



Appendix 15: Township of Old Bridge

The Township of Old Bridge 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 XX date, the Township Administrator signed an “Intent to Participate” letter and assigned a 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 X and worked to gather the necessary information to support the plan update.

Table 15-1: Township of Old Bridge Local Planning Committee Members

Name	Title	Organization
Thomas Gerity	Office of Emergency Management Coordinator	Old Bridge Township OEM
Middlesex County	Hazardous Materials Team	Middlesex County
Damian Gil	Township Zoning Officer & Floodplain Manager	Old Bridge Township
Patrick Reardon	Damage Assessment Construction Official	Old Bridge Township
Chief W. Volkert	Law Enforcement	Old Bridge Police
Nicole Shapiro	Township Engineering	Old Bridge Township
Sam Rizzo	Township Planner	Old Bridge Township
Alan Strader	Shelter Reception Care	Old Bridge Township OEM
Denise Capasso	Evacuation/ Transportation	Old Bridge Township BOE
Middlesex County Health	Public Health	Middlesex County
Himanshu Shah	Resource Manager TOWNSHIP CFO	Old Bridge Township
Middlesex County	Radiology	Old Bridge Township
Spencer Carpenter	Director Public Works	Old Bridge Township
Guy Donatelli	Old Bridge Municipal Utility Authority, Executive Director	Old Bridge MUA
Thomas Badcock	Social Services	Old Bridge Township
Capt. Steve Daroci	Terrorism	Old Bridge Police
Capt. Steve Daroci	Public Information Officer	Old Bridge Police
Justin Erosh	Fire Coordinator	Old Bridge Township
Lisa Giuliano	EMS Coordinator	OBTEMS
Sgt. K. Calvosa	Alert, Warning, Communication	Old Bridge Police
Frank Steffanelli	Emergency Operations Center	Old Bridge Township OEM



2. Community Profile

2.1 Physical Location

The Township of Old Bridge has a total area of 40.78 square miles and is located in the eastern border of Middlesex County, New Jersey. Old Bridge Township is bordered by Sayreville, East Brunswick, Spotswood and Monroe in Middlesex County to the west, and Monmouth County towns of Aberdeen, Matawan, Marlboro and Manalapan, to the east.

2.1.1 Hydrography and Hydrology

Old Bridge Township is split into the Atlantic Coast Basin and the Raritan River Basin. Major waterbodies in the Township include Deep Run, Matchaponix Brook, the Iresick Brook, and Tennent Brook.

2.2 History and Governance

The Township of Old Bridge was formally incorporated on March 2, 1869 as Madison Township, with the name changed to Old Bridge on November 5, 1975. The Township is governed under the Mayor-Council form of government, and has an elected Mayor and nine Council members, three of whom are elected at-large and six that represent wards. The Mayor is elected directly to a four-year term of office. Town Council members are elected to serve four-year terms on a staggered basis, with the six ward representatives seats coming up for election at the same time and the at-large and mayoral seat up for election two years subsequently. 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 65,375.¹ This is an 8.1% increase from 2000. The Township of Old Bridge has a population density of 1,717.7 persons per square mile. It is the 22nd densest municipality within the County. A summary of major population and household characteristics may be found in the following tables.

Table 15-2: Township of Old Bridge Population Summary Estimates (2010 Census)²

Population	Quantity	Percent of Municipal Population
Total Population	65,375	100
Median Age	40.1	N/A
17 years and under	14,896	22.8
65 years and over	7,940	12.1

¹ U.S. Bureau of the Census. American Fact Finder “Old Bridge Township, NJ”. <http://factfinder.census.gov/>. Retrieved 9/10/15.

² Ibid.



Race		
White	48,418	74.1
Black/African-American	4,063	6.2
Native American/Alaskan Native	129	0.2
Asian	9,374	14.3
Native Hawaiian/Pacific Islander	10	0
Other Race (unspecified)	1,780	2.7
Two or More Races	1,601	2.4
Hispanic or Latino	7,064	10.8

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 15-3: Township of Old Bridge Household Characteristics Summary Estimates (2010 Census) ³

Households	Quantity	Percent of Total
Total Households	23,777	100
Family Households (related)	17,322	72.9
Family Households w children under 18	8,012	33.7
Non-Family Households (unrelated)	6,455	27.1
Non-Family Households, living alone	5,378	22.6
Non-Family Households, living alone Male over 65 years	472	2.0
Non-Family Households, living alone Female over 65 years	1,398	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 Old Bridge include (but may not be limited to) the following:

³ Ibid.



Table 15-4: Township of Old Bridge Vulnerable Population Estimates (2010)

Population Type	Population Estimate (2010 Census) ⁴
Under 5 years of age	3,769
Under 18 years of age	14,896
Over 65 years of age	7,940
Limited English Proficiency (LEP)	7,259 (equals 11.7% of population over 5 years old)
Institutionalized	394
Living in Group Quarters	110

In addition to these statistics, approximately 3.7% of the population lives below the poverty line. The mean household income is \$100,864, with the per capita income at approximately \$37,294 (2013 estimates).⁵

2.4 Land Use and Development

2.4.1 Open Space

Table 15-5: Township of Old Bridge Land Cover Summary

Land Cover Class	Percent of Total Land ⁶	2002 (acres)	2007 (acres)	2012 (acres)	Percent Change ⁷
Agriculture	9.19%	3310.88	2714.57	2411.84	-27.15%
Barren Land	1.61%	376.20	669.04	422.85	12.40%
Forest	17.11%	4846.90	4377.35	4489.55	-7.37%
Urban	43.40%	9995.39	10907.39	11389.03	13.94%
Water	1.88%	397.42	468.43	493.53	24.18%
Wetlands	26.81%	7316.27	7106.27	7036.25	-3.83%

2.4.2 Buildings and Development

Table 15-6: Township of Old Bridge Housing Statistics

Housing Characteristics	Estimate
Total Occupied Housing Units	23,788
Percent Owner-occupied	68.6
Percent Renter-occupied	31.4
Percent built after 2000	7.6
Percent built before 1979	67.1

⁴ Ibid.

⁵ U.S. Bureau of the Census. American Fact Finder "Old Bridge Township, NJ". <http://factfinder.census.gov/>. Retrieved 9/10/15.

