HURRICANE RESILIENCE: LONG-RANGE PLANNING FOR THE PORT OF PROVIDENCE

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Nov. 10, 2015

URI Coastal Resources Seminar Series

THE UNIVERSITY OF RHODE ISLAND
DEPARTMENT OF MARINE AFFAIRS

urit
uri transportation center

U.S. Department of Transportation
Federal Highway Administration

RI dot

Review of Workshop Objectives

- Understand and comment on storm scenario & consequences
- Review four long-range resilience concept alternatives
- Review possible long-range "resilience goals" for the port and weigh importance of each
- Provide feedback on workshop methodology as a way to measure port vulnerability and initiate
- Identify collective action that needs to be discussed now and recommendations for RIDOT

http://www.portofprovidenceresilience.org/

STUDY AREA

Perimeter = 7 Miles
Area = 1500 Acres

# of businesses: ~30
employed:

- Direct: ~1,000
- Indirect: ~2,000

Total foreign trade (MT):

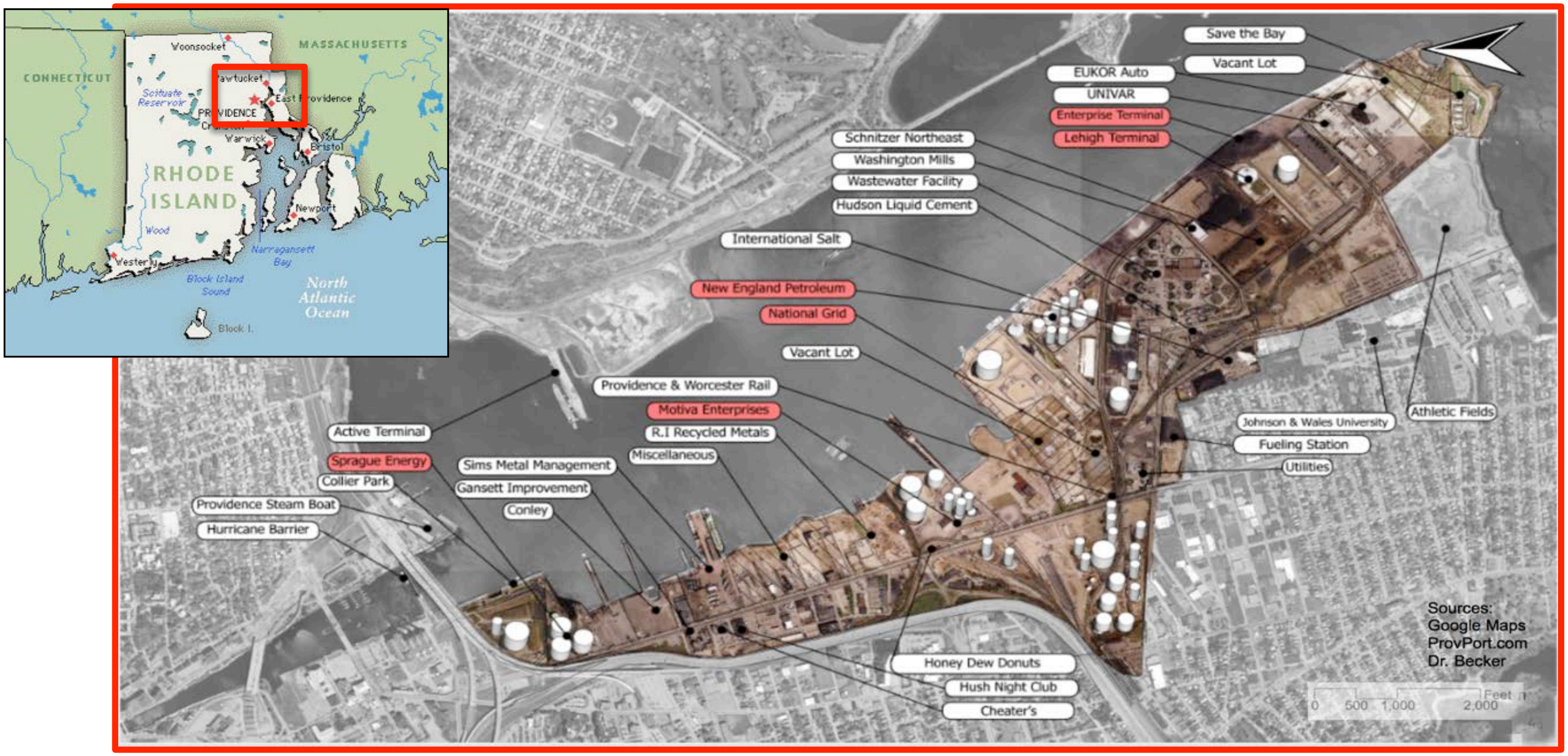
- 4.8M (2013)
- Rank: 46 (in US)

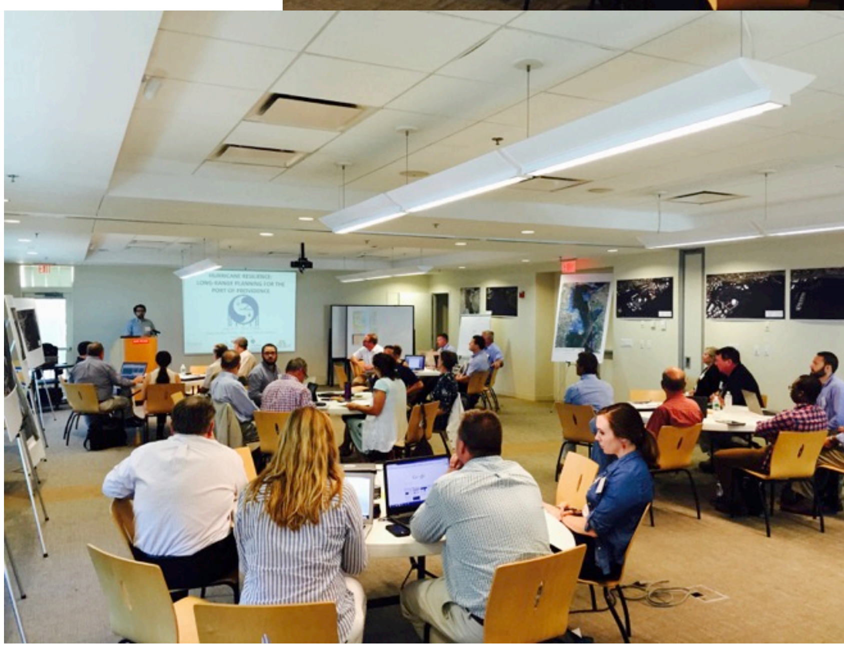
Main petroleum supply for RI

Channel depth: 40’ (2004 - $65M)

