Defining the Threat: Conducting a Successful Hazard Risk Analysis

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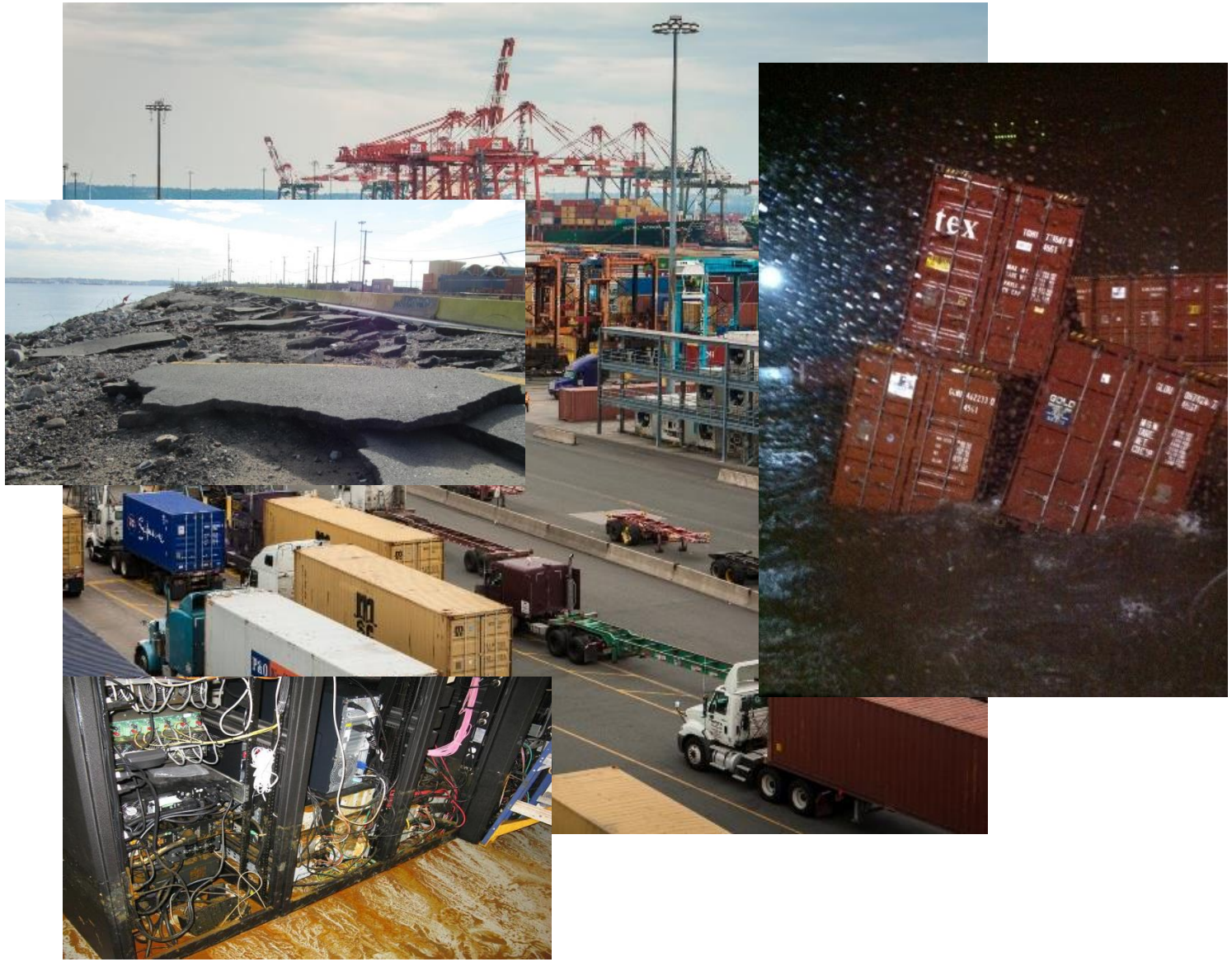
American Association of Port Authorities

