



Appendix 1: Borough of Carteret

The Borough of Carteret participated in the 2015 Middlesex County Hazard Mitigation Plan (HMP) update. This appendix includes the locally-specific information about the Borough. The following sections detail the planning process and participants; the current population, building stock, and land development trends; hazards that specific to the Borough and corresponding risk assessments; the Borough’s mitigation strategy, and a local capability assessment. Information and data that is uniform throughout the planning area is included in Sections 1-7 of this plan update.

1. Plan Development

On December 22, 2014, the Mayor signed an “Intent to Participate” letter. As the primary point of contact Mr. DuPont worked with other municipal employees, consultants, volunteers, and other stakeholders through the formation of a Local Planning Committee, as listed below. The local planning committee filled out the municipal worksheets included in Appendix E and worked to gather the necessary information to support the plan update. The committee reviewed all drafts of the appendix, provided a list of local stakeholders for outreach and engagement, and posted notifications through local outlets, as determined was necessary.

Table 1-1
Borough of Carteret Local Planning Committee Members

Name	Title	Organization
John P. DuPont	Municipal Engineer	Borough of Carteret
Daniel Beasley	OEM Coordinator	Borough of Carteret
Mark Hruska	Fire Chief	Borough of Carteret
Dennis Mcfadden	Police Chief	Borough of Carteret



2. Community Profile

2.1 Physical Location

The Borough of Carteret has a total area of 5.0 square miles and is located in the northeastern corner of Middlesex County, New Jersey. The Rahway River forms the northern border of Carteret (The City of Linden, Union County is to the north of the Rahway River), and it is bordered to the east by the Arthur Kill waterway and by Woodbridge Township to the south and west. Primary transportation routes include the New Jersey Turnpike including Exit 12 of the Turnpike as well as local roads. New Jersey Transit provides bus service. There are no commuter rails in Carteret.

2.1.1 Hydrography and Hydrology

The Borough of Carteret is bounded on two sides by major rivers. The northern border is the Rahway River, where the Rahway meets the Arthur Kill. The Arthur Kill makes up the Borough's entire eastern boundary, which is also the New Jersey state line. The mainstem of the Rahway flows 24 miles from Essex County down to the mouth at the Arthur Kill. It is tidal as it flows past the Borough of Carteret, as the head of tide is just below the Pennsylvania Railroad Bridge in Rahway. There are a number of tributaries leading to the Rahway in the northern edge of the Borough, including Cross Creek, Deep Creek, Casey's Creek, and Run Creek. The only named tributary to the Arthur Kill within the Borough is Noes Creek, which is a source of flooding hazard for the Borough.

2.2 History and Governance

The Borough of Carteret was formally incorporated on April 11, 1906. The Borough is governed under the Borough form of government, and has an elected Mayor and six Council members. The Mayor is elected directly to a four-year term of office. Town Council members are elected to serve three-year terms on a staggered basis, with two seats coming up for election every year. The Borough Council holds monthly meetings open to the public where it discusses legislation under consideration.

Prior to incorporation, Carteret was part of Woodbridge Township. At the time it was called the Borough of Roosevelt, and the name was changed in 1922 to the Borough of Carteret.¹

2.3 Demographics

2.3.1 Population Trends

According to the U.S. Census Bureau, the population in 2010 was 22,844.² This is a 10.3% increase from 2000. The Borough of Carteret has a population density of 5,171 persons per square mile. It is the 8th

¹ Borough of Carteret, "History of Carteret". <http://www.ci.carteret.nj.us/content/2861/3639/default.aspx> Retrieved, 8/16/15.



densest municipality within the County. A summary of major population and household characteristics may be found in the following tables.

Table 1-2
Borough of Carteret Population Summary Estimates (2010 Census)³

Population	Quantity	Percent of Municipal Population
Total Population	22,844	100
Median Age	35.1	N/A
17 years and under	5,791	25.4
65 years and over	2,457	10.8
Race		
White	11,577	50.7
Black/African-American	3,393	14.9
Native American/Alaskan Native	80	0.4
Asian	4,349	19.0
Asian Indian (<i>Note: largest Sikh population in New Jersey</i>)	3,113	13.6
Native Hawaiian/Pacific Islander	12	0.1
Other Race (unspecified)	2,553	11.2
Two or More Races	880	3.9
Hispanic or Latino	7,066	30.9

Population statistics may further reveal potential vulnerabilities in the community. The following table details the distribution of two groups included in vulnerable population analyses (children and the elderly) according to household description. Residents living alone, particularly the elderly, may have fewer coping mechanisms and resource than those in household groups, therefore may constitute a demographic that could require assistance in mitigating their vulnerability.

² U.S. Bureau of the Census. American Fact Finder “Carteret Borough, NJ”. <http://factfinder.census.gov/>. Retrieved 8/16/15.

³ Ibid.



Table 1-3
Borough of Carteret Household Characteristics Summary Estimates (2010 Census) ⁴

Households	Quantity	Percent of Total
Total Households	7,591	100
Family Households (related)	5,689	74.9
Family Households w children under 18	2,816	37.1
Non-Family Households, living alone	1,572	20.7
Non-Family Households, living alone (Male over 65 years)	207	2.7
Non-Family Households, living alone (Female over 65 years)	445	5.9

2.3.2 Vulnerable Populations

Vulnerable populations include those groups that may require special assistance, considerations, accommodation or other needs during emergency events to facilitate their effective and safe compliance with emergency instructions. This includes, but is not limited to, those individuals needing mobility assistance (strollers, wheelchairs, etc.), those with financial needs (cannot afford hotel rooms, food, necessities, during evacuation periods, etc.), those requiring translation or interpretation services to understand emergency information (non-English-speaking populations, Deaf and hard of hearing), persons considered legal minors, those persons with cognitive impairments, persons with specialized medical needs (electric dependent equipment, refrigerated medications, use of Personal Assistants for routine and basic care, medical transportation needs, etc.), and populations with social disadvantages other needs that may require unique considerations during emergency events. Identifiable vulnerable populations in Carteret include (but may not be limited to) the following:

Table 1-4
Borough of Carteret Vulnerable Population Estimates (2010)

Population Type	Population Estimate (2010 Census) ⁵
Under 5 years of age	1,536
Under 18 years of age	5,791
Over 65 years of age	2,457
Limited English Proficiency (LEP) ⁶	4,983 (equals 22.8% of population over 5 years old) ⁷
Institutionalized	0
Living in Group Quarters	9

In addition to these statistics, approximately 11% of the population lives below the poverty line. The mean household income is \$69,832, with the per capita income at approximately \$24,141 (2013 estimates).⁸

⁴ Ibid.

