



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Completion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)	
		the geographic location of each repetitive loss property and determination if that property has been mitigated and by what means. Provide corrections if needed by filing form FEMA AW-501.																					
6	2010	Determine feasibility of developing a drought preparedness and response plan	Town Manager						X									General Funds, FEMA Unified Hazard Mitigation Assistance funding,	December 2013	Research and identify applicable funding mechanisms to develop the plan.	Medium	No	



XVIII. Town of Quantico

Quantico is located on the Potomac River in Prince William County and surrounded by Marine Corps Base Quantico. The 2000 census estimate for the town was 561 and was estimated by the Census Bureau to be 607 in 2009. Based on the 2005-2009 American Community Survey, the town population was comprised of 63.8% white, 16.1% black or African American, 1.3% Native American, 6.3% Asian, 2.9% from other races, and 9.5% bi-racial. Hispanics or Latinos, of any race, represent 8.4% of the total population.

Quantico has a moderate climate. Temperatures generally range from lows in the mid-20s in January to highs in the upper-80s and lower-90s during the month of July. Annual precipitation averages are approximately 41 inches of rain and 16 or more inches of snow fall in any given year. Recent history proves that weather events well outside of these averages can and do occur. Climate change is expected to continue the trend of the past 40 to 50 years of an increased frequency of extreme weather events.

The town is also subjected to tidal and storm surge flooding, due to its location on the Potomac River. As sea levels rise, permanent inundation of low lying areas along and near the river shoreline is also a concern. Quantico is also susceptible to other natural hazards and risks, such as storm damage and winter weather, as evidenced during the 2009 – 2010 winter and summer seasons.

To a large extent, historical records are used to identify the level of risk within the Northern Virginia region, including Quantico, with the assumption that the data sources cited are reliable and accurate. Unless otherwise cited, data on historical weather-related events is based on information made available through the Storm Event Database by NOAA’s NCDC⁵⁵. Hazards were ranked using a semi-quantitative scoring system that involved grouping the data values (normalized to account for inflation) based on statistical methods. This method prioritizes hazard risk based on a blend of quantitative factors extracted from NCDC and other available data sources. The parameters considered include:

- Historical occurrence;
- Vulnerability of population in the hazard area; and
- Historical impact, in terms of human lives and property and crop damage.

The hazard scores were assigned a category of ‘Low’; ‘Medium-Low’; ‘Medium’; ‘Medium-High’; or ‘High’. Based on this methodology, Flood, Wind, Tornado, Winter Weather, and Drought hazards were ranked as ‘High’ for Quantico. See Table 7.83 for a summary of hazard rankings.

Table 7.83: Hazard Ranking for Town of Quantico

Hazard	Flood	Wind	Tornado	Winter Weather	Drought	Earthquake	Landslide	Wildfire	Karst
Ranking	High	High	High	High	High	Med	Med-Low	Med	Med-Low



Annualized loss statistics for Prince William County based on NCDC historical data as the result of Flood, High Wind, Tornado and Winter Storm are summarized in Table 7.84.

Table 7.84: NCDC Annualized Loss by Hazard for Prince William County

Annualized Loss as determine through NCDC data
(based on property and crop damages and number of years of record)

	Drought	Flood	High Wind	Tornado	Winter Storm	Total Annualized
<i>Years of Record</i>	17	17	21	59	17	Loss (for all hazards)
Prince William County	\$114,402	\$155,044	\$795,511	\$117,080	\$60,502	\$1,242,539

It should be noted that while the NCDC storm events data is the most comprehensive database available for which to compare most natural hazards, its considerable limitations include spotty property and crop damage data that are considered to significantly under-estimate actual losses.

FEMA’s HAZUS^{MH} model provides another method for estimating annualized loss that uses science and engineering principals and building stock values along with historical hazard occurrences to analyze potential damage and economic loss. Annualized loss statistics for Quantico based on HAZUS^{MH} runs for flood, hurricane, and earthquake are found in Tables 7.85, 7.86, and 7.87 below.

Table 7.85: HAZUS^{MH} - Annualized Loss Due to Flood for Town of Quantico

Jurisdiction	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Total
Town of Quantico	\$16,000	\$17,000	\$0	\$0	\$0	\$0	\$0	\$33,000

Table 7.86: HAZUS^{MH} - Annualized Loss Due to Hurricane for Town of Quantico

Jurisdiction	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Total
Town of Quantico	\$2,050	\$370	\$4	\$211	\$38	\$151	\$40	\$2,864

Table 7.87: HAZUS^{MH} - Annualized Loss Due to Earthquake for Town of Quantico

Jurisdiction	Annualized Loss
Town of Quantico	\$1,032

As seen in the HAZUS^{MH} analysis, the potential annual loss to property, contents, inventory and related effects due to flooding is high, due to Quantico’s location. Earthquakes occasionally occur in the region; that was the case July 16, 2010, when a 3.6 magnitude quake centered near Gaithersburg, Maryland, shook the area.

A. Town of Quantico Mitigation Actions and Action Plan



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Completion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)
1	2010	Assess the roadway structure at various intersections throughout the Town of Quantico to avoid repeated flooding.	Office of the Mayor	X		X		X										Hazard Mitigation Assistance grant funding, County funding	December 2015	Identify funding sources by January 2012	High	No
2	2010	Continue to identify and employ a broad range of warning systems throughout the Town of Quantico.	Office of the Mayor	X	X	X	X	X	X	X	X	X	X	X	X	X	X	UASI funding, DHS grants, town/county funding	December 2015	Identify one new warning system to utilize by December 2012.	High	No
3	2010	Conduct annual outreach to each FEMA-listed repetitive loss and severe repetitive loss property owner, providing information on mitigation programs (grant assistance, mitigation measures, flood insurance information) that can assist them in reducing their flood risk.	Office of the Mayor	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Develop outreach materials, or identify appropriate outreach materials for dissemination by June 2011.	Medium	No
4	2010	Support mitigation of priority flood-prone structures through promotion of acquisition/ demolition, elevation, flood proofing, minor localized flood	Office of the Mayor	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Identify all priority flood-prone structures by December 2011.	Medium	No



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Comple- tion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)	
		control projects, mitigation reconstruction and where feasible using FEMA HMA programs where appropriate.																					
5	2010	Promote structural mitigation to assure redundancy of critical facilities, to include but not limited to roof structure improvement, to meet or exceed building code standards, upgrade of electrical panels to accept generators, etc.	Office of the Mayor	X		X	X											FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Query local government building services staffs as to effectiveness of provided information regarding the structural review.	Medium	No	
6	2010	Review locality's compliance with the National Flood Insurance Program with an annual review of the Floodplain Ordinances and any newly permitted activities in the 100-year floodplain. Additionally, Conduct annual review of repetitive loss and severe repetitive loss property list requested of VDEM to ensure accuracy. Review will include verification of	Office of the Mayor	X		X	X											General funds	Ongoing	Establish a schedule of review and review committee (if necessary) by June 2011.	Medium	No	



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Comple- tion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)	
		the geographic location of each repetitive loss property and determination if that property has been mitigated and by what means. Provide corrections if needed by filing form FEMA AW-501.																					
7	2010	Determine feasibility of developing a drought preparedness and response plan	Office of the Mayor						X									General Funds, FEMA Unified Hazard Mitigation Assistance funding,	December 2013	Research and identify applicable funding mechanisms to develop the plan.	Medium	No	



XIX. Town of Round Hill

Named after the 910 foot hill located just southwest of the town center, and part of the foothills of the Blue Ridge Mountains, Round Hill was incorporated in 1900. Round Hill was used during the American Civil War as a signals post by both the Confederate and Union troops.



The Town is located at the crossroads of Virginia routes 7 and 719, approximately 45 miles northwest of Washington, DC. The town was the terminus of the Washington and Old Dominion Railroad, formerly the Washington and Ohio line. It is located 7 miles from the Shenandoah River, 15 miles from Harpers Ferry and four miles from the Appalachian Trail.

The population of the Round Hill was 500 as of the 2000 Census and was 539 in 2010. It is part of Loudoun County. Round Hill covers 0.2 square miles of land. The town population was comprised of 93% white, 2.8% Black or African American, 1.1% Asian, and 0.9% bi-racial.

Round Hill has a moderate climate. Temperatures generally range from lows in the mid-20s in January to highs in the upper-80s and lower-90s during the month of July. Annual precipitation averages are approximately 38 inches of rain and 20 inches of snow fall in any given year, with May being the wettest month on average. Recent history proves that weather events well outside of these averages can and do occur. Climate change is expected to continue the trend of the past 40 to 50 years of an increased frequency of extreme weather events.

Round Hill is subject to high wind events and extreme winter weather. Winter storms pose significant threats, as evidenced during the 2009 – 2010 winter season.

To a large extent, historical records are used to identify the level of risk within the Northern Virginia region, including Round Hill, with the assumption that the data sources cited are reliable and accurate. Unless otherwise cited, data on historical weather-related events is based on information made available through the Storm Event Database by NOAA's NCDC⁵⁶. Hazards were ranked using a semi-quantitative scoring system that involved grouping the data values (normalized to account for inflation) based on statistical methods. This method prioritizes hazard risk based on a blend of quantitative factors extracted from NCDC and other available data sources. The parameters considered include:

- Historical occurrence;
- Vulnerability of population in the hazard area; and
- Historical impact, in terms of human lives and property and crop damage.

The hazard scores were assigned a category of 'Low'; 'Medium-Low'; 'Medium'; 'Medium-High'; or 'High'. Based on this methodology, Flood, Wind, Tornado, Winter Weather, and Drought hazards were ranked as 'High' for Round Hill. See Table 7.88 for a summary of hazard rankings.



Table 7.88: Hazard Ranking for Round Hill

Hazard	Flood	Wind	Tornado	Winter Weather	Drought	Earthquake	Landslide	Wildfire	Karst
Ranking	High	High	High	High	High	Med	Med-High	Med-Low	Med-Low

Annualized loss statistics for Loudoun County based on NCDC historical data as the result of Flood, High Wind, Tornado and Winter Storm are summarized in Table 7.89.

Table 7.89: NCDC Annualized Loss by Loudoun County

Annualized Loss as Determine through NCDC Data
(based on property and crop damages and number of years of record)

	Drought	Flood	High Wind	Tornado	Winter Storm	Total Annualized Losses (All Hazards)
<i>Years of Record</i>	17	17	21	59	17	
Loudoun County	\$351,549	\$216,429	\$176,618	\$119,785	\$31,982	\$896,364

It should be noted that while the NCDC storm events data is the most comprehensive database available for which to compare most natural hazards, its considerable limitations include spotty property and crop damage data that are considered to significantly under-estimate actual losses. Much of the NCDC data is gathered from damage reports and insurance records.

FEMA’s HAZUS^{MH} model provides another method for estimating annualized loss that uses science and engineering principals and building stock values along with historical hazard occurrences to analyze potential damage and economic loss. Annualized loss statistics for Round Hill based on HAZUS^{MH} runs for hurricane and earthquake are found in Tables 7.90 and 7.91 below.

Table 7.90: HAZUS^{MH} - Annualized Loss Due to Hurricane for Round Hill

Jurisdiction	Building	Contents	Inventory	Relocation	Income	Rental	Wage	Total
Town of Round Hill	\$44	\$2	\$0	\$2	\$0	\$1	\$0	\$48

Table 7.91: HAZUS^{MH} - Annualized Loss Due to Earthquake for Round Hill

Jurisdiction	Annualized Loss
Town of Round Hill	\$53

As seen in the HAZUS^{MH} analysis, the potential annual loss to property, contents, inventory and related effects is relatively low at \$49 for hurricane wind and \$53 for earthquake. Although



somewhat rare, earthquakes occasionally occur in the region. That was the case July 16, 2010, when a 3.6 magnitude quake centered near Gaithersburg, Maryland, shook the area.

A. Town of Round Hill Mitigation Actions and Action Plan



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Completion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)
				X	X	X	X	X	X	X	X	X	X	X	X	X	X					
1	2010	Identify the Town's Critical Infrastructure and develop a GIS layer	Loudoun County Office of Emergency Management/Town of Round Hill Planning	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Local funding, DHS funding, Hazard Mitigation Grant Programs	December 2012	Secure funding	Critical	No
2	2010	Implement drainage improvements in low-lying roadways.	Virginia Department of Transportation	X	X	X	X	X	X	X	X	X	X	X	X	X	X	DHS funding, Hazard Mitigation Grant Programs	December 2014	Secure funding	Critical	No
3	2010	Provide back-up power for critical facilities.	Town of Round Hill	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Local funding, DHS funding, Hazard Mitigation Grant Programs	December 2014	Secure funding	Critical	No
4	2010	Establish and test emergency notification procedures and protocols for Town personnel.	Town of Round Hill	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Local funding	December 2012	Allocate funding	Critical	No
5	2010	Develop and test a Continuity of Operations Plan (COOP).	Town of Round Hill / Loudoun County Office of Emergency Management	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Local funding, DHS funding, Hazard Mitigation Grant Programs	December 2014	Secure funding	Critical	No



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Completion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)
6	2010	Conduct annual outreach to each FEMA-listed repetitive loss and severe repetitive loss property owner, providing information on mitigation programs (grant assistance, mitigation measures, flood insurance information) that can assist them in reducing their flood risk.	Planning Commission	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Develop outreach materials, or identify appropriate outreach materials for dissemination by June 2011.	Medium	No
7	2010	Support mitigation of priority flood-prone structures through promotion of acquisition/demolition, elevation, flood proofing, minor localized flood control projects, mitigation reconstruction and where feasible using FEMA HMA programs where appropriate.	Planning Commission	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Identify all priority flood-prone structures by December 2011.	Medium	No
8	2010	Promote structural mitigation to assure redundancy of critical facilities, to include but not limited to roof structure improvement, to meet or exceed building code standards, upgrade of electrical panels to accept	Planning Commission	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Query local government building services staffs as to effectiveness of provided information regarding the	Medium	No



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Completion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)	
		generators, etc.																			structural review.		
9	2010	Review locality's compliance with the National Flood Insurance Program with an annual review of the Floodplain Ordinances and any newly permitted activities in the 100-year floodplain. Additionally, Conduct annual review of repetitive loss and severe repetitive loss property list requested of VDEM to ensure accuracy. Review will include verification of the geographic location of each repetitive loss property and determination if that property has been mitigated and by what means. Provide corrections if needed by filing form FEMA AW-501.	Planning Commission	X		X		X											General funds	Ongoing	Establish a schedule of review and review committee (if necessary) by June 2011.	Medium	No
9	2010	Determine feasibility of developing a drought preparedness and response plan	Town of Round Hill / Loudoun County Office of Emergency Management						X									General Funds, FEMA Unified Hazard Mitigation Assistance funding,	December 2013	Research and identify applicable funding mechanisms to develop the plan.	Medium	No	



XX. Town of Vienna

Originally called Ayr Hill, the Fairfax County village agreed in the 1850s to change its name to Vienna at the request of William Hendrick, a medical doctor who grew up in Vienna, New York. Vienna was incorporated into a town in 1890. The population of the town was 14,453 as of the 2000 Census and was estimated by the Census Bureau to be 15,215 in 2009. Based on the 2005-2009 American Community Survey, the town population was comprised of 76.5% white, 6% black or African American, 0.2% Native American, 11% Asian, 4.5% from other races, and 1.8% bi-racial. Hispanics or Latinos, of any race, represent 10.7% of the total population.



The Town of Vienna has a moderate climate. Temperatures generally range from lows in the mid-20s in January to highs in the upper-80s and lower-90s during the month of July. Annual precipitation averages are approximately 45 inches of rain and 15 or more inches of snow fall in any given year. Recent history proves that weather events well outside of these averages can and do occur. Climate change is expected to continue the trend of the past 40 to 50 years of an increased frequency of extreme weather events.

The town's location on the eastern edge of the Virginia piedmont make it susceptible to other natural hazards and risks, such as storm damage and winter weather, as evidenced during the 2009 – 2010 winter season.

The Town of Vienna's situation in the Washington metropolitan area and its ease of access by car and public transportation have attracted an increasingly-varied residential and commercial development. Fairfax County's central business district, Tyson's Corner, is just outside of the town's corporate limits. It is the 12th largest central business district in the United States.

To a large extent, historical records are used to identify the level of risk within the Northern Virginia region, including the Town of Vienna, with the assumption that the data sources cited are reliable and accurate. Unless otherwise cited, data on historical weather-related events is based on information made available through the Storm Event Database by NOAA's NCDC⁵⁷. Hazards were ranked using a semi-quantitative scoring system that involved grouping the data values (normalized to account for inflation) based on statistical methods. This method prioritizes hazard risk based on a blend of quantitative factors extracted from NCDC and other available data sources. The parameters considered include:

- Historical occurrence;
- Vulnerability of population in the hazard area; and
- Historical impact, in terms of human lives and property and crop damage.

The hazard scores were assigned a category of 'Low'; 'Medium-Low'; 'Medium'; 'Medium-High'; or 'High'. Based on this methodology, Flood, Wind, Tornado, and Winter Weather hazards were ranked as 'High' for the Town of Vienna. See Table 7.92 for a summary of hazard rankings.



Table 7.92: Hazard Ranking for the Town of Vienna

Hazard	Flood	Wind	Tornado	Winter Weather	Drought	Earthquake	Landslide	Wildfire	Karst
Ranking	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low

Annualized loss statistics for Fairfax County based on NCDC historical data as the result of Flood, High Wind, Tornado and Winter Storm are summarized in Table 7.93. The NCDC only reports losses for hazards at the city and county level.

Table 7.93: NCDC Annualized Loss by Hazard for Fairfax County

Annualized Loss as determine through NCDC data
(based on property and crop damages and number of years of record)

	Flood	High Wind	Tornado	Winter Storm	Total Annualized Loss
<i>Years of Record</i>	17	21	59	17	
Fairfax County	\$801,903	\$612,562	\$2,265,041	\$60,537	\$3,830,698

It should be noted that while the NCDC storm events data is the most comprehensive database available for which to compare most natural hazards, its considerable limitations include spotty property and crop damage data that are considered to significantly under-estimate actual losses.

FEMA’s HAZUS^{MH} model provides another method for estimating annualized loss that uses science and engineering principals and building stock values along with historical hazard occurrences to analyze potential damage and economic loss. Annualized loss statistics for the Town of Vienna based on HAZUS^{MH} runs for flood, hurricane and earthquake are found in Tables 7.94, 7.95 and 7.96 below.

Table 7.94: HAZUS^{MH} - Annualized Loss Due to Flood for the Town of Vienna

Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Loss	Income Loss	Rental Loss	Wage Loss	Total Annualized Loss
Town of Vienna	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Table 7.95: HAZUS^{MH} - Annualized Loss Due to Hurricane for the Town of Vienna

Jurisdiction	Building Loss	Contents Loss	Inventory Loss	Relocation Loss	Income Loss	Rental Loss	Wage Loss	Total Annualized Loss
Town of Vienna	\$36,154	\$3,979	\$43	\$2,263	\$403	\$791	\$460	\$44,093

Table 7.96: HAZUS^{MH} - Annualized Loss Due to Earthquake for the Town of Vienna

Jurisdiction	Annualized Loss
Town of Vienna	\$29,422



As seen in the HAZUS^{MH} analysis, the potential annual loss to property, contents, inventory and related effects due to hurricanes is significant for the town. Earthquakes occasionally occur in the region; that was the case July 16, 2010, when a 3.6 magnitude quake centered near Gaithersburg, Maryland, shook the area.

A. Town of Vienna Mitigation Actions and Action Plan



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Completion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)
1	2010	Assess the roadway structure at various intersections throughout the Town of Vienna to avoid repeated flooding.	Town of Vienna Public Works	X		X		X										Hazard Mitigation Assistance grant funding, County funding	December 2015	Identify funding sources by January 2012	High	No
2	2010	Continue to identify and employ a broad range of warning systems throughout the Town of Vienna.	Town of Vienna Police Department	X	X	X	X	X	X	X	X	X	X	X	X	X	X	UASI funding, DHS grants, town/county funding	December 2015	Identify one new warning system to utilize by December 2012.	High	No
3	2010	Conduct annual outreach to each FEMA-listed repetitive loss and severe repetitive loss property owner, providing information on mitigation programs (grant assistance, mitigation measures, flood insurance information) that can assist them in reducing their flood risk.	Town of Vienna Police Department	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Develop outreach materials, or identify appropriate outreach materials for dissemination by June 2011.	Medium	No
4	2010	Support mitigation of priority flood-prone structures through promotion of acquisition/demolition, elevation, flood proofing, minor localized flood	Town of Vienna Police Department	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Identify all priority flood-prone structures by December 2011.	Medium	No



#	Year	Agency/Department: Mitigation Action	Lead Agency Department Organization	Flood	Winter Weather	Thunderstorm	Tornado	Hurricane	Drought	Wildfire	Earthquake	Extreme Temps	Dam Failure	Erosion	Landslides	Karst	Human-Caused	Funding Source	Target Completion Date	Interim Measure of Success	Priority	Keep Action Redacted (Yes/No)	
		control projects, mitigation reconstruction and where feasible using FEMA HMA programs where appropriate.																					
5	2010	Promote structural mitigation to assure redundancy of critical facilities, to include but not limited to roof structure improvement, to meet or exceed building code standards, upgrade of electrical panels to accept generators, etc.	Town of Vienna Police Department	X		X		X										FEMA Unified Hazard Mitigation Assistance funding for qualified structures.	Ongoing	Query local government building services staffs as to effectiveness of provided information regarding the structural review.	Medium	No	
6	2010	Review locality's compliance with the National Flood Insurance Program with an annual review of the Floodplain Ordinances and any newly permitted activities in the 100-year floodplain. Additionally, Conduct annual review of repetitive loss and severe repetitive loss property list requested of VDEM to ensure accuracy. Review will include verification of	Town of Vienna Police Department	X		X		X										General funds	Ongoing	Establish a schedule of review and review committee (if necessary) by June 2011.	Medium	No	



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Chapter 8: Plan Maintenance

This section discusses how the mitigation strategies will be implemented by the Northern Virginia jurisdictions and how the overall Plan will be evaluated and enhanced over time. These aspects were reviewed and updated by the MAC for the 2010 update. This section also discusses how the public will continue to be involved in the hazard mitigation planning process. It consists of the following three subsections:

- Implementation;
- Monitoring, Evaluation and Enhancement; and
- Continued Public Involvement.

I. Implementation

Each jurisdiction participating in the Northern Virginia Hazard Mitigation Plan is responsible for implementing specific mitigation actions as prescribed in their locally adopted Mitigation Action Plan. In each Mitigation Action Plan, every proposed action is assigned to a specific local department or agency in order to assign responsibility and accountability and increase the likelihood of subsequent implementation. This approach enables individual jurisdictions to update their unique Mitigation Action Plan as needed without altering the broader focus of the Regional Plan. The separate adoption of locally-specific actions also ensures that each jurisdiction is not held responsible for monitoring and implementing the actions of other jurisdictions involved in the planning process.

In addition to the assignment of a local lead department or agency, the completion date and interim measure of success date have been assigned in order to assess whether actions are being implemented in a timely fashion. The Northern Virginia jurisdictions will seek outside funding sources to implement mitigation projects in both the pre-disaster and post-disaster environments. When applicable, potential funding sources have been identified and targeted for the proposed actions listed in the Mitigation Action Plans.

It will be the responsibility of each participating jurisdiction to determine additional implementation procedures beyond those listed within their Mitigation Action Plan. This includes integrating the requirements of the Northern Virginia Hazard Mitigation Plan into other local planning documents, processes, or mechanisms, such as comprehensive or capital improvement plans, when appropriate⁵⁸. The members of the Northern Virginia MAC will remain charged with ensuring that the goals and strategies of new and updated local planning documents for their jurisdictions or agencies are consistent with the goals and actions of the Hazard Mitigation Plan, and will not contribute to increased hazard vulnerability in their particular jurisdictions or the region as a whole.

Opportunities to integrate the requirements of this Plan into other local planning mechanisms shall continue to be identified through future meetings of the Northern Virginia MAC and through the five-year review process described herein. Although it is recognized that there are many possible benefits to integrating components of this Plan into other local planning mechanisms, the development and maintenance of this stand-alone Hazard Mitigation Plan is



deemed by the Northern Virginia MAC to be the most effective and appropriate method to implement local hazard mitigation actions at this time. As such, the primary means for integrating mitigation strategies into other local planning mechanisms will be through the revision, update, and implementation of each jurisdiction's individual Mitigation Action Plan specific planning and administrative tasks (e.g., plan amendments, ordinance revisions, capital improvement projects, etc.).

The MAC will continue to coordinate with local jurisdictions in creating processes by which the requirements of this Plan will be incorporated into other local plans. During the planning process for new and updated local planning documents, such as a comprehensive plan, capital improvements plan, or emergency management plan, the MAC will provide a copy of the Plan to the appropriate parties. The MAC will continue to recommend that all goals and strategies of new and updated local planning documents be consistent with the Regional Plan and will not contribute to increased hazards in the affected jurisdiction(s).

II. Monitoring, Evaluation, and Enhancement

Periodic revisions and updates of the Northern Virginia Hazard Mitigation Plan are required to ensure that the goals of the plan are kept current, taking into account potential changes in hazard vulnerability and mitigation priorities. In addition, revisions may be necessary to ensure that the Plan is in full compliance with applicable Federal and State regulations. Periodic evaluation of the Plan will also ensure that specific mitigation actions are being reviewed and carried out according to each participating jurisdiction's individual Mitigation Action Plan.

The Northern Virginia MAC will continue to meet annually and following any disaster events warranting a reexamination of the mitigation actions being implemented or proposed by the participating jurisdictions. This will ensure that the Plan is continuously updated to reflect changing conditions and needs within the region. Additionally, they will reexamine the need to incorporate specific strategies into other planning initiatives as necessary. Each participating jurisdiction will be encouraged by the MAC to complete yearly reviews on the progress of their respective Mitigation Action Plan, and incorporate their strategies into local planning initiatives as appropriate. If determined appropriate or as requested, an annual report on the Plan will be developed by the MAC and submitted to the local governing bodies of participating jurisdictions in order to report progress on the actions identified in the Plan and to provide information on the latest legislative requirements and/or changes to those requirements.

If any participating jurisdiction no longer wishes to actively participate in the development and maintenance of the plan, they must notify the MAC in writing.

A. Five-Year Plan Review

The plan will be reviewed by the MAC every five years to determine whether there have been any significant changes in the region that may, in turn, necessitate changes in the types of mitigation actions proposed. New development in identified hazard areas, an increased exposure to hazards, the increase or decrease in capability to address hazards, and changes to Federal or State legislation are examples of factors that may affect the necessary content of the Plan.



The plan review process provides regional and community officials with an opportunity to evaluate those actions that have been successful and to explore the possibility of documenting potential losses avoided due to the implementation of specific mitigation measures. The plan review also provides the opportunity to address mitigation actions that may not have been successfully implemented as assigned. The MAC will be responsible for reconvening the MAC and conducting the five-year review in coordination with the VDEM.

During the five-year plan review process, the following questions will be considered as criteria for assessing the effectiveness and appropriateness of the Plan:

- Do the regional goals address current and expected conditions?
Has the nature or magnitude of risks changed?
- Are the current resources appropriate for implementing the Plan?
- Are there local implementation problems, such as technical, political, legal, or coordination issues with other agencies?
- Have the outcomes occurred as expected?
- Did the jurisdictions, agencies, and other partners participate in the plan implementation process as proposed?

Following the five-year review, any necessary revisions will be implemented according to the reporting procedures and plan amendment process outlined herein. Upon completion of the review and update/amendment process, the Northern Virginia Hazard Mitigation Plan will be submitted to the State Hazard Mitigation Officer for final review and approval in coordination with FEMA.

B. Disaster Declaration

Following a disaster declaration, the Northern Virginia MAC will reconvene and the Plan will be revised as necessary to reflect lessons learned, or to address specific circumstances arising from the event. It will be the responsibility of the NVRC to reconvene the MAC and to ensure the appropriate stakeholders are invited to participate in the plan revision and update process following declared disaster events.

C. Reporting Procedures

The results of the five-year review will be summarized by the MAC in a report that will include an evaluation of the effectiveness of the Plan and any required or recommended changes or amendments. The report will also include an evaluation of implementation progress for each of the proposed mitigation actions, identifying reasons for delays or obstacles to their completion along with recommended strategies to overcome them.

Any necessary revisions to the Regional Plan elements shall follow the plan amendment process outlined herein. For changes and updates to the individual Mitigation Action Plans, appropriate local designees will assign responsibility for completion of the task.

D. Plan Amendment Process

Local participating jurisdictions have the authority to approve/adopt changes to their own Mitigation Action Plans without approval from the MAC; however, the MAC should be advised of all changes as a courtesy and for consideration for changes or modifications to the regional



Plan. The MAC will be responsible for verifying that the proposed change will not affect the jurisdiction's compliance with current State and Federal mitigation planning requirements. Changes to either the Regional Plan or local Mitigation Action Plans will necessitate the adoption of these changes by the appropriate governing body, and ultimately or upon request the updated Plan or plan component(s) will be submitted to VDEM.