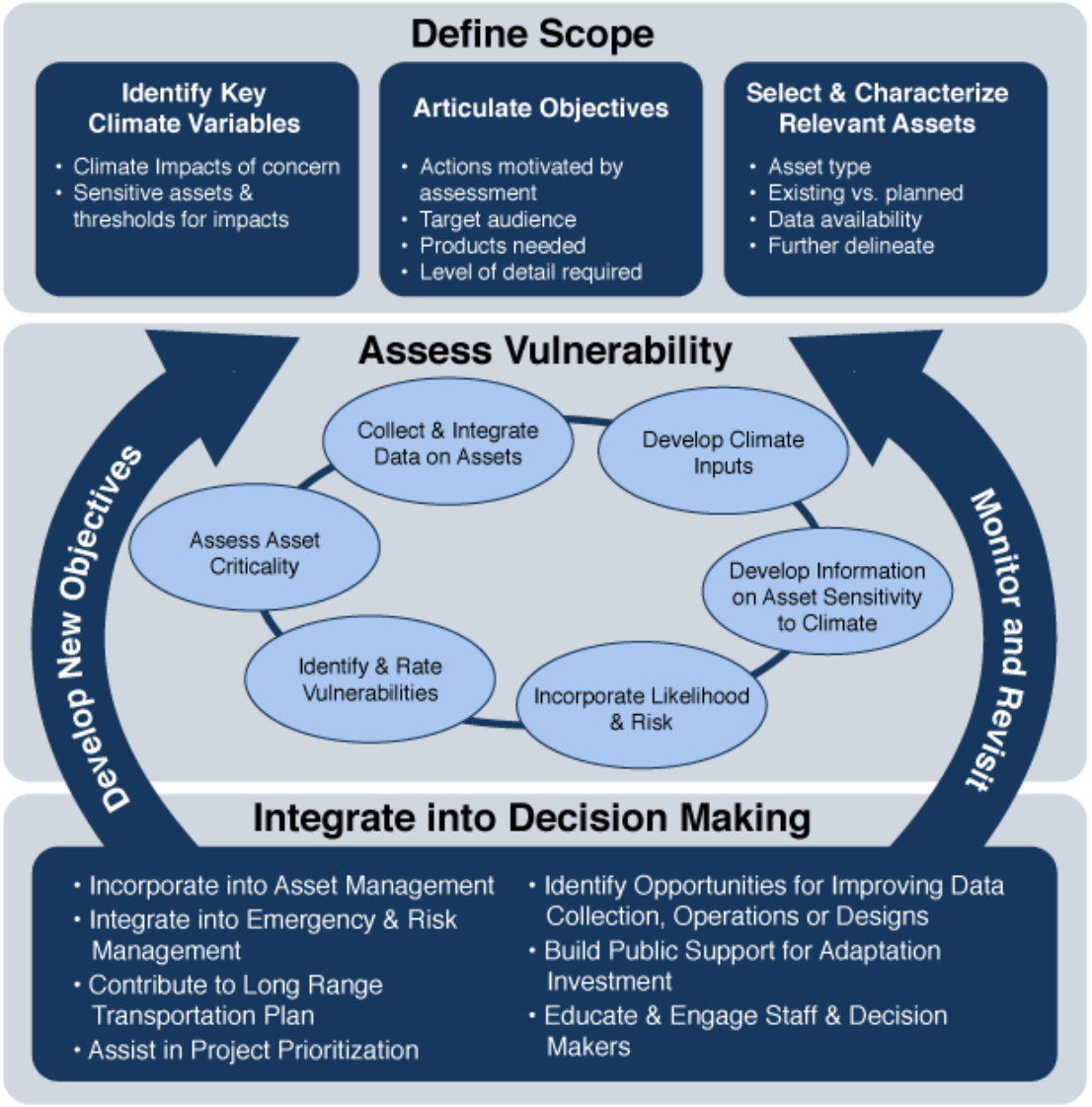
Agenda

- Evaluating Vulnerability
  - Sensitivity
  - Exposure
  - Adaptive Capacity
- Assessing Risks
- Pivoting To Resilience



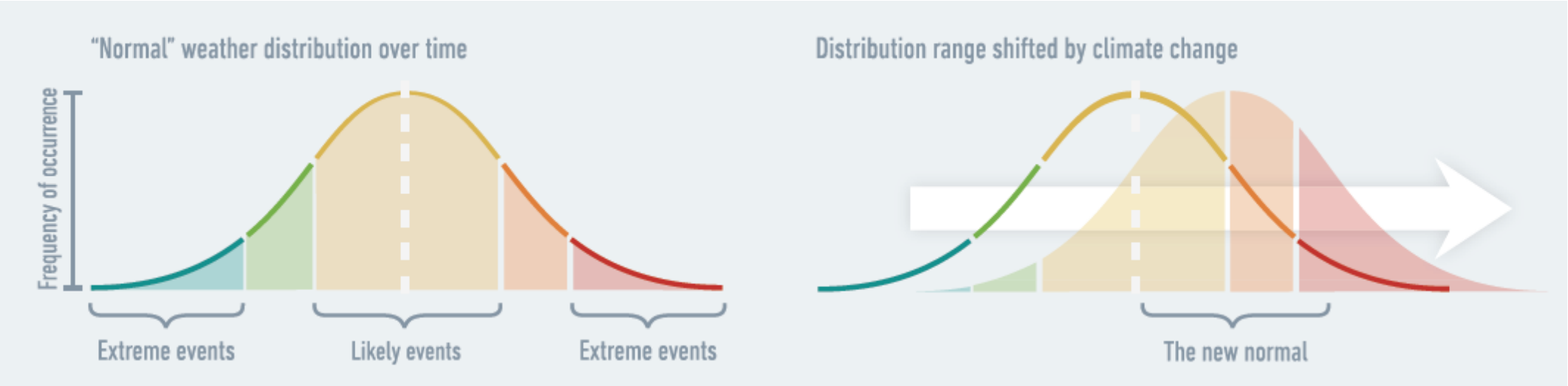
FHWA Framework for Vulnerability

- Sensitivity- stressors of interest
- Exposure- impacted assets and business processes
- Adaptive Capacity- how resilient?

