Roanoke Valley Conceptual Thoroughfare Plan

2050

Roanoke Valley Alleghany Regional Commission

Roanoke Valley Area MPO Metropolitan Planning Organization

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), and the Virginia Department of Transportation (VDOT). The contents of this report reflect the views of the staff of the Roanoke Valley Area Metropolitan Planning Organization (MPO). The MPO staff is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the FHWA, VDOT, or RVARC. This report does not constitute a standard, specification, or regulation. FHWA or VDOT acceptance of this report as evidence of fulfillment of the objectives of this planning study does not constitute endorsement/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.

Inquiries should be submitted to:

Roanoke Valley Area Metropolitan Planning Organization
P.O. Box 2569
Roanoke, Virginia
Phone: (540) 343-4417
Fax: (540) 343-4416
Email: rvarc@rvarc.org
Web site: www.rvarc.org

Roanoke Valley Area MPO Metropolitan Planning Organization

TABLE OF CONTENTS

ROANOKE VALLEY CONCEPTUAL THOROUGHFARE PLAN

Introduction

The Roanoke Valley Conceptual Thoroughfare Plan was developed through a cooperative planning process utilizing the expertise and guidance of a thoroughfare plan steering committee composed of technical transportation and planning staff from local governments represented in the MPO.

Meetings were held starting in the Fall of 2005 and continuing into the Spring of 2006 in which committee members reviewed recommendations from previous thoroughfare plans, reviewed recommendations from the Vision List of the Long Range Plan, and sought to identify any additional 'missing connections' that were not previously identified. The resulting list of projects and Conceptual, generalized location maps for new facilities can be found in the Appendix.

Roanoke Valley Conceptual Thoroughfare Plan Committee

Bedford County	**Botetourt County**
Johnny Roark	Matt Braun
	Chuck Supan
City of Roanoke	**City of Salem**
Kenneth King	Joe Yates
Mark Jamison	Melinda Payne
Ian Shaw	
Roanoke County	**Town of Vinton**
Anthony Ford	Michael Kennedy
	Anita McMillan

Purpose

The Roanoke Valley Conceptual Thoroughfare Plan serves two main purposes:

1. To serve as a broad look at potential highway corridors needed over a longer time horizon than is typically addressed in the RVAMPO Constrained Long-Range Transportation Plan (CLRTP).

2. To serve as in input (vision document) for the roadway component of more specific locality and RVAMPO plans such as: the CLRTP, comprehensive plan transportation elements, and scenario planning exercises etc.

These purposes/goals for the Roanoke Valley Conceptual Thoroughfare Plan project were formulated by a group of local governmental stakeholders that eventually grew into a Roanoke Valley Conceptual Thoroughfare Plan Study Committee. This Committee met in February 2005 and discussed the utility of such a project and the scope of the end product. This group made several important decisions. Stakeholders commented that the plan should look at 30-40 year transportation planning needs, be tied to proposed future land use, and should be based generally on projected level-of-service (LOS) grades from the last CLRTP update. Additionally, it was determined that the Roanoke Valley Conceptual Thoroughfare Plan should be completely unconstrained financially. Stakeholders determined that this plan should seek to include projects that were not included in either the CLRTP constrained list of projects or the vision list of projects due to funding issues or due to the shorter planning horizon. There was a general consensus among those present at the meeting that a Roanoke Valley Conceptual Thoroughfare Plan project would fill some important long-range highway transportation planning needs left unmet by the Constrained Long Range Transportation Plan mandated by the FHWA.

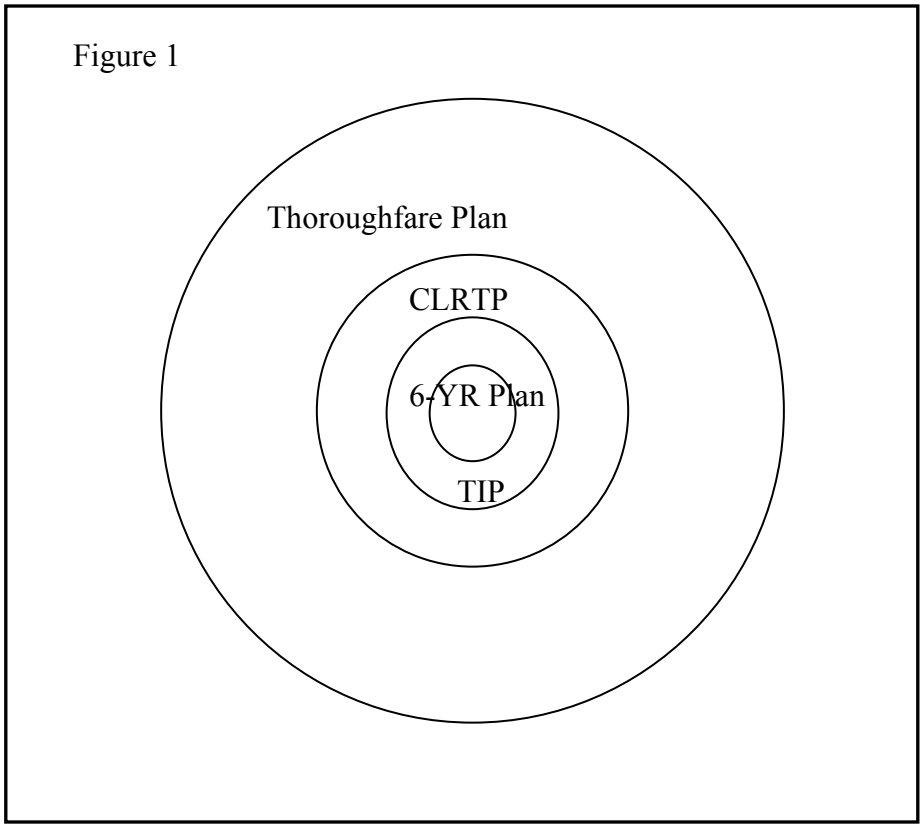
In terms of the relationship of the Roanoke Valley Conceptual Thoroughfare Plan to the Constrained Long Range Transportation Plan, it is perhaps simplest to think of the Roanoke Valley Conceptual Thoroughfare Plan as a step removed from the Constrained Long Range Transportation Plan. The Roanoke Valley Conceptual Thoroughfare Plan looks at a longer time horizon, is completely unconstrained financially, and, therefore, will contain a larger number of potential highway projects from which stakeholders can draw in developing future Constrained Long Range Transportation Plan updates. Projects in the Roanoke Valley Conceptual Thoroughfare Plan have no funding allocated to their construction and have not been programmed in the Constrained Long Range Transportation Plan, the State Six-Year Improvement Program or the Transportation Improvement Program.

The Master List of Projects in the Roanoke Valley Conceptual Thoroughfare Plan is simply a list of conceptual projects that may never be constructed, depending upon whether they are included in later steps of the transportation planning/programming process. Most of the projects, especially the Conceptual Future Connections, would be considered beyond the planning horizon of a typical Constrained Long Range Transportation Plan. It is perhaps best to think of the draft master list of projects as a list of potential ideas for projects (with exact specifications to be determined later) that may be considered for construction in a period between 25 to 50 years from present.

Also, important to note is the fact that, with a few exceptions[1], the Roanoke Valley Conceptual Thoroughfare Plan Master List does not include any projects that have been included in the long-range plan's constrained list of projects nor does it include any projects that have been programmed into any other transportation financial planning documents such as the Commonwealth of Virginia's Six-Year Plan or the federally-mandated 3-Year Transportation Improvement Program (TIP).

[1] Facilities that were listed in the CLRTP may still be listed in the Roanoke Valley Conceptual Thoroughfare Plan if there is potential for a significantly larger project than what is currently proposed. This is the case, for instance, for the Wonju Street Extension project that is in both the 2025 CLRTP and the Conceptual Thoroughfare Plan since the Wonju Street Project as currently planned may not involve new terrain construction but instead may involve only improved signalization and operations management. Similarly, Rte. 654 (Read Mountain) and Rte. 779 (Catawba) is listed in both the CLRTP and the Conceptual Thoroughfare Plan because the CLRTP proposes uprading to Rural 2 lane while it is conceivable that this facility may be upgraded to Rural 4 Lane by 2050.

Figure 1 depicts the relationship of the Roanoke Valley Conceptual Thoroughfare Plan to other planning products in a visual manner:



All projects listed in the Roanoke Valley Conceptual Thoroughfare Plan listing therefore are either on the Vision List of the Long-Range Plan or are otherwise not included in any programmed list of future transportation projects. These projects are well outside the 20-year planning horizon of the long-range transportation plan.

It is important to note the conceptual nature of the Roanoke Valley Conceptual Thoroughfare Plan, especially the 'missing connections' identified by the committee. Most of the 'missing connections' are named after project proposed in the past that would have served a similar role. This plan is not proposing specific solutions to the missing connections identified. Specific locations, precise specifications for typical sections, and other similar transportation engineering questions are left unanswered and intentionally so. The Roanoke Valley Conceptual Thoroughfare Plan seeks simply to identify potential future needs. The solutions to these potential needs are to be examined in more detail later in the long-range planning process should projected future transportation demand justify a closer examination.

