Report on the Commonwealth Threat Hazard Identification and Risk Assessment (C-THIRA)

Code of Virginia, §2.2-222.1(D)

Report to the Chairmen of the Committees on
Senate Finance, House Appropriations, Courts for Justice, and Militia, Police, and Public Safety

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10501 Trade Court
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October 31, 2014

Preface

This report is provided in accordance with the *Code of Virginia, §2.2-222.1(D),* "The Secretary shall develop annually the Commonwealth Threat Hazard Identification and Risk Assessment (C-THIRA) Report to identify threats and hazards and determine capability targets and resource requirements necessary to address anticipated and unanticipated risks to state and local preparedness. The C-THIRA Report shall (i) identify a list of the threats and hazards of primary concern to the Commonwealth; (ii) describe the threats and hazards of concern, showing how they may affect the Commonwealth; (iii) assess each threat and hazard in context to develop a specific capability target for each core capability consistent with federal National Preparedness Goals; and (iv) estimate the resources required to achieve the capability targets through the use of community assets and mutual aid, while also considering preparedness activities, including mitigation opportunities. Additionally, the C-THIRA Report shall assess the Commonwealth's state of planning, organizing, training, equipping, exercising, and evaluating, and its ability to take corrective action, as well as any shortfalls in these areas. The C-THIRA Report shall also serve as the Commonwealth's strategic approach to improving future preparedness and shall be delivered to the Chairmen of the Senate Committees on Finance and for Courts of Justice and the Chairmen of the House Committees on Appropriations and Militia, Police and Public Safety no later than November 1 of each year." (http://leg1.state.va.us/cgi-bin/legp504.exe?000+coh+2.2-222.1+700296).

It was developed by the Virginia Department of Emergency Management (VDEM) and Office of the Secretary of Public Safety and Homeland Security under the direct auspices and coordination by deputy secretary, VDEM state coordinator, VDEM chief deputy state coordinator, and deputy state coordinator.

Special thanks to VDEM's Divisions of Preparedness, Local Support Services, and Recovery and Mitigation, and the Office of Training and Exercise for the inputs they were able to provide. Special acknowledgement also goes to the Urban Areas Security Initiative (UASI) regions of Hampton Roads and the National Capital Region for the information they've provided as part of the Federal Emergency Management Agency (FEMA) Threat Hazard Identification and Risk Assessment (THIRA) process and to the Planning District Commissions and Councils for their participation in mitigation and catastrophic planning. This report would not be possible without their combined, available resources.

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Executive Summary

As this report is the first one provided on this topic, the key focuses were to: identify, list, and contextualize the primary threats to the Commonwealth; identify and define specific state-wide core capability measures in parallel with the National Preparedness Goals and FEMA-mandated THIRA process; where currently possible, identify present capability levels; where currently possible, estimate resources needed; where possible, provide a current assessment of the Commonwealth's efforts and capacity to achieve the core capability targets; and to assist in providing a means to move forward in improving Virginia's capacity to meet the identified needs and meet or improve upon identified measures of success.

Primary threats to the Commonwealth identified in this report include: hurricane, earthquake, wildfire, winter storm, dam failure, avian flu outbreak, pan-flu epidemic, a radiological event, and terrorism events. These threats were identified as relevant to Virginia using: historical occurrence, economic impact, social vulnerabilities, geographical location, health considerations, and critical infrastructure/key resources impacts. These threats were further validated by reviewing the existing work that the UASI regions and localities have done in identifying events of importance to them and by direct contact with state agencies.

Measurable core capability targets for the Commonwealth have been identified as part of the federal THIRA process. Based on available information taken from locality self-assessments, the single strongest critical mission area is response and the strongest core capability is planning. As identified by training requests made by localities, the core capability of operational coordination has been identified as the key area of need.

Current data sets indicate needs, but desired outcome measures for each locality need to be better identified and defined to determine what local, regional, and/or state resources and actions are required to address any shortfalls. Where the data sets or information is lacking, this is automatically an identified gap in the C-THIRA process.

This report recommends developing and implementing a standardized, iterative C-THIRA process, which includes the components of: outreach and education, data gathering and analysis, assisting localities, regions, and the state with identifying needs and shortfalls based on current capacity versus desired capacity using quantified and verifiable measures for success.

Chapter 1 – "identify a list of the threats and hazards of primary concern to the Commonwealth"

In parallel with the FEMA-mandated THIRA process, the C-THIRA classified identified threats and hazards to the Commonwealth in three overarching categories. These categories are: natural, technological, and human-caused.

As a qualifier to these categories, and while recognizing that certain events might have more severe consequences or a higher probability of occurrence than others, an effort was made to be inclusive of all geographical regions of Virginia. The use of geography as a qualifier supports future regional and local interactions, as well as support for this process because it doesn't isolate or create a devaluation of any entity. This inclusion generates a truer state-wide comprehensive picture, total event impact valuations, and can provide a more accurate gap analysis in determining functional shortfalls and methods to address them. All events have impacts and needs that are directly proportional to the local and regional ability to address them. A smaller event in a less resource-enabled locality might have a parallel overall impact level as a more resource-enabled community in the wake of a larger event.

Natural threats and hazards are those events that occur as a result of weather conditions, geological conditions, biological conditions, or a combination of conditions. The natural events identified as primary concerns are reoccurring and have significant life multi-sector, property, and social impacts.

The natural threats and hazards identified are:

- Hurricane
- Earthquake
- Winter Storm
- Wildfire
- Avian Influenza Outbreak
- Pan-Flu Epidemic

Technological threats and hazards are those events that occur as a result of non-human caused impacts associated with failures of systems or critical infrastructure nodes. The technological events identified as primary concerns are low probability, high consequence events that would have significant life, multi-sector, property, and social impacts.

The Technological threats and hazards identified are:

- Dam Failure
- Radiological Event

Human-caused threats and hazards are those events that occur as a result of an accidental or deliberate end result of human interaction. The Human-caused events identified as primary concerns are low probability, high consequence events that would have significant life, multi-sector, life, property, and social impacts.

The Human Caused threat and hazards identified are:

- Vehicle Borne Improvised Explosive Device (VBIED)
- Improvised Nuclear Device (IND)

Chapter 2 – "describe the threats and hazards of concern, showing how they may affect the Commonwealth"

The identified threats and hazards of concern will be presented in the same overarching categories and order as in Chapter 1.

Natural:

Hurricane events contain the synergistic elements of high winds, storm surge, and large amounts of rainfall in a short time period. While considered to be a predominantly coastal event, hurricanes have also traveled inland and while decreasing in wind strength they've also created extensive riverene flooding issues and landslides. However, for the purposes of this report and to maintain the geographical component of the threat and hazard review, the contextualization of this event will be predominantly associated with the coast. The presumption also exists that the activities and impacts associated with hurricanes are consistent with other coastal storm activities.

Hurricanes are categorized by sustained wind speed by using the Saffir-Simpson scale. Per the National Hurricane Center, the Saffir-Simpson Hurricane Wind Scale is a 1 to 5 rating. This scale also estimates potential property damage. Hurricanes reaching Category 3 and higher are considered major hurricanes because of their potential for significant loss of life and damage.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
1	74-95 mph 64-82 kt 119-153 km/h	**Very dangerous winds will produce some damage:** Well-constructed frame homes could have damage to roof, shingles, vinyl siding, and gutters. Large branches of trees will snap and shallowly rooted trees may be toppled. Extensive damage to power lines and poles likely will result in power outages that could last a few to several days.
2	96-110 mph 83-95 kt 154-177 km/h	**Extremely dangerous winds will cause extensive damage:** Well-constructed frame homes could sustain major roof and siding damage. Many shallowly rooted trees will be snapped or uprooted and block numerous roads. Near-total power loss is expected with outages that could last from several days to weeks.
3 (major)	111-129 mph 96-112 kt 178-208 km/h	**Devastating damage will occur:** Well-built framed homes may incur major damage or removal of roof decking and gable ends. Many trees will be snapped or uprooted, blocking numerous roads. Electricity and water will be unavailable for several days to weeks after the storm passes.

Category	Sustained Winds	Types of Damage Due to Hurricane Winds
4 (major)	130-156 mph 113-136 kt 209-251 km/h	**Catastrophic damage will occur:** Well-built framed homes can sustain severe damage with loss of most of the roof structure and/or some exterior walls. Most trees will be snapped or uprooted and power poles downed. Fallen trees and power poles will isolate residential areas. Power outages will last weeks to possibly months. Most of the area will be uninhabitable for weeks or months.
5 (major)	157 mph or higher 137 kt or higher 252 km/h or higher	**Catastrophic damage will occur:** A high percentage of framed homes will be destroyed, with total roof failure and wall collapse. Fallen trees and power poles will isolate residential areas. Power outages will last for weeks to possibly months. Most of the area will be uninhabitable for weeks or months.

