

**Sections 3B and 3C - VULNERABILITY ASSESSMENT****Overview**

As described in Section 2, as part of this first plan update, the planning team reassessed a full range of natural hazards and determined that no hazards should be added to or omitted from the 2010 list of identified hazards. Section 3A profiled each identified hazard.

Sections 3B and 3C build upon the information provided in the *Hazard Profiles* (Section 3A) by identifying and characterizing an inventory of assets in Atlantic County, and then assessing the potential impact and amount of damages that can be expected to be caused by each identified hazard event. The primary objective of the vulnerability assessment is to quantify exposure and the potential loss estimates for each hazard, by jurisdiction. In so doing, Atlantic County and each of its municipalities may better understand their own unique risks to identified hazards and be better prepared to evaluate and prioritize unique hazard mitigation actions for their communities.

This section begins with a summary description of the asset inventory as compiled for Atlantic County through coordination with the Atlantic County Office of GIS, as well as an explanation of the methodology applied to complete the multi-jurisdictional vulnerability assessment. The remainder of this section focuses on the results of the vulnerability assessment and is organized by hazard in similar format to the *Hazard Profiles* section, and as listed below.

- **Atmospheric Hazards**
  - Severe Weather
    - Extreme Temperatures
    - Extreme Wind
    - Hail Storm
    - Lightning
    - Tornado
  - Hurricane and Tropical Storm
  - Nor'easter
  - Severe Winter Weather
- **Hydrologic Hazards**
  - Coastal Erosion and Sea Level Rise
  - Dam and Levee Failure
  - Drought
  - Flood
  - Storm Surge
  - Wave Action
  - Tsunami
- **Geologic Hazards**
  - Earthquake
- **Other Hazards**
  - Wildfire

**3B - Identification and Characterization of Assets in Hazard Areas**

An inventory of Atlantic County's georeferenced assets<sup>1</sup> was created in order to identify and characterize property and persons potentially at risk to the identified hazards. By understanding the type and number of assets that exist and where they are located in relation to known hazard areas, the relative risk and vulnerability for such assets can be assessed. Under this assessment, six categories of assets were created and then further assessed through geographic information systems (GIS) analysis. The six categories of assets include:

1. **Improved property:** This category was identified using Geographic Information System (GIS) parcel data downloaded from New Jersey Geographic Information Network (NJGIN) as part of the current MOD-IV dataset, which provides parcel boundaries for the State of New Jersey. The parcel data file for Atlantic County in the MOD-IV dataset was last updated by the County in 2012. Attribute information including property usage category and improvement values were obtained from the 2021 Atlantic County tax list dataset and then joined to the 2012 parcel records for the county, using unique parcel identification numbers. Due to the differences in the data structure and parcel naming between the GIS data and the tax list and the age of the parcel data, not every parcel can be matched with the corresponding tax information (including property usage category and improvement value). Those parcels that were matched with attribute information and having an improvement value greater than 0 were categorized as "Improved Property".

*Hence for some detailed analyses of delineable hazards in Section 3C, the total value of improvements shown in the tables (\$19.65 billion) differs from the total value of improved property in Atlantic County as provided by the Atlantic County tax list (\$23.2 billion).*

2. **Emergency facilities:** This category covers all facilities dedicated to the management and response of emergency or disaster situations, and includes emergency operations centers (EOCs), fire stations, police stations, ambulance stations, and hospitals. Data sets for fire stations, police stations, and hospitals were provided by Atlantic County Office of GIS. EOC data was obtained from HAZUS-MH<sup>®</sup>. HAZUS defines EOCs as municipal government disaster operation and communication centers deemed (for design) to be vital in emergencies; they are dedicated facilities used for emergency operations, separately and distinctly from hospitals, fire stations, police stations, etc.
3. **Critical infrastructure and utilities:** This category covers facilities and structures vital to the maintenance of basic living conditions in the county, and includes electrical power facilities, communications facilities, potable water supply facilities, wastewater treatment facilities, significant public works buildings, airports, and passenger railroad stations. HAZUS was the main data source, supplemented with public works facilities data from Atlantic County Office of GIS<sup>2</sup>.

<sup>1</sup> While potentially not all-inclusive for Atlantic County, "georeferenced" assets include those assets for which specific location data is readily available for connecting the asset to a specific geographic location for purposes of GIS analysis.

<sup>2</sup> The significant public works facilities GIS layer that was provided also included facility types such as municipal buildings.

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4. Other key facilities: This category covers facilities which may be capable of providing refuge and limited medical care and hence may be utilized as emergency shelters, and those which routinely house more vulnerable sectors of the county population, making them potentially especially vulnerable to identified hazards. Included in this category are schools, senior care facilities, and emergency shelters. Atlantic County Office of GIS provided school data and nursing home data was downloaded from NJGIN. ACOEP provided data for the emergency shelters.
5. Historic and cultural resources: This category includes those historic structures, landmarks and sites that are included in the New Jersey State or National Register of Historic Places.
6. Population: This category covers the number of people residing in the 23 municipalities in the County as measured by the U.S. Census Bureau, 5-Year American Community Survey (2015-2019).

The remainder of this subsection provides a more detailed breakdown, by jurisdiction, of georeferenced assets that have been identified for inclusion in the multi-jurisdictional vulnerability assessment.

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**Improved Property**

The total value of improved property value in Atlantic County is nearly \$23.2 billion, based on parcel data as of 2021 downloaded from NJGIN. **Table 3b.1** lists the total number and percentage of improved parcels as well the total value of their improvements by jurisdiction. The data may not include some public buildings and other tax-exempt structures.

<b>Table 3b.1 Improved Property by Jurisdiction</b>				
<b>Jurisdiction</b>	<b>Total Number of Parcels</b>	<b>Number of Improved Parcels</b>	<b>Percent of Improved Parcels</b>	<b>Total Value of Improvements (in millions)</b>
Absecon, City of	4,187	3,524	84%	\$441.9
Atlantic City, City of	16,769	13,165	79%	\$4,819.2
Brigantine, City of	9,407	8,811	94%	\$1,324.8
Buena, Borough of	1,940	1,545	80%	\$232.7
Buena Vista, Township of	9,184	2,717	30%	\$481.8
Corbin City, City of	380	249	66%	\$34.4
Egg Harbor City, City of	4,773	1,516	32%	\$244.1
Egg Harbor, Township of	19,960	16,251	81%	\$3,314.3
Estell Manor, City of	2,670	800	30%	\$113.9
Folsom, Borough of	1,420	750	53%	\$114.8
Galloway, Township of	19,674	14,277	73%	\$2,609.7
Hamilton, Township of	17,420	9,545	55%	\$1,762.8
Hammonton, Town of	6,606	5,365	81%	\$1,126.2
Linwood, City of	3,095	2,928	95%	\$612.1
Longport, Borough of	1,693	1,611	95%	\$540.0
Margate City, City of	7,579	6,901	91%	\$1,547.9
Mullica, Township of	5,248	2,417	46%	\$329.0
Northfield, City of	3,665	3,414	93%	\$621.1
Pleasantville, City of	6,560	5,854	89%	\$909.7
Port Republic, City of	658	494	75%	\$86.5
Somers Point, City of	4,389	4,140	94%	\$857.0
Ventnor City, City of	6,972	6,554	94%	\$967.0
Weymouth, Township of	1,115	714	64%	\$108.9
<b>Total</b>	<b>115,364</b>	<b>113,542</b>	<b>73%</b>	<b>\$23,199.5</b>

Source: NJGIN, Atlantic County Parcel data, 2021.

### Emergency Facilities

There are 105 georeferenced emergency facilities in Atlantic County, including 61 fire stations, 24 police stations, 9 ambulance stations, 4 hospitals, and 7 EOCs. **Table 3b.2** tabulates these emergency facilities by jurisdiction. Geographic coordinates (latitude and longitude) were used to determine the location of each facility.

Table 3b.2 Emergency Facilities by Jurisdiction					
Jurisdiction	Fire Stations	Police Stations	Ambulance Stations	Hospitals	Emergency Operations Centers
Absecon, City of	1	1	1	0	0
Atlantic City, City of	5	3	0	1	1
Brigantine, City of	1	1	0	0	0
Buena, Borough of	2	1	1	0	0
Buena Vista, Township of	5	1	0	0	0
Corbin City, City of	0	0	0	0	0
Egg Harbor City, City of	1	1		0	0
Egg Harbor, Township of	12	1	1	0	1
Estell Manor, City of	1	0	0	0	0
Folsom, Borough of	1	0	0	0	0
Galloway, Township of	6	1	1	1	0
Hamilton, Township of	6	4	2	0	1
Hammonton, Town of	2	2	0	1	0
Linwood, City of	1	1	1	0	1
Longport, Borough of	1	1	0	0	0
Margate City, City of	2	1	0	0	0
Mullica, Township of	4	2	0	0	0
Northfield, City of	2	1	0	0	0
Pleasantville, City of	1	1	0	0	1
Port Republic, City of	1	0	0	0	1
Somers Point, City of	2	1	1	1	0
Ventnor City, City of	2	0	0	0	1
Weymouth, Township of	2	0	1	0	0
<b>Total</b>	<b>61</b>	<b>24</b>	<b>9</b>	<b>4</b>	<b>7</b>

Source: Atlantic County Office of GIS: Fire Stations, Police Stations, and Hospitals, 2021 Ambulance Stations (Rescue Squad).  
FEMA HAZUS: Emergency Operations Center, 2021

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**Critical Infrastructure and Utilities**

There are 110 identified critical infrastructure and utility elements in Atlantic County, including 36 water supply facilities, 6 wastewater treatment facilities, 7 electrical power facilities, 3 airports, 4 passenger railroad stations, 36 public works facilities, and 18 communications facilities. **Table 3b.3** shows critical infrastructure and utilities by jurisdiction. Geographic coordinates (i.e., latitude and longitude) were used to determine the location of each facility within each jurisdiction.

Table 3b.3 Critical Infrastructure and Utilities by Jurisdiction							
Jurisdiction	Water Supply Facilities	Wastewater Treatment Facilities	Electrical Power Facilities	Airport	Passenger Railroad Stations	Public Works Facilities	Communications Facilities
Absecon, City of	1	0	0	0	1	1	0
Atlantic City, City of	1	2	5	0	1	4	9
Brigantine, City of	0	0	0	0	0	1	0
Buena, Borough of	1	1	0	0	0	1	0
Buena Vista, Township of	0	0	0	0	0	1	0
Corbin City, City of	0	0	0	0	0	1	2
Egg Harbor City, City of	6	1	0	0	1	1	1
Egg Harbor, Township of	0	0	1	1	0	2	0
Estell Manor, City of	0	0	0	0	0	1	0
Folsom, Borough of	0	0	0	0	0	0	0
Galloway, Township of	3	0	0	1	0	2	1
Hamilton, Township of	7	1	0	0	0	3	1
Hammonton, Town of	4	1	0	1	1	3	1
Linwood, City of	0	0	0	0	0	1	0
Longport, Borough of	0	0	0	0	0	1	0
Margate City, City of	6	0	0	0	0	1	0
Mullica, Township of	0	0	0	0	0	1	0
Northfield, City of	0	0	0	0	0	4	0
Pleasantville, City of	0	0	1	0	0	1	3
Port Republic, City of	0	0	0	0	0	2	0
Somers Point, City of	0	0	0	0	0	2	0
Ventnor City, City of	5	0	0	0	0	1	0
Weymouth, Township of	2	0	0	0	0	1	0
<b>Total</b>	<b>36</b>	<b>6</b>	<b>7</b>	<b>3</b>	<b>4</b>	<b>36</b>	<b>18</b>

Source: Atlantic County Office of GIS: Public Works Facilities, 2021. FEMA HAZUS: Electrical Power Facilities, Airports, Passenger Rail Stations, Communication Facilities, Wastewater Treatment Facilities, 2021. Atlantic County OEP: Water Treatment Facilities.

### Other Critical Facilities

This category covers facilities which may be capable of providing refuge and limited medical care and hence may be utilized as emergency shelters, and those which routinely house more vulnerable sectors of the county population, making them potentially especially vulnerable to identified hazards. There are 160 such facilities in Atlantic County, including 117 schools, 23 senior care and living facilities, and 20 emergency shelters. **Table 3b.4** shows these facilities by jurisdiction. Geographic coordinates (i.e., latitude and longitude) were used to determine the location of each facility within each jurisdiction.

Jurisdiction	Schools	Senior Care Facilities	Emergency Shelters
Absecon, City of	3	1	0
Atlantic City, City of	14	2	2
Brigantine, City of	3	0	0
Buena, Borough of	4	0	0
Buena Vista, Township of	6	0	3
Corbin City, City of	3	0	0
Egg Harbor City, City of	2	1	0
Egg Harbor, Township of	11	2	2
Estell Manor, City of	1	0	0
Folsom, Borough of	1	0	0
Galloway, Township of	19	7	4
Hamilton, Township of	12	1	5
Hammonton, Town of	5	2	0
Linwood, City of	5	3	0
Longport, Borough of	0	0	0
Margate City, City of	2	0	0
Mullica, Township of	4	0	1
Northfield, City of	5	1	1
Pleasantville, City of	8	3	2
Port Republic, City of	1	0	0
Somers Point, City of	6	0	0
Ventnor City, City of	2	0	0
Weymouth, Township of	1	0	0
<b>Total</b>	<b>118</b>	<b>23</b>	<b>20</b>

Source: Atlantic County Office of GIS: Schools, 2021. NJGIN: HSIP New Jersey Nursing Homes, 2021 Atlantic County OEP: Emergency Shelters

### Historic and Cultural Resources

There are 109 georeferenced historic properties and sites/districts in Atlantic County which are included in the New Jersey or National Registers of Historic Places, or that have been determined eligible for inclusion through Federal or state processes as administered by the New Jersey Historic Preservation Office (HPO). These properties are listed in **Table 3b.5**. The data does not preclude the existence of other historic properties or sites not within this category or as yet to be identified.

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<b>Table 3b.5 Historic and Cultural Resources by Jurisdiction</b>		
<b>Jurisdiction</b>	<b>Name</b>	<b>Location</b>
Absecon	Captain Francis Babcock House	324 South Shore Road
Absecon	Dr. Jonathan Pitney House	57 North Shore Road
Absecon	John Doughty House	40 North Shore Road
Absecon	North Shore Road Historic District	North Shore Road
Absecon	South Shore Road Historic District	South Shore Road
Absecon, Atlantic City, Egg Harbor City, Egg Harbor Township, Galloway, Hammonton, Mullica, Pleasantville	Camden and Atlantic Railroad Historic District	Parallel NJ Transit Atlantic City Line
Atlantic City	1315 Pacific Avenue	1315 Pacific Avenue
Atlantic City	2-6 South Virginia Avenue	2-6 South Virginia Avenue
Atlantic City	Absecon Lighthouse	Pacific and Rhode Island Avenues
Atlantic City	Administration Building for the Board of Education	1809 Pacific Ave
Atlantic City	Atlantic City Armory	Atlantic Boulevard and New York Avenue
Atlantic City	Atlantic City Convention Hall	Boardwalk between Pacific, Mississippi, and Florida Avenues
Atlantic City	Atlantic City Fire Station #4	2700 Atlantic Avenue
Atlantic City	Atlantic City Fire Station #6	4025 Atlantic Avenue
Atlantic City	Atlantic City Post Office	1701 Pacific Avenue
Atlantic City	Barclay Court	9-11 South Pennsylvania Avenue
Atlantic City	Beth Israel Synagogue	34 South Pennsylvania Avenue
Atlantic City	Beth Kehillah Synagogue Building (H.G. Rosin Senior Center)	901 Pacific Avenue
Atlantic City	Chinn & Schull Boathouse	419 Carson Ave
Atlantic City	Church of the Ascension	1601 Pacific Avenue
Atlantic City	Eldredge Chelsea Fireproof Warehouse	3528 Atlantic Avenue
Atlantic City	Equitable Trust Bank Building	2030 Atlantic Avenue
Atlantic City	Fire Station #8	140 North Indiana Avenue
Atlantic City	Fire Station #9	734 North Indiana Avenue
Atlantic City	Madison Hotel	123 South Illinois Avenue
Atlantic City	Neptune Hose Company	519 Atlantic Avenue
Atlantic City	Raphael-Gordon House	118 South Newton Street
Atlantic City	Ritz Carlton Hotel	2715 Boardwalk at Iowa Avenue
Atlantic City	Segal Building	1200 Atlantic Avenue
Atlantic City	Shelburne Hotel	Michigan Avenue and the Boardwalk
Atlantic City	St. Nicholas of Tolentine Church	1409-1421 Pacific Avenue
Atlantic City	The Knife and Fork Restaurant	29 S. Albany Ave.
Atlantic City	The Strand and Marine Apartments	3821-3825 Boardwalk Ave.
Atlantic City	U.S. Route 30 Bridge	U.S. Route 30 (Absecon Boulevard) over Beach Thorofare
Atlantic City	USCG Station Atlantic City	900 Beach Thorofare
Atlantic City	Warner Theatre	Atlantic City Boardwalk between Michigan and Arkansas Avenues
Atlantic City	Westside All Wars Memorial Building	1510 Adriatic Avenue
Atlantic City	World War 1 Memorial	South Albany Avenue, Ventnor Avenue and O'Donnell Parkway



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<p align="center"><b>Table 3b.5</b> <b>Historic and Cultural Resources by Jurisdiction</b></p>		
<b>Jurisdiction</b>	<b>Name</b>	<b>Location</b>
Atlantic City, Egg Harbor Township, Hamilton, Pleasantville	West Jersey and Atlantic Railroad Historic District	Mays Landing, Hamilton Township to Pleasantville City
Brigantine City	Brigantine Lighthouse	Brigantine Boulevard (County Route 638)
Buena	Hebron Button Factory	Weymouth Malaga & Aberdeen Avenue
Buena Vista	Richland Hotel	1302 Harding Way
Buena Vista	Richland Presbyterian Church	Main Ave. at Sewell Ave.
Buena Vista Hamm	Wood Estate	Cedar Ave.
Buena Vista, Corbin City, Estell Manor, Folsom, Hammonton, Weymouth	Atlantic City Railroad Cape May Division Historic District	Railroad right-of-way from Winslow Junction to Cape May Point, Sea Isle City & Ocean City
Corbin City	North and South Tuckahoe Historic District	NJ Route 50/Tuckahoe-Mount Pleasant Road
Corbin City	South Tuckahoe Historic District	1409-1421 Pacific Avenue
Egg Harbor City	Egg Harbor City Fire Station	351 Cincinnati Avenue
Egg Harbor City	Egg Harbor City Historic District	Philadelphia Avenue
Egg Harbor City	Egg Harbor Commercial Bank	134 Philadelphia Avenue
Egg Harbor City	Lower Bank Road Bridge	Lower Bank Road (County Route 542) over Mullica River
Egg Harbor City	Neutral Water Health Resort Sanitarium	Corner of Claudius Street and London Avenue
Egg Harbor Township	Andrew B. Scull House	1647 Mays Landing-Somers Point Road (CR 559)
Egg Harbor Township	Cannon Court Roadside Cabins	6124 Black Horse Pike
Egg Harbor Township	Captain John Jeffries Burial Marker	Palestine Bible Church Cemetery, County Route 559
Egg Harbor Township	Ocean City-Longport Bridge	Ocean Drive over Great Egg Harbor
Egg Harbor Township	Studebaker Showroom	North West Corner Verona and Toulon Avenues
Egg Harbor Township, Galloway, Port Republic, Somers Point	Garden State Parkway Historic District	Entire Garden State Parkway Right-of-Way
Estell Manor	Estellville Glassworks Industrial Historic District	Estell Manor Park, Stevens Creek, Maple Avenue, Walkers Forge Road, and NJ Rt. 50
Estell Manor	Head of the River Church	NJ Route 49 at Aetna Drive
Estell Manor	Risley School	134 Cape May Avenue
Folsom	Eighth Street Bridge	Eighth Street over Hospitality Branch
Folsom	Jacobus Evangelical Lutheran Church	Mays Landing Road
Galloway	Anonymous Roadside Cabins	US Route 30 and Taylor Avenue
Galloway	Conovertown Historic District	Along New York Road between Brook Lane and the border with Absecon City, west on Biscayne Avenue
Galloway	Frankfurt Avenue Bridge	Frankfurt Avenue over New Jersey Transit Atlantic City Line
Galloway	L.N. Renault and Sons Winery	Bremen Avenue and Leibig Street
Galloway	Modern Boat Works	US Route 9 at Nacote Creek
Galloway	Oceanville / Leeds Point / Moss Mill Historic District	Bounded by New York Road, Somers Town Lane, Leeds Point Road, and Moss Mill Road
Galloway	Roadside Cabins	US Route 30 and 5th Avenue

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<p><b>Table 3b.5</b>  <b>Historic and Cultural Resources by Jurisdiction</b></p>		
<b>Jurisdiction</b>	<b>Name</b>	<b>Location</b>
Galloway	Smithville Apothecary	Smithville-Old Towne and Moss Mill Roads
Galloway	The Country Motel Roadside Cabins	201 White Horse Pike
Hamilton	Abbott's Modern Cabins	217 NJ Route 40
Hamilton	Mays Landing Historic District	Main Street and Cape May Avenue
Hamilton	US Route 322 and NJ Route 50 Cloverleaf	US Route 322 and NJ Route 50
Hamilton	Weymouth Road Bridge	Weymouth Road Bridge over Great Egg Harbor River
Hammonton	101 Bellevue Avenue	101 Bellevue Avenue
Hammonton	733 Bellevue Avenue	733 Bellevue Avenue
Hammonton	Arena Auto Dealership	227 South White Horse Pike
Hammonton	Eagle Theatre	208 Vine Street
Hammonton	Former Town Hall	333 Vine Street
Hammonton	Hammonton Commercial Historic District	Third, Washington, Orchard, and Vine Streets
Hammonton	J.S. Thayer Carpenter Shop	220 Vine Street
Hammonton	William L. Black House	458 Bellevue Avenue
Linwood	Linwood Historic District	Maple and Poplar Avenues, and Shore Road
Linwood	Thomas & Mary Ingersall Naylor House	204 West Garfield Avenue
Longport	Church of the Redeemer	20th and Atlantic Avenues
Longport	Great Egg Coast Guard Station Building	31 st and Pacific avenues
Margate City	Lucy, The Margate Elephant	Decatur and Atlantic Avenues
Margate City	Marven Gardens Historic District	Between Ventnor, Fredericksburg, Winchester and Brunswick Avenues
Mullica	Batsto Village	31 Batsto Rd
Mullica	Pleasant Mills	Elwood-Pleasant Mills Road
Northfield	1715 Tilton Road	1715 Tilton Road
Northfield	Risley Homestead	8 Virginia Avenue
Pleasantville	213 Verona Avenue	213 Verona Avenue
Port Republic	Amanda Blake Store	104 Main Street
Port Republic	Chestnut Neck Battle Monument	US Route 9 and Old York Road
Port Republic	Gulf Service Station	758 Old New York Road
Port Republic	Port Republic Historic District	Central and Pomona Avenues, Riverside Drive, St. Johns Lane, Chestnut Neck, Clarks Landing, and Port Republic-Smithville Roads
Port Republic	Smithville-Port Republic Road Bridge	Smithville-Port Republic Road over Nacote Creek
Somers Point	World War 1 Memorial Bridge	NJ Route 52 over Ship Channel
Somers Point	Bay Front Historic District	Parts of Anna, Bay, Decatur, Delaware, Gibbs, Higbee, New Jersey, and Somers Avenues
Somers Point	Somers Mansion	Shore Road, adjacent to NJ Route 52 traffic circle
Ventnor City	Dorset Avenue Bridge	N. Dorset Avenue between Ventnor Avenue and N. Derby/Edgewater Avenue

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<b>Table 3b.5 Historic and Cultural Resources by Jurisdiction</b>		
<b>Jurisdiction</b>	<b>Name</b>	<b>Location</b>
Ventnor City	John Stafford Historic District	Portions of Atlantic, Austen, Baton Rouge, Marion, and Vassar Avenues
Ventnor City	New Haven Firehouse	20 North New Haven Ave
Ventnor City	Saint Leonard's Tract Historic district	Bounded by Ventnor Ave, Fredericksburg Ave, Ventnor Gardens Plaza, and Derby Place
Ventnor City	Ventnor City Hall	6201 Atlantic Avenue
Ventnor City	Ventnor Motor Boat Club	11 North Derby Avenue, Ventnor City
Weymouth	Belcoville Post Office	1201 Madden Avenue

Source: NJDEP GIS website: *Historic Districts, Historic Properties, 2021*. NJ DEP: *Historic Preservation Office New Jersey and National Registers of Historic Places, 2021*

Note: Municipalities that have historic districts crossing multiple municipal boundaries are listed alphabetically.

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**Population**

The U.S. Census Bureau<sup>3</sup> estimates that the population of Atlantic County in 2019 was 266,105 persons, comprising 99,850 households. **Table 3b.6** shows population and household counts by jurisdiction.