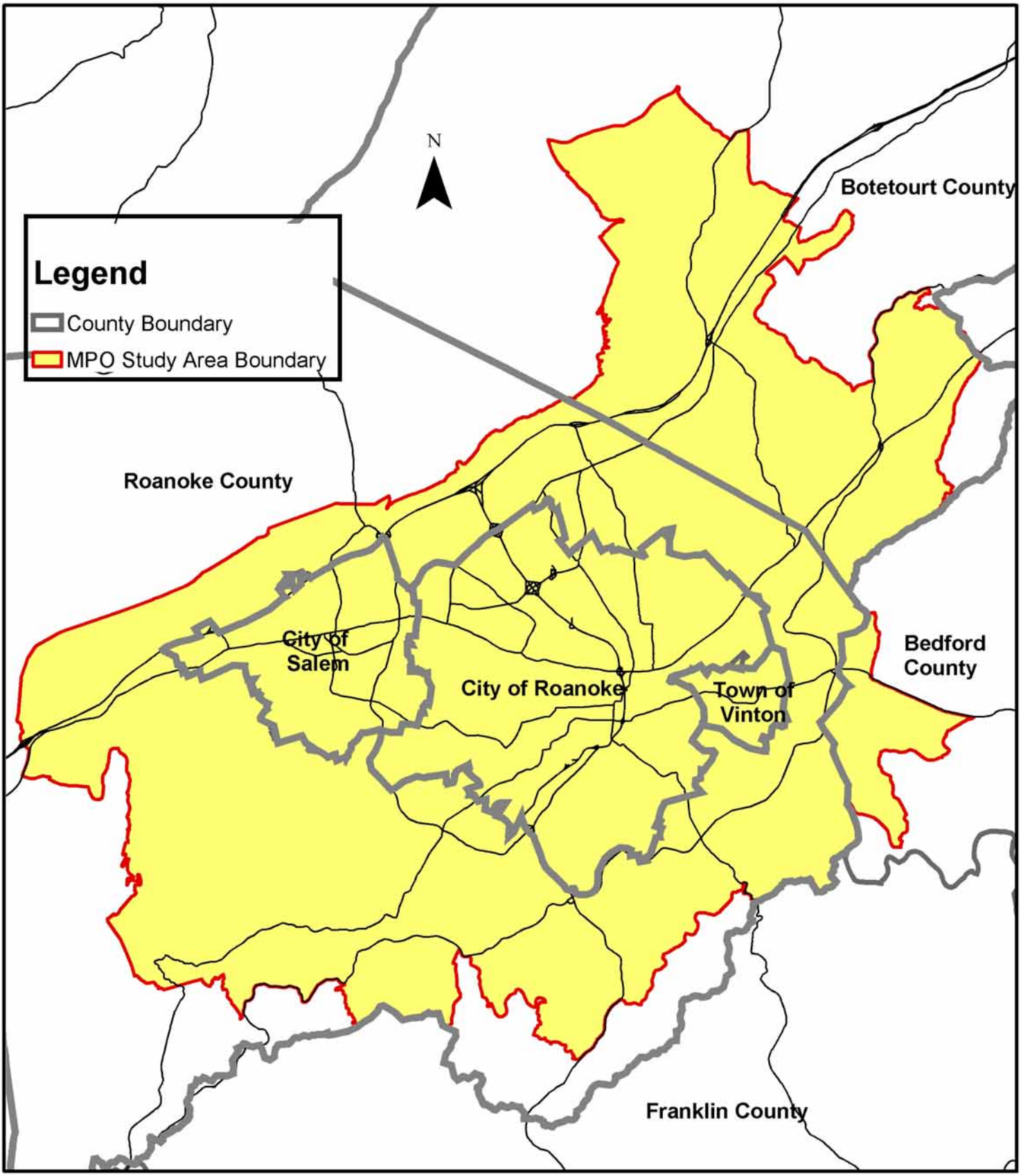
Study Area

The study area for this Roanoke Valley Conceptual Thoroughfare Plan is the 2025 Roanoke Valley Area Metropolitan Planning Organization Boundary. Please see the map (Figure 2) for a precise study area definition.

Figure 2

Roanoke Valley Area Metropolitan Planning Organization (MPO)

2025 MPO Study Area Boundary



Intelligent Transportation Systems/Operations Management

In discussing conceptual transportation needs, the staff of the RVAMPO would certainly be remiss if no mention of Intelligent Transportation Systems (ITS) and other Operations Management concepts were made. There are numerous ITS technologies that are presently emerging across the nation and the world that could all have a part in the transportation system of the future as planners and engineers are increasingly faced with the challenge of finding ways to accommodate increasing transportation demand with a limited amount of transportation construction funds.

Guessing which technologies will be implemented on a wide-scale in 2050 would of course be an exercise in futility. There are however a set of guiding principles that future transportation plans should take into consideration so that future implementation of various ITS technologies along major arterials and thoroughfares in a region can be made much simpler.

For instance, when constructing any new terrain arterial in a locality, the likes of which are considered conceptually in this document, fiber optic cable should be buried in public right-of-way to allow for installation of computerized ITS technologies along the route in the future.

When designing new construction, engineers should also be careful to consider the 'footprint' of large variable messaging signs and consider adding additional right-of-way to typical sections to accommodate additional infrastructure related to ITS technologies. It is conceivable that typical section diagrams from previous decades may not leave enough space in areas for certain new ITS technologies.

Similarly, concepts such as reversible lanes, truck-only lanes, and other special lanes controlled by ITS device signals might play a greater role in the future and be considered in typical section design.

In concluding this brief discussion of ITS, it should again be noted that no particular ITS technology is being proposed for any of the conceptual connections or improvements to existing facilities proposed in this document. It is simply impossible to guess which mix of ITS technologies will emerge in the future as the preferred operations management solution. It is simply noted that ITS will undoubtedly play a more important role in the future of transportation and that thought should be given to accommodating ITS technology in any future consideration of the projects included in this document.

Previous Thoroughfare Plans Completed for Roanoke Region

Examining past recommendations for validity and possible inclusion in the Roanoke Valley Conceptual Thoroughfare Plan served as the logical starting point of the project. Recommendations from previously adopted transportation plans were digitized into a Geographic Information Systems (GIS) project and displayed alongside deficiencies identified by the 4-Step Transportation Model[2] in its runs for the Constrained Long Range Transportation Plan adopted in 2004. The following section discusses the project contributions from each previously adopted plan.

Roanoke Valley Area Thoroughfare Plan (1969)

In 1969, the Metropolitan Transportation Planning Division of the Virginia Department of Highways produced *The Roanoke Valley Area Thoroughfare Plan* with the assistance of the local governments affected by the plan and the Roanoke Valley Regional Planning Commission. Apparently, this plan, which is the earliest thoroughfare planning document available in the Roanoke Valley – Alleghany Regional Commission's extensive planning archive, was itself derived from an earlier planning effort – *The Major Arterial Highway Plan* produced in 1963. The methodology used in studying thoroughfare needs in this study involved both data from roadside interviews from areas on the fringes of the region and at certain points within the region's core as well as internal trip circulation information obtained from home interviews. Similar to the computerized transportation models used in transportation planning today, data regarding trip production and attraction between 'zones' was used to project future transportation demand. The study area for this plan included the Counties of Botetourt and Roanoke, the Cities of Roanoke and Salem, and the Town of Vinton.

Several larger thoroughfare plan projects included in the current project list originated in the 1969 Thoroughfare Plan including the North and South Salem Circumferential, the Route 11 Extension, and a portion of the Hershberger Road Extension project. The 1969 Regional Thoroughfare Plan also included an early concept of the present-day Wonju Extension, the 23rd Street Connector project. Additionally, the 1969 Thoroughfare Plan included several recommendations that have been at least partially constructed. The Southwest Freeway, for instance, was completed following this plan's adoption connecting I-581 with US Route 220 south of Roanoke City. Route 419 and Route 24, two other major recommendations from the plan, were both extended and improved as well. A Peters Creek Extension concept was included in this plan, portions of which have been constructed. Another recommended facility from the 1969 that was actually constructed is the 13th Street and Bennington Avenue connector and bridge that now provides another connection between Mt. Pleasant and Garden City to portions of Southeast Roanoke City across the Roanoke River. Please see Table 1 for a complete list of new terrain projects from the 1969 Thoroughfare Plan including those projects that have been constructed, projects that carry forward into this plan's recommendations, and all other recommended projects. You may also consult pg. 25 for a map representing the projects from the 1969 plan.

[2] More information on the 4-Step Model can be found in the section discussing the 4-Step Model's project recommendations.

Table 1 - New Terrain Projects Listed in the 1969 Thoroughfare Plan

Description	From	To	Proposed Lanes
North Salem Circumferential	Wildwood Road	Hershberger Road	6L
South Salem Circumferential	US 460/11 (West of Salem)	SR 419	4L
Peters Creek Extension	Intersection at US 460	SR 419	4L
Franklin Road Extension (New Rail Crossing)	5th St. NW	3rd St. SW	4L
Cove Road Realignment	Lafayette Boulevard	10th St.	4L
Tenth Street Extension	Williamson Road	US 460 (at intersection with Route 653)	4L
13th St/Bennington Connector	13th Street	Bennington Road	4L
Hollins/Plantation Rd. Connect	Hollins Road NW	Plantation Road NW	4L
Grandin Road Extension	Intersection with Memorial	Patterson St.	4L
23rd Street Connector	Brandon	Colonial	4L
Persinger Road Extension	Colonial Avenue	Franklin Road	4L

Roanoke Valley Area Transportation Plan (1978)

In 1978, the Virginia Department of Highways and Transportation released what it considered a significant update to the original Thoroughfare Plan in 1969. This plan was developed in a fashion that built upon the original analysis in the earlier plan. The 1978 document was initiated as a routine review that examines whether significant changes have occurred in socio-economic or land use factors. The review resulted in an updated thoroughfare plan for the region with several new projects. Some of the additional projects in this plan include the extension of Liberty Street to connect with the proposed Hershberger Extension project, and a connector between US 460 and US 24 in the eastern portion of the region that would connect with the Hershberger project. This plan also called for extensive improvements in the Downtown area involving new terrain connections in the Gainsboro area, widenings of downtown avenues, relocations of certain downtown roads and other projects that are unrealistic presently. Please see pg. 26 in the Appendix for a map representing the new terrain projects from the 1978 plan.

City of Salem Thoroughfare Plan (1989)

Region-wide thoroughfare planning seems to have ended in the late 1970's. In the late 1980's and early 1990's, a couple of locality-specific thoroughfare plans were developed in the Roanoke Valley region. The first such product was the City of Salem Thoroughfare Plan developed in 1989 by the Fifth Planning District Commission with the assistance of the City of Salem, and with the funding assistance of the Virginia Department of Transportation, the Federal Highway Administration, and the US Department of Transportation.

