

Coastal Flood Risk Reduction Program

Quo vadis Texas? Research & education for the next big surge barrier



OCEAN ENGINEERING
TEXAS A&M UNIVERSITY



Jens Figlus, Dipl.-Ing., Ph.D.

Department of Ocean Engineering
Texas A&M University

MOSE Conference

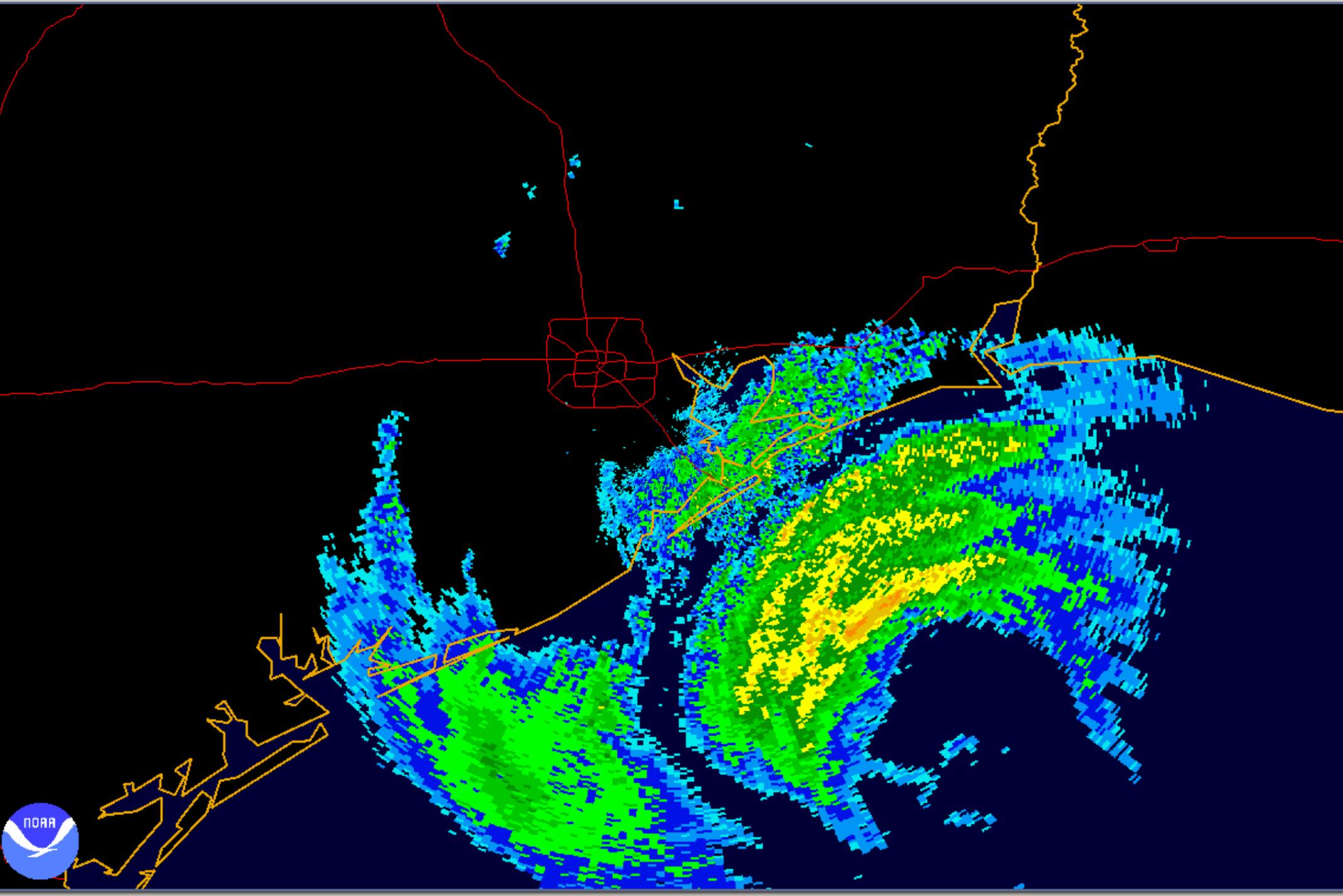
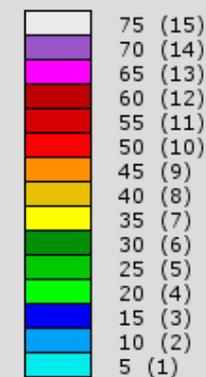
June 1, 2023



