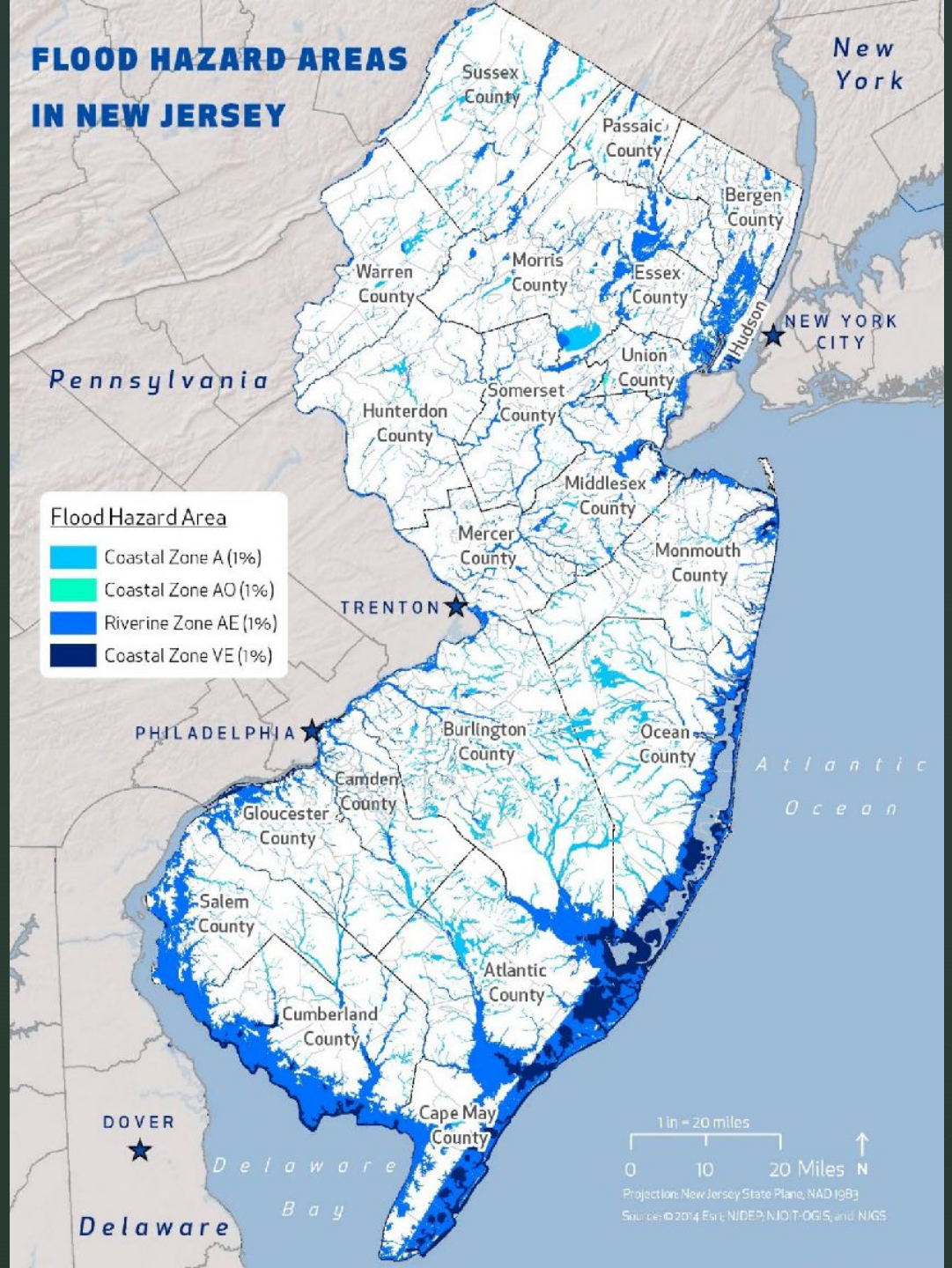
NEW JERSEY'S REGULATORY RESPONSE TO A CHANGING CLIMATE

PROTECTING AGAINST CLIMATE THREATS BOTH TODAY AND IN THE FUTURE

New Jersey Department of Environmental Protection
July 12, 2023

FLOOD RISK ASSESSMENT

- New Jersey's colonial settlements were along navigable waterways
- As a result, many of the State's population centers are located within flood hazard areas today
- Older development was often built without regard for potential flood risk



FLOOD RISK ASSESSMENT

- Flood risk is generally measured by what has happened in the past, using data collected over the past 50+ years, as shown on FEMA flood insurance rate maps
- Not always an accurate predictor of flood risk
- No longer a sound methodology for predicting flood risk due to climate change

FLOOD RISK ASSESSMENT

- People need to be aware of flood risks when buying, renting, occupying or developing property
- Mapping is a good starting point to assess risk but flooding often exceeds mapped floodplain limits
- Floods don’t stop at a line on a map

SNAPSHOT OF NJ

- Population 9.267 million (2021)
- Most densely populated state in the nation
- Approximately 16% of NJ lies within a flood hazard area
- According to 2019 State Hazard Mitigation Plan, NJ has:
  - $241 billion of general building stock exposure to the 1% annual chance flood
  - Roughly 3 million properties not covered by an NFIP policy
  - 16,809 repetitive loss properties (73% are single family homes)
  - 1,238 severe repetitive loss properties (83% are single family homes)
  - 1,707 critical facilities and infrastructure located in the 1% flood hazard area
- $15.3 billion in obligations under post-disaster grants (1990-2021)
- Highest foreclosure rate in the nation, with one in every 605 properties in some stage of foreclosure (Experian, 2018)

“Flooding is NJ’s #1 Natural Hazard” (FEMA, August 4, 2004)

STATEWIDE FLOODPLAIN MANAGEMENT

- Longstanding statewide program dating back to 1929
- NJ design flood in fluvial areas is calculated as 125% of the 1% peak discharge and is always at least one foot above FEMA's 1% elevation
- One foot of freeboard required above design flood elevation for buildings and roads
- Statewide 0% flood storage displacement standard
- Critical buildings and multi-residence buildings in fluvial areas must have "dry access" during flood events
- Progressive statewide stormwater management policies, including the requirement to use green infrastructure
- Progressive stream corridor protection standards

Despite the above, flood damage in NJ continues to increase.

SOCIOECONOMIC IMPLICATIONS

Superstorm Sandy alone:

- Two million households in the state lost power
- 346,000 homes were damaged or destroyed
- Economic losses to businesses of over $30 billion
- 37 people in NJ were killed

Primary, secondary, and tertiary impacts felt for years

SOCIOECONOMIC IMPLICATIONS

Most densely populated state

\+ Chronic flooding issues

\+ 16% of state lies in a flood hazard area

\+ Enormous development pressure

\+ Development can increase flooding

\+ Climate change

= **Unsustainable Condition**

Executive and Administrative Orders

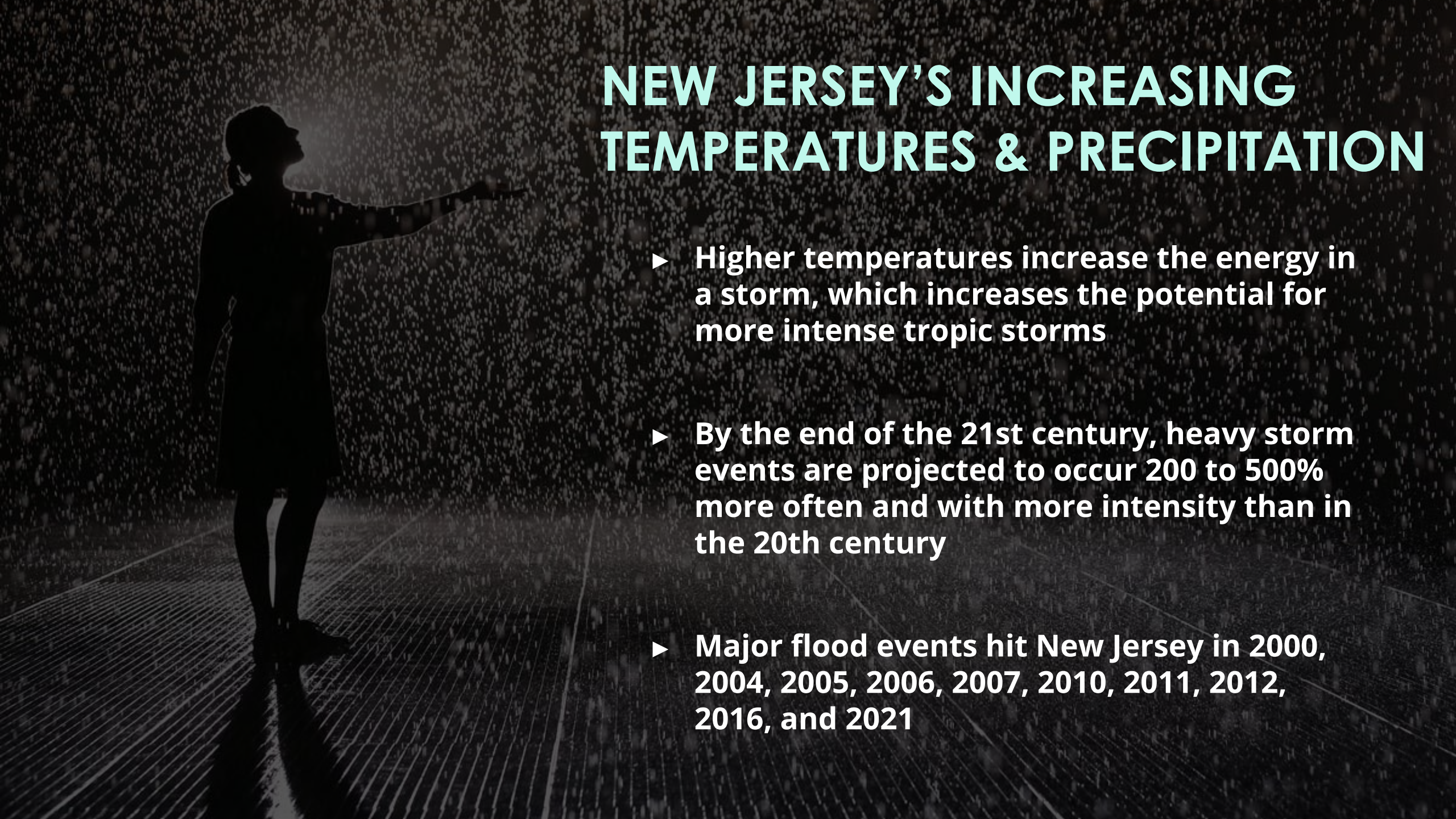
EO 100 signed by Governor Murphy

AO 2020-01 signed by Commissioner McCabe

- Directed NJDEP to integrate climate change considerations, including sea level rise and chronic flooding into its regulatory and permitting programs

INTENSIFYING RAINFALL & FLOODING IN NEW JERSEY

- The data presently used to analyze flood potential in waterways and in the design of stormwater infrastructure is outdated and includes data only through 1999.
- The precipitation expectations that presently guide state policy, planning and development criteria do not accurately reflect current precipitation intensity conditions.