In terms of methodology, the plan relied solely upon present AADT, projected AADT, and projected LOS in making initial recommendations. An advisory committee made up of representatives from the locality, the Virginia Department of Transportation, and the FHWA was formed to assist the Fifth PDC staff in developing the plan.

The purpose of the 1989 Salem Thoroughfare Plan seems to have been maintaining the City's commitment to looking at two important recommendations for the City of Salem from previous thoroughfare plans: US Route 11 Extension and the South Salem Circumferential. The plan also recommended a variety of improvements to existing facilities. The plan states that while these projects are not recommended in the short or middle term due to financial reasons; it is recommended that these two projects remain on the long-term regional agenda. The plan also recommended several alternatives that could be constructed in the middle term to help connect South Salem with Interstate 81, US 460, and US 11 in a more efficient manner.

Roanoke City Thoroughfare Plan (1993)

The Fifth Planning District Commission developed Roanoke City's Thoroughfare Plan four years after developing the City of Salem's plan. The development process of the Roanoke City planned largely paralleled that of Salem's Thoroughfare Plan. It involved the organization of a policy forum, a technical committee, researching service levels of facilities within the City, identifying congested intersections, identifying hazardous travel areas, and reviewing land use plans to promote consistency with future land uses in thoroughfare plan recommendations.

The methodology for identifying service levels and congested intersections involves analyzing data produced by the MINUTP model (the 4-step model for the Roanoke urbanized area mentioned earlier) and producing LOS grades for each facility in the thoroughfare network.

The City of Roanoke Thoroughfare Plan recommendations included two alternative sets of projects. One alternative involved the construction of the Hershberger and Liberty Road Extensions and a new river crossing at 24th Street between Baker and Bridge Streets among other new terrain concepts. The other alternative was very similar to the first except that it did not include the Hershberger and Liberty Road Extensions. Both alternatives were modeled for impacts.

Town of Vinton

It should be noted that no prior plans or records could be found that indicated that the Town of Vinton has produced or collaborated on any town-specific thoroughfare plan. This is the first thoroughfare plan in over 30 years that includes any projects for the Town of Vinton.

Other Plans and Studies

Other long-range transportation plans and transportation studies served as sources for projects in the Master List of Projects. For instance, the Eastern Circumferential concept originated in the 1991 Environmental Impact Statement for the facility. Improvements to Interstate 81 and the Interstate 73 project are listed in VTRANS.

Roanoke Valley Conceptual Thoroughfare Plan Development Process

The process to develop the Roanoke Valley Conceptual Thoroughfare Plan Master List of Projects combines three primary sources of input:

1. The RVAMPO 4-Step Travel Demand Model
2. Past thoroughfare plan recommendations
3. Stakeholder input to provide "missing connections"

The remainder of this chapter will describe each source of input and the role it played in the thoroughfare plan development process.

Source #1 RVAMPO 4-Step Travel Demand Model:

A four-step travel demand model is developed, calibrated, validated and maintained by the Virginia Department of Transportation (VDOT) for the Roanoke Valley Area Metropolitan Planning Organization (RVAMPO). In the long-range planning process recommended improvements from the 4-step process have to be balanced against estimates of future revenues in the form of a financially constrained list o projects. However in the thoroughfare planning process the entire set of recommendations from the 4-step process can be used as an input to the master list of projects without regard to financial constraint.

The following is a modified description of the 4-step travel demand model development process found in Chapter 3 of the *RVAMPO Long-Range Transportation Plan 2025 Technical Report.*

Step #1 Trip Generation

Trip productions and attractions are directly related to various socio-economic characteristics of a given area. The socio-economic (land use) data for the Roanoke Valley Conceptual Thoroughfare Plan was acquired from the 2000 census. The Roanoke Valley-Alleghany Regional Commission developed the socio-economic data for each traffic zone, for model input.

Another separate trip table is developed to include trips that pass through the study area altogether. These external trip tables were developed by BMI and Associates in 1999, and evolved by conducting origin-destination field studies. These counts were updated to reflect the year 2000 counts.

The land use data needed for calculating trip productions and attractions for the Roanoke model were provided by the Roanoke Valley-Alleghany Regional Commission, in cooperation with the relevant local jurisdictions, and are shown in **Table 2**.

Table 2

Land Use Data Input For Trip Generation

Variables
1. Population
2. Employment
3. Auto Ownership
4. Households

These assumptions were used for input into trip generation equations developed by HBA, from previously conducted origin-destination surveys and travel diaries. The relationships derived from these studies are assumed to remain constant; therefore, the equations can still be used to predict current and future trip productions and attractions. The 2000 Roanoke area land use characteristics were used to validate the 2000 model year observed counts while the 2025 projected data were used to determine trip productions and attractions for the 2025 model.

The land use variables were developed for each traffic analysis zone in the study area and were generated as vehicle trips. The external-internal trips were calculated as productions from observed traffic counts taken at the external stations where vehicles entered the study area. The attraction ends of these trips were derived from the IX attraction equation. A return trip was assumed. The trip generation equations used in the model are shown in **Table 3**.

Table 3

Equations Developed From Travel Surveys

Production Equations
HBW trips for internal zones: (10.95068)+(1.00434*Autos)
HBO trips for internal zones: (-48.64429)+(1.88601*Autos)
NHB trips for internal zones: (-3.90186)+(0.80839*Households)+(0.93287*Employment)
X-I production trips derived from machine counts taken at the external stations

Attraction Equations
HBW trips for internal zones: (39.62939)+(0.95168*Employment)
HBO trips for internal zones: (72.33960)+(0.71693*Autos)+(0.84291*Employment)
NHB trips for internal zones: (-3.90186)+(0.80839*Households)+(0.93287*Employment)
I-X trips for internal zones: (46.38660)+(0.05436*Population)+(0.65902*Employment)

The HBW trips were balanced on attractions. The HBO, NHB and IX trips were balanced on productions. As an initial step in validating the accuracy of the socio-economic data, the region-wide balance between productions and attractions should be checked for reasonableness. Ideally,

the ratio between productions and attractions should be in the range of + / – 10%, prior to any adjustments. The pre-adjusted ratio of productions and attractions for the Roanoke area trip generation was 15%. While this is not ideal, it is still acceptable. Some minor adjustments may be needed for the trip generation equations in the next model update.

Special generators are used for zones that have trip rates significantly different than the standard trip rates derived from the production and attraction equations. Zones in this category include land uses such as airports, military bases, universities, regional malls and regional recreational facilities. A significant difference between observed traffic volumes and the assigned volumes in a particular location indicate the need to consider the zone as a special generator. Several zones in the Roanoke study area were regarded as special generators for this study. Trips generated for these zones were derived outside the model's trip generation process using trip rates from the ITE Trip Generation manual. The methodology used to generate these trips can be found in **Table 4**.

Table 4

Special Generators

Generator	*Location*	*GLA*	*Occupancy Rate*	*Occupied GLA*	*Daily Volume**
Towers Mall	Zone 16	316,000	91%	288,000	10,540
Crossroads/Town Sq	Zone 82	928,000	85%	789,000	21,930
Hunting Hills Plaza	Zone 87	150,000	91%	137,000	7,140
Valley View Mall	Zone 90	886,000	85%	753,000	21,080
Tanglewood Mall	Zone 144	766,000	91%	697,000	19,805

*Volumes resulting after 15% reduction for Pass-By Trips.

The distribution of generated trips by trip purposes is shown in **Table 5**.

Table 5

Generated Trips Distributed by Purpose

Purpose	*Trips Generated*	*% of Total*
HBW	131,782	18%
HBO	261,638	36%
NHB	182,319	25%
IX	144,063	20%

Step #2 Trip Distribution

Trip distribution is the process by which trip ends produced in each zone are linked to trip ends attracted to each of the other zones in the study area, forming a matrix of distributed trips. The trip distribution module in MINUTP (and most other travel demand software) utilizes the traditional gravity model equation for distributing trips generated through the trip generation process. The gravity model equation is illustrated in **Table 6**.

Table 6

The Gravity Model

$$T_{ij} = \frac{P_i \times A_j \times FF_{ij}}{\sum (A_j \times FF_{ij})}$$

T_{ij} = Total Trips from zone i to j
P_i = Productions at zone i
A_j = Attractions at zone j
FF = Friction Factors from zone i to j

According to the gravity model theory, the number of trips between any two zones is directly proportional to the relative attraction (number of productions and attractions) between the zones and inversely proportional to an exponential function of the spatial separation (travel time) between zones. The spatial separation between zones is indicated through the use of friction factors and adjusts the relative attraction of each zone for the ability, desire, or necessity of the trip maker to overcome the spatial separation involved. A friction factor table was used for input into the Roanoke trip distribution module. The table was developed by HBA from field surveys conducted in 1986 for the East Roanoke Circumferential Plan.

Step #3 Mode Choice

The 3rd step in the transportation planning process is the mode split, whereby trips are distributed between vehicle and transit modes. For a medium sized area such as Roanoke, transit patronage makes up too small a percentage of trips to affect the highway assignment volumes, so it was not considered in this modeling effort.

Step #4 Traffic Assignment

Traffic assignment is a process that can be used to predict the probable traffic volumes on the various highway thoroughfares of a transportation network. This procedure applies the total trip tables and assigns zone-to-zone trips along an optimum time/distance route. As mentioned above, an "all or nothing" assignment was applied for the Roanoke model using an equilibrium volume adjustment. This method was chosen to determine which paths would be used given existing capacity restraints and congestion.

BASE YEAR ASSIGNMENT VALIDATION

Calibration versus Validation

The traditional four-step modeling process, initiated over 40 years ago, originally called for urbanized areas to conduct large-scale origin-destination (O-D) studies by collecting information from household interviews, travel diaries and individual traffic surveys. This is an expensive and time-consuming process. Calibration was accomplished by modifying model parameters until they replicated travel patterns exhibited by the acquired survey data. After the models were calibrated, a validation effort was undertaken.

