NEW YORK STATE HURRICANE EVACUATION RESTUDY TECHNICAL DATA REPORT

for New York City, Nassau, Suffolk, and Westchester Counties

4 | BEHAVIORAL ANALYSIS

INTRODUCTION

PURPOSE AND OBJECTIVES

The behavioral analysis is conducted to provide estimates of public response to a variety of hurricane threats. These estimates are used in the shelter analysis and transportation analysis, and as guidance in emergency decision making and public awareness efforts. Since an evacuation of New York City's five boroughs and the counties of Nassau, Suffolk, and Westchester will involve decision-making by millions of individuals and households, behavioral analyses were conducted for the study area to provide meaningful behavioral assumptions that will account for the variations in decision making.

The objective of the behavioral analysis is to answer the following questions:

- What percent of the population in different areas will evacuate their dwelling units for future hurricane threats?
- How quickly will evacuees respond to what local officials are telling them to do?
- What type of refuge will evacuees seek should a hurricane threaten the area?
- What are the geographical destinations of the evacuees?
- Of the vehicles available to the households, what percent of those vehicles will be used in an evacuation? And what percent of households will utilize public transportation for their evacuations?
- How will the threatened population respond based upon forecasts of hurricane intensity or other information provided during a hurricane emergency?

4 | BEHAVIORAL ANALYSIS

METHODOLOGY

Every evacuation study must contain estimates and assumptions about how people will react when a hurricane evacuation is implemented. Behavioral assumptions for the five boroughs of New York City and Nassau, Suffolk and Westchester Counties were developed by statistical analysis of data gathered by telephone interviews with participants in each area. The questions asked to interviewees dealt with hurricane preparedness, perceived vulnerability, hazard awareness, evacuation intentions, and other subjects relevant to evaluating the evacuation propensities of the population.

PAST STUDIES

The most recent hurricane evacuation behavioral analyses, which were used for the evacuation studies as well as this Technical Data Report, were conducted as follows:

- New York City Hurricane Evacuation Behavioral Analysis – April 2005
- Nassau County Hurricane Evacuation Behavioral Survey – October 2005
- Suffolk County Hurricane Evacuation Behavioral Survey – October 2005
- Westchester County, Hurricane Evacuation Behavioral Analysis – April 2006

For the above behavioral studies, residents within each surge area was interviewed. Figure 4-1, Figure 4-2, and Figure 4-3 illustrate the number of participants within each of the following surge areas:

- Figure 4-1–New York City (Manhattan, Brooklyn, Queens, Staten Island, and Bronx): Zone A, Zone B, Zone C, and Non-surge;
- Figure 4-2–Nassau and Suffolk Counties: Category 1, Category 2, Category 3/4, and Non-surge;
- Figure 4-3–Westchester County:
    - Category 1 and 2 along the Long Island Sound that would be inundated by storm surge;
    - Category 3 and 4 along the Long Island Sound that would be inundated by storm surge;
    - Category 1, 2, 3 and 4 along the Hudson River that would be inundated by storm surge;
    - Areas along the Hudson River that would not be inundated by storm surge from any hurricanes.

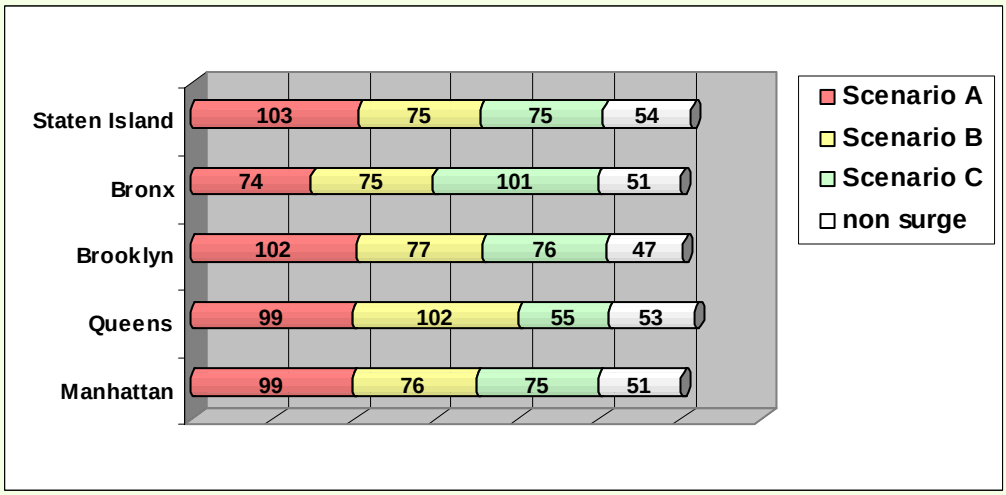

Figure 4-1: *Behavioral Analysis Participants—New York City*

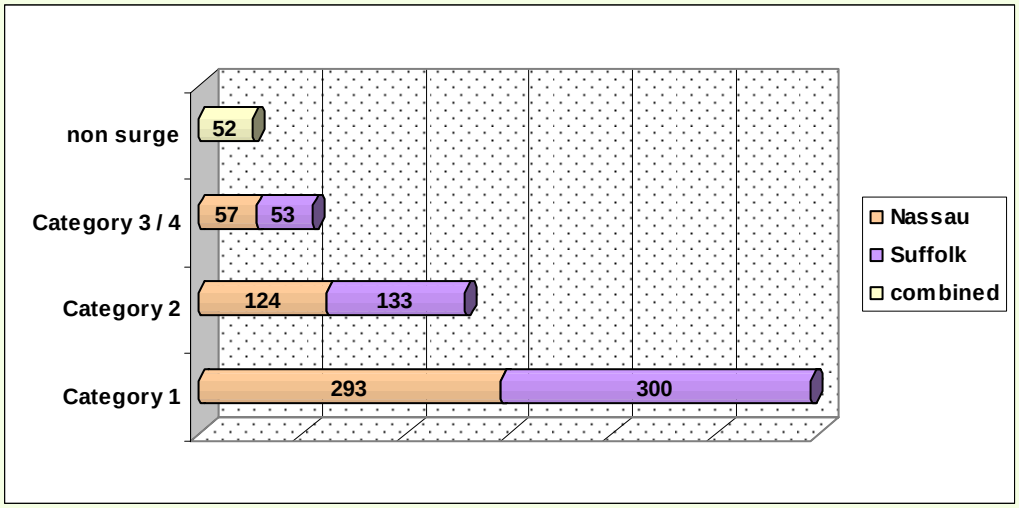

Figure 4-2: *Behavioral Analysis Participants—Nassau and Suffolk Counties*

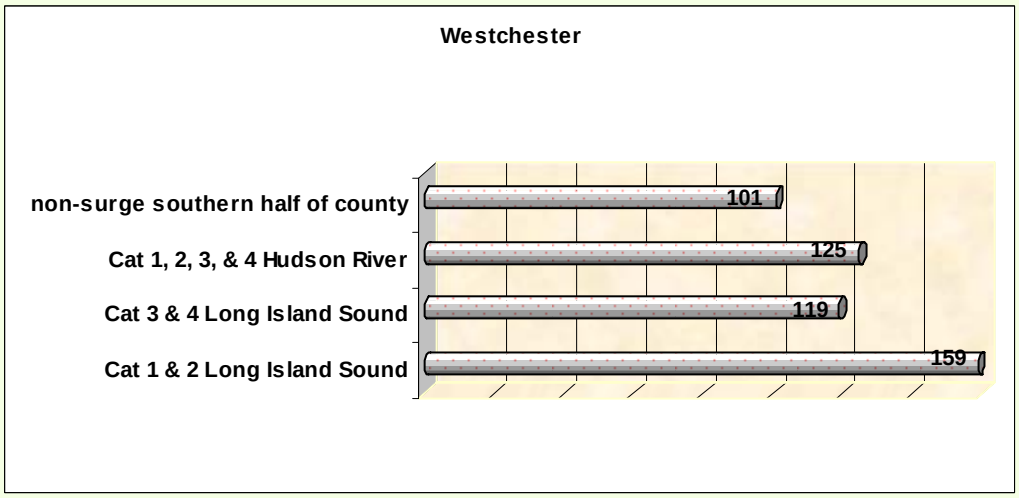

Figure 4-3: *Behavioral Analysis Participants—Westchester County*

BEHAVIORAL ANALYSIS FOR NEW YORK STATE STUDY AREA

GENERAL

The Behavioral Analysis section deals with five principle categories of behavioral response typically addressed in the hurricane evacuation study. These five categories are:

1. Evacuation participation rates
2. Evacuation timing
3. Type of refuge
4. Destinations, and
5. Vehicle use

In Chapter 4, the use of the term "risk zone" generally corresponds to "evacuation zones". At the time the behavioral studies were completed for the New York area, specific evacuation zones had not yet been defined. Interviewees were therefore asked questions relating to "risk zones"; therefore, all references to risk zones should be considered similar to corresponding evacuation zones.

EVACUATION PARTICIPATION RATES

Several factors that influence evacuation participation rates are intention to evacuate, perception of vulnerability, anticipation of evacuation orders, and other considerations. These factors are described in detail in this section.

INTENTION TO EVACUATE

Survey participants were presented with three hypothetical hurricane threats and asked whether they would leave their homes to go someplace safer in each. The storms were a Category 1 hurricane with 80 MPH winds, a Category 2 hurricane with 100 MPH winds, and a Category 3 hurricane with winds of 125 MPH, which meteorologists consider a major hurricane. In each instance the category and wind velocity was provided, and it was indicated that a hurricane warning was in effect for the respondent's community. Interviewees were told that hurricanes could have strong, damaging winds but also could cause flooding from storm surge along shorelines and rivers near the coast. In addition, they were told that buildings nearest the shoreline could also be exposed to waves and erosion. Finally, they were told that officials had called for the evacuation of all areas that would be flooded by the respective category of hurricane.

Table 4-1, Table 4-2, Table 4-3, and Table 4-4 demonstrate the response of intention to evacuate by risk zone for Category 1, Category 2, and Category 3-4 storm scenarios respectively. Category 1/Zone A Risk Zone refers to areas that may flood in some Category 1 hurricane events. Category 3-4/Zone C Risk Zones are for those areas that would flood only in some Category 3-4 storms. Non-Surge Zones are those areas that would not flood even in Category 4 hurricanes.

New York City: A majority of residents said they would evacuate in each storm scenario. As depicted in Table 4-1, there was very little difference in the number of people saying they would leave in a Category 1 (75%), a Category 2 (81%), and a Category 3 (85%). Also, almost as many people said they would evacuate in the non-surge areas as in Zone A. Of the questions asked, one result is that more people intend to evacuate than believe they would be unsafe staying in their home or believe officials would tell them to evacuate. This implies that many people intending to evacuate plan to do so for reasons other than personal safety, although the question was phrased in a way that should have discouraged that response ("Would you leave your home to go someplace safer?").

