

# Flood Hazard Mitigation in the Great Lakes

FEMA Region 5 Monthly Floodplain Management Webinar Series

Frank Shockey, PhD, CFM | August 31, 2022



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*The Great Lakes have been getting new flood maps...*

...and they have new zones (VE zones) on them.

Now what?



Cook County, IL, effective 9/10/21



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## You need to know about:

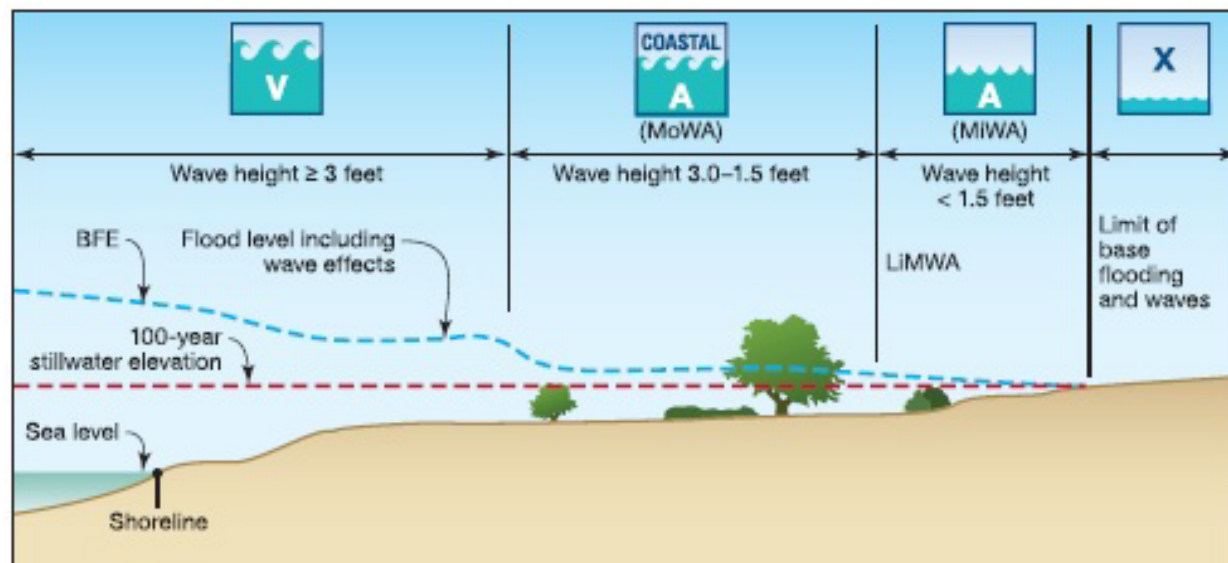
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- What makes coastal flooding different from riverine flooding;
- Finding relevant data for floodplain management in coastal areas;
- Floodplain management standards for coastal high-hazard areas (NFIP minimum and “higher” standards);
- Reducing potential flood damage in a coastal area without unduly restricting property rights;
- Coastal high hazard areas and NFIP insurance.
  - Extended, more detailed versions of this content have been offered over the last few years and will continue to be offered to local officials and other interested people in affected areas.



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# I. Coastal Flooding

## Basics of coastal flooding



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# How is coastal flooding different from riverine and lacustrine flooding?

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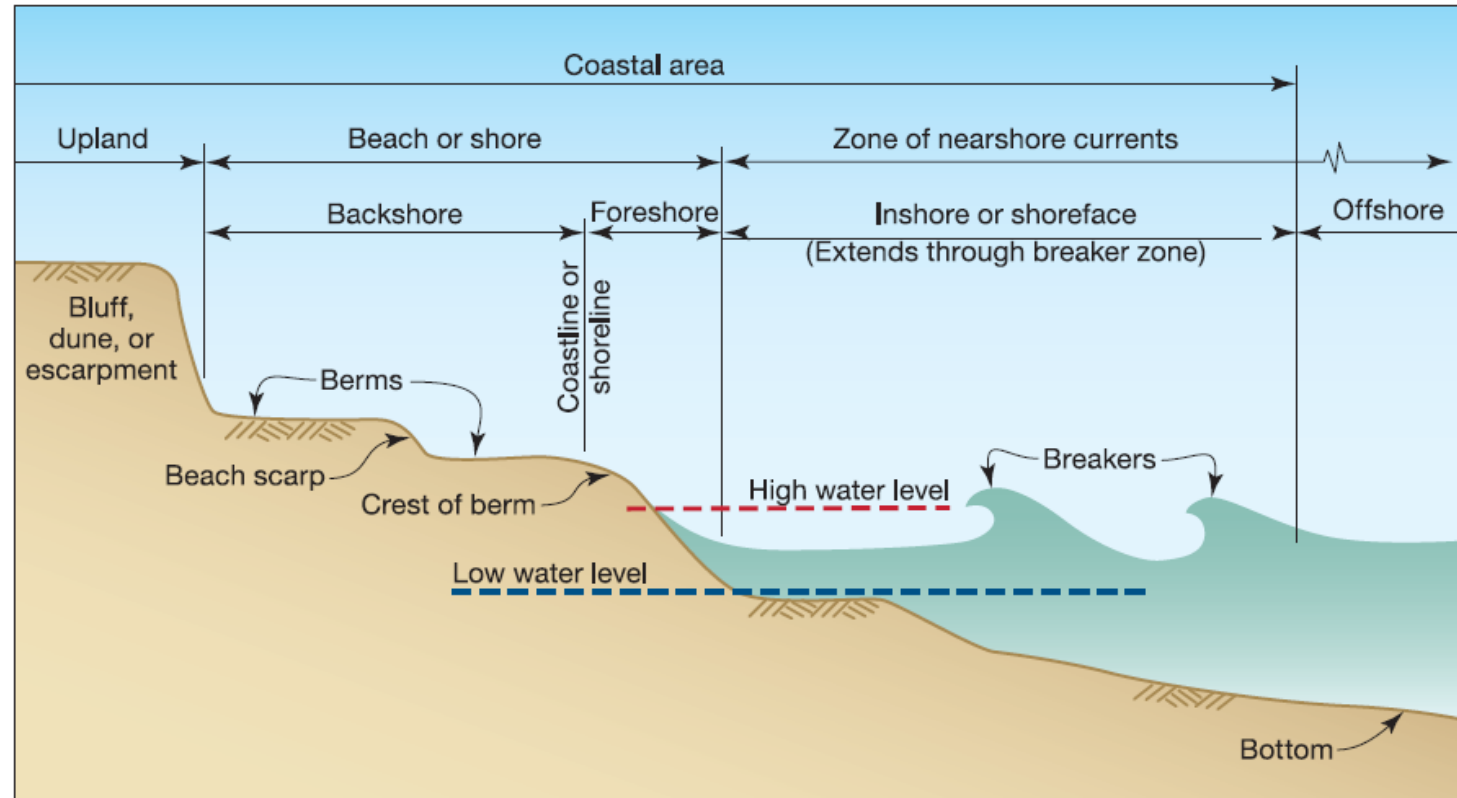
- A river floods when the discharge exceeds the capacity of the channel and it overflows its banks into areas that are “normally” dry.
- A pond or small lake floods when the water level rises above the ordinary high water mark and overflows onto normally dry land areas.
- In both cases, the primary hazards to property (i.e. buildings and their contents) usually are the hydrostatic and buoyant forces from the rising water, and the fact that stuff gets wet.



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# Coastal flooding:

- Tides (or fluctuating water levels)
- Currents
- Waves
- Wind



Coasts flood when storm surge (rising water) combines with wave effects (runup, overtopping, and/or overland wave propagation) to inundate normally dry land areas.



