Public Services Department
433 Hay Street | Fayetteville, NC 28301

FAYETTEVILLE NC
AMERICA'S CAN DO CITY

ATTACHMENT M: BCA METHODOLOGY APPENDICIES INCLUDING BCA REPORT

CITY OF FAYETTEVILLE, NC

WAYLAND DRIVE DRAINAGE IMPROVEMENTS - FY2021 BRIC

Appendix A

Wayland Drive, Fayetteville, NC BCA Report

Benefit-Cost Calculator

V.6.0 (Build 20211021.0641)

Benefit-Cost Analysis

Project Name: Wayland Drive Drainage Improvements BRIC FY2021

Map Marker ▲	Mitigation Title	Property Type	Hazard	Benefits (B)	Costs (C)	BCR (B/C)
1	Drainage Improvement @ Fayetteville, North Carolina	•••	DFA - Riverine Flood	$ 7,033,992	$ 3,568,362	1.97
TOTAL (SELECTED)				**$ 7,033,992**	**$ 3,568,362**	**1.97**
TOTAL				**$ 7,033,992**	**$ 3,568,362**	**1.97**

Property Configuration

Property Title:	Drainage Improvement @ Fayetteville, North Carolina
Property Location:	28301, Cumberland, North Carolina
Property Coordinates:	35.05534, -78.87727
Hazard Type:	Riverine Flood
Mitigation Action Type:	Drainage Improvement
Property Type:	Other
Analysis Method Type:	Professional Expected Damages

Cost Estimation

Drainage Improvement @ Fayetteville, North Carolina

Project Useful Life (years):	50
Project Cost:	$3,554,561.6
Number of Maintenance Years:	50 Use Default:Yes
Annual Maintenance Cost:	$1,000

Damage Analysis Parameters - Damage Frequency Assessment

Drainage Improvement @ Fayetteville, North Carolina

Year of Analysis Conducted:	2021
Year Property was Built:	0
Analysis Duration:	10 Use Default:Yes

Professional Expected Damages Before Mitigation

Drainage Improvement @ Fayetteville, North Carolina

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	CONTENT	DISPLACEMENT COST ($)	ROAD OUTAGE ($)	Number of Volunteers	Number of Days	Damages ($)
2	537,755.94	281,364.79	59,223.97	156,035	0	0	1,034,380
10	725,661.83	370,703.57	86,202.26	156,035	0	0	1,338,603
25	2,670,279.11	3,847,544.51	339,119.62	156,035	0	0	7,012,978
100	3,169,754.38	4,971,046.27	447,191.52	156,035	0	0	8,744,027

Annualized Damages Before Mitigation

Drainage Improvement @ Fayetteville, North Carolina

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
2	1,034,380	470,680
10	1,338,603	183,835
25	7,012,978	234,924
100	8,744,027	87,439
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	18,129,988	976,878

Professional Expected Damages After Mitigation

Drainage Improvement @ Fayetteville, North Carolina

	OTHER	OPTIONAL DAMAGES			VOLUNTEER COSTS		TOTAL
Recurrence Interval (years)	Damages ($)	CONTENT	DISPLACEMENT COST ($)	ROAD OUTAGE ($)	Number of Volunteers	Number of Days	Damages ($)
2	397,153.01	207,512.75	45,378.7	0	0	0	650,044
10	530,618.45	268,256.54	67,495.6	0	0	0	866,371
25	719,598.54	368,501.8	138,463.8	0	0	0	1,226,564
100	1,671,818.61	1,855,778.84	246,262.72	156,035	0	0	3,929,895

Annualized Damages After Mitigation

Drainage Improvement @ Fayetteville, North Carolina

Annualized Recurrence Interval (years)	Damages and Losses ($)	Annualized Damages and Losses ($)
2	650,044	300,181
10	866,371	61,851
25	1,226,564	65,865
100	3,929,895	39,299
	Sum Damages and Losses ($)	Sum Annualized Damages and Losses ($)
	6,672,874	467,196

Standard Benefits - Ecosystem Services

Drainage Improvement @ Fayetteville, North Carolina

Total Project Area (acres):	0
Percentage of Green Open Space:	0.00%
Percentage of Riparian:	0.00%
Percentage of Wetlands:	0.00%
Percentage of Forests:	0.00%
Percentage of Marine Estuary:	0.00%
Expected Annual Ecosystem Services Benefits:	$0

Benefits-Costs Summary

Drainage Improvement @ Fayetteville, North Carolina

Total Standard Mitigation Benefits:	$7,033,992
Total Social Benefits:	$0
Total Mitigation Project Benefits:	$7,033,992
Total Mitigation Project Cost:	$3,568,362
Benefit Cost Ratio - Standard:	1.97
Benefit Cost Ratio - Standard + Social:	1.97

Appendix B

FEMA BCA Reference Guide – Project Useful Life Table

Project Type	Useful Life (years)		Comment
	Standard Value	Acceptable Limits (documentation required)	
Acquisition/Relocation			
All Structures	100	100	
Elevation			
Residential Building	30	30–50	
Non-Residential Building	25	25–50	
Public Building	50	50–100	
Historic Buildings	50	50–100	
Structural/Non-Structural Building Project			
Residential Building Retrofit	30	30	
Non-Residential Building Retrofit	25	25–50	
Public Building Retrofit	50	50–100	
Historic Building Retrofit	50	50–100	
Roof Diaphragm Retrofit	30	30	Roof hardening and roof clips
Tornado Safe Room – Residential	30	30	
Tornado Safe Room – Community	30	30–50	Retrofit or small community safe room ≤ 16 people (30 yr), New (50 yr)
Non-Structural Building Elements	30	30	Ceilings, electrical cabinets, generators, parapet walls, or chimneys
Non-Structural Major Equipment	15	15–30	Elevators, HVAC, sprinklers
Non-Structural Minor Equipment	5	5–20	Generic contents, racks, shelves
Infrastructure Projects			
Major Infrastructure (minor localized flood reduction projects)	50	35–100	
Concrete Infrastructure, Flood Walls, Roads, Bridges, Major Drainage System	50	35–50	
Culverts (concrete, PVC, CMP, HDPE, etc.)	30	25–50	Culvert **with** end treatment (i.e., wing walls, end sections, head walls, etc.)
	10	5–20	Culvert **without** end treatment (i.e., wing walls, end sections, head walls, etc.)
Pump Stations, Substations, Wastewater Systems, or Equipment Such as Generators	50	50	Structures
	5	5–30	Equipment
Hurricane Storm Shutters	15	15–30	Depends on type of storm shutter
Utility Mitigation Projects	50	50–100	Major (power lines, cable, hardening gas, water, sewer lines, etc.)
	5	5–30	Minor (backflow values, downspout disconnect, etc.)

