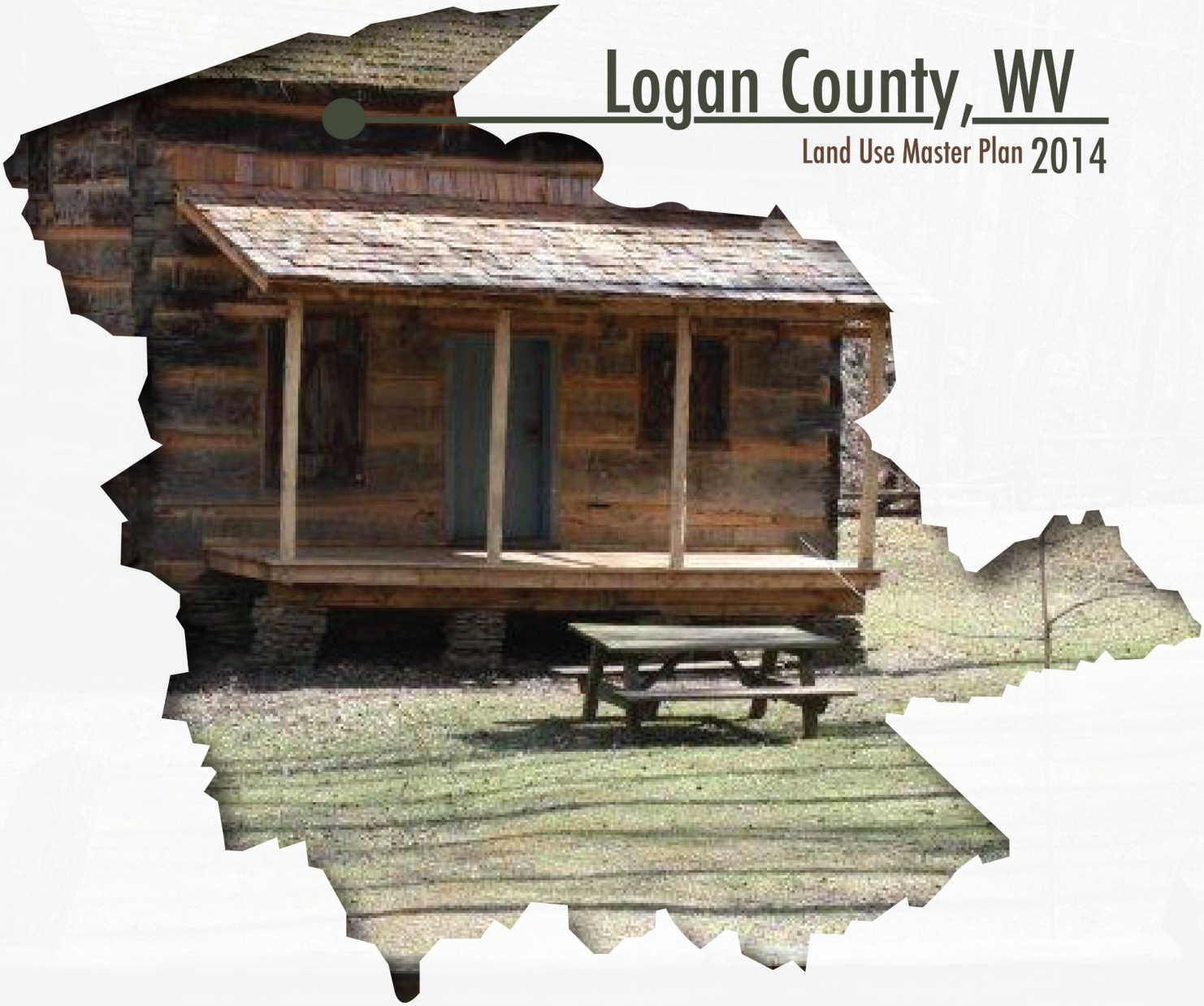
Logan County, WV

Land Use Master Plan 2014



OCCD

Office of Coalfield Community Development
WV Division of Energy

Photo: Chief Logan State Park. - Dorsey Jeffrey

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Executive Summary

This Land Use Master Plan (LUMP) conveys information on Logan County's current demographic and geographic status. This plan will be used to evaluate the potential of post-mine sites for development, and evaluate Logan County's investment position.

Senate Bill (SB) 603 mandates the development of a LUMP by counties with surface mining operations. The LUMP will be an effective tool towards achieving Logan County's development goals. The Nick J. Rahall Appalachian Transportation Institute (RTI) will coordinate with the Office of Coalfield Community Development to provide this essential information. Four major post-mine developments in Logan County include the Logan County Airport, Southwest Regional Jail, Chief Logan Recreational Center, and the Hatfield-McCoy Trails. This plan will help Logan take advantage of its other post-mine sites in just as varied a manner.

Logan County has slowly lost population since 1980. The County's median age and age distribution are average for the state, and indicate a population capable of productivity in the labor force. The population is also projected to decrease past 2030.

Employment consists mainly of Government; Trade, Transportation, and Utilities; Education and Health Services; and Natural Resources and Mining. Natural Resources and Mining is the largest wage contributor. The others follow based on the size of the sector in the County. Even as Logan County total wages have been on the rise, the labor force is at the lowest end of the state spectrum. Of particular note is the amount of income, as opposed to wages, derived from government transfers. Thirty-seven percent of Logan County income is from government transfers. Logan County is not alone in this situation, as West Virginia finds many of its counties deriving almost a third of their incomes from government transfers.

Logan County's total enrollment has risen by almost 400 students since 2002. Logan County's dropout rate is above average for the state. Just under a quarter of Logan County residents 25 and over do not have a high school diploma.

Utility prices are varied throughout the County, and this plan provides municipal and private rates for electricity, sewer, and water. Broadband, an increasingly important utility in the age of globalization, is highlighted to show the necessity for improvement and access, and showcase the developable properties of this utility.

Transportation is an important issue in any development strategy. Logan County's main access route is US route 119. Its rail system, because of Logan's status as a coal generating County, is extensive. The County also has a small airport, the Logan County Airport, which was built on post-mine land.

Logan County also has three historic sites in the National Register and several pieces of historic architecture designated by the state. Historic preservation can be a basis for

tourism, cultural identity, and community cohesion.

This plan also reviews energy and environmental issues in Logan County. The environment of the County should be considered in an overall development strategy. Logan County has a state park and several wildlife management areas. Though natural gas has become very popular in the County, other sources of energy appear to be unrecoverable.

This information is as critical as the site information for several reasons. One is that development is not a process that can occur in a vacuum. Without understanding the resources available in the County, and the demand for more investment, money will end up wasted. Another is that investment requires active partners who will need information on each of the County's essential demographic topics to determine their level of risk. Without this, investors will not be persuaded to enter the County. Finally, this information can help policy makers target their land use strategies to any of these topics, as long as they understand the situation.

Site analysis is integral to this report. Researchers identified all the post mine sites given certain criteria for Logan County. The researchers created a distance analysis using a scoring system based on distance to certain essential utilities and features, summed the scores, and plotted each score for each mine site. A workforce analysis was conducted to determine available labor within certain radii for each site, and a retail analysis was conducted to determine which areas had the most retail activity.

The top five mine sites were then identified, and are displayed individually. Map A contains the sites available in a view of the County.

The tables below are comprehensive comparisons of the five post-mine sites. In Tables A and B, distances and total scores are compared between sites, providing an idea of the more suitable sites under a considered criterion. For example, if we want to look for a site which is located closest to power lines, the answer is site ranking #3, permit ID S502586. However, if we wanted the site closer to broadband, the best site is site ranking #1, permit ID S011275.

Table C explains how each criterion contributes to the final total score and importance of the weights. Because of the assumption that one criterion may be more important than others (different weights), the site with higher absolute and relative scores is still able to receive a smaller total score than others. Though site ranking #5, permit ID S003782, is the closest to water lines, it is outweighed in distance to several other criteria including sewer and power lines, and broadband.

Table A: Distances comparison between top five sites for potential development

Suitability Ranking	1	2	3	4	5	Weight
Existing Highway	6.03	3.34	0.67	0.91	1.05	8
Proposed Highway	8.79	10.79	11.50	9.17	9.32	9
Intermodal Terminal Facilities	14.62	11.93	8.95	8.79	8.93	6
Interstate	53.53	50.85	50.43	47.70	47.85	8
National Waterway Network Ports	62.51	59.83	59.40	56.69	56.83	5
Sewer Treatment Facilities	6.27	6.23	1.20	3.84	3.98	7
Solid Waste Treatment Facilities	6.83	4.69	2.71	9.58	9.72	8
Tri-state Airport	65.88	65.72	65.29	62.58	62.72	3
Yeager Airport	60.82	58.14	57.73	54.99	55.13	3
Broadband	0.04	0.64	0.05	1.41	1.78	9
Gas Pipes	0.08	0.68	4.95	1.53	0.95	6
National Waterway Network	8.06	8.68	12.71	11.61	11.41	4
Power Lines	0.32	0.43	0.23	1.48	1.59	10
Oil Pipes	0.12	0.13	3.61	0.05	0.20	6
Railroad	0.93	0.58	0.75	0.45	0.74	5
Sewer Lines	0.55	0.92	4.99	3.13	3.12	8
Water Lines	0.45	0.76	0.77	0.15	0.11	10

Table B: Total score comparison between top five sites for potential development

Suitability Ranking	1	2	3	4	5	Weight
Existing Highway	14	60	80	80	80	8
Proposed Highway	63	45	45	63	63	9
Intermodal Terminal Facilities	21	31.5	60	60	60	6
Interstate	2	2	2	4	4	8
National Waterway Network Ports	18.75	18.75	18.75	25	25	5
Sewer Treatment Facilities	17.5	17.5	70	24.5	24.5	7
Solid Waste Treatment Facilities	56	80	80	42	42	8
Tri-state Airport	11.25	11.25	11.25	15	15	3
Yeager Airport	3.75	7.5	7.5	11.25	11.25	3
Broadband	90	47.25	90	15.75	15.75	9
Gas Pipes	60	42	1.5	22.5	31.5	6
National Waterway Network	12	12	3	4	4	4
Power Lines	100	100	100	35	25	10
Oil Pipes	60	60	1.5	60	60	6
Railroad	37.5	50	50	50	50	5
Sewer Lines	80	80	18	40	40	8
Water Lines	70	30	30	100	100	10
Total Weighted Score	716.75	694.75	668.5	652	651	

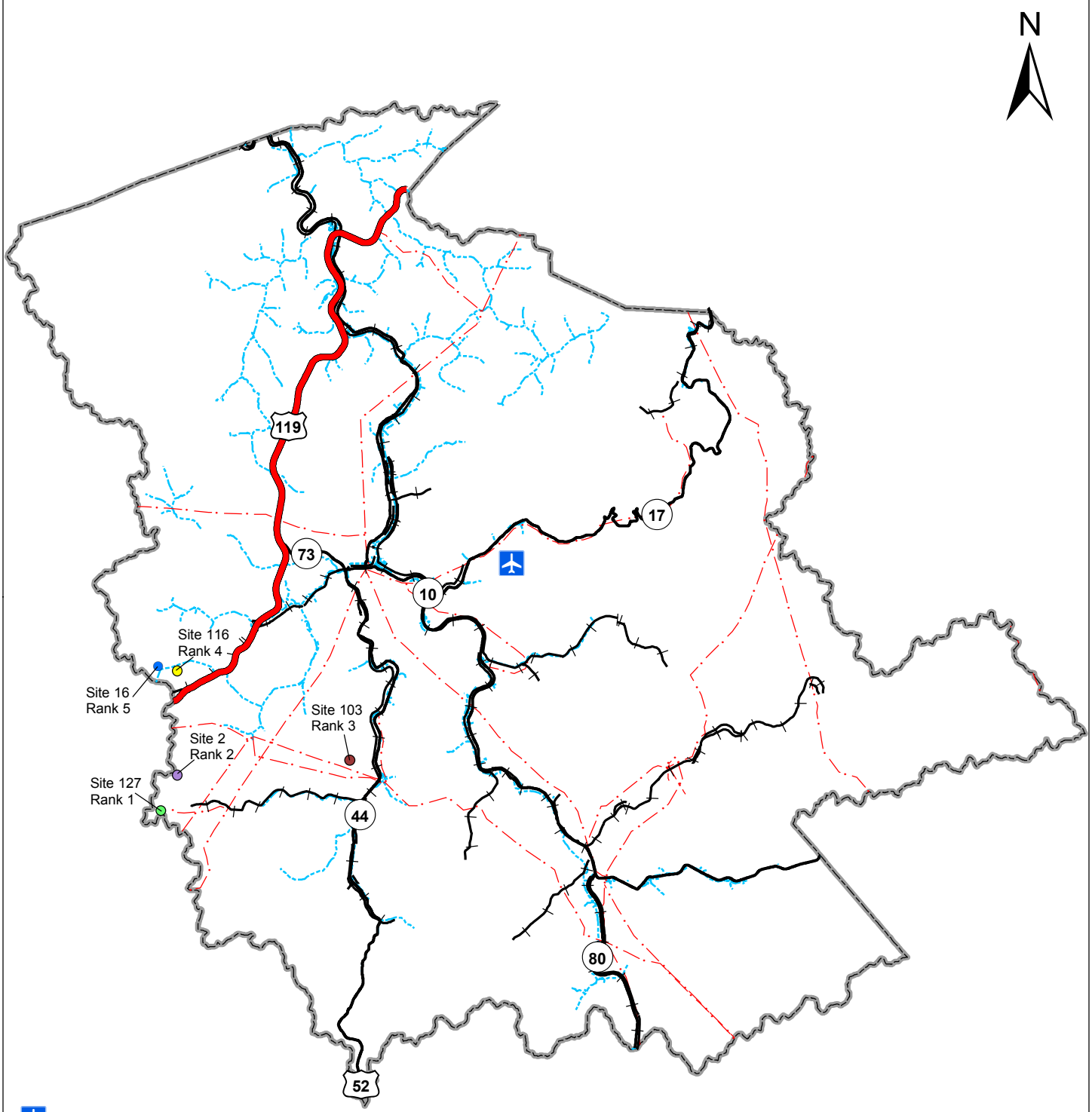
Table C: Absolute/Relative score comparison between top five sites for potential development

Suitability Ranking	**1**	**2**	**3**	**4**	**5**	**Weight**
Existing Highway	7	10	10	10	10	**8**
Proposed Highway	7	5	5	7	7	**9**
Intermodal Terminal Facilities	7	7	10	10	10	**6**
Interstate	1	1	1	1	1	**8**
National Waterway Network Ports	5	5	5	5	5	**5**
Sewer Treatment Facilities	5	5	10	7	7	**7**
Solid Waste Treatment Facilities	7	10	10	7	7	**8**
Tri-state Airport	5	5	5	5	5	**3**
Yeager Airport	5	5	5	5	5	**3**
Broadband	10	7	10	7	7	**9**
Gas Pipes	10	7	1	5	7	**6**
National Waterway Network	3	3	1	1	1	**4**
Power Lines	10	10	10	7	5	**10**
Oil Pipes	10	10	1	10	10	**6**
Railroad	10	10	10	10	10	**5**
Sewer Lines	10	10	3	5	5	**8**
Water Lines	7	3	3	10	10	**10**
Total Absolute Score	119	113	100	112	112	
Suitability Ranking	**1**	**2**	**3**	**4**	**5**	**Weight**
Existing Highway	2.5	7.5	10	10	10	**8**
Proposed Highway	10	10	10	10	10	**9**
Intermodal Terminal Facilities	5	7.5	10	10	10	**6**
Interstate	2.5	2.5	2.5	5	5	**8**
National Waterway Network Ports	7.5	7.5	7.5	10	10	**5**
Sewer Treatment Facilities	5	5	10	5	5	**7**
Solid Waste Treatment Facilities	10	10	10	7.5	7.5	**8**
Tri-state Airport	7.5	7.5	7.5	10	10	**3**
Yeager Airport	2.5	5	5	7.5	7.5	**3**
Broadband	10	7.5	10	2.5	2.5	**9**
Gas Pipes	10	10	2.5	7.5	7.5	**6**
National Waterway Network	10	10	7.5	10	10	**4**
Power Lines	10	10	10	5	5	**10**
Oil Pipes	10	10	2.5	10	10	**6**
Railroad	7.5	10	10	10	10	**5**
Sewer Lines	10	10	7.5	10	10	**8**
Water Lines	10	10	10	10	10	**10**
Total Relative Score	130	140	132.5	140	140	

Map A

Top Five Sites for Potential Development

Logan County



Source: Rahall Transportation Institute Analysis 2014

Site's General Info.

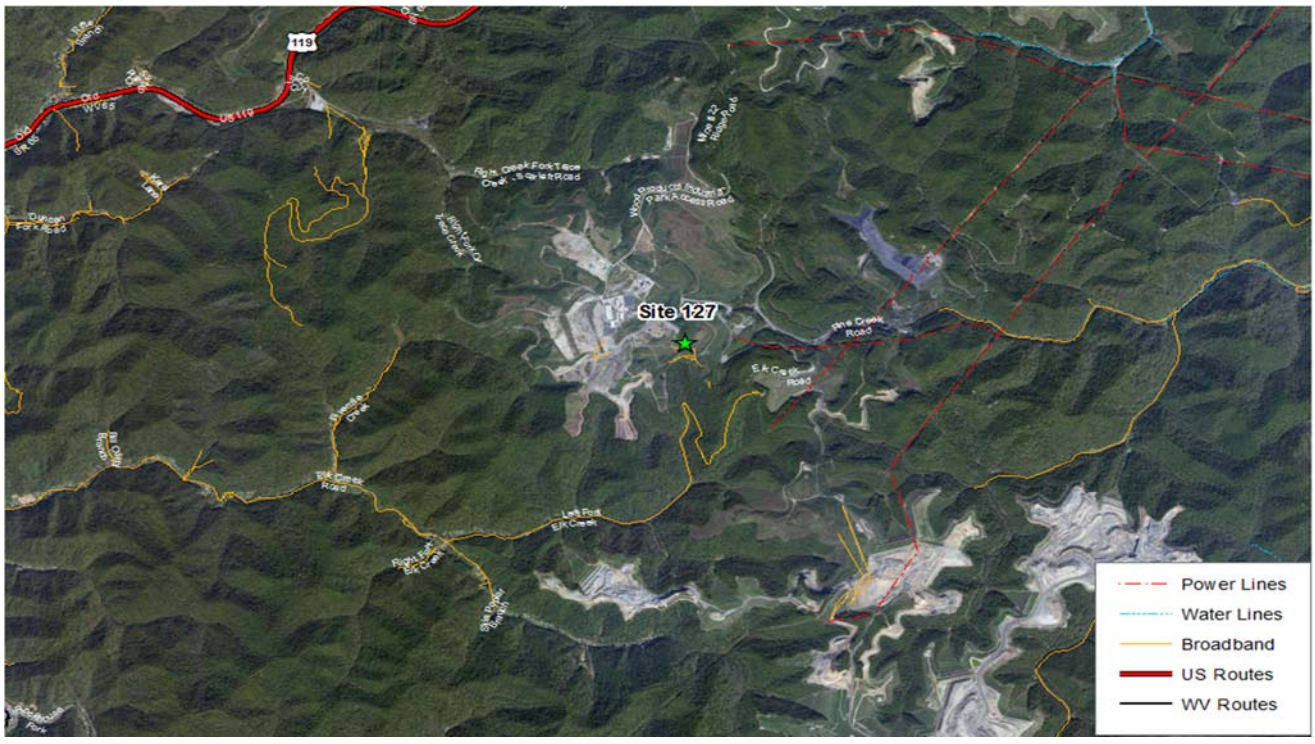
Permittee	Hobet Mining, Inc
Facility Name	NA
Permit ID	S011275
Issue Date	5/19/1975
Expiration Date	5/19/1980
Current Acres	9
Lat	37° 45'6.0000"
Long	82° 6'26.0000"
Nearest Post Office	

Site Number	**127**
Suitability Ranking	**1**
Total Score	**716.75**

Distance Analysis Results

Existing Highway	6.03
Proposed Highway	8.79
Intermodal Terminal Facilities	14.62
Interstate	53.53
National Waterway Network Ports	62.51
Sewer Treatment Facilities	6.27
Solid Waste Treatment Facilities	6.83
Tri-state Airport	65.88
Yeager Airport	60.82
Broadband	0.04
Gas Pipes	0.08
National Waterway Network	8.06
Power Lines	0.32
Oil Pipes	0.12
Railroad	0.93
Sewer Lines	0.55
Water Lines	0.45

Site number 127 should be the first choice for potential development. It has excellent distances to sewer, water, and power lines (.55, .45, and .32 miles), and broadband (.04 miles). It maintains the highest scores in many of the most important attributes. Though it is distant from existing transportation, it will be closest to a proposed highway, and is the prime site for post-mine development.



Site's General Info.

Permittee	Hobet Mining, Inc
Facility Name	NA
Permit ID	I051600
Issue Date	7/30/1980
Expiration Date	7/11/2003
Current Acres	9.88
Lat	37° 45'56.0000"
Long	82° 5'55.0000"
Nearest Post Office	HOLDEN

Site Number	**2**
Suitability Ranking	**2**
Total Score	**694.75**

Distance Analysis Results

Existing Highway	3.34
Proposed Highway	10.79
Intermodal Terminal Facilities	11.93
Interstate	50.85
National Waterway Network Ports	59.83
Sewer Treatment Facilities	6.23
Solid Waste Treatment Facilities	4.69
Tri-state Airport	65.72
Yeager Airport	58.14
Broadband	0.64
Gas Pipes	0.68
National Waterway Network	8.68
Power Lines	0.43
Oil Pipes	0.13
Railroad	0.58
Sewer Lines	0.92
Water Lines	0.76

Site number 2 has the second highest score in the suitability model. The site is located near essential utility features such as power lines (.43 miles), water lines (.76 miles), and sewer lines (.92 miles) making this site a great location for multiple uses. The site is only slightly further from its essentials than site ranking #1.

Site's General Info.

Permittee	Catenary Coal Co
Facility Name	NA
Permit ID	S502586
Issue Date	9/5/1986
Expiration Date	9/5/1991
Current Acres	NA
Lat	37° 46'22.0000"
Long	82° 0'20.0000"
Nearest Post Office	

Site Number	**103**
Suitability Ranking	**3**
Total Score	**668.5**

Distance Analysis Results

Existing Highway	0.67
Proposed Highway	11.50
Intermodal Terminal Facilities	8.95
Interstate	50.43
National Waterway Network Ports	59.40
Sewer Treatment Facilities	1.20
Solid Waste Treatment Facilities	2.71
Tri-state Airport	65.29
Yeager Airport	57.73
Broadband	0.05
Gas Pipes	4.95
National Waterway Network	12.71
Power Lines	0.23
Oil Pipes	3.61
Railroad	0.75
Sewer Lines	4.99
Water Lines	0.77

Site number 103 is listed as the third suitable site for post-mine land development. The site is fairly close to several important criteria. It is near power lines (10 pts. in the suitability model) and broadband (9 pts.). It is the closest to an existing highway, but further away from sewer lines. Overall, this site is still a great choice for development.

Site's General Info.

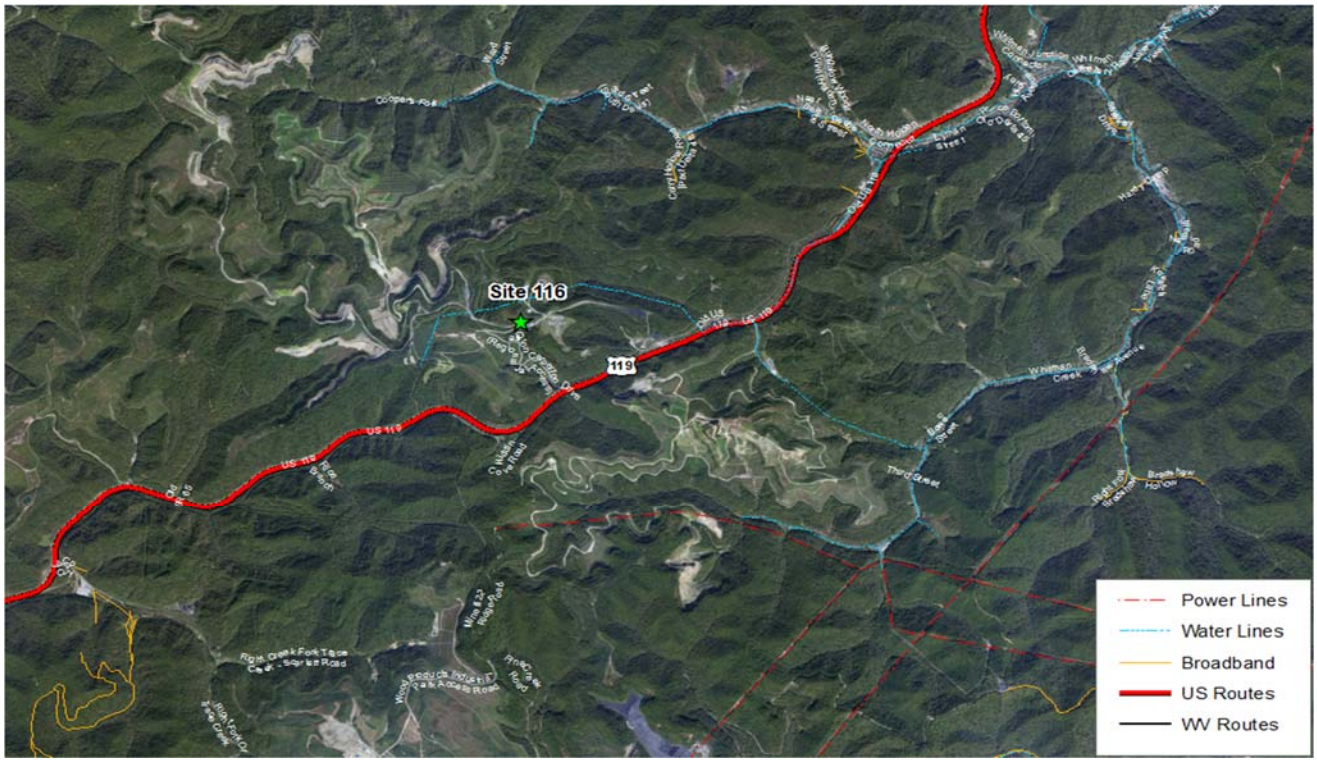
Permittee	Rebel Coal Co Inc
Facility Name	NA
Permit ID	S013679
Issue Date	11/8/1979
Expiration Date	1/6/1998
Current Acres	NA
Lat	37° 48'20.0000"
Long	82° 6'0"
Nearest Post Office	

Site Number	**116**
Suitability Ranking	**4**
Total Score	**652**

Distance Analysis Results

Existing Highway	0.91
Proposed Highway	9.17
Intermodal Terminal Facilities	8.79
Interstate	47.70
National Waterway Network Ports	56.69
Sewer Treatment Facilities	3.84
Solid Waste Treatment Facilities	9.58
Tri-state Airport	62.58
Yeager Airport	54.99
Broadband	1.41
Gas Pipes	1.53
National Waterway Network	11.61
Power Lines	1.48
Oil Pipes	0.05
Railroad	0.45
Sewer Lines	3.13
Water Lines	0.15

Site number 116 is ranked as the fourth most suitable site for post-mine land development in the County. There are several advantages to this site including the short distance to an existing highway (.91 miles) and water lines (.15 miles). Other infrastructure, such as sewer and power lines, are a little further than they are from the other top sites.



Site's General Info.

Permittee	Laurel Run Mining Company
Facility Name	NA
Permit ID	S012478
Issue Date	6/5/1978
Expiration Date	1/4/1998
Current Acres	48.8
Lat	37° 47'54.0000"
Long	87° 2'54.0000"
Nearest Post Office	

Site Number	**16**
Suitability Ranking	**5**
Total Score	**651**

Distance Analysis Results

Existing Highway	1.05
Proposed Highway	9.32
Intermodal Terminal Facilities	8.93
Interstate	47.85
National Waterway Network Ports	56.83
Sewer Treatment Facilities	3.98
Solid Waste Treatment Facilities	9.72
Tri-state Airport	62.72
Yeager Airport	55.13
Broadband	1.78
Gas Pipes	0.95
National Waterway Network	11.41
Power Lines	1.59
Oil Pipes	0.20
Railroad	0.74
Sewer Lines	3.12
Water Lines	0.11

Site number 16 has the fifth highest score in the suitability model for its relatively close distances to several important criteria including water lines (.11 miles), broadband (1.78 miles), and existing highway (1.05 miles). All of those criteria receive high absolute points. The other distances are good relative to all other none-top sites.

I. Introduction

Senate Bill (SB) 603, passed in the 2001 Legislative Session, mandates the development of a Land Use Master Plan (LUMP) by counties with surface mining operations. The creation of a LUMP would facilitate the development of economic or community assets, secure developable land and infrastructure, and ensure that post-mining land use proposed in any reclamation plan is in compliance with the specified land use in the approved LUMP. In order to promote acceptable principles of smart growth within the desired community it has become evident that a sustainable land use plan is needed to determine development needs within a community. The detailed document addresses the physical development needs of properties within the coalfield counties and provides guidelines, strategies, and a framework for future decisions relating to land use and projected community needs.

The 1977 Surface Mining Control and Reclamation Act established a program for the regulation of surface mining activities and the reclamation of coal-mined lands. The Act requires that coal operators minimize the disturbance and adverse impact on the environment and community in addition to restoring the mined property to its approximate original contour. Special provisions are granted for operators who offer development plans for post-mining land use, in which the coal operators (private sector) make capital investments towards land development that would benefit the community (public sector) affected by the mining operations. This unique opportunity, also known as Public-Private Partnership (P3), has far-reaching consequences on those communities with coal mining operations. The operators utilize the LUMP, created by the County officials with post-mine land use in mind, to gain insight into the land and infrastructure needs of the local community and then materialize the development opportunities described in the LUMP. The LUMP leverages private investment to facilitate public development, which is critical to the sustainability of counties and communities. Community sustainability requires a transition from poorly managed land to land-use planning practices that create and maintain efficient infrastructure, ensure close-knit neighborhoods and sense of community, and preserve our natural systems.

RTI, a nationally recognized center of excellence for rural transportation research, was established through the Transportation Equity Act for the 21st Century passed by Congress in 1998 and is funded through a grant from the Research and Innovative Technology Administration (RITA) of the US Department of Transportation. As a University Transportation Center, RTI has cultivated relationships with private industry and public agencies to leverage resources, technology and strategic thinking to improve mobility and to stimulate economic development. RTI has taken the lead in conducting site-specific research, supporting multimodal planning and analysis to improve mobility and global connectivity for rural regions. The Office of Coalfield Community Development (OCCD) was created by the 1999 Legislative Session to assist communities affected by surface mining activity throughout the State. With the passage of SB 603 in 2001, the responsibilities of the OCCD changed to include working with local economic development agencies to develop land use master plans and include the

recommendations of local economic redevelopment authorities in the reclamation plans of surface mine permits. The OCCD established criteria to consider development of these sites, provided for certain land uses as post-mining land uses and stipulated that master plans must comport to environmental reclamation requirements. The office allows existing and future surface mining permits to include master plan criteria and reclamation standards.

This plan provides information and analysis specifically for Logan County. Logan County's economy is typical of coalfield counties, with Government, Natural Resources, and Trade Transportation and Utilities making up the bulk of employment and wages. The resulting combination has led to a steady increase in total wages. While this has not translated to a complete success, as the population continues to decrease, age, and lack varied job opportunities, the use of current post-mine sites for development and other indicators show Logan is pushing development. This plan will put focus on these issues, encouraging an analysis of the range of options available to policymakers, including land use planning.

II. Planning Area

Logan County was formed in 1824, 39 years before West Virginia became a state. The County experienced great upheaval during the Civil War, including having the County seat occupied and burned by Union forces. In the industrial age, as in most coalfield counties, transportation and natural resources were essential sources of wealth and growth. The decline of these industries also saw the decline of Logan County. The County currently attracts major attention from the occurrence of the Hatfield-McCoy Feud between 1882 and 1890. Logan County attracts a great deal of cultural attention, but it remains to be seen how Logan can capitalize on all of its resources to improve the County outlook.[1]

[1] Spence, Robert, "Logan County," *The West Virginia Encyclopedia,* Accessed March 24, 2014, http://www.wvencyclopedia.org/articles/1450.

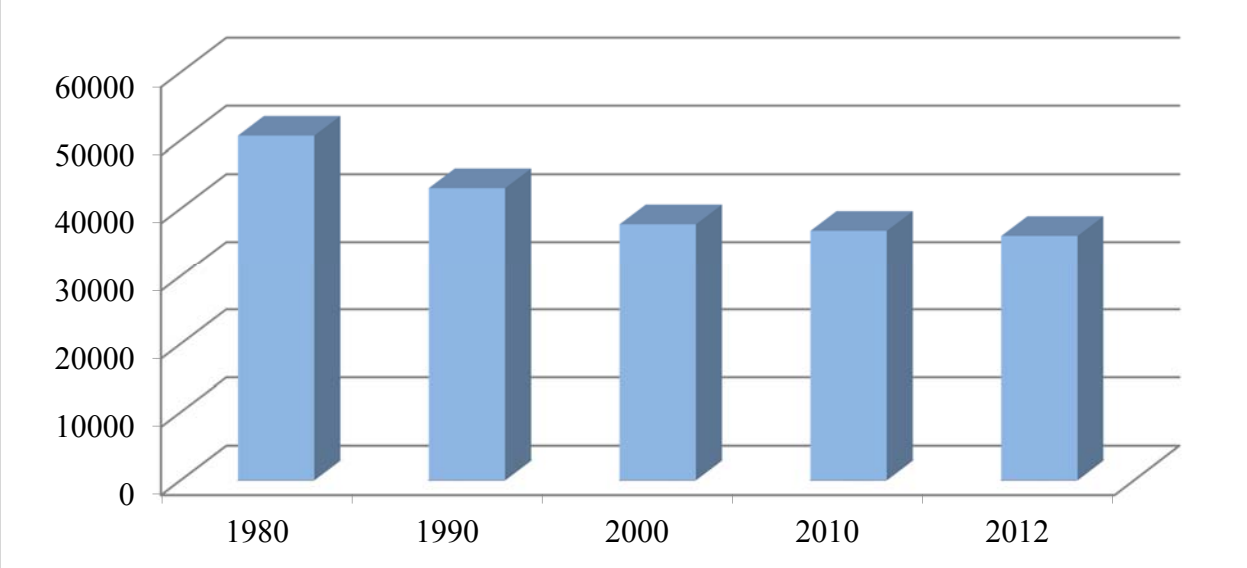
III. Existing Conditions

This information will provide a background understanding of the demographic trends in the County. This base information is meant to provide overall detail on Logan County's status as it stands. Part IV will deal with possible future site development information, to be considered with the demographic data to target strategies for investment.

Population

The population of Logan County in 2012 was 35,987 according to the 2012 American Community Survey (ACS) 5-year estimates, ranking it 15th in County population among the 55 counties in West Virginia.[2] The decennial censuses show that Logan County has slowly lost population. The trend has slowed since the drop of about 15 percent between 1980 and 1990, as well as the 12 percent drop between 1990 and 2000, but continues into the current analysis year.

Figure 1: Census Populations for Logan County



Source: Stats Indiana, USA Counties in Profile

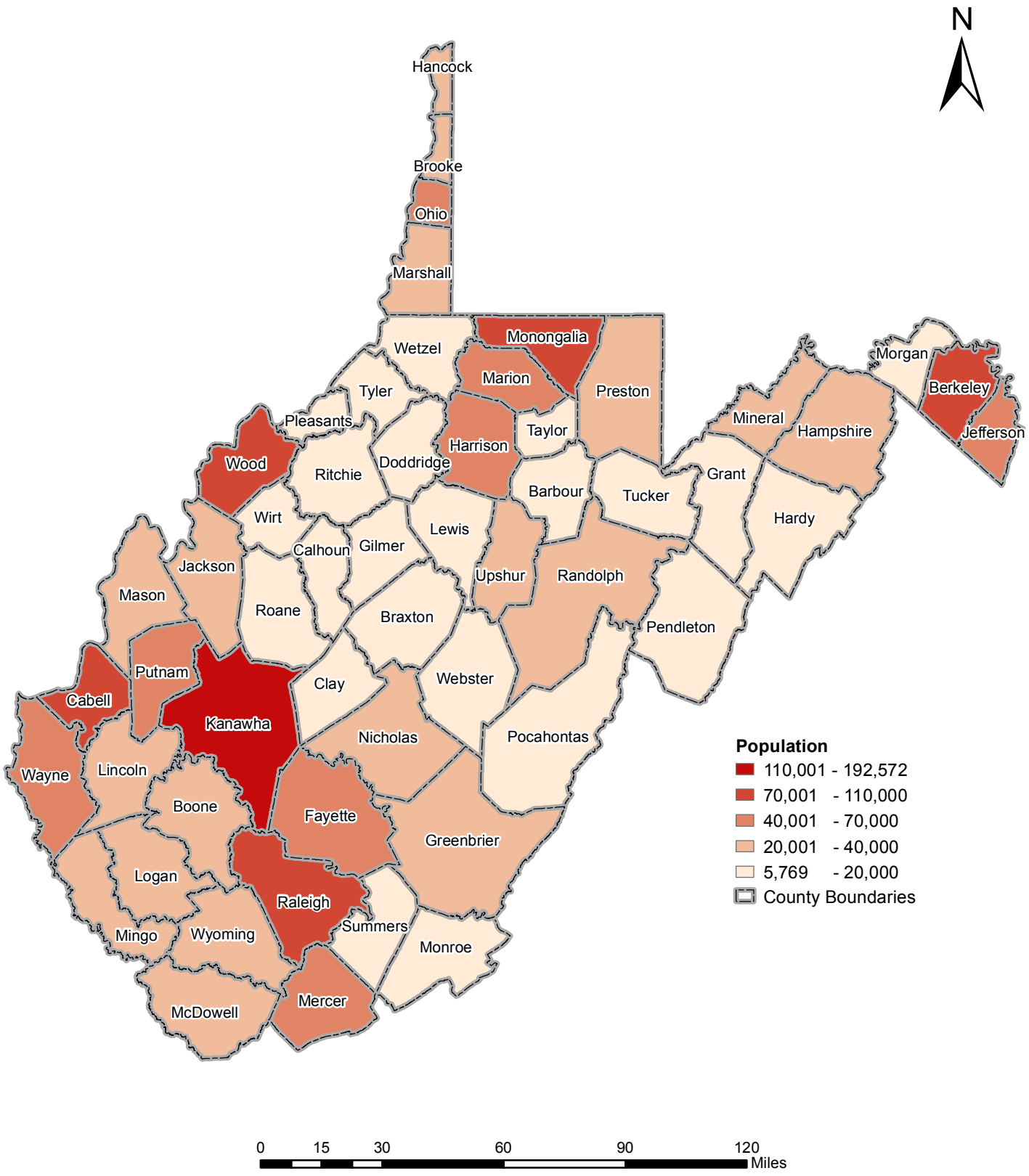
Map 1 illustrates the Logan County population compared to West Virginia overall. Logan is at the lower end of the spectrum, similar to the other surrounding coalfield counties. It is, however, at the higher end of that range.

[2] United States Census Bureau, "2012 American Community Survey 5-year Estimates," Accessed April 20, 2013, www.factfinder2.census.gov

Map 1

Demographic

Population



Source: U.S. Census Bureau, 2008-2012 American Community Survey

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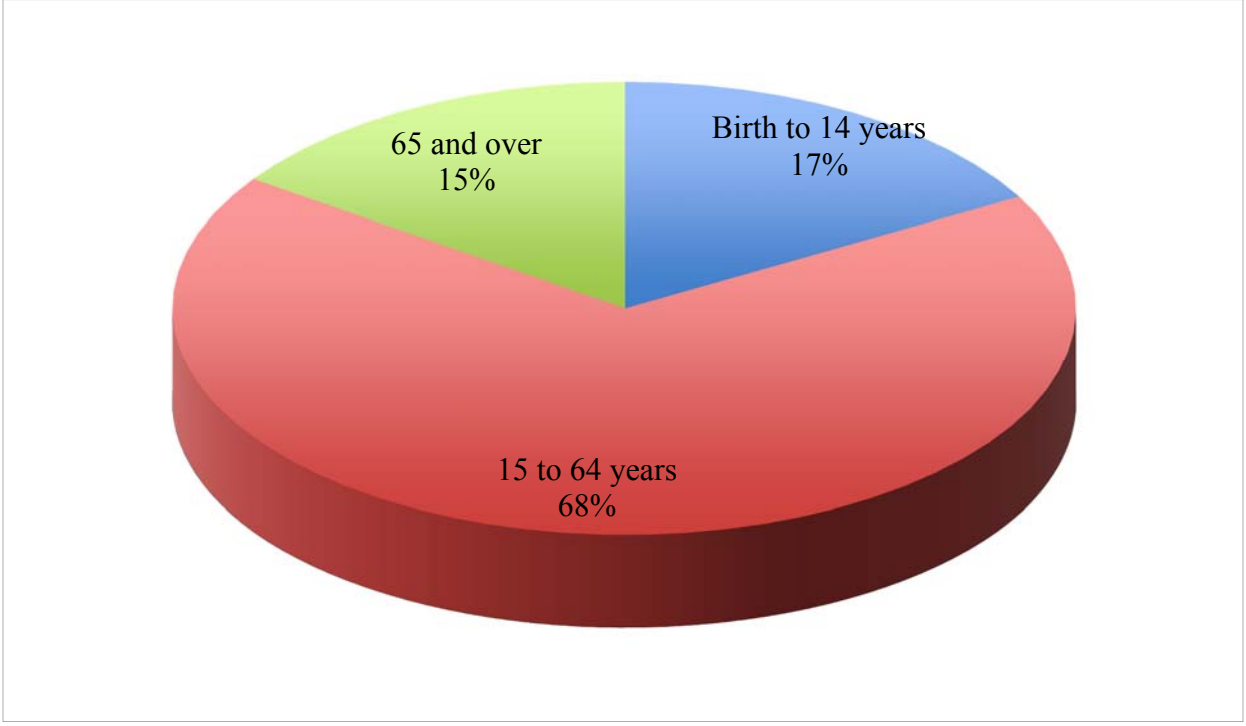
According to the ACS, just over 19 percent of Logan County residents are 62 years of age and over, while over 15 percent are between 5 and 17 years of age and over five percent are below the age of five. Approximately 7,000 people are of retirement age. The median age in Logan is 42.2, which is very near the median age of the State (Map 2). The majority of the population is of prime working age, as denoted in Figure 2.

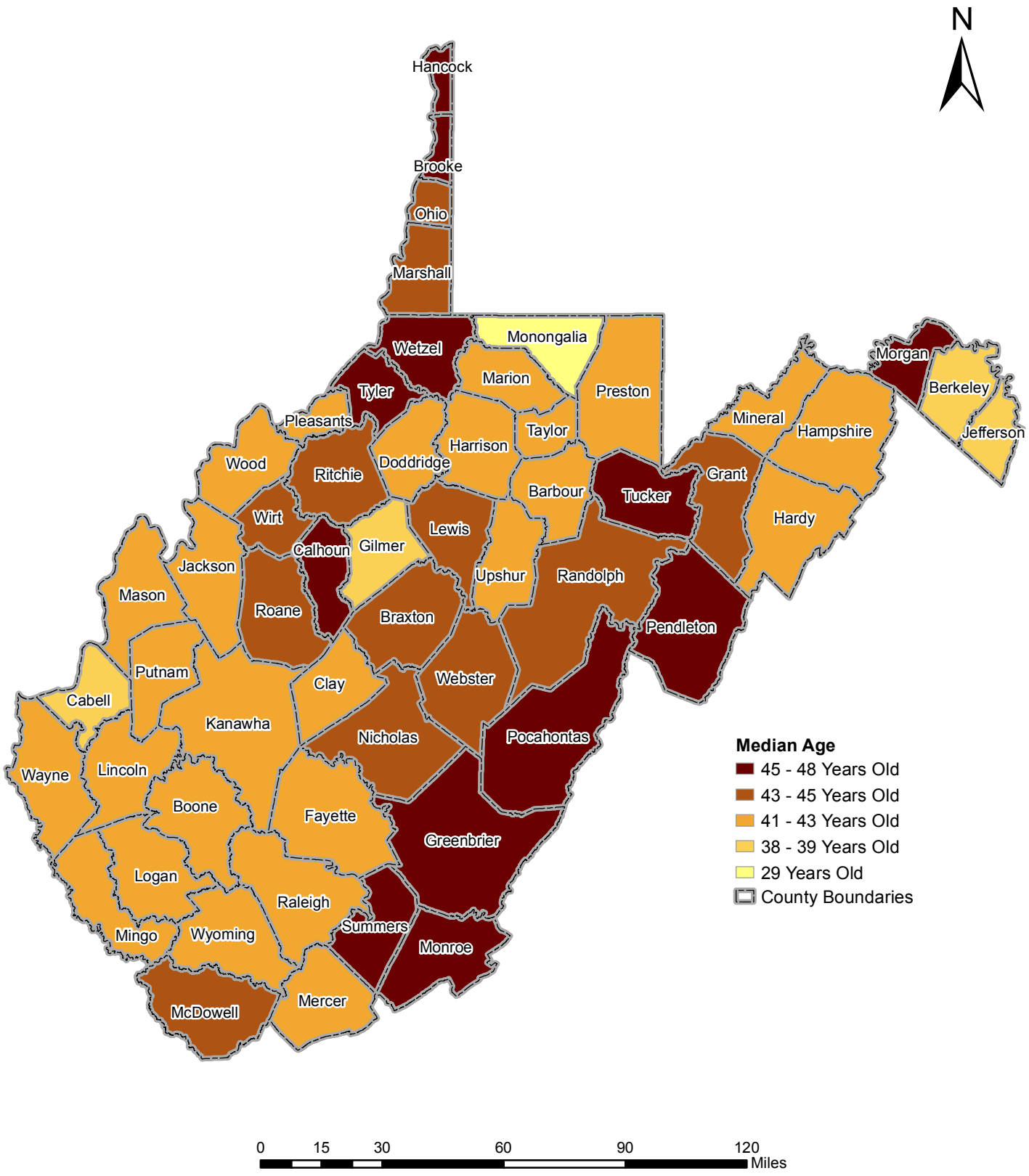
Figure 2: Logan County Age Breakdown



Source: 2012 American Community Survey 5-Year Estimate Calculation

Demographic

Median Age



Source: U.S. Census Bureau, 2008-2012 American Community Survey

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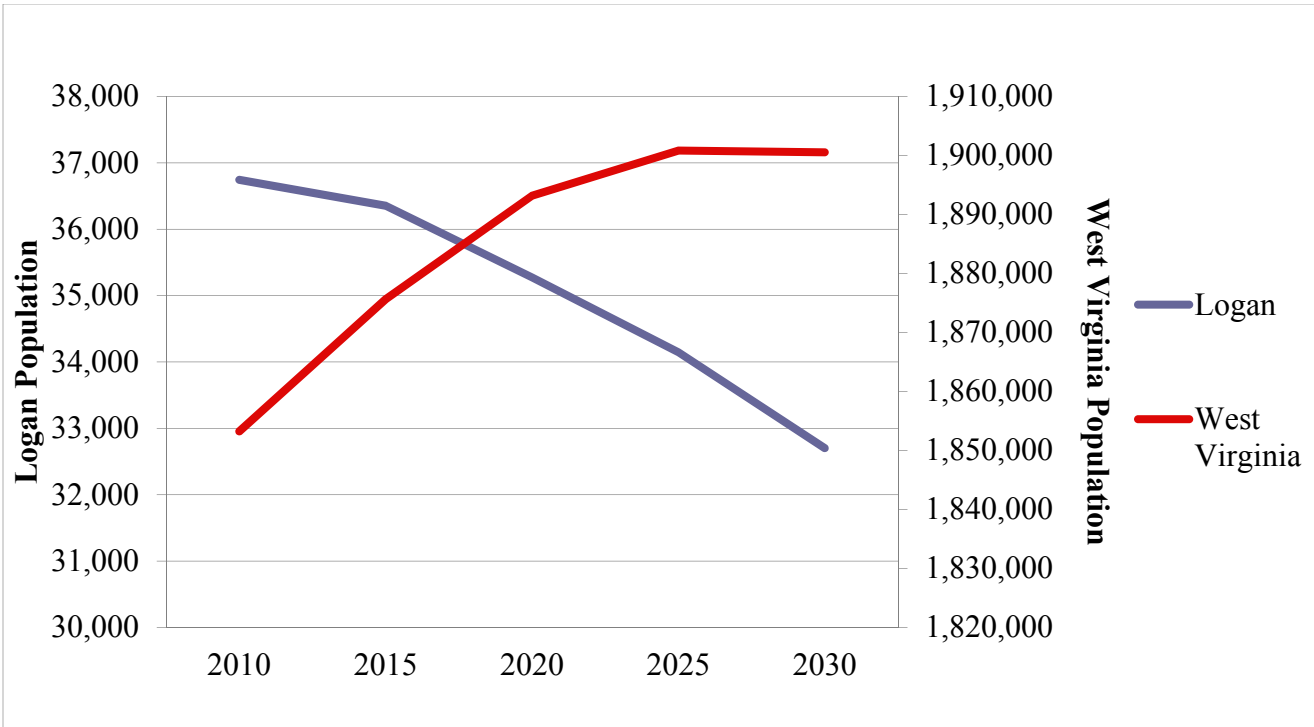
The Bureau of Business and Economic Research at West Virginia University projects an 11 percent decrease in the Logan County population between 2010 and 2030, which is significantly different from the projected growth of West Virginia.[3] The model for the projection is based on past population patterns and statistics, and should not be taken as permanent. The projected decrease is derived from the persistent decrease from 1980 to 2012 and the lack of any noticeable increase in between these census and ACS years.

