

### Storm Surge Mitigation Concepts for the Houston-Galveston Area



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# Galveston Bay Foundation



**Mission:** To preserve and enhance Galveston Bay as a healthy and productive place for generations to come.

### Four target areas:

- Advocacy
- Education
- Research
- Conservation



# Potential Releases from Storm Surge Hit in HSC



### **Comparison of Spill Volumes**



- Deepwater Horizon Spill 210 million gal
- 24 foot surge HSC 92 million gallons
- 22 foot surge HSC 59 million gallons
- Exxon Valdez 11 million gallons
- Murphy Oil 1 million gallons after Katrina

# What do we need to protect?





# Responses to Ike from 2008 to Present – 3 Concepts



- Ike Dike Texas A&M University at Galveston
- Houston-Galveston Area Protection System (H-GAPS) Severe Storm Prediction, Education and Evacuation from Disasters Center (SSPEED), Rice University
- Storm Surge Suppression Study Gulf Coast Community Protection and Recovery District (GCCPRD)
- All of these entities have said that a coastal spine should be part of any structural solution... But where? On beach, elevating existing roads, or somewhere else?
- What about the location and design of the flood gates?

## Ike Dike Concept





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### http://www.tamug.edu/ikedike/

## Ike Dike Concept





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Netherlands model
1953 storm surge
response

 Stop storm surge at the coast with barriers and gates at Bolivar Roads and San Luis Pass; prevent surge from entering Bay.

### Netherlands Deltaworks





# Netherlands Deltaworks – Barriers





# Netherlands Deltaworks – Gates



TAMUG



### Maeslent Gate near Rotterdam



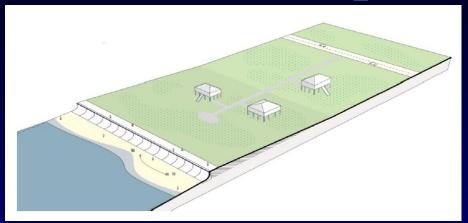
# Netherlands Deltaworks– Gates



### Eastern Scheldt Environmental Gates



## Ike Dike Concept - Barrier

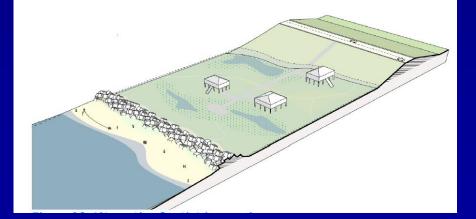




 Some form of a 17-foot or higher revetment on the **beach**

 Extension of the seawall -or- fortified dunes -or- a breakwater and barrier





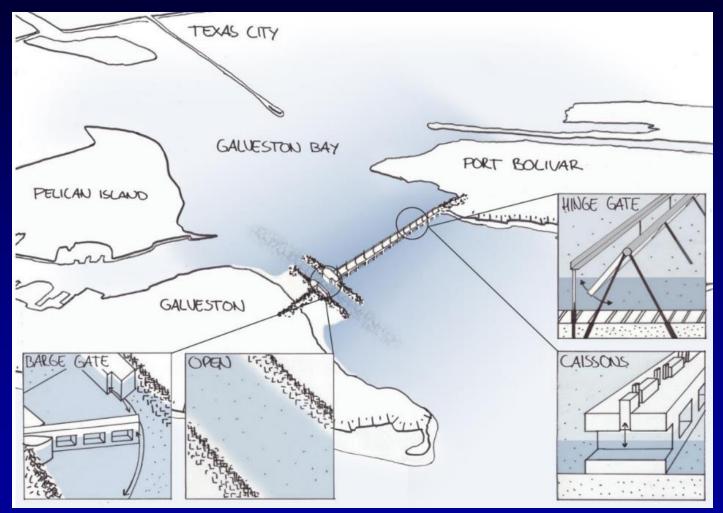
## Ike Dike Concept – Beach Nourishment Sand Engine