⁶ Percent based on acres of land in 2012

⁷ Change is calculated between 2002 and 2012



2.4.3 Recent and Expected Development

Project Name	Type	Number of Structures	Locations	Known Hazards	Description/Status
Woodhaven Plaza I	Commercial	5	Texas Road	None	In progress 50% occupied
Carriage Park U.S. Homes/Lennar	Single Family Residential	34	Matchaponix Road	Matchaponix Brook FEMA FIRM MAP Shaded X	95% complete
Redshaw Village	Single Family Residential	21	Englishtown Road	Fly Brook	90% complete
Winding Brook Estates	Single Family Residential	73	Colorado Blvd & Englishtown Road	Matchaponix Brook, Barclay Brook & Fly Brook	75% complete
Woodhaven Village Section 2 Phase 1	Townhomes, Multi-Family & Single Family	1700	Texas Road & CR	Matchaponix Brook	In progress 10%
The Oaks at Glenwood	Mix-Use-Use 385 acres	TBD	U.S. Hwy 9 South	TBD	Infrastructure in progress
Madison Crossing	Adult Community	363 Multi- Family	U.S. Hwy 9 & Marlboro Rd	None	95% complete
Glenwood Mews	Apartments	38	Ehler's Lane & U.S. Hwy 9 South	None	Site work in Progress
Hillside Estates	Single Family Residential	7	Jockey Hollow Court and Higgins Rd	TBD	Site work in Progress
Town Center Associates	Commercial	4	Cottrell Rd & CR 516	TBD	100% Complete
American Plaza III	Commercial	3	Route 9 North & Texas Road		Pending
Amboy Bank Administration Building	Commercial	1	Route 9 South		Approved
Raritan Marina	Commercial		1707 Rt. 35		Approved
Texas Rd Plaza III	Commercial	1	Texas Rd.		Denied (Litigation)
Sound of Old Bridge (Walgreens)	Commercial		Guab Rd. & CR 516		Site work in Progress
Primrose School	Commercial	1	Rt. 9		Site work in Progress



Project Name	Type	Number of Structures	Locations	Known Hazards	Description/Status
Ajay Barthwal	Commercial	1	CR 516		50% Complete
220 Gordon Rd, LLC	Single Family Residential	13	220 Gordon Rd.		Approved Preliminary
PAJAG LLC Dr. Peter Bufano	Commercial	1	Rt. 34		Approved
JCP&L	Commercial		Old Bridge Englishtown Road		Incomplete
Cottrell CourtTownhomes	Townhomes	12	Cottrell Road		Site work in progress
ACO Arsov	Commercial	1	Bordentown Avenue		Incomplete

2.5 Critical Facilities and Infrastructure

2.5.1 Essential Facilities

Old Bridge owns and operates an Administration Building, Library, Senior Center, Fire Stations, and a Rescue Squad. Additionally, Raritan Bay Medical Center has a 113-bed facility in Old Bridge.

2.5.2 Transportation

Major transportation routes through Old Bridge Township include the Garden State Parkway, Route 9, Route 18, Route 35, and County Routes 516, 520, 527 and 615. New Jersey Transit provides bus service with a bus terminal on Route 9 in the Township. NJ Transit is the only commuter rail in Old Bridge, there is also a small privately-owned public use airport located next to Old Bridge Township Raceway Park. The Raceway is located off CR 527, on Pension Road.

2.5.3 Critical Utilities and Infrastructure

Old Bridge is responsible for 190 miles of roadway, 289 outfalls, and 5503 catch basins. The Township maintains the stormwater infrastructure. The Old Bridge Municipal Utilities Authority is responsible for water and wastewater service. This is a separate entity from the Township.



3. Hazard Identification and Risk Assessment

This section describes the natural hazards and risks that can affect the Township of Old Bridge. Like all the other municipalities in Middlesex County, Old Bridge 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. Municipalities ranked the list of hazards as high, medium, low, or no concern.

Table 15-7 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 15-7
Township of Old Bridge
Hazard Identification and Prioritization

Hazard	Priority
	H
	M
	M
Coastal Erosion	L
Dam/Levee Failure	M
Drought	M
Earthquakes	H
Extremely High Temps	H
Extremely Low Temps	H
Floods*	M
Hurricanes/Tropical Storms*	M
Nor'easters	H
Power Outages	M
Severe Weather	H
Hazardous Substances	H



3.2 Flood Hazard

3.2.1 Type, Location, and Extent

The Township of Old Bridge is located in the south eastern section of Middlesex County. It is geographically a large jurisdiction compared to most other municipalities in the County. The most significant sources of flooding here are Raritan Bay, at the north end of the jurisdiction, and South River, which forms a significant part of the western border of Old Bridge. There are also several streams that crisscross the jurisdiction. These include: Iresick Brook, which crosses the southern end of Old Bridge, draining into Duhernal Lake; Deep Run, which roughly bisects Old Bridge in an east-west configuration and has numerous small tributaries; Tennent Brook, which is found in the northern part of the jurisdiction, and drains to South River; Barclay Brook, which crosses the southern end of Old Bridge and has numerous tributaries; Stump Creek, which meanders across a wide undeveloped area just south of Raritan Bay; and, Cheesquake Creek, which drains a fairly large area of park and wetland at the northern end of the jurisdiction, draining to the Raritan Bay.

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.⁸ At the time the Middlesex County HMP was being updated, the effective FIRM for the Township of Old Bridge 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 15-1. The largest areas of floodplain are adjacent to Raritan Bay and Cheesquake Creek, as well as the eastern side of the South River, on the west side of Old Bridge. Although these areas are fairly large, they are also mostly undeveloped.

As shown in Table 15-8 below, although Old Bridge has a relatively large land area within the 100-year floodplain, a very low percentage of parcels have their centroids within it.

