

Stormwater Reconnaissance Plan for the Coastal Long Island Sound Watershed Westchester County, New York



Stormwater Reconnaissance Plan for the Coastal Long Island Sound Watershed Westchester County, New York

August 2013

Prepared by:
Westchester County Department of Planning
Westchester County Department of Public Works and Transportation

WESTCHESTER COUNTY EXECUTIVE

Robert P. Astorino

WESTCHESTER COUNTY BOARD OF LEGISLATORS

Kenneth Jenkins, Chair

WESTCHESTER COUNTY STORMWATER ADVISORY BOARD

Ex-Officio Members

Edward Burroughs, Chair, Commissioner of Planning
Mary Jane Shimsky, Legislator, 12th District, Board of Legislators

James Caggiano, P.E.

Alfred Gatta

Marc Godick

Sandra Reyes-Guerra

Anthony Landi, P.E.

Donald Marra

William Mascetta

James Palmer

Margaret Slavin

RECONNAISSANCE PLAN STAFF

Department of Planning

Edward Burroughs, AICP, Commissioner of Planning

Patrick Natarelli, Chief Planner

David Kvinge, AICP, RLA, CFM, Director of Environmental Planning

Robert Doscher, PWS, CPESC, Principal Environmental Planner

Paul Gisondo, Associate Planner

Anthony Zaino, RLA, Director of Design

Department of Public Works and Transportation

Jay Pisco, P.E., Commissioner of Public Works and Transportation

Jeffrey Dean, P.E., Assistant Civil Engineer

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
1. INTRODUCTION	10
2. WATERSHED DESCRIPTION	17
3. PRIOR STUDIES	31
4. FLOOD PROBLEM AREAS	47
5. LOCAL ORDINANCES AND CODES	97
6. FINDINGS	105
7. CRITERIA FOR FLOOD MITIGATION PROJECTS	107
8. RECOMMENDED ACTIONS	111
9. NEXT STEPS	124

APPENDICES

- A: Westchester County Stormwater Management Law
- B: Major Drainage Basins and Table of Municipalities
- C. Municipal Questionnaire and Flood Prone Areas Sample Rating Sheet
- D: Prior Studies Rating Methodology
- E. Letter Concerning FEMA ABFE Maps

EXECUTIVE SUMMARY

WESTCHESTER COUNTY STORMWATER MANAGEMENT LAW

The Westchester County Stormwater Management Law was adopted to address flooding problems, a situation of regional concern impacting every municipality in the county, by prioritizing projects to be funded through a partnership of local municipalities and the County.

Flooding tends to be intermunicipal in nature, and the Stormwater Management Law recognizes this and encourages municipalities to work together on solutions. To ensure the most appropriate approach and encourage the most effective use of limited resources, the law requires the Commissioner of Planning, in consultation with the Commissioner of Public Works and Transportation, to prepare reconnaissance plans with the cooperation of local municipalities, locally appointed watershed advisory boards and the County Stormwater Advisory Board appointed by the County Executive and Board of Legislators.

This reconnaissance plan is presented for the Coastal Long Island Sound watershed, running generally north to south down the center of the lower half of the county. The area is suburban in character with a moderate level of impervious surfaces associated with development. There is a wide variety of flooding problems within the watershed, most notably along Long Island Sound and its direct tributaries itself and smaller tributaries to the river, involving significant repetitive property damage and road closures.

PURPOSE OF THE RECONNAISSANCE PLAN:

The County Stormwater Management Law specifies that the reconnaissance plans compile and evaluate existing information about flood problem areas, provide a list of prioritized projects based on previous engineering studies or designs to be considered for funding, and present other recommendations for action. Reconnaissance plans do not represent a detailed, watershed-wide analysis with up-to-date hydrologic and hydraulic data and studies. Nor do they address the full range of natural or man-made disasters. Rather, they are evaluations of available information intended primarily to provide recommendations for physical projects and other actions to address flooding in each of Westchester's major drainage basins. The plans do discuss flooding problems and solutions in the context of the watershed; however, they do not provide a comprehensive analysis of the watershed and cannot be characterized as a flood mitigation study.

Local municipalities played a key role in the data collection for the reconnaissance plan. Previously completed studies related to municipal flooding were provided to the County reconnaissance plan team. Maps of each municipality were prepared and sent to the respective municipality accompanied by a questionnaire to be completed for each flood problem area identified by the municipality. This information was returned to the County reconnaissance team for review, evaluation and ranking.

In order for a proposed project to be considered for funding, it must meet the objectives of the Stormwater Management Law for design efficacy and cost efficiency. Designs must consider a variety of alternatives and ensure there will be no negative off-site impacts. Projects must also be combined with efforts to reduce the volume of stormwater runoff generated throughout the watershed. Municipalities must demonstrate effective efforts to reduce stormwater runoff from new development and redevelopment and reduce flood risk.

RECONNAISSANCE PLAN HIGHLIGHTS:

The review and evaluation of previous studies and any recommended projects in them as well as the identified flood prone areas illuminated three critical findings:

- Many of the previous studies about flooding in the watershed lacked sufficient information concerning any recommendations to be considered for funding to further these recommendations at this time;
- Recommendations made in reports by the Long Island Sound Watershed Advisory Committees 3, 4 and 5 in 1998, 2001 and 1997, respectively, though originally focused on addressing polluted stormwater runoff control to improve water quality, should be reconsidered for stormwater management to achieve flood mitigation;
- There is a need for some data, such as field-derived hydrological/hydraulic information from stream gauges; and
- There is a need for updated water quantity (flood) analyses for much of the coastal Long Island Sound watershed.

Flood Area Ratings and Flood Project Scores:

Two types of evaluations were conducted in the Reconnaissance Plan: Flood Problem Area Ratings and Flood Project Scores. Flood problem area ratings were based on the information submitted by the local municipality on their questionnaire and are used to compare the extent and impact of flooding at each location. Categories of flood impacts such as to homes, businesses, roadways or infrastructure were included in the formula used to evaluate flood problem areas. Emphasis was placed on problem areas that included potential impacts to public health and safety or potential damage to property and infrastructure. Flood problem areas were then either ranked low, medium or high based on the results of the analysis. It is important to note that while impacts that did not involve threats to public health or damage to property, such as temporary road closures, may have resulted in a lower ranking, those problem areas are included in the plan and eligible for further study and funding. Projects may be proposed by local municipalities regardless of their ranking. The ranking serves as a guide in the event of multiple proposals or limited resources.

Flood project scores were based on the information provided in the studies that address flooding, typically conducted by or for a municipality or, in some cases, by a group of residents. Flood project scores assess flood impacts, proposed improvements, benefits, potential impacts to other properties and the costs associated with them.

In many instances the flood studies did not provide the needed information to evaluate the extent of flooding that would be alleviated, the associated impacts to the municipality or the potential impacts up or downstream from the proposed improvement project.

Many of the Previous Studies Lack Sufficient Information:

Many of the areas of significant flooding have been studied, in some instances for many decades. However, the bulk of the studies are narrowly focused on site-specific solutions or geographic areas and do not include the types of comprehensive analysis to demonstrate solutions that meet the multiple goals described above. Most studies do not include an analysis of off-site impacts or the degree to which the proposed solution may benefit additional flood problem areas. In some instances, cost estimates or a quantification of project benefits were not included. Specific deficiencies for the existing studies are noted in this report. This, along with the lack of available detailed baseline data for the watershed, highlights the need for more comprehensive analysis to develop a list of potential projects for funding consistent with the law. While high priority flood problem areas were identified, many potential projects that may have been proposed were not adequately described in order to fully evaluate them.

Need for More Current Baseline Data:

One of the important lessons learned from the collection and review of previous studies and data on flood prone areas is that there is a lack of comprehensive and consistent baseline data of the county's storm events and associated flooding. Data such as stream flow and detailed weather data, particularly rainfall intensity, are essential to improving our understanding of how streams respond to various types of precipitation events and changing weather patterns, with storms of increasing intensity and frequency. This data would be used in computer models to more accurately predict the effectiveness of potential projects. In addition, more detailed data on the actual limits and impacts of flood events would also provide valuable information. Stream gauges installed by the County and others decades ago have long been defunct or abandoned. Federal and state agencies are also interested in reactivating these gauges and installing supplemental gauges such as tide gauges to gather needed data. Similarly, weather data for the variety of areas within Westchester, particularly for rainfall intensity, is difficult to locate and compile, and studies often use weather data from regional airports in Westchester, Long Island and Connecticut. A network of existing and new weather stations will provide much needed accurate data about precipitation events, which can be used over time to better predict flood events. Additionally, information from local municipalities and emergency responders on road closures, evacuations, and flood damage is essential to better understand watershed response to storms, assess vulnerability and estimate recovery costs.

Need for Analysis of the Entire Watershed:

While many studies have been conducted on flood problem areas throughout the watershed or on specific potential solutions to flooding problems, the studies do not provide adequate information to evaluate potential impacts to other areas within the watershed. Watershed modeling software is available and has been used in other watersheds in the county to evaluate various scenarios for both flood reduction and water quality improvement. With the additional baseline data collected as recommended above, watershed analyses should be performed to evaluate in a more comprehensive manner potential solutions for the identified flood problem areas. The County is well suited to conduct such analyses, the results of which can better inform land use and flood reduction decisions at all levels of government and allow analysis of costs and benefits of proposed solutions.

Project Funding Considerations:

The Stormwater Management Law strongly encourages intermunicipal cooperation and collaboration. The law requires that reconnaissance plans “identify local municipalities interested in executing Intermunicipal Agreements (IMAs) with the County” as well as recommend terms and conditions of the IMAs. Municipalities interested in participating in the funding program created by the Stormwater Management Law may demonstrate such an interest through the submission of a letter from the Chief Elected Official and municipal resolution from the governing body. Such documents must describe a willingness to work with other municipalities in the watershed as well as the County and must also express a willingness to implement the recommendations included in the reconnaissance plan. Participation in a watershed organization memorialized by an intermunicipal agreement among watershed municipalities is an excellent way to demonstrate a municipality’s level of commitment to working collaboratively. Municipalities may also find cost efficiencies when working together as a group to address the recommendations included in this plan.

Projects for flood mitigation must achieve the objectives described in the Conclusions section of this report. In addition, in order for the County to participate with local municipalities in funding projects to mitigate flooding, the following must be satisfied prior to submission of a request for bonding. If a municipality has a concern with one or more of these issues, they should consult with County staff prior to making a formal request. It may be possible to fund portions of projects that do comply with these requirements, while excluding County funding reimbursement for other portions of the project.

- Maximum of 50 percent of eligible costs. In no case can the County reimburse the municipality for costs exceeding 50 percent of the value of eligible costs as determined by the County. A detailed scope of work, identifying eligible and, if appropriate, non-eligible expenses will be prepared and become part of the intermunicipal agreement between the County and municipality. Any significant change in project scope may require Board of Legislators approval.

- Ownership interest. The County requires an interest in any property (through an easement or lease) for which bonded funding will be used. The interest must ensure that the improvements made will remain in place and functional in accordance with the intended design. The County must also have the authority to inspect, maintain and correct any changes made to any such improvements. While the intermunicipal agreement may assign one or more of these responsibilities to the municipality, any agreement with a property owner must ensure these rights for at least the life of any County bonds issued to fund the project.
- Municipal efforts to better manage stormwater runoff. The municipality must demonstrate efforts to address each of the municipal recommendations included in the reconnaissance plan. With few easily implemented practical opportunities to eliminate flooding problems, comprehensive efforts must include measures to reduce stormwater runoff generated from sites throughout the entire watershed. Many of these sound stormwater management practices are noted in reports by Watershed Advisory Committees 3, 4 and 5, <http://planning.westchestergov.com/long-island-sound>.

Partnership with State and Federal Agencies

In the past, municipalities and the County have worked with the United States Army Corps of Engineers (USACE) and the New York State Department of Environmental Conservation (DEC) in studying flooding in various parts of the county, particularly for large areas of flooding requiring large scale projects. A primary benefit of this partnership is the state and federal programs to fund the majority of the costs of such projects. However, there can be issues when working with federal and state agencies such as the time needed to complete the requisite studies, and there is increased competition for the decreasing amount of available funding. Plan development and review procedures are rigid and projects that are not initially developed and designed through the approval process of a federal or state agency may not be eligible for federal or state financial assistance.

Partnerships with other agencies such as the Federal Emergency Management Agency (FEMA) and New York State Office of Emergency Management (NYSOEM) should also be pursued as these agencies are excellent resources for information and technical advice and also offer grant programs that can be used to implement many of the recommendations included in this report. Other federal agencies such as the Natural Resources Conservation Service (NRCS) and Fish and Wildlife Service (USFWS) have provided technical advice and may be conduits for federal funding.

1. INTRODUCTION

This reconnaissance plan presents a compilation of existing available data, studies and reports combined with research by County staff and information provided by municipal officials concerning flooding within the Coastal Long Island Sound Watershed (refer to the Major Drainage Basin map included in Appendix B). What is contained in this report is not new or surprising to those familiar with the extent of flooding in Westchester County. What does become clear is that the solutions to reduce or eliminate flooding are complex and very often require intermunicipal and private property owner cooperation. While the results did not uncover any single solution to flooding, the information that was ascertained will prove useful in prioritizing areas subject to flooding and in efforts to develop practical and feasible strategies to address flooding and its impacts.

The Coastal Long Island Sound Watershed, like all of the watersheds in the lower portion of the county, is moderately developed with a large amount of impervious surfaces. Floodplains and wetlands have been filled over the decades, decreasing the amount of available floodplain storage. This combination of increased areas of imperviousness, loss of flood storage, piped storm sewer systems and channel modifications have resulted in watersheds that respond to storms more quickly, resulting in more flooding and increased risk to property and safety. Increases in the frequency of high intensity storms only make matters worse. Home rule control places land use control and, consequently, the responsibility of managing that risk with Westchester's municipalities. However, flooding problems are regional in nature, requiring a significant amount of intermunicipal collaboration.

Almost all of the watershed municipalities have identified at least some areas of flooding. Engineering studies have been conducted over the years for many of those areas. A review of those studies, conducted as part of preparation of this report, found that they are general in nature and do not adequately detail projects that can be moved forward for design. Additional analysis is required to identify and prepare conceptual plans for specific projects, evaluate the costs and benefits of those projects and ensure that they do not create or exacerbate flooding elsewhere. A summary and evaluation of the studies along with detailed discussion of problems and potential solutions (or lack thereof) is included in the Summaries and Maps of Prior Studies Chapter of this report.

The reconnaissance plan municipal questionnaire and survey that were used in this report were created to collect and compile information from municipal officials and staff on the flood problem areas of greatest concern and on any potential projects or solutions to consider for funding. The information that was received is useful in characterizing flooding within local municipalities and the damage associated with it. A description, evaluation and prioritization of flooding areas identified by the municipalities are provided in the Flood Prone Areas Description and Maps Chapter of this report.

The research and review conducted for the reconnaissance plan did highlight a rather significant issue while continuing to move forward with project design and implementation—the need for more accurate information concerning stream flow and weather events. Currently, data for stream flow are lacking. Stream gauges installed by the County and others decades ago are long defunct or abandoned. Many studies of weather patterns utilize weather data provided by the Westchester County Airport or a National Oceanic and Atmospheric Administration (NOAA) weather station in Bridgeport, CT. While there are many weather stations throughout the county, the data are not compiled and made available in a meaningful way. The installation of stream gauges and the systematic collection of data on rainfall events (in particular intensity) are needed to provide more accurate information on weather patterns and how streams respond to these rainfall events. This will not only be useful in planning and engineering flood prevention projects but can also be used to better predict and warn residents and businesses, thus reducing costs associated with emergency response.

Purpose of this Report

In 2011, Westchester County adopted the Westchester County Stormwater Management Law (added as Article III-A of the County Code by Local Law 5-2011). The County determined that the local municipalities within the county should not be solely responsible for stormwater management with respect to flooding and that the County should cooperate with local municipalities as well as the governments of the United States, the State of New York and the adjoining states, counties and other localities for the purpose of managing stormwater to address flooding. It is also in the best interest of county residents for the County to create incentives for local municipalities to work cooperatively with each other and with the County on a watershed basis and to establish partnerships for the preparation of watershed-wide reconnaissance plans (Westchester is divided into six major drainage basins, also referred to as watersheds as described in Appendix B). When economically feasible, the County could consider providing financial assistance to local municipalities who cooperate with the County for approved stormwater management projects that are contained in the reconnaissance plans which are developed by the County with the assistance and cooperation of local municipalities and meet established criteria.

Stormwater Management Law

The Westchester County Stormwater Management Law requires that the Commissioner of Planning, working with other County departments, local municipalities, and others, prepare a reconnaissance plan for each of Westchester's six major drainage basins. The law calls for creation of a County Stormwater Advisory Board and recommends creation of basin-wide advisory boards to assist in the development of the reconnaissance plans. The law specifies that the reconnaissance plans include a comprehensive map and description of the watershed, depicting streams, water bodies, stormwater infrastructure, areas of flooding problems, and the locations of potential flood remediation projects. The reconnaissance plans are intended to

provide a list of recommended projects for Phase I (design) and Phase II (construction) funding. The Law also requires the Commissioner of Planning to prepare semi-annual reports on the status of the reconnaissance plans and any current or proposed stormwater projects. The Stormwater Management Law is included as Appendix A of this report. A map of the major drainage basins and list of municipalities with land within each basin is provided as Appendix B.

Please note that the terms “watershed” and “drainage basin” are used interchangeably throughout this report. In addition, the term “stormwater” is used as a single word for consistency and follows the USEPA Communications Stylebook.

County Stormwater Advisory Board

During 2011, the County Executive and the County Board of Legislators each appointed five members to the County Stormwater Advisory Board (SAB). Members of the SAB are from a broad geographic representation of the county and have specific professional training, familiarity with county and municipal government, or experience and involvement in stormwater management. The SAB includes two non-voting ex-officio members, a county legislator and the Commissioner of Planning. The Commissioner of Planning serves as Chair. The Stormwater Advisory Board is charged with providing advice to the Commissioner of Planning, the Commissioner of Public Works and Transportation, the County Executive, and the County Board of Legislators in matters relating to stormwater management. The law also calls on the SAB to perform and exercise such other and related duties required by the Commissioner of Planning, the Commissioner of Public Works and Transportation, the County Executive, and the County Board of Legislators as needed.

The Board provides valuable insight and recommendations, and it has been actively involved in the review and approval of the process being followed and materials being developed in connection with the drafting of the reconnaissance plan and outreach efforts to Westchester municipalities.

Basin-wide Watershed Advisory Boards

While not a requirement, the law emphasizes the importance of watershed-wide intermunicipal collaboration and strongly encourages the formation of basin-wide watershed advisory boards for each of the major drainage basins. The law suggests that the members of such advisory boards be appointed by the chief elected official of each local municipality with land within the watershed. Inter-municipal agreements can be used to document the commitment of members to work together collaboratively. Existing watershed-wide organizations, such as the Long Island Sound Watershed Intermunicipal Council (LISWIC) and the Northern Westchester Watershed Committee (NWWC) may be used rather than forming a specific body for this task. Basin-wide advisory boards are charged with advising the Commissioner of Planning in the preparation of the reconnaissance plans and making watershed-wide recommendations of stormwater management problems and projects.

County staff have attended and made presentations to the Long Island Sound Watershed Intermunicipal Council (LISWIC).

All Westchester municipalities were informed of the Stormwater Management Law, including requirements and stipulations in the law, the reconnaissance planning process, available data, current outreach efforts, and other County projects and efforts. Information packets, including maps and questionnaires to document areas of significant flooding problems, were sent to the municipalities in all the county watersheds.

Reconnaissance Plan Contents

The Stormwater Management Law requires that the reconnaissance plans address certain specific items. The plans utilize existing data to avoid lengthy data collection efforts and to be completed as quickly as possible. The Coastal Long Island Sound Watershed Reconnaissance Plan is generally organized as follows in compliance with the requirements of the Stormwater Management Law.

- **Watershed Characteristics.** A description of the watershed based on existing available data.
- **Prior Studies.** An overview of prior studies and other information concerning flooding in the watershed. This review focused on more current studies conducted within the past ten years because it was found that many prior studies proposed projects that were not deemed feasible, did not provide adequate information or did not meet current standards or the goals of the Stormwater Management Law. Studies older than approximately ten years were cursorily reviewed and not evaluated in detail.
- **Flood Problems.** Identification of areas subject to flooding and flood damage, based primarily on completed maps and questionnaires received from local municipalities.
- **Potential Flood Damage Reduction Projects.** Description of projects to reduce flooding and flood damage. In areas where no specific projects are identified, recommendations for additional engineering analysis are described.
- **Intermunicipal Agreement (IMA).** A sample intermunicipal agreement to be entered into for local municipal participation. When a significant number of projects are identified for Phase I (planning and design) and/or Phase II (construction) funding, a sample IMA will be developed, specifying details of the project as well as requirements to ensure intermunicipal cooperation and the implementation of non-structural efforts to reduce flooding and flood damage.
- **Analysis of Codes and Ordinances.** A general analysis of local codes and ordinances concerning impacts to floodplains and management of flood waters and stormwater runoff.

- Recommendations. A prioritization of projects, with estimates of costs and benefits, documentation of local municipal interest in the project, and steps to take to move projects forward.

Local Municipal Data and Outreach

One of the critical components of the reconnaissance plans is input from local municipalities concerning the areas of most severe flooding and potential solutions to flooding problems.

Westchester County used its extensive GIS capabilities and data layers as part of the preparation of the reconnaissance plan. The County's GIS was used to make working maps for each municipality depicting the drainage basin boundaries, roads, streets, parking areas, topography, wetlands, watercourses, water bodies and FEMA-designated special flood hazard areas. The working maps were used by local municipalities to document the areas of most significant flooding. Once the maps were returned to the County, the areas highlighted by the local municipalities were brought into the GIS and an analysis and description were performed for each identified flood area.

In conjunction with the maps, the departments of Planning and Public Works and Transportation (DPWT) developed a questionnaire that was used to collect information about each flood area. The maps and questionnaire were reviewed with the SAB before sending to the municipalities. To date, maps and questionnaires have been returned by 14 of the 15 municipalities of the Coastal Long Island Sound watershed. The sample questionnaire and rating sheet are included in Appendix C. This information assisted in the evaluation and ranking of flood problem areas and potential solutions from local municipal officials.

Simultaneously, County staff compiled existing data and information for each municipality. The County Department of Planning has on file copies of local ordinances and codes, studies and reports and maps and information. A list of available data and studies was compiled by staff and is included in a spreadsheet in this plan. Copies of the spreadsheet were given to each municipality as part of the outreach packet for the municipality to review and update as necessary. Staff reviewed and prepared executive summaries for each of the reports on the list (only reports less than ten years old are included). The executive summaries of those reports and studies are included in this plan.

Evaluation Criteria and Additional Data

Additional data were also collected from various sources including other County departments and state and federal agencies. These data were also used in addition to the data collected from municipalities to evaluate problem areas and potential projects.

Planning and DPWT staff developed goals and evaluation criteria for flood mitigation projects, with input from the SAB. These goals include the functional effectiveness of the project, a high benefit to cost ratio, the project's ability to not create or exacerbate flooding problems off-site,

and the overall costs of the project. These criteria were applied to the information supplied by the municipalities on each questionnaire and map in an effort to objectively evaluate the individual flood areas and proposed projects identified in prior studies. The results of the analysis determined that more engineering study is required for the proposed flood mitigation projects to demonstrate that they meet the criteria. Flood problem areas were categorized High, Medium or Low priority rather than the numeric values resulting from the criteria evaluation.

Recommendations

In addition to the evaluation and ranking of projects identified in prior studies and the flood problem areas identified by local municipalities, the reconnaissance plan includes a number of general recommendations for municipalities and the County to address flooding. Such recommendations include stricter development standards to reduce the volume of stormwater generated from development, using zoning to redirect development from flood prone areas, and protection of floodplains and natural resources that store floodwaters. In addition to the general recommendations, the reconnaissance plan provides next steps for both local municipalities and the County to take towards implementation of the plan.

2. WATERSHED DESCRIPTION

Long Island Sound is an estuary where salt water from the ocean mixes with fresh water from inland streams and rivers. Bounded by Connecticut and Westchester County to the north and Long Island to the south, it is approximately 110 miles long and up to 21 miles across at its widest point.

Like other estuaries, Long Island Sound abounds with fish, shellfish and waterfowl. It provides feeding, breeding, nesting and nursery areas for diverse plant and animal life. Unlike other estuaries, though, Long Island Sound has more than one connection to the ocean. Rather than having a major source of freshwater at its head and having a wide mouth that empties into the ocean, Long Island Sound is open at both ends, through “The Race” at the eastern tip of Long Island and at the confluence of the East River and New York Harbor. Most of its freshwater comes from north-to-south flowing rivers, such as the Connecticut and Housatonic rivers in Connecticut, and a series of much smaller streams and rivers that, cumulatively, contribute substantial amounts of freshwater to the Sound. These smaller watercourses include Stephenson, Pine, Blind and Beaver Swamp brooks, and Mamaroneck, Hutchinson and Sheldrake rivers in Westchester County.

The Sound is unique in the degree to which it provides recreational and commercial value to the region. It is in the midst of one of the most densely populated regions of the United States. Some 10 million people live in the Long Island Sound watershed and millions more flock yearly to the Sound for recreation. Research commissioned by the joint state and federal Long Island Sound Study estimates billions of dollars is generated annually in the regional economy from boating, commercial and sport fishing, swimming and beach-going. The ability of the Sound to support these uses is dependent on the quality of its waters, living resources and habitats. Westchester’s economy also benefits from many other valuable uses of the Sound, such as cargo shipping and boat excursions. With the uses it serves and the recreational opportunities it provides, Long Island Sound is among the most important estuaries in the nation.

Because of the Sound’s many opportunities and beauty, it has attracted many property owners, businesses and residents to its shores and flood zones and those of the watercourses and water bodies that drain into it. Storms such as the April 2007 nor’easter, Hurricane Irene and Tropical Storm Lee in 2011 and Hurricane Sandy in 2012 highlighted the vulnerability of the coastal Long Island Sound watershed in Westchester to flooding and its impacts.

It should be noted that the Long Island Sound watershed in Westchester is separated by state boundaries into two distinct areas. The coastal Long Island Sound watershed borders the Sound and its tributaries drain directly into it. The inland Long Island Sound watershed abuts Connecticut and its Long Island Sound tributaries flow through southwestern Fairfield County before draining into the Sound. This reconnaissance plan focuses on the coastal Long Island Sound watershed in Westchester.

The Nature of Westchester’s Long Island Sound Watershed

The Long Island Sound watershed in Westchester County comprises approximately 68,000 acres and supports approximately half of the county’s population. Between the northern and southern

portions of Westchester County, there are drastic demographic and land use differences. The northern section of the county is less developed and less populated compared to the much more urban, highly populated character of the southern portion of the county. This dichotomy can also be seen in the coastal Long Island Sound watershed.

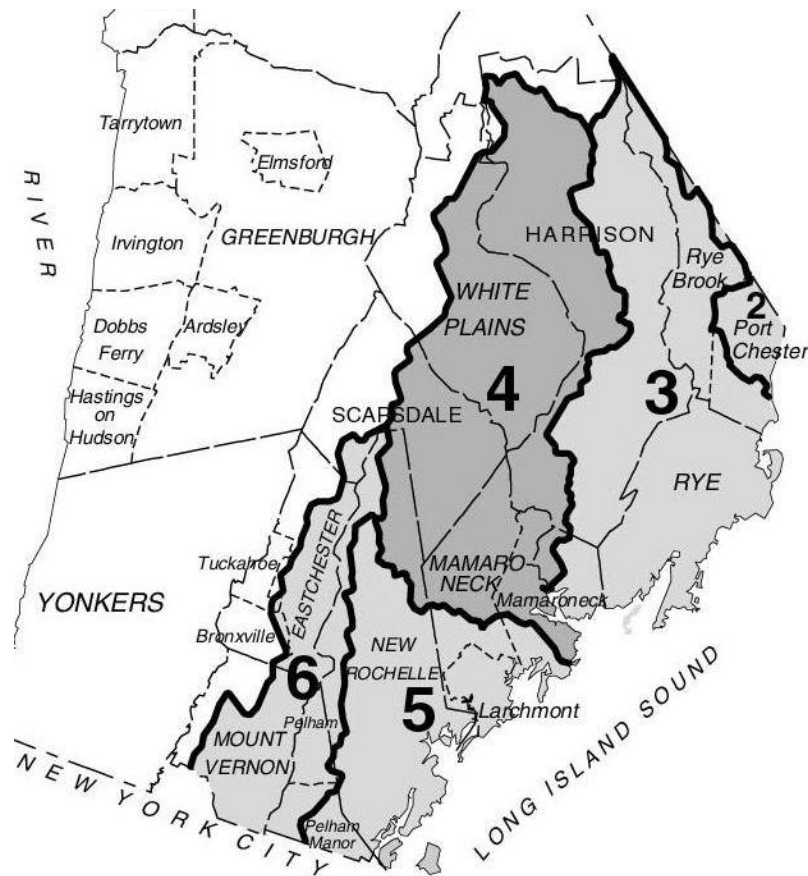
The table below provides a comparative analysis of the land use difference between the coastal portion of the Long Island Sound watershed and the inland portion based on data from 2000. In summary, the largest differences are in the amount of undeveloped land (6,889 acres for inland and 847 acres for coastal) and in the total amount of commercial, retail, office and mixed use land coverage (412 acres in the north and 3,002 acres in the south). These general differences exist today.

Long Island Sound Watershed Land Use Summary

Land Use Type	Inland Watershed Area (Acres)	Coastal Watershed Area (Acres)	Total Watershed Area (Acres)
Undeveloped Land	6,889	847	7,736
Open Space (Public and Private)	2,893	7,502	10,395
Commercial/Retail/Office/Mixed Use	412	3,002	3,414
Residential	14,890	23,628	38,518

Nineteen Westchester County municipalities in 10 subwatersheds of the larger Long Island Sound watershed contribute drainage to the Sound. Fourteen are partially or wholly in the coastal Long Island Sound watershed.

Area Number	Subwatersheds of Long Island Sound	Municipalities
1	Silvermine, Mill and Mianus Rivers (Inland)	Bedford, Lewisboro, North Castle, Pound Ridge
2	Byram River (Inland and Coastal)	Bedford, New Castle, North Castle, Port Chester
3	Blind, Beaver Swamp, and Brentwood Brooks, and Milton and Port Chester Harbors (Coastal)	Harrison, Mamaroneck (Village), Port Chester, Rye Brook, Rye City
4	Mamaroneck and Sheldrake Rivers, and Mamaroneck Harbor (Coastal)	Harrison, Mamaroneck (Town and Village), New Rochelle, Scarsdale, White Plains
5	Pine, Stephenson, and Burling Brooks, and Larchmont Harbor (Coastal)	Mamaroneck (Town and Village), Larchmont, New Rochelle, Pelham, Pelham Manor
6	Hutchinson River (Coastal)	Eastchester, Mount Vernon, New Rochelle, Pelham, Pelham Manor, Scarsdale



Area Nos. 2-6 in Coastal Long Island Sound Watershed

For purposes of this reconnaissance plan that focuses on the *coastal* Long Island Sound watershed in Westchester County, area No. 1 above is not included because it represents Westchester's *inland* Long Island Sound watershed.

Subwatershed Area No. 2

Most of the Byram River drainage basin, including its headwaters, is in Westchester County's inland Long Island Sound watershed. The small portion in Westchester's coastal Long Island Sound watershed runs along the county's border with Fairfield County, Connecticut, with the largest area covering most of Port Chester at the river's mouth. The tidal section of the river channel serves as the boundary between Port Chester and Greenwich, Connecticut. None of the freshwater channel is in the coastal Long Island Sound watershed in Westchester County.

Flooding associated with the freshwater portion of the Byram River in the coastal Long Island Sound watershed in Westchester County primarily impacts Greenwich, just south of constructed levees at Pemberwick in Greenwich. Previously recommended federal flood damage reduction measures, which would have included the continuation of the levee features to the south, were not constructed due to local concerns about the negative aesthetic impacts of the levees. A secondary flood-related impact area of the freshwater portion was identified at Bailiwick Bridge in Greenwich. This bridge is small, with low clearance. It consequently traps debris in the river

channel, effectively acting as a dam. Its stone facing was stripped by raging flood waters during the April 2007 nor'easter. Flooding associated with the tidal portion of the Byram has impacted Port Chester, especially the village's business district.

Subwatershed Area No. 3

The size of each subwatershed for No. 3, above, for example, is:

<u>Subwatershed</u>	<u>Total Area</u> (Acres)
Blind Brook	6,477*
Beaver Swamp Brook	1,962
Beaver Swamp Brook West	1,129
Coastal Long Island Sound	1,067
Port Chester Harbor	848
Milton Harbor	272
TOTAL	11,755

*that portion of the subwatershed in Westchester County.

Land uses within the study area include residential areas (3,132 acres), golf courses (1,430 acres), institutional/public assembly uses (1,250 acres), open space (717 acres), undeveloped land (419 acres), commercial/retail uses (252 acres), and manufacturing/industrial/warehousing uses (48 acres). Other land uses include transportation/communication/utility, office and mixed uses, which total 4,319 acres. The balance, 188 acres, consists of surface water (excluding streams). Ninety-four percent (94 percent) of the roads (189,531 linear feet of roadway), and the properties thereon, in the study area are connected to public sewers; the balance is served by septic systems.

Wetlands

Approximately 921 acres of freshwater wetlands and 94 acres of tidal wetlands exist within the study area, yielding a total estimated acreage of 1,015. This estimate may be low. It is based only on areas of hydric soil (somewhat poorly drained, poorly drained, very poorly drained and flood plain) identified by the USDA-Natural Resources Conservation Service's *Soil Survey for Putnam and Westchester Counties* (1994). This survey is generally accurate to plus or minus two acres; therefore, hydric soil inclusions (wetlands) smaller than two acres are not counted in this estimate.

Five State-designated freshwater wetlands exist within the study area: NYS DEC Nos. G-3 and G-9 in the Blind Brook subwatershed in the Town/Village of Harrison and NYS DEC Nos. J-1, J-3 and J-4 in the Beaver Swamp Brook subwatershed in the City of Rye. State-designated tidal wetlands also occur along the coasts of Rye and the villages of Mamaroneck and Port Chester. The City of Rye co-regulates tidal wetlands with the State of New York.

Watercourses and Water Bodies

Approximately 188 acres (1.6 percent) of the 11,825-acre area are covered by surface water (excluding streams) and approximately 1,497 acres (12.7 percent) are located within the 100-year flood plain. The land adjacent to Beaver Swamp Brook and, in particular, Blind Brook is substantially developed between the Long Island Sound shoreline and Interstate 95. Development adjacent to Blind Brook also is prevalent immediately north of Interstate 95 and the vicinity of Interstate 287. The density of development ranges in intensity from athletic fields to office building complexes to single-family homes on lots of less than 5,000 square feet. Beaver Swamp Brook and Blind Brook also have had significant flooding during this century. Some of the largest events occurred in July 1938, September 1944, October 1955, March 1962, June 1972, September 1975, April 2007, August 2011, September 2011 and October 2012. These storms caused extensive damage to houses, yards, streets and public buildings along these streams. Flooding along Blind Brook is caused by narrow channel width, obstructions, inadequate bridge openings, and, in the lower reaches, by tidal backwater. Flooding along Beaver Swamp Brook is primarily the result of low-lying adjacent land.

Steep Slopes

The southern and northern portions of the study area contain considerably fewer steep slopes (gradient of 15 percent or more) than the central portion between the Hutchinson River Parkway and Interstate 95. Steep slopes are most prevalent in the Blind Brook corridor.

Infrastructure

During a 2000 inventory, approximately 18 dry (detention) stormwater management basins and 27 wet (retention) basins were identified in the area. The majority of dwelling units and businesses are connected to one of three county sewage treatment plants, two of which are located in the study area (one in Rye, the other in Port Chester). The study area is divided into three sewer districts: the Port Chester, Blind Brook and Mamaroneck districts. Ninety-four percent (94 percent) of the roads (189,531 linear feet of roadway), and the properties thereon, are connected to public sewers; the balance is served by on-site septic systems.

Subwatershed Area No. 4

The watersheds of the Mamaroneck and Sheldrake rivers and Mamaroneck Harbor cover 24.7 square miles of Westchester County. This area, from just south of the Kensico Reservoir to Mamaroneck Harbor, is nearly 10 miles long. It stretches nearly four miles at its widest point from eastern New Rochelle to central Harrison. A total of 34.8 linear miles of streams wend their way through these watersheds, which make up the area. They all eventually work their way south to Long Island Sound.

The Mamaroneck River originates in north White Plains and Harrison and flows south to Mamaroneck Town and Village, where it empties into Mamaroneck Harbor. The Sheldrake

River originates in north Scarsdale and New Rochelle and empties into the Mamaroneck River in Mamaroneck Village.

The watersheds' terrain is gently rolling in the north and flatter near the mouth of the Mamaroneck River. The ridges generally extend in a north-to-south direction. Ground elevations range from sea level at the mouth of the Mamaroneck River to approximately 500 feet above sea level in the watershed's northwest corner.

Mamaroneck Harbor consists of inner and outer harbors, the two being connected by a channel having a width of approximately 350 feet. This inner harbor is made up of two basins, the East Basin and West Basin. The two basins are separated by a peninsula occupied by Harbor Island Park. The outer channel faces Long Island Sound.

Land uses in the area's northern portion are generally low to medium density residential with some public parkland and commercial (retail) areas. Several golf courses also occupy a substantial portion of the northern study area. The City of White Plains, occupying the northern and central portions of the study area, consists of a mix of more densely developed residential and commercial land uses largely dominated by office, retail and institutional uses. The City of New Rochelle occupies the area's west side, where low to medium density residential uses are dominant. Aside from publicly and privately owned recreational uses (mostly golf courses), the southern portion of the study area is more densely developed and contains the bulk of the area's retail and light industrial areas.

Streams

The coastal Long Island Sound watershed consists of subwatersheds to the Mamaroneck and Sheldrake river, Mamaroneck Harbor, and coastal Long Island Sound in Mamaroneck Town and Village. All of these are part of the larger Long Island Sound watershed. The study area covers portions of the Town/Village of Harrison, Mamaroneck Town and Village, City of New Rochelle, Village of Scarsdale, and City of White Plains.

Mamaroneck River

Originating in small wetlands and ponds north of Forest Lake in Harrison, at an elevation approximately 430 feet above sea level, the river flows south along the eastern boundary of the City of White Plains. It joins the East Branch near the junction of Anderson Hill Road and Westchester Avenue. The Mamaroneck River flows another 2.5 miles to its confluence with the West Branch, where it forms the river's main stem below Spring Lake near Interstate 287. Human encroachment into the stream corridor and manipulation of the stream channel are byproducts of intense residential construction in and around the river's headwaters. River width in the headwaters range from two to 10 feet. Stream depths there were reported to average from a few inches to about a foot.

The main stem, or middle reach of the Mamaroneck River, then flows southeasterly, paralleling Westchester Avenue to the Hutchinson River Parkway, then southeasterly, paralleling the parkway to its intersection with Mamaroneck Avenue. Below the parkway, the river flows

south to its confluence with the West Branch of the Mamaroneck River at the Mamaroneck Reservoir.

South of the Mamaroneck Reservoir, the river forms the municipal boundary between Mamaroneck Village and Harrison. At Interstate 95 (New England Thruway), the Mamaroneck River flows southward through Mamaroneck Village, where it joins the Sheldrake River and finally empties into Mamaroneck Harbor on Long Island Sound.

The drainage area, or watershed, of the Mamaroneck River is 17.4 square miles. It is dominated by suburban residential neighborhoods as well as tracts of urban commercial (retail and light industry). High density residential development also has occurred throughout the middle and lower portions of the watershed. County-owned parks and privately owned golf courses make up the largest blocks of open space.

Two principal tributaries enter the Mamaroneck River, one from the east and one from the west. The East Branch of the Mamaroneck River is the furthest upstream tributary along the Mamaroneck River. It originates immediately south of Rye Lake in north Harrison near the intersection of Westchester Avenue and Anderson Hill Road. The West Branch originates immediately south of the Hutchinson River Parkway near Mamaroneck Avenue. The surrounding area's land use is medium density residential.

East Branch

The East Branch of the Mamaroneck River is 3.3 miles long. The main stem is 1.9 miles long north of its confluence with the east branch. The east branch originates from a small pond in north Harrison at about 400 feet above sea level and then flows southeast 0.7 miles into Forest Lake. South of Forest Lake, it flows westerly to its confluence with the main stem. Spring Lake, also known as Croker Pond, is approximately 900 feet above the confluence of the east branch and main stem.

West Branch

The West Branch of the Mamaroneck River is the smallest of the Mamaroneck River's two primary tributaries, draining an area of 2.3 square miles just south and southeast of downtown White Plains. The west branch originates from a wetland and pond adjacent to Archbishop Stepinac High School on Mamaroneck Avenue. The river here is 200 feet above sea level and flows about 2.75 miles south and southwest through several stormwater management basins to its confluence with the main stem near the intersection of Mamaroneck Avenue and Hutchinson River Parkway. The west branch's average slope is approximately 56 feet per mile, making for a relatively gentle descent southward.

