

# Richmond – Crater Multi-Regional Hazard Mitigation Plan (2017 Update)

## Executive Summary for the City of Richmond



### 1. Introduction

Disasters have the potential to devastate a community’s economic, social, and environmental well-being. Hazard mitigation is the effort to reduce loss of life and property by lessening the potential impact of future disasters. Mitigation planning is a key process to break the cycle of disaster damage, reconstruction, and repeated damage.

The 26 localities of the Richmond and Crater regions of Virginia have worked together to update the *Richmond-Crater Multi-Regional Hazard Mitigation Plan* to identify vulnerabilities associated with natural disasters and develop long-term strategies to reduce or eliminate long-term risks. The effort was guided by the Hazard Mitigation Technical Advisory Committee (HMTAC) consisting of emergency management staff from each of the 26 localities (appointed by each locality’s chief administrative official).

While the full plan is an exhaustive review of hazard mitigation within the multi-regional planning area, this executive summary highlights key information specific to City of Richmond with emphasis on the results from the Hazard Identification and Risk Assessment (HIRA). Additional information on the region, analysis methodologies, and mitigation actions can be found in the full plan posted on the RRPDC website ([www.richmondregional.org](http://www.richmondregional.org) )

### 2. Hazard Mitigation Planning in City of Richmond

#### 2.1 Demographic Characteristics

<b>Population (2014):</b>	211,063
<b>Population projection (2040):</b>	250,600
<b>Land Area (2010):</b>	59.81 sq. miles
<b>Density (2014):</b>	3528.89 persons per sq. mile
<b>Median household income (2014):</b>	\$41,331
<b>Percent below poverty level (2014):</b>	25.5%
<b>Housing units (2014):</b>	99,123
<b>% of housing units in multi-unit structures (2014):</b>	42.6%
<b>Homeownership rate (2014):</b>	47.3%
<b>Median value owner occupied housing unit (2014):</b>	\$192,400
<small>Sources: 2014 American Community Survey, 2010 Decennial Census, U.S. Census Bureau</small>	

## **2.2 About the City of Richmond**

City of Richmond land use patterns are long established and have been reinforced by city planning efforts. The city is mostly developed with limited space for new development. Residential uses dominate the city with a significant concentration of public/institutional uses in the downtown area due to the city's status as capital of the Commonwealth. Commercial service centers distributed broadly across the city. Parks, recreational areas, and other open spaces are found throughout the city.

Industrial uses are concentrated in several areas: I-95/James River corridor, west of Jefferson Davis highway to the CSX railroad, Scott's Addition and Hermitage Business parks, Manchester, Rocket's Landing and the Shockoe Valley. Scott's Addition has seen a recent resurgence since the 2011 Plan update with formerly industrial buildings converted to microbreweries, restaurants, apartments and condominiums. Residential development, restaurants and the addition of a large national microbrewery expansion at Rocket's Landing has revitalized a former abandoned industrial area on the north bank of the James River east of the Fall Line.

Manchester, once a separate city, has seen an uptick of revitalization perhaps started with Legend microbrewery 19 years ago. A continued influx of artisans, warehouse to condominium conversions and residential restorations, new businesses and new construction in-fill continue to support neighborhood revitalization. Rocket's Landing, in the eastern part of the city adjacent to the Henrico County border, has been revitalized with a multi-use residential development and the new eastern United States Stone Brewery complex.

Future development efforts will focus on redeveloping blighted and vacant properties. In addition, planning efforts are underway to stabilize declining neighborhoods. Particular attention is focused on increasing mixed-use and neighborhood commercial resources and on minimizing conflicts between residential and non-residential uses.

## **2.3 Critical Facilities**

A critical facility is defined as a facility in either the public or private sector that provides essential products and services to the public; is otherwise necessary to preserve the health, welfare, and quality of life in the community; or fulfills important public safety, emergency response, and/or disaster recovery functions. In some instances, one or more critical facility is located within the identified hazard area and is so noted. For this update, critical facilities are defined as follows:

- **Public Safety:** Police, Emergency Operations Centers, Sheriff, Fire, Correctional Facilities, and Emergency Management
- **Infrastructure:** Cell towers, fuel storage, pumping stations, water and wastewater treatment facilities, and transportation structures
- **Government Facilities:** Courthouses and judicial facilities, government offices and facilities
- **Medical Facilities:** Hospitals, nursing facilities, rehabilitation centers and outpatient centers
- **Education:** K – 12 public schools, colleges and universities, and technical schools

## 2.4 Identified Hazards

A solid fact base is a key component of any plan. The Hazard Identification and Risk Assessment (HIRA) serves as the fact base for the regional hazard mitigation plan and evaluates the region's vulnerability to natural hazards so that mitigation strategies, activities, and projects can be developed to minimize hazard risks. It includes the identification of natural hazards and risks that are likely to impact the region based on historical experience, an estimate of the frequency and magnitude of potential disasters, and an assessment of potential loss to life and property. Emphasis is on hazards with a high likelihood of occurring, a significant level of impact, or both.

The information below summarizes the effects on City of Richmond of the hazards identified for the multi-regional plan area. The statistics come from a National Climatic Data Center (NCDC) database. For some hazards, no data was available.

### (1) Flooding (Moderate Threat)

<b>Repetitive Loss Structures:</b>	2
<b>Severe Repetitive Loss Structures:</b>	0
<b>RL/SRL Claims:</b>	0
<b>RL/SRL Building and Contents Payments:</b>	\$113,231.76
<b>Critical Facilities within Identified Floodplain Areas:</b>	2
<b>Annualized Flood Damages:</b>	\$1,065,175
<b>NFIP Policies:</b>	586
<b>NFIP Policy Coverage:</b>	\$183,772,500
<b>NFIP Claims Since 1978:</b>	515
<b>NFIP Payments Since 1978:</b>	\$10,666,886

#### Significant Events:

- 8/27/2011:** Hurricane Irene impacted the area with heavy rainfall and gusty winds which knocked power out to millions of people in the area. It took electrical crews several days to fully restore power in the planning area. Irene originated east of the Lesser Antilles and tracked north and northwest into the western Atlantic. The hurricane reached Category 3 intensity with maximum sustained winds of near 120 mph at its strongest point. The hurricane made an initial U.S. landfall in the eastern portions of the North Carolina Outer Banks on August 27, 2011 as a Category 1 hurricane. The storm then tracked north/northeast along the coast slowly weakening before making its final landfall in Brooklyn, New York on August 28 as a high-end tropical storm. Rainfall totals with the hurricane ranged from around two inches in western sections of the planning region to 5 to 9 inches in eastern sections closest to the coast. At its closest pass, Irene brought sustained winds of 30 to 45 mph with gusts of 60 to nearly 70 mph to the planning area. The winds downed power lines and trees throughout the area. A man was killed when a tree fell on his home near Colonial Heights.

- **9/4/2011:** Tropical Storm Lee moved inland along the Mississippi/Louisiana Gulf Coast on September 4, 2011. The remnants of the weakening storm tracked northeast, producing rainfall over a wide swath extending from the Gulf Coast to New England. Rainfall totals generally ranged from 4 to 8 inches in the planning area with the heaviest totals falling just east of Interstate 95. The rain fell on soils saturated only days earlier with Hurricane Irene's passage. The result was widespread flooding, particularly over the eastern sections of the planning region. Gusty winds in thunderstorms knocked down trees that had already been weakened from the hurricane resulting in thousands of power outages.

**(2) Wind (Limited Threat), including winds from Hurricanes and Thunderstorms**

- **Annualized wind damages including thunderstorm winds:** \$0
- **Annualized hurricane wind damages:** \$0

**Significant Events:**

- **8/27/2011:** Hurricane Irene – See full description in Flood section
- **9/4/2011:** Hurricane Lee – See full description in Flood section.
- **6/29/2012:** A devastating line of thunderstorms known as a derecho moved east-southeast at 60 miles per hour (mph) from Indiana in the early afternoon to the Mid-Atlantic region around midnight. Winds were commonly above 60 mph with numerous reports of winds exceeding 80 mph. Some areas reported isolated pockets of winds greater than 100 mph. Nearly every county impacted by this convective system suffered damages and power outages. To make matters worse, the area affected was in the midst of a prolonged heat wave. Unlike many major tornado outbreaks in the recent past, this event was not forecast well in advance. Warm-season derechos, in particular, are often difficult to forecast and frequently result from subtle, small-scale forcing mechanisms that are difficult to resolve more than 12-24 hours in advance.
- **10/26/2012:** Hurricane Sandy made landfall along the southern New Jersey shore on October 29, 2012, causing historic devastation and substantial loss of life. The National Hurricane Center (NHC) Tropical Cyclone Report estimated the death count from Sandy at 147 direct deaths. In the United States, the storm was associated with 72 direct deaths in eight states: 2 in Virginia. The storm also resulted in at least 75 indirect deaths (i.e., related to unsafe or unhealthy conditions that existed during the evacuation phase, occurrence of the hurricane, or during the post-hurricane/clean-up phase). These numbers make Sandy the deadliest hurricane to hit the U.S. mainland since Hurricane Katrina in 2005, as well as the deadliest hurricane/post-tropical cyclone to hit the U.S. East Coast since Hurricane Agnes in 1972.

