Inspiring Transformational Thinking for Maritime Systems Resilience: Port of Providence (RI) Demonstration Project

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From Sail to Satellite: Delivering Solutions for Tomorrow's Marine Transportation System

4th Biennial TRB–CMTS Research and Development Conference

Washington, DC June 21, 2016

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U.S. Department of Transportation Federal Highway Administration

RI DOT

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How can a more holistic approach to planning reduce climate risks within the environmental, social, economic, and political landscape?

- Framing the problem
- Use of three “boundary objects” in the Port
- Discussion/results/next steps

RI DOT

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Federal Highway Administration

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Boundary Objects to Stimulate Transformational Thinking

- *Maps, repositories, performances, software tools, etc.*
- *Allow groups with different perspectives, backgrounds, or motivations to work together without prior consensus*
- *Jumpstart dialogue, lead to co-production of strategies, more successful policy and implementation*

- Understand and comment on storm scenario & consequences
- Review long-range transformational resilience concept
- Review possible long-range "resilience goals" for the port and weigh importance of each using multi-criteria decision support tool

(Star 2010; Star and Griesemar 1989)

Port of Providence Workshop

600 Hectares

30 businesses, ~3000 jobs

46th port in US

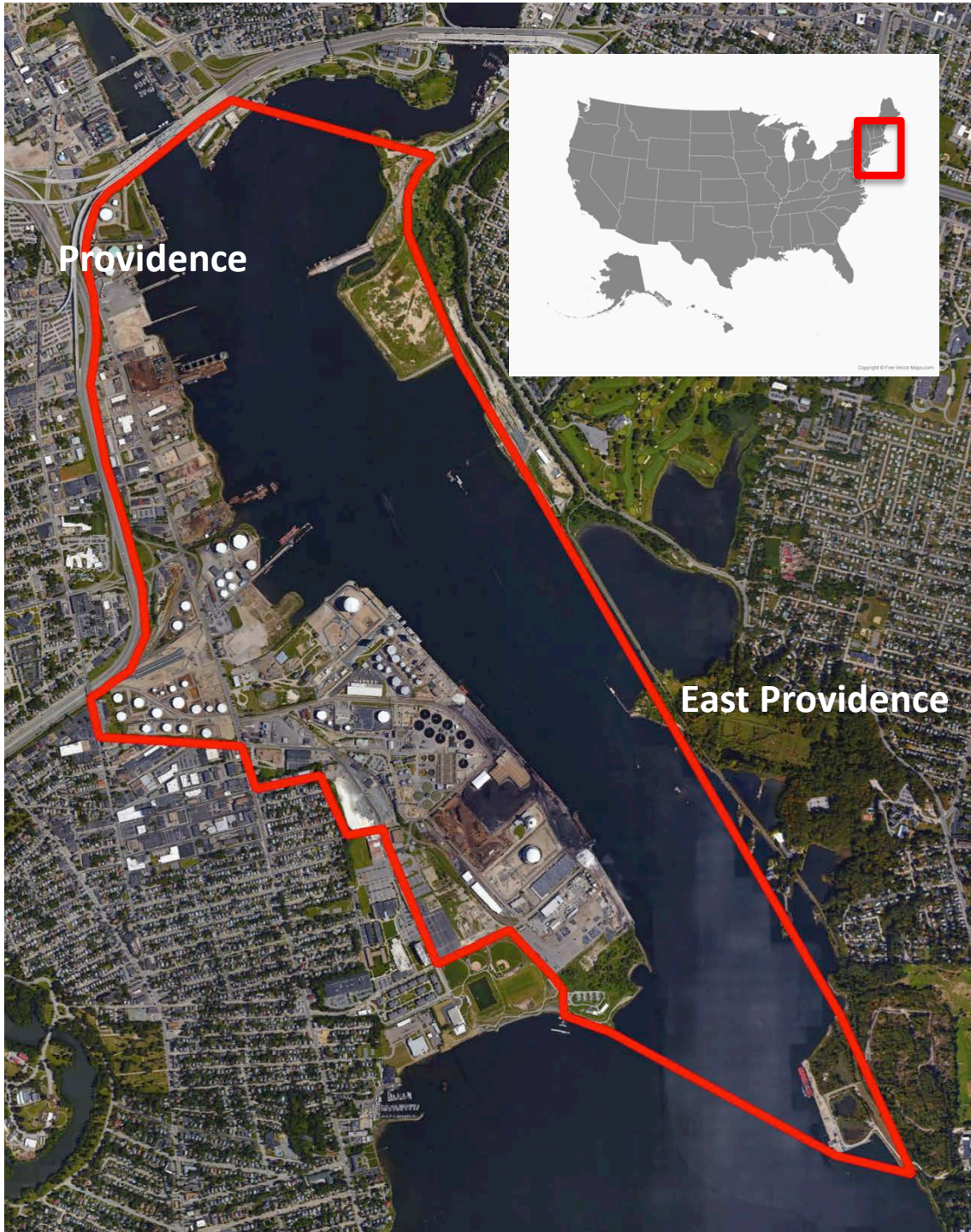
Guided by steering committee

Initial Survey

½ Day workshop

Introduced three boundary objects and discussion

Follow-up survey



USACE, 2013, 2012; FXM Associates, 2008; 4Ward Planning, 2015


COSCO
COSCO
DRAKE


MFI


SIMS
METAL


RELIANCE
MATTHEW McALLISTER

1938 Hurricane Flood Model (StormTools)

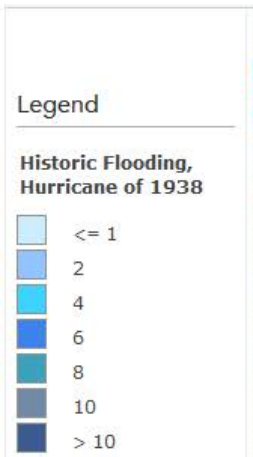
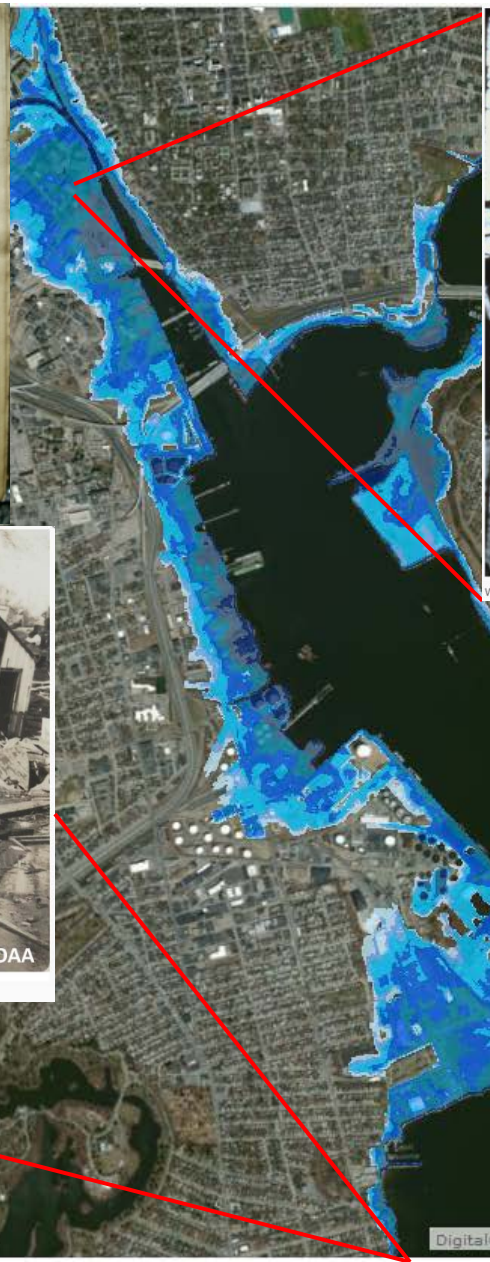
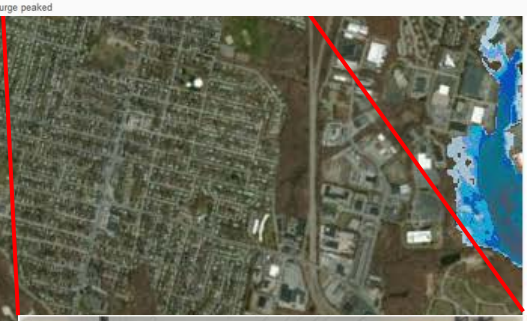


Photo Courtesy of Frederick Furneaux



Weybosset Street in downtown Providence, RI just after the storm surge peaked

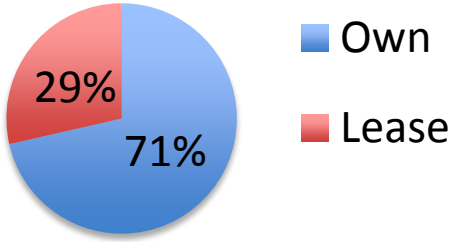
The waterfront of Pawtuxet Cove was devastated by the storm surge



8-3-15 workshop

Private Firms	*Local Government*
Sims Metal Management	Providence Emergency Management Agency
Moran Shipping	City of East Providence Planning
Providence Working Waterfront Alliance	City of Providence Planning*
Narragansett Improvement	***State Government***
McAllister Towing	RI Coastal Resources Management Council*
Exxon Mobil	RI Statewide Planning
Shnitzer Steel Industries	CommerceRI*
Rhode Island Oil Heat Institute	Narragansett Bay Commission
Quonset/Davisville Development Corporation*	***Federal Government***
FM Global	US Maritime Administration*
National Grid	Federal Highway Administration*
Hudson Asphalts	US Coast Guard*
Capital Terminals	US Army Corps of Engineers*
Motiva	***Academia/NGO***
Northeast Pilots	RI Coastal Resources Center/RI Sea Grant/GSO*
P & W Railroad	Save the Bay