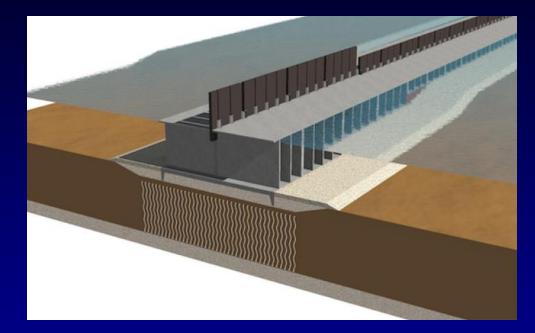
### Ike Dike Concept – Gates





## Ike Dike Concept – Environmental Gate

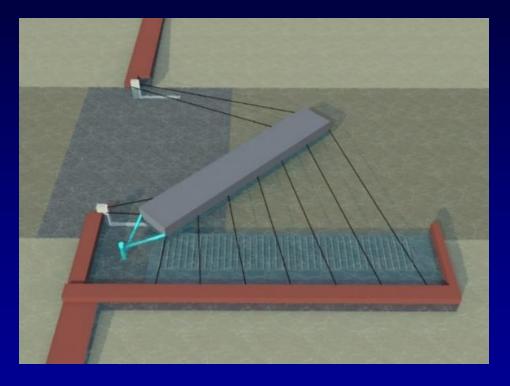


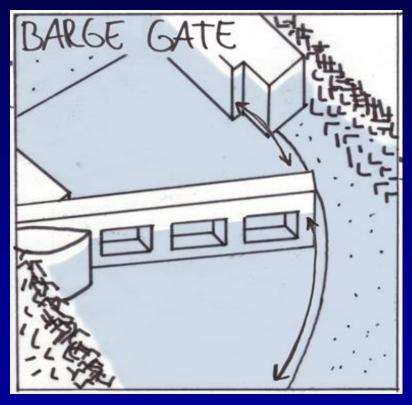




# Ike Dike Concept – Navigation Gate







# Ike Dike – Beach Concept Questions/Concerns





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 Sufficient sediment budget to maintain it?

•Sufficient funding to maintain it properly?

•Will Ike Dike become a new seawall along this whole reach? Is that acceptable?

### SSPEED Center – Houston-Galveston Area Protection System (H-GAPS)





### http://sspeed.rice.edu/sspeed/

### SSPEED Center – H-GAPS



Note: SSPEED focusing studies with Coastal Spine on existing roadways

### "Lower-Bay" Strategy

- Coastal Spine (F, 1 and G)
- HSC Gate and Environmental Gate at Bolivar Roads Inlet (L)
- Backside Galveston Levee (H)
- In-bay Berms w/ small gates
   (E)



### SSPEED Center – H-GAPS



Note: SSPEED focusing studies with Coastal Spine on existing roadways

### "Mid-Bay" Strategy

- Coastal Spine (F, 1 and G)
- HSC Gate in middle of Galveston Bay (M)
- Backside Galveston Levee (H)
- In-bay Berms with small gates
   (E)



### SSPEED Center – Mid-Bay Strategy





SSPEED

### SSPEED Center – Mid-Bay Strategy





# GCCPRD Phase 3 Study **Recommended Actions**



Figure 2: Recommended Central Region Alternative (CR#1) - Coastal Spine



•High Island to San Luis Pass Coastal Spine\* \*parallel to Hwy 87 and FM 3005 •Gate at Bolivar Roads Navigation Gate at Clear Lake

Galveston Ring Levee

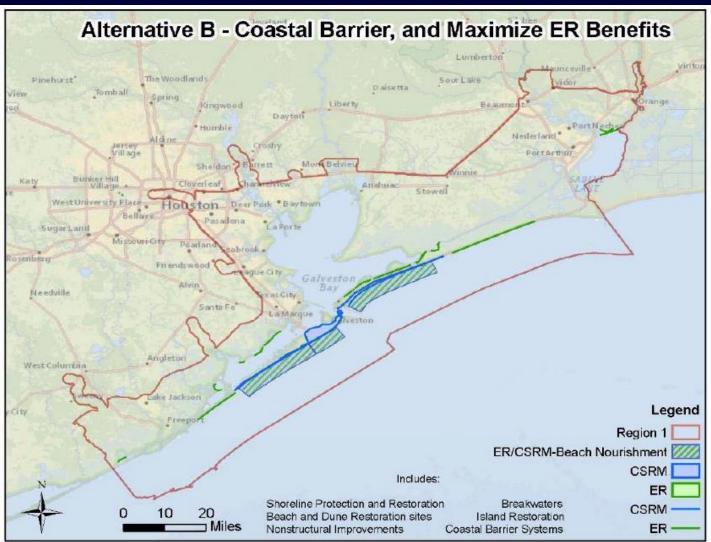
### GCCPRD Phase 3 Study Recommended Actions





