Hazus: Flood Global Risk Report

Region Name: Lyme

Flood Scenario: LymeAllRiverine

Print Date: Wednesday, January 8, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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 Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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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 (FEMA) and the National Institute of Building Sciences (NIBS). 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 flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is approximately 34 square miles and contains 190 census blocks. The region contains over 1 thousand households and has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,311 buildings in the region with a total building replacement value (excluding contents) of 418 million dollars. Approximately 92.45% of the buildings (and 91.41% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	382,199	91.4%
Commercial	19,444	4.7%
Industrial	5,824	1.4%
Agricultural	2,495	0.6%
Religion	3,401	0.8%
Government	2,713	0.6%
Education	2,017	0.5%
Total	**418,093**	**100%**

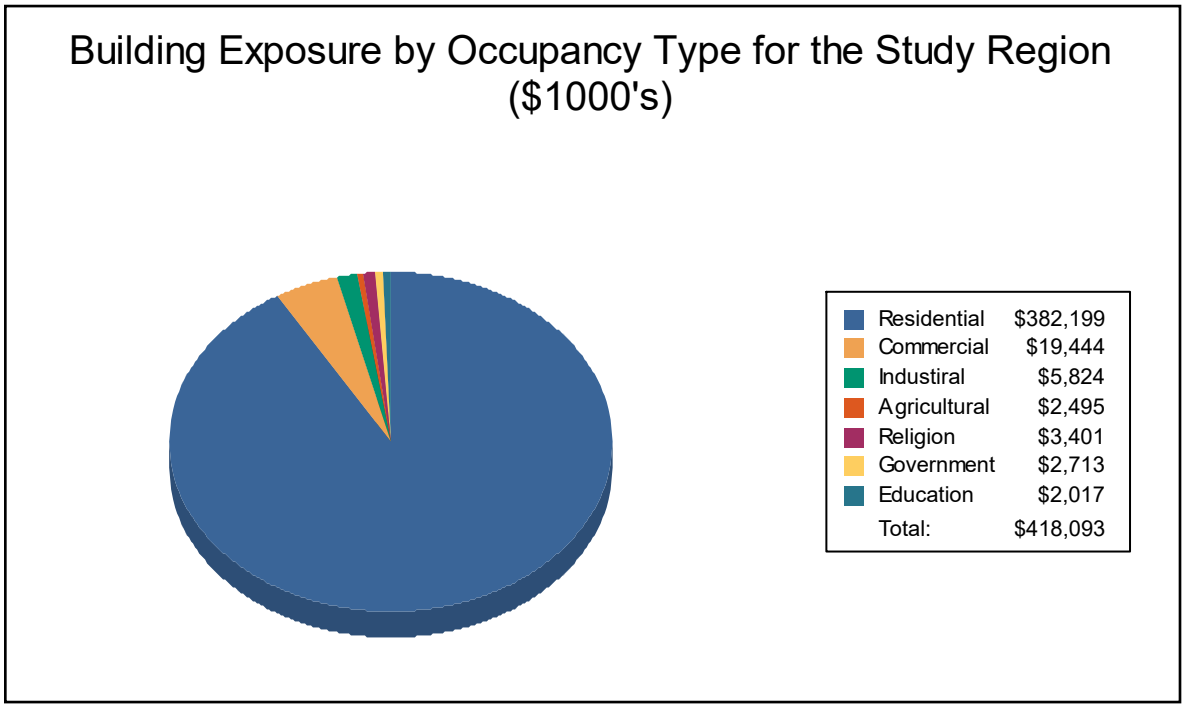
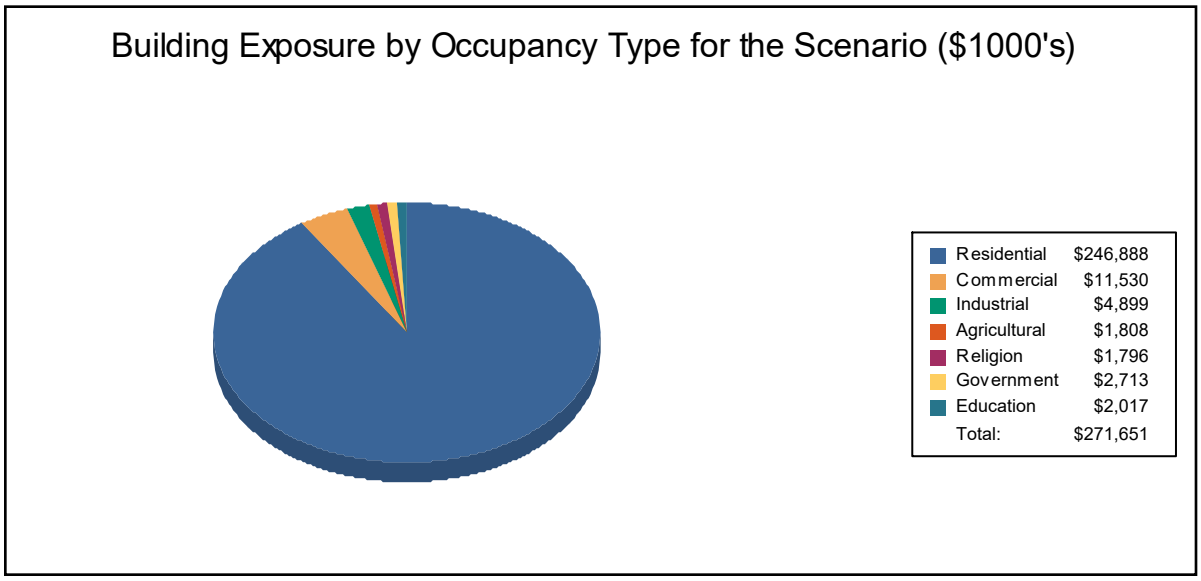


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	246,888	90.9%
Commercial	11,530	4.2%
Industrial	4,899	1.8%
Agricultural	1,808	0.7%
Religion	1,796	0.7%
Government	2,713	1.0%
Education	2,017	0.7%
Total	**271,651**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 1 school, 3 fire stations, no police stations and 1 emergency operation center.

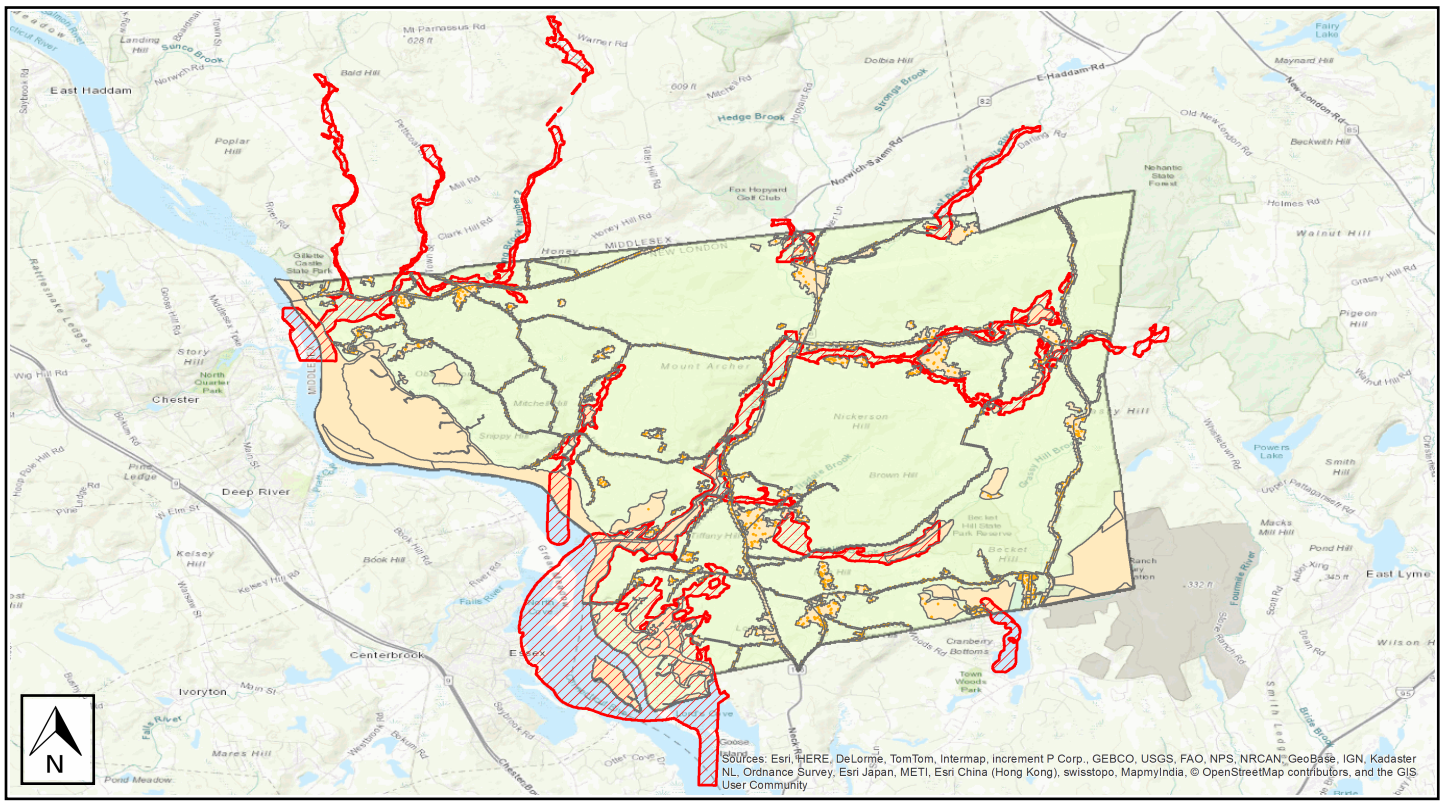
Flood Scenario Parameters

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

Study Region Name:	Lyme
Scenario Name:	LymeAllRiverine
Return Period Analyzed:	10
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 2 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

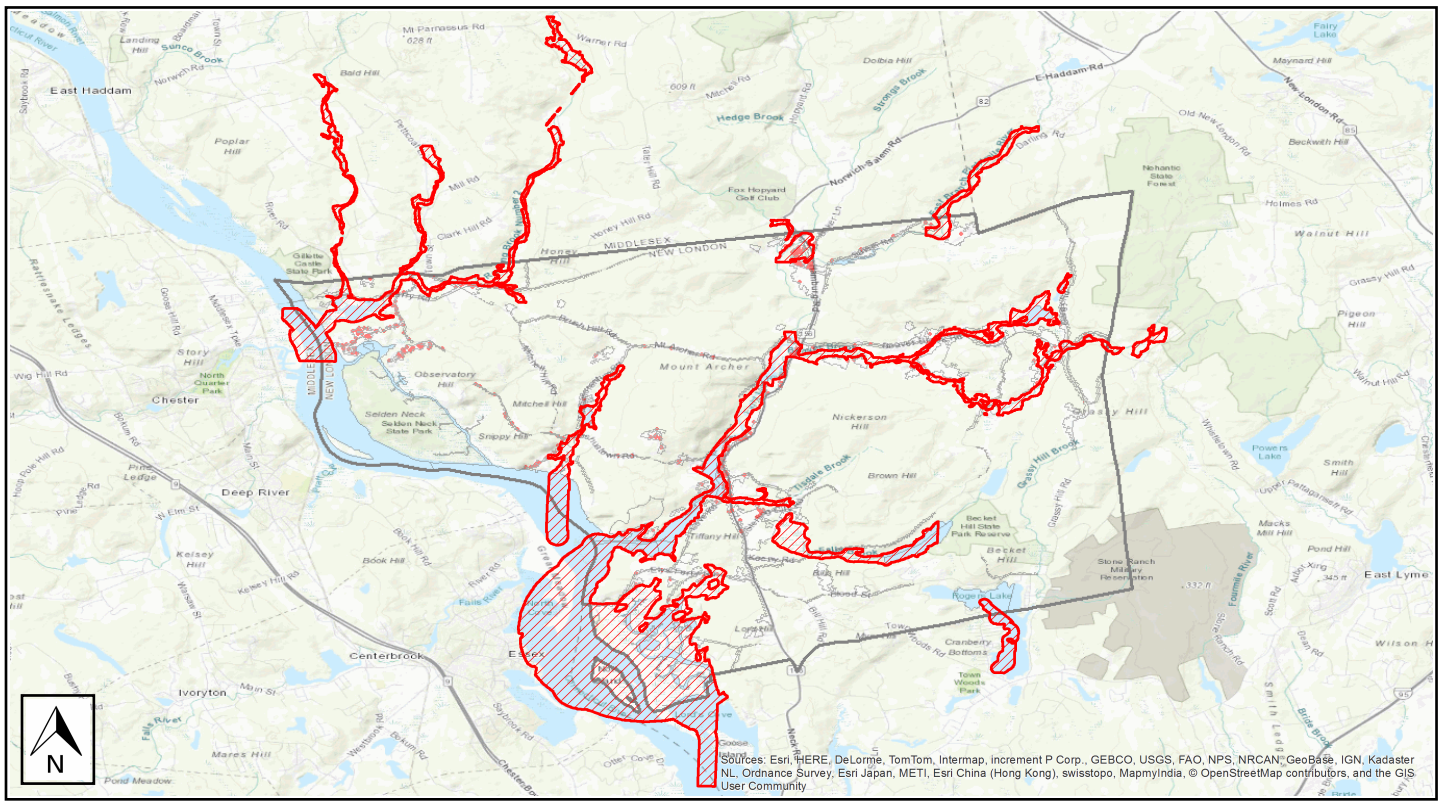


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	5	71	2	29	0	0	0	0	0	0	0	0
Total	**5**		**2**		**0**		**0**		**0**		**0**	

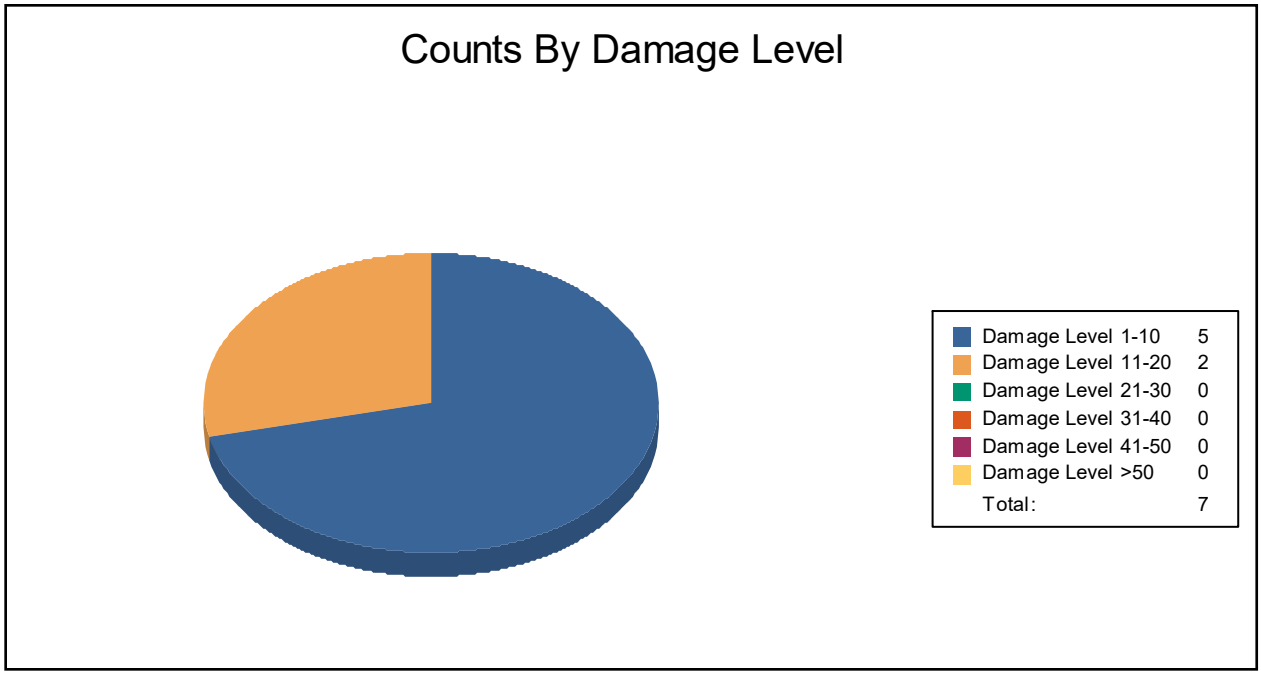


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	5	71	2	29	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	3	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

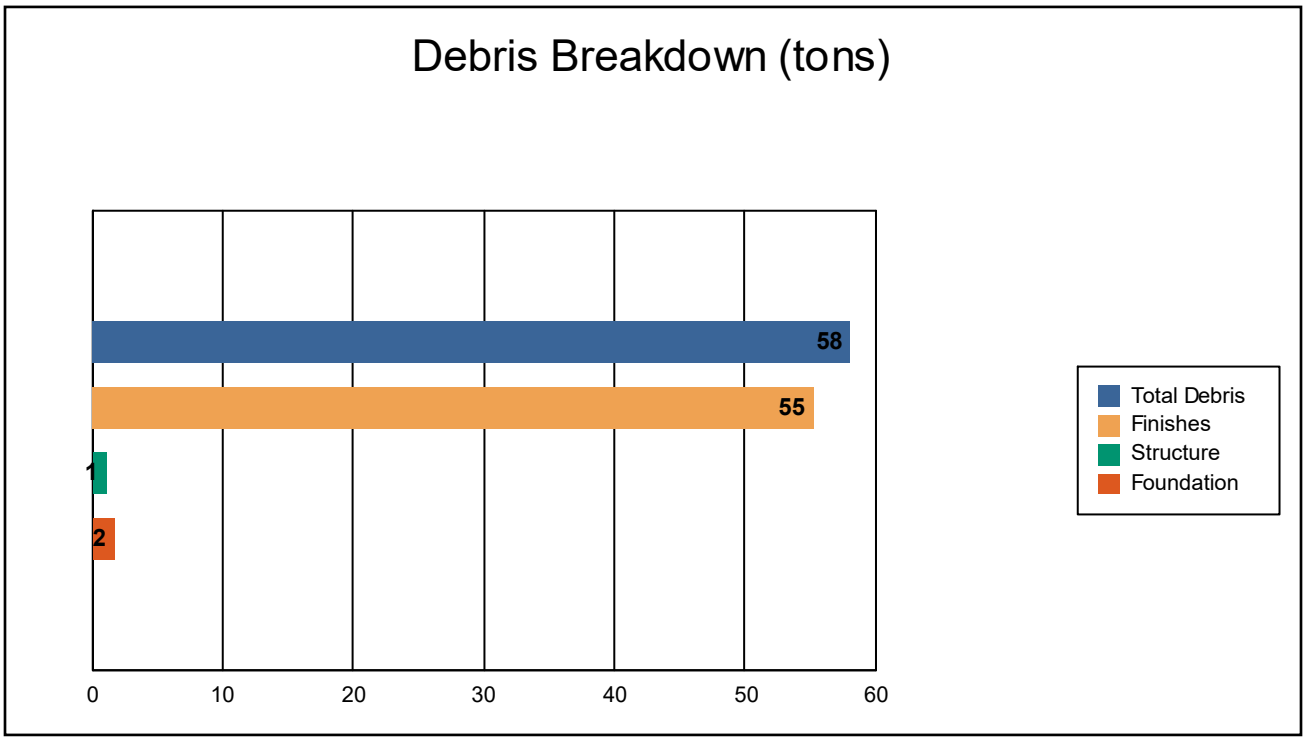
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

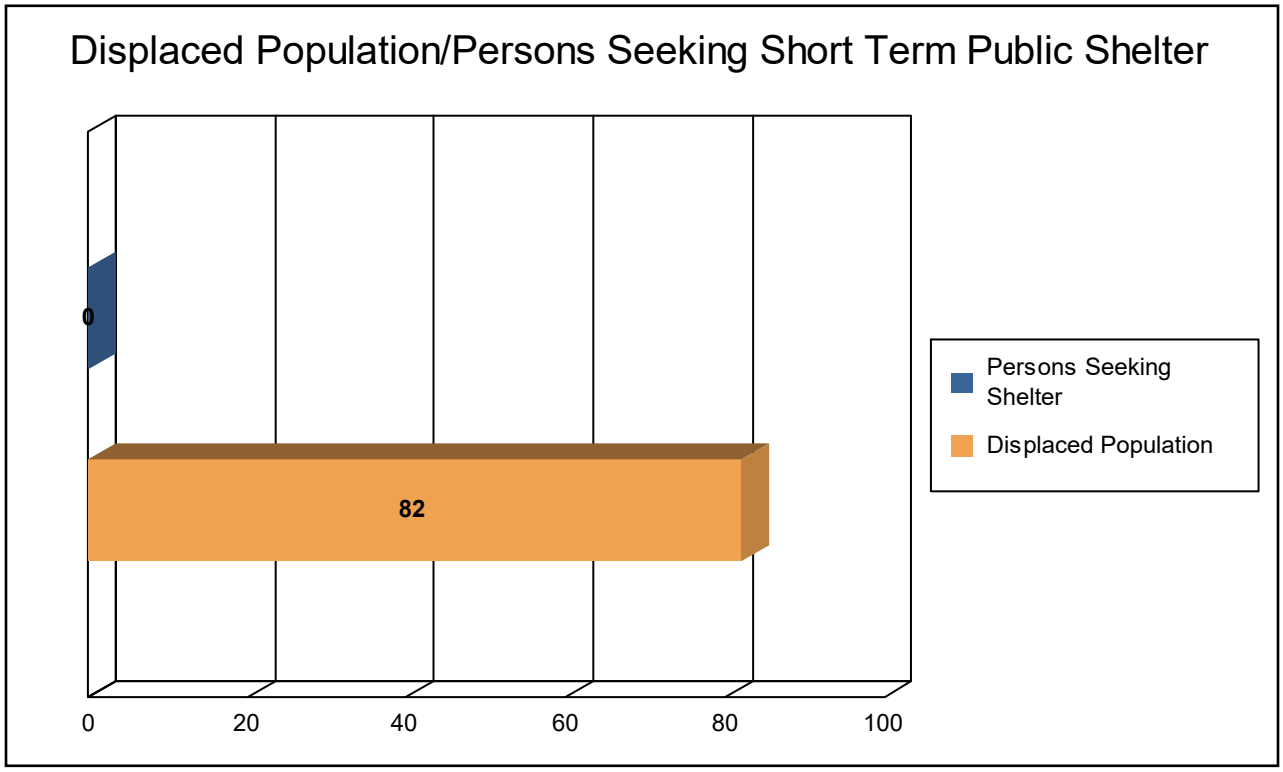


The model estimates that a total of 58 tons of debris will be generated. Of the total amount, Finishes comprises 95% of the total, Structure comprises 2% of the total, and Foundation comprises 3%. If the debris tonnage is converted into an estimated number of truckloads, it will require 3 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 27 households (or 82 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 4.07 million dollars, which represents 1.50 % of the total replacement value of the scenario buildings.

Building-Related Losses

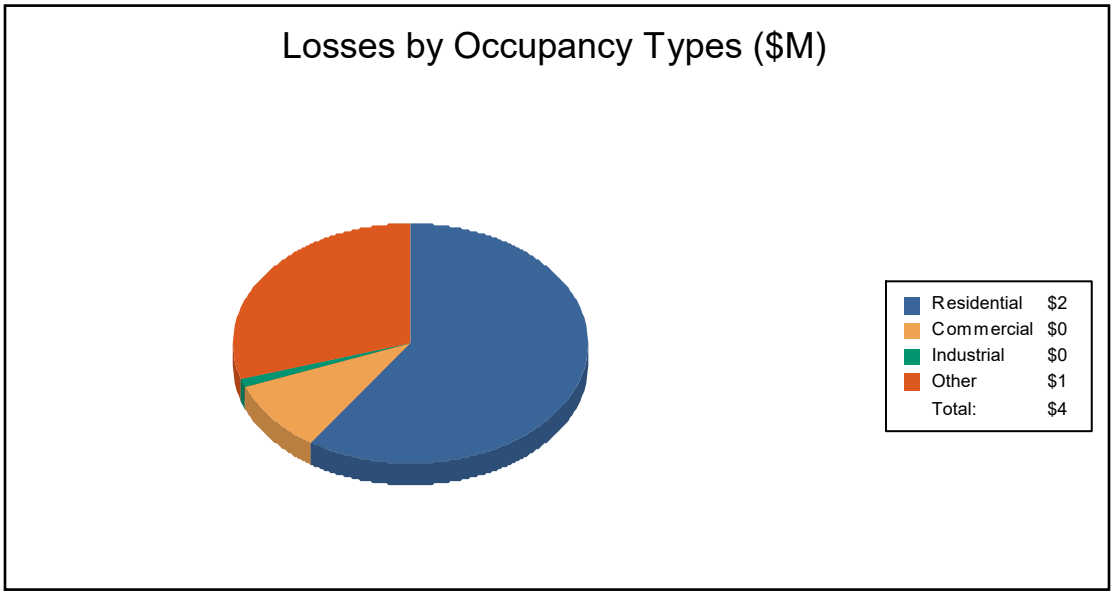
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 2.15 million dollars. 47% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 59.32% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.26	0.03	0.02	0.03	1.34
	Content	0.51	0.10	0.02	0.18	0.81
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**1.77**	**0.13**	**0.05**	**0.21**	**2.15**
Business Interruption						
	Income	0.01	0.17	0.00	0.11	0.28
	Relocation	0.49	0.01	0.00	0.06	0.56
	Rental Income	0.13	0.01	0.00	0.01	0.14
	Wage	0.02	0.09	0.00	0.83	0.94
	Subtotal	**0.64**	**0.27**	**0.01**	**1.00**	**1.92**
ALL	**Total**	**2.41**	**0.39**	**0.05**	**1.21**	**4.07**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Total Study Region	**2,406**	**382,199**	**35,894**	**418,093**

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Building Inventory

General Building Stock

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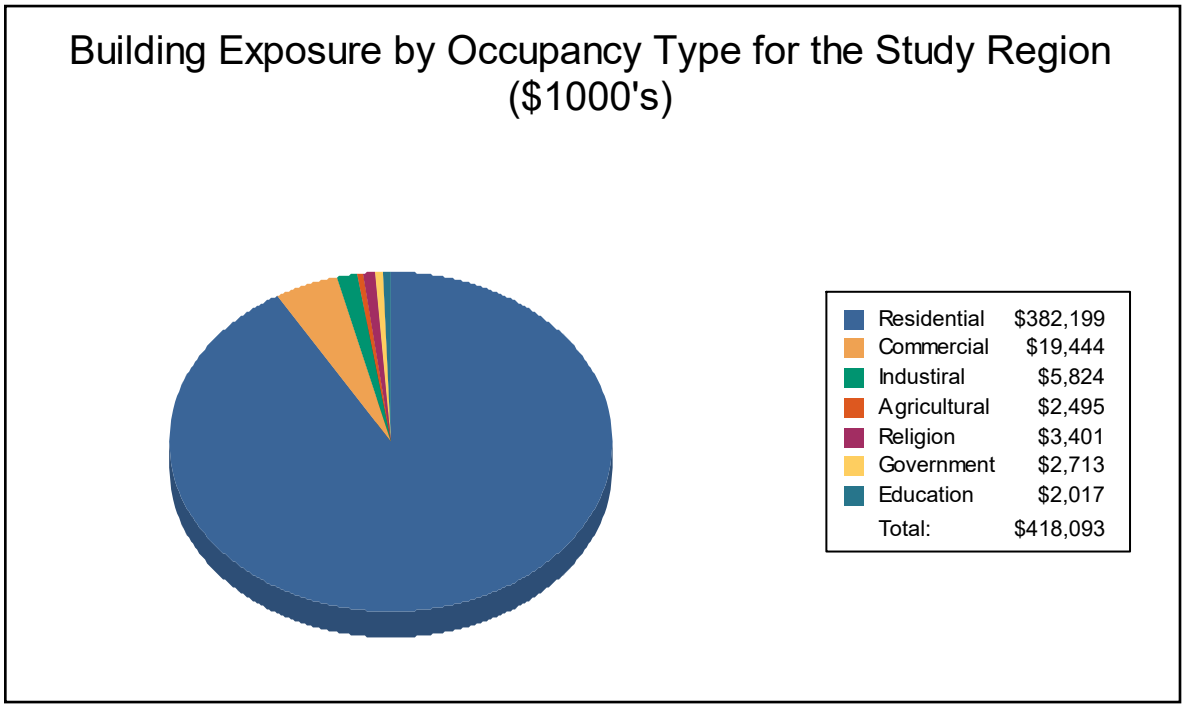

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	246,888	90.9%
Commercial	11,530	4.2%
Industrial	4,899	1.8%
Agricultural	1,808	0.7%
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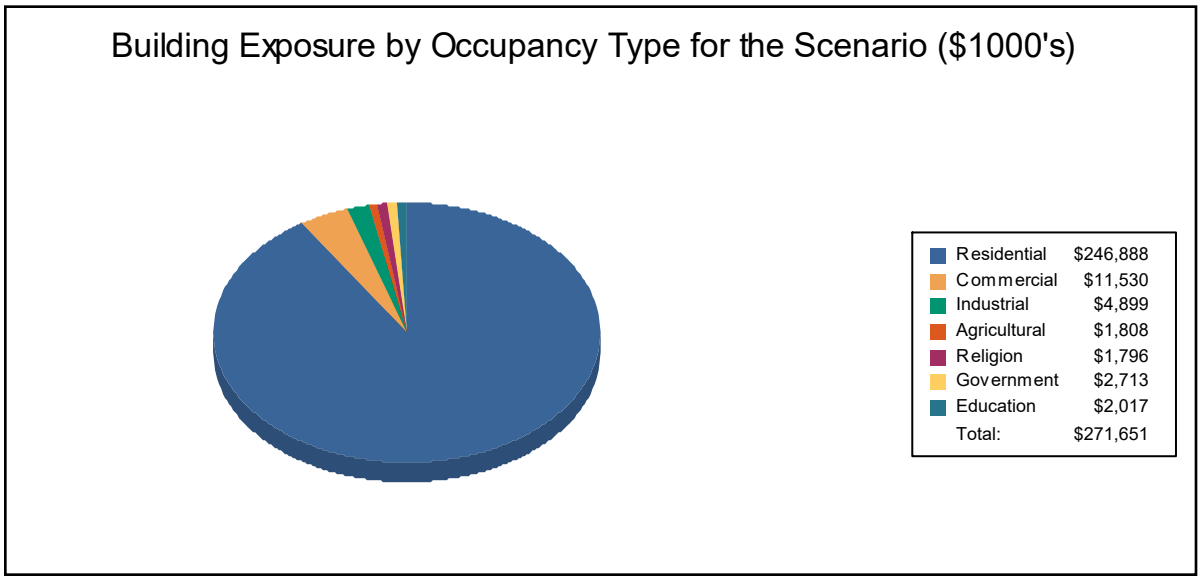


Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 1 school, 3 fire stations, no police stations and 1 emergency operation center.

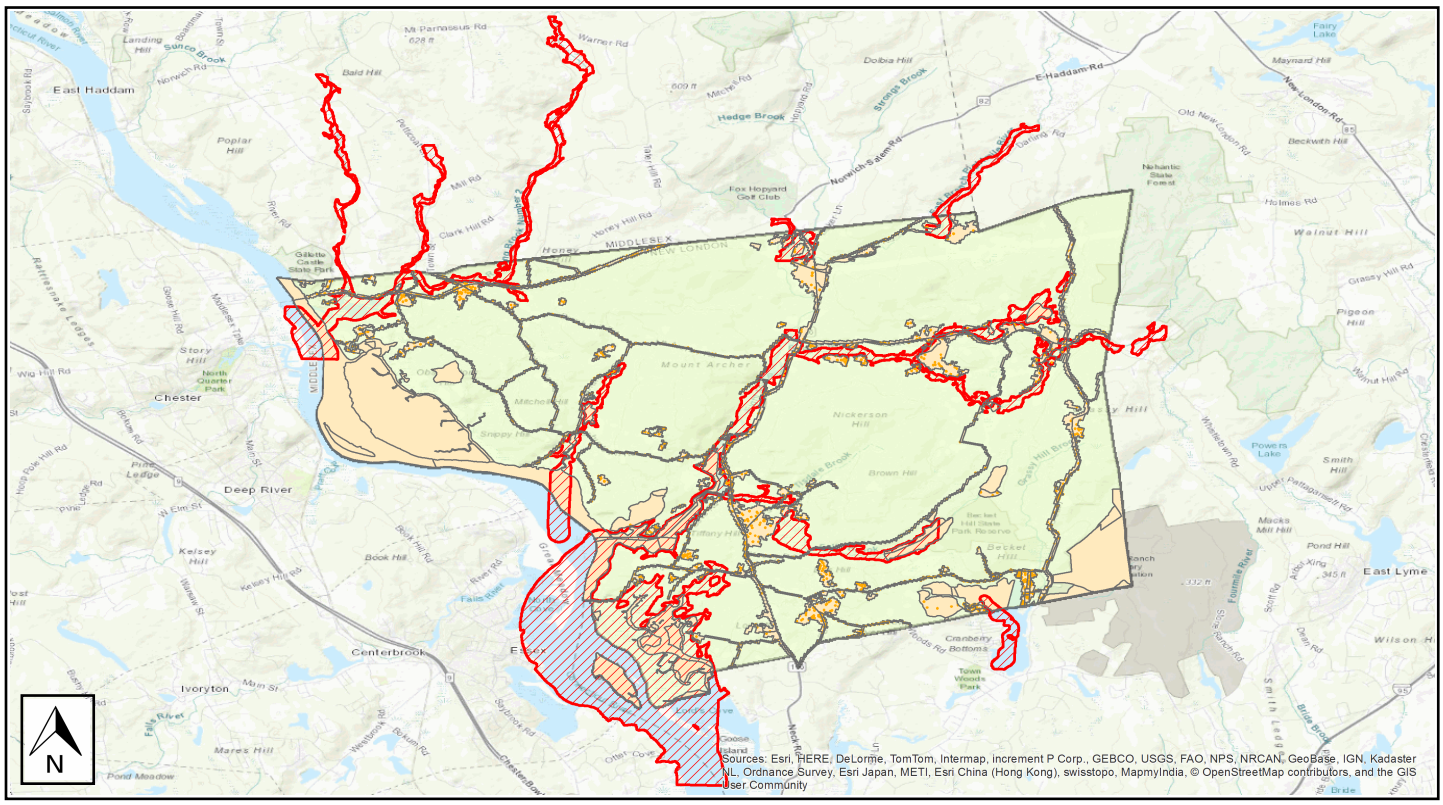
Flood Scenario Parameters

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

Study Region Name:	Lyme
Scenario Name:	LymeAllRiverine
Return Period Analyzed:	25
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 4 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

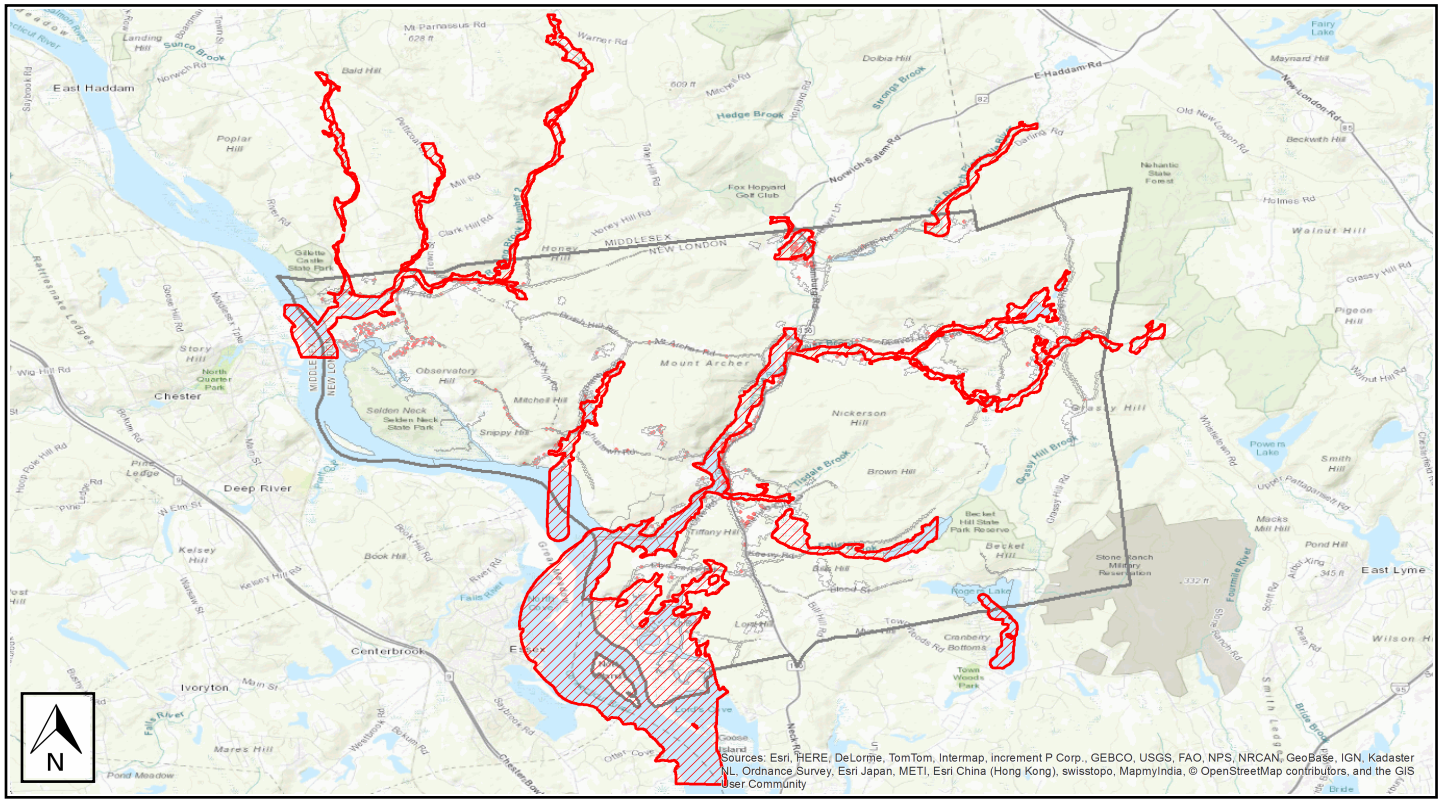


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	4	50	4	50	0	0	0	0	0	0	0	0
Total	**4**		**4**		**0**		**0**		**0**		**0**	

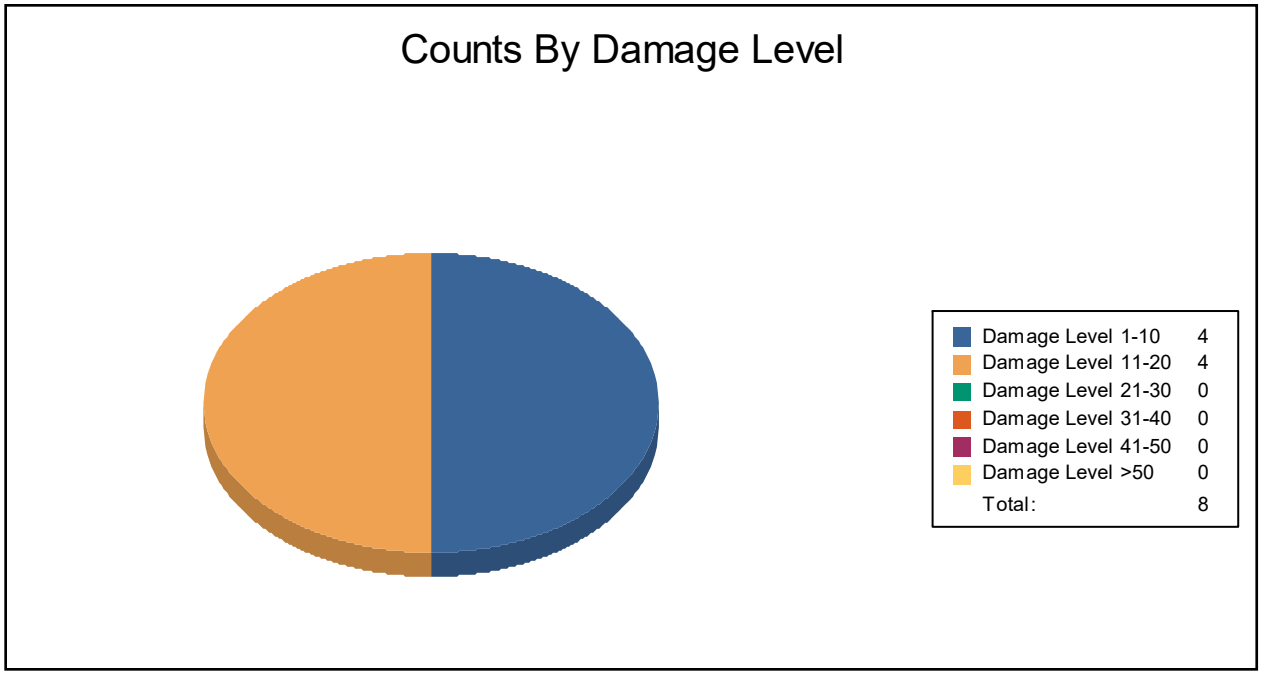


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	4	50	4	50	0	0	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	3	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

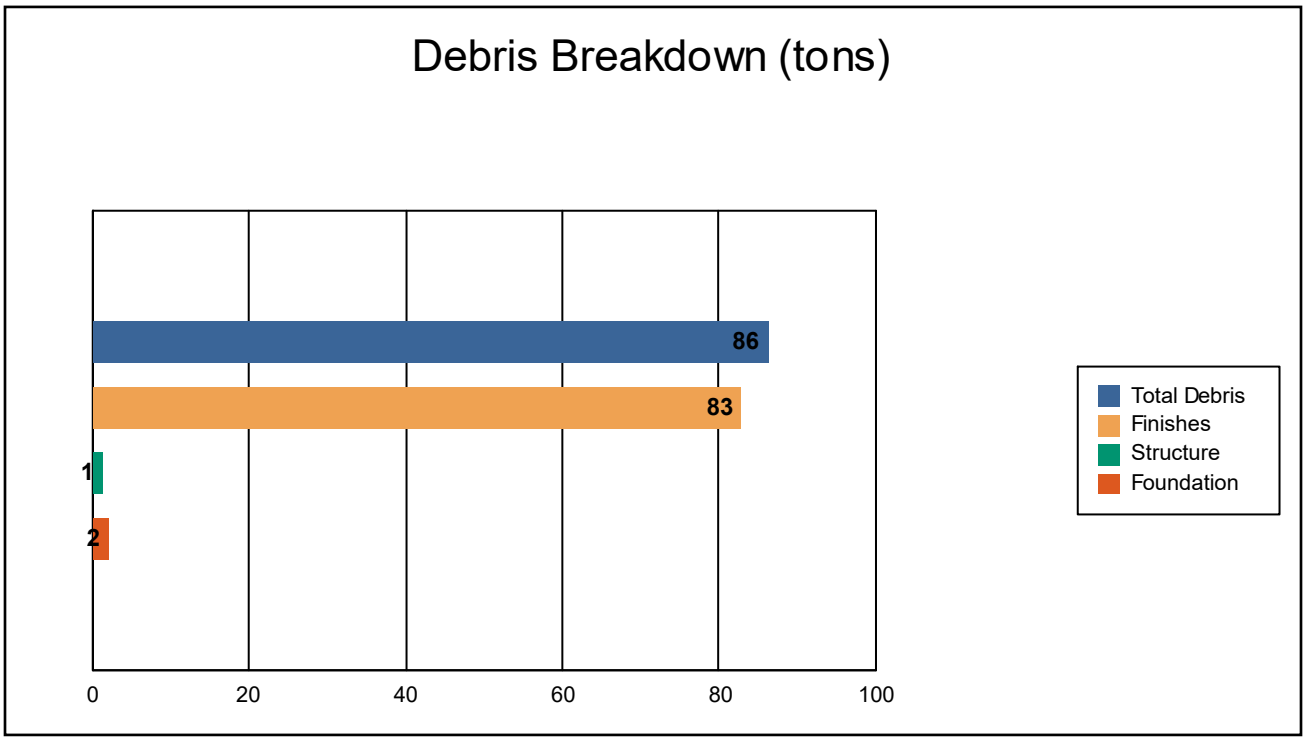
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

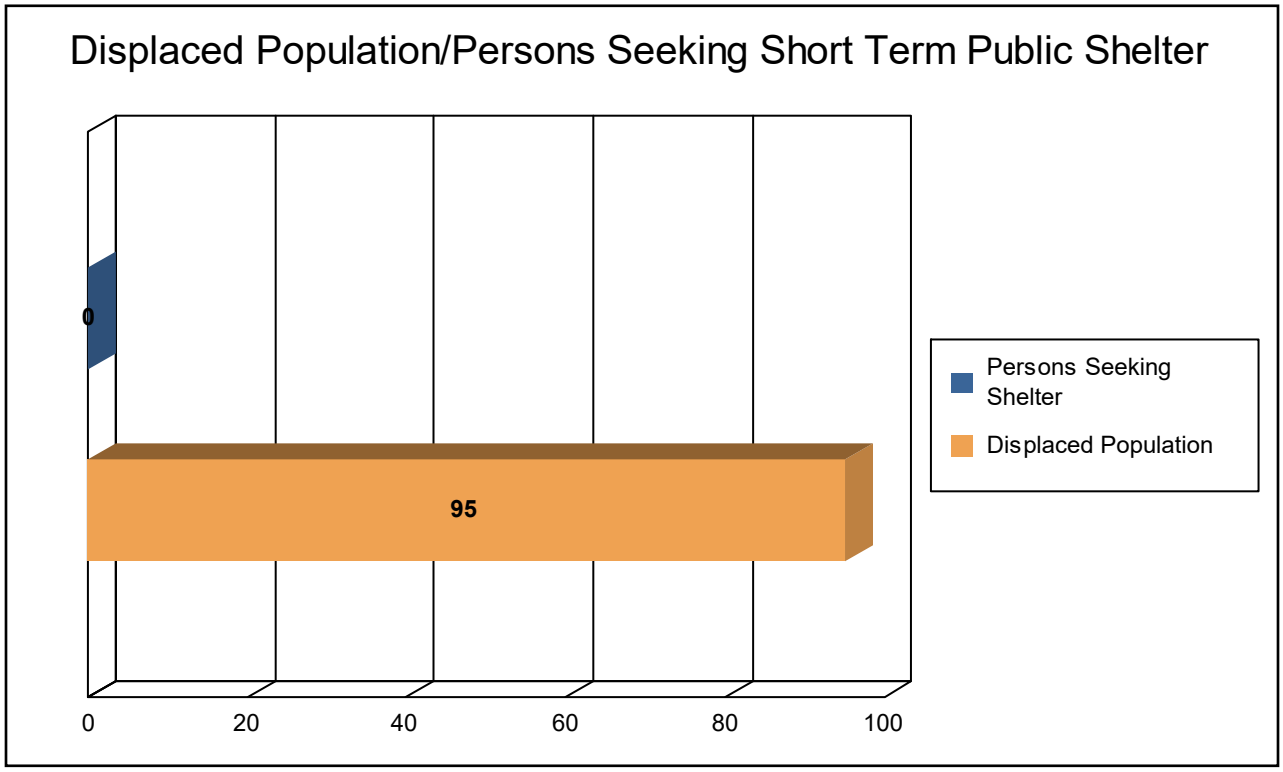


The model estimates that a total of 86 tons of debris will be generated. Of the total amount, Finishes comprises 96% of the total, Structure comprises 2% of the total, and Foundation comprises 3%. If the debris tonnage is converted into an estimated number of truckloads, it will require 4 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 32 households (or 95 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 4.98 million dollars, which represents 1.83 % of the total replacement value of the scenario buildings.