Flooding along the Mamaroneck River is most predominant downstream of the Westchester Joint Water Works (WJWW) Dam next to Mamaroneck Avenue. The flooding is suspected to be largely caused by inadequate channel capacity, restrictions by low bridges, and expansion of impervious surfaces in the watershed. Property most often affected downstream of the WJWW

dam include both residential and commercial structures, bridges and roads. Transportation disruptions have also occurred from street flooding.

Sheldrake River

The Sheldrake River is the largest tributary of the Mamaroneck River. The Sheldrake River watershed drains approximately 6.1 square miles and comprises the upper Sheldrake River (above and including the Larchmont Reservoir) and lower Sheldrake River (below the Larchmont Reservoir), the east branch, the main tributary to the east branch, and various smaller tributary streams. The Sheldrake River drainage system encompasses part of Mamaroneck Town, New Rochelle, Scarsdale, and White Plains.

The upper portion of the Sheldrake River is longer than the lower portion and has an average width of about two feet and depth of a few inches. It originates in a residential area of White Plains near Cushman Road and flows south through Scarsdale, New Rochelle, and Mamaroneck Town before entering Sheldrake Lake (Larchmont Reservoir).

From its origin, the river flows south under Cushman Road, along Willow Lane and under Sheldrake Road through a medium-density residential neighborhood. The river then enters a culvert running partly under Fenway Golf Course, where it re-surfaces and drains into Fenway Pond. The pond is approximately 150 feet wide and 350 feet in length. From the pond, the river flows south/southwest through a residential neighborhood in the vicinity of Mamaroneck Road. The river then flows past the Heathcote Five Corners intersection from Scarsdale to New Rochelle, eventually ending up in Carpenter Pond. The river flows over the dam at Carpenter Pond, where it widens to an average width of 15 feet and reaches depths of up to 1 foot. The river then flows south under the Hutchinson River Parkway and along Pine Brook Boulevard for approximately 1.5 miles where it enters the Larchmont Reservoir (also known as Sheldrake Lake). The river is fed from the “upper” reservoir over a spillway into the “lower” reservoir (also known as Goodliffe Pond).

A dam and spillway at the south end of the “lower” reservoir drains into a seven-foot-wide channel that flows east through the Bonnie Briar Golf Course and next to Brookside Drive. From Goodliffe Pond, the Sheldrake River flows through Mamaroneck Town nearly parallel to Weaver Street and south to Valley Stream Road. At this point, the Sheldrake River is joined by the east branch. The Sheldrake River flows through a series of small waterfalls to Gardens Lake (also known as the Duck Pond). Downstream from Gardens Lake, the river turns northeast through an industrial section of Mamaroneck Village and carried in culverts underneath the Interstate 95, joining the Mamaroneck River just south of the interstate at Columbus Park in Mamaroneck Village business district.

The East Branch of the Sheldrake River originates in Scarsdale and flows south through the Bonnie Briar Country Club to meet the east tributary at Fenimore Road. Below Fenimore Road, the east branch flows through Rockland Avenue to meet the Sheldrake River below Valley Stream Road.

The Sheldrake River and its east branch, as well as most of the other major tributaries to Long Island Sound in Westchester County, have been classified by the New York State Department of Environmental Conservation as at least Class C. According to this state water quality classification, Class C watercourses should be suitable for fishing and fish propagation and discharges to these watercourses must meet standards that enable those uses. Class C watercourses also are suitable for primary and secondary contact recreation even though other factors may limit the use for that purpose. Water quality standards for Class C watercourses include limitations on fecal coliform, pH, total dissolved solids, and dissolved oxygen.

Major Surface Water Bodies

Forest Lake

Forest Lake is the most northerly major water body. It is just south of the headwaters of the Mamaroneck River in Harrison. The lake covers approximately 11 acres. State-designated wetland No. G-8 is next to the lake's northernmost inlet. A concrete dam regulates the lake's outflow at the south end of the lake. The lake discharges into state-designated wetland No. G-6. Land along the lake's west bank is densely wooded, although a large single-family residential development has recently been constructed north and west of the lake just beyond the wooded strip and wetland No. G-8. Nine new single-family houses also have been built next to Park Avenue on the lake's east bank.

Silver Lake

Silver Lake is the largest body of water in the Mamaroneck River subwatershed, covering 42 acres. It is near the headwaters of the main stem of the Mamaroneck River in and forms the boundary of Harrison and White Plains. The watershed of Silver Lake's tributary (the headwaters of the Mamaroneck River) is 0.6 square miles and consists largely of the undeveloped County-owned Silver Lake Park and newly developed residential neighborhoods in Harrison. The state's water quality classification for the tributary is Class D, and will not support fish propagation. The state's water quality classification for Silver Lake is Class B. Best uses are primary and secondary contact recreation and fishing. According to the state classification, Silver Lake is suitable for fish propagation and survival.

Mamaroneck Reservoir (Sheldrake Lake)

The Mamaroneck Reservoir is east of Saxon Woods County Park in Mamaroneck Village and Harrison. It is east and north of Mamaroneck Avenue and west of Winfield Avenue, as well as south of corporate office development. A dam forming the reservoir was constructed for water supply purposes east of Winfield Avenue in Harrison in 1932. The lake basin was a former stream valley which was deepened and enlarged as part of the dam's construction. Use of the reservoir as a water supply was terminated in 1972. The reservoir was drained but allowed to refill over time. Currently, the Mamaroneck Reservoir has a state water quality classification of A. Best uses are as a water supply for drinking and culinary or food processing purposes, and primary and secondary contact recreation and for fishing.

Larchmont Reservoir (Sheldrake Lake) and Goodliffe Pond

Larchmont Reservoir, also known as Sheldrake Lake, is a 22-acre lake formerly used by Larchmont as a source of drinking water. Its use as a reservoir ended and its use as a stormwater management facility began in 1975. Various flood control proposals over the past two decades have noted the flood waters storage capacity of the Larchmont Reservoir. The lake is the largest water body in the Sheldrake River subwatershed and has a drainage basin of approximately 2,050 acres, most of which has been developed into residential neighborhoods and roads. It is formed by a dam across the Sheldrake River.

The lake's dam was built in 1924 and elevated in 1935 when a concrete cap was placed on the existing masonry structure. A 100-foot-long concrete receiving channel at the dam's spillway discharges into Goodliffe Pond, which is immediately south of the lake.

Goodliffe Pond is within the Larchmont Reservoir–James G. Johnson Conservancy and straddles the border of New Rochelle and Mamaroneck Town. It has been locally designated a Critical Environmental Area. In 1984, Larchmont dedicated the reservoir and pond in perpetuity as a conservation area dedicated to specific public uses, including education, open space and flood control.

Low- to medium-density residential neighborhoods and a golf course surround the protected open space that nearly encircles both Larchmont Reservoir and Goodliffe Pond. The open space consists of municipally owned woodlands, including the conservancy.

Croker Pond (Spring Lake)

Croker Pond, also called Spring Lake, is next to the East Branch of the Mamaroneck River north of Anderson Hill Road off Danbury Road in White Plains. It covers more than five acres immediately north of the confluence of the east branch and main stem. The lake's drainage basin has experienced a construction boom and is nearly completely developed into residential neighborhoods. The west bank, though, is relatively steep and is still forested.

Bloomingdale Pond

Bloomingdale Pond, southwest of Interstate 287 next to Bloomingdale Road in White Plains, is next to city-owned open space and lands owned by New York Hospital. About an acre in size, the pond is fed from the south by a small intermittent stream, locally known as Cassaway Brook. The pond discharges to the north, where its waters later enter the Mamaroneck River near Interstate 287, approximately 1,500 feet north of Bloomingdale Pond.

Carpenter Pond

Carpenter Pond in New Rochelle is surrounded by city-owned woodlands and wetlands. It is formed by a dam across the Sheldrake River immediately north of Daisy Farms Road west of Weaver Street. Less than an acre in size, the pond acts as a detention basin for the Sheldrake River, trapping sediment and other nonpoint source pollutants. The woodlands and freshwater

wetlands next to the pond also act to filter out pollutants. The pond is considered to be an important natural resource because of its water quality protection capabilities.

Subwatershed Area No. 5

This area comprises the Stephenson Brook, Pine Brook, Burling Brook and Larchmont Harbor subwatersheds. These subwatersheds occupy portions of the City of New Rochelle, the Town of Mamaroneck, and the villages of Larchmont, Pelham Manor, Mamaroneck and Pelham in Westchester County, and the City of New York (Borough of the Bronx). For the purposes of this profile, figures apply only to Westchester County; they do not, at this time, incorporate the City of New York. The size of each subwatershed is as follows:

<u>Subwatershed</u>	<u>Total Area</u> (Acres)
Stephenson Brook	4,122*
Pine Brook	1,334
Larchmont Harbor	1,201
TOTAL	6,657

* Portion of subwatershed in Westchester County (includes subwatershed of Burling Brook)

Land uses within the area include residential areas (978 acres), open space (530 acres), golf courses (368 acres), institutional/public assembly uses (396 acres), commercial/retail uses (209 acres), manufacturing/industrial/warehousing uses (92 acres), and undeveloped land (15 acres). Other land uses include transportation/communication/utility, office and mixed uses, which total 4,069 acres (see Map 3). Included in the total acreage are 24 acres of surface water (excluding streams). Ninety-seven percent (97 percent) of the roads (1,066,358 linear feet of roadway) in the The Stephenson Brook and Pine Brook subwatersheds are served by public sewers. Properties not served by public sewers are generally connected to on-site septic systems. (see Appendix for complete Profile Summaries).

Wetlands

Approximately 10 to 15 acres of vegetated freshwater wetlands (exclusive of streams and water bodies) and approximately 60 to 65 acres of tidal wetlands exist within the area, yielding an estimated total wetland acreage of 70 to 80 acres, or 1.1 percent of the watershed. These figures are based on the National Wetlands Inventory (NWI) maps and the New York State Tidal Wetlands Maps.

State-regulated tidal wetlands occur along the coasts of the City of New Rochelle, villages of Larchmont, Pelham Manor and Mamaroneck, and the Town of Mamaroneck.

Watercourses and Water Bodies

Approximately 24 acres (0.4 percent) of the 6,657-acre watershed study area are covered by surface water (excluding streams) and approximately 870 acres (13 percent) are located within

the 100-year floodplain. Approximately three miles of surface stream also exist within the area; the balance of the stream reaches have been piped and, therefore, are underground.

Steep Slopes

The area is relatively flat with several exceptions, the most notable being the Pine Brook corridor north of Beechmont Lake adjacent to Pine Brook Boulevard in New Rochelle. This corridor contains a considerable area of steep slope (gradient of 15 percent or more; includes a substantial amount with a gradient of 25 percent or more). Other areas of steep slopes occur north of Interstate 95 at and near the municipal boundary of New Rochelle and the Town of Mamaroneck and adjacent to a freshwater wetland near Albert Leonard Junior High School in New Rochelle.

Subwatershed Area No. 6

The Hutchinson River forms in the vicinity of Brookline Road in Scarsdale. From there, it flows approximately 10 miles south until it empties into Eastchester Bay in the Bronx. The river serves as the boundaries of Scarsdale and New Rochelle, New Rochelle and Eastchester, and Mount Vernon and Pelham. The river channel is in both Westchester County (northern end) and Bronx County (southern end).

The Hutchinson River was dammed by the New Rochelle Water Company in 1886 and 1907 to create three reservoirs at the northern end of the community. The reservoirs and surrounding land were purchased by the Westchester County Park Commission in 1927 for parkland and parkway purposes. A part of the land was used for the Hutchinson River Parkway, which follows the river for most of its distance.

The three reservoirs, each created by impoundments in the Hutchinson River, are identified as Reservoir No. 1 (a.k.a., Lake Isle), the northernmost of the three, and Reservoir No. 3, the middle reservoir, and Reservoir No. 2, the southernmost of the three. Reservoir No. 3 is part of Twin Lakes County Park. A short distance south of Reservoir No. 2 is Nature Study Woods County Park in New Rochelle, which includes most of a large, state-designated freshwater wetland. This wetland serves as a floodplain for the river. Farther south is Pelham Lake, also formed by impounding the river, immediately north of the Metro-North Commuter Railroad New Haven Line tracks along the Pelham and Mount Vernon boundary.

Flood zones in the watershed are largely restricted to areas flanking the river channel.

Studies on the Hutchinson River and its tributaries include a Preliminary Examination in 1946 and a Flood Survey Report in 1964. These studies considered channel improvements at Pelham, Pelham Manor, and part of the Hutchinson River Parkway Reservation as well as tide gates, and water detention structures. Neither report found economic justification for construction.

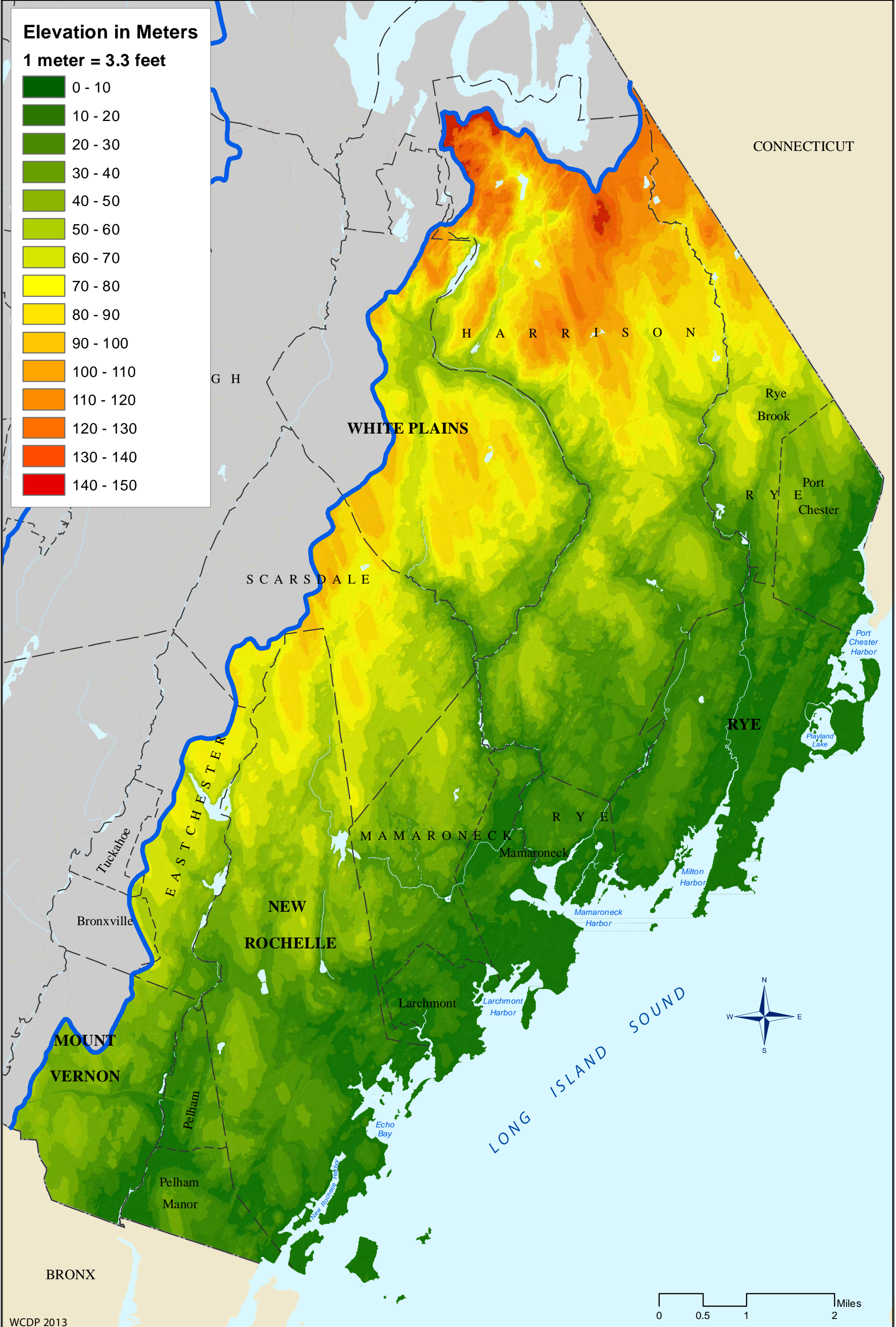
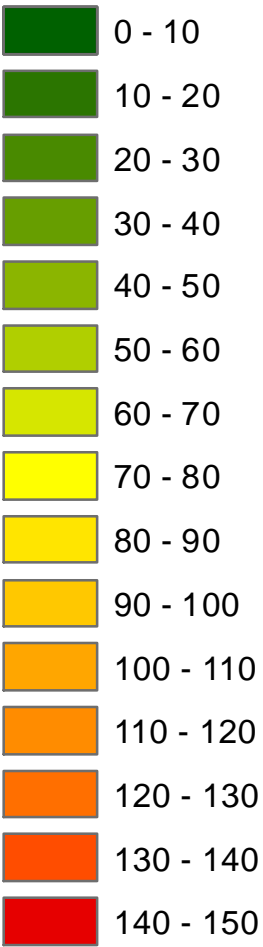
The Hutchinson River is navigable for its final three miles. Tugs and barges and the occasional small tanker still make their way to the terminals that are still operating. The northernmost active terminal is Sprague Energy, located at 100 Canal Road in Mount Vernon. It still accepts barges of heating oil, ultra-low-sulfur diesel and biodiesel blends daily. The other two active docks are

PASCAP, which exports scrap metal, and the former Colonial Sand and Gravel dock, which accepts scows full of aggregate stone to make cement and asphalt. The river is suffering from neglect and, although it was partially dredged in 2010, the northernmost section was not and is filling in with silt. Only shallow draft barges can reach Sprague at high tide. The northernmost dock has not been able to accept a scow of aggregates since 2007 due to the silt.

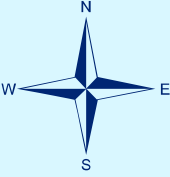
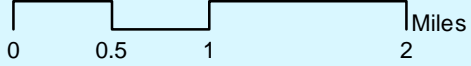
There are six bridges over the navigable section carrying rail and automobile traffic. They are from downstream heading upstream to the north: Pelham Bridge (movable), Amtrak Pelham (movable), Hutchinson River Parkway (movable), New England Thruway (fixed), Boston Post Road (fixed), and Fulton Ave Bridge (movable). The movable bridges still employ tenders and open daily for maritime traffic.

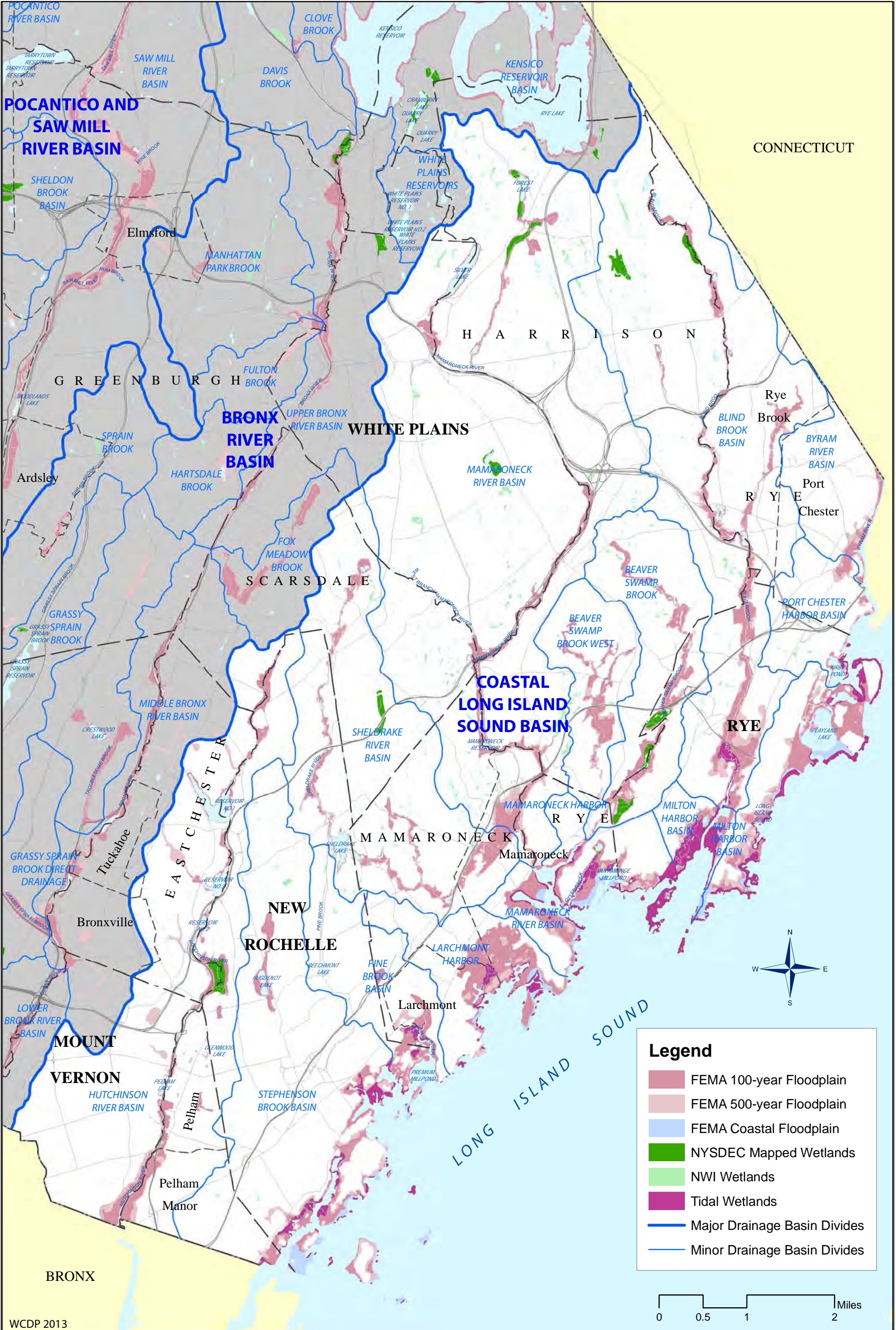
Elevation in Meters

1 meter = 3.3 feet



WCDP 2013





WCDP 2013

3. PRIOR STUDIES

Prior studies of flood problem areas are valuable to the prioritization of flood projects. Studies, particularly those funded by one or more municipalities, signify that the area is of heightened importance. They provide additional data and hydrologic and hydraulic analysis concerning the flooding problem, and they propose a solution or multiple solutions to the flooding problem. It was decided to limit the review to studies completed within the past ten years or so, for expediency.

The largest of the studies for the Coastal Long Island Sound watershed in Westchester County is currently being conducted by the U.S. Army Corps of Engineers, New York District. Seventy-five percent of the more than \$6 million costs for the study is federal with New York State and Westchester County splitting the balance. The study focuses on the analysis of a portion of the Mamaroneck and Sheldrake rivers watershed and a flood mitigation project benefitting Mamaroneck Village, which was severely flooded during the April 2007 nor'easter. This study was begun in 2010 and is expected to be complete by the end of 2016.

This section provides summaries of all studies which were in County staff files or were provided to the County by the local municipalities in the outreach effort as required to complete the Reconnaissance Plan. The summary format provides an easy-to-read single page overview that contains the relevant information in the study. These summaries concentrate on: the flood problem areas, recommended mitigation projects and cost estimates, hydrologic and hydraulic analysis results, conclusions and interpretation of any issues or complexities associated with the study or completing a proposed project's implementation.

A project score was calculated for those studies that provided sufficient data in the above listed categories so that the proposed project's potential flood improvement effect and cost estimate could be determined. For more information about the methodology used to rate the prior studies, refer to Appendix D.

In many instances the flood studies did not provide the needed information to evaluate the extent of flooding that would be alleviated, the associated impacts to the municipality or the potential impacts up or downstream from the proposed improvement project. Of the eight flood studies reviewed, there are three that provided enough information to receive a project score. Those projects are: The Beechmont Lake Attenuation Project on the Pine Brook in the City of New Rochelle; The Chatsworth Drainage Area Diversion Project on the Pine Brook in the Village of Larchmont; The Fifth Avenue Underground Detention Project on the Pine Brook in the City of New Rochelle. Of the three projects, the Fifth Avenue Underground Detention Project scored the highest based on its cost and the number of residences and businesses that would receive flood relief benefit.

The remaining five flood projects did not contain all the necessary information for a project score rating. These projects are: Pine Brook Culvert Replacement, Fourth Avenue Drainage

Assessment, Stormwater Analysis of the East Branch of the Blind Brook – Northeast Section, Stormwater Analysis of the East Branch of the Blind Brook – South/Southwest Section, Recommendation Report for the Westchester Joint Waterworks Reservoir Dam. Below is a summary to explain why each study did not receive a project score rating.

Pine Brook Culvert Replacement – This 2008 study performed by Dvirka and Bartilucci Consulting Engineers analyzed the replacement of an existing culvert with a wider/greater capacity culvert. The project would also require the widening, dredging, and stream bank stabilization of the Premium River. An updated cost estimate including costs associated with land acquisition and river widening along with an in-depth analysis to verify impacts for all design storms between existing and proposed conditions is required. Therefore this project could not receive a project score rating.

Fourth Avenue Drainage Assessment – This 2002 study was performed by TRC Engineers analyzed three alternatives in addition to increasing flow capacity of the existing drainage system, lowering Glenwood Lake by 3 feet, and a subsurface concrete detention system. The analysis/benefits for these projects were not reported. Therefore this project could not receive a project score rating.

Stormwater Analysis of the East Branch of the Blind Brook – Northeast Section – This 2002 study was conducted by Dolph Rotfeld Engineering, P.C. and analyzed the 520 acres of the East Blind Brook Watershed. It focused on the northeast section of the Blind Brook and included channel widening, two detention basins and 36 inch drainage bypass pipe. No estimates were provided for one of the detention basins and the bypass system benefits were not calculated. Therefore this project could not receive a project score rating.

Stormwater Analysis of the East Branch of the Blind Brook – South/Southwest Section – This 2002 study was conducted by Dolph Rotfeld Engineering, P.C. and analyzed the 520 acres of the East Blind Brook Watershed. It focused on the south/southwest section of the Blind Brook and included four culvert replacement projects to increase the hydraulic capacity of the brook. A cost estimate was not provided for these culvert replacements. Therefore this project could not receive a project score rating.

Recommendation Report for the Westchester Joint Waterworks Reservoir Dam – This 2005 study was conducted by Stearns and Wheler, LLC and analyzed the usefulness of the Mamaroneck Reservoir Dam for flood control purposes. This included looking at the effects of either decommissioning the dam or modifying the existing spillway/outlet structure in order to draw down the reservoir before a storm event. The study did not provide detailed cross-sectional data to determine the effects of the modifications upstream and downstream. Further study would also be needed to determine the amount of stream restoration required where reservoir bottom would now be exposed. Therefore this project could not receive a project score rating.

Table 1: Studies Requiring Further Information to Receive a Project Score Rating.

Study/Project	Additional Information Required to Receive a Project Score Rating
Pine Brook Culvert Replacement	Provide cost estimate including cost associated with land acquisition and river widening and calculations showing certain design storms for existing and proposed conditions.
Fourth Avenue Drainage Assessment	Provide analysis/benefits for the projects included in this report.
Blind Brook – Northeast Section	Provide cost estimates for the proposed detention basin and calculate benefits of constructing the drainage bypass system.
Blind Brook – South/Southwest Section	Provide cost estimates for the four culvert replacements
Westchester Joint Waterworks Reservoir Dam	Provide detailed cross-sectional data showing inundation areas post dam removal or post dam remediation. Detailed bathymetric information would also be required to show the amount of reservoir bottom restoration.

S-1 BEECHMONT LAKE ATTENUATION PROJECT - PINE BROOK DRAINAGE STUDY CITY OF NEW ROCHELLE, PINE BROOK – COASTAL LONG ISLAND SOUND WATERSHED DVIRKA & BARTILUCCI CONSULTANT ENGINEERS, JANUARY 2008

PROJECT DESCRIPTION

This project was designed to utilize Beechmont Lake located in the city of New Rochelle to attenuate stormwater. Beechmont Lake has a surface area of 6 acres and an existing 27 foot long weir that acts as the outlet structure. The project would create a total of 2 feet of freeboard, by lowering the lake 1 foot and raising the southern embankment by 1 foot, while installing a multi-staged weir which could manage the flow release. These alterations would create approximately 10 to 12 acre-feet of volume storage to be used for flood control. The lowering of the lake may require dredging and sediment removal. This project was estimated at \$920,000 in 2008 without costs of dredging. The installation of a control pipe and valve with additional sediment removal would produce higher storage volumes but was not studied.

ANALYSIS RESULTS

The project improvements were analyzed using HydroCAD software. The study found the project would reduce flow discharges from Beechmont Lake by 40% for a 2 year storm and 8% for a 100 year storm. The Pine Brook and Premium River flows would each be reduced between 7% and about 10% for up to a 100 year storm. The potential drop in water elevation, as taken at Pine Brook Drive and Kilmer



Drive, was 0.5 feet for a 2 year storm and 2.5 feet for a 10 year storm. The estimated mitigation benefit costs associated with stream flow reductions was at \$32,258 per reduced cubic feet/second (cfs), minus any dredging costs.

ISSUES/COMPLEXITIES

Raising the lake elevation may have visual impacts or provide obstruction. The lowering of the lake may require dredging of the lake (sand bars are evident in the recent aerial picture above) having a potential significant cost increase to the total project. The project requires a more in-depth survey and study. Subsequent storms within 24 to 48 hours of a slow release would reduce the overall benefit of this project.

S-2 CHATSWORTH DRAINAGE AREA DIVERSION PROJECT – PINE BROOK DRAINAGE STUDY VILLAGE OF LARCHMONT, PINE BROOK – COASTAL LONG ISLAND SOUND WATERSHED DVIRKA & BARTILUCCI CONSULTANT ENGINEERS, JANUARY 2008

[see S-8 below for alternative to this project under PINE BROOK CULVERT REPLACEMENT PROJECT – PINE BROOK DRAINAGE STUDY VILLAGE OF LARCHMONT, PINE BROOK – COASTAL LONG ISLAND SOUND WATERSHED DVIRKA & BARTILUCCI CONSULTANT ENGINEERS, JANUARY 2008]

PROJECT DESCRIPTION

This project involves construction of a new stormwater sewer system on Mayhew Avenue to bypass the flows generated by the 77 acre drainage basin from the Chatsworth section of the village of Larchmont. The bypass system would remove the two 48 inch pipes currently draining this basin at Pine Brook near Pine Brook Drive and redirect flows further downstream, terminating at the Premium River. This project was estimated at \$2.4 million in 2008

ANALYSIS RESULTS

The project improvements were analyzed using HydroCAD software. The Pine Brook flow reductions are estimated at 7% for a 2 year storm and about 6% for a 100 year storm. There was no significant flow improvements influenced at the Premium River.

The estimated mitigation benefit costs associated with stream flow reductions was at \$107,143 per reduced CFS.



ISSUES/COMPLEXITIES

The installation of a new gravity storm sewer system has potential significant impact to underground utilities as the storm pipes have to maintain a specific slope for gravity flow operations. Other utilities commonly found in roadways (i.e. gas, electric, telephone, sewer, etc) are also required to be relocated. Utility relocation costs are exceedingly high and would result in service disruptions to residents located on Mayhew Avenue. The improvement offers minor benefits to flows on Pine Brook and, statistically, no benefits to the Premium River. This project was originally submitted to the county's former Flood Action Task Force and it is under consideration for county funding pending an updated project scope of work and cost estimate.

S-3 FIFTH AVENUE UNDERGROUND DETENTION PROJECT – PINE BROOK DRAINAGE STUDY CITY OF NEW ROCHELLE, PINE BROOK – COASTAL LONG ISLAND SOUND WATERSHED DVIRKA & BARTILUCCI CONSULTANT ENGINEERS, JANUARY 2008

PROJECT DESCRIPTION

This project involves constructing an underground retention/detention facility located at Flowers Park in the city of New Rochelle to attenuate stormwater. A 5 acre concrete box/vault system would be installed with the capability of storing 25 acre-feet of stormwater under the ball fields section of the park. Depending on subsurface soil conditions, this system could be used for infiltration of stormwater which would also yield water quality benefits in addition to flood control benefits. This estimated cost for this project was \$10.6 million in 2008.

ANALYSIS RESULTS

The project improvements were analyzed using HydroCAD software. The Pine Brook and Premium River flows would each be reduced between 25% and about 27% for up to a 10 year storm. The model was not able to generate accurate results for a 100 year storm. The potential drop in water elevation, as taken at Pine Brook Drive and Kilmer Drive, was 1.3 feet for a 2 year storm and 6.8 feet for a 10 year storm. The acceptable flood elevation is estimated at hydraulic grade line (HGL) of 8 feet. The HGL of improved condition for a 10 year storm would be 6.58 feet above the acceptable HGL.



The estimated mitigation benefit costs associated with stream flows reductions was at \$80,808 per reduced cubic feet per second (cfs).

ISSUES/COMPLEXITIES

This park has recently undergone extensive renovations using County Legacy funds in the amount of \$9.8 million with no subsurface stormwater attenuation as proposed in this report. Any consideration given to the detention project would have a major impact on the recent field improvements.

A high cost is associated with this project without analytical flood reduction results for 100 year storm event. Unknown subsurface conditions could significantly increase the project cost and could eliminate any secondary water quality benefits. The project requires a more in-depth survey and study. Subsequent storms within 24 to 48 hours of a slow release would reduce the overall benefit of this project. There will be disturbances to the use of the park during installation of the system and re-establishing the field turf.

S-4 FOURTH AVENUE DRAINAGE ASSESSMENT, VILLAGE OF PELHAM MANOR HUTCHINSON RIVER – COASTAL LONG ISLAND SOUND WATERSHED TRC ENGINEERS, INC JANUARY 2002

PROJECT DESCRIPTION

This study was conducted to solve flooding problems on 4th and 7th Avenues north of 6th Street in the village of Pelham, NY. The three types of improvements that were studied are: increasing the drainage system to increase flow capacity; permanently lowering Glenwood Lake by 3 feet with post storm release of created storage; and creating a subsurface concrete detention system under a municipal park. In addition to these measures, three alternatives were studied for increasing the storm sewer capacity in the confluence system. Alternative #1 (estimated 2001 cost of \$2.73 mil.) involves a new system to reroute the flow from 7th Ave. and 6th St. along 5th Ave. and down 5th St. to a new 5th St. outfall. Alternative #2 (estimated 2001 cost of \$2.7 mil.) involves similar pipe routing except terminates with an outfall on Lincoln Ave. Alternative #3 (estimated 2001 cost of \$2.87 mil.) involves similar pipe routing except terminates with an outfall at 3rd Street. The consultant recommended Alternative #2 due to the costs and logistics of system to be installed.

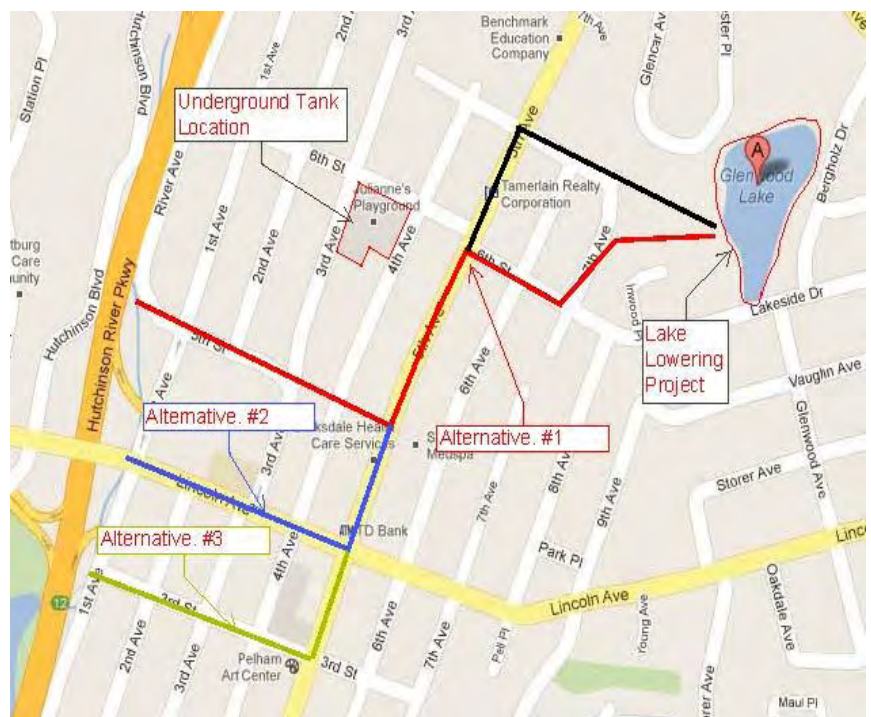
ANALYSIS RESULTS

The analysis/benefits were not clear or reported. The report mentioned the underground storage tank would hold runoff for a period of 1 hour for a 25 year storm. Further review of the benefits is required to determine a cost/benefit for each alternative.

ISSUES/COMPLEXITIES

The Glenwood Lake lowering project was abandoned as it was deemed unacceptable by Glenwood Lake area residents. The underground tank was not selected due to its high cost (\$3.3 mil.), future maintenance requirements and potential for excessive settling of the tank. Alternative #1 would involve work under private properties. The consultant cited use of tunneling but the costs were prohibitive. Alternates #2 and #3 provide installation/upgrade of storm sewer system in a public right-of-way but utility conflicts and disruption to traffic would be significant. The new connection at 6th Street to the lake under these alternatives was not clear and may require an easement or work on private property.

A more in-depth study is recommended for these projects.



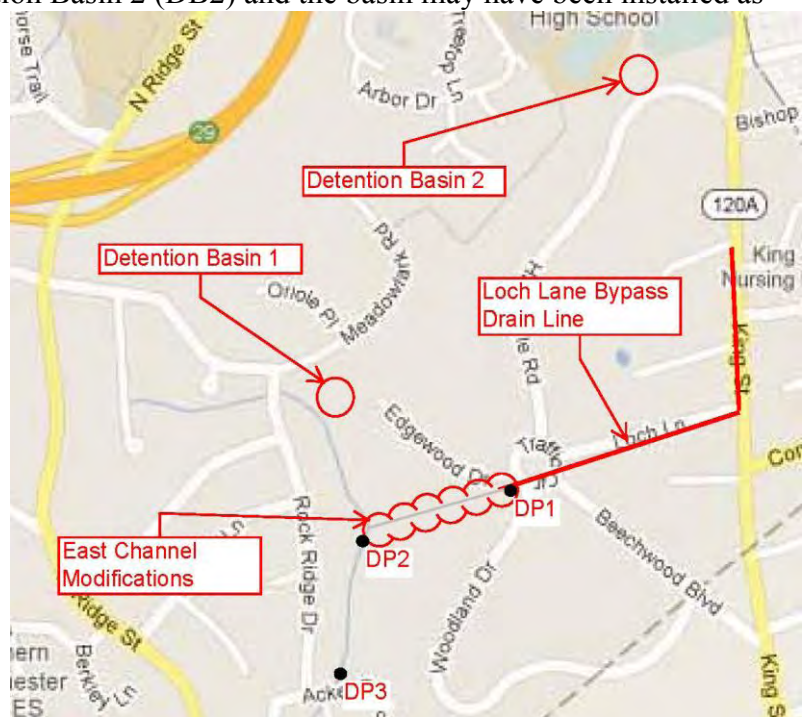
S-5 STORMWATER ANALYSIS OF THE BLIND BROOK EAST BRANCH – NORTHEAST SECTION VILLAGE OF RYE BROOK, BLIND BROOK – COASTAL LONG ISLAND SOUND WATERSHED DOLPH ROTFELD ENGINEERING, NOVEMBER 2002

PROJECT DESCRIPTION

This study was conducted to examine the 520 acres of the East Branch Blind Brook Watershed located in the village of Rye Brook, NY. The study was divided into the northeast and south/southwest portions and this summary is for the northeast section. There were four major infrastructure project improvements proposed: increasing the East Channel to a 12 foot wide 4 foot deep U-shaped channel for improved flow; installation of a detention basin (1 to 1½ acre footprint) located west of the Edgewood Drive cul-de-sac; installation of a 1,500 foot long 36 inch drainage bypass pipe from Little Kings Lane to along Loch Lane and installation of second drainage basin located in Blind Brook High School property. The cost estimates in 2002 for these projects were; East Channel at \$120,000, Detention Basin 1 (DB1) at \$200,000 and Loch Lane by-pass at 120,000. No estimate was provided for Detention Basin 2 (DB2) and the basin may have been installed as viewed from aerial photos.