Figure 3: Population Projections



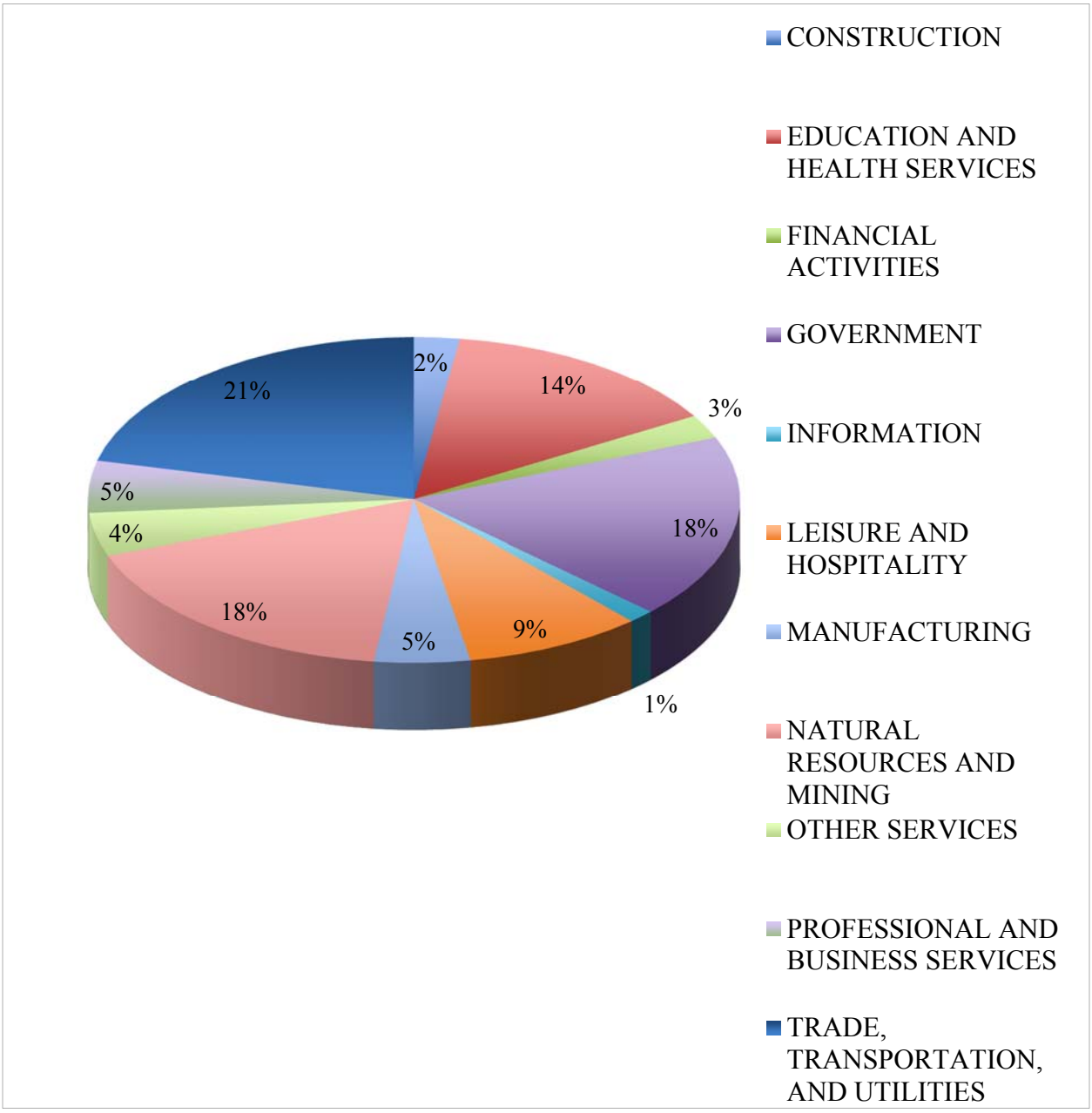
Source: WVU Bureau of Business and Economic Research

Employment

Workforce WV has a complete dataset on employment numbers and wages. The total number of employed in 2012 was 11,869. The employment mix is fairly diversified, but still exhibits the same pattern as other coalfield counties, with Government; Trade, Transportation, and Utilities; and Natural Resources and Mining being the highest employing sectors. This mix, though divided between the private and public sector, is still extremely vulnerable to economic downturns and political attitudes.

[3] Christiadi. "Population Projection for West Virginia Counties." Bureau of Business and Economic Research, College of Business and Economics, West Virginia University, Morgantown, WV (August 2011).

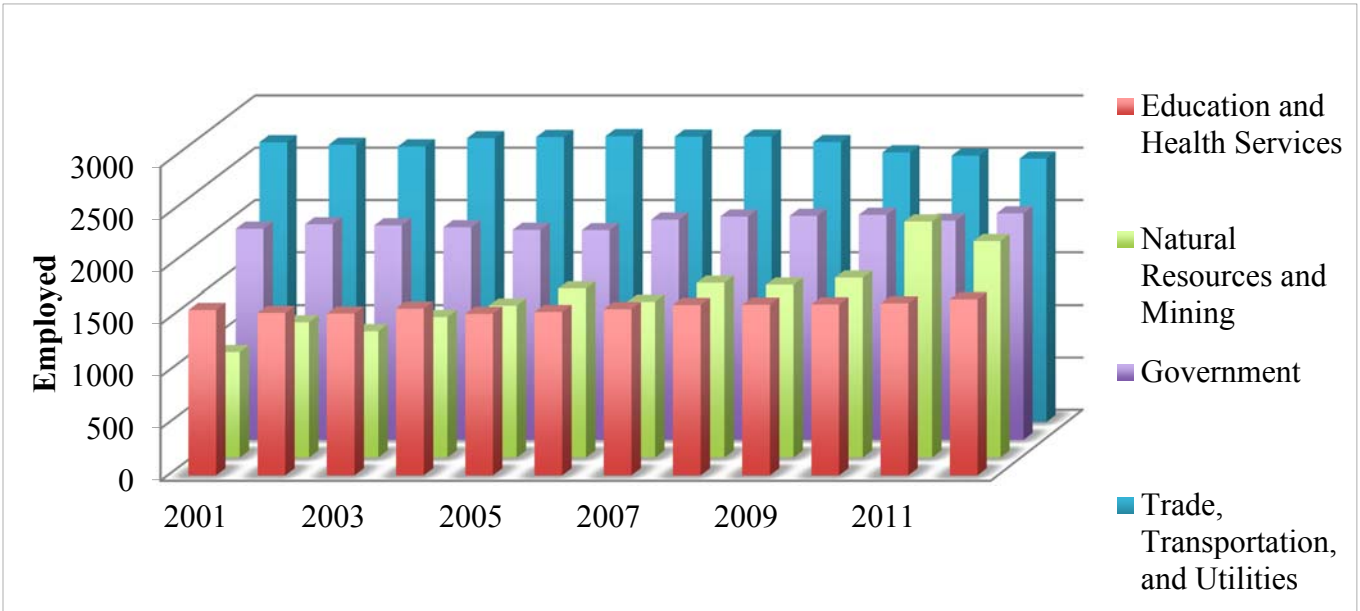
Figure 4: 2012 Logan County Employment



Source: Workforce WV

Four sectors have been the major contributors to employment throughout the past decade: Government; Trade, Transportation and Utilities; Education and Health Services; and Natural Resources and Mining. Trade, Transportation, and Utilities has consistently been the largest employer, with Government being the second highest for every year but 2011. Employment in Natural Resources and Mining has doubled over the decade, even in years that nationally have been difficult for coal companies.

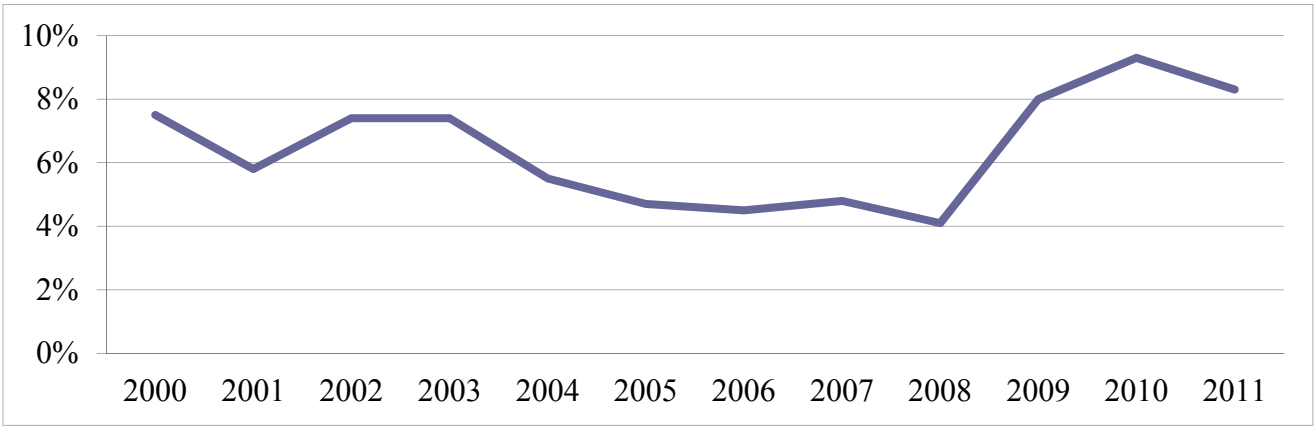
Figure 5: Logan County Employment by 4 Sectors 2001-2012



Source: Workforce WV

The civilian labor force in the County is one of the most interesting statistics when determining potential investors. As Map 3 shows, Logan's participation rate is at the lower end of the scale. This is a condition many coalfield counties face. Despite a small rise from the national economic contraction in 2002, unemployment was decreasing until the recession in 2008 and natural resource sector cost cutting around the same period. (Figure 6). Unemployment has slowly been falling, but is still higher than average for the State (Map 4). Note that 2011 data is used for this graph and map, as the data for Workforce WV and the Census Bureau did not match because the most recent data has not been seasonally adjusted.

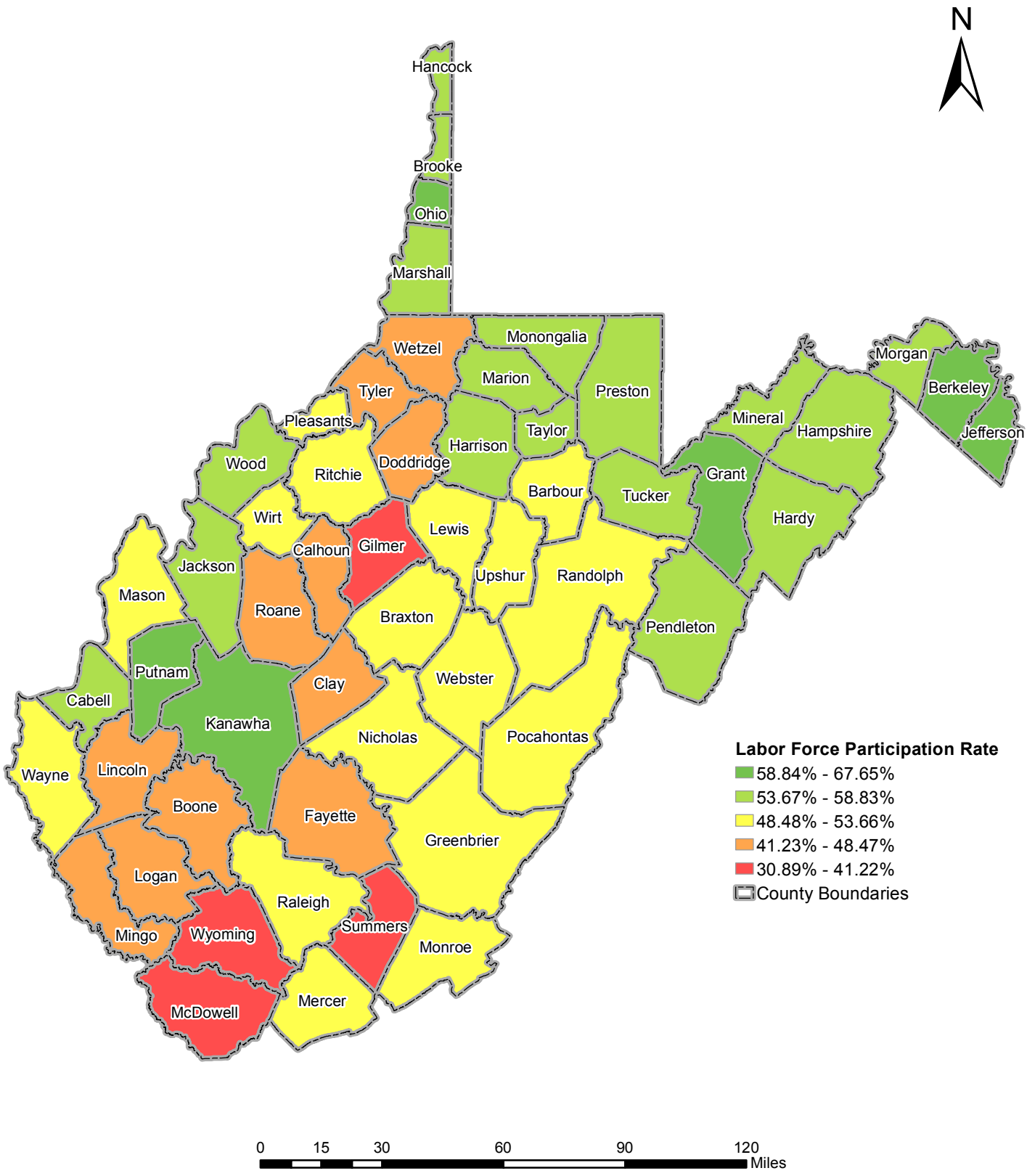
Figure 6: Logan County Unemployment Rate



Source: Workforce WV

Demographic

Labor Force Participation Rate



Source: U.S. Census Bureau, 2008-2012 American Community Survey

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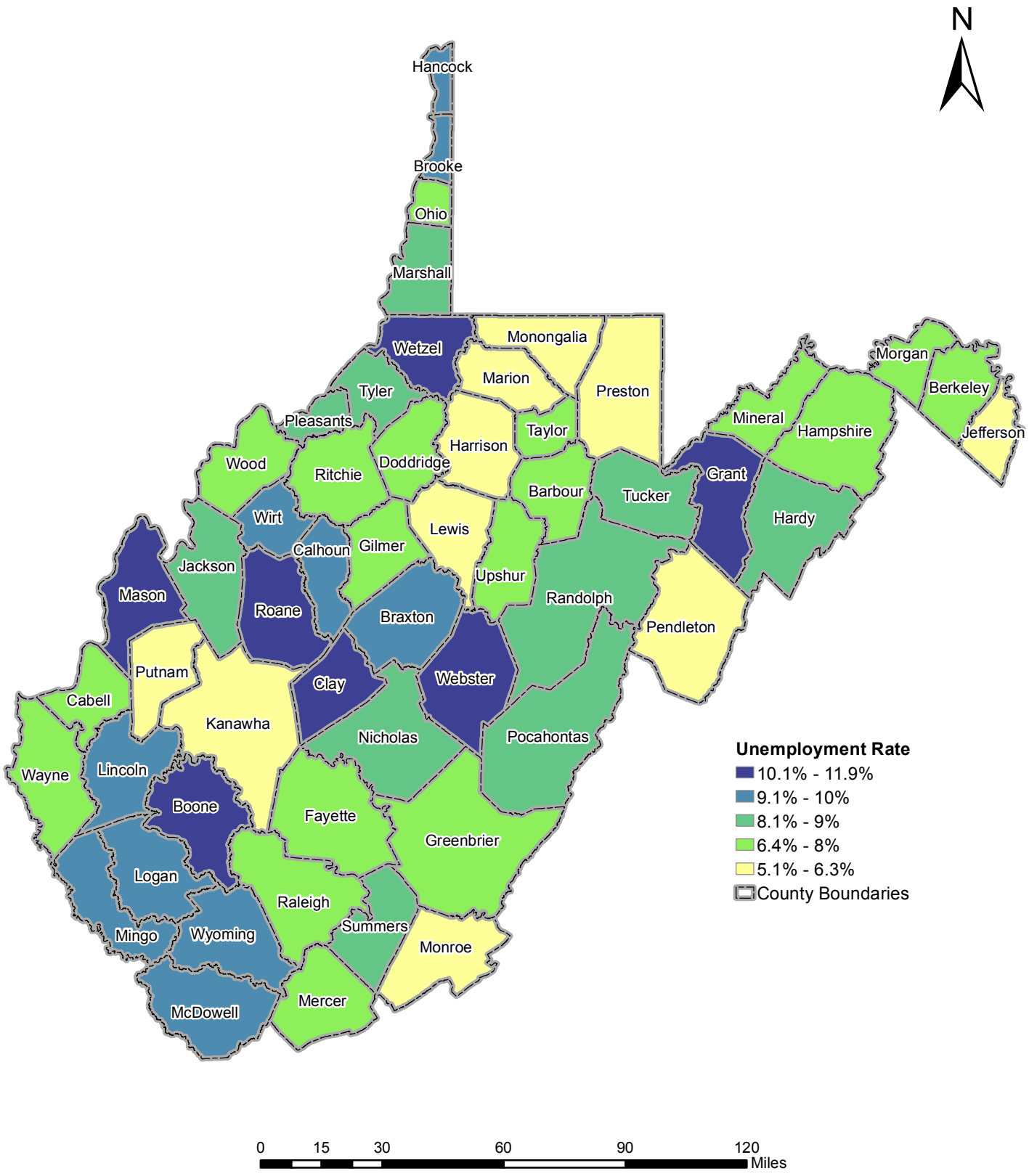
Demographic

Unemployment Rate



Source: United States Census Bureau 2011

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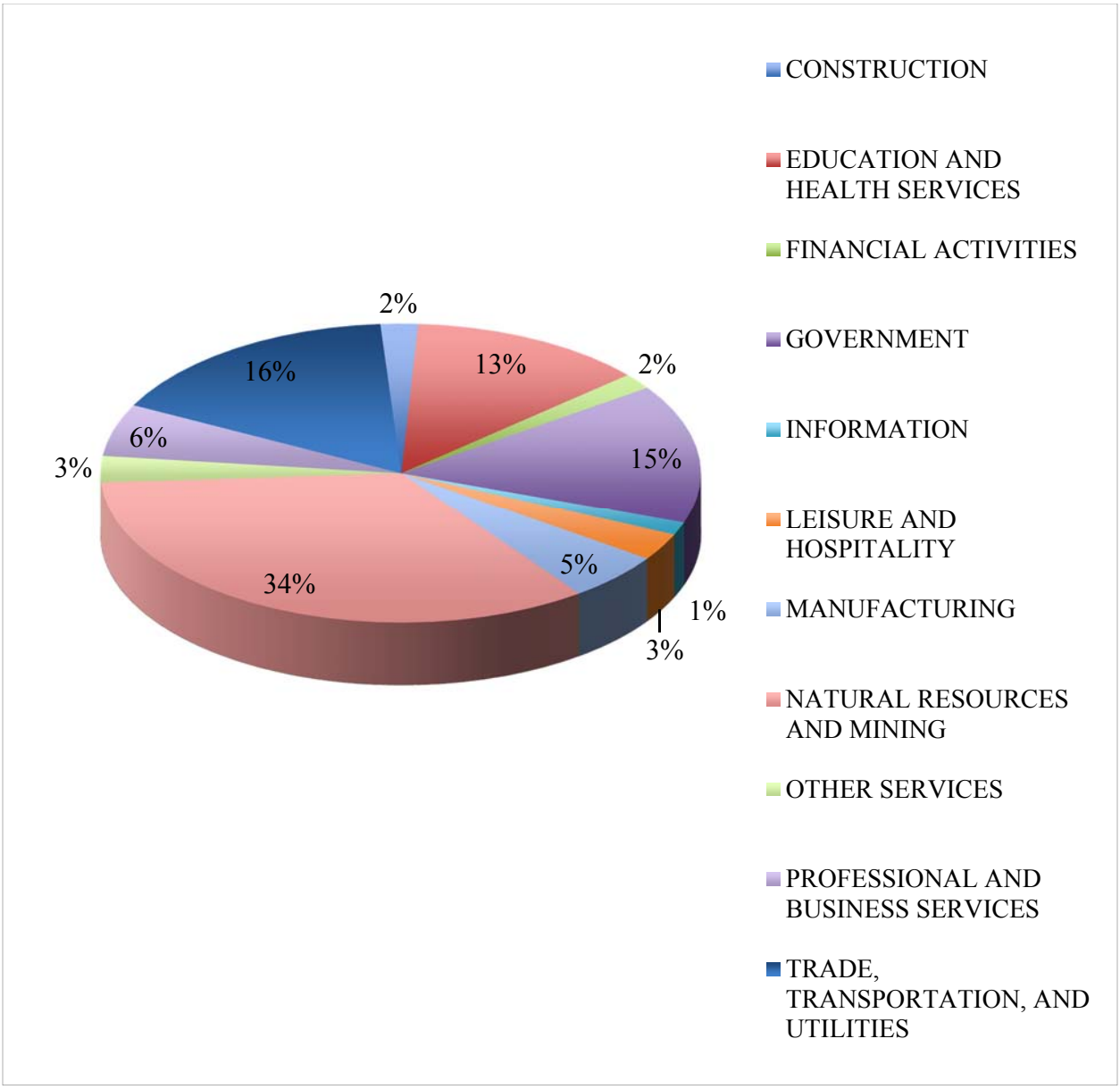
Wages and Income

Logan County's highest wage contributors are also its largest employers. The highest, Natural Resources and Mining, is because of the high wages offered in the sector (Figure 7). The next two highest earning sectors are because of the size of the sectors in Logan County: Trade, Transportation, and Utilities and Government. Finally, Education and Health Services provides 13% of total County wages.

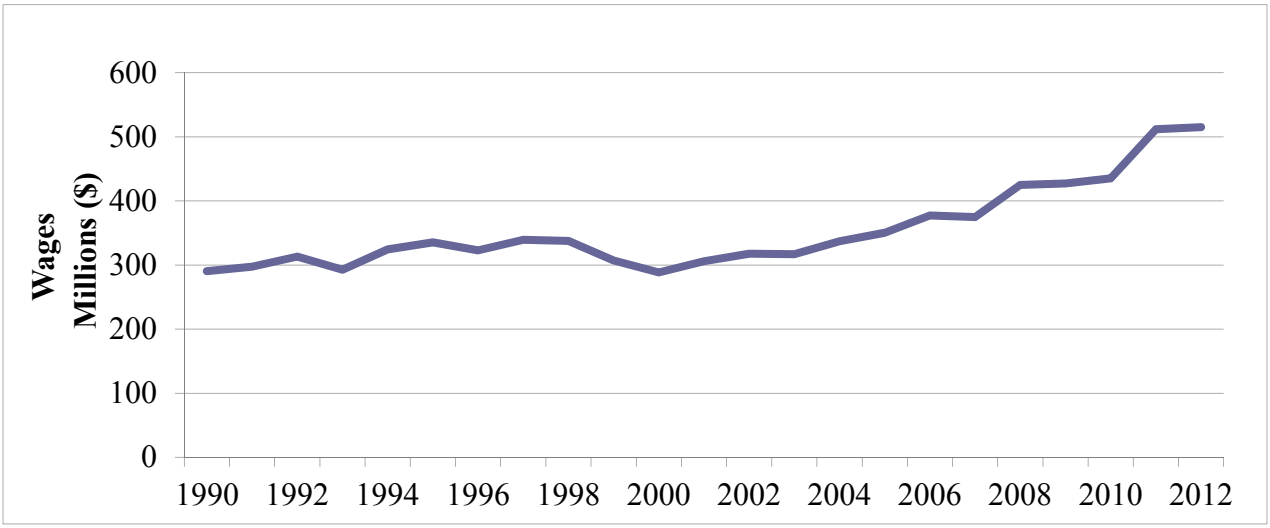
Figure 7: 2012 Logan County Total Wages



Source: Workforce WV

Historically, wages for Logan County have shown a tendency to rise, with the exception of the contraction in the early 2000s. Logan County has managed to grow three of its sectors over the past decades, allowing for wages to rise despite recession and cost-cutting factors that led to a decrease in wages in other sectors. Figure 8 shows total wages for Logan County, which have consistently shown an upward trajectory, with only slight stagnation during the recession period.

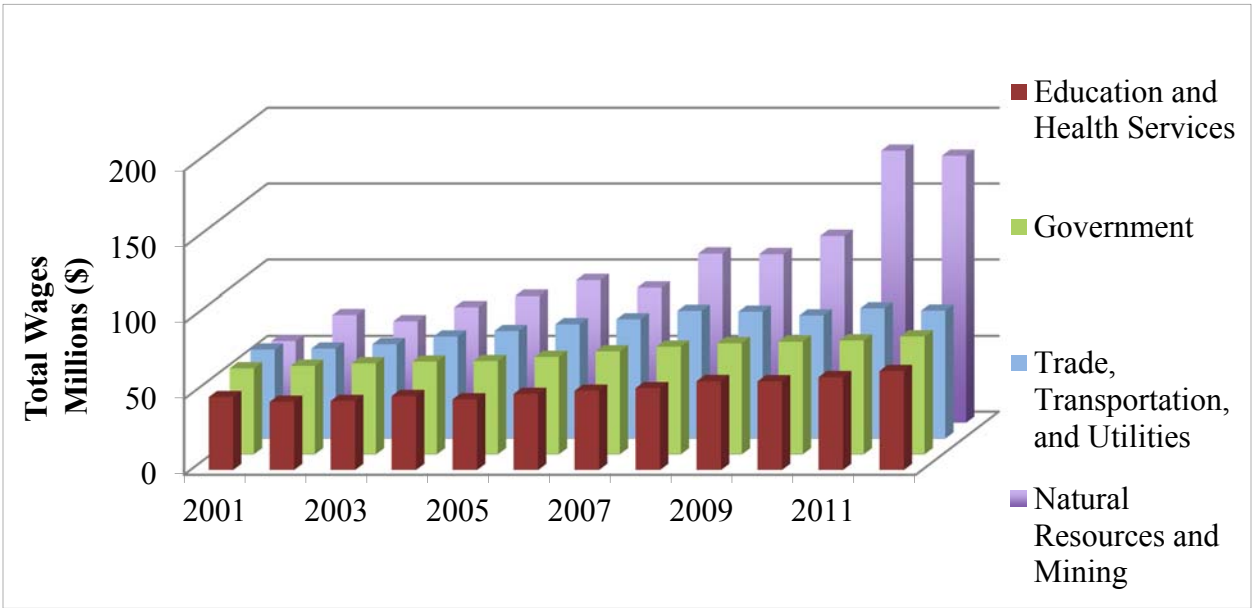
Figure 8: Logan County Total Wages 1990-2012



Source: Workforce WV

Figure 9 confirms the general trend in wages, also showcasing that the top sectors continuously grew throughout the decade. Natural Resources and Mining has been the predominant wage contributor for much of the decade, followed by Trade, Transportation, and Utilities, Government, and Education and Health Services. Wages in all four sectors have shown growth over time. In fact, only in Logan County has the Natural Resources and Mining sector steadily risen even through the recession period.

Figure 9: Logan County Total Wages by 4 Sectors 2001-2012



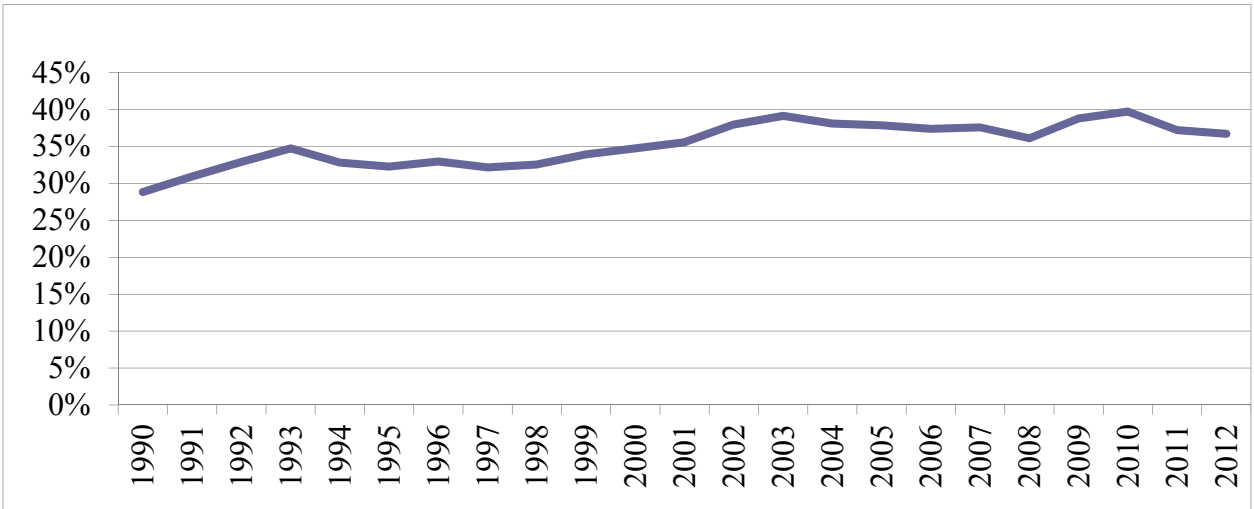
Source: Workforce WV

In most American counties, one would find that the majority of income for people stems from wages. In West Virginia, however, an important distinction must be made between income and wages. Income is the total receipt of earnings resulting from any economic activity, while wages are derived from actual work in an employed setting. Therefore, dividends from stockholdings are considered income, but not wages. In Logan County, wages for all employment were over 515 million.[4] Income for the County was larger, over $1 billion. Though there are many components to income other than work earnings, 37 percent of total Logan County income is derived from government transfers.[5] Government transfers accounted for about 95 percent of total transfers to Logan County, dwarfing transfers from private institutions such as charities. Government transfers have consistently contributed between 30 and 40 percent to income over the past 20 years. This does not count the wages for government workers. This number is higher than average for the State and appears to steadily rise over time, but does tend to follow general economic patterns such as booms and recessions.

[4] "Employment and Wages – 2012, Logan County," Workforce WV, Accessed February 13, 2014, http://www.workforcewv.org/lmi/EW2011/ew11x059.htm

[5] "Tables CA 04 and CA 35 analysis," Bureau of Economic Analysis, Regional Economic Accounts, Local Area Person Income and Employment, Accessed February 13, 2014, http://www.bea.gov/regional/index.htm.

Figure 10: Government Transfers as a Percentage of Income for Logan County



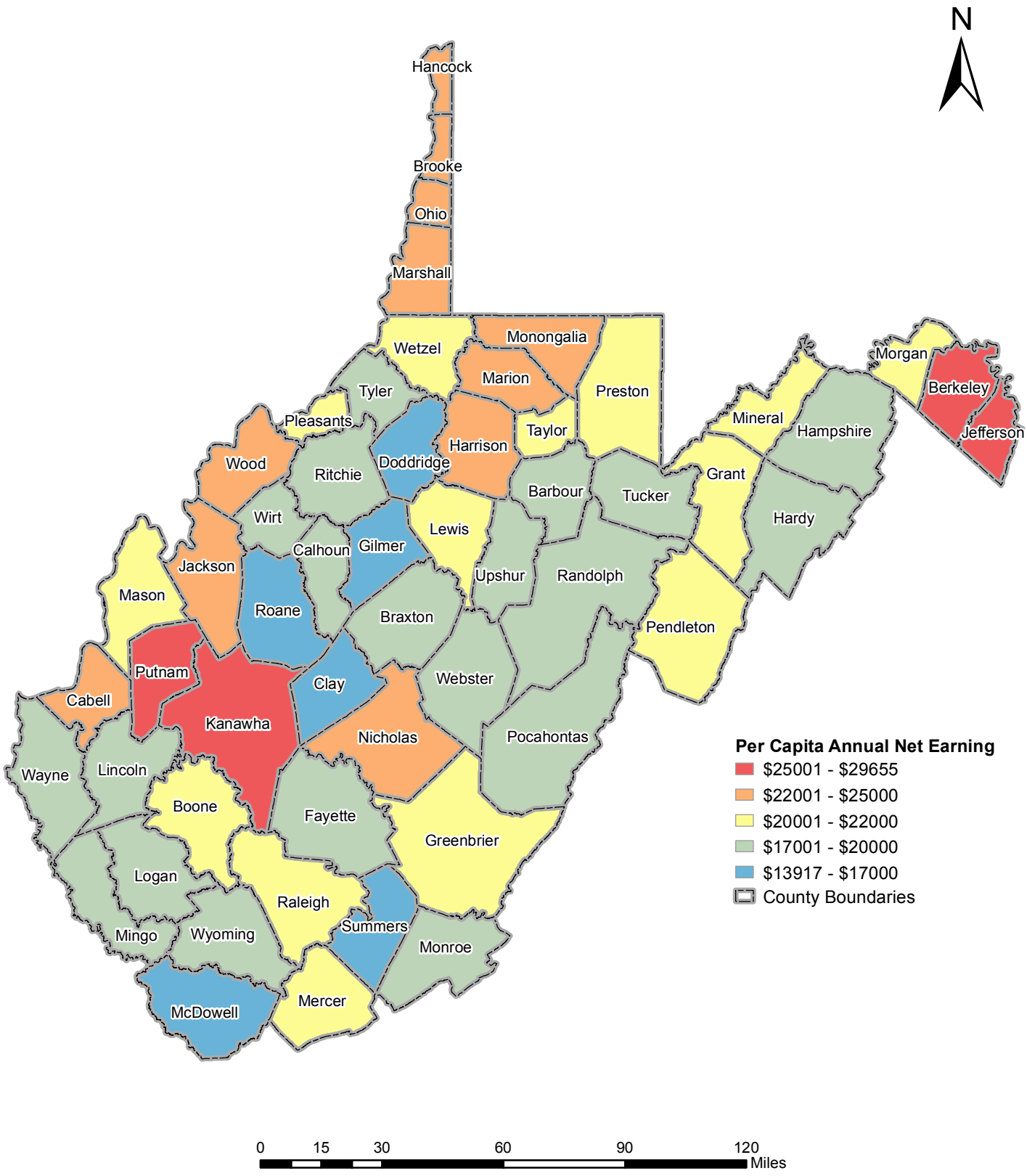
Source: United States Bureau of Economic Analysis

The total personal income of Logan County is therefore made up of 37 percent government transfers and 58 percent income from work. According to the BEA, per capita income was $34,060 for Logan County in 2012. Annual net earnings, or income from work, is displayed in Map 5, and Logan is ranked below average in earned income in West Virginia, similar to other coalfield counties.

Another measure of economic health is the number of establishments that do business in the area. Map 6 shows the number of establishments in each County in West Virginia. Logan County appears to be at the lowest end of the spectrum. This may be due to the fact that the largest economic sectors are characterized by a few, large firms.

Demographic

Per Capita Annual Net Earning



Source: U.S. Census Bureau, 2008-2012 American Community Survey

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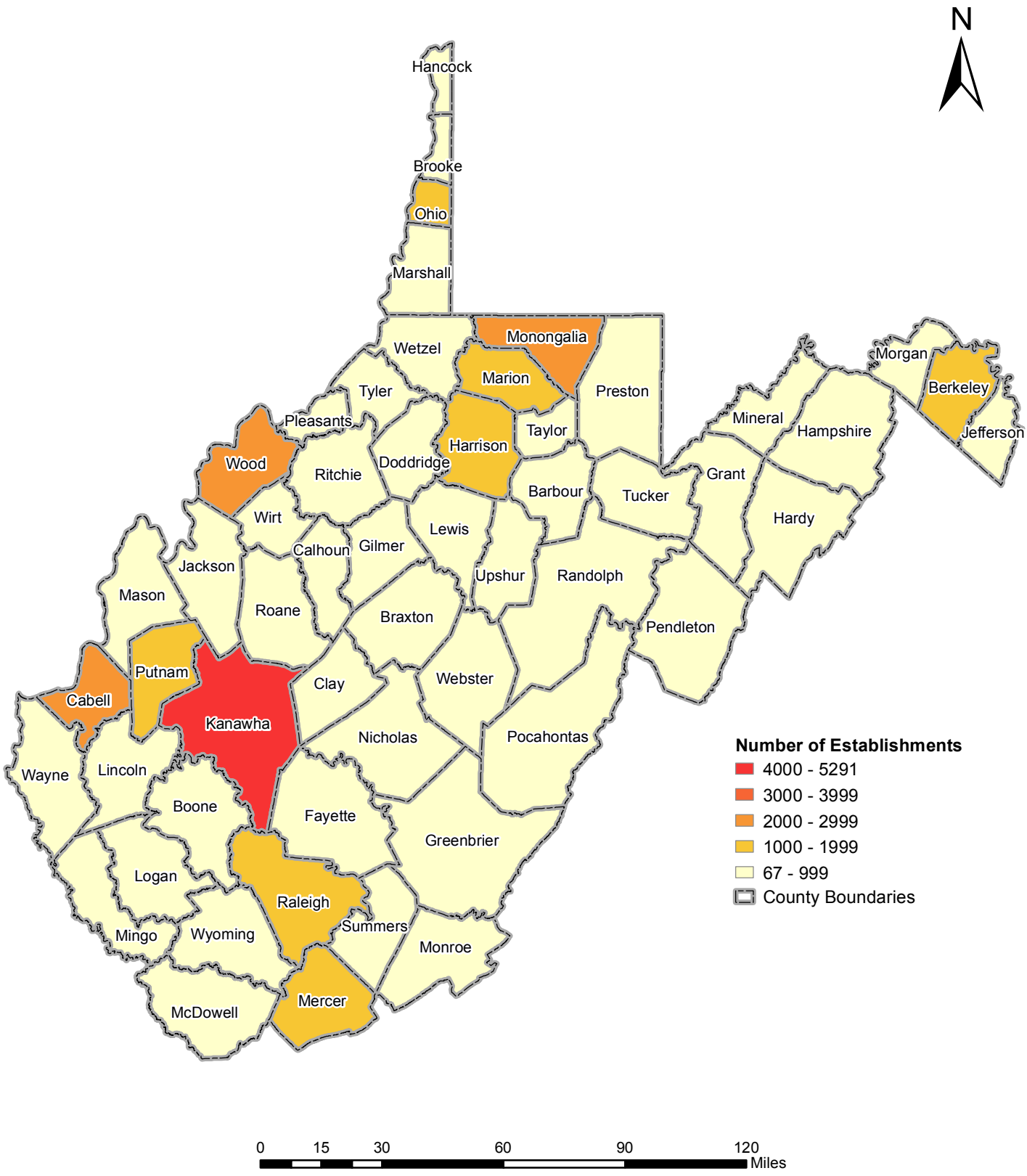
Demographic

Number of Establishments



Source: U.S. Census Bureau, 2011

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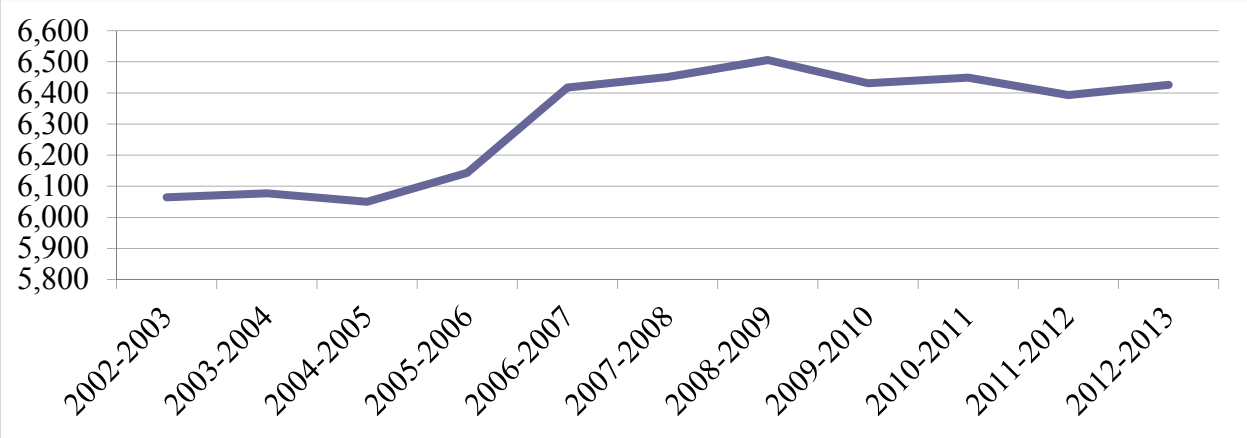
Education

Logan County has three high schools, three middle schools, and 11 elementary schools as of the 2012-2013 school year.[6]

Logan County 2nd month school enrollment increased by 400 students between 2003 and 2005. Enrollment continued to increase until the 2008-2009 school year, when enrollment stagnated. . Logan County's 2nd month enrollment is average for the state (Map 7).

Figure 11: Logan County School Enrollment

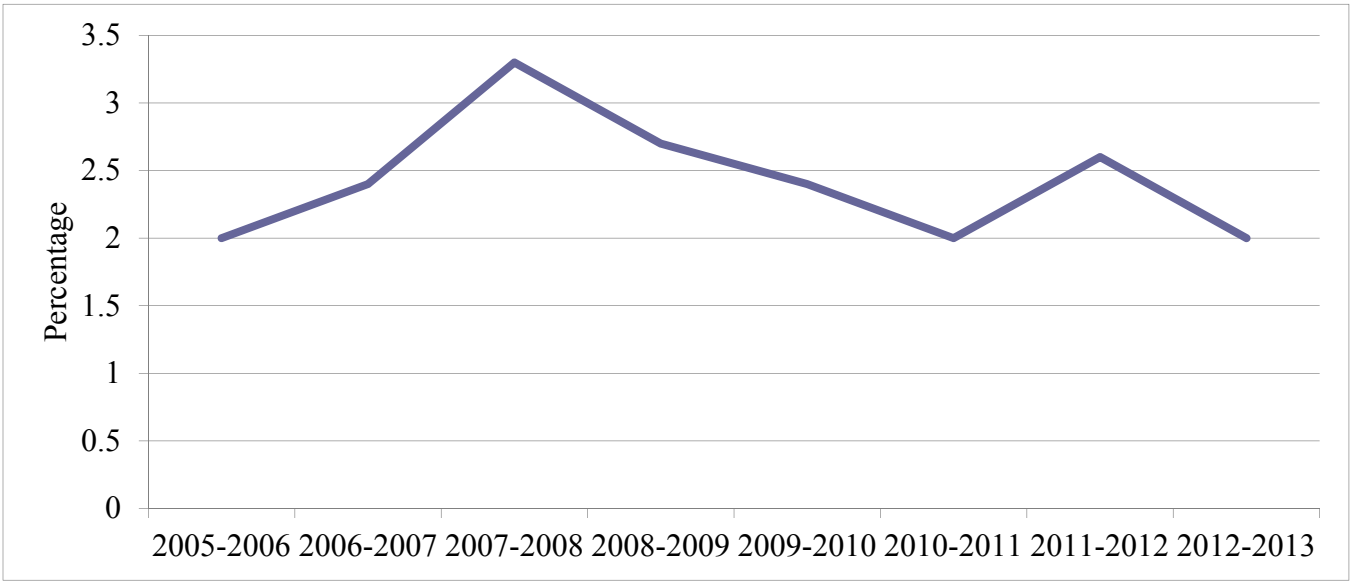


Source: WVEIS

The West Virginia Education Information System (WVEIS) also has dropout rates for the school years from 2005 to 2013. Dropout rates for grades 7-12, which showcase the most likely time for school dropouts, do not follow the total enrollment statistic, as total enrollment is computed with the grades below 7th grade as well. Dropout rates increased after the 2005-2006 school year, as students left school either for job opportunities in the sectors that were growing at the time or were leaving Logan County. The dropout rate declined after 2008 from a combination of educational promotion, which encouraged students not to leave school, and the recession, which may have generated fear in some students about their futures if they dropped out of school (Figure 12).

[6] "School Profiles," West Virginia Education Information System, West Virginia Department of Education, Accessed February 13, 2014, http://wveis.k12.wv.us/nclb/profiles/c_profile.cfm?cn=043.

Figure 12: Logan County Dropout Rate

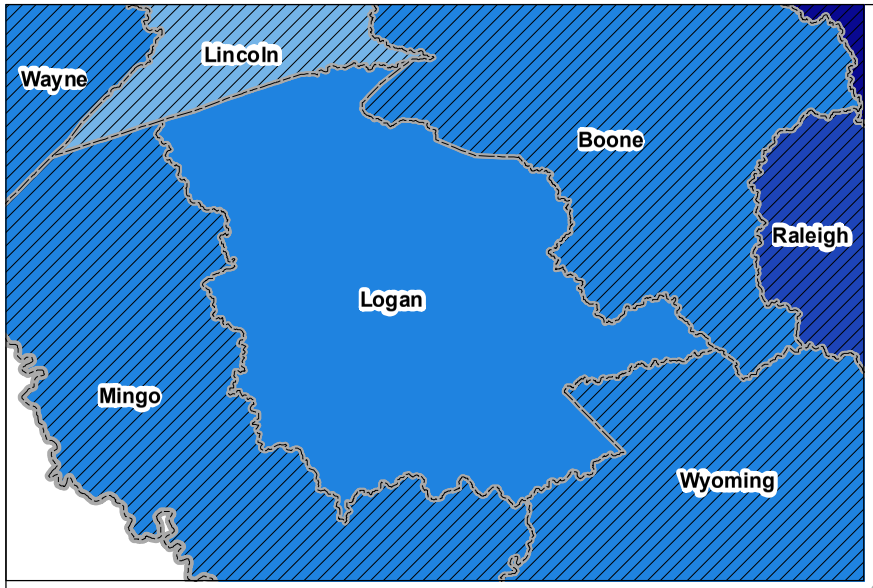


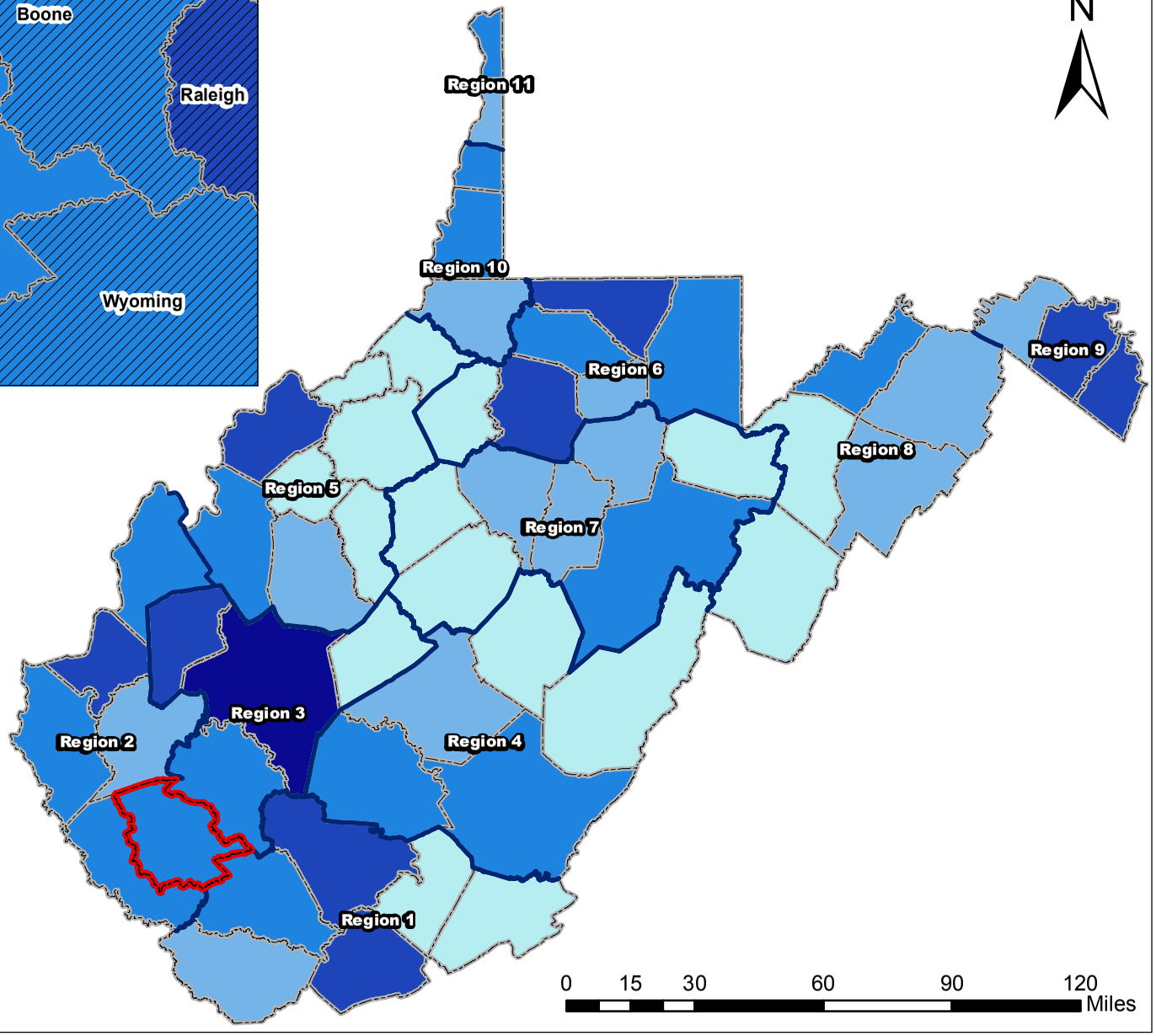
Source: WVEIS

Map 8 shows each County's dropout rate. Logan County currently has an above average dropout rate. Maps 9 and 10 show the total graduates and the graduation rate by County, which are average and below average for the state respectively. Logan County's 17 schools' locations are noted in Map 11. Not coincidentally, the major schools are located on the main roads in the County. The largest school by attendance in the County is Logan High School. The significance of the locations of these schools is the access to major transportation routes. The schools appear to be built in order for parents and students to maintain steady access, which is important to discourage dropping out and to maintain attendance levels.