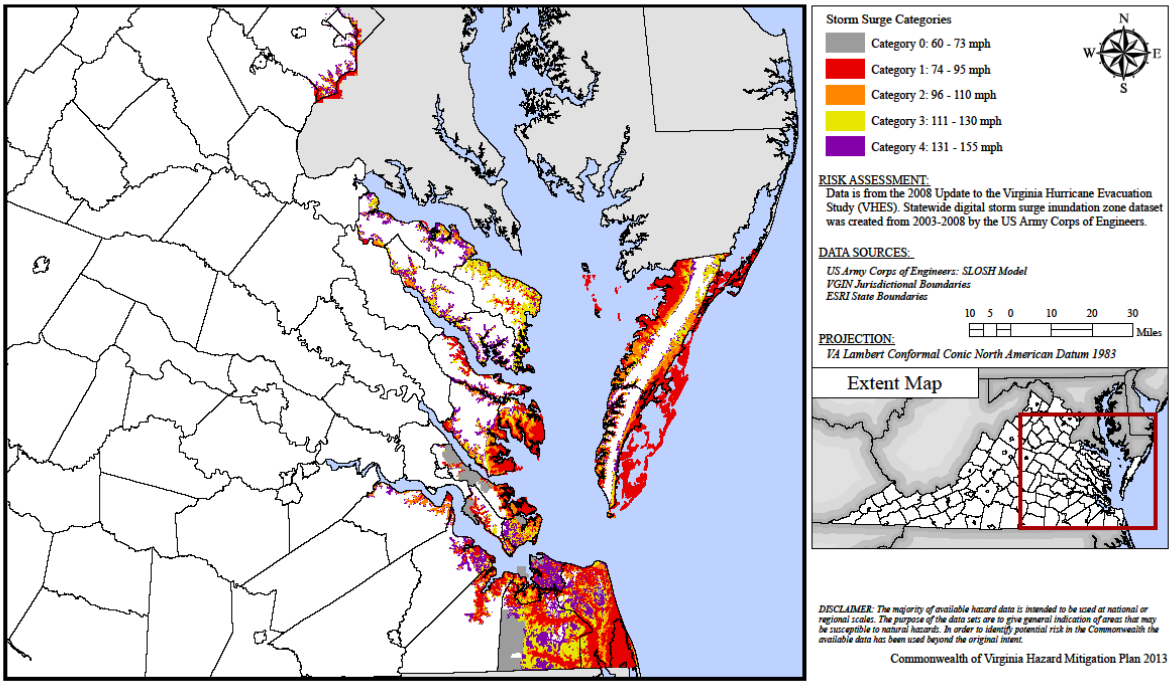
Note that the categorization of a hurricane does not fully describe the potential for damage as it does not consider storm size nor storm surge. The recent example of Hurricane Sandy, for which Virginia received a Presidential Disaster Declaration on November 26, 2012, devastated entire jurisdictions and regions up and down the east coast in spite of it being rated only as a Category 2. Hurricane Sandy resulted in more than $65 billion dollars in direct structural damage and had additional hundreds of billions of dollars in economic impacts. While Virginia was comparatively far less impacted than New Jersey or New York, the originally predicted path for this storm was to directly impact the Hampton Roads region.

In Virginia, the Hampton Roads region is particularly susceptible to coastal storms, and much of the Eastern Shore is less than 6 feet above mean sea level (MSL). The highest historical storm surge recorded at Norfolk was more than 9 feet above mean sea level during the 1933 hurricane. The Hampton Roads region has also been determined to be the second most vulnerable area on the east coast to flooding.

Rough estimates of storm surge have been calculated based on the speed of the winds pushing on the water. However, continuing, evolving, and dynamic variables, which will have impacts on the height and inundation levels of the storm surge. These variables include: tidal conditions; amount of ground level impervious surface close to the shore; topography.

The following projected storm surge image is from the *Commonwealth of Virginia Hazard Mitigation Plan.* It shows the approximate areas of impact from storm surge based on Saffir-Simpson sustained wind categories. As the probability of occurrence from a Category 5 storm is extremely low, it was not pictured.

Figure 3.7-10: Storm Surge Categories



(Figure Source: *Commonwealth of Virginia Hazard Mitigation Plan)*

Maximum surge heights vary based on jurisdiction and the modeled storm scenario. Gloucester, Northumberland, and York counties and the cities of Newport News, Norfolk, Portsmouth, and Virginia Beach could expect to see greater than 15 feet surge heights for Category 3 or 4 events.

As an additional measure of vulnerability, efforts are currently underway to rework the Hampton Roads Evacuation Plan. This need is directly reflected by the amount and vulnerability of residential populations that will need to evacuate since nine out of every 10 deaths associated with hurricanes are directly attributable to storm surge.

Localities with 90 percent of their population directly at risk in a Category 3 or 4 event include:

- Accomack County
- City of Hampton
- City of Newport News
- City of Norfolk
- City of Poquoson
- City of Virginia Beach
- Northampton County

Additional localities with 75 percent of their population directly at risk in a Category 3 or 4 event include:

- City of Chesapeake
- City of Portsmouth
- Gloucester County
- Mathews County
- York County

An additional factor to consider is the vulnerability of the population at risk. As an example, elderly populations typically have more mobility and medical issues than younger populations. As indicated by the 2010 Census, the coastal localities with the most elderly people include:

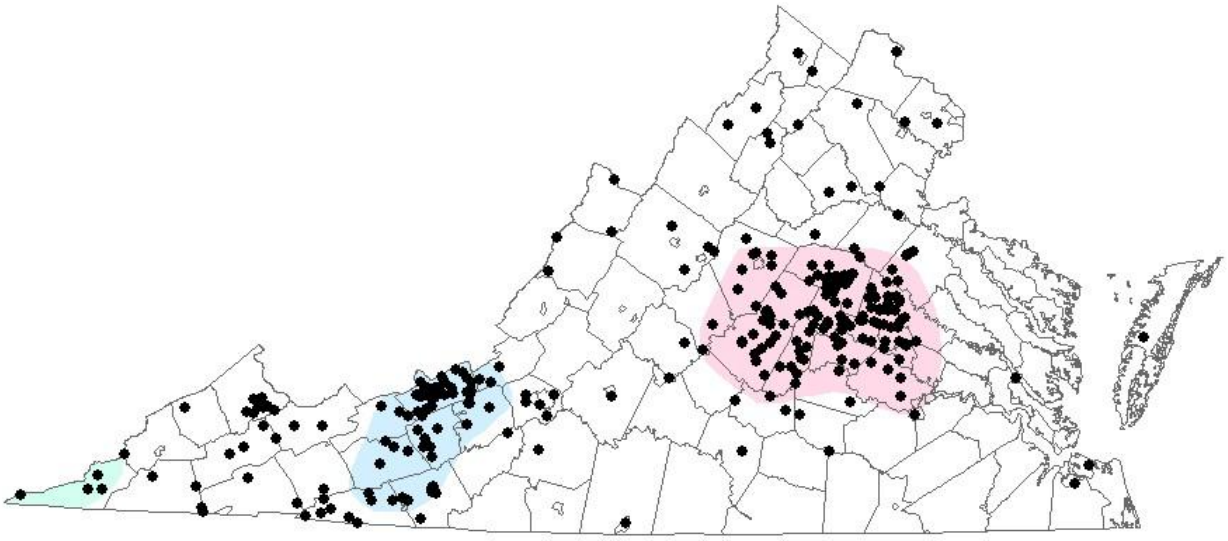
- Lancaster County – 32%
- Northumberland County – 30%
- Mathew County - 26%
- Middlesex County - 26%
- Northampton County – 23%

As of 2103, and referenced in local/regional hazard mitigation plans with cross referencing against tax records, the few coastal communities which reported structures in the surge zones have tens of thousands of structures at risk with cumulative values in excess of $4.5 billion. These structures include homes, businesses, and government buildings, but do not include infrastructure components such as roads, power stations, pump houses, communication towers, pipelines, etc. all of which are vulnerable. Nor does it include undocumented values such as ports and military facilities.

Earthquake events, although rare on the east coast, have the capacity to be devastating in impacts. Historically, they have occurred in three primary areas:

- Eastern Tennessee Seismic Zone – far southwestern Virginia
- Giles County Seismic Zone – southwestern Virginia
- Central Virginia Seismic Zone – central Virginia

The following image provides a representation of event locations.



(Image Source: Virginia Department of Mines, Minerals, and Energy web page)

The most recent significant earthquake event in Virginia was on August 23, 2011, with the epicenter located near the town of Mineral in Louisa County in the Central Virginia Seismic Zone. As Virginia is not located near a tectonic plate edge, its quakes are referred to as intraplate earthquakes. The plate tectonics and geological structure means that east coast and central US intraplate earthquakes can be felt at extreme distances from the epicenter of an event.

The Louisa Earthquake had a Richter Magnitude Scale rating of 5.8 and a maximum perceived intensity of VII (very strong) on the Modified Mercalli Intensity Scale. More than 100 aftershocks, ranging up to 4.5 Richter Magnitude, occurred after the main tremor with additional tremors of up to 3.5 for months after the event.