ANALYSIS RESULTS

The study calculated benefits for East Channel and DB1 projects with and without the bypass drain line for three design point areas. For the 2 and 100-year design storms, the flow reduction was estimated at 17.7% to 18.5% at Design Point 3 (DP3) for projects without the bypass line, and 13.7% to 19.7% reduction with the bypass line. This would equate to a reduction of 101 cubic feet per second (cfs) and 79 cfs, respectively for 100-year storm without and with bypass line, respectively. The upstream benefits of the Loch Lane Bypass were not presented in the summary report. It should be noted that the bypass line can only be installed in conjunction with the other projects.



ISSUES/COMPLEXITIES

Even at the projected cost escalation to meet 2012 prices, the project cost estimates seem low and should be reviewed. Existing easements would be required for work on any residential properties and new temporary easements may be necessary when accessing the brook. There will be traffic disruptions on King Street, a State highway, which is heavily traveled. The presented flow reductions are significant.

Note: It has been learned that DB1, also known as Edgewood Drive and Bluebird Hollow Project, was completed by the Village in 2009 with low bid of \$833,000 and an engineer's estimate at \$474,000.

S-6 STORMWATER ANALYSIS OF THE BLIND BROOK EAST BRANCH – SOUTHWEST SECTION VILLAGE OF RYE BROOK, BLIND BROOK – COASTAL LONG ISLAND SOUND WATERSHED DOLPH ROTFELD ENGINEERING, NOVEMBER 2002

PROJECT DESCRIPTION

This study was conducted to examine the 520 acres of the East Branch of Blind Brook located in the village of Rye Brook, NY. The study was divided into the northeast and south/southwest portions. This summary is for the southwest section. The study area contained four culvert replacement projects to increase the hydraulic capacity of the brook, releasing the back water created by the restriction of the brook during significant rain events. The four culverts are located on Acker Drive, Betsy Brown Road, Argyle Road and Ridge Boulevard. The study cited that installation of detention basin 1 as described in the Northeast Section Report of the Blind Brook Study may eliminate the need to replace the Ridge Boulevard culvert. This detention basin (known as the Edgewood Drive and Bluebird Hollow Project) was completed by the Village in 2009. A cost estimate was not provided for these culvert replacements within the obtained summary report. A definitive cost estimate should be provided to compare a benefit to cost analysis.

ANALYSIS RESULTS

Flood improvement results for the replacement of the four culverts were not included in the obtained summary report.

ISSUES/COMPLEXITIES

These culvert replacements will create traffic disruptions on the associated roadways. The release of stormwater flows south of Ridge Boulevard culvert should be analyzed for impacts on the brook further downstream.



S-7 RECOMMENDATION REPORT WESTCHESTER JOINT WATERWORKS RESERVOIR DAM, VILLAGE OF MAMARONECK – COASTAL LONG ISLAND SOUND WATERSHED STEARNS AND WHELER, LLC, JANUARY 2005

PROJECT DESCRIPTION

This report involves determining the usefulness of the Mamaroneck Reservoir Dam for flood control purposes. Options and remedial actions for the dam were outlined. Advantages and disadvantages for both the decommissioning of the dam structure and maintaining the dam structure with remedial repairs with the expectation that the dam could be used as a flood control device were analyzed. Items included in maintaining the dam structure are performing a seismic analysis, reviewing the spillway capacity to ensure it is NYSDEC compliant, trash rack remediation, the removal or repair of the gatehouse, and either the maintenance or removal of the flashboards. The 2005 cost for this option was estimated between \$210,000 and \$360,000. Items included in the decommissioning of the dam are a river cross section survey, analysis

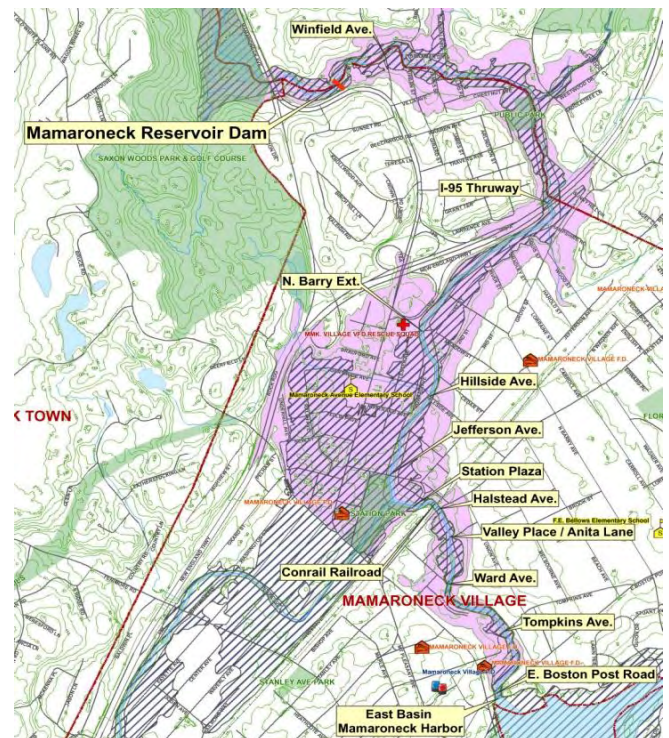
of downstream sections, the acquisition of proper federal, state, and local permits, plans and specifications to remove the dam, and any flood control measures that may be needed in connection with the dam removal. The 2005 cost for this option was estimated between \$860,000 and \$2,400,000.

ANALYSIS RESULTS

A calibrated hydraulic model of the area was created using HydroCAD Stormwater Modeling System. Two different scenarios were simulated. The first scenario was the existing conditions considering the confluence of the Sheldrake River as the point of interest. The other scenario was keeping all parameters the same but removing the existing dam from the model. The volume rates in the vicinity of Columbus Park were compared for each scenario. Since important cross-sectional data was not available, the percent increase in flow at the confluence was analyzed. It was determined that the increase in flow is minimal for storm events beyond a 2-year, 24-hour rainfall. However, the model indicates that the removal of the dam will result in increase flows for both the 1-year storm (38 percent increase), and the 2 year storm (6 percent increase).

CONCLUSIONS

Because there is an insufficient amount of detailed cross-sectional data available, the effect of removing the dam would have on the flood prone areas both upstream and downstream of the dam could not be determined. If the dam was removed, further study would have to be performed in order to determine the amount of stream restoration required. However, based on the information reviewed, it can be concluded that the WJWW Reservoir Dam provides limited flood control for the downstream areas up to a 3-year, 24-hour rainfall event (4 inches)



S-8 PINE BROOK CULVERT REPLACEMENT PROJECT – PINE BROOK DRAINAGE STUDY VILLAGE OF LARCHMONT, PINE BROOK – COASTAL LONG ISLAND SOUND WATERSHED DVIRKA & BARTILUCCI CONSULTANT ENGINEERS, JANUARY 2008

[see S-2 above for alternative to this project under CHATSWORTH DRAINAGE AREA DIVERSION PROJECT – PINE BROOK DRAINAGE STUDY VILLAGE OF LARCHMONT, PINE BROOK – COASTAL LONG ISLAND SOUND WATERSHED DVIRKA & BARTILUCCI CONSULTANT ENGINEERS, JANUARY 2008]

PROJECT DESCRIPTION

This project involves widening the Pine Brook culvert from Brook Place to the termination point at the Premium River. The 1,000 feet of new culvert would be the same height as the existing culvert but the width would be increased from 8 feet to 14 feet, doubling the capacity of gravity flow conditions from 250 to 500 cubic feet per second (cfs). The project also requires improving the Premium River by dredging, widening and stabilizing the stream bank downstream of the resized culvert. In 2008, this project was estimated at \$5.5 million minus the costs associated with land acquisition and the widening cost for the Premium River which are needed to accommodate the projected additional flows of Pine Brook.

ANALYSIS RESULTS

The project improvements were analyzed using HydroCAD and HECRAS software. The consultant has not provided accurate data of the potential impacts to the Premium River area in relation to the additional flows anticipated by enlarging the culvert for Pine Brook. The benefit calculated for this project for locations upstream of the improvement would reduce HGL between 3 and 11 feet for the 10 year storm; however, the base flood elevation (BFE) just downstream of the replaced culvert outlet is projected to be 9 inches higher for a 2- year storm with the Premium River improvements and 15 inches higher for the 2-year storm without the Premium River improvements. A more in-depth analysis is required to verify the impacts for all design storms between the existing conditions and proposed conditions.



ISSUES/COMPLEXITIES

Pine Brook crosses under residential properties and under Boston Post Road, State Highway US 1. Easements would be required for work on any residential properties and new temporary easements may be necessary when accessing the brook. Work on the state road would require state work permit. Property takings may be required on the Premium River near Tony's Nursery, just south of Rte. 1. The estimated mitigation benefit cost associated with stream flow reductions is estimated at \$24,000 per reduced cfs, minus any dredging costs and land acquisition costs. This project was submitted to the County's Flood Action Task Force for funding consideration. The Village is reviewing the scope and cost estimate as of May 2013.

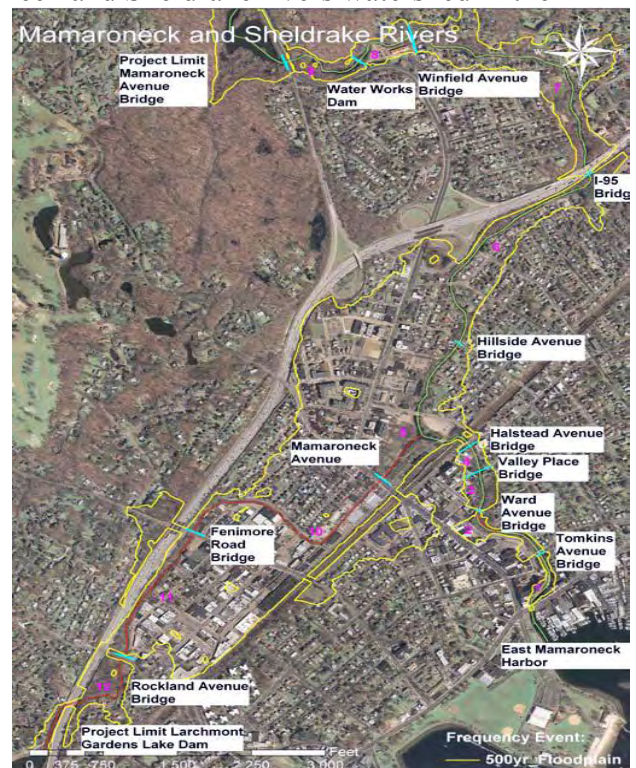
MAMARONECK/SHELDRAKE FLOOD RISK MANAGEMENT, GENERAL RE-EVALUATION REPORT VILLAGE OF MAMARONECK – COASTAL LONG ISLAND SOUND WATERSHED U.S. ARMY CORPS OF ENGINEERS

PROJECT DESCRIPTION

This report is a re-evaluation of earlier studies done by the U.S. Army Corps of Engineers, New York District. The non-federal sponsors for this study is the New York State Department of Environmental Conservation and County of Westchester (the latter represented by staff members from the County's Department of Planning and Department of Public Works and Transportation). The Village of Mamaroneck is a stakeholder and participates in the study's development, which is led by the Corps. The Town of Mamaroneck also is involved. The study area is the Mamaroneck and Sheldrake rivers watershed in the general vicinity of the Mamaroneck Village business center. The actual watershed extends much farther from the village center. The main focus is on the area of flood-related impacts along the Mamaroneck and Sheldrake rivers from below Tomkins Avenue upstream to the Westchester County Joint Water Works Dam. Along the Sheldrake River, the damages occur from the confluence with the Mamaroneck River at Columbus Park upstream to the village boundary at the New England Thruway (I-95) Bridge. A number of alternatives have been presented by the Corps which are based on the following considerations:

- Identification of the flood risk management problems.
- Relationship of flood risk management problems to the environmental and socioeconomic needs and desires of the people living and working in the study area.
- Refinement of solutions in the 1977 Feasibility Report for protecting the flood prone areas and reducing flood risk and re-examining the National Economic Development (NED) plan from 1989.
- Determination of the costs and benefits as well as the environmental, social and economic impacts associated with implementing these measures.
- Selection of the plan that would greatly reduce the flood risk in the Village of Mamaroneck consistent with federal and local planning objectives.
- Provision for protection to emergency response and other critical lifeline facilities impacting the general health and welfare of the region.
- Identification of the shared responsibilities of the federal government and non-federal sponsor.

This study is currently evolving with various alternatives to the project being refined and further analyzed by the Corps. The overall study will be currently expected to be completed by the Corps in mid/late 2016. Any federal funding to construct elements associated with this study will not be available until after the study is complete.



**Village-Wide Comprehensive Stormwater Management Plan - Village of Scarsdale
Coastal Long Island Sound Drainage Basin
February 2009
Dvirka and Bartilucci Consulting Engineers**

Project Description and Recommendations

For this stormwater management plan, the village was divided into 31 sub-drainage areas that drain into the Bronx River, Hutchinson River, Mamaroneck River, and Sheldrake River. Of the 31 drainage areas, the Village identified six of the sub-drainage areas as critical areas (BR 4, BR 7, BR 8, SR 2, SR 3, SR 5). Out of the total 26 project locations identified in the report, 16 are located in these critical areas. Proposed improvement projects 10 through 16 are within the Sheldrake River subwatershed of the Coastal Long Island Sound Drainage Basin. Various other proposed improvement projects 21 through 26 are within the Hutchinson River, Sheldrake River and Mamaroneck River subwatersheds of the Coastal Long Island Sound Drainage Basin.

Sheldrake River Subwatershed Projects in Coastal Long Island Sound Drainage Basin*

Proposed improvement projects 10 through 16 are located within the critical sub-drainage areas (SR 2, SR 3 and SR 5) that discharge to the Sheldrake River. These projects include the following:

- Culvert Improvements at Cushman, Garden and Sheldrake Roads
- Conversion of Fenway Golf Club Groundwater Reservoir to Storm Water Detention Basin
- Cayuga Pond Sediment Forebay
- Cayuga Pond Increase Storage
- Murray Hill Extension Small Ponds Increase Storage
- Roadway Drainage Improvements at Canterbury, Cayuga and Seneca Roads
- Middle School Roof Runoff Detention and Rain Gardens

Miscellaneous Other Projects in Coastal Long Island Sound Drainage Basin*

- Edgewood Road/Barry Road/Tunstall Road
- Hutchinson River Headwaters Segment
- Hutchinson River Headwaters Segment
- Griffen Avenue between Mamaroneck Road and Normandy Lane
- Hutchinson Avenue to Herkimer Road to Meadow Road to Weaver Street
- Saxon Woods Watercourse

*See attached Table 6.1 from village's plan for further information.

Village of Scarsdale Comprehensive Storm Water Management Plan
Budgetary Needs- Proposed Improvement Projects
Table 6-1

No.	SDA	Project	Scope	Responsible Party	Estimated Cost				Future Budget Years (Starting 2009)									
					SEQR Conceptual/ Detail Design & Permitting	Construction Services	Actual Construction	Total	1	2	3	4	5	6	7	8	9	10
1	BR 4	George Field Park Bio-Detention Basin	800' x 200' x 4' or 15 - 20 acre-ft Dry Pond	Village	\$266,074	\$80,628	\$806,284	\$1,152,986										
2	BR 4	Cooper Green (Cooper Road) Bio-Detention Basin	250' x 100' x 4' or 2 - 4 acre-ft Dry Pond	Village	\$101,013	\$30,610	\$306,100	\$437,723										
3	BR 7	Library Roof Runoff Detention and Rain Gardens	10 to 15 50-gallon Rain Barrels	Village	\$61,298	\$23,219	\$232,188	\$316,704										
4	BR 7	Library Parking Lot Drainage Improvements and Sediment Traps	3 to 5 Water Quality Catch Basins, Dry Grass Swales	Village	\$93,225	\$28,250	\$282,500	\$403,975										
5	BR 7	Brewster Road Drainage Diversion	1500' x 5' x 2' Armored or Grass Swale, CB's, curbing	Village	\$195,046	\$59,105	\$591,049	\$845,200										
6	BR 7	Raising or Relocation of High School Parking Lot	1250' x 50' x 3', or 1.5 acres	School District	\$277,473	\$99,098	\$990,975	\$1,367,546										
7	BR 7	High School Roof Runoff Detention and Rain Garden	20 to 30 50-gallon Rain Barrels, Grass Swale	School District	\$149,634	\$45,344	\$453,438	\$648,416										
8	BR 7	Harcourt Woods Bio-Detention Basin	200' x 150' x 4' or 5 acre-ft Dry Pond	Village	\$158,772	\$48,113	\$481,126	\$688,010										
9	BR 8	Watercourse Check Dams at Duck Pond to Murray Hill Road	2 to 3 one (1) acre-ft Dry Ponds	Village	\$82,637	\$25,042	\$250,417	\$358,096										
10	SR 2	Culvert Improvements at Cushman, Garden and Sheldrake Roads	Resize various culverts	Village	\$80,768	\$24,475	\$244,750	\$349,993										
11	SR 2	Conversion of Fenway Golf Club Groundwater Reservoir to Storm Water Detention Basin	250' x 250' x 4' or 3 acre-ft Dry Pond	Fenway GC	\$162,052	\$42,645	\$426,451	\$631,148										
12	SR 3	Cayuga Pond Sediment Forebay	50' x 50' Sediment Forebay	Village/Private	\$65,602	\$19,879	\$198,794	\$284,275										
13	SR 3	Cayuga Pond Increase Storage	400' x 300' x 2' or 3 acre-ft Sediment Removal	Village/Private	\$190,263	\$57,656	\$576,556	\$824,474										
14	SR 3	Murray Hill Extension Small Ponds Increase Storage	500' x 100' x 3' or 2 acre-ft Dry Pond	Village/Private	\$134,117	\$40,642	\$406,417	\$581,176										
15	SR 3	Roadway Drainage Improvements at Canterbury, Cayuga and Seneca Roads	Resize 3 Street and 5 Private Driveway Culverts	Village	\$60,060	\$18,200	\$182,000	\$260,260										
16	SR 3	Middle School Roof Runoff Detention and Rain Gardens	20 to 30 50-gallon Rain Barrels, Grass Swale	School District	\$70,434	\$21,344	\$213,438	\$305,216										
17	BR 3	Drainage Improvements at Chesterfield Road between Oak Lane and Brite Avenue	Reset Drain Pipe on Chesterfield, Test or TV under Tennis Courts	Village	\$36,411	\$13,004	\$130,038	\$179,452										
18	BR 3	Drainage Improvements at Kingston Road at Valley Road	Connect Gorham Court to Deeper Drain Line, Test or TV under Red Maple Swamp	Village	\$43,593	\$15,569	\$155,688	\$214,849										
19	BR 10	Drainage Improvements at Crane/Berkley Development between Taunton and Tisdale Roads	Enlarge Hyatt Park/Tisdale Road Culverts, Clean Watercourse	Village/Private	\$90,309	\$34,734	\$347,344	\$472,388										
20	BR 9	Drainage Improvements at Autenreith Road Between Popham Road and Church Lane	Test or TV Drain under Oakwood Place	Village	\$12,113	\$4,038	\$40,375	\$56,525										
21	HR 1	Drainage Improvements at Edgewood Road/Barry Road/Tunstall Road	Waterproofing Homes/Levees/Pumping	Village/Private	\$294,166	\$113,141	\$1,131,406	\$1,538,713										
22	HR 1	Drainage Improvements at Hutchinson River Headwaters Segment 1	Waterproofing Homes/Levees/Pumping	Village/Private	\$285,196	\$109,691	\$1,096,906	\$1,491,793										
23	HR 1	Drainage Improvements at Hutchinson River Headwaters Segment 2	Enlarge or Additional 54" Culverts Sprague Road/Grand Boulevard	Village	\$45,561	\$13,806	\$138,063	\$197,429										
24	SR 7	Drainage Improvements at Griffen Avenue between Mamaroneck Road and Normandy Lane	Enlarge Culvert to 5' x 10'	Village	\$27,394	\$9,446	\$94,463	\$131,303										
25	SR 7	Drainage Improvements at Hutchinson Avenue to Herkimer Road to Meadow Road to Weaver Street	Enlarge Drain, Install Water Quality Catch Basin	Village	\$27,662	\$9,539	\$95,388	\$132,589										
26	MR 3, 4, 7	Drainage Improvements at Saxon Woods Watercourse	Raise Parking and Soccer Field - 4 acres	County	\$612,677	\$306,339	\$4,376,267	\$5,295,284										
				Total	\$3,623,549	\$1,293,554	\$14,248,416	\$19,165,519										

Evaluation and Ranking of Prior Studies
Drainage Studies – Coastal Long Island Sound Watershed

					Project Post Construction Impacts								Flood Area Evaluations								Mitigation Evaluations								Scoring Summary											
Year	ID#	Project /Study	Watercourse	Need Additional Information*	Permit Requirements (0-2)	Traffic Disruptions (0-5)	Maintenance & Inspection (0-5)	Agency Regulated Structure (0-5)	Park Impacts/River Scarring (0-5)	Land Takings / Easements (0-5)	Water Quality Improv. (0-2)	TMDL Reductions (0-2)	Flood Depth (0-3)	Flood Duration (0-3)	Flood Frequency (0-3)	Critical Facilities (0-5)	Residential Buildings (0-5)	Residential Dwelling Units (0-5)	Number of Persons (0-5)	Commercial Property (0-5)	Roads Closed - Miles (0-5)	Hazardous Materials (0-5)	Flood Depth (0-3)	Flood Duration (0-3)	Flood Frequency (0-3)	Critical Facilities (0-5)	Residential Buildings (0-5)	Residential Dwelling Units (0-5)	Number of Persons (0-5)	Commercial Property (0-5)	Roads Closed - Miles (0-5)	Hazardous Materials (0-5)	Post Impact Score	Flood Area Eval. Overall Score	Mitigation Eval. Overall Score	Mitigation Evaluation	Project Benefit Score	Project Estimates Study Year (\$M)	Projected Project Costs (\$M)	PS/C (Project Score/\$)
2008	S-1	Beechmont Lake Attenuation Project	Pine Brook	n	0	5	2	5	5	5	0	0	2	1	1	0	4	0	2	0	0	0	2	1	1	0	4	0	2	0	0	0	22	10	10	0	0.1	0.92	1.0	0.5
2008	S-2	Chatsworth Drainage Area Diversion Project	Pine Brook	n	2	5	4	5	5	5	0	0	3	1	3	0	5	0	0	0	0	0	3	1	3	0	5	0	0	0	0	0	26	12	12	0	0.8	2.4	2.6	1.5
2008	S-3	Fifth Avenue Underground Detention Project	Pine Brook	n	2	5	4	5	5	5	1	0	3	1	3	0	5	0	0	0	0	0	0	1	3	0	5	0	0	0	0	0	27	12	9	3	4.6	10.6	11.7	2.0
2002	S-4	Fourth Avenue Drain Assessment	Hutchinson River	y																																				
2002	S-5	Stormwater Analysis of East Branch Blind Brook - North East Section	Blind Brook	y																																				
2002	S-6	Stormwater Analysis of East Branch Blind Brook - South/Southwest Section	Blind Brook	y																																				
2005	S-7	Recommendation Report for WJWW Res. Dam	Mamaroneck River	y																																				
2008	S-8	Pine Brook Culvert Replacement	Pine Brook	y																																				
2009		Village-Wide Comprehensive		Y																																				

4. FLOOD PROBLEM AREAS

In July 2012, a request for flood-related information was sent to representatives in each of the 14 municipalities in the Coastal Long Island Sound watershed study area in Westchester County. As of July 31, 2013, 13 municipalities responded to the request and 12 of these provided the information needed to evaluate and summarize the information that was provided. They are:

Town of Eastchester
Town/Village of Harrison
Village of Larchmont
Town of Mamaroneck
City of Mount Vernon
City of New Rochelle
Village of Pelham

Village of Pelham Manor
City of Port Chester
Village of Rye Brook
Village of Scarsdale
City of White Plains

One municipality, the Village of Mamaroneck, although it initially responded to the request, needs to provide information on specific flood problems areas within the village as well as any flood-related studies it may have commissioned over the past decade. The County and State are working with the Village on a federal flood-related study focused on the lower portions of the Mamaroneck and Sheldrake rivers in Mamaroneck Village. This study is currently scheduled to be completed in 2016. The City of Rye has not responded to the initial or subsequent requests for information. Of the municipalities who have provided the requested information, all submitted the location(s) of noteworthy flooding.

The request for information contained a cover letter addressed to each municipal representative explaining the process and identifying the requested information. Representatives were largely municipal managers/administrators or engineers. Mayors and supervisors of each municipality were copied on the letters. The request also contained a two-page questionnaire to be completed by municipal representatives concerning each flooding location identified by them. The questionnaire asked municipalities to provide copies of any relevant flood-related studies or reports. The request also contained (1) a map or maps generally at a scale of one inch equals 400 feet illustrating designated flood zones, topography, water bodies and watercourses, buildings and roads on which municipalities were asked to manually identify and illustrate the flooding locations that correspond to completed questionnaires; (2) a sample completed questionnaire and map; and (3) a table identifying flood-/stormwater-related studies and reports in possession of the county as well as identifying flood-/stormwater-related municipal ordinances and hazard mitigation plans.

County staff offered to meet with municipal representatives at their municipal offices to assist them in completing questionnaire and providing the requested information and/or addressing over the telephone any other questions or comments regarding the county's request. Although no meetings were requested, county staff members addressed telephone inquiries from several municipal representatives.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
TOWN/VILLAGE OF EASTCHESTER
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: ECH-1

Municipality: EASTCHESTER

General Location: Clarence Road and Anpell Drive at Hutchinson Boulevard

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: Analysis Performed by Leonard Jackson Associates Consulting Engineers, 2008

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Back yards and basements of about five to 10 single-family residences next to the Hutchinson River flooded once over the past decade during the April 2007 nor'easter.

Map Area ID: ECH-2

Municipality: EASTCHESTER

General Location: Old Wilmot Road

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: Analysis Performed by Leonard Jackson Associates Consulting Engineers, 2008

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Back yards and basements of about five single-family residences next to the Hutchinson River flooded once over the past decade during the April 2007 nor'easter.

Map Area ID: ECH-3

Municipality: EASTCHESTER

General Location: Crawford Street from Rose Avenue to Middle Road

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: Crawford Street Drainage Study by McLaren Engineering for Town/Village of Eastchester, 2007

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent said roads, yards and basements of about five to 10 single-family residences have flooded three or four times over the past decade due to inadequately sized drainage infrastructure as well as the area being topographically low and, therefore, a natural drainage point. Road asphalt has been damaged by the flooding.

Map Area ID: ECH-4

Municipality: EASTCHESTER

General Location: Hewitt Avenue and Lispenard Road East of California Road, all West of Cross County Parkway

Nearest Watercourse or Water Body: Tributary of Hutchinson River, Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent said portions of public roads have flooded twice over the past decade due to inadequately sized drainage infrastructure as well as the area being topographically low and, therefore, a natural drainage point. No damage is reported.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
TOWN/VILLAGE OF HARRISON
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: HAR-1

Municipality: HARRISON

General Location: Glendale Road between West Street and Mamaroneck Village Boundary

Nearest Watercourse or Water Body: Mamaroneck River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Over the past decade, flooding has occurred five or six times after 2.5 inches to 3.0 inches of rainfall, causing roads to become impassable due to stormwater runoff and the inadequacy of drainage infrastructure to handle large storms. The area is within a 100-year flood zone.

Map Area ID: HAR-2

Municipality: HARRISON

General Location: West Street in Vicinity of Westwood Drive, Westwood Court, Saddletree Lane and Grove Street

Nearest Watercourse or Water Body: Mamaroneck River and LeCount Creek (Tributary of Mamaroneck River)

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, LeCount Creek overtops its banks during severe storms causing water to inundate residences, road and sanitary storm and sewer systems. Over the past decade, flooding has occurred five or six times after two inches of rainfall. Flooding lasts approximately 48 hours, during which roads become impassable due to stormwater runoff and the inadequacy of drainage infrastructure to handle large storms. Approximately 21 single-family residences are within the flood-impact area, though the number of these that are damaged by flooding is not noted. The area is partially within a 100-year flood zone.

Map Area ID: HAR-3

Municipality: HARRISON

General Location: Oakland Avenue from Metro-North Commuter Railroad New Haven Line to City of Rye Boundary

Nearest Watercourse or Water Body: Beaver Swamp Brook

Associated Study/Report: Beaver Swamp Brook Hydrologic and Hydraulic Analysis by Leonard Jackson Associates for Town/Village of Harrison, July 2007

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, 21 single-family residences and 29 multi-family residences, totaling approximately 80 residential units, as well as 14 commercial properties and vacant and publicly owned properties are impacted by flooding, many of these by inundation and basement flooding. Most of the area is within a 100-year flood zone. The area has flooded nine or 10 times over the past decade, with inundation beginning at four inches of

rainfall and basement flooding beginning at two inches of rainfall. The respondent said flooding is exacerbated by constrictions in the stream channel from bridges and bridge abutments, especially the bridge on the Boston Post Road in Mamaroneck Village. Flooding inundation depths reach to approximately two feet and last approximately 48 hours.

Map Area ID: HAR-4

Municipality: HARRISON

General Location: Westerleigh Road South of Hutchinson River Parkway

Nearest Watercourse or Water Body: Blind Brook

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, this area has “experienced roadway washouts, flooding to private property, and inundation of storm drainage system.” During Hurricane Irene in August 2011, the respondent said, “Overland flows and flood waters heading to Blind Brook caused a major roadway and drainage system washout. Flood waters also entered private residences, causing damage.” Approximately 12 single-family residences and six commercial properties are impacted by flooding, which has occurred five or six times over the past decade when rainfall reaches two inches or more. The area is within a 100-year flood zone.

Map Area ID: HAR-5

Municipality: HARRISON

General Location: Barnes Lane South to Anderson Hill Road

Nearest Watercourse or Water Body: Mamaroneck River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, Hurricane Irene in 2011 caused flooding to properties along the Mamaroneck River. A concrete headwall collapsed and river bank erosion occurred due to high-velocity flows in the river channel and small tributaries. Approximately 61 single-family residences and one commercial property are within the area of concern, although the respondent did not report any flood-related impacts to them other than from erosion. Flood-related impacts have occurred five or six times over the past decade after 2.5 inches of rainfall. The area is within 100- and 500-year flood zones.

Map Area ID: HAR-6

Municipality: HARRISON

General Location: Lake Street East, Old Lake Street and Barnes Lane

Nearest Watercourse or Water Body: Forest Lake and Mamaroneck River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, this area, “surrounded by wetlands, routinely experiences flooding to roadways, drainage systems and residential properties. During the April 2007 nor’easter, “culverts collapsed, roadways washed out, and there was extensive infrastructure damage.” The respondent said the cause of flooding is “wetland inundation.” Approximately 14 single-family residences and two multi-family residential buildings with a total of 18 residential units are in the area, although the number of residential units receiving damage, if any, is not stated. Flooding has occurred five or six times

over the past decade after 2.5 inches of rainfall. The area is partially within 100- and 500-year flood zones.

Map Area ID: HAR-7

Municipality: HARRISON

General Location: Osborne Road to Harrison Avenue and Haviland Road to Sterling Avenue

Nearest Watercourse or Water Body: Beaver Swamp Brook

Associated Study/Report: Beaver Swamp Brook Hydrologic and Hydraulic Analysis by Leonard Jackson Associates for Town/Village of Harrison, July 2007

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, this area has “historically” flooded during periods of moderate to heavy rainfall, with flooding beginning at approximately 1.5 inches of rainfall, basements flooding at 2.0 inches of rainfall, and roads becoming impassable at 2.5 inches of rainfall. According to the respondent, 136 single-family residences and 262 multi-family residences, totaling approximately 692 residential units, as well as six commercial properties and houses of worship are indirectly or directly impacted by flooding in this area. Many of the direct impacts are by inundation and basement flooding. Most of the area is within a 100-year flood zone.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
VILLAGE OF LARCHMONT
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: LAR-1

Municipality: LARCHMONT

General Location: Pine Brook Drive and Kilmer Road

Nearest Watercourse or Water Body: Pine Brook

Associated Study/Report: Pine Brook Drainage Study, by Dvirka and Bartilucci Consulting Engineers for Village of Larchmont, 2008

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, “heavy rain overwhelms a 96-inch drainage pipe under US 1, resulting in water rising from catch basins. This is especially worse during high tide. Flooding causes street closures and property damage. The sanitary sewer system was overwhelmed (during nor’easter of April 2007)...structural damage included lifted manholes and storm grate castings and portions of road.” The area is within a 100-year flood zone and approximately 20 single-family residences experience repetitive damage from flooding. The depth of flood water reaches four feet lasting up to 16 hours. Flooding has occurred five or six times over the past decade.

Map Area ID: LAR-2

Municipality: LARCHMONT

General Location: Flint Park at Birch Lane and Nassau Road

Nearest Watercourse or Water Body: East Creek

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The basements and garages of approximately five single-family residences were flooded during the April 2007 nor’easter, according to the respondent. Flint Park’s athletic fields and other recreational facilities also were damaged by flooding during the storm. Storm and sanitary sewer pipes in the area surcharge during flooding events, according to the respondent. The area is partially within a 100-year flood zone, and it has flooded three or four times over the past decade with flood water depths reaching two feet and lasting up to two days.

Map Area ID: LAR-3

Municipality: LARCHMONT

General Location: Pryer Manor Road at Premium River Bridge

Nearest Watercourse or Water Body: Premium River and Premium Mill Pond

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: “Flood waters rise to about four feet in height” and the road and bridge become impassable during severe storms, according to the respondent. “Heavy rain closed roadway and made driveways impassable. High winds and storm surge caused wall to be knocked down into street.” Flooding depths reached approximately four feet lasting two days.

Flooding has occurred five or six times over the past decade. The area is within a designated flood zone.

Map Area ID: LAR-4

Municipality: LARCHMONT

General Location: Magnolia Avenue and Ocean Avenue

Nearest Watercourse or Water Body: Long Island Sound

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The April 2007 nor'easter forced the closure of roads in this area, and a section of road collapsed where two underground storm drainage pipes connect. The area is within a designated flood zone. Flooding has occurred twice over the past decade.

Map Area ID: LAR-5

Municipality: LARCHMONT

General Location: Cedar Island

Nearest Watercourse or Water Body: Long Island Sound

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: During extreme coastal storm resulting in tidal surges, the only bridge to the island is impassable. Flooding has occurred twice over the past decade, when flooding occurred to a depth of approximately two feet lasting approximately 12 hours following the storms.

Map Area ID: LAR-6

Municipality: LARCHMONT

General Location: Pine Brook from Boston Post Road to Guion Lane

Nearest Watercourse or Water Body: Pine Brook

Associated Study/Report: Pine Brook Drainage Study, by Dvirka and Bartilucci Consulting Engineers for Village of Larchmont, 2008

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, "Rushing water overtops banks of brook, flooding dead-end streets and basements along the channel." The respondent said Kane Park between Beach and Kane avenues also is impacted. "Flooding is largely blamed on overbuilding, illegal connections and evacuation of flooded basements/garages upstream," the respondent said. Five single-family residences have been impacted by flood-related damages. Stream bank erosion and damage to retaining walls along the brook also have occurred. The area is within a 100-year flood zone.

Map Area ID: LAR-7

Municipality: LARCHMONT

General Location: Park Avenue at Larchmont Manor Park

Nearest Watercourse or Water Body: Long Island Sound

Associated Study/Report: Pine Brook Drainage Study, by Dvirka and Bartilucci Consulting Engineers for Village of Larchmont, 2008

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Road, seawall and park walkway were damaged during April 2007 nor'easter. The area is in a designated flood zone, and flood-related impacts have been experienced once or twice over the past decade.

Map Area ID: LAR-8

Municipality: LARCHMONT

General Location: Park Avenue at Larchmont Manor Beach

Nearest Watercourse or Water Body: Long Island Sound

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent said “problems occur when heavy rain and storm surge combine. Storm drains are overwhelmed and water has nowhere to go.” The beach and road have been clogged by debris carried in flood waters. The area is in a designated flood zone, and flood-related impacts have been experienced three or four times over the past decade.

Map Area ID: LAR-9

Municipality: LARCHMONT

General Location: Spanish Cove Road and Lindsley Drive

Nearest Watercourse or Water Body: Larchmont Harbor and Long Island Sound

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, “standing water from runoff has nowhere to go because stormwater renders the drainage grid inoperable.” The flooding depth reaches approximately six inches lasting 12 hours. Driveways and garages were flooded and the contents of a few basements were believed to have been damaged by flooding. About three single-family residences have been impacted. The area is in a designated flood zone, and flood-related impacts have been experienced once or twice over the past decade.

Map Area ID: LAR-10

Municipality: LARCHMONT

General Location: North Avenue

Nearest Watercourse or Water Body: Pine Brook

Associated Study/Report: Pine Brook Drainage Study, by Dvirka and Bartilucci Consulting Engineers for Village of Larchmont, 2008

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent said flooding results during severe storms from inadequate stormwater drainage infrastructure. Illegal inflow and infiltration of storm and sanitary sewer pipes leads to “sewer problems downstream,” according to the respondent. Flash flooding also occurs in this area, the respondent said. Stormwater runoff accumulating on roads also has entered the first floor of a commercial property; and three to four commercial properties have been damaged by flooding. The area is not within a designated flood zone but flooding has occurred five or six times over the past decade.

Map Area ID: LAR-11

Municipality: LARCHMONT

General Location: Coolidge Street

Nearest Watercourse or Water Body: Pine Brook

Associated Study/Report: Pine Brook Drainage Study, by Dvirka and Bartilucci Consulting Engineers for Village of Larchmont, 2008

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, the area is subjected to flash flooding during intense rainfall when catch basins cannot handle the inflow of stormwater runoff and become overwhelmed. The flood water enters garages, damaging personal items within them. About four single-family residences are impacted in this area, which is not within a designated flood zone. According to the respondent, flooding has occurred five or six times over the past decade, with the depth of flood water reaching six inches.

Map Area ID: LAR-12

Municipality: LARCHMONT

General Location: Monroe Avenue at Cherry Avenue and Ervilla Drive

Nearest Watercourse or Water Body: Larchmont Harbor and Long Island Sound

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, this area floods during heavy rainfall, overwhelming drainage infrastructure. The respondent said “roads are typically closed but homes do not get damaged.” Flooding has occurred three or four times over the past decade and flood water depths reach one foot. The area is not within a designated flood zone.

Map Area ID: LAR-13

Municipality: LARCHMONT

General Location: Weaver Street at Goodliffe Pond/Sheldrake River (Mamaroneck Town)

Nearest Watercourse or Water Body: Sheldrake River

Associated Study/Report: Sheldrake River Watershed Hydrologic Study, by Malcolm Pirnie for Town of Mamaroneck, May 1991

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Although this area is not within the Village of Larchmont, the village owns adjoining Sheldrake Lake (Larchmont Reservoir). The respondent said the April 2007 nor’easter caused the water level in Goodliffe Pond, immediately downstream from Sheldrake Lake, to top the embankment/dam forming the lake. Both Sheldrake Lake and Goodliffe Pond are formed by impoundments across the Sheldrake River. Goodliffe Pond and the land around it are part of the municipally owned Sheldrake Environmental Center. The respondent said, “A large area of natural growth, one pedestrian bridge and one vehicular bridge were damaged beyond repair by rushing water from the Sheldrake River. A potting shed basement was flooded and the caretaker’s house sustained minor damage.” The area has flooded once or twice over the past decade.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
TOWN OF MAMARONECK
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: MMT-1

Municipality: MAMARONECK TOWN

General Location: Fenimore Road, York Road, Valley Stream Road, Brookside Drive, Bonnie Way, Lakeside Drive, North Brook Road, Orchard Road, Sheldrake Avenue, Little Farms Road, Stoneyside Drive, East Garden Road, West Garden Road, Fernwood Road, Forest Avenue, Winding Brook Drive, and Weaver Street.

Nearest Watercourse or Water Body: Sheldrake River and East Branch of the Sheldrake River

Associated Study/Report: Sheldrake River Hydrologic Study, May 1991, by Malcolm Pirnie for Town of Mamaroneck

Evaluation Score (Low, Medium, High): High

General Description of Flooding: The 100- and 500-year flood zones along the Sheldrake River and East Branch of the Sheldrake River experienced significant flooding during the April 2007 storm once water began overtopping the dam at Sheldrake Lake (Larchmont Reservoir). This area is between Gardens Lake and Sheldrake Lake. Approximately 134 residential units and two commercial properties were impacted, and 23 of these have experienced repetitive damages. Yards, driveways, garages and basements have been damaged by the flooding and one residential unit on Winding Brook Drive had stormwater up to its first floor. In addition to residential and commercial structures, bridges, roads, catch basins and culverts were damaged. Up to two feet of water inundated the area and inundation lasted up to 10 hours.

Map Area ID: MMT-2

Municipality: MAMARONECK TOWN

General Location: Murray Avenue at Colonial Avenue

Nearest Watercourse or Water Body: Larchmont Harbor

Associated Study/Report: Westchester County evaluated Murray Avenue and afterwards replaced a pipe on this County Road, per respondent.

