

**RESOLUTION**  
MAYOR AND COUNCIL OF THE  
BOROUGH OF WESTWOOD

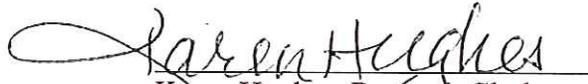
TITLE:        Approving the Flood Acquisition Plan

RESOLUTION #16-154

BE IT RESOLVED that the Mayor and Council of the Borough of Westwood does hereby approve of and accept the Flood Acquisition Plan as prepared by the Land Conservancy as a guide for future conservation efforts that would improve water quality and resident safety; and

BE IT FURTHER RESOLVED that this approval does not bind the Borough to take any particular action at this time and in the future.

Certified to be a true copy of a  
Resolution adopted at the meeting  
of the Mayor and Council on  
June 21, 2016

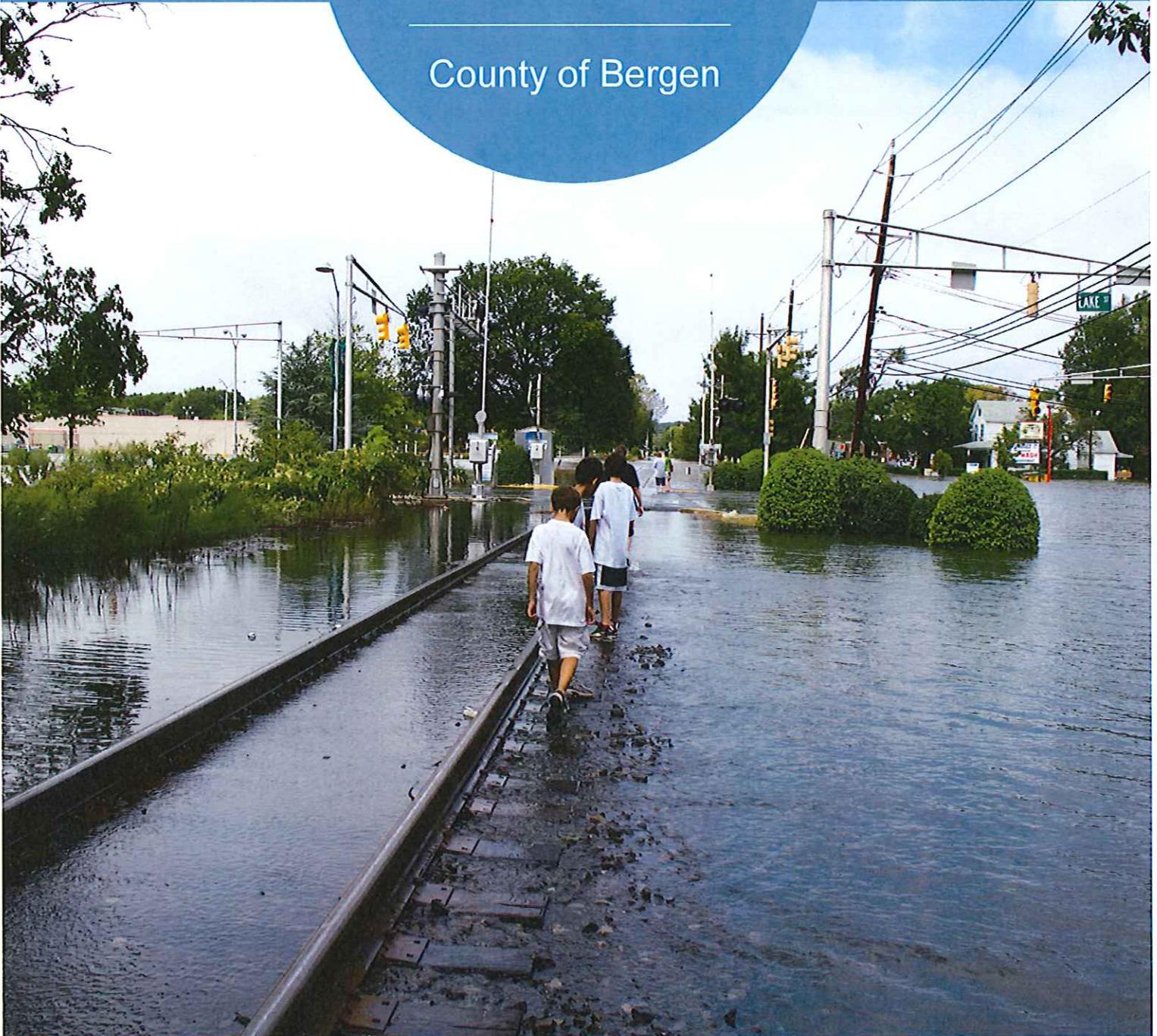
  
Karen Hughes, Borough Clerk

| NAME     | MOVED | SECOND | AYES | NAYS | ABSENT | ABSTAIN |
|----------|-------|--------|------|------|--------|---------|
| Owens    |       |        | ✓    |      |        |         |
| Montana  |       |        | ✓    |      |        |         |
| Grefrath |       |        | ✓    |      |        |         |
| Dell     |       | ✓      | ✓    |      |        |         |
| Arroyo   |       |        | ✓    |      |        |         |
| Biocchi  | ✓     |        | ✓    |      |        |         |

# BOROUGH OF WESTWOOD

## FLOOD ACQUISITION PLAN

County of Bergen



The Land Conservancy  
of New Jersey

**CONFIDENTIAL**  
May 2016



Borough of  
Westwood

*received all confidential information removed*

# FLOOD ACQUISITION PLAN

for

## Borough of Westwood County of Bergen

Prepared for:

Borough of Westwood

Prepared May 24, 2016 by:



The Land Conservancy of New Jersey  
*an accredited land trust*  
19 Boonton Avenue  
Boonton, NJ 07005

---

Barbara Heskins Davis, PP, AICP  
NJ Professional Planner (License No.: 5926)

The original document was appropriately signed and sealed  
in accordance with Chapter 41, Title 13 of the State Board of Professional Planners.

~~Confidential Report~~

Confidentiality waived -  
All confidential information has been removed.

# FLOOD ACQUISITION PLAN

for

## Borough of Westwood County of Bergen

*Produced by:*

The Land Conservancy of New Jersey's  
Partners for Greener Communities Team:  
*"Partnering with Communities to Preserve Natural Treasures"*

David Epstein, President

Barbara Heskins Davis, PP, AICP, Vice President, Programs

Kenneth Fung, GIS Manager

Joshua Malamud, Planning Intern

For further information please contact:



**The Land Conservancy of New Jersey**  
*an accredited land trust*

19 Boonton Avenue  
Boonton, NJ 07005  
Tel: (973) 541-1010  
Fax: (973) 541-1131  
[www.tlc-nj.org](http://www.tlc-nj.org)



**Borough of Westwood**

Westwood Municipal Complex  
101 Washington Avenue  
Westwood, NJ 07675  
Tel: (201) 664-7100  
Fax: (201) 664-4260  
[www.westwoodnj.gov](http://www.westwoodnj.gov)

# TABLE OF CONTENTS

---

|   |    |
|---|----|
| Executive Summary .....                         | 1  |
| Flood Acquisition Plan .....                    | 2  |
| Borough of Westwood .....                       | 2  |
| Land Use and Development .....                  | 3  |
| Flood History and Analysis.....                 | 3  |
| Average Peak Flow.....                          | 6  |
| Other Flood Events.....                         | 6  |
| Conclusion.....                                 | 7  |
| Flood Acquisition Plan Map and Target List..... | 7  |
| Maps.....                                       | 9  |
| Appendix.....                                   | 10 |
| References.....                                 | 11 |

## COVER PHOTOGRAPH

Flooded Intersection of Broadway and Lake Street, Borough of Westwood: Hurricane Irene  
*(Photographer: Justin Roth, Borough of Westwood)*

## ACKNOWLEDGEMENTS

The Land Conservancy of New Jersey wishes to acknowledge the following individuals and organizations for their help in providing information, guidance, and materials for the Borough of Westwood's *Flood Acquisition Plan*. Their contribution has been instrumental in the collection of the data for the report.

John Birkner, Mayor, Westwood Borough

Benjamin A. Kezmarsky, Administrator, Westwood Borough

Darren Blankenbush, Office of Emergency Management, Westwood Borough

Edward Senkevich, Jr., Borough Engineering, Boswell Engineering

Jason Shvanda, U.S. Geological Survey, New Jersey Water Science Center

*The Borough of Westwood's Flood Acquisition Plan was prepared with the assistance of a 2015 Technical Assistance Grant from the County of Bergen, administered by the Bergen County Division of Open Space*

## EXECUTIVE SUMMARY

---

In November 2013 voters in Bergen County approved an additional use for the Bergen County Trust Fund to include the acquisition of flood-prone properties (also known as “Blue Acres Projects”). The ballot question was approved by nearly a two-to-one majority. The Freeholder Board approved the amendment to the Trust Fund and renamed the program the “Bergen County Open Space, Recreation, Floodplain Protection, Farmland & Historic Preservation Trust Fund.

Bergen County’s Floodplain Protection Program provides grants to local municipalities to acquire properties that have been damaged by, or may be prone to incurring damage caused by storms or storm-related flooding, or that may buffer or protect other lands from damage. The program’s goal is to acquire flood damaged properties, remove structures and permanently preserve the lands for recreation and conservation purposes. First priority for County grants will be given to floodplain protection projects that have qualified for acquisition funding by the Federal Emergency Management Agency (FEMA) and the New Jersey Department of Environmental Protection (NJDEP) Blue Acres Program (Federally Funded Projects). Second priority for grants will be given to floodplain protection projects that have not secured acquisition funding from FEMA and/or NJDEP funding sources (Locally Funded Projects). The County Floodplain Protection Program will provide matching funds in partnership with FEMA, NJDEP Blue Acres Program, and the municipal applicant, up to a maximum of 25% of total project costs for Federally Funded Projects and up to a maximum of 75% of total project costs for Locally Funded Projects. Grant applications from Bergen County municipalities may be filed throughout the year on a rolling basis.