Table 3b.6 Population and Households by Jurisdiction				
Jurisdiction	Population		Households	
	Count	Municipal Population as % of County Total	Count	Municipal Households as % of County Total
Absecon, City of	8,362	3%	3,177	3%
Atlantic City, City of	37,999	14%	15,504	16%
Brigantine, City of	8,832	3%	4,052	4%
Buena, Borough of	4,356	2%	1,750	2%
Buena Vista, Township of	7,295	3%	2,558	3%
Corbin City, City of	537	<1%	182	<1%
Egg Harbor City, City of	4,100	2%	1,454	1%
Egg Harbor, Township of	42,714	16%	14,245	14%
Estell Manor, City of	1,728	1%	587	1%
Folsom, Borough of	1,697	1%	588	1%
Galloway, Township of	36,094	14%	12,840	13%
Hamilton, Township of	25,973	10%	9,776	10%
Hammonton, Town of	14,139	5%	4,992	5%
Linwood, City of	6,742	3%	2,509	3%
Longport, Borough of	869	<1%	420	<1%
Margate City, City of	5,997	2%	2,933	3%
Mullica, Township of	5,925	2%	2,282	2%
Northfield, City of	8,153	3%	2,863	3%
Pleasantville, City of	20,301	8%	6,774	7%
Port Republic, City of	1,121	<1%	413	<1%
Somers Point, City of	10,321	4%	4,371	4%
Ventnor City, City of	10,095	4%	4,366	4%
Weymouth, Township of	2,755	1%	1,214	1%
<b>Total</b>	<b>266,105</b>	<b>100%</b>	<b>99,850</b>	<b>100%</b>

Source: U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

Census data indicates that the population is growing and skewing older, with a rise in median age and number of older persons and a decreasing number of young children. The median age in Atlantic County in 2019 was estimated to be 41.7 years (up from 37 years in 2000 and 40.2 years in 2013) and the average household size is 2.6 persons, and the median household income is \$62,110. In terms of population segments that may potentially be at higher risk in general in terms of their ability to prepare for, respond to, and recover from natural disasters:

- 5.6 percent of the total population is under the age of five (down from 6.5 percent in 2000 and 6.1 percent in 2013);
- 17.5 percent is over the age of 65 (up from 13.6 percent in 2000 and 14.6 percent in 2013);

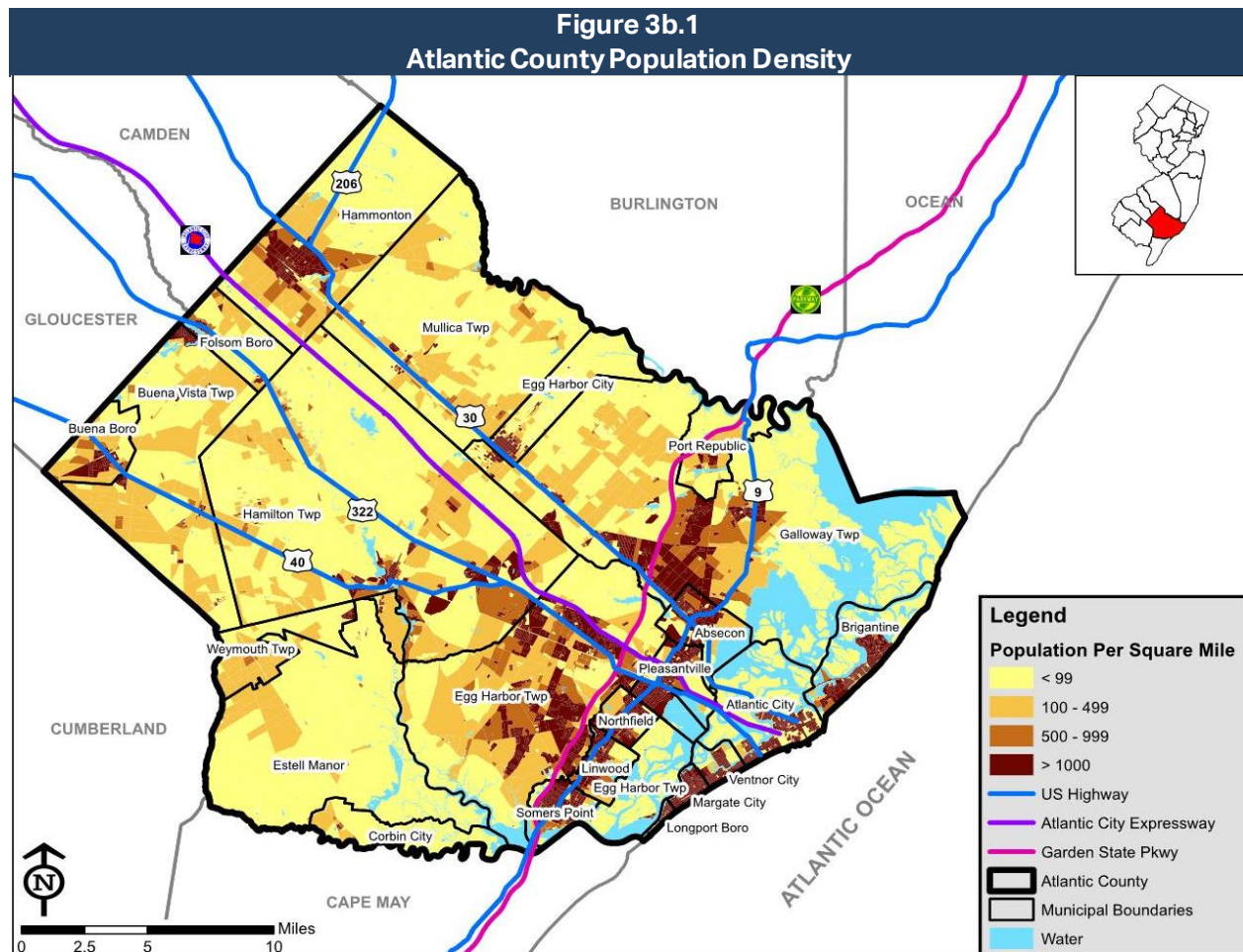
<sup>3</sup> U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

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- 13.3 percent of the population is living below the poverty level (compared to 10.5 percent in 2000 and 14.4 percent in 2013);
- 9.9 percent of persons between the ages of 5 and 64 years of age holds disability status (compared to 14.0 percent in 2000 and 7.4 percent in 2013).

**Figure 3b.1** illustrates the residential population density across Atlantic County. Most of the county's population is located along or near coastal areas. There is also development generally along major thoroughfares including US Routes, 30, 40, 322, 9, and the Garden State Parkway. Development generally decreases as one moves west, and/or away from major thoroughfares. The municipalities with the highest population density are Ventnor City (5,500 people per square mile, Margate City (4,500 per square mile) and Atlantic City (3,680 per square mile). The least densely populated municipality in the county is Estell Manor, with only 32 people per square mile, followed by Corbin City (64 per square mile) and Mullica (109 per square mile).



SOURCE: NJGIN: TIGER/Line Shapefile New Jersey Census Block, 2010; County Boundary, 2012; Municipal Boundary, 2014. Atlantic County Office of GIS: US Highway, Atlantic City Expressway, and Garden State Pkwy, 2003. NJDEP: Atlantic County Lakes (Open Water Areas), 2002.

## **SECTION 3C - Damage Estimates**

### **Methodology**

This multi-jurisdictional vulnerability assessment was conducted with two distinct methodologies, utilizing GIS-based analysis and a statistical risk assessment methodology. Each approach provides estimates for the potential **impact** of hazards by using a common, systematic framework for evaluation, including historical occurrence information provided in the *Hazard Profiles* section. The results of the multi-jurisdictional vulnerability assessment are provided for each hazard immediately following the summary of information provided through the hazard identification and analysis, as listed above.

A GIS-based analysis was conducted for the following hazards:

- Hurricane and tropical storm;
- coastal erosion and sea level rise;
- dam failure;
- flood;
- storm surge;
- wave action;
- earthquake; and
- wildfire.

A statistical risk assessment approach was used to analyze the following hazards:

- extreme temperatures;
- extreme wind;
- hail;
- lightning;
- nor'easter;
- tornado;
- tsunami;
- winter storm; and
- drought.

Below is a brief description of these approaches.

### **GIS-Based Analysis**

For GIS-based assessment, digital data was collected from local, state and national sources. ESRI® ArcGIS™ 9.3 was used to assess risk utilizing digital data for individual tax parcels and georeferenced point locations for buildings and critical facilities. Using these data layers, risk was assessed by estimating the value of buildings determined to be located in identified hazard areas. For the plan update, population estimates were refined using most recent Census data (5-Year American Community Survey, 2016-2019) where the population and value of improved property exposed were estimated to be proportional to the area exposed; and the value of exposed property was refined using updated (2021) improvement values. The objective of the GIS-based analysis was to determine the estimated vulnerability of assets to the identified hazards for



Atlantic County using best available geospatial data. In so doing, local databases made available through the County such as local tax records, parcel boundaries, building footprints and critical facilities data, were used in combination with digital hazard data as included and described in the *Hazard Profiles* section. Where only a portion of a parcel was found to lie within a given hazard area, the ratio of area in to area out of the hazard area was applied to the value of improvements on the parcel to estimate the dollars exposed. A similar process was generally undertaken to estimate population exposed, where the percentage of Census block in the hazard area was applied to total census block population to estimate the population exposed to the hazard. Where it was found that this approach tended to overestimate the exposed population, the approach was refined by applying the average household size taken from census data to the number of affected improved parcels with residential use. The results of the analysis provided an estimated number of people, as well as the numbers and values of buildings and critical facilities determined to be potentially at risk to those hazards with delineable geographic hazard boundaries. These hazards included the coastal erosion and sea level rise, dam failure, flood, storm surge, wave action, earthquake, and wildfire hazards. A more specific description of the GIS-based analysis for each particular hazard is provided under the vulnerability assessment section of each respective hazard.

While GIS analysis as described above has been used to analyze the exposure of assets to some hazards, for this plan update the vulnerability analyses for others have been augmented and refined by the use of HAZUS. HAZUS is a nationally standardized risk modeling software tool developed and freely distributed by FEMA that combines data from many disciplines to generate detailed loss estimates for disaster events of a range of annual probabilities. HAZUS is capable of quantifying risk information such as physical damage to structures and their contents, economic losses such as business interruptions, and social impacts including displaced households and shelter requirements. While HAZUS includes statewide baseline default inventories for buildings and infrastructure, this data may be replaced with more detailed locally specific information for future analyses. In accordance with guidance contained in the current New Jersey State Hazard Mitigation Plan, HAZUS has been used to estimate losses for events of a range of probabilities for hurricanes, riverine flooding, coastal flooding (storm surge), and earthquakes.

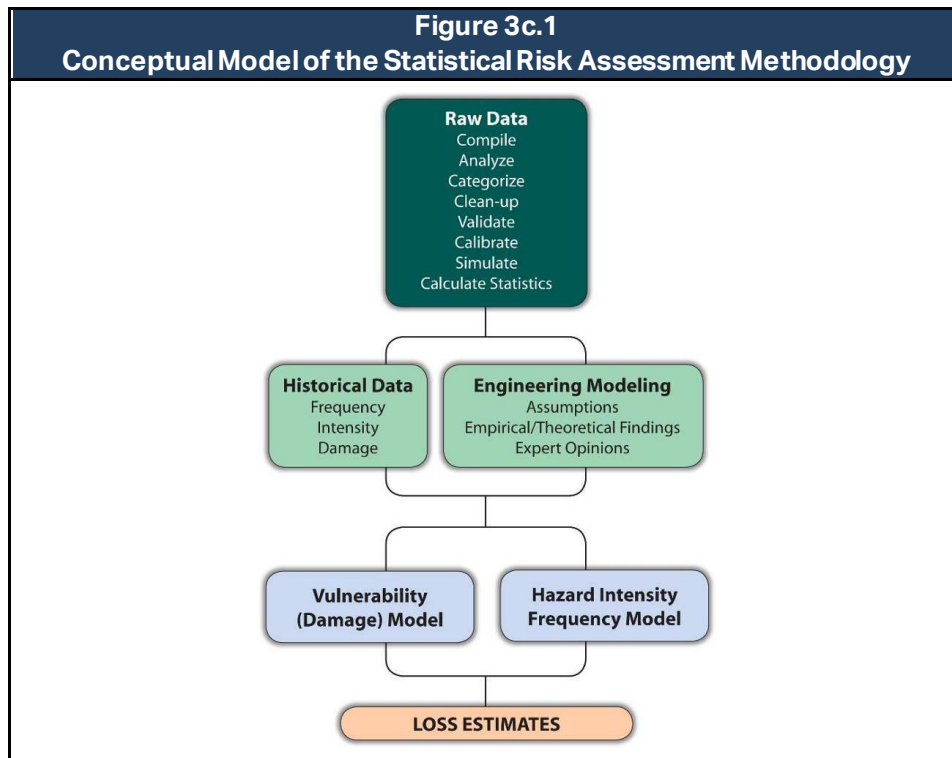
### **Statistical Risk Assessment Methodology**

A statistical risk assessment methodology was applied to analyze hazards of concern that were outside the scope of the GIS-based risk assessment. This methodology uses a statistical approach and mathematical modeling of risk to predict a hazard's frequency of occurrence and estimated impacts based on recorded or historic damage information (presented in the *Hazard Profiles* section). This methodology was used to assess risk to the extreme temperatures, extreme wind, lightning, nor'easter, tornado, winter storm, and drought hazards. Historical data for each hazard as described in the *Hazard Profiles* section was used and statistical evaluations were performed using manual calculations. The general steps used in the statistical risk assessment methodology are summarized below:

1. Compile data from local, state and national sources, as well as literature;
2. Clean up data, including removal of duplicate records and update losses to account for inflation;

3. Identify patterns in frequency, intensity, vulnerability and loss
4. Statistically and probabilistically extrapolate the patterns<sup>4</sup>; and
5. Produce meaningful results, including the development of annualized loss estimates.

**Figure 3c.1** illustrates a conceptual model of the statistical risk assessment methodology as applied to Atlantic County.



Risk (vulnerability) is presented in terms of potential annualized losses, whenever possible. In general, presenting results in the annualized form is useful in three ways:

1. This approach accounts for the contribution of potential losses from all future disasters;
2. Annualized results for different hazards are readily comparable, thus easier to rank; and
3. The use of annualized losses is the most objective approach for evaluating mitigation alternatives.

Annualized losses for the hazards where the parametric approach was utilized were computed in a three-step process:

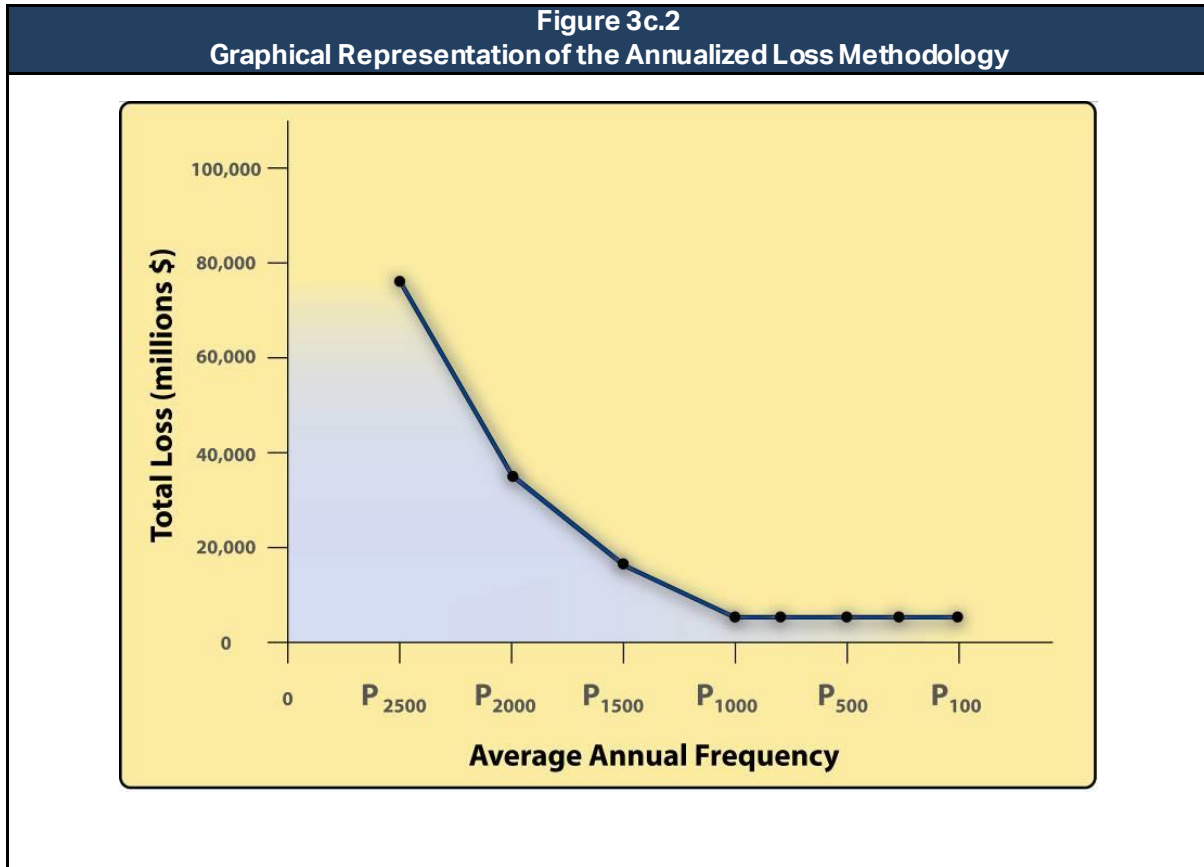
<sup>4</sup> In cases where historical events/losses were recorded for the county as a whole, losses were averaged across all jurisdictions in order to estimate losses by jurisdiction and calculate potential annualized losses by jurisdiction.



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1. Compute/estimate losses for a number of scenario events with different return periods (i.e., 10-year, 100-year, 200-year, 500-year, etc.);
2. Approximate the Probability versus Loss Curve through curve fitting; and
3. Calculate the area under the fitted curve to obtain annualized losses.

This approach is illustrated graphically in **Figure 3c.2**. For other hazards where the statistical approach was used, the computations are based primarily on the observed historical losses.



The economic loss results are presented here using two interrelated risk indicators: Annualized Loss and Annualized Loss Ratio. The Annualized Loss is the estimated long-term weighted average value of losses to property in any single year in a specified geographic area (i.e., municipal jurisdiction). The estimated Annualized Loss (AL) addresses the key idea of risk: the probability of the loss occurring in the study area (largely a function of building construction type and quality). By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the risk. The Annualized Loss Ratio (ALR) represents the AL as a fraction of the assessed value of the local inventory. This ratio is calculated using the following formula:

$$\text{ALR} = \text{Annualized Losses} / \text{Total Exposure}$$

Loss estimates provided in this vulnerability assessment are based on best available data, and the methodologies applied result in an approximation of risk. These estimates should be used to understand relative risk from hazards and potential losses. Uncertainties are inherent in any loss estimation methodology, arising in part from incomplete scientific knowledge concerning natural hazards and their effects on the built environment. Uncertainties also result from approximations and simplifications that are necessary for a comprehensive analysis (i.e., incomplete inventories, demographics or economic parameters).

All conclusions are presented in “Conclusions on Hazard Risk” at the end of this section. Findings for each hazard are detailed in the hazard-by-hazard vulnerability assessment that follows.

## **Extreme Temperatures**

### **Impacts - Extreme Temperatures**

Extreme temperatures are primarily a threat to human life and health, though they are also hazardous to livestock and agricultural crops and occasionally might threaten property and infrastructure, and disrupt transportation systems. They can also exacerbate the impact of other hazards such as severe weather events that cause widespread power outages. Emergency responders are often called upon to work with public officials/non-profit agencies for heating/cooling venues, and to transport vulnerable sectors of the population to such venues. Extreme temperatures are likely to result in relatively minor impacts in Atlantic County, with very few injuries (if any), minor and sporadic property damage, and minimal disruption on quality of life. Temporary shutdown of critical facilities to reduce energy usage or due to the fact that employees may not be able to get to the facility is possible. Common impacts associated with extreme heat in Atlantic County include: injuries associated with swimming to escape extreme heat, and individuals seeking medical treatment for heat related illness (i.e., for heat stress, exhaustion, heat stroke, etc.), and power outages from an associated strain on electrical networks. Cooling centers are typically opened, and schools altering class schedules and/or activities to ensure student safety. Extreme heat events typically impact the elderly and disadvantaged most heavily. Primary impacts of concern for extreme cold temperatures include the life-threatening effects of overexposure hypothermia on people, particularly the elderly and disadvantaged. Other significant impacts include strains on livestock and agriculture.

### **Exposure and Damage Estimates – Extreme Temperatures**

While all of Atlantic County is exposed to extreme temperatures, existing buildings, infrastructure, and critical facilities are not considered vulnerable to significant damage caused by extreme heat or cold events. Damages can occur when thermal tolerances of various systems are exceeded. Extreme cold can cause thermal cracking of paved surfaces, and freezing of pipes. Extreme heat can cause softening and traffic-related rutting of paved surfaces; and buckling of railway tracks. Extreme temperatures can place greater demand on utility systems, with possible associated power outages. While losses could be high for particular events, and could result in increased maintenance costs over time with frequent occurrences, average annual property losses associated with extreme temperatures are anticipated to be minimal across the planning area.

Extreme temperatures do however present a significant life and safety threat to Atlantic County's population.

Heat casualties are usually caused by lack of adequate air conditioning or heat exhaustion. The most vulnerable population to heat casualties are the elderly or infirmed, who frequently live on low fixed incomes and cannot afford to run air-conditioning on a regular basis. This population is sometimes isolated, with no immediate family or friends to look out for their well-being. Casualties resulting from extreme **cold** may result from a lack of adequate heat, carbon monoxide poisoning from unsafe heat sources and frostbite. The most vulnerable populations to cold casualties are the elderly or infirmed and low income households, as they may not be able to afford to operate a heat source on a regular basis and may not have immediate family or friends to look out for their well-being.

Given the lack of historical data and limited likelihood for structural losses resulting from extreme heat or cold occurrences in Atlantic County, annualizing potential structural losses over a long period of time would most likely yield a negligible annualized loss estimate for the entire county.

## **Extreme Wind**

### **Impacts - Extreme Wind**

Impacts associated with extreme wind in Atlantic County can be critical. Multiple deaths/injuries are possible, large portions of property in the affected area can be damaged or destroyed (depending on the nature of the event), and a complete shutdown of critical facilities for more than one week could all be possible, depending on the type of wind event and the nature of the event. Some extreme wind events can be forecasted; others are completely unpredictable. Emergency responders are called up for evacuations, road closures, and attending to the injured. Flying debris, in extreme wind events, can cause secondary impacts. Trees can be downed, buildings can be damaged. High winds can directly damage private property as well as roads and bridges, schools, hospitals, and other types of critical facilities and utilities and communications facilities. In addition, impaired access to these facilities during extreme wind events can cause secondary, indirect damages. Extreme winds may stem from other hazards, including hurricanes and tropical storms, nor'easter, and tornadoes; however, only reported extreme wind events not related to other hazards are considered in this analysis. Vulnerability to winds from hurricanes and tropical storms, nor'easter, and tornadoes are addressed individually in other sections.

### **Exposure and Damage Estimates – Extreme Wind**

Because it cannot be predicted where extreme winds may occur, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported extreme wind occurrences have been factored into this vulnerability assessment<sup>5</sup>. For the 2021 plan update, NCEI historical extreme wind loss

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<sup>5</sup> It is possible that additional extreme wind events may have occurred since 1950 that were not reported to NCDC and are not accounted for in this analysis.

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data current as of May 2021 includes a total of 315 days with high wind, thunderstorm wind, and strong wind events in the 64 years between September 1956 and December 2020. Of these, there are 91 event records in the database through and including the year 1999, and 224 event records from 2000 through 2021. All event records prior to the year 2002 include \$0 in damages – presumably due to database limitations as opposed to decades of non-damaging wind events. Extreme wind events totaled approximately \$424.0 million in property damage (of which \$13.3 million is attributed to damage from the June 2012 Derecho and an additional \$400.0 million is attributed to wind damages during Superstorm Sandy, with the balance of \$10.7 million reported during the balance of wind events). To estimate jurisdictional losses due to extreme wind, expected annualized losses were calculated for the 64 year period of record:

- NCEI losses for all wind events were obtained for the entire county (\$424.0 million total; using a 64 year period of record, this yields expected annualized losses of \$6.6 million countywide).
- NCEI event records included specific loss histories in 20 jurisdictions totaling \$13,361,000 (with \$13,300,000 in damages in Buena Borough during the June 2012 Derecho and the remaining \$61,000 and \$9,567,000 for all other non-Sandy events countywide).
- The total value of all improvements in the County is estimated to be nearly \$23.2 billion for the purposes of this analysis. Thus, based on recent historical data, annual extreme wind damage represents roughly 0.03 percent of the total improved property value in Atlantic County.
- Since the extreme wind hazard is generally uniform across the planning area, this same percentage was applied to each of the County’s jurisdictions to generate annualized expected property losses in each community.

**Table 3c.1** shows potential annualized property losses and percent loss ratios resulting from the extreme wind hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCEI. For the plan update, population estimates were refined using year 2015-2019 American Community Survey data<sup>6</sup>, and annualized expected property losses were based on updated (2021) improvement values<sup>7</sup>.

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<sup>6</sup> U.S. Census Bureau, 5-Year American Community Survey (2015-2021)

<sup>7</sup> NJGIN, Atlantic County Parcel data, 2021

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<b>Table 3c.1</b>				
<b>Potential Annualized Losses from Extreme Wind by Jurisdiction</b>				
<b>Jurisdiction</b>	<b>Estimated Population At Risk*</b>	<b>Total Value of Improvements (Buildings) At Risk (in millions)*</b>	<b>Annualized Expected Property Losses</b>	<b>Annualized Percent Loss Ratio</b>
Absecon, City of	8,362	\$441.9	\$148,000	0.033%
Atlantic City, City of	7,999	\$4,819.2	\$1,612,000	0.033%
Brigantine, City of	8,832	\$1,324.8	\$443,000	0.033%
Buena, Borough of	4,356	\$232.7	\$78,000	0.033%
Buena Vista, Township of	7,295	\$481.8	\$161,000	0.033%
Corbin City, City of	537	\$34.4	\$12,000	0.033%
Egg Harbor City, City of	4,100	\$244.1	\$82,000	0.033%
Egg Harbor, Township of	42,714	\$3,314.3	\$1,109,000	0.033%
Estell Manor, City of	1,728	\$113.9	\$38,000	0.033%
Folsom, Borough of	1,697	\$114.8	\$38,000	0.033%
Galloway, Township of	36,094	\$2,609.7	\$873,000	0.033%
Hamilton, Township of	25,973	\$1,762.8	\$590,000	0.033%
Hammonton, Town of	14,139	\$1,126.2	\$377,000	0.033%
Linwood, City of	6,742	\$612.1	\$205,000	0.033%
Longport, Borough of	869	\$540.0	\$181,000	0.033%
Margate City, City of	5,997	\$1,547.9	\$518,000	0.033%
Mullica, Township of	5,925	\$329.0	\$110,000	0.033%
Northfield, City of	8,153	\$621.1	\$208,000	0.033%
Pleasantville, City of	20,301	\$909.7	\$304,000	0.033%
Port Republic, City of	1,121	\$86.5	\$29,000	0.033%
Somers Point, City of	10,321	\$857.0	\$287,000	0.033%
Ventnor City, City of	10,095	\$967.0	\$323,000	0.033%
Weymouth, Township of	2,755	\$108.9	\$36,000	0.033%
<b>Total</b>	<b>266,105</b>	<b>\$23,199.5</b>	<b>\$7,762,000</b>	<b>0.033%</b>

\* Since the extreme wind hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

## Hail Storms

Probability data from the NOAA National Severe Storms Laboratory indicates that Atlantic County is at minimal risk to severe weather threats featuring damaging hail (defined as at least 2 inches in diameter), and that Atlantic County is located in a part of the country with the lowest annual number of days with hail storms of any kind, with less than two days per year on average. While the NCEI and NSSL databases report very occasional hail storm events in Atlantic County that have been recorded as causing measurable damages, notably \$5 million in crop damage in 2008 and \$10,000 in property damage in 2011, the available data is considered not sufficient to support a detailed estimate of annual damage attributable to hail storms for mitigation planning purposes.