Validation involves testing the models predictive capabilities. Travel models need to replicate observed conditions within reason before being used to produce future-year forecasts. Today, due to their expense, large-scale O-D surveys are not usually carried out. Instead, default model parameters from past surveys are used in the trip generation and trip distribution process. These "calibrated" models are then run with current socioeconomic data and the simulated volumes are compared to the observed (ground) counts. The validation process consists of adjusting certain model values, such as speeds and capacities, to obtain simulated volumes that closely match, within established tolerances, the actual observed traffic counts.

Validation of the Model Assignment

As with trip generation and distribution, the assignment output for the region should be checked for reasonableness, ensuring that observed conditions are closely replicated by the assignment output.

The validation tests for highway assignment are presented at three levels: 1) system-wide, 2) corridor, and 3) link specific.

1. There are several system-wide validation measurements of the auto assignment process, including vehicle miles traveled (VMT), cordon line volume summaries, and VMT per household. The observed data are obtained from HPMS data, VDOT's ongoing traffic count program, and special traffic counts requested for individual planning projects. The HPMS data is compared to the modeled data for accuracy. Modeled regional VMT should generally be within 5 percent of observed regional VMT. Reasonable ranges of VMT per household are 40-60 miles per day for large urban areas and 30-40 miles for small urban areas. If volumes are consistently high or low across the region, then system-wide characteristics must be adjusted to correct the problem.

   Characteristics that can be adjusted to affect system-wide volumes are:

   - Auto occupancy rates
   - Trip generation rates
   - Average trip length
   - Intrazonal impedance for all zones
   - Socioeconomic data for all zones

2. The next level of validation of the highway assignment is the comparison of observed vs. estimated traffic volumes on the highway network. Screen lines and cut lines were developed for the network in order to compare the model's traffic output with actual ground counts. A screen line is established to intercept major traffic flows and is located to minimize "double" crossings. The Roanoke River was chosen as the screen line for the Roanoke 2025 Thoroughfare Plan. Cut lines are shorter than screen lines, travel along one axis, and cross-corridors rather than intercept major flows. An acceptable target is 5% difference for screen lines and 10% for cut lines.

   If there are major differences in volumes across corridors, adjustments may need to be made in the following areas:

   - Zone to link loading points (centroid connectors) in the area of the corridor
   - Trip generation rates for zones near the corridor
   - Auto occupancy rates for facilities in the corridor
   - Intrazonal times in zones near the corridor
   - Intersection (turn) penalties

3. Once the cordon lines and screen lines are validated, the assignment volume-delay functions can be modified to produce the desired individual link assigned volumes.

   For changes that affect only specific links, the following characteristics may be modified:

   - Speed and capacity
   - Turn penalties
   - Centroid connector locations
   - Special generators
   - Local network configuration

Although there are no absolute criteria for assessing the validity of all model systems, some guidelines have been developed to evaluate the relative performance for a particular model.

One criterion involves making statistical comparisons to the model output with other metropolitan areas. These comparisons should be made with similar sized study areas.

The distribution of assigned vehicle miles traveled (VMT) by facility type furnishes one comparison method. The Roanoke study area population is approximately 215,000. Typical VMT distribution by functional classification for a medium sized study area (population: 200,000 to 1 million) is compared to the Roanoke study VMT in **Table 7**.

Table 7

Distribution of 2000 VMT by Functional Class

Facility Type	*VMT*	*Typical Area*	*Roanoke*
Freeways	1,846,901	33-38%	38%
Principle Arterials	1,737,883	27-33%	35%
Minor Arterials	845,160	18-22%	17%
Collectors	494,648	8-12%	10%

The Federal Highway Administration (FHWA) and various states DOT's have established targets for the acceptable range of deviation between assigned and observed counts. **Table 7** shows how the Roanoke area model compares with FHWA and Michigan (MI) DOT targets. Michigan DOT targets are shown because they represent a stricter standard (when compared to the FHWA targets) by which model results can be judged.

Table 8

Percent Deviation of Link Volumes
(Assigned vs. Observed)

Facility Type	*FHWA Targets*	*MI DOT Targets**	*Roanoke Results*
Freeways	+/- 7%	+/- 6%	+ 5.3%
Principle Arterials	+/- 10%	+/- 7%	+ 0.4%
Minor Arterials	+/- 15%	+/- 10%	– 2.3%
Collectors	+/- 25%	+/- 20%	– 7.5%

*MI DOT Targets included for comparative purposes.

Statistical Measures

The Federal Highway Administration (FHWA) publication *Calibration and Adjustment of System Planning Models* (FHWA-ED-90-015), and the Travel Model Improvement Program (TMIP) publication *Model Validation and Reasonable Checking Manual,* identifies four commonly accepted techniques for determining how well the model output matches the observed data. These procedures and the results for the Roanoke Valley Area 2000 base year model are listed below.

1) *Absolute Difference:* Calculated as the difference between the estimated and observed volume totals (estimated–observed) to obtain a positive or negative value, which can be an indicator of performance. For the Roanoke model the absolute difference is a negative value (-131,985), indicating that the overall assignment is slightly lower than the actual traffic volumes.

2) *Relative Difference:* This is expressed as the percentage difference between observed and assigned volumes. The percentage difference is calculated as: {(estimated ─ observed) /

observed}. An acceptable range for the region wide model would be ±5%. The value for the Roanoke assignment falls within 1%.

3) *Correlation:* This is a regression analysis procedure that relates a dependent variable to one or more independent variables and determines the degree to which they are related. The most commonly used measure of correlation is the coefficient of determination (R^2). In modeling, this is an indication of the strength of the relationship between the assigned volumes (dependant variable), and observed volumes (independent variable). The R^2 value can range from 0, indicating no correlation, to 1.00, revealing a precise relationship between the variables. A reliable assignment should have an R^2 value greater than 0.88. The R^2 value for the Roanoke assignment was 0.96.

4) *Variance:* Another statistical measure used to compare observed vs. estimated volumes is known as the Percent Root Mean Square Error (%RMSE). This value represents the statistical amount of error occurring between the assigned and observed volumes. According to the Montana Department of Transportation, an appropriate aggregate %RMSE is less than 30%. The %RMSE for the Roanoke model assignment is 20.6%. A comparison of the %RMSE for Roanoke and several other cities, by facility type, is displayed in **Table 9**.

Table 9

Percent Root Mean Square Error Comparisons With Other Regions

Facility	*Roanoke*	*Reno*	*Phoenix*	*Concord*
Freeways	10.5	18.6	25.4	na
Arterials	18.7	36.8	38.5	na
Collectors	37.1	77.5	62.7	na
Total	20.6	36.8	40.6	36.8

After the validation process, the projected (2025) network was assembled.

FORECAST YEAR MODEL

Existing and Committed Network (E &C)

The future (2025) roadway network consisted of a combination of the existing 2000 network, and all committed improvements included in the VDOT Six Year Improvement Program. This includes one new facility, the Green Ridge Road connector from Route 419 to Dalewood Road in the City of Salem.

Developing Forecast Data

The Roanoke Valley-Alleghany Regional Commission, in cooperation with the local jurisdictions, developed the projected (2025) socio-economic data used for input into the trip generation equations for the forecast model. The data evolved by anticipating future growth and development

in the area. VDOT's Transportation and Mobility Planning Division, using a traditional historical trend methodology, developed the projected external station volumes.

Forecast Trips

Applying the validated trip generation equations from the base year model to the projected 2025 socioeconomic data generates the future zonal productions and attractions. These are then distributed through the gravity model and applied to the 2025 existing and committed network, producing future arterial volumes. For reasons mentioned above, a transit network was not developed for the forecast model.

Forecast Assignment

The additional facilities and capacities, resulting from planned roadway improvements incorporated into the E & C network, will alter the paths traveled during the assignment process, providing projected traffic volumes on the E&C network.

As an offline procedure, the projected traffic was compared to the calculated E & C network capacities on a link-by-link basis, using standard HCM procedures. Future levels of service are then determined based on these projected volume to capacity (V/C) ratios. Improvements to the thoroughfare system can be proposed and tested to relieve any projected deficiencies.[3]

[3] Roanoke Valley Area MPO Long-Range Plan Technical Report 2025 pages 31-39. Source narrative originally provided by Nelson Newton at VDOT's Central Office, Richmond Va.

Source #2 Past Thoroughfare Plan Recommendations

The recommended projects from all previous thoroughfare plans and from other transportation planning documents in the RVARC planning library (e.g. Environmental Impact Statements documents) were digitized into a GIS project. The GIS database built for this project included information on the source plan from which the facility was digitized, segment termini, whether an alternative route exists for the facility, right-of-way information, the number of lanes (original typical section), and if the project involves improvements to an existing facility. Past recommendations were combined with shapefiles of 4 step model recommendations into a master GIS database of projects.

The data in this GIS was shared with the Roanoke Valley Conceptual Thoroughfare Plan Study Committee at a committee meeting in an interactive presentation of the GIS. After reviewing the GIS, the committee requested a comprehensive Master List of Projects. Staff compiled project tables including termini, their number of lanes, right-of-way information, and source information. In subsequent committee meetings, the study committee narrowed down the list, eliminating first the projects that are now in either the State Six Year Plan or the Constrained List of the Long Range Plan, and then eliminating projects deemed unrealistic or unnecessary. In the Appendix, you will find an 'audit trail' stating which projects were removed by the planning committee. Also included in the Appendix is a list of road construction projects on the CLRTP financially-constrained list and on the State Six-Year Improvement Program.[4] The final master list map is the accompanying fold-out map titled, *Conceptual Transportation Needs 2050.*

Source #3 Stakeholder Input to Provide 'Missing Connections'

Members of the stakeholder committee requested MPO staff to provide them with large-format maps of the MPO region to use in identifying any additional 'missing connections' in the regional thoroughfare system not addressed by previously proposed projects or by 4 – Step model deficiencies. The committee members were given a month to work on the large format maps before meeting again to collaboratively identify missing connections on a single large-format map.

