



RESILIENCY MASTER PLAN

City of Jersey City
Hudson County, New Jersey

Adopted June 13, 2017

Prepared by:



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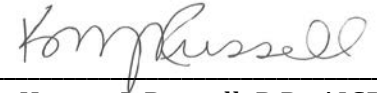
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Executive Summary

Community Resilience is defined as ***“the ability of a community to anticipate, prepare for and adapt to changing conditions, and withstand, respond to, and recover rapidly from disruptions.”***¹ Through thorough analysis of its social, geographic, and economic characteristics, Jersey City is able to identify its strengths and vulnerabilities, thereby making it possible to concentrate flood protection measures where they will be most effective.

In light of past storm events and future storm predictions, the City of Jersey City seeks to develop framework to anticipate and protect against future flood damage. Jersey City seeks to be a strong, prepared, and resilient community. This document will compile data on these characteristics for Jersey City, and use that information to determine areas of the City which merit particular attention to help make the City safer and more resilient going forward.

Today, Jersey City’s waterfront industry has largely transformed into waterfront parks and recreation areas, residences with unparalleled views, and high-rise offices seeking enviable locations with easy access to transit and New York City. The protection of these assets and the people who use them is critical to the future success and desirability of Jersey City.

On October 29, 2012, Superstorm Sandy threatened the City, inundating over thirty-nine percent (39%) of the city’s land area. The financial impacts of Sandy were severe, with over \$11.5 million in housing related claims² and over \$12 million in lost tax ratables.

Today, forty percent (40%) of Jersey City’s land area, or 3,782 acres, is within the proposed FEMA Special Flood Hazard Area (SFHA). Entire historic districts, business districts, transportation systems, and thousands of residents in this quickly growing city are at risk. When predicted sea level rise of 1.2 feet by the year 2050³ is factored in, it is estimated that flooding from a future storm event could reach 7.1 feet.

Critical infrastructure, including the PATH (Port Authority Trans Hudson) system and HBLRT (Hudson-Bergen Light Rail Transit), PSE&G electrical substations, City Hall, and the Jersey City Medical Center were heavily damaged during Hurricane Sandy. Many public housing projects were flooded and lost power, leaving already vulnerable populations without heat or electricity, and in some cases displaced.

This document analyzes community data and storm history and determines areas of vulnerability within the City, which will then be addressed in the City’s Adaptation Master Plan. This Plan is the result of many months of study and analysis, with the input of City representatives and community members and with

¹ U.S. Department of Commerce, National Institute of Standards and Technology

² FEMA

³ ClimateCentral.org

the knowledge that although the future is hard to predict, trends and science can help us plan ahead. It is our hope that this Resiliency Master Plan will guide Jersey City for the future prepared for storms so that the impacts to those who live and work in the City will be limited.

Description of Task

The City of Jersey City received grant funding from the NJ Department of Community Affairs Post Sandy Planning Assistance Grant Program, which funded preparation of this document. This project is intended to help consolidate the findings and recommendations of prior, piecemeal efforts and to identify additional recommendations to help the City better prepare for and recover from future storms. This Resiliency Master Plan describes the framework for the work necessary to create a city that is better prepared for and better able to recover from future storms by describing baseline conditions and inventorying completed and ongoing efforts related to resilience as well as setting forth the City's Vision and Goals and Objectives that promote the City's resilience.

Vision Statement

This Resiliency Master plan is established to reduce the impacts on future storm events. Jersey City is committed to taking steps to protect its people and commerce, its infrastructure and history. To guide its direction, Jersey City has established the following vision for the future:

Jersey City seeks to protect its valuable social, historic, and economic assets against the changing environment and increased risk of storm events through innovative design and infrastructure solutions. By identifying vulnerable populations, neighborhoods, and gaps in the City's preparedness, Jersey City resolves to implement strategies that will ensure that it remains a desirable and dependable place to live, work, and invest for generations to come.

It is the intent of this document, as well as the Adaptation and Green Infrastructure Master Plans which follow, to help this vision come to fruition. By understanding the vulnerabilities of Jersey City and the geographic areas of the city which are points of particular weakness, real solutions can be considered. From infrastructure such as underground storage to surface treatments and landscaping, from levees to living shorelines, there are many opportunities to improve the resilience of Jersey City that will be recommended as effective and viable approaches to handling water inundation. Additionally, programmatic approaches will also be important, including emergency preparedness, public awareness campaigns, and incentives for energy efficiency and flood resiliency. Together, these approaches will help protect all those who live, work, and visit Jersey City.

Snapshot of Jersey City

Community Profile

The City of Jersey City is located in Hudson County, New Jersey between the Hackensack River and Newark Bay to the west, and the Hudson River and Upper New York Bay to the east. The 14.79 square mile city⁴ has 21.7 miles of waterfront along these rivers and bays.⁵

During the nineteenth century it became clear that the City's waterfront would be invaluable. The City was a major transportation and industrial center thanks to the development of many railroads, canals and ports along the Hudson River. Freight and passenger rail served as major employers during the late 19th and through the 20th century; an estimated 10.5 million immigrants passed through Jersey City (specifically the Central Railroad of New Jersey Terminal) as they made their way westward from Ellis Island into the United States;⁶ and, in 1909 the rail system we know today as PATH opened^{7,8}, offering easy access to Manhattan.

The Hackensack River also served an important role in the history of Jersey City. In the World War I era, heavy industrial use was common. Barges and steam ships loaded with building materials and freight headed up and down the river, and significant amounts of coal were transported to coke and gas plants in Kearny and Jersey City. Tugboats were also prevalent, helping ships navigate the shallow waters and treacherous swing-span bridges which hung low over the channel.⁹

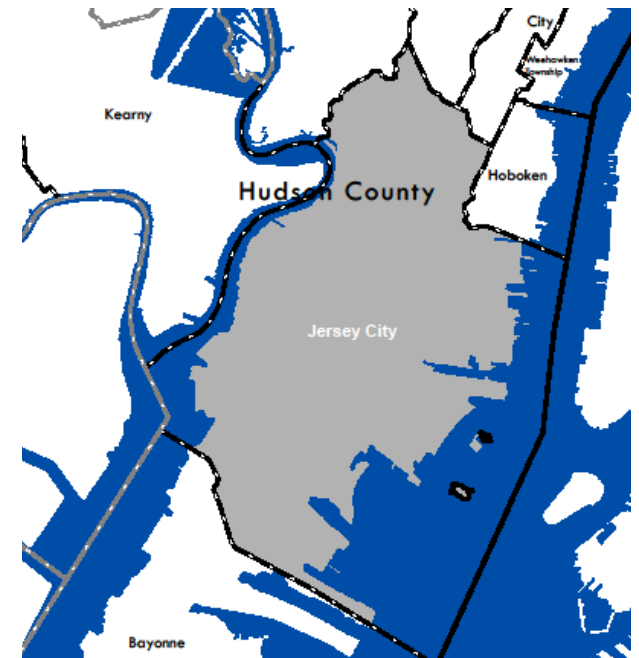


Figure 1: Location map

⁴ Census.gov, Accessed July 21, 2016.

⁵ 2015 DEP Coastline data, Accessed July 21, 2016.

⁶ NJDEP, [Christie Administration Celebrates Official Reopening of Iconic Terminal Building at Liberty State Park](#), June 22, 2016

⁷ Jersey City Landmarks Conservancy, [Powerhouse History: The Hudson & Manhattan Railroad](#), Accessed July 21, 2016.

⁸ [Erie Commuters Held Up](#), New York Times, August 3, 1909.

⁹ Modica, Glenn R. *The Hackensack River Vertical Lift Bridges Historic District: Engineering, Navigation and Commerce in the Port of New York.*

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Beginning in the 1980s, with freight rail in decline, waterfronts increasingly desirable for residential and recreational uses, and increased appreciation for historic preservation, Jersey City began to transform from a gritty industrial city into the modern, prosperous city that it is today. Waterfront Redevelopment plans were adopted, Historic Districts were established, brownstones were reclaimed, rail yards turned into parks and residential neighborhoods, light rail transit spurred development, and high rise development along the waterfront and in Exchange Place earned the nickname “Wall Street West”. Today, Jersey City is the second most populated city in the state of New Jersey with 264,290 residents as of 2015¹⁰ (Newark, the largest, estimates 281,944 residents¹¹).

History of Storm Events in Jersey City

Over thirty seven percent of Jersey City lies within the FEMA Special Flood Hazard Area¹², including 13.3 million square feet of Class A office space¹³ along the Hudson River. The lowest points of Jersey City are along the coast. Inland, areas such as Journal Square and the Heights lie along the ridge of the Palisades, ranging between 100 feet and 180 feet above sea level.

A geographic phenomenon called the "New York Bight" - where Long Island and New Jersey form an upside-down L around shallow waters of the Atlantic Ocean - magnifies a hurricane's effects on the land. The New York Bight will guide storm surge directly into New York City [and Jersey City], trapping the water and ultimately dumping it onto the land, amplifying flooding and related damage.¹⁴ Waves from this excess water, combined with the relative shallowness of the rivers and harbor, form storm surges of dangerous height.¹⁵

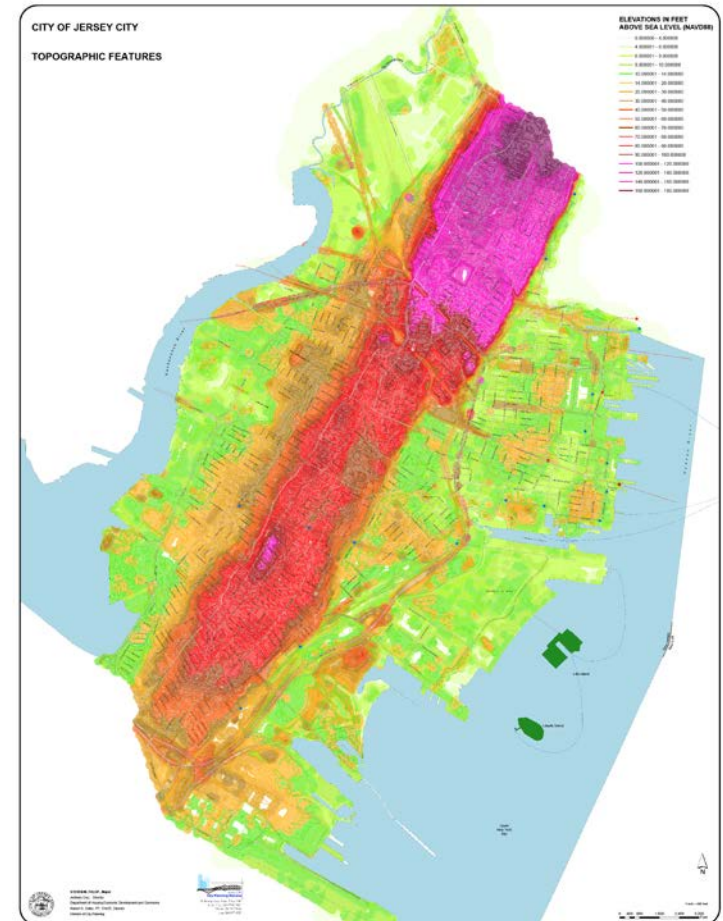


Figure 2: topographic map. Red elevations are the highest, green the lowest.

¹⁰ Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2015, United States Census Bureau. Accessed July 21, 2016.

¹¹ Ibid.

¹² FEMA Flood Insurance Rate Map Database, 04-10-2015. Accessed July 22, 2016.

¹³ City of Jersey City Planning Department. *Sandy Recovery Strategic Planning Report - A Strategic Plan for Resilience*. August 2014.

¹⁴ NYC Emergency Management <http://www1.nyc.gov/site/em/ready/coastal-storms-hurricanes.page>, Accessed July 26, 2016.

¹⁵ National Geographic, [Why New York City Is the Worst Place for a Hurricane](#), November 3, 2012.

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Between 1842 and 2013, NOAA reports 43 tropical storms (including hurricanes and tropical depressions) tracked within 65 nautical miles of Jersey City. Of note, Superstorm Sandy was not even within this radius. Four storms tracked within 10 nautical miles, including Hurricane Irene in 2011.¹⁶

Between 1954 and 2014, FEMA issued a disaster or emergency declaration for Hudson County for 4 coastal storm-related events, classified as one or a combination of the following disaster types: hurricane, tropical storm, severe storm, flooding, Nor'Easter, tropical depression, coastal storm, high tides, and heavy rain.¹⁷

In August 2011, Hurricane Irene made landfall. Mandatory evacuation orders were placed¹⁸ in Society Hill, Country Village, Port Liberté, and in first floor units along the Hudson River waterfront.¹⁹ A driving ban was enacted,²⁰ the Holland Tunnel and Turnpike Exit 14C briefly closed, and public transit temporarily out of service.²¹

Between 5,000 and 10,000 customers lost power during the storm which dropped seven to eight inches of rain at high tide, overwhelming the city's combined sewage system and flooding many first-floor residences with up to eight feet of water.²²

Fourteen months later, in October 2012, Superstorm Sandy hit Jersey City. Unlike Hurricane Irene where rainfall caused flooding, Superstorm Sandy presented a case of severe tidal inundation. In fact, over thirty-nine percent of Jersey City's land area (more than 6,515 parcels) experienced storm surge.²³ These numbers do not include Country Village, which due to a FEMA mapping error

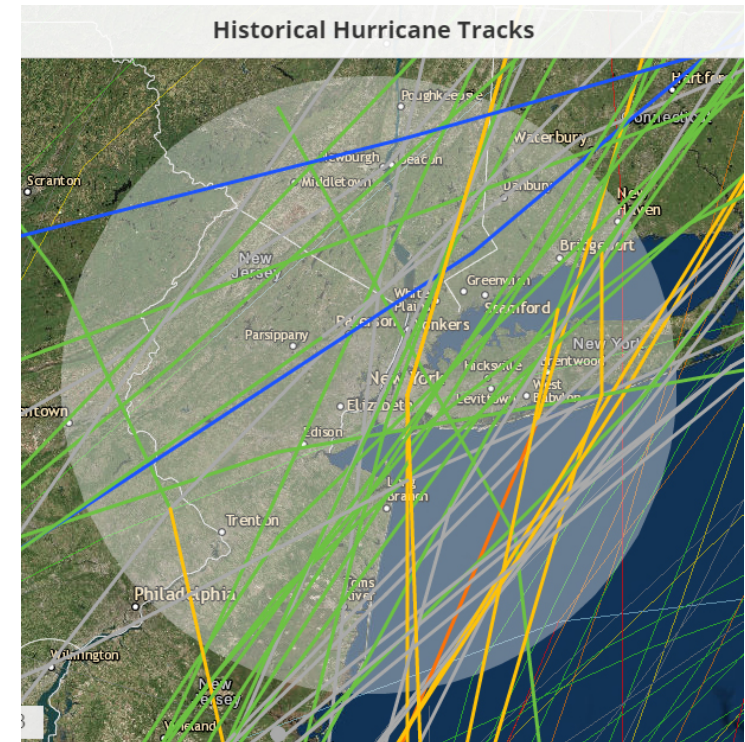


Figure 3: Historical Hurricane Tracks in Area

¹⁶ NOAA, <https://coast.noaa.gov/hurricanes/>, Accessed July 24, 2016.

¹⁷ Tetra Tech, *Hudson County Hazard Mitigation Plan*, 2015 Update

¹⁸ Robb, Adam. *With Hurricane Irene on way, Downtown Jersey City highrise orders evacuation, but Norwegian fire department plans on staying put.* Jersey Journal. August 27, 2011.

¹⁹ *Jersey City releases maps of neighborhoods ordered to evacuate.* Jersey Journal. August 27, 2011.

²⁰ Friedman, Matt. *N.J. storm update: One dead, thousands without power.* NJ Advance Media. August 28, 2011.

²¹ Grant, Jason. *Hurricane Irene traffic, transit, tunnel update for N.J. and N.Y.* Star Ledger. August 28, 2011.

²² Weiss, Jennifer. *Jersey City Sweeps, Pumps and Picks Up After Irene.* Jersey City Independent. August 29, 2011.

²³ Greenfeld, Douglas J. and Hsu, Naomi. *Sandy Recovery Strategic Planning Report.* Prepared for the City of Jersey City. August 2014.

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were not included in Sandy reports. Although this reporting error was never corrected, tax maps indicate over 550 lots in Country Village, most if not all of which experienced flooding. High water marks reached 11.9 feet in Liberty State Park, and the Exchange Place PATH station was flooded. FEMA housing claims topped \$11.5 million, and the City reported over a \$12 million loss in tax ratables²⁴ and \$100 million in damages.²⁵

City Hall, the Jersey City Medical Center emergency room, PSE&G substations, and Housing Authority residential buildings were affected. Seventy-five percent of Jersey City lost power,²⁶ curfews and emergency driving bans were put into effect, seven official emergency shelters were opened by the City²⁷ (Dickinson High School, the Jersey City Armory, School 17, School 4, School 41, School 7 and Pershing Field)²⁸, and the PATH system was entirely out of service for two weeks and not completely restored for three months. CSOs overflowed, resulting in basements flooding in raw sewage.^{29,30}

²⁴ Greenfeld, Douglas J. and Hsu, Naomi. Sandy Recovery Strategic Planning Report. Prepared for the City of Jersey City. August 2014.

²⁵ Healey, Mayor Jeremiah, State of the City address, 2013.

²⁶ Conte, Michelangelo. [Jersey City recovers after Hurricane Sandy](#). The Jersey Journal. October 30, 2012.

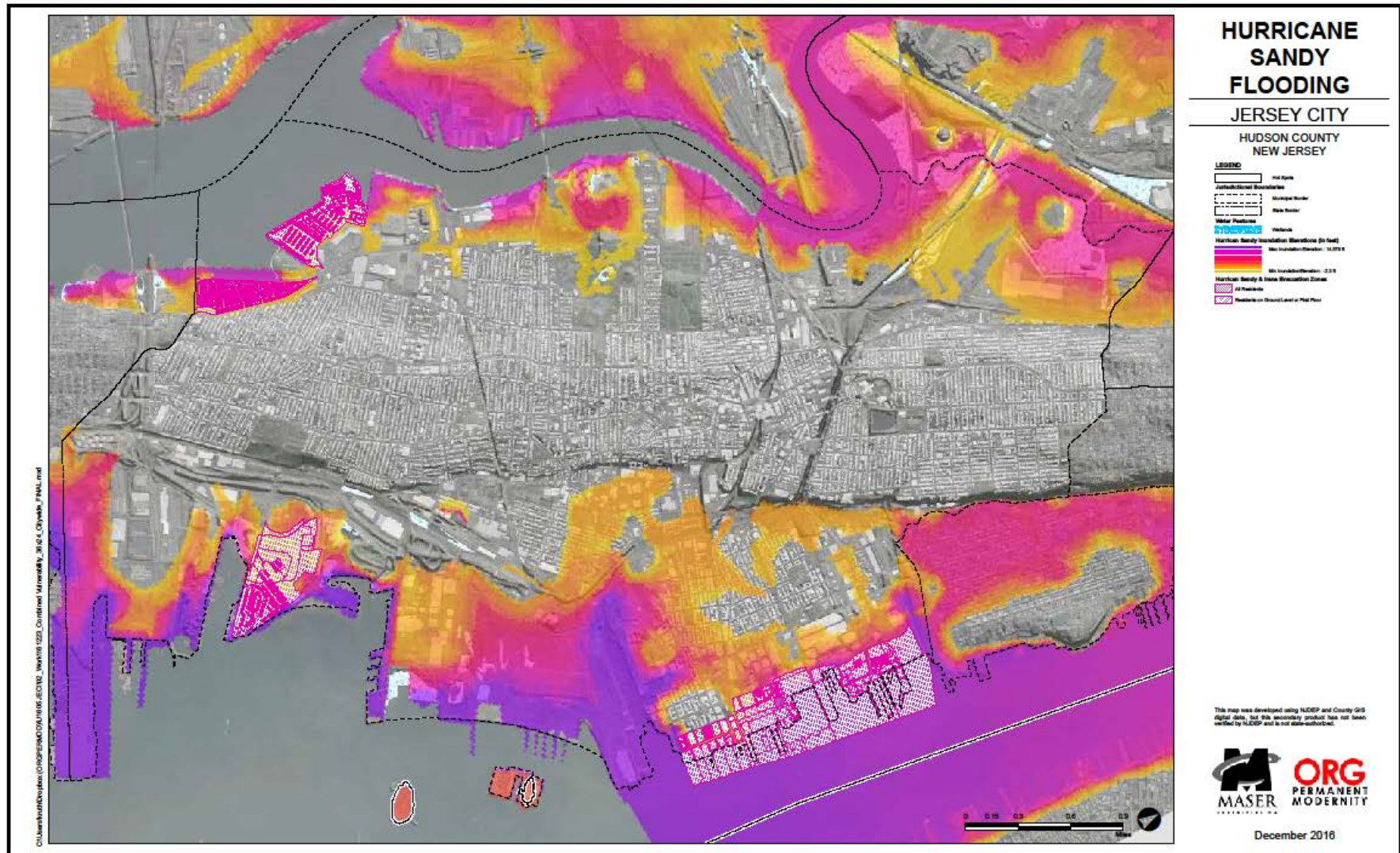
²⁷ Ibid.

²⁸ [Jersey City Consolidates from Seven Shelters to Two](#). The Jersey Journal. October 31, 2012.

²⁹ Ariosto, David. [First Irene, then Sandy: Jersey City Recovers, Again](#). CNN. November 14, 2012.

³⁰ Tetra Tech, [Hudson County Hazard Mitigation Plan](#), 2015 Update

Map 1: Hurricane Sandy Flooding



Types of Flooding

Flooding in Jersey City comes in several forms: Pluvial, CSO (combined sewer overflow), and Coastal flooding . In order to address these three types of flood, it is important to understand the differences.

Pluvial flooding is a surface water flood caused by heavy rainfall. This type of flooding does not require proximity to a water body or a low elevation. This type of flooding is typified by overland flow and ponding before the runoff reaches a watercourse or drainage system.³¹ Pluvial flooding is especially hazardous due to the potential for rapid and sometimes deep ponding or high velocity flows along roads and streets especially where gradients are steep.³²

Related to pluvial flooding is **CSO flooding**. Also typically a result of heavy rain or snow storms, CSO flooding results in combined sewers receiving higher than normal flows. Treatment plants are unable to handle extreme flows, causing a mix of excess stormwater and untreated wastewater to discharge directly into the City's waterways at CSO outfalls.

Coastal flooding occurs along a large body of open water. Although the shorelines of Jersey City are along a river, those bodies are tidal and therefore react in a coastal flooding manner as opposed to strict riverine (or fluvial) floods. Coastal flooding is typically the result of extreme tidal conditions caused by severe weather and storm surge when high winds push water onshore, overwhelming low-lying land.³³

While any one of these three types of floods can be problematic and even dangerous, it is not uncommon for some or all of them to occur simultaneously. As such, it is critical that all three weaknesses be addressed in order to best protect the City from future flood events.

A thorough table of flooding and hazard events in Jersey City between 2007 and 2014, covering all of these food types, was provided in the Hudson County Hazard Mitigation Plan, as is shown below.³⁴ (Text has been modified for brevity.)

³¹ Maddox, Ivan. [Three Common Types of Flood Explained](#). October 31, 2014.

³² Flood ResilienCity. [Understanding Pluvial Flooding](#). Accessed February 2, 2017.

³³ Maddox, Ivan. [Three Common Types of Flood Explained](#). October 31, 2014.