Property Status



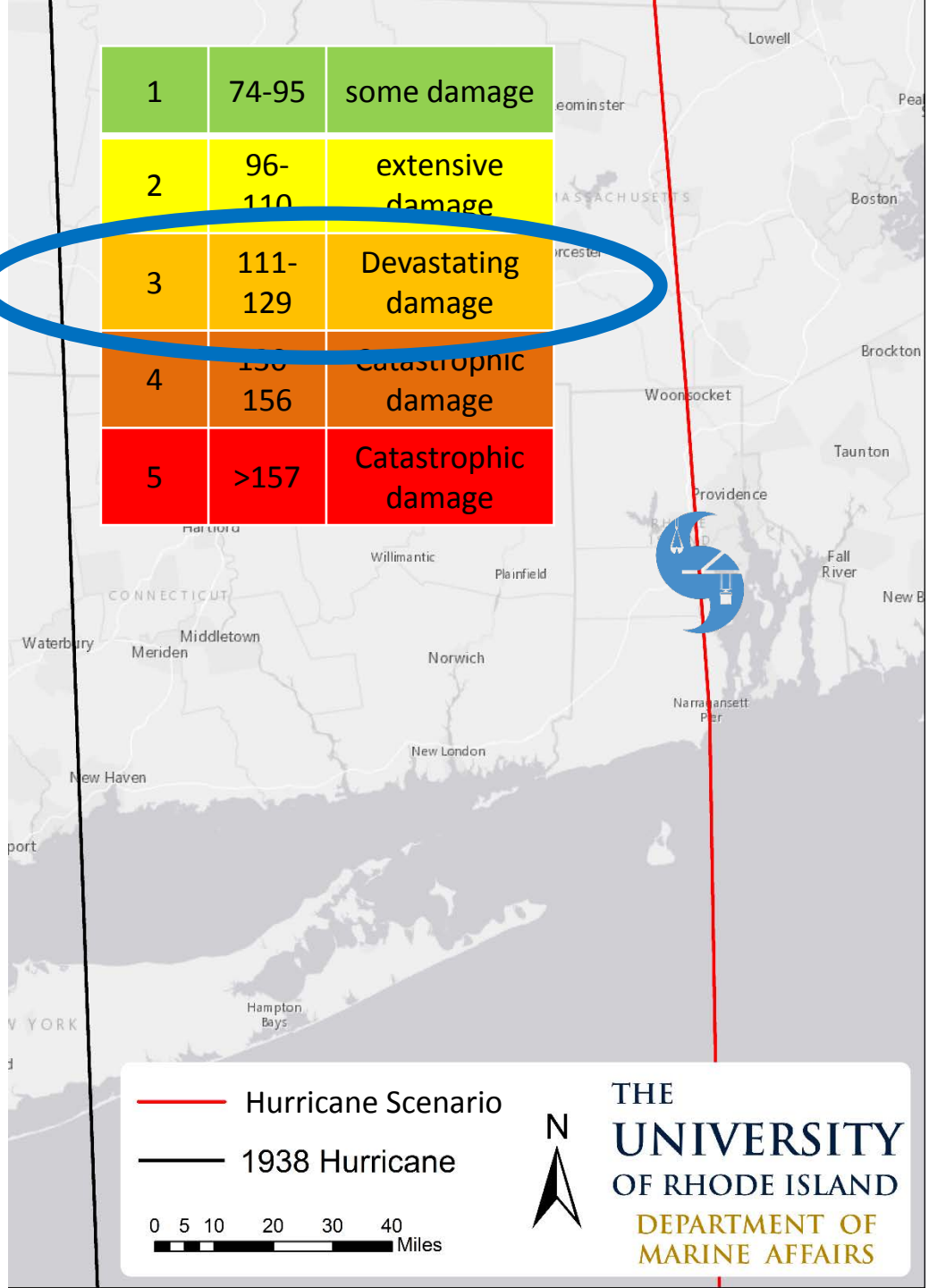
BOUNDARY OBJECT 1

Storm Visualizations

What are the cascading consequences?

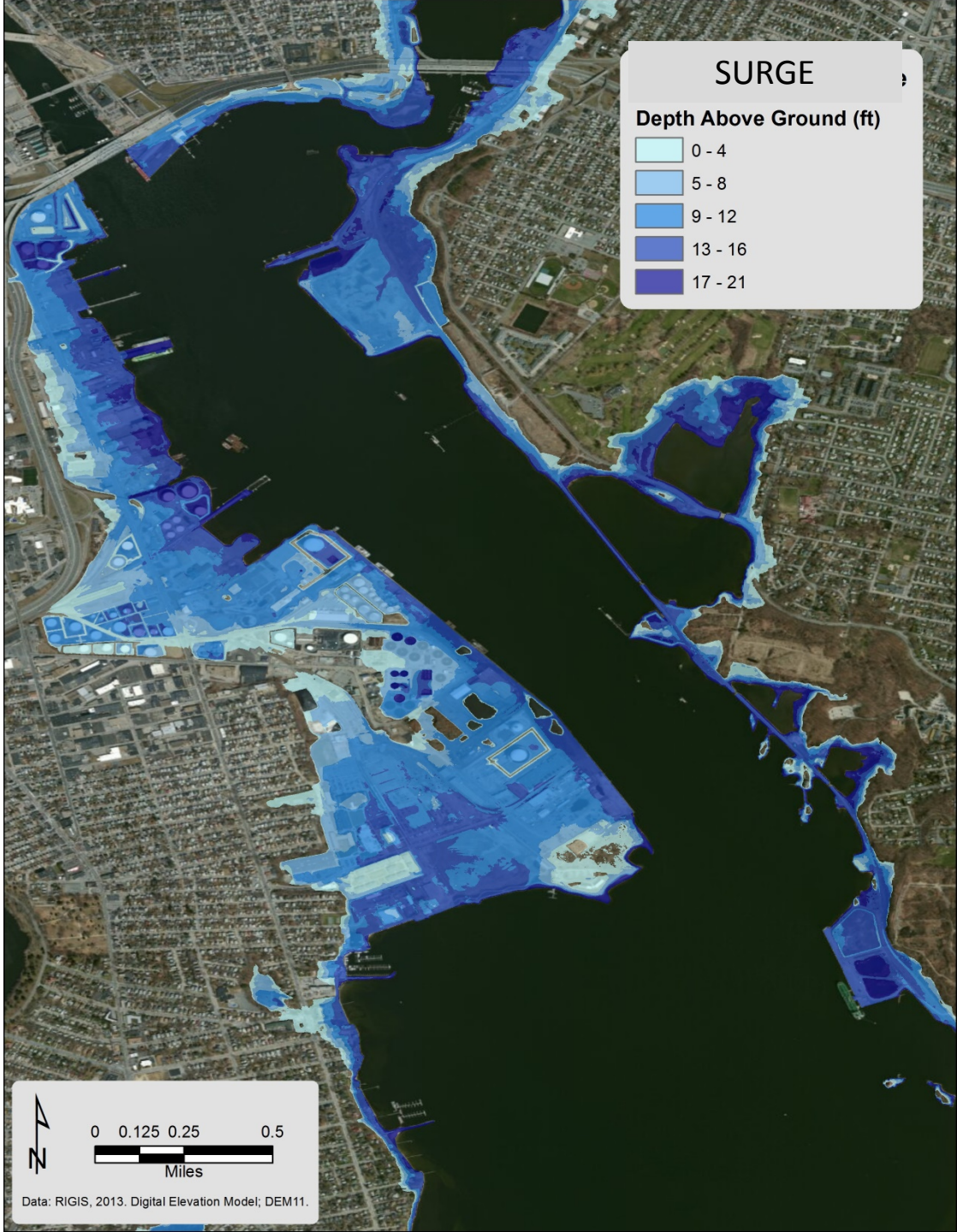
Cat 3 Scenario

- ‘Direct hit’
- 1938 hurricane, but shifted ~ 80 mi East
- Superstorm Sandy without the ‘left hook’



- GIS Visualization of 21 ft “bathtub” inundation
- Assumes Fox Point Barrier not overtopped
- Only shows passive level of surge
- Does not show expected 6-10’ wave action

Based on RIGIS, 2013 DEM derived from a 1-meter resolution digital elevation model originally produced as part of the Northeast LiDAR Project in 2011.



