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the Environment

Maryland Coast Smart-CRAB
Climate Ready Action Boundary And
Riverine Advisory Product
(In Development)

MASFM / Lunch and Learn

June 2021

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State CTP Mapping Coordinator

Maryland Department of the Environment

Agenda –

- **First 5 minutes – Cover What, Why, Where of Coast Smart Criteria Source Presented at MASFM Spring Conf. (So, take a Break if you already know this)**
- **Show Additional Steps Currently Under Development for Riverine 100-year + 3 feet**
- Explain the **new profile tool for visualizing data for floodplain management** / And discuss the different elevation data sets used
- **Wrap Up with Questions and Answers**



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CS-CRAB

100 year + 3 feet - What is It ?

Tied to Coastal 100 year + 3 feet

- Defines Higher Risk Vertically and Extends Horizontal Proximity in Tidal Floodplains
- Screen State Projects and State Funding for Impacts when Inside 100-year +3 Limit



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Who Needs to Use the CRAB ?

- **State Agencies for Projects in Coastal Areas that Cost More than \$ 500,000**
- **Projects that receive State Funding if 50 % or more of the Costs- If State Funding Exceeds \$ 500,000**
- **Note / Roads and Bridges Are Currently Exempt, but likely to be discussed this year**



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Brief History of Coast Smart Council

- [Maryland HB 615: Coast Smart Council Law | Adaptation ...](#)
- **May 05, 2014** - The Coast Smart Council law ensures Maryland follows standards to make safe and fiscally-wise investments when building or updating State agency structures located in vulnerable coastal areas. The law does not affect schools, roads or local government projects, only structures built by State agencies.



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Profile View of FEMA Floodplain at Coastal Shoreline

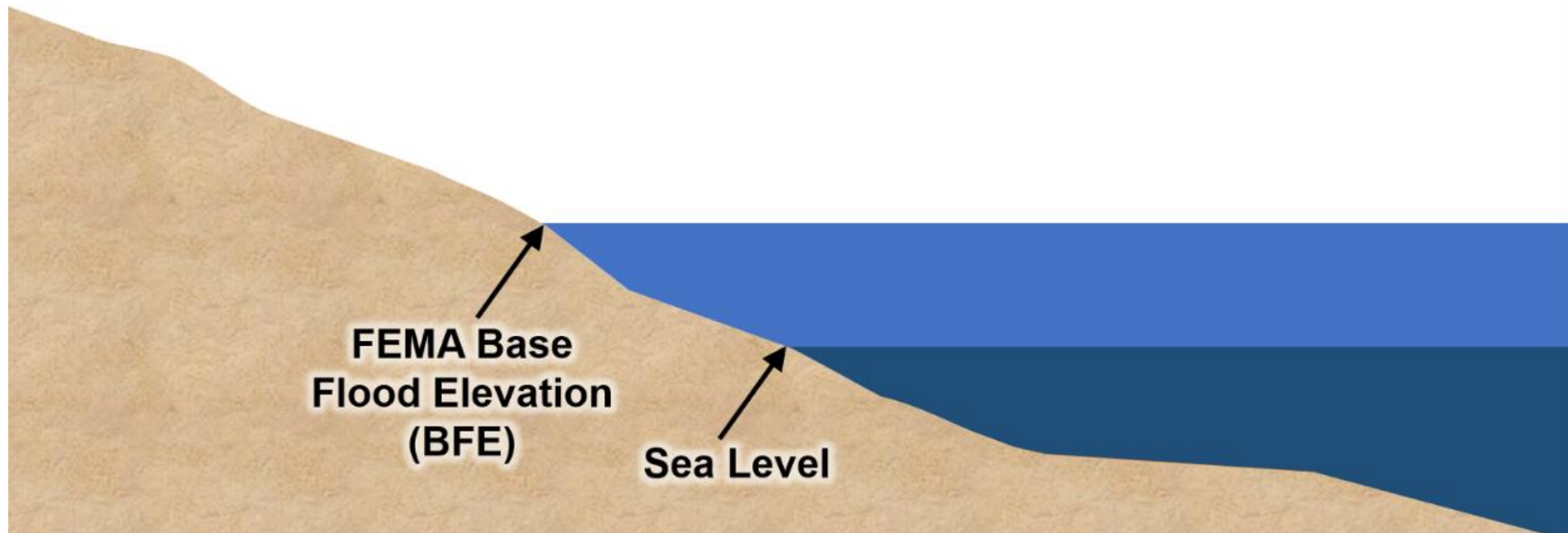
Coast Smart

Existing Conditions

- Land
- Sea Level
- FEMA 100 year Floodplain

FEMA Base
Flood Elevation
(BFE)

Sea Level



Profile View of FEMA Floodplain and Coastal Shorelines

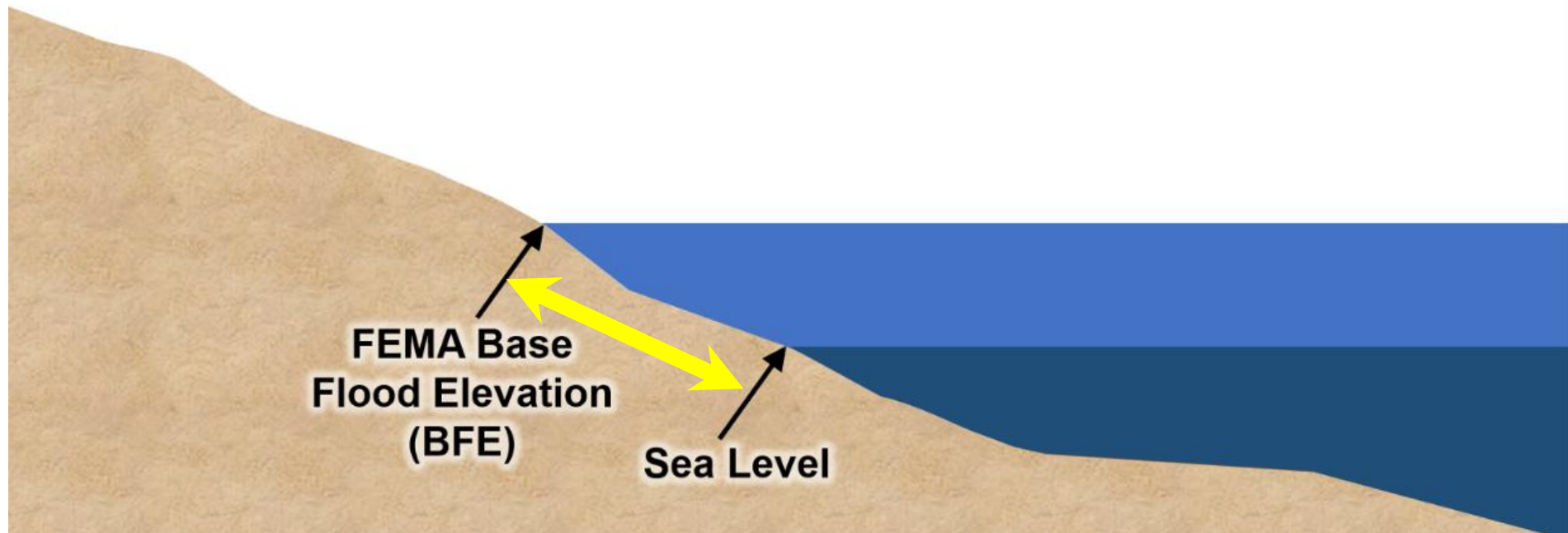
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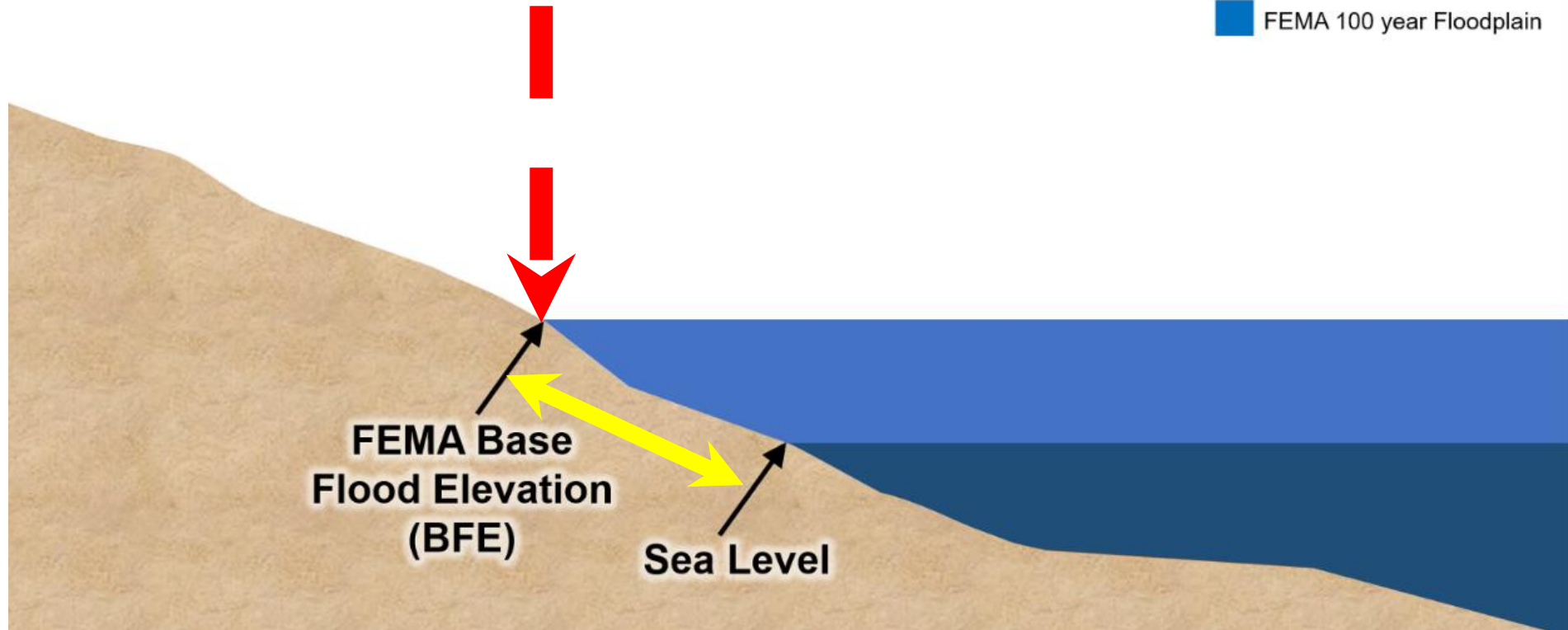
**Current Limit
of Floodplain
Regulations**