Westwood Borough has experienced damaging floods from the Hackensack River and its tributaries that have resulted in over 220 homes currently on the Federal Emergency Management Agency (FEMA) Repetitive Loss (RL) and Severe Repetitive Loss (SRL) lists. The Borough has purchased five flood-prone homes with NJDEP Blue Acres grant funding. Westwood seeks to purchase flood-prone properties, converting them to public open space through participation and partnership with the State of New Jersey Blue Acres Program and with funding support from the Bergen County Open Space, Recreation, Floodplain Protection, Farmland & Historic Preservation Trust Fund. Westwood has prepared this Flood Acquisition Plan to document local impacts from flood events and identify future project areas for acquisition based upon repetitive, ongoing flooding. Completion of the Flood Acquisition Plan is a requirement for participation in Bergen County’s flood acquisition grant program.

The Flood Acquisition Plan is not a planning document that needs to be publicly vetted or adopted. Plan information is to be discussed in closed session by the Borough. The project areas and list of properties which fall within these areas are based upon an analysis of the FEMA mapping and history of local flooding. If a home is identified within the project area it simply means a property is flood-prone, and there is no direct action as a result of ‘being on the list’. It has no effect on the home’s value, assessed tax rates, and is not public information.

Completion of this Plan was done with the input and guidance of the Borough Administrator, Engineer, and the Office of Emergency Management.

# FLOOD ACQUISITION PLAN

---

## Borough of Westwood

Westwood Borough is located in central Bergen County, a 50 minute drive to Midtown Manhattan in New York City. It is bordered by Hillsdale Borough to the north, River Vale Township to the east, Emerson Borough to the south, and Washington Township to the west.

The Borough is located in Watershed Management Area 5 (WMA 5), which covers 165 square miles (105,600 acres) in New Jersey, and is divided into the Hackensack, Hudson, and Pascack Watersheds. Of these three main watersheds, Westwood is located within the Hackensack and Pascack Watersheds.<sup>1</sup>

Spanning the northeast corner of New Jersey, WMA 5 is the most densely populated of the 20 WMAs in New Jersey.<sup>2</sup> WMA 5 is comprised of several smaller subwatersheds (also known as subbasins), including four 14 Digit Hydrologic Unit Code (HUC 14) watersheds that directly impact Westwood (listed from north to south): Hackensack River (above Old Tappan gage), Pascack Brook (above Westwood gage), Pascack Brook (below Westwood gage), and Hackensack River (Oradell to Old Tappan gage)<sup>3</sup>. (*Map 1. Watersheds (HUC 14)*)

A major artery of WMA 5, the Hackensack River watershed spans 197 square miles (126,080 acres) of land in New Jersey and New York, 58% of which flows through Bergen County.<sup>4</sup> The Hackensack River has its northern origin at Lake Lucille in New City, New York. Once it crosses the New Jersey state line, the Hackensack River continues for 32 miles, between Bergen and Hudson Counties. Once the Hackensack River passes below the Oradell Reservoir, it is tidally influenced.<sup>5</sup> The Hackensack River has several tributaries within New Jersey, but the most important to Westwood is Pascack Brook. Pascack Brook originates in Rockland County, New York, and flows south into New Jersey, passing through Woodcliff Lake along the northern border of Westwood Borough. The northern border of Westwood Borough is formed by Pascack Brook, which then flows east before continuing south along Westwood's eastern border. (*Map 2. Pascack Valley*)

The southwest region of Westwood Borough lies within the Musquapsink Brook Watershed. This watershed is approximately 6.6 miles long from its headwaters to where it joins Pascack Brook at Westwood's eastern border with River Vale Township.<sup>6</sup> Flowing into Westwood at its southwestern corner, crossing under Forest Avenue, Musquapsink Brook flows into Pascack Brook at the eastern edge of Westwood. Both Pascack and Musquapsink Brooks are Category 1, state-protected water bodies (C1).<sup>7</sup> From there, Pascack Brook winds east across the southern border of River Vale Township, past Pascack Brook County Park, where it then flows under Emerson Road, ultimately entering Oradell Reservoir at its northwest edge. The Reservoir is a C1 waterbody with a capacity of 3,507 million gallons that was created by the Oradell Dam. It is estimated that within New Jersey, 51 square miles of land drain into the Oradell Reservoir. Of those 51 square miles that flow into the Oradell Reservoir, roughly 18 are connected to Pascack Brook.<sup>8</sup> (*Map 3. Surface Water Quality*)

In terms of topography, the Borough is generally consistently level, with a limited amount of steeply sloped land. The lowest elevation point, located in northeastern Westwood, along the Pascack Brook, is 30 feet above sea level. The high point located between Lafayette and Mountain Avenue, near the border of Westwood and Washington Township, rises to 140 feet. This region of Westwood contains the Borough's largest band of steep slopes (defined as exceeding 15% slope).<sup>9</sup>

## **Land Use and Development**

Westwood encompasses 2.27 square miles of land (1,452 acres) with a population of 10,908 individuals in 4,636 housing units.<sup>10</sup> Westwood is a fully developed suburban community development characterized by mixed use, with a vibrant downtown that attracts visitors to the Borough. The 2,511 single family houses make up 54.6% of all households. The major commercial zones are located along Old Hook Road (Bergen County Route 502) in the eastern part of the Borough and along Broadway, which runs north to south, bisecting Westwood.<sup>11</sup> The business area adjacent to Old Hook Road operates with diverse land uses, as a limited manufacturing, industrial, and warehouse zone. Broadway connects downtown Westwood to the downtown districts of Hillsdale, Woodcliff Lake, and Park Ridge.<sup>12</sup> Commercial development along the northern span of Broadway within Westwood is prone to flooding, as Pascack Brook is in close proximity to many of the impervious surfaces created by expansive parking lots. Westwood Plaza Shopping Center is located directly south of where Pascack Brook passes under Broadway and a section of the Brook curls tightly around the rear-facing parking area of the Plaza. The Westwood Plaza Shopping Center was severely flooded during Hurricane Irene in August 2011. The corner of the parking lot in front of Kmart, adjacent to Broadway, is a topographical low point that is especially prone to flooding during major storms. This commercial area is also prone to flooding when the waters of the Woodcliff Lake Reservoir overflow.<sup>13</sup>

Open space and recreation lands account for 15.6% (226 acres) of land in Westwood, with 9% of total land used for parks and 5% of land remaining undeveloped.<sup>14</sup> Westwood has public parks and open space facilities dotting the Pascack Brook, which are located within local floodplains. These open spaces prone to flooding are: Pascack Brook County Park (55 acres), Westvale Park (30 acres), Brookside Park (5 acres), McKinley Park (3 acres), and Overbrook Park/Bird Sanctuary (2.5 acres). With the exception of the Pascack Brook County Park, located in eastern Westwood, all of the flood-prone parks are concentrated in the northern region of the Borough.<sup>15</sup>

## **Flood History and Analysis**

Federal, state and municipal governments provide oversight regarding areas prone to flooding through various acts, laws and ordinances. The intent is to minimize property damage and negative ecological effects by limiting development and protecting positive environmental influences in areas deemed subject to flooding.

The United States Geological Survey (USGS) maps flood prone areas and the Federal Emergency Management Agency (FEMA) evaluates and maps Special Flood Hazard Areas (SFHAs) and other flood zones, creating official Flood Rate Insurance Mapping (FIRM) that can be used in participating communities to determine flood insurance rates. The New Jersey

Department of Environmental Protection (NJDEP) delineates Flood Hazard Areas along streams and regulates activities within these areas. In recent years, FEMA and the state have coordinated to integrate NJDEP flood hazard area parameters into FEMA updates.

SFHA are defined as the area that will be inundated by the flood event having a one-percent chance of being equaled or exceeded in any given year. The one-percent annual chance flood is also referred to as the base flood or 100-year flood. In Westwood SFHAs are labeled as Zone A and Zone AE. Moderate flood hazard areas, labeled Zone X (shaded) are also shown on the FIRM, and are the areas between the limits of the base flood and the 0.2-percent-annual-chance (or 500-year) flood.

The most recent flood maps for the Borough of Westwood were released as Preliminary Digital FIRM on August 29, 2014 and are shown on *Map 4* and *Map 5. Special Flood Hazard Area (DFIRM Preliminary August 29, 2014) – Aerial Map*. There are 2 acres of land identified as having a 0.2% annual chance flood (500-year) and 33 acres of land identified as having a 1% chance of an annual flood (100-year) in Westwood Borough.

Westwood is subject to flooding due to overflow of Pascack Brook, the Woodcliff Lake Reservoir, and the Oradell Reservoir. Heavy rain leads to flooding and ponding of surface water due to the presence of low-lying areas and ponds along these watercourses. High tides can exacerbate flooding. Westwood has been in the path of several major coastal storms, including Hurricane Floyd (1999), the Spring Nor'easter of 2007, and Hurricane Irene (2011), which produced historic floods along Pascack Brook.

Roads that are subject to flooding during major storm events include:

- Steuben Avenue (McKinley Avenue to Harding Avenue)
- Harding Avenue (Nugent Place to Hillsdale Avenue)
- Nugent Place (entire length)
- Broadway (Lake Street to Washington Avenue)
- Prospect Avenue (Hurlbut Street to Bogert Avenue)
- Lyons Place (entire length)
- Demarest Avenue (Dean Street to Buena Vista Avenue)
- Lockerby Lane (entire length)
- Dean Street (Benson Avenue to Lyons Place)
- Lake Street (Continuing North to Brookside Avenue)
- 4th Avenue (West of Westwood Regional Middle School property)

All of the above streets have experienced multiple flooding events and have been repeatedly closed. Many of these streets have also required rescues by watercraft.<sup>16</sup> See *Appendix A* for photographs of different flooding locations and events in Westwood Borough.

The flow of the Pascack Brook is measured continuously at the Westwood gage station maintained by the United States Geological Survey (USGS). This station (USGS 01377500) is located on the right bank of Pascack Brook, 75 feet upstream from the bridge on Harrington Avenue, and 500 feet downstream from Musquapsink Brook.