Example Visualization: ProvPort

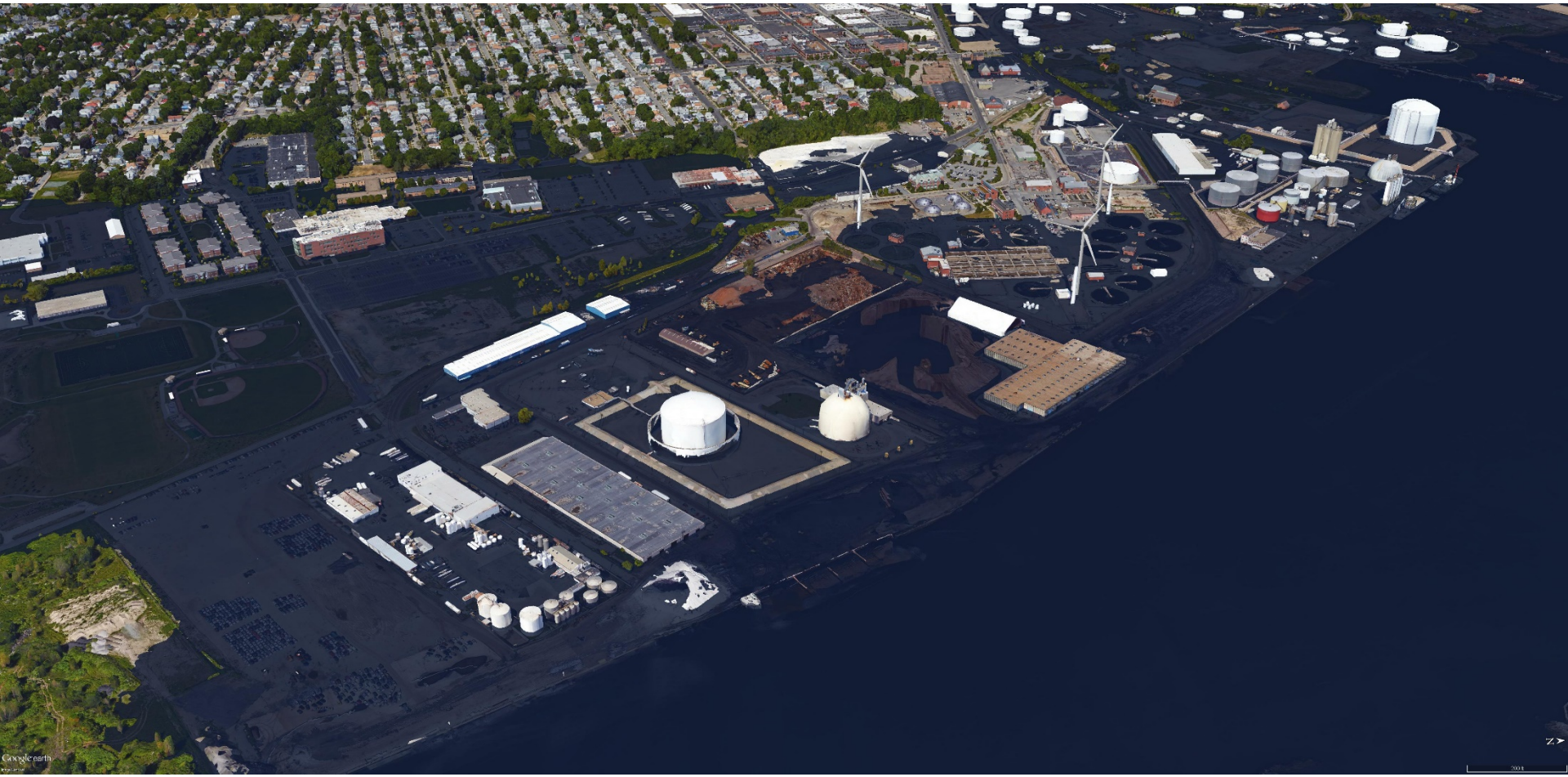


Image: R. McIntosh (Google Earth)