New York City	Zone A	Zone B	Zone C	Non-Surge
Category 1 (80 MPH)				
Manhattan	**76%**	**84%**	**67%**	**71%**
Brooklyn	**72%**	**75%**	**83%**	**72%**
Queens	**81%**	**85%**	**69%**	**74%**
Staten Island	**72%**	**80%**	**75%**	**69%**
Bronx	**76%**	**65%**	**82%**	**69%**
Category 2 (100 MPH)				
Manhattan	**82%**	**88%**	**79%**	**65%**
Brooklyn	**78%**	**78%**	**83%**	**75%**
Queens	**85%**	**89%**	**82%**	**81%**
Staten Island	**82%**	**80%**	**73%**	**82%**
Bronx	**89%**	**71%**	**82%**	**80%**
Category 3 (125 MPH)				
Manhattan	**87%**	**86%**	**80%**	**78%**
Brooklyn	**83%**	**84%**	**80%**	**83%**
Queens	**88%**	**85%**	**86%**	**94%**
Staten Island	**84%**	**92%**	**85%**	**87%**
Bronx	**92%**	**80%**	**85%**	**84%**

Table 4-1: *Intend to Evacuate for Category 1-3 Hurricanes if Told—New York City*

Nassau County: Table 4-2 illustrates the variation in evacuation intentions by risk zone. For a Category 1 hurricane, 83% of the residents living in Category 1 surge areas said they would evacuate compared to 69% living in non-surge areas. For a Category 3 hurricane, 93% of those in Category 1 areas say they would leave, compared to 87% of those in non-surge areas. The overall finding is that people overwhelmingly say they would comply with evacuation notices that they interpreted to apply to them. Even in areas that presumably would not be told to evacuate, a large majority of respondents said they would leave if told to do so. People who said they expected to be told to evacuate were more likely than others to say they would leave in these hypothetical scenarios by an average of 10 to 20 percentage points. There were small differences in evacuation intentions based on demographic variables (0 to 9 percentage points).

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	**83%**	**77%**	**83%**	**69%**
No	**11%**	**22%**	**9%**	**19%**
Don't Know	**7%**	**22%**	**9%**	**12%**
Category 2 (100 MPH)				
Yes	**89%**	**86%**	**86%**	**83%**
No	**5%**	**5%**	**9%**	**10%**
Don't Know	**6%**	**9%**	**5%**	**8%**
Category 3 (125 MPH)				
Yes	**93%**	**96%**	**84%**	**87%**
No	**4%**	**1%**	**7%**	**6%**
Don't Know	**4%**	**3%**	**9%**	**8%**

Table 4-2: *Intend to Evacuate for Category 1-3 Hurricanes if Told—Nassau County*

Suffolk County: Table 4-3 illustrates the variation in evacuation intentions by risk zone. For a Category 1 hurricane, 78% of the residents living in Category 1 surge areas said they would evacuate compared to 69% living in non-surge areas. For a Category 3 hurricane, 94% of those in Category 1 areas say they would leave, compared to 87% of those in non-surge areas. The ending result is that people say they would comply with evacuation notices which they believe apply to them. Even in areas that presumably would not be told to evacuate, a large majority of respondents said they would leave if told to do so. People who said they expected to be told to evacuate were more likely than others to say they would leave in these hypothetical scenarios by an average of 10 to 20 percentage points. There were small differences in evacuation intentions based on demographic variables (0 to 9 percentage points).

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	**78%**	**84%**	**89%**	**69%**
No	**15%**	**11%**	**6%**	**19%**
Don't Know	**7%**	**6%**	**6%**	**12%**
Category 2 (100 MPH)				
Yes	**87%**	**89%**	**94%**	**83%**
No	**10%**	**6%**	**2%**	**10%**
Don't Know	**3%**	**5%**	**4%**	**8%**
Category 3 (125 MPH)				
Yes	**94%**	**93%**	**94%**	**87%**
No	**5%**	**5%**	**2%**	**6%**
Don't Know	**1%**	**2%**	**4%**	**8%**

Table 4-3: *Intend to Evacuate for Category 1-3 Hurricanes if Told—Suffolk County*

Westchester County: Table 4-4 indicates the responses provided by respondents in the Westchester County area. The great majority of people in all three hurricanes and in all interview locations said they would evacuate if they believed they had been told to do so. There was little variation among survey locations and relatively little variation among storm intensities. One interpretation of Table 4-4 is that there would be considerable over-evacuation in some locations. However, officials would not actually tell all of the residents to evacuate in each of the storms. A more valid interpretation of the data is that residents are generally receptive to evacuation advice from officials. In an actual hurricane threat in which officials issued evacuation notices for certain areas, presumably based on susceptibility to storm surge, some residents would believe the notice applied to their locations and others would not.

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	**76%**	**82%**	**75%**	**72%**
No	**11%**	**8%**	**12%**	**14%**
Depends on Evacuation Zone	**7%**	**3%**	**8%**	**5%**
Depends on Other Info	**6%**	**7%**	**5%**	**9%**
Category 2 (100 MPH)				
Yes	**91%**	**89%**	**82%**	**84%**
No	**4%**	**5%**	**7%**	**7%**
Depends on Evacuation Zone	**4%**	**3%**	**7%**	**4%**
Depends on Other Info	**1%**	**3%**	**3%**	**5%**
Category 3 (125 MPH)				
Yes	**93%**	**91%**	**86%**	**89%**
No	**3%**	**3%**	**5%**	**4%**
Depends on Evacuation Zone	**3%**	**3%**	**6%**	**4%**
Depends on Other Info	**2%**	**3%**	**3%**	**3%**

Table 4-4: *Intend to Evacuate for Category 1-3 Hurricanes if Told—Westchester County*

PERCEPTION OF VULNERABILITY

Intention to evacuate does not always indicate how people eventually will respond in actual hurricane threats. A better indicator is whether people believe their own home would be safe in a hurricane. Respondents were asked whether they believed their homes would flood, flood dangerously, or be safe from wind and water in each of the three hurricane categories. The intensities of the storms were Category 1 (80 MPH), Category 2 (100 MPH), and Category 3 storms (125 MPH).

New York City: Only in Zone A in the Bronx did a majority say a Category 1 storm would cause their home or building to flood. On average, citywide, only one-third of Zone A residents said their dwellings would flood. That figure was only slightly higher than in Zone B, and 20% of the people in Zone C and in non-surge areas said their homes or buildings would flood (see Table 4-5). Only 19% of the Zone A respondents said they would experience dangerous flooding in a Category 1 storm, which was only slightly higher than in less vulnerable zones. Queens and Bronx Zone A residents perceived their flood risk to be higher than those in other locations as depicted in Table 4-6. Considering both wind and water, 31% of the Zone A residents said it would be unsafe to stay in their homes or buildings in a Category 1 hurricane. In other zones the figures ranged from 17% to 23% as shown in Table 4-7.

New York City	Zone A	Zone B	Zone C	Non-Surge
Category 1 (80 MPH)				
Manhattan	22%	15%	23%	24%
Brooklyn	24%	25%	21%	17%
Queens	38%	45%	26%	21%
Staten Island	29%	21%	15%	15%
Bronx	57%	29%	20%	22%
Category 2 (100 MPH)				
Manhattan	30%	26%	31%	33%
Brooklyn	48%	31%	37%	30%
Queens	67%	60%	40%	34%
Staten Island	46%	33%	24%	24%
Bronx	74%	43%	35%	41%
Category 3 (125 MPH)				
Manhattan	55%	43%	52%	47%
Brooklyn	57%	51%	46%	45%
Queens	84%	73%	62%	53%
Staten Island	59%	59%	47%	37%
Bronx	82%	55%	52%	51%

Table 4-5: *Expect Flooding in Category 1-3 Hurricanes—New York City*

New York City	Zone A	Zone B	Zone C	Non-Surge
Category 1 (80 MPH)				
Manhattan	13%	9%	17%	16%
Brooklyn	10%	17%	14%	13%
Queens	30%	27%	18%	13%
Staten Island	17%	16%	7%	11%
Bronx	31%	19%	14%	20%
Category 2 (100 MPH)				
Manhattan	26%	13%	24%	29%
Brooklyn	33%	21%	32%	26%
Queens	64%	52%	36%	28%
Staten Island	41%	24%	17%	13%
Bronx	55%	28%	29%	31%
Category 3 (125 MPH)				
Manhattan	46%	36%	48%	45%
Brooklyn	50%	43%	45%	38%
Queens	81%	64%	55%	45%
Staten Island	58%	55%	41%	29%
Bronx	74%	49%	45%	47%

Table 4-6: *Expect Dangerous Flooding in Category 1-3 Hurricanes—New York City*

New York City	Zone A	Zone B	Zone C	Non-Surge
Category 1 (80 MPH)				
Manhattan	72%	79%	80%	80%
Brooklyn	72%	84%	75%	85%
Queens	69%	64%	78%	85%
Staten Island	68%	84%	85%	83%
Bronx	65%	77%	80%	82%
Category 2 (100 MPH)				
Manhattan	61%	64%	77%	71%
Brooklyn	58%	67%	60%	70%
Queens	42%	59%	64%	68%
Staten Island	58%	65%	67%	70%
Bronx	43%	65%	67%	72%
Category 3 (125 MPH)				
Manhattan	34%	51%	59%	59%
Brooklyn	44%	45%	45%	53%
Queens	32%	46%	49%	50%
Staten Island	40%	36%	37%	46%
Bronx	30%	52%	48%	51%

Table 4-7: *Expect Home to be Safe from Wind and Water in Category 1-3 Hurricanes—New York City*

Nassau County: Table 4-8 displays the percentage of respondents who said they expect their homes to flood. In the Category 1 surge area, only 31% said that a Category 1 hurricane would cause flooding where they live. In a Category 2 hurricane only 53% of those in the Category 1 surge area and 44% in the Category 2 zone expect flooding. In a Category 3 hurricane, 74% of the Category 1 residents, 65% of the Category 2 residents, and 33% of the Category 3 and 4 residents believe their structures would flood. In the non-surge area, 29% expect flooding in a Category 3 hurricane.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	**31%**	**16%**	**11%**	**4%**
No	**57%**	**69%**	**77%**	**90%**
Don't Know	**12%**	**15%**	**12%**	**6%**
Category 2 (100 MPH)				
Yes	**53%**	**44%**	**16%**	**15%**
No	**30%**	**43%**	**72%**	**77%**
Don't Know	**16%**	**14%**	**12%**	**8%**
Category 3 (125 MPH)				
Yes	**74%**	**65%**	**33%**	**29%**
No	**13%**	**21%**	**51%**	**62%**
Don't Know	**13%**	**14%**	**16%**	**10%**

Table 4-8: *Expect Flooding in Category 1-3 Hurricanes—Nassau County*

In the Category 1 zone, there was no difference in responses based on whether the person's home was elevated or not. In other areas, people in elevated structures were less likely than others to believe their homes would flood. People in multi-story buildings were only slightly less likely to believe their homes would flood, compared to people in other structures.

