



## Appendix 12: Township of Monroe

The Township of Monroe participated in the 2015 Middlesex County Hazard Mitigation Plan (HMP) update. This appendix includes the locally-specific information about the Township. The following sections detail the planning process and participants; the current population, building stock, and land development trends; hazards that specific to the Township and corresponding risk assessments; the Township’s mitigation strategy, and a local capability assessment.

### 1. Plan Development

On February 3<sup>rd</sup>, 2015, the Mayor signed an “Intent to Participate” letter and assigned the OEM Coordinator as the point of contact for the HMP update. This individual 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. Members of the LPC attended the initial kick-off meetings in spring 2015 and met with the Plan consultant on July 7<sup>th</sup>, 2015. The LPC reviewed all drafts and advised on all changes prior to the adoption of this municipal appendix. Monroe also served on the 2015 Hazard Mitigation Plan Steering Committee and assisted in guiding the plan update process. As part of the update process, the town’s Master Plan, Emergency Operation Plans, and codified ordinances were reviewed.

**Table 12-1: Township of Monroe Local Planning Committee Members**

Name	Title	Organization
Chief Michael Lloyd	Chief of Police/OEM Coordinator	Monroe Twp. PD/OEM
Captain Chris Hays	Police Captain/Deputy OEM Coordinator	Monroe Twp. PD/OEM
Shannon Cenci	Engineering/Deputy OEM Coordinator	Monroe Twp. Engineering/OEM



## 2. Community Profile

### 2.1 Physical Location

The Township of Monroe has a total area of 42.23 square miles and is located in the southernmost portion of Middlesex County, New Jersey. Monroe is bordered by Cranbury and South Brunswick on the west, East Brunswick, Spotswood, Helmetta and Old Bridge to the north, Monmouth County to the east and south, and Mercer County to the south. It is the largest municipality by area in Middlesex County. Monroe Township completely surrounds the Borough of Jamesburg.

#### 2.1.1 Hydrography and Hydrology

The Township of Monroe is located within the Raritan Basin. Part of the Township, in southwestern area, drains into the Millstone Watershed. The Millstone River, and a number of its tributaries flow through the township. These tributaries include the Cedar Brook and Cranbury Brook. Through the center of the Township the Manalapan Brook flows into Lake Manalapan from the South. A couple of tributaries join the Brook as it flows past Helmetta towards Davoe Lake at the northeast edge of the Township. The eastern edge of the Township drains into the Matchaponix watershed. The Matchaponix Brook coincides with the Township's eastern boundary.

### 2.2 History and Governance

The Township of Monroe was formally incorporated on April 9, 1838. Prior to incorporation, Monroe was part of South Amboy Township. Monroe is governed under the Township-Council form of government, and has an elected Mayor and five Council members. The Mayor is elected directly to a four-year term of office. Town Council members include three persons elected from the Township wards and two “at-large” members. The Township Council holds monthly meetings open to the public where it discusses legislation under consideration.

### 2.3 Demographics

#### 2.3.1 Population Trends

According to the U.S. Census Bureau, the population in 2010 was 39,132.<sup>1</sup> This is a 39.8% increase from 2000. The Township of Monroe has a population density of 932.3 persons per square mile. It is the 24th densest municipality within the County. A summary of major population and household characteristics may be found in the following tables.

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<sup>1</sup> U.S. Bureau of the Census. American Fact Finder “Monroe Township, NJ”. <http://factfinder.census.gov/>. Retrieved 8/16/15.



**Table 12-2: Township of Monroe Population Summary Estimates (2010 Census)<sup>2</sup>**

Population	Quantity	Percent of Municipal Population
Total Population	39,132	100
Median Age	53.2	N/A
17 years and under	7,377	18.9
65 years and over	13,626	34.8
<b>Race</b>		
White	31,913	81.6
Black/African-American	1,533	3.9
Native American/Alaskan Native	33	0.1
Asian	4,930	12.6
NOTE: Indian population	2,850	7.3
Native Hawaiian/Pacific Islander	4	0.0
Other Race (unspecified)	244	0.6
Two or More Races	475	1.2
Hispanic or Latino	1,673	4.3

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.

**Table 12-3: Township of Monroe Household Characteristics Summary Estimates (2010 Census)<sup>3</sup>**

Households	Quantity	Percent of Total
Total Households	5,652	100
Family Households (related)	4,018	71.1
Family Households w children under 18	1,837	32.5
Non-Family Households (unrelated)	1,634	28.9
Non-Family Households, living alone	1,297	22.9
Non-Family Households, living alone Male over 65 years	166	2.9
Non-Family Households, living alone Female over 65 years	405	7.2

### 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

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.



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 Monroe include (but may not be limited to) the following:

**Table 12-4: Township of Monroe Vulnerable Population Estimates (2010)**

Population Type	Population Estimate (2010 Census) <sup>4</sup>
Under 5 years of age	1,640
Under 18 years of age	7,377
Over 65 years of age	13,626
Limited English Proficiency (LEP)	2,464 (equals 6.4% of population over 5 years old) <sup>5</sup>
Institutionalized	600
Living in Group Quarters	179

In addition to these statistics, approximately 4.2% of the population lives below the poverty line. The mean household income is \$104,493, with the per capita income at approximately \$44,470 (2013 estimates).<sup>6</sup>

## 2.4 Land Use and Development

The Township of Monroe is actively developing from a rural agricultural community to a suburban residential township. The Township has experienced more development than another town in the County in the past 15 years. According to the NJDEP Land Use/Land Cover data, the Township has seen a drop of nearly 50 percent in its barren land cover, which may be a result of development projects having been completed. According to the 2014 Tax Assessment data from the County, nearly 85 of the assessed parcels in the Township are residential. Close to 8 percent of the remaining parcels are vacant, which is an indication of future development. The Township of Monroe has regulations in place to ensure that future development does not exacerbate flooding, drainage problems, and stormwater runoff. With the rapid development of Monroe, it is very important that these regulations are enforced.

