

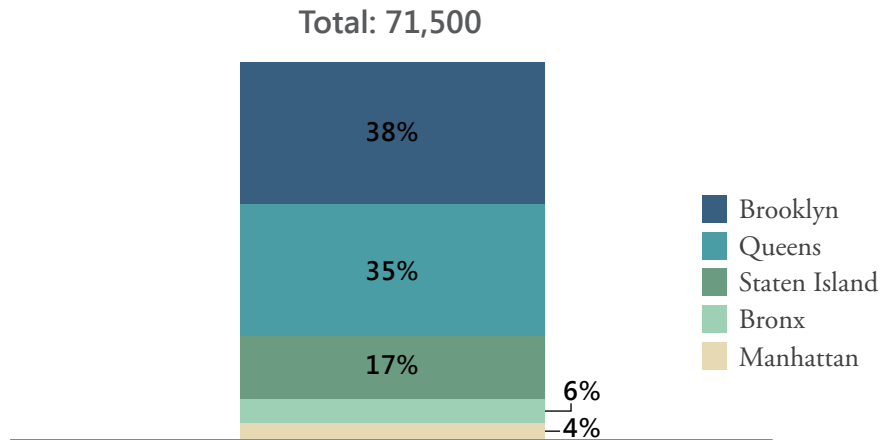
CHAPTER 2 **PROFILE OF NEW YORK CITY BUILDINGS IN THE FLOODPLAIN**

The Rockaway Peninsula, Queens



PROFILE OF BUILDINGS IN THE FLOODPLAIN

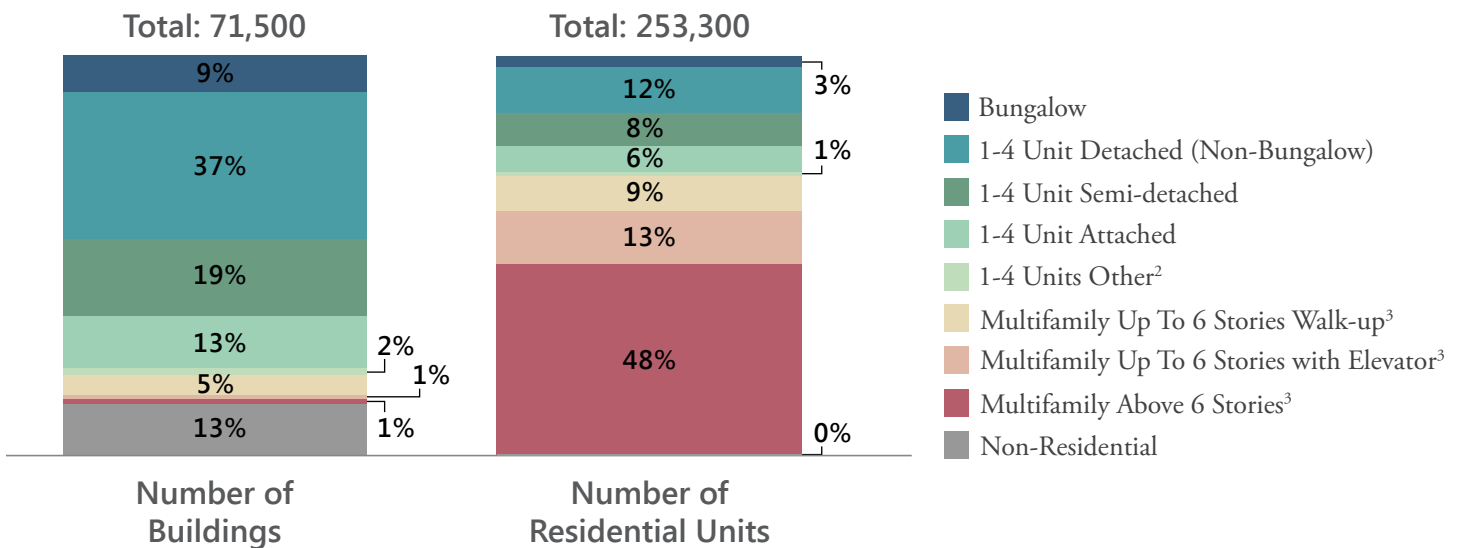
Understanding New York City's wide range of building conditions is key to developing the right set of adaptation solutions. The number of buildings in the floodplain in New York City is among the highest in any city in the United States. There are 71,500 buildings in the 1% annual chance floodplain in New York City (graphic below), as shown on FEMA's Preliminary Flood Insurance Rate Maps (PFIRMs) issued in December 2013. These buildings house roughly 400,000 people, making the population of New York City in the floodplain comparable to many mid-sized cities around the country. At this scale, developing retrofitting solutions for New York City buildings will be beneficial to many other older cities that share some of New York City's building typologies but in much smaller numbers.