**(3) Tornado (Significant Threat)**

- **Total tornado touchdowns since 1950:** 0.13
- **Annualized tornado damages:** \$73,980

**(4) Thunderstorm, including Hail and Lightning (Moderate Threat)**

- **Annualized Thunderstorm Events, 1956 – 2016: 1.41**
- **Annualized Thunderstorm damages: \$3,673**

**Significant Events:**

- **6/29/2012:** The June 2012 Mid-Atlantic and Midwest derecho was one of the most destructive and deadly fast-moving severe thunderstorm complexes in North American history. The progressive derecho tracked across a large section of the Midwestern United States and across the central Appalachians into the mid-Atlantic states on the afternoon and evening of June 29, 2012, and into the early morning of June 30, 2012. It resulted in 20 deaths, widespread damage and millions of power outages across the study region.
- **6/13/2013:** On the morning of the 13, another linear complex of severe storms developed along a line near the southern border of Ohio. The storms eventually strengthened into a powerful derecho and raced to the south and east. Fatalities and injuries occurred as a result of falling trees and power lines as the storms ripped through Virginia, along with numerous reports of damaging winds and power outages. The derecho downed numerous trees and damaged structures winds up to 80 mph (130 km/h) in some areas.
- **5/22/2014:** A large Hail and Thunderstorm event came through the region. Some hail was reported to be as large as ping pong balls. Several areas were affected from fallen electric lines. The NCDC data reports that 12 direct deaths in the study region resulted from this event.
- **2/24/2016:** This storm started in the north eastern states and traveled down through Virginia and south. During the thunderstorm, hail in some parts of the region were as large as 3 inches in diameter.

**(5) Winter Weather (Moderate Threat)**

- **National Weather Service Alerts (1986-2016): 0**
- **Annualized winter weather damages: \$0**

**Significant Events:**

- **12/25/2010:** A 4- to 10-inch snowfall blanketed the region with the heaviest amounts falling over the south and eastern sections. Amounts ranged from 4 inches northwest of the City of Richmond, 6 to 7 inches in the Cities of Petersburg and Emporia, and around a foot near the Town of Wakefield.
- **2/10/2014:** This was a major ice and snow storm that affected the entire region and elsewhere in the Eastern United States. This event produced devastating amounts of freezing rain and snow along and east of Interstate 95 all the way down to the coast. Overall temperatures throughout the winter were much colder in 2014. This was rated as 3 (Major) on the NESIS scale. A Presidential Disaster event was declared in Chesterfield.
- **1/22/2016:** What transpired was reasonably close to what was forecast, with a major snowstorm for our entire region, which also included a mix of some sleet across portions of the area as well as small amounts of freezing rain. NOAA ranks

Northeast U.S. storms according to overall impact, part of which is dependent on societal and economic factors, thus population density is a key component. This particular storm was ranked as a 4 (crippling) on the NESIS scale of 1-5. It is now 4th on the list of historic storms that have been ranked on the NESIS scale, with only two storms ever ranked as a 5 (extreme). Presidential Disasters for this study region were declared for Sussex and Henrico Counties.

**(6) Drought (Limited Threat)**

- **Annualized drought damages: \$0**

**Significant Events:**

- **November 1976 – September 1977:** The region experienced ten months of below average precipitation. The drought began in November 1976 when rainfall totaled only 50% to 75% of normal. During the rest of the winter, storms tracked across the Gulf. During the spring and summer storms tracked across the Great Lakes. These weather patterns created significant droughts throughout most of Virginia.
- **June – November 1998:** A heat wave over the Southeast produced warm and dry conditions over much of Virginia. Unusually dry conditions persisted through much of the fall. The drought produced approximately \$38.8 million in crop damages over portions of central and south-central Virginia.
- **December 2001 – November 2004:** Beginning in the winter of 2001, the Mid-Atlantic began to show long-term drought conditions. The NWS issued reports of moisture-starved cold fronts that would continue throughout the winter. Stream levels were below normal with record lows observed at gauges for the York, James, and Roanoke River basins. By November 2002, the U.S. Secretary of Agriculture had approved 45 counties for primary disaster designation, while 36 requests remained pending.
- **2007:** Unusually dry conditions persisted through a significant portion of the year through much of southern and central Virginia. Virginia as a whole experienced its tenth driest year on record.
- **7/21/2011:** This was one of the hottest July's in the last 75 years, breaking records for multiple. According to the NCDC data, all counties were recorded as having excessive heat waves and drought throughout the entire month.
- **7/5/2012:** Another year of record setting highs and ties throughout the states. These high were accompanied with droughts and heat waves.

**(7) Mass Evacuation (Limited Threat)**

- Mass evacuations from urban areas can strain a community's resources and cause gridlock on major transportation routes, overcrowding of hospitals and shelters, and increased load on local utility infrastructures leading to potential failure.

**(8) Wildfire (Limited Threat)**

<b>Annualized wildfire damages:</b>	\$8
<b>Total acres burned (1995-2008):</b>	6
<b>Total dollar damage (1995-2008):</b>	\$100
<b>Annualized number of wildfire events:</b>	0.15
<b>High fire risk woodland communities:</b>	4
<b>Number of homes in high fire risk woodland communities:</b>	185
<b>Critical facilities within high risk wildfire areas:</b>	64

**(9) Landslide/Shoreline Erosion (Limited Threat)**

- The greatest landslide hazards are found in the higher elevations of western and southwestern Virginia. Analysis of the hazard here is limited by the availability of data. There is no comprehensive database documenting all landslide occurrences within the Commonwealth.

**(10) Land Subsidence/Karst/Sinkholes (Limited Threat)**

- According to the Virginia State Hazard Mitigation Plan, there have been no Federal Declared Disasters or NCDC recorded events for karst related events in the Commonwealth. Land subsidence is very site-specific. There is no comprehensive long-term record of past events in Virginia.

**Significant Events:**

- **1/4/2010:** The ramp from I-95 North to Broad Street in downtown Richmond was closed because of a sinkhole. Reports say that what started as a pothole quickly became a gaping hole in which the ground collapsed, with about 5 feet of earth underneath it washed away.
- **3/1/2011:** A sinkhole closed the intersection of Grove and Stafford Avenues in Richmond.

**(11) Earthquake (Limited Threat)**

- **Annualized earthquake losses: \$591,619**

**Significant Events:**

- Significant earthquakes were first recorded in Virginia in 1774. Virginia has had more than 160 earthquakes since 1977, of which 16% were felt. This averages to approximately one earthquake every month, with two felt each year. There have been four significant earthquakes centered in the region. There is quaternary faulting in the Central Virginia Seismic Zone, running through Powhatan, Goochland, Fluvanna, and Cumberland Counties. Quaternary faults and folds are believed to be sources of earthquakes greater than magnitude 6 in the past 1,600,000 years; however, the USGS reports that only liquefaction features are evidence of strong shaking and that individual faults in the Central Virginia Seismic Zone remain unidentified.

- **8/23/2011:** A 5.8 magnitude quake centered near Mineral, VA occurred at 1:51 pm EDT on August 23, 2011. The earthquake was reportedly felt as far north as Boston, as far south as Georgia and as far west as Chicago. Effects of the earthquake were reported to the USGS through its online survey from over 8,434 zip codes, and ranged from weak intensity to very strong. In terms of damage, particularly hard-hit were brick and unreinforced structures and infrastructure near the quake's epicenter. In addition to cracks and buckling, some buildings were knocked off of their foundations. Minor injuries were reported as a result of the damage and debris. The earthquake forced the North Anna Power Station nuclear power plant offline pending an all-clear from a Nuclear Regulatory Commission review. Aftershocks of a lesser magnitude continued to plague the area for several weeks after the event. The strongest aftershock measured 4.5 and occurred on August 25 at 1:08 am EDT.