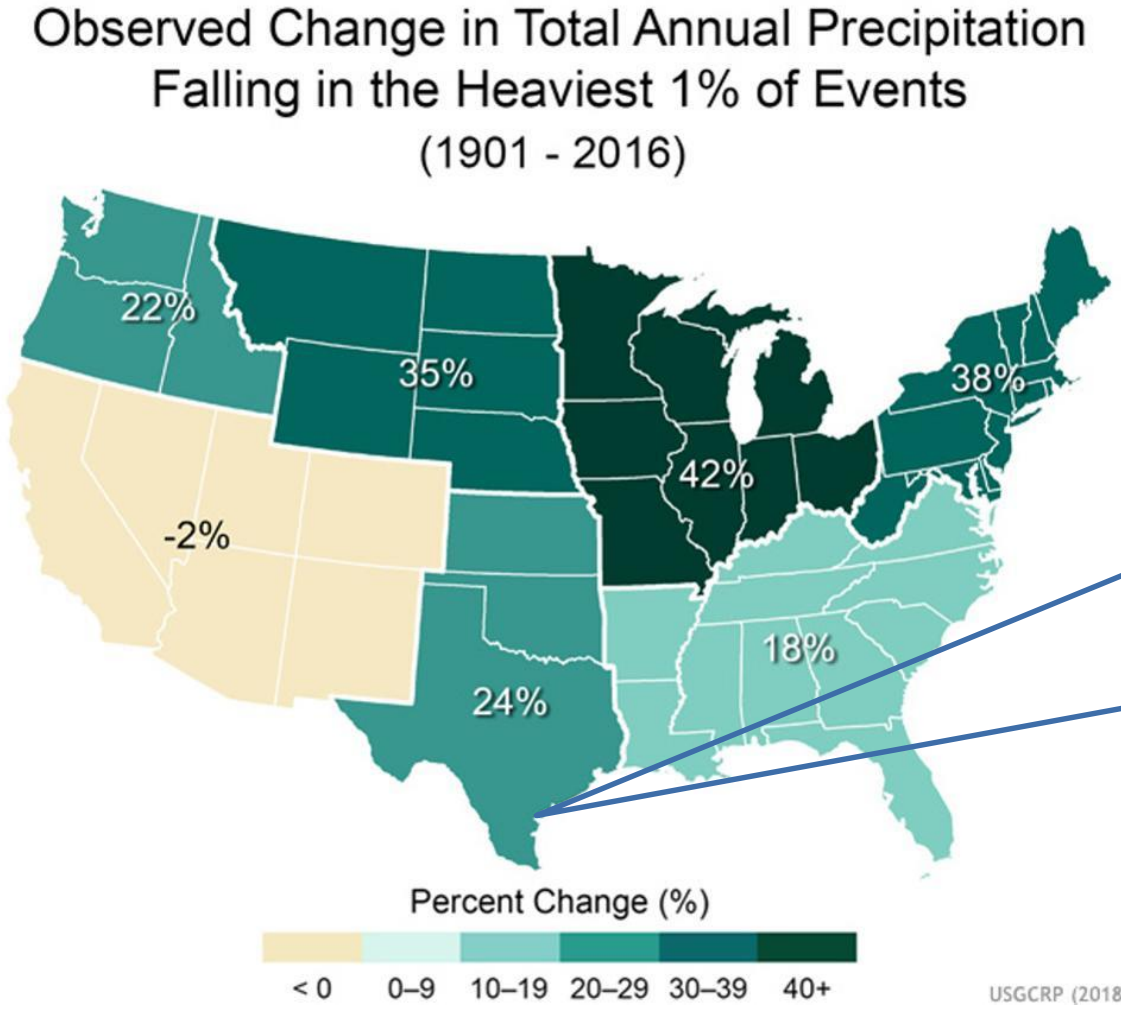


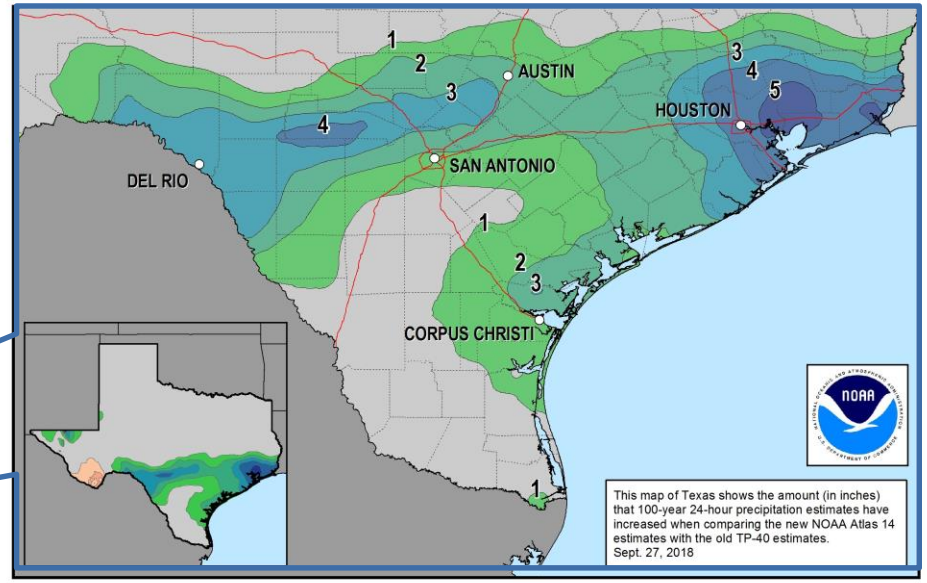
Sensitivity- Storm Surge & SLR

- Shifts in frequency increase flooding
- Sea level increases are shifting the distribution of events…