Flood stage at this location is 4 feet (700 cfs [cubic feet per second]). Moderate flooding occurs between 5 feet and 5.5 feet (1,300-1,650 cfs), and a major flood is one greater than 5.5 feet stage (1,650 cfs). According to a 2013 USGS report, the highest flood peak streamflow recorded by the Pascack Brook at Westwood gage was documented during Hurricane Floyd in 1999, and the second highest was during Hurricane Irene in 2011.<sup>17</sup> The worst flood on record for this location occurred on September 16, 1999, due to Hurricane Floyd, when crest stage reached 11.4 feet, or 8,230 cfs.<sup>18</sup> (*Table 1. Highest Yearly Peak Flows on the Pascack Brook at Westwood*)

The Woodcliff Lake Reservoir dam directly affects flooding events in Westwood. In 2011, before Hurricane Irene reached Westwood, the gates to the Woodcliff Lake Reservoir were lowered to maintain runoff volume in the reservoir “*in order to alleviate peak discharge.*”<sup>19</sup> This is an automatic procedure of the dam in anticipation of a major storm event. Despite these efforts, Westwood did experience significant flooding downstream of the Woodcliff Lake Reservoir.<sup>20</sup> Maintaining proper runoff volume in the reservoir is key to providing relief to areas downstream during flooding events. In the 2011 Boswell Engineering report that was commissioned by Westwood to evaluate the operation of the Woodcliff Lake Reservoir dam, particularly during storm events, it was suggested that United Water (now Suez) “*consider modifications*” to its day-to-day operations of the Reservoir.<sup>21</sup>

The Suez utility company finished construction improvements to the Woodcliff Lake Reservoir dam in December 2015, which encased the exterior of the dam in concrete. The result of the construction is that the dam will retain more water, with more steady water releases. These measures are intended to result in more efficient preventative measures that go into effect in anticipation of flooding events.<sup>22</sup> The project came about as the result of a NJDEP requirement that Suez fortify the formerly earthen dam to protect against a 1,000-year storm event. The new construction has yet to be tested by a major flooding event.<sup>23</sup> The Report concluded that “[*t]he Woodcliff Lake Reservoir has not caused downstream flooding and, in many cases, it has mitigated the impact of flooding by providing flood storage capacity.*”<sup>24</sup>

| Rank* | Gage Height (feet) | Flow (cubic feet per second) | Severity | Date       | Tropical Storm?           |
|-------|--------------------|------------------------------|----------|------------|---------------------------|
| 1     | 11.4               | 9,630                        | Major    | 9/16/1999  | Hurricane Floyd           |
| 2     | 8.69               | 4,630                        | Major    | 8/28/2011  | Hurricane Irene           |
| 3     | 7.57               | 2,440                        | Major    | 9/12/1971  |                           |
| 4     | 7.36               | 3,260                        | Major    | 4/16/2007  | Spring Nor'easter of 2007 |
| 5     | 6.76               | 1,610                        | Major    | 7/23/1945  |                           |
| 6     | 6.75               | 1,940                        | Major    | 2/3/1973   |                           |
| 7     | 6.61               | 1,640                        | Major    | 5/29/1968  |                           |
| 8     | 6.50               | 1,470                        | Major    | 3/31/1951  |                           |
| 9     | 6.45               | 1,330                        | Major    | 10/16/1955 |                           |
| 10    | 6.24               | 1,790                        | Major    | 11/8/1977  |                           |

**Table 1. Highest Yearly Peak Flows on the Pascaek Brook at Westwood  
Major Flood Crests ( in order of highest gage height first)**

| Rank * | Gage Height (feet) | Flow (cubic feet per second) | Severity | Date       | Tropical Storm? |
|--------|--------------------|------------------------------|----------|------------|-----------------|
| 11     | 6.08               | 1,590                        | Major    | 12/21/1973 |                 |
| 12     | 6.06               | 1,190                        | Major    | 8/19/1955  |                 |
| 13     | 5.96               | 2,020                        | Major    | 7/23/2004  |                 |
| 14     | 5.90               | 1,180                        | Major    | 3/13/1953  |                 |
| 15     | 5.75               | 1,120                        | Major    | 6/1/1952   |                 |

\* Rank refers to the relative severity of each flood, i.e. Rank 1 is the highest flood crest on record (1932 - present).  
Source: USGS

### *Average Peak Flow*

The data for the USGS station in Westwood was broken down into 10 to 14-year increments and indicates a 156% increase in the Pascaek Brook's annual peak flow since measurement began in 1932.<sup>25</sup> (Table 2. *Average Annual Peak Flows*) The Woodcliff Lake at Hillsdale flow gage has been used to monitor flooding in the region, but as a result of the recently completed construction to the Woodcliff Lake Reservoir dam, the gage has been taken out of service until further notice.<sup>26</sup>

| <b>Table 2. Average Annual Peak Flows<br/>Selected Periods</b> |  |
|--|--|
| Period   | Average annual peak flow (cubic feet per second) |
| 1935-1948  | 718  |
| 1949-1962  | 854  |
| 1963-1976  | 1,128  |
| 1977-1990  | 1,010  |
| 1991-2004  | 1,646  |
| 2004-2014  | 1,839  |

Source: USGS

### *Other Flood Events*

In June 2011, two months prior to Hurricane Irene, a storm struck Rockland County, to the north of Westwood, and generated floodwater passing through the Park Ridge flow gage at five times the normal surface speed. The floodwater entered Pascaek Brook, which then overflowed into Westwood, flooding homes on Nugent Place and Harding Avenue, and necessitating the use of fire department boats and a crane to rescue residents from their homes.<sup>27</sup> There were, in fact, four major flooding events (characterized by rising above the 1,500 cfs threshold) in 2011 -- the last of the four being Hurricane Irene. This presents a troublesome pattern considering that there were only four major flooding events between 1999 and 2010.<sup>28</sup> The Borough has experienced

flooding in recent months – in one case, a June 2015 storm yielded four inches of rain in just over an hour. However, the 1,300 cfs recorded did not reach the major flooding event threshold.<sup>29</sup> A similar storm struck Westwood in June 2015, collecting six inches of rain in one hour, but once again, not rising to the category of a major flooding event.<sup>30</sup> The recent upgrades to the Woodcliff Lake Reservoir dam were designed by the Suez utility company, in part, to help mitigate flooding in the area, and the recent completion of the construction will soon demonstrate the effectiveness of the flood mitigation upgrades.

## Conclusion

The Borough of Westwood has seen severe and repetitive damage to both residential and commercial properties that sit along the Pascack and Musquapsink Brooks. That topological vulnerability is complicated by the Woodcliff Lake and Oradell Reservoirs that are located in close proximity to Westwood's northern and southern borders. The flood-prone waterways and reservoirs that characterize Westwood's landscape necessitate special flood planning that move people and property out of the way of floodwaters that have become more volatile as new commercial areas bring swaths of impervious surfaces to Westwood's floodplains. The Borough has purchased five flood-prone homes with Blue Acres grant funding (with a sixth home in the process of being purchased), and is committed to removing more structures from the most vulnerable flood prone areas in town.<sup>31</sup> This will allow the land to be returned to a more natural state, provide flood storage, remove people and property from harm's way, and mitigate the impacts of severe flooding events. The Borough of Westwood intends to pursue a flood mitigation program through acquisition based on the following:

- Continued, significant increases in average peak flow in Pascack Brook.
- A trend toward more frequent, more intense flood events.
- Identification of Special Flood Hazard Areas as documented by FEMA Flood Insurance Rate Maps.
- 108 properties with repetitive flood claims and \$10,937,646 in FEMA payments to repetitive loss properties since 1978 (as of February 28, 2014).<sup>32</sup>

## Flood Acquisition Plan Map and Target List

*Map 6. Residential, Commercial and Industrial Properties* identifies preserved lands (state, county, and municipal), public property (tax assessment Class 15C), residential (Class 2), commercial (Class 4A), and industrial property (Class 4B) in the Borough. This serves as the base map for identifying project areas for the municipality. There are 348 residential properties located within the FEMA 100-Year floodplain in Westwood Borough. (*Appendix B. Residential Property (Class 2) located in the 100-Year Floodplain for Westwood Borough*) *Map 7. Residential Properties Located in the 100-Year Floodplain* identifies those residential properties which are located in the FEMA 100-year floodplain in Westwood.

The properties which are listed on FEMA's Repetitive Loss (RL) and Severe Repetitive Loss (SRL) lists were mapped and reviewed. Most recently updated in 2013, the properties identified on these lists are the latest ones to be included. There are 79 properties on the RL list and 142 on the SRL list, for a total of 221 properties *Appendix C. Property on FEMA's Repetitive Loss and Severe Repetitive Loss Lists in Westwood Borough* and *Map 8. Repetitive Loss and Severe*

*Repetitive Loss Properties* shows the locations of both RL and SRL properties. Three properties are on the FEMA RL list, but are located outside of FEMA Zone A and AE (the 100 year flood). The homes are located on McKinley Avenue, Emerson Road, and Euclid Avenue. These have all received funding in the past through FEMA. These properties are not currently priorities for the Borough's *Flood Acquisition Plan*. *Map 8* shows the locations of these properties.

The Borough has identified the following Project Areas based on the location of properties on the RL/SRL lists, streets subjected to severe, ongoing flooding, and historic location of past flood events. These are shown on *Map 9. Project Areas* and listed below:

- ✓ Steuben-Nugent-Harding Street (Priority Area)
- ✓ Hoyer-Lyons Street
- ✓ Fourth Avenue-Westwood School (Westwood Regional Middle School)

The Steuben-Nugent-Harding Street Project Area is the Borough's current Priority Area for flood acquisition buyouts. *Map 9* provides a detail inset map of this Priority Area. Within this Project Area, the Borough has already purchased the properties at 46, 55, and 60 Harding Avenue and at 23 and 27 Nugent Place with the help of NJDEP Blue Acres funding.<sup>33</sup> The Borough has approved the acquisition of 31 Nugent Place and this property is pending closing.<sup>34</sup> Properties located at 83 and 87 Steuben Avenue have been identified as homes abandoned by homeowners due to repetitive flooding.<sup>35</sup> The Project Area boundaries were chosen based on which residential properties have had greatest losses (SRL properties) and which properties could provide a suitable flooding buffer for SRL and RL properties that are not bought out. If properties located within the Steuben-Nugent-Harding Street Project Area south of Nugent Place are bought out, this area will provide increased flood storage capacity for surrounding properties and protect neighboring homes along Harding Avenue. (*Map 9A. Steuben-Nugent-Harding Street Project Area*)

The Hoyer-Lyons Street Project Area is located at the bend in Pascack Brook and adjoins municipal open space between Westwood River and Pascack Brook. A number of properties included on the RL list are located within this Project Area and this section of the Borough is subject to flooding during severe storm events. (*Map 9B. Hoyer-Lyons Street Project Area*)

The Fourth Avenue-Westwood School Project Area straddles the Musquapsink Brook, and adjoins municipal parkland and the Girl Scout Park in the Borough. Purchasing those properties that have experienced repetitive damage from flooding will remove residents from harms way and expand existing municipal open space and parkland. (*Map 9C. Fourth Avenue-Westwood School Project Area*)

*Appendix D. Residential Property (Class 2) located in the Flood Acquisition Plan Project Areas for Westwood Borough* includes those properties within each of the flood buyout Project Areas.

