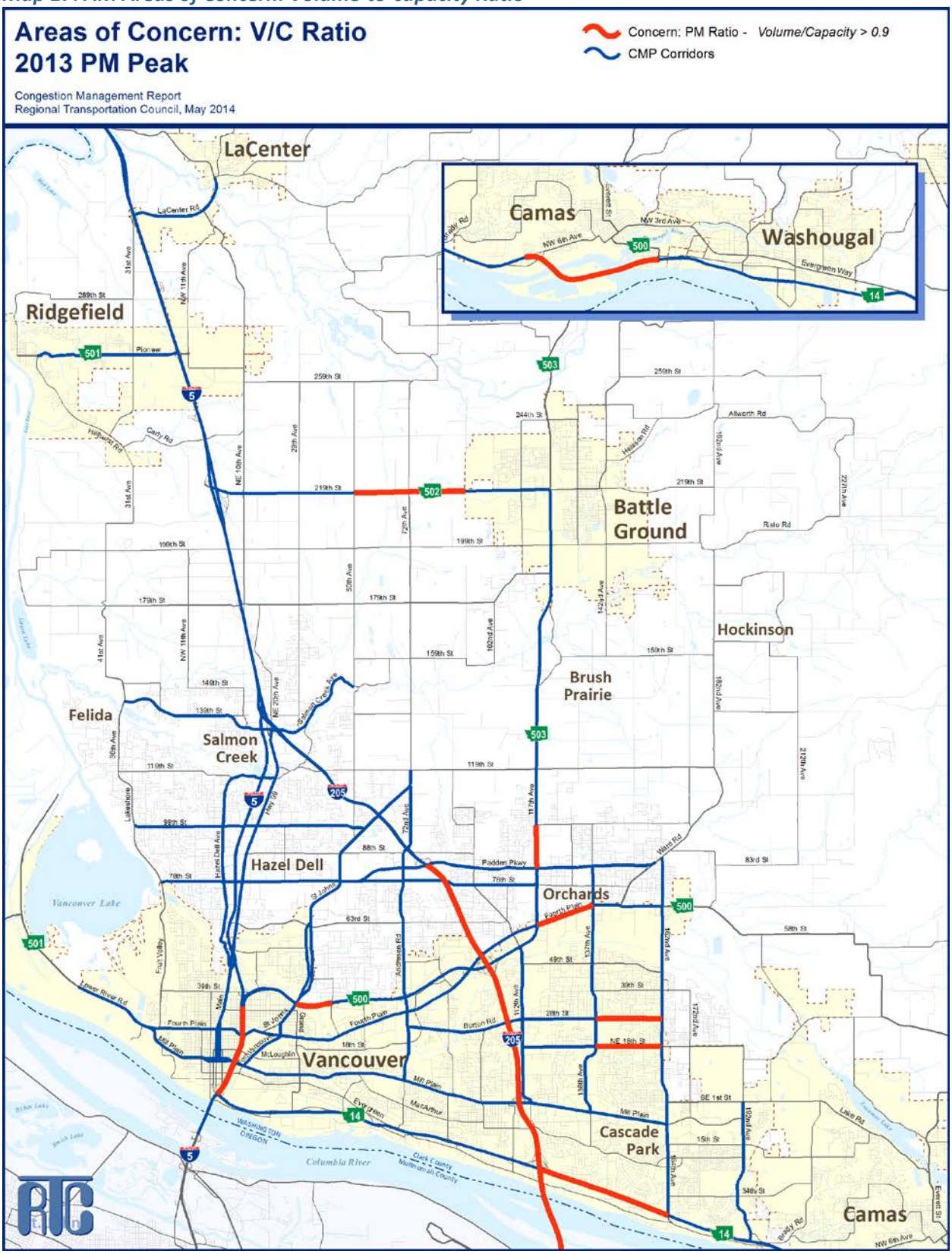
Map 18: In the AM period, speed areas of concern occur along portions of I-5, Main Street, Highway 99, Ft. Vancouver, St. Johns, Andresen, SR-503, 137th Avenue, 192nd Avenue, Mill Plain, Fourth Plain, 78th Street, Padden Parkway, and 134th Street.

Map 19: In the PM period, speed areas of concern occur along portions of most of the congestion management corridors in the Vancouver Urban Area, with the exception of grade-separated facilities (I-5, I-205, and SR-14).