Building-Related Losses

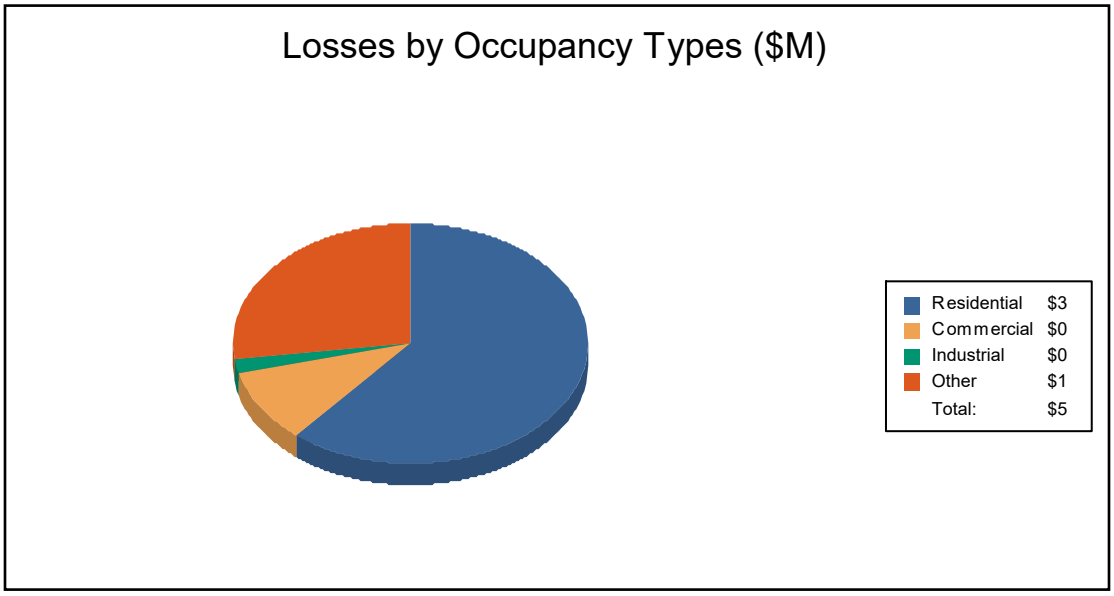
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 2.82 million dollars. 43% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 61.16% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	1.63	0.05	0.04	0.03	1.75
	Content	0.66	0.13	0.04	0.24	1.07
	Inventory	0.00	0.00	0.00	0.00	0.01
	Subtotal	**2.29**	**0.18**	**0.08**	**0.28**	**2.82**
Business Interruption						
	Income	0.01	0.20	0.00	0.12	0.32
	Relocation	0.58	0.01	0.00	0.06	0.65
	Rental Income	0.15	0.01	0.00	0.01	0.17
	Wage	0.02	0.11	0.01	0.89	1.02
	Subtotal	**0.76**	**0.32**	**0.01**	**1.08**	**2.16**
ALL	**Total**	**3.05**	**0.49**	**0.09**	**1.36**	**4.98**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Total Study Region	**2,406**	**382,199**	**35,894**	**418,093**

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Region Name: Lyme

Flood Scenario: LymeAllRiverine

Print Date: Wednesday, January 8, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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 Flood. These results can be improved by using enhanced inventory data and flood hazard information.

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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 (FEMA) and the National Institute of Building Sciences (NIBS). 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 flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is approximately 34 square miles and contains 190 census blocks. The region contains over 1 thousand households and has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,311 buildings in the region with a total building replacement value (excluding contents) of 418 million dollars. Approximately 92.45% of the buildings (and 91.41% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	382,199	91.4%
Commercial	19,444	4.7%
Industrial	5,824	1.4%
Agricultural	2,495	0.6%
Religion	3,401	0.8%
Government	2,713	0.6%
Education	2,017	0.5%
Total	**418,093**	**100%**

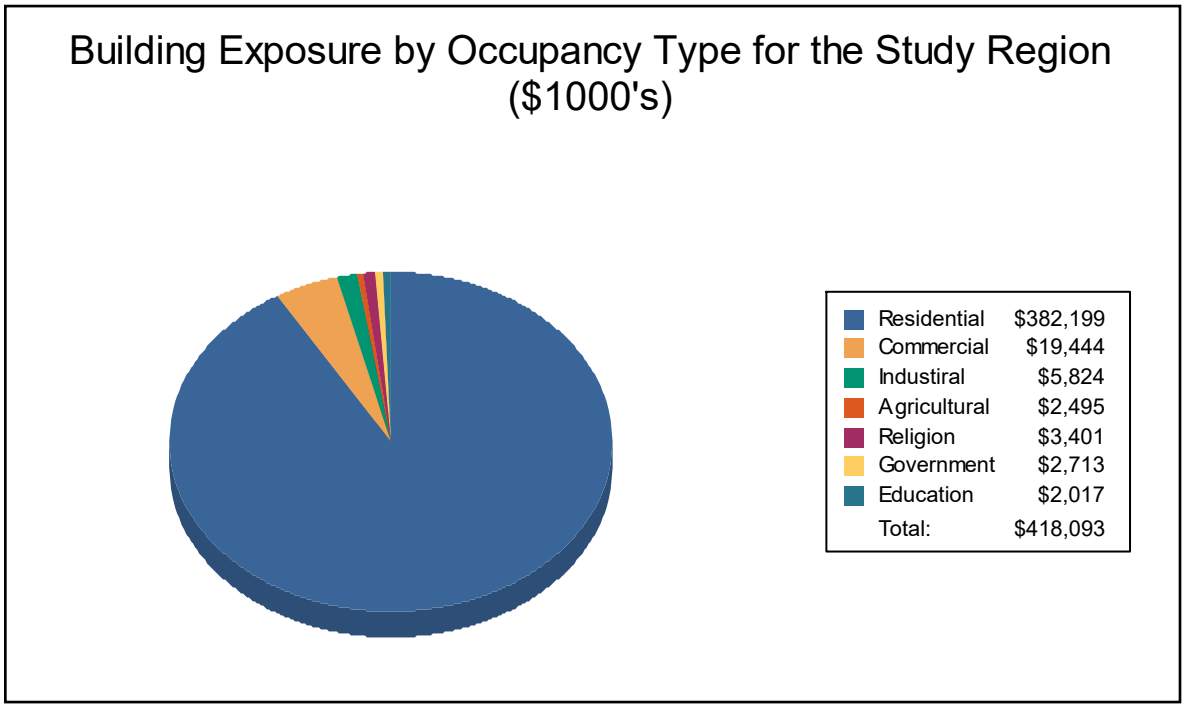
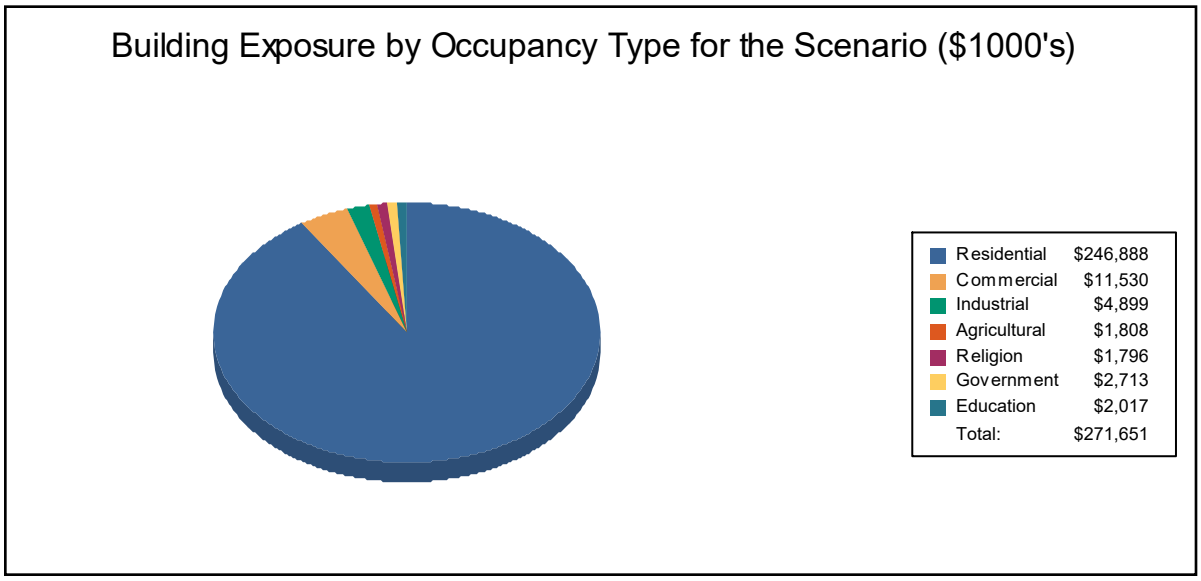


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	246,888	90.9%
Commercial	11,530	4.2%
Industrial	4,899	1.8%
Agricultural	1,808	0.7%
Religion	1,796	0.7%
Government	2,713	1.0%
Education	2,017	0.7%
Total	**271,651**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 1 school, 3 fire stations, no police stations and 1 emergency operation center.

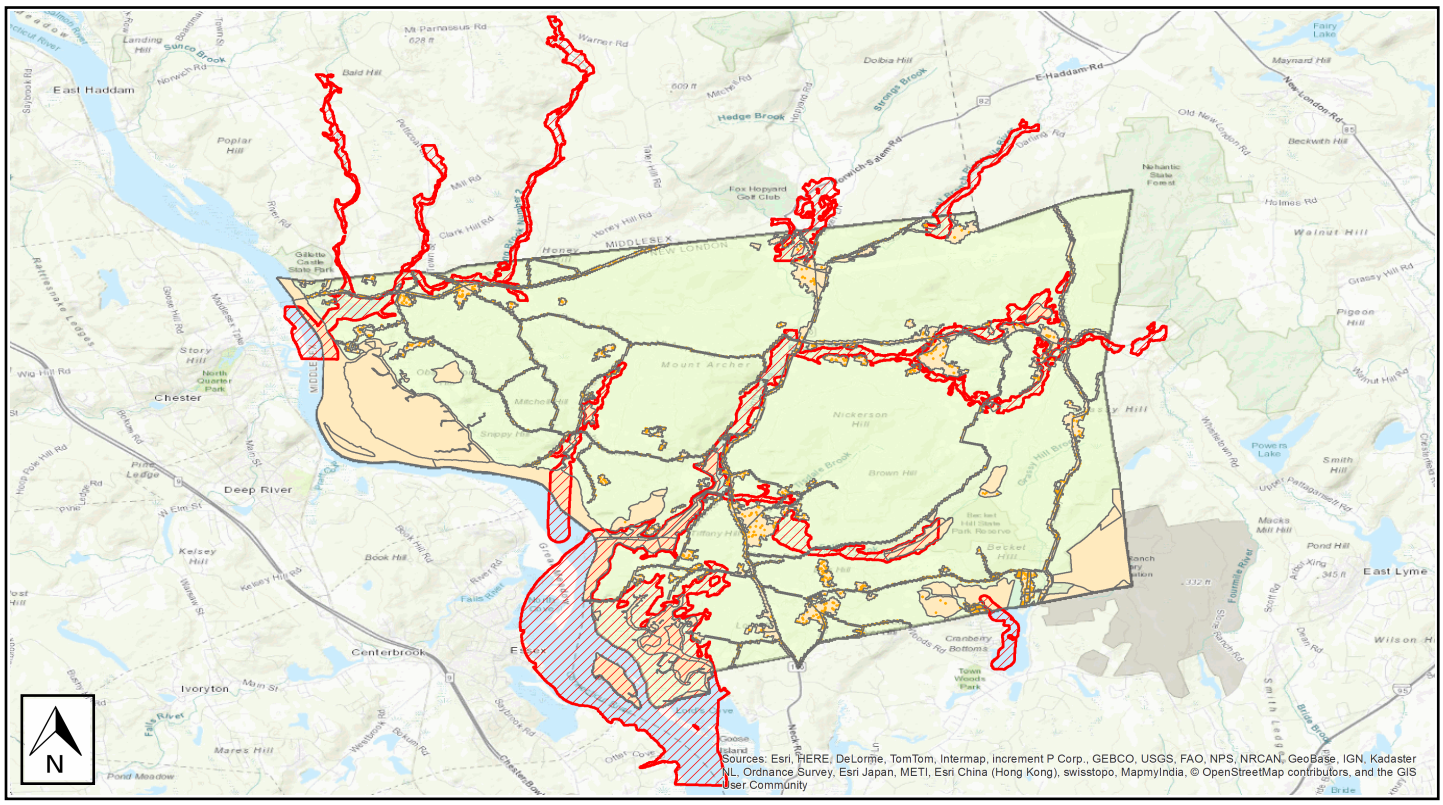
Flood Scenario Parameters

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

Study Region Name:	Lyme
Scenario Name:	LymeAllRiverine
Return Period Analyzed:	50
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 6 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

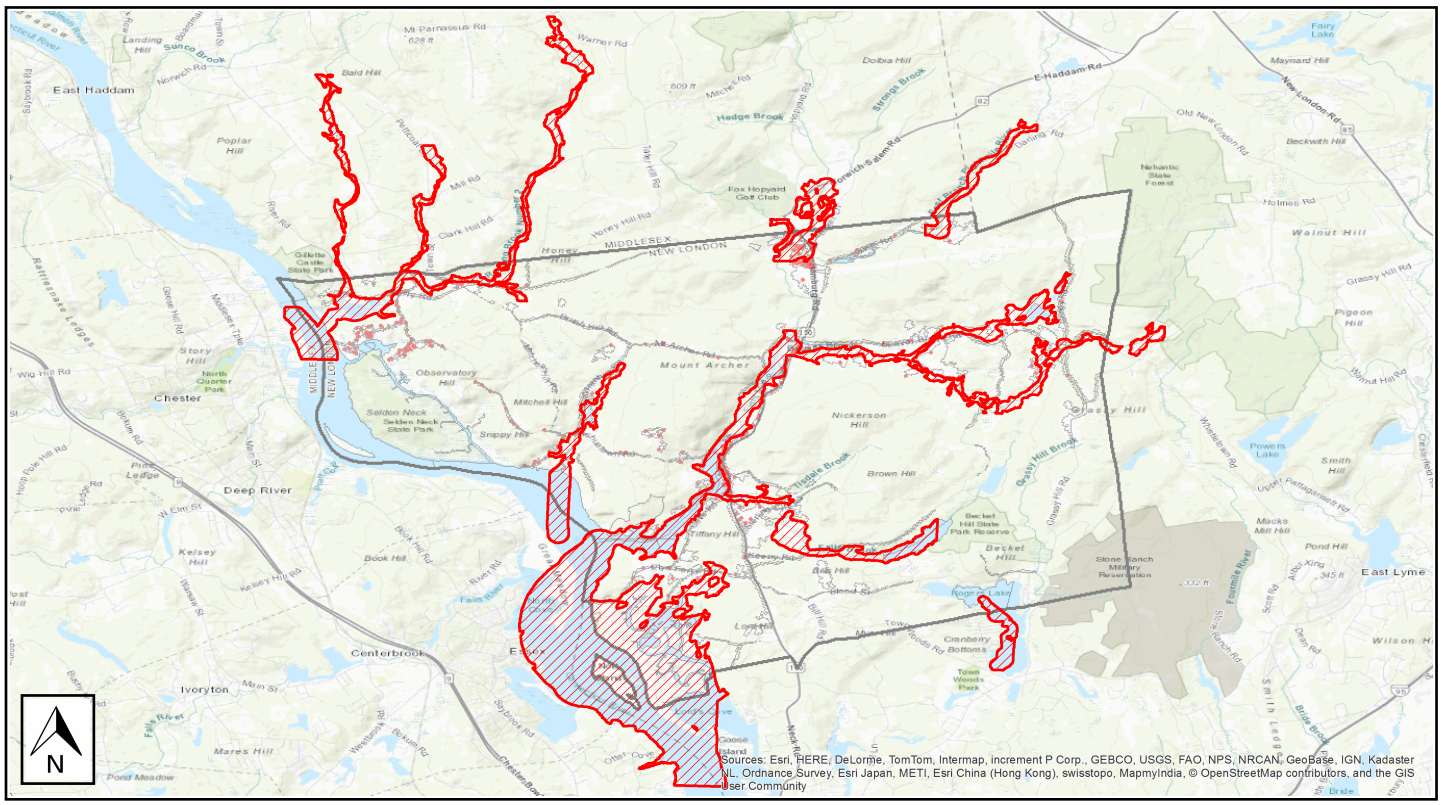


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	5	45	5	45	1	9	0	0	0	0	0	0
Total	**5**		**5**		**1**		**0**		**0**		**0**	

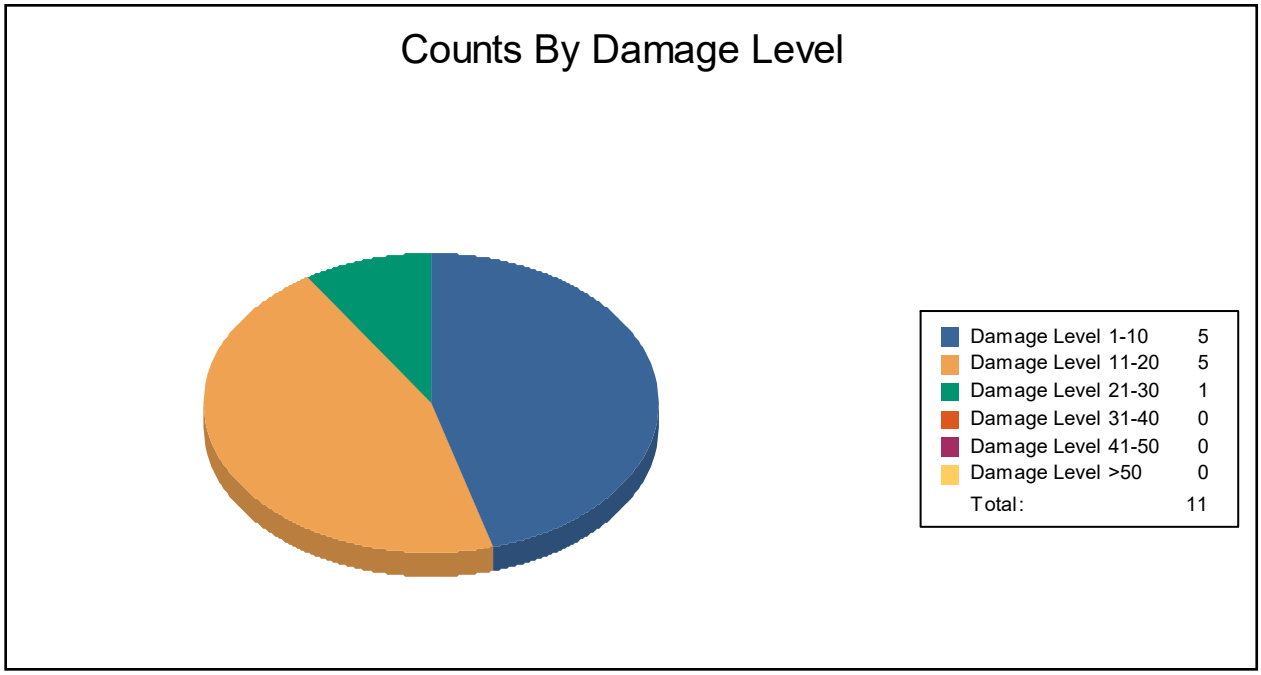


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	5	45	5	45	1	9	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	3	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

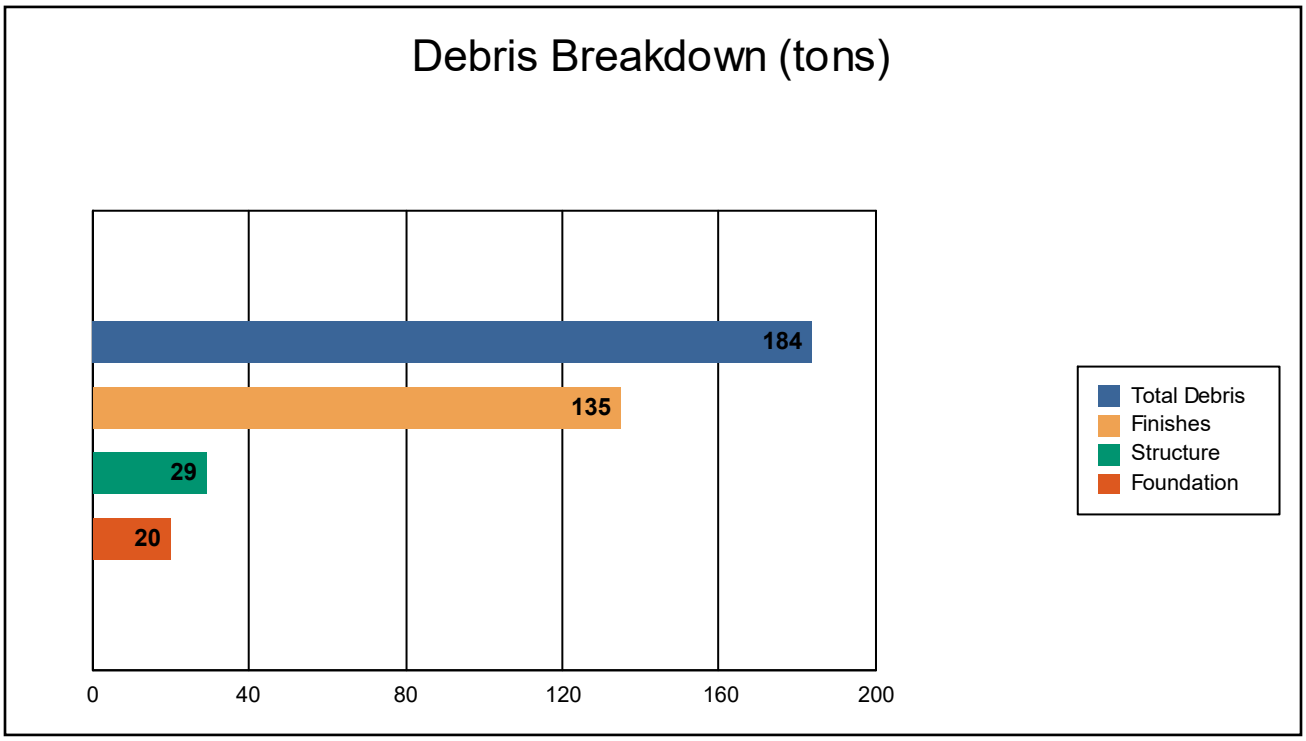
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

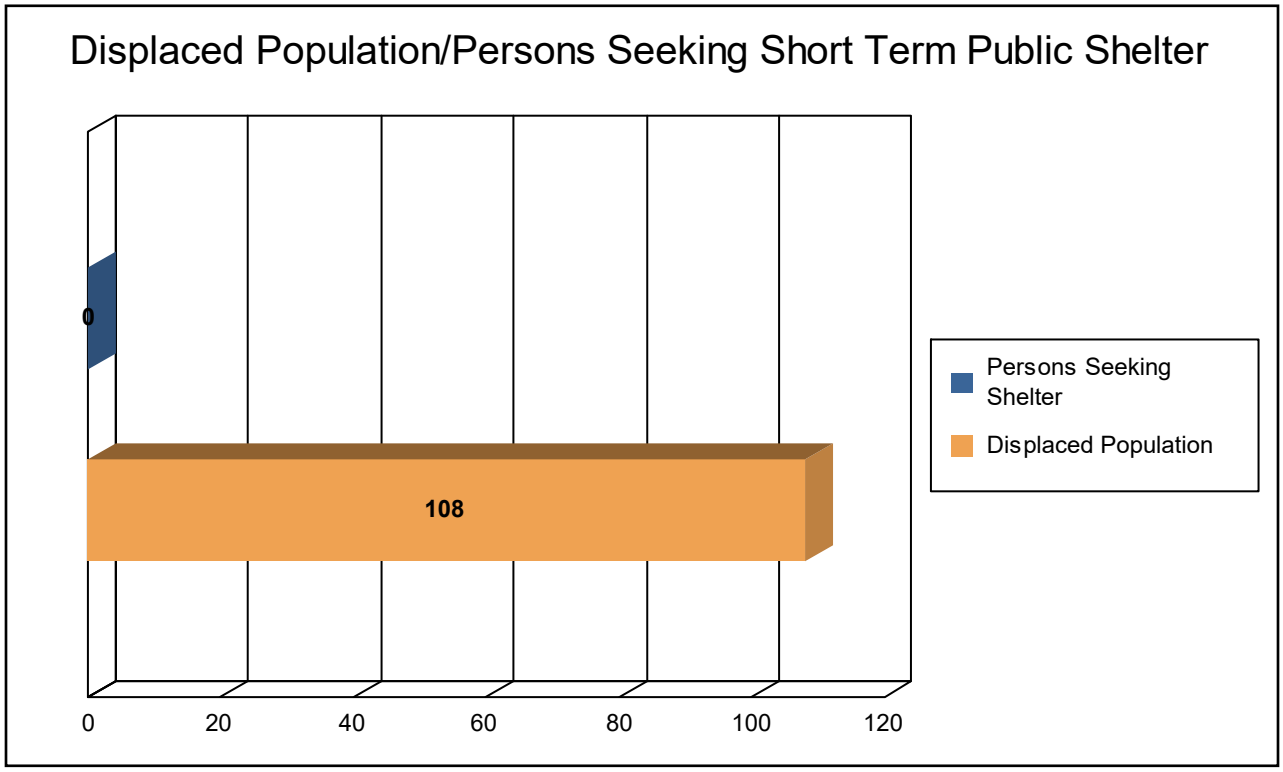


The model estimates that a total of 184 tons of debris will be generated. Of the total amount, Finishes comprises 73% of the total, Structure comprises 16% of the total, and Foundation comprises 11%. If the debris tonnage is converted into an estimated number of truckloads, it will require 8 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 36 households (or 108 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 6.25 million dollars, which represents 2.30 % of the total replacement value of the scenario buildings.

Building-Related Losses

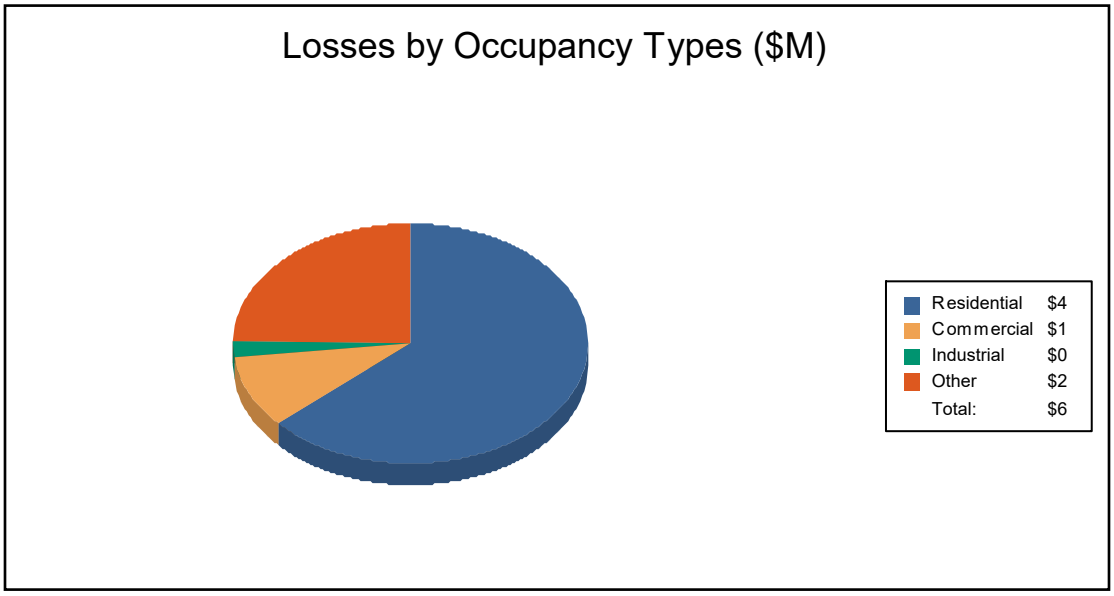
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 3.80 million dollars. 39% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 63.25% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.16	0.07	0.06	0.05	2.33
	Content	0.89	0.18	0.06	0.33	1.45
	Inventory	0.00	0.00	0.01	0.00	0.01
	Subtotal	**3.05**	**0.25**	**0.12**	**0.38**	**3.80**
Business Interruption						
	Income	0.01	0.22	0.00	0.13	0.36
	Relocation	0.69	0.01	0.00	0.07	0.77
	Rental Income	0.19	0.01	0.00	0.01	0.21
	Wage	0.02	0.12	0.01	0.97	1.11
	Subtotal	**0.90**	**0.36**	**0.02**	**1.17**	**2.45**
ALL	**Total**	**3.95**	**0.61**	**0.14**	**1.55**	**6.25**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Total Study Region	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Flood Global Risk Report

Region Name: Lyme

Flood Scenario: LymeAllRiverine

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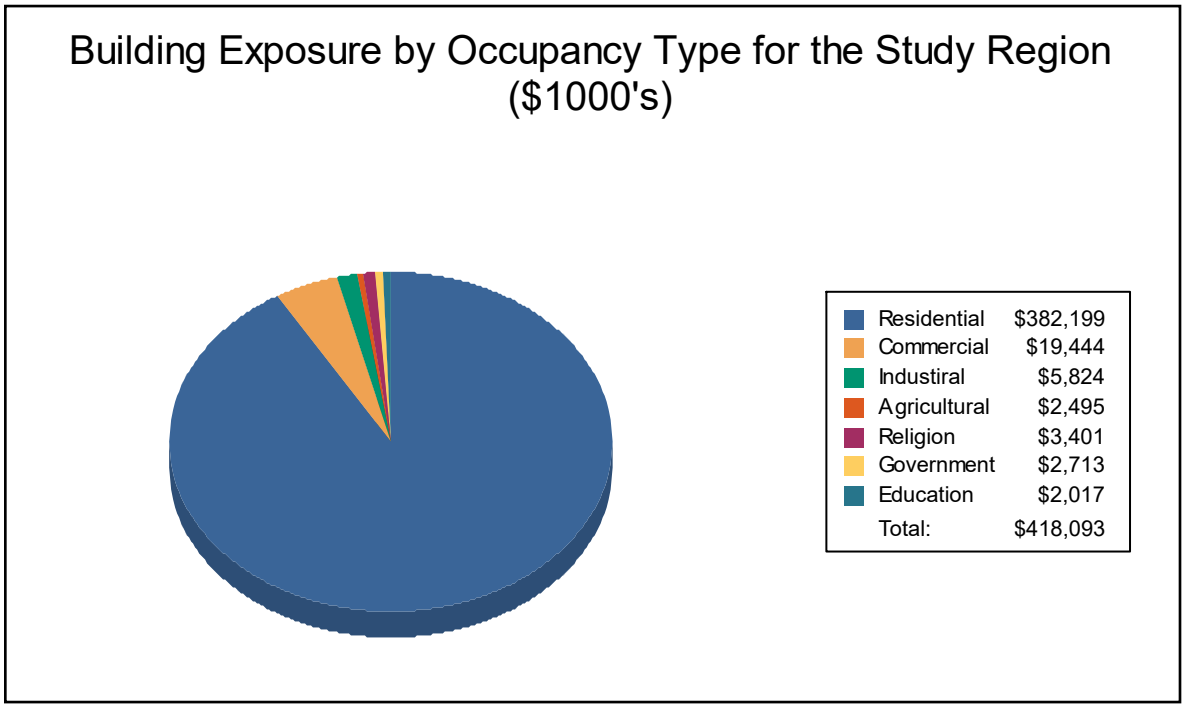

Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	246,888	90.9%
Commercial	11,530	4.2%
Industrial	4,899	1.8%
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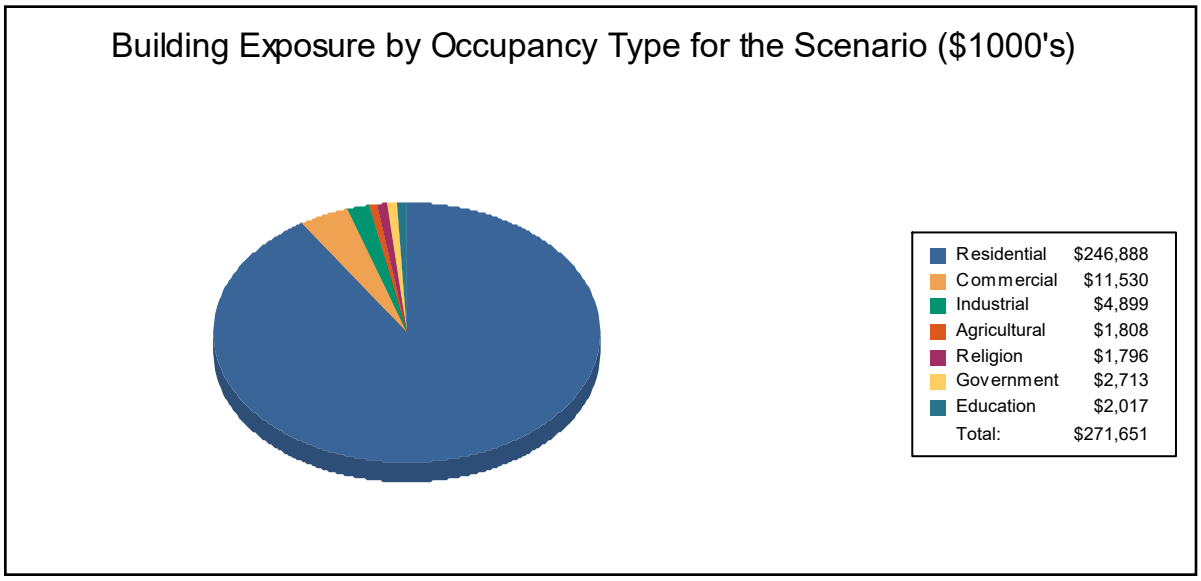


Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 1 school, 3 fire stations, no police stations and 1 emergency operation center.

