

**ATTACHMENT 4A
HAZUS- GLORIA
HISTORICAL HURRICANE
MODEL**

HAZUS-MH: Hurricane Event Report

Region Name: Patchogue - hurricane

Hurricane Scenario: GLORIA

Print Date: Tuesday, February 22, 2005

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using HAZUS loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific Hurricane. These results can be improved by using enhanced inventory data.

Quick Assessment Report

February 22, 2005

Regional Statistics

Area (Square Miles)	2
Number of Census Tracts	2
Number of Buildings	
Residential (x 1000)	2
Total (x 1000)	2
Number of People in the Region (x 1000)	11
Building Exposure (\$ Millions)	
Residential	574
Total	746

Scenario Results

Peak Gust Wind Speed (mph) 125

Number of Buildings Damaged

<i>Occupancy</i>	<i>Minor</i>	<i>Moderate</i>	<i>Severe</i>	<i>Destruction</i>	<i>Total</i>
Residential	901	842	309	163	2,215
Other	19	28	24	1	71
Total	920	870	333	163	2,286

Shelter Requirements

Displaced Households (# Households) 571

Short Term Shelter (# People) 145

Economic Loss

Residential Property (Capital Stock) Losses (\$Millions)	117.2
Total Property (Capital Stock) Losses (\$ Millions)	151.4
Business Interruptions (Income) Losses (\$ Millions)	29.8

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Study Region : Patchogue - hurricane
Scenario : GLORIA

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General Description of the Region

HAZUS is a regional multi-hazard loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of HAZUS is to provide a methodology and software application to develop multi-hazard losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from multi-hazards and to prepare for emergency response and recovery.

The hurricane loss estimates provided in this report are based on a region that includes 1 county(ies) from the following state(s):

- New York

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 2.35 square miles and contains 2 census tracts. There are over 4 thousand households in the region and has a total population of 11,943 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 2 thousand buildings in the region with a total building replacement value (excluding contents) of 747 million dollars (2002 dollars). Approximately 97% of the buildings (and 77% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

HAZUS estimates that there are 2,819 buildings in the region which have an aggregate total replacement value of 747 million (2002 dollars). Table 1 presents the relative distribution of the value with respect to the general occupancies. Appendix B provides a general distribution of the building value by State and County.

Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure (\$1000)	Percent of Total
Residential	574,568	76.9%
Commercial	131,303	17.6%
Industrial	13,505	1.8%
Agricultural	621	0.1%
Religious	14,129	1.9%
Government	2,975	0.4%
Education	9,891	1.3%
Total	746,992	100.0%

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 6 schools, 1 fire stations, 2 police stations and no emergency operation facilities.

Hurricane Scenario

HAZUS used the following set of information to define the hurricane parameters for the hurricane loss estimate provided in this report.

Scenario Name:	GLORIA
Type:	Historic
Max Peak Gust in Study Region:	125 mph

Building Damage

General Building Stock Damage

HAZUS estimates that about 1,367 buildings will be at least moderately damaged. This is over 48% of the total number of buildings in the region. There are an estimated 163 buildings that will be completely destroyed. The definition of the 'damage states' is provided in Volume 1: Chapter 6 of the HAZUS Hurricane technical manual. Table 2 below summarizes the expected damage by general occupancy for the buildings in the region. Table 3 summarizes the expected damage by general building type.

Table 2: Expected Building Damage by Occupancy

Occupancy	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	15	19.94	16	20.98	24	31.56	21	26.91	0	0.62
Education	0	19.91	0	19.22	0	31.74	0	28.94	0	0.19
Government	0	20.32	0	18.98	1	31.32	1	29.30	0	0.08
Industrial	1	20.92	1	17.86	1	30.49	1	29.93	0	0.80
Religion	1	18.47	2	26.33	2	32.10	1	22.40	0	0.70
Residential	514	18.84	901	33.02	842	30.86	309	11.32	163	5.97
Total	532		920		870		333		163	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	8	17.22	7	15.18	18	37.96	14	29.64	0	0.00
Masonry	77	16.41	103	21.85	187	39.63	90	19.17	14	2.94
MH	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	10	20.30	7	15.11	15	31.64	15	32.61	0	0.34
Wood	448	19.90	832	36.94	616	27.35	209	9.30	147	6.52

Essential Facility Damage

Before the hurricane, the region had no hospital beds available for use. On the day of the hurricane, the model estimates that 0 hospital beds (0%) are available for use. After one week, none of the beds will be in service. By 30 days, none will be operational.

Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		Expected Loss of Use < 1 day
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	
Fire Stations	1	1	0	0
Police Stations	2	2	0	0
Schools	6	6	0	0

Induced Hurricane Damage

Debris Generation

HAZUS estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into three general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, and c) Trees. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 22,469 tons of debris will be generated. Of the total amount, Brick/Wood comprises 89% of the total, Reinforced Concrete/Steel comprises of 2% of the total, with the remainder being Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 823 truckloads (@25 tons/truck) to remove the debris generated by the hurricane.

Social Impact

Shelter Requirement

HAZUS estimates the number of households that are expected to be displaced from their homes due to the hurricane and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 571 households to be displaced due to the hurricane. Of these, 145 people (out of a total population of 11,943) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 181.2 million dollars, which represents 24.26 % of the total replacement value of the region's buildings.

Building-Related Losses

The building related losses are broken into two categories: direct property damage losses and business interruption losses. The direct property damage losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the hurricane. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the hurricane.

The total property damage losses were 181 million dollars. 3% of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 74% of the total loss. Table 4 below provides a summary of the losses associated with the building damage.

Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
<u>Property Damage</u>						
	Building	85,832.23	15,292.98	1,790.87	2,943.15	105,859.23
	Content	31,414.21	10,102.81	1,622.63	2,073.88	45,213.52
	Inventory	0.00	211.42	125.44	5.15	342.01
	Subtotal	117,246.44	25,607.21	3,538.94	5,022.18	151,414.77
<u>Business Interruption Loss</u>						
	Income	19.88	2,787.59	19.38	37.62	2,864.48
	Relocation	11,615.96	2,877.54	209.94	719.87	15,423.31
	Rental	5,867.40	1,733.00	40.11	53.65	7,694.17
	Wage	46.94	3,532.21	32.98	216.87	3,829.00
	Subtotal	17,550.18	10,930.34	302.42	1,028.02	29,810.95
Total	Total	134,796.62	36,537.55	3,841.36	6,050.20	181,225.73

Appendix A: County Listing for the Region

New York
- Suffolk

Appendix B: Regional Population and Building Value Data

	Building Value (thousands of dollars)			Total
	Population	Residential	Non-Residential	
New York				
Suffolk	11,943	574,568	172,424	746,992
Total State	11,943	574,568	172,424	746,992
Total Study Region	11,943	574,568	172,424	746,992