Example Visualization: Motiva Enterprises

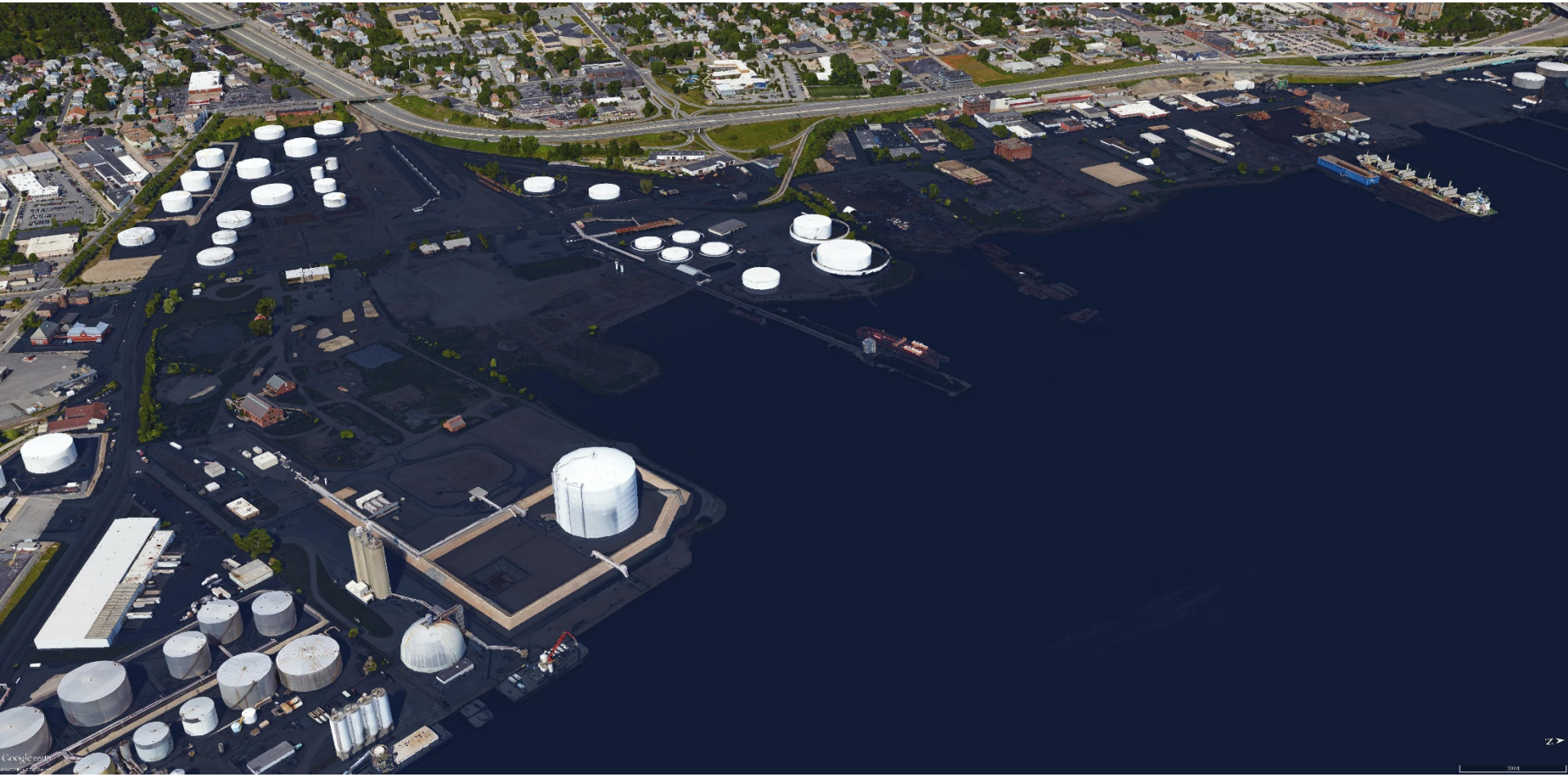


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Image by Peter Stempel

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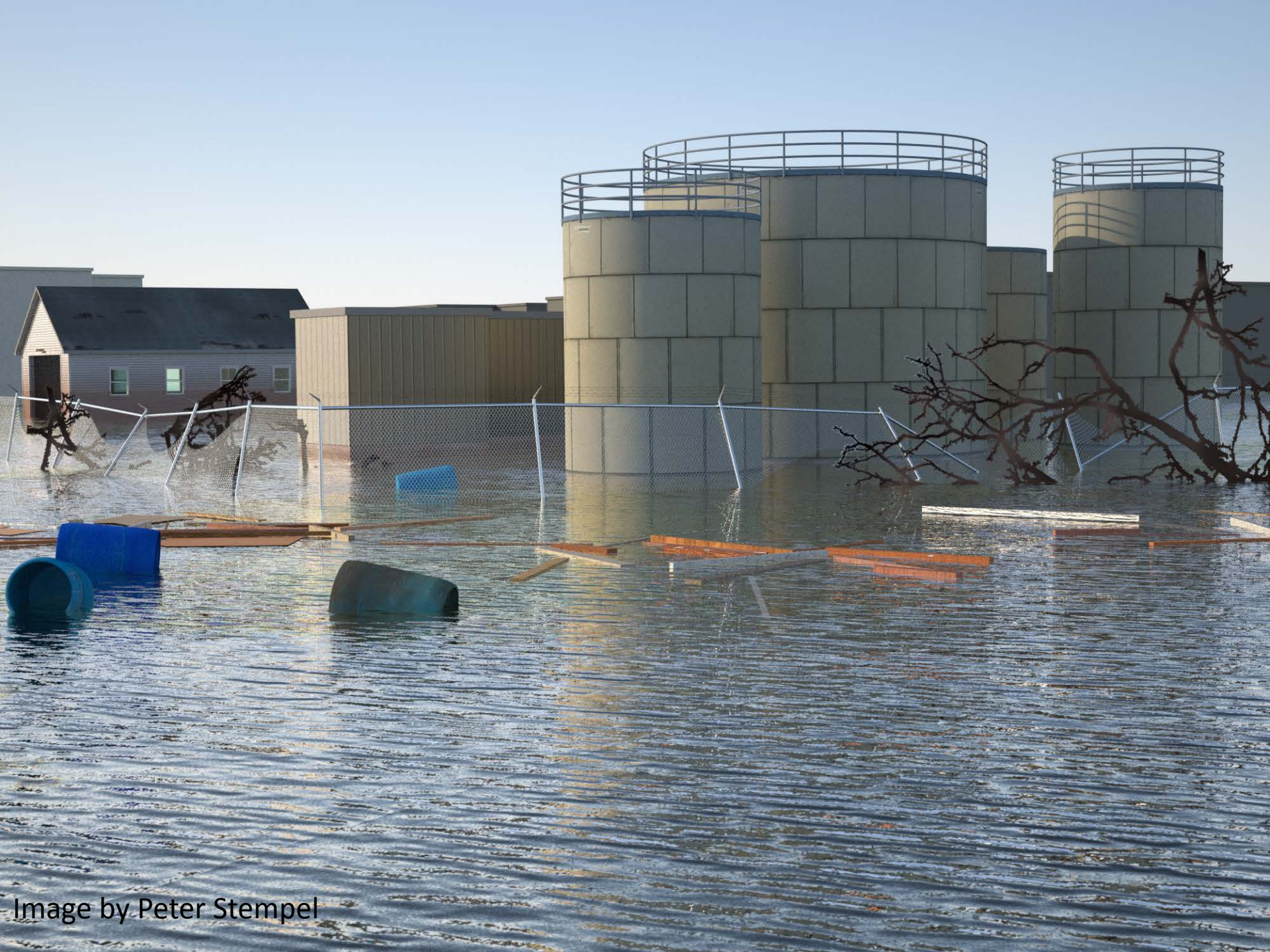


Image by Peter Stempel

Boundary Object 2 – Long-term resilience planning concepts

"…Those that are adopted at a much larger scale or intensity, those that are truly new to a particular region or resource system, and those that transform places and shift locations."