⁵ Ibid.

⁶ Of those that identified Limited English Proficiency, 45.5% speak Spanish as their primary language. Also identified are other Indo-European languages, Asian languages and other languages not specified in the Census.

⁷ 2013 American Community Survey Estimate

⁸ U.S. Bureau of the Census. American Fact Finder "Carteret Borough, NJ". <http://factfinder.census.gov/> . Retrieved 8/16/15.



2.4 Land Use and Development

The Borough of Carteret strives to minimize the risk to person and property within the municipality. For this reason the Borough has regulations and policies in place to limit development in floodprone, environmentally sensitive, and high-risk areas. At this time, these protections match New Jersey’s minimum standards and include a floodplain development ordinance, stormwater management standards, and the state’s building code. More details on the existing ordinances for the Borough is listed in the Capability Assessment section of this appendix.

Carteret is a developed dense residential community, with nearly 82 percent of its 4.5 square miles of land area classified as urban/developed. The Rahway River and its adjacent wetlands at the northern border of the Borough, cover a majority of the remaining land area. Of this 82 percent, the predominant land use is residential housing. Nearly 93 percent of the parcels within Carteret are classified as residential based on tax assessment data. There are two residential areas within the Borough. One is to the west of the NJ Turnpike adjacent to the floodplain for the Rahway River. The other area is central within the Borough, extending north from the Woodbridge border to the east of the NJ Turnpike. Both are dense, small-lot residential zones with the largest single-family residential parcel size 1.33 acres and the average parcel covering .11 acres.

In 2012, there were still a few large parcels that were classified as Barren Land in the community, though there had been a decline in barren land within the community in the past 10 years. This may have been a result of the timing or accuracy of the remote sensing data, or it may indicate that the Borough has experienced smaller infill development in addition to the two larger projects indicated in Section 2.4.3.

**Table 1-5
Borough of Carteret
Land Cover Summary**

Land Cover Class	Percent of Total Land ⁹	2002 (acres)	2007 (acres)	2012 (acres)	Percent Change ¹⁰
Agriculture	0	0	0	0	0
Barren Land	1.31%	70.18	128.65	37.87	-46.04%
Forest	3.70%	167.77	114.70	106.77	-36.36%
Urban	81.96%	2244.17	2267.39	2363.69	5.33%
Water	4.01%	108.72	113.81	115.57	6.30%
Wetlands	9.02%	293.11	259.40	260.06	-11.28%

⁹ Percent based on acres of land in 2012

¹⁰ Change is calculated between 2002 and 2012



2.4.1 Open Space

The Borough of Carteret has 11 municipal parks covering over 130 acres within the Borough. These parks include Joseph “Ducky” Medwick Park, an 83 acre park along the Rahway River buffering the residential neighborhoods from the river’s floodplain. Another large park sits along the Arthur Kill waterfront. In total, 4 percent of the Special Flood Hazard Area within the Borough is open space.

2.4.2 Building Stock Overview

Understanding the existing building stock can help identify potential vulnerabilities to certain natural hazards. It gives an overview of the community economic make-up, as well as, an understanding of the age of structures. The Borough of Carteret is a predominantly residential community with the majority of its homes having been built before 1979.

Table 1-6
Borough of Carteret
Housing Characteristics

Housing Characteristics	Estimate
Total Occupied Housing Units	7,762
Percent Owner-occupied	53.8
Percent Renter-occupied	46.12
Percent built after 2000	13.8
Percent built before 1979	80.7

2.4.3 Recent and Expected Development

According to the Borough, there has only been one large residential project that has gone to construction during this time, and a second project in its final planning phase. The Borough has designated a number of redevelopment areas on the western, northeastern, and southeastern areas of the town. All new development projects are subject to floodplain regulations and stormwater management regulations.

Project Name	Type	Number of Structures	Location	Known Hazards	Description/Status
Meridia Cosmopolitan	Residential	250	Cooke Avenue	Unknown	Construction has begun
Washington Ave. Redevelopment	Residential	125	Washington Ave.	Unknown	Final plans in preparation



2.5 Critical Facilities and Infrastructure

This section details facilities and infrastructure that are critical to the safety, welfare, and operation of the Borough and its residents. This includes facilities and infrastructure that do not fall within the Borough's responsibility or capability to maintain or upgrade, including state, county, and private facilities.

2.5.1 Essential Facilities

Carteret operates its own police, fire, and EMS services. It has two Fire Stations, an EMS building, and a Police Station. None of these facilities are located within the current FEMA Special Flood Hazard Area. Additional public facilities include the Municipal Building, Municipal Garage, and Public Library. The Municipal Garage sits adjacent to Noes Creek near the Arthur Kill. It is located within the floodplain and experienced extensive damage in Hurricane Sandy.

2.5.2 Transportation

The Borough of Carteret is bisected by the NJ Turnpike and Exit 12 is within the Borough. The other significant road in the Borough is Roosevelt Avenue, the designated evacuation route. There are also a number of rail lines within the Borough that run to the industrial areas of town. These are all freight lines, none carry passenger trains.

2.5.3 Critical Utilities and Infrastructure

The Borough is served by PSE&G for both gas and electric. The water for the Borough is served by Middlesex Water Company. The Borough manages its own wastewater services. There is one pump station within the Borough, it has not been damaged in previous storms.



3. Hazard Identification and Risk Assessment

This section describes the natural hazards and risks that can affect Borough of Carteret. Like all the other municipalities in Middlesex County, the Borough of Carteret is potentially subject to the effects of all the hazards that are considered in this mitigation plan. However, only a few of these hazards have significant impacts that are unique to the community. The remaining hazards are discussed in detail in the County part of this mitigation plan update. FEMA mitigation planning guidance requires that County mitigation plans include a risk assessment section that “assess[es] each jurisdiction’s risks where there vary from the risks facing the entire planning area” (44CFR 201.6 (c) (2) (iii)). Because the Middlesex County HMP update includes separate appendices for each municipality, this requirement is met in the appendices, while risks that affect the entire County uniformly are discussed in the County part of the HMP.