NCLB - Second Month Enrollment

Logan County





N

Planning Regions Line
903.00 - 2128.00
2128.01 - 3956.00
3956.01 - 8036.00
8036.01 - 18221.00
18221.01 - 28378.00
County Boundaries

0 15 30 60 90 120
Miles

Source: West Virginia Department of Education 2014

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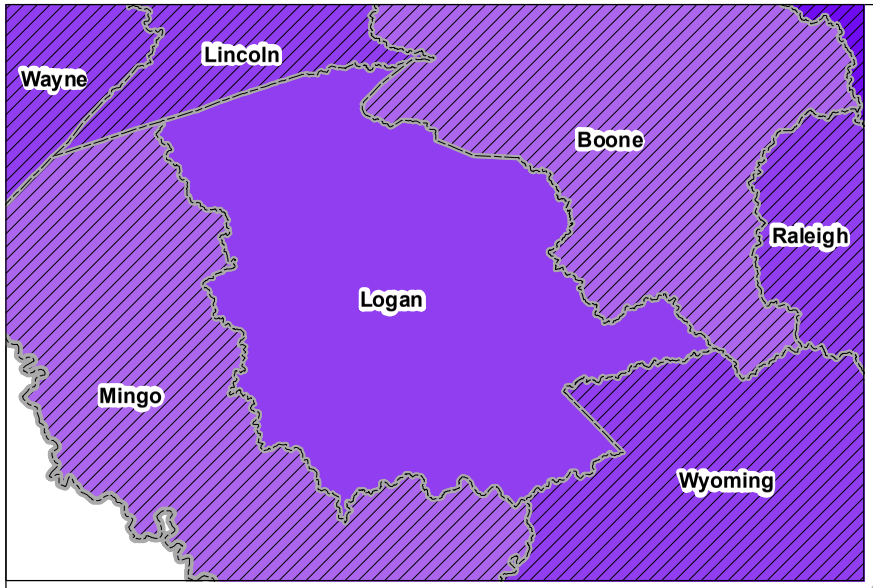
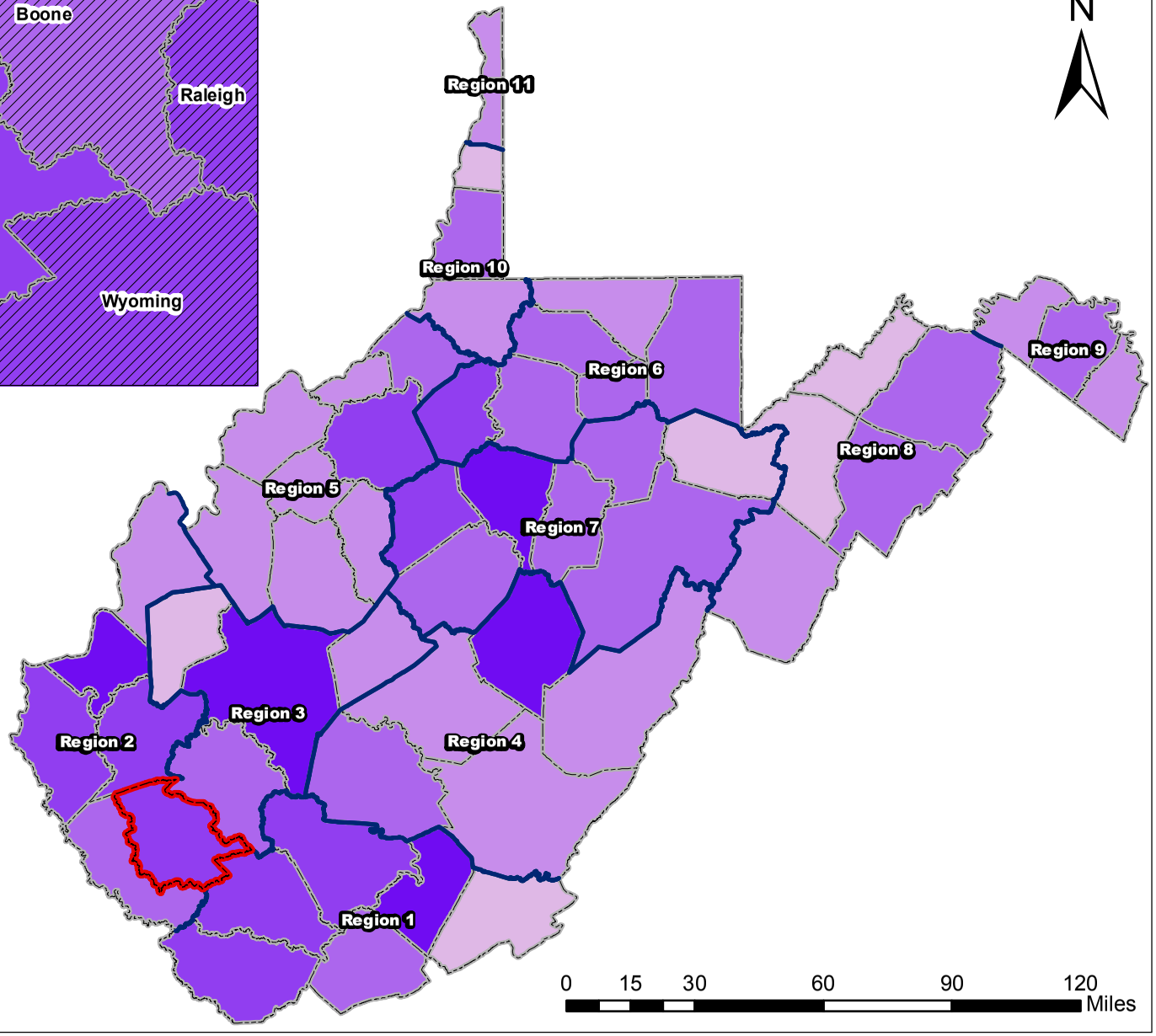
NCLB - Dropout Rate

Logan County





N

Planning Regions Line

Dropout_Rates

- 0.20% - 0.50%
- 0.51% - 1.10%
- 1.11% - 1.60%
- 1.61% - 2.30%
- 2.31% - 4.00%
- County Boundaries

0 15 30 60 90 120 Miles

Source: West Virginia Department of Education 2014

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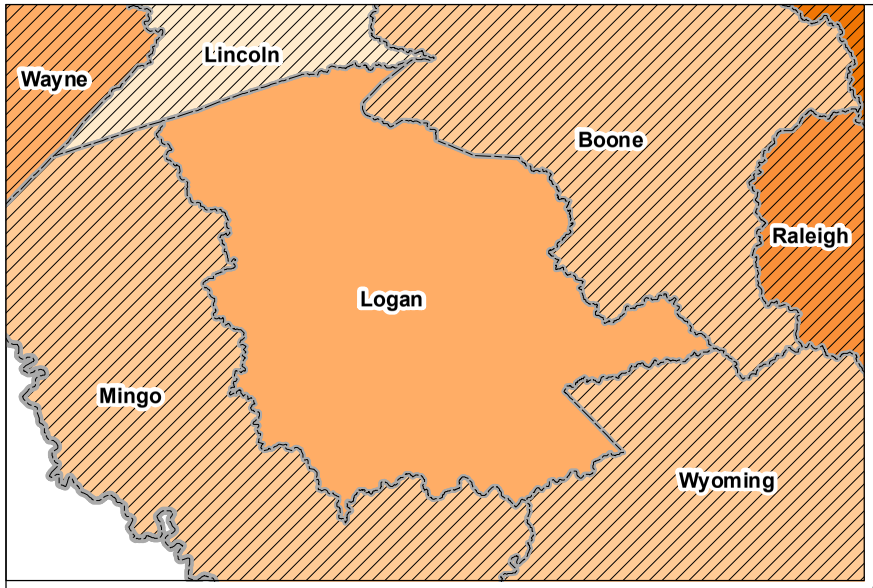
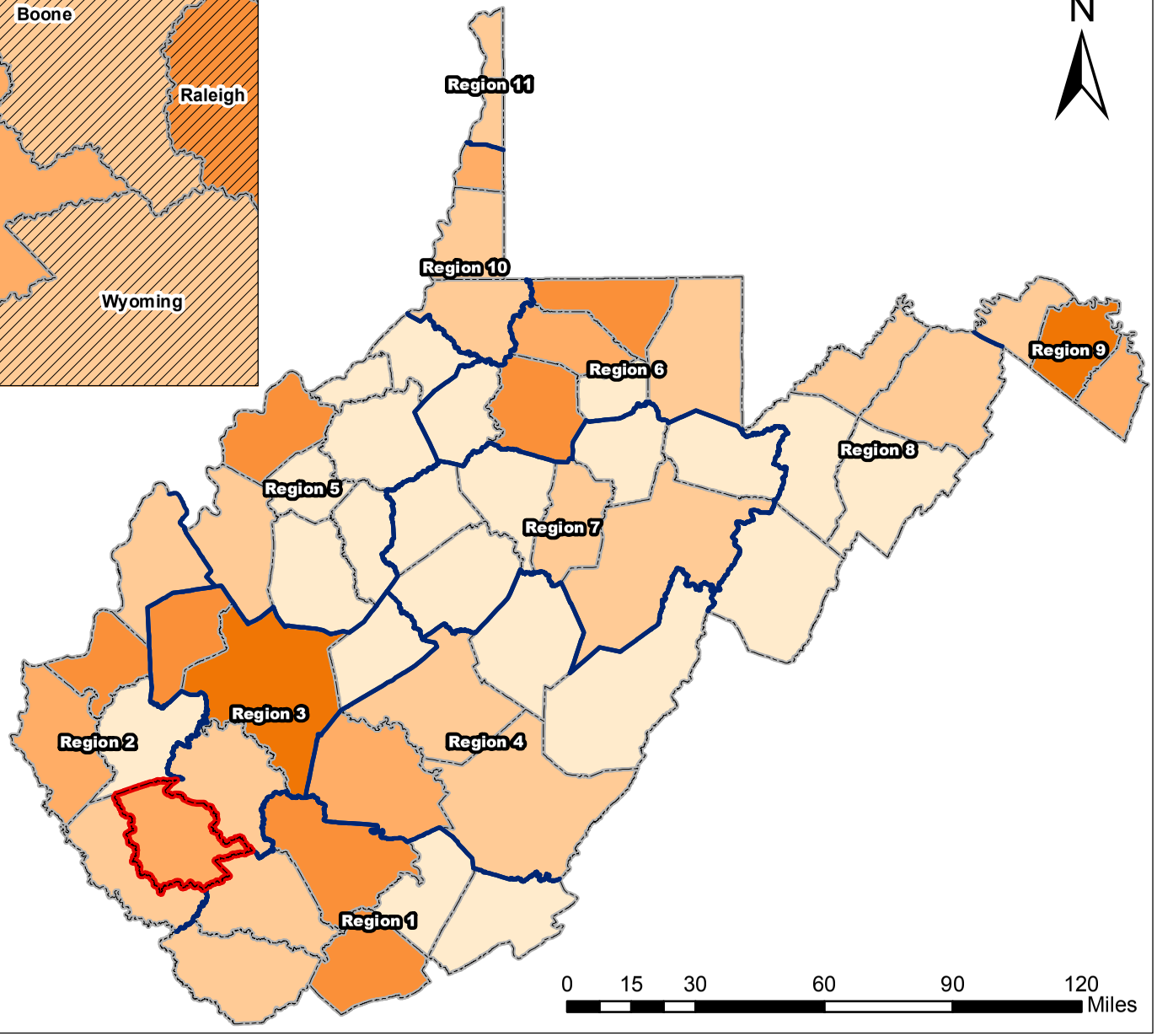
NCLB - Total Graduates

Logan County





Source: West Virginia Department of Education 2013

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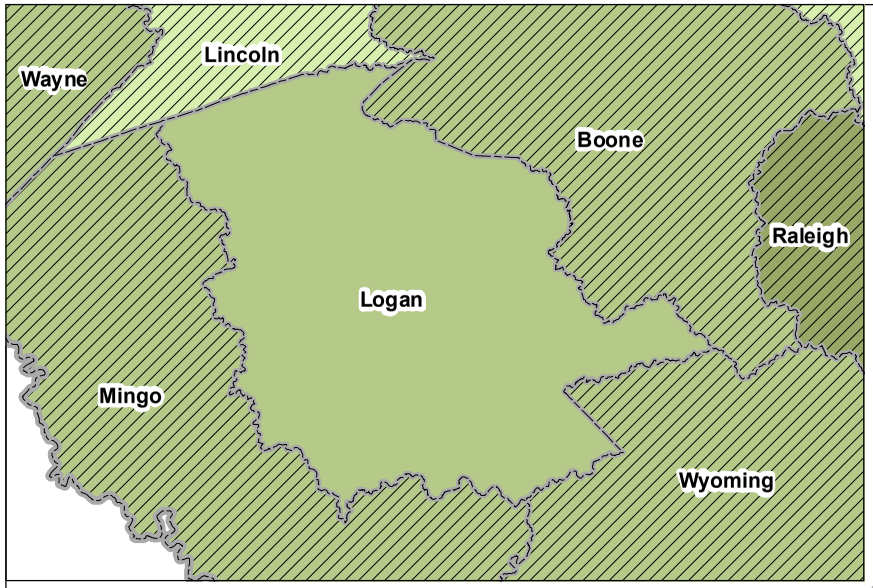
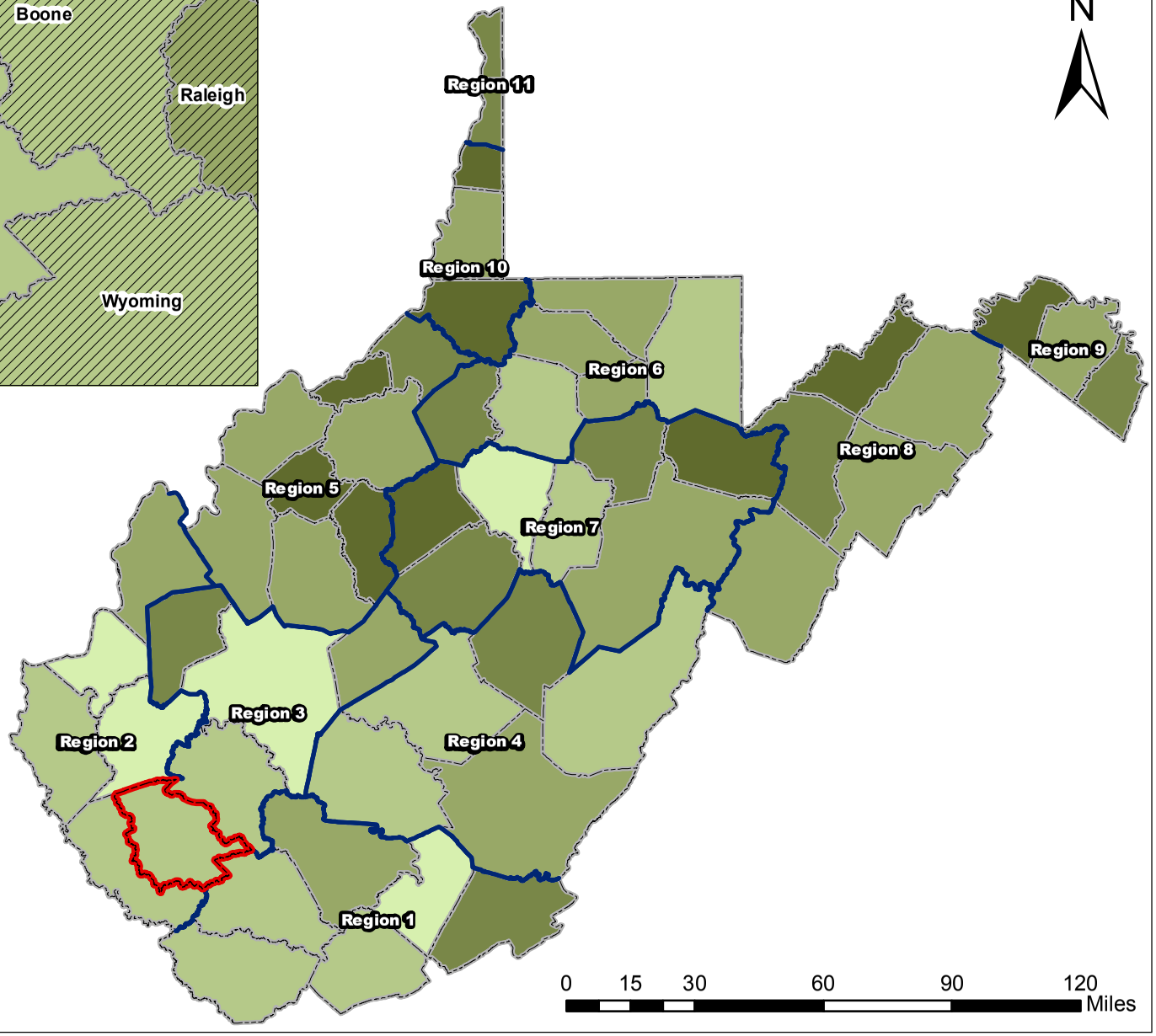
NCLB - Graduates Rate

Logan County





N

Planning Regions Line
70.85% - 76.62%
76.63% - 81.00%
81.01% - 85.00%
85.01% - 90.00%
90.01% - 97.26%
County Boundaries

0 15 30 60 90 120
Miles

Source: West Virginia Department of Education 2014

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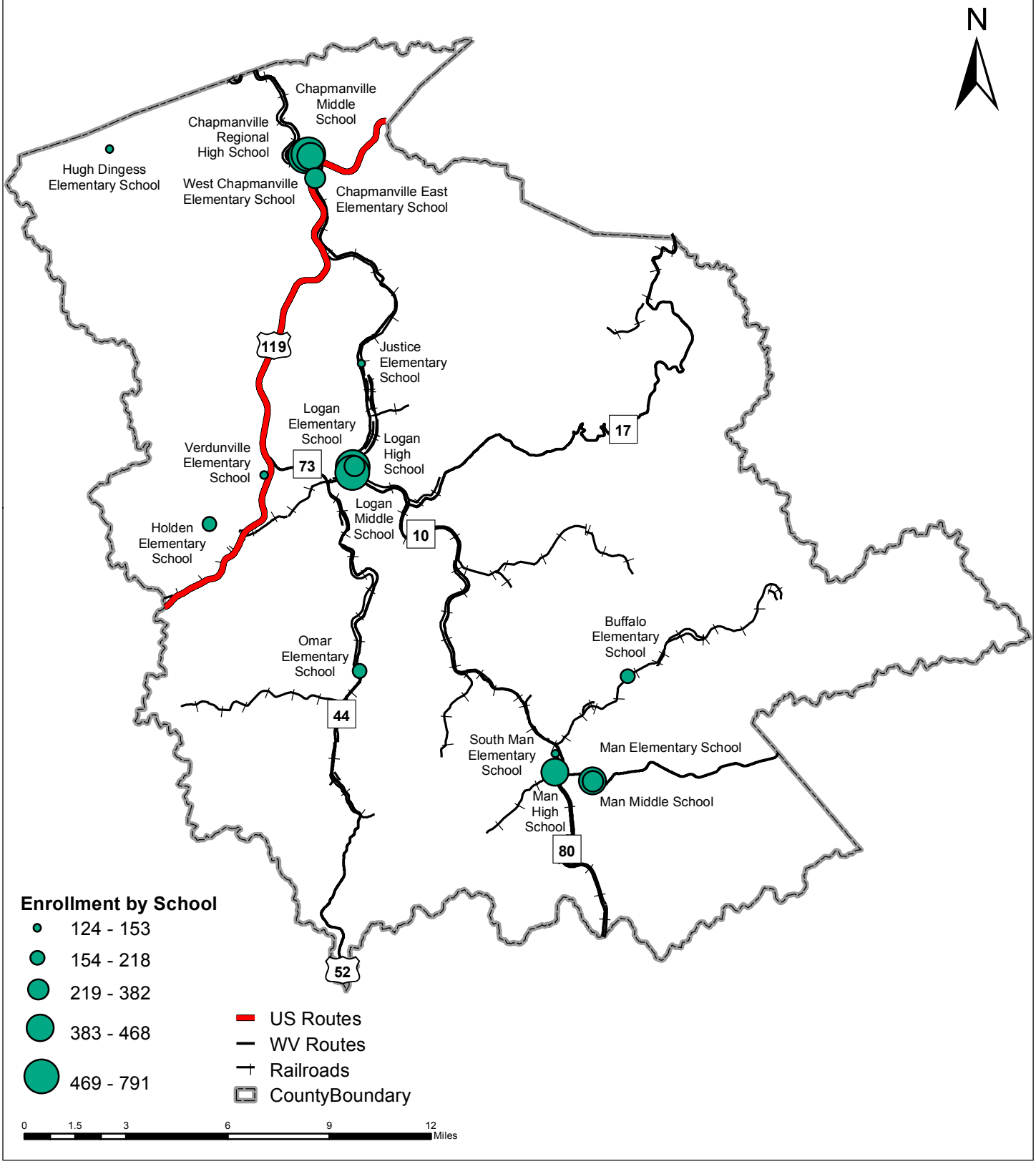
Total Attendance by School - 2014

Logan County



Source: West Virginia Department of Education 2014

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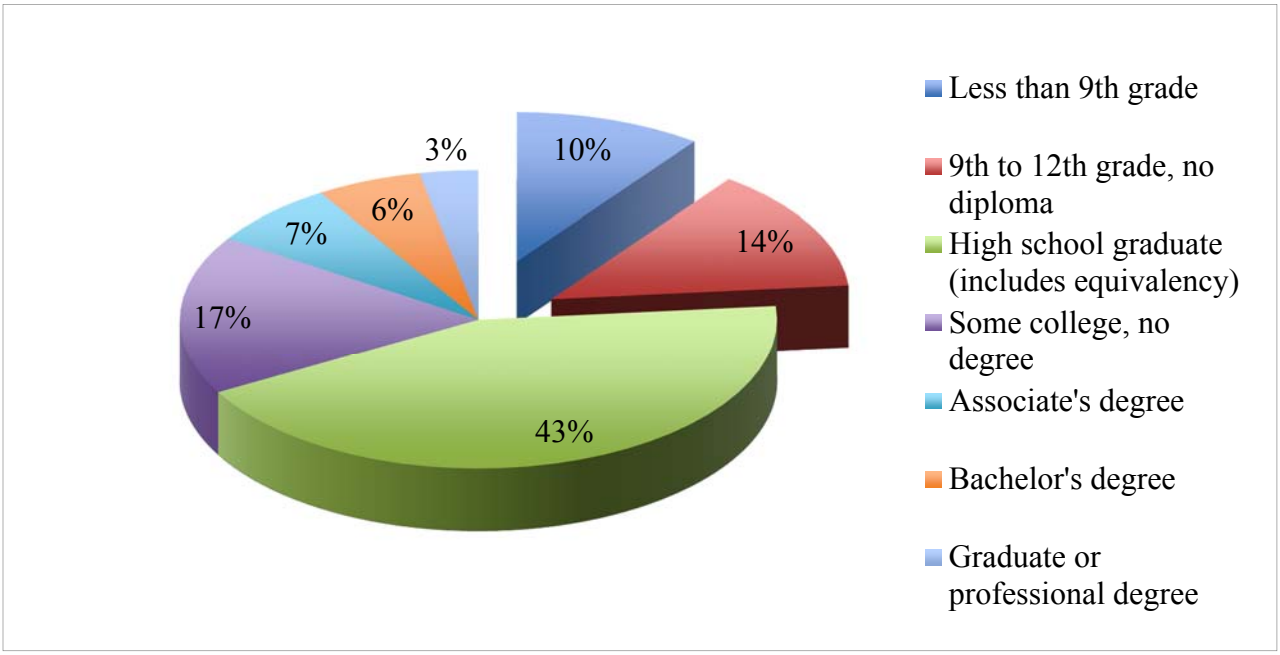
The ACS also maintains data on the educational attainment of the population that is 25 years and over. Forty-three percent of these residents have a high school diploma or equivalent. However, 24 percent have less than a high school diploma. This is a rather high number and particularly concerning when the relationship between education and jobs is considered.

Figure 13: Logan County Educational Attainment



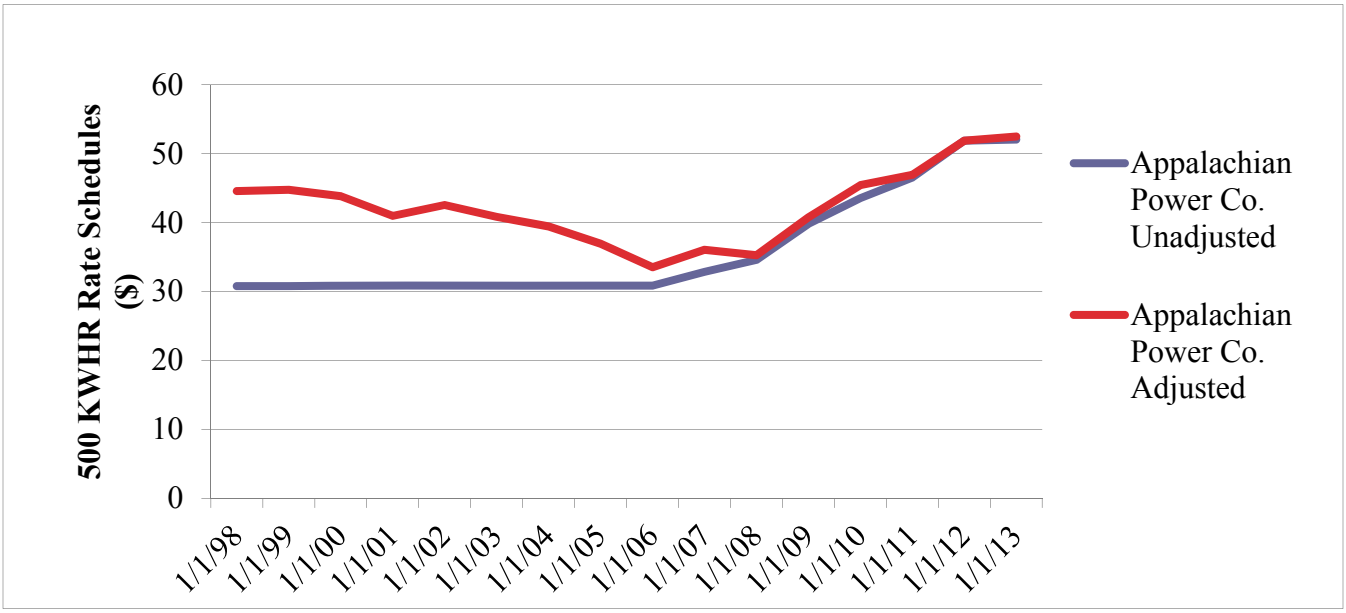
Source: 2012 American Community Survey 5-Year Estimates

Utilities and Infrastructure

Logan County has 36 utility companies according to the West Virginia Public Service Commission (PSC). Economic development depends on infrastructure, and Logan County has several providers of water and sewer and one provider of electricity. Appalachian Power Company provides residential, industrial, and large-capacity service to Logan County.

The West Virginia Public Service Commission maintains tariff rates for all companies involved in providing utilities. Of particular importance are electricity tariffs; the monitoring of these tariffs is an ongoing project. To that end, the PSC observes the growth rate of tariffs and possesses a 20-year comparison based on the average residential utility rate of the State. This provides a significant overview of how electric prices behave in West Virginia as a whole. As Figure 14 shows, if the tariffs are not adjusted by the Consumer Price Index (CPI), it would appear that rates are constantly increasing. Viewing rates in such a manner would be a misunderstanding, and would be incorrect in reference to a State with the highs and lows of West Virginia's past. The Bureau of Labor Statistics has a CPI for electricity prices dating from 1998 to 2012. The adjusted and unadjusted prices are provided in Figure 14.

Figure 14: Power Company Prices



Source: WV Public Service Commission and United States Bureau of Labor Statistics

The graph shows that electricity rates steadily decreased in real terms through 2006 and remained fairly constant with adjustment. Both adjusted and unadjusted prices have increased since 2006. Many possible factors contributed to this rise, including the increased costs of energy and the increased demand. Map 12 also shows the distribution of power lines, plants, and substations within West Virginia and Logan County.

The two other utilities of particular importance are water and sewer. Table 1 displays water and sewer metered rates for the providers of those services. They are all public services with varying rates and categories. Logan County has six public sewer and water providers. Maps 13 and 14 show the water and sewer facilities and the served areas for each of these utilities, as well as the solid waste management facilities in West Virginia, including one solid waste transfer station in Logan County.

Table 1: Logan County Water and Sewer Rates

Logan County Public Service District	
Water Rates	
First 2,000 gallons used per month	8.47 per 1,000 gallons
Next 58,000 gallons used per month	8.11 per 1,000 gallons
Next 240,000 gallons used per month	5.98 per 1,000 gallons
All Over 300,000 gallons used per month	3.13 per 1,000 gallons
Sewer Rates	
First 10,000 gallons used per month	11.89 per 1,000 gallons
All Over 10,000 gallons used per month	9.28 per 1,000 gallons

Boone County Public Service District	
Water Rates	
First 1,500 gallons used per month at the minimum charge	
Next 28,500 gallons used per month	10.29 per 1,000 gallons
Next 870,000 gallons used per month	6.78 per 1,000 gallons
Next 8,100,000 gallons used per month	4.93 per 1,000 gallons
All Over 9,000,000 gallons used per month	3.21 per 1,000 gallons
Sewer Rates	
First 3,000 gallons used per month	12.26 per 1,000 gallons
Next 3,000 gallons used per month	11.06 per 1,000 gallons
Next 4,000 gallons used per month	10.48 per 1,000 gallons
Next 10,000 gallons used per month	7.91 per 1,000 gallons
All Over 20,000 gallons used per month	7.00 per 1,000 gallons
Buffalo Creek Public Service District	
Water Rates	
First 2,000 gallons used per month	9.63 per 1,000 gallons
Next 5,000 gallons used per month	6.19 per 1,000 galions
Next 8,000 gallons used per month	4.63 per 1,000 gallons
All Over 15,000 gallons used per month	3.10 per 1,000 gallons
Sewer Rates	
All gallons used per month	5.80 per 1,000 gallons
City of Logan	
Water Rates (Municipal Water Department)	
First 2,000 gallons used per month	6.05 per 1,000 gallons
Next 3,000 gallons used per month	5.24 per 1,000 gallons
Next 25,000 gallons used per month	4.42 per 1,000 gallons
Next 70,000 gallons used per month	3.05 per 1,000 gallons
Next 100,000 gallons used per month	2.49 per 1,000 gallons
Over 200,000 gallons used per month	1.16 per 1,000 gallons
Sewer Rates (Sanitary Board)	
First 2,000 gallons used per month	14.22 per 1,000 gallons
All Over 2,000 gallons used per month	9.76 per 1,000 gallons
Town of Chapmanville	
Water Rates (Municipal Water Works)	
First 2,000 gallons used per month	9.11 per 1,000 gallons
Next 25,000 gallons used per month	6.06 per 1,000 gallons
Next 75,000 gallons used per month	4.20 per 1,000 gallons
All Over 102,000 gallons used per month	3.29 per 1,000 gallons
Sewer Rates	

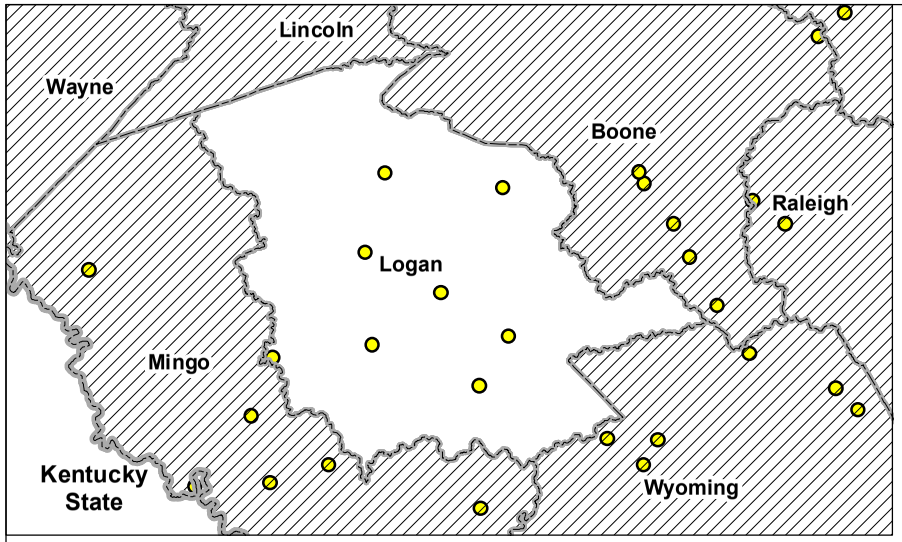
First 2,000 gallons used per month	10.00 per 1,000 gallons
Next 3,000 gallons used per month	7.50 per 1,000 gallons
Next 20,000 gallons used per month	6.50 per 1,000 gallons
Next 75,000 gallons used per month	5.00 per 1,000 gallons
Next 100,000 gallons used per month	4.00 per 1,000 gallons
Town of Man	
Water Rates	
First 2,000 gallons used per month	10.59 per 1,000 gallons
Next 6,000 gallons used per month	8.45 per 1,000 gallons
Next 7,000 gallons used per month	7.55 per 1,000 gallons
Next 15,000 gallons used per month	6.25 per 1,000 gallons
Next 40,000 gallons used per month	5.00 per 1,000 gallons
Next 280,000 gallons used per month	3.38 per 1,000 gallons
Next 350,000 gallons used per month	2.45 per 1,000 gallons
Sewer Rates (Sanitary Board)	
First 2,000 gallons used per month	5.53 per 1,000 gallons
Next 3,000 gallons used per month	5.53 per 1,000 gallons
Next 5,000 gallons used per month	4.25 per 1,000 gallons
Over 10,000 gallons used per month	4.05 per 1,000 gallons

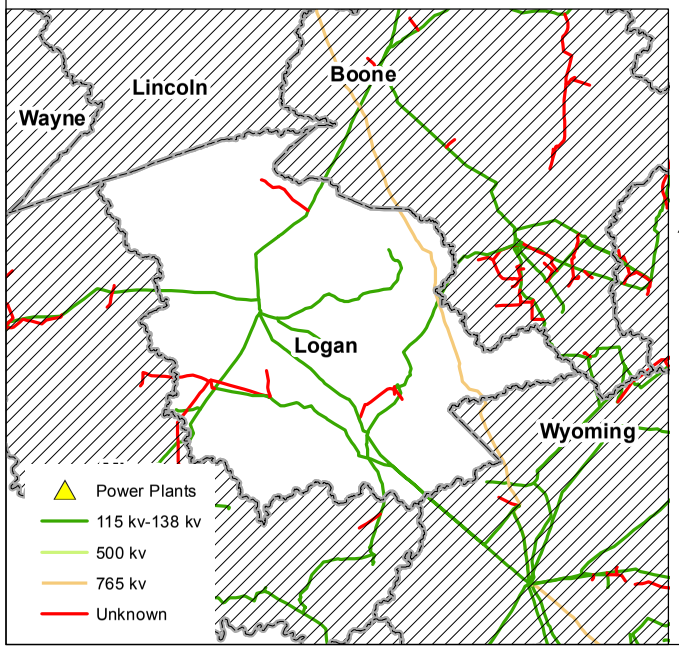
Two private water companies, West Virginia American Water Company and West Logan Water Company, also service Logan County. The general service rates are listed in the table below, and are rounded to the nearest cent.

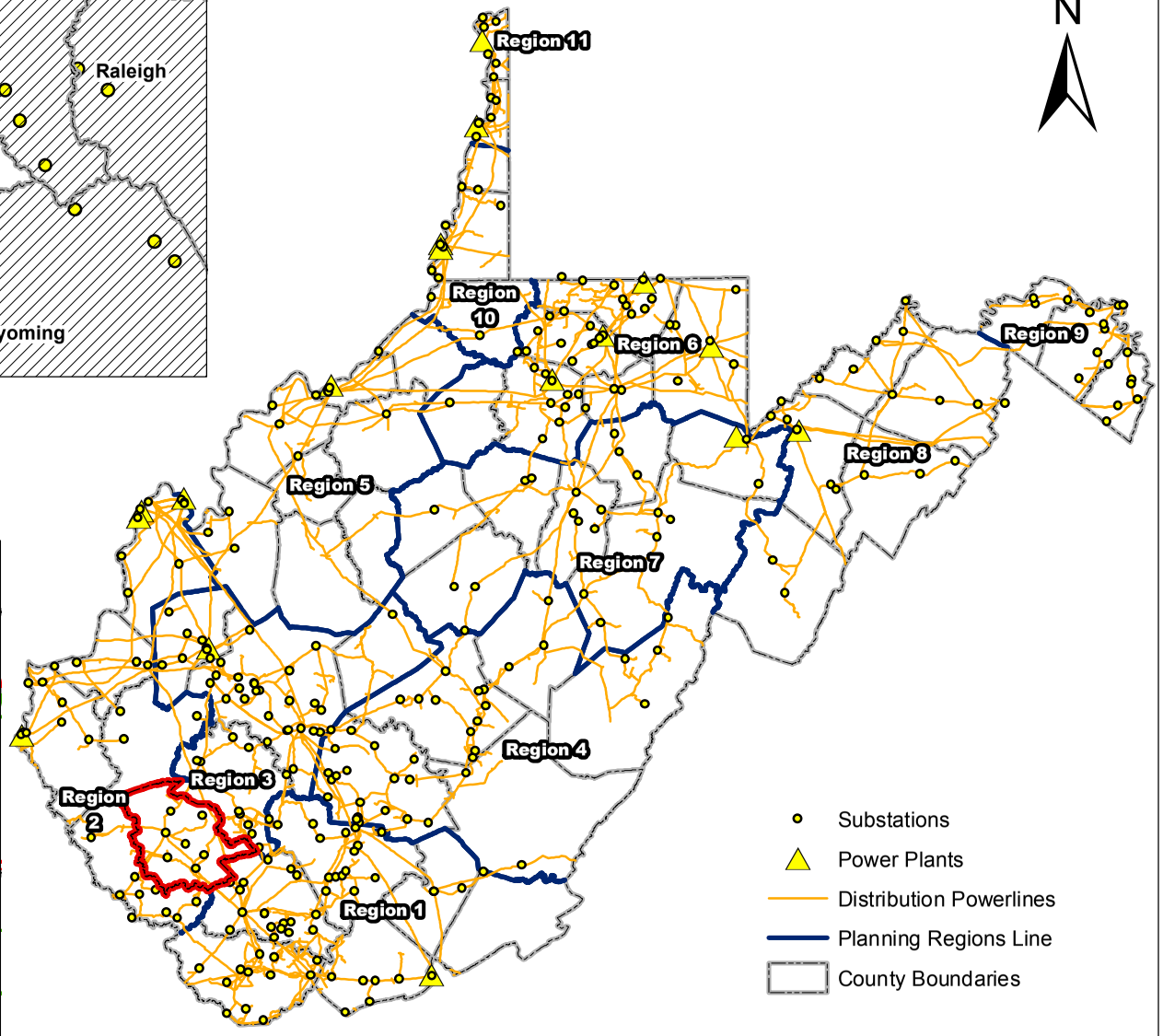
West Virginia American Water Company	
First 1,500 gallons used per month	Minimum charge based on meter size
Next 28,500 gallons used per month	9.61 per 1,000 gallons
Next 870,000 gallons used per month	6.33 per 1,000 gallons
Next 8,100,000 gallons used per month	4.61 per 1,000 gallons
All Over 9,000,000 gallons used per month	3.00 per 1,000 gallons
West Logan Water Company	
First 2,000 gallons used per month	8.92 per 1,000 gallons
Next 3,000 gallons used per month	7.97 per 1,000 gallons
Next 5,000 gallons used per month	7.02 per 1,000 gallons
Next 15,000 gallons used per month	6.03 per 1,000 gallons
Next 25,000 gallons used per month	5.65 per 1,000 gallons
Next 50,000 gallons used per month	5.15 per 1,000 gallons
All Over 100,000 gallons used per month	3.73 per 1,000 gallons

Utilities - Electricity

Logan County







Source: West Virginia Division of Natural Resources, Statewide Addressing and Mapping 2008

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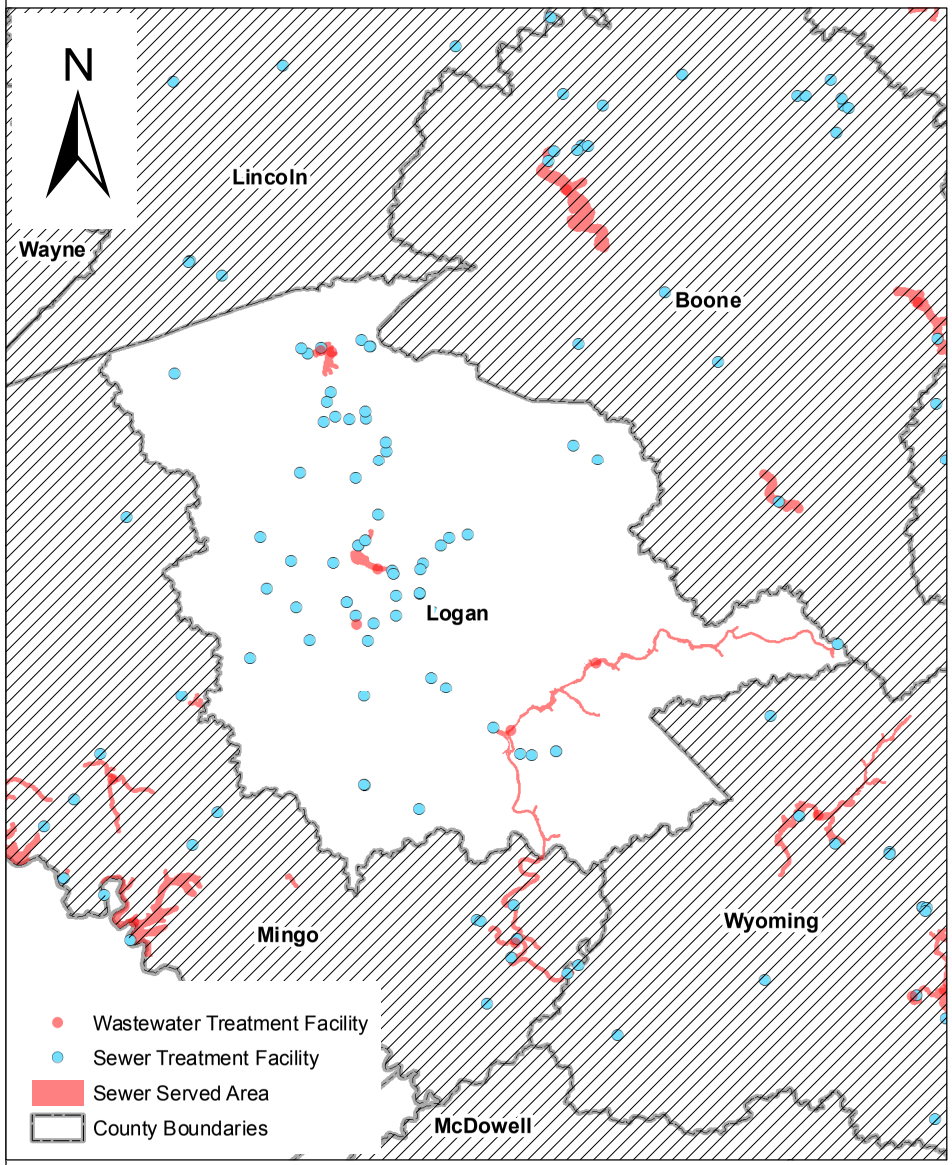
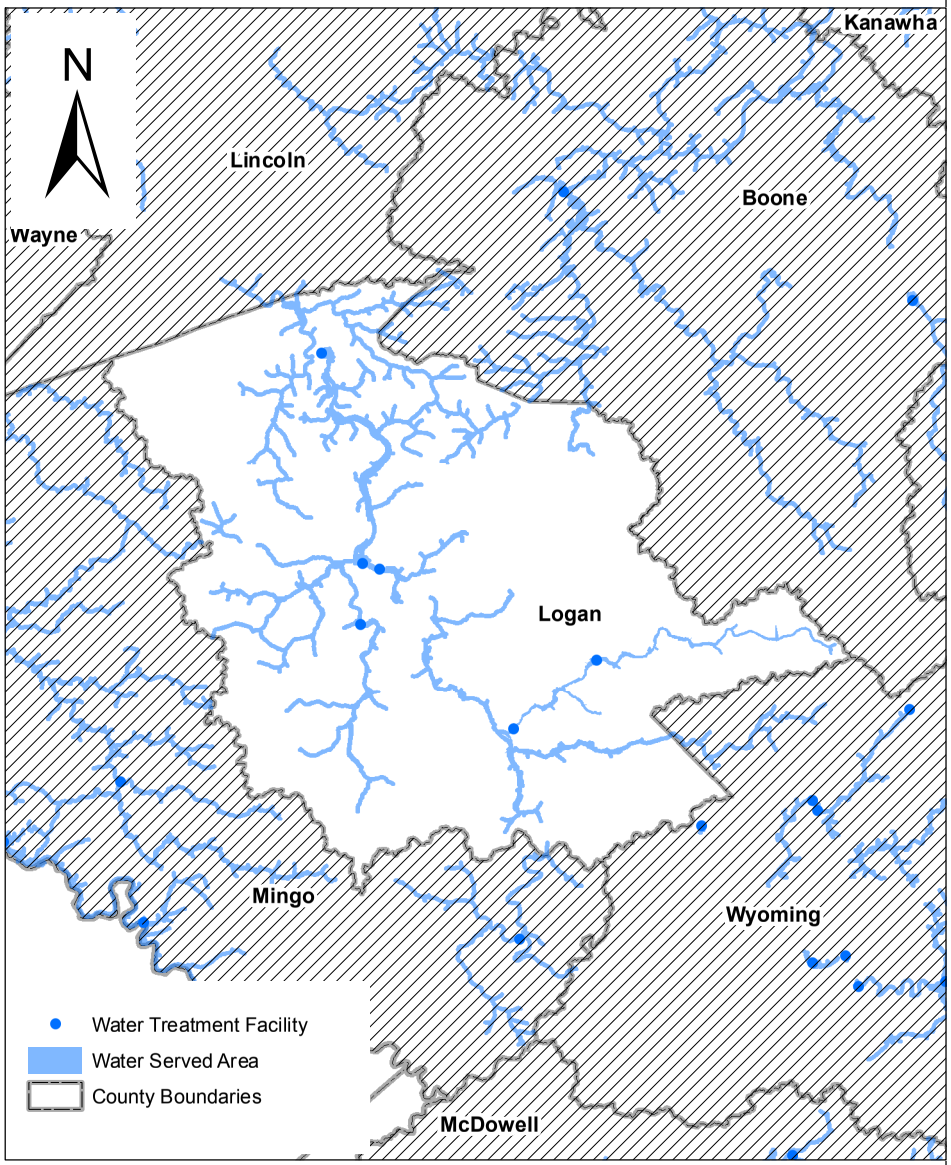
Utilities - Water and Sewer

Logan County





0 15 30 60 90 120
Miles

Source: West Virginia Infrastructure and Jobs Development Council N.A.