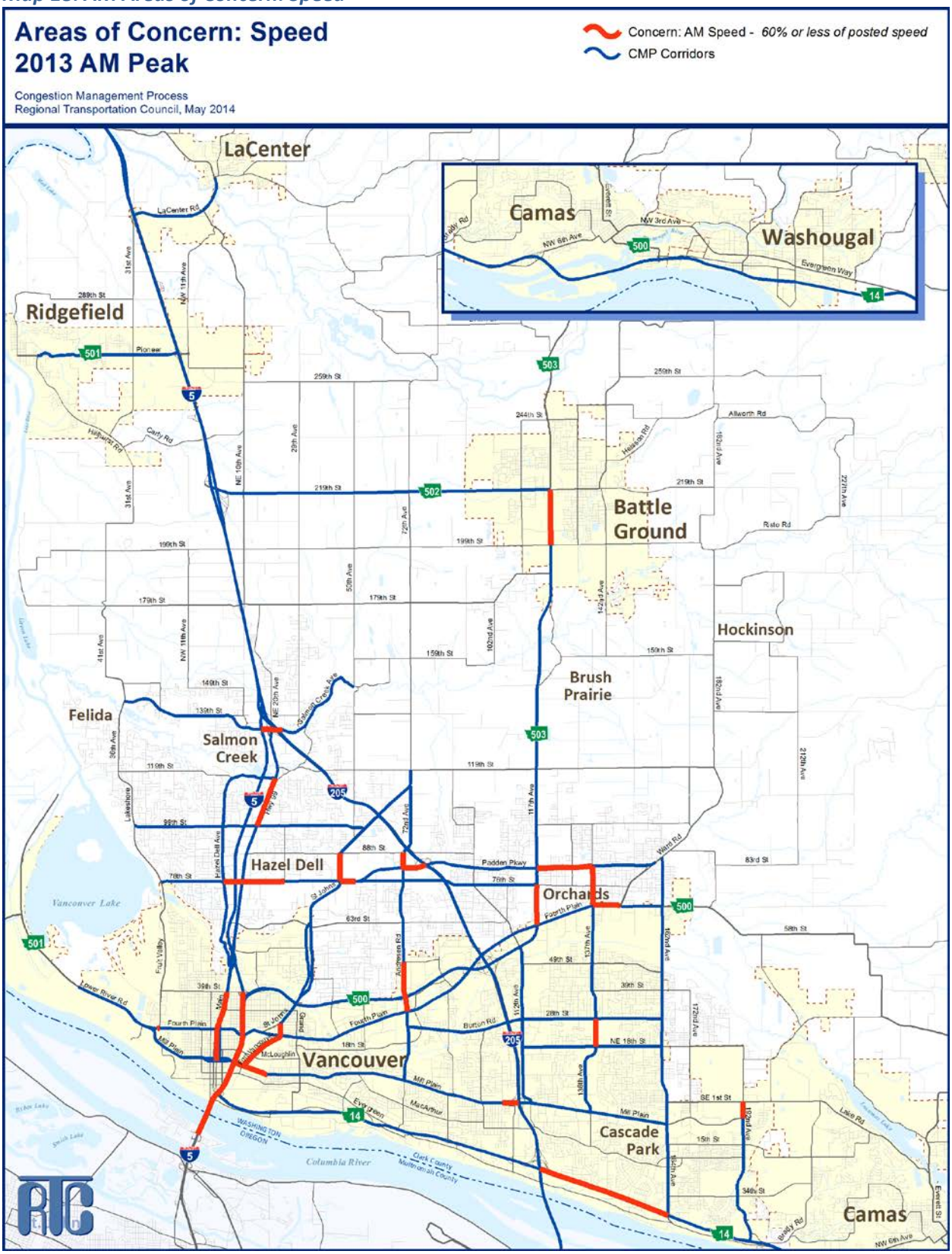
Map 16: AM Areas of Concern: Volume-to-capacity Ratio