While the possibility that Atlantic County may be affected by isolated hail storm events that cause measurable damage in the future is recognized, the low frequency with which such

events have been recorded up to now suggests that any annual damage estimate on a jurisdiction by jurisdiction basis would likely be negligible. In addition, there are considered to be minimal hazard mitigation techniques available to reduce hailstorm impacts outside of the emergency preparedness procedures and severe weather warning systems already in place or under consideration as current mitigation actions.

## Hurricanes and Tropical Storms

### Impacts - Hurricanes and Tropical Storms

Hurricanes and tropical storms are capable of producing catastrophic impacts. A high number of deaths and/or injuries are possible, more than 50 percent of property in the affected area could be damaged or destroyed, and a complete shutdown of critical facilities would be possible for 30 days or more, depending on the nature of the event.

Atlantic County has an active history of hurricanes and tropical storms. According to NOAA historical records<sup>8</sup>, 43 hurricane and tropical storm tracks have passed within 75 nautical miles of Atlantic County since 1856<sup>9</sup>. Recent events have caused significant wind, flood and coastal erosion related damages in Atlantic County.

Coastal areas of Atlantic County are particularly dynamic environments, and are quite susceptible to hazards associated with hurricanes and tropical storms. These susceptibilities are expected to increase over time due to the effects of sea level rise. Impacts of hurricanes and tropical storms are associated with damages as a result of flooding (riverine and coastal (back bay and oceanfront), as well as storm surge), high winds, damaging waves, and coastal erosion. It is possible for the entire county to be impacted by hurricanes and tropical storms, though in different ways. For example, wind impacts may be widespread but more severe in immediate coastal areas. Structures closest to the Atlantic Coast could suffer catastrophic damages from wind, surge, waves and beach erosion while impacts inland structures would be less substantial due to lower wind speeds and absence of surge impacts. Riverine flooding would be limited to riverine flood zones and being of slower velocities in most cases would cause less severe types of structure damages. Roads and bridges across the county would be susceptible to overtopping and damage from floodwaters. Beach erosion can often be severe during hurricanes and tropical storms; though beach restoration and maintenance activities are undertaken regularly to offset storm impacts (such as the USACE flood risk management projects on Brigantine Island and Absecon Island).

Atlantic County is a tourist destination. With summer being the peak vacation time, coincident with hurricane season, the potential population at risk is at its peak during the time of year when Atlantic County is most likely to be impacted by a hurricane or tropical storm. Impacts to the general public include evacuation and sheltering needs, as well as emergency response for those who shelter in

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<sup>8</sup> NOAA Historical Hurricane Tracks, database filtered exclusively for hurricane Categories 1 through 5 and tropical storms within 75 nautical miles of Atlantic City (with tropical depressions and extratropical systems excluded from the search results), online at <http://coast.noaa.gov/hurricanes/>. This is a new version of the NOAA database, which has been improved upon including various data corrections since the 2016 Plan was prepared.






<sup>9</sup> Superstorm Sandy, which was extratropical at its landfall, is included.



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place or are injured during the event. All property types are impacted, with residential and commercial impacts being greatest due to their proximity to the coast. Roads, bridges, schools, hospitals and other types of critical facilities are susceptible to wind and water damage. Secondary impacts would be associated with flying debris, as well as drifting sand from storm surges. Sand covered roads and bridges would be common impacts. Beach erosion can be catastrophic depending on the particular area and the nature of the event. Transportation, communications, and governmental services may be severely impacted. Impacts would be exacerbated when coincident with high tides, or during prolonged types of events that extend across several tidal cycles. Sea level rise will increase impacts over time.

**Table 3c.2** describes the damage that could be expected for each category of hurricane. Damage during hurricanes might also result from spawned tornadoes, storm surge and inland flooding associated with heavy rainfall that usually accompanies these storms.

<b>Table 3c.2 Hurricane Damage Classifications</b>			
<b>Storm Category</b>	<b>Damage Level</b>	<b>Description of Damages</b>	<b>Photo Example</b>
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery and trees. Also, some coastal flooding and minor pier damage.	
2	MODERATE	Some roofing material, door and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings might break their moorings.	
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtainwall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures, with larger structures damaged by floating debris. Terrain might be flooded well inland.	
4	EXTREME	More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain might be flooded well inland.	
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas might be required.	

*Source: National Oceanic and Atmospheric Administration; Federal Emergency Management Agency*

**Exposure and Damage Estimates – Hurricanes and Tropical Storms**

Hurricanes and tropical storms are complex combinations of discrete component hazards occurring simultaneously. The entirety of the County's built environment and population is potentially exposed to this hazard. Damages during these events result from the cumulative impacts of a wide range of hazards including flooding, storm surge, coastal erosion, wave action, and high winds. No two hurricanes or tropical storms are identical. Even hurricanes of the same

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category can bring with them wildly different impacts depending on whether they occur during a time of high tide or low tide. Variations in inland wind affects and precipitation amounts, for example, can vary widely. Vulnerability is being expressed as the number of people and value of property at risk. All of the county's built environment and population could potentially be impacted by the hazards characteristically occurring during a hurricane or tropical storm.

For this plan update HAZUS was used to generate county-wide estimates of damage resulting from two significant potential hurricane/tropical storm events, in accordance with guidance in the current New Jersey State Hazard Mitigation Plan. **Table 3c.3** presents the estimated total losses from all sources for events that have a 1% and a 0.2% annual chance of being equaled or exceeded. **Table 3c.3** also includes annual average losses and annualized loss ratios for all jurisdictions in Atlantic County.

Jurisdiction	HAZUS Building Replacement Value	Total Losses, 1% ACE Event ("100-Year")	Total Losses, 0.2% ACE Event ("500-Year")	Annual Average Total Losses	Annualized Loss Ratio
Absecon, City of	\$1,267	\$10.253	\$46.984	\$0.586	0.05%
Atlantic City, City of	\$7,929	\$103.936	\$633.618	\$4.852	0.06%
Brigantine, City of	\$2,561	\$35.882	\$260.997	\$1.921	0.08%
Buena, Borough of	\$562	\$0.477	\$1.623	\$0.096	0.02%
Buena Vista, Township of	\$944	\$1.454	\$4.870	\$0.180	0.02%
Corbin City, City of	\$79	\$0.224	\$0.735	\$0.017	0.02%
Egg Harbor City, City of	\$665	\$2.582	\$11.026	\$0.155	0.02%
Egg Harbor, Township of	\$6,286	\$39.507	\$173.117	\$2.546	0.04%
Estell Manor, City of	\$258	\$1.469	\$4.815	\$0.110	0.04%
Folsom, Borough of	\$287	\$0.423	\$1.491	\$0.048	0.02%
Galloway, Township of	\$5,139	\$39.886	\$181.110	\$1.920	0.04%
Hamilton, Township of	\$3,563	\$12.914	\$43.594	\$0.888	0.02%
Hammonton, Town of	\$2,080	\$3.731	\$12.764	\$0.377	0.02%
Linwood, City of	\$1,235	\$7.861	\$43.030	\$0.576	0.05%
Longport, Borough of	\$488	\$0.417	\$2.868	\$0.033	0.01%
Margate City, City of	\$2,038	\$15.657	\$106.837	\$1.256	0.06%
Mullica, Township of	\$818	\$2.802	\$8.283	\$0.171	0.02%
Northfield, City of	\$1,492	\$9.226	\$55.772	\$0.618	0.04%
Pleasantville, City of	\$2,166	\$16.337	\$107.909	\$0.987	0.05%
Port Republic, City of	\$196	\$2.892	\$13.370	\$0.124	0.06%
Somers Point, City of	\$1,781	\$8.519	\$49.972	\$0.726	0.04%
Ventnor City, City of	\$2,023	\$23.140	\$143.048	\$1.354	0.07%
Weymouth, Township of	\$257	\$0.332	\$1.087	\$0.025	0.01%
<b>Atlantic County Total</b>	<b>\$44,114</b>	<b>\$339.921</b>	<b>\$1,908.920</b>	<b>\$19.564</b>	<b>0.04%</b>

Note that for this and other HAZUS-based damage estimates that follow in this section, the analysis utilized the baseline default inventory for buildings and infrastructure inherent within the HAZUS



model rather than improvement values from local tax records. The baseline default inventory in HAZUS is generated from industry-standard construction cost estimation models for a range of structure types and is stored at the census tract and census bloc level within the model. The use of building replacement values instead of assessed or market values reflects standard practice when quantifying damages from storm events and the subsequent benefits arising from measures to mitigate them in scenarios such as the economic appraisal of federal flood and storm risk reduction projects by the US Army Corps of Engineers. In such studies the damages are based on the cost to replace or repair a lost or damaged structure, which is less susceptible to influences that cause the market value of similar structures to vary with location.<sup>10</sup>

## **Lightning**

### **Impacts – Lightning**

On average, 55 people are killed and hundreds are injured each year by lightning strikes in the United States. Lightning can strike communications equipment (i.e., radio or cell towers, antennae, satellite dishes, electrical transformers, etc.) and hamper communication and emergency response. Lightning strikes can also cause significant damage to buildings, critical facilities, and infrastructure, largely by igniting a fire. In addition, lightning can ignite vegetation to cause a wildfire. Lightning's impacts can typically be characterized as minor in Atlantic County. Events are typically associated with very few injuries (if any), only minor property damage, and minimal disruption on quality of life. The shutdown of critical facilities, if at all, is typically only temporary in nature. Historical impacts in Atlantic County have included direct health impacts to individuals struck by lightning, structure damages from fires caused by lightning, and impacts to emergency communications facilities when towers have been struck by lightning. Lightning occurs frequently in Atlantic County but damaging events are relatively few in number and limited in scope when they do occur. Building codes requiring buildings to be grounded work to decrease damages. Members of the general public who are outdoors are particularly vulnerable during an event. Lightning most typically occurs within 10 miles of a thunderstorm.

### **Exposure and Damage Estimates – Lightning**

Because it cannot be predicted where lightning may strike, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. For the plan update, NCEI historical lightning data current as of May 2021 was queried. The data includes a total of 24 lightning events between April 2001 and May 2021, resulting in nearly \$1.3 million in damages, 2 deaths, and 6 injuries. The lack of event records prior to the year 2001 is due to database limitations as opposed to decades without lightning events. To estimate jurisdictional losses due to lightning, expected annualized losses were calculated as follows for the 20 year period of record between April 2001 and May 2021:

- NCEI losses were obtained for the entire county (event records included specific loss histories in 15 jurisdictions totaling \$1.3 million total; using a 20 year period of record, this yields expected annualized losses of \$67,000 countywide).

<sup>10</sup> Procedural Guidelines for Estimating Residential and Business Structure Value for Use in Flood Damage Estimations. Institute for Water Resources report 95-R-9, April 1995.

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- The total value of all improvements in the County is estimated to be nearly \$23.2 billion. Thus, based on recent historical data, annual lightning damage represents roughly 0.0003 percent of the total improved property value in Atlantic County.
- Since the lightning hazard is uniform across the planning area, this same percentage was applied to each of the County’s jurisdictions to generate annualized expected property losses in each community.

**Table 3c.4** shows potential annualized property losses and percent loss ratios resulting from the lightning hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCDC. For the plan update, population estimates were refined using 2015-2019 American Community Survey Data<sup>11</sup>, and annualized expected property losses were based on updated (2021) improvement values<sup>12</sup>.

<b>Table 3c.4</b>				
<b>Potential Annualized Losses from Lightning by Jurisdiction</b>				
<b>Jurisdiction</b>	<b>Estimated Population At Risk*</b>	<b>Total Value of Improvements (Buildings) At Risk (in millions)*</b>	<b>Annualized Expected Property Losses</b>	<b>Annualized Percent Loss Ratio</b>
Absecon, City of	8,362	\$441.9	\$1,300	0.0003%
Atlantic City, City of	37,999	\$4,819.2	\$13,900	0.0003%
Brigantine, City of	8,832	\$1,324.8	\$3,800	0.0003%
Buena, Borough of	4,356	\$232.7	\$700	0.0003%
Buena Vista, Township of	7,295	\$481.8	\$1,400	0.0003%
Corbin City, City of	537	\$34.4	\$100	0.0003%
Egg Harbor City, City of	4,100	\$244.1	\$700	0.0003%
Egg Harbor, Township of	42,714	\$3,314.3	\$9,600	0.0003%
Estell Manor, City of	1,728	\$113.9	\$300	0.0003%
Folsom, Borough of	1,697	\$114.8	\$300	0.0003%
Galloway, Township of	36,094	\$2,609.7	\$7,500	0.0003%
Hamilton, Township of	25,973	\$1,762.8	\$5,100	0.0003%
Hammonton, Town of	14,139	\$1,126.2	\$3,200	0.0003%
Linwood, City of	6,742	\$612.1	\$1,800	0.0003%
Longport, Borough of	869	\$540.0	\$1,600	0.0003%
Margate City, City of	5,997	\$1,547.9	\$4,500	0.0003%
Mullica, Township of	5,925	\$329.0	\$900	0.0003%
Northfield, City of	8,153	\$621.1	\$1,800	0.0003%
Pleasantville, City of	20,301	\$909.7	\$2,600	0.0003%
Port Republic, City of	1,121	\$86.5	\$200	0.0003%
Somers Point, City of	10,321	\$857.0	\$2,500	0.0003%
Ventnor City, City of	10,095	\$967.0	\$2,800	0.0003%
Weymouth, Township of	2,755	\$108.9	\$300	0.0003%
<b>Total</b>	<b>266,105</b>	<b>\$23,199.5</b>	<b>\$66,900</b>	<b>0.0003%</b>

\* Since the lightning hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

<sup>11</sup> U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

<sup>12</sup> NJGIN, Atlantic County Parcel data, 2021

## **Nor'easters**

### **Impacts - Nor'easters**

Nor'easters are known for dumping heavy amounts of rain and snow, producing hurricane-force winds, and creating high surf that causes severe beach erosion and coastal flooding. There are two main components to a nor'easter: (1) a Gulf Stream low-pressure system (counter-clockwise winds) generated off the southeastern U.S. coast, gathering warm air and moisture from the Atlantic, and pulled up the East Coast by strong northeasterly winds at the leading edge of the storm; and (2) an Arctic high-pressure system (clockwise winds) which meets the low-pressure system with cold, arctic air blowing down from Canada. When the two systems collide, the moisture and cold air produce a mix of precipitation and have the potential for creating dangerously high winds and heavy seas. As the low-pressure system deepens, the intensity of the winds and waves will increase and cause serious damage to coastal areas as the storm moves northeast. Nor'easters can be extremely large (up to 1,000 miles in diameter) and their duration can last for days and multiple tidal cycles, often causing major coastal flooding, erosion and damages that might even exceed the impacts of shorter-term hurricane events.

Impacts from nor'easters are primarily associated with high winds, severe beach erosion and flood hazards (riverine and coastal flooding, storm surge). Their impacts are often quite similar to winter storms with significant snow accumulations, creating hazardous driving conditions, business/government office closures, potential for damage from snow accumulations on structures, etc. Nor'easters tend to have the greatest impacts in coastal communities, though the entire county has some exposure and past effects have been widespread. Atlantic County's shore is vital to the local economy but remains highly susceptible to the effects of major coastal storms, including nor'easters. Similar to hurricanes and tropical storms, nor'easters are capable of producing catastrophic impacts, depending upon the nature of the storm, its intensity, and duration. Possible impacts can include high numbers of deaths/injuries, more than 50 percent of property in the affected area could be damaged or destroyed, and critical facilities could be shut down for 30 days or more. Historical records<sup>13</sup> indicate that 17 nor'easters have impacted Atlantic County since 1991. Recent events have caused significant wind, flood and coastal erosion related damages in Atlantic County. They have also resulted in power outages and hazardous driving conditions.

Coastal areas of Atlantic County are particularly dynamic environments, and are quite susceptible to hazards associated with nor'easters. These susceptibilities are expected to increase over time due to the effects of sea level rise. Impacts of nor'easters are associated with damages as a result of flooding (riverine and coastal (back bay and oceanfront) as well as storm surge), high winds, damaging waves, and coastal erosion. It is possible for the entire county to be impacted by nor'easters, though in different ways. For example, wind impacts may be widespread but more severe in immediate coastal areas. Structures close to the Atlantic Coast could suffer catastrophic damages from wind, surge, waves and beach erosion while impacts to inland structures would be less substantial due to lower wind speeds and absence of surge impacts.

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<sup>13</sup> State of New Jersey 2014 Hazard Mitigation Plan

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Riverine flooding would be limited to riverine flood zones and being of slower velocities in most cases would cause less severe types of structure damages than in coastal areas but could be more widespread geographically. Roads and bridges across the county would be susceptible to overtopping and damage from floodwaters. Beach erosion can often be severe during nor'easters; though beach restoration and maintenance activities are undertaken regularly to offset storm impacts. As noted earlier, this specifically includes the USACE storm damage reduction projects on Absecon Island and Brigantine Island.

Atlantic County is a tourist destination. With summer being the peak vacation time – opposite the time of the typical nor'easter occurrences in winter, tourists are not generally impacted. Impacts to the general public include evacuation and sheltering needs, as well as emergency response for those who shelter in place or are injured during the event. All property types are impacted, with residential and commercial impacts being greatest due to their proximity to the coast. Roads, bridges, schools, hospitals and other types of critical facilities are susceptible to wind and water damage. Secondary impacts would be associated with flying debris, as well as drifting sand from storm surges. Sand covered roads and bridges would be common impacts. Beach erosion can be catastrophic depending on the particular area and the nature of the event. Transportation, communications, and governmental services may be severely impacted. Impacts would be exacerbated when coincident with high tides, or during prolonged types of events that extend across several tidal cycles. Sea level rise will increase impacts over time.

#### **Exposure and Damage Estimates – Nor'easters**

Because nor'easters often impact large areas and cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. Similar to hurricanes and tropical storms, nor'easters are complex combinations of discrete component hazards occurring simultaneously. Damages during these events result from the cumulative impacts of component hazards such as flooding, storm surge, coastal erosion, wave action, and high winds. No two nor'easters are identical. Even storms of the same magnitude and intensity can bring with them wildly different impacts depending on whether they occur during a time of high tide or low tide; and, since it is not uncommon for nor'easters to stall off of the coast, damages are often affected by the number of tidal cycles during which they occur. Variations in inland wind affects and precipitation amounts can also vary widely. Thus, it is difficult to estimate total potential losses from these cumulative effects in a manner that would allow for the calculation of a meaningful average annual loss estimate for nor'easters. However, because nor'easters are low pressure systems, the impacts from winds found in a strong nor'easter can be modeled using methodology similar to that used for hurricanes.

Nor'easters are complex combinations of discrete component hazards occurring simultaneously. Damages during these events result from the cumulative impacts of a wide range of hazards including flooding, storm surge, coastal erosion, wave action, and high winds. No two nor'easters are identical. Even similar storm systems can bring with them wildly different impacts depending on whether they occur during a time of high tide or low tide – or over multiple tidal cycles. Variations in inland wind affects and precipitation amounts, for example, can also vary widely. Thus, it is difficult to estimate total potential losses from these cumulative hazard effects in a manner that would allow for the calculation of a meaningful average annual loss estimate for

nor'easters as an event. Vulnerability to the component hazards of nor'easter events such as flooding, storm surge, coastal erosion, wave action, and high winds are addressed separately in this section. Vulnerability is being expressed as the number of people and value of property at risk. All of the county's built environment and population could potentially be impacted by the hazards characteristically occurring during a nor'easter.

## **Tornado**

### **Impacts - Tornado**

Tornados are nature's most violent storms. The most intense tornados can cause fatalities and catastrophic damage to both trees and the built environment in a matter of seconds. The number of deaths, injuries, and dollar amount of damages can fluctuate drastically depending on the severity of the tornado and the degree and type of development in the damage path. Emergency responders are called upon for search and rescue, to tend to the injured, assist in evacuations, and to close roads and direct traffic. Transportation, communications, and the general operation of government could be affected by an incident. Property damage can be significant within the tornado's path. Trees can be damaged or destroyed. Power outages can occur. These impacts tend to be felt in rather limited areas, due to the nature of the tornado hazard itself (tornados with limited widths and path lengths after touchdown). The destruction caused by tornadoes ranges from light to catastrophic depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damage to structures of light construction, including residential dwellings and particularly manufactured homes.

### **Exposure and Damage Estimates – Tornado**

Historical evidence shows that Atlantic County is vulnerable to tornadic activity. This hazard can result from severe thunderstorm activity or may occur during a major tropical storm or hurricane. Because it cannot be predicted where a tornado may touch down, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. It is important to note that only reported tornadoes have been factored into this vulnerability assessment<sup>14</sup>.

For the plan update, NCEI historical tornado data current as of May 2021 includes a total of 7 tornado events between November 1970 and May 2021, resulting in just over \$1 million in damages. To estimate jurisdictional losses due to tornados, expected annualized losses were calculated as follows for the 51-year period of record:

- NCEI losses were obtained for the entire county (\$1,025,000 total; using a 51-year period of record, this yields expected annualized losses of \$21,000).
- The total value of all improvements in the County is estimated to be nearly \$23.2 billion. Thus, based on recent historical data, annual tornado damage represents 0.0001 percent of the total improved property value in Atlantic County.

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<sup>14</sup> It is possible that additional tornado events may have occurred since 1950 that were not reported to NCEI and are not accounted for in this analysis.

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- Since the tornado hazard is uniform across the planning area, this same percentage was applied to each of the County's jurisdictions to generate annualized expected property losses in each community.

**Table 3c.5** shows potential annualized losses and percent loss ratios resulting from the lightning hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCDC. For the plan update, population estimates were refined using year 2015-2019 American Community Survey Census data<sup>15</sup>, and annualized expected losses were based on updated (2021) improvement values<sup>16</sup>.

<b>Table 3c.5</b>				
<b>Potential Annualized Losses from Tornadoes by Jurisdiction</b>				
<b>Jurisdiction</b>	<b>Estimated Population At Risk*</b>	<b>Total Value of Improvements (Buildings) At Risk*</b>	<b>Annualized Expected Property Losses</b>	<b>Annualized Percent Loss Ratio</b>
Absecon, City of	8,362	\$441.9	\$400	0.0001%
Atlantic City, City of	37,999	\$4,819.2	\$4,200	0.0001%
Brigantine, City of	8,832	\$1,324.8	\$1,100	0.0001%
Buena, Borough of	4,356	\$232.7	\$200	0.0001%
Buena Vista, Township of	7,295	\$481.8	\$400	0.0001%
Corbin City, City of	537	\$34.4	\$0	0.0001%
Egg Harbor City, City of	4,100	\$244.1	\$200	0.0001%
Egg Harbor, Township of	42,714	\$3,314.3	\$2,900	0.0001%
Estell Manor, City of	1,728	\$113.9	\$100	0.0001%
Folsom, Borough of	1,697	\$114.8	\$100	0.0001%
Galloway, Township of	36,094	\$2,609.7	\$2,300	0.0001%
Hamilton, Township of	25,973	\$1,762.8	\$1,500	0.0001%
Hammonton, Town of	14,139	\$1,126.2	\$1,000	0.0001%
Linwood, City of	6,742	\$612.1	\$500	0.0001%
Longport, Borough of	869	\$540.0	\$500	0.0001%
Margate City, City of	5,997	\$1,547.9	\$1,300	0.0001%
Mullica, Township of	5,925	\$329.0	\$300	0.0001%
Northfield, City of	8,153	\$621.1	\$500	0.0001%
Pleasantville, City of	20,301	\$909.7	\$800	0.0001%
Port Republic, City of	1,121	\$86.5	\$100	0.0001%
Somers Point, City of	10,321	\$857.0	\$700	0.0001%
Ventnor City, City of	10,095	\$967.0	\$800	0.0001%
Weymouth, Township of	2,755	\$108.9	\$100	0.0001%
<b>Total</b>	<b>266,105</b>	<b>\$23,199</b>	<b>\$20,100</b>	<b>0.0001%</b>

\* Since the tornado hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

<sup>15</sup> U.S. Census Bureau, 5-Year American Community Survey (2015-2019)

<sup>16</sup> NJGIN, Atlantic County Parcel data, 2021.