NEXRAD LEVEL-III
BASE REFLECTIVITY
KHGX - HOUSTON, TX
09/13/2008 00:03:56 GMT
LAT: 29/28/19 N
LON: 95/04/44 W
ELEV: 115 FT
MODE/VCP: A / 121

ELEV ANGLE: 2.40 °
MAX: 49 dBZ

Legend: dBZ (Category)





Hurricane Ike impact on Galveston Island (Houston Chronicle)



High Island - Sept. 14, 2008, storm surge of 5.3 m (17.5 feet), looking from GOM toward mainland



East Side of Rollover Pass, Feb. 2009 (photo: Dellapenna)

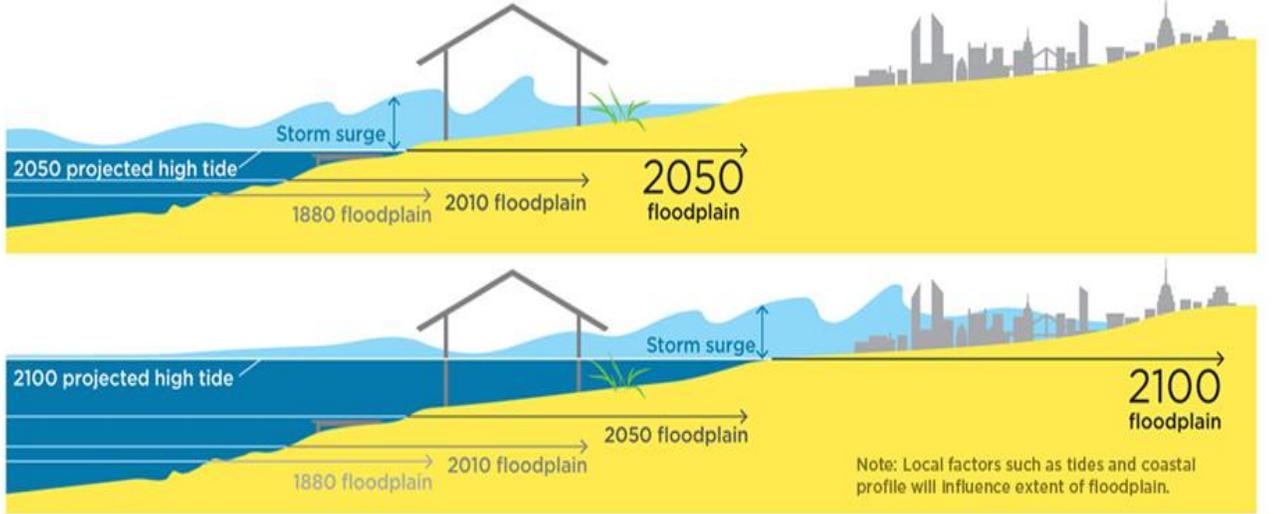
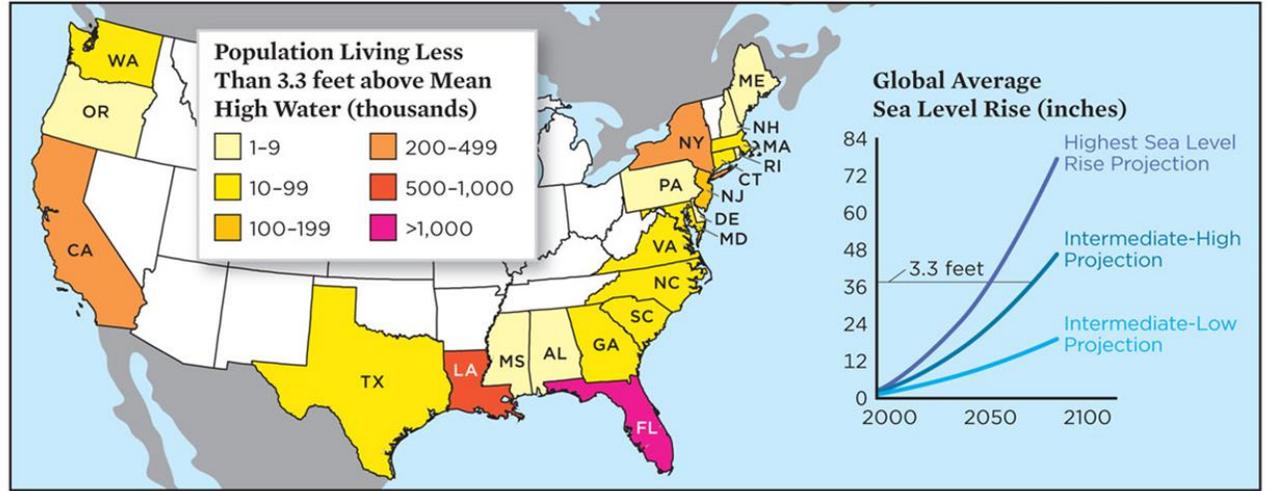