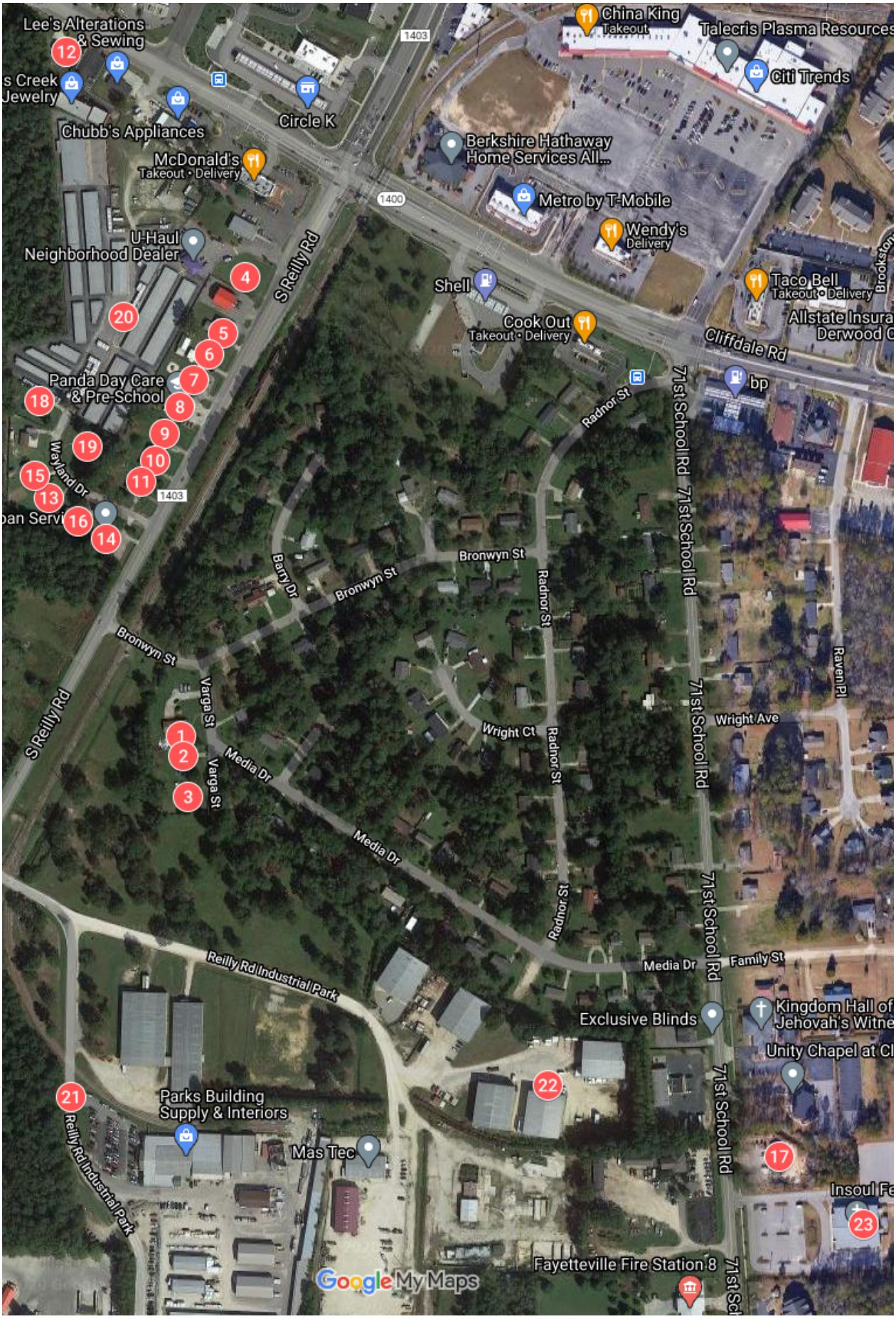
Appendix C

Wayland Drive Homes Protected Photolog

Wayland Drive

Homes protected

1. 524 Varga Street
2. 528 Varga Street
3. 532 Varga Street
4. 836 S Reilly Road
5. 854 S Reilly Road
6. 862 S Reilly Road
7. 868 S Reilly Road
8. 874 S Reilly Road
9. 882 S Reilly Road
10. 888 S Reilly Road
11. 896 S Reilly Road
12. 7133 Cliffdale Road
13. 530 Wayland Drive
14. 902 S Reilly Road
15. 528 Wayland Drive
16. 532 Wayland Drive
17. 1053 Seventy First School Road
18. 522 Wayland Drive
19. 525 Wayland Drive
20. 820 S Reilly Road
21. 201 Reilly Road Industrial Park
22. 217 Reilly Road Industrial Parkway
23. 1077 Seventy First School Road



Appendix D

Hazus MR2 Default Contents Values

Table 10: Hazus MR2 Default Contents Value Based on Percentage of Structure Value