## **Winter Storms**

### **Impacts – Winter Storms**

Winter storms can have tremendous impacts on Atlantic County. Though typically short in duration, winter storms can result in significant snow accumulations, with extensive impacts on local transportation via road, rail, and air. Impacts are exacerbated with storms having an ice component, as snow loads are increased and driving conditions substantially worsen. A severe winter storm can adversely affect roadways, utilities, business activities and can cause loss of life, frostbite, or freezing. The most common effect of winter storms and ice storms are traffic accidents, interruptions in power supply and communications. In addition, heavy snow loads can cause roof collapse in cases of inadequate design and/or maintenance, as the structural integrity of the structure is compromised. Power outages and temperatures below freezing for extended periods of time can cause pipes to freeze and burst. Heavily populated areas tend to be significantly impacted by losses of power and communications systems due to downed lines. Distribution lines can be downed by the weight of snow or ice, or heavy winds – particularly during periods of high winds – which can result in outages when limbs fall on power lines and communication lines. Secondary impacts from downed communication lines can hamper the response and recovery efforts due to lack of communication. When limbs and lines fall on roadways, transportation routes can be adversely affected and buildings and automobiles can be damaged. Secondary impacts from power outages can include frozen pipes, business losses, negative impacts on people associated with trying to heat their homes using portable heat sources (i.e., kerosene) or stoves including carbon monoxide poisoning and fire risks. Severe winter storms can also cause coastal flooding, coastal erosion, and wave action. If significant snowfall amounts melt quickly, inland flooding can occur as bankfull conditions are exceeded or in areas of poor roadway drainage. The impacts of snow and ice storms in the planning area are more likely to be major disruptions to transportation, commerce and electrical power as well as significant overtime work for government employees, rather than large scale property damages and/or threats to human life and safety. The severity of the effects of winter storms and ice storms increases as the amount and rate of precipitation increase. In addition, storms with a low forward velocity are in an area for a longer duration and become more severe in their affects. Storms that are in full force during the morning or evening rush hours tend to have their affects magnified because more people are out on the roadways and directly exposed. Atlantic County's more rural jurisdictions could be expected to be impacted more by heavy snow and freezing rain due to access transportation issues and distances from major population centers and additional emergency response resources. The human impact of winter storms tends to be exacerbated in areas of social vulnerability (for example, low income, and a high proportion of the very young and/or very old).

### **Exposure and Damage Estimates – Winter Storms**

Because winter storms often impact large areas and cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. For the plan update, NCDC historical winter storm data current as of May 2021 was queried for events categorized as: blizzards, heavy snow, ice storms, sleet,

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winter storms, and winter weather. The data includes a total of 121 winter weather days between January 1996<sup>17</sup> and May 2021, resulting in approximately \$5.3 million in property damages. No event records are included prior to 1996. To estimate jurisdictional losses due to winter storms, expected annualized losses were calculated as follows for the 25-year period of record:

- NCEI losses were obtained for the entire county (\$5.3 million total<sup>18</sup>; using a 25-year period of record, this yields expected annualized losses of \$210,000 ).
- The total value of all improvements in the County is estimated to be nearly \$23.2 billion. Thus, based on recent historical data, annual winter storm damage represents 0.001 percent of the total improved property value in Atlantic County.
- Since winter storm hazard is uniform across the planning area, this same percentage was applied to each of the County's jurisdictions to generate annualized expected property losses in each community.

**Table 3c.6** shows potential annualized property losses and percent loss ratios resulting from the winter storm hazard for each jurisdiction in Atlantic County based on historic occurrences as reported by NCEI. For the plan update, population estimates were refined using year 2015-2019 American Community Survey Census data<sup>19</sup>, and annualized expected property losses were based on updated (2021) improvement values<sup>20</sup>.

Jurisdiction	Estimated Population At Risk*	Total Value of Improvements (Buildings) At Risk (in millions)*	Annualized Expected Property Losses	Annualized Percent Loss Ratio
Absecon, City of	8,362	\$441.9	\$4,000	0.001%
Atlantic City, City of	37,999	\$4,819.2	\$44,000	0.001%
Brigantine, City of	8,832	\$1,324.8	\$12,100	0.001%
Buena, Borough of	4,356	\$232.7	\$2,100	0.001%
Buena Vista, Township of	7,295	\$481.8	\$4,400	0.001%
Corbin City, City of	537	\$34.4	\$300	0.001%
Egg Harbor City, City of	4,100	\$244.1	\$2,200	0.001%
Egg Harbor, Township of	42,714	\$3,314.3	\$30,300	0.001%
Estell Manor, City of	1,728	\$113.9	\$1,000	0.001%
Folsom, Borough of	1,697	\$114.8	\$1,000	0.001%
Galloway, Township of	36,094	\$2,609.7	\$23,800	0.001%
Hamilton, Township of	25,973	\$1,762.8	\$16,100	0.001%
Hammonton, Town of	14,139	\$1,126.2	\$10,300	0.001%
Linwood, City of	6,742	\$612.1	\$5,600	0.001%
Longport, Borough of	869	\$540.0	\$4,900	0.001%
Margate City, City of	5,997	\$1,547.9	\$14,100	0.001%

<sup>17</sup> Events between 1950 and 1995 were not included in the NCEI database and, therefore, are not accounted for in this analysis.

<sup>18</sup> It should be noted that the NCEI's estimation of losses to winter storms was limited to documented structural damages and did not include other types of damages or economic impacts such as power outages, infrastructure repair and restoration, loss of business income and snow removal costs. In the absence of detailed historical data, it is difficult to model and quantify these other types of non-structural losses for winter storm at a jurisdictional level in Atlantic County. However, it should be recognized that such losses can indeed be significant and their associated costs are most often borne by local government and the private sector.

<sup>19</sup> U.S. Census Bureau, 5-Year American Community Survey (2019)

<sup>20</sup> NJGIN, Atlantic County Parcel data, 2021.



<b>Jurisdiction</b>	<b>Estimated Population At Risk*</b>	<b>Total Value of Improvements (Buildings) At Risk (in millions)*</b>	<b>Annualized Expected Property Losses</b>	<b>Annualized Percent Loss Ratio</b>
Mullica, Township of	5,925	\$329.0	\$3,000	0.001%
Northfield, City of	8,153	\$621.1	\$5,700	0.001%
Pleasantville, City of	20,301	\$909.7	\$8,300	0.001%
Port Republic, City of	1,121	\$86.5	\$800	0.001%
Somers Point, City of	10,321	\$857.0	\$7,800	0.001%
Ventnor City, City of	10,095	\$967.0	\$8,800	0.001%
Weymouth, Township of	2,755	\$108.9	\$1,000	0.001%
<b>Total</b>	<b>266,105</b>	<b>\$23,199</b>	<b>\$212,000</b>	<b>0.001%</b>

\* Since the winter storm hazard area is countywide, 100 percent of the population and built environment is exposed and potentially at risk.

## Coastal Erosion and Sea Level Rise

### Impacts – Coastal Erosion

Death and injury are not typically associated with coastal erosion, as erosive processes along the coast occur over long durations during which people in the affected areas have sufficient times to evacuate; however, it can cause the destruction of buildings and infrastructure as land is eroded away. Coastal erosion can also represent a major threat to the local economies of coastal communities that rely on the financial benefits of their recreational beaches. Natural recovery from erosion can take years to decades. If a beach and dune system does not recover quickly enough naturally, coastal and upland property may be exposed to further damage in subsequent coastal erosion and flooding events. Human actions to supplement natural coastal recovery, such as beach nourishment, dune stabilization and shoreline protection structures (sea walls, groins, jetties, etc.) can mitigate the hazard of coastal erosion, but may exacerbate it under some circumstances.

### Exposure and Damage Estimates – Coastal Erosion

Unlike other hazards, the coastal erosion hazard is best described as a relatively slow natural process occurring over the long term, with occasional major impacts wrought by episodic natural events such as hurricanes and nor'easters. Another complicating factor in accurately determining specific coastal erosion hazard areas is the continuous implementation of shoreline reinforcement or nourishment projects completed by federal, state and local government agencies. Typically, areas of high concern with regard to long term coastal erosion are addressed through shoreline hardening or stabilization projects, such as seawalls, breakwaters and beach nourishment. The ability to continue successfully mitigating the effects of coastal erosion hazards throughout Atlantic County will therefore depend on regular shoreline monitoring and the design and implementation of site-specific solutions, as has been done in the past.

The New Jersey Coastal Zone Management Rules (NJAC 7:7E) defines erosion hazard areas as extending inland from the edge of a stabilized upland area to the limit of the area likely to be

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eroded in 30 years for one to four unit dwelling structures, and 60 years for all other structures, including developed and undeveloped areas<sup>21</sup>. The extent of an erosion hazard area is calculated by multiplying the projected annual erosion rate at a site by 30 for the development of one to four unit dwelling structures and by 60 for all other developments. According to a study prepared by the Heinz Center<sup>22</sup>, much of the coastline of New Jersey, including Atlantic County, experiences an average of three feet of erosion per year.

To estimate exposure to the coastal erosion hazard, data on shoreline type (as classified by the New Jersey Department of Environmental Protection) was used to delineate areas potentially susceptible to the erosion hazard. For purposes of this analysis, these shoreline types were limited to (1) "beach," which includes waterfront areas comprised of 100 percent sand; and (2) "erodible," which includes any soft shoreline other than beach, rock, marsh, sea wall or earthen dike. The determination of value at-risk was calculated through GIS analysis by summing the total improved values for those parcels that were confirmed to have at least one building located within 200 feet of the identified beach or erodible shoreline types. The figure of 200 feet was determined to be a reasonable yet slightly more conservative estimate for defining erosion hazard areas based on the calculations recommended under NJAC 7:7E as described above (annual erosion rate of three feet per year x 60 years = 180 feet). According to the assessment, 30 jurisdictions have improved property within areas potentially susceptible to coastal erosion.

Atlantic County and its jurisdictions have an active history of pursuing and implementing successful shoreline protection strategies, particularly through the nourishment of critically eroding beaches and for areas in which property is threatened by continued erosion. This is demonstrated particularly in Brigantine's commitment to the USACE Brigantine Island storm damage reduction and storm protection project; and Atlantic City and Ventnor's respective commitments to the USACE Absecon Island shore protection project. Due to these aggressively implemented beach nourishment projects and other mitigating factors, it appears likely that buildings in coastal erosion hazard areas in these areas would be protected from the hazard for at least a foreseeable 30-year planning window (through 2045). Average annual building damages directly attributable to the erosion hazard in these areas have thus been considered to be negligible for the purposes of this risk assessment, assuming that these ongoing beach nourishment and shoreline stabilization practices are expected to be maintained aggressively, implemented on an ongoing basis, and encouraged to continue.

**Table 3c.7** shows exposure to the coastal erosion hazard by jurisdiction. To estimate exposure to coastal erosion, the determination of value and population at-risk was calculated through GIS analysis by calculating the proportion of a parcel or census block lying within 120 feet of 'beach' or 'erodible' shoreline types, and applying that same ratio to the census block population and parcel value to estimate population at risk and value of improvements at risk. Significant event damages are possible, particularly where no shoreline protection features are present (i.e., USACE projects) or if the shoreline were allowed to revert to historical behavior. Assuming no further protective actions (nothing new, and no further maintenance of existing features), and

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<sup>21</sup> This distance is measured from the crest of a bluff for coastal bluff areas, the most seaward established dune crest for unvegetated dune areas, the first vegetation line from the water for established vegetated dune areas, and the landward edge of a beach or the eight foot North American Datum (NAD), 1983, contour line, whichever is farther inland, for non-dune areas.

<sup>22</sup> "Evaluation of Erosion Hazards" prepared by The H. John Heinz III Center for Science, Economics and the Environment, April 2000. <http://www.fema.gov/pdf/library/erosion.pdf>

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assuming a uniform historical erosion estimate of 3 feet per year, and that all improvements in the mapped erosion hazard area could be damaged over a 40 year time frame (120 feet / 3 feet per year = 40 years). Therefore, to derive an upper limit of average annualized erosion damage, maximum losses were estimated at 100 percent of the reported value of improvements on affected parcels, and annualized over a 40 year period, with results shown in Table 3c.8. This methodology assumes that once lost to erosion, an area of land is not subsequently restored and returned to developable condition.

The total exposed populations and structures in Table 3c.8 show a significant decrease from the equivalent table in the previous plan update: This reflects a change in the methodology driven by the 2019 New Jersey State Plan, which recommends that structures and populations should be considered at risk if they lie within 120 feet of the beach or erodible shoreline, whereas the corresponding analysis in the previous version of the Atlantic County plan used a setback of 200 feet.

Assumptions inherent to Table 3c.7: (1) Each affected parcel has one household; (2) The average number of persons per household in each jurisdiction from the US Census, 2019 ACS was applied to each affected parcel; (3) Average annual damages are estimated to be negligible/zero in Margate and Longport. These two areas are subject to regular surveys by NJBPN, and results indicate that the likely natural shoreline change regimes in these areas are accreting; (4) Average annual damages are estimated to be negligible in Pleasantville and Egg Harbor Township because the beach/erodible shorelines in these areas are on the bay side and, while erodible, are subject to erosion rates far less than the rates of 2 to 3 feet per year that are observed on the immediate coast. (5) Average annual damages are estimated to be negligible with ongoing renourishment in Atlantic City, Brigantine, and Ventnor based on local commitments to renourishment and demonstrated protection of the built environment observed during Superstorm Sandy. SOURCE: NJDEP: Shoreline Type, 1993, with modifications by AECOM to reflect current oceanfront conditions: Atlantic County Parcel data, 2021

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**Table 3c.7**  
**Potential Annualized Losses from Coastal Erosion by Jurisdiction**

Jurisdiction	Estimated Population At Risk (Residing Within 120 Feet of Beach/ Erodible Shoreline Types)	Total Value of Improvements (Buildings)	Total Value of Buildings Located Within 120 Feet of Beach/ Erodible Shoreline Types	Percent of Total Building Value Located Within 120 Feet of Beach/ Erodible Shoreline Types	Average Annual Building Damages Directly Attributable to Coastal Erosion <i>Absent Beach Nourishment and Shoreline Stabilization Practices</i>	Average Annual Building Damages Directly Attributable to Coastal Erosion <i>Assuming Continued Beach Nourishment and Shoreline Stabilization Practices</i>
Absecon, City of	0	\$393,695,000	\$0	0%	\$0	\$0
Atlantic City, City of	48	\$3,812,061,000	\$23,780,285	0.62%	\$594,507	Negligible
Brigantine, City of	293	\$1,013,271,000	\$6,449,725	0.64%	\$161,243	Negligible
Buena, Borough of	0	\$223,248,000	\$0	0%	\$0	\$0
Buena Vista, Township of	0	\$458,557,000	\$0	0%	\$0	\$0
Corbin City, City of	0	\$32,062,000	\$0	0%	\$0	\$0
Egg Harbor City, City of	0	\$234,888,000	\$0	0%	\$0	\$0
Egg Harbor, Township of	3	\$3,051,660,000	\$381,572	0.01%	Negligible	Negligible
Estell Manor, City of	0	\$109,654,000	\$0	0%	\$0	\$0
Folsom, Borough of	0	\$110,384,000	\$0	0%	\$0	\$0
Galloway, Township of	0	\$2,074,304,000	\$1,518	0.0001%	Negligible	Negligible
Hamilton, Township of	0	\$1,503,610,000	\$0	0%	\$0	\$0
Hammonton, Town of	0	\$1,064,061,000	\$0	0%	\$0	\$0
Linwood, City of	0	\$525,896,000	\$0	0%	\$0	\$0
Longport, Borough of	0	\$415,591,000	\$0	0%	\$0	\$0
Margate City, City of	0	\$1,230,983,000	\$0	0%	\$0	\$0
Mullica, Township of	0	\$320,889,000	\$0	0%	\$0	\$0
Northfield, City of	0	\$548,660,000	\$0	0%	\$0	\$0
Pleasantville, City of	12	\$831,985,000	\$230,312	0.03%	Negligible	\$Negligible
Port Republic, City of	0	\$75,041,000	\$0	0%	\$0	\$0
Somers Point, City of	0	\$773,084,000	\$0	0%	\$0	\$0
Ventnor City, City of	60	\$733,553,000	\$4,535	0.001%	Negligible	Negligible
Weymouth, Township of	0	\$106,184,000	\$0	0%	\$0	\$0
<b>Total</b>	<b>415</b>	<b>\$19,643,321,000</b>	<b>\$30,847,947</b>	<b>0.16%</b>	<b>\$755,750</b>	<b>Negligible</b>

As mentioned in the Hazard Profiles section, sea level rise will increase the risk of damages/losses due to future coastal erosion and flood events. Rising sea level over time will shorten the return period (increasing the frequency) of episodic coastal erosion. This increased probability clearly will have an effect on the estimation of annualized loss/damage, but one that is typically only analyzed during detailed feasibility studies for projects proposed by the US Army Corps of Engineers.

While there is general agreement that sea levels have been rising for many years and are likely to continue to do so, there is, as the 2019 New Jersey State Hazard Mitigation plan says, no coordinated interagency effort to identify agreed upon estimates for projections of sea level rise. Almost all studies and analyses of sea level rise present a range of projections based on an array of future carbon emissions scenarios. The 2019 New Jersey State Plan recommends quantifying the vulnerability to future sea level rise using two projections taken from the Rutgers Science and Technical Advisory Panel (STAP) Report of 2016. These two scenarios project one foot of sea level rise occurring by 2050 and three feet of sea level rise by 2100.

**Table 3c.8** shows estimates of the number of at risk parcels in residential areas and the corresponding estimate of the population affected by jurisdiction, using Atlantic County GIS parcel data and digital sea level rise inundation data from the National Oceanic and Atmospheric Administration’s Sea Level Rise Viewer website<sup>23</sup>. During the analysis a horizontal offset of 10 feet was added to the landward extent of the sea level rise inundation layers to capture parcels not directly inundated by the projected sea level rise but which would be rendered uninhabitable by permanent flooding of the surrounding streets.

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<sup>23</sup> <https://coast.noaa.gov/digitalcoast/tools/slr.html>

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<b>Table 3c.8</b>					
<b>Estimated Parcels and Population at Risk from Sea Level Rise</b>					
<b>Municipality</b>	<b>Average Household Size*</b>	<b>1 Foot Sea Level Rise</b>		<b>3 Feet Sea Level Rise</b>	
		<b>At-Risk Parcels in Residential Areas**</b>	<b>Estimated At-Risk Population in Residential Areas**</b>	<b>At-Risk Parcels in Residential Areas**</b>	<b>Estimated At-Risk Population in Residential Areas**</b>
Absecon, City of	2.6	117	304	197	512
Atlantic City, City of	2.4	579	1,390	4,875	11,700
Brigantine, City of	2.2	825	1,815	2,816	6,195
Buena Vista, Township of	n/a	0	0	0	0
Buena, Borough of	n/a	0	0	0	0
Corbin City, City of	2.6	25	65	61	159
Egg Harbor City, City of	2.7	79	213	86	232
Egg Harbor, Township of	3	424	1,272	796	2,388
Estell Manor, City of	2.7	2	5	16	43
Folsom, Borough of	n/a	0	0	0	0
Galloway, Township of	2.6	103	268	124	322
Hamilton, Township of	2.6	207	538	230	598
Hammonton, Town of	n/a	0	0	0	0
Linwood, City of	2.6	93	242	168	437
Longport, Borough of	1.9	121	135	864	1,642
Margate City, City of	2	324	648	1,521	3,042
Mullica, Township of	2.87	236	677	267	766
Northfield, City of	2.68	29	78	39	105
Pleasantville, City of	3	59	177	90	270
Port Republic, City of	2.6	72	187	89	231
Somers Point, City of	2.4	178	427	305	732
Ventnor City, City of	2.3	372	856	2,094	4,816
Weymouth, Township of	2.4	55	132	67	161
<b>Total</b>		<b>3,900</b>	<b>9,429</b>	<b>14,705</b>	<b>34,351</b>

\*US Census Bureau, ACS 2019

\*\* Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021. Parcels that did not have a match in Atlantic County tax data are assumed to be Category 2-Residential

## **Dam Failure**

### **Impacts – Dam Failure**

Dam failure presents a significant potential for disaster, in that significant loss of life and property would be expected in addition to the possible loss of power and water resources. The most common cause of dam failure is prolonged rainfall that produces flooding. Failures due to other natural events such as hurricanes, earthquakes or landslides are significant because there is generally little or no advance warning. The best way to mitigate dam failure is through the proper construction, inspection, maintenance and operation of dams, as well as maintaining and updating Emergency Action Plans for use in the event of a dam failure.

### **Exposure and Damage Estimates – Dam Failure**

Of the eight “high” or “significant” hazard dams in Atlantic County, only one has been classified by USGS as a “major” dam and represents the most significant hazard risk based on the potential consequences of a dam failure. Major dams are described as 50 feet or more in height, or with a normal storage capacity of 5,000 acre-feet or more, or with a maximum storage capacity of 25,000 acre-feet or more. In Atlantic County, this includes the Lake Lenape Dam along the Great Egg Harbor River (located in, and owned by, Hamilton Township). The most accurate method to estimate exposure and potential losses to the dam failure hazard relies on data produced through detailed dam failure inundation studies, often prepared by the owners of dam facilities as part of their own emergency action plans. Inundation mapping for the Lake Lenape Dam was not readily available at the time of the preparation of the initial hazard mitigation plan. However, during the first plan maintenance cycle, the mapping was located and is now maintained in the Atlantic County Department of Engineering. In July 2002, the County digitized a dam break inundation limits map prepared by O’Brien & Gere Engineers, Inc., dated January 1992; all inundation limit lines were directly from this map and were still current as of the time this section of the plan was being updated in 2021. While the dam itself is in Hamilton Township, the mapped inundation area extends beyond Hamilton Township and into Egg Harbor Township, Weymouth Township, and the City of Estell Manor. The value of improvements and population at risk was estimated based on the proportion of parcel area within estimated inundation areas (for example, if 10 percent of the parcel area was within a mapped area of inundation during a breach of the dam, 10 percent of the value of improvements on that parcel were also assumed to be at risk). The population at risk was estimated assuming that each residential parcel contained one household, with the average number of persons per household applied by municipality (U.S. Census Bureau, American Community Survey, 2019). **Table 3c.9** shows population and building value exposure to dam failure by jurisdiction for the major, high hazard, Lake Lenape Dam.



<b>Table 3c.9</b>		
<b>Exposure in Dam Failure Hazard Areas for Lake Lenape Dam</b>		
<b>Jurisdiction</b>	<b>Population At-Risk</b>	<b>Value of Improvements At-Risk</b>
Egg Harbor, Township of	177	\$7,938,900
Estell Manor, City of	8	\$167,400
Hamilton, Township of	1,074	\$63,920,400
Weymouth, Township of	485	\$28,748,300
<b>Total</b>	<b>1,744</b>	<b>\$100,775,000</b>

*Source: Atlantic County Department of Engineering; Inundation Area, 2002. NJGIN: Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021.*

Protection of human life through administration of proper emergency notification and evacuation planning, and proper implementation of the emergency action plan, is crucial to minimizing social losses due to dam failure. Because the probability of occurrence of any dam failure event cannot be reliably estimated (and would reasonably be expected to be very low), it is assumed that while one major event may result in significant losses, annualizing structural losses over a long period of time would most likely yield a negligible annualized loss estimate for jurisdictions exposed to this hazard.

## Drought

### Impacts – Drought

Droughts are slow onset hazards, but, over time, they can severely affect crops, municipal water supplies, recreational resources, and wildlife. If drought conditions extend over a number of years, the direct and indirect economic impacts can be significant. High temperatures, high winds, and low humidity can worsen drought conditions and also make areas more susceptible to wildfire. In addition, human actions and demands for water resources can accelerate drought-related impacts.

### Exposure and Damage Estimates – Drought

Because drought impacts large areas and crosses jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted. However, drought impacts are mostly experienced in water shortages and crop losses on agricultural lands and have no impact on buildings. To estimate land exposure to drought, agricultural land acreage was acquired from NJDEP land use / land cover classification data (2019). **Table 3c.10** shows agricultural land acreage in Atlantic County by jurisdiction. Agricultural land consists of cropland and pastureland; orchards, vineyards, nurseries, and horticultural areas; and areas of confined feeding operations and other agricultural uses. Approximately 9.2 percent of land in Atlantic County is used for agriculture; located in 17 of the County's 23 jurisdictions.



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<b>Table 3c.10</b>					
<b>Acreage of Agricultural Land by Jurisdiction</b>					
<b>Jurisdiction</b>	<b>Land Area (Acres)</b>	<b>Area of Agricultural Land (Acres)</b>	<b>Percentage of Municipal Land Devoted to Agricultural Uses</b>	<b>Area of Cultivated Cropland<sup>24</sup> (Acres)</b>	<b>Proportion of Cultivated Cropland (as percentage of County total)</b>
Absecon, City of	3,453	4	0.1%	2	0.1%
Atlantic City, City of	6,878	0	0.0%	0	0.0%
Brigantine, City of	4,088	0	0.0%	0	0.0%
Buena, Borough of	4,850	3,732	76.9%	3,583	73.9%
Buena Vista, Township of	26,274	5,434	20.7%	4,818	18.3%
Corbin City, City of	4,906	217	4.4%	175	3.6%
Egg Harbor City, City of	6,997	120	1.7%	104	1.5%
Egg Harbor, Township of	42,623	776	1.8%	501	1.2%
Estell Manor, City of	34,125	659	1.9%	527	1.5%
Folsom, Borough of	5,249	647	12.3%	622	11.9%
Galloway, Township of	57,008	3,110	5.5%	2,466	4.3%
Hamilton, Township of	71,121	3,766	5.3%	2,409	3.4%
Hammonton, Town of	26,168	9,124	34.9%	8,006	30.6%
Linwood, City of	2,474	12	0.5%	12	0.5%
Longport, Borough of	247	0	0.0%	0	0.0%
Margate City, City of	906	0	0.0%	0	0.0%
Mullica, Township of	36,110	4,899	13.6%	4,156	11.5%
Northfield, City of	2,178	8	0.4%	8	0.4%
Pleasantville, City of	3,644	0	0.0%	0	0.0%
Port Republic, City of	4,788	89	1.9%	70	1.5%
Somers Point, City of	2,579	1	0.0%	1	0.0%
Ventnor City, City of	1,249	0	0.0%	0	0.0%
Weymouth, Township of	7,737	236	3.0%	126	1.6%
<b>Total</b>	<b>355,651</b>	<b>32,833</b>	<b>9.2%</b>	<b>27,585</b>	<b>7.8%</b>

*Source: NJDEP GIS: Land Use/Land Cover, 2021; NJGIN: Municipal Boundary, 2014*

The USDA 2017 Census of Agriculture County Profile for Atlantic County was used to analyze the exposure of Atlantic County crops to drought. It was assumed that the exposure of crops was equal to the total value of crops sold (\$120,673,000). This represents roughly a 2 percent decrease since the last version of the plan was prepared (when the value of crops sold in 2012 was \$123,140,000).