### 2.4.1 Open Space

Monroe has over 2,000 acres of preserved open space including Thompson Park. Of this acreage, only 16 percent is in the Special Flood Hazard Area. Consequently, only less than 7 percent of the Flood Hazard Area has been preserved.

<sup>4</sup> Ibid.

<sup>5</sup> 2013 American Community Survey Estimate

<sup>6</sup> U.S. Bureau of the Census. American Fact Finder "Monroe Township, NJ". <http://factfinder.census.gov/>. Retrieved 8/16/15.



**Table 12-5: Township of Monroe Land Cover Summary**

Land Cover Class	Percent of Total Land <sup>7</sup>	2002 (acres)	2007 (acres)	2012 (acres)	Percent Change <sup>8</sup>
Agriculture	11.69%	4664.28	3307.70	3155.44	-32.35%
Barren Land	1.88%	928.27	799.68	507.00	-45.38%
Forest	14.67%	4599.93	4021.58	3960.06	-13.91%
Urban	41.01%	8167.11	10530.24	11067.98	35.52%
Water	1.47%	299.85	392.72	397.3748	32.52%
Wetlands	29.28%	8329.76	7937.30	7901.365	-5.14%

## 2.4.2 Buildings and Development

Monroe is a young community with an estimated 5,000 residential units having been built after 2000.<sup>9</sup> This is more than double the number of units built in any other town in the County during this time period. These homes, as seen in Section 2.4.3, are a mixture of single-family detached houses and townhome and apartments. A number of these developments are age-restricted, which may increase the Township’s aging population. Another unique characteristic of Monroe’s building stock is the number of homes and communities that rely entirely on electricity. Over one-third of the units use electricity has fuel. Though many homes are new, approximately one-third of the residential units in the Township were built before 1979 and may be pre-FIRM.

**Table 12-6: Township of Monroe Housing Statistics**

Housing Characteristics	Estimate
Total Occupied Housing Units	17,792
Percent Owner-occupied	92.2
Percent Renter-occupied	7.8
Percent built after 2000	28.1
Percent built before 1979	30.3

<sup>7</sup> Percent based on acres of land in 2012

<sup>8</sup> Change is calculated between 2002 and 2012

<sup>9</sup> 2009-2013 American Community Survey 5-year estimates. US Census Bureau. Accessed September 29<sup>th</sup>, 2015.



### 2.4.3 Recent and Expected Development

Project Name	Type	Number of Structures	Known Hazards	Description/Status
Colts Run (England Estates)	Homes	53		Approved, Under Construction
Elm Ridge	Homes	7		Approved, Under Construction
Giancola	Homes	4		Approved, Under Construction
Heritage Chase Extension	Homes	7		Approved, Under Construction
Hidden Pond	Homes	32		Approved, Under Construction
Majestic Woods	Homes	10		Approved, Under Construction
Monarch Woods	Homes	9		Approved, Under Construction
Primrose Acres East	Homes	21		Approved, Under Construction
Pushtel	Homes	9		Approved, Under Construction
Rocky Brook	Homes	41		Approved, Under Construction
RWD (Buckelew Ave.)	Homes	4		Approved, Under Construction
John Statis/River Road	Homes	5		Approved, Under Construction
Sunrise Acres	Homes	36		Approved, Under Construction
Monroe Manor 690	Homes	690		Approved, Under Construction
Stratford 890	Homes	768		Approved, Under Construction
JSM 33 (Marketplace) 749	Homes	618		Pending Court Settlement
JSM (Celebrations)	Apartments/ Townhouses	456		Approved, Court Settlement
Shared Properties	Apartments/ Townhouses	233		Approved, Under Construction
Gateway (Verde)	Townhouses	170		Approved, Under Construction
Gables	Age Restricted Units	71		Approved, Under Construction
K. Hovnanian North	Age Restricted Units	146		Approved, Under Construction
K. Hovnanian (Orchards)	Homes	67		Approved, Under Construction
Monroe Chase (Courts)	Homes/ Townhomes	98		Approved, Under Construction
Regency 1352 (867+644)	Age Restricted Units	1151		Approved, Under Construction
Stonebridge 1046	Age Restricted Units	1046		Approved, Under Construction
Lennar (Herbert)	Age Restricted Units	593		Approved



## **2.5 Critical Facilities and Infrastructure**

### **2.5.1 Essential Facilities**

The Township has five firehouses and a 6<sup>th</sup> under construction. There are two EMS buildings and two EMS substations located within firehouses. The Township has a Municipal Building, Recreation Center, and Mt. Community Center.

The Township reports that there has been no history of flooding or damage to the Township's public facilities.

### **2.5.2 Transportation**

Primary transportation routes include Route 33, County Routes 522, 535, 527, 612, 613, 614, 615, 619 and 625 along with numerous local roads. Exit 8A of the New Jersey Turnpike is located within Monroe. New Jersey Transit provides bus service. There are no commuter rails in Monroe.