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# Coastal flooding in the Great Lakes

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- Tidal variation in Great Lakes is negligible
- Water levels do vary over long periods (years and decades) and seasonally (month to month)
- Storm events, varying atmospheric pressure, and wind-driven wave setup can produce storm surge over short periods (hours)
- Presence of ice cover may reduce the effects of storm events on water levels
- Great Lakes studies account for all of these probabilities

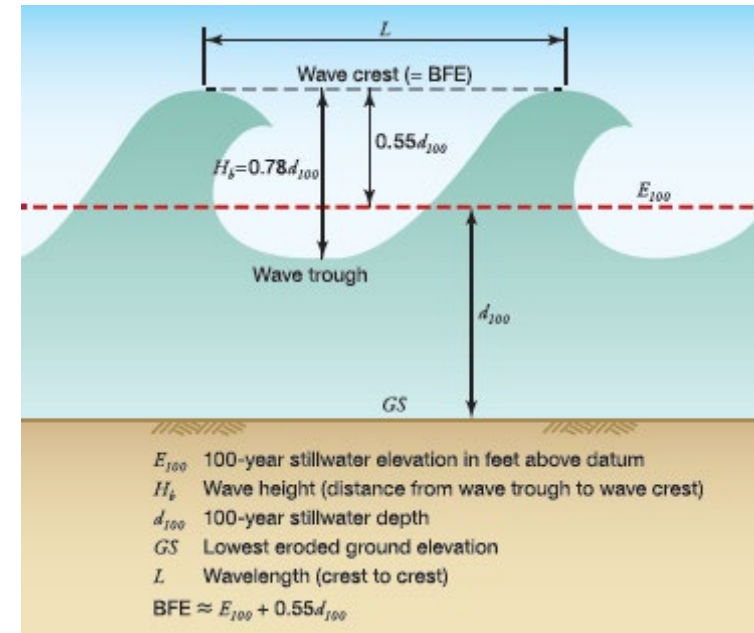
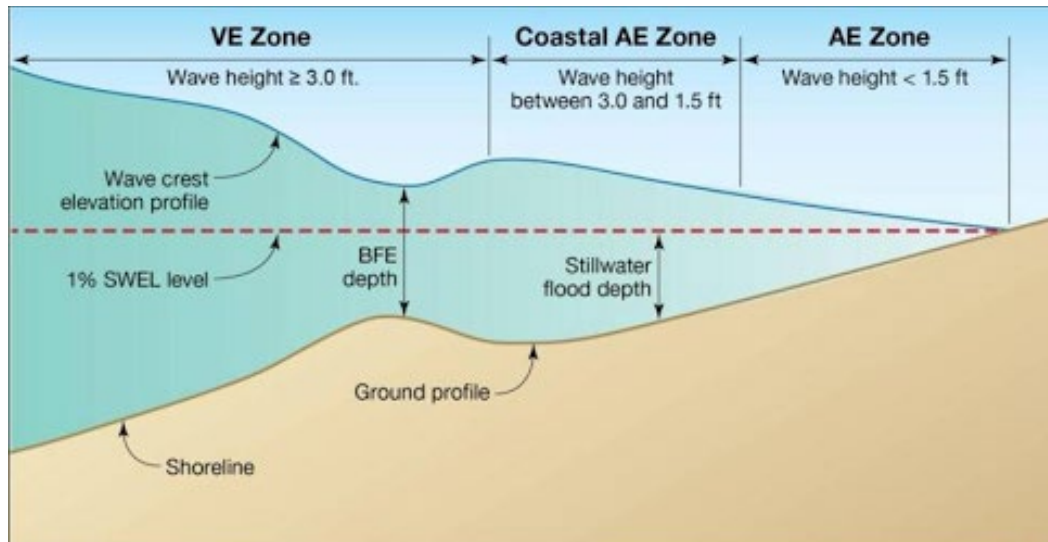


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# Wave heights and overland wave propagation:

- Analysis uses Wave Height Analysis for Flood Insurance Studies (“WHAFIS”)

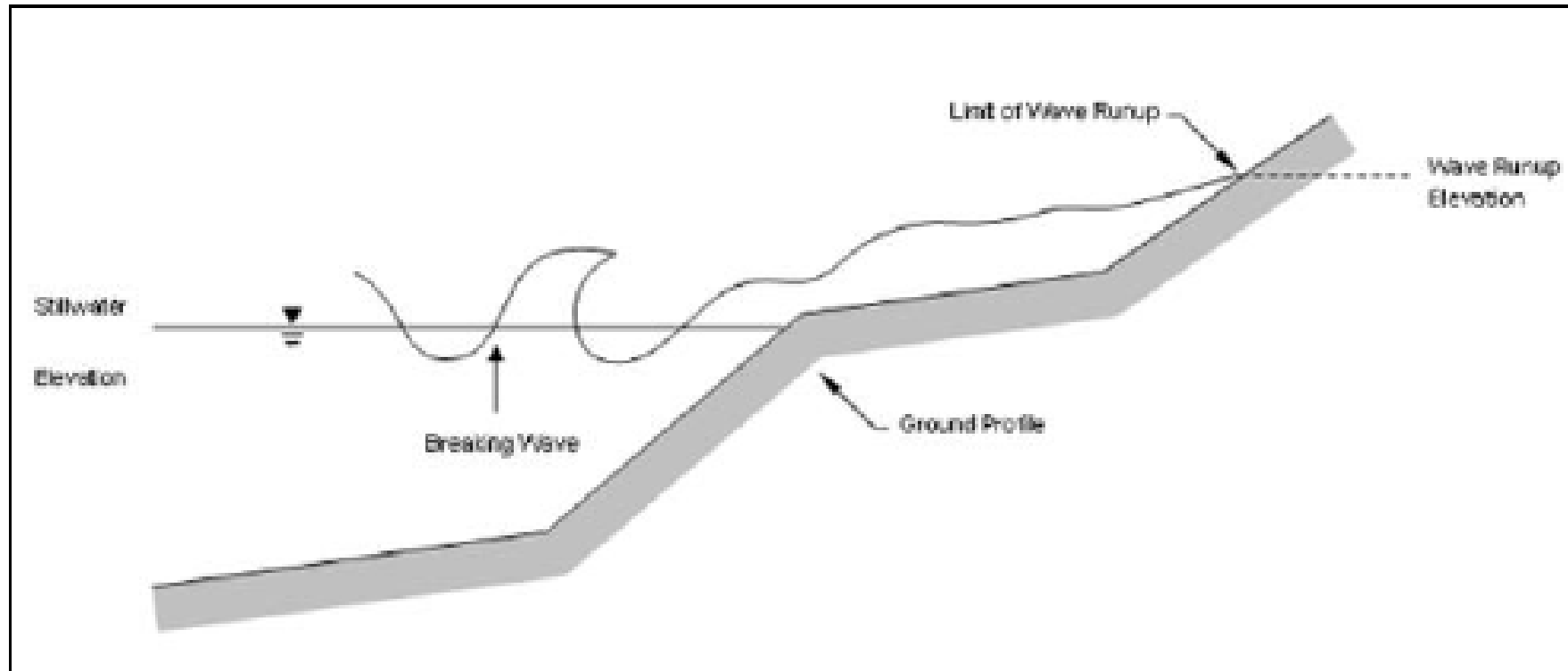


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# Wave runup:

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# Wave runup/overtopping:

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January 11, 2020



Rogers Park, Chicago on a mildly windy day



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# What does this look like on a map?



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# Things to remember about coastal maps:

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- A 1%-annual-chance flood event at one location does not necessarily result in a 1%-annual-chance flood event at another location.
- One storm event probably will not (and perhaps could not) result in a flood that inundates all the areas shown in the SFHA on the map.
- SFHAs do not necessarily represent areas that would be continuously inundated by water for a period of time. Think of moving water and waves that could damage buildings, not necessarily rising water that covers up the land continuously.
- FIS and FIRMs do NOT account for future projections of long-term erosion!
- Over time, the FIRM and the FIS may become outdated due to changes along the shore.