For the 2010 Plan, to estimate losses due to drought, the NOAA NCDC database was evaluated for drought events. The database included three drought events in the period from 1995 to 2009 causing crop damages varying from total losses to 30 to 50 percent reductions in yield, depending on the crop. Based on this data, it was projected that significant crop-damaging droughts occur in Atlantic County approximately once every five years, during which the average reduction in crop yield is 25 percent, for a total annualized damage of almost \$6,291,000 million county-wide. This total was distributed amongst the county's municipalities according to the

<sup>24</sup> Cropland, pastureland, orchards, vineyards, nurseries and horticultural areas.

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total acreage of agricultural land in each, to derive estimated annual losses by jurisdiction. Due to database limitations, it was assumed that crops of different type and sale value were distributed equally across the various municipalities.

For this plan update, NCEI historical drought loss data was once again queried, this time for records current as of May 2021<sup>25</sup>. The data includes a total of 38 periods of drought between June 1997<sup>26</sup> and May 2021, the most recent of which was in October 2010. However, the event records estimated \$0 in both property and crop damages for these events. This was presumed to be a function of ongoing changes to the NCDC data set, as opposed to true zero dollar losses, because episode narratives did present descriptions of often significant losses for these same events, but not in a manner that would permit an accurate breakdown of losses by jurisdiction or even by County.

Using the methodology employed previously, and updating with the most recent 2017 Agriculture Census report of crop sales of \$120.7 million, results in an estimated \$30.2 million reduction in sales (25 percent) once every five years; or an annualized loss estimate for the County of \$6.033 million. Distributing across the 17 jurisdictions with land in agriculture based on the proportion of County agricultural land in the community generates derived losses per jurisdiction, shown in **Table 3c.11**.

Jurisdiction	Estimated Population At Risk*	Area of Cultivated Cropland <sup>27</sup> (Acres)	Proportion of Cultivated Cropland (as percentage of Countywide total)	Annualized Estimated Crop Losses (\$)
Absecon, City of	8,362	2	0.0%	\$500
Atlantic City, City of	37,999	0	0.0%	\$0
Brigantine, City of	8,832	0	0.0%	\$0
Buena, Borough of	4,356	3,583	13.0%	\$783,600
Buena Vista, Township of	7,295	4,818	17.5%	\$1,053,800
Corbin City, City of	537	175	0.6%	\$38,300
Egg Harbor City, City of	4,100	104	0.4%	\$22,700
Egg Harbor, Township of	42,714	501	1.8%	\$109,500
Estell Manor, City of	1,728	527	1.9%	\$115,300
Folsom, Borough of	1,697	622	2.3%	\$136,100
Galloway, Township of	36,094	2,466	8.9%	\$539,400
Hamilton, Township of	25,973	2,409	8.7%	\$526,800
Hammonton, Town of	14,139	8,006	29.0%	\$1,751,000
Linwood, City of	6,742	12	0.0%	\$2,700
Longport, Borough of	869	0	0.0%	\$0
Margate City, City of	5,997	0	0.0%	\$0
Mullica, Township of	5,925	4,156	15.1%	\$909,100
Northfield, City of	8,153	8	0.0%	\$1,700
Pleasantville, City of	20,301	0	0.0%	\$0
Port Republic, City of	1,121	70	0.3%	\$15,400
Somers Point, City of	10,321	1	0.0%	\$100

<sup>25</sup> Queried on and still current as of May 2021; with data through May 2021.

<sup>26</sup> Events between 1950 and 1997 were not included in the NCEI database and, therefore, are not accounted for in this analysis.

<sup>27</sup> Cropland, pastureland, orchards, vineyards, nurseries and horticultural areas.

<b>Jurisdiction</b>	<b>Estimated Population At Risk*</b>	<b>Area of Cultivated Cropland<sup>27</sup> (Acres)</b>	<b>Proportion of Cultivated Cropland (as percentage of Countywide total)</b>	<b>Annualized Estimated Crop Losses (\$)</b>
Ventnor City, City of	10,095	0	0.0%	\$0
Weymouth, Township of	2,755	126	0.5%	\$27,600
<b>Total</b>	<b>266,105</b>	<b>27,585</b>	<b>100.0%</b>	<b>\$6,033,700</b>

\* Since the drought hazard area is countywide, 100 percent of the population is exposed and potentially at risk.

## Flooding

### Impacts – Flooding

Flooding can cause widespread damage throughout rural and urban areas, causing loss of life, injury, and severe structural damage to buildings, damaged or destroyed building contents, loss of function for flooded facilities, flooded roadways causing lengthy detour times and increased emergency response times, deposition of debris in and out of channels; damages to utility and communication networks; and agriculture losses. Flooding can cause damages to property, infrastructure, agriculture, and the environment. Local communities often bear the brunt of costs for emergency responders to provide guidance during the response phase, and lead the community through what is often a long recovery process thereafter. Buildings, roads, and bridges can be damaged or destroyed. Crops can be lost when farm fields are flooded. Functional downtime of businesses and/or damage to merchandise and equipment can have staggering impacts. Flooding can also cause sewage to backup into houses through drainpipes where backflow valves are not present. Unanchored fuel tanks can be easily moved by floodwater, causing environmental damage. When government facilities or critical facilities such as police stations, fire stations, hospitals, etc. are flooded – or where access routes to these structures are impassable due to floodwaters – impacts are even greater, with the community's ability to effectively and efficiently govern, provide emergency services and critical care for the injured. While recovery from these impacts can be quick for small-scale, short-duration events; larger events can cripple a community for weeks, months, and years to follow.

### Exposure and Damage Estimates – Flooding

Where available, FEMA's 2021 Digital Flood Insurance Rate Maps (DFIRMs) were overlaid upon the Atlantic County Parcel data (2021) to identify the flood risk areas for all municipalities in Atlantic County. In other areas, the 2014 DFIRM flood mapping was used, and the collated data is presented in **Tables 3c.12 and 3c.13**. All parcels that were intersected at any point by the DFIRM hazard area shape files were counted, and impacted improved property values were calculated by applying a percentage of the parcel area within the hazard area to the total improved value associated with that parcel to account for the uncertainty regarding the location of the structure(s) within each parcel, since without building footprint data it cannot be automatically assumed that all improvements lie exactly at the center of their associated parcels.

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In total, 35 percent of the County's land area lies within high or moderate flood risk zones<sup>28</sup>, according to the Preliminary DFIRM mapping data. The Borough of Longport has the highest proportion of land area within a high flood risk zone at 100 percent, followed closely by the City of Margate City (96 percent) and City of Brigantine (96 percent) and City of Atlantic City (95 percent), and City of Ventnor City (93 percent). The next highest is the City of Corbin City with 74 percent. For comparison purposes, the average Atlantic County community has 45 percent of its land area in high risk flood zones, ranging from a low of 14. percent in Buena Borough to 100 percent in the Borough of Longport.

The GIS analysis indicates that the Borough of Longport, City of Margate City, City of Brigantine, City of Ventnor City, and City of Atlantic City have the greatest proportions of improved property values in high flood risk zones, with 100, 97, 88, 86 and 79 percent in each municipality, respectively. For every other municipality in the County, the proportion of improved property within the mapped high flood risk zone is less than 27 percent. The average community value of improvements in high risk flood zones in Atlantic County is \$296 million; ranging from a minimum of \$1.5 million in Buena Borough to a maximum of \$3 billion in Atlantic City, followed by Margate with \$1.2 billion, and Brigantine with \$890 million. The distribution in high risk flood zones is as follows:

- Two communities between \$1 billion and \$5 billion;
- Two communities between \$500 million and \$1 billion;
- Three communities between \$100 million and \$500 million;
- Eight communities between \$10 million and \$100 million; and
- Eight communities between \$1 million and \$10 million.

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<sup>28</sup> FEMA Flood Zones A, AE, and VE

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**Table 3c.12**  
**Acres of Land in Flood Hazard Areas by Municipality<sup>29</sup>**

Municipality	Total Land Area (Acres)	High Flood Risk (Acres)		Moderate Flood Risk (Acres)	Low Flood Risk (Acres)	Land in High Flood Risk %		Land in Moderate Flood Risk %
		VE	A, AE	X500	X	VE	A, AE	X500
Absecon, City of	3,611	360	1,412	148	1,691	10.0%	39.1%	4.1%
Atlantic City, City of	7,008	1,263	5,376	129	239	18.0%	76.7%	1.8%
Brigantine, City of	4,544	738	3,631	164	10	16.2%	79.9%	3.6%
Buena, Borough of	4,845	0	68	0	4,776	0.0%	1.4%	0.0%
Buena Vista, Township of	26,299	0	1,180	2	25,117	0.0%	4.5%	0.0%
Corbin City, City of	4,941	71	3,571	87	1,212	1.4%	72.3%	1.8%
Egg Harbor City, City of	6,971	0	3,226	312	3,433	0.0%	46.3%	4.5%
Egg Harbor, Township of	42,972	1,088	9,982	728	31,175	2.5%	23.2%	1.7%
Estell Manor, City of	33,658	108	8,671	480	24,399	0.3%	25.8%	1.4%
Folsom, Borough of	5,290	0	1,344	93	3,854	0.0%	25.4%	1.8%
Galloway, Township of	56,746	5,817	15,377	571	34,982	10.3%	27.1%	1.0%
Hamilton, Township of	71,024	0	13,755	671	56,597	0.0%	19.4%	0.9%
Hammonton, Town of	26,099	0	1,544	48	24,504	0.0%	5.9%	0.2%
Linwood, City of	2,448	277	859	95	1,217	11.3%	35.1%	3.9%
Longport, Borough of	260	35	224	0	0	13.5%	86.2%	0.0%
Margate City, City of	915	38	844	30	3	4.2%	92.2%	3.3%
Mullica, Township of	36,028	0	5,687	259	30,083	0.0%	15.8%	0.7%
Northfield, City of	2,292	0	369	29	1,895	0.0%	16.1%	1.3%
Pleasantville, City of	3,663	118	1,229	50	2,266	3.2%	33.6%	1.4%
Port Republic, City of	4,801	231	2,516	262	1,793	4.8%	52.4%	5.5%
Somers Point, City of	2,575	159	1,067	142	1,206	6.2%	41.4%	5.5%
Ventnor City, City of	1,243	71	1,089	73	10	5.7%	87.6%	5.9%
Weymouth, Township of	7,605	0	1,314	191	6,101	0.0%	17.3%	2.5%
<b>Total</b>	<b>355,838</b>	<b>10,373</b>	<b>84,332</b>	<b>4,565</b>	<b>256,565</b>	<b>2.9%</b>	<b>23.7%</b>	<b>1.3%</b>

Source: FEMA: DFIRM 2021, where available, otherwise Preliminary DFIRM Data, 2014; NJGIN: Municipal Boundary, 2021 and Atlantic County Lakes, Open Water areas.

<sup>29</sup> Zones A/AE (100-year floodplain), Zone VE (100-year coastal flood zones, associated with wave action), Zone X500 (500-year floodplain), and Zone X (areas above the 500-year floodplain)

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.13**  
**Improved Values in Flood Hazard Areas by Municipality (\$million)**

Municipality	Total Value of Improvements	Improved Value in High Flood Risk Areas		Improved Value in Moderate Flood Risk Areas	Improved Value in Low Flood Risk Areas	Improved Value in High Flood Risk Areas %		Improved Value in Moderate Flood Risk Areas %
		VE	A, AE	X500	X	VE	A, AE	X500
Absecon, City of	\$393.695	\$0.094	\$35.761	\$15.556	\$342.283	0.0%	9.1%	4.0%
Atlantic City, City of	\$3,812.061	\$56.046	\$2,948.978	\$173.488	\$633.549	1.5%	77.4%	4.6%
Brigantine, City of	\$1,013.271	\$5.325	\$884.052	\$120.170	\$3.724	0.5%	87.2%	11.9%
Buena, Borough of	\$223.248	\$0	\$1.503	\$0	\$221.745	0.0%	0.7%	0.0%
Buena Vista, Township of	\$458.557	\$0	\$4.502	\$0.015	\$454.039	0.0%	1.0%	0.0%
Corbin City, City of	\$32.062	\$0	\$8.515	\$1.756	\$21.790	0.0%	26.6%	5.5%
Egg Harbor City, City of	\$234.888	\$0	\$5.602	\$2.197	\$227.089	0.0%	2.4%	0.9%
Egg Harbor, Township of	\$3,051.660	\$6.051	\$148.136	\$25.502	\$2,871.972	0.2%	4.9%	0.8%
Estell Manor, City of	\$109.654	\$0	\$2.824	\$0.568	\$106.261	0.0%	2.6%	0.5%
Folsom, Borough of	\$110.384	\$0	\$8.405	\$3.928	\$98.051	0.0%	7.6%	3.6%
Galloway, Township of	\$2,074.304	\$0.464	\$52.520	\$4.416	\$2,016.905	0.0%	2.5%	0.2%
Hamilton, Township of	\$1,503.610	\$0	\$60.137	\$11.274	\$1,432.200	0.0%	4.0%	0.7%
Hammonton, Town of	\$1,064.061	\$0	\$25.613	\$3.040	\$1,035.408	0.0%	2.4%	0.3%
Linwood, City of	\$525.896	\$1.529	\$58.626	\$31.346	\$434.394	0.3%	11.1%	6.0%
Longport, Borough of	\$415.591	\$3.065	\$412.526	\$0	\$0.000	0.7%	99.3%	0.0%
Margate City, City of	\$1,230.983	\$8.974	\$1,183.647	\$35.864	\$2.499	0.7%	96.2%	2.9%
Mullica, Township of	\$320.889	\$0	\$45.404	\$2.876	\$272.608	0.0%	14.1%	0.9%
Northfield, City of	\$548.660	\$0	\$7.252	\$5.767	\$535.641	0.0%	1.3%	1.1%
Pleasantville, City of	\$831.985	\$1.334	\$31.974	\$8.196	\$790.481	0.2%	3.8%	1.0%
Port Republic, City of	\$75.041	\$1.391	\$16.593	\$5.291	\$51.766	1.9%	22.1%	7.1%
Somers Point, City of	\$773.084	\$5.767	\$128.967	\$72.418	\$565.932	0.7%	16.7%	9.4%
Ventnor City, City of	\$733.553	\$0.059	\$630.313	\$103.182	\$0.000	0.0%	85.9%	14.1%
Weymouth, Township of	\$106.184	\$0	\$9.097	\$12.585	\$84.501	0.0%	8.6%	11.9%
<b>Total</b>	<b>\$19,643.323</b>	<b>\$90.099</b>	<b>\$6,710.948</b>	<b>\$639.436</b>	<b>\$12,202.839</b>	<b>0.5%</b>	<b>34.2%</b>	<b>3.3%</b>

Source: FEMA: DFIRM 2021/Preliminary DFIRM Data, 2014, Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021

## **Damage Estimates – Riverine Flooding**

Previous versions of the plan used a variety of methods to estimate annual damages from flooding. The 2010 Update used historic NCEI damage records to estimate annual damages from flooding and the 2016 Update used a combination of historic NCEI damage records and NFIP claims to estimate annual damages from flooding. However, the 2016 Update acknowledged the following limitations with previous methods to estimate annual flood damages:

- NCEI data covers only a relatively short period of record – 25 years. Second, it would therefore appear to be possible that the NCEI data set may not be capturing all losses.
- Of the 127 events identified in the NCEI database to have occurred in Atlantic County, zero dollars in damage are reported for the majority of flood event records (115) despite the fact that many of these events have narratives that qualitatively describe damages occurring in Atlantic County.
- NFIP data does not reflect losses incurred on properties that do not maintain flood insurance. Statistical experience shows that only about 20 percent of properties in the floodplain generally maintain flood insurance<sup>30</sup>. Furthermore, NFIP coverage is capped and therefore claims may not pay for all incurred damages.

For this plan update HAZUS was used to generate county-wide estimates of damage resulting from purely riverine flood events. **Table 3c.14** presents the estimated total losses from all sources for events that have annual probabilities of exceedance of 10%, 2%, 1%, and 0.2% of being equaled or exceeded. **Table 3c.14** also includes annual average losses and annualized loss ratios for all jurisdictions in Atlantic County. As with the analysis of hurricane losses above, this analysis used the baseline default building replacement values within the model, in line with standard practice for the estimation of flood damages for risk reduction planning purposes.

Based on this analysis, a riverine flood event affecting the whole county with an annual chance of exceedance of 1% would be expected to incur \$87 million in total losses. Detailed inspection of the HAZUS model output for the 1% annual chance probability event (the “100-year” flood) indicates that 45% of losses in that event are residential in origin, while 33% are of commercial origin, and 5% attributable to industry. The remaining 17% is generated by losses from other sources such as public and government buildings.

HAZUS has the capacity to distinguish between riverine flooding and coastal flooding, and to analyze and output losses from each source separately. Later in this section coastal flooding damages generated using HAZUS are presented in the section on storm surge vulnerability and losses, since coastal flooding is not riverine in origin, rather it is generated by offshore meteorological events and the delineation of flood hazard areas may not distinguish between the two sources.

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<sup>30</sup> FEMA HARRP-2000



**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

<b>Table 3c.14</b>							
<b>Riverine Flood Damages as Estimated by HAZUS (\$million)</b>							
<b>Jurisdiction</b>	<b>HAZUS Building Replacement Value</b>	<b>Total Losses, 10% ACE Event ("10-Year")</b>	<b>Total Losses, 2% ACE Event ("50-Year")</b>	<b>Total Losses, 1% ACE Event ("100-Year")</b>	<b>Total Losses, 0.2% ACE Event ("500-Year")</b>	<b>Annual Average Total Losses</b>	<b>Annualized Loss Ratio</b>
City of Absecon	\$1,267	\$0	\$0.183	\$0.216	\$0.422	\$0.006	0.0005%
City of Atlantic City	\$7,929	\$0	\$0	\$0	\$0	\$0	0%
City of Brigantine	\$2,561	\$0	\$0	\$0	\$0	\$0	0%
Borough of Buena	\$562	\$0	\$0	\$0	\$0	\$0	0%
Township of Buena Vista	\$944	\$0.996	\$1.396	\$2.166	\$5.384	\$0.144	0.0153%
City of Corbin City	\$79	\$2.562	\$3.838	\$4.530	\$7.619	\$0.341	0.4307%
City of Egg Harbor City	\$665	\$3.127	\$4.349	\$4.881	\$6.148	\$0.392	0.0590%
Township of Egg Harbor	\$6,286	\$0	\$0	\$3.377	\$4.513	\$0.043	0.0007%
City of Estell Manor	\$258	\$0.009	\$0.030	\$0.051	\$0.104	\$0.001	0.0004%
Borough of Folsom	\$287	\$4.529	\$18.161	\$26.214	\$45.064	\$1.160	0.4048%
Township of Galloway	\$5,139	\$0	\$0	\$0	\$0.115	\$0.000	0.0000%
Township of Hamilton	\$3,563	\$11.657	\$19.069	\$33.325	\$54.678	\$1.767	0.0496%
Town of Hammonton	\$2,080	\$0.604	\$0.729	\$0.770	\$0.867	\$0.068	0.0033%
City of Linwood	\$1,235	\$0	\$0	\$0.111	\$0.276	\$0.001	0.0001%
Borough of Longport	\$488	\$0	\$0	\$0	\$0	\$0	0%
City of Margate City	\$2,038	\$0	\$0	\$0	\$0	\$0	0%
Township of Mullica	\$818	\$4.694	\$7.566	\$10.046	\$34.170	\$0.747	0.0913%
City of Northfield	\$1,492	\$0.000	\$0.000	\$1.190	\$1.771	\$0.015	0.0010%
City of Pleasantville	\$2,166	\$0	\$0	\$0	\$0	\$0	0%
City of Port Republic	\$196	\$0.003	\$0.003	\$0.005	\$0.008	\$0.000	0%
City of Somers Point	\$1,781	\$0	\$0	\$0	\$0	\$0	0%
City of Ventnor City	\$2,023	\$0	\$0	\$0	\$0	\$0	0%
Township of Weymouth	\$257	\$0	\$0.020	\$0.025	\$0.132	\$0.001	0.0004%
<b>Atlantic County Total</b>	<b>\$44,114</b>	<b>\$28.181</b>	<b>\$55.344</b>	<b>\$86.907</b>	<b>\$161.271</b>	<b>\$4.686</b>	<b>0.011%</b>

## **Storm Surge**

### **Impacts – Storm Surge**

Storm surge can be devastating to coastal regions causing flooding; wave runup; dune overwash; severe beach erosion. In barrier island systems, backbay areas (both coastal as well as mainland areas) are often spared some of the more severe effects of direct wave action but can still incur significant damages as storm surge piles up along the coast and drives up backbay tide levels. Storm surge impacts often extend beyond the immediate ocean coastline and backbay areas to some areas up to a mile or more inland as riverine regions experience backwater effects from storm surge being driven upriver from coastal estuaries. Water can rise very rapidly due to storm surge, posing a serious threat to people remaining in inundation areas. Depending on the nature of the particular storm system, high water levels can extend over several tidal cycles, often increasing the severity of damages as well as degree of life safety impacts.

### **Exposure and Damage Estimates – Storm Surge**

Storm surge is a unique flood hazard which is associated with storms of tropical origin, which differs from other types of coastal flood events covered within the flood damage estimates. A total of 20 jurisdictions have land exposed to the storm surge hazard. In order to assess storm surge risk, two distinct vulnerability assessment approaches were applied for Atlantic County in order to estimate exposure and potential losses to storm surge events.

Coastal flood inundation zone maps were derived from georeferenced data produced by the National Oceanic and Atmospheric Administration (NOAA). Storm surge data was provided from NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) data (2018). SLOSH is a modeling tool used to estimate storm surge resulting from historical, hypothetical or predicted hurricanes. In this analysis, color-coded storm surge inundation areas were created and overlaid with parcel and Census block data, defining the potential maximum surge for coastal locations in Atlantic County and the number of people and value of improved property in these areas.

To estimate exposure to storm surge, the determination of value and population at risk was calculated through GIS analysis by calculating the proportion of a parcel or census block lying within an identified storm surge zone (Category 1-4 storm events), and applying that same ratio to the Census block population and parcel value to estimate population at risk and value of improvements at risk, as presented in **Tables 3c.15, 16 and 17**.

