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**Richmond Regional Planning District Commission  
Hazard Mitigation Plan**

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## **APPENDIX A – SAMPLE RESOLUTION**

The following resolution can be used by local jurisdictions to adopt the regional Hazard Mitigation Plan per FEMA requirements.

***MODEL RESOLUTION ADOPTING A NATURAL HAZARDS MITIGATION PLAN FOR RICHMOND REGIONAL PLANNING DISTRICT COMMUNITIES:***

WHEREAS, the Disaster Mitigation Act of 2000, as amended, requires that local governments develop and adopt natural hazard mitigation plans in order to receive certain federal assistance, and

WHEREAS, a Mitigation Advisory Committee (“MAC”) comprised of representatives from Charles City, Goochland, Hanover, Henrico, New Kent, and Powhatan Counties and the City of Richmond was convened in order to study the (County’s name) risks from and vulnerabilities to natural hazards, and to make recommendations on mitigating the effects of such hazards on the (County name); and

WHEREAS, a request for proposals was issued to hire an experienced consulting firm to work with the MAC to develop a comprehensive natural hazard mitigation plan for the Richmond Regional Planning District; and

WHEREAS, the efforts of the MAC members and a consultant, in consultation with members of the public, private and non-profit sectors, have resulted in the development of a Hazard Mitigation Plan for the Richmond Regional Planning District including (County name).

NOW THEREFORE, BE IT RESOLVED by the (County Board of Supervisor’s name) that the Hazard Mitigation Plan dated ( ) is hereby approved and adopted for the (County name). A copy of the plan is attached to this resolution.

ADOPTED by the (County) this \_\_\_\_ day of \_\_\_\_\_, 2005.

APPROVED:

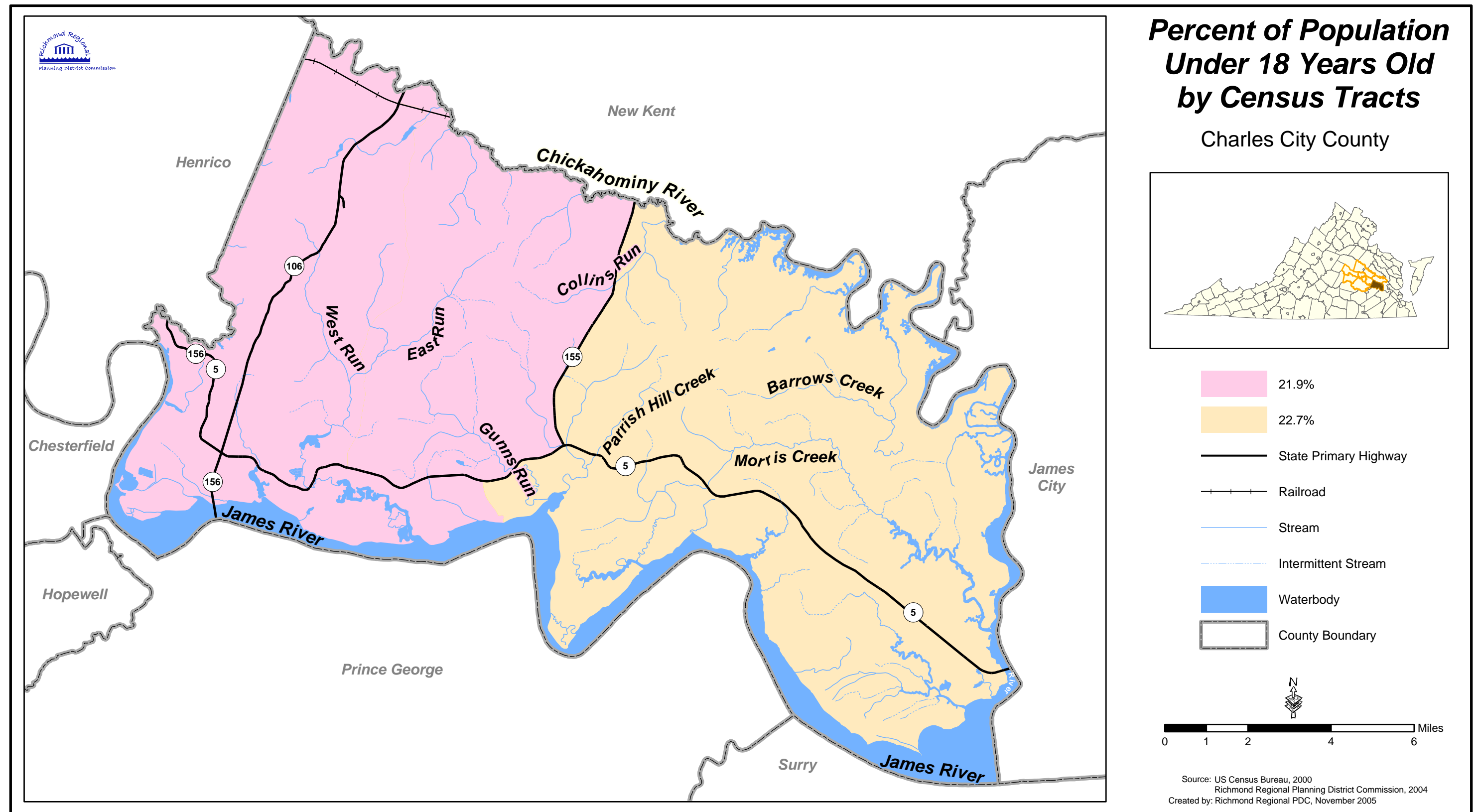
\_\_\_\_\_  
(Chairman, Board of Supervisors)

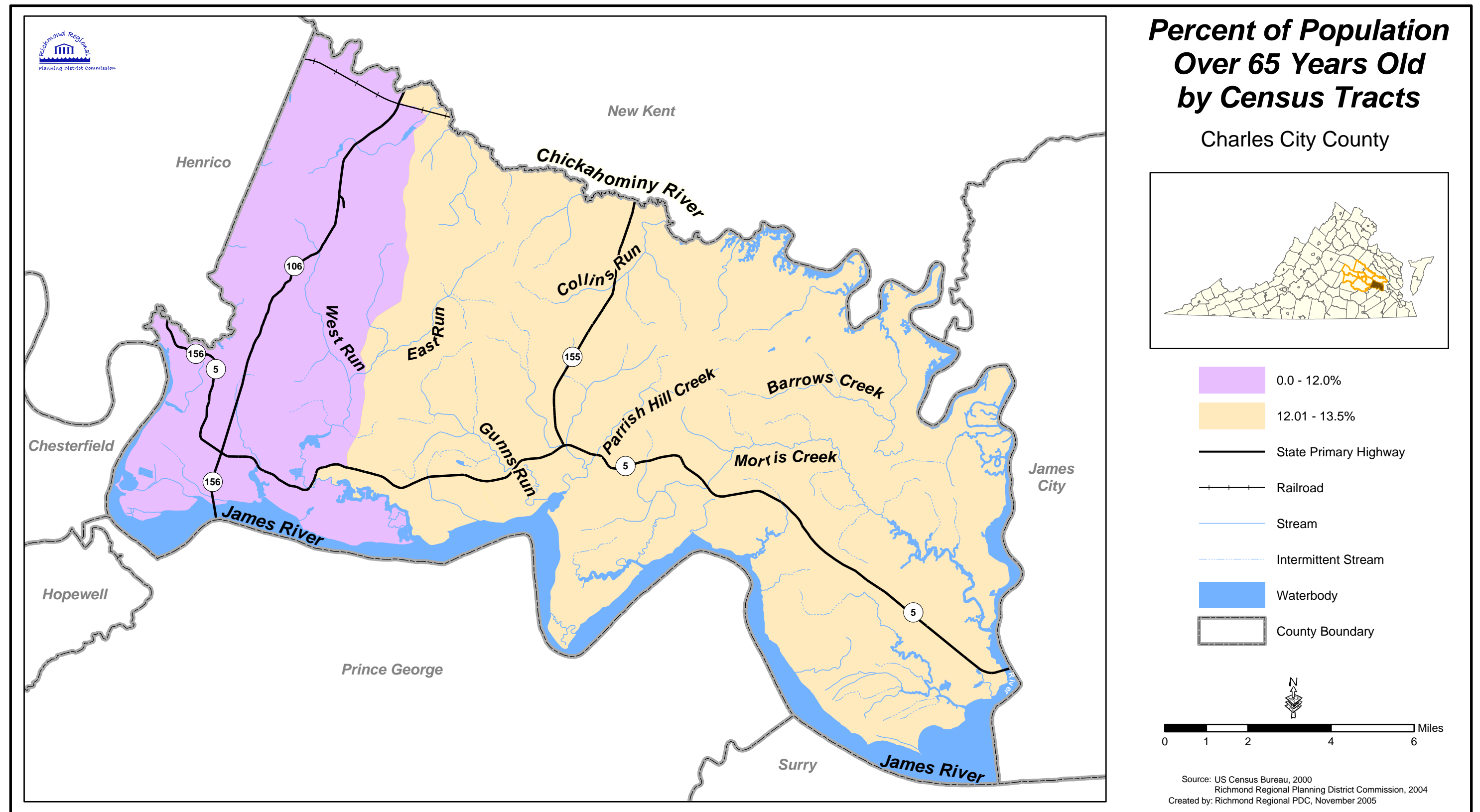
ATTEST:

\_\_\_\_\_  
(Clerk of the County)

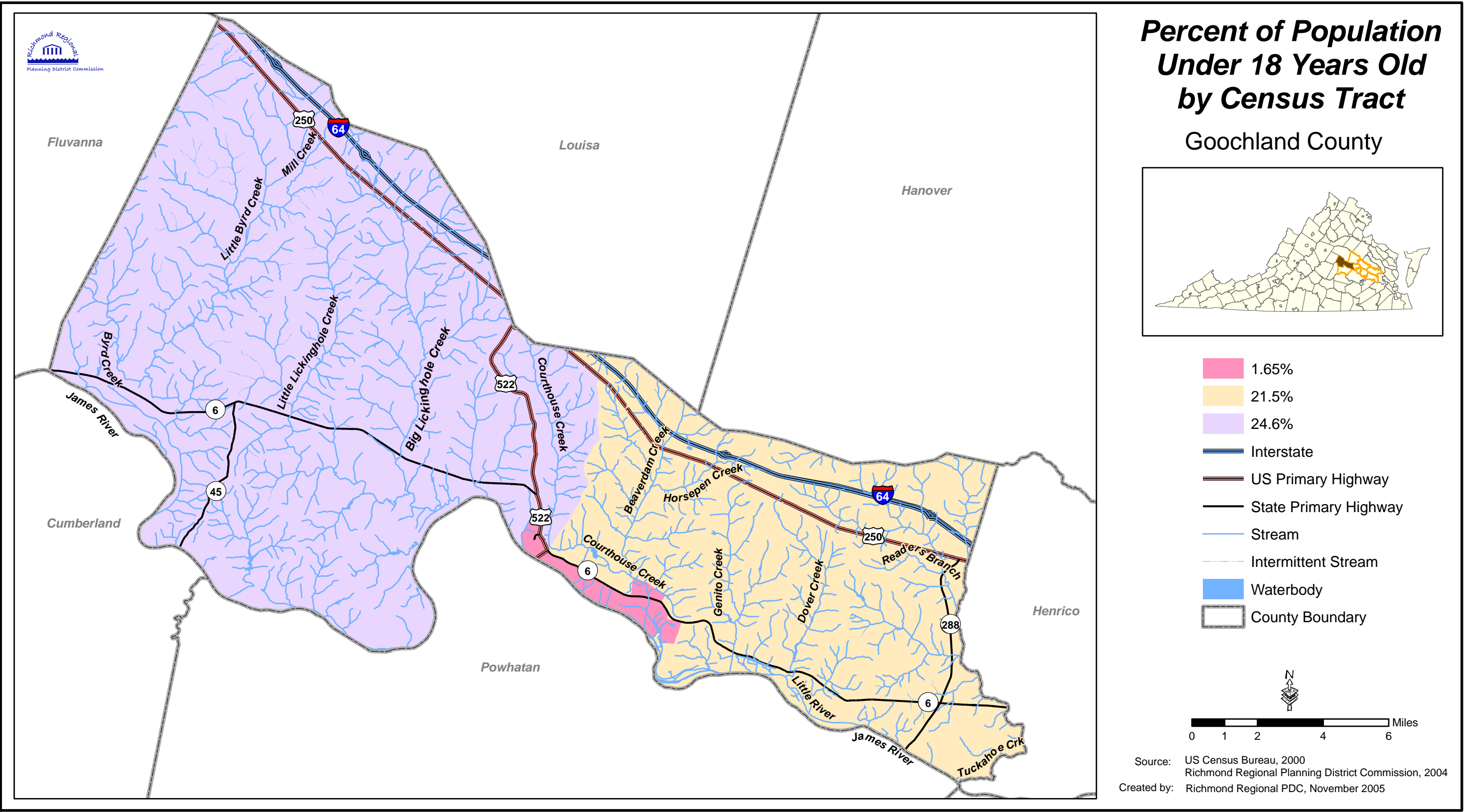
## APPENDIX B – COMMUNITY PROFILE MAPS

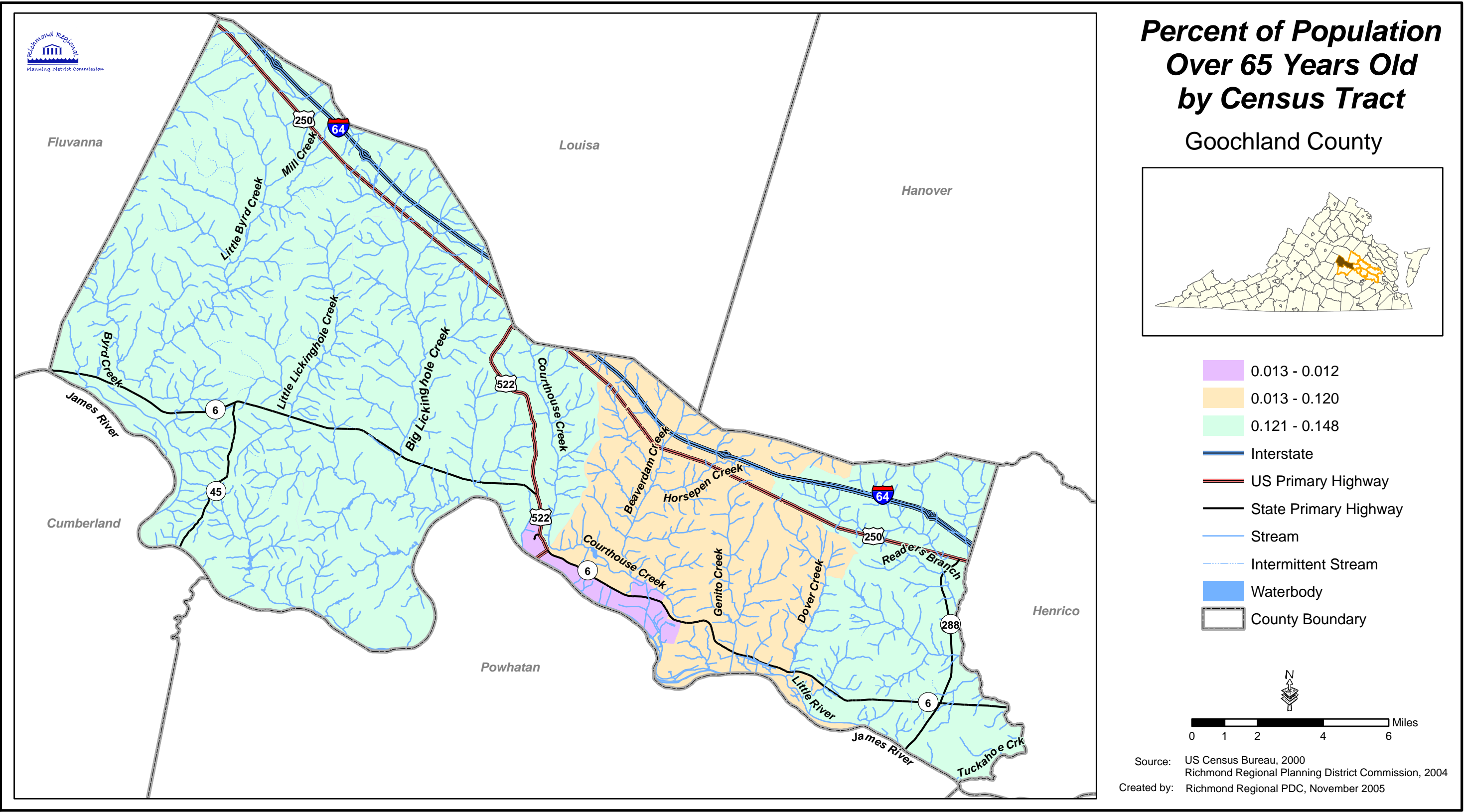
*Percent of Population below Age 18 and Above Age 65 by City/County*