³⁴ Tetra Tech, [Hudson County Hazard Mitigation Plan](#), 2015 Update

Table 1

Hazard and Flooding Event History; 2007-2013		
Dates of Event	Event Type	Summary of Damages/Losses
April 14-20, 2007	Severe Storms and Inland & Coastal Flooding	In the City, electrical wires down causing temporary road closure and power outage. The EOC was opened. The City had over \$38,000 in labor/overtime, equipment use, and municipal damages.
February 13, 2008	Heavy Rain, Snowmelt, Flooding	Precipitation began as snow and transitioned to sleet and rain. Rainfall from 1.5 to three inches fell on top of two to four inches of snow, which led to flooding across the area.
September 6, 2008	Heavy Rain and Flash Flooding (Tropical Storm Hanna)	Tropical Storm Hanna impacted northeast New Jersey, bringing heavy rain and causing flooding in the area. Rainfall totals ranged from 2.52 inches to 5.5 inches. Periods of torrential rainfall from heavy showers and thunderstorms caused flash flooding in many urban areas, small streams and rivers. Highest sustained wind speed of 39 mph with a peak gust of 45 mph was recorded at Newark Airport. In Hudson County, numerous roads were closed due to flooding in Jersey City, and three feet of water inundated Route 440 at and Danforth Avenue, forcing it to close.
July 26, 2009	Heavy Rain and Flooding	Multiple severe thunderstorms produced flash flooding across northeast New Jersey. Estimated wind gusts of 60 mph were recorded. Wires were reported down throughout the County. Overall, the County had approximately \$33,500 in property damage.
July 29, 2009	Flash Flood	The intersection of Kennedy Boulevard and 63 rd Street in Jersey City was inundated with water and impassable. In Jersey City, utility poles fell down onto Hook Road bringing down power lines. Wind gusts were measured at 60 mph. Overall, the County had approximately \$7,000 in damages from this event.
February 10-11, 2010	Snow Storm	The City had 18 weather-related motor vehicle accidents due to this storm; no serious injuries. Transformer fire at Palisade Avenue/Booraem Avenue. Accident with a car and Light Rail at Sixth St./Washington Blvd. that caused temporary shut-down of the Light Rail. The EOC was opened.
March 12-13, 2010	Nor'Easter and Flooding	In the City, electrical wires down causing temporary road closure and power outage. Approximately 50 homes located in Ward A were damaged; Greenville suffered minor to major water damage and flooded basements. Other structural damages throughout the City included a collapse and a gas leak. Damages totaled over \$200,000. The City's EOC was opened. A police car was damaged by a tree limb. Two fire trucks were damaged by flood waters during water rescues. The City had nearly \$4,000 in overtime costs.
July 14, 2010	Flash Flood	Thunderstorms brought heavy rain and flash flooding to northeast New Jersey. In Jersey City (Hudson County), the ramp connecting U.S. 1 North to NJ 440 was closed due to flooding.
October 1, 2010	Heavy Rain and Flooding (Tropical Storm Nicole)	Remnants of Tropical Storm Nicole moved up the Atlantic Coast which resulted in heavy and flooding across portions of Bergen, Hudson, and Passaic Counties. In the City of Hoboken, Park Avenue was closed from Observer Highway to 1 st Street due to flooding. Major flooding occurred at the intersection of Willow Avenue and Newark Street. In the Town of Harrison, 3.74 inches of rainfall was measured.
January 12, 2011	Snow Storm	The City's EOC was opened. The police department responded to 12 reports regarding illegally parked or abandoned cars blocking tow routes. Plowing and salt was used as per the Snow Emergency Plan.
January 25-26, 2011	Snow and Ice Storm	The City's EOC was opened. Plowing and salt was used as per the Snow Emergency Plan. Police, Fire, DPW overtime.
February 1, 2011	Snow / Ice Storm	The City's EOC was opened. Plowing and salt used as per the Snow Emergency Plan. Police, Fire and DPW overtime.
March 11, 2011	Flood	Heavy rainfall in northeast New Jersey resulted in widespread flooding across the area.
August 19, 2011	Heavy Rain and Flash Flooding	Scattered thunderstorms produced heavy rains that resulted in flash flooding in portions of Bergen and Hudson Counties.

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August 26 – September 5, 2011	Heavy Rain and Flooding (Hurricane Irene)	Hurricane Irene made landfall locally as a tropical storm over New York City. Irene brought tropical storm force winds, destructive storm surge, and record breaking freshwater inland flooding across northeast New Jersey. This resulted in thousands of mandatory and voluntary evacuations along the coast and rivers from storm surge and freshwater flooding, and widespread power outages that lasted for up to two weeks in areas that were subsequently impacted by the remnant moisture from Tropical Storm Lee in September. In Jersey City, Route 400 was closed due to flooding between Sip Avenue and Danforth Avenue. The City's EOC was open. Heavy rains caused roadways to flood in the City. Over 30 roadways were closed. Police, Fire and DPW overtime was needed.
September 29, 2011	Heavy Rain and Flooding	A mid-day downpour briefly paralyzed traffic on several Hudson County roadways. In Jersey City, Sip Avenue flooded in several spots, causing some motorists to drive on sidewalks to avoid the inundated street.
October 29, 2011	Severe Storm	The City's Fire Department responded to 16 EMS/Rescue calls and other dangerous condition calls. FDJC also responded to 19 downed power line calls which resulted in temporary road closures and power outages. Numerous facility and structure damage reported. The EOC was opened. Over \$118,000 in debris removal costs and overtime.
January 11, 2012	Snow Storm	The City's EOC was opened. Plowing and salt used as per the Snow Emergency Plan. Police, Fire and DPW overtime.
June 6, 2012	Heavy Rain and Flash Flood	Showers and thunderstorms developed across northeastern New Jersey, with a few of the storms resulting in heavy rainfall and flash flooding in Hudson County.
October 26 – November 8, 2012	Hurricane Sandy	The City was greatly affected by Hurricane Sandy in low lying areas such as Country Village, Liberty State Park, historic downtown, and Exchange Place. Thirteen foot storm surge caused the inundation of many of these areas. The City opened and manned five shelters that housed approximately 200 people. Hundreds of logged search and rescue operations. All roads in the City were closed due to a combination of flooding, downed trees and power lines, and power outages. Portions of the City without power for seven days; scattered outages lasted for 14 days. Businesses were closed. Over 250,000 residents and employees were impacted. The Jersey Avenue pedestrian bridge and Harborside surveillance cameras were lost. The Liberty State Park/USACE boat lift and camera operations were lost. Traffic signals at over 27 intersections were damaged. County buildings in the City sustained wind and flood damage; equipment at the Duncan Ave. Garage had to be replaced. Jersey City Medical Center was flooded and required evacuation. Other critical facilities were also affected by flooding.
January 3, 2013	Winter Storm	A barrier collapse caused a portion of Tonelle Avenue to close. There was a water main break at Warner Avenue and Martin Luther King Drive that closed the roadway. A transformer fire at Griffith Street caused a power outage to that area. The EOC was opened.
January 21, 2013	Winter Storm	The City's EOC was opened. Plowing and salt used as per the Snow Emergency Plan. Police, Fire and DPW overtime.
February 3, 2013	Snow Storm	The roadway was closed at Woodlawn and Westside Avenues due to flooding. The roadway was closed at First Street and Newark Avenue due to a sinkhole. NJ Transit suspended bus service in the City. There was a water main break at Old Bergen Road and Neptune Avenue. Structural damage in the City included a flooded basement, roof and building collapse, and a damaged chimney. The EOC was opened.
February 8-9, 2013	Snow Storm	The FDJC responded to 16 EMS/rescue calls and numerous other dangerous condition calls. FDJC responded to 19 downed power line calls, resulting in temporary road closures and power outages citywide. There was a water main break on Route 440/Kellogg Street and a transformer fire on Sip Avenue. The JCPD/FDJC communications center was without power. The EOC was opened.

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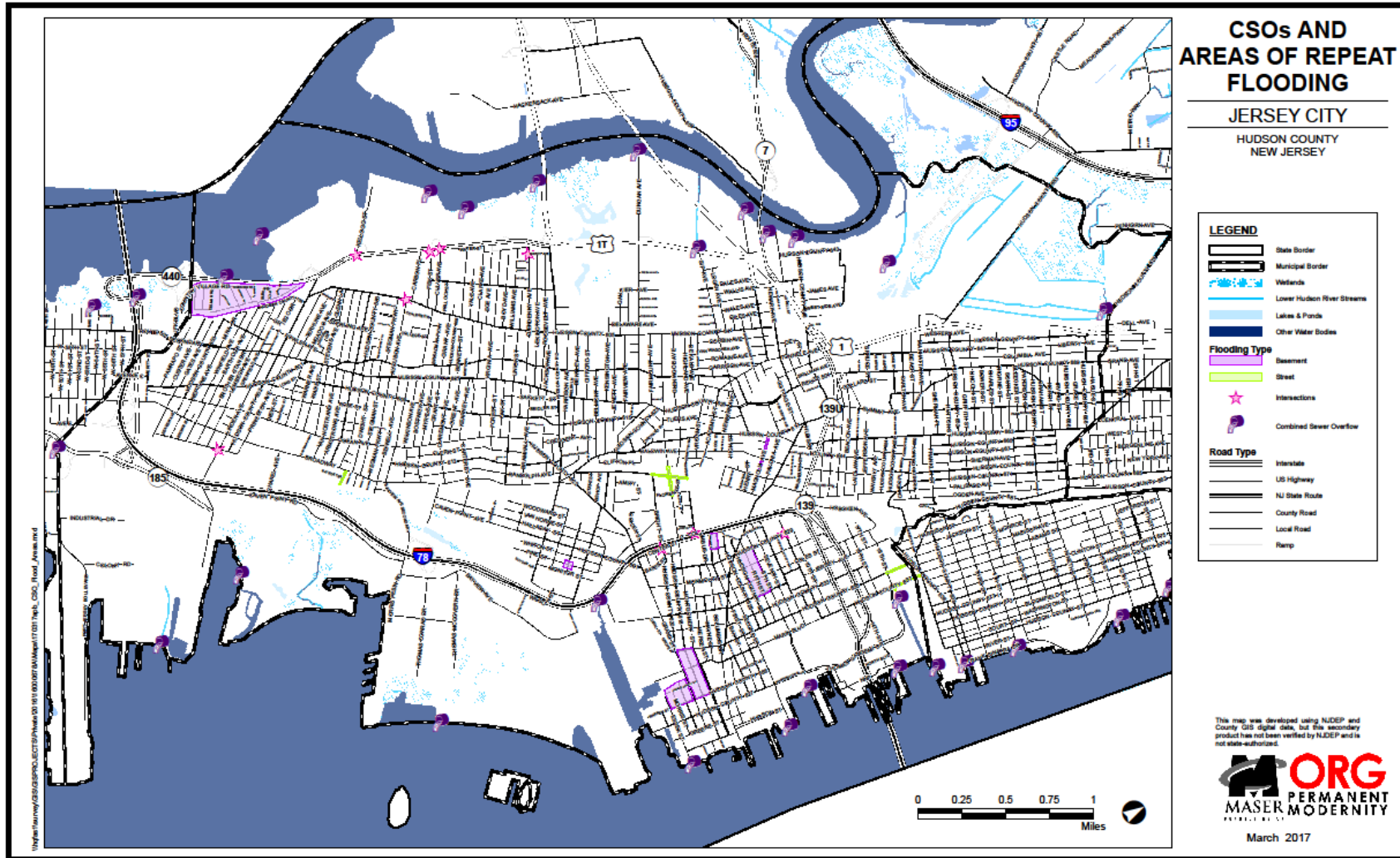
February 13, 2013	Snow Storm	The EOC was activated and the DPW/JCIA/JCPD removed snow for 15 days from February 12 th through February 26 th .
May 8, 2013	Flash Flood	Thunderstorms produced heavy rain and flash flooding in Hudson County. In Jersey City, multiple cars were stranded in high water at the intersection of 18 th Street and Grove Street. The local fire department had to perform water rescues. Multiple cars were also stuck in the high waters along Routes 1 and 9, between Manhattan Avenue and Secaucus Road.
June 7-8, 2013	Tropical Storm Andrea	Heavy rain closed roads to flood in Jersey City; forcing the City to barricade and close 28 roadways. The EOC was activated.
June 13, 2013	Severe Storm and Flooding	Heavy rain closed roads to flood in Jersey City; forcing the City to barricade and close 28 roadways. The EOC was activated.
July 3-4, 2014	Severe Storms and Flash Flooding	Severe thunderstorms hit the tri-state area bringing torrential rain, lightning, and flooding roads and subways. The storms also brought down trees and power lines.
May 1, 2014	Flooding	severe flooding

Additionally, the following locations, also shown below on Map 2, have been identified by the Jersey City Municipal Utilities Authority (MUA) as being subject to repeat pluvial flooding:³⁵

- 1) 9th Street & Brunswick Avenue
- 2) Linden & Princeton Avenue
- 3) Kellogg Street & Route 440 (DOT Drainage)
- 4) Westside Avenue & Audubon Avenue
- 5) Fisk Street & Route 440 (DOT Drainage)
- 6) Culver Avenue & Route 440 (DOT Drainage)
- 7) Grove Street Between Jersey City & Hoboken
- 8) Marin Blvd Between Jersey City & Hoboken
- 9) Merseles & Wayne Street
- 10) Center Street & Bright Street
- 11) Clendenny Avenue & Marcy
- 12) Richard Street just East of Garfield Avenue
- 13) Manholes blow off on Montgomery Street Bet Florence Street & Mill Road
- 14) Cornelison Avenue

³⁵ Haytas, Rich, JCMUA, email dated August 17, 2016.

Map 2: CSOs and Areas of Repeat Flooding



City Demographics

In 2015, Jersey City was named the most diverse mid-size city (100,000 to 300,000 people) in the country and second most diverse city overall, according to finance website WalletHub. This designation was based on racial and ethnic, language, and region of birth diversity. Jersey City got outstanding marks in all three, coming in nationally at No. 2 for racial and ethnic diversity, No. 2 for language diversity and No. 100 for region of birth diversity.³⁶ Demographic tables in the pages that follow will help elaborate on the diverse social make-up of Jersey City.

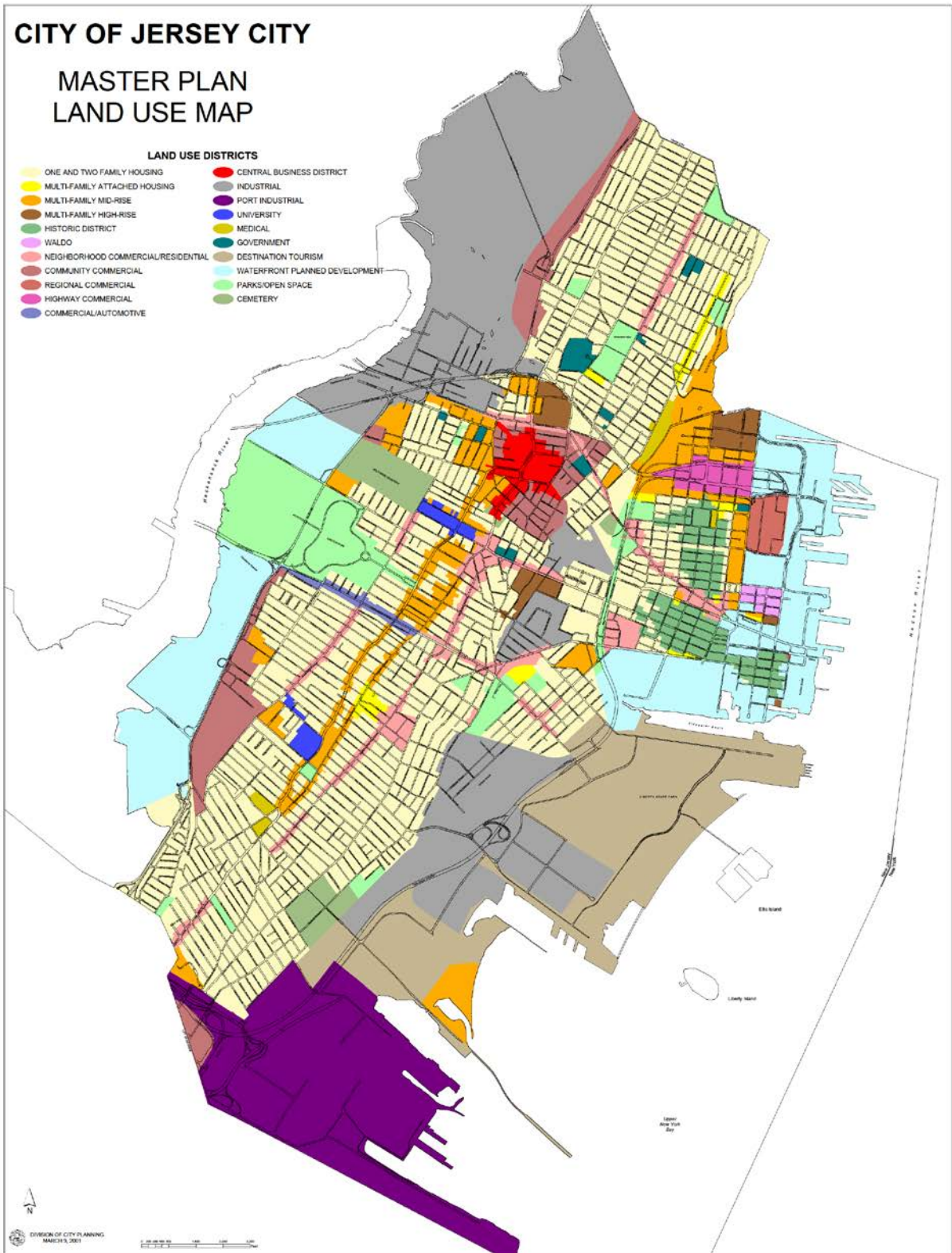
The City of Jersey City is characterized by mostly dense urban development consisting of residential, mixed-use, commercial, and industrial buildings. The map on the following page shows the various land use districts throughout the City., Jersey City has a population density of 17,556 persons per square mile, well above the population density of Hudson County (14,346 per square mile) and the State of New Jersey (1,211 per square mile). In fact, Jersey City is the fourth densest large city (which the Census defines as a city with a population over 100,000),³⁷ and Hudson County is the sixth densest county in the nation.³⁸ As a result, when emergencies happen, the impact is substantial and the response must be well organized and carefully choreographed in order to safely handle so many residents in a small area.

³⁶ Bernardo, Richie. [2015's Most & Least Ethno-Racially Diverse Cities](#), WalletHub, Accessed July 21, 2016.

³⁷ US Census Bureau, [U.S. Gazetteer Files](#). Accessed October 19, 2016.

³⁸ Regional Catastrophic Planning Team. [Participatory Urban Planning](#). January 2015.

Map 3: Land Uses



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Composition of Population

According to 2014 Census estimates, Jersey City has reached a population of 255,861 persons, roughly split 50/50 between male and female. A small majority of Jersey City residents identified as white (35.15 percent), but other major ethnic groups also each made up a sizable portion of the population, with Black or African American at 25.53 percent, and Asian at 24.79. 27.77 percent of the population identified as Hispanic or Latino/a. Jersey City has a median age of 33.5 years. Fifty percent of the population is between 25 and 54 years of age.

POPULATION GROWTH			
Year	Population	Change	Percent
1940	301,173	---	---
1950	299,017	-2,156	-0.7%
1960	276,101	-22,916	-7.7%
1970	260,350	-15,751	-5.7%
1980	223,532	-36,818	-14.1%
1990	228,537	5,005	2.2%
2000	240,055	11,518	9.8%
2010	247,597	7,542	3.3%
2015	259,651	12,054	9.8%

Source: 2011-2015 American Community Survey 5-Year Estimates

From the table above, it is evident that Jersey City experienced significant rates of population decline between 1940 and 1980. After 1980, population rates rebounded – even during the 2008 housing crisis - and are expected to continue to climb. In its “2040 Plan,” NJTPA estimated that by the year 2040, Jersey City would have a population of 356,250 – a growth of 46.5 percent above actual 2010 figures.³⁹ While NJTPA over-estimated the 2010 estimates by approximately 4,300, the general trajectory of growth appears accurate. This number is critical in understanding how many residents may be affected in the case of future storms.

³⁹ [NJTPA Plan 2040, http://www.nitpa.org/Planning/Plan-Update-to-2040/Plan2040Draft_for_Comment_Appendices.aspx](http://www.nitpa.org/Planning/Plan-Update-to-2040/Plan2040Draft_for_Comment_Appendices.aspx)

POPULATION BY RACE		
Race	Total	Percent
Total population	259,651	
White	91,808	35.88%
Black or African American	65,140	25.46%
American Indian and Alaska Native	992	0.39%
Asian	65,116	25.45%
Native Hawaiian and Other Pacific Islander	111	0.04%
Some other race	29,164	11.40%
Two or more races	7,320	2.86%
Hispanic or Latino (of any race)	71,809	28.07%

Source: 2015 American Community Survey 5-Year Estimates

Census estimates for 2014 indicate that foreign-born people made up 39.79 percent of Jersey City's population, and 48.77 percent of respondents spoke a language other than English at home.⁴⁰ Within the 30,000-student Jersey City schools system there were 2,600 English language learning students in 2015 who together spoke a total of more than 40 first languages, ranging from common languages such as Spanish, Mandarin, and Vietnamese to more uncommon languages such as Wolof (West Africa) and Abkhaz (Caucuses).⁴¹ These numbers are important in the understanding of how to make Jersey City resilient – community outreach and information must be accessible to the speakers of many languages.

⁴⁰ US Census, 2010-2014 American Community Survey 5-Year Estimates

⁴¹ Herzog, Laura. [Cebuano? Here are all the languages Jersey City students speak](#). NJ Advance Media. March 25, 2015.

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Educational Attainment

Jersey City is rapidly attracting a more educated populous. Between 2000 and 2015, the number of residents with less than a high school degree dropped in half, and the number with a graduate or professional degree doubled. 10.9% of the overall population had less than a high school degree in 2000, which fell to 5.2% in 2015. This change is indicative of either higher educational achievement or the exodus of the less-educated.

Educational Attainment 2000-2015				
Year	2000 Figures	2010 Figures	2015 Figures	% change from prior year
Population 25 years and over	155,460	165,229	182,103	14.63%
Less than 9th grade	16,435	13,119	13,039	-26.04%
9th to 12th grade, no diploma	26,190	14,762	13,412	-95.27%
High school graduate (includes equivalency)	39,720	40,737	43,419	8.52%
Some college, no degree	24,801	24,744	26,328	5.80%
Associate's degree	5,638	6,507	7,733	27.09%
Bachelor's degree	28,200	41,129	47,535	40.68%
Graduate or professional degree	14,476	24,231	30,628	52.74%

Source: 2011-2015 American Community Survey 5-Year Estimates; table DP02

Source: Profile of Selected Social Characteristics: Census 2000 Summary File 3 (SF 3) - Sample Data; table DP-2

Source: 2006-2010 American Community Survey Selected Population Tables; table DP02

The number of children enrolled in school dropped considerably in all age ranges except preschool and college, suggesting that families are either just starting to stay in Jersey City *or* families are moving out prior to elementary school enrollment. Hopefully the former is true, and evidence based on Kindergarten enrollments – increasing between 2010 and 2014 – suggests that may be the case.

School Enrollment 2000-2015				
Grade Level	2000 Enrollment	2010 Enrollment	2015 Enrollment	% change from prior year
Population 3 years and over enrolled in school	67,945	60,989	60,403	-11.10%
Nursery school, preschool	3,933	5,259	5,509	40.07%
Kindergarten	3,460	2,832	3,234	-6.53%
Elementary school (grades 1-8)	28,845	21,454	21,145	-26.69%
High school (grades 9-12)	13,869	12,525	10,362	-25.29%
College or graduate school	17,838	18,919	20,153	12.98%

Source: 2011-2015 American Community Survey 5-Year Estimates; table DP02

Source: Profile of Selected Social Characteristics: Census 2000 Summary File 3 (SF 3) - Sample Data; table DP-2

Source: 2006-2010 American Community Survey Selected Population Tables; table DP02

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Housing

Jersey City has a mix of old, historic neighborhoods, low-density neighborhoods with a mixture of old and new construction, and new high-rise development. Very few residents in Jersey City live in single-family housing (16%). Rather, as of 2010, 23% of residents live in two-family buildings, 24% live in what are generally mid-rise buildings with 3 to 9 units, and 31% live in buildings with over 20 units. Overall, just over 61% of residents live in multi-family buildings (more than 2 units).

2015 POPULATION DENSITY			
	Land Area	Population	Density (persons per square mile)
Jersey City	14.79	259,651	17,556
Hudson County	46.19	662,619	14,346
New Jersey	7,354.00	8,904,413	1,211

Source: 2011-2015 American Community Survey 5-Year Estimates, US Census Bureau
 Source: USGS <http://water.usgs.gov/edu/wetstates.html>
 Source: 2010 Census Gazetteer Files: New Jersey County Subdivisions, US Census Bureau

HOUSING TYPE BY UNITS IN STRUCTURE, 2015		
Unit Type	Number of Units	Percent
1, Detached	8,874	8.0%
1, Attached	8,673	7.8%
2	25,208	22.7%
3 to 9	26,328	23.7%
10 to 19	7,789	7.0%
20 or more	34,104	30.7%
Other	268	0.2%
Total	111,244	100.0%

Source: DP04: Selected Housing Characteristics 2011-2015 American Community Survey 5-Year Estimates

Because census figures were not available to demonstrate the rapid change in housing type over the past five years, a second table has been provided which shows the considerable number of units built since 2010, as well as the proportion of which are in multi-family buildings.