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.15**  
**Acres of Land in Surge Hazard Areas by Municipality**

Municipality	Total Municipal Land Area (Acres)	Area of Municipal Land in Surge Hazard Areas (Acres)				Percent of Municipal Land in Surge Hazard Areas (%)			
		Category 1	Category 2	Category 3	Category 4	Category 1	Category 2	Category 3	Category 4
Absecon, City of	3,611	1,609	2,220	2,573	2,803	44.6%	61.5%	71.3%	77.6%
Atlantic City, City of	7,008	5,487	6,393	6,539	6,625	78.3%	91.2%	93.3%	94.5%
Brigantine, City of	4,544	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Buena, Borough of	4,845	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Buena Vista, Township of	26,299	3,314	4,023	4,060	4,091	12.6%	15.3%	15.4%	15.6%
Corbin City, City of	4,941	3,346	3,869	4,362	4,851	67.7%	78.3%	88.3%	98.2%
Egg Harbor City, City of	6,971	2,332	3,150	3,832	4,315	33.5%	45.2%	55.0%	61.9%
Egg Harbor, Township of	42,972	8,952	11,605	14,477	17,305	20.8%	27.0%	33.7%	40.3%
Estell Manor, City of	33,658	6,657	8,620	11,834	15,003	19.8%	25.6%	35.2%	44.6%
Folsom, Borough of	5,290	0	0	0	0	0.0%	0.0%	0.0%	0.0%
Galloway, Township of	56,746	16,411	18,242	19,957	21,881	28.9%	32.1%	35.2%	38.6%
Hamilton, Township of	71,024	181	779	3,486	8,546	0.3%	1.1%	4.9%	12.0%
Hammonton, Town of	26,099	0	0	26	633	0.0%	0.0%	0.1%	2.4%
Linwood, City of	2,448	1,025	1,458	1,784	2,091	41.9%	59.6%	72.9%	85.4%
Longport, Borough of	260	252	255	256	257	96.9%	98.1%	98.5%	98.8%
Margate City, City of	915	831	901	902	904	90.8%	98.5%	98.6%	98.8%
Mullica, Township of	36,028	1,338	2,280	4,876	9,265	3.7%	6.3%	13.5%	25.7%
Northfield, City of	2,292	311	489	997	1,542	13.6%	21.3%	43.5%	67.3%
Pleasantville, City of	3,663	1,222	1,469	1,772	2,085	33.4%	40.1%	48.4%	56.9%
Port Republic, City of	4,801	2,273	3,112	3,596	4,143	47.3%	64.8%	74.9%	86.3%
Somers Point, City of	2,575	960	1,597	1,891	2,166	37.3%	62.0%	73.4%	84.1%
Ventnor City, City of	1,243	950	1,200	1,204	1,212	76.4%	96.5%	96.9%	97.5%
Weymouth, Township of	7,605	790	1,240	1,313	1,351	10.4%	16.3%	17.3%	17.8%
<b>Total</b>	<b>355,838</b>	<b>58,241</b>	<b>72,905</b>	<b>89,742</b>	<b>111,075</b>	<b>16.4%</b>	<b>20.5%</b>	<b>25.2%</b>	<b>31.2%</b>

Source: NOAA: SLOSH Data, 2018; NJGIN: Municipal Boundary, 2021, 2019 Census ACS

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.16**  
**Improved Values in Surge Hazard Areas by Municipality<sup>31</sup>**

Municipality	Total Municipal Improvement Value (\$)	Value of Municipal Improvements Surge Hazard Areas (\$)				Percent of Municipal Improvements in Surge Hazard Areas			
		Category 1	Category 2	Category 3	Category 4	Category 1	Category 2	Category 3	Category 4
Absecon, City of	\$393,695,263	\$25,560,810	\$109,867,212	\$186,955,649	\$238,648,292	6.5%	27.9%	47.5%	60.6%
Atlantic City, City of	\$3,812,060,699	\$1,904,761,709	\$3,314,223,946	\$3,529,272,876	\$3,694,803,001	50.0%	86.9%	92.6%	96.9%
Brigantine, City of	\$1,013,271,279	\$674,765,264	\$1,000,313,960	\$1,002,851,646	\$1,006,658,544	66.6%	98.7%	99.0%	99.3%
Buena, Borough of	\$223,248,148	\$0	\$0	\$0	\$0	0.0%	0.0%	0.0%	0.0%
Buena Vista, Township of	\$458,556,770	\$0	\$0	\$0	\$0	0.0%	0.0%	0.0%	0.0%
Corbin City, City of	\$32,061,701	\$4,748,825	\$14,032,371	\$21,098,668	\$31,178,594	14.8%	43.8%	65.8%	97.2%
Egg Harbor City, City of	\$234,888,323	\$256,054	\$434,434	\$718,829	\$852,289	0.1%	0.2%	0.3%	0.4%
Egg Harbor, Township of	\$3,051,660,285	\$115,599,574	\$234,465,411	\$330,925,252	\$470,090,900	3.8%	7.7%	10.8%	15.4%
Estell Manor, City of	\$109,653,697	\$967,092	\$3,219,663	\$6,821,828	\$11,936,068	0.9%	2.9%	6.2%	10.9%
Folsom, Borough of	\$110,384,232	\$0	\$0	\$0	\$0	0.0%	0.0%	0.0%	0.0%
Galloway, Township of	\$2,074,304,491	\$8,392,748	\$26,292,795	\$89,125,589	\$135,446,327	0.4%	1.3%	4.3%	6.5%
Hamilton, Township of	\$1,503,610,485	\$9,581,621	\$36,828,176	\$178,661,049	\$385,247,239	0.6%	2.4%	11.9%	25.6%
Hammonton, Town of	\$1,064,061,337	\$0	\$0	\$0	\$0	0.0%	0.0%	0.0%	0.0%
Linwood, City of	\$525,895,540	\$48,827,358	\$176,300,627	\$290,986,943	\$403,632,233	9.3%	33.5%	55.3%	76.8%
Longport, Borough of	\$415,591,279	\$411,472,292	\$412,465,141	\$414,327,040	\$415,041,908	99.0%	99.2%	99.7%	99.9%
Margate City, City of	\$1,230,983,282	\$1,142,313,256	\$1,216,860,583	\$1,218,732,997	\$1,221,844,860	92.8%	98.9%	99.0%	99.3%
Mullica, Township of	\$320,888,692	\$32,542,408	\$43,627,351	\$59,168,947	\$74,841,752	10.1%	13.6%	18.4%	23.3%
Northfield, City of	\$548,659,960	\$5,109,262	\$37,077,481	\$126,729,047	\$279,637,138	0.9%	6.8%	23.1%	51.0%
Pleasantville, City of	\$831,985,384	\$26,682,952	\$77,421,820	\$176,830,953	\$292,769,647	3.2%	9.3%	21.3%	35.2%
Port Republic, City of	\$75,041,209	\$10,084,966	\$28,676,546	\$49,045,443	\$61,894,601	13.4%	38.2%	65.4%	82.5%
Somers Point, City of	\$773,083,713	\$71,513,017	\$343,663,802	\$468,012,308	\$578,531,598	9.3%	44.5%	60.5%	74.8%
Ventnor City, City of	\$733,552,937	\$472,174,052	\$729,230,095	\$730,084,182	\$731,157,735	64.4%	99.4%	99.5%	99.7%
Weymouth, Township of	\$106,183,795	\$3,281,178	\$26,584,002	\$28,551,192	\$28,663,841	3.1%	25.0%	26.9%	27.0%
<b>Total</b>	<b>\$19,643,322,501</b>	<b>\$4,968,634,438</b>	<b>\$7,831,585,416</b>	<b>\$8,908,900,438</b>	<b>\$10,062,876,567</b>	<b>25.3%</b>	<b>39.9%</b>	<b>45.4%</b>	<b>51.2%</b>

Source: NOAA: SLOSH Data, 2018, Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021

<sup>31</sup> Maximum sustained wind speeds: Category 1 = 74 to 95 miles per hour; Category 2 = 96 to 110 miles per hour; Category 3 = 111 to 129 miles per hour; Category 4 = 130 to 156 miles per hour; Category 5 = 157 miles per hour and greater. Categories 3, 4, and 5 are classified as “major” hurricanes.

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.17**

**Exposure in Storm Surge Areas by Jurisdiction**

<b>Jurisdiction</b>	<b>Estimated Population at Risk</b>	<b>Total Value of Improvements (Buildings)</b>	<b>Value of Improvements Located in Category 1-4 Storm Surge Areas</b>	<b>Percent of Municipal Improvement Value Exposed to Surge</b>
Absecon, City of	5,417	\$393,695,263	\$238,648,292	60.6%
Atlantic City, City of	38,497	\$3,812,060,699	\$3,694,803,001	96.9%
Brigantine, City of	7,716	\$1,013,271,279	\$1,006,658,544	99.3%
Buena, Borough of	0	\$223,248,148	\$0	0.0%
Buena Vista, Township of	0	\$458,556,770	\$0	0.0%
Corbin City, City of	485	\$32,061,701	\$31,178,594	97.2%
Egg Harbor City, City of	657	\$234,888,323	\$852,289	0.4%
Egg Harbor, Township of	13,150	\$3,051,660,285	\$470,090,900	15.4%
Estell Manor, City of	1,419	\$109,653,697	\$11,936,068	10.9%
Folsom, Borough of	0	\$110,384,232	\$0	0.0%
Galloway, Township of	6,464	\$2,074,304,491	\$135,446,327	6.5%
Hamilton, Township of	5,883	\$1,503,610,485	\$385,247,239	25.6%
Hammonton, Town of	91	\$1,064,061,337	\$0	0.0%
Linwood, City of	4,951	\$525,895,540	\$403,632,233	76.8%
Longport, Borough of	761	\$415,591,279	\$415,041,908	99.9%
Margate City, City of	5,317	\$1,230,983,282	\$1,221,844,860	99.3%
Mullica, Township of	1,273	\$320,888,692	\$74,841,752	23.3%
Northfield, City of	3,741	\$548,659,960	\$279,637,138	51.0%
Pleasantville, City of	10,632	\$831,985,384	\$292,769,647	35.2%
Port Republic, City of	896	\$75,041,209	\$61,894,601	82.5%
Somers Point, City of	8,651	\$773,083,713	\$578,531,598	74.8%
Ventnor City, City of	9,210	\$733,552,937	\$731,157,735	99.7%
Weymouth, Township of	144	\$106,183,795	\$28,663,841	27.0%
<b>Total</b>	<b>125,355</b>	<b>\$19,643,322,501</b>	<b>\$10,062,876,567</b>	<b>51.2%</b>

The preceding tables indicate that life and property is at risk from storm surge in all but four of Atlantic County's municipal jurisdictions, and in six of those municipalities (Atlantic City, Brigantine, Corbin City, Longport, Margate City, and Ventnor City) the proportion of life and property at risk is approaching 100%. Approximately half the County's total population and half of the total municipal improvement value are at risk from storm surge.

In previous versions of the plan a methodology was employed to estimate annual losses from storm surge using NFIP loss records and historic events with associated damage listed in the NCEI database. This method may have underestimated storm surge damage due to limitations of these datasets described above in the discussion of other hazards, hence for this plan update losses due to storm surge were estimated using HAZUS. As mentioned above, HAZUS has the capability to distinguish between riverine flooding and coastal flooding, and to analyze and output losses from each source separately. For the purposes of calculating losses in this study, "storm surge" has been taken to cover all coastal flooding events from abnormally high tides which cause backups and nuisance flooding in local drainage systems up to category 4 events in the SLOSH model, since basic riverine flooding is clearly not capturing the majority of flood events observed by the people of Atlantic County or the primary source of flooding used to generate many jurisdictional Flood Insurance Rate Maps.

The coastal flooding module in HAZUS has been used to estimate the storm surge losses presented in **Table 3c.18**, for the same array of event probabilities as for riverine flooding, using the baseline default inventory as before, but also incorporating ocean water surface elevations and associated frequencies taken directly from the County Flood Insurance Study<sup>32</sup>. The analysis was conducted for still water conditions only, i.e., without the wave action component.

As with the analysis of hurricane and riverine flood losses above, this analysis used the baseline default building replacement values within the model, in line with standard practice for the estimation of flood damages for risk reduction planning purposes.

Based on this analysis, a coastal flooding/storm surge event affecting the whole of Atlantic County with an annual chance of exceedance of 1% could be expected to result in more than \$6 billion in total losses. Detailed inspection of the HAZUS model output for the 1% annual chance probability event indicates that 54% of losses in that event are residential in origin, while 28% are of commercial origin, and 1% attributable to industry. The remaining 16% is generated by losses from other sources such as public and government buildings.

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<sup>32</sup> FEMA Flood Insurance Study for Atlantic County, study number 34001CV000A, effective August 28, 2018.

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**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.18**  
**Coastal Flood Damages as Estimated by HAZUS (\$million)**

Jurisdiction	HAZUS Building Replacement Value	Total Losses, 10% ACE Event ("10-Year")	Total Losses, 2% ACE Event ("50-Year")	Total Losses, 1% ACE Event ("100-Year")	Total Losses, 0.2% ACE Event ("500-Year")	Annual Average Total Losses	Annualized Loss Ratio
City of Absecon	\$1,267	\$0	\$43.205	\$78.693	\$145.344	\$2.108	0.17%
City of Atlantic City	\$7,929	\$871.539	\$2,525.910	\$3,192.281	\$4,875.117	\$156.164	1.97%
City of Brigantine	\$2,561	\$188.539	\$502.510	\$698.936	\$1,188.515	\$33.742	1.32%
Borough of Buena	\$562	\$0	\$0	\$0	\$0	\$0	0.00%
Township of Buena Vista	\$944	\$0	\$0	\$0	\$0	\$0	0.00%
City of Corbin City	\$79	\$5.281	\$12.224	\$14.610	\$24.760	\$0.798	1.01%
City of Egg Harbor City	\$665	\$0.008	\$0.029	\$0.047	\$0.379	\$0.002	0.00%
Township of Egg Harbor	\$6,286	\$16.773	\$182.834	\$209.288	\$500.575	\$8.635	0.14%
City of Estell Manor	\$258	\$0.598	\$1.042	\$1.387	\$2.383	\$0.077	0.03%
Borough of Folsom	\$287	\$0	\$0	\$0	\$0	\$0	0.00%
Township of Galloway	\$5,139	\$0	\$0.625	\$29.920	\$47.208	\$0.546	0.01%
Township of Hamilton	\$3,563	\$0	\$0	\$1.072	\$56.302	\$0.299	0.01%
Town of Hammonton	\$2,080	\$0	\$0	\$0	\$0	\$0	0.00%
City of Linwood	\$1,235	\$12.492	\$22.383	\$119.416	\$217.402	\$3.476	0.28%
Borough of Longport	\$488	\$55.933	\$113.333	\$149.772	\$258.499	\$8.489	1.74%
City of Margate City	\$2,038	\$236.370	\$569.820	\$744.300	\$1,231.723	\$38.957	1.91%
Township of Mullica	\$818	\$29.513	\$50.346	\$59.363	\$81.642	\$3.823	0.47%
City of Northfield	\$1,492	\$7.823	\$14.567	\$18.859	\$33.758	\$1.112	0.07%
City of Pleasantville	\$2,166	\$11.718	\$55.550	\$74.084	\$128.592	\$3.004	0.14%
City of Port Republic	\$196	\$0.603	\$12.003	\$19.092	\$34.568	\$0.570	0.29%
City of Somers Point	\$1,781	\$110.601	\$188.061	\$351.313	\$600.778	\$17.127	0.96%
City of Ventnor City	\$2,023	\$77.399	\$218.353	\$316.020	\$655.871	\$15.129	0.75%
Township of Weymouth	\$257	\$0	\$0	\$4.631	\$16.872	\$0.110	0.04%
<b>Atlantic County Total</b>	<b>\$44,114</b>	<b>\$1,625.515</b>	<b>\$4,512.795</b>	<b>\$6,083.084</b>	<b>\$10,100.288</b>	<b>\$294.168</b>	<b>0.67%</b>

**Impact of Sea Level Rise on Storm Surge Inundation for Category 1-4 Hurricanes**

The impact of long-term sea level rise can be expected to increase the annual occurrence probability of significant storm surge events and hence the future expected annual losses in Atlantic County. Quantifying this increase in damages would require mapping from other sources, or significant amounts of hydrologic data to perform detailed analyses which are typically only undertaken at the feasibility stage during the planning for specific coastal flood and erosion protection projects, and hence is outside the scope of this current plan.



## **Tsunami**

Tsunamis have the potential to cause enormous damage and disruption to the Atlantic coast of the USA, including Atlantic County. Similarly to the impacts and exposure to wave action, assets and populations most at risk from tsunamis are those in the immediate coastal and shorefront areas, although tsunamis carry the possibility that the risk of loss and disruption would extend far inland, significantly beyond the limits of currently mapped V-Zones, and would strike with greater force and speed than inundation from storm surge that is currently mapped using SLOSH Zones. While there is some discussion in the 2019 New Jersey State Hazard Mitigation Plan about future efforts to develop spatial analyses of potential tsunami impact areas, there currently exists little baseline source data from which tsunami exposure, impacts and losses could be quantified for Atlantic County.

The State Plan lists a number of minor events impacting New Jersey which have been attributed to tsunamis (or tsunami-like occurrences), but only one is listed as causing a measurable impact in Atlantic County: Unusual tidal and wave conditions were reported in June of 1913 and damages to wharfs and embankments in the Borough of Longport totaling \$10,000 were recorded. While this sum would equal approximately \$280,000 in 2021, this single damage estimate in more than 100 years of record does not strongly suggest that annual damages in Atlantic County from tsunami or tsunami-like events would rise above the level of negligible.

In the absence of reliable sources for damage estimates arising from tsunamis in New Jersey and the absence of any analyses of their spatial impacts or probabilities of occurrence, the exposure and losses attributable to tsunamis in Atlantic County are considered currently unquantifiable, and likely negligible. However, the possibility that Atlantic County may be struck by a catastrophic (though statistically extremely rare) tsunami at some point in the future is acknowledged.

## **Wave Action**

### **Impacts – Wave Action**

Wave action is a significant hazard to buildings and infrastructure located in coastal areas. Large, fast moving waves can cause extreme erosion and scour and their impact on buildings can cause severe damage. Storm surge and wind increase the destructiveness of waves and cause them to reach higher elevations and penetrate further inland.

### **Exposure and Damage Estimates – Wave Action**

To estimate exposure to wave action, it is assumed that vulnerable areas are located in the mapped VE flood zone, which experiences coastal flood with velocity hazard (wave action). To estimate exposure to wave action, the determination of value and population at-risk was calculated through GIS analysis by calculating the proportion of a parcel lying within VE zones, and applying that same ratio to parcel value to estimate the value of improvements at risk. The same ratio was applied at the parcel level to multiply the number of affected parcels by the average household size by municipality to estimate the affected population. **Table 3c.19** shows exposure to wave action by jurisdiction. Twelve jurisdictions have developed areas (as represented by improved parcels) that are exposed to wave action, with the most significant areas at risk in Atlantic City, Margate, City, Brigantine, Somers Point, and Longport.

All of the estimates in **Table 3c.19** are observed to have changed fairly significantly from the prior version of the plan, in particular the estimated population at risk is now greatly reduced. While some of this difference may be attributable to changes in the latest DFIRM data, this is principally due to the revised methodology used: In the previous analysis the population at risk was derived from the proportion of each census block overlapping with the VE zone, but it was found that many shorefront census blocks extended far beyond the boundaries of the parcels of improved property that they covered, often into large areas of beach and other undeveloped land. The current methodology reduces this overcount by deriving the population at risk from developed parcels that intersect with the VE zone, which in coastal areas of Atlantic County are more likely to closely correspond to actual human habitation.

For this plan update, given the lack of readily available historical loss data on discrete wave damages in Atlantic County<sup>33</sup>, it is assumed that while one major event (i.e., hurricane or nor'easter) may result in significant losses specifically due to wave action, annualizing these structural losses over a long period of time would most likely yield a negligible annualized loss estimate in each jurisdiction exposed to this hazard. However, it should also be noted that over the long term, anticipated sea level rise will increase the risk of damages/losses to future wave action events.

<sup>33</sup> Wave action is not a discrete hazard with specific event records that can be queried in the NOAA NCEI database.

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<b>Table 3c.19</b>				
<b>Exposure to Wave Action by Jurisdiction</b>				
<b>Jurisdiction</b>	<b>Estimated Population at Risk</b>	<b>Total Value of Improvements (Buildings)</b>	<b>Value of Buildings Located in VE Flood Zone*</b>	<b>Percent of Municipal Building Value Exposed to Wave Action</b>
Absecon, City of	5	\$393,695,263	\$94,198	0.02%
Atlantic City, City of	7	\$3,812,060,699	\$56,045,760	1.47%
Brigantine, City of	273	\$1,013,271,279	\$5,325,079	0.53%
Buena, Borough of	0	\$223,248,148	0	0%
Buena Vista, Township of	0	\$458,556,770	0	0%
Corbin City, City of	0	\$32,061,701	0	0%
Egg Harbor City, City of	0	\$234,888,323	0	0%
Egg Harbor, Township of	141	\$3,051,660,285	\$6,050,788	0.20%
Estell Manor, City of	0	\$109,653,697	0	0%
Folsom, Borough of	0	\$110,384,232	0	0%
Galloway, Township of	8	\$2,074,304,491	\$464,462	0.02%
Hamilton, Township of	0	\$1,503,610,485	0	0%
Hammonton, Town of	0	\$1,064,061,337	0	0%
Linwood, City of	44	\$525,895,540	\$1,528,873	0.29%
Longport, Borough of	47	\$415,591,279	\$3,065,403	0.74%
Margate City, City of	154	\$1,230,983,282	\$8,973,568	0.73%
Mullica, Township of	0	\$320,888,692	0	0%
Northfield, City of	0	\$548,659,960	0	0%
Pleasantville, City of	21	\$831,985,384	\$1,334,477	0%
Port Republic, City of	130	\$75,041,209	\$1,391,039	1.85%
Somers Point, City of	97	\$773,083,713	\$5,767,093	0.75%
Ventnor City, City of	14	\$733,552,937	\$58,732	0.01%
Weymouth, Township of	0	\$106,183,795	0	0%
<b>Total</b>	<b>941</b>	<b>\$19,643,322,501</b>	<b>\$90,099,472</b>	<b>0.46%</b>

Source: FEMA: DFIRM 2021, where available, otherwise Preliminary DFIRM Data, 2014; Atlantic County Parcel data, 2021 and Atlantic County tax information, 2021, 2019 Census ACS

## **Earthquake**

### **Impacts – Earthquake**

Most earthquake-related property damage and deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the extent and duration of the shaking. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (in mountain regions and along hillsides), and liquefaction.

According to USGS data, damage caused by an earthquake will begin at a level of ground shaking (peak ground acceleration, or PGA) of approximately ten percent of the force of gravity (0.1g, or 10%g). Below this level, damages are typically very slight except in unusually vulnerable facilities. An earthquake of this magnitude (10%g) can be expected to occur in New Jersey only once every 2,476 years; while a 100-year return period even would have a PGA of less than 0.17%g<sup>34</sup>. Damages from ground shaking at 10%g to 20%g tend to be minor to moderate, with only unusually poor buildings being subject to potential collapse. Events in the range of 20%g to 50%g may cause significant damage in some modern buildings and very high levels of damage (include collapse) in poorly designed buildings. Events more than 50%g may cause higher levels of damage in many buildings, even those designed to resist seismic forces. The probability of significant, damaging earthquake events affecting Atlantic County is low. According to the United States Geological Survey (USGS), an earthquake with a 10 percent probability of exceedance over 50 years would have PGA values between 2%g and 3%g, which would result in light to moderate perceived shaking and damages ranging from none to very light. More destructive earthquakes are very rare, low probability events for Atlantic County with highly infrequent recurrence periods.

### **Exposure and Damage Estimates – Earthquake**

Because earthquakes often impact large areas and cross jurisdictional boundaries, all existing and future buildings, facilities and populations are considered to be exposed to this hazard and could potentially be impacted.

Seismic hazard maps for New Jersey show because of the low frequency of occurrence and the relatively low levels of ground shaking that would be experienced; the entire State of New Jersey can be expected to have a low-to-moderate risk to earthquake damage as compared to other areas of the country. Historical records indicate the occurrence of approximately one earthquake per year in New Jersey. The most likely earthquake in New Jersey is not likely to be particularly intense, or particularly damaging.

A previous version of the New Jersey State Hazard Mitigation Plan presented the expected peak ground acceleration for earthquake events of various estimated frequencies for Atlantic County. **Table 3c.20** lists the expected peak ground acceleration (PGA) for various return period earthquake events for the whole county as reported in that version of the plan, and there is considered to be no strong reason for any subsequent changes.

<sup>34</sup> NJ State Hazard Mitigation Plan 2014

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An event with a PGA of less than 0.17%g would not be felt, and would have a zero damage potential. An event between 0.17%g and 1.4%g would result in weak perceived shaking, but no damage. Events between 1.4%g and 3.9%g would likely result in light perceived shaking, but again, no damage. Damages would be expected in the 3.9%g to 9.2%g range, where perceived shaking would be moderate but would result in very light damages.

Table 3c.20 Peak Ground Acceleration <sup>35</sup>				
Jurisdiction	100-year Mean Return Period Event PGA	500-year Mean Return Period Event PGA	1,000-year Mean Return Period Event PGA	2,500-year Mean Return Period Event PGA
Atlantic County	< 0.17%g <i>No perceived shaking; No potential damage</i>	1.4%g - 3.9%g <i>Light perceived shaking; No potential damage</i>	3.9%g - 9.2%g <i>Moderate perceived shaking; Very light damage</i>	9.2%g - 18%g <i>Strong perceived shaking; Light damage</i>

Source: New Jersey State Hazard Mitigation Plan, 2014

Earthquakes with higher PGAs cause more damage, but have a lower probability of occurrence. Conversely, earthquakes with low PGAs such as those that could potentially impact Atlantic County, have a higher probability of occurrence but would only cause negligible to minor damage due to light shaking. In comparison to PGAs above 0.25g which can cause strong to violent shaking and major damage, expected PGAs for Atlantic County will likely only cause negligible to light shaking and negligible to minor damage. Estimated losses for a 100-year earthquake event in Atlantic County were considered to be negligible. HAZUS

For this plan update HAZUS was used to generate estimates of damage resulting from earthquake events of two different probabilities for all jurisdictions in Atlantic County. **Table 3c.21** presents the estimated total losses for events that have annual probabilities of exceedance of 1%, and 0.2% of being equaled or exceeded, also includes annual average losses generated by HAZUS and annualized loss ratios for all jurisdictions in Atlantic County. In concurrence with the earlier version of the State plan, the analysis indicated that an earthquake event with a 1% chance of being equaled or exceeded in any one year would not result in any measurable losses, while an event an annual chance of 0.2% would likely result in losses totaling \$33 million.

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<b>Table 3c.21</b>					
<b>Earthquake Damages as Estimated by HAZUS</b>					
<b>Jurisdiction</b>	<b>HAZUS Building Replacement Value</b>	<b>Total Losses, 1% ACE Event ("100-Year")</b>	<b>Total Losses, 0.2% ACE Event ("500-Year")</b>	<b>Annual Average Total Losses</b>	<b>Annualized Loss Ratio</b>
City of Absecon	\$1,267,196,000	\$0	\$1,014,223	\$12,758	0.001%
City of Atlantic City	\$7,929,398,000	\$0	\$6,929,701	\$85,591	0.001%
City of Brigantine	\$2,561,457,000	\$0	\$1,572,737	\$19,409	0.001%
Borough of Buena	\$562,168,000	\$0	\$654,545	\$9,230	0.002%
Township of Buena Vista	\$943,547,000	\$0	\$825,473	\$11,446	0.001%
City of Corbin City	\$79,168,000	\$0	\$46,499	\$606	0.001%
City of Egg Harbor City	\$664,696,000	\$0	\$613,238	\$8,245	0.001%
Township of Egg Harbor	\$6,286,181,000	\$0	\$4,442,717	\$57,115	0.001%
City of Estell Manor	\$258,137,000	\$0	\$304,513	\$3,968	0.002%
Borough of Folsom	\$286,550,000	\$0	\$218,072	\$3,101	0.001%
Township of Galloway	\$5,139,040,000	\$0	\$4,222,039	\$54,883	0.001%
Township of Hamilton	\$3,562,661,000	\$0	\$2,792,280	\$37,168	0.001%
Town of Hammonton	\$2,080,000,000	\$0	\$2,333,973	\$32,499	0.002%
City of Linwood	\$1,234,913,000	\$0	\$614,520	\$7,583	0.001%
Borough of Longport	\$488,334,000	\$0	\$15,827	\$194	0.000%
City of Margate City	\$2,037,682,000	\$0	\$1,179,967	\$14,321	0.001%
Township of Mullica	\$817,791,000	\$0	\$603,679	\$8,240	0.001%
City of Northfield	\$1,492,484,000	\$0	\$1,063,959	\$13,370	0.001%
City of Pleasantville	\$2,165,941,000	\$0	\$1,743,811	\$22,223	0.001%
City of Port Republic	\$196,115,000	\$0	\$142,385	\$1,814	0.001%
City of Somers Point	\$1,781,072,000	\$0	\$731,824	\$8,348	0.000%
City of Ventnor City	\$2,022,669,000	\$0	\$1,517,371	\$18,667	0.001%
Township of Weymouth	\$257,200,000	\$0	\$68,785	\$896	0.000%
<b>Atlantic County Total</b>	<b>\$44,114,400,000</b>	<b>\$0</b>	<b>\$33,652,136</b>	<b>\$431,675</b>	<b>0.001%</b>

## **Wildfire**

### **Impacts – Wildfires**

Wildfires have the potential to destroy large portions of a community. Firefighters are at risk during the time that they are trying to contain and control the blaze. Loss of life and injuries are possible for people living, working, or traveling through an impacted area. Beyond the loss of vegetation that wildfires leave in their wake, structures in the wildland/urban interface can be severely damaged or destroyed. Following a large wildfire, the possibility exists for significant increases in stormwater runoff and landslides which can lead to downstream flooding. Depending on the scale of the impacted area and the type and numbers of buildings and infrastructure impacted, secondary effects are possible on local economies and the social fabric of communities following the event.