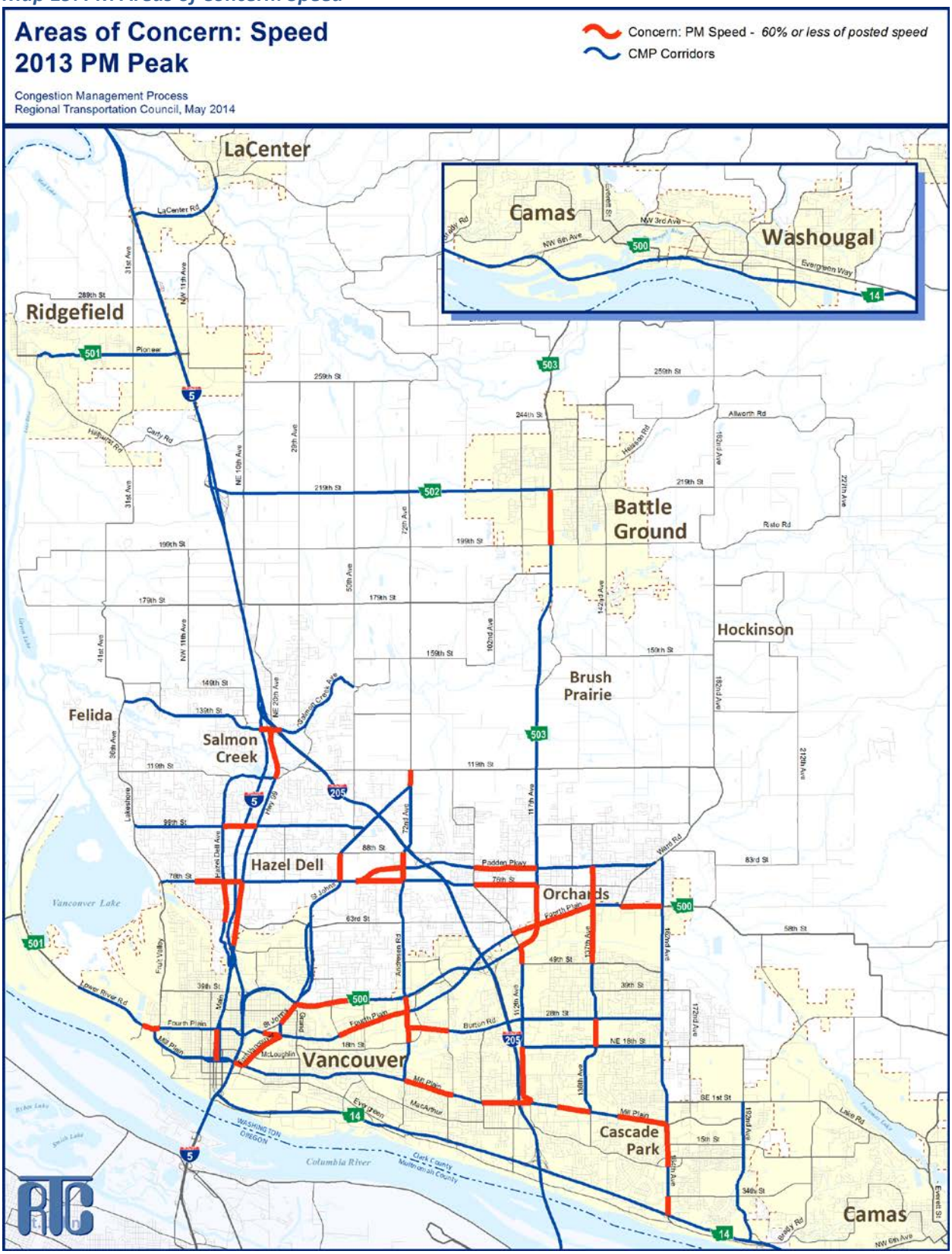
Map 17: AM Areas of Concern: Volume-to-capacity Ratio



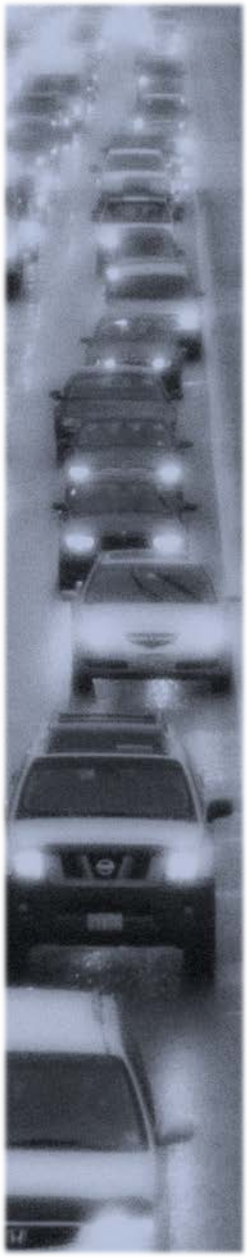
Map 18: AM Areas of Concern: Speed



Map 19: 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[11] 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. The model simulates both current travel demand and also forecasts travel demand twenty years into the future based on planned land use growth. Using the model, the region can identify where future congestion is most likely to occur.