**Coast Smart
Existing Conditions**

- Land
- Sea Level
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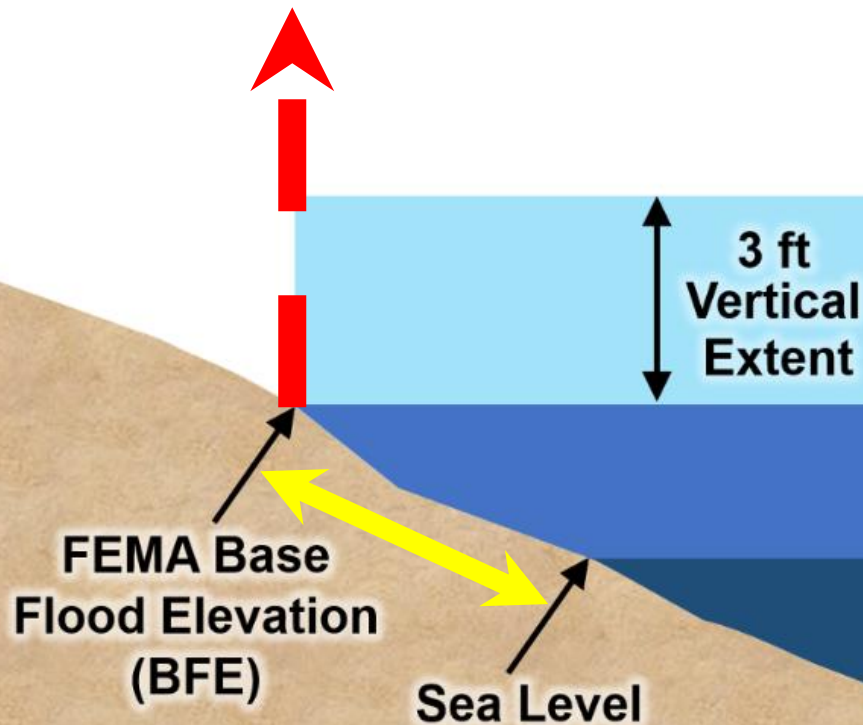


State (via CRAB) & Many Communities Apply a Freeboard of (1, 2, or 3 feet)

**Current Limit
of Floodplain
Regulations**

**Coast Smart
Vertical Increase**

- Land
- Sea Level
- FEMA 100 year Floodplain
- 100 year + 3ft

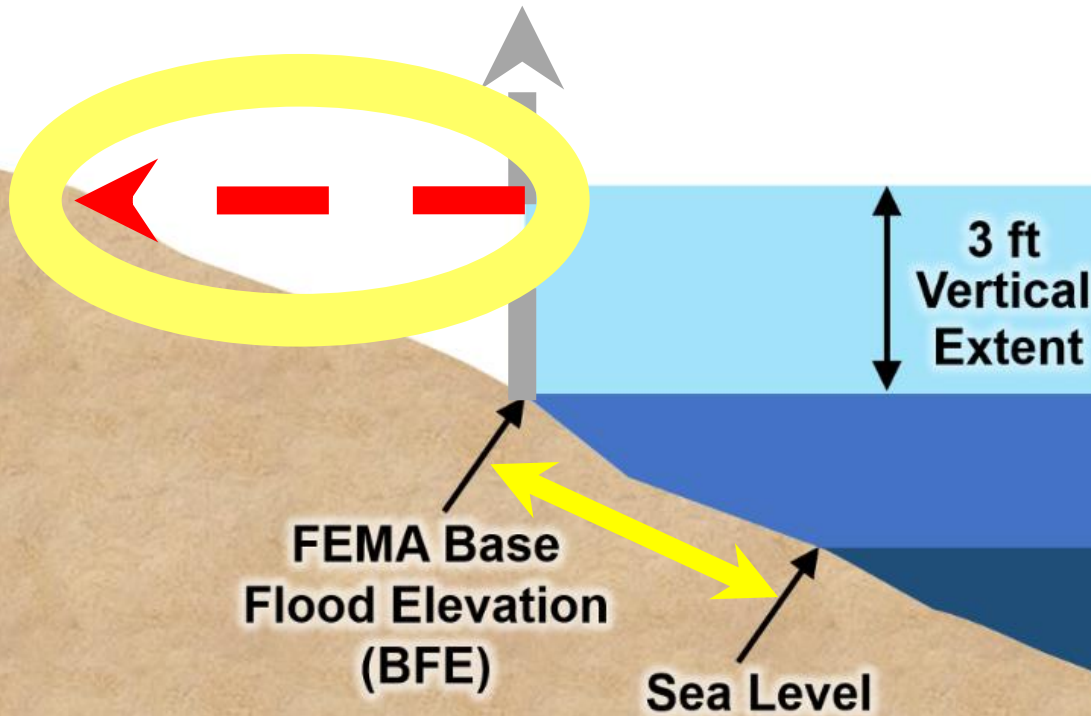


But, that Vertical Wall of Water doesn't Stop at the mapped FEMA Limits ...