# MAPS

---

Map 1. Watersheds (HUC 14)

Map 2. Pascack Valley

Map 3. Surface Water Quality

Map 4. Special Flood Hazard Area (DFIRM Preliminary August 29, 2014)

Map 5. Special Flood Hazard Area (DFIRM Preliminary August 29, 2014) – Aerial Map

Map 6. Residential, Commercial and Industrial Properties

Map 7. Residential Properties Located in the 100-Year Floodplain

Map 8. Repetitive Loss and Severe Repetitive Loss Properties

Map 9. Project Areas

Map 9A. Steuben-Nugent-Harding Street Project Area

Map 9B. Hoyer-Lyons Street Project Area

Map 9C. Fourth Avenue-Westwood School Project Area

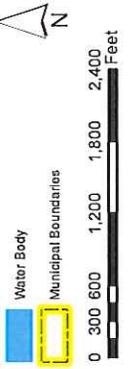
*Map 8, and Maps 9A, 9B, and 9C are not included in the report submitted to Sustainable Jersey as they include property information for sites on the Federal Emergency Management Agency (FEMA) Repetitive Loss (RL) and Severe Repetitive Loss (SRL) databases. This information is confidential.*

# Map 1: Watershed (HUC 14)

## Westwood Borough, Bergen County

### Sub-Watershed Name

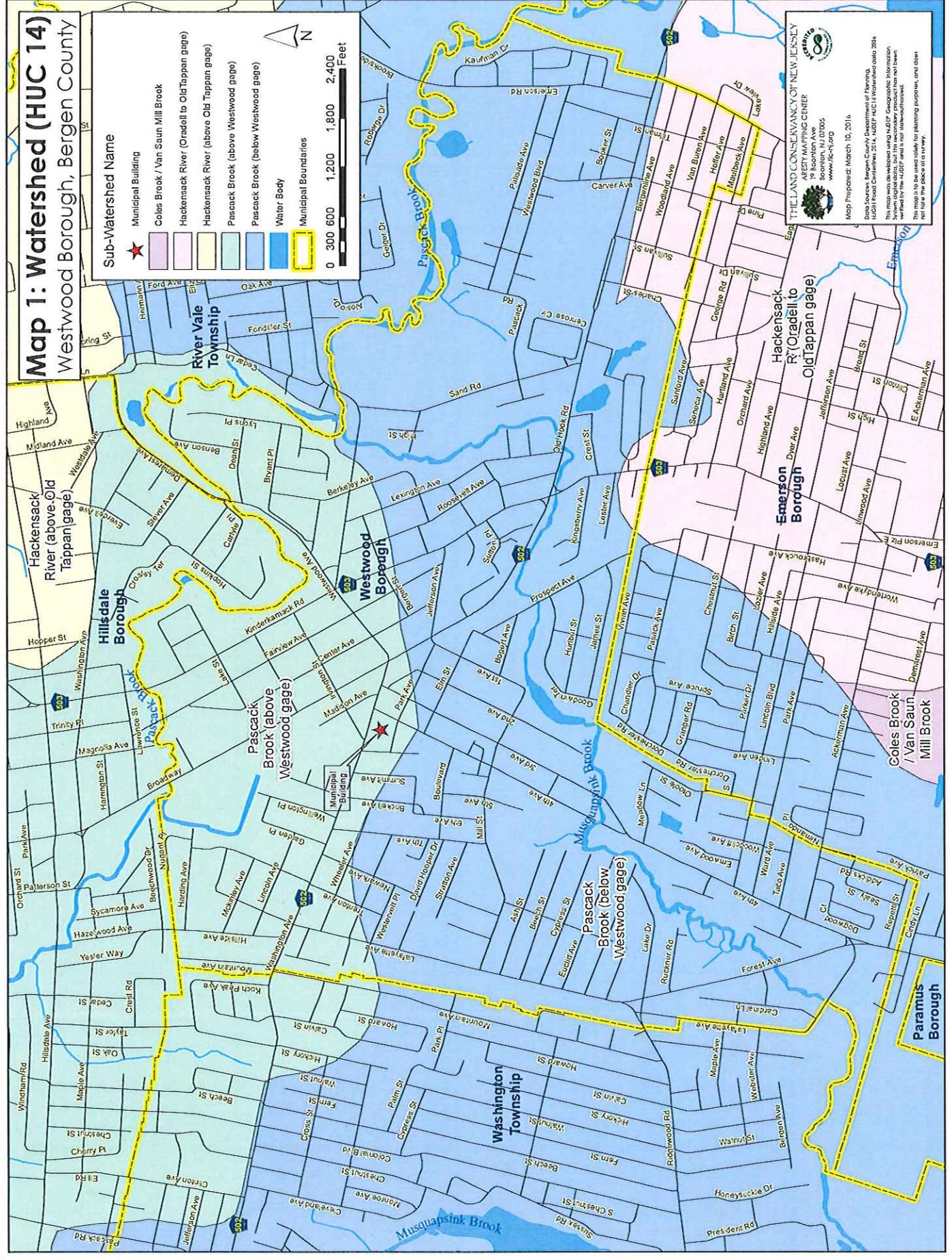
-  Municipal Building
-  Coles Brook / Van Saun Mill Brook
-  Hackensack River (Oradell to Old Tappan gage)
-  Hackensack River (above Old Tappan gage)
-  Pasack Brook (above Westwood gage)
-  Pasack Brook (below Westwood gage)
-  Water Body
-  Municipal Boundaries



THE LAND CONSERVANCY OF NEW JERSEY  
 APERTY MAPPING CENTER  
 19 Locust Ave  
 Leonia, NJ 07005  
 www.lcnj.org

Map Prepared: March 10, 2016

Data Sources: Bergen County Department of Planning, 1:25,000 Vector Contour, 2014; NJDEP HUC 14 Watershed, 2004. This map was developed using NJDEP Geographic Information System (GIS) data. The GIS data was not been verified by the NJDEP and is not for use in any other project. This map is to be used only for planning purposes, and does not take the place of a survey.

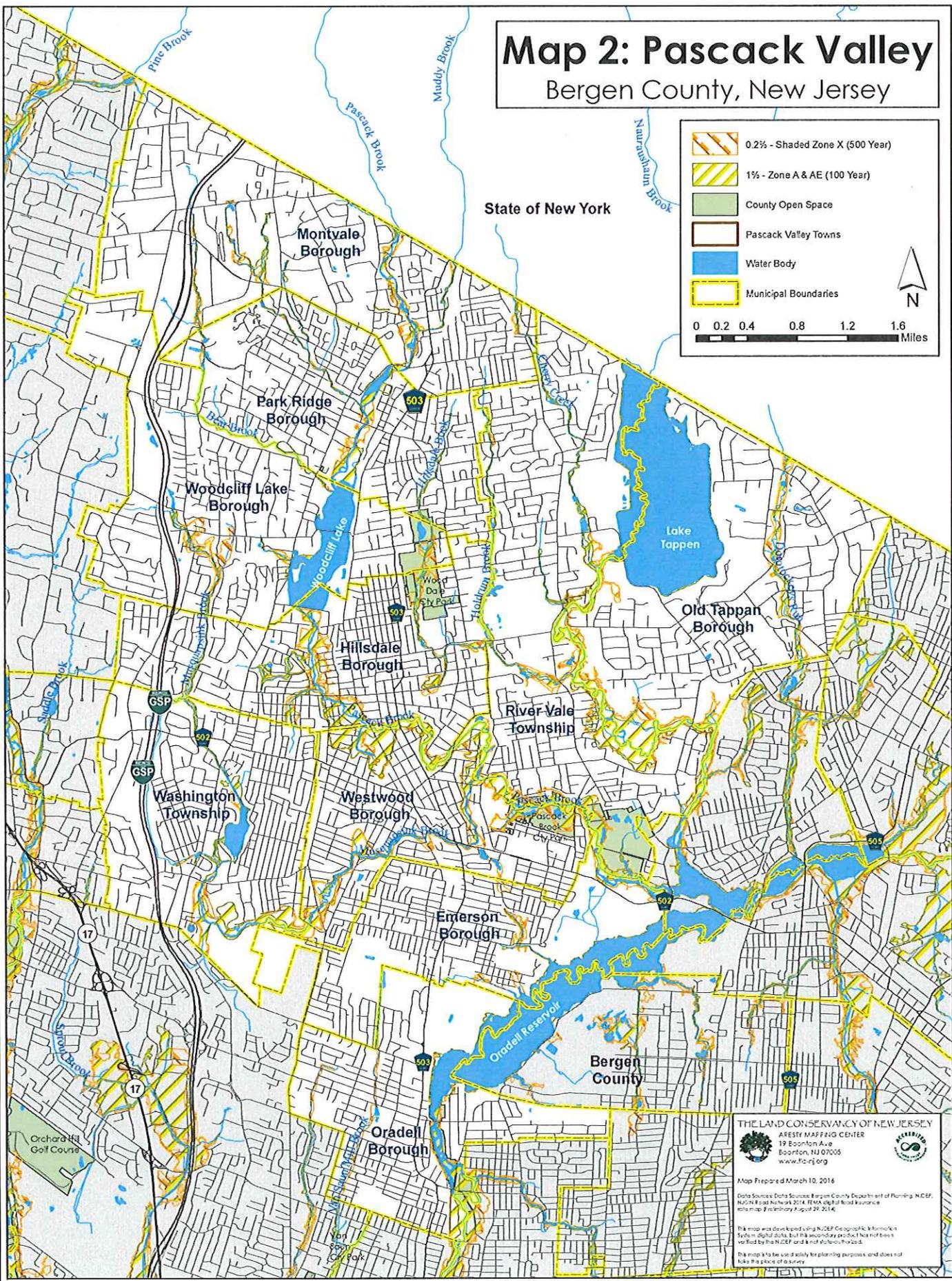


# Map 2: Pascack Valley

## Bergen County, New Jersey

 0.2% - Shaded Zone X (500 Year)  
 1% - Zone A & AE (100 Year)  
 County Open Space  
 Pascack Valley Towns  
 Water Body  
 Municipal Boundaries

0 0.2 0.4 0.8 1.2 1.6 Miles

THE LAND CONSERVANCY OF NEW JERSEY  
 ARESTY MAPPING CENTER  
 19 Boonton Ave.  
 Boonton, NJ 07005  
 www.lcnj.org

Map Prepared March 10, 2016

Data Sources: Data Source: Bergen County Department of Planning, NCEP, NGSN Road Network 2014, FEMA digital flood insurance rate map # preliminary August 29, 2014.