The MAC and its participating jurisdictions will forward information on any proposed change(s) to all interested parties including, but not limited to, all affected county and municipal departments, residents and businesses. When a proposed amendment may directly affect particular private individuals or properties, each jurisdiction will follow existing local, State or Federal notification requirements which may include published public notices as well as direct mailings. Information on any proposed plan amendments will also be forwarded to VDEM. This information will be disseminated in order to seek input on the proposed amendment(s) for not less than a 45-day review and comment period.

At the end of the 45-day review and comment period, the proposed amendment(s) and all comments will be forwarded to the MAC for final consideration. The committee will review the proposed amendment along with the comments received from other parties, and if acceptable, the committee will submit a recommendation for the approval and adoption of changes to the Plan to each appropriate governing body within 60 days.

In determining whether to recommend approval or denial of a plan amendment request, the following factors will be considered by the MAC:

- There are errors, inaccuracies, or omissions made in the identification of issues or needs in the Plan;
- New issues or needs have been identified which are not adequately addressed in the Plan;
- There has been a change in information, data, or assumptions from those on which the Plan is based; and
There has been a change in local capabilities to implement proposed hazard mitigation activities.

Upon receiving the recommendation from the Northern Virginia MAC and prior to adoption of the Plan, each local governing body will hold a public hearing. The governing body will review the recommendation from the committee (including the factors listed above) and any oral or written comments received at the public hearing. Following that review, the governing body will take one of the following actions:

- Adopt the proposed amendments as presented;
- Adopt the proposed amendments with modifications;
- Refer the amendments request back to the MAC for further revision; or
- Defer the amendment request back to the MAC for further consideration and/or additional hearings.



III. Continued Public Involvement

Public participation is an integral component of the mitigation planning process and will continue to be essential as this Plan evolves over time. As described above, significant changes or amendments to the Plan may require a public hearing prior to any adoption procedures.

Additional efforts to involve the public in the maintenance, evaluation, and revision process will be made as necessary. These efforts may include:

- Advertising meetings of the MAC in the local newspaper, public bulletin boards, and/or municipal or county office buildings;
- Designating willing and voluntary citizens and private sector representatives as official members of the MAC;
- Utilizing local media to update the public on any maintenance and/or periodic review activities taking place;
- Utilizing the MAC and municipal or county websites to advertise any maintenance and/or periodic review activities taking place; and
- Keeping copies of the Plan in public libraries and making it accessible via public Websites.



- ¹ Gutowski, W.J., G.C. Hegerl, G.J. Holland, T.R. Knutson, L.O. Mearns, R.J. Stouffer, P.J. Webster, M.F. Wehner, and F.W. Zwiers, 2008: Causes of observed changes in extremes and projections of future changes. In: *Weather and Climate Extremes in a Changing Climate: Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands* [Karl, T.R., G.A. Meehl, C.D. Miller, S.J. Hassol, A.M. Waple, and W.L. Murray (eds.)]. Synthesis and Assessment Product 3.3. U.S. Climate Change Science Program, Washington, DC, pp. 81-116.
- ² The Future of the Washington Area Economy: Alternative Forecast, Employment and Housing Implications. Center for Regional Analysis George Mason University. September 2009. <http://www.cra-gmu.org/forecastreports/10forecasts/2%20-%202030%20Alternatives%20and%20Implications%20Sept%202009.pdf>
- ³ Cutter, Susan L., Bryan J. Boruff, and W. Lynn Shirley. 2003. Social vulnerability to environmental hazards. *Social Science Quarterly* 84 (1):242-261
- ⁴ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.
- ⁵ National Water Service Instruction 10-1605. Operations and Services Performance: Storm Data Preparation Guide. August 17, 2007. Available at: <http://www.nws.noaa.gov/directives/sym/pd01016005curr.pdf>
- ⁶ Commonwealth of Virginia Emergency Operations Plan Annex 3 (Volume II)
- ⁷ 2006 FEMA Mitigation BCA Toolkit. July 2006, Version 3.0
- ⁸ IPCC. (2007). *Climate Change 2007: The Physical Science Basis*. Intergovernmental Panel on Climate Change.
- ⁹ Pfeffer, W., Harper, J., & O'Neil, S. (2008). Kinematic Constraints on Glacier Contributions to 21st-Century Sea-Level Rise. *Science*, 321, 1340-1343.
- ¹⁰ FEMA Severe Repetitive Loss Guidance for Severe Repetitive Loss Properties <http://www.fema.gov/pdf/nfip/manual200610/20srl.pdf> 10/2006
- ¹¹ NFIP repetitive loss data is protected under the federal Privacy Act of 1974 (5 U.S.C. 552a) which prohibits personal identifiers (i.e., owner names, addresses, etc.) from being published in local mitigation plans.
- ¹² National Flood Insurance Program (www.fema.gov)
- ¹³ HAZUS-MH MR4 Flood User Manual
- ¹⁴ Currently hosted at: <http://hurricane.ncdc.noaa.gov/CDO/cdo>
- ¹⁵ *Global Climate Change Impacts in the United States*, Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009.
- ¹⁶ Changes in severe thunderstorm environment frequency during the 21st century caused by anthropogenically enhanced global radiative forcing; Robert J. Trapp*, Noah S. Diffenbaugh*, Harold E. Brooks‡, Michael E. Baldwin*, Eric D. Robinson*, and Jeremy S. Pal; PNAS December 11, 2007, vol. 104, no. 50.
- ¹⁷ IPCC Special Report on Emissions Scenarios, 2000
- ¹⁸ *Modeled Impact of Anthropogenic Warming on the Frequency of intense Atlantic Hurricanes*, Morris A. Bender, Thomas R. Knutson, Robert E. Tuleya, Joseph J. Sirutis, Gabriel A. Vecchi, Stephen T. Garner, Isaac M. Held
- ¹⁹ HAZUS Hurricane Manual
- ²⁰ Whole Building Design Guide (WBDG) Wind Safety of the Building Envelop by Tom Smith 5/26/2008
- ²¹ Gutowski, W.J., G.C. Hegerl, G.J. Holland, T.R. Knutson, L.O. Mearns, R.J. Stouffer, P.J. Webster, M.F. Wehner, and F.W. Zwiers, 2008: Causes of observed changes in extremes and projections of future changes. In: *Weather and Climate Extremes in a Changing Climate: Regions of Focus: North America, Hawaii, Caribbean, and U.S. Pacific Islands* [Karl, T.R., G.A. Meehl, C.D. Miller, S.J. Hassol, A.M. Waple, and W.L. Murray (eds.)]. Synthesis and Assessment Product 3.3. U.S. Climate Change Science Program, Washington, DC, pp. 81-116.
- ²² Significant Earthquakes figure is from the 2010 Commonwealth of Virginia's Hazard Mitigation Plan. Earthquake Section 3.13, Figure 3.13-1.
- ²³ The Daily News Spot July 16, 2010 interview with Amy Vaughan, geophysicist USGS National Earthquake Information Center.
- ²⁴ Recent Earthquakes from NEIC Earthquake Bulletin: Magnitude 3.4-Potomac-Shenandoan Region. USGS July 16, 2010. <http://earthquake.usgs.gov/earthquakes/recenteqsww/Quakes/us2010yua6.php>
- ²⁵ Recent Earthquakes from NEIC Earthquake Bulletin: Magnitude 3.4-Potomac-Shenandoan Region. USGS July 16, 2010. <http://earthquake.usgs.gov/earthquakes/recenteqsww/Quakes/us2010yua6.php>
- ²⁶ 2500-year Return Period Peak Ground Acceleration (PGA) figure is from the 2010 Commonwealth of Virginia's Hazard Mitigation Plan. Earthquake Section 3.13, Figure 3.13-3.
- ²⁷ Telephone and Email correspondence with Dr. Martin Chapman. June 3, 2010.



²⁸ Smith, K., *Environmental Hazards, Assessing Risk and Reducing Disaster*, Third Edition, Rutledge Press, New York 1991

²⁹ USGS Fact Sheet 2004-3072

³⁰ The National Wildfire Coordinating Group (NWCG) is made up of the USDA Forest Service; four Department of the Interior agencies: Bureau of Land Management (BLM), National Park Service (NPS), Bureau of Indian Affairs (BIA), and the Fish and Wildlife Service (FWS); and State forestry agencies through the National Association of State Foresters. The purpose of NWCG is to coordinate programs of the participating wildfire management agencies so as to avoid wasteful duplication and to provide a means of constructively working together.

³¹ U.S. Fire Administration. *National Fire Incident Reporting System (NFIRS), Version IV.1 Incident Codes*. Retrieved from www.usfa.fema.gov/nfirs/tools.

³² Tihansky, B, Ann. U.S Geological Survey, Tampa, Florida. Sinkholes, West-Central Florida: A link between surface water and ground water.

³³ Hubbard, D. A. "Sinkhole Distribution of the Valley and Ridge Province, Virginia." *Geotechnical and Environmental Applications of Karst Geology and Hydrology*, (April 2001): 33–36.

³⁴ Loudoun County Zoning Ordinance Section 4-1900 Limestone Overlay District. May 6, 2010.

³⁵ Commonwealth of Virginia Emergency Hazard Mitigation Plan, 2010.

³⁶ See *Protecting the Past from Natural Disasters*. 1989. Nelson, Carl. National Trust for Historic Preservation: Washington, D.C.

³⁷ The EMAP Standard is based on the NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Programs, 2004 Edition.

³⁸ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

³⁹ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴⁰ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴¹ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴² NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴³ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴⁴ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴⁵ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴⁶ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴⁷ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴⁸ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁴⁹ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵⁰ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵¹ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵² NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵³ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵⁴ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵⁵ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵⁶ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵⁷ NCDC's Storm Event database is available at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwEvent~Storms>.

⁵⁸ A listing of each jurisdiction's local planning documents (or those under development) is provided in Section 7: Capability Assessment.

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APPENDIX A

PLAN CROSSWALK

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Instructions for Using the Plan Review Crosswalk for Review of Local Mitigation Plans

Attached is a Plan Review Crosswalk based on the *Multi-Hazard Mitigation Planning Guidance Under the Disaster Mitigation Act of 2000*, published by FEMA, dated March 2004. This Plan Review Crosswalk is consistent with the *Disaster Mitigation Act of 2000* (P.L. 106-390), enacted October 30, 2000 and *44 CFR Part 201 – Mitigation Planning, Interim Final Rule* (the Rule), published February 26, 2002.

SCORING SYSTEM

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer’s comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer’s comments are encouraged, but not required.

Each requirement includes separate elements. All elements of a requirement must be rated “Satisfactory” in order for the requirement to be fulfilled and receive a summary score of “Satisfactory.” A “Needs Improvement” score on elements shaded in gray (recommended but not required) will not preclude the plan from passing.

When reviewing single jurisdiction plans, reviewers may want to put an N/A in the boxes for multi-jurisdictional plan requirements. When reviewing multi-jurisdictional plans, reviewers may want to put an N/A in the prerequisite box for single jurisdiction plans.

States that have additional requirements can add them in the appropriate sections of the *Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

Optional matrices for assisting in the review of sections on profiling hazards, assessing vulnerability, and identifying and analyzing mitigation actions are found at the end of the Plan Review Crosswalk.

The example below illustrates how to fill in the Plan Review Crosswalk.

Example

Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction’s vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Element	Location in the Plan (section or annex and page #)	Reviewer’s Comments	SCORE	
			N	S
A. Does the new or updated plan include an overall summary description of the jurisdiction’s vulnerability to each hazard?	Section II, pp. 4-10	The plan describes the types of assets that are located within geographically defined hazard areas as well as those that would be affected by winter storms.		✓
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?	Section II, pp. 10-20	The plan does not address the impact of two of the five hazards addressed in the plan. Required Revisions: • Include a description of the impact of floods and earthquakes on the assets. Recommended Revisions: • This information can be presented in terms of dollar value or percentages of damage.	✓	
SUMMARY SCORE			✓	

Local Mitigation Plan Review and Approval Status

Jurisdiction:	Title of Plan:	Date of Plan:
Local Point of Contact:	Address:	
Title:		
Agency:		
Phone Number:	E-Mail:	

State Reviewer: Robbie Coates	Title: Hazard Mitigation Coordinator	Date: April 25, 2011
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FEMA Reviewer:	Title:	Date:
Date Received in FEMA Region [Insert #]		
Plan Not Approved		
Plan Approved		
Date Approved		

Jurisdiction:	NFIP Status*			
	Y	N	N/A	CRS Class
1.				
2.				
3.				
4.				
5. [ATTACH PAGE(S) WITH ADDITIONAL JURISDICTIONS]				

* Notes: Y = Participating N = Not Participating N/A = Not Mapped

LOCAL MITIGATION PLAN REVIEW SUMMARY

The plan cannot be approved if the plan has not been formally adopted. Each requirement includes separate elements. All elements of the requirement must be rated "Satisfactory" in order for the requirement to be fulfilled and receive a score of "Satisfactory." Elements of each requirement are listed on the following pages of the Plan Review Crosswalk. A "Needs Improvement" score on elements shaded in gray (recommended but not required) will not preclude the plan from passing. Reviewer's comments must be provided for requirements receiving a "Needs Improvement" score.

Prerequisite(s) (Check Applicable Box)

	NOT MET	MET
1. Adoption by the Local Governing Body: §201.6(c)(5) OR	<input type="checkbox"/>	<input type="checkbox"/>

	NOT MET	MET
2. Multi-Jurisdictional Plan Adoption: §201.6(c)(5) AND	<input type="checkbox"/>	<input type="checkbox"/>
3. Multi-Jurisdictional Planning Participation: §201.6(a)(3)	<input type="checkbox"/>	<input type="checkbox"/>

Planning Process

	N	S
4. Documentation of the Planning Process: §201.6(b) and §201.6(c)(1)	<input type="checkbox"/>	<input type="checkbox"/>

Risk Assessment

	N	S
5. Identifying Hazards: §201.6(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>
6. Profiling Hazards: §201.6(c)(2)(i)	<input type="checkbox"/>	<input type="checkbox"/>
7. Assessing Vulnerability: Overview: §201.6(c)(2)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
8. Assessing Vulnerability: Addressing Repetitive Loss Properties: §201.6(c)(2)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
9. Assessing Vulnerability: Identifying Structures, Infrastructure, and Critical Facilities: §201.6(c)(2)(ii)(B)	<input type="checkbox"/>	<input type="checkbox"/>
10. Assessing Vulnerability: Estimating Potential Losses: §201.6(c)(2)(ii)(B)	<input type="checkbox"/>	<input type="checkbox"/>
11. Assessing Vulnerability: Analyzing Development Trends: §201.6(c)(2)(ii)(C)	<input type="checkbox"/>	<input type="checkbox"/>
12. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(iii)	<input type="checkbox"/>	<input type="checkbox"/>

*States that have additional requirements can add them in the appropriate sections of the *Multi-Hazard Mitigation Planning Guidance* or create a new section and modify this Plan Review Crosswalk to record the score for those requirements.

SCORING SYSTEM

Please check one of the following for each requirement.

N – Needs Improvement: The plan does not meet the minimum for the requirement. Reviewer's comments must be provided.

S – Satisfactory: The plan meets the minimum for the requirement. Reviewer's comments are encouraged, but not required.

Mitigation Strategy

	N	S
13. Local Hazard Mitigation Goals: §201.6(c)(3)(i)	<input type="checkbox"/>	<input type="checkbox"/>
14. Identification and Analysis of Mitigation Actions: §201.6(c)(3)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
15. Identification and Analysis of Mitigation Actions: NFIP Compliance: §201.6(c)(3)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
16. Implementation of Mitigation Actions: §201.6(c)(3)(iii)	<input type="checkbox"/>	<input type="checkbox"/>
17. Multi-Jurisdictional Mitigation Actions: §201.6(c)(3)(iv)	<input type="checkbox"/>	<input type="checkbox"/>

Plan Maintenance Process

	N	S
18. Monitoring, Evaluating, and Updating the Plan: §201.6(c)(4)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
19. Incorporation into Existing Planning Mechanisms: §201.6(c)(4)(ii)	<input type="checkbox"/>	<input type="checkbox"/>
20. Continued Public Involvement: §201.6(c)(4)(iii)	<input type="checkbox"/>	<input type="checkbox"/>

Additional State Requirements*

	N	S
Insert State Requirement	<input type="checkbox"/>	<input type="checkbox"/>
Insert State Requirement	<input type="checkbox"/>	<input type="checkbox"/>
Insert State Requirement	<input type="checkbox"/>	<input type="checkbox"/>

LOCAL MITIGATION PLAN APPROVAL STATUS

PLAN NOT APPROVED
See Reviewer's Comments
PLAN APPROVED

PREREQUISITE(S)

1. Adoption by the Local Governing Body

Requirement §201.6(c)(5): [The local hazard mitigation plan shall include] documentation that the plan has been formally adopted by the governing body of the jurisdiction requesting approval of the plan (e.g., City Council, County Commissioner, Tribal Council).

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Has the local governing body adopted new or updated plan?				
B. Is supporting documentation, such as a resolution, included?				
SUMMARY SCORE				

2. Multi-Jurisdictional Plan Adoption

Requirement §201.6(c)(5): For multi-jurisdictional plans, each jurisdiction requesting approval of the plan must document that it has been formally adopted.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET
A. Does the new or updated plan indicate the specific jurisdictions represented in the plan?	Executive Summary (Pp. 1) Chapter 1: (Pp. 4) Chapter 3: Section I (Pp. 17)			
B. For each jurisdiction, has the local governing body adopted the new or updated plan?	Chapter 1: Section IV, Authority (Pp. 7) (will upon completion) Appendix B			
C. Is supporting documentation, such as a resolution, included for each participating jurisdiction?	Appendix B (to be completed after adoption)			
SUMMARY SCORE				

3. Multi-Jurisdictional Planning Participation

Requirement §201.6(a)(3): Multi-jurisdictional plans (e.g., watershed plans) may be accepted, as appropriate, as long as each jurisdiction has participated in the process ... Statewide plans will not be accepted as multi-jurisdictional plans.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			NOT MET	MET

A. Does the new or updated plan describe how each jurisdiction participated in the plan's development?	Chapter 2: Planning Process (Pp. 11-15), Chapter 6: Mitigation Strategies (Pp. 291-300)			
B. Does the updated plan identify all participating jurisdictions, including new, continuing, and the jurisdictions that no longer participate in the plan?	Executive Summary: Page 1 Chapter 1 (Pp. 4); Chapter 3: Section I (Pp. 17)			
SUMMARY SCORE				

PLANNING PROCESS: §201.6(b): *An open public involvement process is essential to the development of an effective plan.*

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

- (1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan provide a narrative description of the process followed to prepare the new or updated plan?	Chapter 2 (Pp. 11-15); Appendix C			
B. Does the new or updated plan indicate who was involved in the current planning process? (For example, who led the development at the staff level and were there any external contributors such as contractors? Who participated on the plan committee, provided information, reviewed drafts, etc.?)	Chapter 2: Planning Process (Pp. 11-15)			
C. Does the new or updated plan indicate how the public was involved? (Was the public provided an opportunity to comment on the plan during the drafting stage and prior to the plan approval?)	Chapter 2: Section II Public Involvement and Citizen Input (Pp. 13-15); Appendix H			
D. Does the new or updated plan discuss the opportunity for neighboring communities, agencies, businesses, academia, nonprofits, and other interested	Chapter 2: Section II Public Involvement and Citizen Input (Pp. 13-15)			

4. Documentation of the Planning Process

Requirement §201.6(b): *In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:*

- (1) *An opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;*
- (2) *An opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and*
- (3) *Review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.*

Requirement §201.6(c)(1): *[The plan shall document] the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.*

Location in the		SCORE	
parties to be involved in the planning process?			
E. Does the planning process describe the review and incorporation, if appropriate, of existing plans, studies, reports, and technical information?	Chapter 2: Section III Incorporation of Existing Plans and Studies (Pp. 15)		
F. Does the updated plan document how the planning team reviewed and analyzed each section of the plan and whether each section was revised as part of the update process?	Chapter 2: Planning Process (Pp. 11-12) Chapter 7: Jurisdiction Executive Summaries (Pp. 301-433) Chapter 8: Plan Maintenance (Pp. 439)		
SUMMARY SCORE			

RISK ASSESSMENT: §201.6(c)(2): *The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.*

5. Identifying Hazards

Requirement §201.6(c)(2)(i): *[The risk assessment shall include a] description of the type ... of all natural hazards that can affect the jurisdiction.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include a description of the types of all natural hazards that affect the jurisdiction?	Chapter 1 : Section I Background (Pp. 4-5) Chapter 4: Section III Hazard Identification: (Pp. 66-75) Chapter 4: Regional Hazard Identification and Risk Assessment: Flood (Pp.89)			

	<p>Winter Storm (with extreme cold) (Pp. 125) High Wind/Severe Storm (Pp. 138) Tornadoes (Pp. 174) Drought (and extreme heat) (Pp. 188) Earthquake (Pp. 197) Landslide (Pp.217) Wildfire (Pp. 229) SinkHoles/Karsts/Land Subsidence (Pp. 244) Dam Failure (Pp.256) Chapter 7: Jurisdiction Executive Summaries (Pp. 301-433) Chapter 3: Regional Information Section 1 Profiles (Pp. 17-20)</p>			
SUMMARY SCORE				

6. Profiling Hazards

Requirement §201.6(c)(2)(i): [The risk assessment shall include a] description of the ... location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
<p>A. Does the risk assessment identify the location (i.e., geographic area affected) of each natural hazard addressed in the new or updated plan?</p>	<p>Chapter 4: Regional Hazard Identification and Risk Assessment, Flood (Pp.95-97) Winter Storm (with extreme cold) (Pp. 126) High Wind/Severe Storm (Pp. 139), Tornadoes (Pp. 176-177) Drought (and extreme heat) (Pp. 189-190) Earthquake (Pp. 197-198) Landslide (Pp.217-218) Wildfire (Pp. 230) Sink Holes/Karsts/Land Subsidence (Pp. 245-247) Dam Failure (Pp.256-258)</p>			
<p>B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the new or updated</p>	<p>Chapter 4: Regional Hazard Identification and Risk Assessment, Flood (Pp.95-97)</p>			

<p>plan?</p>	<p>Winter Storm (with extreme cold) (Pp. 126) High Wind/Severe Storm (Pp. 139), Tornadoes (Pp. 176-177) Drought (and extreme heat) (Pp. 189-190) Earthquake (Pp. 197-198) Landslide (Pp.217-218) Wildfire (Pp. 230) Sink Holes/Karsts/Land Subsidence (Pp. 245-247) Dam Failure (Pp.256-258)</p>			
<p>C. Does the plan provide information on previous occurrences of each hazard addressed in the new or updated plan?</p>	<p>Chapter 4: Regional Hazard Identification and Risk Assessment, Flood (Pp.98-100) Winter Storm (with extreme cold) (Pp. 126-130) High Wind/Severe Storm (Pp. 143-145), Tornadoes (Pp. 180-183) Drought (and extreme heat) (Pp. 191-193) Earthquake (Pp. 200-203) Landslide (Pp.221) Wildfire (Pp. 230-232) Sink Holes/Karsts/Land Subsidence (Pp. 248) Dam Failure (Pp.259)</p>			
<p>D. Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the new or updated plan?</p>	<p>Chapter 4: Regional Hazard Identification and Risk Assessment, Flood (Pp.105) Winter Storm (with extreme cold) (Pp. 130-133) High Wind/Severe Storm (Pp. 145), Tornadoes (Pp. 183) Drought (and extreme heat) (Pp. 193) Earthquake (Pp. 204-205) Landslide (Pp.221) Wildfire (Pp. 232) Sink Holes/Karsts/Land Subsidence (Pp. 249) Dam Failure (Pp.259)</p>			

SUMMARY SCORE

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7. Assessing Vulnerability: Overview

Requirement §201.6(c)(2)(ii): [The risk assessment shall include a] description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?	Chapter 4: Regional Hazard Identification and Risk Assessment, Flood (Pp.105-106) Winter Storm (with extreme cold) (Pp. 134) High Wind/Severe Storm (Pp. 159), Tornadoes (Pp. 183) Drought (and extreme heat) (Pp. 193) Earthquake (Pp. 206) Landslide (Pp.222) Wildfire (Pp. 232) Sink Holes/Karsts/Land Subsidence (Pp. 249-250) Dam Failure (Pp.259)			
B. Does the new or updated plan address the impact of each hazard on the jurisdiction?	Chapter 4: Regional Hazard Identification and Risk Assessment, Flood (Pp.105-106) Winter Storm (with extreme cold) (Pp. 134) High Wind/Severe Storm (Pp. 159), Tornadoes (Pp. 183) Drought (and extreme heat) (Pp. 193) Earthquake (Pp. 206) Landslide (Pp.222) Wildfire (Pp. 232) Sink Holes/Karsts/Land Subsidence (Pp. 249-250) Dam Failure (Pp.259)			
SUMMARY SCORE				

8. Assessing Vulnerability: Addressing Repetitive Loss Properties

Requirement §201.6(c)(2)(ii): [The risk assessment] must also address National Flood Insurance Program (NFIP) insured structures that have been repetitively damaged floods.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of repetitive loss properties located in the identified hazard areas?	Chapter 4: Regional Hazard Identification and Risk Assessment (Pp. 103-104) Table 4.23	<i>Note: This requirement becomes effective for local plans approved after October 1, 2008, for any jurisdiction with NFIP repetitive loss properties.</i>		
SUMMARY SCORE				

9. Assessing Vulnerability: Identifying Structures

Requirement §201.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of the types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard area ...