No.	Hazus Occupancy Class Code	Hazus Occupancy Class Description	Contents Value (% of BRV)
Residential			
1	RES1	Single Family Dwelling	50
2	RES2	Mobile Home	50
3	RES3	Multi Family Dwelling	50
4	RES4	Temporary Lodging	50
5	RES5	Institutional Dormitory	50
6	RES6	Nursing Home	50
Commercial			
7	COM1	Retail Trade	100
8	COM2	Wholesale Trade	100
9	COM3	Personal and Repair Services	100
10	COM4	Professional/Technical/Business Services	100
11	COM5	Banks	100
12	COM6	Hospital	150
13	COM7	Medical Office/Clinic	150
14	COM8	Entertainment & Recreation	100
15	COM9	Theaters	100
16	COM10	Parking	50
Industrial			
17	IND1	Heavy	150
18	IND2	Light	150
19	IND3	Food/Drugs/Chemicals	150
20	IND4	Metals/Minerals Processing	150
21	IND5	High Technology	150
22	IND6	Construction	100
Agriculture			
23	AGR1	Agriculture	100
Religion/Non-Profit			
24	REL1	Church/Membership Organization	100
Government			
25	GOV1	General Services	100
26	GOV2	Emergency Response	150
Education			
27	EDU1	Schools/Libraries	100
28	EDU2	Colleges/Universities	150

The exception to these defaults is when users select residential USACE Generic DDFs. The BCA software uses 100% of the BRV for the contents replacement value as the default when USACE Generic DDFs are selected because the content-to-structure value ratio is already incorporated in the contents DDF.

When conducting a Flood module analysis, the user normally uses the default contents values provided by the BCA software. The default contents values are based on the DDF selection (residential or non-residential/primary use, number of stories, basement type, and default or generic). However, in some situations, the primary building use for non-residential buildings

Appendix E

FEMA Standard Values Appendix C Displacement Costs

Building Type		Displacement Costs	
HAZUS-MH MR3 Label	Occupancy Class	[A] Rental Cost (2008)	[B] Disruption Costs (2008)
		$/ft²/month	$/ft²
Residential			
RES1	Single Family Dwelling	0.73	0.88
RES2	Mobile Home	0.51	0.88
RES3	Multi Family Dwelling (All Types, includes duplex to 50+ units)	0.65	0.88
RES4	Temporary Lodging	2.19	0.88
RES5	Institutional Lodging	0.44	0.88
RES6	Nursing Home	0.80	0.88
Commercial			
COM1	Retail Trade	1.25	1.17
COM2	Wholesale Trade	0.52	1.02
COM3	Personal and Repair Services	1.46	1.02
COM4	Professional/Technical/Business	1.46	1.02
COM5	Banks	1.82	1.02
COM6	Hospital	1.46	1.46
COM7	Medical Office/ Clinic	1.46	1.46
COM8	Entertainment and Recreation	1.82	0.00
COM9	Theaters	1.82	0.00
COM10	Parking	0.36	0.00
Industrial			
IND1	Heavy	0.21	0.00
IND2	Light	0.29	1.02
IND3	Food/Drugs/Chemicals	0.29	1.02
IND4	Metals/Mineral Processing	0.21	1.02
IND5	High Technology	0.36	1.02
IND6	Construction	0.15	1.02
Agricultural			
AGR1	Agriculture	0.73	0.73
Religious/Non-Profit			
REL1	Church/Membership Organization	1.09	1.02
Government			
GOV1	General Services	1.46	1.02
GOV2	Emergency Response	1.46	1.02
Education			
EDU1	Schools/Libraries	1.09	1.02
EDU2	College/Universities	1.46	1.02

Source: HAZUS-MH MR3 Flood Technical Manual, Table 14.10. The 2006 HAZUS values were inflated using the CPI for 2007 and 2008 from the Bureau of Labor Statistics (bls.gov) Historical CPI Data

Appendix F

Wayland Drive Inventory Spreadsheet

	Building Damages	Content Damages	Displacement Costs	Road Outages
2-Yr	$ 537,755.94	$ 281,364.79	$ 59,223.97	$ 156,035.00
10-Yr	$ 725,661.83	$ 370,703.57	$ 86,202.26	$ 156,035.00
25-Yr	$ 2,670,279.11	$ 3,847,544.51	$ 339,119.62	$ 156,035.00
100-Yr	$ 3,169,754.38	$ 4,971,046.27	$ 447,191.52	$ 156,035.00
2-Yr After Mitigation	$ 397,153.01	$ 207,512.75	$ 45,738.70	$ -
10-Yr After Mitigation	$ 530,618.45	$ 268,256.54	$ 67,495.60	$ -
25-Yr After Mitigation	$ 719,598.54	$ 368,501.80	$ 138,463.80	$ -
100-Yr After Mitigation	$ 1,671,818.61	$ 1,855,778.84	$ 246,262.72	$ 156,035.00

Annual Average Daily Traffic (AADT) 2016	16000
Additional Time (min)	11
Additional Miles	6.7

ID	Address	2-Yr Flood Depth (ft)	10-Yr Flood Depth (ft)	25-Yr Flood Depth (ft)	100-Yr Flood Depth (ft)	AM 2-Yr Flood Depth (ft)	AM 10-Yr Flood Depth (ft)	AM 25-Yr Flood Depth (ft)	AM 100-Yr Flood Depth (ft)
1	7133 Cliffdale Rd	-5	-5	0	0	-5	-5	0	0
2	836 S Reilly Rd	-5	0	1	1	-5	0	0	0
3	854 S Reilly Rd	0	1	1	1	0	0	0	0
4	862 S Reilly Rd	1	1	1	1	0	0	0	0
5	868 S Reilly Rd	0	0	0	1	0	0	0	0
6	874 S Reilly Rd	1	1	1	1	0	0	0	0
7	882 S Reilly Rd	1	1	1	1	0	0	0	0
8	888 S Reilly Rd	1	1	1	1	0	0	0	0
9	896 S Reilly Rd	1	1	1	2	0	0	0	1
10	820 S Reilly Rd	0	0	1	1	0	0	0	0
11	522 Wayland Dr	0	0	1	1	0	0	0	0
12	525 Wayland Dr	1	1	1	1	0	0	0	0
13	528 Wayland Dr	0	0	1	1	0	0	0	0
14	530 Wayland Dr	0	1	1	1	0	0	0	0
15	532 Wayland Dr	0	1	1	1	0	0	0	0
16	902 S Reilly Rd	1	1	1	1	0	0	0.25	0.5
17	524 Varga St	-5	0	0.5	0.75	-5	0	0	0
18	528 Varga St	-5	0	0	0	-5	0	0	0
19	532 Varga St	-5	0	0	0	-5	0	0	0
20	201 Reilly Rd Industrial Park	-5	0	0	0	-5	0	0	0
21	217 Reilly Rd Industrial Park	-5	-5	0.5	1.5	-5	-5	0	1
22	1053 Seventy First School Rd	-5	-5	0	0	-5	-5	0	0
23	1077 Seventy First School Rd	-5	-5	0	0	-5	-5	0	0