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Coordinating efforts to keep residents safe and informed should bear this in mind. New construction can and should be designed to withstand the threat of flooding, and can generally afford to do so based on the project size and budget. Smaller and older homes face a much more significant challenge, both in retrofitting existing structures to combat flood risk, and in meeting the financial burden of flood proofing when constructing new one-, two-, or three-family buildings.

HOUSING TYPE BY UNITS IN STRUCTURE, 2010-2015			
Year	1- and 2-family	multifamily	annual total
2010	55	882	937
2011	29	872	901
2012	30	20	50
2013	203	365	568
2014	96	94	190
2015	113	837	950
Total	526	3,070	3,596

Source: "New Jersey Construction Reporter" - New Jersey Department of Community Affairs.

Over 36% of the City was built before 1939 – much of it in the 1800s. In fact, 12,253 units are within the City’s five historic districts.⁴² Since 1940, each decade has generally produced between 5 and 9% additional housing stock. In the decade of the 2000s, that number jumped to 15.5%. The New Jersey Department of Community Affairs (DCA) reports in “The New Jersey Construction Reporter,” an annual count of construction on a municipal level, that by 2015 the Jersey City housing stock had already increased 3.2% since 2010, indicating that housing production this decade will likely meet or exceed prior decades.

⁴²Blazak, Brian. Jersey City Historic Preservation Specialist. July 25, 2016.

AGE OF HOUSING STOCK		
Year Built	Number of Units	Percent
1939 or earlier	41,095	36.5%
1940 to 1949	10,052	8.9%
1950 to 1959	10,840	9.6%
1960 to 1969	8,957	8.0%
1970 to 1979	7,447	6.6%
1980 to 1989	5,457	4.9%
1990 to 1999	7,643	6.8%
2000 to 2009	17,384	15.5%
2010 or later	3,596	3.2%
Total	112,471	100.0%

Source: DP04: Selected Housing Characteristics 2010-2014 American Community Survey 5-Year Estimates

Source: "New Jersey Construction Reporter" - New Jersey Department of Community Affairs.

Economic Profile

Income

Since the 2000 U.S. Census, the adjusted median household income rose by 55.6% from \$37,862 to \$58,907 in 2014. Median family income increased equally, and adjusted per capita income increased by 68% over the same period. However, the percentage of residents living in poverty remained roughly the same.

INCOME CHARACTERISTICS				
Income Type	2000	2010	2014	change
Median Household Income	\$37,862	\$52,950	\$58,907	55.58%
Median Family Income	\$41,639	\$58,089	\$64,491	54.88%
Per Capita Income	\$19,410	\$28,772	\$32,791	68.94%
Poverty Status (% of People)	18.6%	18.8%	19.0%	0.40%
Poverty Status (% of families)	16.4%	16.1%	16.2%	-0.20%

Source: US Census, Selected Econ. Characteristics 2014 ACS 5-Year Estimates; table DP03

Source: US Census, Selected Econ. Characteristics 2010 ACS 1-Year Estimates; table DP03

Source: US Census, Profile of Selected Econ. Characteristics: 2000 Summary File 3; table DP-3

Income is a very important consideration in determining resiliency. Households that do not earn enough to afford a basic household survival budget are particularly vulnerable, as documented in a 2012 United Way report, *ALICE (Asset-Limited, Income-Constrained, Employed): A Study of Financial Hardship in New Jersey*. Families with income below the ALICE Threshold account for 44 percent of Jersey City households.⁴³

“Often living in substandard conditions or flood prone areas and working at hourly wage jobs, households earning below the ALICE Threshold were disproportionately impacted by Superstorm Sandy, incurring 53 percent of residential expenses and receiving only 27 percent of resources. [...] In addition, households earning below the ALICE Threshold were much less likely to have the resources to recover, such as savings to cover lost wages and emergency expenses, or insurance to cover damage.”⁴⁴

Jersey City reported over \$38.8 million in lost wages as a result of Sandy.⁴⁵ Income and financial stability of residents and businesses factor into the resiliency of a community. Higher-income households have more disposable income available to make home modifications and to take other protective measures that will affect their ability to successfully weather a storm. Income also affects the quality of flood insurance that can be purchased by homeowners. Business owners that are financially able to withstand possible short- or long-term disruptions are more likely to be able to survive after a major storm or flooding event.

⁴³ United Way of Northern New Jersey. *ALICE: Asset Limited, Income Constrained, Employed*. September 2014.

⁴⁴ Halpin, Stephanie Hoopes, PhD. [The Impact of Superstorm Sandy on New Jersey Towns and Households](#).

⁴⁵ Ibid.

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Lower income working households were disproportionately impacted by Superstorm Sandy. With low wage jobs and minimal or no savings, they are more likely to buy or rent in disaster prone areas, and are unable to invest in preventative measures, or save for a 'rainy day.' As a result, the cost of residential damage and lost income for households after Sandy was \$4.1 billion of the \$7.84 billion total for the residential sector.⁴⁶

Employment

According to the 2014 U.S. Census Bureau 5-Year American Community Survey (ACS), the civilian unemployment rate in the City of Jersey City was 7.2% in 2014. Between 2010 and 2014, the numbers have hovered between 6.7 and 7.5%.⁴⁷

Four percent of residents were self-employed. One-fifth of the population was employed in educational services, and health care and social assistance (20.8% in 2014 – up from 19.9% in 2010). Professional, scientific, and management, and administrative and waste management services employed the second largest population (16.1% – up from 15.6% in 2010), followed by finance and insurance, and real estate and rental and leasing (13.0% – down from 14.3% 2010), and retail trade 10.5% – up slightly from 9.3% in 2010).⁴⁸

Thirty-eight percent of Jersey City households do not have a vehicle. It is therefore essential that public transportation methods be available and well-coordinated in the event that an emergency evacuation be required.⁴⁹

Businesses

Jersey City is home to over 20,193 businesses, large and small.⁵⁰ Storm events can cause substantial commercial property damage and short-term and long-term business operations losses. During storm events, businesses incur “direct damage as well as lost income from temporary closures, unavailability of critical inputs, and/or displaced customer bases.”⁵¹ Small businesses with five or fewer employees are expected to be more severely affected than larger businesses likely to have more resources or capability to offset storm-based losses.⁵²

There are several commercial or business areas in Jersey City, including Journal Square, Exchange Place, Newport, Newark Avenue Downtown, Communipaw Avenue, MLK Drive, Newport Mall, and Route 440. However, commercial properties and businesses are found scattered throughout the City.

⁴⁶ Halpin, Stephanie Hoopes, PhD. [The Impact of Superstorm Sandy on New Jersey Towns and Households](#).

⁴⁷ US Census: 2010-2014 American Community Survey 5-Year Estimates, table DP03: Selected Economic Characteristics

⁴⁸ Ibid.

⁴⁹ US Census: 2010-2014 American Community Survey 5-Year Estimates, table B08201: Household Size by Vehicles Available

⁵⁰ Greenfeld, Douglas J. and Hsu, Naomi. Sandy Recovery Strategic Planning Report. Prepared for the City of Jersey City. August 2014

⁵¹ NJ Department of Community Affairs (NJCA), [Community Development Block Grant Disaster Recovery Action Plan](#), April 29, 2013.

⁵² Ibid.

Insurance Costs

According to FEMA, “[t]he BFE is the regulatory requirement for the elevation or floodproofing of structures. The relationship between the BFE and a structure’s elevation determines the flood insurance premium.”⁵³ The expected surge from a 100-year storm, or 1% Chance, now generally follows the storm surge outline of Hurricane Sandy, which was considered to be a 100-year storm. While the updated FEMA flood zones have not yet been officially adopted by the State, Jersey City has incorporated them into the zoning code so as to protect the development potential of any lot. Jersey City allows extra height for buildings within a 100-year flood plain, indicating that “the number of feet required to reach the base flood elevation plus one shall be added to the maximum permitted height of the building.”⁵⁴

As of 2014, 20.38% of all buildings in Jersey City are located in either the A/AE or VE flood zones, with a value of \$103,391,654 at risk. In addition to future storms, sea level rise also poses a formidable threat to the City. Even when factoring in the lowest sea level rise scenario of .3 feet, it is estimated that there will be \$6.8 billion in potential losses by the year 2050.^{55,56}

These costs are felt by the residents and businesses as they are forced to insure their properties at higher costs, and by the City whose infrastructure, real estate, and affordability are at risk. After Sandy, of those registered for FEMA Individual Assistance, 69 percent did not have homeowners insurance and 90 percent did not have flood insurance.⁵⁷ Jersey City needs to impress upon its businesses and residences the importance of being well-insured. Programs such as the Community Rating System (CRS) are available to help reduce insurance costs which should help encourage new policies.

Risks and Vulnerabilities

The impact of hurricane Sandy⁵⁸ revealed a region-wide exposure to multiple hazards and risks. Power blackouts, severely contaminated storm waters, evacuation of residential communities and massive disruptions to public transport are just a few examples of the systemic nature of risk. Layering maps of those urban systems enables us to determine where an intervention could address the largest portfolio of risks and hazards. A citywide analysis has been conducted, layering a maximum spectrum of risks and vulnerabilities, combining flood risk with pollution risks, social vulnerability, critical infrastructure vulnerability and economic development vulnerability. This study was developed as an analytical process to identify the areas in the city that are at greatest risk, and by that aim to guide

⁵³ FEMA. Department of Homeland Security. <http://www.fema.gov/base-flood-elevation>.

⁵⁴ [Jersey City Municipal Code, §345-6](#)

⁵⁵ Tetra Tech, [Hudson County Hazard Mitigation Plan](#), 2015 Update

⁵⁶ Tetra Tech, [State of New Jersey 2014 Hazard Mitigation Plan](#), Sec. 5-2.

⁵⁷ Halpin, Stephanie Hoopes, PhD. [The Impact of Superstorm Sandy on New Jersey Towns and Households](#).

⁵⁸ See Appendix Map #1 – Citywide Sandy Inundation Map

this Plan's priority investments in adaptation measures. The underlying argument is that a dollar is best spent when it addresses the widest variety of risks (including but also beyond flood risk) to the largest plurality of stakeholders (starting with vulnerable populations and economies).

Mapping Risks Against Vulnerabilities

Resilience, as defined in the NRC's *Disaster Resilience: A National Imperative*,⁵⁹ "is the ability to prepare and plan for, absorb, recover from and more successfully adapt to adverse events".⁶⁰ Disaster Risk Reduction (DRR) research has developed dramatically in recent decades at every scale, from households to international development programs. Put simply, disaster risk is formulated as:^{61,62}

$$DR = H \times (V/C - M)$$

in which:

DR – disaster risk, which is a composite measure of exposure and vulnerability

H – hazards, which is the frequency, intensity, and duration of coastal storms

V – vulnerability to losses

C – capacity at the local scale for mitigating and responding to hazards

M – broader social mitigation of potential and actual losses

Because of the complexity and associated uncertainties of these categories it is extremely important to be clear about the analytic frameworks, and to analyze how they can individually and jointly help understand and address disaster risk and risk reduction opportunities in the city. Below is a description of how we addressed the variables of **H - Hazards** and **V - Vulnerabilities**.

C—Capacity and **M—Mitigation** are closely related. Whereas risk and vulnerability have received increasing research attention in recent years, the capacities and capabilities for mitigating and effectively responding to disaster have been less so. The city's capacity to withstand and mitigate disaster is studied in depth in the City's Adaptation and Green Infrastructure Master Plans which directly succeed this research. Mitigation refers to action taken in advance of a disaster to reduce its impacts on society and environment. The Federal Emergency Management Agency's shift from disaster response to mitigation in the 1990s was one of the most important policy shifts in the field of disaster risk reduction. The entire work that forms the content of these reports can be seen as an advancement of this policy.

⁵⁹ National Research Council. *Disaster Resilience: A National Imperative*. Washington, DC: The National Academies Press, 2012.

⁶⁰ Ibid.

⁶¹ Ward, Brian. *Disaster Risk Assessment*, 1999.

⁶² Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (1994). *At Risk: Natural Hazards, People Vulnerability and Disasters*. London: Routledge.

Hydrological Risks

H—Hazard (or Risks)

Hazards or Risks mapped include: Coastal inundation extent and frequency; Sea level rise inundation zones; toxicity and pollution levels in ground and sewer overflow features⁶³.

“A critical threat from flooding is the release of toxic or otherwise dangerous chemicals from chemical use or storage locations that may become inundated by rising waters.” For example, “in the aftermath of Hurricane Katrina in 2005, flood waters were found to have levels of bacteria ten times higher than acceptable levels for sewage and to be high in lead,” which could be the result of typically high lead levels in urban soils and dust. After Hurricane Sandy, fuel oils and gasoline spills damaged sensitive coastal ecosystems and wildlife.⁶⁴

Our team mapped the NOAA SLOSH⁶⁵ models for current sea level rise and overlaid these with the FEMA flood maps. FEMA maps are conservative in that they do not factor in predicted sea level rise and precipitation increase.

Watersheds

Jersey City is part of a coastal peninsula and includes tidally influenced watersheds: the Hackensack Watershed to the north, the Passaic River watershed to the west, the Rahway River/Arthur Kill/Kill Van Kull watershed to the south, and the Hudson River to the east.⁶⁶ This location means that Jersey City will experience direct impacts from rising sea levels, more intense storms, and the combined impacts of the two.⁶⁷ Sea level rise will increase the floodplain acreage within the County, thus increasing the population and property exposed to flooding.⁶⁸

⁶³ See appendix map #3 – Hydrological Risks Map

⁶⁴ Herb, J., J. Whytlaw, M. Campo. 2017. Using Geographic Tools to Identify Industrial and Commercial Facilities for which pollution prevention efforts may reduce exposures to hazards associated with climate-related flooding. New Jersey Climate Adaptation Alliance. New Brunswick, NJ: Rutgers University.

⁶⁵ The Sea, Lake and Overland Surges from Hurricanes (SLOSH) model is a computerized numerical model developed by the National Weather Service (NWS) to estimate storm surge heights resulting from historical, hypothetical, or predicted hurricanes by taking into account the atmospheric pressure, size, forward speed, and track data. These parameters are used to create a model of the wind field which drives the storm surge. The SLOSH model consists of a set of physics equations which are applied to a specific locale's shoreline, incorporating the unique bay and river configurations, water depths, bridges, roads, levees and other physical features. NOAA, <http://www.nhc.noaa.gov/surge/slosh.php>.

⁶⁶ U.S. Geological Survey (USGS)

⁶⁷ Tetra Tech, [Hudson County Hazard Mitigation Plan](#), 2015 Update

⁶⁸ Hudson County Division of Planning, 2014

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Flooding

Coastal flooding is a result of the storm surge where local sea levels rise often resulting in weakened or destroyed coastal structures. Hurricanes and tropical storms, severe storms, and Nor'easters cause most of the coastal flooding in New Jersey.⁶⁹ Much of the damage in Jersey City is attributed to storm surge and wave action along the waterfronts.

The following drainage basins are prone to tidal flooding:⁷⁰

- 1) Pine Street
- 2) Mill Creek
- 3) Mina Avenue
- 4) Sip Avenue
- 5) 18th Street
- 6) Claremont Carteret
- 7) Clendenny Avenue
- 8) Essex Street

Additionally, as discussed earlier in this document and shown in Map 2, repeat pluvial flooding can be found at the following streets and intersections:⁷¹

- 1) 9th Street & Brunswick Avenue
- 2) Linden & Princeton Avenues
- 3) Kellogg Street & Route 440 (DOT Drainage)
- 4) West Side & Audubon Avenues
- 5) Fisk Street & Route 440 (DOT Drainage)
- 6) Culver Avenue & Route 440 (DOT Drainage)
- 7) Grove Street between Jersey City & Hoboken
- 8) Marin Boulevard between Jersey City & Hoboken
- 9) Merseles & Wayne Streets
- 10) Center & Bright Streets
- 11) Clendenny & Marcy Avenues

⁶⁹ Tetra Tech, *State of New Jersey 2014 Hazard Mitigation Plan*, Sec. 5.

⁷⁰ Tetra Tech, *Hudson County Hazard Mitigation Plan*, Sec. 9.15-4, 2015 Update

⁷¹ Haytas, Rich, JCMUA, email dated August 17, 2016.

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- 12) Richard Street just East of Garfield Avenue
- 13) Manholes blow off on Montgomery Street between Florence Street & Mill Road
- 14) Cornelison Avenue

Repeat basement flooding, shown on Map 2, has been reported at the following locations:⁷²

- 1) Magnolia Avenue between Summit Avenue & Chestnut Street
- 2) York Street between Grove & Warren Streets
- 3) Country Village
- 4) Parts of Sussex, Morris, and Van Vorst Streets
- 5) 5th Street between Brunswick Street & Jersey Avenue
- 6) 1st/2nd Street & Merseles Street
- 7) Pine & Maple Streets

Climate change impact

There are no science-driven scenarios that foresee a future reduction in risk probability. According to the Hudson County Hazard Mitigation Plan, Jersey City has several medium and high-risk classifications for natural hazards.⁷³ They are as follows: High (Coastal storm, Flood, Severe weather, Severe winter weather) Medium (Coastal erosion, Drought, Earthquake, Extreme Temperature, Wildfire). From the same study for Hudson County we can read that “Temperatures in the Northeast United States have increased 1.5 degrees Fahrenheit (°F) on average since 1900. Most of this warming has occurred since 1970. The State of New Jersey, for example, has observed an increase in average annual temperatures of 1.2°F between the period of 1971-2000 and the most recent decade of 2001- 2010. Winter temperatures across the Northeast have seen an increase in average temperature of 4 °F since 1970.”⁷⁴ By the 2020s, the average annual temperature in New Jersey is projected to increase by 1.5°F to 3°F above the statewide baseline (1971 to 2000), which was 52.7°F. By 2050, the temperature is projected to increase 3°F to 5°F.⁷⁵ Rainfall is also increasing, with Northern New Jersey’s 1971-2000 precipitation average over 5” (12%) greater than the average from 1895-1970.⁷⁶

⁷² Ibid.

⁷³ Tetra Tech, [Hudson County Hazard Mitigation Plan](#), 2015 Update

⁷⁴ Ibid.

⁷⁵ Sustainable Jersey Climate Change Adaptation Task Force, 2013.

⁷⁶ Office of New Jersey State Climatologist

Vulnerabilities assessment

V—Vulnerability

Vulnerability categories mapped include:

Social Vulnerability

This crucial dimension of risk has advanced from analysis of hazards to underlying social processes of poverty and marginalization. The Social Vulnerability Index (SOVI) developed for NOAA by Susan Cutter⁷⁷ includes 32 variables and is the broadest multi-variate assessment available. The SOVI values for Jersey City are shown in the maps in the Appendix of this report. Social vulnerability (SOVI) was mapped against population numbers in order to understand which of the vulnerable areas contains greater concentrations of people at risk.

Map 4 below demonstrates the distribution of social vulnerability throughout Jersey City, including senior housing and public housing. The maps generally show that there are pockets of increased vulnerability throughout the city. At lower elevations (that is, areas that are more susceptible to coastal flooding), areas of note are northwest of the Morris Canal/Tidewater Basin and southwest of the Hoboken border. Both of these areas were historically very marshy areas, making them hydrologically challenging, and they are now compounded by having pockets of relative poverty which make them particularly vulnerable.

Critical Infrastructure

Critical infrastructure network vulnerability was identified by mapping the following: major trunk lines for transportation by track or road (including emergency evacuation routes, power (sub)station and transmission lines, main gas pipelines, hospitals, police and fire stations, emergency shelters and medical services and municipal offices. This mapping revealed that about 75% of the region's power generation lies in the flood zone.

The City of Jersey City has 95 critical facilities that were analyzed, 42.1% (40 critical facilities) of which fall within the Special Flood Hazard Area (SFHA 100- and 500-year flood zone). Another 31.5% (30 critical facilities) have a 1% annual chance of flooding (100-year flood zone). Zero facilities are expected to be permanently inundated due to one to three feet of sea level rise.

Map 5 below identifies hospitals and EMS, police and fire stations, electrical substations and utility transmission lines, and municipal offices as well as transportation infrastructure including transit routes, railroads, major roads, and evacuation routes. This map shows, for example, a significant cluster of power infrastructure and rail lines along the Hackensack River at the northern end of Jersey City. While such an area has little to no residential

⁷⁷ Cutter, Susan. Social Vulnerability to Environmental Hazards. *Social Science Quarterly*, Volume 84, Number 2, June 2003

population, the impact of damage to the infrastructure in this area would affect all residents, making it a less obvious, though critically important area needing protection.

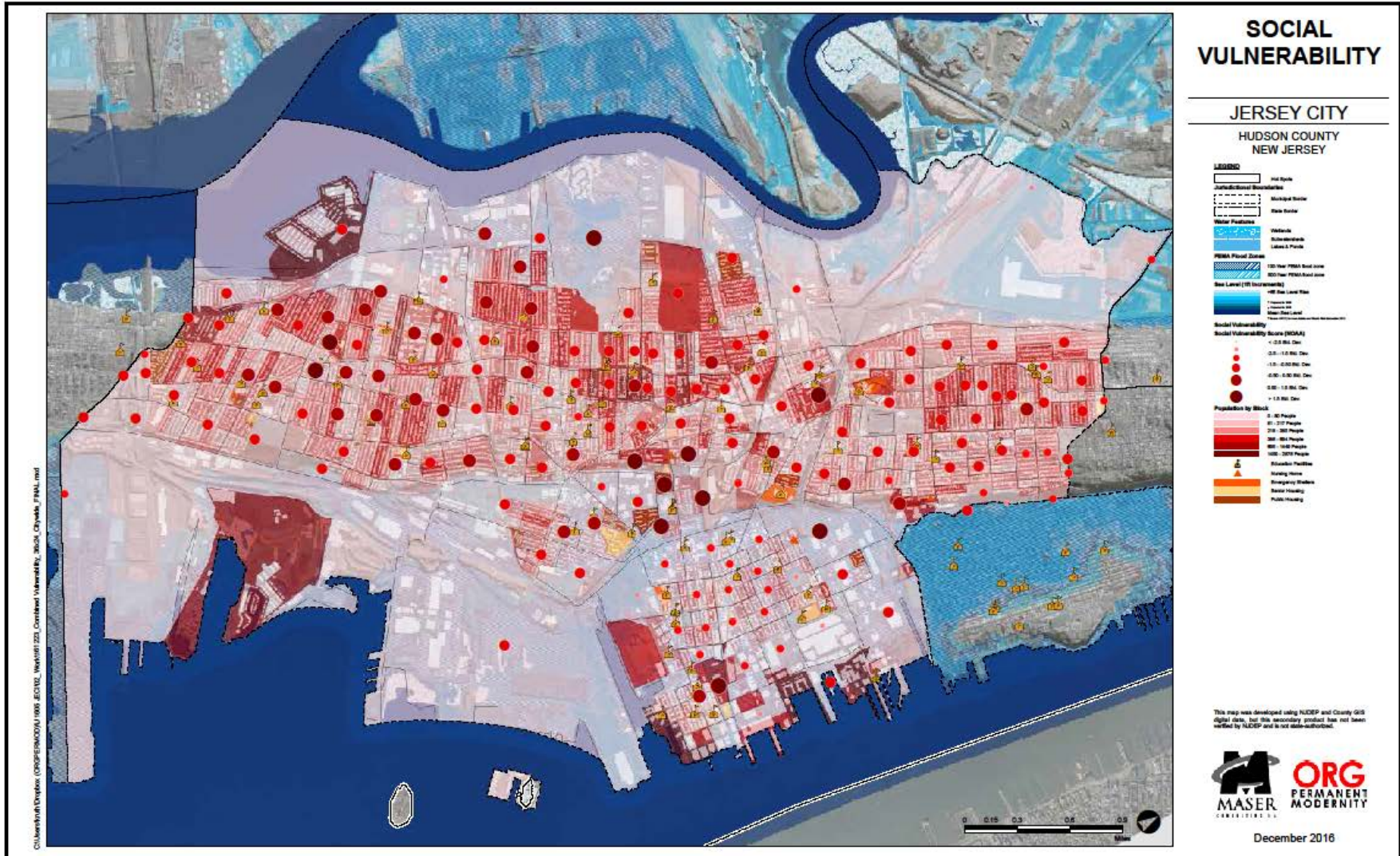
A complete list of critical infrastructure facilities is provided in the Appendix of this report.