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

The Port of Providence





Photos: John Haymaker

8-3-15

28 participants

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
Northeast Pilots	Quonset/Davisville Development Corporation*
P & W Railroad	***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***
	RI Coastal Resources Center/RI Sea Grant/GSO*
	Save the Bay

Aug. 3 Workshop Agenda

Scenarios

a. **Super Storm Sandy and the PNYNJ**
b. **What the science says could happen in Providence**
c. **Consequences of Cat 3 in weeks/months/years**

Long term resilience concept alternatives

a. **Present Wecision tool**
b. **Three long term resilience concept alternatives**
c. **Compare proposed long term resilience goals to concept alternatives**

Conclusion

Adjourn for cocktails (Sponsor: Providence Working Waterfront Alliance)

Hurricane Science and a "Hurricane Scenario"

R. Duncan McIntosh, MPS

University of Rhode Island
Department of Marine Affairs

Rhode Island Hurricanes: Historical Record

- 37 hurricanes within 50 mi of RI since 1851
- ≈ 4 year return period
- ≈ 22.8% chance of hurricane per year

Storm Surge in a Changing Climate

For the Northeastern US:
By 2050 today's 100-year storm surge event may be equaled or exceeded every 30 years.

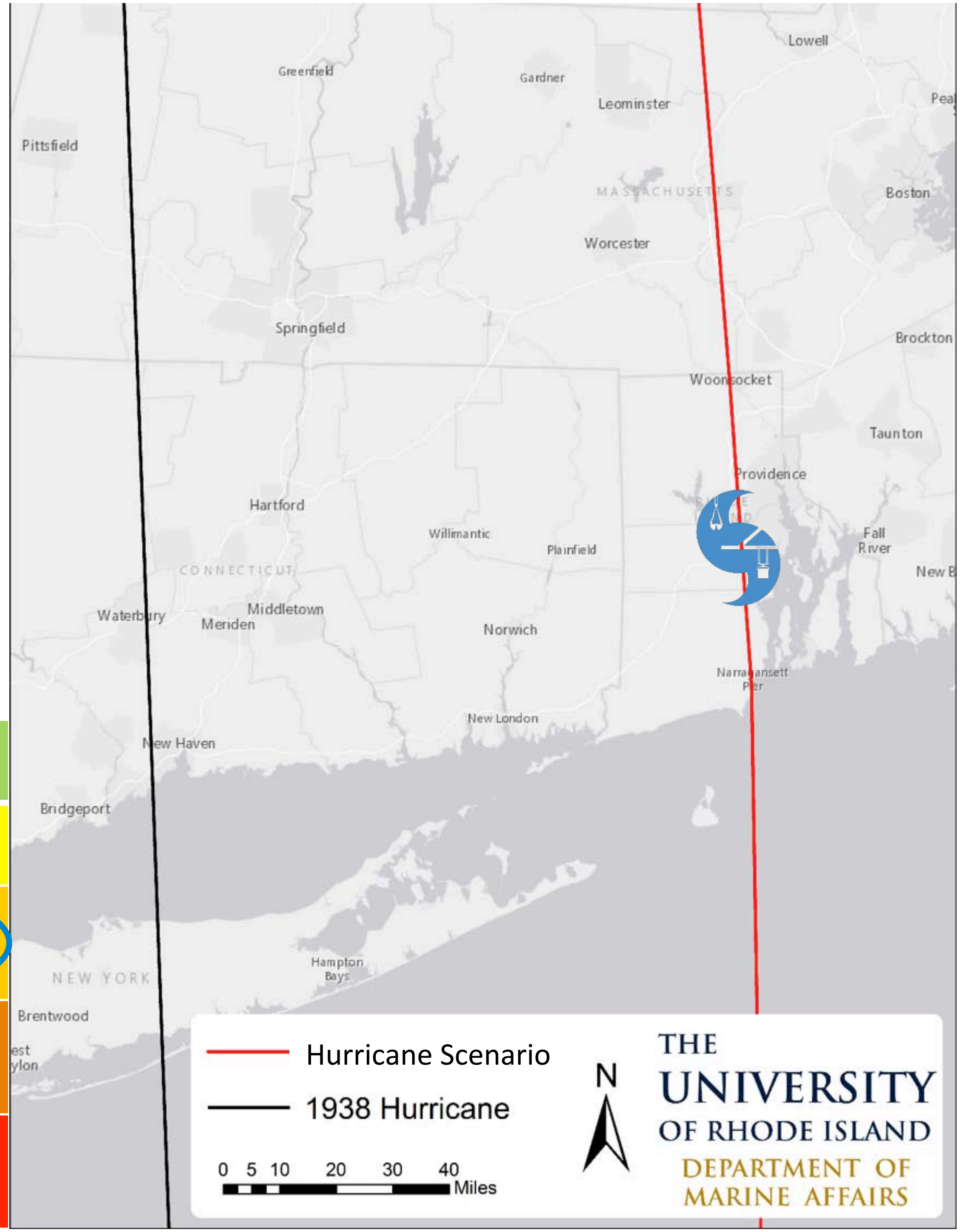
(Kirshen et al. 2008)

