



SOMERSET COUNTY

# HAZARD MITIGATION PLAN

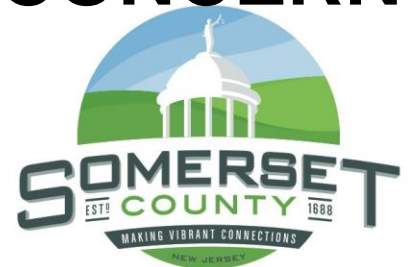
## SOMERSET COUNTY MULTI-JURISDICTIONAL HAZARD MITIGATION PLAN

FINAL PLAN UPDATE  
JULY 2019

[www.co.somerset.nj.us/hmp](http://www.co.somerset.nj.us/hmp)

### Section 5.2: IDENTIFICATION OF NATURAL HAZARDS OF CONCERN

*Prepared by the Somerset County  
Mitigation Planning Committee*



## 5.2 IDENTIFICATION OF NATURAL HAZARDS OF CONCERN

To provide a strong foundation for mitigation strategies considered in Section 6.0, Somerset County considered a full range of natural hazards that could impact the area, and then identified and ranked those hazards that presented the greatest concern. The natural hazard of concern identification process incorporated input from the County and participating jurisdictions; review of the State of New Jersey Hazard Mitigation Plan (NJ HMP) and previous hazard identification efforts; research and local, state, and federal information on the frequency, magnitude, and costs associated with the various hazards that have previously, or could feasibly, impact the region; and qualitative or anecdotal information regarding natural hazards and the perceived vulnerability of the study area’s assets to them.

Hazards of Concern are defined as those hazards that are considered most likely to impact a community. These are identified using available data and local knowledge.

For the purposes of this planning process, the Planning Committee chose to group some natural hazards together, based on the similarity of hazard events, their typical concurrence or their impacts, consideration of how hazards have been grouped in Federal Emergency Management Agency (FEMA) guidance documents (FEMA 386-1, “Understanding Your Risks, Identifying Hazards and Estimating Losses; FEMA’s “Multi-Hazard Identification and Risk Assessment – The Cornerstone of the National Mitigation Strategy”), and consideration of hazard grouping in the NJ HMP. This approach was maintained for the most recent plan update.

The “Flood” hazard includes riverine flooding, flash flooding, ice-jam flooding, and dam flooding. Other types of flooding such as coastal do not occur within this county; therefore, they were not further considered for inclusion within this HMP. Inclusion of the various forms of flooding under a general “Flood” hazard is consistent with that used in FEMA’s “Multi-Hazard Identification and Risk Assessment” guidance.

The “Severe Storm” hazard includes windstorms that often entail a variety of other influencing weather conditions including thunderstorms, hail, lightning and tornados. Since tropical disturbances are identified as a type of severe storm event, this hazard also includes tropical cyclone events (hurricanes, tropical storms and tropical depressions). Tropical cyclones were not grouped as a separate hazard, because the county felt that these types of events do not directly impact the County on a frequent basis and that exposure and risk of such events are minimal in comparison to communities along the New Jersey coastline. However, this was found to be an exception for certain tropical events that created a regional impact upon the state, such as Tropical Storm Doria (1971), Tropical Storm Floyd (1999), and Superstorm Sandy (2012) as further discussed in Section 5.4.1 Severe Storm of this HMP.

The “Severe Winter Storm” hazard includes heavy snowfall, blizzards, freezing rain/sleet, ice storms, and extra-tropical cyclones (nor’easters and severe winter low-pressure systems). Extra-tropical events generally occur during winter weather months; therefore, for the purpose of this HMP, all such events are to be grouped within this hazard. Although not all extra-tropical events, such as Nor’easters, occur during the winter, they will remain grouped within this hazard category to avoid duplication of events in hazard profiles. This grouping is consistent with that used in the NJ HMP.

Please note that technological [e.g. hazardous material incidents] and man-made hazards (e.g. terrorism) are not being addressed in this planning process. The DMA 2000 regulations do not require consideration of such hazards, these were not chosen for inclusion in this plan by the County and planning participants.

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As part of the 2018 Plan Update, Somerset County conducted research to identify hazard events that have occurred since the last plan update was prepared. After further evaluation, the Somerset County Project Management Team (PMT) determined in late Summer 2017 that Somerset County’s recent hazard history did not alter previous assessment results regarding whether individual hazards did or did not pose a significant threat to the County. Through distribution of a Risk Assessment Interim Deliverable, the SC PMT solicited feedback from all participating jurisdictions. Contractor re-assessments were verified by planning team members and the SC PMT determined that previous assessments were still applicable for this plan update, with no hazards added to or omitted from the 2014 list of identified hazards.

**Table 5.2-1** provides a summary of the hazard identification and reevaluation process noting which of the 24 evaluated hazards were identified as significant enough for further evaluation through Somerset County’s multi-jurisdictional hazard risk assessment (marked with a “☑”).