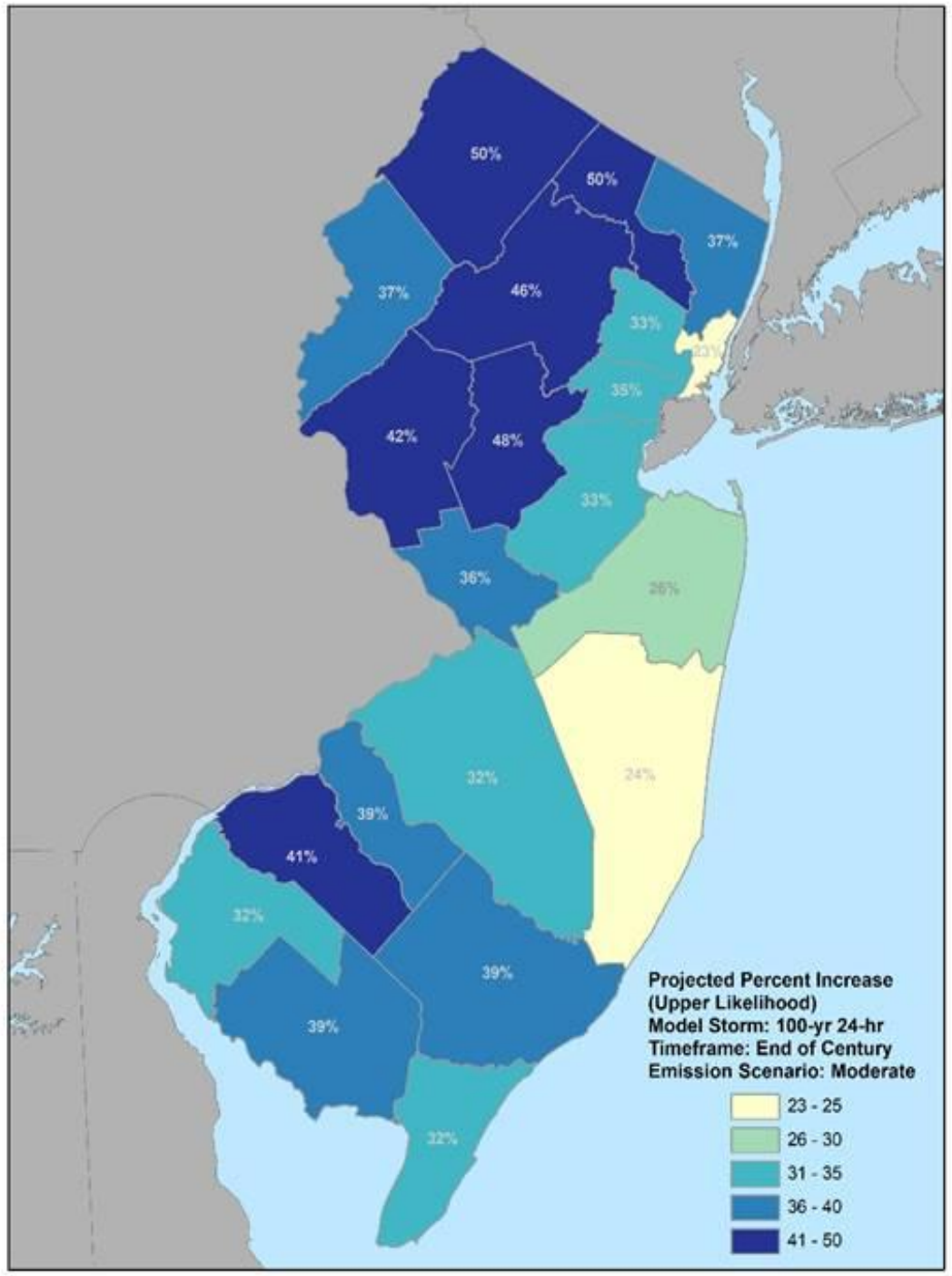


NEW JERSEY'S INCREASING TEMPERATURES & PRECIPITATION

- Higher temperatures increase the energy in a storm, which increases the potential for more intense tropic storms

- By the end of the 21st century, heavy storm events are projected to occur 200 to 500% more often and with more intensity than in the 20th century

- Major flood events hit New Jersey in 2000, 2004, 2005, 2006, 2007, 2010, 2011, 2012, 2016, and 2021



November 2021: NJDEP and the Northeast Regional Climate Center, a National Oceanic and Atmospheric Administration (NOAA) partner, released studies showing past and projected increases in precipitation

CURRENT PRECIPITATION

Since 1999:

- **The 2-year storm has increased as much as 5%**
- **The 10-year storm has increased as much as 7%**
- **The 100-year storm has increased as much as 15%**

FUTURE PRECIPITATION

Over the coming decades:

- **The 2-year storm is likely to increase by as much as 24%**
- **The 10-year storm likely to increased as much as 27%**
- **The 100-year storm likely to increased as much as 50%**

More Rain = More Stormwater Runoff

More Runoff = Increased Riverine Flow

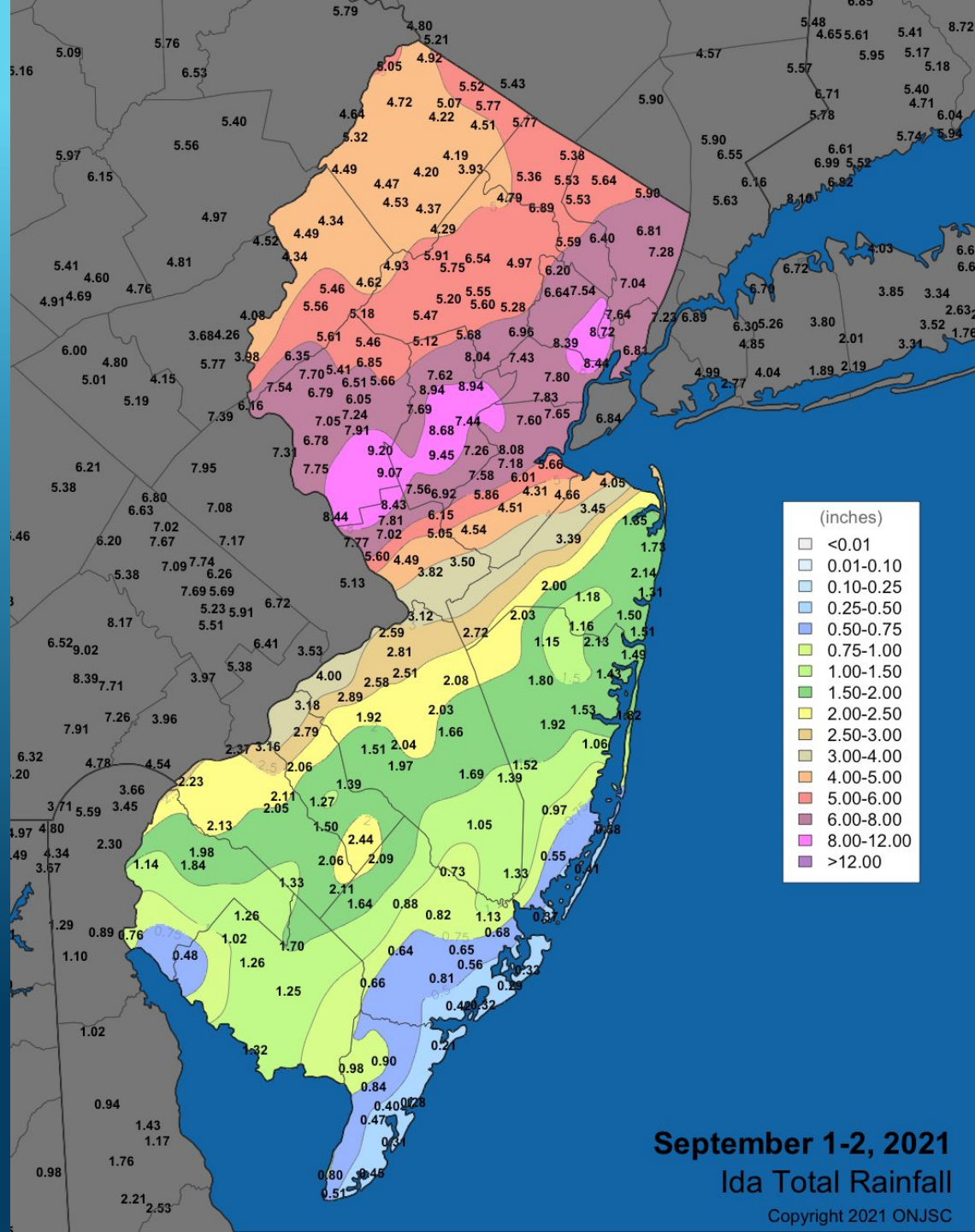
More Flow = Higher Flood Elevations

EFFECTS OF INCREASING PRECIPITATION

- Adds stress on already overtaxed infrastructure and overwhelms stormwater management systems
- Increased fluvial flood depths
- Increased risk to life and property