East Side of Rollover Pass, Feb. 2009 (photo: Dellapenna)

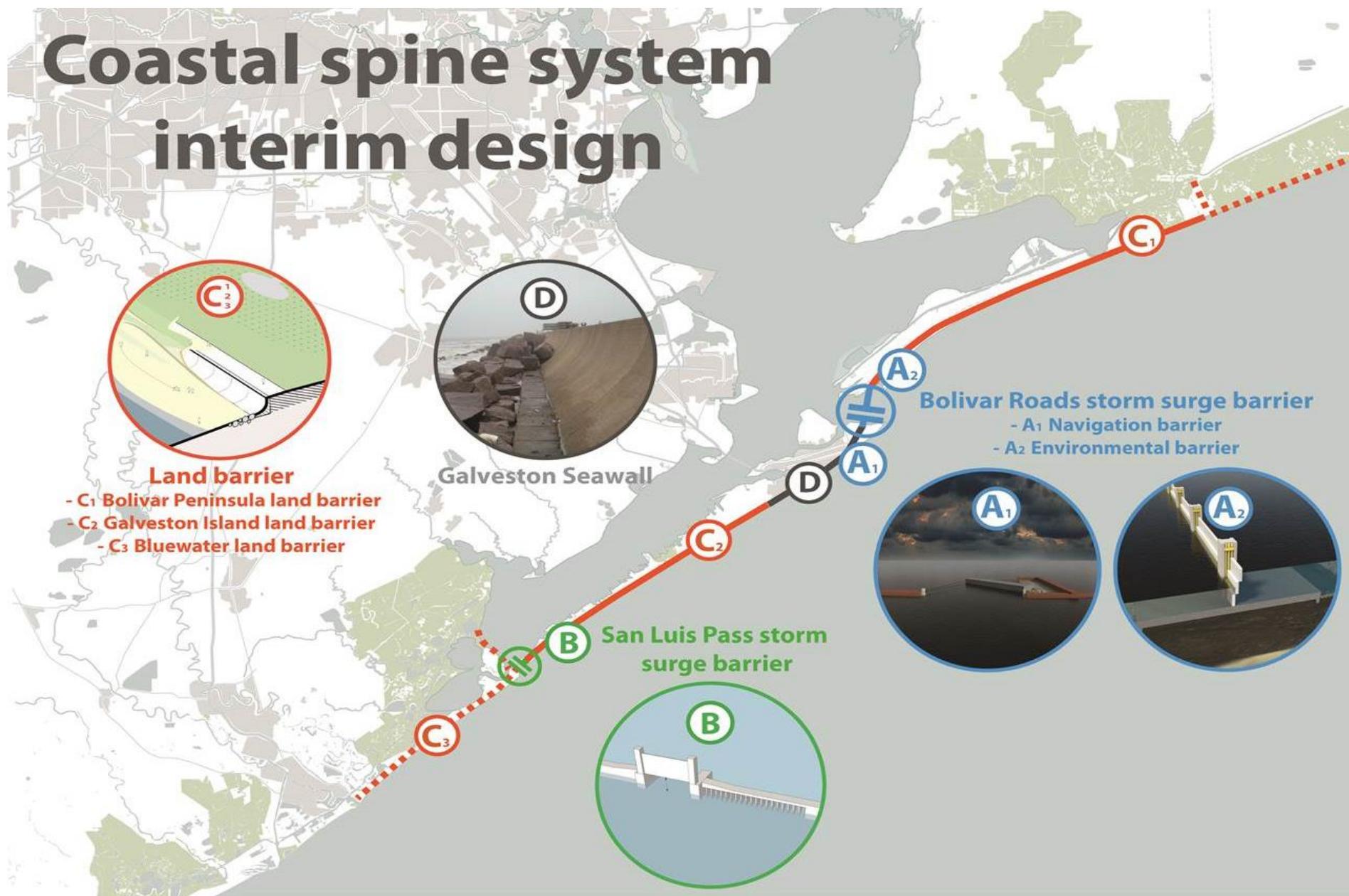
Need for Innovative Solutions and International Collaboration to advance Coastal Flood Risk Reduction