ID	Address	Occupancy	Structure Type	Year built	Sq Ft	Floors
1	7133 Cliffdale Road		RES1	1970	1880	1
2	836 S Reilly Road		RES1	1969	1078	1
3	854 S Reilly Road		RES1	1969	1552	1
4	862 S Reilly Road		RES1	1969	1824	1
5	868 S Reilly Road		RES1	1969	1400	1
6	874 S Reilly Road		RES1	1969	1428	1
7	882 S Reilly Road		RES1	1969	1050	1
8	888 S Reilly Road		RES1	1969	1104	1
9	896 S Reilly Road		RES1	1969	1306	1
10	820 S Reilly Road	Warehouse	COM5	1994	19600	1
11	522 Wayland Drive		RES1	1984	1092	1
12	525 Wayland Drive		RES1	1984	1485	1
13	528 Wayland Drive		RES1	1972	1425	1
14	530 Wayland Drive		RES1	1971	988	1
15	532 Wayland Drive		RES1	1972	1100	1
16	902 S Reilly Road		RES1	1971	1204	1
17	524 Varga Street		RES1	1967	1736	1
18	528 Varga Street		RES1	1967	1100	1
19	532 Varga Street		RES1	1967	1050	1
20	201 Reilly Road Industrial P	Warehouse	COM5	2006	12000	1
21	217 Reilly Road Industrial P	Office	COM4	2006	36320	1
22	1053 Seventy First School I	Retail	COM3	1983	1860	1
23	1077 Seventy First School I	Church	REL1	2009	13310	1

Total Project Cost

$ 2,425,000.00

BRV	CRV	total B+C	Ground Elevation	Ajusted Ground Elevation	Foundation Elevation
$ 284,016.12	$ 284,016.12	$ 568,032.23	252	250	250.5
$ 162,856.05	$ 162,856.05	$ 325,712.10	244	242	242.5
$ 234,464.37	$ 234,464.37	$ 468,928.74	247	245	245.5
$ 275,556.06	$ 275,556.06	$ 551,112.12	243	241	241.5
$ 211,501.36	$ 211,501.36	$ 423,002.73	239	237	237.5
$ 215,731.39	$ 215,731.39	$ 431,462.78	237	235	235.5
$ 158,626.02	$ 158,626.02	$ 317,252.04	237	235	235.5
$ 166,783.93	$ 166,783.93	$ 333,567.86	240	238	238.5
$ 197,300.56	$ 197,300.56	$ 394,601.11	241	239	239.5
$ 6,283,703.21	$ 6,283,703.21	$ 12,567,406.42	237	235	235.5
$ 164,971.06	$ 164,971.06	$ 329,942.13	237	235	235.5
$ 224,342.52	$ 224,342.52	$ 448,685.03	239	237	237.5
$ 215,278.17	$ 215,278.17	$ 430,556.35	238	236	236.5
$ 149,259.53	$ 149,259.53	$ 298,519.07	241	239	239.5
$ 166,179.64	$ 166,179.64	$ 332,359.28	243	241	241.5
$ 181,891.17	$ 181,891.17	$ 363,782.34	241	239	239.5
$ 262,261.69	$ 262,261.69	$ 524,523.38	247	245	245.5
$ 166,179.64	$ 166,179.64	$ 332,359.28	245	243	243.5
$ 158,626.02	$ 158,626.02	$ 317,252.04	242	240	240.5
$ 3,847,165.23	$ 3,847,165.23	$ 7,694,330.46	249	247	247.5
$ 7,723,995.08	$ 7,723,995.08	$ 15,447,990.17	225	223	223.5
$ 319,519.87	$ 319,519.87	$ 639,039.74	234	232	232.5
$ 3,039,609.76	$ 3,039,609.76	$ 6,079,219.52	238	236	236.5
$ 24,809,818.47	**$ 24,809,818.47**	**$ 49,619,636.93**			

2 Yr Flood Depth	2-Yr Bldg	2-Yr Cont	2-Yr Total	2-Yr Displacement
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
0	$ 31,418.23	$ 18,991.61	$ 50,409.84	$ 1,789.15
1	$ 64,204.56	$ 36,648.96	$ 100,853.52	$ 4,719.14
0	$ 28,341.18	$ 17,131.61	$ 45,472.79	$ 1,613.92
1	$ 50,265.41	$ 28,692.27	$ 78,957.69	$ 3,694.59
1	$ 36,959.86	$ 21,097.26	$ 58,057.12	$ 2,716.61
1	$ 38,860.66	$ 22,182.26	$ 61,042.92	$ 2,856.32
1	$ 45,971.03	$ 26,240.97	$ 72,212.00	$ 3,378.95
0	$ 53,860.31	$ -	$ 53,860.31	$ 26,189.52
0	$ 22,106.12	$ 13,362.66	$ 35,468.78	$ 1,258.86
1	$ 52,271.81	$ 29,837.55	$ 82,109.36	$ 3,842.07
0	$ 28,847.28	$ 17,437.53	$ 46,284.81	$ 1,642.74
0	$ 20,000.78	$ 12,090.02	$ 32,090.80	$ 1,138.97
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
1	$ 42,380.64	$ 24,191.53	$ 66,572.17	$ 3,115.05
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
	$ 537,755.94	**$ 281,364.79**		**$ 59,223.97**

Note: -5 means there is no flooding in the property, 0 means flooding occurs at minimal depth. Such distinction is necessary for DDFs.