### **2.5.3 Critical Utilities and Infrastructure**

Electricity in the Township is provided by JCP&L, while PSE&G services the Township with natural gas. As mentioned above as approximately 30 percent of their homes are heated through electricity. The Township reports that service will be disrupted periodically without a storm event, but restoration is usually fairly quick.

The Township's Utility Department manages the water and sewer services for the Township. During Hurricane Irene, the Township experienced a complete loss of one pump station, which has since been rebuilt and elevated above flood elevation.



### 3. Hazard Identification and Risk Assessment

This section describes the natural hazards and risks that can affect Township of Monroe. Like all the other municipalities in Middlesex County, the Township of Monroe 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. 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.

#### 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 12-7 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.

**Table 12-7**  
**Township of Monroe**  
**Hazard Identification and Prioritization**

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



## 3.2 Flood Hazard

### 3.2.1 Type, Location, and Extent

The Township of Monroe is located in southern Middlesex County, and is one of the larger jurisdictions within Middlesex. Although there are no major rivers in or adjacent to Monroe, there are numerous streams and tributaries throughout. Cranbury Brook is found near the southern end of the community, and is oriented in a roughly east-west direction. It has several unnamed tributaries. At the far south end of Monroe, the Millstone River also crosses west to east and has several tributaries. The Manalapan Brook is found near the northern end of the jurisdiction, and ultimately drains to the South and Raritan River. Manalapan also has numerous unnamed tributaries. The last significant stream in Monroe is Matchaponix Brook, which forms much of the eastern border of the jurisdiction.

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.<sup>10</sup> At the time the Middlesex County HMP was being updated, the effective FIRM for the Township of Monroe 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 12-1. It shows that nearly all the floodplain in the community is adjacent to the four streams discussed about. It also shows that much of the floodplain area remains relatively undeveloped.

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<sup>10</sup> FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition



**Figure 12-1**  
**Monroe Township portion of FEMA Revised Preliminary Flood Insurance Rate Map (January, 2015)**  
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)

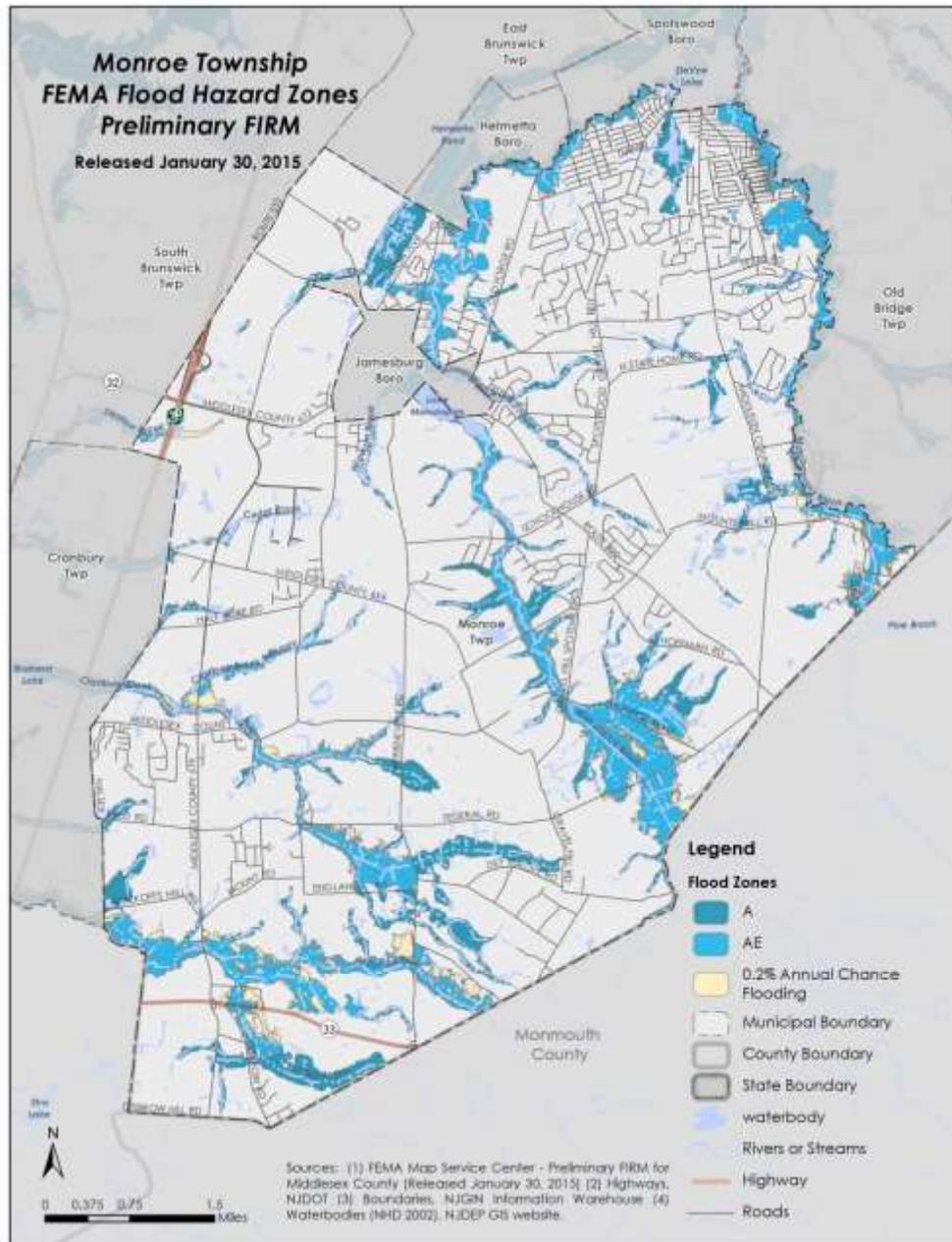




Table 12-8 provides basic information about floodplain and parcels subject to flooding within the jurisdiction based on the Preliminary FIRM. Compared to many other jurisdictions in Middlesex County, Monroe Township has relatively little area and a low percentage of parcels in the floodplain.