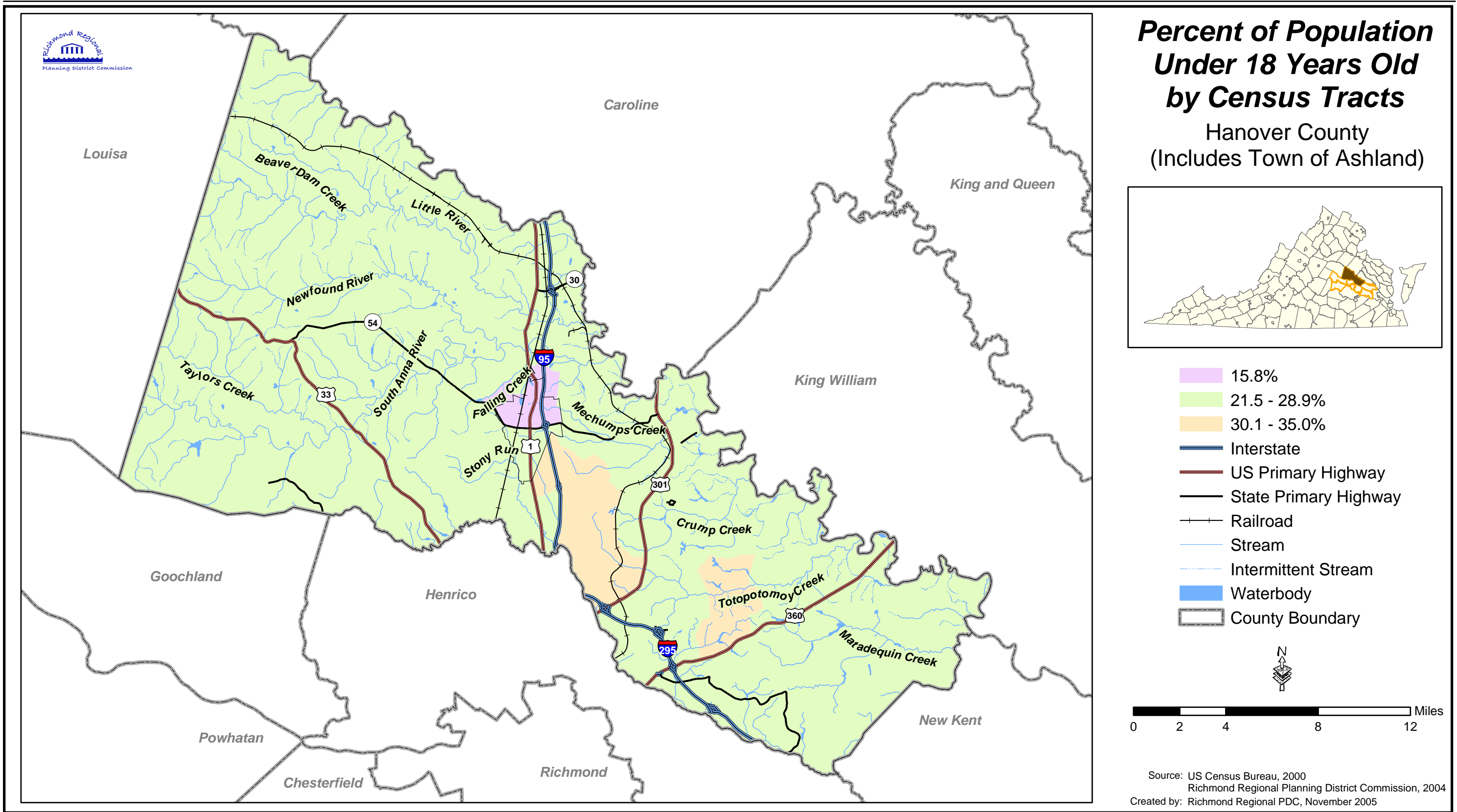




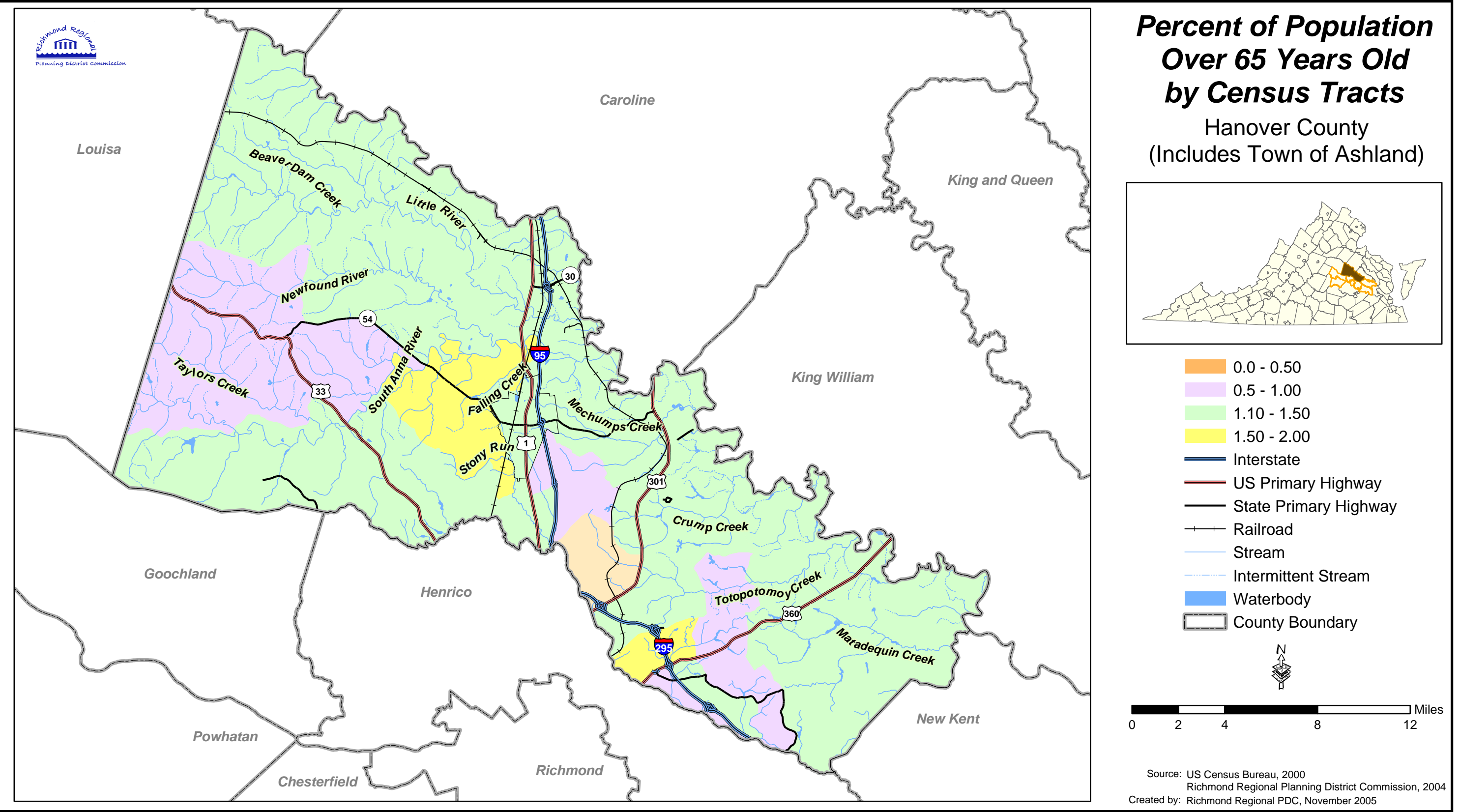


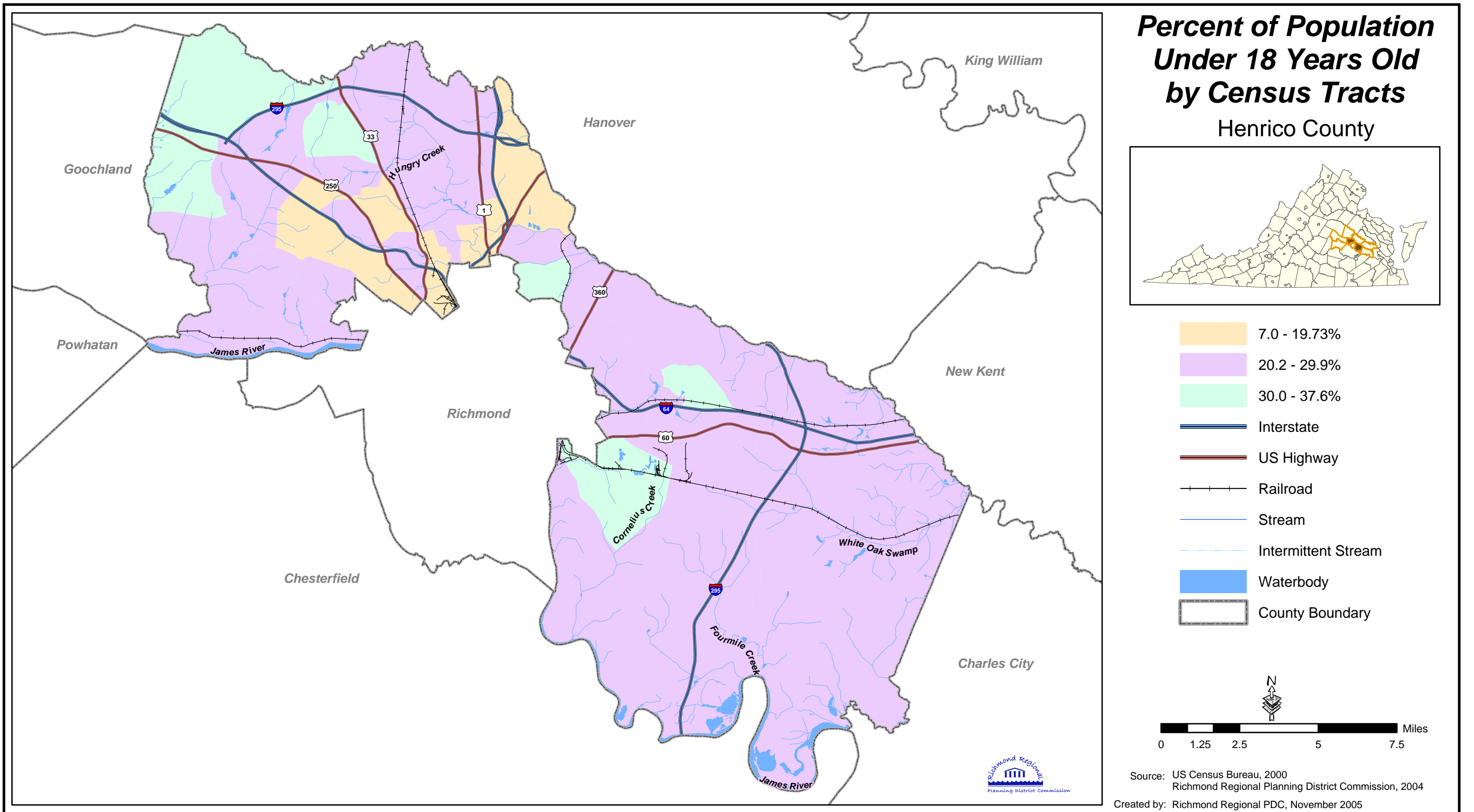


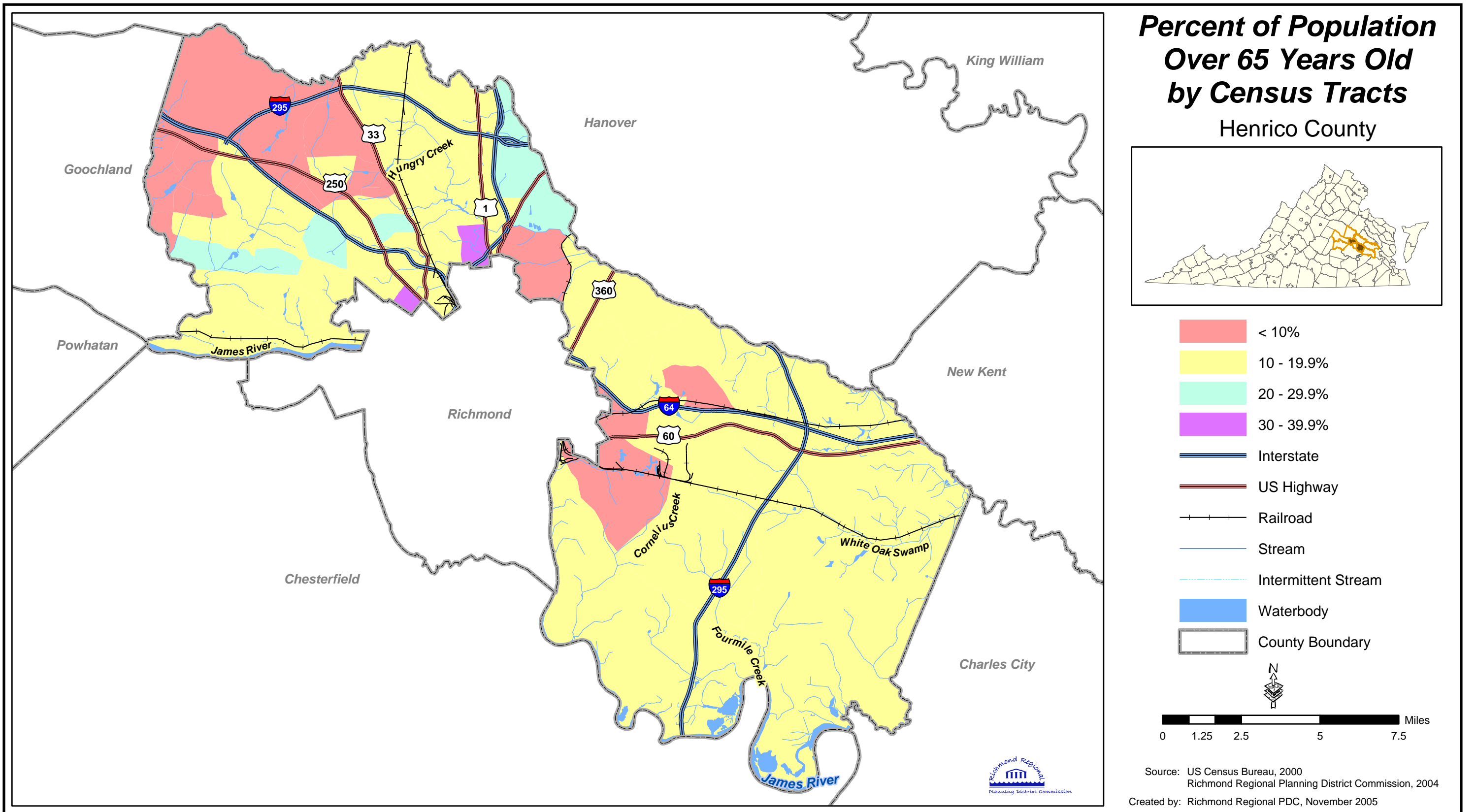




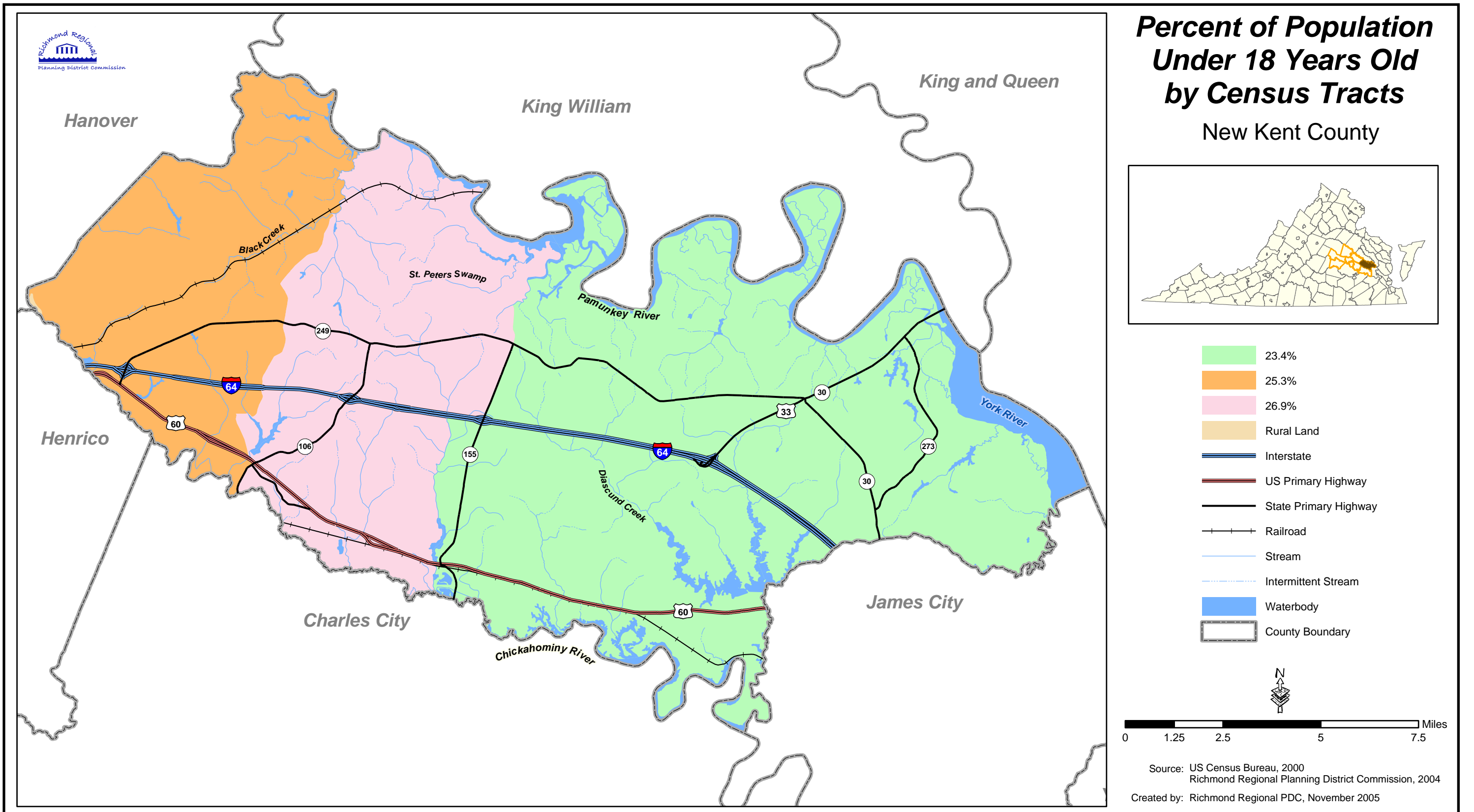




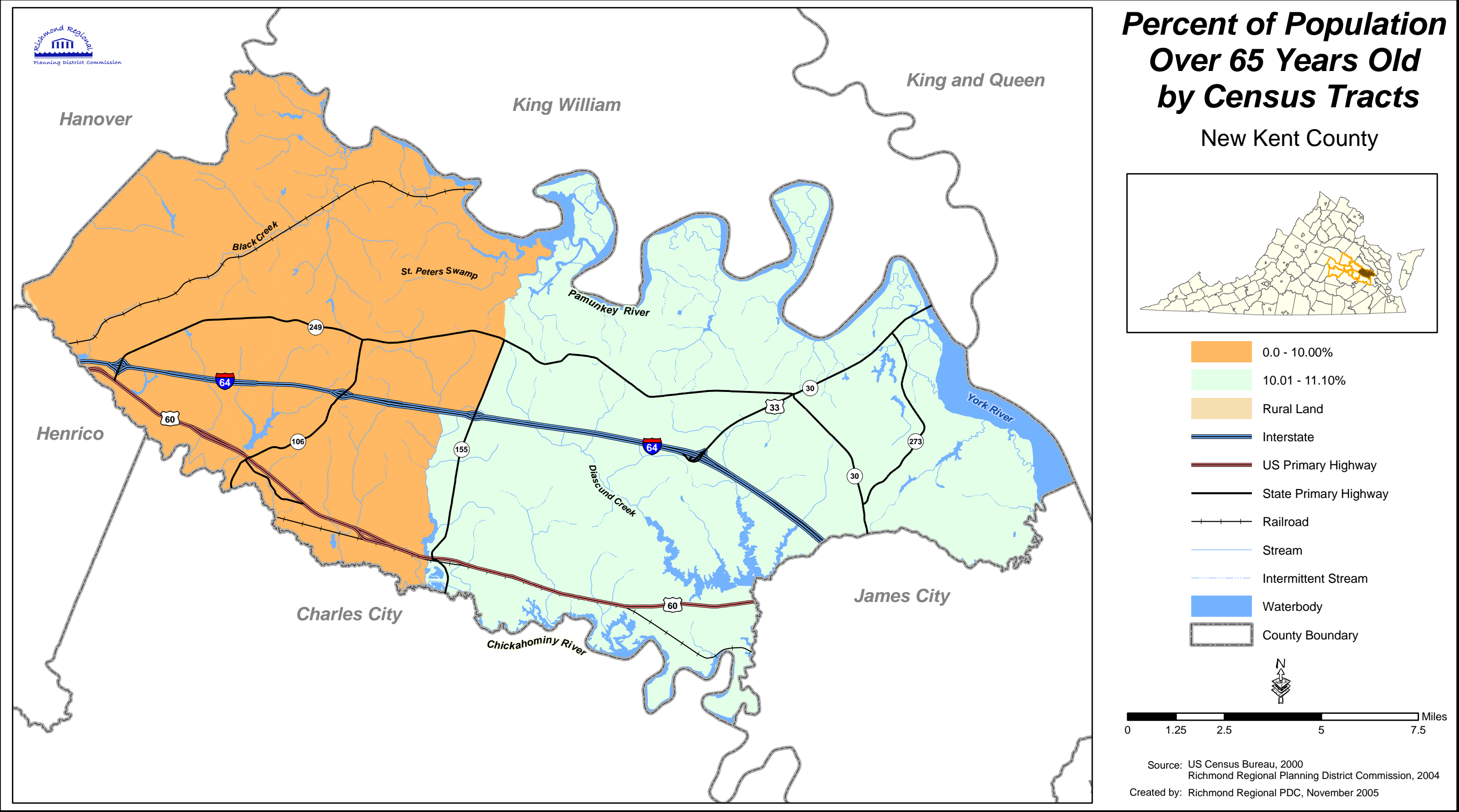


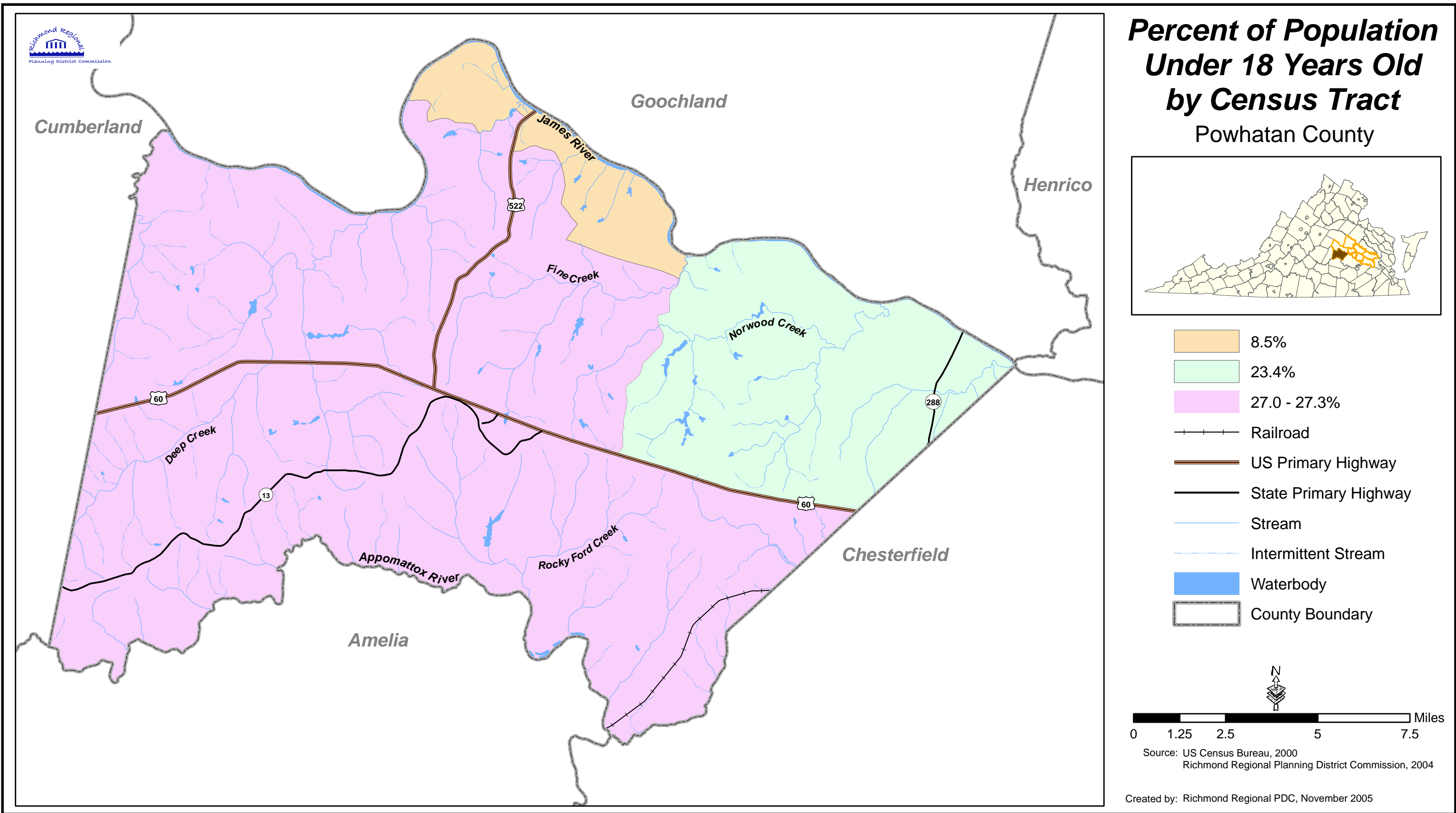


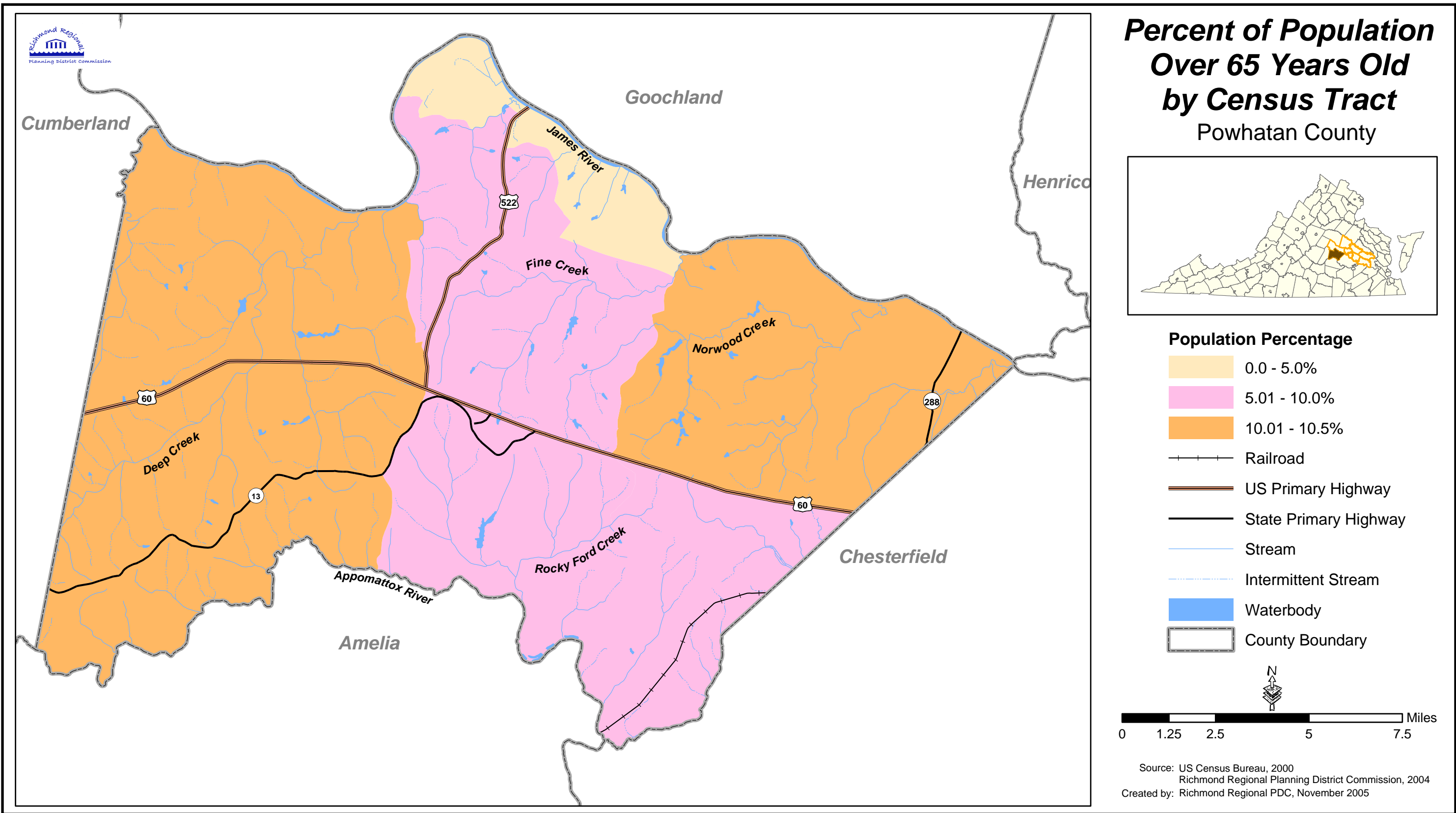


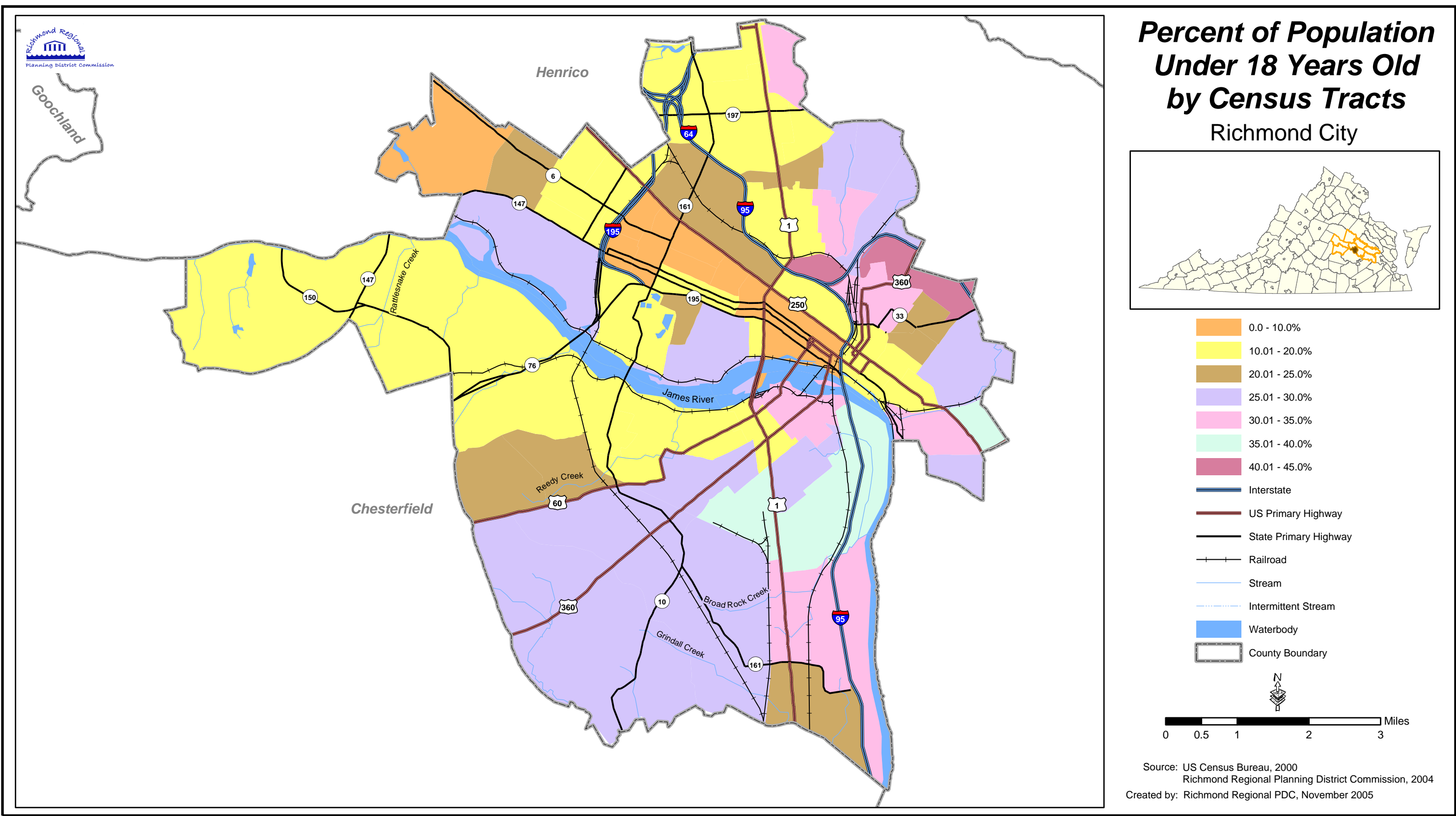






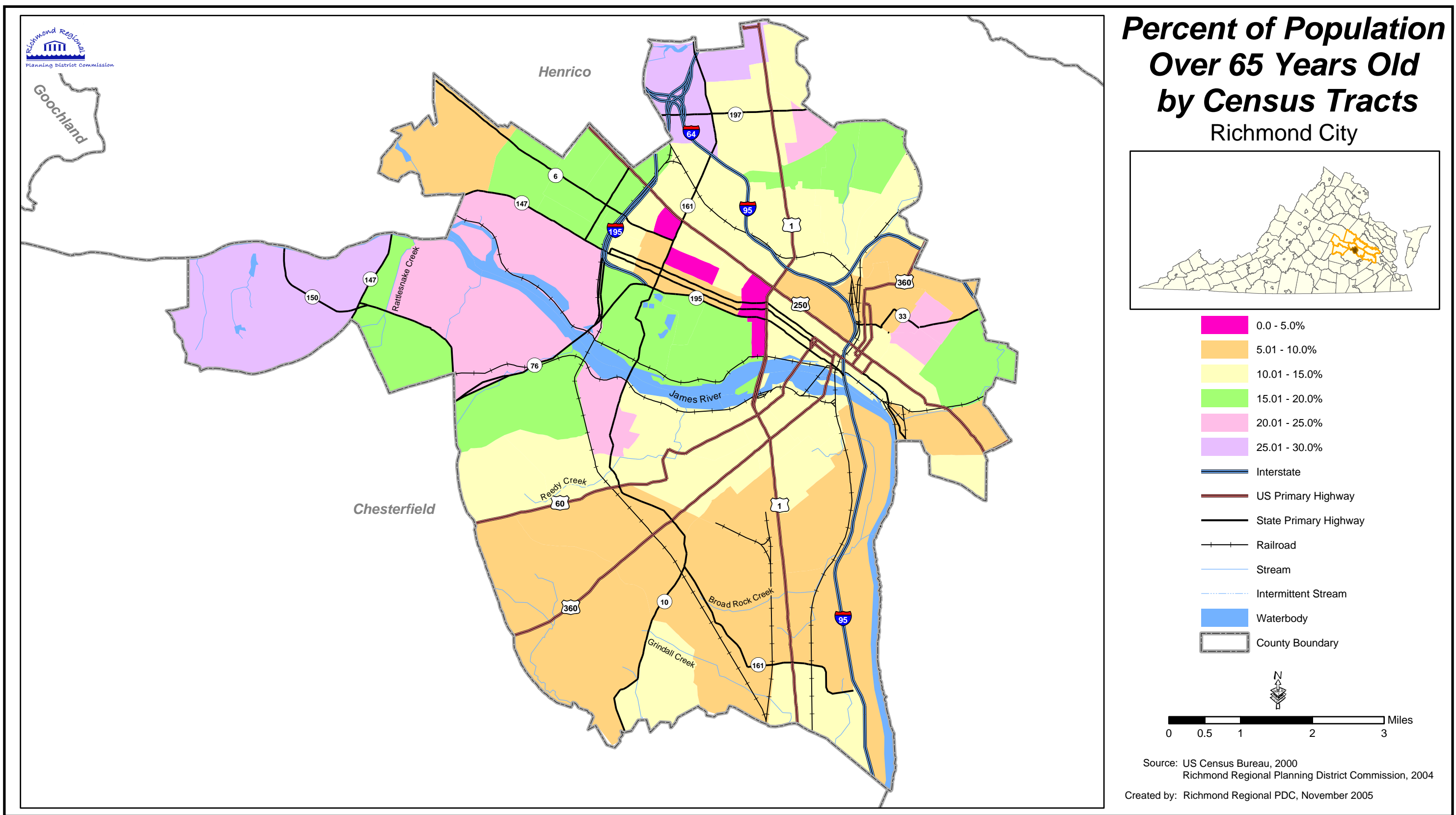








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Hazard Mitigation Plan