<ul style="list-style-type: none"> <li><input type="checkbox"/> Avalanche</li> <li><input type="checkbox"/> Coastal Erosion</li> <li><input checked="" type="checkbox"/> Drought</li> <li><input checked="" type="checkbox"/> Earthquake</li> <li><input type="checkbox"/> Expansive Soils</li> <li><input checked="" type="checkbox"/> Extreme Temperatures</li> <li><input checked="" type="checkbox"/> Flood (Riverine, Flash, Ice Jam, and Dam Flooding)</li> <li><input type="checkbox"/> Groundwater Contamination</li> <li><input checked="" type="checkbox"/> Hailstorm</li> <li><input checked="" type="checkbox"/> Hurricane (and other Tropical Cyclones)</li> <li><input type="checkbox"/> Ice Jams</li> <li><input checked="" type="checkbox"/> Ice Storm</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Infestation</li> <li><input type="checkbox"/> Land Subsidence</li> <li><input type="checkbox"/> Landslide</li> <li><input checked="" type="checkbox"/> Nor’easters</li> <li><input type="checkbox"/> Radon</li> <li><input checked="" type="checkbox"/> Severe Storms (Windstorms, Thunderstorms, Hail, Lightning, Tornados, and Hurricanes)</li> <li><input checked="" type="checkbox"/> Severe Winter Storms (Heavy Snow, Blizzards, Freezing Rain/Sleet, Nor’easters, Ice Storms)</li> <li><input checked="" type="checkbox"/> Tornado</li> <li><input type="checkbox"/> Tsunami</li> <li><input type="checkbox"/> Volcano</li> <li><input checked="" type="checkbox"/> Wildfire</li> <li><input checked="" type="checkbox"/> Windstorm</li> </ul>
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☑ = Hazard considered significant enough for further evaluation through Somerset County’s multi-jurisdictional hazard risk assessment.

**Table 5.2-2<sup>1</sup>** documents the evaluation process rationale used for determining which natural hazards were considered significant enough for further evaluation through Somerset County’s multi-jurisdictional hazard risk assessment. For each hazard considered, the table indicates whether or not the hazard was identified as a significant hazard to be further assessed, how this determination was made, and why this determination was made. The table summarizes not only the 11 hazards that *were* identified (and why) but also the 13 that *were not* identified (and why not). Hazards that were not identified for inclusion at this time may be addressed during future evaluations and updates of the risk assessment if deemed necessary by the planning team during the next plan update phase. Table 5.2-2 also documents the planning team’s reassessment of hazard significance during the first plan update as part of its ongoing maintenance of the plan to ensure that it reflects current conditions.

<sup>1</sup> Table 5.2-2 was updated to include events captured by readily-available data sources (particularly NCDC records) in Fall 2017. The sources themselves are not updated to the same end date across all hazards; hence, Table 5.2-2 will show event records through different end dates. Most were current through late 2016 or mid-2017, though particular variability across hazards is reflected in the table. Hazards included in bold in Table 5.2-2 are considered significant hazards.

SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

Table 5.2-2 – Identification of Natural Hazards of Concern for Somerset County

Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
Avalanche	No	No	No	<ul style="list-style-type: none"> <li>The NJ HMP does not identify avalanche as a hazard of concern for NJ.</li> <li>The topography and climate of SC does not support the occurrence of an avalanche event.</li> <li>NJ in general has a very low occurrence of avalanche events based on statistics provided by National Avalanche Center – American Avalanche Association (NAC-AAA) between 1950 and 2017.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> <li>Review of NAC-AAA database between 1950 and 2017.</li> </ul>
Coastal Erosion	No	No	No	<ul style="list-style-type: none"> <li>The NJ HMP identifies coastal erosion as a hazard of concern for NJ. Counties bounded by coastal waters are most affected by coastal erosion. SC is not bounded by coastal waters; therefore, coastal erosion was not identified as a hazard of concern by the county.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> </ul>
Drought	Yes	Yes	No	<ul style="list-style-type: none"> <li>The NJ HMP identifies drought as a hazard of concern for NJ. NJ HMP indicated that SC experienced drought events during the following time periods:                             <ul style="list-style-type: none"> <li>March 1995</li> <li>October 1997</li> <li>December 1998</li> <li>January 1999</li> <li>July-September 1999</li> <li>November-December 2001</li> <li>January-July 2002</li> <li>September - October 2002</li> <li>September 2005</li> <li>May-July 2006</li> <li>August-October 2010</li> <li>March-May 2012</li> </ul> </li> <li>Counties most affected by drought are those dependent on water stored aboveground in reservoirs. SC is one of those counties.</li> <li>USGS indicated that many statewide drought events which generally impacted all counties of NJ, have occurred, including, but</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> <li>USGS</li> <li>NRCC</li> <li>NOAA</li> <li>D. Ludlum (NJ Weather Book) 1983</li> <li>DIR</li> <li>ONJSC</li> <li>NDMC</li> <li>Gov. Byrne EO</li> <li>Gov. Whitman EO</li> <li>SHELDUS</li> </ul>