Photo: Kris Allred

Hurricane Scenario

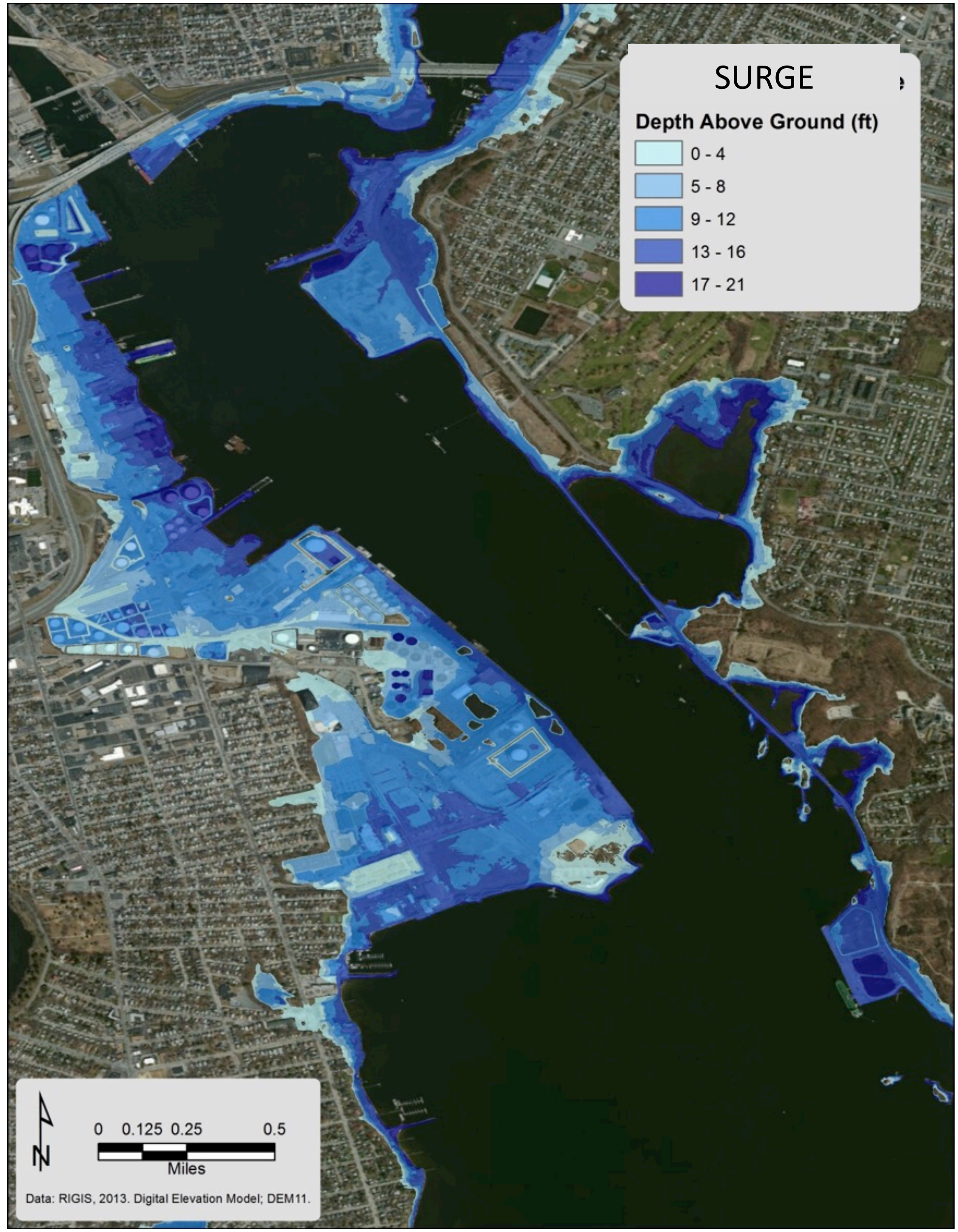
- 'Direct hit' for Providence
- Comparable to 1938 hurricane, but shifted ~ 80 mi East
- Comparable to Sandy without the 'left hook'

1	74-95	some damage
2	96-110	extensive damage
3	111-129	Devastating damage
4	130-156	Catastrophic damage
5	>157	Catastrophic damage

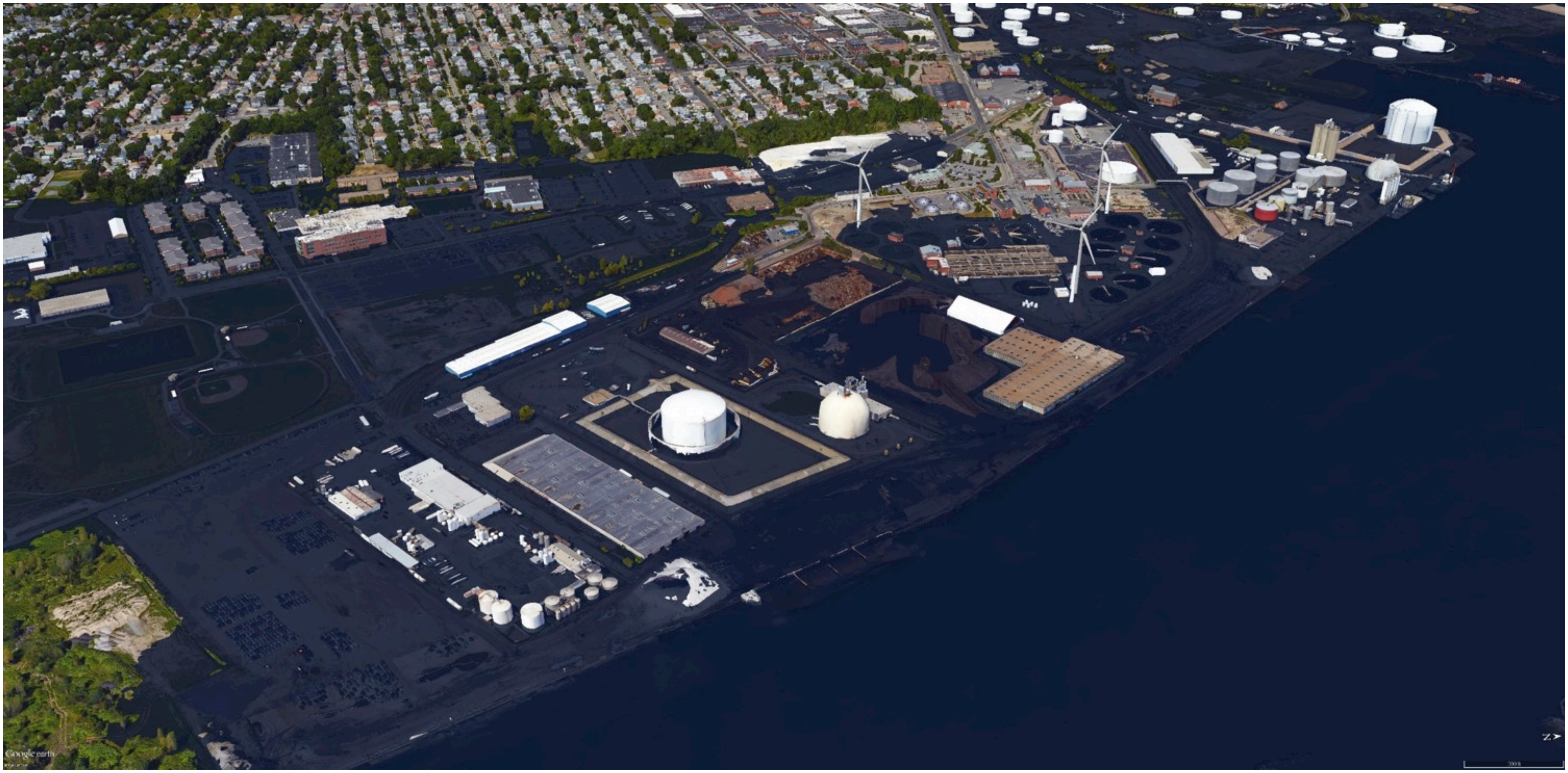


- GIS Visualization of 21 ft "bathtub" inundation
- Assumes Fox Point Barrier not overtopped
- Only shows passive level of sea
- Does not show expected 6-10' wave action
- You have hard copies of this map at your tables

- 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.