Table 1-7
Hazard Identification and Prioritization

Hazard	Priority
Coastal Erosion	Low
Dam/Levee Failure	Low
Drought	Medium
Earthquakes	Low
Extremely High Temps	High
Extremely Low Temps	Low
Floods	High*
Hurricanes/Tropical Storms	High*
Nor’easters	High
Power Outages	High
Severe Weather	High
Hazardous Substances	Medium
Wildfire	Low
Winter Storm	Medium

3.1 Background and Hazard Rankings

One of the first steps in developing jurisdictional appendices was for participating municipalities to review and prioritize the hazards that can affect them. This was done based on how often a hazard has occurred, how significant effects have been in the past, the difficulty and cost of recovering from such events. The planning team also reviewed hazard-specific data at the jurisdiction level to provide communities with insight about which hazards would be afforded detailed risk assessments. Municipalities ranked the list of hazards as high, medium, low, or no concern.

Table 1-7 shows community hazard rankings. To the extent possible, the level of discussion and detail about specific hazards in this section are based on these rankings. However, in many cases there is insufficient hazard information available at the level of the jurisdiction to allow detailed discussion or risk estimates. For some hazards there is limited jurisdiction-level tabular data included in the County portion of the HMP, and users should refer to those subsections for more detail. The hazards marked with asterisks in the table above are included in this appendix; the others are included in the County portion of this HMP, but not discussed in detail here.



3.2 Flood Hazard

3.2.1 Type, Location, and Extent

The Borough of Carteret is located in far northeastern Middlesex County. The northern border of the jurisdiction is formed by the Rahway River, which drains east to the Arthur Kill, which in turn comprises the eastern border of Carteret. Although there is significant floodplain in the northeast part of the jurisdiction, that area is almost entirely comprised of industrial uses (tank farms and associated infrastructure) and marshland. Although the area is subject to overbank flooding from the Rahway and Arthur Kill, impacts to the Borough and its citizens are minimal, and damages are presumably addressed through private insurance. The most floodprone part of Carteret is a relatively small area west of Civic Center Park, in the east-central part of the jurisdiction. This area drains to Noes Creek, which is channelized underground to the west of Peter Sica Industrial Highway, and open from east of the highway to its outfall into the Arthur Kill. As shown in Figure 1-2 below, flood insurance losses are highly concentrated in a relatively small number of streets. The flooding is caused by inadequate drainage into Noes Creek in this area.

One of the best resources for determining flood risk in a jurisdiction is Flood Insurance Rate Maps (FIRMs), which are produced by FEMA. The FIRM is the official map of a community on which FEMA has delineated both the special flood hazard areas (1% annual chance of flooding) and the risk premium zones applicable to the jurisdiction.¹¹ At the time the Middlesex County HMP was being updated, the *effective* FIRM for the Borough of Carteret is dated July 6, 2010. While the effective FIRM is the approved map and is used for regulatory purposes, the Middlesex County hazard mitigation plan update was developed in 2015, and the best available flood mapping at that time was the FEMA revised Preliminary Flood Map (released on January 30, 2015). This map is shown below in Figure 1-1 It shows that all the 100- and 500-year floodplain in the jurisdiction is related to the Rahway River, Arthur Kill, and low-lying and poorly drained areas leading to Noes Creek.

¹¹ FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition



Figure 1-1
Carteret portion of FEMA Revised Preliminary Flood Insurance Rate Map
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)

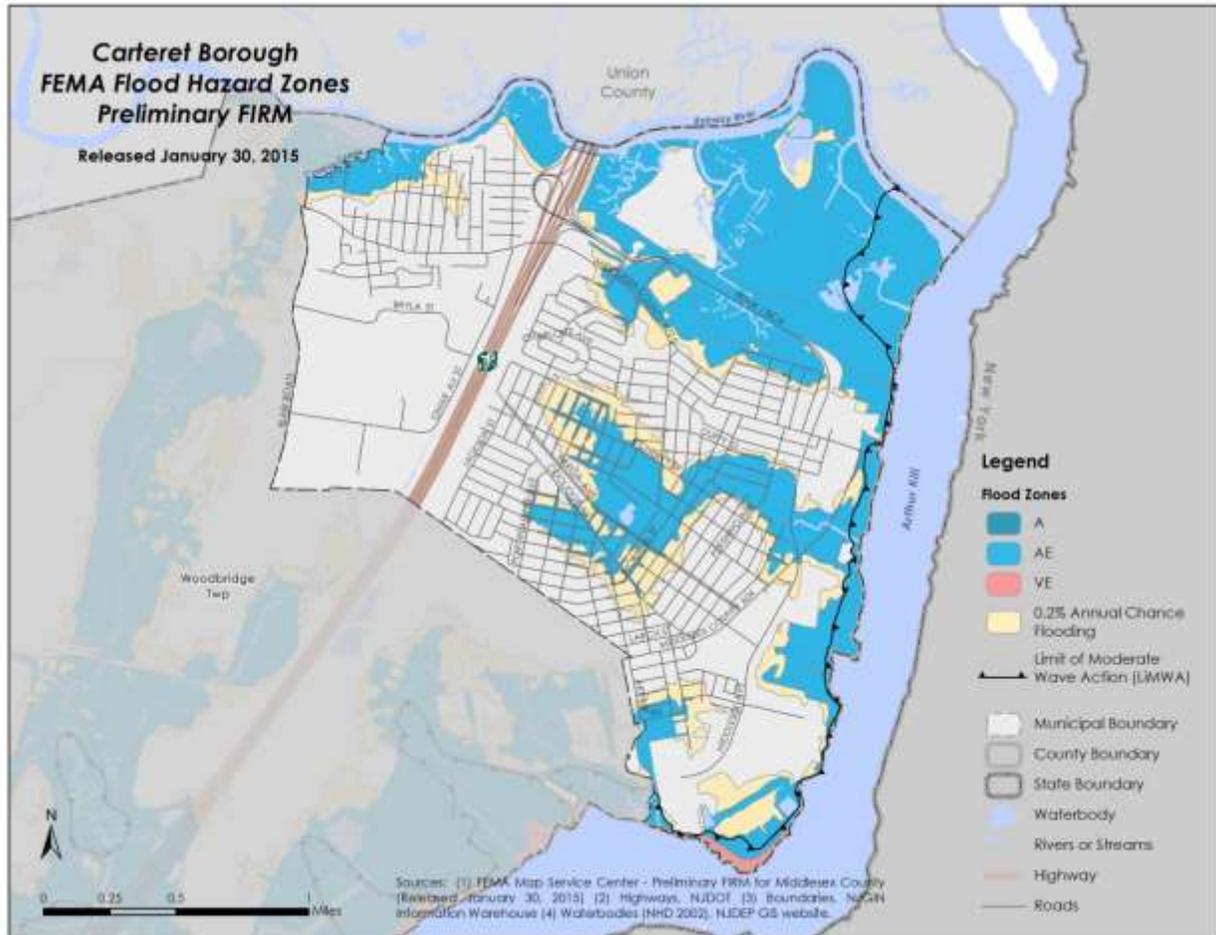


Table 1-8 provides basic information about floodplain and parcels subject to flooding within the jurisdiction based on the Preliminary FIRM. Note that although a large percentage of Carteret is within the FEMA Special Flood Hazard Area (SFHA), relatively few parcels are within that zone. This is due to the large industrial area of floodplain at the north end of the jurisdiction.