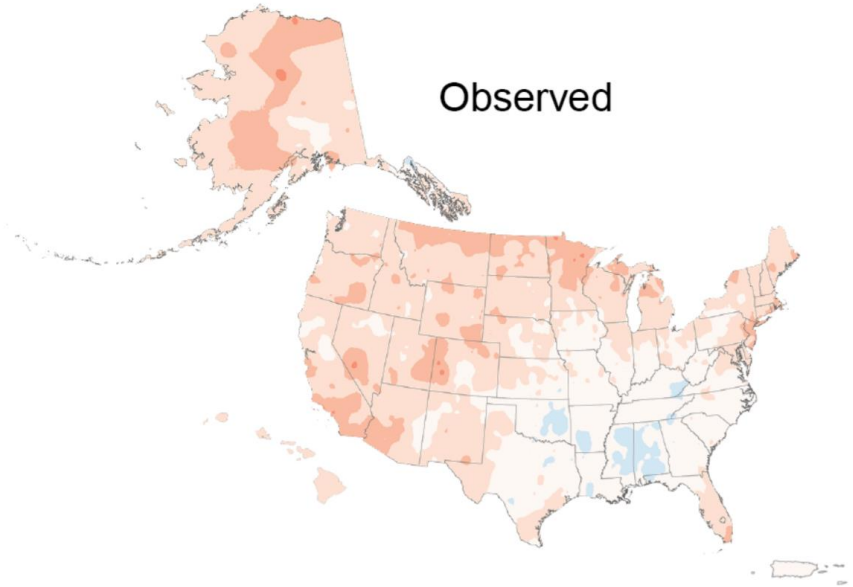
Sensitivity- Increased Precipitation

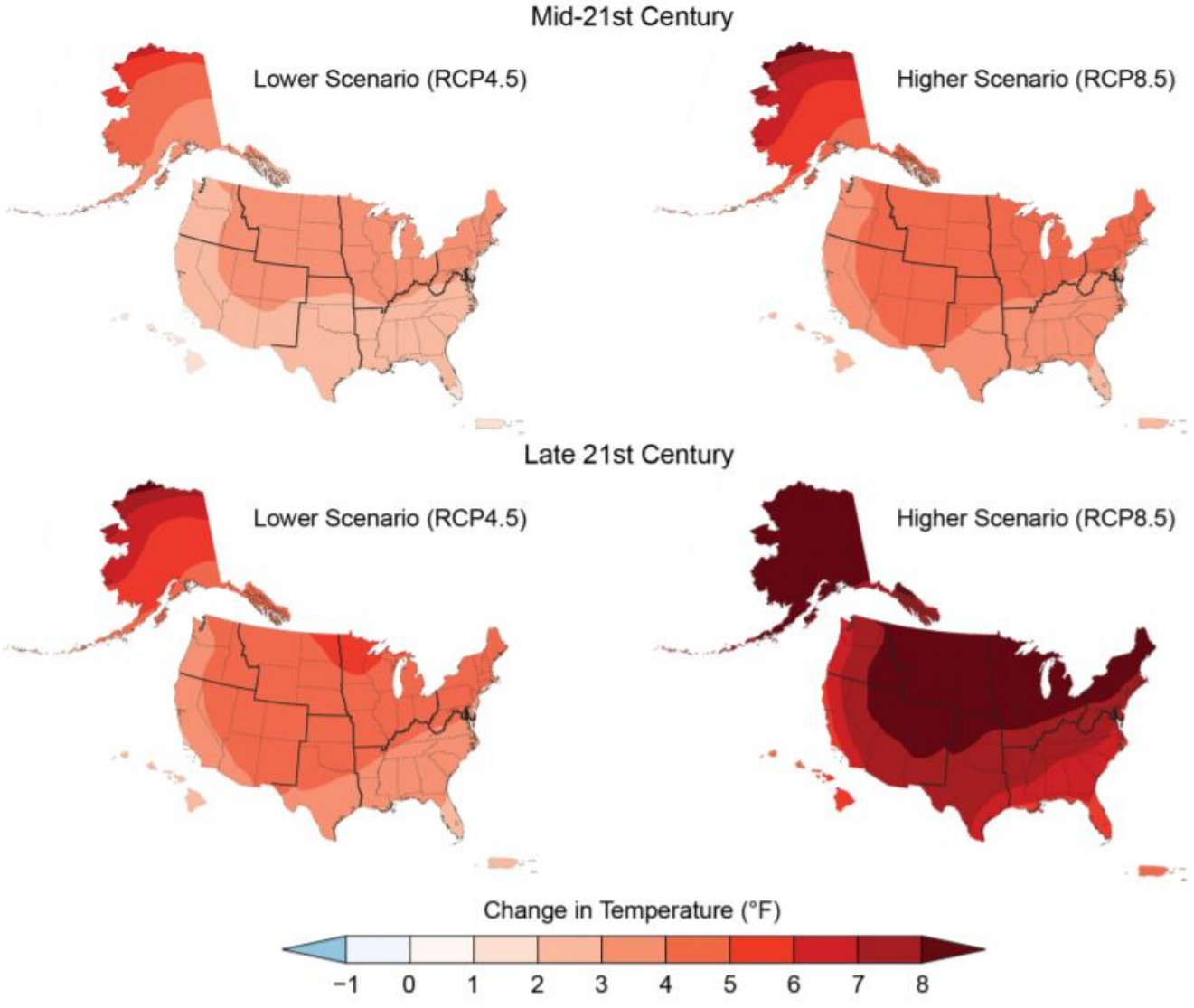




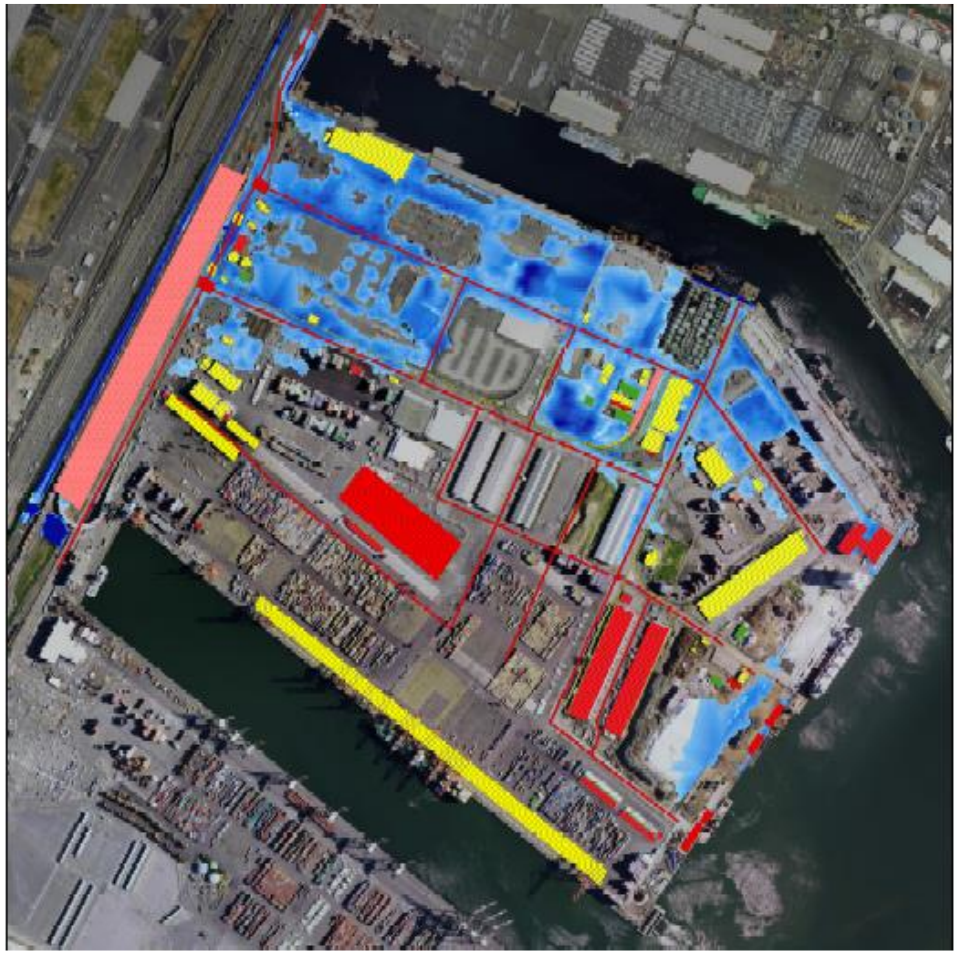
Sensitivity- Higher Temperatures

- Change in temperature across the United States.
- Mid-21st Century is 2036-2065
- Late 21st Century is 2071–2100