Residents saying they expected surge or waves to cause water to enter their homes were asked if they expected the flooding to be severe enough to pose a serious danger to their safety. Table 4-9 indicates the percentage of all respondents (including those who do not expect any flooding at all) who expect dangerous flooding. Only in a Category 3 hurricane do a majority of respondents expect dangerous flooding in their homes or buildings. Differences in response based on elevation of home or type of structure were small or did not exist at all.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	23%	10%	7%	4%
No	64%	74%	81%	90%
Don't Know	13%	16%	12%	6%
Category 2 (100 MPH)				
Yes	40%	36%	9%	8%
No	41%	47%	75%	85%
Don't Know	19%	18%	16%	8%
Category 3 (125 MPH)				
Yes	64%	57%	26%	25%
No	20%	27%	54%	64%
Don't Know	16%	16%	19%	12%

Table 4-9: *Expect Dangerous Flooding in Category 1-3 Hurricanes—Nassau County*

Respondents were then asked whether, considering both wind and flooding, it would be safe to stay in their homes if each of the three hurricanes struck their location directly. The difference between those expecting dangerous flooding and those saying their homes would not be safe considering both wind and water would be an indication of concern about wind rather than water. Results are shown in Table 4-10. A majority of people in all locations said their homes would be safe in a Category 1 hurricane. Only in the Category 1 surge area did a majority of respondents say their homes would be unsafe in a Category 2 hurricane. In a Category 3 storm, a majority or close to it in all areas said their homes would be unsafe (including 58% in the non-surge area).

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	60%	65%	79%	83%
No	31%	19%	16%	6%
Don't Know	9%	15%	5%	12%
Category 2 (100 MPH)				
Yes	30%	55%	60%	50%
No	56%	35%	28%	31%
Don't Know	14%	11%	12%	19%
Category 3 (125 MPH)				
Yes	25%	35%	42%	31%
No	67%	56%	47%	58%
Don't Know	8%	10%	11%	12%

Table 4-10: *Expect Home to be Safe from Wind and Water in Category 1-3 Hurricanes—Nassau County*

Suffolk County: Table 4-11 displays the percentage of respondents who said they expect their homes to flood. In the Category 1 surge area, only 27% said that a Category 1 hurricane would cause flooding where they live. In a Category 2 hurricane only 47% of those in the Category 1 surge area and 50% in the Category 2 zone expect flooding. In a Category 3 hurricane, 74% of the Category 1 residents, 66% of the Category 2 residents, and 66% of the Category 3 and 4 residents believe their structures would flood. In the non-surge area, 29% expect flooding in a Category 3 hurricane.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	**27%**	**31%**	**17%**	**4%**
No	**63%**	**60%**	**77%**	**90%**
Don't Know	**10%**	**9%**	**6%**	**6%**
Category 2 (100 MPH)				
Yes	**47%**	**50%**	**34%**	**15%**
No	**40%**	**39%**	**53%**	**77%**
Don't Know	**13%**	**11%**	**13%**	**8%**
Category 3 (125 MPH)				
Yes	**74%**	**66%**	**66%**	**29%**
No	**18%**	**21%**	**26%**	**62%**
Don't Know	**9%**	**13%**	**8%**	**10%**

Table 4-11: *Expect Flooding in Category 1-3 Hurricanes—Suffolk County*

In the Category 1 zone, there was no difference in responses based on whether the person's home was elevated or not. In other areas, people in elevated structures were less likely than others to believe their homes would flood. People in multi-story buildings were only slightly less likely to believe their homes would flood, compared to people in other structures.

Table 4-12 indicates the percentage of all respondents (including those who do not expect any flooding at all) who expect dangerous flooding. Only in a Category 3 hurricane do a majority of respondents expect dangerous flooding in their homes or buildings. Differences in response based on elevation of home or type of structure were small or did not exist at all.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	19%	17%	9%	4%
No	69%	71%	85%	90%
Don't Know	11%	11%	6%	6%
Category 2 (100 MPH)				
Yes	41%	39%	28%	8%
No	44%	48%	59%	85%
Don't Know	15%	13%	13%	8%
Category 3 (125 MPH)				
Yes	67%	62%	66%	25%
No	22%	23%	26%	64%
Don't Know	11%	15%	8%	12%

Table 4-12: *Expect Dangerous Flooding in Category 1-3 Hurricanes—Suffolk County*

Respondents were then asked whether, considering both wind and flooding, it would be safe to stay in their homes if each of the three hurricanes struck their location directly. The difference between those expecting dangerous flooding and those saying their homes would not be safe considering both wind and water would be an indication of concern about wind rather than water. Results are shown in Table 4-13. A majority of people in all locations said their homes would be safe in a Category 1 hurricane. Only in the Category 2 surge area did a majority of respondents say their homes would be unsafe in a Category 2 hurricane. In a Category 3 storm, a majority in all areas said their homes would be unsafe (including 58% in the non-surge area).

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	62%	55%	74%	83%
No	28%	36%	25%	6%
Don't Know	10%	9%	2%	12%
Category 2 (100 MPH)				
Yes	42%	38%	51%	50%
No	47%	52%	42%	31%
Don't Know	11%	10%	8%	19%
Category 3 (125 MPH)				
Yes	26%	23%	30%	31%
No	67%	69%	66%	58%
Don't Know	6%	8%	4%	12%

Table 4-13: *Expect Home to be Safe from Wind and Water in Category 1-3 Hurricanes—Suffolk County*

Westchester County: Table 4-14, Table 4-15, and Table 4-16 summarize the responses of those who expect to receive flooding, dangerous flooding, and unsafe from wind and water. Based on Table 4-15, people living in surge-prone areas underestimate their vulnerability to flooding from storm surge. For example, only 60% of the respondents living in Category 1 and 2 surge zones along Long Island Sound believe their homes or buildings would flood dangerously in a Category 3 hurricane.

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	33%	27%	17%	12%
No	55%	59%	70%	77%
Don't Know	12%	14%	14%	10%
Category 2 (100 MPH)				
Yes	49%	45%	30%	13%
No	35%	42%	54%	76%
Don't Know	16%	13%	17%	11%
Category 3 (125 MPH)				
Yes	65%	63%	45%	26%
No	22%	23%	38%	56%
Don't Know	13%	14%	18%	18%

Table 4-14: *Expect Flooding in Category 1-3 Hurricanes—Westchester County*

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	18%	15%	10%	6%
No	67%	67%	75%	83%
Don't Know	16%	18%	14%	11%
Category 2 (100 MPH)				
Yes	39%	35%	24%	10%
No	42%	50%	58%	79%
Don't Know	19%	16%	18%	11%
Category 3 (125 MPH)				
Yes	60%	52%	42%	19%
No	26%	31%	41%	60%
Don't Know	15%	17%	18%	21%

Table 4-15: *Expect Dangerous Flooding in Category 1-3 Hurricanes—Westchester County*

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	65%	66%	69%	69%
No	25%	26%	18%	17%
Don't Know	10%	8%	14%	14%
Category 2 (100 MPH)				
Yes	37%	37%	34%	37%
No	50%	50%	49%	48%
Don't Know	13%	13%	18%	16%
Category 3 (125 MPH)				
Yes	19%	22%	14%	25%
No	70%	69%	72%	59%
Don't Know	11%	9%	14%	16%

Table 4-16: *Expect Home to be Safe from Wind and Water in Category 1-3 Hurricanes—Westchester County*

Table 4-16 indicates that there is considerable perceived vulnerability to wind along the Hudson and especially in the non-surge locations. However, along the Sound only 70% believe they would be unsafe, considering both wind and water.

In general, residents in the more vulnerable locations accurately perceive themselves to be at a greater risk than those in less vulnerable locations. Also, the residents accurately perceive their risk to be greater from stronger hurricanes, compared to weaker hurricanes.

ANTICIPATION OF EVACUATION ORDERS

An evacuation order from public officials is usually a strong indicator to people that they need to evacuate. Unfortunately many people living in areas ordered to evacuate do not think the order applies to them. Studies indicate that, when asked, people respond that they did not hear an evacuation order for them specifically. For this study, interviewees were asked whether they thought emergency management officials in their community would issue an evacuation notice saying that the respondent should evacuate to a safer location. The results are displayed in Table 4-17, Table 4-18, Table 4-19, and Table 4-20.

New York City: For those expecting an evacuation notice from officials for New York City, a similar pattern was observed when perceived vulnerability was measured; under response in high-vulnerability areas and over response in low-vulnerability areas. Fewer than half the Zone A residents said they expect to be told to evacuate in a Category 1 storm, but more than a third in Zone B, Zone C, and non-surge areas anticipate being told to evacuate. In a Category 3 storm, 72% of the Zone C respondents expect that officials will tell them to leave, but 77% of the people living outside of any evacuation zone believe they would also be told to evacuate in a Category 3 hurricane. In general, more people expect to be told to evacuate than believe they would be unsafe. Table 4-17 depicts the expectation of evacuation notices of New York City respondents.

New York City	Zone A	Zone B	Zone C	Non-Surge
Category 1 (80 MPH)				
Manhattan	40%	34%	32%	37%
Brooklyn	37%	34%	34%	40%
Queens	49%	54%	46%	30%
Staten Island	43%	37%	29%	24%
Bronx	61%	35%	40%	37%
Category 2 (100 MPH)				
Manhattan	60%	57%	47%	53%
Brooklyn	58%	49%	61%	51%
Queens	78%	74%	60%	62%
Staten Island	67%	60%	64%	46%
Bronx	77%	56%	57%	53%
Category 3 (125 MPH)				
Manhattan	74%	78%	65%	80%
Brooklyn	70%	68%	74%	77%
Queens	88%	87%	76%	81%
Staten Island	86%	89%	75%	78%
Bronx	87%	75%	71%	69%

Table 4-17: *Expect Evacuation Notice in Category 1-3 Hurricanes—New York City*

Nassau County: Table 4-18 provides a summary of responses from Nassau County residents regarding the anticipation of receiving evacuation notices. Only 52% of the people living in Category 1 surge areas said they expect to be told to evacuate in a Category 1 hurricane. In a Category 2 storm, 77% of those in Category 1 areas and 67% of those in Category 2 areas think they would be told to evacuate. In a Category 3 storm, a majority of respondents in all areas expect to be told by officials to leave (91% in Category 1 areas and 85% in Category 2 areas). In all categories of storms there are substantial numbers of people outside the affected surge zones who expect to be told to evacuate. The number of people expecting evacuation notices exceeds the number believing their homes would be unsafe.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	52%	44%	30%	14%
No	34%	43%	63%	77%
Don't Know	14%	13%	7%	10%
Category 2 (100 MPH)				
Yes	77%	67%	44%	35%
No	13%	20%	39%	46%
Don't Know	11%	13%	18%	19%
Category 3 (125 MPH)				
Yes	91%	85%	60%	69%
No	4%	7%	26%	19%
Don't Know	5%	9%	14%	12%