**Table 12-8**  
**Floodplain and Parcel Data for Monroe Township**  
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)

Data Type	Value
Jurisdiction area in square miles	42.16
Square miles within 100-year floodplain	6.31
Percentage of jurisdiction within 100-year floodplain	14.96%
Number of parcels in jurisdiction	31,925
Number of parcels with centroids within 100-year floodplain	2,035
Percentage of parcels with centroids within 100-year floodplain	6.37%

[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].

Current FEMA guidance uses the term *extent* as analogous to potential severity. The extent of the flood hazard in Monroe appears to be significant but not as severe as some other jurisdictions in Middlesex County. Except for Tropical Storm Irene, flooding has been relatively minor and not of significant depths.

### 3.2.2 Previous Occurrences and the Probability of Future Floods

Given its large geographic size and population (compared to other Middlesex jurisdictions), Monroe Township has relatively little floodplain and few flood insurance claims. Although the claims are somewhat spread out over the years, the majority of them were related to Tropical Storm Irene, in 2011.

### 3.2.3 Flood Impacts and Vulnerabilities to Flooding

The impacts from past floods in this jurisdiction have not been especially significant, except for Tropical Storm Irene, which flooded dozens of insured structures. Vulnerabilities are generally limited to those structures that are at low elevations within the floodplain, and most of these appear to be on a few streets in northeast Monroe, including Forest Park Terrace, Ashmall Ave, Tyndale Ave, and Carlton Avenue.



### 3.2.4 National Flood Insurance Program and Repetitive Loss Properties

**Table 12-9**  
**NFIP Policies and Claims**

<b>Number of Parcels:</b>	
Monroe Township:	31,925
Middlesex County:	283,276
<b>Number of Policies In-Force:</b>	
Monroe Township:	187
Middlesex County:	4,489
<b>Number of Claims:</b>	
Monroe Township:	72
Middlesex County:	3,478
<b>Total Paid Claims</b>	
Monroe Township:	\$2,678,160
Middlesex County:	\$109,727,837
<b>Repetitive Loss (RL) Properties:</b>	
Monroe Township:	1
Middlesex County:	429
<b>Total Building (RL)</b>	
Monroe Township:	\$60,496
Middlesex County:	\$44,015,885
<b>Total Contents (RL)</b>	
Monroe Township:	\$14,755
Middlesex County:	\$5,106,609
<b>Number of Claims (RL)</b>	
Monroe Township:	3
Middlesex County:	1,322
<b>Average Claim (RL)</b>	
Monroe Township:	\$25,084
Middlesex County:	\$37,158

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. Monroe Township has been a member of the NFIP since 1985.

FEMA NFIP statistics indicate that as of February 2015, federal flood insurance policies were in-force on 337 properties in Monroe. Between 1978 and 2015, there have been a total of 72 NFIP insurance claims in the Monroe Township, with a total claims value of \$2,678,160.<sup>11</sup> Table 12-9 compares the number of policies in-force and paid claims in the jurisdiction. The table shows that Monroe comprises 1.6%% of the NFIP policies in-force in Union County.

Monroe Township 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.<sup>12</sup> 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

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.

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

<sup>11</sup> FEMA – Policy and Claim Statistics for Flood Insurance

<sup>12</sup> FEMA – Community Rating System (CRS).



FEMA BureauNet NFIP interface. Of this total, only one property was located in Monroe; this comprises less than one percent of the County total.

Table 12-10 provides a comparison of the residential repetitive loss claims for Middlesex County and Monroe Township. 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 single repetitive loss properties in Monroe was responsible for a total of three insurance claims, totaling \$75,251.