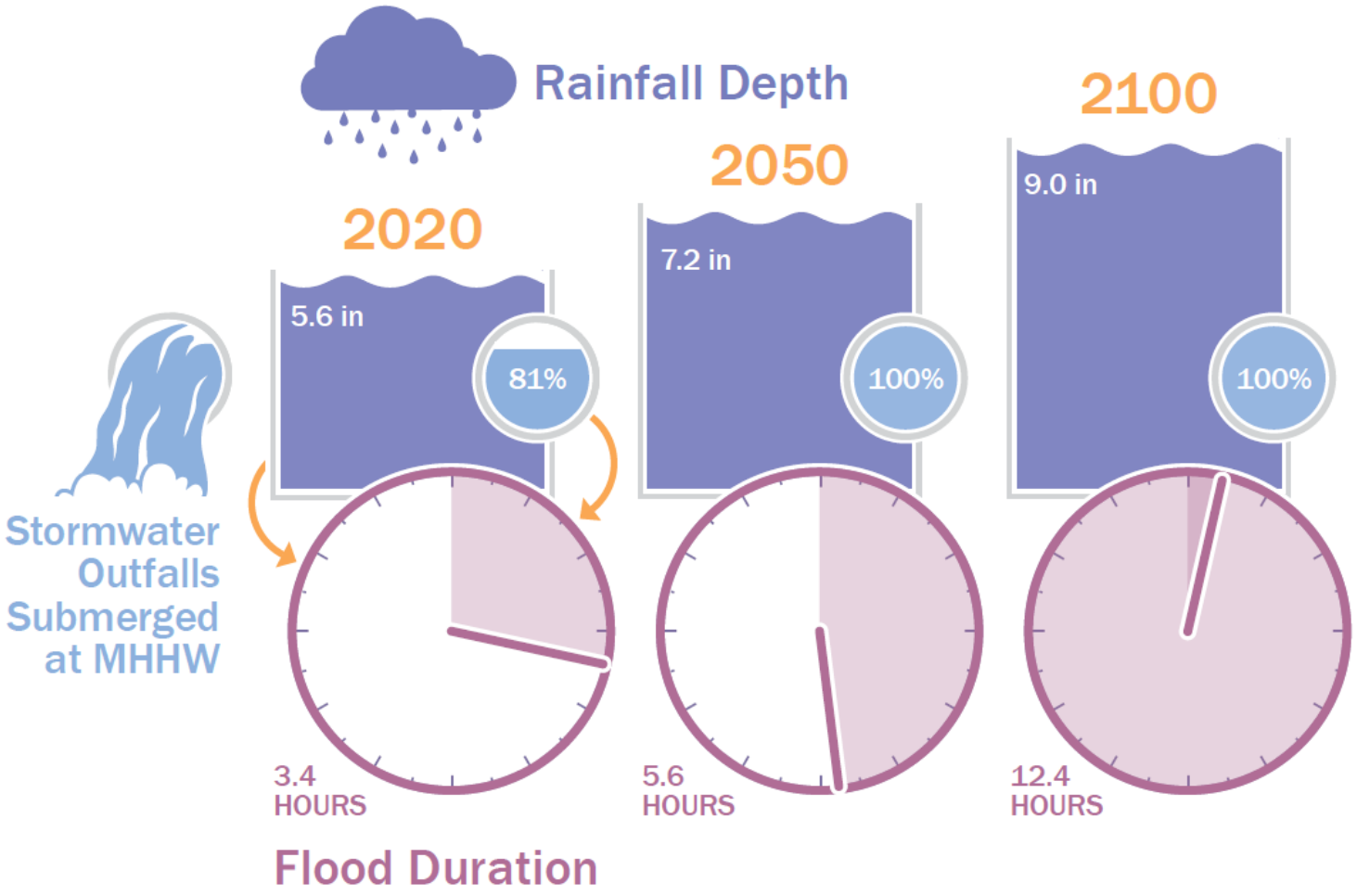


Exposure- Storm Surge & SLR



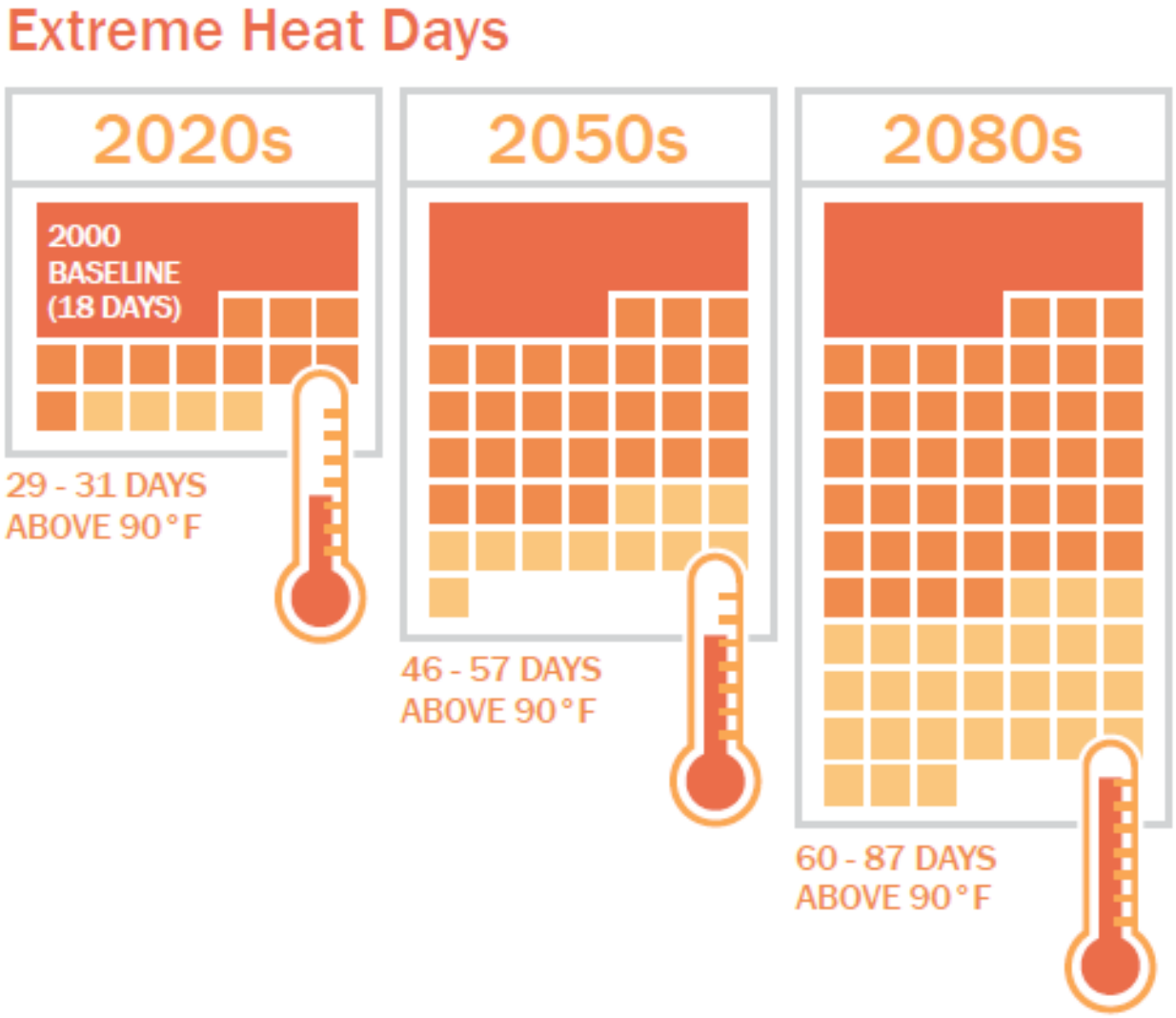
Exposure- Precipitation and Stormwater

- Clear signal in data for increased precipitation- e.g. NOAA Atlas 14
- Drainage system capacity limits