This map was developed using NCEP Geographic Information System digital data, but this secondary product has not been verified by the NCEP and is not a warranty.

This map is to be used solely for planning purposes and does not take the place of survey.

# Map 3: Surface Water Quality

## Westwood Borough, Bergen County

**River Vale Township**

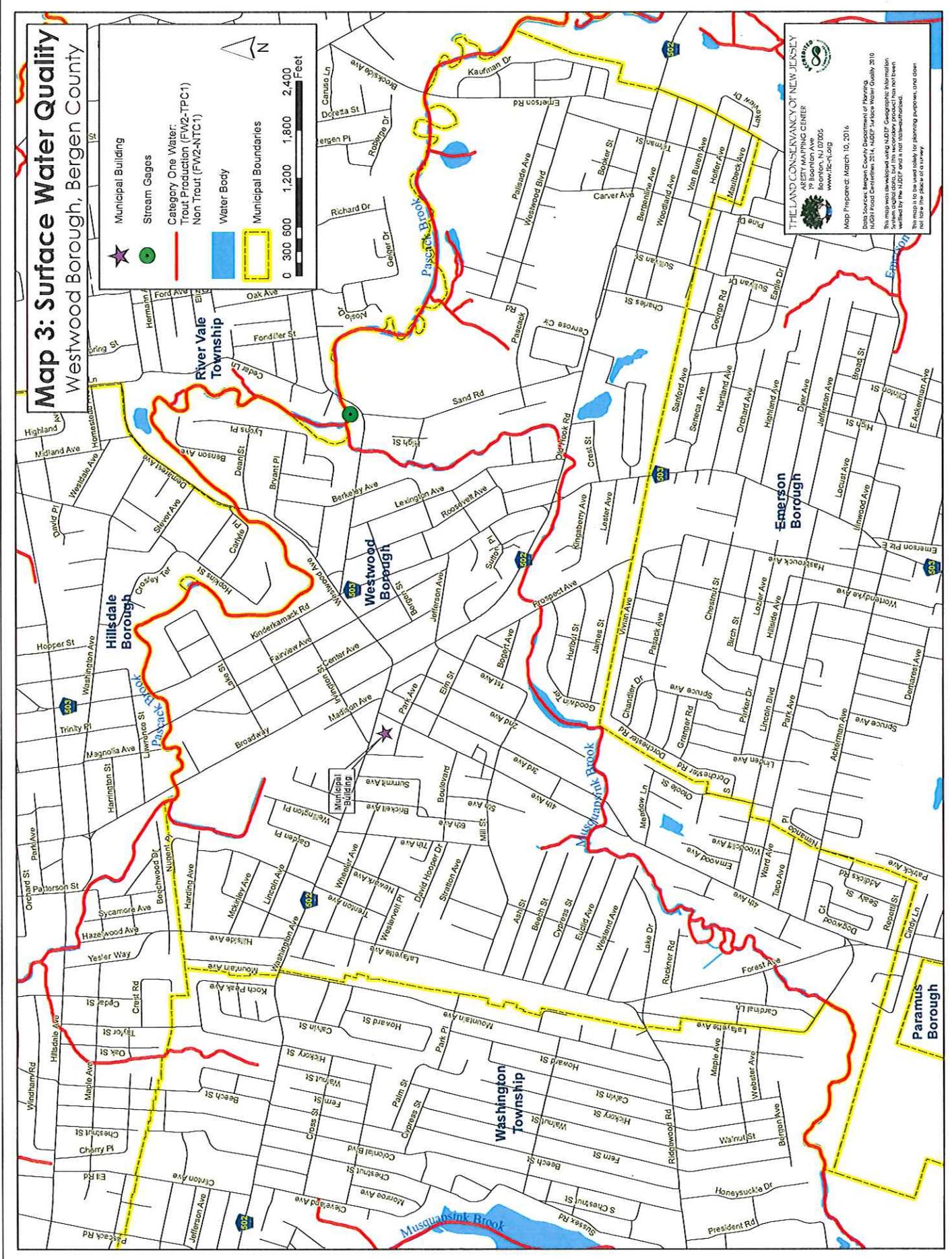
- Municipal Building
- Stream Gages
- Category One Water
- Trout Production (FW2-TPC1)
- Non Trout (FW2-NTC1)
- Water Body
- Municipal Boundaries

0 300 600 1,200 1,800 2,400 Feet

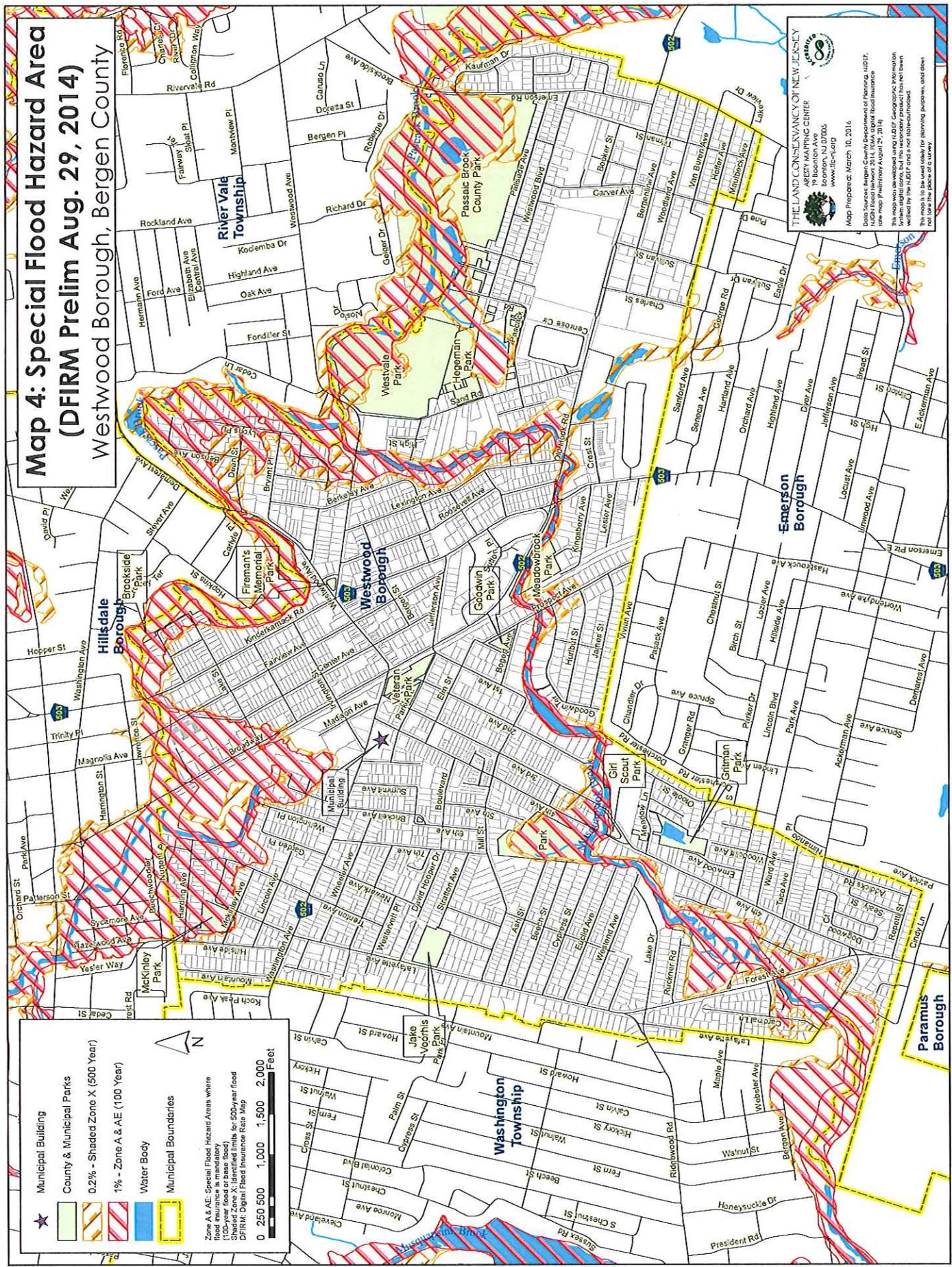
THE LAND CONSERVANCY OF NEW JERSEY  
 ARISTO MAPPING CENTER  
 79 Isacron Ave  
 Teaneck, NJ 07606  
 www.lcnj.org

Map Prepared: March 10, 2016

Data source: Bergen County Department of Planning  
 High Speed Rail Station S-14, NJ Dept of River Water Quality 2010  
 The map was developed using NJ DEP Geographic Information  
 System (GIS) data. The map was prepared and printed  
 by the LCNJ and is not for sale.  
 This map is to be used solely for planning purposes, one does  
 not take the place of a survey.