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: During intense storm events, drainage infrastructure cannot accommodate all of the stormwater runoff, sometimes inundating the yards, driveways, garages and basements of approximately 12 residential units on Murray Avenue, Colonial Avenue, Bryson Street, Maplewood Street, and Homer Avenue. These roads also become inundated, causing the accumulation of sediment in catch basins. Sewer pipes back up during certain significant storm events. The inundation is approximately six to eight inches in depth and lasts for approximately two hours after a storm event.

Map Area ID: MMT-3

Municipality: MAMARONECK TOWN

General Location: Hommocks Road, Hommocks Middle School, Hampshire Country Club and Golf Course

Nearest Watercourse or Water Body: Larchmont Harbor

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, this area, with the 100- and 500-year flood zones, is primarily impacted by coastal storms exacerbated by significant volumes of precipitation, extreme high tides, and storm surges. Over the past decade, the worst storms and flooding conditions were experienced during the April 2007 nor'easter and Hurricane Sandy. Inundation reaches two feet in depth, lasts approximately six hours after a significant storm event, and impacts an unknown number of residential units, one to four commercial properties, and a public middle school. Damage occurs to public assets, including stormwater pipes, boardwalk, manhole covers and catch basins, and a bridge.

Map Area ID: MMT-4

Municipality: MAMARONECK TOWN

General Location: Fifth Avenue between New Rochelle Boundary and Lester Place

Nearest Watercourse or Water Body: Pine Brook

Associated Study/Report: Pine Brook Drainage Study, January 2008, by Dvirka & Bartilucci for the Village of Larchmont

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: An isolated area in the 100-year flood zone immediately north of Interstate 95 experiences periodic (approximately five times in the past decade) flooding during intense storm events when drainage infrastructure cannot accommodate high rates and volumes of stormwater runoff. Water reaches up to two feet in depth on public roads and the yards of an unknown number of adjoining residential units impacted as well as four commercial properties. The inundation lasts less than one hour.

Map Area ID: MMT-5

Municipality: MAMARONECK TOWN

General Location: Premium Marsh and Environs and Premium Point

Nearest Watercourse or Water Body: Premium Mill Pond and Long Island Sound

Associated Study/Report: Pine Brook Drainage Study, January 2008, by Dvirka & Bartilucci for the Village of Larchmont

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, the Premium Marsh and surrounding neighborhoods flood when periods of significant precipitation coincide with higher-than-normal tides. This area and nearby Premium Point also are subjected to general coastal flooding as well as storm surges, impacting approximately 20 residential units, one of which has had repetitive damage. The inundation reaches up to four to five feet in depth and lasts up to six hours after significant storm events. Inundation occurs over Dillon Road, Dorethy Place, Pheasant Run, Pryer Manor Road and Wildwood Circle, and yards, driveways, garages and basements on Dogwood Lane and Gailard Place are flooded.

Map Area ID: MMT-6

Municipality: MAMARONECK TOWN

General Location: Two Separate Areas: (6A) South of Interstate 95 at Boston Post Road South of Richbell Road, Cabot Road and Thompson Place; and (6B) North of Interstate 95 at Madison Avenue Between Fifth Avenue and Myrtle Boulevard

Nearest Watercourse or Water Body: Larchmont Harbor

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: Two isolated areas not within any flood zone immediately north of Interstate 95 experience periodic (approximately 10 to 15 times in the past decade) flooding during intense storm events when drainage infrastructure cannot accommodate high rates and volumes of stormwater runoff. Water reaches up to two feet in depth on public roads and the yards of approximately 39 adjoining residential units impacted as well as three commercial properties. Sediment accumulates in catch basins during these storm events. The inundation lasts less than one hour. Basements have reportedly been flooded in residential units on Cabot Road and Thompson Place.

Map Area ID: MMT-7

Municipality: MAMARONECK TOWN

General Location: Griffen Avenue and Adrian Circle

Nearest Watercourse or Water Body: East Branch of the Sheldrake River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: During significant storm events, small tributaries of the East Branch of the Sheldrake River swell, causing local flooding. The respondent states that culverts are too small for these storm events and cannot accommodate the stormwater runoff. Three separate and isolated areas of flooding were noted by the respondent and none of these are within designated flood zones. An unknown number of residential units and one commercial property are impacted. The flooding causes some road erosion and catch basins and stormwater pipes become filled with sediment. Inundation depths reach approximately two feet and inundation lasts less than one hour after the storm event.

Map Area ID: MMT-8

Municipality: MAMARONECK TOWN

General Location: Old White Plains Road, Bruce Road and Winged Foot Golf Club

Nearest Watercourse or Water Body: Mamaroneck River and Unnamed Ponds

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: During significant storm events, stormwater collects on Old White Plains Road. Small ponds have flooded near Bruce Road and at Winged Foot Golf Club flood, impacting local roads and residential units, too. Flooding has occurred approximately five times in the past decade. The respondent states that the flooding on White Plains Road is largely caused by insufficient drainage infrastructure. Inundation reaches depths of up to one foot and last approximately two hours after storm events.

Map Area ID: MMT-9

Municipality: MAMARONECK TOWN

General Location: Country Road at Leatherstocking Lane and Fenimore Road at Mamaroneck Village Boundary

Nearest Watercourse or Water Body: Sheldrake River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: During significant storm events, stormwater collects at low points in these two roads. Inundation has occurred approximately seven or eight times over the past decade and reaches one to two feet in depth. The inundation lasts less than one hour.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
CITY OF MOUNT VERNON*
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: MTV-1

Municipality: MOUNT VERNON

General Location: Valois Place

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated road and basement flooding occurs on Valois Place, a cul-de-sac that ends next to the Hutchinson River and Hutchinson River Parkway. Over the past decade flooding from a swollen river during extreme storm events occurred once or twice, most notably during the April 2007 nor'easter. The flooding impacted an unknown number of residential units. The area is within a 100-year flood zone.

Map Area ID: MTV-2

Municipality: MOUNT VERNON

General Location: Hutchinson Boulevard (North End)

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated road and basement flooding occurs along Hutchinson Boulevard, a road running parallel to the Hutchinson River and Hutchinson River Parkway. Over the past decade flooding from a swollen river during extreme storm events occurred once or twice, mostly notably during the April 2007 nor'easter. The flooding impacted an unknown number of residential units. The area is within a 100-year flood zone.

Map Area ID: MTV-3

Municipality: MOUNT VERNON

General Location: Stuyvesant Plaza

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated road and basement flooding occurs along Stuyvesant Plaza Place, a dead-end loop road with eastbound/westbound lanes separated by a vegetated plaza. The easternmost end of the road is adjacent to Mount Vernon High School and Cross County Parkway. Over the past decade flooding caused by stormwater runoff from an adjacent property occurred once or twice, most notably during the April 2007 nor'easter, according to the respondent. The flooding impacted an unknown number of residential units. The area is within a 500-year flood zone.

*** The evaluation score for each of the areas in Mount Vernon is listed as "low" because the respondent did not indicate the type or degree of damage, if any, to the impacted properties within each area. Based on a review of aerial photographs, it does not appear that a significant number of properties were impacted. However, any additional information that would assist in the re-evaluation of any area will be considered.**

Map Area ID: MTV-4

Municipality: MOUNT VERNON

General Location: Hanover Place

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated road and basement flooding occurs on Hanover Place, a short side road connecting Station Place and Bradley Avenue west of the Hutchinson River and Hutchinson River Parkway. A small tributary stream runs along the eastern end of the road. Over the past decade flooding from a swollen river during extreme storm events occurred once or twice, most notably during the April 2007 nor'easter. The flooding impacted an unknown number of residential units.

Map Area ID: MTV-5

Municipality: MOUNT VERNON

General Location: Farrell Avenue

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated road and basement flooding occurs on Farrell Avenue, a side road off Martin Luther King Boulevard immediately west of the Hutchinson River and Hutchinson River Parkway. The road is a short distance downstream from Pelham Lake. Over the past decade flooding from a swollen river during extreme storm events occurred once or twice, most notably during the April 2007 nor'easter. The flooding impacted an unknown number of residential units.

Map Area ID: MTV-6

Municipality: MOUNT VERNON

General Location: East Sanford Boulevard

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated road flooding occurs along East Sanford Boulevard, which intersects and runs perpendicular to the Hutchinson River and Hutchinson River Parkway. The road is largely flanked by commercial properties, including "big box" stores, but it also is bounded by a public park and residential units. Over the past decade flooding from a swollen river during extreme storm events occurred once or twice, most notably during the April 2007 nor'easter.

* The evaluation score for each of the areas in Mount Vernon is listed as "low" because the respondent did not indicate the type or degree of damage, if any, to the impacted properties within each area. Based on a review of aerial photographs, it does not appear that a significant number of properties were impacted. However, any additional information that would assist in the re-evaluation of any area will be considered.

Map Area ID: MTV-7

Municipality: MOUNT VERNON

General Location: South Third Avenue

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated that road flooding occurs along South Third Avenue, a side road of East Sanford Boulevard and about 15 blocks west of the Hutchinson River and Hutchinson River Parkway. The road is flanked by residential units. Over the past decade, flooding has occurred once or twice from stormwater running off South Third Avenue and possibly other local roads onto South Third Avenue during extreme storm events. Flooding was most notable during the April 2007 nor'easter.

Map Area ID: MTV-8

Municipality: MOUNT VERNON

General Location: Hutchinson Boulevard (South End)

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated road and basement flooding occurs along the south end (closest to Hillcrest Road) of Hutchinson Boulevard, a road running parallel to the Hutchinson River and Hutchinson River Parkway. Over the past decade flooding from a swollen river during extreme storm events occurred once or twice, most notably during the April 2007 nor'easter. The flooding impacted an unknown number of residential units. The area is within a 100-year flood zone.

* The evaluation score for each of the areas in Mount Vernon is listed as "low" because the respondent did not indicate the type or degree of damage, if any, to the impacted properties within each area. Based on a review of aerial photographs, it does not appear that a significant number of properties were impacted. However, any additional information that would assist in the re-evaluation of any area will be considered.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
CITY OF NEW ROCHELLE
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: NRO-1

Municipality: NEW ROCHELLE

General Location: Grand Boulevard, Primrose Avenue, Charlotte Lane, Sprague Road

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: Analysis Performed by Leonard Jackson Associates Consulting Engineers, 2008

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, the “area is located within the 100-year floodplain and floods frequently. Flooding is due to insufficient capacity of downstream culverts and open channels. Streets and homes were flooding, causing property losses.” Approximately 30 residential units are repetitively flooded, and it has flooded five or six times over the past decade. It generally begins to flood at two inches of rainfall and flooding depths during extraordinarily severe storms reaches two to three feet.

Map Area ID: NRO-2

Municipality: NEW ROCHELLE

General Location: Valley Road

Nearest Watercourse or Water Body: Stephenson Brook

Associated Study/Report: Analysis of Existing Storm Drain in Valley Road, by WSP-Sells for City of New Rochelle, October 2008

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, stormwater runoff during severe storms exceeds the capacity of storm drainage infrastructure in this area. Flood-related impacts have occurred five or six times over the past decade to approximately 15 properties and secondary roads. The area is not within a designated flood zone.

Map Area ID: NRO-3

Municipality: NEW ROCHELLE

General Location: Brookside Place and Brookdale Avenue

Nearest Watercourse or Water Body: Stephenson Brook

Associated Study/Report: Analysis of Existing Storm Drain in Brookdale Avenue, by WSP Sells for City of New Rochelle, October 2008

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, the “area floods due to lack of flow capacity in existing storm drains and poor hydraulic configuration of manholes and chambers at bends on large diameter pipes. Streets and properties were flooded due to insufficient capacity of downstream drains.” Approximately 30 residential units are repetitively flooded, and it has flooded seven or eight times over the past decade. It generally begins to flood at two inches of rainfall and flooding depths during extraordinarily severe storms reaches three to four feet lasting about two days. The area is not within a designated flood zone.

Map Area ID: NRO-4

Municipality: NEW ROCHELLE

General Location: White Oak Street

Nearest Watercourse or Water Body: Stephenson Brook

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, the “area is located in the 100-year floodplain and floods frequently. The apartment buildings’ underground garages are subjected to flooding due to insufficient capacity of the culvert at Eastchester Avenue. Streets and properties are flooded due to insufficient capacity of culvert and downstream drainage pipes.” Approximately four single-family residences and eight multi-family residential buildings are repetitively flooded. It has flooded seven or eight times over the past decade. It generally begins to flood at two inches of rainfall.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
VILLAGE OF PELHAM MANOR
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: PMR-1

Municipality: PELHAM MANOR

General Location: Mount Tom Road and Pelham Country Club

Nearest Watercourse or Water Body: New Rochelle Harbor

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Respondent stated the problem is general road flooding and flooding on the golf course of Pelham Country Club. Road flooding impacts about four or five residences. Flooding has occurred up to about 15 times over the past decade.

Map Area ID: PMR-2

Municipality: PELHAM MANOR

General Location: Wolfs Lane and Iden Avenue

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Respondent stated the problem is general road flooding impacting 15 to 40 residential units. Flooding has occurred seven or eight times over the past decade.

Map Area ID: PMR-3

Municipality: PELHAM MANOR

General Location: Shore Road and Shoreview Circle

Nearest Watercourse or Water Body: New Rochelle Harbor

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Respondent stated the problem is general road flooding from rainfall and tidal influences. Flooding has occurred about six times over the past decade.

Map Area ID: PMR-4

Municipality: PELHAM MANOR

General Location: Pelham Country Club

Nearest Watercourse or Water Body: New Rochelle Harbor

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Respondent stated the problem is general road flooding along Country Club Lane in the vicinity of Pelham Country Club Lake. Flooding has occurred about six times over the past decade.

Map Area ID: PMR-5

Municipality: PELHAM MANOR

General Location: Highbrook Avenue and Randall Place

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Respondent stated the problem is general road flooding impacting 15 to 40 residential units. Flooding has occurred five to six times over the past decade.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
VILLAGE OF PELHAM
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: PEL-1

Municipality: PELHAM

General Location: 6th Street from 4th Avenue to 8th Avenue

Nearest Watercourse or Water Body: Glenwood Lake and Hutchinson River

Associated Study/Report: Fourth Avenue Drainage Assessment, for Village of Pelham Manor, by TRC Engineers Inc., January 2002

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, this area “experiences chronic flooding attributable to an inadequate stormwater conveyance system and frequently receives overflow discharges from Glenwood Lake from neighboring New Rochelle. Conceptual improvement projects have been developed and grants have been applied for, respectively, to engineer and install a network of higher capacity storm drainage pipes to remediate the chronic flooding in this area.” A federal 55/45 share grant has been approved, according to the respondent, “for the Phase I construction of a proposed 72-inch diameter relief stormwater outfall pipe to replace an inadequate 12-inch pipe on 3rd Street between the Hutchinson River and 4th Avenue...Streets and homes in the area flooded during storm events and remained flooded for days after the storm. Personal property losses were severe with lesser amounts of damage to structures. Inadequate and undersized storm water conveyance system contributed to flooding and standing water issues. Glenwood Lake in New Rochelle overflowed for days over land via an open natural culvert into Pelham, also contributing to flooding and standing water issues.” The respondent said 83 residential units and 20 commercial properties are impacted with flooding reaching depths of several inches to eight feet lasting three to four days. All have experienced repetitive flooding. According to the respondent, flooding in this area has occurred more than 15 times over the past decade.

Map Area ID: PEL-2

Municipality: PELHAM

General Location: Highbrook Avenue from Harmon Avenue to Boulevard and Vicinity

Nearest Watercourse or Water Body: Glenwood Lake and Hutchinson River

Associated Study/Report: Fourth Avenue Drainage Assessment, for Village of Pelham Manor, by TRC Engineers Inc., January 2002

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, this area “experiences chronic flooding attributable to an inadequate stormwater conveyance system. Underground stream adjacent to “Highbrook” Avenue regularly surfaces and swells. Streets and homes in the subject area flooded during storm events and remained flooded for days after the storms. Personal property losses were high and structural damage was minimal. Inadequate and undersized storm water pipes exacerbated the flooding and standing water issues. High ground water table in this area.” The respondent said 18 residential units and two commercial properties are impacted with flooding reaching depths of several inches to four feet lasting one to two days. All have

experienced repetitive flooding. According to the respondent, flooding in this area has occurred up to about 10 times over the past decade.

Map Area ID: PEL-3

Municipality: PELHAM

General Location: 4th Avenue from 2nd Street to Pelhamwood Avenue

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, this area “experiences chronic flooding attributable to an inadequate stormwater conveyance system.” It is in a 500-year flood zone; however, according to the respondent, “this area is prone to chronically more frequent flood events due to its low elevation and proximity to the Hutchinson River. Streets and homes in the subject area flooded during storm events and remained flooded for days after the storms. Personal property losses were high and structural damage was minimal. Inadequate and undersized storm water pipes exacerbated the flooding and standing water issues. A high ground water table exists in this area.” The respondent said seven residential units and two commercial properties are impacted with flooding reaching depths of about two to three feet lasting one to two days. All have experienced repetitive flooding. According to the respondent, flooding in this area has occurred up to about eight times over the past decade.

Map Area ID: PEL-4

Municipality: PELHAM

General Location: Marquand Place from Wolfs Lane to Dead End at Hutchinson River Parkway

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, this area “experiences chronic flooding attributable to an inadequate stormwater conveyance system.” The area is in a 100-year flood zone. However, according to the respondent, “this area is prone to chronically more frequent flood events due to its low elevation and proximity to the Hutchinson River. Streets and homes in the subject area flooded during storm events and remained flooded for days after the storms. Personal property losses were high and structural damage was minimal. Inadequate and undersized storm water pipes exacerbated the flooding and standing water issues. A high ground water table exists in this area.” The respondent said six residential units are repetitively impacted with flooding reaching depths of about three to four feet lasting one to two days. According to the respondent, flooding in this area has occurred up to about six times over the past decade.

Map Area ID: PEL-5

Municipality: PELHAM

General Location: Colonial Avenue from Wolfs Lane to Hutchinson River Parkway and Vicinity

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, this area “experiences chronic stormwater flooding as Colonial Avenue traverses the Hutchinson River where the three (3) local municipalities meet, namely Village of Pelham, Village of Pelham Manor and City of Mount Vernon. The Hutchinson River bottlenecks at this point with the close proximity to the Hutchinson River Parkway entrance and exit ramps. Flooding at this location causes major vehicular traffic congestion as roadways become impassable for cars, trucks and emergency vehicles.” This area is in a 100-year flood zone, but the respondent states, “However, this area is prone to chronically more frequent flood events due to its low elevation and proximity to the Hutchinson River. Major thoroughfares including the Hutchinson River Parkway, Colonial Avenue and Wolfs Lane in the subject area flooded during storm events and remained flooded for days after the storms. Flooding at this location causes major vehicular traffic congestion as roadways become impassable for cars, trucks and emergency vehicles.” The respondent said an unknown number of residential units are impacted with flooding reaching depths of about three to four feet and lasting two to three days. The respondent stated that flooding undermines roadways, sidewalks, curbs, storm and sanitary pipes, water mains, gas mains, and catch basins. According to the respondent, flooding in this area has occurred up to about 10 times over the past decade.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
VILLAGE OF PORT CHESTER
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: PCH-1

Municipality: PORT CHESTER

General Location: Upland Street and King Street

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Standing water to a depth of approximately one foot occurs in a low spot around a drain inlet in the back yard of a single-family residence. The standing water occurs during a two-year or greater storm event, about three or four times during the past decade. The respondent stated the cause may be a clogged or collapsed Village-owned pipe draining the inlet.

Map Area ID: PCH-2

Municipality: PORT CHESTER

General Location: Betsy Brown Road

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Local road is inundated to a depth of approximately six to eight inches due to undersized drainage structures or damaged pipes, according to respondent. The inundation begins after approximately two to three inches of rain and impacts approximately five single-family residences. The inundation lasts approximately one hour.

Map Area ID: PCH-3

Municipality: PORT CHESTER

General Location: Barrett Lane

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: During periods of heavy rain, stormwater runoff cannot be accommodated by the drainage structures along the road. As a result, “runoff overtops lip of private driveway, flows down driveway and gets into basement of [a single-family] residence,” according to the respondent.

Map Area ID: PCH-4

Municipality: PORT CHESTER

General Location: Brook Road

Nearest Watercourse or Water Body: Tributary of Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: During periods of extraordinary heavy rain, a small stream in the vicinity of Brook Road and a nearby stormwater management basin overflow onto the road,

flooding driveways and garages. The flooding has occurred once or twice over the past decade during storms dropping approximately six to eight inches of rain. The respondent stated that the local drainage infrastructure cannot accommodate this degree of precipitation. The depth of inundation is approximately 2.0 feet to 2.5 feet but the inundation lasts less than five hours after the rain stops or significantly slackens.

Map Area ID: PCH-5

Municipality: PORT CHESTER

General Location: Glendale Place

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Respondent stated that “drains that are tributary to a large culvert back up and cause street flooding when the culvert is filled and cannot evacuate quickly enough.” The respondent added that catch basins might be undersized and “...a trash grate at the outlet of the culvert has the ability to restrict flow. This conditions tends to cause the culvert to run full which prevents runoff from the previously mentioned catch basin from entering the culvert,” according to the respondent, who said four single-family residences were impacted by some basement flooding during Hurricane Irene in 2011. About four to five inches of standing water are created that last up to two hours after rains stop during storms producing more than two to three inches of rainfall.

Map Area ID: PCH-6

Municipality: PORT CHESTER

General Location: Wesley Avenue and Irving Avenue

Nearest Watercourse or Water Body: Blind Brook

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Existing drainage is inadequate to convey significant storm events resulting in inundation to a depth of approximately twelve inches at the intersection of Wesley Avenue and Irving Avenue, according to respondent, adding that “existing drainage infrastructure is undersized to convey volume of water.”

Map Area ID: PCH-7

Municipality: PORT CHESTER

General Location: Willett Avenue and Marvin Place

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent states that the intersections of the New Haven Line railroad tracks/bridge, Willett Avenue and Marvin Place is a low point in the topography. “A large tributary area accounting for up to three-quarters of the village’s storm drain system combines at this location. Stormwater ponds at this low point, where subsurface drainage pipes are tidally influenced,” according to the respondent. Therefore, ponding occurs at intersection of Willett Avenue and Marvin Place. The depth of inundation is approximately two to three inches and lasts for about an hour after storm events. The area is within a 500-year flood zone.

Map Area ID: PCH-8

Municipality: PORT CHESTER

General Location: Lower King Street

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: The respondent states that road flooding and basement flooding impacts 10 to 12 commercial properties on Lower King Street. Flooding occurs when a large culvert is inundated with stormwater runoff and a rising tide in the Byram River combine to overwhelm the drainage infrastructure. High groundwater also contributes to basement flooding. Surface inundation reaches two to three feet in depth. The flooding recedes when the tide recedes and flooding has occurred multiple times over the past decade. The area is within 100-year and 500-year flood zones.

Map Area ID: PCH-9

Municipality: PORT CHESTER

General Location: North Main Street and Westchester Avenue to Willett Avenue

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): High

General Description of Flooding: The respondent states that road flooding and basement flooding impacts 10 to 12 commercial properties and sanitary sewer pipe(s) in the downtown area of Port Chester at North Main Street and along Westchester Avenue. Flooding occurs when stormwater backs up in drainage pipes and then surcharges from catch basins and manholes, inundating the area with stormwater. The problem is largely created by a rising tide in the Byram River, which combines with stormwater runoff to overwhelm the drainage infrastructure. Surface inundation reaches two to three feet in depth. The flooding recedes when the tide recedes and flooding has occurred multiple times over the past decade. The area is within 100-year and 500-year flood zones.

Map Area ID: PCH-10

Municipality: PORT CHESTER

General Location: Abendroth Avenue

Nearest Watercourse or Water Body: Byram River

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent states that “with its close proximity to the Byram River, this area is constantly in danger of flooding due to storm surges and the high tides that occur during storm events. Storm drainage systems surcharge and then streets become inundated.” The area is within the 100-year flood zone.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
VILLAGE OF RYE BROOK
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: RYB-1

Municipality: RYE BROOK

General Location: Intersection of Rockinghorse Trail and Country Ridge Drive

Nearest Watercourse or Water Body: Blind Brook

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, “A tributary brook feeding Blind Brook bordering the rear yards of properties located at Country Ridge Drive elevated to approximately five to six feet and overtook the surrounding topography causing uncontrolled flow over the adjacent property owners’ rear and front yards and flooding the intersection of Rockinghorse Trail and Country Club Drive. Numerous basements have been flooded, rear yards have been damaged, patio furniture washed away and debris deposited on these properties. The roadway is submerged under approximately 12 inches of water and is impassable during such events. Because roadway is flooded, storm drains cannot handle any rainfall, therefore water flows down driveways. This brook flows as an open channel but then is piped under Rockinghorse Trail, where it daylights again on the other side of the road in the rear of a residential property.” The approximate depth of flooding is 8 to 10 inches lasting approximately four to six hours after a storm event. The respondent stated three residential units experience repetitive damage from flooding. The impacted area is not within a designated flood zone.

Map Area ID: RYB-2

Municipality: RYE BROOK

General Location: Rockridge Drive, Concord Place, Acker Drive, Woodland Drive, Loch Lane, Beechwood Boulevard

Nearest Watercourse or Water Body: East Branch of Blind Brook

Associated Study/Report: Stormwater Analysis of Blind Brook East Branch, by Dolph Rotfeld Engineering, for Village of Rye Brook, November 2002

Evaluation Score (Low, Medium, High): Medium

General Description of Flooding: According to the respondent, “A tributary brook feeding (the East Branch of) Blind Brook bordering the rear yards of properties located at Loch Lane elevates approximately three to five feet and overtakes the surrounding topography causing uncontrolled flow over the roadway and floods” area encompassing the circle where Loch Lane, Beechwood Boulevard, Woodland Drive, Edgewood Drive and Hillandale Road intersect. A county-owned sewer pipe surcharges during a two-inch or greater storm, according to the respondent. Flooding is partially centered around a small pond at 17 Loch Lane. This area is within a 100-year flood zone. The respondent further states that nearby “Rich Manor Park acts as a retention basin and floods, water spills into properties at Rock Ridge Drive and impacts the garages, driveways and basements.” Two 6-inch-diameter culverts carrying the East Branch of Blind Brook at Acker Drive, immediately south of Rich Manor Park, are “overwhelmed and water overtakes the road. Approximately two feet of water floods the road and cuts off approximately 18 single-family residences from emergency services.” Woodland Drive rear yards also flood and, the respondent

said one property basement flooded three times in 2011 due to “overwhelming” street runoff, overtaken storm drains and rear yard flooding. This area also is within a 100-year flood zone. In total, the respondent said 11 residential units have been damaged by flooding with six to eight of these repetitively. The approximate depth of flooding is eight to 10 inches at Beechwood Circle and two to three feet at Rich Manor Park. Inundation usually lasts six to 12 hours.

Map Area ID: RYB-3

Municipality: RYE BROOK

General Location: Avon Circle (Rye Ridge Condominiums)

Nearest Watercourse or Water Body: East Branch of Blind Brook

Associated Study/Report: None

Evaluation Score (Low, Medium, High): High

General Description of Flooding: According to the respondent, “Avon Circle is at a bottleneck of the East Branch of Blind Brook, which borders the rear yards of (the Rye Ridge Condominiums). The (brook) crossing under Westchester Avenue restricts flow and moderate to severe storms” generate inundation in this area to depths of a “few feet” to 10 feet”. Inundation floods basements and, in some case, to the first floors of residential units. Debris is commonly contained in the flood waters. The brook “elevates approximately three to 10 feet and overtakes the surrounding properties.” The respondent said the first floors of some units are only a “few feet” above grade, although the area is in a designated 100-year flood zone. Approximately 85 residential units have been repetitively damaged by flooding. In addition, building utilities, such as heating, electrical and telephone systems, are “routinely” damaged, according to the respondent.

Map Area ID: RYB-4

Municipality: RYE BROOK

General Location: Brook Lane

Nearest Watercourse or Water Body: Blind Brook

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: According to the respondent, Brook Lane and four to six single-family residences along it have experienced repetitive flooding from Blind Brook. The respondent said that during extraordinarily severe storms the brook’s water level rises eight to 10 feet. The brook is lined with a rock retaining wall. It “surcharges through people’s rear yards,” the respondent said, and the entire area is generally flat. The residences are on concrete slabs with no basements. The road gets flooded and is impassable during several storms. The respondent said that “street drains empty in the brook and are useless once head pressure in the brook prohibits drainage, so the road starts to flood.” Flood water depths on the road and elsewhere reach up to three feet during severe storms and lasts six to 12 hours. The area is in a designated 100-year flood zone.

Map Area ID: RYB-5

Municipality: RYE BROOK

General Location: Wyman Street and Brookridge Court

Nearest Watercourse or Water Body: Blind Brook

Associated Study/Report: None

Associated Study/Report: None

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Blind Brook overtakes the rock wall-lined banks of the river and jumps the channel walls as well as seeps through drain openings at the end of Wyman Street. This area also is subjected to tidal influences. The brook elevation rises three to five feet during severe storms and then spills onto the road. When head pressure in the brook prohibits drainage from the road infrastructure, the drains become “useless” and road impassable, according to the respondent. Once the road starts to flood, some properties along it also experience flooding. Wyman Street gets “repeated” flooding from Blind Brook (seven or eight times over the past decade and following storms with greater than 2.5 inches of rainfall), according to the respondent. The yards of approximately four to six single-family residences, which have basements, experience flooding during severe storms. Besides the road becoming impassable, asphalt in the road and driveways is sometimes damaged and debris is deposited in the yards and water damage occurs in garages. During the most severe storms, the first floors of some homes might be “compromised,” according to the respondent. No basement flooding was reported. The area is in a designated 100-year flood zone.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
VILLAGE OF SCARSDALE
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: SCD-1

Municipality: SCARSDALE

General Location: North of Fenway Country Club and Golf Course

Nearest Watercourse or Water Body: Sheldrake River

Associated Study/Report: Village of Scarsdale Village-Wide Comprehensive Stormwater Management Plan, February 2009, by Dvirka and Bartilucci Engineers and Architects for Village of Scarsdale

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated that the uppermost section of the Sheldrake River flows through Fenway Golf Course and, during the April 2007 nor'easter, it overflowed its banks and flooded much of the golf course as well as the back yards of single-family residences that border the golf course on Sheldrake Road. Yards also flooded across Sheldrake Road upstream from twin culverts underneath the road. Damage occurred to one single-family residence and the flooding clogged stormwater drainage infrastructure. Flooding of this nature has occurred about three times over the past decade and usually occurs when precipitation reaches five inches or more.

Map Area ID: SCD-2

Municipality: SCARSDALE

General Location: South of Fenway Country Club and Golf Course

Nearest Watercourse or Water Body: Sheldrake River and Cayuga Pond

Associated Study/Report: Village of Scarsdale Village-Wide Comprehensive Stormwater Management Plan, February 2009, by Dvirka and Bartilucci Engineers and Architects for Village of Scarsdale

Evaluation Score (Low, Medium, High): High

General Description of Flooding: The respondent stated that the uppermost section of the Sheldrake River and a smaller tributary flow from Fenway Golf Course and, during the April 2007 nor'easter, they overflowed their banks and flooded the golf course as well as the back yards, driveways, garages and/or basements of about 30 to 40 single-family residences along Oneida Road, Cayuga Road, Quaker Center, and Brookby Road. Cayuga Pond also overflowed and contributed to the flooding. The flooding reached depths of up to five feet. Much of the impacted area is within a 100-year flood zone. Flooding of this nature has occurred about 10 times over the past decade and usually occurs when precipitation reaches three inches or more, according to the respondent.

Map Area ID: SCD-3

Municipality: SCARSDALE

General Location: Griffen Avenue and Normandy Lane

Nearest Watercourse or Water Body: Sheldrake River

Associated Study/Report: Village of Scarsdale Village-Wide Comprehensive Stormwater Management Plan, February 2009, by Dvirka and Bartilucci Engineers and Architects for Village of Scarsdale

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: The respondent stated that heavy rainfall of approximately three inches or more leads to the closure of Griffen Avenue between Mamaroneck Road and Normandy Lane. This section has been closed about five times over the past decade with one to two feet of inundation lasting one to two days after a storm event. Sometimes residential yards become inundated, too. The area is not within a designated flood zone.

Map Area ID: SCD-4

Municipality: SCARSDALE

General Location: Crossway Field

Nearest Watercourse or Water Body: East Branch of the Sheldrake River

Associated Study/Report: Village of Scarsdale Village-Wide Comprehensive Stormwater Management Plan, February 2009, by Dvirka and Bartilucci Engineers and Architects for Village of Scarsdale

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Flooding occurs along the East Branch of the Sheldrake River with three inches or more of rainfall. The flooding impacts the back yards of about 10 single-family residences along Rural Drive and a Village-owned park called Crossway Field. The area is not within a designated flood zone.

Map Area ID: SCD-5

Municipality: SCARSDALE

General Location: Weaver Street

Nearest Watercourse or Water Body: Sheldrake River

Associated Study/Report: Village of Scarsdale Village-Wide Comprehensive Stormwater Management Plan, February 2009, by Dvirka and Bartilucci Engineers and Architects for Village of Scarsdale

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Flooding occurs along in the front yards of single-family residences along Weaver Street. This section of the road also floods when rainfall reaches more than three inches. The area is not within a designated flood zone.

Map Area ID: SCD-6

Municipality: SCARSDALE

General Location: Headwaters of Hutchinson River at Drake Road

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: Village of Scarsdale Village-Wide Comprehensive Stormwater Management Plan, February 2009, by Dvirka and Bartilucci Engineers and Architects for Village of Scarsdale

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: Catch basins overflow due to submerged outlets caused by river flooding and leaves and other debris clogging them, according to the respondent. The result is flooded sections of roads and flooded front yards. These areas are not within designated flood

zones but they are adjacent to a 100-year flood zone. Flood usually occurs when there is three inches or more of rainfall.

Map Area ID: SCD-7

Municipality: SCARSDALE

General Location: East Woods Lane, Barry Road, Tunstall Road, Grand Boulevard, Sprague Avenue

Nearest Watercourse or Water Body: Hutchinson River

Associated Study/Report: Village of Scarsdale Village-Wide Comprehensive Stormwater Management Plan, February 2009, by Dvirka and Bartilucci Engineers and Architects for Village of Scarsdale

Evaluation Score (Low, Medium, High): High

General Description of Flooding: Catch basins overflow due to submerged outlets caused by river flooding and high groundwater and leaves and other debris clogging them, according to the respondent. The result is flooded sections of roads and flooded yards and the respondent said 30 to 40 single-family residences have been damaged. The impacted area is inundated with two to four feet of stormwater lasting one to two days and following storm events yielding more than three inches of rainfall. These areas are within and/or adjacent to a 100-year flood zone. Flood usually occurs when there is three inches or more of rainfall.

MUNICIPALLY IDENTIFIED FLOOD PROBLEM AREAS
CITY OF WHITE PLAINS
COASTAL LONG ISLAND SOUND STUDY AREA

Map Area ID: WHP-1

Municipality: WHITE PLAINS

General Location: North of Interstate 287 at Brockway Place, Belway Place and Delfino Park

Nearest Watercourse or Water Body: Mamaroneck River

Associated Study/Report: NONE

Evaluation Score (Low, Medium, High): Low

General Description of Flooding: This area is largely within the 100-year flood zone and experiences flooding during the most significant storm events, notably the April 2007 nor'easter and the back-to-back Hurricane Irene and Tropical Storm Lee. Commercial properties have been impacted by flooding, including a refuse facility, supply and construction firms, and automobile maintenance and repair facilities. A city park, which includes baseball fields, tennis courts and an outdoor ice rink, also has been impacted by flooding.