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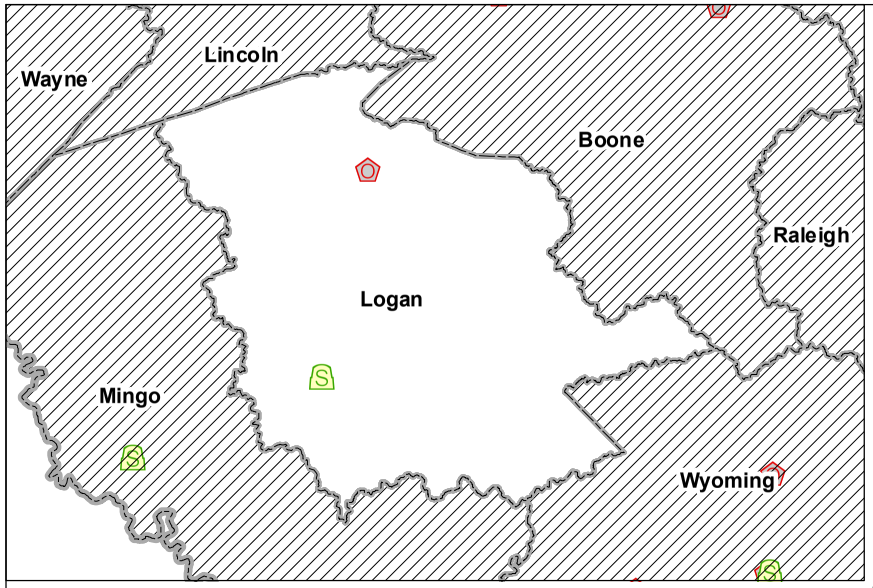
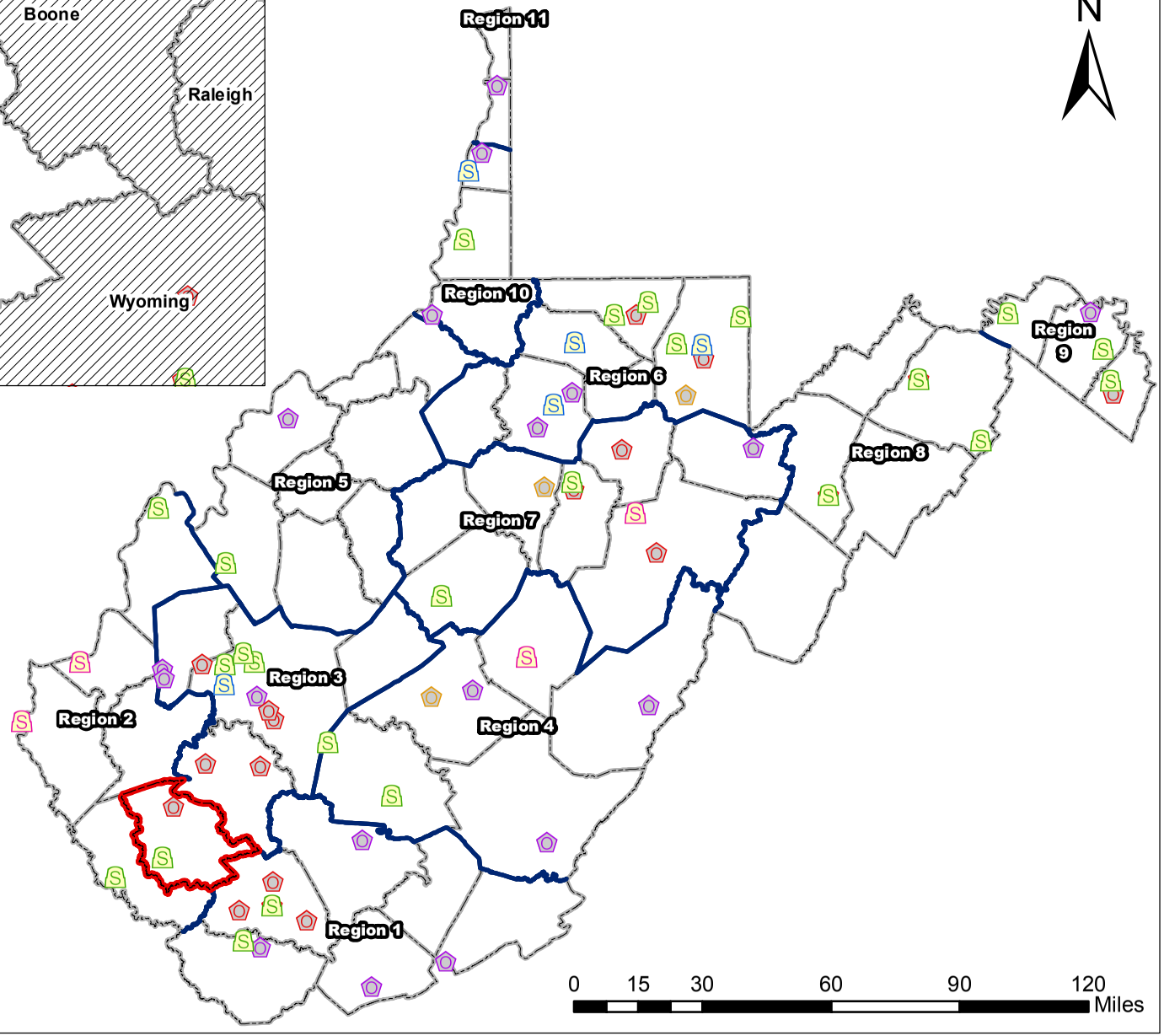
Utility - Solid Waste Facility

Logan County





N

Non Operational Facility

- Post-closure status
- Closure status
- A non LCAP** facility

Operational Facility

- Operational landfill
- Solid waste transfer station
- Operational tire monofill
- Planning Regions Line
- County Boundaries

** Landfill Closure Assistance Program

0 15 30 60 90 120 Miles

Source: West Virginia Solid Waste Management Board 2012

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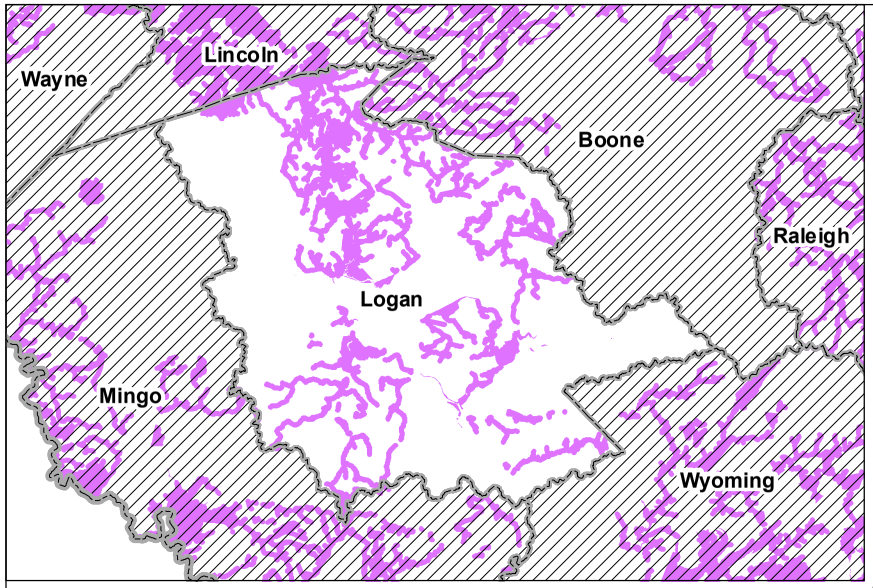
One essential modern convenience, now widely understood as an essential utility in a globalized world, is broadband access. The following 11 maps demonstrate Logan County's broadband infrastructure in relation to the State's. The largest number of providers in Logan County is 5 in areas with higher population density than the rest of the County. Logan County broadband infrastructure resembles more populous counties rather than coalfield counties. Of particular note is the lack of fixed wireless, the connection of two fixed points wirelessly by radio or other links, and the large swaths of area without broadband coverage. The lack of broadband is extensive, part of a pattern of rural counties not containing broadband access, but for Logan County is not as extensive as the surrounding coalfield counties.

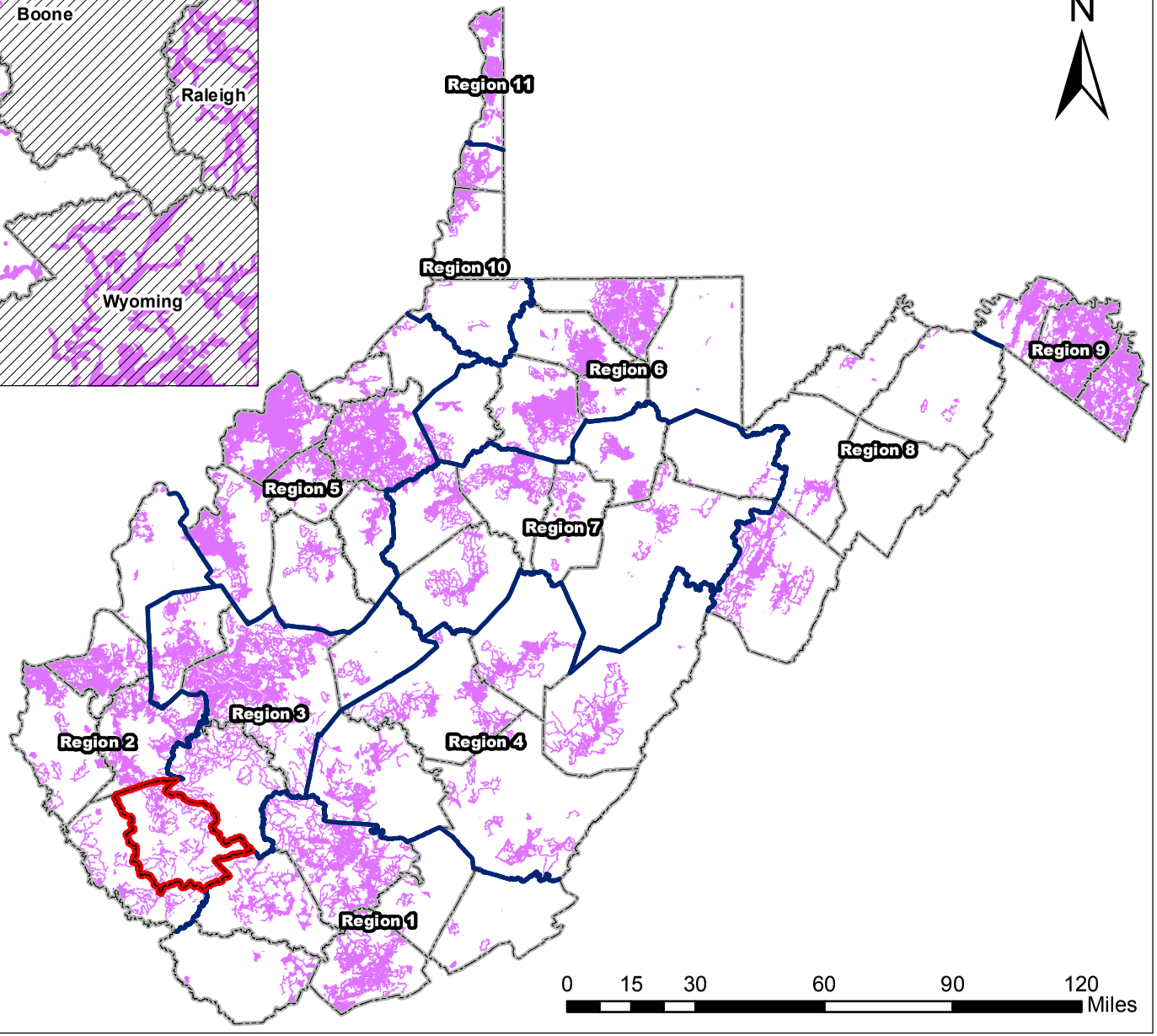
Map 15 shows physical cable infrastructure running from ISPs to other structures. DSL, BPL, and other copper represent the transferal system of broadband (Map 16). Map 17 shows the entire wire system, represented by physical wires, while Maps 18 and 19 show the maximum uploading and downloading speeds for the system. Map 20 shows the total number of providers, which is denser in the more economically developed areas of the State. Map 21 has fixed wireless coverage, or the connection between two fixed points wirelessly by radio or other links, and the next two maps show the maximum uploading and downloading speeds in a given area (22 and 23). Map 24 shows the location of mobile wireless coverage, including for smartphones and tablets, and Map 25 shows areas where no broadband coverage is reported in any way.

Each of these maps shows the same pattern in Logan County internet service as exhibited by WV. Internet service, specifically broadband, is non-existent in many rural areas, and instead focuses on population centers. While this may be financially wise, it deprives rural areas of an increasingly integral link to a globalized economy and society. All areas now need broadband service, and a complete inventory of these services is needed to plan for future investment in any given area. Logan County still has large areas without broadband, but its system is more extensive than other coalfield counties. This could position Logan County as a major residential and economic hub. Note also that the map data is for 2012, the most recent map available. Changes have been made since that time, thanks to broadband expansion programs encouraged by the state.

Broadband - Internet Cable and FTTP Coverage

Logan County





Source: West Virginia Broadband Mapping Program 2012

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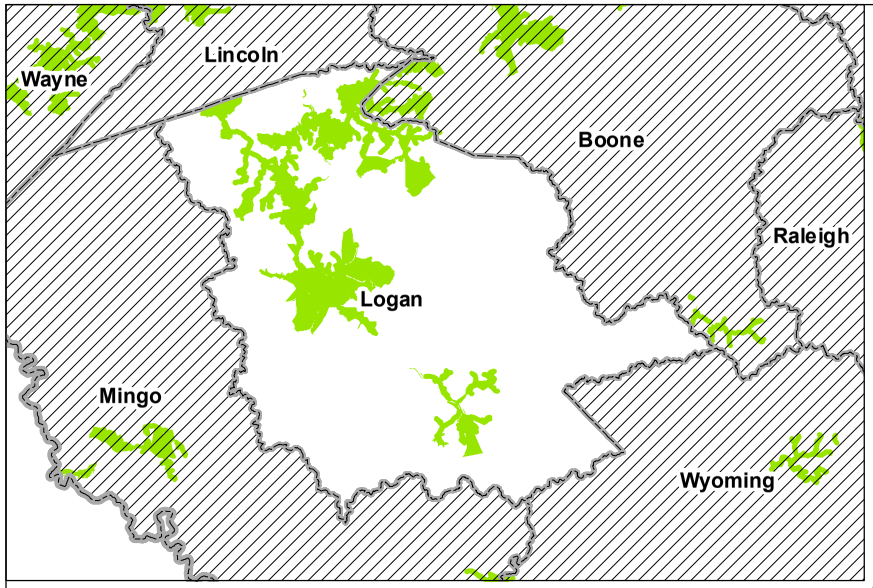
Broadband - Internet DSL, BPL, Other Copper

Logan County



Source: West Virginia Broadband Mapping Program 2012

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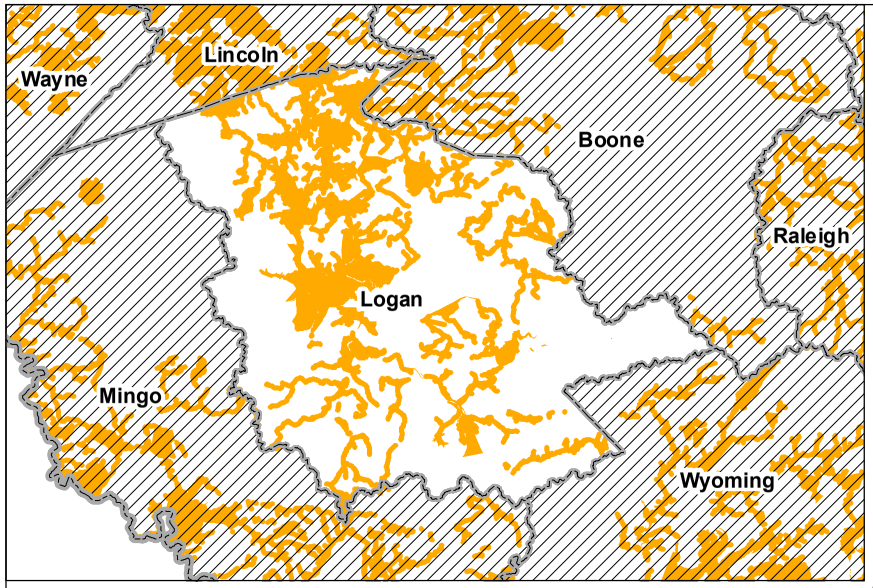
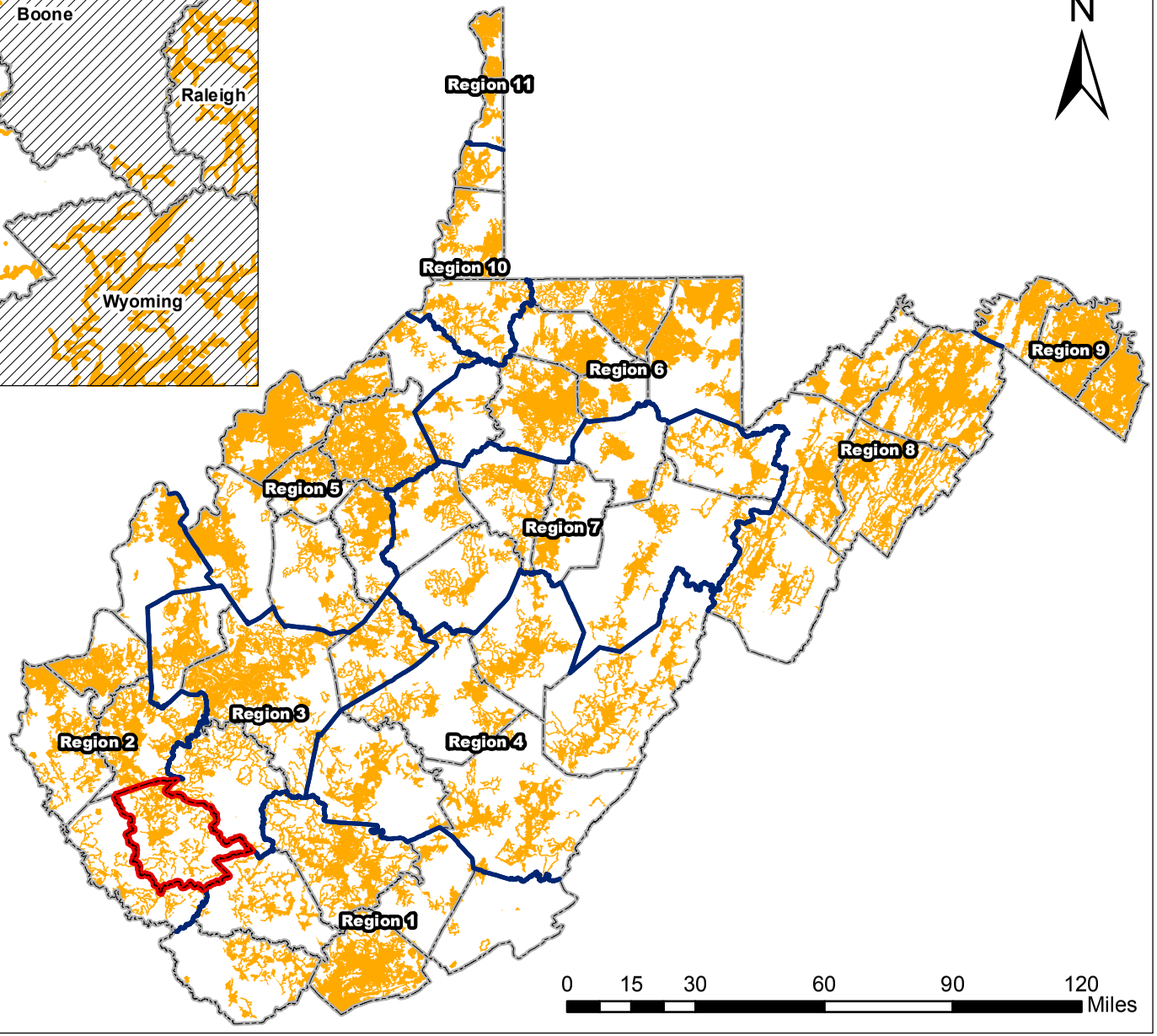
Broadband - Internet Wireline Coverage

Logan County





N

Planning Regions Line
Wireline Coverage
County Boundaries

0 15 30 60 90 120
Miles

Source: West Virginia Broadband Mapping Program 2012

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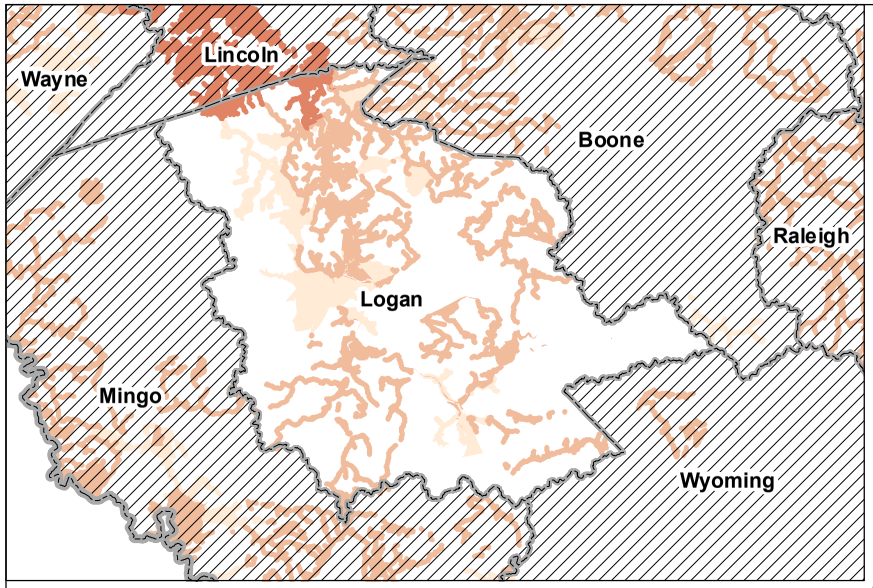
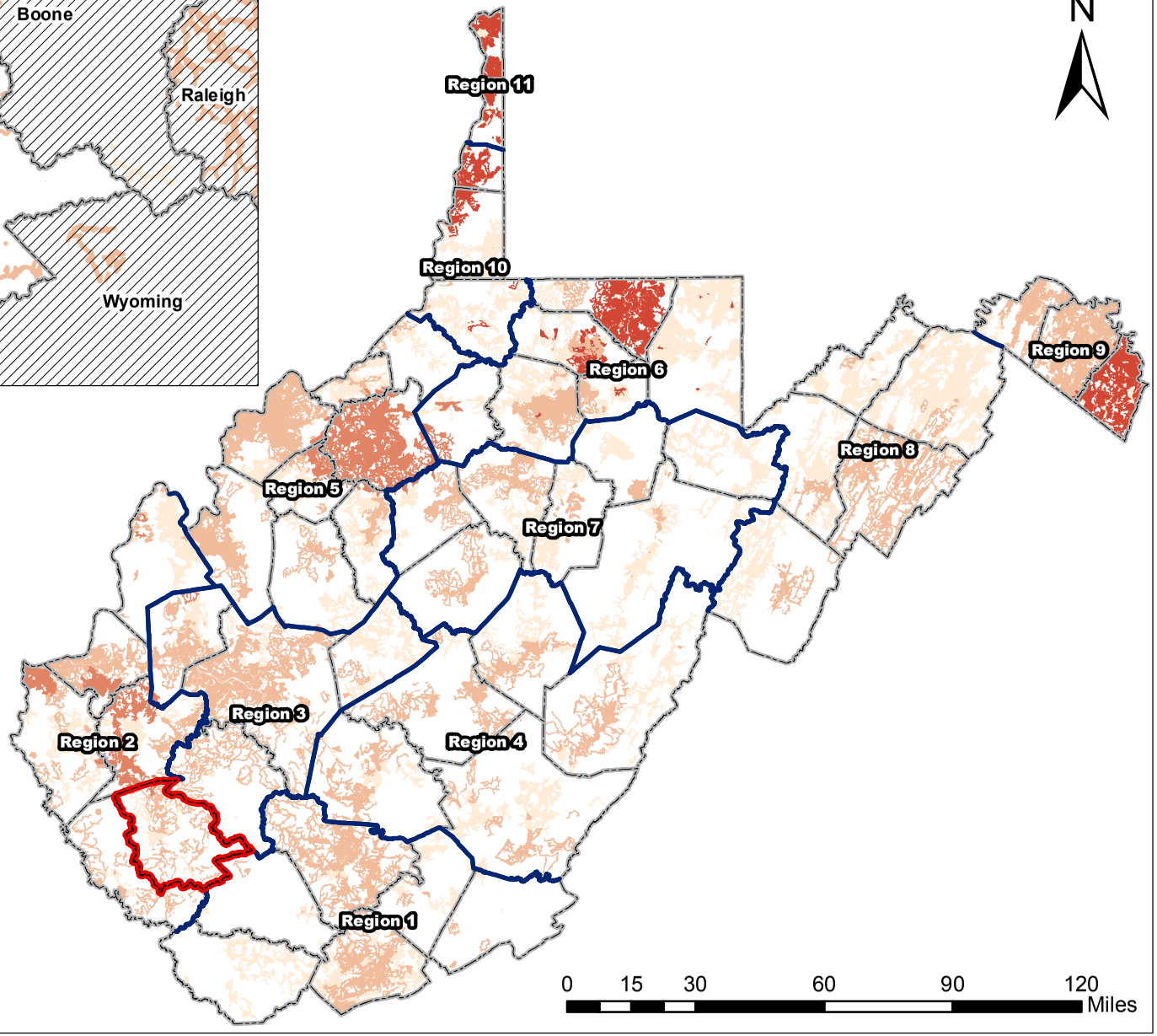
Broadband - Internet MaxUp Speed Wireline

Logan County





Source: West Virginia Broadband Mapping Program 2012

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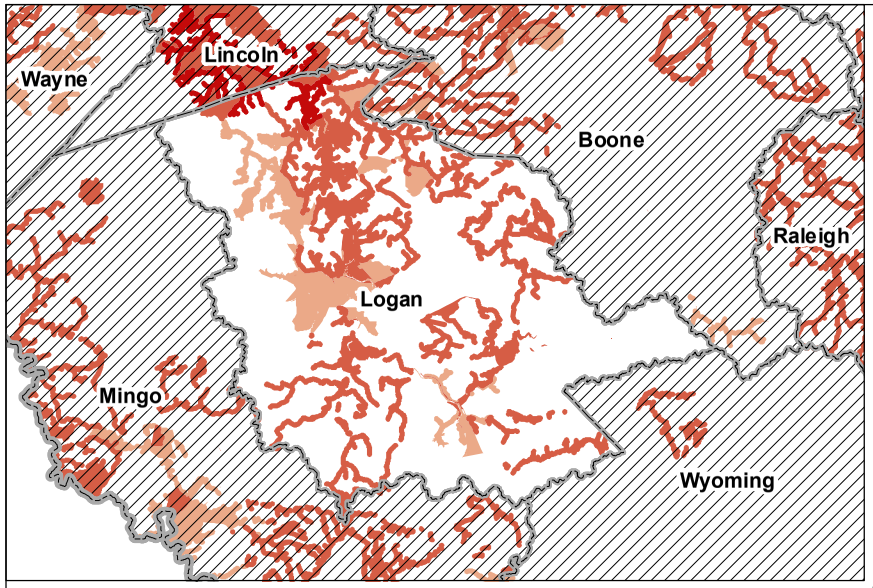
Broadband - Internet MaxDown Speed Wireline

Logan County



Source: West Virginia Broadband Mapping Program 2012

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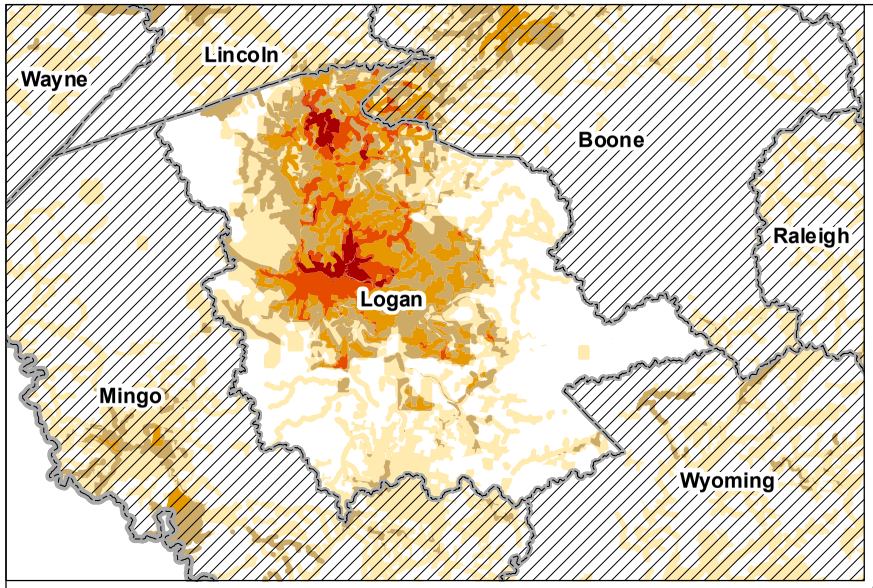
Broadband - Internet Total Number of Providers

Logan County



Source: West Virginia Broadband Mapping Program 2012

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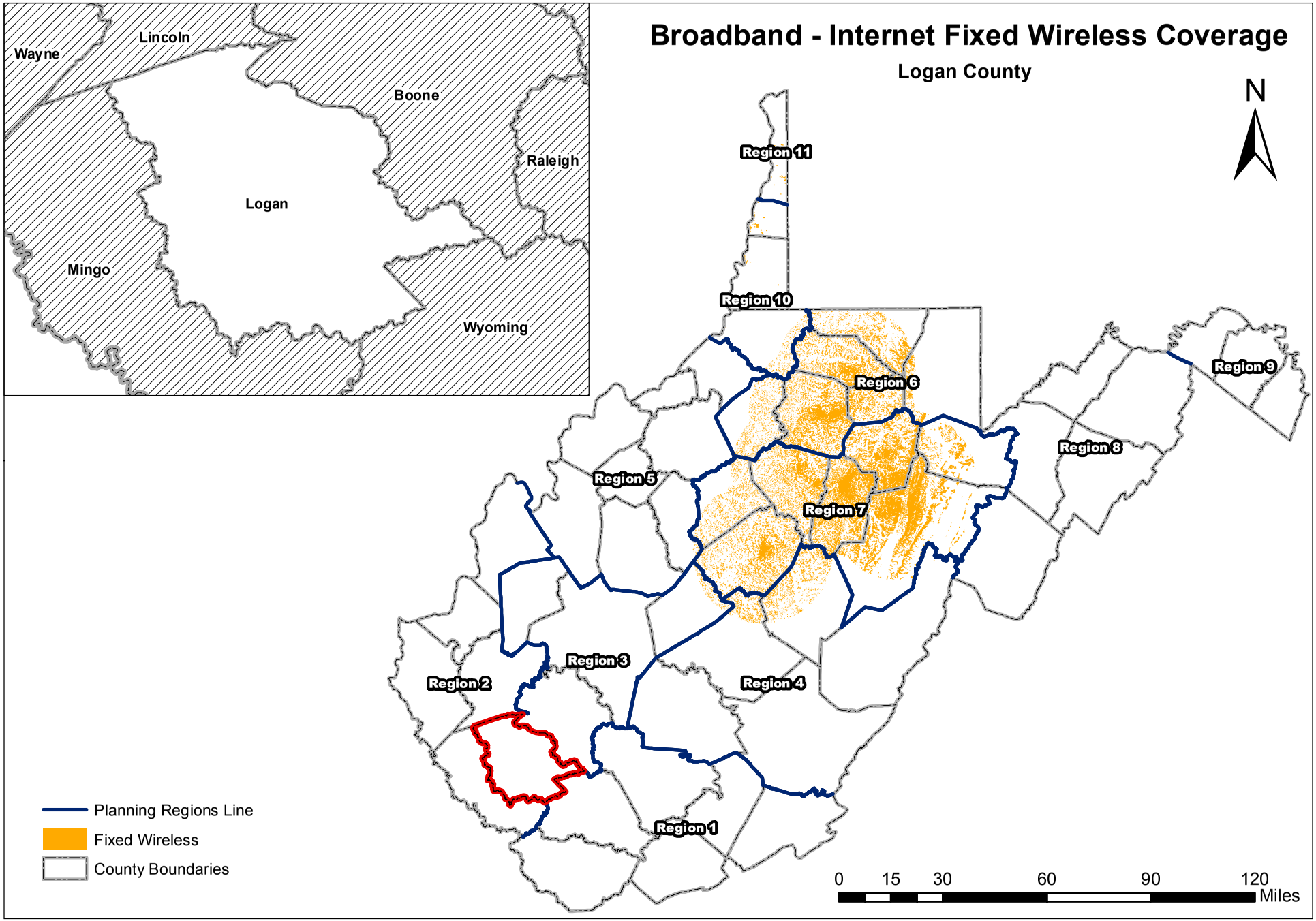
Broadband - Internet Fixed Wireless Coverage

Logan County



Source: West Virginia Broadband Mapping Program 2012

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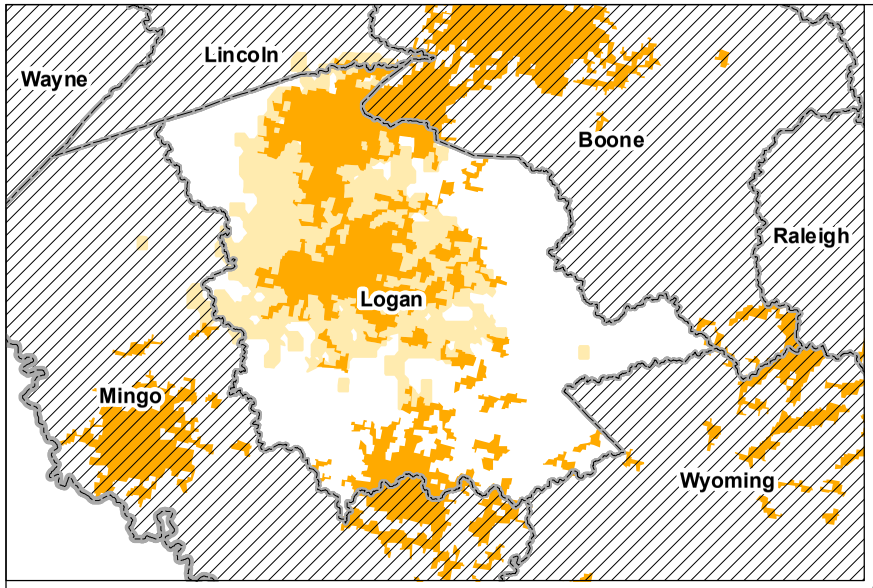
Broadband - Internet MaxDown Speed Wireless

Logan County



Source: West Virginia Broadband Mapping Program 2012

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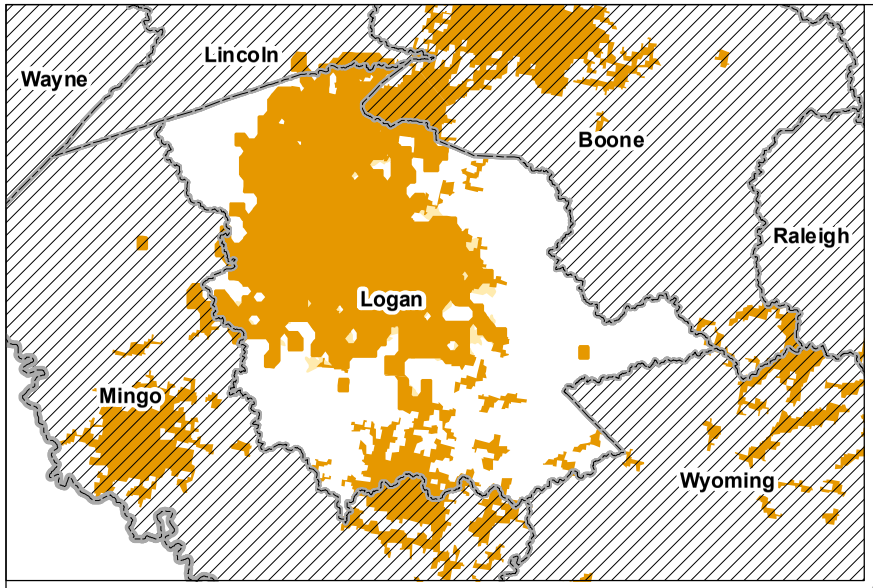
Broadband - Internet MaxUp Speed Wireless

Logan County



Source: West Virginia Broadband Mapping Program 2012

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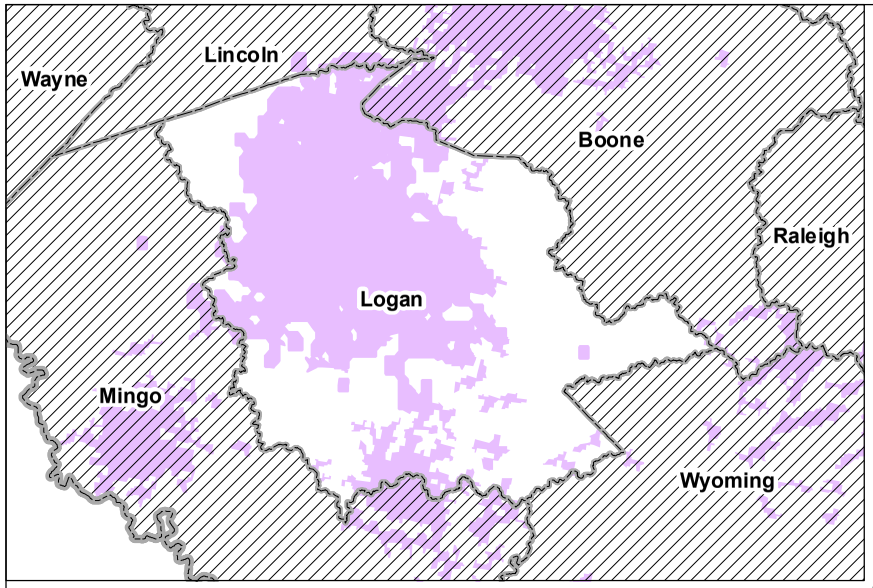
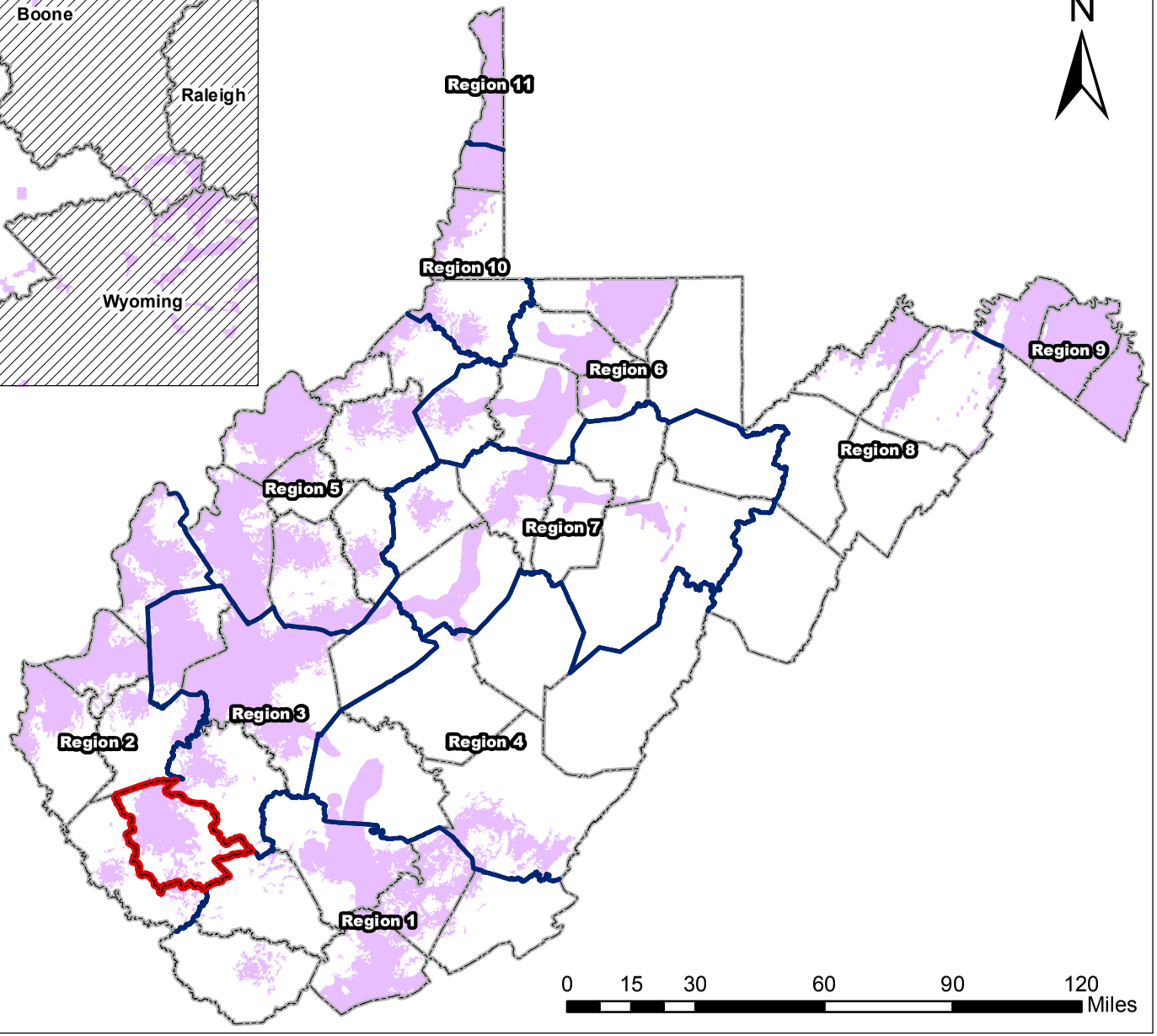
Broadband - Internet Mobile Wireless Coverage

Logan County





Source: West Virginia Broadband Mapping Program 2012

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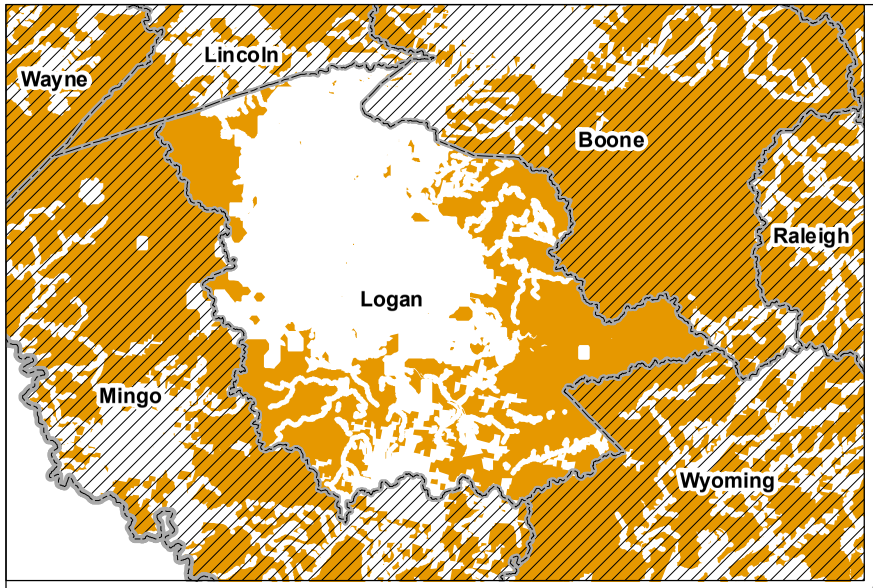
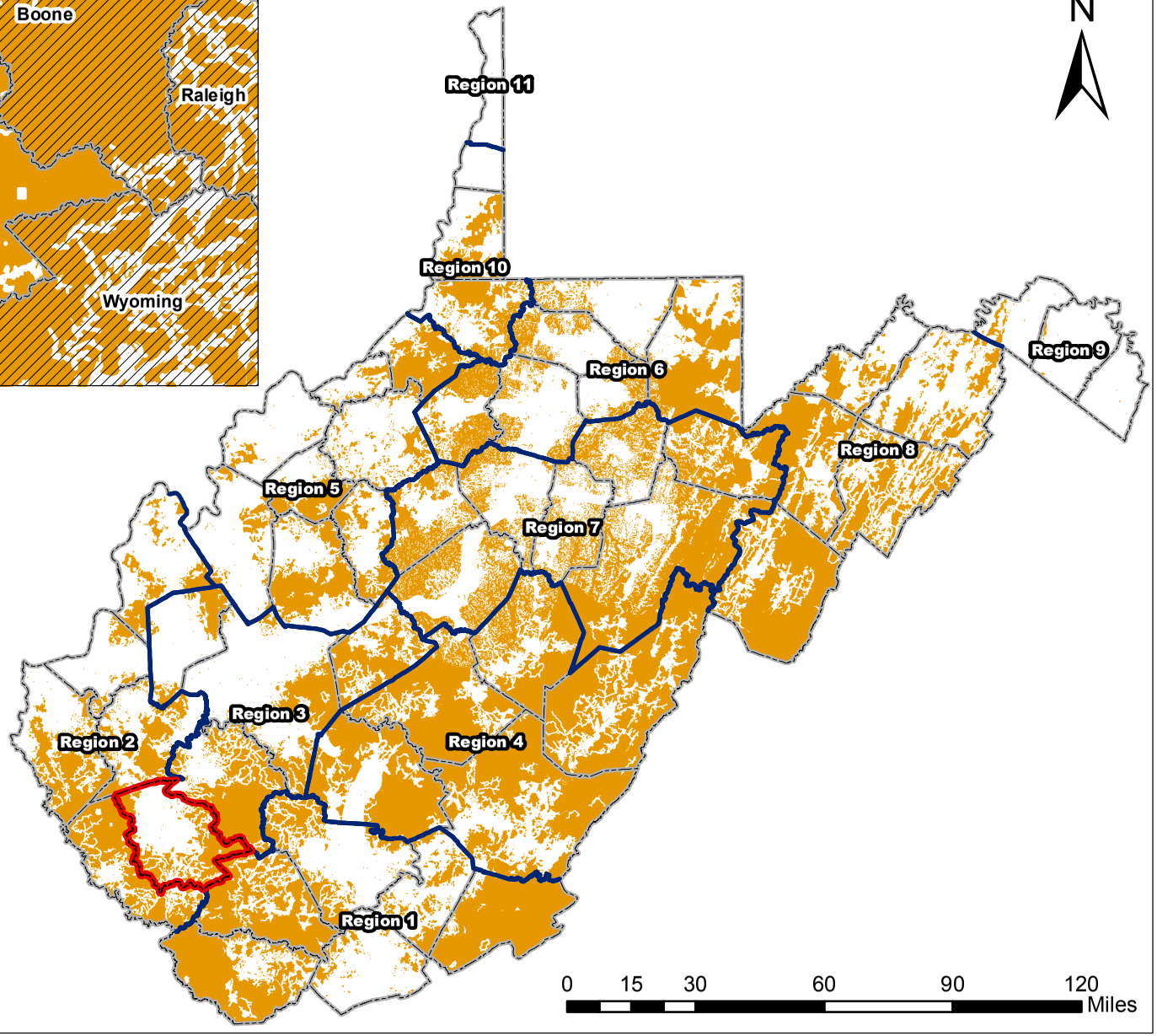
Broadband - No Broadband Coverage

Logan County





Source: West Virginia Broadband Mapping Program 2012

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Transportation

Highways

Logan County's main thoroughfare is US Route 119. Logan County has no interstate and five State Routes; 10, 17, 44, 73, and 80. A small part of US Route 52 is at the southern tip of the County. (Map 26).

