Roanoke Valley Transportation
PLANNING ORGANIZATION

Staffed by the REGIONALcommission

Roanoke Valley
TRANSIT VISION PLAN

Approved September 22, 2016

PART 4: Preferences and Demand

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1.0 INTRODUCTION

For any city or region developing recommendations it is critical that they be based on an objective data-driven analysis supported by a robust public engagement plan. This section describes the four contributing elements that were utilized to develop the recommendations in Part 5 including:

- Public input and feedback;
- Transit Propensity;
- Model Analysis; and,
- Gap Analysis.

The process to develop the recommendations started and ended with public input and feedback. The first events focused on obtaining input on both the type and location of transit service the public wanted. It is also important to understand the public's preferences in regards to transit service. This was accomplished through a trade-off survey. The trade-off preference survey provides critical feedback on how the system can be designed in a cost effective manner tailored to the community preferences, because generally it is not affordable to provide everyone exactly what they want with local transit service.

This was supported by a Transit Propensity analysis. This analysis utilizes the latest available census data to identify areas throughout the Roanoke Valley region that have a need and are viable for new or additional transit services. The census data is used to create four propensity indices that focus on where people live, where commuters live, locations of where people work and locations where people make non-work trips.

This data is then compared to information on trips in the region from the regional travel model. The VDOT Regional Travel Model was developed to estimate and forecast travel flows throughout the Roanoke Valley region. Within this project, it was used as a source of origin-destination data and was analyzed to understand residents travel patterns within the region.

Finally, all of this information was combined and used to identify two types of gaps that exist in the system: service area gaps and service connection gaps.

- Service area gaps are identified through the public input and propensity analysis. They are locations where service is needed and not currently provided, or is provided at an insufficient level.
- Service connection gaps are identified through the public input and model analysis. They are connections between areas that are not being served by transit. In other words, places people want to travel to and from that currently are not connected with transit.

The details of each of these elements that were used to develop the recommendations are described in the remainder of Part 4.

2.0 PUBLIC INPUT ON CONNECTIONS AND PREFERENCES

This section provides an overview of the second phase of public outreach efforts conducted in the fall 2015 to determine what places in our region should be connected as well as people's preferences on a number of criteria that help shape a transit system.

Two public outreach workshops were held on November 5, 2015 to inform the public about the prior input received, while also providing an opportunity for input on the needed connections, timing, frequency, and appropriateness of different types of transit services. The same information was asked of the general public via an online survey that was advertised widely throughout the Roanoke Valley. Information about needed connections was also provided through the first phase of public outreach efforts through the general public survey and the Valley Metro rider survey summarized in Part 3. A separate survey regarding transit service preferences was also administered on Valley Metro buses in December 2015.

The November 2015 public outreach workshops were held at Campbell Court and the Brambleton Center and were advertised in a local newspaper, online (social media, website, email), through signage outside Campbell Court and along major roadways, and on-board Valley Metro and RADAR buses. Approximately 74 people attended the two public workshops, 180 people provided input via the online survey, and 804 people completed the preferences survey on-board the buses.

The public comments, pertaining to transit preferences and types of service, were included as part of the overall transit system evaluation.

Figure 2.0-1 | Roadside sign advertises public meeting

Figure 2.0-2 | RVARC Facebook Video Post Advertising Public Workshops, October 30, 2015

The following sections highlight the input received through these outreach initiatives.

2.1 Needed Connections

Public workshop attendees participated in three separate (but connected) interactive mapping activities.

- **FIXED ROUTE AND DOOR-TO-DOOR SERVICE:** PARTICIPANTS USED MARKERS TO INDICATE ON THE REGIONAL MAP WHERE FIXED ROUTE AND DOOR-TO-DOOR TRANSIT IS NEEDED. CURRENT TRANSIT SERVICES WERE NOT INDICATED ON THE MAP ENABLING PARTICIPANTS TO CONSIDER THE REGION AS A WHOLE WITHOUT BEING INFLUENCED BY THE NOTATIONS OF CURRENT ROUTES AND SERVICES.
- **SUNDAY AND EVENING SERVICE**: BOTH SUNDAY AND EVENING SERVICES WERE IDENTIFIED AS NEEDS BY MANY PEOPLE IN PREVIOUS SURVEYS. PARTICIPANTS USED MARKERS TO INDICATE ON THE REGIONAL MAP WHERE SUNDAY AND EVENING SERVICE IS NEEDED.
- **ALL DAY AND COMMUTER SERVICE:** PARTICIPANTS USED MARKERS TO INDICATE ON THE REGIONAL MAP WHERE FREQUENT ALL-DAY AND COMMUTER SERVICES ARE NEEDED.

Figure 2.1-1 | Public Workshop Interactive Mapping Activity

During the interactive mapping activity, public workshop attendees identified needs in the following areas:

▲ **ALL DAY TRANSIT SERVICE** (**Figure 2.1-2**)

- Tanglewood to Lewis Gale Medical Center
- Downtown Roanoke to Downtown Salem
- Downtown Roanoke to Hollins Area
- Hollins Area to VA Medical Center
- Downtown Salem to Downtown Vinton
- Downtown Salem to Glenvar
- Tanglewood to Clearbrook
- Downtown Roanoke to Cave Spring
- Downtown Roanoke to Blacksburg
- Cloverdale to Roanoke Centre for Industry and Technology

▲ **COMMUTER TRANSIT SERVICE** (**Figure 2.1-3**)

- Glenvar to Blacksburg
- Downtown Roanoke to Exit 150/Lord Botetourt
- Downtown Roanoke to Hollins District
- Downtown Roanoke to VA Medical Center to Glenvar
- Downtown Roanoke to Valley View to DMV
- Downtown Roanoke to Tanglewood to Cave Spring
- Service to Troutville and Daleville

▲ **EVENING TRANSIT SERVICE** (**Figure 2.1-4**)

- Downtown Roanoke to Crossroads to Hollins
- Downtown Roanoke to Tanglewood
- Tanglewood to Clearbrook
- Tanglewood to Cave Spring to Lewis Gale Hospital
- Downtown Roanoke to Downtown Salem
- Downtown Roanoke to Downtown Vinton
- Downtown Salem to Melrose
- Lewis Gale Hospital to Downtown Salem
- Lewis Gale Hospital to Grandin to Downtown Roanoke

▲ **SUNDAY TRANSIT SERVICE** (**Figure 2.1-5**)

- Downtown Roanoke to Downtown Salem
- Downtown Salem to Lewis Gale Hospital to Virginia Western Community College
- Downtown Roanoke to Crossroads to Valley View
- Downtown Roanoke to SE Roanoke/Bennington St.
- Service to Troutville, South County Library, and Towers Shopping Center