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Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
				<p>not limited to, the following:</p> <ul style="list-style-type: none"> <li>o July – September 1923</li> <li>o January – February 1931</li> <li>o November 1931 – February 1932</li> <li>o December 1939 – January 1940</li> <li>o November 1949 – January 1950</li> <li>o July – August 1963</li> <li>o August 1964 – August 1966 (25 month period)</li> <li>o July – August 1999</li> <li>o December 2001 – May 2002</li> <li>o September 2015 – August 2017</li> </ul> <ul style="list-style-type: none"> <li>• As indicated by other sources, additional drought events to impact SC include: <ul style="list-style-type: none"> <li>o May – July 1949 – Warmest summer in the northeast U.S. SC only had 0.08 inches of rain during this time.</li> <li>o May 1980 – May 1981 – Affected central and eastern U.S., causing an estimated \$20 B in damage/cost to agriculture, estimated 10,000 deaths. Serious rainfall deficits in much of NJ. Governor Byrne declared a state of emergency in several SC jurisdictions.</li> <li>o March – October 1995 – Unseasonably hot and dry weather in northwestern and central NJ, with the drought intensifying during the summer months. Rainfall totals below normal for much of NJ. Gov. Whitman declared a state of emergency in SC.</li> <li>o July 1998 – September 1999 (Drought of 1999) – Worst drought ever for farmers in NJ. Senate approved \$7.4 B in farm aid. Farming industry lost \$80 M in NJ due to the drought. NJ declared a drought emergency by the Clinton Administration. A drought emergency was declared in SC by Gov. Whitman. The drought resulted in \$5 M in crop damage in SC.</li> </ul> </li> </ul>	

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Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
Earthquake	Yes	Yes	No	<ul style="list-style-type: none"> <li>• The NJ HMP identifies earthquake as a hazard of concern for NJ. Although they are known to occur on a regular basis, records indicate that no major earthquakes have struck the state since the establishment of historical record-keeping (1500's). The 2011 HMP indicated that between 1924 and 1999, there were 17 documented earthquakes in NJ and 23 along the state's border with Pennsylvania and New York, none of which took place in SC. The 2014 HMP reports that since 2000, there have been 41 events impacting the State. Of these, 38 occurred in NJ and 3 occurred out of state but were felt in NJ. Only 4 occurred in Somerset County. No damages were reported.</li> <li>• The USGS reported 7 damaging earthquakes that were felt in NJ between 1737 and 1927. Chimney damage was reported; no deaths reported for these incidents.</li> <li>• Although relatively weak events, the 2014 HMP lists 189 earthquakes have impacted NJ from 1737 to 2012.</li> <li>• NJ DEP reports that damaging earthquakes in NJ are rare but have happened and will happen again. The NJGS web site suggests that New Jersey is overdue for a moderate, damaging earthquake. Location of potential future events is not clearly identified.</li> <li>• A moderate earthquake measuring 4.1 on the Richter scale occurred on November 30, 2017 six miles east-northeast of Dover, Delaware. Reports of buildings shaking were felt by people as far north as New York City and as far south as northern Virginia, including New Jersey (and SC), but no damages or injuries were reported.</li> <li>• According to USGS seismic hazard maps, the peak ground acceleration (PGA) with a 10% probability of exceedance in 50 years for Somerset County ranges between 3%g and 4%g. FEMA recommends that earthquakes be further evaluated for mitigation purposes in areas with a PGA of 3%g or more.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP 2014</li> <li>• NJ OEM</li> <li>• NJGS</li> <li>• USGS – Earthquake Hazards Program, Review of USGS Seismic Maps</li> <li>• NJGS Report DGS04-1 (as indicated in NJ HMP)</li> <li>• NJDEP</li> </ul>

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Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
Expansive Soils	No	No	No	<ul style="list-style-type: none"> <li>The NJ HMP does not identify expansive soils as a hazard of concern for NJ.</li> <li>USGS indicated that 50% or less of the soils in SC consist of clay that has slight to moderate potential of swelling.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> <li>Review of USGS 1989 Swelling Clays Map of the Conterminous United States.</li> </ul>
Extreme Temperature	Yes	Yes	No	<ul style="list-style-type: none"> <li>The NJ HMP identifies extreme temperatures (extreme heat and extreme cold) as a hazard of concern for NJ citing 22 extreme temperature events between 1995 and 2013. Of these, 3 were extreme cold events and 19 were extreme heat events.</li> <li>Extreme temperatures are generally a regional hazard event, affecting a large swath of counties and/or states simultaneously.</li> <li>Many sources have indicated that all counties of NJ have experienced extreme temperature events (heat waves or cold temperatures). Most recent events:               <ul style="list-style-type: none"> <li>February 1996 – Extreme Cold throughout NJ. Blackwell Mills experienced temperatures near -8oF</li> <li>July 1997 – Excessive Heat effecting 16 counties (25 injuries)</li> <li>July 1999 – All NJ counties affected by a Heat Wave, with 17 fatalities and 160 injuries. The heat in SC resulted in 10 Injuries and 1 death. Somerville experienced temperatures near 103oF.</li> <li>January 2000 – Extremely cold temperatures and wind chills</li> <li>August 2001 – Heat wave</li> <li>July 2002 – Heat wave</li> <li>January 2003 – Extreme Cold, resulting in 1 fatality and 7 injuries in the state.</li> <li>January 2004 – Extremely cold temperatures and wind chills</li> <li>July-August 2006 – Heat wave; entire tristate area under excessive heat warning. NJ experienced 41 injuries.</li> <li>January 2009 – Extreme cold, reported temperature of -2 degrees F in Basking Ridge</li> <li>June 2011 – Extreme heat, resulting in 1 injury in SC.</li> <li>July 2011 – Extreme heat resulting in 3 injuries in SC. 104 degree temperatures were recorded in Somerville.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> <li>SHELDUS</li> <li>NOAA – NCDC Storm Events Query</li> <li>D. Ludlum (NJ Weather Book) 1983</li> <li>ONJSC</li> </ul>