Table 15-8
Floodplain and Parcel Data for the Township of Old Bridge
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, January 2015)

Data Type	Value
Jurisdiction area in square miles	38.68
Square miles within 100-year floodplain	6.20
Jurisdiction area within 100-year floodplain	16.03%
Number of parcels in jurisdiction	23,198
Number of parcels with centroids within 100-year floodplain	1,034
Parcels with centroids within 100-year floodplain	4.46%

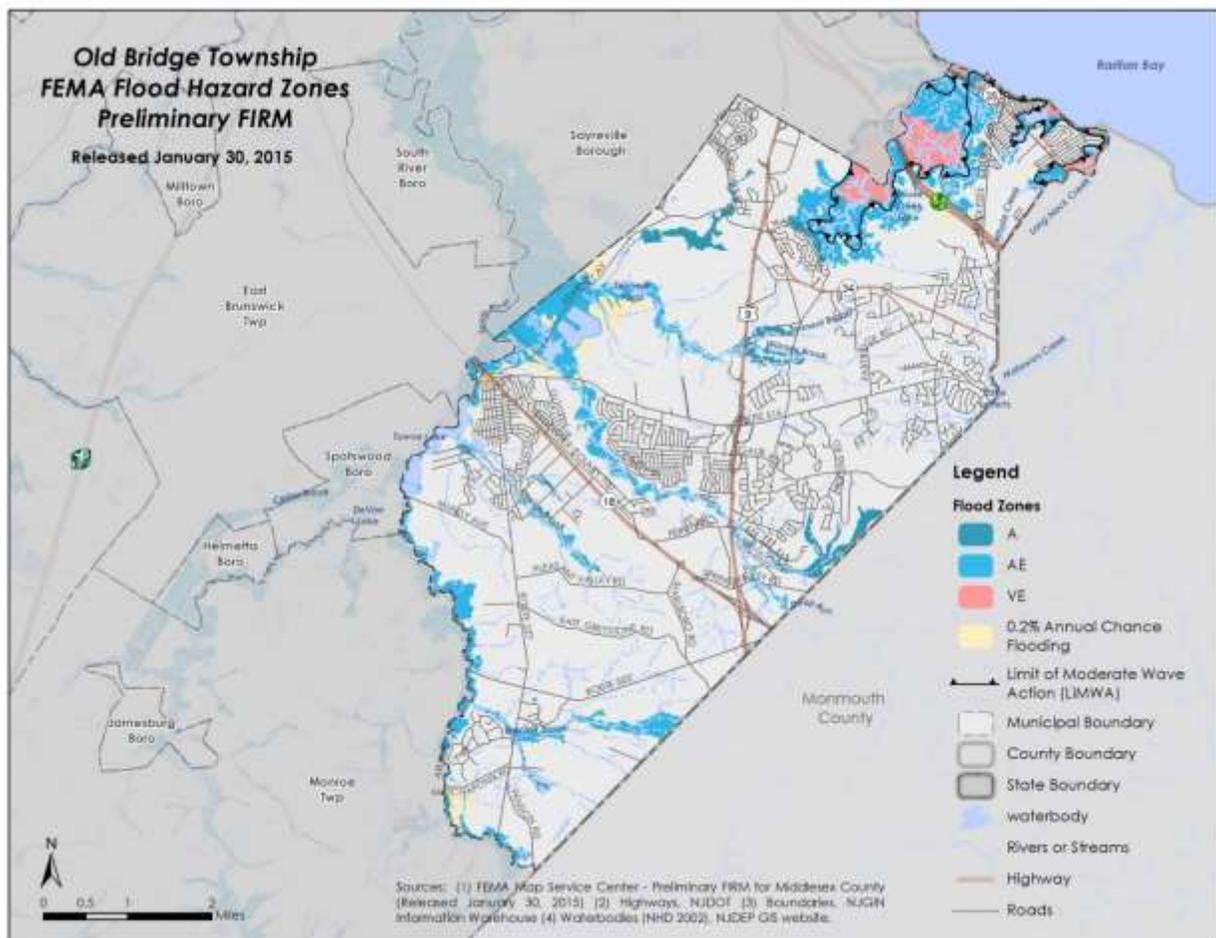
⁸ FEMA online - Floodplain Management. Flood Insurance Rate Map (FIRM) definition



[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 Old Bridge is significant in certain specific areas. As much as a few feet of flooding may be expected in areas immediately adjacent to Raritan Bay and Cheesequake Creek, with somewhat lesser depths along the banks of the South River.

Figure 15-1
Old Bridge portion of FEMA Revised Preliminary Flood Insurance Rate Map
(Source: FEMA Region II, Coastal Analysis and Mapping, Preliminary FIRM, January 2015)





3.2.2 Previous Occurrences and the Probability of Future Floods

Flooding occurs regularly in Old Bridge, although NFIP insurance claims data strongly suggests that most damages were caused by Tropical Storm Irene (2011) and Superstorm Sandy (2012). It appears from a review of the claims that damages in Irene were a combination of inland and coastal flooding, whereas Sandy damages were predominated by surge near coastal areas of Raritan Bay. There is no specific

**Table 15-9
NFIP Policies and Claims**

Number of Parcels:	
Old Bridge:	23,198
Middlesex County:	283,276
Number of Policies In-Force:	
Old Bridge:	227
Middlesex County:	4,489
Number of Claims:	
Old Bridge:	100
Middlesex County:	3,478
Total Paid Claims	
Old Bridge:	\$4,654,517
Middlesex County:	\$109,727,837

reason to believe the probability of inland and riverine flooding from the South River and the numerous internal streams will change significantly from the past. However, the probability of coastal flooding and storm surge is expected to increase over time as the effects of sea level rise increase.

3.2.3 Flood Impacts and Vulnerabilities to Flooding

Flood impacts in Old Bridge from past events have affected specific areas of the community much more than others, as discussed above. Overall, such impacts have been relatively minor considering the physical size and population of Old Bridge. However, in localized areas close to Raritan Bay and the South River, flood impacts have been quite significant, and many vulnerabilities exist. This is particularly notable in the areas called Laurence Harbor and Cliffwood Beach, which abuts Raritan Bay, and is highly developed. The area on the bay side of

Route 35 is especially vulnerable because it has direct exposure to the bay. The second area with higher vulnerability is located west of Route 18 on the western side of the jurisdiction, specifically on Appleby and River Streets, which are directly adjacent to the South River and its floodplain.

3.2.4 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. Old Bridge has been a member of the NFIP since 1985.