	Modified Mercalli Scale	Richter Magnitude Scale
I	Detected only by sensitive instruments	1.5
II	Felt by few persons at best, especially on upper floors; delicately suspended objects may swing	2
III	Felt noticeably indoors, but not always recognized as an earthquake; standing autos rock slightly, vibrations like a passing truck	2.5
IV	Felt indoors by many; outdoors by few, at night some awaken; dishes, windows, doors disturbed; standing autos rock noticeably	3
V	Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects	3.5
VI	Felt by all, many frightened and run outdoors; falling plaster and chimneys, damage small	4
VII	Everybody runs outdoors; damage to buildings varies depending on quality of construction; noticed by drivers of autos	4.5
VIII	Panel walls thrown out of frames, walls, monuments, chimneys fall; sand and mud ejected; drivers of autos disturbed	5
IX	Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked; underground pipes broken	5.5
X	Most masonry and frame structures destroyed; ground cracked, rails bent, landslides	6
XI	Few structures remain standing; bridges destroyed, fissures in ground, pipes broken, landslides, rail bent	6.5
XII	Damage total; waves seen on ground surface, lines of sight and level distorted, objects thrown up into air	7
		7.5
		8

(Figure Source: Virginia Department of Mines, Minerals, and Energy web page)

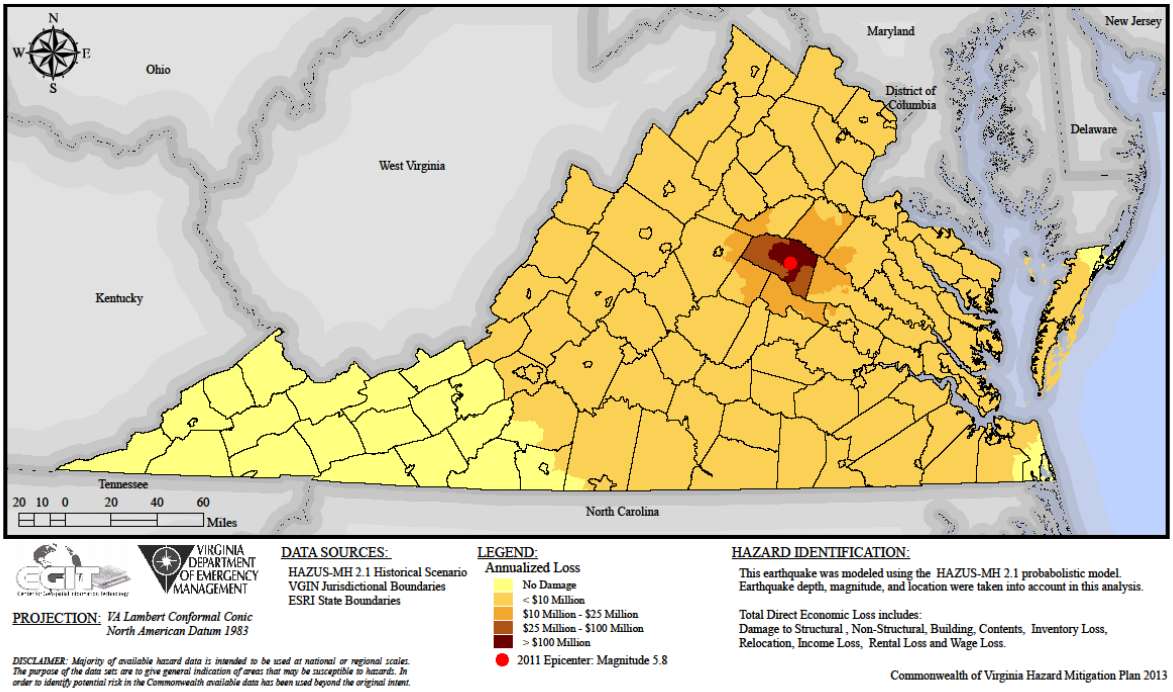
The intensity of the earthquake was enough to require two schools to be torn down afterwards due to irreparable damage, multiple chimneys to collapse, hundreds of homes with foundation damage, and dozens of private wells to be functionally destroyed. The total structural damage estimate in Louisa was estimated to be in excess of $80 million.

The quake was severe enough that the shaking caused two nuclear reactors to automatically shut down at North Anna Nuclear Power Plant. The inspections for damage were extensive. Reactor restart was on November 11, 2011, roughly eleven weeks after the event. Multiple gas line leaks in nearby localities were also reported.

In Culpeper County, two historical churches were damaged. At St. Stephen's Episcopal Church built in 1821, walls buckled and were damaged so severely that daylight was visible from inside the sanctuary. Culpeper Baptist Church built in 1894, lost a chimney. Total estimated structural damages in Culpeper were in excess of $10 million.

Hazards U.S. (HAZUS) is a FEMA-developed nationally applicable, standardized estimate methodology that uses GIS to show damages as a result of an impact from earthquakes, floods, and hurricanes. Using this method, the estimated impacts from the Louisa Earthquake can be visually presented and contextualized. Earthquakes in Virginia are considered to be a low probability, high consequence event.

Figure 3.13-5:Total Loss from 2011 Mineral, VA Earthquake (HAZUS)



(Figure source: *Commonwealth of Virginia Hazard Mitigation Plan*)

Winter storms in Virginia have been epitomized by extensive power outages and snow or ice blocked roads. Virginia's biggest winter weather threat comes from a storm pattern known as a northeaster or "nor'easter". These large storms usually originate to the south, and travel northward along the Atlantic Coast. Warm, moist air from the ocean combined with cold air from the north can produce significant snowstorms throughout the mid-Atlantic and northeast coast states. Depending on the specifics of each storm, the event may result primarily in rain, snow, ice, or some combination thereof.

Strong winds also characterize Nor'easters, often resulting in coastal flooding and erosion. The combination of heavy frozen precipitation and strong winds is destructive and often damaging to

trees and utility lines. Nor'easters may occur from November through April, but are usually at their worst in January, February, and March.

Some of the historic winter weather extremes in Virginia include:

- Lowest temperature of -30°F, recorded on January 21, 1985, at the Mountain Lake Biological Station in Giles County.
- Greatest one-day snowfall of 34 inches, recorded on February 6, 2010, at the Lincoln weather station near Purcellville, Virginia.
- Highest single storm snowfall of 48 inches, recorded January 6-7, 1996, at Big Meadows.
- Greatest monthly snowfall of 54 inches during February 1899 recorded in Warrenton.
- Greatest seasonal snowfall of 124.2 inches during the 1995-1996 winter season, recorded in Wise County.
- Major winter storms typically affect large areas of the nation. During the 1990s, winter storms in Virginia resulted in more localities qualifying for major disaster declarations than any other hazard.

Weather station data from 1960 to 2000 shows nearly all monitoring stations experiencing a day with 12 inches of snow. However, in southeast Virginia events approaching this magnitude typically occur approximately only once every decade.

Winter storms are rated using NOAA's National Climatic Data Center (NCDC) Regional Snowfall Index (RSI). The RSI ranks snowstorm impacts on a scale from one to five, which is similar to the Fujita scale for tornadoes or the Saffir-Simpson scale for hurricanes. The RSI includes societal impacts. RSI is based on the spatial extent of the storm, the amount of snowfall, and the combination of the extent and snowfall totals with population.

RSI RANKING CATEGORIES

Category	Description	RSI Value
1	Notable	1-3
2	Significant	3-6
3	Major	6-10
4	Crippling	10-18
5	Extreme	18.0+

Table Source: NCDC, 2011 (http://www.ncdc.noaa.gov/snow-and-ice/rsi/)

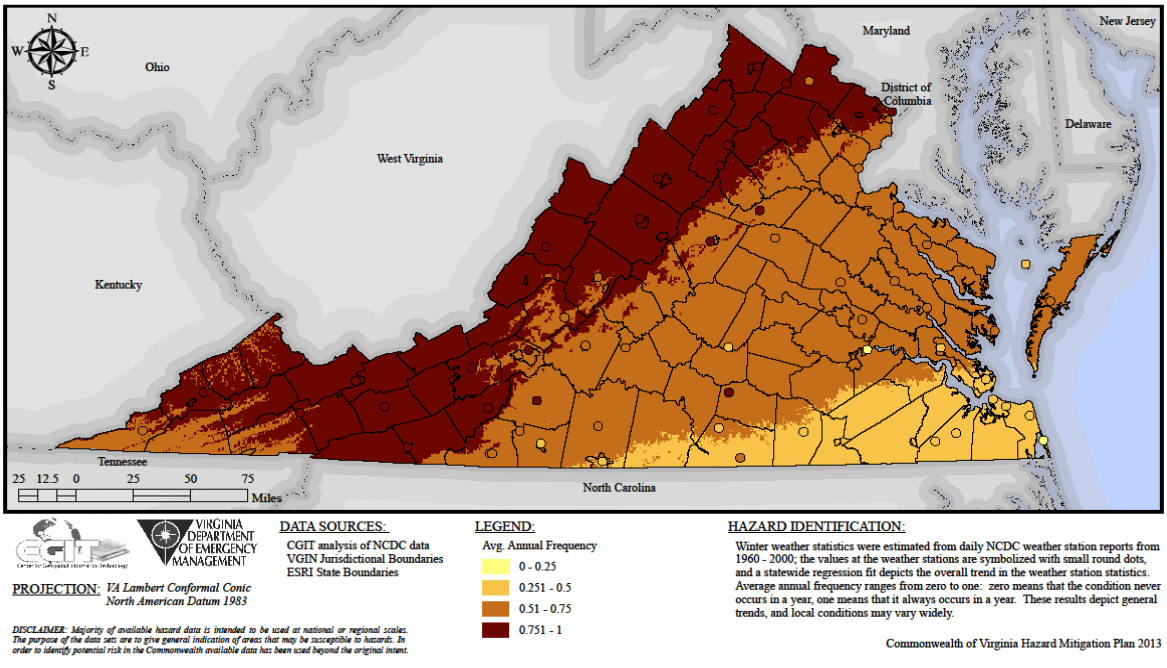
Virginia has received two presidential disaster declarations for winter storms in the last five years. They included:

- December 18–21, 2009: A nor'easter that formed over the Gulf of Mexico developed into a winter storm affecting much of the East Coast. This event was rated a 12.776 on the southeast region RSI scale, or "crippling." Buchanan County reported 27 inches of snow on December 19. This snowstorm resulted in a federally declared disaster (FEMA-1874-VA-DR) declared on February 16, 2010.
- February 4–7, 2010: A nor'easter affecting northern Virginia was rated an 8.103 on the Southeast Region RSI scale, or "major." The Lincoln weather station near Purcellville in Loudoun County reported 34 inches of snow on February 6. This snowstorm was a federally declared disaster (FEMA -1905-VA-DR) declared on April 27.