ProvPort

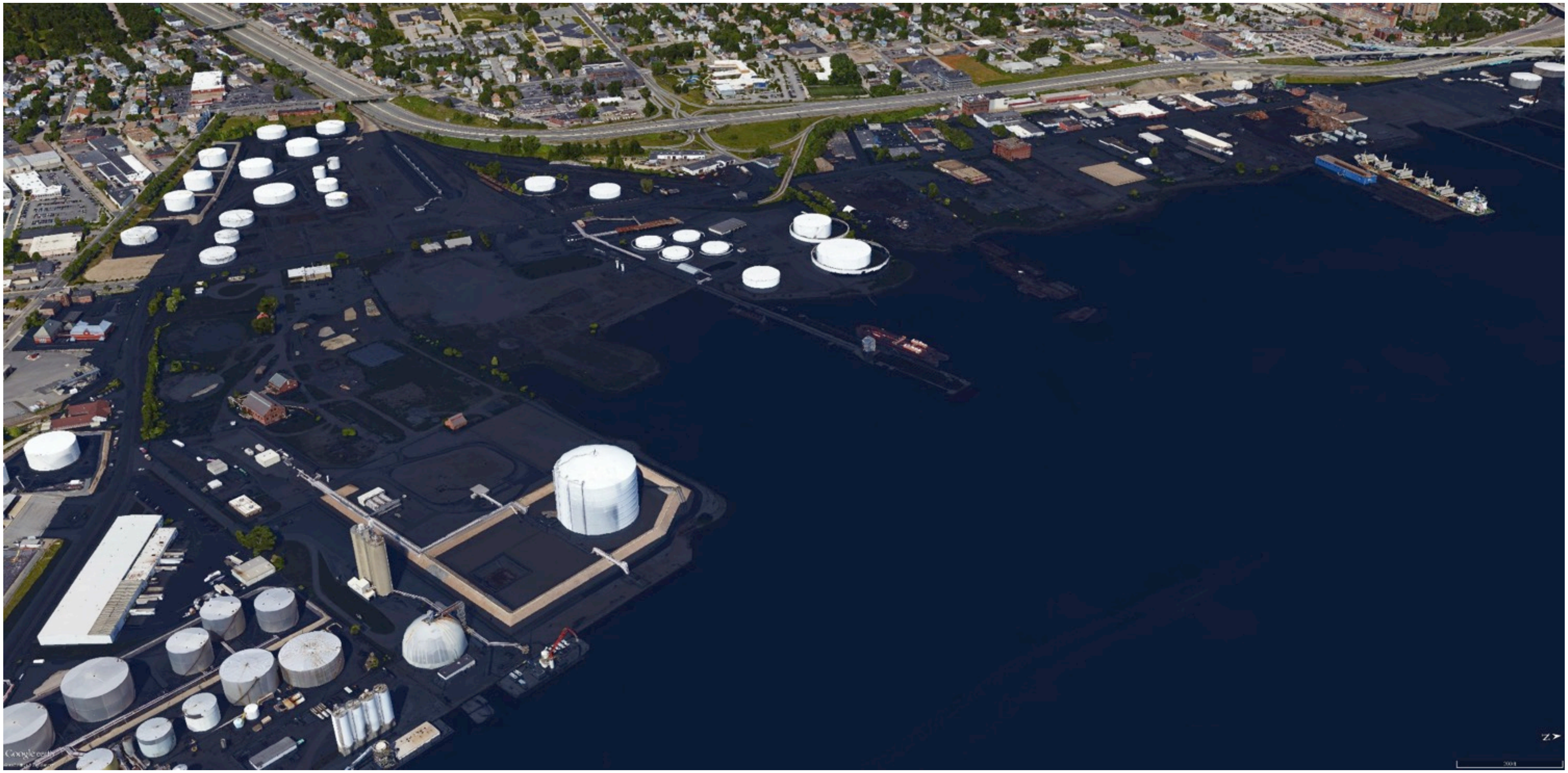


See: http://www.portofprovidenceresilience.org/storm-scenario.html

Metals Recycling, Inc.