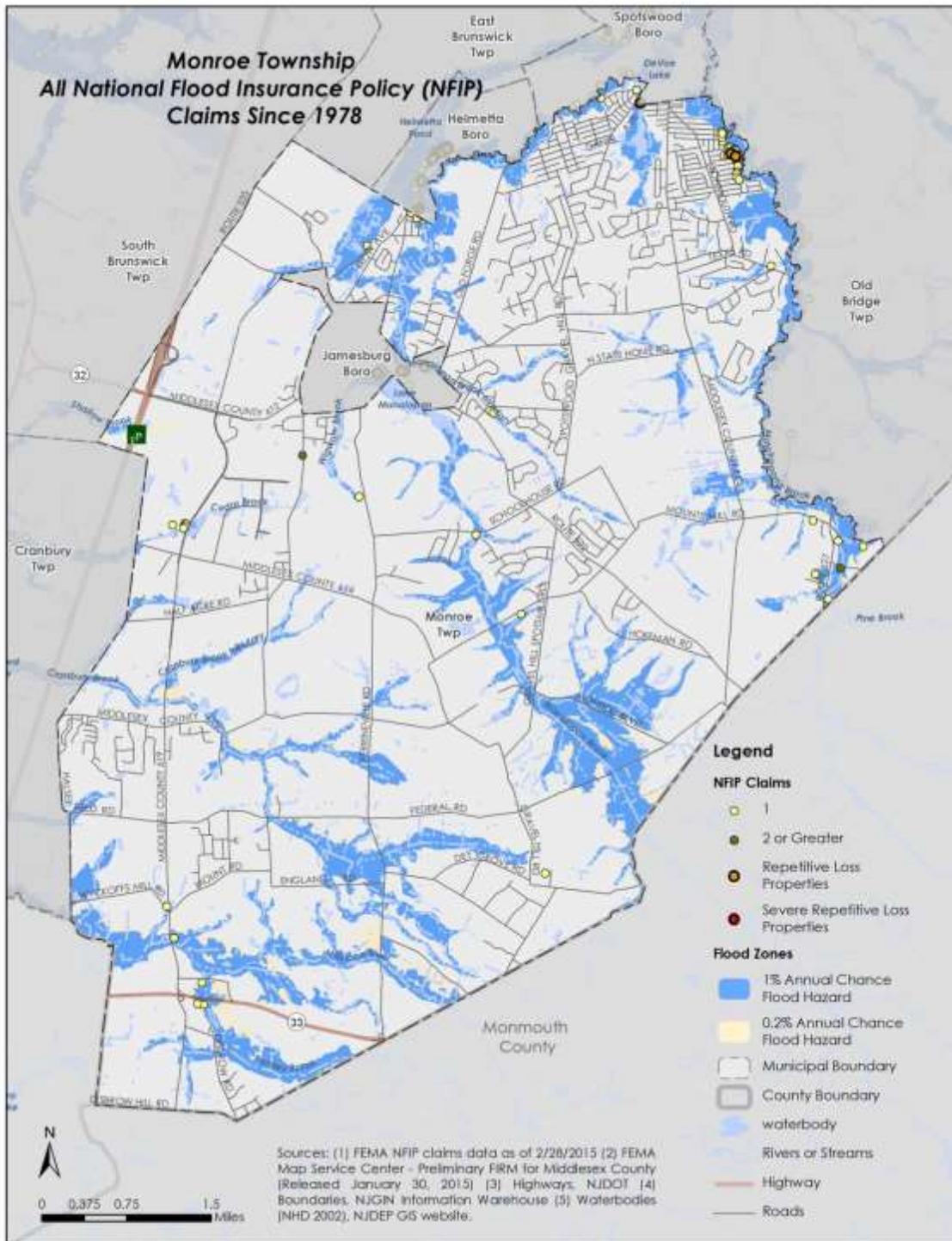
**Table 12-10**  
**Repetitive Loss Statistics in Monroe Township and Middlesex County**  
(Source: FEMA National Flood Insurance Program, February 2015)

City/County Name	Properties	Total Building	Total Contents	Total Losses	# of Claims	Average Claim
Monroe Township	1	\$66,496	\$14,755	\$75,251	3	\$25,084
Middlesex County	429	\$44,015,885	\$5,106,609	\$49,122,494	1,322	\$37,158

Figure 12-2 shows all NFIP claims in Monroe Township between 1978 and 2015. Note that most of the claims have been in a small area in the northeast part of the jurisdiction, adjacent to the Matchaponix Brook.



**Figure 12-2**  
**Map of NFIP Claims in the Township of Monroe (1978 to 2015),**  
**Including Repetitive Loss and Severe Repetitive Loss Properties**  
**(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, September 19, 2014)**





### 3.2.5 Flood Risk to Repetitive Loss Properties in Monroe Township

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. (Note that the data about Repetitive Loss properties in this subsection are based on the previous definition. Under the revised definition, Middlesex County has 47 RL properties, and Monroe has no RL properties.)

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, only one property was located in Monroe; this comprises less than one percent of the County total. Table 12-11 provides a comparison of the residential repetitive loss claims for Middlesex County and Monroe Township. 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 next table provides the results of a simple risk projection for the single repetitive loss property in Monroe Township. 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 12-11**  
**100-Year Risk Projection for NFIP Repetitive Loss Properties in Monroe Township**

Data	Value
Period in years	32
Number of claims	3
Average claims per year	0.09
Total value of claims	\$75,251
Average value of claims per year	\$2,352
<b>Projected risk, 100-year horizon</b>	<b>\$33,557</b>

### 3.2.6 Flood Risk to Severe Repetitive Loss Properties in Monroe Township

The definition of Severe Repetitive Flood Loss (SRL) is included in the County portion of this mitigation plan. As of February 2014, there were no SRL properties in Monroe Township.



### 3.3 Dam and Levee Failure Hazards

This subsection briefly discusses dam failure hazards in the Township of Monroe. This appendix to the Middlesex County HMP includes this information because one of the State-designated high-hazard damages is located within the jurisdictional boundaries of Monroe. There is more detailed information about the overall dam and levee failure risk in Middlesex County in the main portion of this document. There is also additional information on dam designations on the [NJDEP Bureau of Dam Safety and Flood Control](#) website. The present subsection provides some additional detail Regency Pond dam.

High-hazard (potential) dams are defined by the State as those where failure or operational failure will probably cause loss of life and/or significant infrastructure losses. Dam failure risks have several components, including the age and condition of the dam, antecedent conditions (extreme rainfall, seismic events), downstream topography, and the type and extent of populations and infrastructure downstream. Given the number of variables involved, it is never possible to state definitively the probability of dam failure, or the consequences. However, it is possible to develop a general sense of downstream extent and populations potential affected using census block information merged with GIS-based inundation limits. This does not suggest that any possible dam failure would necessarily impact those numbers of people and housing units, only that this is the total expected exposure. Figure 12-3 graphically shows the inundation limits and the census blocks with which the flood waters intersect. A review of available GIS data showed that only one census block intersects with the inundation limit, so it is not possible in this case to indicate the potential exposure of populations and housing to flooding due to dam failure, although it is presumed to be minimal based on other information.