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				<ul style="list-style-type: none"> <li>o August 2011 to November 2017 – 22 extreme temperature events occurred in this time frame; however, none resulted in deaths, injuries, or reported dollar damages.</li> <li>• The NOAA-NCDC storm event database indicated that SC has been a part of 104 temperature extremes since 1996. All these events included other counties or the entire state. Twelve of these events have occurred since 2014.</li> </ul>	
Flood (Riverine, Flash, Ice Jam and Dam Flooding)	Yes	Yes	No	<ul style="list-style-type: none"> <li>• The 2014 NJ HMP states that floods have been, and continue to be, the most frequent, destructive, and costly natural hazard in New Jersey.. The NJ HMP cited the NOAA NCDC storm events database when it reported 1,169 flood events statewide between 1950 and 2009; and an additional 413 events between January 2010 and December 2012.</li> <li>• The Raritan River, Passaic River and Millstone River Basins are all present throughout SC, which also includes 79 tributaries. Many communities have development and infrastructure located within the floodplains of these basins.</li> <li>• NJ HMP indicated that SC has been issued 11 FEMA Disaster Declarations for flooding associated with many types of storm events (Severe Storm, Hurricane events or Nor’easters), each event resulting in millions of dollars in damages.               <ul style="list-style-type: none"> <li>o <b>FEMA DR-245</b> (June 1968) Heavy Rains and Flooding.</li> <li>o <b>FEMA DR-310</b> (August 1971) Tropical Storm Doria – resulted in approx. \$138.5 M in damages to NJ (\$2.4 M in SC).</li> <li>o <b>FEMA DR-402</b> (August 1973) Flood, Severe Storm, resulted in approx. \$67 M in damages to NJ</li> <li>o <b>FEMA DR-973</b> (December 1992) Coastal Storm, High Tides, Heavy Rain, Flooding (also identified as a Nor’easter)</li> <li>o <b>FEMA DR-1145</b> (October 1996) Severe Storm and Flooding (also identified as a Nor’easter). Resulted in \$31 M in damages to SC.</li> <li>o <b>FEMA DR-1295</b> (September 1999) Hurricane/Tropical Storm Floyd. SC experienced \$358 M in property damages, 2 deaths and over 100 injuries.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP 2014</li> <li>• FEMA Declared Disasters for NJ</li> <li>• FEMA County FIS report</li> <li>• NJ OEM</li> <li>• NOAA – NCDC Storm Events Query</li> <li>• SHELDUS</li> <li>• USACE</li> <li>• NJDEP</li> <li>• D. Ludlum (NJ Weather Book) 1983</li> <li>• MARFC</li> <li>• USACE CRREL Ice Jam Database</li> </ul>



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				<ul style="list-style-type: none"> <li>○ <b>FEMA DR-1694</b> (April 2007) Severe Storm and Inland and Coastal Flooding (also identified as a Nor'easter). Resulted in over \$180 M in damages to NJ. Damages to the recently completed Segment T Pumping Station (of the Green Brook Sub-Basin Project) occurred in Bound Brook. \$5.2 M in Federal Aid is going to Bound Brook.</li> <li>○ FEMA DR-1897 (April 2010) Severe Storms and Flooding</li> <li>○ FEMA DR-4021 (August 2011) Hurricane/Tropical Storm Irene</li> <li>○ FEMA DR-4048 (November 2011) Severe Storms</li> <li>○ FEMA DR-4086 (October 2012) Hurricane/Tropical Storm Sandy</li> <li>• No additional FEMA designated Disaster Declarations for flooding have occurred in SC since 2012.</li> <li>• NJ HMP indicated that parts of SC are within flood hazard areas. Approximately 17.8% (over 54 square miles) of SC is located in the 100-year flood plain.</li> <li>• According to NOAA NCDC storm database, SC experienced 170 total flood events from 1950 to August 2017. Of these, 39 are reported in the last five years (August 2012 through August 2017).</li> <li>• During flood events, the Boroughs of Bound Brook and Manville generally experience the most flooding and damages in SC. Record floods in SC occurred in 1971 (Doria), 1999 (Floyd), April 2007, March 2010, 2011 (Irene, Lee), and 2012 (Sandy).</li> <li>• MARFC indicated that:             <ul style="list-style-type: none"> <li>○ The USGS Bound Brook stream gage along the Raritan River has experienced 50 flood events between 1966 and 2006. Tropical Storm Floyd was the worst event on record.</li> <li>○ The Manville gage along the Raritan River has experienced 100 flood events between 1923 and 2006. Tropical Storm Floyd was the worst event on record.</li> <li>○ The Raritan gage along the N. Branch Raritan River has experienced 37 flood events between 1936 and 2006.</li> <li>○ The Blackwell Mills gage along the Millstone River has experienced 121 flood events between 1928 and 2006.</li> </ul> </li> </ul>	