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# Additional forces acting on buildings in coastal areas

- *Hydrodynamic forces*
  - Velocity flow
  - Breaking waves
  - Wave uplift
- High winds
  - Lateral
  - Uplift
- Debris
  - Windborne
  - Waterborne
- Erosion and scour



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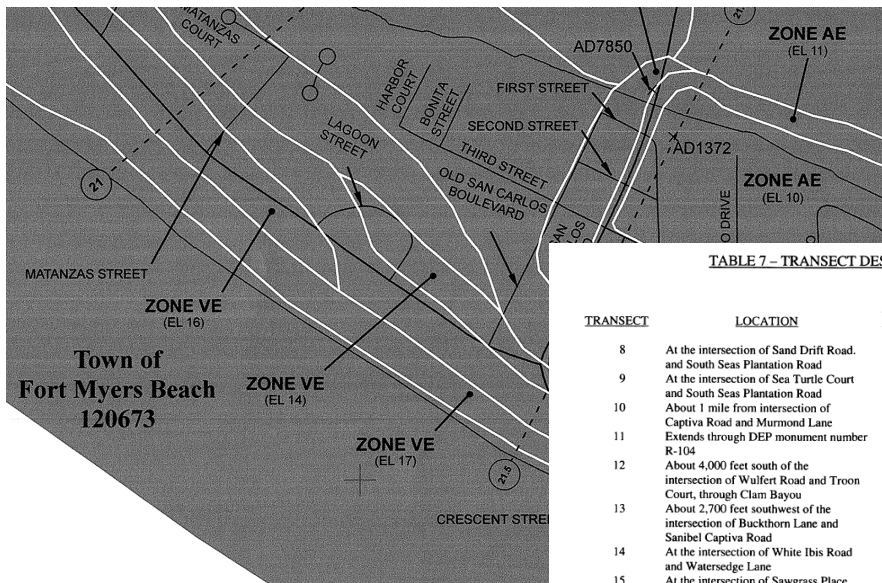


TABLE 5 - SUMMARY OF COASTAL STILLWATER ELEVATIONS - continued

FLOODING SOURCE AND LOCATION	ELEVATION (feet NAVD*)			
	10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
SAN CARLOS BAY				
Between Punta Rassa and Bunch Beach	5.2	10.0	11.5	14.0
Between Bunch Beach and Bodwitch Point	5.4	9.8	11.3	14.1
GULF OF MEXICO				
Along the Gulf of Mexico	4.9	9.7	11.3	14.3
Along the Gulf of Mexico	4.9	9.6	11.2	14.3
Along the Gulf of Mexico	4.1	9.8	11.7	14.8
Along the Gulf of Mexico	5.2	8.8	11.5	14.3
Along the Gulf of Mexico	4.8	8.9	11.3	13.2
Along the Gulf of Mexico	4.8	8.9	11.3	13.2
Along the Gulf of Mexico	4.8	8.9	9.9	N/A

TABLE 7 - TRANSECT DESCRIPTIONS - continued

TRANSECT	LOCATION	STILLWATER ELEVATION IN FEET (NAVD 88)		
		10-PERCENT	1-PERCENT	WAVE CREST <sup>1</sup>
8	At the intersection of Sand Drift Road and South Seas Plantation Road	4.52	10.52 <sup>2</sup>	16.17
9	At the intersection of Sea Turtle Court and South Seas Plantation Road	4.52	10.52 <sup>2</sup>	16.17
10	About 1 mile from intersection of Captiva Road and Murmond Lane	4.52	10.52 <sup>2</sup>	16.17
11	Extends through DEP monument number R-104	4.52	10.52 <sup>2</sup>	16.17
12	About 4,000 feet south of the intersection of Wulfert Road and Troon Court, through Clam Bayou	4.12	10.62 <sup>3</sup>	16.32
13	About 2,700 feet southwest of the intersection of Buckthorn Lane and Sanibel Captiva Road	4.12	9.82 <sup>3</sup>	15.10
14	At the intersection of White Ibis Road and Wateredge Lane	4.12	9.82 <sup>3</sup>	15.10
15	At the intersection of Sawgrass Place and West Gulf Drive	4.12	11.22 <sup>3</sup>	17.24
16	About 300 feet east from the intersection of Daniels Drive and West Gulf Drive	4.12	11.22 <sup>3</sup>	17.24
17	About 150 feet east from the intersection of Olde Middle Gulf Drive and Middle Gulf Drive	4.52	12.72 <sup>2</sup>	19.53
18	At the intersection of Sand Dollar Drive and Lindgren Boulevard	4.72	12.82 <sup>2</sup>	19.68
19	About 70 feet east from the intersection of Spoon Bill Court and East Gulf Drive	4.92	13.22 <sup>2</sup>	20.29
20	About 300 feet west of the end of Sanibel Island	4.92	13.22 <sup>2</sup>	20.29
21	At the intersection of Matanzas Street and Matanzas Court	4.92	12.82 <sup>3</sup>	19.68
21.5	100 ft east of the intersection of Estero Boulevard and Fishermans Wharf Drive	4.92	12.82 <sup>3</sup>	19.68

## II. Floodplain Management Using Coastal Data

### NFIP Coastal FIRM and FIS Data



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# Coastal BFE: Where's the Base Flood Elevation?

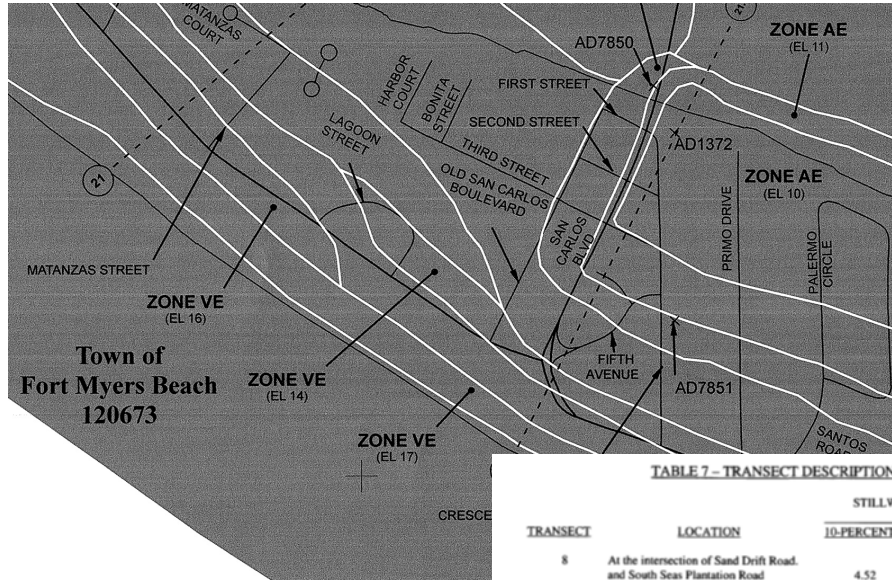


TABLE 5 - SUMMARY OF COASTAL STILL WATER ELEVATIONS - continued

FLOODING SOURCE AND LOCATION	ELEVATION (feet NAVD <sup>83</sup> )			
	10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT
<b>SAN CARLOS BAY</b>				
Between Punta Rassa and Bunch Beach	5.2	10.0	11.5	14.0
Between Bunch Beach and Bodwitch Point	5.4	9.8	11.3	14.1
<b>GULF OF MEXICO</b>				
Between Bodwitch Point and Cottage Avenue on Estero Island	4.9	9.7	11.3	14.3
Between Cottage Avenue on Estero Island and Big Carlos Pass	4.9	9.6	11.2	14.3
Between Big Carlos Pass and New Pass	4			
Between New Pass and Big Hickory Pass	4			
Between Big Hickory Pass and county boundary	4			
About 1 mile northwest of the intersection of Bonita Beach Road and Hickory Boulevard along the shoreline	4			
About 2,400 feet northwest of the intersection of Bonita Beach Road and Hickory Boulevard along the shoreline	4			
About 1,950 feet southeast of the intersection of Bonita Beach Road and Hickory Boulevard along the shoreline	4			

TABLE 8 - TRANSECT DATA - continued

FLOODING SOURCE	TRANSECT	STILL WATER ELEVATION (feet NAVD <sup>83</sup> )				ZONE	BASE FLOOD ELEVATION (feet NAVD <sup>83</sup> )
		10-PERCENT	2-PERCENT	1-PERCENT	0.2-PERCENT		
Gulf of Mexico	17	4.5	N/A	12.8 <sup>2</sup>	N/A	VE	14-20
						AE	11-14
Pine Island Sound		3.1	N/A	6.5	N/A	VE	9-11
						AE	7-9
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Gulf of Mexico	18	4.7	N/A	13.2 <sup>2</sup>	N/A	VE	15-20
						AE	12-15
Pine Island Sound		3.1	N/A	6.5	N/A	VE	10-11
						AE	8-10
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Gulf of Mexico	19	4.9	N/A	13.2 <sup>2</sup>	N/A	VE	15-20
						AE	12-15
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Gulf of Mexico	20	4.9	N/A	13.2 <sup>2</sup>	N/A	VE	15-20
						AE	12-15
Matlacha Pass		3.5	N/A	7.3	9.3	VE	9-11
						AE	7-9
Gulf of Mexico	21	4.9	9.7	12.8 <sup>2</sup>	14.3	VE	14-20
						AE	13-14
Estero Bay		2.5	N/A	9.4	13.2	VE	10-13
						AE	9-10
Gulf of Mexico	21.5	4.9	9.7	12.8 <sup>2</sup>	14.3	VE	13-20
						AE	10-13
Estero Bay		2.5	N/A	9.4	13.2	AE	10-11

