Roanoke Valley Area
METROPOLITAN PLANNING ORGANIZATION

CONGESTION MANAGEMENT PROCESS PLAN

2013/14

Prepared by the REGIONALcommission

RVARC.ORG

ROANOKE VALLEY AREA
METROPOLITAN PLANNING ORGANIZATION

STAFFED BY THE REGIONAL commission
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The 23rd day of January, 2014

RESOLUTION

Approving the Congestion Management Process Plan for the Roanoke Valley Area Metropolitan Planning Organization

WHEREAS, the Roanoke Valley Area Metropolitan Planning Organization (MPO) was classified as a Transportation Management Area (TMA) MPO by the federal government in July 2012 based on the increase in population of the Roanoke Urbanized Area as documented by Census 2010; and

WHEREAS, TMA classification resulted in additional planning responsibilities, including the development of a regional Congestion Management Process (CMP) Plan; and

WHEREAS, the region's first CMP Plan is a multi-modal approach to traffic congestion, which provides ample discussion of the role of highway, public transportation and non-motorized transportation approaches to reducing traffic congestion; and

WHEREAS, the various drafts of the CMP Plan have been reviewed and revised through the MPO's Transportation Technical Committee and MPO process.

NOW, THEREFORE BE IT RESOLVED that the Policy Board of the Roanoke Valley Area Metropolitan Planning Organization does hereby approve the Congestion Management Process Plan for the Roanoke Valley Area Metropolitan Planning Organization, as presented.

Billy W. Martin, Sr.
Chairman

MPO POLICY BOARD: Counties of Bedford, Botetourt, Montgomery and Roanoke; Cities of Roanoke and Salem; Town of Vinton; Federal Highway Administration; Federal Transit Administration; Greater Roanoke Transit Company *(Valley Metro)*; Roanoke Regional Airport Commission; Roanoke Valley-Alleghany Regional Commission; Virginia Department of Rail & Public Transportation; Virginia Department of Transportation

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Roanoke Valley Area
Metropolitan Planning Organization
Congestion Management Process (CMP) Plan

Fiscal Years 2013/2014

1. Disclaimer and Acknowledgements

This report was prepared by the Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) in cooperation with the U.S. Department of Transportation (USDOT), the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), the Virginia Department of Transportation (VDOT) and the Virginia Department of Rail and Public Transportation (VDRPT). The contents do not necessarily reflect the official views or policies of the USDOT, FHWA, FTA, VDOT, VDRPT, RVAMPO or Roanoke Valley-Alleghany Regional Commission (RVARC). This report does not constitute a standard, specification, or regulation. FHWA, FTA or VDOT acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement/approval of the need for any recommended improvements nor does it constitute approval of their location and design or a commitment to fund any such improvements. Additional project level environmental impact assessments and/or studies of alternatives may be necessary.

The RVAMPO fully complies with Title VI of the Civil Rights Act of 1964 and related statutes and regulations in all programs and activities. For more information, or to obtain a Discrimination Complaint Form, see www.rvarc.org or call (540) 343-4417.

Source: http://www.uschamber.com/ads/bottlenecks-and-congestion-cost-about-200-billon-year

2. Executive Summary

Private sector businesses increasingly rely on logistics, supply chain management and just-in-time delivery as key components in their business models and related strategies. All of these approaches rely on an uncongested transportation network in order to work. If congestion problems worsen in the future, traffic congestion would translate into economic losses to area business because of the supply chain management effects; and congestion could negatively affect regional economic development. In fact, the United States Chamber of Commerce, which is a membership organization that advocates and lobbies for business policy and interests, is so concerned about the negative effects of traffic congestion on businesses that it placed the following advertisement in Bloomberg Businessweek and online.

The CMP Plan is intended to be a high level "30,000 feet" plan that needs to satisfy multiple stakeholder groups at various levels of technical and planning sophistication. The sheer volume of potential corridors, bottlenecks and areas that were returned by public surveys and Google Traffic snapshots for consideration was overwhelming. In order for the CMP Plan to develop a focus and delve deeply into other local and regional plans, as source material, for congestion related strategies, a finite number of locations needed to be chosen. RVAMPO planners decided to focus efforts on the concept of a "Top 10" listing. The concept of a "Top 10" is very well established in popular culture and will be relatable to citizens and other stakeholders regardless of technical sophistication. RVAMPO planners chose to focus the "Top 10" on loosely defined geographies so that the geography would not rigidly or arbitrarily constrain the potential for finding locally documented strategies in local comprehensive plans or corridor plans. It is of note that a rigorous multimodal-center and multimodal-district definition process is currently underway as a part of the Pedestrian and Transit Vision Plans of FY 2014. These multimodal districts and centers will be defined using the Department of Rail and Public Transit's new Statewide Multimodal Design Guidelines. These geographic definitions are not available for use in this CMP, but will be available for future CMPs and LRTPs.

The purpose of the CMP is not to limit ideas, but to expand them. The "Top 10" Areas of Emphasis themselves were chosen through a combination of comparing public feedback with the frequency of congestion found in the Google Traffic Snapshots. It is not one or the other, but a combination of both plus planners' professional judgment that lead to the current "Top 10." The appendices of this document contain every snapshot and a full summary of public input for the interested stakeholder. Later in the process, planners realized that the "Top 10" did not capture all potential areas of future congestion. A "Watch List" was added listing other areas that were indicated in public feedback, Google Traffic Snapshots or both as having congestion, yet did not make the "Top 10."

It is intended that the CMP undergo a yearly week-long review process in which a series of public feedback and updated snapshots are produced each year. This yearly review process will be an early indicator of changes in the system and can prompt a wholesale update of the CMP when necessary. Future wholesale updates of the CMP can proceed along an organizational path that is appropriate at the time. The "Top 10" are intended to be a convention to move the plan forward and relate it to a wide variety of stakeholders.

3. Overview and Background

a. Congestion Management Process (CMP) Plan

Although citizens may not perceive traffic congestion to be all that bad at the present moment, it is important to get ahead of the issue to help insure this remains the case in the future. Paradoxically, a successful CMP Plan will mean that future citizens will wonder why we ever needed a plan in the first place. They will not experience the traffic congestion problems that did not happen, but would have happened otherwise.

The concept of industry clusters and cluster based strategy has been a vibrant topic in economic development circles over the past few decades. Specific cluster related studies or profiles that cover the combined New River and Roanoke Valleys, Alleghany Highlands and Region 2000 (Lynchburg) have been completed in the past decade and have been useful in regional economic development initiatives. The famous Harvard Business School professor Michael E. Porter defines clusters in "On Competition" as:

> *"A geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities."*

The last three multi-year federal transportation funding bills *(TEA-21, SAFETEA-LU and MAP-21)* have included a collection of planning factors that guide the intent of the legislation. The planning factors from MAP-21 follow:

> *Congress showed support for metropolitan and statewide transportation planning by emphasizing eight distinct areas which Metropolitan Planning Organizations (MPOs) and states should consider when developing their plans:*
>
> A. Support **economic vitality** by enabling global competitiveness, productivity, and efficiency;
> B. Increase the **safety** of the transportation system for motorized and non-motorized users;
> C. Increase the **security** of the transportation system for motorized and non-motorized users;
> D. Increase the **accessibility** and mobility of people and for freight;
> E. Protect and enhance the **environment,** promote energy conservation, improve the quality of life, and promote consistency between transportation improvements and State and local planned growth and economic development patterns;
> F. Enhance the **integration** and connectivity of the transportation system, across and between modes, for people and freight;
> G. Promote efficient system **management and operation**; and
> H. Emphasize the **preservation** of the existing transportation system

The RVAMPO Congestion Management Process (CMP) Plan addresses the majority of these planning factors. The CMP Plan especially addresses planning factors: A, B, D, F, G and H. It should be noted that the first planning factor - A - focuses on economic vitality. In this sense the planning factors are aligned with the aforementioned concerns of the U.S. Chamber of Commerce.

It is precisely in helping to improve the free flow of freight, people and information in the spirit of the MAP-21 Planning Factors and the economic need as recognized by the U.S. Chamber of Commerce and others, that this CMP plan is important for the future of the region.

b. Methodology

When tasked with developing a CMP plan for our area, staff challenged themselves to explore newly available, yet cost effective, methods for capturing data about our region's congestion network. Staff established that the CMP Plan should identify 10 Areas of Emphasis within our urbanized area. Each area of emphasis was determined by analyzing survey responses, identifying trends using Google Traffic, and conducting site visits for each area of emphasis. In reviewing the process, we have provided a brief description of the limitations for each method.

1. Public Input Surveys - RVAMPO planners conducted online surveys asking citizens identify congested areas and bottlenecks. Responses were generated using a several online surveys and social media strategies. Survey #1 received the most responses. We asked participants open ended questions and grouped their responses into areas within the urbanized boundaries. Staff conducted several other surveys, including a Regional Congestion Satisfaction Survey, in which we asked participants to rank their overall feelings about regional congestion.

    - Limitations: In Survey #1, open ended questions were used in an effort to avoid guiding participants. In future surveys, staff will avoid open ended responses to improve the efficiency of the data collection and analysis process.

2. Google Traffic Analysis - Google monitors anonymous cell phone system data to determine real time traffic conditions using a proprietary algorithm. The real time traffic congestion is communicated using a color coded palette of red, yellow, orange and green to indicate traffic congestion. RVAMPO planners took a series of Google Traffic screenshots at various times during the day over a several month period, in order to have a visual data inventory of traffic conditions to analyze. RVAMPO planners then added up the number of occurrences of traffic congestion at various spots to indicate areas of emphasis for the RVAMPO CMP Plan.

    - Limitations: We are not aware of any other MPO using this data for CMP planning purposes. Analyzing these screenshots was very time consuming and does not offer a complete view of every intersection and road. In addition, the data that appears in each screen shot may not be 100% reflective of actual real time traffic conditions. This is due in part to not knowing exactly how Google calculates traffic conditions. We believe the tool may be most effective for identifying broader patterns of congestion. Staff will use the experience of this effort to improve the efficiency and effectiveness of Google Traffic for future data collection. We expect the tool and its accuracy will improve with time.

3. Field Verification - RVAMPO planners visited the top locations indicated by both the surveys and Google Traffic in order to corroborate the indicated congestion.

Once each of the 10 Areas of Emphasis was identified, staff then analyzed each area through 3 perspectives with which to discuss congestion. Staff then researched previous plans and studies in an effort to consolidate recommendations. The three lenses that are used to analyze, discuss and make recommendations for each of the 10 areas of emphasis are listed below:

Highway Transportation
1. Congestion
2. Strategies
3. Performance Monitoring

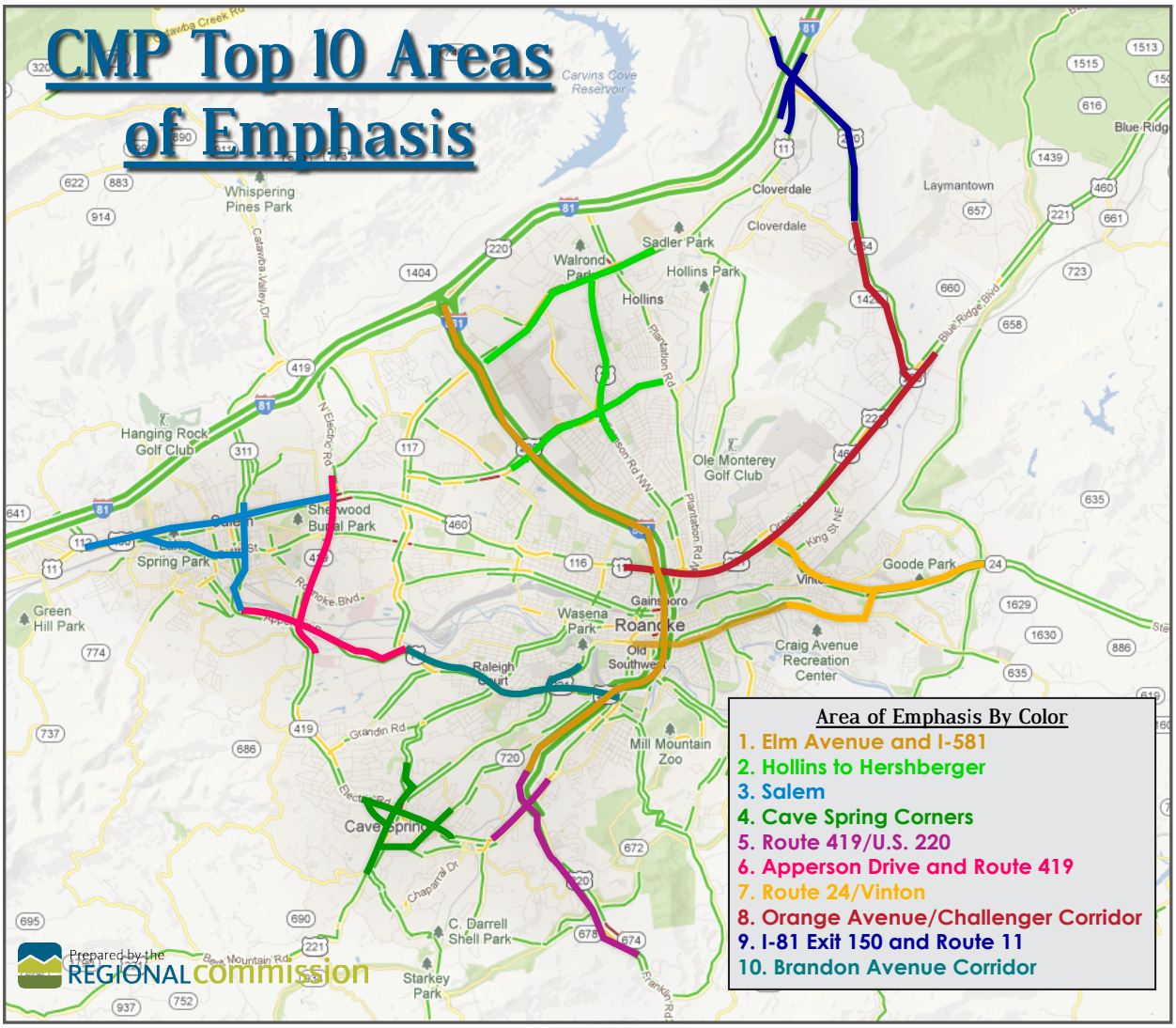
Public Transit
1. Congestion
2. Strategies
3. Performance Monitoring

Non-motorized Transportation
1. Congestion
2. Strategies
3. Performance Monitoring

The 10 CMP Areas of Emphasis

(Not necessarily in order of priority)

1. **Elm Avenue and I-581**
2. **Hollins to Hershberger**
3. **Salem**
4. **Cave Spring Corners**
5. **Route 419/U.S. 220**
6. **Apperson Drive and Route 419**
7. **Route 24/Vinton**
8. **Orange Avenue/Challenger Corridor**
9. **I-81 Exit 150 and Route 11**
10. **Brandon Ave. Corridor**



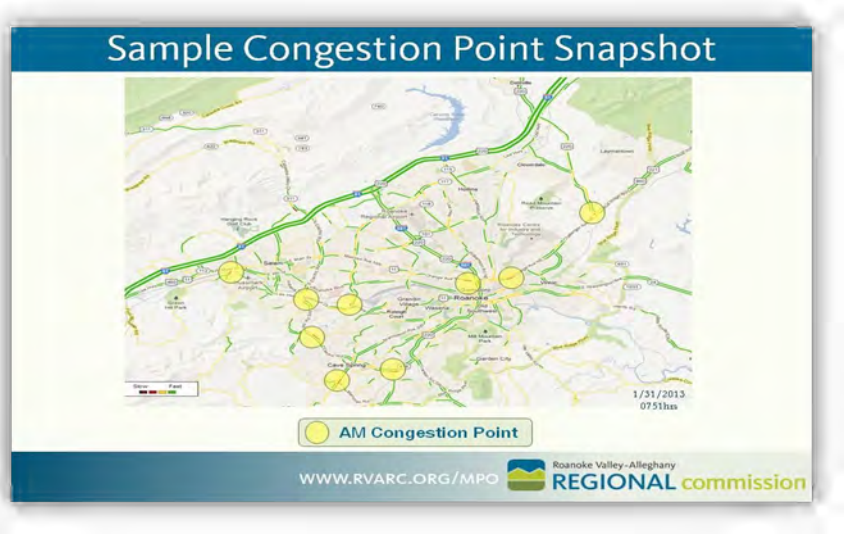
In addition, we have included a "watch list" of other areas that were noted or identified during the process of compiling the areas of emphasis. These areas will be monitored for consideration in future updates to the CMP Plan.

- Towers/Colonial Area
- Peters Creek Corridor
- Hershberger/Valley View Area
- Williamson Road
- I-581 Exits
- Downtown Roanoke
- Route 311
- Route 11/460 West of Salem

4. Regional Objectives

The Roanoke Valley Area Metropolitan Planning Organization (RVAMPO) became a Transportation Management Area (TMA) MPO as a result of Census 2010. As such, this plan is the first ever Congestion Management Process (CMP) Plan for the RVAMPO Study Area. Since the RVAMPO TMA Study Area is relatively small, 210,111 in population, compared to large metropolitan areas, conventional definitions of congestion and conventional congestion reduction strategies may not always apply to the RVAMPO. Additionally, some data sets that other TMA MPOs employ in their CMP Plans may not be available for the RVAMPO Study Area. Therefore, RVAMPO planners used a mixed methodology to identify congestion hot spots and implicitly define congestion for the region. The mixed methodology combines data, information and/or input from the following sources:

Google Traffic Live Traffic Snapshots: Google provides live traffic coverage for the RVAMPO area based on aggregate location data from Android phones. Essentially, Android phones on the transportation system serve as anonymous traffic probes. This information is packaged in visual format and RVAMPO staff have taken a series of "snapshots" to identify congestion patterns.



Volume over Capacity (V/C) Ratios from the RVAMPO Constrained Long-Range Transportation Plan 2035 (CLRTP 2035): The RVAMPO CLRTP 2035 reports 2005 "Base Year" V/C ratios and estimated 2035 "Study Year" V/C ratios for the CLRTP 2035 network.

Public Involvement, Surveys and Social Media: RVAMPO planners have asked the public to tell us where they experience congestion through various channels including Survey Monkey surveys and social media such as Facebook, Twitter and Linkedin. This provides an external view of congestion. If citizens perceive an area to be congested then they are experiencing congestion regardless of what the other data supports.

Fieldwork: The top congestion spots or facilities from the aforementioned mixed methodology analysis will be further investigated with fieldwork.

5. Defined Types of Congestion

a. Non-Recurring Congestion

The aforementioned methodology applies to recurring congestion that demonstrates a fairly consistent pattern. Non-recurring congestion is the result of accidents, the weather and other factors that don't follow a predictable pattern. The Federal Highway Administration (FHWA) estimates that up to 55% of congestion is non-recurring in nature *(Traffic Incidents 25%, Work Zones 10%, Weather 15%, other/Special Events 5%)*.

By definition, non-recurring congestion is difficult or impossible to predict. However, non-recurring congestion can amplify the effects of normal recurring patterns of congestion and delays can accumulate as a result. The best we can do at anticipating the effects of non-recurring congestion is to consider the impacts of established detours when there is an accident or other incident on a major facility such as Interstate 81. VDOT's Regional Incident Management Coordinator provided RVAMPO staff with the detour plans for Interstate 81. The I-81 Northbound Detour for Exit 140/141 is depicted below:

I-81 NB Detour: NO Exit 140 to SO Exit 141 (Salem District)

Incident Location: I-81 north of Exit 140 to south of Exit 141 (Roa noke)

Current detour hard route: northbound I-81, get off Exit 141 and make a left at the bottom of the ramp on VA-311 and continue through the traffic signal at VA-311 which turns into VA-419. Continue south to the Interstate bridge, after crossing the bridge make a left at the light to go north on I-81.

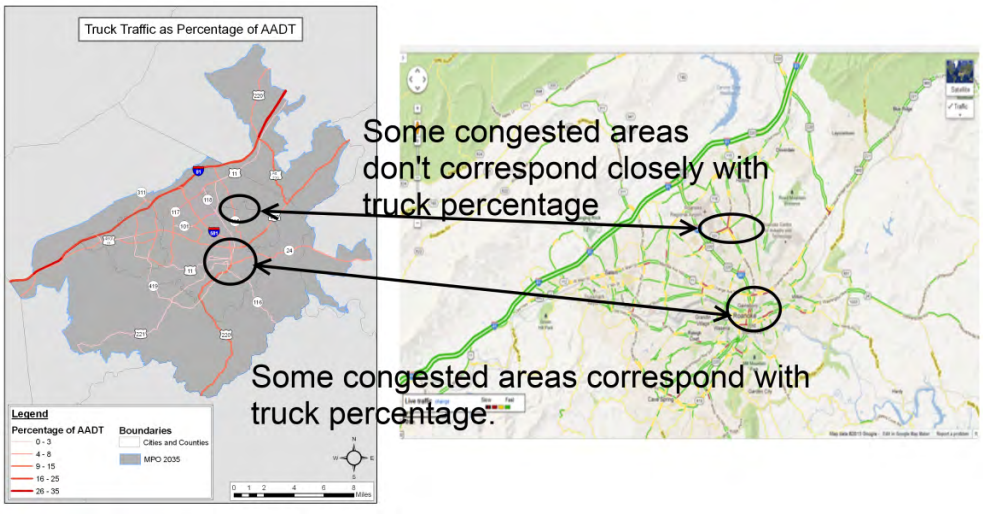
Non-recurring congestion will be evaluated by its potential interaction with recurring congestion. Potential detour routes will be compared to the top recurring congestion locations that are determined by the aforementioned mixed methodology.

b. Recurring Congestion

Recurring congestion is regularly occurring traffic congestion due to normal transportation demands such as work commutes. Recurring congestion demonstrates a somewhat regular pattern over time with peaks at particular times, such as the morning commute and evening commute. Recurring congestion is often contrasted with non-recurring congestion the latter which results from accidents, construction or other temporary disturbances to traffic flow.

c, Freight Related Highway Congestion

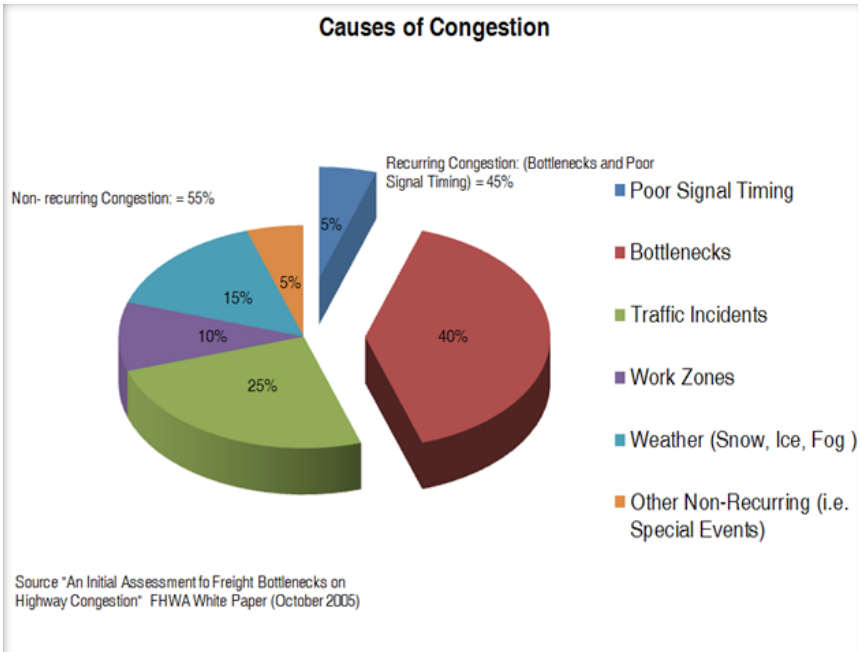
Private sector businesses increasingly rely on logistics, supply chain management and just-in-time delivery as key components in their business models and related strategies. All of these approaches rely on an uncongested transportation network in order to work. If congestion problems worsen in the future, traffic congestion would translate into economic losses to area businesses because of the supply chain management effects; and congestion could negatively affect regional economic development.



d. Transit Congestion

The current bus system functions as a hub and

spoke system. The hub is the Downtown Roanoke Campbell Court transfer center and the spokes are the many transit routes that connect at the facility. In order for the hub (Campbell Court) to function well, two factors are critical: people must intuitively understand how to transfer buses and people must physically be able to easily move throughout the facility. In part, the success of the current layout of the transit system relies on these factors related to Campbell Court. Presently, Campbell Court can be confusing to maneuver, even for seasoned riders, and excessively challenging for persons with disabilities, despite the continuous safety countermeasures taken on the part of the Greater Roanoke Transit Company (GRTC or Valley Metro).



The Campbell Court facility is at its maximum capacity. Buses that enter Campbell Court carrying a bicycle in the front bike rack must enter a separate drive aisle than the typical prescribed to that route, due to space restrictions in the main bays. This can be confusing to people waiting to board the bus since it is not definite that the bus desired will always be in the same location. To mitigate the confusion GRTC staff announce, over loud speaker, any changes in lane assignments and are present to direct riders to proper lanes. Likewise, while the buses are assigned to a bay, the order in which they enter the bay may vary depending on the time of day and traffic factors. With three buses to a bay, a person may wish to board a bus that may sometimes be the first in line, the second, or the third. This variability requires waiting passengers to be alert to the ultimate stop location of incoming buses and move to the appropriate boarding location for the desired route. In order to facilitate this, all GRTC buses display route numbers on the front, rear and sides of the bus; while destinations are clearly displayed on the front and sides of the bus.

Peak transit at Campbell Court

The landing areas for pedestrian movement are eight feet wide, which is the minimum required through the Americans with Disabilities Act to deploy a bus lift. With many transit users making transfers throughout the day, the narrow pedestrian spaces can easily become congested and hard to maneuver in the limited time available to make a transfer, particularly for slower moving older adults or an individual with a disability. Ramps located at the ends of the landing areas may sometimes be inadvertently blocked by buses not able to pull into the bay far enough due to limited space. Ramp users may then be required to find another ramp, sometimes at the opposite end of the landing area. Although the occurrence of blocked ramps is not commonplace, GRTC drivers are trained not to block ramps and additional safety

supervisors are on site, monitoring, to take corrective action when needed. Safety within the facility is a concern because of the multiple conflict points between pedestrians and incoming/outgoing buses. Both transit operators and transit users must be very alert when inside the facility. Pedestrians transferring between buses must walk across the bus bays in front of stopped buses to access their connection. GRTC has taken multiple countermeasures to promote passenger and pedestrian safety, through:

- Strict enforcement of a 5 mile per hour speed limit on all vehicles in the facility;
- The posting of warning signs throughout the facility--unless escorted by a GRTC staff member or supervisor, no passenger is permitted to approach a moving bus, following its departure;
- Movement of GRTC buses are regulated by a transit bus traffic light and the departure of buses is strictly coordinated by a road supervisor and lane assignment; and
- GRTC staff ensures the clearance of all bays and that pedestrians have boarded a bus, left the facility or have moved to a designated waiting area prior to bus departure.

The existing buses measure 96 inches wide. The new buses being fabricated to replace the current fleet are all 102 inches wide by industry standards. When Valley Metro gets its first shipment of nine replacement buses in 2014, space within Campbell Court will become even more constrained. It will not be until the following group of 10 replacement buses arrives that the facility could surpass a critical space threshold. The bus replacement as well as passenger rail service being extended to Roanoke, was sufficient rationale for the City of Roanoke and Valley Metro to plan for the future.

In 2014, a Downtown Multimodal Transportation Facility study will be undertaken by the City of Roanoke as part of funds allocated to the project through the Regional Surface Transportation Program. This study will consider the future space demands of Campbell Court and identify options for better accommodating buses and pedestrians as well as transfers between local buses and intercity buses (Greyhound) and intercity rail (Amtrak). The selected consultants will have experience in designing and siting intermodal transportation facilities, bearing in mind regional accessibility; and the consultants will recommend new or enhanced facilities on either the existing Campbell Court site or a new site with viable, intermodal accessibility.

The City of Roanoke, in its issuance of the Request for Proposal for Downtown Roanoke Intermodal Transportation Study, cited the study as:

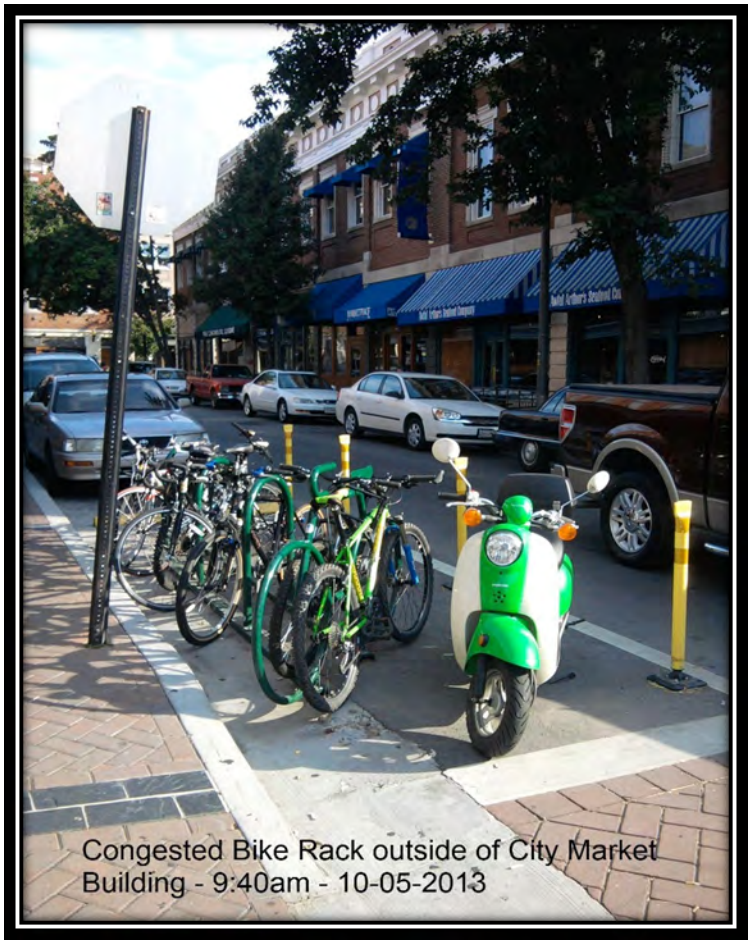
> *"an opportunity for an Intermodal transportation facility that arises from the proximity of the selected location of the future rail platform, GRTCs current transit hub at Campbell Court, and the relationship of both to other transportation modes."*

Aside from congestion experienced by transit users at Campbell Court, transit congestion can occur on buses themselves. If transit is to be one remedy for traffic congestion, there needs to be sufficient space on the bus to accommodate the intended number of users. The current system was designed to provide coverage to as much area of three jurisdictions as possible. Given its intent, it is natural that many routes will not experience heavy ridership through much of the day because the system was not designed for ridership, it was designed to provide access to a wide area. Nevertheless, the locations of some routes naturally lead them to greater ridership, due to their proximity to many jobs and individuals without cars (by choice or necessity). Specifically, XYZ routes at XYZ times currently experience congestion by XYZ measures. Measures of transit congestion are discussed later in this document.

e. Non-motorized Congestion

Congestion is generally a function or result of traffic volume exceeding roadway capacity at a given time. As most of the roadways in the MPO study area are 'shared' roadways (motorized and non-motorized) with limited designated or specific on-street bicycle accommodations, congestion has both direct and indirect impacts on non-motorized travel modes. However, congestion along a greenway or shared use trail can be created by several factors beyond volume (i.e., number of users at a given time). Contributing factors include but are not limited to:

- Uses (e.g., commuting, recreation, exercise)
- Hourly, daily, and seasonal user patterns
- Mode split (cyclist, pedestrian, other)
- Travel mode speed differential
- User behavior
- Greenway trail design and operation
- Level of enforcement of trail use policies


Congested Bike Rack outside of City Market Building - 9:40am - 10-05-2013

Understanding the diversity of greenway users (current and future) and associated uses (commuting, recreation, exercise) can assist in designing, maintaining, and operating shared use paths in a manner that accommodates user volumes and mode mixes (pedestrian, bicycle). Possible methods to mitigate both volume induced congestion as well as user conflicts caused by mode split and user behavior include but are not limited to:

- Trail design
- Centerline striping
- 'Congestion pricing' of special event user fees (i.E. Use of 'open space' fees charged by parks and recreation department to discourage 'special events' at peak user times and locations)
- Encouraging use of lesser used greenways and trails open space use permits and fees
- User counts (i.E., Regional greenway and trail user count program)
- User etiquette
- User education and outreach
- Increased enforcement of trail use policies

6. CMP Areas of Application

a. RVAMPO Highway

RVAMPO highway congestion areas of emphasis were determined using a three step methodology:

1. **Public Input** - RVAMPO planners asked citizens using a variety of online surveys and social media strategies to indicate where they experienced congestion.
2. **Google Traffic Analysis** - Google monitors anonymous cell phone system data to determine real time traffic conditions using a proprietary algorithm. The real time traffic congestion is communicated using a color coded may of red, yellow, orange and green to indicate traffic congestion. RVAMPO planners took a series of Google Traffic screenshots at various times during the day over a several month period, in order to have a visual data inventory of traffic conditions to analyze. RVAMPO planners then analyzed the number of occurrences of traffic congestion at various spots to indicate areas of emphasis for the CMP Plan.
3. **Field Verification** - RVAMPO planners visited the top locations indicated by the Google Traffic Analysis step in order to corroborate the indicated traffic congestion.