# Map 4: Special Flood Hazard Area (DFIRM Prelim Aug. 29, 2014) Westwood Borough, Bergen County



☆ Municipal Building  
 County & Municipal Parks  
 0.2% - Shaded Zone X (500 Year)  
 1% - Zone A & AE (100 Year)  
 Water Body  
 Municipal Boundaries

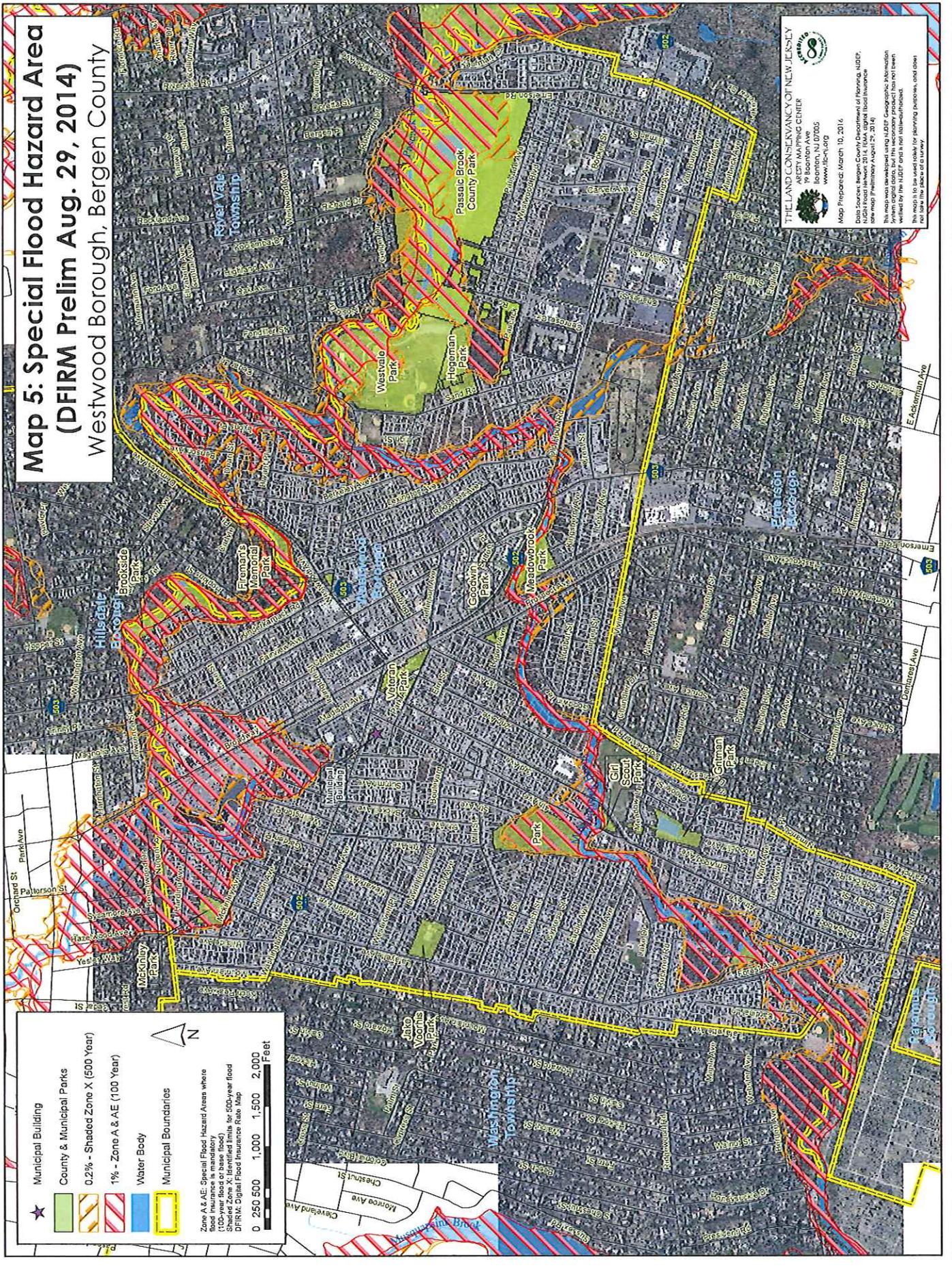
Zone A & AE: Special Flood Hazard Areas where flood insurance is mandatory (100-year flood or base flood)  
 Shaded Zone X: Special Flood Hazard Areas where flood insurance is mandatory (500-year flood)  
 DFIRM: Digital Flood Insurance Rate Map

0 250 500 1,000 1,500 2,000 Feet

THE LAND CONSULVANCY OF NEW JERSEY  
 ARISTY MAPPING CENTER  
 19 Isaacson Ave  
 Teaneck, NJ 07605  
 www.lcny.com

Map Prepared: March 10, 2014  
 Data Source: Bergen County Department of Planning, AEDT, NCEM Flood Hazard, 2014, FEMA Digital Flood Insurance Rate Map Preliminary August 29, 2014  
 This map was developed using AEDT Geographic Information System data. AEDT data was used as the base product. It has been updated to reflect the latest available data. The user should not rely on this map for planning purposes, and should not take the place of a survey.

# Map 5: Special Flood Hazard Area (DFIRM Prelim Aug. 29, 2014) Westwood Borough, Bergen County



★ Municipal Building  
 County & Municipal Parks  
 0.2% - Shaded Zone X (500 Year)  
 1% - Zone A & AE (100 Year)  
 Water Body  
 Municipal Boundaries

Zone A & AE: Special Flood Hazard Areas where flood insurance is mandatory (100-year flood or base flood)  
 Shaded Zone X: Areas with a 500-year flood  
 DFIRM: Digital Flood Insurance Rate Map

0 250 500 1,000 1,500 2,000 Feet

THE LAND CONSULTANCY OF NEW JERSEY  
 ARTS & MAPPING CENTER  
 19 Liochton Ave  
 Liochton, NJ 07035  
 www.lcn-jr.com

Map Prepared: March 10, 2014  
 Data Source: Bergen County Department of Planning, MDR, NEMA Flood Hazard, 2014 FEMA Digital Flood Insurance Rate Map Preliminary August 29, 2014  
 This map was developed using NJDEP Geographic Information System digital data, but the secondary product has not been verified by the NJDEP digital data infrastructure.  
 This map is to be used solely for planning purposes, and does not constitute a warranty.

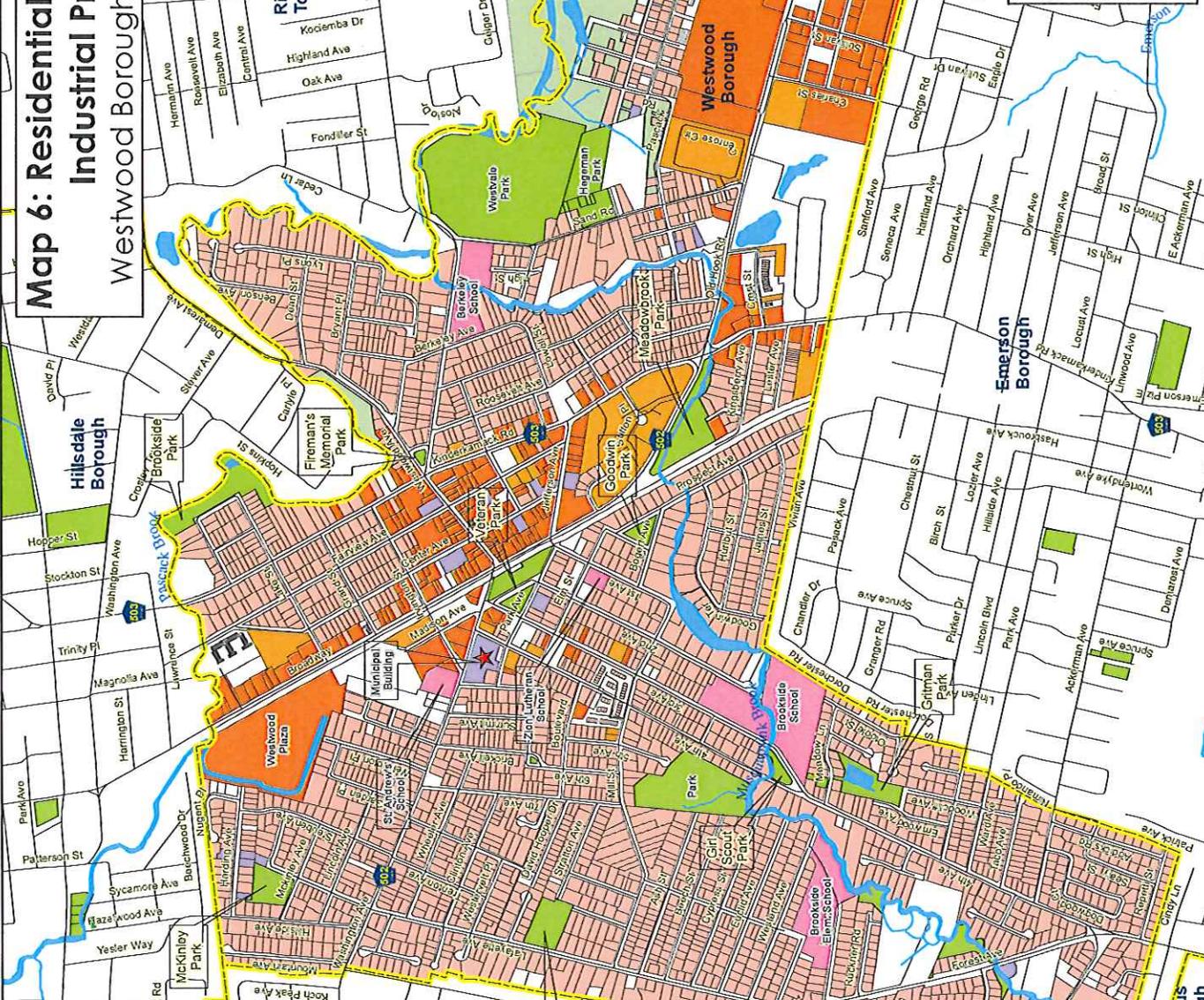
# Map 6: Residential, Commercial & Industrial Properties

## Westwood Borough, Bergen County

THE LAND CONSERVANCY OF NEW JERSEY  
 ARTIST MAPPING CENTER  
 19 Hudson Ave  
 Isoton, NJ 07035  
 www.lcnj.org

Map Prepared: March 10, 2016  
 Data Source: Bergen County Department of Planning, NJDP  
 NJDOT (last known: 2014 FEMA right of way database  
 last map: Preliminary August 29, 2014)

This map was developed using NJDP Geographic Information System digital data, but this secondary product has not been verified by the NJDP, and the information contained herein may not be used for planning purposes, and does not constitute a warranty.