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?	Chapter 4: Section II Data Availability (Pp. 50-65) Table 4.1 Table 4.3 Appendix D2			
B. Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?	Chapter 3, Section I, D, 2. Development Trends (Pp. 42-43)			
SUMMARY SCORE				

10. Assessing Vulnerability: Estimating Potential Losses

Requirement §201.6(c)(2)(ii)(B): *[The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan estimate potential dollar losses to vulnerable structures?	Executive Summary (Pp. 2) Chapter 4: Regional Hazard Identification and Risk Assessment (Pp. 64-65) Tables 4.26, 4.27, 4.28, 114-120,	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
B. Does the new or updated plan describe the methodology used to prepare the estimate?	Executive Summary (Pp. 2,8,10) Chapter 4: Section III: Hazard Identification (Pp. 66-67) Chapter 4: Section II Data Availability and Limitations (Pp. 50-67) Chapter 4: Section IV: Ranking and Analysis Methodologies (Pp. 76-83)	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
SUMMARY SCORE				

11. Assessing Vulnerability: Analyzing Development Trends

Requirement §201.6(c)(2)(ii)(C): *[The plan should describe vulnerability in terms of] providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe land uses and development trends?	Chapter 3: Section I: D: 1: Land Use, Development (Pp. 36-41)	Note: A "Needs Improvement" score on this requirement will not preclude the plan from passing.		
SUMMARY SCORE				

12. Multi-Jurisdictional Risk Assessment

Requirement §201.6(c)(2)(iii): *For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S

A. Does the new or updated plan include a risk assessment for each participating jurisdiction as needed to reflect unique or varied risks?	Page 270, Table 4.91			
SUMMARY SCORE				

MITIGATION STRATEGY: §201.6(c)(3): *The plan shall include a mitigation strategy that provides the jurisdiction's blueprint for reducing the potential losses identified in the risk assessment, based on existing authorities, policies, programs and resources, and its ability to expand on and improve these existing tools.*

13. Local Hazard Mitigation Goals

Requirement §201.6(c)(3)(i): *[The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A Does the new or updated plan include a description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards?	Chapter 6: Mitigation Strategies (Pp. 296-298)			
SUMMARY SCORE				

14. Identification and Analysis of Mitigation Actions

Requirement §201.6(c)(3)(ii): *[The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?	Chapter 6 Pp. 298, Chapter 7 Executive Summaries (Pp.301-433)			
B Do the identified actions and projects address reducing the effects of hazards on new buildings and infrastructure?	Chapter 7: Jurisdiction Executive Summaries (Pp. 301-433)			
C. Do the identified actions and projects address reducing the effects of hazards on existing buildings and infrastructure?	Chapter 7: Jurisdiction Executive Summaries Pages 301-433, Property Protection (Pp. 293)			

SUMMARY SCORE

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15. Identification and Analysis of Mitigation Actions: National Flood Insurance Program (NFIP) Compliance

Requirement: §201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the jurisdiction (s) participation in the NFIP?	National Flood Insurance Program (Pp. 100-102) Table 4.21, Section III Identifying Objectives and Strategies (Pp. 297)	<i>Note: This requirement becomes effective for all plans approved after October 1, 2008.</i>		
B. Does the mitigation strategy identify actions related to participation in and continued compliance with the NFIP?	Chapter 6: Section III: Identifying Objectives and Strategies (Pp. 296-300) Chapter 7: Jurisdiction Executive Summaries: Alexandria (Pp. 305-306) Arlington (Pp.314-316) Fairfax (Pp. 324, 331) Loudoun (Pp. 338) Prince William (Pp. 345-346) City of Fairfax (Pp. 351) City of Falls Church (Pp. 357-358) City of Manassas (Pp. 363-364) City of Manassas Park (Pp. 371-372) Town of Clifton (Pp. 377-378) Town of Dumfries (Pp. 382-383) Town of Haymarket (Pp. 388-389) Town of Herndon (Pp. 394-395) Town of Leesburg (Pp. 403-404) Town of Middleburg (Pp. 407-408) Town of Occoquan (Pp. 412-413) Town of Purcellville (Pp. 417-418) Town Quantico (Pp. 421-422) Town of Round Hill (Pp.427-428) Town of Vienna (Pp. 432-433)	<i>Note: This requirement becomes effective for all plans approved after October 1, 2008.</i>		

SUMMARY SCORE

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16. Implementation of Mitigation Actions

Requirement: §201.6(c)(3)(iii): [The mitigation strategy section **shall** include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization **shall** include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated mitigation strategy include how the actions are prioritized? (For example, is there a discussion of the process and criteria used?)	Chapter 6: Section II: Considering Mitigation Alternatives (Pp. 292)			
B. Does the new or updated mitigation strategy address how the actions will be implemented and administered, including the identification of the department responsible for implementing each action, existing and potential resources for each action and the timeframe for completion of each action?	Chapter 7: Jurisdiction Executive Summaries (Pp. 301-433)			
C. Does the new or updated prioritization process include an emphasis on the use of a cost-benefit review to maximize benefits?	Chapter 6: Section II: Considering Mitigation Alternatives B. Prioritizing Alternatives (Pp. 294)			
D. Does the updated plan identify the completed, deleted, or deferred actions as a benchmark for progress, and if activities are unchanged (i.e., deferred) does the updated plan describe why no change has occurred?	Chapter 7: Jurisdiction Executive Summaries (Pp. 301-433) Appendix E			
SUMMARY SCORE				

17. Multi-Jurisdictional Mitigation Actions

Requirement §201.6(c)(3)(iv): For multi-jurisdictional plans, there **must** be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan include identifiable action items for each jurisdiction requesting FEMA approval of the plan?	Chapter 7: Jurisdiction Executive Summaries (Pp. 301-433)			
B. Does the updated plan identify the completed, deleted, or deferred actions as a benchmark for progress, and if activities are unchanged (i.e., deferred) does the updated plan describe why no change has occurred?	Chapter 7: Jurisdiction Executive Summaries (Pp. 301-433); Appendix E			
SUMMARY SCORE				

PLAN MAINTENANCE PROCESS

18. Monitoring, Evaluating, and Updating the Plan

Requirement §201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan describe the method and schedule for monitoring the plan, including the responsible department and other methods or schedules?	Chapter 8: Plan Maintenance: Section II Monitoring, Evaluation, and Enhancement (Pp. 436)			
B. Does the new or updated plan describe the method and schedule for evaluating the plan, including the responsible department and the criteria used to evaluate the plan?	Chapter 8: Plan Maintenance: Section II Monitoring, Evaluation, and Enhancement (Pp. 436)			
C. Does the new or updated plan describe the method and schedule for updating the plan within the five-year cycle?	Chapter 8: Plan Maintenance II Monitoring, Evaluation, and Enhancement (Pp. 436-437)			
SUMMARY SCORE				

19. Incorporation into Existing Planning Mechanisms

Requirement §201.6(c)(4)(ii): *[The plan shall include a] process by which local governments incorporate the requirements of the mitigation plan into other planning mechanisms such as comprehensive or capital improvement plans, when appropriate.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan identify other local planning mechanisms available for incorporating the mitigation requirements of the mitigation plan?	Chapter 2: Section III Incorporation of Existing Plans and Studies (Pp.14)			
B. Does the new or updated plan include a process by which the local government will incorporate the mitigation strategy and other planning mechanisms, when appropriate?	Chapter 5: Section III, Subsection B: Planning and Regulatory Capability (Pp. 279) Chapter 8: Plan Maintenance (Pp. 435)			
C. Does the updated plan explain how the local government incorporated the mitigation strategy into other planning mechanisms, when appropriate?	Chapter 5: Section III, Subsection B: Planning and Regulatory Capability (Pp. 279) Chapter 8: Plan Maintenance (Pp. 435)			
SUMMARY SCORE				

Continued Public Involvement

Requirement §201.6(c)(4)(iii): *[The plan maintenance process shall include a] discussion on how the community will continue public participation in the plan maintenance process.*

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the new or updated plan explain how continued public participation will be obtained? (For example, will there be public notices, an on-going mitigation plan committee, or annual review meetings with stakeholders?)	Chapter 8: Plan Maintenance Section III Continued Public Involvement (Pp. 435)			
SUMMARY SCORE				

ADDITIONAL STATE REQUIREMENTS

Virginia State Requirements

Element	Location in the Plan (section or annex and page #)	Reviewer's Comments	SCORE	
			N	S
A. Does the plan include a Capability Assessment for each participating jurisdiction?	Chapter 5: Capability Assessment (Pp. 271-290)			
B. Are flood maps included for each participating jurisdiction?	Chapter 4: (A) Flood Hazard Profile (Pp. 96)			
C. Have other high hazard risk maps been included for each participating jurisdiction?	Chapter 4, Section XV Overall Hazard Results (Pp. 265) Fig. 4.61	<i>Note: A "Needs Improvement" score on this requirement will not preclude the FMA plan from passing.</i>		
SUMMARY SCORE				

Other Comments
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Matrix A: Profiling Hazards

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that their plan addresses each natural hazard that can affect the jurisdiction. **Completing the matrix is not required.**

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each applicable hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Location		B. Extent		C. Previous Occurrences		D. Probability of Future Events	
	Yes	N	S	N	S	N	S	N	S
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

To check boxes, double click on the box and change the default value to "checked."

Legend:

§201.6(c)(2)(i) Profiling Hazards

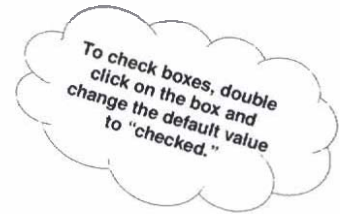
- A. Does the risk assessment identify the location (i.e., geographic area affected) of each hazard addressed in the new or updated plan?
- B. Does the risk assessment identify the extent (i.e., magnitude or severity) of each hazard addressed in the new or updated plan?
- C. Does the plan provide information on previous occurrences of each natural hazard addressed in the new or updated plan?
- D. Does the plan include the probability of future events (i.e., chance of occurrence) for each hazard addressed in the plan?

Matrix B: Assessing Vulnerability

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure that the new or updated plan addresses each requirement. **Completing the matrix is not required.**

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each applicable hazard. An "N" for any element of any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.

Note: Receiving an N in the shaded columns will not preclude the plan from passing.



Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Overall Summary Description of Vulnerability				B. Hazard Impact				A. Types and Number of Existing Structures in Hazard Area (Estimate)	B. Types and Number of Future Structures in Hazard Area (Estimate)	A. Loss Estimate		B. Methodology		
	Yes	N	S	N	S	N	S	N	S			N	S			
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Legend:
 §201.6(c)(2)(ii) Assessing Vulnerability: Overview

- A. Does the new or updated plan include an overall summary description of the jurisdiction's vulnerability to each hazard?
- B. Does the new or updated plan address the impact of each hazard on the jurisdiction?

- B. Does the new or updated plan describe vulnerability in terms of the types and numbers of future buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(A) Assessing Vulnerability: Identifying Structures

- A. Does the new or updated plan describe vulnerability in terms of the types and numbers of existing buildings, infrastructure, and critical facilities located in the identified hazard areas?

§201.6(c)(2)(ii)(B) Assessing Vulnerability: Estimating Potential Losses

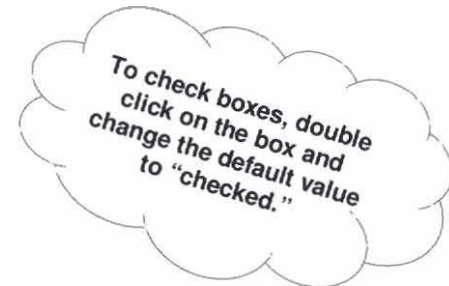
- A. Does the new or updated plan estimate potential dollar losses to vulnerable structures?
- B. Does the new or updated plan describe the methodology used to prepare the estimate?

Matrix C: Identification and Analysis of Mitigation Actions

This matrix can assist FEMA and the State in scoring each hazard. Local jurisdictions may find the matrix useful to ensure consideration of a range of actions for each hazard. **Completing the matrix is not required.**

Note: First, check which hazards are identified in requirement §201.6(c)(2)(i). Then, place a checkmark in either the N or S box for each applicable hazard. An "N" for any identified hazard will result in a "Needs Improvement" score for this requirement. List the hazard and its related shortcoming in the comments section of the Plan Review Crosswalk.

Hazard Type	Hazards Identified Per Requirement §201.6(c)(2)(i)	A. Comprehensive Range of Actions and Projects	
	Yes	N	S
Avalanche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Erosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coastal Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drought	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Earthquake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expansive Soils	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee Failure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flood	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hailstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hurricane	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Land Subsidence	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslide	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Severe Winter Storm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tornado	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tsunami	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Volcano	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wildfire	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Windstorm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Legend:

§201.6(c)(3)(ii) Identification and Analysis of Mitigation Actions

A. Does the new or updated plan identify and analyze a comprehensive range of specific mitigation actions and projects for each hazard?

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APPENDIX B

PLAN ADOPTION

Note, to be completed following conditional approval.

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APPENDIX C

MEETING DOCUMENTATION

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Update of the Northern Virginia Hazard Mitigation Plan Proposal Presentation

Kick Off Meeting
Dewberry

December 4, 2009



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Meeting Agenda

1. Welcome & Introductions – Lucia Schmit
2. Meet the Team – Larry Zensinger
3. Plan Update Requirements – Deborah Mills
4. Plan Update Process and Schedule – Jane Sibley Frantz
5. Human-Caused Risk Analysis – Digital Sandbox
6. Visioning : Desirable Plan Outcomes – Deborah Mills
7. Visioning : Engaging Internal & External Stakeholders – Carrie Speranza and Shandi Treloar
8. Wrap Up & Future Meetings – Lucia Schmit & Deborah Mills

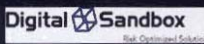
UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Corporate Overview

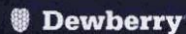


- 50 years in Northern Virginia
- 2,000 professionals
- More than \$300 M annual revenue
- Core service: Emergency Management and Hazard Mitigation



- 10+ years developing and deploying risk management solutions
- Holds 3 U.S. patents

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



It's Your Plan!

We are here to:

- ✓ Facilitate the process
- ✓ Lend technical expertise and consultation
- ✓ Do the heavy lifting and dirty work

You need to:

- ✓ Participate & Make the final decisions
- ✓ Ensure a feasible plan that meets regional, community and stakeholder needs

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Company Roles



- Steering Committee Facilitation
- Hazard Identification/Risk Assessment
- Goals, Objectives and Project Development
- Project Scoping
- Public Outreach
- Adoption Tracking



- Human-caused Threat Analysis



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Project Team



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Understanding Requirements

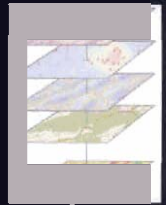
- **New FEMA Local Plan Requirements**
 - Clear roadmap on update process
 - Incorporate previous plan crosswalk comments
 - Integrate NFIP program
 - Describe current status of projects
 - Address critical facilities

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Understanding Requirements

- **Challenges unique to region**
 - Scheduling conflicts
 - Disasters happen
 - Multiple GIS sources
 - Complicated review process



UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Project Schedule

Project Task	Dec. 2009 - June 2010	June 2010 - Nov 2010	Aug 2011
Task 1 Planning Support & Project Management			
Task 2 Hazard Identification and Risk Assessment			
Task 3 Mitigation Goals, Objectives and Projects			
Task 4 Plan Production & Adoption			

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Planning Support

- Encourage diverse Steering Committee membership
- Meet up to two times with each participating jurisdiction
- Use multi-faceted approach to public input
- Stay in constant communication

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Tools We Use

- Facilitated Meetings
- Public Workshops
- Secure Northern Virginia Project Share Site

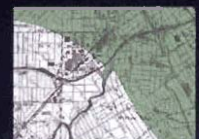


UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Hazard Identification and Risk Assessment (HIRA)

- Address natural and human-caused hazards
- Build on existing data from VDEM, MWCOG, and jurisdictions
- Use risk matrix to prioritize hazards
- Use GIS to conduct vulnerability assessment and estimate losses



UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Meet Digital Sandbox

Digital Sandbox provides risk management solutions to homeland security organizations.

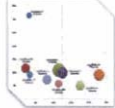
We strive to enable organizations to make policy, budget, and operational decisions based on analysis of the terrorism and natural hazard risks they face.



Leading tools for collection, analysis, and reporting



Expert analysts to interpret risk data, uncover trends



Analytic processes and presentations to drive business results

Quick Facts

- Rapidly growing, 11-year old business headquartered in McLean, Virginia
- Provider of threat and risk ranking system to all levels of government
- Sponsored by IC, DOI, DoD, and DHS to develop analytic approaches and technology for risk analysis and management
- Our analytics have directed in excess of \$10B of investments over the past 3 years
- Regularly brief Congress, the White House, and senior government executives on risk
- Advisors to Financial Services Firms, Corporate Security Officers, Governments, and Lawyers
- Holders of 3 US patents for risk analysis with others pending

The Digital Sandbox Project Team

Project Team

Anthony Beverina - President & Founder

- Leading expert on state & local homeland security
- Works directly with state and local Homeland Security Advisors (HSAs), Chiefs of Police, and Fire Chiefs

Adam Trister - Chief of Staff

- Responsible for executive oversight of the engagement
- Former Maryland CIP Manager

Erin Mohres - Project Manager

- Responsible for day to day management of this engagement
- Former Emergency Manager for the City of Fort Lauderdale
- Currently managing DSB's work in Manassas Road's Virginia

Adam McCann - Lead Analyst

- Responsible for authoring the risk context
- Former analyst at DC HESEHA

Digital Sandbox staff include world-class quantitative analysts, software developers, and homeland security experts.

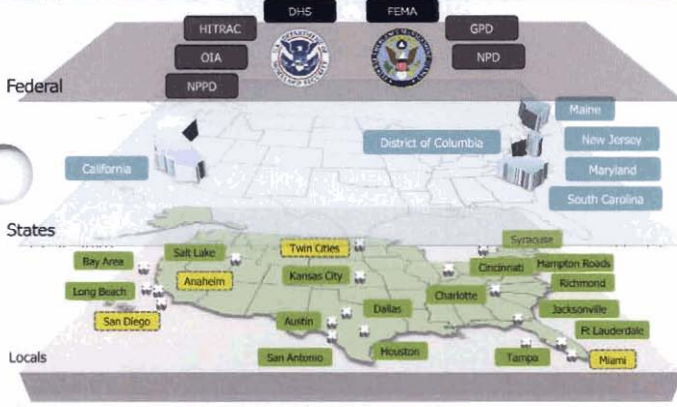
2/3 of staff have active clearances
40% of staff have advanced degrees

Staff include former:

- Deputy Homeland Security Advisor
- City Emergency Manager
- State CIP Manager
- Military and Intelligence Officers
- Senior DHS Executives



Digital Sandbox Clients



DSB will develop Terrorism Risk Context "Tear Sheets" that...

- Identifies High Profile Infrastructure within each region
- Identifies Factors (Drivers) of Risk within each region
- Discusses the risk impact on Local and National Level
- Will be developed quickly (30 days) and can be delivered individually to each jurisdiction as well to the Project Team to drive HIRA development

Terrorism Risk Content - Example

Jurisdictional summary

Population risk for each jurisdiction and how that compares to other jurisdictions

Overview of threats each jurisdiction is susceptible to

Commuter population displays how the risk changes from night to day

Summary of potential high risk assets in each jurisdiction

Overview of additional factors that affect risk in a jurisdiction

HIRA cont.

- Capture NFIP requirements such as repetitive loss
- Incorporate existing land use and other plans
- Create a regional HIRA with jurisdiction-specific executive summaries



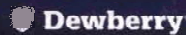
UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



HIRAs build a foundation

- A solid HIRA is the foundation for all emergency management planning
- Your investment in a strong mitigation plan will support:
 - Emergency Operations Plans
 - Emergency Response Plans
 - Shelter and Evacuation Plans
 - Long Term Community Recovery Plans – ESF 14
 - Continuity of Operations Plans

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Mitigation Goals, Objectives and Projects

- Inventory and assess status of 2007 mitigation actions
- Develop regional goals and projects by Steering Committee
- Facilitate development of jurisdiction-specific goals and projects
- Create mitigation strategy tracking tool for use over next 5 years



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Plan Production and Adoption

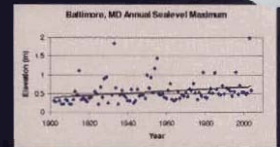
- Circulate drafts early and often
- Submit completed plan with crosswalk to VDEM
- Provide adoption resolution templates
- Compile adoption notices and submit full plan to VDEM and FEMA

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Value Added Services

- Address non-traditional hazards like climate change
- Conduct a Social Vulnerability Analysis
- Scope highest priority projects
 - Project Description
 - Feasibility Analysis
 - Benefit Cost Analysis
 - EHP Review
- EMAP Compliance



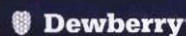
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Visioning Exercise – Desired Plan Outcomes

- See written notes

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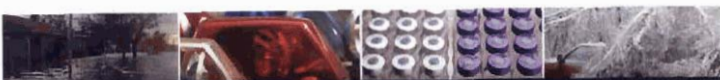


Brainstorming : Engage Internal and External Stakeholders

- See written notes

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

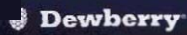




Brainstorming : How to Engage Internal and External Stakeholders

- Internal kickoff for each jurisdiction
- Invite them to HIRA meetings

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Primary Contacts

Project Manager: Deborah Mills

dmills@dewberry.com 703.849.0162

Planning Lead: Jane Sibley Frantz

jfrantz@dewberry.com 703.849.0473

HIRA Lead: Rachael Heltz-Herman

rherman@dewberry.com 585.949.6327

Digital Sandbox:

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



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**Northern Virginia Mitigation Plan Update Kick Off Meeting
December 4, 2009 Sign-in Sheet**

Name	Department/Organization	Phone	Fax	E-mail
Becky McKinney	Fairfax County OEM	571-350-1009		Elizabeth.mckinney@fairfaxcounty.gov
Pat Collins	Prince William County OEM	703-792-5828	703-792-7149	pcollins@pwcgov.org
Alexa Hussar	Prince William County OEM	703-792-5254	703-792-7149	ahussar@pwcgov.org
Kevin Johnson	Loudon County OEM	703-737-8831	703-779-0012	Kevin.johnson@loudon.gov
Charlie McRorie	City of Alexandria	703-838-3825	703-548-6952	Charlie.mcrories@alexandriava.gov
Beth Brown	VDEM	804-317-6685		Beth.brown@vdem.virginia.gov
Robbie Coates	VDEM	804-897-6800, ext. 6582		Robbie.coates@vdem.virginia.gov
Lucia Schmit	Arlington County	703-228-7936		lschmit@arlingtonva.us
Dan Ellis	City of Falls Church	703-248-5058	703-248-5158	delis@fallschurchva.gov
Sam Myers	Loudon County OEM	703-737-8130	703-779-0012	Sam.myers@loudon.gov
Deborah Mills	Dewberry (contractor)	703-849-0216	703-206-0803	dmills@dewberry.com
Larry Zensinger	Dewberry (contractor)	703-849-0139	703-206-0803	lzensinger@dewberry.com

Meeting Agenda

Subject:	<i>Northern Virginia RC Hazard Mitigation Plan Update</i>	Date & Time:	Friday January 15, 2010 9:30 am – 12:00 pm
Location:	<i>Dewberry HQ Office 8403 Lobby Conference Room</i>		
Purpose:	<i>Hazard Identification & Risk Assessment (HIRA) Kick-Off Meeting</i>		
Attendees:	NoVA Hazard Mitigation Planning Committee Digital Sandbox Dewberry		
Description		Lead	Est. Time
Welcome and Introductions <ul style="list-style-type: none"> • SharePoint Site • Planning Process 		Deborah Mills	9:30 – 9:45
Plan Update Requirements & Data Availability <ul style="list-style-type: none"> • Overview of HIRA Planning Process • Hazard Analysis consistent with State Hazards • New Hazards to Consider? • Identified Weaknesses of Existing Plan • Data discrepancies from previous plan, what can be improved • Historical Event Descriptions • Critical Facilities and Assets 		Rachael Heltz Herman	9:45 – 10:30
BREAK			10:35 – 10:45
Ranking Methodology, Risk & Vulnerability <ul style="list-style-type: none"> • Review of Existing Ranking Potential Methodology for Revision • Determining Risk & Vulnerability • Annualized Loss 		Rachael Heltz Herman	10:45 – 11:15
		Digital Sandbox	11:15 - 11:45
Project Schedule - Milestones		Deborah Mills	11:45 – 11:50
Wrap Up and Future Meetings <ul style="list-style-type: none"> • Individual meetings with each jurisdiction • Next Steering Committee Meeting • Overview of Action Items 		Deborah Mills Rachael Heltz Herman	11:50 – 12:00

2006 Local Plan Comparison to Virginia 2010 Plan

PDC/Jurisdiction	Flood	Erosion	Wind	Hurricane	Tornado	Thunder storm	Lightning	Hail	Winter	Extreme Heat	Extr. Cold
2006 Northern Virginia RC	High	Low	Medium	Medium	High	High	NA	NA	High	Low	Low
Average Ranking From Local Plans	High	Low	Medium	Medium-High	Medium-Low	Medium-Low	NA	Low	Medium-High	Low	NA
2010 Statewide Analysis Ranking	High	NA	Medium-High		Medium	NA	NA	NA	Medium-High	NA	NA

PDC/Jurisdiction	Drought	Earthquake	Tsunami	Wildfire	HazMat	Land slide	Karst	Terroris	Bio.
2006 Northern Virginia RC	Medium	Low		Medium	NA	Low	Low		
Average Ranking From Local Plans	Medium-Low	Low	NA	Medium-Low	Low	Low	Low	NA	Low
2010 Statewide Analysis Ranking	Medium	Medium-Low	NA	Medium	NA	Medium-Low	Low		NA

Update of the Northern Virginia Hazard Mitigation Plan

Hazard Identification & Risk Assessment Kick Off Meeting
Dewberry
January 15, 2010



UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Meeting Agenda

1. Welcome & Introductions
 - SharePoint Site
2. Plan Update Requirements & Data Availability
3. Ranking Methodology, Risk & Vulnerability
4. Digital Sandbox
5. Project Schedule - Milestones
6. Wrap Up & Future Meetings

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Plan Update Process

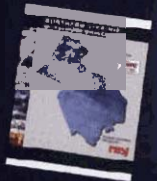
- Data Collection & 2006 Plan Evaluation
- Hazard Identification and Risk Assessment Update
- Mitigation Goals, Strategies and Projects (revision)
- Capability Assessment
- Plan Maintenance
- Draft Plan Submittal and Review
- Plan Adoption
- Plan Submission to VDEM & FEMA

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Understanding Requirements

- New FEMA Local Plan Requirements
 - Clear roadmap on update process
 - Incorporate previous plan crosswalk comments
 - Integrate NFIP program
 - Describe current status of projects
 - Address critical facilities



UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Plan Update Requirements

- Must be updated every five years
- Re-assess Hazard Identification and Risk Assessment (HIRA)
 - Considers changes to hazards and vulnerability of people and assets
 - Address hazard events that have occurred since the last plan
- Incorporate local planning efforts with Virginia State Plan
- Report on progress with mitigation strategy to-date and discuss adjustments
- Address weaknesses identified in previous plan review

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Hazard Identification and Risk Assessment (HIRA)

- Address natural and human-caused hazards
- Build on existing data from VDEM, MWCOG, and jurisdictions
- Use risk matrix to prioritize hazards
- Use GIS to conduct vulnerability assessment and estimate losses




UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN




HIRA [Continued]

- Capture NFIP requirements such as repetitive loss
- Incorporate existing land use and other plans
- Create a regional HIRA with jurisdiction-specific executive summaries

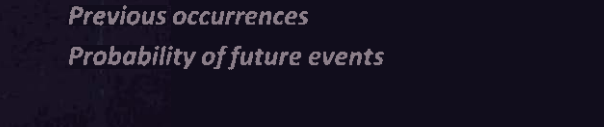


UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN




HIRA Sections

Identify Hazards
Profile Hazards
 Geographic area affected
 Magnitude or extent
 Previous occurrences
 Probability of future events




UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



HIRA Sections [Continued]

Assessing Vulnerability
 Jurisdictions vulnerability to Hazard
 Impact of Hazard
 Repetitive Loss Properties Addressed
 Types & Numbers of existing structures (buildings, infrastructure, critical facilities) in Hazard Areas
 Types & Numbers of future structures in Hazard Areas
 Methodology & Estimation of potential dollar loss to vulnerable structures
 Land Use & Development Trends

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN




RISK ASSESSMENT: §201.6(c)(2): The plan shall include a risk assessment that provides the factual basis for activities proposed in the strategy to reduce losses from identified hazards. Local risk assessments must provide sufficient information to enable the jurisdiction to identify and prioritize appropriate mitigation actions to reduce losses from identified hazards.

Risk Assessment

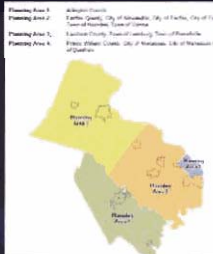
	H	R
1. Identifying Hazards: §201.6(c)(2)(i)		
2. Profiling Hazards: §201.6(c)(2)(ii)		X
3. Assessing Vulnerability: Overview: §201.6(c)(2)(iii)		
4. Assessing Vulnerability - Addressing Repetitive Loss Properties: §201.6(c)(2)(iv)		
5. Assessing Vulnerability - Identifying Buildings, Infrastructure, and Critical Facilities: §201.6(c)(2)(v)		
6. Assessing Vulnerability - Estimating Potential Losses: §201.6(c)(2)(vi)		
7. Assessing Vulnerability - Analyzing Development Trends: §201.6(c)(2)(vii)		
8. Multi-Jurisdictional Risk Assessment: §201.6(c)(2)(viii)		

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



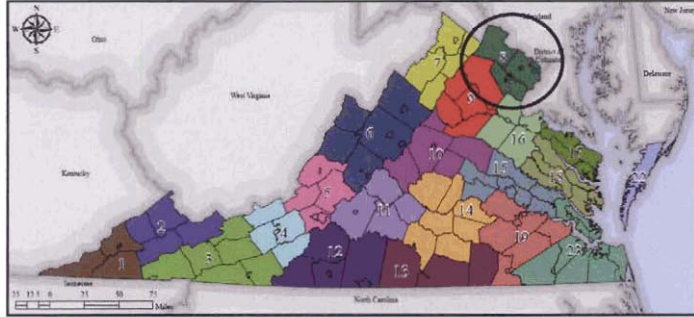
2010 HIRA Update

- Update Hazard Profiles
- Review identified hazards & their priority/ranking
- Review and update methodology for:
 - Vulnerability Analysis
 - Potential Loss Estimates



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Figure 3.2-4: Planning District Commissions



LEGEND:

- 1 Loudoun PDC
- 2 Shenandoah PDC
- 3 Mount Rogers PDC
- 4 New River Valley PDC
- 5 Potomac Valley Adaptive PDC
- 6 Central Shenandoah PDC
- 7 Northern Shenandoah Valley PDC
- 8 Northern Tidewater PDC
- 9 Tidewater PDC
- 10 Thomas Jefferson PDC
- 11 Virginia Express 2010/11 PDC
- 12 Shenandoah PDC
- 13 Shenandoah PDC
- 14 Commonwealth PDC
- 15 Piedmont Region
- 16 George Washington
- 17 Northern Neck
- 18 Middle Peninsula
- 19 Eastern Shore PDC
- 20 Accomack-Norfolk
- 21 Hampton Roads

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Hazard Identification: New Hazards to Consider?

- Flood
- Severe Thunderstorms
- Tornadoes
- Winter Storms
- Hurricanes & Tropical Storms
- Drought
- Wildfire
- Earthquakes
- Extreme Temperatures
- Dam Failure
- Erosion
- Landslides
- Sinkholes

Table 6.37
Conclusions on Hazard Risk for the Northern Virginia Region

HIGH RISK	Flood Severe Thunderstorms Tornadoes Winter Storms
MODERATE RISK	Hurricanes and Tropical Storms Drought Wildfire
LOW RISK	Earthquakes Extreme Temperatures Dam Failure Erosion Landslides Sinkholes

Climate Change as an amplifier of other hazards?

Hazards Addressed in 2010 VA State Plan

- High
- Flood
- Medium-High
- Non-Rotational Wind
 - Winter Weather
- Medium
- Tornado
 - Drought
 - Wildfire
- Medium Low
- Earthquake
 - Landslide
- Low
- Karst
 - Dam Failure

Hazard Naming Ambiguity

- Interrelated Hazards
- Review Virginia State Plan to see what hazard naming conventions were used
 - Do these seem reasonable?
 - Any hazards missing?