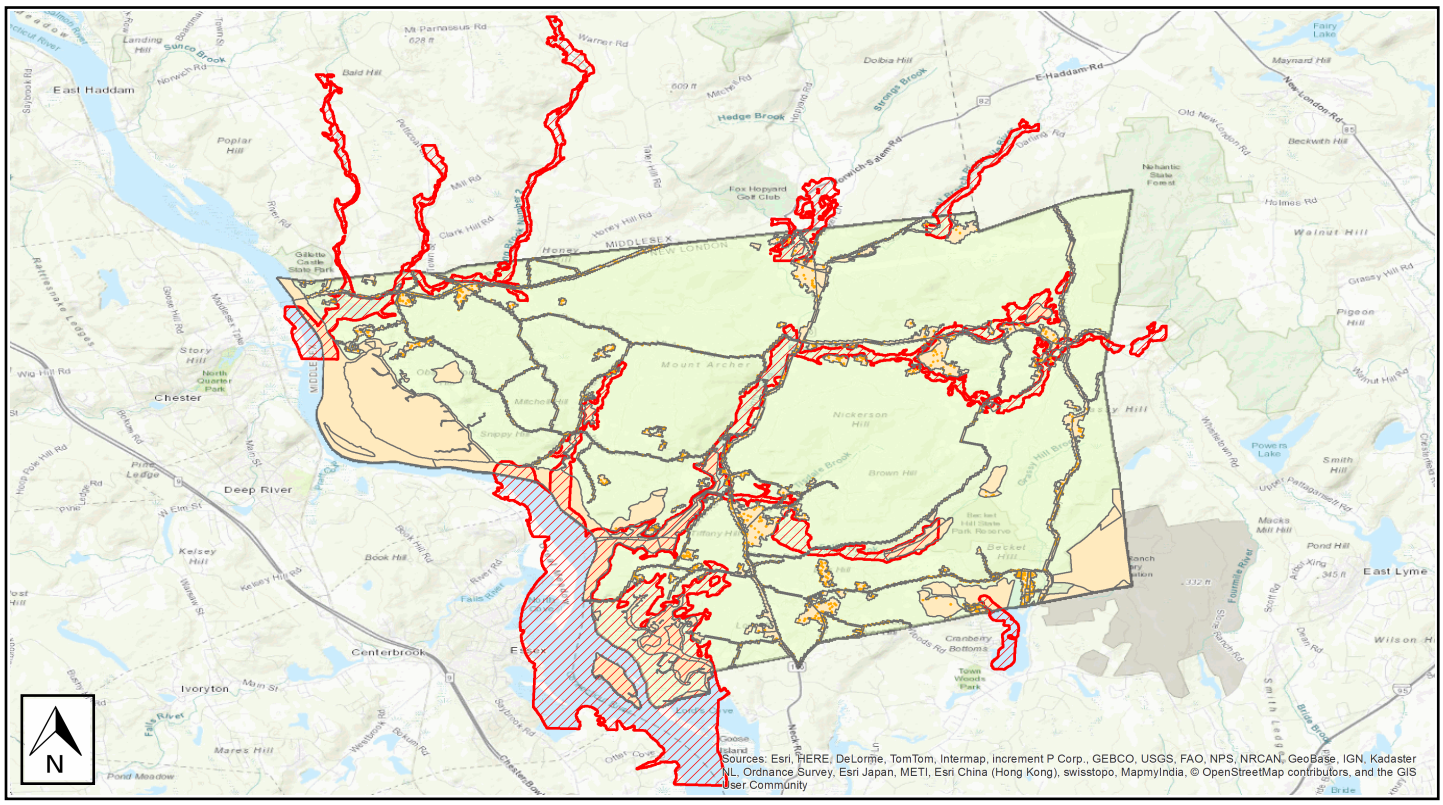
Flood Scenario Parameters

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

Study Region Name:	Lyme
Scenario Name:	LymeAllRiverine
Return Period Analyzed:	100
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 6 buildings will be at least moderately damaged. This is over 100% of the total number of buildings in the scenario. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

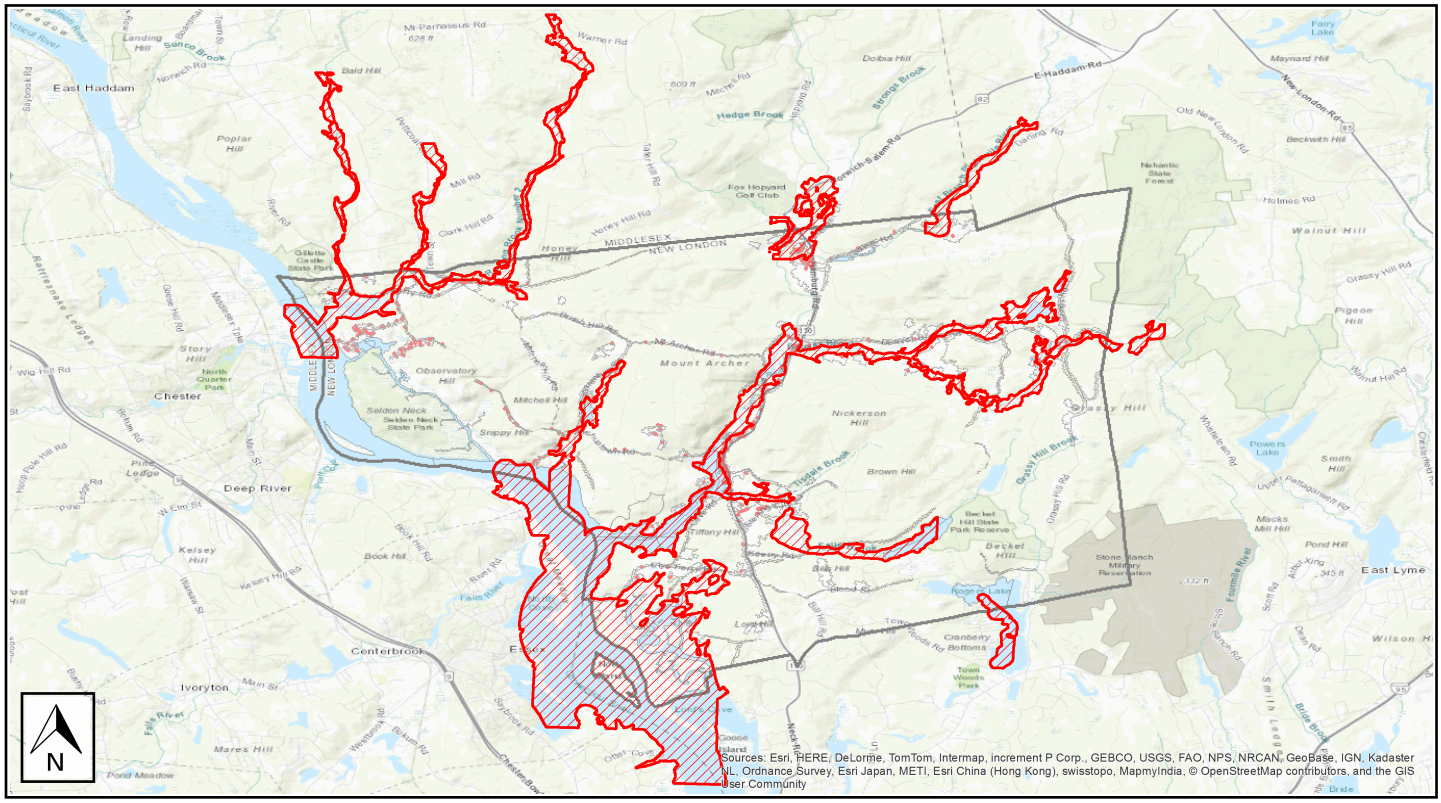


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	6	50	5	42	1	8	0	0	0	0	0	0
Total	**6**		**5**		**1**		**0**		**0**		**0**	

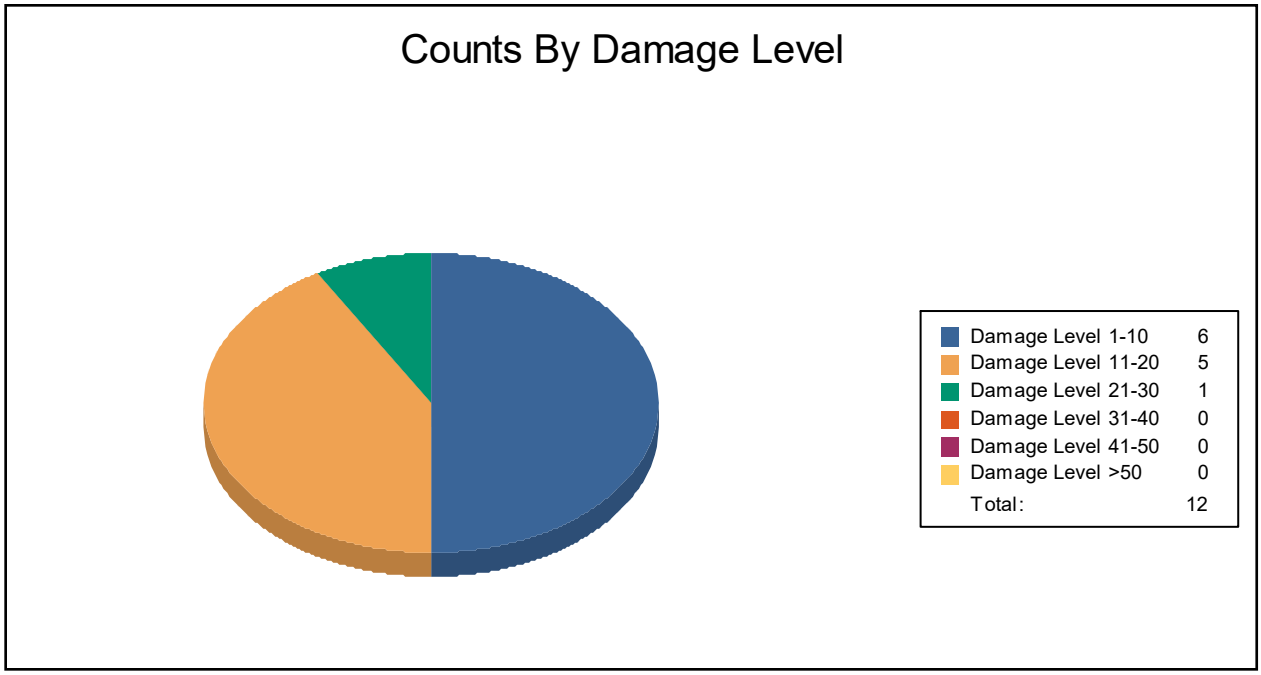


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	6	50	5	42	1	8	0	0	0	0	0	0

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	3	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

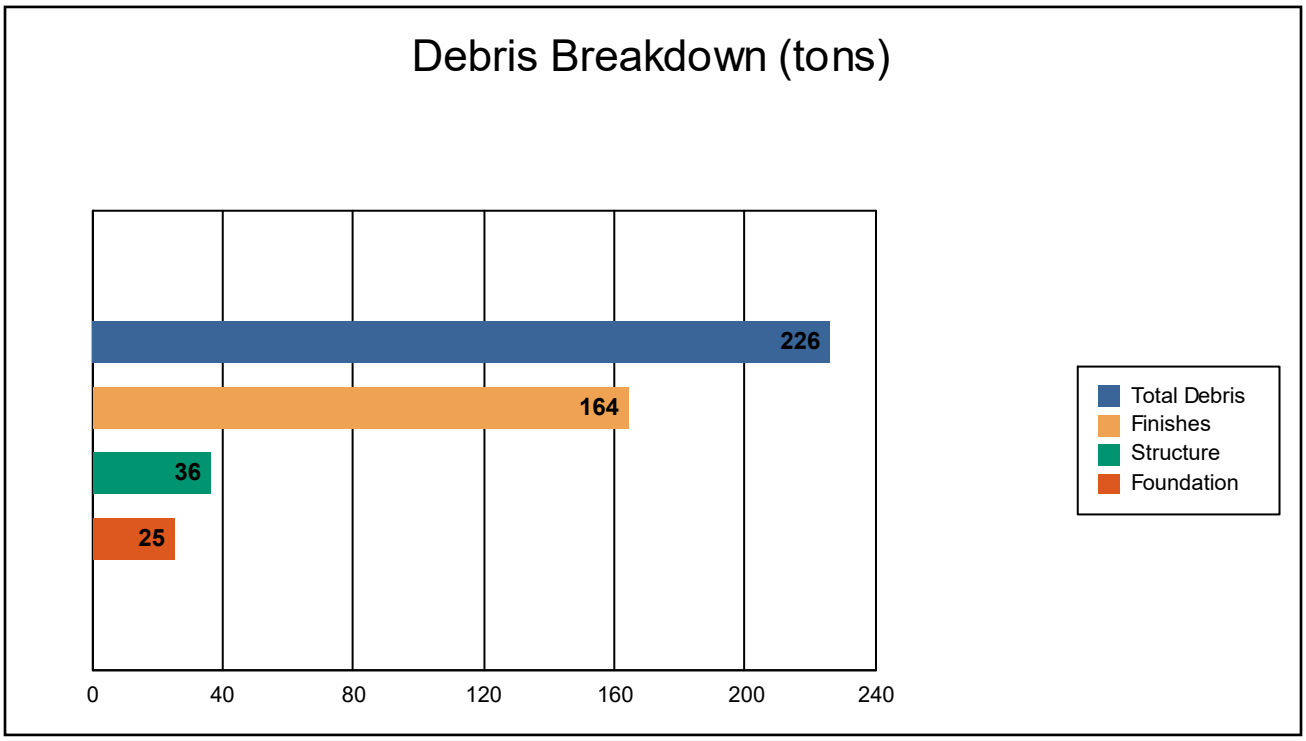
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

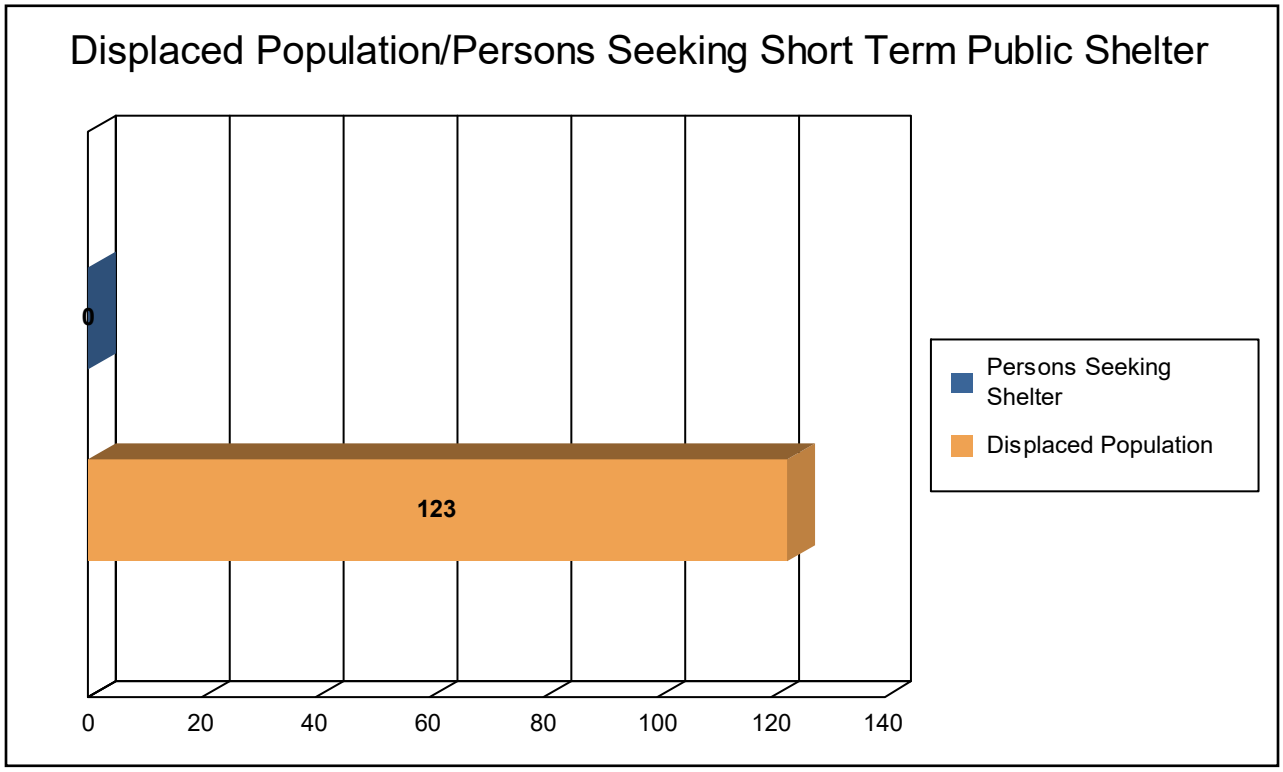


The model estimates that a total of 226 tons of debris will be generated. Of the total amount, Finishes comprises 73% of the total, Structure comprises 16% of the total, and Foundation comprises 11%. If the debris tonnage is converted into an estimated number of truckloads, it will require 10 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 41 households (or 123 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 7.15 million dollars, which represents 2.63 % of the total replacement value of the scenario buildings.

Building-Related Losses

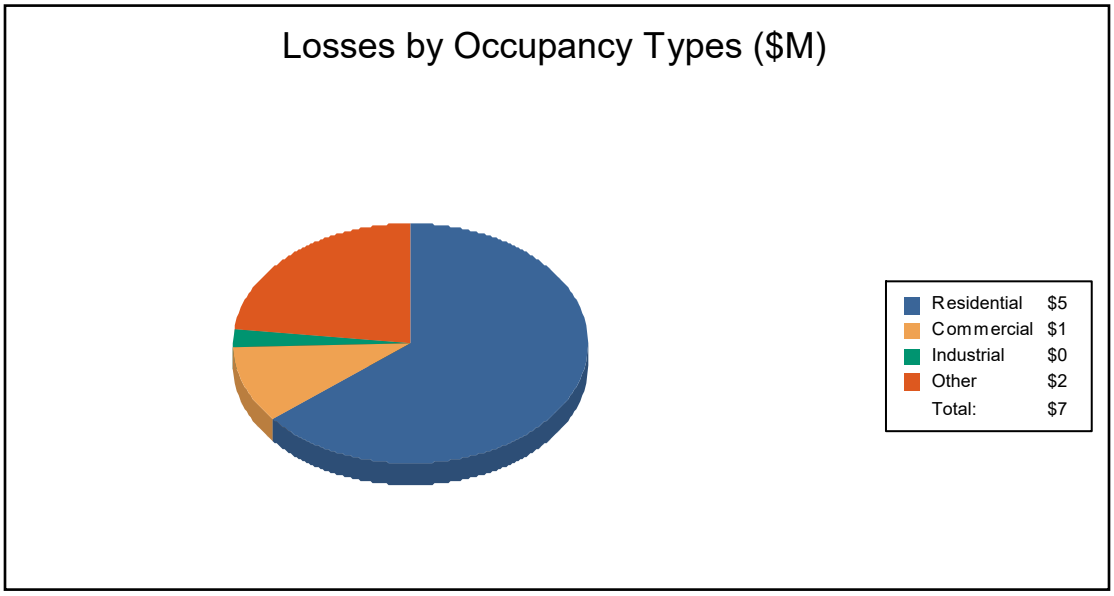
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 4.49 million dollars. 37% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 64.30% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	2.55	0.09	0.07	0.06	2.76
	Content	1.05	0.21	0.08	0.38	1.72
	Inventory	0.00	0.00	0.01	0.00	0.01
	Subtotal	**3.60**	**0.30**	**0.16**	**0.43**	**4.49**
Business Interruption						
	Income	0.01	0.26	0.00	0.14	0.41
	Relocation	0.76	0.01	0.00	0.07	0.85
	Rental Income	0.21	0.01	0.00	0.01	0.23
	Wage	0.02	0.14	0.01	1.01	1.17
	Subtotal	**1.00**	**0.42**	**0.02**	**1.22**	**2.66**
ALL	**Total**	**4.59**	**0.72**	**0.18**	**1.65**	**7.15**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Total Study Region	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Flood Global Risk Report

Region Name: Lyme

Flood Scenario: LymeAllRiverine

Print Date: Wednesday, January 8, 2020

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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 Flood. These results can be improved by using enhanced inventory data and flood hazard information.

FEMA

RiskMAP
Increasing Resilience Together

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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 (FEMA) and the National Institute of Building Sciences (NIBS). 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 flood loss estimates provided in this report were based on a region that included 1 county(ies) from the following state(s):

- Connecticut

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

The geographical size of the region is approximately 34 square miles and contains 190 census blocks. The region contains over 1 thousand households and has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County for the study region is provided in Appendix B.

There are an estimated 1,311 buildings in the region with a total building replacement value (excluding contents) of 418 million dollars. Approximately 92.45% of the buildings (and 91.41% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million dollars. Table 1 and Table 2 present the relative distribution of the value with respect to the general occupancies by Study Region and Scenario respectively. Appendix B provides a general distribution of the building value by State and County.

Table 1
Building Exposure by Occupancy Type for the Study Region

Occupancy	Exposure ($1000)	Percent of Total
Residential	382,199	91.4%
Commercial	19,444	4.7%
Industrial	5,824	1.4%
Agricultural	2,495	0.6%
Religion	3,401	0.8%
Government	2,713	0.6%
Education	2,017	0.5%
Total	**418,093**	**100%**

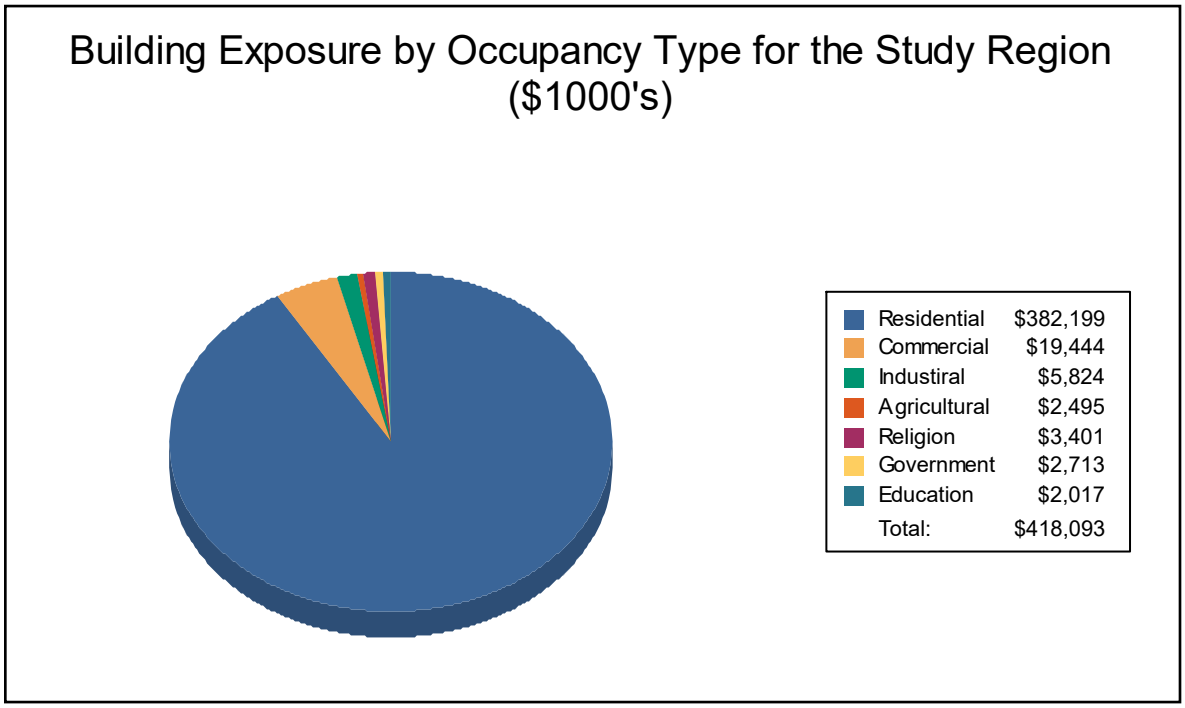
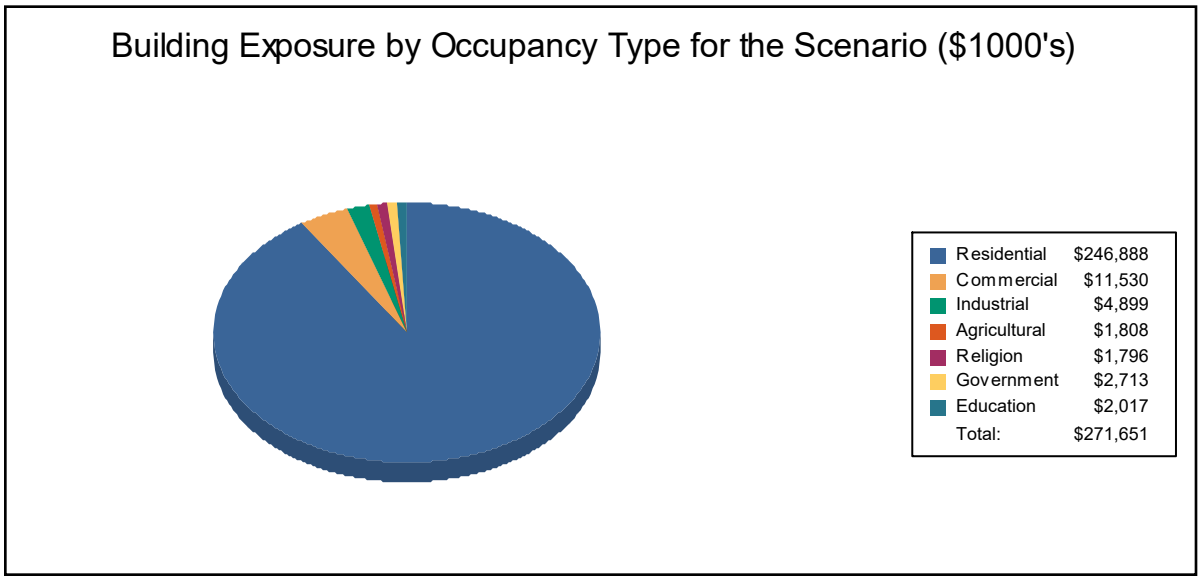


Table 2
Building Exposure by Occupancy Type for the Scenario

Occupancy	Exposure ($1000)	Percent of Total
Residential	246,888	90.9%
Commercial	11,530	4.2%
Industrial	4,899	1.8%
Agricultural	1,808	0.7%
Religion	1,796	0.7%
Government	2,713	1.0%
Education	2,017	0.7%
Total	**271,651**	**100%**



Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds.
There are 1 school, 3 fire stations, no police stations and 1 emergency operation center.

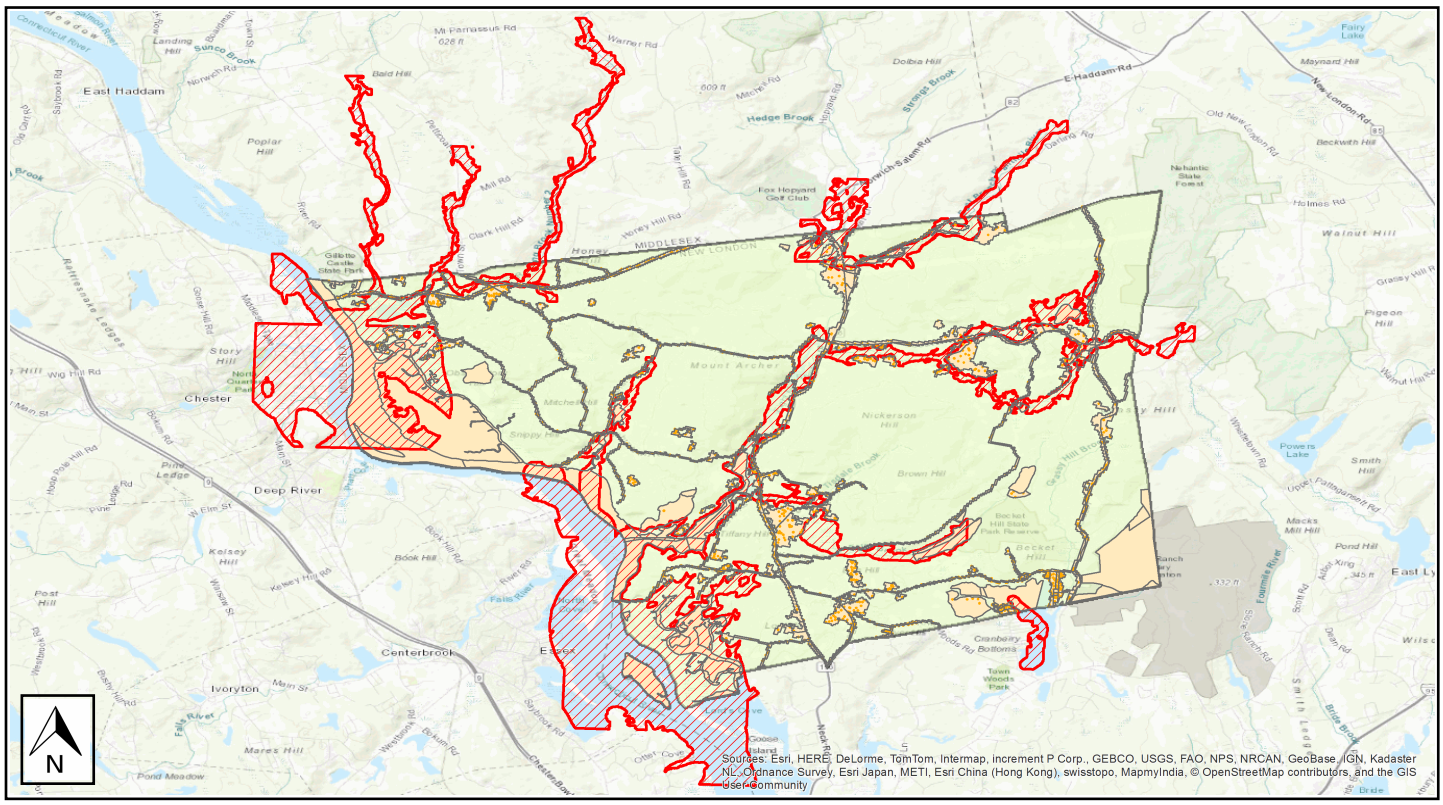
Flood Scenario Parameters

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

Study Region Name:	Lyme
Scenario Name:	LymeAllRiverine
Return Period Analyzed:	500
Analysis Options Analyzed:	No What-Ifs

Study Region Overview Map

Illustrating scenario flood extent, as well as exposed essential facilities and total exposure



Building Damage

General Building Stock Damage

Hazus estimates that about 28 buildings will be at least moderately damaged. This is over 66% of the total number of buildings in the scenario. There are an estimated 5 buildings that will be completely destroyed. The definition of the 'damage states' is provided in the Hazus Flood Technical Manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 summarizes the expected damage by general building type.

Total Economic Loss (1 dot = $300K) Overview Map

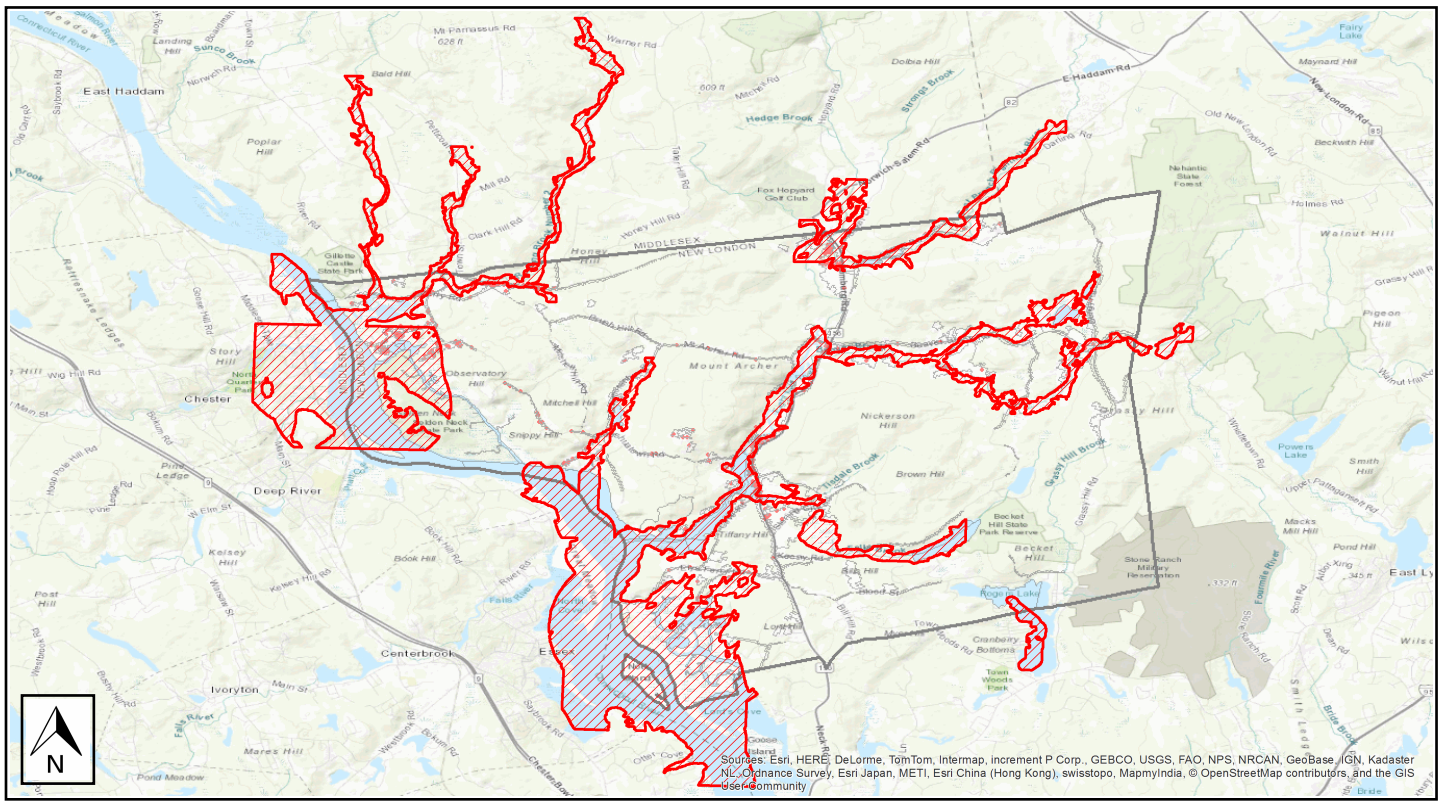


Table 3: Expected Building Damage by Occupancy

	1-10		11-20		21-30		31-40		41-50		>50	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	0	0	0	0	0	0	0	0	0	0
Government	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0
Religion	0	0	0	0	0	0	0	0	0	0	0	0
Residential	7	20	10	29	6	17	5	14	2	6	5	14
Total	**7**		**10**		**6**		**5**		**2**		**5**	

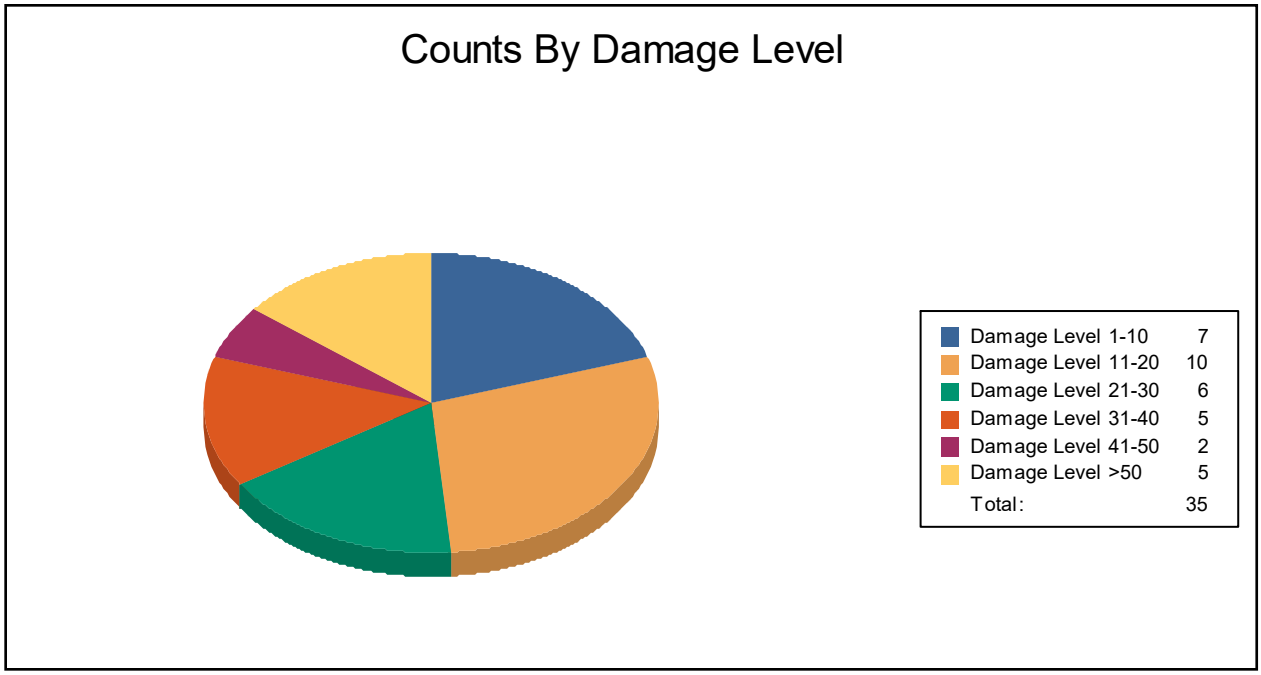


Table 4: Expected Building Damage by Building Type

Building Type	1-10		11-20		21-30		31-40		41-50		>50	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0	0	0	0	0	0	0	0	0	0	0
ManufHousing	0	0	0	0	0	0	0	0	0	0	0	0
Masonry	0	0	0	0	0	0	0	0	0	0	0	0
Steel	0	0	0	0	0	0	0	0	0	0	0	0
Wood	7	20	10	29	6	17	5	14	2	6	5	14

Essential Facility Damage

Before the flood analyzed in this scenario, the region had 0 hospital beds available for use. On the day of the scenario flood event, the model estimates that 0 hospital beds are available in the region.

Table 5: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Emergency Operation Centers	1	0	0	0
Fire Stations	3	0	0	0
Hospitals	0	0	0	0
Police Stations	0	0	0	0
Schools	1	0	0	0

If this report displays all zeros or is blank, two possibilities can explain this.

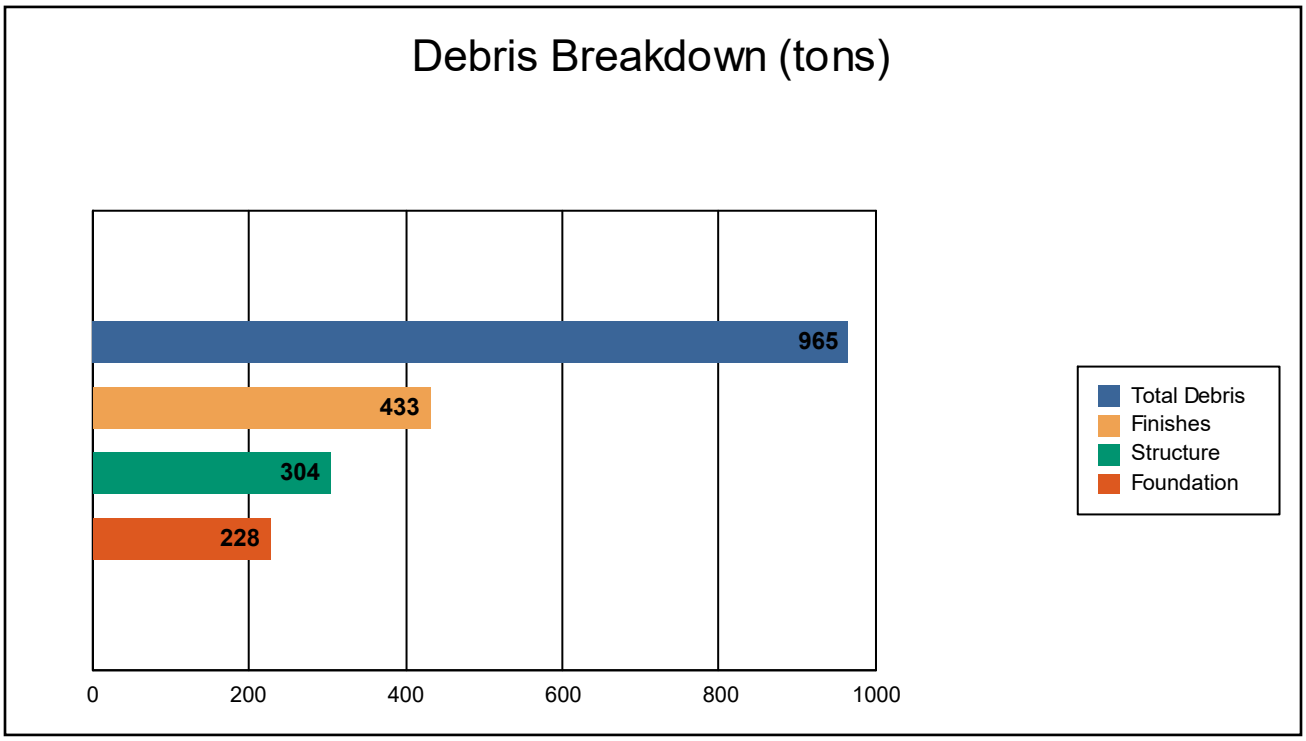
(1) None of your facilities were flooded. This can be checked by mapping the inventory data on the depth grid.

(2) The analysis was not run. This can be tested by checking the run box on the Analysis Menu and seeing if a message box asks you to replace the existing results.

Induced Flood Damage

Debris Generation

Hazus estimates the amount of debris that will be generated by the flood. The model breaks debris into three general categories: 1) Finishes (dry wall, insulation, etc.), 2) Structural (wood, brick, etc.) and 3) Foundations (concrete slab, concrete block, rebar, etc.). This distinction is made because of the different types of material handling equipment required to handle the debris.

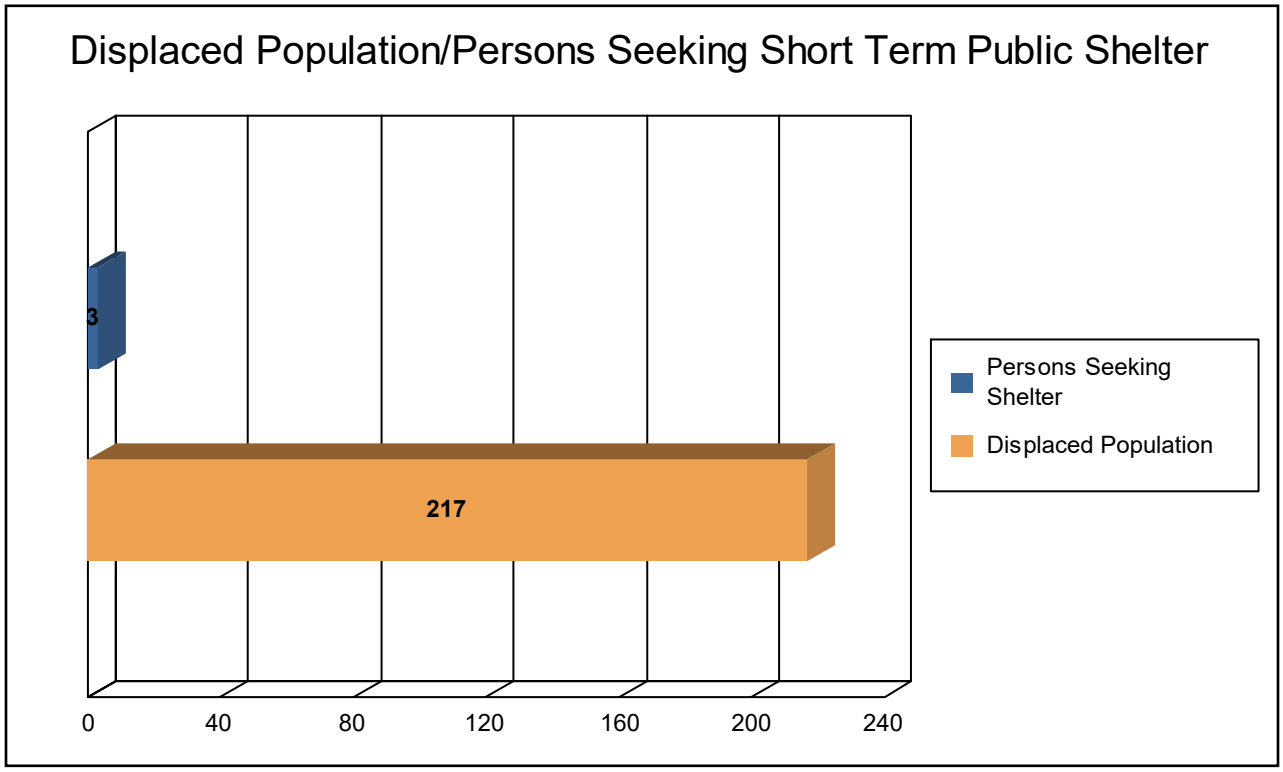


The model estimates that a total of 965 tons of debris will be generated. Of the total amount, Finishes comprises 45% of the total, Structure comprises 31% of the total, and Foundation comprises 24%. If the debris tonnage is converted into an estimated number of truckloads, it will require 39 truckloads (@25 tons/truck) to remove the debris generated by the flood.