Introduction of three "transformational concepts"

Accommodate

Relocate

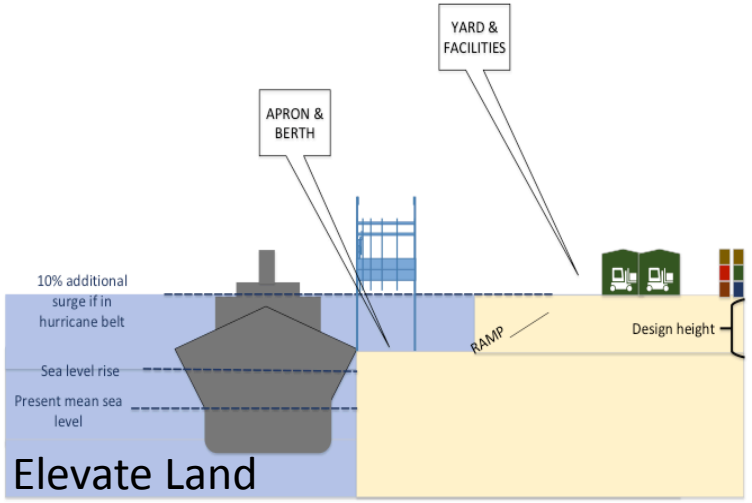
Protect

(Kates, Travis, and Wilbanks 2012, p. 7156; Cheong 2011; J. Dronkers, J. Campbell, and Spradley 1990)