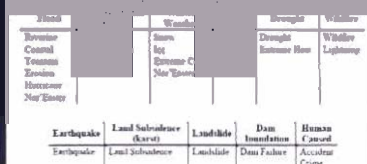


Table 6.2: Level III-IV summary of hazard ranking and comparison with 2010 statewide hazard ranking results

Hazard Category	Flood	Wind	Drought	Wildfire	Earthquake	Land Subsidence (Karst)	Landslide	Dam	Dam Failure	Human Caused	Accidents	Crime	Terror
Albemarle DDC	High	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
... (many more rows) ...													

Local vs. State Hazard Ranking Comparison

DC/Jurisdiction	Flood	Wind	Winter	Hurricane	Tornado	Thunder storms	Lightning	Heat	Winter	Extreme Heat	Extreme Cold
2006 Northern Virginia RC	High	Low	Medium	Medium	High	High	NA	NA	High	Low	Low
Average Ranking from Local Plans	High	Low	Medium	Medium-High	Medium-Low	Medium-Low	NA	Low	Medium-High	Low	NA
2010 Statewide Analysis Ranking	High	NA	Medium-High	Medium	NA	NA	NA	NA	Medium-High	NA	NA

DC/Jurisdiction	Drought	Earthquake	Tsunami	Wildfire	Hot/Hot	Land slide	Karst	Terrorism	Dam	Blow-Downs & Explosions
2006 Northern Virginia RC	Medium	Low	NA	Medium	NA	Low	Low	NA	Low	NA
Average Ranking from Local Plans	Medium-Low	Low	NA	Medium-Low	Low	Low	Low	NA	Low	NA
2010 Statewide Analysis Ranking	Medium	Medium-Low	NA	Medium	NA	Medium-Low	Low	NA	Low	NA

Identified Weaknesses in Existing Plan Discussion with Planning Committee

- What do you like about current plan?
- Are there other efforts currently going on in your community that we should be aware of?
- Have the necessary people/departments been asked to participate?
- How can this plan help your agency?

Identified Weaknesses in Existing Plan [Continued]

- What would you like changed in the revision?
 - Simple rather than wordy
 - Subject matter experts
 - Useful HIRA with better data
 - Social Vulnerability improved
 - Components to Address

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Data Discrepancies

- What can be improved?
- Tying HIRA to specific mitigation projects/activities
- Does your locality/agency have new data sources that have been created since the 2006 plan?
- What types of data would you like to see in the revision?

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Data Needs: Building & Critical Facilities

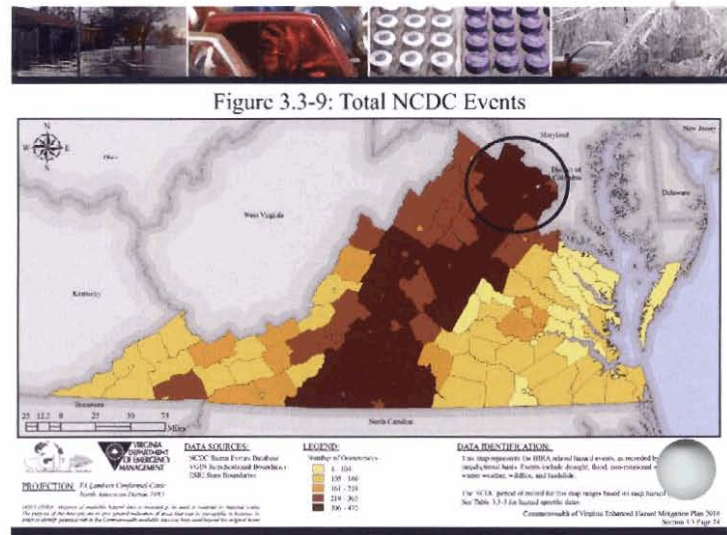
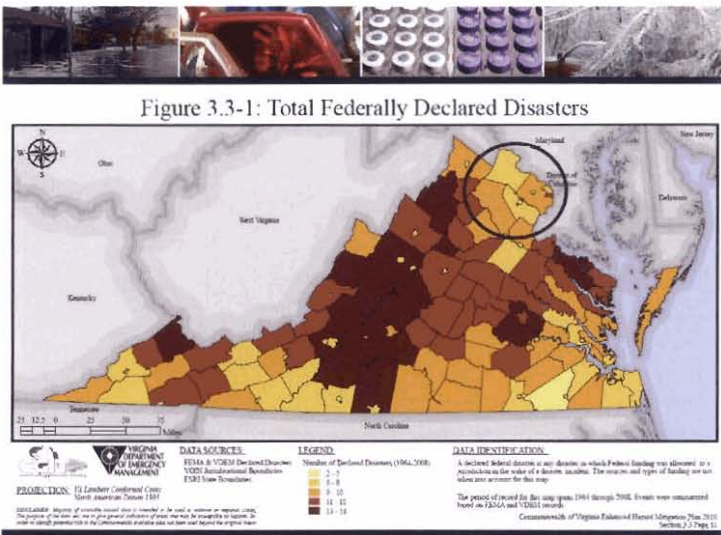
- Local Data
 - Building Specific (year, materials, value...)
 - Infrastructure
- Critical/Essential Facilities
 - Local Facilities with Building Specific Parameters
 - HAZUS-MH default Data
 - VDEM does not have a standard definition of a Critical Facility
 - 2010 HMP identifies broad types of CF with only general location:
 - Law Enforcement Facilities
 - Schools
 - EOCs
 - Fire Stations
 - Hospitals
 - Nursing Homes

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

General Historical Disaster Databases

- List of Federally Declared Disasters from FEMA
 - Jurisdictions declared
 - Nature of disaster
 - Type(s) of assistance provided
- National Climatic Data Center (NCDC) Storm Events Database
 - Area Impacted
 - Damages
 - Description of event
- Virginia Department of Forestry

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Data Sources & Needs

- Demographics
 - Census Data
- Hazard Data
 - Flood: FEMA FIRMS, FEMA Rep Loss, VDEM, DCR, NCDC & HAZUS-MH
 - Tornado: NCDC & SVRGIS
 - Wind (Microburst/Straightline): HAZUS-MH, NCDC & SVRGIS
 - Land & Mine Subsidence: USGS
 - Severe Thunderstorms: NCDC & SVRGIS
 - Winter Weather: NCDC
 - Earthquake: HAZUS-MH
 - Wildfire: VDOF & NCDC
- Land Use
 - Local Planning Efforts (population changes and/or shifts, changes in land use activities)
 - National Land Cover Data (NLCD)

Data Transfer from Localities to Dewberry

- Local GIS contacts
- Data used in previous planning efforts
- Other Planning Efforts (MWCOG, NCR SHIELD, Critical Infrastructure Plan)

Rachael Herman
716-949-6327
rherman@dewberry.com

10 Minute Break

2006 Ranking Parameters

- A "hybrid" approach was developed to include:
 - Quantitative Analysis
 - Hazard Loss Estimates (HAZUS, NCDC, VDOT)
 - At-risk Community Assets
 - Qualitative Analysis
 - Mitigation Advisory Committee's scoring system results
 - Likelihood of occurrence, spatial extent, potential impact
- Dual-faceted review of the hazards

Qualitative Approach

- Historical & Anecdotal Data, Community Input, Professional Judgment
- Priority Risk Tool (PRI)
- MAC Score 1-4 with weighting factors

$$PRI \text{ Value} = [(Probability \times .30) + (Impact \times .30) + (Spatial \text{ Extent} \times .20) + (Warning \text{ Time} \times .10) + (Duration \times .10)]$$

Priority Risk Index

- Discussion from Planning Committee
- Benefits
- Limitations

Table 6.30
Priority Risk Index (PRI) Values

Hazard	PRI Value
Flood	3.2
Tornado Storms	3.6
Extreme Temperatures	2.7
Thunderstorms	2.7
Humidexes and Tropical Storms	2.6
Wildfire	2.6
Extreme Temperatures	2.4
Drought	2.3
Open Ponds	2.3
Collaps	1.9
Landslides	1.9
Earthquakes	1.9
Landslides	1.6
Avionics	1.6

Table 6.1
Summary of Priority Risk Index (PRI)

PRI Category	Likelihood of Risk		Index Value	Assigned Weighted Factor
	Level	Criteria		
Probability	Unlikely	Less than 1% annual probability	1	30%
	Possible	Between 1 and 10% annual probability	2	
	Likely	Between 10 and 100% annual probability	3	
Impact	High/Low	100% annual probability	4	30%
Minor	Very low impact, 0 yrs. Only minor property damage and minimal disruption on quality of life. Temporary shutdown of critical facilities.	1		
Major	Minor impacts only. More than 10% of critical facilities are damaged or destroyed. Complete shutdown of critical facilities for more than one day.	3		
Spatial Extent	Small	Less than 1% of area affected	1	20%
	Large	Between 50 and 100% of area affected	4	
Warning Time	More than 24 hours	Self-explanatory	1	10%
	Less than 24 hours	Self-explanatory	2	
Duration	Less than 1 hour	Self-explanatory	1	10%
	More than one week	Self-explanatory	2	

Quantitative Approach

- Annualized Loss
 - NCDC
 - Flood
 - Drought
 - Severe Thunderstorm
 - Tornadoes
 - Winter Storm
 - Wildfire
 - HAZUS
 - Hurricane Winds
 - Earthquake
- At-Risk Community Assets
 - Flooding
 - Landslides
 - Wildfires

Annualized Loss = _____ of record

Hazard	Annualized Loss
Hurricanes and Tropical Storms	\$33,723,000
Flood	\$3,012,000
Drought	\$2,207,000
Severe Thunderstorms	\$1,110,000
Tornadoes	\$731,000
Earthquakes	\$341,000
Winter Storms	\$109,000
Wildfire	\$25,000
Extreme Temperatures	Negligible
Sea Level Rise	Negligible
Oil Spills	Negligible
Chemical Releases	Negligible
Other	Negligible

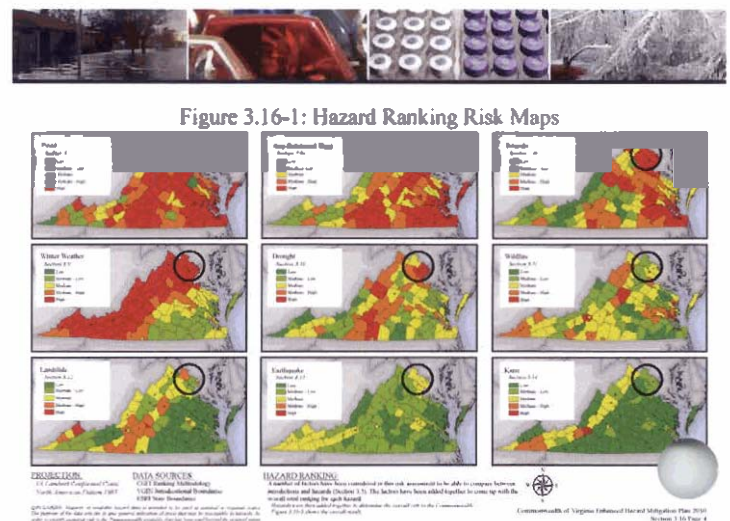
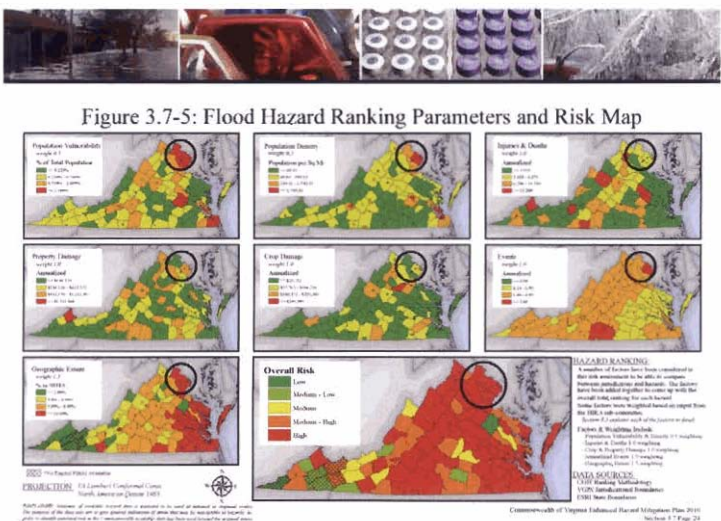
VA State Plan Ranking Parameters

- "Semi-Quantitative" Scoring System
 - Actual Data Values grouped in categories 1-4 based on statistics
- NCDC Data with normalization (inflation ...)
 - Limitations with probability & impact data
- Parameters Used:
 - Population Vulnerability (weight 0.5)
 - Population Density (weight 0.5)
 - Geographic Extent (weight 1.5)
 - Annualized Deaths & Injuries (weight 1)
 - Annualized Crop & Property Damage (weight 1)

Virginia 2010 Ranking Maps

- Illustrate data sources that could be used as part of the local plan update
- Estimation of Annualized Loss
 - Values that will be created & used in this revision will fine-tune the Virginia State Plan estimates based on better data inputs for:
 - Inclusion of 2006-2010 hazard events
 - Critical facility locations and information
 - Building/Infrastructure parameters

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Vulnerability Analysis & Loss Estimation

- Annualized Loss based on NCDC and HAZUS-MH
- Building Specific Analysis for Buildings & Critical Facilities
 - Data Dependent
- Social Vulnerability
- Development Trends
 - In areas of high risk?

Social Vulnerability

- Who, What, Where ...
- Parameters to be considered:

Elderly and Special Care Populations	Income
Socially Dependent Immigrants	Race/Ethnicity
	Gender
- Highlight areas for potential mitigation projects
- Everything is Relative

Flood Loss Estimation

TABLE 6.10
100-year Floodplain Exposure in the Northern Virginia Region (Zones A and AE)

Jurisdiction	Total Number of Structures	Number of Structures in Flooded Area	Number of Structures in Flooded Area with Flood Insurance	Number of Structures in Flooded Area with Flood Insurance and FEMA Flood Insurance
Arlington, City of	19,967	4,260	1,200	1,200
Fairfax County	2,200	4,200	1,200	1,200
Prince William County	2,200	4,200	1,200	1,200
Loudoun County	2,200	4,200	1,200	1,200
Alexandria, City of	2,200	4,200	1,200	1,200
Fairfax, City of	2,200	4,200	1,200	1,200
Arlington County	2,200	4,200	1,200	1,200
Manassas, City of	2,200	4,200	1,200	1,200
Falls Church, City of	2,200	4,200	1,200	1,200
Manassas Park, City of	2,200	4,200	1,200	1,200
TOTAL	11,300	23,000	6,400	6,400

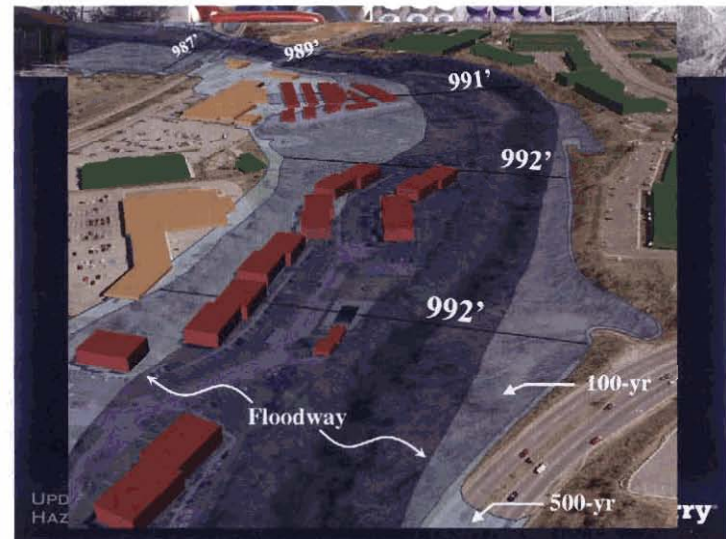
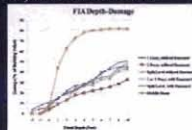
Jurisdiction	Annualized Loss
Fairfax County (2)	\$7,505,247
Prince William County (6)	\$3,069,348
Loudoun County (8)	\$2,157,843
Alexandria, City of (10)	\$1,997,414
Fairfax, City of (10)	\$420,031
Arlington County	\$308,235
Manassas, City of	\$212,413
Falls Church, City of	\$112,545
Manassas Park, City of	\$41,580
TOTAL	\$15,824,658

2006 Planning Area	2010 State Plan	2006 Local Plan
Planning Area 1	\$308,235	\$1,236,000
Planning Area 2	\$10,015,252	\$1,240,000
Planning Area 3	\$2,157,843	\$556,000
Planning Area 4	\$3,323,349	\$880,000
Total	\$15,824,658	\$3,912,000

2010 Plan Update: Potential Assumptions for annualized loss Calculations

Annualized Loss = Percent Damaged * Building \$\$ Exposure * Hazard Probability/Recurrence Interval

FEMA Flood Zone	Flood Depth (feet)	Annual Probability	Percent Damaged
Floodway, VE	0	0.0100	40%
AE	2	0.0100	22%
A, AO, AH	1	0.0100	14%
0.2 percent annual change (500 year)	1	0.0020	14%



HAZUS-MH Scenarios

- Level I Analysis
 - Nationally-developed data for building square footage, building value, population characteristics, costs of building repair and economic data (broken down by census division units)
 - Flood
 - Earthquake
 - Hurricane Winds
- HAZUS is not required in Local Mitigation Plans, communities are encouraged to use HAZUS to form a scientific basis from which the mitigation strategy is developed.

Annualized Loss

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate ...

2006 Local Plan Loss Estimates for:

- | | |
|------------------------|-----------------------|
| Hurricanes (HAZUS-MH) | Earthquake (HAZUS-MH) |
| Flood (NCDC) | Winter Storm (NCDC) |
| Drought (NCDC) | Wildfire (NCDC) |
| Severe T-storms (NCDC) | |
| Tornado (NCDC) | |

2010 State Plan Loss Estimates for:

- | | |
|---|------------------------|
| Flooding (Flood depth assumptions & NCDC) | Winter Storm (NCDC) |
| Non-Rotational Wind (HAZUS-MH) | Wildfire (NCDC & VDOF) |
| Drought (NCDC) | Landslide (NCDC) |
| Earthquake (HAZUS-MH) | |
| Tornado Wind (NCDC) | |

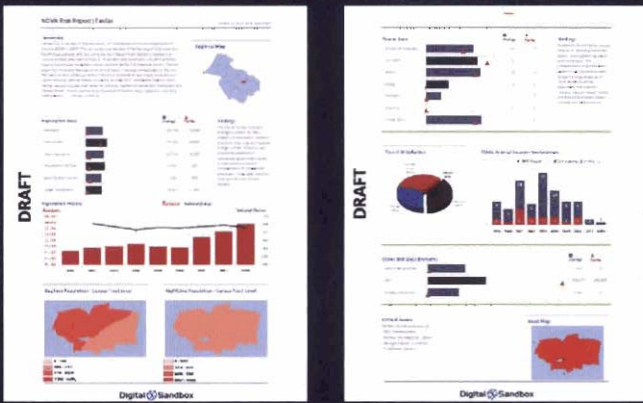
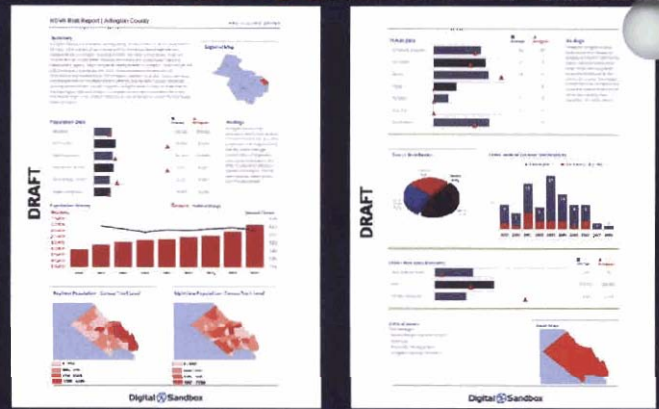
2010 Local Plan Estimates should align with (or update) state data sources and established hazard occurrence probabilities



Terrorism Context Report

Digital Sandbox

- Risk Input Template
- Expectations
 - What Hazards to Consider?
- Specific Buildings/Infrastructure



Updates to Risk Assessment: Next Steps...

- Data Collection for Hazards & Critical Facilities
- Collection of Development and Land Use planning documents
- Inclusion of disasters/events since 2006 plan
- Conduct Hazard & Vulnerability Analysis
 - Ranking Methodology based on Available Data
 - Loss Estimation
 - Alignment/Refinement with Virginia State Plan HIRA
 - HAZUS-MH Analysis
- Map generation & Report writing
 - Reorganization of Chapters 5-8 for better readability



Project Schedule

Project Task	Dec. 2009 - June 2010	June 2010 - Nov 2010	Aug 2011
Task 1 Planning Support & Project Management			
Task 2 Hazard Identification and Risk Assessment			
Task 3 Mitigation Goals, Objectives and Projects			
Task 4 Plan Production & Adoption			



Primary Contacts

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Northern Virginia Mitigation Plan Update Kick Off Meeting

~~December 4, 2009~~ Sign-in Sheet

January 15, 2010

Name	Department/Organization	Phone	Fax	E-mail
Becky McKinney	Fairfax County OEM	571-350-1009	571-351-1010	Elizabeth.mckinney@fairfaxcounty.gov <i>EM</i>
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Alexa Hussar	Prince William County OEM	703-792-5254	703-792-7149	ahussar@pwcgov.org <i>AH</i>
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Charlie McRorie	City of Alexandria	703-838-3825	703-548-6952	Charlie.mcrorie@alexandriava.gov <i>CM</i>
Beth Brown	VDEM	804-317-6685		Beth.brown@vdem.virginia.gov <i>BMB</i>
Robbie Coates	VDEM	804-897-6800, ext. 6582		Robbie.coates@vdem.virginia.gov
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Agenda

Northern Virginia Hazard Mitigation Plan Update
 Hazard Identification, Risk Assessment and Vulnerability Analysis
 Review and Update of 2006 Plan Goals, Objectives and Regional Strategies

Monday, July 12, 2010 9:00 – 3:00 PM

Dewberry

8403 Arlington Boulevard (rear Building), Fairfax VA 22031

Training Center – Ground Floor

Description	Lead	Time
Welcome, Introductions and Agenda <ul style="list-style-type: none"> • Planning Process Review • Progress to Date 	Deborah Mills	9:00 – 9:30
Hazard identification, Risk Assessment and Vulnerability Analysis by hazard	Ryan Towell, Ginni Melton	9:15 – 10:15
BREAK		10:15 – 10:30
HIRA Review, continued	Ryan Towell, Ginni Melton	10:30 – 11:00
Human Caused Hazards Analysis	Digital Sandbox	11:00 - NOON
LUNCH	Provide	NOON – 12:30 PM
Review and Validation of 2006 Plan Goals and Action Strategy	Jane Sibley Frant:	1:00 – 2:30
Next Steps: Local Plan Committee Scheduling Project Schedule Remaining Local Inputs Required 2006 Evaluation Capability Analysis	Deborah Mills Carrie Speranza	2:30 – 3:00

Attendees Morning Session:

HIRA, Vulnerability Analysis and Human-Caused Hazard Presentations:

NOVA Hazard Mitigation Committee	VDEM
Northern Virginia Regional Commission Climate Change Committee	FEMA
NOVA Emergency Managers or designees	

Attendees Afternoon Session:

2006 Plan Goals and Mitigation Actions Group Review, Validation and Update

NOVA Hazard Mitigation Committee	VDEM
Northern Virginia Regional Commission	FEMA
NOVA Emergency Managers or designees	



Update of the Northern Virginia Hazard Mitigation Plan

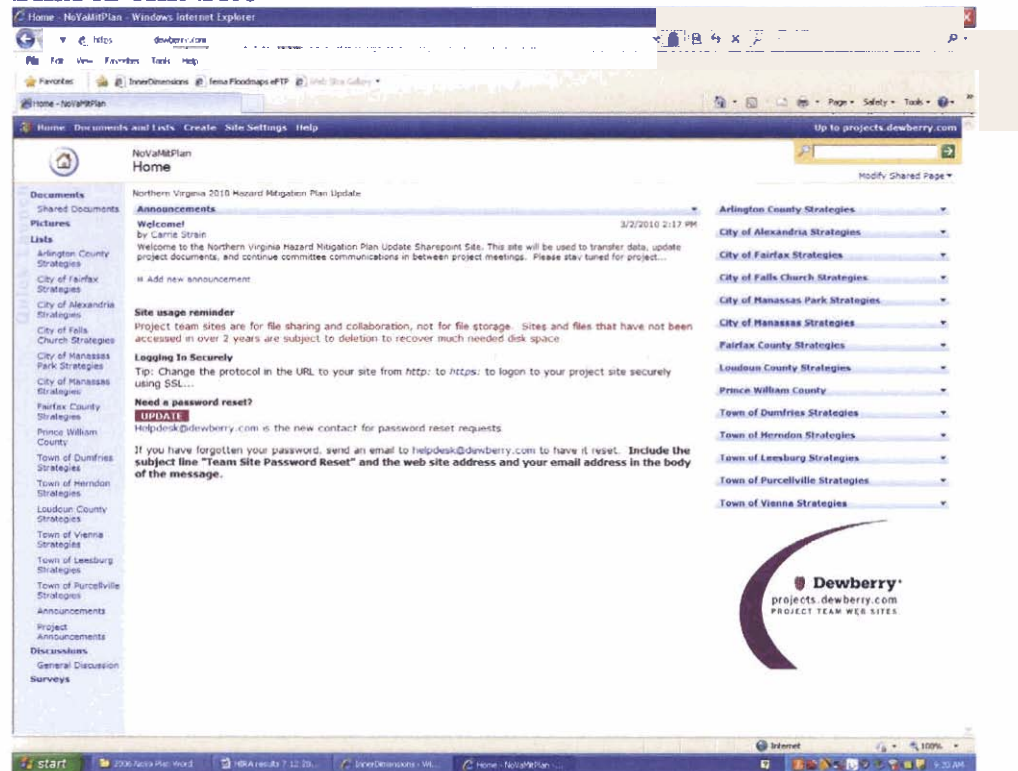
Dewberry Team:

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Planning Support and Share Point Site	Carrie Speranza	703.849.0367	csperanza@dewberry.com
Climate Change and HIRA Support	Ryan Towell	703.849.0275	rtowell@dewberry.com
Local Plan Annex Leads	Carrie Speranza Shandi Treloar	703.849.0367 703.849.0449	csperanza@dewberry.com streloar@dewberry.com
Structural Mitigation Project Scoping	Julia Moline Jennifer Holcomb	703.849.0610 703.849.0556	jmoline@dewberry.com jholcomb@dewberry.com

Arlington County Project Management Team:

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Financial Lead	Joanne Hughes	703.228.3560	jmhughes@arlingtonva.us
Senior Advisor	Bonnie Regan	703.228.3464	bregan@arlingtonva.us
Outreach Lead	TBD		

SharePoint Site



Email Carrie Speranza for access to the Share Point Site: csperanza@dewberry.com

**Update of the Northern Virginia Hazard Mitigation Plan
2006 Plan Goals**



- Goal #1** Improve the quality of *best available data* for conducting detailed hazard risk assessments and preparing meaningful mitigation action plans.
- Goal #2** Increase the financial capability of local jurisdictions throughout the Northern Virginia region to implement hazard mitigation measures through maximizing grant funding opportunities as well as locally available fiscal resources.
- Goal #3** Develop and maintain specific plans to minimize the potential affects of natural hazards, including the relevant local emergency preparedness, response and recovery plans.
- Goal #4** Work to improve existing local policies, codes and regulations to reduce or eliminate the impacts of known natural hazards. This includes maintaining continued compliance with the National Flood Insurance Program (NFIP) for all participating jurisdictions.
- Goal #5** Investigate and implement a range of structural projects that will reduce the effects of natural hazards on public and private property throughout the region.
- Goal #6** Disseminate information to increase the general public's awareness of natural hazard risks in the Northern Virginia region, while also educating residents and businesses on the mitigation measures available to minimize those risks.