In combination with power outages, extreme cold can also present significant potential loss of life or sheltering issues. Social and population vulnerabilities increase issues associated with any event. As an example, poverty and the inability to independently heat homes combined with severe cold may have fatal consequences or require extensive access to sheltering.

The Commonwealth has three regional hazard mitigation plans that specify extreme cold as a high concern. These regions are: Central Shenandoah Valley; the New River Valley; and the Northern Shenandoah Valley. In the regions identified, the cities of Radford and Harrisonburg both have poverty level residents equal to approximately 28% of their total population.

Figure 3.9-5: Frequency of 5 or more days entirely at or below 32 F



(Figure Source: *Commonwealth of Virginia Hazard Mitigation Plan)*

Wildfire, to the level of a catastrophe or disaster in Virginia, is uncommon. However, it can have significant local or regional impacts, as well as extensive resources requirements. Wildfire poses an extraordinary hazard when it can transition from forest or range land into woodland-urban interface locations putting populations, critical infrastructure, local economies, historical resources, and homes at significant risk.

Three critical factors determine the formation of wildfire hazard — fuel, topography, and weather. The weather conditions considered to be most supportive of wildfire formation include drought and high winds.

With respect to topography:

- When land rises in height such as up a mountain side, the fire spreads more quickly upwards,
- When land drops in height such as descending into a valley, the fire spreads slower going down, and
- When the land is flat, then winds have the ability to carry embers or flaming debris further distances.

The following table shows the historical records of Wildfire in Virginia. Source information was provided by the Virginia Department of Forestry (VDOF) and referenced in the *Commonwealth of Virginia Hazard Mitigation Plan.*

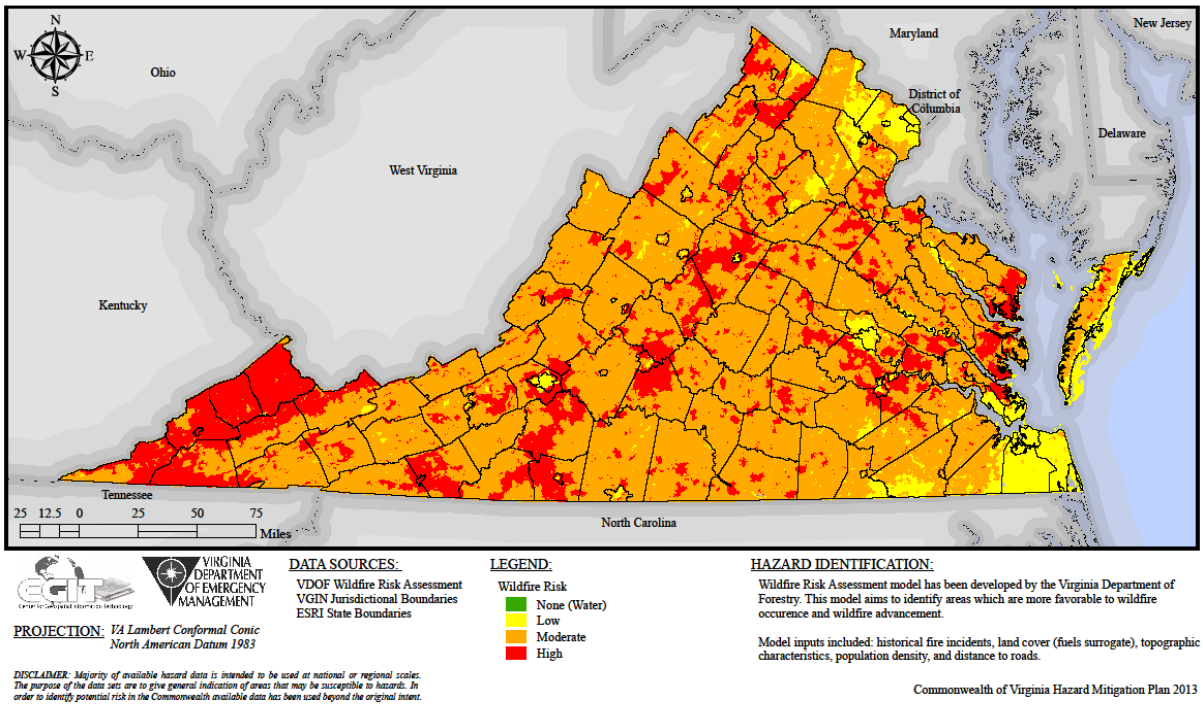
Year	Acres Burned	Damages	Description
1917	305,000	$809,000	Earliest known records in Virginia; more than 1,460 fires were reported with two fatalities.
1927	27,863		An all-time recorded low of 404 fires were reported for the state of Virginia.
1930	333,023		The year that the "great drought" occurred in Virginia. It was recorded that the year "will long be remembered in Virginia, not only for its yearlong fire season and unprecedented, disastrous summer fires, but also because it brought disaster to many farmers and stockmen. Coming as it did immediately following the crash in the fall of 1929, its economic effects were severely felt." 2,554 fires were recorded across 58 counties.
1941-1943			An average of 2,970 wildfires burn 148,937 acres each of the three years.

Year	Acres Burned	Damages	Description
1948	7,782		The Smokey Bear Campaign was implemented in 1944. This campaign is one of the most successful advertising campaigns in American history and resulted in the first year that Virginia recorded less than 10,000 acres burned.
1952	111,571		2,494 fires burned 111,571 acres. It was the last time 100,000+ acres were burned in a single year.
1963	44,823		"Everywhere" 3,300 fires burned 44,823 acres in a year.
1982	11,170		More than 10,000 acres in Eastern Virginia were destroyed by numerous spring wildfires.
1987	20,393		A dry summer and fall caused extreme fire conditions throughout the state. Governor Wilder considered cancelling fall hunting season as fires burned in Southwest Virginia until a frontal system reduced the fire risk.
1995	9,240	$1,258,541	On April 9, dry conditions, gusty winds, and deadwood resulted in 66 acres of forest burned in Buckingham County, 150 acres of forest burned in Franklin County requiring 65 residents to be evacuated, and 24 acres of forest burned in Pittsylvania County, all on the same day. Damage was estimated at about $50,000.

Twenty-six jurisdictions defined wildfire as a "medium-high" risk within their local hazard mitigation plans. Four jurisdictions - Albemarle, Clarke, Roanoke, and Warren counties - have identified wildfire as a "high risk."

Using VDOF criteria a GIS representation was generated to demonstrate an overall wildfire risk assessment.

Figure 3.11-2: VDOF Statewide Wildfire Risk Assessment



(Figure Source: *Commonwealth of Virginia Hazard Mitigation Plan*)

According to National Climatic Data Center (NCDC) crop and property damage data, the Commonwealth can expect approximately $377,009 in annualized damages per year for wildfire-related events. Annualized damages were calculated by taking the total damages per jurisdiction and dividing by the period of record and adjusting for inflation.

However, a more realistic perspective of probable loss for the Commonwealth using information supplied by the VDOF is expected annualized damages of approximately $7,189,330. This dollar value was calculated using wildfire damages from 1999 through 2008 and adjusting for inflation. One of the reasons for the difference in the two annualized loss estimates is a result of the VDOF data including all types of damages, to include timber, structures, and personal property while the NCDC data only documents damages to property and crops. Additionally, the VDOF database is a much more complete record of all wildfires in Virginia, while NCDC is known to be an underestimate of the true quantity of events and damages – not just for wildfire, but for all event types. The difference also highlights the fact that wildfire is a predominant hazard in Virginia.

Avian Influenza (AI), a low pathogenic and highly contagious disease with multiple strains, has the significant potential to devastate Virginia's poultry businesses. In 2012, per the Virginia Poultry Federation, it provided a direct economic impact of $3,608,859,090 to the Commonwealth and overall contribution of $8,062,929,510 in economic activity. The bulk of the poultry industry is located in or near the northern and central Shenandoah Valley.