10 Yr Flood Depth	10-Yr Bldg	10-Yr Cont	10-Yr Total	10-Yr Displacement
-5	$ -	$ -	$ -	$ -
0	$ 21,822.71	$ 13,191.34	$ 35,014.05	$ 1,242.72
1	$ 54,630.20	$ 31,183.76	$ 85,813.96	$ 4,015.41
1	$ 64,204.56	$ 36,648.96	$ 100,853.52	$ 4,719.14
0	$ 28,341.18	$ 17,131.61	$ 45,472.79	$ 1,613.92
1	$ 50,265.41	$ 28,692.27	$ 78,957.69	$ 3,694.59
1	$ 36,959.86	$ 21,097.26	$ 58,057.12	$ 2,716.61
1	$ 38,860.66	$ 22,182.26	$ 61,042.92	$ 2,856.32
1	$ 45,971.03	$ 26,240.97	$ 72,212.00	$ 3,378.95
0	$ 53,860.31	$ -	$ 53,860.31	$ 26,189.52
0	$ 22,106.12	$ 13,362.66	$ 35,468.78	$ 1,258.86
1	$ 52,271.81	$ 29,837.55	$ 82,109.36	$ 3,842.07
0	$ 28,847.28	$ 17,437.53	$ 46,284.81	$ 1,642.74
1	$ 34,777.47	$ 19,851.52	$ 54,628.99	$ 2,556.20
1	$ 38,719.86	$ 22,101.89	$ 60,821.75	$ 2,845.98
1	$ 42,380.64	$ 24,191.53	$ 66,572.17	$ 3,115.05
0	$ 35,143.07	$ 21,243.20	$ 56,386.26	$ 2,001.26
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 32,975.70	$ -	$ 32,975.70	$ 16,034.40
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
	$ 725,661.83	**$ 370,703.57**		**$ 86,202.26**

25 Yr Flood Depth	25-Yr Bldg	25-Yr Cont	25-Yr Total	25-Yr Displacement
0	$ 38,058.16	$ 23,005.31	$ 61,063.46	$ 2,167.26
1	$ 37,945.46	$ 21,659.85	$ 59,605.31	$ 2,789.06
1	$ 54,630.20	$ 31,183.76	$ 85,813.96	$ 4,015.41
1	$ 64,204.56	$ 36,648.96	$ 100,853.52	$ 4,719.14
0	$ 28,341.18	$ 17,131.61	$ 45,472.79	$ 1,613.92
1	$ 50,265.41	$ 28,692.27	$ 78,957.69	$ 3,694.59
1	$ 36,959.86	$ 21,097.26	$ 58,057.12	$ 2,716.61
1	$ 38,860.66	$ 22,182.26	$ 61,042.92	$ 2,856.32
1	$ 45,971.03	$ 26,240.97	$ 72,212.00	$ 3,378.95
1	$ 815,086.07	$ 1,867,157.53	$ 2,682,243.60	$ 96,285.00
1	$ 38,438.26	$ 21,941.15	$ 60,379.41	$ 2,825.28
1	$ 52,271.81	$ 29,837.55	$ 82,109.36	$ 3,842.07
1	$ 50,159.81	$ 28,632.00	$ 78,791.81	$ 3,686.83
1	$ 34,777.47	$ 19,851.52	$ 54,628.99	$ 2,556.20
1	$ 38,719.86	$ 22,101.89	$ 60,821.75	$ 2,845.98
1	$ 42,380.64	$ 24,191.53	$ 66,572.17	$ 3,115.05
1	$ 61,106.97	$ 34,880.80	$ 95,987.78	$ 4,491.47
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 32,975.70	$ -	$ 32,975.70	$ 16,042.57
1	$ 1,040,467.10	$ 1,544,799.02	$ 2,585,266.12	$ 152,729.23
0	$ 3,423.43	$ -	$ 3,423.43	$ 2,485.33
0	$ 21,711.50	$ -	$ 21,711.50	$ 17,784.82
	$ 2,670,279.11	**$ 3,847,544.51**		**$ 339,119.62**

100 Yr Flood Depth	100-Yr Bldg	100-Yr Cont	100-Yr Total	100-Yr Displacement
0	$ 38,058.16	$ 23,005.31	$ 61,063.46	$ 2,167.26
1	$ 37,945.46	$ 21,659.85	$ 59,605.31	$ 2,789.06
1	$ 54,630.20	$ 31,183.76	$ 85,813.96	$ 4,015.41
1	$ 64,204.56	$ 36,648.96	$ 100,853.52	$ 4,719.14
1	$ 49,279.82	$ 28,129.68	$ 77,409.50	$ 3,622.15
1	$ 50,265.41	$ 28,692.27	$ 78,957.69	$ 3,694.59
1	$ 36,959.86	$ 21,097.26	$ 58,057.12	$ 2,716.61
1	$ 38,860.66	$ 22,182.26	$ 61,042.92	$ 2,856.32
2	$ 63,333.48	$ 35,316.80	$ 98,650.28	$ 5,252.34
1	$ 815,086.07	$ 1,867,157.53	$ 2,682,243.60	$ 96,285.00
1	$ 38,438.26	$ 21,941.15	$ 60,379.41	$ 2,825.28
1	$ 52,271.81	$ 29,837.55	$ 82,109.36	$ 3,842.07
1	$ 50,159.81	$ 28,632.00	$ 78,791.81	$ 3,686.83
1	$ 34,777.47	$ 19,851.52	$ 54,628.99	$ 2,556.20
1	$ 38,719.86	$ 22,101.89	$ 60,821.75	$ 2,845.98
1	$ 42,380.64	$ 24,191.53	$ 66,572.17	$ 3,115.05
1	$ 61,106.97	$ 34,880.80	$ 95,987.78	$ 4,491.47
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 32,975.70	$ -	$ 32,975.70	$ 16,034.40
2	$ 1,501,641.29	$ 2,648,226.89	$ 4,149,868.18	$ 256,927.68
0	$ 3,423.43	$ -	$ 3,423.43	$ 2,485.33
0	$ 21,711.50	$ -	$ 21,711.50	$ 17,784.82
	$ 3,169,754.38	**$ 4,971,046.27**		**$ 447,191.52**