Staff digitized these missing connections and combined them with the original master list.

[4] Construction projects listed in the CLRTP and on the SSYIP are not included in the Thoroughfare Plan Master List with a few exceptions (see Note #1). The purpose of including these lists is to increase ease of reference across regional transportation plans and so that readers may know what projects are planned for the nearer term.

Roanoke Valley Conceptual Thoroughfare Plan Project Master List

These three sources were combined into a single master list of projects for the Roanoke Valley Conceptual Thoroughfare Plan. While many of the source documents recommended specific improvements including right-of-way acquisition requirements, typical sections, numbers of lanes, and so forth, this Conceptual Thoroughfare Plan simply identifies needed new terrain facilities and existing facilities where realignment or additional capacity will be needed in the next 45 to 50 years.

In particular, the recommendations from the CLRTP's Vision List and deficiencies identified through the RVAMPO's 4-Step Travel Demand Model specified a projected LOS or Level of Service grade for each facility in the network and recommended additional lanes on certain existing facilities. This information is not included in the final master list because the 4-Step Travel Demand Model is calibrated to project travel demand only 20 years into the future. The Roanoke Valley Conceptual Thoroughfare Plan seeks to identify needs nearly half a century into the future.

Please note that Conceptual Future Connection (CFC) Project 11-13 are referred to as South Salem Circumferential Alternatives. This reference is taken literally from the source, the *City of Salem Thoroughfare Plan* (1989). These projects were listed as short term alternatives to ease congestion in South Salem. The South Salem Circumferential was listed in that plan as a long-term project. Therefore, both sets of projects are included in this regional conceptual thoroughfare plan, as well. A diagram of the South Salem Circumferential Alternatives can be found in the Appendix . Please review the accompanying map, *Conceptual Transportation Needs 2050*, for a detailed map showing locations of Master List Projects.

The Roanoke Valley Conceptual Thoroughfare Plan Master List of Projects are to be consulted in later stages of the long-range planning process for project ideas to solve projected traffic congestion issues. Precise recommendations in terms of the number of lanes and so forth will be determined in a later stage of the process.

Thoroughfare Plan: Master List of Projects

Conceptualized Future Connections and New Terrain Projects*

Project #	Project Name/Description	Source	From	To
CFC 1	10th Street Extension	1969 Thoroughfare Plan	Williamson Road	Oliver Road
	10th Street Extension	1969 Thoroughfare Plan	Oliver Road	ECL Roanoke City
	10th Street Extension	1969 Thoroughfare Plan	ECL Roanoke City	US 460
CFC 2	23rd Street Extension (Wonju Extension)	1969 Thoroughfare Plan, 1975 Thoroughfare Plan	Colonial Avenue	Brandon Avenue
CFC 3	North Salem Circumferential	1969 Thoroughfare Plan	SR 112 (Wildwood Road)	SR 311 Thompson Memorial
	North Salem Circumferential	1969 Thoroughfare Plan	SR 311 Thompson Memorial	SR 419 North Electric Road
CFC 4	Persinger Road Extension	1969 Thoroughfare Plan	Colonial Avenue	Franklin Road (across US 220)
CFC 5	Route 11 Extension	1969 Thoroughfare Plan, 1989 Salem City Thoroughfare Plan	Apperson Drive	South Salem Circumferential
CFC 6	South Salem Circumferential	1969 Thoroughfare Plan	Wildwood Road	SR 419 Electric Road
CFC 7	Hersbherger Extension (East)	1975 Thoroughfare Plan	Hershberger Road	US 460 East
CFC 8	Liberty Road Extension	1975 Thoroughfare Plan	Williamson Road	Route 115 Hollins Road
	Liberty Road Extension	1975 Thoroughfare Plan	Route 115 Hollins Road	Hershberger Extension (East)
CFC 9	24th Street Extension	Committee Suggestion	Baker Street	Bridge Street
CFC 10	US 460 - Route 24 Connector	1975 Thoroughfare Plan	US 460	Route 24
CFC 11	S. Salem Alternative 1	1989 Salem City Thoroughfare Plan	Apperson Drive	Colorado
	S. Salem Alternative 1	1989 Salem City Thoroughfare Plan	Riverside Drive (existing)	Front Avenue
CFC 12	S. Salem Alternative 2	1989 Salem City Thoroughfare Plan	Vine St.	Bowman Avenue
	S. Salem Alternative 2	1989 Salem City Thoroughfare Plan	Front Avenue	Colorado US 11

Project #	Project Name/Description	Source	From	To
CFC 13	S. Salem Alternative 3	1989 Salem City Thoroughfare Plan	Apperson Drive	Front Avenue (at Colorado)
	S. Salem Alternative 3 Extend Riverside Drive	1989 Salem City Thoroughfare Plan	Eddy Avenue	Bowman Avenue
CFC 14	Eastern Circumferential (Alternative 7)	1991 EIS	US 220 (at Intersection with Route 676 - Back Creek)	Cloverdale Road
CFC 15	Interstate 73	VTRANS	Interstate 81	Southern Boundary MPO
CFC 16	South Salem Circum. - Bent Mt. Rd. Connector	Committee Work Map	South Salem Circumferential	US 221 (Bent Mt. Road)
CFC 17	US 221 and US 220 Connector	Committee Suggestion	US 221 (near Cotton Hill Rd)	US 220 (near Buck Mtn Rd)

* The specific nature of the project to include number of lanes, typical section and right-of-way needs are to be considered later in the planning process. This document simply identifies the conceptual need for additional new terrain facilities in the region.