Per the Virginia Poultry Federation, in 2012 the poultry industry:

- Generated approximately direct 13,400 jobs
- Generated approximately indirect 28,500 jobs
- Supported the livelihood of more than 1100 farm families
- Ranked in the Top 10 in the U.S. in production of chicken and turkey

The Virginia Department of Agriculture and Consumer Services (VDACS), the Virginia Department of Environmental Quality (DEQ), and the Virginia Cooperative Extension Services out of Virginia Tech all acknowledge the importance of and provide information this hazard.

The most recent AI situation was in 2007 when an H5N1 subtype was identified in turkeys as a result of routine testing. An immediate ban on poultry shipping, shows, etc. was ordered by the VDAS State Veterinarian. This order affected 17 counties in the Shenandoah Valley. They were Albemarle, Alleghany, Augusta, Bath, Clarke, Culpeper, Frederick, Greene, Highland, Madison, Orange, Page, Rappahannock, Rockbridge, Rockingham, Shenandoah, and Warren.

Historical records of Avian Influenza outbreaks are kept by DEQ. According to their records, in 1983 an avian influenza outbreak cost Virginia poultry farmers and industry approximately $40 million. In 2002, the poultry industry in the Central Shenandoah Valley was affected by an even larger avian influenza outbreak, costing the industry an estimated $130 million.

At the time of the outbreak in 2002, more than 56 million commercial turkeys and chickens were being grown on more than 1,000 poultry farms. It was on March 12, 2002, when low pathogenic avian influenza was confirmed in a turkey breeder flock near Penn Laird. One month later more than 60 flocks tested positive. A total of 197 farms were infected, and 4.7 million birds were destroyed to eradicate the virus. Adjusting for inflation, the value of the 2002 loss would be more than $170 million in 2014.

Pan-Flu Epidemic is a threat to the continuity of businesses and government, as well as being a serious life threat to the elderly, very young, and those with immunologically suppressed systems. An influenza pandemic can occur when a non-human (novel) influenza virus gains the ability for efficient and sustained human-to-human transmission and then spreads.

A recent pan-flu outbreak occurred in 2009. This outbreak initiated in Vera Cruz, Mexico and spread globally. In April, the flu event was the first situation ever declared by the World Health Organization (WHO) to be a "public health emergency of international concern." In June, it was declared by both WHO and the Center for Disease Control (CDC) in the USA to be a pandemic. In August of 2010, the pandemic was officially declared over. Final approximate death count was estimated to be in excess of 284,000 people.

A key component of the 2009 outbreak was not just the ease of transmission; it was the ease of people to travel from place to place. Virginia has international airports, deep water ports, extensive highway infrastructure, and passenger rail. For example, Dulles International Airport hosted more than 21.9 million passengers in 2013 and Ronald Reagan Washington National Airport serviced more 20.4 million passengers.

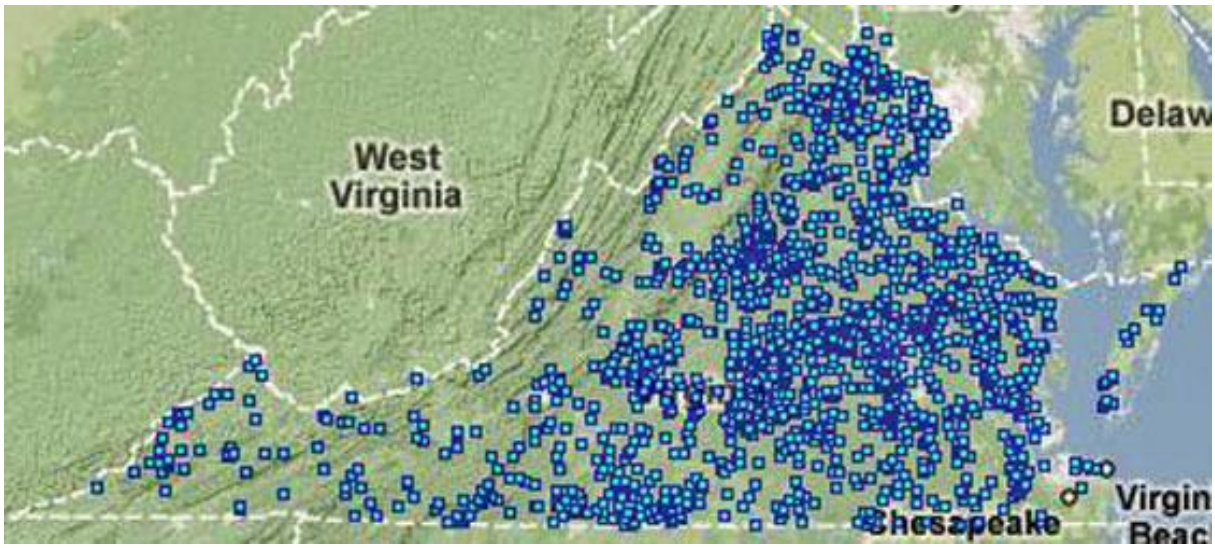
In November of 2007, the Federal Reserve Bank of St. Louis published a study of the economic impacts of the 1918 flu epidemic entitled, *Economic Effects of the 1918 Influenza Pandemic Implications for a Modern-day Pandemic.* Among other conclusions, the study indicates that impacts of a modern day pan-flu Epidemic would include:

- Some businesses would have revenue losses in excess of 50%,
- Job loss, and
- Health care services would lack the capacity to provide services.

Technological:

Dam failure presents recognized downstream impacts of such potential magnitude that it is identified as a potential condition for the buyer to understand on the mandatory real estate disclosure statement from the Virginia Department of Professional and Occupational Regulation (DPOR).

Virginia is home to only two natural lakes — Lake Drummond in the Great Dismal Swamp and Mountain Lake in Giles County. All other lakes are a result of impoundments.



(Image Source: *2013 National Inventory of Dams* by the Association of State Dam Safety Officials)

According to the 2013 America's Report card for Infrastructure generated by the American Society of Civil Engineers (ASCE), Virginia has 184 "high hazard" dams. The definition for high hazard can be found at *4VAC50-20-40, Hazard potential classifications of impounding structures (B)(1)* "High Hazard Potential is defined where an impounding structure failure will cause probable loss of life or serious economic damage. "Probable loss of life" means that impacts will occur that are likely to cause a loss of human life, including but not limited to impacts to residences, businesses, other occupied structures, or major roadways. Economic damage may occur to, but not be limited to, building(s), industrial or commercial facilities, public utilities, major roadways, railroads, personal property, and agricultural interests. "Major

roadways" include, but are not limited to, interstates, primary highways, high-volume urban streets, or other high-volume roadways.

In its *2013 Performance Report for the State of Virginia*, the Association of State Dam Safety Officials indicate that approximately 50 of Virginia's high hazard dams are in "poor" condition and another 10 in "unsatisfactory." This organization defines these two conditions as:

- Poor – A dam safety deficiency is recognized for loading conditions, which may realistically occur. Remedial action is necessary.
- Unsatisfactory – A dam safety deficiency is recognized that requires immediate or emergency remedial action for problem resolution.

The Virginia Department of Conservation and Recreation lists four reasons for dam failure. They are:

- Lack of attention and maintenance,
- Days of rain plus weakened dams,
- Inadequate spillway size, and
- Extreme event (precipitation or seismic) or other means;
    - Contractor error and/or
    - Equipment malfunction.

The location of the dam and the level of failure are the two key factors associated with potential impacts from an event of this nature. As "high hazard" has been defined by regulation and the evaluative processes indicate that approximately 60 of the high hazard dams are at significant risk of failure, a calculation determines that if any single or combination of the identified reasons for dam failure happen and result in catastrophic collapse, then significant life, economic, and infrastructure consequences may occur in the inundation zone. Lake Moomaw is an example of an impounded body of water where, if the Gathright Dam were to catastrophically fail, there would be significant and lasting consequences for multiple downstream localities.

Radiological event is classified as a low probability, high consequence event. It represents a potential hazard of such consequence that all states with nuclear reactors are required to perform an annual graded exercise evaluated by the Nuclear Regulatory Commission (NRC). In addition to the testing process, the NRC provides guidance on the physical protection of facilities, material controls, and accounting for special nuclear materials. FEMA, in coordination with the NRC and other federal agencies, has assisted in identifying response priorities and processes for a radiological event.

Virginia's nuclear reactors are located in two locations, Surry and Louisa Counties. Areas around these sites are monitored at all times with radiation detectors. The potential for impacts from a nuclear event will be determined by the nature of the event. The impacts can be increased or decreased by weather conditions. Should an event occur, it would fall under one of four classifications with actions as required:

- Notification of an unusual event – detection of a minor problem, no release of radioactive matter is expected, no danger to the public, and no special precautions are needed.

- Alert – a minor incident has occurred, small amount of radioactive might be released within the station, no danger to the public, and no special precautions are needed.
- Site Area Emergency – a more serious incident has happened, a possibility of small amounts of radioactive material could be released into the area immediately surrounding the site, and listen for instructions from the local TV or radio station broadcasting emergency information.
- General Emergency – the most serious type of event, radioactive material may be released outside the station site. Sirens will sound. A General Emergency may require that prompt, specific steps or actions be taken to protect yourself or family. Listen for instructions from a local TV or radio broadcasting emergency information.