Table 4-18: *Expect Evacuation Notice in Category 1-3 Hurricanes—Nassau County*

Suffolk County: A summary of the responses from Suffolk County residents regarding the anticipation of receiving evacuation notices is shown in Table 4-19. Only 43% of the people living in Category 1 surge areas said they expect to be told to evacuate in a Category 1 hurricane. In a Category 2 storm, 70% of those in Category 1 areas, 67% of those in Category 2 areas, and 60% of those in Category 3-4 areas believe they would be told to evacuate. In a Category 3 storm, a majority of respondents in all areas expect to be told by officials to leave (91% in Category 1 areas, 92% in Category 2 areas, and 89% in Category 3 areas). In all categories of storms there are substantial numbers of people outside the affected surge zones who expect to be told to evacuate. The number of people expecting evacuation notices exceeds the number believing their homes would be unsafe.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	43%	44%	40%	14%
No	44%	37%	53%	77%
Don't Know	13%	20%	8%	10%
Category 2 (100 MPH)				
Yes	70%	67%	60%	35%
No	19%	17%	34%	46%
Don't Know	11%	16%	6%	19%
Category 3 (125 MPH)				
Yes	91%	92%	89%	69%
No	4%	2%	8%	19%
Don't Know	5%	6%	4%	12%

Table 4-19: *Expect Evacuation Notice in Category 1-3 Hurricanes—Suffolk County*

Westchester County: Westchester County was also surveyed to obtain responses regarding evacuation notice expectation. Table 4-20 shows the responses by storm category and by risk zone. One observation that can be obtained of the responses is that the surge area residents generally underestimate the likelihood of being told by officials to evacuate and non-surge residents overstate the likelihood.

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Yes	40%	45%	34%	36%
No	41%	39%	47%	53%
Don't Know	19%	16%	19%	12%
Category 2 (100 MPH)				
Yes	66%	67%	58%	63%
No	17%	20%	18%	23%
Don't Know	17%	13%	25%	14%
Category 3 (125 MPH)				
Yes	87%	85%	76%	76%
No	4%	7%	10%	10%
Don't Know	9%	8%	14%	14%

Table 4-20: *Expect Evacuation Notice in Category 1-3 Hurricanes—Westchester County*

OTHER CONSIDERATIONS

Evacuation Routes and Perceived Evacuation Time of Residents: Huge evacuation events in Louisiana and Texas during Hurricane Katrina and Hurricane Rita in 2005 have produced lingering images of massive traffic congestion. The Nassau and Suffolk County interviewees were asked about their evacuation routes and their intended time on the roadway during an evacuation.

People were asked whether they would use evacuation routes posted on signs, try to use posted routes but switch to other routes if posted routes were too congested, or assume that posted routes would be congested and use other routes from the start. Most people said they would use posted routes or at least try them first. This information is displayed in Table 4-21.

Nassau and Suffolk Counties	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Nassau County				
Use Posted Routes	65%	47%	46%	54%
Try Posted Routes First	14%	15%	9%	10%
Use Other Routes	14%	24%	30%	31%
Don't Know / Other	7%	14%	16%	6%
Suffolk County				
Use Posted Routes	48%	32%	40%	54%
Try Posted Routes First	16%	22%	11%	10%
Use Other Routes	26%	36%	38%	31%
Don't Know / Other	9%	10%	11%	6%
Note: Survey questions were not asked to New York City and Westchester County residents.				

Table 4-21: *Intention to Use Posted Evacuation Routes—Nassau and Suffolk Counties*

Respondents were asked how long they would be willing to cope with congested traffic before giving up during an evacuation and returning home. As depicted in Table 4-22, about a third said they didn't know, and approximately a third said they would be willing to try for more than six hours.

Nassau and Suffolk Counties	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Nassau County				
< 1 Hour	6%	9%	19%	4%
1-2 Hours	13%	20%	19%	6%
2-4 Hours	12%	11%	11%	19%
4-6 Hours	5%	2%	2%	14%
> 6 Hours	29%	28%	16%	29%
Don't Know / Other	34%	30%	33%	29%
Suffolk County				
< 1 Hour	3%	10%	9%	4%
1-2 Hours	11%	14%	15%	6%
2-4 Hours	5%	17%	13%	19%
4-6 Hours	5%	4%	4%	14%
> 6 Hours	39%	26%	28%	29%
Don't Know / Other	36%	29%	30%	29%
Note: Survey questions were not asked to New York City and Westchester County residents.				

Table 4-22: *Expected Time Spent in Traffic before Abandoning Evacuation and Returning Home—Nassau and Suffolk Counties*

Evacuation Preparedness: Having a plan in place is the number one message public officials put out consistently year after year. All interviewees were asked if they and their families had definite plans for how they would respond when faced with the threat of a hurricane. As displayed in Table 4-23, the number of households with a definite hurricane evacuation plan varies greatly by area.

- ***New York City:*** Almost half of the residents in Zone A in Queens have a definite evacuation plan.
- ***Nassau County:*** Almost half of those interviewed in the Category 1 surge area said they had a definite plan for deciding whether to evacuate and where to go in case of a hurricane threat. The number decreased to 28% in the Category 2 zone and decreased further in the Category 3-4 and non-surge areas.
- ***Suffolk County:*** 52% of the Category 1, 44% of Category 2, 40% of Category 3, and 19% in the non-surge area had a definite plan.
- ***Westchester County:*** Between one-fourth and one-third of the residents in each of the risk zones had a definite evacuation plan should they be faced with the threat of a hurricane.

It should be noted that the percentages of residents making evacuation preparations does not correlate to the evacuation or risk zone they reside in. Overall, vulnerable residents in the entire study area should evaluate their evacuation options and have a definite plan in place in the event they are ordered to evacuate.

New York City	Zone A	Zone B	Zone C	Non-Surge
Manhattan	14%	22%	16%	18%
Brooklyn	16%	12%	18%	32%
Queens	48%	24%	15%	13%
Staten Island	28%	24%	24%	22%
Bronx	31%	19%	18%	10%
Nassau & Suffolk Counties	**Category 1 Risk Zones**	**Category 2 Risk Zones**	**Category 3-4 Risk Zones**	**Non-Surge Zones**
Nassau County				
Yes	48%	28%	18%	19%
No	45%	63%	75%	67%
Not Very Definite	7%	9%	7%	14%
Suffolk County				
Yes	52%	44%	40%	19%
No	37%	43%	53%	67%
Not Very Definite	11%	13%	7%	14%
Westchester County	**Sound 1-2 Risk Zones**	**Sound 3-4 Risk Zones**	**Hudson 1-4 Risk Zones**	**Non-Surge Zones**
Yes	25%	28%	30%	27%
No	64%	68%	62%	66%
Not Very Definite	12%	4%	8%	7%

Table 4-23: *Household has a Definite Hurricane Evacuation Plan*

In addition to having a hurricane plan, interviewees were asked about hurricane preparations, such as a "go bag", emergency supply kit, and identified the safest place within their home or building. A "go bag" was described as a bag containing items they might need in the event of an evacuation (important documents, keys, water, medication and credit cards).

In all of the areas, between 14% and 34% said they had a "go bag". A higher number (34% to 65%) said they had prepared an emergency supply kit containing supplies like water, canned foods, a flashlight, batteries, a battery-powered radio that would permit them to survive at least three days after a hurricane. Of the interviewees, 41% to 85% said they had identified the safest place in their home or building to ride out a strong hurricane if it was necessary. Table 4-24 displays the preparations made by interviewees.

New York City	Zone A	Zone B	Zone C	Non-Surge
Has a Go Bag				
Manhattan	16%	25%	25%	20%
Brooklyn	22%	14%	21%	30%
Queens	32%	22%	24%	17%
Staten Island	23%	24%	28%	15%
Bronx	23%	27%	34%	20%
Has Emergency Supply Kit				
Manhattan	49%	40%	51%	39%
Brooklyn	34%	40%	42%	51%
Queens	57%	45%	36%	47%
Staten Island	56%	65%	60%	54%
Bronx	53%	43%	55%	37%
ID'd Safest Place in Home				
Manhattan	49%	63%	57%	53%
Brooklyn	41%	48%	68%	64%
Queens	71%	56%	71%	72%
Staten Island	67%	76%	76%	85%
Bronx	65%	59%	60%	65%
Nassau County	**Category 1 Risk Zones**	**Category 2 Risk Zones**	**Category 3-4 Risk Zones**	**Non-Surge Zones**
Has a Go Bag	31%	21%	28%	25%
Has Emergency Supply Kit	54%	49%	60%	57%
ID'd Safest Place in Home	64%	68%	72%	69%
Suffolk County	**Category 1 Risk Zones**	**Category 2 Risk Zones**	**Category 3-4 Risk Zones**	**Non-Surge Zones**
Has a Go Bag	32%	20%	23%	25%
Has Emergency Supply Kit	61%	60%	60%	57%
ID'd Safest Place in Home	65%	65%	70%	69%
Westchester County	**Sound 1-2 Risk Zones**	**Sound 3-4 Risk Zones**	**Hudson 1-4 Risk Zones**	**Non-Surge Zones**
Has a Go Bag	16%	23%	26%	19%
Has Emergency Supply Kit	48%	51%	58%	52%
ID'd Safest Place in Home	63%	62%	70%	73%

Table 4-24: *Made Preparations*

Another factor to be considered is whether residents are aware of their evacuation zones. Of those asked, a majority of the New York City residents were unfamiliar with the evacuation zones while Nassau, Suffolk and Westchester county residents expressed more familiarity with their evacuation zones as depicted in Table 4-25. One common trend among all of the areas is that familiarity decreased continuously in Category 2 areas, Category 3-4 areas, and in non-surge areas.

New York City (Not Familiar At All)	Zone A	Zone B	Zone C	Non-Surge
Manhattan	92%	78%	87%	92%
Brooklyn	86%	84%	93%	75%
Queens	36%	65%	84%	85%
Staten Island	60%	56%	55%	57%
Bronx	74%	73%	81%	94%
Nassau County	**Category 1 Risk Zones**	**Category 2 Risk Zones**	**Category 3-4 Risk Zones**	**Non-Surge Zones**
Very Familiar	58%	48%	32%	14%
Somewhat Familiar	29%	26%	39%	48%
Not Familiar At All	14%	26%	30%	39%
Suffolk County	**Category 1 Risk Zones**	**Category 2 Risk Zones**	**Category 3-4 Risk Zones**	**Non-Surge Zones**
Very Familiar	52%	47%	49%	14%
Somewhat Familiar	34%	36%	34%	48%
Not Familiar At All	14%	16%	17%	39%
Westchester County	**Sound 1-2 Risk Zones**	**Sound 3-4 Risk Zones**	**Hudson 1-4 Risk Zones**	**Non-Surge Zones**
Very Familiar	52%	47%	34%	21%
Somewhat Familiar	31%	29%	31%	36%
Not Familiar At All	17%	24%	36%	44%

Table 4-25: *Familiarity with Evacuation Zones*

People who said they were very familiar with evacuation areas were asked whether they lived in an area that would need to evacuate in certain hurricanes or not. Of the residents in Zone A in New York City, between 12% (Brooklyn) and 65% (Queens) believe they would need to evacuate. In Nassau, Suffolk and Westchester, almost all of those in Category 1 areas said they would need to evacuate in certain hurricanes as shown in Table 4-26. In non-surge areas, of those who had earlier said they were very familiar with evacuation areas, 14% in Nassau and Suffolk and 68% in Westchester County said they lived in an area that would need to evacuate.