Economic Development Vulnerability

Economic vulnerability was mapped by identifying ongoing and recent development areas as well as primary employment areas. Lots which are yet to be developed and are in proximity to the water's edge are particularly relevant as such plots may be able to be incorporated into a larger flood protection strategy and therefore benefit their surroundings. Identifying employment centers (or commercial and industrial land uses in general) is critical not only to maintain operations during storm events, but also as an opportunity to involve the private business sector in resiliency projects. We would argue that a robust involvement of the business community in the city's pursuit for resilience is critical for the establishment of a stakeholder coalition around large infrastructure projects.

Map 6 below shows the land uses throughout Jersey City including recent approvals, overlaid with flood areas and FEMA zones. These layers indicate that the Downtown Jersey City waterfront has the greatest economic development risk due to its high rate of new construction. Inaction in protecting this area could slow or halt development, which in turn would affect the economic growth and tax base of the city as a whole.

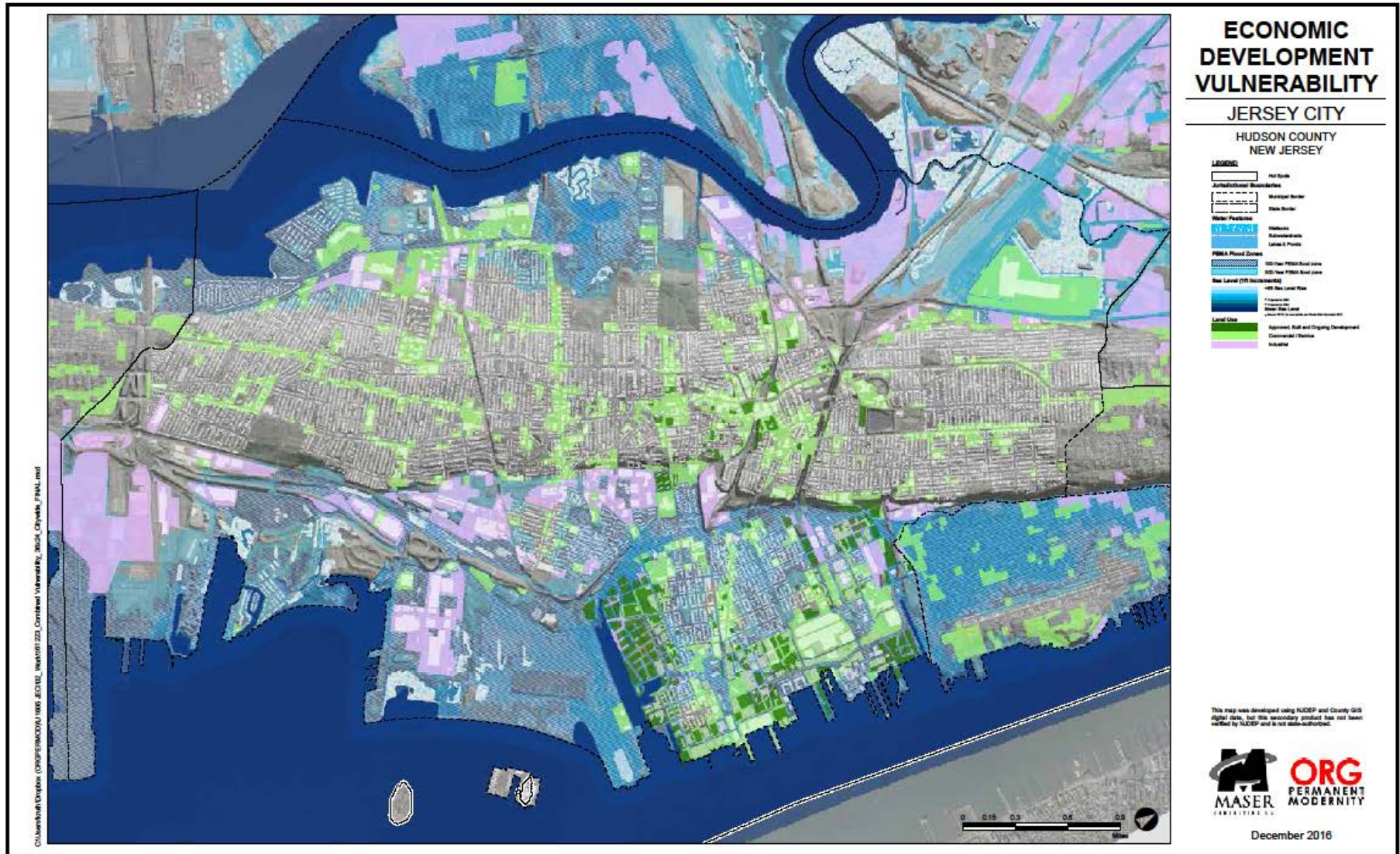
Map 4: Social Vulnerability



Map 5: Critical Infrastructure



Map 6: Economic Vulnerability



Prioritizing Vulnerable Districts

With the hazards and vulnerabilities identified, the next step is to determine what areas of the city will receive the greatest impact if and when resiliency measures are implemented.

Weather events can become disastrous when urban practices are not able to accommodate extreme environmental conditions and resilience is low. To a large degree, this is a scalar problem. Regional dynamics cause extreme environmental conditions (sea level rise, global warming, watershed dynamics, geomorphology etc.); they are systemic and work across jurisdictional boundaries. However, projects and interventions that can be realistically implemented, such as infrastructure or landscaping, have constraints such as capital availability, ownership structure complexity, and permitting across scales (municipal, county, state, federal).

Our approach understands the scale difference between analysis and intervention as a reason to describe a somewhat new, intermediate scale level – which is why we emphasize the importance of identified Priority Areas. Those identified areas should be seen as general target areas for further analysis and design development to establish cost efficiency and feasibility of resiliency projects (for more information see the Adaptation Master Plan).

Watershed Districts

A preliminary hydrological analysis of the City and its immediate environs was conducted as a first means of classifying the City into discrete locations with contained tidal inundation vulnerabilities. FEMA and NOAA data sets for both storm surge (Hurricane Flood Zones) and sea level rise scenarios (up to 6 feet) were compiled. High-resolution topographical data were mapped to understand what portions of the City are subject to these risks, and distinct areas were then delineated by common risk levels, herein referred to as Watershed Districts. These Watershed Districts allow for localized intervention to address their own coastal inundation risks, with the expectation that providing flood resiliency along critical points within the District will protect the District as a whole. As a result, eight Watershed Districts are herein established.

Further analysis of these Watershed Districts in the Adaptation Master Plan will serve as the basis for a flood protection element alignment plan which will protect the city at large against coastal inundation to a level of the 500-year storm (or about 15 feet in elevation) by establishing a Coastal Protection line of areas that are either high enough to not require any construction, or areas that are considerably high such as to require minimal interventions.

The eight **Watershed Districts** are generally described as follows:

1. Downtown Jersey City (Watershed District 1): including Newport, Exchange Place, and the four Downtown historic districts. The area includes a range of residential neighborhoods, from one- and two-family dwellings to multi-family high-rise residential buildings. District 1 is also a major commercial and employment center, as well as a transportation hub for PATH, the Hudson-Bergen Light Rail lines, and the Holland Tunnel. Downtown has many

City of Jersey City

neighborhoods that are characterized by having a one percent annual chance flood hazard area where block groups equal or exceed the regional poverty threshold. There are six CSOs in this District.

2. Liberty State Park (Watershed District 2): A major recreation hub along the Hudson River waterfront, with industrial and commercial uses located at its southern portion in the Liberty Harbor industrial park area. There are two CSOs in this District.
3. Bergen-Lafayette, Morris Canal, Communipaw (Watershed District 3): Primarily residential neighborhood west of the New Jersey Turnpike Extension (Interstate 78), which also includes industrial and neighborhood commercial land uses, and the Hudson-Bergen Light Rail line. There are Census blocks in this neighborhood that are characterized by having a one percent annual chance flood hazard area and comprising populations that equal or exceed the regional poverty threshold. There are no CSOs in this District.
4. Port Liberté (Watershed District 4): The Port Liberté residential development and the Liberty National Golf Course are in this District. There is one CSO in this District.
5. Greenville Yards (Watershed District 5): Adjacent to the City of Bayonne, this District includes port facilities, industrial, and commercial land uses. There is one CSO in this District.
6. Country Village and Society Hill (Watershed District 6): This area encompasses residential neighborhoods. Country Village is a one- and two-family residential neighborhood within the one percent annual chance flood hazard area and with block groups that equal or exceed the regional poverty threshold. Society Hill is also a residential neighborhood, with commercial development along Route 440 east of Society Hill Drive. There are five CSOs in this District.
7. Westside, Lincoln Park, Marion (Watershed District 7): South of Newark Avenue and west of West Side Avenue, including the Route 440 commercial corridor. Residential neighborhoods are located east of Route 440. Many of these neighborhood census blocks are characterized by having areas with a one percent annual chance flood hazard area where the population equals or exceeds the regional poverty threshold. These areas are primarily located north of Communipaw Avenue and US Truck Route 1 & 9. There are five CSOs in this District.
8. Riverbend (Watershed District 8): Located in the northwest portion of Jersey City, west of Tonnelle Ave and under the NJSEA jurisdiction. Land uses include industrial, distribution, and railroads. There are five CSOs in this District.

Map 7: Watershed Districts



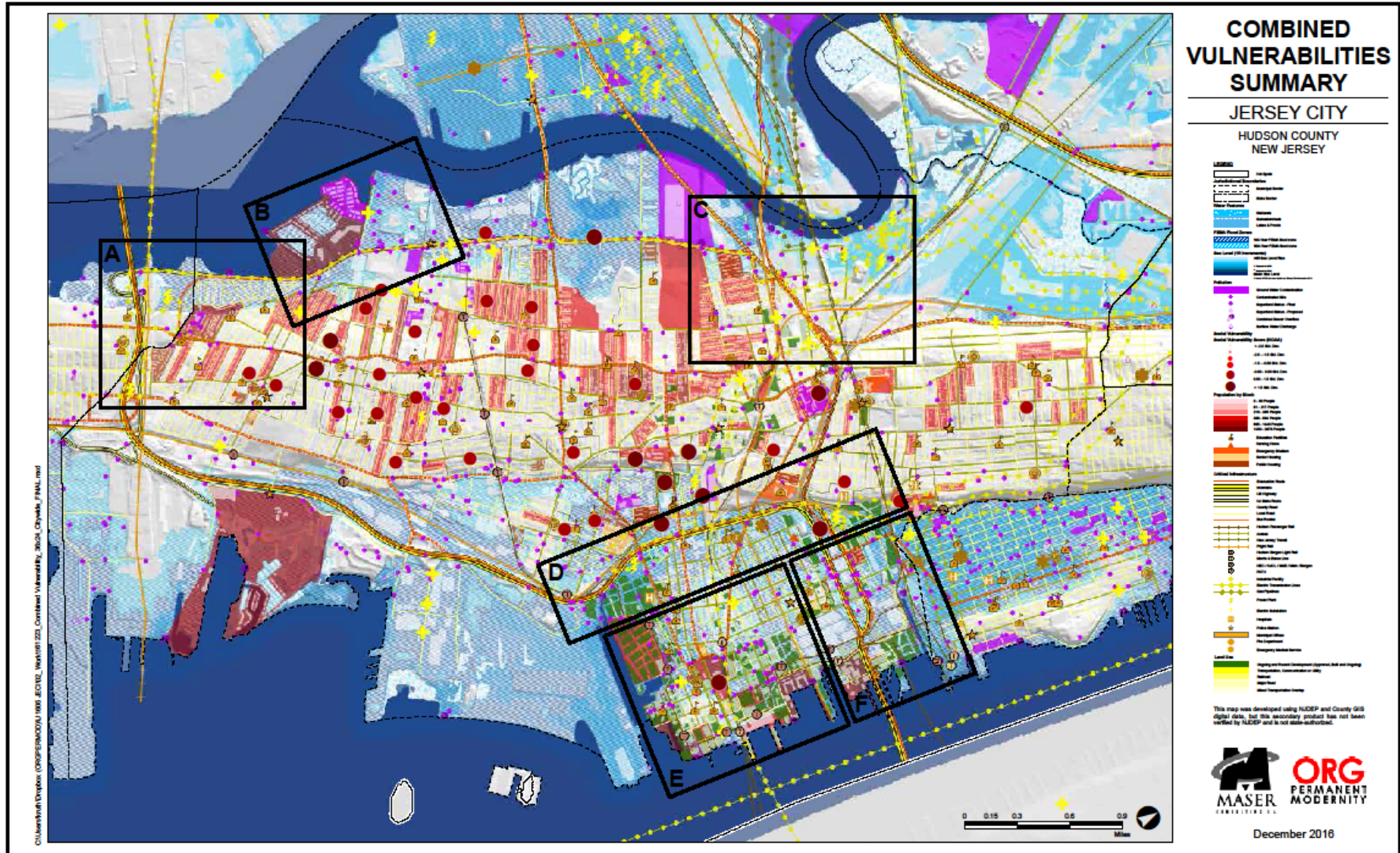
Priority Areas

These eight Watershed Districts were then overlaid with social, infrastructure, and economic development vulnerabilities in order to identify where the combined vulnerability is the greatest. The result is six areas where combined vulnerability is higher than in other watershed districts. These areas, termed as **Priority Areas** and labeled Areas A through F, are found on Map 8, and are generally described as follows:

- A. Country Village (Priority Area A): Includes the Westside neighborhood south of Society Hill, which is in a one-percent flood zone, comprises block groups that equal or exceed the regional poverty threshold, has a combined sewer overflow, and includes Route 440. This Priority Area includes the southern portion of Watershed District 6.
- B. Society Hill (Priority Area B): Located in a one-percent flood zone and includes several contaminated sites and ground water contamination. Includes Watershed Districts 6 and 7.
- C. Westside/Riverbend (Priority Area C): Centered on the boundary of Watershed Districts 7 and 8, this area includes critical infrastructure such as New Jersey Route 139 and US Route 1 & 9, and environmental concerns such as contaminated sites, combined sewer overflows, and surface water discharge.
- D. Mill Creek/Bergen-Lafayette/Van Vorst Park/Hamilton Park (Priority Area D): Includes portions of Watershed Districts 1, 2, and 3. The Mill Creek Redevelopment Area and Jersey City Medical Center are in this area, which is characterized by a one-percent flood zone and critical infrastructure. Western portions of the Van Vorst Park and Hamilton Park Historic Districts are in this Area. There is also a CSO in Area D. This area extends the length of the New Jersey Turnpike Newark Bay Extension from Morris Canal to the Hoboken border.
- E. Downtown/Exchange Place (Priority Area E): Comprises several neighborhoods, four of which are historic districts, plus numerous historic structures, bounded by the Hudson River, Jersey Avenue, the Tidewater Basin, and 10th Street.
- F. Newport (Priority Area F): Located in the northern portion of Watershed District 1, Priority Area F includes Newport and the Holland Tunnel approach.

Further study of these areas and how to address them individually and collectively can be found in the Adaptation Master Plan.

Map 8: Priority Areas (A through F)



Planning Consistency

While existing Master Plan documents will likely need to be updated to reflect the evolving needs and concerns of Jersey City as they relate to resiliency, consistency between municipal documents is of utmost importance in order to demonstrate a clear direction that the City intends to take.

The 2000 Jersey City Master Plan has among its goals and objectives the following:

- Provide unique, attractive, and high quality residential areas that would serve existing and attract new residents with a wide range of housing and life-style choices.
- Continue to develop regional economic engines within the City that support local economic development objectives.
- Plan for continued waterfront development.
- Create attractive landscaped gateways throughout Jersey City.

And, from the 2009 Circulation Element (revised through 2011):

- Integrate and connect neighborhoods, and improve public access to and along waterfront areas.
- Create a city-wide pedestrian-friendly environment.

Steps taken toward greater Resiliency will not only respect and uphold these and other Master Plan goals and objectives, but in many cases shall advance them.

Resiliency Goals & Objectives

To accomplish the City's Vision, the following Resiliency Goals and Objectives are established to guide the decision making of the City and to set the course for future development and resiliency measures that will be considered and implemented.

Goal: *Create a Jersey City that is resilient against flooding*

Objectives:

- Protect vulnerable areas from coastal and pluvial flooding.
- Preserve and protect historic neighborhoods and structures.
- Mitigate the impacts of known sources of hazardous sediment and combined sewer outflows.

City of Jersey City

- Develop gray and green infrastructure solutions to reduce the impact of flooding events.
- Identify points of necessary infrastructure coordination with the neighboring communities.
- Minimize the impact of flood control infrastructure on existing and planned neighborhoods.

Goal: *Protect Jersey City's critical infrastructure***Objectives:**

- Plan for operational continuity of critical infrastructure networks (energy, water, sewage, mobility, medical, communications, etc.) in the case of an emergency event.

Goal: *Improve emergency preparedness citywide***Objectives:**

- Identify “resilience centers” accessible to and capable of serving residents citywide.
- Provide usable, accessible, and up-to-date online emergency resources.
- Identify City agencies and positions therein who will be responsible for providing leadership during emergencies.
- Provide emergency response training for City departments and positions therein who will be held responsible during emergencies.
- Facilitate mobility and connectivity for ease of emergency evacuation.

Goal: *Create a socially resilient community***Objectives:**

- Maintain and expand access to the Jersey City waterfronts.
- Leverage proposed flood protection infrastructure and landscape projects to benefit all citizens of Jersey City with an emphasis on the most vulnerable communities.
- Ensure that flood protection infrastructure protects the connections between communities and the services, necessities (food, water, medical needs), and critical support needed during flood emergencies, and that no measures isolate neighborhoods or limit points of access.
- Provide equity in protection measures along both the Hackensack and Hudson River waterfronts.
- Retain and expand waterfront access for the enjoyment of the residents of and visitors to Jersey City wherever possible.

Goal: *Ensure economic stability against the threat of flooding*

Objectives:

- Reduce the economic losses due to interruption and insurance expenses for all businesses and employees within Jersey City.
- Coordinate between the proposed flood protection infrastructure and landscape projects and the ongoing and foreseen development projects in the city.

Needs Assessment

Prior studies

Prior to developing new recommendations for Jersey City, it is necessary to understand the studies that have already been undertaken on the issue of resiliency. The following previous studies and proposed initiatives were referenced in the creation of this Resiliency Master Plan. It is noted that concurrent with the writing of this document, an Environmental Resources Inventory was being prepared by Rutgers University. Its content, therefore, was not included with the background studies for this Plan, though should be considered relevant if and when future sustainability efforts are undertaken.

1. *Visualizations of Adaptation Scenarios and Next Steps White Paper*, prepared by Michael Baker, Jr. Inc. for City of Jersey City, dated February 14, 2015.
2. *Sandy Recovery Strategic Planning Report - A Strategic Plan for Resilience*, prepared by City of Jersey City Planning Department, dated August 2014.
3. *Jersey City Stormwater Management Plan*, prepared by Malcolm Pirnie, Inc. for City of Jersey City, dated June 2005 and most recently amended August 2008.
4. *Hudson County Hazard Mitigation Plan*, Section 9.7 City of Jersey City, prepared by Tetra Tech, dated February 2015.
5. *Understanding the Flood Insurance Rate Maps – Jersey City Fact Sheet*, prepared by Hudson County Division of Planning.
6. *City of Jersey City, FEMA Preliminary Flood Insurance Rate Map*, revisions issued January 30, 2015.
7. *Jersey City Tree Canopy Assessment – A Report on Current Tree Canopy and Strategies for the Future*, prepared by Green Infrastructure Center, dated June 2015.

City of Jersey City

8. *The Green Guide - Increasing Sustainable Development in Jersey City's Redevelopment Areas*, prepared by Clark Caton Hintz and Pace Law School Land Use Law Center, dated March 2013.
9. *Booker T. Washington Housing Stormwater & Resiliency Master Plan*, prepared by Stantec, dated December 14, 2015.
10. *Collaborative Design and Dynamic Modeling for Urban Coastal Flood Adaption*, prepared by Davidson Laboratory, Stevens Institute of Technology, Jersey City Planning Department, Michael Baker, Jr., Inc., and New Jersey Sea Grant Consortium; report not dated.
11. *Resilient Building Design Guidelines*, prepared by Princeton Hydro on behalf of the City of Hoboken, Hudson County, New Jersey, dated October 19, 2015.
12. *Resist Delay Store Recharge: A Comprehensive Urban Water Strategy*, prepared by Rebuild by Design, copyrighted 2014.
13. *State of New Jersey Hazard Mitigation Plan*, prepared by Tetra Tech, Inc., dated 2014.
14. *An Overview and Comparison of Navigable Storm Surge Barriers*, prepared by P.T.M Dircke, T.H.G. Jongeling, and P.L.M. Jansen; report not dated.
15. *Route 440/Routes 1&9T Multi-Use Urban Boulevard and Through Truck Diversion Concept Development Study Abstract and Executive Summary*, prepared for the City of Jersey City and prepared by Jacobs Engineering Group, Inc.; dated May 2011.

Gaps in existing body of research

The studies above offered a comprehensive analysis of the history of flooding, existing conditions, and predications for future sea level rise. The studies also provided adaptation measures to reduce the impacts of future flooding. However, the recommendations were generally broad solutions without considering local constraints, feasibility issues, and cost.

It is clear that each neighborhood in Jersey City has its own character and limitations. Historic districts, for example, have preservation and aesthetic limitations that newer neighborhoods may not. Areas of dense residential development would likely have more community input than areas used primarily for infrastructure, though protecting infrastructure is of utmost importance. And, across the board, the costs of some adaptation measures are more prohibitive than others.

The Jersey City Adaptation Master Plan will fill these gaps by evaluating specific adaptation recommendations with these considerations in mind.

Study Conclusion

Jersey City's resiliency risks can best be understood by understanding the measurable disaster risks that it faces.

The first of these risks are hazards, including the watersheds that are present, flooding activity, and climate change. Second, vulnerability to losses is added to the risk assessment. This includes social vulnerability such as income and isolation, infrastructure vulnerability such as power and emergency response, and economic development vulnerability which includes the resiliency of employment centers and businesses.

This report has evaluated the hazards and vulnerabilities through in-depth analysis of census data, hydrological data, and other socio-economic information. The result is a Vulnerability Assessment, which identifies six areas, citywide, that are at the highest risk and pose the greatest potential for positive impact if these areas are addressed. Waterfront areas with dense population and commerce such as Downtown, low-lying Country Village, as well as an intense area of infrastructure along the Hackensack River are some of the areas that have been identified as Priority Areas based on this analysis.

In order for the City to become more resilient in the face of major storms and flood events, it is recommended that the Priority Areas identified in this Plan be the focus of capital adaptation efforts related to stormwater, flooding, and sea level rise. Additionally, citywide policies and mitigation efforts should be implemented that will reduce the burden on the City's infrastructure, improve the resiliency of existing structures, and improve emergency response and coordination efforts. This Plan, together with a forthcoming Urban Environmental and Green Infrastructure Design Plan, Capital Improvements Plan, and recommended Zoning and Design standards, will set a firm path to improve the City's resiliency and protect vulnerable populations, insuring the continued relevance and success of Jersey City.

As identified in the Risks and Vulnerabilities section of this report, the hazards and vulnerability should be tempered by local capacity and mitigation efforts. This second step of the process is covered in the Adaptation Master Plan. This is followed by the Green Infrastructure and Urban Design Master Plan which identifies additional green infrastructure measures which can lessen the negative impacts of stormwater. Zoning and Design Guidelines will be provided to set forth specific land use, bulk, and design techniques to reduce the effects of stormwater and mitigate the visual impact of adaptation measures. And, finally, the Capital Improvements Plan recommends the order of priorities of each of the recommendations provided in these documents, and anticipates the cost of each.

Combined, these documents identify vulnerable Priority Areas through data analysis, recommend the most impactful adaptation measures for these Areas, offer further suggestions for green infrastructure mitigation in strategic locations citywide to complement the adaptation measures and manage stormwater inundation, and finally address the costs of each, resulting in a complete guide for Jersey City's resilient future.

Appendix

List of Critical Facilities⁷⁸

Medical Services		
Hospital	Address	Type of Facility
Christ Hospital	176 Palisade Ave.	Acute Care Hospital
Jersey City Medical Center	355 Grand st.	Acute Care Hospital
Christopher Columbus	115 Christopher Columbus Dr.	Federally Qualified Health Center
Horizon Health Center - Mobile Unit	714 Bergen Ave.	Federally Qualified Health Center
Metropolitan Family Health Network	935 Garfield Ave.	Federally Qualified Health Center
Metropolitan Family Health Network at Bergen Ave	857 Bergen Ave.	Federally Qualified Health Center
NHCAC Jersey City	324 Palisade Ave.	Federally Qualified Health Center
Snyder High School	239 Bergen Ave.	Federally Qualified Health Center

Police
Address
1 MLK Drive
13 Linden Ave. East
139 Cator Avenue
191 Bergen Avenue
207 7th Street
282 Central Avenue
365 Summit Avenue
465 Marin Blvd.
73-85 Bishop St.