Depending on the level of the event and weather conditions, specific consequences can include:

- A requirement for nearby residents to evacuate or shelter in place,
- A negative impact on agriculture and farming products, especially milk,
- Loss of critical infrastructure and a key resource,
- Power outages,
- Environmental impacts, and
- Closure of roads and shipping/transportation facilities due to downwind impacts.

Currently, no Virginia nuclear power plant has had an event that has been classified as greater than a Notification of an Unusual Event. That notification occurred as a result of the Louisa Earthquake that forced the shutdown of the North Anna reactors, 11 miles from the epicenter of the quake. However, historical events such as Chernobyl, Three Mile Island, and more recently Fujishima and their subsequent impacts illustrate the need to identify this as a hazard and risk.

Human Caused

Vehicle Borne Improvised Explosive Device (VBIED) is a relatively simple mechanism that has been used multiple times in the US with success. Historical events include:

- The Alfred P. Murrah Federal Building in Oklahoma City, OK – 1995
- The World Trade Center Bombing, New York City, NY – 1993
- Criminal enterprise associated car bombs, Cleveland, OH – mid-1970s
- The Bath School Disaster, Bath Township, MI – 1927
- The Wall Street Bombing, New York City, NY – 1920

While damages are directly related to the materials used, the amount of the materials, the placement of the vehicle, the vulnerability of a structure, and other considerations such as occupancy, a VBIED has the potential to kill hundreds, create significant social impacts, damage or destroy critical infrastructure and key resources, and undermine confidence in government.

Improvised Nuclear Device potential events are classified as low probability, high consequence. While the difficulty in procuring fissile material, transporting it, preparing it

properly, and creating a bomb cannot be overstated, the ingenuity and determination of an enemy state or agent should not be underestimated.

Potential consequences of such an event could include thousands dead, loss of critical infrastructure and key resources, societal disarray, significant economic impacts, loss of governmental structure and services, etc. It would also provide encouragement and celebration to the entity that perpetrated the event, encouraging additional strikes and measures.

Chapter 3 – "assess each threat and hazard in context to develop a specific capability target for each core capability consistent with federal National Preparedness Goals"

In direct parallel with the FEMA-mandated THIRA process, each identified threat and hazard is assigned a geographical location where the probability of occurrence is matched with historically and probability matched criteria. The locations were selected to incorporate all of Virginia and the events are difficult enough to exceed current known state capacity in some or most core capabilities in all mission critical areas.

Included in this process was the identification of Virginia Emergency Response Team (VERT) agencies and their responsibilities as defined with the Commonwealth of Virginia Emergency Operations Plan (COVEOP) to ensure that no VERT agency was excluded. Also considered were the National Capital Region (NCR) and Hampton Roads Catastrophic plans as they were referenced to assist in defining the events that would most impact those regions.

As events are multi-jurisdictional and would clearly involve state agencies, the application of FEMA-mandated THIRA measures for desired outcomes of each core capability provides a legitimate first C-THIRA effort base-line.

Threat and Hazard Contextualization

Hurricane – A strong Category 3 on the Saffir-Simpson scale hurricane impacts Virginia during Labor Day week with heavy flooding and significant storm surge. Initial impacts of the hurricane's effects will be in the Chesapeake/Virginia Beach area during high tide. The storm travels essentially north-northwest, almost paralleling the Virginia coastline and into the Chesapeake Bay. It makes landfall as Category 2 and loses strength as it crosses over the Middle Peninsula and Northern Neck regions. The storm impacts Northern Virginia as a tropical storm and stalls, dropping an additional 15 to 20 inches of rain in 24 hours.

Earthquake - At 11 a.m. on a Wednesday in late-January, a 6.5 magnitude event occurs as a result of reverse-faulting with the epicenter in north-central area of the Central Virginia Seismic Zone slightly south of Mineral. The principle fault line runs southwest to northeast with minor connecting fault lines running off at other angles. The shaking can be easily felt as far as 400 miles away.

Winter Storm - An arctic jet stream collides with winter oceanfront storm system pushing across Virginia. The 48-hour snowfall across Virginia ranges from a high of 56 inches through the Shenandoah Valley to a low of 20-24 inches in Hampton Roads. Average snow accumulation across the Commonwealth is in excess of three feet. Winds are at a sustained 20 mph with gusts of up to 45 mph and heavy drifting is occurring. Weather forecast is calling for the precipitation to continue with snowfall to change to ice over the next few days. Maryland, Pennsylvania, DC, and North Carolina are all reporting extreme blizzard conditions roughly equivalent to Virginia. Average temperature during the day in central and northern VA is 15° F and at night is 0°.

Wildfire - Drought conditions across all of Virginia result in a Cumulative Severity Index (CSI) of approximately 700. Dry lightning strikes ignite numerous spot fires in Pulaski and Montgomery County with high winds carrying flaming debris to ignite other locations. Relative

humidity values range from low to upper 20s and fuel moisture is less than 7%. High temperatures range from low to upper 80s with low temperatures in mid to upper 60s. Winds are predominantly blowing from south-west to northeast 20 to 25 mph with gusts up to 45 mph. Seven day weather forecast indicates no precipitation is expected, calls for high temperatures in 90s, and low temperatures in 70s. Winds for next two days to continue from Northwest at 20 to 25 mph with gusts up to 40 mph. Relative humidity values will range from upper teens to mid 20s and fuel moisture is expected to remain at less than 7%.

Avian Influenza Outbreak - Highly pathogenic Avian Influenza A Virus, referred to as HPAI H5N1 and sometimes shortened to H5N1, has been verified in at least 250 Virginia poultry farms, predominantly in the Shenandoah Valley region. Poultry mortality rate is in excess of 90%. If there is no additional spread, current minimum culling estimates are for eight million birds. The source of the infection is not yet identified and the full extent of the outbreak is not yet known, but quarantining has started for breeding populations. H5N1 outbreaks are simultaneously occurring in North Carolina, Maryland, and West Virginia. Current analysis validates that the same strain of H5N1 is affecting all three states. Officials have not yet started to check wild bird populations.

Pan-Flu Epidemic - In early November, initial flu cases are identified in Northern Virginia. This flu is a novel strain that is not recognized by the human immune system. It causes increased sickness and death and is a readily sustained person-to-person transmissible virus. A presumption exists that initial infection to the area may have come from Hong Kong/Asia air passengers debarking at one of the international airports in Northern Virginia. By mid-January, the influenza has spread across Virginia, Washington D.C., Maryland, and Pennsylvania with higher concentrations identified in the higher population density areas corresponding with major vehicle transportation corridors. Current estimates are that up to 35% of the population in Northern Virginia may have been exposed. The exposure rate diminishes as distance increases from Northern Virginia. The current exposure rate in the Richmond Metro area is estimated to be between 10 and 20%. The current exposure rate in the Hampton Roads region is estimated to be between 5 and 15%.

Dam Failure - The Gathright Dam impounds Lake Moomaw, a 2,530 acre lake with water depths as much as 150 feet. It normally holds approximately 40 billion gallons of water. In 2009, the USACOE gave the Gathright a Dam Safety Action Classification (DSAC) II (defined as "Urgent - Unsafe or Potentially Unsafe") due to seepage at the toe. Heavy rains (more than 30 inches in under 12 hours) following previous drought conditions causes a toe fracture at the dam base of the Gathright Dam in Covington. The base fracture results in a sudden, catastrophic failure of the dam. Water from the dam is traveling downstream at approx 35 mph. As the river is already swollen due to the rains, the addition of the dam water raises the river level in the inundation zone to approximately the 1000-year flood level.

Radiological Event - During the Fourth of July weekend, Surry Nuclear Power Plant experiences a General Emergency with a "worst-case" release of radiation. Eastward wind conditions are 10 to 15 mph with gusts of up to 20. Weather conditions are in excess of 90° F with 85% humidity. Instrumentation was reading normal until the sudden catastrophic failure of the steam generator in Unit 2. Initial structural thoughts are that at least one vertical U-tube has ruptured causing heat levels in the pressurizer to rapidly increase. The failure of the steam generator has caused pressure and heat to build up in the containment building to the point that a

relief valve opened, venting steam directly into the atmosphere. Appropriate vector evacuation sirens have been sounded.

Vehicle Borne Improvised Explosive Device (VBIED) - At 2:15 p.m. on the last Sunday in October, a small delivery truck containing 4,000 pounds of ammonium nitrate/fuel oil (ANFO) is detonated adjacent to the south side of a sports stadium during an event. Construction of the stadium area is aluminum and steel open frame. The stadium is at full capacity. Simultaneously, a vehicle marked to resemble a heavy duty ambulance/medical transport explodes under the emergency room canopy of the nearby hospital carrying roughly two tons of ANFO. In addition to the damage to the hospital, emergency response vehicles/rescue squad ambulances parked nearby are damaged or destroyed. At the time of the explosion, approximately 175 of the 225 beds in the hospital were occupied.

Improvised Nuclear Device (IND) - During the first week in July at mid-day in Washington DC, a 10-kiloton IND has been exploded in downtown. Most buildings within 1,000 meters are severely damaged if not destroyed. The mushroom cloud is drifting south-southwest. Electrical distribution grids are destroyed. Most electronic devices within approximately three miles are disabled or destroyed due to electro-magnetic pulse generated by the explosion. Structural damages and injuries occur as far out as four miles due to flying debris. Communication infrastructure is significantly impacted. Cascading impacts include power generation and distribution systems away from the blast site.