### **Exposure and Damage Estimates - Wildfires**

To estimate exposure to wildfire, the determination of value and population at-risk was calculated through GIS analysis by calculating the proportion of a parcel or census block located within areas of wildfire susceptibility (low/moderate and high/extreme), and applying that same ratio to the census block population and parcel value to estimate population at risk and value of improvements at risk. Approximately 21 percent of total assessed improvements in the county are located in wildfire hazard areas; however, only about 7 percent is located in high or extreme susceptibility areas.. **Table 3c.23** shows exposure to wildfire by jurisdiction.

Given the lack of historical loss data on significant wildfire occurrences resulting in large-scale structural losses in Atlantic County, it is assumed that while one major event may result in significant losses, annualizing structural losses over a long period of time would most likely yield a negligible annualized loss estimate in each jurisdiction exposed to this hazard.



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**Table 3c.22**  
**Exposure to Wildfire by Jurisdiction (\$million)**

Jurisdiction	Estimated Population At Risk in All Wildfire Susceptibility Areas	Total Value of Improvements (Buildings) –**	Total Value of Buildings Located in Low/ Moderate Susceptibility Areas	Total Value of Buildings Located in High/ Extreme Susceptibility Areas	Total Value of Buildings Located in All Wildfire Susceptibility Areas	Percent of Total Building Value Exposed to Wildfire
Absecon, City of	4,005	\$441.9	\$41.4	\$30.4	\$71.8	16.2%
Atlantic City, City of	15,541	\$4,819.2	\$102.8	\$0.7	\$103.6	2.1%
Brigantine, City of	3,482	\$1,324.8	\$28.8	\$3.8	\$32.6	2.5%
Buena, Borough of	1,429	\$232.7	\$37.2	\$7.0	\$44.2	19.0%
Buena Vista, Township of	5,646	\$481.8	\$189.8	\$44.7	\$234.5	48.7%
Corbin City, City of	371	\$34.4	\$9.5	\$8.8	\$18.4	53.4%
Egg Harbor City, City of	344	\$244.1	\$27.4	\$39.1	\$66.5	27.2%
Egg Harbor, Township of	291,509	\$3,314.3	\$830.1	\$624.4	\$1,454.5	43.9%
Estell Manor, City of	1,621	\$113.9	\$84.0	\$16.4	\$100.4	88.1%
Folsom, Borough of	1,393	\$114.8	\$25.1	\$17.8	\$42.9	37.4%
Galloway, Township of	23,333	\$2,609.7	\$676.0	\$437.2	\$1,113.1	42.7%
Hamilton, Township of	22,811	\$1,762.8	\$503.7	\$231.9	\$735.6	41.7%
Hammonton, Town of	8,699	\$1,126.2	\$209.7	\$87.7	\$297.4	26.4%
Linwood, City of	2,873	\$612.1	\$48.8	\$5.3	\$54.1	8.8%
Longport, Borough of	59	\$540.0	\$0.7	\$0.7	\$1.3	0.2%
Margate City, City of	572	\$1,547.9	\$6.3	\$1.5	\$7.8	0.5%
Mullica, Township of	5,181	\$329.0	\$129.9	\$68.0	\$197.9	60.2%
Northfield, City of	3,248	\$621.1	\$27.0	\$7.6	\$34.6	5.6%
Pleasantville, City of	6,916	\$909.7	\$68.0	\$12.1	\$80.1	8.8%
Port Republic, City of	1,000	\$86.5	\$53.6	\$16.2	\$69.8	80.7%
Somers Point, City of	3,524	\$857.0	\$13.6	\$9.7	\$23.3	2.7%
Ventnor City, City of	2,659	\$967.0	\$9.5	\$0.6	\$10.1	1.0%
Weymouth, Township of	2,494	\$108.9	\$59.2	\$14.1	\$73.2	67.3%
<b>Total</b>	<b>146,288</b>	<b>\$23,199</b>	<b>\$3,102</b>	<b>1,686</b>	<b>\$4,867</b>	<b>21%</b>

\* Population in Low, Moderate, High, or Extreme Risk Areas

\*\* Exposure calculated by GIS Analysis using local improvement values (2021)

## **Vulnerability of Other Assets**

The Asset Inventory presented earlier in this document presented six categories of assets, including improved property, emergency facilities, critical infrastructure and utilities, other critical facilities, historic and cultural resources, and population. The preceding sections of this vulnerability assessment have addressed improved property and population for each hazard. This section will specifically address the vulnerability of the other asset categories.

To analyze vulnerability of specific assets located in Atlantic County, facilities were grouped as follows:

- Critical Facilities:
  - Airports
  - Communication Facilities
  - Electrical Power Facilities
  - Emergency Shelters
  - Emergency Operations Centers
  - Fire Stations
  - Hospitals
  - Nursing homes
  - Passenger rail stations
  - Police stations
  - Public works
  - Ambulance/Rescue squads
  - Schools
  - Water supply facilities
  - Wastewater treatment facilities
- Historical and Cultural Resources

**All assets throughout Atlantic County are exposed to extreme temperatures, extreme winds, hurricanes and tropical storms, hail, lightning, nor'easters, tornadoes, winter storms, drought and earthquakes.** For the hazards with delineable hazard areas (i.e., flood, wave action, storm surge, coastal erosion, sea level rise, dam failure, and wildfire), **Table 3c.23 and Table 3c.24** shows exposure of Atlantic County's critical facilities by jurisdiction. Exposure of these assets was determined through GIS analysis of hazard areas using georeferenced point locations for critical facilities, which were aggregated by facility type. A full list of exposed critical facilities by delineable hazard is provided in **Appendix 3c**. In summary:

- Of the 376 critical facilities identified and georeferenced in Atlantic County's jurisdictions, 202 lie in one or more delineable hazard areas.
- No critical facilities are in areas mapped as susceptible to coastal erosion.<sup>36</sup>
- One facility is susceptible to wave action.<sup>37</sup>
- 91 critical facilities are in the 100-year floodplain.<sup>38</sup>

<sup>36</sup> Within 120 feet of shoreline types classified by NJDEP as "beach" or "erodible".

<sup>37</sup> FEMA V-zones (2021 DFIRM data where available, elsewhere 2014 Preliminary DFIRMs)

<sup>38</sup> FEMA A, AE, and V-zones (as per previous footnote)

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- 7 structures are at risk from one foot of sea level rise and 13 are at risk from three feet of sea level rise.<sup>39</sup>
- 24 critical facilities are in mapped areas of high to extreme wildfire hazard.<sup>40</sup>
- 147 critical facilities are in mapped surge hazard areas.<sup>41</sup>
- 6 critical facilities could potentially be impacted by dam failure.<sup>42</sup>

<b>Table 3c.23 Critical Facilities in Hazard Areas by Jurisdiction</b>		
Jurisdiction	Number of Critical Facilities	Number of Critical Facilities in At Least One Delineable Hazard Area
Absecon, City of	10	7
Atlantic City, City of	50	50
Brigantine, City of	6	6
Buena Vista, Township of	11	5
Buena, Borough of	16	2
Corbin City, City of	6	6
Egg Harbor City, City of	14	9
Egg Harbor, Township of	34	8
Estell Manor, City of	3	1
Folsom, Borough of	2	0
Galloway, Township of	46	11
Hamilton, Township of	44	25
Hammonton, Town of	23	8
Linwood, City of	13	10
Longport, Borough of	3	3
Margate City, City of	12	12
Mullica, Township of	12	3
Northfield, City of	14	9
Pleasantville, City of	21	8
Port Republic, City of	5	4
Somers Point, City of	13	5
Ventnor City, City of	11	7
Weymouth, Township of	7	3
Atlantic County, Total	376	202

**Table 3c.25** shows exposure of historic and cultural resources for delineable hazards (i.e., flood, wave action, storm surge, coastal erosion, one foot of sea level rise, three feet of sea level rise, dam failure, and wildfire). Exposure of historic properties was determined through GIS analysis of hazard areas using georeferenced locations for historic properties provided by the New Jersey Historic Preservation Office. Only those historic property locations which intersect with at least one of the nine delineable hazard categories are included in **Table 3c.25**.

<sup>39</sup> <https://coast.noaa.gov/digitalcoast/tools/slr.html>

<sup>40</sup> An additional 58 facilities are in mapped areas of low to moderate wildfire hazard, though this is likely to be an overestimate because many of the low to moderate hazard areas are mapped in urban centers near small pockets of vegetation such as local parks or small clusters of trees).

<sup>41</sup> This reflects facilities in mapped SLOSH zones for Category 1 through 4 hurricanes, as per NOAA Sea, Lake and Overland Surges from Hurricanes (SLOSH) data (2021).

<sup>42</sup> Dam inundation hazard area maps.

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.24**  
**Exposure of Georeferenced Critical Facility Types by Jurisdiction**

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
<b>ABSECON, CITY OF</b>											
	Ambulance	1	0	0	1	0	0	0	0	0	0
	Fire Station	1	0	0	1	0	0	0	0	0	0
	Passenger Rail Station	1	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	1	0	0	0	0	0	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	3	0	0	1	0	0	0	0	0	0
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	Water Supply Facility	1	0	0	1	0	0	0	0	0	0
	<b>TOTAL, ABSECON</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>ATLANTIC CITY, CITY OF</b>											
	Communication Facility	9	8	0	9	0	3	3	0	6	0
	Electrical Power Facility	5	4	0	5	0	0	0	0	1	0
	Emergency Operations Center	1	1	0	1	0	0	0	0	0	0
	Emergency Shelter	2	2	0	2	0	0	0	0	0	0
	Fire Station	5	5	0	5	0	0	0	0	0	0
	Hospital	1	1	0	1	0	0	0	0	0	0
	Passenger Rail Station	1	0	0	1	0	0	0	0	0	0
	Police Station	3	3	1	3	0	0	0	0	1	0
	Public Works	4	3	0	4	0	0	1	0	1	0
	School	14	13	0	14	0	0	0	0	0	0
	Senior Care Facility	2	2	0	2	0	0	0	0	0	0
	Wastewater Treatment Facility	2	2	0	2	0	0	0	0	0	0
	Water Supply Facility	1	1	0	1	0	0	0	0	1	0
	<b>TOTAL, ATLANTIC CITY</b>	<b>50</b>	<b>45</b>	<b>1</b>	<b>50</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>0</b>	<b>10</b>	<b>0</b>
<b>BRIGANTINE, CITY OF</b>											
	Fire Station	1	1	0	1	0	0	0	0	0	0
	Police Station	1	1	0	1	0	0	0	0	0	0
	Public Works	1	1	0	1	0	0	1	0	0	0
	School	3	2	0	3	0	0	0	0	0	0
	<b>TOTAL, BRIGANTINE</b>	<b>6</b>	<b>5</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>BUENA, BOROUGH OF</b>											
	Ambulance	1	0	0	0	0	0	0	0	0	1
	Fire Station	2	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	1	0
	Public Works	1	0	0	0	0	0	0	0	0	1

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.24**  
**Exposure of Georeferenced Critical Facility Types by Jurisdiction**

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
	School	4	0	0	0	0	0	0	0	0	0
	Water Supply Facility	1	0	0	0	0	0	0	0	1	0
	WWTP	1	0	0	0	0	0	0	0	1	0
	<b>TOTAL, BUENA</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>
<b>BUENA VISTA, TOWNSHIP OF</b>											
	Emergency Shelter	3	0	0	0	0	0	0	0	1	0
	Fire Station	5	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	6	0	0	0	0	0	0	0	1	0
	<b>TOTAL, BUENA VISTA</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>CORBIN CITY, CITY OF</b>											
	Communication Facility	2	2	0	2	0	0	0	0	2	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	3	0	0	3	0	0	0	0	0	0
	<b>TOTAL, CORBIN CITY</b>	<b>6</b>	<b>2</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>EGG HARBOR CITY, CITY OF</b>											
	Communication Facility	1	0	0	0	0	0	0	0	1	1
	Fire Station	1	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	1	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	2	0	0	0	0	0	0	0	0	1
	Senior Living Facility	1	0	0	0	0	0	0	0	0	0
	Water Supply Facility	6	5	0	0	0	0	0	0	1	1
	WWTP	1	1	0	0	0	0	0	0	0	1
	<b>TOTAL, EGG HARBOR CITY</b>	<b>14</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>4</b>
<b>EGG HARBOR, TOWNSHIP OF</b>											
	Airport	1	0	0	0	0	0	0	0	0	0
	Ambulance	1	0	0	0	0	0	0	0	0	1
	Electrical Power Facility	1	0	0	0	0	0	0	0	0	0
	Emergency Operations Center	1	0	0	0	0	0	0	0	0	0
	Emergency Shelter	2	0	0	0	0	0	0	0	0	1
	Fire Station	12	2	0	4	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	2	0	0	0	0	0	0	0	0	0
	School	11	0	0	0	0	0	0	0	0	1
	Senior Care Facility	2	0	0	0	0	0	0	0	1	0

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.24**  
**Exposure of Georeferenced Critical Facility Types by Jurisdiction**

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
<b>TOTAL, EGG HARBOR TOWNSHIP</b>		<b>34</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>
<b>ESTELL MANOR, CITY OF</b>											
	Fire Station	1	0	0	0	0	0	0	0	0	0
	Public Works	1	1	0	0	0	0	0	0	1	0
	School	1	0	0	0	0	0	0	0	0	0
<b>TOTAL, ESTELL MANOR</b>		<b>3</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>FOLSOM, BOROUGH OF</b>											
	Fire Station	1	0	0	0	0	0	0	0	0	0
	School	1	0	0	0	0	0	0	0	0	0
<b>TOTAL, FOLSOM</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>GALLOWAY, TOWNSHIP OF</b>											
	Ambulance	1	0	0	0	0	0	0	0	0	0
	Communication Facility	1	0	0	0	0	0	0	0	0	0
	Emergency Shelter	4	0	0	0	0	0	0	0	1	1
	Fire Station	6	0	0	1	0	0	0	0	0	0
	Hospital	1	0	0	0	0	0	0	0	0	0
	Passenger Rail Station	1	0	0	0	0	0	0	0	1	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	2	0	0	0	0	0	0	0	1	0
	School	19	0	0	0	0	0	0	0	3	0
	Senior Care Facility	7	0	0	0	0	0	0	0	0	1
	Water Supply Facility	3	0	0	0	0	0	0	0	3	0
<b>TOTAL, GALLOWAY</b>		<b>46</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>9</b>	<b>2</b>
<b>HAMILTON, TOWNSHIP OF</b>											
	Airport	1	0	0	0	0	0	0	0	0	0
	Ambulance	2	0	0	1	0	0	0	0	0	0
	Communications Facility	1	0	0	0	0	0	0	0	0	1
	Emergency Operations Center	1	0	0	1	0	0	0	0	0	1
	Emergency Shelter	5	0	0	0	0	0	0	0	2	0
	Fire Station	6	0	0	2	0	0	0	1	1	0
	Police Station	4	0	0	2	0	0	0	0	1	0
	Public Works	3	0	0	2	0	0	0	0	0	1
	School	12	1	0	4	0	0	0	2	0	1
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	Wastewater Treatment Facility	1	1	0	1	0	1	1	1	1	2
	Water Supply Facility	7	0	0	2	0	0	0	0	4	0
<b>TOTAL, HAMILTON</b>		<b>44</b>	<b>2</b>	<b>0</b>	<b>15</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>4</b>	<b>9</b>	<b>6</b>

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.24**  
**Exposure of Georeferenced Critical Facility Types by Jurisdiction**

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
<b>HAMMONTON, TOWN OF</b>											
	Airport	1	0	0	0	0	0	0	0	0	0
	Communication Facility	1	0	0	0	0	0	0	0	1	1
	Fire Station	2	0	0	0	0	0	0	0	0	0
	Hospital	1	0	0	0	0	0	0	0	1	0
	Passenger Rail Station	1	0	0	0	0	0	0	0	0	0
	Police Station	2	0	0	0	0	0	0	0	0	0
	Public Works	3	0	0	0	0	0	0	0	2	1
	School	5	0	0	0	0	0	0	0	0	0
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	Water Treatment Facility	1	0	0	0	0	0	0	0	3	0
	WWTP	4	0	0	0	0	0	0	0	1	0
	<b>TOTAL, HAMMONTON</b>	<b>23</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>8</b>	<b>2</b>
<b>LINWOOD, CITY OF</b>											
	Ambulance	1	1	0	1	0	0	0	0	1	0
	Emergency Operations Center	1	0	0	1	0	0	0	0	0	0
	Fire Station	1	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	1	0	0	0	0	0	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	5	0	0	5	0	0	0	0	1	0
	Senior Care Facility	3	0	0	0	0	0	0	0	0	0
	<b>TOTAL, LINWOOD</b>	<b>13</b>	<b>1</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>LONGPORT, BOROUGH OF</b>											
	Fire Station	1	1	0	1	0	0	0	0	1	0
	Police Station	1	1	0	1	0	0	0	0	1	0
	Public Works	1	1	0	1	0	0	0	0	1	0
	<b>TOTAL, LONGPORT</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>MARGATE CITY OF</b>											
	Fire Station	2	2	0	2	0	0	0	0	0	0
	Police Station	1	1	0	1	0	0	0	0	0	0
	Public Works	1	1	0	1	0	0	1	0	0	0
	School	2	2	0	2	0	0	0	0	0	0
	Water Supply Facility	6	6	0	6	0	0	2	0	0	0
	<b>TOTAL, MARGATE</b>	<b>12</b>	<b>12</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>MULLICA, TOWNSHIP OF</b>											
	Emergency Shelter	1	0	0	0	0	0	0	0	0	0
	Fire Station	4	0	0	2	0	0	0	0	1	1



**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.24**  
**Exposure of Georeferenced Critical Facility Types by Jurisdiction**

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
	Police Station	2	0	0	0	0	0	0	0	0	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	4	0	0	0	0	0	0	0	1	0
	<b>TOTAL, MULLICA</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>NORTHFIELD, CITY OF</b>											
	Emergency Shelter	1	0	0	1	0	0	0	0	0	0
	Fire Station	2	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	4	0	0	0	0	0	0	0	3	0
	School	5	0	0	4	0	0	0	0	0	0
	Senior Care Facility	1	0	0	0	0	0	0	0	0	0
	<b>TOTAL, NORTHFIELD</b>	<b>15</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>
<b>PLEASANTVILLE, CITY OF</b>											
	Communication Facility	3	3	0	3	0	0	0	0	0	3
	Electrical Power Facility	1	1	0	1	0	0	0	0	1	1
	Emergency Operations Center	1	0	0	0	0	0	0	0	0	0
	Emergency Shelter	2	0	0	0	0	0	0	0	0	0
	Fire Station	1	0	0	0	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	1	0	0	0	0	0	0	0	0	0
	School	8	0	0	3	0	0	0	0	0	0
	Senior Care Facility	1	0	0	1	0	0	0	0	0	0
	<b>TOTAL, PLEASANTVILLE</b>	<b>21</b>	<b>4</b>	<b>0</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>4</b>
<b>PORT REPUBLIC, CITY OF</b>											
	Emergency Operations Center	1	1	0	1	0	0	0	0	1	0
	Fire Station	1	0	0	1	0	0	0	0	0	0
	Public Works	2	1	0	1	0	0	0	0	1	0
	School	1	0	0	1	0	0	0	0	0	0
	<b>TOTAL, PORT REPUBLIC</b>	<b>5</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>SOMERS POINT, CITY OF</b>											
	Ambulance	1	0	0	0	0	0	0	0	0	0
	Fire Station	2	0	0	0	0	0	0	0	0	0
	Hospital	1	0	0	1	0	0	0	0	0	0
	Police Station	1	0	0	0	0	0	0	0	0	0
	Public Works	2	0	0	0	0	0	0	0	0	0
	School	6	0	0	4	0	0	0	0	0	0
	<b>TOTAL, SOMERS POINT</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C - DAMAGE ESTIMATES**

**Table 3c.24**  
**Exposure of Georeferenced Critical Facility Types by Jurisdiction**

Jurisdiction	Facility Type	Total Number of Facilities	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise: 1 Ft	Sea Level Rise: 3Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
<b>VENTNOR, TOWNSHIP OF</b>											
	Emergency Operations Center	1	1	0	1	0	0	0	0	0	0
	Fire Station	2	2	0	2	0	0	0	0	0	0
	Public Works	1	0	0	1	0	0	0	0	0	0
	School	2	2	0	2	0	0	0	0	0	0
	Water Supply Facility	5	1	0	1	0	0	1	0	0	0
	<b>TOTAL, VENTNOR</b>	<b>11</b>	<b>6</b>	<b>0</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>WEYMOUTH, TOWNSHIP OF</b>											
	Ambulance	1	0	0	1	0	0	1	0	0	0
	Fire Station	2	0	0	1	0	0	1	0	0	0
	Public Works	1	0	0	0	0	0	0	0	1	0
	School	1	0	0	0	0	0	0	0	0	0
	Water Supply Facility	2	0	0	2	0	0	0	0	0	0
	<b>TOTAL, WEYMOUTH</b>	<b>9</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>0</b>
<b>ATLANTIC, COUNTY OF</b>											
	<b>TOTAL</b>	<b>376</b>	<b>91</b>	<b>1</b>	<b>147</b>	<b>0</b>	<b>7</b>	<b>13</b>	<b>6</b>	<b>58</b>	<b>24</b>

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.25**  
**Exposure of Historic Properties by Hazard**

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Absecon	Captain Francis Babcock House	324 South Shore Road	1	0	1	0	0	1	0	1	0
Absecon	Dr. Jonathan Pitney House	57 North Shore Road	0	0	1	0	0	0	0	1	0
Absecon	North Shore Road Historic District	North Shore Road	1	0	1	0	0	1	0	1	0
Absecon	South Shore Road Historic District	South Shore Road	1	0	1	0	1	1	0	1	0
Absecon, Atlantic City, Egg Harbor City, Egg Harbor Township, Galloway, Hammonton, Mullica, Pleasantville	Camden and Atlantic Railroad Historic District	Parallel NJ Transit Atlantic City Line	1	0	1	0	1	1	0	0	0
Atlantic City	1315 Pacific Avenue	1315 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	2-6 South Virginia Avenue	2-6 South Virginia Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Absecon Lighthouse	Pacific and Rhode Island Avenues	1	0	1	0	0	0	0	1	0
Atlantic City	Administration Building for the Board of Education	1809 Pacific Ave	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Armory	Atlantic Boulevard and New York Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Convention Hall	Boardwalk between Pacific, Mississippi, and Florida Avenues	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Fire Station #4	2700 Atlantic Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Atlantic City Fire Station #6	4025 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Atlantic City Post Office	1701 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Barclay Court	9-11 South Pennsylvania Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Beth Israel Synagogue	34 South Pennsylvania Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Beth Kehillah Synagogue Building (H.G. Rosin Senior Center)	901 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Chinn & Schull Boathouse	419 Carson Ave	1	1	1	0	1	1	0	0	0

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.25**  
**Exposure of Historic Properties by Hazard**

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Atlantic City	Church of the Ascension	1601 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Eldredge Chelsea Fireproof Warehouse	3528 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Equitable Trust Bank Building	2030 Atlantic Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Fire Station #8	140 North Indiana Avenue	1	0	1	0	0	1	0	0	0
Atlantic City	Fire Station #9	734 North Indiana Avenue	1	0	1	0	0	1	0	0	0
Atlantic City	Madison Hotel	123 South Illinois Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Neptune Hose Company	519 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Raphael-Gordon House	118 South Newton Street	1	0	1	0	0	0	0	0	0
Atlantic City	Ritz Carlton Hotel	2715 Boardwalk at Iowa Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	Segal Building	1200 Atlantic Avenue	1	0	1	0	0	0	0	1	0
Atlantic City	Shelburne Hotel	Michigan Avenue and the Boardwalk	1	0	1	0	0	0	0	0	0
Atlantic City	St. Nicholas of Tolentine Church	1409-1421 Pacific Avenue	1	0	1	0	0	0	0	0	0
Atlantic City	The Knife and Fork Restaurant	29 S. Albany Ave.	1	0	1	0	0	0	0	0	0
Atlantic City	The Strand and Marine Apartments	3821-3825 Boardwalk Ave.	1	0	1	0	0	0	0	0	0
Atlantic City	U.S. Route 30 Bridge	U.S. Route 30 (Absecon Boulevard) over Beach Thorofare	1	0	1	0	1	1	0	1	0
Atlantic City	USCG Station Atlantic City	900 Beach Thorofare	1	1	1	0	1	1	0	1	0
Atlantic City	Warner Theatre	Atlantic City Boardwalk between Michigan and Arkansas Avenues	1	0	1	0	0	0	0	0	0
Atlantic City	Westside All Wars Memorial Building	1510 Adriatic Avenue	1	0	1	0	0	1	0	1	0
Atlantic City	World War 1 Memorial	South Albany Avenue, Ventnor Avenue and O'Donnell Parkway	1	0	1	0	0	0	0	1	0
Atlantic City, Egg Harbor Township,	West Jersey and Atlantic Railroad Historic District	Mays Landing, Hamilton Township to Pleasantville City	1	0	1	0	1	1	1	0	1