<u>Municipality</u>	<u>Site</u>	<u>Site Description</u>	<u>Rating</u>
Eastchester	ECH-1	Clarence Road and Anpell Drive at Hutchinson Boulevard	Low
Eastchester	ECH-2	Old Wilmot Road	Low
Eastchester	ECH-3	Crawford Street from Rose Avenue to Middle Road	Low
Eastchester	ECH-4	Hewitt Avenue and Lisperdard Road East of California Raod, all West of Cross County Parkway	Low
Harrison	HAR-1	Glendale Road Between West Street and Mamaroneck Village Boundary	Low
Harrison	HAR-2	West Street In Vicinity of Westwood Drive, Westwood Court, Saddletree Lane and Grove Street	Medium
Harrison	HAR-3	Oakdland Avneue from Metro-North Commuter Railroad New Haven Line to City of Rye Boundary	High
Harrison	HAR-4	Westerleigh Road South of Hutchinson River Parkway	Medium
Harrison	HAR-5	Barnes Lane South to Anderson Hill Road	Low
Harrison	HAR-6	Lake Street East, Old Lake Street and Barnes Lane	Low
Harrison	HAR-7	Osborne Road to Harrison Avenue and Haviland Road to Sterling Avenue	High
Larchmont	LAR-1	Pine Brook Drive and Kilmer Road	High
Larchmont	LAR-10	North Avenue	Low
Larchmont	LAR-11	Coolidge Street	Low
Larchmont	LAR-12	Monroe Avenue at Cherry Avenue and Ervilla Drive	Low
Larchmont	LAR-13	Weaver Street at Goodliffe Pond/Sheldrake River (Mamaroneck Town	Low
Larchmont	LAR-2	Flint Park at Birch Lane and Nassau Road	Medium
Larchmont	LAR-3	Pryer Manor Road at Premium River Bridge	Low
Larchmont	LAR-4	Magnolia Avenue and Ocean Avenue	Low
Larchmont	LAR-5	Cedar Island	Low
Larchmont	LAR-6	Pine Brook from Boston Post Road to Guion Lane	Low
Larchmont	LAR-7	Park Avenue at Larchmont Manor Park	Low
Larchmont	LAR-8	Park Avenue at larchmont Manor Beach	Low
Larchmont	LAR-9	Spanish Cove Raod and Lindsley Drive	Low
Mamaroneck Town	MMT-1	Fenimore Road, York Road, Valley Stream Road, Brookside Drive, Bonnie Way, Lakeside Drive, North Brook Road, Orchard Road, Sheldrake Avenue, Little Farms Road, Stoneyside Drive, East Garden Road, West Garden Road, Fernwood Road, Forest Avenue, Winding Brook Drive, and Weaver Street	High
Mamaroneck Town	MMT-2	Murray Avenue at Colonial Avenue	Medium
Mamaroneck Town	MMT-3	Hommocks Road, Hommocks Middle School, Hampshire Country Club and Golf Course	Medium
Mamaroneck Town	MMT-4	Fifth Avenue Between New Rochelle Boundary and Lester Place	Low
Mamaroneck Town	MMT-5	Premium Marsh and Environs and Premium Point	Medium
Mamaroneck Town	MMT-6	Two Separate Areas: (6A) South of Interstate 95 at Boston Post Road South of Richbell Road, Cabot Road and Thompson Place; and (6B) North of Interstate 95 at Madison Avenue Between Fifth Avenue and Myrtle Boulevard	Medium
Mamaroneck Town	MMT-7	Griffen Avenue and Adrian Circle	Low
Mamaroneck Town	MMT-8	Old White Plains Road, Bruce Road and Winged Foot Golf Club	Low
Mamaroneck Town	MMT-9	Country Road at Leatherstocking Lane and Fenimore Road at Mamaroneck Village Boundary	Low
Mount Vernon	MTV-1	Valois Place	Low*
Mount Vernon	MTV-2	Hutchinson Boulevard (North End)	Low*

<u>Municipality</u>	<u>Site</u>	<u>Site Description</u>	<u>Rating</u>
Mount Vernon	MTV-3	Stuyvesant Plaza	Low*
Mount Vernon	MTV-4	Hanover Place	Low*
Mount Vernon	MTV-5	Farrell Avenue	Low*
Mount Vernon	MTV-6	East Sanford Boulevard	Low*
Mount Vernon	MTV-7	South Third Avenue	Low*
Mount Vernon	MTV-8	Hutchinson Boulevard (South End)	Low*
New Rochelle	NRO-1	Grand Boulevard, Primrose Avenue, Charlotte Lane, Sprague Road	High
New Rochelle	NRO-2	Valley Road	Low
New Rochelle	NRO-3	Brookside Place and Brookdale Avenue	High
New Rochelle	NRO-4	White Oak Street	Medium
Pelham	PEL-1	6 th Street from 4 th Avenue to 8 th Avenue	High
Pelham	PEL-2	Highbrook Avenue from Harmon Avenue to Boulevard and Vicinity	High
Pelham	PEL-3	4 th Avenue from 2 nd Street to Pelhamwood Avenue	Medium
Pelham	PEL-4	Marquand Place from Wolfs Lane to Dead End at Hutchinson River Parkway	Low
Pelham	PEL-5	Colonial Avenue from Wolfs Lane to Hutchinson River Parkway and Vicinity	Medium
Pelham Manor	PMR-1	Mount Tom Road and Pelham Country Club	Low
Pelham Manor	PMR-2	Wolfs Lane and Iden Avenue	Low
Pelham Manor	PMR-3	Shore Road and Shoreview Circle	Low
Pelham Manor	PMR-4	Pelham Country Club	Low
Pelham Manor	PMR-5	Highbrook Avenue and Randall Place	Low
Port Chester	PCH-1	Upland Street and King Street	Low
Port Chester	PCH-10	Abendroth Avenue	Low
Port Chester	PCH-2	Betsy Brown Road	Low
Port Chester	PCH-3	Barrett Lane	Low
Port Chester	PCH-4	Brook Road	Low
Port Chester	PCH-5	Glendale Place	Low
Port Chester	PCH-6	Wesley Avenue and Irving Avenue	Low
Port Chester	PCH-7	Willett Avenue and Marvin Place	Low
Port Chester	PCH-8	Lower King Street	Medium
Port Chester	PCH-9	North Main Street and Westchester Avenue to Willett Avenue	High
Rye Brook	RYB-1	Intersection of Rockinghorse Trail and Country Ridge Drive	Low
Rye Brook	RYB-2	Rockridge Drive, Concord Place, Acker Drive, Woodland Drive, Loch Lane, Beechwood Boulevard	Medium
Rye Brook	RYB-3	Avon Circle (Rye Ridge Condominiums)	High
Rye Brook	RYB-4	Brook Lane	Low
Rye Brook	RYB-5	Wyman Street and Brookridge Court	Low
Scarsdale	SCD-1	North of Fenway Country Club and Golf Course	Low
Scarsdale	SCD-2	South of Fenway Country Club and Golf Course	High
Scarsdale	SCD-3	Griffen Avenue and Normandy Lane	Low
Scarsdale	SCD-4	Crossway Field	Low

<u>Municipality</u>	<u>Site</u>	<u>Site Description</u>	<u>Rating</u>
Scarsdale	SCD-5	Weaver Avenue	Low
Scarsdale	SCD-6	Headwaters of Hutchinson River at Drake Road	Low
Scarsdale	SCD-7	East Woods Lane, Barry Road, Tunstall Road, Grand Boulevard, Sprague Avenue	High
White Plains	WHP-1	North of Interstate 287 at Brockway Place, Belway Place and Delfino Park	Low

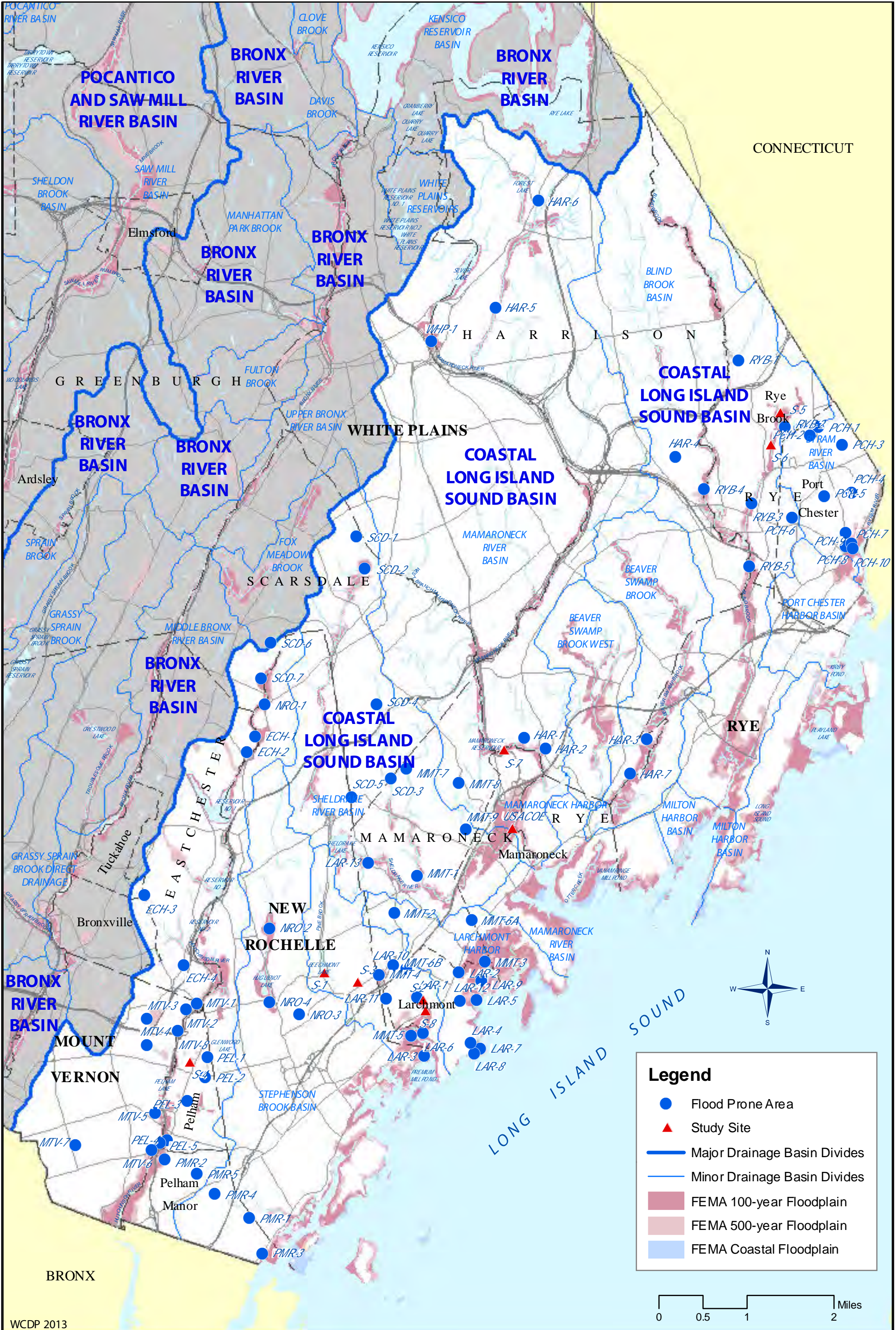
* Further information needed for comparative rating.

Municipality	Site	Site Description	Rating
Harrison	HAR-3	Oakdland Avneue from Metro-North Commuter Railroad New Haven Line to City of Rye Boundary	High
Harrison	HAR-7	Osborne Road to Harrison Avenue and Haviland Road to Sterling Avenue	High
Larchmont	LAR-1	Pine Brook Drive and Kilmer Road	High
Mamaroneck Town	MMT-1	Fenimore Road, York Road, Valley Stream Road, Brookside Drive, Bonnie Way, Lakeside Drive, North Brook Road, Orchard Road, Sheldrake Avenue, Little Farms Road, Stoneyside Drive, East Garden Road, West Garden Road, Fernwood Road, Forest Avenue, Winding Brook Drive, and Weaver Street	High
New Rochelle	NRO-1	Grand Boulevard, Primrose Avenue, Charlotte Lane, Sprague Road	High
New Rochelle	NRO-3	Brookside Place and Brookdale Avenue	High
Pelham	PEL-1	6 th Street from 4 th Avenue to 8 th Avenue	High
Pelham	PEL-2	Highbrook Avenue from Harmon Avenue to Boulevard and Vicinity	High
Port Chester	PCH-9	North Main Street and Westchester Avenue to Willett Avenue	High
Rye Brook	RYB-3	Avon Circle (Rye Ridge Condominiums)	High
Scarsdale	SCD-2	South of Fenway Country Club and Golf Course	High
Scarsdale	SCD-7	East Woods Lane, Barry Road, Tunstall Road, Grand Boulevard, Sprague Avenue	High
Harrison	HAR-2	West Street In Vicinity of Westwood Drive, Westwood Court, Saddletree Lane and Grove Street	Medium
Harrison	HAR-4	Westerleigh Road South of Hutchinson River Parkway	Medium
Larchmont	LAR-2	Flint Park at Birch Lane and Nassau Road	Medium
Mamaroneck Town	MMT-2	Murray Avenue at Colonial Avenue	Medium
Mamaroneck Town	MMT-3	Hommocks Road, Hommocks Middle School, Hampshire Country Club and Golf Course	Medium
Mamaroneck Town	MMT-5	Premium Marsh and Environs and Premium Point	Medium
Mamaroneck Town	MMT-6	Two Separate Areas: (6A) South of Interstate 95 at Boston Post Road South of Richbell Road, Cabot Road and Thompson Place; and (6B) North of Interstate 95 at Madison Avenue Between Fifth Avenue and Myrtle Boulevard	Medium
New Rochelle	NRO-4	White Oak Street	Medium
Pelham	PEL-3	4 th Avenue from 2 nd Street to Pelhamwood Avenue	Medium
Pelham	PEL-5	Colonial Avenue from Wolfs Lane to Hutchinson River Parkway and Vicinity	Medium
Port Chester	PCH-8	Lower King Street	Medium
Rye Brook	RYB-2	Rockridge Drive, Concord Place, Acker Drive, Woodland Drive, Loch Lane, Beechwood Boulevard	Medium
Eastchester	ECH-1	Clarence Road and Anpell Drive at Hutchinson Boulevard	Low
Eastchester	ECH-2	Old Wilmot Road	Low
Eastchester	ECH-3	Crawford Street from Rose Avenue to Middle Road	Low
Eastchester	ECH-4	Hewitt Avenue and Lispendar Road East of California Raod, all West of Cross County Parkway	Low
Harrison	HAR-1	Glendale Road Between West Street and Mamaroneck Village Boundary	Low
Harrison	HAR-5	Barnes Lane South to Anderson Hill Road	Low
Harrison	HAR-6	Lake Street East, Old Lake Street and Barnes Lane	Low
Larchmont	LAR-10	North Avenue	Low
Larchmont	LAR-11	Coolidge Street	Low
Larchmont	LAR-12	Monroe Avenue at Cherry Avenue and Ervilla Drive	Low

<u>Municipality</u>	<u>Site</u>	<u>Site Description</u>	<u>Rating</u>
Larchmont	LAR-13	Weaver Street at Goodliffe Pond/Sheldrake River (Mamaroneck Town	Low
Larchmont	LAR-3	Pryer Manor Road at Premium River Bridge	Low
Larchmont	LAR-4	Magnolia Avenue and Ocean Avenue	Low
Larchmont	LAR-5	Cedar Island	Low
Larchmont	LAR-6	Pine Brook from Boston Post Road to Guion Lane	Low
Larchmont	LAR-7	Park Avenue at Larchmont Manor Park	Low
Larchmont	LAR-8	Park Avenue at larchmont Manor Beach	Low
Larchmont	LAR-9	Spanish Cove Raod and Lindsley Drive	Low
Mamaroneck Town	MMT-4	Fifth Avenue Between New Rochelle Boundary and Lester Place	Low
Mamaroneck Town	MMT-7	Griffen Avenue and Adrian Circle	Low
Mamaroneck Town	MMT-8	Old White Plains Road, Bruce Road and Winged Foot Golf Club	Low
Mamaroneck Town	MMT-9	Country Road at Leatherstocking Lane and Fenimore Road at Mamaroneck Village Boundary	Low
New Rochelle	NRO-2	Valley Road	Low
Pelham	PEL-4	Marquand Place from Wolfs Lane to Dead End at Hutchinson River Parkway	Low
Pelham Manor	PMR-1	Mount Tom Road and Pelham Country Club	Low
Pelham Manor	PMR-2	Wolfs Lane and Iden Avenue	Low
Pelham Manor	PMR-3	Shore Road and Shoreview Circle	Low
Pelham Manor	PMR-4	Pelham Country Club	Low
Pelham Manor	PMR-5	Highbrook Avenue and Randall Place	Low
Port Chester	PCH-1	Upland Street and King Street	Low
Port Chester	PCH-10	Abendroth Avenue	Low
Port Chester	PCH-2	Betsy Brown Road	Low
Port Chester	PCH-3	Barrett Lane	Low
Port Chester	PCH-4	Brook Road	Low
Port Chester	PCH-5	Glendale Place	Low
Port Chester	PCH-6	Wesley Avenue and Irving Avenue	Low
Port Chester	PCH-7	Willett Avenue and Marvin Place	Low
Rye Brook	RYB-1	Intersection of Rockinghorse Trail and Country Ridge Drive	Low
Rye Brook	RYB-4	Brook Lane	Low
Rye Brook	RYB-5	Wyman Street and Brookridge Court	Low
Scarsdale	SCD-1	North of Fenway Country Club and Golf Course	Low
Scarsdale	SCD-3	Griffen Avenue and Normandy Lane	Low
Scarsdale	SCD-4	Crossway Field	Low
Scarsdale	SCD-5	Weaver Avenue	Low
Scarsdale	SCD-6	Headwaters of Hutchinson River at Drake Road	Low
White Plains	WHP-1	North of Interstate 287 at Brockway Place, Belway Place and Delfino Park	Low
Mount Vernon	MTV-1	Valois Place	Low*
Mount Vernon	MTV-2	Hutchinson Boulevard (North End)	Low*

<u>Municipality</u>	<u>Site</u>	<u>Site Description</u>	<u>Rating</u>
Mount Vernon	MTV-3	Stuyvesant Plaza	Low*
Mount Vernon	MTV-4	Hanover Place	Low*
Mount Vernon	MTV-5	Farrell Avenue	Low*
Mount Vernon	MTV-6	East Sanford Boulevard	Low*
Mount Vernon	MTV-7	South Third Avenue	Low*
Mount Vernon	MTV-8	Hutchinson Boulevard (South End)	Low*

* Further information needed for comparative rating.



WCDP 2013

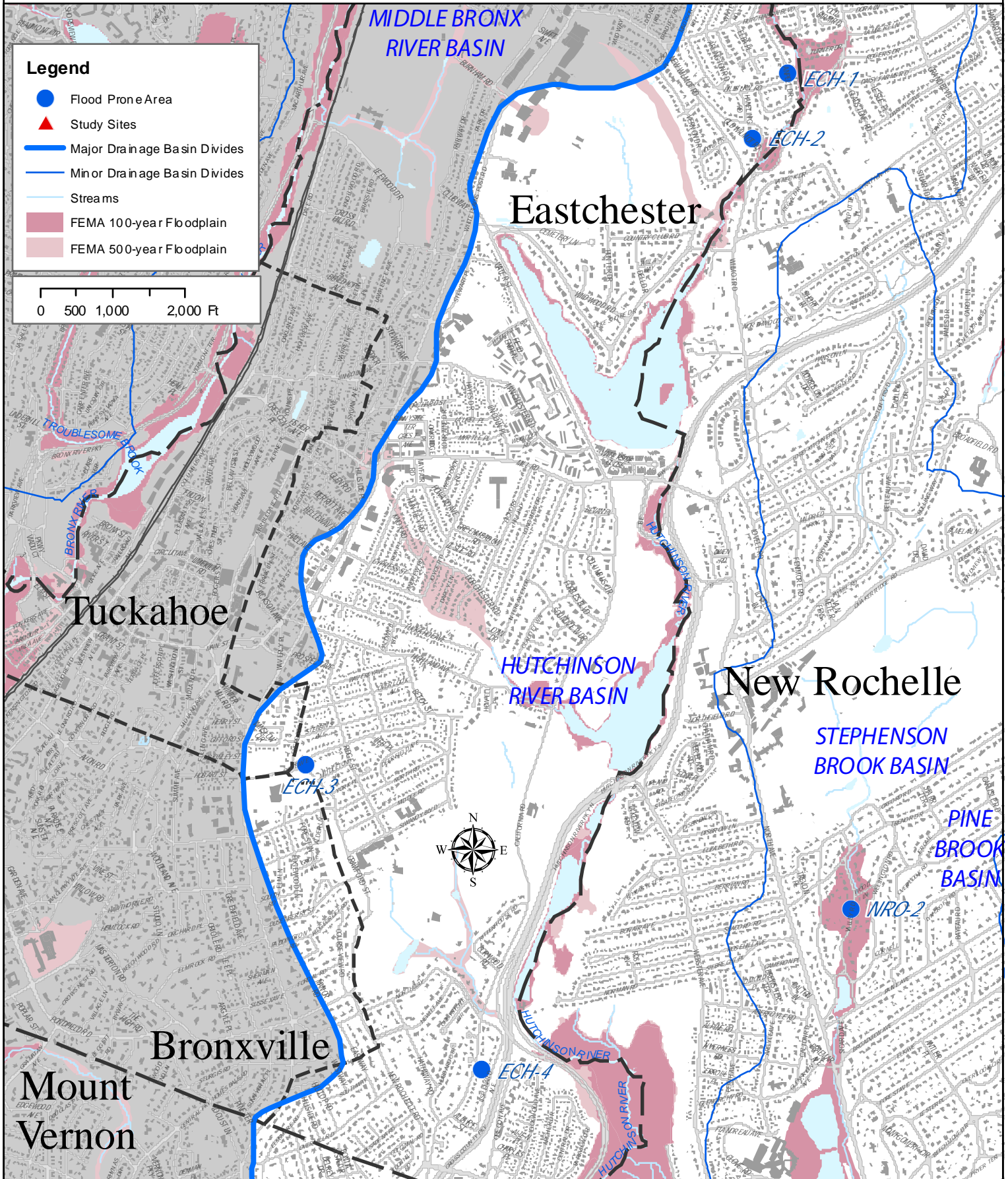


Municipally Identified Flood Prone Areas Coastal Long Island Sound Basin

432 Michaelian Office Building
148 Martine Ave
White Plains, NY 10601
www.westchestergov.com/planning



COASTAL LONG ISLAND SOUND BASIN

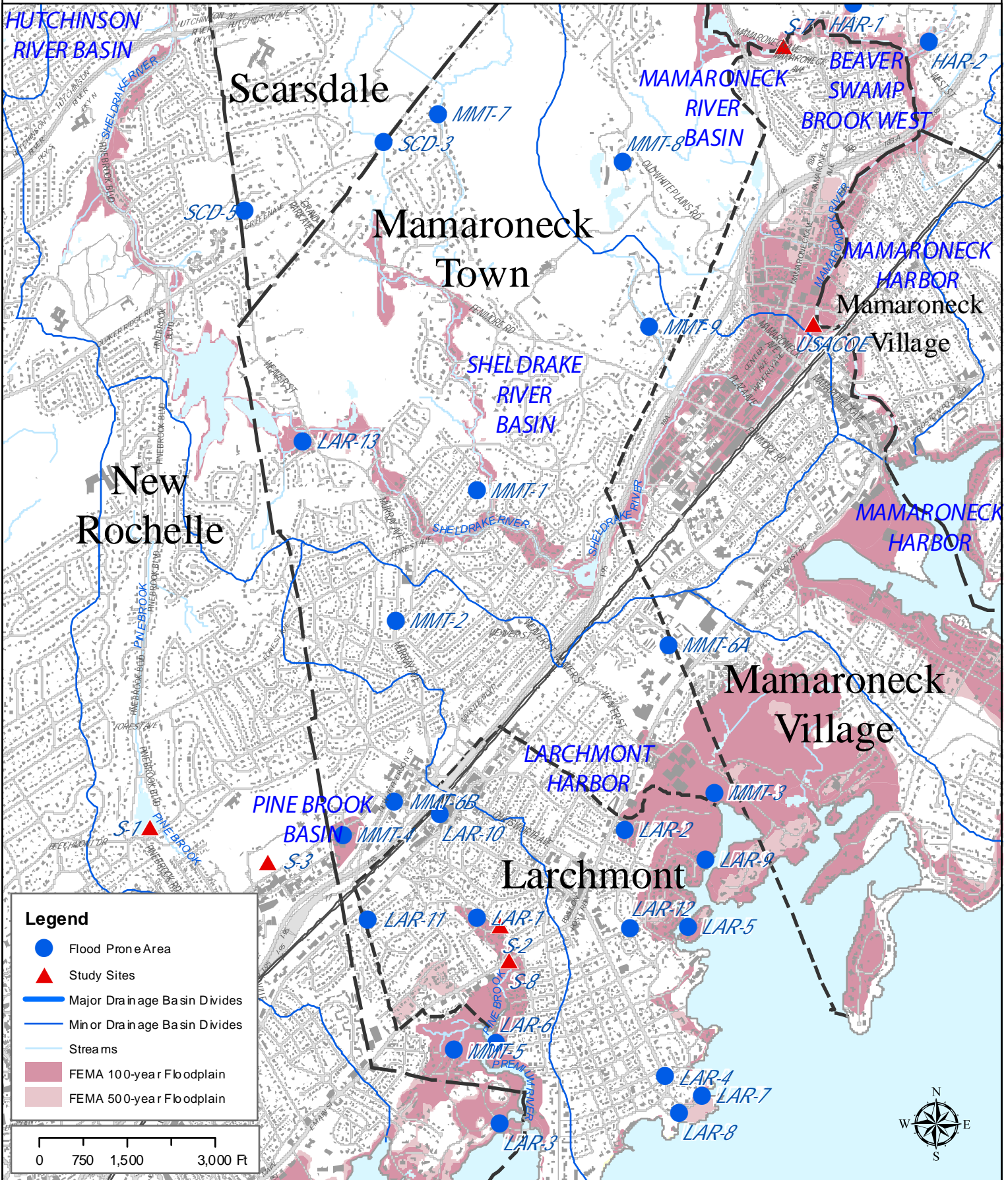


Municipally Identified Flood Prone Areas
Town of Eastchester

432 Michaelian Office Building
148 Martine Ave
White Plains, NY 10601
www.westchester.gov/planning
GIS

This map illustrates the Mamaroneck River Basin, highlighting flood-prone areas and study sites. The basin is divided into several sub-basins: White Plains Reservoirs, Mamaroneck River Basin, Blind Brook Basin, Beaver Swamp Brook, Beaver Swamp Brook West, and Milton Harbor Basin. Major drainage basin divides are shown as thick blue lines, while minor divides are thinner blue lines. Streams are depicted as light blue lines. Flood-prone areas are shaded in pink, with darker pink indicating FEMA 100-year floodplains and lighter pink indicating FEMA 500-year floodplains. Study sites are marked with red triangles and labeled: S-1, S-5, S-6, S-7, S-8, S-9, S-10, S-11, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19, S-20, S-21, S-22, S-23, S-24, S-25, S-26, S-27, S-28, S-29, S-30, S-31, S-32, S-33, S-34, S-35, S-36, S-37, S-38, S-39, S-40, S-41, S-42, S-43, S-44, S-45, S-46, S-47, S-48, S-49, S-50, S-51, S-52, S-53, S-54, S-55, S-56, S-57, S-58, S-59, S-60, S-61, S-62, S-63, S-64, S-65, S-66, S-67, S-68, S-69, S-70, S-71, S-72, S-73, S-74, S-75, S-76, S-77, S-78, S-79, S-80, S-81, S-82, S-83, S-84, S-85, S-86, S-87, S-88, S-89, S-90, S-91, S-92, S-93, S-94, S-95, S-96, S-97, S-98, S-99, S-100. Other locations shown include Harrison, White Plains, Port Chester, Rye City, Scarsdale, and Mamaroneck Town. A legend in the top right corner defines the symbols used. A scale bar indicates distances up to 1 mile. A north arrow is located in the bottom right corner.

COASTAL LONG ISLAND SOUND BASIN



COASTAL LONG ISLAND SOUND BASIN

Yonkers

Legend

- Flood Prone Area
- ▲ Study Sites
- Major Drainage Basin Divides
- Minor Drainage Basin Divides
- Streams
- FEMA 100-year Floodplain
- FEMA 500-year Floodplain

0 500 1,000 2,000 Ft

Eastchester

New Rochelle

MTV-3

MTV-4

MTV-8

S-4

PEL-1

PEL-2

Pelham

MTV-5

PEL-5

PEL-4

MTV-6

PMR-2

Pelham Manor

PMR-5

PMR-4



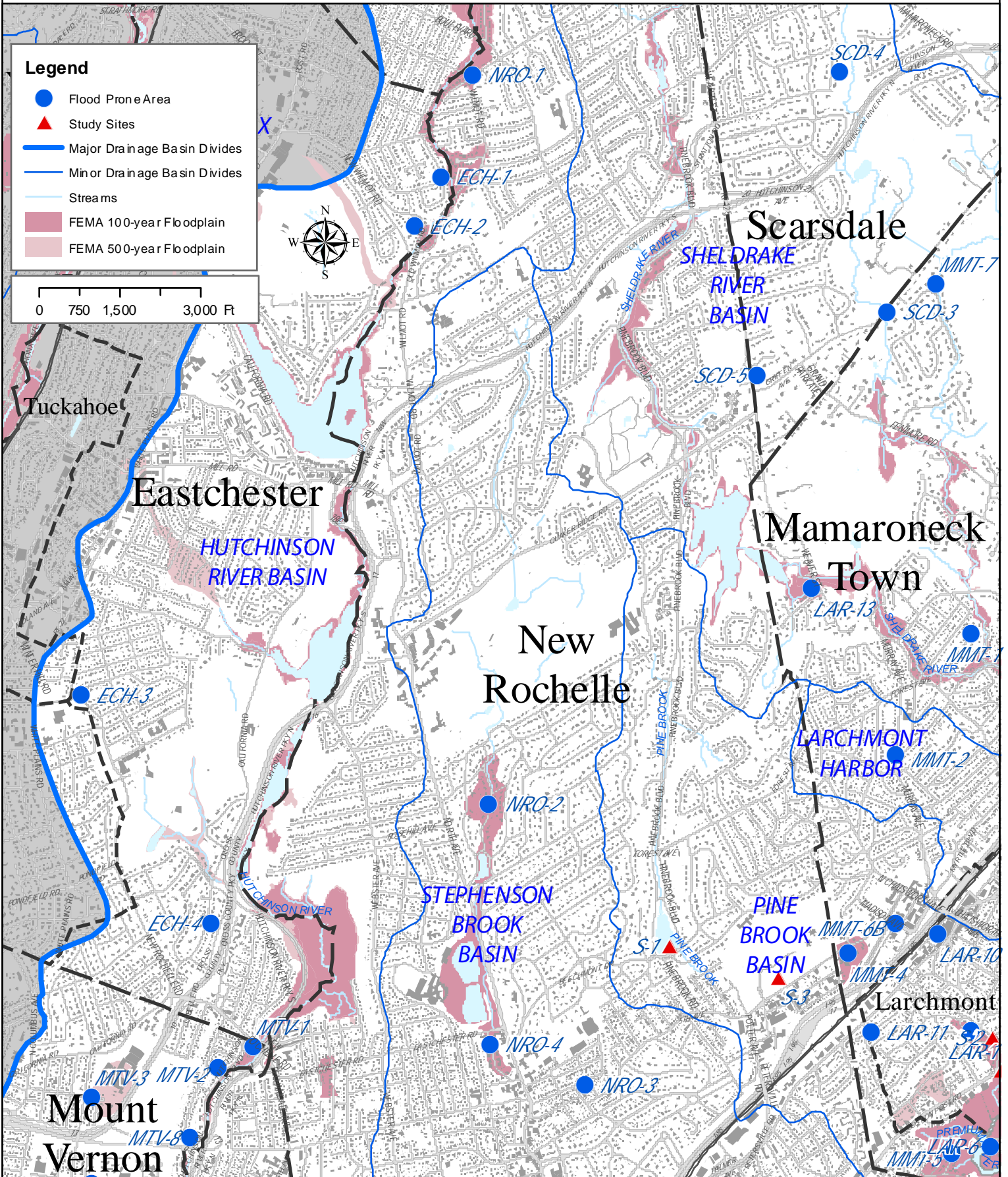
Westchester
gov.com

Municipally Identified Flood Prone Areas
City of Mount Vernon

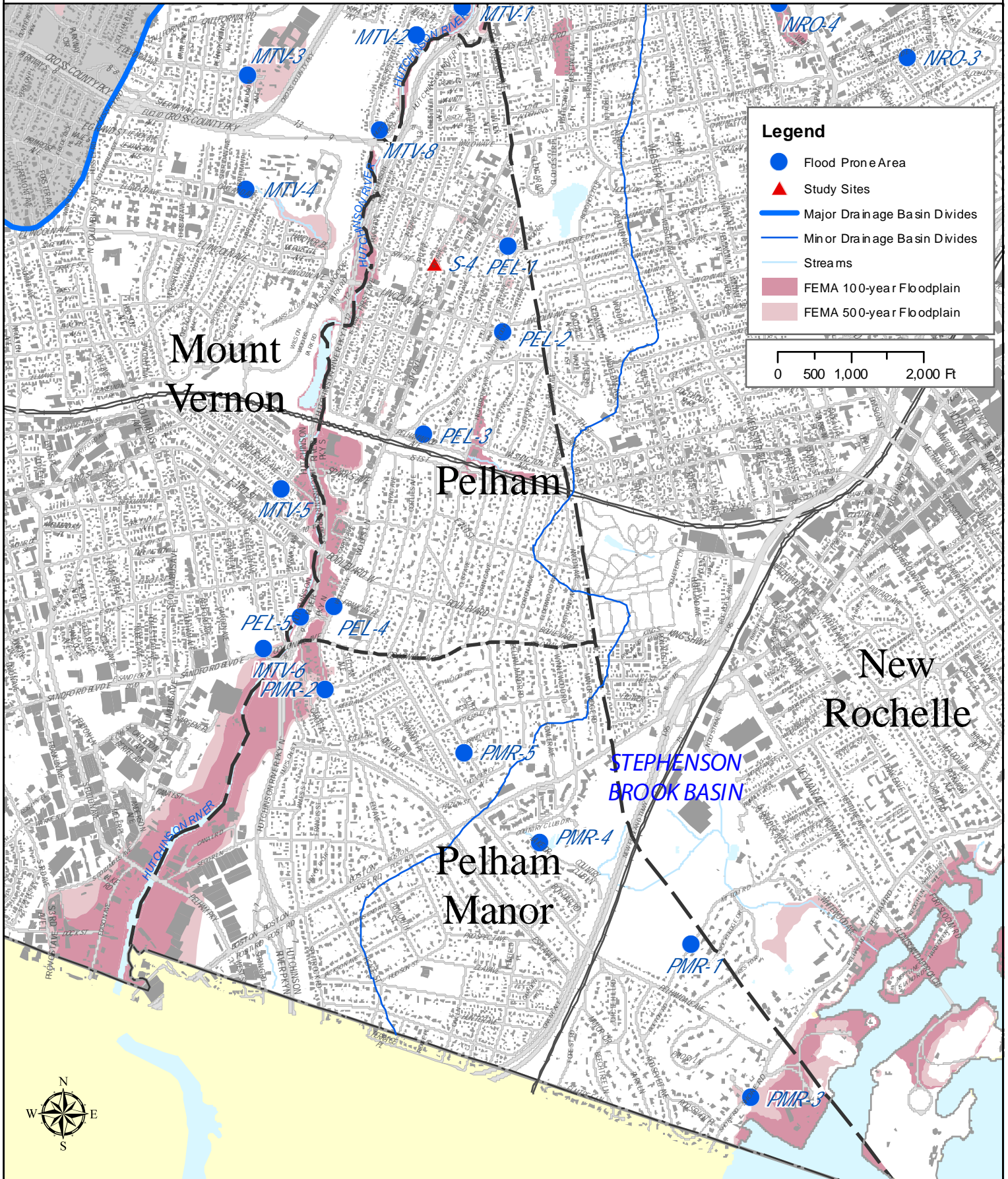
432 Michaelian Office Building
148 Martine Ave
White Plains, NY 10601
www.westchester.gov/planning

GIS GEOGRAPHIC INFORMATION SYSTEM

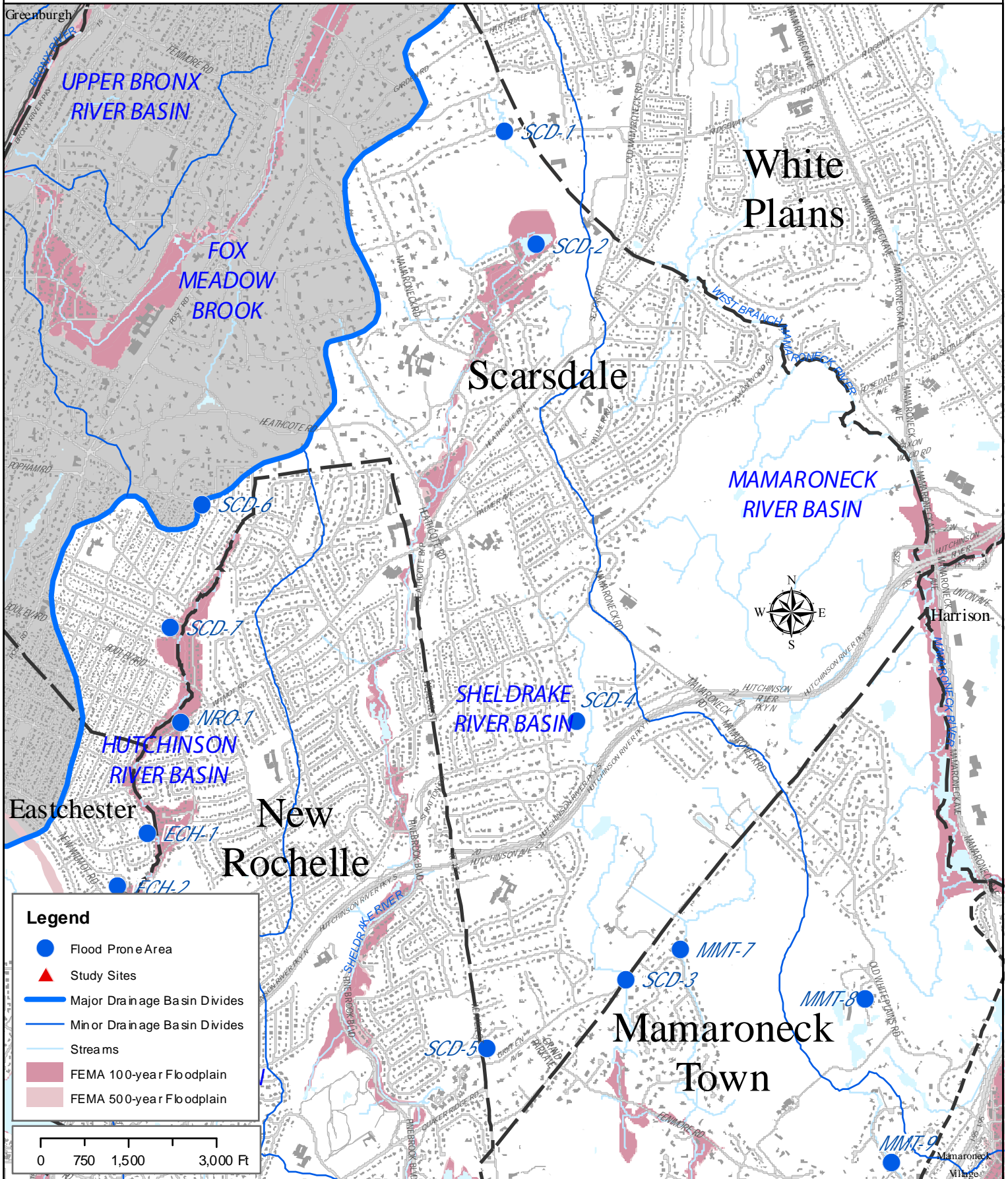
COASTAL LONG ISLAND SOUND BASIN



COASTAL LONG ISLAND SOUND BASIN



COASTAL LONG ISLAND SOUND BASIN



Legend

- Flood Prone Area
- ▲ Study Sites
- Major Drainage Basin Divides
- Minor Drainage Basin Divides
- Streams
- FEMA 100-year Floodplain
- FEMA 500-year Floodplain

0 750 1,500 3,000 Ft

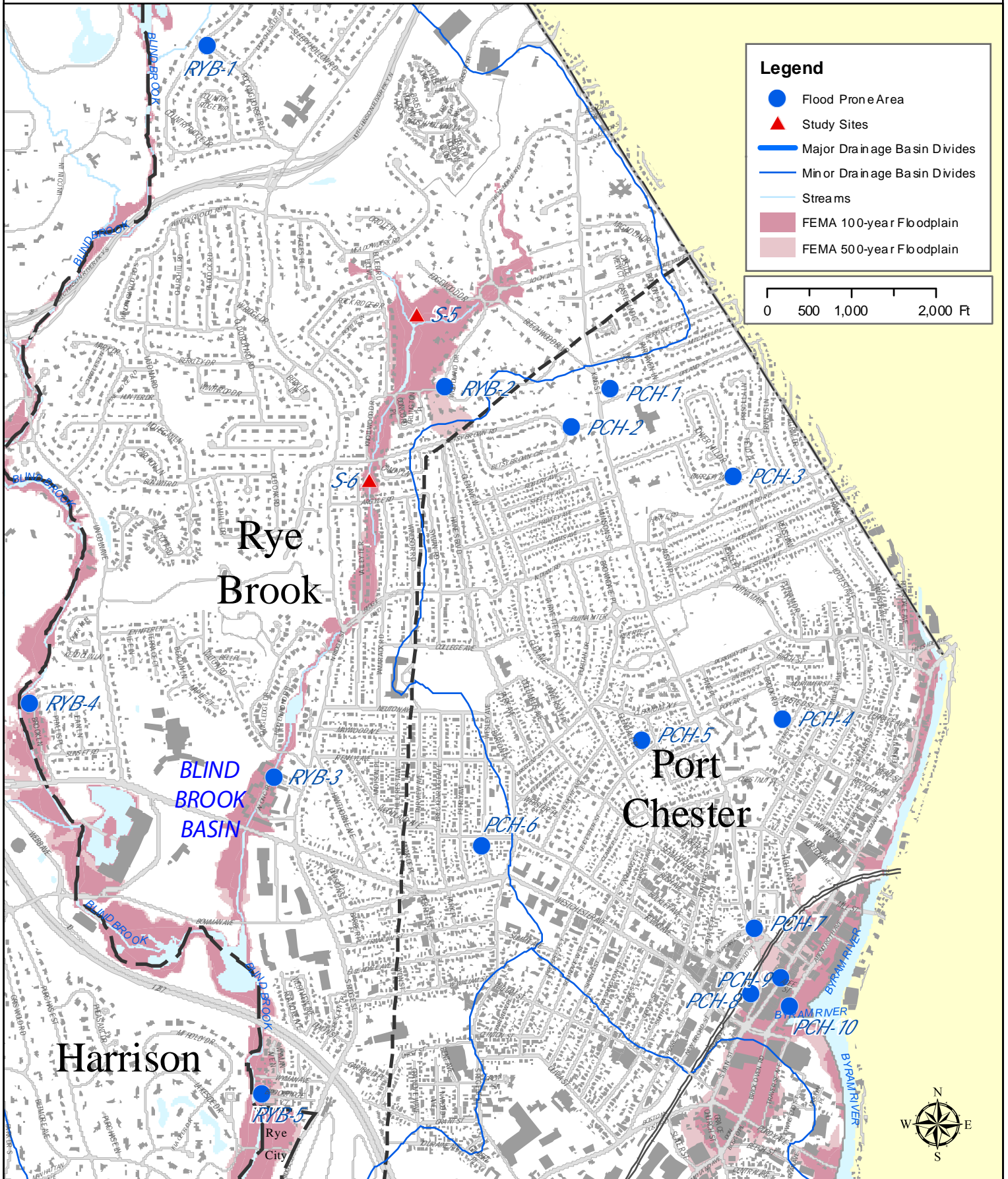
Westchester
gov.com

Municipally Identified Flood Prone Areas Town/Village of Scarsdale

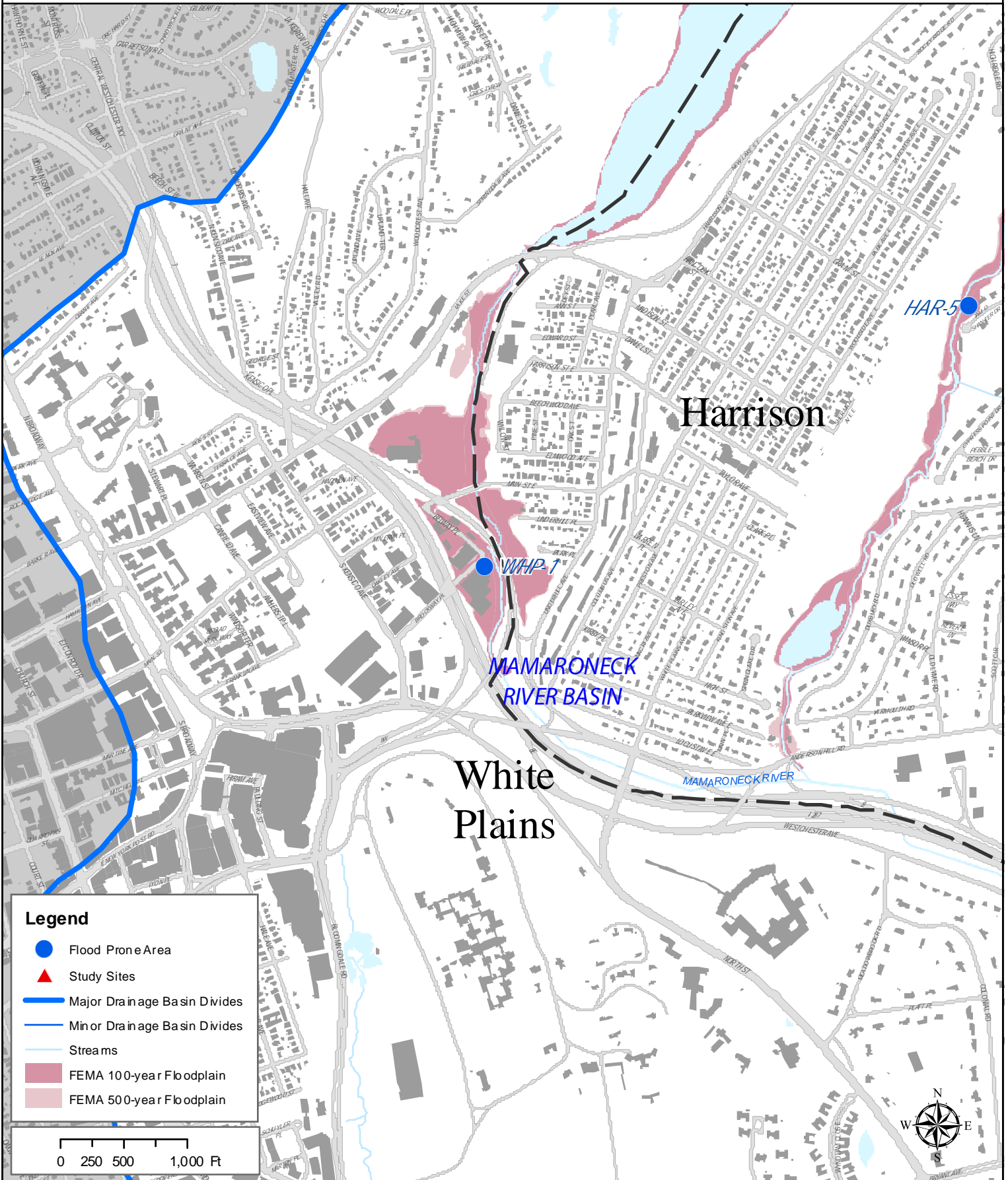
432 Michaelian Office Building
148 Martine Ave
White Plains, NY 10601
www.westchester.gov.com/planning

GIS

COASTAL LONG ISLAND SOUND BASIN



COASTAL LONG ISLAND SOUND BASIN



Legend

- Flood Prone Area
- ▲ Study Sites
- Major Drainage Basin Divides
- Minor Drainage Basin Divides
- Streams
- FEMA 100-year Floodplain
- FEMA 500-year Floodplain

0 250 500 1,000 Ft

Westchester
gov.com

Municipally Identified Flood Prone Areas
City of White Plains

432 Michaelian Office Building
148 Martine Ave
White Plains, NY 10601
www.westchester.gov/planning

GIS Geographic Information Systems

5. LOCAL ORDINANCES AND CODES

New York is a strong home rule state and as such, local municipalities have broad land use control and play an important role in the flooding issue. Increased runoff from impervious surfaces exacerbates flooding conditions while the filling of wetlands and floodplains reduces flood storage and the development of flood hazard areas creates risk. Municipalities have many tools and techniques that they can use to address flooding, control stormwater runoff, minimize damage and reduce risk.