Steps 1 - 3 were used in conjunction to arrive at the top 10 congestion areas of emphasis which will serve as the traffic congestion areas of discussion throughout this plan.

The first effort to engage the public consisted of an open ended survey via Surveymonkey.com. Surveys were accepted from 7/09/12 thru 8/09/12. Participants were targeted using various methods of outreach which included social media campaigns on Twitter, Linkedin, and Facebook. As a result, 221 individuals from around the region responded. Participants were asked to answer the following questions:

1. Where are the most congested areas in the Roanoke Valley? (Congestion occurring in a general area or corridor of heavy traffic.)
2. Where do you think the worst congestion problems will be 10 years from now?
3. Where are the worst bottlenecks in the Roanoke Valley? (A bottleneck is a specific point or intersection that suffers from poor traffic flow.)
4. Where do you think the worst bottlenecks will be in 10 years?

The open-ended responses were compiled and then grouped into zones throughout the urbanized area. The chart below indicates what the Top 10 Congested Areas and the Top 10 Bottleneck Points (Top 10 are highlighted in yellow).

During our subsequent public input surveys, we asked respondents a variety of questions to continue gauging the sources of congestion, bottlenecks, and their perceived severity. Ongoing efforts to solicit feedback, such as a Regional Congestion Satisfaction Survey, will be a part of the long-term strategy in updating the CMP Plan and further assessing potential hot spots that may not be apparent.

In addition to the Public Input surveys, the Google Traffic Snapshots provided real-time insights into the congestion areas. RVAMPO staff collected snapshots of the region three times a day for over 75 days. Snapshots were taken during the morning rush hour (8 a.m. EST), noon, and evening rush hours (5:15 p.m. EST). This new concept of data collection for a CMP Plan has, to our knowledge, not been tried before. While there are other areas that were highlighted and discovered during our research, the following list represents the 10 Areas of Emphasis that were most prominent:

The 10 CMP Areas of Emphasis

(Not necessarily in order of priority)

1. **Elm Avenue and I-581**
2. **Hollins to Hershberger**
3. **Salem**
4. **Cave Spring Corners**
5. **Route 419/U.S. 220**
6. **Apperson Drive and Route 419**
7. **Route 24/Vinton**
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9. **I-81 Exit 150 and Route 11**
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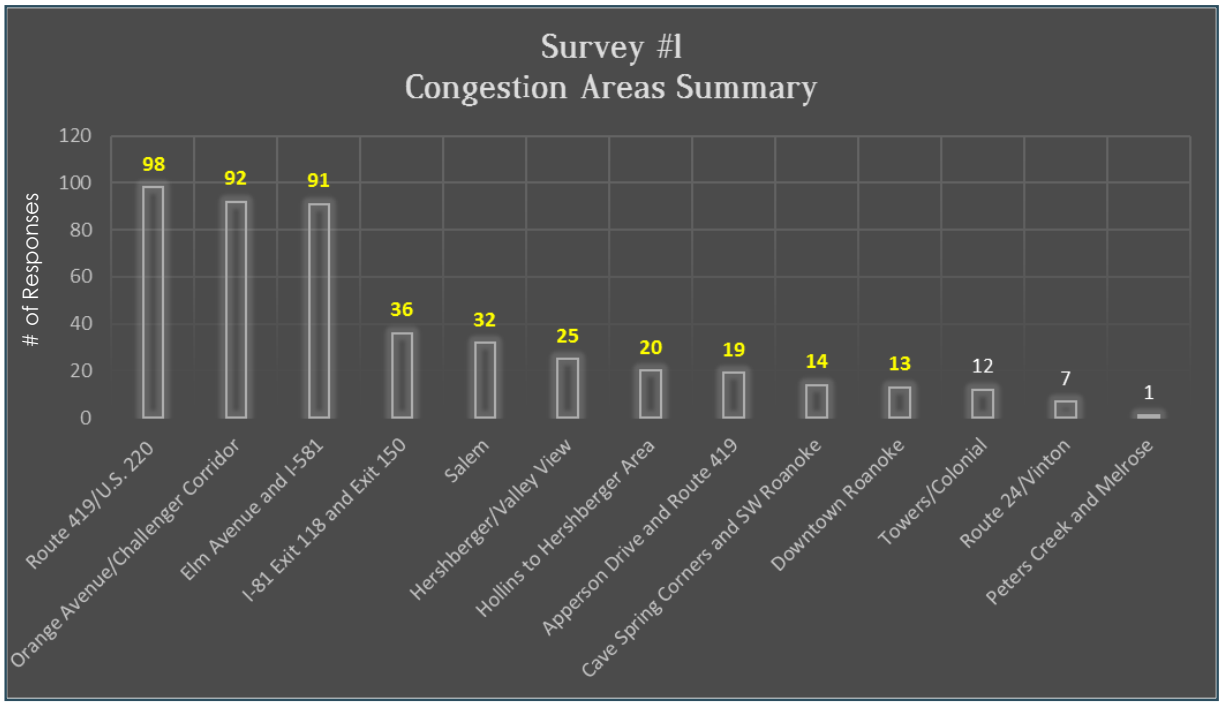
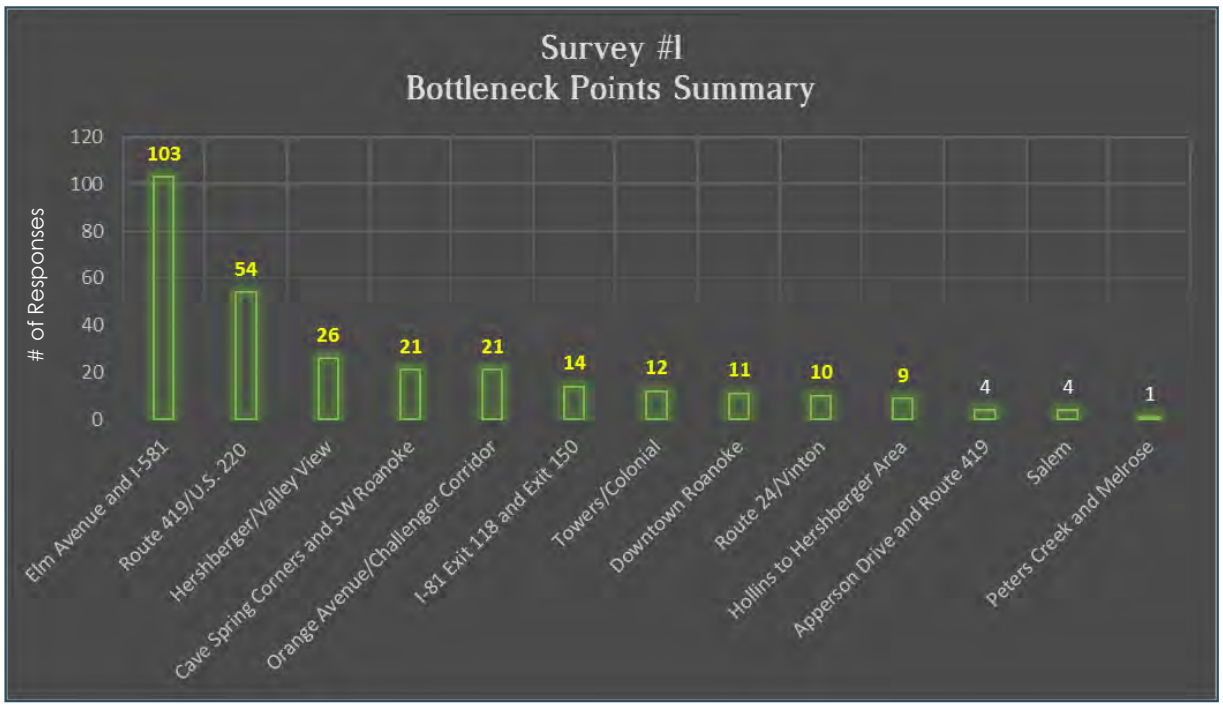




In addition, we have included a "watch list" of other areas that were noted or identified during the process of compiling the areas of emphasis. These areas will be monitored for consideration in future updates to the CMP Plan.

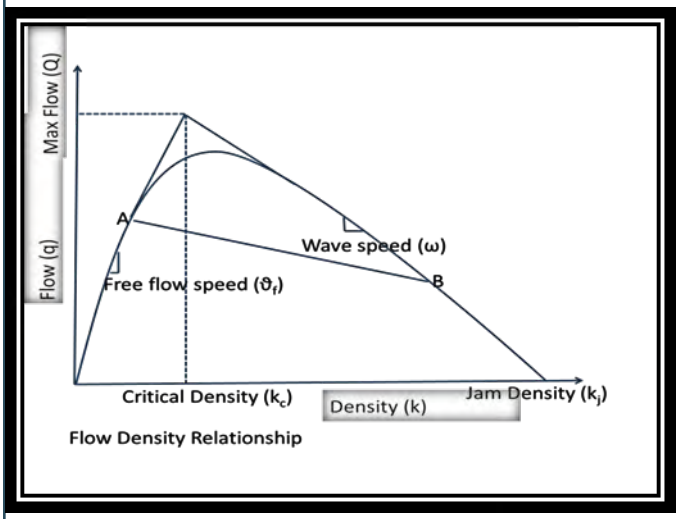
- Towers/Colonial Area
- Peters Creek Corridor
- Hershberger/Valley View Area
- Williamson Road
- I-581 Exits
- Downtown Roanoke
- Route 311
- Route 11/460 West of Salem

b. RVAMPO Transit

Public transportation (transit) can substitute for traffic congestion by taking single occupancy vehicle (SOV) trips off the road; and transit can be congested itself when a vehicle has more patrons than seats - standing room only.

Citizens and other stakeholders often ask how much of a difference shifting trips from private vehicles to buses will make in overall traffic congestion. They often ask: if only 1% or 2% of current automobile trips shift to public transit, bicycle or other non single-occupancy-vehicle (SOV) modes of transportation; how will that help? The answer lies in the fact that when a roadway is near congestion the relationship between vehicles and congestion is not linear; rather it is depicted by the Flow Density Relationship Chart depicted to the side.

Past the "Critical Density" even a 1% improvement (reduction) in density can improve the traffic situation by more than just 1%. It is natural that people's everyday experience encourages them to think in linear one-to-one terms. When traffic conditions are near the critical density threshold this can become a "linear thinking fallacy" that obscures potentially helpful strategies such as diverting a portion of trips to public transit, carpool or bicycle. This is the main reason that this multimodal CMP plan includes adequate discussion of public transit and non-motorized (bicycle, pedestrian, greenway trail) approaches to helping reduce traffic congestion on nearby roadways.



(source http://en.wikipedia.org/wiki/File:Flow_Density_Relationship.png)

In many cases the ***Flow Density Relationship Chart*** may not be the best way to illustrate the potential for both public transit and non-motorized transportation approaches to alleviate traffic congestion by taking vehicles off the road. The following set of images, courtesy of the Thomas Jefferson Planning District Commission (www.tjpdc.org) may better illustrate the opportunity. The exact same number of people are accommodated in the following series of images representing a bus, cars, people in chairs separated by the distance of a car, and people walking respectively.

c. RVAMPO Non-Motorized Transportation:

Non-motorized transportation (Pedestrian, Bicycle, Greenway Trail) can substitute for traffic congestion in a similar way as discussed in the previous section by taking single occupancy vehicle (SOV) trips off the road; and non-motorized facilities can become congested themselves primarily through user conflict on the facility. Although it is not often the case that pedestrian or bicycle facilities are congested in the traditional sense of pedestrians being

Images Courtesy of the Thomas Jefferson Planning District Commission- tjpdc.org

crowded shoulder to shoulder, there can be an equivalent effect that arises out of user conflict of movement due to a variety of facility uses. A simple illustrative example would entail a section of greenway that has runners, bicyclers, mothers pushing strollers, recreational walkers, rollerbladers and families walking dogs using the greenway at the same time. The conflict between the different needs of these users would create a non-motorized version of traffic congestion.

Each of the aforementioned 10 areas of emphasis will be evaluated with regards to pedestrian and bicycle accommodations' potential to alleviate the traffic congestion already documented (substitution), and for any indication whether nearby bicycle and pedestrian facilities experience congestion themselves through user conflict on routes that serve the areas of emphasis.

d. Air Quality Benefits of Traffic Congestion Reduction:

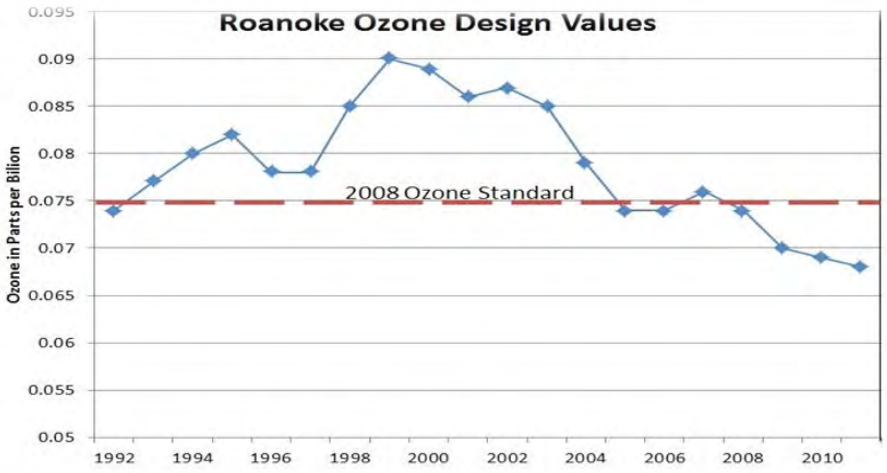
In 1997, the Environmental Protection Agency (EPA) made an amendment to the Clear Air Act's National Ambient Air Quality Standards (NAAQS). The amendment essentially replaced the 1-hour ozone standard with a more stringent 8-hour standard. In the late 1990s the ozone levels taken at an air quality monitor in the Roanoke area had exceeded the newer 8-hour standard. Due to these high ozone levels, the RVAMPO and its member localities worked with the Virginia Department of Environmental Quality (DEQ) to establish a nonattainment boundary for the Roanoke area. This agreed upon boundary encompassed the entire Roanoke Metropolitan Statistical Area (1990 definition – Counties of Roanoke and Botetourt, Cities of Roanoke and Salem and Town of Vinton.) The EPA required that all areas exceeding the new standard establish a nonattainment boundary and submit it to them for review. The recommended boundary for the Roanoke area was submitted along with the others from around the Commonwealth of Virginia in June 2000.

In the fall of 2002 the EPA extended an opportunity to regions which were to be designated nonattainment under the 8-hour standard, but which were in attainment for the previous 1-hour standard, to pursue an Ozone Early Action Compact (EAC) followed by an Ozone Early Action Plan (EAP). This opportunity extends from a protocol that was developed in EPA's Region 6 and subsequently extended through administrative action to other EPA Regions in the country. The RVAMPO is located in EPA's Region 3.

The EAC is essentially an agreement between local governments, the DEQ and the EPA to pursue an Ozone EAP before an air quality plan would have been otherwise required under traditional nonattainment designation. The EAP must incorporate the same scientific rigor as the traditional approach and the EAP will be incorporated into the State Implementation Plan (SIP).

In early March 2008 the Federal EPA revised the nationwide 8-hour Ozone Standard to 75 parts per billion (ppb) based on a three-year average. The Roanoke Region's three-year average for the 2006, 2007 and 2008 Ozone seasons were at 74 ppb, within the new nationwide standard.

In the Spring and Summer of 2011, the Federal EPA postponed a new adjustment of the nationwide 8-hour Ozone Standard until 2013. The Federal EPA has stated that the primary 8-hour Ozone Standard will be revised to a final value somewhere within the range of 60 ppb to 70 ppb. The Federal EPA asserts that the final standard will be set sometime in 2013. As of the writing of this document, the Federal EPA has not yet set the final 8-hour Ozone standard.



Recent trends in ground level ozone for the Roanoke Valley

When motorized vehicles are stuck in traffic congestion it contributes to poor regional air quality. The traffic congestion reduction strategies discussed later in this plan, have the added benefit of helping to improve regional air quality.

e. Partnership for a Livable Roanoke Valley

A parallel and complementary planning process is currently being conducted by the Partnership for a Livable Roanoke Valley (http://livableroanoke.org/). The Roanoke Valley-Alleghany Regional Commission provides fiscal agency and lead staffing services to the Livable Roanoke effort. Background information and the purpose of the effort is summarized below:

> *The Partnership for a Livable Roanoke Valley seeks to promote economic opportunity and a greater quality of life for all Roanoke Valley residents through the development of the Valley's first coordinated regional plan. The goal of this effort is to promote economic opportunity and a greater quality of life for all Roanoke Valley residents.*
>
> *More than 50 organizations, including local governments, nonprofits, businesses and educational institutions are already involved in the Partnership. Citizen input guides our goals and informs the content of the Partnership's regional plan – those who live in the Roanoke Valley know what is best for the Roanoke Valley.*
>
> *To stimulate local economies and job creation, and to continue making the Roanoke Valley one of America's best places to live and raise a family, we're adopting a problem-solving approach to addressing the key issues affecting the region.*
>
> *The Partnership is undertaking a coordinated, regional planning process to ensure the long term economic, social, and environmental well-being of the Roanoke Valley. Central to the process will be identifying how local governments, businesses, and nonprofits can bring together their separate efforts to address issues of mutual concern. The plan will also identify opportunities that these entities have to become eligible for funding from the three federal agencies participating in the Partnership for Sustainable Communities (EPA, HUD, & USDOT). It will also include an evaluation of current barriers that may exist due to conflicting federal statutes or uncoordinated program directives.*
>
> *(source:* http://livableroanoke.org/?page_id=43 and http://livableroanoke.org/)

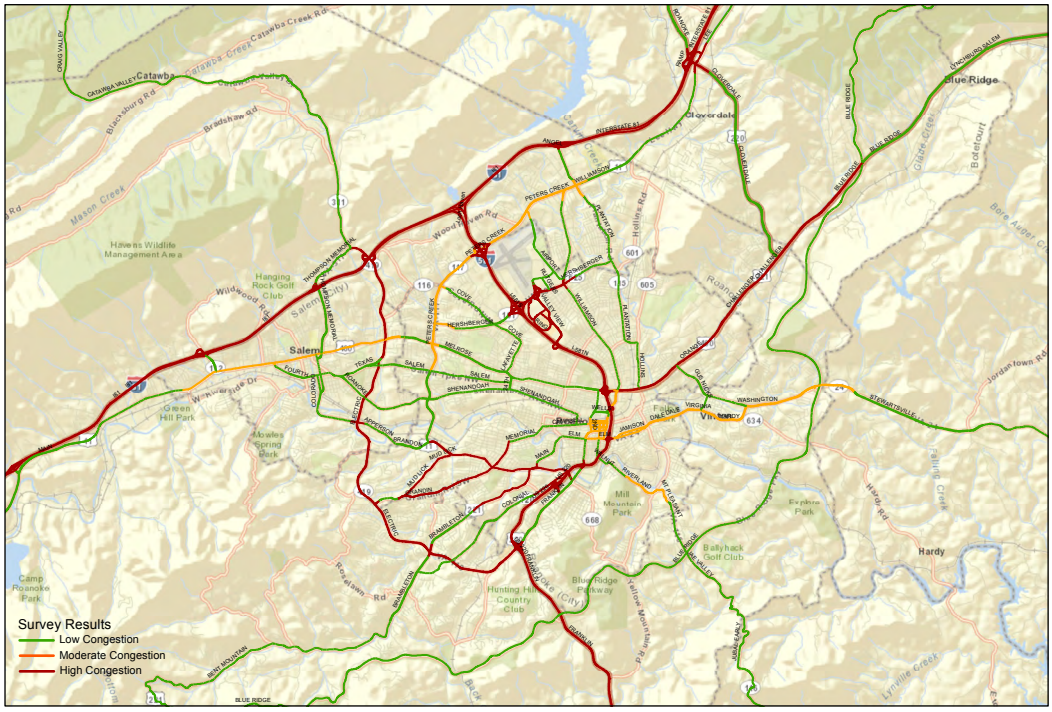
The Livable Roanoke planning process is anticipated to be completed by early 2014. It has already produced useful data and maps for incorporation into this CMP Plan. The following map relates employment density to the availability of public transit.

Of particular interest are areas of high employment density that are not currently served by public transit. Public transit has no opportunity to substitute for traffic congestion in the manner previously discussed using the Flow Density Relationship Chart. The following Areas of Emphasis fall into this category and may be candidates for future public transit service extensions to be discussed in "Section 6 - Identification and Evaluation of Strategies" of this report.

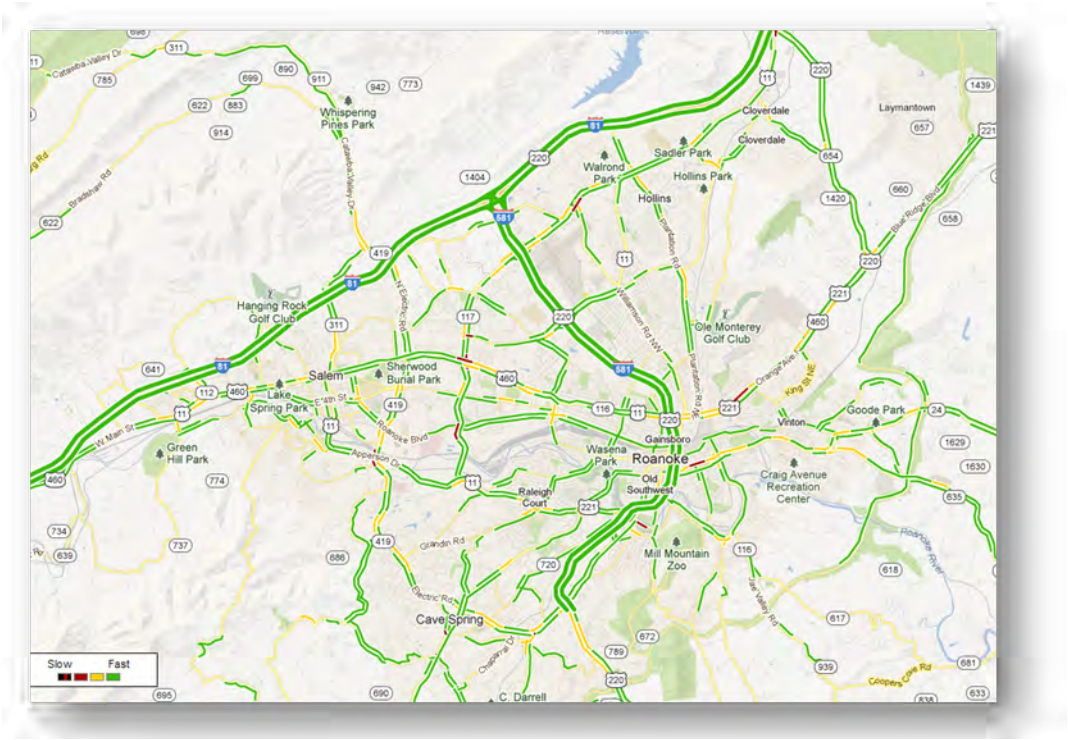
7. CMP Transportation Networks

a. RVAMPO Highway Network *(Proposed January 2013)*

Proposed Congestion Network

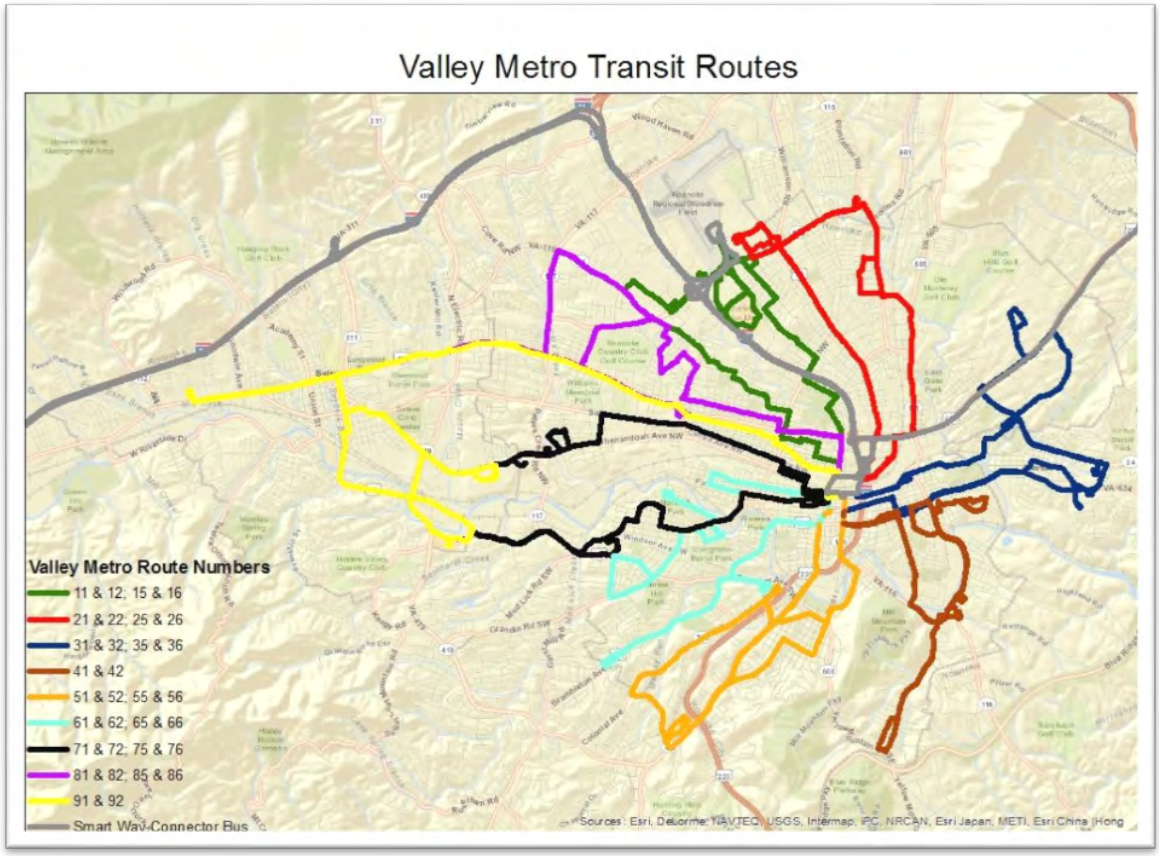


The data source that matches the CMP network more closely than any other data available to RVAMPO planners is Google Traffic. An example of a Google Traffic snapshot that corresponds to the CMP Highway Network follow:



b. RVAMPO Transit Network:

Data from the Census indicate approximately .6% of residents in the RVAMPO area commute to work via public transit. The map below reflects the present Valley Metro fixed route transit network.

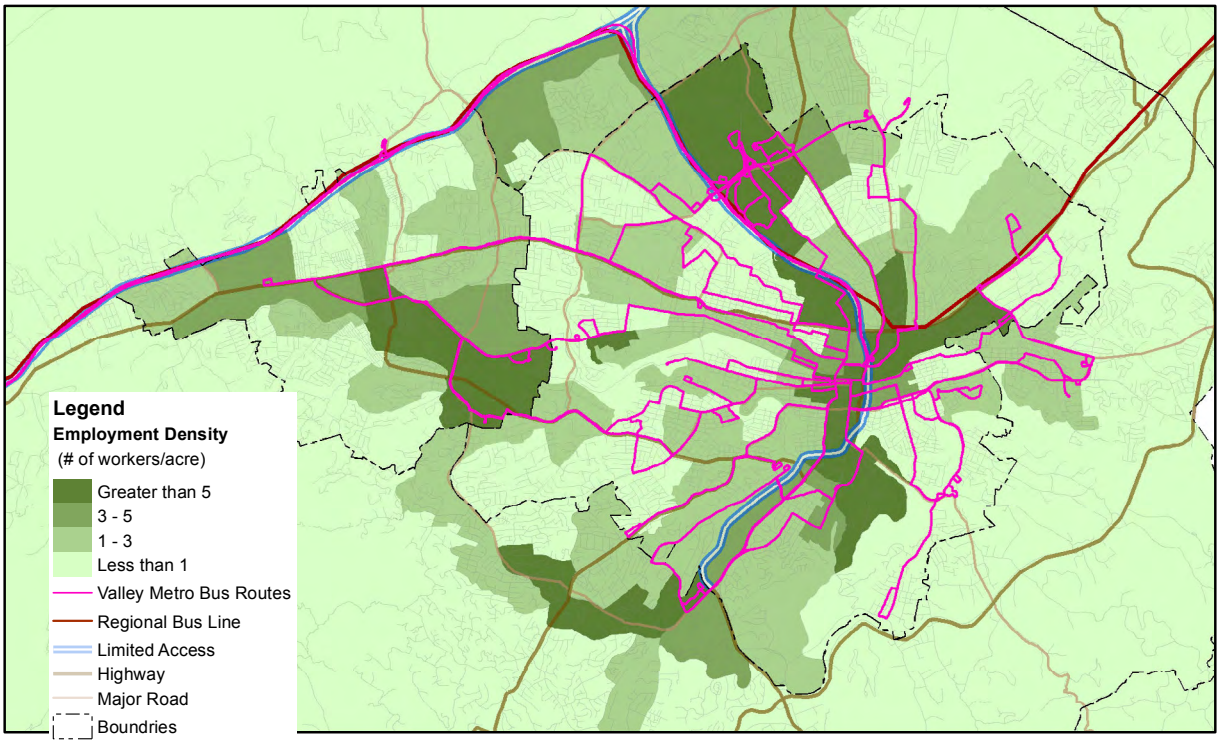


The current transit network does not reflect the areas of high congestion as shown previously in the diagram "Proposed Congestion Network". In order for transit to assist with alleviating the traffic in moderate to high congestion corridors (such as Route 419, Orange Avenue, I-581, U.S. 220, Peters Creek Road and Brandon Avenue), the transit system will need to be modified to reflect the real travel patterns within these corridors.