Current Limit of Floodplain Regulations

Coast Smart Vertical Increase

- Land
- Sea Level
- FEMA 100 year Floodplain
- 100 year + 3ft

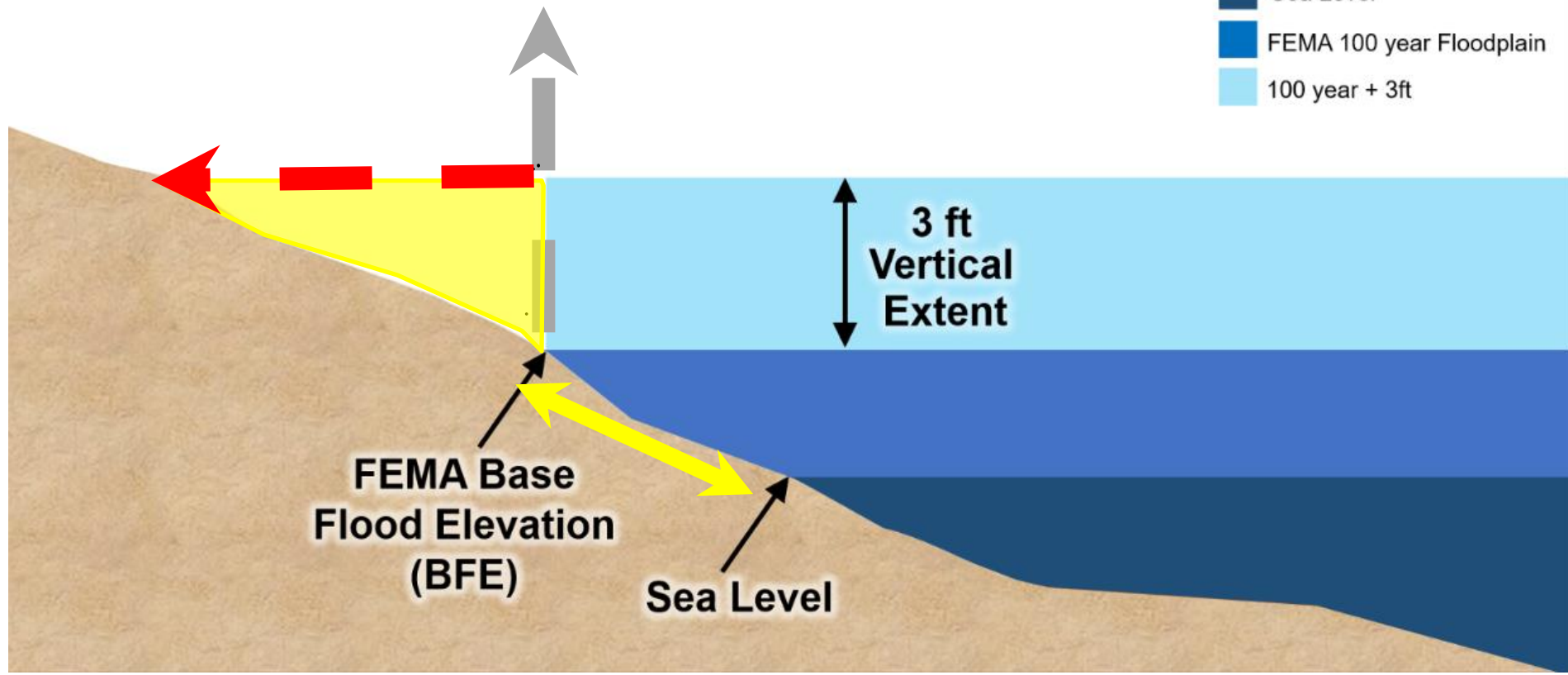


Flooding Can and Will Occur Beyond the FEMA Limits ! (in New Areas -)

Current Limit of Floodplain Regulations

Coast Smart Vertical Increase


-  Land
-  Sea Level
-  FEMA 100 year Floodplain
-  100 year + 3ft

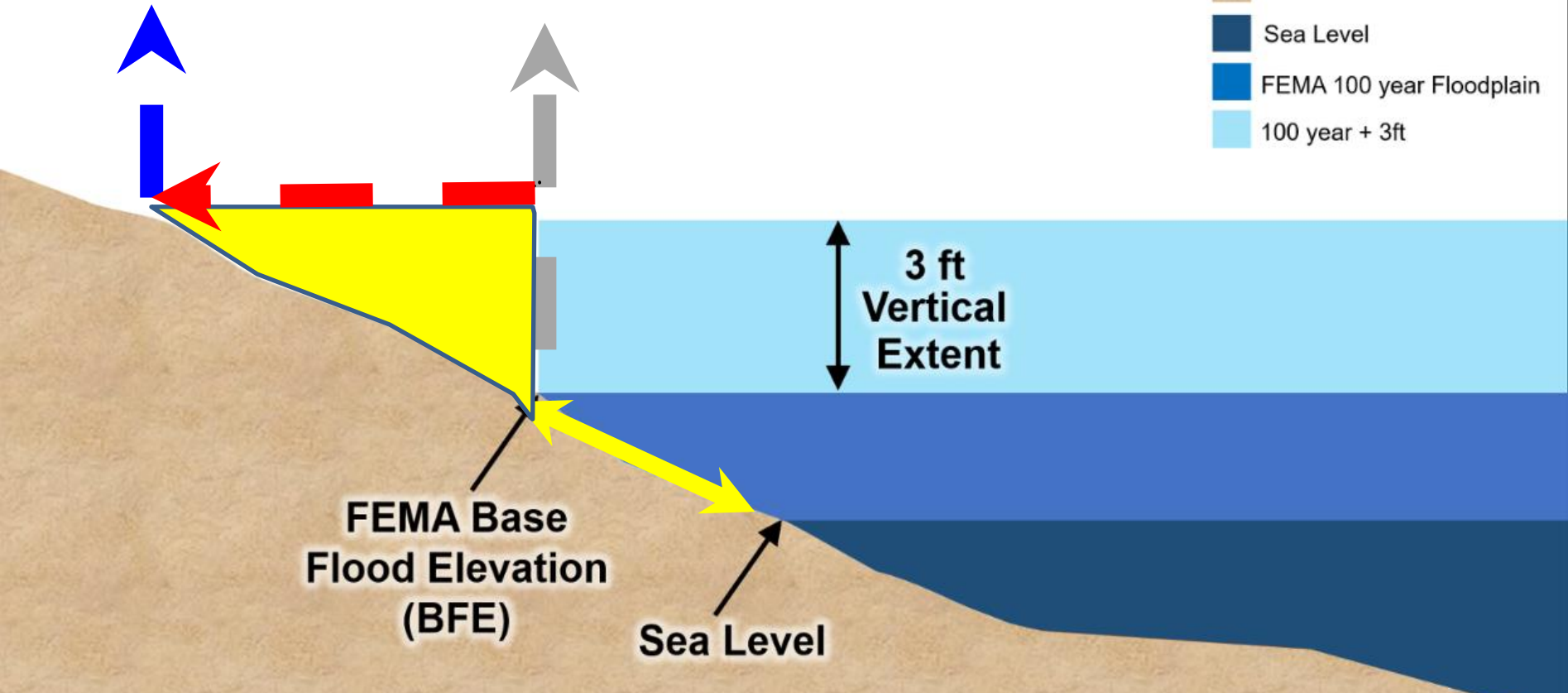


Flooding Can and Will Occur Beyond the FEMA Limits ! (in New Areas -)