NVRC Mitigation Action 1	Coordinate with participating local jurisdictions on the acquisition and/or development of improved GIS data layers for use in conducting enhanced risk assessment studies for future updates to the Northern Virginia Regional Hazard Mitigation Plan.
Category:	Planning
Hazard(s) Addressed:	All Hazards
Lead Agency/Department Responsible:	Regional Planning Services
Estimated Cost:	\$100,000
Potential Funding Sources:	U.S. Department of Homeland Security, Office of Domestic Preparedness: Homeland Security Grant Program (HSGP), Pre-Disaster Mitigation Grant (PDM) Program
Implementation Schedule:	2006 – 2007
Priority (High, Moderate, Low):	High



2006 Plan Mitigation Techniques:

1. Prevention

Preventative activities are intended to keep hazard problems from getting worse, and are typically administered through government programs or regulatory actions that influence the way land is developed and buildings are built. They are particularly effective in reducing a community's future vulnerability, especially in areas where development has not occurred or capital improvements have not been substantial. Examples of preventative activities include:

- Planning and zoning
- Building codes
- Open space preservation
- Floodplain regulations
- Stormwater management regulations
- Drainage system maintenance
- Capital improvements programming
- Shoreline / riverine / fault zone setbacks

2. Property Protection

Property protection measures involve the modification of existing buildings and structures to help them better withstand the forces of a hazard, or removal of the structures from hazardous locations. Examples include:

- Acquisition
- Relocation
- Building elevation
- Critical facilities protection
- Retrofitting (e.g., windproofing, floodproofing, seismic design techniques, etc.)
- Safe rooms, shutters, shatter-resistant glass
- Insurance

3. Natural Resource Protection

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

- Floodplain protection
- Watershed management
- Beach and dune preservation
- Riparian buffers
- Forest/vegetation management (e.g., fire resistant landscaping, fuel breaks, etc.)
- Erosion and sediment control
- Wetland preservation and restoration
- Habitat preservation
- Slope stabilization

4. Structural Projects

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

- Reservoirs
- Dams / levees / dikes / floodwalls / seawalls
- Diversions / detention / retention
- Channel modification

Update of the Northern Virginia Hazard Mitigation Plan

- Beach nourishment
- Storm sewers

5. Emergency Services

Although not typically considered a “mitigation” technique, emergency service measures do minimize the impact of a hazard event on people and property. These commonly are actions taken immediately prior to, during, or in response to a hazard event. Examples include:

- Warning systems
- Evacuation planning and management
- Emergency response training and exercises
- Sandbagging for flood protection
- Installing temporary shutters for wind protection

6. Public Education and Awareness

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

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

2010 Update of the Northern Virginia Hazard Mitigation Plan

Hazard Identification & Risk Assessment (HIRA) Results
Dewberry
July 12, 2010



UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN

Meeting Agenda

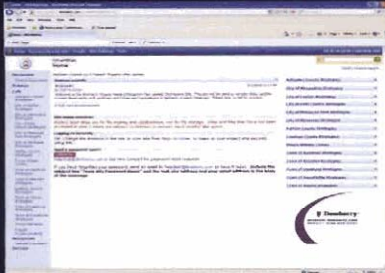
1. Welcome & Introductions
2. Hazard Identification and Risk Assessment
3. Human Caused Hazards Analysis
4. Review and Validation of the 2006 Plan Goals and Action Strategy
5. Next Steps:
 - Local Plan Committee Scheduling
 - Project Schedule
 - Remaining Local Inputs Required
 - 2006 Evaluation
 - Capability Analysis

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Reviewing HIRA via SharePoint

- <http://projects.dewberry.com/NoVaMitPlan>
- Requires:
 - Username
 - Password



Share Point Access:

csperanza@dewberry.com

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



HIRA: Hazard Identification & Risk Assessment

- Purpose: Provides a factual basis for prioritizing hazard mitigation activities
- Major components:
 - Identify and profile natural hazards
 - Describe vulnerability to jurisdictions and estimate potential losses
 - Assess Vulnerability to Repetitive Loss properties
 - Describe vulnerability to critical facilities, and estimate potential losses
 - Describe land use and development trends



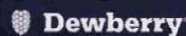
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FEMA Guidance for HIRA

- Identify Hazards
 - Which hazards are significant enough to warrant investigation?
 - How is each hazard defined?
- Profiling Hazards
 - Identify Location (geographic areas affected) and Intensity
 - Information on Previous Occurrences
 - Probability of Future Events

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HAZARD MITIGATION PLAN

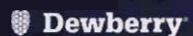


FEMA Guidance for HIRA

- Assessing Vulnerability
 - Jurisdictions most threatened & vulnerable to damage and loss
 - Identify facilities most threatened & vulnerable to damage and loss
 - Updated plan needs to Reflect changes in development for jurisdictions in hazard prone areas
- Estimating Potential Losses to Local Critical Facilities
 - Analysis of potential losses by jurisdiction
 - Analysis of potential losses to the identified vulnerable structures
 - Updated plan needs to Reflect the effects of changes in development on loss estimates

For multi-jurisdictional plans, the risk assessment must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



HIRA

- 2010 HIRA Update
 - Review & revision to the 2006 HIRA and Vulnerability assessment
 - “Base” 2006 hazard identification still valid
 - Incorporate new jurisdictions into HIRA

Arlington County	Prince William County
Fairfax County	Town of Dumfries
Town of Herndon	Town of Heathsville
Town of Vienna	Town of Occoquan
Town of Culpeper	Town of Quantico
Loudoun County	City of Alexandria
Town of Leesburg	City of Fairfax
Town of Purcellville	City of Falls Church
Town of McLeansville	City of Manassas
Town of Round Hill	City of Manassas Park

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Report Re-Structuring with Hazard Specific Sub-Sections

- SPECIFIC HAZARD – RANKING
- 2010 Commonwealth of Virginia Ranking Results
- Description
- Hazard History
- Risk Assessment
 - Probability
 - Impact & Vulnerability
 - Risk
 - Critical Facility Risk
 - Jurisdictional Risk

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Hazards Addressed

- Multiple hazards impact NoVA; how do we determine priority hazards?
 - Previous Hazard Mitigation Plan (2006)
 - Declared Disasters
 - Availability of Data

Flood	Extreme Temperatures
Winter Storms	Dam Failure
Severe Thunderstorms	Erosion
Tornadoes	Landslides
Hurricanes & Tropical Storms	Sinkholes
Drought	Human-Caused (Digital Sandbox)
Wildfire	
Earthquakes	

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Background Data

- Population
- Social Vulnerability
- Climate Change
- Land Use and Development
- Local Zoning
- Critical Facilities
- Building Inventory
- Disaster Data
 - Federally Declared
 - NCDC

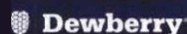
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Population

- Primary measure of vulnerability in the hazard ranking system.
- Hazards affecting populated areas have greater impact than hazards affecting uninhabited areas.
- Maps & Data for:
 - 2009 Population
 - 2009 Population Density
 - Population Change
 - Land Use trends were briefly assessed at a broad scale, noting areas of significant urbanization

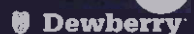
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Population

Jurisdiction	2000 Census	Estimated 2008/2009	Percent Change
Arlington County	185,453	212,038	11.92%
Fairfax County	969,749	1,036,473	6.88%
Town of Herndon	21,655	22,045	1.80%
Town of Vienna	14,454	14,903	3.11%
Town of Clifton	183	210	
Loudoun County	169,599	298,113	75.78%
Town of Leesburg	28,111	39,645	40.02%
Town of Purcellville	3,584	5,117	43.33%
Town of Middleburg	832	943	49.21%
Town of Rural Hill	500	746	49.20%
Prince William County	280,813	386,934	37.79%
Town of Dumfries	4,037	4,805	-2.67%
Town of Haymarket	879	1,226	39.48%
Town of Occoquan	759	816	7.51%
Town of Quantico	561	607	8.20%
City of Alexandria	128,283	141,738	10.49%
City of Fairfax	21,498	24,702	14.90%
City of Falls Church	10,377	11,711	12.86%
City of Manassas	35,135	36,213	3.07%
City of Manassas Park	10,290	14,021	36.31%

Source: U.S. C...



NOVA Population Density

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Social Vulnerability

- The vulnerability of people is termed *'social vulnerability'* and describes the vulnerability of populations before an event occurs.
- Pre-existing condition that impacts:
 - Ability to prepare for event
 - Recover from event
- By determining the most vulnerable populations and identifying why they are at risk, we can tailor preparedness and recovery programs for hazard events.

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30 Social Vulnerability variables were measured and grouped into 8 Principal Components:

1. Socioeconomic Status
2. Wealth
3. Elderly
4. Densely Populated Female Headed Households
5. Rural Agriculture
6. Female/Female Labor
7. Asian Population
8. Mobile Homes

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Climate Change

- Considered as a potential *amplifier* of existing natural hazards
- Discussion of projections as related to specific hazards (i.e. flooding, drought)
 - Potential future impact on hazard:
 - Frequency
 - Intensity
 - Distribution

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Sustainable Shorelines and Community Management

Project Manager
Laura Grape
Senior Environmental Planner
lgrape@novaregion.org

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Working together to:

- Collect Data
 - Storm Surge Flooding
 - Sea Level Rise
- Develop Strategies
 - Protect
 - Accommodate
 - Retreat
- Improve Resilience

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Scope of Work

Phase I

Oct 08 – Sep 09

- Workgroup Establishment;
- Broad Vulnerability Analysis;
- Policy Review



Phase II

Oct 09 – Sep 10

- Assessment Refinement;
 - Economic Analysis
- Strategy Development
 - Best Practices
 - Community Awareness



Phase III

Oct 10 - Sep 11+

- Strategy Refinement;
- Implementation Framework
- Outreach, as appropriate



UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Workgroup

- Identify key targeted planning areas
- Provide data and information
- Shape the strategy and recommendations



Arlington County
City of Alexandria
Fairfax County
Prince William County
Town of Quantico
Town of Occoquan
George Mason University
Virginia Tech
NPS – Center for Urban Ecology
NPS – GW Memorial Parkway
Fort Belvoir
Quantico Marine Corps Base
VA DCR – Mason Neck
USFWS – Mason Neck Refuge
VA Dept of Transportation

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End Goals

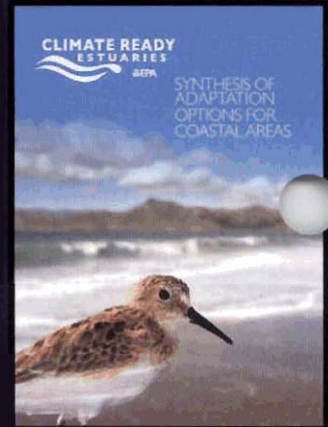
- Maps showing areas at risk of inundation from SLR and Storm Surge in the region.
- Quantification of specific elements vulnerable for both the built and natural environments.
 - Building, roadways, parks, tidal wetlands, critical infrastructure, wells, septic fields, etc...
 - Economic value/Ecosystem services
- Strategies to improve resilience of communities & structures located in areas at risk.

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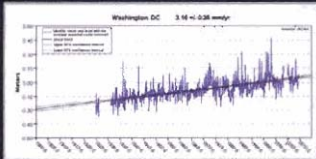
Current Efforts

- VIMS Shoreline Situation Report update
- Quantifying other important elements
 - Economic Evaluation
- Survey of Waterfront Property Owners
- Analysis of adaptation options and applicability to NoVA



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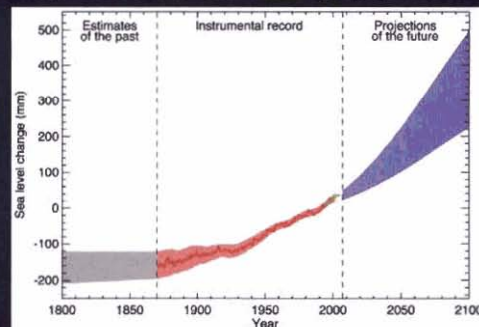
SLR Scenarios



Scenario	Definition	Relative Sea Level Rise Rate
Steady State	Observed historic trend at Washington, D.C. gage. <small>(NOAA Tide and Currents Station 844900)</small>	3.2 mm/year (1 foot by 2100)
Average Accelerated	Average projected sea level rise rate for the Chesapeake Bay region. <small>(SPECC, aesp; STAG, aesh; and GCMC, aesh)</small>	11.6 mm/year (1.9 feet by 2050; 3.8 feet by 2100)
Worst Case	Highest projected rate for the mid-Atlantic and Chesapeake Bay regions. <small>(STAG, aesh; and GCMC, aesh)</small>	16 mm/year (2.6 feet by 2050; 5.2 feet by 2100)



Future Global Sea Level Rise Projections to 2100



Uncertainties lie with the magnitude and speed of changes in the future.

If the West Antarctic Ice Sheet and the Greenland Ice Sheet were to melt, there would be a global increase in sea level rise of at least 13 meters.

(IPCC 2007, NRC 2002).

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HAZARD MITIGATION PLAN



NOVA Areas at Risk - SLR

- Sea Level Rise = Hot Spots (i.e. the lowest lying areas in the region)

Hot Spots for Sea Level Rise	
Arlington	<ul style="list-style-type: none"> National Airport Four Mile Run
Alexandria	<ul style="list-style-type: none"> Four Mile Run Dangerfield Island Old Town Jones Point
Fairfax County	<ul style="list-style-type: none"> Huntington Belle Haven/New Alexandria Dyke Marsh Tidal Embayments Hallowing Point
Prince William County	<ul style="list-style-type: none"> Occoquan NWR Tidal Embayments Town of Quantico Occoquan River

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

City of Alexandria

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Arlington County

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Fairfax County

Relative Sea Level Rise

Scenarios:

- Scenario 1: 10'
- Scenario 2: 15'
- Scenario 3: 20'
- Scenario 4: 25'

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Prince William County

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Land Use and Development

- Jurisdiction Provided Zoning Data and/or Maps discussed in report
- National Land Cover Dataset (NLCD)
 - 1992 & 2001 datasets
 - Land Use types defined by the NLCD Land Use Change Project
 - Percent Change for:
 - Urban Land Cover
 - Forest Cover
 - Wetland Cover
 - Agricultural Land Cover

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Land Use Changes

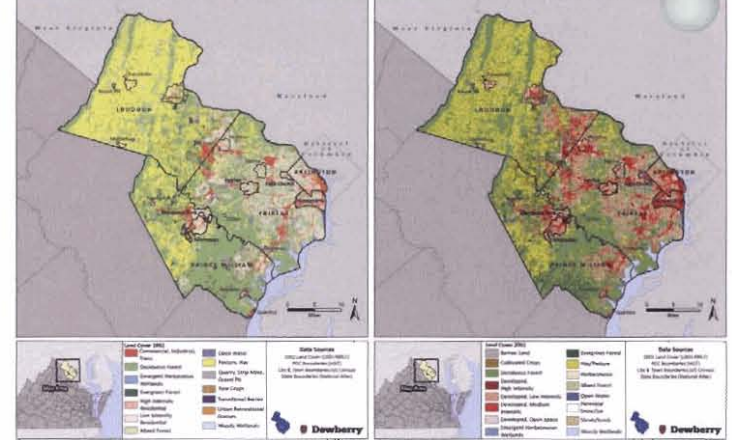
Jurisdiction	Urban Change (Acres)	Forest Change (Acres)	Agricultural Change (Acres)	Wetland Change (Acres)
Arlington County	(628.49)	(1,693.09)	385.19	146.34
Fairfax County	(16,529.25)	(27,808.21)	13,700.61	(1,425.55)
Herndon	(84.73)	(228.18)	(72.06)	(28.91)
Vienna	(688.53)	(274.21)	111.20	9.56
Clifton	(43.59)	(12.23)	24.24	1.33
Loudoun County	9,838.96	(17,791.12)	(8,349.58)	72.95
Leesburg	1,596.18	(1,517.62)	(1,259.64)	(15.12)
Purcellville	215.95	(160.57)	(489.49)	0.00
Middleburg	(27.80)	(37.14)	(52.93)	0.00
Round Hill	22.68	(38.25)	(56.49)	(3.11)
Prince William	(1,350.38)	(16,364.01)	8,406.07	840.43
Dumfries	(65.61)	14.90	12.45	(41.37)
Haymarket	(44.92)	4.67	(45.59)	3.78
Ocquan	(17.57)	(4.23)	(4.89)	1.56
Quantico	(2.67)	(2.22)	6.23	(3.78)
Alexandria	(211.27)	(695.65)	(62.49)	(39.14)
Fairfax City	(555.10)	(640.05)	245.75	23.57
Falls Church	(288.89)	(48.93)	20.02	(0.44)
Manassas	(231.29)	(294.45)	(328.03)	10.01
Manassas Park	(121.65)	(86.73)	31.36	(1.33)
Total	(9,218.03)	(67,677.32)	12,221.91	(449.24)

UPDATE OF THE HAZARD MITIGATION PLAN



National Land Cover Dataset 1992

National Land Cover Dataset 2001



Critical Facilities

- GIS Data collected from each of the participating jurisdictions

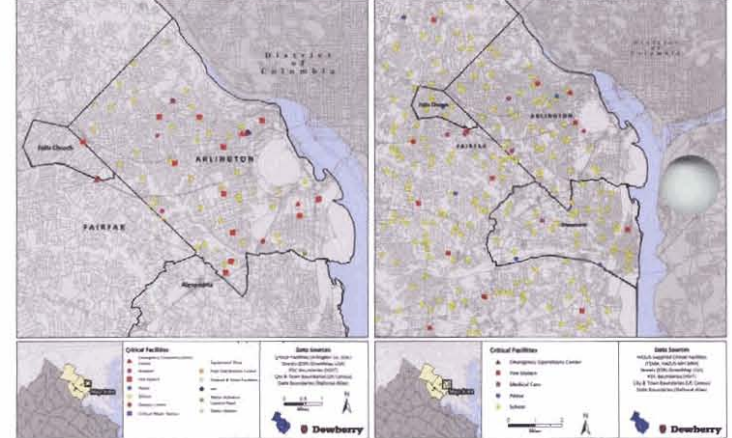
Jurisdiction	Schools	Fire Stations	Hospital	Police	Total
Arlington County	275	39	26	35	375
Fairfax County					
Town of Herndon					
Town of Vienna					
Loudoun County					
Town of Leesburg	84		2		86
Town of Purcellville					
Town of Middleburg					
Town of Round Hill					
Prince William County					
Town of Dumfries					
Town of Haymarket					
Town of Occoquan					
Town of Quantico					
City of Alexandria	18				18
City of Fairfax					
City of Falls Church					
City of Manassas					
City of Manassas Park					
Total	377	39	28	35	479

UPDATE OF THE NORTHERN HAZARD MITIGATION PLAN



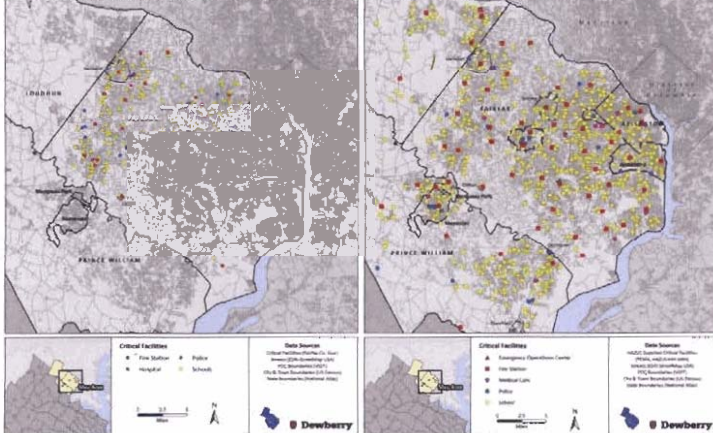
Critical Facilities: Arlington County Government

HAZUS Critical Facilities: Arlington County



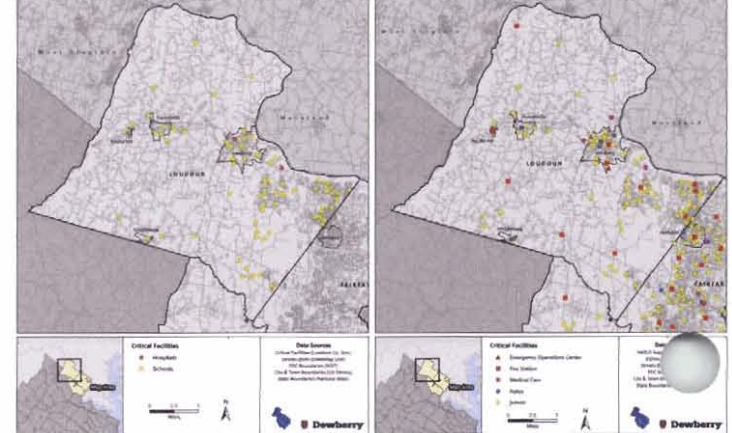
Critical Facilities: Fairfax County Government

HAZUS Critical Facilities: Fairfax County



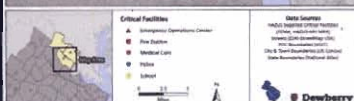
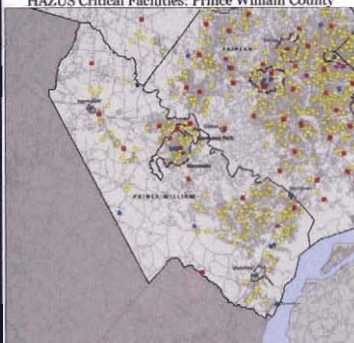
Critical Facilities: Loudoun County Government

HAZUS Critical Facilities: Loudoun County



Prince William County Critical Facilities per HAZUS-MH4

HAZUS Critical Facilities: Prince William County



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

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Critical Facilities

Local data supplemented with HAZUS essential facility data

Jurisdiction	EOC	Fire Station	Hospitals	Police Stations	Schools (grade)	Total
County	3	3	1	43	50	50
Alexandria	1	1	2	31	35	35
Fairfax	4	0	4	14	22	22
Leesburg	0	0	1	5	6	6
Manassas	1	1	5	19	26	26
Manassas Park	1	0	0	3	4	4
Prince William	35	8	9	303	355	355
Stafford	1	8	3	61	73	73
Stafford County	9	1	5	114	129	129
Town of Clifton	1	0	0	0	1	1
Town of Dumfriesshire	0	0	1	2	3	3
Town of Haymarket	0	0	1	0	1	1
Town of Herndon	1	0	1	8	10	10
Town of Leesburg	2	0	5	17	24	24
Town of Middleburg	0	0	1	2	3	3
Town of Occoquan	0	0	1	0	1	1
Town of Purcellville	0	0	1	3	4	4
Town of Quantico	0	0	1	0	1	1
Town of Round Hill	1	0	0	0	1	1
Town of Vienna	1	0	1	11	13	13
Total	1	68	17	40	636	762

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Hazard Data Availability

Federally Declared Disasters

- Jurisdictions declared
- Nature of disaster
- Type(s) of assistance provided

National Climatic Data Center (NCDC) Storm Events Database

- Local NWS Offices
- Includes location and time of event, property and crop damages, injuries and deaths
- Data may be biased by population
- Need to process data to assign all events/damages to specific jurisdictions



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Federally Declared Disasters

- 14 of the 52 Virginia disasters have included at least one community in the NoVA planning area
 - City of Alexandria has been declared 11 times
- Disaster Types
 - 5 Severe winter storms, snowstorms or blizzards
 - 4 Hurricanes or tropical storms
 - 4 Severe storms (tornadoes) and flooding
 - 1 Terrorism

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National Climatic Data Center (NCDC) Storm Events Database

- Events records from February 1, 1951 – August 31, 2009
- Data from VDEM for ranking parameters
- Data Processing to be able to compare & complete loss estimates
 - Zonal Events
 - Normalizing by Number of Counties
 - Damage Inflation
- Ranking Methodology Discussed Later in Presentation

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NCDC Data

- There are 3,164 events recorded for the NOVA region
- 797 are grouped in the "N/A" category


Jurisdiction	Drought	Flood	High Wind	Tornado	Winter Storm	Total
LOUDOUN	81	75	244	24	144	518
FAIRFAX	20	101	209	19	126	475
PRINCE WILLIAM	20	75	128	15	128	366
ARLINGTON	20	50	94	2	113	279
MANASSAS (C)	20	46	54	2	124	246
ALEXANDRIA (C)	20	47	60	1	111	239
FALLS CHURCH (C)	20	38	46	1	1111	216
FAIRFAX (C)	0	5	20	0	0	25
MANASSAS PARK (C)	0	2	1	1	0	4
Total	151	439	856	63	857	2,366

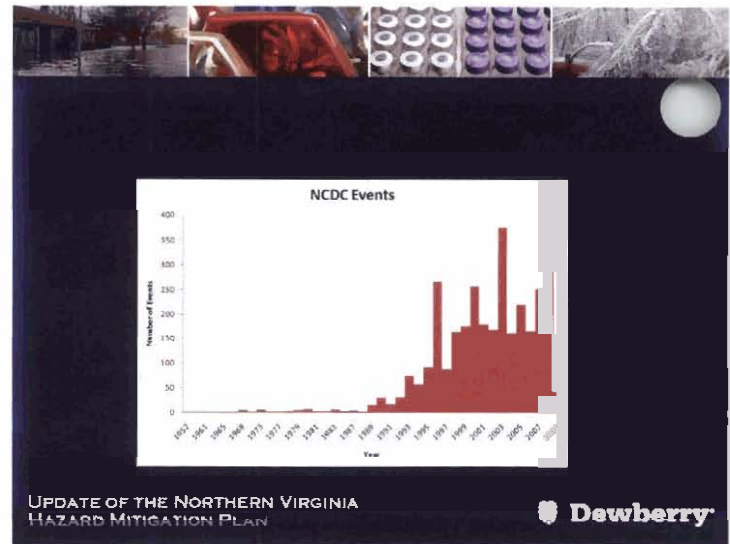

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Jurisdiction	Injuries	Fatalities	Total Events	Total Crop Damage	Total Property Damage
ALEXANDRIA (C)	0	0	239	\$2,860,525	\$4,759,842
ARLINGTON	5	1	279	\$2,860,525	\$10,502,315
FAIRFAX	59	2	475	\$2,620,475	\$94,131
FAIRFAX (C)	0	1	25	\$0	\$160,082,881
FALLS CHURCH (C)	0	1	216	\$2,860,525	\$10,005,943
LOUDOUN	11	0	518	\$7,317,346	\$13,657,805
MANASSAS (C)	0	0	246	\$3,014,556	\$16,054,822
MANASSAS PARK (C)	5	0	4	\$0	\$12,041
PRINCE WILLIAM	18	2	364	\$3,080,631	\$26,141,920
Total	98	7	2,366	\$24,614,583	\$241,311,501

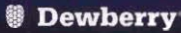
UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN 





Hazard Ranking

- The purpose of the hazard identification and risk assessment is to provide a factual basis for developing mitigation strategies; to **prioritize** those jurisdictions which most threatened and vulnerable to natural hazards.
- FEMA guidance indicates that the jurisdictions at **greatest risk** to specific hazards should be identified, considering both the characteristics of the hazard and the jurisdictions' degree of vulnerability.

A variety of analysis methods may be sufficient to meet these goals; FEMA does not mandate a specific analysis method.

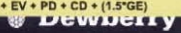
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2010 Ranking Parameters

- "Semi-Quantitative" Scoring System
 - Actual Data Values grouped in categories 1-4 based on statistics
- NCDC Data with normalization (inflation ...)
 - Limitations with probability & impact data
- Parameters Used:
 - Population Vulnerability (weight 0.5)
 - Population Density (weight 0.5)
 - Geographic Extent (weight 1.5)
 - Annualized Deaths & Injuries (weight 1)
 - Annualized Crop & Property Damage (weight 1)
 - Annualized Events (weight 1)

Jurisdictional Risk (RS):
 $RS = (0.5 \cdot (PV + PN)) + ID + EV + PD + CD + (1.5 \cdot GE)$


UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN 

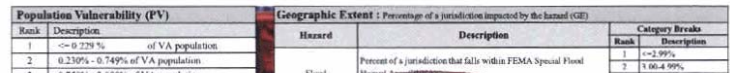


NCDC Ranking Spreadsheet

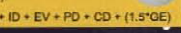
Source Definitions: Population Vulnerability, Population Density, Annualized Deaths & Injuries, Annualized Crop & Property Damage, Annualized Events, Geographic Extent.

Ranking Worksheet	NCDC Data	Population Vulnerability	Population Density	Annualized Deaths & Injuries	Annualized Crop & Property Damage	Annualized Events	Geographic Extent
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN 



Population Vulnerability (PV)	Geographic Extent: Percentage of a jurisdiction impacted by the hazard (GE)																																																													
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UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN 

Potential Losses (annualized)

Requirement §201.6(c)(2)(H)(ii): [The plan should describe vulnerability in terms of an] estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate ...

2006 Local Plan Loss Estimates for:

Hurricanes (HAZUS-MH)	Earthquake (HAZUS-MH)
Flood (NCDC)	Winter Storm (NCDC)
Drought (NCDC)	Wildfire (NCDC)
Severe T-storms (NCDC)	
Tornado (NCDC)	

2010 Update Loss Estimates for:

Hurricane Wind (HAZUS-MH Annualized Loss)	High Wind (NCDC)
Flooding (HAZUS-MH Annualized Loss and 100-yr)	Earthquake (HAZUS-MH Annualized Loss)
Drought (NCDC)	Winter Storm (NCDC)
Tornado Wind (NCDC)	Wildfire (NCDC & VDOF)
	Landslide (NCDC)

HAZUS-MH Scenarios

• Level I Analysis

➤ Nationally-developed data for building square footage, building value, population characteristics, costs of building repair and economic data (broken down by census division units)

- Flood
- Earthquake
- Hurricane Winds

- HAZUS is not required in Local Mitigation Plans, communities are encouraged to use HAZUS to form a scientific basis from which the mitigation strategy is developed.