Rail

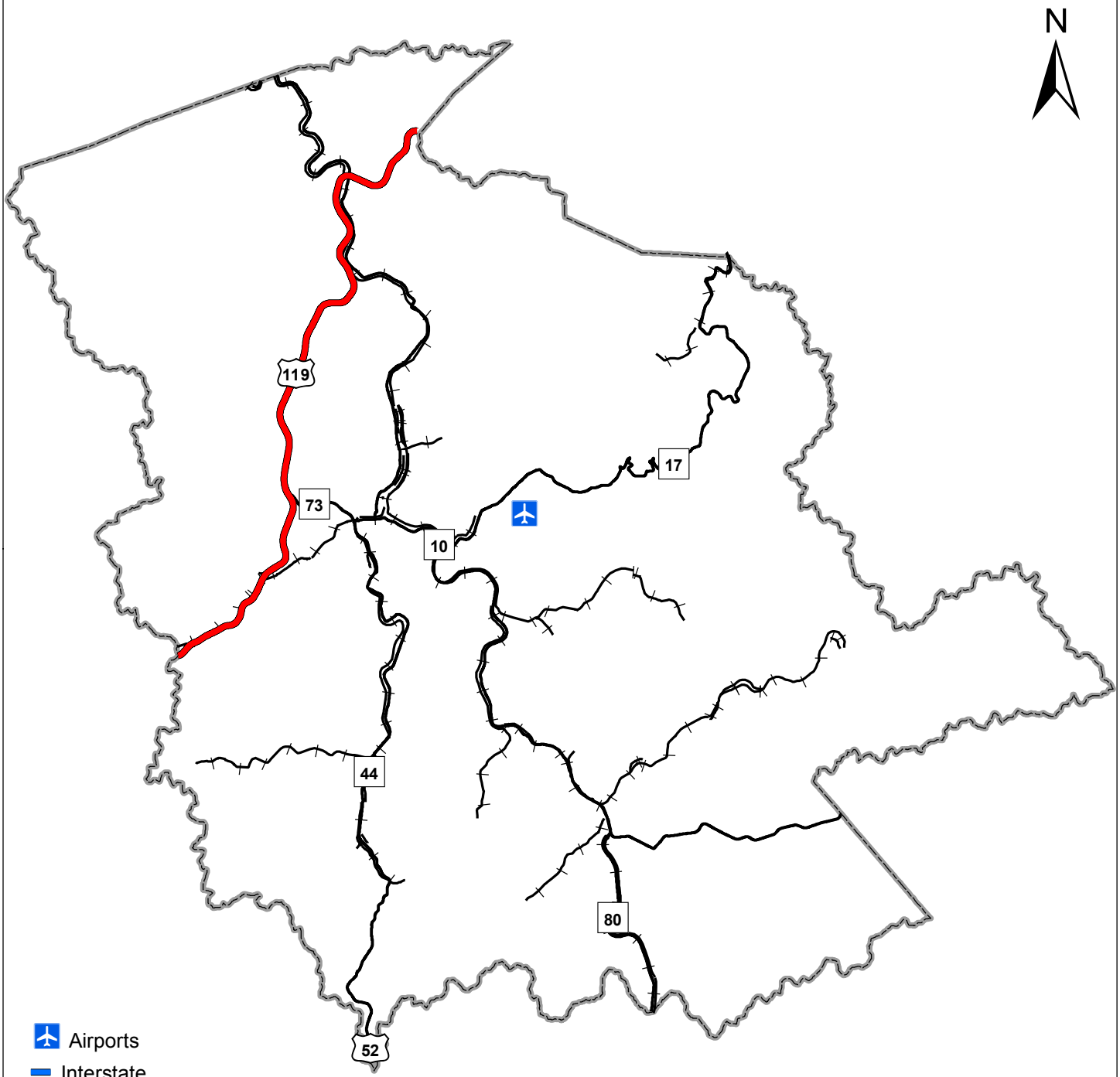
Logan County has an extensive rail system to complement its natural resource activities. The system is owned entirely by CSX and consists of 112 miles of track across the county.

Air

Logan County is home to the Logan County Airport, a few miles from the city of Logan. It is a public airport that was activated in 1993. It is owned by the Logan County Airport Authority, a public entity, and has 25 aircraft based on the airport.

Transportation

Logan County



Source: Airports; United States Department of Transportation 2012, West Virginia GIS Technical Center; US Routes, West Virginia Routes, I66 Pikeville, King Coal Highway; West Virginia Department of Transportation 2012; Railroads; Rahall Transportation Institute 2012

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Current Post-Mine Economic Development Sites

Logan County has four major developments on its post-mine sites. This is an encouraging sign showcasing interest in post-mine land development, and the diversity in developments signifies the varying interests that post-mine land can be utilized to attract.[7]

Logan County Airport

Logan County Airport was built on post-mine land in 1993. Airports are integral regional, national, and international links to commerce. Although not all airports are destined to be major hubs, this access can be essential for those in rural areas, such as coalfield counties, in maintaining vital links to more metropolitan areas. As the land is usually already cleared, airports are an excellent example of post-mine land utilization.

Southwestern Regional Jail

Sources indicate that Southwest Regional Jail in Logan is also built on a post-mine site. Though prisons are not the most attractive use, they provide security to communities, assistance for inmates, and can attract jobs to the area.

Chief Logan Recreational Center

Recreation is one of the key utilizations of post-mine lands. Chief Logan Recreational Center, labeled after the namesake of Logan County, is on six acres of reclaimed mine land and provides athletic and fitness programs to improve lifestyles in Logan County. Recreation areas can not only improve life but also bring money and potentially act as tourism attractions.[8]

Hatfield-McCoy Trails

Hatfield-McCoy Trails is a multi-County trail system in West Virginia known nationally for its off-highway vehicle trails. The trail is named after a famous feuding family that fought after the Civil War. Opening in 2000, the trails have expanded tremendously, and in 2006 generated an economic impact of 7.7 million dollars for the State of West Virginia. The trail system adapts to the mining character of Logan County and consistently adjusts trails to run on post-mine land. [9]

---

[7] "Development on Post Mined Land," Google, September 28, 2010, Accessed July 2, 2013, http://www.wvgazette.com/static/coal%20tattoo/Post%20Mine%20Land%20Use%20Employment%209-28-2010.pdf

[8] "Chief Logan Recreational Center," Google, February 2, 2014, Accessed March 3, 2014, http://www.chiefloganreccenter.org/

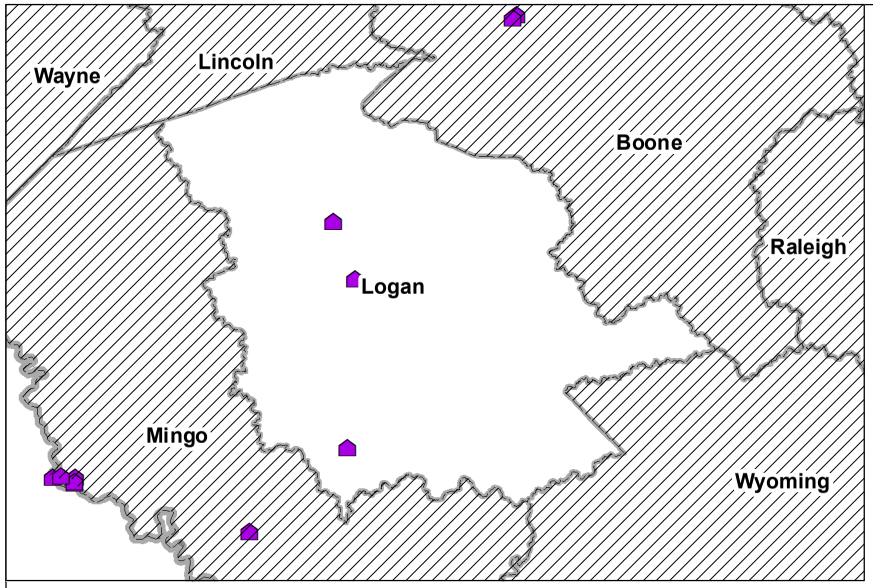
[9] Center for Business and Economic Research. "The Economic Impact of the Hatfield-McCoy Trail System in West Virginia." Prepared for the Hatfield-McCoy Regional Recreation Authority, Huntington, WV (2012).

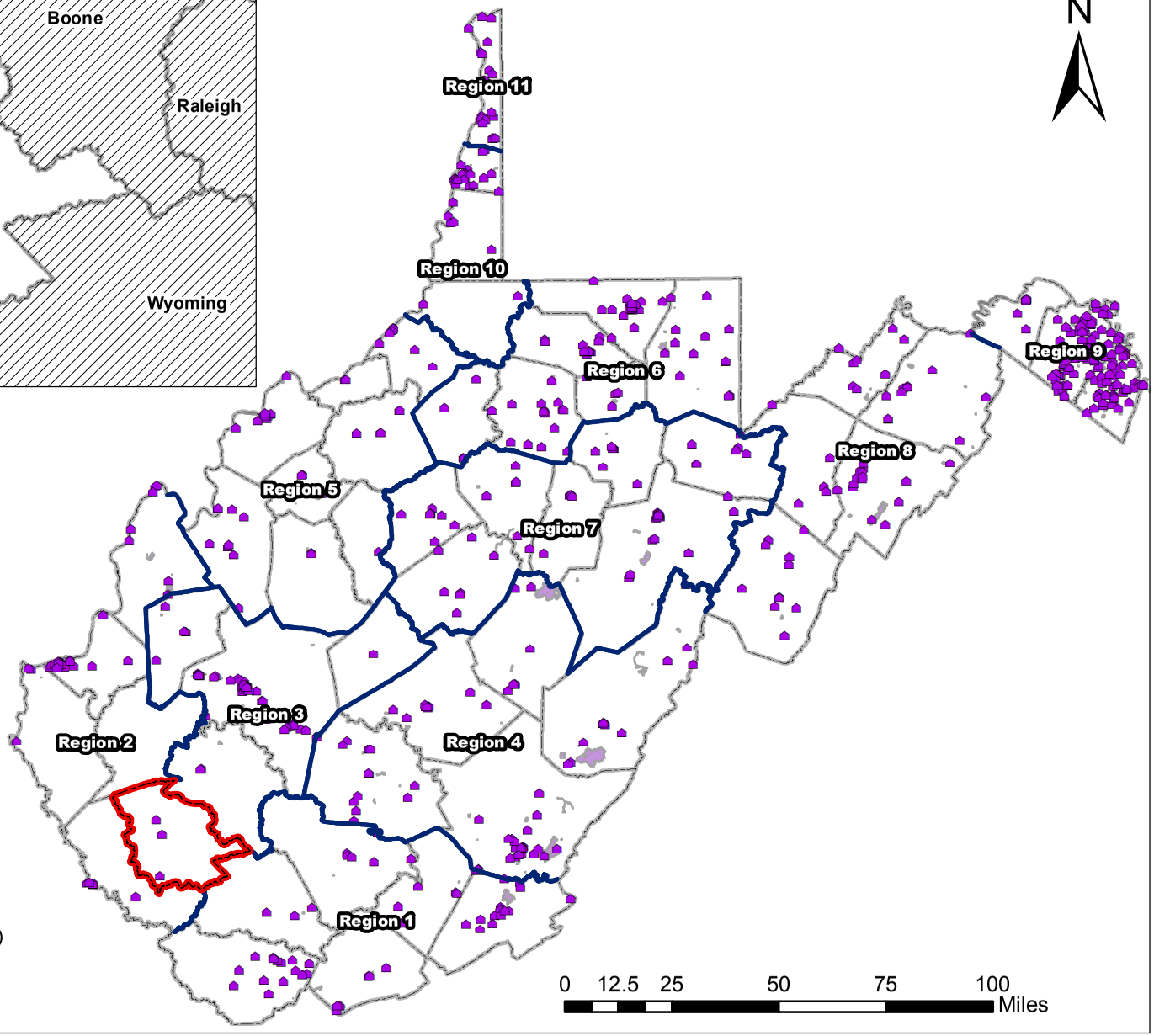
Historic Preservation

Historic preservation will be essential in a County steeped in coal mining history. Logan County currently has three listings in the National Register of Historic Places. They are an historic house, a locomotive, and a cemetery, all harkening to Logan County's coal past (Map 27). Other historic areas have been designated by West Virginia. Map 28 gives a spatial position to each designated State historic piece of architecture.

National Register of Historic Place

Logan County





National Register of Historic Place

Planning Regions Line

National Register of Historic Place (Area)

County Boundaries

Source: West Virginia State Historic Preservation Office 2012

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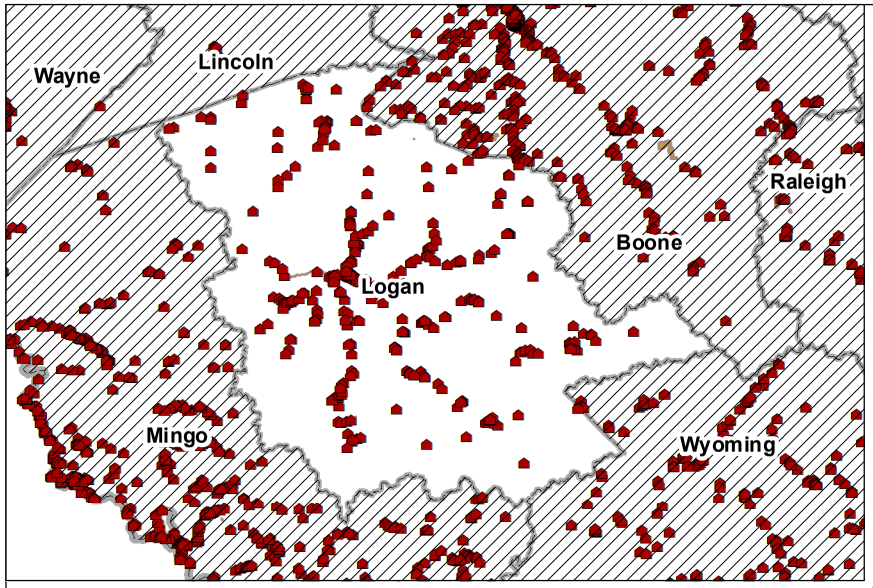
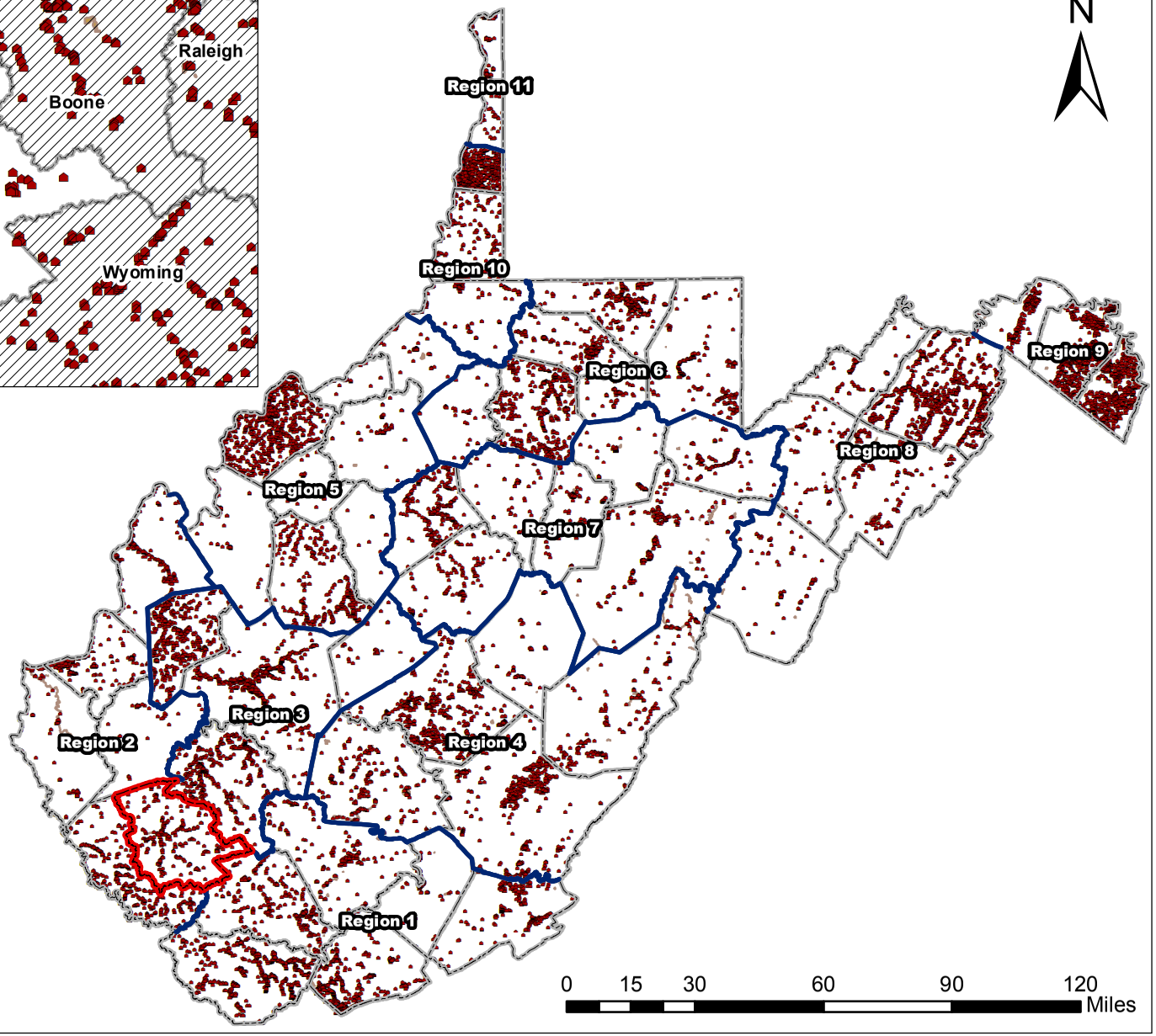
State Historic Architecture

Logan County





N

State Historic Architecture

Planning Regions Line

State Historic Architecture (Area)

County Boundaries

0 15 30 60 90 120

Miles

Source: West Virginia State Historic Preservation Office 2012

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Natural Resources, Environment, and Energy

Particular importance should be given to the spatial positions of natural resource areas, geographic environments, and potential energy resources in a County. This serves to inform potential investors about what possibilities the land provides for production of resources and energy. Logan County has several advantages in these areas that can be utilized to the advantage of the citizens.

West Virginia has an extensive wetlands inventory, because of its extensive system of lakes, streams, and rivers. Wetlands provide many environmental benefits, including housing fish, replenishing groundwater, and relaying nutrients. Logan County's wetlands inventory is not extensive, but has one major line that crosses the County. (Map 29).

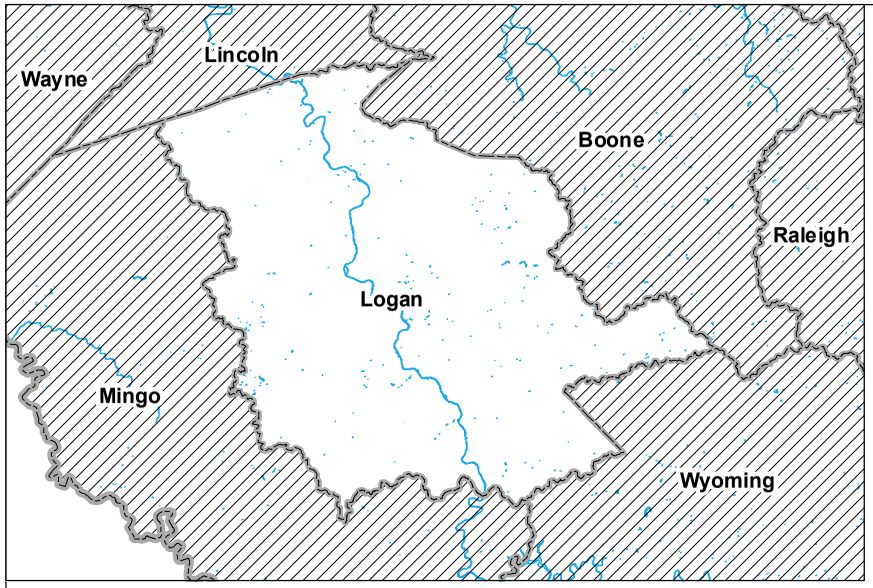
The State also possesses a respectable amount of park and forest land. Most of this land is located in the eastern portion of the State, the area that contains the main part of the Appalachian Mountain range. Logan contains a state park, Chief Logan State Park, and several wildlife management areas (Map 30).

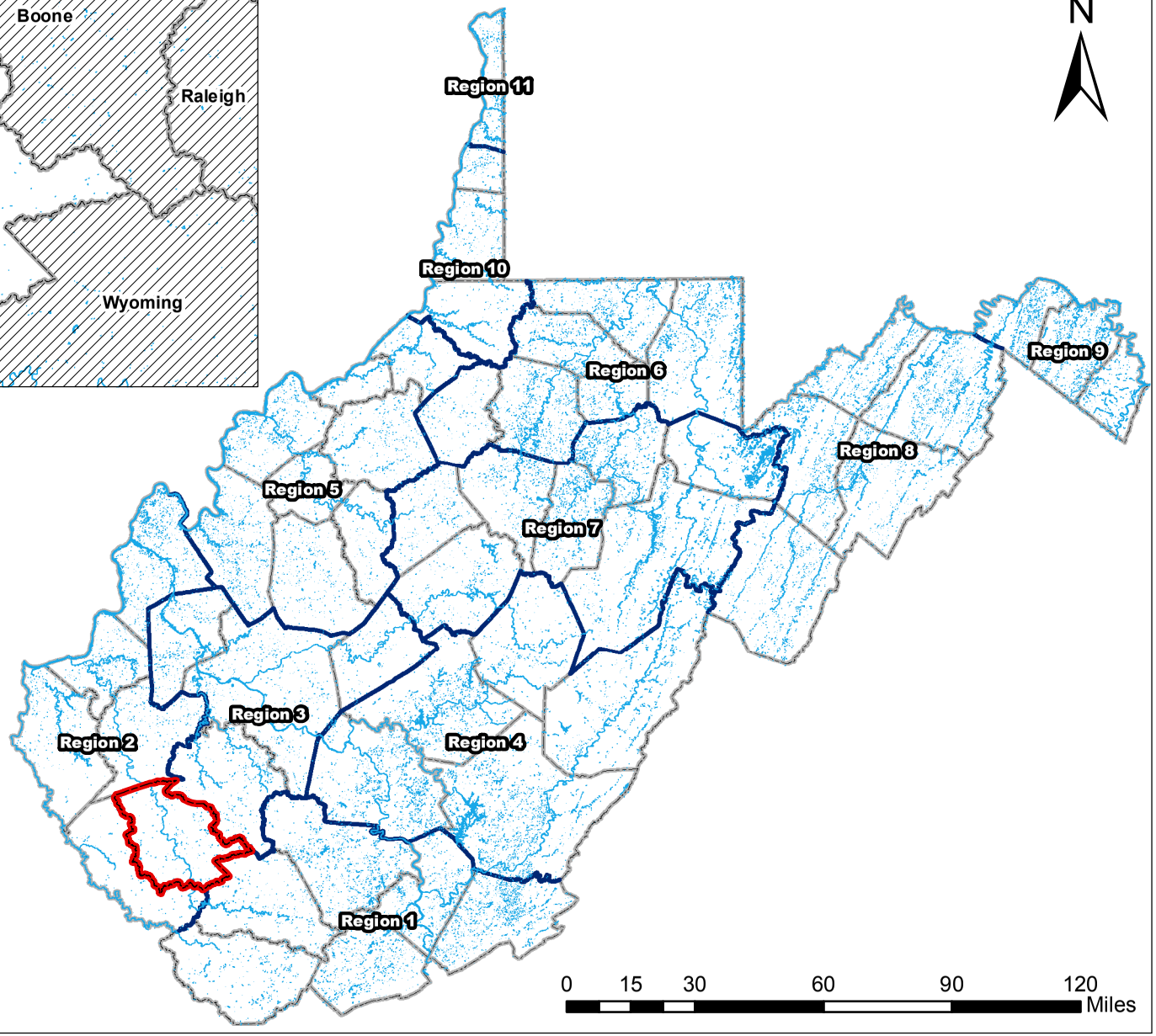
Air quality is a necessary environmental health benchmark that can determine the health and vitality of an area's residents. The air pollution non-attainment areas are "areas of the country where air pollution levels persistently exceed the national ambient air quality standards."[10] There are six full counties in West Virginia that are designated air pollution non-attainment areas, either in annual or 2006 24-hour standards as of the publication of this plan; Logan County is not among them (Map 31).

[10] "The Green Book Nonattainment Areas for Criteria Pollutants," Environmental Protection Agency, Accessed March 1, 2013, http://www.epa.gov/oaqps001/greenbk/.

Hydrology - National Wetlands Inventory

Logan County





Planning Regions Line
National Wetlands Inventory
County Boundaries

Source: United States Fish and Wildlife Service 1996

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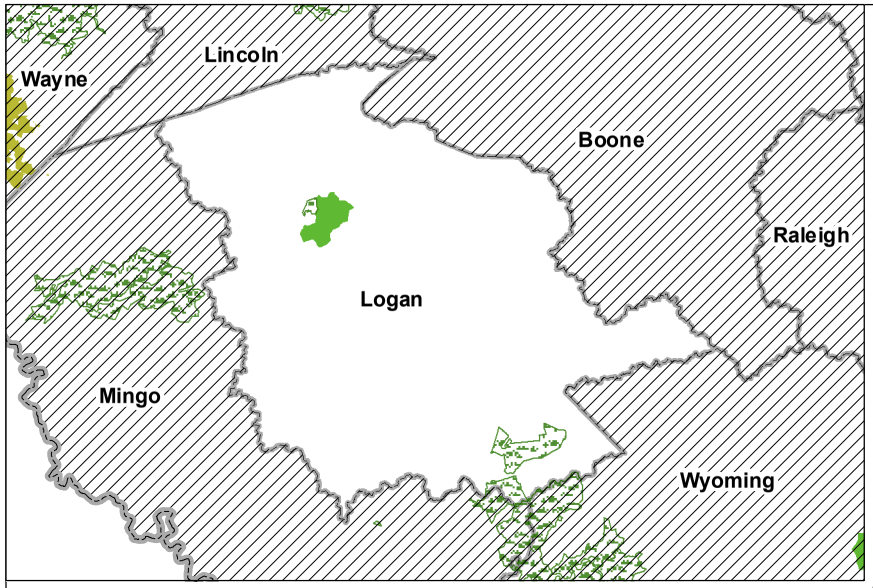
Public Land - Parks and Forests

Logan County



Source: Wildlife Management Areas; West Virginia Division of Natural Resources 2002; State Forest; West Virginia Division of Forestry 2004; State Park; West Virginia Division of Natural Resources, Natural Resource Analysis Center 2000 National Forest; United States Forest Service 2005; National Park; United States National Park Service 2003

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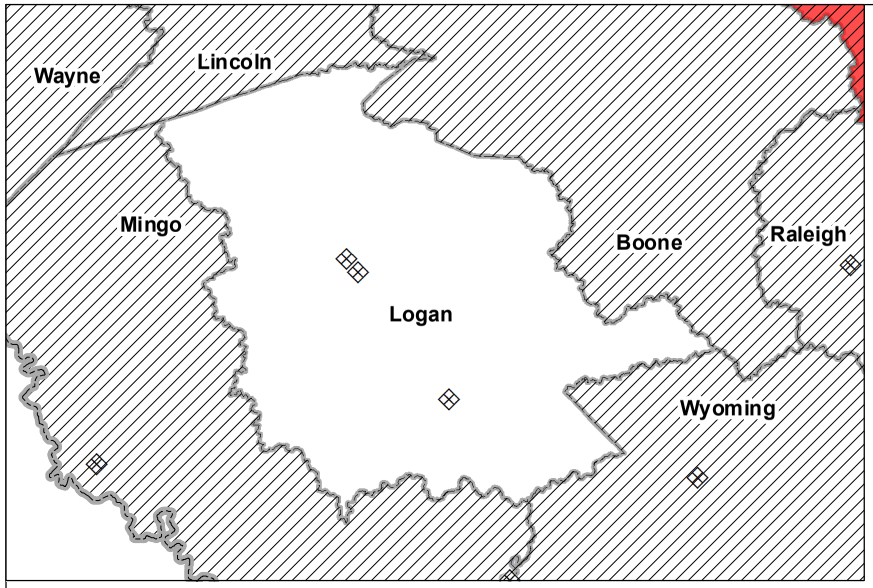
Environment - Monitoring

Logan County



+ On December 28, 2012, U.S.EPA re-designated Cabell and Wayne Counties and the Graham Tax District in Mason County to attainment for the 1997 NAAQS.
+ September , 2013, U.S.EPA re-designated Wood, Marshall and Ohio Counties and the Grant Tax District in Pleasants County to attainment for the 1997 NAAQS.

Source: Weather Stations; National Oceanic and Atmospheric Administration 1999; Air Pollution Non Attainment Areas; West Virginia Department of Environmental Protection and United States Environmental Protection Agency, 2013

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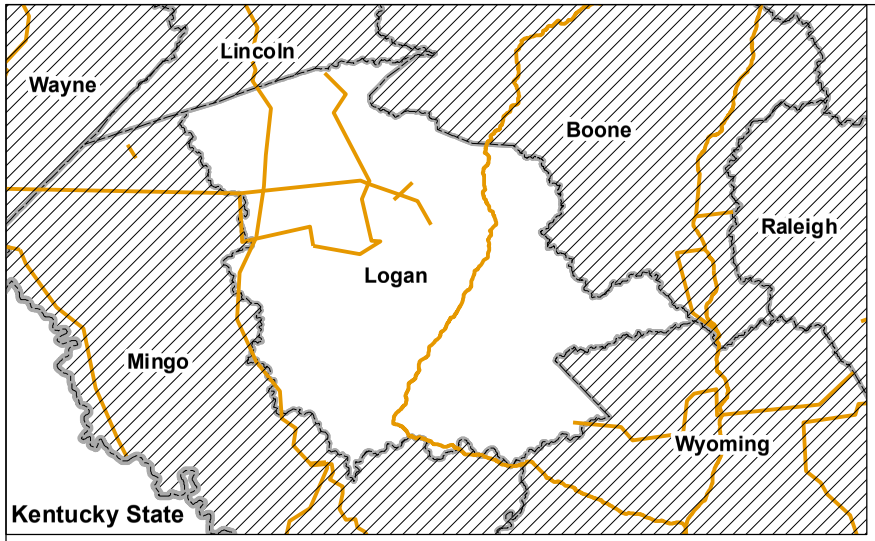
West Virginia's past and most likely its future are defined by energy. Besides coal, other options for energy have been investigated in the State. Gas and oil are of course the main energy staples in the nation, and West Virginia has access to this energy in a number of ways. Logan County has a small oilfield and oil pipe infrastructure, but a large system of gas pipes (Map 32). Logan County also appears to have potential for Marcellus development, with a large amount of completed wells across the northern part of the County (Map 33). The Marcellus Shale will continue to be a major player in West Virginia's energy layout for the foreseeable future, and as technology improves recoverability may also.

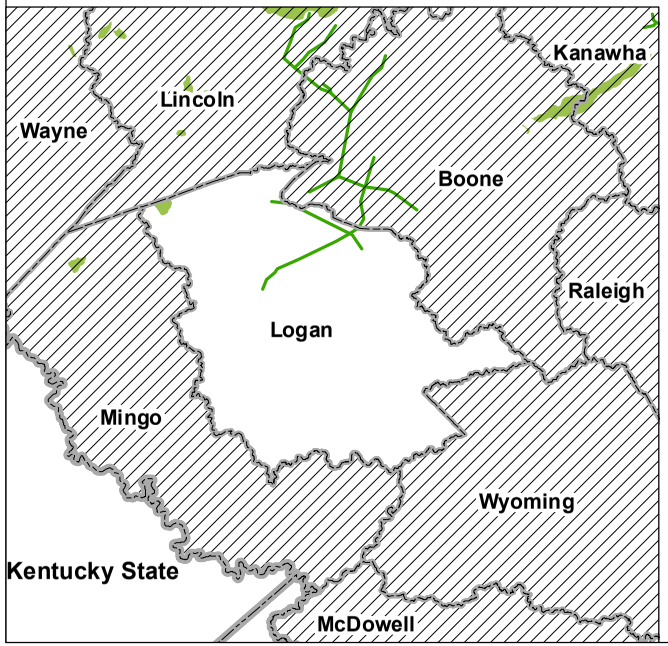
Potential renewable energy sources were also examined. Wood byproducts are a potential energy source classified as biomass energy. Naturally it is most useful in areas with a great deal of wood products. West Virginia is one of the most forested States in the country. Logan County appears to be one of the least forested counties in West Virginia. (Map 34). This explains why the County does not have much activity in wood byproducts (Maps 35 and 36). Other potential renewable energy sources include geothermal (Map 37), solar (Map 38), and wind (Map 39). Each of these resources was examined in a recent report from the Center of Business and Economic Research at Marshall University.[11] None of these sources was "likely to provide fuel or electricity at a lower cost" than coal and oil. Subsidizing these resources appears to be the only way to encourage faster growth in consumption, and in some cases they still have very limited potential in West Virginia. Geothermal energy appears to have great potential in certain parts of the State, as shown in Map 37, but Logan appears to be only moderately favorable for development, and parts of that resource coincide with the locations of the park areas. Logan County does not appear to be a favorable location for solar development or wind development. Still, technology is not predictable, and improvements could occur in each of these resource areas that will make generation more feasible. Efforts to monitor research in all these areas should be undertaken to make use of any potential developments.[12]

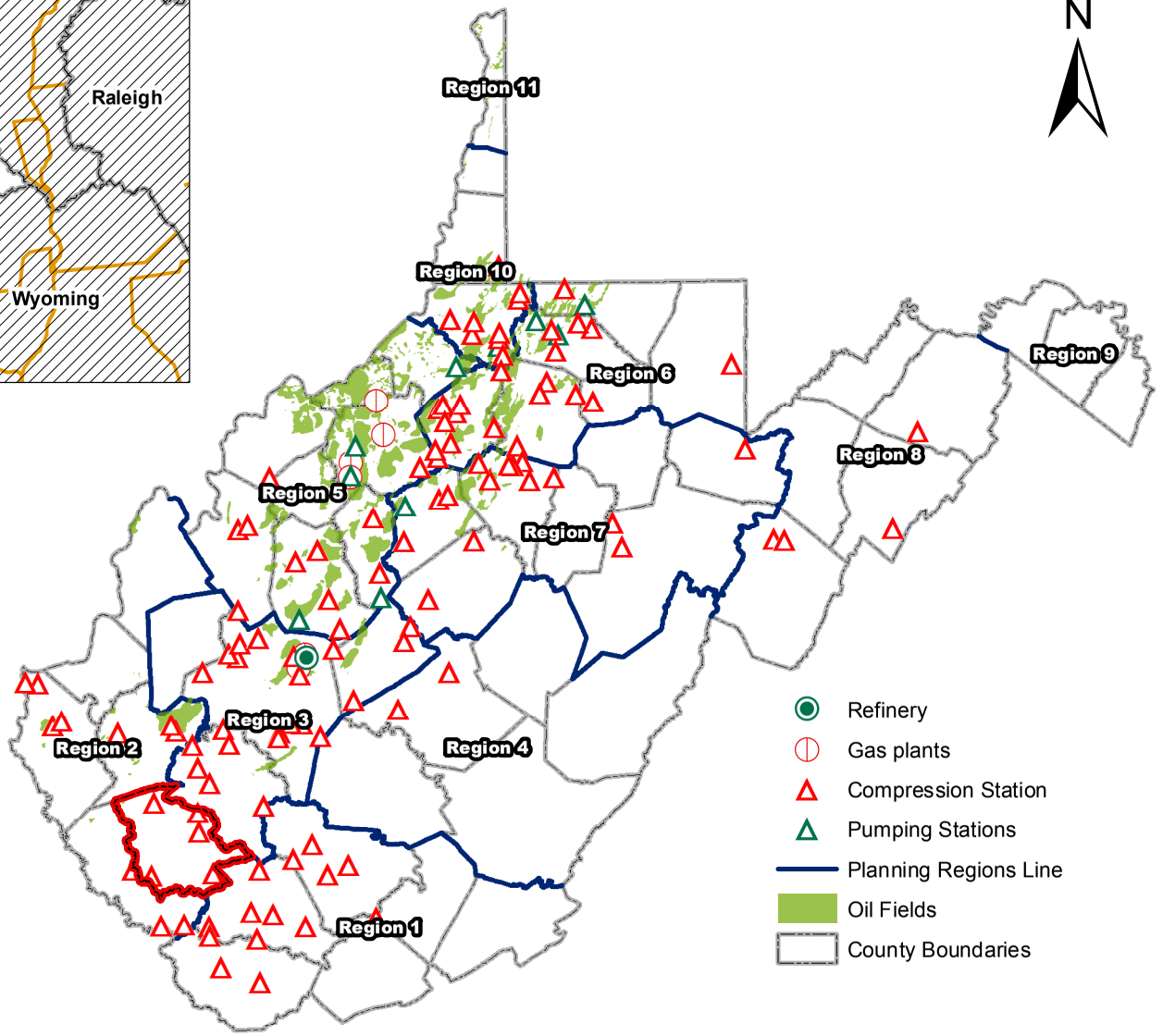
[11] Kent, Calvin, Risch, Christine, and Pardue, Elizabeth. *Renewable Energy Policy: Opportunities for West Virginia.* Center for Business and Economic Research, Huntington, WV (2012).
[12] Ibid.

Energy - Gas and Oil

Logan County







Source: West Virginia Geological and Economic Survey 2007

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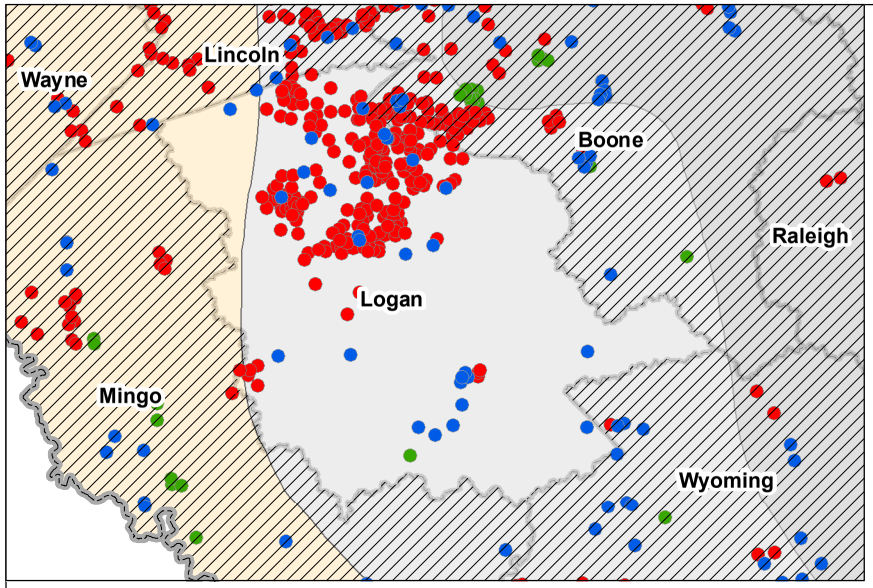
Energy - Marcellus Wells

Logan County



N

Region 11
Region 10
Region 9
Region 6
Region 8
Region 5
Region 7
Region 3
Region 2
Region 4
Region 1

- Cancelled Marcellus Wells
- Completed Marcellus Wells
- Permitted Marcellus Wells
- Planning Regions Line
- 0 ft. - 20 ft.
- 21 ft. - 40 ft.
- 41 ft. - 60 ft.
- 61 ft. - 80 ft.
- 81 ft. - 100 ft.
- Over 100 ft.
- Possible/Uncertain Marcellus
- Uncertain thickness
- Marcellus assumed to be absent
- County Boundaries

0 15 30 60 90 120
Miles

Source: West Virginia Geological and Economic Survey 2013

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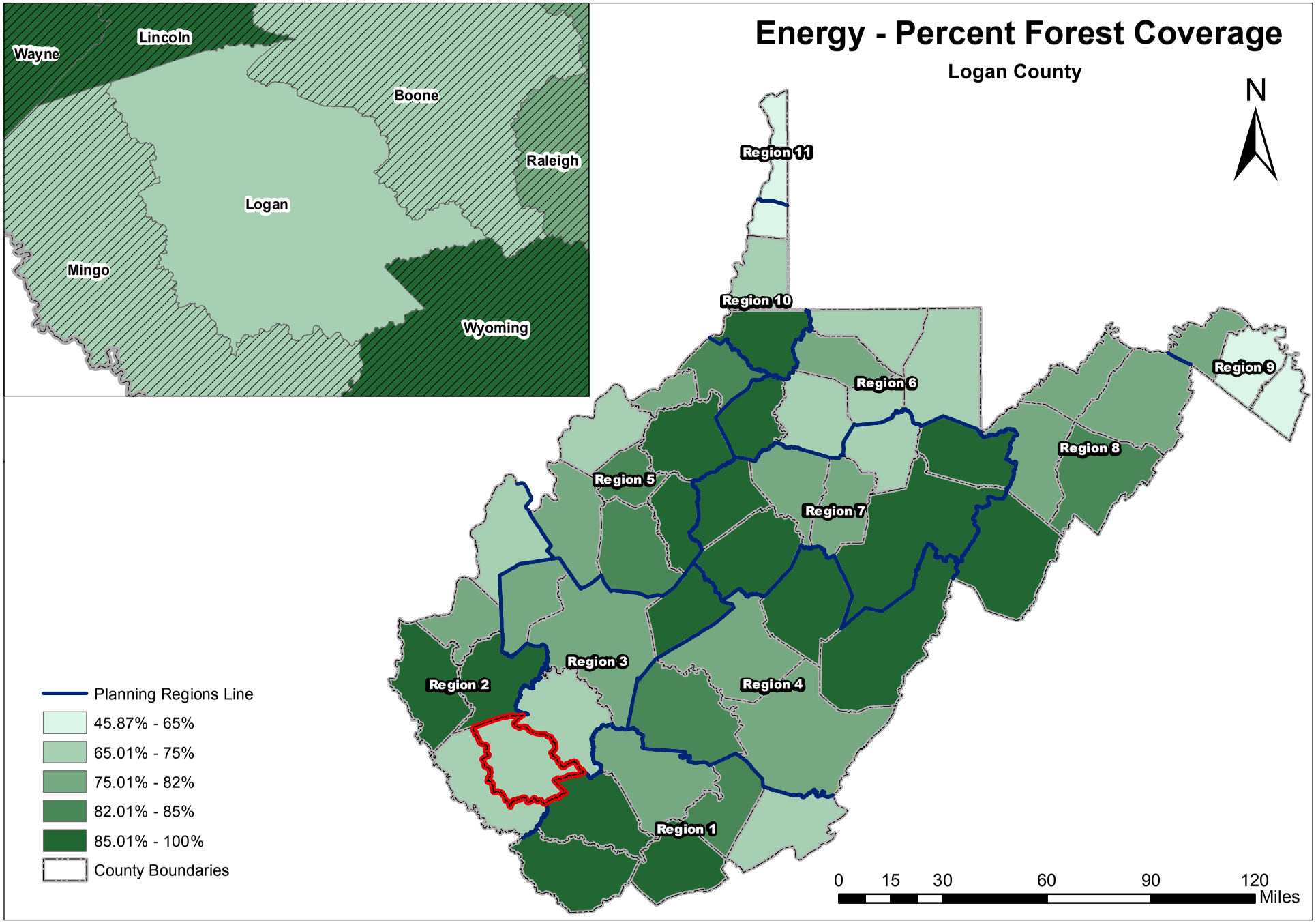

Source: Rahall Transportation Institute 2013

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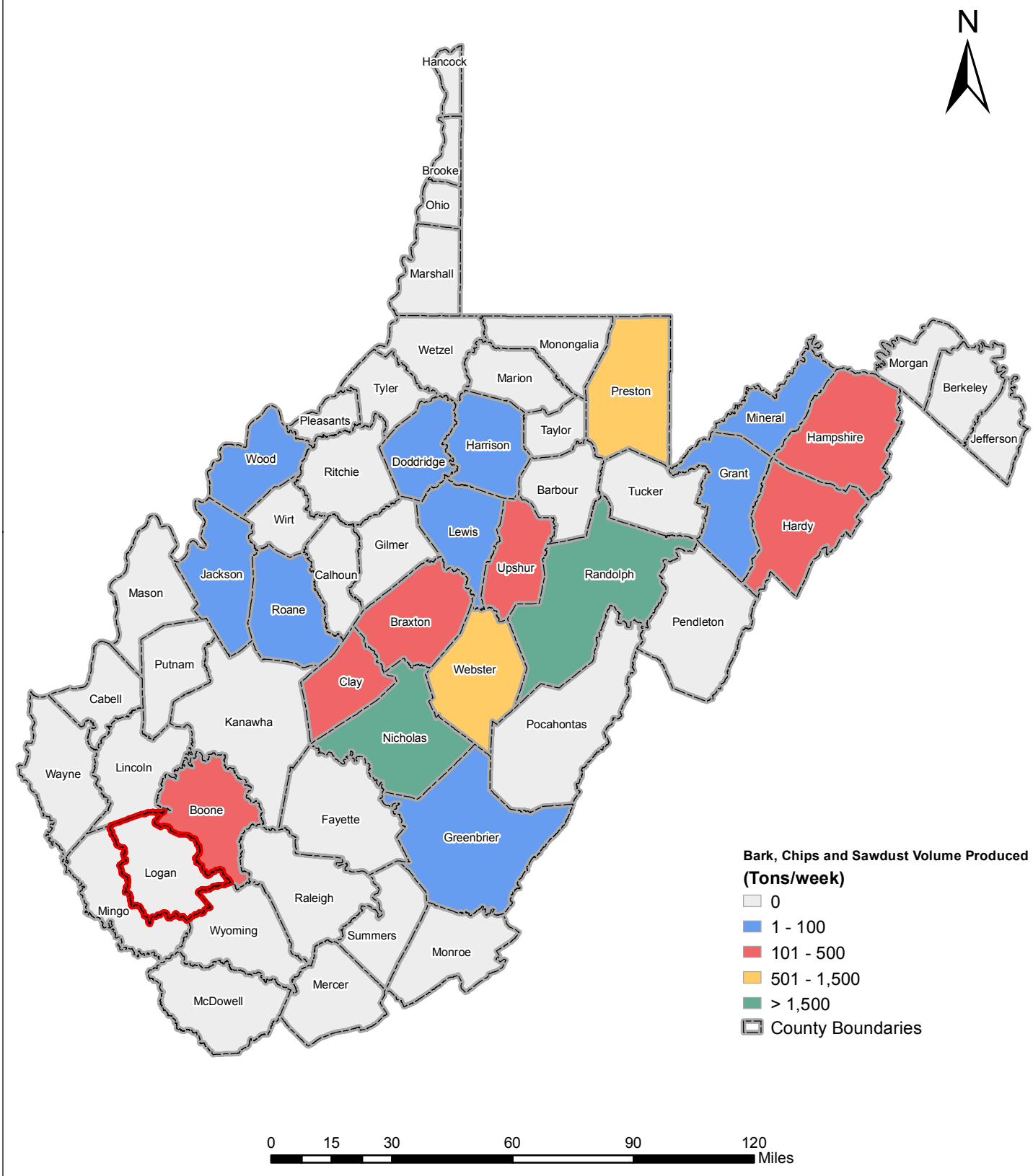
Renewable Energy - Wood By Products