- Greater extent, depth, and duration of flooding.



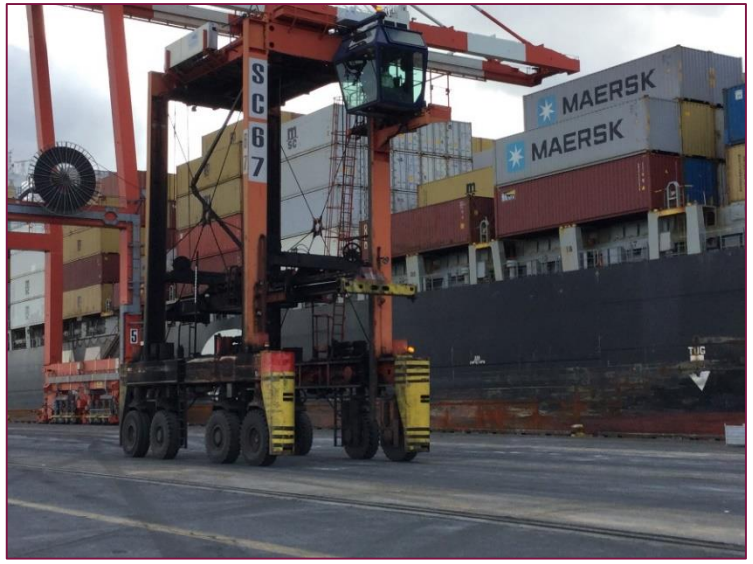
Exposure- Higher Temperatures

- Stress to high value cargo
- Infrastructure impacts (e.g. rail buckling)
- Worker safety and productivity impacts
- Reduced throughput
- Impacts to IT systems