Number of Buildings in 1% Annual Chance Floodplain

The vast majority of buildings (97%) in the 1% annual chance floodplain in New York City are located in the A zone, where wave action above three feet is not expected. The large majority, 87%, include residential units (graphic on page 17). While construction in most of the coastal areas throughout the country, such as the Gulf Coast and the Southern Atlantic Coast, consists primarily of single-family detached wood frame homes on large lots, structures in New York City's floodplain include a substantial number of homes on narrow or shallow lots, as well as many higher density and often attached and mid-rise multi-family buildings with various construction types ranging from wood frame, unreinforced masonry, and reinforced concrete. Approximately 37% of the buildings within the floodplain in New York City are 1-4 family, detached buildings on standard lots, defined here as wider than 20 feet. **This means that about 63% of New York City's residential buildings in the floodplain will encounter additional challenges when retrofitting under the current federal regulations.**

The report's case studies are based on prevalent typologies within the floodplain that vary in their vulnerability to damage and in their retrofitting options. The report is focused on retrofitting options for residential and mixed-use buildings that contain residential units. It does not study commercial and manufacturing buildings. For residential buildings, the report does not include multi-family high-rise buildings, defined here as buildings with more than six stories. While high-rise structures only represent less than 2% of buildings in the floodplain, they contain 48% of the residential units (graphic on page 17). These buildings are by definition large and often located on large lots and therefore have more physical retrofitting options. A further study, separate from this report, is necessary to outline the retrofit options available to this building type. Furthermore, in New York City, many of these buildings provide affordable housing to low-income and vulnerable populations through the use of federal housing subsidies, which often limit their capacity to make significant capital investments.



For the purposes of this report, we have classified building types according to key factors that determine which adaptation strategies are feasible. The following physical elements relating to the building and its context were used to define the ten case studies: siting and adjacency, scale, construction type and use.

Siting & Adjacency

This is defined by the proximity of neighboring structures, size of yards and street and sidewalk widths. At a basic level, adjacency applies to building types through the categorization of Detached, Semi-Detached and Attached. A detached building is freestanding and characterized by yards surrounding the building. A semi-detached building typology shares a common bearing wall with another building, often referred to as a party-wall, and as a result, two properties share the same structural entity. Attached buildings share two party-walls, one on each side, making them structurally tied to each adjoining building.

With regards to construction, access to the structure and its foundation must be considered when selecting a retrofit strategy. Narrow streets, lots, and a neighboring building's relationship to the structure may affect the type of construction methods used. To select an appropriate architectural and urban design strategy, factors such as building access, vehicular parking, and streetscape must be considered in addition to a building's construction type and height. When one building adjusts its physical layout, it may have direct implications on its neighbor and the neighborhood as a whole.

Scale

At the individual building scale, building height and street frontage are defining factors. Low-rise (1-2 stories), Mid-rise (3-6 stories) and High-rise (more than 6 stories) are categories used to help define a building's structural characteristics for the purpose of this report. Building lots and their associated building widths are defined by their adjacencies (attached, semi-detached, detached). The length of the streetwall varies widely but generally follows the building typology; 14'-18' for narrow lots and bungalows, 18-20'

for attached buildings, 25' for Old Law tenements and up to 100' for multi-family mid-rise buildings. In some cases, especially on narrow lots, it may be more efficient to address retrofitting in clusters of sites or at the block scale instead of retrofitting on the individual building scale.