Fire Houses
Address
160 Grand St
196 Audrey Zapp Dr.
355 Newark Ave
465 Marin Blvd
283 Halladay St
14-16 Orient Ave
152 Linden Ave
2 Bergen Ave
468 Ocean Ave
715 Summit Ave
152 Lincoln St
595 Palisade Ave
697 Bergen Ave
200 Sip Ave
255 Kearney Ave
582 Communipaw Ave
48 State Street

⁷⁸ Source: City of Jersey City

City of Jersey City

Ambulances & EMS		
Name	Address	Description
Amb-U-Care Ambulances	702 Summit Ave.	Ambulance Services
Amcare Inc.	34 Division st.	Ambulance Services
JC medical Center EMS	415 Montgomery St	EMS/ALS

Senior Housing	
Housing Name	Address
Battery View	72 Montgomery St
Berry Gardens (4 buildings)	72-92 Danforth Ave.
	199 Ocean Ave.
Boyd McGuinness	2555 Kennedy Blvd.
Cambridge Apartments	80 Cambridge Ave.
Curries Woods	3 New Heckman Dr.
Fairmount Hotel	2595 Kennedy Blvd.
Forrest Senior Apartments	376 Bergen Ave.
Grandview	3060 Kennedy Blvd.
Harborview	145 Ocean Ave.
Heights Senior Plaza	2 Hague St.
Jones Hall	591 Montgomery St.
JHRC Senior Housing	259 Van Nostrand St.
Lafayette Living Center	463 Pacific Ave.
Muhlenberg Gardens	1065 Summit Ave.
New Community	25 Orchard St.
Ocean Towers/Ocean Pointe	425 Ocean Ave.
Plaza Apartments	91 Sip Ave.
St. Anthony's Padua	350 Sixth St.
Salem Lafayette	94 Union St.
Stewart Apartments	88 Erie St.
Unico Towers	500 Grove St.
YWCA	111 Storms Ave.

Nursing Homes	
Facility Name	Address
St. Ann's	198 Old Bergen Rd.
Hamilton Park Healthcare Center	533 Monmouth St.
Harbor View Healthcare Center	178 Ogden Ave.
Jersey City Care Center	136 Summit Ave.
Newport Nursing and Rehabilitation Center	198 Stevens Ave.
Liberty House	620 Montgomery St.
The Atrium at Hamilton Park	330 Ninth St.
Margaret Anna Cusack Care	537 Pavonia Ave.

City of Jersey City

Schools		
School Name	Address	District Name
Beloved Community Charter School	508 Grand Street	BelovED Community Charter School
Academy of Technology Design	525 Montgomery Street	Hudson County Schools of Technology
Adult Evening High School	2 Palisade Avenue	Jersey City Public Schools
Alexander D. Sullivan School	171 Seaview Avenue	Jersey City Public Schools
Alfred Zampella School	201 North Street	Jersey City Public Schools
Anthony J. Infante School	3055 Kennedy Blvd	Jersey City Public Schools
Badr School	539 Bergen Avenue	Jersey City
Chaplain Charles Watters School	220 Virginia Avenue	Jersey City Public Schools
Charles E. Trefurt School	96 Franklin Street	Jersey City Public Schools
Christa McAuliffe School	167 Hancock Avenue	Jersey City Public Schools
Cornelia F. Bradford School	96 Sussex Street	Jersey City Public Schools
County Prep High School	525 Montgomery Street	Hudson County Schools of Technology
Dr Ronald McNair High School	123 Coles Street	Jersey City Public Schools
Dr. Charles P. DeFuccio School	214 Plainfield Avenue	Jersey City Public Schools
Dr. Lena Edwards Academic Charter School	12 Chapel Avenue	Dr Lena Edwards Academic Charter School
Dr. Michael Conti School	182 Merseles Street	Jersey City Public Schools
Explore 2000 Middle School	525 Montgomery Street	Hudson County Schools of Technology
Ezra L. Nolan School	88 Gates Avenue	Jersey City Public Schools
First Christian Pentecostal Academy	441 Jersey Avenue	Jersey City
Frank R Conwell School	70 Bright Street	Jersey City Public Schools
Franklin L. Williams School	222 Laidlaw Avenue	Jersey City Public Schools
Full Will Of God Christian Academy	81-84 Martin Luther King Bouleva	Jersey City
Genesis Education Center	317 THIRD STREET	JERSEY CITY
Gladys Nunery School	123 Claremont Avenue	Jersey City Public Schools
Great Futures Charter High School	1 Canal Street	Great Futures Charter School
Henry Snyder High School	239 Bergen Avenue	Jersey City Public Schools
Hudson Catholic Regional High School	790 Bergen Avenue	Jersey City
I.E.F. Al-Ghazaly	17 Park Street	Jersey City

City of Jersey City

Schools		
School Name	Address	District Name
Infinity Institute	193 Old Bergen Rd	Jersey City Public Schools
James F. Murray School	339 Stegman Parkway	Jersey City Public Schools
James J Ferris High School	35 Colgate Street	Jersey City Public Schools
Jersey City Community Charter School	128 Danforth Avenue	Jersey City Community Charter School
Jersey City Global Charter School	255 Congress Street	Jersey City Global CS
Jersey City Golden Door Charter School	3040 Kennedy Blvd	Jersey City Golden Door Charter School
Joseph H. Brensinger School	600 Bergen Avenue	Jersey City Public Schools
Joseph School of Tomorrow	1510 JOHN F. KENNEDY BLVD	JERSEY CITY
Jotham W. Wakeman School	100 St. Pauls Avenue	Jersey City Public Schools
Julia A. Barnes School	91 Astor Place	Jersey City Public Schools
Kenmare High School For Women	89 York Street	Jersey City
Learning Community Charter School	One Canal Street	Learning Community Charter School
Liberty High School	40 Sip Avenue	Jersey City Public Schools
Lincoln High School	60 Crescent Avenue	Jersey City Public Schools
M.E.T.S. Charter School	180 9th St	M.E.T.S. Charter School
Mahatma K. Gandhi School	143 Romaine Avenue	Jersey City Public Schools
Martin Center for the Arts	59 Wilkinson Avenue	Jersey City Public Schools
Martin Luther King, Jr. School	886 Bergen Avenue	Jersey City Public Schools
Middle School # 4	107 Bright Street	Jersey City Public Schools
Nicolaus Copernicus School	3385 Kennedy Boulevard	Jersey City Public Schools
Ollie Culbreth, Jr. School	153 Union Street	Jersey City Public Schools
Our Lady Of Czestochowa	248 Luis Munoz Marin Blvd.	Jersey City
Our Lady Of Mercy	254 Bartholdi Avenue	Jersey City
Primary Prep School	2495 Kennedy Boulevard	Jersey City
PS # 20	160 Danforth Avenue	Jersey City Public Schools
PS # 33	326 Union Street	Jersey City Public Schools
PS # 34	1830 Kennedy Blvd	Jersey City Public Schools

City of Jersey City

Schools		
School Name	Address	District Name
Rafael de J. Cordero School	158 Erie Street	Jersey City Public Schools
Regional Day School	425 Johnson Avenue	Jersey City Public Schools
Resurrection School - Brunswick Campus	153 York Street	Jersey City
Rev. Dr. Ercel F. Webb School	264 Van Horne Street	Jersey City Public Schools
Sacred Heart School	183 Bayview Avenue	Jersey City
Saint Anthony High School	175 Eighth Street	Jersey City
Saint Mary High School	209 Third Street	Jersey City
Soaring Heights Charter School	1 Romar Avenue	Soaring Heights
St Aloysius Elementary	721 West Side Avenue	Jersey City
St Anne School	255 Congress Street	Jersey City
St Dominic Academy	2572 Kennedy Boulevard	Jersey City
St Elizabeth's School	129 Garrison Avenue	Jersey City
St Joseph School	509 Pavonia Avenue	Jersey City
St Joseph's School for the Blind	253 Baldwin Avenue	Jersey City
St Nicholas School	118 Ferry Street	Jersey City
St Patrick School	509 Bramhall Avenue	Jersey City
St Peters Preparatory School	144 Grand Street	Jersey City
Stevens Cooperative School	100 RIVER DRIVE	JERSEY CITY
The Academy	209 Bergen Avenue	Jersey City Public Schools
The Ethical Community Charter School	95 Broadway	The Ethical Community Charter School
University Academy Charter School	275 West Side Avenue	University Academy Charter High School
Waterfront Montessori	150 WARREN ST., SUITE 108	JERSEY CITY
Whitney M. Young, Jr. School	135 Stegman Street	Jersey City Public Schools
William L Dickinson High School	2 Palisade Avenue	Jersey City Public Schools
YCS May Academy Upper-Lower School	36 Emory Street	Jersey City

City of Jersey City

Emergency Shelters		
Address	Owner	Name
2 Palisade Ave.	Board of Education	Dickinson High School
107-111 Bright St.	Board of Education	PS#3 / MS #4
678 Montgomery St.	State of NJ Department of Defense	Armory
105 Belmont Ave.	Board of Education	Vacant land
339 Stegman Pkwy.	Board of Education	PS #38
59 Wilkinson Ave.	Board of Education	PS #41
Van Houten Ave.	Board of Education	Vacant land
600 Bergen Ave.	Board of Education	PS #17
107 Bright St.	Board of Education	MS #14
222 Laidlaw Ave.	Board of Education	MS #7
88 Gates Ave.	Board of Education	MS #40

City Owned Buildings		
Address	Name	Critical / Asset
28-30 Paterson St.	Joseph Connors Senior Center	Critical
54 Journal Square	Loew's Theater	Asset
325-353 Rt. 1&9	maintenance	Asset
365 Summit Ave.	Courthouse	Asset
109 Oxford Ave.	garage	Asset
335 Bergen Ave.	Maureen Collier Senior Center	Critical
235 Jersey City Blvd.	Liberty Humane	Critical
140 MLK Drive	Bethune Life Center	Critical
163 Old Bergen Rd.	Police Athletic League	Asset
13-15 Linden Ave.	DPW	Critical
80 Bay St.	Powerhouse	Asset
298 Academy St.	Apple Tree House	Asset
51 Crescent Ave.	housing	Asset
280 Grove St.	City Hall	Critical

Visual Appendix

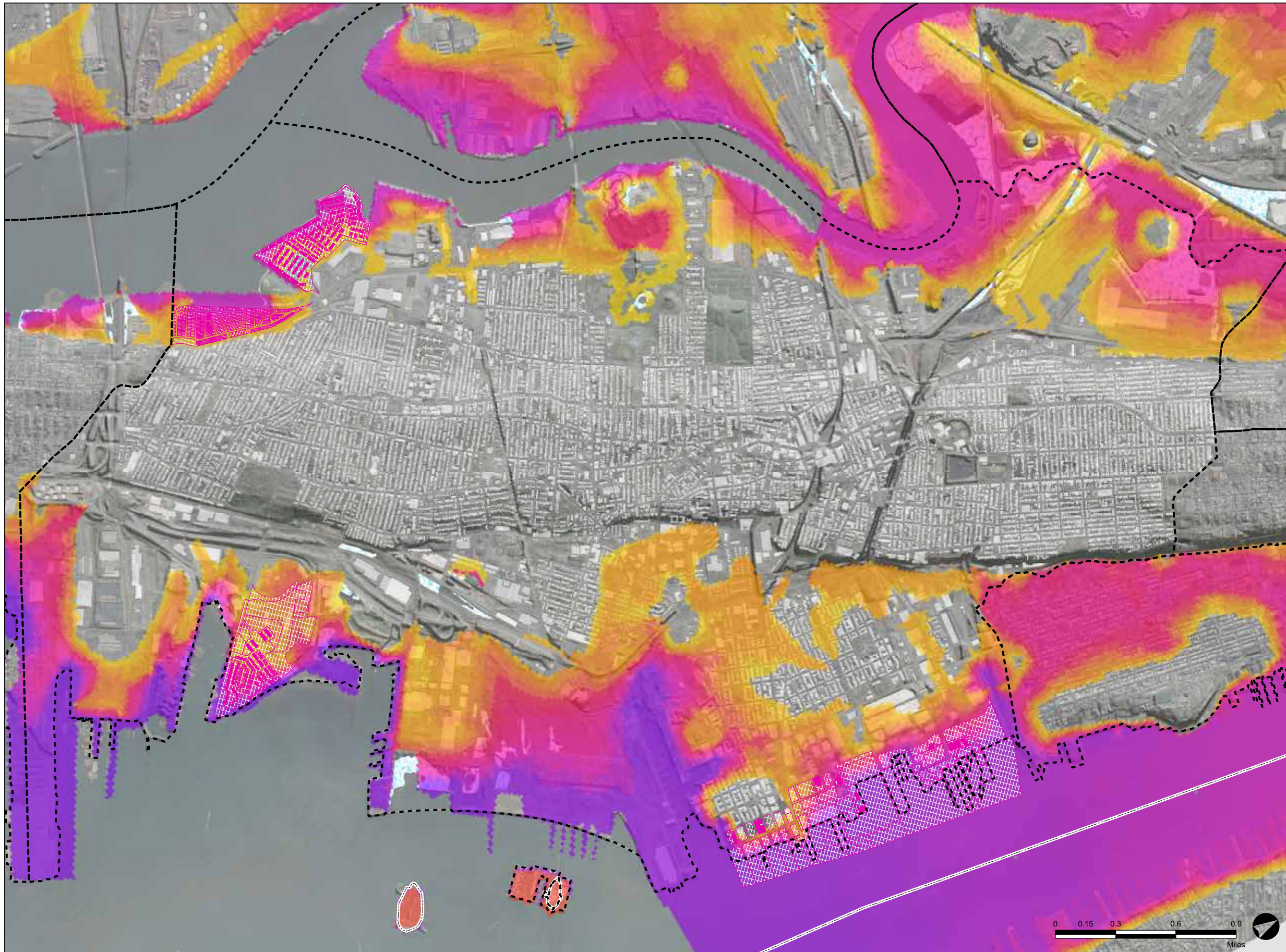
Resiliency Masterplan

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VISUALS APPENDIX

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MAP 1



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HURRICANE SANDY FLOODING

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

- Hot Spots
- Jurisdictional Boundaries**
 - Municipal Border
 - State Border
- Water Features**
 - Wetlands
- Hurricane Sandy Inundation Elevations (in feet)**
 - Max Inundation Elevation : 14.579 ft
 - Min Inundation Elevation : -2.3 ft
- Hurricane Sandy & Irene Evacuation Zones**
 - All Residents
 - Residents on Ground Level or First Floor

This map was developed using NJDEP and County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



December 2016

MAP 2

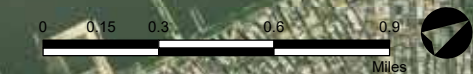


WATERSHED DISTRICTS

JERSEY CITY
HUDSON COUNTY
NEW JERSEY

LEGEND

- Jurisdictional Boundaries**
- State Border
 - Municipal Border
- Water**
- Wetlands
 - Lower Hudson River Streams
 - Lakes & Ponds
 - Other Water Bodies
 - 100-Year FEMA flood zone
 - 500-Year FEMA flood zone
 - Mean Sea Level
 - +1 ft Sea Level Rise
 - +2 ft Sea Level Rise
 - +3 ft Sea Level Rise
 - +4 ft Sea Level Rise
 - +5 ft Sea Level Rise
 - +6 ft Sea Level Rise
- Hydrological Analysis**
- Watershed Districts
 - Sea Level Rise Sub-basins

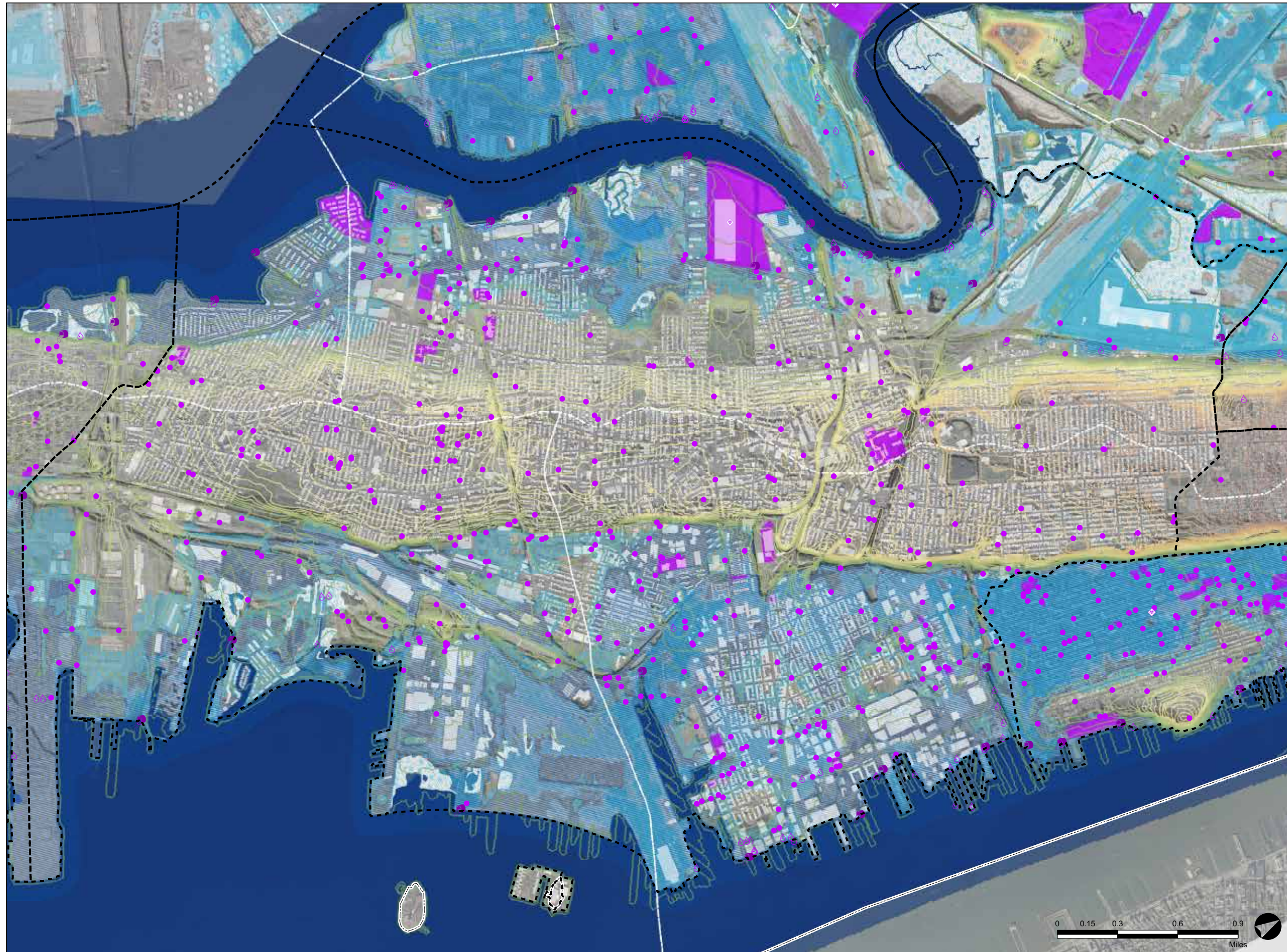


November 2016

This map was developed using NJDEP and County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX

MAP 3



HYDROLOGICAL RISKS

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

- Hot Spots
- Jurisdictional Boundaries**
- Municipal Border
- State Border
- Water Features**
- Wetlands
- Subwatersheds
- Lakes & Ponds
- FEMA Flood Zones**
- 100-Year FEMA flood zone
- 500-Year FEMA flood zone
- Sea Level (1ft increments)**
- +6ft Sea Level Rise
- * Projected for 2050
- * Projected for 2070
- Mean Sea Level
- * Source: IPCC, in more detail see Climate Risk Information 2013.
- Pollution**
- Ground Water Contamination
- Contaminated Site
- Superfund Status - Final
- Superfund Status - Proposed
- Combined Sewer Overflow
- Surface Water Discharge
- Topographical contours (5ft increments)**
- Max Elevation : 260.0 ft
- Min Elevation : -5.0 ft

This map was developed using NJDEP and County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



December 2016

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







MAP 4







SOCIAL VULNERABILITY












JERSEY CITY

HUDSON COUNTY
NEW JERSEY

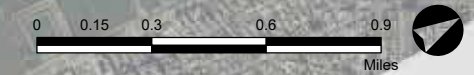
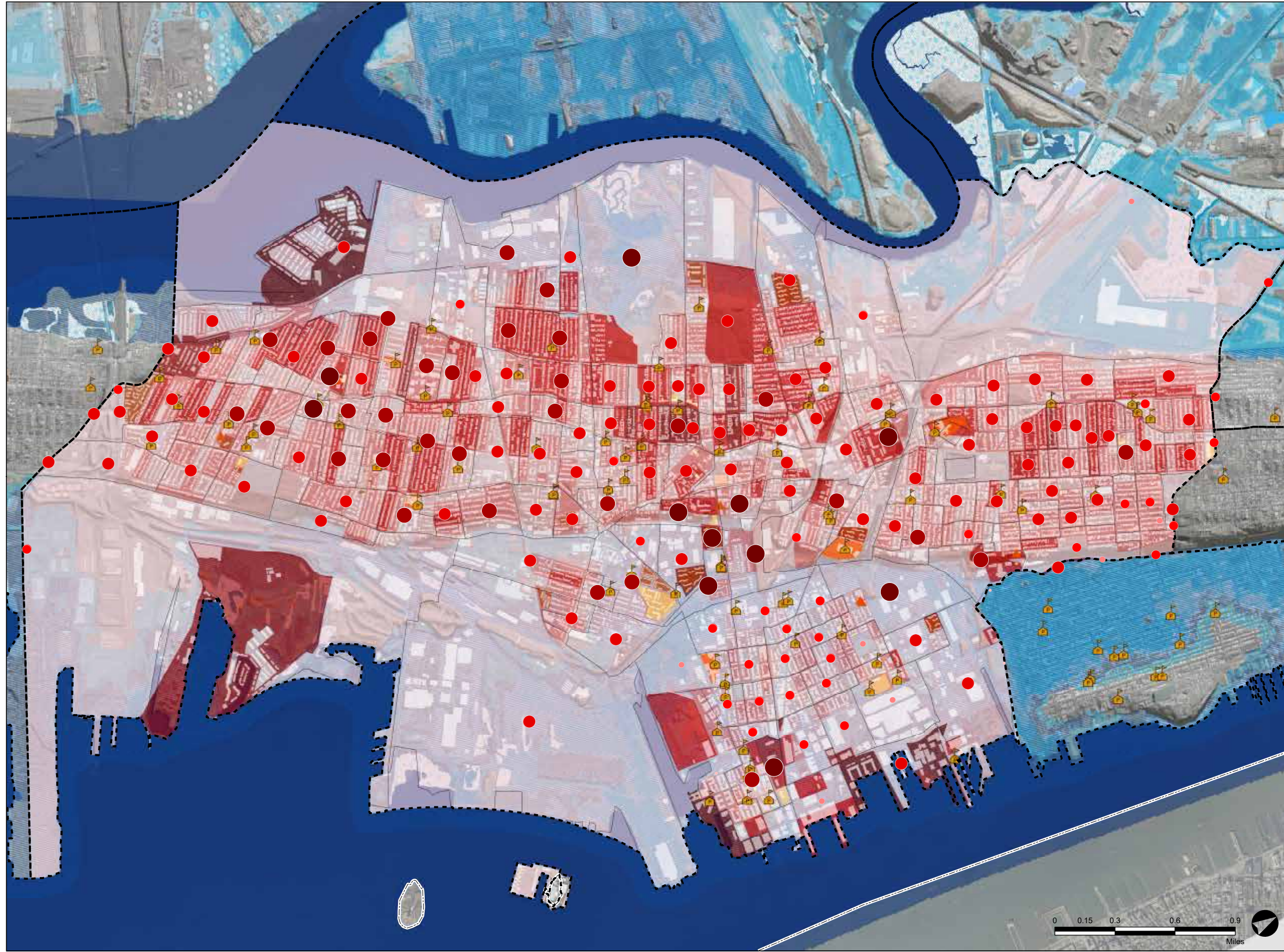
LEGEND

-  Hot Spots
- Jurisdictional Boundaries**
-  Municipal Border
-  State Border
- Water Features**
-  Wetlands
-  Subwatersheds
-  Lakes & Ponds
- FEMA Flood Zones**
-  100-Year FEMA flood zone
-  500-Year FEMA flood zone
- Sea Level (1ft increments)**
-  +6ft Sea Level Rise
- * Projected to 2030
- * Projected to 2050
- Mean Sea Level

- Social Vulnerability Score (NOAA)**
-  < -2.5 Std. Dev.
-  -2.5 - -1.5 Std. Dev.
-  -1.5 - -0.50 Std. Dev.
-  -0.50 - 0.50 Std. Dev.
-  0.50 - 1.5 Std. Dev.
-  > 1.5 Std. Dev.