See: http://www.portofprovidenceresilience.org/storm-scenario.html

Motiva

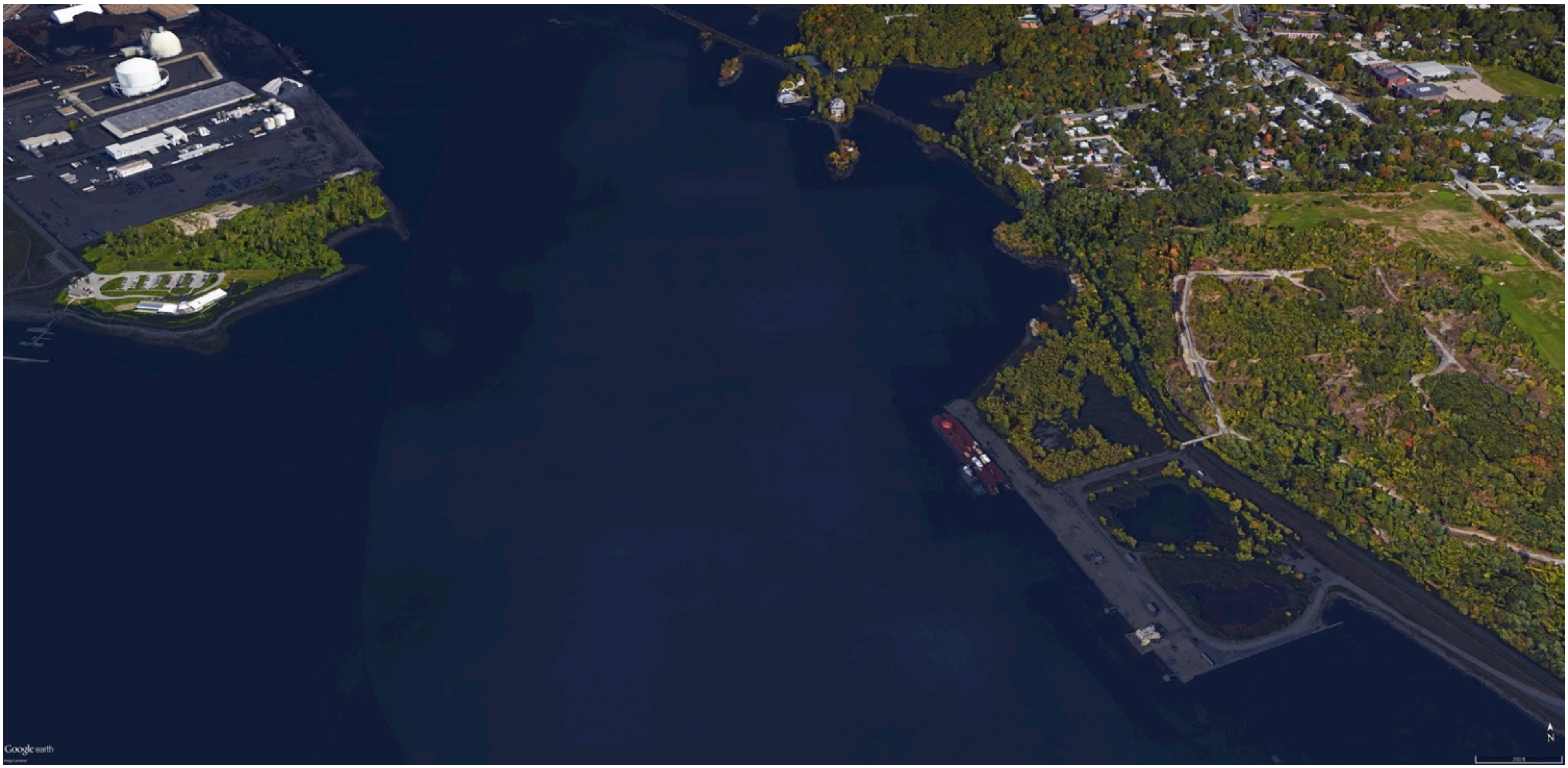


See: http://www.portofprovidenceresilience.org/storm-scenario.html

Sprague

See: http://www.portofprovidenceresilience.org/storm-scenario.html

Exxon Mobile (E. Providence)



See: http://www.portofprovidenceresilience.org/storm-scenario.html

Wilkes-Barre Pier (Capital Terminals, E. Providence)

See: http://www.portofprovidenceresilience.org/storm-scenario.html

Preliminary Findings

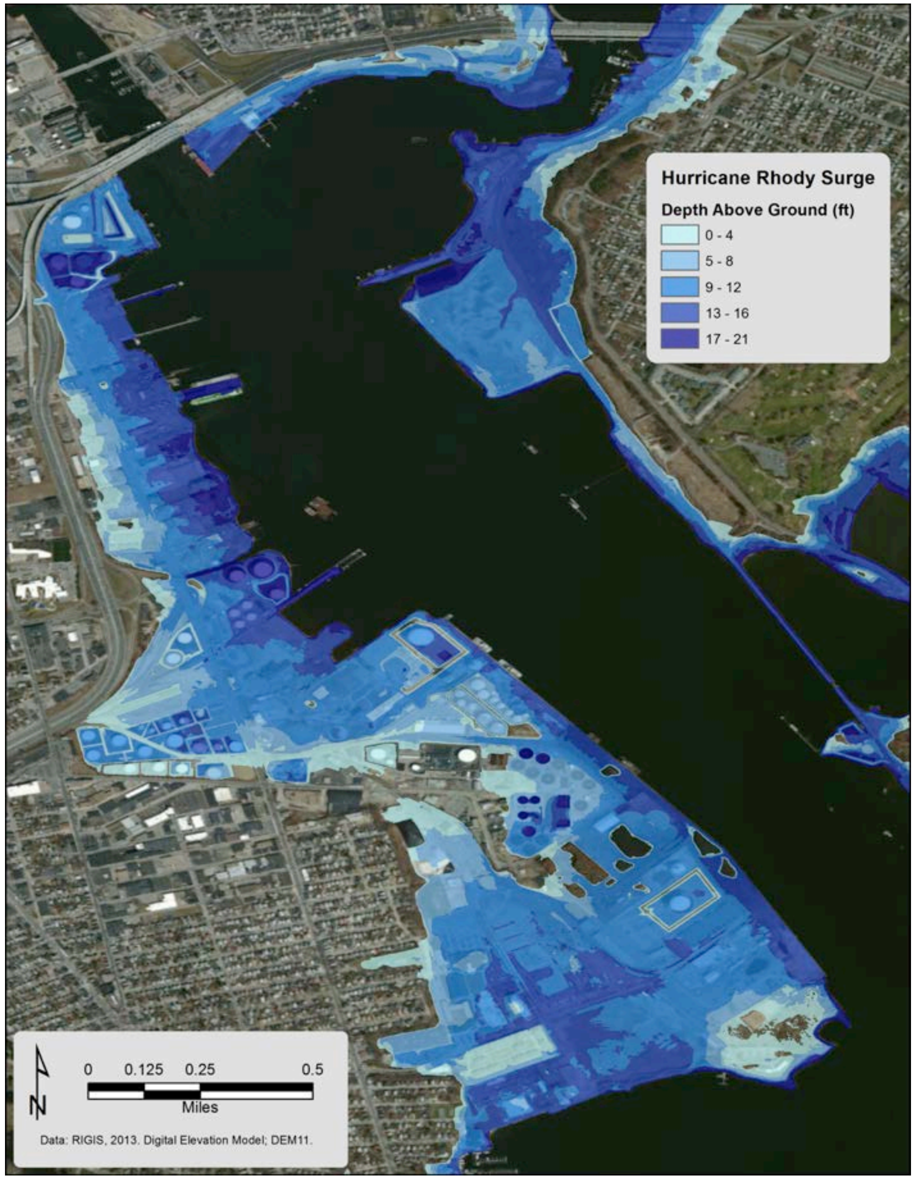
Weeks	Loss of critical facilities cripples business Energy supply compromised (hospitals, institutions, etc.) Raw wastewater discharge Debris cleanup, debris obstructions, debris as battering ram
Months	Damaged roads and rail disrupt commerce Debris/sedimentation require surveying, restrict navigation Bulkhead/pier damage result in permitting delays & repair Erosion of riverbank leads to sediment loading of deep channel
Years	Long-term environmental impacts to Narr. Bay Economic impacts, but little clarity over their nature Risks to competiveness of port if perceived as vulnerable to storms Increase in insurance rates could force business to leave

Resilience Strategies:

4 long-term resilience design concepts

http://www.portofprovidenceresilience.org/

1. Do Nothing –
No change to port resilience



1. Do Nothing –

No change to port resilience

Advantages

- Low/no upfront costs
- No disruption until storm event(s) occur
- Easy
- Allows for investments in other priorities