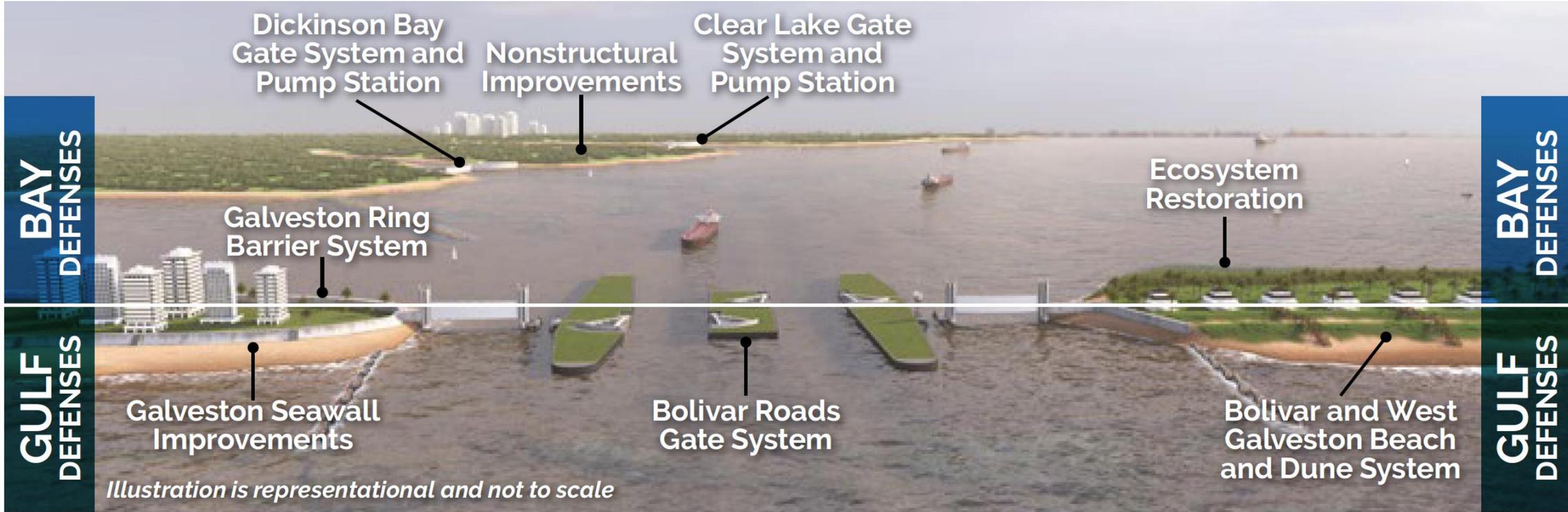
Texas Gulf Coast Region population grew by 20% (1.2 million) between 2010 and 2020