- Population by Block**
-  0 - 80 People
-  81 - 217 People
-  218 - 385 People
-  386 - 694 People
-  695 - 1449 People
-  1450 - 2876 People
-  Education Facilities
-  Nursing Home
-  Emergency Shelters
-  Senior Housing
-  Public Housing

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MAP 5

CRITICAL INFRASTRUCTURE

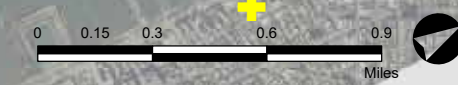
JERSEY CITY

HUDSON COUNTY
NEW JERSEY

- LEGEND**
- Hot Spots
 - Jurisdictional Boundaries**
 - Municipal Border
 - State Border
 - Water Features**
 - Wetlands
 - Subwatersheds
 - Lakes & Ponds
 - FEMA Flood Zones**
 - 100-Year FEMA flood zone
 - 500-Year FEMA flood zone
 - Sea Level (ft increments)**
 - +6ft Sea Level Rise
 - * Projected to 2050
 - * Projected to 2030
 - Mean Sea Level
 - * Source: NCEM, for more details see Climate Risk Information 2013.
 - Critical Infrastructure**
 - Evacuation Route
 - Interstate
 - US Highway
 - NJ State Route
 - County Road
 - Local Road
 - Bus Routes
 - Hudson Passenger Rail
 - Amtrak
 - New Jersey Transit
 - Freight Rail
 - Hudson Bergen Light Rail
 - Morris & Essex Line
 - NEC / NJCL / M&E / Main / Bergen
 - PATH
 - + Industrial Facility
 - + Electric Transmission Lines
 - + Gas Pipelines
 - + Power Plant
 - + Electric Substation
 - + Hospitals
 - + Police Station
 - + Municipal Offices
 - + Fire Department
 - + Emergency Medical Service
 - + Transportation, Communication or Utility
 - + Railroad
 - + Major Road
 - + Mixed Transportation Overlap



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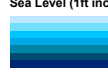

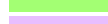

MAP 6

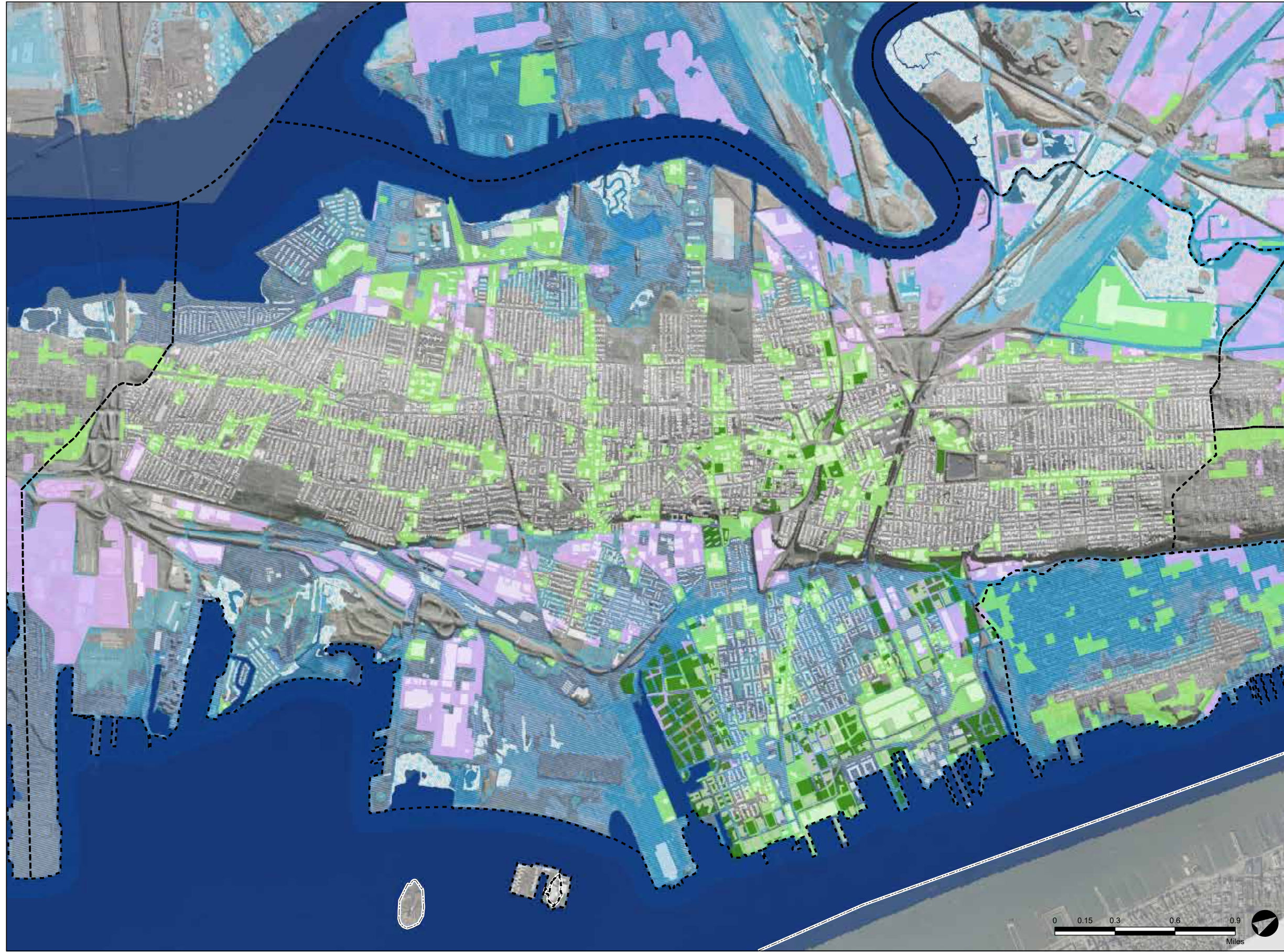
ECONOMIC DEVELOPMENT VULNERABILITY

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

-  Hot Spots
- Jurisdictional Boundaries**
-  Municipal Border
-  State Border
- Water Features**
-  Wetlands
-  Subwatersheds
-  Lakes & Ponds
- FEMA Flood Zones**
-  100-Year FEMA flood zone
-  500-Year FEMA flood zone
- Sea Level (1ft increments)**
-  +0ft Sea Level Rise
* Projected for 2030
* Projected for 2050
Mean Sea Level
* Source: NCEM for more details see Climate Risk Information 2013.
- Land Use**
-  Approved, Built and Ongoing Development
-  Commercial / Service
-  Industrial



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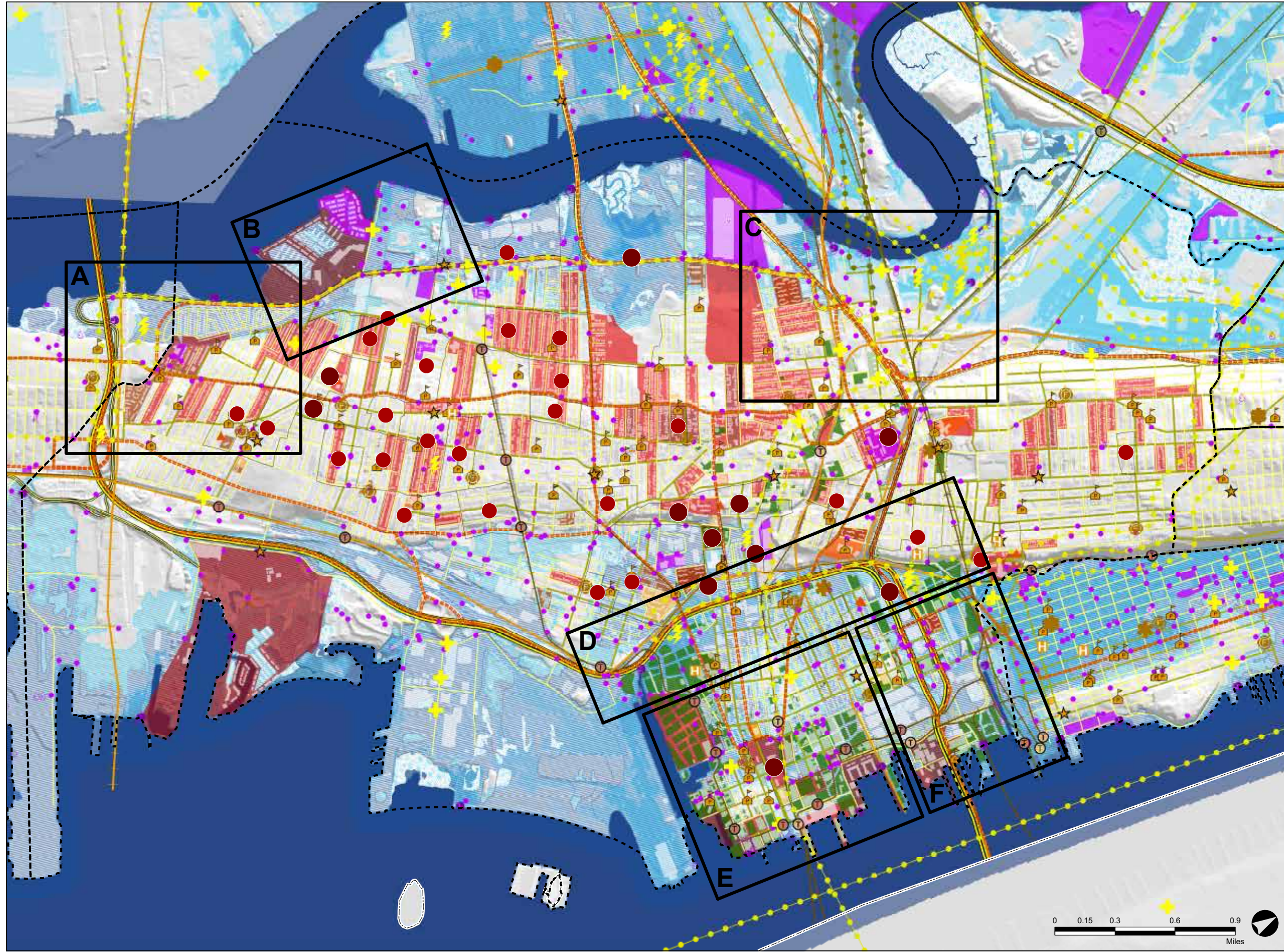
December 2016

MAP 7

COMBINED VULNERABILITIES SUMMARY

JERSEY CITY

HUDSON COUNTY
NEW JERSEY



LEGEND

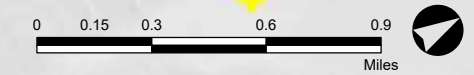
- Hot Spots**
 - Hot Spots
- Jurisdictional Boundaries**
 - Municipal Border
 - State Border
- Water Features**
 - Wetlands
 - Subwatersheds
 - Lakes & Ponds
- FEMA Flood Zones**
 - 100-Year FEMA flood zone
 - 500-Year FEMA flood zone
- Sea Level (1ft Increments)**
 - +0.8 Sea Level Rise
 - +1.5 Sea Level Rise
 - +2.5 Sea Level Rise
 - +3.5 Sea Level Rise
 - +4.5 Sea Level Rise
 - +5.5 Sea Level Rise
 - +6.5 Sea Level Rise
 - +7.5 Sea Level Rise
 - +8.5 Sea Level Rise
 - +9.5 Sea Level Rise
 - +10.5 Sea Level Rise
 - +11.5 Sea Level Rise
 - +12.5 Sea Level Rise
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 - +72.5 Sea Level Rise
 - +73.5 Sea Level Rise
 - +74.5 Sea Level Rise
 - +75.5 Sea Level Rise
 - +76.5 Sea Level Rise
 - +77.5 Sea Level Rise
 - +78.5 Sea Level Rise
 - +79.5 Sea Level Rise
 - +80.5 Sea Level Rise
 - +81.5 Sea Level Rise
 - +82.5 Sea Level Rise
 - +83.5 Sea Level Rise
 - +84.5 Sea Level Rise
 - +85.5 Sea Level Rise
 - +86.5 Sea Level Rise
 - +87.5 Sea Level Rise
 - +88.5 Sea Level Rise
 - +89.5 Sea Level Rise
 - +90.5 Sea Level Rise
 - +91.5 Sea Level Rise
 - +92.5 Sea Level Rise
 - +93.5 Sea Level Rise
 - +94.5 Sea Level Rise
 - +95.5 Sea Level Rise
 - +96.5 Sea Level Rise
 - +97.5 Sea Level Rise
 - +98.5 Sea Level Rise
 - +99.5 Sea Level Rise
 - +100.5 Sea Level Rise
- Pollution**
 - Ground Water Contamination
 - Contaminated Site
 - Superfund Status - Final
 - Superfund Status - Proposed
 - Combined Sewer Overflow
 - Surface Water Discharge
- Social Vulnerability**
 - Social Vulnerability Score (NOAA)
 - < -2.5 Std. Dev.
 - 2.5 - -1.5 Std. Dev.
 - 1.5 - -0.50 Std. Dev.
 - 0.50 - 0.50 Std. Dev.
 - 0.50 - 1.5 Std. Dev.
 - > 1.5 Std. Dev.
- Population by Block**
 - 0 - 80 People
 - 81 - 217 People
 - 218 - 385 People
 - 386 - 642 People
 - 643 - 1449 People
 - 1450 - 2876 People
- Facilities**
 - Education Facilities
 - Nursing Home
 - Emergency Shelters
 - Senior Housing
 - Public Housing
- Critical Infrastructure**
 - Evacuation Route
 - Interstate
 - US Highway
 - NJ State Route
 - County Road
 - Local Road
 - Bus Routes
 - Hudson Passenger Rail
 - Amtrak
 - New Jersey Transit
 - Fright Rail
 - Hudson Bergen Light Rail
 - Morris & Essex Line
 - NEC / NJCL / M&E / Main / Bergen
 - PRTV
 - Industrial Facility
 - Electric Transmission Lines
 - Gas Pipelines
 - Power Plant
 - Electric Substation
 - Hospitals
 - Police Station
 - Municipal Offices
 - Fire Department
 - Emergency Medical Service
- Land Use**
 - Ongoing and Recent Development (Approved, Built and Ongoing)
 - Transportation, Communication or Utility
 - Railroad
 - Major Road
 - Mixed Transportation Overlap

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MAP 8

PRIORITY AREAS A+B

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

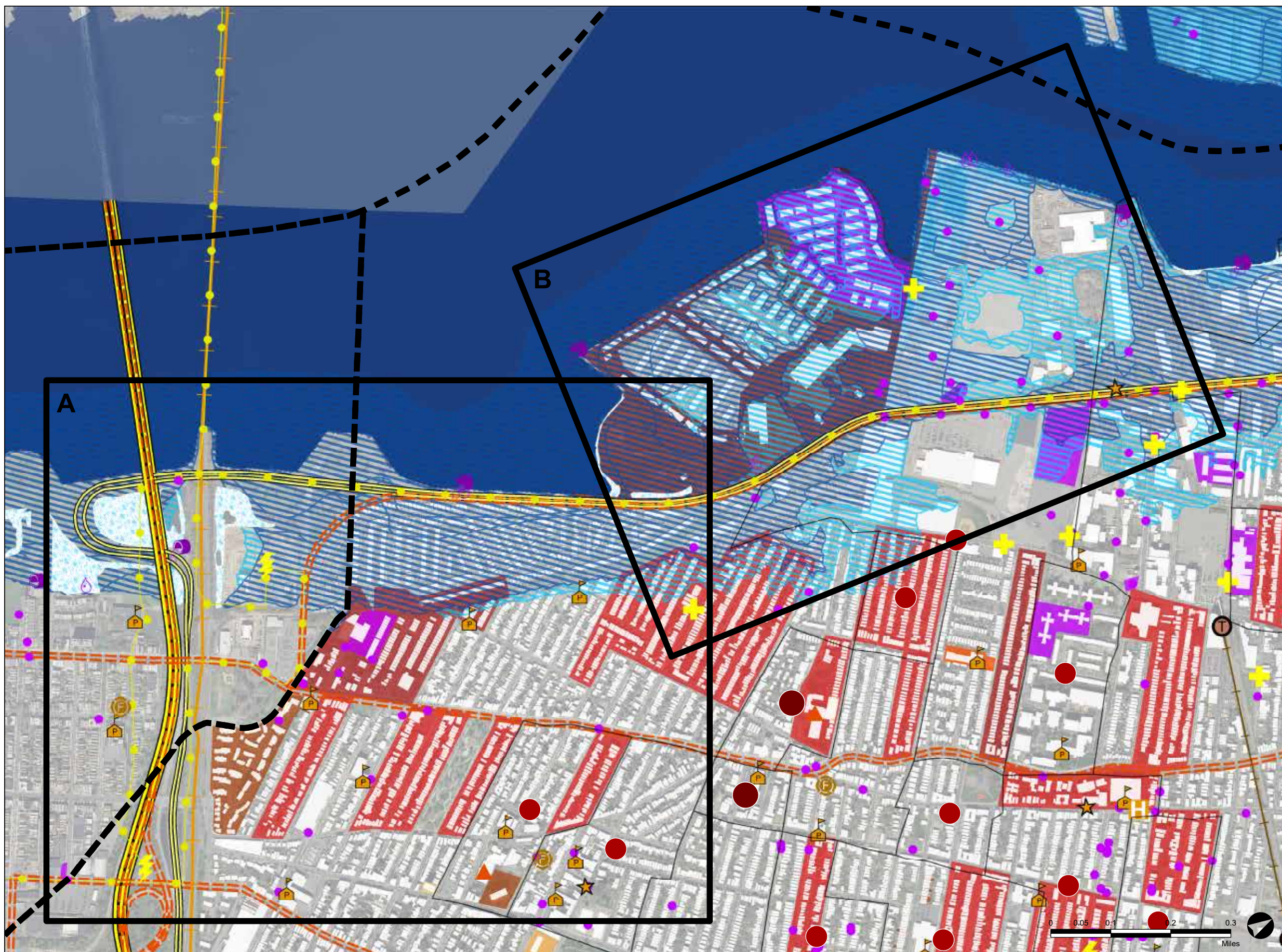
- Jurisdictional Boundaries
- Municipal Border
- State Border
- Water Features**
 - Wetlands
 - Subwatersheds
 - Lakes & Ponds
- FEMA Flood Zones**
 - 100-Year FEMA flood zone
 - 500-Year FEMA flood zone
- Sea Level (ft increments)**
 - +6ft Sea Level Rise
 - Mean Sea Level
- Pollution**
 - Ground Water Contamination
 - Contaminated Site
 - Superfund Status - Final
 - Superfund Status - Proposed
 - Combined Sewer Overflow
 - Surface Water Discharge
- Social Vulnerability Score (NOAA)**
 - < -2.5 Std. Dev.
 - 2.5 - -1.5 Std. Dev.
 - 1.5 - -0.50 Std. Dev.
 - 0.50 - 0.50 Std. Dev.
 - 0.50 - 1.5 Std. Dev.
 - > 1.5 Std. Dev.
- Population by Block**
 - 0 - 80 People
 - 81 - 217 People
 - 218 - 385 People
 - 386 - 694 People
 - 695 - 1449 People
 - 1450 - 2676 People
- Land Use**
 - Ongoing and Recent Development (Approved, Built and Ongoing)
- Critical Infrastructure**
 - Evacuation Route
 - Interstate
 - US Highway
 - NJ State Route
 - County Road
 - Local Road
 - Bus Routes
 - Hudson Passenger Rail
 - Amtrak
 - New Jersey Transit
 - Flight Rail
 - Hudson Bergen Light Rail
 - Mon & Essex Line
 - NEC / NJCL / M&E / Main / Bergen
 - PATH
 - Industrial Facility
 - Electric Transmission Lines
 - Gas Pipelines
 - Power Plant
 - Electric Substation
 - Hospitals
 - Police Station
 - Municipal Offices
 - Fire Department
 - Emergency Medical Service

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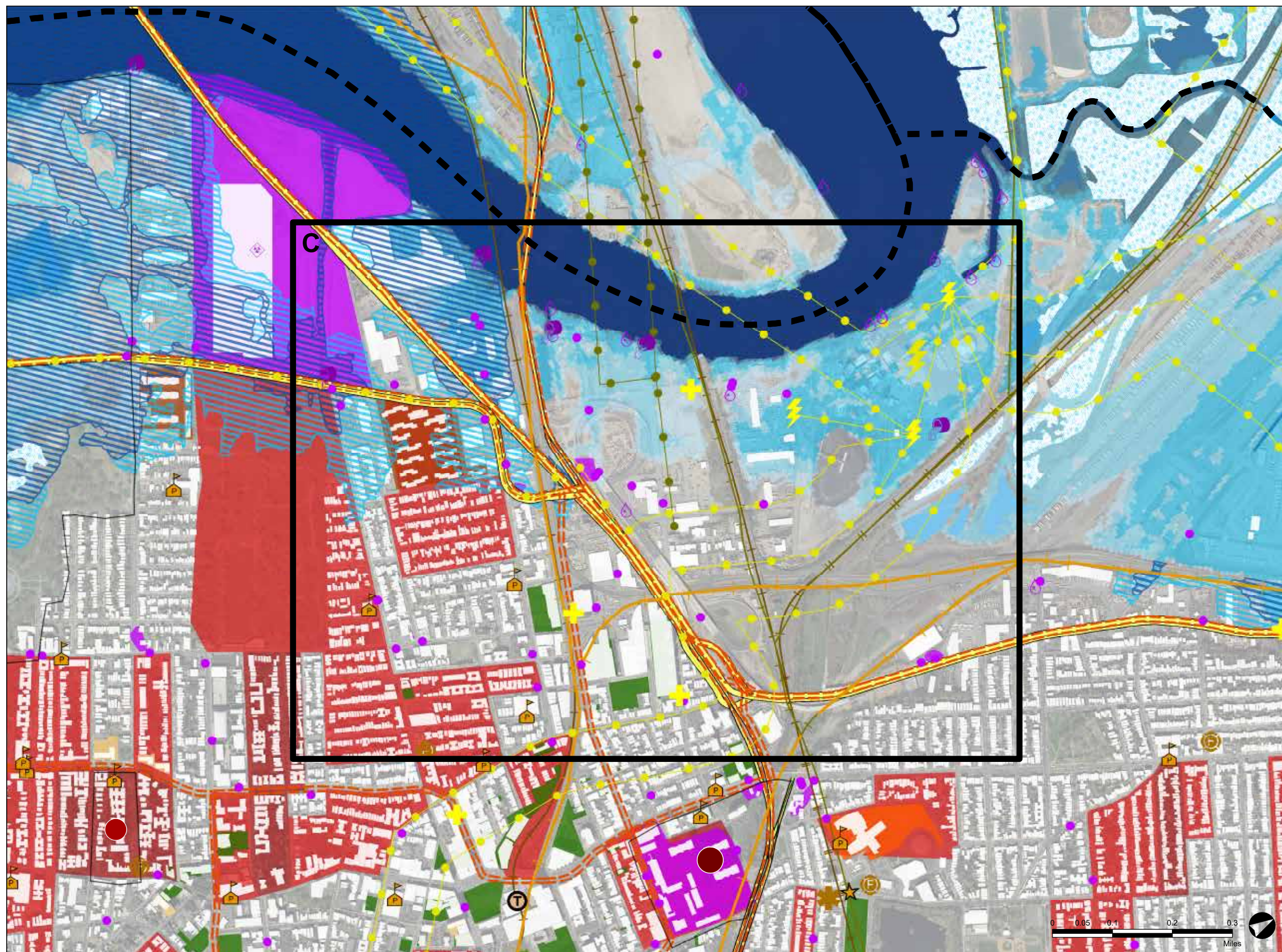