FEMA NFIP statistics indicate that as of February 2014, federal flood insurance policies were in-force on 227 properties in Old Bridge. Between 1978 and 2014, there have been a total of 100 NFIP insurance claims in the jurisdiction with a total claims value of \$4,654,517.⁹ Table 15-9 compares the number of policies in-force and paid claims in the jurisdiction. The table shows that Old Bridge comprises 5% of the NFIP policies in-force in Middlesex County. The average NFIP claim in Old Bridge (\$46,545) is significant more than the overall County, which is \$31,549. This suggests more severe flooding.

⁹ FEMA – Policy and Claim Statistics for Flood Insurance



Old Bridge 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.¹⁰ CRS communities are ranked between 1 and 10, with Class 1 communities receiving a 45% premium discount.

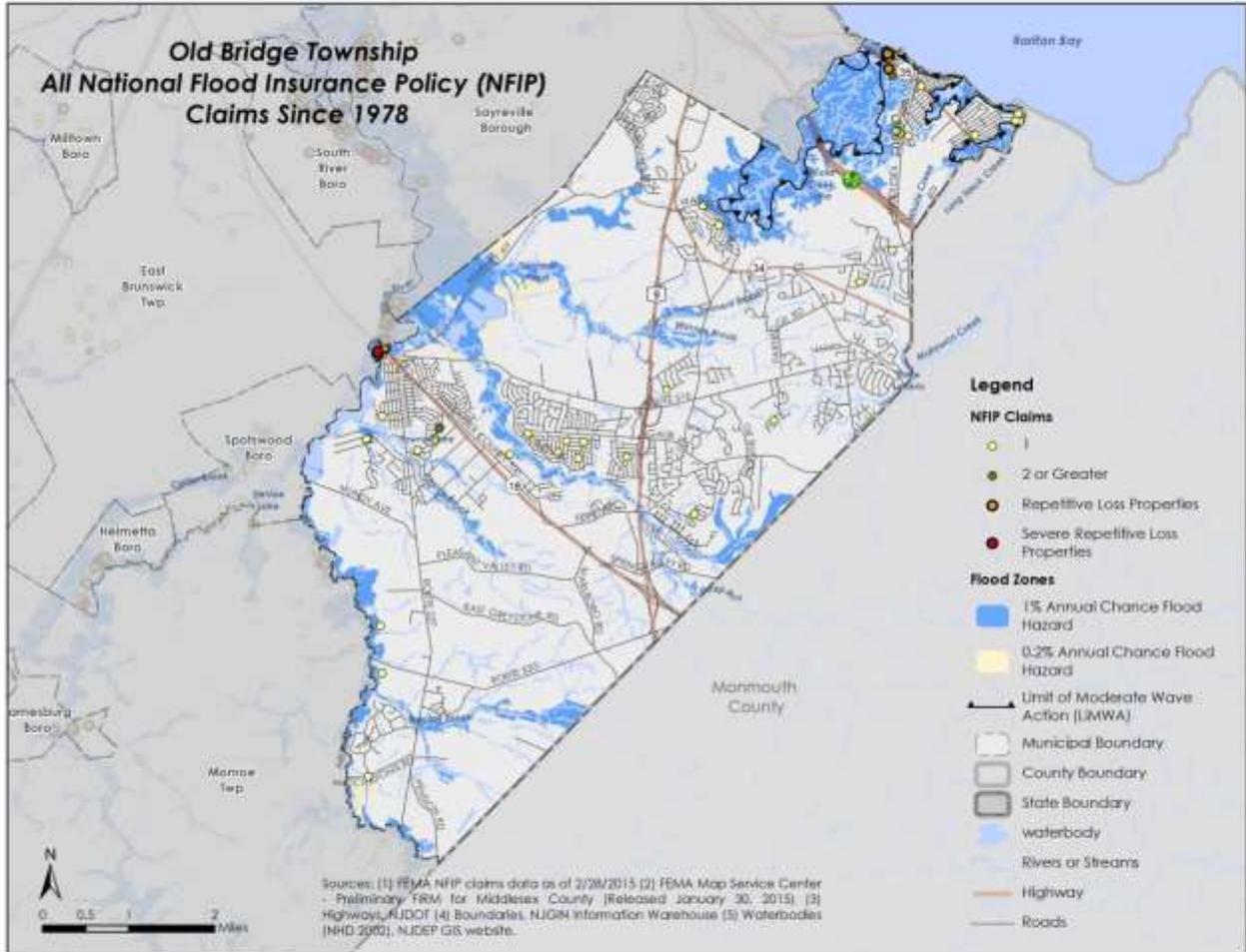
It should be noted that NFIP claims are not a direct or completely accurate proxy for flood risk in a community. The data does not include flood damages to structures that had no flood insurance. Also, in some cases, structures or contents may have been underinsured. The NFIP claims data also does not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

Figure 15-2 shows all NFIP claims in Old Bridge between 1978 and 2014. There are two distinct areas with dense clusters of claims, as discussed above. Otherwise, the map shows mostly single claims that are spread fairly widely over various areas in the jurisdiction. This suggests periodic ponding and sheet flow in discreet areas due to heavy rain.

¹⁰ FEMA – Community Rating System (CRS).



Figure 15-2
Map of NFIP Claims in the Township of Old Bridge (1978 to 2014),
Including Repetitive Loss and Severe Repetitive Loss Properties
(Source: FEMA National Flood Insurance Program, February 2014)





3.2.5 Flood Risk to Repetitive Loss Properties in Old Bridge

Table 15-10
NFIP Policies and Claims

Repetitive Loss (RL) Properties:	
Old Bridge:	7
Middlesex County:	429
Total Building (RL)	
Old Bridge:	\$620,139
Middlesex County:	\$44,015,885
Total Contents (RL)	
Old Bridge:	\$131,333
Middlesex County:	\$5,106,609
Number of Claims (RL)	
Old Bridge:	14
Middlesex County:	1,322
Average Claim (RL)	
Old Bridge:	\$53,677
Middlesex County:	\$37,158
Severe Repetitive Loss (SRL) Properties:	
Old Bridge:	1
Middlesex County:	77
Total Building (SRL)	
Old Bridge:	\$107,075
Middlesex County:	\$14,512,761
Total Contents (SRL)	
Old Bridge:	\$10,805
Middlesex County:	\$910,122
Number of Claims (SRL)	
Old Bridge:	2
Middlesex County:	385
Average Claim (RL)	
Old Bridge:	\$53,677
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 2014, Middlesex County had 429 such properties based on a query of the FEMA BureauNet NFIP interface. Of this total, seven properties were located within Old Bridge; this comprises 1.6 percent of the County total. Table 15-10 provides a comparison of the residential repetitive loss claims for Middlesex County and Old Bridge. 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 seven repetitive loss properties in Old Bridge were responsible for a total of 14 insurance claims, totaling \$620,139. Table 15-11 provides summary repetitive loss statistics for the community. Although Old Bridge has relatively few RL claims compared to many other jurisdictions, the average claim amount is notable, particularly since the claims have come from only a few policy holders.