Comprehensive planning sets land use policies and guides development patterns. Most municipalities mention flooding as an issue within their comprehensive plans and as long range policy statements. However, few of these statements are supported with specific strategies with measurable objectives. More analysis of historic flooding, flood-prone areas, potential damage and costs of solutions should be incorporated into comprehensive planning. Through long-range planning, more cost effective solutions can be implemented to reduce risk compared to large structural solutions that are either financially or politically infeasible.

Zoning, subdivision regulations and site plan review standards more specifically control how properties are developed, in particular the amounts and locations of impervious surfaces associated with development. While municipalities all have these regulations, more stringent controls need to be implemented to reduce stormwater runoff generated from developed areas and protect areas like floodplains and wetlands that store floodwaters. In addition, these tools can be used to direct development away from flood-prone areas or ensure that if developed, impacts and risk are minimized and the development does not exacerbate flooding conditions for others.

More specific regulatory controls such as stormwater management ordinances can provide more stringent regulations to apply to development and the ways that stormwater is managed. The New York State Department of Environmental Conservation has created a sample local law for Stormwater Management and Sediment and Erosion Control. The sample local law was created as a guidance tool for communities subject to the Municipal Separate Storm Sewer System (MS4) permit requirements of the Phase II implementation of the Clean Water Act by the U.S. Environmental Protection Agency (EPA), administered by New York State by the Department of Environmental Conservation (DEC) through the State Pollutant Discharge Elimination System (SPDES) permit program. One of the requirements is to adopt regulatory controls of new development and redevelopment to better manage stormwater runoff and reduce pollutants within stormwater runoff.

Regulations that protect environmental resources can also reduce flooding by protecting resources like wetlands and trees that store and absorb stormwater runoff as well as protecting sensitive areas like steep slopes from development, which could increase runoff rates and erosion. Most Westchester municipalities have adopted model ordinances promoted by the Soil and Water Conservation District or the New York State Department of Environmental

Conservation (NYSDEC). However, some of these ordinances have been modified to restrict the applicability of the regulations or otherwise reduce the level of protection. These ordinances may benefit from review and updating to more recent standards, which protect more of the resource of concern and also require vegetated buffers to further protect the resource from encroachment and the impacts of development.

Most importantly, all municipalities that participate in the National Flood Insurance Program (NFIP) are required to adopt a model local law that meets certain minimum standards. The New York State Department of Environmental Conservation has created two sample local laws that not only meet FEMA's national standards but also heightened standards for New York State. In addition, the model local laws prepared by NYSDEC also include additional language that is optional but recommended for increased protection. Both FEMA and New York State strongly recommend that municipalities, particularly those that suffer from repetitive flood damage, increase the standards included in the model laws. A review of the ordinances adopted by Westchester municipalities indicates that most, if not all, have adopted the model local laws for flood damage prevention as written, with minimal, if any, modification of the standards contained within it.

Below is a chart of ordinances, regulations, studies and other information for each of the watershed municipalities as well as an inventory of the flood damage prevention ordinance of Westchester municipalities prepared by the New York State Department of Environmental Conservation.

The Recommended Actions section of the Reconnaissance Plan provides direction to municipalities on reviewing their stormwater-related regulations and guidance in considering new or revised standards.

Inventory of Local Ordinances, Codes and Studies

Municipality	Contact Information	Stormwater Management Ordinance	Flood Control Ordinance	MS4 Annual Report	Phase II Stormwater Management Plan	Flood Control Studies	Map of Stormwater Conveyance System	Hazard Mitigation Plan	Other (Includes Municipal-Specific FEMA Reports)
City of Mount Vernon	Curtis Woods, Commissioner of Public Works, (914) 665-2334								
City of New Rochelle	Chuck Strome, City Manager, (914) 654-2140 Cstrome@ci.new-rochelle.ny.us	Chapter 215-1 to 215-9 (Illicit Discharges)	Chapter 111-28 to 111-35 (Flood Hazard Reduction); Chapter 127-1 to 127-6 (Coastal Erosion Hazard Areas)	2011 @ http://www.newrochelle.ny.com/DocumentView.aspx?DID=517	New Rochelle Stormwater Management Plan	Watershed Study 1			Submitted Application for Hutchinson River Flood Mitigation Project
City of Rye	Scott D. Pickup, City Manager (914) 967-7404 manager@ryeny.gov	Ch. 173 (Surface Water, Erosion and Sediment Control) Ch. 174 (Erosion and Sediment Control)	Chapter 100 (Floodplain Management)		City of Rye Stormwater Management Program (Undated)	Watershed Study 1		HMP, City of Rye, NY (April 2007)	Flood Mitigation Plan (November 2001); LWRP (September 1991); Blind Brook Dam Retrofit @ Bowman Avenue (Construction 2012)
City of White Plains	Joseph J. Nicoletti, Jr., P.E. Commissioner of Public Works (914) 422-1206	Comparison of Stormwater Rules: Ch. 3-6 (Stormwater Management and Erosion and Sediment Control) Ch. 7-7 (IDDE)	Ch. 7-10 (Flood Damage Prevention)	http://www.cityofwhiteplains.com/dataimages/water_report.pdf		Watershed Study 1			
Town of Eastchester	Margaret Uhle, Director of Planning, (914) 771-3317; muhle@eastchester.org	Local Law 1-2008- The Stormwater Management and Erosion and Sediment Control Law and Local Law 8-2007- The Illicit Detection and Elimination Local Law	Local Law 7-2007- Flood Damage Prevention Law			Watershed Wide Studies 1; Crawford Street Study (M.G. McLaren, PC, September 2007); Huntley-Mill Road Drainage Study- Lockwood (Kessler & Bartlett, Inc. 1998)	Map of Stormwater Conveyance System (File)		FEMA Flood Insurance Study (September 2007)
Town of Mamaroneck	Steve Altieri, Town Administrator (914) 381-7810; Saltieri@townofmamaroneck.org	Ch. 95 (Erosion and Sediment Control)	Ch. 110 (Flood Damage Prevention)		Town of Mamaroneck Stormwater Management Plan- March 2004	Sheldrake River Watershed Hydrologic Study (1991; Malcolm Pirnie); Watershed Study 1			Gardens Lake Flood Mitigation Project (Completed 2011)

Municipality	Contact Information	Stormwater Management Ordinance	Flood Control Ordinance	MS4 Annual Report	Phase II Stormwater Management Plan	Flood Control Studies	Map of Stormwater Conveyance System	Hazard Mitigation Plan	Other (Includes Municipal-Specific FEMA Reports)
Town/Village of Harrison	NFIP, Robert FitzSimmons (914) 670-3051; MS4, Michael Amodeo (914) 670-3072	Ch 130, Stormwater Management and Erosion and Sediment Control; Ch 131, Illicit Discharge	Ch 146, Flood Damage Prevention	2011 @ http://www.town.harrison.ny.us/docs/Engineering/stormwater-report-3-9-2011.pdf		Beaver Swamp Brook Hydrologic and Hydraulic Analysis (2007) @ www.harrison-ny.gov/Beaver_Brook_report.html ; Watershed Study 1	Outfall Map in File	draft (2010) available online at www.harrison-ny.gov/HHMP/draftplan.html	
Town/Village of Scarsdale	Steve Pappalardo, Deputy Village Manager (914) 722-1110, spappalardo@scarsdale.com	Chapter 254 (Stormwater Management)	Chapter 167 (Flood Damage Prevention)	2011 @ http://www.scarsdale.com/LinkClick.aspx?fileticket=eomceEWCQnc%3d&tabid=173&mid=999	Village-Wide Comprehensive Stormwater Management Plan, Vols. 1/2 (2009; Dvirka and Bartilucci); http://www.scarsdale.com/Home/Departments/VillageManager/WaterQuality/tabid/173/Default.aspx	Village-Wide Comprehensive Stormwater Management Plan, Vols. 1/2 (2009; Dvirka and Bartilucci); Watershed Study 1			Fox Meadow Brook Flood Mitigation Project (Construction 2012); Proposed Projects on Sheldrake River and Hutchinson River (Latter in Coordination w/New Rochelle)
Village of Larchmont	Eileen A. Finn, Stormwater Management Coordinator, (914) 834-6230	Local Law 6-2005 (Chapter 335) - Stormwater, Drainage and Water Pollution Control	Local Law 1-2007 (Chapter 337) - Flood Damage Prevention Law		Phase II Stormwater Management Plan-Minimum Measure #6 Pollution Prevention and Good Housekeeping	Pine Brook Drainage Study-Dvirka and Bartilucci- January 2008; Watershed Study 1	Storm Water Drainage System- Dolph Rotfeld Engineering-1997		
Village of Mamaroneck	Rich Slingerland, Village Manager, (914) 777-7703	Chapter 294- Stormwater Management and Erosion and Sediment Control (online)	Chapter 186- Flood Damage Prevention; Erosion and Sediment Control	2010 @ http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_Stormwater/Phase%20II%20Report%20Y2010.pdf	USEPA Phase II Final Rule Storm Water Management Plan(March 2003) @ http://www.village.mamaroneck.ny.us/Pages/MamaroneckNY_Stormwater/Phase%20II%20NOI%20-%20March%202003.pdf	Watershed Study 1; List of Flood Control Studies referenced for Recommendation Report for Westchester Joint Water Works Reservoir Dam Hydraulic Analysis Study prepared by Stearns and Wheler, Inc.- January 2005		Local Multi-Hazard Mitigation Plan, Environmental Technology Group, Inc., January 2012	

Municipality	Contact Information	Stormwater Management Ordinance	Flood Control Ordinance	MS4 Annual Report	Phase II Stormwater Management Plan	Flood Control Studies	Map of Stormwater Conveyance System	Hazard Mitigation Plan	Other (Includes Municipal-Specific FEMA Reports)
Village of Pelham	Robert Yamuder, Village Administrator, (914) 738-2015, robert.yamuder@pelhamgov.com	Chapter 83- Stormwater Management and Erosion and Sediment Control (online)	Chapter 45- Flood Damage Prevention	2011 @ http://www.pelhamgov.com/MS4%20Annual%20Report%202011.pdf	Stormwater Management Program (February 2009) @ http://www.pelhamgov.com/Village%20Stormwater%20Mgmt%20Program.pdf	Watershed Study 1; Storm Drainage System Analysis- Leonard Jackson Associates- 2009; CDs- Images of Flooding Events		Multi-Hazard Mitigation Plan, Environmental Technology Group, Inc., September 2007	
Village of Pelham Manor	John T. Pierpont, Village Manager, (914) 738-8820					Assessment of Fourth Avenue Drain and Related Watershed- TRC Engineers, Inc. - January 2002; Fourth Avenue Drainage System, J. Jakubowsky Engineer- October 1962; Watershed Study 1			
Village of Port Chester	Chris Gomez, Director of Planning & Development- (914) 481-8037, cgomez@portchesterny.com	Ch 281, Stormwater Management; Ch 199, Illicit Discharges	Ch 181, Flood Damage Prevention	2011 @ www.portchesterny.com/Pages/PortChesterNY_DPW/2011report.pdf	Executive Summary online (www.portchesterny.com/Pages/PortChesterNY_DPW/summary.pdf)	Watershed Study 1	Outfall Map in File		
Village of Rye Brook	Chris Bradbury, Village Administrator, (914) 939-1121 cbradbury@ryebrook.org	Ch 118, Erosion and Sediment Control; Ch 216, Storm Sewers (IDDE); Ch 217, Stormwater Management	Ch 130, Flood Damage Prevention;	2011 @ http://www.ryebrook.org/FCpdf/Rye%20Brook%20SWM%20AR%201011.pdf		Watershed Study 1; USACE Blind Brook Watershed Management Plan (March 2009); Project Report, Flood Mitigation, Bowman Avenue Dam Site (March 2008); East Branch Blind Brook Stormwater Analysis (2002) @ http://www.ryebrook.org/Cite-Access/FormCenter/?TID=31#F15251		Online (2007) www.ryebrook.org/documents/hazard.pdf	

¹- Section 905(B) Reconnaissance Study, Westchester County Streams, Westchester County, NY and Fairfield County, CT (United States Army Corps of Engineers; February 2008)

Evaluation of Flood Damage Prevention Ordinances prepared by New York State Department of Environmental Conservation, 2011

Community Name	Community Type	County	CID	REG TYPE	CITATION	Designated Office of FPA	APPEALS BOARD	OPTIONAL LANGUAGE	Freeboard Requirement as noted in Local Law	Date this Record was Edited
Ardsley	Village	Westchester	360902	D	Local Law # 11 of 2007- Chapter 115	Building Inspector	Zoning Board of Appeals	None.	2 feet per model local law.	9/12/2007
Bedford	Town	Westchester	360903	D	Chapter 62	Building Inspector	Zoning Board of Appeals	None	2 feet per model law	10/17/2007
Briarcliff Manor	Village	Westchester	360904	D	Local Law #8 of 2007- Chapter 127	Code Enforcement Officer	Zoning Board of Appeals	Cumulative Substantial Improvement,	2 feet per model	9/27/2007
Bronxville	Village	Westchester	360905	D	Local Law #6- Chapter 156	Superintendent of Buildings	Board of Appeals	critical facilities, cumulative substantial improvement, repetitive damage, and compensatory storage	2 feet per model	8/23/2007
Buchanan	Village	Westchester	361534	D	Local Law #3 of 2007	Building Inspector	Zoning Board of Appeals	None.		9/28/2007
Cortlandt	Town	Westchester	360906	D	Local Law #11 of 2007	Department of Technical Services	Zoning Board of Appeals	Critical facilities. Repetitive Damage. Compensatory Storage	2 feet based on state model	10/1/2007
Dobbs Ferry	Village	Westchester	360908	D	Local Law #13 of 2007-Chapter 186	Village Engineer	Board of Trustees	critical facilities, cumulative substantial damage/improvement, ICC, repetitive damage, and compensatory storage	2 feet per state model	11/26/2007
Eastchester	Town	Westchester	360909	D	Local Law #7 of 2007	Building Inspector	Planning Board	None	2 feet based on state model	8/28/2007
Elmsford	Village	Westchester	360910	D	Local Law #6 of 2007- Chapter 175	Building Inspector	Zoning Board of Appeals	None	2 feet	9/14/2007
Greenburgh	Town	Westchester	360911	D	Local Law #9	Town Engineer	Zoning Board of Appeals	None.	2 feet freeboard	9/14/2007
Harrison	Town	Westchester	360912	D	Local Law #3 of 2007- Chapter 146	Building Inspector	Zoning Board of Appeals	Critical facilities, repetitive damage, cumulative substantial damage/improvement, and compensatory storage.	2 feet per model	10/2/2007
Hastings-on-Hudson	Village	Westchester	360913	D	Local Law #4 of 2007- Chapter 146	Building Inspector	Zoning Board of Appeals	None	2 feet	11/30/2007
Irvington	Village	Westchester	360914	D	Local Law #3 of 2007- Chapter 124	Building Inspector	Zoning Board of Appeals	None.	2 feet per model	10/4/2007
Larchmont	Village	Westchester	360915	E	Local Law #1 of 2007	Village Building Inspector	Zoning Board of Appeals	None	2 feet per local law	9/18/2007
Lewisboro	Town	Westchester	361227	D	Local Law #3 of 2007	Building Inspector	Zoning Board of Appeals	None.	2 feet per local law	10/25/2007
Mamaroneck	Town	Westchester	360917	E	Local Law #8 of 2007	Director of Building Code Enforcement and Land Use Administration	Planning Board	Critical facility, freeboard, cumulative substantial damage/improvement, repetitive damage	2 feet per state model	8/7/2007

Evaluation of Flood Damage Prevention Ordinances prepared by New York State Department of Environmental Conservation, 2011 (continued)

Community Name	Community Type	County	CID	REG TYPE	CITATION	Designated Office of FPA	APPEALS BOARD	OPTIONAL LANGUAGE	Freeboard Requirement as noted in Local Law	Date this Record was Edited
Mamaroneck	Village	Westchester	360916	E	Local Law #11 of 2007	Building Inspector	Planning Board	Critical facilities, cumulative substantial damage/improvement, mitigatory storage	2 feet per state model law	8/23/2007
Mount Kisco	Village	Westchester	360918	D	Local Law #2 of 2007- Chapter 66	Building Inspector	Zoning Board	None	2 feet	9/27/2007
Mount Pleasant	Town	Westchester	360919	D	Local Law #2 of 2007	Town Engineer	Planning Board	None.	2 feet per model law.	9/12/2007
Mount Vernon	City	Westchester	360920	D	Local Law #5 of 2007	Building Commissioner	Zoning Board of Appeals	None	2 feet per state model	9/27/2007
New Castle	Town	Westchester	360921	D	Local Law #12 of 2007- Chapter 70	Building Inspector	Zoning Board of Appeals	None	2 feet per model	9/27/2007
New Rochelle	City	Westchester	360922	E	Local Law # - Chapter 111	Building Official	Zoning Board of Appeals	Critical facilities and repetitive damage	2 feet per state model	9/18/2007
North Castle	Town	Westchester	360923	D	Local Law #13 of 2007	Building Inspector	Town Board (Sent letter telling them to change this)	Cumulative substantial damage/improvement, 2 feet of freeboard, mitigatory storage.	2 feet per model law	8/9/2007
North Salem	Town	Westchester	361240	D	Local Law #6 of 2007	Building Inspector	Planning Board	Cumulative substantial damage, repetitive damage and compensatory storage	2 feet freeboard per state model	8/28/2007
Ossining	Village	Westchester	361021	D	Local Law #9 of 2007 repealing chapter 141	Building Department	Zoning Board of Appeals	None	2 feet per model	9/17/2007
Ossining	Town	Westchester	361241	D	Local Law #7	Building Inspector	Board of Appeals	None.	2 feet per model law	8/22/2007
Peekskill	City	Westchester	360924	D	Local Law #6 of 2007	Director of Planning, Development and Code Assistance	City of Peekskill Zoning Board of Appeals	None	2 feet per model	9/17/2007
Pelham	Village	Westchester	360925	D	Local Law #4	Building Inspector	Zoning Board of Appeals	None	2 feet per state model	9/17/2007
Pelham Manor	Village	Westchester	360926	D	Local Law #2 of 2007	Board of Trustees	Zoning Board of Appeals	None	2 feet per model	9/27/2007
Pleasantville	Village	Westchester	360927	D	Local Law #6 of 2007	Building Inspector	Zoning Board of Appeals	None	2 feet per state model law	9/6/2007
Port Chester	Village	Westchester	360928	E	Local Law #11 of 2007	Building Inspector	Zoning Board of Appeals	None	2 feet	9/17/2007
Pound Ridge	Town	Westchester	360929	D	Local Law #4 of 2007	Building Inspector/Code Enforcement Officer	Zoning Board of Appeals	None	2 feet per state model law.	9/13/2007
Pound Ridge	Town	Westchester	360929	D	Local Law #4 of 2007- Chapter 60	Code Enforcement Officer, Building Inspector or employee of engineering department	Zoning Board of Appeals	None	2 feet	9/21/2007

Evaluation of Flood Damage Prevention Ordinances prepared by New York State Department of Environmental Conservation, 2011 (continued)

Community Name	Community Type	County	CID	REG TYPE	CITATION	Designated Office of FPA	APPEALS BOARD	OPTIONAL LANGUAGE	Freeboard Requirement as noted in Local Law	Date this Record was Edited
Rye	City	Westchester	360931	E	Local Law #5 amending Chapter 100 of City Code	City Building Inspector	Board of Appeals	None	2 feet freeboard	9/17/2007
Rye Brook	Village	Westchester	360930	D	Local Law #12 of 2007	Village Engineer	Zoning Board of Appeals	Cumulative substantial damage, repetitive damage, compensatory storage	2 feet per state model	9/14/2007
Scarsdale	Village	Westchester	360932	D	Local Law #9 of 2007- Chapter 167	Village Engineer	Planning Board	None	2 feet	10/15/2007
Sleepy Hollow	Village	Westchester	361515	D	Local Law #3 of 2007- Chapter 23	Building Inspector	Zoning Board of Appeals	None	2 feet per model	9/27/2007
Somers	Town	Westchester	361242	D	Local Law # 6-2007 (6-14-2007)					
Tarrytown	Village	Westchester	360933	D	LL 5 2007					1/2/2009
Tuckahoe	Village	Westchester	360934	D	Local Law #11 of 2007	Building Inspector	Zoning Board of Appeals	Critical facility, repetitive damage, compensatory storage	2 feet per model	9/28/2007
White Plains	City	Westchester	360935	D	LL 3 of 2007	Commissioner of Public Works	Zoning Board of Appeals	None	2'	11/21/2007
Yonkers	City	Westchester	360936	E	Local Law #11 of 2007	City Engineer	Planning Board	None	2 feet	10/9/2007
Yorktown	Town	Westchester	360937	D	Local Law #12 amending chapter 175 of town code	Building Inspector	Town Board (potential problem)	None	2 feet per state model	10/2/2007

6. FINDINGS

This report represents a compilation of available studies and reports, research by County staff and information provided by municipal officials concerning flooding within the Coastal Long Island Sound Watershed. What was learned from this fact gathering process is where flooding occurs, when and how frequently it occurs, and to what extent residents and businesses are impacted throughout the watershed. It is already known that many municipalities suffer from repeated occurrences of flood events. The events may be brief and localized or large and sustained, but they all impact residences, businesses and public infrastructure, disrupting lives and damaging property. In addition, the Coastal Long Island Sound Watershed suffers coastal flooding and damage from coastal surge events such as Hurricane Sandy in 2012.

A review of prior studies continues to show a relatively fragmented approach to flooding within the watershed. While a number of studies of sub drainage basins had been undertaken, a comprehensive watershed-wide analysis was not performed for the entire watershed focused on flooding and flood reduction. Three of the completed studies were water quality focused planning efforts facilitated by the Westchester County Department of Planning in 1997, 1998 and 2001 and are not evaluated in this report. An analysis of the watershed was performed by Hydroqual Engineers in 2010 for the County to create a tool to evaluate efforts required to achieve meaningful flood reduction and water quality improvements for the entire watershed. Estimated project costs resulting from the study were far greater than the amount of flood reduction achieved, although the tool and data created for it will be useful for additional analysis. A re-evaluation of a prior plan addressing flooding in the lower portions of the Mamaroneck and Sheldrake rivers is currently being prepared by the United States Army Corps of Engineers in partnership with New York State, Westchester County and the Village of Mamaroneck. While a specific alternative has not been chosen at this time, the study, scheduled to be completed in 2016, will include a description and analysis of a variety of flood reduction measures.

The review of previous flood-related studies done for various municipalities in the watershed did not identify construction-ready projects to solve or significantly reduce flood volumes or frequency, although a number of conceptual projects warrant additional engineering. The studies and information provided by the municipalities are useful in prioritizing areas subject to flooding and evaluating potential projects in order to recommend a course of action for project plan preparation and evaluation. Following is a list of key findings for the watershed.

Flooding has been occurring for decades.

With continued development and increasing frequency and intensity of storms, flooding has increased.

Flooding is an intermunicipal and watershed-wide problem requiring intermunicipal cooperation and watershed-wide analysis and solutions.

Coastal flooding is an additional concern to the communities along Long Island Sound.

The frequency and intensity of severe storms, whether large hurricanes or short-duration thunderstorms, appears to be increasing.

Despite all the studies, few have been comprehensive and watershed-wide in approach, evaluating all possible activities and efforts, evaluating off-site impacts or considering lower levels of protection as cost considerations are also of paramount concern.

While there is a large amount of baseline data for the watershed, largely the result of the watershed-wide studies that have been prepared, analysis of how the watershed and its rivers function during the variety of storm events encountered remains largely anecdotal. Field-derived data for the watershed will more accurately account for current hydrologic and hydraulic conditions, weather patterns and watershed response to various storm events.

With the variety of issues facing municipal leaders in these difficult economic times, it is challenging to keep focus on issues like flooding that, while potentially devastating, occur sporadically. The devastation resulting from Hurricane Sandy has served to keep the flooding issue on the radar, promising significant and sustained action.

Municipalities have many tools and techniques to manage stormwater runoff and reduce flood risk. Most have adopted available sample ordinances and other regulatory controls to address flooding. However, the sample laws do not go far enough, and more stringent regulations are needed in order to make municipalities more resilient to flooding and reduce stormwater runoff throughout the watershed.

Areas of most significant flooding have been identified by municipalities. While some of the problem areas are localized and may be addressed with small solutions at reasonable cost, some are regional, requiring larger solutions at considerably greater cost and necessitating intermunicipal cooperation.

7. CRITERIA FOR FLOOD MITIGATION PROJECTS

Many of the areas within the watershed that experience repetitive flooding are in areas of dense development, which limits the variety of techniques to manage floodwaters and reduce flood damage. There is a saying that “one person’s flooding problem is another person’s flooding solution.” Mitigation must not solve a problem for one site by creating a problem for another. For this reason, storage and runoff reduction is generally preferred over conveyance off-site. Projects must also be cost effective, including maintenance costs. All flood mitigation project proposals must address the following goals:

Projects must be effective, following generally accepted engineering practices and utilizing appropriate data and levels of accuracy. Managing stormwater runoff on-site is preferred to conveyance off-site. Trends in weather patterns should also be taken into consideration so that the project does not become ineffective within a short period of time.

Achieve the maximum cost effectiveness, as determined by an analysis of benefits resulting from the project compared with costs associated with the project construction and long term operation. Benefits should include not only the number of properties and persons benefitted from the project but the degree of benefit. Other impacts such as economic value must utilize a standardized method so that apples-to-apples comparisons can be made. Costs must include non-structural costs such as property ownership and permitting issues and long term operation and maintenance costs.

Achieve the most valuable benefits. High priority benefits include the protection of human safety and life, critical facilities, housing and business establishments.

Consider a wide variety of alternatives, including both structural and non-structural alternatives as well as various levels of protection.

Projects must not create or exacerbate flooding conditions elsewhere in the watershed. Design concepts that merely push water to another property or jurisdiction should not be deemed acceptable. Projects cannot be designed in a vacuum and must consider impacts or lost opportunity for other flood problem areas throughout the watershed.

Reduce stormwater volume. A flood mitigation project should include measures to reduce the volume and rate of stormwater runoff. Projects that merely move water from one area to another are generally not preferred compared with projects that reduce and more actively manage stormwater runoff on the site.

In addition to the project goals described above, in order for the County to participate with local municipalities in funding projects to mitigate flooding, the following must be satisfied as part of the project. If a municipality has a concern with one or more of these issues, they should consult with County staff prior to making a formal request. It may be possible to fund portions of

projects that do comply with these requirements, while excluding County funding reimbursement for other portions of the project.

Maximum of 50 percent of eligible costs. In no case can the County reimburse the municipality for costs exceeding 50 percent of the value of eligible costs as determined by the County. A detailed scope of work, identifying eligible and, if appropriate, non-eligible expenses will be prepared and become part of the intermunicipal agreement between the County and municipality. Any significant change in project scope may require Board of Legislators approval. On-going maintenance costs are not eligible expenses.

Ownership interest. The County requires an interest in any property for which bonded funding will be used. The interest must ensure that the improvements made will remain in place and functional in accordance with the intended design. The County must also have the authority to inspect, maintain and correct any changes made to any such improvements. While the intermunicipal agreement may assign one or more of these responsibilities to the municipality, any agreement with a property owner or third party must ensure the County these rights for at least the life of the bond.

Municipal efforts to better manage stormwater runoff. The municipality must demonstrate efforts to address each of the municipal recommendations included in the reconnaissance plan. With few easily implemented practical opportunities to eliminate flooding problems, comprehensive efforts must include measures to reduce stormwater runoff generated from sites throughout the entire watershed.

Request Letter of Map Amendment. Once a flood mitigation project is completed that reduces the base flood elevation, changes the flood hazard area boundaries or otherwise modifies the information shown on the Flood Insurance Rate Maps, the municipality must request from FEMA that the map be revised to reflect the new conditions or new (lower) base flood elevations. Municipalities participating in the NFIP are obligated by their agreement with FEMA to submit new or revised map information when it becomes available. Section 65.3 of the NFIP regulations states: “A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify [FEMA] of the changes by submitting technical or scientific data.”

The Stormwater Management Law strongly encourages intermunicipal cooperation and collaboration. The law requires that reconnaissance plans “identify local municipalities interested in executing Intermunicipal Agreements (IMAs) with the County” as well as recommend terms and conditions of the IMAs.

Municipalities interested in participating in the funding program created by the Stormwater Management Law may demonstrate such an interest through the submission of a letter from the Chief Elected Official and municipal resolution from the governing body. Such documents must

describe a willingness to work with other municipalities in the watershed as well as the County and must also express a willingness to implement the recommendations included in the reconnaissance plan. Participation in a watershed organization memorialized by intermunicipal agreement among watershed municipalities is an excellent way to demonstrate a strong level of commitment to working collaboratively. Municipalities may find cost efficiencies if working together as a group to address the recommendations included in this plan.

Westchester County Discretionary Funding Policy

The 31 Westchester County municipalities that are “eligible municipalities” pursuant to the August 10, 2009 Stipulation and Order of Settlement and Dismissal in U.S. *ex rel.* Anti-Discrimination Center of Metro New York v. Westchester County, New York (the “Settlement Agreement”) are subject to additional application requirements. The Settlement Agreement required that the grant of discretionary intermunicipal funding by Westchester County to eligible municipalities shall be conditioned, as appropriate, upon the recipient eligible municipality’s commitment to affirmatively further fair housing within its borders. The County’s contribution in the funding of flood and stormwater mitigation projects is considered discretionary intermunicipal funding.

Each eligible municipality requesting County funds shall be required to commit to the County, in writing, that it is in compliance with the following terms and conditions in connection with its commitment to affirmatively further fair housing:

- (a) Recipient eligible municipality has adopted municipal zoning code provisions and/or policies which reflect the guidance provided in the Model Ordinance Provisions approved pursuant to the Settlement Agreement and demonstrate a commitment by the eligible municipality to affirmatively further fair housing, including a ban on local residency requirements and preferences and other selection preferences that do not affirmatively further fair housing, except to the extent provided in the Model Ordinance Provisions;
- (b) Recipient eligible municipality will offer the County a Right of First Refusal to retain and/or purchase any and all land acquired in rem to be used for housing that affirmatively furthers fair housing; and
- (c) Recipient eligible municipality will actively further implementation of the Settlement Agreement through its land use regulations and other affirmative measures to assist the development of affordable housing.

Such commitments by recipient eligible municipality shall be in the funding agreement between the County and the recipient eligible municipality.

The funding agreement will also provide that housing units that affirmatively further fair housing must be marketed in accordance with Westchester County’s Affirmative Fair Housing Marketing Plan approved pursuant to the Settlement Agreement, throughout the period of affordability.

Should recipient eligible municipality fail to abide by any of these conditions, recipient eligible municipality will be obliged, upon thirty (30) days written notice by the County, to refund any discretionary funding paid to the recipient eligible municipality.

8. RECOMMENDED ACTIONS

In addition to physical projects to manage floodwaters, there are a number of other measures that should be taken to reduce the volume of stormwater runoff generated, better manage flood prone areas and reduce the damage, risk and costs associated with flooding. Efforts to implement these measures can be taken immediately, many with very little cost. The County Stormwater Management Law requires that reconnaissance plans include a set of conditions that local municipalities must meet in order to receive County funding support. Such conditions are intended to increase development standards to reduce the volume of stormwater runoff generated from development as well as reduce potential flood related damage. Following is a list of recommended actions for both local municipalities and the County. The recommendations describe ways to improve ordinances and standards. The Board of Legislators may require that municipalities, as a condition of County participation in project funding, demonstrate how they are achieving heightened performance or are otherwise addressing the recommendations below.

MUNICIPALITIES

For a densely developed area such as Westchester County, and in particular the Coastal Long Island Sound Watershed, faced with increasing frequency and intensity of storms, there may not be many opportunities for practical traditional solutions to significantly reduce flood levels or the frequency of flooding events. Adequate amounts of undeveloped land to construct large detention areas do not exist and the construction of tunnels, large concrete sluiceways or levees are either too expensive or politically infeasible. Large scale land acquisition to reduce flood risk is also financially and politically infeasible. However, there are many things that municipalities, the development community, and land owners can do to reduce the damage and risk associated with flood events. In 2010 the County created a guidance manual for local municipal officials, land use board members and related professionals that outlines many common causes and impacts of flooding, focusing on land development patterns and the impact of impervious surfaces, and provides information on how to address flooding through land use planning and regulation. The guidance manual can be downloaded from the County's website at www.westchestergov.com/flooding. The Association of State Floodplain Managers (ASFPM) published *A Guide for Higher Standards in Floodplain Management* (available for download at www.floods.org) in 2011 to assist municipalities with ways to heighten flood damage prevention standards. Many of the recommendations included below are adopted from these sources.

Under natural conditions, as much as 50 percent of rain is infiltrated into the ground and 40 percent returned to the air through evaporation and transpiration by plants. Replacement of naturally vegetated land with impervious surfaces dramatically increases the amount of rain that runs off a site and into streams as stormwater runoff. Wetlands and floodplains act like natural sponges, serving to hold back floodwaters, releasing them slowly over time. Filling in wetlands and developing floodplains eliminates this function, forcing more stormwater to flow into streams with greater speed, eating away stream banks. In addition, development of low-lying

flood-prone areas like wetlands and floodplains creates risk and can increase costs for infrastructure repair, emergency response and other impacts from flooding. Land use planning and regulations can be used to address these issues and reduce flooding and its impacts. Education and outreach can be conducted to better inform landowners and residents on how to prepare for and respond to flood events. Other measures can be implemented to reduce flood risk, improve response and make communities more resilient.

As a requirement of funding under the Stormwater Management Law, municipalities wishing to receive funding may be required to demonstrate what measures they have implemented or plan to implement with respect to the following recommendations.

RECOMMENDATION #1: Review NFIP Requirements, Maps and Studies

Participation in the National Flood Insurance Program (NFIP) not only makes municipalities eligible for a wide variety of federal assistance programs but also requires those municipalities to address flooding in the municipality's long range planning goals and policy statements and undertake efforts to implement those goals and reduce flood damage and flood risk through long-term comprehensive planning and other tools available to the municipality (refer to 44CFR60.22). Municipalities have a wide variety of tools available to them to reduce flood damage, flood risk, and the costs associated with flooding.

The first thing a municipality should do is review the Flood Insurance Rate Maps (FIRM) for the community. The Federal Emergency Management Agency (FEMA) prepares Flood Insurance Rate Maps that describe Special Flood Hazard Areas (SFHA) within a community and are used by the insurance industry to assign levels of risk. Every property in a community is subject to flooding, but properties within SFHAs face higher risk. Municipalities should review the flood maps for accuracy and also review the information contained within the accompanying Flood Insurance Study (FIS). The FIS includes additional information on the area and historic flood events. It is important to note that the maps show the *likelihood* of flooding *and not the limits of flooding*. While FEMA follows a procedure to ensure that municipalities and the public are given opportunity to review and comment on the maps before they are finalized, there are often areas on the maps that may raise questions. To enhance the accuracy of the maps and because the boundaries of SFHAs can have financial impacts to property owners, municipalities should carefully review the maps and studies for accuracy, reporting any discrepancies to FEMA. After the maps have been adopted, municipalities may petition FEMA for map amendments. Municipalities should also note any other flood-prone areas that may not have been studied by or otherwise meet FEMA's definitions.

Review additional mapping and other information. FEMA also publishes guidance documents and additional information concerning flooding and flood damage. One example is the Advisory Base Flood Elevation (ABFE) maps, released in early 2013, that are the result of years of analysis of coastal flooding and storm surge. FEMA strongly recommends that municipalities adopt the revised base flood elevations included in the new mapping. However,

because the maps are advisory, there was no comment period. Local municipalities should carefully examine the maps and evaluate the impacts of adopting the new standards prior to taking any action regarding the new information. A letter expressing concerns with the new mapping is included as Appendix E. Other information on the National Flood Insurance Program (NFIP), associated mapping and studies, and ways to make communities more resilient to flood damage is available from FEMA on its website at www.fema.gov/NFIP or www.floodsmart.gov.

The municipality must also comply with the requirements of the National Flood Insurance Program. The National Flood Insurance Program provides valuable underwriting of flood insurance, without which many properties would be undevelopable due to lack of available investment dollars. However, participation in the program requires the municipality to perform a number of tasks including ensuring that new and substantially damaged structures comply with the standards required by FEMA and that documents are recorded and made available to the public.

Consider participation in the Community Rating System (CRS), which lowers insurance premiums for property owners. CRS municipalities that adopt increased standards and perform additional mitigation activities beyond the minimum required under the NFIP are eligible to receive points for the degree to which they have increased their program effectiveness. The points (range from a low of 9 to a high of 1) are related to percentage reductions in insurance premiums, in 5 percent increments up to a maximum of 45 percent. As insurance rates climb, every little bit will help.

RECOMMENDATION #2: Protect Floodplains, Streams and Wetlands

One of the most effective means to reduce risk is to redirect development away from flood hazard areas. To this end, comprehensive plans must not only identify flooding as an issue of concern but must identify all known flood-prone areas within the municipality, whether shown on FIRMs or not, and include strategies to redirect development away from those areas while also minimizing impacts to the tax base and meeting other community needs. Many municipalities around the country have restricted floodplains for conservation and passive recreation, sometimes purchasing parcels to prevent future development. Development potential can be relocated using zoning, floating zones, transfer of development rights, or other tools that will enable the municipality to maintain its tax base while mitigating flood impacts. A municipality's comprehensive plan or long-range planning policy must include an analysis of special flood hazard areas, evaluate the feasibility of redirecting development from them and identify methods to be utilized or investigated further. Similarly, capital improvement plans for roads and utilities should also be directed away from flood-prone areas.

Floodplains provide the critical and beneficial functions of flood storage, natural habitat, and water quality. **The placement of fill impairs these functions and should be avoided to the greatest extent possible.** Flood-prone areas should be excluded from developable area calculations unless (1) it can be demonstrated that building sites and access to them are above the

base flood elevation, (2) adequate compensatory storage will be provided, and (3) measures will be utilized to ensure that property owners are notified of the existence of the floodplain and that future filling of the floodplain is prohibited.