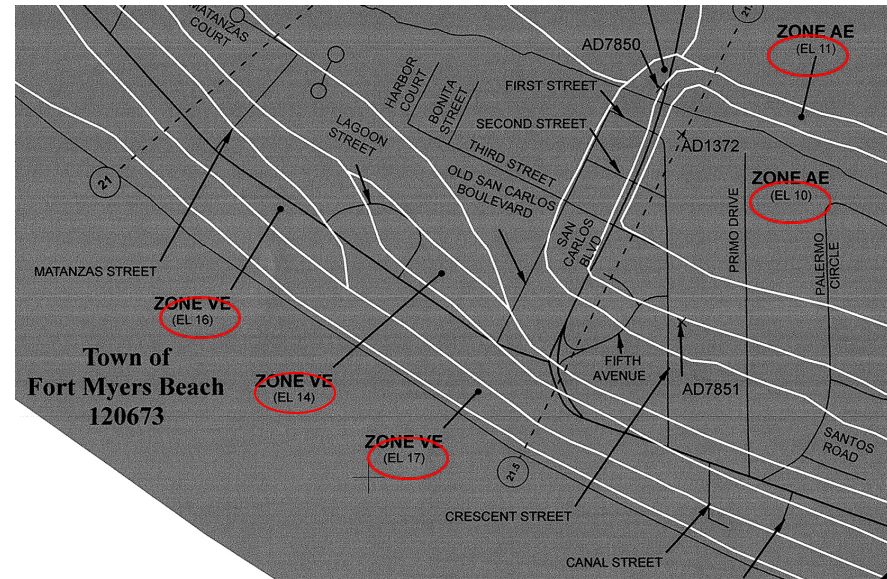
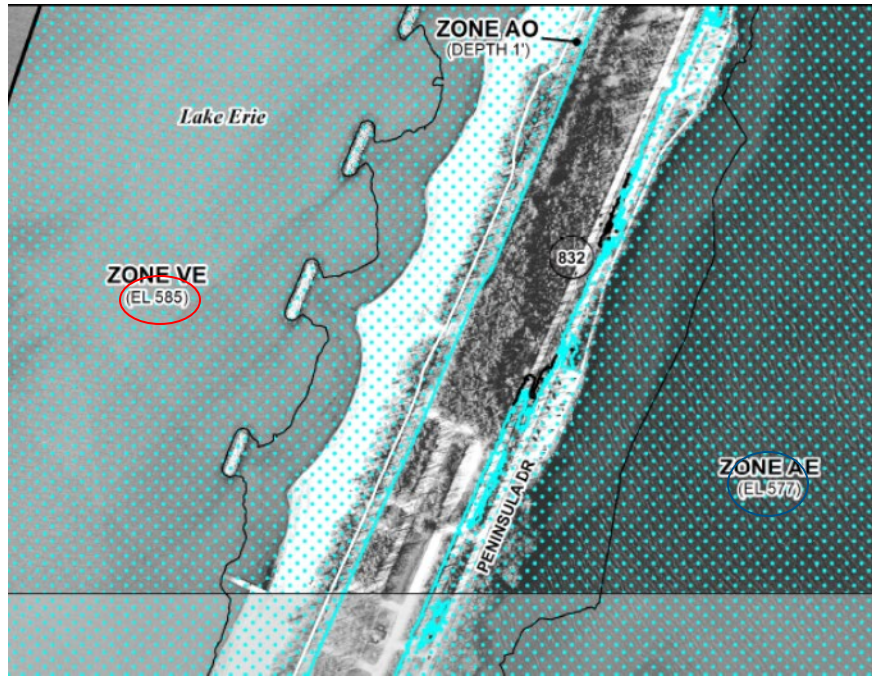
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# The BFE is the number ON THE MAP for the area bounded by the gutter lines



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# What if the site crosses over the gutter lines?

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And therefore has multiple BFEs?

Or multiple flood zones (VE, AE, AO...)?

- Always use the more hazardous zone for the area encompassed by the development.
- Always use the highest BFE for the area encompassed by the development.
- If the development is a building, the whole building needs to meet the requirements for the most hazardous zone and highest BFE that applies to any part of the building.



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# The BFE labeled on the map may be rounded to the nearest whole number, in a limited situations

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- Whole-number BFEs on coastal FIRMs are rounded, just like the wavy-line BFEs in riverine areas. (100.4 becomes 100, 100.5 becomes 101)
- Check the FIS table to ensure that the 1% annual chance still water elevation for the lake is not higher than the whole-number BFE on the map. Use the higher of the two elevations.
  - In the Great Lakes this would be unusual but possible: in some areas, near or at the landward boundary of the SFHA



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## Floodway meets coastal flooding:

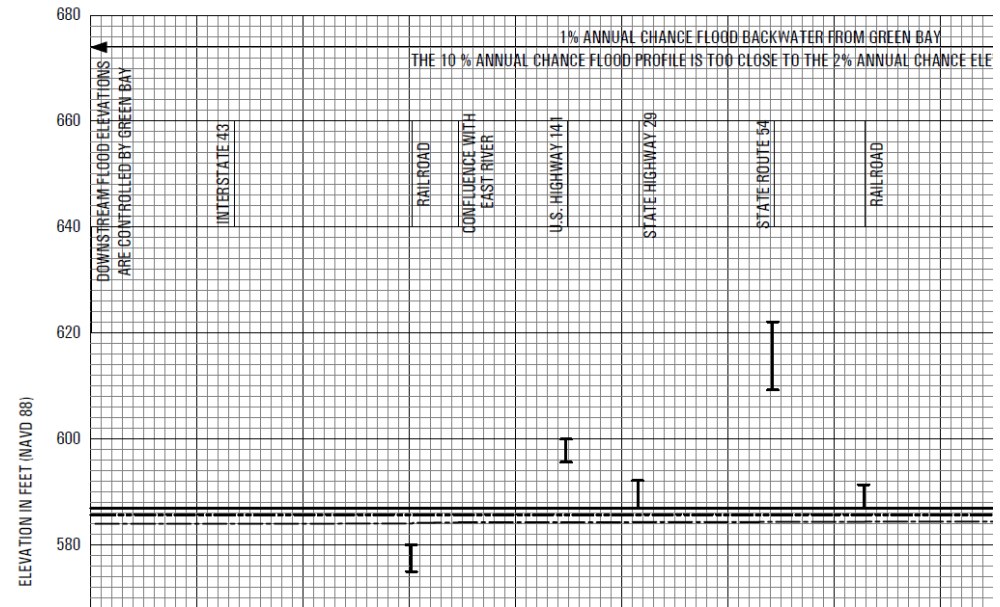
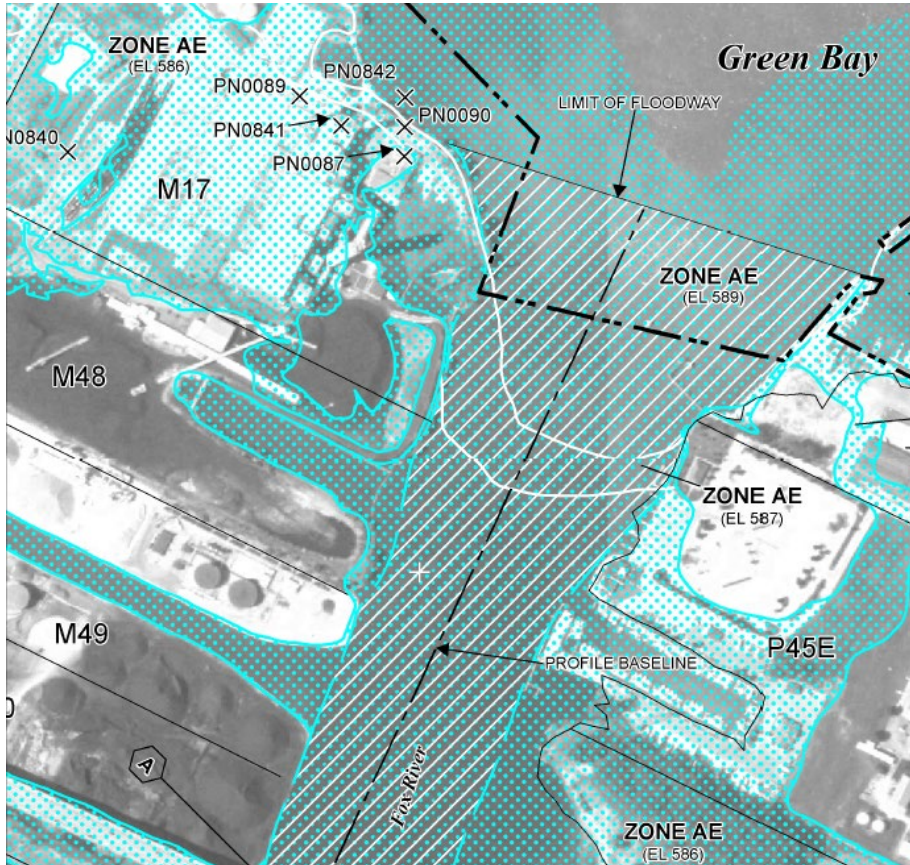
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- At river mouths, the terminus of the floodway is labeled.
- The floodway near a river mouth may extend for administrative purposes into areas where the 1% flood is a coastal (or lacustrine) event.
- The “no rise” requirement is in relation to the river’s “without floodway” profile, not the regulatory BFE!
- When in doubt, read the FIS text, look at the Floodway Data Table, and the profiles!