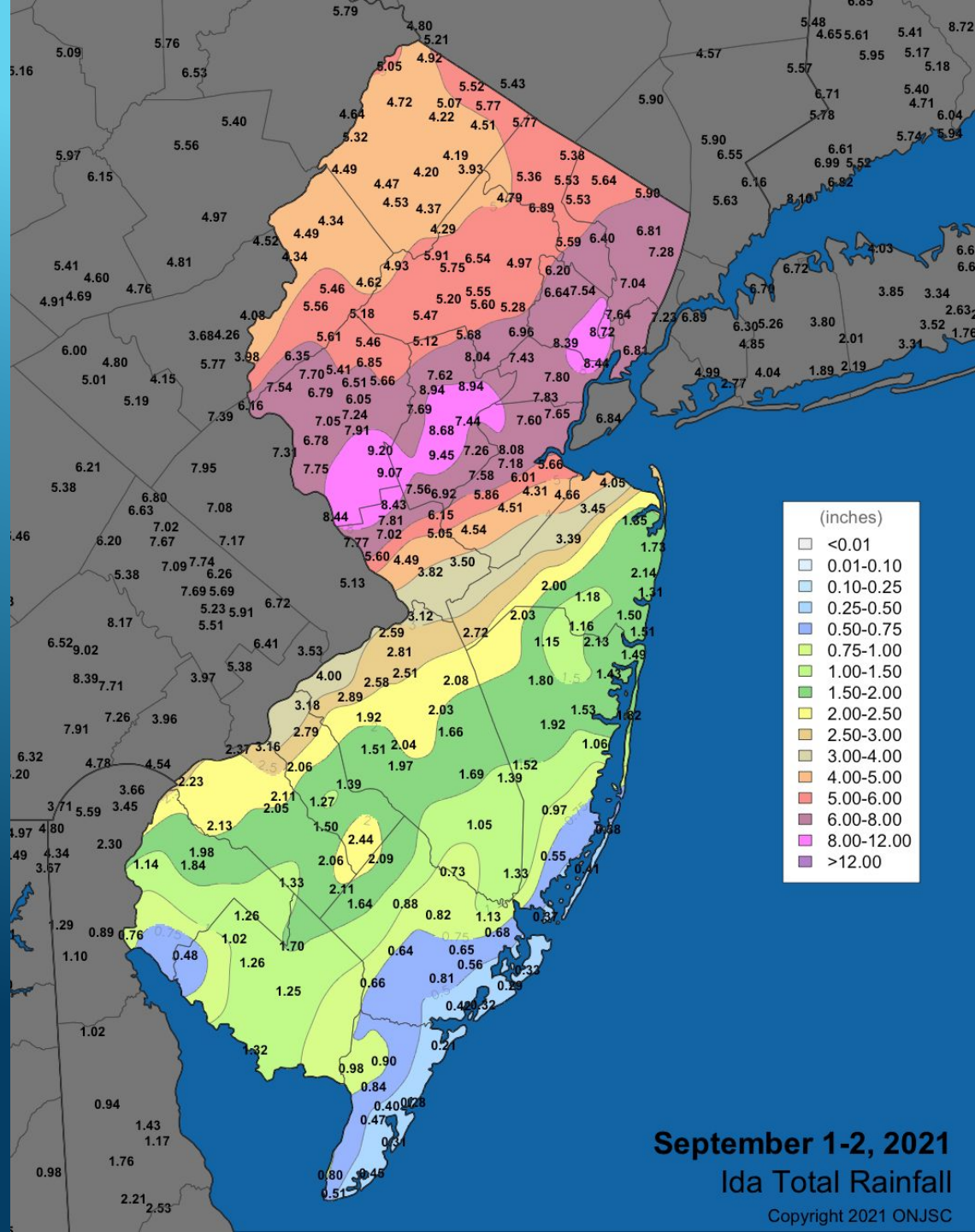
REMNANTS OF TROPICAL STORM IDA

- Struck September 1, 2021
- Record rainfalls reported
  - State Climatologist: Newark experienced an all-time record for highest one-hour rainfall total (3.65 inches)
  - National Weather Service: documented over 10 inches of rainfall in parts of Hunterdon, Essex, Middlesex and Union Counties



REMNANTS OF TROPICAL STORM IDA

- Severe flash flooding due to intense precipitation
  - Storm sewers were overwhelmed
  - Streams and rivers couldn't convey so much water in such a short time
  - More than 12 rivers exceeded their 100-year flood levels



IDA COMPARED WITH FLOOD HAZARD RULES: CASE STUDIES

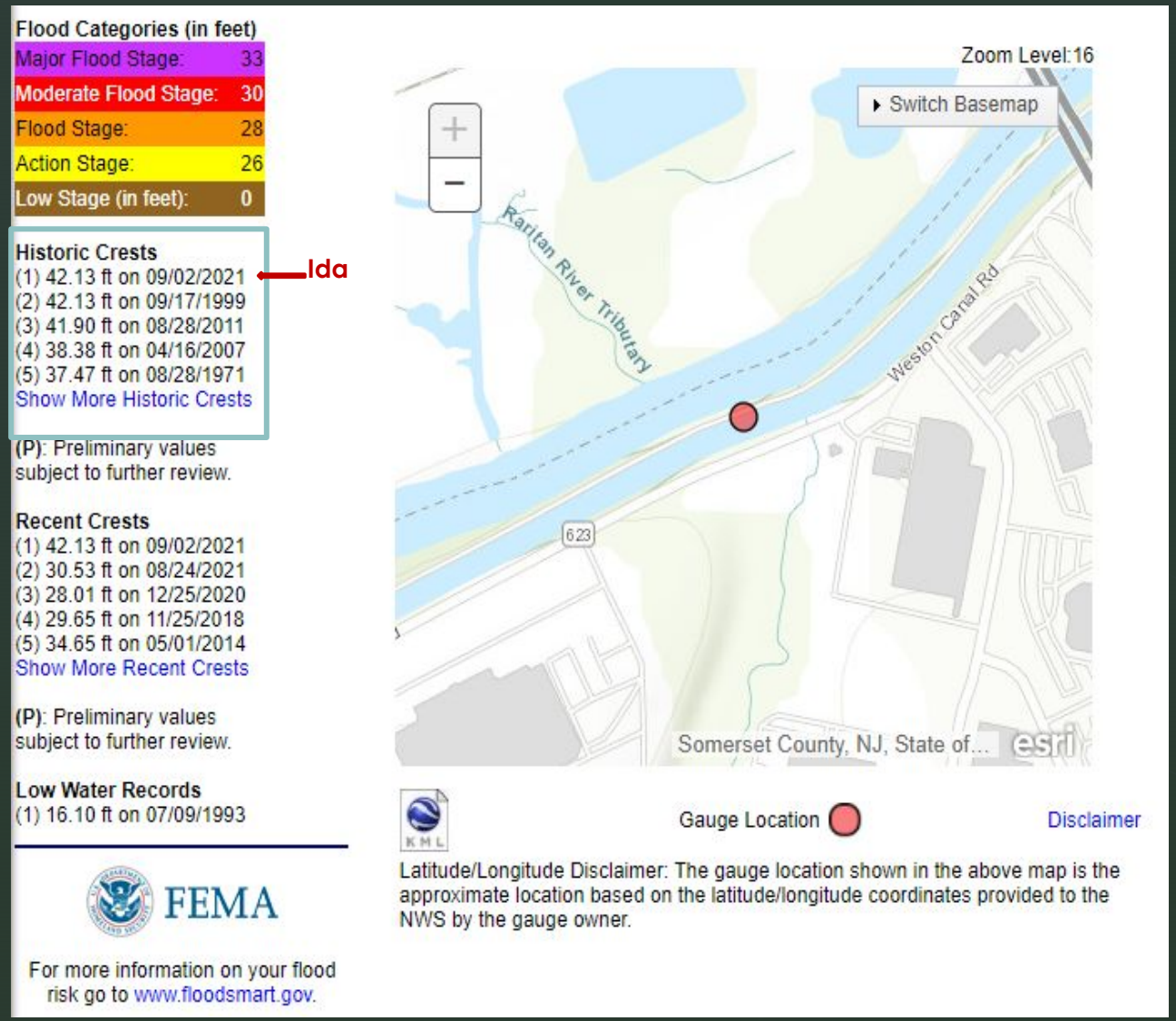
The current FHACA Rules set the design flood elevation (DFE) as the higher of:

- Flood elevation mapped by NJDEP (where available)
- FEMA 100-year elevation plus 1 ft

Ida case studies show average elevations of 3.1 feet above FEMA's 100-year flood elevation.

- This is 2.1 ft higher than the current DFE

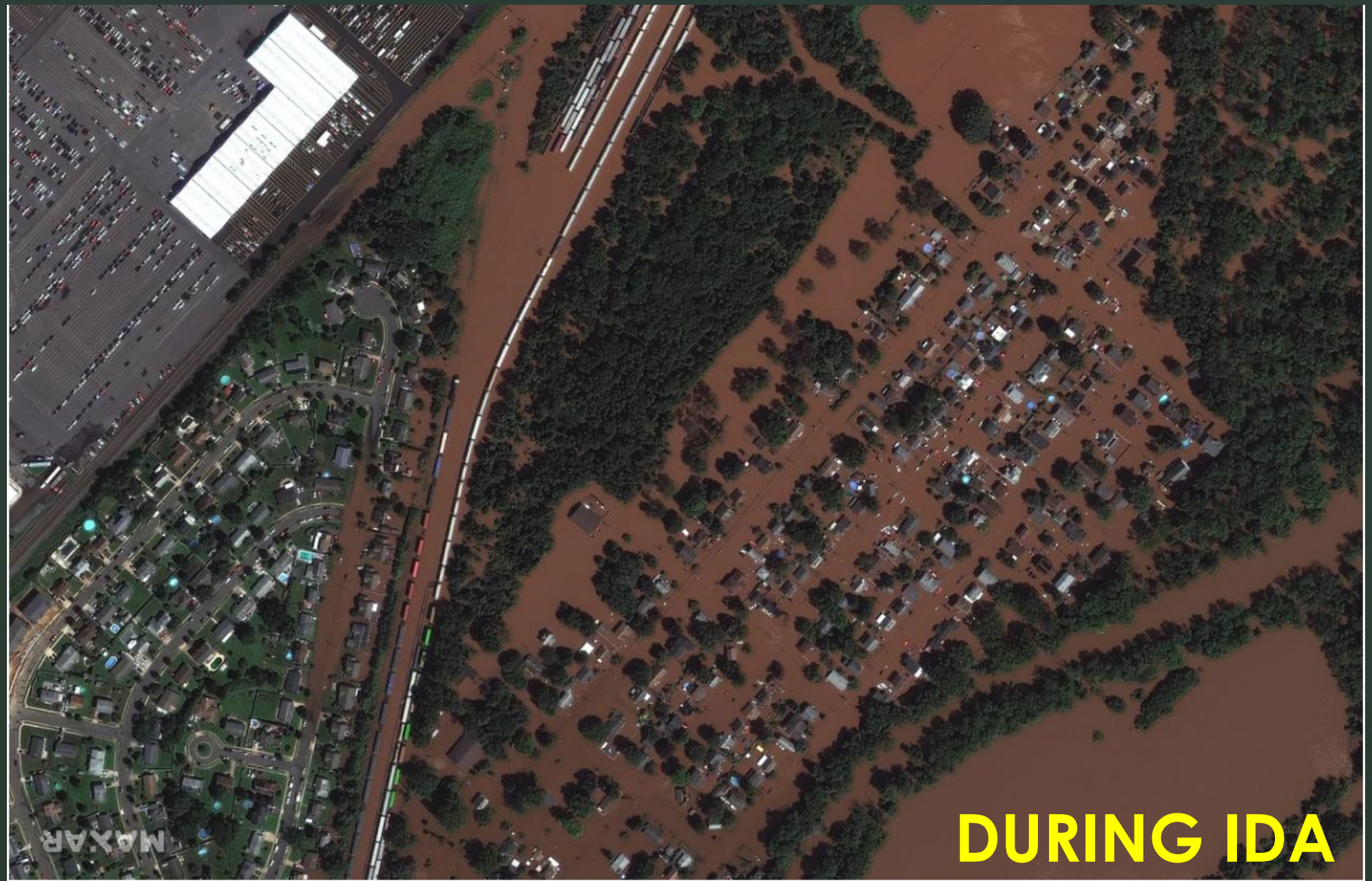
RARITAN RIVER AT BOUND BROOK



- Flooding during Ida equaled 1999's Hurricane Floyd, which was the highest elevation ever recorded at Bound Brook.
- The 500-year flood elevation at this location has been exceeded three times since 1999.