Social Impact

Shelter Requirements

Hazus estimates the number of households that are expected to be displaced from their homes due to the flood and the associated potential evacuation. Hazus also estimates those displaced people that will require accommodations in temporary public shelters. The model estimates 72 households (or 217 of people) will be displaced due to the flood. Displacement includes households evacuated from within or very near to the inundated area. Of these, 3 people (out of a total population of 2,406) will seek temporary shelter in public shelters.



Economic Loss

The total economic loss estimated for the flood is 18.21 million dollars, which represents 6.70 % of the total replacement value of the scenario buildings.

Building-Related Losses

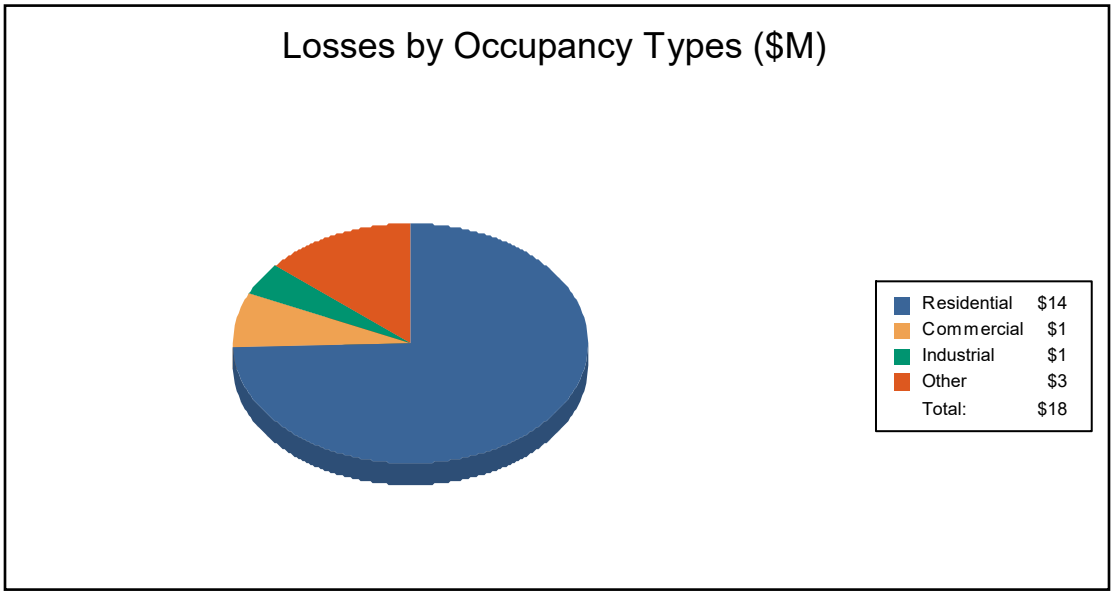
The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability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

The total building-related losses were 13.61 million dollars. 25% of the estimated losses were related to the business interruption of the region. The residential occupancies made up 74.46% of the total loss. Table 6 below provides a summary of the losses associated with the building damage.

Table 6: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Building Loss						
	Building	8.01	0.21	0.26	0.12	8.60
	Content	3.40	0.43	0.44	0.68	4.95
	Inventory	0.00	0.00	0.05	0.01	0.06
	Subtotal	**11.40**	**0.65**	**0.75**	**0.81**	**13.61**
Business Interruption						
	Income	0.01	0.44	0.01	0.20	0.66
	Relocation	1.64	0.01	0.01	0.09	1.75
	Rental Income	0.48	0.01	0.00	0.01	0.50
	Wage	0.03	0.23	0.02	1.41	1.69
	Subtotal	**2.16**	**0.70**	**0.03**	**1.72**	**4.60**
ALL	**Total**	**13.56**	**1.35**	**0.78**	**2.53**	**18.21**



Appendix A: County Listing for the Region

Connecticut

- New London

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Total Study Region	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: UN-NAMED-1938-4

Print Date: Friday, October 11, 2019

Disclaimer:
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General Description of the Region

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

- Connecticut

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

The geographical size of the region is 34.03 square miles and contains 1 census tracts. There are over 1 thousand households in the region and a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 million dollars (2014 dollars). Approximately 92% of the buildings (and 91% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million (2014 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.

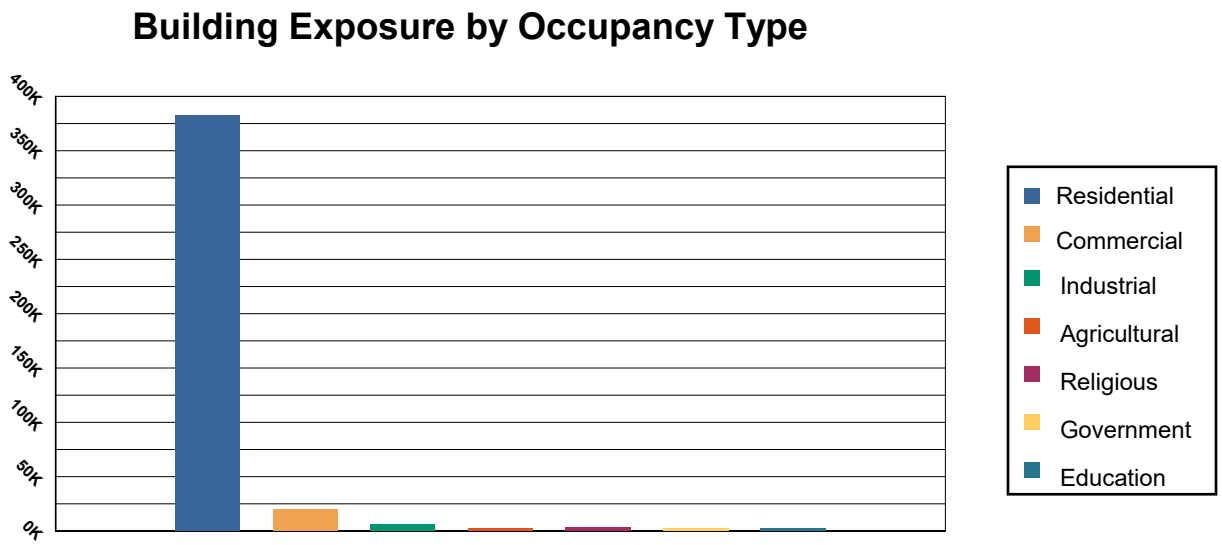


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	382,199	91.41%
Commercial	19,444	4.65%
Industrial	5,824	1.39%
Agricultural	2,495	0.60%
Religious	3,401	0.81%
Government	2,713	0.65%
Education	2,017	0.48%
Total	**418,093**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 1 schools, 3 fire stations, no police stations and 1 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:	UN-NAMED-1938-4
Type:	Historic
Max Peak Gust in Study Region:	116 mph

Building Damage

General Building Stock Damage

Hazus estimates that about 125 buildings will be at least moderately damaged. This is over 10% of the total number of buildings in the region. There are an estimated 8 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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.

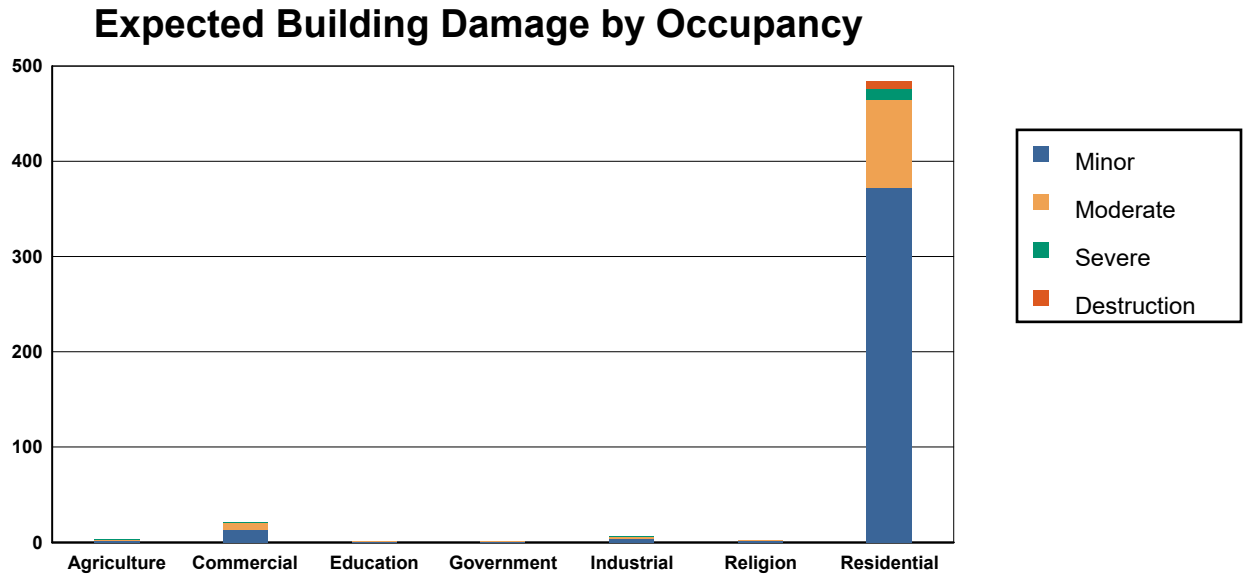


Table 2: Expected Building Damage by Occupancy

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	4.78	59.71	2.03	25.37	0.77	9.57	0.37	4.61	0.06	0.73
Commercial	39.77	65.20	13.85	22.70	6.33	10.37	1.04	1.71	0.01	0.01
Education	1.22	61.18	0.48	24.07	0.25	12.53	0.04	2.23	0.00	0.00
Government	2.43	60.67	0.94	23.46	0.53	13.32	0.10	2.55	0.00	0.00
Industrial	11.62	64.57	3.84	21.32	1.96	10.87	0.53	2.95	0.05	0.29
Religion	3.95	65.82	1.49	24.89	0.50	8.35	0.06	0.94	0.00	0.00
Residential	727.85	60.05	371.99	30.69	92.19	7.61	11.84	0.98	8.12	0.67
Total	**791.62**		**394.62**		**102.53**		**13.99**		**8.24**	

Table 3: Expected Building Damage by Building Type

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	25	60.49	11	26.21	5	10.84	1	1.96	0	0.50
MH	13	81.42	1	9.29	1	6.75	0	0.45	0	2.09
Steel	28	66.92	8	20.17	4	10.66	1	2.23	0	0.02
Wood	689	59.88	358	31.12	85	7.39	11	0.97	7	0.63

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

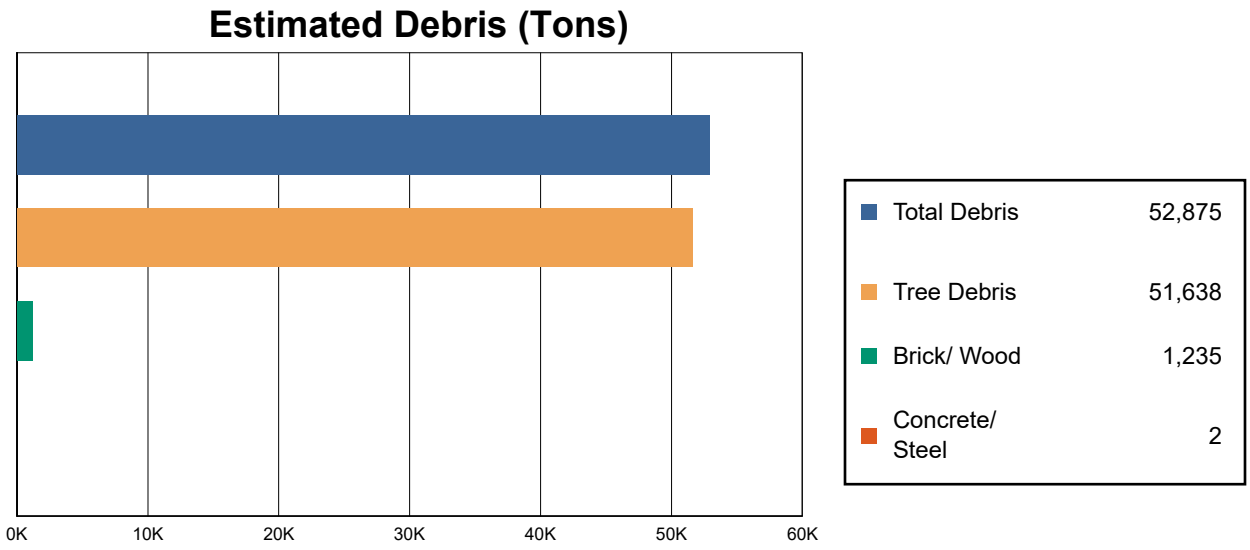
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	Total	Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	0

Induced Hurricane Damage

Debris Generation

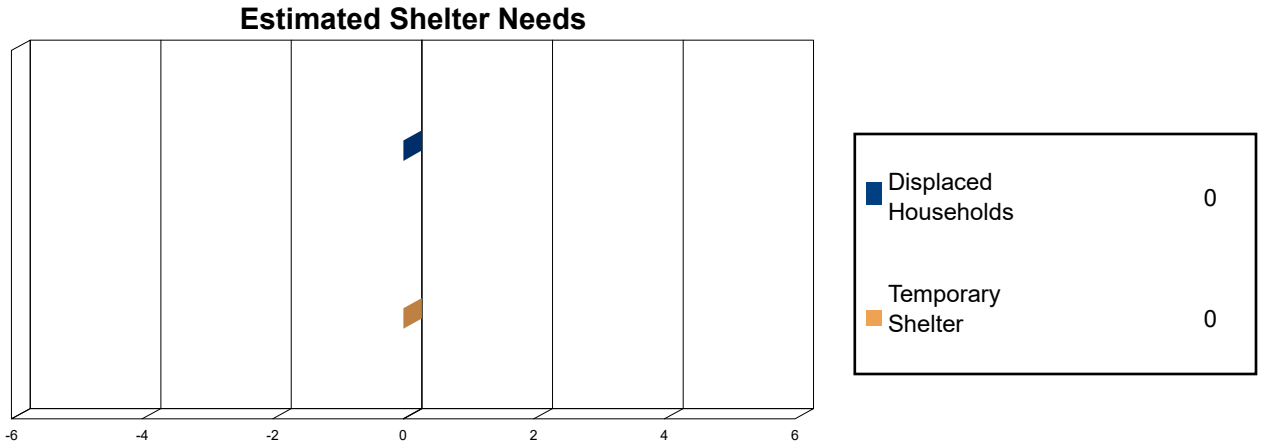


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 52,875 tons of debris will be generated. Of the total amount, 47,469 tons (90%) is Other Tree Debris. Of the remaining 5,406 tons, Brick/Wood comprises 23% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 49 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 4,169 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Economic Loss

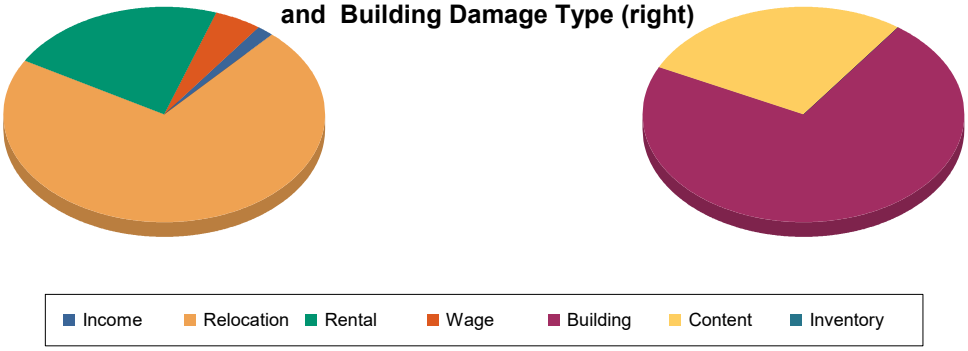
The total economic loss estimated for the hurricane is 24.3 million dollars, which represents 5.82 % of the total replacement value of the region's buildings.

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 24 million dollars. 8% 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 95% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

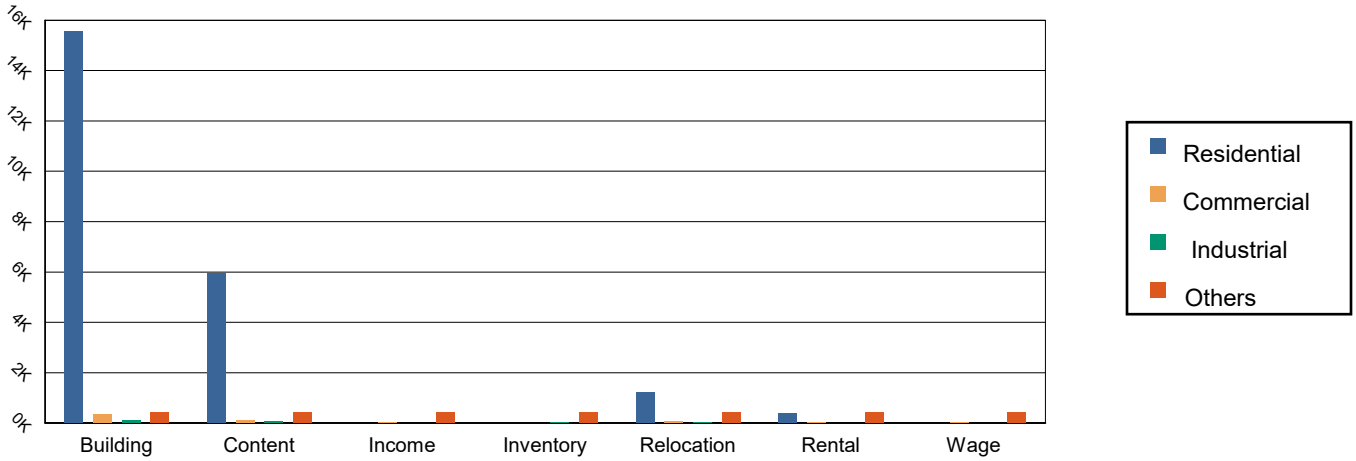


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	15,552.64	331.20	120.18	213.40	16,217.43
	Content	5,956.03	106.43	75.39	87.25	6,225.10
	Inventory	0.00	2.69	11.14	3.44	17.27
	Subtotal	**21,508.67**	**440.32**	**206.71**	**304.08**	**22,459.79**
Business Interruption Loss						
	Income	0.32	21.72	1.35	6.57	29.97
	Relocation	1,235.31	58.62	8.94	38.04	1,340.91
	Rental	375.44	33.85	1.21	3.53	414.03
	Wage	0.76	15.28	2.30	68.92	87.25
	Subtotal	**1,611.83**	**129.47**	**13.80**	**117.06**	**1,872.15**

Total

Total	**23,120.50**	**569.79**	**220.51**	**421.14**	**24,331.94**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: Probabilistic 10-year Return Period

Print Date: Thursday, October 3, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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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):

- Connecticut

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

The geographical size of the region is 34.03 square miles and contains 1 census tracts. There are over 1 thousand households in the region and a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 million dollars (2014 dollars). Approximately 92% of the buildings (and 91% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million (2014 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.

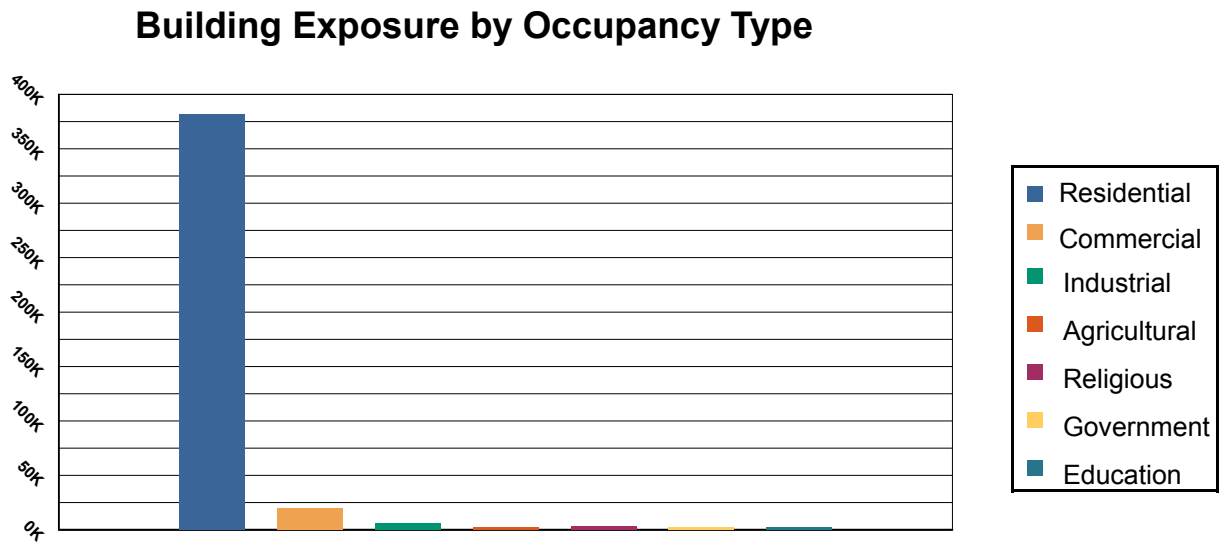


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	382,199	91.41 %
Commercial	19,444	4.65%
Industrial	5,824	1.39%
Agricultural	2,495	0.60%
Religious	3,401	0.81%
Government	2,713	0.65%
Education	2,017	0.48%
Total	**418,093**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 1 schools, 3 fire stations, no police stations and 1 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:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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.

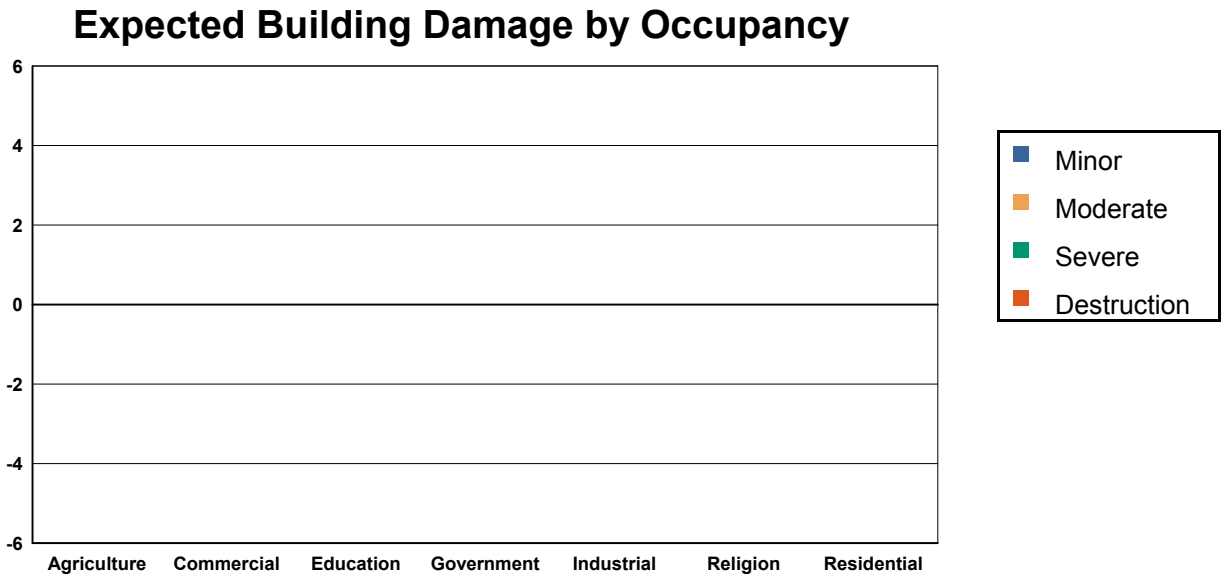


Table 2: Expected Building Damage by Occupancy : 10 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	8.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commercial	61.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education	2.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Government	4.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	18.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Religion	6.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Residential	1,212.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	**1,311.00**		**0.00**		**0.00**		**0.00**		**0.00**	

Table 3: Expected Building Damage by Building Type : 10 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	42	100.00	0	0.00	0	0.00	0	0.00	0	0.00
MH	16	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	42	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Wood	1,150	100.00	0	0.00	0	0.00	0	0.00	0	0.00

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

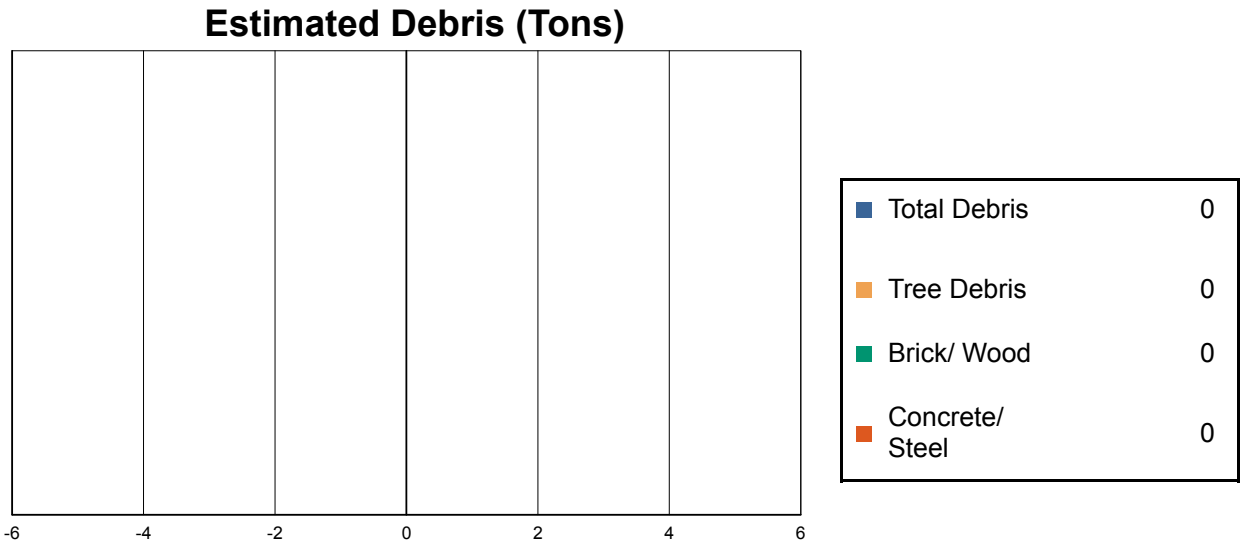
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		Probability of at Least Moderate Damage > 50%	Probability of Complete Damage > 50%	Expected Loss of Use < 1 day
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	1

Induced Hurricane Damage

Debris Generation

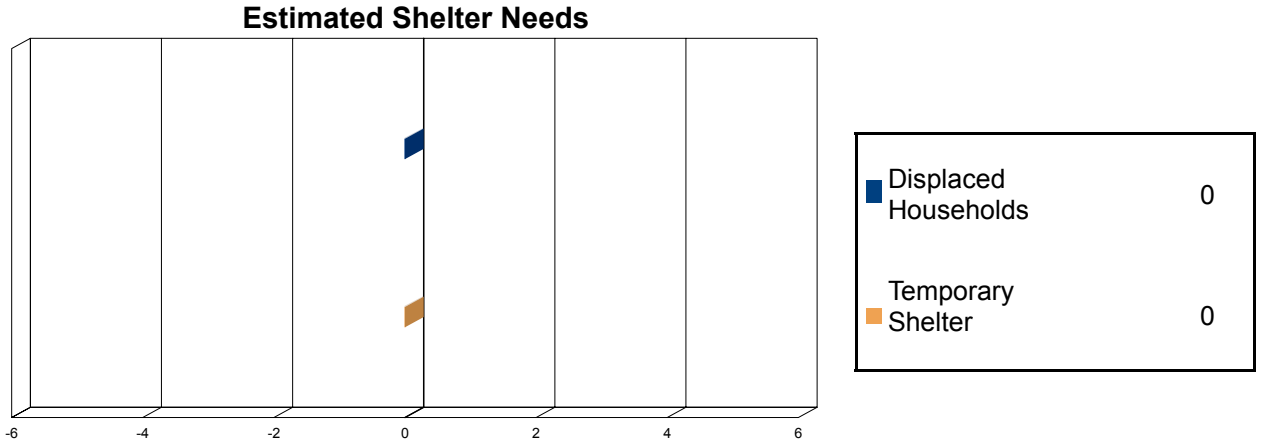


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 0 tons of debris will be generated. Of the total amount, 0 tons (0%) is Other Tree Debris. Of the remaining 0 tons, Brick/Wood comprises 0% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 0 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Economic Loss

The total economic loss estimated for the hurricane is 0.0 million dollars, which represents 0.00 % 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 0 million dollars. 0% 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 0% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)

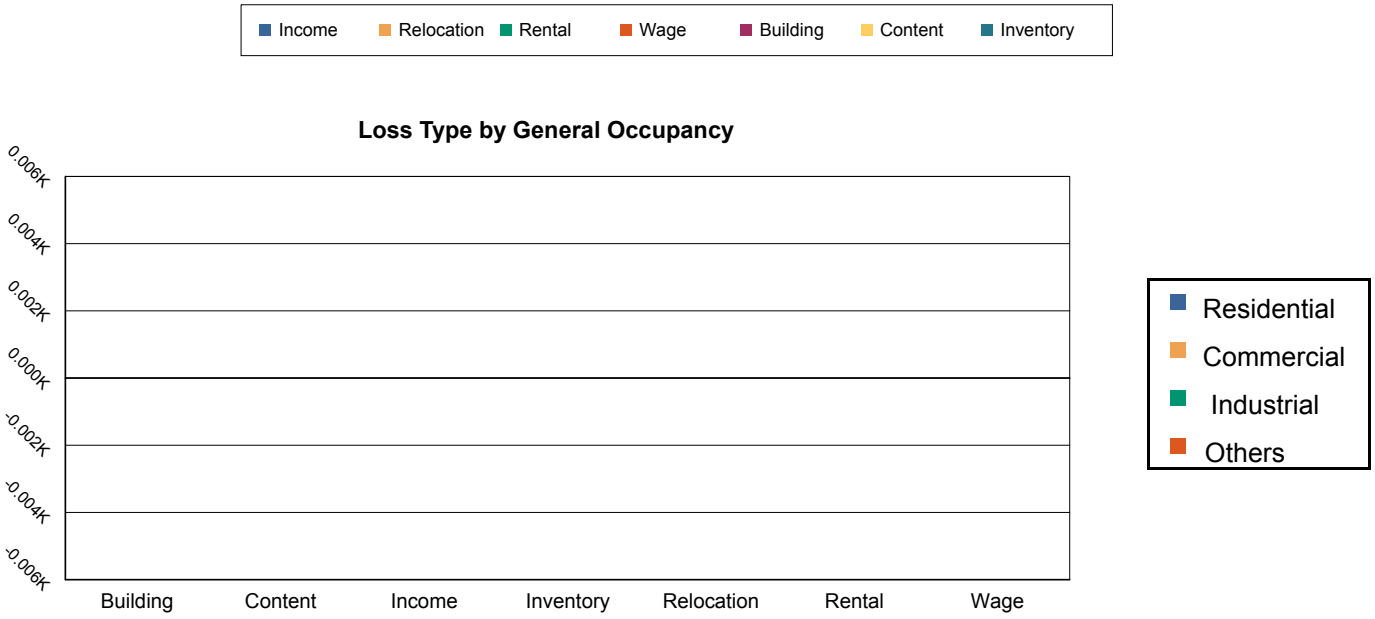


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	0.00	0.00	0.00	0.00	0.00
	Content	0.00	0.00	0.00	0.00	0.00
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.00	0.00	0.00	0.00	0.00
	Rental	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Total

Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: Probabilistic 20-year Return Period

Print Date: Thursday, October 3, 2019

Disclaimer:
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Totals only reflect data for those census tracts/blocks included in the user's study region.

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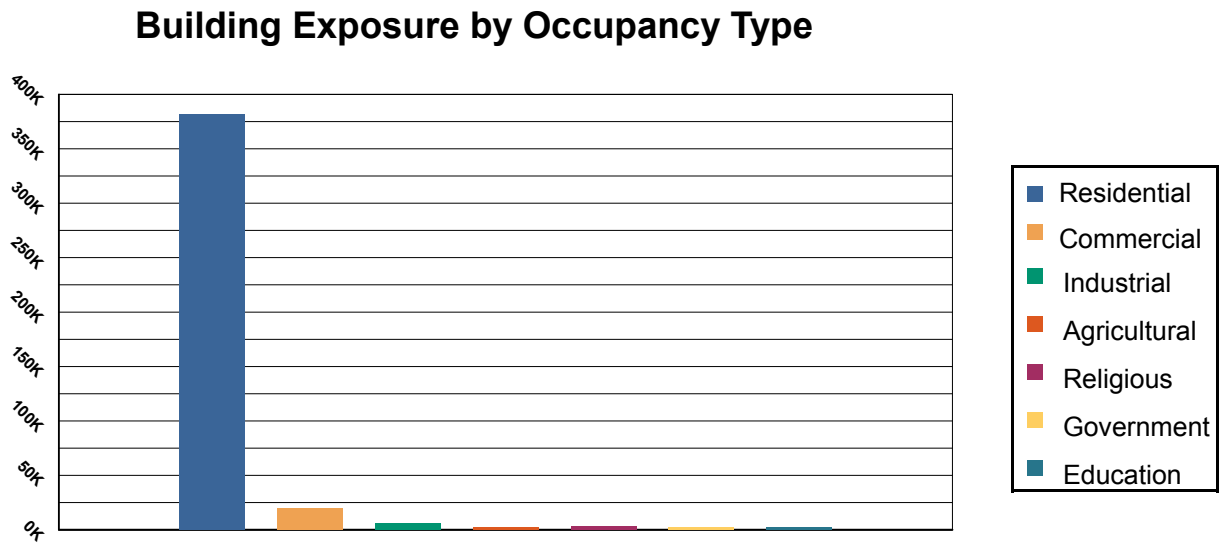

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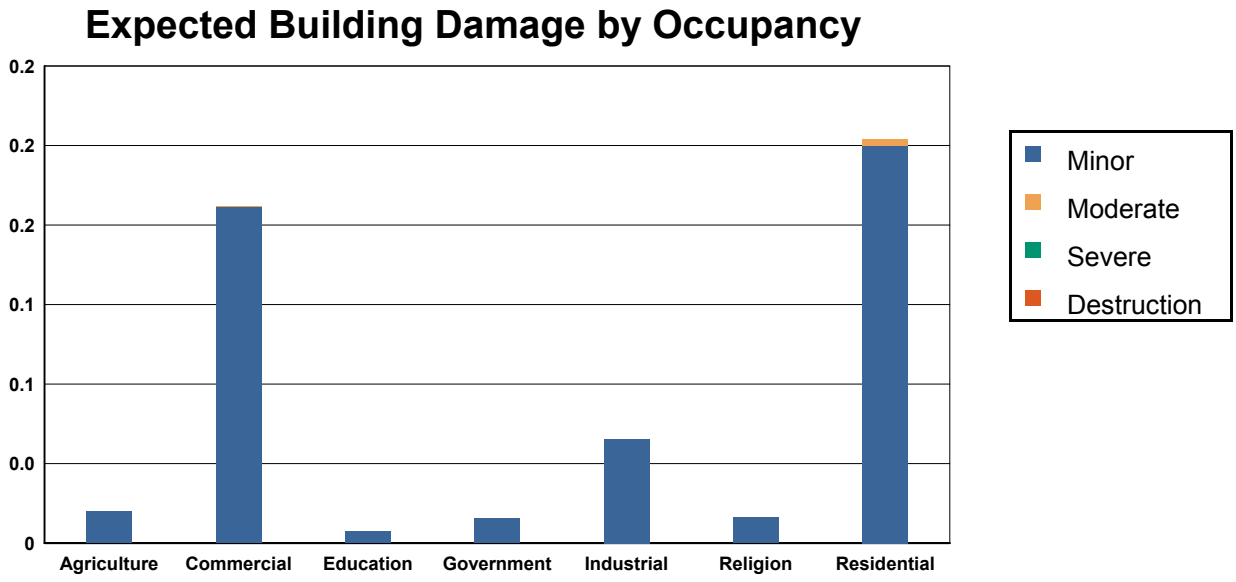


Table 2: Expected Building Damage by Occupancy : 20 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	7.98	99.80	0.02	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Commercial	60.83	99.72	0.17	0.28	0.00	0.00	0.00	0.00	0.00	0.00
Education	1.99	99.72	0.01	0.29	0.00	0.00	0.00	0.00	0.00	0.00
Government	3.99	99.69	0.01	0.31	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	17.95	99.71	0.05	0.29	0.00	0.00	0.00	0.00	0.00	0.00
Religion	5.99	99.79	0.01	0.21	0.00	0.00	0.00	0.00	0.00	0.00
Residential	1,211.80	99.98	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Total	**1,310.53**		**0.47**		**0.00**		**0.00**		**0.00**	

Table 3: Expected Building Damage by Building Type : 20 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	42	99.80	0	0.19	0	0.00	0	0.00	0	0.00
MH	16	100.00	0	0.00	0	0.00	0	0.00	0	0.00
Steel	42	99.70	0	0.30	0	0.00	0	0.00	0	0.00
Wood	1,150	99.99	0	0.01	0	0.00	0	0.00	0	0.00

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

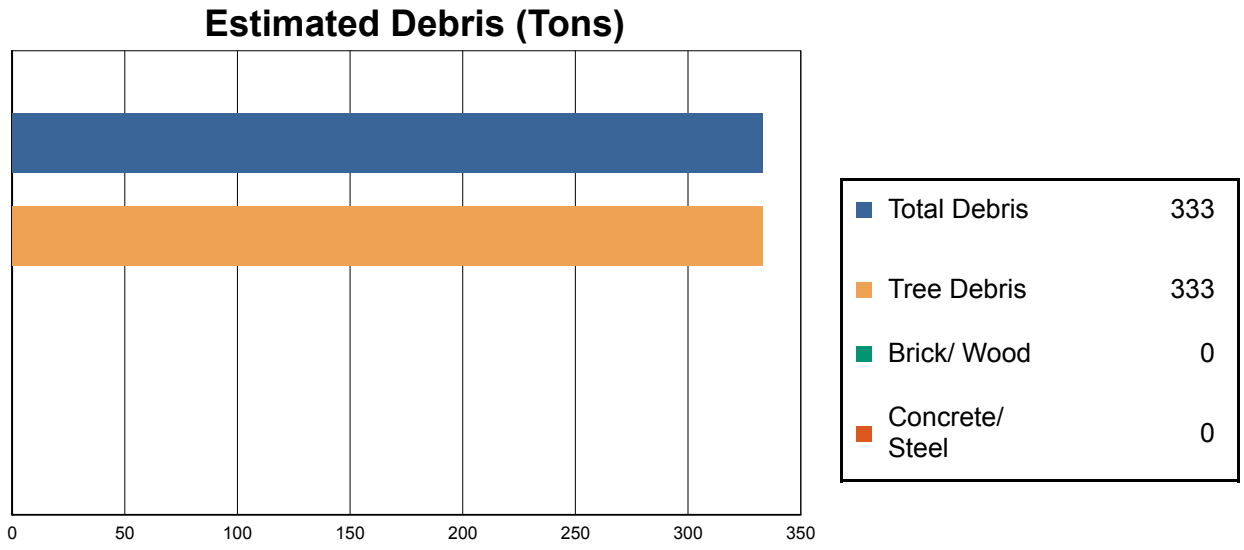
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	1

Induced Hurricane Damage

Debris Generation

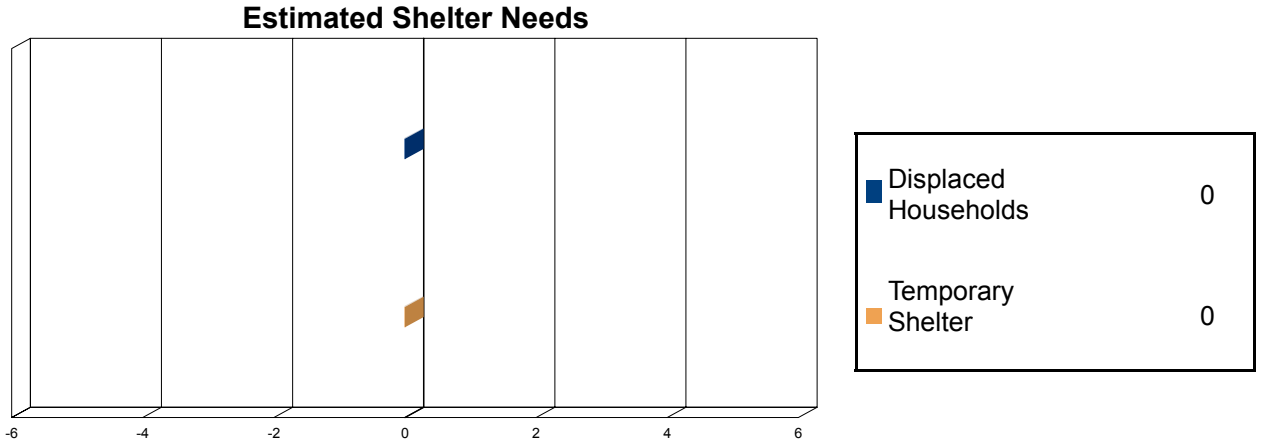


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 333 tons of debris will be generated. Of the total amount, 306 tons (92%) is Other Tree Debris. Of the remaining 27 tons, Brick/Wood comprises 0% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 27 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

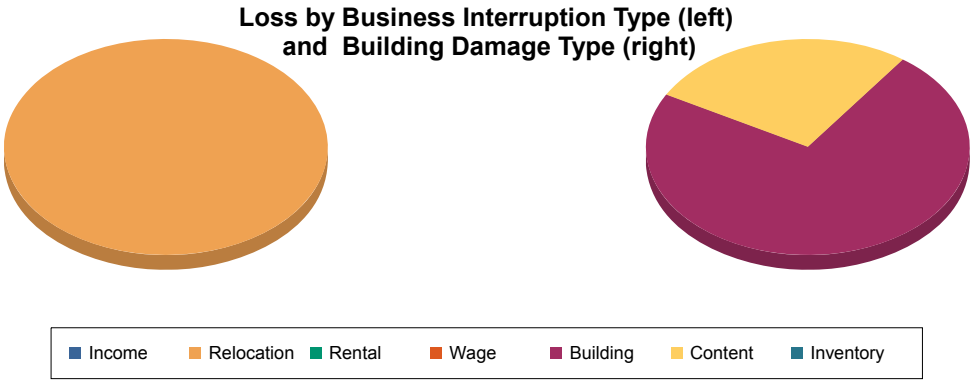
Economic Loss

The total economic loss estimated for the hurricane is 0.1 million dollars, which represents 0.03 % 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 0 million dollars. 0% 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 97% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.