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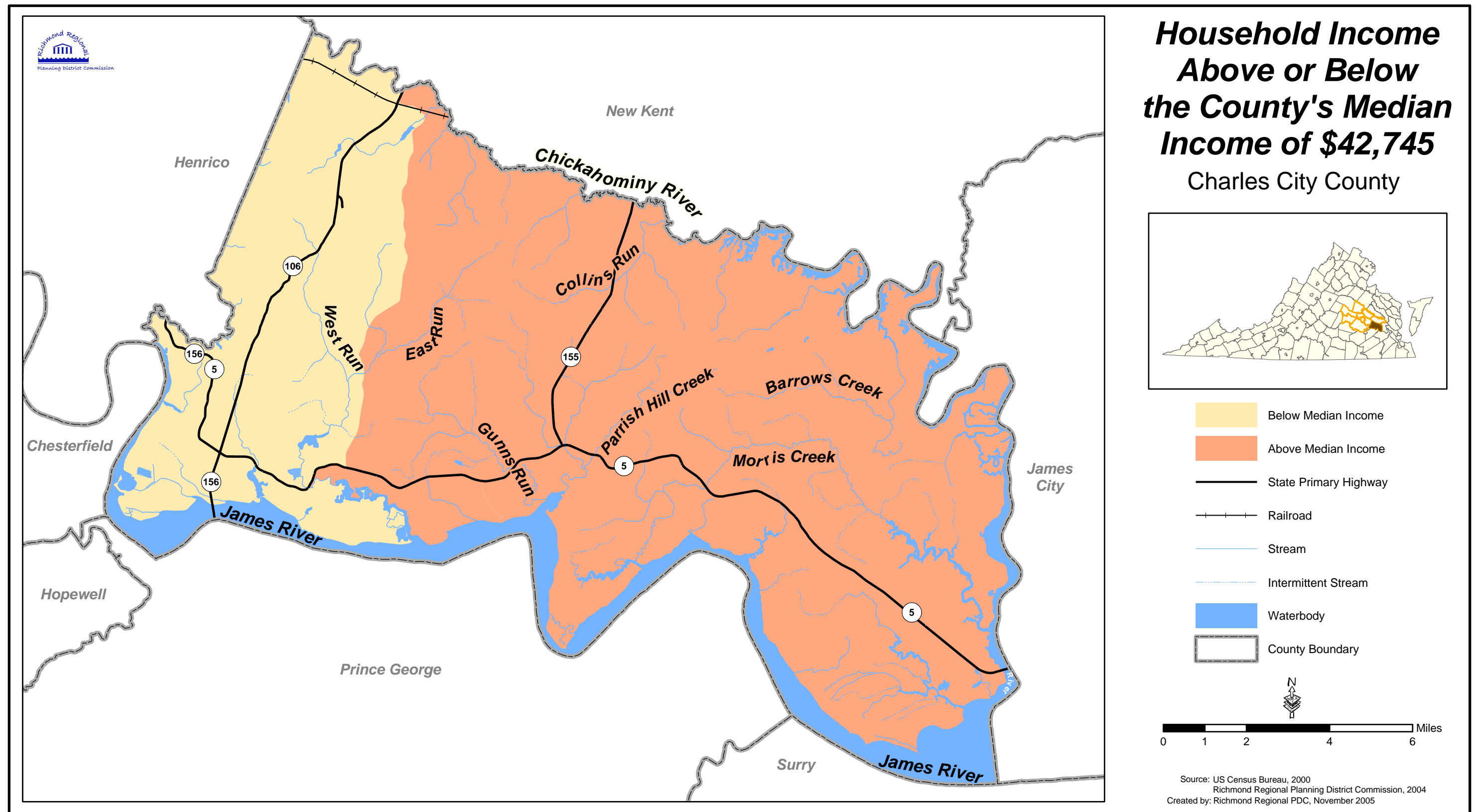
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Richmond Regional Planning District Commission  
Hazard Mitigation Plan

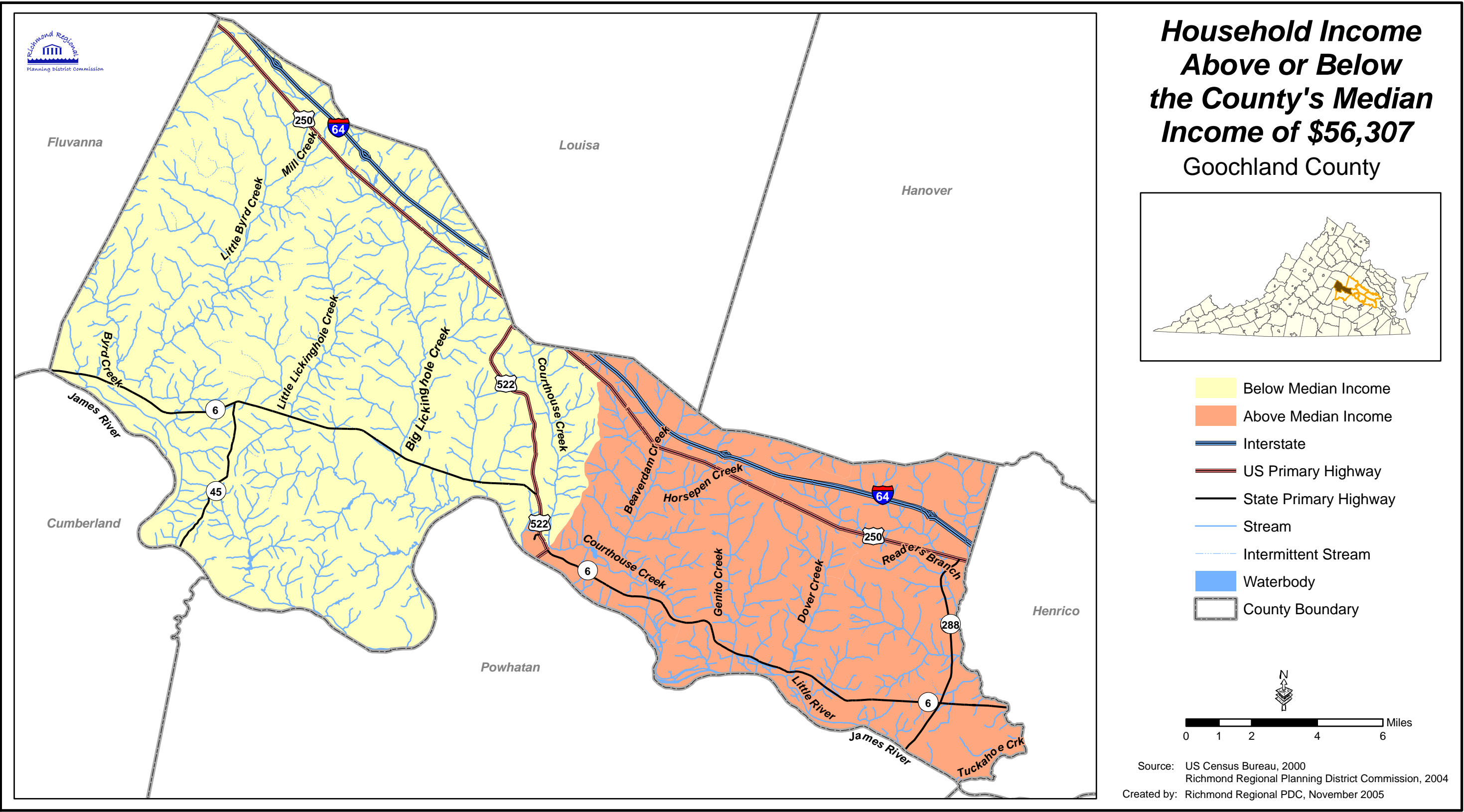
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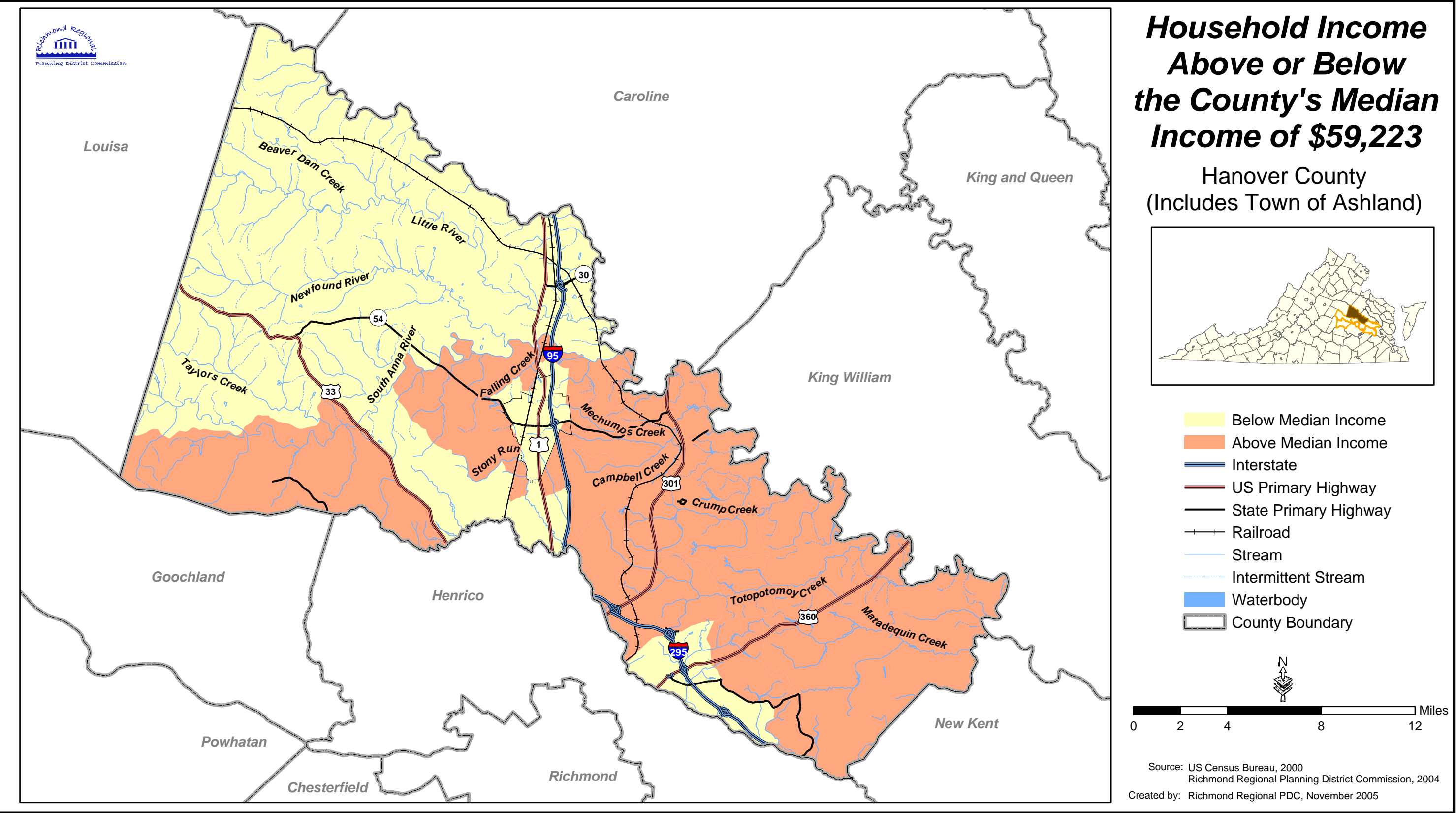
***Household Income Above or Below City/County Median***

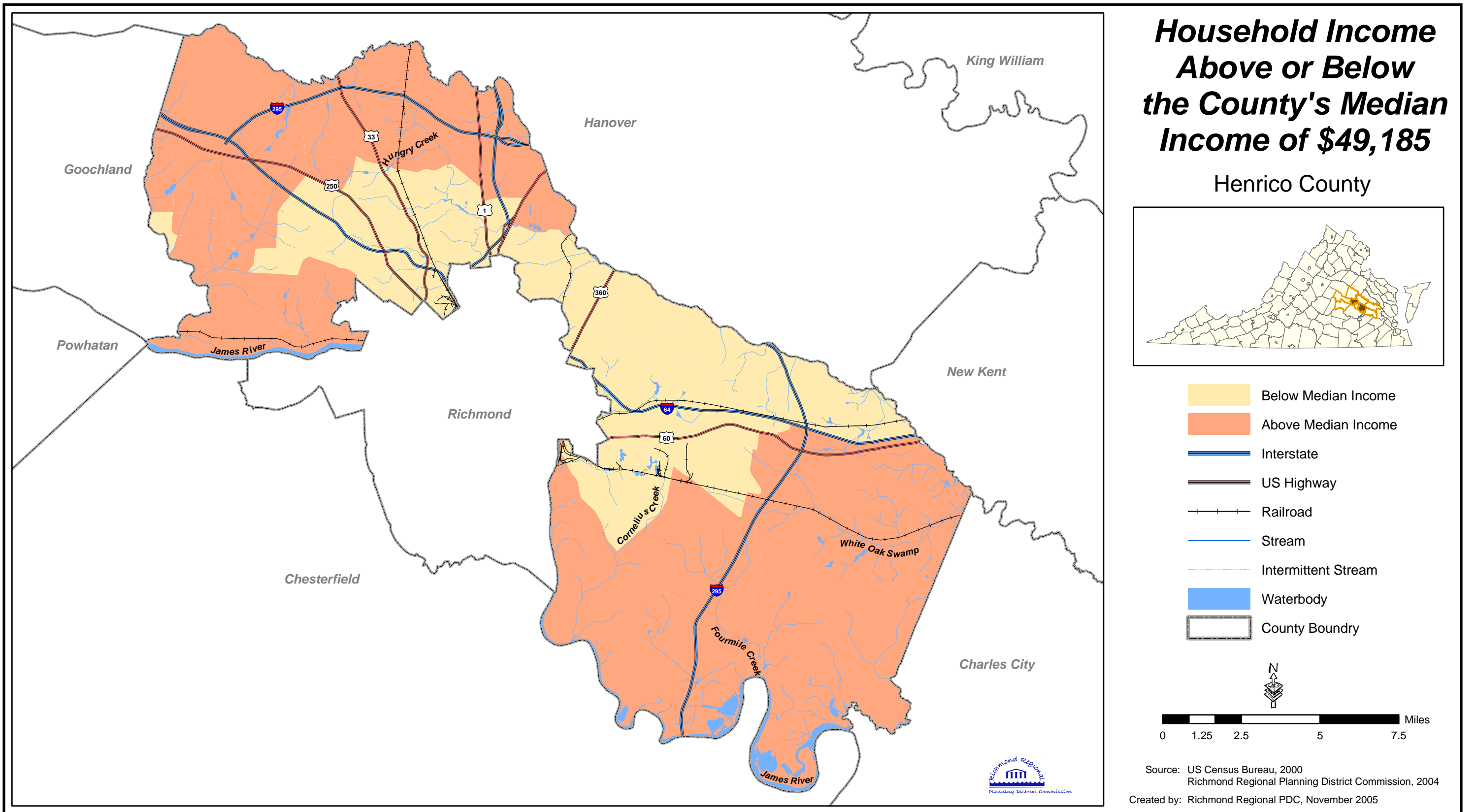




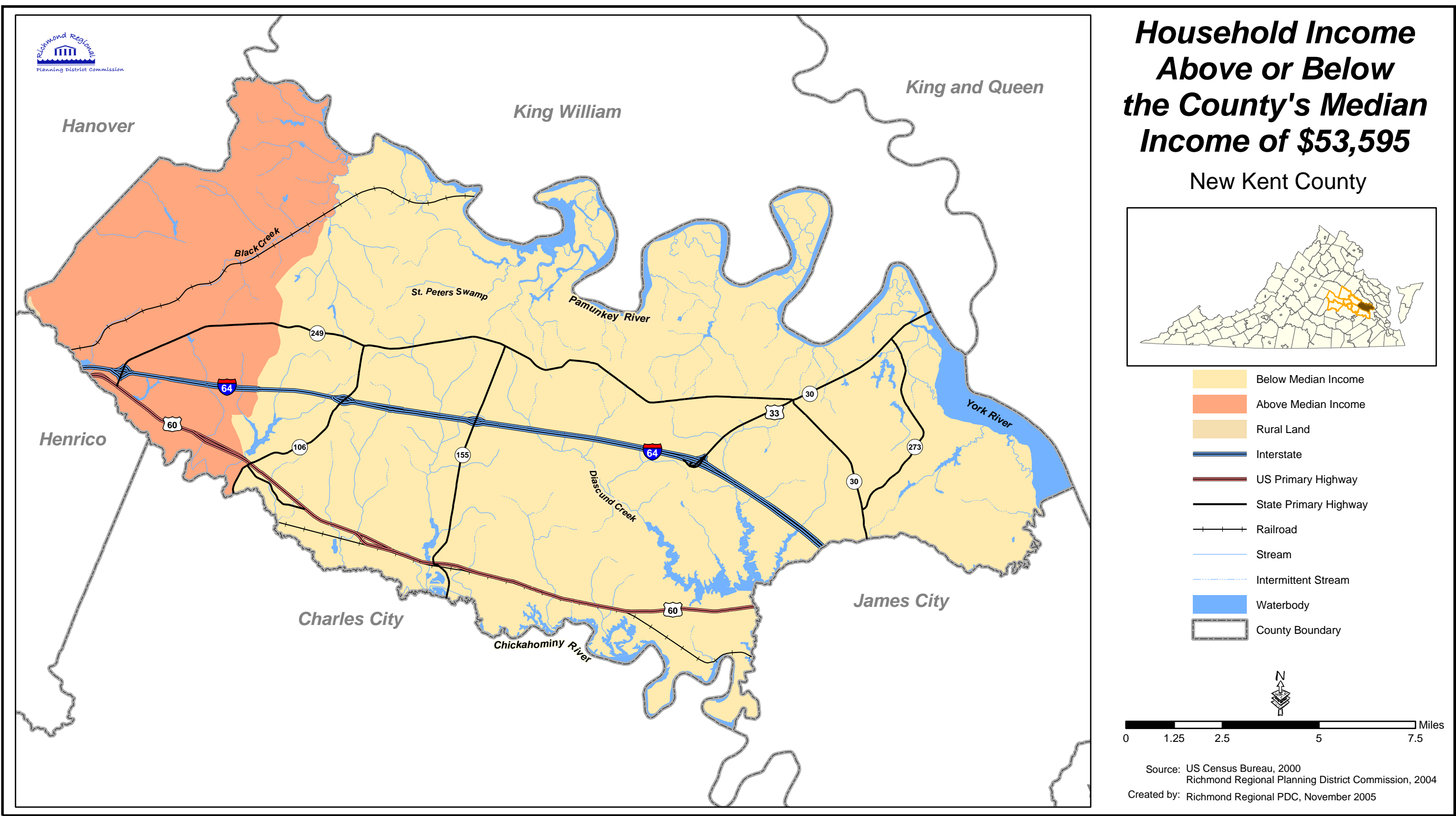


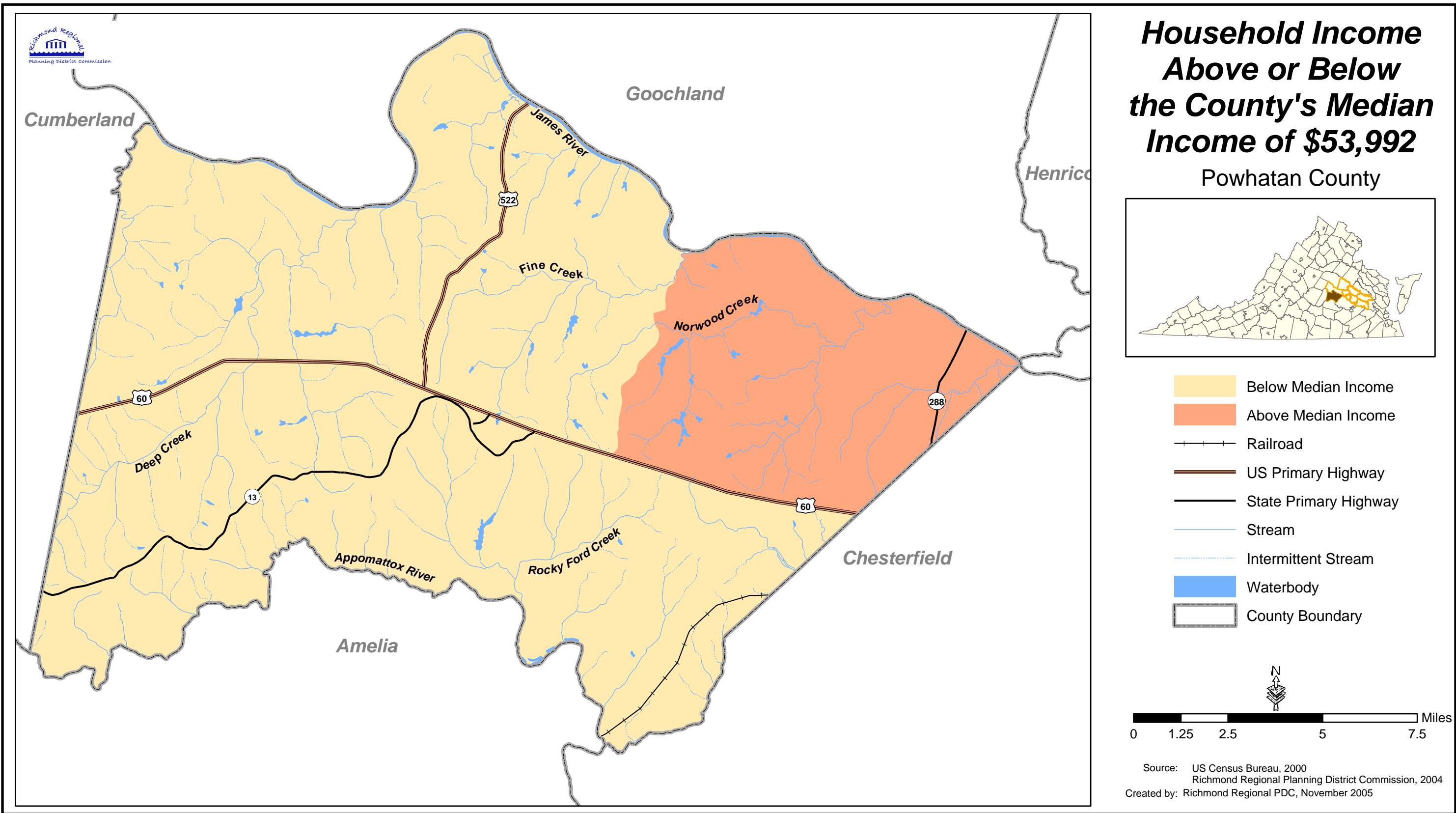
Richmond Regional Planning District Commission  
Hazard Mitigation Plan