Given this new regional focus on traffic congestion the current transit network, when it was designed many decades ago, was not planned with the intent of alleviating traffic congestion. The current network was designed to provide service within three localities: City of Roanoke, City of Salem, and the Town of Vinton. The limits of the present transit service are not sufficient to assist with easing traffic congestion today much less in the future. The Virginia Department of Rail and Public Transportation's Statewide Transit and Transportation Demand Management Update identified the Hollins and Cave Spring areas as currently lacking sufficient transit service based on the 2010 population density. If transit is to be a strategy for managing traffic congestion in addition to providing people with an alternative way to get around, it will be necessary to re-evaluate the transit system as a regional service for the entire TMA.

In addition, the Partnership for a Livable Roanoke Valley has compiled the a map detailing regional employment centers and how the current transit system supports access to them. Some areas of high job density, like the Blue Hills Industrial Park, which falls within the Orange Ave./Challenger Corridor are not currently accessible via the current transit network.

c. CMP Non-Motorized Network



Source: Longitudinal Employer-Household Dynamics 2010; RVARC 2013

0 1.25 2.5 5 Miles

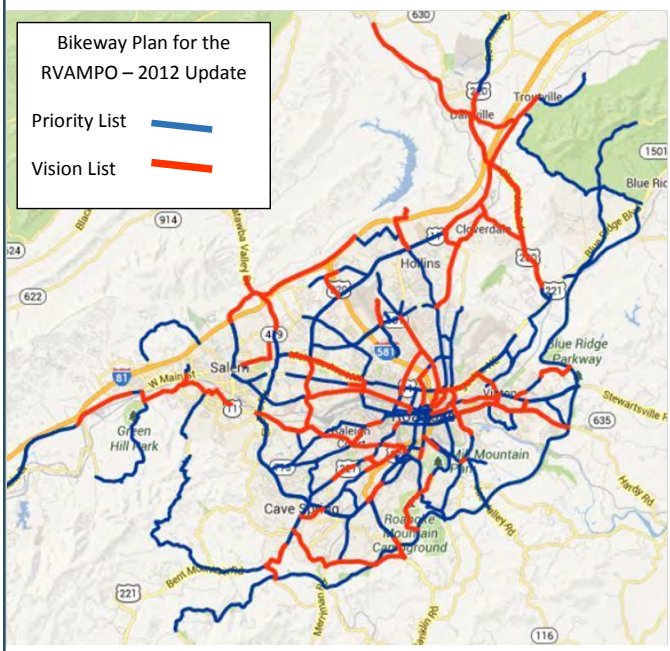
1 inch = 2.5 miles

Figure 3
Public Transportation And Job Centers

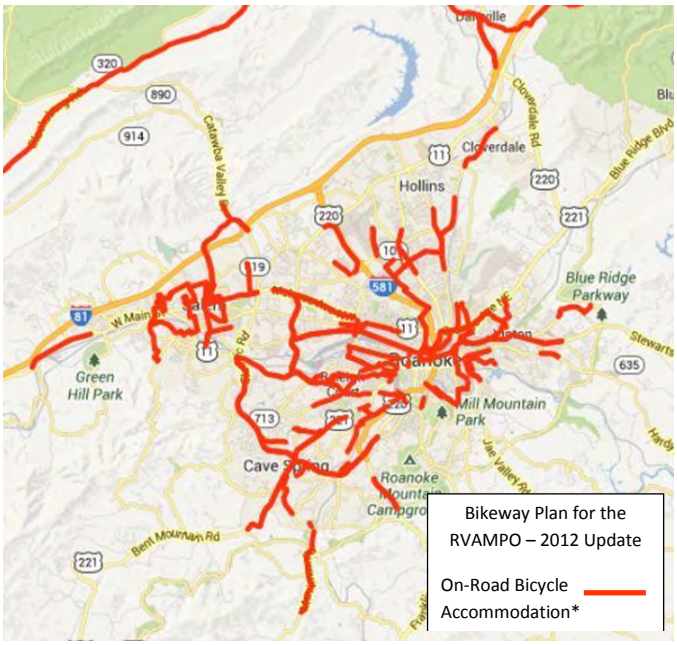
Livable Roanoke Valley

Date created: 7/3/2013

The Bikeway Plan for the RVAMPO - 2012 Update



Bike Routes- 2012 Update



8. CMP Performance Measures

The RVAMPO CMP Plan uses a balanced approach to performance measures. The 10 primary performance measures are classified into three groups:

1. Traffic congestion, volume or flow performance measures (measures 1-4).
2. Public perception/sentiment performance measures (measure 5)
3. Transportation modes that substitute for and alleviate vehicular traffic congestion (measures 6 through 10).

As such the RVAMPO CMP performance measures are multimodal in nature and do not exclusively focus on traditional vehicular traffic congestion.

a. Primary Traffic Congestion Performance Measures:

1. **AADT** (on selected routes near the 10 congestion areas featured in the RVAMPO CMP Plan) – Average Annual Daily Traffic (AADT) is a measure that indicates the daily volume that the transportation facility experiences. An upward trend indicates the potential need for mitigation measures.
2. **Volume over Capacity ratio and/or Level of Service** (on selected routes near the 10 congestion areas featured in the RVAMPO CMP Plan) – V/C ratios and or LOS are similar measures. V/C is from the supply perspective – i.e. Is the traffic volume above or below the facility's capacity? – and LOS is from the user perspective – i.e. What is the Level of Service the user is experiencing? The RVAMPO CMP will use both as performance measures when available from the Constrained Long-Range Transportation Planning (CLRTP) Process or similar endeavors.
3. **Average Travel Time** (as determined by American Community Survey, Longitudinal Employer-Household Dynamics On the Map or similar sources at the locality level).
4. **Peak Hour Volume** (on selected routes near the 10 congestion areas of emphasis featured in the RVAMPO CMP Plan) – as available.

b. Public Sentiment Performance Measure:

5. **Percent of the population reporting being satisfied or highly satisfied with travel conditions?** (As determined by recurring surveys to a wide variety of citizens - not necessarily statistically sampled.)

c. Substitutes For Vehicle Trips Performance Measures:

6. **Annual Vehicle** (Public Transportation) **Revenue Miles Per Capita** - System Wide
7. Annual Passenger (Public Transportation) **Miles Traveled Per Capita** – System Wide
8. Number of Park and Ride Lots and their occupancy rates in RVAMPO Study Area
9. **Number of Bicyclists by Location in RVAMPO Study Area** (as determined by annual NBPD count locations and day administered by RVARC).
10. **Number of Greenway Users by Location in RVAMPO Study Area** (as determined by RVARC's on-going automated greenway count program).

d. Additional CMP Transit Performance Measures:

The following list reflects the adopted RVAMPO Transit Usage Performance Measures *(Performance measures already included in the above list of 10 performance measures were omitted)*.

- Annual Unlinked Passenger Transit Trips
- Annual Unlinked Passenger Transit Trips Per Capita
- Annual Passenger Miles Traveled
- Annual Smart Way Connector Bus Ridership

These transit measures will need to be updated as MAP-21 performance measures develop and as the Commonwealth of Virginia modifies its statewide transit-related performance measures.

While public transit is a good option for alleviating traffic congestion, it is not attractive if buses themselves are congested. Additional measures may be desirable that evaluate congestion on transit to identify any routes by time of day that experience congestion and would need improved service such as higher capacity buses or more frequent service. Additional coordination with Valley Metro is needed to determine if performance measures such as on-time performance and passenger crowding would be feasible measures to assess.

Examples of such measures:

- ***On-Time Performance-*** Bus Timepoint Test for Walk-Up Service: Applied to routes that operate every 10 minutes or less in which a customer can arrive at a stop without looking at a schedule and expect only a short wait. Only the Trolley service currently would fall under this measure. In this test, the trolley must arrive at the destination timepoint within 20 percent of the scheduled run time.
- ***On-Time Performance-*** Bus Route Test: This test would determine whether or not a route is on time by measuring the proportion of timepoints on the routes that are on time. According to this test, 75 percent of all timepoints on the route must be on time as scheduled over the entire service day.
- ***Passenger Crowding-*** A ratio of the number of passengers to the number of seats on the vehicle. A value at or above the established threshold indicates crowded conditions. Examples of such thresholds include 1.0 passengers per seat or 1.1 passengers per seat during commute periods. Such thresholds would first need to be established by Valley Metro as part of a Service Delivery Policy.

e. RVAMPO Annual Performance Measures Report

As of 2012 the RVAMPO is now required by VDOT to track regional performance measures to evaluate the region's transportation system against its transportation goals and standards and contribute to the Statewide Transportation Plan. This is a new requirement since RVAMPO became a Transportation Management Area Metropolitan Planning Organization (TMA MPO). RVAMPO will be eligible for funding through sources only available to TMA MPOs and receipt of those funds is contingent upon the MPO's development, and the Commonwealth Transportation Board's approval, of the regional performance measures.

In the Performance Measures Report, regional performance measures fall under the categories of: Congestion Reduction; Safety; Bicycle and Pedestrian Facility Usage; Transit Usage; HOV Usage; Jobs-to-Housing Ratio; Job and Housing Access to Pedestrian Facilities; Air Quality; and Movement of Freight. For purposes of relevance to the CMP Plan, the following RVAMPO performance measures should be monitored: Congestion Reduction section as it relates to non-motorized forms of congestion; Safety section for non-recurring forms of congestion; and Transit Usage section for comparing and monitoring transit strategies.

Upon the regional adoption of the CMP Plan, the RVAMPO may see the utility of echoing the performance measures contained herein, or incorporating new non-motorized and transit-

related measures into the annual update of their report.

The "10 Primary Performance Measures" for the CMP Plan are listed in section 4 of this report along with additional optional performance measures. The more expansive RVAMPO Performance Measures Report will serve as a barometer to indicate signs of impending congestion and thus signal the need for a possible CMP Plan update in the future. The RVAMPO Performance Measures Report applies to all of the transportation planning processes and plans of the RVAMPO and not just this report exclusively.

9. CMP Performance Monitoring Plan

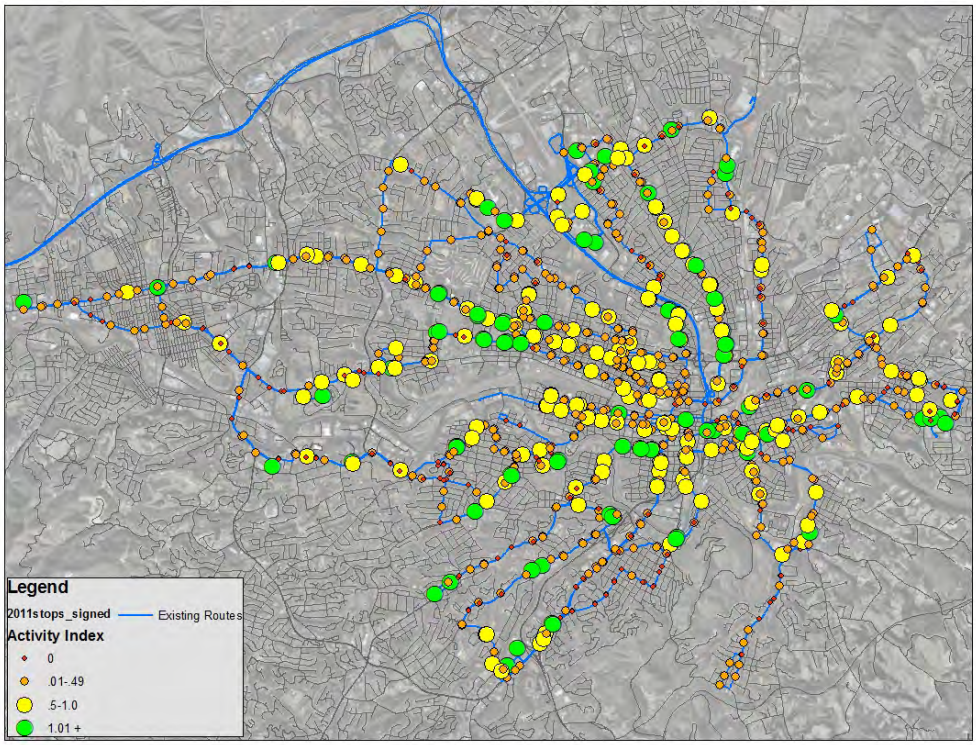
The CMP Plan **will not** be updated every year in its entirety. It is likely that the CMP Plan will be updated every four to six years in years in which the Constrained Long-Range Transportation Plan (CLRTP) is not being updated, so that the CMP Plan can benefit from the most recent CLRTP and serve as input into the next CLRTP.

Nonetheless, there will be routine performance measuring activities and review process that allow planners to monitor the system for any serious traffic congestion problems or unanticipated anomalies. From a highway perspective, planners will do the following on a yearly basis:

1. Repeat the congestion perception surveys to gauge public perception of traffic congestion.
2. Repeat the Google Traffic Snapshots for one week (either in Spring or Fall) and analyze for any deviations in traffic congestion from this CMP Plan.

a. Transit Performance Monitoring Plan

CMP Transit Performance Monitoring Plan will consist of collecting and analyzing the National Transit Database (NTD) survey data every three years. This is a three-year endeavor that RVAMPO staff is already engaged in with the Greater Roanoke Transit Company (Valley Metro) for carrying out and analyzing the data. One result is a Bus Stop Activity Index as depicted below. The activity index indicates the most active bus stops on the system and consequently those stops' routes with the greatest potential to help address traffic congestion by diverting trips onto transit and/or those routes and stops that are good candidates for increased transit service due to possible overcrowding on the transit vehicles themselves.



b. Non-motorized Performance Monitoring Plan:

CMP Non-motorized Performance Monitoring Plan will involve the following activities:

1. Regional Greenway and Trail Users Count Program (ongoing)
2. National Bicycle and Pedestrian Documentation Project (NBPD) (annually)

1. Regional Greenway and Trail Users Count Program

The Regional Greenway and Trail User Count Program, initiated in 2009, uses TRAFx (www.trafx.net) automated counters (infrared and magnetic) to collect use data for area greenways and trails. The goal of the Regional Greenway and Trail User Count Program is to obtain current, accurate, ongoing, and continuous use greenway and trail use data for general planning, maintenance, and management purposes, and to compare baseline data to future use as the greenway network is expanded, connected, and promoted.

The following data are collected as part of the program:

- Total counts
- Date and time of each count
- Hourly, daily, weekly, and yearly use totals and averages

Currently user counts are being conducted at the following locations:

- Lick Run Greenway - at 10th Street
- Lick Run Greenway - at I-581/Valley View Mall
- Mill Mountain Greenway - near top of Mill Mountain
- Murray Run Greenway - near tennis courts
- Roanoke River Greenway - near Rivers Edge Sports Complex
- Roanoke River Greenway - between Memorial Ave and Bridge Street
- Roanoke River Greenway - Moyers Sports Complex - Salem
- Tinker Creek / Roanoke River - at Underhill / Regional Water Pollution Control Center

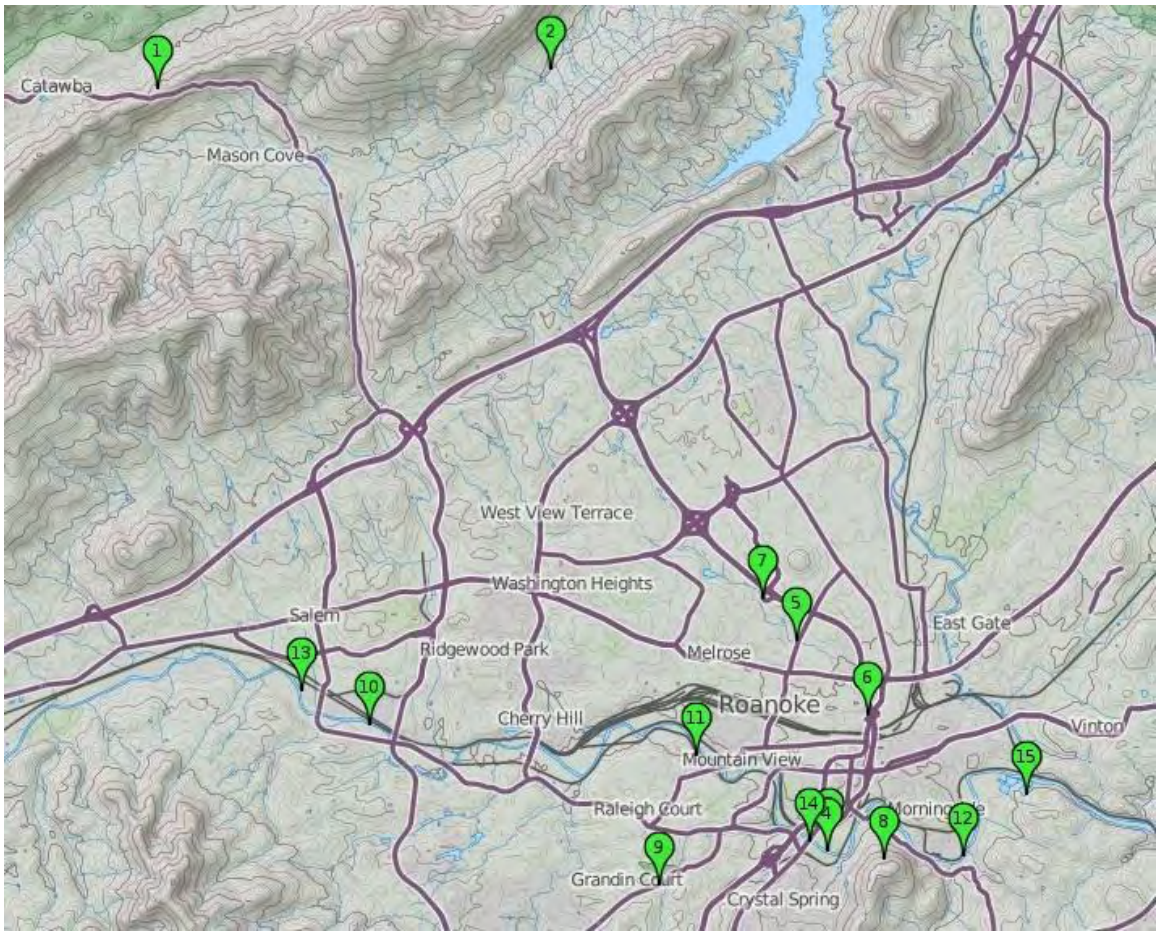
Past count locations include:

- Carvins Cove Natural Reserve - Four Gorges Trail
- Appalachian Trail (between Route 311 parking lot and McAfee's Knob)
- Lick Run Greenway - at Commonwealth Avenue
- Roanoke River Greenway - West Riverside Drive
- Roanoke River Greenway - near IGA

Although managed by the Roanoke Valley-Alleghany Regional Commission, the Regional Greenway and Trail User Count Program is a collaborative effort involving the Regional Commission, local governments, the Roanoke Valley Greenway Commission, and Pathfinders for Greenways. Count data are available for use stakeholders for a range of purposes including grant applications, greenway maintenance, congestion management, budgeting and reporting, and event planning.

2. National Bicycle & Pedestrian Documentation Project (NBPD)

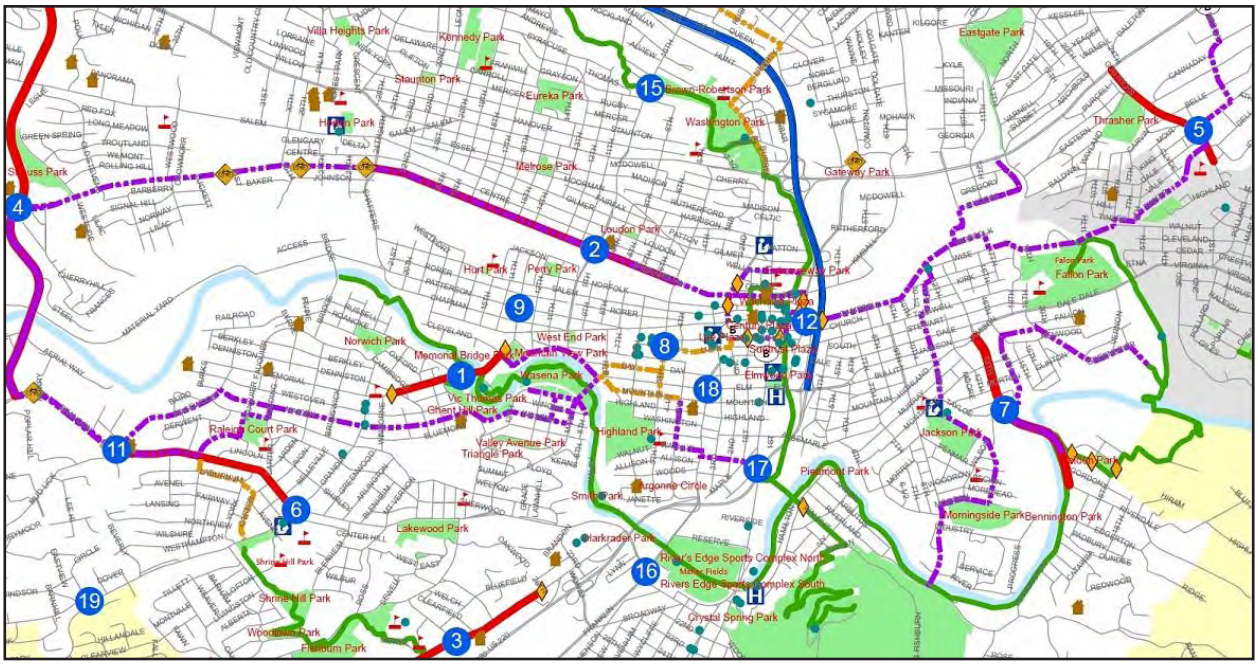
The National Bicycle & Pedestrian Documentation Project (NBPD), initiated in 2004, is an effort led by Alta Planning + Design, in collaboration with the ITE Pedestrian & Bicycle Council to



Trail Counter Location Map

address the lack of useful data on walking and bicycling. The NBPD provides a standard and consistent methodology and conventions for the collection and analysis of bicycling or walking data across the United States.

The City of Roanoke NBPD is a collaborative effort between the City of Roanoke and the RVAMPO to collect cycling and pedestrian data for use in bicycle and pedestrian accommodations planning, funding, implementation, maintenance, and promotion by the City of Roanoke, RVAMPO, and other stakeholders. The 2012 NBPD was the initial year of City of Roanoke participation in the count program and will serve as 'baseline' data. The 2013 NBPD, conducted in September 2013, represents the second year of participation in the program. It is anticipated that the City of Roanoke NBPD will be conducted annually with possible participation by other RVAMPO localities in future years.



NBPD Survey Points

10. Identification and Evaluation of Strategies

CMP Strategies for Areas of Emphasis

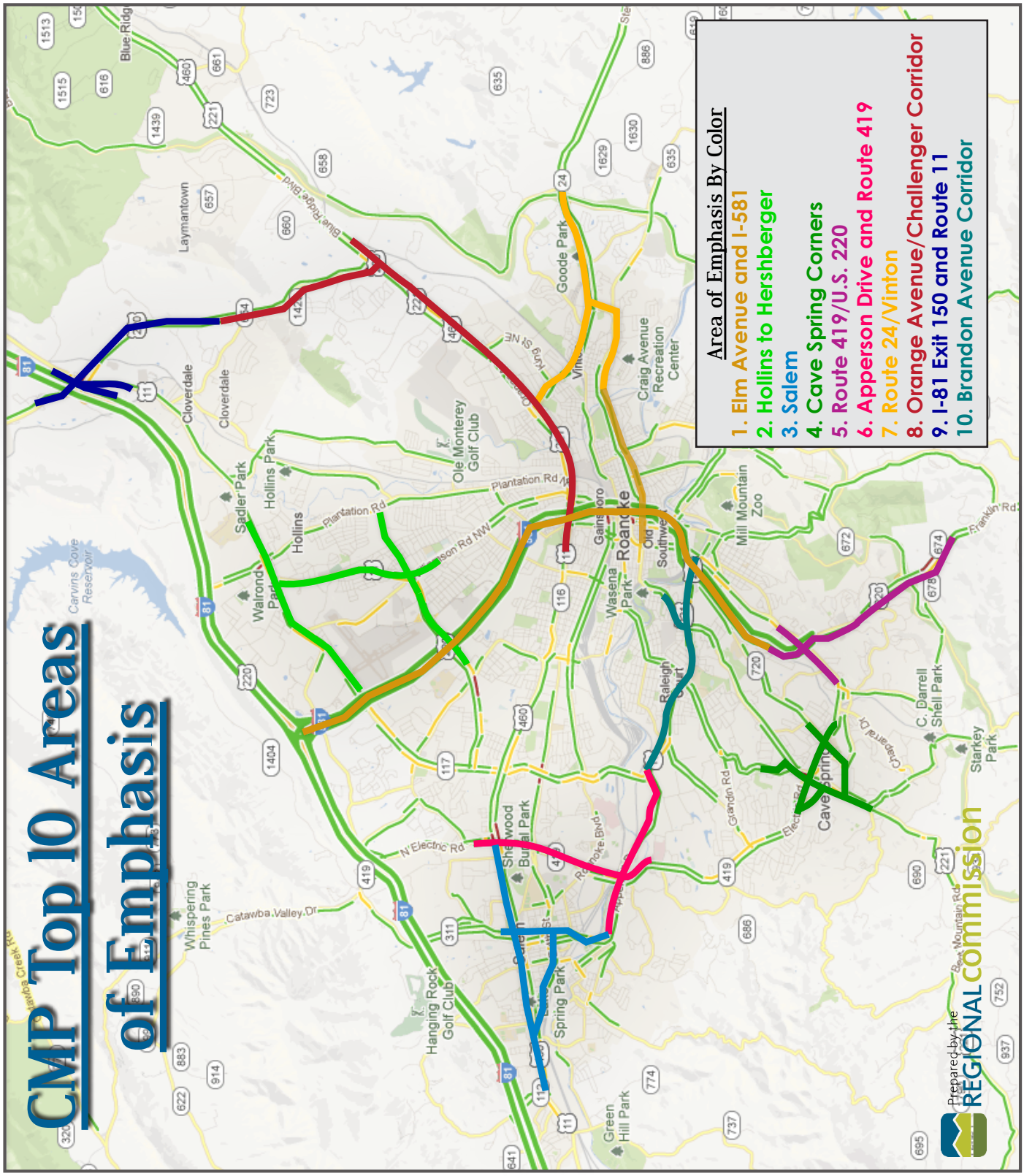
Potential strategies to reduce congestion will be organized into three broad groups:

- **CMP Highway Strategies** - will include a variety of approaches including traditional construction (additional lanes, intersection improvements etc.) and Intelligent Transportation Systems (applying operations management and information technology approaches). CMP highway strategies will consider both recurring and nonrecurring congestion.

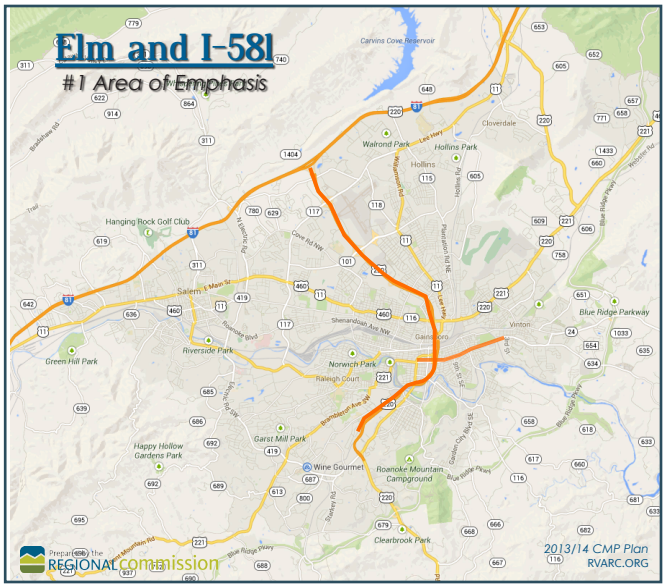
- **CMP Transit and Transportation Demand Management Strategies** - will consider a variety of non-Single Occupancy Vehicle (SOV) strategies including but not limited to: rideshare, public transportation and park and ride lots. Transit strategies have the potential to both substitute for recurring and non-recurring highway congestion by taking additional SOVs off the road, and have the potential of being congested themselves when a bus or a park and ride lot becomes full. Both possibilities will be discussed where applicable.

- **CMP Non-motorized Strategies** - will consider pedestrian and bicycle accommodations that can help alleviate for traffic congestion by substituting for SOVs during peak travel hours. It is possible that non-motorized facilities, such as greenway trails, can experience a form of congestion due to conflict between multiple modes - bicycle and pedestrian - and multiple trip purposes - work commute or recreation.

Each of the 10 areas of emphasis will be evaluated for Highway Transit and Non-motorized strategies where applicable with particular attention afforded to the potential of several strategies being used in combination to produce a greater congestion management benefit. The 10 areas of emphasis are presented in no particular ranked or prioritized order.


CMP Top 10 Areas of Emphasis
Area of Emphasis By Color
1. Elm Avenue and I-581
2. Hollins to Hershberger
3. Salem
4. Cave Spring Corners
5. Route 419/U.S. 220
6. Apperson Drive and Route 419
7. Route 24/Vinton
8. Orange Avenue/Challenger Corridor
9. I-81 Exit 150 and Route 11
10. Brandon Avenue Corridor
Prepared by the REGIONALcommission

#1 Elm Avenue and I-581

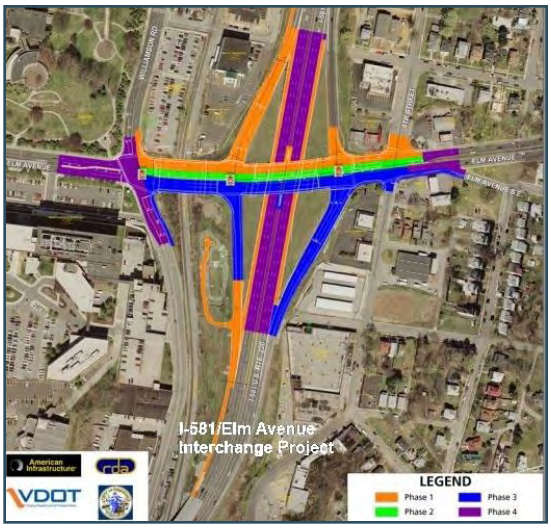


I. CMP Highway Strategies:

The I-581/Elm Avenue Interchange project, which began construction in the Spring of 2013 and is estimated to be completed in the summer of 2015, will reduce traffic congestion by:

- Widening bridge by one lane on each side (north and south)
- Redesigning and extending entrance and exit ramps to accommodate large trucks
- Constructing new bridges to accommodate additional lanes
- Widening both off-ramps by one lane

II. Recurring Congestion:

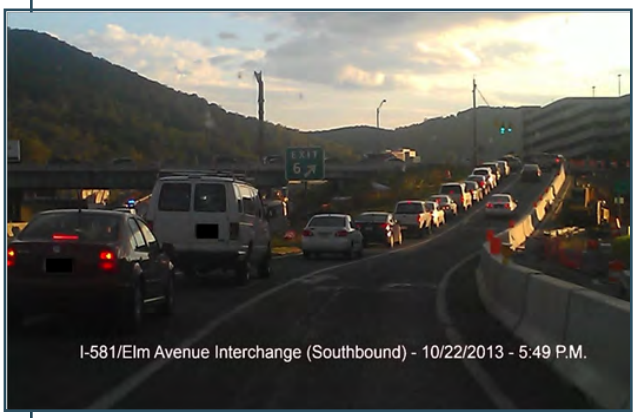


Large truck traffic and peak hour commuter traffic exiting I-581 onto Elm Avenue, Walnut and Bullitt Avenues. The close proximity of the ramp intersections along Elm Avenue along with the high turning movements at these signalized locations contributes to the frequent peak hour traffic congestion. This congestion will be mitigated through the I-581/Elm Avenue Interchange project.