- ★ Municipal Building
- Preserved Municipal Open Space (ROSI)
- County Parks
- Residential (Class 2)
- Commercial & Industrial (Class 4A & 4B)
- Apartments (Class 4C)
- Public & Private Schools (Class 15A & 15B)
- Public Property (Class 15C)
- Water Body
- Municipal Boundaries

N

0 250 500 1,000 1,500 2,000 Feet

Paramus Borough

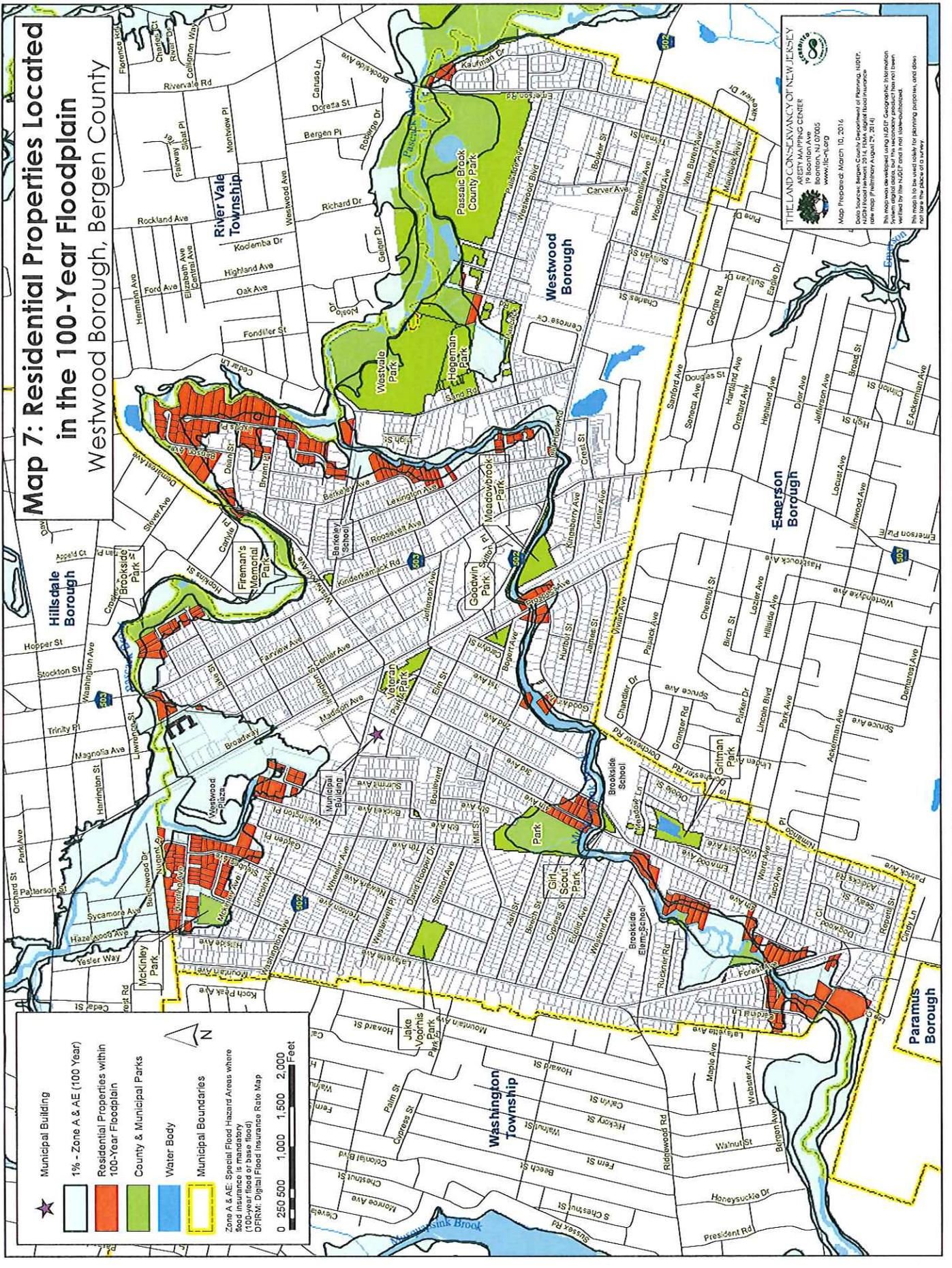
Emerson Borough

Westwood Borough

River Vale Township

Washington Township

# Map 7: Residential Properties Located in the 100-Year Floodplain Westwood Borough, Bergen County



THE LAND CONSULTANCY OF NEW JERSEY  
 ARETY MAPPING CENTER  
 19 Blooming Ave  
 Bloomton, NJ 07005  
 www.lc-nj.com

Map Prepared: March 10, 2016

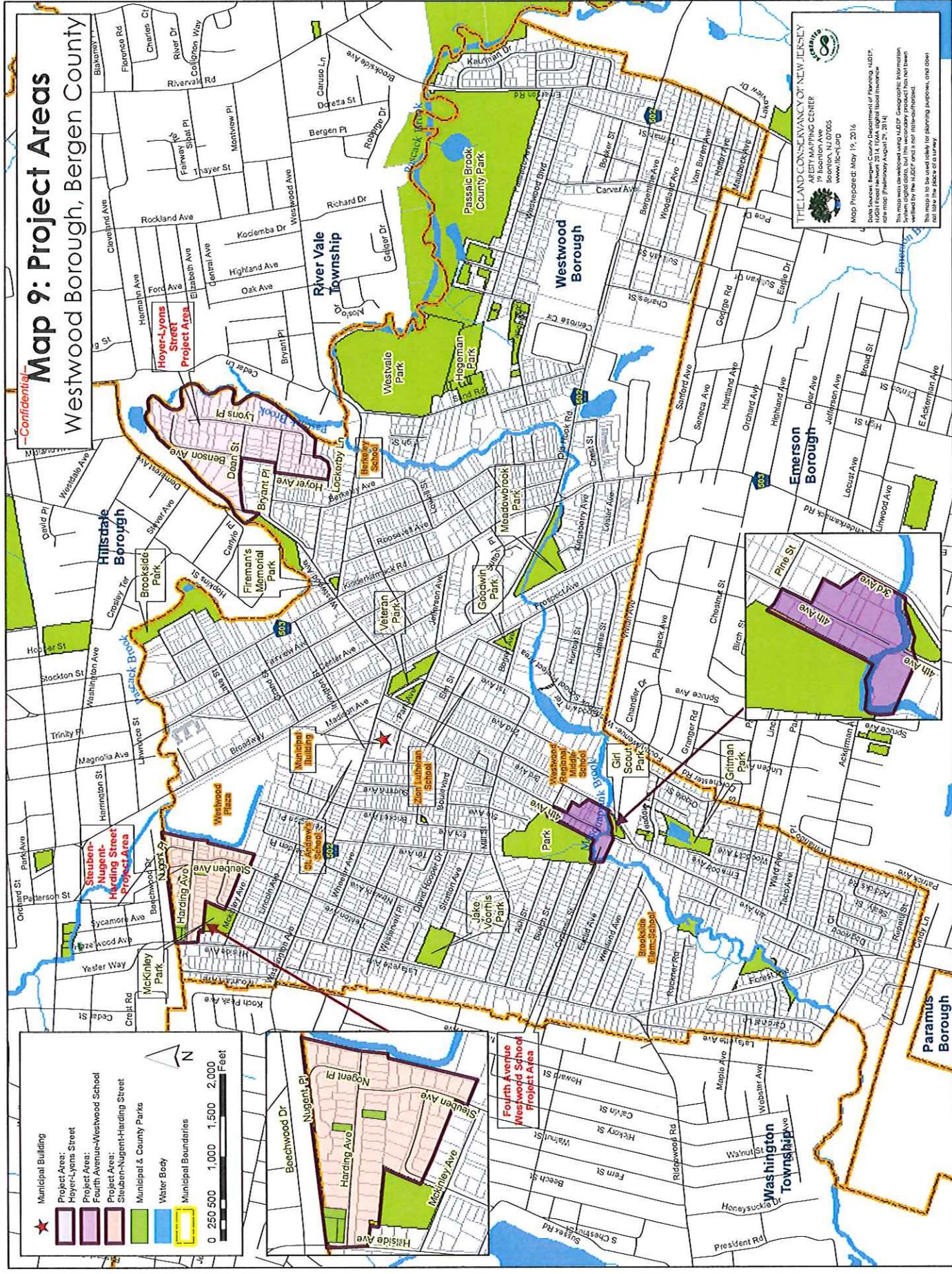
Public Notice: Bergen County Department of Planning, DRIRM, 100-Year Flood Hazard, 2014 FEMA Inland Flood Insurance Rate Map (Preliminary August 27, 2014)

This map was developed using the best Geographic Information System digital data, but the accuracy of the information is not guaranteed. The user should make their own determination as to the accuracy of the information and use it only for planning purposes, and does not constitute a warranty.

# Map 9: Project Areas

Westwood Borough, Bergen County

Confidential



THE LAND CONSULTANCY OF NEW JERSEY  
 AREITY MAPPING CENTER  
 19 Hudson Ave  
 Teaneck, NJ 07606  
 www.lcny.com

Map Prepared: May 19, 2016

Data Source: Bergen County Department of Planning, NJDOT  
 NJDOT Street Network, 2014 FEMA Inland Flood Insurance  
 Rate Map (Preliminary August 29, 2014)

This map was developed using NJDOT Geographic Information System (GIS) data. Geographic information not shown on this map may be used solely for planning purposes, and does not constitute a warranty of accuracy.

**Legend**

- Municipal Building
- Project Area: Hoyer-Lyons Street
- Project Area: Fourth Avenue-Westwood School
- Project Area: Stauben-Nugent-Harding Street
- Municipal & County Parks
- Water Body
- Municipal Boundaries

Scale: 0, 250, 500, 1,000, 1,500, 2,000 Feet

North Arrow

**Inset Map 1: Hoyer-Lyons Street Project Area**

Shows detailed view of the Hoyer-Lyons Street project area, including streets like Hillside Ave, Nugent Pl, Harding Ave, and McKinley Ave.

**Inset Map 2: Fourth Avenue-Westwood School Project Area**

Shows detailed view of the Fourth Avenue-Westwood School project area, including streets like Hillside Ave, Nugent Pl, and McKinley Ave.

**Inset Map 3: Stauben-Nugent-Harding Street Project Area**

Shows detailed view of the Stauben-Nugent-Harding Street project area, including streets like Hillside Ave, Nugent Pl, and McKinley Ave.