Bark, Chip and Sawdust Volume Produced - Logan County



Source: Appalachian Hardwood Center 2011

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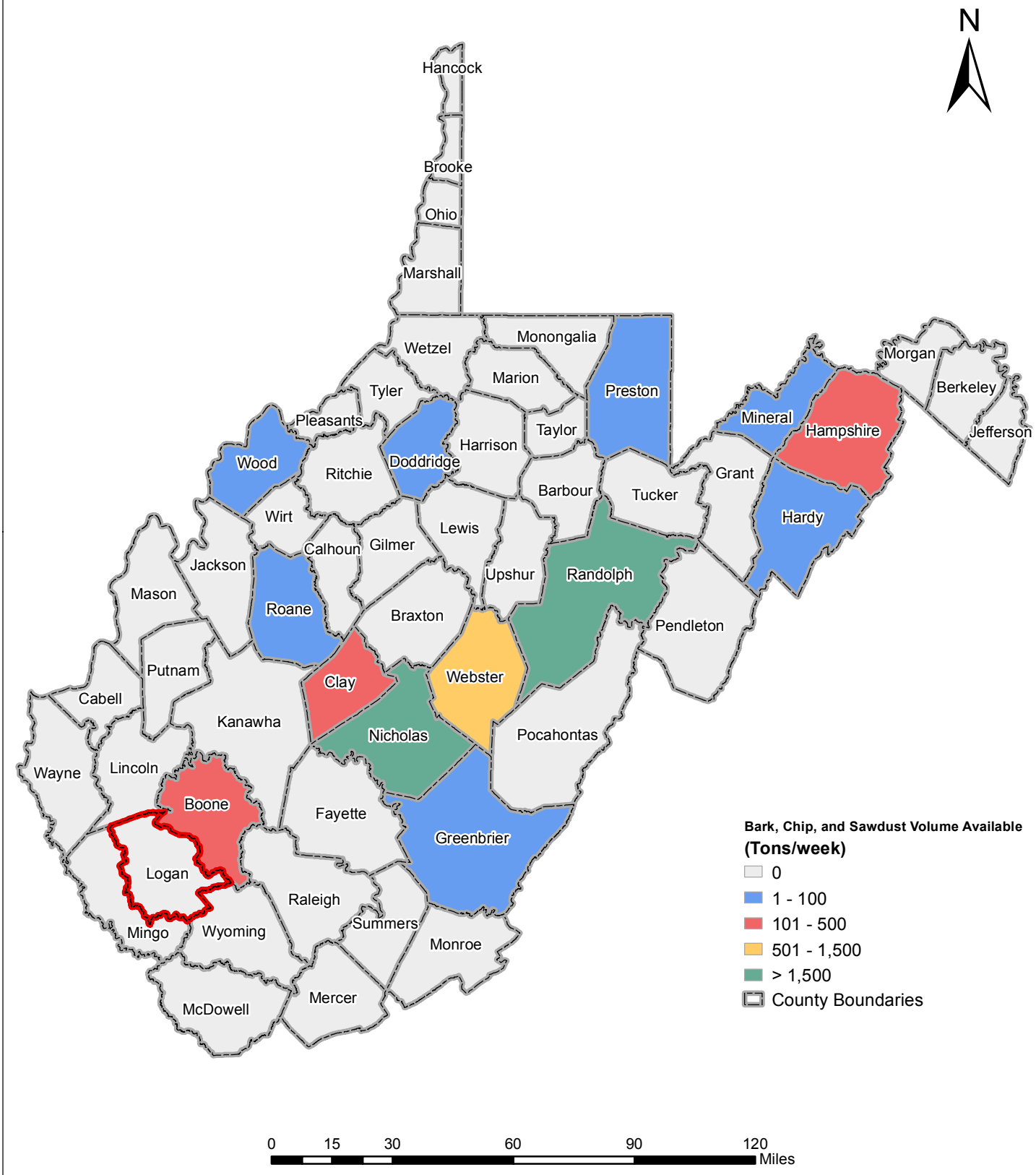
Renewable Energy - Wood By Products

Bark, Chip, and Sawdust Volume Available - Logan County



Source: Appalachian Hardwood Center 2011

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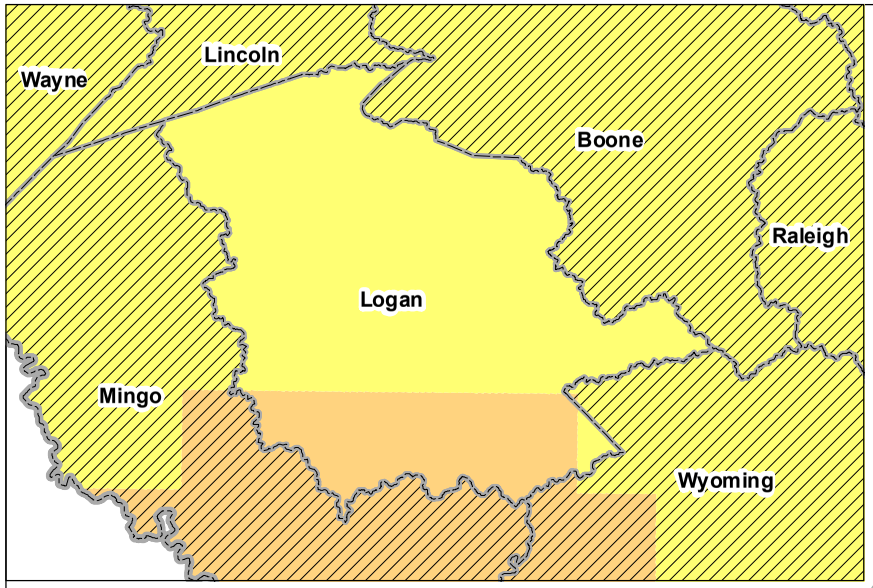
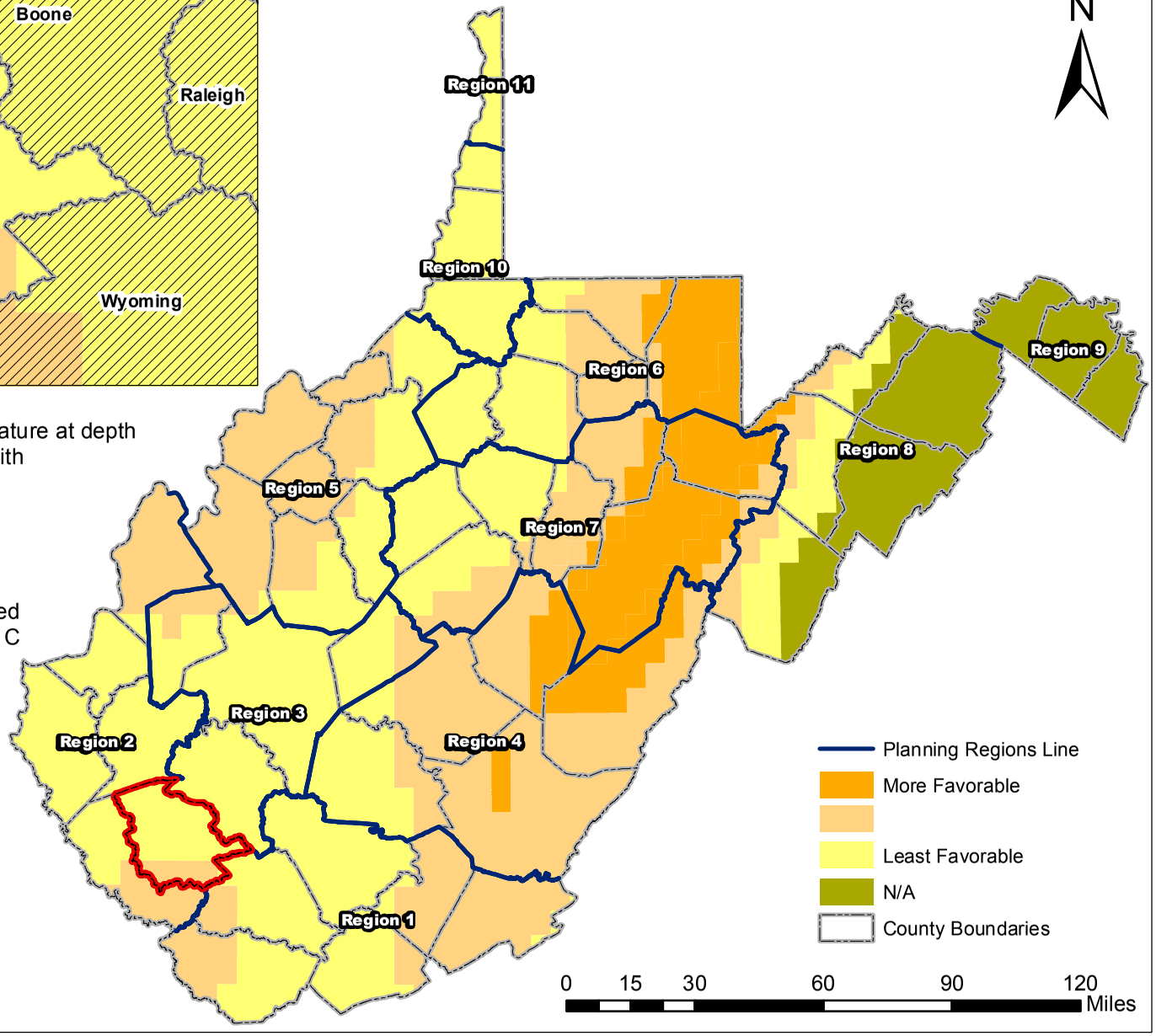
Energy - Geothermal Resource of Logan County

Favorability of Deep Enhanced Geothermal Systems



_ Source data for deep EGS includes temperature at depth from 3 to10 km and analyses (for regions with temperatures >= 150 degrees C).

_ Class values reflect relative favorability, with 1 being more favorable, 3 being least favorable, and "N/A" regions not having been assessed due to temperatures less than 150 degrees C at 10 km depth.



Source: National Renewable Energy Laboratory 2009

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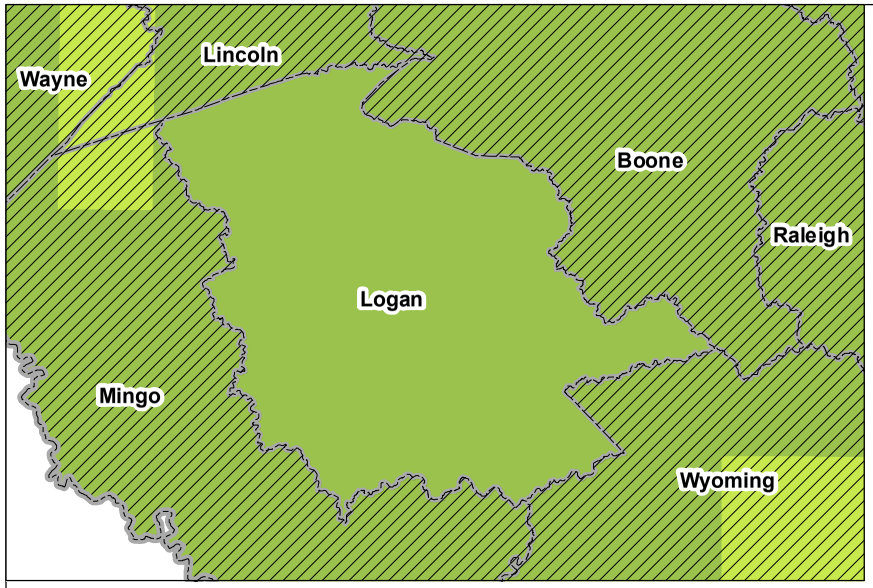
Solar - Renewable Energy

Logan County



Source: National Renewable Energy Laboratory 2012

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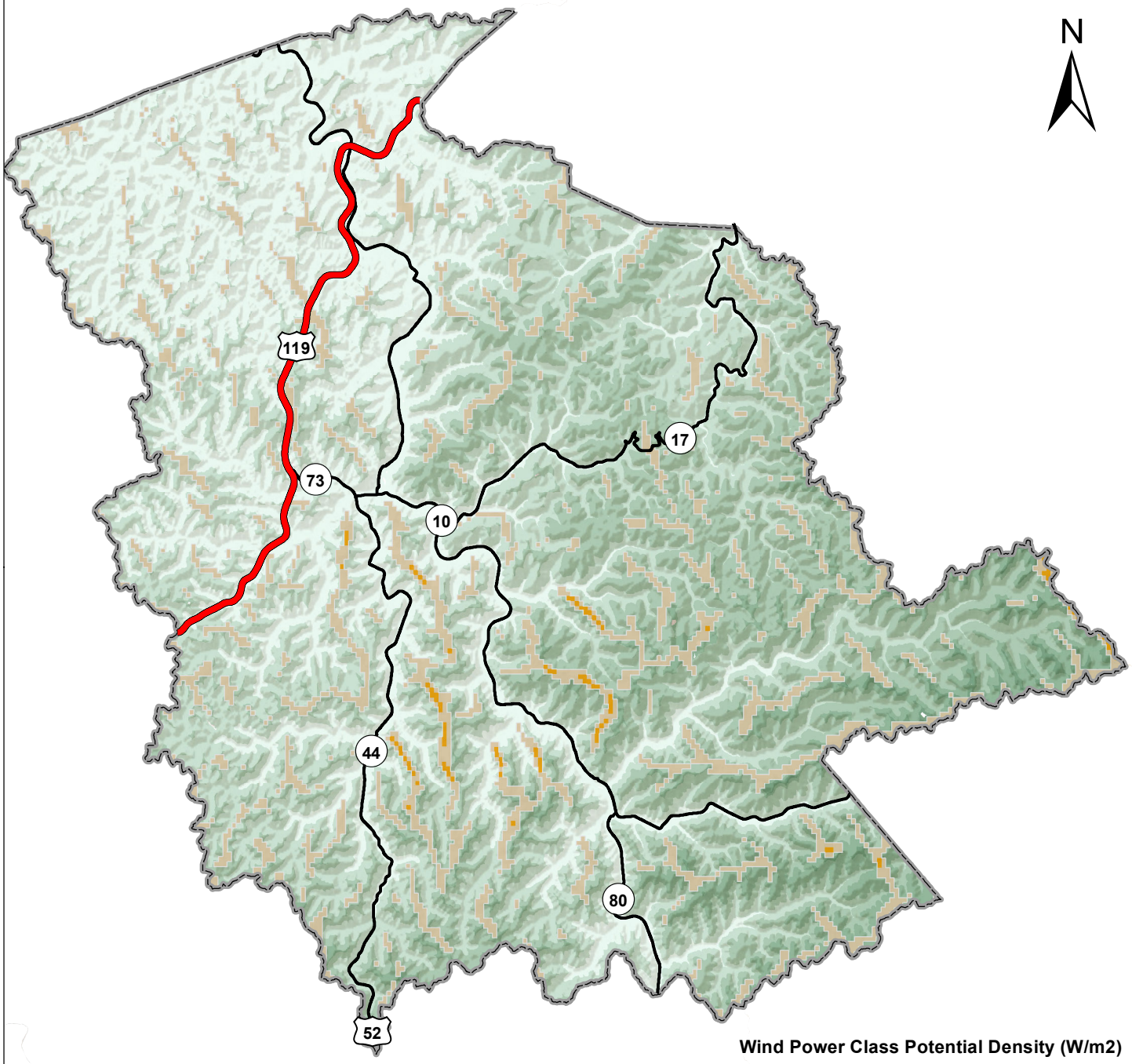
Renewable Energy-Wind

Logan County



Source: National Renewable Energy Laboratory 2006, United States Geological Survey n.d., ESRI, 2013

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IV. Land Use Smart Planning

The research team constructed a smart planning criterion that would apply to each mine site in Logan. Tax Districts were utilized and labeled based on a particular land use practice that has previously been incorporated into the site. This criterion allows researchers and policymakers to determine suitability after weighing all the factors mentioned in the plan. A range of potential utilizations is given to give optimal control to policymakers and investors.

The table below (Table 2) provides the categories and their areas. The Smart Planning Map (Map 40) showcases the geographies separated by utilization.

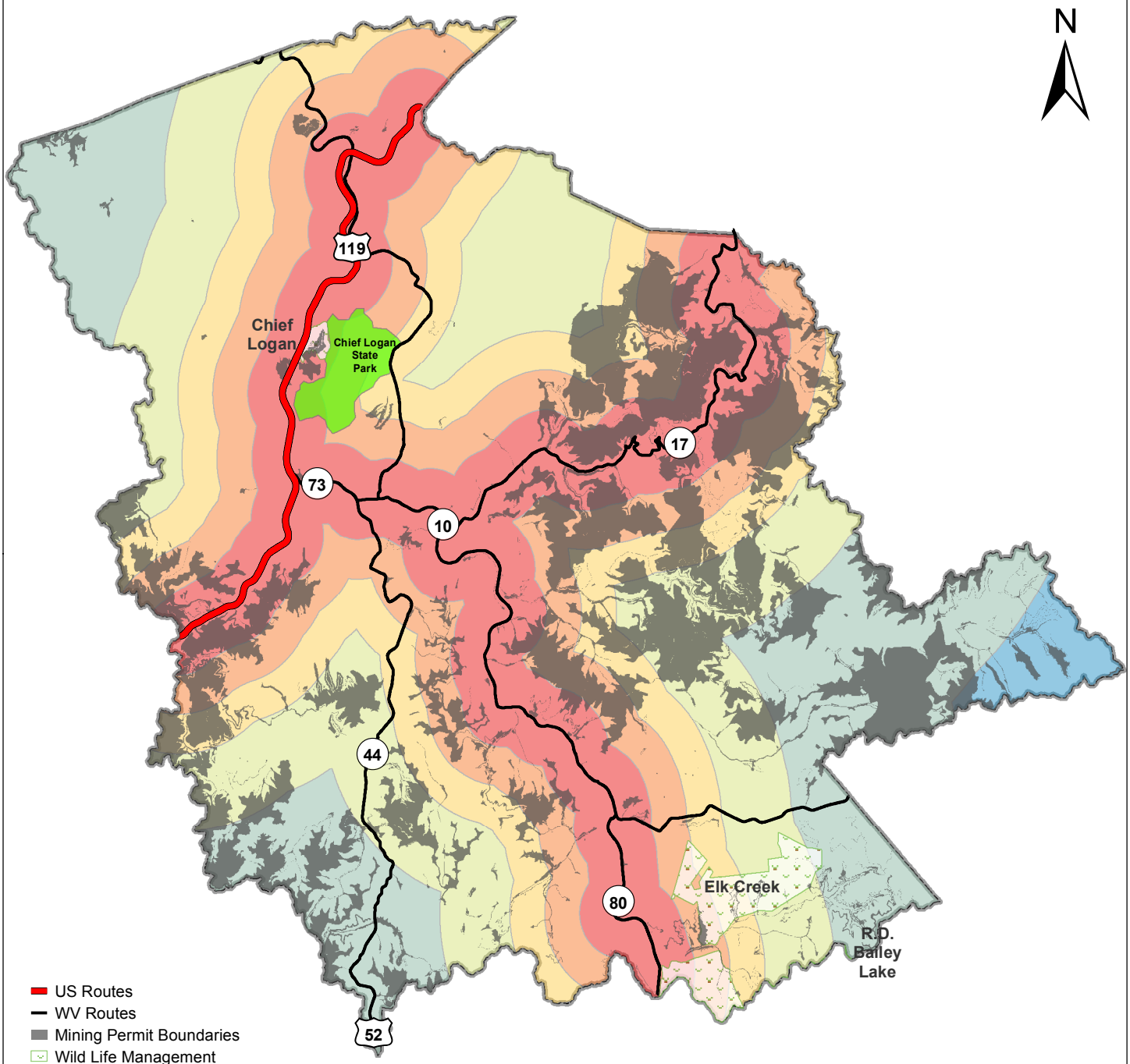
Table 2: Smart Planning Utilizations

Name	Smart Planning Criteria
Utilization Area 0-1 mile	Industrial, Commercial/Retail, Residential, Public Facility, Recreational
Utilization Area 1-2 miles	Industrial, Commercial/Retail, Residential, Public Facilities, Recreational
Utilization Area 2-3 miles	Industrial, Commercial/Retail, Residential, Recreational
Utilization Area 3-5 miles	Industrial, Residential, Recreational, Agriculture, Forestland
Utilization Area 5-10 miles	Industrial, Residential, Agriculture, Forest Land, Recreational
Utilization Area 10 miles +	Industrial, Residential, Agriculture, Forest Land

Land development or redevelopment options are determined through a review of the redevelopment authority's anticipated needs. The required infrastructure component standards are determined on a site by site basis by the County economic development authority as designated by West Virginia Code Chapter 05B Article 2A.

Landuse Criteria

Logan County



Source: Rahall Transportation Institute 2014

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V. Site Evaluation

Once the smart planning buffers have been created, the sites available for analysis are confirmed. This evaluation provides the County with an inventory of post mine sites that are suitable for development. The evaluation consists of existing infrastructure availability, which gives the most accurate assessment of a site's physical capabilities for investment purposes. This will encourage strategic development and evaluation.

Initial Data Collection:

The consulting team collected all available data on mine sites located in Logan County to produce an inventory of sites for analysis. The source for site information was primarily the West Virginia Department of Environment Protection (WV DEP) website, which allows permit searches by geographic location and mining type. The information provided by this source was used to develop a preliminary property database of all surface mines as well as general mapping.

The WV DEP permit database acts as a general clearinghouse for information, but is not infallible. The data is often updated by third-party sources, which increases the margin of error for site location. Because of this, the actual attributes being measured may not be at the distance stated because the mine site is not actually in the location given. The WV DEP has sought to minimize those errors, and RTI attempts to maintain the reliability of the measurements by observing their locations when mapping. RTI does not ensure the reliability of the site location or distances to the attributes. Any and all information should be verified for accuracy.

The initial data collection revealed all the mine sites in the County. Together, the team put together 134 sites for analysis. All of the sites and their distance attributes are listed below.

Table 3: Logan County Potential Surface Mine Sites for Development

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
1	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	I051400	Pine Creek Loadout	20.5	7/29/1980	5/26/2007
2	HOBET MINING, INC	I051600	NA	9.88	7/30/1980	7/11/2003
3	ALEX ENERGY INC	S000279	NA	530	1/8/1979	1/26/1998
4	APOGEE COAL CO DBA ARCH OF WEST VIRGINIA, INC.	S000285	NA	355	1/7/1985	1/7/2000
5	FALCON LAND CO INC	S000480	NA	400	1/14/1980	1/5/1993
6	ALEX ENERGY INC	S000580	NA	148	1/14/1980	1/5/2018
7	ALEX ENERGY INC	S000985	NA	186.91	2/11/1985	2/11/2005
8	APOGEE COAL COMPANY LLC	S001376	WYLO MINE	571	1/16/1976	5/19/2002
9	TWIN ACTION COAL CO	S001783	NA	145	2/10/1983	2/10/1993

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
10	APOGEE COAL COMPANY LLC	S006885	WYLO MINE	129.9	7/30/1985	7/30/2000
11	APOGEE COAL COMPANY LLC	S007585	NA	740.8	8/15/1985	8/15/2015
12	FALCON LAND CO INC	S009480	NA	653.76	10/2/1980	1/5/1998
13	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S010685	NA	139	11/7/1985	11/7/2005
14	TRACE CREEK COAL COMPANY	S011785	NA	64.5	12/13/1985	12/13/2000
15	REBEL COAL CO INC	S012378	NA	475	6/5/1978	1/5/1993
16	LAUREL RUN MINING COMPANY	S012478	NA	224	6/5/1978	1/4/1998
17	APOGEE COAL COMPANY LLC	S015974	WYLO MINE	1228.3	8/16/1974	7/6/2002
18	LOGAN COUNTY AIRPORT CONTRACT	S019877	NA	185	11/29/1977	1/7/1993
19	BUFFALO MINING CO	S020373	NA	1000	11/13/1973	1/7/1998
20	ELKAY MINING CO	S025876	NA	200	11/24/1976	1/6/1993
21	EASTERN ASSOCIATED COAL, LLC	S400508	Huff Creek Surface Mine No. 1	745	1/3/2012	1/3/2017
22	RUM CREEK COAL SALES INC	S500104	ANNA BRANCH #2 SURFACE MINE	59	4/14/2004	4/14/2014
23	MINGO LOGAN COAL COMPANY	S500189	NA	234	9/21/1990	9/21/2015
24	APOGEE COAL COMPANY LLC	S500190	NA	444.9	9/29/1990	9/29/2015
25	HIGHLAND MINING COMPANY	S500194	BANDMILL NO.1 SURFACE MINE	710	6/23/1994	6/23/2019
26	HIGHLAND MINING COMPANY	S500201	GEORGES CREEK SURFACE MINE NO.	343.83	12/20/2002	12/20/2017
27	HICA CORPORATION	S500291	NA	120.44	9/14/1992	9/14/1997
28	STOLLINGS TRUCKING CO INC	S500502	SURFACE MINE NO. 4	489.01	1/9/2003	1/9/2018
29	MINGO LOGAN COAL COMPANY	S500503	Adkins Fork Surface Mine	332.9	9/25/2007	9/25/2017

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
30	MINGO LOGAN COAL COMPANY	S500591	NA	186.93	6/28/1991	6/28/2001
31	APOGEE COAL COMPANY LLC	S500593	NORTHWEST RUFFNER	1330.3	11/10/1994	11/10/2014
32	SNAP CREEK MINING LLC	S500604	SURFACE MINE NO. 2	322.44	12/28/2005	12/28/2015
33	APOGEE COAL COMPANY LLC	S500605	North Rum	800.53	6/8/2006	6/8/2016
34	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S500607	Pine Creek No. 1 Surface Mine	758.97	9/5/2008	9/5/2018
35	APOGEE COAL COMPANY LLC	S500691	CHESTNUT FLATS SURFACE	826.33	11/30/1992	11/30/2007
36	APOGEE COAL COMPANY LLC	S500701	GUYAN SURFACE MINE	898	12/17/2001	12/17/2016
37	CATENARY COAL CO	S500790	NA	703	8/17/1990	8/17/1995
38	APOGEE COAL COMPANY LLC	S500904	GUYAN RIDGE 3A	49.28	5/17/2005	5/17/2010
39	COYOTE COAL CO LLC	S500907	Little White Oak Surface Mine	218.5	11/13/2008	11/13/2018
40	MINGO LOGAN COAL COMPANY	S500908	Seng Camp No. 2 A Mine	70.9	9/18/2008	9/18/2018
41	BANDMILL COAL CORPORATION	S501095	Boardtree No. 2 Surface	712	9/5/1995	9/5/2005
42	MINGO LOGAN COAL COMPANY	S501188	NA	254	7/29/1988	7/29/2008
43	GREENTHORN, LLC	S501300	WV-3	461.43	11/3/2000	11/3/2015
44	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S501301	PHOENIX NO. 4 SURFACE MINE	851	9/29/2003	9/29/2018
45	ARACOMA COAL COMPANY INC	S501390	NA	912.1	7/29/1991	7/29/2016
46	SNAP CREEK MINING LLC	S501396	SURFACE MINE # 1	568	12/15/1997	12/15/2017
47	MINGO LOGAN COAL COMPANY	S501397	SPRUCE NO. 1 MINE	3113	11/4/1998	11/4/2018

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
48	PYXIS RESOURCES COMPANY	S501490	NA	270.12	5/7/1991	5/7/1996
49	STOLLINGS TRUCKING CO INC	S501499	SURFACE MINE NO. 3	148	4/7/2000	4/7/2015
50	HIGHLAND MINING COMPANY	S501506	REYLAS SURFACE MINE	635	1/3/2008	1/3/2018
51	BANDMILL COAL CORPORATION	S501596	WADE # 3	969.5	12/17/1996	12/17/2011
52	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S501598	PHOENIX SURFACE MINE #3	533.64	3/6/2003	3/6/2008
53	HOBET MINING, INC	S501688	NA	89.73	6/9/1988	6/9/1998
54	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S501693	RAGLAND #25 COMPLEX BIG SOUTH	610.09	7/16/1997	7/16/2007
55	HOBET MINING, INC	S501788	NA	36.44	6/9/1988	6/9/1998
56	ALEX ENERGY INC	S501796	SANDY GAP SURFACE MINE	734.87	3/18/1997	3/18/2017
57	ROAD FORK DEVELOPMENT COMPANY INC	S501798	ROCKHOUSE BRANCH SURFACE MINE	1109.9	1/23/2004	1/23/2019
58	COYOTE COAL CO LLC	S501809	Buffalo I Surface Mine	609.4	1/24/2012	1/24/2017
59	HOBET MINING, INC	S501986	NA	53	2/4/1986	2/4/1996
60	BUFFALO MINING CO	S501989	NA	12.33	5/31/1990	5/31/1995
61	BANDMILL COAL CORPORATION	S502100	RIGHT HAND FORK SURFACE MINE	235	12/20/2002	12/20/2017
62	PYXIS RESOURCES COMPANY	S502188	NA	128.39	9/20/1988	9/20/1998
63	BANDMILL COAL CORPORATION	S502393	NA	1585	11/17/1993	11/17/2008
64	MINGO LOGAN COAL COMPANY	S502486	NA	1738	2/13/1986	2/13/2001

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
65	RUM CREEK COAL SALES INC	S502493	ANNA BRANCH SURFACE	209.98	5/16/1994	5/16/2009
66	STOLLINGS TRUCKING CO INC	S502495	#2	149.6	3/8/1996	3/8/2016
67	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S502701	PHOENIX NO. 5 SURFACE MINE	601	1/21/2005	1/21/2015
68	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S502789	NA	553.51	9/28/1989	9/28/2014
69	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S502889	NA	57.34	2/8/1990	2/8/2005
70	MINGO LOGAN COAL COMPANY	S503091	BUMBO NO.1 MINE	64	5/19/1994	5/19/2014
71	HIGHLAND MINING COMPANY	S503096	FREEZE FORK MINE	1354.35	2/17/1998	2/17/2018
72	BUFFALO MINING CO	S503186	NA	494	7/24/1986	7/24/1996
73	ROAD FORK DEVELOPMENT COMPANY INC	S503408	SANDY GAP SURFACE MINE	209.9	9/3/2009	9/3/2014
74	APOGEE COAL CO DBA ARCH OF WEST VIRGINIA, INC.	S503586	NA	202.5	6/16/1986	6/16/1996
75	TRACE CREEK COAL COMPANY	S504186	NA	356	8/8/1986	8/8/2006
76	ALEX ENERGY INC	S504189	NA	668	12/18/1990	12/18/2015
77	BANDMILL COAL CORPORATION	S504193	BOARDTREE SURFACE MINE	273	6/21/1994	6/21/1999
78	TRACE CREEK COAL COMPANY	S504288	NA	327.74	1/20/1989	1/20/2009
79	STOLLINGS TRUCKING CO INC	S504492	SURFACE MINE NO. 1	112	11/30/1992	11/30/2002
80	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S504592	LAUREL FORK SURFACE MINE	330	7/6/1993	7/6/2008
81	ARACOMA COAL COMPANY INC	S504689	NA	840.62	10/17/1989	10/17/1999

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
82	MINGO LOGAN COAL COMPANY	S504991	BUMBO NO. 2 MINE	1511.49	2/24/1995	2/24/2015
83	MINGO LOGAN COAL COMPANY	S505286	NA	161.46	9/5/1986	9/5/2006
84	ALEX ENERGY INC	S505389	NA	1063.41	1/31/1991	1/31/2016
85	ALEX ENERGY INC	S505489	NA	251	1/31/1991	1/31/2016
86	ISLAND CREEK COAL COMPANY	S505587	NA	21	12/8/1987	12/8/1997
87	TRACE CREEK COAL COMPANY	S506288	NA	422	4/24/1989	4/24/2019
88	MINGO LOGAN COAL COMPANY	S506391	GUT FORK MINE	846	4/3/1995	4/3/2015
89	ISLAND CREEK COAL COMPANY	S506491	NA	87	2/23/1994	2/23/2004
90	APOGEE COAL COMPANY LLC	S506992	WYLO MINE	154	3/17/1993	3/17/2003
91	MINGO LOGAN COAL COMPANY	S507091	SING CAMP SURFACE #2	220.76	5/19/1994	5/19/2019
92	APOGEE COAL COMPANY LLC	S507986	EAST RUFFNER MINE	546.2	12/17/1986	12/17/2016
93	MINGO LOGAN COAL COMPANY	S508187	NA	1589.21	3/9/1988	3/9/2018
94	ALEX ENERGY INC	S508486	NA	427	8/18/1986	8/18/2016
95	HICA CORPORATION	S509386	NA	149.42	1/8/1987	1/8/1997
96	MINGO LOGAN COAL COMPANY	S510186	NA	638	3/13/1987	3/13/2007
97	FREEMAN BRANCH MINING CORP	S510486	NA	132	3/23/1987	3/23/1992
98	W-P COAL CO	Z004381	NA	76.56	2/1/1981	2/1/1993
99	HOBET MINING, INC	I051200	NA	1.4	7/25/1980	7/25/1985
100	HICA CORPORATION	S000785	NA	337.9	1/28/1985	1/28/1995
101	ISLAND CREEK COAL COMPANY	S505686	NA	150	1/21/1987	1/21/1997
102	CONCORD COAL CORP	S005177	NA	76	3/23/1977	3/23/1982
103	CATENARY COAL CO	S502586	NA	347	9/5/1986	9/5/1991
104	AMHERST COAL COMPANY	S001885	NA	187.34	3/6/1985	3/6/1990
105	TWIN BRANCH COAL CO	S000680	NA	129	1/14/1980	1/20/1998

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
106	APOGEE COAL CO DBA ARCH OF WEST VIRGINIA, INC.	Z001481	NA	161.64	1/18/1981	1/7/1993
107	ELKAY MINING CO	S009985	NA	66.36	10/9/1985	10/9/1995
108	ISLAND CREEK MINING CO	S011878	NA	204	5/29/1978	5/29/1983
109	ISLAND CREEK COAL COMPANY	S025374	NA	217	12/18/1974	12/18/1979
110	CLIFFS LOGAN COUNTY COAL LLC	S501410	Elklick Surface Mine	710.82	8/16/2013	8/16/2018
111	DAL-TEX COAL CORP	S003784	NA	150	7/9/1984	7/9/1989
112	BUFFALO MINING CO	S007779	NA	283	1/5/1983	1/5/1988
113	W-P COAL CO	S007775	NA	150	3/21/1975	3/21/1980
114	ELKAY MINING CO	S509086	NA	113	8/25/1986	8/25/1996
115	TWIN BRANCH COAL CO	S049600	NA	1.5	1/25/1988	1/25/1993
116	REBEL COAL CO INC	S013679	NA	391	11/8/1979	1/6/1998
117	COYOTE COAL CO LLC	S501112	Brushy Fork Surface Mine	262	8/6/2013	8/6/2018
118	HAMPDEN COAL COMPANY LLC	S501110	Pound Mill Surface Mine	39.2	9/28/2012	9/28/2017
119	COYOTE COAL CO LLC	S501908	Stanley Fork Surface Mine	1086.5	12/4/2012	12/4/2017
120	BUFFALO MINING CO	I014600	NA	4	6/24/1975	6/24/1980
121	ELKAY MINING CO	S025675	NA	200	12/19/1975	12/19/1980
122	PEACH CREEK PROCESSING CO	S024800	NA	2	10/29/1976	10/29/1981
123	DAL-TEX COAL CORP	S018978	NA	60	11/17/1978	11/17/1983
124	FERRELL EXCAVATING CO INC	S003479	NA	15	12/14/1982	12/14/1987
125	HIGH SPUR COAL CO INC	S008177	NA	160	5/13/1977	5/13/1982
126	BELVA COAL COMPANY	S002775	NA	32.72	2/7/1975	2/7/1980
127	HOBET MINING, INC	S011275	NA	146	5/19/1975	5/19/1980
128	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S500809	Pine Creek No. 2 Surface Mine	696.81	10/29/2012	10/29/2017
129	ELKAY MINING CO	I051700	NA	74	7/31/1980	7/31/1985
130	IROQUOIS COAL CORP	S000182	NA	112.69	1/26/1982	1/26/1993
131	DAL-TEX COAL CORP	Z004281	NA	100	9/30/1982	9/30/1987
132	BUFFALO MINING CO	S002285	NA	58.4	3/27/1985	3/27/1995
133	HIGH SPUR COAL CO INC	S023400	NA	16	9/2/1976	9/2/1981

Site No	Permittee	Permit_ID	Facility	Acres	Issue Date	Expiration Date
134	STOLLINGS TRUCKING CO INC	S500212	Winifrede Contour No. 2	30	9/10/2013	9/10/2018

Site Analysis (Distance Analysis)

Once the surface mining sites in the County were identified each of the sites were evaluated by estimating the shortest distance from the site to a specified criteria (features which are important to development). There are two types of distance calculation in this analysis: road-path and Euclidean distance. Road-path distance is the distance when travelling on an actual roadway from the site to the feature; Euclidean distance is when the distance is a straight line from the site to the feature, without the necessity of following a roadway. Following are lists of criteria used in the analysis:

- Road-path Distances:
  - Distance to nearest roadway (Interstate, Existing Highway, Proposed Highway…)
  - Distance to major airports (Tri-State, Yeager)
  - Distance to Intermodal Terminal Facility and Huntington Port
  - Distance to nearest Sewer/ Solid Waste Treatment Facility
- Euclidean Distances:
  - Distance to Water Lines, Sewer Lines, Power Lines and Broadband
  - Distance to Gas Pipe and Oil Pipe
  - Distance to Railroad, National Waterway Network

The following tables illustrate the results of these assessments for all of the identified sites. All distances were recorded in miles.

Table 4: Assessment of Distances

Site No	Permit_ID	Interstate (IS)	Sign -IS	Existing Highway (EH)	Sign-EH	Proposed Highway (PH)	PH Name
1	I051400	51.38	I64	3.87	U119	10.76	Kingcoal Highway
2	I051600	50.85	I64	3.34	U119	10.79	Kingcoal Highway
3	S000279	49.85	I64	2.34	U119	9.90	Kingcoal Highway
4	S000285	41.79	I64	6.18	S17	29.28	Kingcoal Highway
5	S000480	53.06	I64	2.12	S44	11.83	Kingcoal Highway
6	S000580	49.15	I64	5.17	U119	17.09	Kingcoal Highway
7	S000985	48.99	I64	1.48	U119	9.04	Kingcoal Highway
8	S001376	44.41	I64	7.80	S10	36.04	Kingcoal Highway
9	S001783	47.26	I64	9.01	S97	15.06	Kingcoal Highway
10	S006885	44.97	I64	8.37	S10	36.60	Kingcoal Highway
11	S007585	39.36	I64	5.83	S10	29.69	Kingcoal Highway
12	S009480	50.91	I64	3.40	U119	10.96	Kingcoal Highway
13	S010685	53.35	I64	5.84	U119	8.60	Kingcoal Highway
14	S011785	47.99	I64	4.00	U119	10.02	Kingcoal Highway

Site No	Permit_ID	Interstate (IS)	Sign -IS	Existing Highway (EH)	Sign-EH	Proposed Highway (PH)	PH Name
15	S012378	46.29	I64	1.91	U119	12.69	Kingcoal Highway
16	S012478	47.85	I64	1.05	U119	9.32	Kingcoal Highway
17	S015974	45.41	I64	8.81	S10	37.05	Kingcoal Highway
18	S019877	49.20	I64	2.86	S17	19.72	Kingcoal Highway
19	S020373	33.53	I64	8.25	S85	31.97	Coal Express Highway
20	S025876	46.19	I64	4.08	S10	22.96	Kingcoal Highway
21	S400508	38.76	I64	5.22	S10	23.27	Coal Express Highway
22	S500104	45.93	I64	0.88	S17	20.02	Kingcoal Highway
23	S500189	37.44	I64	3.05	S17	32.84	Kingcoal Highway
24	S500190	43.06	I64	7.85	S10	26.72	Kingcoal Highway
25	S500194	45.99	I64	3.75	S10	22.63	Kingcoal Highway
26	S500201	44.74	I64	4.87	S10	23.74	Kingcoal Highway
27	S500291	39.36	I64	2.82	U119	16.49	Kingcoal Highway
28	S500502	43.12	I64	6.52	S10	25.39	Kingcoal Highway
29	S500503	40.49	I64	0.37	S17	24.42	Kingcoal Highway
30	S500591	34.78	I64	4.17	S17	26.74	Kingcoal Highway
31	S500593	43.83	I64	5.46	S10	24.33	Kingcoal Highway
32	S500604	46.23	I64	0.76	S10	18.59	Kingcoal Highway
33	S500605	42.30	I64	5.59	S17	29.80	Kingcoal Highway
34	S500607	55.52	I64	3.90	S44	10.72	Kingcoal Highway
35	S500691	42.03	I64	5.43	S10	33.67	Kingcoal Highway
36	S500701	35.45	I64	7.95	S10	33.11	Kingcoal Highway
37	S500790	51.41	I64	0.90	S44	11.01	Kingcoal Highway
38	S500904	39.84	I64	6.31	S10	27.34	Kingcoal Highway
39	S500907	43.32	I64	3.79	S17	28.43	Kingcoal Highway
40	S500908	37.63	I64	0.60	S17	27.63	Kingcoal Highway
41	S501095	47.00	I64	3.82	S10	22.69	Kingcoal Highway
42	S501188	35.97	I64	5.37	S17	27.13	Kingcoal Highway
43	S501300	51.75	I64	1.59	S44	12.04	Kingcoal Highway
44	S501301	57.25	I64	5.62	S44	8.96	Kingcoal Highway
45	S501390	44.04	I64	0.59	S17	21.34	Kingcoal Highway
46	S501396	47.16	I64	1.55	S10	19.52	Kingcoal Highway
47	S501397	40.09	I64	1.36	S17	26.81	Kingcoal Highway
48	S501490	36.04	I64	5.91	S10	28.10	Kingcoal Highway
49	S501499	41.63	I64	7.28	S10	26.15	Kingcoal Highway
50	S501506	49.06	I64	2.72	S17	19.57	Kingcoal Highway

Site No	Permit_ID	Interstate (IS)	Sign -IS	Existing Highway (EH)	Sign-EH	Proposed Highway (PH)	PH Name
51	S501596	42.04	I64	2.69	S10	19.91	Kingcoal Highway
52	S501598	54.61	I64	1.65	S44	9.32	Kingcoal Highway
53	S501688	36.76	I64	2.37	S17	32.16	Kingcoal Highway
54	S501693	59.88	I64	5.97	U52	9.12	Kingcoal Highway
55	S501788	37.13	I64	2.74	S17	32.54	Kingcoal Highway
56	S501796	48.81	I64	4.43	U119	15.21	Kingcoal Highway
57	S501798	55.32	I64	1.27	S44	7.74	Kingcoal Highway
58	S501809	38.85	I64	1.11	S10	23.36	Coal Express Highway
59	S501986	36.49	I64	2.10	S17	31.89	Kingcoal Highway
60	S501989	29.84	I64	4.57	S85	28.29	Coal Express Highway
61	S502100	42.15	I64	2.80	S10	20.02	Kingcoal Highway
62	S502188	36.60	I64	5.83	S10	21.29	Kingcoal Highway
63	S502393	50.35	I64	1.51	S10	21.22	Kingcoal Highway
64	S502486	36.90	I64	2.50	S17	32.30	Kingcoal Highway
65	S502493	45.86	I64	0.81	S17	19.96	Kingcoal Highway
66	S502495	40.96	I64	7.41	S10	26.42	Kingcoal Highway
67	S502701	56.70	I64	5.08	S44	10.43	Kingcoal Highway
68	S502789	56.69	I64	5.06	S44	9.63	Kingcoal Highway
69	S502889	52.86	I64	5.01	S44	12.26	Kingcoal Highway
70	S503091	36.60	I64	5.99	S17	27.75	Kingcoal Highway
71	S503096	44.40	I64	0.99	S17	21.66	Kingcoal Highway
72	S503186	33.61	I64	8.33	S85	32.05	Coal Express Highway
73	S503408	48.14	I64	3.76	U119	14.54	Kingcoal Highway
74	S503586	44.86	I64	8.26	S10	36.50	Kingcoal Highway
75	S504186	47.60	I64	3.61	U119	15.53	Kingcoal Highway
76	S504189	48.52	I64	0.51	U119	7.56	Kingcoal Highway
77	S504193	44.72	I64	6.36	S10	25.23	Kingcoal Highway
78	S504288	45.20	I64	0.57	U119	10.95	Kingcoal Highway
79	S504492	41.15	I64	7.61	S10	26.60	Kingcoal Highway
80	S504592	50.16	I64	2.66	U119	10.20	Kingcoal Highway
81	S504689	47.32	I64	10.21	U119	14.01	Kingcoal Highway
82	S504991	36.68	I64	6.07	S17	27.82	Kingcoal Highway
83	S505286	36.89	I64	2.50	S17	32.29	Kingcoal Highway
84	S505389	49.24	I64	5.26	U119	17.17	Kingcoal Highway
85	S505489	48.94	I64	1.43	U119	8.99	Kingcoal Highway

Site No	Permit_ID	Interstate (IS)	Sign -IS	Existing Highway (EH)	Sign-EH	Proposed Highway (PH)	PH Name
86	S505587	46.88	I64	8.65	S97	14.70	Kingcoal Highway
87	S506288	46.32	I64	2.32	U119	14.24	Kingcoal Highway
88	S506391	38.13	I64	0.21	S17	26.47	Kingcoal Highway
89	S506491	46.45	I64	8.21	S97	14.26	Kingcoal Highway
90	S506992	33.98	I64	8.71	S85	32.42	Coal Express Highway
91	S507091	37.70	I64	0.67	S17	27.69	Kingcoal Highway
92	S507986	38.74	I64	5.21	S10	28.85	Kingcoal Highway
93	S508187	36.76	I64	2.37	S17	32.16	Kingcoal Highway
94	S508486	47.85	I64	3.46	U119	14.24	Kingcoal Highway
95	S509386	39.96	I64	3.42	U119	15.41	Kingcoal Highway
96	S510186	39.56	I64	0.71	S17	26.01	Kingcoal Highway
97	S510486	48.23	I64	1.89	S17	18.75	Kingcoal Highway
98	Z004381	56.53	I64	0.41	S44	4.94	Kingcoal Highway
99	I051200	49.03	I64	1.52	U119	9.07	Kingcoal Highway
100	S000785	40.03	I64	3.49	U119	16.65	Kingcoal Highway
101	S505686	47.03	I64	8.79	S97	14.84	Kingcoal Highway
102	S005177	49.08	I64	2.74	S17	19.59	Kingcoal Highway
103	S502586	50.43	I64	0.67	S44	11.50	Kingcoal Highway
104	S001885	42.53	I64	7.46	S10	26.33	Kingcoal Highway
105	S000680	50.33	I64	2.83	U119	10.38	Kingcoal Highway
106	Z001481	40.00	I64	6.47	S10	27.50	Kingcoal Highway
107	S009985	47.36	I64	2.99	S10	21.86	Kingcoal Highway
108	S011878	53.78	I64	2.84	S44	12.55	Kingcoal Highway
109	S025374	42.96	I64	3.44	S17	28.09	Kingcoal Highway
110	S501410	36.24	I64	2.70	S10	20.75	Coal Express Highway
111	S003784	36.63	I64	2.24	S17	32.03	Kingcoal Highway
112	S007779	28.98	I64	3.70	S85	27.42	Coal Express Highway
113	S007775	54.04	I64	0.72	S44	8.02	Kingcoal Highway
114	S509086	47.76	I64	1.63	S10	20.14	Kingcoal Highway
115	S049600	47.16	I64	0.36	U119	8.63	Kingcoal Highway
116	S013679	47.70	I64	0.91	U119	9.17	Kingcoal Highway
117	S501112	41.02	I64	6.37	S17	28.51	Kingcoal Highway
118	S501110	44.05	I64	0.44	S10	17.18	Kingcoal Highway
119	S501908	43.15	I64	6.06	S17	30.70	Kingcoal Highway