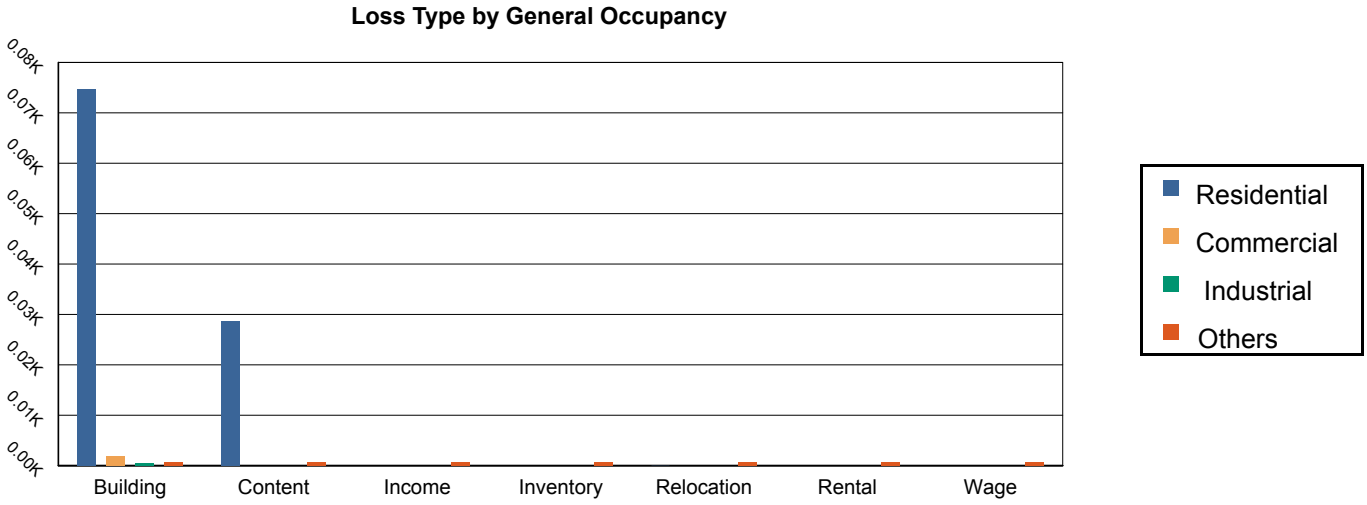


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	74.77	1.94	0.58	0.81	78.11
	Content	28.64	0.00	0.00	0.00	28.64
	Inventory	0.00	0.00	0.00	0.00	0.00
	Subtotal	**103.41**	**1.94**	**0.58**	**0.81**	**106.75**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	0.01	0.00	0.00	0.00	0.01
	Rental	0.00	0.00	0.00	0.00	0.00
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**0.01**	**0.00**	**0.00**	**0.00**	**0.01**

Total

Total	**103.42**	**1.95**	**0.58**	**0.81**	**106.76**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
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Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: Probabilistic 50-year Return Period

Print Date: Thursday, October 3, 2019

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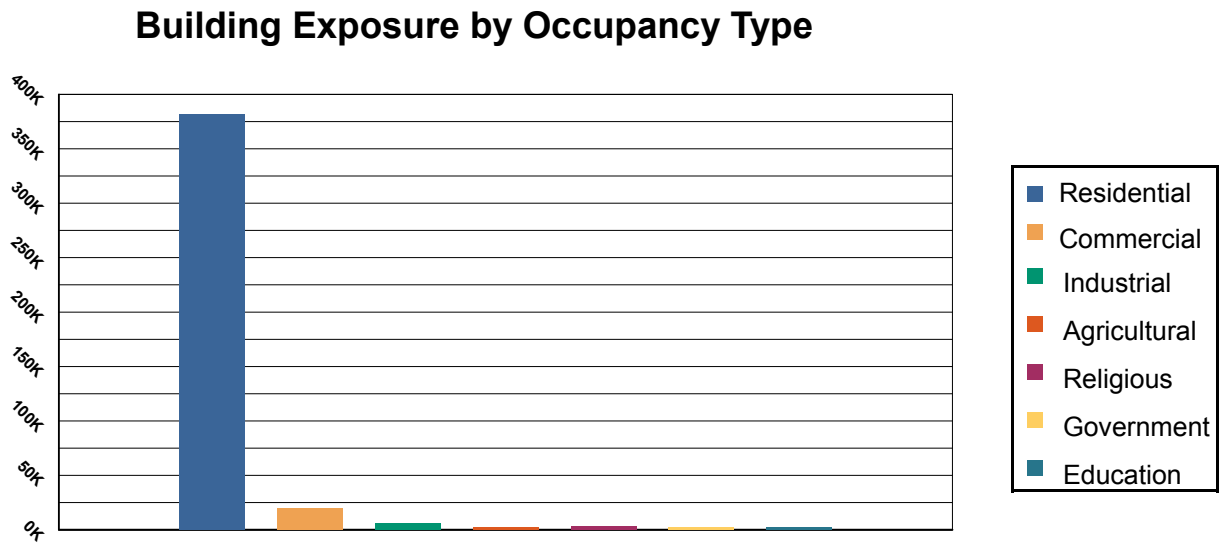

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General Building Stock Damage

Hazus estimates that about 0 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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.

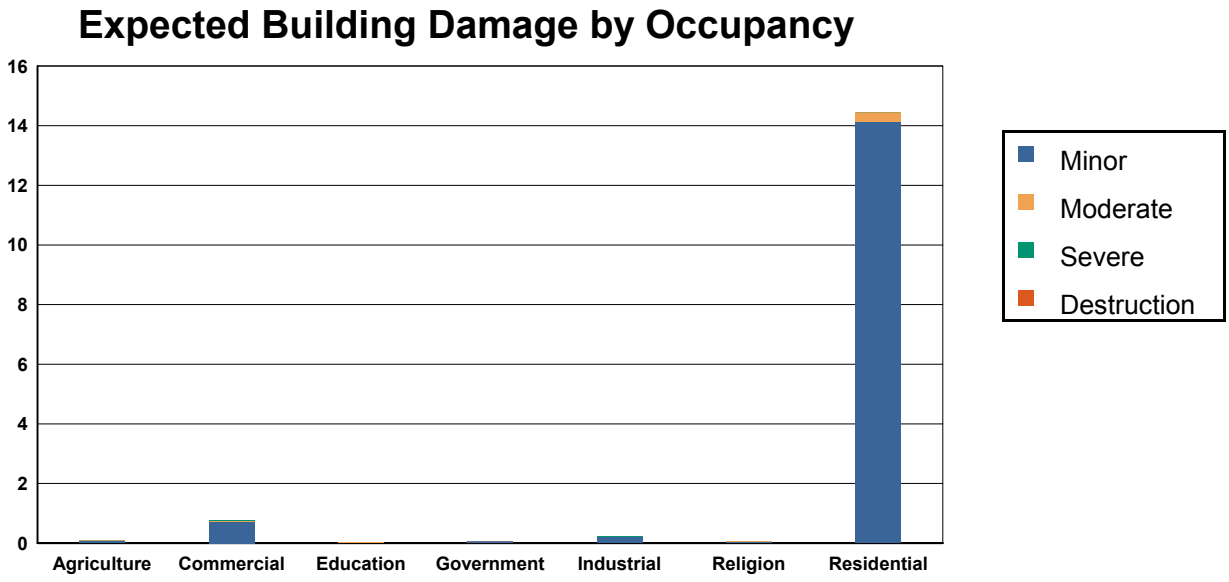


Table 2: Expected Building Damage by Occupancy : 50 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	7.90	98.75	0.09	1.14	0.01	0.10	0.00	0.02	0.00	0.00
Commercial	60.23	98.74	0.71	1.16	0.06	0.09	0.00	0.00	0.00	0.00
Education	1.97	98.71	0.03	1.27	0.00	0.03	0.00	0.00	0.00	0.00
Government	3.95	98.66	0.05	1.32	0.00	0.02	0.00	0.00	0.00	0.00
Industrial	17.77	98.72	0.22	1.23	0.01	0.04	0.00	0.01	0.00	0.00
Religion	5.94	99.02	0.06	0.96	0.00	0.03	0.00	0.00	0.00	0.00
Residential	1,197.54	98.81	14.13	1.17	0.32	0.03	0.00	0.00	0.00	0.00
Total	**1,295.31**		**15.29**		**0.39**		**0.01**		**0.00**	

Table 3: Expected Building Damage by Building Type : 50 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	41	98.38	1	1.48	0	0.13	0	0.01	0	0.00
MH	16	99.95	0	0.04	0	0.01	0	0.00	0	0.00
Steel	41	98.81	0	1.15	0	0.05	0	0.00	0	0.00
Wood	1,136	98.82	13	1.15	0	0.02	0	0.00	0	0.00

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

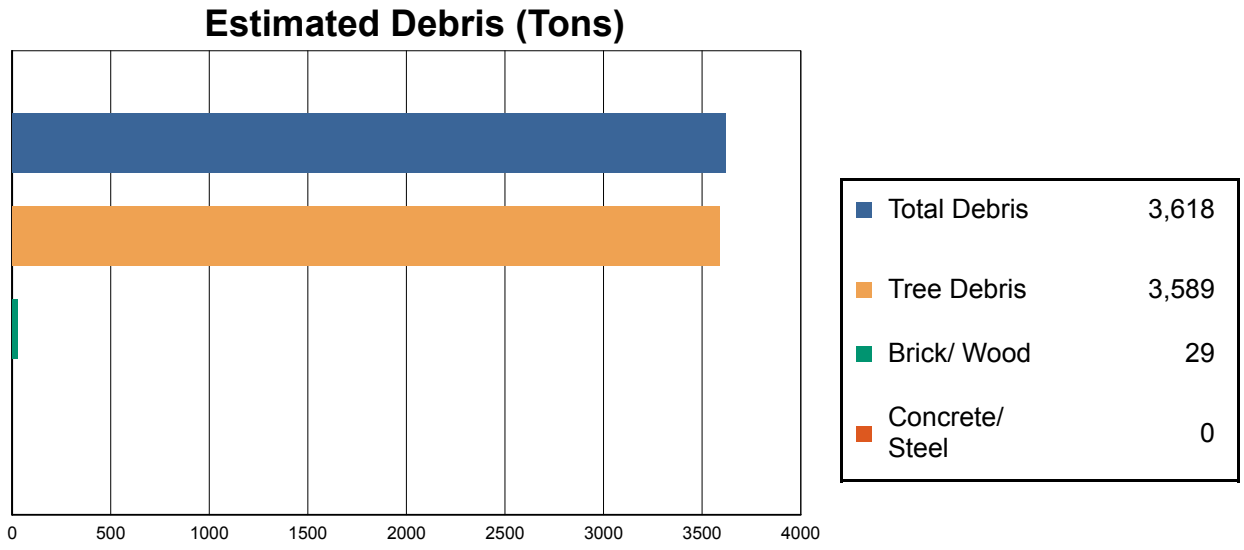
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	1

Induced Hurricane Damage

Debris Generation

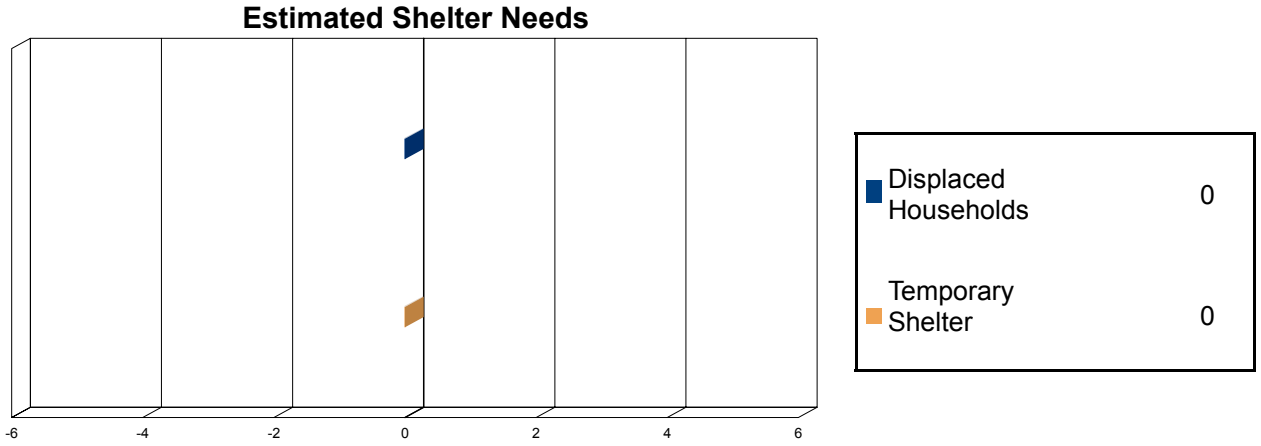


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 3,618 tons of debris will be generated. Of the total amount, 3,299 tons (91%) is Other Tree Debris. Of the remaining 319 tons, Brick/Wood comprises 9% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 1 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 290 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Economic Loss

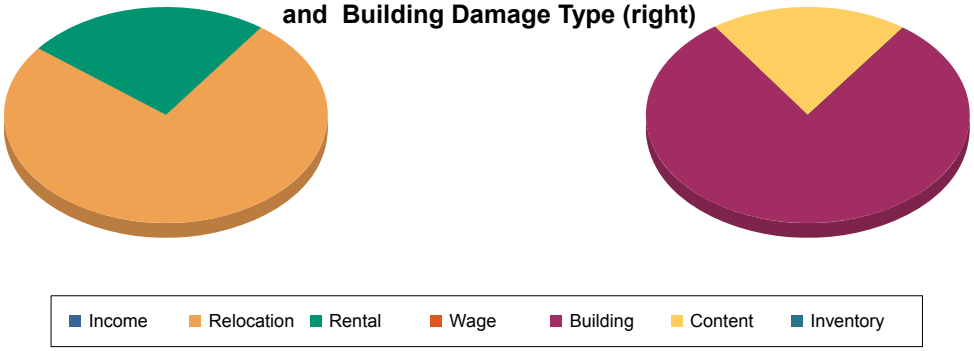
The total economic loss estimated for the hurricane is 1.2 million dollars, which represents 0.29 % of the total replacement value of the region's buildings.

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 1 million dollars. 0% 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 99% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

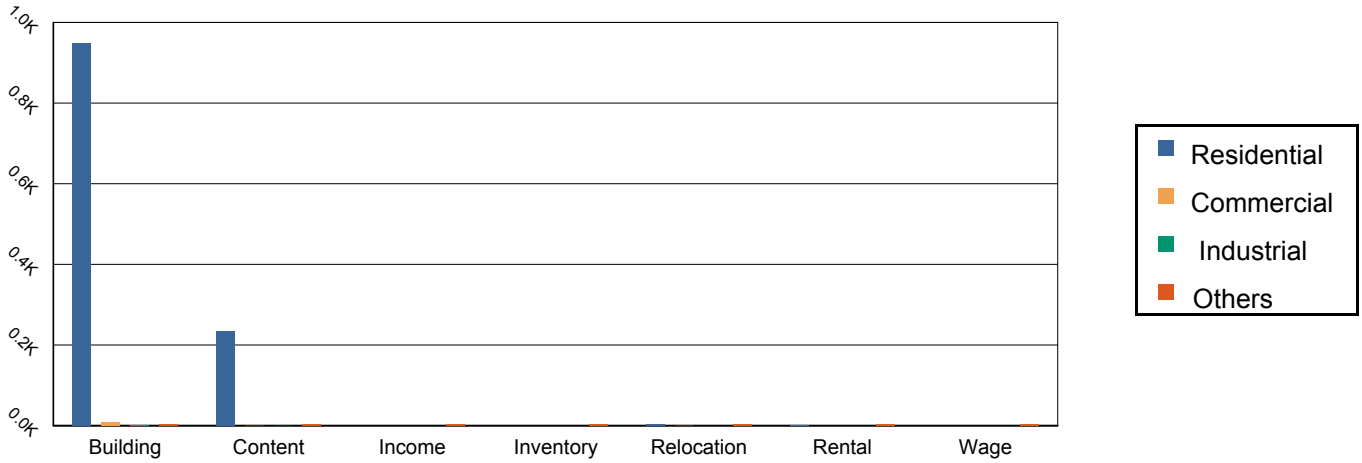


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	948.10	8.71	1.62	3.29	961.72
	Content	234.89	0.08	0.07	0.00	235.04
	Inventory	0.00	0.00	0.01	0.00	0.02
	Subtotal	**1,182.99**	**8.79**	**1.70**	**3.29**	**1,196.77**
Business Interruption Loss						
	Income	0.00	0.00	0.00	0.00	0.00
	Relocation	4.21	0.14	0.01	0.03	4.38
	Rental	1.41	0.00	0.00	0.00	1.41
	Wage	0.00	0.00	0.00	0.00	0.00
	Subtotal	**5.62**	**0.14**	**0.01**	**0.03**	**5.80**

Total

Total	**1,188.61**	**8.93**	**1.71**	**3.32**	**1,202.57**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: Probabilistic 100-year Return Period

Print Date: Thursday, October 3, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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.

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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):

- Connecticut

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

The geographical size of the region is 34.03 square miles and contains 1 census tracts. There are over 1 thousand households in the region and a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 million dollars (2014 dollars). Approximately 92% of the buildings (and 91% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million (2014 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.

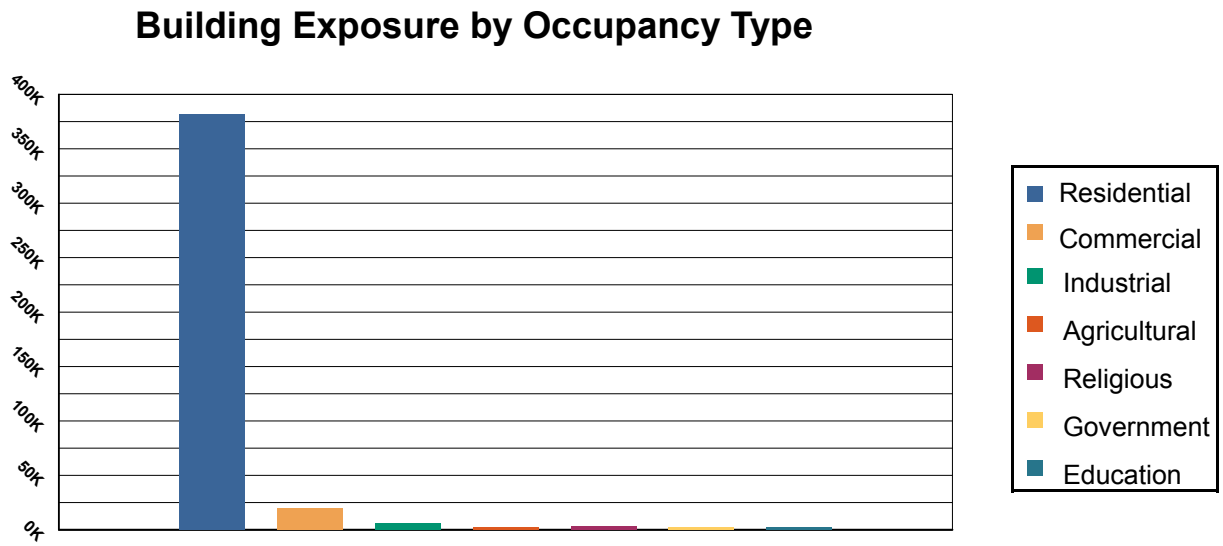


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	382,199	91.41 %
Commercial	19,444	4.65%
Industrial	5,824	1.39%
Agricultural	2,495	0.60%
Religious	3,401	0.81%
Government	2,713	0.65%
Education	2,017	0.48%
Total	**418,093**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 1 schools, 3 fire stations, no police stations and 1 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:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 5 buildings will be at least moderately damaged. This is over 0% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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.

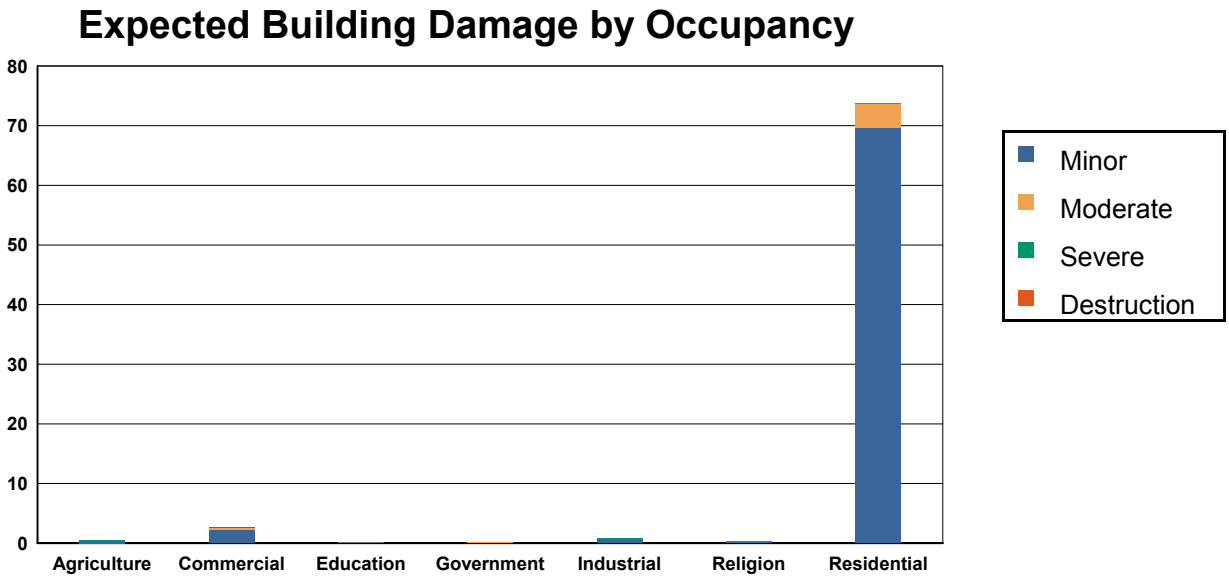


Table 2: Expected Building Damage by Occupancy : 100 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	7.56	94.53	0.35	4.44	0.06	0.73	0.02	0.30	0.00	0.01
Commercial	58.41	95.76	2.27	3.71	0.30	0.49	0.02	0.04	0.00	0.00
Education	1.91	95.50	0.08	4.23	0.01	0.27	0.00	0.01	0.00	0.00
Government	3.82	95.42	0.17	4.29	0.01	0.29	0.00	0.01	0.00	0.00
Industrial	17.24	95.76	0.67	3.72	0.07	0.40	0.02	0.12	0.00	0.00
Religion	5.77	96.25	0.22	3.59	0.01	0.15	0.00	0.01	0.00	0.00
Residential	1,138.27	93.92	69.66	5.75	4.02	0.33	0.02	0.00	0.02	0.00
Total	**1,232.98**		**73.42**		**4.48**		**0.09**		**0.03**	

Table 3: Expected Building Damage by Building Type : 100 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	39	93.76	2	5.35	0	0.81	0	0.08	0	0.00
MH	16	99.30	0	0.54	0	0.13	0	0.00	0	0.03
Steel	40	96.33	1	3.29	0	0.34	0	0.04	0	0.00
Wood	1,080	93.92	66	5.77	3	0.30	0	0.00	0	0.00

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

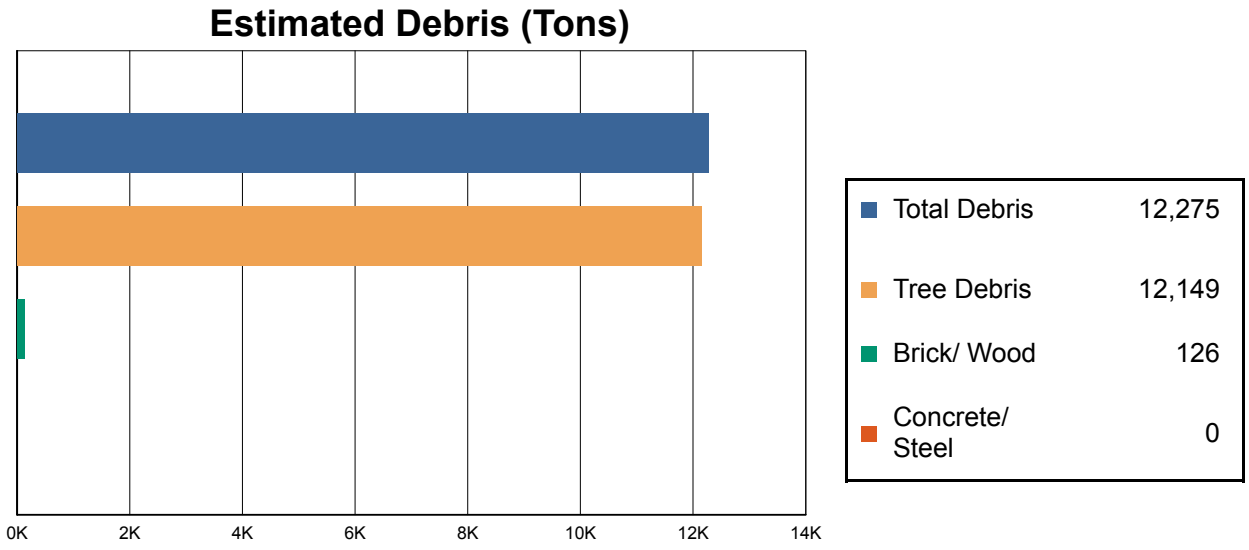
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	1

Induced Hurricane Damage

Debris Generation

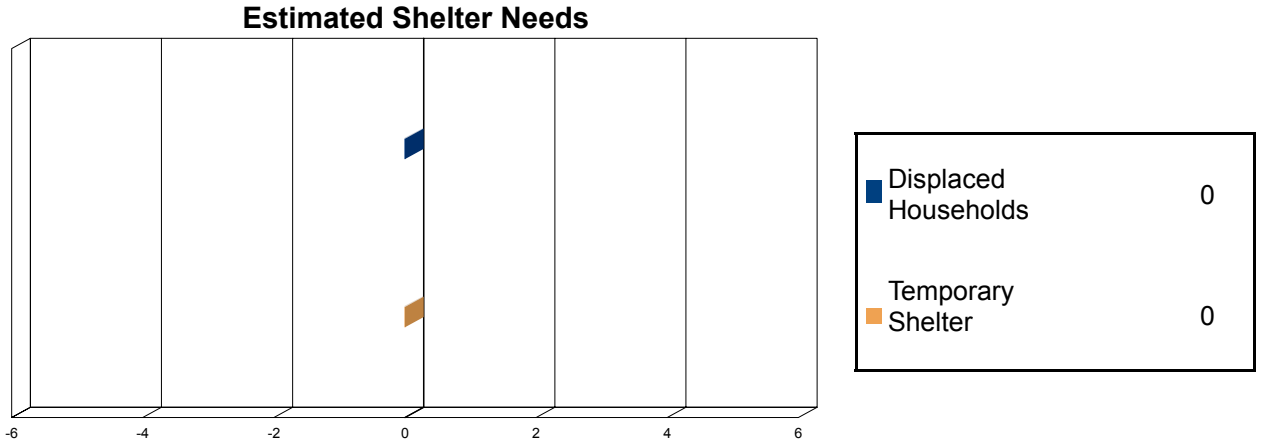


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 12,275 tons of debris will be generated. Of the total amount, 11,168 tons (91%) is Other Tree Debris. Of the remaining 1,107 tons, Brick/Wood comprises 11% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 5 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 981 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Economic Loss

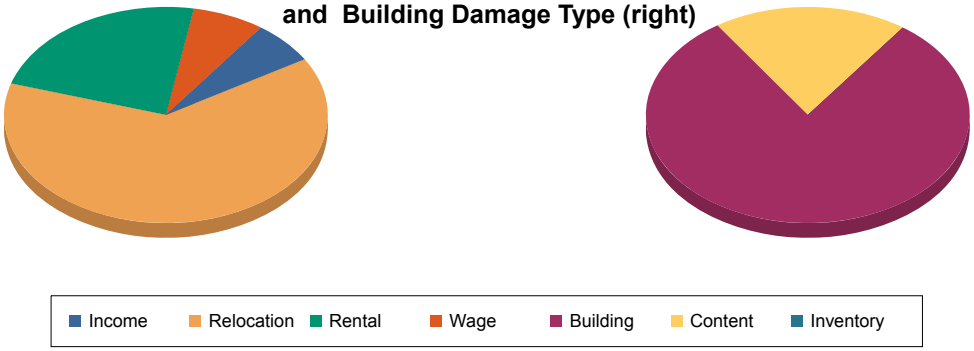
The total economic loss estimated for the hurricane is 3.1 million dollars, which represents 0.74 % of the total replacement value of the region's buildings.

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 3 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 97% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

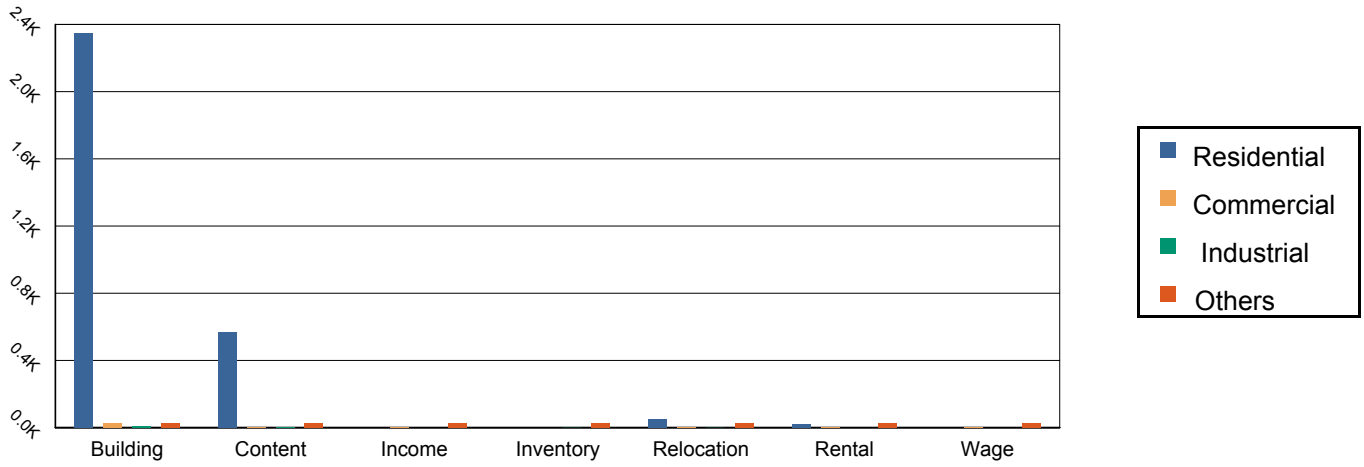


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	2,349.98	30.07	7.10	14.54	2,401.69
	Content	571.15	4.36	2.24	2.44	580.20
	Inventory	0.00	0.08	0.36	0.13	0.57
	Subtotal	**2,921.13**	**34.51**	**9.70**	**17.12**	**2,982.46**
Business Interruption Loss						
	Income	0.00	3.95	0.04	1.78	5.77
	Relocation	51.69	4.12	0.18	1.91	57.90
	Rental	18.06	2.71	0.03	0.15	20.95
	Wage	0.00	2.43	0.07	4.17	6.67
	Subtotal	**69.75**	**13.21**	**0.32**	**8.02**	**91.30**

Total

Total	**2,990.88**	**47.72**	**10.02**	**25.14**	**3,073.76**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: Probabilistic 200-year Return Period

Print Date: Thursday, October 3, 2019

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Building Inventory

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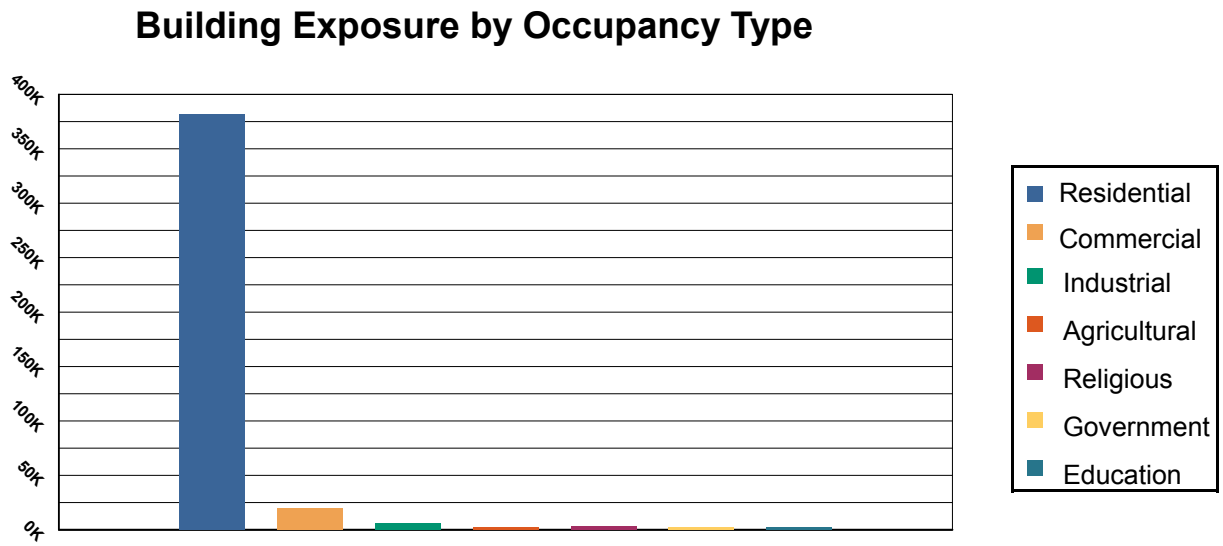

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Religious	3,401	0.81%
Government	2,713	0.65%
Education	2,017	0.48%
Total	**418,093**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 1 schools, 3 fire stations, no police stations and 1 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:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 19 buildings will be at least moderately damaged. This is over 1% of the total number of buildings in the region. There are an estimated 0 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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.

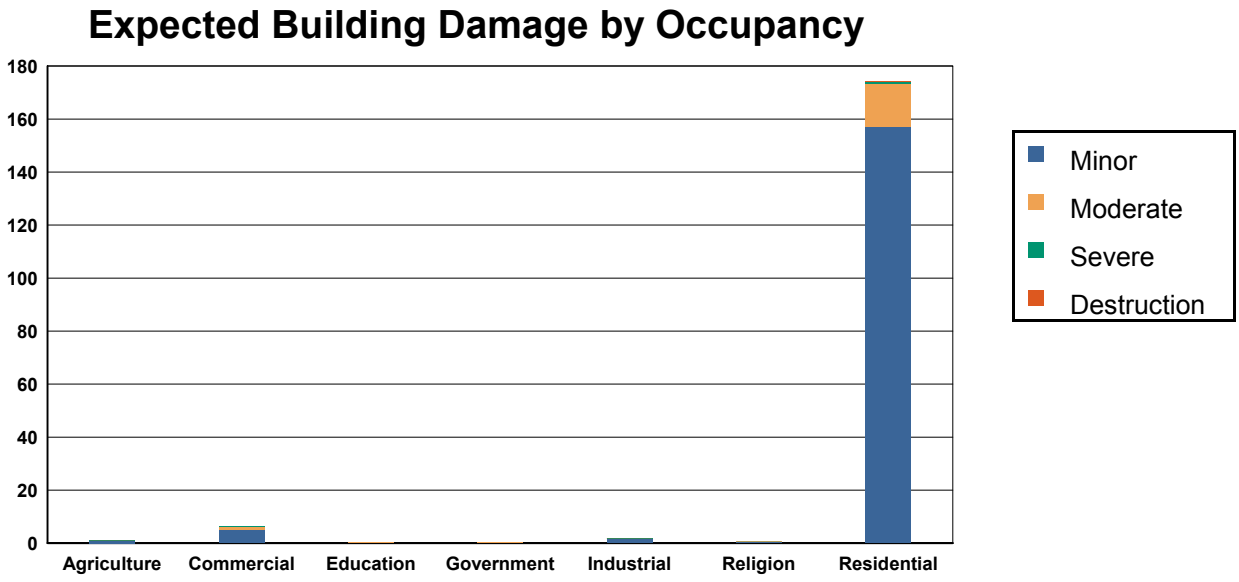


Table 2: Expected Building Damage by Occupancy : 200 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	6.93	86.64	0.80	10.02	0.18	2.21	0.08	1.05	0.01	0.09
Commercial	54.77	89.79	5.14	8.43	0.98	1.60	0.11	0.18	0.00	0.00
Education	1.77	88.68	0.19	9.71	0.03	1.55	0.00	0.08	0.00	0.00
Government	3.54	88.47	0.39	9.74	0.07	1.71	0.00	0.08	0.00	0.00
Industrial	16.15	89.73	1.48	8.21	0.28	1.58	0.08	0.45	0.01	0.03
Religion	5.42	90.41	0.52	8.72	0.05	0.83	0.00	0.04	0.00	0.00
Residential	1,037.70	85.62	157.13	12.96	16.33	1.35	0.47	0.04	0.37	0.03
Total	**1,126.29**		**165.66**		**17.92**		**0.75**		**0.39**	

Table 3: Expected Building Damage by Building Type : 200 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	36	85.97	5	11.32	1	2.40	0	0.28	0	0.03
MH	15	96.83	0	2.19	0	0.78	0	0.01	0	0.19
Steel	38	91.07	3	7.37	1	1.35	0	0.21	0	0.00
Wood	984	85.58	150	13.07	15	1.29	0	0.04	0	0.03

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

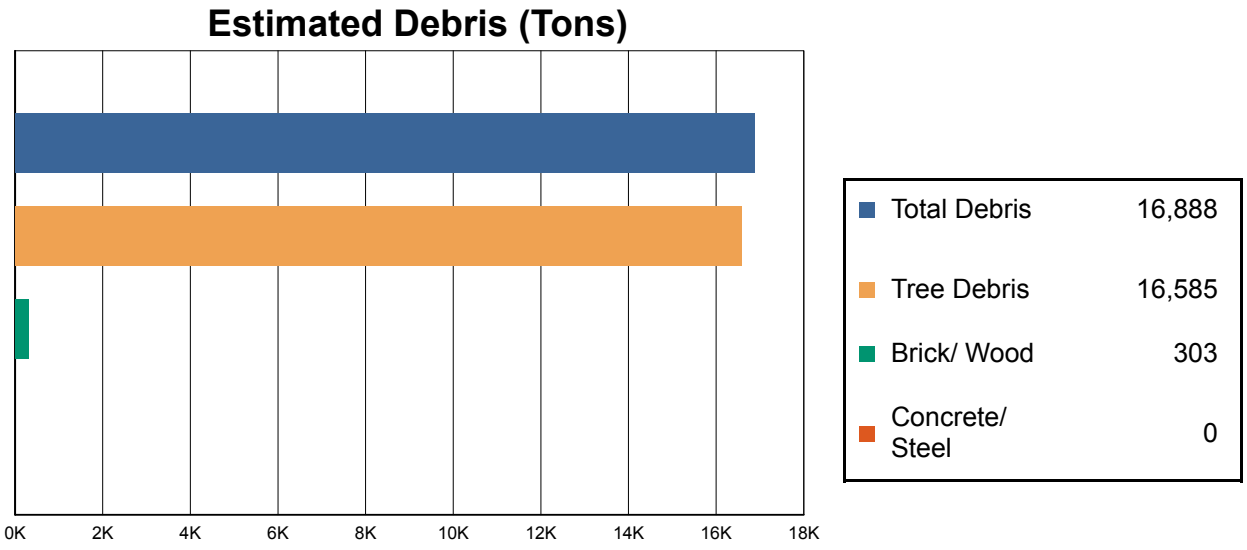
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	1

Induced Hurricane Damage

Debris Generation

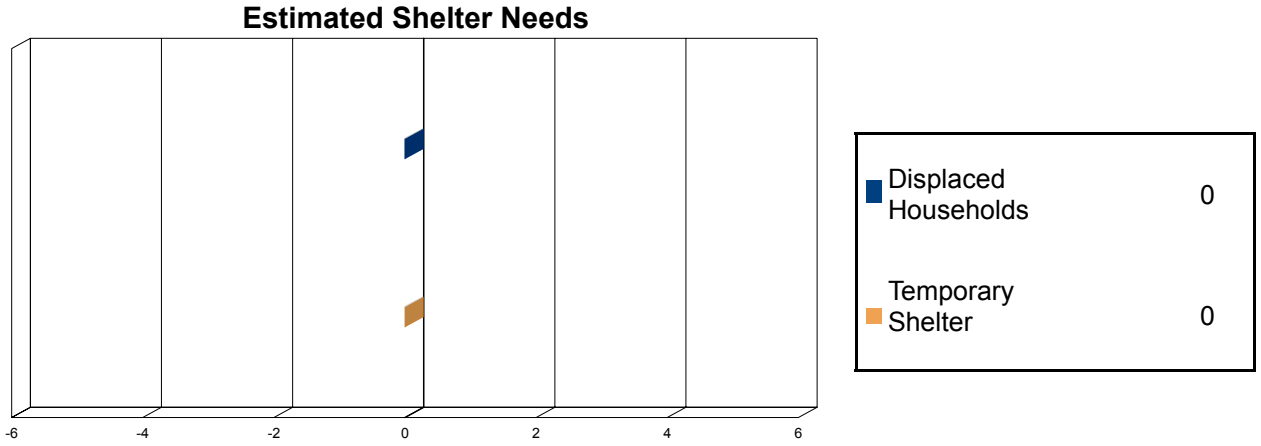


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 16,888 tons of debris will be generated. Of the total amount, 15,246 tons (90%) is Other Tree Debris. Of the remaining 1,642 tons, Brick/Wood comprises 18% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 12 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 1,339 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Economic Loss

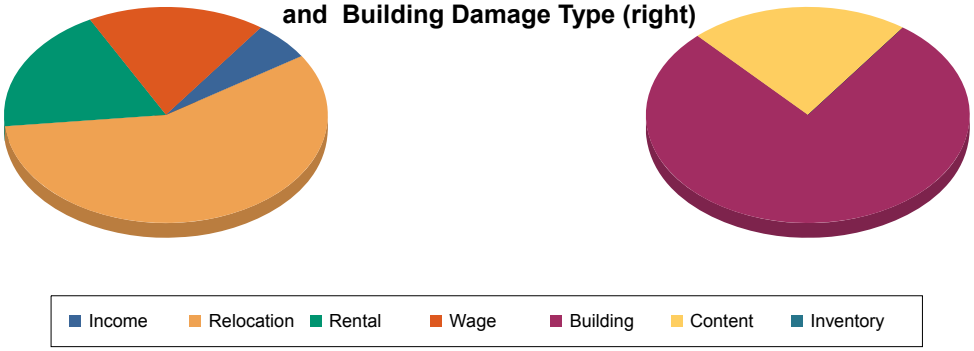
The total economic loss estimated for the hurricane is 6.0 million dollars, which represents 1.43 % of the total replacement value of the region's buildings.