III. Non-recurring Congestion:

Currently, the I-581/Elm Avenue Interchange project work zone, which is projected to be completed in the summer of 2015, is a major source of congestion. Disabled vehicles and special events throughout the year are minor forms of congestion.

- In 2002-03 RVAMPO and the Roanoke Valley Alleghany Regional Commission (RVARC) contracted with Wilbur Smith Associates to conduct a regional freight study for the Roanoke Valley.
- That study used the Reebie (now Transearch) freight database and developed and in-depth analysis of freight flows to and from the Roanoke Valley.
- That study also included a freight stakeholder involvement process that developed a list of the "Top 10 Freight Fast Action Projects" that should be considered in future plans.
- Projects #3 and #4 in this list reference the Elm Avenue Interchange (excerpted below). The current redesign and construction project is expected to address some of these issues.

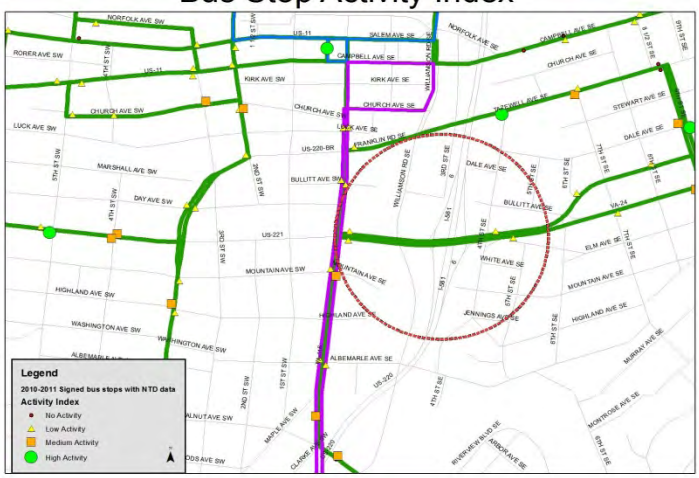


PROJECT #4 ELM AVENUE & WILLIAMSON

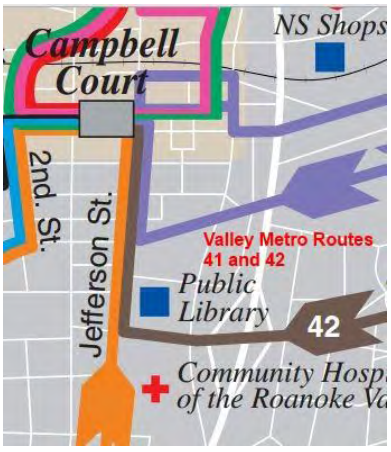
Source: Motor Carrier Survey
Jurisdiction: City of Roanoke
Problem: Congested intersection – difficult to turn through with a truck
Proposal: Study traffic patterns to determine if an alternate route could be used by trucks, and/or conduct an operational analysis of the intersection.

IV. CMP Transit Strategies:

Bus Stop Activity Index



- Consider developing a park and ride lot and commuter transit service to serve commuters from the east. Possible locations could be the East Vinton Plaza or the River Park Shopping Center in Vinton.
- Evaluate current Valley Metro routes 35 and 36 to determine if any modifications in the routes could reduce traffic congestion from Vinton and Roanoke County via VA Route 24.
- Evaluate Valley Metro routes 41 and 42, which cross the Elm Avenue bridge, to determine if any changes could increase the number of passengers; and reduce SOV trips across Elm Avenue by making a more direct instead of roundabout route and increasing service frequency.
- Also consider the possibility of rerouting this transit route to eliminate the Elm Avenue congested interchange area in order to save running time spent in traffic and avoid the bus being late to make transfers due to traffic congestion.



- Consider the possibility of the bus entering downtown through less congested streets. As shown in the Bus Stop Activity Index Map, there are four bus stops within a quarter-mile radius of the interchange that all experienced low activity during the 2010-2011 National Transit Database Survey.

V. CMP Non-motorized Strategies:

- The construction of raised medians, sidewalks, curb and gutter and curb ramps, through the I-581/Elm Avenue Interchange project, will provide connectivity to the existing pedestrian network and increase overall walkability.
- Consideration should be given to providing bike lanes along Elm Avenue and provide connection to the existing greenway at Elm and Williamson Road.

- In the *Update to the Roanoke Valley Conceptual Greenway Plan – 2007*, it is stated that there will be coordination between the Roanoke City Parks and Recreation Department and other agencies, to develop wayfinding signs which will connect the Lick Run and Mill Mountain greenways, making identification of on and off-road sections easier.

VI. CMP Transportation Demand Management (TDM) Strategies:

RIDE Solutions (http://ridesolutions.org/) is the regional rideshare agency for the Roanoke and New River Valleys plus Region 2000 (Lynchburg Region) has an active business outreach program. Like the RVAMPO, RIDE Solutions' lead staffing agency is the RVARC (Regional Commission). RIDE Solutions' FY2014 Work Program indicates that they plan to reach out to the Virginia Tech Carilion Medical School, located near Area of Emphasis #1, concerning possible

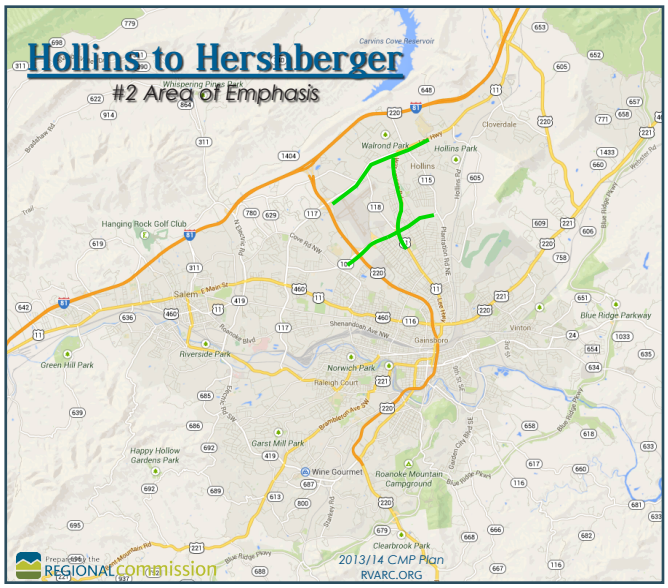
Targeted Business Outreach: Roanoke	**Due**	Ongoing
Description:	**Project Leader**	Jeremy
VTC Medical School, Advance Autoparts, Ferrum College, Roanoke College, and Friendship Manor, as well as satellites of existing businesses, including Carilion Franklin County Hospital and LewisGale Hospital at Alleghany.	**Zone**	Roanoke
	Hours	100
	Budget	$5000
	Strategic Goals	1.2, 3.3
Measure: Recruitment of new workplace partners.		

Strengthen Workplace Partnership Program	**Due**	3/1/14
Description:	**Project Leader**	Jeremy, Christy
Develop a stronger workplace program by establishing a menu and tiered service levels to add value to make the program more attractive to local businesses. Develop printed marketing and "starter kit" materials to deliver to new and existing sites. Elements of program will include: • A TDM Site Plan product to be delivered to new partners • Tools for outreach coordinators including pre-meeting worksheets to determine TDM opportunities • Sales training as required for staff	**Zone**	Roanoke, NRV
	Hours	20
	Budget	$1000
	Strategic Goals	3.2, 3.3, 5.1
Measure: Complete deliverable to use as a marketing tool in recruiting businesses into the workplace partner program		

Travel Demand Management (TDM) strategies and rideshare and vanpool services (see below)

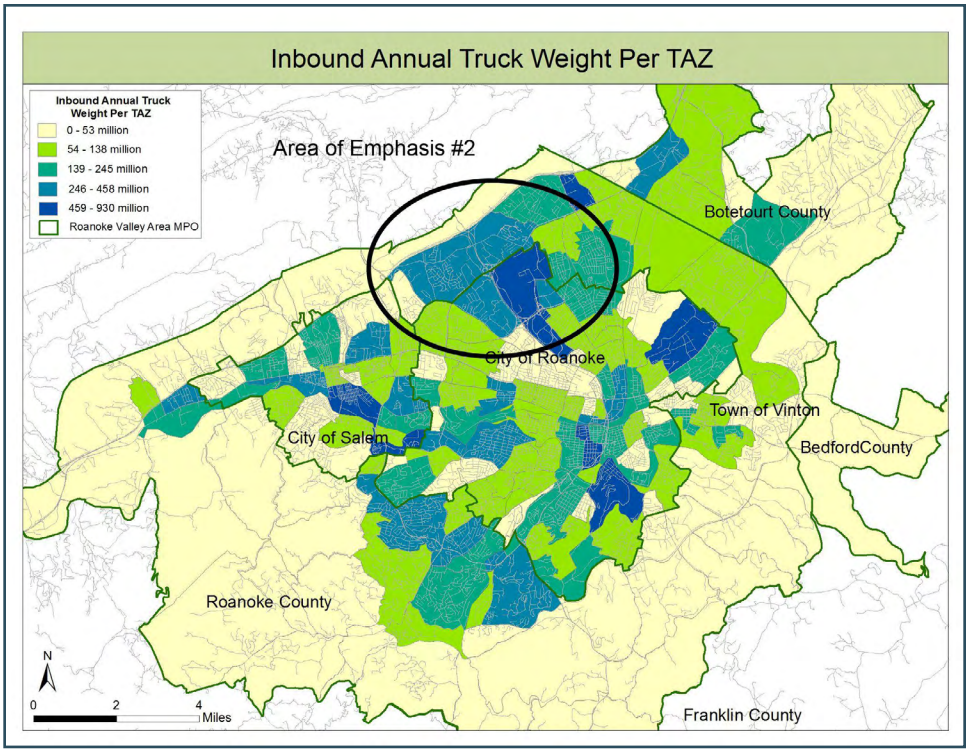
#2 Hollins to Hershberger

I. CMP Highway Strategies:



- The "Freight Trip Generation for the Roanoke Valley - Technical Report" (Fiscal Year 2012) estimates that the area from Hollins to Hershberger is a significant generator of inbound truck traffic. The proximity to Interstate 81 and the mixture of truck freight, passenger vehicles and passenger movements in the area make this general location especially susceptible to recurring and non-recurring traffic congestion.
- The CLRTP 2035 recommends widening Hollins Road to four lanes with bike lanes from Orange Avenue to Liberty Road. Consideration should be given to widening

the entire length of Hollins Road to Plantation Road, to avoid additional congestion caused by bottlenecks.



- The CLRTP 2035 designates the section of Plantation Road, from Liberty Road to Hollins Road, to be widened to four lanes with curb, gutter and sidewalk. Widening Plantation Road to four lanes could serve as an alternative to reduce congestion on Hollins and Williamson roads, but could encourage truck traffic due to the industrial uses along it.
- The RVAMPO 2012-2015 Transportation Improvement Program (TIP) lists the reconstruction of Hollins Road and the bridge over Tinker Creek, both of which will be widened to allow greater traffic flow.
- To avoid any potentially negative impacts on traffic congestion, the Orange Ave/ Challenger Corridor, (through a future Orange Ave/Challenger corridor study) should be strongly considered in connection with any Hollins Road improvements which could be made.

II. Recurring Congestion:

During the peak hours there is truck traffic along the industrial portions, and employment-related automobile traffic, of Plantation Road. Hollins Road experiences automobile congestion as an alternative route to Plantation Road. Both are affected through congestion related to Orange Avenue and the related corridor.

III. Non-recurring Congestion:

Special events, major traffic accidents or weather-related closures of I-581, I-81 or US 460.

The Virginia Department of Transportation (VDOT) has detour plans for major incidents that occur on interstates and other major thoroughfares. The following detour plans apply to the area near Area of Emphasis #2 (source VDOT officials at the Salem Traffic Operations Center - TOC - http://www.virginiadot.org/travel/smart-default.asp)

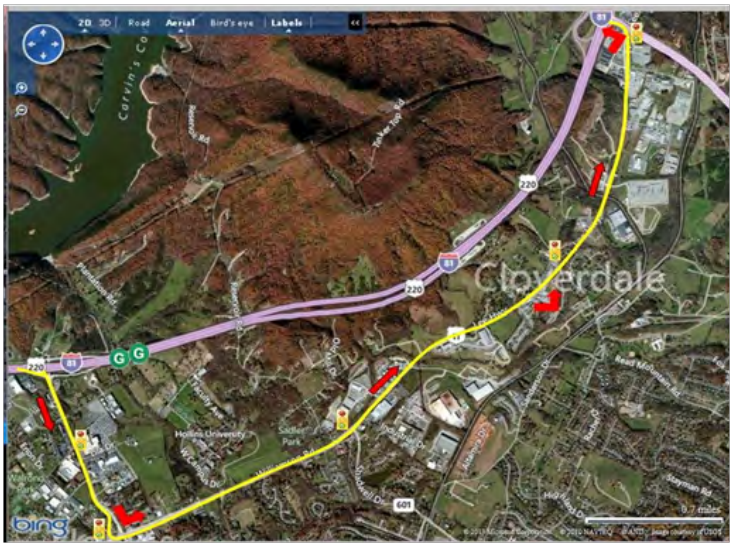
I-81 SB Detour: SO Exit 146 to NO Exit 143 (Salem District)

- **Incident Location**: I-81 south of Exit 146 to north of Exit 143 (Roanoke)
- **Current detour hard route:** SB I-81 north of Exit 143, exit at Exit 146 and go to the end of the ramp and take a left onto VA-115 (Plantation Rd.), continue to the intersection of VA-115 and US-11 and make a right, stay in the right lane and get on VA-117 (Peters Creek Rd.), continue to the intersection of I-581 and VA-117 and follow the signs to SB I-81 or SB I-581.

I-81 NB Detour: NO Exit 146 to SO Exit 150 (Salem District)

I-81 NB Detour: NO Exit 146 to SO Exit 150 (Salem District)

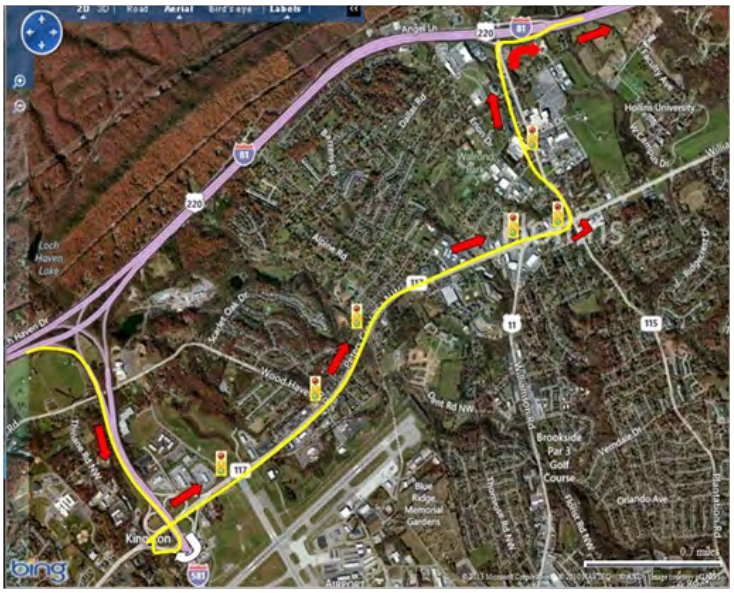
- **Incident Location:** I-81 north of Exit 146 to south of Exit 150 (Roanoke/ Botetourt)
- **Current detour hard route:** NB I-81 get off at Exit 146 go right at the end of the ramp and follow VA-115 (Plantation Rd.) to the intersection of US-11 (Williamson Rd.) and turn left, follow US-11 to the intersection of US-11 and US-220 and take a left and get on I-81 north.



I-81 NB Detour: NO Exit 146 to SO Exit 150 (Salem District)

I-81 NB Detour: NO Exit 143 to SO Exit 146 (Salem District)

- **Incident Location**: I-81 north of Exit 143 to south of Exit 146 (Roanoke)
- **Current detour hard route:** NB I-81 south of Exit 146, get off at Exit 143 and go south on I-581, go under Peters Creek Rd./VA-117 overpass and get on Peters Creek Rd. East, follow VA-117 to the intersection of US-11 (Williamson Rd.), turn left on US-11 to the light at the intersection of US Rt. 11 and VA-115, make a left on US-115 and follow the signs to the interstate.



I-81 NB Detour: NO Exit 143 to SO Exit 146 (Salem District)

IV. CMP Transit Strategies:

- The Virginia Statewide Transit / TDM Plan Update technical memorandum released by VDRPT in 2012 identifies the Hollins census-designated place (CDP) as an existing suburban area that is currently underserved by transit service. The technical memorandum to the VA Statewide Transit / TDM Plan Update provides data that gives evidence to the need and demand for public transit services in the Hollins CDP that could take the form of fixed-route, deviated fixed-route, circulator, and/or Commuter/Express Bus.

Hollins Census Designated Place

- Surveys conducted for the 2008 Hollins Area Plan, a component of the Roanoke County Comprehensive Plan, indicate a desire for transit service. The Hollins Area Plan includes an implementation strategy to 'Expand transit opportunities for the study area when and where feasible'. Surveys of Plantation Road businesses, conducted in 2009 for a Transportation Enhancement Program application, indicate desire for transit service as well. To this day, Hollins University desires a transit connection to the greater Roanoke fixed-route system. Such a connection would also benefit nearby residential areas and businesses.

- Beginning in 2013, RVAMPO staff embarked on the development of the Regional Transit and Pedestrian Vision Plans. More specifically, the transit vision plan will investigate: the existing transit network; perceived deficiencies in the current system; gaps in regional transit service; and potentially recommend extensions to service. From the first of September to December 31, 2013, RVAMPO planners have administered a Regional Pedestrian and Transit Vision Plans Survey online, through social media, neighborhood and civic groups, senior living facilities, etc. Responses will be analyzed in 2014 and incorporated into the vision plans, illustrating the public vision for transit and walking in the region. During this process, the region will explore what the best form of transit is for the Hollins CDP and identify long-term sustainable funding that will support successful transit services to its residents, visitors, and employees.

- An additional goal of the Transit Vision Plan is to encourage a conversation with regional decision-makers about funding for a transit system that will better serve the Roanoke region specifically, in this case, to the Hollins to Hershberger congestion management Area of Emphasis.

- Valley Metro routes 25 and 26 currently have transit stops on Hershberger Road and on Plantation Road, south of Hershberger. As transit routes are amended in the future to better serve the Roanoke area, fixed-route transit service needs to be extended into the Hollins area to better serve businesses and residents. Specifically, fixed route transit needs to be considered for Plantation Road between I-81 and Hershberger Road; Williamson Road from Hershberger to Hollins University; Valleypointe Parkway; and Peters Creek Road.

V. CMP Non-motorized Strategies:

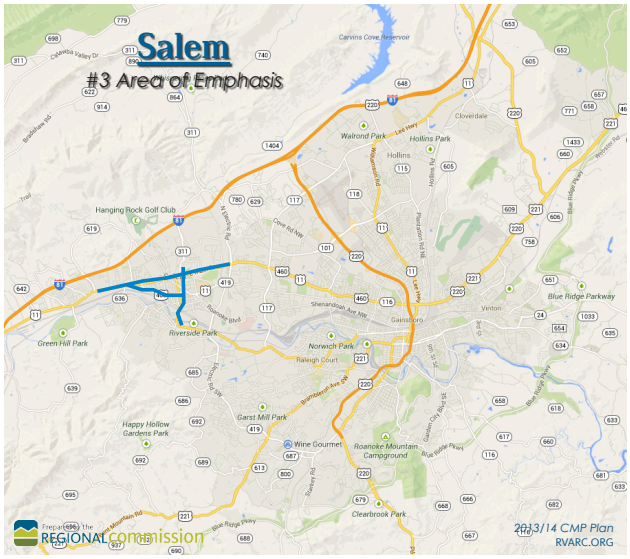
- Increased marketing of the Bike n' Ride program by bicycle advocacy groups and

Valley Metro is important in order to sustain this multimodal form of transportation.

- The CLRTP 2035 recommends bike lanes on Hollins Road from Orange Avenue to Liberty Road. Such improvements, although not currently programmed for funding, would continue to encourage cycling and promote fewer motorized vehicle trips.
- In 2013, Roanoke County was awarded Regional Surface Transportation Program (RSTP) funds for the Plantation Road, Bicycle, Pedestrian and Streetscape Improvement Project. In addition to the project providing bicycle accommodations, sidewalks, crosswalks, trails, ADA ramps and streetscape improvements to a one-mile section of Plantation Road from I-81 to Williamson Road, it will construct turn lanes, realign commercial driveways, and reduce congestion through provision of separate bike/pedestrian facilities.
- The *Update to the Roanoke Valley Conceptual Greenway Plan – 2007* recommends the completion of the Tinker Creek Greenway. In October 2012, Roanoke County opened a 2.8 mile section of the Tinker Creek Greenway.
- Additionally in 2013, the City of Roanoke was awarded RSTP funds for the Tinker Creek Greenway Corridor Planning Study. The study seeks to hire consultants to engineer a multi-phased/year process for completion of the Greenway, with its ultimate connection to the Carvins Cove Natural Reserve.

#3 Salem

I. CMP Highway Strategies:



- In 2002-03 RVAMPO and the RVARC contracted with Wilbur Smith Associates to conduct a regional freight study for the Roanoke Valley.
- That study used the Reebie (now Transearch) freight database and developed and in-depth analysis of freight flows to and from the Roanoke Valley.
- That study also included a freight stakeholder involvement process that developed a list of the "Top 10 Freight Fast Action Projects" that should be considered in future plans.
- Project #8 (excerpted below) from the aforementioned freight plan is applicable to this area of emphasis.
- A VDOT Urban project is set for construction in 2017 of a 1.2 mile portion of East Main Street (U.S. 460) between VA 311 and Kessler Mill Road. This project will widen the road to three lanes.

II. Recurring Congestion:

Peak and non-peak hour traffic as a result of commercial and residential trips along East Main Street. One area of congestion occurs at Mill Lane, just south of West Main Street. This is typically

caused by the train crossing directly south of this intersection. It's common for the congestion to spill over into the turn lanes on West Main, and even the through lanes on Spartan Drive.

The City of Salem has studied the possibility of syncing the traffic lights with the railroad signals. The system would detect a train a mile away, and would trip the light to clear out the traffic queue and could manage turns onto Mill Lane when the crossing is closed, resulting in a pretty significant improvement in the operation of the intersection at those times.

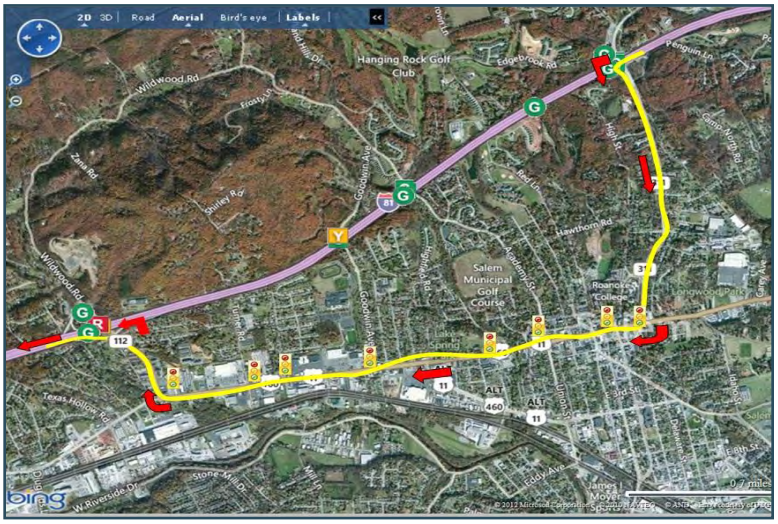
III. Non-recurring Congestion:

Special events and detouring traffic from I-81 due to construction and road closures.

The Virginia Department of Transportation (VDOT) has detour plans for major incidents that occur on interstates and other major thoroughfares. The following detour plan applies to the area near Area of Emphasis #3 (source VDOT officials at the Salem Traffic Operations Center - TOC - http://www.virginiadot.org/travel/smart-default.asp)

I-81 SB Detour: SO Exit 140 to NO Exit 137 (Salem District)

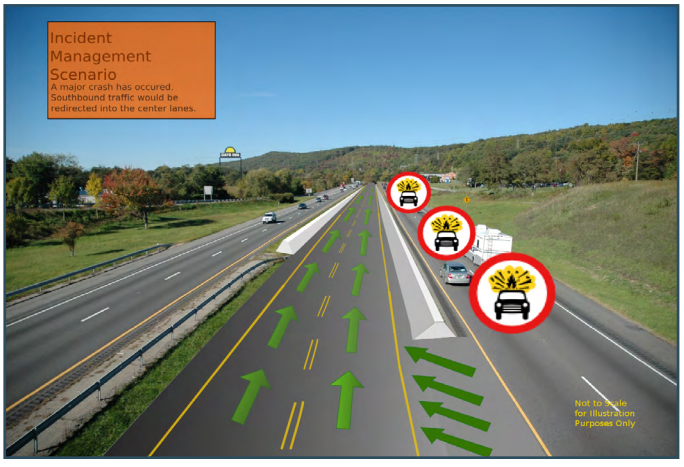
- **Incident Location**: I-81 south of Exit 140 to north of Exit 137 (Salem City)
- **Current detour hard route:** SB I-81 exit at Exit 140 and go south on VA -311 (Thompson Memorial Blvd.) to the intersection of VA-311 and US-11/460 (Main Street), continue west of Main Street to the intersection of US-11/460 and VA-112 (Wildwood Rd.) and take a right, following the signs to I-81.
- **Restrictions on hard detour:** This will go thru the City of Salem and all lights and intersections will need to be controlled.



I-81 SB Detour: SO Exit 140 to NO Exit 137 (Salem District)

Alternative to I-81 SB Detour: SO Exit 140 to NO Exit 137 (Salem District)

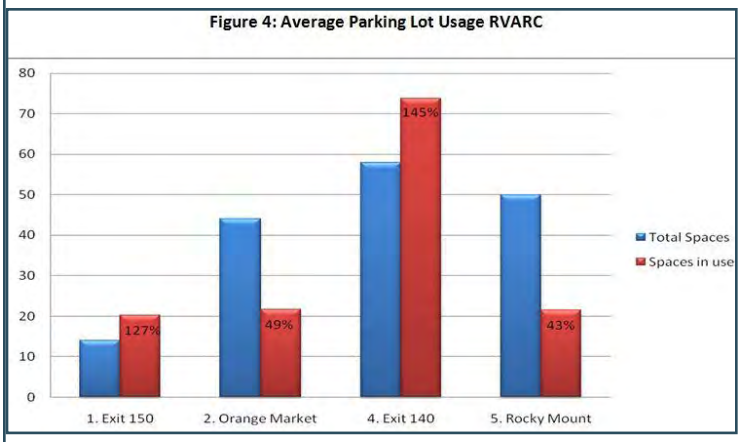
- Salem representatives have expressed concern about I-81 incident related traffic being re-routed through Downtown Salem, and have expressed a desire for a viable alternative to be discussed in the plan. Staff could not find a viable alternative using existing roadways that does not involve portions of Downtown Salem. Wildwood Road is not viable due to safety issues and geometry concerning large trucks. The best longer term option available is to pursue the concept of a "managed lane" (see image), connecting the Roanoke and New River Valleys as an



Source I-81 NEPA Tier II Process- RVAMPO Feedback

expansion to I-81's current right-of-way (ROW). The included image demonstrates the concept of re-routing traffic around an accident using a movable barrier managed lane. This would allow traffic to be re-routed within the I-81 ROW itself.

IV. CMP Transit Strategies:



- In December 2012, Valley Metro streamlined the transit service provided by routes 81 and 82 (in Roanoke) and routes 91 and 92 (in Salem), combining them into one continuous service and eliminating the need for a transfer at Goodwill opposite Lakeside Plaza. At this time, the service was extended to the Salem Walmart (West Main Street and Turner Road). The route currently provides a straight line service from Campbell Court to the Salem Walmart; however, on the return, the route veers south on S. College Avenue providing service to Lewis Gale, the VA Hospital, and the Salem Civic Center before returning to East Main Street and heading to Campbell Court.
    - In order for this transit line to be a viable alternative and to reduce single-occupant vehicle use in the corridor, the route would ideally provide continuous return service from Salem Walmart to Campbell Court with a separate route created for service to the Hospitals and Civic Center. Such an adjustment requires additional funds to provide this service and is being explored in the ongoing regional transit visioning process (2013-2014).
- Without the improvements implemented in December 2012, discussed above, routes 91 and 92 were already experiencing high ridership and adding more riders could create congestion on the buses. An additional strategy to address this concern is to increase the frequency of this route from every 60 to every 30 minutes as well as increasing the size of the transit vehicle, which is currently 35-feet long (Valley Metro and the Transit Vision Plan will explore these options).
- Several businesses and residential areas beyond the Salem Walmart are also in need of transit service, and extending fixed-route service would reduce vehicle trips on West Main Street. A route adjustment to extend routes 91/92 to Ritchfield Retirement Center may be the answer. Early responses from the Regional Transit Vision Plan public outreach efforts have shown a need for this extension of service.

V. CMP Non-motorized Strategies:

- The City of Salem should endeavor, as stated in its 2012 Comprehensive Plan, to develop a non-motorized transportation plan which takes into account such solutions as greenways, bike lanes, and sidewalks. Such a plan would seek to promote walkability, increase bicycling through the City, and mitigate congestion. Implementation of a non-motorized transportation plan should incorporate internal site plan, development, and design review as well as other internal governmental controls.
- Increased marketing of the Bike n' Ride program by bicycle advocacy groups and Valley Metro is important in order to sustain this multimodal form of transportation.

- East Main Street (U.S. 460) from Electric Road (Route 419) to the City of Roanoke corporate limit was cited as a bicycle lane improvement vision list corridor in the *Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update*.
- East Main Street (U.S. 460) from Kessler Mill to Lynchburg Turnpike was cited as a bicycle lane improvement priority list corridor in the *Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update*.
  - The VDOT road improvement project for East Main Street between VA 311 and Kessler Mill Road, will provide sidewalks for a 1.2 mile segment and improve the pedestrian connections along East Main Street.
  - The *Update to the Roanoke Valley Conceptual Greenway Plan – 2007*, gives number one priority to the completion of the Roanoke River Greenway, which passes through the City of Salem.