Table 15-11
Repetitive Loss Statistics in the Township of Old Bridge and Middlesex County
(Source: FEMA National Flood Insurance Program, February 2014)

City/County Name	Properties	Total Building	Total Contents	Total Losses	# of Claims	Average Claim
Township of Old Bridge	7	\$620,139	\$131,333	\$751,473	14	\$53,677
Middlesex County	429	\$44,015,885	\$5,106,609	\$49,122,494	1,322	\$37,158

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

Table 15-12
Streets in the Township of Old Bridge with Highest Numbers and Amounts of NFIP Claims
(Repetitive Loss Properties)
(Source: FEMA National Flood Insurance Program, February 2014)

Street Name	Building	Contents	Total	# of Claims	Average
Appleby Street	\$365,542	\$69,095	\$434,637	8	\$54,330

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 15-13
100-Year Risk Projection for NFIP Repetitive Loss Properties in Old Bridge Township

Data	Value
Period in years	21
Number of claims	146
Average claims per year	6.95
Total value of claims	\$5,555,225
Average value of claims per year	\$264,535
Projected risk, 100-year horizon	\$3,774,908

3.2.6 Flood Risk to Severe Repetitive Loss Properties in Old Bridge

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 Old Bridge Township.

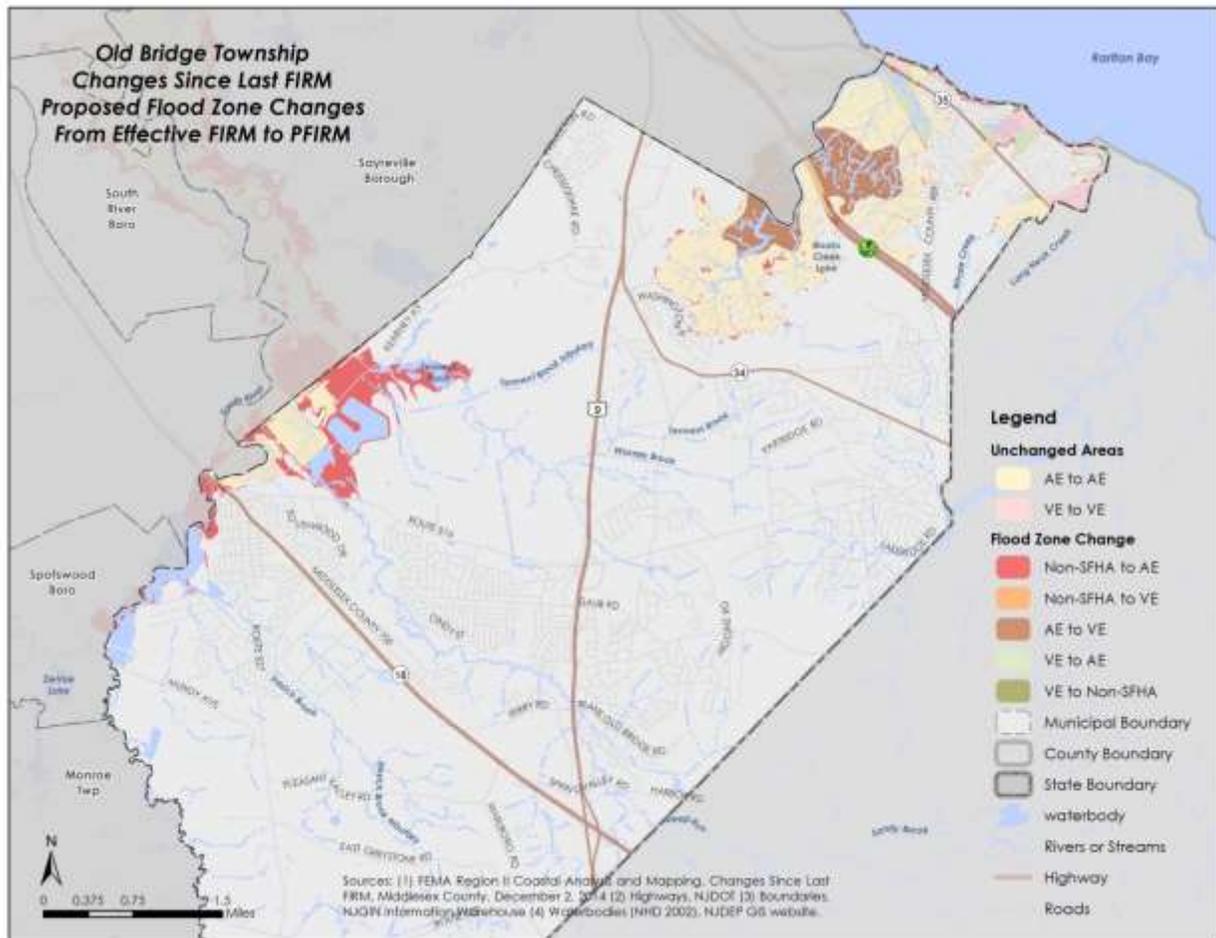
3.2.7 Changes in Floodplain Boundaries

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 15-4 below indicates changes in various flood zones in South Amboy. 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.