MILLSTONE RIVER AT MANVILLE

MILLSTONE RIVER AT MANVILLE



MILLSTONE RIVER AT MANVILLE

NJ Response to Ida

Emergency rule contemplated

- Based on a finding of imminent peril
- Applied only to fluvial floodplains and stormwater management regulations

Received mixed support and opposition

- NJDEP decided to solicit additional stakeholder input and undertake a traditional rulemaking process

INLAND FLOOD PROTECTION RULE
Proposed 12/5/22

Applies to:

- Flood Hazard Area Control Act Rules, N.J.A.C. 7:13
- Stormwater Management rules, N.J.A.C. 7:8

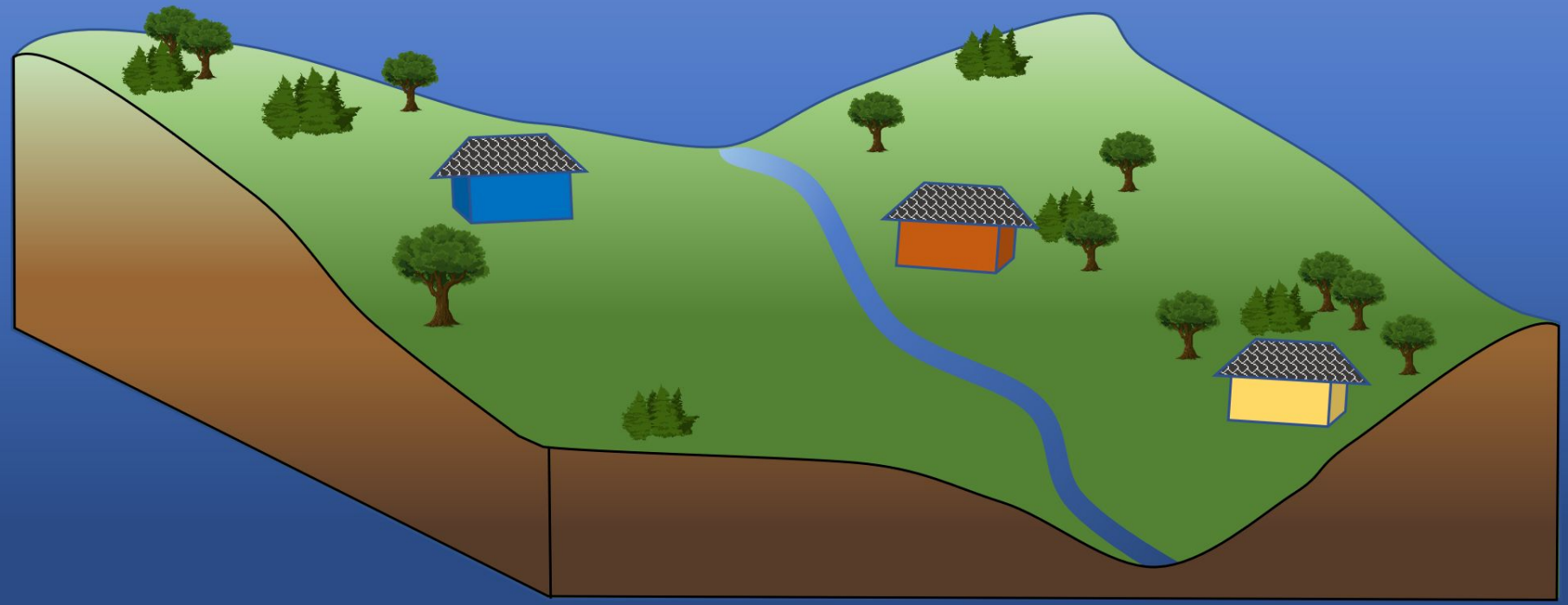
FHA Key Points:

- Raises fluvial design flood elevations by two feet when State/FEMA flood mapping is used.
- Requires use of future projected precipitation when calculating flood elevations.
- Ensures that permits and authorizations under the FHACA rules meet minimum NFIP standards.

SWM Key Points:

- Requires stormwater systems to be designed to manage runoff for both today's storms and anticipated future storms.
- Prevents use of Rational and Modified Rational methods for stormwater calculations.

Effect of New Flood Hazard Area Design Flood Elevation



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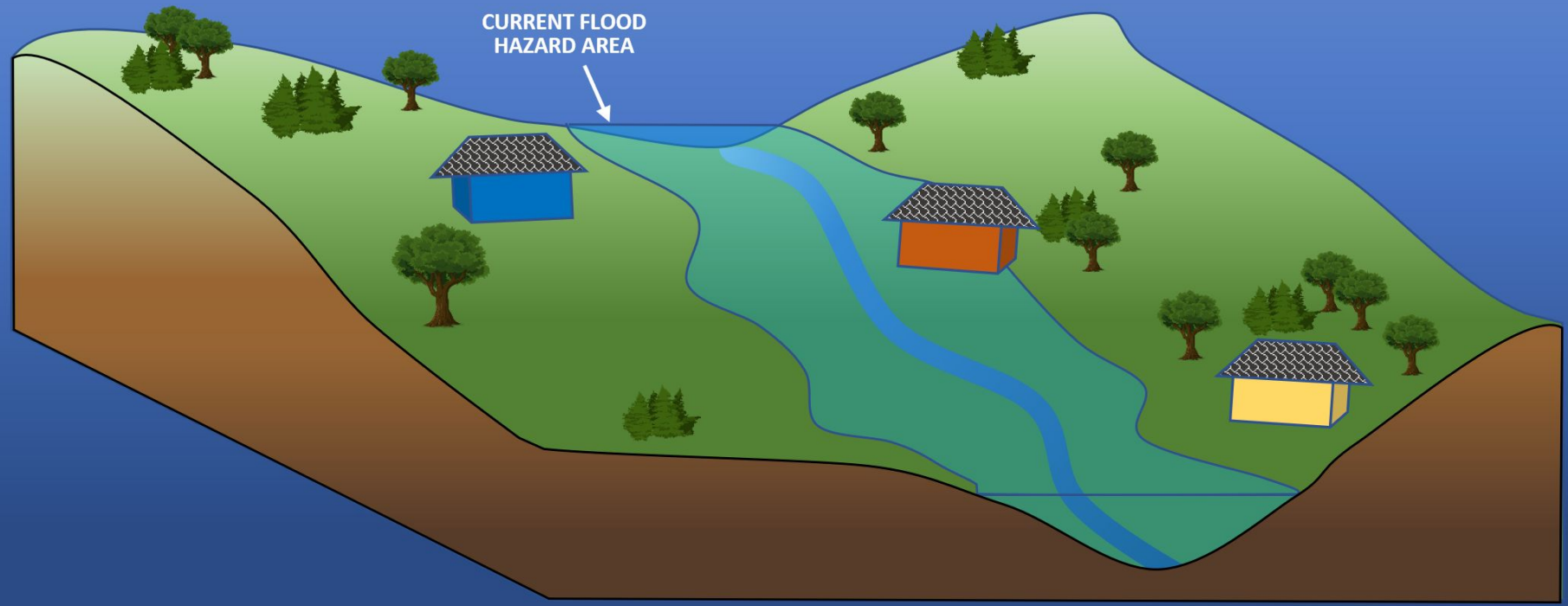

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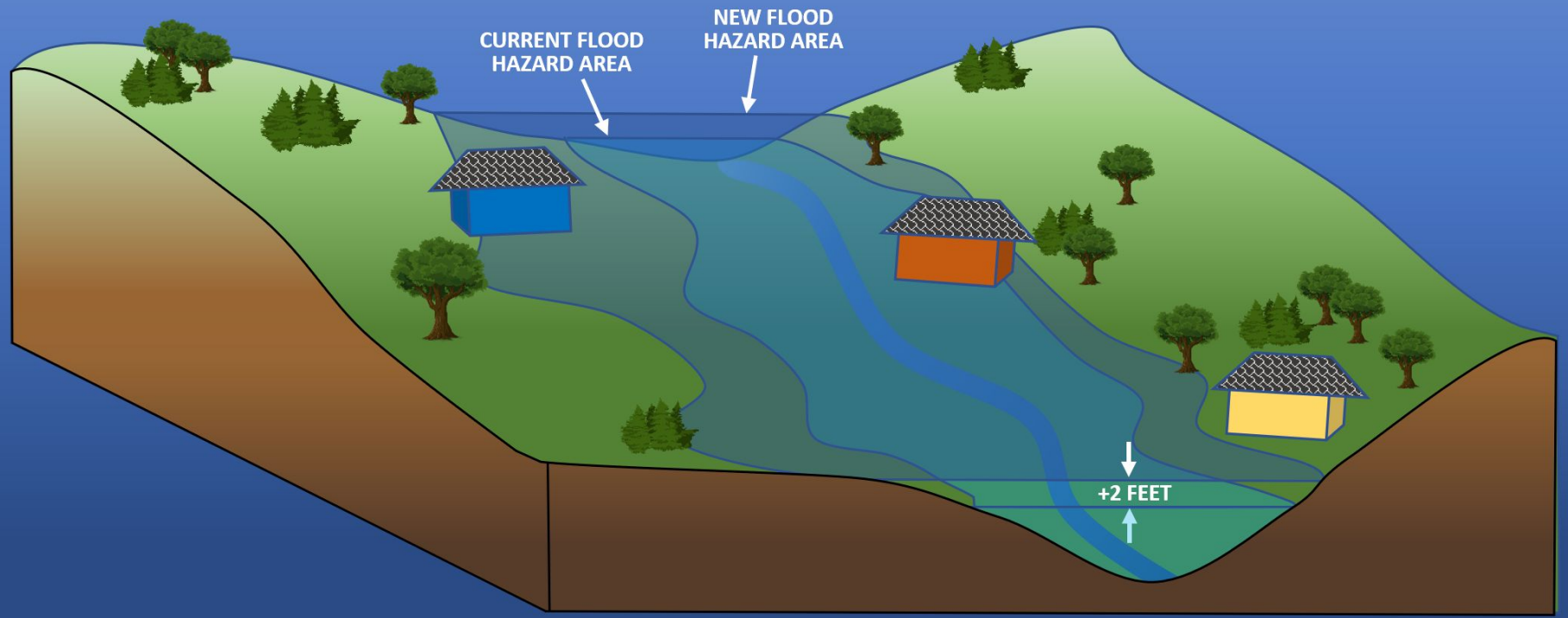


Stormwater Management Rules

Subchapter 5. Design and Performance Standards for Stormwater Management Measures: Two new tables at N.J.A.C. 7:8-5.7 for adjusting NOAA Atlas 14 precipitation for 2019 and 2100:

Table 5-5:
Current Precipitation Adjustment

County	2-Year Design Storm	10-Year Design Storm	100-Year Design Storm
Atlantic	1.01	1.02	1.03
Bergen	1.01	1.03	1.06
Burlington	0.99	1.01	1.04
Camden	1.03	1.04	1.05
Cape May	1.03	1.03	1.04
Cumberland	1.03	1.03	1.01
Essex	1.01	1.03	1.06
Gloucester	1.05	1.06	1.06
Hudson	1.03	1.05	1.09
Hunterdon	1.02	1.05	1.13
Mercer	1.01	1.02	1.04
Middlesex	1.00	1.01	1.03
Monmouth	1.00	1.01	1.02
Morris	1.01	1.03	1.06
Ocean	1.00	1.01	1.03
Passaic	1.00	1.02	1.05
Salem	1.02	1.03	1.03
Somerset	1.00	1.03	1.09
Sussex	1.03	1.04	1.07
Union	1.01	1.03	1.06
Warren	1.02	1.07	1.15

Use this to adjust 1999 rainfall to 2019

Table 5-6:
Future Precipitation Change Factors

County	2-Year Design Storm	10-Year Design Storm	100-Year Design Storm
Atlantic	1.22	1.24	1.39
Bergen	1.20	1.23	1.37
Burlington	1.17	1.18	1.32
Camden	1.18	1.22	1.39
Cape May	1.21	1.24	1.32
Cumberland	1.20	1.21	1.39
Essex	1.19	1.22	1.33
Gloucester	1.19	1.23	1.41
Hudson	1.19	1.19	1.23
Hunterdon	1.19	1.23	1.42
Mercer	1.16	1.17	1.36
Middlesex	1.19	1.21	1.33
Monmouth	1.19	1.19	1.26
Morris	1.23	1.28	1.46
Ocean	1.18	1.19	1.24
Passaic	1.21	1.27	1.50
Salem	1.20	1.23	1.32
Somerset	1.19	1.24	1.48
Sussex	1.24	1.29	1.50
Union	1.20	1.23	1.35
Warren	1.20	1.25	1.37

Use this to adjust 1999 rainfall to 2100

Stormwater Management Rules

Subchapter 5: Design and Performance Standards for Stormwater Management Measures

N.J.A.C. 7:8-5.4 Groundwater recharge standards

- Where an applicant proposes to recharge the increase of stormwater runoff volume from pre-construction to post-construction, they will now need to calculate these volumes using the projected year 2100 two-year storm in Table 5-6

N.J.A.C. 7:8-5.6 Stormwater runoff quantity standards

- Applicants now need to demonstrate compliance for six different sets of precipitation:
  - Year 2019 precipitation:
    - Existing and proposed 2-year storm
    - Existing and proposed 10-year storm
    - Existing and proposed 100-year storm
  - Year 2100 precipitation:
    - Existing and proposed 2-year storm
    - Existing and proposed 10-year storm
    - Existing and proposed 100-year storm

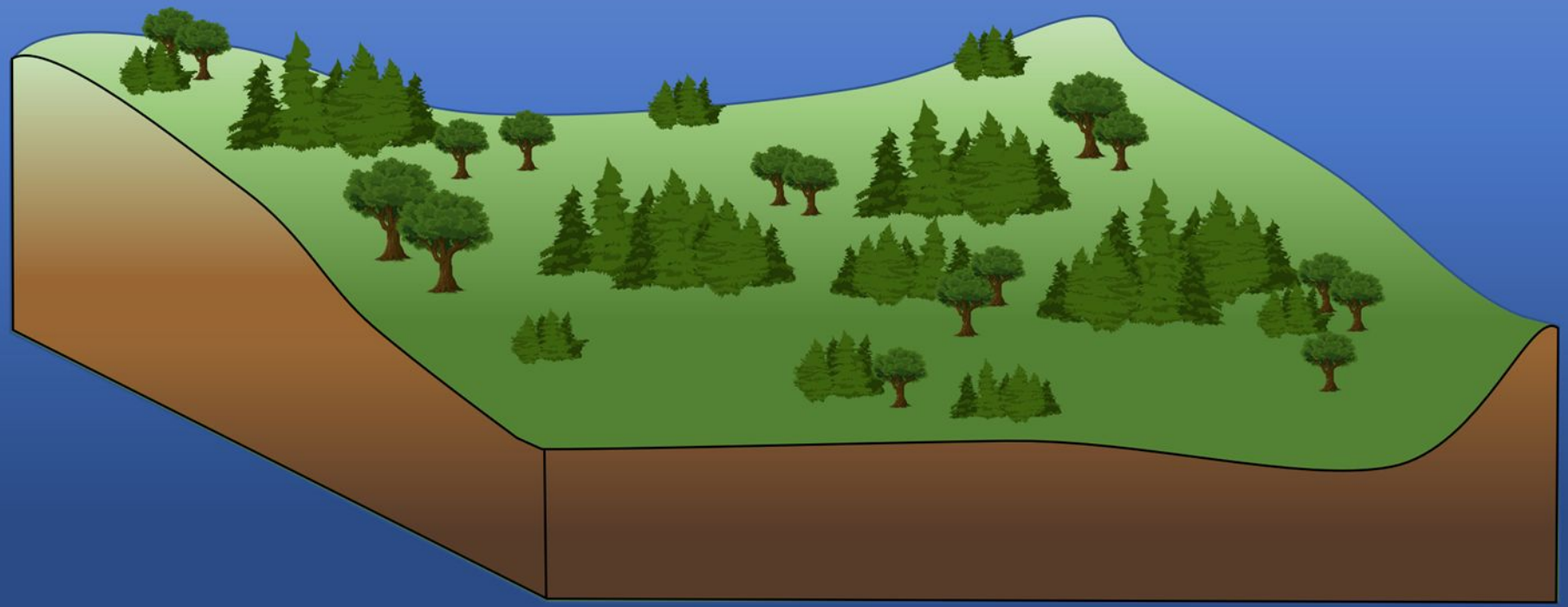
Necessary to ensure that the BMPs will work for today's runoff and also for future runoff

STORMWATER EXAMPLE:

2.5 Acre Site

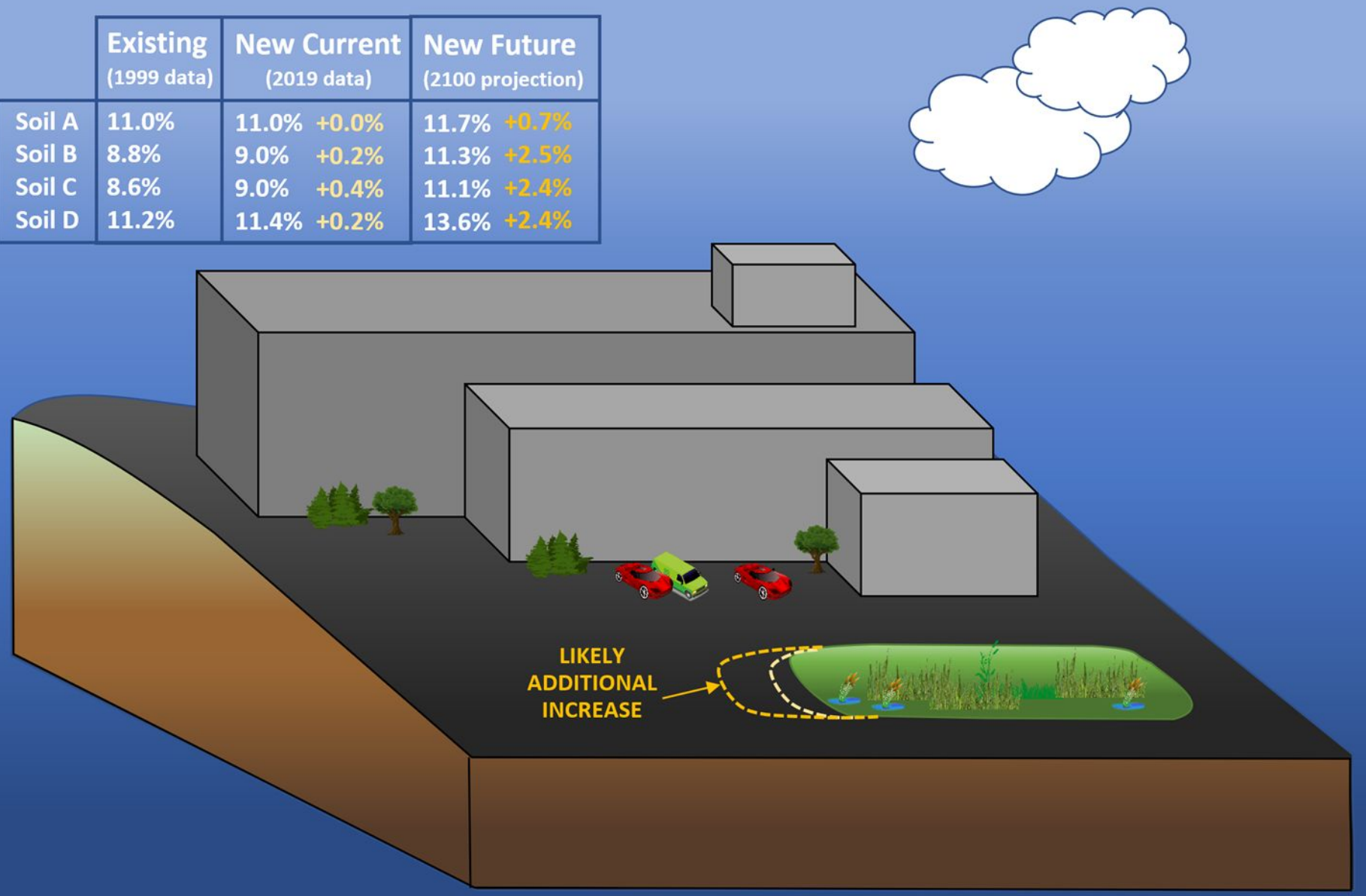
Existing Conditions: Forested and Undeveloped