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# Floodway and river mouth:



Fox River Profile, Brown County, WI

Green Bay, Brown County, WI (8/18/2009)



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# Regulatory BFE is higher than “with floodway” profile

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER-SURFACE ELEVATION (FEET NAVD)			
CROSS SECTION	DISTANCE <sup>1</sup>	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
Fox River								
A	3,076	604	15,597	2.2	585.7	584.1 <sup>2</sup>	584.1 <sup>2</sup>	0.0
B	6,119	515	14,870	2.3	585.7	584.2 <sup>2</sup>	584.2 <sup>2</sup>	0.0
C	9,196	699	17,355	1.8	585.7	584.7 <sup>2</sup>	584.7 <sup>2</sup>	0.0
D	10,658	614	16,216	1.9	585.7	584.7 <sup>2</sup>	584.7 <sup>2</sup>	0.0
E	13,207	540	15,369	2.0	585.7	584.8 <sup>2</sup>	584.8 <sup>2</sup>	0.0
F	14,982	615	17,770	1.7	585.7	584.9 <sup>2</sup>	584.9 <sup>2</sup>	0.0
G	18,584	1,067	29,370	1.1	585.7	585.0 <sup>2</sup>	585.0 <sup>2</sup>	0.0
H	22,084	1,413	22,815	1.5	585.7	585.0 <sup>2</sup>	585.0 <sup>2</sup>	0.0
I	26,962	2,483	30,720	1.0	585.7	585.1 <sup>2</sup>	585.1 <sup>2</sup>	0.0
J	40,215	1,042	9,264	3.2	585.7	585.3 <sup>2</sup>	585.3 <sup>2</sup>	0.0
K	40,497	983	21,852	1.4	589.3	589.3	589.3	0.0
L	53,939	1,032	11,248	2.7	589.9	589.9	589.9	0.0
M	66,171	1,820	14,712	2.0	590.7	590.6	590.7	0.0
N	71,996	537	6,388	4.7	591.5	591.5	591.5	0.0
O	72,693	565	8,266	3.6	598.5	598.5	598.5	0.0
P	78,931	530	7,363	4.0	599.2	599.2	599.2	0.0
Q	86,403	478	6,833	4.1	600.4	600.4	600.4	0.0
R	94,903	454	5,682	5.0	601.4	601.4	601.5	0.1
S	103,310	535	7,444	3.8	602.7	602.5	602.7	0.2

<sup>1</sup>Feet above mouth  
<sup>2</sup>Elevations computed without consideration of backwater effects from Green Bay

<b>TABLE 7</b>	<b>FEDERAL EMERGENCY MANAGEMENT AGENCY</b>	<b>FLOODWAY DATA</b>
	<b>BROWN COUNTY, WI AND INCORPORATED AREAS</b>	
		<b>FOX RIVER</b>



# Designing and building a compliant building in a coastal high-hazard area

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- Coastal high-hazard means Zone VE
- Not a simple matter of “raising it up high enough.”
- A qualified design professional will need to be involved.
- Relies on data from the FIRM and FIS, and on that design professional’s calculations and judgments.
- Much guidance on this topic is in FEMA’s Coastal Construction Manual (FEMA 55), and companion publications. See also ASCE 24-14 and ASCE 7-22.



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## LiMWA/MoWA areas

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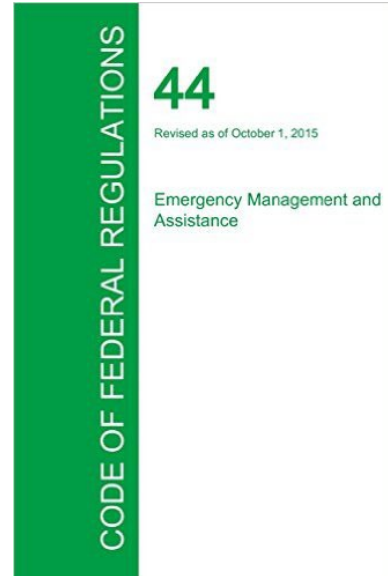
- In some coastal AE zones, wave heights may be more than 1.5 feet, but less than the 3 feet that would make them VE zones.
- The boundary showing where the wave heights drop to less than 1.5 feet is called a Limit of Moderate Wave Action (LiMWA). This indicates the area between the LiMWA and VE zone gutter line is a MoWA area (waves between 1.5 and 3 feet).
  - MoWA is often (confusingly) called “coastal A zone” (in ASCE 24, and I-codes, for example)



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## III. Floodplain Management Standards in Coastal Zones

Minimum NFIP Provisions, Building Codes, and Consensus Engineering Standards

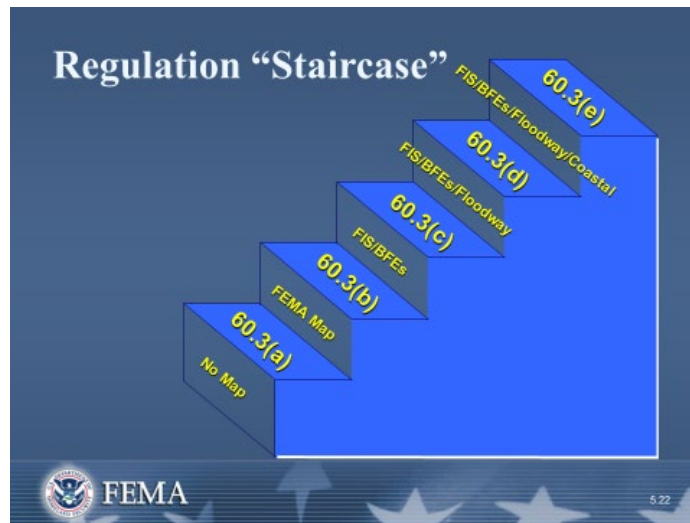


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# NFIP Floodplain Management Standards for Coastal High Hazard Areas

- 44 CFR §60.3(e):

“When the Federal Insurance Administrator [...] has identified on the community’s FIRM coastal high hazard areas by designating Zones V1-30, VE, and/or V, the community shall: [...]”



Remember the staircase from E273?