Disadvantages

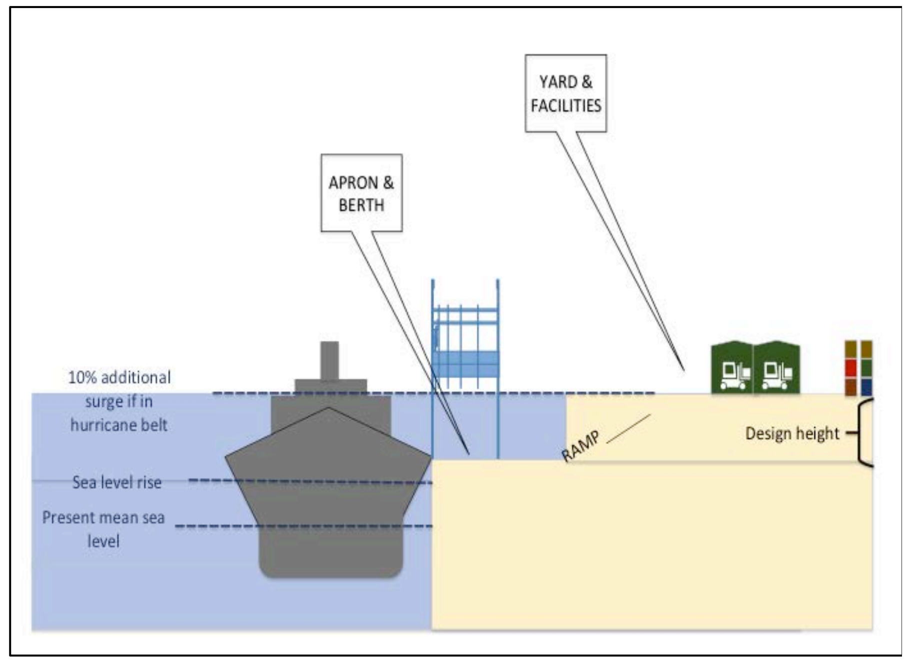
- Risk of major catastrophe after each storm event
- Risk of businesses leaving the State
- Risk of major environmental damage to Narragansett Bay
- Risk of channel closing for weeks/months
- Impacts to state's energy supplies

2. Accommodate –

Site-specific improvements to increase resilience

Elevate

Elevated Utilities and Generator
(Pt. Judith, RI)



Land underneath infrastructure
(Gulfport, MS)

2. Accommodate –

Site-specific improvements to increase resilience

Advantages

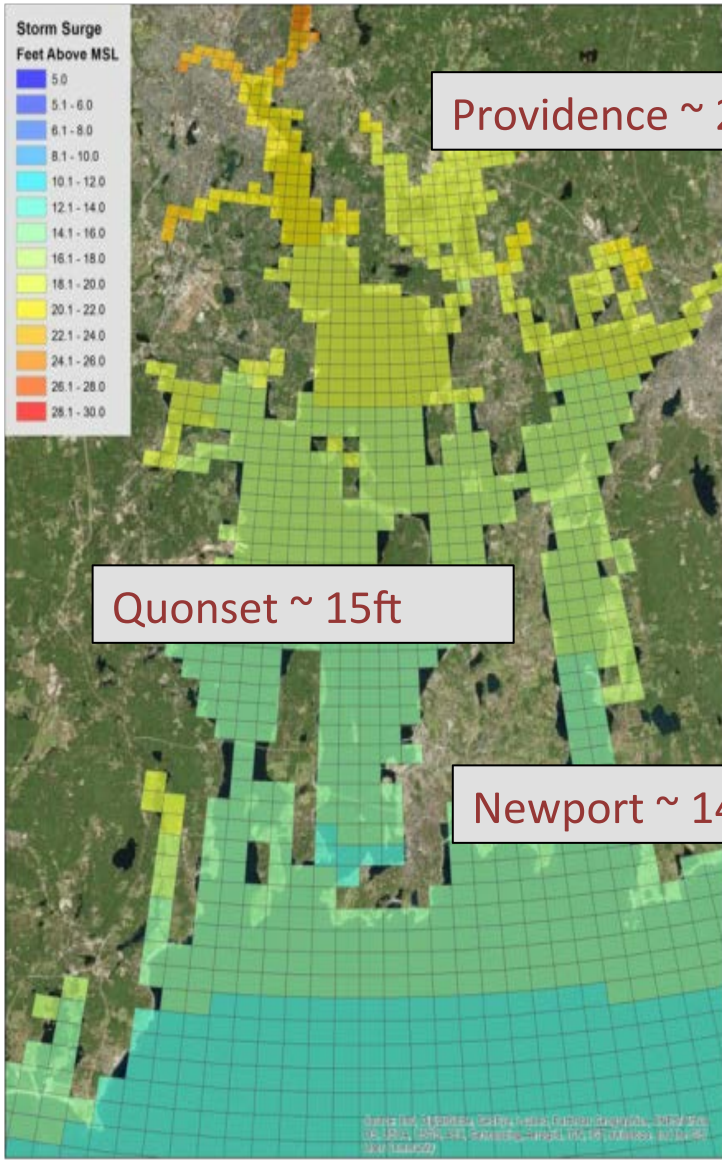
- Costs can be incremental
- Site-specificity
- Low-cost options
- Single business could improve its own resilience
- Could address SLR
- Does not disrupt port system as a whole