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				<ul style="list-style-type: none"> <li>o Tropical Storm Floyd (1999) was the worst flood event on record at all four gage locations within the County.</li> </ul>	
Groundwater Contamination (Natural)	No	No	No	<ul style="list-style-type: none"> <li>• The NJ HMP does not identify natural groundwater contamination as a hazard of concern for NJ.</li> <li>• USGS and National Atlas Map Maker (a service of the United States Department of the Interior) recognize SC as having little threat of natural groundwater contamination.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP 2014</li> <li>• NationalAtlas.gov (USGS)</li> </ul>
Hailstorm	Yes	Yes	No	Please see Severe Storm	
Hurricane (and other Tropical Cyclones)	Yes	Yes	No	Please see Severe Storm and Flood	
Ice Jams	Yes	No	No	Please see Flood	
Ice Storm	Yes	Yes	No	Please see Severe Winter Storm	
Infestation	No	No	No	<ul style="list-style-type: none"> <li>• The NJ HMP does not identify infestation as a hazard of concern for NJ.</li> <li>• Although some infestations of ticks, mosquitoes, and/or other types of pest may be present, no sources indicate that this is a major hazard of concern for the county.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP 2014</li> </ul>
Land Subsidence	Yes	No	No	<ul style="list-style-type: none"> <li>• NJ HMP indicates NJ is vulnerable to land subsidence; the soil collapse sinkhole is the most concerned type of sinkhole for NJ.</li> <li>• NJ HMP does not identify SC as an area that has experienced significant land subsidence in the past. In general, areas with narrow bands of carbonate rock are prone to sinkholes and subsidence.</li> <li>• Only small portions in the northernmost areas of the County (Peapack-Gladstone) have been affected by land subsidence. This area has karst geology and occasional sink holes develop.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP 2014</li> <li>• Somerset County Engineering Division</li> </ul>
Landslide	Yes	No	No	<ul style="list-style-type: none"> <li>• The NJ HMP identifies landslide as a hazard of concern for NJ. It shows 6 historic occurrences in Somerset County through 2012.</li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP 2014</li> <li>• NJGS</li> </ul>

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				<ul style="list-style-type: none"> <li>USGS indicates within the National Atlas Map Maker program that northern SC is identified as having a moderate to high landslide incidence.</li> <li>NJGS provides six recorded landslides within SC through March 2017:               <ul style="list-style-type: none"> <li>November 1994 - Two men injured, one critically when a ledge collapsed where the men were working, they fell 100 feet into a rock quarry.</li> <li>August 2000 – A debris flow in North Plainfield occurred due to construction and heavy rains near Route 22.</li> <li>April 2007 - A landslide was triggered in Bernards Township due to a Nor'easter. Slumps of clayey pre-illinoian till came out onto the shoulder of the northbound lanes of Rt. 287.</li> <li>August 2011 – A debris flow in Bernards Township was triggered along Rt. 287 southbound.</li> <li>Unknown - A slump in Bernards Township came out onto the shoulder of the northbound lanes of Rt. 287.</li> <li>Unknown – A small rock fall occurred in Peapack-Gladstone along Rte. 206 south.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>NationalAtlas.gov (USGS)</li> <li>NJDEP Summer 2007 Newsletter</li> </ul>
Nor'easters	Yes	Yes	No	Please see Severe Winter Storm and Flood	
Radon	Yes	No	No	<ul style="list-style-type: none"> <li>SC has a moderate to high radon potential in NJ.</li> <li>SC is located in EPA Zone 1. Zone 1 has a predicted average radon screening level greater than 4 picocuries per liter (pCi/L).</li> <li>Radon was not identified as a hazard of concern due to the limited opportunity for mitigation actions for this hazard.</li> </ul>	<ul style="list-style-type: none"> <li>NJDEP</li> <li>EPA</li> </ul>
Severe Storm (Windstorms, Thunderstorms, Hail, Lightning, Tornadoes and Hurricanes,)	Yes	Yes	No	<ul style="list-style-type: none"> <li>NJ HMP identifies thunderstorms, lightning, tornadoes, hurricanes and extreme winds as hazards of concern for NJ.</li> <li>NJ HMP indicated that the State has experienced 14 severe storm related disasters or emergencies. SC has been issued 6 FEMA Disaster Declarations associated with severe storm events (1954 to 2012), each event resulting in millions of dollars in damages. Some of these events have also been identified as Nor'easter events by</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> <li>NOAA – NCDC Storm Events Query</li> <li>FEMA Declared Disasters for NJ</li> <li>D. Ludlum (NJ Weather Book) 1983</li> </ul>

SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
				<p>other sources. Due to their flood impacts, these events have been identified previously in 'Flood'; therefore, refer to that location for additional details.</p> <ul style="list-style-type: none"> <li>• Since 2012, NJ has received two other disaster declarations, one of which impacted Somerset County. Both declarations were a result of damage caused by severe storms (June 2015 in Atlantic ,Burlington, Camden, and Gloucester Counties; and January 2016 in Atlantic, Bergen, Burlington, Camden, Cape May, Cumberland, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Somerset, Union, and Warren counties).</li> <li>• NOAA's NCDC storm events database indicates that SC was impacted by approximately 340 severe storm events between 1950 and August 2017 causing a total of 25 injuries, 0 deaths and approximately \$31.3 M in property damage, and \$2,000 in crop damages (these figures were calculated for all counties impacted in NJ, not just SC). Major events from this database include: <ul style="list-style-type: none"> <li>○ August 1971 (Doria) – See Flood</li> <li>○ October 1990 (F3 Tornado) creating \$2.5 M in damages to SC.</li> <li>○ April 1996 Thunderstorm created \$100 K in damages to SC.</li> <li>○ September 1998 (TSTM Winds) created \$2.7 M in damages and 1 injury to SC.</li> <li>○ September 1998 (TSTM/Wind) affected much of NJ, causing power outages and tornadoes. SC had one injury and \$2.7 M in damages.</li> <li>○ September 1999 (Floyd) – See Flood</li> <li>○ June 2001 (Lightning) in Franklin Township, resulting in \$85K in damages.</li> <li>○ July 2003 (TSTM Winds) created \$1.5 M in damages Bernards Twp.</li> <li>○ September 2003 (High Winds from Tropical Storm Isabel) created \$1.9 M in damages to multiple counties, including SC.</li> <li>○ July 2009 (Lightning) caused approximately \$1.5 M in damages to six condominium units on Fisher Drive in Franklin Township.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• NJ OEM</li> <li>• SHELDUS</li> <li>• USACE</li> <li>• Tornado Project</li> </ul>

SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
				<ul style="list-style-type: none"> <li>○ August 2011 (Irene) caused about \$500k in damages as torrential rains caused major flooding.</li> <li>○ October 2012 (Sandy) caused more than \$20M in property damages throughout SC.</li> <li>○ April 2013 (Lightning) caused \$275k in damages after striking a home in Bridgewater.</li> <li>○ February 2015 (High winds) caused a combined \$10k in property damages as trees and powerlines were downed by wind gusts of 40 to 50 mph on two occasions.</li> <li>○ June 2016 (Lightning) caused a combined \$2k in damages on two occasions after striking homes in southern Branchburg and in Basking Ridge.</li> <li>● NJ has experienced 155 tornadoes between 1950 and August 2017. These events caused a reported \$2.55M in property damage and 8 injuries.</li> <li>● NJ HMP indicates that only a few tornadoes occur annually in NJ, with an average of two to three tornadoes a year occurring over the past 100 years, according to NOAA. NJ has experienced a total of 155 tornadoes since 1950. It appears that SC has experienced 4 main tornado events in 1960, 1977, 1990, and 2003.</li> <li>● As indicated by other sources, additional severe storm events to impact SC include: <ul style="list-style-type: none"> <li>○ New Brunswick Tornado (June 19, 1835) destroyed 120 buildings and resulted in 5 fatalities; \$61 K in damages</li> <li>○ Great Atlantic Hurricane (September 1944)</li> <li>○ Hurricane Donna (September 1960)</li> <li>○ F1 Tornado in Branchburg (November 29, 1960) caused \$25 K in property damage</li> <li>○ Tropical Storm Agnes (June 1972)</li> <li>○ F3 Tornado in Bernardsville (May 1973)</li> <li>○ Hurricane Bertha (July 1996)</li> <li>○ Hailstorm in Green Brook (March 2003) created \$100 K in property damage due to golf ball sized hail.</li> <li>○ F0 Tornado in Bedminster (October 2003)</li> </ul> </li> </ul>	

SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
Severe Winter Storm (Heavy Snow, Blizzards, Freezing Rain/Sleet, Nor'easters, Ice Storms)	Yes	Yes	No	<ul style="list-style-type: none"> <li>• NJ HMP indicates winter storms are significant hazards that impact NJ. Average yearly snowfall in SC is between 30 and 35 inches. The NJ HMP reports that significant snowfalls occurred in NJ in 1933, 1947, 1958, 1961, 1978, 1996, 2001, 2003, 2010, and 2011.</li> <li>• FEMA Declared Disasters(DR) issued for winter storms that impacted the State of New Jersey include:               <ul style="list-style-type: none"> <li>○ FEMA DR-4264 (February 2016) Severe winter storm and snowstorm.</li> <li>○ FEMA DR-4048 (October 2011) Severe storm with snow</li> <li>○ FEMA DR-1954 (December 2010) Severe winter storm and snowstorm</li> <li>○ FEMA DR-1889 (February 2010) Severe winter storm and snowstorm</li> <li>○ FEMA DR-1873 (December 2009) Snowstorm</li> <li>○ FEMA DR-1206 (February 1998) Coastal Storm</li> <li>○ FEMA DR-1088 (January 1996) Blizzard</li> <li>○ FEMA DR-973 (December 1992) Coastal Storm, High Tides, Heavy Rain, Flooding</li> <li>○ FEMA DR-936 (January 1992) Severe Coastal Storm</li> <li>○ FEMA DR-528 (February 1977) Ice Storm</li> </ul> </li> <li>• Recent FEMA Declared Disasters(DR) / Emergencies (EM) issued for winter storms that impacted SC, include:               <ul style="list-style-type: none"> <li>○ <b>FEMA EM-3106</b> (March 16, 1993) Statewide Blizzard. NJ OEM indicated that this event resulted in \$2.6 M in damages to NJ.</li> <li>○ <b>FEMA DR-1088</b> (January 1996) Statewide Blizzard. SHELUDUS indicated this event resulted in \$1.4 M in damages to SC.</li> <li>○ <b>FEMA EM-3181</b> (Feb. 16-17, 2003) Statewide Snowstorm resulting in \$8 M in damages, 1 fatality and 8 injuries. Bridgewater (SC) received 22.5 inches. SHELUDUS indicated that this event resulted in \$1 M in damages to SC.</li> <li>○ <b>FEMA DR-1954</b> (December 2010) Statewide Snowstorm resulting in more than \$52M in FEMA Public Assistance Program grant funds obligated. Snowfall totals in Somerset</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• NJ HMP 2014</li> <li>• NWS</li> <li>• FEMA</li> <li>• NOAA – NCDC Storm Events Query</li> <li>• NJ OEM</li> <li>• SHELUDUS</li> <li>• NESIS</li> <li>• D. Ludlum (NJ Weather Book)</li> </ul>

SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
				<p>County included 16.5 inches in Hillsborough, 13.2 inches in Millstone, 8.6 inches in Branchburg, and 7.1 inches in Bridgewater. The statewide per capita impact of this storm was estimated to be approximately \$6.03, with \$5.31 per capita in SC.</p> <ul style="list-style-type: none"> <li>○ <b>FEMA DR-4048</b> (October 2011) This snowstorm affected primarily the northern half of the State of NJ, and resulted in nearly \$27M in FEMA Public Assistance Program grant funds obligated. The per capita impact statewide was estimated to be \$2.53, with \$10.62 per capita in SC.</li> <li>○ <b>FEMA DR-4264</b> (January 2016) This snowstorm affected most of the state's 21 counties, with a total of roughly \$73M in FEMA Public Assistance Program grant funds obligated. The per capita impact statewide was estimated to be \$9.40, and \$4.44 per capita in SC.</li> <li>● During an undeclared winter storm event in January 2005, 17 of the 21 NJ counties reported at least one measurement of a foot or greater of snow, resulting in a reported \$27M in damages state-wide. SC was impacted by this event. The NOAA NCDC Storm Events database records \$2.0M of damages in SC.</li> <li>● Events that were classified as Severe Storm disasters by FEMA in SC, which were also identified as Nor'easter events by many other source include <b>DR-973</b> (Dec. 1992), <b>DR-1145</b> (Oct. 1996) and <b>DR-1694</b> (Apr. 2007) (See 'Floods')</li> <li>● NOAA-NCDC has indicated that SC has experienced the impacts of 187 winter storm events between January 1996 and August 2017, five of which included records with property damage. Total property damage from all events was reported as \$7.6M, the worst of which was the Blizzard of '96 with \$4.4M in property damage reported, The second most damaging event was the January 2005 snowstorm, with \$2M in damages in SC. Other events had substantially less property damage recorded in this database (February 2003 - \$1M; January 2011 - \$100,000; and February 2014 - \$100,000).</li> </ul>	

SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
Tornado	Yes	Yes	No	Please see Severe Storm	
Tsunami	No	No	No	<ul style="list-style-type: none"> <li>The NJ HMP discusses tsunamis in the context of flood hazards. It identifies minor tsunami events that have occurred along the east coast of the US, some of which had very minor observed runup in NJ, but cites no deaths or damages as a result of these events does not identify tsunami as a hazard of concern for NJ.</li> <li>SC is not bounded by coastal waters where tsunami events occur; therefore, tsunami was not identified as a hazard of concern by the county.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> </ul>
Volcano	No	No	No	<ul style="list-style-type: none"> <li>The NJ HMP does not identify volcano as a hazard of concern for NJ.</li> <li>Volcanos are not located in or near the State of New Jersey.</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> </ul>
Wildfire	Yes	Yes	No	<ul style="list-style-type: none"> <li>Wildfires are not an uncommon occurrence in NJ, especially in the Pine Barrens. Fires which burn more than 1,000 acres occur, on average, once every 10 years in the Pine Barrens.</li> <li>The 2014 NJ HMP documents 172 historic wildfire events statewide between 1905 and 2012, burning a total of 424,636 acres. These 172 events represent the subset of total historic wildfire occurrences that are considered major wildfires (burning a total of greater than 100 acres) or those that were considered to be significant wildfires in the previous (2011) State HMP.</li> <li>The 2014 NJ HMP reports that :                             <ul style="list-style-type: none"> <li>more than 8% of Somerset County's total land area is located in extreme, very high, or high wildfire hazard areas</li> <li>nearly 6% of the County's population is located in extreme, very high, or high wildfire hazard areas</li> <li>one significant wildfire occurred in Somerset County between 1924 and 2012, when more than 100 acres of land were burned.</li> <li>3 dams, 1 school, and 1 shelter are located in an extreme, very, or high hazard area</li> </ul> </li> <li>In May 2007, a wildfire along the border of Ocean and Burlington</li> </ul>	<ul style="list-style-type: none"> <li>NJ HMP 2014</li> <li>NOAA – NCDC Storm Events Query</li> <li>USGS</li> </ul>



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Hazard	Is this a hazard that may occur in SC?	If yes, does this hazard pose a significant threat to the County?	Change in assessment findings since the last plan update?	Why was this determination made?	Source(s)
				<p>Counties burned 15,550 acres). Based on the historic occurrences documented in the NJ HMP 2014, this represents the most significant wildfire in the last 10 years and one of the most acres burned for any event in recorded state history.</p> <ul style="list-style-type: none"> <li>• USGS's Federal Fire Occurrence Map Viewer tool indicates that between January 1, 1980 and December 31,2016, NJ experienced two wildfires greater than 250 acres; one in April 1999 in the Delaware Water Gap National Recreation Area (623 acres) and the Warren Grove Fire in May 2007 on the border of Burlington and Ocean Counties, burning 17,050 acres according to this data source; whereas the NJ HMP 2014 plan cited 15,550 acres burned)</li> <li>• This same tool indicates that SC has no occurrences of wildfire of any size during this same time frame.</li> <li>• However according to the NJ DEP Division of Parks and Forestry, Somerset County experienced 77 wildfires in 2007 and 280 fires in the period of 2002-2006.The majority of these fires were contained in 0.25 acres with the largest having burned 12 acres (2/11/2007 in Bridgewater).</li> <li>• The 2011 NJ HMP indicated that from 1993 to 2003, a total of 561 wildfires occurred within the County, with a 10 year average of 56 wildfires. In 1994, SC had their greatest number of wildfires (94 wildfires). During this 10 year period, 399 acres burned, with an average of 40 acres. In 1999, SC saw approximately 164 acres burned due to wildfire.</li> <li>• According to the NOAA-NCDC, queried in November 2017 and current as of August 31, 2017, no events were documented in the years since the plan was last updated (the three most recent significant wildfire events in Somerset County occurred in April 2012, February 2012, and July 2002).</li> </ul>	
Windstorm	Yes	Yes	No	Please see Severe Storm	

CRREL Cold Regions Research and Engineering Laboratory  
 DIR Drought Impact Reporter  
 DR Presidential Disaster Declaration Number

EM Presidential Disaster Emergency Number  
 FEMA Federal Emergency Management Agency  
 HMP Hazard Mitigation Plan

## SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

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K	Thousands (\$)
M	Millions (\$)
MARFC	National Oceanic and Atmospheric Administration Middle Atlantic Forecast Center
NCDC	National Oceanic and Atmospheric Administration National Climatic Data Center
NDMC	National Drought Mitigation Center
NESIS	Northeast Snowfall Impact Scale
NJ	New Jersey
NJDEP	New Jersey Department of Environmental Protection
NJGS	New Jersey Geological Survey (as part of the NJDEP)
NOAA	National Oceanic and Atmospheric Administration
NRCC	Northeast Regional Climate Center
NWS	National Weather Service
OEM	Office of Emergency Management
ONJSC	Office of New Jersey State Climatologist
SC	Somerset County
SHELDUS	Spatial Hazard Events and Losses Database for the U.S.
TSTM	Thunderstorm
TWP	Township
USACE	U.S. Army Corp of Engineers
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geologic Survey

## SECTION 5.2: RISK ASSESSMENT – IDENTIFICATION OF HAZARDS OF CONCERN

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- An assessment of risks associated with each identified hazard of significance is divided into the following sections: Severe Storm (Windstorms, Hurricanes, Thunderstorms, Hail, Lightning and Tornadoes)
- Severe Winter Storm (Heavy Snow, Blizzards, Freezing Rain/Sleet, Nor'easters and Ice Storms)
- Flooding (Riverine, Flash, Ice Jam and Dam)
- Wildfire
- Extreme Temperatures
- Drought
- Earthquake