Table 1-8
Floodplain and Parcel Data for the Borough of Carteret
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)

Data Type	Value
Jurisdiction area in square miles	4.5
Square miles within 100-year floodplain	1.62
Percentage of jurisdiction within 100-year floodplain	35.92%
Number of parcels in jurisdiction	5,933
Number of parcels with centroids within 100-year floodplain	782
Percentage of parcels with centroids within 100-year floodplain ¹²	13.18%

Current FEMA guidance uses the term *extent* as analogous to potential severity. Although there are periodic small and localized floods in Carteret, most of the past flood damage was from two events, Hurricanes Irene and Sandy. Based on the amounts of flood insurance claims (discussed below), depths are likely on the order of two to three feet in more severe events, although a significant portion of the damages may be to basements.

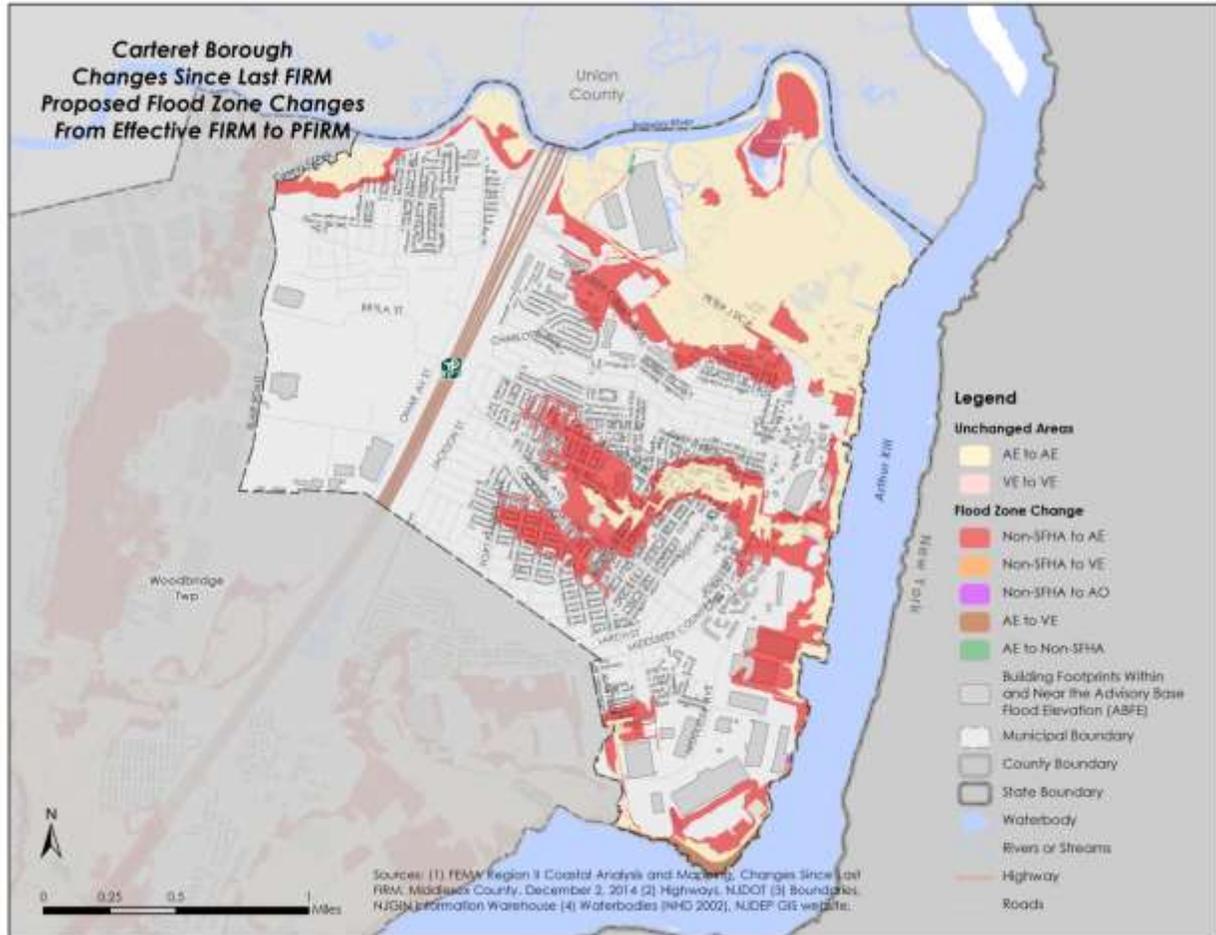
3.2.2 Changes in Floodplain Boundaries

Prior to Sandy in 2012, FEMA had begun a coastal flood study to update Flood Insurance Rate Maps (FIRMs) and Flood Insurance Study (FIS) reports for portions of New York and New Jersey, including Middlesex County, using improved methods and data to better reflect coastal flood risk. Much of the resulting information is publicly available from the [FEMA Region II Coastal Analysis and Mapping](#) website. Figure 1-2 below indicates changes in various flood zones in Carteret. The Changes Since Last FIRM (CSLF) dataset compares information shown on the preliminary FIRM with that of the effective FIRM. This includes a comparison of the floodplain boundaries and zones, Base Flood Elevation changes, and where applicable, the regulatory floodway. See the main body of the 2015 Middlesex County Plan update (Section 3.3.7) for additional information about the CSLF dataset.

¹² Note: The table refers to centroids, which are the geographic center of a parcel. This is a better indicator of flood exposure than simple intersection with the floodplain, although it does not necessarily mean that any structures or infrastructure are within the boundaries of the Special Flood Hazard Area



Figure 1-2
Changes in Floodplain Boundaries in the Borough of Carteret
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)



3.2.3 Previous Occurrences and the Probability of Future Floods

Although flood insurance claims in Carteret extend back to the 1980s, the claims are almost all related to two events: Hurricane Irene in 2011, and Sandy in 2012. Few if any of these claims appear to be related to any overbank flooding from the Rahway or Arthur Kill. Rather, they are evidently caused by poor drainage, ponding and/or surcharge in those areas west of Civic Center Park. Specific streets vulnerable to flooding are discussed in the subsections below. The Borough also reported that several streets in the jurisdiction flood regularly during routine rain events. These include Noe Street, and Harris and Pershing Streets.