Coastal spine system interim design



USACE Texas Coastal Study Feasibility Report



Current USACE Study Plan for Bolivar Roads Gate System

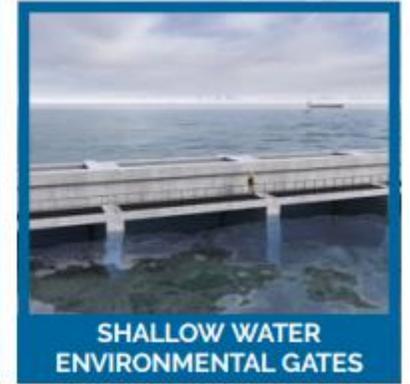
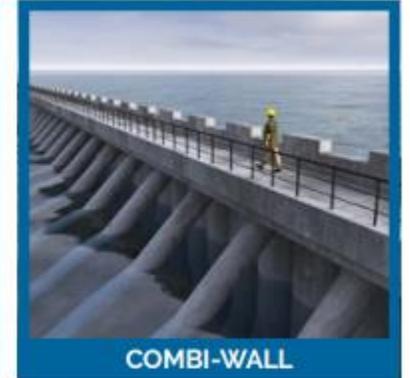
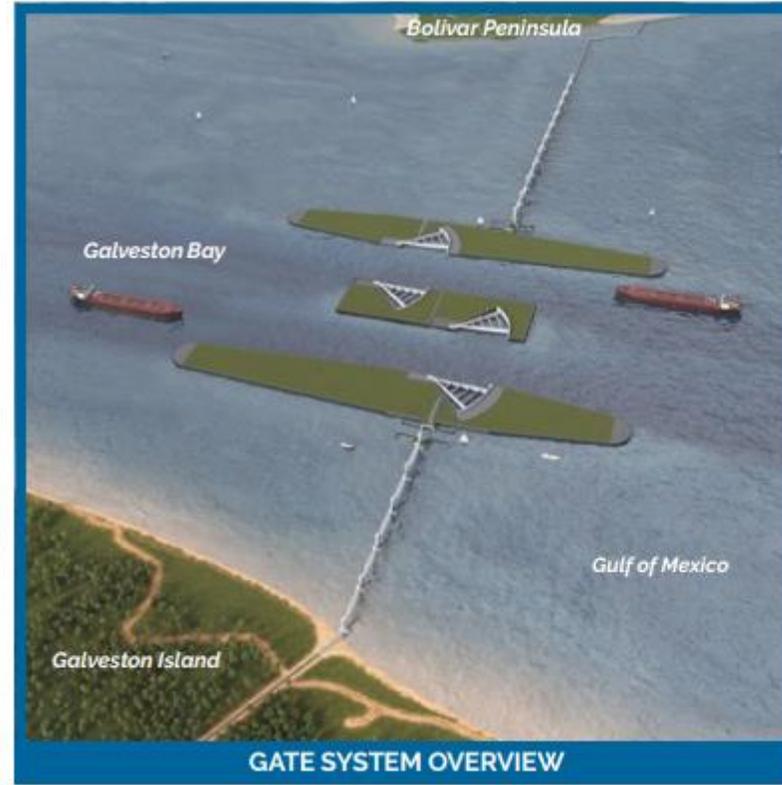
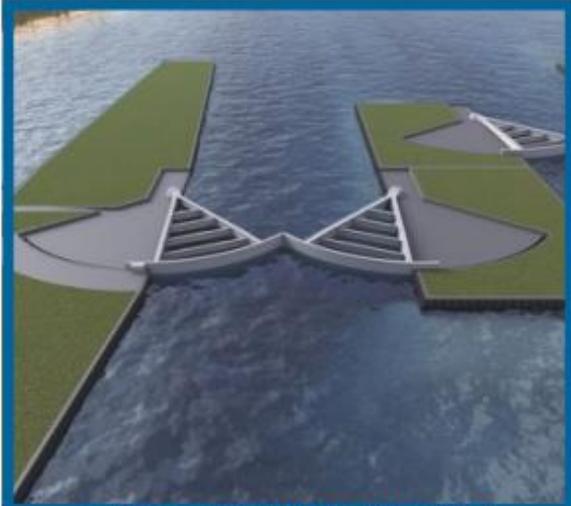
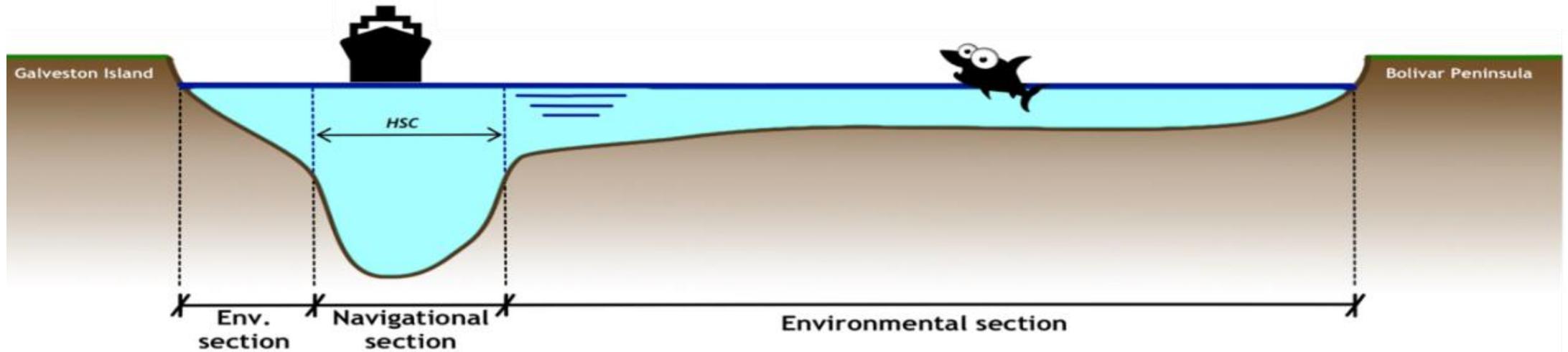
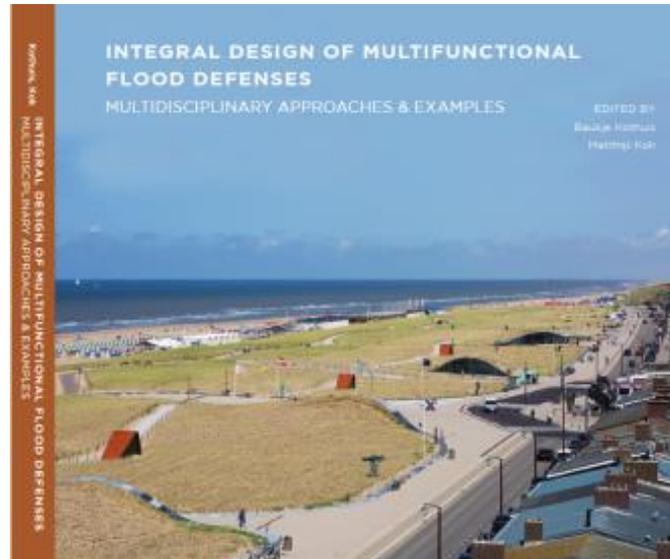
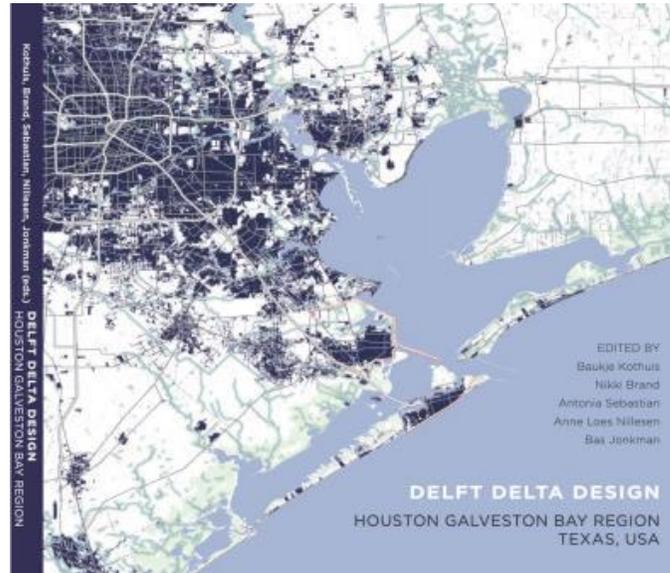
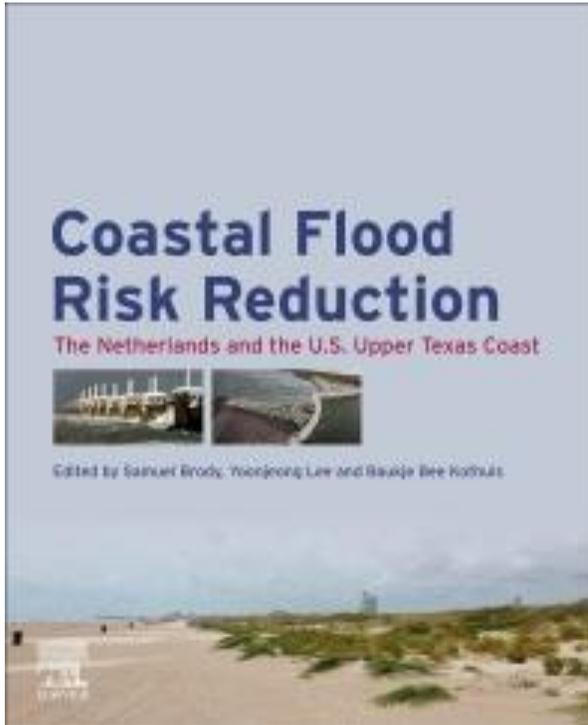