Figure 2.1-2 | All Day Service Transit Needs

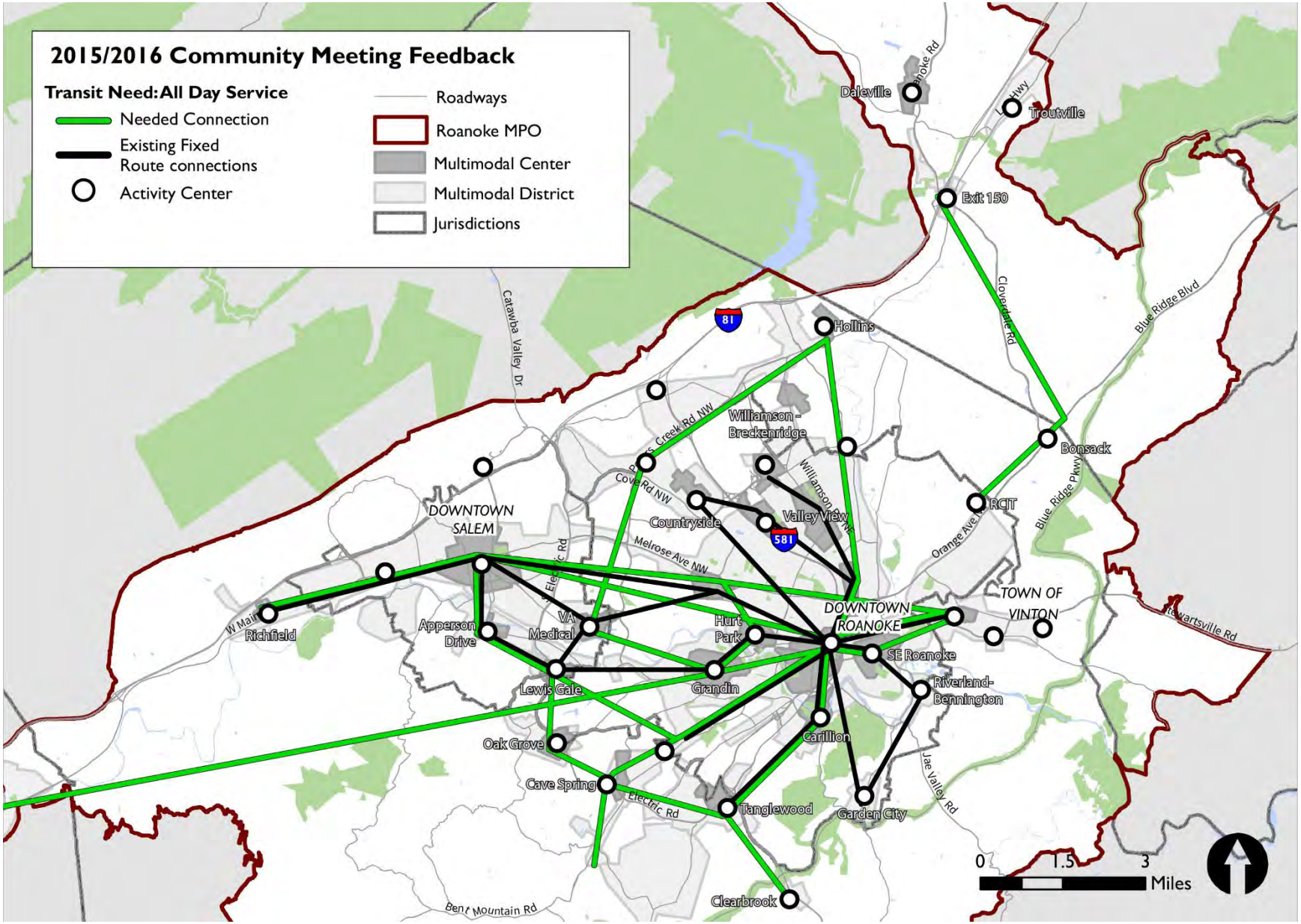


Figure 2.1-3 | Commuter Service Transit Needs

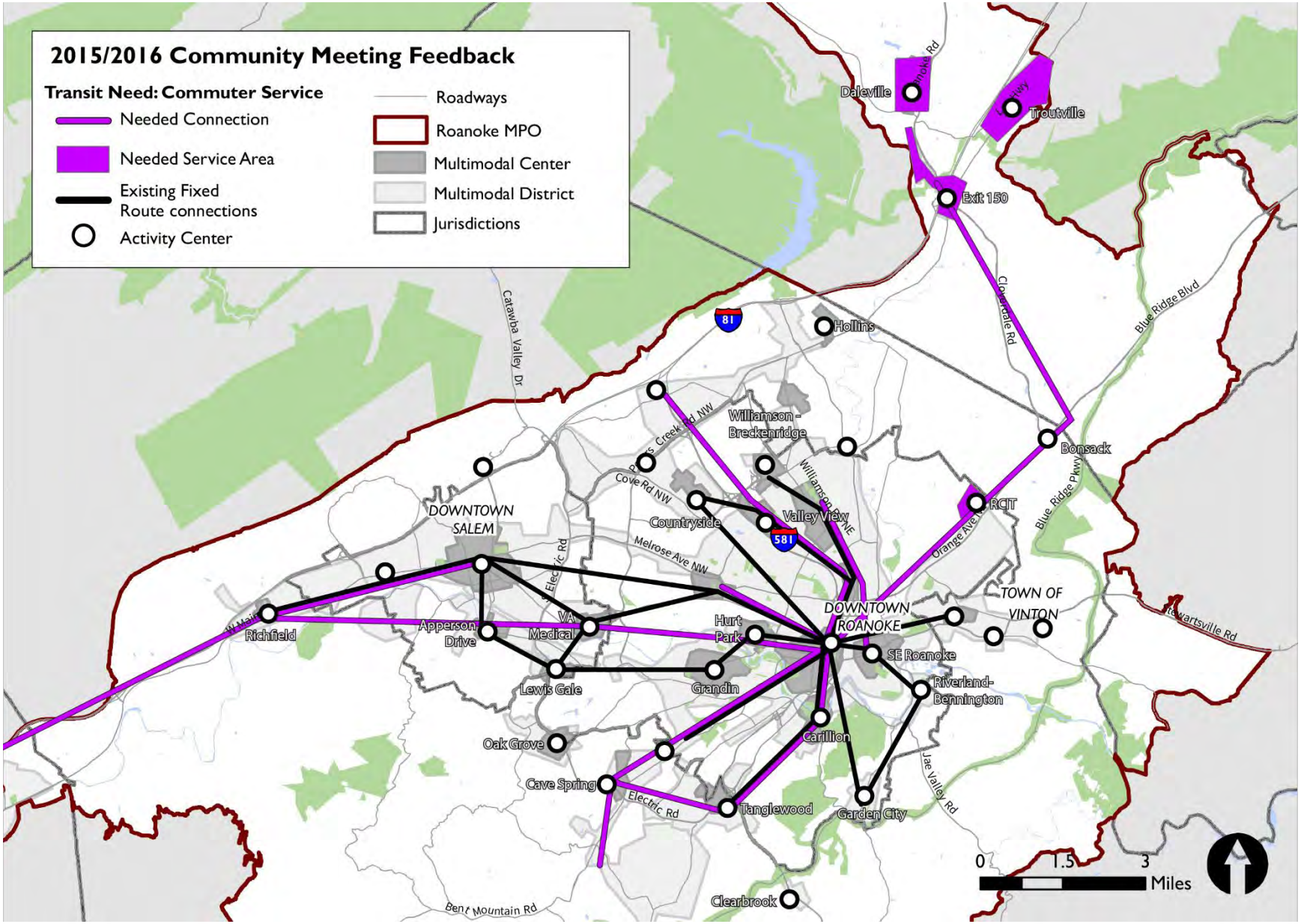


Figure 2.1-4 | Evening Service Transit Needs

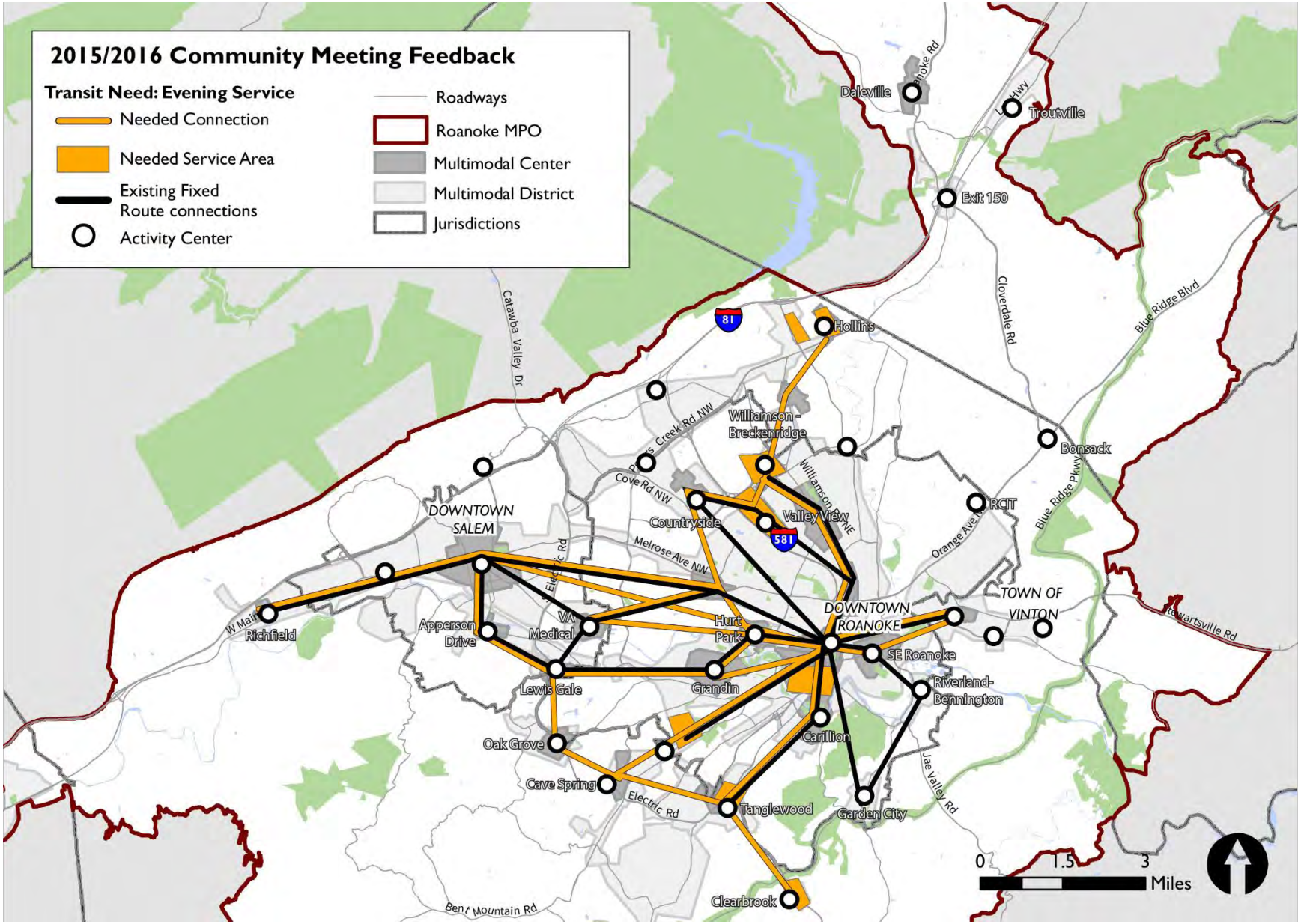
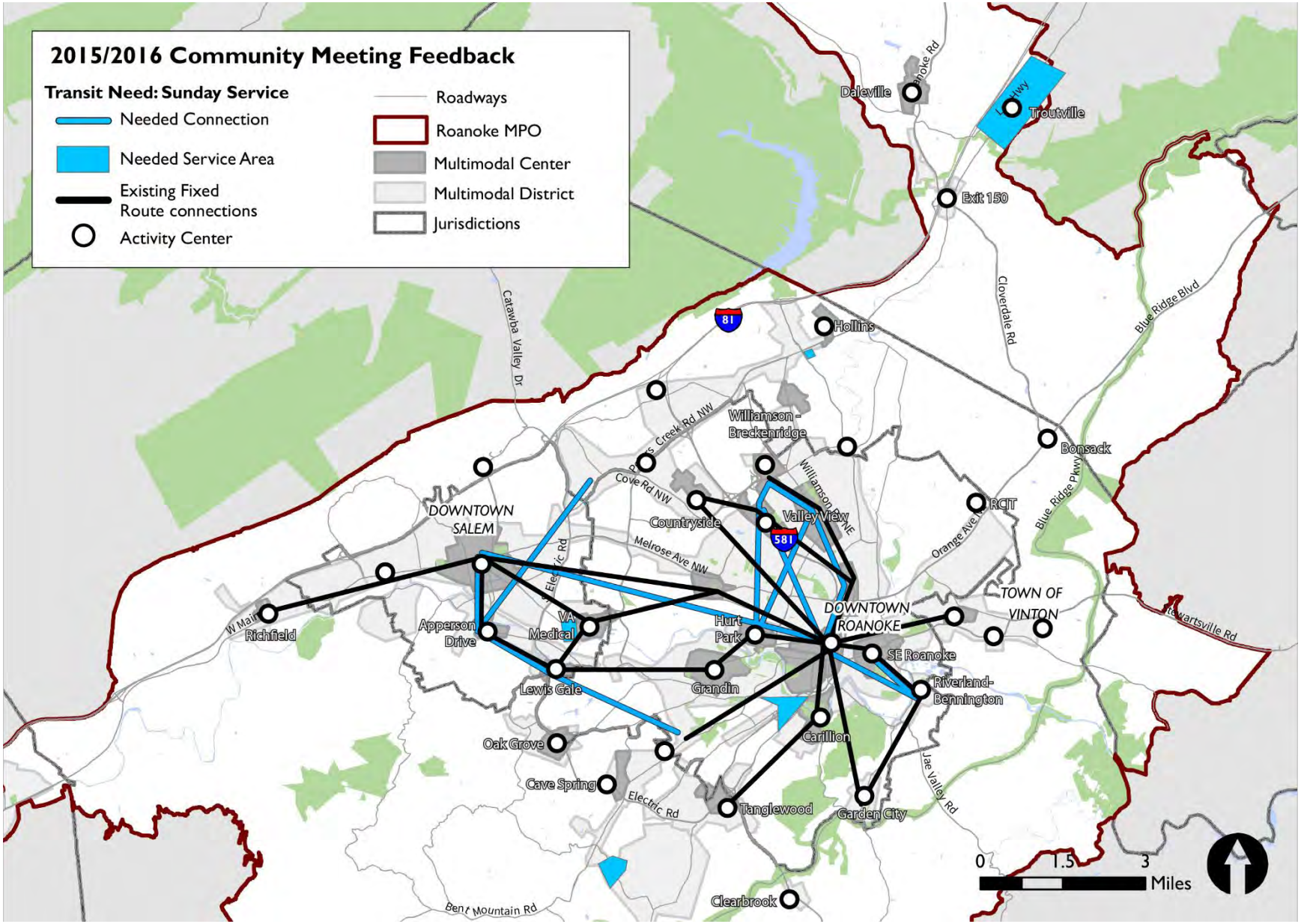


Figure 2.1-5 | Sunday Service Transit Needs



As mentioned, a web survey was also used to help identify where specific types of services are needed, such as door-to-door service, evening service, Sunday service, and commuting service. Because participants were unable to draw connections on a map, questions guided their answers. For example, one question asked: "Which areas should offer a DIRECT CONNECTION for all residents AND DOOR-TO-DOOR service for seniors and people with disabilities?" (List up to five areas). The number of responses corresponds to a variety of destinations where transit service may be needed and are highlighted in the following table.

Table 2.1-1 | Web Survey Results on Connections

Topic/Question	Number of Responses
Which areas should offer a DIRECT CONNECTION for all residents AND DOOR-TO-DOOR service for seniors and people with disabilities?	334
Which areas ONLY need DOOR-TO-DOOR service for seniors and people with disabilities?	155
Which areas should be connected with EVENING service?	263
Which areas should be connected with SUNDAY service?	206
Which areas should be connected with ALL DAY service?	193
Which areas should be connected with COMMUTE TO/FROM WORK (6-9am, 3-6pm) service?	208

In addition, a word cloud offers one way to visualize the range of areas listed by the public. The word cloud is an illustrative example of which areas should offer a direct connection for all residents AND door-to-door service for seniors and people with disabilities. The more frequently a word is found, the larger it appears in the word cloud.

Figure 2.1-6 | Word Cloud Visualization of Web Survey Results

The web survey was open for approximately one month and received 180 responses. The following is a brief summary of the demographic input received through the web survey:

- THE MEDIAN AGE OF RESPONDENT WAS 53
- 62% OF RESPONDENTS LIVE IN THE CITY OF ROANOKE
- 51% TAKE TRANSIT, AT LEAST "ONCE IN A WHILE"

2.2 Transit Preferences

A transit preferences survey was a key component of the workshops, the web survey, and the on-board survey, all of which took place in November and December of 2015. Trade-off preference surveys allow the system to be designed in a cost effective manner tailored to the community preferences, because generally it is not affordable to provide everyone exactly what they want with local transit service. In all, approximately 889 people participated in a transit preferences exercise, in which participants were asked to indicate their transit preferences on six different questions/topics:

- **LOCAL SERVICE VERSUS REGIONAL SERVICE** – IDENTIFIED WHETHER PEOPLE PREFERRED MORE TRANSIT SERVICE WITHIN THE ROANOKE VALLEY OR CONNECTING THE ROANOKE VALLEY WITH OTHER REGIONS (SUCH AS BLACKSBURG AND LYNCHBURG).
- **SHORT WALK VERSUS FREQUENT SERVICE** – IDENTIFIED IF PEOPLE PREFERRED BUS STOPS THAT WERE CLOSER, WITHIN NEIGHBORHOODS, WITH LESS FREQUENT SERVICE OR BUS STOPS FARTHER AWAY, ALONG MAIN CORRIDORS, WITH MORE FREQUENT SERVICE.
- **WORK TRIP-FOCUSED SERVICE VERSUS ALL DAY SERVICE –** IDENTIFIED IF PEOPLE PREFERRED MORE SERVICE DURING TIMES WHEN PEOPLE ARE GOING TO OR COMING HOME FROM WORK, OR IF THEY PREFERRED SERVICE DURING THE DAY AND EARLY EVENING, TO BETTER ACCESS SHOPPING, MEDICAL, AND SOCIAL TRIPS.
- **TRANSFER CONNECTIONS VERSUS ONE-SEAT RIDE CONNECTIONS** – IDENTIFIED IF PEOPLE WOULD PREFER TO TRANSFER IF THEIR BUS RAN MORE FREQUENTLY OR A DIRECT CONNECTION TO THEIR DESTINATION, EVEN IF THEY HAD TO WAIT LONGER FOR THEIR BUS.
- **LARGER SERVICE AREA COVERAGE VERSUS HIGHER RIDERSHIP** – IDENTIFIED IF PEOPLE PREFERRED EVERYONE TO HAVE EQUAL SERVICE, EVEN AREAS WITH FEWER PEOPLE AND FEWER JOBS, OR TO FOCUS SERVICE WHERE THE MOST PEOPLE WOULD RIDE, WITH LESS OR NO SERVICE WHERE FEWER PEOPLE LIVED OR WORKED.
- **PRIORITY FOR TRANSIT OR FOR CARS** – IDENTIFIED IF PEOPLE PREFERRED PRIORITY FOR TRANSIT (AND CARS WITH TWO OR MORE PEOPLE) DURING CONGESTED TRAVEL TIMES, SO THAT THEY CAN RUN FASTER AND MORE RELIABLY, OR TO RUN TRANSIT IN MIXED TRAFFIC, MAKING RELIABLE OPERATIONS DIFFICULT, WHILE PRESERVING AS MUCH ROAD SPACE AS POSSIBLE FOR CARS.