**New
Limit of
Maryland
CS-CRAB**

**Coast Smart
Vertical Increase**

-  Land
-  Sea Level
-  FEMA 100 year Floodplain
-  100 year + 3ft



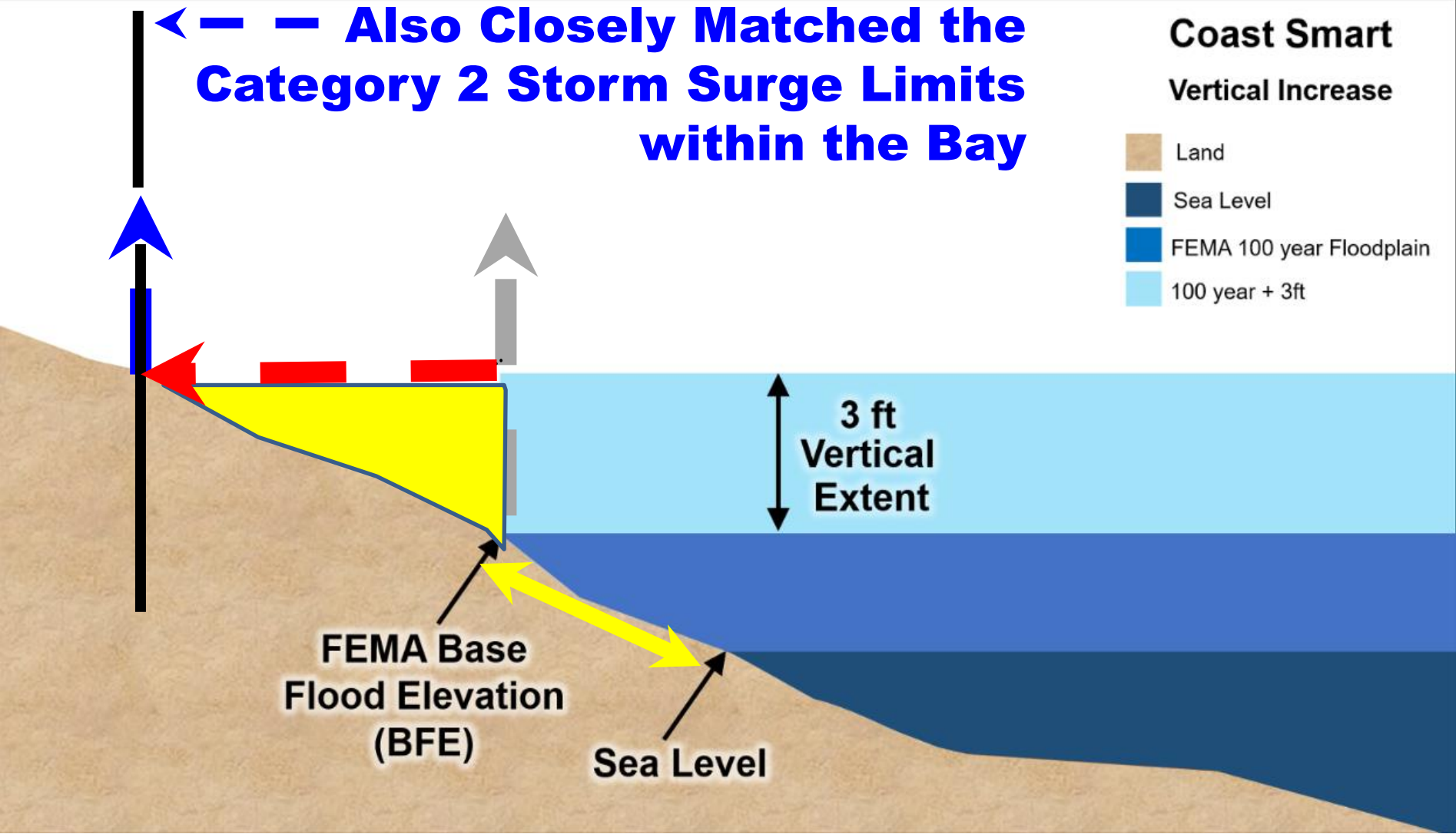
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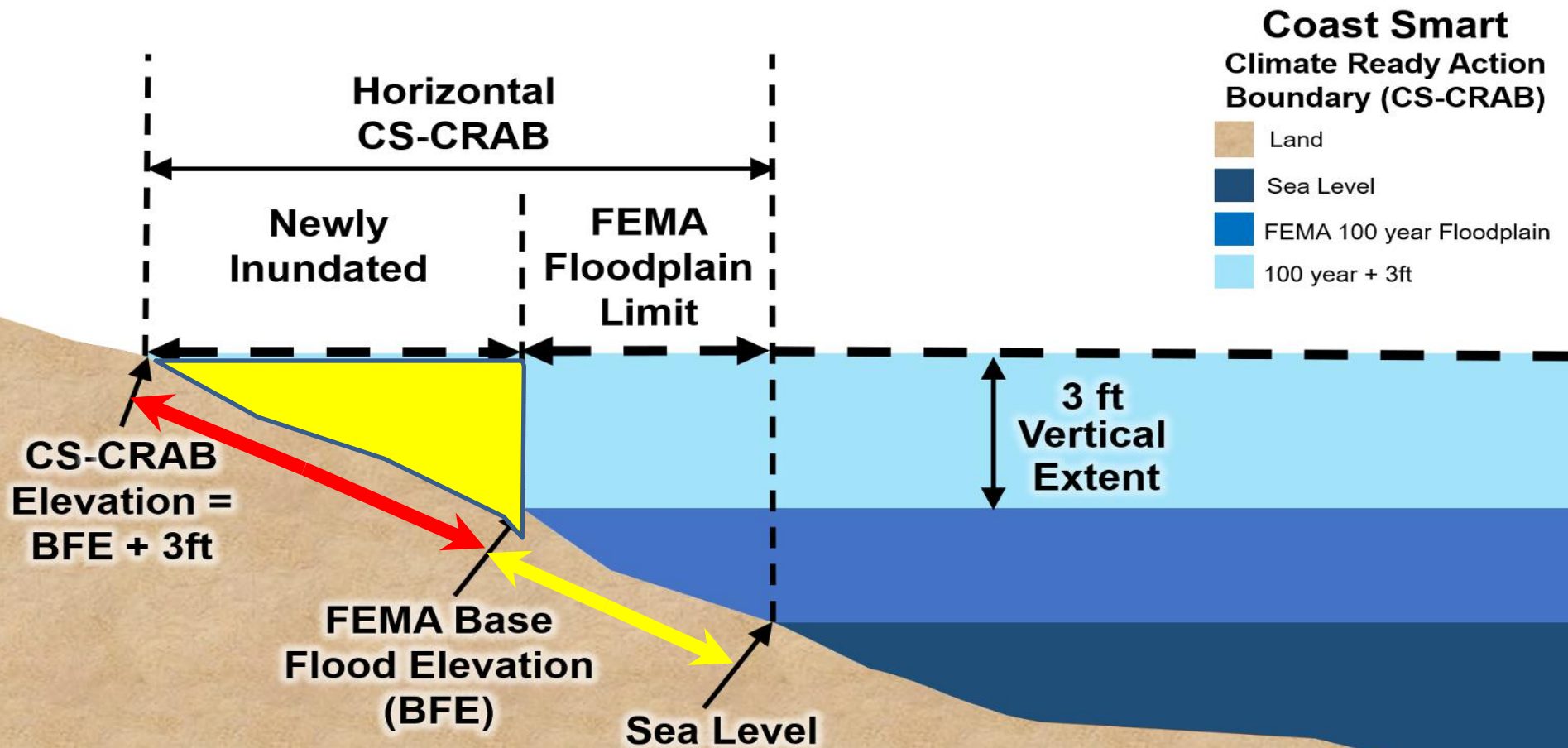
← — Also Closely Matched the Category 2 Storm Surge Limits within the Bay

Coast Smart Vertical Increase

- Land
- Sea Level
- FEMA 100 year Floodplain
- 100 year + 3ft

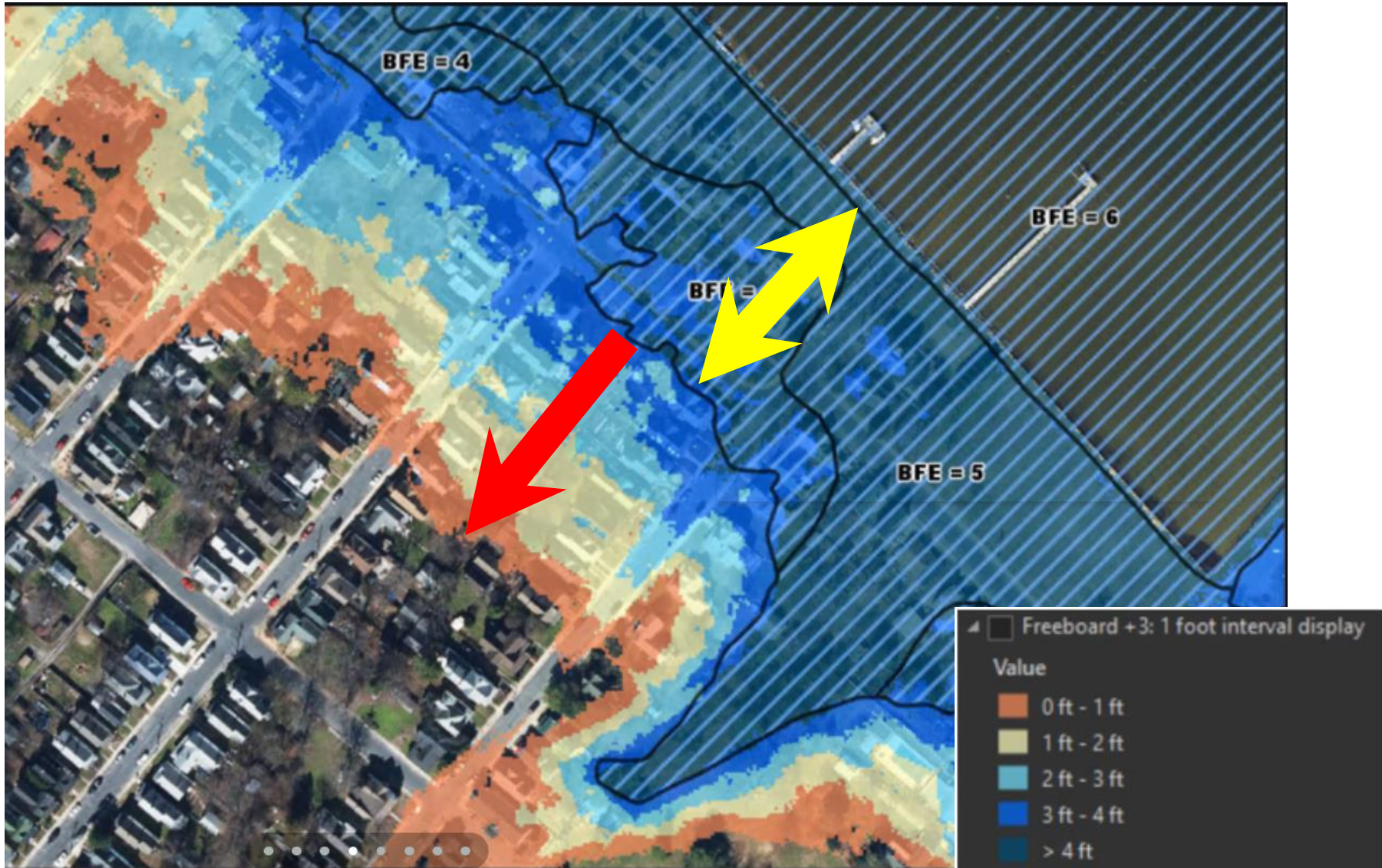


CS - CRAB: **Climate Ready Action Boundary** Establishes A Defined Landward Limit And An Elevation for Resiliency



What Does the CRAB Look Like In Plan View on a Map ? ...