Site No	Permit_ID	Interstate (IS)	Sign -IS	Existing Highway (EH)	Sign-EH	Proposed Highway (PH)	PH Name
120	I014600	30.64	I64	5.37	S85	29.08	Coal Express Highway
121	S025675	42.57	I64	3.23	S10	20.45	Kingcoal Highway
122	S024800	49.80	I64	0.82	S80	12.29	Kingcoal Highway
123	S018978	36.09	I64	1.70	S17	31.49	Kingcoal Highway
124	S003479	47.13	I64	0.80	S17	17.65	Kingcoal Highway
125	S008177	47.26	I64	2.38	S10	21.25	Kingcoal Highway
126	S002775	41.25	I64	1.90	S10	19.12	Kingcoal Highway
127	S011275	53.53	I64	6.03	U119	8.79	Kingcoal Highway
128	S500809	53.43	I64	2.49	S44	12.20	Kingcoal Highway
129	I051700	42.58	I64	3.24	S10	20.46	Kingcoal Highway
130	S000182	40.00	I64	6.47	S10	27.50	Kingcoal Highway
131	Z004281	36.71	I64	2.32	S17	32.11	Kingcoal Highway
132	S002285	30.54	I64	5.27	S85	28.99	Coal Express Highway
133	S023400	44.50	I64	0.11	S17	19.88	Kingcoal Highway
134	S500212	41.87	I64	6.43	S10	25.30	Kingcoal Highway

Table 5 Distances from Sites to Major Airports

Site No	Permit_ID	Tri-State	Yeager
1	I051400	66.25	58.67
2	I051600	65.72	58.14
3	S000279	64.72	57.14
4	S000285	74.73	53.34
5	S000480	67.92	60.36
6	S000580	64.03	56.44
7	S000985	63.86	56.27
8	S001376	81.49	63.07
9	S001783	97.81	81.92
10	S006885	82.05	63.64
11	S007585	75.15	56.73
12	S009480	65.78	58.20
13	S010685	65.70	60.64
14	S011785	62.87	55.27
15	S012378	61.16	53.58
16	S012478	62.72	55.13
17	S015974	82.50	64.08
18	S019877	65.17	56.49

Site No	Permit_ID	Tri-State	Yeager
19	S020373	81.76	55.43
20	S025876	68.42	59.74
21	S400508	87.33	69.18
22	S500104	65.47	53.57
23	S500189	69.12	45.10
24	S500190	72.17	57.59
25	S500194	68.08	59.41
26	S500201	69.19	59.26
27	S500291	54.74	46.65
28	S500502	70.85	57.65
29	S500503	69.88	48.12
30	S500591	60.36	42.42
31	S500593	69.79	58.36
32	S500604	70.97	62.30
33	S500605	75.25	52.75
34	S500607	70.37	62.82
35	S500691	79.12	60.70
36	S500701	78.56	57.35
37	S500790	66.28	58.71
38	S500904	72.79	54.30
39	S500907	73.88	50.95
40	S500908	69.31	45.27
41	S501095	68.14	59.46
42	S501188	60.75	43.62
43	S501300	66.61	59.04
44	S501301	69.69	64.55
45	S501390	66.79	51.67
46	S501396	71.60	62.92
47	S501397	71.77	47.72
48	S501490	46.07	52.84
49	S501499	71.61	56.16
50	S501506	65.03	56.35
51	S501596	79.12	60.71
52	S501598	69.47	61.92
53	S501688	68.43	44.41
54	S501693	69.86	67.18
55	S501788	68.80	44.78
56	S501796	63.68	56.11
57	S501798	70.18	62.61
58	S501809	79.00	69.27

Site No	Permit_ID	Tri-State	Yeager
59	S501986	68.16	44.14
60	S501989	81.76	51.75
61	S502100	79.24	60.82
62	S502188	48.78	52.08
63	S502393	66.68	58.00
64	S502486	68.57	44.54
65	S502493	65.41	53.50
66	S502495	71.87	55.48
67	S502701	71.16	63.99
68	S502789	70.36	63.98
69	S502889	67.73	60.15
70	S503091	61.36	44.25
71	S503096	67.11	52.03
72	S503186	81.84	55.51
73	S503408	63.01	55.43
74	S503586	81.95	63.53
75	S504186	62.48	54.89
76	S504189	63.04	55.81
77	S504193	70.68	59.25
78	S504288	60.06	52.48
79	S504492	72.05	55.68
80	S504592	65.03	57.45
81	S504689	56.69	57.02
82	S504991	61.44	44.32
83	S505286	68.56	44.53
84	S505389	64.12	56.52
85	S505489	63.81	56.23
86	S505587	97.43	81.55
87	S506288	61.20	53.61
88	S506391	69.81	45.77
89	S506491	97.00	81.11
90	S506992	80.72	55.89
91	S507091	69.38	45.33
92	S507986	74.30	55.89
93	S508187	68.43	44.41
94	S508486	62.71	55.13
95	S509386	54.84	47.26
96	S510186	71.23	47.19
97	S510486	64.20	55.53
98	Z004381	71.38	63.82

Site No	Permit_ID	Tri-State	Yeager
99	I051200	63.90	56.32
100	S000785	54.91	47.32
101	S505686	97.57	81.69
102	S005177	65.05	56.37
103	S502586	65.29	57.73
104	S001885	71.78	57.06
105	S000680	65.20	57.63
106	Z001481	72.95	54.06
107	S009985	67.31	58.63
108	S011878	68.64	61.08
109	S025374	73.53	50.60
110	S501410	84.81	55.84
111	S003784	68.31	44.28
112	S007779	80.90	50.88
113	S007775	68.90	61.34
114	S509086	71.16	62.48
115	S049600	62.03	54.45
116	S013679	62.58	54.99
117	S501112	73.96	53.53
118	S501110	72.38	63.70
119	S501908	76.14	53.21
120	I014600	81.84	52.54
121	S025675	79.67	61.25
122	S024800	77.36	68.69
123	S018978	67.77	43.74
124	S003479	63.10	54.43
125	S008177	66.71	58.03
126	S002775	78.34	59.92
127	S011275	65.88	60.82
128	S500809	68.29	60.73
129	I051700	79.67	61.25
130	S000182	72.95	54.06
131	Z004281	68.39	44.35
132	S002285	82.46	52.45
133	S023400	65.33	52.14
134	S500212	70.75	56.39

Table 6: Shortest Distances from Sites to Other Transportation Methods

Site No	Permit_ID	Railroad	Intermodel Terminal Facility (CSXT Peach Creek Yd Bulk TransFlo)	National Waterway Network (Big Sandy River)	Huntington Port
1	I051400	0.15	12.47	8.49	60.36
2	I051600	0.58	11.93	8.68	59.83
3	S000279	1.47	10.94	10.14	58.83
4	S000285	1.43	17.29	21.31	68.84
5	S000480	0.89	11.58	11.96	62.03
6	S000580	1.08	9.35	10.78	58.15
7	S000985	0.89	10.08	10.72	57.97
8	S001376	1.00	24.04	19.99	75.60
9	S001783	1.49	40.82	14.85	91.92
10	S006885	2.43	24.60	19.53	76.16
11	S007585	1.29	17.69	18.48	69.26
12	S009480	0.53	12.00	9.05	59.89
13	S010685	1.21	14.43	7.66	62.32
14	S011785	0.77	8.18	11.84	56.98
15	S012378	0.94	7.41	12.51	55.27
16	S012478	0.74	8.93	11.41	56.83
17	S015974	2.87	25.04	19.63	76.61
18	S019877	1.76	7.71	20.26	59.27
19	S020373	3.37	24.31	20.54	75.87
20	S025876	1.31	10.97	19.88	62.53
21	S400508	3.05	29.88	20.13	81.44
22	S500104	2.84	8.02	21.59	59.58
23	S500189	1.53	20.85	23.77	63.02
24	S500190	1.58	14.72	18.18	66.28
25	S500194	1.00	10.63	19.84	62.19
26	S500201	0.91	11.75	21.22	63.30
27	S500291	2.25	8.04	18.09	48.85
28	S500502	0.89	13.40	20.76	64.96
29	S500503	2.73	12.43	23.07	63.98
30	S500591	1.64	11.53	26.11	54.45
31	S500593	0.65	12.33	19.31	63.89
32	S500604	0.81	13.52	13.80	65.08
33	S500605	1.79	17.80	21.21	69.36
34	S500607	1.42	14.04	8.51	64.49
35	S500691	1.17	21.67	17.79	73.23

Site No	Permit_ID	Railroad	Intermodel Terminal Facility (CSXT Peach Creek Yd Bulk TransFlo)	National Waterway Network (Big Sandy River)	Huntington Port
36	S500701	0.87	21.12	21.01	72.68
37	S500790	0.86	9.94	12.61	60.39
38	S500904	0.61	15.34	19.82	66.90
39	S500907	3.48	16.44	23.37	67.99
40	S500908	2.34	15.63	25.79	63.20
41	S501095	1.45	10.69	17.93	62.25
42	S501188	1.38	11.92	24.60	54.84
43	S501300	1.38	10.27	14.04	60.72
44	S501301	0.85	15.78	6.58	66.21
45	S501390	2.94	9.34	22.22	60.90
46	S501396	1.33	14.15	13.18	65.71
47	S501397	2.98	14.81	24.63	65.65
48	S501490	4.59	21.71	14.57	42.34
49	S501499	0.90	14.16	20.26	65.72
50	S501506	1.96	7.57	19.94	59.13
51	S501596	1.10	21.67	16.33	73.23
52	S501598	1.23	13.13	9.53	63.59
53	S501688	0.76	20.17	24.54	62.33
54	S501693	1.87	18.41	7.95	68.86
55	S501788	1.17	20.54	24.24	62.70
56	S501796	1.91	9.93	10.23	57.79
57	S501798	0.83	13.84	12.04	64.29
58	S501809	2.40	21.55	18.73	73.11
59	S501986	0.47	19.90	24.86	62.06
60	S501989	2.67	26.23	21.40	75.37
61	S502100	1.64	21.78	17.08	73.35
62	S502188	4.50	17.04	15.18	42.89
63	S502393	1.10	9.23	17.04	60.79
64	S502486	0.95	20.31	25.93	62.46
65	S502493	2.82	7.96	21.55	59.52
66	S502495	1.44	14.43	20.24	65.98
67	S502701	2.02	15.23	7.33	65.67
68	S502789	1.82	15.21	8.08	65.66
69	S502889	0.92	13.95	9.89	61.85
70	S503091	1.66	12.55	23.88	55.47
71	S503096	1.22	9.66	21.01	61.22
72	S503186	3.55	24.39	20.89	75.95

Site No	Permit_ID	Railroad	Intermodel Terminal Facility (CSXT Peach Creek Yd Bulk TransFlo)	National Waterway Network (Big Sandy River)	Huntington Port
73	S503408	2.81	9.26	11.04	57.11
74	S503586	2.31	24.49	18.82	76.06
75	S504186	0.76	7.78	12.36	56.59
76	S504189	0.63	9.61	10.94	57.50
77	S504193	1.61	13.23	18.34	64.79
78	S504288	0.71	6.29	13.22	54.18
79	S504492	1.39	14.61	20.43	66.16
80	S504592	1.27	11.25	9.03	59.14
81	S504689	3.52	13.35	11.16	53.61
82	S504991	1.78	12.62	23.77	55.55
83	S505286	1.20	20.30	24.20	62.46
84	S505389	0.81	9.43	11.45	58.23
85	S505489	0.68	10.03	10.84	57.92
86	S505587	1.06	40.44	15.10	91.55
87	S506288	1.11	6.51	13.58	55.31
88	S506391	0.92	14.48	25.73	63.69
89	S506491	0.66	40.01	14.47	91.11
90	S506992	1.20	23.26	20.45	74.82
91	S507091	2.42	15.69	25.75	63.26
92	S507986	1.09	16.85	19.29	68.41
93	S508187	1.07	20.17	24.43	62.33
94	S508486	1.59	8.96	11.42	56.83
95	S509386	3.18	6.96	16.88	48.95
96	S510186	1.24	14.02	24.78	65.12
97	S510486	0.98	6.75	19.44	58.31
98	Z004381	2.17	15.05	9.30	65.50
99	I051200	0.94	10.11	10.68	58.01
100	S000785	2.65	8.19	17.26	49.02
101	S505686	1.27	40.58	14.69	91.69
102	S005177	2.05	7.60	20.60	59.16
103	S502586	0.75	8.95	12.71	59.40
104	S001885	1.09	14.33	18.67	65.89
105	S000680	1.09	11.42	9.39	59.31
106	Z001481	0.62	15.50	20.06	67.06
107	S009985	0.64	9.86	17.54	61.42
108	S011878	0.41	12.31	10.39	62.76
109	S025374	2.35	16.08	22.25	67.64

Site No	Permit_ID	Railroad	Intermodel Terminal Facility (CSXT Peach Creek Yd Bulk TransFlo)	National Waterway Network (Big Sandy River)	Huntington Port
110	S501410	3.94	27.36	20.33	78.92
111	S003784	0.60	20.04	25.60	62.20
112	S007779	2.04	26.23	22.29	74.51
113	S007775	0.84	12.56	11.85	63.01
114	S509086	1.45	13.71	17.01	65.27
115	S049600	0.27	8.25	11.52	56.15
116	S013679	0.45	8.79	11.61	56.69
117	S501112	1.31	16.52	20.63	68.07
118	S501110	0.50	14.93	14.34	66.49
119	S501908	1.57	18.70	22.37	70.25
120	I014600	3.18	24.40	22.22	75.95
121	S025675	1.96	22.21	17.35	73.78
122	S024800	0.61	19.91	10.54	71.47
123	S018978	0.47	19.50	25.08	61.66
124	S003479	0.79	5.65	18.94	57.21
125	S008177	0.96	9.25	19.04	60.82
126	S002775	0.45	20.88	15.94	72.45
127	S011275	0.93	14.62	8.06	62.51
128	S500809	0.74	11.95	10.35	62.41
129	I051700	1.97	22.22	17.88	73.78
130	S000182	0.62	15.50	20.06	67.06
131	Z004281	0.68	20.12	25.85	62.28
132	S002285	3.16	26.93	20.62	76.07
133	S023400	2.44	7.88	20.89	59.43
134	S500212	0.38	13.30	19.90	64.86

Table 7: Shortest Distances from Sites to Sewer Lines (SL) and Water Lines (WL)

Site No	Permit_ID	SL	Public Utility-SL	WL	Public Utility-WL
1	I051400	1.29	Mingo County Public Service District	1.14	Mingo County Public Service District
2	I051600	0.92	Mingo County Public Service District	0.76	Mingo County Public Service District
3	S000279	1.92	Mingo County Public Service District	0.95	Logan County Public Service District
4	S000285	7.72	Boone-Raleigh Public Service District	5.20	Logan County Public Service District
5	S000480	5.11	Mingo County Public Service District	0.85	Logan County Public Service District
6	S000580	2.51	Mingo County Public Service District	0.48	Logan County Public Service District
7	S000985	2.36	Mingo County Public Service District	0.78	Logan County Public Service District
8	S001376	8.03	Town of Oceana Sewer System	2.78	Logan County Public Service District
9	S001783	4.77	Town of Oceana Sewer System	1.56	Coal Mountain Public Service District
10	S006885	6.60	Town of Oceana Sewer System	1.62	Logan County Public Service District
11	S007585	8.11	City of Logan Sanitary Board	3.12	Logan County Public Service District
12	S009480	1.32	Mingo County Public Service District	1.16	Mingo County Public Service District
13	S010685	0.72	Mingo County Public Service District	0.71	Mingo County Public Service District
14	S011785	3.64	Mingo County Public Service District	0.06	Logan County Public Service District
15	S012378	4.03	Mingo County Public Service District	0.50	Logan County Public Service District
16	S012478	3.12	Mingo County Public Service District	0.11	Logan County Public Service District
17	S015974	6.16	Town of Oceana Sewer System	1.53	Logan County Public Service District
18	S019877	3.20	City of Logan Sanitary Board	0.36	Logan County Public Service District
19	S020373	6.06	Town of Oceana Sewer System	2.15	Logan County Public Service District
20	S025876	3.98	City of Logan Sanitary Board	1.20	Logan County Public Service District

Site No	Permit_ID	SL	Public Utility-SL	WL	Public Utility-WL
21	S400508	5.01	Town of Oceana Sewer System	1.14	Logan County Public Service District
22	S500104	4.03	City of Logan Sanitary Board	1.06	Logan County Public Service District
23	S500189	6.29	City of Logan Sanitary Board	1.97	Logan County Public Service District
24	S500190	7.55	City of Logan Sanitary Board	2.66	Logan County Public Service District
25	S500194	4.21	City of Logan Sanitary Board	0.97	Logan County Public Service District
26	S500201	5.86	City of Logan Sanitary Board	1.15	Logan County Public Service District
27	S500291	3.73	City of Logan Sanitary Board	1.01	Logan County Public Service District
28	S500502	8.11	City of Logan Sanitary Board	2.80	Logan County Public Service District
29	S500503	7.43	City of Logan Sanitary Board	3.21	Logan County Public Service District
30	S500591	8.12	Boone County Public Service District (Sewer)	0.86	Logan County Public Service District
31	S500593	6.66	City of Logan Sanitary Board	1.55	Logan County Public Service District
32	S500604	5.61	Town of Gilbert (Sewer)	0.73	Logan County Public Service District
33	S500605	8.48	Boone-Raleigh Public Service District	3.79	Logan County Public Service District
34	S500607	3.39	Mingo County Public Service District	1.09	Logan County Public Service District
35	S500691	7.49	Town of Gilbert (Sewer)	2.28	Logan County Public Service District
36	S500701	7.83	Boone-Raleigh Public Service District	4.88	Logan County Public Service District
37	S500790	5.04	City of Logan Sanitary Board	0.89	Logan County Public Service District
38	S500904	9.10	Boone-Raleigh Public Service District	4.31	Logan County Public Service District
39	S500907	7.08	Boone-Raleigh Public Service District	4.18	West Virginia-American Water Company
40	S500908	6.47	Boone-Raleigh Public Service District	1.67	West Virginia-American Water Company
41	S501095	6.05	City of Logan Sanitary Board	1.50	Logan County Public Service District

Site No	Permit_ID	SL	Public Utility-SL	WL	Public Utility-WL
42	S501188	6.75	City of Logan Sanitary Board	0.78	Logan County Public Service District
43	S501300	5.55	City of Logan Sanitary Board	0.72	Logan County Public Service District
44	S501301	3.92	Town of Delbarton (Sewer)	0.81	Mingo County Public Service District
45	S501390	5.18	City of Logan Sanitary Board	1.59	Logan County Public Service District
46	S501396	5.57	Town of Gilbert (Sewer)	1.65	Logan County Public Service District
47	S501397	6.87	Boone-Raleigh Public Service District	2.71	West Virginia-American Water Company
48	S501490	8.20	Town of Chapmanville (Sewer)	2.31	Mingo County Public Service District
49	S501499	8.57	City of Logan Sanitary Board	3.26	Logan County Public Service District
50	S501506	3.49	City of Logan Sanitary Board	1.35	Logan County Public Service District
51	S501596	7.13	City of Logan Sanitary Board	1.25	Logan County Public Service District
52	S501598	4.27	Mingo County Public Service District	1.20	Logan County Public Service District
53	S501688	7.03	City of Logan Sanitary Board	1.70	Logan County Public Service District
54	S501693	2.91	Mingo County Public Service District	0.95	Mingo County Public Service District
55	S501788	6.63	City of Logan Sanitary Board	1.52	Logan County Public Service District
56	S501796	3.89	Mingo County Public Service District	1.60	Logan County Public Service District
57	S501798	6.36	Mingo County Public Service District	0.69	Logan County Public Service District
58	S501809	6.83	Town of Oceana Sewer System	1.18	Logan County Public Service District
59	S501986	7.33	City of Logan Sanitary Board	1.63	Logan County Public Service District
60	S501989	6.24	Boone-Raleigh Public Service District	2.36	Logan County Public Service District
61	S502100	7.05	City of Logan Sanitary Board	2.00	Logan County Public Service District
62	S502188	7.22	Town of Chapmanville (Sewer)	2.54	Mingo County Public Service District

Site No	Permit_ID	SL	Public Utility-SL	WL	Public Utility-WL
63	S502393	5.14	City of Logan Sanitary Board	1.48	Logan County Public Service District
64	S502486	8.17	City of Logan Sanitary Board	1.33	West Virginia-American Water Company
65	S502493	4.02	City of Logan Sanitary Board	0.98	Logan County Public Service District
66	S502495	9.14	Boone-Raleigh Public Service District	3.88	Logan County Public Service District
67	S502701	2.81	Mingo County Public Service District	1.50	Mingo County Public Service District
68	S502789	4.08	Mingo County Public Service District	1.32	Mingo County Public Service District
69	S502889	2.15	Mingo County Public Service District	1.16	Logan County Public Service District
70	S503091	6.16	City of Logan Sanitary Board	1.43	Logan County Public Service District
71	S503096	4.82	City of Logan Sanitary Board	1.03	Logan County Public Service District
72	S503186	6.24	Town of Oceana Sewer System	2.18	Logan County Public Service District
73	S503408	4.94	Mingo County Public Service District	1.02	Logan County Public Service District
74	S503586	6.89	Town of Oceana Sewer System	1.28	Logan County Public Service District
75	S504186	4.18	Mingo County Public Service District	0.48	Logan County Public Service District
76	S504189	2.77	Mingo County Public Service District	0.36	Logan County Public Service District
77	S504193	6.58	City of Logan Sanitary Board	1.73	Logan County Public Service District
78	S504288	3.81	City of Logan Sanitary Board	0.67	Logan County Public Service District
79	S504492	9.04	Boone-Raleigh Public Service District	3.76	Logan County Public Service District
80	S504592	0.74	Mingo County Public Service District	0.60	Mingo County Public Service District
81	S504689	5.64	Mingo County Public Service District	0.48	Mingo County Public Service District
82	S504991	6.04	City of Logan Sanitary Board	1.35	Logan County Public Service District
83	S505286	7.01	City of Logan Sanitary Board	2.40	West Virginia-American Water Company

Site No	Permit_ID	SL	Public Utility-SL	WL	Public Utility-WL
84	S505389	3.19	Mingo County Public Service District	0.50	Logan County Public Service District
85	S505489	2.43	Mingo County Public Service District	0.94	Logan County Public Service District
86	S505587	4.30	Town of Oceana Sewer System	1.17	Coal Mountain Public Service District
87	S506288	3.32	City of Logan Sanitary Board	0.64	Logan County Public Service District
88	S506391	7.88	Boone-Raleigh Public Service District	1.19	West Virginia-American Water Company
89	S506491	3.94	Town of Oceana Sewer System	0.69	Coal Mountain Public Service District
90	S506992	7.88	Town of Oceana Sewer System	2.98	Logan County Public Service District
91	S507091	6.43	Boone-Raleigh Public Service District	1.75	West Virginia-American Water Company
92	S507986	8.71	City of Logan Sanitary Board	3.55	Logan County Public Service District
93	S508187	7.29	City of Logan Sanitary Board	2.19	West Virginia-American Water Company
94	S508486	3.91	Mingo County Public Service District	0.68	Logan County Public Service District
95	S509386	3.93	City of Logan Sanitary Board	0.36	Logan County Public Service District
96	S510186	7.92	City of Logan Sanitary Board	2.00	West Virginia-American Water Company
97	S510486	2.39	City of Logan Sanitary Board	0.47	Logan County Public Service District
98	Z004381	3.07	Mingo County Public Service District	0.77	Logan County Public Service District
99	I051200	2.34	Mingo County Public Service District	0.76	Logan County Public Service District
100	S000785	3.37	City of Logan Sanitary Board	0.74	Logan County Public Service District
101	S505686	4.55	Town of Oceana Sewer System	1.31	Coal Mountain Public Service District
102	S005177	3.48	City of Logan Sanitary Board	0.21	Logan County Public Service District
103	S502586	4.99	City of Logan Sanitary Board	0.77	Logan County Public Service District
104	S001885	7.81	City of Logan Sanitary Board	2.79	Logan County Public Service District

Site No	Permit_ID	SL	Public Utility-SL	WL	Public Utility-WL
105	S000680	1.25	Mingo County Public Service District	1.10	Mingo County Public Service District
106	Z001481	8.83	Boone-Raleigh Public Service District	4.36	Logan County Public Service District
107	S009985	4.95	City of Logan Sanitary Board	1.27	Logan County Public Service District
108	S011878	3.44	Mingo County Public Service District	0.41	Logan County Public Service District
109	S025374	8.04	Boone-Raleigh Public Service District	3.79	Logan County Public Service District
110	S501410	5.67	Town of Oceana Sewer System	1.64	Logan County Public Service District
111	S003784	7.92	City of Logan Sanitary Board	1.40	West Virginia-American Water Company
112	S007779	5.34	Boone-Raleigh Public Service District	3.26	Logan County Public Service District
113	S007775	6.30	Mingo County Public Service District	0.79	Logan County Public Service District
114	S509086	5.78	City of Logan Sanitary Board	1.70	Logan County Public Service District
115	S049600	3.04	Mingo County Public Service District	0.35	Logan County Public Service District
116	S013679	3.13	Mingo County Public Service District	0.15	Logan County Public Service District
117	S501112	8.40	Boone-Raleigh Public Service District	4.86	Logan County Public Service District
118	S501110	5.02	Town of Gilbert (Sewer)	0.46	Logan County Public Service District
119	S501908	6.65	Boone-Raleigh Public Service District	5.84	Logan County Public Service District
120	I014600	5.76	Boone-Raleigh Public Service District	3.40	Logan County Public Service District
121	S025675	6.60	City of Logan Sanitary Board	2.10	Logan County Public Service District
122	S024800	0.52	Town of Gilbert (Sewer)	0.40	Town of Gilbert Water Works
123	S018978	7.88	City of Logan Sanitary Board	1.52	West Virginia-American Water Company
124	S003479	2.08	City of Logan Sanitary Board	0.23	Logan County Public Service District
125	S008177	3.37	City of Logan Sanitary Board	0.86	Logan County Public Service District
126	S002775	6.76	Town of Gilbert (Sewer)	1.60	Logan County Public Service District

Site No	Permit_ID	SL	Public Utility-SL	WL	Public Utility-WL
127	S011275	0.55	Mingo County Public Service District	0.45	Mingo County Public Service District
128	S500809	4.49	Mingo County Public Service District	0.79	Logan County Public Service District
129	I051700	7.03	City of Logan Sanitary Board	2.30	Logan County Public Service District
130	S000182	8.83	Boone-Raleigh Public Service District	4.36	Logan County Public Service District
131	Z004281	8.20	City of Logan Sanitary Board	1.13	West Virginia-American Water Company
132	S002285	5.58	Town of Oceana Sewer System	1.62	Logan County Public Service District
133	S023400	3.88	City of Logan Sanitary Board	0.59	Logan County Public Service District
134	S500212	8.13	City of Logan Sanitary Board	2.85	Logan County Public Service District

Table 8: Shortest Distances from Sites to Broadband and Power Lines

Site No	Permit_ID	Broadband	Provider	Power Lines	Type	Size_kV
1	I051400	0.51	Cebridge Acquisition LLC	0.04	Transmission	115-138
2	I051600	0.64	Cebridge Acquisition LLC	0.43	Transmission	115-138
3	S000279	1.70	Cebridge Acquisition LLC	0.45	Sub-Transmission	Unknown
4	S000285	1.17	Cebridge Acquisition LLC	1.02	Transmission	765
5	S000480	0.00	Cebridge Acquisition LLC	0.08	Sub-Transmission	Unknown
6	S000580	2.13	Cebridge Acquisition LLC	0.04	Sub-Transmission	Unknown
7	S000985	2.27	Cebridge Acquisition LLC	0.16	Sub-Transmission	Unknown
8	S001376	2.78	Shentel Cable Company	0.30	Transmission	765
9	S001783	0.75	Cebridge Acquisition LLC	1.86	Transmission	115-138
10	S006885	1.62	Shentel Cable Company	0.60	Transmission	765
11	S007585	0.28	Cebridge Acquisition LLC	1.13	Transmission	115-138
12	S009480	0.82	Cebridge Acquisition LLC	0.53	Sub-Transmission	Unknown
13	S010685	0.20	Cebridge Acquisition LLC	0.65	Transmission	115-138
14	S011785	1.57	Frontier West Virginia, Inc.	0.92	Sub-Transmission	Unknown
15	S012378	0.50	Frontier West Virginia, Inc.	2.18	Sub-Transmission	Unknown
16	S012478	1.78	Frontier West Virginia, Inc.	1.59	Sub-Transmission	Unknown
17	S015974	1.77	Shentel Cable Company	0.33	Transmission	765
18	S019877	0.62	Cebridge Acquisition LLC	0.54	Transmission	115-138
19	S020373	2.14	Shentel Cable Company	1.74	Transmission	765

Site No	Permit_ID	Broadband	Provider	Power Lines	Type	Size_kV
20	S025876	1.29	Cebridge Acquisition LLC	1.55	Transmission	115-138
21	S400508	0.95	Shentel Cable Company	2.28	Transmission	115-138
22	S500104	1.08	Cebridge Acquisition LLC	1.16	Transmission	115-138
23	S500189	0.47	Cebridge Acquisition LLC	2.09	Transmission	115-138
24	S500190	0.06	Cebridge Acquisition LLC	1.36	Sub-Transmission	Unknown
25	S500194	0.96	Cebridge Acquisition LLC	1.43	Transmission	115-138
26	S500201	1.10	Cebridge Acquisition LLC	1.45	Transmission	115-138
27	S500291	0.31	Cebridge Acquisition LLC	1.56	Transmission	115-138
28	S500502	0.28	Cebridge Acquisition LLC	0.83	Transmission	115-138
29	S500503	0.41	Cebridge Acquisition LLC	0.43	Transmission	115-138
30	S500591	0.19	Cebridge Acquisition LLC	2.07	Transmission	115-138
31	S500593	0.32	Cebridge Acquisition LLC	1.81	Transmission	115-138
32	S500604	0.75	Frontier West Virginia, Inc.	0.17	Transmission	115-138
33	S500605	0.57	Cebridge Acquisition LLC	0.20	Transmission	115-138
34	S500607	0.50	Cebridge Acquisition LLC	1.01	Transmission	115-138
35	S500691	1.74	Cebridge Acquisition LLC	1.28	Sub-Transmission	Unknown
36	S500701	1.83	Cebridge Acquisition LLC	0.87	Transmission	765
37	S500790	0.12	Cebridge Acquisition LLC	0.18	Sub-Transmission	Unknown
38	S500904	1.45	Cebridge Acquisition LLC	1.11	Transmission	115-138
39	S500907	0.23	Cebridge Acquisition LLC	0.77	Transmission	115-138
40	S500908	0.03	Cebridge Acquisition LLC	0.57	Transmission	765
41	S501095	0.38	Cebridge Acquisition LLC	2.13	Sub-Transmission	Unknown
42	S501188	0.11	Cebridge Acquisition LLC	2.09	Transmission	115-138
43	S501300	0.35	Cebridge Acquisition LLC	0.32	Transmission	115-138
44	S501301	0.50	Cebridge Acquisition LLC	0.99	Sub-Transmission	Unknown
45	S501390	0.92	Cebridge Acquisition LLC	0.68	Transmission	115-138
46	S501396	0.94	Cebridge Acquisition LLC	0.62	Transmission	115-138
47	S501397	0.29	Cebridge Acquisition LLC	0.96	Transmission	765
48	S501490	0.82	Frontier West Virginia, Inc.	7.20	Sub-Transmission	Unknown
49	S501499	0.09	Cebridge Acquisition LLC	0.11	Transmission	115-138
50	S501506	1.59	Cebridge Acquisition LLC	1.21	Transmission	115-138
51	S501596	0.79	Cebridge Acquisition LLC	0.96	Transmission	115-138
52	S501598	1.20	Cebridge Acquisition LLC	3.51	Transmission	115-138
53	S501688	0.60	Cebridge Acquisition LLC	1.37	Transmission	115-138
54	S501693	1.35	Cebridge Acquisition LLC	2.44	Transmission	115-138
55	S501788	0.70	Cebridge Acquisition LLC	1.82	Transmission	115-138
56	S501796	1.91	Frontier West Virginia, Inc.	1.98	Sub-Transmission	Unknown
57	S501798	0.64	Cebridge Acquisition LLC	2.40	Transmission	115-138
58	S501809	1.18	Shentel Cable Company	1.28	Transmission	765

Site No	Permit_ID	Broadband	Provider	Power Lines	Type	Size_kV
59	S501986	0.51	Cebridge Acquisition LLC	1.14	Transmission	115-138
60	S501989	2.34	Shentel Cable Company	1.83	Transmission	115-138
61	S502100	0.29	Cebridge Acquisition LLC	1.31	Sub-Transmission	Unknown
62	S502188	0.40	Frontier West Virginia, Inc.	6.76	Sub-Transmission	Unknown
63	S502393	0.01	Cebridge Acquisition LLC	0.98	Transmission	115-138
64	S502486	0.05	Cebridge Acquisition LLC	1.33	Transmission	115-138
65	S502493	1.09	Cebridge Acquisition LLC	1.09	Transmission	115-138
66	S502495	0.38	Cebridge Acquisition LLC	0.49	Transmission	115-138
67	S502701	0.17	Cebridge Acquisition LLC	0.03	Transmission	115-138
68	S502789	0.63	Cebridge Acquisition LLC	2.01	Transmission	115-138
69	S502889	0.90	Cebridge Acquisition LLC	0.27	Sub-Transmission	Unknown
70	S503091	0.77	Cebridge Acquisition LLC	2.32	Transmission	115-138
71	S503096	1.48	Cebridge Acquisition LLC	1.01	Transmission	115-138
72	S503186	2.17	Shentel Cable Company	2.25	Transmission	765
73	S503408	2.60	Frontier West Virginia, Inc.	2.40	Transmission	115-138
74	S503586	1.28	Shentel Cable Company	1.19	Transmission	765
75	S504186	1.18	Frontier West Virginia, Inc.	1.39	Sub-Transmission	Unknown
76	S504189	2.29	Frontier West Virginia, Inc.	1.24	Sub-Transmission	Unknown
77	S504193	0.07	Cebridge Acquisition LLC	2.17	Sub-Transmission	Unknown
78	S504288	0.73	Frontier West Virginia, Inc.	1.56	Transmission	115-138
79	S504492	0.43	Cebridge Acquisition LLC	0.27	Transmission	115-138
80	S504592	1.08	Cebridge Acquisition LLC	1.03	Transmission	115-138
81	S504689	2.53	Frontier West Virginia, Inc.	1.72	Transmission	115-138
82	S504991	0.82	Cebridge Acquisition LLC	2.44	Transmission	115-138
83	S505286	0.09	Cebridge Acquisition LLC	1.36	Transmission	115-138
84	S505389	1.89	Frontier West Virginia, Inc.	0.61	Sub-Transmission	Unknown
85	S505489	2.14	Frontier West Virginia, Inc.	0.36	Sub-Transmission	Unknown
86	S505587	0.84	Cebridge Acquisition LLC	1.47	Transmission	115-138
87	S506288	0.58	Frontier West Virginia, Inc.	1.00	Transmission	115-138
88	S506391	0.25	Cebridge Acquisition LLC	0.40	Transmission	115-138
89	S506491	1.33	Cebridge Acquisition LLC	1.00	Transmission	115-138
90	S506992	2.98	Shentel Cable Company	0.22	Transmission	765
91	S507091	0.05	Cebridge Acquisition LLC	0.55	Transmission	765
92	S507986	0.75	Cebridge Acquisition LLC	0.24	Transmission	115-138
93	S508187	0.09	Cebridge Acquisition LLC	1.08	Transmission	115-138
94	S508486	1.77	Frontier West Virginia, Inc.	2.38	Sub-Transmission	Unknown
95	S509386	0.45	Frontier West Virginia, Inc.	1.91	Transmission	115-138
96	S510186	0.56	Cebridge Acquisition LLC	0.61	Transmission	115-138
97	S510486	0.47	Cebridge Acquisition LLC	0.41	Transmission	115-138

Site No	Permit_ID	Broadband	Provider	Power Lines	Type	Size_kV
98	Z004381	0.48	Cebridge Acquisition LLC	2.45	Transmission	115-138
99	I051200	2.22	Cebridge Acquisition LLC	0.11	Sub-Transmission	Unknown
100	S000785	0.44	Cebridge Acquisition LLC	1.86	Transmission	115-138
101	S505686	0.98	Cebridge Acquisition LLC	1.62	Transmission	115-138
102	S005177	0.58	Cebridge Acquisition LLC	0.26	Transmission	115-138
103	S502586	0.05	Cebridge Acquisition LLC	0.23	Sub-Transmission	Unknown
104	S001885	0.05	Cebridge Acquisition LLC	1.25	Transmission	115-138
105	S000680	1.32	Cebridge Acquisition LLC	1.04	Sub-Transmission	Unknown
106	Z001481	1.63	Cebridge Acquisition LLC	1.41	Transmission	115-138
107	S009985	0.19	Cebridge Acquisition LLC	1.11	Sub-Transmission	Unknown
108	S011878	0.38	Cebridge Acquisition LLC	0.48	Transmission	115-138
109	S025374	0.15	Cebridge Acquisition LLC	1.03	Transmission	115-138
110	S501410	1.63	Shentel Cable Company	2.14	Transmission	765
111	S003784	0.32	Cebridge Acquisition LLC	1.11	Transmission	115-138
112	S007779	3.02	Shentel Cable Company	1.26	Transmission	115-138
113	S007775	0.07	Cebridge Acquisition LLC	1.91	Transmission	115-138
114	S509086	0.13	Cebridge Acquisition LLC	1.24	Transmission	115-138
115	S049600	1.44	Frontier West Virginia, Inc.	1.31	Sub-Transmission	Unknown
116	S013679	1.41	Frontier West Virginia, Inc.	1.48	Sub-Transmission	Unknown
117	S501112	1.39	Cebridge Acquisition LLC	1.22	Transmission	115-138
118	S501110	0.46	Cebridge Acquisition LLC	0.12	Transmission	115-138
119	S501908	1.08	Cebridge Acquisition LLC	0.09	Transmission	765
120	I014600	3.39	Shentel Cable Company	2.94	Transmission	115-138
121	S025675	0.23	Cebridge Acquisition LLC	1.79	Sub-Transmission	Unknown
122	S024800	0.56	Cebridge Acquisition LLC	0.66	Transmission	115-138
123	S018978	0.04	Cebridge Acquisition LLC	0.53	Transmission	115-138
124	S003479	0.77	Cebridge Acquisition LLC	0.65	Transmission	115-138
125	S008177	0.94	Cebridge Acquisition LLC	0.78	Transmission	115-138
126	S002775	0.35	Cebridge Acquisition LLC	0.22	Sub-Transmission	Unknown
127	S011275	0.04	Cebridge Acquisition LLC	0.32	Transmission	115-138
128	S500809	0.74	Cebridge Acquisition LLC	1.56	Transmission	115-138
129	I051700	0.15	Cebridge Acquisition LLC	1.60	Sub-Transmission	Unknown
130	S000182	1.63	Cebridge Acquisition LLC	1.41	Transmission	115-138
131	Z004281	0.40	Cebridge Acquisition LLC	0.98	Transmission	115-138
132	S002285	1.60	Shentel Cable Company	2.25	Transmission	115-138
133	S023400	0.99	Cebridge Acquisition LLC	0.04	Transmission	115-138
134	S500212	0.35	Cebridge Acquisition LLC	0.35	Transmission	115-138

Table 9: Shortest Distances from Sites to Sewer and Solid Waste Treatment Facilities

Site No	Permit_ID	Sewer Treatment (ST)	Facility Name (ST)	Solid Waste Treatment (SD)	Facility Name (SD)
1	I051400	5.68	Omar Jr. High and Elementary School	4.14	Pine Creek/ Omar
2	I051600	6.23	Omar Jr. High and Elementary School	4.69	Pine Creek/ Omar
3	S000279	5.98	Bungalow Woods Subdivision	6.87	Pine Creek/ Omar
4	S000285	9.21	Dehue-Chambers Grade School	21.52	Refuse Disposal
5	S000480	2.77	Omar Jr. High and Elementary School	1.23	Pine Creek/ Omar
6	S000580	0.41	RIVENBARK ADDITION	13.59	Refuse Disposal
7	S000985	5.12	Bungalow Woods Subdivision	7.38	Pine Creek/ Omar
8	S001376	15.96	Dehue-Chambers Grade School	28.28	Refuse Disposal
9	S001783	12.39	R. D. BAILEY LAKE - DAM	10.12	Morgan Sanitation
10	S006885	16.53	Dehue-Chambers Grade School	28.85	Refuse Disposal
11	S007585	9.62	Dehue-Chambers Grade School	21.94	Refuse Disposal
12	S009480	6.67	Omar Jr. High and Elementary School	5.13	Pine Creek/ Omar
13	S010685	6.08	DELBARTON TOWN OF	6.64	Pine Creek/ Omar
14	S011785	2.23	BUTCHER MOBILE HOME PARK	12.42	Refuse Disposal
15	S012378	1.58	Bungalow Woods Subdivision	11.65	Refuse Disposal
16	S012478	3.98	Bungalow Woods Subdivision	9.72	Pine Creek/ Omar
17	S015974	16.97	Dehue-Chambers Grade School	29.29	Refuse Disposal
18	S019877	2.80	Melville MHP	11.96	Refuse Disposal
19	S020373	6.64	V-MART MOBILE HOME PARK	25.65	Glen Fork/ Jeese
20	S025876	2.89	Dehue-Chambers Grade School	15.21	Refuse Disposal

Site No	Permit_ID	Sewer Treatment (ST)	Facility Name (ST)	Solid Waste Treatment (SD)	Facility Name (SD)
21	S400508	4.26	Road Branch Elementary School	16.78	Glen Fork/ Jeese
22	S500104	1.12	Park 17 MHP	12.26	Refuse Disposal
23	S500189	3.15	Logan County PSD (Sharples Water System)	15.91	Refuse Disposal
24	S500190	6.64	Dehue-Chambers Grade School	18.96	Refuse Disposal
25	S500194	2.55	Dehue-Chambers Grade School	14.87	Refuse Disposal
26	S500201	3.67	Dehue-Chambers Grade School	15.98	Refuse Disposal
27	S500291	0.64	Chief Logan State Park Convention Center	5.33	Refuse Disposal
28	S500502	5.32	Dehue-Chambers Grade School	17.64	Refuse Disposal
29	S500503	4.64	Sharples Elementary School	16.67	Refuse Disposal
30	S500591	6.32	Ramage Elementary School	6.37	Refuse Disposal
31	S500593	4.26	Dehue-Chambers Grade School	16.58	Refuse Disposal
32	S500604	0.98	BUFFALO CREEK PSD	17.77	Refuse Disposal
33	S500605	9.26	Sharples Elementary School	22.04	Refuse Disposal
34	S500607	4.81	Ragland Water Treatment Plant	5.50	Pine Creek/ Omar
35	S500691	13.59	Dehue-Chambers Grade School	25.91	Refuse Disposal
36	S500701	8.57	V-MART MOBILE HOME PARK	25.36	Refuse Disposal
37	S500790	1.13	Omar Jr. High and Elementary School	2.22	Pine Creek/ Omar
38	S500904	7.26	Dehue-Chambers Grade School	19.58	Refuse Disposal
39	S500907	7.47	Sharples Elementary School	20.67	Refuse Disposal
40	S500908	1.78	Sharples Elementary School	16.09	Refuse Disposal
41	S501095	2.61	Dehue-Chambers Grade School	14.93	Refuse Disposal
42	S501188	7.52	Ramage Elementary School	6.76	Refuse Disposal

Site No	Permit_ID	Sewer Treatment (ST)	Facility Name (ST)	Solid Waste Treatment (SD)	Facility Name (SD)
43	S501300	1.74	Omar Jr. High and Elementary School	3.25	Pine Creek/ Omar
44	S501301	3.04	Ragland Water Treatment Plant	7.22	Pine Creek/ Omar
45	S501390	1.97	Park 17 MHP	13.58	Refuse Disposal
46	S501396	1.91	BUFFALO CREEK PSD	18.40	Refuse Disposal
47	S501397	4.24	Sharples Elementary School	18.54	Refuse Disposal
48	S501490	6.08	Harts High School	18.01	Refuse Disposal
49	S501499	6.08	Dehue-Chambers Grade School	18.40	Refuse Disposal
50	S501506	2.67	Melville MHP	11.82	Refuse Disposal
51	S501596	13.59	Dehue-Chambers Grade School	25.91	Refuse Disposal
52	S501598	2.94	MT. VIEW III, LTD.	4.59	Pine Creek/ Omar
53	S501688	2.46	Logan County PSD (Sharples Water System)	15.22	Refuse Disposal
54	S501693	3.21	Ragland Water Treatment Plant	9.86	Pine Creek/ Omar
55	S501788	2.83	Logan County PSD (Sharples Water System)	15.60	Refuse Disposal
56	S501796	4.11	Bungalow Woods Subdivision	14.18	Refuse Disposal
57	S501798	1.26	LOGAN-MINGO AREA MENTAL HEALTH	5.29	Pine Creek/ Omar
58	S501809	5.64	Ralph R. Willis Vo-Tech School	16.87	Glen Fork/ Jeese
59	S501986	2.19	Logan County PSD (Sharples Water System)	14.96	Refuse Disposal
60	S501989	2.96	V-MART MOBILE HOME PARK	21.97	Glen Fork/ Jeese
61	S502100	13.71	Dehue-Chambers Grade School	26.02	Refuse Disposal
62	S502188	1.38	Hugh Dingess Elementary School	15.78	Refuse Disposal
63	S502393	2.45	LOGAN MOTOR LODGE	13.47	Refuse Disposal
64	S502486	2.59	Logan County PSD (Sharples Water System)	15.36	Refuse Disposal
65	S502493	1.04	Park 17 MHP	12.20	Refuse Disposal

Site No	Permit_ID	Sewer Treatment (ST)	Facility Name (ST)	Solid Waste Treatment (SD)	Facility Name (SD)
66	S502495	6.34	Dehue-Chambers Grade School	18.66	Refuse Disposal
67	S502701	4.51	Ragland Water Treatment Plant	6.68	Pine Creek/ Omar
68	S502789	3.71	Ragland Water Treatment Plant	6.66	Pine Creek/ Omar
69	S502889	5.67	Omar Jr. High and Elementary School	4.12	Pine Creek/ Omar
70	S503091	8.14	Ramage Elementary School	7.39	Refuse Disposal
71	S503096	2.29	Park 17 MHP	13.90	Refuse Disposal
72	S503186	6.71	V-MART MOBILE HOME PARK	25.73	Glen Fork/ Jeese
73	S503408	3.43	Bungalow Woods Subdivision	13.50	Refuse Disposal
74	S503586	16.42	Dehue-Chambers Grade School	28.74	Refuse Disposal
75	S504186	1.83	BUTCHER MOBILE HOME PARK	12.03	Refuse Disposal
76	S504189	4.63	Mingo County Wood Products Industrial Park	8.97	Pine Creek/ Omar
77	S504193	5.15	Dehue-Chambers Grade School	17.47	Refuse Disposal
78	S504288	1.45	Bungalow Woods Subdivision	10.53	Refuse Disposal
79	S504492	6.53	Dehue-Chambers Grade School	18.84	Refuse Disposal
80	S504592	6.30	Bungalow Woods Subdivision	5.94	Pine Creek/ Omar
81	S504689	2.75	Dingess Grade School	12.42	Mingo County Transfer
82	S504991	8.22	Ramage Elementary School	7.46	Refuse Disposal
83	S505286	2.59	Logan County PSD (Sharples Water System)	15.35	Refuse Disposal
84	S505389	0.50	RIVENBARK ADDITION	13.67	Refuse Disposal
85	S505489	5.07	Bungalow Woods Subdivision	7.37	Pine Creek/ Omar
86	S505587	12.02	R. D. BAILEY LAKE - DAM	9.75	Morgan Sanitation
87	S506288	1.06	BUTCHER MOBILE HOME PARK	10.75	Refuse Disposal

Site No	Permit_ID	Sewer Treatment (ST)	Facility Name (ST)	Solid Waste Treatment (SD)	Facility Name (SD)
88	S506391	2.28	Sharples Elementary School	16.59	Refuse Disposal
89	S506491	11.58	R. D. BAILEY LAKE - DAM	9.31	Morgan Sanitation
90	S506992	7.09	V-MART MOBILE HOME PARK	26.11	Glen Fork/ Jeese
91	S507091	1.85	Sharples Elementary School	16.16	Refuse Disposal
92	S507986	8.78	Dehue-Chambers Grade School	21.10	Refuse Disposal
93	S508187	2.46	Logan County PSD (Sharples Water System)	15.22	Refuse Disposal
94	S508486	3.14	Bungalow Woods Subdivision	13.21	Refuse Disposal
95	S509386	0.74	Chief Logan State Park Convention Center	5.94	Refuse Disposal
96	S510186	3.71	Sharples Elementary School	18.01	Refuse Disposal
97	S510486	1.84	Melville MHP	11.00	Refuse Disposal
98	Z004381	2.25	MOUNTAIN VIEW APARTMENTS	6.50	Pine Creek/ Omar
99	I051200	5.16	Bungalow Woods Subdivision	7.36	Pine Creek/ Omar
100	S000785	0.75	Chief Logan State Park Convention Center	6.00	Refuse Disposal
101	S505686	12.16	R. D. BAILEY LAKE - DAM	9.89	Morgan Sanitation
102	S005177	2.69	Melville MHP	11.84	Refuse Disposal
103	S502586	1.20	Omar Jr. High and Elementary School	2.71	Pine Creek/ Omar
104	S001885	6.25	Dehue-Chambers Grade School	18.57	Refuse Disposal
105	S000680	6.47	Bungalow Woods Subdivision	5.37	Pine Creek/ Omar
106	Z001481	7.42	Dehue-Chambers Grade School	19.74	Refuse Disposal
107	S009985	1.78	Dehue-Chambers Grade School	14.10	Refuse Disposal
108	S011878	3.50	Omar Jr. High and Elementary School	1.96	Pine Creek/ Omar
109	S025374	7.11	Sharples Elementary School	20.32	Refuse Disposal