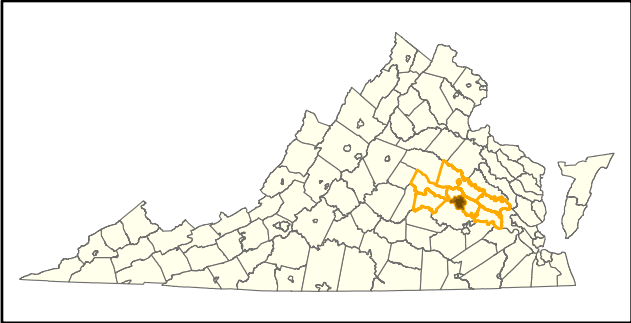






**Household Income  
Above or Below  
the County's Median  
Income of \$31,121**

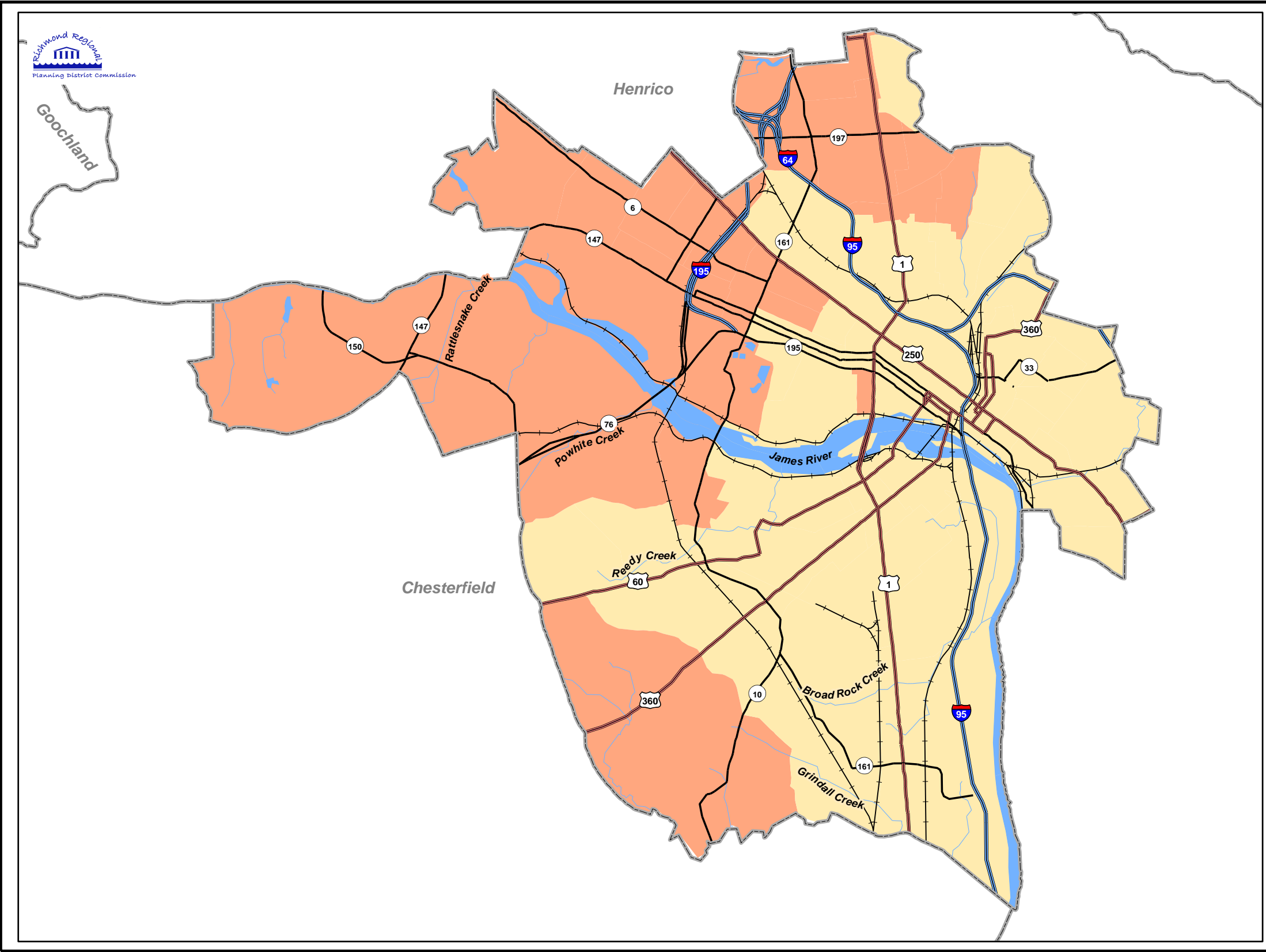
Richmond City



- Below Median Income
- Above Median Income
- Interstate
- US Primary Highway
- State Primary Highway
- Railroad
- Stream
- Intermittent Stream
- Waterbody
- County Boundary



Source: US Census Bureau, 2000  
Richmond Regional Planning District Commission, 2004  
Created by: Richmond Regional PDC, November 2005



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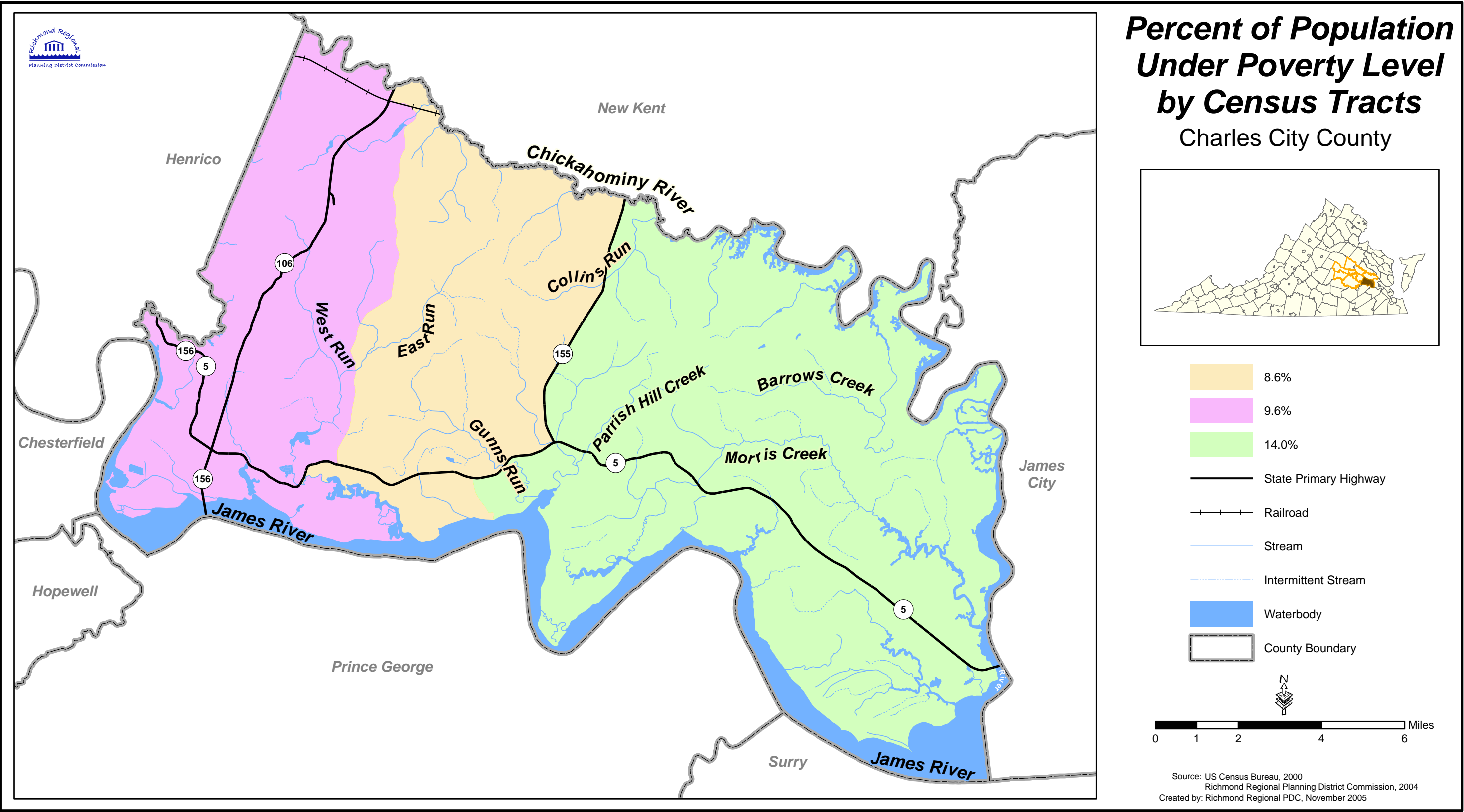
Richmond Regional Planning District Commission  
Hazard Mitigation Plan

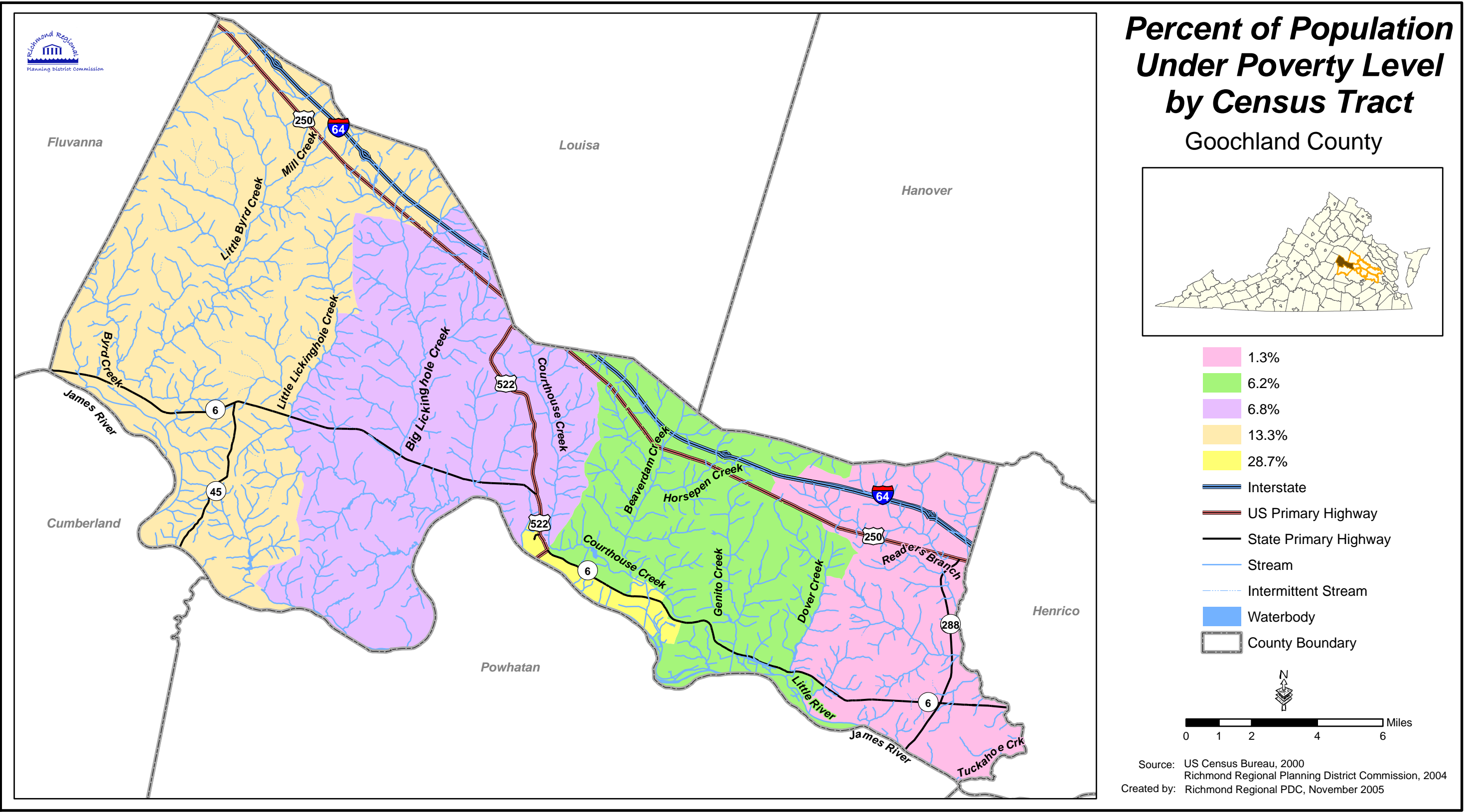
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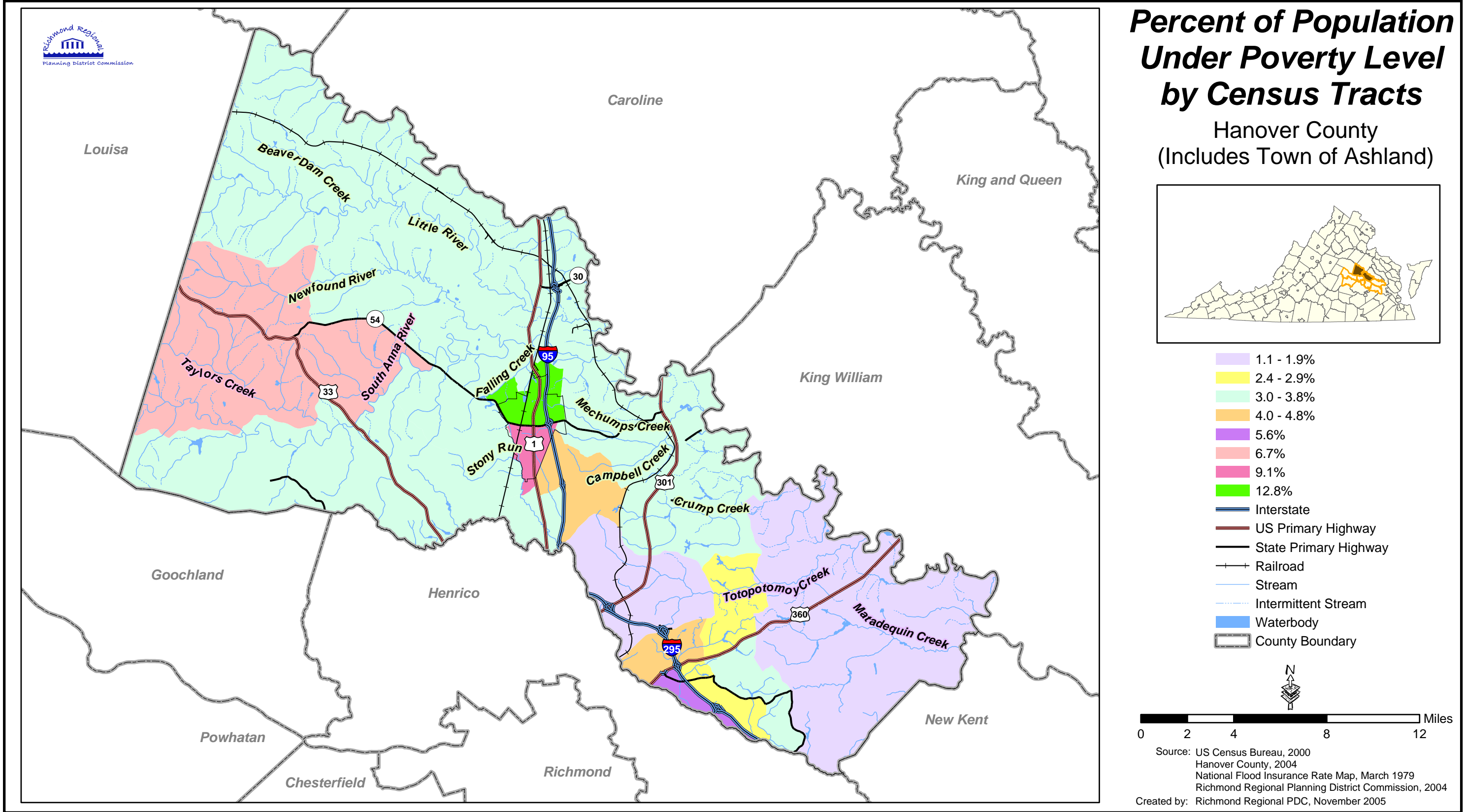
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***Poverty Distribution***

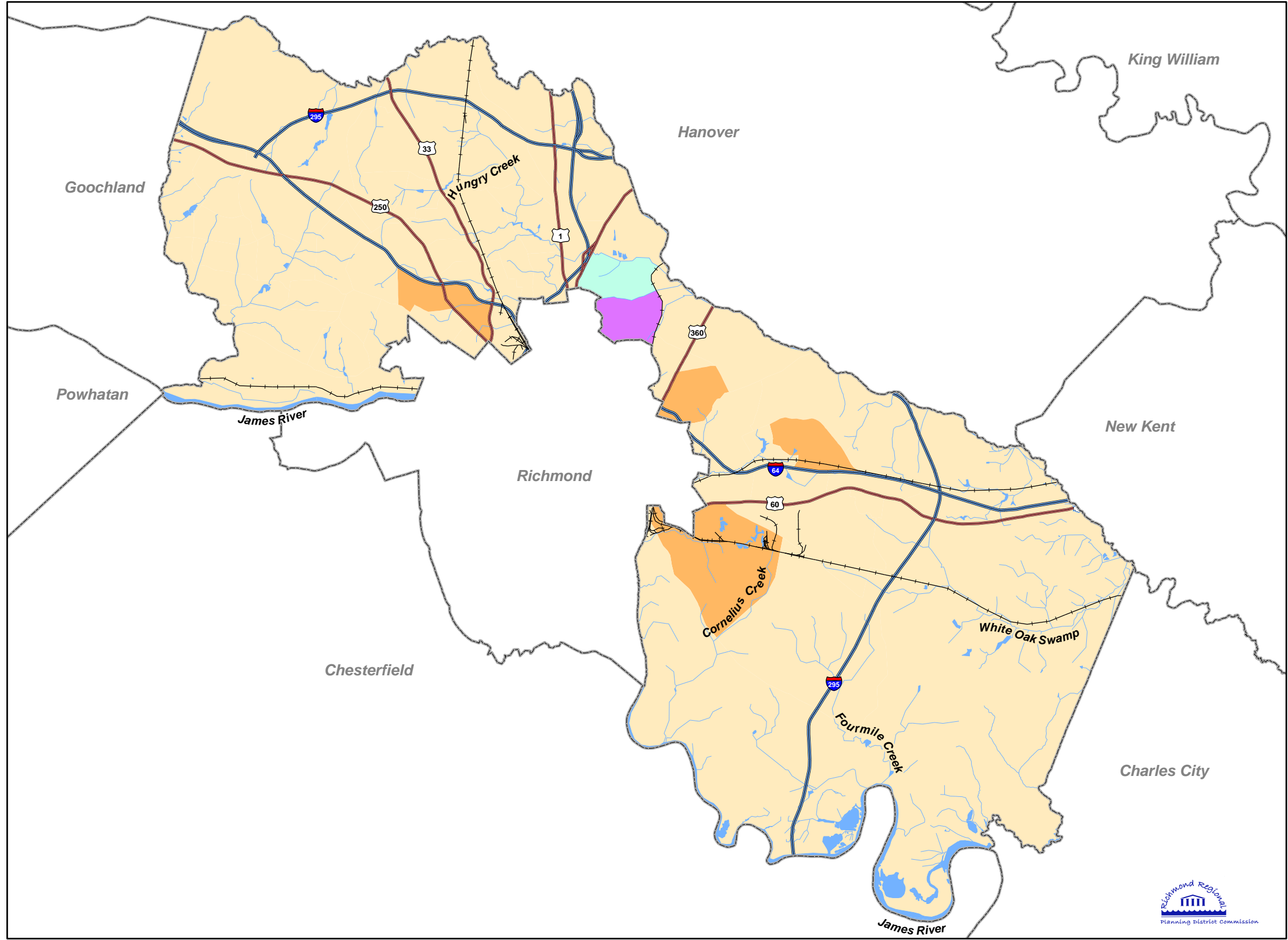






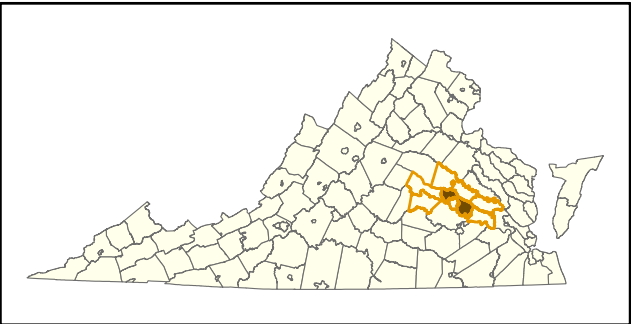




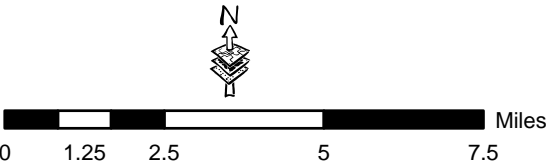


# Percent of Population Under Poverty Level by Census Tracts

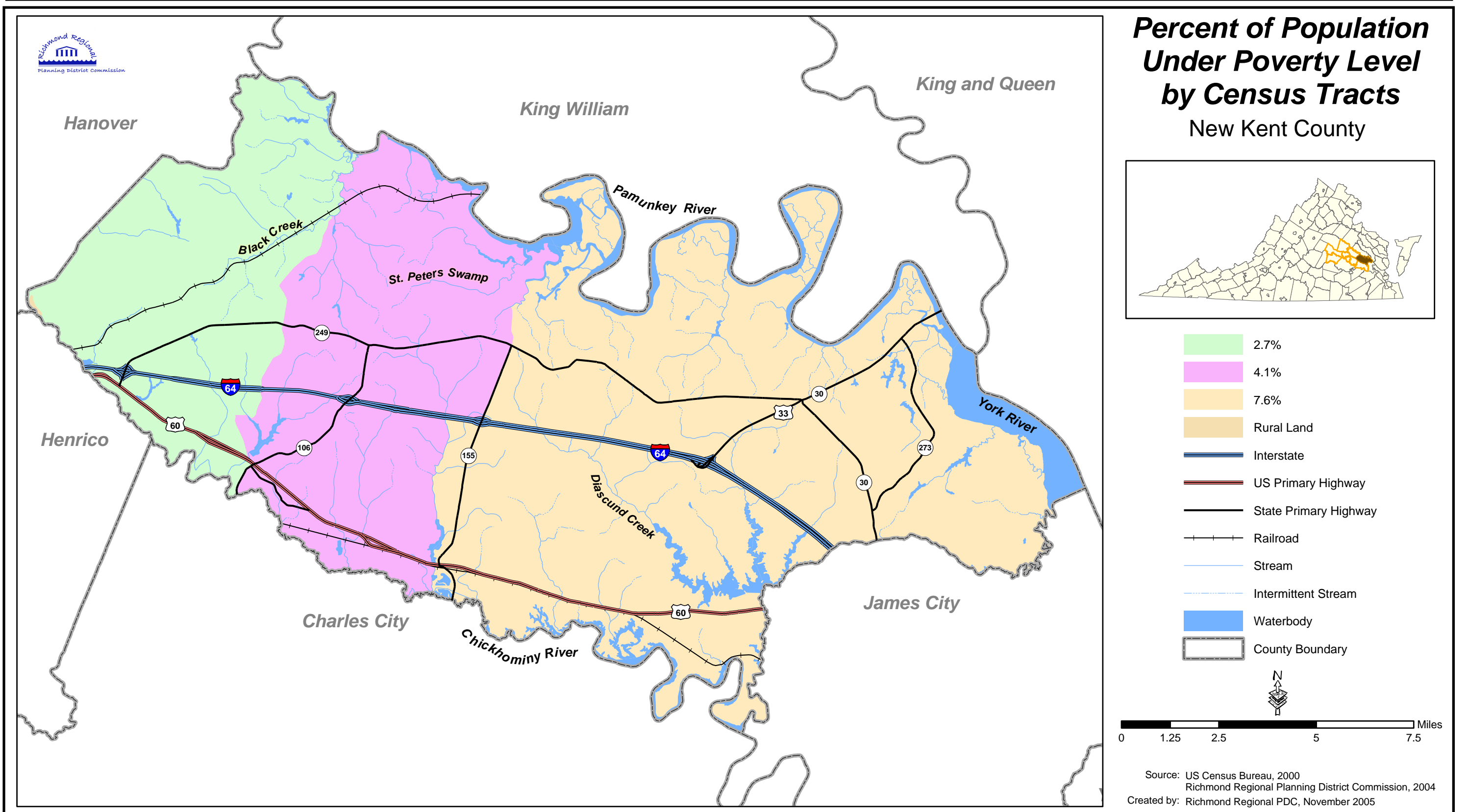
Henrico County

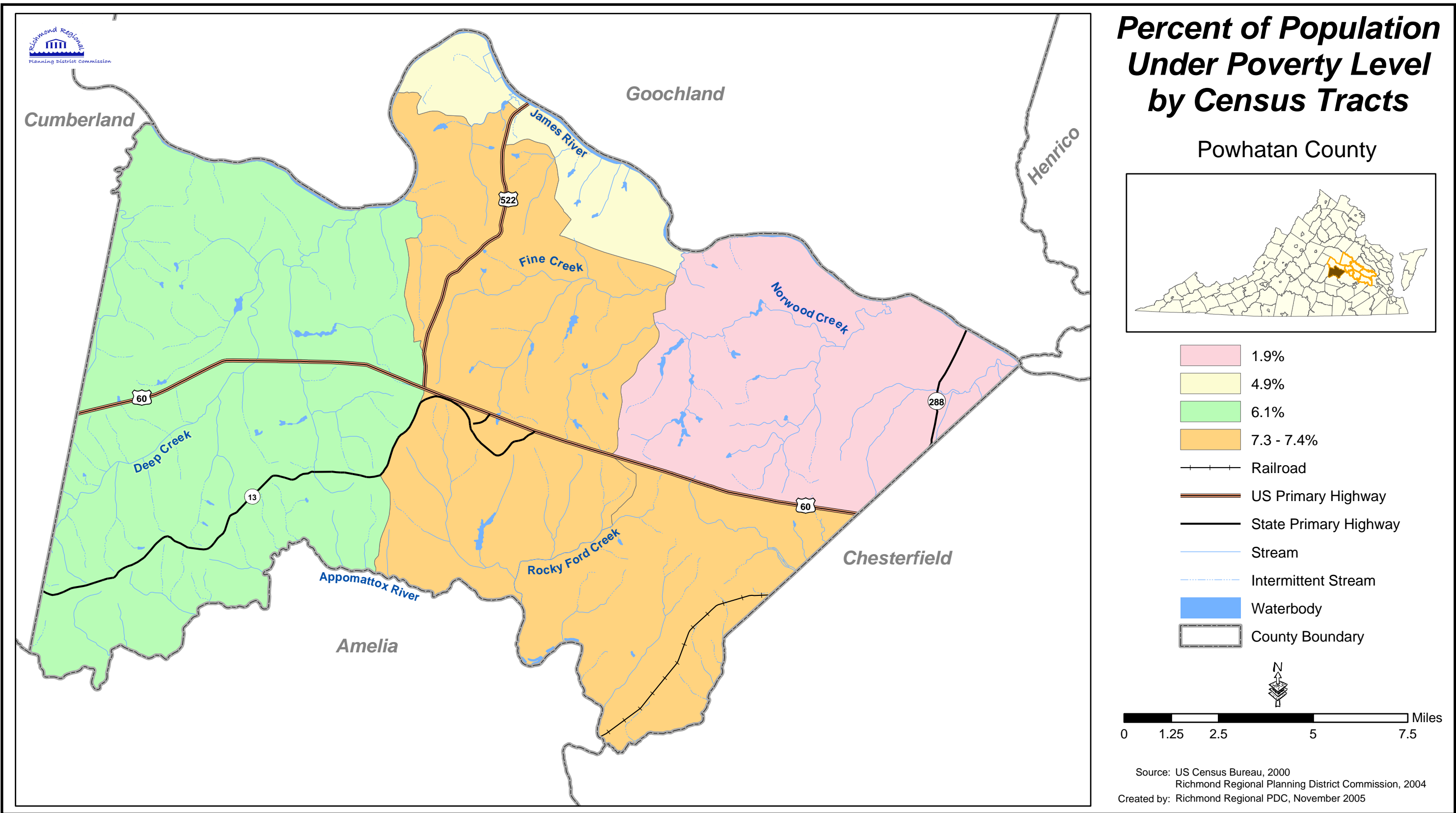


- 0.01 - 9.91%
- 10.4 - 13.5%
- 23.3%
- 31.5%
- Interstate
- US Highway
- Railroad
- Stream
- Intermittent Stream
- Waterbody
- County Boundary