1. Accommodate –

Site-specific improvements to increase resilience

Elevate Utilities and Generator



Elevate Land

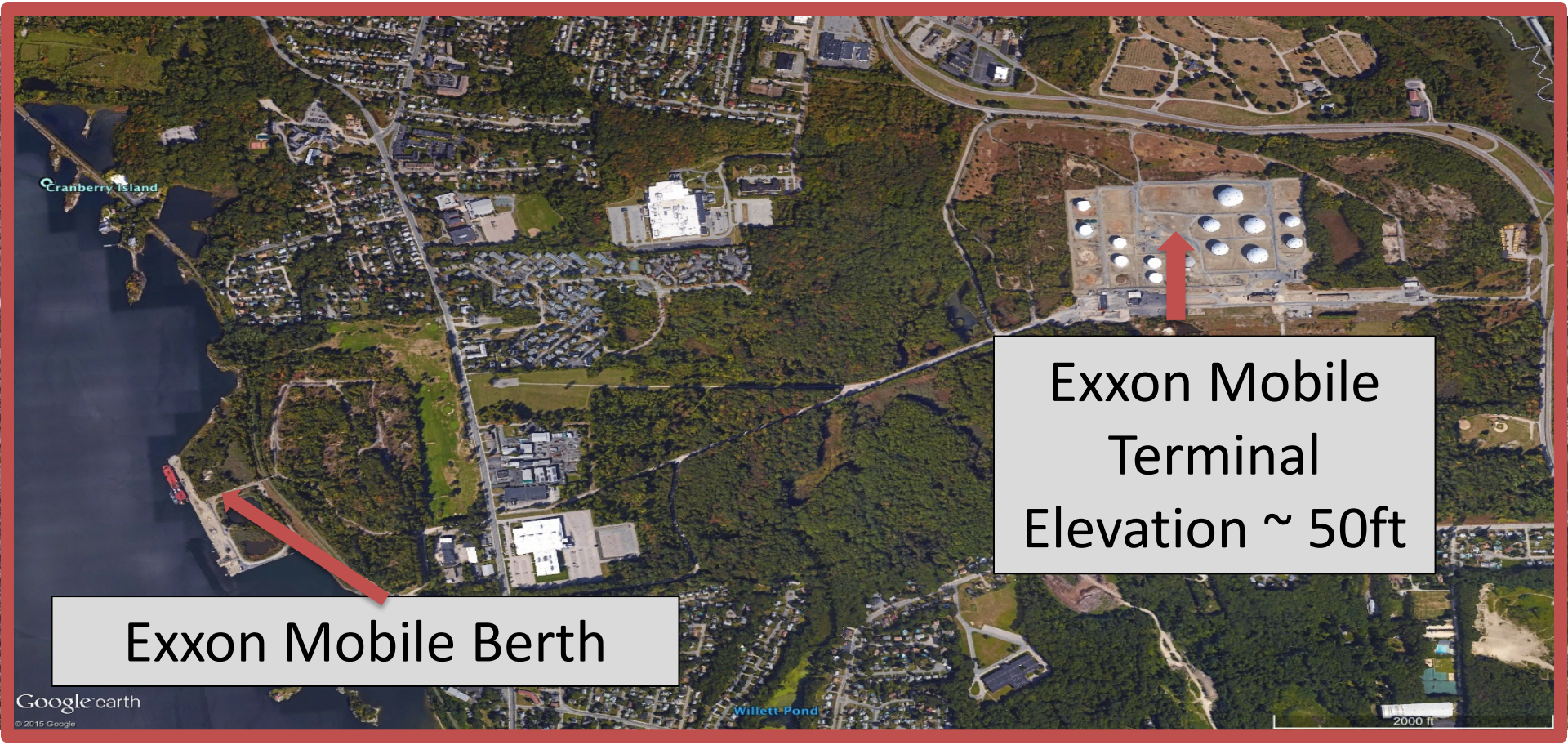
Flood berms

https://www.walthers.com/prodimage/0933/09330000003168.gif

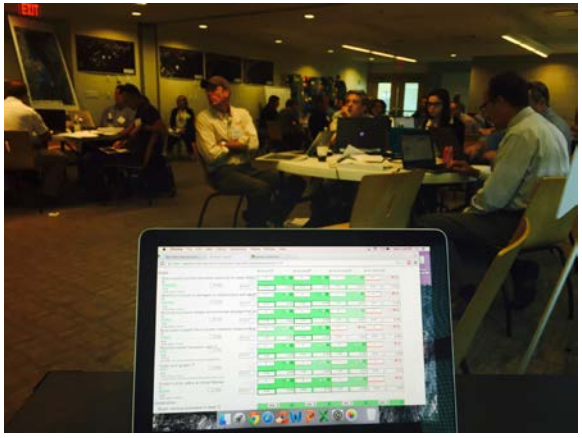
Flood proof

2. Relocate –

Move port uses to less vulnerable location.



3. Protect –
New storm barrier for Providence Harbor.



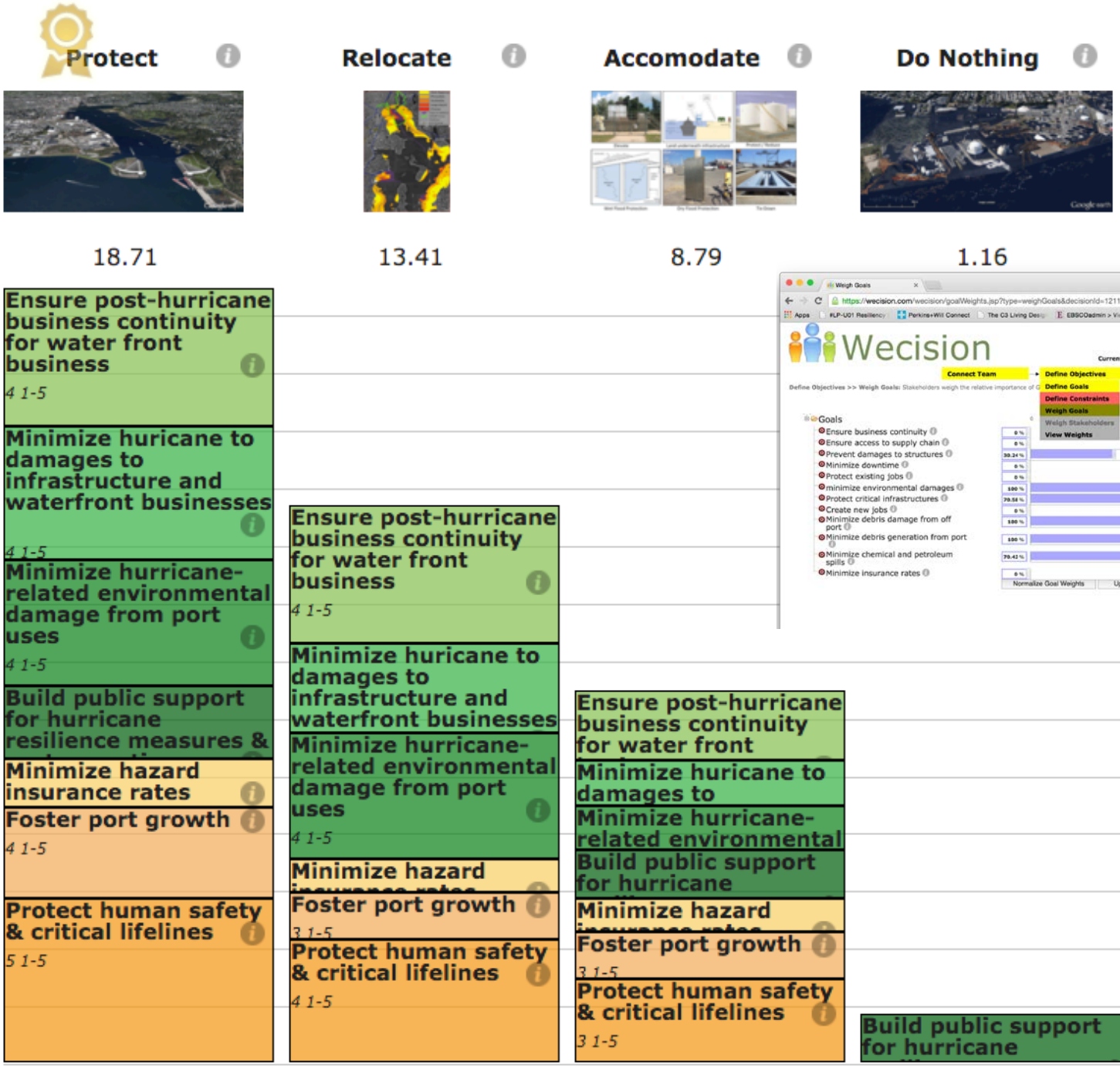
Boundary Object 3

Wecision

http://www.wecision.com/

1) How well does each concept meet each "resilience goal"?
2) How important is each goal to you?