Figure ES-7: Bolivar Roads Gate System



Ongoing Research and Education Activities



- ❑ Research collaboration with TU Delft
- ❑ 50+ student projects, 40+ exchanges
- ❑ NSF-funded programs: PIRE, IRES, FRAP, Global Center (in progress)
- ❑ MSc and PhD theses, UG capstone projects, reports, books, researcher exchanges
- ❑ A&M coastal engineering short course
- ❑ A&M – USACE Coastal Science and Engineering Collaborative
- ❑ A&M Ocean Engineering Study Abroad Program Italy



The Shade Curtain Barrier

A conceptual design for a storm surge barrier at the San Luis Pass in Galveston Bay, Texas, United States of America

by

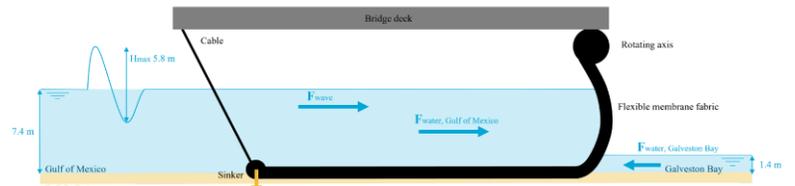
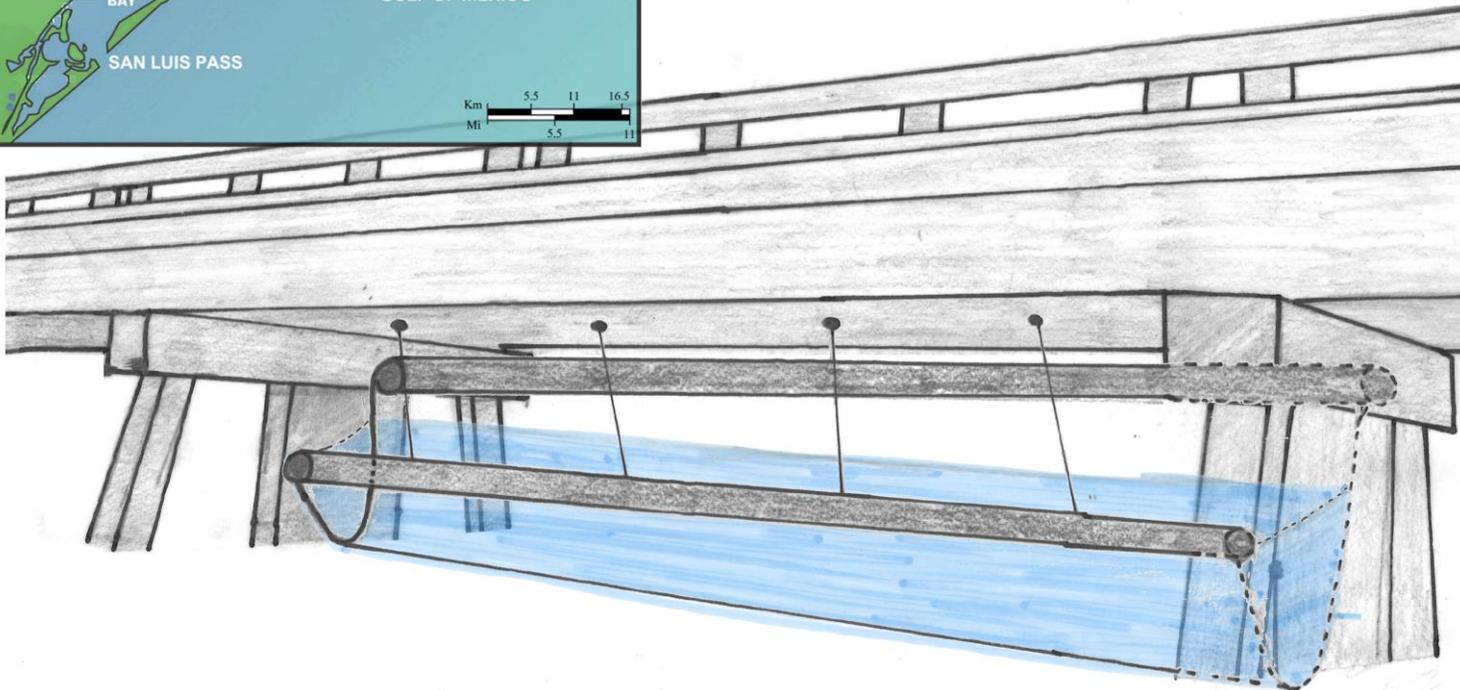
Malou M. J. van Schaijk