3.2.4 Flood Impacts and Vulnerabilities to Flooding

The impacts from past floods in this jurisdiction have been moderate in nature, and concentrated in a very specific geographic area (discussed elsewhere in this section). Based on a brief analysis of the floodplain and the location/magnitude of flood insurance claims, flood vulnerabilities here are not severe, and are generally related to more significant storm events such as hurricanes and tropical storms.

3.2.5 National Flood Insurance Program and Repetitive Loss Properties

To provide a sense of the flood risk in a community it is also beneficial to summarize the policies in force and claims statistics from the National Flood Insurance Program (NFIP). There is a discussion of the NFIP in the County section of this hazard mitigation plan update. The Borough of Carteret has been a member of the NFIP since 1978.

FEMA NFIP statistics indicate that as of February 2014, federal flood insurance policies were in-force on 156 properties in Carteret. Between 1978 and 2014, there have been a total of 149 NFIP insurance claims in the jurisdiction, with a total claims value of \$2,292,687.¹³ Table 1-9 compares the number of policies in-force and paid claims in the jurisdiction. The table shows that Borough of Carteret comprises 3.5 % of the NFIP policies in-force in Middlesex County.

**Table 1-9
NFIP Policies and Claims**

Number of Parcels:	
Carteret:	5,993
Middlesex County:	283,276
Number of Policies In-Force:	
Carteret:	156
Middlesex County:	4,489
Number of Claims:	
Carteret:	149
Middlesex County:	3,478
Total Paid Claims	
Carteret:	\$2,292,687
Middlesex County:	\$109,727,837

The Borough of Carteret is not presently a member of the Community Rating System (CRS), a voluntary program for communities participating in the NFIP. The CRS is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. For CRS participating communities, flood insurance premium rates are discounted in increments of 5% based on creditable activities.¹⁴ CRS communities are ranked between 1 and 10, with Class 1 communities receiving a 45% premium discount.

It should be noted that NFIP claims are not a direct or completely accurate proxy for flood risk in a community. The data does not include flood damages to structures that had no flood insurance. Also, in some cases, structures or contents may have been underinsured. The NFIP claims data also does

¹³ FEMA – Policy and Claim Statistics for Flood Insurance

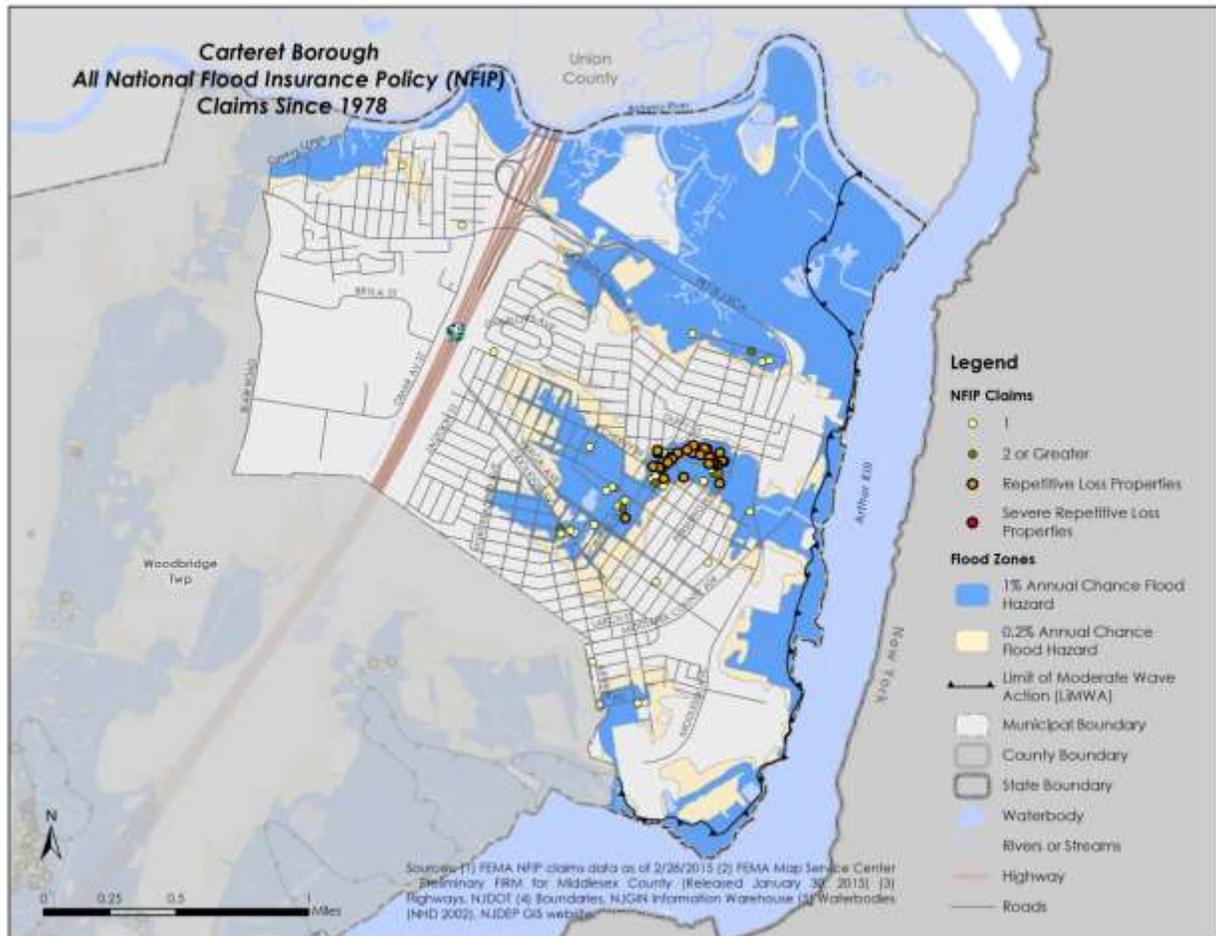
¹⁴ FEMA – Community Rating System (CRS).



not include any damages to public facilities, which may be insured via other means (such as self-insurance or non-FEMA policies); such damages may also be addressed through other federal programs such as FEMA's Public Assistance Program.