Core Capability Targets

Core capability targets were designed to be measurable and in accordance with the federal National Preparedness Goals. The C-THIRA core capabilities reside within the five mission critical areas of Prevent, Protect, Mitigate, Respond, and Recover. Of the core capabilities, three span all five mission critical areas. They are Planning, Public Information and Warning, and Operational Coordination.

Planning Core Capability - Successful implementation of state, regional, and local plans and annexes as appropriate for the event to include the COVEOP, Continuity of Operations, Recovery, and Hazard Mitigation, Emergency Medical, Incident Action Plans, and catastrophic plans. Monitor the implementation process and document the results. Where required, provide for a review of After Action Reports to determine if or where changes need to be made. Implementation timeframe will be driven by the event and by the timeframes established within the plans themselves. Updates to plans will be completed within the appropriate planning cycle for that item or as identified as needed based on After Action Reports.

Public Information and Warning Core Capability - Share prompt, actionable, and accurate information 100% of the time; when events allow, provide information to the public regarding possible impacts and actions to be taken no less than 72 hours prior to the event. If the event is dynamic in nature, such as an IND, provide appropriate, single message to the public providing information relevant to the situation no more than one hour post impact that is minimal in nature but comprehensive enough to allow the public to information to act appropriately. During and immediately after an event, expand the various communication platforms to meet required capacities 100% of the time with a strong focus on single messaging and keeping appointed/elected officials in the loop via a Joint Information Center. Coordinate state-level elected officials' public outreach.

Operational Coordination Core Capability - Share prompt, actionable, and accurate information 100% of the time with 100% interoperability and capacity as defined by the appropriate plans and procedures in place for each type of event; provide direct linkages between agencies and entities as required to coordinate response and recovery 100% of the time before, during, and after an event; provide a common use platform providing essential elements of information for appropriate agencies and entities 100% of the time before, during, and after an event. Increase trained staff available for functional deployment by 100% and increase technical/platform capacity by 100% within the next three years.

Forensics and Attribution Core Capability - In coordination with other applicable entities, provide the ability and capacity to identify and attribute actions, equipment and materials used, and entities involved 100% of the time post human-caused or technological event.

Intelligence and Information Sharing Core Capability - In coordination with other applicable partners and entities via the Fusion Center, share critical information as appropriate to reduce the probability of deliberate physical human or cyber driven activities that are designed to disrupt, harm or otherwise damage people, systems, structures, or infrastructure 100% of the time in advance of the potential event occurring. Expand provision of training and placements of key staff to facilitate coordination with appropriate agencies by 100%.

Interdiction and Disruption Core Capability - In coordination with other applicable partners and entities via the Fusion Center, act on the shared critical information as appropriate to reduce the probability of deliberate physical human or cyber driven activities that are designed to disrupt, harm or otherwise damage people, systems, structures, the economy, or infrastructure 100% of the time in advance of the potential event occurring. Increase technical capacity and staffing by 100% to meet shortfalls that currently exist.

Screening, Search, and Detection Core Capability - In cooperation with other applicable partners and entities and coordinated through the various transportation sectors screen 100% of all packages, luggage, et.al. with the intent of detecting and identifying goods, materials, components, infected animals, etc. that pose a threat to the Commonwealth, its citizens, or its economy. Once identified, then interdict and disrupt as appropriate for the security of the Commonwealth with a 100% success rate.

Access Control and Identity Verification Core Capability - In coordination with federal partners, to verify identity and control access to EOCs and JFOs 100% of the time under all conditions in all events.

Cybersecurity Core Capability - In coordination with appropriate public and private partners, ensure that the Commonwealth's systems remain secure 100% of the time under all conditions. To provide support and assistance to private sector partners in accordance with existing plans and processes, including the National Infrastructure Protection Plan.

Physical Protective Measures Core Capability - In coordination with appropriate partners and using existing plans, identify physical vulnerabilities with the intent to prioritize/focus, implement, and maintain resources or activities to reduce or mitigate potential consequences from harm caused by human, technological, or natural events. The Commonwealth recognizes that 100% efficacy is impossible in the totality of these situations (especially the natural) and so will continue to identify and target high-priority vulnerabilities as measured/identified using risk and consequence analysis. Implement 100% of state mitigation activities as identified in the 2013 Hazard Mitigation Plan.

Risk Management for Protection Programs and Activities Core Capability - Ensure that 100% of operational activities and critical infrastructure sectors have and maintain appropriate threat, vulnerability, and consequence tools necessary to appropriately identify and prioritize threats and vulnerabilities as measured by consequences.

Supply Chain Integrity and Security Core Capability - Secure and increase resiliency for all critical and key transportation nodes within the Commonwealth. In coordination with public/private partners, implement programs and processes designed to help secure and make resilient methods of transportation and materials in transit.

Community Resilience Core Capability - In accordance with existing local, regional, and hazard mitigation plans, take actions as described in the mitigation strategies that will increase the whole community's ability to resist impacts and recovery more quickly from an event. Ensure that both the state hazardous materials and local hazardous materials plans are updated in a timely fashion to comply with the five- and three-year planning cycles.

Long-term Vulnerability Reduction Core Capability - Using current conditions as a baseline, achieve a measurable decrease in the vulnerability of the entire Commonwealth in the context of infrastructure, economic, historical, and cultural considerations.

Risk and Disaster Resilience Assessment Core Capability - Ensure that the Commonwealth, its regions, and its localities complete and regularly update contextualized risk assessments/analysis and update existing plans in accordance to the time frames as established for the various documents.

Threats and Hazard Identification Core Capability - Using sound science, historical occurrence, and in collaboration with the whole community, identifies the threat and hazard risks appropriate to the Commonwealth.

Critical Transportation Core Capability - Within 72 hours post-event impact, re-establish transportation corridors for (at minimum) the transportation of required resources to save lives and provide assistance to survivors.

Environmental Response/Health and Safety Core Capability - Within 12 hours post-event impact and/or as event appropriate, provide samples and measures of targeted environmental conditions for decision making purposes. Within a time frame dependent on the nature of the event and in accordance to existing plans/policies/procedures, make recommendations directly related to health considerations to include but not limited to boil water notices, shellfish harvesting, and other guidance as required.

Fatality Management Services Core Capability - Within 72 hours post event impact and if the impacted areas have been stabilized, the Commonwealth has an expectation to find and handle 75% of all casualties. Disaster patient locator services and family reunification processes will be set up within 72 hours post-event impact.

Infrastructure Systems Core Capability - Within 72 hours post-event impact, reestablish critical infrastructure or create workarounds as required within the affected areas to support on-going emergency operations, life sustainment, supply chains, and to support recovery operations 100% of the time.

Mass Care Services Core Capability - Within 72 hours post-event impact, initiate the provision of mass care and sheltering services for up to 90,000 people statewide with an estimated 5% special needs for up to 30 days.

Mass Search and Rescue Operations Core Capability - Within 24 hours of an officially declared state emergency or within 24 hours of event stabilization have appropriate resources being deployed to assist public/private partner operations in event affected areas.

On-scene Security and Protection Core Capability - In coordination with federal partners, on-scene security and protection will be established at all targeted locations within 24 hours post-event impact.

Operational Communications Core Capability - In coordination with public and private partners, communication is expected to be maintained 100% of the time. When operational communications are negatively impacted by an event, depending on the nature and extent of damage, restoration is targeted to be restored within 24 hours. Temporary measures to improve functionality should be in place within six hours of notification of systemic failure.

Public and Private Services and Resources Core Capability - As driven by the event, appropriate public/private MOUs and in place contracts will be activated in advance of the event to aid in meeting the pre-identified needs of the impacted areas. Where the event is spontaneous in nature and an emergency declaration is made by the governor and then existing contracts will be implemented. Per Virginia Code, if an event occurs that requires a vendor that does not have a contract in place, then the normal procurement process can be bypassed.

Public Health and Medical Services Core Capability - As event driven and in accordance with existing plans and processes, Virginia will track the event, identify appropriate actions, activate or request the needed resources 100% of the time. Once the resources are enroute and when necessary, points of dispensing (PODs) will be established within the impacted health districts.

Situational Assessment Core Capability - The Commonwealth of Virginia will monitor state conditions 24/7/365 100% of the time. Information will be gathered and dispersed to decision makers in a timely manner appropriate to the event and based on local sit-rep reports, media, and other communication resources.

Economic Recovery Core Capability - In accordance to existing plans and processes, the Commonwealth will act to identify the economic impacts from an event and where possible, identify strength, weaknesses, opportunities, and threats to assist in identifying appropriate actions to take to restore the economic base of the impacted area. Depending on impacts, economic recovery actions will be identified for short-term (up to six months), mid-term (six months to two years) and long-term (more than two years) and designed to return the affected area to sustainability.

Health and Social Services Core Capability - An assessment of impacts will be performed starting immediately after the event. Dependent upon the extent of the event, this assessment timeframe may range from 72 hours to several weeks. Using the information gathered in the early stages of the assessment and in accordance with existing plans and processes, the Commonwealth will construct a preliminary schedule of actions and activities necessary to initiate actions for a comprehensive recovery.