AM 2 Yr Flood Depth	AM 2-Yr Bldg	AM 2-Yr Cont	AM 2-Yr Total	AM 2-Yr Displacement
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
0	$ 31,418.23	$ 18,991.61	$ 50,409.84	$ 1,789.15
0	$ 36,924.51	$ 22,320.04	$ 59,244.55	$ 2,102.71
0	$ 28,341.18	$ 17,131.61	$ 45,472.79	$ 1,613.92
0	$ 28,908.01	$ 17,474.24	$ 46,382.25	$ 1,646.20
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 22,349.05	$ 13,509.50	$ 35,858.55	$ 1,272.69
0	$ 26,438.27	$ 15,981.35	$ 42,419.62	$ 1,505.56
0	$ 53,860.31	$ -	$ 53,860.31	$ 26,189.52
0	$ 22,106.12	$ 13,362.66	$ 35,468.78	$ 1,258.86
0	$ 30,061.90	$ 18,171.74	$ 48,233.64	$ 1,711.91
0	$ 28,847.28	$ 17,437.53	$ 46,284.81	$ 1,642.74
0	$ 20,000.78	$ 12,090.02	$ 32,090.80	$ 1,138.97
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 24,373.42	$ 14,733.18	$ 39,106.60	$ 1,387.97
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
	$ 397,153.01	**$ 207,512.75**		**$ 45,738.70**

AM 10 Yr Flood Depth	AM 10-Yr Bldg	AM 10-Yr Cont	AM 10-Yr Total	AM 10-Yr Displacement
-5	$ -	$ -	$ -	$ -
0	$ 21,822.71	$ 13,191.34	$ 35,014.05	$ 1,242.72
0	$ 31,418.23	$ 18,991.61	$ 50,409.84	$ 1,789.15
0	$ 36,924.51	$ 22,320.04	$ 59,244.55	$ 2,102.71
0	$ 28,341.18	$ 17,131.61	$ 45,472.79	$ 1,613.92
0	$ 28,908.01	$ 17,474.24	$ 46,382.25	$ 1,646.20
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 22,349.05	$ 13,509.50	$ 35,858.55	$ 1,272.69
0	$ 26,438.27	$ 15,981.35	$ 42,419.62	$ 1,505.56
0	$ 53,860.31	$ -	$ 53,860.31	$ 26,189.52
0	$ 22,106.12	$ 13,362.66	$ 35,468.78	$ 1,258.86
0	$ 30,061.90	$ 18,171.74	$ 48,233.64	$ 1,711.91
0	$ 28,847.28	$ 17,437.53	$ 46,284.81	$ 1,642.74
0	$ 20,000.78	$ 12,090.02	$ 32,090.80	$ 1,138.97
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 24,373.42	$ 14,733.18	$ 39,106.60	$ 1,387.97
0	$ 35,143.07	$ 21,243.20	$ 56,386.26	$ 2,001.26
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 32,975.70	$ -	$ 32,975.70	$ 16,034.40
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
-5	$ -	$ -	$ -	$ -
	$ 530,618.45	**$ 268,256.54**		**$ 67,495.60**

AM 25 Yr Flood Depth	AM 25-Yr Bldg	AM 25-Yr Cont	AM 25-Yr Total	AM 25-Yr Displacement
0	$ 38,058.16	$ 23,005.31	$ 61,063.46	$ 2,167.26
0	$ 21,822.71	$ 13,191.34	$ 35,014.05	$ 1,242.72
0	$ 31,418.23	$ 18,991.61	$ 50,409.84	$ 1,789.15
0	$ 36,924.51	$ 22,320.04	$ 59,244.55	$ 2,102.71
0	$ 28,341.18	$ 17,131.61	$ 45,472.79	$ 1,613.92
0	$ 28,908.01	$ 17,474.24	$ 46,382.25	$ 1,646.20
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 22,349.05	$ 13,509.50	$ 35,858.55	$ 1,272.69
0	$ 26,438.27	$ 15,981.35	$ 42,419.62	$ 1,505.56
0	$ 53,860.31	$ -	$ 53,860.31	$ 26,189.52
0	$ 22,106.12	$ 13,362.66	$ 35,468.78	$ 1,258.86
0	$ 30,061.90	$ 18,171.74	$ 48,233.64	$ 1,711.91
0	$ 28,847.28	$ 17,437.53	$ 46,284.81	$ 1,642.74
0	$ 20,000.78	$ 12,090.02	$ 32,090.80	$ 1,138.97
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 24,373.42	$ 14,733.18	$ 39,106.60	$ 1,387.97
0	$ 35,143.07	$ 21,243.20	$ 56,386.26	$ 2,001.26
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 32,975.70	$ -	$ 32,975.70	$ 16,034.40
0	$ 125,787.01	$ 77,239.95	$ 203,026.96	$ 48,530.78
0	$ 3,423.43	$ -	$ 3,423.43	$ 2,485.33
0	$ 21,711.50	$ -	$ 21,711.50	$ 17,784.82
	$ 719,598.54	**$ 368,501.80**		**$ 138,463.80**