Disadvantages

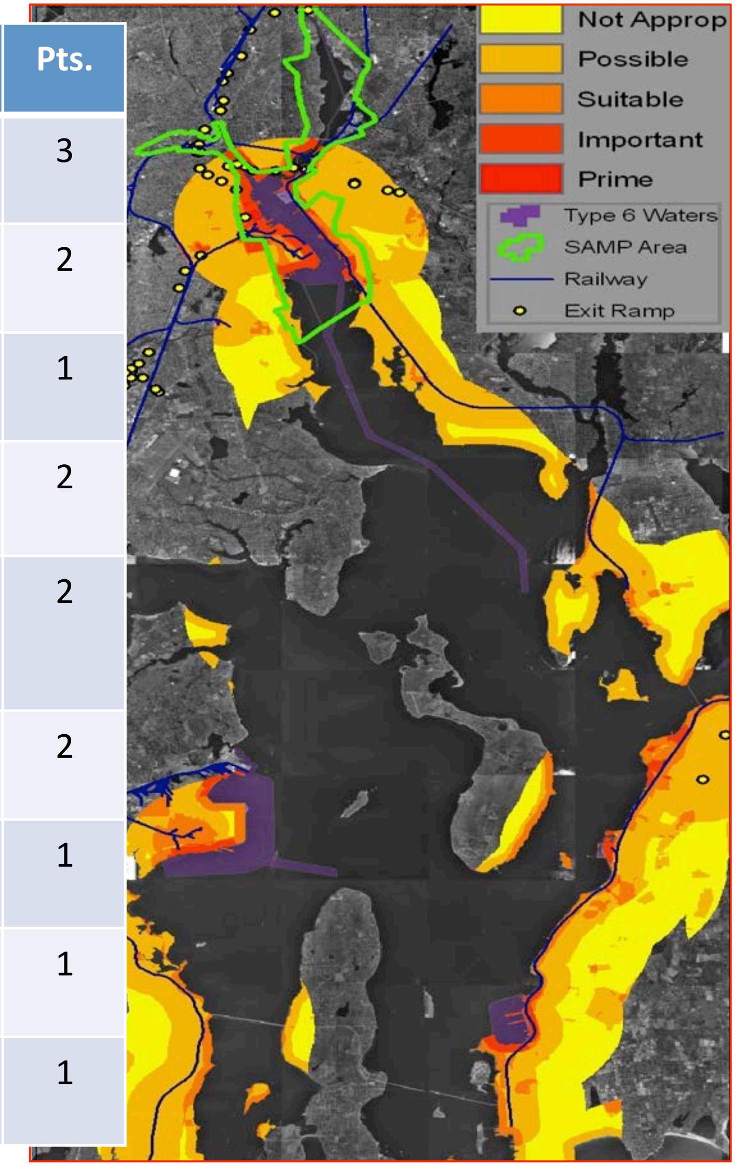
- Limited in ability to protect against major storm
- Does not address interdependent uses
- Storm could result in high levels of environmental damages
- Few tested examples for industrial waterfronts
- Less likely to protect navigation channel from debris

3. Relocate

Move port uses to less vulnerable location.



Characteristic	Pts.
1000' from >40' water	3
1000' from 30-40' water	2
1000' from 10-20' water	1
1000' from Type 6 waters	2
Current land use industrial	2
Current land use vacant	2
Industrial zoning in place	1
>1 mile from highway exit	1
<1000' from rail line	1



Example: East Providence Terminals

3. Relocate – Moving port uses to less vulnerable location.

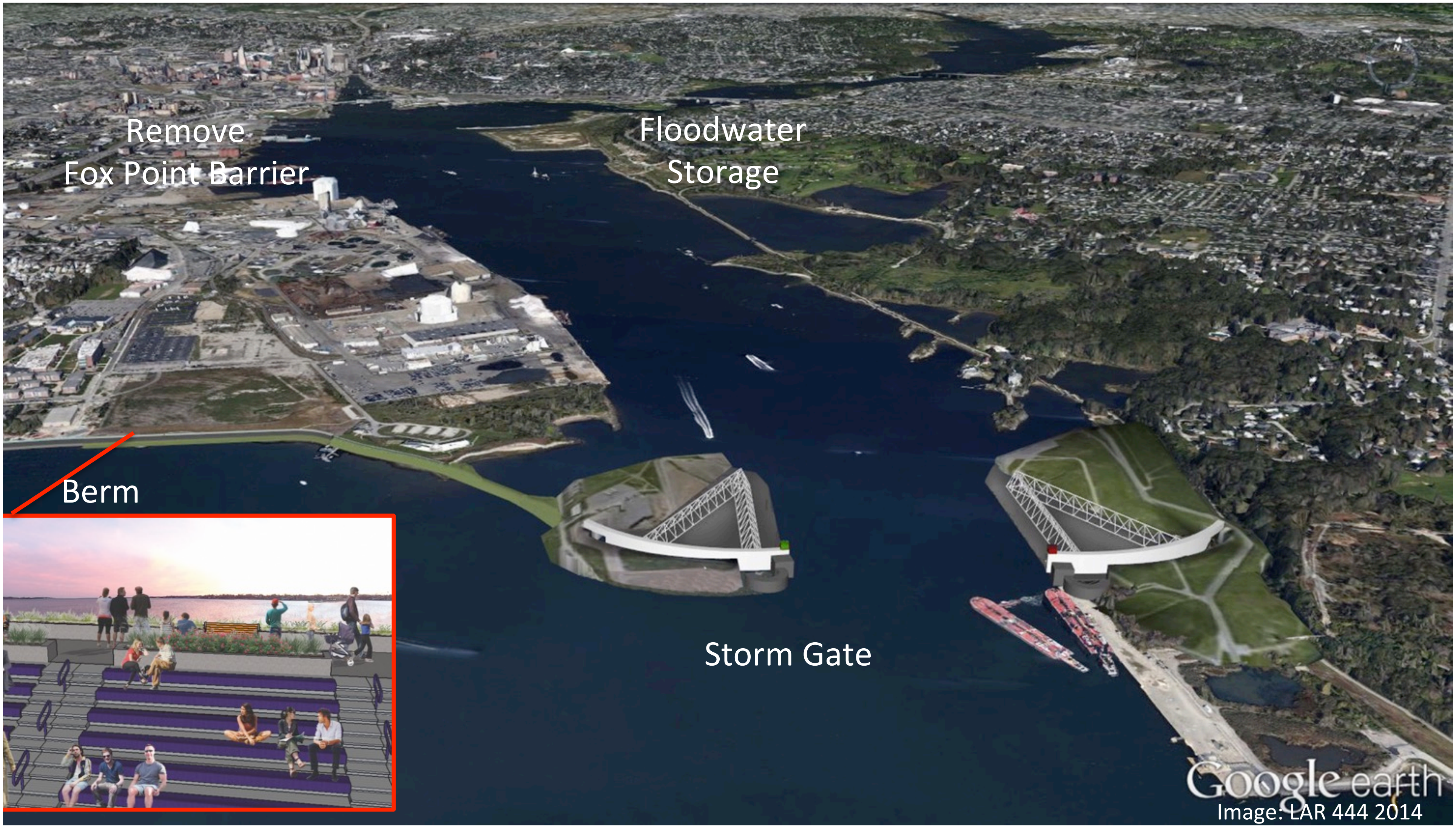
Advantages

- Removes hazardous materials from floodplain
- Tested strategy has been implemented elsewhere
- Opens floodplain as public waterfront space and/or environmental remediation
- Can account for SLR
- Reduces debris in navigation channel after storm
- Improves water quality to Providence Harbor

Disadvantages

- Disrupts port network
- Limited land availability
- High costs
- May impact communities around relocation sites
- Complexities from dependence on utilities (e.g., pipelines, rail, highway)
- May displace environmental damages to other places