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

Table 3c.25 Exposure of Historic Properties by Hazard											
Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Hamilton, Pleasantville											
Brigantine	Brigantine Lighthouse	Brigantine Boulevard (County Route 638)	1	0	1	0	0	1	0	0	0
Buena Vista Township	Richland Presbyterian Church	Main Ave. at Sewell Ave.	0	0	0	0	0	0	0	1	0
Buena Vista, Corbin City, Estell Manor, Folsom, Hammonton, Weymouth	Atlantic City Railroad Cape May Division Historic District	Railroad right-of-way from Winslow Junction to Cape May Point, Sea Isle City & Ocean City	1	0	1	0	1	1	0	0	1
Corbin City	North and South Tuckahoe Historic District	NJ Route 50/Tuckahoe-Mount Pleasant Road	1	0	1	0	1	1	0	1	0
Corbin City	South Tuckahoe Historic District	1409-1421 Pacific Avenue	1	0	1	0	1	1	0	1	0
Egg Harbor City	Egg Harbor City Fire Station	351 Cincinnati Avenue	0	0	0	0	0	0	0	1	0
Egg Harbor City	Egg Harbor City Historic District	Philadelphia Avenue	0	0	0	0	0	0	0	1	0
Egg Harbor City	Lower Bank Road Bridge	Lower Bank Road (County Route 542) over Mullica River	1	0	1	0	1	1	0	0	1
Egg Harbor City	Neutral Water Health Resort Sanitarium	Corner of Claudius Street and London Avenue	1	0	0	0	0	0	0	0	1
Egg Harbor Township	Andrew B. Scull House	1647 Mays Landing-Somers Point Road (CR 559)	1	0	1	0	1	1	0	1	0
Egg Harbor Township	Captain John Jeffries Burial Marker	Palestine Bible Church Cemetery, County Route 559	0	0	1	0	0	0	0	1	0
Egg Harbor Township	Ocean City-Longport Bridge	Ocean Drive over Great Egg Harbor	1	1	1	1	1	1	0	1	0
Egg Harbor Township	Studebaker Showroom	North West Corner Verona and Toulon Avenues	1	0	1	0	0	0	0	0	0

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

Table 3c.25 Exposure of Historic Properties by Hazard											
Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Egg Harbor Township, Galloway, Port Republic, Somers Point	Garden State Parkway Historic District	Entire Garden State Parkway Right-of-Way	1	1	1	0	1	1	0	0	1
Estell Manor	Estellville Glassworks Industrial Historic District	Estell Manor Park, Stevens Creek, Maple Avenue, Walkers Forge Road, and NJ Rt. 50	1	0	1	0	0	0	0	0	1
Estell Manor	Head of the River Church	NJ Route 49 at Aetna Drive	1	0	1	0	0	0	0	0	1
Estell Manor	Risley School	134 Cape May Avenue	0	0	0	0	0	0	0	1	0
Folsom	Eighth Street Bridge	Eighth Street over Hospitality Branch	1	0	0	0	0	0	0	0	1
Folsom	Jacobus Evangelical Lutheran Church	Mays Landing Road	0	0	0	0	0	0	0	0	1
Galloway	Anonymous Roadside Cabins	US Route 30 and Taylor Avenue	0	0	0	0	0	0	0	1	0
Galloway	Conovertown Historic District	Along New York Road between Brook Lane and the border with Absecon City, west on Biscayne Avenue	1	0	1	0	0	0	0	0	1
Galloway	Frankfurt Avenue Bridge	Frankfurt Avenue over New Jersey Transit Atlantic City Line	0	0	0	0	0	0	0	0	1
Galloway	L.N. Renault and Sons Winery	Bremen Avenue and Leibig Street	1	0	1	0	0	0	0	0	1
Galloway	Modern Boat Works	US Route 9 at Nacote Creek	1	0	1	0	1	1	0	1	0
Galloway	Oceanville / Leeds Point / Moss Mill Historic District	Bounded by New York Road, Somers Town Lane, Leeds Point Road, and Moss Mill Road	1	0	1	0	0	0	0	1	0
Galloway	Roadside Cabins	US Route 30 and 5th Avenue	0	0	1	0	0	0	0	1	0

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.25**  
**Exposure of Historic Properties by Hazard**

Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Galloway	Smithville Apothecary	Smithville-Old Towne and Moss Mill Roads	0	0	1	0	0	0	0	0	0
Galloway	The Country Motel Roadside Cabins	201 White Horse Pike	0	0	0	0	0	0	0	1	0
Hamilton	Abbott's Modern Cabins	217 NJ Route 40	0	0	0	0	0	0	0	0	1
Hamilton	Mays Landing Historic District	Main Street and Cape May Avenue	1	0	1	0	1	1	1	0	1
Hamilton	US Route 322 and NJ Route 50 Cloverleaf	US Route 322 and NJ Route 50	1	0	1	0	0	0	0	0	1
Hamilton	Weymouth Road Bridge	Weymouth Road Bridge over Great Egg Harbor River	1	0	1	0	0	0	0	1	0
Hammonton	101 Bellevue Avenue	101 Bellevue Avenue	0	0	0	0	0	0	0	1	0
Hammonton	Hammonton Commercial Historic District	Third, Washington, Orchard, and Vine Streets	0	0	0	0	0	0	0	1	0
Linwood	Linwood Historic District	Maple and Poplar Avenues, and Shore Road	1	0	1	0	0	0	0	0	1
Linwood	Thomas & Mary Ingersall Naylor House	204 West Garfield Avenue	0	0	1	0	0	0	0	0	1
Longport	Church of the Redeemer	20th and Atlantic Avenues	1	0	1	0	0	1	0	0	0
Longport	Great Egg Coast Guard Station Building	31st and Pacific avenues	1	0	1	0	0	1	0	0	0
Margate City	Lucy, The Margate Elephant	Decatur and Atlantic Avenues	1	0	1	0	0	0	0	0	1
Margate City	Marven Gardens Historic District	Between Ventnor, Fredericksburg, Winchester and Brunswick Avenues	1	0	1	0	0	1	0	0	0
Mullica	Batsto Village	31 Batsto Rd	1	0	1	0	1	1	0	0	1
Mullica	Pleasant Mills	Elwood-Pleasant Mills Road	1	0	1	0	0	1	0	1	0
Northfield	1715 Tilton Road	1715 Tilton Road	0	0	0	0	0	0	0	1	0



**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

Table 3c.25 Exposure of Historic Properties by Hazard											
Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Pleasantville	213 Verona Avenue	213 Verona Avenue	1	0	1	0	0	0	0	0	0
Port Republic	Amanda Blake Store	104 Main Street	0	0	1	0	0	0	0	1	0
Port Republic	Chestnut Neck Battle Monument	US Route 9 and Old York Road	1	0	1	0	0	1	0	1	0
Port Republic	Gulf Service Station	758 Old New York Road	1	1	1	0	1	1	0	1	0
Port Republic	Port Republic Historic District	Central and Pomona Avenues, Riverside Drive, St. Johns Lane, Chestnut Neck, Clarks Landing, and Port Republic-Smithville Roads	1	1	1	0	1	1	0	0	1
Port Republic	Smithville-Port Republic Road Bridge	Smithville-Port Republic Road over Nacote Creek	1	1	1	0	1	1	0	1	0
Somers Point	World War 1 Memorial Bridge	NJ Route 52 over Ship Channel	1	1	1	0	1	1	0	1	0
Somers Point	Bay Front Historic District	Parts of Anna, Bay, Decatur, Delaware, Gibbs, Higbee, New Jersey, and Somers Avenues	1	1	1	0	1	1	0	1	0
Somers Point	Somers Mansion	Shore Road, adjacent to NJ Route 52 traffic circle	0	0	1	0	0	0	0	0	0
Ventnor	Dorset Avenue Bridge	N. Dorset Avenue between Ventnor Avenue and N. Derby/Edgewater Avenue	1	0	1	0	1	1	0	0	0
Ventnor City	John Stafford Historic District	Portions of Atlantic, Austen, Baton Rouge, Marion, and Vassar Avenues	1	0	1	0	0	0	0	0	0
Ventnor City	New Haven Firehouse	20 North New Haven Ave	1	0	1	0	0	0	0	0	0
Ventnor City	Saint Leonard's Tract Historic district	Bounded by Ventnor Ave, Fredericksburg Ave, Ventnor Gardens Plaza, and Derby Place	1	0	1	0	1	1	0	0	0

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

Table 3c.25 Exposure of Historic Properties by Hazard											
Jurisdiction	Property	Location	Flood, A Zone	Flood, V Zone (Wave)	Category 1-4 Storm Surge	Coastal Erosion	Sea Level Rise, 1 Ft	Sea Level Rise, 3 Ft	Dam Failure	Low to Moderate Wildfire	High to Extreme Wildfire
Ventnor City	Ventnor City Hall	6201 Atlantic Avenue	1	0	1	0	0	0	0	0	0
Ventnor City	Ventnor Motor Boat Club	11 North Derby Avenue, Ventnor City	1	0	1	0	1	1	0	0	0
Weymouth	Belcoville Post Office	1201 Madden Avenue	0	0	1	0	0	0	1	1	0
<b>Total</b>			<b>77</b>	<b>9</b>	<b>83</b>	<b>1</b>	<b>24</b>	<b>35</b>	<b>3</b>	<b>39</b>	<b>21</b>

## Conclusions on Hazard Risk

The results of this vulnerability assessment are useful in at least three ways:

- Improving our understanding of the risk associated with the natural hazards in Atlantic County through better understanding of the complexities and dynamics of risk, how levels of risk can be measured and compared, and the myriad of factors that influence risk. An understanding of these relationships is critical in making balanced and informed decisions on managing the risk.
- Providing a baseline for policy development and comparison of mitigation alternatives. The data used for this analysis presents a current picture of risk in Atlantic County. Updating this risk “snapshot” with future data will enable comparison of the changes in risk with time. Baselines of this type can support the objective analysis of policy and program options for risk reduction in the region.
- Comparing the risk among the natural hazards addressed. The ability to quantify the risk to all these hazards relative to one another helps in a balanced, multi-hazard approach to risk management at each level of governing authority. This ranking provides a systematic framework to compare and prioritize the very disparate natural hazards that are present in Atlantic County. This final step in the risk assessment provides the necessary information for local officials to craft a mitigation strategy to focus resources on only those hazards that pose the most threat to the county.

Exposure to hazards can be an indicator of vulnerability. Economic exposure can be identified through locally assessed values for improvements (buildings), and social exposure can be identified by estimating the population exposed to each hazard. This information is especially important for decision-makers to use in planning for evacuation or other public safety related needs. A summary of the value of buildings at-risk (exposed) to each hazard is presented in **Table 3c.26** and a summary of population exposure is presented in **Table 3c.27**. Using the previously described methodology, economic results were estimated for the different hazards profiled earlier in this section. The economic loss results are summarized in **Table 3c.28** using Annualized Loss (AL), which is the estimated long-term value of losses to the general building stock in any single year in a specified geographic area (i.e., jurisdiction). The estimated AL addresses the two key components of risk: the probability of the hazard occurring in the jurisdiction and the consequences of the hazard, largely a function of building construction type and quality, and of the intensity of the hazard event. By annualizing estimated losses, the AL factors in historic patterns of frequent smaller events with infrequent but larger events to provide a balanced presentation of the risk.

A summary of the annualized loss ratio (ALR) results is presented in **Table 3c.29**. The ALR represents the AL as a fraction of the local value of improvements (calculated as annualized losses divided by the total exposure at risk). The annualized loss ratio gauges the relationship between average annualized loss and the value of exposed assets.

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.26**  
**Building Value Exposure by Hazard (\$million)**

Jurisdiction	Countywide Hazards*	Coastal Erosion**	Dam Failure	Drought** (Value of Crops at Risk)	Flood (A, V Zones)	Storm Surge (Zones 1-4)	Wave Action	Wildfire
Absecon, City of	\$441.9	\$0	\$0	Not Available	\$35.86	\$238.65	\$0.09	\$71.8
Atlantic City, City of	\$4,819.2	\$23.780	\$0	\$0	\$3,005.02	\$3,694.80	\$56.05	\$103.6
Brigantine, City of	\$1,324.8	\$6.449	\$0	\$0	\$889.38	\$1,006.66	\$5.33	\$32.6
Buena, Borough of	\$232.7	\$0	\$0	Not Available	\$1.50	\$0.00	\$0	\$44.2
Buena Vista, Township of	\$481.8	\$0	\$0	Not Available	\$4.50	\$0.00	\$0	\$234.5
Corbin City, City of	\$34.4	\$0	\$0	Not Available	\$8.52	\$31.18	\$0	\$18.4
Egg Harbor City, City of	\$244.1	\$0	\$0	Not Available	\$5.60	\$0.85	\$0	\$66.5
Egg Harbor, Township of	\$3,314.3	\$0.382	\$7.938	Not Available	\$154.19	\$470.09	\$6.05	\$1,454.5
Estell Manor, City of	\$113.9	\$0	\$0.167	Not Available	\$2.82	\$11.94	\$0	\$100.4
Folsom, Borough of	\$114.8	\$0	\$0	Not Available	\$8.41	\$0.00	\$0	\$42.9
Galloway, Township of	\$2,609.7	\$0.0015	\$0	Not Available	\$52.98	\$135.45	\$0.46	\$1,113.1
Hamilton, Township of	\$1,762.8	\$0	\$63.920	Not Available	\$60.14	\$385.25	\$0	\$735.6
Hammonton, Town of	\$1,126.2	\$0	\$0	Not Available	\$25.61	\$0.00	\$0	\$297.4
Linwood, City of	\$612.1	\$0	\$0	Not Available	\$60.16	\$403.63	\$1.53	\$54.1
Longport, Borough of	\$540.0	\$0	\$0	\$0	\$415.59	\$415.04	\$3.07	\$1.3
Margate City, City of	\$1,547.9	\$0	\$0	\$0	\$1,192.62	\$1,221.84	\$8.97	\$7.8
Mullica, Township of	\$329.0	\$0	\$0	Not Available	\$45.40	\$74.84	\$0	\$197.9
Northfield, City of	\$621.1	\$0	\$0	Not Available	\$7.25	\$279.64	\$0	\$34.6
Pleasantville, City of	\$909.7	\$20.30	\$0	\$0	\$33.31	\$292.77	\$1.33	\$80.1
Port Republic, City of	\$86.5	\$0	\$0	Not Available	\$17.98	\$61.89	\$1.39	\$69.8
Somers Point, City of	\$857.0	\$0	\$0	Not Available	\$134.73	\$578.53	\$5.77	\$23.3
Ventnor City, City of	\$967.0	\$0.0045	\$0	\$0	\$630.37	\$731.16	\$0.06	\$10.1
Weymouth, Township of	\$108.9	\$0	\$28.748	Not Available	\$9.10	\$28.66	\$0	\$73.2
<b>Total</b>	<b>\$23,199.5</b>	<b>\$30.847</b>	<b>\$100.775</b>	<b>\$120.673</b>	<b>\$6,801.05</b>	<b>\$10,062.88</b>	<b>\$90.10</b>	<b>\$4,867.8</b>
<b>% Exposure</b>	<b>100%</b>	<b>0.16%</b>	<b>0.43%</b>	<b>100%</b>	<b>35%</b>	<b>51.0%</b>	<b>0.46%</b>	<b>21.0%</b>

\*Extreme wind, winter weather, tornado, lightning, hurricane and tropical storm, tornado, extreme temperatures, earthquake.

\*\*Assumes absence of current beach nourishment and stabilization actions.

\*\*\*All mapped areas of low, moderate and high wildfire risk

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.27**  
**Population Exposure by Hazard**

Jurisdiction	Countywide Hazards*	Coastal Erosion**	Sea Level Rise 1 Ft	Sea Level Rise 3Ft	Dam Failure	Drought	Flood (A, V Zones)	Storm Surge (Zones 1-4)	Wave Action	Wildfire***
Absecon, City of	8,362	0	197	512	0	8,362	2,243	5,417	5	4,005
Atlantic City, City of	37,999	48	4,875	11,700	0	37,999	33,856	38,497	7	15,541
Brigantine, City of	8,832	293	2,816	6,195	0	8,832	6,094	7,716	273	3,482
Buena, Borough of	4,356	0	0	0	0	4,356	76	0	0	1,429
Buena Vista, Township of	7,295	0	0	0	0	7,295	351	0	0	5,646
Corbin City, City of	537	0	61	159	0	537	886	485	0	371
Egg Harbor City, City of	4,100	0	86	232	0	4,100	4,398	657	0	344
Egg Harbor, Township of	42,714	3	796	2,388	177	42,714	96	13,150	141	291,509
Estell Manor, City of	1,728	0	16	43	8	1,728	797	1,419	0	1,621
Folsom, Borough of	1,697	0	0	0	0	1,697	486	0	0	1,393
Galloway, Township of	36,094	0	124	322	0	36,094	4,025	6,464	8	23,333
Hamilton, Township of	25,973	0	230	598	1,074	25,973	3,838	5,883	0	22,811
Hammonton, Town of	14,139	0	0	0	0	14,139	783	91	0	8,699
Linwood, City of	6,742	0	168	437	0	6,742	1,880	4,951	44	2,873
Longport, Borough of	869	0	864	1,642	0	869	694	761	47	59
Margate City, City of	5,997	0	1,521	3,042	0	5,997	4,915	5,317	154	572
Mullica, Township of	5,925	0	267	766	0	5,925	850	1,273	0	5,181
Northfield, City of	8,153	0	39	105	0	8,153	1,266	3,741	0	3,248
Pleasantville, City of	20,301	12	90	270	0	20,301	4,702	10,632	21	6,916
Port Republic, City of	1,121	0	89	231	0	1,121	526	896	130	1,000
Somers Point, City of	10,321	0	305	732	0	10,321	3,822	8,651	97	3,524
Ventnor City, City of	10,095	60	2,094	4,816	0	10,095	8,224	9,210	14	2,659
Weymouth, Township of	2,755	0	67	161	485	2,755	118	144	0	2,494
<b>Total</b>	<b>266,105</b>	<b>415</b>	<b>14,705</b>	<b>34,351</b>	<b>1,744</b>	<b>266,105</b>	<b>84,926</b>	<b>125,355</b>	<b>941</b>	<b>146,288</b>
<b>% Exposure</b>	<b>100%</b>	<b>0.15%</b>	<b>5.5%</b>	<b>12.9%</b>	<b>0%</b>	<b>100%</b>	<b>32%</b>	<b>47%</b>	<b>0.04%</b>	<b>55%</b>

\*Extreme wind, winter weather, tornado, lightning, hurricane and tropical storm, tornado, extreme temperatures, earthquake.

\*\*Assumes absence of current beach nourishment and stabilization actions.

\*\*\*All mapped areas of low, moderate and high wildfire risk

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

<b>Table 3c.28</b> <b>Annualized Losses by Hazard</b> <b>(\$million)</b> <b>(Only includes Hazards for which Annual Losses were Quantified)</b>										
Jurisdiction	Extreme Wind	Hurricane and Tropical Storm	Lightning	Tornado	Drought*	Winter Storm	Coastal Erosion**	Flooding (Riverine)	Storm Surge (Coastal Flooding)	Earthquake
Absecon, City of	\$0.148	\$0.586	\$0.001	\$0.000	\$0.001	\$0.004	\$0	\$0.006	\$2.108	\$0.013
Atlantic City, City of	\$1.612	\$4.852	\$0.014	\$0.004	\$0.000	\$0.044	\$0.594	\$0.000	\$156.164	\$0.086
Brigantine, City of	\$0.443	\$1.921	\$0.004	\$0.001	\$0.000	\$0.012	\$0.161	\$0.000	\$33.742	\$0.019
Buena, Borough of	\$0.078	\$0.096	\$0.001	\$0.000	\$0.784	\$0.002	\$0	\$0.000	\$0.000	\$0.009
Buena Vista, Township of	\$0.161	\$0.180	\$0.001	\$0.000	\$1.054	\$0.004	\$0	\$0.144	\$0.000	\$0.011
Corbin City, City of	\$0.012	\$0.017	\$0.000	\$0.000	\$0.038	\$0.000	\$0	\$0.341	\$0.798	\$0.001
Egg Harbor City, City of	\$0.082	\$0.155	\$0.001	\$0.000	\$0.023	\$0.002	\$0	\$0.392	\$0.002	\$0.008
Egg Harbor, Township of	\$1.109	\$2.546	\$0.010	\$0.003	\$0.110	\$0.030	Negligible	\$0.043	\$8.635	\$0.057
Estell Manor, City of	\$0.038	\$0.110	\$0.000	\$0.000	\$0.115	\$0.001	\$0	\$0.001	\$0.077	\$0.004
Folsom, Borough of	\$0.038	\$0.048	\$0.000	\$0.000	\$0.136	\$0.001	\$0	\$1.160	\$0.000	\$0.003
Galloway, Township of	\$0.873	\$1.920	\$0.008	\$0.002	\$0.539	\$0.024	Negligible	\$0.000	\$0.546	\$0.055
Hamilton, Township of	\$0.590	\$0.888	\$0.005	\$0.002	\$0.527	\$0.016	\$0	\$1.767	\$0.299	\$0.037
Hammonton, Town of	\$0.377	\$0.377	\$0.003	\$0.001	\$1.751	\$0.010	\$0	\$0.068	\$0.000	\$0.032
Linwood, City of	\$0.205	\$0.576	\$0.002	\$0.001	\$0.003	\$0.006	\$0	\$0.001	\$3.476	\$0.008
Longport, Borough of	\$0.181	\$0.033	\$0.002	\$0.001	\$0.000	\$0.005	\$0	\$0.000	\$8.489	\$0.000
Margate City, City of	\$0.518	\$1.256	\$0.005	\$0.001	\$0.000	\$0.014	\$0	\$0.000	\$38.957	\$0.014
Mullica, Township of	\$0.110	\$0.171	\$0.001	\$0.000	\$0.909	\$0.003	\$0	\$0.747	\$3.823	\$0.008
Northfield, City of	\$0.208	\$0.618	\$0.002	\$0.001	\$0.002	\$0.006	\$0	\$0.015	\$1.112	\$0.013
Pleasantville, City of	\$0.304	\$0.987	\$0.003	\$0.001	\$0.000	\$0.008	Negligible	\$0.000	\$3.004	\$0.022
Port Republic, City of	\$0.029	\$0.124	\$0.000	\$0.000	\$0.015	\$0.001	\$0	\$0.000	\$0.570	\$0.002
Somers Point, City of	\$0.287	\$0.726	\$0.003	\$0.001	\$0.000	\$0.008	\$0	\$0.000	\$17.127	\$0.008
Ventnor City, City of	\$0.323	\$1.354	\$0.003	\$0.001	\$0.000	\$0.009	Negligible	\$0.000	\$15.129	\$0.019
Weymouth, Township of	\$0.036	\$0.025	\$0.000	\$0.000	\$0.028	\$0.001	\$0	\$0.001	\$0.110	\$0.001
<b>Total</b>	<b>\$7.762</b>	<b>\$19.564</b>	<b>\$0.067</b>	<b>\$0.020</b>	<b>\$6.034</b>	<b>\$0.212</b>	<b>\$0.755</b>	<b>\$4.686</b>	<b>\$294.168</b>	<b>\$0.432</b>

\*Potential Crop Losses Only; Data allowed for estimate of a county-wide total but not a jurisdiction specific estimate. Communities with USDA reported 0 acres in agriculture were assigned \$0 average annual crop losses for planning purposes. \*\*Assumes absence of current beach nourishment and stabilization actions.

**SECTION 3 - RISK ASSESSMENT**  
**SECTION 3C – DAMAGE ESTIMATES**

**Table 3c.29**  
**Annual Loss Ratios by Hazard**  
**(Only Hazards for which Annual Losses were Quantified)**

Jurisdiction	Extreme Wind	Hurricane and Tropical Storm	Lightning	Tornado	Drought*	Winter Storm	Coastal Erosion**	Flooding (Riverine)	Storm Surge (Coastal Flooding)	Earthquake
Absecon, City of	0.033%	0.05%	0.0003%	0.0001%	5%	0.001%	0	0.0005%	0.17%	0.0010%
Atlantic City, City of	0.033%	0.06%	0.0003%	0.0001%	0%	0.001%	0.02%	0%	1.97%	0.0011%
Brigantine, City of	0.033%	0.08%	0.0003%	0.0001%	0%	0.001%	0.02%	0%	1.32%	0.0008%
Buena, Borough of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0%	0.00%	0.0016%
Buena Vista, Township of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.02%	0.00%	0.0012%
Corbin City, City of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.43%	1.01%	0.0008%
Egg Harbor City, City of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.06%	0.00%	0.0012%
Egg Harbor, Township of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0.001%	0.14%	0.0009%
Estell Manor, City of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0.0004%	0.03%	0.0015%
Folsom, Borough of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.40%	0.00%	0.0011%
Galloway, Township of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0%	0.01%	0.0011%
Hamilton, Township of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.05%	0.01%	0.0010%
Hammonton, Town of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.003%	0.00%	0.0016%
Linwood, City of	0.033%	0.05%	0.0003%	0.0001%	5%	0.001%	0	0.0001%	0.28%	0.0006%
Longport, Borough of	0.033%	0.01%	0.0003%	0.0001%	0%	0.001%	0	0%	1.74%	0.0000%
Margate City, City of	0.033%	0.06%	0.0003%	0.0001%	0%	0.001%	0	0%	1.91%	0.0007%
Mullica, Township of	0.033%	0.02%	0.0003%	0.0001%	5%	0.001%	0	0.09%	0.47%	0.0010%
Northfield, City of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0.001%	0.07%	0.0009%
Pleasantville, City of	0.033%	0.05%	0.0003%	0.0001%	0%	0.001%	0	0%	0.14%	0.0010%
Port Republic, City of	0.033%	0.06%	0.0003%	0.0001%	5%	0.001%	0	0%	0.29%	0.0009%
Somers Point, City of	0.033%	0.04%	0.0003%	0.0001%	5%	0.001%	0	0%	0.96%	0.0005%
Ventnor City, City of	0.033%	0.07%	0.0003%	0.0001%	0%	0.001%	0	0%	0.75%	0.0009%
Weymouth, Township of	0.033%	0.01%	0.0003%	0.0001%	5%	0.001%	0	0.0004%	0.04%	0.0003%
<b>Total</b>	<b>0.033%</b>	<b>0.04%</b>	<b>0.0003%</b>	<b>0.0001%</b>	<b>5%</b>	<b>0.001%</b>	<b>0.004%</b>	<b>0.011%</b>	<b>0.67%</b>	<b>0.0010%</b>

\*Drought losses are computed based on the estimated percent of loss of crops per year; all other estimates relate to percentage of improved property or HAZUS building replacement value loss per year.

\*\*Assumes absence of current beach nourishment and stabilization actions – in actuality losses are assumed to be negligible in all jurisdictions. .