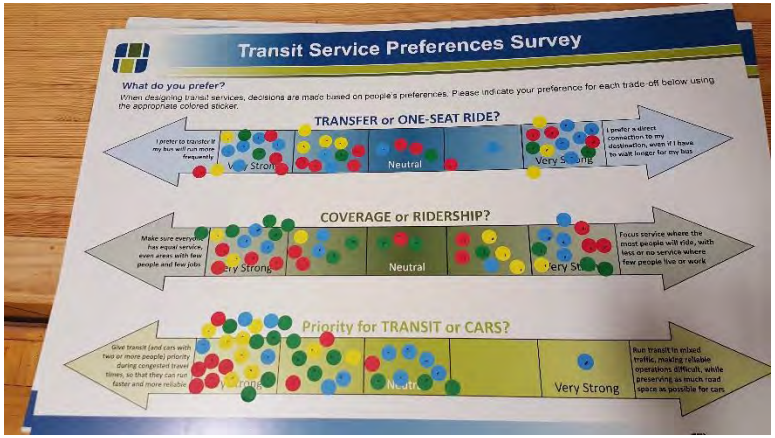
The transit preferences survey results below reflect the input received from the November 5, 2015 public meeting and the associated online engagement activities.

- IN GENERAL, THE PARTICIPANTS (INCLUDING ALL VENUES) PREFER:
  - More transit service **within the Roanoke Valley**. Approximately 62 percent of respondents *prefer or strongly prefer* more local service while 26 percent *prefer or strongly prefer* more transit service between the Roanoke Valley and other regions (12 percent are *neutral*).
  - **Work-focused service** rather than all-day service. Over half of respondents (51 percent) *prefer* or *strongly prefer* more transit service during the times people are going to or coming home from work (14 percent are neutral, 34 percent *prefer or strongly prefer* all day service).
  - **More frequent service**. Nearly 56 percent *prefer or strongly prefer* more frequent service even if

it means transferring buses (25 percent are neutral and 20 percent *prefer or strongly prefer* direct connections even if it means less frequent service).

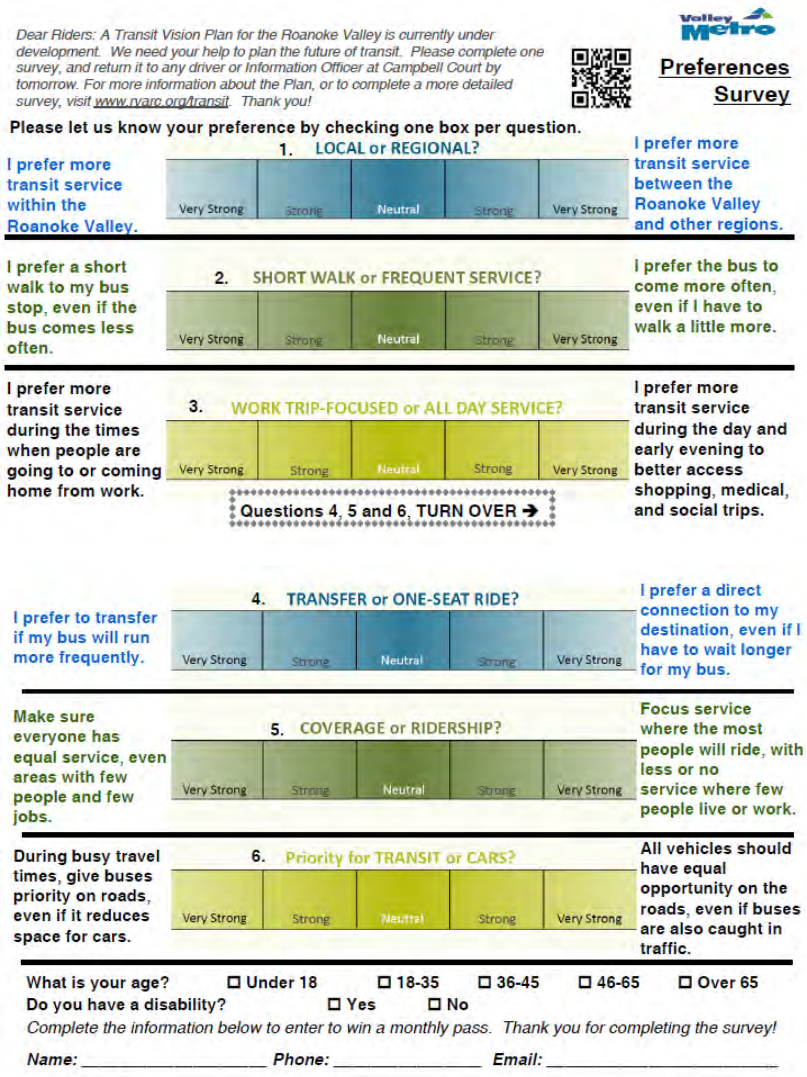
- **Maximize coverage**. Approximately 61 percent *prefer or strongly prefer* that everyone has equal service, even areas with few jobs and few people (16 percent are neutral and 23 percent *prefer or strongly prefer* to focus service where the most people will ride).
- **Priority for transit** (and cars with more than one person) over single-occupancy vehicles. Approximately one-half of respondents (51 percent) *prefer* or *strongly prefer* transit to have priority (26 percent are neutral, 23 percent *prefer or strongly prefer* that transit run in mixed traffic).
- Overall the workshop participants were relatively split on the topic of **short walk or frequent service.** 31 percent *prefer or strongly prefer* a short walk to the bus even if the bus comes less often, 31 percent are neutral (the largest group of neutral respondents on the six topics), and 34 percent *prefer or strongly prefer* more frequent service even if it means walking a little more.

Figure 2.2-1 | Public Workshop Transit Preference Activity



A similar survey was also distributed on Valley Metro buses in order to gauge rider perceptions on the same series of transit preferences. 804 people responded to the on-board transit survey; 6% of respondents were over 65, 42% were aged 46-65, 19% were 36-45, 31% were 19-35; and 3% of riders were under 18. In reporting whether the rider had a disability, 117 or 23% of respondents indicated “yes” and 401 or 77% indicated “no”.

Figure 2.2-2 | Rider Preferences Survey



Dear Riders: A Transit Vision Plan for the Roanoke Valley is currently under development. We need your help to plan the future of transit. Please complete one survey, and return it to any driver or Information Officer at Campbell Court by tomorrow. For more information about the Plan, or to complete a more detailed survey, visit www.rvarc.org/transit. Thank you!

Valley Metro

Preferences Survey

Please let us know your preference by checking one box per question.

I prefer more transit service within the Roanoke Valley.	1. LOCAL or REGIONAL?	Very Strong	Strong	Neutral	Strong	Very Strong	I prefer more transit service between the Roanoke Valley and other regions.
I prefer a short walk to my bus stop, even if the bus comes less often.	2. SHORT WALK or FREQUENT SERVICE?	Very Strong	Strong	Neutral	Strong	Very Strong	I prefer the bus to come more often, even if I have to walk a little more.
I prefer more transit service during the times when people are going to or coming home from work.	3. WORK TRIP-FOCUSED or ALL DAY SERVICE?	Very Strong	Strong	Neutral	Strong	Very Strong	I prefer more transit service during the day and early evening to better access shopping, medical, and social trips.

Questions 4, 5 and 6, TURN OVER →

I prefer to transfer if my bus will run more frequently.	4. TRANSFER or ONE-SEAT RIDE?	Very Strong	Strong	Neutral	Strong	Very Strong	I prefer a direct connection to my destination, even if I have to wait longer for my bus.
Make sure everyone has equal service, even areas with few people and few jobs.	5. COVERAGE or RIDERSHIP?	Very Strong	Strong	Neutral	Strong	Very Strong	Focus service where the most people will ride, with less or no service where few people live or work.
During busy travel times, give buses priority on roads, even if it reduces space for cars.	6. Priority for TRANSIT or CARS?	Very Strong	Strong	Neutral	Strong	Very Strong	All vehicles should have equal opportunity on the roads, even if buses are also caught in traffic.

What is your age? ☐ Under 18 ☐ 18-35 ☐ 36-45 ☐ 46-65 ☐ Over 65

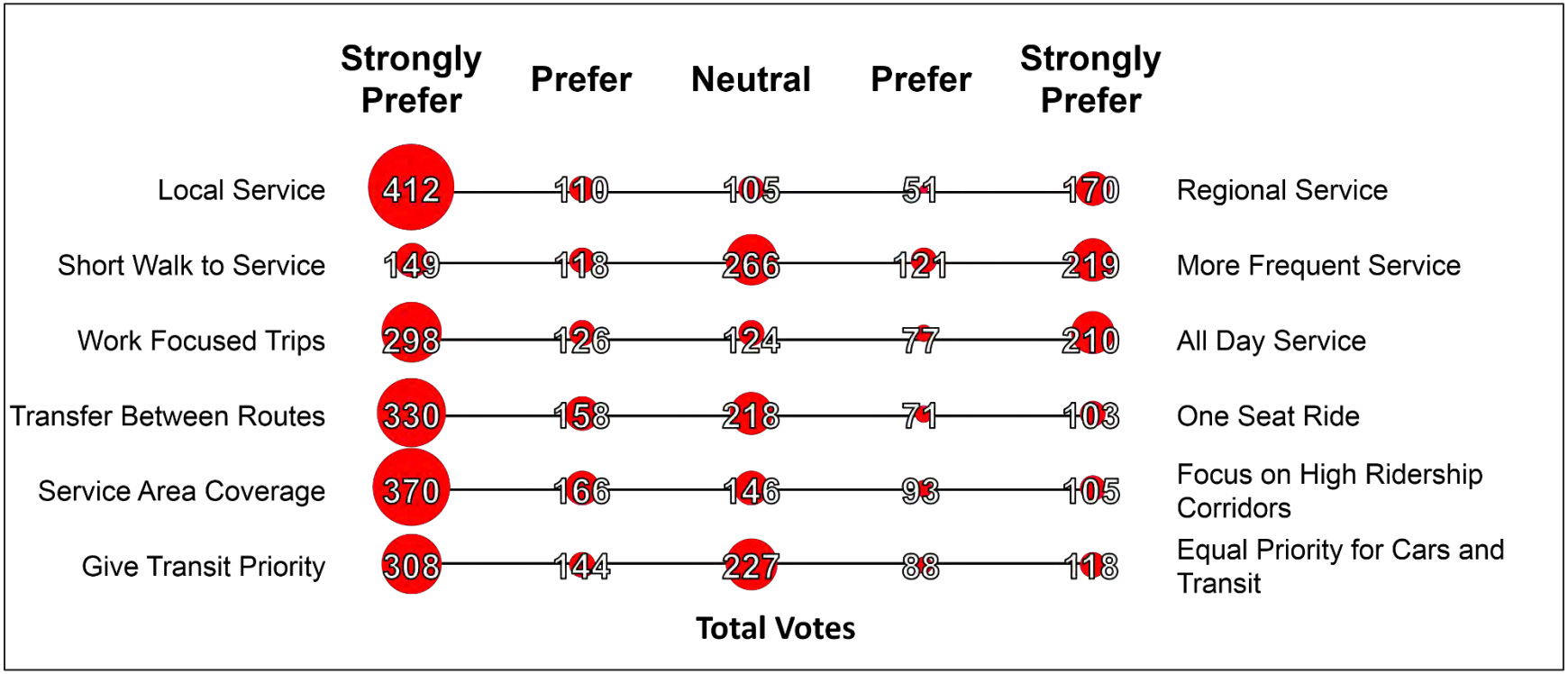
Do you have a disability? ☐ Yes ☐ No

Complete the information below to enter to win a monthly pass. Thank you for completing the survey!