Sussex County



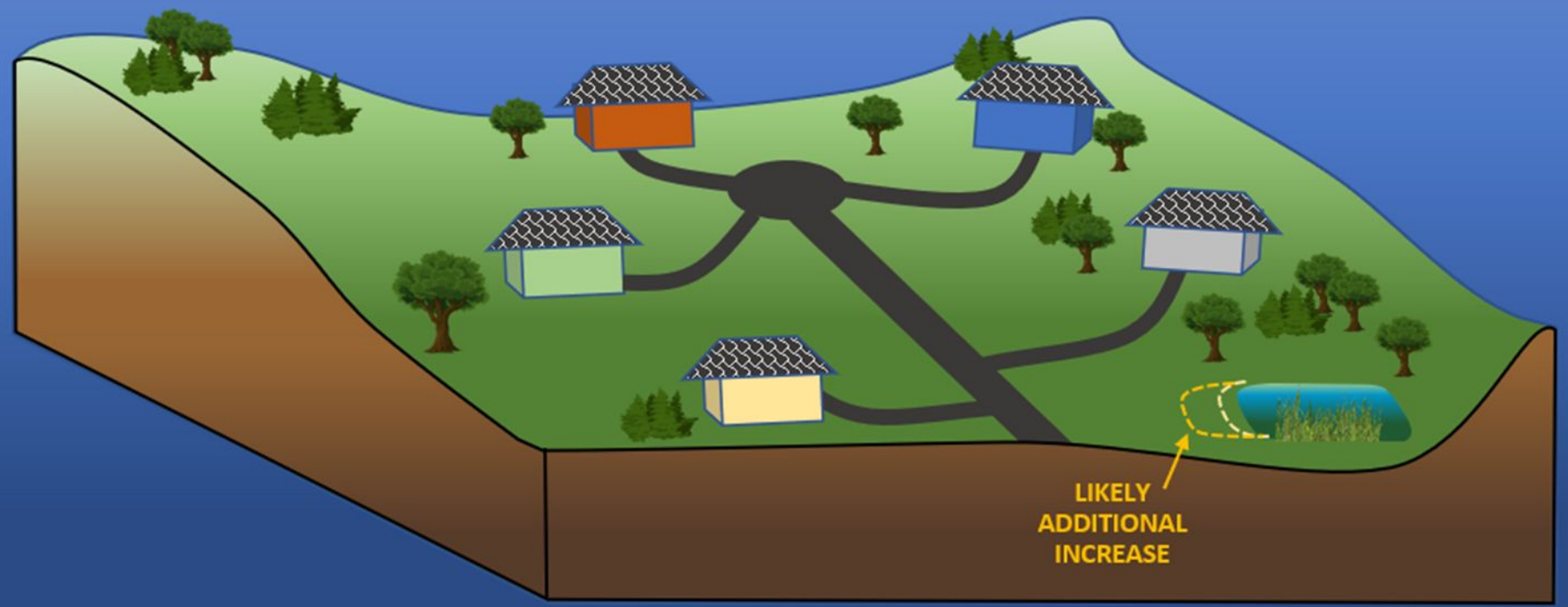
SIZE OF BMP (% OF SITE)

	Existing (1999 data)	New Current (2019 data)	New Future (2100 projection)
Soil A	11.0%	11.0% +0.0%	11.7% +0.7%
Soil B	8.8%	9.0% +0.2%	11.3% +2.5%
Soil C	8.6%	9.0% +0.4%	11.1% +2.4%
Soil D	11.2%	11.4% +0.2%	13.6% +2.4%



SIZE OF BMP (% OF SITE)

	Existing (1999 data)	New Current (2019 data)		New Future (2100 projection)	
Soil A	4.1%	4.1%	+0.0%	4.7%	+0.6%
Soil B	3.9%	4.1%	+0.2%	5.5%	+1.6%
Soil C	4.3%	4.5%	+0.2%	5.9%	+1.6%
Soil D	5.9%	6.1%	+0.3%	8.0%	+2.1%



NJPACT: Resilient Environment And Landscapes (REAL) Reforms

To address the unavoidable impacts of climate change, such as sea-level rise, extreme weather, and chronic flooding, NJDEP is pursuing targeted regulatory reforms that will modernize the land use rules and focus on increased resiliency throughout the State.

- **Protect against chronic inundation, sea-level rise, and flood damage**
- **Protect critical facilities and infrastructure**
- **Protect land and water resources**
- **Manage stormwater runoff for today and tomorrow's precipitation**
- **Encourage nature-based solutions**
- **Support renewable energy deployment**
- **Improve DEP permitting processes**

COASTAL INUNDATION & FLOOD DAMAGE

Rutgers University's Science and Technical Advisory Panel (STAP) Report indicates a 50% probability that sea level rise will exceed 3.3 feet and a 17% probability that sea level rise will exceed 5.1 feet by 2100 assuming moderate emissions.

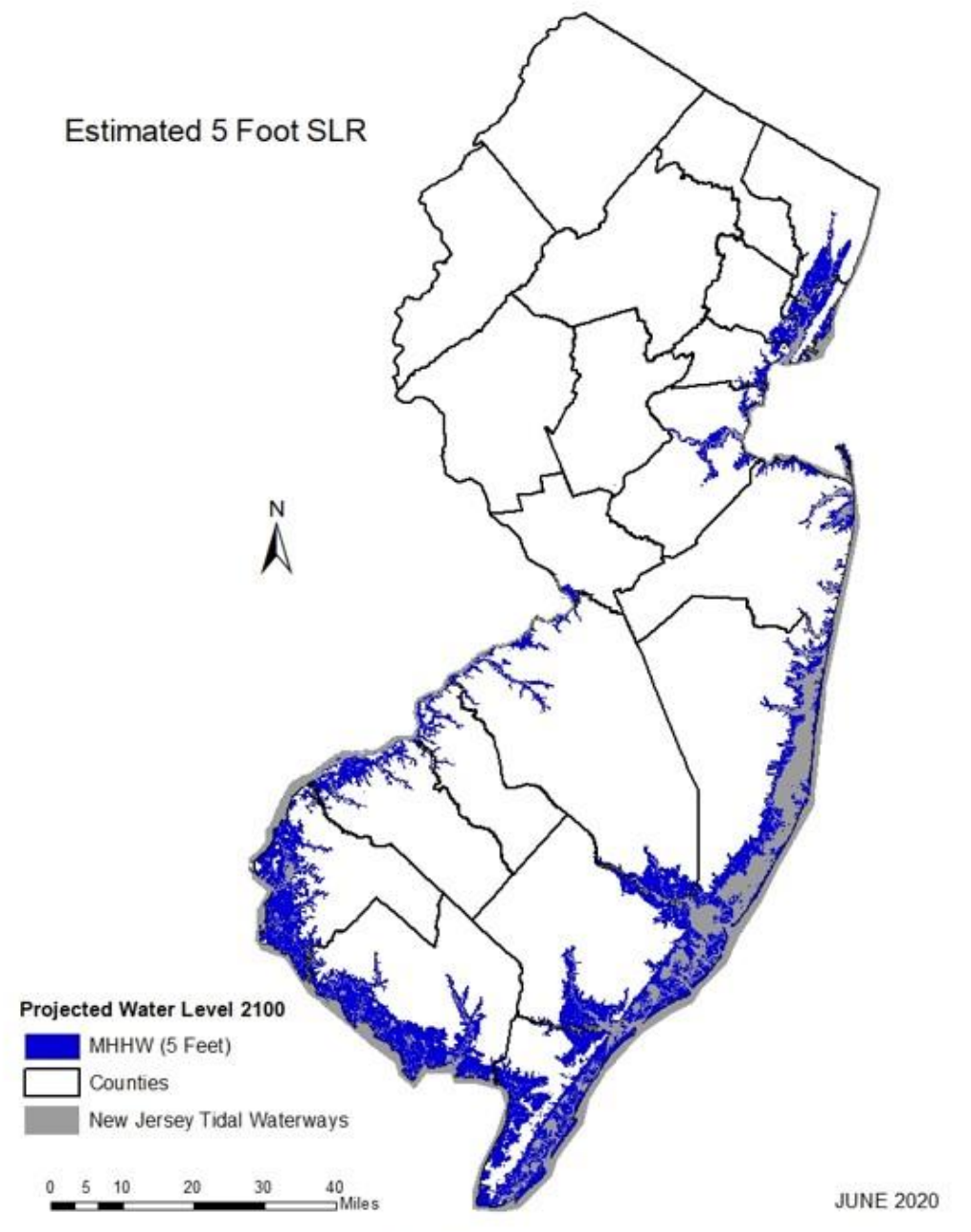
Sea-level rise:

Table ES-1: New Jersey Sea-Level Rise above the year 2000 (1991-2009 average) baseline (ft)*

		2030	2050	2070			2100			2150		
				Emissions								
	Chance SLR Exceeds			Low	Mod.	High	Low	Mod.	High	Low	Mod.	High
Low End	> 95% chance	0.3	0.7	0.9	1	1.1	1.0	1.3	1.5	1.3	2.1	2.9
Likely Range	> 83% chance	0.5	0.9	1.3	1.4	1.5	1.7	2.0	2.3	2.4	3.1	3.8
	~50 % chance	0.8	1.4	1.9	2.2	2.4	2.8	3.3	3.9	4.2	5.2	6.2
	<17% chance	1.1	2.1	2.7	3.1	3.5	3.9	5.1	6.3	6.3	8.3	10.3
High End	< 5% chance	1.3	2.6	3.2	3.8	4.4	5.0	6.9	8.8	8.0	13.8	19.6

**2010 (2001-2019 average) Observed = 0.2 ft*

FIX DATA GAPS TO PROTECT COASTAL INVESTMENTS



Sea Level Rise = More land regularly or permanently inundated

More Inundation = Higher flood elevations

Higher Elevations = More recurring flood damage

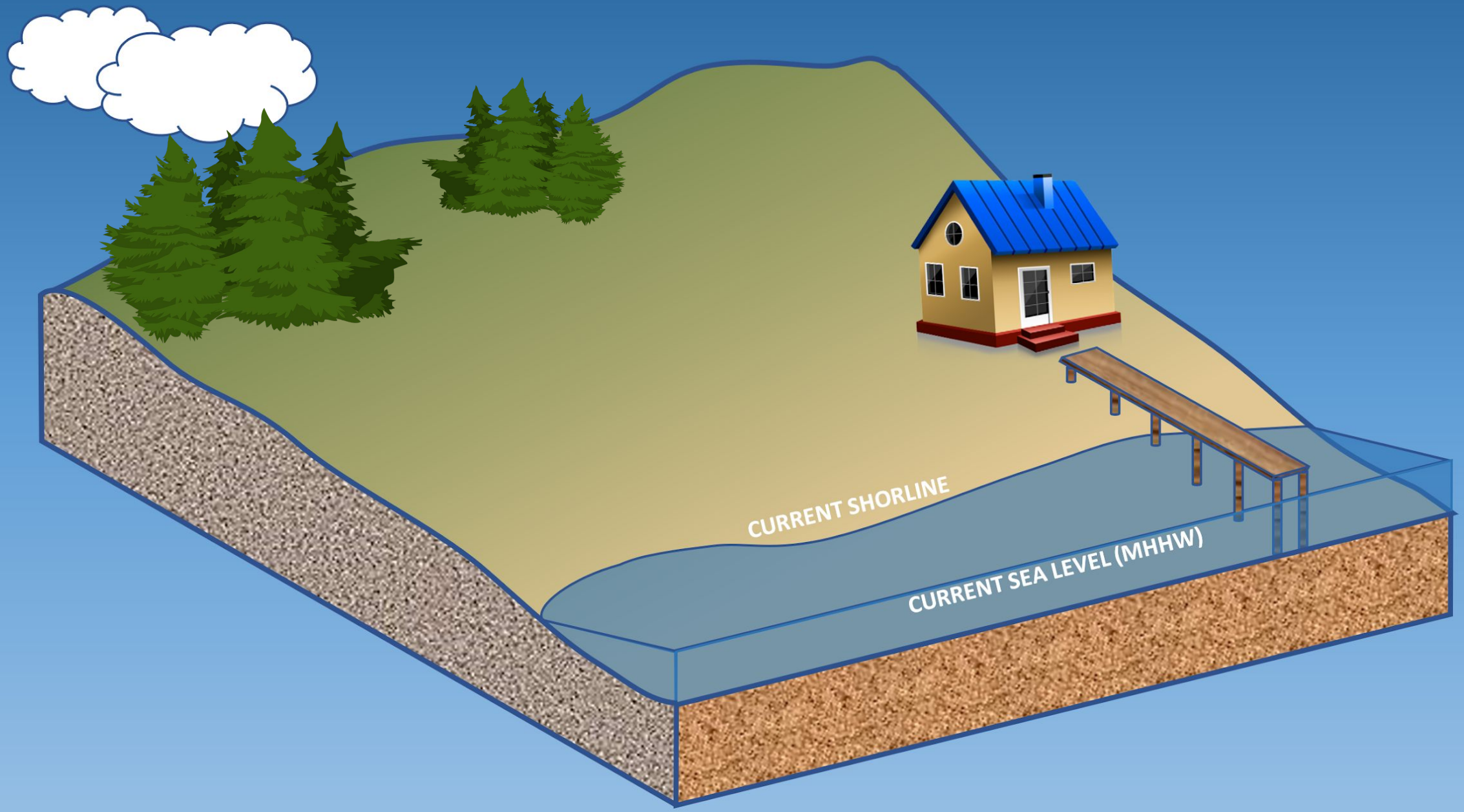
Existing standards are based on outdated historical trends that do not account for sea-level rise and attendant storm surge