New York City	Zone A	Zone B	Zone C	Non-Surge
Manhattan	17%	7%	11%	10%
Brooklyn	12%	9%	1%	4%
Queens	65%	31%	11%	6%
Staten Island	29%	32%	29%	28%
Bronx	32%	28%	9%	6%
Nassau County	**Category 1 Risk Zones**	**Category 2 Risk Zones**	**Category 3-4 Risk Zones**	**Non-Surge Zones**
Yes, in evacuation zone	91%	54%	22%	14%
No, not in evacuation zone	6%	33%	78%	86%
Don't Know	4%	13%	0%	0%
Suffolk County	**Category 1 Risk Zones**	**Category 2 Risk Zones**	**Category 3-4 Risk Zones**	**Non-Surge Zones**
Yes, in evacuation zone	83%	92%	77%	14%
No, not in evacuation zone	13%	6%	15%	86%
Don't Know	4%	2%	8%	0%
Westchester County	**Sound 1-2 Risk Zones**	**Sound 3-4 Risk Zones**	**Hudson 1-4 Risk Zones**	**Non-Surge Zones**
Yes, in evacuation zone	94%	89%	56%	68%
No, not in evacuation zone	4%	8%	36%	33%
Don't Know	1%	3%	8%	0%

Table 4-26: *Belief Residence is in an Evacuation Zone*

PROBABLE PARTICIPATION RATES

Table 4-27 indicates the most probable participation rates for three categories of hurricanes for each risk zone. Residents interviewed were told emergency officials had issued mandatory evacuation orders for areas that would be inundated by the respective storm and that the evacuation orders were communicated aggressively. The participation rates tend to increase for each storm category within each risk zone.

New York City	Zone A	Zone B	Zone C	Non-Surge
Category 1 (80 MPH)				
Manhattan	40%	25%	20%	15%
Brooklyn	45%	25%	20%	15%
Queens	65%	35%	20%	15%
Staten Island	50%	25%	20%	15%
Bronx	60%	25%	20%	15%
Category 2 (100 MPH)				
Manhattan	50%	30%	20%	15%
Brooklyn	50%	35%	20%	15%
Queens	70%	40%	25%	15%
Staten Island	60%	35%	20%	15%
Bronx	65%	40%	25%	15%
Category 3 (125 MPH)				
Manhattan	65%	45%	40%	20%
Brooklyn	70%	45%	40%	20%
Queens	80%	60%	50%	20%
Staten Island	70%	50%	40%	20%
Bronx	80%	55%	45%	20%
Nassau County	**Cat 1 Risk Zones**	**Cat 2 Risk Zones**	**Cat 3-4 Risk Zones**	**Non-Surge**
Category 1 (80 MPH)	83%	77%	83%	69%
Category 2 (100 MPH)	89%	86%	86%	83%
Category 3 (125 MPH)	93%	96%	84%	87%
Suffolk County	**Cat 1 Risk Zones**	**Cat 2 Risk Zones**	**Cat 3-4 Risk Zones**	**Non-Surge**
Category 1 (80 MPH)	78%	84%	89%	69%
Category 2 (100 MPH)	87%	89%	94%	83%
Category 3 (125 MPH)	94%	93%	94%	87%
Westchester County	**Sound 1-2 Risk Zones**	**Sound 3-4 Risk Zones**	**Hudson 1-4 Risk Zones**	**Non-Surge**
Category 1 (80 MPH)	76%	82%	75%	72%
Category 2 (100 MPH)	91%	89%	82%	84%
Category 3 (125 MPH)	93%	91%	86%	89%

Table 4-27: *Estimated Evacuation Participation*

EVACUATION TIMING

Relatively few evacuees actually leave before officials issue an evacuation notice. Generally, people do not leave in substantial numbers until someone in a position of authority tells them to do so, and then they will leave as promptly as they believe they must. To account for the intentions of residents in the area, Nassau and Suffolk Counties were surveyed to see if residents would wait for an evacuation notice or leave earlier. Unlike most areas, a large number in various zones (between 37% and 74%) indicated that they would leave earlier, before a notice was issued. Table 4-28 provides detailed responses of Nassau and Suffolk County residents. Ultimately, the urgency of evacuations varies because of the error inherent in hurricane forecasting and the reluctance of public officials to have residents leave unnecessarily. If a storm intensifies, increases forward speed, or changes course unexpectedly, it usually becomes more necessary for evacuees to leave quickly.

Nassau and Suffolk Counties	Cat 1 Risk Zones	Cat 2 Risk Zones	Cat 3-4 Risk Zones	Non-Surge
Nassau County				
Wait for Notice	**31%**	**25%**	**53%**	**42%**
Leave Earlier	**64%**	**64%**	**37%**	**56%**
Don't Know	**5%**	**11%**	**10%**	**2%**
Suffolk County				
Wait for Notice	**18%**	**26%**	**25%**	**42%**
Leave Earlier	**74%**	**67%**	**74%**	**56%**
Don't Know	**8%**	**7%**	**2%**	**2%**
Note: Survey questions were not asked to New York City and Westchester County residents.				

Table 4-28: *Evacuees would Wait for Official Notice before Evacuating or would Leave Earlier*

Regardless of the proficiency of emergency management officials, circumstances are going to arise in which prompt evacuation is necessary. In other cases the notice will be issued earlier, and evacuation can proceed more gradually. For planning purposes, at least three different timing response curves as those shown in Figure 4-4 should be evaluated. The flattest of the three curves assumes that the evacuation orders were issued at least 24 hours before landfall. In each threat scenario occupants of low risk areas will tend to wait longer to evacuate than those living in more hazardous locations.

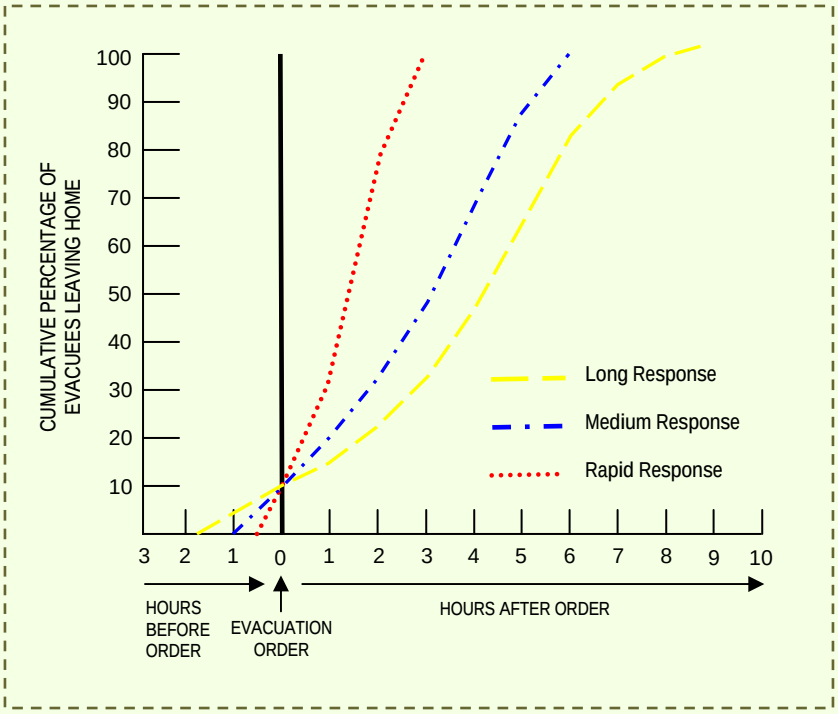

Figure 4-4: *Behavioral Response Curve*

If officials issue evacuation notices more than 24 hours prior to anticipated landfall, evacuation departures will be distributed over a period longer than 24 hours. Where plenty of time is available, some evacuees will leave shortly after the evacuation notice during daylight hours, with departures essentially stopping on the evening of the first day, and then departures resume on the morning of the second day.

TYPE OF REFUGE

Residents in the study area were asked what type of refuge they would seek for each of the three storm scenarios if they evacuated. They were asked whether they would go to a hurricane shelter operated by the city/county and Red Cross, the home of a friend or relative, a hotel or motel, or someplace else. Their responses are explained in detail for each area.

In regard to shelters, the strongest demographic predictors of shelter demand were income and race. In most hurricane related behavioral surveys, twice as many people say they would go to public shelters as those who use public shelters in actual evacuations. People who said they had definite evacuation plans were less likely than others to say they would go to public shelters.

People also tend to overstate the likelihood that they will go to public shelters when they evacuate. The extent to which people go to public shelters as well as other destinations will depend on the actual availability of those options. If shelters are not opened locally, shelter use will be substantially lower. Reliance on hotels and motels could also depend on the extent to which they are available.

New York City: The clear indication is that a majority of people intend to go to a hurricane shelter or to the home of a friend or relative. Approximately 45% say they would go to each. In stronger storms there was an insignificant increase in the percentage saying they would go to hurricane shelters. Residents of Queens and the Bronx were slightly less likely than others to say they would go to hurricane shelters. People evacuating from Zone A were less likely than others to say they would use hurricane shelters. Table 4-29 depicts the intended refuge responses of New York residents by borough while Table 4-30 shows the intended refuge by risk area.