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 6 million dollars. 4% 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 96% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

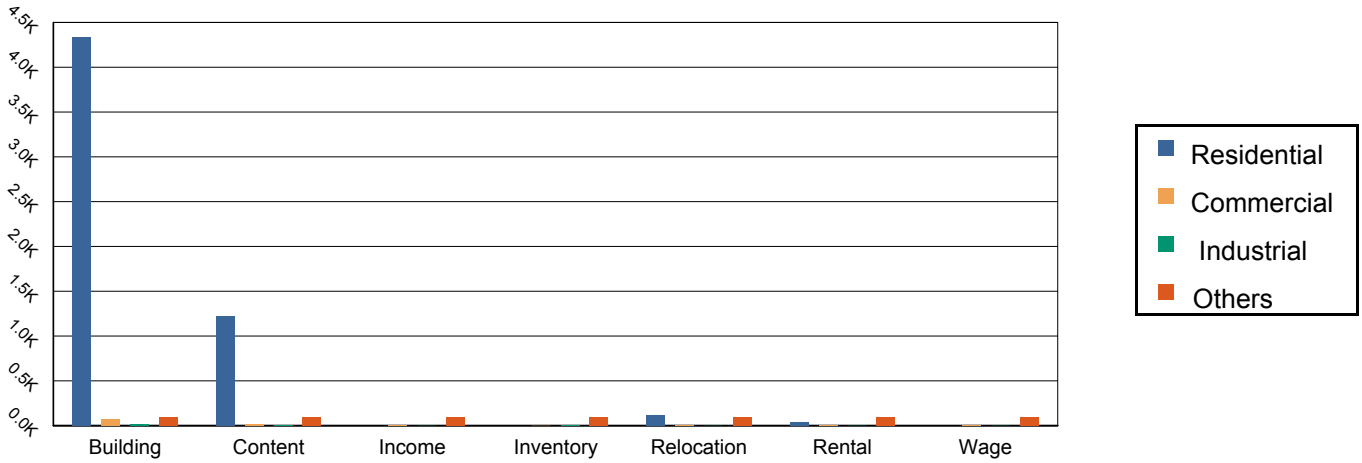


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	4,335.91	72.54	21.27	40.44	4,470.15
	Content	1,224.55	13.28	10.37	10.50	1,258.70
	Inventory	0.00	0.30	1.63	0.59	2.52
	Subtotal	**5,560.46**	**86.12**	**33.27**	**51.53**	**5,731.38**
Business Interruption Loss						
	Income	0.00	10.35	0.25	2.45	13.06
	Relocation	113.45	10.97	1.12	6.06	131.61
	Rental	35.62	6.81	0.19	0.49	43.11
	Wage	0.00	6.11	0.43	34.09	40.63
	Subtotal	**149.07**	**34.25**	**2.01**	**43.09**	**228.42**

Total

Total	**5,709.53**	**120.37**	**35.28**	**94.62**	**5,959.79**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: Probabilistic 500-year Return Period

Print Date: Thursday, October 3, 2019

Disclaimer:
This version of Hazus utilizes 2010 Census Data.
Totals only reflect data for those census tracts/blocks included in the user's study region.

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.

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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):

- Connecticut

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

The geographical size of the region is 34.03 square miles and contains 1 census tracts. There are over 1 thousand households in the region and a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 million dollars (2014 dollars). Approximately 92% of the buildings (and 91% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million (2014 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.

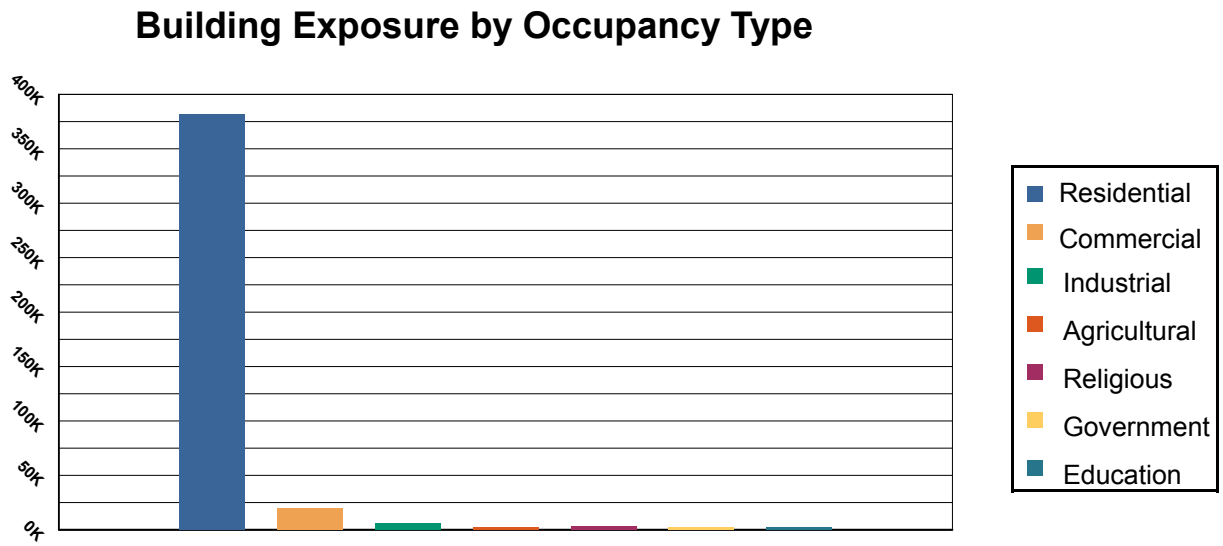


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	382,199	91.41 %
Commercial	19,444	4.65%
Industrial	5,824	1.39%
Agricultural	2,495	0.60%
Religious	3,401	0.81%
Government	2,713	0.65%
Education	2,017	0.48%
Total	**418,093**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 1 schools, 3 fire stations, no police stations and 1 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:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 72 buildings will be at least moderately damaged. This is over 5% of the total number of buildings in the region. There are an estimated 3 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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.

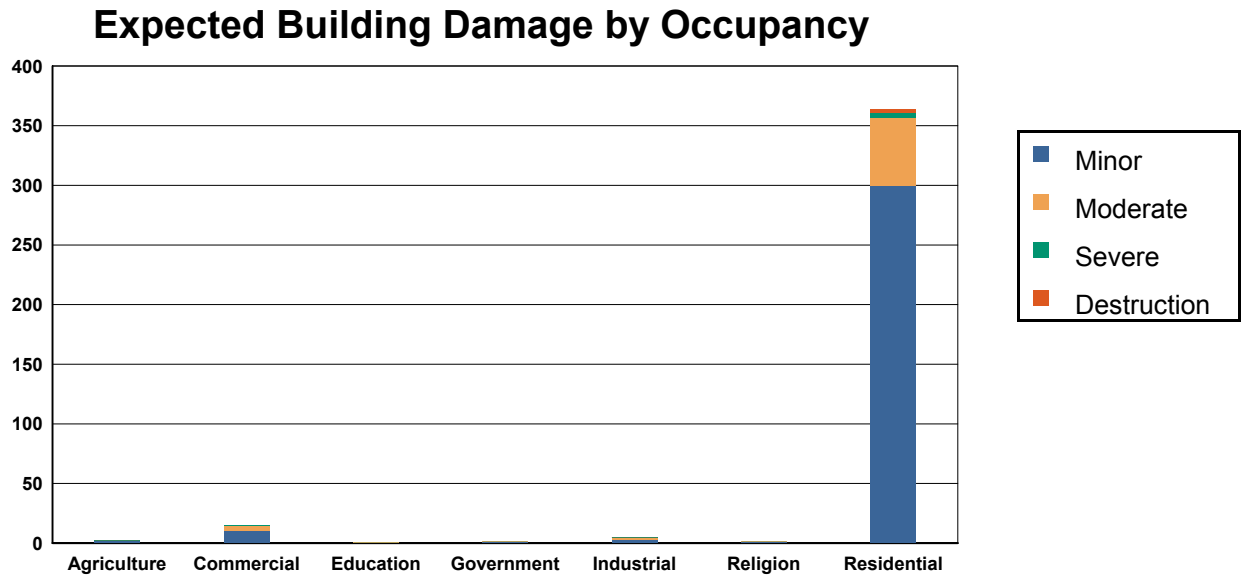


Table 2: Expected Building Damage by Occupancy : 500 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	5.64	70.49	1.60	19.94	0.49	6.18	0.24	2.98	0.03	0.41
Commercial	46.18	75.71	10.76	17.64	3.57	5.85	0.48	0.79	0.00	0.01
Education	1.45	72.70	0.39	19.43	0.14	7.08	0.02	0.80	0.00	0.00
Government	2.89	72.28	0.77	19.15	0.31	7.65	0.04	0.92	0.00	0.00
Industrial	13.56	75.35	3.02	16.79	1.10	6.13	0.28	1.57	0.03	0.16
Religion	4.58	76.31	1.14	19.04	0.26	4.33	0.02	0.33	0.00	0.00
Residential	847.72	69.94	299.62	24.72	56.68	4.68	4.71	0.39	3.28	0.27
Total	**922.02**		**317.30**		**62.55**		**5.78**		**3.35**	

Table 3: Expected Building Damage by Building Type : 500 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	30	70.60	9	21.25	3	6.90	0	1.03	0	0.22
MH	14	88.72	1	6.40	1	3.71	0	0.17	0	1.00
Steel	33	77.55	7	15.66	2	5.75	0	1.02	0	0.01
Wood	803	69.82	288	25.02	52	4.52	4	0.39	3	0.25

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

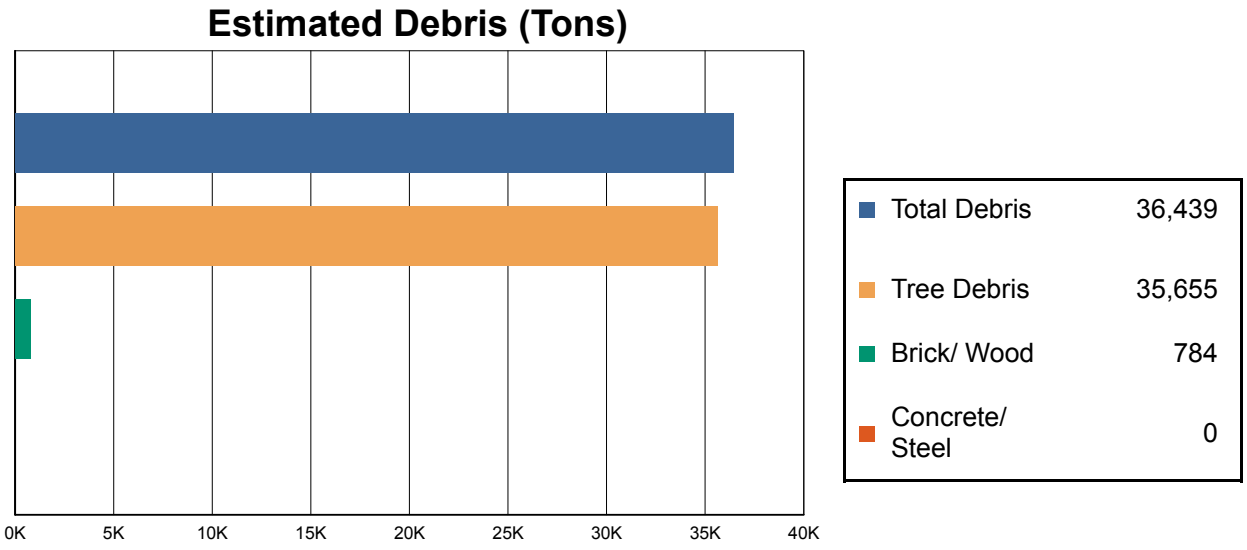
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	0

Induced Hurricane Damage

Debris Generation

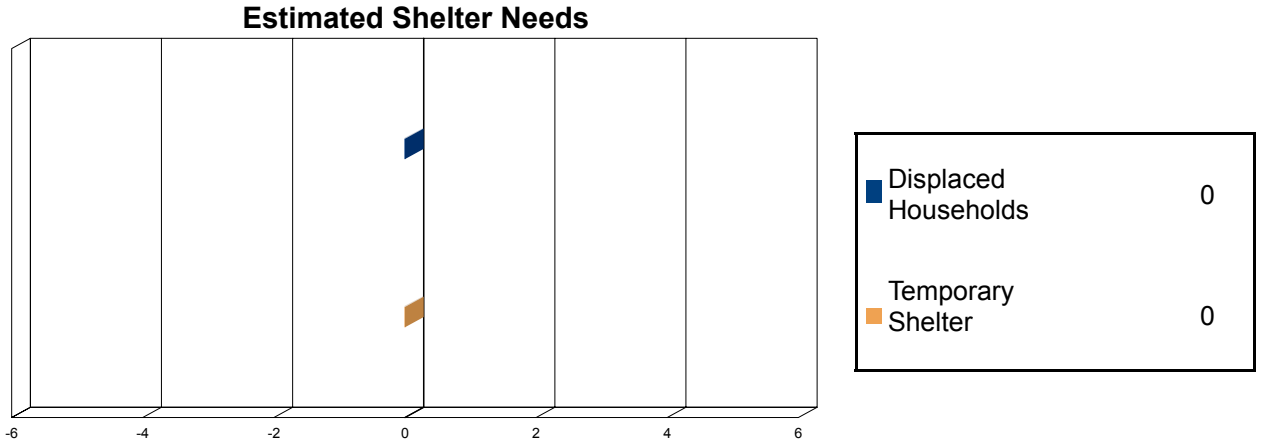


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 36,439 tons of debris will be generated. Of the total amount, 32,776 tons (90%) is Other Tree Debris. Of the remaining 3,663 tons, Brick/Wood comprises 21% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 31 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 2,879 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Economic Loss

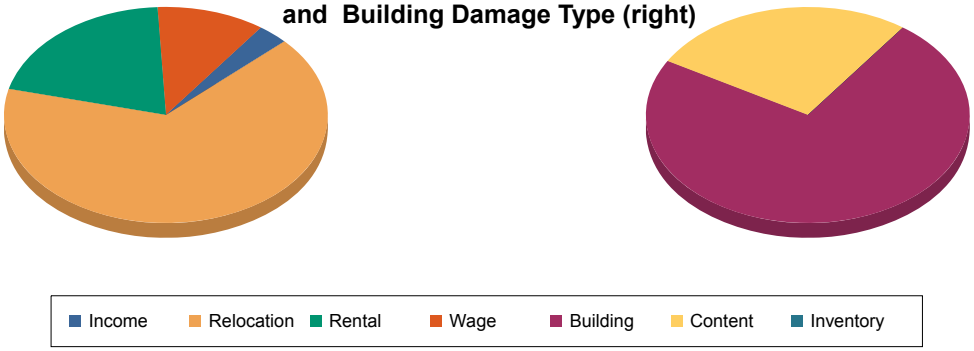
The total economic loss estimated for the hurricane is 15.1 million dollars, which represents 3.61 % of the total replacement value of the region's buildings.

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 15 million dollars. 7% 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 95% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

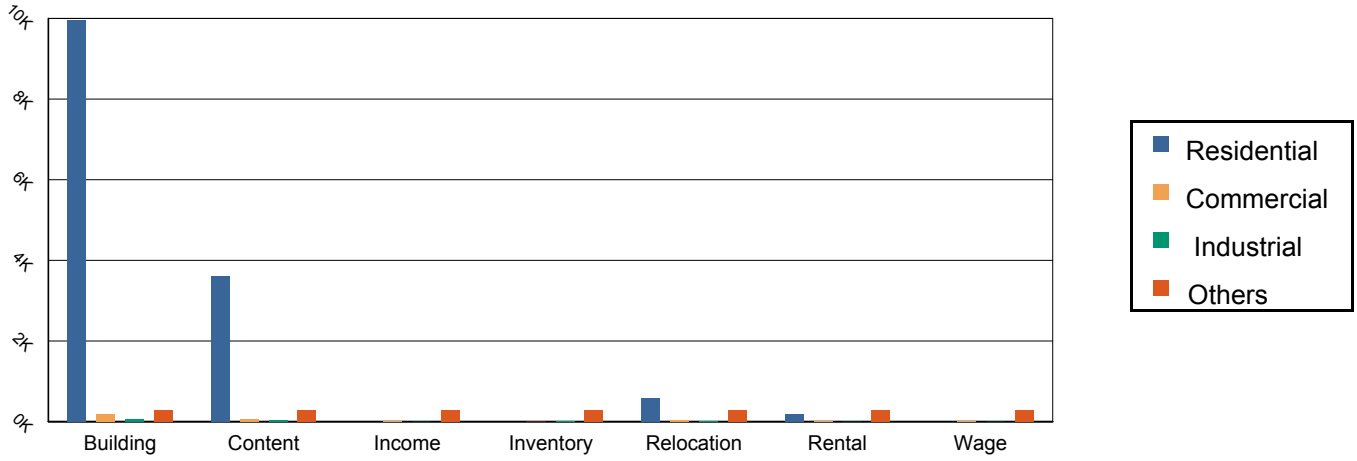


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	9,957.20	198.86	69.78	125.63	10,351.47
	Content	3,599.99	53.12	40.74	44.79	3,738.64
	Inventory	0.00	1.35	6.16	2.06	9.57
	Subtotal	**13,557.19**	**253.34**	**116.68**	**172.48**	**14,099.69**
Business Interruption Loss						
	Income	0.03	22.33	0.81	6.94	30.11
	Relocation	593.06	34.89	4.77	22.28	655.00
	Rental	179.57	20.69	0.69	2.01	202.96
	Wage	0.06	14.61	1.39	91.34	107.40
	Subtotal	**772.71**	**92.53**	**7.67**	**122.56**	**995.47**

Total

Total	**14,329.90**	**345.86**	**124.35**	**295.04**	**15,095.15**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Hurricane Global Risk Report

Region Name: Lyme

Hurricane Scenario: Probabilistic 1000-year Return Period

Print Date: Thursday, October 3, 2019

Disclaimer:
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General Description of the Region

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

The geographical size of the region is 34.03 square miles and contains 1 census tracts. There are over 1 thousand households in the region and a total population of 2,406 people (2010 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 million dollars (2014 dollars). Approximately 92% of the buildings (and 91% of the building value) are associated with residential housing.

Building Inventory

General Building Stock

Hazus estimates that there are 1,311 buildings in the region which have an aggregate total replacement value of 418 million (2014 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.

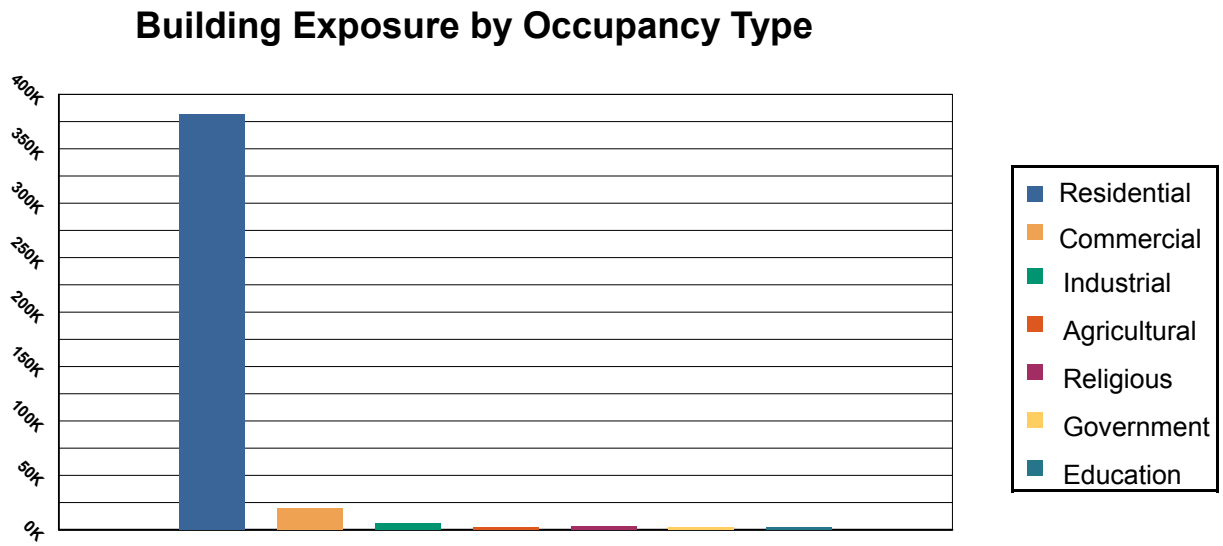


Table 1: Building Exposure by Occupancy Type

Occupancy	Exposure ($1000)	Percent of Tot
Residential	382,199	91.41 %
Commercial	19,444	4.65%
Industrial	5,824	1.39%
Agricultural	2,495	0.60%
Religious	3,401	0.81%
Government	2,713	0.65%
Education	2,017	0.48%
Total	**418,093**	**100.00%**

Essential Facility Inventory

For essential facilities, there are no hospitals in the region with a total bed capacity of no beds. There are 1 schools, 3 fire stations, no police stations and 1 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:	Probabilistic
Type:	Probabilistic

Building Damage

General Building Stock Damage

Hazus estimates that about 141 buildings will be at least moderately damaged. This is over 11% of the total number of buildings in the region. There are an estimated 10 buildings that will be completely destroyed. The definition of the 'damage states' is provided in 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.

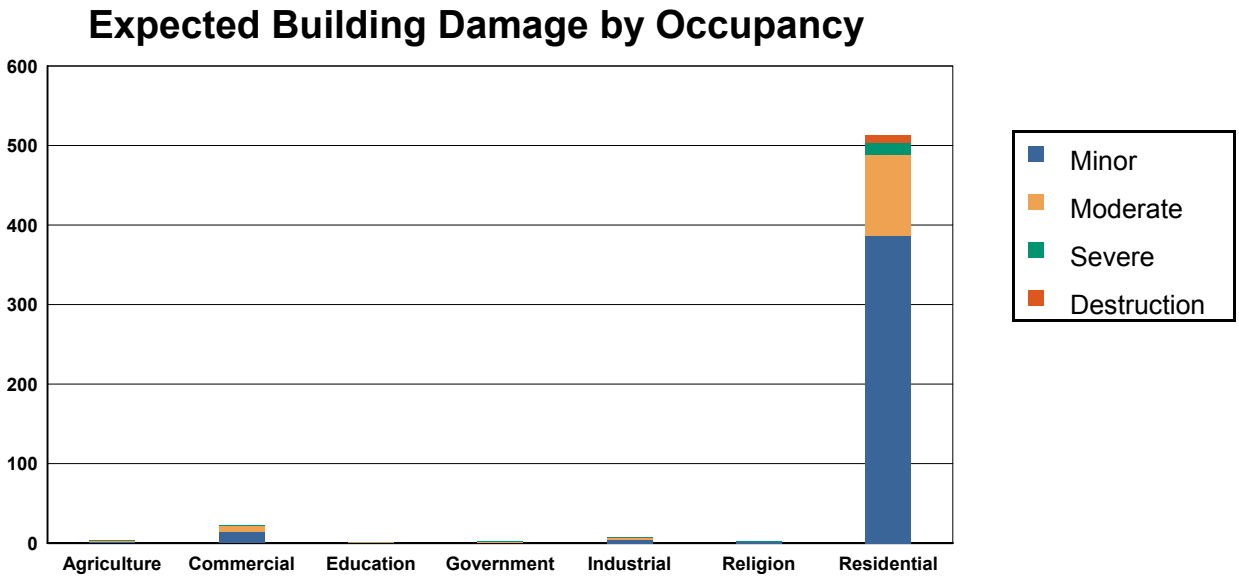


Table 2: Expected Building Damage by Occupancy : 1000 - year Event

	None		Minor		Moderate		Severe		Destruction	
Occupancy	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**	**Count**	**(%)**
Agriculture	4.57	57.10	2.12	26.48	0.84	10.52	0.40	5.05	0.07	0.85
Commercial	38.16	62.55	14.44	23.68	7.14	11.70	1.25	2.05	0.01	0.02
Education	1.17	58.40	0.50	24.83	0.28	14.02	0.06	2.76	0.00	0.00
Government	2.32	57.90	0.97	24.14	0.59	14.82	0.13	3.15	0.00	0.00
Industrial	11.14	61.87	3.98	22.14	2.20	12.24	0.62	3.42	0.06	0.34
Religion	3.79	63.25	1.56	26.04	0.57	9.52	0.07	1.20	0.00	0.00
Residential	699.26	57.69	386.45	31.88	101.91	8.41	14.46	1.19	9.92	0.82
Total	**760.40**		**410.02**		**113.54**		**16.99**		**10.06**	

Table 3: Expected Building Damage by Building Type : 1000 - year Event

Building Type	None		Minor		Moderate		Severe		Destruction	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Concrete	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Masonry	24	58.06	11	27.15	5	11.91	1	2.28	0	0.60
MH	13	79.48	2	9.90	1	7.60	0	0.58	0	2.44
Steel	27	64.22	9	20.97	5	12.10	1	2.68	0	0.03
Wood	661	57.52	372	32.34	94	8.18	14	1.19	9	0.77

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 by patients already in the hospital and those injured by the hurricane. After one week, none of the beds will be in service. By 30 days, none will be operational.

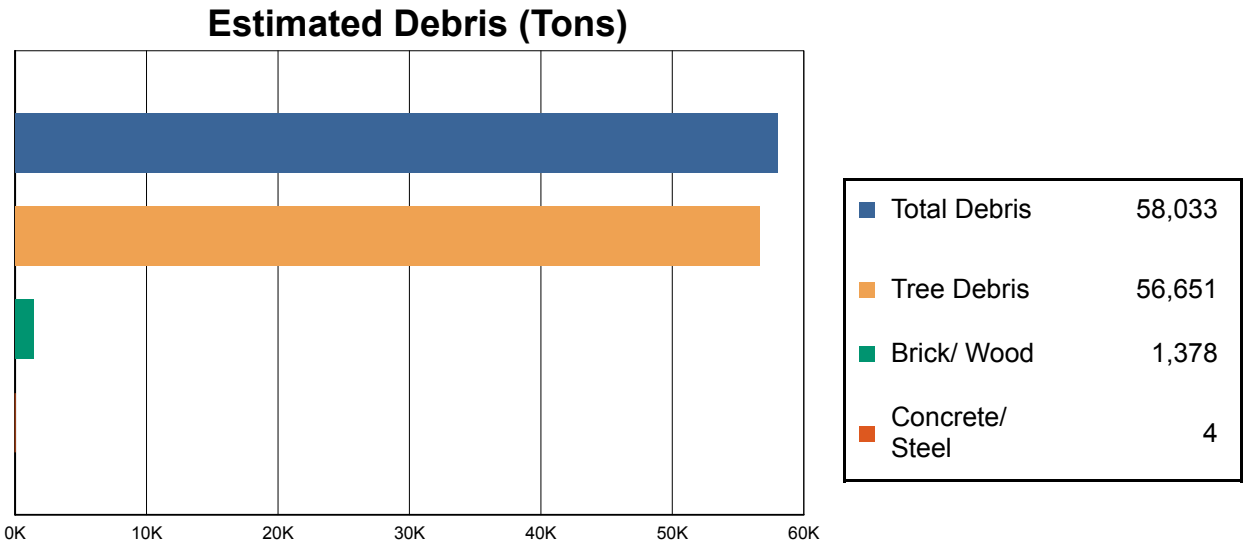
Thematic Map of Essential Facilities with greater than 50% moderate

Table 4: Expected Damage to Essential Facilities

		# Facilities		
Classification	**Total**	**Probability of at Least Moderate Damage > 50%**	**Probability of Complete Damage > 50%**	**Expected Loss of Use < 1 day**
EOCs	1	0	0	1
Fire Stations	3	0	0	3
Schools	1	0	0	0

Induced Hurricane Damage

Debris Generation

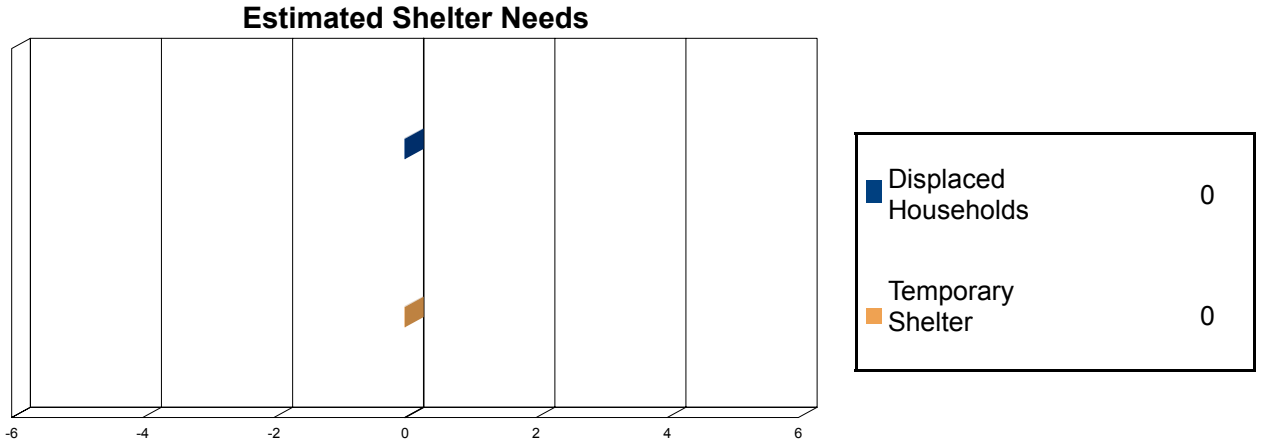


Hazus estimates the amount of debris that will be generated by the hurricane. The model breaks the debris into four general categories: a) Brick/Wood, b) Reinforced Concrete/Steel, c) Eligible Tree Debris, and d) Other Tree Debris. This distinction is made because of the different types of material handling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

The model estimates that a total of 58,033 tons of debris will be generated. Of the total amount, 52,077 tons (90%) is Other Tree Debris. Of the remaining 5,956 tons, Brick/Wood comprises 23% of the total, Reinforced Concrete/Steel comprises of 0% of the total, with the remainder being Eligible Tree Debris. If the building debris tonnage is converted to an estimated number of truckloads, it will require 55 truckloads (@25 tons/truck) to remove the building debris generated by the hurricane. The number of Eligible Tree Debris truckloads will depend on how the 4,574 tons of Eligible Tree Debris are collected and processed. The volume of tree debris generally ranges from about 4 cubic yards per ton for chipped or compacted tree debris to about 10 cubic yards per ton for bulkier, uncompacted debris.

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 0 households to be displaced due to the hurricane. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Economic Loss

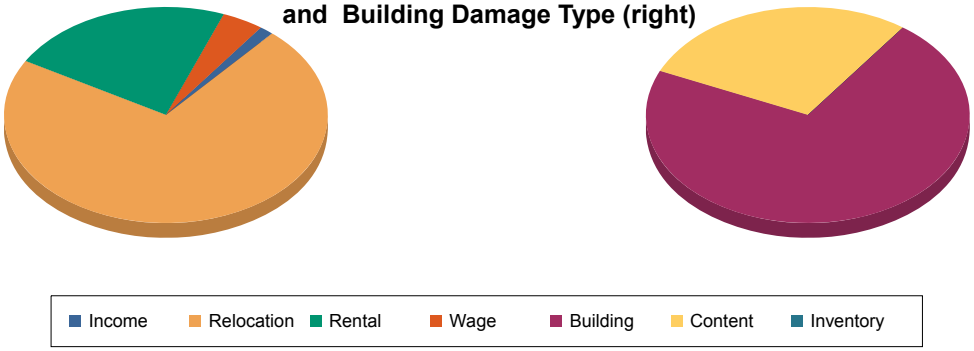
The total economic loss estimated for the hurricane is 27.4 million dollars, which represents 6.55 % of the total replacement value of the region's buildings.

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 27 million dollars. 8% 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 95% of the total loss. Table 5 below provides a summary of the losses associated with the building damage.

Loss by Business Interruption Type (left) and Building Damage Type (right)



Loss Type by General Occupancy

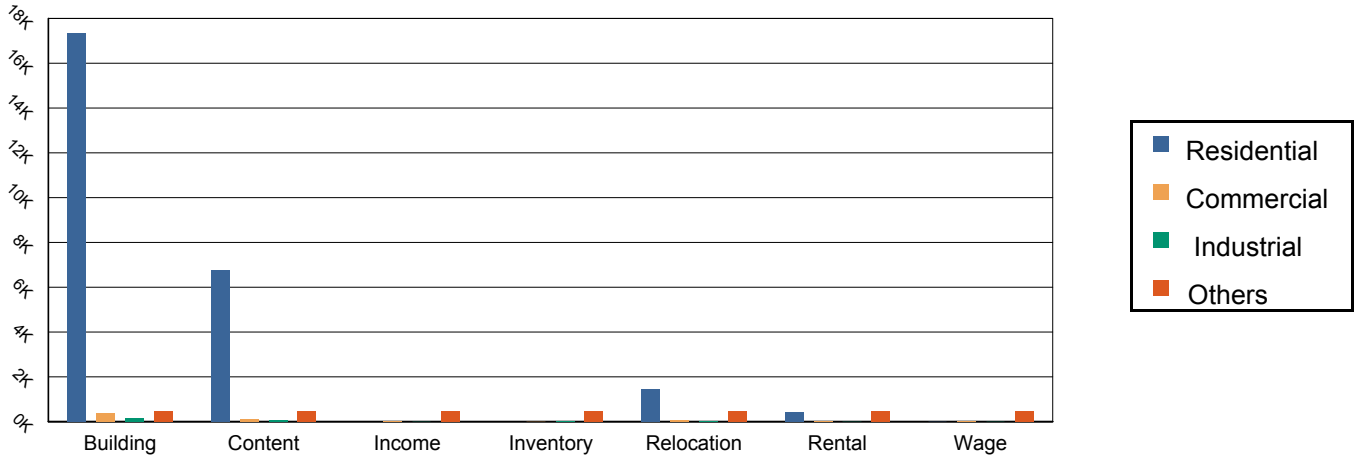


Table 5: Building-Related Economic Loss Estimates

(Thousands of dollars)

Category	Area	Residential	Commercial	Industrial	Others	Total
Property Damage						
	Building	17,353.52	371.69	135.21	239.40	18,099.83
	Content	6,789.09	123.79	85.79	99.94	7,098.61
	Inventory	0.00	3.09	12.61	3.84	19.54
	Subtotal	**24,142.62**	**498.58**	**233.61**	**343.18**	**25,217.98**
Business Interruption Loss						
	Income	0.48	20.79	1.51	6.34	29.13
	Relocation	1,446.61	67.36	10.17	43.78	1,567.92
	Rental	440.68	39.10	1.36	4.11	485.25
	Wage	1.13	15.14	2.56	74.17	93.00
	Subtotal	**1,888.91**	**142.40**	**15.60**	**128.40**	**2,175.30**

Total

Total	**26,031.53**	**640.97**	**249.21**	**471.57**	**27,393.28**

Appendix A: County Listing for the Region

Connecticut
- New London

Appendix B: Regional Population and Building Value Data

		Building Value (thousands of dollars)		
	Population	Residential	Non-Residential	Total
Connecticut				
New London	2,406	382,199	35,894	418,093
Total	**2,406**	**382,199**	**35,894**	**418,093**
Study Region Total	**2,406**	**382,199**	**35,894**	**418,093**

Hazus: Earthquake Global Risk Report

Region Name: Lyme

Earthquake Scenario: Annualized

Print Date: October 17, 2019

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

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 earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) 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 earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 34.02 square miles and contains 1 census tracts. There are over 1 thousand households in the region which has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 (millions of dollars). Approximately 92.00 % of the buildings (and 91.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 291 and 9 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1 thousand buildings in the region which have an aggregate total replacement value of 418 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 1 schools, 3 fire stations, 0 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 300.00 (millions of dollars). This inventory includes over 25.48 miles of highways, 10 bridges, 303.23 miles of pipes.