Name: _____ ***Phone:*** _____ ***Email:*** _____

- 63% OF RESPONDENTS INDICATED THAT THEY STRONGLY **PREFER MORE LOCAL TRANSIT SERVICE**. 23% STRONGLY PREFERRED MORE REGIONAL TRANSIT SERVICE, AND 14% WERE NEUTRAL ON THE QUESTION.
- 31% OF RESPONDENTS INDICATED THAT THEY STRONGLY PREFER A SHORT WALK TO THE BUS IF IT COMES LESS FREQUENTLY TO 36% WHO STRONGLY **PREFER GREATER FREQUENCY IF IT REQUIRES MORE WALKING**. 32% WERE NEUTRAL ON THE QUESTION.
- 56% OF RESPONDENTS INDICATED THAT THEY STRONGLY **PREFER MORE TRANSIT SERVICE DURING TIMES WHEN PEOPLE TRAVEL TO AND FROM WORK**, TO 29% WHO STRONGLY PREFER MORE SERVICE DURING THE DAY AND EVENING HOURS FOR SHOPPING, MEDICAL AND SOCIAL TRIPS. 15% WERE NEUTRAL ON THE QUESTION.
- 59% OF RESPONDENTS INDICATED THAT THEY STRONGLY **PREFER A TRANSFER IF THE BUS RUNS MORE FREQUENTLY** TO 15% WHO STRONGLY PREFER A DIRECT CONNECTION THAT MIGHT REQUIRE A LONGER WAIT. 26% WERE NEUTRAL ON THE QUESTION.
- 65% OF RESPONDENTS INDICATED THAT THEY STRONGLY PREFER THAT EVERYONE HAS **EQUAL SERVICE**, EVEN AREAS WITH FEW PEOPLE AND JOBS, TO 16% WHO STRONGLY PREFER A FOCUSED SERVICE WHERE THE MOST PEOPLE RIDE AND WITH LESS OR NO SERVICE WHERE FEW PEOPLE LIVE OR WORK. 19% WERE NEUTRAL ON THE QUESTION.
- 49% OF RESPONDENTS INDICATED THAT THEY STRONGLY **PREFER PRIORITY GIVEN TO BUSES ON ROADS EVEN IF IT REDUCES SPACE FOR CARS**, TO 24% WHO STRONGLY PREFER THAT ALL VEHICLES SHOULD BE GIVEN EQUAL OPPORTUNITY ON THE ROADS EVEN IF BUSES ARE ALSO CAUGHT IN TRAFFIC. 27% WERE NEUTRAL.

Figure 2.2-2 | Transit Preferences Survey Results



*The dot sizes are scaled based on the number of responses. *Note: in many cases, on-board respondents selected more than one response (example: selecting "very strong" on both ends of the transit preferences spectrum). These types of responses are not included in this public outreach summary, but were factored into the overall transit analysis*

3.0 TRANSIT PROPENSITY ANALYSIS

A Transit Propensity analysis was used to identify areas throughout the Roanoke Valley that have a need and are viable for new or additional transit services. The four propensity indices developed focus on where people live, where commuters live, locations where people work and locations where people make non-work trips.

3.1 Residential Propensity

The residential propensity analysis uses 2010-2014 American Community Survey data. Variables such as number of households and people identify where high densities of population can be found to support transit. Other factors including age, vehicle ownership and disability also play into the analysis. The analysis found a propensity for transit in many of the medium density areas in Roanoke County including, Hollins and West Park (NW Roanoke County). Additionally, the communities around Vinton and Downtown Roanoke such as Old Southwest and Loudon-Melrose have a higher residential propensity for transit (**Figure 3.1-1**).

Category	Measurement	Source
Population	Total Population	2010-2014 ACS
	Population Density	
Households	Total Households	2010-2014 ACS
	Household Density	
Age	Total Seniors (>65 years old)	2010-2014 ACS
	Seniors Density	
	Seniors Percent of Population	
	Total Youth (<18 years old)	
	Youth Density	
	Youths Percent of Population	
Vehicle Ownership	Total Zero-Car Households	2010-2014 ACS
	Percent Zero-Car Households	
	Zero-Car Household Density	
	Total One-Car Households	
	Percent One-Car Households	
	One-Car Household Density	
Persons with Disabilities	Total Disabled Persons	2010-2014 ACS
	Disabled Persons Density	

3.2 Commuter Propensity

The Commuter Propensity is used to identify where persons with jobs reside. The labor force category identifies where persons eligible for work or those who are currently employed live, and the commute mode category incorporates where commuters reside.

The Commuter Propensity depicts areas outside of the current service area where there is a high concentration of residents who make trips to work, including Hollins, Beacon Hills (North Roanoke County) as well as Grandin and the Williamson Rd corridor, as shown in **Figure 3.2-1**. Outside of the existing transit service area, there is also a collection of moderately high propensity block groups centered on Cave Spring.

Category	Measurement	Source
Labor Force	Labor Force Size	2010-2014 ACS
	Labor Force Density	
	Employed Persons	
	Employed Person Density	
	Percent Employed	

Category	Measurement	Source
Commute Mode	Total Commuters	2010-2014 ACS
	Commuter Density	
	Total Transit Commuters	
	Percent Transit Commuters	
	Transit Commuter Density	

3.3 Work Propensity

The Work Propensity is used to identify areas where employment centers are located. The employment category factors in the number of employees and density of employees by location.

The Work Propensity analysis resulted in a high density of employment centers and jobs in and around the downtowns of Roanoke, Vinton and Salem, as shown in **Figure 3.3-1**. Additionally, the region has many other high propensity job centers outside the downtown areas. These are comprised of areas with hospitals, universities, malls, and large business parks including: Carilion Roanoke Memorial Hospital; Salem VA Medical Center; and Lewis-Gale Medical Center; Hollins University; Tanglewood Mall; Valley View Mall/Roanoke-Blacksburg Regional Airport; and, Bonsack. Outside the existing transit service areas there was a chain of high propensity block groups along Electric Rd connecting Tanglewood Mall, Cave Spring, and Lewis Gale, as well as the area around Cloverdale/Hollins University.

Category	Measurement	Source
Employment	Total Number of Employees	2014 Longitudinal Employer-Household Dynamics (LEHD)
	Density of Employees	

3.4 Non-Work Propensity

The Non-Work Propensity is used to identify where typical non-work transit trips are made, which commonly include retail, medical, and school trips. The retail, medical, school, and public administration categories use the number/density of employees as measurements based on the assumption more workers correlate to more general utilization at a location.

The Non-Work Propensity analysis resulted in a high propensity of activity spread out across the region (**Figure 3.4-1**). The downtowns of Roanoke, Salem and Vinton as well as the two regional malls are hubs for retail and recreational activity; as a result, these areas were found to have a high Non-Work Propensity. Similarly, the area south of Downtown Roanoke that houses Carilion Roanoke Memorial Hospital and the area to the southeast of Downtown Salem that contains both Salem VA Medical Center and Lewis-Gale Medical Center were the region's largest medical attractors. The educational jobs were fairly dispersed throughout the region because of the public school system but the Colleges and Universities, like Hollins University, Virginia Western Community College, Roanoke College, Jefferson College of Health Sciences, and the Roanoke Higher Education Center, tended to have the highest concentration of these activities. Outside the existing transit service area there was a moderately high propensity in Bonsack and Daleville for Non-

Work trips. These areas also operate as commercial and retail hubs for their communities.

Category	Measurement	Source
Retail	Number of Restaurant/Retail Jobs	2014 LEHD by NAICS Code
	Restaurant / Retail Job Density	
	Number of Recreation Jobs	
	Recreation Jobs Density	
Medical	Number of Medical Jobs	2014 LEHD by NAICS Code
	Medical Jobs Density	
School	Number of Educational Jobs	2014 LEHD by NAICS Code
	Educational Jobs Density	
Public Administration	Number of Public Administration Jobs	2014 LEHD by NAICS Code
	Public Administration Job Density	