Figure 12-3

Intersection of Census Blocks with Potential Downstream Inundation Limits, Regency Pond Dam





## 3.4 Hurricanes and Tropical Storms

### Tropical Storm Irene and Hurricane Sandy

Like many of the other jurisdictions in Middlesex County, Monroe experienced severe flooding in Tropical Storm Irene, while Hurricane Sandy was primarily a wind event. Flooding in Irene was mostly related to the 13 inches of rain that fell in a relatively short period of time, coupled with reported surge from Raritan Bay. As described in early subsections, flooding from the Matchaponix Brook flowed into several areas in the northeast part of the township, including Applegate Avenue, shown in Figure 12-4. The Township was bisected by flood waters with numerous road closures, utility outages, and over 125 properties flooded. A number of roads, bridges, and culverts were damaged, as well as the complete loss of one municipal pump station.

**Figure 12-4 Flooding on Applegate Avenue, Monroe Township**  
(Photo: Joe Harvie, The Monroe News, Fall 2011 Edition)



Hurricane Sandy was primarily a high wind event in Monroe. The combination of relatively high winds and saturated ground caused many trees to fall, with the result that approximately 18,000 residents were without power, temporarily and up to 14 days. JCP&L initially advised the township that it would take up to ten days to fully restore power.



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## Hurricane 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 12-12 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 County-wide results in the main section of this HMP update.

## 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 12-14 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 12-12**  
**Probabilistic Wind Risk in Monroe 50- and 100-year Planning Horizons**  
(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	18,253,557	\$477,833	\$173,079	\$0	\$31,588	\$55	\$13,000	\$130
Commercial	2,695,752	\$26,424	\$12,439	\$441	\$4,184	\$2,354	\$2,277	\$2,388
Industrial	645,886	\$5,580	\$3,960	\$563	\$374	\$68	\$60	\$108
Agricultural	268,474	\$2,544	\$1,294	\$158	\$399	\$26	\$16	\$10
Religious	140,995	\$1,650	\$623	\$0	\$232	\$110	\$21	\$259
Government	127,354	\$1,088	\$555	\$0	\$242	\$11	\$65	\$876
Education	92,048	\$787	\$338	\$0	\$140	\$31	\$6	\$72
<b>Totals</b>	<b>22,224,065</b>	<b>\$515,906</b>	<b>\$192,288</b>	<b>\$1,162</b>	<b>\$37,159</b>	<b>\$2,655</b>	<b>\$15,444</b>	<b>\$3,843</b>

**Table 12-13**  
**Probabilistic Wind Risk in Monroe 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	\$695,686	\$9,601,158	\$9,926,739
Commercial	\$50,508	\$697,058	\$720,696
Industrial	\$10,714	\$147,870	\$152,885
Agricultural	\$4,446	\$61,361	\$63,442
Religious	\$2,894	\$39,946	\$41,301
Government	\$2,835	\$39,123	\$40,449
Education	\$1,374	\$18,961	\$19,604
<b>Totals</b>	<b>\$768,457</b>	<b>\$10,605,478</b>	<b>\$10,965,116</b>

**Table 12-14**  
**FEMA Public Assistance Expenditures in Tropical Storm Irene and Hurricane Sandy, by Category**  
(Source: FEMA Region II, Public Assistance)

Event Name/Public Assistance Category	A	B	C	D	E	F	G	Total
Tropical Storm Irene	\$173,408	\$154,086	\$0	\$0	\$1,231,408	\$67,015	\$0	\$1,625,917
Hurricane Sandy	\$493,999	\$704,841	\$0	\$0	\$58,859	\$0	\$0	\$1,257,699
<b>Total</b>	<b>\$667,407</b>	<b>\$858,928</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1,290,267</b>	<b>\$67,015</b>	<b>\$0</b>	<b>\$2,883,616</b>



### 3.5 Wildfire

#### 3.5.1 Type, Location and Extent

Compared to many other states (particularly in the west and southwest), New Jersey has a relatively low level of wildfire risk. However, Monroe Township is one of several jurisdictions in the County that has an elevated risk of wildfire compared to most other jurisdictions. As explained in the County portion of this plan, wildfire risk is a more dynamic phenomenon than other hazards. This is because risk is created by both static conditions such as the amount of burnable vegetation and the degree of wildland-urban interface, as well as changeable factors like the weather and presence of fuel load. Any truly accurate risk assessment for this hazard must consider real-time conditions. See the Wildfire section in the main plan for more details.

#### 3.5.2 Previous Occurrences and the Probability of Future Occurrences

One of the largest wildfires in New Jersey history occurred in 1985 in Monroe Township. The fire started on April 19, and was initially observed from the Jamesburg fire tower. Investigators later determined that the fire was human-caused. Very low humidity and relatively high winds contributed to its quick growth, and it eventually encompassed about 700 acres. It was declared under control the following day, but was not fully extinguished until 18 days later.

#### 3.5.3 Wildfire Impacts and Vulnerabilities to the Hazard

The present subsection considers two of the static factors as the basis for a risk discussion. The first of these is the presence of fuel hazard in the community. In this respect, Monroe is about average among jurisdictions in Middlesex County. The community has no areas of extreme fuel hazard; 2.12% of the very high fuel hazard area in the County (0.118 square miles); 1.31% of the high hazard area (0.157 square miles); 0.11% of the moderate hazard area (0.106 square miles); and 0.35% of the low hazard area (0.345 square miles).