The Transportation System Management and Operations Plan[12] (TSMO) was adopted in June 2011. 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. TSMO project examples include traffic signal integration, ramp metering, access management, traveler information, smart transit management, and coordinated incident response to make the transportation system work better.

The C-TRAN 20-year Transit Development Plan[13] was adopted in 2010. 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.

[11] *http://rtc.wa.gov/programs/rtp/clark/*
[12] *http://rtc.wa.gov/programs/vast/docs/tsmoReport2011.pdf*
[13] *http://www.c-tran.com/about-c-tran/reports/c-tran-2030*

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. RTC approved a Regional Commute Trip Reduction Plan and endorsed CTR plans for unincorporated Clark County, Vancouver, Camas, and Washougal. The City of Vancouver is implementing their CTR plan through Destination Downtown[14].

The Clark County Freight Mobility Study[15] (RTC, 2010) provides useful information and analysis designed to inform regional transportation planning, local comprehensive planning, and project design. Study efforts included an evaluation of freight traffic movement, identification of freight system deficiencies, identified future infrastructure needs, and identified policy issues to support freight mobility in Clark County.

The Human Services Transportation Plan for Clark, Skamania, and Klickitat Counties[16] 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.

The 2014 Safety Management Assessment for Clark County[17] is intended to be an organized approach to transportation safety. Safety for all modes of travel is an important component of the regional transportation planning process. The purpose of the plan is to consider ways to increase the safety of the transportation system.

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:

[14] *http://www.cityofvancouver.us/ced/page/destination-downtown*
[15] *http://rtc.wa.gov/studies/freight/*
[16] *http://rtc.wa.gov/programs/hstp/*
[17] *http://rtc.wa.gov/reports/safety/SafetyMgmt2014.pdf*

- 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 potential congestion reduction and mobility strategies. The intent of this toolbox is to encourage ways to deal with congestion and mobility issues prior to traditional roadway widening projects. To address transportation issues, 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.

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.

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 in dense urban corridors.

Preservation and maintenance of existing systems is essential to mobility.

Bicycle and Pedestrian Improvements

New Sidewalks and Bicycle Lanes, Separated Pathway, 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 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.

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.

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.

The CMP provides information to help guide the investment of transportation funding toward improving 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[18] (RTP). Needs are developed 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[19] (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:

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

The Transportation Improvement Program and Annual List of Obligation will allow the region to track the implementation of congestion management strategies.

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.

[18] *http://www.rtc.wa.gov/programs/mtp/*
[19] *http://www.rtc.wa.gov/programs/tip/*

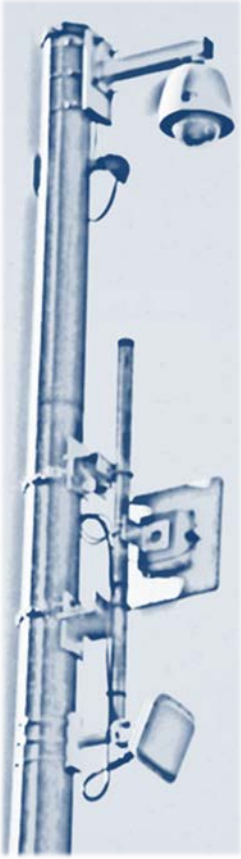
As part of the project implementation process, all regionally selected projects are required to complete a before and after analysis that identifies project goals and outcomes. This information is reported back to the Regional Transportation Advisory Committee. The region also tracks effectiveness through a 10 year corridor analysis.

2003-2013 Trends

Between 2003 and 2013 the region experienced a substantial increase in overall traffic volumes. The overall increase in traffic volumes relates to growth in the regional population and employment totals. This growth along with improvements to the transportation system is reflected in the following ten-year analysis of corridor capacity, vehicle volumes, and speed.