VI. CMP Transportation Demand Management (TDM) Strategies:

The 2009 "RIDE Solutions Park-and Ride Study: Inventory, Use and Need For the Roanoke and New River Valley Regions" found that usage of the Exit 140 Park-and-Ride was at 145% capacity in 2009. This means that vehicles are parked on shoulders and access approaches in addition to the spaces provided in the lot.

New and Expanded Facilities: I-81 Exit 140

To meet the needs of carpoolers and limits of the right-of-way at the exiting Exit 140 lot, RIDE Solutions recommends the addition of a second carpool lot, either at Exit 137 in West Salem or Exit 141 at Route 419. A lot at Route 419 would better connect commuters directly to the primary arterial roadway through the Roanoke Valley than the existing connection at Route 311 at Exit 140. In addition, a park-and-ride facility at Route 419 could connect to future transit service along the 419 corridor. *Excerpt from 2009 Park and Ride Study*

The 2009 study has the following additional recommendations concerning the Park-and-Ride at Exit 140. It is of note that the Exit 140 Park-and-Ride received Regional Surface Transportation Program (RSTP) funds from the RVAMPO Policy Board; however, a significant increase in capacity is not expected to result from the project. The project's main goals are to address design, storm water/drainage and parking lot surface conditions.

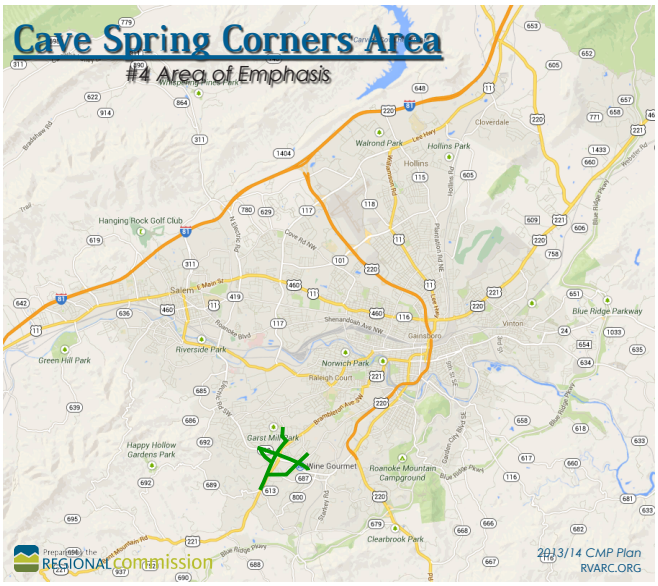
VII. Other TDM approaches to this area of emphasis include:

RIDE Solutions (http://ridesolutions.org/) is the regional rideshare agency for the Roanoke and New River Valleys plus Region 2000 (Lynchburg Region) has an active business outreach program. Similar to the RVAMPO, RIDE Solutions' lead staffing agency is also the RVARC (Regional Commission). RIDE Solutions' FY2014 Work Program indicates that they plan to reach out to Roanoke College, located in Area of Emphasis #3, concerning possible Travel Demand Management (TDM) strategies and rideshare and/or vanpool services (see below)

Targeted Business Outreach: Roanoke	**Due**	Ongoing
Description:	**Project Leader**	Jeremy
VTC Medical School, Advance Autoparts, Ferrum College, Roanoke College, and Friendship Manor, as well as satellites of existing businesses, including Carilion Franklin County Hospital and LewisGale Hospital at Alleghany.	**Zone**	Roanoke
	Hours	100
	Budget	$5000
	Strategic Goals	1.2, 3.3
Measure: Recruitment of new workplace partners.		

Strengthen Workplace Partnership Program	Due	3/1/14
Description:	**Project Leader**	Jeremy, Christy
Develop a stronger workplace program by establishing a menu and tiered service levels to add value to make the program more attractive to local businesses. Develop printed marketing and "starter kit" materials to deliver to new and existing sites. Elements of program will include: • A TDM Site Plan product to be delivered to new partners • Tools for outreach coordinators including pre-meeting worksheets to determine TDM opportunities • Sales training as required for staff	**Zone**	Roanoke, NRV
	Hours	20
	Budget	$1000
	Strategic Goals	3.2, 3.3, 5.1
Measure: Complete deliverable to use as a marketing tool in recruiting businesses into the workplace partner program		

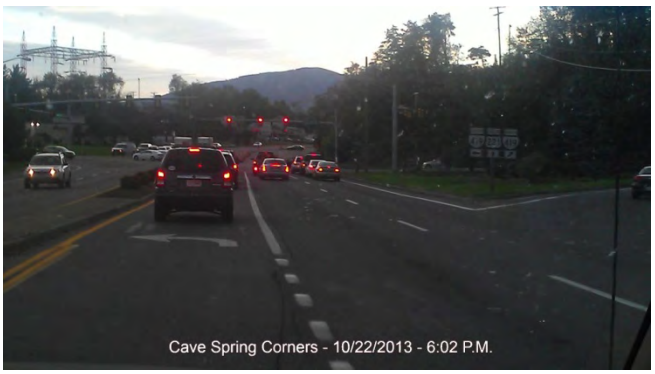
#4 Cave Spring Corners



I. CMP Highway Strategies:

The Route 419 Corridor Plan, a study undertaken jointly by the RVAMPO and VDOT's Salem District, recommended the following to reduce traffic congestion:

- Widen Route 419 from a four to six-lane divided highway, from Brambleton Avenue to the U.S. 220 interchange.
- Construct two southbound left-turn lanes on Route 419.
- Construct two westbound left-turn lanes on Brambleton Avenue.
- Create an acceleration lane for the southbound right turn.
- Include pedestrian countdown signal heads/pushbuttons and pedestrian crossing signs on each corner of the intersection.
- All municipalities along Route 419 should consider updating their traffic signaling system to be consistent with one another to improve progression along the corridor. The recommended coordination of traffic signals along the corridor is a maximum of a half-mile apart.
- Upgrade the signal lights to LED lights when possible. They are brighter and require less energy. Signal visibility is increased and it may help reduce total crashes at the intersection as well as throughout the corridor.
- Traffic and video control sensors should be installed at the traffic signal, which could increase response rates to non-recurring congestion caused by accidents.

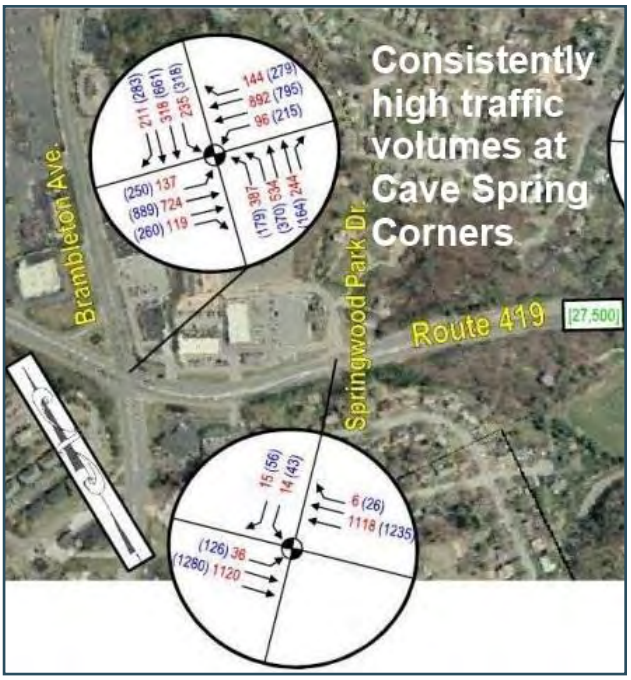


II. Recurring Congestion:

Peak and non-peak hour traffic as a result of commercial and residential trips along Brambleton Avenue and Route 419.

III. Non-recurring Congestion:

Detours from the closures, or severe congestion of I-581 and US 220 South.



IV. CMP Transit Strategies:

The Virginia Statewide Transit / TDM Plan Update released by the Virginia Department of Rail and Public Transportation in 2012 identifies the Cave Spring Census-Designated Place (CDP) as an existing medium urban area. Roanoke City, Salem City, and the Town of Vinton also are classified as existing medium urban areas; however, unlike these areas, the Cave Spring CDP does not have the same level of transit service.

Some transit services have been tried in Roanoke County in the past and not continued for reasons such as lack of funding or ridership. Current plans such as the Route 419 Corridor Study indicate a desire for transit in the Cave Spring CDP. To support these recommendations, a 2012 technical memorandum to the VA Statewide Transit / TDM Plan Update provides data that gives evidence to the need and demand for public transit services in that Cave Spring CDP could take the form of fixed-route, circulator, Urban Bus Rapid Transit, Commuter/Express Bus, and/or Regional Bus Rapid Transit.

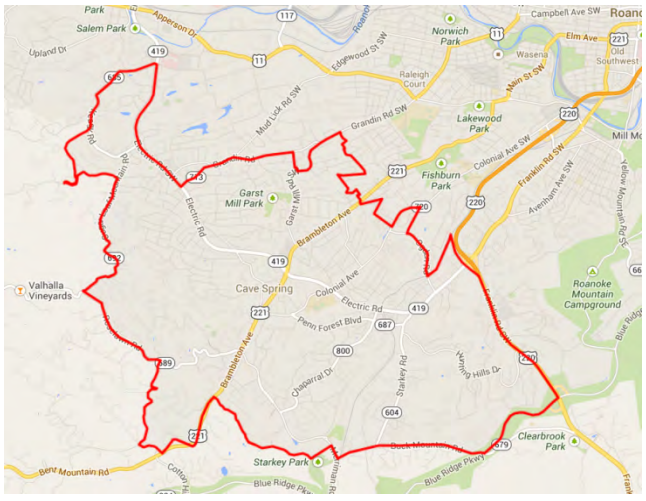
The region needs to revisit the conversation with regional decision-makers about funding for a transit system that will better serve the Roanoke region, specifically in this case to the Cave Spring congestion management Area of Emphasis.

V. CMP Non-motorized Strategies:

- Install ADA compliant sidewalk ramps and pedestrian crosswalks on each corner of the intersection.
- Construct sidewalk on both the north and south sides of Route 419 east and west of the intersection providing connectivity to adjacent intersections.
- *The Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update* suggests an on-road greenway connection along Route 419 from Salem to U.S. 220.
- The Route 419 Corridor Plan illustrates and emphasizes the demand for bicycle facilities to be constructed throughout the study area.

IV. CMP Transportation Demand Management (TDM) Strategies:

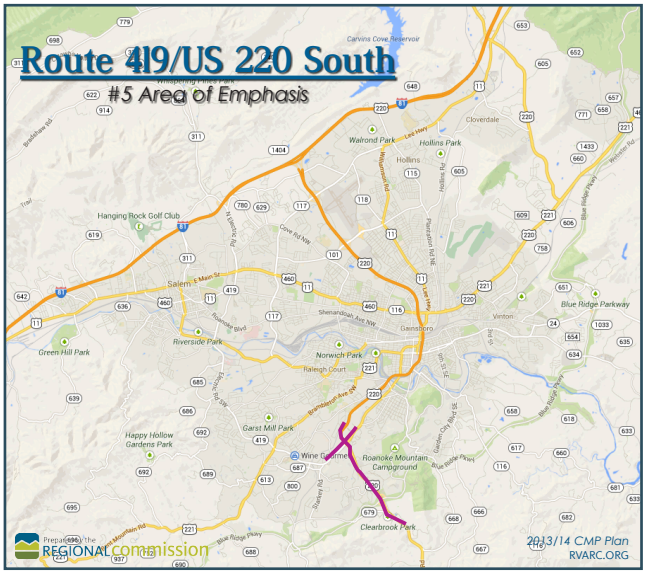
There are several churches in the vicinity of Cave Spring Corners. One TDM strategy would be to seek an agreement with one or more area churches to host a weekday park-and-ride lot, when there is typically extra capacity in their parking lots. As of the writing of this report, no park-and-ride agreements have been executed between a church and RIDE Solutions. However,



Cave Spring Census-Designated Place (CDP)

the concept could be regionally beneficial if an agreement could be made that addresses the mutual interests of a particular congregation and RIDE Solutions.

#5 Route 419/U.S. 220



I. CMP Highway Strategies:

Observations concerning U.S. 220 in the Clearbrook and Red Hill areas of Roanoke County include:

U.S. 220 Clearbrook Area – South of Tanglewood Area

- The U.S. 220 Corridor through Clearbrook and Red Hill areas of Roanoke County is a good candidate for intense application of Access Management principles.
- Signal Coordination and Signal Timing approaches may also be beneficial for this section of U.S. 220.

The Route 419 Corridor Plan recommended the following highway strategies to reduce traffic congestion:

- Route 419/Electric Road should be widened to six lanes from U.S. 221/Brambleton Avenue (Cave Spring Corners) to U.S. 220.

Tanglewood Mall - Western Signalized Entrance

- Convert the outside northbound lane between Ogden Road and the mall entrance, to a through lane.
- Increase the northbound capacity on 419 by restriping the wide shoulder, making it a through lane.
- To increase capacity, construct a southbound lane, just beyond Ogden Road, which eventually would connect to the U.S. 220 on-ramp.

Tanglewood Mall - Eastern Signalized Entrance

- To increase capacity, convert the outside northbound lane to a through lane.
- Increase the northbound capacity on 419 by restriping the wide shoulder, making it a through lane.
- To handle increased traffic volume from the development, construct a right-hand turning lane (eastbound) at the Slate Hill entrance.
- To increase capacity, construct a southbound lane, just beyond Ogden Road, which eventually would connect to the U.S. 220 on-ramp.
- Construct a northbound right-hand turn lane only.

U.S. 220 Southbound Signalized Ramps

- In order to reduce heavy congestion and increase capacity of Route 419/U.S. 220, it is recommended that the interchange be redesigned.
- Construct a second southbound lane on 419 from the southbound U.S. 220 on-ramp to the northbound U.S. 220 on-ramp. The additional lane should be constructed to provide two northbound on-ramp lanes for eastbound traffic heading northbound on U.S. 220. U.S. 220 will need to be widened to provide extra merging distance created

from the additional on-ramp lane.

- To increase capacity, create a through lane by restriping the outside northbound lane.
- Close the furthest east Tanglewood Mall access point which is closest to U.S. 220 Southbound.
- Remove the traffic signal at the U.S. 220 Southbound off-ramp.

U.S. 220 Northbound Signalized Ramps

- Construct a second southbound lane on 419 from the southbound U.S. 220 on-ramp to the northbound U.S. 220 on-ramp. The additional lane should be constructed to provide two northbound on-ramp lanes for eastbound traffic heading northbound on U.S. 220. U.S. 220 will need to be widened to provide extra merging distance created from the additional on-ramp lane.

II. Recurring Congestion:

The areas in and around the interchange near Tanglewood mall including: left-hand turning lanes of the northbound U.S. 220 exit ramp; all lanes of the southbound U.S. 220 exit ramp; the exit ramp onto southbound U.S. 220; and the eastern and western signalized entrances to Tanglewood Mall experience regular peak hour congestion. In addition U.S. 220 in the vicinity of Clearbrook also experiences concentrations of traffic congestion.

III. Non-recurring Congestion:

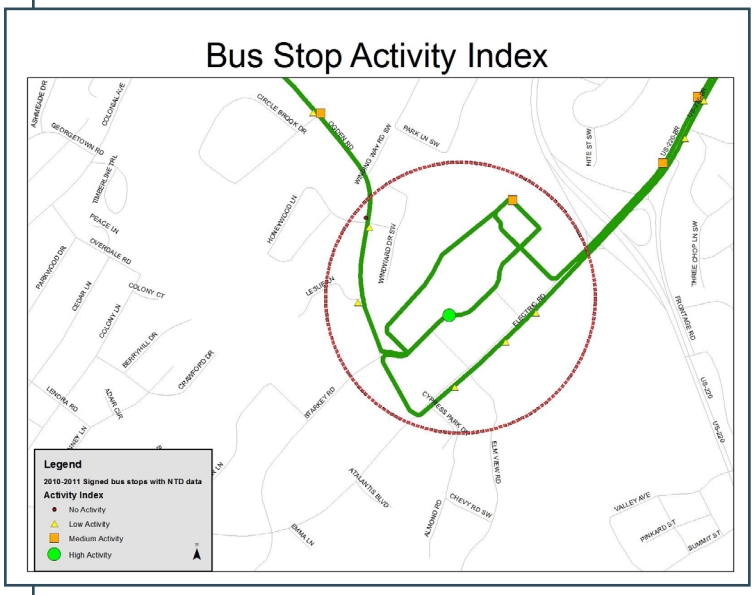
The holiday shopping season, special events, and detours from the closure or severe congestion of I-81 and/or I-581. Based on a crash analysis of Route 419 performed in connection with the Corridor Plan, the western Tanglewood Mall entrance/Elm View Road intersection had the third highest number of crashes in the entire study area. The presence of a Super Wal-Mart further south on U.S. 220 in Clearbrook can also experience holiday shopping

related congestion.

To respond to the high congestion experienced in the A.M. and P.M. peak periods along U.S. 220 from the Clearbrook area to Franklin Road/Route 419, a reversible lane system could be utilized. The lane signs would be visible well in advance and would control the flow of traffic during specified times.

IV. CMP Transit Strategies:

- While Tanglewood Mall itself is a big trip generator, many trips simply pass through the area on the way to another destination. Transit strategies to alleviate congestion along Route 419 in the Tanglewood area need to consider the many directions in which trips are approaching and passing through this congested area.



o Trips coming from or going towards Franklin Road North and Ogden Road already have the option of transit service. However, trips from Route 419 North, I-581/U.S. 220 North and South do not have an option of transit service.

o Therefore, the ability of transit to alleviate traffic congestion given the current transit network is very limited in the Tanglewood area and providing new transit services along the corridors mentioned would help.

o However, additional transit service should not simply be added to the current transit system. Such efforts have been tried in the past and have not succeeded in part because the addition of new service in this area will require a comprehensive look at the entire network, how it operates, and the types of services that should be added (local, commuter express, etc.) as opposed to piecemeal additions here and there.

- The map shows the current bus stops and routes in the Tanglewood/Route 419 area. Activity at existing bus stops was determined through a National Transit Database survey in 2010-2011. Given that Tanglewood Mall is currently considered to be at the end-of-the-line, the last stop itself experiences relatively high activity; however, the stops along Route 419 do not. To go from Tanglewood/419 to the northern part of the system takes one-hour; and it takes half an hour to get into Campbell Court and another half an hour to get to Valley View Mall, for example. Driving takes approximately 10-15 minutes.

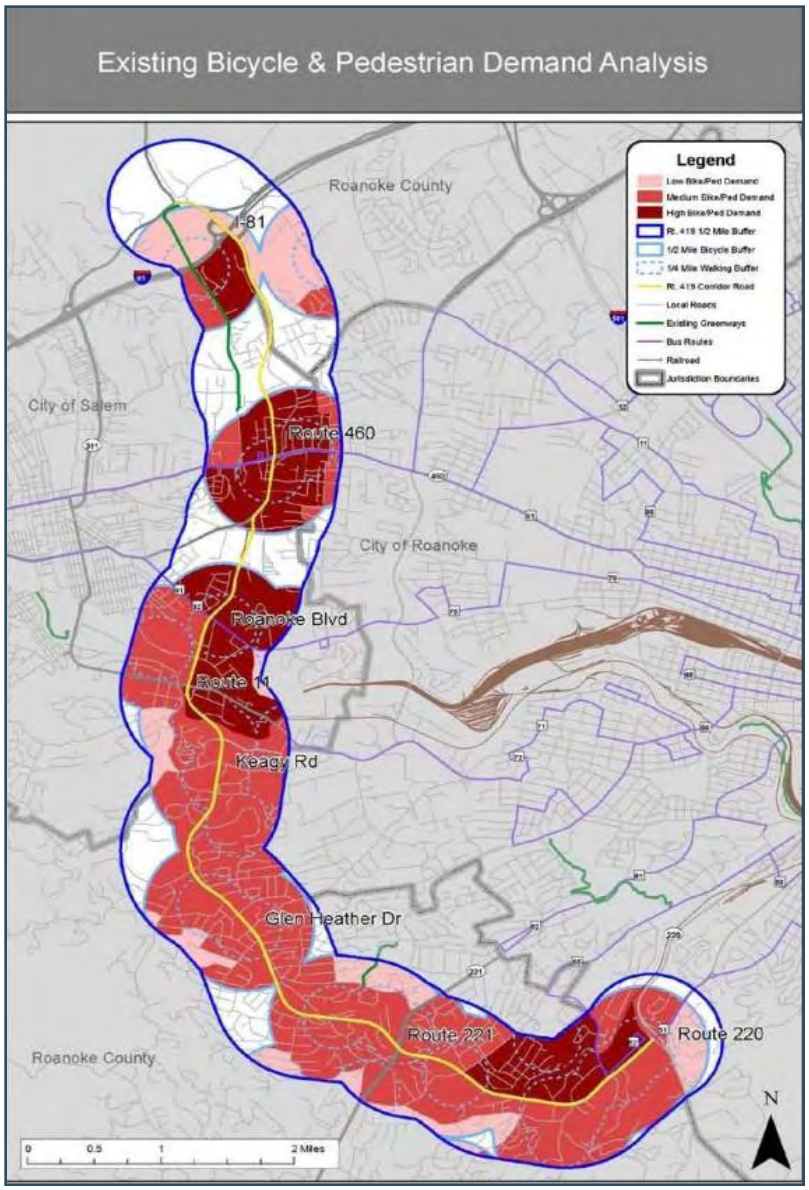
    - In order for transit to be a reasonable alternative for people, service from one end of the network to the other needs to be competitive. While it would not be expected that taking transit would be as fast as driving, travel times could be improved by using express services or more direct routes. Changes to the routes in the future should also consider the time of day service is needed at Tanglewood Mall given the operating hours of its businesses.

The Route 419 Corridor Plan recommended the following transit strategies to reduce traffic congestion:

- Four of the Valley Metro routes studied in 2008 that crossed or ran along a portion of Electric Road, were ranked in the top 10 highest ridership routes in the entire system. Given the need for connections to employment and retail centers, not currently served outside the City of Roanoke, Valley Metro, the City of Salem and Roanoke County should enter discussions on the provision of transit service for the entire Route 419/ Electric Road corridor. Examples of potential service could include the use of varying sized buses to provide specialized trips for commuters into downtown Roanoke, or to commercial centers in Salem and Roanoke County.
- The 419 Corridor Plan specifically recommends extending the Smart Way Bus service to include the Orange Market Park and Ride lot (on Route 419, off I-81 at exit 140), and Tanglewood Mall.
- Valley Metro routes 61 and 62 are recommended to be extended to the Cave Spring Corners area.

VI. CMP Non-motorized Strategies:

- Franklin Road/U.S. 220 from Route 419 in the City of Roanoke to the Blue Ridge Parkway is listed in the RVAMPO Bikeway Plan as a Vision List corridor.
- The Update to the Roanoke Valley Conceptual Greenway Plan – 2007 mentions a planned extension of the Greenway to Tanglewood Mall, by way of Colonial Avenue and Ogden Road. The City of Roanoke's Parks and Recreation Department performed a feasibility study to determine alternative routes to reach Roanoke County. Completion of the Greenway will improve overall connectivity throughout the entire network.
- The *Route 419 Corridor Plan* recommended the following non-motorized strategies to reduce congestion:
- Install ADA ramps and crosswalks on all corners of the intersection at the western signalized entrance to Tanglewood Mall.



- Construct sidewalk on both sides of Route 419, in both directions of the intersection at the Tanglewood Mall western signalized entrance, providing connectivity to adjacent intersections..
- Construct crosswalks, pedestrian signals and ADA ramps to and from Tanglewood Mall to the apartments across Electric Road at the eastern signalized entrance.
- Construct sidewalk on both sides of Route 419, in both directions of the intersection at the eastern signalized entrance, providing connectivity to adjacent intersections.
- With the *Route 419 Corridor Plan* recommendation of Electric Road/Route 419 being widened to six lanes from U.S. 221/Brambleton Avenue (Cave Spring Corners) to U.S. 220, it is recognized and recommended that dedicated bicycle lanes be included in the widening project.
- Accompanying any future proposed widening project on Electric Road (from U.S. 221 to U.S. 220) should be the inclusion of sidewalks on both sides of the roadway.

V. CMP Transportation Demand Management (TDM) Strategies:

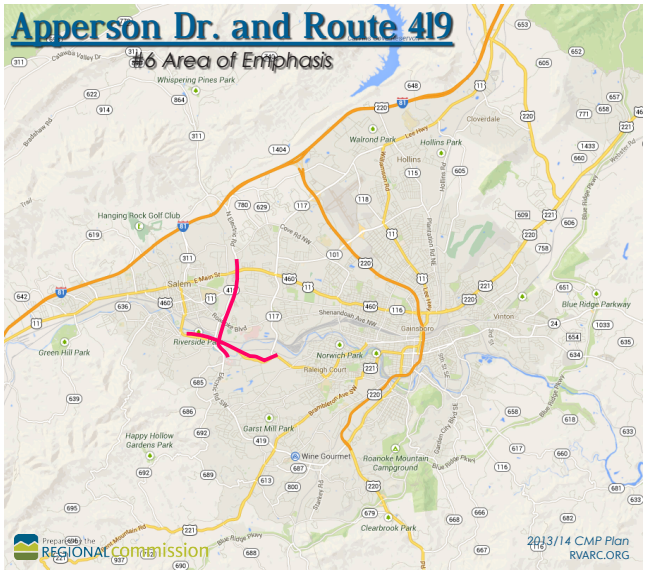
The 2009 "RIDE Solutions Park-and Ride Study: Inventory, Use and Need For the Roanoke and New River Valley regions" recommended that a new park-and-ride lot be pursued for the Boones Mill area south of Clearbrook on U.S. 220 (see below). A similar demand for a park-and-ride lot would likely exist in the Clearbrook area itself.

New and Expanded Facilities: Route 220 at Boones Mill

During the gas price spikes of 2008, one of the fastest-growing commuter segments in the RIDE Solutions database were commuters coming from Rocky Mount and the greater Franklin County area into Roanoke. Commuters in Rocky Mount and farther south are well-served by the existing Park and Ride at Routes 200 and 40, but commuters farther north have no such facilities. Further, origin points north of Rocky Mount – particularly in the Boones Mill area – are much more varied in the rural area, providing no good meeting spot for commuters until commute routes converge in Boones Mill itself. A Park-and-Ride facility in the Boones Mill area would not only service commuters in the immediate vicinity, but would provide a convenient connection to existing carpools coming north from Rocky Mount.

RIDE Solutions therefore recommends a new Park-and-Ride facility in the Boones Mill region. There is at least one opportunity for a private-public partnership with the Boones Mill Baptist Church just south of the town proper; the lot, with direct access to Route 200, was seen to be largely unused during the day on each of the field work visits to the Rocky Mount lot, and appears to have more than sufficient space to meet existing demand. Barring that, a 50-space lot should be considered by VDOT. In the latter case, VDOT should also consider building a bus shelter, as there is commuter bus service between Roanoke and Rocky Mount, and Boones Mill would likely be one of a very few stops along the route.

#6 Apperson and Route 419

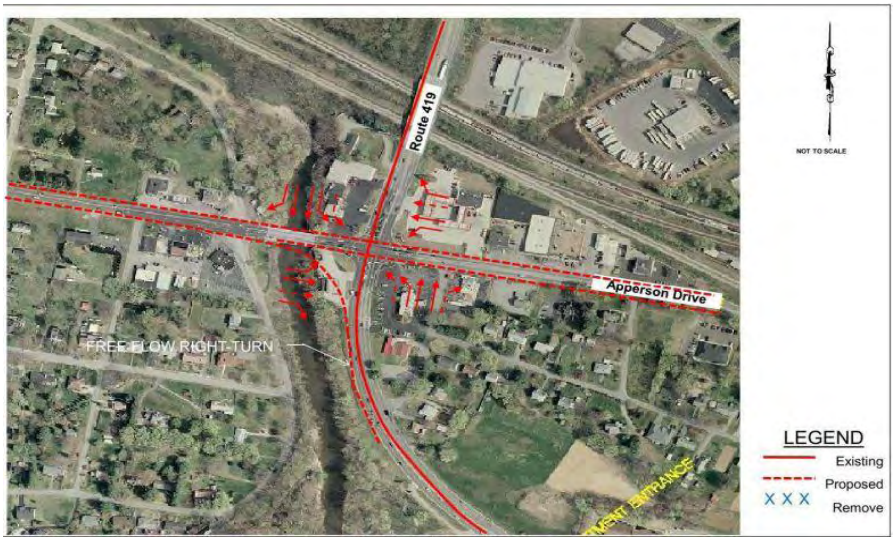


I. CMP Highway Strategies:

The 2012-2015 TIP lists intersection improvements at Apperson Drive and Route 419, which were initially recommended in the *Route 419 Corridor Plan*. The recommendations were to widen the northbound lanes of Route 419 to include a left and right-hand turn lane; widen Route 419 southbound to include a left-hand turn lane; widen Apperson Drive east and westbound to provide a second through lane; and to reconstruct the Apperson Drive bridge.

The *Route 419 Corridor Plan* recommended the following highway strategies to reduce traffic congestion:

- A reconfiguration of the intersection which includes:
    - Construction of a dedicated right-turn lane on Apperson, heading eastbound
    - Construction of two northbound left-hand turn lanes to accommodate A.M. peak traffic on Route 419
    - Construction of two eastbound left-hand turn lanes to accommodate A.M. peak traffic on Apperson Drive.



II. Recurring Congestion:

Severe peak hour traffic (A.M. Peak, LOS F; P.M. Peak, LOS E) on Route 419 and Apperson due to industrial, commercial, and employment traffic.

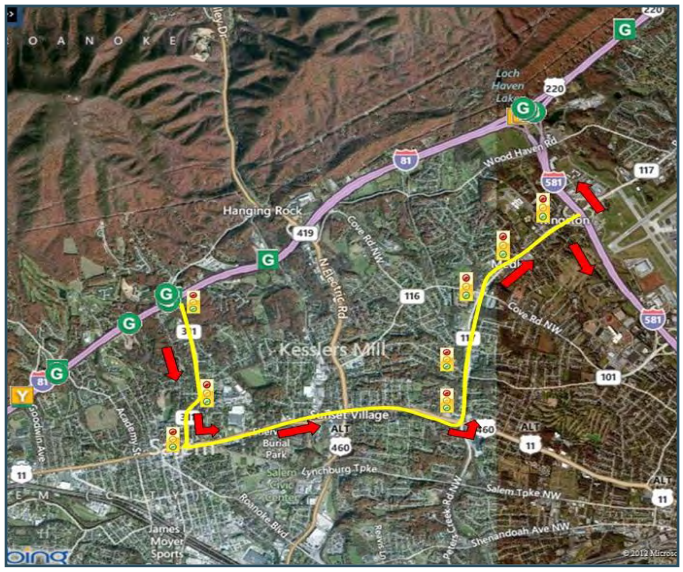
III. Non-recurring Congestion:

Based on a crash analysis of Route 419 performed in connection with the corridor plan, this intersection had the highest number of crashes of any in the study area.