The second wildfire risk factor is the amount of wildland-urban *interface* and *intermix* in the community (see main plan for definitions). Interface areas are those where the built environment is immediately adjacent to potential wildfire fuel sources, and intermix areas are those where potential fuel sources are spread throughout. As indicated in Table 12-14, Monroe is above the County jurisdictional average in these categories, and thus may be considered at relatively higher risk based on these measures. Data in the table is based on the 2010 census.

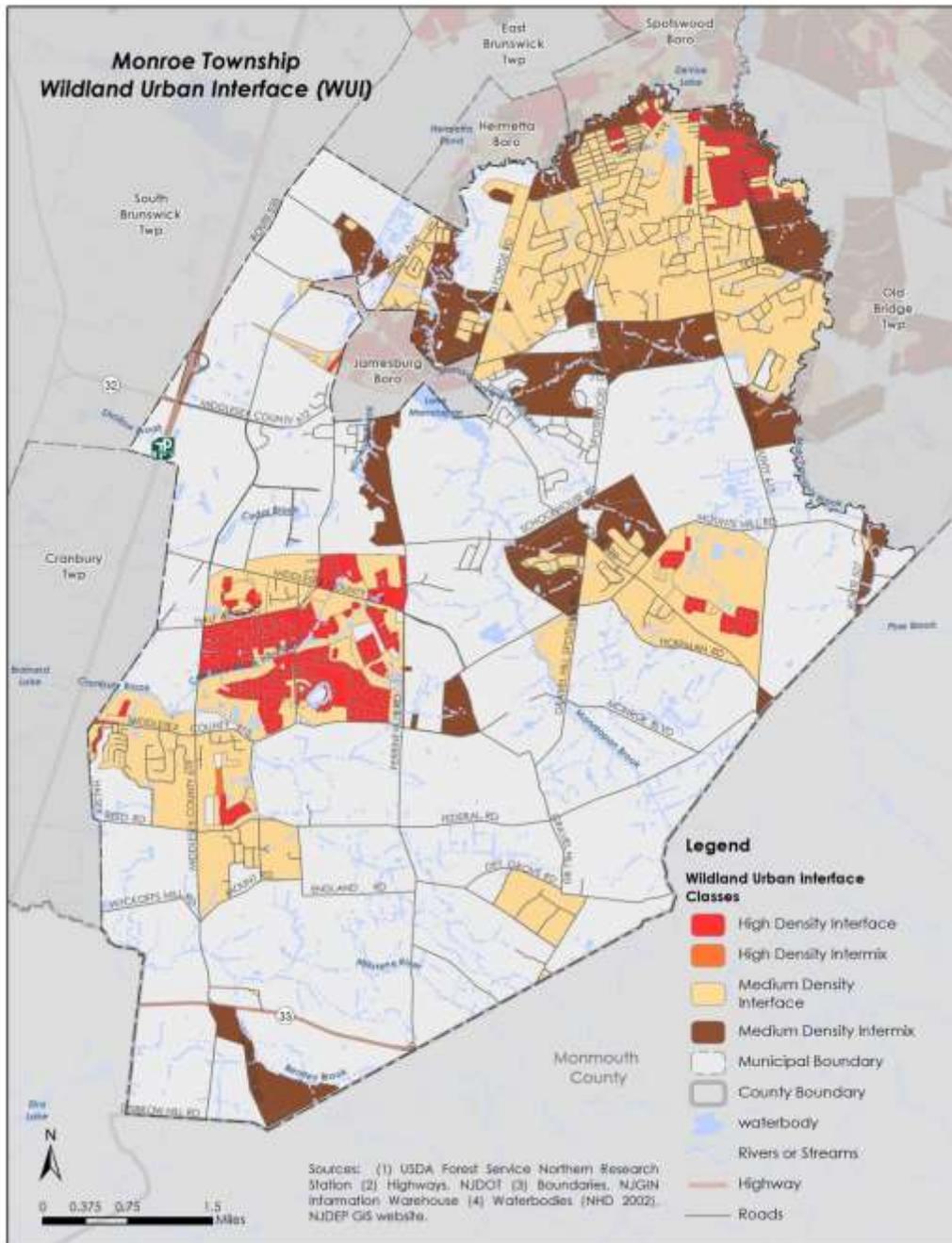
**Table 12-14**  
**Summary of Wildland-Urban Interface and Intermix Data, Township of Monroe**

	Housing Units	Population
High-density interface	258	779
High-density intermix	5	19
Medium-density interface	310	1,049
Medium-density intermix	164	367



Figure 12-5 shows areas of wildland-urban intermix and interface in Monroe Township. Most of the intermix and interface areas are in the southern part of the jurisdiction. A review of related aerial photography seems to indicate that most of the intermix is simply forested areas and parks that are close to developed areas.

**Figure 12-5**  
**Wildland-Urban Wildfire High- and Medium-Density Interface and Intermix Zones, Township of Monroe**





Absent a more detailed evaluation of fuel loads and characteristics of the structures that are near burnable areas it is not possible to complete a quantitative risk assessment of the wildfire hazard. The areas of highest vulnerability are clearly those nearest to vegetation, but, generally speaking, fire detection and suppression capabilities are very good in this area of the country, and this significantly reduces wildfire risk.