4. Protect – New storm barrier for Providence Harbor.



4. Protect –
Storm barrier for Providence Harbor.

Advantages

- Protects during all major events
- New public uses can be integrated (e.g., on berm)
- Does not disrupt shipping
- Creates safe harbor for new business
- Tested solution
- Very long term solution
- Frees up land in City through removal of current barrier system

Disadvantages

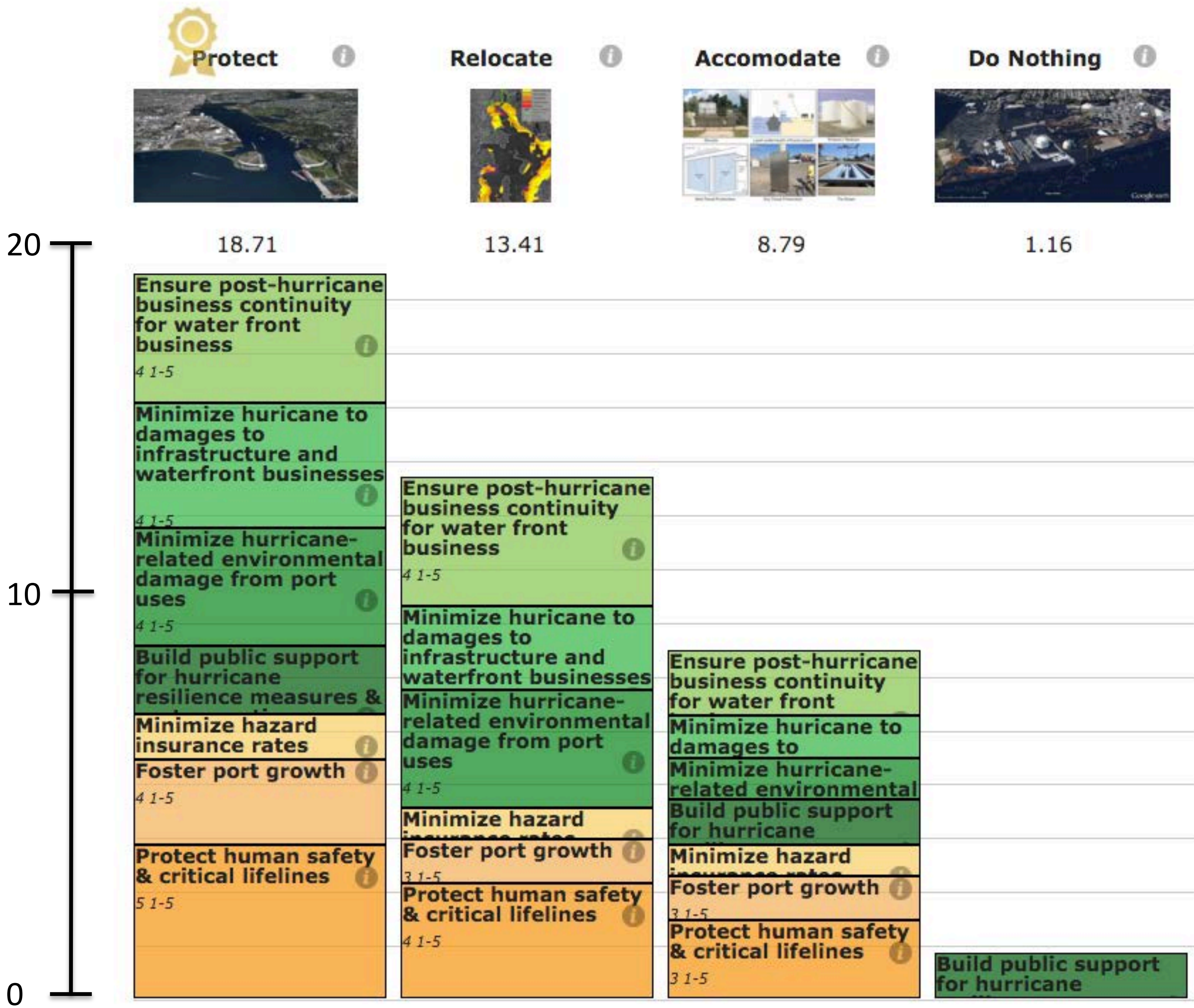
- Impacts of sea level rise are not addressed
- May impact tidal flows (water quality)
- Impacts sediment flow, water quality, discharge from watershed (sedimentation of navigation channel)
- High upfront costs
- May impact view of Bay
- May require pumping due to increased freshwater flows

RESILIENCE GOALS REVIEW

1. Ensure post-hurricane business continuity for waterfront business
2. Minimize hurricane damage for infrastructure and waterfront business
3. Minimize hurricane-related environmental damage from port uses.
4. Build public support for hurricane resilience measures & port operations
5. Minimize hazard insurance rates
6. Foster port growth
7. Protect human safety & critical lifelines

CONCEPTS	***G1***	***G2***	***G3***	***G4***	***G5***	***G6***	***G7***
Protect							
Relocate							
Accommodate							
Do Nothing							

LESS EFFECTIVE	1	2	3	4	5	**MORE EFFECTIVE**


Protect
Relocate
Accomodate
Do Nothing
20
10
0
18.71
13.41
8.79
1.16
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
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Foster port growth
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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

Preliminary findings

- No clear long-term port plan for major hurricane event
- Difficult to entice private business to participate when next steps aren't clear
- No clear champion (gov't or private) to take the lead on long-term planning
- Businesses very resistant to "relocate" concept, mostly because they felt it would not be feasible
- Overall, "protect" would be the favored strategy
- Stakeholders found it difficult to engage because costs were not part of conversation
- Cost calculations very difficult to estimate

Preliminary Recommendations

- Revise workshop methodology (e.g., probabilistic storm scenario, add cost and feasibility, add more time for discussion)
- Create database of experts and best practices to include in resilience dialogues
- Create *ad hoc* stakeholder group to begin more formal dialogue around long-term resilience planning
- Engage port with existing climate efforts in the state (e.g., the EC4, CRMC Beach SAMP)
- Create "post storm rebuilding goals and strategies"
- Identify business-continuity opportunities before the storm hits (e.g., contingency contracts, debris destinations)
- Conduct economic assessment of "port shutdown"

Project Team

Leads

Evan Matthews, Port of Davisville, Chair of Steering Committee
Dr. Austin Becker, URI, Project co-lead
Dr. Rick Burroughs, URI, Project co-lead
Dr. John Haymaker, Area Research, Wecision lead
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