(Production View of CRAB)






Story Map View of CRAB

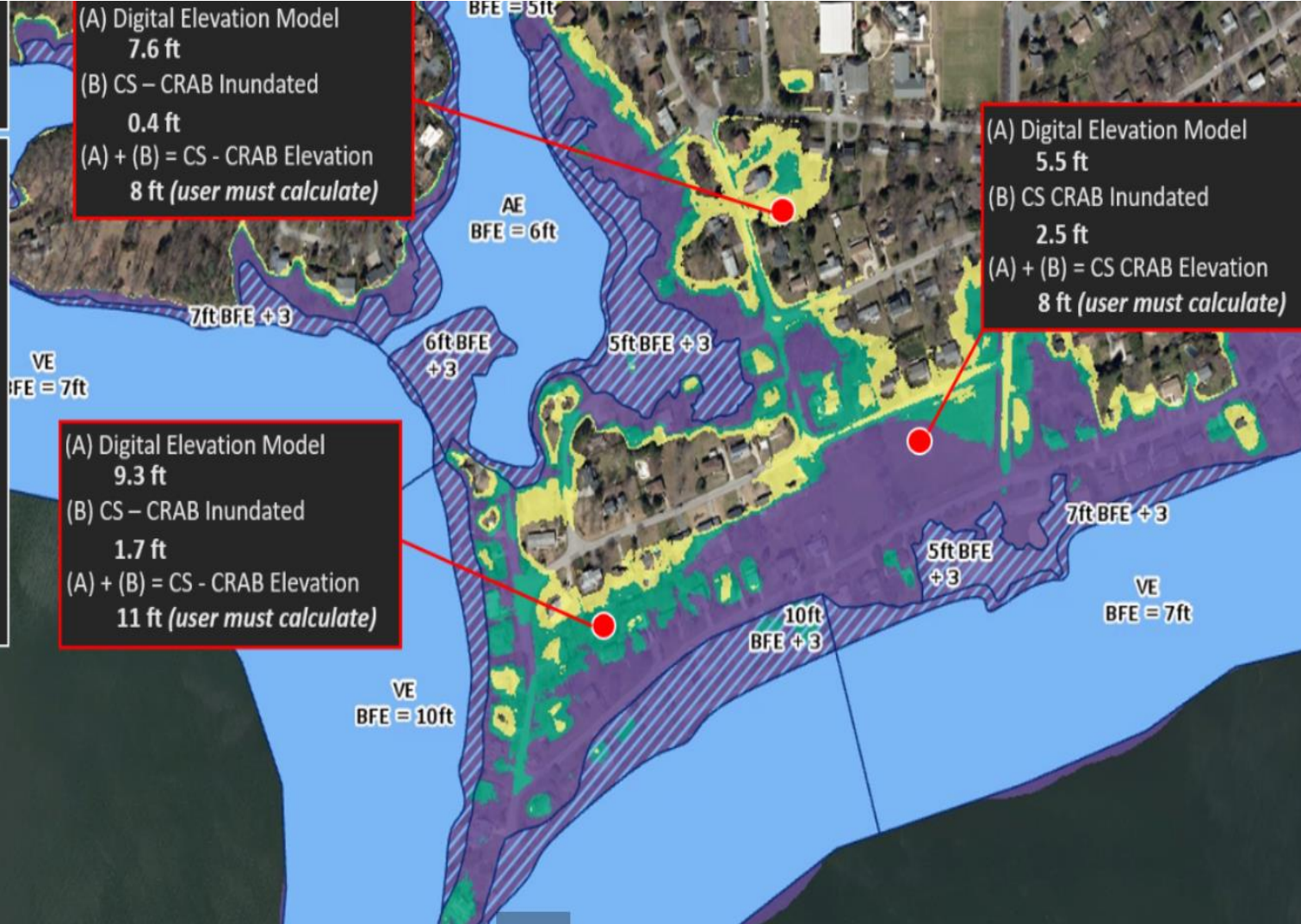
CS – CRAB Boundary
Base Flood Elevation + 3
with Floodplain overlay

FEMA Effective Floodplain

	Floodplain in Water
	Floodplain on Land

Coast Smart CRAB Boundary
Vertical Extent to CRAB Elevation

	Risk
	< 1 ft CRAB inundated
	1 - 2 ft CRAB inundated
	> 2 ft CRAB inundated



Web Sites ...

CRAB Web Site

<https://mdfloodmaps.net/CRAB/>

Floodplain Data and Models

<https://mdfloodmaps.net/>

Story Map

- <https://storymaps.arcgis.com/stories/bd1ab6827c77457a9c6aec5ca1eb4af2>



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CRAB Tool

<https://mdfloodmaps.net/CRAB/>

Coast Smart CRAB

Input coordinates or click on map to query:

39.004403N 076.460005W

(A) Digital Elevation Model: 8.7 ft
 (B) CS CRAB Inundated: 0.3 ft
 (A) + (B) = CS CRAB Elevation: 9.0 ft

MD LiDAR Effective DFIRM List 2020

This chart helps to identify counties where the effective DFIRM product may not align with results from the CRAB because of utilizing the latest and greatest DEM. Click on the table below to view the full size image.

COUNTY	Effective DFIRM Date	Effective Date	Available Date
Allegany	6/30/2020	2020	2020
Anne Arundel	10/14/20 (Revised)	Revised 2020	2020
Baltimore	12/10/20 (Current)	Current 2020	2020
Baltimore City	9/29/20 (Revised)	2020	2020
Baltimore County	9/29/20 (Revised)	2020	2020
Caldwell	12/29/20 (Current)	2020	2020
Carroll	12/29/20 (Current)	2020	2020
Cecil	12/29/20 (Current)	2020	2020
Charles	12/29/20 (Current)	2020	2020
Chesapeake	12/29/20 (Current)	2020	2020
Frederick	Revisy Underway	2020	2020
Harford	10/27/20	2020	2020
Howard	12/29/20	2020	2020
Montgomery	Revisy Underway	2020	2020
Prince George's	12/29/20 (Current)	2020	2020
Queen Anne's	12/29/20 (Current)	2020	2020
St. Mary's	12/29/20 (Current)	2020	2020
Talbot	12/29/20 (Current)	2020	2020
Washington	12/29/20	2020	2020
Wicomico	12/29/20 (Current)	2020	2020
Worcester	12/29/20 (Current)	2020	2020

The Coast Smart Data Model

Currently the FEMA floodplain layer records a base flood elevation above sea level

Coast Smart
Baseline Conditions

200ft

-76.461 39.000 Degrees

Coast Smart CRAB

(A) Digital Elevation Model: 8.7 ft
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AE (6)

AE (3)

Esri Community Maps Contributors, County of Anne Arundel, VITA, BuildingFootprintUSA, Esri, HERE, Garmin, Safe...