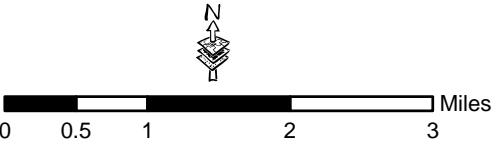
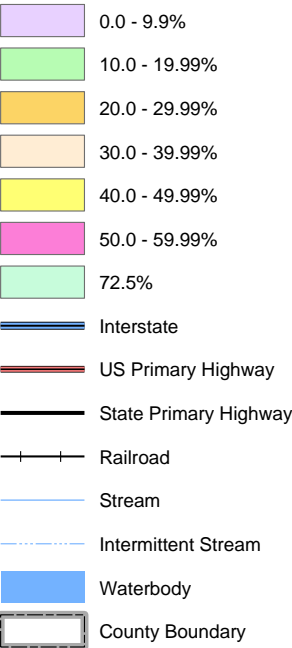
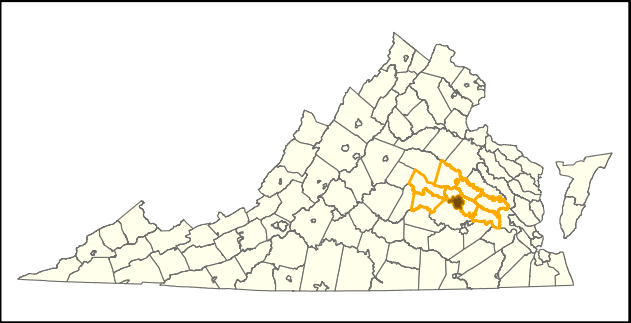
Source: US Census Bureau, 2000  
Richmond Regional Planning District Commission, 2004  
Created by: Richmond Regional PDC, November 2005



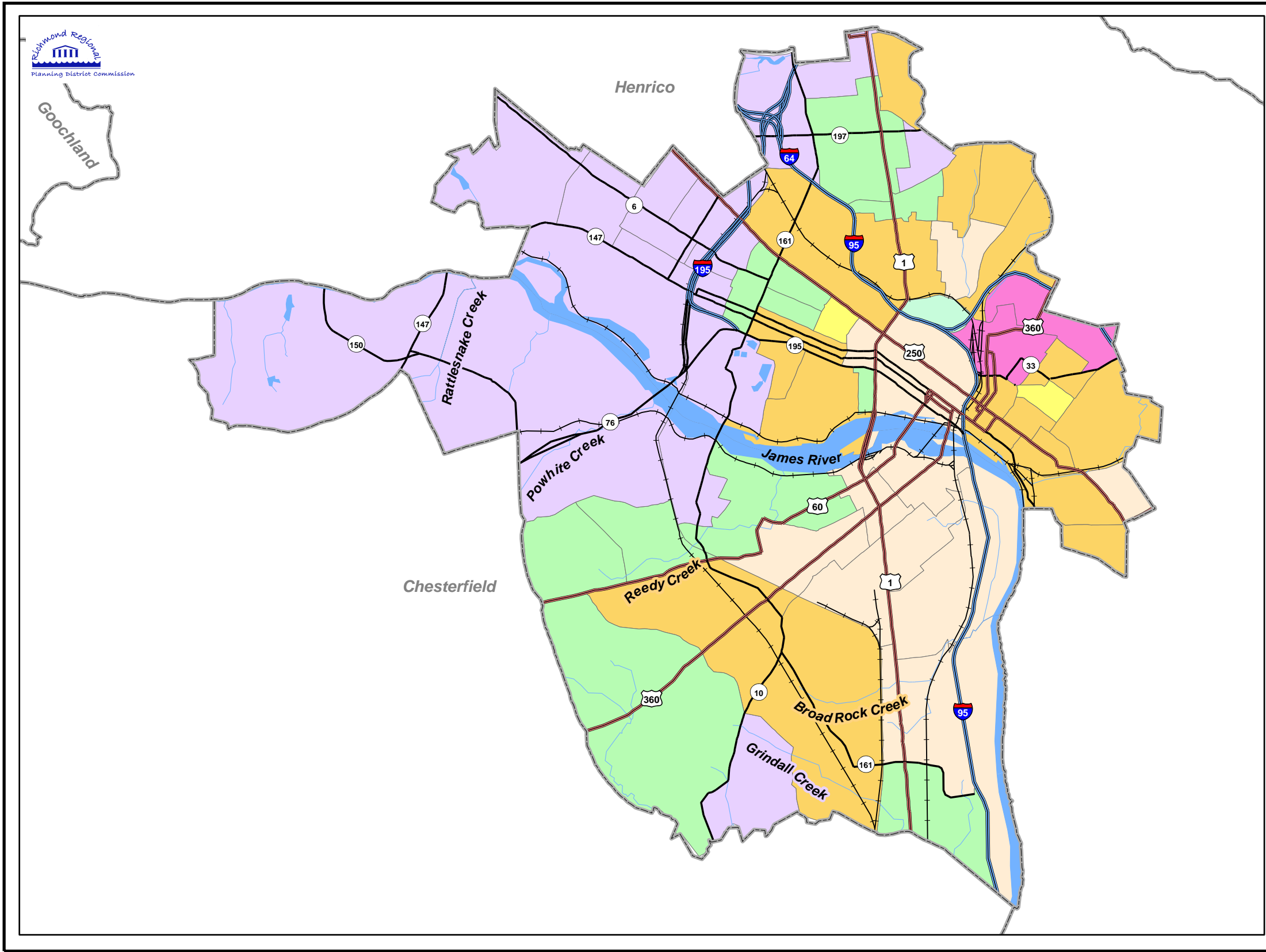


# Percent of Population Under Poverty Level by Census Tracts

Richmond City



Source: US Census Bureau, 2000  
Richmond Regional Planning District Commission, 2004  
Created by: Richmond Regional PDC, November 2005





## APPENDIX C — DETAILED HAZARD IDENTIFICATION PARAMETERS AND METHODOLOGY

Based on all local and regional hazard data collected, an analysis of the potential hazards that can affect the Richmond Region was performed based on the four parameters that are described below. These four parameters were based on two separate factors — *the probabilities that a potential hazard will affect the region and the potential impacts on the region should a hazard event occur*. Hazard identification parameters and computations used to prioritize the potential hazards that can threaten the Richmond Region are listed in tabular form at the end of this appendix.

Mitigation Advisory Committee members were given an opportunity to provide input to the Hazard Identification. The worksheet was posted to the project website for review and comment. Powhatan County noted that “the Hazard Consideration for flooding is not as great as other parts of the region. We have no dwellings or commercial structures in the flood plain. Therefore we would have a lower ‘Affected Area’ and lower ‘Primary and Secondary Impacts’.” The Flood section of the analysis notes this differing degree of risk.

- **Probability** — This parameter addresses the probability that a potential hazard will affect the locality. The probability for each hazard was determined based on the history of events in the Richmond Region. Hazard probabilities were classified into one of four distinct categories by estimating the hazard’s average annual frequency, which is the probability of a specific hazard event occurring in the Richmond Region in a given year. Some average annual frequencies were relatively simple to estimate. For example, a review of Richmond Region’s tornado hazard history indicated the region has experienced 21 tornadoes over the past 100 years. Therefore, the average annual frequency of a tornado event occurring in any given year was  $(21/100 \times 100) = 21\%$ . However, the frequencies of other hazards in the region were more difficult to determine due to incomplete or limited historical data. In such cases, frequency estimates relied on experience with similar events in neighboring regions.
- **Affected Area** — This parameter is the first of three impact parameters, and addresses the potentially affected geographic area within the region should a hazard event occur. The extent of the affected area for each hazard was determined based on the specific characteristics of each hazard, the history of such events in the Richmond Region, and experience with similar events that

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have occurred in neighboring regions. The affected areas were classified into one of four distinct categories based on the extent of the locality directly impacted by the hazard, ranging from a single building or facility to a widespread area of the region.

- **Primary Impact** — This second impact parameter addresses the potential direct damages to locality buildings, facilities, and individuals should a hazard event occur. The primary impact was determined based on the specific characteristics of each hazard, the history of such events in the Richmond Region, and experience with similar events that have occurred in neighboring regions. Primary impacts were classified into one of four distinct categories by estimating the typical damage to a city building or facility from a given hazard, ranging from negligible (less than 10% damage) to catastrophic (greater than 50% damage).
- **Secondary Impacts** — This third impact parameter addresses the potential secondary impacts on the region should a hazard event occur. Note that while primary impacts are a direct result of the hazard, secondary impacts can only arise subsequent to a primary impact. For example, a primary impact of a flood event may be road closures due to submerged pavement; while a secondary impact could be restricted access of emergency vehicles to citizens in a portion of the community due to the road closure. Other examples of secondary impacts include loss of building or facility services (functional downtime), power outages, and mass evacuation of locality residents. The secondary impacts were determined based on the specific characteristics of each hazard, the history of such events in the Richmond Region, and experience with similar events that have occurred in neighboring regions. Secondary impacts were classified into one of four distinct categories by estimating the typical impacts to the city at large from a given hazard, ranging from negligible (no loss of function, downtime, and/or evacuations) to high (major loss of function, downtime, and/or evacuations).

Once these parameters were determined, a preference scale was utilized to arrive at a hazard level for each of the hazard types considered for the Richmond Region. The preference scale method has been used as a means of quantifying hazard assessment results in other communities, and similar scales were developed to rank alternatives in other FEMA documents such as FEMA Publication 259. The preference scale used for this hazard analysis first assigned a numerical value between 1 and 4 to each parameter, with 1 representing the lowest hazard potential and 4 being the highest. These numerical values were then modified by weighing each parameter by a factor to reflect the overall importance of that parameter, with 0.5 representing parameters

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of lowest importance and 2.0 representing parameters of highest importance. Importance factors also may be adjusted to reflect the level of confidence with the information supplied for a given parameter. For this reason, probability parameters were assigned a factor of 2.0 to reflect their high importance and the generally high confidence in the available information. However, the affected area, primary impact and secondary impacts parameter were assigned factors of 0.8, 0.7 and 0.5 to reflect their lower importance and the low confidence in the available information. Finally, the factored values assigned to the various parameters for each hazard were totaled, and the hazard types with the highest totals were considered the highest potential hazard level.

In order to quantify these hazard parameters, the following formula was developed to assign a value for probability and impact for each of the hazards considered.

$$\text{Hazard Level} = \text{Probability} \times \text{Impacts}$$

Where:

$$\text{Probability} = (\text{Probability score} \times \text{Importance factor})$$

$$\text{Impacts} = (\text{Affected Area} + \text{Primary Impact} + \text{Secondary Impacts})$$

$$\text{Affected Area} = \text{Affected Area score} \times \text{Importance factor}$$

$$\text{Primary Impact} = \text{Primary Impact score} \times \text{Importance factor}$$

$$\text{Secondary Impact} = \text{Secondary Impact score} \times \text{Importance factor}$$

The preference scale computations used to determine the hazard level for each of the potential hazards impacting the Richmond Region are summarized in tabular form at the end of this appendix. The hazard levels are broken down into four distinct categories that represent the likelihood of a hazard event of that type significantly impacting the Richmond Region: Significant, Moderate, Limited, and None. The level of *None* should be interpreted as not being critical enough to warrant further evaluation; however, these hazards should not be interpreted as having zero probability or impact. Note that the assigning of numerical values and importance factors for parameters is qualitative in nature and based on data from a number of sources with varying degrees of accuracy.

# Richmond Regional Planning District Commission

## Hazard Mitigation Plan

HAZARD ANALYSIS WORKSHEET - RICHMOND REGIONAL PLANNING DISTRICT																																																																																						
Hazard Type	Probability	Impact			Total Score	Hazard Planning Consideration																																																																																
		Affected Area	Primary Impact	Secondary Impacts																																																																																		
SEVERE WINTER STORM	3	4	2	3	37	Moderate																																																																																
DROUGHT	2	4	4	1	26	Limited																																																																																
EARTHQUAKE	1	4	2	2	11	None																																																																																
WILDFIRE	2	2	4	4	26	Limited																																																																																
FLOODING	4	3	4	4	58	Significant																																																																																
EXTREME HEAT	2	4	1	1	18	Limited																																																																																
LANDSLIDES, LAND SUBSIDENCE, SOIL EROSION	3	1	1	1	12	None																																																																																
SEVERE WIND (Hurricane)	3	4	3	3	41	Moderate																																																																																
HAIL STORM	3	2	1	1	17	Limited																																																																																
TORNADO	2	1	4	2	18	Limited																																																																																
<p><b>Probability</b> Importance <b>2.0</b></p> <p><i>Based on estimated likelihood of occurrence from historical data</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Level</th> <th>Probability</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Unlikely</td> <td>2</td> </tr> <tr> <td>2</td> <td>Somewhat Likely</td> <td>4</td> </tr> <tr> <td>3</td> <td>Likely</td> <td>6</td> </tr> <tr> <td>4</td> <td>Highly Likely</td> <td>8</td> </tr> </tbody> </table> <p><b>Affected Area</b> Importance <b>0.8</b></p> <p><i>Based on size of geographical area of community affected by hazard</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Level</th> <th>Affected Area</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Isolated</td> <td>0.8</td> </tr> <tr> <td>2</td> <td>Small</td> <td>1.6</td> </tr> <tr> <td>3</td> <td>Medium</td> <td>2.4</td> </tr> <tr> <td>4</td> <td>Large</td> <td>3.2</td> </tr> </tbody> </table> <p><b>Primary Impact</b> Importance <b>0.7</b></p> <p><i>Based on percentage of damage to typical facility (including farms) in community</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Level</th> <th>Impact</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Negligible - less than 10% damage</td> <td>0.7</td> </tr> <tr> <td>2</td> <td>Limited - between 10% and 25% damage</td> <td>1.4</td> </tr> <tr> <td>3</td> <td>Critical - between 25% and 50% damage</td> <td>2.1</td> </tr> <tr> <td>4</td> <td>Catastrophic - more than 50% damage</td> <td>2.8</td> </tr> </tbody> </table> <p><b>Secondary Impacts</b> Importance <b>0.5</b></p> <p><i>Based on estimated secondary impacts to community at large</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Level</th> <th>Impact</th> <th>Score</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Negligible - no loss of function, downtime, and/or evacuations</td> <td>0.5</td> </tr> <tr> <td>2</td> <td>Limited - minimal loss of function, downtime, and/or evacuations</td> <td>1</td> </tr> <tr> <td>3</td> <td>Moderate - some loss of function, downtime, and/or evacuations</td> <td>1.5</td> </tr> <tr> <td>4</td> <td>High - major loss of function, downtime, and/or evacuations</td> <td>2</td> </tr> </tbody> </table> <p><b>Total Score = Probability x Impact</b>, where:  Probability = (Probability Score x Importance)  Impact = (Affected Area + Primary Impact + Secondary Impacts), where:  Affected Area = Affected Area Score x Importance  Primary Impact = Primary Impact Score x Importance  Secondary Impacts = Secondary Impacts Score x Importance</p> <p><b>Hazard Level</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Total Score</th> <th>(Range)</th> <th>Distribution</th> <th>Hazard Level</th> </tr> </thead> <tbody> <tr> <td>0.0</td> <td>12.0</td> <td>2</td> <td>None</td> </tr> <tr> <td>12.1</td> <td>28.0</td> <td>5</td> <td>Limited</td> </tr> <tr> <td>28.1</td> <td>48.0</td> <td>2</td> <td>Moderate</td> </tr> <tr> <td>48.1</td> <td>64.0</td> <td>1</td> <td>Significant</td> </tr> </tbody> </table> <p>The probability of each hazard is determined by assigning a level, from 1 to 4, based on the likelihood of occurrence from historical data. The total impact value includes the affected area, primary impact and secondary impact levels of each hazard. These levels are then multiplied by an importance factor to obtain a score for each category. The probability score is multiplied by the sum of the three impact categories to determine the total score for the hazard. Based on this total score, the hazards will be separated into four categories based on the hazard level they pose to the communities: none, limited, moderate, and significant.</p>							Level	Probability	Score	1	Unlikely	2	2	Somewhat Likely	4	3	Likely	6	4	Highly Likely	8	Level	Affected Area	Score	1	Isolated	0.8	2	Small	1.6	3	Medium	2.4	4	Large	3.2	Level	Impact	Score	1	Negligible - less than 10% damage	0.7	2	Limited - between 10% and 25% damage	1.4	3	Critical - between 25% and 50% damage	2.1	4	Catastrophic - more than 50% damage	2.8	Level	Impact	Score	1	Negligible - no loss of function, downtime, and/or evacuations	0.5	2	Limited - minimal loss of function, downtime, and/or evacuations	1	3	Moderate - some loss of function, downtime, and/or evacuations	1.5	4	High - major loss of function, downtime, and/or evacuations	2	Total Score	(Range)	Distribution	Hazard Level	0.0	12.0	2	None	12.1	28.0	5	Limited	28.1	48.0	2	Moderate	48.1	64.0	1	Significant
Level	Probability	Score																																																																																				
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28.1	48.0	2	Moderate																																																																																			
48.1	64.0	1	Significant																																																																																			

## APPENDIX E – FLOOD PRONE ROADWAYS

### ***Charles City County***<sup>1</sup>

#### **Flood Prone Roadways identified by VDOT and Local Sources**

- Route 603 0.5 mile west of Route 609
- Route 609 south of Route 625
- Route 602 1 mile north of Route 155
- Route 626 1 mile south of Route 615
- Route 614 @ Morris Creek
- Route 613 1.5 miles south of Route 5
- Route 631 @ Bradley Run
- Route 618 0.25 mile south New Kent County /Charles City County Line

### ***Goochland County***<sup>2</sup>

#### **Flood Prone Roadways identified by VDOT and Local Sources**

- Route 600 @ Rock Castle
- Route 618 @ Bridge 0.4 miles west of 616
- Route 608 @ Elk Hill
- Route 608 1 mile north of Route 606
- Route 608 @ Little Lickinghole Creek
- Route 687 0.5 mile south of Route 608
- Route 687 0.75 mile north of Route 6
- Route 680 @ dead end
- Route 616 @ Little Lickinghole Creek
- Route 600 @ Little Lickinghole Creek
- Route 613 @ Big Lickinghole Creek
- Route 673 @ Big Lickinghole Creek
- Route 611 @ Big Lickinghole Creek
- Route 609 @ Big Lickinghole Creek
- Route 607 @ Irwin
- Route 603 @ Elk Island Bridge
- Route 603 @ Byrd Creek

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<sup>1</sup> *Rural Flood Prone Roadway Study* (June 27, 2003). Richmond Regional Planning District Commission.

<sup>2</sup> *Rural Flood Prone Roadway Study*.



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- Route 667 @ Byrd Creek
- Route 667 @ Little Byrd Creek
- Route 610 @ Little Byrd Creek
- Route 609 @ Little Byrd Creek
- Route 603 @ Little Wittle Creek
- Route 609 @ Mill Creek
- Route 681 1 mile south of Route 605
- Route 646 1 mile south of Route 250
- Route 669 0.75 mile south of Route 250
- Route 632 @ Beaver Dam Creek
- Route 639 @ Beaver Dam Creek
- Route 645 0.75 north of Route 6
- Route 628 @ dead end

***Hanover County***<sup>3</sup>

- 301/Kersey Creek Hanover Wayside
- Bell Creek Road (Near Ukrops/Home Depot)
- Mechumps Creek/Goddins Hill Road
- Cool Springs Road/New Ashcake Road 637/643
- Rt 640 between Studley and 301
- Studley Road between 640/643
- Rt. 656 @ 798 & Rt. 654
- McClellan Road/Spill Way Lane
- Shady Grove Rd between 606/301
- Sliding Hill Road @ 798/654
- 360 East and West at Henrico Line
- Peaks Road
- Atlee Station/Cool Spring Road
- Georgetown Road/Rt. 301
- Flannigan Mill Road/Sandy Valley Road
- Ellerson Drive/Christian Lane
- Studley Road 1 mile south of Rural Point Road
- McClelland Road/Lakeview Road
- Mary Esther Lane/Walnut Grove Road
- Buckeye Road/Studley Road
- Flannigans Mill Road/Bon Mar Road
- Creighton Road/Henrico Line

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<sup>3</sup> Road Closures during Tropical Storm Gaston. Information provided by Hanover County.

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- Meadowbridge Road/Henrico Line
- Rt. 301 and Depot Road
- Rt. 301 and Hillcrest
- Little Florida Road ½ mile from 360
- Sandy Valley Road/Creighton Road
- River Road/Crumps Road
- Academy Drive/Shady Grove Road
- Academy Drive/Triple Lane
- Academy Drive/Dead end
- Richfood Road/301
- 9551 Fawn Park Lane
- Parsleys Mill Road/McClellan Road
- Summer Hill/Summer Plains Road
- Georgetown Road/Dam
- Market Road at bridge
- Lakeshore Court/Chickahominy River Lane
- Open Meadows Lane
- Studley Farms Lane/ Studley Farms Drive
- Colonial Forest/Georgetown Road

***New Kent County***<sup>4</sup>

**Flood Prone Roadways identified by VDOT and Local Sources**

- Route 638 @ Cattail Swamp Pond Creek
- Route 606 @ County Line Bridge
- Route 607 @ dead end
- Route 614 @ White House
- Route 606 @ Tunstall
- Route 624 @ dead end
- Route 625 @ dead end
- Route 33 0.25 mile west of West Point
- Route 636 @ Plum Point
- Route 1002 Intersection with Route 627
- Route 627 @ Chickahominy Shores
- Route 618 south of Interstate 64
- Route 615 Between Routes 106 and 60

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<sup>4</sup> *Rural Flood Prone Roadway Study.*

***Powhatan County*<sup>5</sup>**

**Flood Prone Roadways identified by VDOT and Local Sources**

- Route 603 @ Rocky Ford Creek
- Route 603 @ Skippers Creek
- Route 604 @ Butterwood Creek
- Route 603 @ Butterwood Creek
- Route 614 @ Jones Creek
- Route 711 Between Routes 659 and 617
- Route 711 West of Route 652
- Route 652 @ dead end
- Route 669 @ boat landing

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<sup>5</sup> *Rural Flood Prone Roadway Study.*

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## APPENDIX F – SUMMARY OF FLOODPLAIN EXPOSURE

### *Charles City County*

- Total parcels: 5,838
- Total parcels completely within floodplain: 64
- Total parcels partially within floodplain: 676
- Value is dwelling value and improvement value

#### **Parcels completely within floodplain**

- Count includes only parcels with dwellings/improvements. All are pre-FIRM.
- Exposure is equal to total value.

Total count	14
Total value	\$983,800
Average value	\$70,271

Improvement Type	Total	Count
<i>Dwelling</i>	\$911,700	7
<i>Improve</i>	\$52,100	6
<i>Vacant</i>	\$20,000	1
<b>Grand total</b>	<b>\$983,800</b>	<b>14</b>

#### **Parcels partially within floodplain**

- Count includes only parcels with dwellings/improvements built pre-FIRM (17% of whole).
- An average value was determined for each improvement type found on parcels partially within the floodplain. Exposure was based on an estimate of the number of parcels with structures in the floodplain (20%) multiplied by the previously determined average value.

Total count	240
Total building value	\$31,375,800
Average value	\$130,733
Potential exposure	\$6,275,160

Improvement Type	Total	Count	Exposure
<i>Barn</i>	\$13,800	1	\$2,760
<i>Commercial</i>	\$8,200	2	\$1,640
<i>Dwelling</i>	\$28,747,300	186	\$5,749,460
<i>Fire station</i>	\$4,500	1	\$900
<i>Improvement</i>	\$544,100	26	\$108,820
<i>Office</i>	\$39,700	1	\$7,940
<i>Plantation</i>	\$817,000	2	\$163,400
<i>Unknown</i>	\$46,600	2	\$9,320
<i>Vacant</i>	\$1,154,600	19	\$230,920
<b>Grand total</b>	<b>\$31,375,800</b>	<b>240</b>	<b>\$6,275,160</b>

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***Goochland County***

- Square miles in floodplain: 28.71
- Percentage of total area: 12.1%
  
- Total parcels: 14,487
- Total parcels completely within floodplain: 0
- Total parcels partially within floodplain: 1,682

**Parcels completely within floodplain**

- None.