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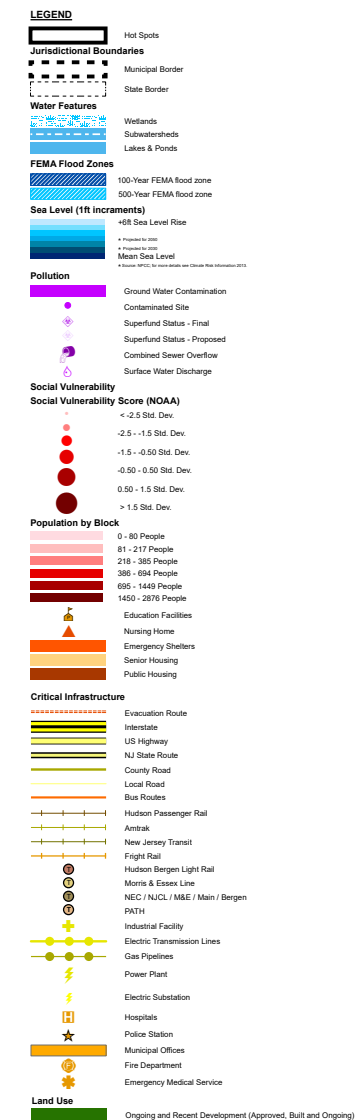
MAP 9



PRIORITY AREA C

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

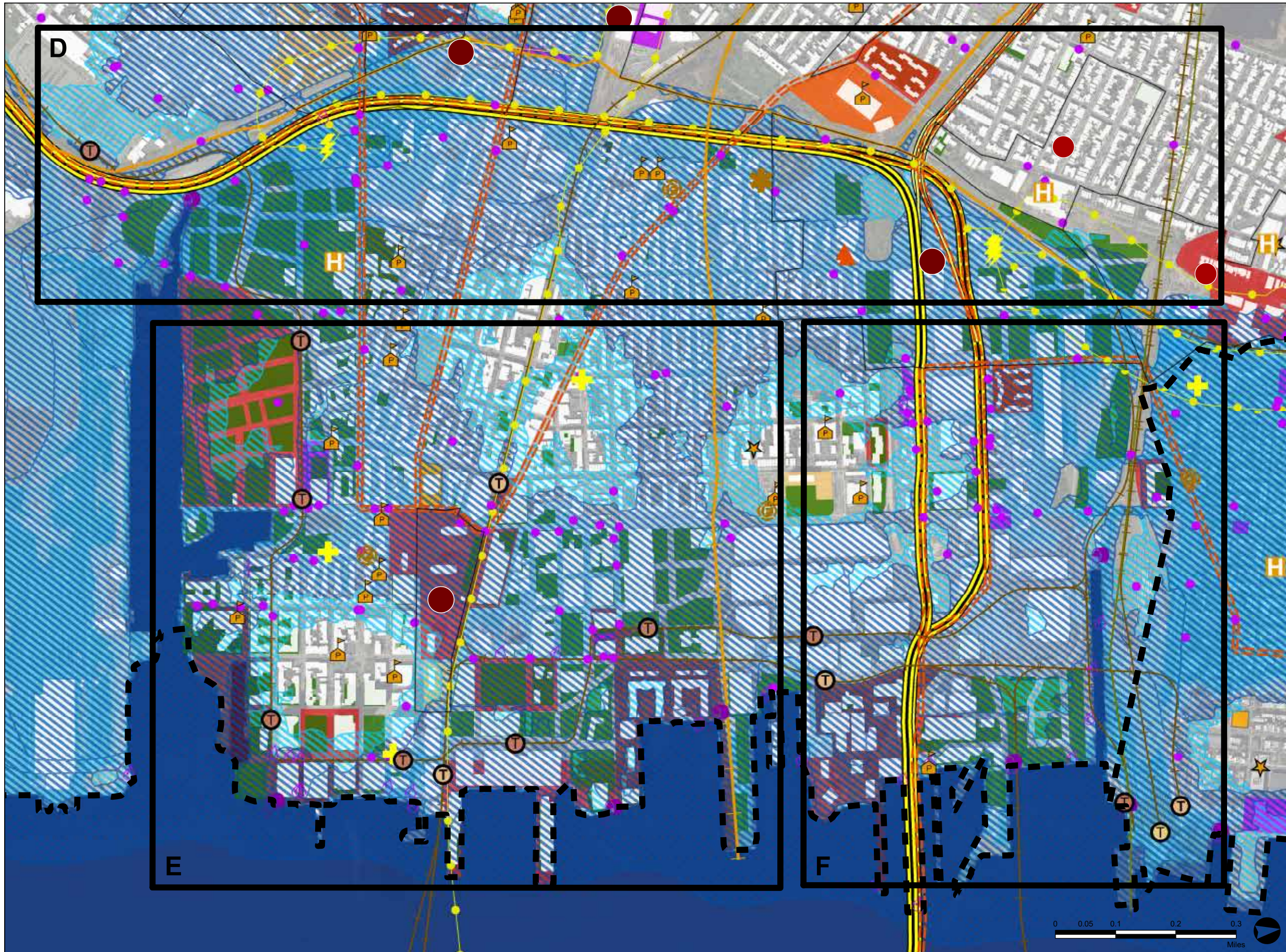


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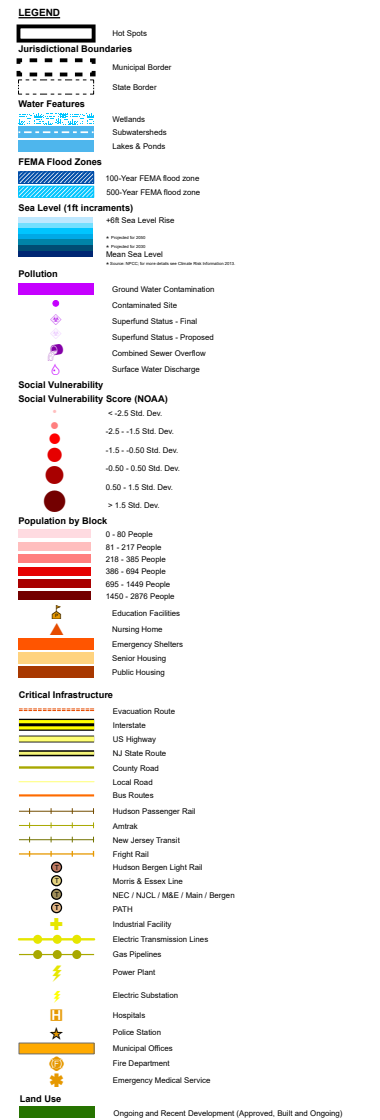
MAP 10



PRIORITY AREAS D+E+F

JERSEY CITY

HUDSON COUNTY
NEW JERSEY



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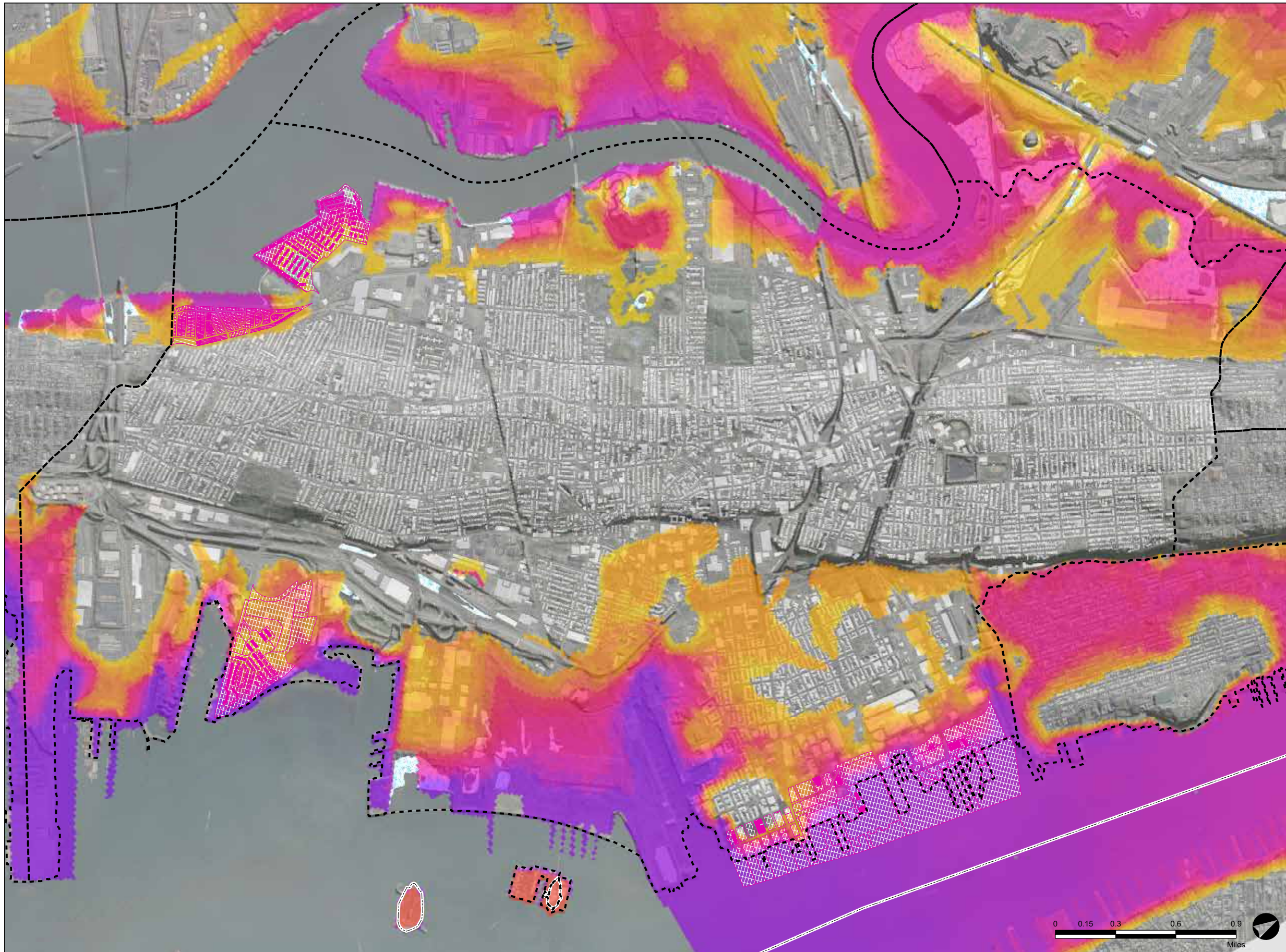
Resiliency Masterplan

-

VISUALS APPENDIX

01.04.17

MAP 1



HURRICANE SANDY FLOODING

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

- Hot Spots
- Jurisdictional Boundaries**
 - Municipal Border
 - State Border
- Water Features**
 - Wetlands
- Hurricane Sandy Inundation Elevations (in feet)**
 - Max Inundation Elevation : 14.579 ft
 - Min Inundation Elevation : -2.3 ft
- Hurricane Sandy & Irene Evacuation Zones**
 - All Residents
 - Residents on Ground Level or First Floor

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MAP 2



WATERSHED DISTRICTS

JERSEY CITY
HUDSON COUNTY
NEW JERSEY

LEGEND

Jurisdictional Boundaries

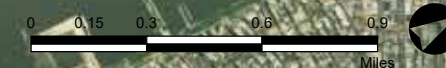
- State Border
- Municipal Border

Water

- Wetlands
- Lower Hudson River Streams
- Lakes & Ponds
- Other Water Bodies
- 100-Year FEMA flood zone
- 500-Year FEMA flood zone
- Mean Sea Level
- +1 ft Sea Level Rise
- +2 ft Sea Level Rise
- +3 ft Sea Level Rise
- +4 ft Sea Level Rise
- +5 ft Sea Level Rise
- +6 ft Sea Level Rise

Hydrological Analysis

- Watershed Districts
- Sea Level Rise Sub-basins



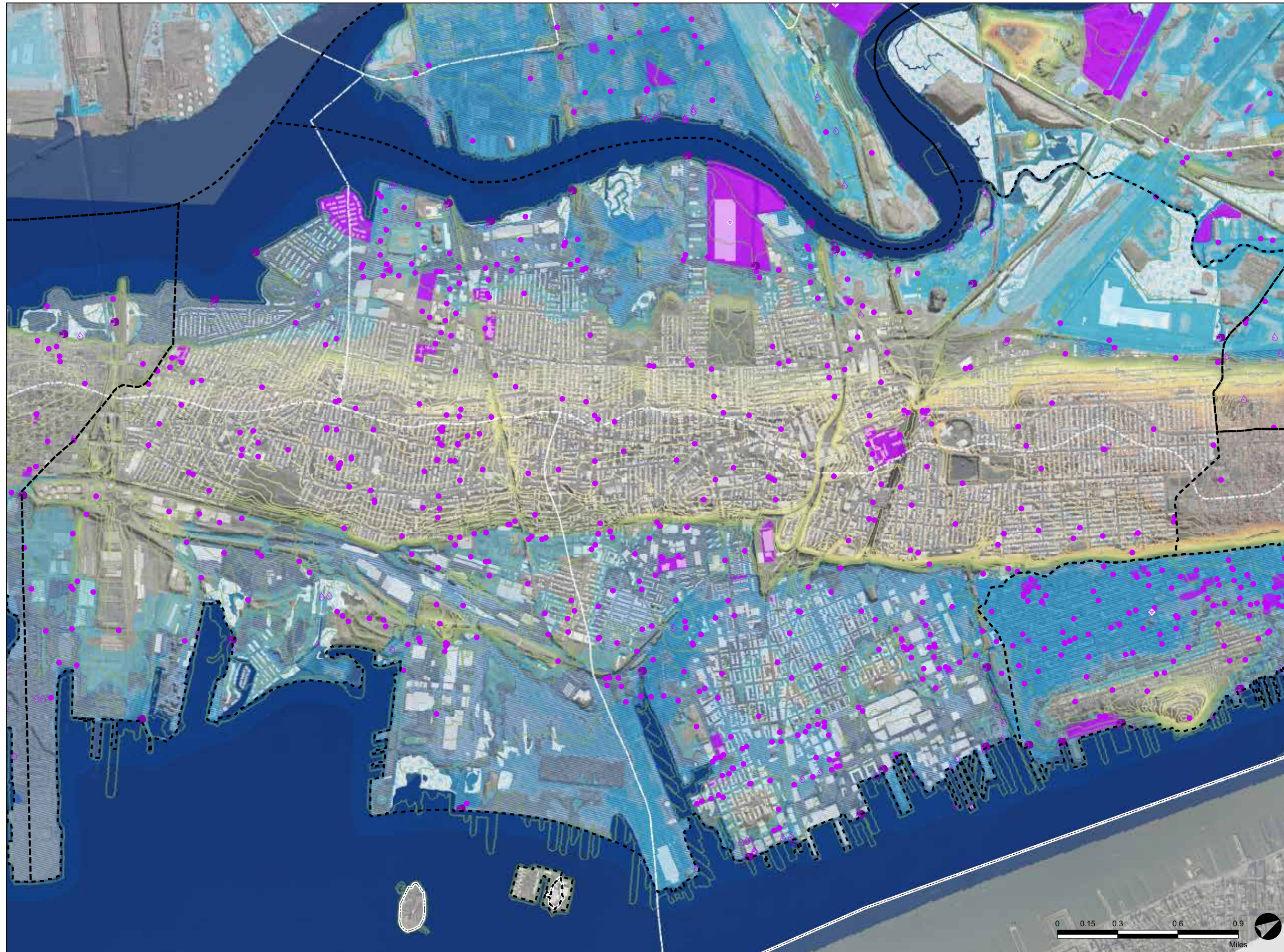
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX



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MAP 3



HYDROLOGICAL RISKS

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

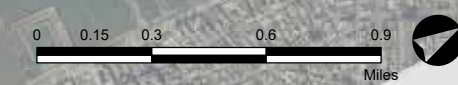
- Hot Spots
- Jurisdictional Boundaries**
- Municipal Border
- State Border
- Water Features**
- Wetlands
- Subwatersheds
- Lakes & Ponds
- FEMA Flood Zones**
- 100-Year FEMA flood zone
- 500-Year FEMA flood zone
- Sea Level (1ft increments)**
- +6ft Sea Level Rise
- * Projected for 2050
- * Projected for 2070
- Mean Sea Level
- * Source: IPCC, in more detail see Climate Risk Information 2013.
- Pollution**
- Ground Water Contamination
- Contaminated Site
- Superfund Status - Final
- Superfund Status - Proposed
- Combined Sewer Overflow
- Surface Water Discharge
- Topographical contours (5ft increments)**
- Max Elevation : 260.0 ft
- Min Elevation : -5.0 ft

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








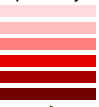





MAP 4

SOCIAL VULNERABILITY

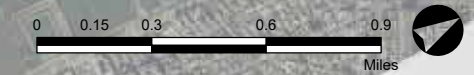
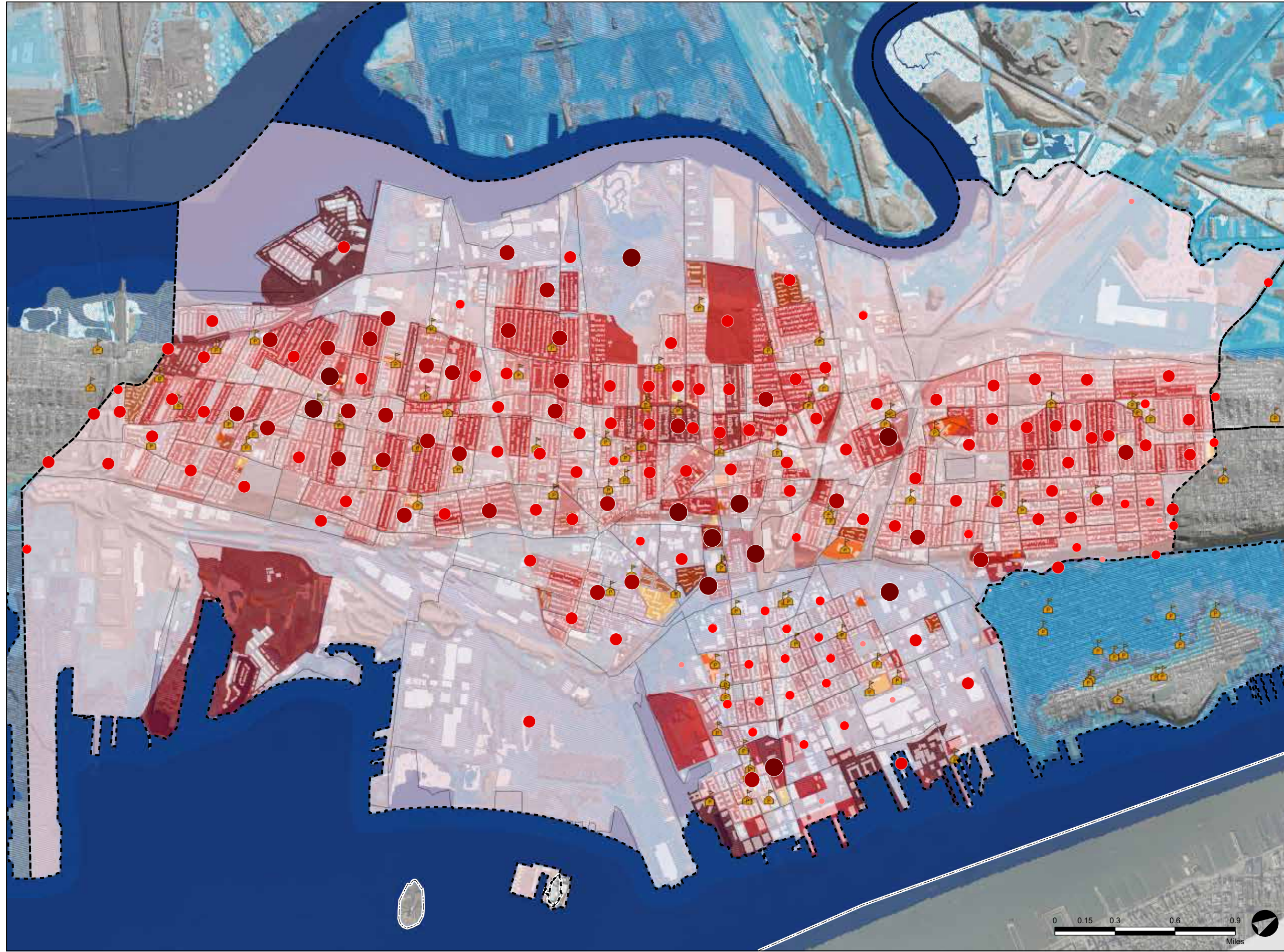
JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

-  Hot Spots
- Jurisdictional Boundaries**
-  Municipal Border
-  State Border
- Water Features**
-  Wetlands
-  Subwatersheds
-  Lakes & Ponds
- FEMA Flood Zones**
-  100-Year FEMA flood zone
-  500-Year FEMA flood zone
- Sea Level (1ft increments)**
-  +6ft Sea Level Rise
- * Projected to 2030
- * Projected to 2050
- Mean Sea Level
- * Source: SLOIC, for more details see Climate Risk Information 2013.
- Social Vulnerability Score (NOAA)**
-  Social Vulnerability Score (NOAA)
- < -2.5 Std. Dev.
- 2.5 - -1.5 Std. Dev.
- 1.5 - -0.50 Std. Dev.
- 0.50 - 0.50 Std. Dev.
- 0.50 - 1.5 Std. Dev.
- > 1.5 Std. Dev.
- Population by Block**
-  Population by Block
- 0 - 80 People
- 81 - 217 People
- 218 - 385 People
- 386 - 694 People
- 695 - 1449 People
- 1450 - 2876 People
-  Education Facilities
-  Nursing Home
-  Emergency Shelters
-  Senior Housing
-  Public Housing

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








































MAP 5

CRITICAL INFRASTRUCTURE

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

-  Hot Spots
- Jurisdictional Boundaries**
-  Municipal Border
-  State Border
- Water Features**
-  Wetlands
-  Subwatersheds
-  Lakes & Ponds
- FEMA Flood Zones**
-  100-Year FEMA flood zone
-  500-Year FEMA flood zone
- Sea Level (ft increments)**
-  +6ft Sea Level Rise
-  * Projected to 2050
-  * Projected to 2030
-  Mean Sea Level
- * Source: NCEM, for more details see Climate Risk Information 2013.
- Critical Infrastructure**
-  Evacuation Route
-  Interstate
-  US Highway
-  NJ State Route
-  County Road
-  Local Road
-  Bus Routes
-  Hudson Passenger Rail
-  Amtrak
-  New Jersey Transit
-  Freight Rail
-  Hudson Bergen Light Rail
-  Morris & Essex Line
-  NEC / NJCL / M&E / Main / Bergen
-  PATH
-  Industrial Facility
-  Electric Transmission Lines
-  Gas Pipelines
-  Power Plant
-  Electric Substation
-  Hospitals
-  Police Station
-  Municipal Offices
-  Fire Department
-  Emergency Medical Service
-  Transportation, Communication or Utility
-  Railroad
-  Major Road
-  Mixed Transportation Overlap