New York City	Manhattan	Brooklyn	Queens	Staten Island	Bronx
Category 1 (80 MPH)					
Hurricane Shelter	46%	44%	37%	46%	40%
Friend or Relative	43%	46%	54%	46%	48%
Hotel or Motel	7%	6%	6%	5%	9%
Other	5%	5%	3%	4%	4%
Category 2 (100 MPH)					
Hurricane Shelter	49%	48%	39%	45%	42%
Friend or Relative	41%	42%	52%	46%	48%
Hotel or Motel	7%	5%	6%	5%	7%
Other	4%	5%	3%	4%	3%
Category 3 (125 MPH)					
Hurricane Shelter	53%	51%	39%	47%	42%
Friend or Relative	36%	38%	53%	44%	48%
Hotel or Motel	7%	6%	5%	5%	7%
Other	4%	5%	4%	4%	4%

Table 4-29: *Intended Refuge in Category 1-3 Hurricanes (by borough)—New York City*

New York City	Zone A	Zone B	Zone C	Non-Surge
Category 1 (80 MPH)				
Hurricane Shelter	34%	42%	50%	47%
Friend or Relative	55%	48%	41%	41%
Hotel or Motel	6%	7%	7%	6%
Other	5%	3%	2%	6%
Category 2 (100 MPH)				
Hurricane Shelter	35%	44%	53%	51%
Friend or Relative	55%	47%	39%	37%
Hotel or Motel	6%	6%	7%	6%
Other	4%	4%	3%	6%
Category 3 (125 MPH)				
Hurricane Shelter	35%	45%	57%	53%
Friend or Relative	53%	45%	36%	35%
Hotel or Motel	6%	6%	6%	6%
Other	5%	4%	2%	6%

Table 4-30: *Intended Refuge in Category 1-3 Hurricanes (by risk area)—New York City*

In addition to the intended refuge of residents, they were asked if they would still go to a hurricane shelter after having knowledge of the reception center plans. Evacuation plans for New York City call for evacuees who plan to go to a hurricane shelter operated by the City and Red Cross to go to a reception center first, rather than having people go directly to a hurricane shelter. The reception centers would be easily reached by public transportation and some would have parking. At the reception center evacuees would be assigned to a hurricane shelter and transported to that shelter by bus or van. The plan was explained to people who said they would evacuate to a hurricane shelter, and they were then asked if they would still plan to go to a hurricane shelter, given that arrangement. Approximately 60% said they would still go to a hurricane shelter. Table 4-31a summarizes their responses.

By Borough		By Risk Area	
Manhattan	59%	Zone A	56%
Brooklyn	60%	Zone B	57%
Queens	58%	Zone C	65%
Staten Island	58%	Non-Surge	62%
Bronx	63%		

Table 4-31a: *Would Still go to Public Shelter after Hearing of Reception Center Plan—New York City*

Table 4-31b applies the percentages from 4-31a to the respondents percentages from 4-29 and 4-30. Table 4-31b therefore are the percentages of hurricane public shelter evacuees as a percentage of total evacuees for New York City by borough and risk area.

New York City by Borough	Manhattan	Brooklyn	Queens	Staten Island	Bronx
Category 1 (80 MPH)					
Hurricane Shelter Refuge	27%	26%	21%	27%	25%
Category 2 (100 MPH)					
Hurricane Shelter Refuge	29%	29%	23%	26%	26%
Category 3 (125 MPH)					
Hurricane Shelter Refuge	31%	31%	23%	27%	26%
New York City by Risk Area	**Zone A**	**Zone B**	**Zone C**	**Non-Surge**	
Category 1 (80 MPH)					
Hurricane Shelter Refuge	19%	24%	33%	29%	
Category 2 (100 MPH)					
Hurricane Shelter Refuge	20%	25%	34%	32%	
Category 3 (125 MPH)					
Hurricane Shelter Refuge	20%	26%	37%	33%	

Table 4-31b: *Hurricane Public Shelter Evacuees as a Percent of Total Evacuees—New York City (Table 4-31a Percentages Applied to Tables 4-29 & 4-30)*

Interviewees were also surveyed on pet ownership. Between 25% and 30% of the households interviewed said they had pets, except in Staten Island, where 43% had pets. There was no significant variation in pet ownership among risk zones. Pets as a rule are not allowed into evacuation shelters. This policy may have changed since the studies were completed for the New York HES.

Pet owners who planned to evacuate to a hurricane shelter were asked what they planned to do with their pet when they evacuated. Table 4-32 depicts the percentage of households who have pets, those who intend to evacuate with their pet, and those who plan to take their pet to a shelter aware of the no-pet policy in the City and Red Cross operated shelters. Most people are not aware of the policy, but among those who were aware, almost 25% said they would take their pets to the shelter.

Scenario	By Borough		By Risk Area	
Households with Pets	Manhattan	26%	Zone A	33%
	Brooklyn	27%	Zone B	31%
	Queens	31%	Zone C	28%
	Staten Island	43%	Non-Surge	33%
	Bronx	29%		
Pet Owners Intending to Take Pet to Hurricane Shelter	Manhattan	83%	Zone A	76%
	Brooklyn	88%	Zone B	78%
	Queens	63%	Zone C	82%
	Staten Island	80%	Non-Surge	70%
	Bronx	68%		
Pet Owners Aware of Red Cross Policy Intending to Take Pet to Hurricane Shelter	Manhattan	17%	Zone A	22%
	Brooklyn	16%	Zone B	15%
	Queens	34%	Zone C	21%
	Staten Island	13%	Non-Surge	27%
	Bronx	32%		

Table 4-32: *Pet Statistics—New York City*

Lastly, people intending to go to hurricane shelters were told that city officials encourage evacuees to stay with friends and relatives in locations outside the areas being told to evacuate. Then they were asked if they had friends or relatives in safe locations with whom they could stay in an evacuation, if necessary. More than 70% said they did have friends and relatives with whom they could stay. Table 4-33 provides detailed percentages of the responses by borough and risk area. Perhaps pet owners who are aware of the no-pet policy at City and Red Cross operated shelters will reconsider staying at a shelter and stay with a friend or relative. By residents staying at friends or relatives, this could help to alleviate overcrowding at shelters. It should be noted that the no pet policy in public shelters may have changed since the behavioral studies were completed for the New York HES.

By Borough		By Risk Area	
Manhattan	71%	Zone A	77%
Brooklyn	69%	Zone B	71%
Queens	76%	Zone C	68%
Staten Island	74%	Non-Surge	71%
Bronx	72%		

Table 4-33: *Respondents Intending to use Public Shelters who have Friends or Relatives in Safe Areas with whom they could Stay—New York City*

Nassau County: Table 4-34 displays the refuge evacuees intend to seek for Nassau County. The majority of respondents said they would go to the homes of friends and relatives in all three categories of hurricanes. In Category 1 and 2 surge areas between 11% and 19% of intended evacuees said they would use public shelters. In Category 3-4 and non-surge areas, the public shelter figure was higher.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Public Shelter	11%	17%	33%	21%
Friend or Relative	68%	57%	44%	50%
Hotel or Motel	9%	7%	7%	8%
Other	3%	2%	4%	6%
Don't Know	9%	17%	13%	15%
Category 2 (100 MPH)				
Public Shelter	12%	17%	35%	17%
Friend or Relative	67%	57%	40%	52%
Hotel or Motel	8%	8%	9%	8%
Other	3%	2%	4%	6%
Don't Know	9%	16%	13%	17%
Category 3 (125 MPH)				
Public Shelter	15%	19%	33%	21%
Friend or Relative	64%	57%	40%	48%
Hotel or Motel	9%	7%	9%	8%
Other	3%	2%	4%	6%
Don't Know	9%	15%	15%	17%

Table 4-34: *Intended Refuge in Category 1-3 Hurricanes (by risk area)—Nassau County*

Residents who indicated that they would go to a public shelter were also asked if they could stay with a friend or relative outside the areas told to evacuate if encouraged to by County officials. Table 4-35 summarizes their responses. Approximately half (88% in the Category 2 area) replied affirmatively.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Yes	49%	88%	47%	54%
No	43%	0%	42%	31%
Don't Know	8%	13%	11%	15%

Table 4-35: *Respondents Intending to use Public Shelters who have Friends or Relatives in Safe Areas with whom they could Stay—Nassau County*

Suffolk County: The majority of respondents said they would go to the homes of friends and relatives in all three categories of hurricanes. In Category 1 and 2 surge areas between 14% and 21% of intended evacuees said they would use public shelters. In Category 3-4 and non-surge areas, the public shelter figure was slightly higher, between 17% and 23%. Table 4-36 displays the refuge evacuees intend to seek for Suffolk County.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Public Shelter	14%	18%	21%	21%
Friend or Relative	59%	64%	68%	50%
Hotel or Motel	8%	8%	9%	8%
Other	10%	4%	0%	6%
Don't Know	9%	7%	2%	15%
Category 2 (100 MPH)				
Public Shelter	16%	18%	23%	17%
Friend or Relative	60%	65%	66%	52%
Hotel or Motel	7%	8%	9%	8%
Other	11%	4%	0%	6%
Don't Know	6%	5%	2%	17%
Category 3 (125 MPH)				
Public Shelter	18%	21%	21%	21%
Friend or Relative	57%	62%	68%	48%
Hotel or Motel	9%	7%	8%	8%
Other	9%	5%	0%	6%
Don't Know	7%	5%	4%	17%

Table 4-36: *Intended Refuge in Category 1-3 Hurricanes (by risk area)—Suffolk County*

Residents who indicated that they would go to a public shelter were also asked if they could stay with a friend or relative outside the areas told to evacuate if encouraged to by County officials. Table 4-37 summarizes their responses with over half of the residents in all areas indicating that they could stay with someone instead of going to a shelter.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Yes	63%	57%	58%	54%
No	25%	36%	33%	31%
Don't Know	12%	7%	8%	15%

Table 4-37: *Respondents Intending to use Public Shelters who have Friends or Relatives in Safe Areas with whom they could Stay—Suffolk County*

Westchester County: The most observed behavioral response of Westchester County residents is the intention to go to the homes of friends and relatives if they evacuate. There was little difference in intended refuges among storm intensities. People expect to go to the same places when they evacuate for a Category 1, 2, or 3 hurricane. Table 4-38 summarizes the responses of residents as to where they would seek shelter. The responses indicate that a substantial number of residents have not given much thought to where they would go. People who said they would go to public shelters were asked if they had friends and relatives in safe locations with whom they could stay (Table 4-39), and 48% to 64% said they did.

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Public Shelter	15%	15%	17%	32%
Friend or Relative	48%	55%	50%	32%
Hotel or Motel	17%	11%	10%	8%
Other	3%	4%	5%	4%
Don't Know	17%	15%	19%	25%
Category 2 (100 MPH)				
Public Shelter	16%	17%	18%	33%
Friend or Relative	47%	54%	49%	32%
Hotel or Motel	17%	10%	10%	8%
Other	3%	4%	5%	4%
Don't Know	17%	16%	19%	23%
Category 3 (125 MPH)				
Public Shelter	16%	20%	18%	32%
Friend or Relative	46%	46%	46%	30%
Hotel or Motel	17%	18%	21%	25%
Other	3%	4%	5%	4%
Don't Know	18%	18%	21%	25%

Table 4-38: *Intended Refuge in Category 1-3 Hurricanes (by risk area)—Westchester County*

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Yes	52%	48%	64%	59%
No	26%	35%	27%	34%
Don't Know	22%	17%	9%	6%

Table 4-39: *Respondents Intending to use Public Shelters who have Friends or Relatives in Safe Areas with whom they could Stay—Westchester County*

DESTINATIONS

Most people planning to evacuate do not anticipate going very far from home. Residents in the New York City, Nassau, Suffolk and Westchester County areas were surveyed to obtain their intended destinations.