POWERED BY esri

CRAB Tool Topo

Identifies the topo dataset used in the effective floodplain product vs best current available topo data used for CRAB development

COUNTY	Effective FIRM Date	Effective Topo	Available Topo (as of 2020 Q1)
Allegany	4/3/2020	2012	2012
Anne Arundel	10/16/12 (Riverine)	Riverine 2004	2017
	2/18/15 (Coastal)	Coastal 2011	
Baltimore City	6/16/21 (Riverine)	2008	2015
	4/2/14 (Coastal)		
Baltimore	Restudy Underway (Riverine)	2005	2015
	5/5/14 (Coastal)		
Calvert	12/16/11 (Riverine)	2003	2017
	11/19/14 (Coastal)		
Caroline	1/16/15 (Countywide)	2006	2013
Carroll	10/2/15	2006	2015
Cecil	7/8/13 (Riverine)	2005	2013
	5/4/15 (Coastal)		
Charles	9/4/13 (Riverine)	2004	2014
	5/4/15 (Coastal)		
Dorchester	3/16/15 (countywide)	2003	2013
Frederick	Restudy Underway	2012	2012
Garrett	10/2/13	2005	2015
Harford	4/9/16	2007	2013
Howard	Restudy Underway	2004	2018 / 2019
Kent	6/9/14 (Countywide)	2006	2015
Montgomery	Restudy Underway	Unknown	2013 / 2018
Prince George's	9/16/16	Unknown	2018
Queen Anne's	11/5/14 (Countywide)	2006	2013
Somerset	2/4/15 (Countywide)	2003	2011 / 2012
St. Mary's	Restudy Underway	Unknown	2014
Talbot	8/5/13 (Riverine)	2006	2015
	7/6/16 (Coastal PMR)		
Washington	8/15/17	2012	2012
Wicomico	8/17/15 (Countywide)	2003	2011 / 2012
Worcester	7/16/15 (Countywide)	Riverine 2011	2011
		Coastal 2011	



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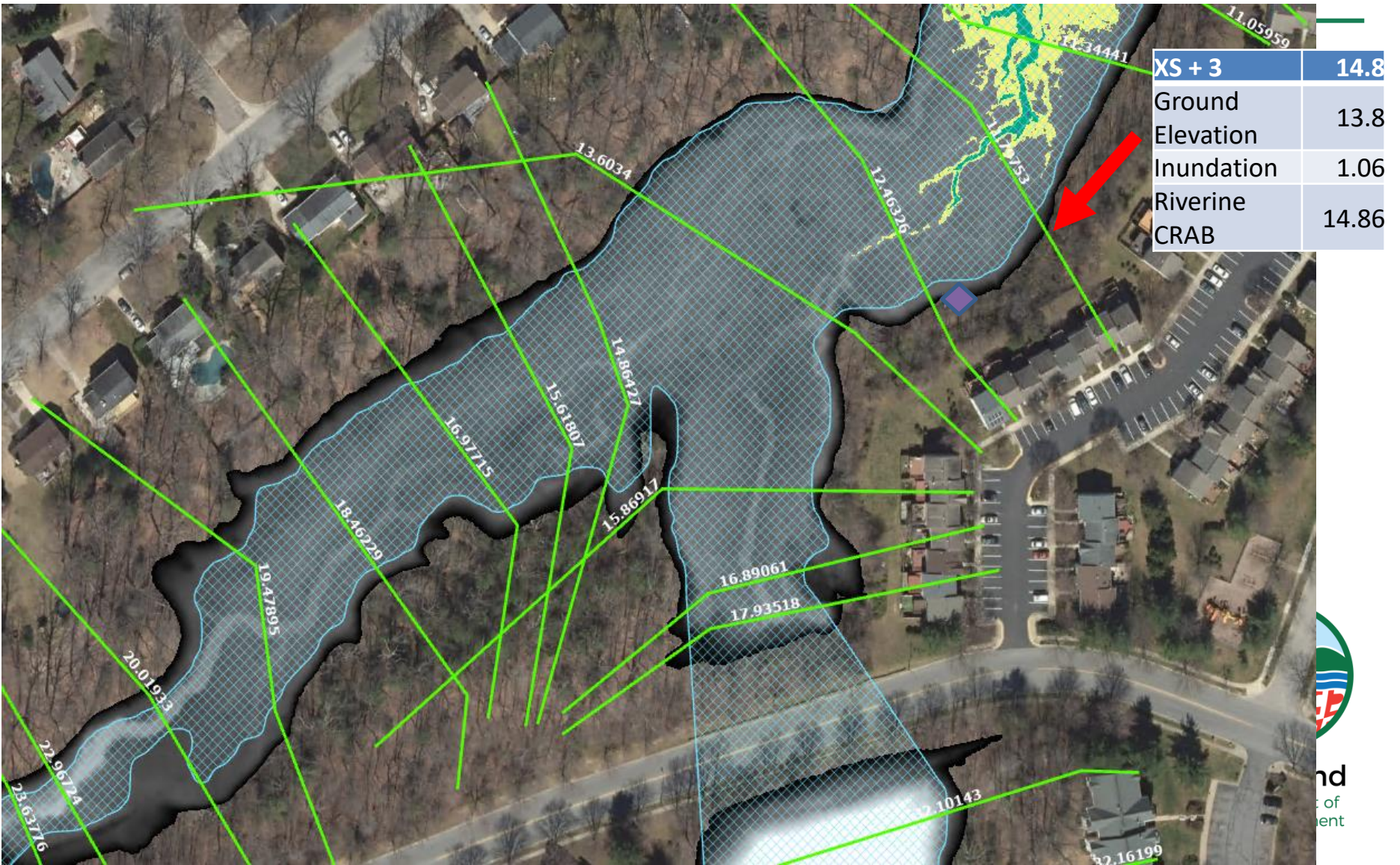
Riverine Dataset Development

- **Currently focusing on developing Anne Arundel county dataset first**
- **Progressing to Dorchester county dataset development next**
- **Phased roll out of data products – to be hosted in CRAB tool and DOIT servers**



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Riverine CRAB



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Riverine Methodology and Validation

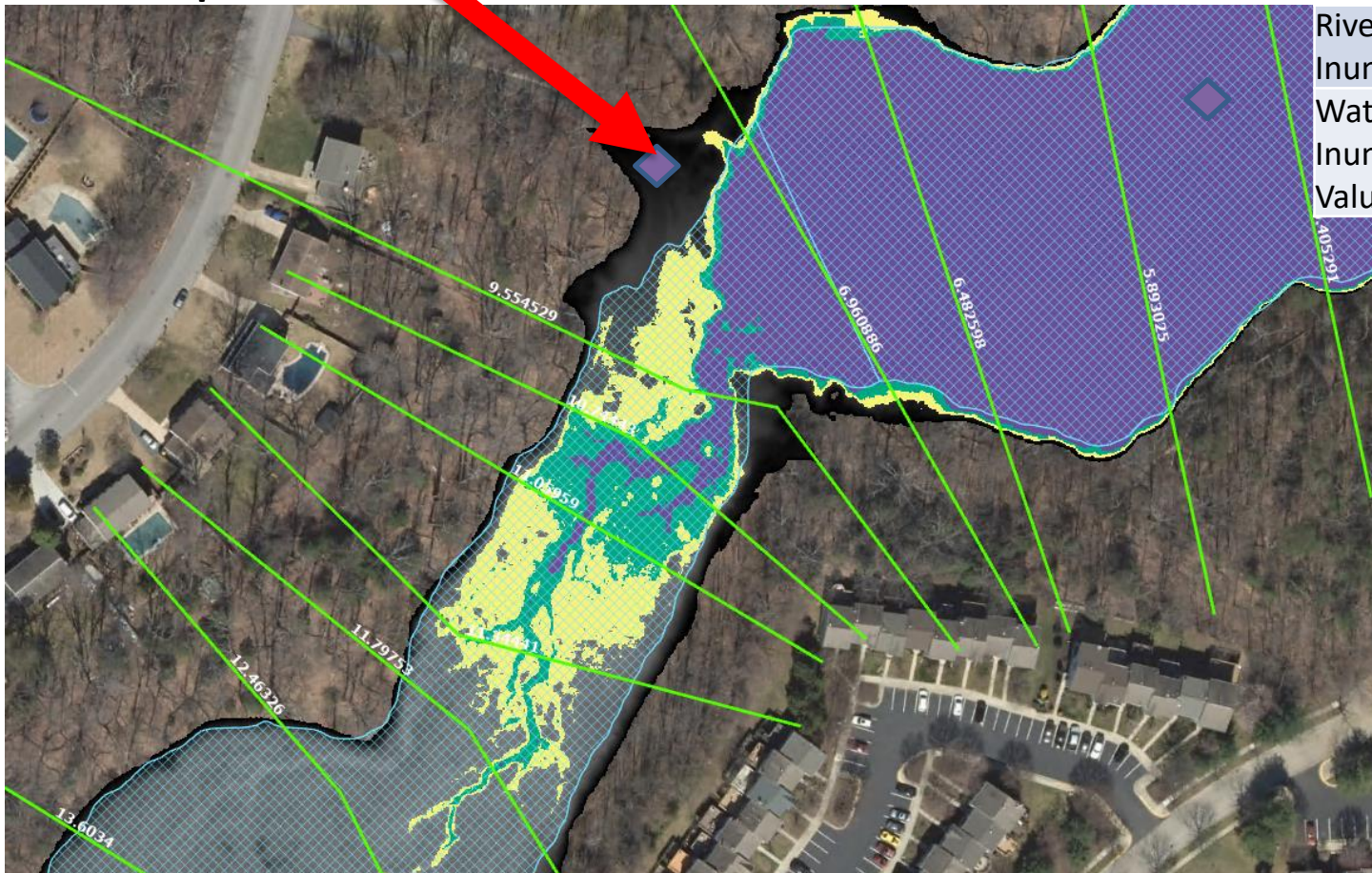
- **Each reach in the county is processed independently to ensure that reaches do not influence each other**
- **Riverine water surface elevation is interpolated using Inverse Distance Weighted (IDW) Interpolation – (Closer Elevation Values have a Higher Influence)**
- **Cross-sections are used as barriers to ensure that the WSE does not overrun the cross-section values**
- **Digital elevation model (DEM) is removed from the IDW surface to obtain a water depth**
- **All riverine branches are mosaiced together using the most conservative value**