## 4. Capability Assessment

Each community within the planning area has a unique set of capabilities and priorities that affect its mitigation strategy. The following tables detail the capabilities assessed for the Township of Monroe during this plan update.

### 4.1.1 Planning and Regulatory

Tool / Program (code, ordinance, plan)	( Yes/No)	Code Citation and Comments
Master Plan	Y	
Capital Improvements Plan	Y	Annually
Floodplain Management / Basin Plan	Y	
Stormwater Management Plan	Y	
Open Space Plan	Y	All land use ordinances
Stream Corridor Management Plan	N	Are found in Chapter 108
Watershed Management or Protection Plan	N	State/Land Development
Economic Development Plan	N	
Comprehensive Emergency Management Plan	Y	MTEOP
Emergency Operation Plan	Y	MTEOP
Post-Disaster Recovery Plan	Y	MTEOP
Transportation Plan	Y	
Strategic Recovery Planning Report	N	
Zoning Ordinance	Y	
Subdivision Ordinance	Y	
NFIP: Cumulative Substantial Damages	N	
Growth Management Ordinances	N	
Site Plan Review Requirements	Y	
Stormwater Management Ordinance	Y	
Municipal Separate Storm Sewer System (MS4)	Y	
Combined Sewer Overflows (CSO)	N	
Natural Hazard Ordinance	N	
Post-Disaster Recovery Ordinance	N	
Real Estate Disclosure Requirement	N	
Other [Special Purpose Ordinances (i.e., sensitive areas, steep slope)]	Y	

### 4.1.2 Staff/Personnel

Resources	Is this in place? (Y/N)	Department/ Agency/Position
Planning Board	Y	
Mitigation Planning Committee	N	
Environmental Board/Commission	Y	



Resources	Is this in place? (Y/N)	Department/ Agency/Position
Open Space Board/Committee	Y	
Economic Development Commission/Committee	N	
Maintenance Programs to Reduce Risk	Y	
Mutual Aid Agreements	Y	
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	
Planners or engineers on staff with a strong understanding of natural hazards	Y	
NFIP Floodplain Administrator	Y	Township Engineer
Surveyors	Y	
GIS layers and maps	Y	In Progress
Personnel trained in GIS	Y	
Personnel trained in HAZUS	N	
Emergency Manager	Y	
Grant Writer	Y	
Staff with expertise in cost/benefit analysis	N	
Professionals trained in conducting damage assessments	Y	

#### 4.1.3 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)	TBD		
Building Code Effectiveness Grading Schedule (BCEGS)	-		
Public Protection (ISO Fire Protection Classes 1 to 10)	-		
Storm Ready	-		
Firewise	-		
Disaster/Safety Programs in/for Schools	-		
Organizations with Mitigation Focus (advocacy group, non-government)	-		
Public Education Program/Outreach (through website, social media)	Y		
Public-Private Partnerships	Y		

#### 4.1.4 Fiscal Capabilities

	Yes/No
Do you have a line item in your operating budget for mitigation project funding?	Y, Annual Capital Budget
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 Township 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
Monroe 1: Install Back-up generator at shelter: MT Senior Center, Halsey Reed Road	Monroe OEM	Project is under construction
Monroe 2: Install back-up generator at shelter: MT Community Center, Monmouth road	Monroe OEM	Project will bid and be under construction by spring 2016
Monroe 3: Property acquisition/elevation of 2 repetitive loss properties located on Union Hill Road & Spotswood Gravel Hill Rd.	Monroe OEM	Mitigation project at Union Hill Road is complete, property acquired by Township
Monroe 4: Property acquisition/elevation of 2 repetitive loss properties located on Tyndale Ave. & Ashmall Road.	Monroe OEM	Mitigation project complete at Ashmall & Tyndale Avenue. In this are 8 homes were acquired by Township

### 5.2 Other Mitigation Activities

The Township has bought out 12 homes that had been substantial damaged in Irene. In addition to these acquisitions, the Township has rebuilt a pump station above flood elevation. The Township has been working with its communities and neighborhoods to improve education, outreach, and awareness for flood and storm preparedness. The Township has installed back-up power at all critical municipal facilities and pump stations. They have been targeting senior communities to ensure shelter-in-place opportunities are available for appropriate populations.



### 5.3 Proposed Mitigation Actions

The table below details the mitigation initiatives the Township of Monroe 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 Township 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
Pursue CRS application with County support	Reduction in premiums and continued conformance to the NFIP	OEM Coordinator	Existing staffing; County assistance	1-2 years	Medium
Provide training for Floodplain Administrator	Improved compliance with NFIP and reduction in future risk	Township Engineering/ Middlesex County	Potential support from County; NJAFM; or capital	1-2 years	Medium
Supports Old Bridge detention project	Reduction in flows for Manalapan	--	--	--	High



## 6. Plan Implementation

The LPC shall document, as needed and appropriate:

- Hazard events and losses in Monroe 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 Township.
- Copies of any grant applications filed on behalf of the Township

### 6.1 Continued Public Input

The Township of Monroe 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 Township of Monroe's LPC shall ensure that:

- Copies of the latest approved Plan are available for review at Township 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 Township of Monroe will post a notice on the Township's website and invite the public to review and comment.
- For major changes involving Township Council approval, the Township 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 Township Council approved the plan on [insert date]. The Township 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 Township of Monroe 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 Township retains the discretion to implement minor changes to the document without formal procedures involving the Township Council subject to local policies and regulations.

In addition to the annual progress report, the Township of Monroe 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.