**Parcels partially within floodplain**

- Count includes only parcels with dwellings/improvements.
- An average value was determined for each zoning type found for parcels partially within the floodplain. Exposure was based on an estimate of the number of parcels with structures in the floodplain multiplied by the previously determined average value. Fifteen percent of agricultural and agricultural/residential were assumed to have structures within floodplain while twenty percent was used for the remaining uses. Exposure was based on an estimate of the number of parcels with structures in the floodplain (20%) multiplied by the previously determined average value.

Count	743
Total improvement value	\$391,814,000
Average value	\$527,342
Potential exposure	\$67,859,340

<b>Zoning</b>	<b>Total improvement value</b>	<b>Count</b>	<b>Exposure</b>
<i>Agricultural</i>	\$159,033,700	554	\$23,855,055
<i>Commercial</i>	\$9,117,100	21	\$1,823,420
<i>Industrial</i>	\$134,663,500	6	\$26,932,700
<i>Residential</i>	\$37,763,200	130	\$7,552,640
<i>Split – Agricultural/Community</i>	\$109,600	2	\$21,920
<i>Split – Agricultural/Industrial</i>	\$89,400	1	\$17,880
<i>Split – Agricultural/Residential</i>	\$51,035,500	28	\$7,655,325
<i>Split – Community/Residential</i>	-		-
<i>Government</i>	-		-
<i>Unknown</i>	\$2,000	1	\$400
<b>Grand Total</b>	<b>\$391,814,000</b>	<b>743</b>	<b>\$67,859,340</b>



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**Hanover County**

- Square miles in floodplain: 49.36
- Percentage of total area: 15.0%
- Total parcels: 44,378
- Total parcels completely within floodplain: 124
- Total parcels partially within floodplain: 4,451

**Parcels completely within floodplain**

- Count includes only parcels with dwellings/improvements.
- Exposure is equal to total value.

Count	51
Total improvement value	\$9,809,300
Average value	\$ 192,339

Use	Total improvement value	Count
<i>Agricultural</i>	\$1,739,800	20
<i>Commercial</i>	\$3,755,900	8
<i>Industrial</i>	\$3,271,200	14
<i>Residential</i>	\$1,042,400	9
<b>Grand Total</b>	<b>\$9,809,300</b>	<b>51</b>

**Parcels partially within floodplain**

- Count includes only parcels with dwellings/improvements.
- An average value was determined for each use found for parcels partially within the floodplain. Exposure was based on an estimate of the number of parcels with structures in the floodplain multiplied by the previously determined average value. Fifteen percent of agricultural and agricultural/residential were assumed to have structures within floodplain while twenty percent was used for the remaining uses.

Count	2,850
Total improvement value	\$875,573,200
Average value	\$307,219
Potential exposure	\$148,903,675

Use	Total improvement value	Count	Exposure
<i>Agricultural</i>	\$505,403,300	2,030	\$75,810,495
<i>Agricultural Residential</i>	\$18,816,000	84	\$2,822,400
<i>Commercial</i>	\$98,105,000	42	\$19,621,000
<i>Industrial</i>	\$136,374,500	79	\$27,274,900
<i>Residential</i>	\$116,810,700	614	\$23,362,140
<i>Historic</i>	\$63,700	1	\$12,740
<b>Grand Total</b>	<b>\$875,573,200</b>	<b>2,850</b>	<b>\$148,903,675</b>

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**Richmond Regional Planning District Commission  
Hazard Mitigation Plan**

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***Henrico County***

- Square miles in floodplain: 44.75
- Percentage of total area: 18.4%
  
- Total parcels: 106,696
- Total parcels completely within floodplain: 4,848
- Total parcels partially within floodplain: 4,350

**Parcels completely within floodplain**

- Count includes only parcels with dwellings/improvements.
- Exposure is equal to total value.

Count	4,167
Total improvement value	\$677,062,900
Average value	\$162,482

Use	Total	Count
<i>Club</i>	\$452,900	3
<i>Commercial</i>	\$67,494,000	54
<i>Government</i>	\$969,200	3
<i>Industrial</i>	\$749,000	2
<i>Medical</i>	\$16,129,200	6
<i>Non-profit</i>	\$2,543,500	6
<i>Other</i>	\$655,800	39
<i>Residential</i>	\$582,566,900	4,091
<i>Transportation</i>	-	3
<i>Utilities</i>	\$5,009,000	6
<i>Vacant</i>	\$493,400	630
<b>Grand Total</b>	<b>\$677,062,900</b>	<b>4,843</b>

**Parcels partially within floodplain**

- Count includes only parcels with dwellings/improvements.
- An average value was determined for each use found for parcels partially within the floodplain. Exposure was based on an estimate of the number of parcels with structures in the floodplain (30%) multiplied by the previously determined average value.

Count	3,515
Total improvement value	\$1,766,617,000
Average value	\$502,594
Potential exposure	\$529,985,100

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**Richmond Regional Planning District Commission**  
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***Henrico County (cont.)***

<b>Use</b>	<b>Total</b>	<b>Count</b>	<b>Exposure</b>
<i>Club</i>	\$19,233,500	8	\$5,770,050
<i>Commercial</i>	\$651,971,400	156	\$195,591,420
<i>Educational</i>	\$109,663,500	18	\$32,899,050
<i>Government</i>	\$11,616,200	6	\$3,484,860
<i>Industrial</i>	\$104,958,700	23	\$31,487,610
<i>Medical</i>	\$168,489,200	9	\$50,546,760
<i>Non-profit</i>	\$36,608,400	19	\$10,982,520
<i>Other</i>	\$29,870,100	25	\$8,961,030
<i>Residential</i>	\$573,464,600	3,181	\$172,039,380
<i>Transportation</i>	-		
<i>Utilities</i>	\$57,673,500	30	\$17,302,050
<i>Vacant</i>	\$3,067,900	40	\$920,370
<b>Grand Total</b>	<b>\$1,766,617,000</b>	<b>3,515</b>	<b>\$529,985,100</b>

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***New Kent County***

- Square miles in floodplain: 33.41
- Percentage of total area: 15.0%
  
- Total parcels: 15,726
- Total parcels completely within floodplain: 1,005
- Total parcels partially within floodplain: 1,485

**Parcels completely within floodplain**

- Count includes only parcels with dwellings/improvements.
- Exposure is equal to total value.

Count	74
Total assessed value	\$7,342,000
Average assessed value	\$9,216

Use	Total assessed value	Count
<i>Hunting/Fishing Club</i>	\$1,367,700	6
<i>Agriculture</i>	\$61,000	1
<i>Commercial</i>	\$84,100	8
<i>Non-profit</i>	\$1,499,700	1
<i>Individual</i>	\$4,329,500	58
<b>Grand Total</b>	<b>\$7,342,000</b>	<b>74</b>

**Parcels partially within floodplain**

- Count includes only parcels with dwellings/improvements.
- An average value was determined for each use found for parcels partially within the floodplain. Exposure was based on an estimate of the number of parcels with structures in the floodplain multiplied by the previously determined average value. Fifteen percent of agricultural and hunting/fishing club were assumed to have structures within floodplain while twenty percent was used for the remaining uses (except for conservation). Conservation uses were assumed to have no structures within floodplain.

Count	809
Total assessed value	\$191,418,900
Average value	\$236,612
Potential exposure	\$37,612,380



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***New Kent County (cont.)***

Use	Total	Count	Exposure
<i>Agriculture</i>	\$1,271,600	5	\$190,740
<i>Commercial</i>	\$20,706,800	58	\$4,141,360
<i>Government</i>	\$20,748,400	6	\$4,149,680
<i>Hunting/Fishing Club</i>	\$1,157,600	8	\$173,640
<i>Individuals</i>	\$144,784,800	730	\$28,956,960
<i>Non-profit</i>	\$2,749,700	3	-
<b>Grand Total</b>	<b>\$191,418,900</b>	<b>809</b>	<b>\$37,612,380</b>

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***Powhatan***

- Square miles in floodplain: 22.06
- Percentage of total area: 8.3%
- No residential, commercial or industrial structures in floodplain.

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**Richmond Regional Planning District Commission**  
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### ***City of Richmond***

- Square miles in floodplain: 6.45
- Percentage of total area: 10.3%
  
- Total parcels: 68,945
- Total parcels completely within floodplain: 280
- Total parcels partially within floodplain: 1,114

### **Parcels completely within floodplain**

- Count includes only parcels with dwellings/improvements.
- Exposure is equal to total value.

Count	147
Total dwelling value	\$40,799,500
Average dwelling value	\$277,548

Use	Total dwelling value	Count
<i>Commercial</i>	\$3,341,200	10
<i>Government</i>	\$184,000	13
<i>Industrial</i>	\$2,682,000	27
<i>Mixed Use</i>	\$28,932,500	25
<i>Residential</i>	\$5,508,200	72
<i>Vacant</i>	\$151,600	133
<b>Total</b>	<b>\$40,799,500</b>	<b>280</b>

### **Parcels partially within floodplain**

- Count includes only parcels with dwellings/improvements.
- An average value was determined for each use found for parcels partially within the floodplain. Exposure was based on an estimate of the number of parcels with structures in the floodplain (40%) multiplied by the previously determined average value.

Count	796
Total dwelling value	\$661,089
Average dwelling value	\$2,459,003
Potential exposure	\$210,490,680

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**Richmond Regional Planning District Commission**  
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***City of Richmond (cont.)***

Use	Total dwelling value	Total	Exposure
<i>Commercial</i>	\$127,669,900	18	\$51,067,960
<i>Government</i>	\$6,342,200	10	\$2,536,880
<i>Industrial</i>	\$117,550,100	66	\$47,020,040
<i>Mixed Use</i>	\$83,461,700	65	\$33,384,680
<i>Other</i>	\$5,178,300	3	\$2,071,320
<i>Residential</i>	\$184,952,600	627	\$73,981,040
<i>Vacant</i>	\$1,071,900	7	\$428,760
<b>Grand Total</b>	<b>\$526,226,700</b>	<b>796</b>	<b>\$210,490,680</b>

*Data Sources for GIS Analysis:*

- Charles City County: Commissioner of the Revenue
- Goochland County: Zoning, property values and acreage - Commissioner of the Revenue; Building points - developed by Woolpert, maintained by Goochland County
- Henrico County: Zoning - Henrico County Planning Department. Parcels - Henrico Department of Finance. Structures - developed by Merrick Inc, provided by the county
- Hanover County and the Town of Ashland: Hanover County Planning Department, Land Records and Mapping GIS
- New Kent County: Addresses determined based on 2002 VGIN Orthography, building permits and the tax assessor's database
- Powhatan County: Land use/zoning was digitized by the Richmond Regional Planning District Commission based on a hand drawn map provided by the county
- City of Richmond: GIS data provided by the city. Parcel data created by Michael Baker Jr. Corporation Inc. based on orthophotography and scanned/registered "keycard" images. Land use data created by city GIS staff based on Vector GIS Parcel Layer, Tax Assessor Office *ProVal Database*, and "General Land Use" look-up-table. Structure data based on created by Michael Baker Jr. Corporation Inc. based on Orthophotography and updated with submitted site plans. Zoning created by city GIS staff based on scanned/registered keycard images, orthophotography and hardcopy zoning maps.
- Flood Insurance Rate Maps – Federal Emergency Management Agency, National Flood Insurance Program; digitized by the Richmond Regional Planning District Commission

## **APPENDIX G – PLAN REVIEW EXCERPTS**

The following plans and regulations were reviewed as part of developing the capability assessment section of this plan (Section VI):

- Charles City County Comprehensive Land Use Plan
- Charles City County Zoning Ordinance (Draft)
- City of Richmond Master Plan 2000-2020
- City of Richmond's Downtown Plan
- City of Richmond Floodplain Ordinance
- Goochland County Capital Improvements Program 2005-2009
- Goochland 2023: The Comprehensive Plan for Goochland County, Virginia
- Goochland County Zoning Ordinance
- Hanover County Comprehensive Plan - Vision 2022
- Hanover County Floodplain Ordinance
- Henrico County 2010 Land Use Plan
- Henrico County Consolidated Plan (for CDBG and HOME)
- Henrico County County Code
- New Kent County Floodplain Ordinance
- New Kent Comprehensive Plan – New Kent Vision 2020
- Powhatan County Comprehensive Plan
- Powhatan County Subdivision Regulations
- Powhatan County Zoning Ordinance
- Town of Ashland Comprehensive Plan



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<b>Jurisdiction</b>	<b>Plan Name</b>	<b>Date Adopted</b>	<b>Excerpts/Details of Document</b>	<b>Effect?</b>
Charles City County	Comprehensive Land Use Plan	May 12, 1998	<p><i>Goal 1: Overall Development</i></p> <p>To permit orderly, well-planned development to meet the physical and economic needs while retaining a majority of the County's agricultural and forestall resources, open space and communities.</p> <p>Objective 6: Establish design requirements that lessen the impact of new development on existing land uses, the environment and the natural beauty of the County.</p> <p><i>Goal 5: Industrial Development</i></p> <p>Objective 7: Provide opportunities for water dependent industrial development and activities based on existing and anticipated needs and sensitive environmental resources.</p> <p><i>Goal 8: Environmental Resources Management</i></p> <p>To preserve and protect the natural environment while permitting development to occur in a manner consistent with the capacity of the land to handle development.</p> <p>Objective 2: Promote development in and adjacent to flood plains, wetlands, steep slopes and other sensitive areas that protects the environment and water quality, and allows for the development of water dependent uses.</p> <p>Primary strategy: Assure that environmentally sensitive areas are protected from inappropriate development and, where necessary, left undeveloped.</p> <p>Actions and policies: Locate intensive development away from...environmentally sensitive areas...</p>	Neutral

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<b>Jurisdiction</b>	<b>Plan Name</b>	<b>Date Adopted</b>	<b>Excerpts/Details of Document</b>	<b>Effect?</b>
			<p>Second strategy: Assume that where development does take place, it is done in a way that is compatible with the environmental capabilities of the site and that potential on-site and off-site impacts are considered.</p> <p>Actions and policies: Require strict compliance with the County's Erosion and Sediment Control Ordinance, Chesapeake Bay Ordinance, Flood plains Ordinance and Wetlands Ordinance as a means to minimize the impact of development. Encourage the use of nonstructural methods of erosion and sedimentation control and storm water management where possible. Develop a county wide stormwater management plan, as financial resources allow, that addresses specifically those areas of the County programmed for intensive industrial, commercial or residential development.</p> <p>3<sup>rd</sup> strategy, policies and actions: Require and proposed development that will locate on a river or stream shore to demonstrate the necessity of locating on a shoreline and provide an analysis of potential negative impacts on the environment and water quality and actions that will be taken to mitigate these potential impacts. Promote water conservation through education, as resources allow.</p>	
<b>Charles City County</b>	Zoning Ordinance (Draft)	September 2004  [Previously adopted September 28, 1953 and re-	<p>The purpose of this Zoning Ordinance is to promote the health, safety and general welfare of the public. To this end, this Ordinance is designed to:</p> <ol style="list-style-type: none"> <li>1. Provide for adequate light, air, convenience of access, and safety from fire, flood, crime and other dangers;</li> <li>4. Facilitate the provision of adequate police and fire</li> </ol>	Neutral

**Richmond Regional Planning District Commission  
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Jurisdiction	Plan Name	Date Adopted	Excerpts/Details of Document	Effect?
			protection, disaster evacuation, civil defense, transportation, water, sewerage, flood protection, schools, parks, forests, playgrounds, recreational facilities, airports and other public requirements; 6. Protect against one or more of the following: overcrowding of land, undue density of population in relation to the community facilities existing or available, obstruction of light and air, danger and congestion in travel and transportation, or loss of life, health, or property from fire, flood, panic or other dangers.	
City of Richmond	City of Richmond Master Plan 2000-2020	2001	<p><i>Natural Resources Goal</i></p> <ul style="list-style-type: none"> <li>❖ Environmentally sensitive lands will be protected from harmful and inappropriate land uses.</li> </ul> <p><i>Key Strategies</i></p> <ul style="list-style-type: none"> <li>❖ Richmond is essentially a built-out city with limited vacant and developable land.</li> </ul> <p><i>Natural Resources</i></p> <ul style="list-style-type: none"> <li>❖ There are approximately 24 miles of James River waterfront within the City, most of which remains in its natural state. Development along the River is confined to areas within Downtown and portions of the western bank, south to the City limits. [James River Park]</li> <li>❖ Prevent development in flood plains that would result in environmental degradation or significant changes in the hydraulic condition of the watercourse.</li> <li>❖ Continue to enforce those elements of the City's zoning, subdivision, floodplain and erosion and sediment control ordinances that directly affect its ability to comply with</li> </ul>	Positive

**Richmond Regional Planning District Commission  
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Jurisdiction	Plan Name	Date Adopted	Excerpts/Details of Document	Effect?
City of Richmond	City of Richmond's Downtown Plan	October 13, 1997	<p>the Chesapeake Bay Preservation Act.</p> <ul style="list-style-type: none"> <li>❖ Urban forests slow and absorb stormwater, reducing flooding and stream degradation.</li> </ul> <p><i>Public Facilities and Services</i></p> <ul style="list-style-type: none"> <li>❖ Continue to reduce the amount of overflow of storm water and sewage into the James River through improvements to the conveyance system and sewage treatment facilities.</li> </ul> <p><i>Downtown Goals</i></p> <ul style="list-style-type: none"> <li>❖ Open Space. Increase the amount and quality of public open space for the recreational and economic benefit of Downtown residents, workers, and visitors.</li> <li>❖ Historic Resources. Facilitate the preservation, rehabilitation and adaptive reuse of the valuable Downtown architectural and urban heritage.</li> </ul> <p><i>Significant Recommendations</i></p> <p>3. CREATE MORE OPEN SPACE. If Downtown is to attract more residents, visitors and workers, adequate open spaces need to be provided as a balance to the dense urban environment and to direct activity and provide focal points. The Canal and Riverfront Development project, which is already underway, will provide significant new open space to help achieve this objective. It will also induce substantial adjacent private sector investment.</p> <p>4. PROMOTE MIXED-USE AND RESIDENTIAL USES. Residential use should be permitted throughout most of</p>	Neutral – may promote development in flood-prone areas

**Richmond Regional Planning District Commission  
Hazard Mitigation Plan**

Jurisdiction	Plan Name	Date Adopted	Excerpts/Details of Document	Effect?
			<p>Downtown as a means to complement other uses and generate greater activity. Monroe Ward and Shockoe Bottom have particular potential as sizable Downtown residential neighborhoods that offer a mixed-use environment unique to the region. Development regulations and financial incentives should be designed to encourage multiple uses within structures and within city blocks. Design guidelines should be established to promote the continued use of existing buildings and ensure infill development will be compatible in scale and character with surrounding structures.</p> <p>8. DEVELOP A FIXED-ROUTE DOWNTOWN CIRCULATOR CONNECTING MAJOR ACTIVITY AREAS. The distances and grade changes between major visitor attractions and other major Downtown destinations require a predictable, user-friendly public transit linkage. Of particular importance is the need to interconnect the City Center and convention area, the canal corridor, Shockoe Bottom and Shockoe Slip. An at-grade, light rail transit system using steel wheel electric trolley technology is proposed to provide this linkage. Ultimately, the system should be extended throughout the Downtown area. Such a system will enhance economic development opportunities and provide an attractive alternative to use of the automobile.</p>	
City of Richmond	Floodplain Ordinance		<i>Chapter 50 FLOODPLAIN MANAGEMENT, EROSION AND SEDIMENT CONTROL, AND DRAINAGE</i>	Positive



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			<p><i>GENERALLY*</i></p> <ul style="list-style-type: none"> <li>❖ Applies to areas of the city subject to inundation by waters of the 100-year flood</li> <li>❖ Designates floodway districts, flood fringe districts, and approximate floodplain districts.</li> <li>❖ No development or land disturbing activity within a designated floodplain district shall be undertaken until after issuance of a building permit and/or land disturbing activity permit</li> <li>❖ No development shall be permitted within any floodplain district except in strict compliance with the applicable sections of the Virginia Uniform Statewide Building Code</li> <li>❖ Includes Chesapeake Bay provision</li> <li>❖ Provision of vehicular access. No new residential construction, with start of construction on or after December 9, 1991, shall be permitted without the provision of adequate vehicular access to the site at all times prior to and during the 100-year flood.</li> </ul> <p><i>Sec. 50-92. Floodway districts.</i></p> <ul style="list-style-type: none"> <li>❖ Increase in flood levels. No development or land disturbing activity shall be permitted within a floodway district that will cause any increase in flood levels during the 100-year flood.</li> <li>❖ Placement of manufactured homes. The placement of any manufactured home shall not be permitted within</li> </ul>	

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			<p>designated floodway districts.</p> <p>❖ Sets design criteria for utilities and facilities</p> <p><i>Sec. 50-94. Subdivision requirements.</i> Any proposed subdivision any portion of which lies within a floodplain district:</p> <p>(1) The 100-year floodplain shall be delineated on tentative and final subdivision plats.</p> <p>(2) Residential building lots shall be provided with adequate buildable area outside of the 100-year floodplain.</p> <p>(3) The design criteria for utilities and facilities set forth in this article shall be met.</p> <p><i>Sec. 50-96. Manufactured homes and recreational vehicles.</i> (a) Manufactured homes. Manufactured homes that are placed or substantially improved on site shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and shall be securely anchored to an adequately anchored foundation system to resist flotation, collapse, and lateral movement.</p> <p><i>Sec. 50-97. New construction and substantial improvements.</i> ❖ All substantial improvements to existing structures or new construction within any floodplain district shall conform to the applicable sections of the uniform</p>	

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<b>Jurisdiction</b>	<b>Plan Name</b>	<b>Date Adopted</b>	<b>Excerpts/Details of Document</b>	<b>Effect?</b>
			<p>statewide building code for construction in a floodplain district.</p> <ul style="list-style-type: none"> <li>❖ Sets criteria for variance requests.</li> <li>❖ Procedures for building permits and land disturbing activities.</li> </ul>	
<b>Goochland County</b>	Capital Improvements Program 2005-2009	April 6, 2004	<p>The benefits of viable capital improvement programming include the following:</p> <ul style="list-style-type: none"> <li>❖ Assists in implementing the County's Comprehensive and Area Plans and related policies;</li> <li>❖ Focuses attention on community goals and objectives.</li> <li>❖ Does not address hazard mitigation related projects</li> </ul>	Neutral
<b>Goochland County</b>	Goochland 2023: The Comprehensive Plan for Goochland County, Virginia	March 4, 2003	<p><i>3.0 Land Use</i></p> <p>Residential Land Use Principles</p> <ul style="list-style-type: none"> <li>❖ Residential developments should be designed to promote the health, safety and welfare of the inhabitants -- they should be blight free, attractive and contain a variety of compatible housing types.</li> </ul> <p>Rural Enhancement District</p> <ul style="list-style-type: none"> <li>❖ Natural Resource Areas are intended to protect natural environmental resources such as floodplains, steep slopes and wetlands. Most of the land within these areas is intended for little or no additional development, other than passive recreation, agriculture, forestry and other very low-intensity uses.</li> </ul> <p>Goal 3.1: General - Promote a future land use pattern that</p>	Positive

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			<p>reinforces the objectives of the Comprehensive Plan...</p> <p>Objective 3.1.2: Protect sensitive areas from new development.</p> <p>Strategy 3.1.2a: Adopt a Map of Potential Conservation Lands that delineates sensitive environmental features for the entire county. These features include prime farmland (USDA definition), steep slopes (&gt;25%), moderate slopes (15%-25%), and Floodprone lands (&gt;50% chance of annual flooding). Development proposals should be assessed using this map to determine the extent of impact on the environment.</p> <p>Strategy 3.1.2i: Develop strategies and incentives to permanently preserve from development twenty (20) percent of Goochland County's land area by 2010. This strategy mirror's the Commonwealth of Virginia's commitment to do the same for Virginia's portion of the Chesapeake Bay watershed.</p> <p>Objective 3.1.3: Coordinate county codes, ordinances, and policies with land use planning.</p> <p>Goal 3.2: Residential Development – Retain the rural character of the county outside villages and designated growth centers...</p> <p>Objective 3.2.1: Guide major growth towards villages and designated growth centers.</p>	

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			<p>Goal 3.6: Guide growth in each of the eight (8) established villages and the designated growth areas to create healthy, vibrant communities...</p> <p>Objective 3.6.4: Direct growth patterns in the Courthouse Village so that it develops as a mixed-use commercial/residential community in central Goochland.</p> <p>Strategy 3.6.4d: Provide community recreation opportunities...An additional park should be considered for access to the James River. Consider an unimproved piece of land in the floodplain just west of Rt. 522 that could be used as river access for non-motorized boating and passive recreation (picnic shelters, etc).</p> <p><i>5.0 Utilities</i></p> <p>Goal 5.1: To provide for more efficient utilization of land resources in utility extension.</p> <p>Objective 5.1.3: New distribution lines should be placed underground.</p> <p>Strategy 5.1.3a: Enforcement of the County Subdivision Ordinance requiring new distribution lines to be placed underground.</p> <p><i>8.0 Community Facilities</i></p> <p>Goal 8.1: Provide for the welfare of all citizens of Goochland County through provision of adequate</p>	