Coastal and Riverine Transition

Riverine interpolation is more conservative in this area – recommend to use these values, when possible

Coastal CRAB Inundation	7.71
Riverine CRAB Inundation	7.55
Waterfall Inundation Value'	0.16



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Profile or Cross-Section CRAB Tool (Works In Riverine Areas)

mdfloodmaps.net/CRAB/

Apps MES Apps Manen DJJ Material

Coast Smart CRAB

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COUNTY	Effective DFIRM Scale	Effective Date	Available Data Scale (CRAB)
Allegany	6/30/2010	2010	2010
Anne Arundel	10/14/10 (Revised)	Revised 2010	2010
Arundel	1/10/10 (Original)	Original 2010	2010
Baltimore City	9/29/10 (Revised)	2010	2010
Baltimore	9/29/10 (Revised)	2010	2010
Caldwell	11/27/10 (Revised)	2010	2010
Carroll	12/24/10 (Revised)	2010	2010
Cecil	10/20/10 (Revised)	2010	2010
Charles	10/20/10 (Revised)	2010	2010
Chesapeake	1/14/10 (Original)	2010	2010
Frederick	Revised Underway	2010	2010
Harford	10/20/10	2010	2010
Howard	10/20/10	2010	2010
Montgomery	10/20/10 (Revised)	2010 / 2010	2010 / 2010
Prince George's	10/20/10 (Revised)	2010	2010
Queen Anne's	11/23/10 (Revised)	2010	2010
St. Mary's	10/20/10 (Revised)	2010	2010 / 2010
Talbot	10/20/10 (Revised)	2010	2010
Washington	10/20/10	2010	2010
Wicomico	10/10/10 (Original)	Revised 2010	2010 / 2010
Worcester	11/10/10 (Original)	Original 2010	2010

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Live Or Back Up ?



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Elevation Profile

Measure

Profile Result

Use the Measure tool to draw a line on the map that you want to see the elevation profile for.



Feet (US) ▼

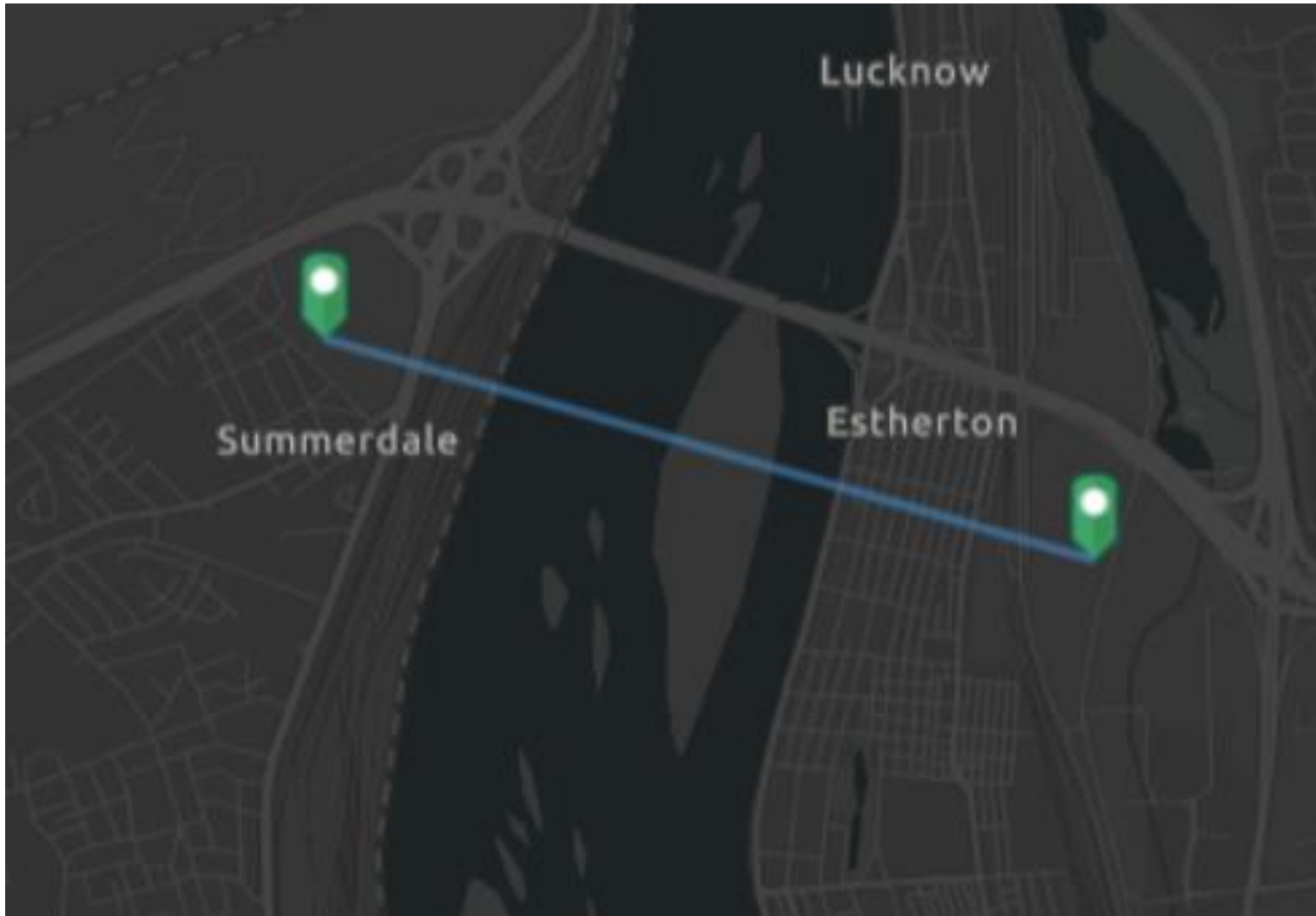
- Miles
- Kilometers
- Feet
- Feet (US)
- Meters
- Yards
- Nautical Miles