Hazard Specific Analysis

Data Sources

• Hazard Data

- Flood: FEMA FIRMs, FEMA Rep Loss, VDEM, DCR, NCDC & HAZUS-MH
- Tornado: NCDC & SVRGIS
- Wind (Microburst/Straightline): HAZUS-MH, NCDC & SVRGIS
- Land & Mine Subsidence: USGS
- Severe Thunderstorms: NCDC & SVRGIS
- Winter Weather: NCDC
- Earthquake: HAZUS-MH
- Wildfire: VDOF & NCDC

Flood

• Risk Assessment

- Probability (100-yr and Annualized)
 - HAZUS-MH
- Impact & Vulnerability
 - HAZUS-MH
- Risk
 - Critical Facility Risk
 - 2006 Analysis Results
 - HAZUS-MH
 - Jurisdictional Risk
 - 2006 Analysis Results
 - HAZUS-MH



National Flood Insurance Program (NFIP)

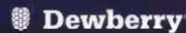
NoVA region has more than 10,398 National Flood Insurance policies in-force



Flood Map Status:

Community Name	Init FIRM Identified	Init FIRM Date	Current Effective Map Date	Rep-Emer Date	DFIRM/Q3
Arlington County	10/1/1969	5/3/1982	12/31/1976		DFIRM
Fairfax County	5/5/1970	3/5/1990	3/5/1990 will be 9/17/2010	1/7/1972	
Town of Herndon	6/14/1974	8/1/1979	8/1/1979 will be 9/17/2010	8/1/1979	
Town of Vienna	8/2/1974	2/3/1982	2/3/1982 will be 9/17/2010	2/3/1982	DFIRM
Town of Clifton	3/28/1975	5/2/1977	will be 9/17/2010	5/2/1977	
Loudoun County	4/25/1975	1/5/1978	7/5/2001	1/5/1978	
Town of Leesburg	8/3/1974	9/30/1982	7/5/2001	9/30/1982	
Town of Purcellville	7/11/1975	11/15/1989	7/5/2001	11/15/1989	DFIRM
Town of Middleburg		7/5/2001	7/5/2001	7/31/2001	
Town of Round Hill	5/13/1977	7/5/2001	7/5/2001	1/10/2008	
Prince William County	1/10/1976	12/1/1981	1/5/1995	12/1/1981	
Town of Dumfries	6/18/1976	5/15/1980	1/5/1995	5/15/1980	
Town of Haymarket	8/9/1974	1/17/1990	1/5/1995	1/31/1990	DFIRM
Town of Occoquan	7/19/1974	9/1/1978	1/5/1995	9/1/1978	
Town of Quantico	11/1/1974	8/15/1978	1/5/1995	8/15/1978	
City of Alexandria	8/22/1969	8/22/1969	5/15/1995	5/8/1974	Q3
City of Fairfax	5/5/1970	12/23/1971	8/2/2008	12/17/1971	DFIRM
City of Falls Church	9/6/1974	2/3/1982	7/16/2004	2/3/1982	DFIRM
City of Manassas	6/31/1974	1/3/1979	1/5/1995	1/3/1979	DFIRM
City of Manassas Park	3/11/1977	9/29/1978	1/5/1995	9/29/1978	DFIRM

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

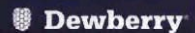


NFIP Policy Statistics

County	Community Name	Policy Statistics (as of 3/31/2010)		Claim Statistics (1/1/1978 - 3/31/2010)	
		Policies In-Force	Insurance In-Force	Total Claims	Total Payment
Arlington County	Arlington County	790	\$144,938,600	91	\$285,832
	TOTAL	790	\$144,938,600	91	\$285,832
Fairfax County	Fairfax County	5,324	\$1,211,787,500	80	\$1,076,818
	Town of Herndon	54	\$16,065,800	0	0
	Town of Vienna	87	\$24,256,400	1	44
	Town of Clifton	2	\$1,200,000	0	0
	TOTAL	5,467	\$1,253,209,200	81	\$1,076,818
Loudoun County	Loudoun County	517	\$143,390,200	87	\$1,076,818
	Town of Leesburg	84	\$23,083,200	0	\$160,180
	Town of Purcellville	11	\$2,633,000	0	0
	Town of Middleburg	0	0	0	0
	Town of Round Hill	0	0	0	0
	TOTAL	614	\$168,777,000	87	\$1,236,998
Prince William County	Prince William County	1,091	\$973,055,600	237	\$3,615,233
	Town of Dumfries	68	\$3,988,100	4	\$34,847
	Town of Haymarket	0	\$700,000	0	0
	Town of Occoquan	38	\$12,124,600	16	\$66,812
	Town of Quantico	0	\$600,000	0	0
	TOTAL	1,169	\$990,448,300	257	\$3,706,696
City of Alexandria	City of Alexandria	1,090	\$371,645,100	221	\$3,677,300
	TOTAL	1,090	\$371,645,100	221	\$3,677,300
City of Fairfax	City of Fairfax	558	\$63,868,200	27	\$388,720
	TOTAL	604	\$63,868,200	27	\$388,720
City of Falls Church	City of Falls Church	141	\$39,887,200	18	\$111,260
	TOTAL	141	\$39,887,200	18	\$111,260
City of Manassas	City of Manassas	66	\$16,254,800	20	\$164,618
	TOTAL	66	\$16,254,800	20	\$164,618
City of Manassas Park	City of Manassas Park	24	\$5,879,400	9	\$68,527
	TOTAL	24	\$5,879,400	9	\$68,527
	NOVA TOTAL	10,398	\$2,352,673,800	1,253	\$17,152,866
	VIRGINIA TOTAL	109,713	\$25,557,729,100	38,038	\$48,249,815

Source: <http://fema.nfipstat.com/> 7/8/2010

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Repetitive & Severe Repetitive Loss

Repetitive Loss (RL) property = any insurable building for which 2 or more claims of >\$1,000 were paid by the NFIP within a rolling 10-year period

Severe Repetitive Loss (SRL) property = has at least 4 NFIP claim payments >\$5,000, and the cumulative amount >\$20,000 OR at least 2 separate claim payments exceed the market value of the building

- 63 Repetitive Loss Properties in NoVA totaling \$5,257,918 in total losses paid
- 2 Severe Repetitive Loss Properties in NoVA planning district
 - Prince William County (City of Manassas)
 - Loudoun County

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Jurisdiction	Number of Rep Loss Properties	Total Number of Losses	Total Building Payment	Total Contents Payment	Total Payment
Arlington County	2	4	\$101,395	\$16,529	\$117,924
Fairfax County	8	18	\$444,586	\$71,371	\$515,956
Town of Herndon					
Town of Vienna*	1	2	\$4,819	\$0	\$4,819
Town of Clifton					
Loudoun County	12	37	\$678,170	\$119,538	\$797,708
Town of Leesburg					
Town of Purcellville					
Town of Middleburg					
Town of Round Hill					
Prince William County	10	42	\$1,303,075	\$788,669	\$2,091,744
Town of Dumfries					
Town of Haymarket					
Town of Occoquan					
Town of Quantico					
City of Alexandria	22	52	\$1,205,361	\$107,825	\$1,313,186
City of Fairfax	2	4	\$66,944	\$20,364	\$87,308
City of Falls Church	7	20	\$272,585	\$61,507	\$334,092
City of Manassas					
City of Manassas Park					
TOTAL	63	177	\$4,072,115	\$1,185,803	\$5,257,918

*Town information included in the county totals

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



HAZUS-MH MR4 Analysis

Flood Runs completed for the 100-yr and Probabilistic Scenarios

- \$3,405,921 could be expected from a 100-year event in NoVA
- \$99,049,000 annually in damages due to flood events
 - Fairfax County accounts for 47.7% of total losses
 - Property or "capital stock" losses make up about \$98,899,000 (building, content, and inventory)
 - Business interruption accounts for 0.15% of the annualized losses and includes income, rental, wage, and relocation costs.
 - Residential losses account for the majority of the estimated losses.

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

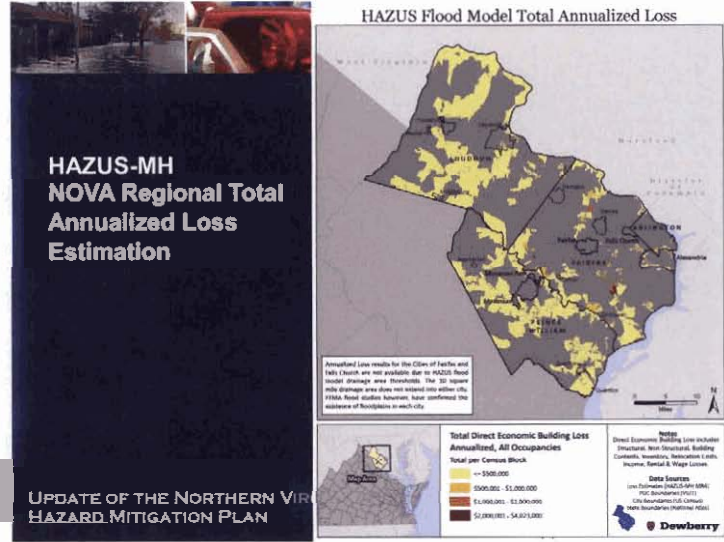
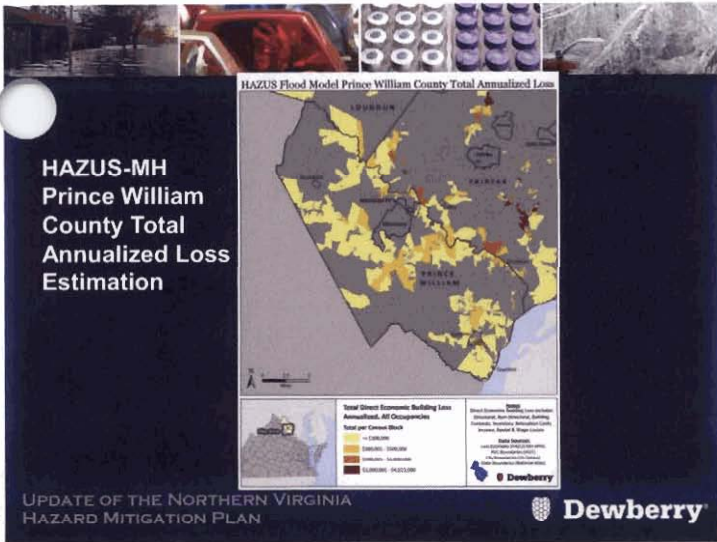


Critical Facilities

- 100-year Scenario
 - Schools with moderate damage
 - SAMUEL W. TUCKER ELEMENTARY SCHOOL
 - LEES CORNER
 - ST MARY'S ELEMENTARY SCHOOL
 - HUTCHISON FARMS ELEMENTARY SCHOOL
 - Fire Stations with moderate damage
 - Aldie Volunteer Fire Department Inc.
 - Police Stations with moderate damage
 - Dumfries Police Dept

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN





Comparison with Commonwealth

- Based on the 2010 State plan the NOVA planning commission can expect \$15 Million in annualized loss due to flooding
- NCDC Property Damage \$1,512,232
- NCDC Crop Damage \$140,371

Planning Area	2010 State Plan	2006 Local Plan
Planning Area 1	\$308,235	\$1,236,000
Planning Area 2	\$10,035,232	\$1,240,000
Planning Area 3	\$2,157,842	\$556,000
Planning Area 4	\$3,323,349	\$880,000
Total	\$15,824,658	\$3,912,000

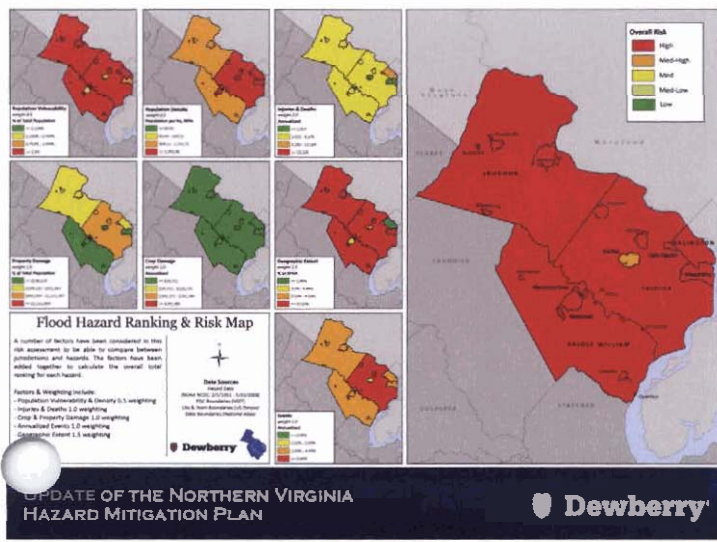
Jurisdiction (rank in state)	Annualized Loss
Fairfax County (2)	\$7,505,247
Prince William County (6)	\$3,069,348
Loudoun County (8)	\$2,157,842
Alexandria, City of (10)	\$1,997,414
Fairfax, City of	\$420,031
Arlington County	\$308,235
Manassas, City of	\$212,413
Falls Church, City of	\$112,540
Manassas Park, City of	\$43,588
TOTAL	\$15,824,658

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Flood Loss Estimate Variation

Plan	Loss Estimate	Methodology
2006 NoVA HMP	\$3,912,000	Based on recorded historical events and applied loss estimation methodology.
2010 UPDATE	\$99,049,000	HAZUS-MH MR4 riverine analysis
NCDC Ann. Loss	\$1,652,603	Total reported property damages divided by total number of years of record
2010 VA HMP	\$15,824,658	Based on FIA Depth-Damage assumptions, DFIRMS, and census data for building exposure

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



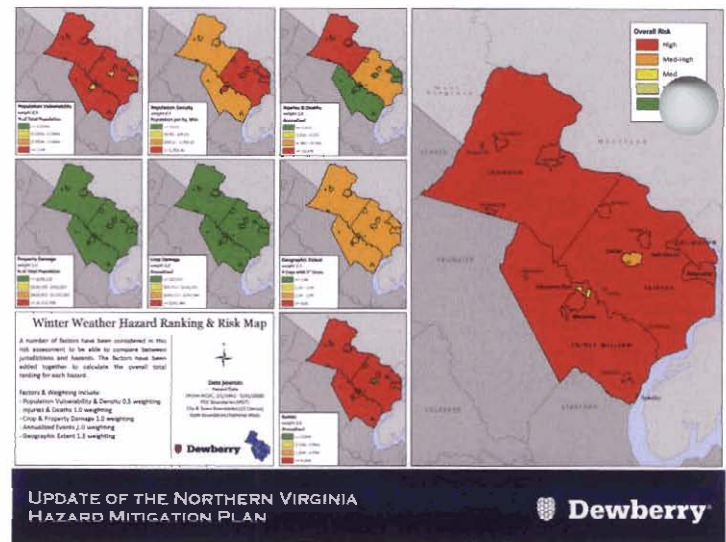
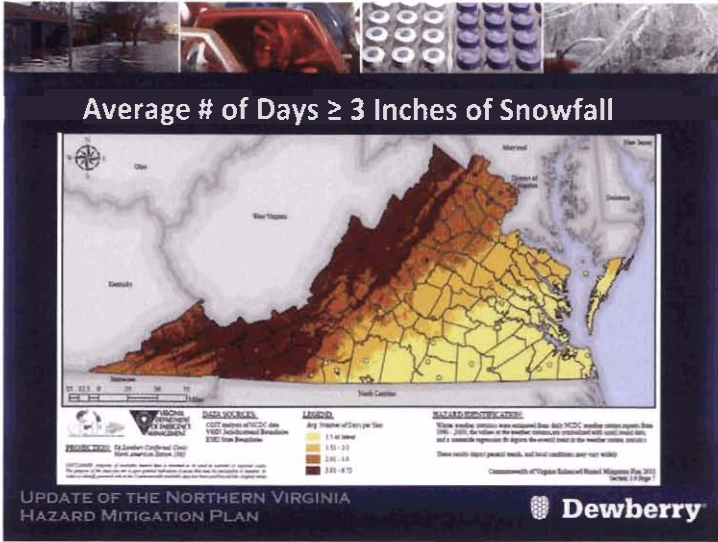
Winter Storms

NCDC Annualized Loss \$394,974

Jurisdiction	Annualized Winter Storm Property & Crop Damages
Alexandria, City of	\$60,484
Arlington County	\$60,484
Fairfax, City of	\$0
Fairfax County	\$60,537
Falls Church, City of	\$60,484
Loudoun County	\$31,982
Manassas, City of	\$60,501
Manassas Park, City of	\$0
Total	\$394,974

- Impact and Vulnerability
 - Transportation agencies and utility companies
- VA HMP used weather station data to examine frequency of snowfall

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Tornadoes

- Historically, tornado intensity has been rated on the F-scale (now the EF-scale)
- Data Source: SVRGIS, a GIS dataset of tornado touchdowns and paths (1950 – 2006)
- No model of intensity-damage relationship available for use in loss estimates

FUJITA SCALE			ENHANCED FUJITA SCALE	
F Number	Fastest 1/4-mile (mph)	3 Second Gust (mph)	EF Number	3 Second Gust (mph)
0	40-72	45-78	0	65-85
1	73-112	79-117	1	86-110
2	113-157	118-161	2	111-135
3	158-207	162-209	3	136-165
4	208-260	210-261	4	166-200
5	261-318	262-317	5	Over 200

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

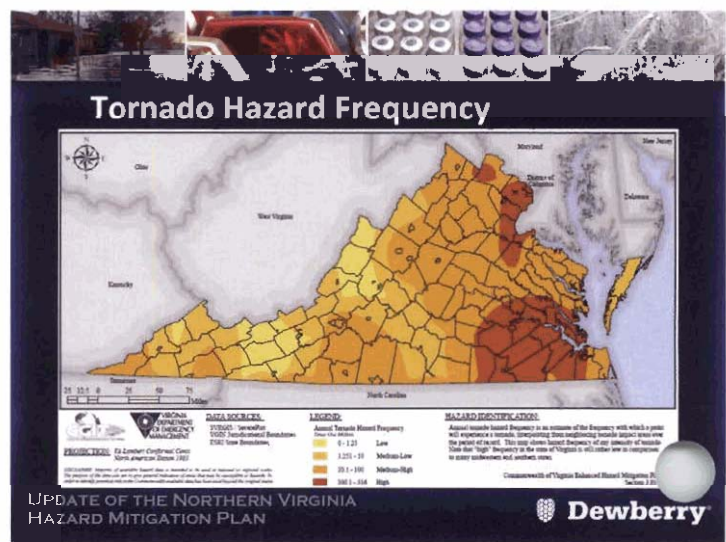
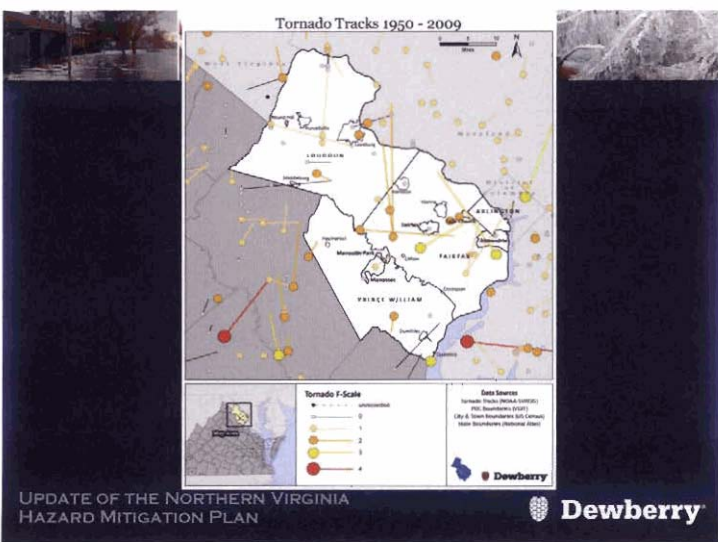
Dewberry

Tornadoes

- Low probability / high impact events
- Probability quantified by VA HMP using historical frequency method

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Dewberry

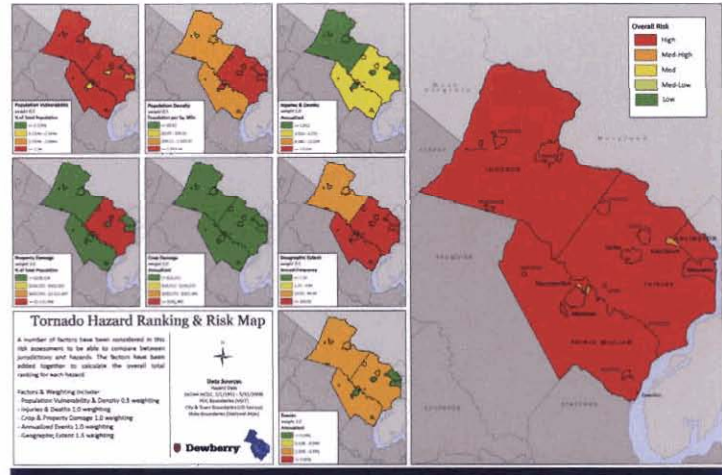


Tornado Loss Estimation

- NCDC Annualized Loss \$2,612,298

County	Annualized Tornado Property & Crop Damages
Fairfax County	\$2,265,041
Prince William County	\$117,080
Manassas, City of	\$0
Arlington County	\$22,033
Loudoun County	\$119,785
Falls Church, City of	\$88,210
Alexandria, City of	\$149
Fairfax, City of	\$0
Manassas Park, City of	\$0
Total	\$2,612,298

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



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Hurricanes and Tropical Storms

- Probability
- Impact & Vulnerability
- Risk
 - Critical Facility Risk
 - Jurisdictional Risk

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Hurricanes and Tropical Storms

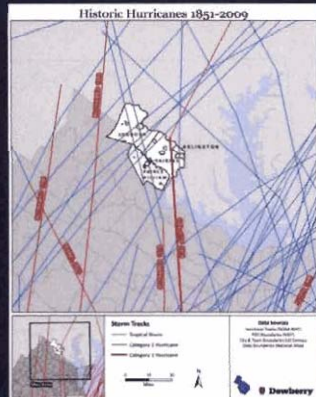
- Data Source: NCDC & HAZUS
- NCDC Annualized Loss
- HAZUS Annualized Loss \$1,468,890

Hurricane Category	Wind Speed	Barometric Pressure	Damage Potential
1	75-95 mph	>980 Mb	Minimal
2	96-110 mph	965-979 Mb	Moderate
3	111-130 mph	945-964 Mb	Extensive
4	131-155 mph	920-944 Mb	Extreme
		<920 Mb	Catastrophic

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



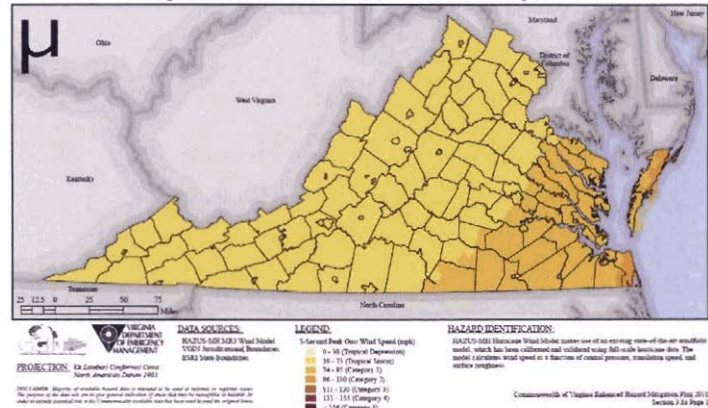
Historic Hurricane Tracks



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Figure 3.8a-4: HAZUS 100-Year Wind Speeds





HAZUS-MH MR4

Annualized Loss = \$ 4,795,691

- Probabilistic Annualized Loss = Expected value of loss in any one year, developed by aggregating the losses and exceedance probabilities.
Simulation Period is 100,000 years
- Module estimates direct and indirect economic losses due to hurricane speed winds.
 - Damage to buildings & contents
 - Economic loss (business interruptions)
 - Social impacts

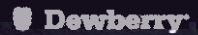
UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



100-year HAZUS Scenario

- 1% chance of happening in any given year
- Estimated losses from a 100-year event in NoVA \$53,264,373
- \$29 M in Fairfax
- \$8 M in Prince William

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



1000-year HAZUS Scenario

- 0.1% chance of happening in any given year
- Estimated losses from a 1000-year event in NoVA \$806,589,749
- \$433 M in Fairfax County
- \$119 M in Prince William County

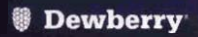
UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



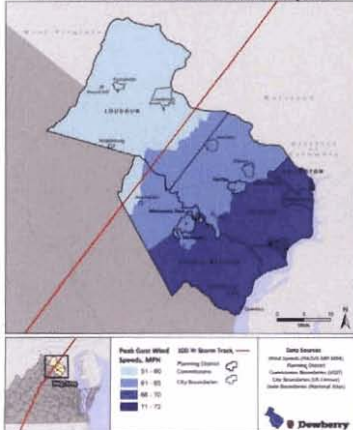
Critical Facilities

- 100-year Scenario
 - All essential facilities would have 100% functionality
- 1000-year Scenario
 - Day of event there would be 98% of hospital beds available for use
 - After one week, 100% of the beds will be back in service
 - All essential facilities would have functionality of >50% on day 1

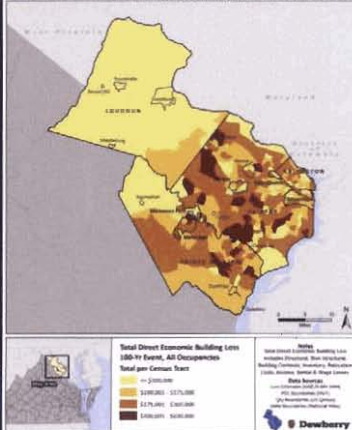
UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



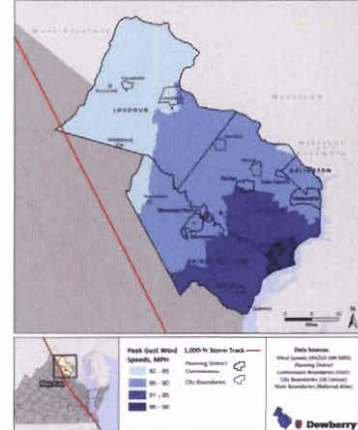
HAZUS Hurricane Model 100-Year Wind Speeds



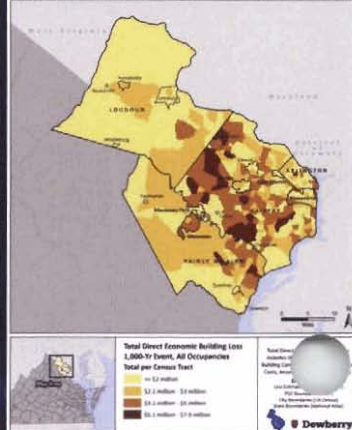
HAZUS Hurricane Model Total Losses 100-Year Event



HAZUS Hurricane Model 1,000-Year Wind Speeds



HAZUS Hurricane Model Total Losses 1,000-Year Event





Probabilistic Scenario

- Represent range of probable losses estimated from a 100,000-year simulation of expected hurricane activity
- \$4,795,691

Hurricane Wind Annualized Loss = total losses for simulation period divided by 100,000 years

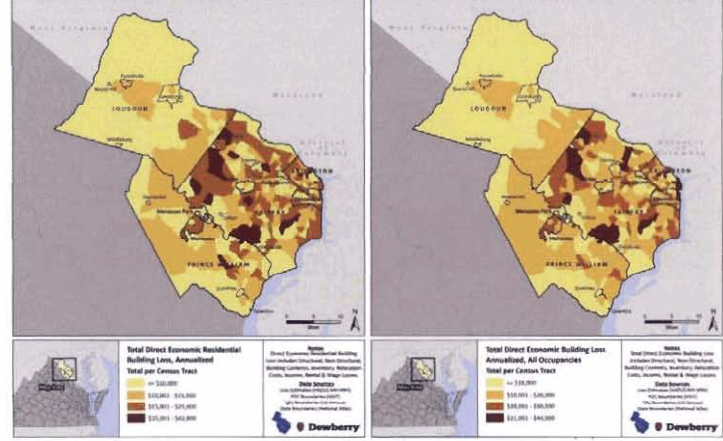
Jurisdiction	Building Loss	Content Loss	Inventory Loss	Relocation Loss	Income Loss	Rental Loss	Wage Loss	Total Loss
Arlington County	\$43,847	\$77,374	\$579	\$40,174	\$5,554	\$28,946	\$7,342	\$200,012
Fairfax County	\$7,086,376	\$212,515	\$1,841	\$119,367	\$11,795	\$50,745	\$19,512	\$2,495,751
Town of Herndon	\$16,458	\$4,274	\$44	\$2,434	\$454	\$1,099	\$559	\$24,328
Town of Vienna	\$38,154	\$3,979	\$43	\$2,267	\$409	\$793	\$460	\$44,099
Town of Clifton	\$504	\$36	\$0	\$22	\$4	\$7	\$12	\$584
Loudoun County	\$242,274	\$20,148	\$433	\$12,197	\$1,113	\$4,444	\$1,141	\$281,948
Town of Leesburg	\$23,605	\$1,807	\$20	\$1,312	\$160	\$612	\$238	\$27,765
Town of Purcellville	\$730	\$41	\$1	\$28	\$4	\$10	\$4	\$818
Town of Middleburg	\$89	\$5	\$0	\$4	\$1	\$2	\$1	\$101
Town of Round Hill	\$44	\$2	\$0	\$2	\$0	\$1	\$0	\$49
Prince William County	\$473,454	\$36,818	\$427	\$24,402	\$1,736	\$9,219	\$2,155	\$496,004
Town of Dumfries	\$4,411	\$457	\$4	\$362	\$28	\$191	\$41	\$5,464
Town of Haymarket	\$172	\$8	\$0	\$4	\$1	\$2	\$1	\$188
Town of Occoquan	\$88	\$4	\$1	\$3	\$0	\$2	\$0	\$105
Town of Quantico	\$2,050	\$370	\$4	\$211	\$48	\$151	\$40	\$2,664
City of Alexandria	\$387,214	\$17,628	\$427	\$30,477	\$4,701	\$17,598	\$6,277	\$504,342
City of Fairfax	\$45,380	\$5,279	\$98	\$3,158	\$731	\$1,460	\$770	\$56,876
City of Falls Church	\$29,561	\$3,810	\$31	\$2,127	\$401	\$1,014	\$488	\$37,463
City of Manassas	\$22,935	\$6,288	\$110	\$3,896	\$3,346	\$667	\$75	\$35,938
City of Manassas Park	\$16,418	\$1,393	\$30	\$903	\$47	\$275	\$78	\$19,145
Total	\$3,942,333	\$430,314	\$5,911	\$243,431	\$27,563	\$124,149	\$33,987	\$4,795,691