If development cannot be redirected from within the floodplains, standards for the development of floodplains must include a restriction on the loss of floodplain storage. The sample Flood Damage Prevention Ordinance required by FEMA is not a floodplain protection ordinance but an ordinance which regulates development within floodplains. Without additional measures to reduce flood volumes and protect floodplains and other areas that store floodwaters, flood volumes and levels will only continue to increase. This is one of the reasons that FEMA's model ordinances include a freeboard above the calculated base flood elevation and the model ordinance required by New York State increases this standard. Municipalities are strongly encouraged to review all the standards contained within the flood damage prevention ordinance and increase them wherever appropriate.

Municipalities may consider applying the no-net rise standard now commonly used for development within floodways to the entire floodplain (area known as the 1% annual chance flood or 100-year floodplain) for additional restriction of floodplain impacts. In order to further discourage the reduction in floodwater storage and ensure adequate compensation for any floodplain loss, mitigation must be provided at a ratio of at least 1.2 acre-feet of mitigation for each acre-foot of loss. The floodplain compensation volume needs to be located within the same reach of the river, stream, or intermittent stream impacted. Compensation needs to be met for each storm event over the entire elevation range of the site's floodplain, including the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year and 100-year storms. In addition, riparian buffers, a minimum of 50 feet in width (100 feet is preferred) must be provided along the edge of the stream or floodway, whichever is further from the center of the stream, for flood damage prevention, resource protection, floodwater storage, water quality, pollutant/sediment removal, and natural stream function. These requirements can be included in the flood damage prevention ordinance or other applicable regulations. In addition, development plans should be reviewed to evaluate the likelihood of future filling or placement of obstructions by property owners. Appropriate deed restrictions may be necessary to ensure that floodplains remain floodplains.

All wetlands should be protected from alteration, regardless of size, and a minimum buffer of 50 feet must be required (100 feet is preferred). Most Westchester municipalities have adopted a model ordinance that prohibits the alteration of wetlands, in part as a recognition of the ability of natural wetlands to detain stormwater runoff and mitigate flooding. However, the definition of wetlands and wetlands buffers varies widely. Wetlands, particularly those with significant flood storage potential, should be protected from filling or alteration to the maximum extent practical. Adequate buffers should be provided to further protect the wetland areas.

Similarly, streams should also be protected from alteration unless it can be demonstrated, using acceptable engineering studies, that the proposed alteration will not: (a) create or

exacerbate any flooding conditions on properties upstream or downstream from the project area, (b) create an unstable condition within the stream channel, or (c) substantially impact aquatic habitats and organisms within the stream and its buffer. Riparian buffers must also be required to protect streams and their banks.

RECOMMENDATION #3: Increase Development Standards

Subdivision regulations and site plan review standards must ensure that development plans are carefully evaluated so that any increases in risk or costs to the community are eliminated or minimized (e.g., a development that creates an inaccessible building or neighborhood during a flood event must not be approved). Language must be included in applicable regulations (at a minimum, subdivision regulations) to ensure that building sites are located on a portion of the property above the base flood elevation and with adequate access during a 100-year flood event. To protect property against impacts of increased flood heights due to anticipated future development anywhere in the watershed, especially in rapidly developing areas, applicable regulations must require that analyses consider reasonable anticipated full build-out throughout the entire watershed. The flood damage prevention ordinance must be modified to prohibit the outdoor storage of hazardous materials or materials that may become buoyant during flood events and cause blockage or damage. Local laws must be enacted prohibiting the use of space below the base flood elevation for habitation in flood-prone areas.

Municipal development standards and regulations must reference technical state stormwater management guidance documents. The principal goal of these documents is to provide guidance on the design, implementation and maintenance of “best stormwater management practices” aimed at improving water quality. However, most if not all of these practices also aim to reduce runoff volume and encourage infiltration, having beneficial impacts on stormwater runoff that contributes to flooding. Therefore, these guidelines should be viewed as beneficial from both water quality and water quantity standpoints. The guidelines are found in the New York State *Stormwater Management Design Manual* and New York State *Standards and Specifications for Erosion and Sediment Control*.

Carefully review the model flood damage prevention ordinance and consider whether increased standards are appropriate. The model flood damage prevention ordinance provides minimum standards for development within special flood hazard areas. The regulations can be modified to apply to other areas of the municipality also known to be flood-prone. Municipalities may also increase the standards contained in the ordinance. For instance, in order to provide additional levels of protection, increasing the elevation standard to require that the lowest floor elevation be placed a minimum of three feet above the base flood elevation will provide additional protection against flooding. Elevations for properties within the “X” zone (i.e., the area of minimal flood hazard) should be elevated a minimum of two feet above the highest adjacent natural grade measured on each side of the building. This is relatively inexpensive to build into development regulations and typically pays for itself in reduced insurance premiums

and prevented flood damage within the first 10 years of a structure's lifetime. Significant Community Rating System (CRS) credit is also available for this activity, which leads to lower flood insurance premiums for all policy holders in the community.

Amend the flood damage prevention ordinance or other applicable ordinances to require that critical facilities be elevated a minimum of two feet above the base flood elevation for the 0.2% annual chance flood (500-year flood interval) and that access routes must be elevated to at least the base flood elevation for the 0.2% annual chance flood. Critical facilities are those critical to the community's public health and safety; essential to the orderly functioning of a community; store or produce highly volatile, toxic or water-reactive materials; or house occupants that may be insufficiently mobile to avoid loss of life or injury. Examples of critical development include jails, hospitals, schools, daycare facilities, public electric utilities, fire stations, emergency operation centers, police facilities, nursing homes, wastewater treatment facilities, water plants, gas/oil/propane storage facilities, hazardous waste handling and storage facilities and other public equipment storage facilities.

Municipalities can expand the applicability of regulations like the flood damage prevention ordinance by modifying definitions of applicable development. For example, the definition of substantial damage can be modified to include properties suffering repeated damage within a certain period of time (typically instances of damage equaling or exceeding 25% of the fair market value of the structure two or more times within a ten-year period). This would result in the required flood-proofing of additional structures, breaking repeating patterns of flood, repair, flood, repair. Residents within municipalities that require buildings subject to such a heightened definition of repetitive damage may be eligible for additional funding assistance to cover the increased cost of compliance for the more stringent regulations. However, due to much higher construction costs in the region, the amounts available from FEMA (based on nation-wide figures) may not provide sufficient assistance for residents and be financially burdensome. Municipalities should carefully consider the potential impacts of such actions prior to adoption.

Adopt a Hazard Mitigation Plan, meeting the requirements of the Federal Emergency Management Agency (FEMA). The plan must be approved or determined to be approvable by FEMA. FEMA provides grant funding to assist municipalities with the development of Hazard Mitigation Plans. However, funding for individual plans is not available and all municipalities are encouraged to participate in a county-wide Hazard Mitigation Plan currently being prepared by the County Office of Emergency Management. Guidance on Local Hazard Mitigation Plans is available at: www.fema.gov/library/viewRecord.do?id=3336. To be most effective, a mitigation plan must adequately evaluate potential hazards and include specific yet comprehensive strategies that decrease the risk and increase the community's resilience to the variety of hazards included in the plan. FEMA defines mitigation as "any sustained action taken to reduce or eliminate long-term risk to people and property from natural hazards and their effects." Further, many FEMA documents emphasize mitigation as actions that prevent or reduce risk and damage,

providing passive protection at the time of disaster impact. Effective strategies must focus on continued risk reduction and not maintenance of the status quo.

RECOMMENDATION #4: Reduce Impervious Surfaces

Review and amend subdivision regulations, road standards, site plan review standards, special permit standards and/or other applicable regulations to require clustering within special flood hazard areas and minimization of impervious surfaces within all other areas of the municipality. Impervious surfaces are the single issue most responsible for increased flooding. Strict limits must be placed on the amount of impervious surfaces created, and redevelopment plans must require conversion of impervious surfaces to pervious surfaces or otherwise reduce the volume of stormwater generated from the site. The goal is to minimize the difference between pre-development and post-development runoff volumes and patterns. Porous pavement, rainwater cisterns, infiltration devices and other measures must be required for development within all areas of the municipality to mitigate the impacts from additional impervious surfaces. Applicants may use traditional methods only upon demonstrating that low impact strategies will not be effective. Guidance on sustainable development is available through several sources, including:

“Low Impact Development Design Strategies: An Integrated Design Approach” (1999), by the Prince George’s County (Maryland) Department of Environmental Resources, at: www.epa.gov/owow/nps/lid/lidnatl.pdf;

“Low Impact Development: Urban Design Tools” Website, by the Low Impact Development Center, at: www.lid-stormwater.net;

“Polluted Runoff (Nonpoint Source Pollution): Low Impact Development (LID)” Website, by U.S. Environmental Protection Agency, at: www.epa.gov/nps/lid.

RECOMMENDATION #5: Require On-Site Detention

Requiring on-site detention and, to the extent practical, infiltration, is an appropriate method to reduce the amount of stormwater entering the streams during or shortly after the storm event in order to prevent increased flood flows and limit increased runoff from a proposed development to pre-development conditions. Continued development not only decreases the ability of these areas to hold back stormwater runoff but increases the speed at which the water reaches the stream. Multiplied throughout a watershed, the impacts to streams are destructive. Increasing storm intensity and frequency (more and more of our storms are in the form of short, intense outbursts rather than slow sustained rains) also contributes to more runoff and increased flows, causing erosion and creating blockages at choke points. Studies in the northeast indicate that, partly due to increases in impervious surfaces and partly due to increases in storm intensity, road culverts and other conveyance structures are no longer adequately sized. Retrofitting roadway culverts and the larger stormwater infrastructure is extremely expensive and requires watershed-

wide planning. In addition, regulations are required to maintain floodplains and stream channels by reducing erosion and sedimentation from construction activities throughout the municipality.

The municipality must demonstrate adoption of the sample local law for stormwater management and erosion and sediment control prepared by the New York State Department of Environmental Conservation (http://www.dec.ny.gov/docs/water_pdf/localaw06.pdf), or equal, modified to apply to all development activity involving 5,000 square feet or more of land disturbance. Some municipalities have increased this standard to capture land disturbance as small as 500 square feet. Major and minor classifications can be used to apply different sets of standards and permit procedures for different levels of disturbance. Various methods may be utilized to provide on-site detention, and municipalities are encouraged to review the runoff reduction requirements included in the New York State Stormwater Management Design Manual (available at http://www.dec.ny.gov/docs/water_pdf/swdm2010entire.pdf). The manual requires that “[r]unoff reduction shall be achieved by infiltration, groundwater recharge, reuse, recycle, evaporation/evapotranspiration of 100 percent of the post-development water quality volumes to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, as well as minimizing concentrated flow by using runoff control techniques to provide treatment in a distributed manner before runoff reaches the collection system.” Consider requiring that development or redevelopment activity involving 5,000 square feet or more of land disturbance provide infiltration or reuse of the stormwater volume generated from the site for at least the 90% rainfall event as defined by the New York State Stormwater Management Design Manual (approximately 1.3 inches) for all new impervious surfaces and at least the 90% rainfall event for 25% of existing impervious surfaces. Existing infiltration or reuse volumes may be used as a credit in such calculations. Some municipalities have increased this standard to require on-site detention or infiltration of the 25-year storm.

RECOMMENDATION #6: Review Engineering Data and Methodology

Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds, was first issued by the Soil Conservation Service (now the Natural Resource Conservation Service) in January 1975. It is a set of simplified procedures to calculate storm runoff volume, peak rate of discharge, hydrographs, and storage volumes required for small watersheds. TR-55 uses the rainfall data included in Technical Paper 40, Rainfall Frequency Atlas of the United States, which was prepared by the Weather Bureau of the U.S. Department of Commerce in 1961. The Northeast Regional Climate Center (NRCC) at Cornell University has developed updated precipitation data, including the 1993 publication, *Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada*, and a more recent, interactive website at <http://precip.eas.cornell.edu/> where extreme precipitation data can be downloaded. These sources describe the 24-hour 100-year rainfall as approximately 9 inches in Westchester County, suggesting that stormwater management practices designed using TR-55 and TP-40 will result in significantly under-designed systems. Many jurisdictions are beginning to require the use of the

more recent extreme precipitation data prepared by NRCC or other best available rainfall data in place of TP-40, and Westchester municipalities should consider whether similar action is warranted to ensure the most conservative analysis and design of stormwater practices.

RECOMMENDATION #7: Implement Recommendations from Watershed Plans

Three watershed plans were prepared as a collaborative partnership of the County and watershed municipalities in the sub drainage basins of the Coastal Long Island Sound Watershed. While the plans primarily focus on water quality issues, many of the recommendations and identified projects are equally applicable to water quantity issues. **Municipalities should be familiar with the plans and continue implementing as many recommendations as practical.**

RECOMMENDATION #8: Increase Public Awareness

Municipalities can adopt local laws requiring property owners to disclose historic flooding as a condition of property transfer. As described above, development located within special flood hazard areas must be restricted from impacting streams or floodplains by filling or obstructions. Property owners must be notified by documenting such conditions on subdivision plats, deed restrictions or other means. Working with local boards of realtors on flooding issues and the requirements of local regulations can also be effective. While most local municipalities have an ordinance requiring property owners to maintain local streams and drainage ways many residents may not be aware of these requirements or may need assistance in maintaining the stream channels.

Utilize community websites to post information on flooding and how to prepare in advance of a flood. Many resources are available with this information such as FloodSmart.gov and the American Red Cross. Individual property owners can take many measures to protect their property from flood damage, including installing check valves to prevent sewage backups, making sure that surface drainage flows away from the building, moving valuables to upper floors, and ensuring that critical equipment is located above the base flood elevation or is adequately flood-proofed. The County's website contains much information and resources on flood issues for a variety of audiences. Local municipalities must present evidence of public education and outreach activities to inform their residents and business owners of flooding issues.

RECOMMENDATION #9: Maintain and Improve Infrastructure

Undertake efforts to maintain and improve infrastructure capacity. This may include one or more of the following: enforcing regulations to prevent obstructions to stream channels or modification of floodplains, clearing snags and obstructions from stream channels, maintaining culverts and storm sewer systems, regular catch basin cleaning and street sweeping to reduce sediment buildup. Recent studies have shown that rainfall intensity will continue to increase throughout the northeast, and that stormwater conveyance systems following traditional sizing criteria are not adequate. Municipalities must work together to fund watershed-wide analysis of

the stormwater storage and conveyance system, amending development and road standards to enlarge stream culverts and provide additional storage of floodwaters to meet these increasing demands.

RECOMMENDATION #10: Work Together

Demonstrate a willingness and commitment to work with other watershed municipalities as well as the County. Flooding impacts everyone and municipalities must work together to address this problem. Many municipalities have developed intermunicipal watershed groups to work on regional issues such as flooding. State and federal agencies favor these types of intermunicipal arrangements when awarding grants for studies or projects. Watershed plans that include a list of opportunities, sites, or specific projects are another effective method to work collaboratively and increase chances for grant funding. Municipalities can demonstrate a commitment to work together by participating in watershed wide groups, or by resolution adopting policy statements to that effect.

RECOMMENDATION #11: Reduce Costs

The National Flood Insurance Program's (NFIP) Community Rating System (CRS) is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. **As a result, flood insurance premium rates are discounted to reflect the reduced flood risk resulting from the community actions meeting the three goals of the CRS:**

Reduce flood damage to insurable property;

Strengthen and support the insurance aspects of the NFIP, and

Encourage a comprehensive approach to floodplain management.

The Federal Emergency Management Agency (FEMA) has published a guidance document for local municipal officials that describes the program and its benefits. National Flood Insurance Program (NFIP) Community Rating System (CRS): A Local Official's Guide to Saving Lives, Preventing Property Damage, Reducing the Cost of Flood Insurance is available from the FEMA website at <http://www.fema.gov/national-flood-insurance-program/community-rating-system>. CRS discounts on flood insurance premiums range from 5% up to 45%.

RECOMMENDATION #12: Acquire Flood-Prone Land

Municipalities should seek to acquire and hold as a public open space available properties that lie in flood prone areas and that thereby can achieve a flood mitigation purpose. Similarly, acquisition and clearance of vacant or derelict properties in flood prone areas also should be considered in a municipal flood action program. Many municipalities in other areas of the country have implemented programs to purchase floodplains, using the land for conservation and passive recreation (one example is the City of Lenexa, Kansas at www.raintorecreation.org).

COUNTY GOVERNMENT

Originally formed to serve specific functions at the local level on behalf of the state, county governments in New York State have evolved to function as a form of regional government, with the ability to provide a variety of services to its residents. The Storm Water Management Law adopted by the Westchester County Board of Legislators in 2011 recognizes not only the ability of the County to address flooding and provide relief for its residents but its responsibility to do so. New York is also a strong home rule state. While county government is limited in its ability to regulate, it is well suited to facilitate efforts to address regional issues like flooding. Following are general recommendations for Westchester County to consider in its efforts to protect residents from flooding and flood damage.

RECOMMENDATION #1: Collect Field Data to Supplement Existing Information

One of the most important lessons learned from the data collection and review of the reconnaissance plan development was the lack of comprehensive and consistent baseline data of the county's streams and localized weather. Stream gauges installed by the County and others decades ago are long defunct or abandoned. Past flood studies recommended projects that were neither financially nor politically feasible. These projects focused on specific problem areas and did not analyze the impacts of proposed solutions to other areas within the watershed nor did they take into consideration the development that occurred throughout the watershed. More recent studies of weather patterns had to use weather data provided by the Westchester County Airport or a NOAA weather station in Bridgeport, CT. While there are likely many weather stations throughout the county, the data are not compiled and made available in a meaningful way.

The installation of stream gauges and the systematic collection of data on rainfall events (in particular rainfall intensity) is needed to provide more accurate information on weather patterns and how streams respond to these rainfall events. Tide gauges will provide valuable information on tides and coastal surges during storm events. This will not only be useful in planning and engineering flood prevention projects but can also be used to better predict and warn residents and businesses of impending events, thus reducing costs associated with emergency response. This field data will support a substantive amount of existing data and computer-based hydrologic and hydraulic information and modeling for the watershed

RECOMMENDATION #2: Use Existing Watershed-Wide Data for Neighborhood-/Site-Specific Project Planning and Design

Previous data analysis and studies and existing data and modeling of the Coastal Long Island Sound watershed, including the development of hydrologic/hydraulic modeling, enable neighborhood-/site-specific analyses and project planning and design to be performed. While

additional data such as that described above will provide more accurate analysis, adequate data exists to perform analysis and evaluation of areas and potential improvements.

RECOMMENDATION #3: Continue Implementation of Recommendations Included in Watershed Plans

The County has been implementing recommendations resulting from the preparation of watershed plans for sub drainage basins of the Coastal Long Island Sound Watershed, particularly physical projects to restore degraded habitat. In addition to improving water quality and restoring habitat, many of these projects also restore floodplains and provide storage of flood waters. Implementation of these projects, with a specific emphasis on providing flood storage, will continue, utilizing grant funding to the extent possible.

RECOMMENDATION #4: Prepare County-Wide Hazard Mitigation Plan

The County is currently undertaking an effort, funded by a FEMA grant, to prepare a county-wide Hazard Mitigation Plan. All Westchester municipalities are encouraged to participate in the plan, as it may also be used to meet the requirements for local hazard mitigation plans. Over 20 municipalities have already signed on, and the plan will be completed in 2014.

RECOMMENDATION #5: Consider Participation in State and Federal Efforts

Westchester County has a long history of working in partnership with state and federal agencies. The Westchester County Soil and Water Conservation District, administered by the County Department of Planning, has provided a conduit between the County and millions of federal dollars to design and construct natural resources restoration and stormwater management projects to better manage runoff and lessen the impacts from flooding. The District's unique standing among state and federal agencies, like that of other such County districts throughout the state, also has brought state funding to the county for a variety of natural resources and stormwater management projects. See www.westchestergov.com/soilwater. More funds from various state and federal agencies have also been obtained for similar projects through the Department of Planning.

The County is currently working with the United States Army Corps of Engineers (USACE), and New York State Department of Environmental Conservation (DEC), in cooperation with the Village of Mamaroneck, on a study to reduce flooding in the village. That study is progressing with assessments and preliminary designs of specific flood mitigation alternatives that will benefit the village and may be used as a guide for other sub-drainage basins.

RECOMMENDATION #6: Expand Research and Technical Guidance

Westchester County has a long history of award-winning education and outreach programs, utilizing state of the art technology to produce both technical and general information to a variety of audiences using the full range of media types. One of the most efficient methods involves the utilization of the County's website to disseminate information to municipal officials, the

professional community, and residents concerning issues such as flooding. As part of the reconnaissance plan development, use of the website will continue to expand as more information is collected and prepared for dissemination. The County will continue to conduct research of flood related issues and prepare technical guidance documents and information to municipalities and others. Technical workshops are also sponsored by the County, in partnership with the Soil and Water Conservation District. These will also continue to provide technical information for targeted audiences.

RECOMMENDATION #7: Explore Regional Partnership for NFIP Administration

Westchester County can take a lead role in creating a regional partnership with local municipalities in the administration and implementation of the National Flood Insurance Program, resulting in improved effectiveness of the program and reduced burden on local municipal resources. For example, many of the NFIP reporting, file storage and public information requirements could be performed more efficiently in a county-wide system rather than numerous individual systems.

9. NEXT STEPS

MUNICIPALITIES

Next steps in the process will be for the County to consider the recommendations made for it and whether to move those recommendations forward, and the local municipalities will need to determine whether to petition the County to assist in funding the additional engineering study and evaluation needed to address one or more of the flooding areas listed in the reconnaissance plan. Recommended next steps follow:

Review Information. Each local municipality should review the reconnaissance plan to ensure that it accurately reflects the information provided by the municipality and to understand the requirements of the funding program and recommendations included in the plan.

Review Project List. In the review of the reconnaissance plan, particular attention should be paid to the evaluation of identified flood problem areas and available studies and additional information that may be needed to fully evaluate the areas and/or studies.

Review Recommendations. Many municipalities have addressed flooding through local land use regulations and ordinances and other efforts. Municipalities interested in participating in the funding program should review the Recommendations for Local Municipalities included in the reconnaissance plan and prepare a document describing what the municipality has implemented for each of the recommendations, with specific examples where appropriate.

Review Goals and Requirements. Refer to the stated goals for projects, conditions of intermunicipal agreements and requirements for County funding. Proposals that are in conflict with any of these goals or requirements may not receive funding.

Request Funding. Interested municipalities should work with the County to prepare a scope of work for engineering analysis that will be needed to amend an existing study or prepare a new study for a previously unstudied area. Studies will need to address the goals for flood mitigation projects as described in the Reconnaissance Plan (refer to Conclusions section). Detailed cost estimates will also need to be prepared.

WESTCHESTER COUNTY

The reconnaissance plan identified a number of tasks that are best undertaken on a regional basis or for which the County is uniquely suited to conduct. For Westchester County, the next steps in the process will be to consider the recommendations and whether to move those recommendations forward. Recommended next steps for the County to follow:

Consider advancing at least one of the projects/studies that were reviewed in the Prior Studies section of this Reconnaissance Plan to Phase I engineering. Phase I engineering must

demonstrate that the projects are cost effective, will not impact other properties and will satisfy the other evaluation criteria described in Section 7 in order to be considered for Phase II funding.

Continue to implement recommendations made in watershed management plans. Many of the prior watershed management plans identified the restoration of sites such as floodplains and wetlands that also function as flood storage areas.

Establish a comprehensive system for collecting flood data in all watersheds for planning and engineering of projects and as an early warning system for residents and businesses of impending events.

Develop a detailed stormwater management plan for the entire watershed, focusing on flooding and flood damage reduction. In conjunction with watershed-wide analysis, build on engineering studies and analyses already completed for areas identified in the reconnaissance plan.

Expand regional education and outreach to Westchester residents and public officials to advise them on flood related issues such as ways to reduce flooding and better protect themselves from flood damage. Provide additional information, including technical information on flooding and related issues, on County website.

APPENDIX A
Westchester County
Stormwater Management Law

Local Law Approved by Westchester County Board of Legislators on February 14, 2011.
Local Law Approved by Westchester County Executive on February 18, 2011.

Downloaded from General Code Publishers Website (<http://www.ecode360.com/WE0640>) Friday, January 6, 2012

Article III-A. WESTCHESTER COUNTY STORM WATER MANAGEMENT LAW

Sec. 241.252. Short Title.

[Added by L.L. No. 5-2011] This Local Law shall be known and cited as the "Westchester County Storm Water Management Law."

Sec. 241.253. Legislative findings and intent.

[Added by L.L. No. 5-2011] The County Board of Legislators recognizes and finds that:

- 1 The local municipalities within the County should not be solely responsible for storm water management.
- 2 The County should cooperate with these local municipalities as well as the governments of the United States, the State of New York and the adjoining states, counties and other localities for the purpose of storm water management.
- 3 The County should create incentives for local municipalities to work cooperatively with each other and the County on a watershed basis, subject to appropriations, and to establish partnerships for the preparation of watershed-wide storm water management plans.
- 4 The County should provide, subject to appropriations, financial assistance to eligible local municipalities for approved Storm Water Management Projects that are contained in the County's Reconnaissance Plan and which meet established criteria.
- 5 In light of these findings, it is the intention of the County Board of Legislators that this Article relating to storm water management acknowledge the authority of the County to appropriate and expend county funds to protect public and private property within the County from floods and to comply with the procedures set forth in New York State County Law § 223 relating to flood control. In addition, the Storm Water Advisory Board and the Basin-wide Watershed Advisory Boards which are created in this article shall explore, among other things, the feasibility and desirability for the creation of drainage and small watershed protection districts for local municipalities as another viable option to address the issue of flooding in Westchester County as provided in Articles 5-A and 5-D in New York State County Law.

Sec. 241.254. Definitions.

[Added by L.L. No. 5-2011] For the purposes of this article, the following terms shall mean:

1. Commissioner of Planning: the Commissioner of Planning of the County or his or her designee.
2. Commissioner of Public Works and Transportation: the Commissioner of Public Works and Transportation of the County or his or her designee.
3. Construction: construction or reconstruction, including enlargement, extension, modification or improvement.
4. County: the County of Westchester.
5. County Board: the County Board of Legislators.
6. Flood or Storm Water Management Problem: any overflowing of water onto land located within a flood hazard area of the County as designated by the Federal Emergency Management Agency or other areas related to flooding or storm water management as designated in the Reconnaissance Plan.
7. Local municipality: any city, town, or village within the County.
8. Municipality: local municipalities, drainage and small watershed protection districts, inter-municipal councils, or other public agency or authority, any part of the area of jurisdiction of which lies within the County.

9. Phase I Funding: funds approved subject to appropriations and by act of the County Board for the detailed design, specification, and construction documents for a Storm Water Management Project.
10. Phase II Funding: funds approved subject to appropriations and by act of the County Board for the implementation and construction of a Storm Water Management Project.
11. Storm Water Management: any activities or strategies for controlling flooding and minimizing damage therefrom, including the design and construction of storm water management facilities.
12. Storm Water Management Facilities: any canals, ditches, collection systems, reservoirs, dams, levees, sluiceways, dredging, holding basins, floodways, pumping stations, swales, detention ponds, culverts, bio-retention areas, sand filters, infiltration trenches, or any other works or structures for the conservation, control, development utilization, and disposal of flood water.
13. Storm Water Management Project: any project proposed and/or undertaken by the County alone or pursuant to an inter-municipal agreement to address flood and storm water management problems.

Sec. 241.255. Reconnaissance Plan.

[Added by L.L. No. 5-2011]

1. The Reconnaissance Plan is a conceptual plan prepared on a watershed basis, that locates and describes areas of flood or storm water management problems, existing storm water management facilities, and proposed or potential capital improvements that are appropriate to reduce flooding and flood damage.
2. Within 180 days after this article takes effect, or such other longer period as the County Board may by act direct, the Commissioners of Planning and Public Works and Transportation shall jointly proceed to make such inventories, surveys and investigations of the six (6) major watersheds, streams and watercourses in the county, their runoff producing characteristics, and related matters, as may be necessary to enable the Commissioner of Planning to formulate a proposed Reconnaissance Plan for the County, to serve as the basis for the funding of Storm Water Management Projects, subject to appropriations. In making such inventories, surveys and investigations, the Commissioners of Planning and Public Works and Transportation may utilize any maps or other materials prepared by the Federal Emergency Management Agency and other government authorities and municipalities.
3. In preparing the Reconnaissance Plan, the Commissioner of Planning shall:
 - a. consult with and consider the recommendations of the Storm Water Advisory Board and other County agencies and departments;
 - b. consult with and consider the recommendations of the chief elected officials of the local municipalities, or their designated representatives, and any other municipality and obtain their recommendations for storm water management facilities and practices;
 - c. utilize available documents and reports that may exist in each municipality to avoid replicating existing data and the costs associated therewith; and
 - d. consult with and consider the recommendations of any basin-wide watershed advisory board or other interested organization.
4. The Commissioner of Planning shall submit the Reconnaissance Plan to the County Board as soon as practicable, which shall include, but not be limited to:
 - a. A comprehensive map of the watersheds, streams and watercourses wholly or partially within the county; their runoff producing characteristics, and related matters;
 - b. A comprehensive inventory of the existing flood and storm water management problems in the County, and including those problems that may be located on County-owned or municipally-owned properties;
 - c. Recommendations concerning the construction of Storm Water Management Facilities at appropriate sites within the county to alleviate the identified problems, and recommendations on the reduction of flooding and flood damage that can be achieved by improvement in building and land use codes and procedures, or by the implementation of other Best Management Practices.
 - d. A list of proposed Storm Water Management Projects for Phase I and Phase II funding, and preliminary estimates, to be provided by the Commissioner of Public Works and Transportation,

- of the cost of constructing the proposed Storm Water Management Projects and the method of financing for Phase I and Phase II funding, as appropriate;
 - e. Identification of local municipalities interested in executing inter-municipal agreements with the County on Storm Water Management Projects and the recommended terms and conditions of such appropriate inter-municipal agreements;
 - f. Recommendations concerning rules, regulations, and legislation as may be required for the management of flood water within the County and for the operation and administration of Storm Water Management Facilities; and
 - g. Recommendations on such other matters as deemed necessary or appropriate, including areas or problems requiring further research, analysis and study before a formal inclusion in the Reconnaissance Plan.
5. The Commissioner of Planning shall submit status reports to the County Board on the development of the Reconnaissance Plan and all current and proposed Storm Water Management Projects for inclusion in the Reconnaissance Plan on or before June 30 and December 31 of each year.
 6. The County Board may approve, or amend and approve, the Reconnaissance Plan as proposed by the Commissioner of Planning by act of the County Board. Once the Reconnaissance Plan is approved by the County Board, it may be amended by the County Board as deemed necessary. The Reconnaissance Plan and any proposed amendments shall not become effective until approved by the County Board.

Sec. 241.256. Storm Water Management Projects.

[Added by L.L. No. 5-2011] Subject to appropriations and in accordance with New York State County Law § 223, the County Board may authorize the Phase I or Phase II funding of any Storm Water Management Project shown on the Reconnaissance Plan. The County Board authorization to execute an intermunicipal agreement shall determine, to the extent allowable under Federal, State and local laws, the portion of the cost of the Storm Water Management Project to be paid by the County and the portion to be paid by any other governmental entity involved in the Storm Water Management Project. No Storm Water Management Project may be authorized by the County Board unless the intended participating municipalities first agree (i) to comply with all of the Federal, State and local laws and regulations relating to the storm water management, and (ii) to certify such compliance.

Sec. 241.257. Municipal Participation.

[Added by L.L. No. 5-2011]

1. *Eligibility Criteria.*
 - a. All local municipalities are eligible, and encouraged to apply, for County financial assistance for projects to address flood or storm water management problems.
 - b. Local municipalities must provide a clear description of the area-wide benefit that will result from a proposed Storm Water Management Project, with detailed information on the size of the area that will benefit, the number of people and properties protected and any benefit to County-owned infrastructure in regard to improved health and life safety and a reduction in physical and economic impacts from flooding.
 - c. Local municipalities must participate financially with significant local funds, grants, and/or in-kind services in a minimum amount of fifty percent (50%) of total Storm Water Management Project costs, of which up to thirty percent (30%) of the municipal share may be in-kind services as identified in the municipal budget for the Storm Water Management Project and as otherwise allowable pursuant to applicable Federal, State and local laws and regulations. Under no circumstances shall the municipal share of in-kind services exceed fifteen percent (15%) of the total project cost.
 - d. Local municipalities must provide a certification from a qualified licensed professional engineer that the Storm Water Management Project will not create or exacerbate flooding conditions in the County.
 - e. Applications must clearly demonstrate how the local municipality has addressed flooding as part

- of its comprehensive planning process.
- f. Local municipalities must adopt, amend and enforce local laws and ordinances (including but not limited to, zoning, overlay zones, floodplain regulations, stormwater regulations, best storm water management practices, stricter building and development standards) as well as any other development standards prepared by the Storm Water Advisory Board and approved by the County Board, to limit flood risk and flood damage and to reduce the volume of stormwater runoff discharged from sites.
 - g. Local municipalities must demonstrate the preparation and submission for approval of a Community Hazard Mitigation Plan, in accordance with Federal Emergency Management Agency guidelines, that identifies flood prone areas, inventories historic flood damage, and describes recommended actions.
 - h. Local municipalities must adopt a resolution that commits the local municipality to work cooperatively with other municipalities and the County on watershed planning efforts.
 - i. Applications must include a description of other ways in which the local municipality has or will attempt to reduce flooding and flood damage including studies, actual projects or otherwise.
2. *Selection Criteria.* Storm Water Management Project applications for funding will be prioritized according to the following criteria:
 - a. Recommendations in the Reconnaissance Plan
 - b. Nature and extent of the flooding problem and extent of recorded or potential risk to individuals, properties and public health.
 - c. Degree to which the Storm Water Management Project will reduce the identified problem(s).
 - d. Expected time to complete the Storm Water Management Project.
 - e. Degree to which the local municipality has taken steps to reduce flooding and flood impacts/risk on its own or in conjunction with other municipalities.
 - f. The commitment of the local municipality to provide the local match for the Storm Water Management Project, the amount of total project costs, and the available County funding.
 - g. Degree to which other feasible alternatives exist.
 - h. Degree to which the storm water management problems are inter-municipal in nature, and the extent to which the proposed resolution will involve greater inter-municipal cooperation and result in more effective storm water management.
 3. *Application and Review Procedures for Phase I Funding.*
 - a. Local municipalities shall submit a preliminary application for Phase I funding and attend a preliminary meeting with County staff to review the scope of the proposed Storm Water Management Project contained in the Reconnaissance Plan and evaluate eligibility criteria and to determine if additional information is needed.
 - b. Following this initial review, the local municipality shall submit a completed Phase I funding application to the County for consideration. Phase I funding is limited to the preparation of detailed plans and specifications for any Storm Water Management Project contained in the Reconnaissance Plan. The local municipality shall consult with the County and complete such other administrative tasks as well as finalize inter-municipal agreements for Phase I funding, as appropriate. Applications for Phase I funding shall be reviewed and recommendations made to the County Board by the Departments of Planning and Public Works and Transportation and the Storm Water Advisory Board regarding the plans and specifications for construction, as defined in this Article, of Storm Water Management Projects. The approval of a Phase I funding by the County Board shall comply with all of the procedures and requirements set forth in New York State County Law § 223.
 - c. The County Board's approval for Phase I funding does not guarantee funding for Phase II construction.
 4. *Application and Review Procedures for Phase II Funding.* Upon the completion of the development of detailed design, specification, and construction documents for a Storm Water Management Project contained in the Reconnaissance Plan by a local municipality at its own expense or for which Phase I funding has been provided by the County, a local municipality may apply for Phase II funding. Such application for Phase II funding shall follow the same review process as those set forth above for a

Phase I application and shall be in compliance with all of the procedures and requirements set forth in New York State County Law § 223.

Sec. 241.258. Terms, Conditions, Rules, and Regulations.

[Added by L.L. No. 5-2011]

1. The Commissioner of Planning, and the Commissioner of Public Works and Transportation, after consultation with the Storm Water Advisory Board, may recommend the adoption of any legislation including, but not limited to, terms, conditions, rules, and regulations, regarding Storm Water Management Projects and application procedures and any inter-municipal agreements for a proposed Storm Water Management Project.
2. The Commissioners' recommendations shall be consistent with the Reconnaissance Plan and shall:
 - a. address the priorities set in the Reconnaissance Plan;
 - b. describe the basis and reasons for the selection of a Storm Water Management Project;
 - c. specify the basis for the proposed contributions toward the costs of Storm Water Management Projects by the County and each of the involved municipalities, in accordance with Federal, State and local laws; and
 - d. describe the appropriate allocation of responsibility for the construction and maintenance of Storm Water Management Projects by the County and involved municipalities.

Sec. 241.259. Storm Water Advisory Board.

[Added by L.L. No. 5-2011]

1. There shall be a Storm Water Advisory Board which shall advise the Commissioner of Planning, the Commissioner of Public Works and Transportation, the County Executive, and the County Board in matters relating to storm water management, and shall perform and exercise such other and related duties required by the Commissioner of Planning, the Commissioner of Public Works and Transportation, the County Executive, and the County Board.
2. The Storm Water Advisory Board will consist of 12 members, as follows:
 - a. Ten voting members, five appointed by the County Executive, and five appointed by the County Board;
 - b. A County Legislator appointed by the Chairman of the County Board to serve as an ex-officio, non-voting member; and
 - c. The Commissioner of Planning, an ex officio non-voting member, who shall serve as the Chair of the Storm Water Advisory Board.
3. In selecting the members to be appointed, the County Executive and the County Board shall give due consideration to the geographic distribution of the members within the county and within the cities, towns and villages thereof, and shall select members who by virtue of their professional training, familiarity with county and municipal government, or experience and involvement in storm water management are particularly well qualified to serve.
4. The ten voting members of the Storm Water Advisory Board shall serve two year terms, except that of those first five appointed by the County Board, two shall be appointed for a term of one year, and three for two years, and those first five appointed by the County Executive, three shall be appointed for a term of one year, and two for two years, thereby resulting in half of the appointed members' terms expiring December 31st in odd-numbered years, and the balance on December 31st in even-numbered years.

Sec. 241.260. Basin-wide Watershed Advisory Boards.

[Added by L.L. No. 5-2011]

1. Local municipalities in a watershed may form a Basin-wide Watershed Advisory Board. The Watershed Advisory Board members shall be appointed by the chief elected official of each local municipality and the number of members shall equal the number of local municipalities in the watershed. One member from each local municipality shall be appointed.
2. The Basin-wide Watershed Advisory Board shall:
 - a. fulfill the duties relative to making recommendations of Storm Water Management Projects for inclusion in the Reconnaissance Plan;
 - b. advise the Commissioner of Planning in the preparation of Reconnaissance Plan and any other matters relating to storm water management within their watershed; and
 - c. shall adopt such internal structure, rules, and procedures as may be necessary to accomplish its responsibilities.

APPENDIX B
Major Drainage Basins and
Table of Municipalities

WESTCHESTER COUNTY, NEW YORK



Major Drainage Basins

Municipality	Drainage Basin						Municipality	Drainage Basin					
	Peekskill & Haverstraw Bay	Croton River	Pocantico & Saw Mill River	Bronx River	Inland Long Island Sound	Coastal Long Island Sound		Peekskill & Haverstraw Bay	Croton River	Pocantico & Saw Mill River	Bronx River	Inland Long Island Sound	Coastal Long Island Sound
Cities							Villages						
Mount Vernon							Ardsley						
New Rochelle							Briarcliff Manor						
Peekskill							Bronxville						
Rye							Buchanan						
White Plains							Croton-on-Hudson						
Yonkers							Dobbs Ferry						
Towns							Elmsford						
Bedford							Harrison (V/T)						
Cortlandt							Hastings-on-Hudson						
Eastchester							Irvington						
Greenburgh							Larchmont						
Lewisboro							Mamaroneck						
Mamaroneck							Mount Kisco						
Mount Pleasant							Ossining						
New Castle							Pelham						
North Castle							Pelham Manor						
North Salem							Pleasantville						
Ossining							Port Chester						
Pound Ridge							Rye Brook						
Somers							Scarsdale						
Yorktown							Sleepy Hollow						
							Tarrytown						
							Tuckahoe						

APPENDIX C
Municipal Questionnaire and
Flood Prone Areas Sample Rating Sheet



Robert P. Astorino
County Executive

Department of Planning

Edward Burroughs
Commissioner

July 20, 2012

Charles Strome, Manager
City of New Rochelle
City Hall
515 North Avenue
New Rochelle, NY 10801-3416

Subject: MUNICIPAL SURVEY FOR INFORMATION RELATED TO LOCAL FLOODING

Dear Mr. Strome:

As you may know, in 2011 Westchester County adopted the Westchester County Stormwater Management Law (Local Law 5-2011 establishing Section 241.252 of the County Code), a copy of which can be found at the following link (<http://ecode360.com/WE0640>). The purpose of the law is to address flooding throughout Westchester County, establishing a program where the county and local municipalities work cooperatively to prepare watershed-wide stormwater management plans and jointly fund projects to mitigate flooding throughout the county.