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## Before we get to §60.3(e)

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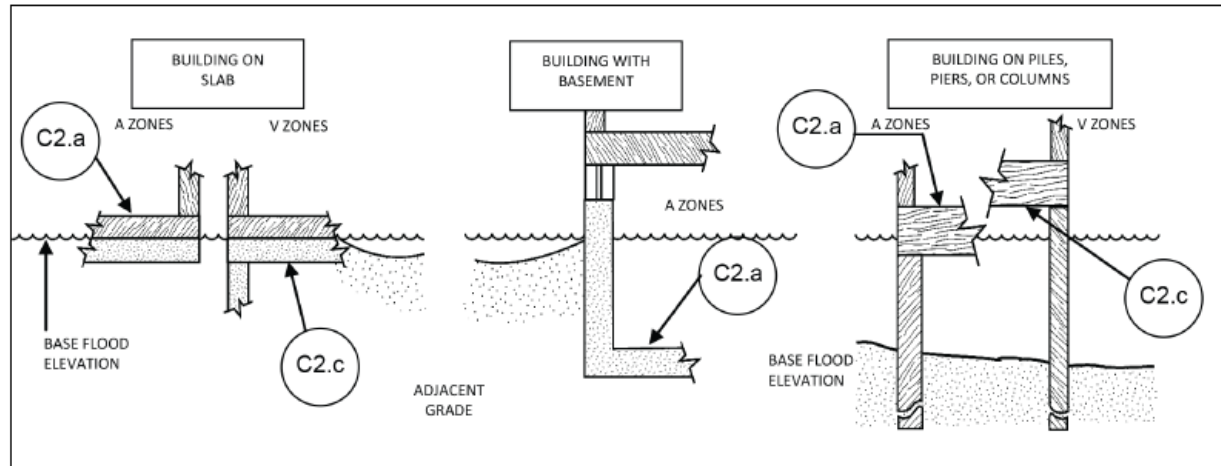
- Section 60.3(a)(2): assure that all necessary permits have been received from government agencies whose approval is required by federal or state law
  - “404” permits from US Army Corps of Engineers or EPA
  - Sections 9 and 10 of the Rivers and Harbors Act of 1899
  - Endangered Species Act (comply with Section 9, get Section 10 incidental take permit if required)
    - For federal actions, comply with Section 7 including the requirement to consult with the Services
  - State permits may be required from a variety of agencies, depending on the state. “Enforceable policies” are described in the state’s coastal zone management program documents, developed with encouragement and funding from NOAA’s Coastal Zone Management office under the federal Coastal Zone Management Act.



# 60.3(e)(2)

Within Zones V1-30, VE, and V on the FIRM:

“Obtain the elevation [in relation to the FIRM datum] of the bottom of the lowest structural member of the lowest floor (excluding pilings and columns) of all new and substantially improved structures, and whether or not such structures contain a basement, and maintain a record of all such information[...].”



Line C2.c on the Elevation Certificate

IBC 110.3.3; 110.3.10.1; 104.7; 1612.5(2.1); R104.7; R109.1.3; R109.1.6.1; R322.1.10



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# Where's the bottom of the lowest horizontal structural member?



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# 60.3(e)(3)

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- “Provide that all new construction within Zone[...] VE [...] on the community’s FIRM is located landward of the reach of mean high tide”
- In the Great Lakes, the line of mean high tide is analogous in many ways to the Ordinary High Water Mark.\*
- The purpose is to prevent new buildings from being built in extraordinarily exposed positions directly over water in locations where damaging wave impacts are anticipated.
  - \*However, adopting a regulation to require new construction to be landward of a specific location is not currently required in Great Lakes VE zones.

1612.4 (through reference to ASCE 24-14, 4.3(1)); G401.2; R322.3.1(1)



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# 60.3(e)(4)(i)

- “Provide that all new construction and substantial improvements in Zone[...] VE [...] on the community’s FIRM are elevated on pilings and columns so that (i) the bottom of the lowest horizontal structural member of the lowest floor (excluding the pilings or columns) is elevated to or above the base flood level[...].”



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# 60.3(e)(4)(ii)

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- “[...] and (ii) the pile or column foundation and structure attached thereto is anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads acting simultaneously on all building components. Water loading values shall be those associated with the base flood. Wind loading values shall be those required by applicable State or local building standards.” (emphasis added)

104.2.1; 1612.1; 1612.4 (through reference to ASCE 24); R322.3; R322.3.2; R322.3.3



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# 60.3(e)(4)

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“A registered professional engineer shall develop or review the structural design, specifications and plans for the construction, and shall certify that the design and methods of construction to be used are in accordance with accepted standards of practice for meeting the provisions of paragraphs (e)(4)(i) and (ii) of this section.”

“accepted standards of practice”:

*ASCE/SEI 7-22 Minimum Design Loads for Buildings and Other Structures*

*ASCE/SEI 24-14 Flood Resistant Design and Construction*



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1612.5(2.2); R322.3.3; R322.3.6

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## 60.3(e)(5)

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“Provide that all new construction and substantial improvements within Zone[...] VE [...] on the community’s FIRM have the space below the lowest floor either free of obstruction or constructed with non-supporting breakaway walls, open wood lattice-work, or insect screening intended to collapse under wind and water loads without causing collapse, displacement, or other structural damage to the elevated portion of the building or supporting foundation system.”



Wood lattice-work:



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## “Breakaway” walls (60.3(e)(5))

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“[...]a design safe loading resistance of not less than 10 and no more than 20 pounds per square foot.”

“Use of breakaway walls which exceed a design safe loading resistance of 20 pounds per square foot (either by design or when so required by local or State codes) may be permitted only if a registered professional engineer or architect certifies that the designs proposed meet the following conditions:

- (i) Breakaway wall collapse shall result from a water load less than that which would occur during the base flood; and
- (ii) The elevated portion of the building and supporting foundation system shall not be subject to collapse, displacement or other structural damage due to the effects of wind and water loads acting simultaneously on all building components (structural and non-structural).”



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1403.6; 1612.4 (through reference to ASCE 24; 1612.5(2.3); 1804.4(3); G501.5;  
R322.3.2; R322.3.4; R322.3.5

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# Breakaway wall enclosures

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“Such enclosed space shall be useable solely for parking of vehicles, building access, or storage.”

Communities must be diligent in ongoing enforcement. Built in compliance needs to remain in compliance afterward.



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## 60.3(e)(6)

“Prohibit the use of fill for structural support of buildings within Zones V1-30, VE, and V on the community’s FIRM.” (emphasis added)



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1612.4(through reference to ASCE 24; G401.2; R322.3.2(3))

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# No fill for structural support?

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How am I going to get my LOMR-F so I can get out of paying for flood insurance?!

NO LOMR-F in Zone VE.

NO BASEMENT in Zone VE.

What about Zone AE, right on the other side of the gutter line? Not a good idea.



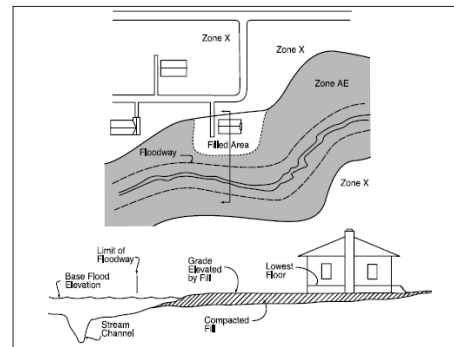
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# Technical Bulletin 10-01 and coastal areas



Ensuring That Structures Built on Fill In or Near Special Flood Hazard Areas Are Reasonably Safe From Flooding  
in accordance with the  
National Flood Insurance Program



FEDERAL EMERGENCY MANAGEMENT AGENCY  
MITIGATION DIRECTORATE

FIA-TB-10  
(5/01)

ASCE/SEI 7 requires all flood loads, including wave loads, to be included in design, even in A zones.

Fill and below-BFE basement floor will not meet the assumptions for the “simplified” approach in TB 10-01.

TB 10-01 says “this bulletin strongly recommends that structural fill not be used to elevate buildings constructed in A zones in coastal areas.”



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## 60.3(e)(7)

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“Prohibit man-made alteration of sand dunes and mangrove stands within Zone[...] VE [...] on the community’s FIRM which would increase potential flood damage.”

Mangroves (*Avicennia nitida*, *Rhizophora mangle*, *Languncularia racemosa*, and *Conocarpus erecta*) do not grow naturally in the Great Lakes.

Sand dunes are present in some parts of the Great Lakes, however, and if altering them would increase the potential for flood damage, man-made alterations must be prohibited.

“Coastal high hazard area” : ...from offshore to the inland limit of the primary frontal dune on an open coast...”

*Primary frontal dune* is a defined term.

1612.4(through reference to ASCE 24); G103.7; R322.3.1(2)



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# September 10, 2021 Cook County FIRM effective date



The red squiggly line is the inland limit of a Primary Frontal Dune that the landowner destroyed in pursuit of a \$270 million athletics center, which was mapped into zone VE shortly after its completion.



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# ASCE/SEI 24-14 “Flood Resistant Design and Construction”

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- Sec. 60.3(e): “accepted standards of practice”
- ASCE 24 is a consensus standard developed by engineering professionals
- Relied upon by International Code Council for International Building Code and International Residential Code

*Chapter 5 of ASCE 7 (referenced in ASCE 24) contains direction on calculation and application of flood loads for structural design purposes.*



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## A note on “substantial damage” and “substantial improvement”:

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- Any building in an SFHA, pre-FIRM or post-FIRM, that is substantially damaged, or proposed to be substantially improved, should be reviewed for compliance with all of the applicable standards of Part 60 for permitting.
- This means that even if the building’s lowest floor or lowest horizontal structural member is “high enough,” the building must meet ALL of the 60.3(e) standards that apply when it is substantially improved (including repair following substantial damage) after it is shown in zone VE.
  - Open, vertical foundation, designed/reviewed and certified by engineer or architect to withstand wind and water loads acting simultaneously on the foundation and structure attached thereto...
  - Could be an issue for pre- or post-FIRM buildings that were built to AE zone standards, or before the imposition of floodplain regulations.