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



HAZUS Hurricane Model Annualized Residential Loss

HAZUS Hurricane Model Total Annualized Losses



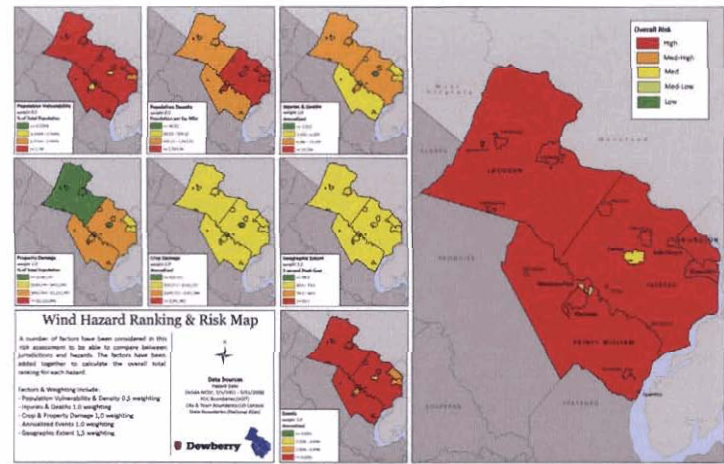
Wind Events NCDC

Annualized Loss Totals

- Tornado \$2,612,298
- High Wind (includes hurricane, thunderstorm) \$2,932,999
 - Hurricane/Tropical \$1,570,057

Jurisdiction	Hurricane/Tropical Storm	Annualized
Arlington County	\$2,019,524	\$96,168
Fairfax County	\$2,019,524	\$96,168
Loudoun County	\$66,158	\$5,150
Prince William County	\$12,413,476	\$591,118
City of Alexandria	\$2,019,524	\$96,168
City of Fairfax	\$0	\$0
City of Falls Church	\$2,019,524	\$96,168
City of Manassas	\$12,413,476	\$591,118
City of Manassas Park	\$0	\$0
Total	\$32,971,209	\$1,570,057

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

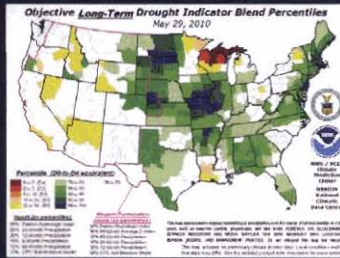


UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



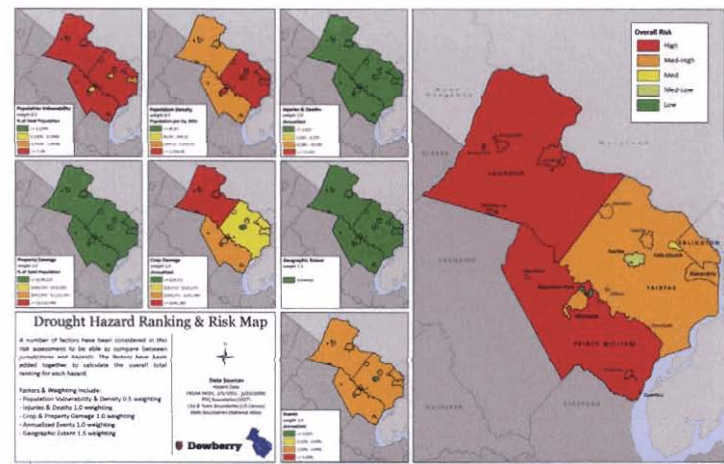
Drought

- Probability
- Impact and Vulnerability
 - Drought Monitor
- Risk
 - Critical Facility Risk
 - Jurisdictional Risk
- 168 recorded "droughts" in NCDC for NDVA; Loudoun County highest (31 events)




NCDC Annualized Loss \$942,971

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN





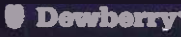

Wildfire

Risk Level	Probability	Impact	Spatial Extent	Warning Time	Duration
	Highly Likely	Minor	Small	Less than 6 hours	Less than one week

- Virginia Department of Forestry
- Probability
- Impact and Vulnerability
- Risk
 - Critical Facility Risk
 - Jurisdictional Risk

No NCDL records for Wildfire in NOVA

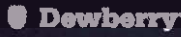

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

VDOF: Wildfire Causes and Events

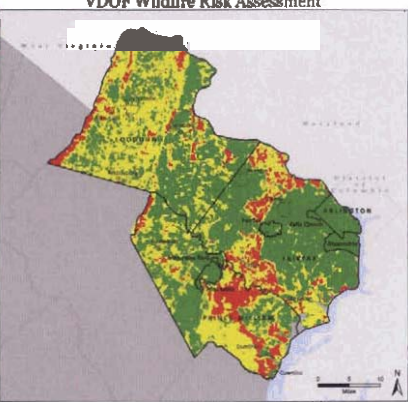
- Causes of wildfire in the NOVA region:
 - 29% Debris Burning
 - 20% Children
 - 19% Miscellaneous
 - 12% Incendiary
 - 10% Smoking
- There have been 120 wildfires burning 368 acres during 1995 – 2008 totaling \$180,895 in damages

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN






VDOF Wildfire Risk Assessment

Jurisdiction	% Area Low Risk	% Area Medium Risk	% Area High Risk
Arlington County	96.30%	2.61%	1.10%
Fairfax County	57.22%	30.76%	12.02%
Town of Herndon	99.93%	0.04%	0.00%
Town of Vienna	99.25%	0.75%	0.00%
Town of Clifton	26.05%	57.58%	16.36%
Loudoun County	42.10%	51.68%	6.23%
Town of Leesburg	58.46%	32.98%	8.56%
Town of Purcellville	13.69%	85.62%	0.69%
Town of Middleburg	33.06%	58.76%	8.31%
Town of Round Hill	0.00%	68.62%	29.56%
Prince William County	39.77%	44.78%	15.44%
Town of Dumfries	73.40%	25.12%	1.38%
Town of Haymarket	78.43%	21.57%	0.00%
Town of Occoquan	74.77%	24.32%	0.69%
Town of Quantico	93.62%	6.38%	0.00%
City of Alexandria	98.83%	1.17%	0.00%
City of Fairfax	84.85%	5.35%	0.69%
City of Falls Church	100.00%	0.00%	0.00%
City of Manassas	85.90%	4.47%	0.63%
City of Manassas Park	65.20%	20.95%	14.32%
Total	48.91%	41.00%	10.03%



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

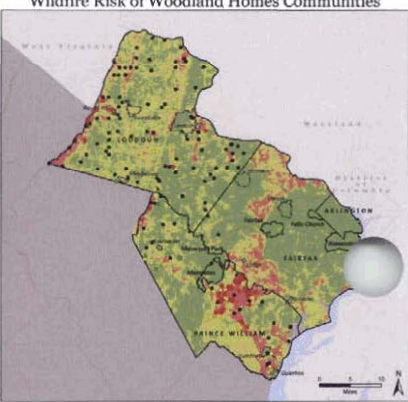



Urban-Woodland Interface:



Prince William Co.
36 HIGH at-risk woodland communities

Loudoun County
7 HIGH at-risk woodland communities

Wildfire Risk of Woodland Homes Communities



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

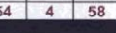




Critical Facility Risk

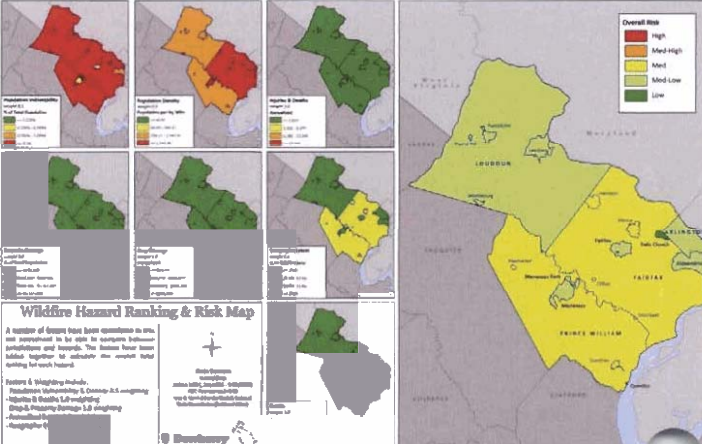
- Local and HAZUS critical facilities intersected with VDOF risk assessment
- Majority of facilities are schools

Jurisdiction	HAZUS			Local Data		
	Moderate	High	Total	Moderate	High	Total
Arlington County						
Fairfax County	19	5	24	25	2	27
Town of Herndon						
Town of Vienna						
Town of Clifton	1		1			
Loudoun County	24	2	26	29	2	31
Town of Leesburg	5		5			
Town of Purcellville	4		4			
Town of Middleburg						
Town of Round Hill	1		1			
Prince William County	34	15	49			
Town of Quantico						
Town of Haymarket						
Town of Occoquan						
Town of Quantico						
City of Alexandria						
City of Fairfax	1		1			
City of Falls Church						
City of Manassas						
City of Manassas Park						
Total	89	22	111	54	4	58

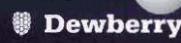
UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Wildfire Hazard Ranking & Risk Map



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Building Fire

- Accidental building fires are relatively unpredictable
- Potential ignition sources include:
 - Heat from fuel-fired, fuel-powered object (e.g., heat, spark, ember, or flame from equipment);
 - Heat from electrical equipment arcing, overloaded (e.g., short circuit arc, fluorescent light ballast);
 - Heat from smoking material (e.g., cigarette);
 - Heat from open flame (e.g., lighter, candle);
 - Heat from hot object (e.g., electric lamp, spark from friction);
 - Heat from natural source (e.g., lightning); and
 - Heat spreading from another hostile fire (exposure) (e.g., radiated heat, direct flame)
- Existing Fire Protection
 - Sprinkler Systems
 - Construction Materials

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Earthquake

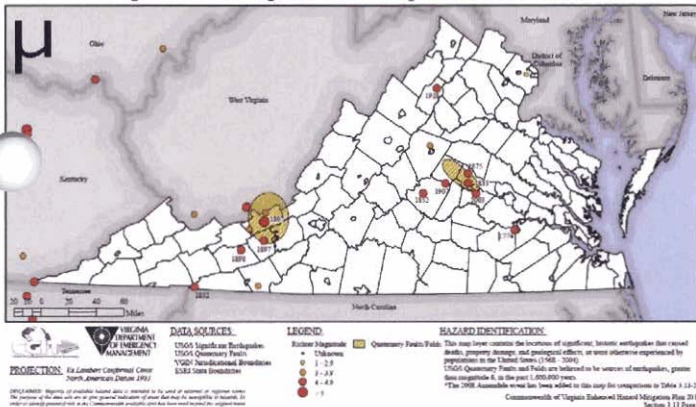
- Various visual & spatial representations of historical earthquakes and seismic hazard zones exist.
 - HAZUS Earthquake Module
 - USGS Significant Earthquake Locations
 - USGS Quaternary Fault Zones
 - Peak Ground Acceleration Mapping
- FEMA's HAZUS Earthquake module estimates damage and loss to buildings, lifelines and critical facilities.

No NCDL records for Earthquake in NoVA

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Figure 3.13-1: Significant Earthquakes 1568 - 2004*



HAZUS-MH MR4

Correspondence with Dr. Martin Chapman director of the Virginia Tech Seismological Observatory (VTSO)

- Probabilistic Scenario for Annualized Loss
- Goochland 6.5 magnitude @ depth of 10: majority of continued EQ activity in this area and therefore is a reasonable and likely scenario.

MMI	PGA (%g)	Perceived Shaking	Potential Damage
I	< 0.17	Not Felt	None
II	0.17 - 1.4	Weak	None
III	0.17 - 1.4	Weak	None
IV	1.4 - 3.9	Light	None
V	3.9 - 9.2	Moderate	Vary Light
VI	9.2 - 18	Strong	Light
VII	18 - 34	Very Strong	Moderate
VIII	34 - 65	Severe	Moderate to Heavy
IX	65 - 124	Violent	Heavy
X	> 124	Extreme	Very Heavy
XI	> 124	Extreme	Very Heavy
XII	> 124	Extreme	Very Heavy

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



HAZUS-MH MR4

NOVA regional commission can expect \$2,408,945 annually from Earthquake damage

ANNUALIZED LOSS

- Fairfax County accounts for 49.6%, with towns 52.2%
- Prince William County 12.7%, with towns 12.8%

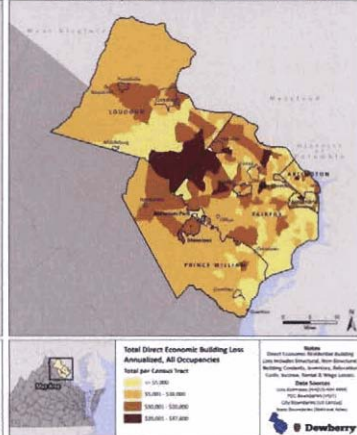
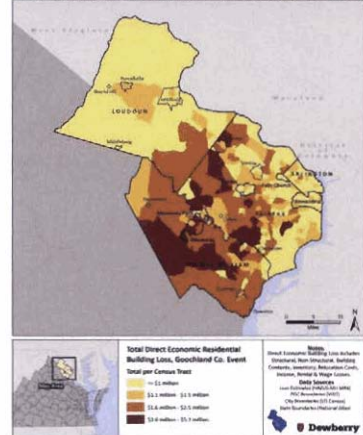
Jurisdiction	Annualized Loss	Goochland County Scenario
Arlington County	\$256,214	\$50,596,616
Fairfax County	\$1,194,034	\$305,518,774
Town of Herndon	\$32,972	\$6,502,171
Town of Vienna	\$29,422	\$6,231,892
Town of Clifton	\$475	\$157,123
Loudoun County	\$222,490	\$40,023,317
Town of Leesburg	\$29,955	\$4,527,822
Town of Purcellville	\$912	\$149,583
Town of Middleburg	\$126	\$22,863
Town of Round Hill	\$52	\$7,490
Prince William County	\$304,948	\$119,524,967
Town of Dumfries	\$2,492	\$1,143,557
Town of Haymarket	\$165	\$50,758
Town of Occoquan	\$635	\$233,037
Town of Quantico	\$1,022	\$468,964
City of Alexandria	\$198,495	\$42,904,170
City of Fairfax	\$49,175	\$11,399,801
City of Falls Church	\$20,589	\$4,212,152
City of Manassas	\$53,304	\$18,694,282
City of Manassas Park	\$11,457	\$4,096,617
Total	\$2,408,945	\$616,472,447

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



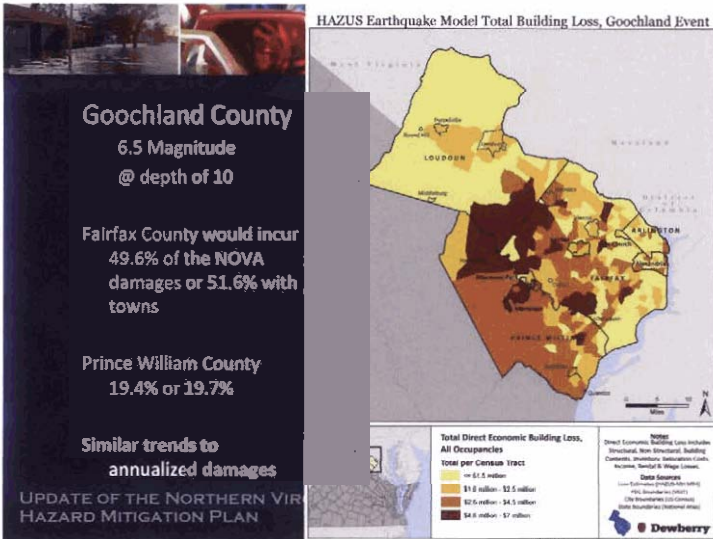
HAZUS Earthquake Model Residential Loss Goochland Event

HAZUS Earthquake Model Total Annualized Losses



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



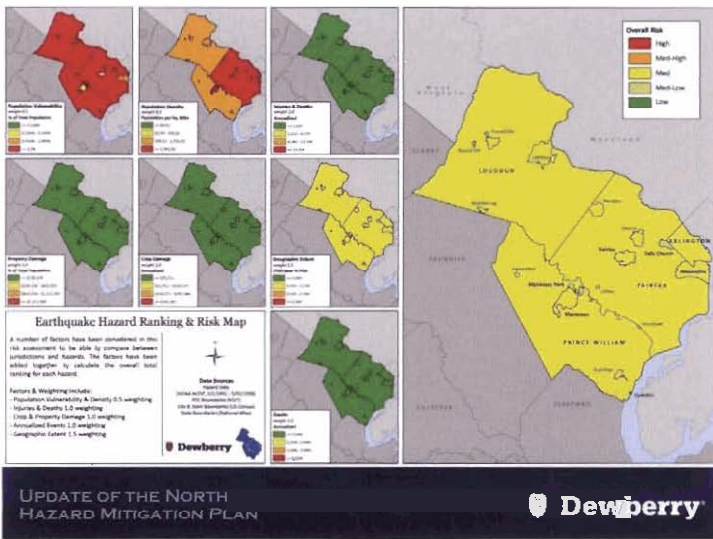


Critical Facilities

- Goochland County, VA Scenario
 - Day of Earthquake 85% of hospital beds available for use by patients already in the hospital and those injured by the earthquake would be available
 - After one week, 94% of the beds will be back in service
 - All essential facilities would have functionality of >50% on day 1

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Dewberry



Dam Failure

- Department of Conservation & Recreation monitors routine inspection and maintenance of dams presenting the greatest risk or that need structural repair.

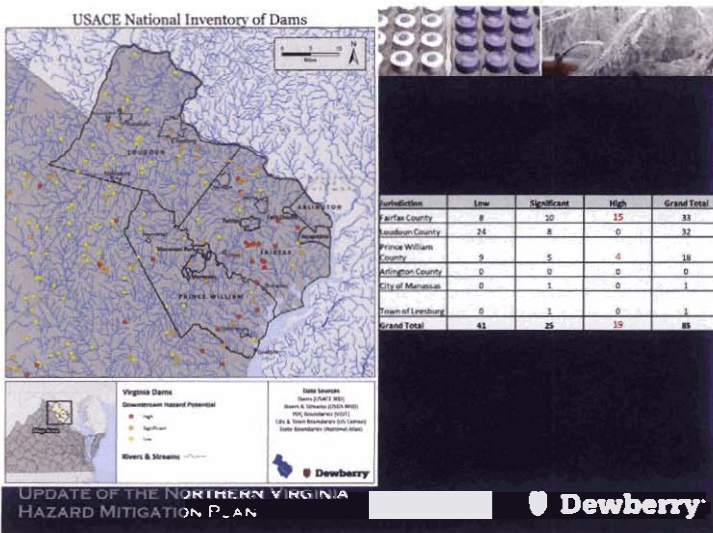
Major Dams in the Northern Virginia Region

Dam Name	Hazard Class	Drainage Area (Sq. Mi.)	Primary Purpose	Owner
Upper Occoquan	High	596	Hydroelectric	Fairfax County Water Authority
T. Nelson Elliott	High	74	Hydroelectric	City of Manassas
Barcroft	High	15	Recreation	Lake Barcroft Watershed Improv. Dist.
Lake Montclair	High	11	Recreation	Montclair Property Owners Association
Poison Creek #1	High	6	Flood Control	Fairfax County Board of Supervisors
Lake Thomas	High	1	Recreation	Resident Home Owners Association
Swaley Lake	Significant	10	Irrigation	Round Hill Associates
Beaverdam Creek	Significant	6	Water Supply	City of Fairfax
Kingdown Lake	Significant	1	Recreation	Kingdowne Limited Partnership
Poissant Point Ash	Significant	< 0	Debris Control	Virginia Power
Beckenkidge	Significant	< 0	Water Supply	U.S. Department of Defense (USMC)
Horsepen	Low	23	Other	Metro-Washington Airport Authority

Source: U.S. Army Corps of Engineers

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Dewberry



Dam Failure

- Dam failure has not been included in the hazard ranking or analysis portion of the plan; it's addressed through text with a summary of National Inventory of Dams statistics & the current hazard potential.
- Predicting the probability of dam failure requires a detailed, site-specific engineering analysis for each dam in question. Failure may result from hydrologic and hydraulic design limitations, or from geotechnical or operational factors.

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Dewberry

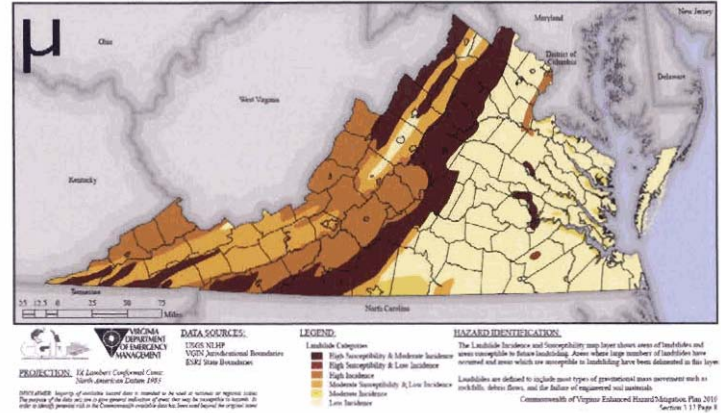


Landslides

- **Data Sources:**
 - USGS Landslide Incidence and Susceptibility
- Probability has not been quantified; but a qualitative high/moderate/low rating has been derived from the USGS mapping.
- NCDC Annualized Loss \$105,174



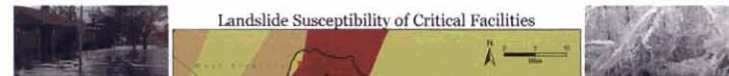
Figure 3.12-1: Landslide Incidence and Susceptibility



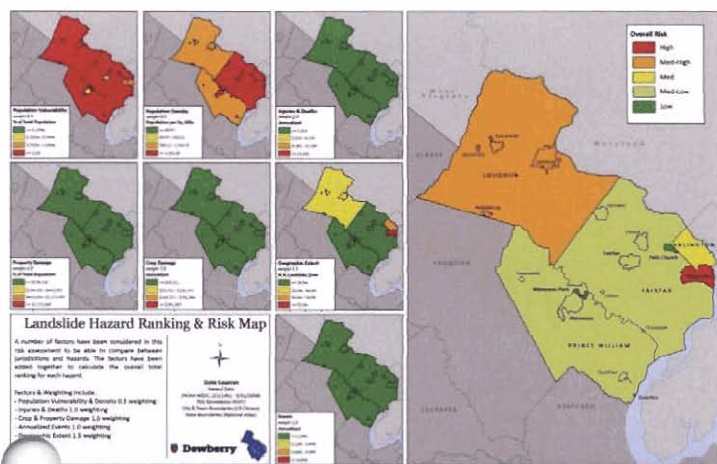
Landslide: Critical Facility Risk

- Facilities were intersected with USGS Susceptibility & Incidence Map

Landslide Susceptibility	EOC	Fire Station	Medical Care	Police	School	Total
High landslide incidence (more than 15% of the area is involved in landsliding)	0	5	4	5	92	110
High susceptibility to landsliding and moderate incidence	0	3	1	2	20	28
Low landslide incidence (less than 1.5% of the area is involved in landsliding)	1	56	12	33	524	636
Total	1	68	17	40	636	762



Landslide Susceptibility of Critical Facilities

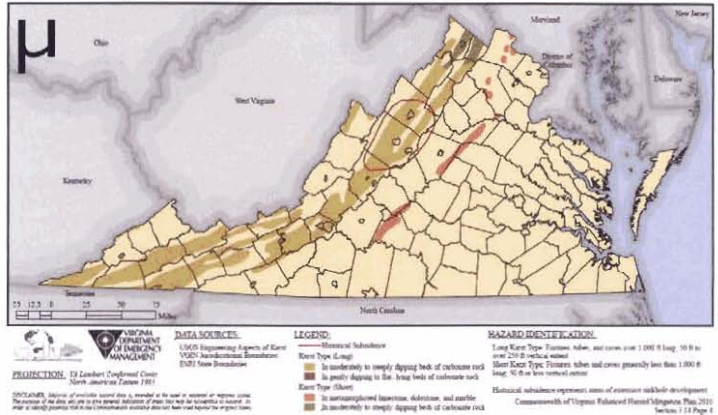


Land Subsidence (Karst)

- **Data Sources:**
 - USGS Engineering Aspects of Karst
- Probability has not been quantified; jurisdictions in mapped karst zones were considered at a greater risk than those not in karst zones.
- NCDC does have any karst related events.



Figure 3.14-1: Karst Regions and Historical Subsidence

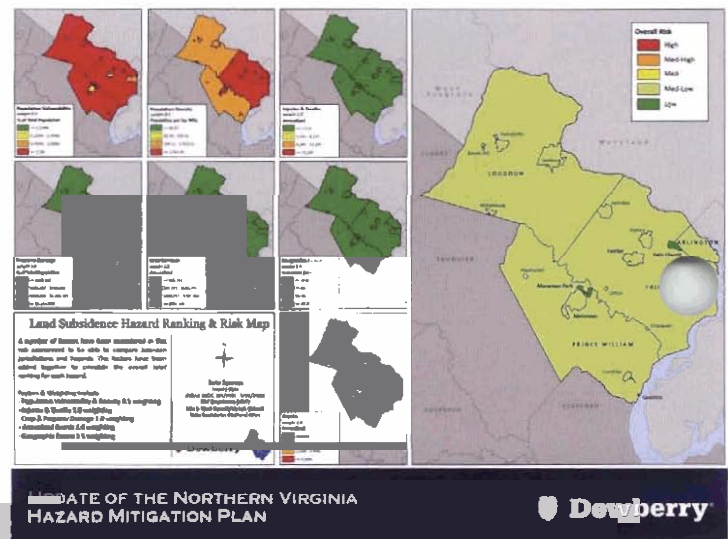
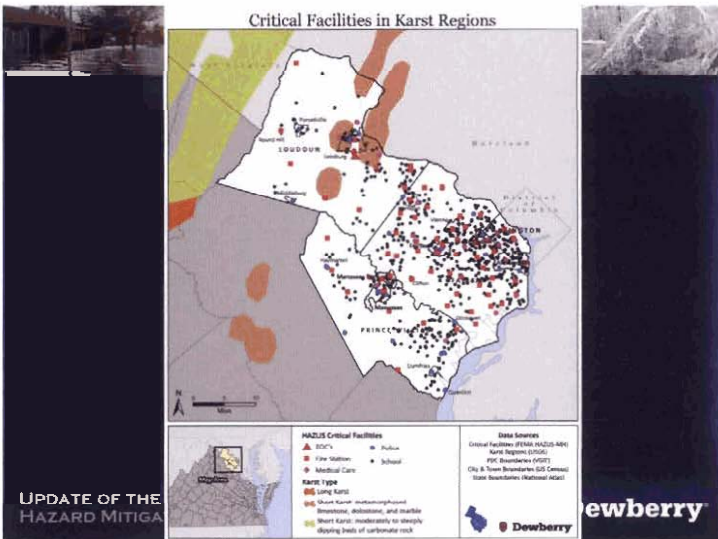


Karst: Critical Facility Risk

- Facilities were intersected with USGS Karst Map

Jurisdiction	Fire Station	Medical Care	Police	School	Total
Loudoun County	3	2	0	4	7
Town of Leesburg	0	0	3	17	19
Total	3	2	3	16	22

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



OVERALL RISK

- NCDC county/city hazard rankings are relative to the NOVA region
- Jurisdictional risk ranking and analysis is more comprehensive than the previous version, but it is still limited by underlying biases/flaws in the source data
- The analyses of critical facilities were limited by little (or no) building-specific parameters necessary to quantify vulnerability
- Potential resolutions of limitations in the hazard profiles and risk assessments may be included in 2010 mitigation strategies

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

2010 Ranking

Jurisdiction	Flood	Wind	Tornado	Winter Weather	Drought	Earthquake	Landslide	Wildfire	Karst
Arlington County	High	High	High	High	Med-High	Med	Med	Med-Low	Med-Low
Fairfax County	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Herndon	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Vienna	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Clifton	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Loudoun County	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Leesburg	High	High	High	High	Med-High	Med	Med-High	Med-Low	Med-Low
Town of Middleburg	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Round Hill	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Prince William County	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Dumfries	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Haymarket	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Occoquan	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
Town of Quantico	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
City of Alexandria	High	High	High	High	Med-High	Med	Med-Low	Med	Med-Low
City of Fairfax	Med-High	Med	High	Med-High	Med-Low	Med	Med-Low	Med-Low	Med-Low
City of Falls Church	High	High	Med-High	High	Med	Med-Low	Low	Low	Low
City of Manassas	High	High	High	High	Med-High	Med	Med-Low	Med-Low	Med-Low
City of Manassas Park	High	Med-Low	Med-High	Med	Low	Med-Low	Low	Med-Low	Low
Overall Risk	High	High	High	High	Med-High	Medium	Medium	Med-Low	Med-Low

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

Text Descriptions:

- Building Fires
- Extreme Temperatures
- Erosion
- Dam Failure
- Hail/Lightning

Annualized Loss

Requirement §201.6(c)(2)(ii)(B): [The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(ii)(A) of this section and a description of the methodology used to prepare the estimate ...]