- Ensure post-hurricane **business continuity** for waterfront business
- **Minimize hurricane damage** for infrastructure and waterfront business
- Minimize hurricane-related **environmental damage** from port uses.
- Build **public support** for port resilience
- Minimize **hazard insurance** rates
- Foster **port growth**
- Protect **human safety & critical lifelines**


Protect
Relocate
Accomodate
Do Nothing
18.71
13.41
8.79
1.16
20
10
0
Ensure post-hurricane business continuity for water front business
4 1-5
Minimize huricane to damages to infrastructure and waterfront businesses
4 1-5
Minimize hurricane-related environmental damage from port uses
4 1-5
Build public support for hurricane resilience measures &
Minimize hazard insurance rates
Foster port growth
4 1-5
Protect human safety & critical lifelines
5 1-5
Ensure post-hurricane business continuity for water front business
4 1-5
Minimize huricane to damages to infrastructure and waterfront businesses
Minimize hurricane-related environmental damage from port uses
4 1-5
Minimize hazard
Foster port growth
3 1-5
Protect human safety & critical lifelines
4 1-5
Ensure post-hurricane business continuity for water front
Minimize huricane to damages to
Minimize hurricane-related environmental
Build public support for hurricane
Minimize hazard
Foster port growth
3 1-5
Protect human safety & critical lifelines
3 1-5
Build public support for hurricane
Wecision
Connect Team
Define Objectives
Create Alternatives
Analyze Value
Define Goals
Define Constraints
Weigh Goals
Weigh Stakeholders
View Weights
Goals
Ensure business continuity
Ensure access to supply chain
Prevent damages to structures
Minimize downtime
Protect existing jobs
minimize environmental damages
Protect critical infrastructures
Create new jobs
Minimize debris damage from off port
Minimize debris generation from port
Minimize chemical and petroleum spills
Minimize insurance rates
Normalize Goal Weights
Update Goal Weights

Findings

- **No long-term plan** for major hurricane events
- Difficult to entice private business to participate when **next steps are not clear**
- **No clear champion** (gov't or private) to take the lead on long-term planning
- Stakeholders found it difficult to engage, as **costs were not addressed**
- **Boundary objects effective,** percolating through system, need some improvements

Questions?

Hurricane Sandy photos courtesy Mary Lee Clanton, Port of NYNJ

Seaport Planning for Storms, Tides, and Sea Level Rise
2 Day Symposium– Baltimore MD, USA 2017
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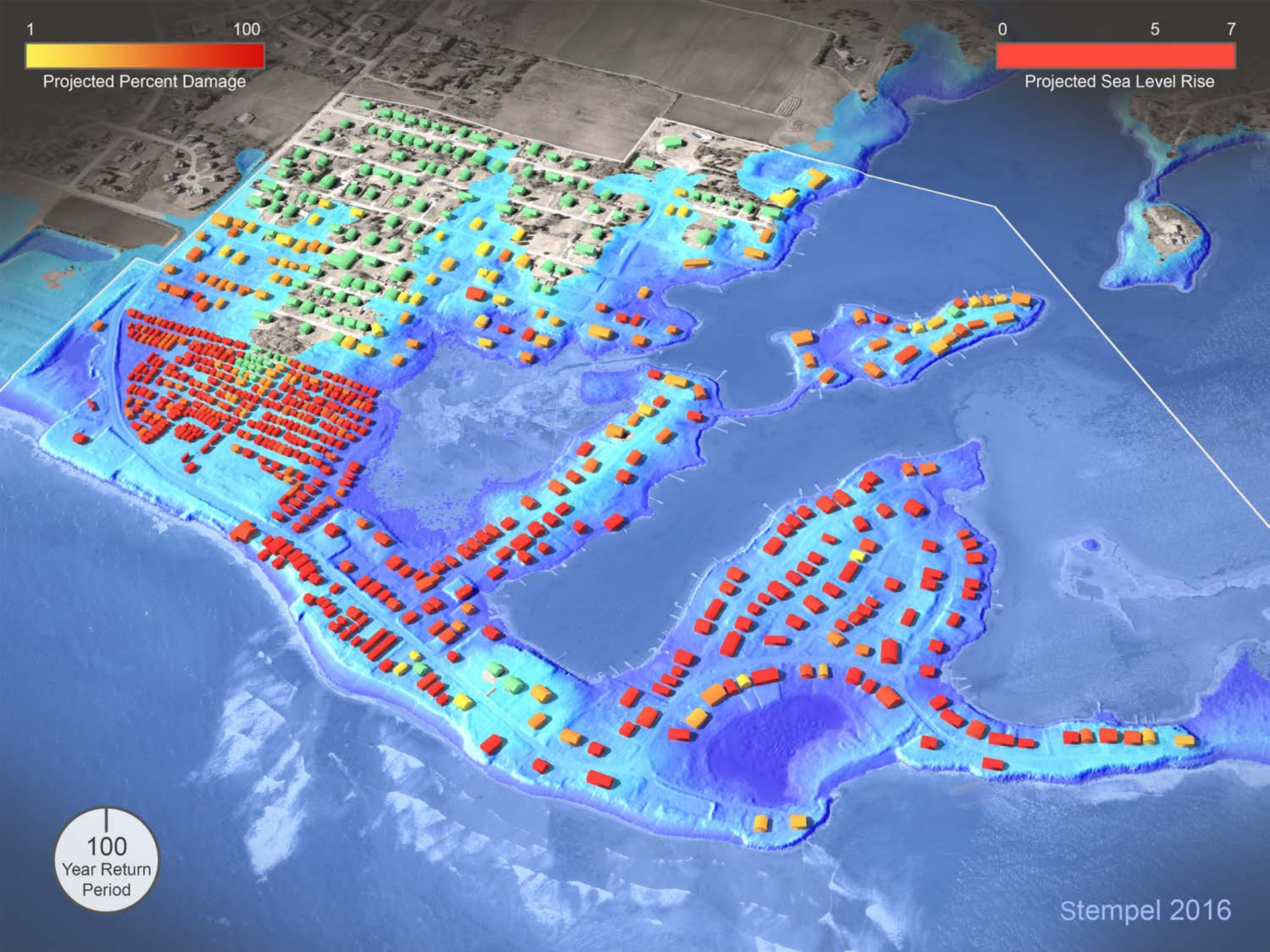
1
100
Projected Percent Damage
0
5
7
Projected Sea Level Rise
100
Year Return
Period
Stempel 2016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