Figure 3.1-1 | Residential Propensity Map

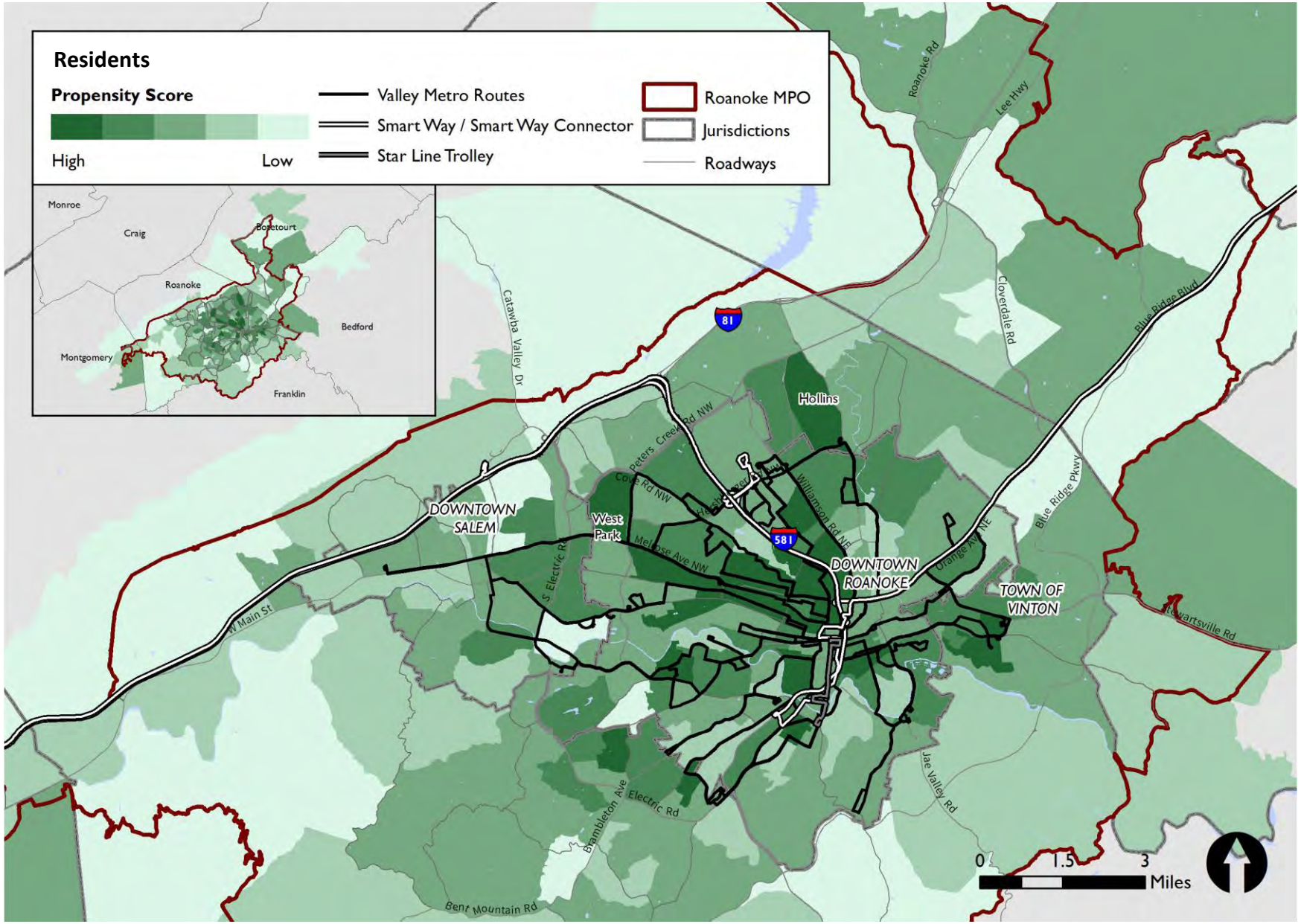


Figure 3.2-1 | Commuter Propensity Map

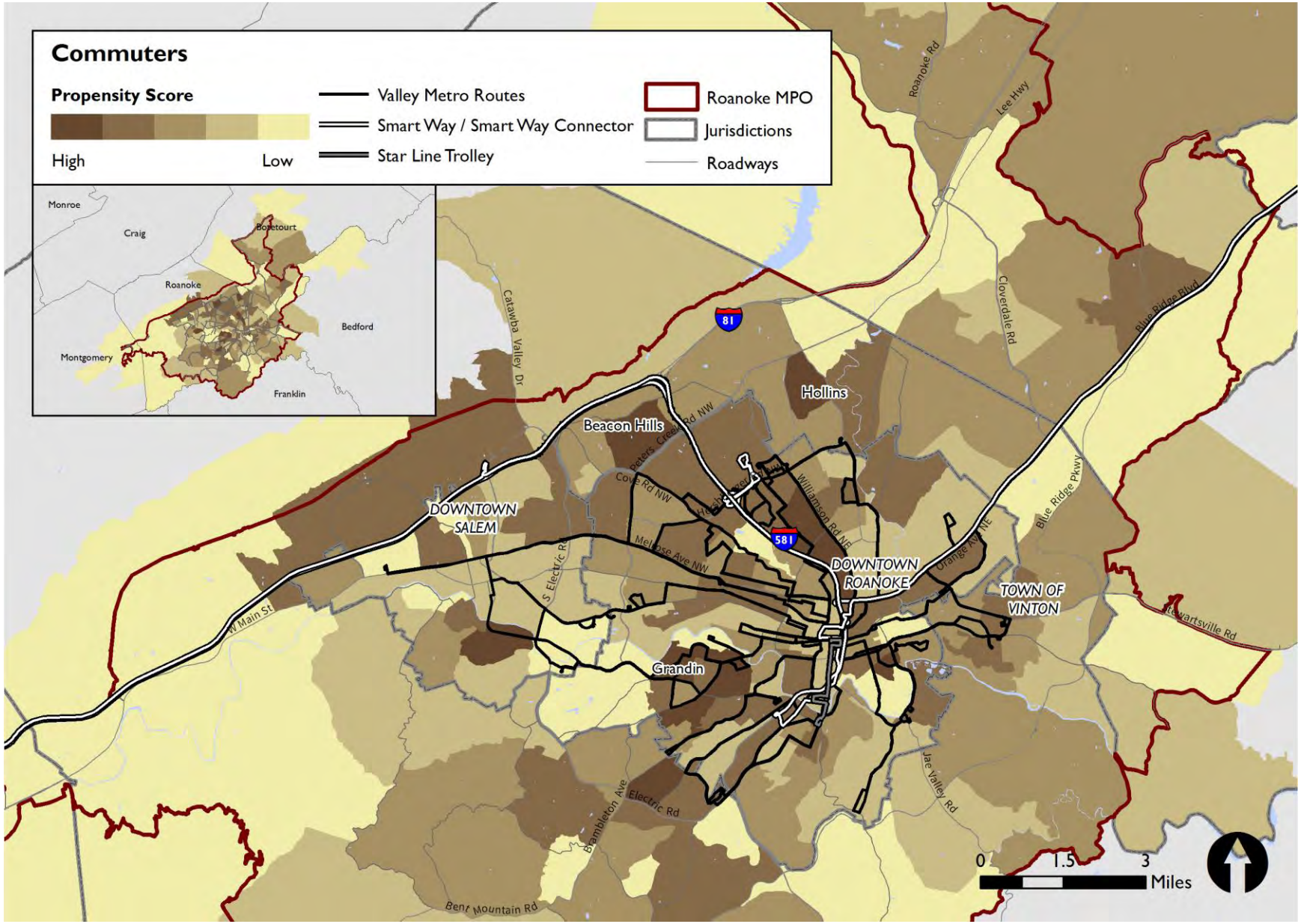


Figure 3.3-1 | Work Propensity Map

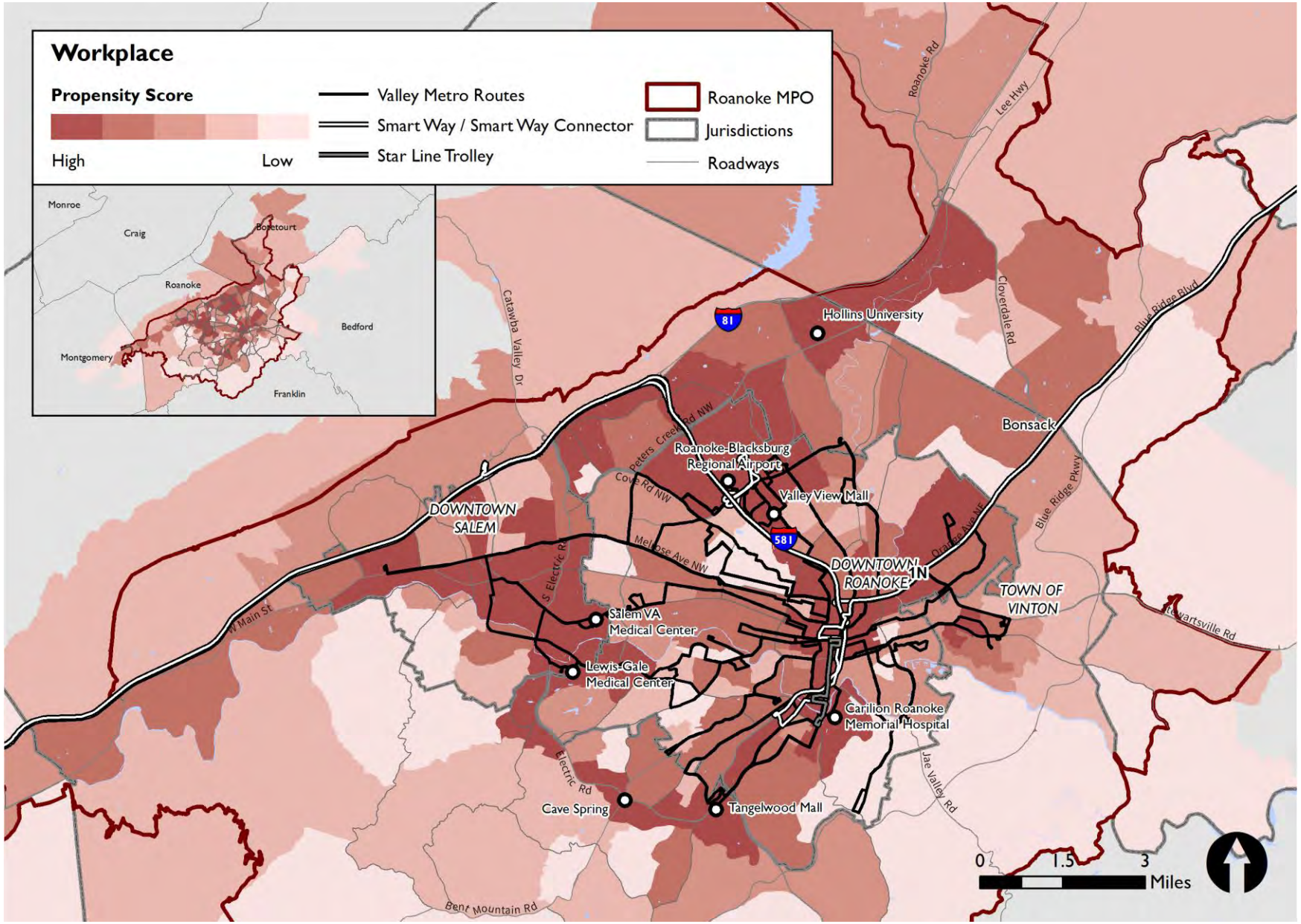
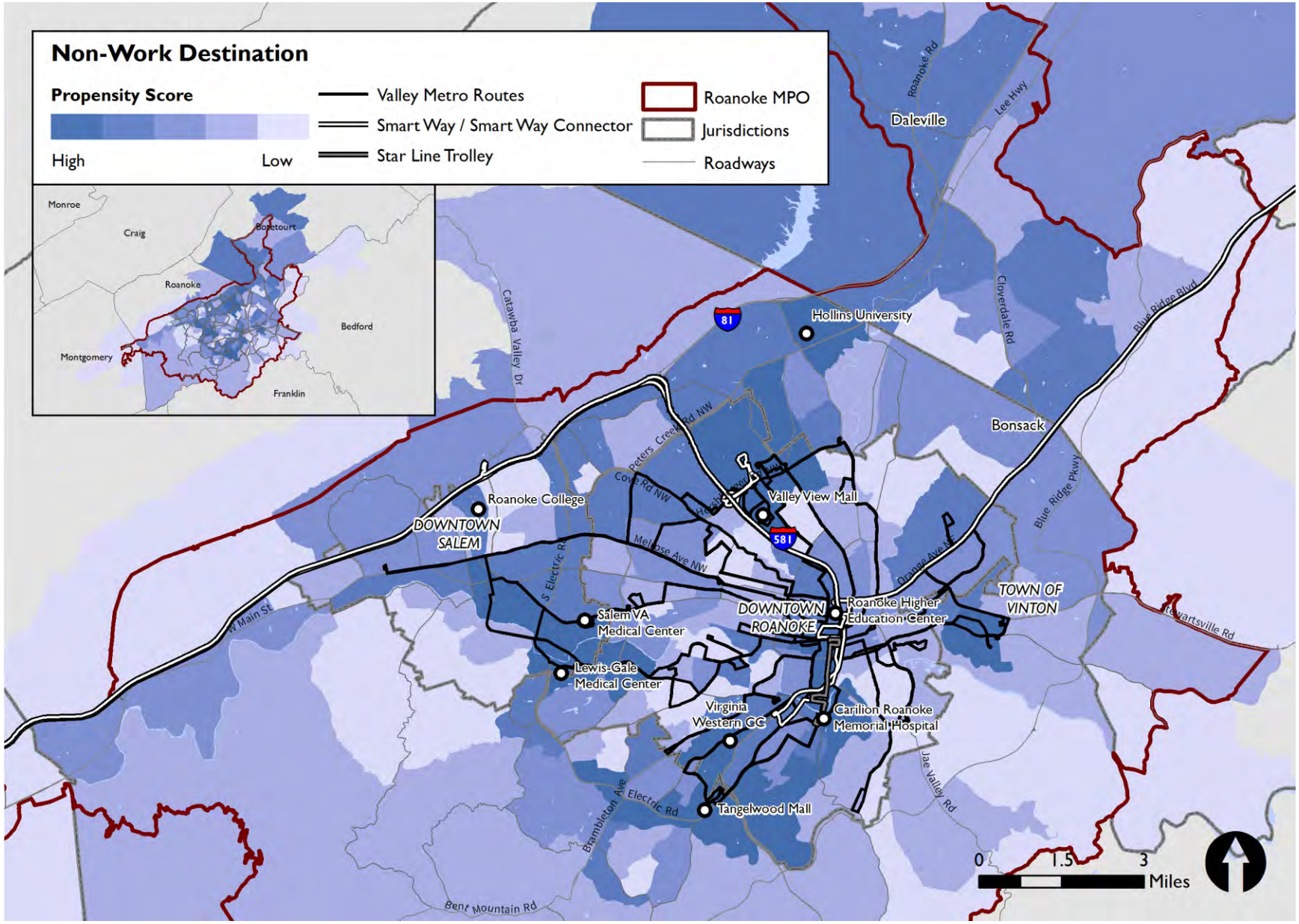


Figure 3.4-1 | Non-Work Propensity Map



4.0 REGIONAL TRAVEL DEMAND ANALYSIS

The VDOT Regional Travel Model was developed to estimate and forecast travel flows throughout the Roanoke Valley region. Within this project, it was used as a source of origin-destination data and was analyzed to understand residents travel patterns within the region.

The travel model data is broken out by different trip types which include home-based work, home-based other, home-based school, and non-home based trips. All of the trip types were combined to establish a baseline for travel throughout the day. Additionally, the home-based work trips were analyzed separately to visualize how the travel patterns differ in the peak hours.

4.1 Base Year (2005) Flows

The analysis of the base year (2005) model data found clusters of high volume flows, of all the different trip types, within three different zones on the fringe of the existing service area (**Figure 4.1-1**). The largest of these zones was centered on Valley View Mall. These flows from the mall were connecting with many of the surrounding residential communities and other large attractors such as Hollins University, Walmart, and the Crossroads/Roanoke-Blacksburg Regional Airport area. Similarly, there was another cluster of trip flows in the southern zone of the Roanoke Valley region, around Tanglewood Mall. The final zone was along U.S. 460 East (Orange Avenue/Challenger Avenue), with high volume trip connections between Downtown Roanoke, Bonsack, and Blue Ridge.