The Virginia Department of Transportation (VDOT) has detour plans for major incidents that occur on interstates and other major thoroughfares. The following detour plan applies to the area near Area of Emphasis #6 (source VDOT officials at the Salem Traffic Operations Center - TOC - http://www.virginiadot.org/travel/smart-default.asp)

I-81 NB Detour: NO Exit 141 to SO Exit 143 (Salem District)

- **Incident Location:**
  - I-81 north of Exit 141 to south of Exit 143 (Roanoke County)
- **Current detour hard route:**
  - NB I-81 get off Exit 141 and go to traffic control and make a left turn, follow VA-419 and go to the intersection of US-11/460 (Main St) and make a left, go straight to the next light at the intersection of US 11/460 and US-117, (Peters Creek Rd.) and make a left, follow signs to I-581. NB traffic go over Interstate Bridge and exit right and SB I-581 gets on entrance ramp to SB 581.



I-81 NB Detour: NO Exit 141 to SO Exit 143 (Salem District)

IV. CMP Transit Strategies:

- Limited transit service exists around Apperson Drive and Route 419. One-way transit service connects Lewis Gale Medical Center to the VA Hospital. A transfer between route 91 and route 72 enables people traveling from Salem to go into Roanoke and vice-versa. However, most of the traffic congestion at this intersection is caused by vehicles passing through. Transit service needs to be improved in other places that will have a resulting positive effect on managing traffic congestion at Apperson Drive and Route 419. Transit can be improved to provide two-way connections and missing links to employment and retail centers. The City of Roanoke, the City of Salem, Roanoke County and Valley Metro could enter into discussions on the provision of transit service for the entire Route 419/Electric Road corridor. Examples of potential service could include the use of varying sized buses to provide specialized trips for commuters into downtown Roanoke, or to commercial centers in Salem and Roanoke County.

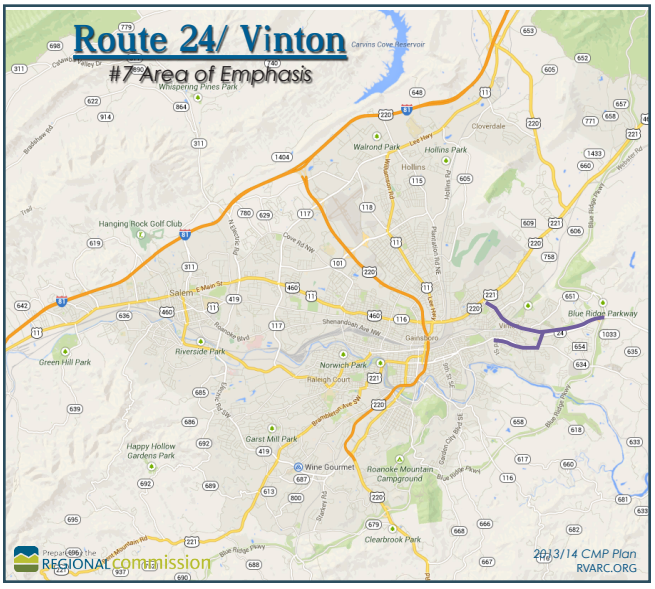
- Multimodal transit, pedestrian and car/vanpool interactions could be facilitated by the development of a new multimodal park and ride lot/multimodal transfer center near Downtown Salem and Roanoke College. This would allow for downtown workers, college faculty and students to park once and walk, bike or take transit for other trips. This concept may be further explored in the ongoing regional pedestrian and transit vision planning process anticipated to be completed by July 2014.

- As a complement to the aforementioned concept; and in order to service long-distance commuters between the Roanoke and New River Valleys, The *Route 419 Corridor Plan* specifically recommends extending the Smart Way Bus service to include the Orange Market Park and Ride lot (on Route 419, off I-81 at exit 140), with an accessory location near East Main Street in Salem. Such a commuter service extension would make transit a real option for people who live in Christiansburg/Blacksburg and work at places such as Roanoke College, the VA Hospital, and Lewis Gale Medical Center.

V. CMP Non-motorized Strategies:

- In order to accommodate bicycle riders, the RVAMPO Bikeway Plan 2012 update suggests wider travel lanes or paved shoulders be included in the proposed intersection improvements.
- In the *Update to the Roanoke Valley Conceptual Greenway Plan – 2007*, it stresses the importance of completing the Mason's Creek Greenway, from the Hanging Rock Battlefield Trail to the Roanoke River Greenway. When completed, the Greenway will connect multiple recreational attractions such as Carvins Cove and the Appalachian Trail; and the Greenway is situated near numerous business/commercial nodes making it important for fitness and overall quality of life.
- The *Route 419 Corridor Plan* recommends utilizing the proposed extension of the Hanging Rock Trail, to join the Roanoke River Greenway north of Apperson Drive, allowing bicyclists to connect to Route 419/Electric Road, north of Braeburn Drive in Salem.
- Apperson Drive, from the City of Roanoke corporate limit to Electric Road/Route 419 is on the priority corridor list in the *Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update*.
- When the Apperson Drive bridge is rebuilt, it is recommended that the Roanoke River Greenway be relocated along Route 419.

#7 Route 24/Vinton



I. CMP Highway Strategies:

The Town of Vinton Comprehensive Plan suggests the following strategies:

- Widening Virginia Avenue/Route 24, from the eastern corporate limit of the City of Roanoke to Pollard Street, to six lanes.
- Restripe Virginia Avenue/Route 24, from the City of Roanoke eastern corporate limit to Chestnut Street, to add width to road to accommodate bicycle traffic.

The *Vinton Area Corridors Plan*, performed in 2010 which is a component of the Roanoke County and Town of Vinton Comprehensive Plans, suggested the following strategies:

- Access management - with regard to sharing parking lots, reducing driveway entrances, and utilizing parallel streets (to the extent feasible).
- Determine potential improvements by analyzing the turning radius at the intersection of Virginia Avenue and 3rd Street.

II. Recurring Congestion:

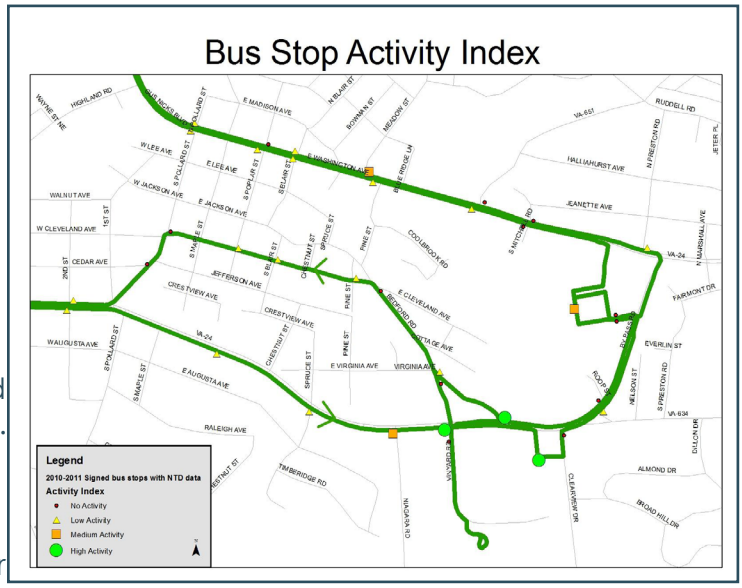
A.M. and P.M. peak hour traffic, generally commuter traffic west into the City of Roanoke and east into Roanoke County. Washington Avenue is one of two major corridors traveling through Roanoke County and the Town of Vinton, which has high traffic speeds and volumes.

III. Non-recurring Congestion:

Between 2006 and 2008, the Roanoke County and Town of Vinton Police Departments reported that Washington Avenue/Route 24 intersections ranked 1, 4 and 9 (Feather Road, Maplewood Drive, and Spring Grove Drive respectively) of the top 10 Vinton area accident locations.

IV. CMP Transit Strategies:

The bus stop activity index maps shows bus stops along Route 24 in Vinton and the activity level per the 2010-2011 National Transit Database Survey.



- The existing transit service in Vinton is somewhat circuitous. Service along Route 24 varies from two-way to one-way, where inbound service is provided via Bedford Road and Cleveland Road. This one-way inbound service, makes it difficult for residents who live in that corridor to take the bus to Lake Drive Plaza. Two-way service is prefered over one-way service to get the combined effect of being able to travel in both directions to and from a destination. Routes in Vinton should be evaluated to consider using transit to alleviate congestion on Route 24 by making short local trips easier to accomplish on public transit.
- The majority of traffic on Route 24 in the morning and the afternoon results mainly from commuters from Roanoke, Bedford or Franklin counties accessing jobs west of Vinton. Existing transit service is time-consuming for regional commuters because of the number of local stops. Regional transit commuter services as well as park-and-ride lots should be explored to determine if the availability of such services would encourage people to not use a single-occupant vehicle to commute to work thus reducing the number of vehicles on Route 24 and improving traffic congestion.
- According to the *Vinton Area Corridors Plan*, Roanoke County should evaluate the need to extend the current Valley Metro bus routes serving the Town of Vinton to Eastern Roanoke County. Extending the bus routes along Washington Avenue would ensure access to commercial centers, increase ridership, provide an alternative mode of transportation for the aging population, and connect Roanoke County with the Valley's multimodal transportation network.

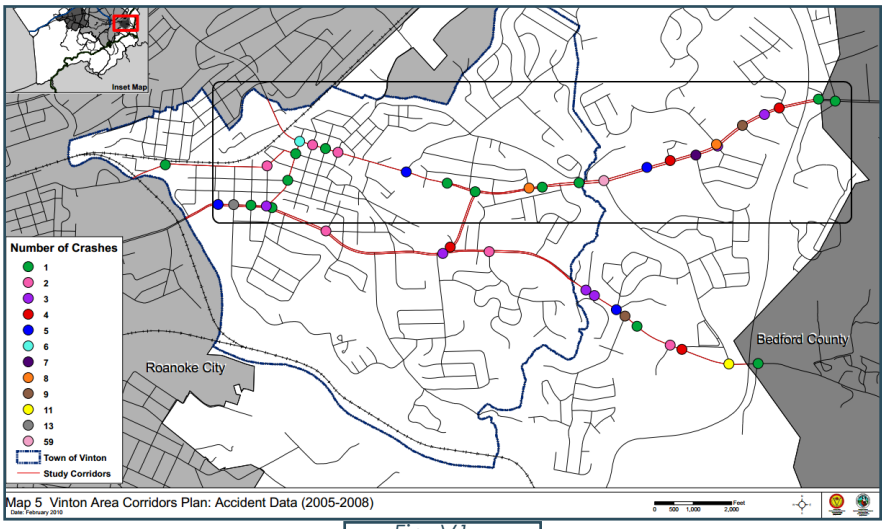
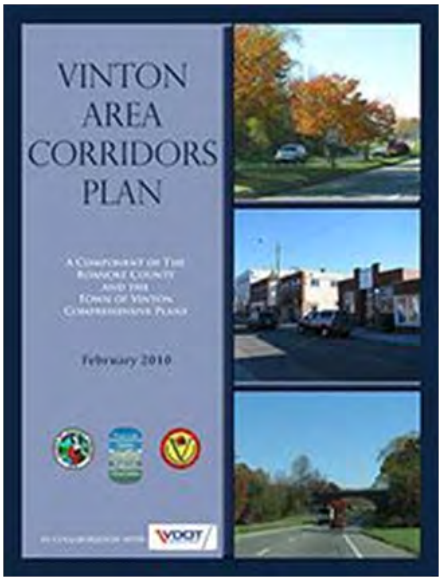


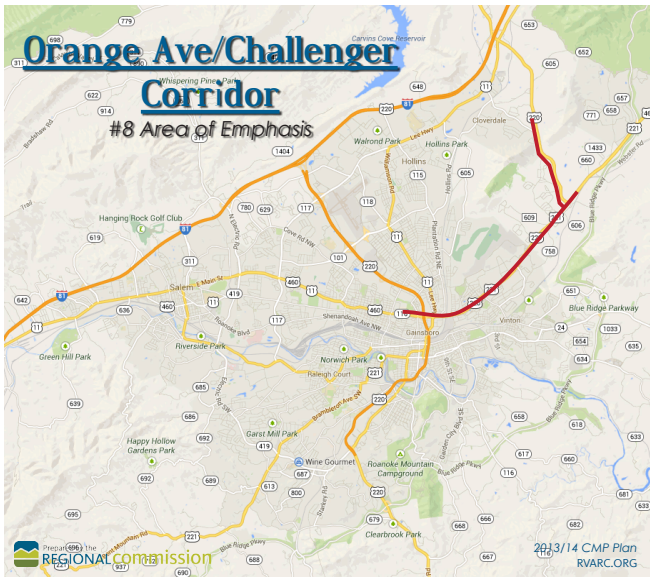
Fig. V1

V. CMP Non-motorized Strategies:

- In the *Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update*, Route 24/Washington Avenue, from the western corporate limit of the Town of Vinton to the Bedford County corporate limit, is listed as an on-road greenway connection consideration.
- The *Update to the Roanoke Valley Conceptual Greenway Plan – 2007*, listed the completion of the Roanoke River Greenway through the Town of Vinton. As a number one priority on its list of off-road greenways and trails.
- Additionally in the 2007 Greenway Plan update, the Tinker Creek Greenway was listed as a number two priority for completion. When completed, the Greenway will connect the Roanoke River Greenway to the Carvins Cove trail network. The Greenway Plan Update suggests the formation of a partnership between Hollins University and other key landowners, with the goal of creating a more specific master plan to address land acquisition and future capital outlays.
- The RVAMPO Bikeway Plan lists Washington Avenue/ Route 24, from the City of Roanoke corporate limit to the Blue Ridge Parkway, as a vision list and priority corridor to construct bike lanes.
- RVAMPO has established funding for the Glade Creek Greenway and connection from Route 24 to Walnut Ave.
- The Town of Vinton Comprehensive Plan recommends widening Washington Avenue/Route 24 from Bypass Road to the Roanoke County corporate limit, in order to accommodate bicycle traffic.
- To provide pedestrian connections throughout the Route 24 corridor, sidewalks should be completed on sections of Washington Avenue from Bypass Road to the Vinton corporate limit.



#8 Orange Ave/Challenger Corridor



I. CMP Highway Strategies:

- In 2002-03 RVAMPO and the Roanoke Valley Alleghany Regional Commission (RVARC) contracted with Wilbur Smith Associates to conduct a regional freight study for the Roanoke Valley.
- That study used the Reebie (now Transearch) freight database and developed and in-depth analysis of freight flows to and from the Roanoke Valley.
- That study also included a freight stakeholder involvement process that developed a list of the "Top 10 Freight Fast Action Projects" that should be considered in future plans.
- That freight study listed four potential projects (captioned below) as applicable to the Route 460 corridor named Orange Avenue in the City of Roanoke and Challenger Avenue in Roanoke County.

The City of Roanoke's *Hollins/Wildwood Neighborhood Plan* offers the following strategies:

- Consider the development of alternative routes that could divert the high traffic volumes on Orange Avenue, and recommend road improvements to Hollins Road, Gus Nicks Boulevard, and King Street which would improve congestion and traffic flow on Orange Avenue.
- Analyze and consider intersection improvements as an alternative to adding more travel lanes on arterial streets.
- Construction is currently underway to construct east- and westbound left turning lanes and signal at Blue Hills Drive and U.S. 460/Orange Avenue.
- The VDOT Six-Year Improvement Plan has programmed a reconstruction project, to six lanes, on U.S. 460/Orange Avenue from 11th Street to Gus W. Nicks Boulevard.

- To respond to the high congestion experienced in the A.M. and P.M. peak periods along Orange Avenue (U.S. 460), a reversible lane system could be utilized. The lane signs would be visible well in advance and would control the flow of traffic during specified times. Dynamic road signs, as demonstrated in the simulation above could be used in tandem with the reversible lanes to alert drivers of delays, new traffic patterns, etc.

Project #2 Orange Ave & I-581

Source: Motor Carrier Survey
Jurisdiction: VDOT
Problem: Inadequate acceleration/deceleration lanes at interchange
Proposal: Redesign and extend entrance/exit ramps to accommodate large trucks. (note: current TIP references ramp acceleration projects)

Project #5 Orange Av. & 13th St. NE

Source: Motor Carrier Survey
Jurisdiction: City of Roanoke
Problem: Traffic merges from 3 to 2 lanes creating a dangerous area as people attempt to beat trucks to the merge point.
Proposal: Conduct preliminary engineering analysis for possible road widening project.

Project #9 US 460 and Granby Road

Source: Motor Carrier Survey
Jurisdiction: City of Roanoke
Problem: Very difficult for trucks to make a right hand turn off US 460 (Orange Av) onto Granby Rd. to access to Statesman Industrial Center.
Proposal: Conduct an operational analysis of the intersection.

II. Recurring Congestion:

Severe A.M. and P.M. peak hour automobile and truck traffic is a common occurrence on Orange Avenue and Challenger.

III. Non-recurring Congestion:

Special events at the Roanoke Civic Center, and detours from the closure or severe congestion of I-81 and/or I-581.

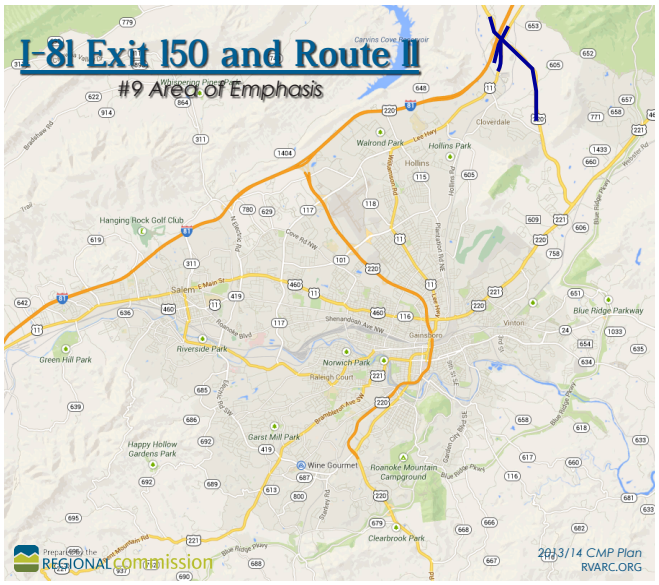
IV. CMP Transit Strategies:

- As shown in the bus stop activity index map, public transit service in the Orange Ave/ Challenger Corridor is limited. A short section between Kimball Avenue and Hollins Road is used to provide north-south service between Campbell Court and Crossroads Shopping Center. Similarly a section between Gus Nicks Boulevard and King Street provides access to some businesses on Orange Avenue for people traveling from Vinton and less directly, from Downtown Roanoke. At a minimum, morning and afternoon commuter transit service should be explored that is direct and express from the Bonsack area into Downtown Roanoke. Regular fixed-route transit service to the businesses near the U.S. 220/U.S. 460 intersection should also be explored.
- Several businesses within the Blue Hills Industrial Park have repeatedly expressed interest in all-day public transit service for their employees, and this service should be explored with the City of Roanoke, Valley Metro, and the businesses.
- Like the configuration shown in the picture, when Orange Avenue is widened to six-lanes, consideration should be given to providing a morning and afternoon restriction on the right-lane for turning movements, public transit, and high occupancy vehicles.

V. CMP Non-motorized Strategies:

- Orange Ave (U.S. 460), from Williamson Road to Gus Nicks Boulevard is listed as a priority corridor in the *Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update*.
- Orange Avenue (U.S. 460), from Gus Nicks Boulevard to the Roanoke County Corporate Limits, is listed as a vision corridor in the *Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update*.
- As a means of relieving congestion at the Roanoke Civic Center, the Lick Run Greenway could be used from downtown parking garages.

#9 Exit l50 and Route l1



I. CMP Highway Strategies:

- The Interstate 81 Exit 150 Access Management Improvements Project, which is currently in the right-of-way acquisition phase and it scheduled for construction in the fall of 2014, will accomplish the following:
- Relocate the northbound I-81 entrance ramp to a new location adjacent to the Exit 150B off-ramp.
- Construct a roundabout at Exit 150B/ Route 11 intersection.
- Build a new loop road to extend from the roundabout to U.S. 220 Alternate.
- Provide better access management on Route 11 by installing a raised median and reducing the number of entrances.
- Modify the entrances onto Route 11 as right-in/right-out only.
- In the *Botetourt County Comprehensive Plan 2010*, it is asserted that the development of a new land use plan for the Exit 150 area will improve "negative traffic impacts." Beginning in late 2013, staff of the RVAMPO will assist Botetourt County in the development of a vision master plan for the Exit 150 interchange.
- Walkable and transit-friendly mixed-use developments can lessen the vehicle miles traveled by offering services that would normally require vehicle trips.
- To respond to the daily high congestion due to the intensity and concentration of commercial uses at Exit 150, a reversible lane system could be utilized. In 2004, under the Public-Private Transportation Act (PPTA)of 1995, Fluor Virginia submitted an acceptable proposal for Interstate 81, to VDOT which added one lane in each direction, on the inside, for passenger vehicles only. It is beyond the scope of this

document to perform extensive GIS analysis and preliminary engineering, however, the concept of managed lanes with a one-lane per direction addition would conceivably be similarly feasible to the Fluor Virginia proposal.

- The Managed Lane illustration suggests which incorporates general purpose lanes, reversible lanes (separated by raised medians), and emergency lanes. As growth occurs or transportation needs arise in the area, the lanes can be managed in a flexible way to compensate for the change.
- The High Occupancy Vehicle lanes (HOV) illustration depicts the installation of and an HOV-HOT (High Occupancy Toll) lane. The center lanes could be incentivized for car and vanpooling, for free, while single-occupancy vehicles would be required to pay a toll. A dynamic road sign is shown in the I-81 southbound lane, which alerts drivers to delays and other information.
- The Variable Speed Zone illustration would be necessary during periods of severe congestion. A dynamic road sign could alert drivers of delays and congestion.

II. Recurring Congestion:

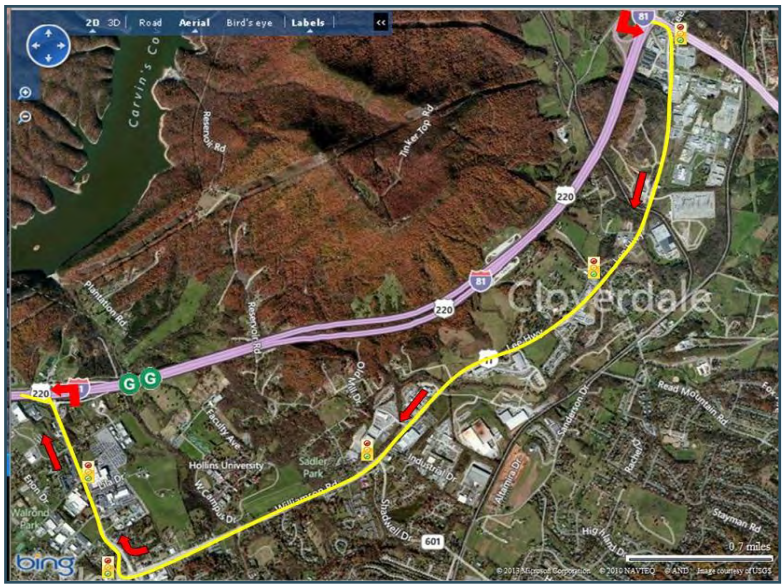
Exit 150 is at the meeting of U.S. Routes 11, 220, 220 Alternate, and VA Route 604. Due to the high intensity and concentration of commercial uses, this is a constant source of daily congestion. The *Botetourt County 2010 Comprehensive Plan* noted RVAMPO-provided Level of Service guidelines, which indicated a LOS D for U.S. 220, from the northern County limit to I-81, Exit 150.

III. Non-recurring Congestion:

The Virginia Department of Transportation (VDOT) has detour plans for major incidents that occur on interstates and other major thoroughfares. The following detour plans apply to the area near Exit 150 (source VDOT officials at the Salem Traffic Operations Center - TOC - http://www.virginiadot.org/travel/smart-default.asp)

I-81 SB Detour: SO Exit 150 to NO Exit 146 (Salem District)

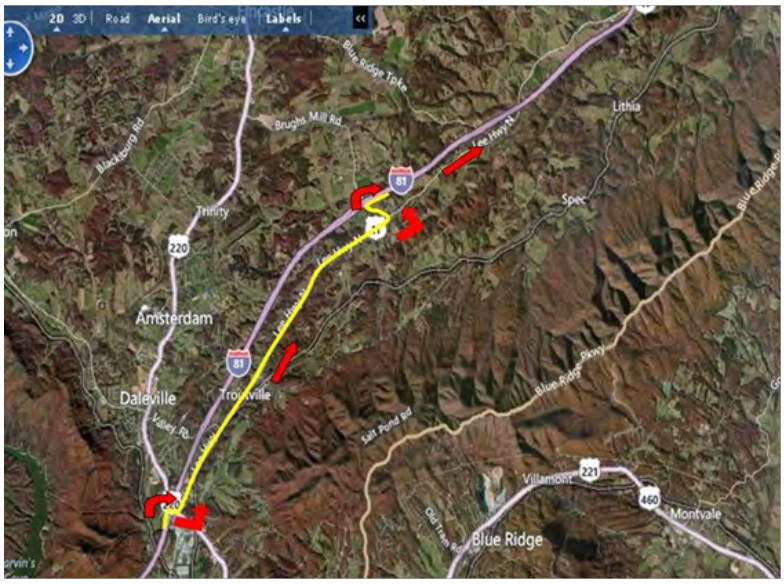
- **Incident Location**: I-81 south of Exit 150 to north of Exit 146 (Roanoke/Botetourt)
- **Current detour hard route**: Exit 150 and make a right onto US-220, make a right at the intersection or US- 220 and US-11 turn right, follow US-11 to the intersection of VA-115 (Plantation Road) and make a right, follow the signs to SB I-81.



I-81 SB Detour: SO Exit 150 to NO Exit 146 (Salem District)

I-81 NB Detour: NO Exit 150 to SO Exit 156 (Salem District)

- **Incident Location**: I-81 north of Exit 150 to south of Exit 156 (Botetourt)
- **Current detour hard route:** NB I-81 exit at 150B and stay in left lane, at the end of the ramp turn left onto US-11, continue onto US-11 to Rt. 640 (Brughs Mill Rd.) and turn left, and follow signs to the Interstate.

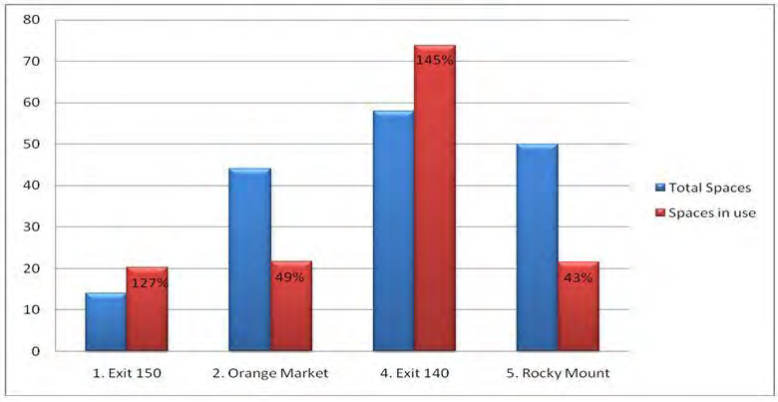


I-81 NB Detour: NO Exit 150 to SO Exit 156 (Salem District)

IV. CMP Transit Strategies:

- Currently, no transit services exist for people that need to commute to a job without the use of a personal vehicle. Transit service in Botetourt County is limited to van services for medical or shopping trips for senior citizens and disabled persons and is provided by the County's parks and recreation department. The *Botetourt County 2010 Comprehensive Plan* recommends developing transportation systems that shorten vehicle trips, and are focused around receptive mixed-use, population and growth centers, with an overall goal of lessening congestion. Broader transit services in Botetourt County should be explored.

Figure 4: Average Parking Lot Usage RVARC



- Specifically, Botetourt County should explore development of a commuter transit service that provides connections from areas with commercial centers and large residential developments, such as those in Daleville.
- It is not possible for people without personal vehicles in the Roanoke Valley who do not live in Botetourt County to travel to places in Botetourt County because services such as those provided for senior citizens and people with disabilities are limited to Roanoke County, the Cities of Roanoke and Salem, and the Town of Vinton. A regionally integrated public transit service should be established to enable such mobility at least within the urban areas of the region.

V. CMP Transportation Demand Management (TDM) Strategies:

The 2009 "RIDE Solutions Park-and Ride Study: Inventory, Use and Need for the Roanoke and New River Valley Regions" found that usage of the Exit 150 Park-and-Ride was at 127% capacity in 2009. This means that vehicles are parked on shoulders and access approaches in addition to the spaces provided in the lot.

The 2009 report had the following recommendation for new and expanded park-and-ride facilities in the Exit 150 vicinity:

New and Expanded Facilities: I-81 Exit 150

I-81 Exit 150 has long required expansion, and given the drop in usage numbers over the 2008 survey period compared to both the 2005 and 2003 numbers, there is some concern than the lack of accommodations may have driven potential users away and encouraged them to remain in their SOV mode. Given the state of the existing lot, it appears unlikely that there is sufficient room to expand the lot to the recommended 40 or 50 spaces. VDOT should consider relocating the lot entirely, and perhaps even consider a space-sharing agreement with one of the businesses immediately north of the existing lot.

VI. CMP Non-motorized Strategies:

- The *Bikeway Plan for the Roanoke Valley Area MPO - 2012 Update* stresses the importance of upgrading current deficiencies on U.S. Bicycle Route 76 as: a lack of wayfinding signage and maps, narrow travel lanes, lack of shoulders, and speed limits.
- Although Bicycle Route 76 is connected to activity centers in Daleville (Exit 150) through U.S. Route 11, the Bikeway Plan suggests stronger stakeholder involvement to strengthen additional and existing corridors' connections. This will become increasingly important as interchange improvements occur at Exit 150.

#10 Brandon Ave. Corridor

I. CMP Highway Strategies:

The City of Roanoke's *Greater Raleigh Court Neighborhood Plan* recommended studying this intersection for any potential level of service improvements. In a 2010 implementation report from the City of Roanoke, it was noted that any improvements to increase capacity would require additional lanes and the acquisition of right-of-way.

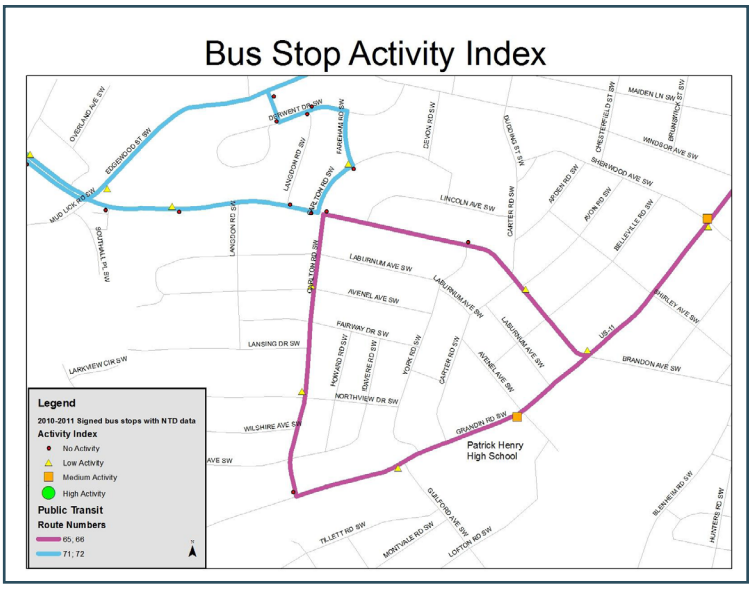
II. Recurring Congestion:

A.M. and P.M. peak hour commuter and commercial traffic; and morning/evening school bus/student-related traffic. Brandon Road experiences congestion at multiple intersections starting with Main St. and running through Mud Lick Rd.