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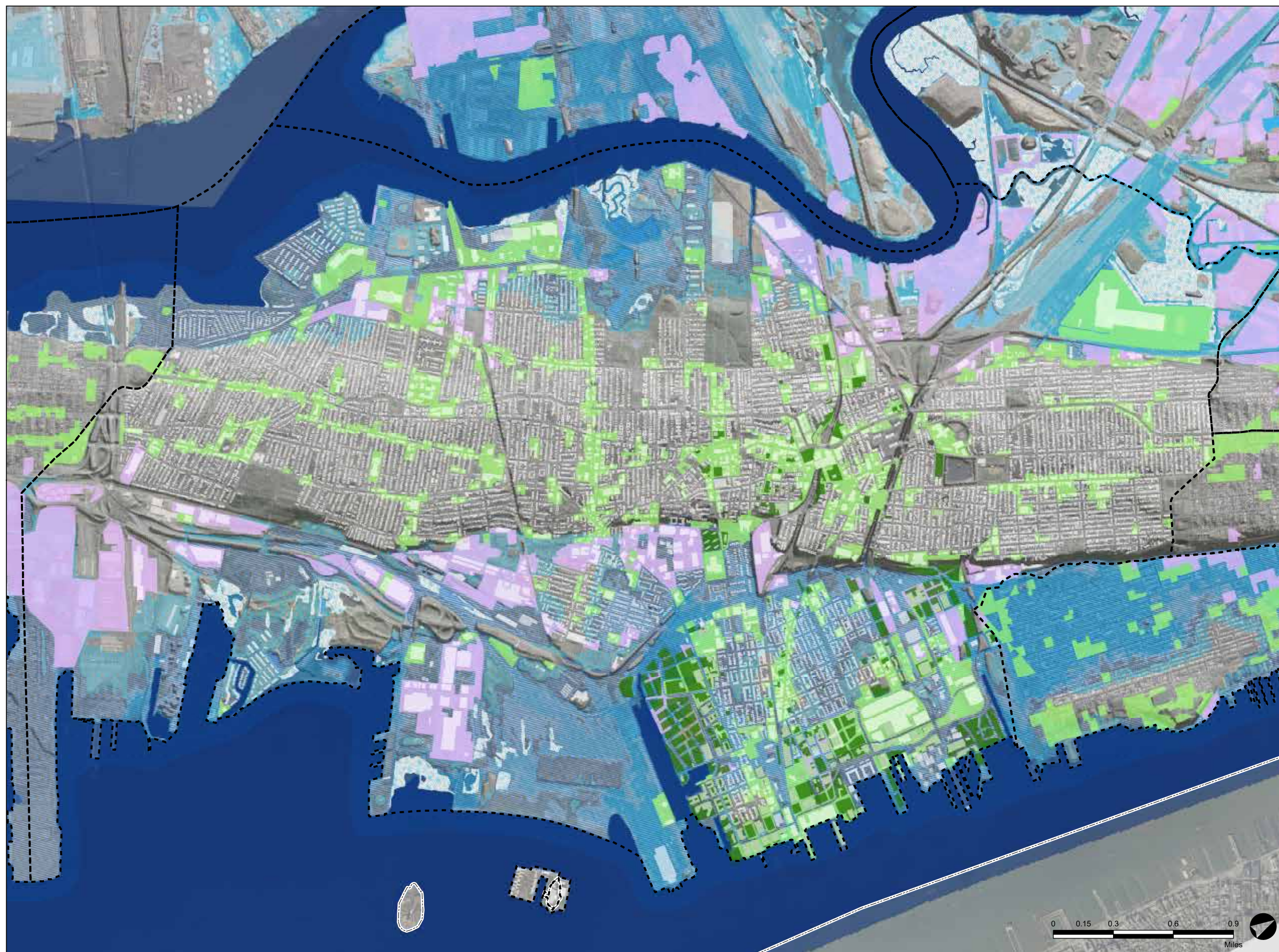


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MAP 6



ECONOMIC DEVELOPMENT VULNERABILITY

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

- Hot Spots
- Jurisdictional Boundaries**
 - Municipal Border
 - State Border
- Water Features**
 - Wetlands
 - Subwatersheds
 - Lakes & Ponds
- FEMA Flood Zones**
 - 100-Year FEMA flood zone
 - 500-Year FEMA flood zone
- Sea Level (1ft increments)**
 - +0ft Sea Level Rise
 - * Projected for 2030
 - * Projected for 2050
 - Mean Sea Level
 - * Source: NCEM for more details see Climate Risk Information 2013.
- Land Use**
 - Approved, Built and Ongoing Development
 - Commercial / Service
 - Industrial

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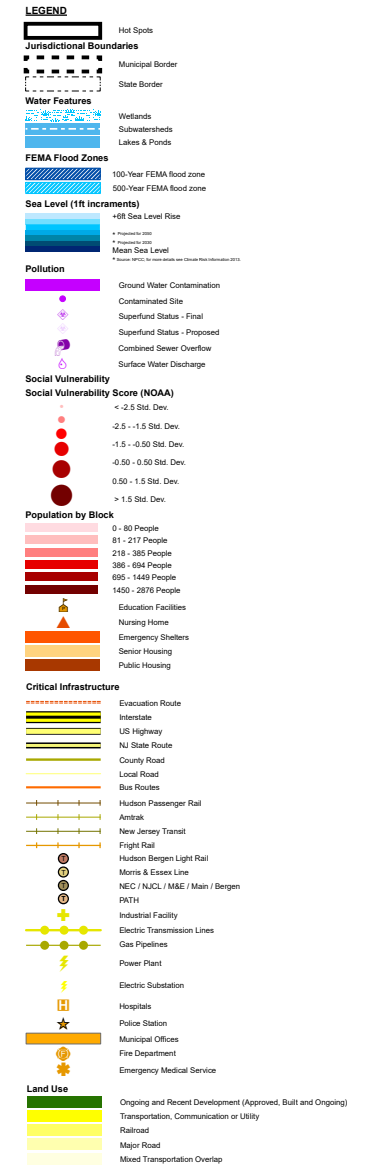
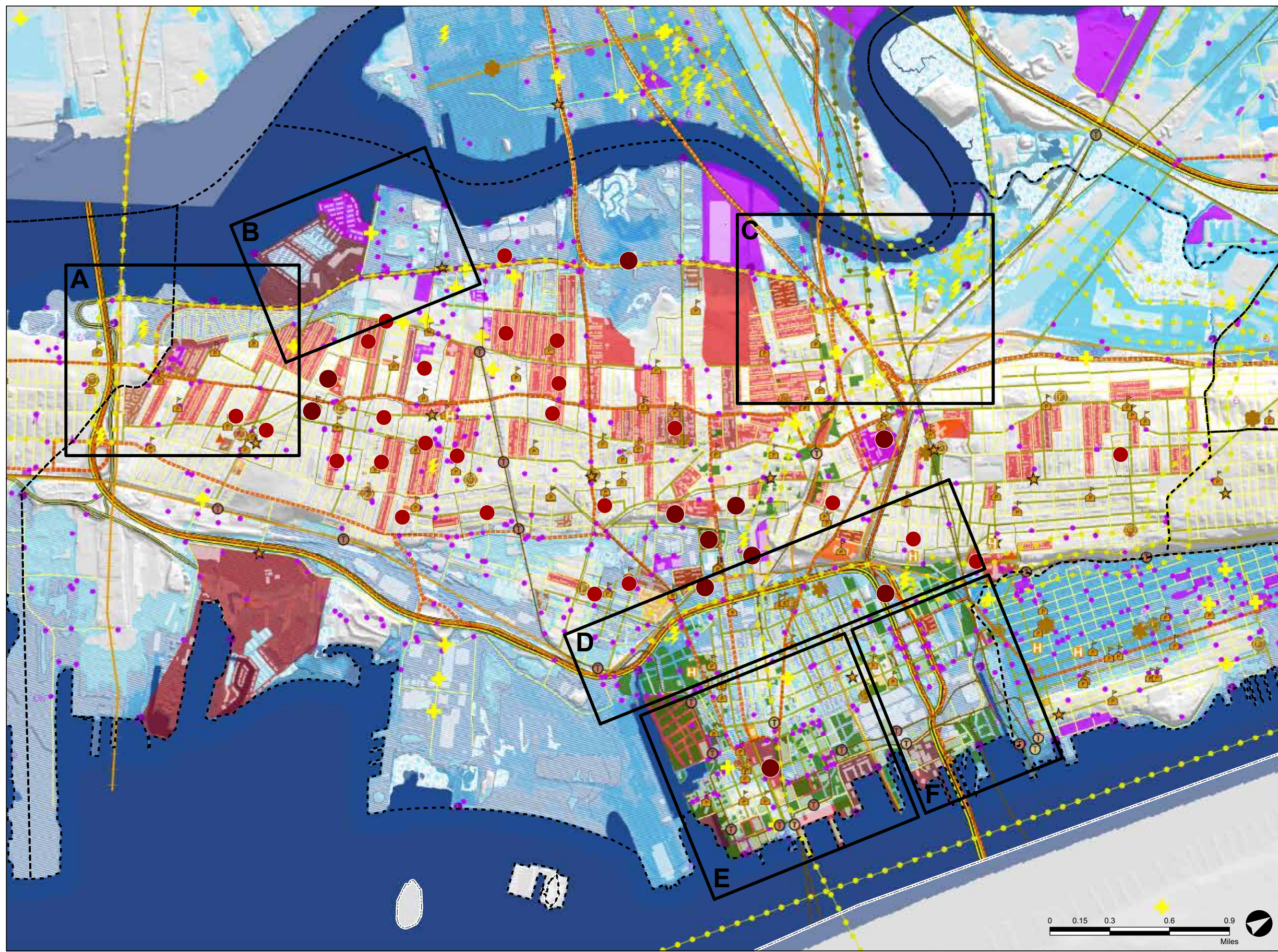
MAP 7

COMBINED VULNERABILITIES SUMMARY

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

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This map was developed using NJDEP and County GIS digital data, but this secondary product has not been verified by NJDEP and is not state-authorized.



December 2016

MAP 8

PRIORITY AREAS A+B

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

LEGEND

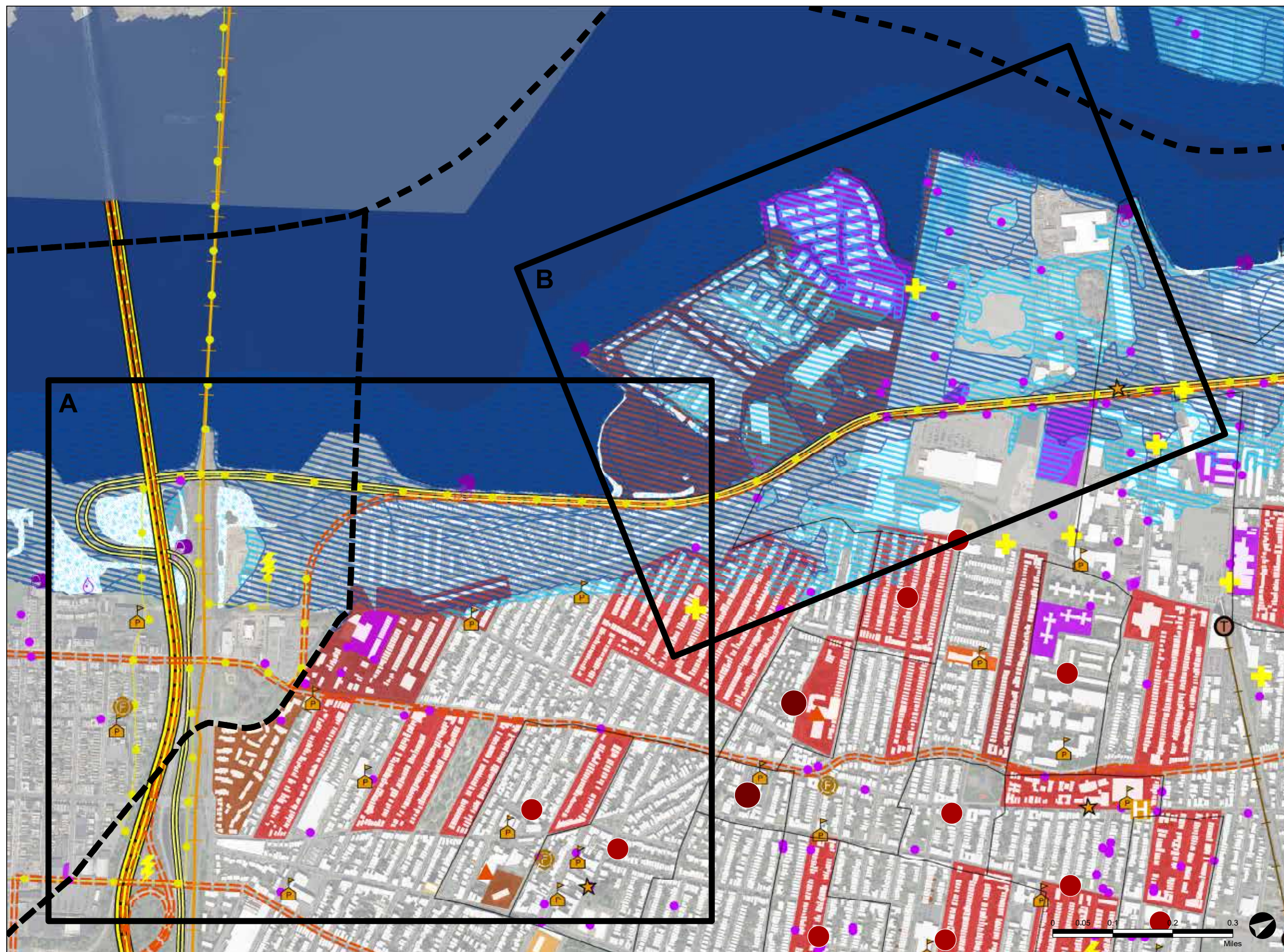
- Jurisdictional Boundaries
- Municipal Border
- State Border
- Water Features**
 - Wetlands
 - Subwatersheds
 - Lakes & Ponds
- FEMA Flood Zones**
 - 100-Year FEMA flood zone
 - 500-Year FEMA flood zone
- Sea Level (ft increments)**
 - +6ft Sea Level Rise
 - Mean Sea Level
- Pollution**
 - Ground Water Contamination
 - Contaminated Site
 - Superfund Status - Final
 - Superfund Status - Proposed
 - Combined Sewer Overflow
 - Surface Water Discharge
- Social Vulnerability Score (NOAA)**
 - < -2.5 Std. Dev.
 - 2.5 - -1.5 Std. Dev.
 - 1.5 - -0.50 Std. Dev.
 - 0.50 - 0.50 Std. Dev.
 - 0.50 - 1.5 Std. Dev.
 - > 1.5 Std. Dev.
- Population by Block**
 - 0 - 80 People
 - 81 - 217 People
 - 218 - 385 People
 - 386 - 694 People
 - 695 - 1449 People
 - 1450 - 2676 People
- Land Use**
 - Education Facilities
 - Nursing Home
 - Emergency Shelters
 - Senior Housing
 - Public Housing
- Critical Infrastructure**
 - Evacuation Route
 - Interstate
 - US Highway
 - NJ State Route
 - County Road
 - Local Road
 - Bus Routes
 - Hudson Passenger Rail
 - Amtrak
 - New Jersey Transit
 - Flight Rail
 - Hudson Bergen Light Rail
 - Mon & Essex Line
 - NEC / NJCL / M&E / Main / Bergen
 - PATH
 - Industrial Facility
 - Electric Transmission Lines
 - Gas Pipelines
 - Power Plant
 - Electric Substation
 - Hospitals
 - Police Station
 - Municipal Offices
 - Fire Department
 - Emergency Medical Service
- Land Use**
 - Ongoing and Recent Development (Approved, Built and Ongoing)

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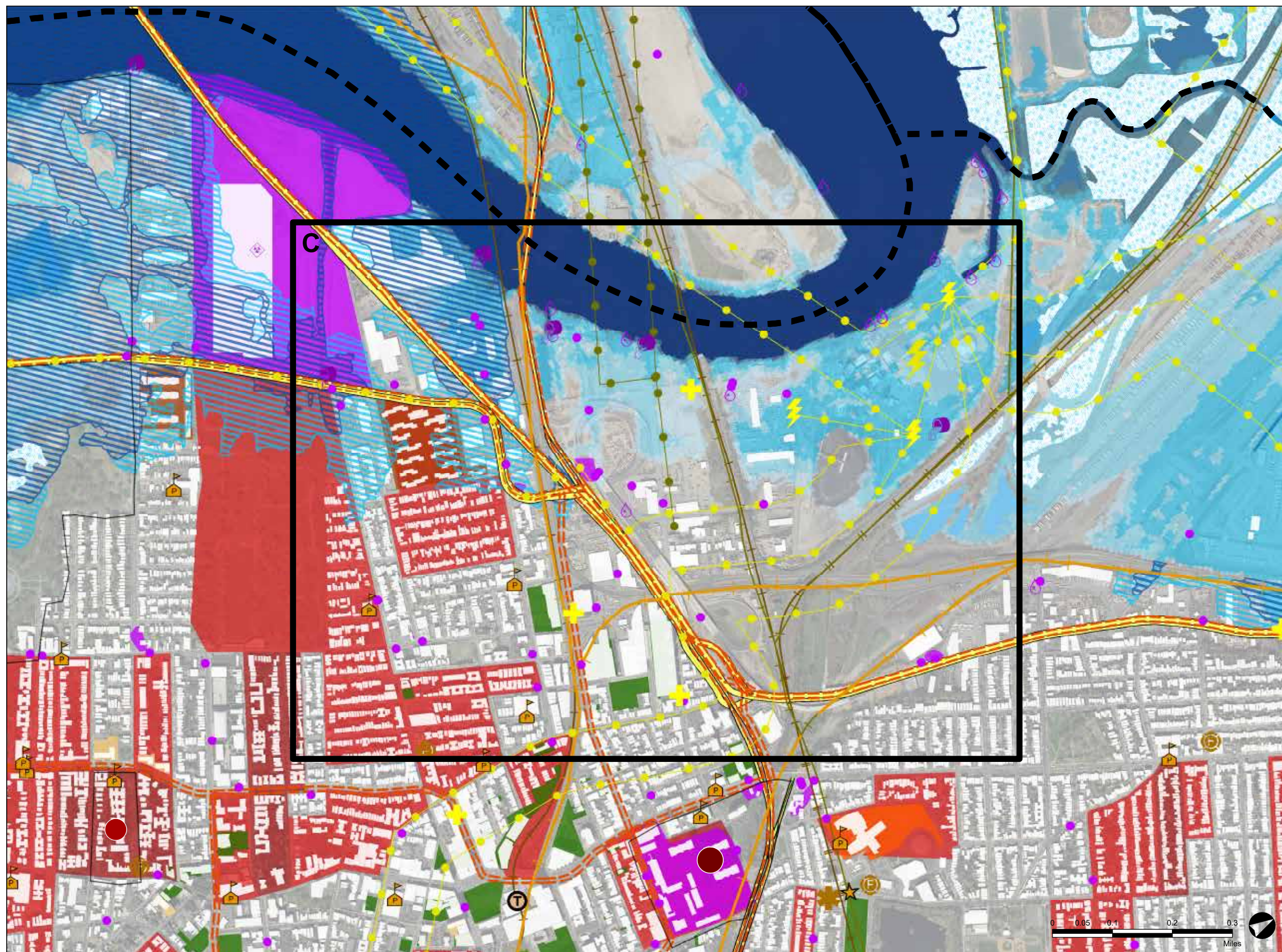


December 2016

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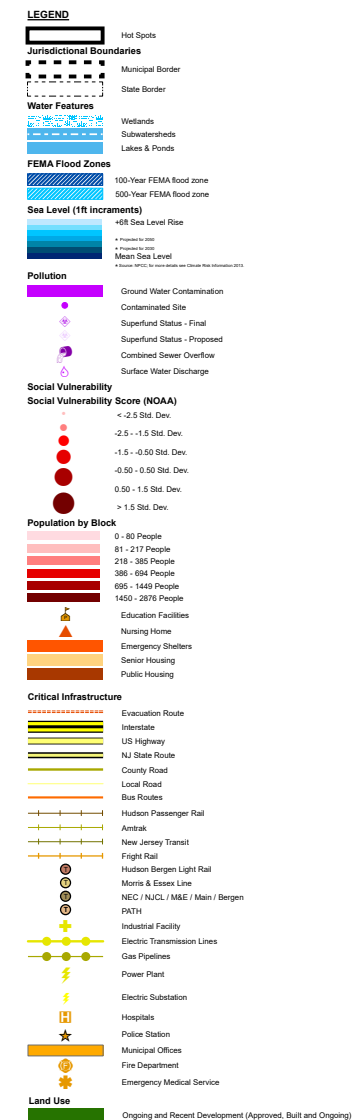
MAP 9



PRIORITY AREA C

JERSEY CITY

HUDSON COUNTY
NEW JERSEY

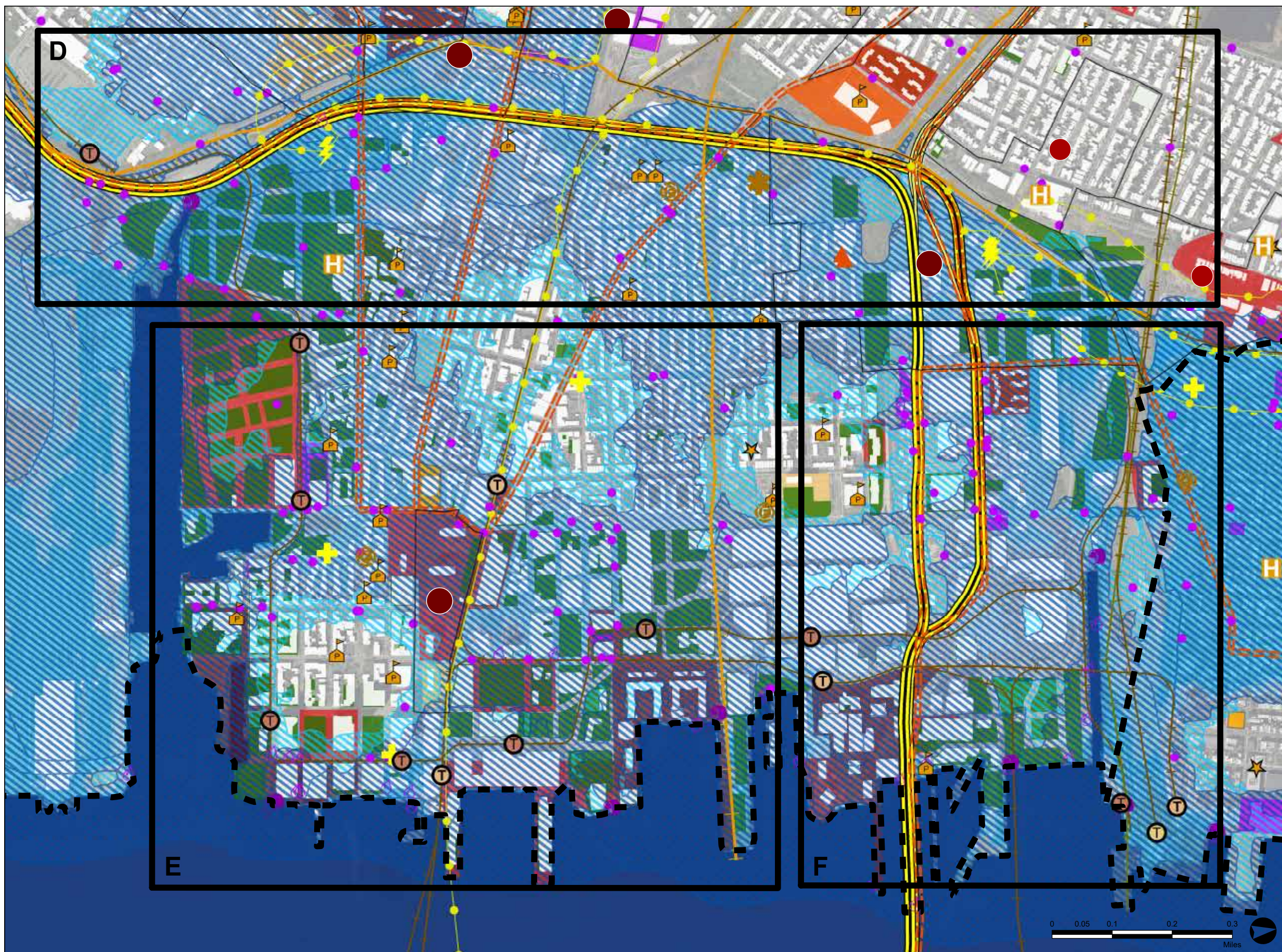


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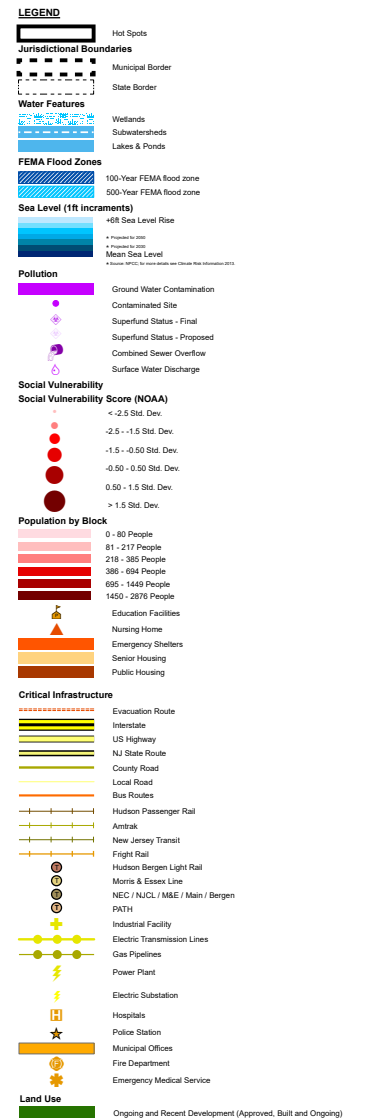
MAP 10



PRIORITY AREAS D+E+F

JERSEY CITY

HUDSON COUNTY
NEW JERSEY



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