Site No	Permit_ID	Sewer Treatment (ST)	Facility Name (ST)	Solid Waste Treatment (SD)	Facility Name (SD)
110	S501410	1.74	Road Branch Elementary School	14.26	Glen Fork/ Jeese
111	S003784	2.33	Logan County PSD (Sharples Water System)	15.10	Refuse Disposal
112	S007779	2.09	V-MART MOBILE HOME PARK	21.11	Glen Fork/ Jeese
113	S007775	1.65	MT. VIEW III, LTD.	4.01	Pine Creek/ Omar
114	S509086	2.52	BUFFALO CREEK PSD	17.95	Refuse Disposal
115	S049600	3.29	Bungalow Woods Subdivision	9.03	Pine Creek/ Omar
116	S013679	3.84	Bungalow Woods Subdivision	9.58	Pine Creek/ Omar
117	S501112	8.44	Dehue-Chambers Grade School	20.75	Refuse Disposal
118	S501110	0.57	GREEN VALLEY SEWAGE PLANT	19.17	Refuse Disposal
119	S501908	9.72	Sharples Elementary School	22.93	Refuse Disposal
120	I014600	3.75	V-MART MOBILE HOME PARK	22.77	Glen Fork/ Jeese
121	S025675	14.13	Dehue-Chambers Grade School	26.46	Refuse Disposal
122	S024800	4.70	GILBERT TOWN OF	16.54	Morgan Sanitation
123	S018978	1.80	Logan County PSD (Sharples Water System)	14.55	Refuse Disposal
124	S003479	0.74	Melville MHP	9.90	Refuse Disposal
125	S008177	1.17	Dehue-Chambers Grade School	13.50	Refuse Disposal
126	S002775	12.81	Dehue-Chambers Grade School	25.13	Refuse Disposal
127	S011275	6.27	DELBARTON TOWN OF	6.83	Pine Creek/ Omar
128	S500809	3.14	Omar Jr. High and Elementary School	1.60	Pine Creek/ Omar
129	I051700	14.14	Dehue-Chambers Grade School	26.47	Refuse Disposal
130	S000182	7.42	Dehue-Chambers Grade School	19.74	Refuse Disposal
131	Z004281	2.41	Logan County PSD (Sharples Water System)	15.17	Refuse Disposal
132	S002285	3.66	V-MART MOBILE HOME PARK	22.67	Glen Fork/ Jeese

Site No	Permit_ID	Sewer Treatment (ST)	Facility Name (ST)	Solid Waste Treatment (SD)	Facility Name (SD)
133	S023400	0.51	Park 17 MHP	12.12	Refuse Disposal
134	S500212	5.23	Dehue-Chambers Grade School	17.54	Refuse Disposal

Table 10: Shortest Distances from Sites to Gas Pipe and Oil Pipe

Site No	Permit_ID	Gas Pipe (GP)	Company Name (GP)	Pipe Lines (OP)	Company Name (OP)
1	I051400	0.77	Columbia Gas Transmission Corp.	0.58	CS
2	I051600	0.68	Columbia Gas Transmission Corp.	0.13	CS
3	S000279	1.74	Columbia Gas Transmission Corp.	0.64	CS
4	S000285	3.94	Dominion Transmission Inc.	1.87	CN
5	S000480	4.56	Columbia Gas Transmission Corp.	3.26	CS
6	S000580	2.27	Columbia Gas Transmission Corp.	0.92	CS
7	S000985	2.05	Columbia Gas Transmission Corp.	0.64	CS
8	S001376	5.84	Dominion Transmission Inc.	3.34	CN
9	S001783	0.59	Dominion Transmission Inc.	2.88	CN
10	S006885	4.63	Dominion Transmission Inc.	2.10	CN
11	S007585	2.11	Dominion Transmission Inc.	1.54	CN
12	S009480	1.13	Columbia Gas Transmission Corp.	0.53	CS
13	S010685	0.24	Columbia Gas Transmission Corp.	0.16	CS
14	S011785	3.32	Columbia Gas Transmission Corp.	0.95	CS
15	S012378	2.03	Columbia Gas Transmission Corp.	0.13	CS
16	S012478	0.95	Columbia Gas Transmission Corp.	0.20	CS
17	S015974	4.60	Dominion Transmission Inc.	1.99	CN
18	S019877	1.33	Columbia Gas Transmission Corp.	2.76	CL
19	S020373	5.04	Dominion Transmission Inc.	1.46	CN
20	S025876	2.14	Dominion Transmission Inc.	1.81	Unknown
21	S400508	2.42	Dominion Transmission Inc.	1.02	CN
22	S500104	0.03	Columbia Gas Transmission Corp.	1.00	CL
23	S500189	1.50	Dominion Transmission Inc.	0.94	CN
24	S500190	1.56	Dominion Transmission Inc.	1.05	CN
25	S500194	1.83	Dominion Transmission Inc.	1.47	Unknown
26	S500201	0.68	Dominion Transmission Inc.	0.71	CN
27	S500291	0.35	Columbia Gas Transmission Corp.	0.38	UC
28	S500502	1.77	Dominion Transmission Inc.	0.20	CN
29	S500503	0.16	Dominion Transmission Inc.	0.03	CN

Site No	Permit_ID	Gas Pipe (GP)	Company Name (GP)	Pipe Lines (OP)	Company Name (OP)
30	S500591	0.83	Dominion Transmission Inc.	0.21	CN
31	S500593	0.58	Dominion Transmission Inc.	0.55	CN
32	S500604	1.04	Dominion Transmission Inc.	1.00	CN
33	S500605	2.49	Dominion Transmission Inc.	0.61	CN
34	S500607	1.16	Columbia Gas Transmission Corp.	0.30	CS
35	S500691	4.66	Dominion Transmission Inc.	2.64	CN
36	S500701	4.54	Dominion Transmission Inc.	2.16	CN
37	S500790	5.06	Dominion Transmission Inc.	3.59	CS
38	S500904	4.04	Dominion Transmission Inc.	1.28	CN
39	S500907	2.47	Dominion Transmission Inc.	2.31	CN
40	S500908	2.30	Dominion Transmission Inc.	2.26	CN
41	S501095	0.05	Dominion Transmission Inc.	0.02	CN
42	S501188	1.60	Dominion Transmission Inc.	0.26	CN
43	S501300	2.53	Dominion Transmission Inc.	2.57	CN
44	S501301	0.18	Columbia Gas Transmission Corp.	1.28	CS
45	S501390	1.46	Columbia Gas Transmission Corp.	2.30	CN
46	S501396	0.49	Dominion Transmission Inc.	0.45	CN
47	S501397	1.84	Dominion Transmission Inc.	1.80	CN
48	S501490	3.99	Columbia Gas Transmission Corp.	1.32	CL
49	S501499	2.42	Dominion Transmission Inc.	0.14	CN
50	S501506	2.23	Columbia Gas Transmission Corp.	2.53	Unknown
51	S501596	1.04	Dominion Transmission Inc.	0.96	CN
52	S501598	2.66	Columbia Gas Transmission Corp.	0.71	CS
53	S501688	0.85	Dominion Transmission Inc.	0.71	CN
54	S501693	1.05	Columbia Gas Transmission Corp.	0.39	CS
55	S501788	1.29	Dominion Transmission Inc.	0.46	CN
56	S501796	0.54	Columbia Gas Transmission Corp.	0.77	CS
57	S501798	1.78	Dominion Transmission Inc.	0.34	CS
58	S501809	4.23	Dominion Transmission Inc.	1.72	CN
59	S501986	0.68	Dominion Transmission Inc.	0.72	CN
60	S501989	2.91	Dominion Transmission Inc.	2.25	CN
61	S502100	1.04	Dominion Transmission Inc.	0.21	CN
62	S502188	3.42	Columbia Gas Transmission Corp.	0.38	CL
63	S502393	0.94	Dominion Transmission Inc.	0.96	CN
64	S502486	0.25	Dominion Transmission Inc.	0.29	CN
65	S502493	0.01	Columbia Gas Transmission Corp.	1.08	CL
66	S502495	3.01	Dominion Transmission Inc.	0.37	CN
67	S502701	0.05	Columbia Gas Transmission Corp.	0.45	CS

Site No	Permit_ID	Gas Pipe (GP)	Company Name (GP)	Pipe Lines (OP)	Company Name (OP)
68	S502789	1.45	Columbia Gas Transmission Corp.	0.69	CS
69	S502889	2.02	Columbia Gas Transmission Corp.	1.20	CS
70	S503091	1.79	Dominion Transmission Inc.	0.63	CN
71	S503096	1.55	Dominion Transmission Inc.	1.58	CN
72	S503186	4.58	Dominion Transmission Inc.	1.63	CN
73	S503408	0.30	Columbia Gas Transmission Corp.	1.10	CS
74	S503586	4.33	Dominion Transmission Inc.	1.82	CN
75	S504186	3.71	Columbia Gas Transmission Corp.	0.65	CS
76	S504189	0.57	Columbia Gas Transmission Corp.	0.32	CS
77	S504193	0.59	Dominion Transmission Inc.	0.56	CN
78	S504288	2.90	Columbia Gas Transmission Corp.	0.78	CS
79	S504492	2.87	Dominion Transmission Inc.	0.35	CN
80	S504592	0.59	Columbia Gas Transmission Corp.	0.17	CS
81	S504689	0.78	Columbia Gas Transmission Corp.	0.55	CL
82	S504991	1.91	Dominion Transmission Inc.	0.74	CN
83	S505286	0.74	Dominion Transmission Inc.	0.77	CN
84	S505389	2.90	Columbia Gas Transmission Corp.	1.24	CS
85	S505489	2.03	Columbia Gas Transmission Corp.	0.58	CS
86	S505587	0.20	Dominion Transmission Inc.	2.72	CN
87	S506288	2.80	Columbia Gas Transmission Corp.	1.46	CS
88	S506391	1.22	Dominion Transmission Inc.	1.19	CN
89	S506491	0.79	Dominion Transmission Inc.	3.04	CN
90	S506992	6.04	Dominion Transmission Inc.	3.53	CN
91	S507091	2.33	Dominion Transmission Inc.	2.29	CN
92	S507986	2.62	Dominion Transmission Inc.	0.56	CN
93	S508187	0.46	Dominion Transmission Inc.	0.50	CN
94	S508486	0.67	Columbia Gas Transmission Corp.	0.09	CS
95	S509386	0.97	Columbia Gas Transmission Corp.	0.35	UC
96	S510186	0.18	Dominion Transmission Inc.	0.14	CN
97	S510486	2.02	Columbia Gas Transmission Corp.	3.06	CL
98	Z004381	2.11	Columbia Gas Transmission Corp.	0.34	CS
99	I051200	2.04	Columbia Gas Transmission Corp.	0.65	CS
100	S000785	1.24	Columbia Gas Transmission Corp.	0.15	UC
101	S505686	0.63	Dominion Transmission Inc.	2.96	CN
102	S005177	1.02	Columbia Gas Transmission Corp.	2.51	CL
103	S502586	4.95	Dominion Transmission Inc.	3.61	CS
104	S001885	1.82	Dominion Transmission Inc.	1.55	CN
105	S000680	1.14	Columbia Gas Transmission Corp.	0.24	CS

Site No	Permit_ID	Gas Pipe (GP)	Company Name (GP)	Pipe Lines (OP)	Company Name (OP)
106	Z001481	4.25	Dominion Transmission Inc.	1.49	CN
107	S009985	1.00	Dominion Transmission Inc.	0.52	Unknown
108	S011878	2.91	Columbia Gas Transmission Corp.	2.30	CS
109	S025374	1.91	Dominion Transmission Inc.	1.29	CN
110	S501410	4.57	Dominion Transmission Inc.	1.05	CN
111	S003784	0.38	Dominion Transmission Inc.	0.41	CN
112	S007779	2.50	Dominion Transmission Inc.	3.15	CN
113	S007775	2.84	Dominion Transmission Inc.	0.65	CS
114	S509086	0.22	Dominion Transmission Inc.	0.26	CN
115	S049600	1.69	Columbia Gas Transmission Corp.	0.17	CS
116	S013679	1.53	Columbia Gas Transmission Corp.	0.05	CS
117	S501112	3.87	Dominion Transmission Inc.	1.36	CN
118	S501110	2.83	Dominion Transmission Inc.	0.58	CS
119	S501908	4.26	Dominion Transmission Inc.	2.67	CN
120	I014600	4.35	Dominion Transmission Inc.	2.94	CN
121	S025675	0.57	Dominion Transmission Inc.	0.02	CN
122	S024800	0.34	Dominion Transmission Inc.	0.34	CN
123	S018978	0.10	Dominion Transmission Inc.	0.06	CN
124	S003479	2.14	Columbia Gas Transmission Corp.	3.33	Unknown
125	S008177	2.53	Dominion Transmission Inc.	1.82	Unknown
126	S002775	1.87	Dominion Transmission Inc.	0.73	CN
127	S011275	0.08	Columbia Gas Transmission Corp.	0.12	CS
128	S500809	3.02	Columbia Gas Transmission Corp.	1.45	CS
129	I051700	1.03	Dominion Transmission Inc.	0.60	CN
130	S000182	4.25	Dominion Transmission Inc.	1.49	CN
131	Z004281	0.10	Dominion Transmission Inc.	0.14	CN
132	S002285	3.02	Dominion Transmission Inc.	1.50	CN
133	S023400	1.09	Columbia Gas Transmission Corp.	2.63	CL
134	S500212	1.96	Dominion Transmission Inc.	0.66	CN

Suitability Model

The suitability model for Logan County is created with a weighted scoring method. The method scores options against a prioritized requirements list to determine which option best fits the selection criteria. Using a consistent list of criteria, weighted according to the importance or priority of the criteria to the researcher, a comparison of similar "products" can be completed. If numerical values are assigned to the criteria priorities (**weighting**) and the ability of the product to meet a specific criterion (**scoring**), a "score" can be derived. By summing the score (**total score**), the product most closely meeting the criteria can be determined.

Criteria are chosen and weighted based on published Land Use Master Plans (LUMPs) for several counties in West Virginia, our own research on the existing conditions in Logan County and expert advice about important factors to site development.[13] Then, scores for each site are given by comparing the closest distance from the site to all factors within given distance thresholds. There are three sets of scores in this suitability model: **absolute scores**, **relative scores** and the **total score**.

Absolute scores are given by comparing certain distance thresholds with the results of GIS Distance Analysis. Thresholds are determined mainly based on the researcher's experience, characteristics of the considered criteria and the priority given to the criteria. For example, if the closest distance from a site to an interstate ranges from 5 to 10 miles, the site will be given 7 points for the Interstate Criteria. Absolute scores will directly affect the site selection. Different score categories may result in significant change in the cost of investment, and will thus impact the County's decisions.

Relative scores, on the other hand, depend solely on the closest distances of sites to relative criteria features. Initially, statistical values will be computed according to distance values from all sites to a certain factor (criteria), including min, quartile 1 – Q1, quartile 2 – Q2, quartile 3 – Q3, and max. Then, distance values will be classified into four groups and given the scores shown in Table 13 (below). This score set is used to sharpen differences between all sites in a certain category and therefore aid the decision maker. For example, two sites may have the same absolute score (in the same range of miles) but may fall in different statistical groups. Then the two sites will have different relative scores.

[13] Joseph, M. *A Decision-Support Model of Land Suitability Analysis for the Ohio Lake Erie Balanced Growth Program*. EcoCity Cleveland. (2006).

The total score is a combination of weights, absolute scores, and relative scores. The following equation is used to calculate the total score of a certain studied site:

Total score of site A = $\sum$ (absolute score x relative score x weight)$_{ci}$ / 10 (ci: criteria i)

Sites with higher total scores reveal a higher chance of being developed. Total scores will vary according to a combination of three components: weights, absolute scores, and relative scores. In this report, total scores are calculated by the linear equation indicating that all components are treated equally.

1. Weighting

Table 11 prioritizes post-mining land-use criteria for surface coal mining site selection in Logan County. Criteria weights are assigned on a one-to-ten scale. According to Joseph, utilities (power, water, and sewer) and road networks are considered more important factors to development. Therefore, those factors receive higher weights (7-10) in the suitability model. On the other hand, decision-makers are less affected by factors such as airports, national waterways, and ports. Those factors may be good supplements but do not critically change the investments.

Table 11: Weighting Sites Selection Criteria

No	Criteria	Weight
1	Interstate	8
2	Existing Highway	8
3	Proposed Highway	9
4	Yeager Airport	3
5	Tri-state Airport	3
6	National Waterway Network Ports	5
7	Sewer Treatment Facilities	7
8	Solid Waste Treatment Facilities	8
9	National Waterway Network	4
10	Intermodal Terminal Facilities	6
11	Sewer Lines	8
12	Railroads	5
13	Water Lines	10
14	Power Lines	10
15	Gas Pipes	6
16	Pipe Lines	6
17	Broadband	9

2. Scoring

2.1 Absolute Scores:

The shorter the distance to a feature from a site, the higher absolute score the site receives. Table 12 describes the thresholds and score categories for each criterion, ranging from 1 to 10. In order to achieve a better comparison between sites, the score scale is evenly distributed between five distance groups (1-3-5-7-10).

As mentioned above, thresholds are mainly defined based on researcher experience, traveling method from a site to the features (road-path vs. Euclidean), and characteristic of criteria (type of feature, priority, and density). For example, distance thresholds for "Solid Waste Treatment Facilities" are much smaller than ones for "Intermodal Terminal Facilities". This is because treatment facilities are much denser than intermodal terminal facilities. In addition, solid waste facilities are considered more important in site selection (weight: 8 vs. 6).

Table 12: Absolute Scoring System

Absolute Score		**10**	**7**	**5**	**3**	**1**
Criteria (Distances in miles)	Existing Highway	0 - 5	5 - 10	10 - 15	15 - 20	> 20
	Proposed Highway	0 - 5	5 - 10	10 - 15	15 - 20	> 20
	Intermodal Terminal Facilities	0 - 10	10 - 20	20 - 30	30 - 40	> 40
	Interstate	0 - 5	5 - 14	14 - 22	22 - 30	> 30
	National Waterway Network Ports	0 - 30	30 - 50	50 - 70	70 - 90	> 90
	Sewer Treatment Facilities	0 - 2.5	2.5 - 5	5 - 7.5	7.5 - 10	> 10
	Solid Waste Treatment Facilities	0 - 5	5 - 14	14 - 22	22 - 30	> 30
	Tri-State Airport	0 - 30	30 - 50	50 - 70	70 - 90	> 90
	Yeager Airport	0 - 30	30 - 50	50 - 70	01 - 90	> 90
	Broadband	0 - 0.5	0.5 - 2	2 - 3	3 - 4	> 4
	Gas Pipe (Natural Gas)	0 - 0.5	0.5 - 1.5	1.5 - 2	2 - 2.5	> 2.5
	National Network Waterway	0 - 2.5	2.5 - 5	5 - 7.5	7.5 - 10	> 10
	Power Lines	0 - 0.5	0.5 - 1.5	1.5 - 2	2 - 2.5	> 2.5
	Pipe Lines (Oil)	0 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75 - 1	> 1
	Railroads	0 - 1	1 - 3	3 - 4	4 - 5	> 5
	Sewer Lines	0 - 1	1 - 3	3 - 4	4 - 5	> 5
	Water Lines	0 - 0.25	0.25 - 0.5	0.5 - 0.75	0.75 - 1	> 1

2.2 Relative Scores:

Table 13 shows four statistical groups and their relative scores in the Logan County land suitability model. The total number of coal mining sites will be equally distributed in each group.
The relative score differs from the absolute score in two ways. First, thresholds for relative scores are derived only from real distances from the sites to the features (criteria). It is not affected by personal opinion and does not consider either traveling method or nature of criteria.

Table 13: Relative Scoring System

Threshold (Distances in miles)		**Min - Q1**	**Q1 - Q2**	**Q2 - Q3**	**Q3 – Max**	
Relative Score		10	7.5	5	2.5	
No	**Criteria**	**Min**	**Q1**	**Q2**	**Q3**	**Max**
1	Interstate	28.98	39.63	44.73	48.91	59.88
2	Existing Highway	0.11	1.66	3.41	5.83	10.21
3	Proposed Highway	4.94	12.59	20.60	27.67	37.05
4	Yeager Airport	42.42	52.59	56.29	60.31	81.92
5	Tri-state Airport	46.07	65.18	68.85	73.39	97.81
6	National Waterway Network Ports	42.34	59.28	62.89	67.91	91.92
7	Sewer Treatment Facilities	0.41	2.26	3.73	6.61	16.97
8	Solid Waste Treatment Facilities	1.23	8.98	14.41	18.57	29.29
9	National Waterway Network	6.58	11.88	18.41	20.98	26.11
10	Intermodal Terminal Facilities	5.65	10.09	14.09	20.01	40.82
11	Sewer Lines	0.52	3.75	5.59	7.07	9.14
12	Railroads	0.15	0.85	1.22	1.96	4.59
13	Water Lines	0.06	0.77	1.28	2.13	5.84
14	Power Lines	0.03	0.53	1.11	1.61	7.20
15	Gas Pipes	0.01	0.77	1.78	2.84	6.04
16	Pipe Lines	0.02	0.38	0.78	1.78	3.61
17	Broadband	0.00	0.33	0.73	1.38	3.39

3. Logan County's Suitability Model:

Table 14 shows the total scores of all studied sites in Logan County. Site No-127 (Permit ID = S011275) has the highest score of 716.75. The sites with higher total scores suggest better opportunities for development. Results in Table 14 are also plotted in the bar chart (Figure 15) for better visualization. Among 134 potential development sites of Logan County, it is easy to notice the top 5 sites and determine the most suitable sites for investment.

Certainly, any change in weight values or the scoring system will result in different output and may change the decision. For better analysis and decision-making, the dynamic suitability model, which allows modification in criteria's weights, thresholds and scores is available for distribution through RTI's Geospatial Program.

Besides a distance analysis, a suitability model for Logan is supported by demographic data as well as two additional analyses, which are retail location density and workforce analysis (shown on Table 15 and Map 41 below). The best decision will be made with careful consideration of the suitability analysis as well as the demographic and economic information.

Table 14: Total Score of Mine Sites in Logan County

Site No.	Permitee	PermitID	Score
1	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	I051400	590.75
2	HOBET MINING, INC	I051600	694.75
3	ALEX ENERGY INC	S000279	538.25
4	APOGEE COAL CO DBA ARCH OF WEST VIRGINIA, INC.	S000285	188.25
5	FALCON LAND CO INC	S000480	551
6	ALEX ENERGY INC	S000580	555.25
7	ALEX ENERGY INC	S000985	574.5
8	APOGEE COAL COMPANY LLC	S001376	205.5
9	TWIN ACTION COAL CO	S001783	218.75
10	APOGEE COAL COMPANY LLC	S006885	136.25
11	APOGEE COAL COMPANY LLC	S007585	237.5
12	FALCON LAND CO INC	S009480	504.25
13	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S010685	638
14	TRACE CREEK COAL COMPANY	S011785	585

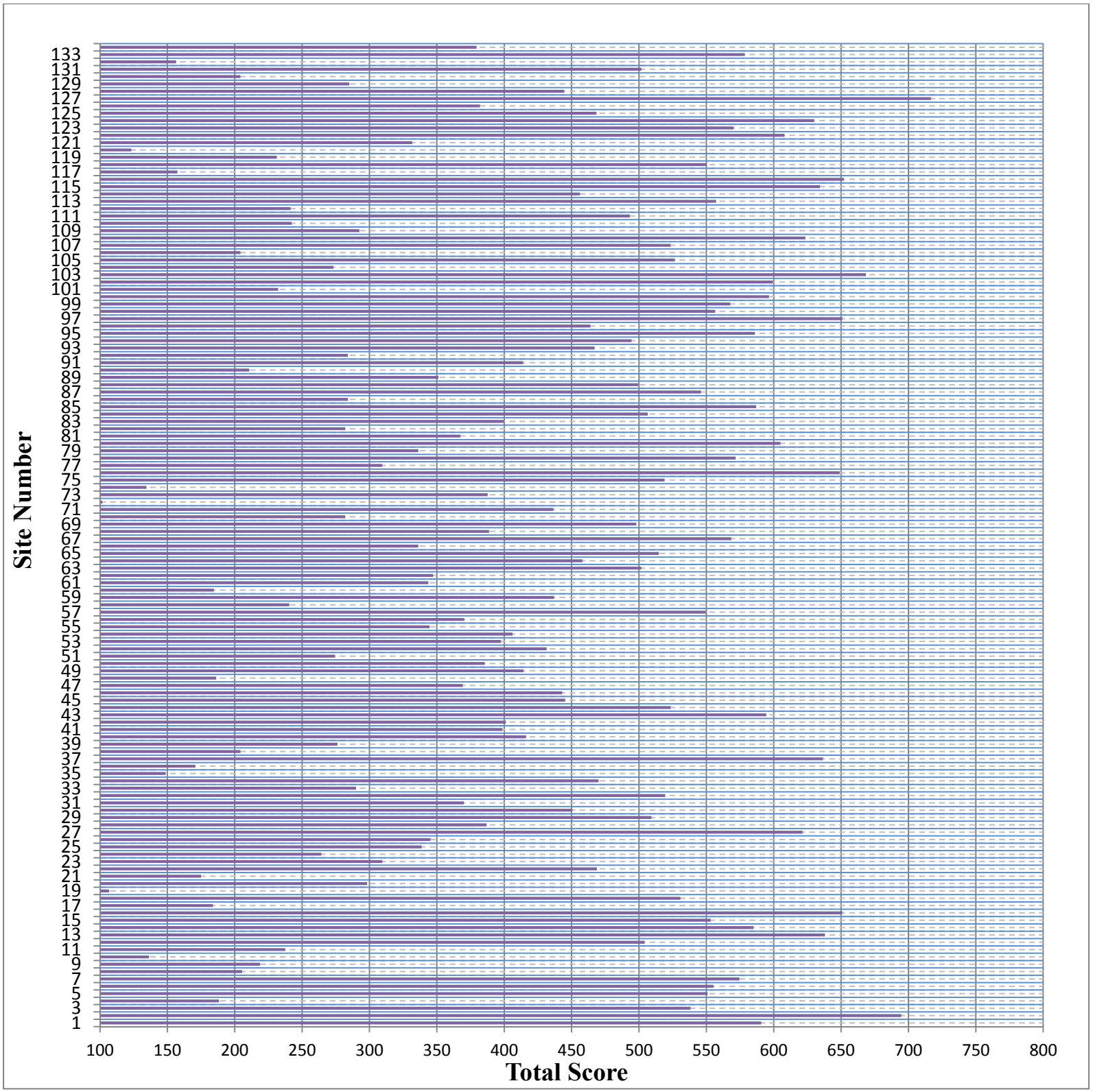
Site No.	Permitee	PermitID	Score
15	REBEL COAL CO INC	S012378	553.25
16	LAUREL RUN MINING COMPANY	S012478	651
17	APOGEE COAL COMPANY LLC	S015974	183.75
18	LOGAN COUNTY AIRPORT CONTRACT	S019877	530.75
19	BUFFALO MINING CO	S020373	106.75
20	ELKAY MINING CO	S025876	298.25
21	EASTERN ASSOCIATED COAL, LLC	S400508	175
22	RUM CREEK COAL SALES INC	S500104	468.75
23	MINGO LOGAN COAL COMPANY	S500189	309.5
24	APOGEE COAL COMPANY LLC	S500190	264.25
25	HIGHLAND MINING COMPANY	S500194	338.75
26	HIGHLAND MINING COMPANY	S500201	345.25
27	HICA CORPORATION	S500291	621.5
28	STOLLINGS TRUCKING CO INC	S500502	387
29	MINGO LOGAN COAL COMPANY	S500503	509.25
30	MINGO LOGAN COAL COMPANY	S500591	450.5
31	APOGEE COAL COMPANY LLC	S500593	370
32	SNAP CREEK MINING LLC	S500604	519.5
33	APOGEE COAL COMPANY LLC	S500605	290
34	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S500607	470
35	APOGEE COAL COMPANY LLC	S500691	148.75
36	APOGEE COAL COMPANY LLC	S500701	170.75
37	CATENARY COAL CO	S500790	636.5
38	APOGEE COAL COMPANY LLC	S500904	204.25
39	COYOTE COAL CO LLC	S500907	276.25
40	MINGO LOGAN COAL COMPANY	S500908	416.25
41	BANDMILL COAL CORPORATION	S501095	398.75
42	MINGO LOGAN COAL COMPANY	S501188	401.25
43	GREENTHORN, LLC	S501300	594.5
44	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S501301	523.5
45	ARACOMA COAL COMPANY INC	S501390	445.25
46	SNAP CREEK MINING LLC	S501396	443
47	MINGO LOGAN COAL COMPANY	S501397	369.25
48	PYXIS RESOURCES COMPANY	S501490	186.25
49	STOLLINGS TRUCKING CO INC	S501499	414.25
50	HIGHLAND MINING COMPANY	S501506	385.5
51	BANDMILL COAL CORPORATION	S501596	274.5

Site No.	Permitee	PermitID	Score
52	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S501598	431.5
53	HOBET MINING, INC	S501688	397.5
54	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S501693	406.25
55	HOBET MINING, INC	S501788	344.5
56	ALEX ENERGY INC	S501796	370.25
57	ROAD FORK DEVELOPMENT COMPANY INC	S501798	549.5
58	COYOTE COAL CO LLC	S501809	240.5
59	HOBET MINING, INC	S501986	437
60	BUFFALO MINING CO	S501989	184.5
61	BANDMILL COAL CORPORATION	S502100	343.75
62	PYXIS RESOURCES COMPANY	S502188	347.25
63	BANDMILL COAL CORPORATION	S502393	501.75
64	MINGO LOGAN COAL COMPANY	S502486	458
65	RUM CREEK COAL SALES INC	S502493	514.75
66	STOLLINGS TRUCKING CO INC	S502495	336.25
67	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S502701	568.5
68	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S502789	388.75
69	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S502889	498
70	MINGO LOGAN COAL COMPANY	S503091	282
71	HIGHLAND MINING COMPANY	S503096	436.5
72	BUFFALO MINING CO	S503186	101.75
73	ROAD FORK DEVELOPMENT COMPANY INC	S503408	387.75
74	APOGEE COAL CO DBA ARCH OF WEST VIRGINIA, INC.	S503586	134.5
75	TRACE CREEK COAL COMPANY	S504186	519
76	ALEX ENERGY INC	S504189	649
77	BANDMILL COAL CORPORATION	S504193	309.5
78	TRACE CREEK COAL COMPANY	S504288	571.75
79	STOLLINGS TRUCKING CO INC	S504492	336.25
80	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S504592	605
81	ARACOMA COAL COMPANY INC	S504689	367.5
82	MINGO LOGAN COAL COMPANY	S504991	282
83	MINGO LOGAN COAL COMPANY	S505286	399.75
84	ALEX ENERGY INC	S505389	506.5

Site No.	Permitee	PermitID	Score
85	ALEX ENERGY INC	S505489	587
86	ISLAND CREEK COAL COMPANY	S505587	284
87	TRACE CREEK COAL COMPANY	S506288	546
88	MINGO LOGAN COAL COMPANY	S506391	499.5
89	ISLAND CREEK COAL COMPANY	S506491	351.25
90	APOGEE COAL COMPANY LLC	S506992	210.75
91	MINGO LOGAN COAL COMPANY	S507091	414
92	APOGEE COAL COMPANY LLC	S507986	284
93	MINGO LOGAN COAL COMPANY	S508187	467
94	ALEX ENERGY INC	S508486	494.5
95	HICA CORPORATION	S509386	586
96	MINGO LOGAN COAL COMPANY	S510186	464
97	FREEMAN BRANCH MINING CORP	S510486	651
98	W-P COAL CO	Z004381	556.5
99	HOBET MINING, INC	I051200	567.75
100	HICA CORPORATION	S000785	596.5
101	ISLAND CREEK COAL COMPANY	S505686	232.25
102	CONCORD COAL CORP	S005177	599.5
103	CATENARY COAL CO	S502586	668.5
104	AMHERST COAL COMPANY	S001885	273.25
105	TWIN BRANCH COAL CO	S000680	526.75
106	APOGEE COAL CO DBA ARCH OF WEST VIRGINIA, INC.	Z001481	204.25
107	ELKAY MINING CO	S009985	523.5
108	ISLAND CREEK MINING CO	S011878	623.5
109	ISLAND CREEK COAL COMPANY	S025374	292.5
110	CLIFFS LOGAN COUNTY COAL LLC	S501410	242.25
111	DAL-TEX COAL CORP	S003784	493.25
112	BUFFALO MINING CO	S007779	241.5
113	W-P COAL CO	S007775	557.25
114	ELKAY MINING CO	S509086	456.25
115	TWIN BRANCH COAL CO	S049600	634.25
116	REBEL COAL CO INC	S013679	652
117	COYOTE COAL CO LLC	S501112	157.5
118	HAMPDEN COAL COMPANY LLC	S501110	550
119	COYOTE COAL CO LLC	S501908	231.25
120	BUFFALO MINING CO	I014600	123.25
121	ELKAY MINING CO	S025675	331.75
122	PEACH CREEK PROCESSING CO	S024800	608

Site No.	Permitee	PermitID	Score
123	DAL-TEX COAL CORP	S018978	570.25
124	FERRELL EXCAVATING CO INC	S003479	630
125	HIGH SPUR COAL CO INC	S008177	468.5
126	BELVA COAL COMPANY	S002775	382
127	HOBET MINING, INC	S011275	716.75
128	COAL-MAC, INC. DBA PHOENIX COAL-MAC MINING, INC.	S500809	444.5
129	ELKAY MINING CO	I051700	285
130	IROQUOIS COAL CORP	S000182	204.25
131	DAL-TEX COAL CORP	Z004281	501.75
132	BUFFALO MINING CO	S002285	156.5
133	HIGH SPUR COAL CO INC	S023400	578.5
134	STOLLINGS TRUCKING CO INC	S500212	379.5

Figure 15: Logan County's Suitability Model (Total Score of Each Surface Coal Mining Site)



Work Force Analysis

A work force analysis estimates total employment and unemployment within a certain distance, providing potential labor sources if an investment is made on the site. According to Gary Langer, the average one-way commute time is 26 minutes or 16 miles.[14] It is reasonable to consider unemployment within 15 miles of the site as an upper limit for a potential employer. This data set does not provide a skill set analysis however; therefore employers may not find the labor skills they need. This dataset provides the pool of labor resources from which to choose.

Table 15: Employment and unemployment within radius of 5, 10 and 15 miles from the site

Site No	Permit_ID	Emp_05	Unemp_05	Emp_10	Unemp_10	Emp_15	Unemp_15
1	I051400	1154	280	3678	906	7083	1730
2	I051600	1168	292	3700	921	7137	1745
3	S000279	1577	417	4597	1170	8036	1917
4	S000285	1300	329	4169	938	7376	1671
5	S000480	1771	388	5840	1420	9244	2154
6	S000580	1740	466	5012	1279	8439	1987
7	S000985	1671	451	4884	1253	8342	1968
8	S001376	1311	370	3193	720	6474	1439
9	S001783	474	87	2207	534	3951	834
10	S006885	1207	346	2850	664	5794	1278
11	S007585	1512	357	5710	1265	8830	2050
12	S009480	1298	325	4004	998	7392	1793
13	S010685	858	208	3081	757	6596	1629
14	S011785	1952	523	5548	1412	9195	2118
15	S012378	1743	497	5410	1425	9066	2065
16	S012478	1417	405	4652	1237	8345	1941
17	S015974	1145	337	2698	641	5273	1150
18	S019877	2650	616	6880	1577	11162	2547
19	S020373	943	300	2350	589	4321	935
20	S025876	2339	521	6783	1555	11071	2518
21	S400508	525	180	1499	422	3073	703
22	S500104	2679	627	6940	1515	10996	2524
23	S500189	1866	387	5884	1262	10501	2424
24	S500190	1469	333	5931	1310	9087	2122
25	S500194	2174	474	6771	1547	11014	2503

[14] Gary Langer, "Poll: Traffic in the United States," ABC News Online, February 13, 2005, Accessed March 1, 2013, http://abcnews.go.com/Technology/Traffic/story?id=485098&page=1.

Site No	Permit_ID	Emp_05	Unemp_05	Emp_10	Unemp_10	Emp_15	Unemp_15
26	S500201	1637	321	6113	1404	10847	2458
27	S500291	2499	689	7249	1723	9462	2132
28	S500502	1357	284	5616	1273	9030	2059
29	S500503	1292	224	5450	1277	10110	2259
30	S500591	934	158	5210	1064	9244	2153
31	S500593	1403	288	6217	1385	9783	2263
32	S500604	1147	195	5268	1136	8860	2097
33	S500605	1311	289	5187	1185	8214	1873
34	S500607	1162	251	3702	872	7165	1733
35	S500691	1448	365	3790	817	7628	1729
36	S500701	1328	354	3826	850	7185	1622
37	S500790	1679	345	6084	1468	9456	2191
38	S500904	1447	377	4328	956	7703	1750
39	S500907	1042	187	4771	1131	8348	1852
40	S500908	838	143	4127	962	8481	1861
41	S501095	1353	272	6527	1450	9722	2276
42	S501188	1538	305	5835	1210	10041	2338
43	S501300	1349	232	6371	1499	9342	2179
44	S501301	776	172	2620	590	6219	1510
45	S501390	2298	506	6061	1382	11054	2522
46	S501396	1095	174	5102	1101	8697	2056
47	S501397	971	166	4641	1107	8688	1904
48	S501490	381	120	2120	516	5730	1416
49	S501499	1423	325	5525	1244	8566	1966
50	S501506	2588	594	6854	1577	11136	2537
51	S501596	1331	271	6107	1349	9203	2172
52	S501598	1110	214	3439	749	7309	1747
53	S501688	1503	291	5529	1175	10118	2334
54	S501693	841	169	2581	530	6568	1579
55	S501788	1674	338	5777	1222	10265	2375
56	S501796	1050	317	3871	1062	7835	1849
57	S501798	1168	195	4513	993	8151	1928
58	S501809	1250	344	2981	681	6229	1380
59	S501986	1351	252	5385	1137	9940	2293
60	S501989	647	217	1828	489	3496	770
61	S502100	1377	291	6127	1354	9261	2180
62	S502188	518	163	2727	655	6428	1582
63	S502393	1379	259	6891	1554	9871	2306
64	S502486	992	168	5049	1039	9350	2162

Site No	Permit_ID	Emp_05	Unemp_05	Emp_10	Unemp_10	Emp_15	Unemp_15
65	S502493	2679	626	6925	1515	11013	2525
66	S502495	1427	344	5134	1153	8188	1874
67	S502701	915	203	2999	699	6606	1612
68	S502789	1018	211	3023	663	6841	1650
69	S502889	1559	393	4623	1156	7977	1907
70	S503091	1870	392	6047	1272	10405	2413
71	S503096	2138	464	6357	1460	11047	2511
72	S503186	863	279	2262	574	4154	897
73	S503408	1131	348	4437	1227	8307	1920
74	S503586	1256	346	2993	684	6241	1385
75	S504186	2060	554	5722	1447	9514	2172
76	S504189	1308	375	4300	1144	8014	1888
77	S504193	1406	297	6322	1402	9568	2238
78	S504288	2284	624	5971	1502	9902	2237
79	S504492	1405	331	5217	1176	8248	1888
80	S504592	1200	311	3765	952	7266	1772
81	S504689	1090	342	4377	1224	8294	1919
82	S504991	1923	405	6105	1283	10437	2421
83	S505286	1555	298	5339	1186	10311	2354
84	S505389	1872	505	5379	1375	8898	2065
85	S505489	1653	448	4896	1262	8371	1970
86	S505587	446	84	2213	546	3816	804
87	S506288	2460	660	6160	1528	10166	2291
88	S506391	976	165	4446	1013	9135	2042
89	S506491	346	54	2033	508	3583	764
90	S506992	1271	368	3092	706	6247	1387
91	S507091	837	142	4126	964	8454	1856
92	S507986	1527	370	5421	1209	8485	1953
93	S508187	1421	262	5155	1155	10173	2317
94	S508486	1361	399	4732	1279	8470	1954
95	S509386	2187	652	7199	1721	9391	2114
96	S510186	1168	198	4900	1123	9816	2209
97	S510486	2710	641	7221	1665	11129	2535
98	Z004381	790	146	2548	488	6835	1630
99	I051200	1671	451	4870	1250	8326	1966
100	S000785	2506	730	7386	1753	9603	2164
101	S505686	429	75	2142	522	3831	810
102	S005177	2647	614	6771	1549	11162	2548
103	S502586	1664	338	6119	1475	9483	2198

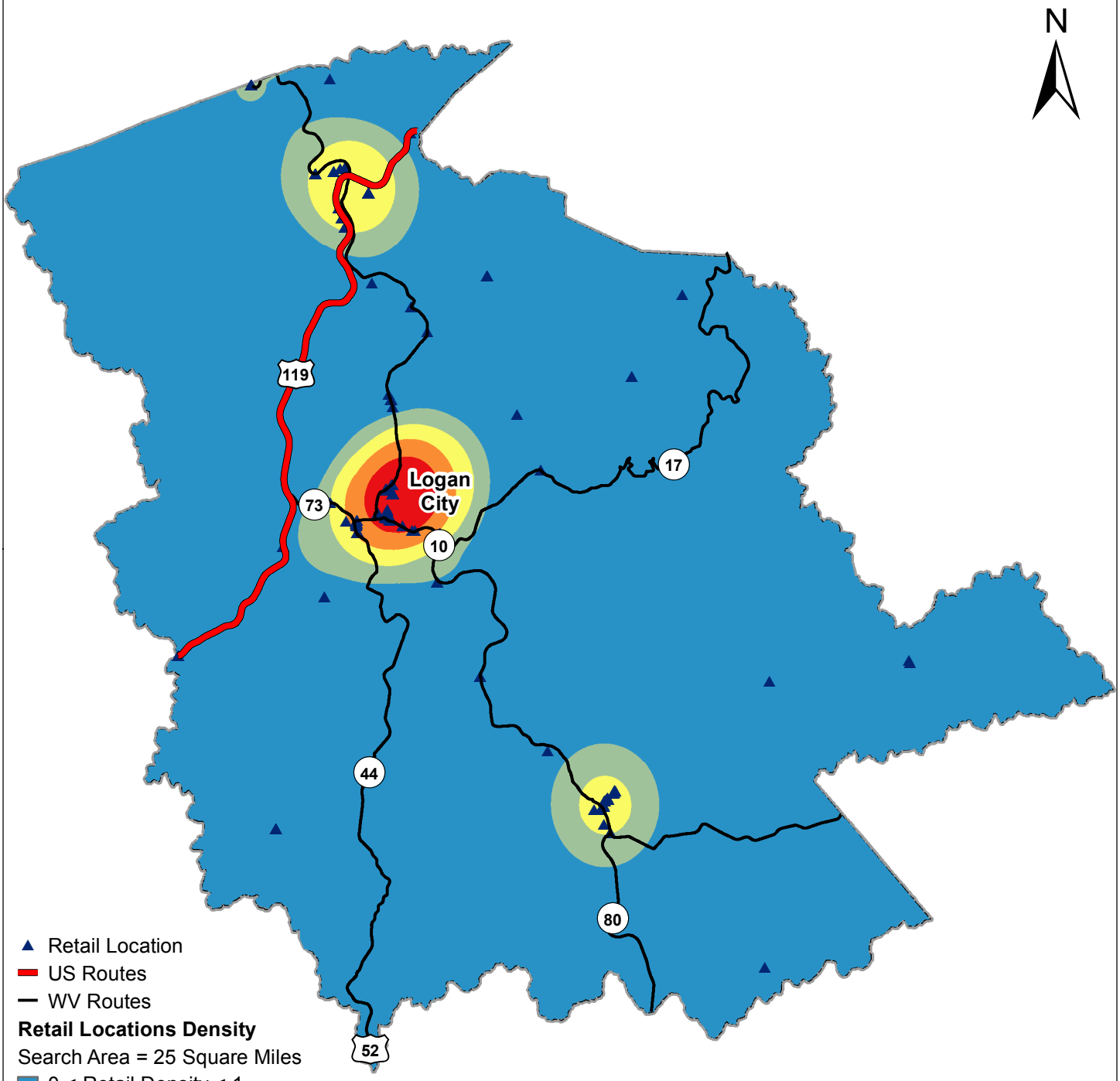
Site No	Permit_ID	Emp_05	Unemp_05	Emp_10	Unemp_10	Emp_15	Unemp_15
104	S001885	1502	348	5842	1295	8987	2089
105	S000680	1357	350	4127	1042	7568	1827
106	Z001481	1424	374	4167	920	7562	1714
107	S009985	1498	294	6919	1561	10060	2338
108	S011878	1615	376	5087	1251	8311	1972
109	S025374	1194	230	5202	1212	8702	1948
110	S501410	850	275	2190	561	3941	848
111	S003784	1067	182	5132	1064	9534	2202
112	S007779	620	207	1780	479	3477	769
113	S007775	1319	235	4937	1135	8251	1949
114	S509086	1291	245	6670	1490	9641	2267
115	S049600	1606	451	5012	1317	8614	1997
116	S013679	1571	445	4972	1312	8595	1989
117	S501112	1377	351	4412	986	7600	1726
118	S501110	1258	253	4386	916	8426	1968
119	S501908	1179	293	3741	851	7013	1585
120	I014600	853	270	2328	584	4536	996
121	S025675	1362	281	6329	1401	9441	2220
122	S024800	531	75	2338	458	5940	1322
123	S018978	1169	201	4932	1085	9789	2230
124	S003479	2727	649	7367	1707	11114	2529
125	S008177	2465	559	7110	1633	11080	2519
126	S002775	1353	287	5580	1219	8892	2091
127	S011275	972	239	3288	814	6775	1671
128	S500809	1487	310	4983	1201	8111	1935
129	I051700	1416	307	6141	1357	9312	2183
130	S000182	1424	374	4167	920	7562	1714
131	Z004281	1013	171	4977	1032	9391	2164
132	S002285	629	213	1779	481	3417	757
133	S023400	2609	600	6599	1509	11163	2547
134	S500212	1453	327	5721	1282	8857	2040

Retail Location Analysis

A retail location analysis is a hot spot analysis that depicts a number of retailers within 25 square miles of any certain location in the County (Map 41). The result, as shown on the map, is displayed in blue-to-red color for retail's density from low to high. Normally, the area with a high density of retailers indicates an already developed and populated community, which possibly has the highest opportunity as well as the heaviest competition. The areas with low retail density showcase where population is lowest, but also where competition is lowest and which may provide retail opportunities.

Retail Location Density

Logan County



Source: ESRI 2011

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V. Conclusion

Logan County is one of the most rural counties in West Virginia. Due to Government services and Trade, Transportation, and Utilities, wages have been steadily growing in the County. Logan County is also using its natural resources to for recreational opportunities. However, government services and trade jobs may not continue to be stable, and aging and educational issues persist. This plan could be useful in assisting Logan County in creating a development plan using their post-mine sites.

This plan has identified and displayed the five post-mine sites that are most suitable for development. These sites have the integral tools that researchers have shown can assist in spatial development. Though success is not guaranteed, this overview combined with careful strategic planning can bring about the changes in the trends that are necessary for Logan County to thrive.

Through a site distance analysis and complete demographic calculation, this plan provides the most comprehensive understanding of the economic state of Logan County and the potential of its land. By analyzing specific infrastructures and demographics, policymakers can begin attracting investors to post-mine sites, and continue the process of developing the economy. This plan provides strategic information; the choice as to how to utilize this information belongs with the administrators and people of the County.