Adaptive Capacity

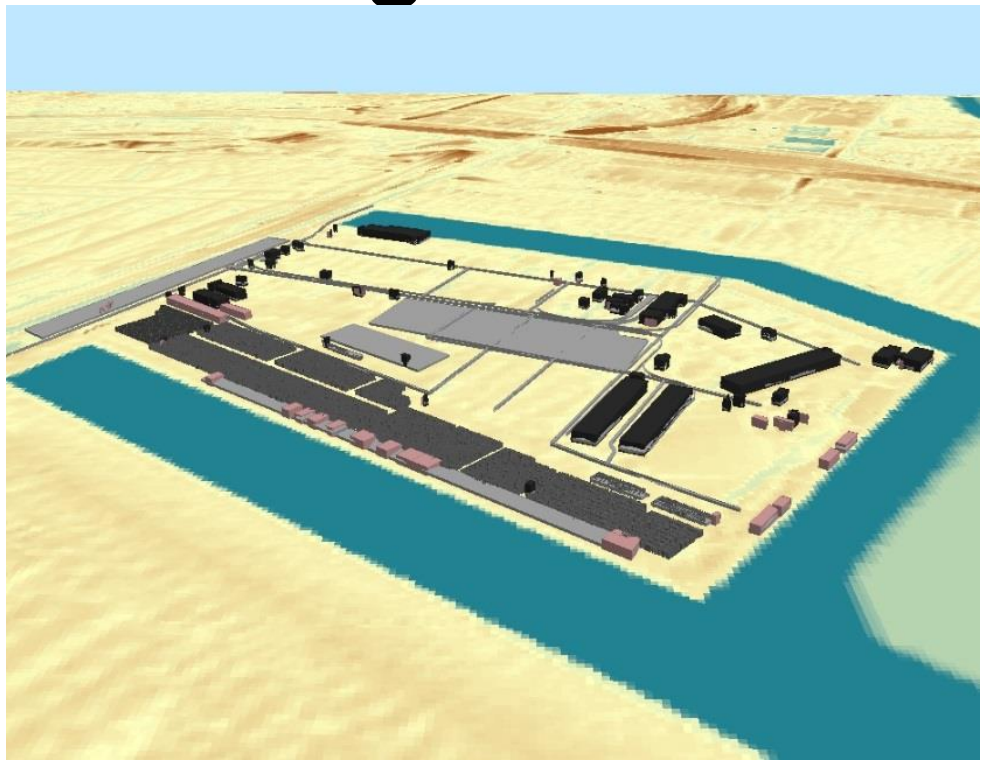
- Elevation
- Relocation
- Protection
- Accommodation

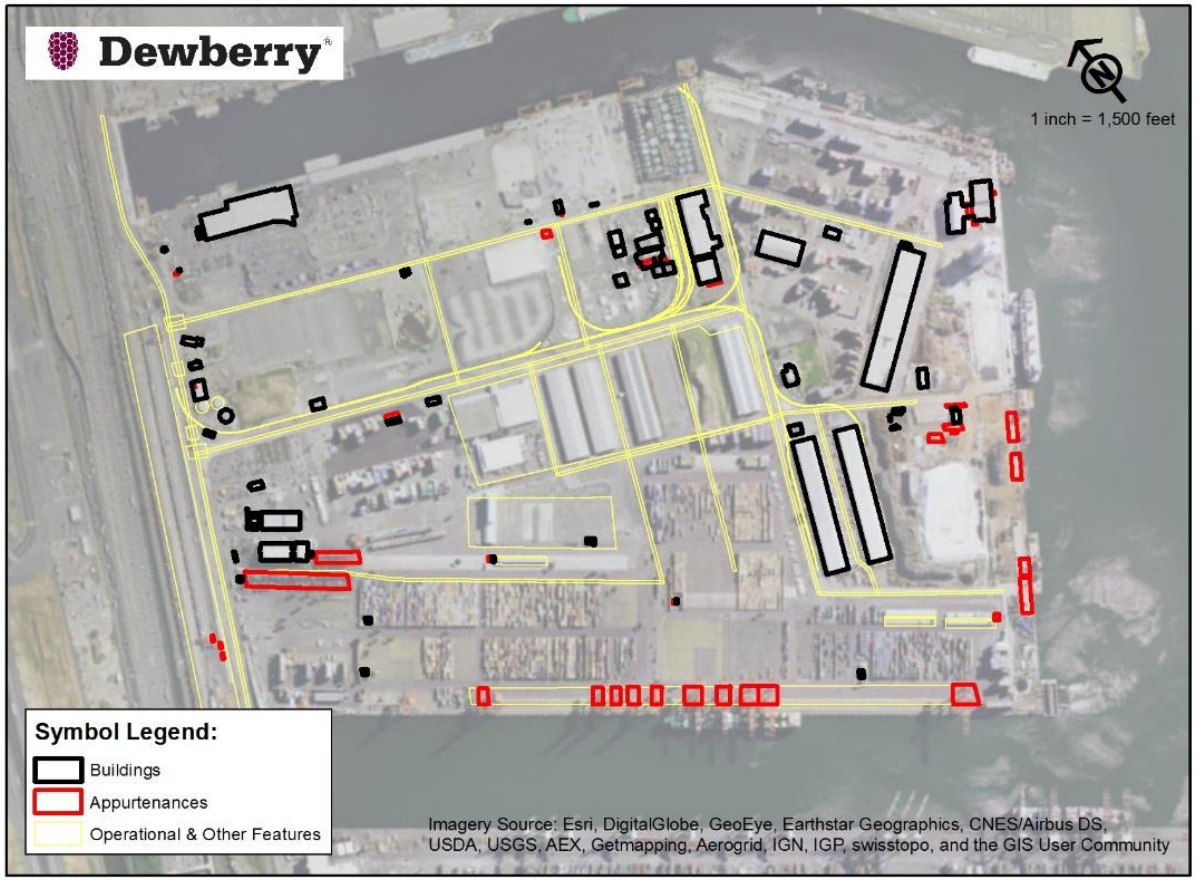


Areas of Adaptation Interest by Ports

	Los Angeles	Long Beach	Baltimore	MASSPORT	Seattle	Tacoma	Rotterdam	Cartagena	Freeport, TX
Hazard Mitigation Plans			X				X		
Upgrade/Enhance Building Codes	X	X	X	X	X	X	X		X
Harden Structures	X	X		X			X		X
Elevate Structures/Equipment	X	X	X	X	X	X	X	X	X
Elevate Structures in the Future									
Barriers Around Individual Structures	X	X		X			X		X
Specialized Building Materials				X					
Approach to Storm Drains/Outfalls	X	X	X	X	X	X	X	X	X
Coordination Between Tenants						X			
Property Acquisition/Port Expansion			X						
Commercial Approach	X	X					X		