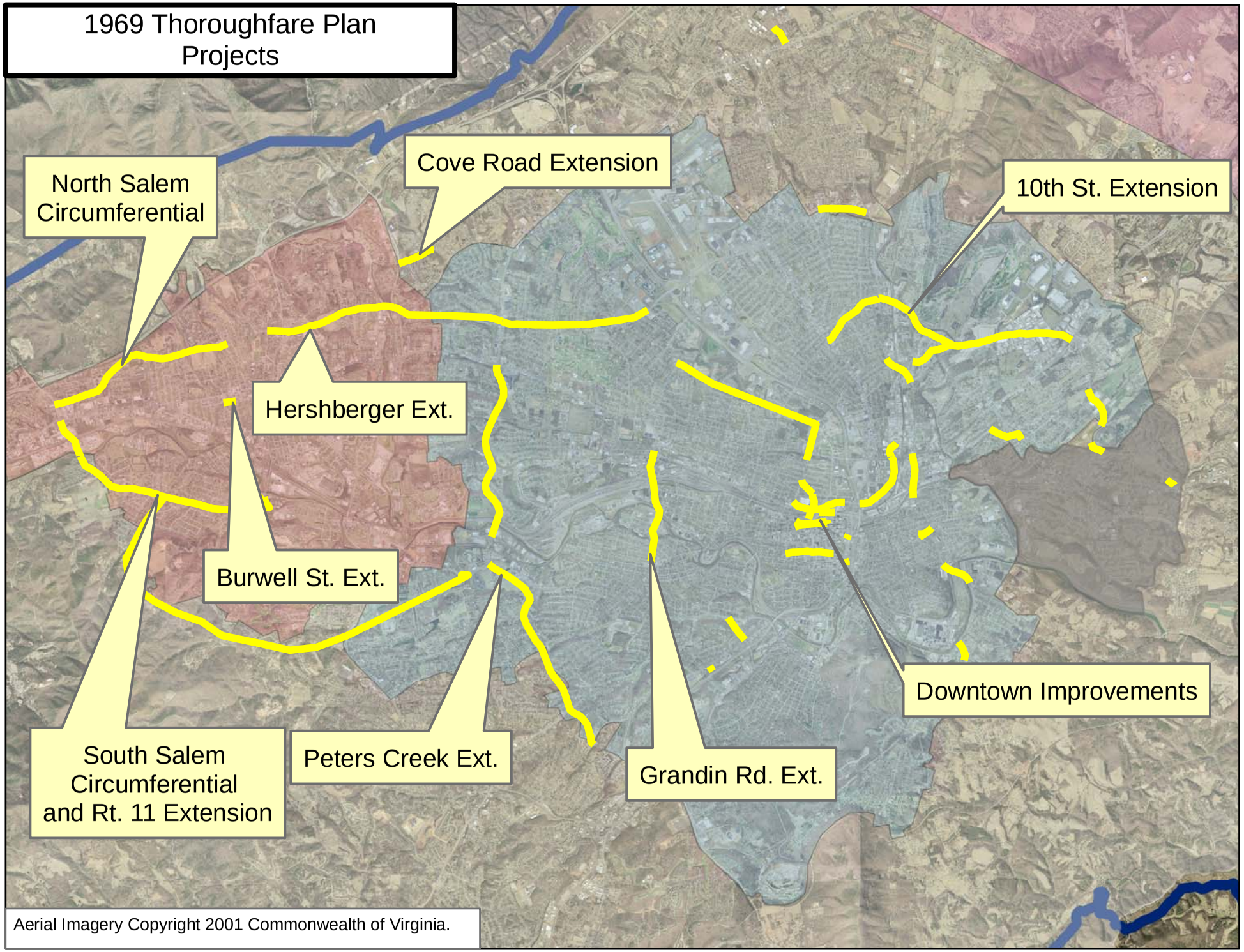
Improvements to Existing Facilities

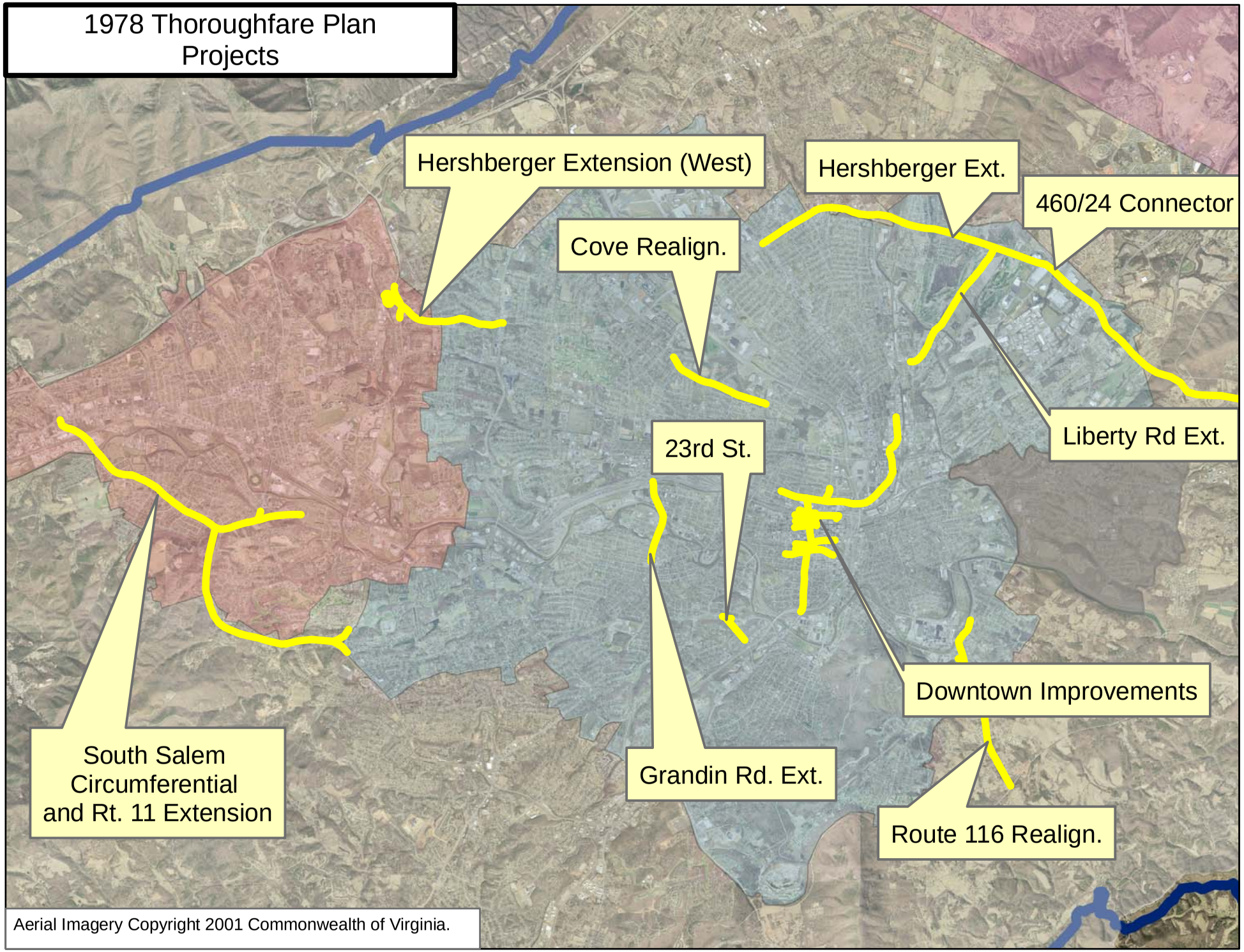
Project #	Project Name/Facility	Source	From	To
IEF 1	Alt. 220 Cloverdale	4-Step Model/Vision List	Roa Co CL	Rt. 654
IEF 2	US 220	4-Step Model/Vision List	Rt. 654	Rt. 11
IEF 3	US 220	4-Step Model/Vision List	Rt. 11	N Rt. 779
IEF 4	US 220	4-Step Model/Vision List	N Rt. 779	Greenfields
IEF 5	US 460 - Blue Ridge Blvd	4-Step Model/Vision List	R Co CL	E SAB (Rt. 1501)
IEF 6	Rte 654 - Read Mountain	4-Step Model/Vision List	Alt 220	Rt. 11
IEF 7	Rt 779 - Catawba	4-Step Model/Vision List	Rt. 220	Rt. 672
IEF 8	Rt. 419 Electric Rd	4-Step Model/Vision List	Rt. 220	Starkey
IEF 9	Rt. 419 Electric Rd	4-Step Model/Vision List	Starkey	SCL Salem
IEF 10	Rt. 101 Hershberger	4-Step Model/Vision List	Peter's Creek	Cove Rd
IEF 11	Rt. 101 Hershberger	4-Step Model/Vision List	Williamson	ECL Roanoke
IEF 12	Rt. 11 Williamson	4-Step Model/Vision List	10th St	Hershberger
IEF 13	Rt. 115 Plantation	4-Step Model/Vision List	Orange	Hollins
IEF 14	Rt. 116 Lafayette Blvd	4-Step Model/Vision List	Cove Rd	Melrose
IEF 15	Rt. 116 Mt Pleasant Blvd	4-Step Model/Vision List	Roa Co CL	Riverdale
IEF 16	US 220 Franklin	4-Step Model/Vision List	R Co CL	Rt. 419
IEF 17	US 460 Orange	4-Step Model/Vision List	Salem TP	11th St NW
IEF 18	US 460 Orange	4-Step Model/Vision List	I-581	11th St NW
IEF 19	US 460 Orange	4-Step Model/Vision List	11th St NW	R Co CL
IEF 20	US 460 Salem TP	4-Step Model/Vision List	Melrose	Orange
IEF 21	US 220 Expressway	4-Step Model/Vision List	Elm Ave	Rt. 419
IEF 22	Brandon	4-Step Model/Vision List	Brambleton	Main St
IEF 23	Colonial	4-Step Model/Vision List	R Co CL	Wonju
IEF 24	Cove Rd	4-Step Model/Vision List	Green Ridge	Peter's Creek
IEF 25	Cove Rd	4-Step Model/Vision List	Peter's Creek	Lafayette Blvd
IEF 26	Elm Ave	4-Step Model/Vision List	Franklin	Jefferson
IEF 27	Elm Ave	4-Step Model/Vision List	Jefferson	Jamison
IEF 28	Garden City Blvd	4-Step Model/Vision List	Yellow Mountain Rd.	Bandy
IEF 29	Grandin	4-Step Model/Vision List	Garst Mill	Brandon
IEF 30	Green Ridge	4-Step Model/Vision List	Salem CL	Cove Rd
IEF 31	Hollins	4-Step Model/Vision List	Orange	Liberty
IEF 32	King St	4-Step Model/Vision List	Gus Nicks	Orange
IEF 33	Salem TP	4-Step Model/Vision List	ECL Salem	36th St
IEF 34	Salem TP	4-Step Model/Vision List	36th St	24th St
IEF 35	Shenandoah	4-Step Model/Vision List	ECL Salem	10th St
IEF 36	Tazewell	4-Step Model/Vision List	Williamson	9th St
IEF 37	Alt. 11/460 4th St	4-Step Model/Vision List	Union	Colorado

Project #	Project Name/Facility	Source	From	To
IEF 38	Alt. 11/460 Roanoke Blvd	4-Step Model/Vision List	4th	Idaho
IEF 39	US 11 College	4-Step Model/Vision List	Colorado	8th
IEF 40	Rt. 419 Electric Rd	4-Step Model/Vision List	R Co CL	Roanoke Blvd
IEF 41	US 460 Main St	4-Step Model/Vision List	Rt. 112	4th St
IEF 42	US 460 Main St	4-Step Model/Vision List	4th St	Rt. 311
IEF 43	Colorado	4-Step Model/Vision List	4th	College
IEF 44	Lynchburg TP	4-Step Model/Vision List	Rt. 419	WCL Roanoke
IEF 45	W. Riverside	4-Step Model/Vision List	Mill Ln	Piedmont
IEF 46	Rt. 651 Mountain View Road	4-Step Model/Vision List	Washington Ave.	R Co CL
IEF 47	Rt. 634 Hardy Rd	4-Step Model/Vision List	R Co CL	E SAB (Rt. 619)
IEF 48	River Crossing	4 Step Model/Vision List	4th St.	W. Riverside
IEF 49	Ogden Road	1969 Thoroughfare Plan	SR 419	Colonial Avenue
IEF 50	Ogden Road	1969 Thoroughfare Plan	Colonial Avenue	US 221 (Brambleton)
IEF 51	Rt. 116 Yellow Mountain	1969 Thoroughfare Plan	Blue Ridge Parkway	S Jefferson Street
IEF 52	Rt. 116 Cove Road	1969 Thoroughfare Plan	Lafayette Boulevard	Andrews Road
IEF 53	Rt. 116 Cove Road Ext.	1969 Thoroughfare Plan	Andrews Road	10th Street
IEF 54	Burwell Street	1969 Thoroughfare Plan	Chestnut St.	Chapman St.
IEF 55	Interstate 81	VTRANS	Eastern Bdry MPO	Northern Bdry MPO

* Specific improvement is not specified in this document. Generally, improvement refers to widening existing facility. The exact nature of the improvement to include number of lanes, typical section and right-of-way needs are to be considered later in the planning process. This document simply identifies the need for additional capacity on these facilities.

APPENDIX


1969 Thoroughfare Plan Projects
North Salem Circumferential
Cove Road Extension
10th St. Extension
Hershberger Ext.
Burwell St. Ext.
South Salem Circumferential and Rt. 11 Extension
Peters Creek Ext.
Grandin Rd. Ext.
Downtown Improvements
Aerial Imagery Copyright 2001 Commonwealth of Virginia.


1978 Thoroughfare Plan Projects
Hershberger Extension (West)
Hershberger Ext.
460/24 Connector
Cove Realign.
Liberty Rd Ext.
23rd St.
Downtown Improvements
South Salem Circumferential and Rt. 11 Extension
Grandin Rd. Ext.
Route 116 Realign.
Aerial Imagery Copyright 2001 Commonwealth of Virginia.