Construction Type

The New York City Building Code and the International Building Code (IBC) categorize buildings by occupancy. This type of classification and fire separation distance determines minimum fire ratings and size of building. The *Special Initiative for Rebuilding and Resiliency* (SIRR) report lists two categories especially relevant to retrofitting strategies: Combustible buildings, which use light wood frame construction, or wood joists on masonry bearing walls; and Non-Combustible buildings that use steel, masonry, or concrete frames. Retrofitting may require an upgrade from combustible to non-combustible materials as well as the construction of a non-combustible first floor separation.

Use

Floodproofing techniques, as defined by federal, state and local jurisdictions, are regulated by building use. As defined in the Zoning Handbook, residential use is categorized into Single Family, Two-Family and Multi-family. A Mixed-use building is a building used partly for residential use and partly for community facility or commercial use. Under current federal standards, residential uses are not allowed to use dry floodproofing techniques, but community facility and commercial uses within a residential building may use dry floodproofing techniques.

The choice of building types, site locations and application of retrofit strategies are intended to show the most options for retrofit designs over the ten case studies. Therefore, the strategies illustrated may be one option of many, and were selected based on what is considered best practice. Each building and site condition is unique and it is up to the individual property owner to select the appropriate retrofit strategy based on the physical nature of the building and site while considering codes, regulations, and costs.

TYOLOGY MAPPING

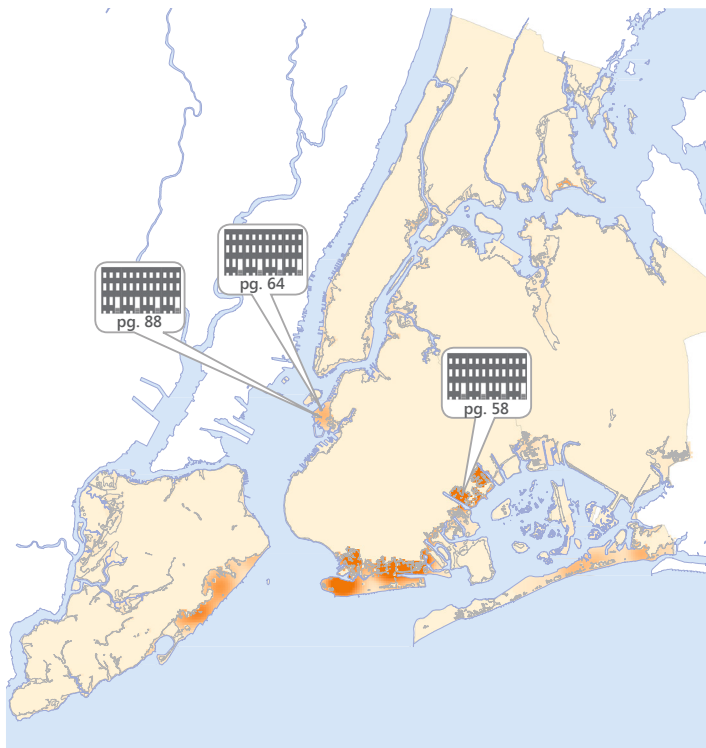
These maps, based on data from PLUTO and the Mass Appraisal System, represent concentrations of buildings in seven typologies within New York City's 1% annual chance floodplain as outlined by the FEMA 2013 Preliminary Flood Insurance Rate Maps. The areas shown in the brightest orange are locations in the city where a high number of buildings are of a particular typology, while areas shown in lighter orange have lower numbers of that typology. The call outs on the maps show the location of retrofitting case studies presented later in this publication.

These maps can be used to develop a general understanding of the spatial distribution and extent of each building typology in the city; however, they should not be used for neighborhood-scale analysis or as a basis for comparisons of relative frequencies across different typologies.