Figure 15-3
Changes in Floodplain Boundaries in the Township of Old Bridge



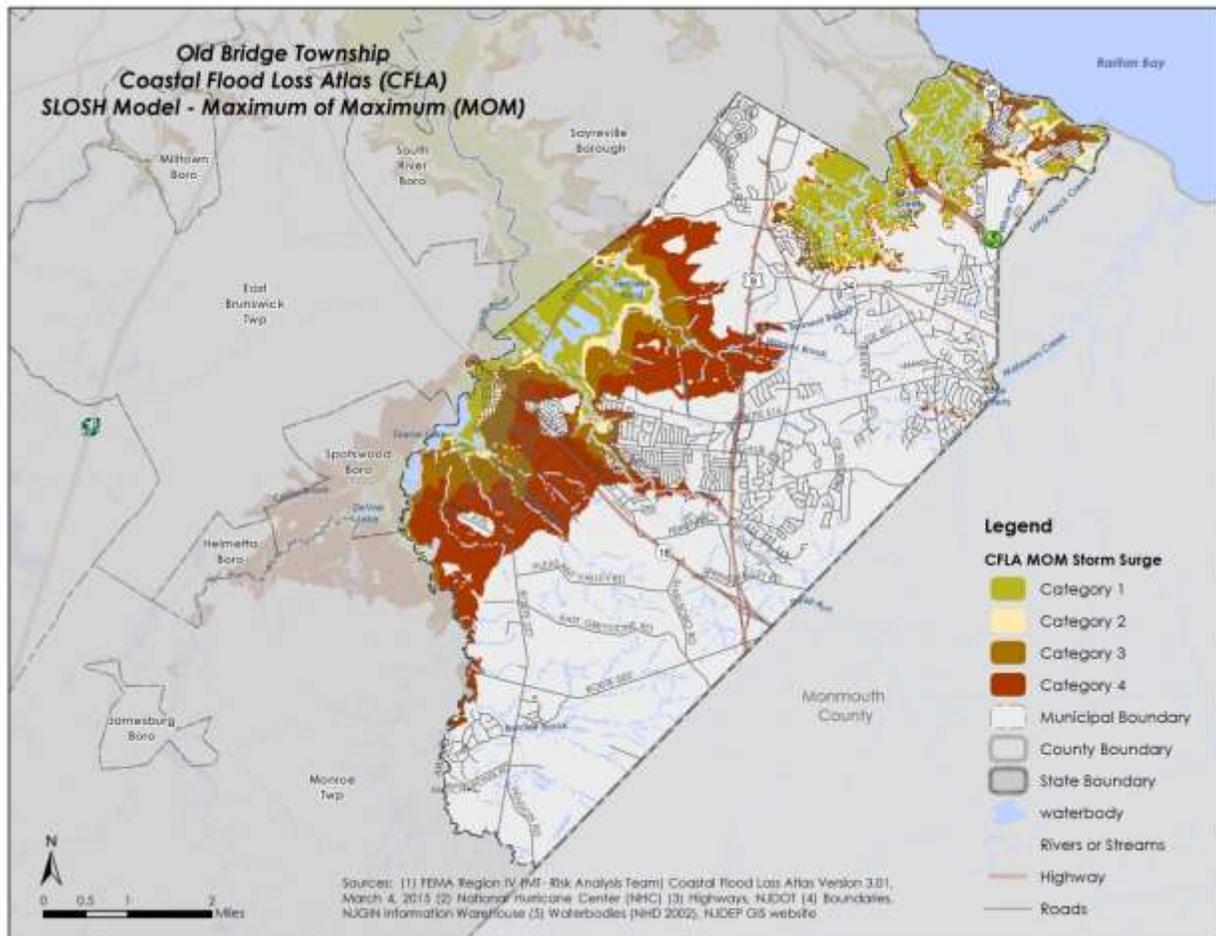
3.2.8 Storm Surge

Of the 25 jurisdictions in Middlesex County, 13 have some risk from storm surge. Old Bridge is among these due its exposure to Raritan Bay. It is useful to discuss statistics that are clearly related to surge. Various studies and GIS analysis provide information about the jurisdiction’s exposure to various levels of storm surge.



Figure 15-4 is a map of storm surge zones 1 through 4 in Old Bridge. The northeast portion of the jurisdiction is particularly exposed to storm surge, with even Category 1 events impacting a relatively large developed area. The map also shows large areas of potential inundation on the western part of the jurisdiction, but these areas are most significantly impacted by events of lesser probability (Categories 3 and 4) and appear to affect open spaces more so than developed locations.

Figure 15-4
Map of Storm Surge Zones, Categories 1-4, Old Bridge Township
(Source: FEMA Region IV, Coastal Flood Loss Atlas (CFLA) SLOSH – March, 2014)



SLOSH inundation zones from the FEMA Coastal Flood Loss Atlas (CFLA) were used to complete the storm surge vulnerability assessment for Old Bridge. 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 15-14
Storm Surge Exposure Statistics for Old Bridge Township
(Source: FEMA Region IV, Coastal Flood Loss Atlas (CFLA) SLOSH – March, 2014, County GIS)

Storm Surge Category	Square Miles Impacted	Parcels Exposed
1	4.24	758
2	5.42	1,928
3	7.85	4,586
4	12.86	7,258

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 15-15
Assumptions for Storm Surge Risk Assessment, Old Bridge Township

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 15-16
Flood Risk in Storm Surge Scenarios, Old Bridge Township

	Category 1	Category 2	Category 3	Category 4
Assumed annual probability	2%	1%	0.5%	0.01%
Assumed flood depth (feet)	1	2	3	4
Number of parcels impacted	758	1,928	4,586	7,258
Scenario risk	\$98,919,000	\$251,604,000	\$598,473,000	\$947,169,000
Annual risk	\$1,978,380	\$2,516,040	\$2,992,365	\$947,169
100-year risk	\$28,231,483	\$35,903,891	\$42,701,049	\$13,516,102