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			community facilities and services...  Objective 8.1.5: Promote the general welfare by considering negative environmental impacts when planning community facilities Strategy 8.1.5a: Choose sites for facilities on the basis of acceptable topography, soils, and other physical traits, as well as on proximity to population centers and other factors, including traffic patterns and volume.  ❖ Implementation tools include zoning, subdivision regulations, capital improvements programming, building and housing codes, and preferential tax assessments.	
Goochland County	Zoning Ordinance		ARTICLE 17. FLOOD HAZARD, DISTRICT F-1 (FLOODPLAIN DISTRICT)* ❖ Applies to all lands within the jurisdiction of Goochland County and identified as being in the 100-year floodplain ❖ Acts as an overlay district; must comply with USBC ❖ All uses, activities and development occurring within any floodplain district shall be undertaken only upon the issuance of a zoning permit. ❖ Manufactured homes are prohibited in the F-1 zoning district.  <i>Permitted uses:</i> • Agricultural uses, such as general farming, pasture,	Positive



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			<p>grazing, outdoor plant nurseries, horticulture, truck farming, forestry, sod farming, and wild crop harvesting.</p> <ul style="list-style-type: none"> <li>• Accessory residential uses, such as yard areas, gardens, play areas, and previous loading areas.</li> <li>• Game farm, fish hatchery (excluding rearing structures), hunting and fishing reserves, boat landing.</li> <li>• Hunting, fishing.</li> <li>• Wildlife preserve, conservation area, woodland preserve, arboretum.</li> <li>• Outlet installation for sewage treatment plant, sealed public and private water supply well.</li> <li>• Public utility distribution facilities.</li> <li>• Retaining wall, channel improvement, flood retention dam and levee, culvert and bridge (approved by Department of Highways, Commonwealth of Virginia).</li> <li>• On-premises signs constructed in accordance with Article 19 of this appendix and as permitted in the underlying zoning district. (Ord. of 3-21-95(2))</li> </ul> <p><i>Conditional uses and structures</i></p> <ul style="list-style-type: none"> <li>• Park, playground, day camp, picnic ground, golf course, golf driving range, miniature golf course, yacht club.</li> <li>• Carnival, circus, fair and any similar transient amusement</li> <li>• Paved off-street parking or loading and unloading area related to a use in an adjoining district.</li> <li>• Sand and gravel pits, quarries, soil removal, mining operations (excavating and equipment used for the</li> </ul>	

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			<p>production and transportation of materials shall be confined to an area of at least one thousand (1,000) feet from the nearest occupied dwelling).</p> <ul style="list-style-type: none"> <li>• Gas transmission line.</li> <li>• Public utility transmission line (including liquid and natural gas), transmission tower, pipe, meter, railroad.</li> <li>• Roadside stand for the sale of fish bait and agricultural and horticultural products produced on the premises.</li> <li>• Front, side and rear yard of uses permitted in an adjoining district when expressly permitted by this article and other ordinances of the county.</li> <li>• Commercial campgrounds.</li> <li>• Pulpwood receiving and storage yard, wood shipping scales, scalehouses, pumping stations and loading docks</li> <li>• Structures customarily accessory and clearly incidental and subordinate to uses listed previously or permitted by-right</li> <li>• Public and commercial swimming pool.</li> <li>• Office quarters housed in a temporary structure such as a mobile home or trailer which may be readily towed or otherwise removed.</li> <li>• Commercial and industrial structures and uses, including warehousing</li> </ul> <p>❖ Establishes design criteria for utilities and facilities</p> <p><i>Section 14. Area regulations.</i></p> <p>❖ The minimum lot area for each permitted use shall be</p>	

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<b>Hanover County</b>	Hanover County Comprehensive Plan - Vision 2022	June 2003	<p>eight (8) acres. Maximum lot coverage by all structures shall not exceed five (5) percent of total tract area.</p> <p>❖ Sets criteria for special exceptions and variance requests.</p> <p><i>Goal 6: To protect natural and cultural resources while providing for adequate areas to accommodate planned growth.</i></p> <p><u>Objective 2:</u> Evaluate the benefits of preserving productive agricultural and forestal land for such use as watershed protection, recreation, floodplains, scenic natural beauty and protection of historical resources. Protect the County's natural features from development, such as prime agricultural soils, excessively steep slopes, flood prone areas, and major stream valleys with unusual and sensitive ecologies.</p> <p>THE MEANS</p> <p>To continue to effectively combat sprawl, certain design and development criteria should be used when considering development proposals. These criteria are divided into categories:</p> <p>4. Open Space. Open space preservation is an important component of planning in both the Rural Planning Area and the Suburban Service Area. Planning for open space should be directed primarily to:</p> <p>C. Preservation, both immediate and long-range, of the floodplains of the County's streams and rivers.</p> <p>THE FUTURE</p>	Positive

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			<p>7. Non-Agricultural Development. The only non-agricultural development that would be permitted in the Rural Land Use Area would be:</p> <p>A. Individual Homes.</p> <p>2. A request for rezoning to the RC, Rural Conservation District, will be considered in compliance with the Comprehensive Plan if the following criteria are met:</p> <p>a. Protection and preservation of all floodplains, wetlands, and steep slopes from clearing, grading, filling, or construction (except as may be approved by the county for essential infrastructure or active or passive recreation amenities).</p>	
<b>Hanover County</b>	Floodplain Ordinance	1/27/1993	<p>❖ All uses, activities, and development occurring within the floodplain shall be undertaken only upon the issuance of a permit and only in strict compliance with the provisions of this article and all other applicable codes and ordinances (e.g., the Virginia Uniform Statewide Building Code and the County of Hanover Subdivision Regulations).</p> <p>❖ <i>Manufactured homes.</i> Manufactured homes to be placed or substantially improved on sites within a floodplain area shall be elevated on a permanent foundation such that the lowest floor of the manufactured home is elevated to or above the base flood elevation and is securely anchored to an adequately anchored foundation system to resist flotation collapse and lateral movement.</p>	Positive

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Jurisdiction	Plan Name	Date Adopted	Excerpts/Details of Document	Effect?
Henrico County	2010 Land Use Plan		<ul style="list-style-type: none"> <li>❖ Sets criteria for exceptions including for historic structures.</li> <li>❖ Sets design criteria for utilities and public facilities.</li> <li>❖ <i>General Goals</i> – To promote the protection of natural resources by respecting the physical limitations of the land. To promote the health, safety, morals, order, convenience, prosperity, and general welfare of all residents. <ul style="list-style-type: none"> <li>❖ General Objectives – Promote development of vacant property to maximize use of existing and programmed community facilities, minimize public service costs and reduce the impact on the environment. Promote well planned controlled density developments which minimize public facility and service costs, preserve open space and environmentally critical areas, and utilize the best features of the natural environment.</li> <li>❖ <i>Residential Goals</i> – To address public safety through environmental design and enhanced public awareness of crime and crime prevention techniques.</li> <li>❖ Residential Objectives – Discourage development in area where the land's physical limitations may threaten the safety, health, and welfare of residents.</li> <li>❖ Residential Policies – Recommend the rezoning of flood plain areas to Conservation (C1) during rezoning. Encourage residential growth in those areas where the physical conditions are conducive</li> </ul> </li> </ul>	Positive

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			<p>to development, i.e., soils, drainage and topography.</p> <ul style="list-style-type: none"> <li>❖ <i>Economic Development Goals</i> – To ensure minimal adverse environmental and fiscal impacts of development.</li> <li>❖ <i>Environmental Goals</i> – To promote environmental management as an integral part of the comprehensive planning process. <ul style="list-style-type: none"> <li>❖ Environmental Objectives – Recommend land uses which respect the physical resources while providing adequate areas to accommodate growth. Regulate and manage development to minimize disruptions to life and property resulting from erosion and flooding.</li> <li>❖ Environmental Policies – Manage the development of flood prone and wetlands areas through ordinances such as erosion and sediment control, zoning, subdivision, and other regulations. Delineate through on-site assessment, survey and map environmentally sensitive lands such as floodplains...steep slopes...and natural habitat areas which should be protected from disruption. Require conspicuous statements on all subdivision plats to alert prospective purchasers of pre-existing conditions which may be hazardous or affect the use and enjoyment of the property (e.g., ...flood plains...). Encourage owners of</li> </ul> </li> </ul>	



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<b>Jurisdiction</b>	<b>Plan Name</b>	<b>Date Adopted</b>	<b>Excerpts/Details of Document</b>	<b>Effect?</b>
<b>Henrico County</b>	Consolidated Plan (for CDBG and HOME)	Oct. 2003	<p>property located within the 100 year flood plain to seek C-1 Conservation District zoning in order to protect these environmentally sensitive areas and to minimize stormwater control problems.</p> <p>❖ Implementation tools: PUD zoning (allows greater density) and overlay zoning</p> <p><i>Housing Priorities</i></p> <p>❖ Priorities for housing include residential rehabilitation, support for assistance for elderly tenants, Sec. 8 vouchers for special populations, weatherization, use of state and local funds for the mentally disabled and group homes for the mentally disabled.</p> <p><i>Non-Housing Community Development Priorities</i></p> <p>❖ Priorities include flood drain improvements</p> <p><i>Description of Key Projects</i></p> <p>❖ Priority #1: Provide \$120,000 from CDBG and \$360,000 in HOME funds for the rehabilitation of homes owned by very low or low income elderly residents of the County.</p>	Positive
<b>Henrico County</b>	County Code		<p><i>Sec. 24-106.1. Development and land disturbing activities within the 100-year floodplain.</i></p> <p>❖ No developer may commence any development within a base flood hazard area without first obtaining a permit from the county engineer</p> <p>❖ If new buildings or structures are to be included in the</p>	Positive

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			<p>development, the elevation of the lowest floor of such building or structure (including basement) shall be a minimum of one foot above the base flood elevation</p> <ul style="list-style-type: none"> <li>❖ If substantial improvements to existing buildings or structures are to be included in the development, the elevation of the lowest floor (including basement) of such improvements shall be a minimum of one foot above the base flood elevation.</li> <li>❖ Repair, replacement or reconstruction of damaged or destroyed buildings. No repair, replacement or reconstruction of a damaged or destroyed building or structure may occur without complying with the provisions of this section which are applicable to new buildings or structures.</li> <li>❖ Sets variance criteria.</li> </ul> <p><i>ARTICLE XXI. HEIGHT, LOT, YARD AND BUILDING REGULATIONS</i></p> <p><i>Sec. 24-95. Additional requirements, exceptions and modifications.</i></p> <ul style="list-style-type: none"> <li>❖ Provides special yard and additional regulations for any lot used for dwelling purposes and having lot area in a base flood hazard area</li> <li>❖ No new dwelling or manufactured home may be located within the base flood hazard area</li> <li>❖ No new dwelling or manufactured home may be</li> </ul>	

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			<p>located any closer to a base flood hazard area than the minimum side yard width otherwise required for the lot or ten feet, whichever is greater in horizontal distance.</p> <p>❖ The elevation of the lowest floor, for any new dwelling or manufactured home, when located nearer to the base flood hazard area than the minimum rear yard depth otherwise required for the lot, shall be one foot above the base flood elevation.</p>	
<b>New Kent County</b>	Floodplain Ordinance		<p>ARTICLE II. GENERAL AREA, FRONTAGE, YARDS, HEIGHT, SETBACK, PERFORMANCE REQUIREMENTS AND STANDARDS</p> <p>Sec. 98-57. Floodplain.</p> <p>❖ Shall apply to all lands within the jurisdiction of the county and identified as being in the 100-year floodplain</p> <p>❖ Overlay district; comply with USBC</p> <p>❖ All uses, activities and development occurring within any floodplain district shall be undertaken only upon the issuance of a zoning permit</p> <p><i>Mobile homes.</i></p> <p>(1) Mobile homes that are placed or substantially improved within zones A-1 and MHP on the county's FIRM, on sites:</p> <p>a. Outside of a mobile home park or subdivision;</p> <p>b. In a new mobile home park or subdivision;</p>	Positive

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			<p>c. In an expansion to an existing mobile home or subdivision; or</p> <p>d. In an existing mobile home park or subdivision on which a mobile home has incurred substantial damage as the result of a flood, must be elevated on a permanent foundation such that the lowest floor of the mobile home is elevated to or above the base flood elevation and be securely anchored to an adequately anchored foundation system to resist floatation, collapse and lateral movement.</p> <p>(2) Mobile homes to be placed or substantially improved on sites in an existing mobile home park or subdivision within zones A-1 and MHP on the county's FIRM that are not subject to the provisions of subsection (e)(1) of this section must be elevated so that either:</p> <p>a. The lowest floor of the mobile home is at or above the base flood elevation; or</p> <p>b. The mobile home chassis is supported by reinforced piers or other foundation elements of at least equivalent strength that are no less than 36 inches in height above grade and are securely anchored to an adequately anchored foundation system to resist floatation, collapse and lateral movement.</p> <p>❖ Sets design criteria for utilities and facilities</p> <p>Sec. 98-61. Existing structures in floodplain districts.</p> <p>❖ A structure or use of a structure or premises which lawfully existed before the enactment of this article,</p>	

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<b>New Kent County</b>	New Kent Comprehensive Plan – New Kent Vision 2020	August 4, 2003	<p>but which is not in conformity with this article, may be continued subject to the following conditions:</p> <p>(1) Any modification, alteration, repair, reconstruction or improvement of any kind to a structure and/or use located in any floodplain areas to an extent or amount of less than 50 percent of its market value, shall be elevated and/or floodproofed to the greatest extent possible.</p> <p>(2) The modification, alteration, repair, reconstruction or improvement of any kind to a structure and/or use, regardless of its location in a floodplain district, to an extent or amount of 50 percent or more of its market value shall be undertaken only in full compliance with the provisions of the Virginia Uniform Statewide Building Code.</p> <p>❖ Overarching goal: Protect the natural environment.</p> <p>❖ Scenic highway corridors, villages, hamlets, and crossroads giving way to subdivisions and strip residential and commercial development – comprehensive plan to de-emphasize this growth pattern</p> <p>❖ Areas with slopes in excess of 25 percent are found throughout the County. These slopes, in addition to an extensive amount of tidal and non-tidal wetlands, floodplains, Chesapeake Bay Protection areas and endangered species provide a formidable challenge to the County to protect sensitive areas from the potentially harmful effects of development.</p>	Positive

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			<p><i>Resource Protection</i></p> <p>Goal 1: Conserve, protect and preserve the quality of the County's air, water, soil, wildlife habitat and scenic views through responsible stewardship of the land.</p> <p>Objective D: Develop practical and realistic zoning and regulatory controls that protect the natural environment while recognizing and considering private property rights.</p> <ul style="list-style-type: none"> <li>o Strategy 5. Adopt and maintain floodplain protection measures in appropriate County ordinances and development policies.</li> </ul> <p>Objective F: Provide incentives for conservation land use planning.</p> <ul style="list-style-type: none"> <li>o Strategy 1. Adopt clustering and open space development techniques as an option for residential developments and provide incentives for their use.</li> <li>o Strategy 3. Promote the use of conservation easements on private property.</li> <li>o Strategy 4. Seek enabling legislation to allow for public purchase and private trading of development rights.</li> <li>o Strategy 7. Continue to improve the County's Geographic Information system (GIS) to identify and delineate sensitive environmental areas.</li> </ul>	



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			<p><i>Public Utilities</i></p> <p>Goal 2: Explore creative and innovative approaches to the provision of public utilities.</p> <p>Objective A: Compare local and regional approaches to the provision of public utilities.</p> <ul style="list-style-type: none"> <li>o Strategy 5. Work with the Virginia Department of Forestry to install dry hydrants in portions of the County where water services do not exist.</li> </ul> <p><i>Priority Implementation Strategies</i></p> <p>Provide for the purchase and/or dedication of conservation, agricultural and scenic easements in order to protect the County's natural environment, productive lands and scenic vistas.</p>	
<b>Powhatan County</b>	Comprehensive Plan	January 12, 1998	<p><i>Goals for the County's Future</i></p> <p>Overall Growth Management Goals</p> <ul style="list-style-type: none"> <li>❖ Maintain the rural character of the County as defined by existing features such as the feeling of personal safety and privacy, quiet, natural habitats, forested land, rivers, streams and creeks, uncrowded conditions and a low cost of living.</li> <li>❖ Locate new public facilities and services so as to promote a compact development pattern that allows services to be provided in a cost-effective manner.</li> </ul> <p><i>Land Use Policies for the Rural Preservation Policy Area</i></p> <p>a. Residential Land Use Policies</p> <ul style="list-style-type: none"> <li>❖ Conservation easements – require conservation</li> </ul>	Neutral

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			<p>easements on residual parcels greater than 20 acres at the time of subdivision to stabilize the character and intensity of the property ....will prohibit further subdivision or substantial non-farm development...for a minimum of 40 years, and may be in perpetuity.</p> <p>f. Zoning Districts</p> <ul style="list-style-type: none"> <li>❖ Flood Plain District is appropriate for use in this area.</li> </ul> <p><i>Land Use Policies for the Village Preservation Areas</i></p> <p>f. Zoning Districts</p> <ul style="list-style-type: none"> <li>❖ Flood Plain District is appropriate for use in this area.</li> </ul> <p><i>Land Use Policies for the Village Service Areas</i></p> <p>f. Zoning Districts</p> <ul style="list-style-type: none"> <li>❖ Flood Plain District is appropriate for use in this area.</li> </ul> <p><i>Land Use Policies for the Business Service Areas</i></p> <p>f. Zoning Districts</p> <ul style="list-style-type: none"> <li>❖ Flood Plain District is appropriate for use in this area.</li> </ul> <p><i>Countywide Planning Policies and Actions</i></p> <p>Agricultural, Forest and Natural Resources – Floodplains, Wetlands, and Surface Water Resources</p> <p>Policies for Floodplains, Wetlands and Surface Water Resources</p> <ul style="list-style-type: none"> <li>❖ The County will: 1) encourage establishment of vegetative buffers along all active creeks and streams; 2) maintain natural drainage courses wherever possible during the design and construction process for land development, 3) maintain existing topography and vegetation wherever possible during the design and</li> </ul>	

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			<p>construction process for land development, 4) encourage the establishment and preservation of 100 foot stream buffers along streams which drain areas of one square mile or greater, and 5) encourage the use of Best Management Practices (BMPs) for all construction and agricultural activities.</p> <p>Implementation Actions for Floodplains, Wetlands and Surface Water Resources</p> <ul style="list-style-type: none"> <li>❖ The County will: 1) review the County's land development regulations to ensure that the policies of this plan for floodplains, wetlands and surface waters are adequately supported and implemented through those ordinances</li> </ul> <p>Citizen Involvement in the Planning Process</p> <ul style="list-style-type: none"> <li>❖ Policy: Foster and support opportunities for all citizens to become more knowledgeable about land use, environmental, transportation and land development issues, techniques and legal aspects.</li> </ul>	
<b>Powhatan County</b>	Subdivision Regulations		<p><i>4.2 Preliminary Plats – 4.2-2.12.4 –Other Conditions - A</i></p> <p>50-foot natural vegetative buffer shall be maintained along all intermittent streams. A 100-foot natural vegetative buffer shall be maintained along all perennial streams.</p> <ul style="list-style-type: none"> <li>❖ Floodplain shall be shown on final plat.</li> </ul> <p><i>6.6 Flooding of Subdivisions Along Watercourses – Land</i></p> <p>within any flood plain district will not be included in minimum lot area requirements and will not be raised by fill.</p>	Positive

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<b>Jurisdiction</b>	<b>Plan Name</b>	<b>Date Adopted</b>	<b>Excerpts/Details of Document</b>	<b>Effect?</b>
<b>Powhatan County</b>	Zoning Ordinance	November 18, 1996	<p><i>6.6.-1.0 – All residences constructed on lots within a 100-year HUD designated flood plain area shall maintain a ten (10) foot horizontal and one (1) foot vertical separation from the flood plain.</i></p> <p><i>Article 19 – Flood Plain District (FP)</i></p> <ul style="list-style-type: none"> <li>❖ Establishes overlay district. Intended to comply with NFIP requirements.</li> <li>❖ Permitted uses: <ul style="list-style-type: none"> <li>○ Agricultural uses</li> <li>○ Hunting, fishing and wildlife preserves, and boat landings</li> <li>○ Railroads, streets, bridges, and public utility transmission and distribution lines</li> <li>○ Public parks and playgrounds, sports areas, nature areas and outdoor private clubs</li> <li>○ No principal structures may be erected in this District, however, structures incidental to the permitted uses are permitted</li> </ul> </li> <li>❖ All development in flood plain district requires permit.</li> <li>❖ Sets design criteria for utilities and facilities.</li> <li>❖ Sets criteria for existing structures regarding expansion and reconstruction.</li> </ul>	Positive
<b>Town of Ashland</b>	Comprehensive Plan	May 14, 2004 (verify year)	<p><i>Natural Resources</i></p> <ul style="list-style-type: none"> <li>❖ Resource Management Area – includes floodplains</li> </ul>	Neutral

## APPENDIX H – MITIGATION ACTIVITIES<sup>6</sup>

Mitigation activities fall into six general categories. These categories are explained in the next section. The second and third sections provide more detail on common mitigation activities.

### ***General Categories***

#### **Prevention**

Preventative activities are intended to keep hazard problems from getting worse. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

- Planning and zoning
- Open space preservation
- Floodplain regulations
- Storm water management
- Drainage system maintenance
- Capital improvements programming
- Shoreline / riverine setbacks

#### **Property Protection**

Property protection measures protect new or existing structures by modifying the building to withstand hazardous events, or removing structures from hazardous locations. Examples include:

- Acquisition
- Relocation
- Building elevation
- Critical facilities protection
- Retrofitting (i.e., windproofing, floodproofing, seismic design standards, etc.)
- Enhanced building codes

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<sup>6</sup> This information is based, in part, on the City of Chesapeake (VA) Hazard Mitigation Plan. Portions of this document also were drawn from the *Tools and Techniques: An Encyclopedia of Strategies to Mitigate the Impact of Natural Hazards* developed by the State of North Carolina in 2002.

- Insurance
- Safe rooms

### **Natural Resource Protection**

Natural resource protection activities reduce the impact of natural hazards by preserving or restoring natural areas and their mitigation functions. Such areas include floodplains, wetlands, and dunes. Parks, recreation, or conservation agencies, and organizations often implement these measures. Examples include:

- Floodplain protection
- Riparian buffers
- Fire-resistant landscaping
- Fuel breaks
- Erosion and sediment control
- Wetland preservation and restoration
- Habitat preservation
- Slope stabilization

### **Structural Projects**

Structural mitigation projects are intended to lessen the impact of a hazard by modifying the environmental natural progression of the hazard event. They are usually designed by engineers and managed or maintained by public works staff. Examples include:

- Channel modification
- Diversions / detention / retention
- Levees / dikes / floodwalls
- Reservoirs
- Storm sewers
- Utility protection/upgrades
- Wind retrofitting

### **Emergency Services**

Although not typically considered a “mitigation technique,” emergency service measures do minimize the impact of a hazard event on people and property. These



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commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- Warning systems
- Evacuation planning and management
- Sandbagging for flood protection
- Installing shutters for wind protection

### **Public Information and Awareness**

Public information and awareness activities are used to advise residents, business owners, potential property buyers, and visitors about hazards, hazardous areas, and mitigation techniques they can use to protect themselves and their property. Examples of measures to educate and inform the public include:

- Outreach projects
- Speaker series / demonstration events
- Hazard map information
- Real estate disclosure
- Library materials
- School children education
- Hazard expositions
- Websites

### ***General Multi-Hazard Mitigation Alternatives***

The mitigation alternatives selected should be linked to the Planning District's goals and objectives, and must address each jurisdiction's hazard risks and vulnerability outlined in the plan's Hazard Identification and Risk Assessment. The following potential mitigation activities are not specific to one hazard but can benefit a community's overall hazard reduction efforts.

### **Comprehensive Plans**

Comprehensive plans address how and where a community should grow by guiding the rate, intensity, form, and quality of physical development. These plans address land use, economic development, transportation, recreation, environmental protection, the provision of infrastructure, and other municipal functions. Comprehensive plans help to guide other local measures such as capital improvement

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programs, zoning ordinances, subdivision ordinances and other community policies and programs. By including natural hazard considerations into the plan, mitigation becomes integrated with community functions and could therefore be an institutionalized part of a jurisdiction's planning efforts.

Density and development patterns should reflect the Planning District communities' ability to protect their jurisdictions, the environment, and the ability to evacuate the area. Development management tools should be incorporated into the local policies that address the location, density, and use of land, with a particular emphasis on development within high-risk areas. Efforts should be made to keep people and property out of high-hazard areas whenever possible. Particularly hazardous areas could be used for recreational uses, open space, or wildlife refuges.

### **Zoning**

Zoning is by far the most common land use control technique used by local governments. While a useful tool for regulating and restricting undesirable land uses, zoning has a somewhat more limited benefit when it comes to mitigation. Zoning is most effective on new development rather than existing development, which does little to address the pre-existing development in hazardous areas. Communities with a large amount of undeveloped land will benefit much more than older, more established communities.

A community might create an overlay zone for high-hazard districts that establishes mitigation requirements for development in those districts. Overlays are also useful for periods of reconstruction. A recovery overlay zone would include temporary planning regulations that might strictly limit reconstruction in the hazard area or could require any new development to include hazard mitigation techniques. The overlay zone would remain transparent until it was triggered by a disaster event.

Even for new development, the issuance of variances, special use permits, rezoning, and the failure to enforce existing codes, however, will weaken zoning's ability to prevent certain types of building practices.

### **Capital Improvement Plans/Critical Facility Placement**

Capital improvement plans typically provide for the future and ongoing provision of public facilities and infrastructure. These plans can be vital tools in keeping new development out of high-hazard areas by limiting the availability of public infrastructure. Public facilities can often be relocated to less hazardous areas in the

aftermath of a disaster. Public utilities also can be relocated, or they can be upgraded or floodproofed. Power and telephone lines can be buried underground.

In order to maximize the gravity flow area of wastewater treatment plants, the facilities are often located at the lowest elevation in the community. If this point lies within a floodplain for example, consideration may be given to relocating or floodproofing such facilities. New locations for critical facilities should not be in hazard-prone areas, or in areas where their function may be impaired by a given hazard event (i.e., where water can flood the access roads). Critical facilities should be designed and/or retrofitted in order to remain functional and safe before, during, and after a hazard event.