The home-based work trip flows showed high volumes of travel in many of the same clusters as the other trip types, but were primarily connecting with Downtown Roanoke. In total, there were 17 high volume home-based work trip flows between Downtown Roanoke and the surrounding areas include Vinton, Hollins, Bonsack, Garden City, Oak Grove, Cave Spring, and Valley View. Despite the radial travel pattern in the region, there were a few notable connections where high volumes of home-based work trips were made not connecting with Downtown Roanoke. These pairs were between, Valley View and Bonsack, Valley View and Grandin, and Valley View and Tanglewood.

4.2 Forecasted Year (2035) Flows

The analysis of the forecasted model year, 2035, showed a similar regional travel pattern for both home-based work and all the other trip types see **Figure 4.2-1**. The most notable changes are the growth in the number of home-based work trips between the areas along U.S. 460 East and a new cluster of home-based work trips connecting with Carilion Roanoke Memorial Hospital. Preliminary data from an ongoing update of the regional travel demand model was reviewed. Differences between the two models were not significant as to require adjustments to any of the recommendations developed as part of this plan.

Figure 4.1-1 | Travel Model Flows (2005) Map

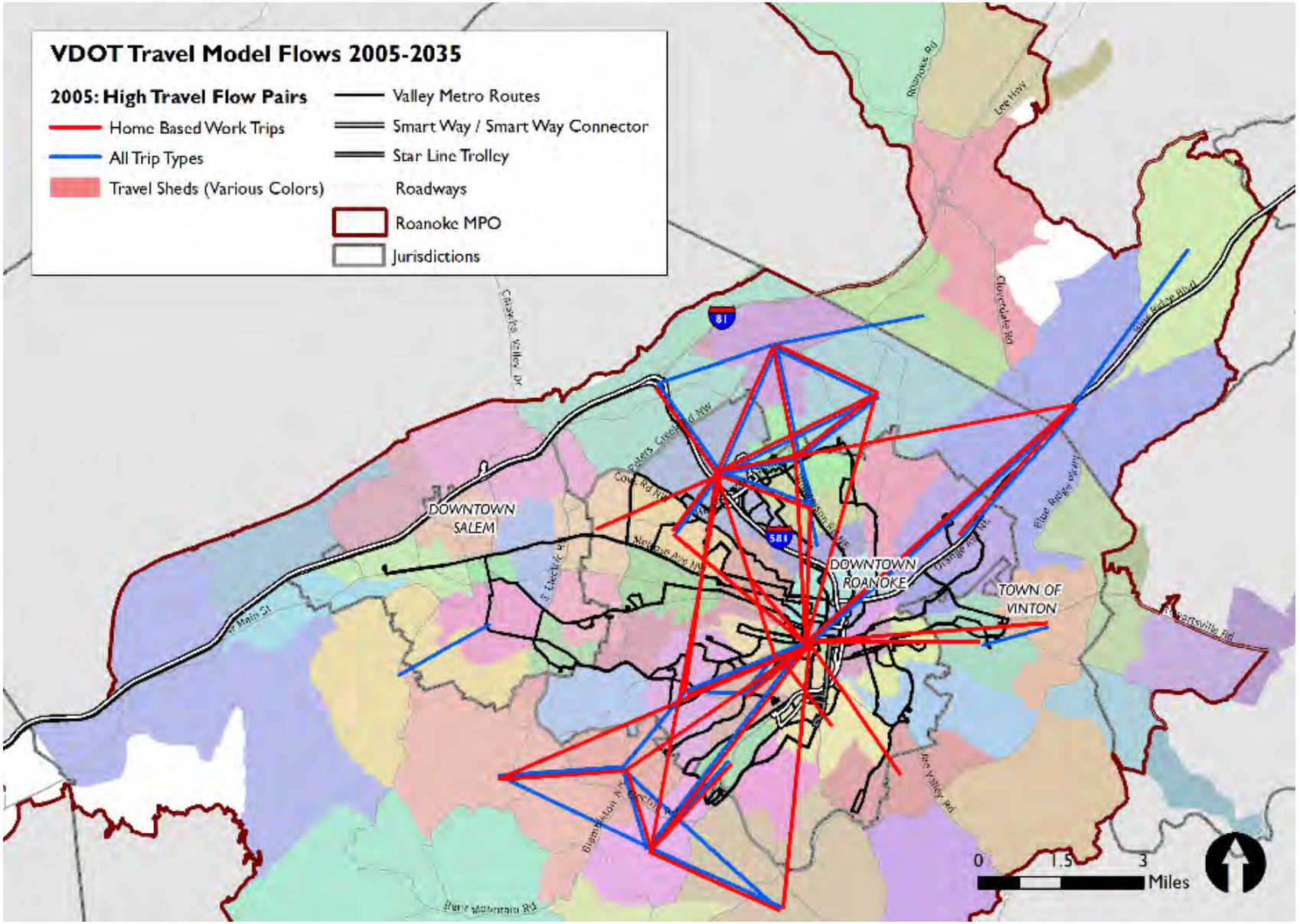
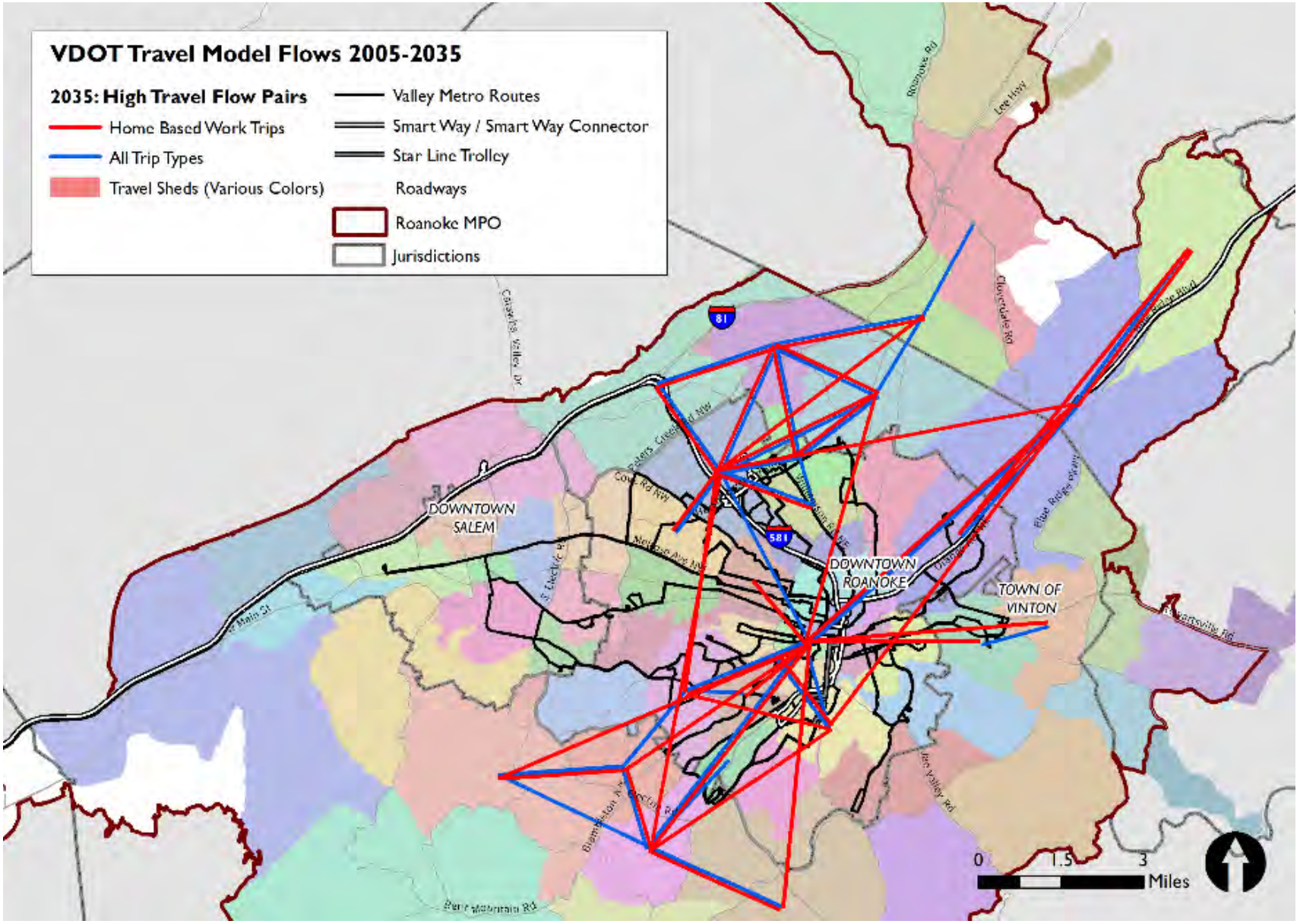


Figure 4.2-1 | Travel Model Flows (2035) Map



5.0 GAP ANALYSIS

A comparison of existing services against various transit needs analyses were reviewed and identified gaps throughout the system.

5.1 Service Area Gaps

The transit propensities were combined to illustrate where there are service gaps or areas where there is no transit where it is needed.

The Commuter and Work propensities were merged to create a Peak Hour Service Propensity (**Figure 5.1-1**), this propensity identifies the major areas where people are either beginning their typical work trip or ending it. The Peak Hour Service Propensity is generally focused on typical work travel hours, 6:15 AM – 9:15 AM and 3:15 PM – 7:15 PM.

The analysis of the Peak Hour Service Propensity found numerous areas outside the existing transit system that have a high peak hour propensity score without any peak hour service, including the Hollins area, Hollins University, Daleville, the Electric Rd corridor, and the communities north of the Roanoke–Blacksburg Regional Airport. The analysis also found areas that were underserved by existing transit, receiving less than 30 minute frequency in the peak hour. The underserved areas include Salem, Downtown Vinton, and the Roanoke Centre for Industry and Technology.

The Residential and Non-Work propensities were combined to make an All Day Service Propensity (**Figure 5.1-2**). This propensity is focused on identifying areas that need transit throughout the day.

The analysis of the All Day Service identified service gaps in the transit system within the Hollins area, Hollins University, Clearbrook, and Cave Spring.

5.2 Frequent Service Corridor Analysis

Using all four propensity analyses, a Frequent Service Corridor Propensity was created that identified the corridors that already have strong transit-supportive land use characteristics. Upon adoption of appropriate land use policies, as described in **Part 6: Implementation Strategies**, these corridors could foster greater transit-supportive land uses. This analysis identified the following frequent service corridors (**Figure 5.2-1**):

- DOWNTOWN ROANOKE – DOWNTOWN SALEM
- DOWNTOWN ROANOKE – DOWNTOWN VINTON
- DOWNTOWN ROANOKE – HOLLINS
- DOWNTOWN ROANOKE – SOUTH ROANOKE COUNTY – TANGLEWOOD

While this analysis primarily considered existing land uses and development patterns, there are other less developed corridors in future growth areas. Local governments have the opportunity to shape how these places are developed over time. Such places that could be further developed with a strong emphasis on transit-oriented development include:

- DOWNTOWN SALEM – GLENVAR/RICHFIELD
- GREENFIELD/DALEVILLE-EXIT 150-BONSACK
- HOLLINS-TROUTVILLE
- THE ROUTE 220 BUSINESS/419 CORRIDOR FROM CARILION TO I-81

5.3 Service Connection Gaps

Missing connections in the existing transit service were identified by comparing the high volume travel flows from VDOT Regional Travel Model data to the existing transit network.

As shown in **Figure 5.3-1**, the majority of the connection gaps are outside of the existing service area and include Daleville, Hollins University, and the DMV to Valley View/Airport area. Additionally, there is a service gap between Oak Grove, Cave Spring, Tanglewood Mall and Clearbrook at the end of Routes 55/56 and 61/62.

Within the transit service area there are connection gaps between Valley View and Bonsack, Valley View and Grandin, and Valley View and Tanglewood.

5.4 Public Feedback Gaps

The 2015/2016 Vision Plan Public Outreach analysis highlighted the connections important to the community and identified some of the potential gaps in the system (**Figure 5.4-1**).

Many communities, like Bonsack, Daleville, and the Starkey Rd. area, have no transit options but expressed a desire to commute to larger activity centers. The public also expressed a need for all day service to the VA Medical Center/Lewis Gale Medical Center area from the north and south, along Peters Creek and Electric Roads, respectively. Current service to the Medical Centers is provided through east and west connections. Finally, students at Hollins University expressed the need for all day service, particularly to Downtown Roanoke and evening service to Valley View Mall.