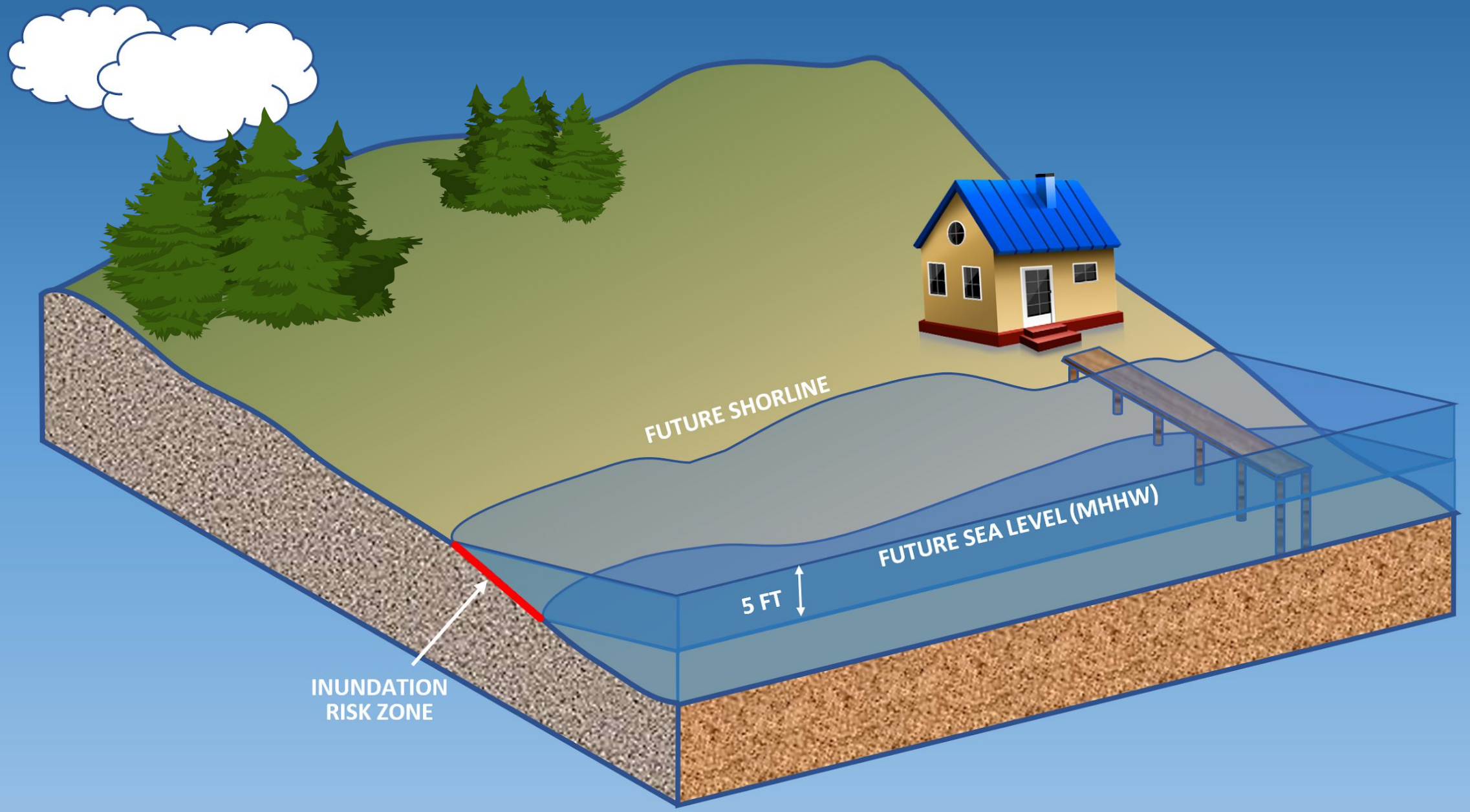
- **NJ-specific science: 5.1 ft of sea-level rise by 2100**
  - **Predicated on *moderate* SLR scenarios**
  - ***Worst case SLR scenario is 8.8 ft by 2100***

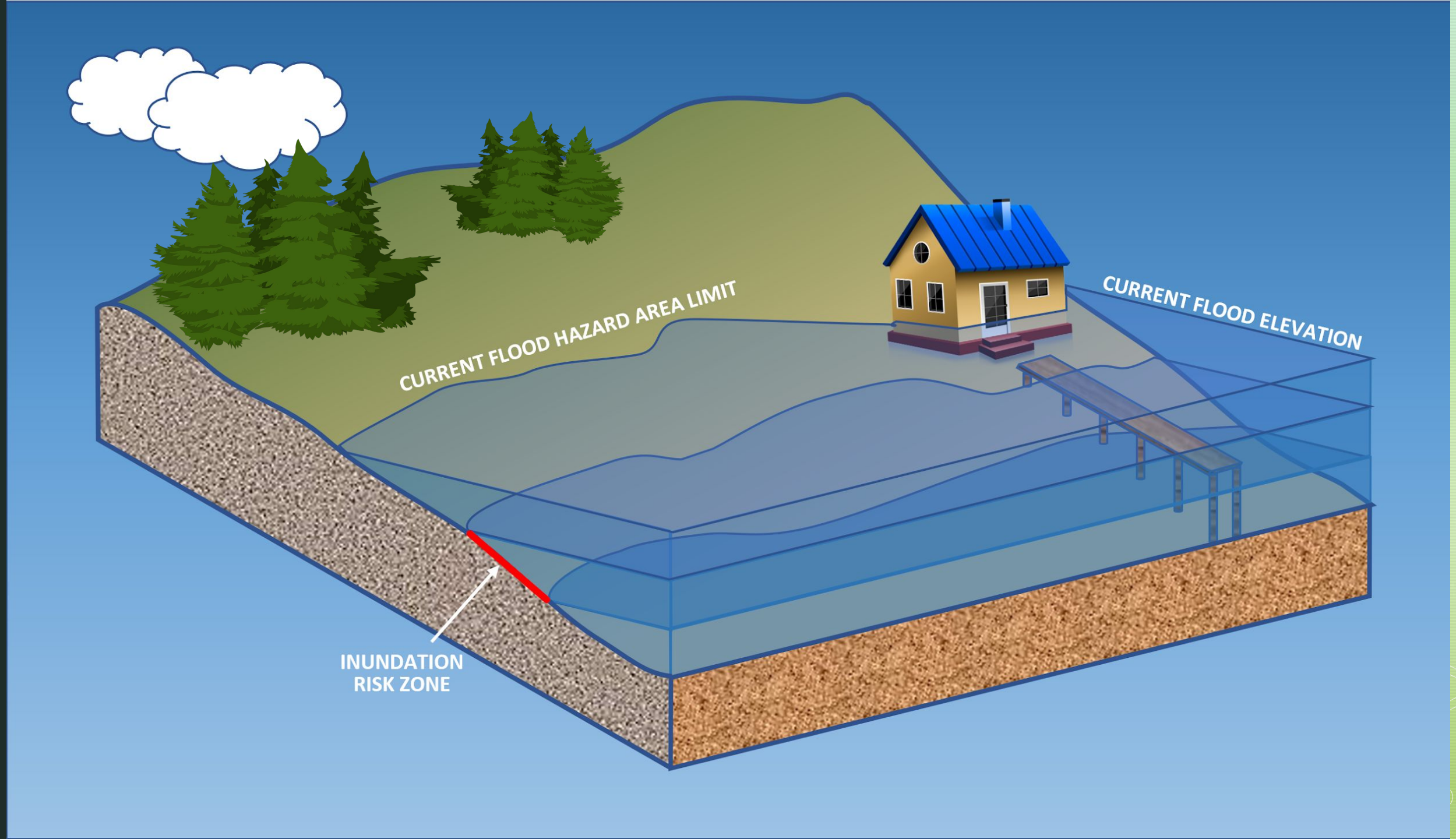
Reliance on incomplete and inaccurate data leads to inadequate risk assessment and substandard design criteria for buildings and infrastructure.