3.3 Hurricanes and Tropical Storms Hazard

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 15-17 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 15-18 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 15-17
Probabilistic Wind Risk in Old Bridge, 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	28,771,743	\$907,142	\$324,518	\$0	\$54,024	\$62	\$24,664	\$145
Commercial	3,851,889	\$41,520	\$18,293	\$333	\$6,766	\$4,878	\$3,944	\$5,435
Industrial	1,193,977	\$10,354	\$6,890	\$961	\$713	\$111	\$103	\$188
Agricultural	103,054	\$954	\$480	\$58	\$149	\$10	\$6	\$4
Religious	339,411	\$4,045	\$1,475	\$0	\$576	\$281	\$51	\$661
Government	96,609	\$794	\$363	\$0	\$181	\$9	\$57	\$396
Education	380,494	\$3,897	\$1,705	\$0	\$710	\$147	\$29	\$346
Totals	34,737,177	\$968,705	\$353,723	\$1,352	\$63,119	\$5,498	\$28,854	\$7,174

Occupancy Class	Total Annualized Loss	50-year Risk	100-year Risk
Residential	\$1,310,554	\$18,086,960	\$18,700,299
Commercial	\$81,169	\$1,120,216	\$1,158,203
Industrial	\$19,319	\$266,618	\$275,660
Agricultural	\$1,661	\$22,926	\$23,704
Religious	\$7,089	\$97,832	\$101,149
Government	\$1,800	\$24,835	\$25,677
Education	\$6,834	\$94,310	\$97,508
Totals	\$1,428,425	\$19,713,697	\$20,382,200

Table 15-18
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	\$134,258	\$105,965	\$23,500	\$0	\$2,500	\$27,499	\$0	\$293,722
Hurricane Sandy	\$720,413	\$1,329,987	\$398,794	\$0	\$36,769	\$152,812	\$1,475	\$2,640,250
Total	\$854,672	\$1,435,951	\$422,294	\$0	\$39,269	\$180,311	\$1,475	\$2,933,972



3.4 Wildfire Hazard

3.4.1 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, the Township of Old Bridge 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.

3.4.2 Previous Occurrences and the Probability of Future Occurrences

Previous occurrences of the wildfire hazards at the County level are discussed in detail in the main portion of this hazard mitigation plan, and for reasons of brevity are not repeated here.

3.4.3 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, Old Bridge is well above average among jurisdictions in Middlesex County. The community has 51% of the extreme fuel hazard in the County (2.4 square miles); 7.65% of the very high fuel hazard area in the County (0.427 square miles); 18.30 % of the high hazard area (2.191 square miles); 16.11% of the moderate hazard area (4.139 square miles); and 18.29%% of the low hazard area (15.55 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 15-19, Old Bridge 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.

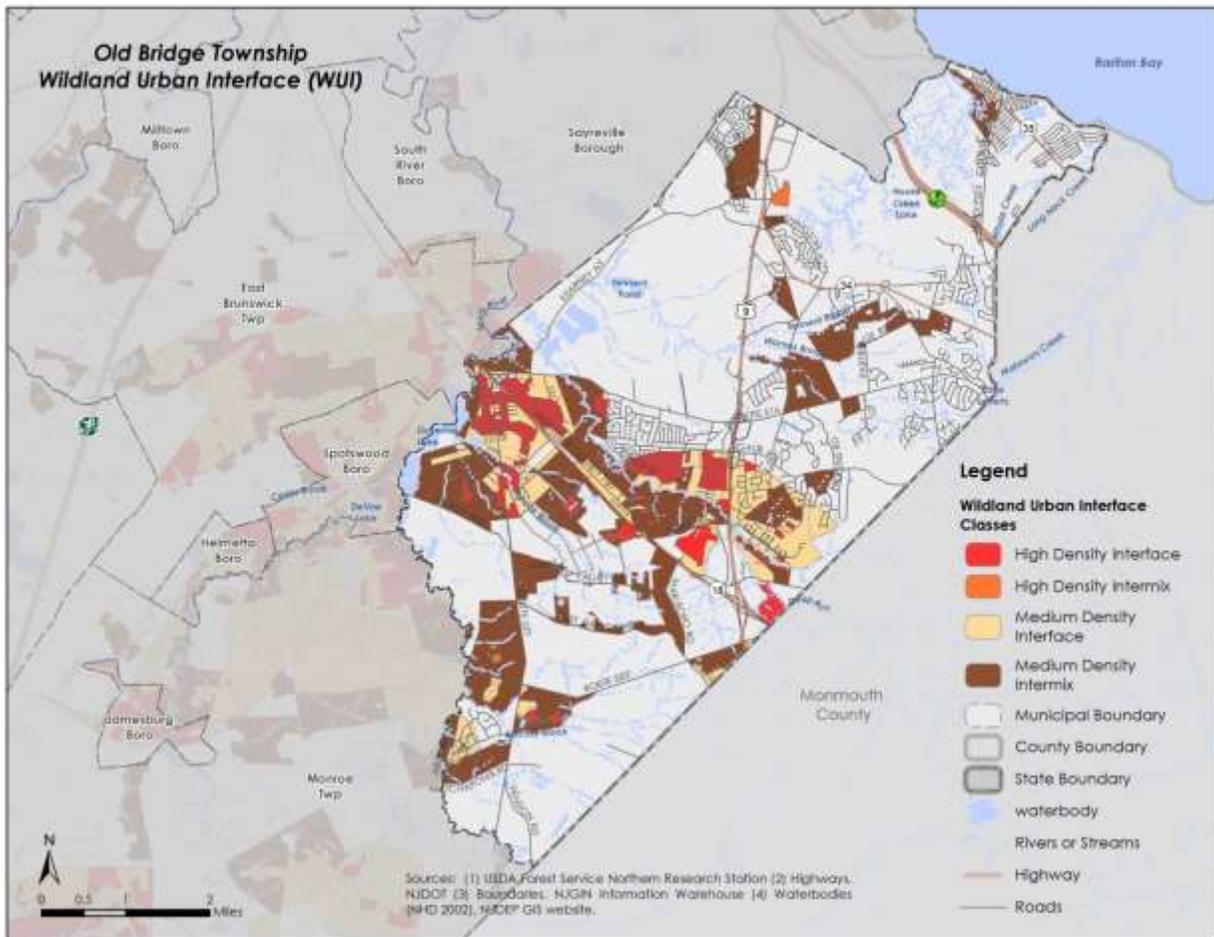
Table 15-19
Summary of Wildland-Urban Interface and Intermix Data, Township of Old Bridge

	Housing Units	Population
High-density interface	4,755	12,623
High-density intermix	195	422
Medium-density interface	2,748	8,960
Medium-density intermix	3,679	10,516



Figure 15-5 shows areas of wildland-urban intermix and interface in Old Bridge. Most of the intermix and interface areas are in the south-central part of the jurisdiction. Based on analysis of aerial photography, this appears to be related to large areas of undeveloped land south of Route 18 – these are heavily treed.