Corridor Capacity

Through the ten-year period, both the AM and PM peak periods had increased congestion along congestion management corridors. However, congestion decreased along corridors where capacity has been added to the system. The change in corridor capacity (volume-to-capacity ratio) has been especially reflective of location with road, intersection, and interchange improvements. In the past few years, capacity has been improved with transportation improvements along many of the congestion management corridors. Some of the major improvements include:



I-5 / Highway 99 / Main Street Corridor

- I-5/Pioneer Street Interchange Improvements
- I-5, I-205 to 179th Street Widening
- I-5/SR-502 Interchange
- I-5, 99th Street to 134th Street Widening
- Highway 99/20th Avenue Realignment

I-205 / 112th Avenue Corridor

- NE 18th Street, 112th Avenue Intersection
- I-205 Off ramp to 112th Avenue

162nd / 164th Avenue Corridor

- 164th Avenue, SE 1st Street to SR-14: Reconstruct five intersections
- 162nd Avenue, NE 39th Street to Ward Road (Widen to 5 lanes)
- 192nd Avenue (Relieves 162nd Avenue)

SR-500 / Fourth Plain Corridor

- SR-500 / St. Johns Boulevard Interchange
- SR-500 / 112th Avenue Interchange
- SR-500 / I-205 Extend Westbound Auxiliary Lane

Mill Plain Corridor

- Mill Plain Boulevard / NE 136th Avenue Intersection

Saint Johns Corridor

- Saint Johns, NE 50th Avenue to 72nd Avenue

Andresen Road Corridor

- 72nd Avenue, north of 88th Street to Saint Johns

NE 136/137/138th Avenue Corridor

- NE 138th Avenue, 18th Street to 28th S
- NE 137/138th Avenue, 28th St. to 49th

SR-14

- SR-14, NW 6th Av to Union St.

Vehicle Volumes

Several corridors have shown a significant increase in peak hour vehicle volumes since 2003. Some are due to regional growth, while others can be attributed to improvements to the transportation system. For example, in years 2003 the 192nd Avenue corridor was added as a new facility creating a significant shift in vehicles from the 162nd Avenue corridor. Corridors that experienced a volume increase of over 400 vehicles in the AM and PM peak hour, between 2003 and 2013 include:

- SR-14, 164th Avenue to Skamania Co. Line (AM and PM)
- 192nd Avenue, SR-14 to SE 1st Street (AM and PM)
- Fourth Plain, Andresen Road to SR-503 (AM and PM)

The only corridor to show a significant decrease in peak hour vehicle volumes is 162nd/164th Avenue corridor which experienced a decrease of over 400 vehicles in both the AM and PM peak hour as 192nd Avenue was added to the network and began to serve the same travel shed.

Due to peak hour congestion, the I-5, I-205, and Main Street corridors often experience decrease in volumes of greater than 500 vehicles. In the I-5 corridor, vehicles will often shift from I-5 to Main Street to avoid the AM southbound backup near the I-5 Interstate Bridge. In the I-205 corridor, vehicle throughput can decreased in the PM peak hour due to congestion at the interchanges on both sides of the Glenn Jackson Bridge.

Speed

In general, a trend between 2003 and 2013 congestion monitoring reports includes decreased speeds along congestion management corridors, with the exception of where the system has been improved. Corridors that had a significant (5 mph or more) decrease in peak period speed includes the following:

Table 9: Corridors with Significant Decrease and Increase in Peak Period Speed

Corridor	Peak Period	2003 Speed	2013 Speed	Difference
I-5: Main St. to Jantzen Beach	AM	35 mph	20 mph	-15 mph
I-5: Jantzen Beach to Main St.	PM	36 mph	49 mph	+13 mph
Andresen Road: SR-500 to Mill Plain	AM	29 mph	22 mph	-7 mph
SR-503: 119th St. to Fourth Plain	AM	30 mph	22 mph	-8 mph
SR-503: Fourth Plain to 119th St.	PM	34 mph	28 mph	-6 mph
SR-14: I-205 to I-5	AM	63 mph	57 mph	-6 mph
SR-14: 164th Ave. to I-205	AM	63 mph	35 mph	-28 mph
SR-14: I-205 to 164th Ave.	PM	57 mph	40 mph	-17 mph
SR-500: Andresen Rd. to I-5	AM	42 mph	48 mph	+6 mph
SR-500: SR-503 to Andresen Rd.	AM	43 mph	54 mph	+11 mph
SR-500: Andresen Rd. to SR-503	PM	29 mph	45 mph	+16 mph
Padden Parkway: 78th St. to Ward Rd.	PM	35 mph	42 mph	+7 mph
18th Street: 112th Ave. to 164th Ave.	PM	19 mph	25 mph	+6 mph

The following is a list of three congestion management projects that became operational between 2012 and 2013 data collection. These projects seem to improve safety, increased capacity, reduced backups, and reduced travel time. These projects will continue to be monitored in future years.

- Andresen Road TSMO Pilot Project
- NE 137th/138th Avenue Roundabouts
- SR-14 Camas-Washougal Widening