III. Non-recurring Congestion:

Vehicle crashes and special events at Patrick Henry High School.

IV. CMP Transit Strategies:



- As shown in the bus stop activity index map, transit service exists on portions of Brandon Avenue and Grandin Road, but they are not continuous, so their usefulness and ability to substitute for personal vehicle trips is limited. The current north-south transit service (Routes 65/66) on Grandin Road is limited because it stops at Patrick Henry High School, which is an unnecessary endpoint on weekends and evenings when there are few school activities. These routes also are circuitous between the high school and Campbell Court in that they loop through neighborhoods such as Norwich, Raleigh Court along Maiden Lane, and Hurt Park. The fact that it takes 30 minutes to travel from Patrick Henry High School to Downtown Roanoke will deter most choice riders given that the alternative, driving, takes 10 minutes. Routes 65/66 should be evaluated in the context of the greater transit network to see if they can be made less circuitous and if Patrick Henry High School is still a good end point for this transit line.
- Similarly, routes 71/72 cover a portion of Brandon Avenue from Lewis Gale Medical Center to Carlton Road. However, people who want to continue towards Towers

Shopping Center or Carilion Roanoke Memorial Hospital must first go into Downtown Roanoke and then back out. A continuous east-west route between Lewis Gale Medical Center and Carilion Roanoke Memorial Hospital should be evaluated within the context of modifications made to the greater transit system. Such a route would have greater opportunities for replacing some single vehicle trips along Brandon Avenue.

III. CMP Non-motorized Strategies:

- The RVAMPO Bikeway Plan lists Grandin Road, from Brandon Avenue to Memorial Avenue, as a priority corridor for the provision of bicycle accommodations.
- Additionally, the Bikeway Plan has Grandin Road, from Garst Mill Road to Brandon Avenue as a vision corridor for bicycle accommodations.
- The *Update to the Roanoke Valley Conceptual Greenway Plan – 2007 was written prior to the completion of a section of the* Murray Run Greenway from Grandin Road (at Patrick Henry High School) to Colonial Avenue. The Greenway Plan does, however, mention a planned extension of the Greenway to Tanglewood Mall, by way of Colonial Avenue and Ogden Road. The City of Roanoke's Parks and Recreation Department performed a feasibility study to determine alternative routes to reach Roanoke County. Completion of the Greenway will improve overall connectivity throughout the entire network.


Traffic Congestion near intersection of Brandon AVE and Grandin Road - August 26, 2013 - 5:11 p.m.

10. CMP General Strategies

In addition to the above groups of strategies, there are some broad, over-arching strategies which apply to many of the 10 Areas of Emphasis.

a. Transit Strategies

Bike n' Ride - bike racks on buses

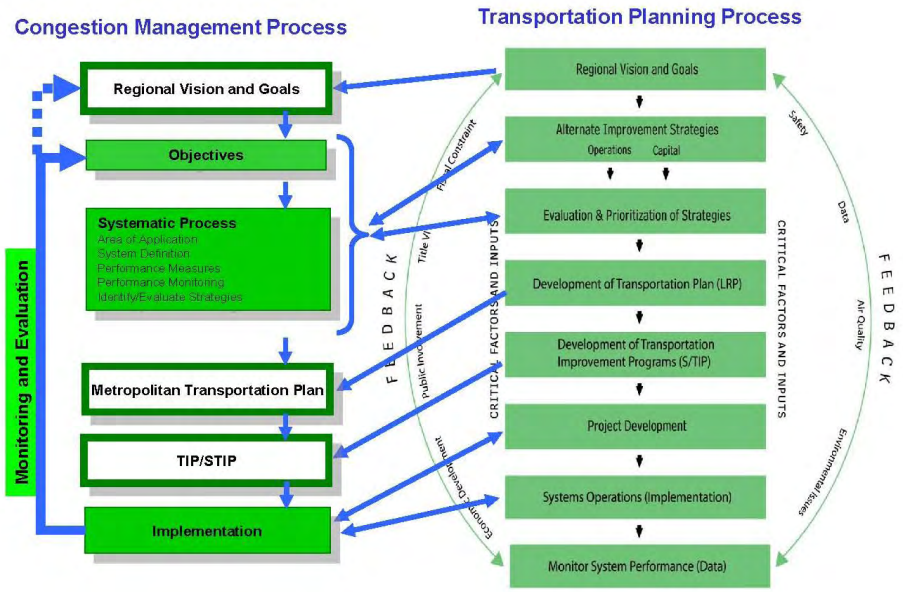
- In the fall of 2006, as part of its Bike "n" Ride program, Valley Metro began installing front mounted racks with a two bicycle capacity on its fleet. Valley Metro also allows cyclists to bring bicycles onto buses not equipped with bicycle racks. With future restructuring of the Valley Metro system, it is anticipated that the frequency of buses will increase along high-ridership routes/ destinations.
- The planning of more transit/bike connections with new and existing bus routes to increase usage of the Bike n' Ride program would be prudent.
- The installation of a bus arrival sign, as is illustrated in the photo, informs riders of arrivals and potential delays.
- Intelligent Transportation Systems such as on-board GIS systems allow for bus movement monitoring and adherence to current schedules. Automatic passenger counters should be a feature on new buses to calculate the boarding and alighting of passengers, providing transit agencies with data to make informed route and system refinements.

b. Non-motorized Strategies

- Increased marketing of the Bike n' Ride program by bicycle advocacy groups and Valley Metro is important in order to sustain this multimodal form of transportation.
- Even beyond the sections identified in the Bikeway Plan, bicycle use exists and accommodations are needed as evidenced by a bike commuter leaving the Jack C. Smith Industrial Park in Botetourt County.
- The Update to the Roanoke Valley Conceptual Greenway Plan – 2007, discusses and suggests that the connectivity between greenways could be greatly improved by on-road wayfinding and signage.

12. CMP Implementation and Management

How Does the CMP Relate to Transportation Planning Process

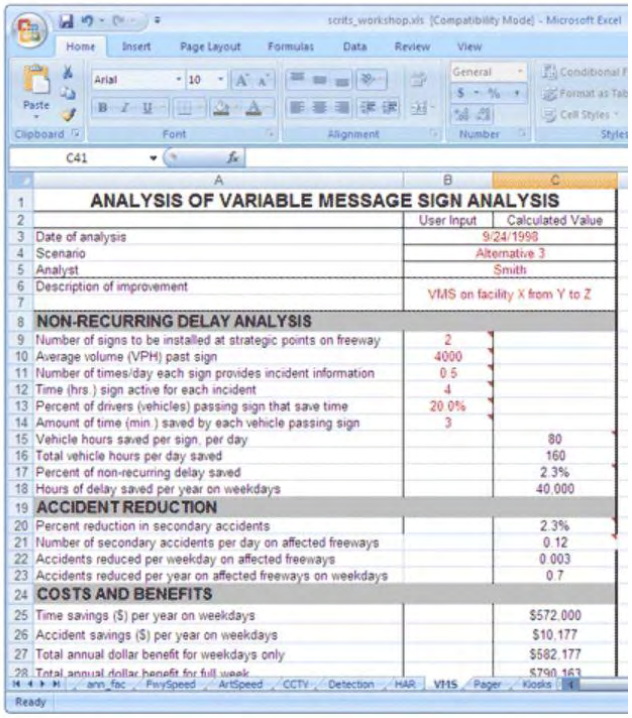


a. Highway Implementation and Management:

CMP Highway Implementation and Management depends on the interaction of various stakeholders and agencies. In the Federal 3-C (continuing, cooperative and comprehensive) transportation planning process, the federal level, the state level and the regional (local government) level all have checks and balances in the constraining and programming of federal surface transportation funds. The following flow chart gives a general idea of the relationship between the CMP and the Constrained Long-Range Transportation Plan (CLRTP) and the TIP.

It is important to note that the CMP does not have any specific financial leverage, check or balance with respect to federal surface transportation funds. The CMP serves primarily as a way to develop congestion reduction strategies and to introduce them into the CLRTP process and subsequently for programming into the TIP. As such the CMP, CLRTP and TIP all have a feedback loop with each other.

Although the CMP cannot directly obligate or program funds, it can present project ideas, concepts and estimated costs so that the same projects can be included in future CLRTPs and TIPs. In this way the CMP serves as a concept and project scoping document and a way to present intelligent transportation systems (ITS) and other approaches to solving congestion on an equal footing with traditional roadway construction based approaches. VDOT is developing ITS project cost



ANALYSIS OF VARIABLE MESSAGE SIGN ANALYSIS

	User Input	Calculated Value
Date of analysis	9/24/1998	
Scenario	Alternative 3	
Analyst	Smith	
Description of improvement	VMS on facility X from Y to Z	
NON-RECURRING DELAY ANALYSIS		
Number of signs to be installed at strategic points on freeway	2	
Average volume (VPH) past sign	4000	
Number of times/day each sign provides incident information	0.5	
Time (hrs.) sign active for each incident	4	
Percent of drivers (vehicles) passing sign that save time	20.0%	
Amount of time (min.) saved by each vehicle passing sign	3	
Vehicle hours saved per sign, per day		80
Total vehicle hours per day saved		160
Percent of non-recurring delay saved		2.3%
Hours of delay saved per year on weekdays		40,000
ACCIDENT REDUCTION		
Percent reduction in secondary accidents		2.3%
Number of secondary accidents per day on affected freeways		0.12
Accidents reduced per weekday on affected freeways		0.003
Accidents reduced per year on affected freeways on weekdays		0.7
COSTS AND BENEFITS		
Time savings ($) per year on weekdays		$572,000
Accident savings ($) per year on weekdays		$10,177
Total annual dollar benefit for weekdays only		$582,177

ITS Project Cost Estimator Spreadsheets

estimator spreadsheets which will allow planners to develop a planning level cost estimate for congestion management approaches and compare costs with highway construction approaches. The forthcoming cost sheets will be integral in helping to put operations approaches such as ITS on an equal footing with highway construction approaches in the CLRTP planning process. The image below is a similar tool from the FHWA's "Operations Benefit/Cost Analysis Desk Reference."

b. Transit Implementation and Management:

The transit usage performance measures listed previously are scheduled to be updated annually through the Annual Performance Measures Report developed by RVAMPO. The additional performance measures discussed would need to be established with Valley Metro.

Bus stops at the Salem/Roanoke line, causing traffic delays because no bus pull-off exists

c. Non-Motorized Implementation and Management:

Non-motorized transportation facilities can be implemented using a variety of programs and funding sources. One common way to incrementally add bicycle infrastructure is to work with the localities that have responsibility for their urban transportation system, such as the City of Roanoke, through their paving and maintenance schedule. Often lanes can be restriped during the maintenance process allowing for extra shoulder width or even a bicycle lane. The same strategy can be applied to the maintenance and paving schedules administered by VDOT on transportation facilities that it maintains.

Otherwise, facilities such as trails, paths and even bicycle lanes can qualify for Regional Surface Transportation (RSTP) funds. Likewise some non-motorized transportation projects can qualify for Transportation Alternatives (TA) funds which incorporates funding sources that were previously referred to as Transportation Enhancements (TE) and Safe Routes to School (SRTS) funding.

13. Monitor Strategy Effectiveness

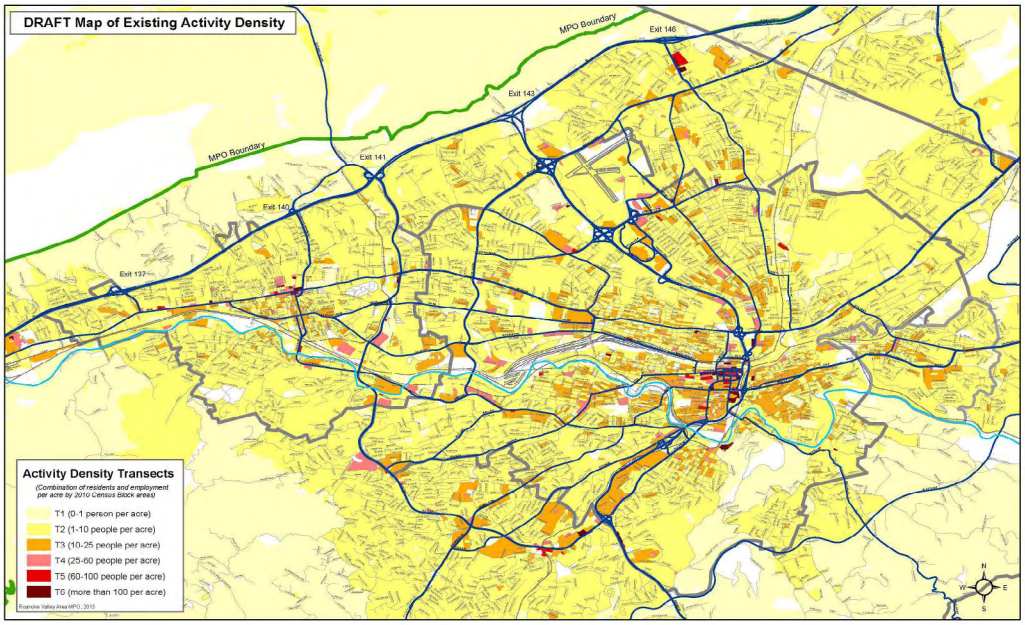
a. CMP Highway Strategy Effectiveness

The task of monitoring the system tracks the effectiveness of CMP recommendations and allows planners to see where new problems may arise. The first step of system monitoring will be a yearly review of the 10 CMP Performance Measures that were previously mentioned in this report. Specific additional system monitoring initiatives for the 10 Areas of Emphasis will be discussed below.

The CMP methodology that identified the ten areas of emphasis relied on Google Traffic snapshots that reflected real-time traffic conditions in 2013. The Constrained Long-Range Transportation Planning Process (CLRTP) uses a computerized Travel Demand Model to estimate future travel demand for the 2035 planning horizon year. The estimated Volume over Capacity (V/C) ratios for the 2035 horizon are included for each of the areas of emphasis. The computer model provides indications of where traffic congestion may be more of a problem in the future, and consequently indicates where system monitoring, measurement and feedback should be incorporated. Maps depicting 2035 V/C estimates for each of the 10 Areas of Emphasis will be included below.

b. CMP Transit Strategy Effectiveness

The Virginia Department of Rail and Public Transportation (DRPT) has recently developed Multimodal System Design Guidelines. These guidelines present core concepts of "The Transect" and "Activity Density" An Activity Density for an area is the sum of people and jobs in the area divided by the acreage, yielding a total density of jobs plus people per acre (DRPT, Page 26). Since "Activity Density" incorporates both population and employment, it encompasses the primary spatial drivers of both traffic congestion and potential public transit ridership. An "Activity Density" map for each area of emphasis, when available, will be provided below. Like the 2035 Volume/Capacity estimates for highway congestion, the "Activity Density" map should indicate potential traffic congestion and transit hot-spots that will need to be addressed in the aforementioned "yearly review," or the full plan update which is anticipated every 5 - 7 years. A vignette of the Existing Activity Density Map for the region is provided below for contextual purposes. Individual areas of emphasis will have a "zoomed in" version that applies to the particular area.



c. CMP Non-Motorized Strategy Effectiveness

Expansion of the bicycle and pedestrian counting activities will be needed to fully incorporate all 10 areas of emphasis:

- Expand national bicycle and pedestrian documentation project (nbpd) counts to include the 10 cmp areas of emphasis
- Expand regional greenway and trail user count program to additional count locations
- Consider automation of on-street, non-motorized counts (i.E., Eco-counter)
- Conduct greenway user survey to determine reason for using greenway
- Conduct a follow-up to the 2009 rvampo bicycle user survey

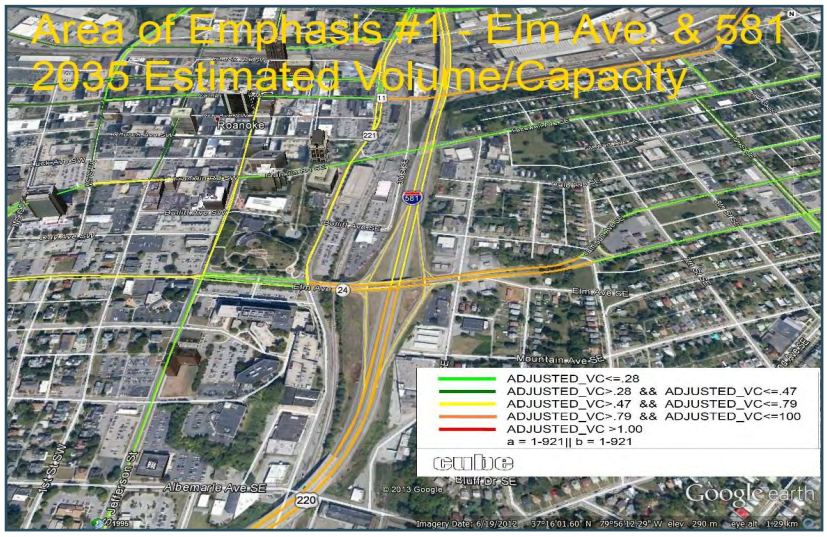
#1 Elm Avenue and I-581

I. CMP Highway System Monitoring:

Section 6 of this document stated that the current interchange reconstruction project is anticipated to be completed in the Summer of 2015. The map of forecasted 2035 V/C ratios for the intersection, depicted above, indicates that ongoing monitoring of the intersection is warranted in the yearly Google Traffic review process. The CLRTP 2035 was completed in 2011 before final designs for the interchange reconstruction project were developed. It will be instructive to monitor this interchange once reconstructed to see whether traffic congestion continues toward the long-range forecast, or if the new design is largely successful at alleviating peak hour congestion over time.

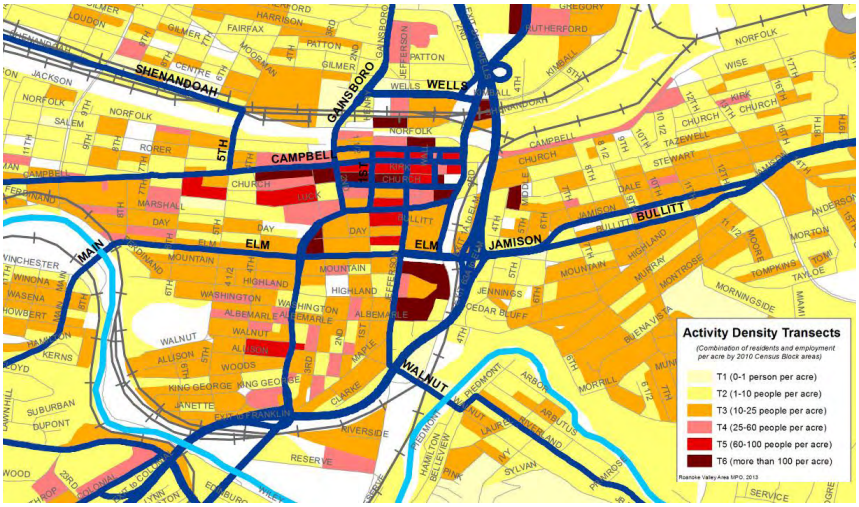
II. CMP Transit System Monitoring:

The activity density transect map, depicted above, indicates that this area of emphasis in heavily influenced by its location in Downtown Roanoke. As such, continued monitoring of both public transit usage and parking policies will be key to early indications of opportunities to help address traffic congestion in this area. The concept is to promote a "drive once - park once" message to those who choose to drive to Downtown Roanoke. Once a vehicle is parked other trips in the trip chain can be accomplished on foot and/ or by transit (Downtown Rubber-Tired Trolley). Parking policies and pricing will have a key influence on traffic congestion in this area of emphasis.



III. CMP Non-motorized System Monitoring:

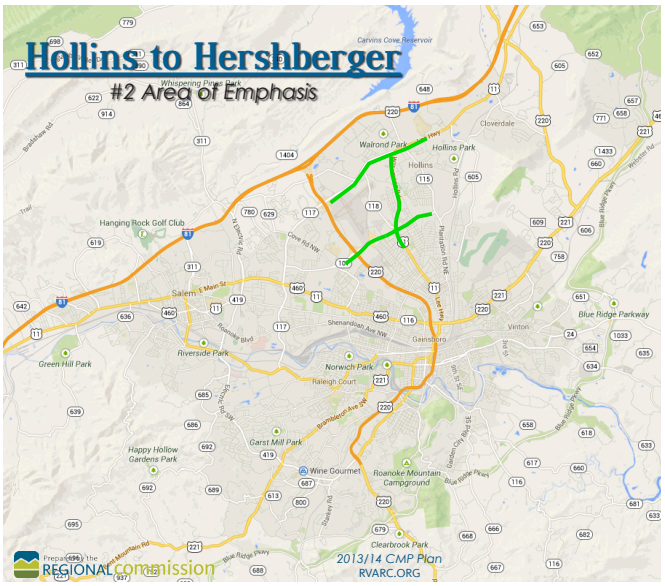
The reconstruction of Exit 150 will feature reconfigured pedestrian access. Once the new facility is in place, it may be a good candidate for future pedestrian counts.



#2 Hollins to Hershberger

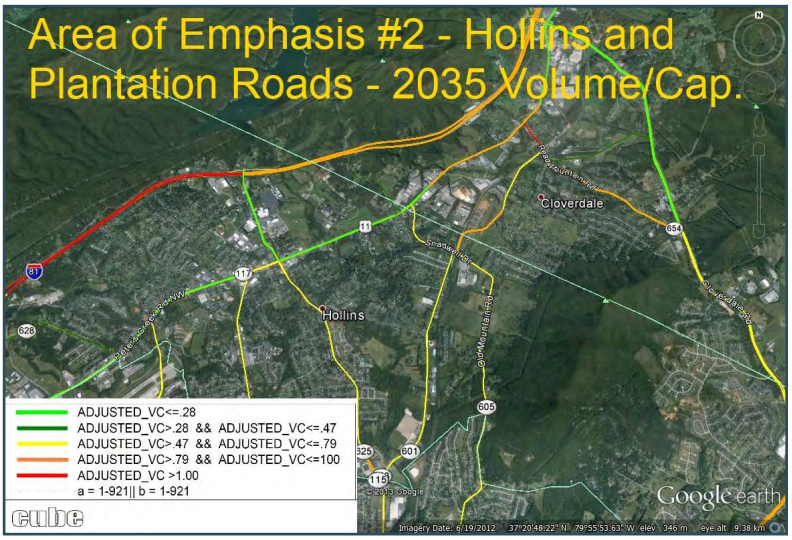
I. CMP Highway System Monitoring:

Area of emphasis #2 is subject to both recurring congestion due to the concentration of employment, see activity transect map depicted below, and non-recurring congestion due to figuring into 3 different I-81 detour plans (see section 6).



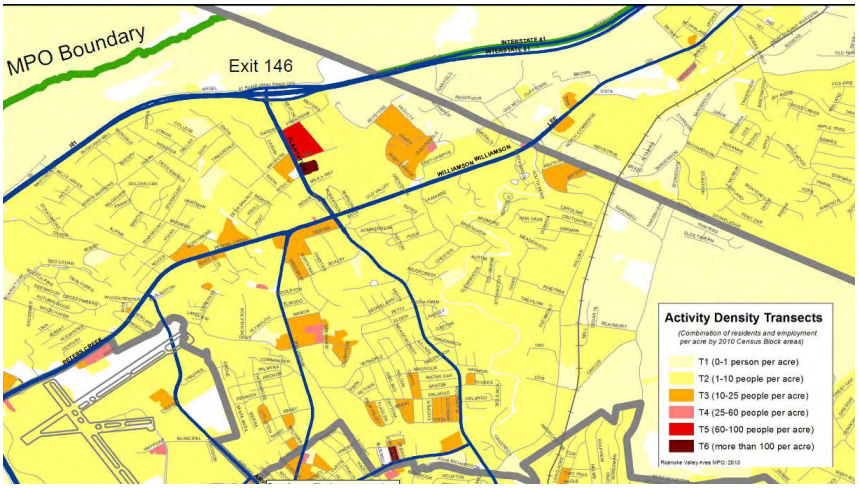
II. CMP Transit System Monitoring:

Section 6 of this document specifically mentioned the possibility of extending public transit to this area of emphasis. The area around Exit 146 on I-81 has a particularly intense activity index due to the high concentration of employment near the exit. It is anticipated that public transportation and TDM strategies can help reduce some vehicular traffic congestion. Data to monitor in this regard will be whether transit service gets extended to the Exit 146 area of Plantation Road in the future and member data from RIDE Solutions, the TDM agency serving the region, concerning whether more carpools are being registered from this area of emphasis.

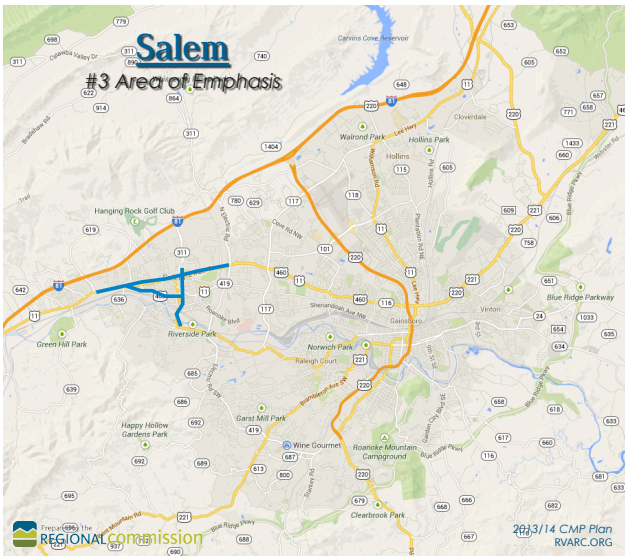


III. CMP Non-motorized System Monitoring:

Roanoke County has an ongoing streetscaping project that applies to the area near the intersection of Plantation Road and Williamson Road extending on Plantation Road towards Exit 146. These pedestrian improvements can help facilitate a park once and walk to other destinations, such as lunch, message to those employed in the area. Once the pedestrian facilities are completed they should be considered for pedestrian count activities as described elsewhere in this document.



#3 Salem



I. CMP Highway System Monitoring:

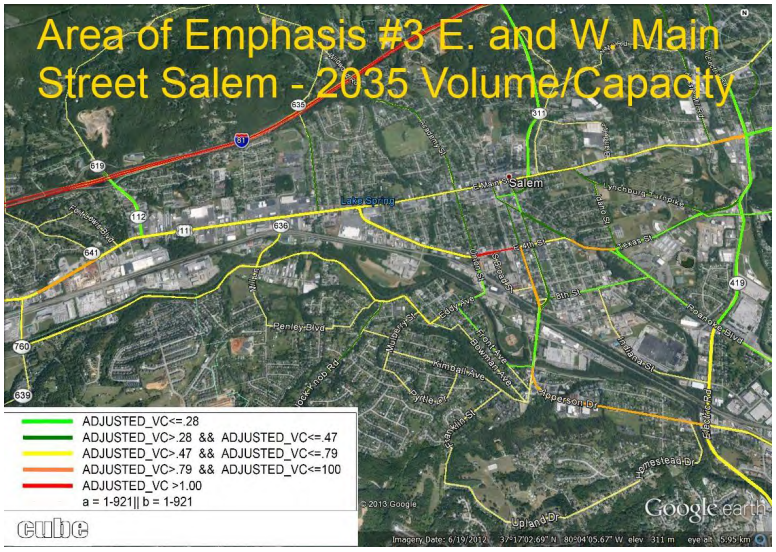
East and West Main Streets of Salem are burdened by their own locally generated vehicular traffic and non-recurring overflow traffic from incidents on I-81. Ongoing traffic congestion monitoring will need to take into account these two distinct sources of traffic congestion.

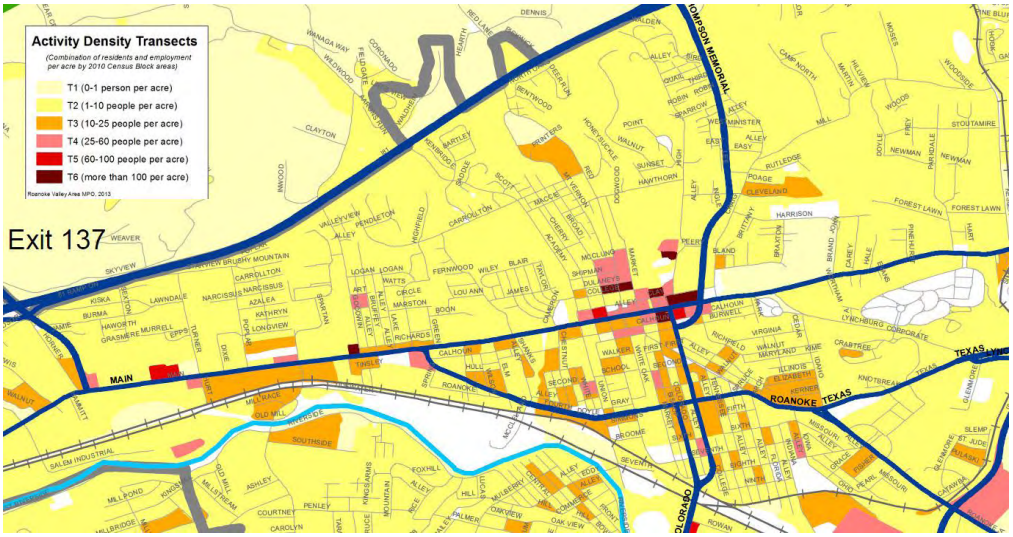
II. CMP Transit System Monitoring:

The Activity Density Map featured above indicates that this area has a great potential to attract more choice public transit riders thereby relieving some pressure on vehicular traffic congestion. The triennial National Transit Database (NTD) data will be analyzed and reviewed to monitor transit and bus-stop usage in the corridor.

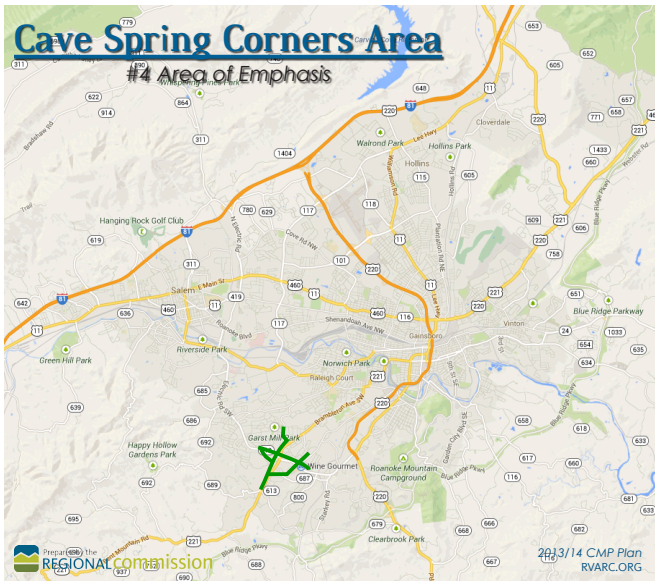
III. CMP Non-motorized System Monitoring:

This corridor is a good candidate for expanded use of pedestrian counts as resources become available in the future.