## 2.5 2017 – 2022 Mitigation Actions identified by City of Richmond

Richmond City 2017 - 2022 Mitigation Actions							
Number	Strategy	Responsible Department	Priority	Goals Supported	Hazards Addressed	Timeframe	Resources
Richmond - 1	Add additional emergency management staff.	Emergency Management	Medium	2, 3, 5, 6, 7	All	Ongoing	Funding
Richmond - 2	Continue implementation of the "Turn Around, Don't Drown" public education campaign. Install along Gillis Creek.	Department of Public Works & Department of Public Utilities	Medium	1, 2, 3	Flooding	Ongoing	Funding
Richmond - 3	Request list from VDEM or VA DCR and conduct annual review of RL and SRL property list to ensure accuracy. Review will include verification of the geographic location of each RL property and determination if mitigated and by what means. Provide corrections if needed by filing form FEMA AW-501.	Department of Public Utilities	Low	1, 2	Flooding	Ongoing	Staff
Richmond - 4	Pursue a higher Community Rating System rating to increase premium savings for flood insurance holders.	Department of Public Utilities	Medium	1, 2	Flooding	Long-term	Staff and Funding
Richmond - 5	Continue to enforce zoning and building codes, with emphasis on floodplain management.	Planning and Development Review & Department of Public Utilities	High	1, 2	Flooding	Ongoing	Staff
Richmond - 6	Continue to improve real-time data about flood depths.	Emergency Management	High	1, 2	Flooding	Long-term	Staff and Funding

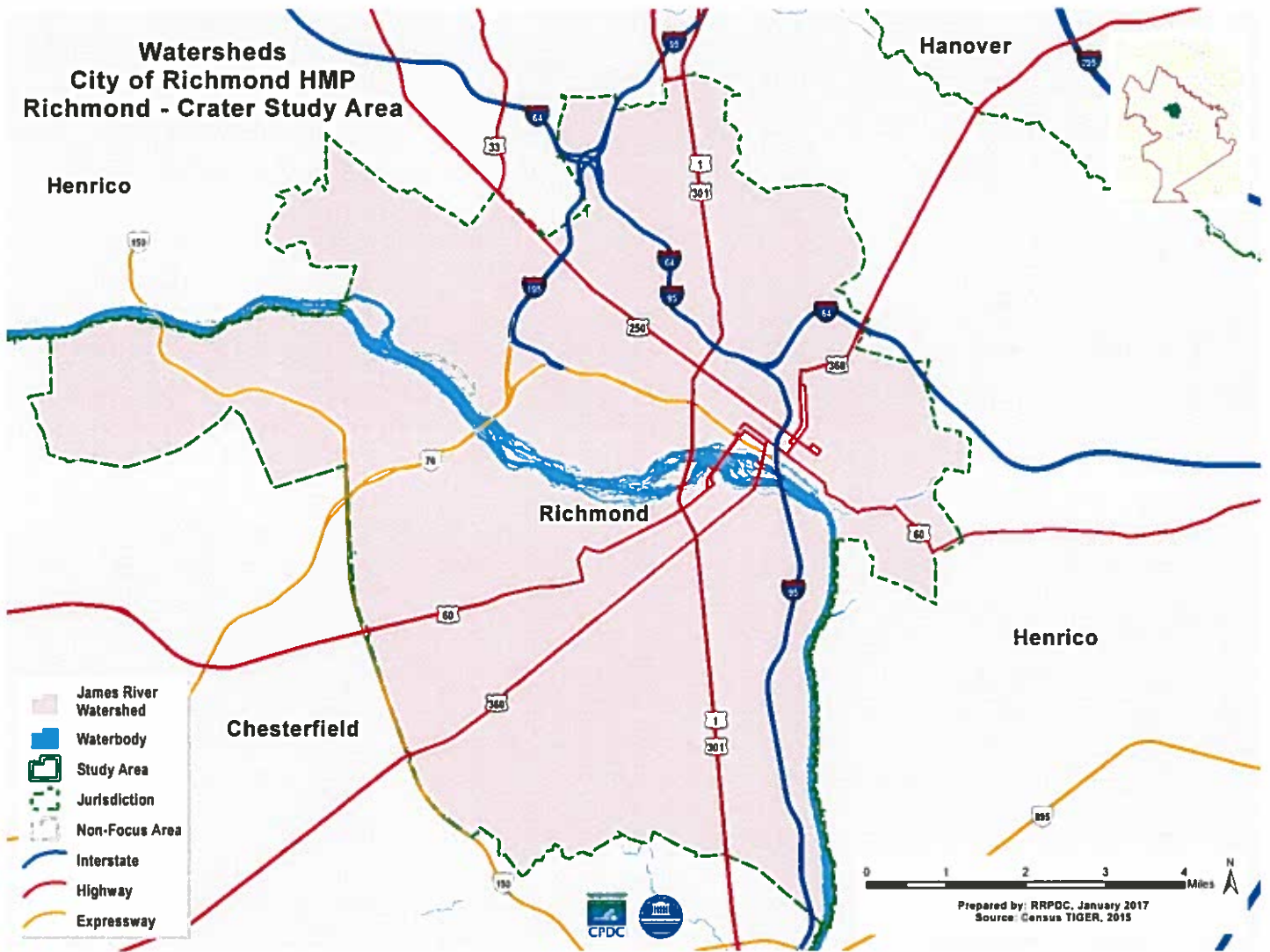
Richmond City 2017 - 2022 Mitigation Actions							
Number	Strategy	Responsible Department	Priority	Goals Supported	Hazards Addressed	Timeframe	Resources
Richmond - 7	Distribute brochures and use other means to educate the public regarding preparedness and mitigation. Conduct annual preparedness days for hazards to include floods, wind, and earthquakes.	Emergency Management	Medium	1, 2, 3	All	Long-term	Funding
Richmond - 8	Encourage purchase of NOAA radios by citizens. Provide NOAA weather radios to public facilities.	Emergency Management	Medium	1, 2, 3	All	Long-term	Funding
Richmond - 9	Identify training opportunities for staff to enhance ability to use GIS for emergency management needs.	Emergency Management	Medium	1, 2, 3, 5, 6, 7	All	Long-term	Staff and Funding
Richmond - 10	Investigate all primary and secondary schools to evaluate their resistance to all natural hazards in coordination with school system emergency planner.	Emergency Management & Richmond Public Schools	Medium	1, 2, 3	All	Long-term	Staff and Funding
Richmond - 11	Support mitigation projects that will result in protection of public or private property from natural hazards. Eligible projects include but are not limited to: 1. acquisition of flood prone property 2. elevation of flood prone structures 3. minor structural flood control projects 4. relocation of structures from hazard prone areas 5. retrofitting of existing buildings, facilities and infrastructure 6. retrofitting of existing buildings and facilities for shelters 7. critical infrastructure protection measures 8. stormwater management improvements 9. advanced warning systems and hazard gauging systems (weather radios, reverse-911, stream gauges, I-flows) 10. targeted hazard education 11. wastewater and water supply system hardening and mitigation	Emergency Management	High	1, 2, 4, 5, 7	All	Ongoing	Staff and Funding
Richmond - 12	Identify and target an outreach program to businesses (particularly those with hazardous materials stored on	Emergency Management	Medium	1, 2	All	Long-term	Staff

Richmond City 2017 - 2022 Mitigation Actions							
Number	Strategy	Responsible Department	Priority	Goals Supported	Hazards Addressed	Timeframe	Resources
	site) to discuss hazards and mitigation alternatives.	& Richmond Fire and Emergency Services					
Richmond - 13	Investigate redundant power for identified critical facilities	Emergency Management & Department of Public Utilities	Medium	1, 7	All	Short-term	Staff and Funding
Richmond - 14	Expand capability to provide community "human needs" centers during and after an emergency or disaster to include clothes washing trucks, electronic device charging stations, shower facilities, etc.	Emergency Management	Medium	1, 2, 3, 4, 5,	All	Long-term	Funds, Equipment
Richmond - 15	Integrate mitigation plan requirements and actions into other appropriate planning mechanisms such as comprehensive plans and capital improvement plans.	Emergency Management	Medium	1, 2	All	ongoing	Staff and Funding

The Richmond-Crater Multi-Regional Hazard Mitigation Plan 2017 was developed by the Richmond Regional and Crater Planning District Commissions with the assistance and support of local planning, emergency management, and other local staff from the participating localities, as well as from Dewberry Consultants, LLC.