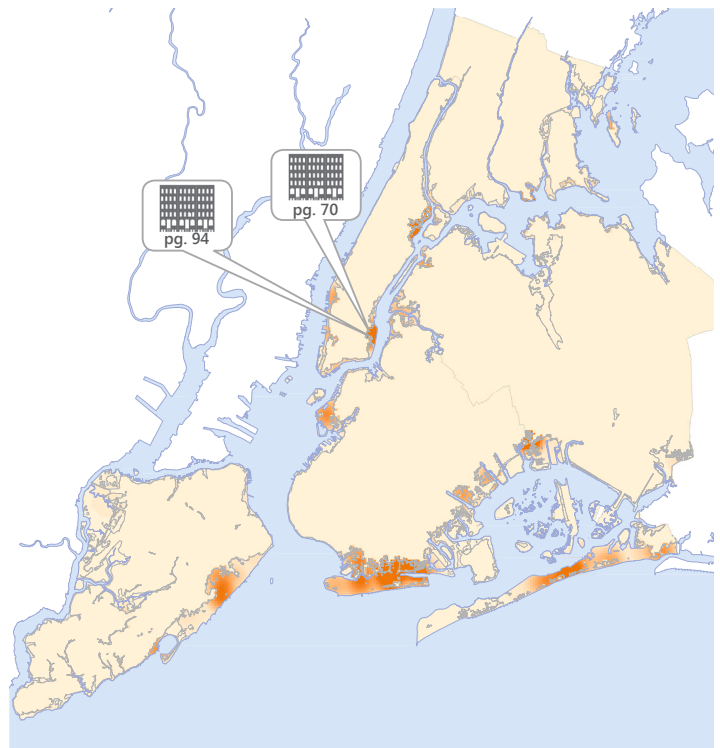
- ¹ These maps do not include non-residential buildings, but that category has been factored into into the percentage of total buildings in the flood zone. All percentages have been rounded for clarity.
- ² The buildings represented here are narrow (less than 20 feet), single-family, detached homes of wood frame construction.
- ³ The buildings represented here are defined as more than four residential units.



BUNGALOW²
 6,354 buildings / 9% of total
 6,354 residential units / 3% of total



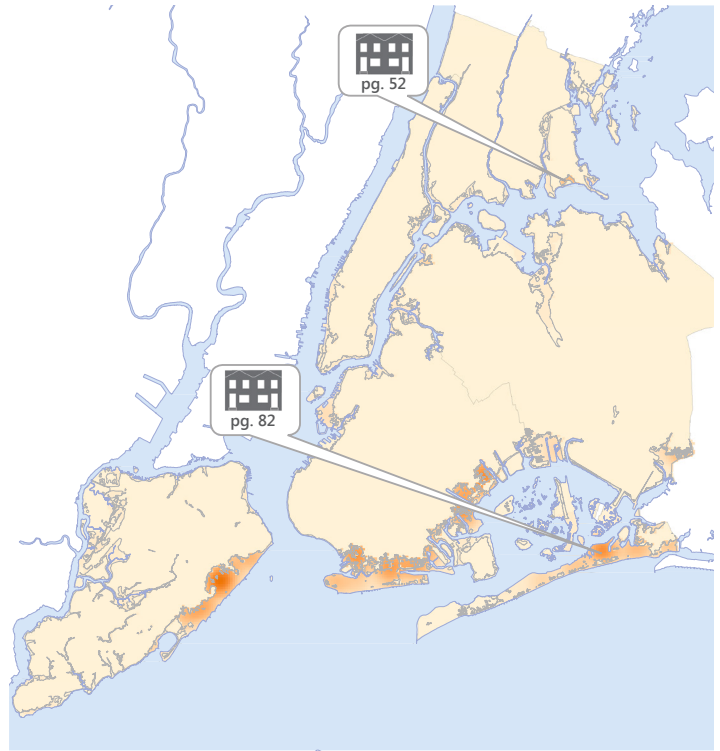
1-4 UNIT ATTACHED
 9,320 buildings / 13% of total
 16,450 residential units / 6% of total



MULTI-FAMILY³ 6 STORIES OR LESS, WALK-UP
 3,480 buildings / 5% of total
 22,570 residential units / 9% of total



1-4 UNIT DETACHED (NON-BUNGALOW)
 25,860 buildings / 36% of total
 29,310 residential units / 12% of total



1-4 UNIT SEMI-DETACHED
 13,690 buildings / 19% of total
 20,990 residential units / 8% of total