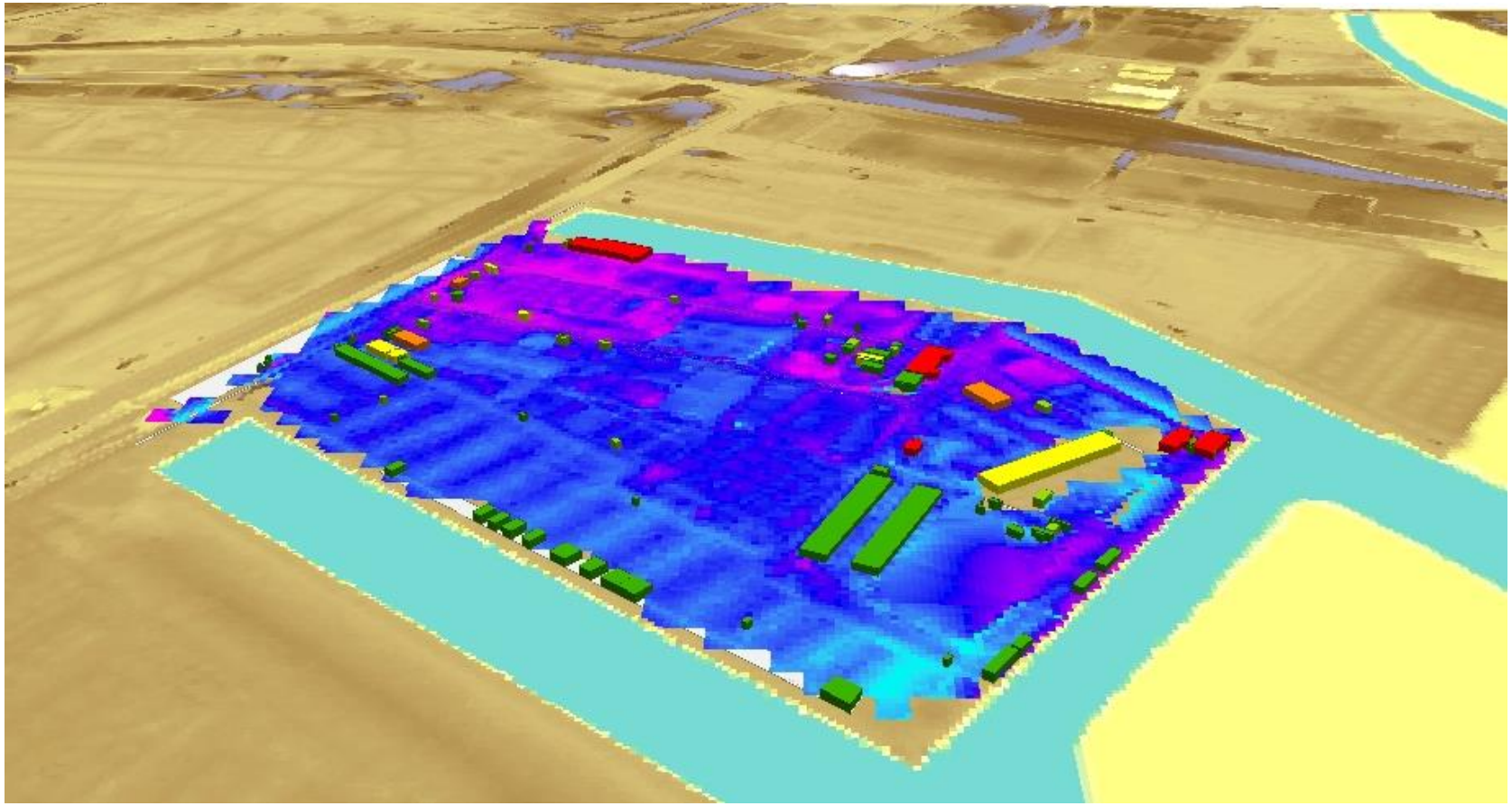
Assessing Risks





- Buildings (Black)
- Appurtenances (Red)
  - cranes, sub-station transformers, truck weight scales

Assessing Risks



1% Annual Chance Event– Building Losses

Assessing Risks

		Frequency Event $Dollar Loss				
Scenario	Loss Type	10	50	100	500	AAL
S0	Building Loss	$ 2,617,986	$ 30,246,143	$ 52,972,377	$ 110,531,341	$ 2,605,735
	Contents Loss	$ 5,035,086	$ 47,871,731	$ 85,831,163	$ 161,963,028	$ 4,099,890
	Inventory Loss	$ 4,022,842	$ 66,031,314	$ 86,673,194	$ 140,450,405	$ 4,755,084
S1	Building Loss	$ 9,370,747	$ 45,244,205	$ 74,269,496	$ 122,333,611	$ 3,813,246
	Contents Loss	$ 14,066,056	$ 73,078,270	$ 109,750,299	$ 184,569,462	$ 5,946,334
	Inventory Loss	$ 16,518,464	$ 76,476,202	$ 102,893,906	$ 153,444,148	$ 5,948,878
S2	Building Loss	$ 9,370,747	$ 45,244,205	$ 74,269,496	$ 122,333,611	$ 3,813,246
	Contents Loss	$ 14,066,056	$ 73,078,270	$ 109,750,299	$ 184,569,462	$ 5,946,334
	Inventory Loss	$ 16,518,464	$ 76,476,202	$ 102,893,906	$ 153,444,148	$ 5,948,878
S4	Building Loss	$ 16,388,479	$ 58,254,957	$ 88,050,737	$ 129,517,506	$ 4,846,574
	Contents Loss	$ 22,312,090	$ 90,091,974	$ 126,688,145	$ 203,321,009	$ 7,306,742
	Inventory Loss	$ 38,474,628	$ 88,357,166	$ 114,731,849	$ 161,413,317	$ 7,516,124
S6	Building Loss	$ 36,172,806	$ 83,231,420	$ 105,192,774	$ 141,357,858	$ 6,987,208
	Contents Loss	$ 58,892,808	$ 120,619,418	$ 155,179,718	$ 214,554,601	$ 10,467,531
	Inventory Loss	$ 70,542,137	$ 108,670,840	$ 133,412,994	$ 169,392,717	$ 9,928,947

Scenario & Frequency-based Damage and Loss Assessment Results

Pivoting to Resilience

Questions?