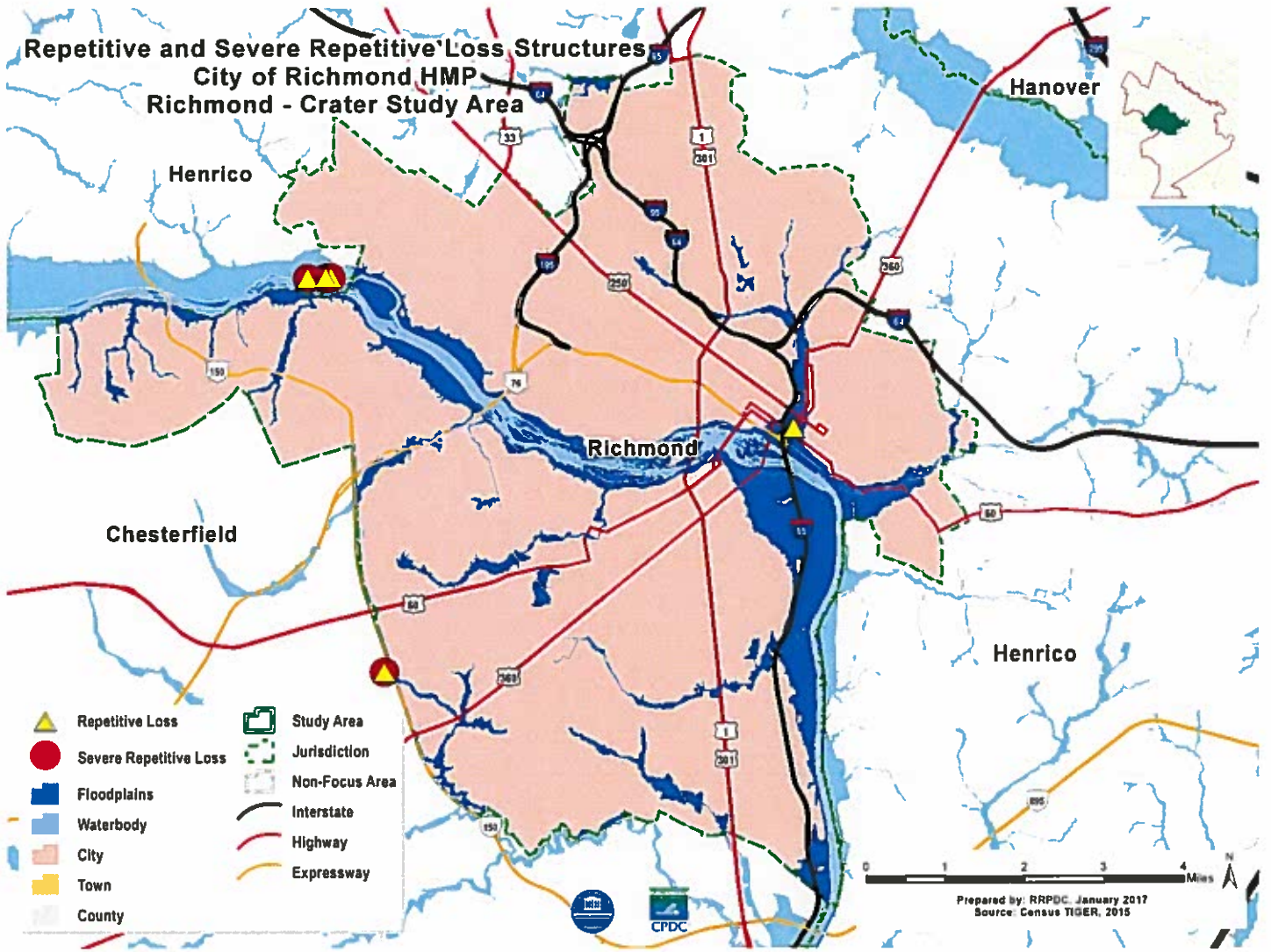
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**Watersheds**  
**City of Richmond HMP**  
**Richmond - Crater Study Area**