Figure 1-3 shows all NFIP claims in Carteret between 1978 and 2014. Note the dense concentrations of claims to the west of Civic Center Park, particularly on Harris and Noe Streets.

Figure 1-3
Map of NFIP Claims in the Borough of Carteret (1978 to 2014),
including Repetitive Loss and Severe Repetitive Loss Properties
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)





3.2.6 Flood Risk to Repetitive Loss Properties in the Borough of Carteret

**Table 1-10
NFIP Repetitive Loss (RL) and Severe Repetitive Loss (SRL) Policies and Claims**

Repetitive Loss (RL) Properties:	
Carteret:	29
Middlesex County:	429
Total Building (RL)	
Carteret:	\$1,281,679
Middlesex County:	\$44,015,885
Total Contents (RL)	
Carteret:	\$53,389
Middlesex County:	\$5,106,609
Number of Claims (RL)	
Carteret:	69
Middlesex County:	1,322
Average Claim (RL)	
Carteret:	\$19,355
Middlesex County:	\$37,158

FEMA requires a discussion of NFIP Repetitive Loss and Severe Repetitive flood loss statistics in hazard mitigation plans. A repetitive loss property is a structure covered by a contract for flood insurance made available under the NFIP that has incurred flood-related damage on two occasions, in which the cost of the repair, on average, equaled or exceeded 25% of market value of the structure at the time of each such flood event.

The flood risk assessment in this section is based in part on analysis of NFIP data on repetitive flood loss properties. As of February 2015, Middlesex County had 429 such properties based on a query of the FEMA BureauNet NFIP interface. Of this total, 29 properties were located within Carteret; this comprises 6.8 percent of the County total. Table 1-10 provides a comparison of the residential repetitive loss claims for Middlesex County and Carteret. The tables below include the number of repetitive loss properties, building and contents damages, the total number of claims, and the average claim amounts.

The 29 repetitive loss properties in Carteret were responsible for a total of 69 insurance claims, totaling \$1,335,518. Table

1-10 provides summary repetitive loss statistics for the community. As shown in the table, the jurisdiction has relatively few claims, and the average amounts are much lower than the County average. This suggests relatively low flood depths in the affected areas.

The next table shows the streets in Carteret with the most insurance claims. For reasons of confidentiality, this mitigation plan does not show specific addresses.



Table 1-11
Streets in the Borough of Carteret with Highest Numbers and Amounts of NFIP Claims
(Repetitive Loss Properties)
(Source: FEMA National Flood Insurance Program, February 2014)

Street Name	Building	Contents	Total	# Claims	Average
Harris Street	\$500,860	\$9,680	\$510,540	25	\$20,422
Hermann Avenue	\$68,152	\$13,257	\$81,409	10	\$8,141
Maple Street	\$131,014	\$0	\$131,014	6	\$21,836
Noe Street	\$298,377	\$30,902	\$329,279	10	\$32,928

The next table provides the results of a simple risk projection for repetitive loss properties. This is done by annualizing past insurance claims and using this as the basis for estimating future losses. This method employs standard FEMA statistical techniques, and may be used for developing a sense of flood risk, i.e. total future losses over the 100-year planning horizon. The results below should be considered general and preliminary. It is possible to complete more accurate risk assessments for specific projects using FEMA software and methodologies, combined with information about sites and facilities.

Table 1-12
100-Year Risk Projection for NFIP Repetitive Loss Properties in the Borough of Carteret

Data	Value
Period in years	26
Number of claims	69
Average claims per year	2.65
Total value of claims	\$1,335,518
Average value of claims per year	\$51,366
Projected risk, 100-year horizon	\$732,994

3.2.7 Flood Risk to Severe Repetitive Loss Properties in Carteret

The definition of Severe Repetitive Flood Loss (SRL) is included in the County portion of this mitigation plan. As of February 2015, there were no SRL properties in Carteret.

3.2.8 Storm Surge Hazard

Of the 25 jurisdictions in Middlesex County, 13 have some risk from storm surge. The Borough of Carteret is among these, due its exposure to the Rahway River and Arthur Kill. Although areas of floodplain in Carteret are mostly industrial (in addition to the area west of Civic Center Park, noted above), the Borough’s relatively low elevation and proximity to Arthur Kill make it vulnerable to storm



SLOSH inundation zones from the FEMA Coastal Flood Loss Atlas (CFLA) were used to complete the storm surge vulnerability assessment for Carteret. The initial analysis included calculating the land area and parcels within Categories 1 - 4 for the jurisdiction. This portion of the risk assessment approach matches the vulnerability assessment completed for the State of New Jersey 2014 Hazard Mitigation Plan. Knowing the land area within each zone can help determine the overall impact to buildings and other infrastructure in the region a result of storm surge.

Table 1-13
Storm Surge Exposure Statistics for the Borough of Carteret
(Source: FEMA Region IV, Coastal Flood Loss Atlas (CFLA) SLOSH – March, 2014, County GIS)

Storm Surge Category	Square Miles Impacted	Parcels Exposed
1	1.68	620
2	2.76	2,952
3	3.49	4,828
4	4.30	5,879

There is no reliable open-source information that allows assignment of specific probabilities to surge categories, so certain assumptions must be made in order to complete a risk assessment. The next table shows the assumptions used in a simple risk calculation for storm surge.

Table 1-14
Assumptions for Storm Surge Risk Assessment, Borough of Carteret

Data Type	Value
Structures per parcel	1
Structure replacement value/s.f.	\$150
Contents replacement value/s.f.	\$75
Assumed square footage of average structure	2,000

The risk assessment is then based on FEMA depth-damage functions, i.e. indications of the percentage damage at a given flood depth for structure and contents. The main section of the mitigation plan includes a detailed description of the methodology. The results are intended only to provide a general sense of potential losses.



Table 1-15
Flood Risk in Storm Surge Scenarios, Borough of Carteret

	Category 1	Category 2	Category 3	Category 4
Assumed annual probability	2%	1%	0.5%	0.1%
Number of parcels impacted	620	2,952	4,828	5,879
Assumed flood depth	1	2	3	4
Scenario risk	\$0	\$1,305,000	\$6,090,000	\$597,885,750
Annual risk	\$0	\$13,050	\$76,125	\$597,886
100-year risk	\$0	\$186,224	\$1,086,304	\$8,531,830

3.3 Hurricanes and Tropical Storms

Based on input from the hazard ranking process, Carteret considers hurricanes and tropical storms significant hazards, and thus there is a short discussion in the present subsection. Early in the development of this HMP, Carteret provided a few details about damages from Hurricane Irene and Hurricane Sandy. In both cases the Borough noted that there was significant damage to both public and private property. Damages from Sandy took months to repair, and in some cases are still not complete. The jurisdiction lost power for about six days. Numerous roads, parks and buildings were damaged or destroyed, with approximately \$10 million in damages overall.