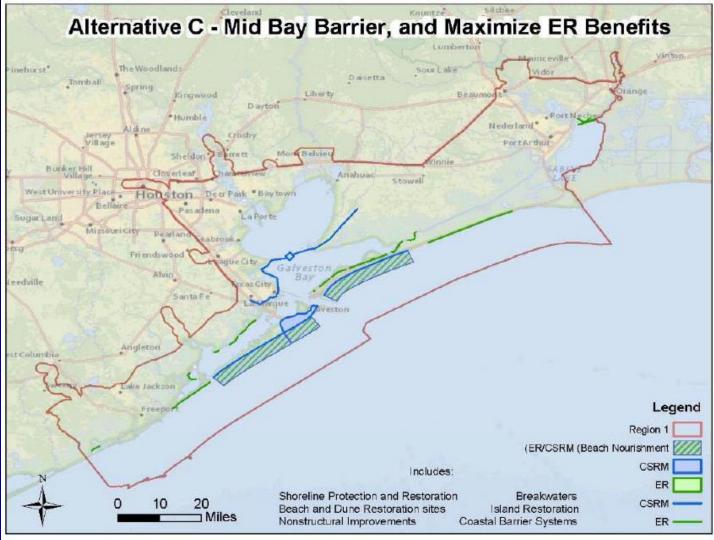
GCCPRD

### Corps of Engineers – Coastal Texas Protection and Restoration Feasibility Study\_\_\_\_\_



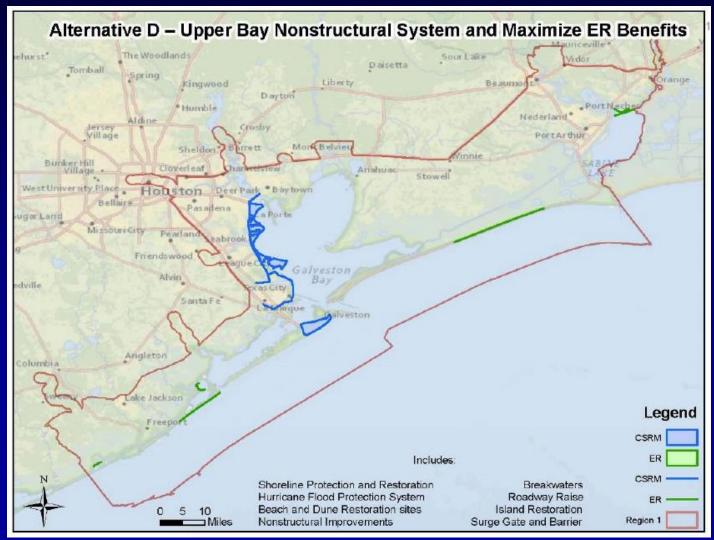
GALVESTON

Corps of Engineers – Coastal Texas Protection and Restoration Feasibility Study



GALVESTON

### Corps of Engineers – Coastal Texas Protection and Restoration Feasibility Study



GALVESTON

# Politics...



Cities supporting lke Dike concept



 Ike Dike concept has support of many local governments and business-related organizations.

 Concept is relatively simple and theoretically protective of all communities.

# Environmental Questions and Concerns for All Concepts



Direct and indirect impacts to habitat. •Will this be a "green light" to runaway development? Direct and indirect impacts to living species. Changes to bay circulation and salinity.





Storm Surge Protection: Can we protect people and the Bay? GBF Membership Meeting August 18th Come hear our panel of experts talk about current plans under consideration for mitigating hurricane storm surge in the Houston-Galveston region.

#### Panel Participants:

#### Jim Blackburn

Co-Director, Severe Storm Prediction, Education, and Evacuation from Disasters Center, Rice University

#### Leonard Waterworth

Executive Professor, Department of Maritime Administration, Texas A&M University at Galveston

#### **Christopher Sallese**

Project Engineer, Gulf Coast Community Protection and Recovery District

#### Sheridan Willey

U.S. Army Corps of Engineers – Coastal Texas Protection and Restoration Study Region 1 Project Manager

#### Thursday, August 18, 2016

#### Brady's Landing

Reception: 6:00–6:30 pm Business meeting: 6:30–6:45 pm Program: 6:45–8:30 pm

8505 Cypress Street Houston, TX 77012

RSVP by Friday, August 12, 2016 to Sharon at sroark@galvbay.org

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### **Questions?**



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### www.galvbay.org