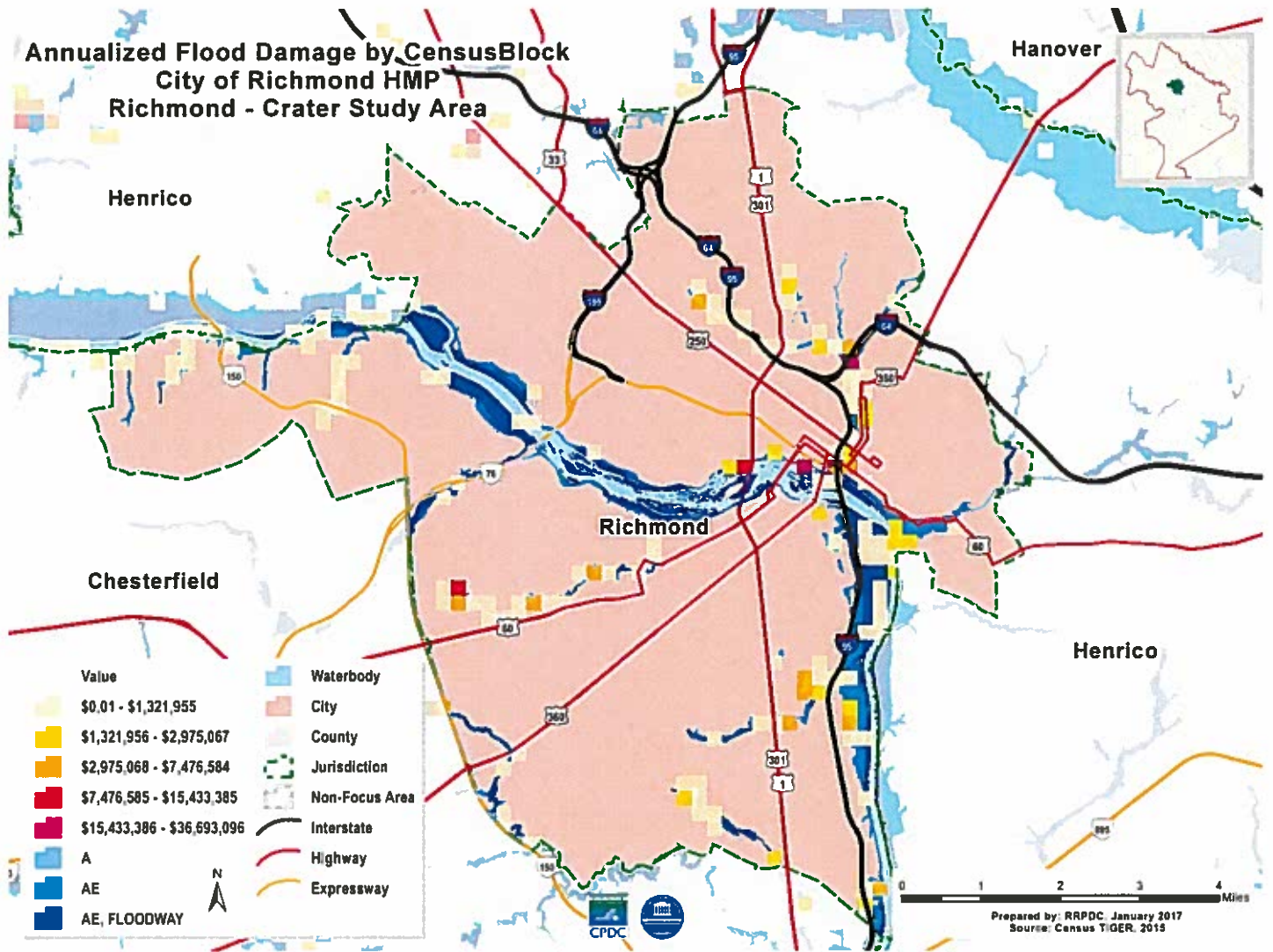


**Repetitive and Severe Repetitive Loss Structures**  
**City of Richmond HMP**  
**Richmond - Crater Study Area**

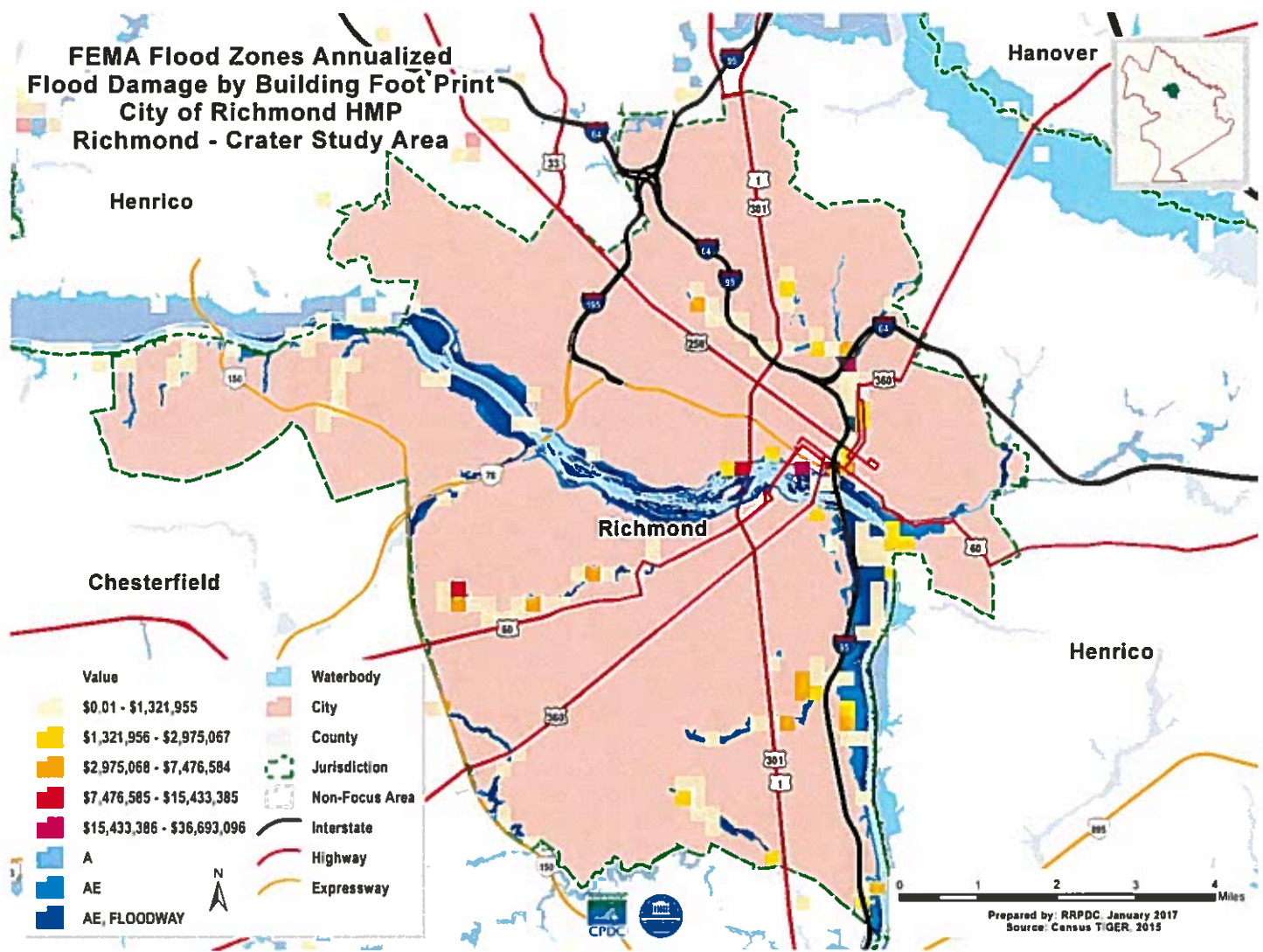


Prepared by: RRPDC, January 2017  
 Source: Census TIGER, 2015

**Annualized Flood Damage by CensusBlock  
City of Richmond HMP  
Richmond - Crater Study Area**

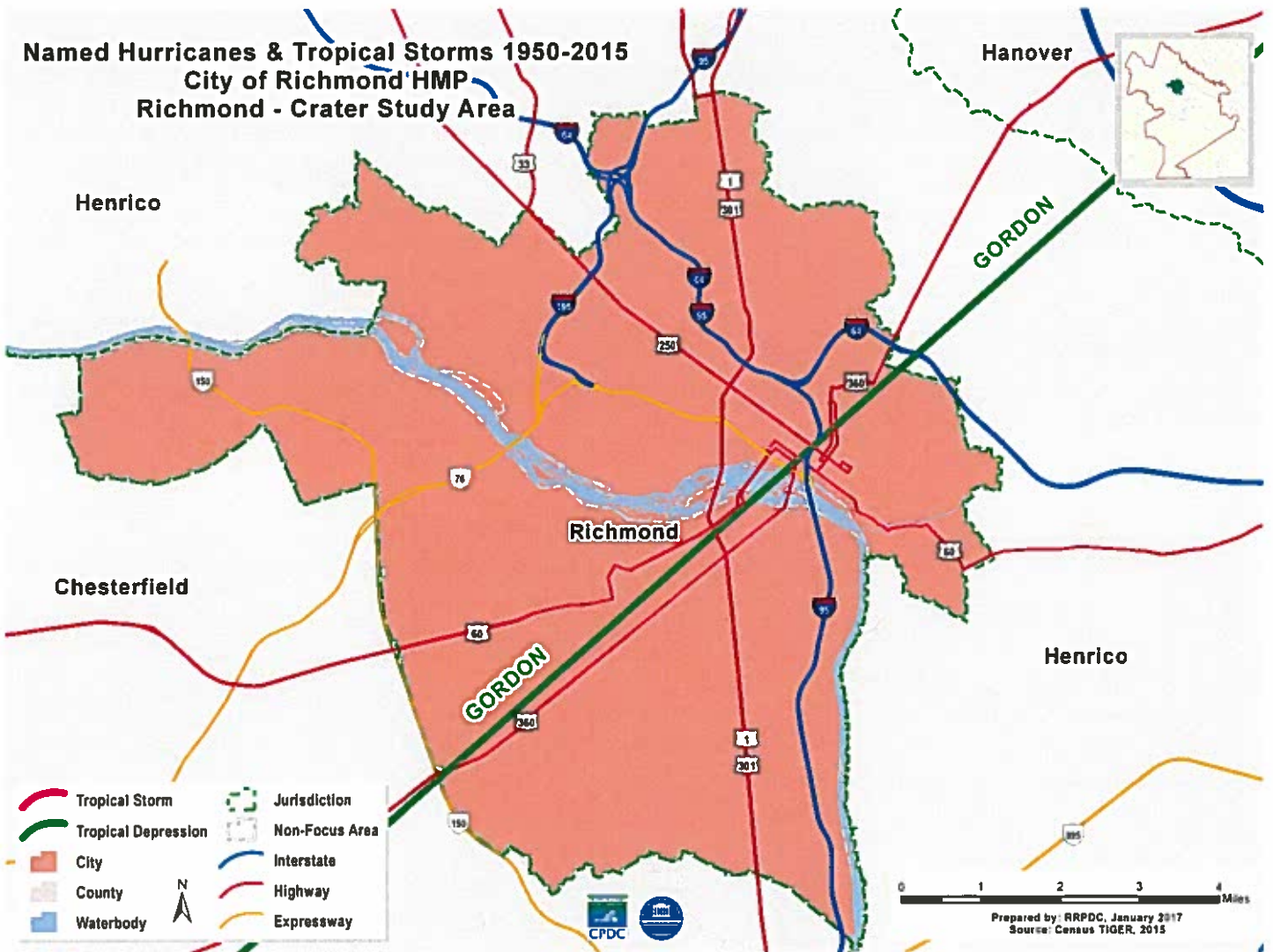


**FEMA Flood Zones Annualized  
Flood Damage by Building Foot Print  
City of Richmond HMP  
Richmond - Crater Study Area**