## **APPENDIX**

---

Appendix A. Photographs of Flooding Events in Westwood Borough

Appendix B. Residential Property (Class 2) located in the 100-Year Floodplain for Westwood Borough

Appendix C. Property on FEMA's Repetitive Loss and Severe Repetitive Loss Lists in Westwood Borough

Appendix D. Residential Property (Class 2) located in the Flood Acquisition Plan Project Areas for Westwood Borough

*Appendices B, C, and D are not included in the report submitted to Sustainable Jersey as they include property information (ownership and address) for sites on the Federal Emergency Management Agency (FEMA) Repetitive Loss (RL) and Severe Repetitive Loss (SRL) databases. This information is confidential.*



Intersection of Broadway and Lake Street (facing north) after Hurricane Irene, August 2011

*Photographer: Justin Roth*



Off of Lake Street at intersection of Broadway (facing north) after Hurricane Irene, August 2011

*Photographer: Justin Roth*



Intersection of Lake Street and Broadway (facing west) after Hurricane Irene, August 2011

*Photographer: Justin Roth*



Intersection of Lake Street and Broadway (facing west) after Hurricane Irene, August 2011

*Photographer: Justin Roth*



Broadway at Westwood Plaza (facing north) after 2007 Nor'easter  
*Photographer: Darren Blankenbush, Office of Emergency Management*

## REFERENCES

---

- <sup>1</sup> Watershed Management Area 5 – Hackensack, Hudson, Pascack. [http://www.nj.gov/dep/watershedrestoration/wma5\\_info.html](http://www.nj.gov/dep/watershedrestoration/wma5_info.html). Accessed January 2016.
- <sup>2</sup> State of New Jersey 2014 Hazard Mitigation Plan – Appendix P: Watersheds of New Jersey. <http://ready.nj.gov/programs/pdf/mitigation2014/2014-Appendix-P.pdf>. Accessed January 2016.
- <sup>3</sup> 14 Digit Hydrologic Unit Code Delineations for New Jersey. <http://www.state.nj.us/dep/gis/digidownload/metadata/statewide/dephuc14.htm>. Accessed January 2016.
- <sup>4</sup> R.W. Tiner and H.C. Bergquist. 2007. The Hackensack River Watershed, New Jersey/New York Wetland Characterization, Preliminary Assessment of Wetland Functions, and Remotely-sensed Assessment of Natural Habitat Integrity. U.S. Fish and Wildlife Service, National Wetlands Inventory, Ecological Services, Region 5, Hadley, MA. [http://www.fws.gov/northeast/EcologicalServices/pdf/wetlands/Hackensack\\_River\\_Watershed.pdf](http://www.fws.gov/northeast/EcologicalServices/pdf/wetlands/Hackensack_River_Watershed.pdf). Accessed January 2016.
- <sup>5</sup> United States Environmental Protection Agency. Lower Hackensack River, Bergen and Hudson Counties, New Jersey: Preliminary Assessment. [http://www.nj.gov/dep/rules/rules/njac7\\_9b.pdf](http://www.nj.gov/dep/rules/rules/njac7_9b.pdf). Accessed January 2016.
- <sup>6</sup> Rutgers Cooperative Extension Water Resources Program. Musquapsink Brook Watershed Restoration and Protection Plan: Data Report. August 2011. [http://www.water.rutgers.edu/Projects/Musquapsink/Musquapsink\\_Data\\_Report.pdf](http://www.water.rutgers.edu/Projects/Musquapsink/Musquapsink_Data_Report.pdf). Accessed January 2016.
- <sup>7</sup> Open Space and Recreation Plan for Borough of Westwood. September 2008. <http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/%7BA4885CFC-19D5-42AF-82D8-0EC55143EB49%7D.PDF>. Accessed January 2016.
- <sup>8</sup> Watershed Management Area 5 – Hackensack, Hudson, Pascack. [http://www.nj.gov/dep/watershedrestoration/wma5\\_info.htm](http://www.nj.gov/dep/watershedrestoration/wma5_info.htm). Accessed January 2016.
- <sup>9</sup> Open Space and Recreation Plan for Borough of Westwood. September 2008. <http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/%7BA4885CFC-19D5-42AF-82D8-0EC55143EB49%7D.PDF>. Accessed January 2016.
- <sup>10</sup> US Census State and County Quickfacts. <http://quickfacts.census.gov/qfd/states/34000.html>. Accessed January 2016.

---

<sup>11</sup> Periodic Reexamination Report of the Master Plan for Borough of Westwood. November 2011. [http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Master\\_Plan\\_Reexamination\\_Report\\_11.18.11.pdf](http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Master_Plan_Reexamination_Report_11.18.11.pdf). Accessed January 2016.

<sup>12</sup> *Quoted from 2005 Master Plan in* Periodic Reexamination Report of the Master Plan for Borough of Westwood. November 2011. [http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Master\\_Plan\\_Reexamination\\_Report\\_11.18.11.pdf](http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Master_Plan_Reexamination_Report_11.18.11.pdf). Accessed January 2016.

<sup>13</sup> Personal Communication. Darren Blankenbush. Westwood Borough Office of Emergency Management. January 2016.

<sup>14</sup> Open Space and Recreation Plan for Borough of Westwood. September 2008. <http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/%7BA4885CFC-19D5-42AF-82D8-0EC55143EB49%7D.PDF>. Accessed January 2016.

<sup>15</sup> Open Space and Recreation Plan for Borough of Westwood. September 2008. <http://www.westwoodnj.gov/vertical/Sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/%7BA4885CFC-19D5-42AF-82D8-0EC55143EB49%7D.PDF>. Accessed January 2016.

<sup>16</sup> "Flood Waters Hit Westwood Thursday." Westwood-Hillsdale Patch. June 2011. <http://patch.com/new-jersey/westwood-hillsdale/flood-waters-hit-westwood-thursday>. Accessed February 2016.

<sup>17</sup> USGS. Hurricane Irene and Associated Floods of August 27-30, 2011, in New Jersey. <http://pubs.usgs.gov/sir/2013/5234/pdf/sir2013-5234.pdf>. Accessed February 2016.

<sup>18</sup> National Weather Service. Advanced Hydrologic Prediction Service. Pascack River at Westwood. [http://water.weather.gov/ahps2/hydrograph.php?wfo=okx&gage=wsgn4&hydro\\_type=2](http://water.weather.gov/ahps2/hydrograph.php?wfo=okx&gage=wsgn4&hydro_type=2). Accessed February 2016.

<sup>19</sup> Hormoz Pazwash. December 2011. Pascack Brook Flood Study: Woodcliff Lake and Oradell Reservoirs. Boswell McClave Engineering. [http://www.westwoodnj.gov/vertical/sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Reservoir\\_Dam\\_Report\\_-\\_Tables\\_1\\_and\\_2\\_12.6.11.pdf](http://www.westwoodnj.gov/vertical/sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Reservoir_Dam_Report_-_Tables_1_and_2_12.6.11.pdf). Accessed February 2016.

<sup>20</sup> Hormoz Pazwash. December 2011. Pascack Brook Flood Study: Woodcliff Lake and Oradell Reservoirs. Boswell McClave Engineering. <http://www.westwoodnj.gov/vertical/sites/%7BEFC400E6-A5E3-462B-B522->

---

*F7250102DEBD%7D/uploads/Reservoir\_Dam\_Report\_-\_Tables\_1\_and\_2\_12.6.11.pdf*.  
Accessed February 2016.

<sup>21</sup> Hormoz Pazwash. December 2011. Pascack Brook Flood Study: Woodcliff Lake and Oradell Reservoirs. Boswell McClave Engineering.  
*http://www.westwoodnj.gov/vertical/sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Reservoir\_Dam\_Report\_-\_Tables\_1\_and\_2\_12.6.11.pdf*.  
Accessed February 2016.

<sup>22</sup> Personal Communication. Darren Blankenbush. Westwood Borough Office of Emergency Management. January 2016.

<sup>23</sup> Meeting with Mayor John Birkner Jr., Benjamin Kezmarsky (Westwood Borough Administrator), Edward Senkevich (Westwood Borough Engineer), Adam Strobel (Bergen County), Jeremiah Bergstrom (Rutgers University), Barbara Heskins Davis (The Land Conservancy of New Jersey). December 2015.

<sup>24</sup> Hormoz Pazwash. December 2011. Pascack Brook Flood Study: Woodcliff Lake and Oradell Reservoirs. Boswell McClave Engineering.  
*http://www.westwoodnj.gov/vertical/sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Reservoir\_Dam\_Report\_-\_Tables\_1\_and\_2\_12.6.11.pdf*.  
Accessed February 2016.

<sup>25</sup> USGS National Water Information System: Peak Streamflow. USGS 01377500 Pascack Brook at Westwood NJ.  
*http://nwis.waterdata.usgs.gov/nwis/peak?site\_no=01377500&agency\_cd=USGS&format=html*.  
Accessed February 2016.

<sup>26</sup> Personal Communication. Jason Shvanda, U.S. Geological Survey. January 2016.

<sup>27</sup> "Flood Waters Hit Westwood Thursday." Westwood-Hillsdale Patch. June 2011.  
*http://patch.com/new-jersey/westwood-hillsdale/flood-waters-hit-westwood-thursday*. Accessed February 2016.

<sup>28</sup> Hormoz Pazwash. December 2011. Pascack Brook Flood Study: Woodcliff Lake and Oradell Reservoirs. Boswell McClave Engineering.  
*http://www.westwoodnj.gov/vertical/sites/%7BEFC400E6-A5E3-462B-B522-F7250102DEBD%7D/uploads/Reservoir\_Dam\_Report\_-\_Tables\_1\_and\_2\_12.6.11.pdf*.  
Accessed February 2016.

<sup>29</sup> "Westwood storms cause flooding issue." NorthJersey.com. June 2015.  
*http://www.northjersey.com/news/weather/storms-cause-flooding-issue-1.1358259*. Accessed March 2016.

<sup>30</sup> Meeting with Mayor John Birkner Jr., Benjamin Kezmarsky (Westwood Borough Administrator), Edward Senkevich (Westwood Borough Engineer), Adam Strobel (Bergen

---

County), Jeremiah Bergstrom (Rutgers University), Barbara Heskins Davis (The Land Conservancy of New Jersey). December 2015.

<sup>31</sup> Personal Communication. Darren Blankenbush. Westwood Borough Office of Emergency Management. January 2016.

<sup>32</sup> Bergen County Multi-Jurisdictional All-Hazards Mitigation Plan Update 2015. <http://www.co.bergen.nj.us/index.aspx?NID=779>. Accessed February 2016.

<sup>33</sup> Personal Communication. Darren Blankenbush. Westwood Borough Office of Emergency Management. January 2016.

<sup>34</sup> Personal Communication. Darren Blankenbush. Westwood Borough Office of Emergency Management. January 2016.

<sup>35</sup> Personal Communication. Darren Blankenbush. Westwood Borough Office of Emergency Management. January 2016.