Projects Listed in the Financially Constrained Long Range Transportation Plan
Source: RVAMPO CLRTP (2025)

Ciy of Roanoke Urban System

Facilty	From	To	Improvement	Projected Cost
10th Street	Gilmer Ave	Andrews Rd	Reconstruction	$7,565,000
10th Street	Andrews Rd.	Williamson Rd.	Reconstruction	$5,055,000
Wonju Street Extension	Colonial Ave.	Brandon Ave.	4 Lane	$20,676,000
13th Street/Hollins Rd	Dale Ave	Orange Ave	U4D/Bike Lanes	$10,020,000
Campbell Ave. SE	Williamson Rd.	Norfolk Ave.	U3L	$4,013,000
Norfolk Ave.	Campbell Ave	Wise Ave	U3L	$915,000
Wise Ave.	Norfolk Ave.	ECL Roanoke	U3L	$8,166,000
Colonial Ave.	Wonju St.	Winding Way Rd.	U3L/Bike Lanes	$7,518,733
I-581/Elm Ave Interchange	Jefferson St.	Jamison Ave.	U6L	$8,000,000
Orange Ave. Network	I-581	ECL Roanoke	Corridor Study	$300,000
Orange Ave.	11th Street	Gus Nicks Blvd.	U6L	$11,414,000
Salem Turnpike/Shenandoa	36th St.	24th St.	U2L/Bike Lanes	$5,641,000
Willamson Rd.	Orange Ave.	Angell Ave.	Corridor Improvement	$15,493,000

City of Salem Urban System

Facilty	From	To	Improvement	Projected Cost
Route 11 Apperson	Apperson Drive at	Electric Road	Intersection Improvement	$2,337,000
Route 460 (E. Main Street)	Route 311	Parkdale Drive	3L	$9,505,000
Route 460 (E. Main Street)	Parkdale Dr.	Route 419	4 to 5 L	$8,099,000
Route 11 Apperson	Colorado	WCL Roanoke	U4L	$17,114,000
Route 11 Apperson	Apperson Drive at	Electric Road	Intersection Improvement	$6,485,323

Town of Vinton Urban System

Facilty	From	To	Improvement	Projected Cost
Route 634 Hardy Rd.	Niagra Rd.	ECL Vinton	5L	$5,516,000
Route 24 Virginia Ave	ECL Roanoke	Pollard	U6L	$4,608,000
Walnut	WCL Vinton	Lee	U2L/Bicycle, Curb, Gutter	$2,112,000
Lee	Walnut	Pollard	Realign Intersection and U2L	$282,000
Route 24 Wasington Ave	By Pass Rd	Route 654	PE Only	$1,758,141

Roanoke County Secondary System

Facilty	From	To	Improvement	Projected Cost
601 Hollins Road	Rt. 115	.59 Mi S Rte 627	Add 2 L, Rebuild 2L	$8,793,000
613 Merriman Rd.	.1 Mi S Starkey Rd	Rt 1640	PE and RW	$3,667,300
688 Cotton Hill Rd.	.09 Mi S Rte 221	.15 Mi S Rte 934	Rebuild 2L	$2,936,900
720 Colonial Ave.	.04 Mi W. Rte. 687	Rte 419	Rebuild 2L	$3,605,540
720 Colonial Ave.	Rte 419	Rte 681	PE Only	$950,000
634 Hardy Rd	Vinton CL	.01 Mi E Route 654	PE Only	$750,000
679 Buck Mountain Rd	.15 Mi E Rte 220	.04 Mi E. Rte 678	Reconstruct 2L and Intersection with 220	$4,731,590
679 Buck Mountain Rd	Starkey Rd	Rte 220	U2L	$2,954,000
613 Merriman Rd.	.1 Mi S Rte 904	Rte 1640	U2L	$5,000,000
634 Hardy Rd	Vinton CL	.01 Rte E Route 65	U4L/Bicycle Lanes	$7,566,000
904 Starkety Road	Rte 613	Rt 633	U4L	$11,676,000
625 Hershberger Rd	Roanoke CL	Rte 115	U3L	$4,838,000
720 Colonial Ave.	Rte 419	Rte 681	U3L	$5,000,000
682 Garst Mill	Brambleton	Grandin	U3L	$6,886,000

Botetourt County Secondary System

Facilty	From	To	Improvement	Projected Cost
Rte 605	Rte 654	.15 Mi W Alt 220	Rebuild 2L	$3,091,877
Rte 779	.19 Mi W Rte 672	.21 Mi E Rte 672	Rebuild 2L, New Bridge, Add Turn Lanes	$3,001,000
Rte 779	Rte 220	Rte 11	Realign ROW, Intersection Improvements	$2,100,000
Rte 779	Rte 220	Rte 672	Upgrade to Rural 2L	$2,461,000
Rte 605	Alt 220	Rte 652	Rural 2L	$1,134,000
Rte 652	Rte 658	Rte 11	Reconstruct	$5,513,000
Rte 654	Alt 220	Rte 11	Upgrade to Rural 2L	$2,255,000

Bedford County Secondary System

Facilty	From	To	Improvement	Projected Cost
Rte 634	Roanoke Co CL	East Study Area B	R4L - PE and ROW Only	$2,825,146

RVAMPO Interstate System

Facilty	From	To	Improvement	Projected Cost
Interstate 73	South SAB	Elm/I-581	PE Only	$12,146,000
Interstate 581	Elm Ave	I-81	Corridorwide Improvement	$21,661,000
Interstate 81	West SAB	East SAB	NEPA and PPTA Process	$44,280,100

RVAMPO Primary System

Facilty	From	To	Improvement	Projected Cost
Roanoke County - Rt 11	WCL Salem	.10 Mi W Route 830	4L	$25,254,000
Roanoke County - Rte 460	Roanoke CL	Botetourt CL	6L	$11,850,000
Roanoke County - Rt 11	Roanoke CL	Rte 117	4L	$14,018,000
Botetourt County - Rte 11	.21 Mi N Rte 601	.38 Mi N Rte 654	4L	$13,294,000
City of Roanoke - US 220	Wonju St.	Elm Ave	8L	$20,880,000
Roanoke County - US 220	South Roanoke 715	Rte 419	6L	$11,907,000
Roanoke County - Rte 115	Roanoke CL	Rte 11	4L	$19,622,000
Roanoke County - Rte 116	Roanoke CL	Rte 664	2L	$4,101,000
Roanoke County - Rte 116	Rte 664	Franklin CL	2L	$2,546,000
Roanoke County - Rte 221	1.05 Mi W. Rte 694	.35 Mi S Rte 897	4L	$9,206,000

RVAMPO Projects Listed in the Commonwealth of VA State Six-Year Improvement Program
Source: SSYIP (FY 2006-2011)

City of Roanoke Urban System

Facilty	From	To	Projected Cost
13th Street/Hollins Rd	Orange Ave	Dale Ave	$15,498,000
10th Street Reconstruction	Gilmer Ave	Andrews Rd	$7,959,000
10th Street 4 Lanes, Curb, Gutter, and Sidewalk	.42 N Andrews Rd	Williamson Rd	$4,649,000
10th Street 2-Stage Xing with Warning Devices	Lick Run Creek	170 Ft. S Syracuse Ave	$75,000
Wonju Extension	Colonial Ave	Brandon Ave	$19,161,000
Riverland Rd. - Intersection Improvement	Riverland Rd	at Bennington St.	$1,020,000

City of Salem Urban System

Facilty	From	To	Projected Cost
Rte 11 Apperson Intersection Improvements - PE	NA	NA	$9,234,000
Rte 311 Exit Turn Lanes an RTL Cleveland St.	Thompson Memorial Drive	at Cleveland Ave	$581,000
Rte 460 - Widen to 3 Lanes with Curb and SW	Lynchburg Turnpike	.05 Mi E Kessler Mill Rd	$7,513,000
Rte 460 - Widen to 4 Lanes, Curb, Gutter, SW, Bridge	.013 Mi E Kessler Mill Rd	.145 Mi E Rte 419	$7,021,000

Town of Vinton Urban System

Facilty	From	To	Projected Cost
Hardy Rd - Widen to 5 Lanes	Niagra	ECL Vinton	$6,109,000
Walnut Ave - Upgrade Curb, Gutter, Bike Lns, SW	PE Only	NA	$518,000

Roanoke County Secondary System

Facilty	From	To	Projected Cost
Rte 11/460 Widen to 5 Lanes	WCL Salem	.10 M W Rte 830	$27,069,000
Rte 221 Reconstruction to 4 Lanes - PE	NA	NA	$1,284,000
Rte 221 Reconstruction to 4 Lanes	NA	NA	$13,152,000
Rte 311 - Minor Widening for LTL and Improve Sight Distance	Rte 864	.16 Mi W Rte 864	$184,000

Botetourt County Secondary System

Facilty	From	To	Projected Cost
None Listed Within RVAMPO			

Bedford County Secondary System

Facilty	From	To	Projected Cost
None Listed Within RVAMPO			

RVAMPO Interstate System

Facilty	From	To	Projected Cost
Botetourt Co. - Interstate 81 Upgrade Substandard Guardrail	1.6 Mi N Rte 220 SBL	Rockbridge CL	$1,117,000
Botetourt Co. - Interstate 81 Widen from 4 to 8 Lanes - PE and RW Only	.28 Mi S Rte 648	.79 Mi N Rte 779	$7,232,000
Botetourt Co. - Relocate Route 11 at Exit 150 PE	Route 11 at	Exit 150	$5,273,000
City of Roanoke - I-581 Interchange and CD Roads PE	.81 Mi N 581	Hershberger Rd	$515,000
Roanoke County - Interstate 81 Widen from 4 to 8 Lanes PE Only	.047 Mi N Butt Hallow Rd	Botetourt CL	$11,428,000

RVAMPO Primary System

Facilty	From	To	Projected Cost
Botetourt County - Rt. 11	Replace Str#1012	Over Tinker Creek	$3,302,000
Botetourt County - Rt. 11	Replace Str#1013	Over Tinker Creek	$651,000