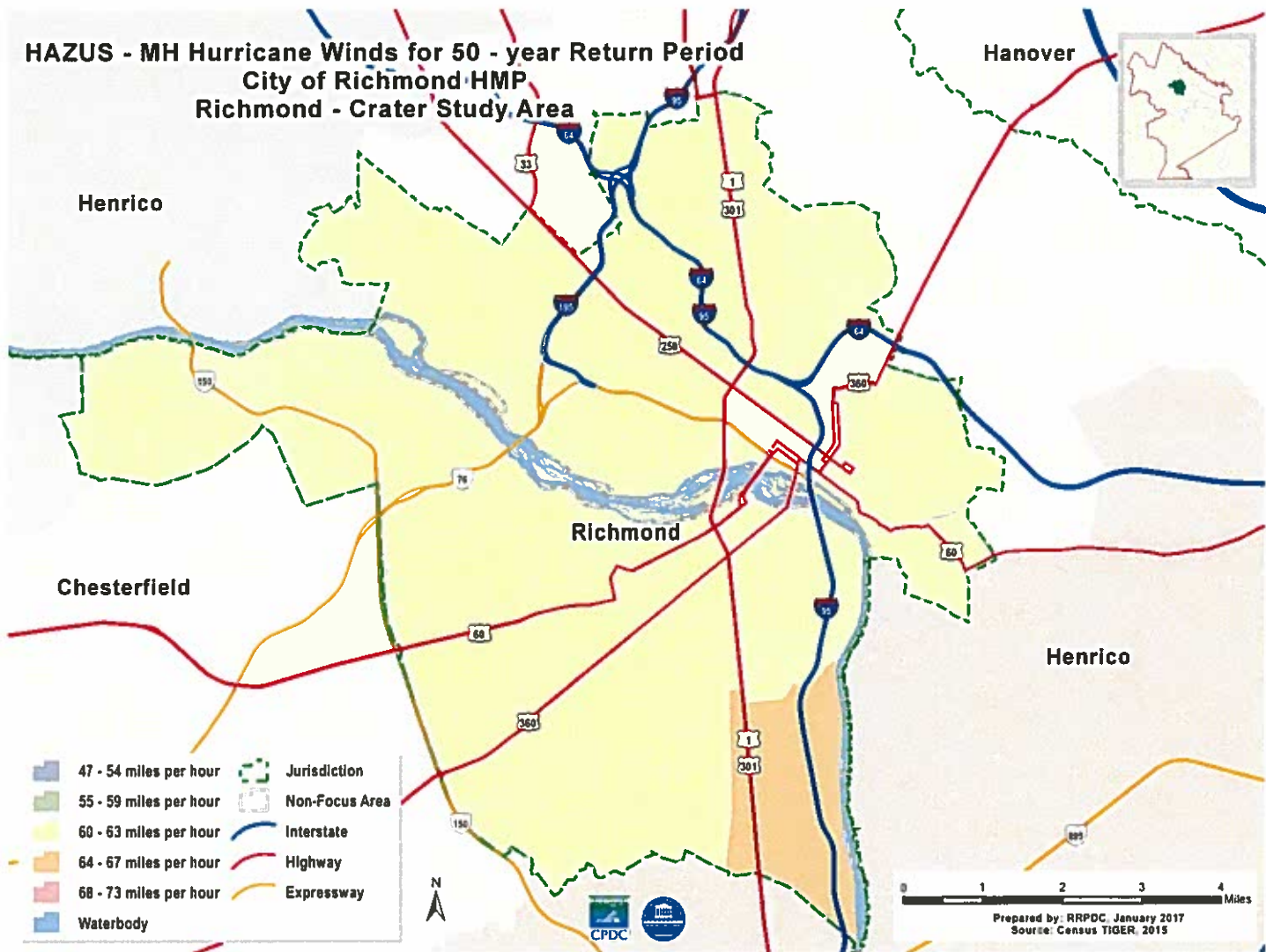


**Named Hurricanes & Tropical Storms 1950-2015**  
**City of Richmond HMP**  
**Richmond - Crater Study Area**

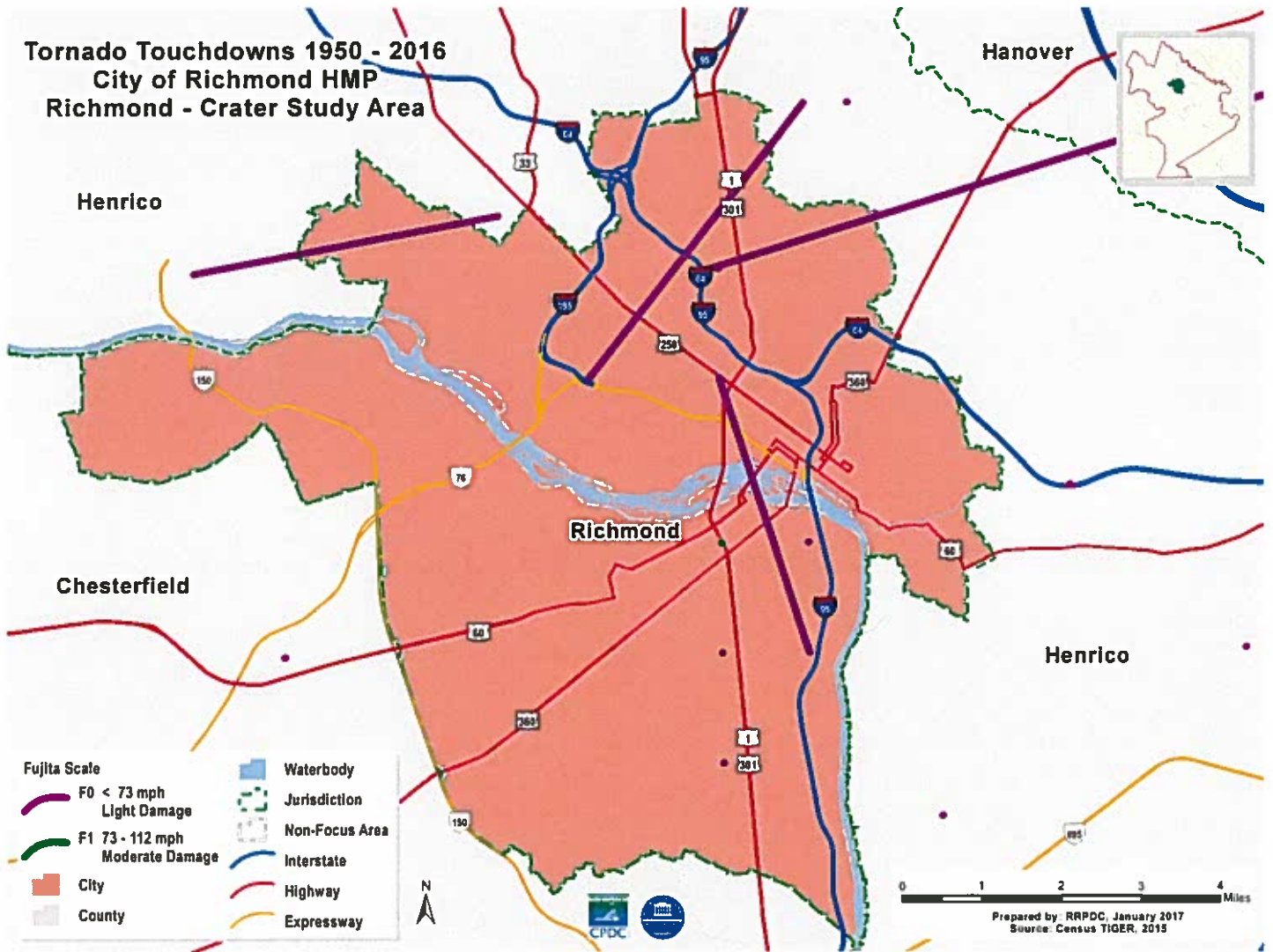


Prepared by: RRPDC, January 2017  
 Source: Census TIGER, 2015