Figure 15-5
Wildland-Urban Wildfire High- and Medium-Density Interface and Intermix Zones, Old Bridge Township



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 Old Bridge during this plan update.

4.1.1 Planning and Regulatory

Tool / Program (code, ordinance, plan)	(Yes/No)	Code Citation and Comments
Master Plan	Y	Planning
Capital Improvements Plan	Y	Administration
Floodplain Management / Basin Plan	Y	Public Works
Stormwater Management Plan	Y	Engineering
Open Space Plan	Y	Parks & Rec
Stream Corridor Management Plan	Y	Engineering
Watershed Management or Protection Plan	Y	Engineering
Economic Development Plan	Y	EOC
Comprehensive Emergency Management Plan	Y	OEM
Emergency Operation Plan	Y	OEM
Post-Disaster Recovery Plan	Y	OEM
Transportation Plan	Y	Overseen by School District Transportation Department
Strategic Recovery Planning Report	Y	OEM
Zoning Ordinance	Y	CDEV
Subdivision Ordinance	Y	CDEV
NFIP: Cumulative Substantial Damages	Y	Code
Growth Management Ordinances	Y	Planning
Site Plan Review Requirements	Y	Planning/Code
Stormwater Management Ordinance	Y	Engineering/Public Works
Municipal Separate Storm Sewer System (MS4)	Y	Engineering/Public Works
Combined Sewer Overflows (CSO)	N	Engineering/Public Works
Natural Hazard Ordinance	Y	OEM
Post-Disaster Recovery Ordinance	Y	OEM
Real Estate Disclosure Requirement	Y	HBPA – Conservation Easement Notices Finance
Other [Special Purpose Ordinances (i.e., sensitive areas, steep slope)]	Y	LDO: Section 250-82

4.1.2 Staff/Personnel

Resources	Is this in place? (Y/N)	Department/ Agency/Position
Planning Board	Y	CDEV
Mitigation Planning Committee	Y	LEPC – OEM COOR.
Environmental Board/Commission	Y	CDEV
Open Space Board/Committee	Y	CDEV
Economic Development Commission/Committee	Y	ADMIN
Maintenance Programs to Reduce Risk	Y	Safety Comm. Frank/ DPW



Resources	Is this in place? (Y/N)	Department/ Agency/Position
Mutual Aid Agreements	Y	Each Fire Dist., Co. OEM,
Planner(s) or Engineer(s) with knowledge of land development and land management practices	Y	Planner Sam Rizzo Engineer Nicole Shapiro
Engineer(s) or Professional(s) trained in construction practices related to buildings and/or infrastructure	Y	Code Enforcement, Construction Official
Planners or engineers on staff with a strong understanding of natural hazards	Y	Planner Sam Rizzo Engineer Nicole Shapiro
NFIP Floodplain Administrator	Y	CDEV
Surveyors	N	
GIS layers and maps	Y	Tom Sommers
Personnel trained in GIS	Y	Tom Sommers
Personnel trained in HAZUS	N	
Emergency Manager	Y	Police Department/OEM
Grant Writer	Y	Karen Longo
Staff with expertise in cost/benefit analysis	Y	ADMIN
Professionals trained in conducting damage assessments	Y	Code Enforcement

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)	N	4	
Building Code Effectiveness Grading Schedule (BCEGS)	Y	4	
Public Protection (ISO Fire Protection Classes 1 to 10)	Y	All FD's Class 4	
Storm Ready	Y		
Firewise	Y	Fire Watch	
Disaster/Safety Programs in/for Schools	Y		
Organizations with Mitigation Focus (advocacy group, non-government)	Y		
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?	N
If no, will you look at mitigation actions when allocating funding in the future?	Y
Do you have a line item in the Capital Improvement Budget for mitigation project funding?	N
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?	N
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?	N
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. A ~~strike through~~ indicates that the project is no longer under consideration.

Mitigation Action	Responsible Party	Status	Review Comments
Old Bridge 1: Acquisition of 4 properties	Municipal Engineering Department	Complete	
Old Bridge 2: Dune stabilization and replenishment	Municipal OEM and Engineering Department	Complete	
Old Bridge 3: Public awareness program on local TV channel for hazard safety	Municipal OEM	TV Channel is still active, but the Township also uses website, Facebook, reverse 911, and outdoor media board as communication.	
Old Bridge 4: Code update	Municipal Building Department	Old Bridge adopts the State building code and is unable to make an changes.	

5.2 Other Mitigation Activities

In addition to the actions listed above, the Township secured back-up generators for Old Bridge Public Library and Fire District #2.

5.3 Proposed Mitigation Actions

The table below details the mitigation initiatives the Township of Old Bridge 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
Cleanout and repair culverts and draining ditches	Will reduce and or remove flooding	Old Bridge & Middlesex Co Mosquito Commission	HMG Grant	First year to complete all cleanouts of culverts and drainage ditches 2 nd years and going forward a maintenance program to keep clean	High priority
Inspection of culverts and ditches	Will know when culverts or ditches are in need of additional work	Old Bridge OEM	HMG Grant	Inspection will occur every three months or as needed to provide necessary monitoring	High Priority
Permanent stabilization for Shoreline Circle	Protection against coastal erosion	Old Bridge Engineering	Grants/Cpaital Funds	Funding dependent	High
Elevate or acquire repetitive loss properties	Reduce potential property loss from flooding	Old Bridge Engineering	Grants	Funding dependent	High



6. Plan Implementation

The LPC shall document, as needed and appropriate:

- Hazard events and losses in Old Bridge 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

Continued Public Input

The Township of Old Bridge 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 Old Bridge'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 Old Bridge 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.

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 2016 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.

Plan Maintenance

The Township of Old Bridge 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 Old Bridge 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.