Wind Risk Estimates

There are three significant hazards related to hurricanes, tropical storms, and to a lesser extent, nor'easters. These are: floods, storm surge, and high winds. Both floods and storm surge are addressed in the flood section of the present municipal appendix, as well as the County section of the hazard mitigation plan update. This subsection provides a preliminary quantification of hurricane wind risk based that was generated by FEMA's HAZUS-MH software (version 2.1, 2014). The calculations in Table 1-16 show a range of loss categories across the top row versus "occupancy classes" on the first column. The occupancy classes are various land uses that are represented in HAZUS. The last two columns indicate the projected 50-year and 100-year risks, i.e. the total amount of damage over those planning horizons. The figures are based on annualizing losses, then discounting them to present value using the software. There is more detailed information about the calculations and Countywide results in the main section of this HMP update.



Table 1-16
Probabilistic Wind Risk by Occupancy Class
(Source: FEMA, HAZUS-MH version 2.1)

Occupancy Class	Total SF	Building Damages	Contents Damages	Inventory Loss	Relocation Cost	Business Income Loss	Rental Loss	Lost Wages
Residential	1,965,505	\$78,062	\$29,094	\$0	\$4,449	\$56	\$1,837	\$133
Commercial	1,543,745	\$19,178	\$10,453	\$492	\$2,992	\$1,644	\$1,537	\$1,771
Industrial	1,222,461	\$17,496	\$14,084	\$2,074	\$1,109	\$201	\$203	\$335
Agricultural	45,226	\$559	\$306	\$37	\$88	\$6	\$4	\$3
Religious	37,900	\$557	\$241	\$0	\$79	\$32	\$7	\$75
Government	16,331	\$238	\$165	\$0	\$50	\$1	\$8	\$298
Education	18,300	\$228	\$114	\$0	\$42	\$8	\$2	\$19
Totals	4,849,468	\$116,318	\$54,455	\$2,604	\$8,809	\$1,949	\$3,597	\$2,632

Table 1-17
Probabilistic Wind Risk in Carteret, 50- and 100-year Planning Horizons
(Source: FEMA, HAZUS-MH version 2.1)

Occupancy Class	Total Annualized Loss	50-year Risk	100-year Risk
Residential	\$113,630	\$1,568,211	\$1,621,390
Commercial	\$38,067	\$525,362	\$543,177
Industrial	\$35,502	\$489,968	\$506,583
Agricultural	\$1,002	\$13,828	\$14,297
Religious	\$990	\$13,667	\$14,131
Government	\$760	\$10,486	\$10,842
Education	\$413	\$5,700	\$5,893
Totals	\$190,365	\$2,627,223	\$2,716,314



FEMA Project Worksheets from Tropical Storm Irene and Hurricane Sandy

Following many natural disasters, FEMA engineers and field teams complete formal assessments of damage to community assets, and document these in project worksheets (PWs). The PWs are the basis of FEMA Public Assistance grants for repairs. There are seven categories of damage, indicated by the letters A through G. These are: A – debris removal; B – emergency protective measures; C – roads and bridges; D – water control facilities; E – public buildings; F – utilities, and; G – recreational facilities/other. The categories and amounts of the PWs are listed in Table 1-18 below for Tropical Storm Irene and Hurricane Sandy. Note that in some cases there are multiple different organizations in a community that are applicants for FEMA Public Assistance. In order to simplify the table, the PW amounts for all applicants in a community are combined.

Table 1-18
Public Assistance to Carteret by Category

Event Name	Public Assistance Category							Total
	A	B	C	D	E	F	G	
Tropical Storm Irene	\$68,086	\$66,373	\$6,129	\$27,371	\$4,119	\$0	\$1,042,130	\$1,214,207
Hurricane Sandy	\$360,440	\$310,168	\$15,626	\$454,847	\$56,788	\$1,354,851	\$2,552,719	\$360,440
Total	\$428,526	\$376,541	\$21,755	\$482,218	\$60,907	\$1,354,851	\$3,594,849	\$1,574,647



4. Capability Assessment

4.1 Planning and Regulatory

Tool / Program (code, ordinance, plan)	(Yes/No)	Code Citation and Comments
Master Plan	Y	1986
Capital Improvements Plan		
Floodplain Management / Basin Plan		
Stormwater Management Plan	Y	2015
Open Space Plan		
Stream Corridor Management Plan		
Watershed Management or Protection Plan		
Economic Development Plan		
Comprehensive Emergency Management Plan		
Emergency Operation Plan		
Post-Disaster Recovery Plan		
Transportation Plan		
Strategic Recovery Planning Report		
Zoning Ordinance	Y	2015
Subdivision Ordinance	Y	2015
NFIP: Cumulative Substantial Damages		
Growth Management Ordinances		
Site Plan Review Requirements	Y	2015
Stormwater Management Ordinance	Y	2015
Municipal Separate Storm Sewer System (MS4)		
Combined Sewer Overflows (CSO)		
Natural Hazard Ordinance		
Post-Disaster Recovery Ordinance		
Real Estate Disclosure Requirement		
Other [Special Purpose Ordinances (i.e., sensitive areas, steep slope)]		

4.2 Staff/Personnel

Resources	Is this in place? (Y/N)	Department/ Agency/Position
Planning Board	Y	Planning
Mitigation Planning Committee	N	
Environmental Board/Commission	N	
Open Space Board/Committee	N	
Economic Development Commission/Committee	N	
Maintenance Programs to Reduce Risk	N	
Mutual Aid Agreements	N	
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Engineering



Resources	Is this in place? (Y/N)	Department/ Agency/Position
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Engineering
Planners or engineers on staff with a strong understanding of natural hazards	Y	Engineering
NFIP Floodplain Administrator	Y	Engineering
Surveyors	N	
GIS layers and maps	N	
Personnel trained in GIS	N	
Personnel trained in HAZUS	N	
Emergency Manager	N	
Grant Writer	N	
Staff with expertise in cost/benefit analysis	N	
Professionals trained in conducting damage assessments	N	