## Residual risk ≠ No risk

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- Site is shown outside SFHA.
- Pre- and post-construction grade is below BFE.
  - Is there truly \*no\* risk of flooding during the base flood?
- How clearly is the site outside the SFHA? Is there no chance that a Flood Hazard Determination Vendor is going to call the building “in” the SFHA?
- If you apply for a LOMA or LOMR-F and the lowest adjacent grade is below BFE, the result is a non-removal.



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c. 1994



c. 2010



c. 2013

## What makes a successful development project?

What does it take for a building in a coastal area to be a success after a disaster?

# After the event:

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- Building's foundation should be intact.
- Building envelope (floor, walls, openings, roof) should remain sound and minimize penetration by wind, rain, and debris.
- Utility connections should be intact or be easily restored.
- Floodwater should not have entered the building.
- The building should be accessible and useable after an event it was designed to withstand.

How long are you hoping the building/development will last? 30 years? 50 years? “Forever”? What may happen during that time?



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# Coastal areas challenge conventional assumptions:

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- There is not necessarily a viable engineering solution to every site-related factor.
- Wise subdivision practices, and wise siting decisions, can minimize the cost of building design and construction to resist anticipated coastal hazards.
- Following *\*only\** the NFIP-minimum floodplain management regulations could allow design practices that could result in reduced coverage or very costly flood insurance premiums.
- Insurance provides you with an indemnity (financial compensation) and does not stop the damage from happening.
- Plan for the future events, not the past events:

[http://www.geol.ucsb.edu/faculty/sylvester/UCSB\\_Beaches/IVCLIFFS/pillarhus.html](http://www.geol.ucsb.edu/faculty/sylvester/UCSB_Beaches/IVCLIFFS/pillarhus.html)



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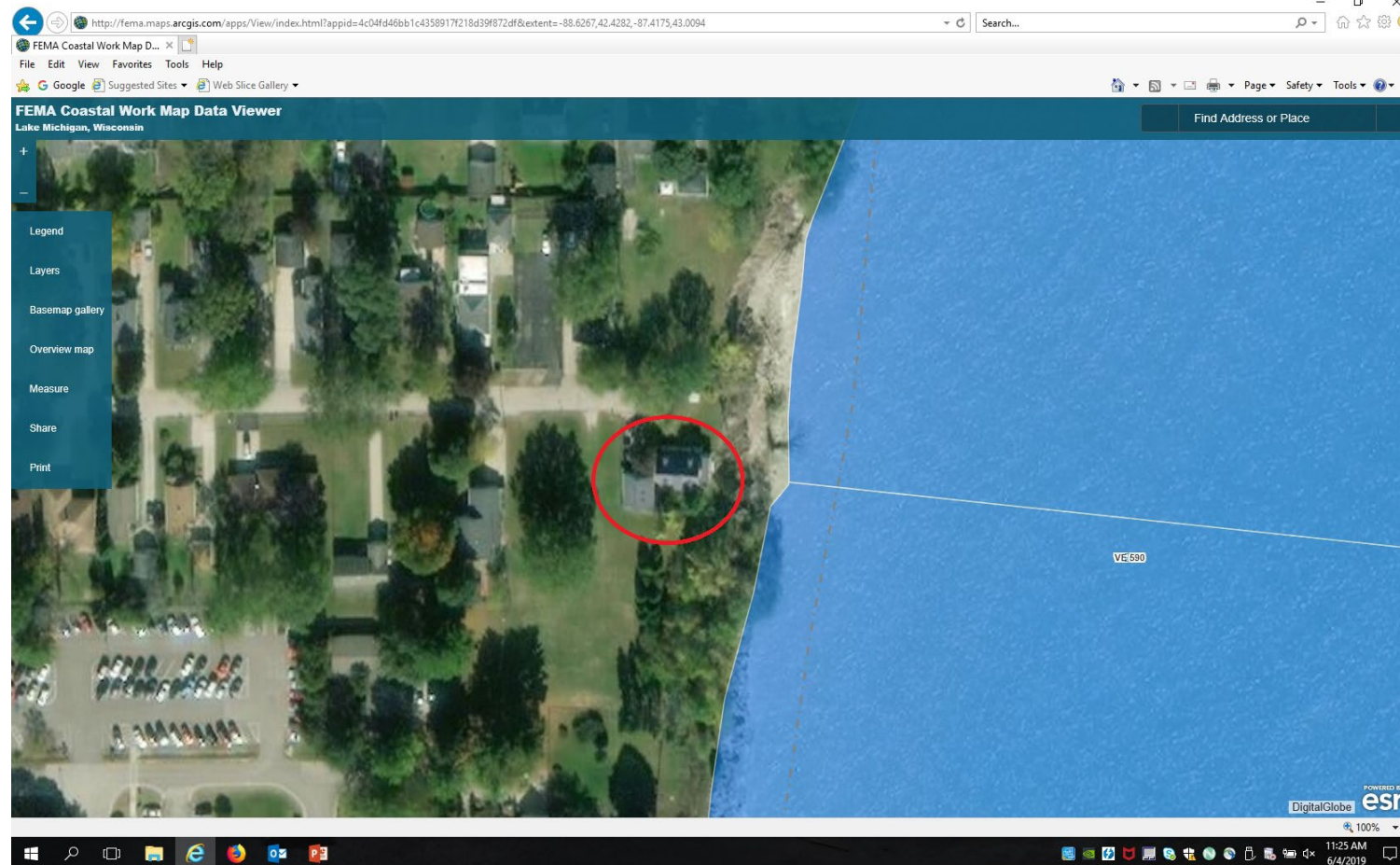
# FEMA–55 “Coastal Construction Manual” - Chapter 3

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- Chapter 3 is entitled “Identifying Hazards”
- Section 3.7 focuses on flood hazard assessments for design purposes
- Section 3.7 is broken into two subsections.
- One discusses how to determine whether the current FIRM and FIS accurately depict current potential flood hazards.
- The other discusses how a design professional could (or SHOULD) update or revise to consider more hazardous conditions that have developed since the analysis that produced the FIRM and FIS.



This site was shown in unshaded zone X (not zone VE) on the Kenosha County workmap released in 2017