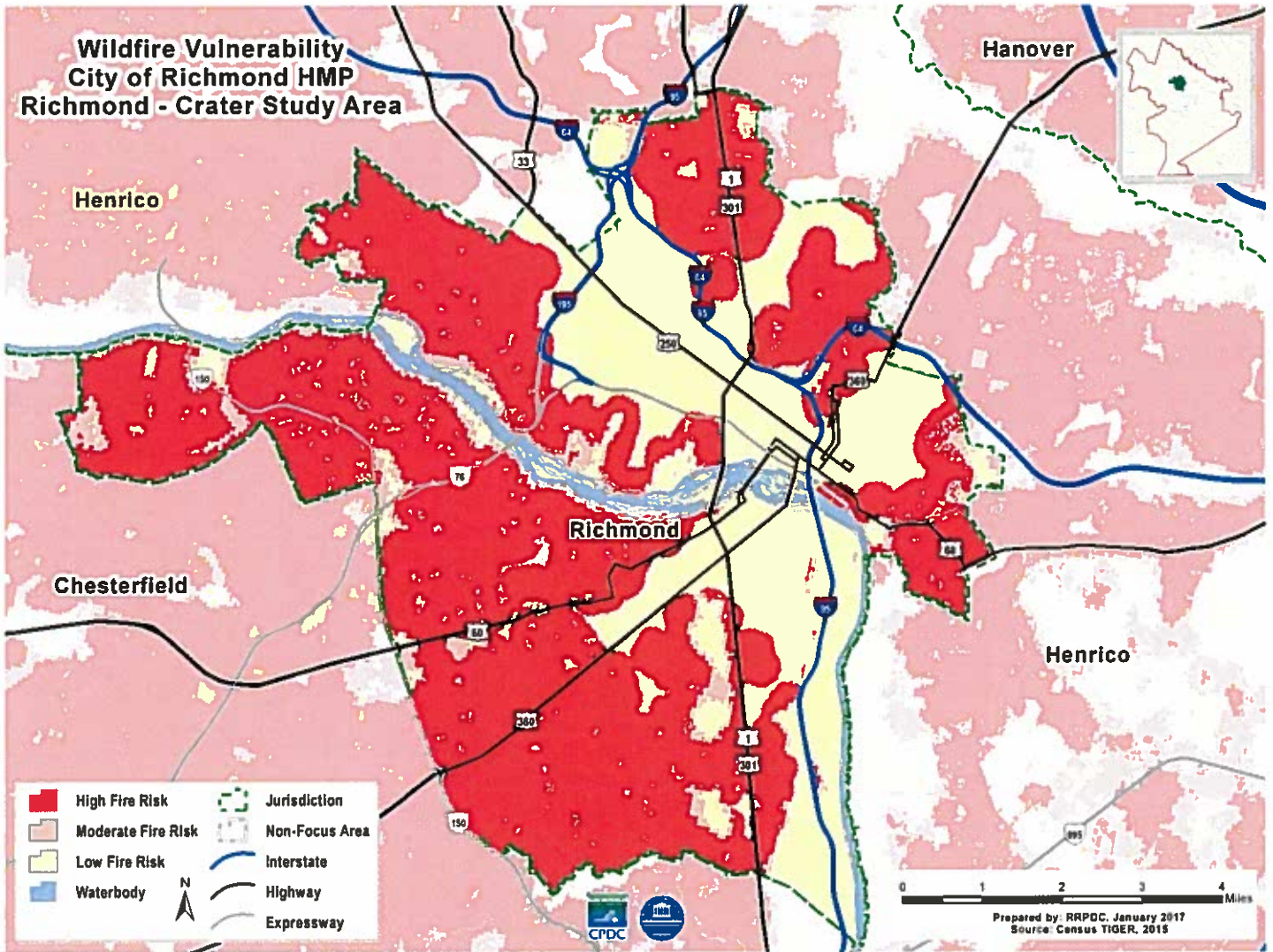
**HAZUS - MH Hurricane Winds for 50 - year Return Period  
 City of Richmond HMP  
 Richmond - Crater Study Area**



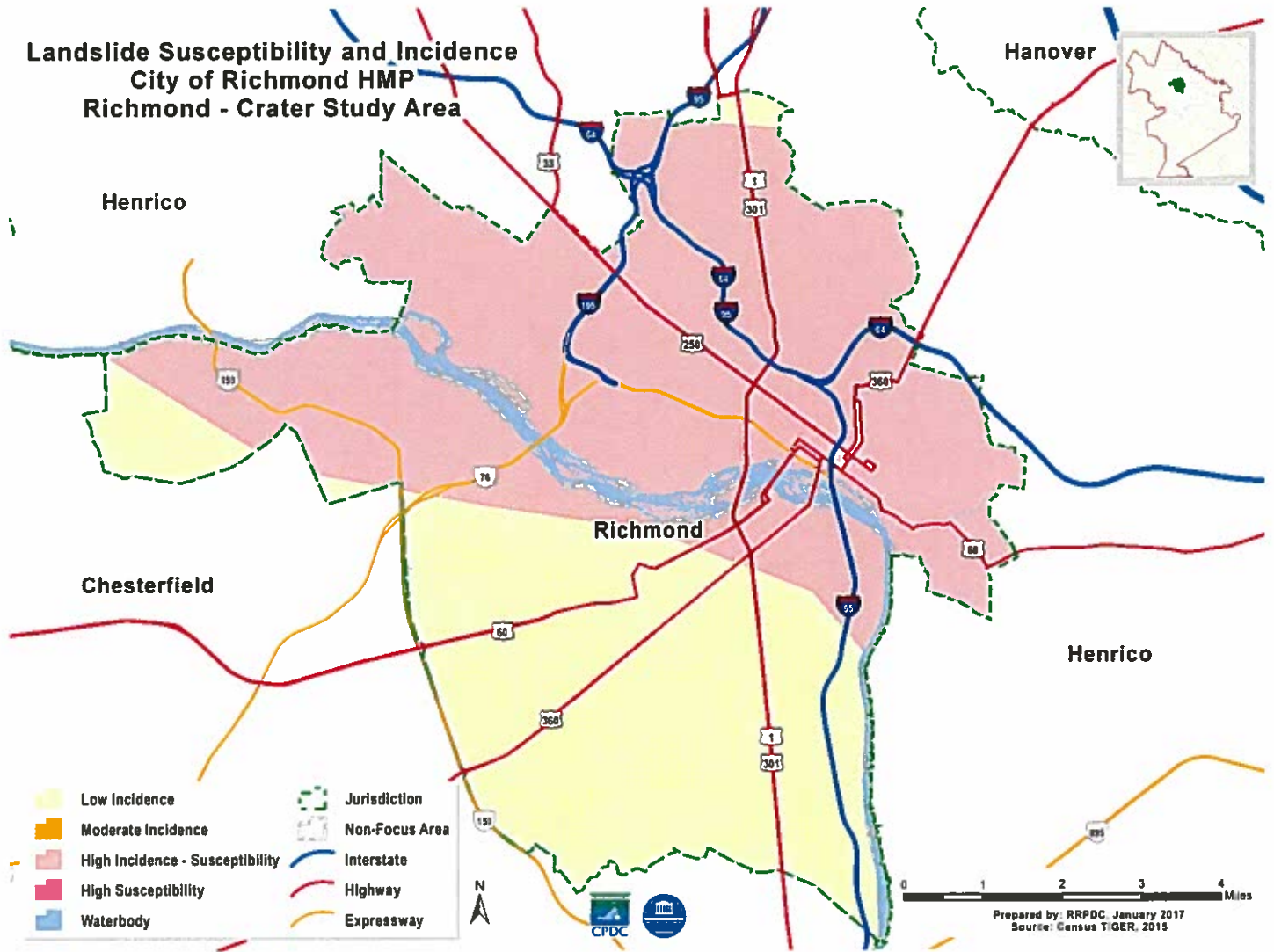
**Tornado Touchdowns 1950 - 2016**  
**City of Richmond HMP**  
**Richmond - Crater Study Area**