#4 Cave Spring Corners

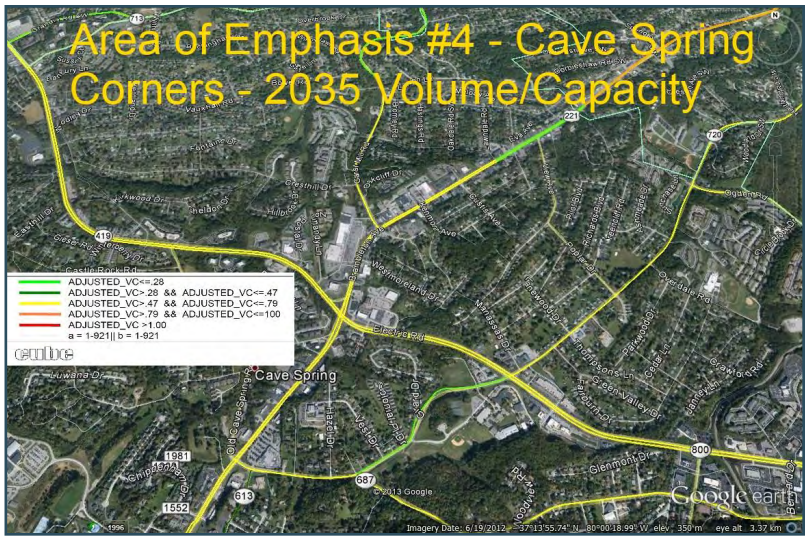


I. CMP Highway System Monitoring:

Various intersection, widening and operations strategies are mentioned in Section 6 of this document that apply to this corridor. The *Route 419 Corridor Plan* documents that this corridor is a regional priority with various improvements discussed as being applicable to the area. This area should be focused on during the yearly review process using Google Traffic Snapshots. Any indication of worsening congestions should be communicated to the RVAMPO Policy Board during their discussions of the CLRTP and the TIP.

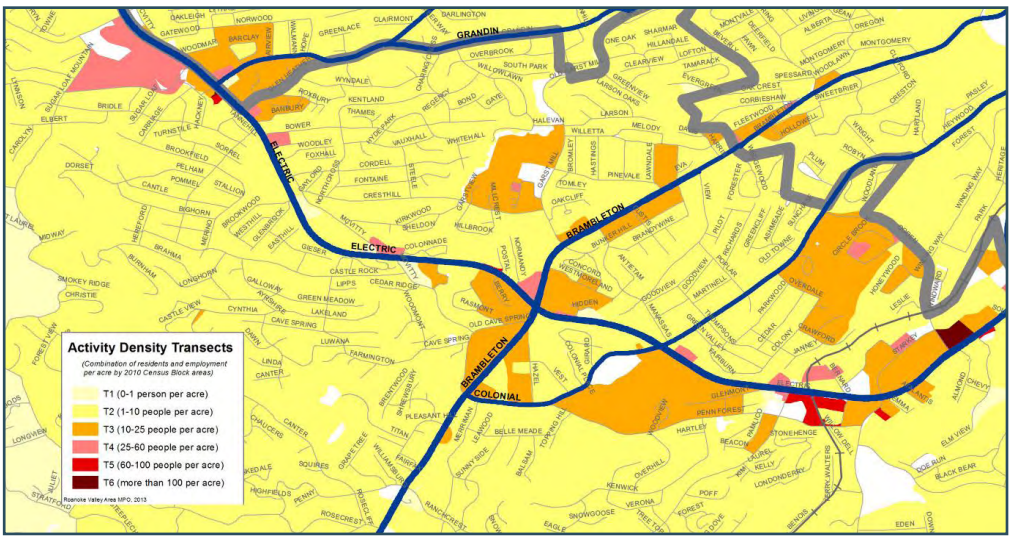
II. CMP Transit System Monitoring:

Section 6 of this document specifically mentioned the possibility of extending public transit to this area of emphasis. It is anticipated that public transportation and travel demand management (TDM) strategies can help reduce some vehicular traffic congestion. Data to monitor in this regard will be whether transit service gets extended to the Route 419 corridor in the future and member data from RIDE Solutions, the TDM agency serving the region, indicating whether more carpools are being registered from this area of emphasis.

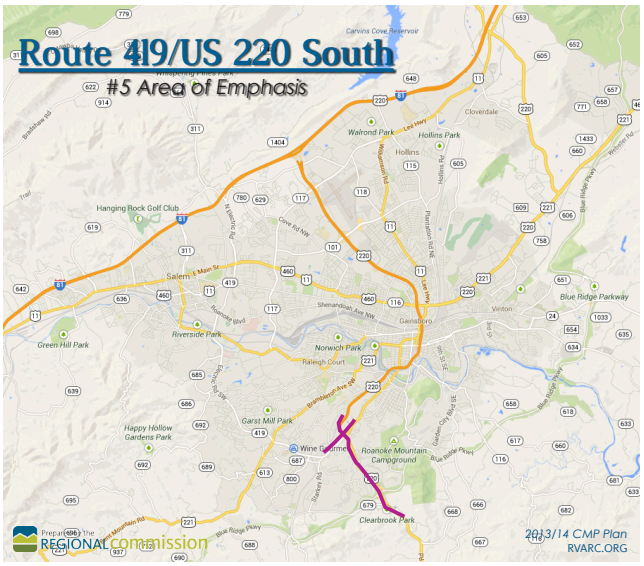


III. CMP Non-motorized System Monitoring:

Once pedestrian and bicycle accommodations are added and improved in this area, annual count activities should be considered.



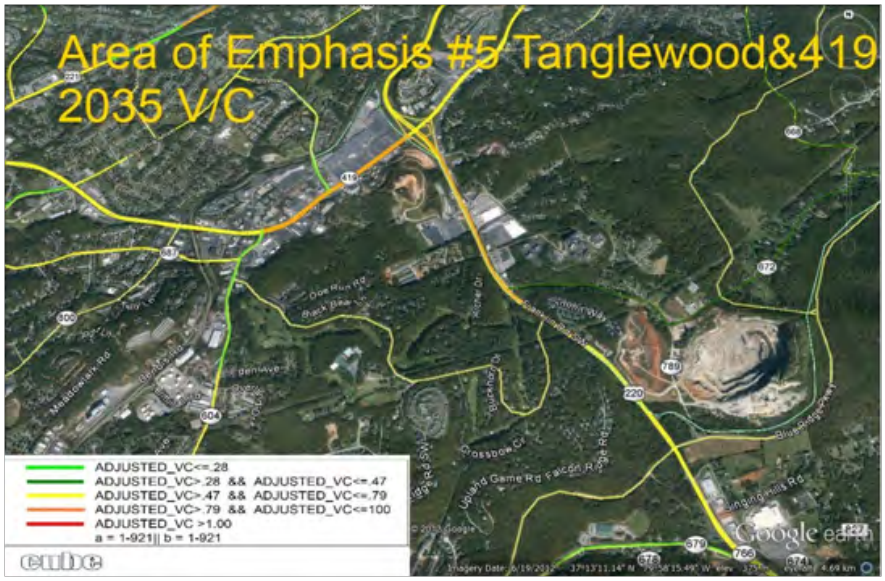
#5 Route 419/U.S. 220 South



I. CMP Highway System Monitoring:

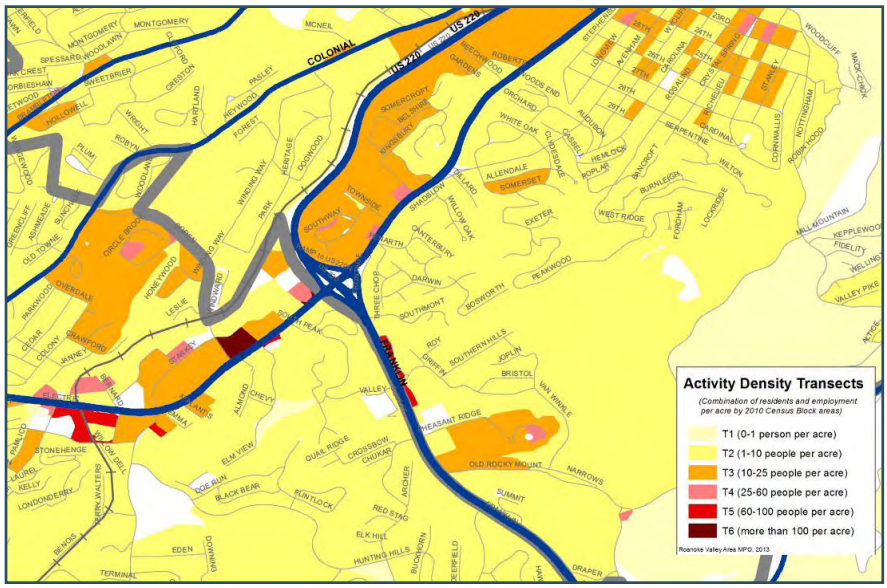
U.S. 220 goes through this area connecting I-581 in the North and heading through Clearbrook toward Franklin County in the south. The yearly review process should pay particular attention to the area around Clearbrook on U.S. 220 due to the new Walmart Supercenter and other development.

In addition, various intersection, widening and operations strategies are mentioned in Section 6 of this document that apply to this corridor. The *Route 419 Corridor Plan* documents that this corridor is a regional priority with various improvements discussed as being applicable to the area. This area should be focused on during the yearly review process using Google Traffic Snapshots. Any indication of worsening congestions should be communicated to the RVAMPO Policy Board during their discussions of the CLRTP and the TIP.



III. CMP Transit System Monitoring:

Public Transit service exists up to and around Tanglewood Mall. The strategies in Section 6 of this document mention the possibility of extending public transit along the majority of the Route 419 corridor. Data to monitor in this regard will be whether transit service gets extended to the Route 419 corridor in the future and member data from RIDE Solutions, the TDM agency serving the region, indicating whether more carpools are being registered from this area of emphasis.



IV. CMP Non-motorized System Monitoring:

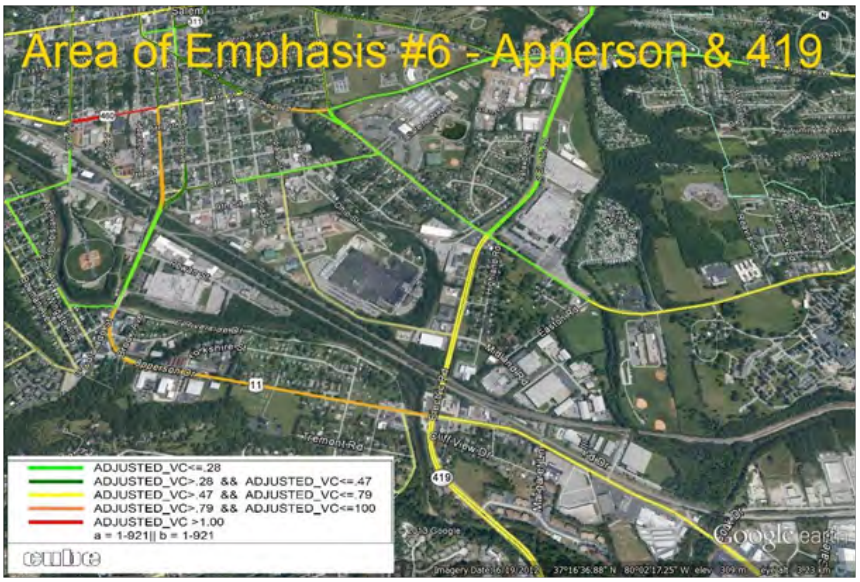
Once pedestrian and bicycle accommodations are added and improved in this area, annual count activities should be considered.

Area of Emphasis #6 – Apperson and Route 419

I. CMP Highway System Monitoring:

Various intersection, widening and operations strategies are mentioned in Section 6 of this document that apply to this corridor. The Route 419 Multimodal Corridor Plan documents that this corridor is a regional priority with various improvements discussed as being applicable to the area. This area should be focused on during the yearly review process using Google Traffic Snapshots. Any indication of worsening congestions should be communicated to the RVAMPO Policy Board during their discussions of the CLRTP and the TIP.

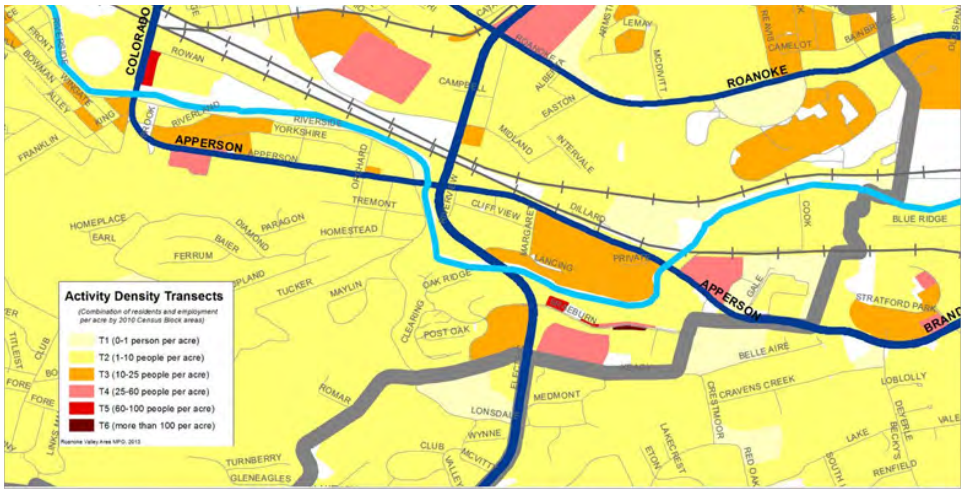
II. CMP Transit System Monitoring:



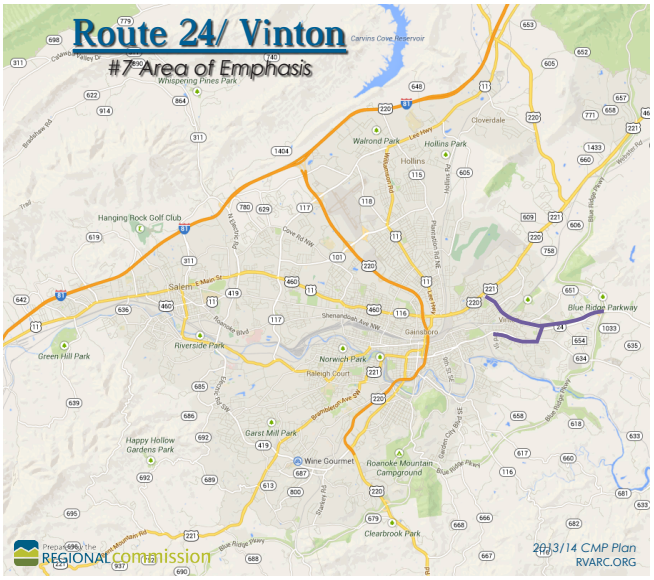
Continued triennial National Transit Database (NTD) data monitoring for the four Valley Metro routes that cross or run along a portion of Electric Road and that were ranked in the top 10 highest ridership routes in the entire system. There is potential for transit vehicles themselves to become congested along these routes thus indicating a market need for increased transit service.

III. CMP Non-motorized System Monitoring:

Once pedestrian and bicycle accommodations are added and improved in this area, annual count activities should be considered.



#7 Route 24/Vinton



I. CMP Highway System Monitoring:

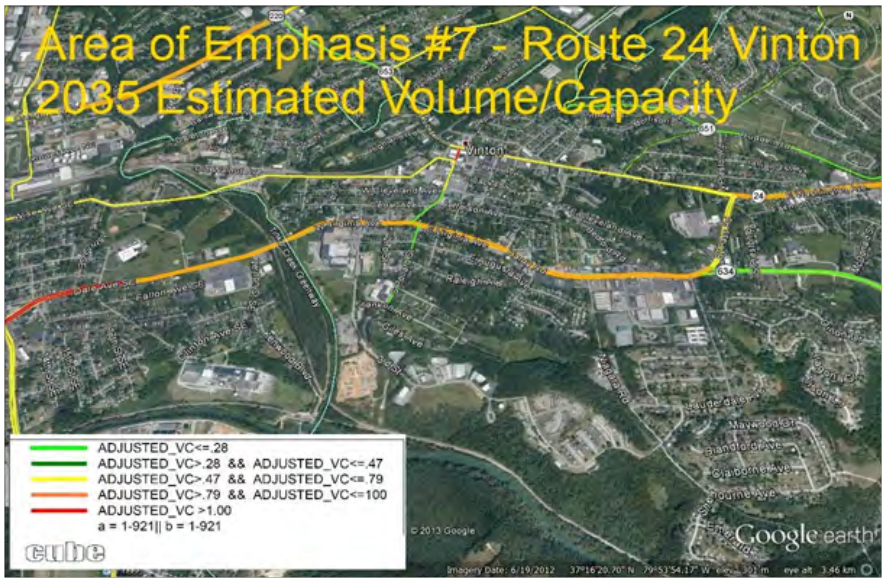
Continued yearly monitoring to indicate worsening of congestion on the Route 24 corridor.

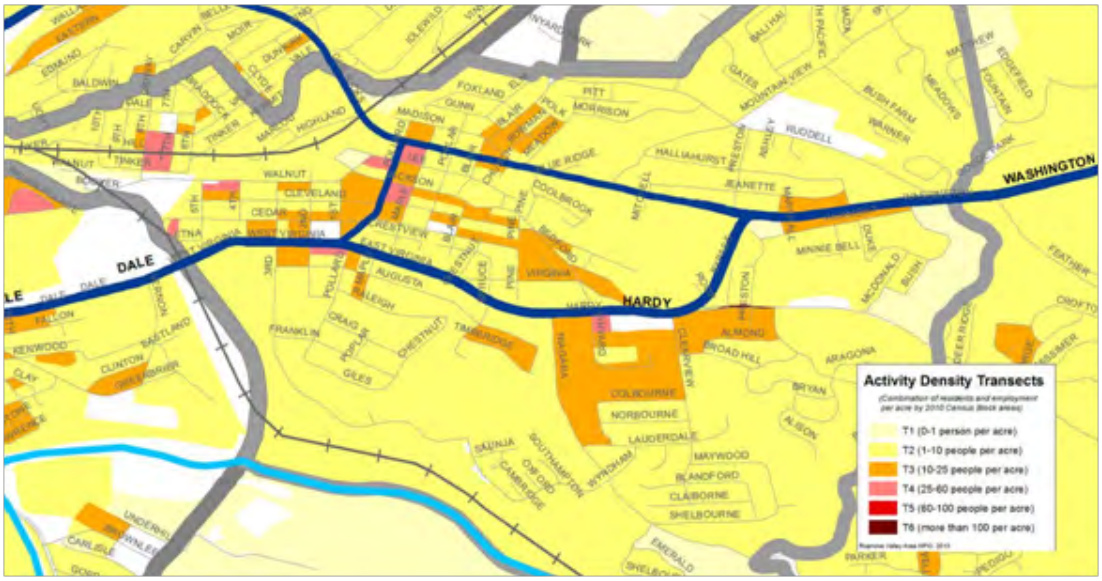
II. CMP Transit System Monitoring:

Continued triennial National Transit Database (NTD) data monitoring for the Valley Metro routes that serve Vinton.

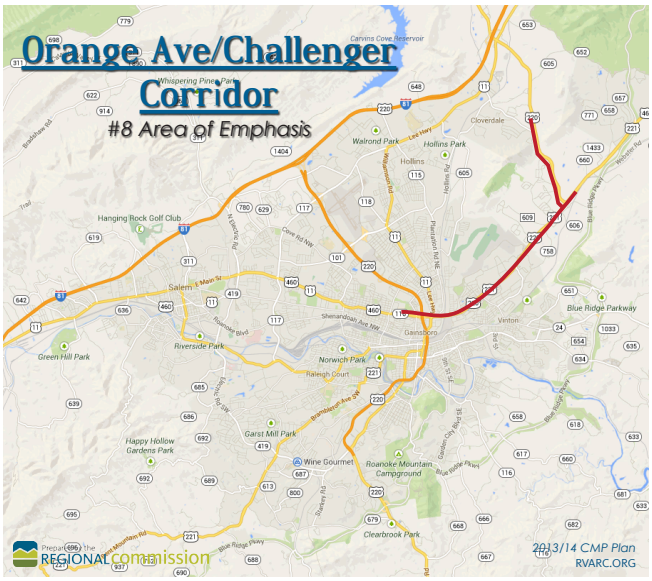
III. CMP Non-motorized System Monitoring:

Consideration of pedestrian and bicycle counts along this corridor.





Area of Emphasis #8 – Orange Ave/ Challenger Corridor

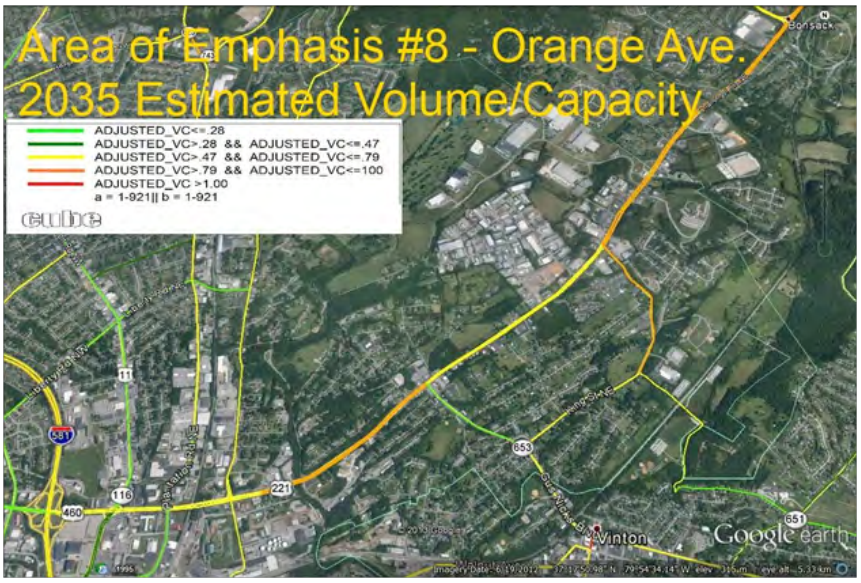


I. CMP Highway System Monitoring:

Orange Avenue is a priority corridor for logistics and supply chain management due to the various industrial properties located on or near the corridor. Traffic congestion along this corridor especially impacts economic development due to the compounded logistics and supply chain effects. Special attention should be paid to Orange Avenue during the yearly review process. Any worsening of traffic congestions should be communicated to the RVAMPO Policy Board during their CLRTP and TIP discussions.

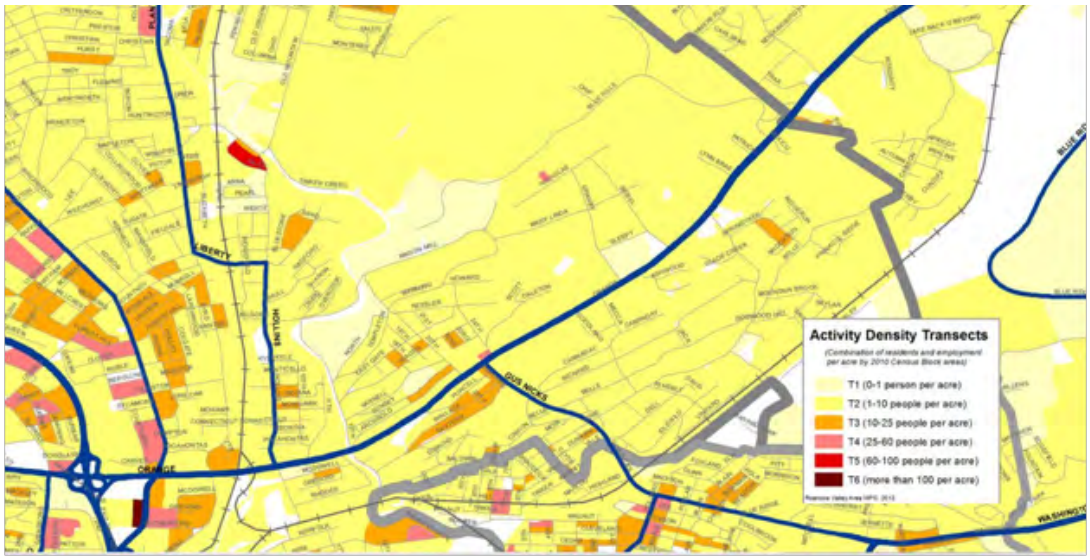
II. CMP Transit System Monitoring:

Section 6 of this document mentions the possibility of further extending public transit to industrial properties that are currently unserved. Ridership on any public transit extension should be monitored and adjustments be made accordingly.

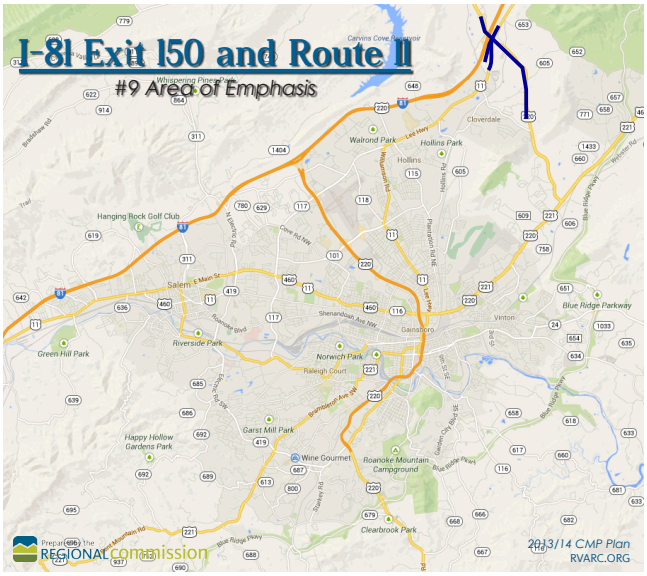


III. CMP Non-motorized System Monitoring:

Once pedestrian and bicycle accommodations are added and improved in this area, annual count activities should be considered.



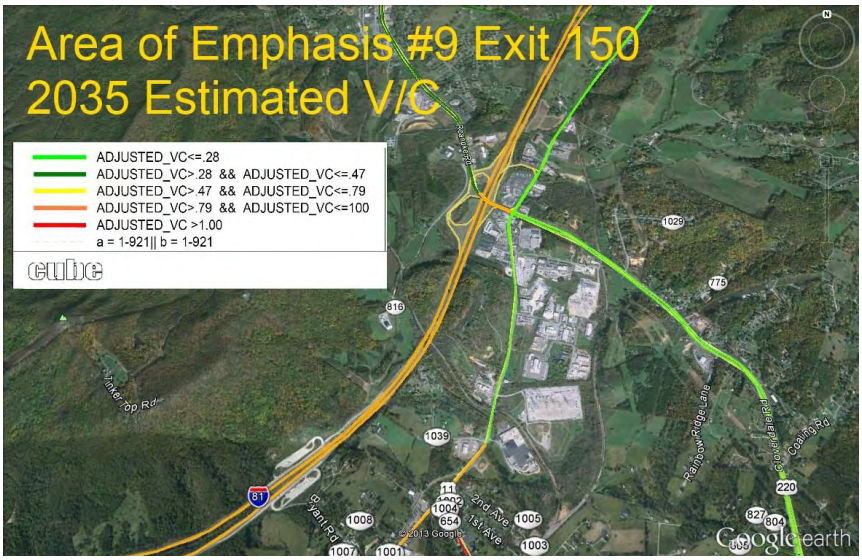
#9- I-81 Exit 150 and Route 11



I. CMP Highway System Monitoring:

Area of emphasis #9 is subject to both recurring congestion due to the concentration of activities and non-recurring congestion due to figuring into several different I-81 detour plans (see section 6). Also, the exit 150 interchange is soon to be reconfigured. It will be instructive to monitor this interchange once reconstructed to see whether traffic congestion continues toward the long-range forecast, or if the new design is largely successful at alleviating peak hour congestion over time.

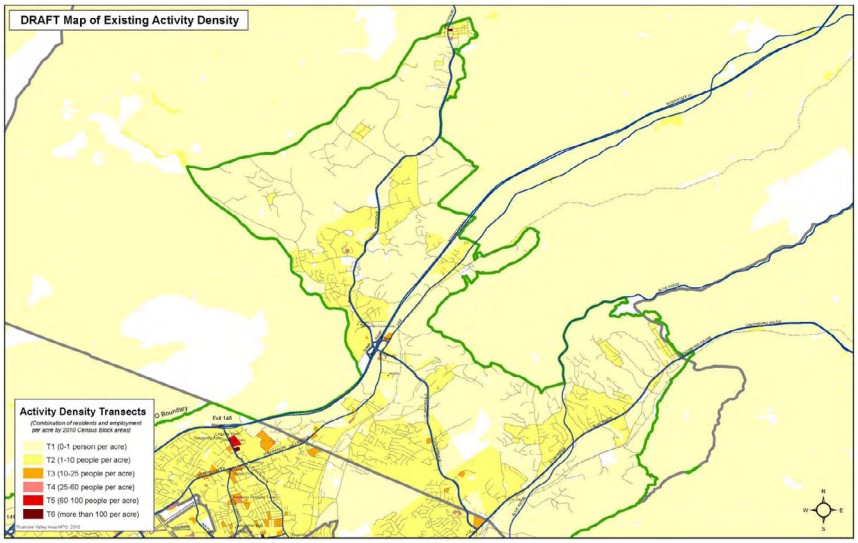
II. CMP Transit System Monitoring:



There is not any current public transit service serving exit 150. Exit 150 is a prime area for concentrating Transportation Demand Management (TDM) activities due to the presence of a park-and-ride lot. Redevelopment of the interchange could offer an opportunity to expand the park-and-ride supply in the area and to monitor park-and-ride usage counts.

III. CMP Non-motorized System Monitoring:

Once Exit 150 is reconstructed and the area redeveloped there is an opportunity to monitor any pedestrian amenities that are included.



#10- Brandon Ave. Corridor

I. CMP Highway System Monitoring:

This area should be focused on during the yearly review process using Google Traffic Snapshots. Any indication of worsening congestions should be communicated to the RVAMPO Policy Board during their discussions of the CLRTP and the TIP.

II. CMP Transit System Monitoring:

This area should be focused on during the triennial National Transit Database (NTD) data collection and review process.

III. CMP Non-motorized System Monitoring:

This area is a yearly NBPD count location, described previously in this report. The two recent years of count data are included below. These can form a baseline for future trends.

NBPD 2012- Sample Data

NBPD Count Location	Roadway Classification	Bicyclists Thursday	Pedestrians Thursday	Bicyclists Saturday	Pedestrians Saturday
Brandon Ave	Arterial	16	79	7	25
Grandin Rd	Collector	29	Na	13	No Data

NBPD 2013- Sample Data

NBPD Count Location	Roadway Classification	Bicyclists Thursday	Pedestrians Thursday	Bicyclists Saturday	Pedestrians Saturday
Brandon Ave.	Arterial	No Data	No Data	0	22
Grandin Rd.	Collector	No Data	No Data	16	

14. Appendix

Data collections, Google Traffic Snapshots and surveys can be viewed and provided in a separate Appendix document. Contact mmccaskill@rvarc.org for more information.

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