FEMA

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2002 aerial photo



2015 aerial photo



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2017 aerial photo



2018 aerial photo

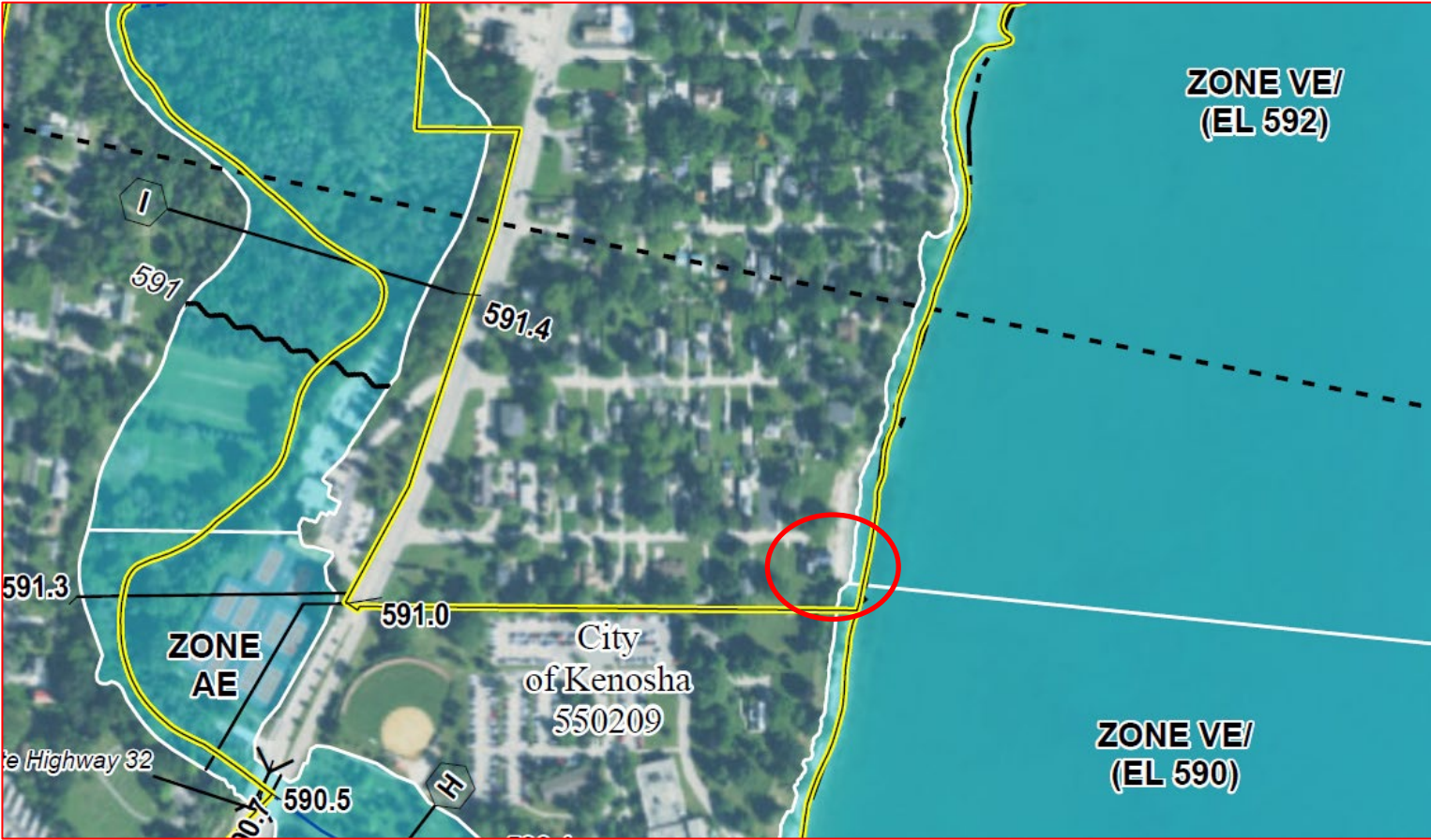


2019



2020 aerial photo

# Kenosha County coastal PMR preliminary release, March 28, 2022



“Unshaded” zone X = “Areas of minimal flood hazard”



FEMA





## IV. A few words about insurance: NFIP Risk Rating 2.0 and Great Lakes Coastal areas

### **FEMA Updates Its Flood Insurance Rating Methodology to Deliver More Equitable Pricing**

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Release Date: April 1, 2021

**WASHINGTON**— FEMA is updating the National Flood Insurance Program’s pricing methodology to communicate flood risk more clearly, so policyholders can make more informed decisions on the purchase of adequate insurance and on mitigation actions to protect against the perils of flooding.

The 21st century rating system, Risk Rating 2.0—Equity in Action, provides actuarially sound rates that are equitable and easy to understand. It transforms a pricing methodology that has not been updated in 50 years by leveraging improved technology and FEMA’s enhanced understanding of flood risk.



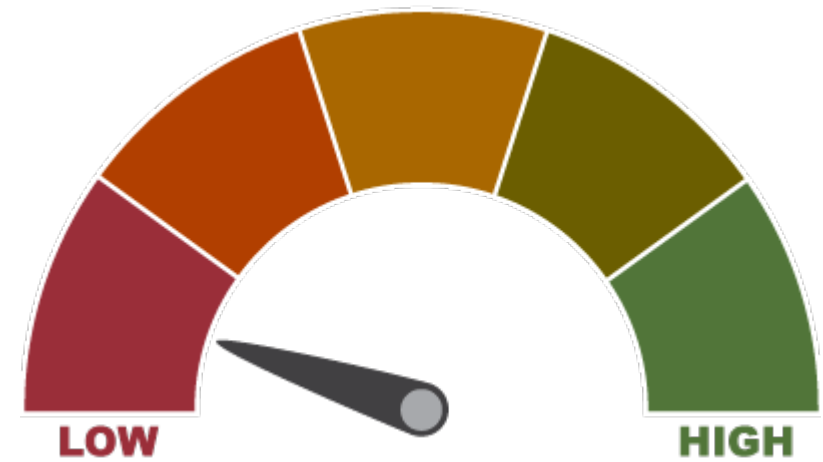
**FEMA**



# Overview of Flood Insurance Rating Factors (Risk Rating 2.0)

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- Geographic Location
- Structural Variables
- Claims History
- Discounts
  - Mitigation
  - Statutory
  - CRS



# Mitigation Discounts

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- Flood Openings (in enclosures/crawlspaces)
- Elevation of Machinery & Equipment (M&E)



## Requirements for Flood Openings in Foundation Walls and Walls of Enclosures

Below Elevated Buildings in Special Flood Hazard Areas  
In Accordance with the National Flood Insurance Program

NFIP Technical Bulletin 1 / March 2020



# SFIP coverage and erosion

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- The NFIP Standard Flood Insurance Policy covers “direct physical damage by or from flood to your insured property”
- Specifically excluded:
  - Loss of land
  - Earth movement, even when flood directly causes the earth movement, unless there is evidence of sudden erosion or undermining from a specific type of flood causing the earth to move
    - Specific examples of “excluded” earth movement include land subsidence, sinkholes, or “gradual erosion”



**FEMA**



## SFIP “erosion” coverage... yes or no?

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- “Gradual erosion“ is excluded...but:

“flood” specifically includes “collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined [...] above [(a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (one of which is your property) from [...] overflow of inland or tidal waters”)]

Direct physical damage by or from flood, to your insured property:

Insured property is a building and/or personal property inside a building. Not land, land value, or the right to develop land.



## Summary:

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- Development in VE zones is hazardous.
- In the Great Lakes development in VE zones is usually avoidable. Staying out of the SFHA, or \*at least\* getting to Zone AO, AH, or AE, is possible on almost every site.
- When pursued, more stringent development regulations apply to buildings and other forms of development in Zone VE.
- Flood insurance rates near a Great Lake's coast will be higher (all other factors being equal) than for areas away from the coast.
- NFIP flood insurance is not a panacea for erosion problems.



**FEMA**

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## Resources:

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FEMA – 55 Coastal Construction Manual Vols. 1 and 2:

[https://www.fema.gov/sites/default/files/2020-08/fema55\\_voli\\_combined.pdf](https://www.fema.gov/sites/default/files/2020-08/fema55_voli_combined.pdf)

[https://www.fema.gov/sites/default/files/2020-08/fema55\\_volii\\_combined\\_rev.pdf](https://www.fema.gov/sites/default/files/2020-08/fema55_volii_combined_rev.pdf)

FEMA Building Science Technical Bulletins (see especially TB 5 Free of Obstruction and TB 9 Breakaway Walls):

<https://www.fema.gov/emergency-managers/risk-management/building-science/national-flood-insurance-technical-bulletins>

FEMA P-499 Home Builder’s Guide to Coastal Construction:

[https://www.fema.gov/sites/default/files/2020-08/fema499\\_2010\\_edition.pdf](https://www.fema.gov/sites/default/files/2020-08/fema499_2010_edition.pdf)



## More resources:

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FEMA P-762 Local Officials Guide to Coastal Construction:

[https://www.fema.gov/sites/default/files/documents/fema\\_p-762-local-officials-guide-coastal-construction.pdf](https://www.fema.gov/sites/default/files/documents/fema_p-762-local-officials-guide-coastal-construction.pdf)

Substantial Improvement/Substantial Damage Desk Reference:

[https://www.fema.gov/sites/default/files/documents/fema\\_nfip\\_substantial-improvement-substantial-damage-desk-reference.pdf](https://www.fema.gov/sites/default/files/documents/fema_nfip_substantial-improvement-substantial-damage-desk-reference.pdf)



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# Vertical Datum and Height

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- Except in AO and some unnumbered A zones, NFIP floodplain management is concerned with elevation in terms of height above a vertical datum.
- The datum used to regulate floodplain development, and to report as-built conditions, should be the same as the datum used on the FIRM and in the FIS.
- “We’ve always used IGLD 85 on the lakes! Why do we have to change to NAVD 88?”
- The short answer is “because we are concerned with building construction and land development.”
  - The long answer would take an entire presentation to explain fully.



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