MULTIFAMILY³ 6 STORIES OR LESS WITH ELEVATOR
 690 buildings / 1% of total
 33,400 residential units / 13% of total



MULTIFAMILY³ ABOVE 6 STORIES
 920 buildings / 1% of total
 121,650 residential units / 48% of total

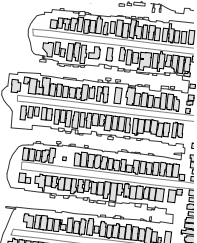


BUILDING TYPES

Building Type	Count within the Flood Zone ⁴	Construction Type	Foundation Type	Subgrade Condition	Height
  Bungalow	6,350 buildings ⁵ 9% of total 6,350 units ⁵ 3% of total	Wood Frame	Shallow Masonry	None or Shallow Crawl Space	Single Story
  Detached	25,860 buildings ⁶ 36% of total 29,310 units ⁶ 12% of total 9% mixed-use ⁷	Wood Frame	Masonry	Basement and/or Cellar	1-2 Story
  Semi-Detached	13,690 buildings ⁸ 19% of total 20,990 units ⁸ 8% of total 10% mixed-use ⁷	Wood Frame or Masonry with Wood Joists	Masonry	Basement and/or Cellar	1-3 Story
  Attached	9,320 buildings ⁹ 13% of total 16,450 units ⁹ 7% of total 11% mixed-use ⁷	Masonry with Wood Joists	Concrete or Masonry	Basement and/or Cellar	1-3 Story
  Mid-Rise Walk-up	3,480 buildings ¹⁰ 5% of total 88,570 units ¹⁰ 35% of total 27% mixed-use ⁷	Masonry with Wood Joists	Masonry	Basement and/or Cellar	4-6 Story
  Mid Rise Elevator	690 buildings ¹¹ 1% of total 33,400 units ¹¹ 13% of total 6% mixed-use ⁷	Steel & Concrete	Concrete or Masonry	Basement and/or Cellar	4-6 Story

⁴ The count of building types are based on information from PLUTO and the Mass Appraisal System and are not representative of the specific construction types, foundation type or subgrade condition of each case study. This chart does not include residential buildings above 6 stories or non-residential buildings, but those categories have been factored into the percentage of total buildings and residential units in the flood zone. Numbers have been rounded for clarity.

⁵ These numbers are based on the number of narrow (less than 20 feet),

NEIGHBORHOOD TYPES

Neighborhood Fabric	Neighborhood Type	Lot Size	Lot Coverage	Street Width	Parking
	 Low Rise Residential Small Lots	Narrow width & Shallow to Standard depth	Small front & side yards, small to standard rear yard	Narrow or Pedestrian Path Only	Street
	 Low Rise Residential Semi-Detached	Small width, standard depth	Small to Medium front/side/rear yards	Narrow, Medium or Pedestrian Path Only	Street, Driveway, Garage or Rear Alley Access
	 Low Rise Residential Rowhouse	Small width, standard depth	Small to Medium front & side yards, Small to standard rear yard	Narrow, Medium or Pedestrian Path Only	Street, Driveway, Garage or Rear Alley Access
	 Low Rise Mixed Use	Narrow to wide width & shallow to standard depth	Relative to Contextual Density	Medium	Garage or Rear Alley Access
	 Mid Rise Mixed Use	Medium to wide width & standard depth	Small or No front/side yard, Small to Medium rear yard	Medium to Wide	Rear Alley Access
	 Mid Rise Residential	Medium to wide width & standard depth	Small to Medium front/rear yards, No side yard	Medium to Wide	Garage

single-family, detached homes of wood frame construction.

⁶ 1-4 unit detached buildings other than those captured in the “bunagalow” category.

⁷ The percentage of lots in this category that contain at least 500 square feet of commercial flood area.

⁸ 1-4 unit semi-detached buildings.

⁹ 1-4 unit attached buildings.

¹⁰ Buildings with 5 or more units, less than 6 stories, and no elevator.

¹¹ Buildings with 5 or more units, less than 6 stories, and an elevator.