AM 100 Yr Flood Depth	AM 100-Yr Bldg	AM 100-Yr Cont	AM 100-Yr Total	AM 100-Yr Displacement
0	$ 38,058.16	$ 23,005.31	$ 61,063.46	$ 2,167.26
0	$ 21,822.71	$ 13,191.34	$ 35,014.05	$ 1,242.72
0	$ 31,418.23	$ 18,991.61	$ 50,409.84	$ 1,789.15
0	$ 36,924.51	$ 22,320.04	$ 59,244.55	$ 2,102.71
0	$ 28,341.18	$ 17,131.61	$ 45,472.79	$ 1,613.92
0	$ 28,908.01	$ 17,474.24	$ 46,382.25	$ 1,646.20
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 22,349.05	$ 13,509.50	$ 35,858.55	$ 1,272.69
1	$ 45,971.03	$ 26,240.97	$ 72,212.00	$ 3,378.95
0	$ 53,860.31	$ -	$ 53,860.31	$ 26,189.52
0	$ 22,106.12	$ 13,362.66	$ 35,468.78	$ 1,258.86
0	$ 30,061.90	$ 18,171.74	$ 48,233.64	$ 1,711.91
0	$ 28,847.28	$ 17,437.53	$ 46,284.81	$ 1,642.74
0	$ 20,000.78	$ 12,090.02	$ 32,090.80	$ 1,138.97
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
1	$ 42,380.64	$ 24,191.53	$ 66,572.17	$ 3,115.05
0	$ 35,143.07	$ 21,243.20	$ 56,386.26	$ 2,001.26
0	$ 22,268.07	$ 13,460.55	$ 35,728.62	$ 1,268.08
0	$ 21,255.89	$ 12,848.71	$ 34,104.59	$ 1,210.44
0	$ 32,975.70	$ -	$ 32,975.70	$ 16,034.40
1	$ 1,040,467.10	$ 1,544,799.02	$ 2,585,266.12	$ 152,729.23
0	$ 3,423.43	$ -	$ 3,423.43	$ 2,485.33
0	$ 21,711.50	$ -	$ 21,711.50	$ 17,784.82
	$ 1,671,818.61	**$ 1,855,778.84**		**$ 246,262.72**

Hazus Occupancy Code	Occupancy Code Description	2021 BRV	CSVR	2021 CRV
RES1	Single Family Dwelling	$ 151.07	1	$ 151.07
COM1	Retail Trade	$ 147.40	1	$ 147.40
COM2	Wholesale Trade	$ 142.83	1	$ 142.83
COM3	Personal and Repair Services	$ 171.78	1	$ 171.78
COM4	Business/Professional/Technical Services	$ 212.67	1	$ 212.67
COM5	Depository Institutions	$ 320.60	1	$ 320.60
REL1	Church/Membership Organizations	$ 228.37	1	$ 228.37

Occupancy	Code D	BRV	CSVR	CRV
RES1	Single Fan	$130.34	1	$130.34
COM1	Retail Trac	$127.17	1	$127.17
COM2	Wholesale	$123.23	1	$123.23
COM3	Personal a	$148.21	1	$148.21
COM4	Business/F	$183.48	1	$183.48
COM5	Depository	$276.60	1	$276.60
REL1	Church/Me	$197.03	1	$197.03

Occupancy	Code D	2019 BRV	CSVR	2019 CRV
RES1	Single Fan	$140.38	0.69	$140.38
COM1	Retail Trac	$136.96	1.19	$136.96
COM2	Wholesale	$132.72	2.07	$132.72
COM3	Personal a	$159.62	2.36	$159.62
COM4	Business/F	$197.61	0.54	$197.61
COM5	Depository	$297.90	0.54	$297.90
REL1	Church/Me	$212.20	0.55	$212.20

Retail	Building	Cont	Disp	LOF
-2	0.01	0.00	0	0
-1	0.01	0.00	0	0
0	0.01	0.00	0	0
1	0.13	0.23	45	45
2	0.20	0.34	90	90
3	0.27	0.44	135	135
4	0.33	0.67	180	180
5	0.37	0.78	225	225
6	0.40	0.87	270	270
7	0.44	0.95	315	315
8	0.48	0.97	360	360
9	0.52	0.99	405	405
10	0.53	0.99	450	450
11	0.53	0.99	450	450
12	0.53	0.99	450	450
13	0.53	0.99	450	450
14	0.53	0.99	450	450
15	0.53	0.99	450	450
16	0.53	0.99	450	450

Church	Building	Cont	Disp	LOF
-2	0.00	0.00	0	0
-1	0.00	0.00	0	0
0	0.01	0.00	0	0
1	0.16	0.29	45	45
2	0.28	0.48	90	90
3	0.36	0.60	135	135
4	0.43	0.69	180	180
5	0.48	0.76	225	225
6	0.54	0.81	270	270
7	0.58	0.88	315	315
8	0.62	0.94	360	360
9	0.65	0.97	405	405
10	0.66	0.97	450	450
11	0.66	0.97	450	450
12	0.66	0.97	450	450
13	0.66	0.97	450	450
14	0.66	0.97	450	450
15	0.66	0.97	450	450
16	0.66	0.97	450	450

Retail										
Building	1%	1%	1%	13%	20%	27%	33%	37%	40%	44%
Cont	0%	0%	0%	23%	34%	44%	67%	78%	87%	95%
Church										
Building	0%	0%	1%	16%	28%	36%	43%	48%	54%	58%
Cont	0%	0%	0%	29%	48%	60%	69%	76%	81%	88%
Office										
Building	1%	1%	2%	13%	19%	25%	31%	34%	39%	46%
Cont	1%	1%	1%	20%	34%	45%	55%	64%	73%	76%
Warehouse										
Building	0%	0%	1%	13%	22%	29%	37%	40%	46%	50%
Cont	0%	0%	0%	30%	48%	59%	66%	74%	80%	84%

Office	Building	Cont	Disp	LOF
-2	0.01	0.01	0	0
-1	0.01	0.01	0	0
0	0.02	0.01	0	0
1	0.13	0.20	45	45
2	0.19	0.34	90	90
3	0.25	0.45	135	135
4	0.31	0.55	180	180
5	0.34	0.64	225	225
6	0.39	0.73	270	270
7	0.46	0.76	315	315
8	0.51	0.83	360	360
9	0.55	0.89	405	405
10	0.59	0.91	450	450
11	0.59	0.91	450	450
12	0.59	0.91	450	450
13	0.59	0.91	450	450
14	0.59	0.91	450	450
15	0.59	0.91	450	450
16	0.59	0.91	450	450