**Wildfire Vulnerability  
City of Richmond HMP  
Richmond - Crater Study Area**

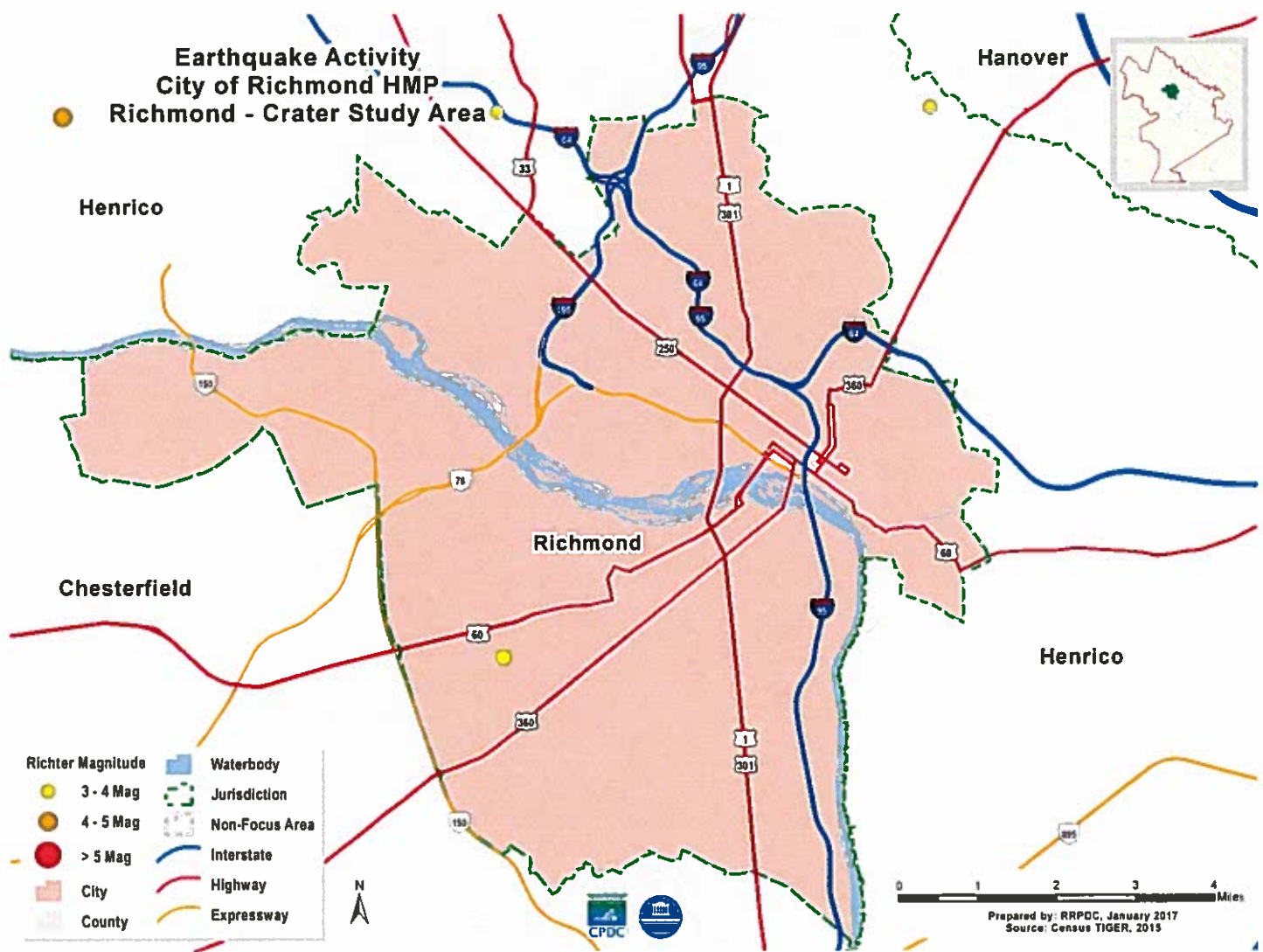


**Landslide Susceptibility and Incidence  
City of Richmond HMP  
Richmond - Crater Study Area**



**Earthquake Activity  
City of Richmond HMP**

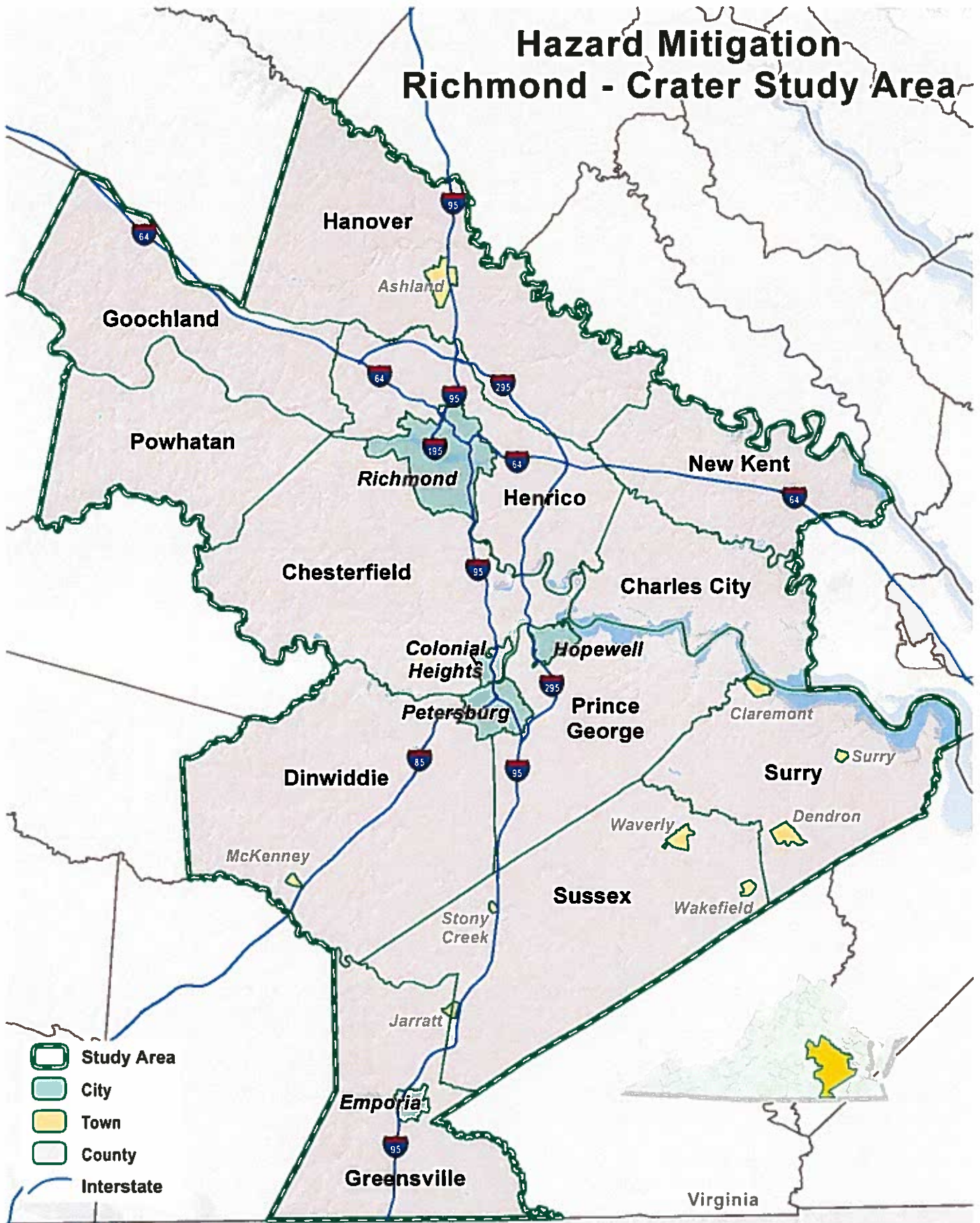
**Richmond - Crater Study Area**








- |                          |                |
|--------------------------|----------------|
| <b>Richter Magnitude</b> | Waterbody      |
| 3 - 4 Mag                | Jurisdiction   |
| 4 - 5 Mag                | Non-Focus Area |
| > 5 Mag                  | Interstate     |
| City                     | Highway        |
| County                   | Expressway     |

Prepared by: RRPDC, January 2017  
Source: Census TIGER, 2015

# Hazard Mitigation Richmond - Crater Study Area



-  Study Area
-  City
-  Town
-  County
-  Interstate



0 5 10 15 20 Miles



Prepared by: Richmond Regional PDC, October 2016  
Source: Census Tiger, 2010  
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# Virginia's Coastal Zone



## North Carolina

### BOUNDARY DESCRIPTION

Virginia's coastal zone encompasses 29 counties, 16 cities, and 42 incorporated towns in "Tidewater" region of the state. Virginia's coastal zone includes 5,000 miles of shoreline, four tidal rivers reaching as far as 100 miles inland – the Potomac, Rappahannock, York, and James Rivers and all of the waters therein, and out to, the three nautical mile Territorial Sea Boundary, including all of the Chesapeake Bay and Albemarle – Pamlico Sound watersheds.

### FEDERAL CONSISTENCY

Federal consistency is the CZMA requirement where Federal agency activities, Federal license or permit activities, and Federal financial assistance activities located inside or outside the state's coastal zone that have reasonable foreseeable effects on the coastal use or resource must be consistent with the enforceable policies of the state's coastal zone management program.

0 5 10 20 30 40 Miles



Virginia Coastal Zone  
MANAGEMENT PROGRAM