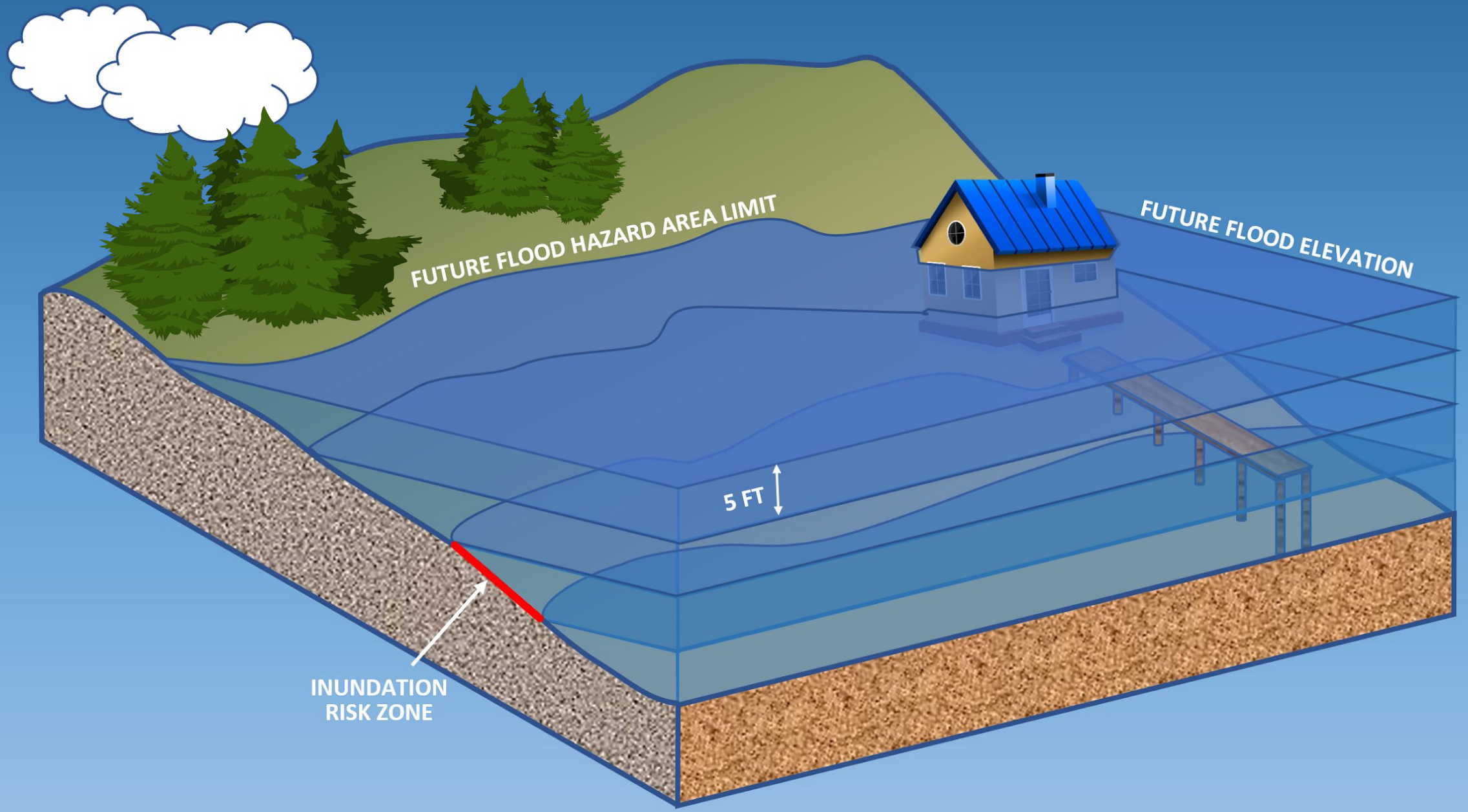
Tidal Flood Hazard Areas

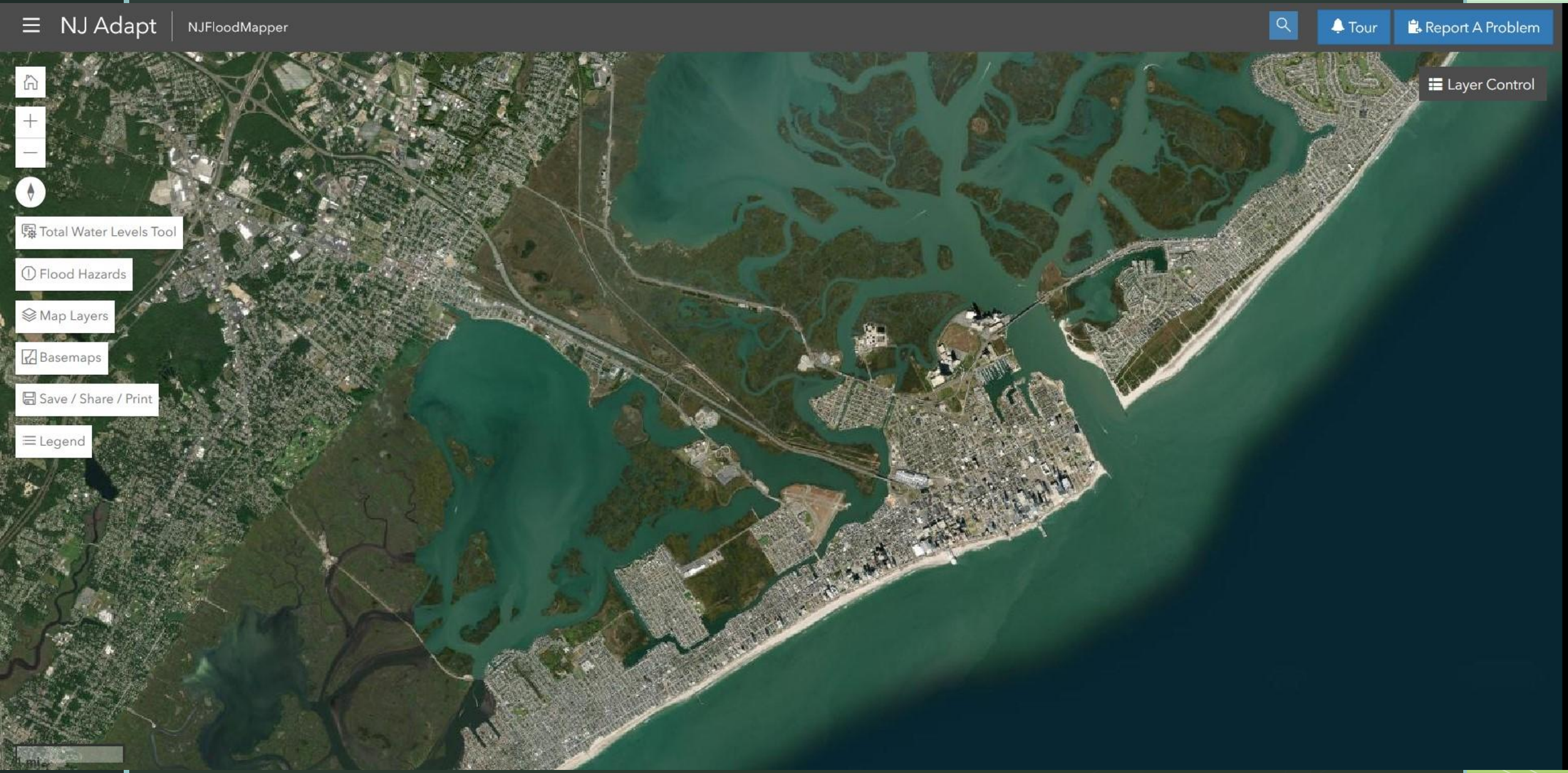
- Existing tidal floodplain is based on the higher of FEMA's effective or preliminary 100-year flood elevation.
- The contemplated **Climate Adjusted Flood Elevation (CAFE)** in tidal areas would be five feet above FEMA's 100-year flood elevation to account for expected rises in sea level.

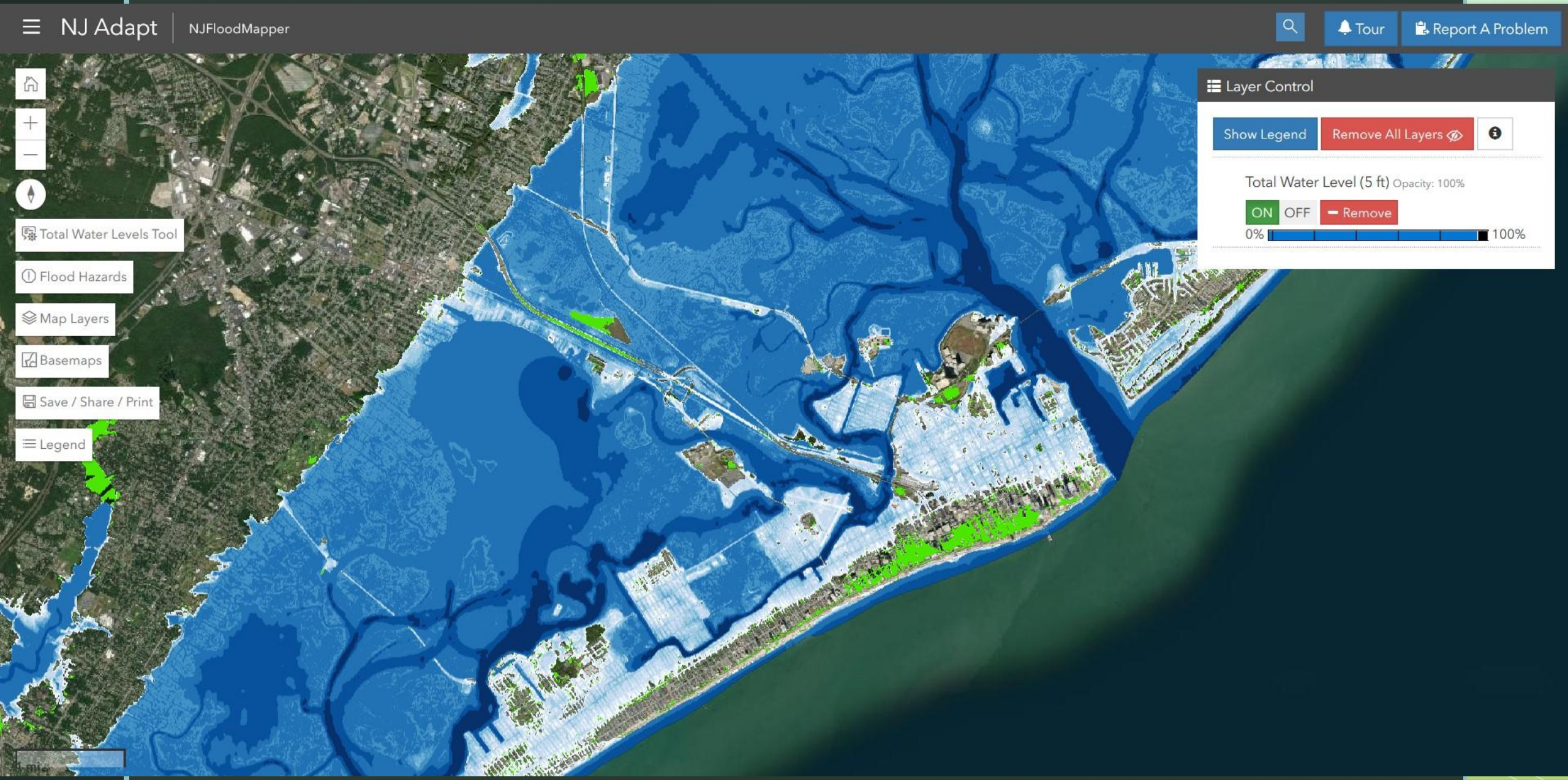

CURRENT SHORLINE
CURRENT SEA LEVEL (MHHW)


FUTURE SHORLINE
FUTURE SEA LEVEL (MHHW)
5 FT
INUNDATION
RISK ZONE


CURRENT FLOOD HAZARD AREA LIMIT
CURRENT FLOOD ELEVATION
INUNDATION
RISK ZONE


FUTURE FLOOD HAZARD AREA LIMIT
FUTURE FLOOD ELEVATION
5 FT
INUNDATION
RISK ZONE


NJ Adapt
NJFloodMapper
Tour
Report A Problem
Layer Control
Total Water Levels Tool
Flood Hazards
Map Layers
Basemaps
Save / Share / Print
Legend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Legend
Layer Control
Show Legend
Remove All Layers
Total Water Level (5 ft) Opacity: 100%
ON
OFF
Remove
0%
100%

QUESTIONS?

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- www.nj.gov/dep