Housing Core Capability - Depending on the extent and nature of the event and within three to fourteen days after operational conditions have stabilized an initial assessment of housing and placement needs will take place. Once this assessment has been completed, the process of identifying resources for temporary housing will start.

Natural and Cultural Resources Core Capability - Depending on the extent and nature of the event and resources available, the Commonwealth will work to stabilize conditions of natural resources. Identification of opportunities for the preservation of cultural resources is an on-going process that occurs at all times. Post-event impact, this identification process provides a baseline measure of what needs to be done (where possible) to restore and mitigate the impacted resource.

Chapter 4 – "estimate the resources required to achieve the capability targets through the use of community assets and mutual aid, while also considering preparedness activities, including mitigation opportunities."

Existing data sets for this criterion are currently very limited. Identification can be made of some strengths and weakness for localities using the 2014 Local Capability Assessment for Readiness (LCAR) reports in which jurisdictions have self-evaluated and responded to specific questions that can be linked to core capabilities or mission critical areas. Cross referencing the LCAR inputs with the local jurisdiction training requests information gathered by VDEM's Office of Training and Exercise makes it possible to identify some of the core capabilities the localities self-identified as needing additional training in as a component of considering the preparedness activities required. However, the completion of an accurate gap analysis to estimate other resources required to achieve capability targets requires additional, in-depth gathering of information.

Per the 2014 LCAR reports:

- In the area of "Mitigation", localities have evaluated themselves at an average of 69 % across the Commonwealth. Specific components of the questionnaire discuss mitigation planning, mitigation activities to deal with repetitively flooded properties, and participation in national mitigation based programs. Mitigation is an overall mission critical area within the THIRA and C-THIRA.
- In the LCAR area of "Resource Management and Logistics," which can be tied to the core capability of Operational Coordination, localities self-evaluated with an average score of 70%. Specific questions within the LCAR discuss mutual aid, existing contracts, volunteer coordination, and donations management.
- In the LCAR area of "Planning," an identified core capability in all mission critical areas, localities self-evaluated at an average score of 90% across the Commonwealth. Specific questions within the LCAR discuss Emergency Operations Planning, Continuity of Operations Planning, Special Needs Planning, Mass Care and Sheltering, and outreach.
- In the LCAR area of "Direction, Control, and Coordination," which can be directly tied to the core capability of Operational Coordination, localities self scored at an average of 88%. Specific questions within this category referred to Emergency Operations Center activation, mobile command posts, and the National Incident Management System (NIMS).
- In the LCAR area of "Communications and Warning," which can be directly tied to the core capabilities of Operational Communications and Public Information and Warning, localities self-scored at an average of 86%. Specific LCAR questions referenced interoperability, communication procedures, backup systems, and Reverse 911.
- In the LCAR category of "Operations," localities self-scored with an average of 86% across the Commonwealth. Specific questions that can be tied to core capabilities referred to Planning, Search and Rescue, and Operational Communications.
- In the LCAR area of "Training," which can be directly referenced in identifying needs and resources for improved performance or to meet core capability targets, localities self-scored at an average of 76%. Questions within this section reference NIMS, hazardous materials, and the need for a locality to develop an annual training needs assessment.

- In the LCAR area of "Crisis Communication, Public Education, and Information," which can be directly tied to the core capability of Public Information and Warning across all critical mission areas, localities self-scored at an average of 70%. Specific questions referenced public outreach, Community Emergency Response Teams (CERTs), communication with special needs populations, and Public Information Officers.

As identified in the records from VDEM's Office of Training and Exercise, the top core capabilities exercised this year through 145 training opportunities were:

- Operational Coordination – across all mission critical areas
- Public Information and Warning – across all mission critical areas
- Planning – across all mission critical areas
- Mass Care Services
- Health and Social Services
- On-Scene Security and Protection
- Environmental Response
- Intelligence and Information Sharing
- Operational Communication
- Situational Assessment
- Threats and Hazard Identification
- Critical Transportation

As these training opportunities were offered in direct response to requests from localities, it indicates the core capabilities the jurisdictions targeted and prioritized for improvement or exercise. While this does not indicate the functional level of resource requirements necessary to achieve the core capability targets through the use of community assets, combining this information with the LCAR self-assessments may provide insight into the areas that communities wish to improve.

Currently, there has been no comprehensive C-THIRA review of the mutual aid agreements for all cities, counties, or regions in Virginia. While there are known mutual aid agreements dealing with such issues as debris management, fire and emergency services response, shared emergency operation center (EOC) resources, portable radio caches, and UASI components, there is no comprehensive list or resource that can allow for fact based estimations.

Mitigation opportunities have been self-identified by every locality that has a hazard mitigation plan. Almost all jurisdictions participate in one of the 22 regional mitigation plans facilitated by the planning district commissions. A key required component of this plan is to identify strategies and opportunities that will assist the community in reducing its risk and increasing its resilience.

Mitigation is cost effective. FEMA has demonstrated that for every dollar spent on mitigation, there is a four dollar savings against future damages. Estimation of the resource requirements are predicated on the review of these strategies and a discussion resulting in agreed upon local, regional, and state prioritizations. Once this is accomplished, then resources can be identified for those mitigation opportunities.

Chapter 5 – "shall assess the Commonwealth's state of planning, organizing, training, equipping, exercising, evaluating, and ability to take corrective action, as well as any shortfalls in these areas"

The process as specified in this section of the legislation is a functional gap analysis with identification of corrective measures or shortfalls. It starts with baseline measures of the Commonwealth's capacities as specified. Once these capacities are qualified and quantified, then they are compared against the desired level capacities. The gap analysis process provides input to what activities meet current desired capacities and what activities do not.

Once any gaps are determined and measured, then an additional evaluative process needs to be implemented to determine the ability to or the methodology to take corrective actions. This can be achieved by using a business process with steps that identify targeted components, internal processes, and products, etc. with a focus on efficacy and efficiency.

Partial information that assists in this process is captured in the 2013 THIRA and State Preparedness Report (SPR), Coordinator's Briefings, After Action Reports (AARs), event logistics requests made through the Virginia Emergency Operations Center and documented in WebEOC. Current assessment methodology includes surveys to identify if the Commonwealth is providing is actually concurrent with identified needs. In example the survey and information gathering process of the VDEM Office of Training and Exercise:

- **Improvement Planning Workshops (IPW) (governed by the Homeland Security Exercise and Evaluation Program doctrine)**
    - IPWs framed by the THIRA core capabilities and any specialized locality inputs needed based on specifics for that area.
    - IPWs are conducted in each VDEM region (as well as some sub-regions) on an annual basis.
    - IPWs may identify any threats and/or hazards the localities within that region want to include not already on the state THIRA prioritized list.
    - IPW information is cross referenced against exercise and real-world event after-action reports for validation measures.
    - Identify training to build capability, and then exercise to test newly improved capability.
    - All these inputs from each region, plus inputs from other stakeholders such as other state agencies, VERT agencies, etc, feed into the annual State Training and Exercise Plan.
- **Training Assessment Survey**
    - Done biannually
    - Focuses on level of satisfaction with current offerings, what areas not currently meeting needs, marketing strategy, and barriers to enrollment to identify training and exercise shortfalls
    - Results are reviewed and an improvement planning session conducted to identify how processes and offering can be improved to meet identified needs
- **Post-course Surveys**

    - Each course has a survey associated with it that assesses customer satisfaction with the course material and course logistics, and requests suggestions for improvement
    - Results are compiled monthly with corrections applied as necessary.
- **Other Ad Hoc Surveys**
    - Periodically conducted when determination is made that feedback on some specific program element or strategy is needed. (i.e. post-exercise or event.

Chapter 6 – "serve as the Commonwealth's strategic approach to improving future preparedness"

The 2014 C-THIRA is the initial step of this process. It is the beginning of a roadmap, which has:

- Identified the threats and hazards of concern
- Contextualized these threats and hazards
- Articulated measureable and achievable targets for core capabilities
- Identified information sources and gaps
- Provided a process for gap analysis
- Recommended standardization and iteration
- Understood that conditions change and flexibility is critical
- Been consistent with the National Preparedness Goals
- Provided specific information on suggested actions for future C-THIRAs

This report recommends that the next step is to initialize the 2015 C-THIRA process by developing a specific plan for the implementation of the actions discussed within this report, to include:

- Completing a review of data sets available
- Identifying data gaps
- Conducting outreach to regions and localities
- Collection of information
- Validation of measures and capability targets
- Working with appropriate entities on the prioritization process
- Presentation of information
- Iteration of the C-THIRA process to insure accuracy and viability

Implementing the next step will require the development of appropriate resources, personnel, and coordination with stakeholders. The coordination insures the C-THIRA process is one that considers the constraints and burdens on all stakeholders, most especially the localities. Ideally this next step would be concurrent with existing planning activities or requirements. This serves two main purposes: first, it would help to enable direct sharing of information, and; second, it would assist the state agencies and localities in quantifying their needs and capabilities as part of their individual planning processes. Lastly, recognizing that this is the first C-THIRA, this methodology also serves as a mechanism which assists in gathering additional information as to how to better this process for future iterations.