New York City: Almost 40% of those intending to evacuate said they would plan to go someplace in their own neighborhood as shown in Table 4-40. Another 23% said they would go elsewhere in their own borough. There was relatively little variation among boroughs and even less among storm scenarios.

New York City	Manhattan	Brooklyn	Queens	Staten Island	Bronx
Category 1 (80 MPH)					
Neighborhood	39%	45%	32%	38%	41%
Own Borough	20%	19%	25%	29%	22%
Other Borough	21%	15%	26%	15%	13%
New York State	7%	8%	9%	2%	14%
New Jersey	6%	7%	2%	13%	5%
Other	7%	7%	6%	2%	5%
Category 2 (100 MPH)					
Neighborhood	44%	47%	33%	40%	44%
Own Borough	22%	18%	26%	28%	19%
Other Borough	14%	13%	24%	13%	13%
New York State	14%	7%	9%	2%	14%
New Jersey	7%	9%	3%	14%	5%
Other	8%	7%	5%	3%	5%
Category 3 (125 MPH)					
Neighborhood	44%	47%	35%	44%	41%
Own Borough	22%	17%	24%	28%	21%
Other Borough	15%	14%	27%	12%	12%
New York State	6%	7%	8%	2%	15%
New Jersey	5%	8%	2%	11%	5%
Other	8%	7%	5%	3%	7%

Table 4-40: *Intended Location of Refuge in Category 1-3 Hurricanes—New York City*

Nassau County: The most obvious finding in Nassau County was that a majority of people in surge zones said they would go to destinations in their own community or county, with the majority shifting from county to community as respondents were located farther inland. However, in non-surge areas a majority of people said they would leave their own county. Table 4-41 summarizes their responses.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Own Community	15%	38%	58%	24%
Own County	53%	32%	28%	16%
Suffolk	2%	2%	5%	0%
Manhattan	4%	2%	0%	5%
Queens	4%	6%	0%	3%
Brooklyn	4%	3%	0%	5%
Bronx	2%	1%	0%	3%
Westchester	3%	1%	0%	5%
Orange/Rockland	1%	1%	0%	0%
Putnam	<1%	0%	0%	5%
Other New York	5%	6%	2%	11%
Other State	7%	8%	7%	24%
Category 2 (100 MPH)				
Own Community	17%	38%	60%	19%
Own County	51%	31%	26%	16%
Suffolk	2%	3%	2%	0%
Manhattan	4%	2%	2%	5%
Queens	5%	6%	2%	3%
Brooklyn	4%	3%	0%	5%
Bronx	2%	1%	0%	3%
Westchester	3%	1%	0%	5%
Orange/Rockland	2%	1%	0%	0%
Putnam	<1%	0%	0%	5%
Other New York	5%	6%	5%	14%
Other State	6%	8%	2%	24%
Category 3 (125 MPH)				
Own Community	20%	40%	62%	20%
Own County	47%	31%	24%	17%
Suffolk	2%	3%	2%	0%
Manhattan	5%	2%	5%	6%
Queens	4%	6%	2%	3%
Brooklyn	4%	2%	0%	3%
Bronx	2%	1%	0%	3%
Westchester	3%	0%	0%	3%
Orange/Rockland	2%	1%	0%	0%
Putnam	<1%	0%	0%	6%
Other New York	5%	6%	2%	14%
Other State	6%	8%	2%	26%

Table 4-41: *Intended Location of Refuge in Category 1-3 Hurricanes*

Suffolk County: In Suffolk County most people in surge zones said they would go to destinations in their own community or county. The majority shifted from county to community as respondents were located farther inland. In non-surge areas a majority of people said they would leave their own county. Table 4-42 summarizes their responses.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Own Community	32%	36%	27%	24%
Own County	36%	47%	48%	16%
Nassau	8%	5%	13%	0%
Manhattan	8%	1%	4%	5%
Queens	2%	2%	2%	3%
Brooklyn	1%	0%	2%	5%
Bronx	<1%	0%	0%	3%
Westchester	2%	0%	0%	5%
Orange/Rockland	1%	0%	0%	0%
Putnam	0%	0%	0%	5%
Other New York	5%	4%	2%	11%
Other State	5%	5%	2%	24%
Category 2 (100 MPH)				
Own Community	33%	34%	29%	19%
Own County	34%	48%	48%	16%
Nassau	8%	6%	10%	0%
Manhattan	7%	1%	4%	5%
Queens	2%	3%	2%	3%
Brooklyn	1%	0%	2%	5%
Bronx	<1%	0%	0%	3%
Westchester	2%	0%	0%	5%
Orange/Rockland	1%	0%	0%	0%
Putnam	0%	0%	0%	5%
Other New York	5%	3%	2%	14%
Other State	7%	4%	2%	24%
Category 3 (125 MPH)				
Own Community	34%	38%	28%	20%
Own County	30%	43%	43%	17%
Nassau	8%	5%	11%	0%
Manhattan	7%	1%	4%	6%
Queens	2%	3%	2%	3%
Brooklyn	1%	0%	2%	3%
Bronx	0%	1%	0%	3%
Westchester	2%	0%	0%	3%
Orange/Rockland	2%	0%	0%	0%
Putnam	0%	0%	0%	6%
Other New York	6%	4%	4%	14%
Other State	9%	5%	6%	26%

Table 4-42: *Intended Location of Refuge in Category 1-3 Hurricanes—Suffolk County*

Westchester County: Few evacuees plan to leave Westchester County, and about a third anticipate going someplace within their own neighborhood. Most destinations in the "Other" category were in New York State. As in the case of refuge, locations varied little among storms of varying intensities as shown in Table 4-43.

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Category 1 (80 MPH)				
Own Neighborhood	35%	21%	18%	33%
Own Town	16%	24%	26%	13%
Westchester County	31%	38%	25%	35%
Manhattan	7%	0%	10%	4%
Other New York City	2%	1%	6%	0%
Long Island	2%	0%	3%	0%
Other	8%	17%	14%	15%
Category 2 (100 MPH)				
Own Neighborhood	35%	21%	20%	32%
Own Town	15%	23%	24%	13%
Westchester County	31%	36%	26%	34%
Manhattan	7%	0%	8%	4%
Other New York City	2%	1%	5%	2%
Long Island	2%	0%	1%	0%
Other	8%	19%	15%	15%
Category 3 (125 MPH)				
Own Neighborhood	32%	25%	19%	33%
Own Town	16%	17%	22%	12%
Westchester County	34%	39%	24%	33%
Manhattan	5%	0%	8%	4%
Other New York City	2%	1%	6%	2%
Long Island	2%	0%	1%	0%
Other	9%	17%	19%	16%

Table 4-43: *Intended Location of Refuge in Category 1-3 Hurricanes—Westchester County*

VEHICLE USE

Transportation modeling requires an accurate estimate of the number of vehicles that will be used in an evacuation. Also, some vehicles, such as trailers and motor homes, impact traffic flow more than other vehicles, and should be accounted for in the model. Finally, emergency management officials need to anticipate the number of people who will need their assistance in order to evacuate. Vehicle use refers to vehicle ownership and the percent of vehicles owned at the home and that will be used in the evacuation.

New York City: Vehicle ownership varies greatly among boroughs, and in the Bronx it varies among evacuation zones. In households with vehicles, respondents were asked whether they would use their own vehicle in a hurricane evacuation, ride with a friend or relative, or use public transportation. The great majority said they would use their own vehicle. Vehicle owners planning to use their own vehicles were asked what they would do if public officials urged them to use public transportation instead of their own vehicle. In Manhattan, Brooklyn, and the Bronx approximately 65% said they would use public transportation. In Queens and Staten Island, just fewer than half said they would use public transportation. Respondents were asked how many vehicles they had available in their household that could be used in an evacuation and how many of those vehicles would be used. Table 4-44 indicates the number of households with no vehicles available in household, transportation mode intended by households with vehicles, and the intentions by households with vehicles. The vehicles per household figures do not include a reduction due to appeals by officials to use public transportation.

New York City		Manhattan	Brooklyn	Queens	Staten Island	Bronx
No Vehicles Available in Household	Zone A	62%	40%	12%	7%	10%
	Zone B	62%	40%	17%	16%	20%
	Zone C	68%	30%	22%	11%	38%
	Non-Surge	59%	45%	15%	9%	37%
Transportation Mode Intended by Households with Vehicles	Own Vehicle	68%	69%	82%	83%	78%
	Friend or Relative	5%	9%	8%	9%	9%
	Public Transit	17%	11%	5%	3%	5%
	Don't Know	8%	7%	5%	5%	5%
	Other	2%	4%	1%	1%	3%
Intentions by Households with Vehicles	Use Public Transit if Urged	67%	65%	47%	48%	64%
	Vehicles per Households with Vehicles	1.12	1.22	1.37	1.34	1.32
	Vehicles per all Households	0.28	0.52	0.97	0.97	0.76

Table 4-44: *Vehicle Use During Evacuation—New York City*

Nassau County: The Nassau County interviewees were asked a number of questions pertaining to vehicle use in an evacuation. Table 4-45 provides detailed information regarding vehicle availability and usage among households. As shown in the table, the average number of vehicles said to be available to households ranged from 1.70 to 2.15, and the number of vehicles to be used ranged from 1.22 to 1.43 per household. Between 66% and 81% of the available vehicles would be used in an evacuation, and only 2% to 5% of households said they had no vehicles of their own. Those intending to use public transportation ranged from zero to 4%, and between 29% and 51% said they would be willing to use public transportation if urged by officials to do so. Lastly, of those surveyed, only one to two percent of households plan to pull a trailer or take a motor home or camper if they evacuate.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Average Vehicles Available	1.70	1.85	1.84	2.15
Average Vehicles Would Use	1.31	1.38	1.22	1.43
% of Available Would Use	81%	75%	66%	67%
No Vehicles Available	5%	4%	4%	2%
Intend to Use Public Transit	2%	4%	0%	2%
Use Public Transit if Urged	35%	37%	51%	29%
Would Pull Trailer / Take Motor Home	2%	1%	2%	2%

Table 4-45: *Vehicle Use During Evacuation—Nassau County*

Suffolk County: In Suffolk County, the average number of vehicles said to be available to households ranged from 1.97 to 2.15, and the number of vehicles to be used ranged from 1.33 to 1.47 per household. Between 62% and 72% of the available vehicles would be used in an evacuation, and only zero to 4% of households said they had no vehicles of their own. Those intending to use public transportation ranged from zero to 2%, and between 28% and 39% said they would be willing to use public transportation if urged by officials to do so. Of those surveyed, only zero to 8% of households plan to pull a trailer or take a motor home or camper if they evacuate. Table 4-46 provides supporting information regarding vehicle availability and usage among households.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Average Vehicles Available	2.03	1.97	2.13	2.15
Average Vehicles Would Use	1.47	1.36	1.33	1.43
% of Available Would Use	72%	69%	62%	67%
No Vehicles Available	2%	0%	4%	2%
Intend to Use Public Transit	1%	2%	0%	2%
Use Public Transit if Urged	39%	41%	28%	29%
Would Pull Trailer / Take Motor Home	8%	4%	0%	2%

Table 4-46: *Vehicle Use During Evacuation—Suffolk County*

Westchester County: Most, but not all vehicles available to households would be used in an evacuation. The 67% and 71% figures indicated by respondents is consistent with typical vehicle usage, except for the 85% figure on the Hudson, which is higher than usual. The number of vehicles to be taken per household ranged from 1.24 to 1.34. In three of the sample locations only 2% to 6% of the households had no vehicles. In the Hudson sample, the figure was 12%. Only 2% to 3% of the households expect to take motor homes or to pull trailers if they evacuate. People were asked if they would be willing to use public transportation in an evacuation instead of their own vehicle, if asked to do so by public safety officials, and 36% to 54% said they would. No explanation concerning the nature or availability of public transportation was provided to respondents. Table 4-47 provides the vehicle usage information for Westchester County.