Table 1: Transportation System Lifeline Inventory

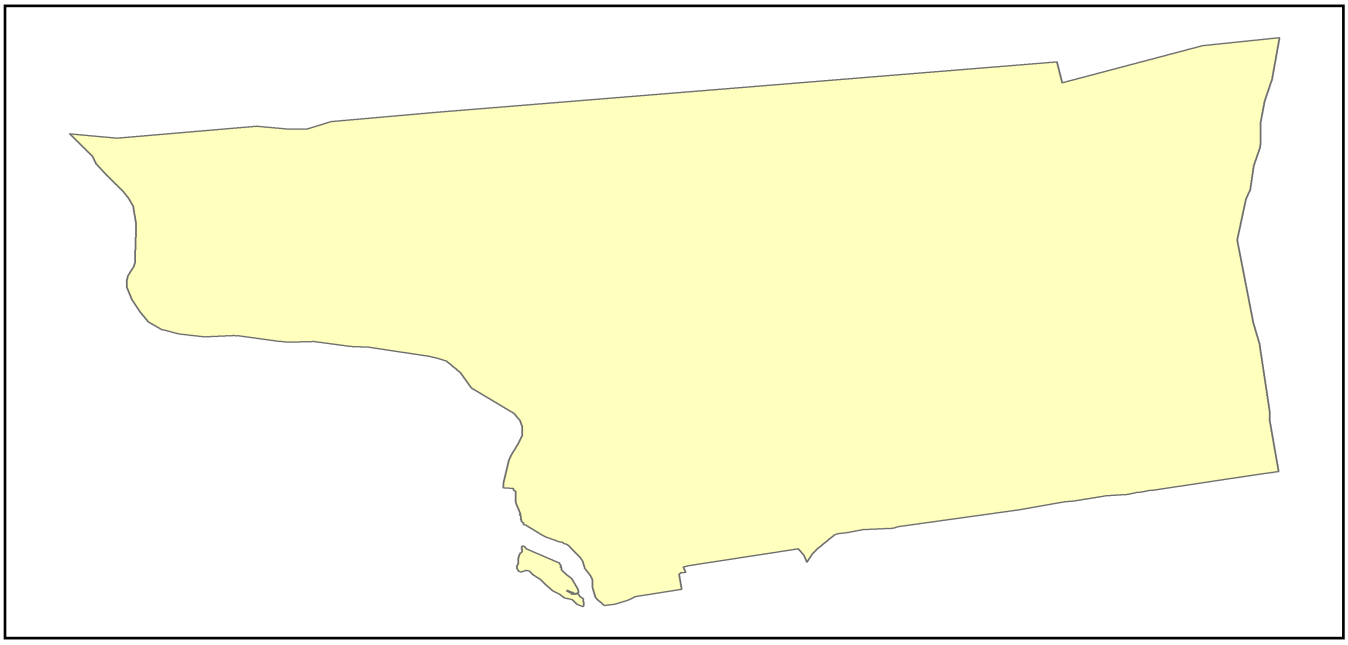
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	10	33.9321
	Segments	11	254.0865
	Tunnels	0	0.0000
		Subtotal	**288.0186**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	1	1.3310
		Subtotal	**1.3310**
Port	Facilities	1	1.9970
		Subtotal	**1.9970**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**291.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.8850
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**4.8850**
Waste Water	Distribution Lines	NA	2.9310
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.9310**
Natural Gas	Distribution Lines	NA	1.9540
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**1.9540**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**9.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Annualized
Type of Earthquake	Probabilistic
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	Annualized
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	NA
Depth (km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Direct Earthquake Damage

Building Damage

Hazus estimates that about 2 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

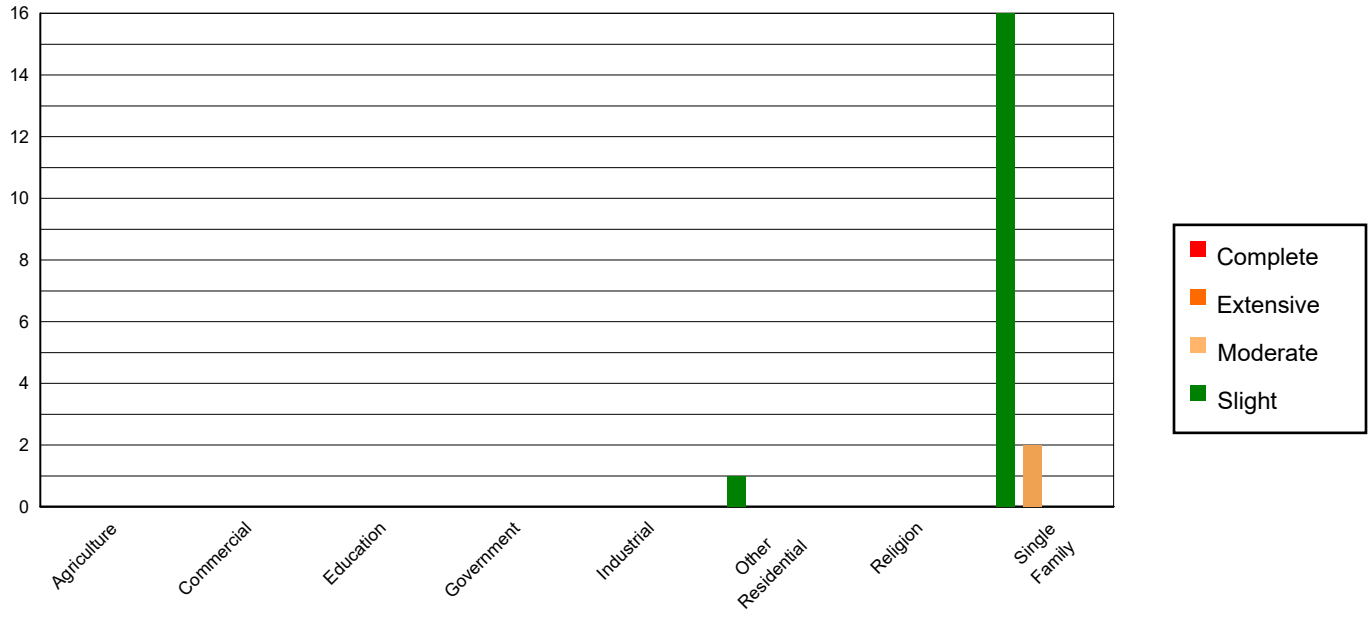


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	2.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commercial	22.00	1.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Education	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Government	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Industrial	2.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other Residential	27.00	2.24	1.00	5.88	0.00	0.00	0.00	0.00	0.00	0.00
Religion	3.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Single Family	1152.00	95.36	16.00	94.12	2.00	100.00	0.00	0.00	0.00	0.00
Total	**1,208**		**17**		**2**		**0**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1126.00	93.21	14.00	82.35	1.00	50.00	0.00	0.00	0.00	0.00
Steel	10.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Concrete	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Precast	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
URM	48.00	3.97	2.00	11.76	1.00	50.00	0.00	0.00	0.00	0.00
MH	24.00	1.99	1.00	5.88	0.00	0.00	0.00	0.00	0.00	0.00
Total	**1,208**		**17**		**2**		**0**		**0**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	1	0	0	1
EOCs	1	0	0	1
PoliceStations	0	0	0	0
FireStations	3	0	0	3

Transportation Lifeline Damage

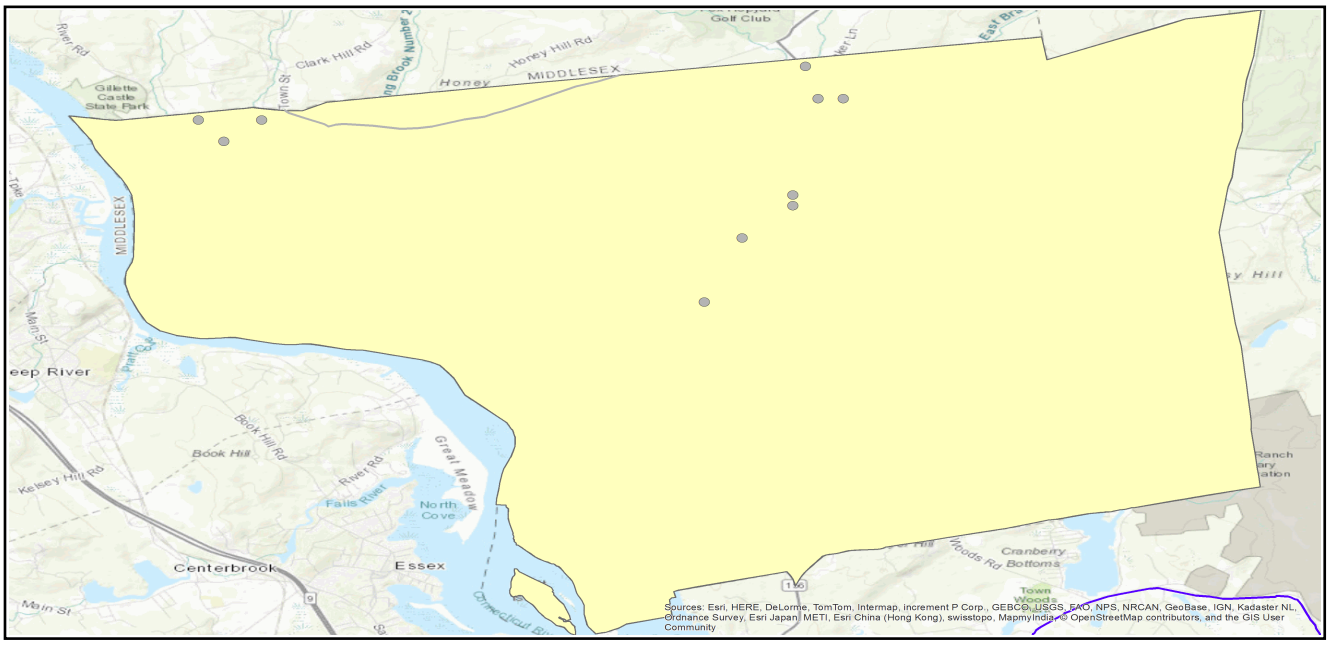


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	11	0	0	8	8
	Bridges	10	0	0	10	10
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	1	0	0	1	1
Port	Facilities	1	0	0	1	1
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	152	0	0
Waste Water	91	0	0
Natural Gas	61	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water						
Electric Power						

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. 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 0 tons of debris will be generated. Of the total amount, Brick/Wood comprises 77.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)

Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.00	0.00	0.00	0 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced households as a result of the earthquake	Persons seeking temporary public shelter
0	0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.00	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**

Economic Loss

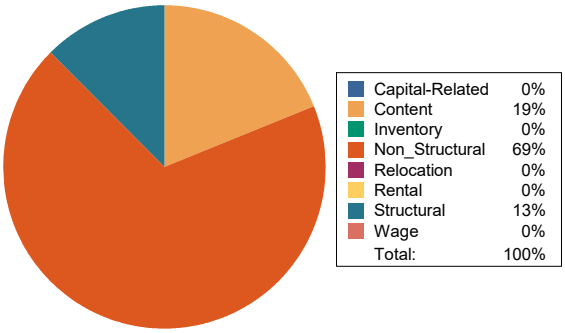
The total economic loss estimated for the earthquake is 0.03 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building 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 earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 0.00 (millions of dollars); 0 % 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 100 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

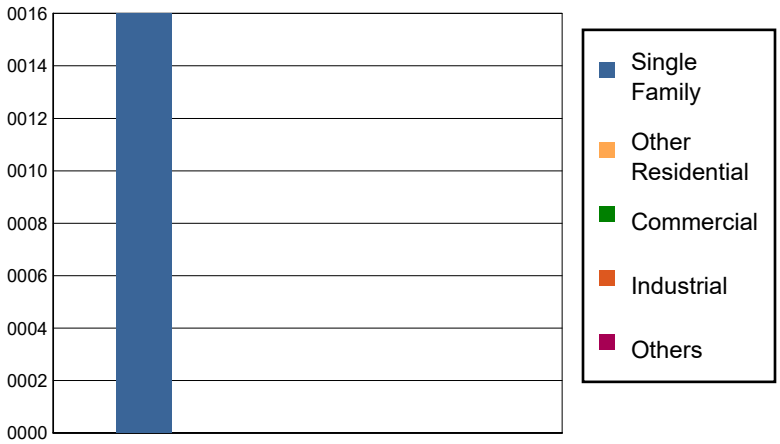


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Capital-Related	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Rental	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Relocation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Subtotal	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**
Capital Stock Losses							
	Structural	0.0002	0.0000	0.0000	0.0000	0.0000	0.0002
	Non_Structural	0.0011	0.0000	0.0000	0.0000	0.0000	0.0011
	Content	0.0003	0.0000	0.0000	0.0000	0.0000	0.0003
	Inventory	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Subtotal	**0.0016**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0016**
	Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	254.0865	0.0000	0.00
	Bridges	33.9321	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**288.0186**	**0.0000**	
Railways	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	1.3310	0.0122	0.92
	Subtotal	**1.3310**	**0.0122**	
Port	Facilities	1.9970	0.0183	0.92
	Subtotal	**1.9970**	**0.0183**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**291.35**	**0.03**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	4.8850	0.0000	0.00
	Subtotal	**4.8850**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.9310	0.0000	0.00
	Subtotal	**2.9310**	**0.0000**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	1.9540	0.0000	0.00
	Subtotal	**1.9540**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**9.77**	**0.00**	

Appendix A: County Listing for the Region

New London,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	2,406	382	35	418
Total Region		**2,406**	**382**	**35**	**418**

Hazus: Earthquake Global Risk Report

Region Name: Lyme

Earthquake Scenario: EastHaddam

Print Date: October 17, 2019

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

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 earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) 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 earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 34.02 square miles and contains 1 census tracts. There are over 1 thousand households in the region which has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 (millions of dollars). Approximately 92.00 % of the buildings (and 91.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 291 and 9 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1 thousand buildings in the region which have an aggregate total replacement value of 418 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 1 schools, 3 fire stations, 0 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 300.00 (millions of dollars). This inventory includes over 25.48 miles of highways, 10 bridges, 303.23 miles of pipes.

Table 1: Transportation System Lifeline Inventory

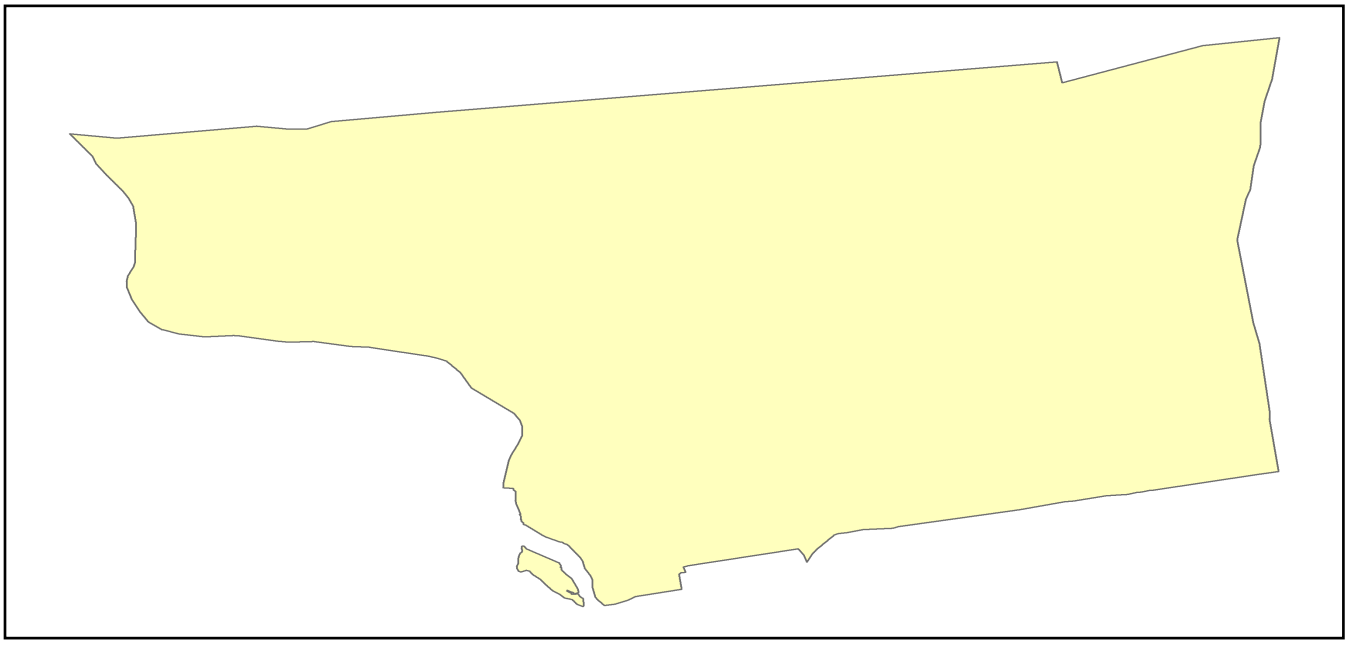
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	10	33.9321
	Segments	11	254.0865
	Tunnels	0	0.0000
		Subtotal	**288.0186**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	1	1.3310
		Subtotal	**1.3310**
Port	Facilities	1	1.9970
		Subtotal	**1.9970**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**291.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.8850
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**4.8850**
Waste Water	Distribution Lines	NA	2.9310
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.9310**
Natural Gas	Distribution Lines	NA	1.9540
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**1.9540**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**9.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	EastHaddam
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.40
Latitude of Epicenter	41.50
Earthquake Magnitude	6.40
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 700 buildings will be at least moderately damaged. This is over 53.00 % of the buildings in the region. There are an estimated 142 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

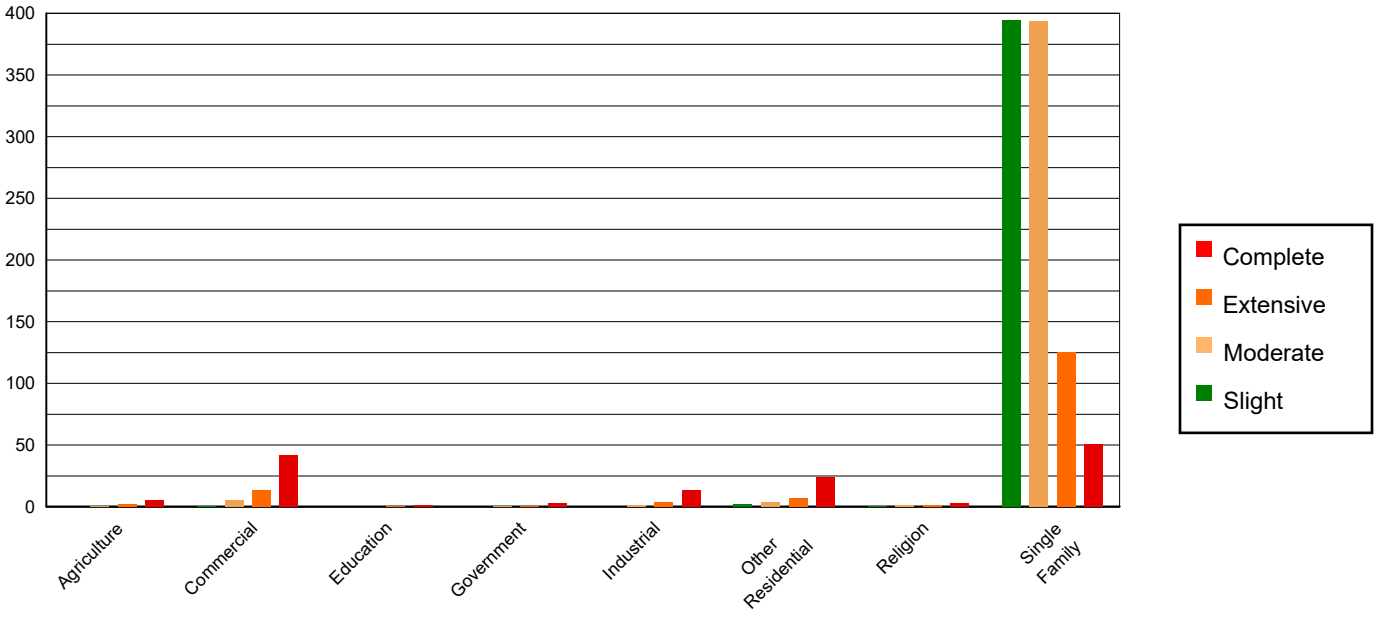


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	0.02	0.01	0.12	0.03	0.92	0.23	2.04	1.33	4.89	3.44
Commercial	0.17	0.08	0.70	0.17	5.04	1.24	13.40	8.75	41.69	29.35
Education	0.01	0.00	0.02	0.01	0.15	0.04	0.43	0.28	1.39	0.98
Government	0.01	0.00	0.03	0.01	0.23	0.06	0.78	0.51	2.95	2.07
Industrial	0.04	0.02	0.14	0.04	1.07	0.26	3.52	2.30	13.23	9.31
Other Residential	0.89	0.42	1.82	0.46	3.35	0.83	6.93	4.53	24.00	16.90
Religion	0.42	0.20	0.80	0.20	1.03	0.25	0.96	0.63	2.80	1.97
Single Family	210.29	99.27	394.85	99.09	393.60	97.09	125.14	81.68	51.11	35.98
Total	**212**		**398**		**405**		**153**		**142**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	211.48	99.83	396.82	99.58	395.15	97.47	123.08	80.34	26.78	18.85
Steel	0.07	0.03	0.16	0.04	1.50	0.37	7.86	5.13	33.81	23.80
Concrete	0.01	0.00	0.03	0.01	0.25	0.06	1.16	0.76	5.11	3.60
Precast	0.01	0.00	0.01	0.00	0.14	0.03	0.41	0.27	2.51	1.77
RM	0.05	0.02	0.08	0.02	0.64	0.16	1.61	1.05	5.89	4.14
URM	0.21	0.10	1.22	0.31	6.26	1.54	13.47	8.79	47.23	33.25
MH	0.02	0.01	0.17	0.04	1.46	0.36	5.62	3.67	20.73	14.59
Total	**212**		**398**		**405**		**153**		**142**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	1	1	1	0
EOCs	1	1	1	0
PoliceStations	0	0	0	0
FireStations	3	3	3	0

Transportation Lifeline Damage

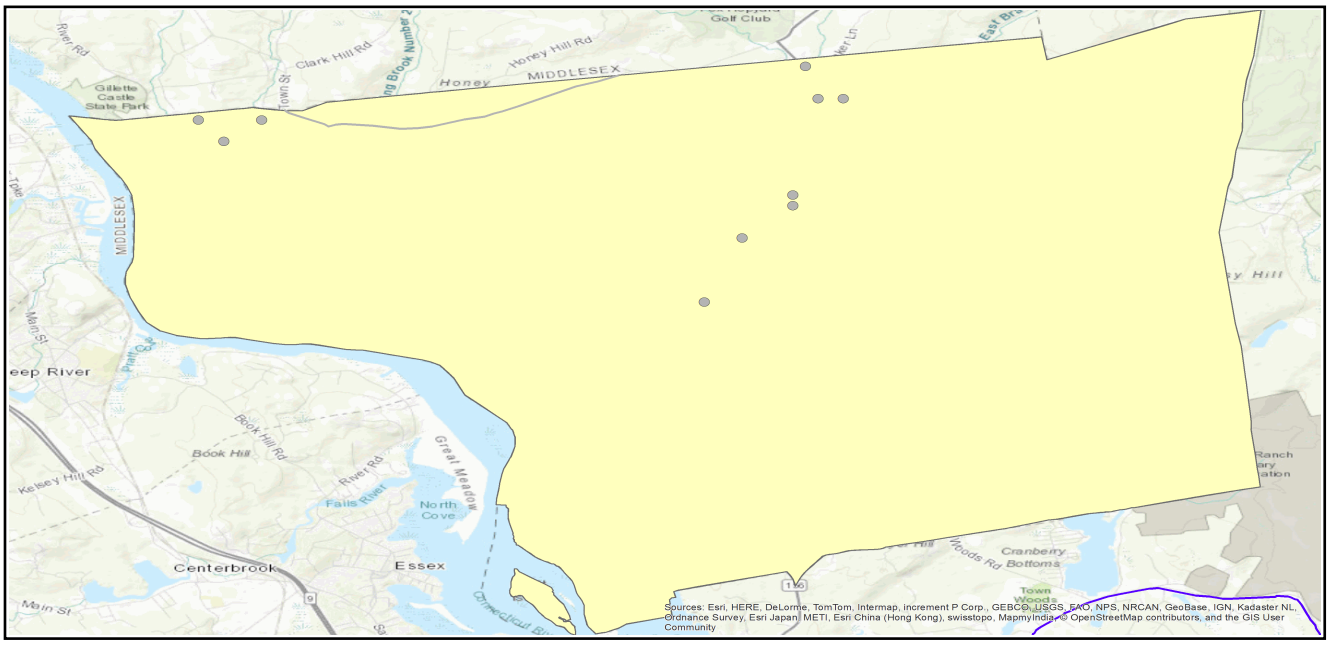


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	11	0	0	8	8
	Bridges	10	6	0	4	10
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	1	1	0	0	0
Port	Facilities	1	1	0	0	0
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	152	0	0
Waste Water	91	0	0
Natural Gas	61	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water						
Electric Power						

Induced Earthquake Damage

Fire Following Earthquake

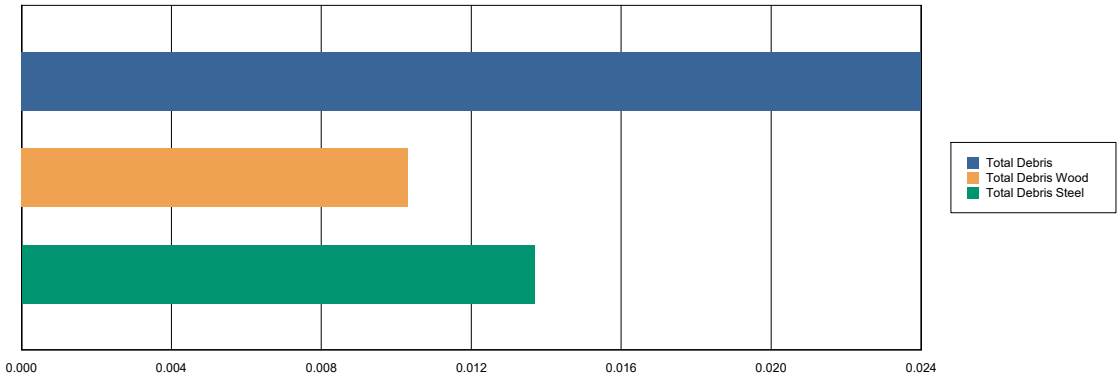
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. 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 24,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 43.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 960 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



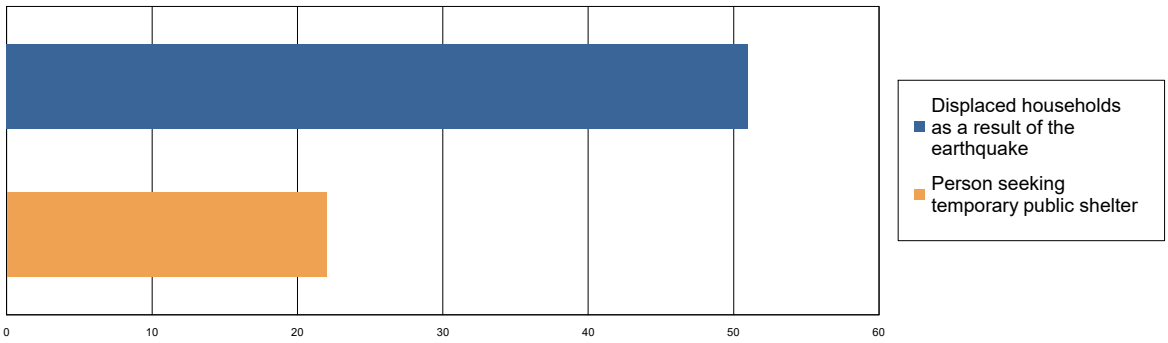
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.01	0.01	0.02	960 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 51 households to be displaced due to the earthquake. Of these, 22 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
51	22

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	1.55	0.48	0.08	0.15
	Commuting	0.00	0.01	0.01	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	1.48	0.47	0.08	0.15
	Other-Residential	3.68	1.05	0.13	0.24
	Single Family	16.35	4.05	0.53	1.02
	Total	**23**	**6**	**1**	**2**
2 PM	Commercial	89.78	28.10	4.47	8.75
	Commuting	0.02	0.06	0.05	0.01
	Educational	21.31	6.85	1.14	2.24
	Hotels	0.00	0.00	0.00	0.00
	Industrial	10.94	3.48	0.57	1.10
	Other-Residential	0.79	0.23	0.03	0.05
	Single Family	3.75	0.96	0.13	0.24
	Total	**127**	**40**	**6**	**12**
5 PM	Commercial	61.72	19.33	3.10	5.99
	Commuting	0.23	0.84	0.78	0.18
	Educational	0.19	0.06	0.01	0.02
	Hotels	0.00	0.00	0.00	0.00
	Industrial	6.84	2.18	0.35	0.69
	Other-Residential	1.38	0.40	0.05	0.09
	Single Family	6.55	1.67	0.23	0.42
	Total	**77**	**24**	**5**	**7**

Economic Loss

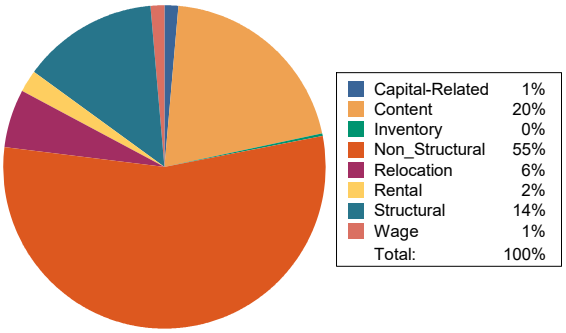
The total economic loss estimated for the earthquake is 149.94 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building 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 earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 138.04 (millions of dollars); 11 % 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 70 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

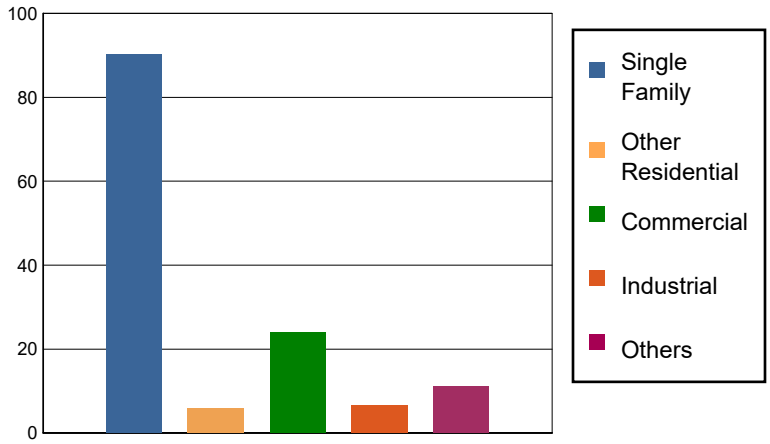


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.2091	1.1975	0.1184	0.4410	1.9660
	Capital-Related	0.0000	0.0893	1.5945	0.0674	0.0595	1.8107
	Rental	1.5049	0.3195	1.0492	0.0259	0.1174	3.0169
	Relocation	5.3106	0.2068	1.4257	0.1421	0.8407	7.9259
	Subtotal	**6.8155**	**0.8247**	**5.2669**	**0.3538**	**1.4586**	**14.7195**
Capital Stock Losses							
	Structural	11.9858	0.8011	3.3683	0.7666	1.9326	18.8544
	Non_Structural	53.7171	3.4127	10.4835	3.3316	5.0372	75.9821
	Content	17.8457	0.7728	4.8399	1.8733	2.6337	27.9654
	Inventory	0.0000	0.0000	0.1222	0.3262	0.0748	0.5232
	Subtotal	**83.5486**	**4.9866**	**18.8139**	**6.2977**	**9.6783**	**123.3251**
	Total	**90.36**	**5.81**	**24.08**	**6.65**	**11.14**	**138.04**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	254.0865	0.0000	0.00
	Bridges	33.9321	9.4868	27.96
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**288.0186**	**9.4868**	
Railways	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	1.3310	0.9633	72.37
	Subtotal	**1.3310**	**0.9633**	
Port	Facilities	1.9970	1.4474	72.48
	Subtotal	**1.9970**	**1.4474**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**291.35**	**11.90**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	4.8850	0.0000	0.00
	Subtotal	**4.8850**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.9310	0.0000	0.00
	Subtotal	**2.9310**	**0.0000**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	1.9540	0.0000	0.00
	Subtotal	**1.9540**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**9.77**	**0.00**	

Appendix A: County Listing for the Region

New London,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	2,406	382	35	418
Total Region		**2,406**	**382**	**35**	**418**

Hazus: Earthquake Global Risk Report

Region Name: Lyme

Earthquake Scenario: Haddam

Print Date: October 17, 2019

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

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 earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) 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 earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 34.02 square miles and contains 1 census tracts. There are over 1 thousand households in the region which has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 (millions of dollars). Approximately 92.00 % of the buildings (and 91.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 291 and 9 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1 thousand buildings in the region which have an aggregate total replacement value of 418 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 1 schools, 3 fire stations, 0 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 300.00 (millions of dollars). This inventory includes over 25.48 miles of highways, 10 bridges, 303.23 miles of pipes.

Table 1: Transportation System Lifeline Inventory

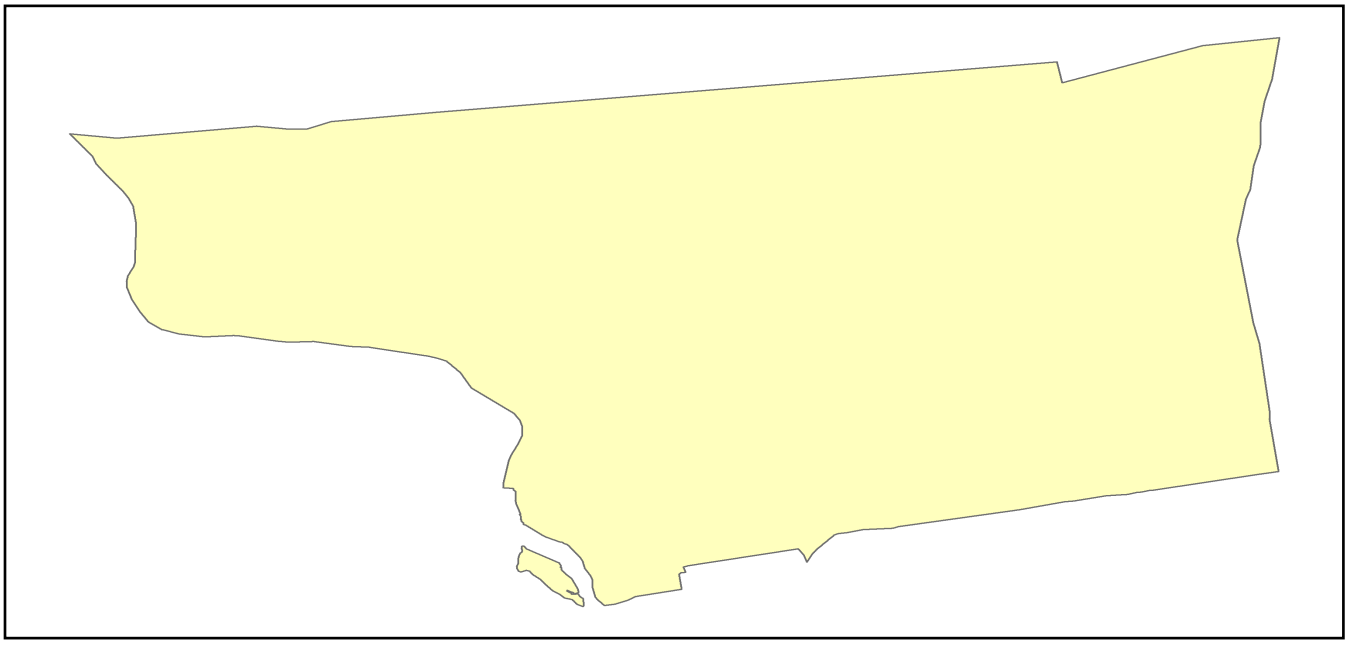
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	10	33.9321
	Segments	11	254.0865
	Tunnels	0	0.0000
		Subtotal	**288.0186**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	1	1.3310
		Subtotal	**1.3310**
Port	Facilities	1	1.9970
		Subtotal	**1.9970**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**291.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.8850
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**4.8850**
Waste Water	Distribution Lines	NA	2.9310
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.9310**
Natural Gas	Distribution Lines	NA	1.9540
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**1.9540**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**9.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Haddam
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.50
Latitude of Epicenter	41.50
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 237 buildings will be at least moderately damaged. This is over 18.00 % of the buildings in the region. There are an estimated 18 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

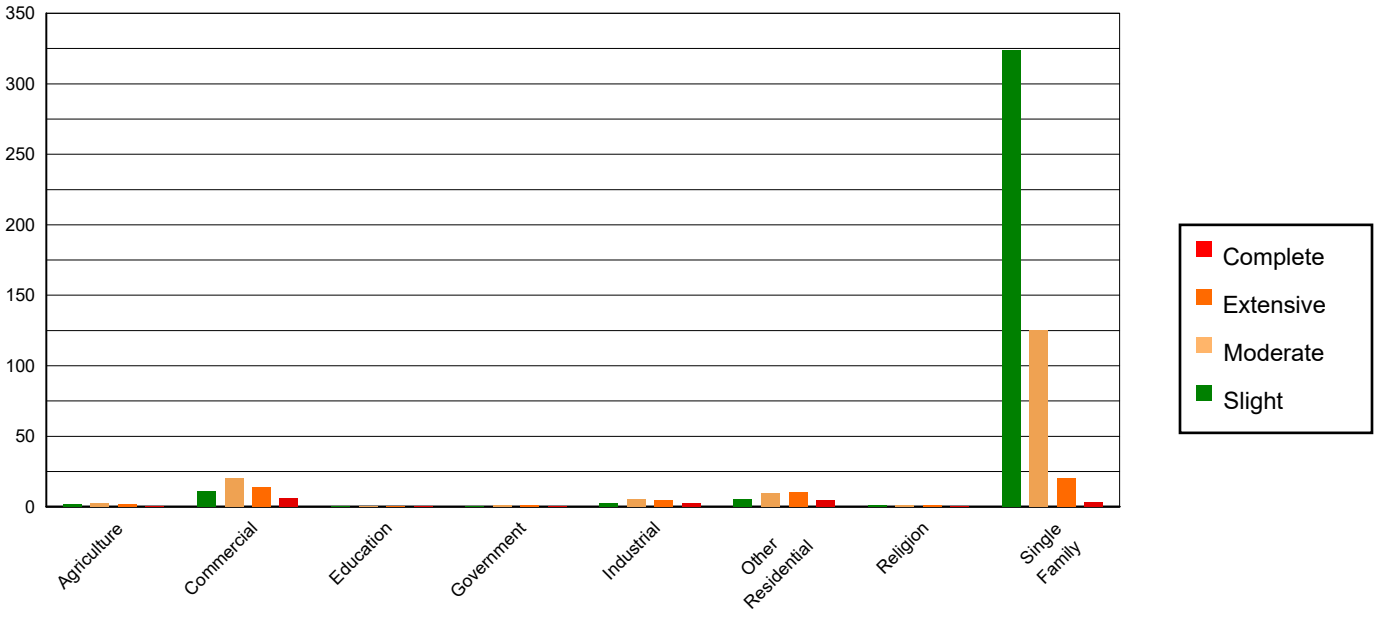


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	1.24	0.17	1.67	0.48	2.80	1.68	1.57	3.00	0.72	3.92
Commercial	10.21	1.41	10.89	3.13	19.92	11.94	13.79	26.25	6.19	33.67
Education	0.35	0.05	0.34	0.10	0.65	0.39	0.46	0.88	0.20	1.09
Government	0.57	0.08	0.59	0.17	1.29	0.77	1.06	2.01	0.50	2.71
Industrial	2.55	0.35	2.65	0.76	5.75	3.45	4.76	9.07	2.28	12.41
Other Residential	6.44	0.89	5.77	1.66	9.82	5.89	10.12	19.26	4.85	26.37
Religion	2.21	0.30	1.30	0.37	1.33	0.80	0.84	1.60	0.32	1.75
Single Family	702.37	96.75	324.07	93.32	125.29	75.10	19.93	37.94	3.33	18.09
Total	**726**		**347**		**167**		**53**		**18**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	695.38	95.79	320.09	92.17	120.96	72.50	15.53	29.56	1.36	7.38
Steel	4.37	0.60	5.02	1.45	14.06	8.43	13.11	24.96	6.83	37.13
Concrete	0.60	0.08	0.69	0.20	2.19	1.31	2.08	3.96	0.98	5.35
Precast	0.38	0.05	0.31	0.09	0.90	0.54	1.05	2.00	0.44	2.37
RM	1.79	0.25	1.02	0.29	2.47	1.48	2.36	4.50	0.63	3.43
URM	20.71	2.85	16.39	4.72	18.21	10.91	9.35	17.81	3.73	20.29
MH	2.72	0.37	3.76	1.08	8.06	4.83	9.04	17.21	4.43	24.06
Total	**726**		**347**		**167**		**53**		**18**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	1	1	0	0
EOCs	1	0	0	0
PoliceStations	0	0	0	0
FireStations	3	2	0	0

Transportation Lifeline Damage

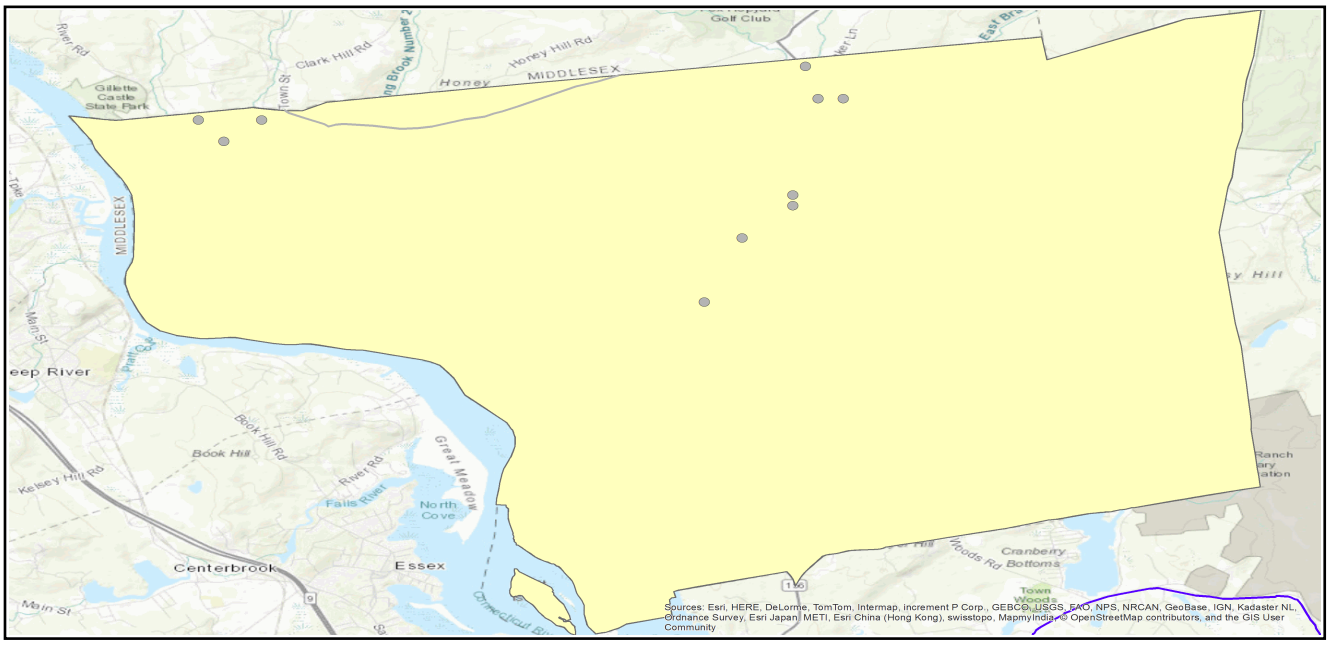


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	11	0	0	8	8
	Bridges	10	0	0	10	10
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	1	1	0	0	1
Port	Facilities	1	1	0	0	1
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	152	0	0
Waste Water	91	0	0
Natural Gas	61	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water						
Electric Power						

Induced Earthquake Damage

Fire Following Earthquake

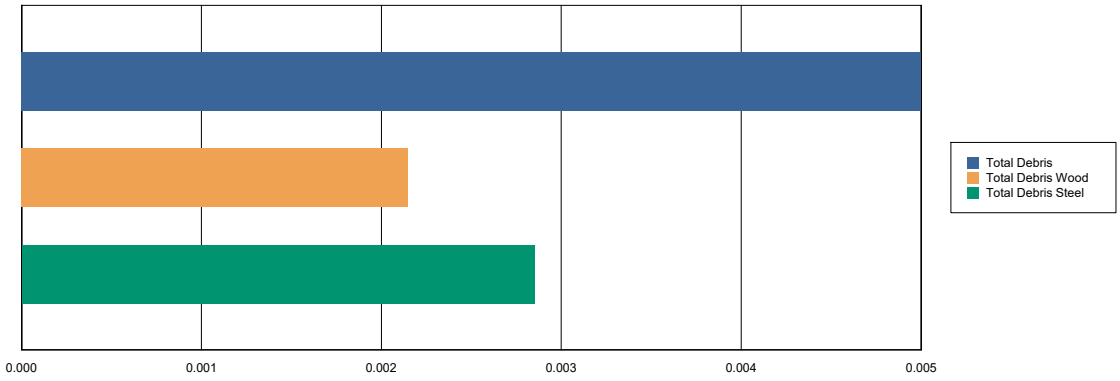
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. 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 5,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 43.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 200 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



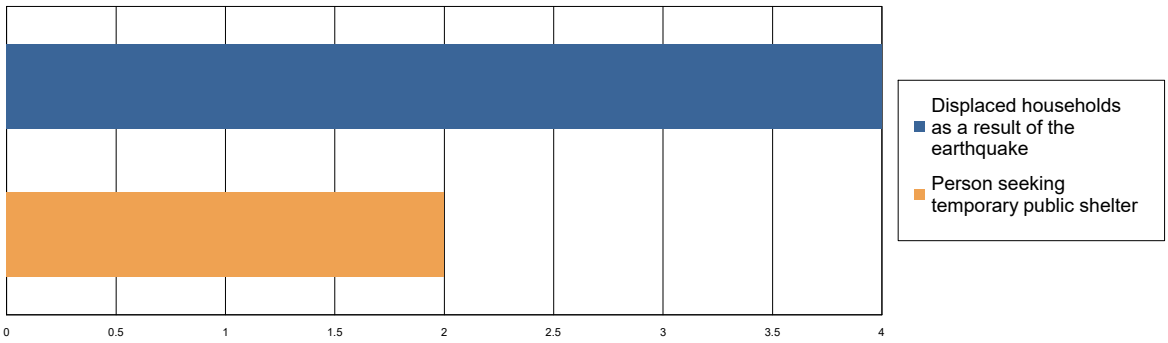
Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.00	0.00	0.01	200 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 4 households to be displaced due to the earthquake. Of these, 2 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter



Displaced households as a result of the earthquake	Persons seeking temporary public shelter
4	2

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.28	0.07	0.01	0.02
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.31	0.08	0.01	0.02
	Other-Residential	0.84	0.19	0.02	0.03
	Single Family	2.29	0.39	0.04	0.08
	Total	**4**	**1**	**0**	**0**
2 PM	Commercial	16.34	4.25	0.61	1.18
	Commuting	0.00	0.00	0.00	0.00
	Educational	3.89	1.05	0.16	0.32
	Hotels	0.00	0.00	0.00	0.00
	Industrial	2.29	0.61	0.09	0.18
	Other-Residential	0.18	0.04	0.00	0.01
	Single Family	0.51	0.09	0.01	0.02
	Total	**23**	**6**	**1**	**2**
5 PM	Commercial	11.19	2.91	0.42	0.81
	Commuting	0.02	0.07	0.06	0.01
	Educational	0.04	0.01	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	1.43	0.38	0.06	0.11
	Other-Residential	0.31	0.07	0.01	0.01
	Single Family	0.90	0.16	0.02	0.03
	Total	**14**	**4**	**1**	**1**

Economic Loss

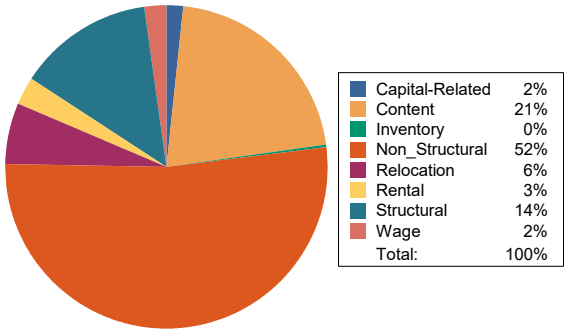
The total economic loss estimated for the earthquake is 36.49 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building 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 earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 33.39 (millions of dollars); 13 % 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 67 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

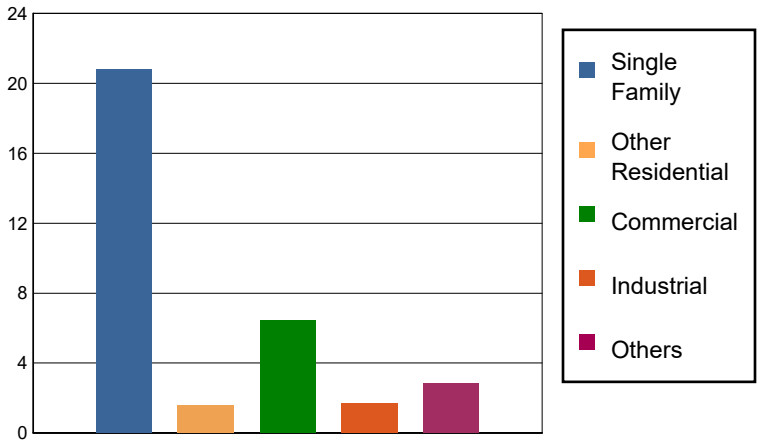


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0737	0.4125	0.0427	0.1722	0.7011
	Capital-Related	0.0000	0.0315	0.5191	0.0245	0.0174	0.5925
	Rental	0.3011	0.1098	0.4111	0.0108	0.0441	0.8769
	Relocation	1.0728	0.0879	0.5851	0.0691	0.3047	2.1196
	Subtotal	**1.3739**	**0.3029**	**1.9278**	**0.1471**	**0.5384**	**4.2901**
Capital Stock Losses							
	Structural	2.4248	0.2542	1.0572	0.2696	0.5878	4.5936
	Non_Structural	12.2163	0.8588	2.4107	0.7794	1.1465	17.4117
	Content	4.7797	0.1737	1.0279	0.4289	0.5632	6.9734
	Inventory	0.0000	0.0000	0.0270	0.0746	0.0161	0.1177
	Subtotal	**19.4208**	**1.2867**	**4.5228**	**1.5525**	**2.3136**	**29.0964**
	Total	**20.79**	**1.59**	**6.45**	**1.70**	**2.85**	**33.39**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	254.0865	0.0000	0.00
	Bridges	33.9321	1.4735	4.34
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**288.0186**	**1.4735**	
Railways	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	1.3310	0.6506	48.88
	Subtotal	**1.3310**	**0.6506**	
Port	Facilities	1.9970	0.9761	48.88
	Subtotal	**1.9970**	**0.9761**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**291.35**	**3.10**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	4.8850	0.0000	0.00
	Subtotal	**4.8850**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.9310	0.0000	0.00
	Subtotal	**2.9310**	**0.0000**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	1.9540	0.0000	0.00
	Subtotal	**1.9540**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**9.77**	**0.00**	

Appendix A: County Listing for the Region

New London,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	2,406	382	35	418
Total Region		**2,406**	**382**	**35**	**418**

Hazus: Earthquake Global Risk Report

Region Name: Lyme

Earthquake Scenario: Portland

Print Date: October 17, 2019

Disclaimer:

This version of Hazus utilizes 2010 Census Data.