### **Building Codes**

Building codes regulate the design, construction, and maintenance of construction within most communities. These regulations prescribe standards and requirements for occupancy, maintenance, operation, construction, use, and appearance of buildings. Building codes are an effective way to ensure that new and extensive re-development projects are built to resist natural hazards. In Virginia, communities are required by law to adopt and enforce the Uniform Statewide Building Code, which has provisions for wind, water, and seismicity.

### **Public Outreach and Education Programs**

Educating the public about what actions they can take to protect themselves and their property from the effects of natural hazards can be an effective means for reducing losses. These types of programs could target public officials, citizens, businesses, or the local construction trade. The program could cover preparedness, recovery, mitigation, and general hazard awareness information. The information could be presented in a variety of ways, from workshops, brochures, advertisements, or local media. Potential outreach and education topics include:

- Code awareness training
- Sheltering and evacuation
- Flood insurance
- School information (primary, secondary, colleges, and universities)
- New homeowner/resident information
- Emergency preparedness for families, businesses, and tourists
- Driver safety in disasters

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- Hazard mitigation for homeowners (including manufactured homes and trailers), renters, and businesses
- Special needs populations

### **Neighborhood Access**

Provide additional means of access into single-entry neighborhoods, in order to prevent residents from becoming trapped in a hazardous area during a wildfire or flood. It may be more cost-effective to require this of new developments.

### **Vegetative Maintenance**

Vegetative maintenance is the pruning and maintenance of trees, bushes, and other vegetation that could increase threats to power lines during storms, or could act as fuels during wildfires. This could be applied in limited areas that have a significant vulnerability to these hazards, such as within utility easements or along the urban-wildland interface.

### **Vegetative Planting and Treatment**

Vegetative planting and treatments can help to capture and filter runoff or reduce wildfire risk depending on the types of plants used. Perennial vegetation includes grass, trees, and shrubs that cover the soil, reduce water pollution, slow the rate of runoff, increase filtration, and prevent erosion. This type of land treatment includes maintaining trees, shrubberies, and the vegetative cover; terracing (i.e., a raised bank of earth with vertical sloping sides and a flat top to reduce surface runoff); stabilizing slopes; grass filter strips; contour plowing; and strip farming (i.e., the growing of crops in rows along a contour). Other potential options include vegetated swales, infiltration ditches, and permeable paving blocks.

### **Special Assessment Districts**

Special assessment districts apply to property owners who directly benefit from a specific public improvement. These owners of both new and existing development in the district are charged a fee that is proportional to the benefits received from the improvement. There are a number of ways to apply this technique, from temporary assessments that raise revenue for a specific improvement to indefinite assessments that fund independent, special purpose governmental entities. The former could be used to fund structural projects, such as a floodwall, while the latter could be used to establish a regional floodplain management organization.

Another example might be the creation of a “special storm services” district, where funds would go toward mitigation, recovery and response activities. In other cases,

the fee could be used to pay for the upkeep of stormwater management system or as a way of providing for the future replacement of roads and utilities at the public expense. These charges may or may not have the effect of discouraging development in the assessment district. However, they do transfer some of the cost of living or doing business in a hazard-prone area to those who choose to do so.

### ***Hazard-Specific Alternatives***

The following is a list of potential mitigation measures that tend to work better when applied to a specific hazard.

#### **Flood**

Flood mitigation measures can be classified as structural or non-structural. In simple terms, structural mitigation attempts to eliminate the possibility of flooding at a particular location. Non-structural mitigation removes the potentially effected people or property from the potentially flooded area. The following is a description of potential flood mitigation measures.

#### **Floodplain Management Ordinances**

Floodplain management addresses the hazard risk of communities partially or entirely located in a floodplain. Floodplain management ordinances should restrict development that would increase flood heights and ensure that construction materials and methods used will minimize future flood damage. Provisions requiring first floor elevations to be above the base flood elevation may be appropriate for certain areas. These “freeboard” requirements compensate for the unknown factors that may increase flood levels beyond the anticipated level

Floodplain management ordinances are weakened by development pressures, a lack of suitable sites outside of the floodplain, community desires to be near the water, inability to effectively monitor floodplain management activities, or by land use planning policies that are encouraging development into floodplain areas.

#### **Acquisition**

Acquisition involves the purchasing of property in a hazardous area, which is subsequently cleared and permanently held as open space. Acquisition permanently moves people and property out of harm’s way, increases floodplain capacities, recreation areas and open space, and can help to preserve wetlands, forests, estuaries and other natural habitats. Participation in federally-funded grant programs requires voluntary participation by the owner.

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Acquisition programs can be expensive to undertake, and the property will no longer accrue taxes for the community and must be maintained, but it is by far the most effective and permanent mitigation technique. Acquisition is most effective when targeting repetitive loss structures, extremely vulnerable structures, or other high-hazard areas.

**Elevation**

Elevation is the raising of a structure above the Base Flood Elevation. Elevation is often the best alternative for structures that must be built or remain in flood-prone areas, and is less costly than acquisition or relocation. However, elevating a structure can increase its vulnerability to high winds and earthquakes. Some building types are either unsuitable or cost-prohibitive to elevate.

**Relocation**

Relocation involves the moving of a building or facility to a less hazardous area, on either the same parcel or another parcel. This measure also moves people and property out of harm's way, and is a very effective measure overall. Some building types are either unsuitable or cost-prohibitive to relocate.

**Stormwater Management Plans**

New development that increases the amount of impervious surfaces affects the land's ability to absorb the water and can intensify the volume of peak flow runoff. Without efficient stormwater management, runoff could cause flooding, erosion, and water quality problems. Stormwater management plans should incorporate both structural and nonstructural measures in order to be most effective.

Structural measures include retention and detention facilities that minimize the increase of runoff due to impervious surfaces and new development. Retention facilities allow stormwater to seep into the groundwater. Detention systems accumulate water during peak runoff periods that will be released at off-peak times. Nonstructural measures include establishing impervious surface limit policies and maintenance programs for existing drainage systems.

**Dry Floodproofing**

Dry floodproofing involves making all areas below the flood protection level watertight by strengthening walls, sealing openings, using waterproof compounds, or applying plastic sheeting on the walls. This method is not recommended for residential structures, but may work well for new construction, retrofitting, or repairing a non-residential structure. Due to pressure exerted on walls and floors by

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floodwater, dry floodproofing is effective on depths less than 2 to 3 feet. Floodproofing of basements is not recommended.

**Wet Floodproofing**

The opposite of dry floodproofing, wet floodproofing lets the floodwater actually enter a structure. This technique is effective on deeper flood depths, as it does not have the same potential to build up exterior pressure. Again, this method is not recommended for residential structures and may not be used for basements under new construction, substantial improvements, or substantially damaged structures.

**Storm Drainage Systems**

Mitigation efforts include the installation, re-routing, or increasing the capacity of storm drainage systems. Examples include the separation of storm and sanitary sewers, addition or increase in size of drainage or retention ponds, drainage easements, or creeks and streams.

**Drainage Easements**

Easements can be granted that enable regulated public use of privately owned land for temporary water retention and drainage areas.

**Stream/Channel Maintenance**

Waterways should be cleared of debris to allow for the free flow of water during a flood event. If streams or rivers are clogged with debris, damming could occur. As a result, areas upstream and adjacent to the unintended dam can receive unanticipated higher flood levels. In addition, downstream areas may be vulnerable to higher flooding if and when the dam breaks.

**Structural Flood Control Measures**

Water can be channeled away from people and property with structural control measures such as levees, dams, or floodwalls. These measures also may increase drainage and absorption capacities. These structural control measures also may increase Base Flood Elevations and could create a false sense of security.

**Basement Backflow Prevention**

Check valves, sump pumps, and backflow prevention devices in homes and buildings can be used to prevent flooding in basements from sewer backflows. This option can be done only if the infrastructure allows it.



## **Wind**

Proper engineering and design of a structure can increase a structure's ability to withstand the lateral and uplift forces of wind. Building techniques that provide a continuous load path from the roof of the structure to the foundation are generally recommended.

### **Windproofing**

Windproofing is the modification of the design and construction of a building to resist damages from wind events, and can help to protect the building's occupants from broken glass and debris. Windproofing involves the consideration of aerodynamics, materials, and the use of external features such as storm shutters. These modifications could be integrated into the design and construction of a new structure or applied to reinforce an existing structure.

Manufactured homes, which tend to be vulnerable to the effects of extreme wind events, can be protected by anchoring the structures to their foundations. Mobile homes could be tied down to their pads in order to prevent them from being destroyed. Public facilities, critical infrastructure, and public infrastructure (such as signage and traffic signals) should all be windproofed in vulnerable areas. However, windproofing is not a viable mitigation technique to protect against tornadoes.

### **Community Shelters/Safe Rooms**

Community shelters and concrete safe rooms can offer protection and reduce the risk to life. Locations for these shelters or safe rooms are usually in concrete buildings such as shopping malls or schools. Communities lacking basements and other protection nearby should consider developing tornado shelters.

### **Burying Power Lines**

Buried power lines can offer uninterrupted power during and after severe wind events and storms. Burying power lines can significantly enhance a community's ability to recover in the aftermath of a disaster. Buried power lines are typically more expensive to maintain and are more vulnerable to flooding. Encouraging back-up power resources in areas where burial is not feasible will enable the continuity of basic operations (e.g., security, refrigeration, and heat) for businesses and facilities when there is a loss of power.

## APPENDIX I – FREQUENTLY USED MITIGATION TERMS AND ACRONYM LIST

### *Frequently Used Mitigation Terms*

<b>Acquisition of Hazard-Prone Structures</b>	Local governments can acquire lands in high hazard areas through conservation easements, purchase of development rights, or outright purchase of property.
<b>Base Flood Elevation (BFE)</b>	Elevation of the base flood in relation to a specified datum, such as the National Geodetic Vertical Datum of 1929. The Base Flood Elevation is used as a standard for the National Flood Insurance Program.
<b>Benefit</b>	Net project outcomes, usually defined in monetary terms. Benefits may include direct and indirect effects. For the purposes of conducting a benefit cost analysis of proposed mitigation measures, benefits are limited to specific, measurable risk reduction factors, including a reduction in expected property losses (building, contents, and function) and protection of human life.
<b>Benefit-Cost Analysis (BCA)</b>	A systematic, quantitative method of comparing the projected benefits to projected costs of a project or policy. It is used as a measure of cost-effectiveness.
<b>Capability Assessment</b>	An assessment that provides a description and analysis of a community or state's current capacity to address the threats associated with hazards. The capability assessment attempts to identify and evaluate existing policies, regulations, programs, and practices that positively or negatively affect the community or state's vulnerability to hazards or specific threats.
<b>Community Rating System (CRS)</b>	CRS is a program that provides incentives for National Flood Insurance Program communities to complete activities that reduce flood hazard risk. When the community completes specified activities, the insurance premiums of these policyholders in communities are reduced.
<b>Cost-Effectiveness</b>	Cost-effectiveness is a key evaluation criterion for federal grant programs. Cost-effectiveness has several possible definitions, although for grant making purposes FEMA defines a cost-effective project as one whose long-term benefits exceed its costs. That is, a project should prevent more expected damages than it costs initially to fund the effort. This is done to ensure that limited public funds are used in the most efficient manner possible. Benefit-cost analysis is one way to illustrate that a project is cost-effective.

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<b>Critical Facilities</b>	Facilities vital to the health, safety, and welfare of the population and that are especially important following hazard events. Critical facilities include, but are not limited to, shelters, police and fire stations, and hospitals.
<b>Debris</b>	The scattered remains of assets broken or destroyed in a hazard event. Debris transported by a wind or water hazard event can cause additional damage to other assets.
<b>Disaster Mitigation Act of 2000 (DMA 2000)</b>	DMA 2000 (Public Law 106-390) is the latest legislation to improve the planning process. Signed into law on October 30, 2000, this legislation reinforces the importance of mitigation planning and emphasizes planning for disasters before they occur.
<b>Displacement Time</b>	The average time (in days) which the building's occupants typically must operate from a temporary location while repairs are made to the original building due to damages resulting from a hazard event.
<b>Elevation of Structures</b>	Raising structures above the base flood elevation to protect structures located in areas prone to flooding.
<b>Erosion</b>	Wearing away of the land surface by detachment and movement of soil and rock fragments, during a flood or storm or over a period of years, through the action of wind, water, or other geologic processes.
<b>Essential Facility</b>	Elements that are important to ensure a full recovery of a community or state following a hazard event. These would include government functions, major employers, banks, schools, and certain commercial establishments, such as grocery stores, hardware stores, and gas stations.
<b>Federal Emergency Management Agency (FEMA)</b>	Agency created in 1979 to provide a single point of accountability for all federal activities related to disaster mitigation and emergency preparedness, response, and recovery. FEMA is now part of the Department of Homeland Security.
<b>Flash Flood</b>	A flood event occurring with little or no warning where water levels rise at an extremely fast rate.
<b>Flood</b>	A general and temporary condition of partial or complete inundation of normally dry land areas from (1) the overflow of inland or tidal waters, (2) the unusual and rapid accumulation or runoff of surface waters from any source, or (3) mudflows or the sudden collapse of shoreline land.
<b>Flood Depth</b>	Height of the flood water surface above the ground surface.

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<b>Flood Elevation</b>	Elevation of the water surface above an established datum, e.g. National Geodetic Vertical Datum of 1929, North American Vertical Datum of 1988, or Mean Sea Level.
<b>Flood Hazard Area</b>	The area on a map shown to be inundated by a flood of a given magnitude.
<b>Flood Insurance Rate Map (FIRM)</b>	Map of a community, prepared by the Federal Emergency Management Agency that shows both the special flood hazard areas and the risk premium zones applicable to the community.
<b>Flood Insurance Study (FIS)</b>	A study that provides an examination, evaluation, and determination of flood hazards and, if appropriate, corresponding water surface elevations in a community or communities.
<b>Flood Mitigation Assistance (FMA) Program</b>	A program created as part of the National Flood Insurance Reform Act of 1994. FMA provides funding to assist communities and states in implementing actions that reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes, and other NFIP insurable structures, with a focus on repetitive loss properties.
<b>Floodplain</b>	Any land area, including watercourse, susceptible to partial or complete inundation by water from any source.
<b>Floodproofing</b>	Actions that prevent or minimize future flood damage. Making the areas below the anticipated flood level watertight (dry floodproofing) or intentionally allowing floodwaters to enter the interior to equalize flood pressures are examples of flood-proofing (wet floodproofing).
<b>Flood Zone</b>	A geographical area shown on a Flood Insurance Rate Map (FIRM) that reflects the severity or type of flooding in the area.
<b>Frequency</b>	A measure of how often events of a particular magnitude are expected to occur. Frequency describes how often a hazard of a specific magnitude, duration, and/or extent typically occurs, on average. Statistically, a hazard with a 100-year recurrence interval is expected to occur once every 100 years on average, and would have a 1 percent chance – its probability – of happening in any given year. The reliability of this information varies depending on the kind of hazard being considered.
<b>Functional Downtime</b>	The average time (in days) during which a function (business or service) is unable to provide its services due to a hazard event.
<b>Geographic Information Systems (GIS)</b>	A computer software application that relates physical features on the earth to a database to be used for mapping and analysis.

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<b>Goals</b>	General guidelines that explain what you want to achieve. They are usually broad policy-type statements, long term in nature, and represent global visions.
<b>Hazard</b>	A source of potential danger or adverse condition. Hazards include naturally occurring events such as floods, earthquakes, tornadoes, tsunamis, coastal storms, landslides, and wildfires that strike populated areas and has the potential to harm people or property.
<b>Hazard Event</b>	A specific occurrence of a particular type of hazard.
<b>Hazard Identification</b>	The process of identifying hazards that threaten an area.
<b>Hazard Information Center</b>	Information booth, publication kiosk, exhibit, etc. that displays information to educate the public about hazards that affect the jurisdiction and hazard mitigation activities people can undertake.
<b>Hazard Mitigation</b>	Sustained actions taken to reduce or eliminate long-term risk from hazards and their effects.
<b>Hazard Mitigation Grant Program (HMGP)</b>	Authorized under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, HMGP is administered by FEMA and provides grants to states, tribes, and local governments to implement hazard mitigation actions after a major disaster declaration. The purpose of the program is to reduce the loss of life and property due to disasters and to enable mitigation activities to be implemented as a community recovers from a disaster.
<b>Hazard Profile</b>	A description of the physical characteristics of hazards and a determination of various descriptors including magnitude, duration, frequency, probability, and extent. In most cases, a community can most easily use these descriptors when they are recorded and displayed as maps.
<b>Hurricane</b>	An intense tropical cyclone, formed in the atmosphere over warm ocean seas, in which wind speeds reach 74-miles-per-hour or more and blow in large spiral around a relatively calm center or "eye". Hurricanes develop over the north Atlantic Ocean, northeast Pacific Ocean, or the south Pacific Ocean east of 160°E longitude. Hurricane circulation is counter-clockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.
<b>Hydrology</b>	The science of dealing with the waters of the earth. A flood discharge is developed by a hydrologic study.
<b>Infrastructure</b>	Refers to the public services of a community that have a direct impact on the quality of life. Infrastructure includes communication technology such as phone lines or Internet access, vital services such as public water supplies and sewer treatment

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	facilities, and transportation systems such as airports, heliports; highways, bridges, tunnels, roadbeds, overpasses, railways, bridges, rail yards, depots; and waterways, canals, locks, seaports, ferries, harbors, dry docks, piers and regional dams.
<b>Landslide</b>	Downward movement of a slope and materials under the force of gravity.
<b>Loss Estimation</b>	Forecasts of human and economic impacts and property damage from future hazard events, based on current scientific and engineering knowledge.
<b>Lowest Floor</b>	Under the NFIP, the lowest floor of the lowest enclosed area (including basement) of a structure.
<b>Magnitude</b>	A measure of the strength of a hazard event. The magnitude (also referred to as severity) of a given hazard event is usually determined using technical measures specific to the hazard.
<b>Mitigate</b>	To cause something to become less harsh or hostile: to make less severe or painful.
<b>Mitigation Actions</b>	Activities or projects that help achieve the goals and objectives of a mitigation plan.
<b>Mitigation Plan</b>	The document that articulates results from the systematic process of identifying hazards and evaluating vulnerability, identifying goals, objectives, and actions to reduce or eliminate the effects of identified hazards, and an implementation plan for carrying out the actions.
<b>National Flood Insurance Program (NFIP)</b>	Federal program created by Congress in 1968 that makes flood insurance available in communities that enact minimum floodplain management regulations in 44 CFR §60.3.
<b>National Weather Service (NWS)</b>	Prepares and issues flood, severe weather, and coastal storm warnings and can provide technical assistance to Federal and state entities in preparing weather and flood warning plans.
<b>Nor'easter</b>	An extra-tropical cyclone producing gale-force winds and precipitation in the form of heavy snow or rain.
<b>Objectives</b>	Objectives define strategies or implementation steps to attain the identified goals. Unlike goals, objectives are specific and measurable.
<b>Open Space Preservation</b>	Preserving undeveloped areas from development through any number of methods, including low-density zoning, open space zoning, easements, or public or private acquisition. Open space

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	preservation is a technique that can be used to prevent flood damage in flood-prone areas, land failures on steep slopes or liquefaction-prone soils, and can enhance the natural and beneficial functions of floodplains.
<b>Post-Disaster Recovery Planning</b>	The process of planning those steps the jurisdiction will take to implement long-term reconstruction with a primary goal of mitigating its exposure to future hazards. The post-disaster recovery planning process can also involve coordination with other types of plans and agencies, but it is distinct from planning for emergency operations.
<b>Probability</b>	A statistical measure of the likelihood that a hazard event will occur.
<b>Public Education and Outreach Programs</b>	Any campaign to make the public more aware of hazard mitigation and mitigation programs, including hazard information centers, mailings, public meetings, etc.
<b>Regulation</b>	Most states have granted local jurisdictions broad regulatory powers to enable the enactment and enforcement of ordinances that deal with public health, safety, and welfare. These include building codes, building inspections, zoning, floodplain and subdivision ordinances, and growth management initiatives.
<b>Recurrence Interval</b>	The time between hazard events of similar size in a given location. It is based on the probability that the given event will be equaled or exceeded in any given year.
<b>Relocation Out of Hazard Areas</b>	A mitigation technique that features the process of demolishing or moving a building to a new location outside the hazard area.
<b>Repetitive Loss Property</b>	A property that is currently insured for which two or more National Flood Insurance Program losses (occurring more than ten days apart) of at least \$1,000 each have been paid within any 10-year period since 1978.
<b>Replacement Value</b>	The cost of rebuilding a structure. This is usually expressed in terms of cost per square foot, and reflects the present-day cost of labor and materials to construct a building of a particular size, type and quality. This is not the same as market value.
<b>Resources</b>	Resources include the people, materials, technologies, money, etc., required to implement strategies or processes. The costs of these resources are often included in a budget.
<b>Risk</b>	The estimated impact that a hazard would have on people, services, facilities, and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or



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	damage. Risk is often expressed in relative terms such as a high, moderate or low likelihood of sustaining damage above a particular threshold due to a specific type of hazard event. It also can be expressed in terms of potential monetary losses associated with the intensity of the hazard.
<b>Special Flood Hazard Area (SFHA)</b>	An area within a floodplain having a 1 percent or greater chance of flood occurrence in any given year (100-year floodplain); represented on Flood Insurance Rate Maps by darkly shaded areas with zone designations that include the letter A or V.
<b>Stafford Act</b>	The Robert T. Stafford Disaster Relief and Emergency Assistance Act, PL 100-107 was signed into law November 23, 1988 and amended the Disaster Relief Act of 1974, PL 93-288. The Stafford Act is the statutory authority for most Federal disaster response activities, especially as they pertain to FEMA and its programs.
<b>Stakeholders</b>	Individuals or groups, including businesses, private organizations, and citizens, that will be affected in any way by an action or policy.
<b>State Hazard Mitigation Officer (SHMO)</b>	The representative of state government who is the primary point of contact with FEMA, other state and Federal agencies, and local units of government in the planning and implementation of pre- and post disaster mitigation activities.
<b>Storm Surge</b>	Rise in the water surface above normal water level on the open coast due to the action of wind stress and atmospheric pressure on the water surface.
<b>Structural Retrofitting</b>	Modifying existing buildings and infrastructure to protect them from hazards.
<b>Subdivision and Development Regulations</b>	Regulations and standards governing the division of land for development or sale. Subdivision regulations can control the configuration of parcels, set standards for developer-built infrastructure, and set standards for minimizing runoff, impervious surfaces, and sediment during development. They can be used to minimize exposure of buildings and infrastructure to hazards.
<b>Tornado</b>	A violently rotating column of air extending from a thunderstorm to the ground.
<b>Tropical Cyclone</b>	A generic term for a cyclonic, low-pressure system over tropical or subtropical waters.
<b>Tropical Depression</b>	A tropical cyclone with maximum sustained winds of less than 39 mph.
<b>Tropical Storm</b>	A tropical cyclone with maximum sustained winds greater than 39

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mph and less than 74 mph.

### **Vulnerability**

Describes how exposed or susceptible to damage an asset is. Vulnerability depends on an asset's construction, contents, and the economic value of its functions. Like indirect damages, the vulnerability of one element of the community is often related to the vulnerability of another. For example, many businesses depend on uninterrupted electrical power – if an electric substation is flooded, it will affect not only the substation itself, but a number of businesses as well. Often, indirect effects can be much more widespread and damaging than direct ones.

### **Vulnerability Assessment**

The extent of injury and damage that may result from a hazard event of a given intensity in a given area. The vulnerability assessment should address impacts of hazard events on the existing and future built environment.

### **Zoning Ordinance**

Designation of allowable land use and intensities for a local jurisdiction. Zoning ordinances consist of two components: a zoning text and a zoning map.

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***Acronym List***

**BFE** – Base Flood Elevation  
**BRV** – Building Replacement Value  
**BZA** – Board of Zoning Appeals  
**CBPA** – Chesapeake Bay Preservation Area  
**CRS** – Community Rating System  
**CRV** – Contents Replacement Value  
**DDF** – Depth Damage Function  
**DMA 2000** – Disaster Mitigation Act of 2000  
**DOF** – Virginia Department of Forestry  
**DPW** – Department of Public Works  
**EMI** – Emergency Management Institute  
**FEMA** – Federal Emergency Management Agency  
**FIA** – Flood Insurance Administration  
**FIRM** – Flood Insurance Rate Map  
**FIS** – Flood Insurance Study  
**GIS** – Geographical Information System  
**HAZMAT** – Hazardous Materials  
**HIRA** – Hazard Identification Risk Assessment  
**HMGP** – Hazard Mitigation Grant Program  
**HVA** – Hazard Vulnerability Assessment  
**IBC** – International Building Code  
**IFPC** – International Fire Protection Codes  
**IRC** – International Residential Code  
**ISO** – Insurance Services Office  
**LEPC** – Local Emergency Planning Committee  
**LOF** – Loss of Function  
**MAC** – Mitigation Advisory Committee  
**MLW** – Mean Low Water

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**MSA** – Metropolitan Statistical Area

**NFIP** – National Flood Insurance Program

**NHC** – National Hurricane Center

**NOAA** – National Oceanic Atmospheric Administration

**NPDES** – National Pollutant Discharge Elimination System

**NWS** – National Weather Service

**PFM** – Public Facilities Manual

**RMA** – Resource Management Area

**RPA** – Resource Protection Area

**RRPDC** – Richmond Regional Planning District Commission

**SFHA's** – Special Flood Hazard Areas

**STAPLE/E** – Social, Technical, Administrative, Political, Legal, Economic and Environmental

**USDA** – United States Department of Agriculture

**USGS** – United States Geological Survey

**VDEM** – Virginia Department of Emergency Management

**VDEQ** – Virginia Department of Environmental Quality

**WDF** – Wind Damage Function