4.3 Education/Outreach and Community Classifications

Program	Do you Participate in/Use this Program (Yes/No)	Classification (if applicable)	Date Classified (if applicable)
Community Rating System (CRS)	N		
Building Code Effectiveness Grading Schedule (BCEGS)	TBD		
Public Protection (ISO Fire Protection Classes 1 to 10)	Y	3	2012
Storm Ready	Y		
Firewise	Y		
Disaster/Safety Programs in/for Schools	Y		
Organizations with Mitigation Focus (advocacy group, non-government)	N		
Public Education Program/Outreach (through website, social media)	Y		
Public-Private Partnerships	Y		

4.4 Fiscal Capabilities

	Yes/No
Do you have a line item in your operating budget for mitigation project funding?	Y
If no, will you look at mitigation actions when allocating funding in the future?	
Do you have a line item in the Capital Improvement Budget for mitigation project funding?	Y
Have you provided funding for mitigation projects identified in the hazard mitigation plan?	Y
Does your town have the authority to Levy Taxes for specific purposes?	Y
Does your town have user fees for water, sewer, gas or electric service?	Y
Do you impose impact Fees for homebuyers or developers of new development/homes?	Y
Does your community have an open space acquisition fund?	Y
Do you use bonds to finance projects (general obligation bonds, special tax bonds, private activity bonds)	Y



5. Mitigation Strategy

This section describes what projects, initiatives, and other actions the Borough has undertaken or plans to implement to reduce risk and loss within its jurisdiction. This includes the status of previously identified actions and any other projects that have been completed since the 2010 Plan was adopted. The additional actions were determined by the LPC based on self-determined priorities and experience.

5.1 Past Mitigation Actions

The table below lists the mitigation projects and actions that were included in the original 2010 Plan.

Mitigation Action	Responsible Party	Status
Feasibility determination/ project design for drainage for Carteret Fire/Police and EOC (located in same corridor)	Municipal OEM	This 600-800 acre project has been designed, and is waiting on funding and the remaining property acquisitions.

5.2 Other Mitigation Actions

In addition to the project listed above, the Borough secured a grant through the HMGP program for a permanent generator at the Municipal Building.

5.3 Proposed Mitigation Actions

The table below details the mitigation initiatives the Borough of Carteret would like to pursue to minimize future effects of hazard events. These actions have been determined through a local assessment of current risk and needs. The LPC met with the Plan Consultant to review all hazard and risk assessment data and evaluate the strategy. These initiatives are dependent upon funding and may change based on municipal priorities and future hazard events.

For each new mitigation action, the Borough has ranked as ‘High’, ‘Medium’, or ‘Low’, based on the evaluation criteria outlined in Section 5.

Proposed Action	Anticipated Benefits	Responsible Party	Funding or Implementation Mechanism	Timeline	Priority
Improve drainage from Noe’s Creek along Noe Street region.	Reduce property losses	Carteret Administration/ OEM	Grants/EIT	2-5 years	High



Acquire or elevate repetitive loss properties	Reduce property losses	Carteret Administration/OEM	Grants/Existing Resources	2-5 years	High
Ensure power duplicity at all critical facilities and utilities	Allow for continued operation of critical municipal services during and after hazard events.	Carteret Administration/OEM	Grants/Existing Resources	2-5 years	High

6. Plan Implementation

The LPC shall document, as needed and appropriate:

- Hazard events and losses in Carteret and the effects that mitigation actions have had on impacts and losses,
- Progress on the implementation of mitigation actions, including efforts to obtain outside funding for projects,
- Any obstacles or impediments to the implementation of actions,
- Additional mitigation actions believed to be appropriate and feasible,
- All public and stakeholder input and comment on the Plan that has been received by the Borough.
- Copies of any grant applications filed on behalf of the Borough

6.1 Continued Public Input

The Borough of Carteret is committed to incorporating public input into its ongoing hazard mitigation planning. The public will have an opportunity to comment on the Plan prior to any changes and during the 5-year plan update. The annual progress reports will be posted on the County mitigation website in addition to the adopted Plan.

All public comments and input on the plan will be recorded and addressed, as appropriate. Opportunity to comment on the plan will be provided directly through the County’s website. Public comments can also be submitted in writing to the County’s HMP Coordinator. All public comments shall be addressed to: Middlesex County Office of Emergency Management c/o All Hazards Pre-disaster Mitigation Plan Coordinator, 1001 Fire Academy Drive, Sayreville, NJ 08872.

The Borough of Carteret’s LPC shall ensure that:

- Copies of the latest approved Plan are available for review at Borough Hall along with instructions to facilitate public input and comment on the Plan.



- Public notices are made as appropriate to inform the public of the availability of the Plan, particularly during Plan update cycles.
- For minor changes to this appendix, the Borough of Carteret will post a notice on the Borough’s website and invite the public to review and comment.
- For major changes involving Borough Council approval, the Borough will use its standard public notice procedures inviting the public to review the document and provide feedback.

6.2 Plan Adoption

On [insert date] Middlesex County submitted the initial draft of the 2015 Plan Update to NJOEM for review and comment. After addressing NJOEM comments in the document, the HMP was resubmitted for final consideration and approval by NJOEM and FEMA. FEMA approved the plan on [insert date], and the Plan update was forwarded to the Middlesex County Board of Chosen Freeholders for adoption, which occurred on [insert date].

The Borough Council approved the plan on [insert date]. The Borough resolution for adoption is provided below, the County’s adoption resolution is provided as Appendix F of the 2015 HMP update. Following adoption, the plan update was resubmitted to FEMA for final approval, which occurred on [insert date]. The FEMA approval letter is included as Appendix G.

6.3 Plan Maintenance

The Borough of Carteret will review this Appendix of the County’s hazard mitigation plan appendix each year and give the County’s HMP Coordinator an annual progress report. The OEM Coordinator is responsible for convening the LPC, initiating the plan review, and submitting the annual progress report. The LPC may use worksheets #1 and #3 in the FEMA 386-4 guidance document, to facilitate the review and progress report. FEMA guidance worksheets are provided in Appendix H. Local progress reports shall be provided to the County HMP Coordinator at least two weeks prior to the annual plan review meeting.

Additionally, the LPC will convene and review the plan when major hazard events impact the jurisdiction, potentially yielding opportunities for mitigation grant funding, or when new information suggests that plan elements do not accurately reflect the community’s risk or its mitigation priorities.

If necessary, the OEM Coordinator will convene a meeting of the LPC to review and approve all changes. The Borough retains the discretion to implement minor changes to the document without formal procedures involving the Borough Council subject to local policies and regulations.

In addition to the annual progress report, the Borough of Carteret will provide Middlesex County with a copy of the written notice of any changes to the jurisdictional appendix at the time such changes are implemented.