Roanoke Valley Conceptual Thoroughfare Plan
Audit Trail of Projects

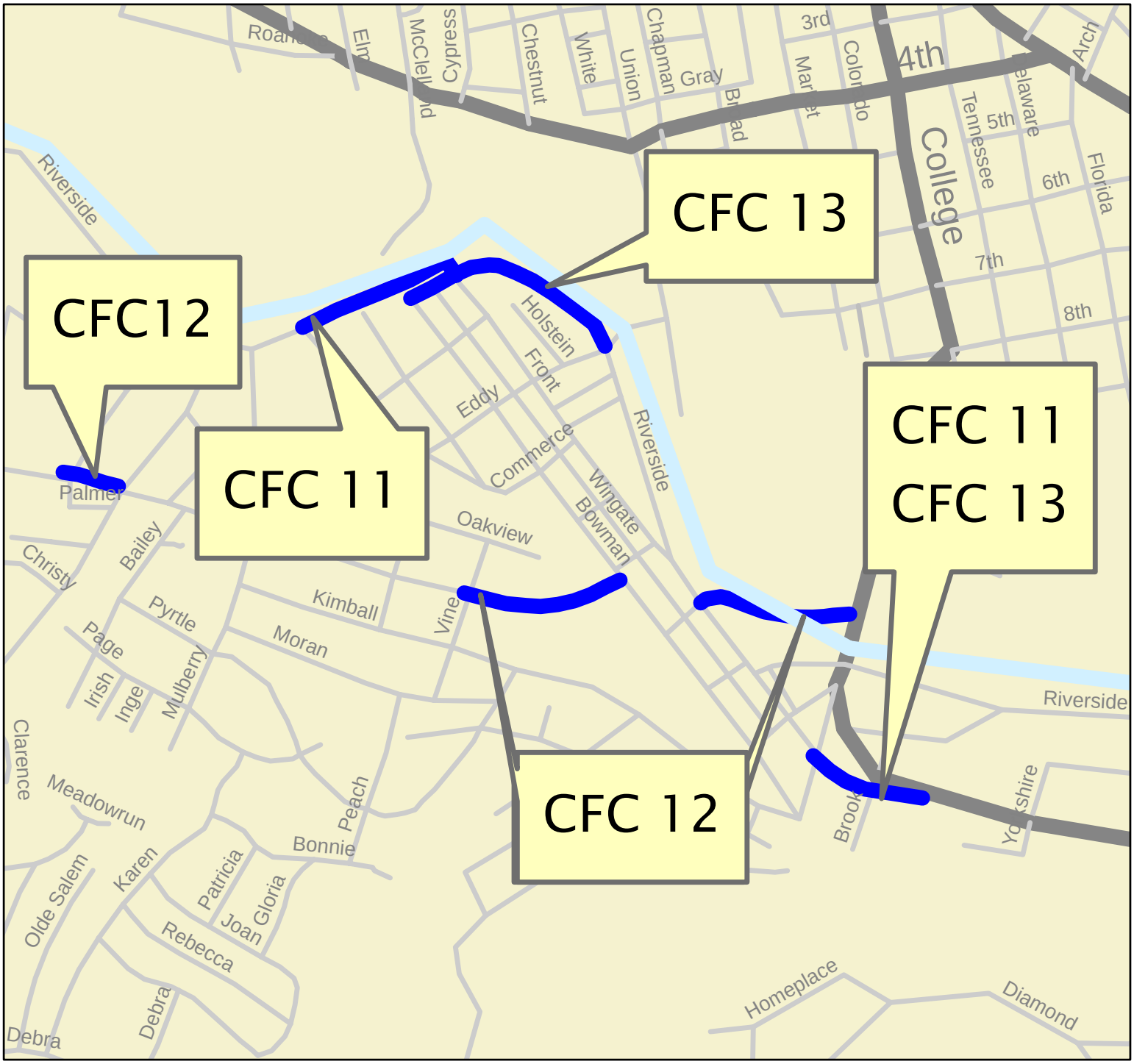
Project Name	Source	From	To	Date Removed
10th Street Extension	1969 Thoroughfare Plan	US 460	Route 24	3/3/2006
Franklin Road Extension	1969 Thoroughfare Plan/1975	US 220	3rd Street SW	12/9/2005
Franklin Road Extension	1969 Thoroughfare Plan/1975	3rd Street SW	Salem Avenue	12/9/2005
Franklin Road Extension	1969 Thoroughfare Plan/1975	Salem Avenue	US 460	12/9/2005
Franklin Road Extension	1969 Thoroughfare Plan/1975	US 460	Liberty Street	12/9/2005
Grandin Road Extension	1969 Thoroughfare Plan	Grandin Road (at intersection	Melrose Avenue	3/3/2006
JAE Valley/Mt. Pleasant	1969 Thoroughfare Plan	Blue Ridge Parkway	Rutrough Road	12/9/2005
JAE Valley/Mt. Pleasant	1969 Thoroughfare Plan	Rutrough Rd	Bennington Rd	12/9/2005
Peters Creek Extension	1969 Thoroughfare Plan	US 221	Grandin Road	3/3/2006
Peters Creek Extension	1969 Thoroughfare Plan	Grandin Road	Brandon Ave	3/3/2006
Cove Rd Exension	1969 Thoroughfare Plan	10th St.	Franklin Road Extension	12/9/2005
Cove Rd Exension	1969 Thoroughfare Plan	SR 419	Peters Creek Rd	12/9/2005
Cove Rd Exension	1969 Thoroughfare Plan	Peters Creek Rd	WCL Roanoke City	12/9/2005
Cove Rd Exension	1969 Thoroughfare Plan	WCL Roanoke City	Lafayette Blvd	12/9/2005
Wells Avenue Extension	1969 Thoroughfare Plan/1975	Williamson Rd	Walker Ave	12/9/2005
Wells Avenue Extension	1969 Thoroughfare Plan/1975	Walker Ave	Indiana Ave	12/9/2005
Elm Avenue Relocation	1975 Thoroughfare Plan	Jefferson St.	Elm Ave (Existing)	12/9/2005
Hershberger Extension (West)	1975 Thoroughfare Plan	SR 419	SR 117	3/3/2006
Williamson Road	4-Step Model Recommendations	Campbell Ave	Wells Ave	3/3/2006
Williamson Road*	4-Step Model Recommendations	Roanoke CL	Rt 117	12/23/2005
Lee Highway*	4-Step Model Recommendations	Rt. 612	WCL Salem	12/23/2005
Plantation*	4-Step Model Recommendations	Roanoke CL	Rt. 117	12/23/2005
Jae Valley Rd.*	4-Step Model Recommendations	S SAB	Rt. 664	12/23/2005

Project Name	Source	From	To	Date Removed
Jae Valley Rd.*	4-Step Model Recommendations	Rt. 664	Roanoke CL	12/23/2005
US 220*	4-Step Model Recommendations	Rte. 715	Roanoke CL	12/23/2005
Bent Mt. Rd*	4-Step Model Recommendations	W SAB	.35 Mi S Rt. 897	12/23/2005
Brambleton	4-Step Model Recommendations	Rte. 689	Rte. 419	12/23/2005
Challenger*	4-Step Model Recommendations	Roanoke CL	Botetourt CL	12/23/2005
Merriman*	4-Step Model Recommendations	Starkey Rd.	Rte. 1640	12/23/2005
Hershberger*	4-Step Model Recommendations	Peters Creek Rd	Cove Rd	12/23/2005
Hardy Rd.*	4-Step Model Recommendations	Vinton CL	Bedford CL	12/23/2005
Garst Mill*	4-Step Model Recommendations	Brambleton Ave	Grandin Rd.	12/23/2005
Penn Forest*	4-Step Model Recommendations	Colonial	Starkey	12/23/2005
Colonial*	4-Step Model Recommendations	Merriman	Penn Forest	12/23/2005
Colonial*	4-Step Model Recommendations	Penn Forest	Electric	12/23/2005
Starkey*	4-Step Model Recommendations	Rte. 613	Eden Ave	12/23/2005
Brandon	4-Step Model Recommendations	Mud Lick	Grandin	12/9/2005
Williamson Road	4-Step Model Recommendations	10th St.	Hershberger	12/9/2005
Williamson Road	4-Step Model Recommendations	Campbell Ave	Wells Ave	12/9/2005
Riverland*	4-Step Model Recommendations	Bennington	Garden City Blvd	12/9/2005
Jefferson	4-Step Model Recommendations	Elm Ave	Campbell Ave	12/9/2005
Dale	4-Step Model Recommendations	Jamison	WCL Vinton	12/9/2005
Jamison	4-Step Model Recommendations	13th St.	Dale	12/9/2005
Campbell*	4-Step Model Recommendations	Williamson Rd	Norfolk Ave	12/9/2005
Brandon	4-Step Model Recommendations	Brambleton Ave	Main St	12/9/2005
Franklin	4-Step Model Recommendations	Jefferson St.	Williamson Rd.	12/9/2005
Franklin	4-Step Model Recommendations	Expressway (220)	Elm Ave	12/9/2005
Brambleton	4-Step Model Recommendations	R Co CL	Overland	12/9/2005

Project Name	Source	From	To	Date Removed
Hollins*	4-Step Model Recommendations	Dale	Orange	12/9/2005
Main St.	4-Step Model Recommendations	Brandon	Elm	12/9/2005
McClanahan	4-Step Model Recommendations	Franklin	Jefferson	12/9/2005
Norfolk Ave*	4-Step Model Recommendations	Campbell Ave	Wise Ave	12/9/2005
Overland	4-Step Model Recommendations	Brambleton Ave	Colonial Ave	12/9/2005
9th St. SE	4-Step Model Recommendations	Penmar	.05 Mi S Bullitt	12/9/2005
10th St. NW	4-Step Model Recommendations	Gilmer Ave	Orange Ave	12/9/2005
Washington Ave (Route 24)*	4-Step Model Recommendations	By Pass Rd	Rte. 654	12/9/2005
Walnut*	4-Step Model Recommendations	WCL Vinton	Lee	12/9/2005

*denotes project already listed in LRTP or SSYIP or a completed project.

South Salem Circumferential Alternatives



Prepared by the staff of the Roanoke Valley – Alleghany Regional Commission, 2006.