Annualized Loss*

NCDC Storm Events

1. High Wind
2. Tornado
3. Flood
4. Winter Storm

NOVA region can expect approximately \$7.5 Million in annualized losses from natural hazards

an NCDC
statistics

County	Annualized Loss (based on property and crop damages and number of years of record)					TOTAL
	Flood	High Wind	Tornado	Winter Storm		
Fairfax County	\$801,806	\$636,049	\$2,265,015	\$40,517		\$3,743,510
Prince William County	\$155,044	\$799,142	\$117,080	\$40,501		\$1,111,767
Manassas, City of	\$89,036	\$598,018	\$0	\$40,505		\$897,572
Arlington County	\$179,199	\$230,954	\$22,033	\$40,484		\$592,670
Loudoun County	\$216,428	\$181,205	\$119,785	\$31,982		\$549,399
Falls Church, City of	\$93,959	\$299,718	\$89,210	\$40,484		\$494,382
Alexandria, City of	\$57,038	\$199,839	\$149	\$40,484		\$336,509
Fairfax, City of	\$0	\$4,482	\$0	\$0		\$4,482
Manassas Park, City of	\$0	\$578	\$0	\$0		\$578
Total	\$1,652,603	\$2,932,999	\$2,612,298	\$394,974		\$7,592,873

Comparison of Annualized Loss

Hazard Type	Years of Record	NCDC			Other Source	
		Annualized Property Damage	Annualized Crop Damage	Total Annualized Loss	Total Annualized Loss	Data Source
Flooding	1993 - 2009	\$1,512,232	\$140,370.82	\$1,652,603	\$99,049,000	FEMA HAZUS MR4
Winter Weather	1993 - 2009	\$386,191	\$8,782.63	\$394,974		Not Available
Tornado	1950 - 2009	\$2,611,514	\$784.88	\$2,612,298		Not Available
High Wind	1955 - 2009	\$2,617,096	\$315,902.85	\$2,932,999	\$4,795,691	FEMA HAZUS MR4
Drought	1995 - 2009	\$0	\$942,971.35	\$942,971		Not Available
Earthquake				Not Available	\$2,408,945	FEMA HAZUS MR4
Total				\$8,535,845	\$106,253,636	
<i>Total Annualized Loss Estimate for major hazard in NOVA</i>					\$110,203,879	

HUMAN-CAUSED HAZARDS

- Digital Sandbox

Using the HIRA Results

- Creating Mitigation Actions
 - What is the HIRA telling us?
 - Current Projects?
 - Potential Funding Sources?





Review and Update of 2006 Plan Goals and Regional Objective(s)



Workshop Definitions

- **Goal:** general guideline that describes what West Virginia would like to achieve
- **Objective:** specific and measurable strategies that must be implemented to achieve the identified goals
- **Action:** more specific than an objective with identified responsible parties, timeframes, and potential funding sources



Verification of 2006 Plan Goals

Goal #1 *Improve the quality of best available data for conducting detailed hazard risk assessments and preparing meaningful mitigation action plans.*



Verification of 2006 Plan Goals

Goal #2 *Increase the financial capability of local jurisdictions throughout the Northern Virginia region to implement hazard mitigation measures through maximizing grant funding opportunities as well as locally available fiscal resources.*



Verification of 2006 Plan Goals

Goal #3 *Develop and maintain specific plans to minimize the potential affects of natural hazards, including the relevant local emergency preparedness, response and recovery plans.*



Verification of 2006 Plan Goals

Goal #4 *Work to improve existing local policies, codes and regulations to reduce or eliminate the impacts of known natural hazards. This includes maintaining continued compliance with the National Flood Insurance Program (NFIP) for all participating jurisdictions.*



Verification of 2006 Plan Goals

Goal #5 *Investigate and implement a range of structural projects that will reduce the effects of natural hazards on public and private property throughout the region.*



Verification of 2006 Plan Goals

Goal #6 *Disseminate information to increase the general public's awareness of natural hazard risks in the Northern Virginia region, while also educating residents and businesses on the mitigation measures available to minimize those risks.*



2006 NOVA Plan Objective:

NOVA Regional Commission Mitigation Action 1

Coordinate with participating local jurisdictions on the acquisition and/or development of improved GIS data layers for use in conducting enhanced risk assessment studies for future updates to the Northern Virginia Regional Hazard Mitigation Plan.



2006 NOVA Plan Objective:

NOVA Regional Commission Mitigation Action 2



2006 NOVA Plan Objective:

NOVA Regional Commission Mitigation Action 3



2006 NOVA Plan Objective:

NOVA Regional Commission Mitigation Action 4



Next Steps:

- Local Plan Committee Scheduling
- Project Schedule
- Remaining Local Inputs Required
 - 2006 Evaluation
 - Capability Analysis

UPDATE OF THE NORTHERN VIRGINIA
HAZARD MITIGATION PLAN



Northern Virginia Mitigation Plan Update HIRA Meeting July 12, 2010 Sign-in Sheet

Name	Department/Organization	Phone	Fax	E-mail
✓ Becky McKinney	Fairfax County OEM	571-350-1009	571-350-1050	Elizabeth.mckinney@fairfaxcounty.gov
✓ Pat Collins	Prince William County OEM	703-792-5828	703-792-7149	pcollins@pwcgov.org
✓ Alexa Hussar	Prince William County OEM	703-792-5254	703-792-7149	ahussar@pwcgov.org
✓ Charlie McRorie	City of Alexandria 746-5257	703-838-3825	703-548-6952	Charlie.McRorie@alexandriava.gov
Beth Brown	VDEM	804-317-6685		Beth.brown@vdem.virginia.gov
✓ Carrie Strain	Dewberry (contractor)	703-849-0367	703-206-0803	cstrain@dewberry.com
✓ Jane Sibley Frantz	Dewberry (contractor)	703-849-0473	703-206-0803	jfrantz@dewberry.com
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Michael Liddle	Fairfax County	703.324.3515		Michael.Liddle@fairfaxcounty.gov
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✓ Deborah Mills	Dewberry			dmills@dewberry.com
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Sam Kinzick	NVRC	703-642-4636	703-642-5072	SKINZICK@NOVAREGION.ORG
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Kevin Johnson	Loudoun County OEM	703-737-8831	703-779-0012	Kevin.Johnson@loudoun.gov
DAVID SCHWENDEL	NVRC	703 642 4624	703 642 5077	dschwengel@novaregion.org
Mary Ann Welton	Fairfax County DPZ	703.324.1364	703.324.3056	mary.welton@fairfaxcounty.gov
Stephanie Jaffe	Arlington County OEM	703 228 4739	703 228 3667	sjaffe@arlingtonva.us
JEFF STERN	NVRC	703.642.4628		JEFF.STERN@NOVAREGION.ORG



Agenda

Northern Virginia Hazard Mitigation Plan Update
 Final Hazard Identification, Risk Assessment and Vulnerability Analysis
 Development of Regional Strategies

Monday, October 18, 2010 1:00pm – 4:00 PM

Dewberry

8403 Arlington Boulevard (rear Building), Fairfax VA 22031

Lobby Level Conference Rooms

Description	Lead	Time
Welcome, Introductions and Agenda	Deborah Mills	1:00pm-1:20pm
Final Hazard identification, Risk Assessment and Vulnerability Analysis Results Presentation	Ryan Towell	1:20pm-1:50pm
Social Vulnerability Appendix Review	Deborah Mills Ginni Melton	1:50pm-2:20pm
BREAK	Deborah Mills Ginni Melton	2:20pm-2:30pm
Develop Regional Mitigation Actions	Carrie Speranza	2:30pm-3:15pm
Outreach	Deborah Mills	3:15pm-3:45pm
Next Steps: Draft Plan Development	Deborah Mills	3:45pm-4:00pm

Dewberry Team:

Project Manager	Deborah Mills	703.849.0162 804.335.9946 (c)	dmills@dewberry.com
HIRA Lead	Rachael Herman	585-429-7448	rherman@dewberry.com
Planning Lead	Jane Sibley Frantz	703.849.0473	jfrantz@dewberry.com
Planning Support and Share Point Site	Carrie Speranza	703.849.0367	csperanza@dewberry.com
Climate Change and HIRA Support	Ryan Towell	703.849.0275	rtowell@dewberry.com
Local Plan Annex Lead	Carrie Speranza	703.849.0367	csperanza@dewberry.com
Structural Mitigation Project Scoping	Julia Moline Jennifer Holcomb	703.849.0610 703.849.0556	jmoline@dewberry.com jholcomb@dewberry.com

Arlington County Project Management Team:

Project Manager	Stephanie Jaffe	(703) 228-4739	sjaffe@arlingtonva.us
Financial Lead	Joanne Hughes	703.228.3560	jmhughes@arlingtonva.us
Senior Advisor	Bonnie Regan	703.228.3464	bregan@arlingtonva.us
Outreach Lead	TBD		



2010 Update of the Northern Virginia Hazard Mitigation Plan

Vulnerability Assessment Review Regional Mitigation Action Planning Outreach

October 18, 2010



Meeting Agenda

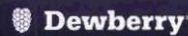
1. Welcome & Introductions
2. Final Hazard Identification, Risk Assessment & Vulnerability Analysis Review
3. Populations at Risk (Social Vulnerability) Appendix Review
4. Break
5. Develop Regional Mitigation Actions
6. Outreach
7. Next Steps:
Draft Plan Development



Hazard Ranking

- The purpose of the hazard identification and risk assessment is to provide a factual basis for developing mitigation strategies; to *prioritize* those jurisdictions which are most threatened and vulnerable to natural hazards.
- FEMA guidance indicates that the jurisdictions at *greatest risk* to specific hazards should be identified, considering both the characteristics of the hazard and the jurisdictions' degree of vulnerability.

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Hazards Addressed

- Multiple hazards impact Fairfax County and NOVA; how do we determine priority hazards?
 - Previous Hazard Mitigation Plan (2006)
 - Declared Disasters
 - Availability of Data

Flood
Winter Storms
Severe Thunderstorms
Tornadoes
Hurricanes & Tropical Storms
Drought
Wildfire
Earthquakes

Extreme Temperatures
Dam Failure
Erosion
Landslides
Sinkholes
Human-Caused (Digital Sandbox)

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



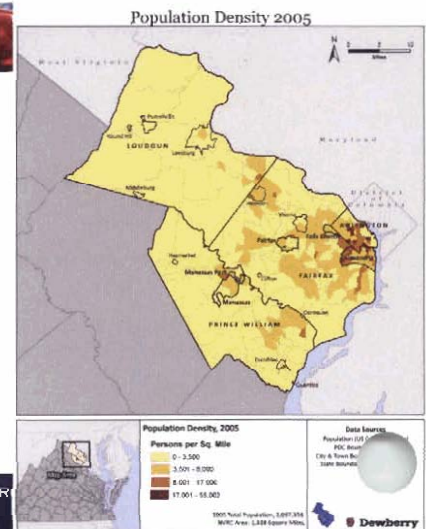
Data Sources

- Population
- Social Vulnerability
- Climate Change
- Land Use and Development
- Local Zoning
- Critical Facilities
- Building Inventory
- Disaster Data
 - Federally Declared
 - NCDC

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



Population Density



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN





Climate Change

- Considered as a potential *amplifier* of existing natural hazards
- Discussion of projections as related to specific hazards (i.e. flooding, drought)
 - Potential future impact on hazard:
 - Frequency
 - Intensity
 - Distribution
- Sea Level Rise = Hot Spots (i.e. the lowest lying areas in the region)



NOVA Areas at Risk – Sea Level Rise

- Sea Level Rise = Hot Spots (i.e. the lowest lying areas in the region)



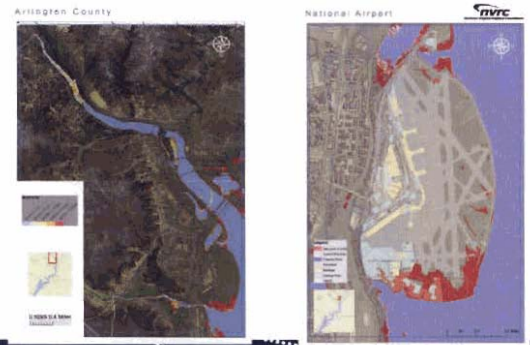
Hot Spots for Sea Level Rise	
Arlington	<ul style="list-style-type: none"> • National Airport • Four Mile Run
Alexandria	<ul style="list-style-type: none"> • Four Mile Run • Dangerfield Island • Old Town • Jones Point
Fairfax County	<ul style="list-style-type: none"> • Huntington • Belle Haven/New Alexandria • Dyke Marsh • Tidal Embayments • Hallowing Point
Prince William County	<ul style="list-style-type: none"> • Occoquan NWR • Tidal Embayments • Town of Quantico • Occoquan River



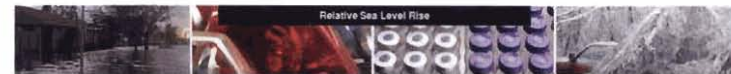
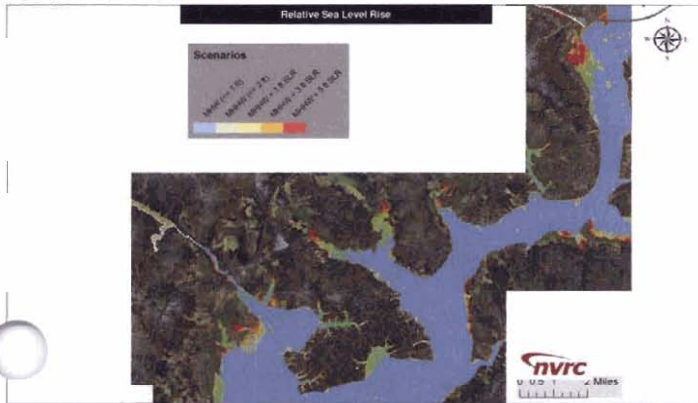
City of Alexandria



Arlington County



Fairfax County



Prince William County





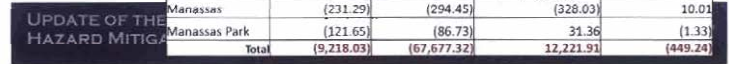
Land Use and Development

- Jurisdiction Provided Zoning Data and/or Maps discussed in report
- National Land Cover Dataset (NLCD)
 - 1992 & 2001 datasets
 - Land Use types defined by the NLCD Land Use Change Project
 - Percent Change for:
 - Urban Land Cover
 - Forest Cover
 - Wetland Cover
 - Agricultural Land Cover



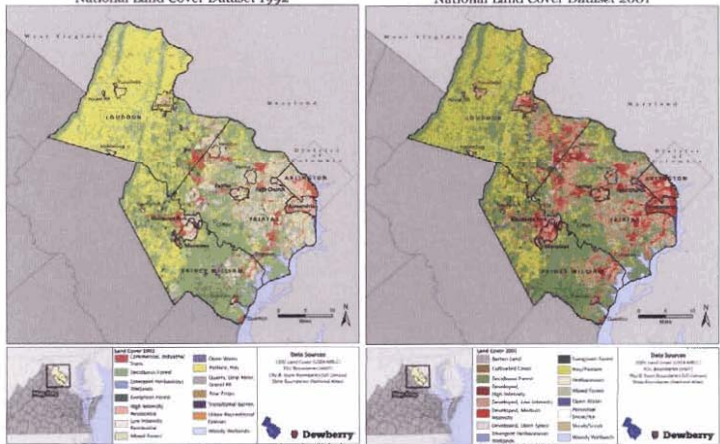
Land Use Changes

Jurisdiction	Urban Change (Acres)	Forest Change (Acres)	Agricultural Change (Acres)	Wetland Change (Acres)
Arlington County	(628.49)	(1,693.09)	385.19	(1,420.05)
Fairfax County	(16,529.25)	(27,808.21)	13,700.61	(1,420.05)
Herndon	(84.73)	(228.18)	(72.06)	(28.91)
Vienna	(688.53)	(274.21)	111.20	9.56
Clifton	(43.59)	(12.23)	24.24	1.33
Loudoun County	9,838.96	(17,791.12)	(8,349.58)	72.95
Leesburg	1,596.13	(1,517.62)	(1,259.64)	(15.12)
Purcellville	215.95	(160.57)	(489.49)	0.00
Middleburg	(27.80)	(37.14)	(52.93)	0.00
Round Hill	22.68	(38.25)	(56.49)	(3.11)
Prince William	(1,350.38)	(16,364.01)	8,406.07	840.43
Dumfries	(65.61)	14.90	12.45	(41.37)
Haymarket	(44.92)	4.67	(45.59)	3.78
Occoquan	(17.57)	(4.23)	(4.89)	1.56
Quantico	(2.67)	(2.22)	6.23	(3.78)
Alexandria	(211.27)	(695.65)	(62.49)	(39.14)
Fairfax City	(555.10)	(640.05)	245.75	23.57
Falls Church	(288.89)	(48.93)	20.02	(0.44)
Manassas	(231.29)	(294.45)	(328.03)	10.01
Manassas Park	(121.65)	(86.73)	31.36	(1.33)
Total	(9,218.03)	(67,677.32)	12,221.91	(449.24)



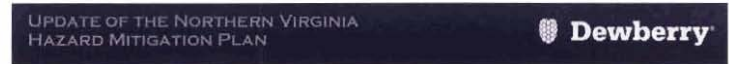
National Land Cover Dataset 1992

National Land Cover Dataset 2001



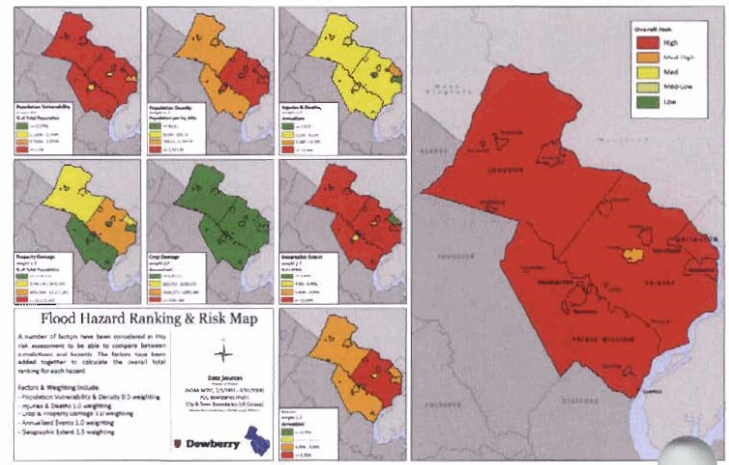
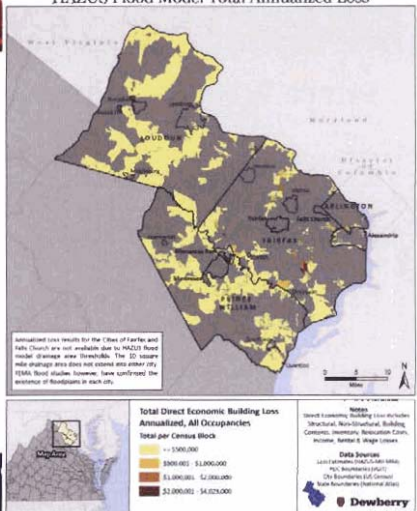
Federally Declared Disasters

- Since 1972
- 14 of the 52 Virginia Presidentially declared disasters have included at least one community in the NoVA planning area
- Disaster Types
 - 5 Severe winter storms, snowstorms or blizzards
 - 4 Hurricanes or tropical storms
 - 4 Severe storms (tornadoes) and flooding
 - 1 Terrorism



HAZUS-MH NOVA Regional Total Annualized Loss Estimation

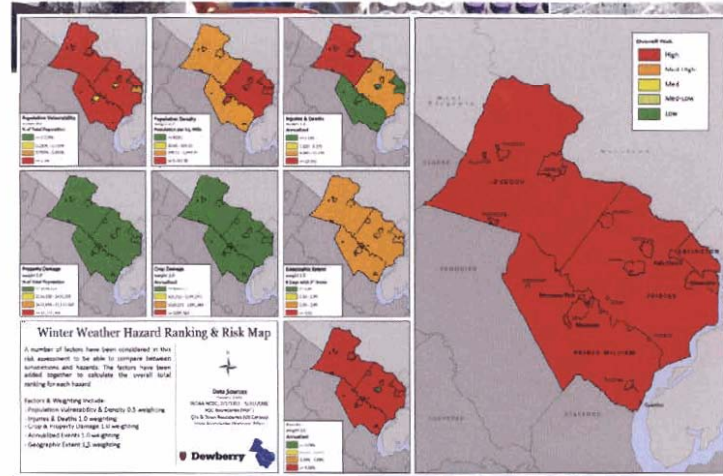
HAZUS Flood Model Total Annualized Loss





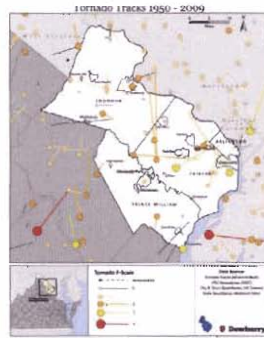
Winter Storms

- Impact and Vulnerability
 - Transportation agencies and utility companies
- VA HMP used weather station data to examine frequency of snowfall

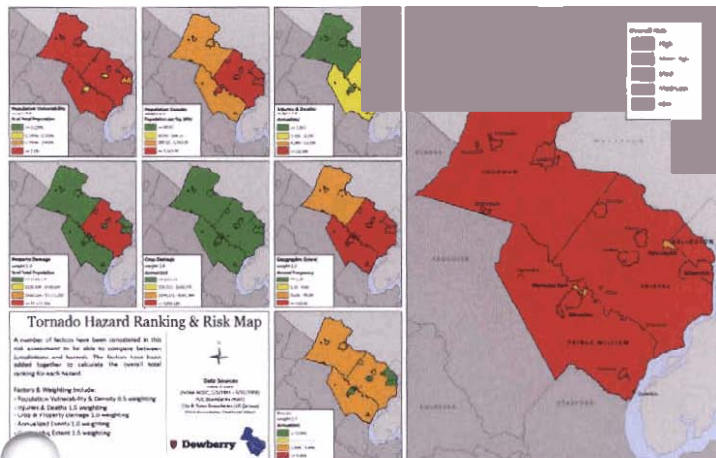
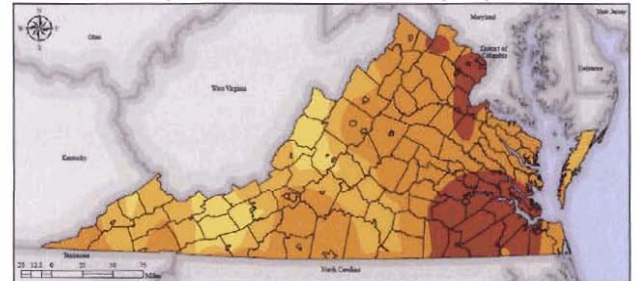


Tornadoes

- Low probability / high impact events
- Probability quantified by Commonwealth of Virginia Hazard Mitigation Plan using historical frequency method



Tornado Hazard Frequency

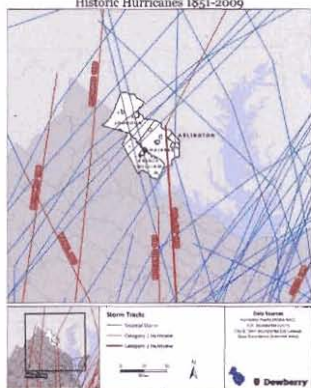
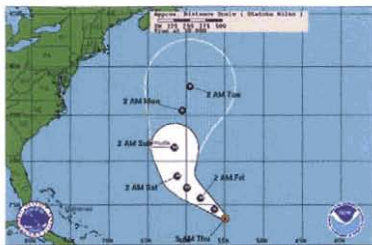


Hurricanes and Tropical Storms

- Probability
- Impact & Vulnerability
- Risk
 - Critical Facility Risk
 - Jurisdictional Risk
- Data Source: NCDC & HAZUS
- NCDC Annualized Loss
- HAZUS Annualized Loss



Historic Hurricane Tracks

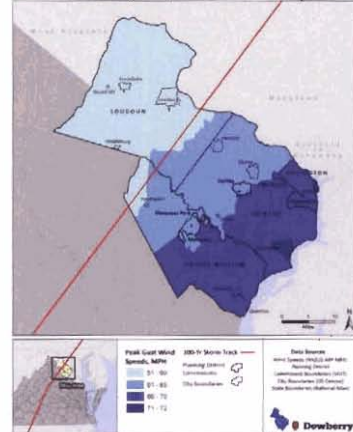


UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

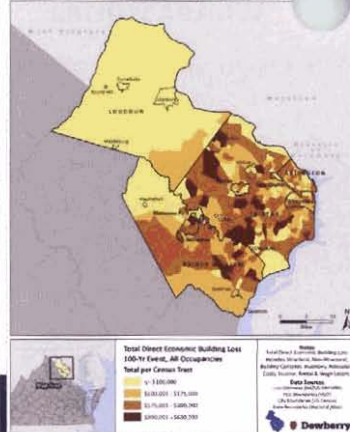


Hurricane Force Winds

HAZUS Hurricane Model 100-Year Wind Speeds



HAZUS Hurricane Model Total Losses 100-Yr



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

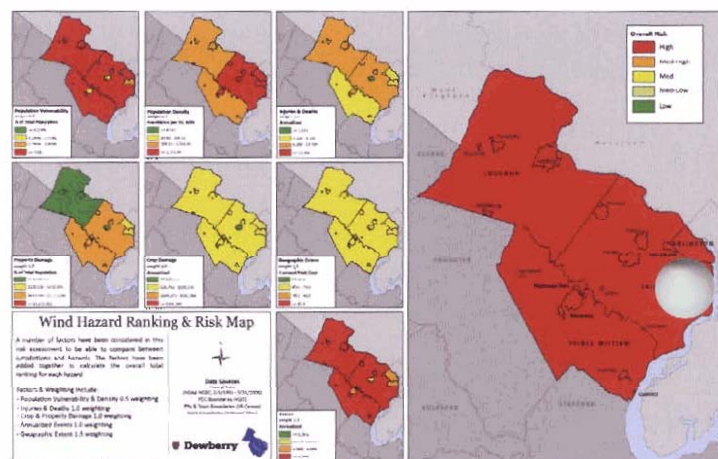


Wind Events

Tornado – Low Probability, High Damage

Hurricane and Thunderstorm – Medium Probability, Lower/Localized Damage (i.e. microburst)

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

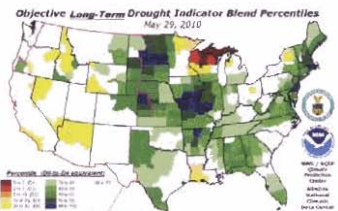


UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



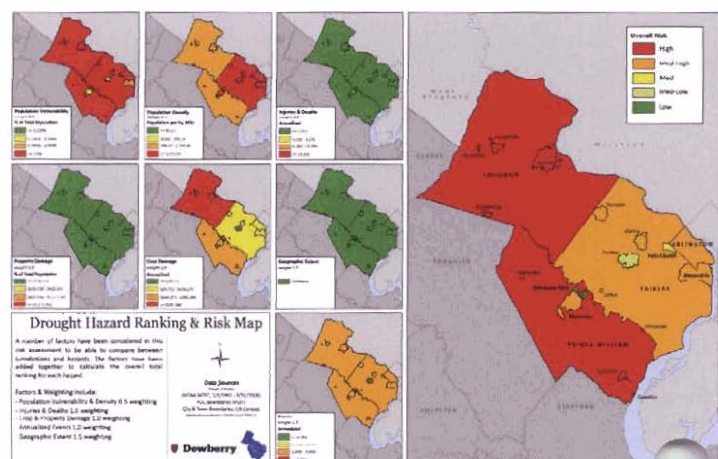
Drought

- Probability
- Impact and Vulnerability
 - Drought Monitor
- Risk
 - Critical Facility Risk
 - Jurisdictional Risk
- 168 recorded "droughts" in NCDC for NOVA since 1995; Loudoun County highest (31 events)



NCDC Annualized Loss \$942,971

UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN



UPDATE OF THE NORTHERN VIRGINIA HAZARD MITIGATION PLAN