Profile Result



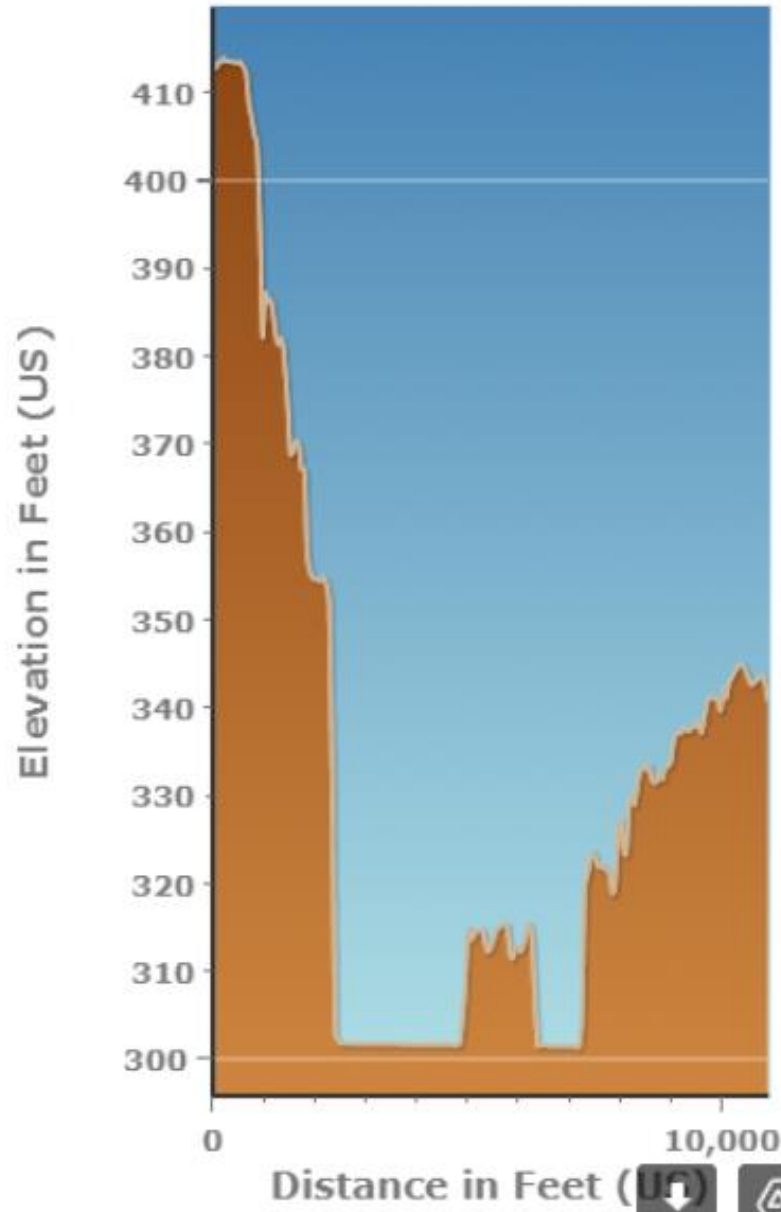
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Which Side of the River is Higher ?



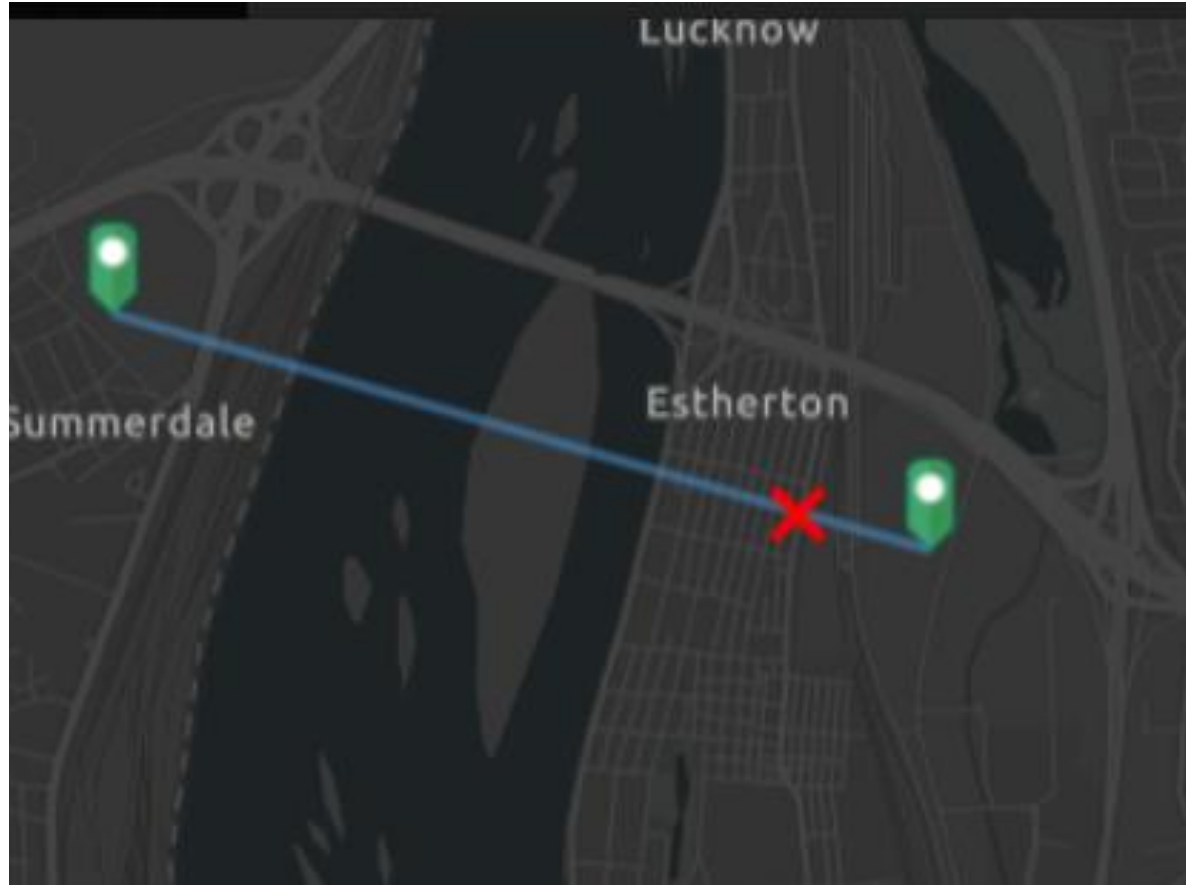
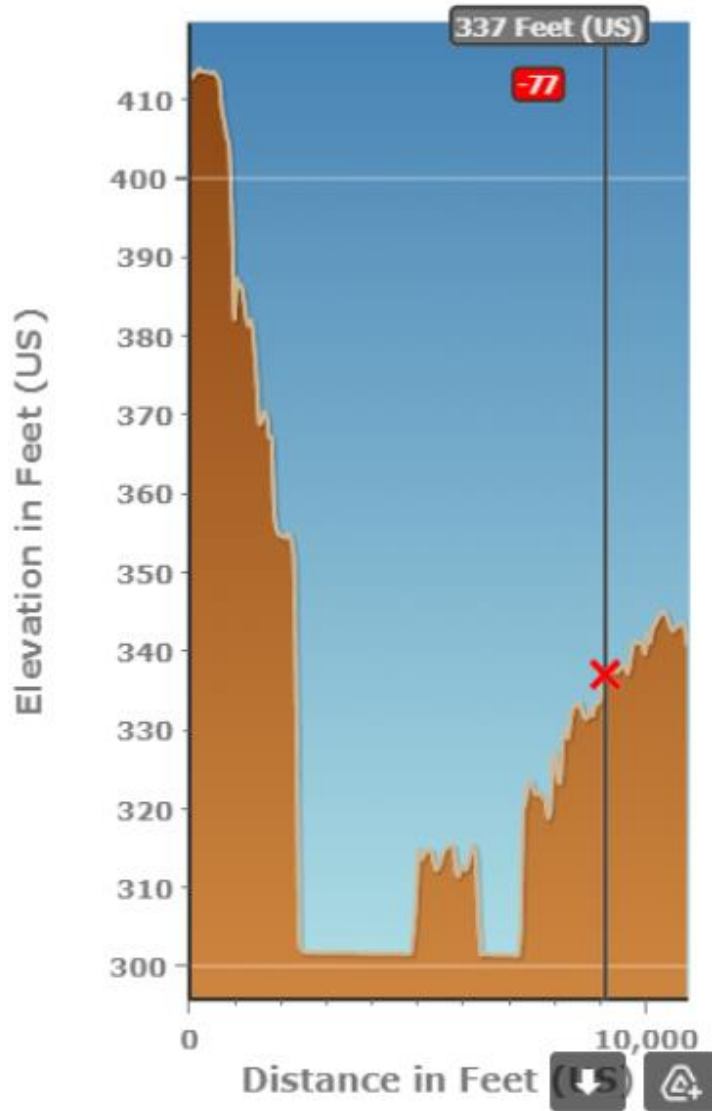
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Elevation Profile



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Elevation Profile



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Limitations (Not Quite Sliced Bread)

- **Profile Tool Uses ESRI 20-meter DEM**
- **Profile Tool Is “Out of the Box” Product / No Enhancements**
- **Profile Tool Does Not Include Maryland’s Flood Profiles (10,25,50 & 100-yr.)**
- **BUT – It Does Help to Understand & Convey Risk !**



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Future Enhancements ???

- Profile Tool Uses ESRI 20 meter DEM – **Looking at incorporating MD DEM's**
- Profile Tool Is “Out of the Box” Product – **Looking at MD X-Sections**
- Profile Tool Does Not Include Maryland's Flood Profiles (10,25,50 & 100-yr.) - **Yet**
- BUT – It Does Help to Understand & Convey Risk ! – **Even More Def.**



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Questions / Comments /

Dave Guignet

dave.guignet@maryland.gov

**Outreach Info and CRAB Tool:
mdfloodmaps.net**



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