Totals only reflect data for those census tracts/blocks included in the user's study region.

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 earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus-MH is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency (FEMA) 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 earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Connecticut

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

The geographical size of the region is 34.02 square miles and contains 1 census tracts. There are over 1 thousand households in the region which has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 (millions of dollars). Approximately 92.00 % of the buildings (and 91.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 291 and 9 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1 thousand buildings in the region which have an aggregate total replacement value of 418 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 1 schools, 3 fire stations, 0 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 300.00 (millions of dollars). This inventory includes over 25.48 miles of highways, 10 bridges, 303.23 miles of pipes.

Table 1: Transportation System Lifeline Inventory

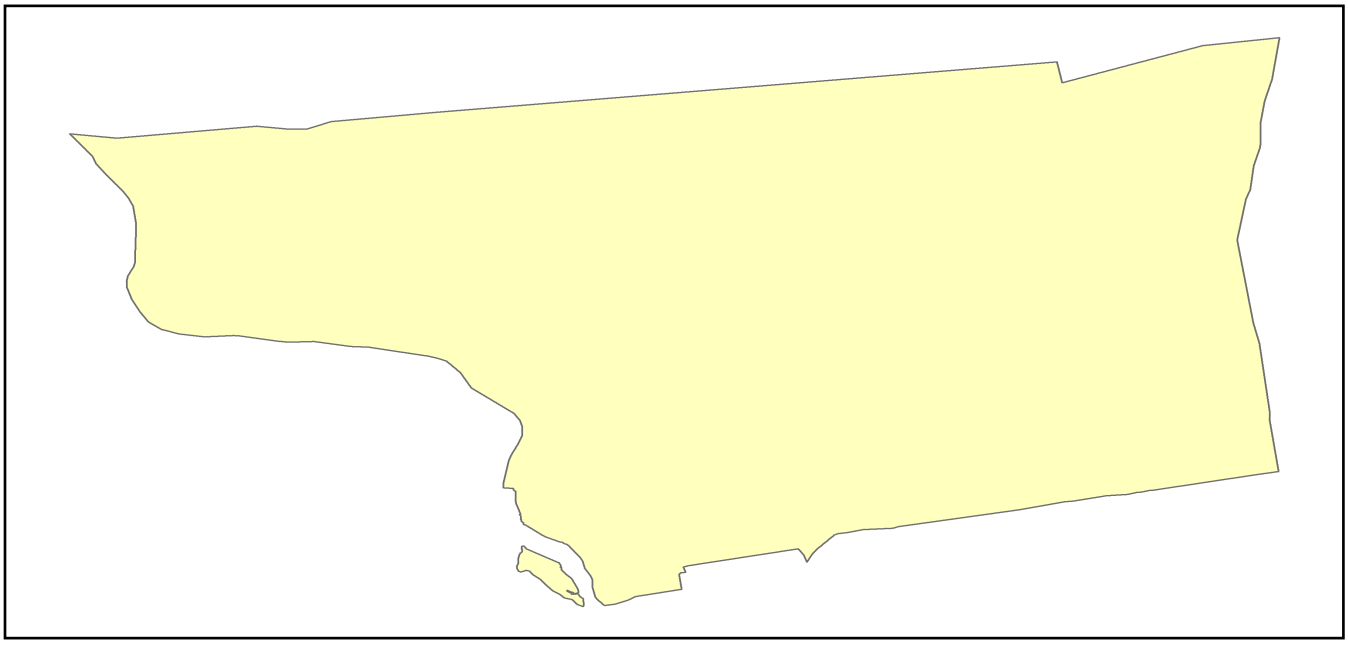
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	10	33.9321
	Segments	11	254.0865
	Tunnels	0	0.0000
		Subtotal	**288.0186**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	1	1.3310
		Subtotal	**1.3310**
Port	Facilities	1	1.9970
		Subtotal	**1.9970**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**291.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.8850
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**4.8850**
Waste Water	Distribution Lines	NA	2.9310
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.9310**
Natural Gas	Distribution Lines	NA	1.9540
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**1.9540**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**9.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Portland
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-72.60
Latitude of Epicenter	41.60
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 68 buildings will be at least moderately damaged. This is over 5.00 % of the buildings in the region. There are an estimated 1 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

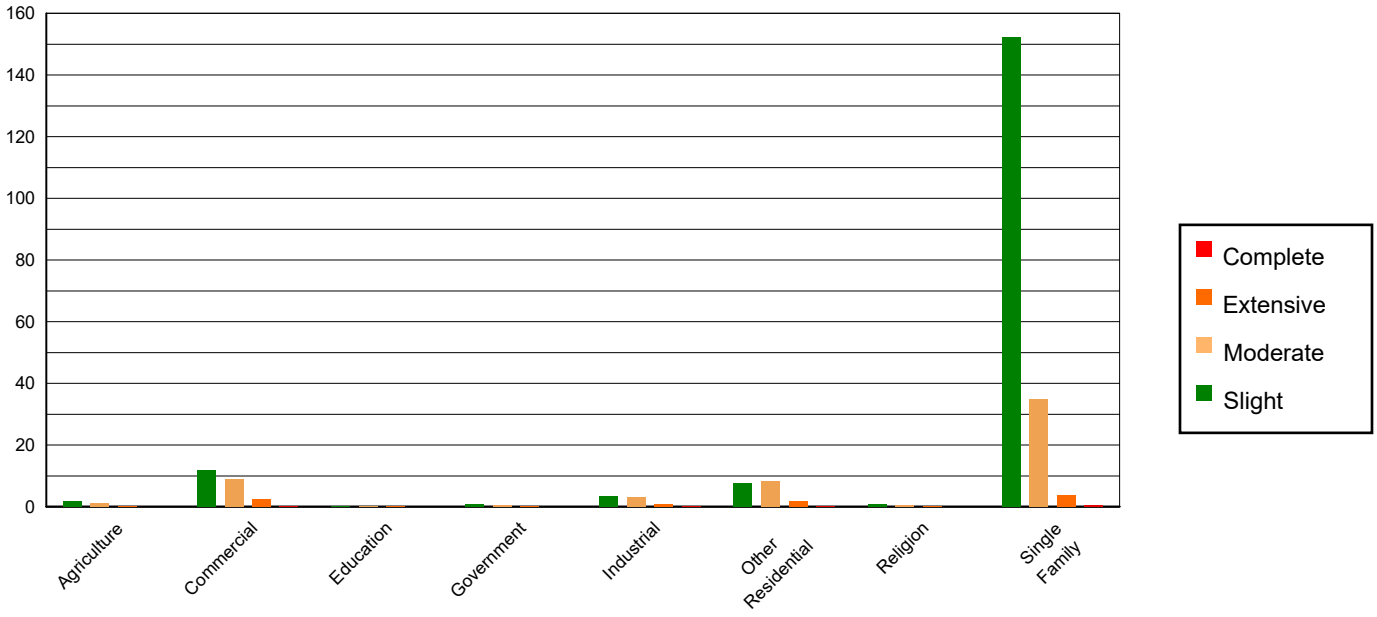


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	5.03	0.47	1.65	0.92	1.02	1.76	0.27	2.82	0.03	2.74
Commercial	37.52	3.53	11.77	6.58	9.07	15.63	2.28	24.21	0.36	29.58
Education	1.24	0.12	0.37	0.21	0.30	0.52	0.07	0.74	0.01	1.00
Government	2.36	0.22	0.76	0.42	0.68	1.17	0.17	1.83	0.03	2.32
Industrial	10.57	0.99	3.40	1.90	3.08	5.31	0.83	8.75	0.12	10.19
Other Residential	18.90	1.78	7.68	4.30	8.38	14.43	1.87	19.78	0.18	14.45
Religion	4.27	0.40	0.95	0.53	0.61	1.05	0.16	1.65	0.02	1.95
Single Family	983.67	92.49	152.16	85.13	34.91	60.13	3.80	40.22	0.46	37.77
Total	**1,064**		**179**		**58**		**9**		**1**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	972.58	91.45	148.35	83.00	30.18	51.98	2.08	22.01	0.12	9.83
Steel	23.65	2.22	8.40	4.70	8.65	14.90	2.31	24.47	0.39	31.78
Concrete	3.69	0.35	1.23	0.69	1.31	2.26	0.28	2.96	0.04	2.97
Precast	1.86	0.17	0.46	0.26	0.54	0.94	0.21	2.24	0.01	0.75
RM	6.04	0.57	0.98	0.55	0.96	1.65	0.29	3.04	0.00	0.36
URM	43.49	4.09	12.98	7.26	8.82	15.20	2.59	27.42	0.51	41.90
MH	12.24	1.15	6.33	3.54	7.59	13.07	1.68	17.85	0.15	12.40
Total	**1,064**		**179**		**58**		**9**		**1**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	1	0	0	1
EOCs	1	0	0	1
PoliceStations	0	0	0	0
FireStations	3	0	0	1

Transportation Lifeline Damage

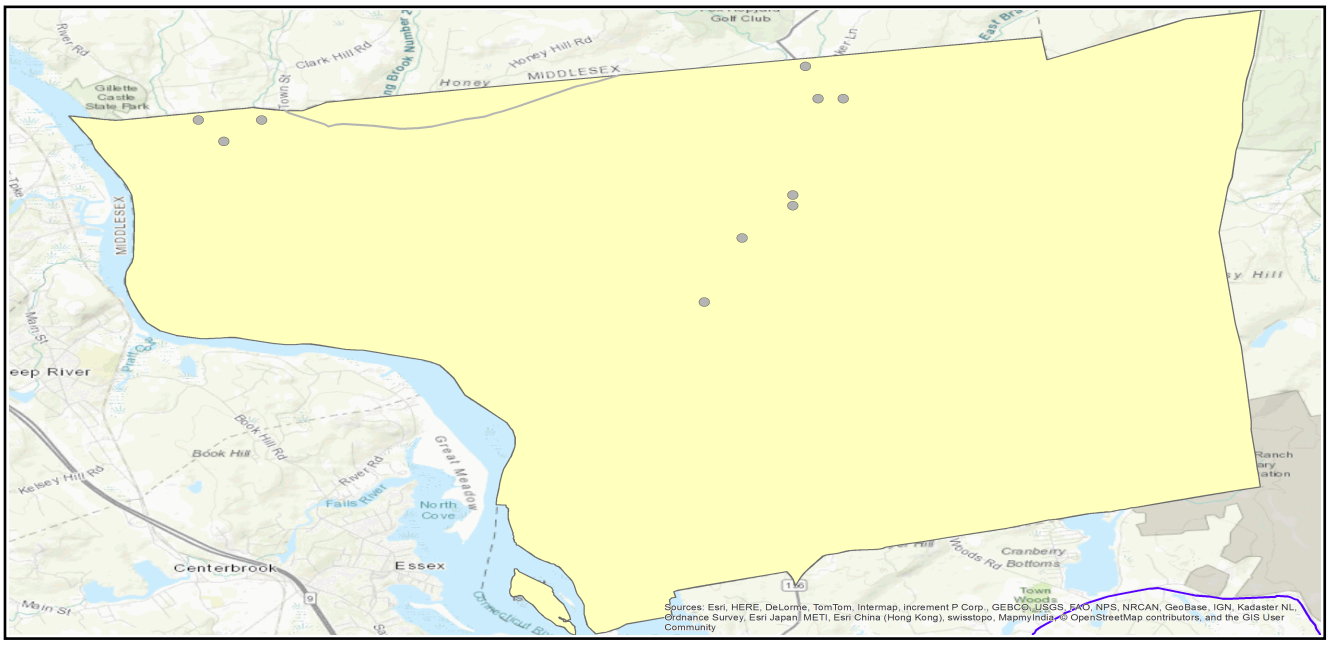


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	11	0	0	8	8
	Bridges	10	0	0	10	10
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	1	0	0	1	1
Port	Facilities	1	0	0	1	1
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	152	0	0
Waste Water	91	0	0
Natural Gas	61	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water						
Electric Power						

Induced Earthquake Damage

Fire Following Earthquake

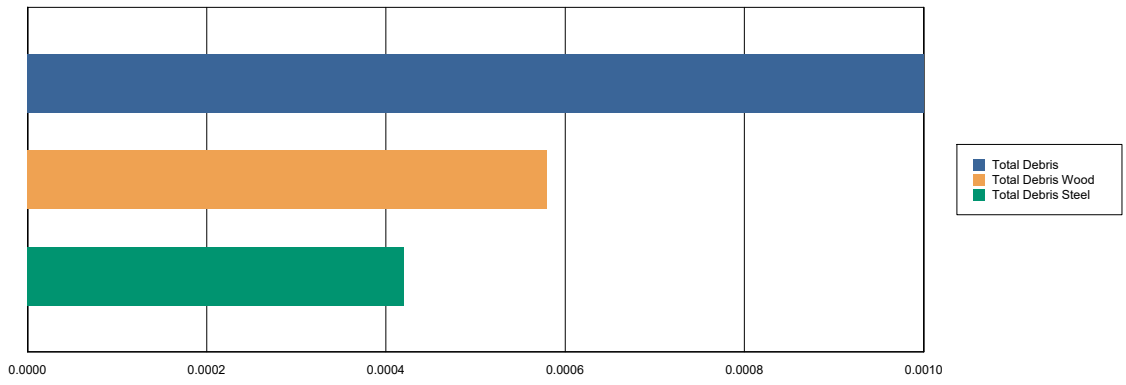
Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. 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 1,000 tons of debris will be generated. Of the total amount, Brick/Wood comprises 58.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 40 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)



Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.00	0.00	0.00	40 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced households as a result of the earthquake	Persons seeking temporary public shelter
0	0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.03	0.01	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.04	0.01	0.00	0.00
	Other-Residential	0.11	0.02	0.00	0.00
	Single Family	0.55	0.07	0.01	0.01
	Total	**1**	**0**	**0**	**0**
2 PM	Commercial	1.98	0.36	0.04	0.08
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.46	0.09	0.01	0.02
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.26	0.05	0.01	0.01
	Other-Residential	0.02	0.00	0.00	0.00
	Single Family	0.12	0.02	0.00	0.00
	Total	**3**	**1**	**0**	**0**
5 PM	Commercial	1.35	0.25	0.03	0.05
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.16	0.03	0.00	0.01
	Other-Residential	0.04	0.01	0.00	0.00
	Single Family	0.21	0.03	0.00	0.00
	Total	**2**	**0**	**0**	**0**

Economic Loss

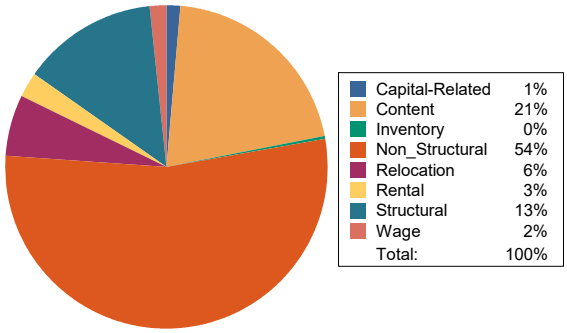
The total economic loss estimated for the earthquake is 8.42 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building 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 earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 7.82 (millions of dollars); 12 % 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 76 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

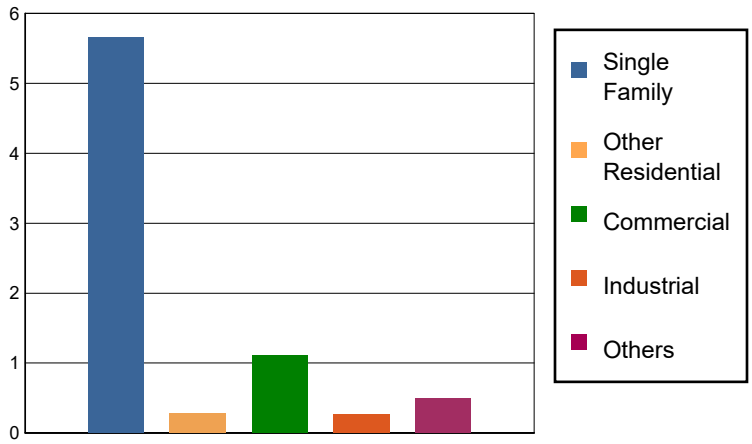


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0118	0.0780	0.0078	0.0350	0.1326
	Capital-Related	0.0000	0.0050	0.0944	0.0045	0.0031	0.1070
	Rental	0.0763	0.0220	0.0865	0.0023	0.0086	0.1957
	Relocation	0.2621	0.0228	0.1218	0.0169	0.0608	0.4844
	Subtotal	**0.3384**	**0.0616**	**0.3807**	**0.0315**	**0.1075**	**0.9197**
Capital Stock Losses							
	Structural	0.6737	0.0475	0.1822	0.0473	0.1007	1.0514
	Non_Structural	3.4045	0.1420	0.3731	0.1167	0.1853	4.2216
	Content	1.2414	0.0287	0.1733	0.0657	0.0977	1.6068
	Inventory	0.0000	0.0000	0.0043	0.0114	0.0026	0.0183
	Subtotal	**5.3196**	**0.2182**	**0.7329**	**0.2411**	**0.3863**	**6.8981**
	Total	**5.66**	**0.28**	**1.11**	**0.27**	**0.49**	**7.82**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	254.0865	0.0000	0.00
	Bridges	33.9321	0.0637	0.19
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**288.0186**	**0.0637**	
Railways	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	1.3310	0.2135	16.04
	Subtotal	**1.3310**	**0.2135**	
Port	Facilities	1.9970	0.3203	16.04
	Subtotal	**1.9970**	**0.3203**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**291.35**	**0.60**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	4.8850	0.0000	0.00
	Subtotal	**4.8850**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.9310	0.0000	0.00
	Subtotal	**2.9310**	**0.0000**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	1.9540	0.0000	0.00
	Subtotal	**1.9540**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**9.77**	**0.00**	

Appendix A: County Listing for the Region

New London,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
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	New London	2,406	382	35	418
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Hazus: Earthquake Global Risk Report

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Earthquake Scenario: Stamford

Print Date: October 17, 2019

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Connecticut

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

The geographical size of the region is 34.02 square miles and contains 1 census tracts. There are over 1 thousand households in the region which has a total population of 2,406 people (2010 Census Bureau data). The distribution of population by Total Region and County is provided in Appendix B.

There are an estimated 1 thousand buildings in the region with a total building replacement value (excluding contents) of 418 (millions of dollars). Approximately 92.00 % of the buildings (and 91.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 291 and 9 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 1 thousand buildings in the region which have an aggregate total replacement value of 418 (millions of dollars) . Appendix B provides a general distribution of the building value by Total Region and County.

In terms of building construction types found in the region, wood frame construction makes up 88% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 0 hospitals in the region with a total bed capacity of beds. There are 1 schools, 3 fire stations, 0 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are no dams identified within the inventory. The inventory also includes 1 hazardous material sites, no military installations and no nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 300.00 (millions of dollars). This inventory includes over 25.48 miles of highways, 10 bridges, 303.23 miles of pipes.

Table 1: Transportation System Lifeline Inventory

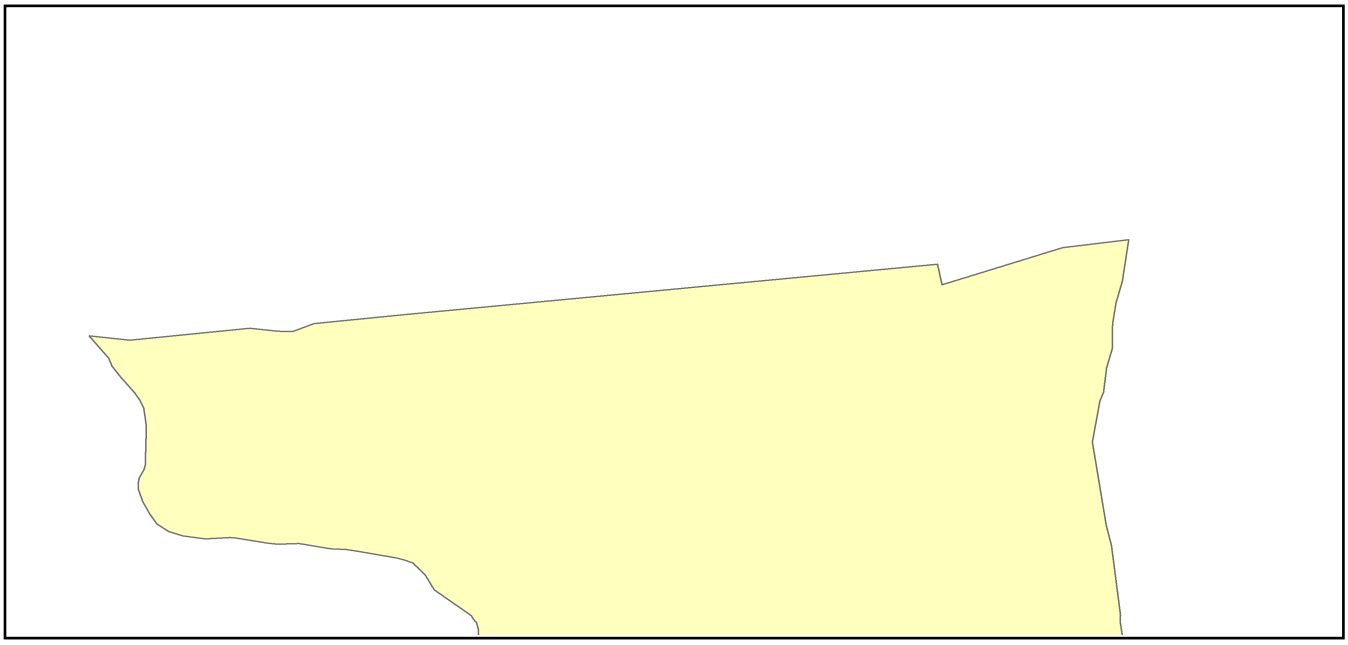
System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	10	33.9321
	Segments	11	254.0865
	Tunnels	0	0.0000
		Subtotal	**288.0186**
Railways	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Light Rail	Bridges	0	0.0000
	Facilities	0	0.0000
	Segments	0	0.0000
	Tunnels	0	0.0000
		Subtotal	**0.0000**
Bus	Facilities	0	0.0000
		Subtotal	**0.0000**
Ferry	Facilities	1	1.3310
		Subtotal	**1.3310**
Port	Facilities	1	1.9970
		Subtotal	**1.9970**
Airport	Facilities	0	0.0000
	Runways	0	0.0000
		Subtotal	**0.0000**
		Total	**291.30**

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	4.8850
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**4.8850**
Waste Water	Distribution Lines	NA	2.9310
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**2.9310**
Natural Gas	Distribution Lines	NA	1.9540
	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**1.9540**
Oil Systems	Facilities	0	0.0000
	Pipelines	0	0.0000
		Subtotal	**0.0000**
Electrical Power	Facilities	0	0.0000
		Subtotal	**0.0000**
Communication	Facilities	0	0.0000
		Subtotal	**0.0000**
		Total	**9.80**

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.



Scenario Name	Stamford
Type of Earthquake	Arbitrary
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	-73.56
Latitude of Epicenter	41.11
Earthquake Magnitude	5.70
Depth (km)	10.00
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	Central & East US (CEUS 2008)

Direct Earthquake Damage

Building Damage

Hazus estimates that about 5 buildings will be at least moderately damaged. This is over 0.00 % of the buildings in the region. There are an estimated 0 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Damage Categories by General Occupancy Type

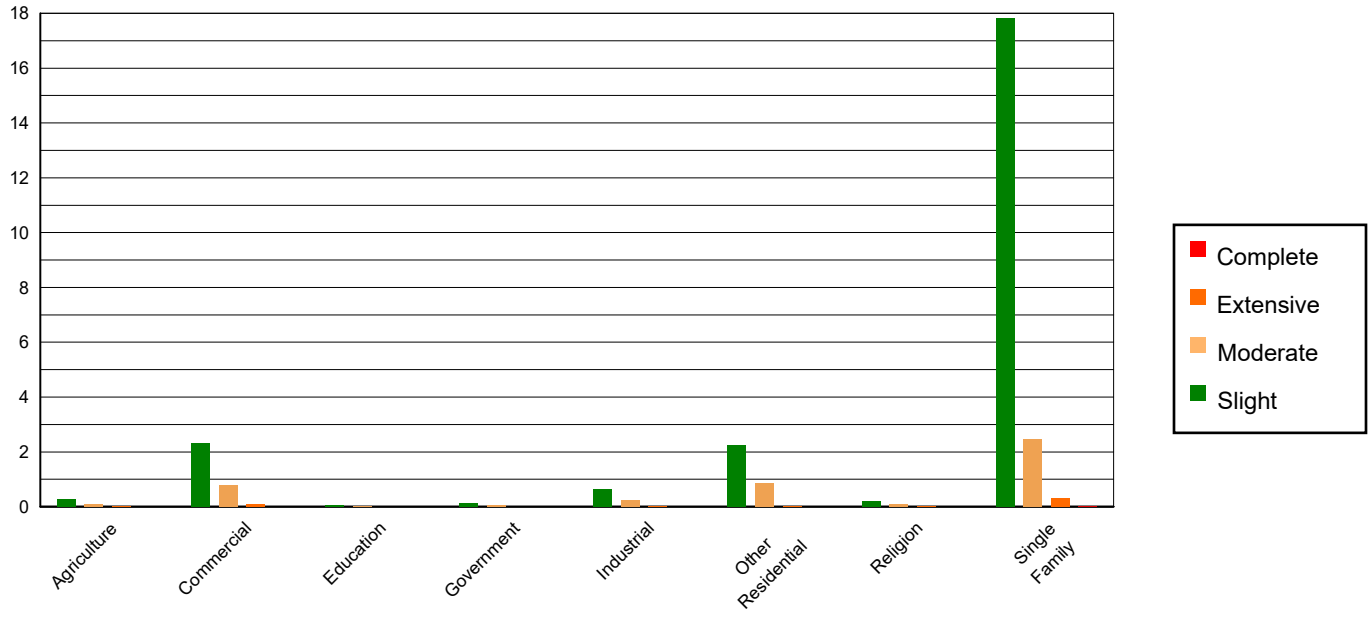


Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	7.61	0.59	0.29	1.24	0.08	1.83	0.01	2.17	0.00	1.57
Commercial	57.80	4.51	2.32	9.76	0.77	16.96	0.10	19.88	0.01	21.33
Education	1.90	0.15	0.07	0.30	0.02	0.52	0.00	0.57	0.00	0.72
Government	3.80	0.30	0.14	0.60	0.05	1.04	0.01	1.09	0.00	1.05
Industrial	17.08	1.33	0.66	2.77	0.23	5.04	0.03	5.55	0.00	4.74
Other Residential	33.88	2.64	2.25	9.47	0.84	18.37	0.03	5.82	0.00	2.56
Religion	5.69	0.44	0.21	0.90	0.08	1.75	0.01	2.34	0.00	3.05
Single Family	1154.36	90.03	17.83	74.96	2.48	54.49	0.31	62.58	0.02	64.99
Total	**1,282**		**24**		**5**		**0**		**0**	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	1136.43	88.64	15.49	65.11	1.28	28.04	0.11	23.03	0.00	0.00
Steel	41.51	3.24	1.41	5.94	0.44	9.68	0.04	8.06	0.00	3.38
Concrete	6.30	0.49	0.19	0.81	0.05	1.19	0.00	0.56	0.00	0.00
Precast	2.84	0.22	0.14	0.59	0.09	1.93	0.02	3.12	0.00	0.73
RM	7.89	0.62	0.24	1.00	0.12	2.61	0.02	3.21	0.00	0.00
URM	61.94	4.83	4.32	18.14	1.82	39.97	0.29	58.44	0.03	95.89
MH	25.23	1.97	2.00	8.42	0.75	16.58	0.02	3.59	0.00	0.00
Total	**1,282**		**24**		**5**		**0**		**0**	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had hospital beds available for use. On the day of the earthquake, the model estimates that only hospital beds (%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, % of the beds will be back in service. By 30 days, % will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	0	0	0	0
Schools	1	0	0	1
EOCs	1	0	0	1
PoliceStations	0	0	0	0
FireStations	3	0	0	3

Transportation Lifeline Damage

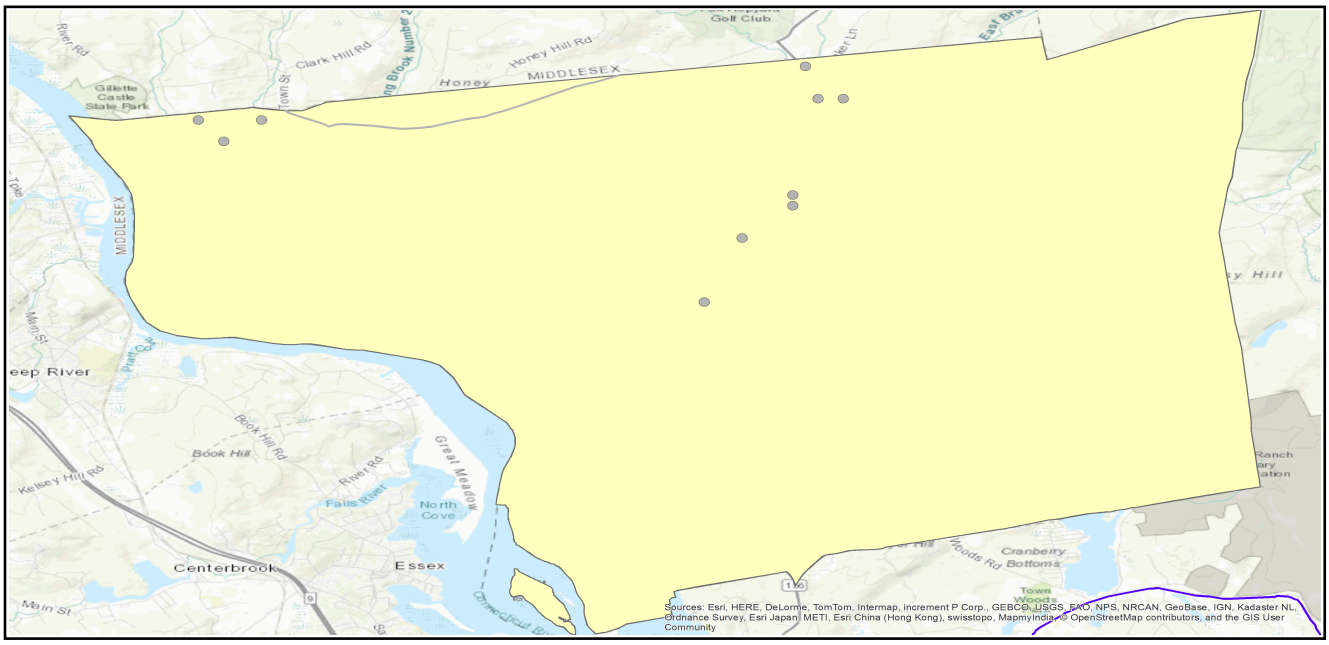


Table 6: Expected Damage to the Transportation Systems

System	Component		Number of Locations			
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 % After Day 1	With Functionality > 50 % After Day 7
Highway	Segments	11	0	0	8	8
	Bridges	10	0	0	10	10
	Tunnels	0	0	0	0	0
Railways	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	1	0	0	1	1
Port	Facilities	1	0	0	1	1
Airport	Facilities	0	0	0	0	0
	Runways	0	0	0	0	0

Table 6 provides damage estimates for the transportation system.

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	0	0	0	0	0
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	0	0	0	0	0
Communication	0	0	0	0	0

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (miles)	Number of Leaks	Number of Breaks
Potable Water	152	0	0
Waste Water	91	0	0
Natural Gas	61	0	0
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water						
Electric Power						

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. 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 0 tons of debris will be generated. Of the total amount, Brick/Wood comprises 77.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 0 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Earthquake Debris (millions of tons)

Brick/ Wood	Reinforced Concrete/Steel	Total Debris	Truck Load
0.00	0.00	0.00	0 (@25 tons/truck)

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 0 households to be displaced due to the earthquake. Of these, 0 people (out of a total population of 2,406) will seek temporary shelter in public shelters.

Displaced Households/ Persons Seeking Short Term Public Shelter

Displaced households as a result of the earthquake	Persons seeking temporary public shelter
0	0

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0.00	0.00	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.00	0.00	0.00	0.00
	Other-Residential	0.01	0.00	0.00	0.00
	Single Family	0.05	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
2 PM	Commercial	0.13	0.02	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.03	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.01	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.01	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**
5 PM	Commercial	0.09	0.01	0.00	0.00
	Commuting	0.00	0.00	0.00	0.00
	Educational	0.00	0.00	0.00	0.00
	Hotels	0.00	0.00	0.00	0.00
	Industrial	0.01	0.00	0.00	0.00
	Other-Residential	0.00	0.00	0.00	0.00
	Single Family	0.02	0.00	0.00	0.00
	Total	**0**	**0**	**0**	**0**

Economic Loss

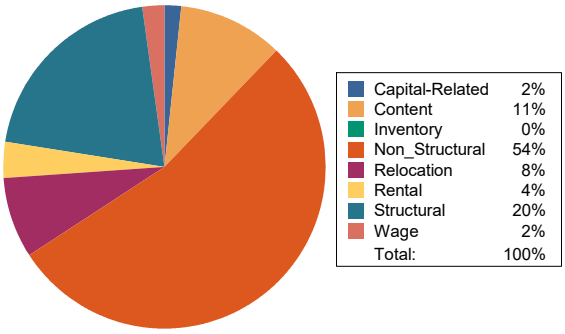
The total economic loss estimated for the earthquake is 0.45 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building 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 earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 0.42 (millions of dollars); 15 % 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 77 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Earthquake Losses by Loss Type ($ millions)



Earthquake Losses by Occupancy Type ($ millions)

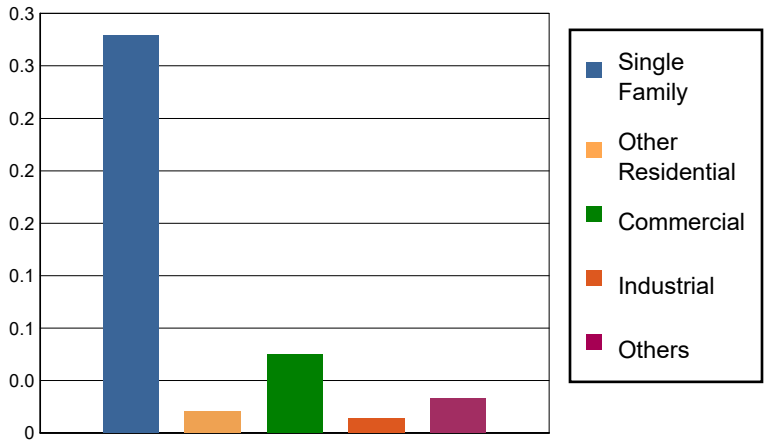


Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.0000	0.0007	0.0048	0.0004	0.0029	0.0088
	Capital-Related	0.0000	0.0003	0.0059	0.0002	0.0002	0.0066
	Rental	0.0058	0.0017	0.0066	0.0001	0.0005	0.0147
	Relocation	0.0188	0.0016	0.0079	0.0009	0.0041	0.0333
	Subtotal	**0.0246**	**0.0043**	**0.0252**	**0.0016**	**0.0077**	**0.0634**
Capital Stock Losses							
	Structural	0.0596	0.0038	0.0122	0.0027	0.0070	0.0853
	Non_Structural	0.1863	0.0077	0.0170	0.0042	0.0086	0.2238
	Content	0.0324	0.0008	0.0055	0.0021	0.0031	0.0439
	Inventory	0.0000	0.0000	0.0001	0.0003	0.0000	0.0004
	Subtotal	**0.2783**	**0.0123**	**0.0348**	**0.0093**	**0.0187**	**0.3534**
	Total	**0.30**	**0.02**	**0.06**	**0.01**	**0.03**	**0.42**

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	254.0865	0.0000	0.00
	Bridges	33.9321	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Subtotal	**288.0186**	**0.0000**	
Railways	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Light Rail	Segments	0.0000	0.0000	0.00
	Bridges	0.0000	0.0000	0.00
	Tunnels	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Bus	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Ferry	Facilities	1.3310	0.0122	0.92
	Subtotal	**1.3310**	**0.0122**	
Port	Facilities	1.9970	0.0183	0.92
	Subtotal	**1.9970**	**0.0183**	
Airport	Facilities	0.0000	0.0000	0.00
	Runways	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**291.35**	**0.03**	

Table 13: Utility System Economic Losses

(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	4.8850	0.0000	0.00
	Subtotal	**4.8850**	**0.0000**	
Waste Water	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	2.9310	0.0000	0.00
	Subtotal	**2.9310**	**0.0000**	
Natural Gas	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Distribution Lines	1.9540	0.0000	0.00
	Subtotal	**1.9540**	**0.0000**	
Oil Systems	Pipelines	0.0000	0.0000	0.00
	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Electrical Power	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
Communication	Facilities	0.0000	0.0000	0.00
	Subtotal	**0.0000**	**0.0000**	
	Total	**9.77**	**0.00**	

Appendix A: County Listing for the Region

New London,CT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Connecticut					
	New London	2,406	382	35	418
Total Region		**2,406**	**382**	**35**	**418**