5.5 System Structure (Pulse or Non-Pulse)

Presently, the Valley Metro local bus system operates on a pulse system where all of the routes, except the Star Line Trolley, start service around the region, are timed to meet in Downtown Roanoke at the Campbell Court Transfer Center, and then travel radially back out into the region.

This System Structure analysis examined whether the current pulse system makes more sense than a direct (non-pulse) network which would not force a transfer at Campbell Court. To begin this analysis, the pros and cons of each type of system were considered as shown in the following table.

Table 5.5-1 | Pulse System versus Direct (Non-Pulse) Network

	Pros	Cons
Pulse System	• Allows for more coverage through the region • Less transfer time between routes • More access across the system • Singe central hub results in less infrastructure • Relatively lower costs to cover more area	• Large number of trips are forced to transfer • Less attractive to the average rider • Individual route distances are limited by the need to meet scheduled transfer times
Direct Network	• Direct connections between destinations people want to go • More convenient for riders with beginning and end of trip on the line • More attractive to prospective riders	• Higher costs due to increase in routes and service frequencies needed to sustain the network • Longer direct routes may provide less coverage overall and as a result less accessibility

The potential for going away from a pulse system was evaluated using the travel flows from the VDOT Regional Travel Model. The volume of travel between the service areas of each route was calculated to understand how people moved across the system. The analysis found that over 50 percent of trips go to or through Downtown Roanoke and over 40 percent of individual trips are internal to the route they start on.

Upon further analysis, the region's current Valley Metro service can be compared to the three geographic travel zones first mentioned in **Part 2: Background and Existing Conditions**. The routes within a zone all have a moderately high volume of travel within the group, but had limited interaction with the routes that fell outside their zone, see **Table 5.5-2**. The individual routes fall into the following zones:

- **NORTH-WEST**: 11/12, 15/16, 21/22, 25/26, 75/76, 81/82, 85/86
- **NORTH-EAST:** 31/32, 35/36, 41/42
- **SOUTH:** 51/52, 55/56, 61/62, 65/66, 71/72

This travel pattern is largely due to natural and built features that divide the Roanoke Valley, see **Figure 5.5-1**. The barriers identified have limited locations where they can be crossed. Both the Roanoke River and the railroad tracks pass through Downtown Roanoke; breaking the street grid and dividing the region into the north and south. To the northeast of Downtown, the Read Mountain Preserve further subdivides the northern region.

For many Valley Metro routes these barriers force them to travel through the Downtown of Roanoke, even if they were designed to provide a direct connection to another zone.

Therefore based on the nature of the barriers and the flow patterns of travel throughout the region, it was concluded that for the foreseeable future a centralized hub in Downtown Roanoke continues to be the most appropriate approach for the transit system in the Roanoke Valley.

Table 5.5-2 | Valley Metro Route Travel Patterns

Origin Route \ Destination Route	11/12	15/16	21/22	25/26	31/32	35/36	41/42	51/52	55/56	61/62	65/66	71/72	75/76	81/82	85/86	Downtown	# Through Downtown	# Internal
11/12	11,947	9,634	10,645	9,895	4,107	4,777	4,808	5,150	5,427	3,953	5,161	4,904	5,499	6,278	9,858	4,384	42,671	11,957
15/16	9,634	17,862	10,300	9,867	3,078	3,516	3,478	3,708	3,948	2,828	3,635	3,405	3,778	4,542	7,574	3,170	30,765	17,862
21/22	10,645	10,300	22,997	13,170	4,137	4,748	4,668	4,841	5,011	3,513	4,217	3,816	4,021	4,615	7,519	4,099	39,049	22,997
25/26	9,895	9,867	13,170	28,108	4,379	4,884	4,654	4,817	4,906	3,380	3,980	3,605	3,736	4,183	6,899	4,362	38,966	28,108
31/32	4,107	3,078	4,137	4,379	9,926	7,486	5,213	4,325	4,248	2,826	2,968	2,580	2,276	2,054	3,515	3,356	43,849	9,926
35/36	4,777	3,516	4,748	4,884	7,486	13,981	6,434	5,591	5,541	3,728	3,811	3,287	2,793	2,365	4,098	3,989	53,127	13,981
41/42	4,808	3,478	4,668	4,654	5,213	6,434	14,480	7,413	7,148	4,436	4,391	3,804	2,996	2,440	4,195	4,091	43,960	14,480
51/52	5,150	3,708	4,841	4,817	4,325	5,591	7,413	26,392	14,050	6,635	6,157	5,387	3,658	2,938	4,683	4,065	43,775	26,392
55/56	5,427	3,948	5,011	4,906	4,248	5,541	7,148	14,050	31,136	8,320	7,536	6,659	4,257	3,300	4,981	4,599	46,216	31,136
61/62	3,953	2,828	3,513	3,380	2,826	3,728	4,436	6,635	8,320	12,018	5,963	5,442	3,383	2,572	3,716	3,382	31,429	12,018
65/66	5,161	3,635	4,217	3,980	2,968	3,811	4,391	6,157	7,536	5,963	14,375	7,531	4,915	3,887	5,229	4,070	32,234	14,374
71/72	4,904	3,405	3,816	3,605	2,580	3,287	3,804	5,387	6,659	5,442	7,531	18,086	5,284	4,320	5,440	3,657	29,057	18,086
75/76	5,499	3,778	4,021	3,736	2,276	2,793	2,996	3,658	4,257	3,383	4,915	5,284	10,566	5,192	6,394	3,086	22,448	10,567
81/82	6,278	4,542	4,615	4,183	2,054	2,365	2,440	2,938	3,300	2,572	3,887	4,320	5,192	12,395	7,303	2,825	15,921	12,395
85/86	9,858	7,574	7,519	6,899	3,515	4,098	4,195	4,683	4,981	3,716	5,229	5,440	6,394	7,303	18,577	4,184	25,657	18,576

Low Volume of Trips — **Medium Volume of Trips** — **High Volume of Trips**

Route pair that requires travel through Downtown Roanoke.