Apartment	Building	Cont	Disp	LOF
-2	0.00	0.00	0	0
-1	0.00	0.00	0	0
0	0.01	0.00	0	0
1	0.13	0.22	45	45
2	0.20	0.30	90	90
3	0.26	0.39	135	135
4	0.32	0.45	180	180
5	0.34	0.48	225	225
6	0.37	0.52	270	270
7	0.39	0.56	315	315
8	0.42	0.59	360	360
9	0.45	0.61	405	405
10	0.47	0.63	450	450
11	0.47	0.63	450	450
12	0.47	0.63	450	450
13	0.47	0.63	450	450
14	0.47	0.63	450	450
15	0.47	0.63	450	450
16	0.47	0.63	450	450

48%	**52%**	53%	53%	53%	53%	53%	**53%**	53%
97%	**99%**	99%	99%	99%	99%	99%	**99%**	99%
62%	**65%**	66%	66%	66%	66%	66%	**66%**	66%
94%	**97%**	97%	97%	97%	97%	97%	**97%**	97%
51%	**55%**	59%	59%	59%	59%	59%	**59%**	59%
83%	**89%**	91%	91%	91%	91%	91%	**91%**	91%
54%	**59%**	61%	61%	61%	61%	61%	**61%**	61%
90%	**94%**	94%	94%	94%	94%	94%	**94%**	94%

Warehouse	Building	Cont	Disp	LOF
-2	0.00	0.00	0	0
-1	0.00	0.00	0	0
0	0.01	0.00	0	0
1	0.13	0.30	45	45
2	0.22	0.48	90	90
3	0.29	0.59	135	135
4	0.37	0.66	180	180
5	0.40	0.74	225	225
6	0.46	0.80	270	270
7	0.50	0.84	315	315
8	0.54	0.90	360	360
9	0.59	0.94	405	405
10	0.61	0.94	450	450
11	0.61	0.94	450	450
12	0.61	0.94	450	450
13	0.61	0.94	450	450
14	0.61	0.94	450	450
15	0.61	0.94	450	450
16	0.61	0.94	450	450

Updated Coastal Depth-Damage Function Curves

DDF Type: **USACE Generic Riverine**

Flood Zone: **Outside Coastal A Zone**

Structure Type: **1-Story Without Basement**

Reference elevation is at top of floor

Flood Depth (ft)	Building DDF (%)	Contents DDF* (%)	Displacement DDF (days)	Loss of Function DDF (days)
-2	0.0%	0.0%	0	0
-1	2.5%	2.4%	0	0
0	13.4%	8.1%	0	0
1	23.3%	13.3%	45	45
2	32.1%	17.9%	90	90
3	40.1%	22.0%	135	135
4	47.1%	25.7%	180	180
5	53.2%	28.8%	225	225
6	58.6%	31.5%	270	270
7	63.2%	33.8%	315	315
8	67.2%	35.7%	360	360
9	70.5%	37.2%	405	405
10	73.2%	38.4%	450	450
11	75.4%	39.2%	495	495
12	77.2%	39.7%	540	540
13	78.5%	40.0%	585	585
14	79.5%	40.0%	630	630
15	80.2%	40.0%	675	675
16	80.7%	40.0%	720	720

APPENDIX C
FEMA Standard Values

https://www.bls.gov/data/inflation_calculator.htm

1.31 Jan 2008 to Oct 2020

Building Type		Displacement Costs			
HAZUS-MH MR3 Label	Occupancy Class	[A] Rental Cost (2008)	[B] Disruption Costs (2008)	[A] Rental Cost (2021)	[B] Disruption Costs (2021)
		$/ft^2/month	$/ft^2	$/ft^2/month	$/ft^2
Residential					
RES1	Single Family Dwelling	0.73	0.88	0.9563	1.1528
RES2	Mobile Home	0.51	0.88	0.6681	1.1528
RES3	Multi Family Dwelling (All Types, includes duplex to 50+ units)	0.65	0.88	0.8515	1.1528
RES4	Temporary Lodging	2.19	0.88	2.8689	1.1528
RES5	Institutional Lodging	0.44	0.88	0.5764	1.1528
RES6	Nursing Home	0.80	0.88	1.048	1.1528
Commercial				0	0
COM1	Retail Trade	1.25	1.17	1.6375	1.5327
COM2	Wholesale Trade	0.52	1.02	0.6812	1.3362
COM3	Personal and Repair Services	1.46	1.02	1.9126	1.3362
COM4	Professional/Technical/Business	1.46	1.02	1.9126	1.3362
COM5	Banks	1.82	1.02	2.3842	1.3362
COM6	Hospital	1.46	1.46	1.9126	1.9126
COM7	Medical Office/ Clinic	1.46	1.46	1.9126	1.9126
COM8	Entertainment and Recreation	1.82	0.00	2.3842	0
COM9	Theaters	1.82	0.00	2.3842	0
COM10	Parking	0.36	0.00	0.4716	0
Industrial				0	0
IND1	Heavy	0.21	0.00	0.2751	0
IND2	Light	0.29	1.02	0.3799	1.3362
IND3	Food/Drugs/Chemicals	0.29	1.02	0.3799	1.3362
IND4	Metals/Mineral Processing	0.21	1.02	0.2751	1.3362
IND5	High Technology	0.36	1.02	0.4716	1.3362
IND6	Construction	0.15	1.02	0.1965	1.3362
Agricultural				0	0
AGR1	Agriculture	0.73	0.73	0.9563	0.9563
Religious/Non-Profit				0	0
REL1	Church/Membership Organization	1.09	1.02	1.4279	1.3362
Government				0	0
GOV1	General Services	1.46	1.02	1.9126	1.3362
GOV2	Emergency Response	1.46	1.02	1.9126	1.3362
Education				0	0
EDU1	Schools/Libraries	1.09	1.02	1.4279	1.3362
EDU2	College/Universities	1.46	1.02	1.9126	1.3362

Source: HAZUS-MH MR3 Flood Technical Manual, Table 14.10. The 2006 HAZUS values were inflated using the CPI for 2007 and 2008 from the Bureau of Labor Statistics (bls.gov) Historical CPI Data