The law requires the county, acting through its departments of Planning and Public Works and Transportation, to develop Reconnaissance Plans that identify areas of flooding, the extent of flooding and damage, and ways to mitigate the flooding and related damage for each of Westchester's six major watersheds. We have enclosed a map of the six major watersheds. Note that your municipality may be located in more than one major watershed. The aforementioned departments have developed the enclosed outline for the watershed reconnaissance plans. As you will note from the outline and the stormwater management law, a strong spirit of cooperation and partnership is required in order to accurately describe existing flooding problems and to prioritize feasible mitigation projects. At this time we are asking for your assistance by reviewing the information that the county has compiled and providing additional information needed to develop a reconnaissance plan for your municipality, regardless of the number of watersheds that might be located within it. Once the information has been collected, a meeting of the watershed municipalities will be arranged to review the information and discuss potential projects.

The following are enclosed with this letter:

1. A spreadsheet listing ordinances, codes, plans and studies related to flooding in your municipality that the county has collected to date;
2. Map(s) of your municipality and the bordering areas showing watershed boundaries, the special flood hazard areas as delineated by the Federal Emergency Management Agency (FEMA), streams, water bodies, wetlands, roadways and buildings; and

432 Michaelian Office Building
148 Martine Avenue
White Plains, New York 10601

Telephone: (914) 995-4400

Fax: (914) 995-3780

Website: westchestergov.com

3. A questionnaire concerning areas of flooding within your community.

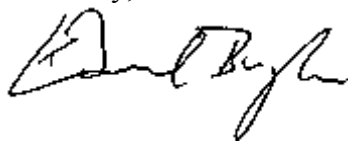
Here is how you can help. Please use the map(s) provided to delineate the boundaries of significant flood-prone areas within your municipality. Label ***each area*** on the map(s), and ***for each area you identify*** complete a copy of the enclosed questionnaire. We are interested in flood-related data over the past ten years within your municipality particularly during the major storm events of March and April 2007 and the storm events of August and September 2011. If there were other storm events where a substantial amount of flooding occurred, please include that data and note the date of the storm on the sheet. Also enclosed is a sample map and completed questionnaire for your use as a guide in completing the questionnaire for each identified flood area.

Please review the list of ordinances, codes, plans and studies that is enclosed on the spreadsheet and edit and update it as necessary, including the contact information. We are also interested in any flood related plans or projects within the past five or ten years, completed or not, that do not appear on the list or within the summaries provided. Please provide copies of such plans or studies so that they may be incorporated into the reconnaissance plan.

The Long Island Sound Watershed Intermunicipal Council (LISWIC) has retained the services of a professional consultant, Malcolm Pirnie, to assist municipalities within the Coastal Long Island Sound Watershed in responding to the data request and contribute to the development of the reconnaissance plan. The consultant will follow up with you and is available to assist in completing the enclosed materials and meet with you to discuss the reconnaissance plan process in more detail, if you desire.

Please make every effort to return all the completed materials and maps to Robert Doscher, Principal Environmental Planner, Westchester County Department of Planning, 148 Martine Avenue, Room 432, White Plains, NY 10601, within two weeks of the date of this letter. Your assistance is greatly appreciated. If you have any questions, require any assistance, or would like to meet with staff, please contact Cindy How, Senior Environmental Engineer, with Malcolm Pirnie at 914.641.2887 or cindy.how@arcadis-us.com.

Sincerely,



Edward Burroughs, AICP, Commissioner

EEB/dsk

cc: Hon. Noam Bramson, Mayor, w/o enclosures

ec: George Oros, Chief of Staff
Joseph Kenner, Assistant to the County Executive
Jay Pisco, Commissioner of Public Works and Transportation
Cindy How, Malcolm Pirnie
Patrick Natarelli, Chief Planner
David Kvinge, Director of Environmental Planning
Robert Doscher, Principal Environmental Planner

**WESTCHESTER COUNTY FLOOD MITIGATION PROGRAM
DATA COLLECTION 2012**

Westchester County is preparing a Reconnaissance Plan to locate and describe areas of flood or stormwater management problems, existing stormwater management facilities and proposed or potential improvements that could reduce flooding and flood damage. To begin this work, local data is needed.

Maps have been prepared that show the streets, buildings, watercourses, wetlands, floodplains and 10-foot contours in your community. Please outline on these maps the boundaries of areas of significant or repeated flooding. Please be as accurate as possible. Designate each flood area with a unique number or letter and then complete the attached form – one form for each flood area identified. Your police and fire departments may have valuable information that can be included in your response.

If you are have or are aware of photos or videos of any storm event, please note that on this form where indicated.

For assistance or if you have questions, please contact Robert Doscher, County Department of Planning, at 995.4423 or by email at rrd1@westchestergov.com.

MUNICIPAL CONTACT INFORMATION

(This section will be completed by the County prior to distribution based on available information.)

Name and Title of Contact Person: _____

Phone: _____ Email: _____

Date: _____

Please update the above contact information as appropriate

Name and Title of Contact Person: _____

Phone: _____ Email: _____

WATERSHED INFORMATION

(This section will be completed by the County prior to distribution based on available information.)

Municipality: _____

Major Drainage Basin Name: _____

Major Streams and Waterbodies: _____

WESTCHESTER COUNTY FLOOD MITIGATION PROGRAM
DATA COLLECTION 2012
Identified Flood Prone Areas

Map Area ID: _____

General Location: _____

GENERAL FLOOD INFORMATION

In March/April 2007, significant rainfall during two storms caused widespread flooding in Westchester County, resulting in transportation corridor obstructions, threats to public safety and property damage. Subsequent storms through 2011's Tropical Storm Lee and Hurricane Irene caused similar impacts and risks. Please provide a general description of flooding in the above location over the last ten years.

Flooding Characteristics:

☐ Standing Water

☐ Rushing Water

☐ Sewage in Floodwaters

☐ Large Debris in Floodwaters

☐ Other: _____

Located within a FEMA designated Special Flood Hazard Area? ☐ Yes ☐ No

Where did the flood waters originate? (Check all that apply.)

☐ Stream, brook, pond, etc.

☐ Clogged/inoperable storm drain

☐ Run-off from an adjacent property

☐ Run-off from street

☐ Groundwater entering through the floor

☐ Other: _____

Did the sanitary sewer back-up as a result of the flooding? ☐ Yes ☐ No

What did the flood conditions impact? (Check all that apply.)

☐ Street: _____

☐ Private Yards: _____

☐ Driveways: _____

☐ Private Garages: _____

☐ Basements: _____

☐ First Floor: _____

☐ Other: _____

Within the last ten years, how many times has this area experienced flooding?

☐ 1-2

☐ 3-4

☐ 5-6

☐ 7-8

☐ 9-10

☐ 10-15

☐ 15+

Area begins to flood after approximately _____ inches of rain. ☐ unknown

Streets become impassable after approximately _____ inches of rain. ☐ unknown

Building basements are flooded after approximately _____ inches of rain. ☐ unknown

Building first floors are flooded after approximately _____ inches of rain. ☐ unknown

SPECIFIC FLOOD EVENT INFORMATION

Please complete the following information for the storm that has caused the worst flooding in this area within the past ten years. (You may complete additional forms for more than one storm if appropriate.)

Storm Name and Date: _____

Brief Description of Flooding and Source of Problem: _____

Approximate Average Depth of Flooding: _____

Approximate Duration of Flooding (in hours or days): _____

Flooding Characteristics: ☐ Standing Water ☐ Rushing Water

☐ Sewage in Floodwaters ☐ Large Debris in Floodwaters

☐ Other: _____

Please complete the following information for the storm that has caused the worst flooding in the area within the past ten years. (You may complete additional forms for more than one storm if appropriate.)

Number of residential units damaged: _____ Amount (\$): _____

Number of commercial properties damaged: _____ Amount (\$): _____

Number of properties suffering repetitive damage: _____ Amount (\$): _____

Damage to utilities: _____

Damage to public infrastructure: _____

PHOTOS OR VIDEOS OF FLOOD CONDITIONS

Are photos or videos available of flood conditions at this location? ☐ Yes ☐ No

If so, please provide them to the County on CD or DVD or advise us how they may be reviewed.

FLOOD AREA DESCRIPTION

Zoning District(s): _____

Number of Single Family Buildings: _____ Approximate Value: _____

Number of Multi-Family Buildings: _____ Approximate Value: _____

Total Number of Residential Dwelling Units: _____

Number of Commercial Properties: _____ Approximate Value: _____

Critical infrastructure or facilities: ☐ schools ☐ hospitals ☐ group homes ☐ sewer lines

☐ major roads ☐ other: _____

Is habitable space permitted at grade for this area? ☐ Yes ☐ No

Is habitable space permitted below grade for this area? ☐ Yes ☐ No

Is there evidence of habitable space below the base flood elevation? ☐ Yes ☐ No

Are there instances of hazardous material storage within the area of flooding? Examples follow:

☐ Gasoline Stations

☐ Automotive Repair/Body Shops

☐ Paint Shops

☐ Dry Cleaners












☐ Industrial Uses

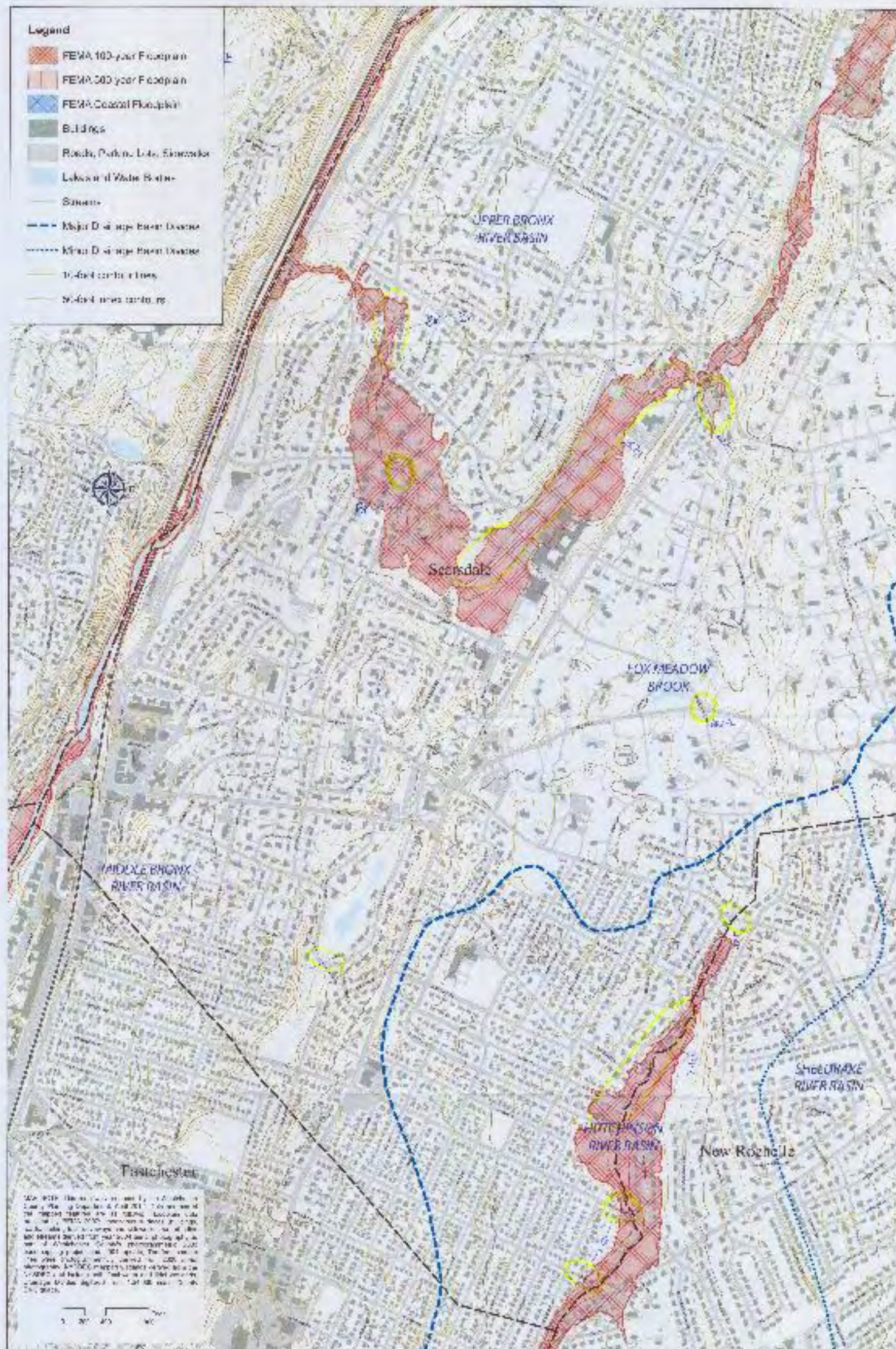
☐ Outdoor Storage

☐ Other: _____

Has flooding in the area been studied: ☐ Yes ☐ No If Yes, please provide study titles and dates:

Legend

-  FEMA 100-year Floodplain
-  FEMA 500-year Floodplain
-  FEMA Coastal Floodplain
-  Buildings
-  Roads, Parking Lots, Sidewalks
-  Lakes and Water Bodies
-  Streams
-  Major Drainage Basin Divides
-  Minor Drainage Basin Divides
-  10-foot contour lines
-  50-foot contour lines



Map 42 of 42
This map was prepared by the Town of Scarsdale, New York, in cooperation with the Westchester County Office of Planning and Development. The map shows the floodplains of the town of Scarsdale, New York, and the surrounding areas. The map was prepared using the latest available data and is subject to change without notice. The map is for informational purposes only and should not be used for any other purpose. The map is the property of the Town of Scarsdale, New York, and is loaned to you for your use only. It is to be returned to the Town of Scarsdale, New York, when you are finished with it. The map is not to be reproduced or distributed in any form without the written permission of the Town of Scarsdale, New York.

Flood Mitigation Project Analysis, Area Evaluation

Flood Area Evaluations

Municipality _____

Map # _____ Flood Location # _____

Score

Flooding Depth	
Flooding Duration	
Flooding Frequency	
Critical Facilities	
Residential Buildings	
Residential Dwelling Units	
Number of Persons	
Commercial Property	
Roads	
Hazardous Materials	
Other:	
TOTAL	0

Point System

Flood Depth	3	Greater than 3 feet
	2	2-3 feet
	1	1-2 feet
	0	Less than one foot
Flood Duration	3	More than 3 days
	2	2-3 days
	1	12-47 hours
	0	Less than 12 hours
Flood Frequency	3	More than four times within the last ten years
	2	3-4 times within the last ten years
	1	2-3 times within the last ten years
	0	Once within the last ten years
Persons in critical facilities requiring coordinated evacuation	5	> 100 persons
	4	76-100
	3	51-75
	2	26-50
	1	25 or less
Number of residential buildings impacted	5	> 20 buildings
	4	15-20
	3	11 to 14
	2	6 to 10
	1	5 or less
Residential Dwelling Units	5	> 40 dwelling units
	4	31-40
	3	21-30
	2	11 to 20

Flood Mitigation Project Analysis, Area Evaluation

Number of Persons	1	10 or less
	5	200 or more
	4	150 to 199
	3	100 to 149
	2	50 to 99
Commercial Properties	1	49 or less
	5	> 20 properties
	4	15 to 20
	3	11 to 14
	2	6 to 10
Miles of roads closed	1	5 or less
	5	> 3 miles
	4	2 to 3 miles
	3	1 to 1.9 miles
	2	0.5 to 0.9 miles
Number of facilities with hazardous material storage	1	less than 0.5 miles
	5	> 10 facilities
	4	8 to 10
	3	5 to 7
	2	2 to 4
	1	1

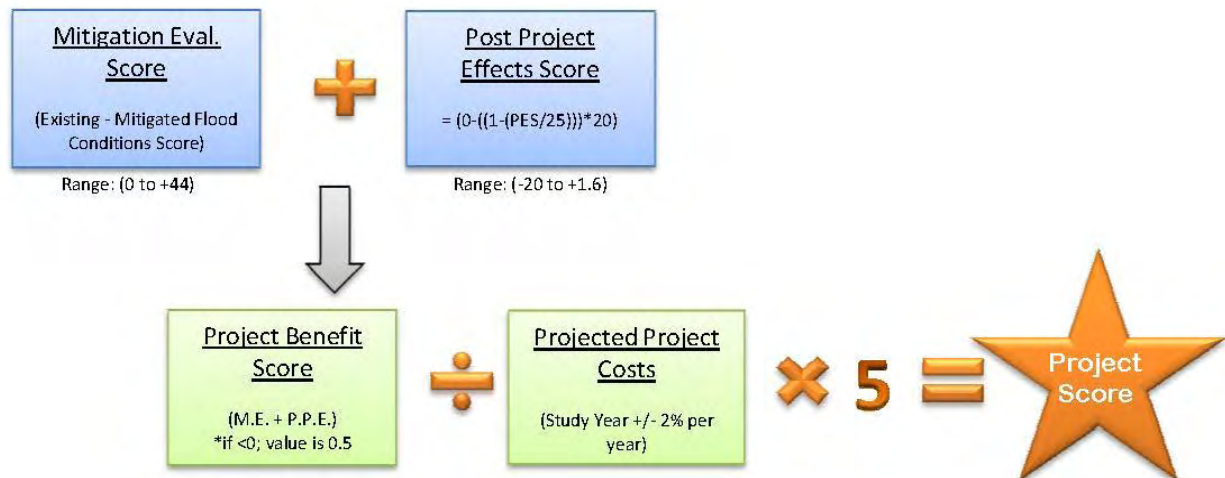
APPENDIX D

Prior Studies Rating Methodology

Westchester County Flood Project Rating System

The Westchester County flood project rating system was developed based on three main areas: flood improvements, post project negative changes and the cost estimates associated with mitigation improvements. The final Project Score Rating is determined by the Mitigation Evaluation Score plus the Post Project Effects Score divided by Projected Project Costs. This formula is presented below.

Figure 1.



There are instances when the Project Benefit Score can result in a negative value. Under this scenario, the Project Benefit Score is given a minimum value of 0.1 in place of the negative value. This yields a positive value for all Project Score Ratings while still providing a score ranking system that compares different levels of advantageous projects.

Mitigation Evaluation Score

The Mitigation Evaluation Score is based on the actual mitigation benefits returned by a flood improvement project. A project's overall benefit is required to determine how flood conditions have improved by reduction of the base flood elevation, reduction in flood duration, structures removed from flooded areas, etc. The projects resulting in greater benefits are given a higher value related to the degree of improvement. Eleven categories (shown Fig.2) were used with each category having a different degree of value.

Fig.2 – Flood Evaluation Categories

Flood Depth (0-3)
Flood Duration (0-3)
Flood Frequency (0-3)
Critical Facilities (0-5)
Residential Buildings (0-5)
Residential Dwelling Units (0-5)
Number of Persons (0-5)
Commercial Property (0-5)
Roads Closed - Miles (0-5)
Hazardous Materials (0-5)
Other: (as nec)

A mitigation evaluation score is calculated from the difference between the mitigated flood condition summary minus the existing flood condition summary. This value is then used in the overall Project Score formula.

Post Project Effects Score

The Post Project Effects Score calculates the negative impacts a proposed project may have on the community, traveling public, property owners, and the maintenance and operational costs associated with the work once the project has been completed. Figure 3 lists the categories and value range of the possible negative impacts.

Fig. 3 – Post Project Impact Categories

Permit Requirements (0-2)
Traffic Disruptions (0-5)
Maintenance & Inspection (0-5)
Agency Regulated Structure (0-5)
Park Impacts/River Scarring (0-5)
Land Takings / Easements (0-5)

These impacts may result in a negative value and would lower the overall score for a project. The Post Project Effects Score has a value range from 1.6 to -20 and is based on the overall weight of all the categories.

APPENDIX E

Letter Concerning FEMA ABFE Maps



Robert P. Astorino
County Executive

Department of Planning

Edward Burroughs
Commissioner

August 9, 2013

MaryAnne E. Tierney, Acting Regional Administrator
Federal Emergency Management Agency
26 Federal Plaza
New York, NY 10278-0002

Subject: Advisory Base Flood Elevation Maps for Westchester County, New York

Dear Administrator Tierney:

Advisory base flood elevation maps (ABFEs) were released for New Jersey in December, followed with the release in January of ABFEs for New York, including Westchester County. It is our understanding that the amount of damage and potential reconstruction associated with Hurricane Sandy in 2012 pressured FEMA to release these maps earlier than anticipated. FEMA began studying storm surge for coastal areas, in particular the northeast, in 2008, well before the recent storm events of Irene, Lee and Sandy. The ABFEs are based on an analysis of this study.

New Jersey's governor adopted the ABFEs statewide. However, there is no indication that Governor Cuomo will enact a similar directive, leaving it to local municipalities to investigate and decide on their own whether to adopt the ABFE information in part, in whole, or at all.

Westchester County staff attended multiple teleconferences and webinars concerning the ABFEs, in addition to a roundtable discussion hosted by Congresswoman Nita Lowey on March 11. We have been informed at these meetings that since the ABFEs are advisory, there is no public comment period. In our review of the information, we have developed a number of questions and concerns, listed below, which we would appreciate the opportunity to discuss in detail with your staff. As a result of our findings, we strongly recommend that municipalities be encouraged to review the data and understand the implications that adopting the information into local regulations and ordinances will have before taking such action.

Our concerns are in three categories:

- (1) technical concerns on how the maps were prepared, what information was used in the preparation of the maps, and apparent anomalies in the mapping results;

(2) concerns involving the administration of the information contained on the maps, such as how to incorporate the new designation of areas of limited wave action into the model floodplain ordinances adopted by municipalities; and

(3) concerns on what impacts the information may have on insurance rates for property owners and how to offset potentially large increases.

We make these comments with a strong commitment to continuing to work with state and federal agencies in assisting to implement the most practical and effective measures to decrease risk and increase resiliency for Westchester communities.

1. Technical Concerns.

- a. ***Map Preparation and Modeling*** - While FEMA has provided much information on the maps themselves, including new categories of flooding and surge impacts, little information was presented explaining how the maps were created before their release. In a cursory review of the maps by County staff, we have identified apparent anomalies such as the attached map showing significant increases in the base flood elevation of adjacent coastal zones. Westchester County has the greatest variability in base flood elevations and the highest base flood elevation (31 feet) of all the areas of study, according to the *Final Report, New York/New Jersey Coastal Advisory Flood Hazard Information Development* (“Final Report”) dated March 22, 2013 and available for download at (http://184.72.33.183/Public/Public_Documents/NJ_NY_ABFE_Report.pdf).

FEMA representatives have stated that the ABFEs do not include data from storms within the previous three years before Sandy, yet the data is presented as Sandy-related. The report states that FEMA “had initiated revisions to the Flood Insurance Studies (FISs) for a majority of the counties affected by Hurricane Sandy” and that the analysis had progressed to a point where “leveraging the data to develop conservative, technically-backed advisory flood hazard information for Hurricane Sandy recovery was possible.” Yet the preceding paragraph of the report states that Hurricane Sandy resulted in “the highest storm surge levels on record”, questioning the degree to which the data and analysis may be considered conservative. The Final Report states that Westchester has been included in the analysis but does not mention the use of LiDAR data or other datasets available from the County. A more technical session, in particular with staff from the County departments of Public Works and Transportation, Information Technology and Planning, as well as staff from the County Office of Emergency Management, would be helpful to review the modeling and mapping methodology and process and resolve some of the County’s concerns.

- b. ***Incorporation of Other Weather Related Data and Studies*** - It is our understanding from attending meetings and presentations by FEMA that other studies regarding weather related trends and information such as sea level rise, increased frequency of intense storm events, and updated precipitation data are not incorporated into the modeling. The Northeast Regional Climate Center (NRCC) at Cornell University has developed updated

precipitation data, including the 1993 publication, *Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada*, and a more recent, interactive website at <http://precip.eas.cornell.edu/> where one can download extreme precipitation data for locations chosen from a map. These sources describe the 24-hour 100-year rainfall as approximately 9 inches in Westchester County. The data shows that the 100-year storm event shown on Technical Paper 40 (TP-40¹) represents a storm interval at or below the 50-year return rate. Though prepared in 1961, TP-40 continues to be used for many modeling programs, including TR-55² used in the design of most stormwater management practices, potentially resulting in significantly under-designed systems. Many jurisdictions are beginning to require the use of the more recent extreme precipitation data prepared by NRCC or other best available rainfall data in place of TP-40. At issue is the degree to which the ABFEs represent a conservative estimation of extreme storm events.

- c. **Storm Surge Analysis** - The County Office of Emergency Management has conducted teleconferences with representatives from the National Oceanographic and Atmospheric Administration (NOAA) and the United States Geological Survey (USGS) concerning tidal data for the Long Island Sound, in particular its western reaches in Westchester and the Bronx. The discussions highlighted the need for more accurate data and included anecdotal evidence of significant increases in storm surge during high tide events and also during storm events involving strong, sustained offshore winds that prevent early high tides from fully receding, causing abnormally high subsequent tidal surges. From the tone of the discussion, it appeared that these issues are not fully understood by the scientific community, and we believe that a similar discussion including FEMA staff would be beneficial.
- d. **Map Revisions** - The mapping website (<http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=2f0a884bfb434d76af8c15c26541a545>) shows the map panels for which ABFEs have been prepared. It was stated at some of the meetings that there is no comment period for these maps. However, a number of the panels have been revised (noted as “Version 2” on the ESRI website, with revisions summarized on FEMA’s Sandy website at <http://www.region2coastal.com/sandy/abfe/ABFE-Map-Updates>). We would like to know how these maps were revised and, more importantly, if there is a process for a local municipality to petition for more investigation and potential revision. Again, we call attention to apparent anomalies represented by significant variations in flood elevations for adjacent coastal flood zones as shown on the attached maps.
- e. **Update of FIRM** - The Flood Insurance Rate Map (FIRM) for Westchester County was updated in 2007. On-going updates of Flood Insurance Studies (FIS) in New York City and New Jersey were mentioned in the ABFE presentations as well as the Final Report. The

¹ Technical Paper 40, Rainfall Frequency Atlas of the United States, was prepared by the Weather Bureau of the U.S. Department of Commerce in 1961.

² Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds, was first issued by the Soil Conservation Service (now the Natural Resource Conservation Service) in January 1975. It is a set of simplified procedures to calculate storm runoff volume, peak rate of discharge, hydrographs, and storage volumes required for small watersheds.

interactive mapping website has been updated to add status of preliminary maps and preliminary work maps for the various counties within the study area. However, the website does not describe what the preliminary work maps are or their value to the municipality. The County is not aware of any plans to update the FIRM or FIS and would like to be informed of such an update effort if currently underway or prior to initiation in the future.

2. Administrative Concerns.

- a. ***New Flood Zone*** - The ABFE maps include areas denoted as “moderate wave action”. This new zone is located within the „A’ zone (areas of inland flooding) and in some areas covers a significant portion of the „A’ zone. There is no provision for this new zone in the model local law prepared by NYSDEC for local municipalities. The coastal mapping website (<http://www.region2coastal.com/coastal-mapping-basics>) states that “FEMA currently does not require special floodplain management standards or flood insurance purchase requirements based on LiMWA delineations” but “communities are encouraged to adopt the more stringent building construction standards applicable for [coastal] V Zones in these areas”. In addition, the printed ABFEs distributed by FEMA include notes recommending that these areas be treated the same as the „V’ areas. This essentially extends the „V’ zone (coastal flooding with increased building standards) into the „A’ zone (areas of inland flooding). More guidance is needed on how to incorporate this new zone into a municipality’s flood ordinance to ensure accuracy and consistency among ordinances, thereby improving administration as well as an understanding of such requirements by the development industry, insurance industry and property owners.
- b. ***National Flood Hazard Layer (Sandy Area)*** - FEMA representatives have stated that the ABFE maps do not take into consideration storms within the three years preceding Hurricane Sandy, yet it may easily be construed that the maps are Sandy related because much of the information is posted on websites that are Sandy-related or presented at meetings in response to Hurricane Sandy. On the mapping website (hosted by ESRI at <http://fema.maps.arcgis.com/home/webmap/viewer.html?webmap=2f0a884bfb434d76af8c15c26541a545>) there is a layer titled National Flood Hazard Layer (Sandy Area). The metadata for this dataset appears incomplete, and it is not clear whether this data has been revised to include data from Hurricane Sandy or is just a clipped subset of the National Flood Hazard Layer. It contains the same special flood hazard areas (VE, AE, X) as the Flood Insurance Rate Maps, but when compared to the County Digital Flood Insurance Rate Map (DFIRM), the boundaries of the zones in places are different (in at least one location, a VE zone is completely surrounded by AE and X zones, which are not shown on the County DFIRM). At a minimum, this adds confusion concerning the ABFEs and the potential for additional modification based on more current storms such as Sandy.
- c. ***Building Standards*** - Westchester County does not have many, if any, elevated pile structures. Residences could very well be required to be raised significantly higher than neighboring homes, potentially blocking views and impacting sales prices in the neighborhood. A local municipality must conduct a thorough analysis of potential impacts

prior to adopting the new standards, and alternative building standards or practices along with code changes should also be explored prior to adoption. FEMA, with extensive nationwide experience and knowledge, is in a unique position to provide such guidance and examples.

- d. ***Difficult Position for Municipalities*** - Without more specific guidance, local municipalities are placed in a position of uncertainty concerning the potential impact to residents, the development potential of properties, as well as the potential liability of the municipality should the new elevations be adopted or not.
3. **Insurance Rate Concerns**. We have been advised at meetings that the new maps are advisory in nature and do not constitute an update of the Flood Insurance Rate Map (FIRM), which is used to set insurance rates for properties and structures. However, in brochures distributed at meetings and on its website, FEMA notes that there is nothing stopping the insurance industry from adopting more conservative rates based on all available information, including the ABFEs. As seen in newspaper reports such as that prepared by the New York Times (<http://www.nytimes.com/newsgraphics/2013/0214-fema-map/new-fema-flood-insurance-maps-for-new-jersey.html> and <http://www.nytimes.com/2013/05/11/your-money/after-hurricane-sandy-rebuilding-under-higher-flood-insurance.html?pagewanted=all>), this may result in dramatic increases for insurance premiums regardless of whether a structure suffered substantial damage.

Planning Department staff have attended teleconference presentations sponsored by the Association of State Floodplain Managers and others where representatives from FEMA discussed the flood insurance rate increases associated with the Flood Insurance Reform Act of 2012 (aka Biggert-Waters Act), some of which went into effect this past January. As we understand it, under Section 205 of Biggert-Waters, if a municipality adopts new flood maps, the maps will become regulatory, potentially triggering immediate flood insurance rate increases for residents. Additional increases under Biggert-Waters will go into effect this October, with still others to follow in 2014. Outreach concerning this impact should be conducted (one of the teleconference speakers indicated that FEMA would not be conducting outreach to property owners but rather municipal officials and insurance agents) to inform Westchester residents and municipal officials and recommend appropriate analysis prior to decision making.

We make these comments in a spirit of cooperation, believing that the County can provide valuable assistance to FEMA in providing data, disseminating information and facilitating feedback. However, more discussion and information dissemination is needed so that the County can better understand the new information and assist in promoting changes to make Westchester communities more resilient and sustainable.

I look forward to hearing from you and having our respective staffs discuss the concerns raised in this letter.

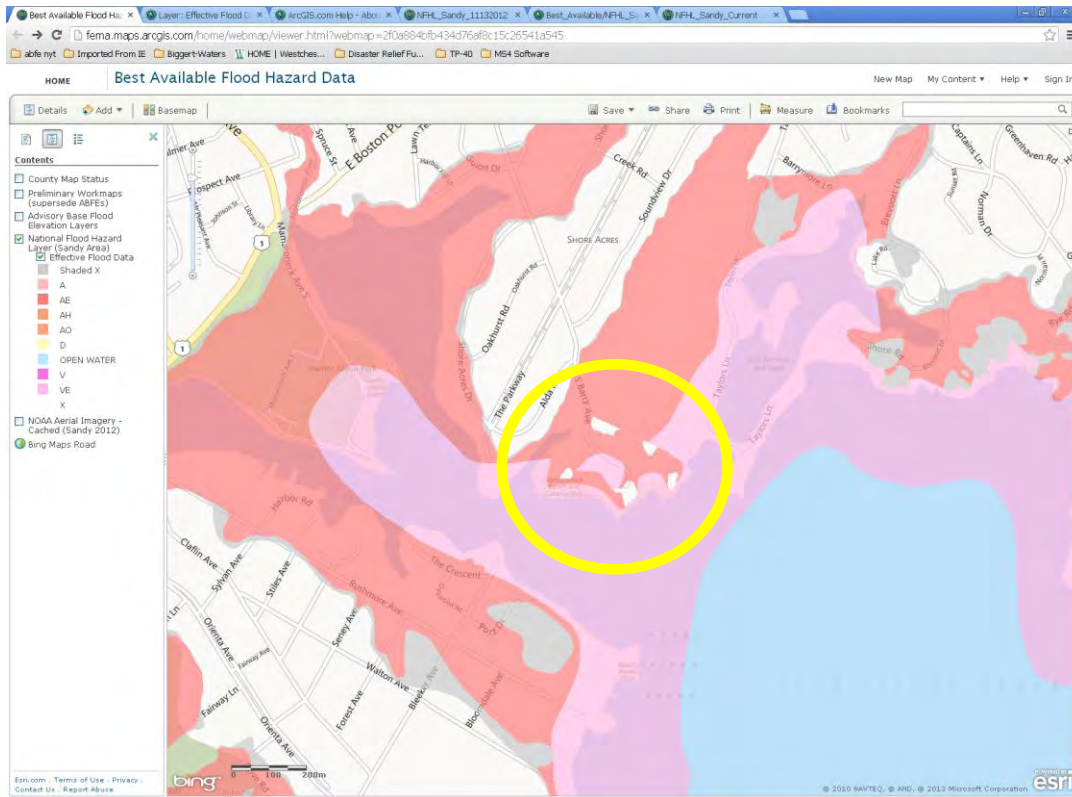
Sincerely,



Edward Burroughs, AICP
Commissioner

Enclosures

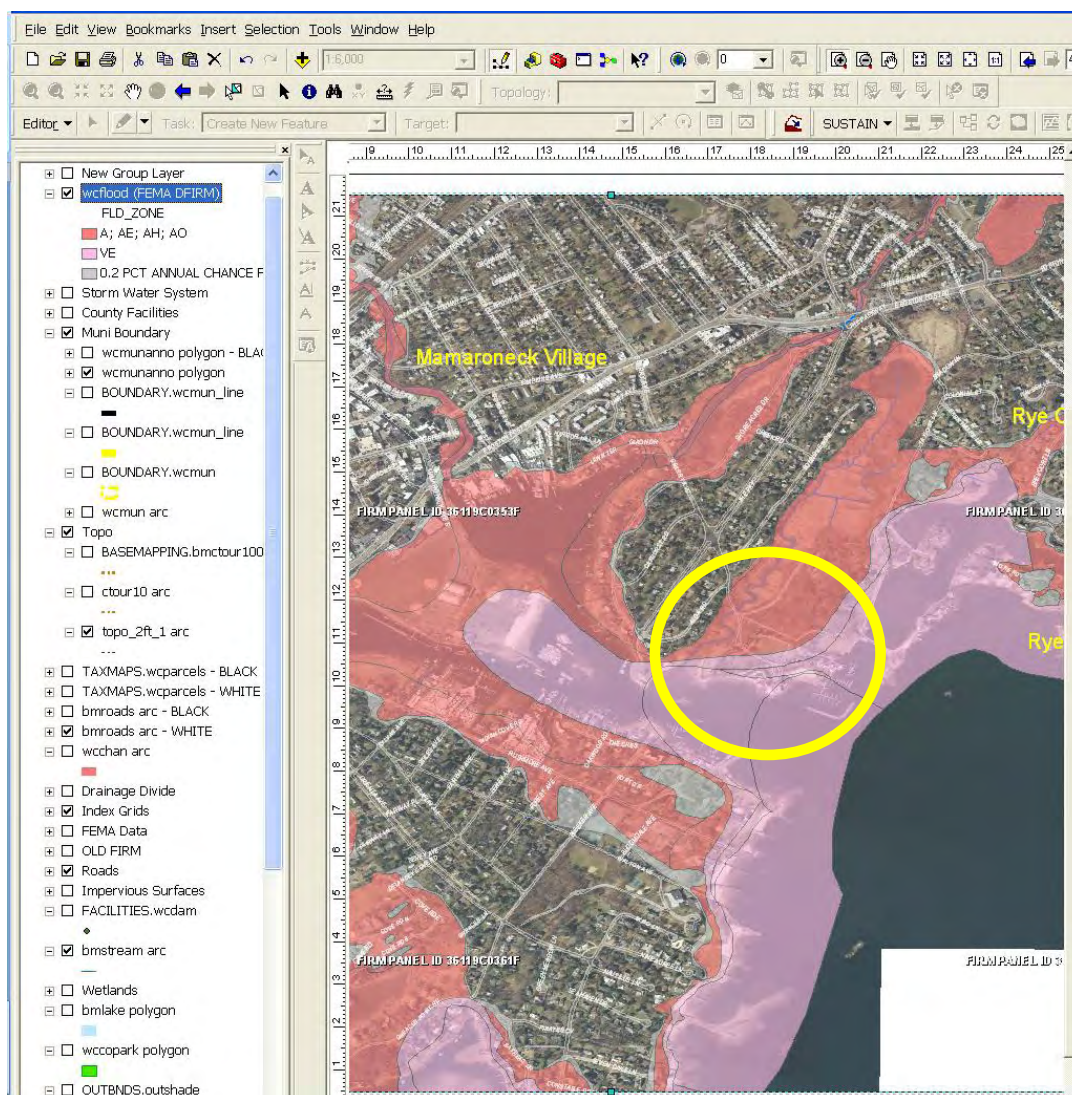
cc: Kevin Plunkett, Deputy County Executive
John Cullen, Commissioner of Emergency Services
Jay Pisco, Commissioner of Public Works and Transportation
John McCaffrey, Chief Information Officer
Joseph Kenner, Assistant to the County Executive
David Kvinge, Director of Environmental Planning
Richard Lord, Director, NYSOEM
William Nechamen, Chief, Floodplain Management Bureau, NYSDEC
Westchester Municipal Officials Association



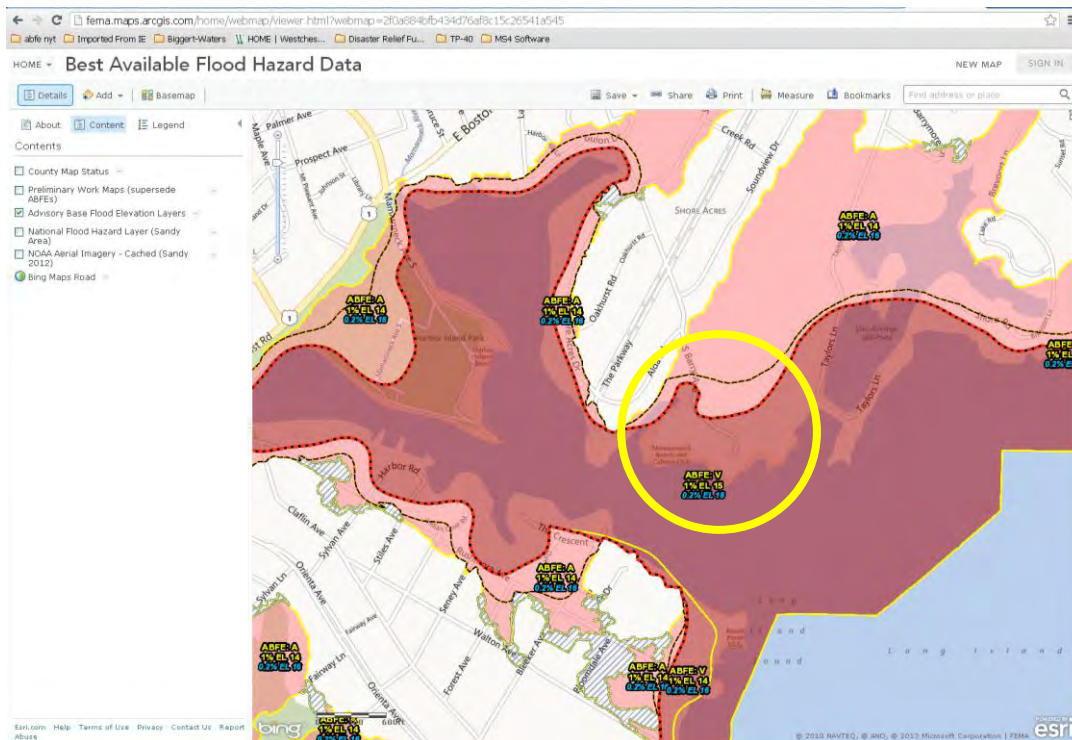
Subject area highlighted on National Flood Hazard Layer (Sandy Area) from ESRI map server.

Note the area in the center of the circle shows a VE zone surrounded by AE zones and X zones.

How is the area in the center subject to coastal wave action while the areas surrounding it are not?



The same subject area highlighted on FEMA DFIRM coverage (wcflood) from Westchester County GIS.



For reference, the same area showing FEMA ABFE data from ESRI map server.