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Average Vehicles per Household	**1.32**	**1.30**	**1.24**	**1.34**
% of Available to Use	**71%**	**71%**	**85%**	**67%**
Households without Vehicles	**4%**	**6%**	**12%**	**2%**
Motor Home or Trailer	**3%**	**2%**	**3%**	**3%**
Use Public Transit if Urged	**42%**	**43%**	**36%**	**54%**

Table 4-47: *Vehicle Use During Evacuation—Westchester County*

OTHER TRANSPORTATION RELATED ISSUES

Respondents were asked if anyone in their household would need assistance in order to evacuate. This included residents who would need transportation and/or medical assistance, and who would be providing the assistance.

New York City: Fewer than 20% of households said they would need assistance. In those households needing assistance, interviewees were asked whether the person would just need transportation or the person had a disability or medical problem that would require special assistance. Table 4-48 shows the percentages of residents needing evacuation assistance, the type of assistance, and the provider by borough. Except in Manhattan, most households expect to provide the assistance from within the household or with the aid of friends and relatives.

New York City		Manhattan	Brooklyn	Queens	Staten Island	Bronx
Someone in Household Needs Evacuation Assistance	Zone A	17%	19%	8%	14%	7%
	Zone B	20%	17%	18%	24%	16%
	Zone C	35%	16%	22%	17%	23%
	Non-Surge	31%	23%	19%	7%	29%
Type of Assistance Needed (all households)	Transport Only	12%	11%	6%	3%	6%
	Special Need	6%	4%	6%	7%	8%
	Both	6%	1%	3%	4%	3%
Provider of Assistance (households needing assistance)	Within Household	19%	42%	38%	51%	33%
	Friend or Relative	24%	20%	15%	14%	27%
	Agency or Organization	43%	35%	35%	27%	31%
	Don't Know	11%	4%	8%	8%	7%
	Other	3%	0%	4%	0%	2%

Table 4-48: *Special Needs—New York City*

Nassau County: Between 6% and 13% of the Nassau County respondents told the interviewers someone in their household would require assistance to evacuate. Most of those individuals would require medical or medical and transportation assistance. In a majority of households the assistance would be provided by someone in the household or by a friend or relative. In 16% to 50% of the households, assistance from an agency would be required. Table 4-49 provides detailed information of the type of assistance needed and the provider by risk zone.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Someone in Household Would Need Assistance	13%	11%	12%	6%
Type of Assistance				
Transportation	34%	21%	14%	0%
Medical	40%	36%	43%	67%
Both	24%	21%	43%	33%
Don't Know	0%	14%	0%	0%
Other	3%	7%	0%	0%
Provider of Assistance				
Household	29%	36%	57%	67%
Friend / Relative	40%	7%	0%	0%
Agency	16%	50%	43%	33%
Don't Know	13%	7%	0%	0%
Other	3%	0%	0%	0%

Table 4-49: *Special Needs—Nassau County*

Suffolk County: Suffolk County respondents indicated that between 6% and 11% of households has someone who would require assistance to evacuate. Most of those individuals would require medical and/or transportation assistance. In a majority of the households the assistance would be provided by someone in the household or by a friend or relative. In three of the four zones, 13% to 33% of the households would require assistance from an agency. Table 4-50 provides detailed information of the type of assistance needed and the provider by risk zone.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Someone in Household Would Need Assistance	7%	6%	11%	6%
Type of Assistance				
Transportation	52%	0%	33%	0%
Medical	29%	88%	50%	67%
Both	19%	13%	17%	33%
Don't Know	0%	0%	0%	0%
Other	0%	0%	0%	0%
Provider of Assistance				
Household	38%	75%	67%	67%
Friend / Relative	29%	13%	33%	0%
Agency	19%	13%	0%	33%
Don't Know	10%	0%	0%	0%
Other	5%	0%	0%	0%

Table 4-50: *Special Needs—Suffolk County*

Westchester County: Between 7% and 14% of respondents said someone in their household would require assistance in order to evacuate. Almost half of those needing assistance would just need transportation, but an equal number have a special medical condition requiring accommodation in a vehicle or shelter. Only 16% of the households with someone requiring evacuation assistance need assistance from an agency. Most expect to rely on friends and relatives or others in the household, but 13% did not know who would provide the needed assistance. Table 4-51 provides detailed information of the type of assistance needed and the provider by risk zone.

Westchester County	
Someone in Household Would Require Assistance	
Sound 1-2 Risk Zones	7%
Sound 3-4 Risk Zones	12%
Hudson 1-4 Risk Zones	14%
Non-Surge Zones	12%
Type of Assistance Required	
Transportation Only	44%
Special Need	33%
Both	18%
Other / Don't Know	5%
Provider of Assistance Required	
Household	35%
Friend / Relative	36%
Agency	16%
Other / Don't Know	13%

Table 4-51: *Special Needs—Westchester County*

TOURIST RESPONSE

No survey was conducted with vacationers to ascertain their intentions. Behavioral assumptions for tourists are derived from intended-response survey findings with visitors to other similar locations and from the existing data on how vacationers have responded. Based on data results from those studies regarding vacationer characteristics it is reasonable to assume 90 to 95% of vacationers in the study area will evacuate their accommodations if evacuation orders are issued. Since tourists tend to leave as early as residents, the same curves used for residents should be used for tourists.

SOURCES OF INFORMATION

Participants in the survey were presented with a list of sources which they may have received information about hypothetical storms and were asked how much they relied upon each. The percentages from the selected respondents that said they relied a "great deal" on specific sources are shown in Table 4-52 , Table 4-53, Table 4-54, and Table 4-55.

New York City: Most people expect to rely mainly on local radio and television, followed by The Weather Channel (TWC). Only 20% anticipating relying a great deal on the internet, including the New York City's web site. There was little variation among boroughs or risk zones. Table 4-52 shows the percentages by borough of people saying they would rely a "great deal" on each of the sources while Table 4-53 shows the same information only by risk zone.

New York City	Manhattan	Brooklyn	Queens	Staten Island	Bronx
Radio	62%	60%	69%	70%	65%
Local Television	65%	59%	64%	69%	65%
CNN	39%	31%	47%	49%	42%
The Weather Channel®	54%	52%	56%	65%	60%
Other TV	42%	35%	42%	45%	39%
Internet	27%	19%	22%	18%	20%
www.nyc.gov	21%	19%	18%	18%	20%
Phone Calls from Officials	24%	20%	20%	17%	20%

Table 4-52: *Expect to Rely a Great Deal on Information Sources (by borough)—New York City*

New York City	Zone A	Zone B	Zone C	Non-Surge
Radio	64%	67%	67%	62%
Local Television	64%	63%	66%	65%
CNN	41%	40%	45%	40%
The Weather Channel®	57%	56%	61%	55%
Other TV	42%	38%	43%	40%
Internet	22%	20%	20%	22%
www.nyc.gov	17%	18%	20%	18%
Phone Calls from Officials	20%	21%	20%	18%

Table 4-53: *Expect to Rely a Great Deal on Information Sources (by risk area)—New York City*

***Nassau County**:* Local television stations were relied upon most, followed by TWC and local radio. Between 38% and 44% said they would rely a great deal on AM 1620. Between 25% and 35% said they would rely a great deal on the internet, which would be higher than reported in actual hurricane evacuations. Up to 48% said they would rely a great deal on phone calls from local officials. Table 4-54 indicates the percentage of respondents who said they would rely a great deal on the respective sources of information.

Nassau County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Radio	59%	62%	58%	71%
Local Television	63%	67%	67%	77%
CNN	50%	48%	44%	60%
The Weather Channel®	66%	63%	63%	75%
Other TV	48%	48%	51%	62%
Internet	35%	26%	25%	29%
County Website	23%	23%	7%	10%
Word of Mouth	26%	23%	14%	21%
AM 1620	38%	41%	44%	39%
Phone Calls from Officials	41%	48%	28%	39%

Table 4-54: *Expect to Rely a Great Deal on Information Sources (by risk area)—Nassau County*

Suffolk County: Local television stations were relied upon most followed by TWC and local radio stations. Between 32% and 43% said they would rely a great deal on AM 1620. Between 27% and 37% said they would rely a great deal on the internet, which would be higher than reported in actual hurricane evacuations. Up to 42% said they would rely a great deal on phone calls from local officials. Table 4-55 indicates the percentage of respondents who said they would rely a great deal on the respective sources of information.

Suffolk County	Category 1 Risk Zones	Category 2 Risk Zones	Category 3-4 Risk Zones	Non-Surge Zones
Radio	61%	66%	68%	71%
Local Television	67%	77%	64%	77%
CNN	59%	59%	45%	60%
The Weather Channel®	72%	77%	83%	75%
Other TV	55%	63%	55%	62%
Internet	27%	37%	30%	29%
County Website	21%	20%	17%	10%
Word of Mouth	17%	17%	15%	21%
AM 1620	39%	32%	43%	39%
Phone Calls from Officials	35%	30%	42%	39%

Table 4-55: *Expect to Rely a Great Deal on Information Sources (by risk area)—Suffolk County*

Westchester County: Most people said they would depend on local television and TWC, although they also expect to rely heavily on local radio and other cable stations, including CNN. Anticipated internet usage is higher than observed in actual hurricane threats in other locations. Table 4-56 indicates the percentage of respondents who said they would rely a great deal on the respective sources of information.

Westchester County	Sound 1-2 Risk Zones	Sound 3-4 Risk Zones	Hudson 1-4 Risk Zones	Non-Surge Zones
Local Radio	52%	48%	57%	60%
Local Television	54%	61%	68%	63%
CNN	42%	40%	43%	45%
The Weather Channel®	59%	64%	63%	61%
Other Cable	42%	56%	48%	55%
Internet (any site)	35%	27%	22%	27%
Town Website	17%	13%	7%	15%
Westchester.gov	16%	14%	13%	24%
Friends and Relatives	13%	19%	18%	11%

Table 4-56: *Expect to Rely a Great Deal on Information Sources (by risk area)—Westchester County*