Figure 5.1-1 | Peak Hour Service Gap Map

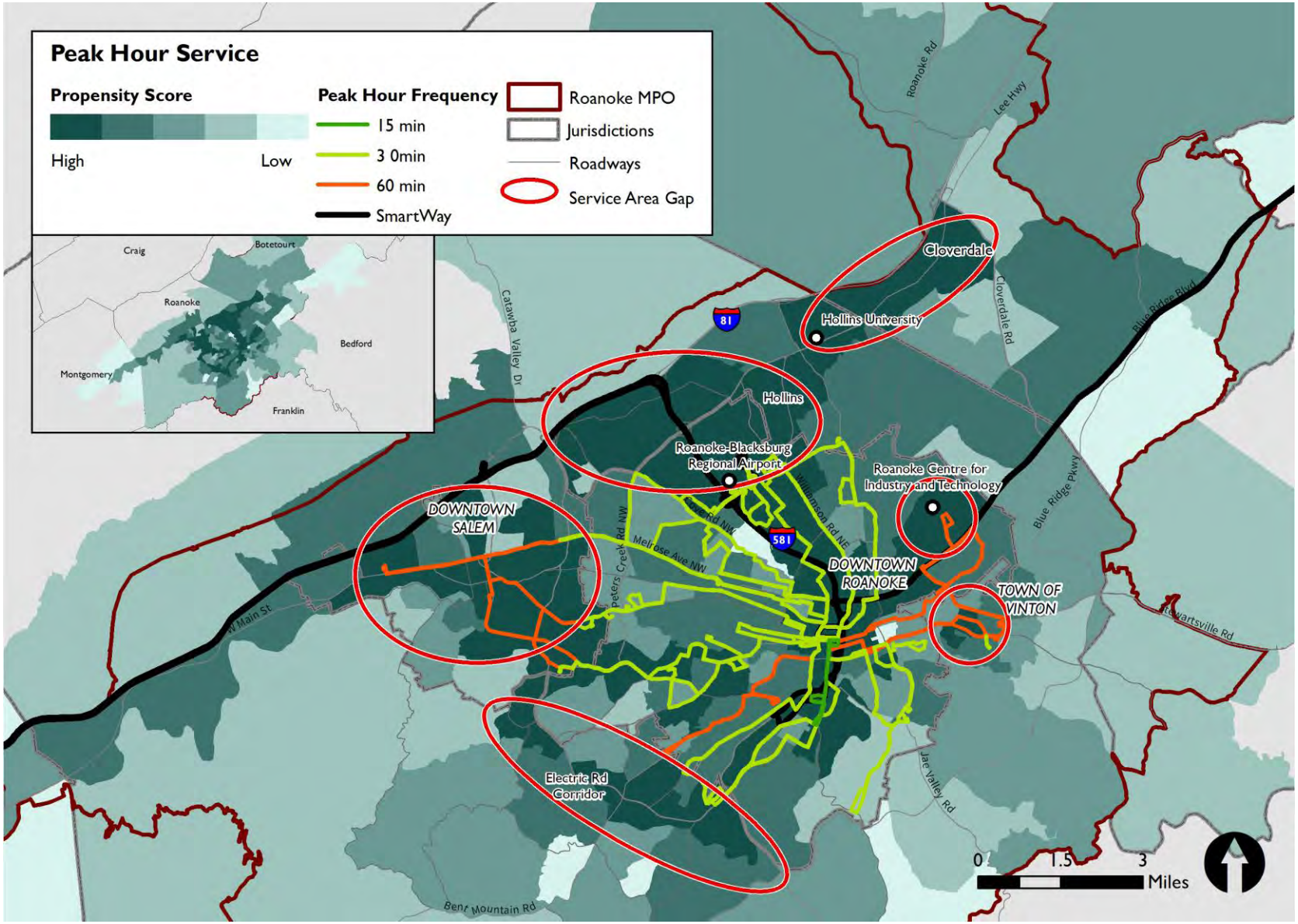


Figure 5.1-2 | All Day Service Gap Map

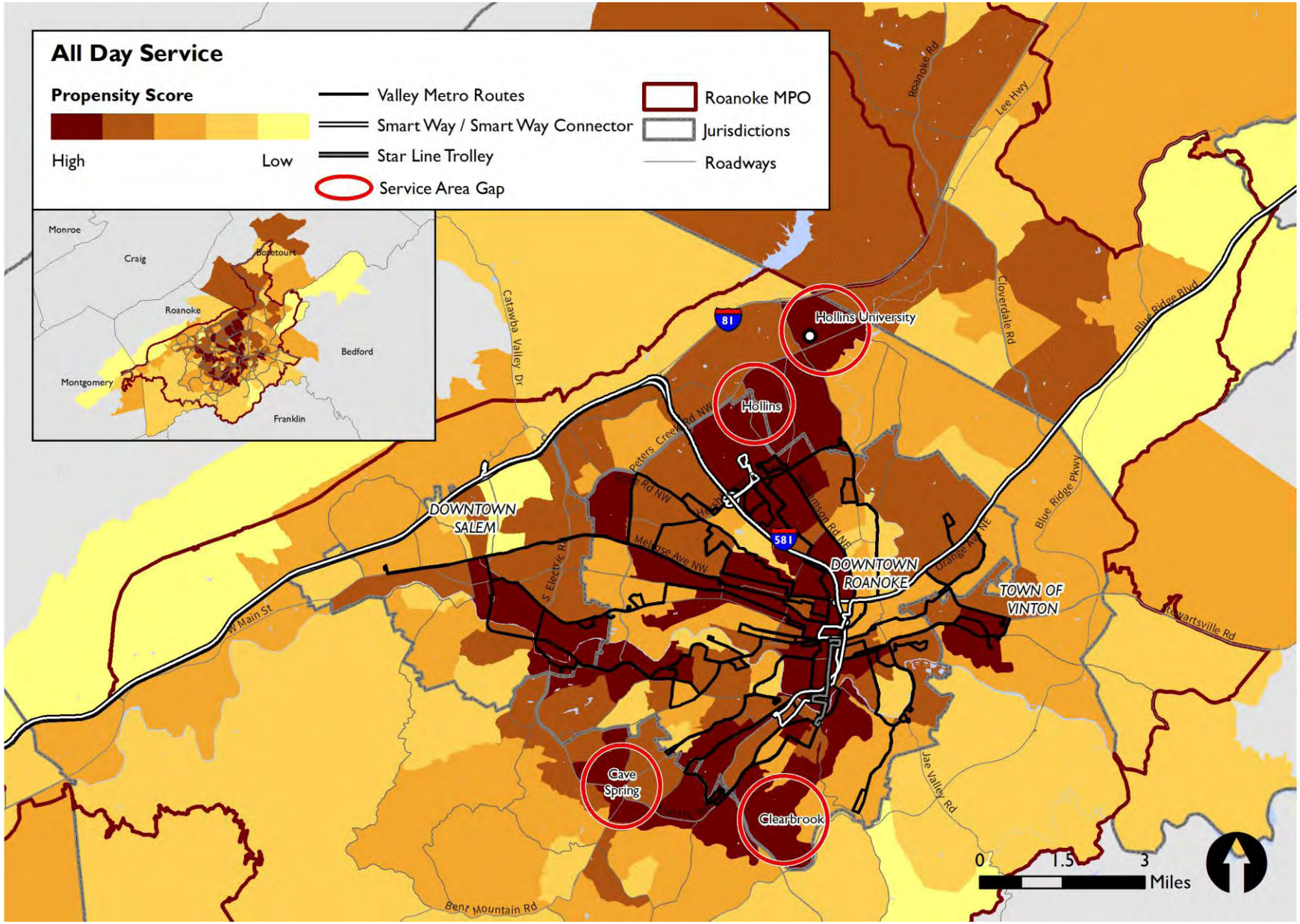


Figure 5.2-1 | Frequent Corridor Map

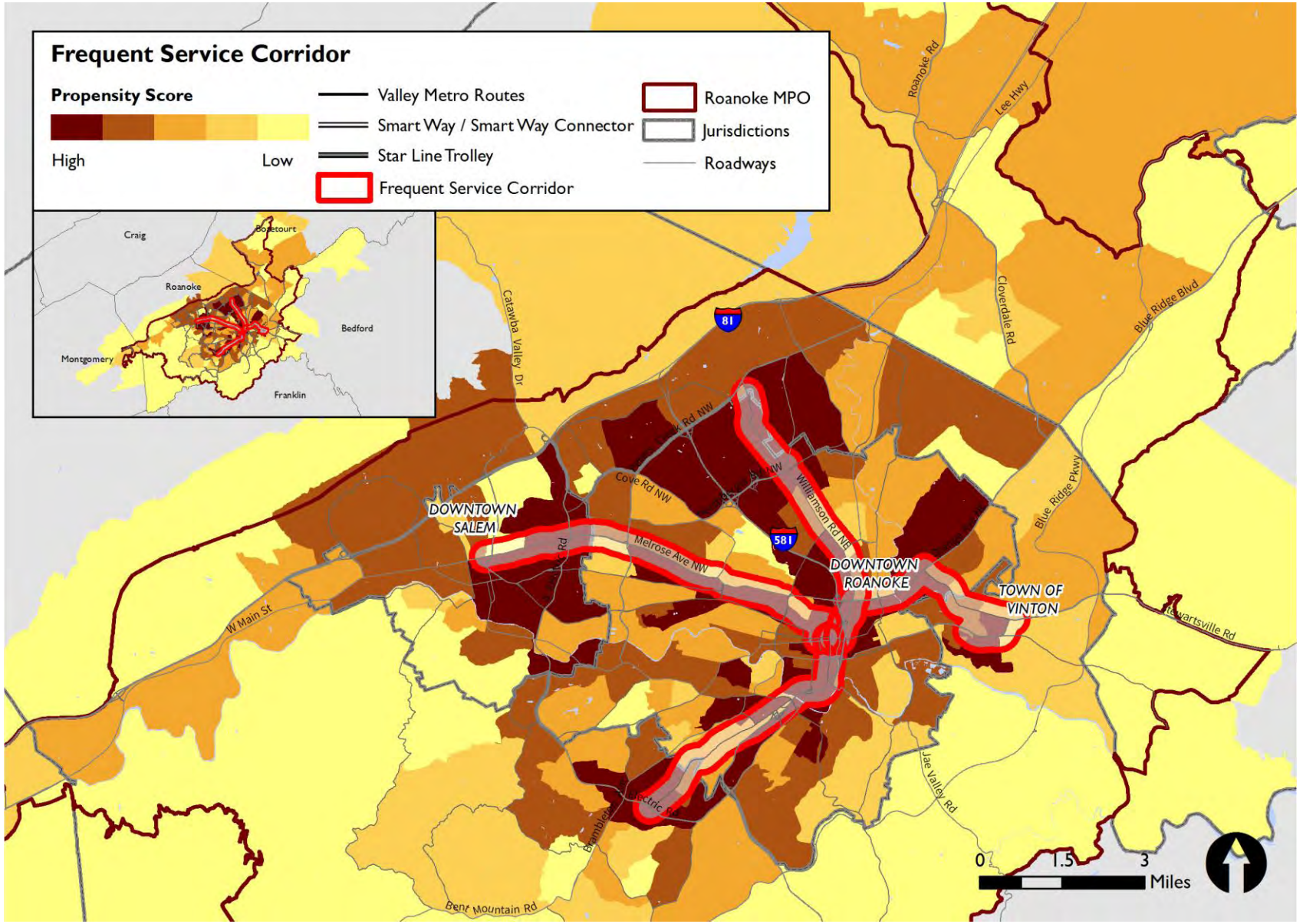


Figure 5.3-1 | Service Connection Gap Map

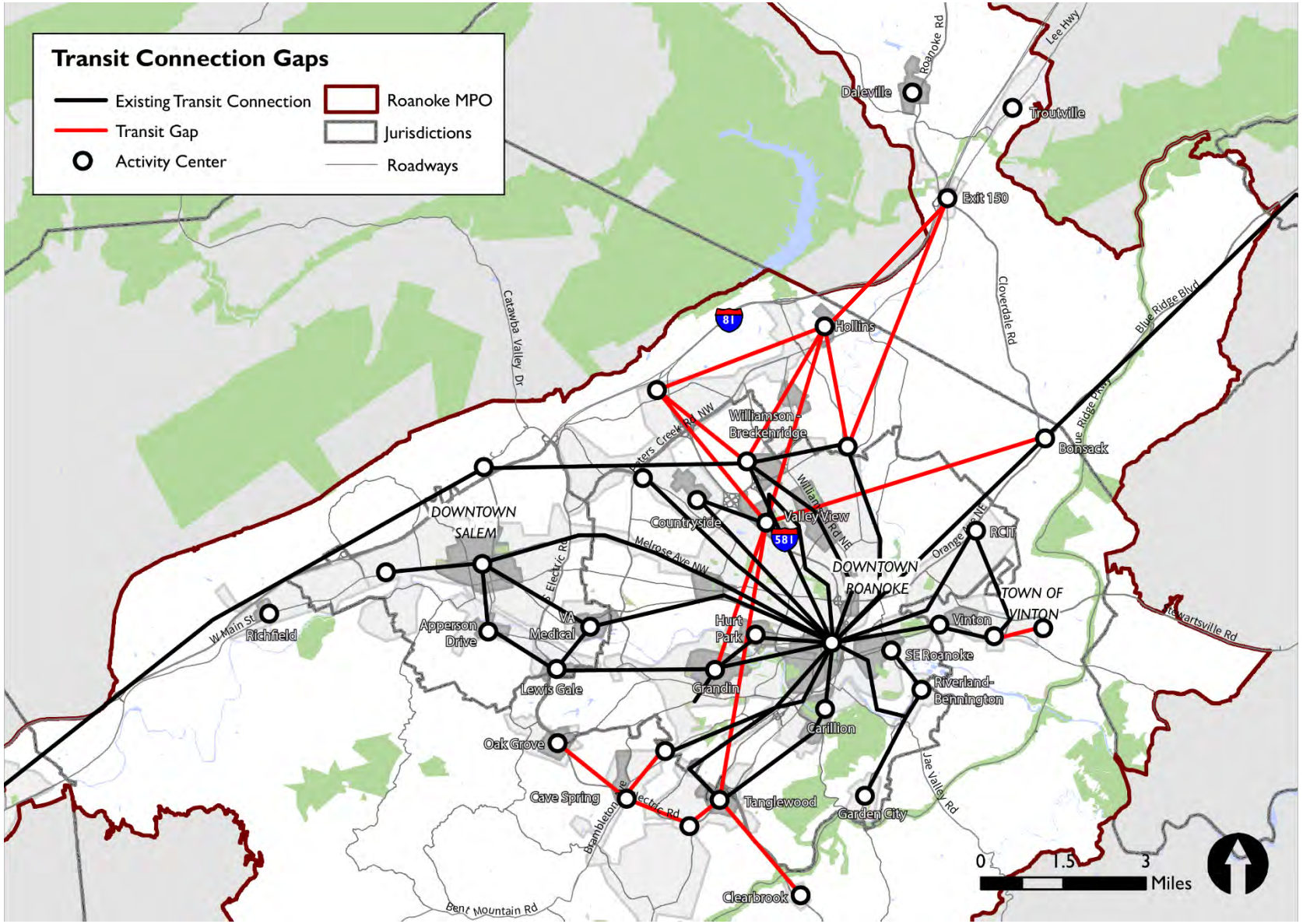


Figure 5.4-1 | Public Feedback Gap Map

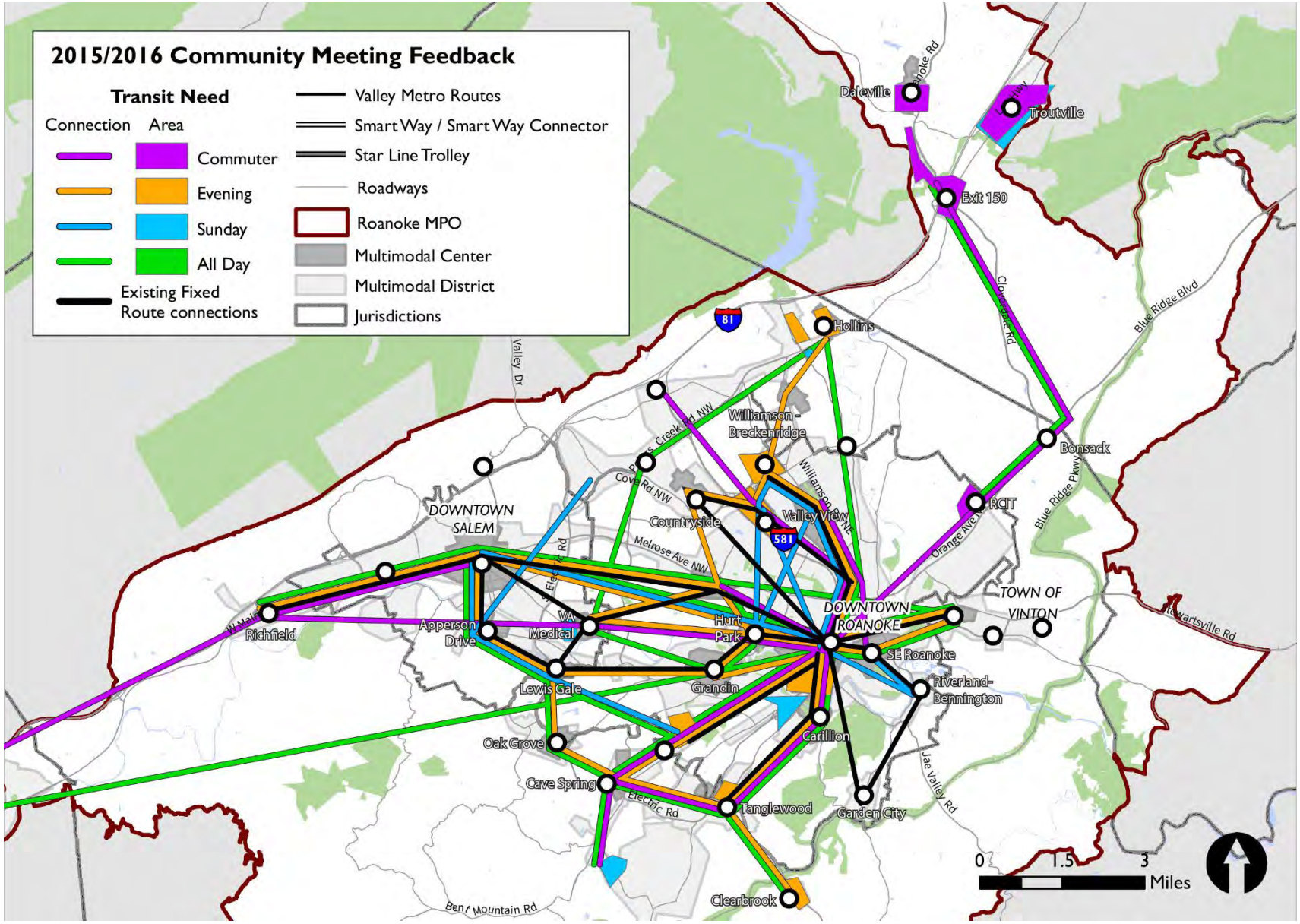


Figure 5.5-1 | Barriers to Travel Map