to obtain the degree of Master of Science
at the Delft University of Technology,
to be defended publicly on Wednesday September 21, 2022 at 2 PM.



Faculty of Civil Engineering and Geosciences
Hydraulic Engineering

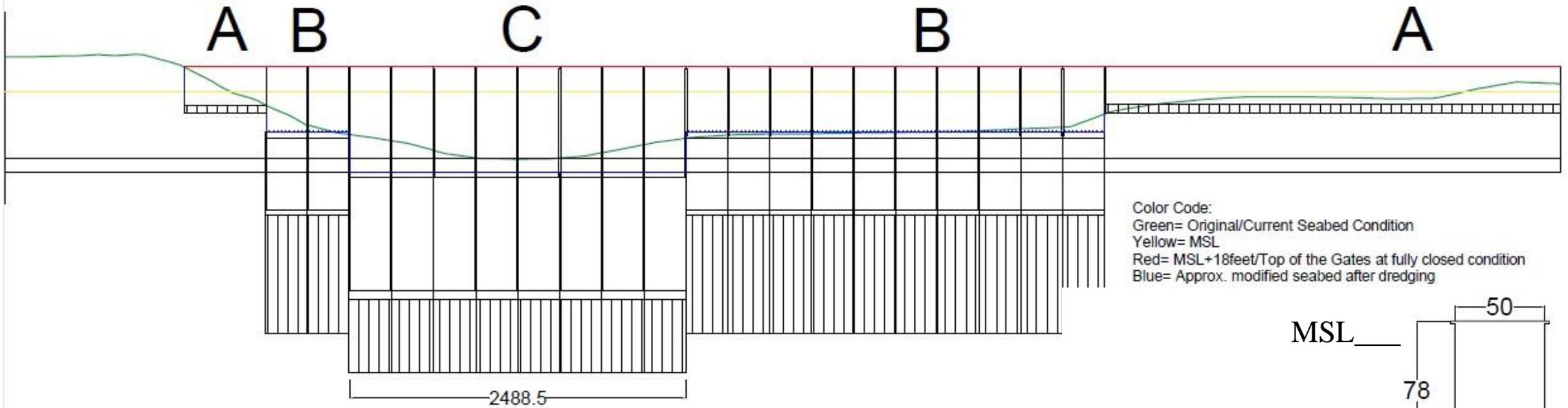
In collaboration with:



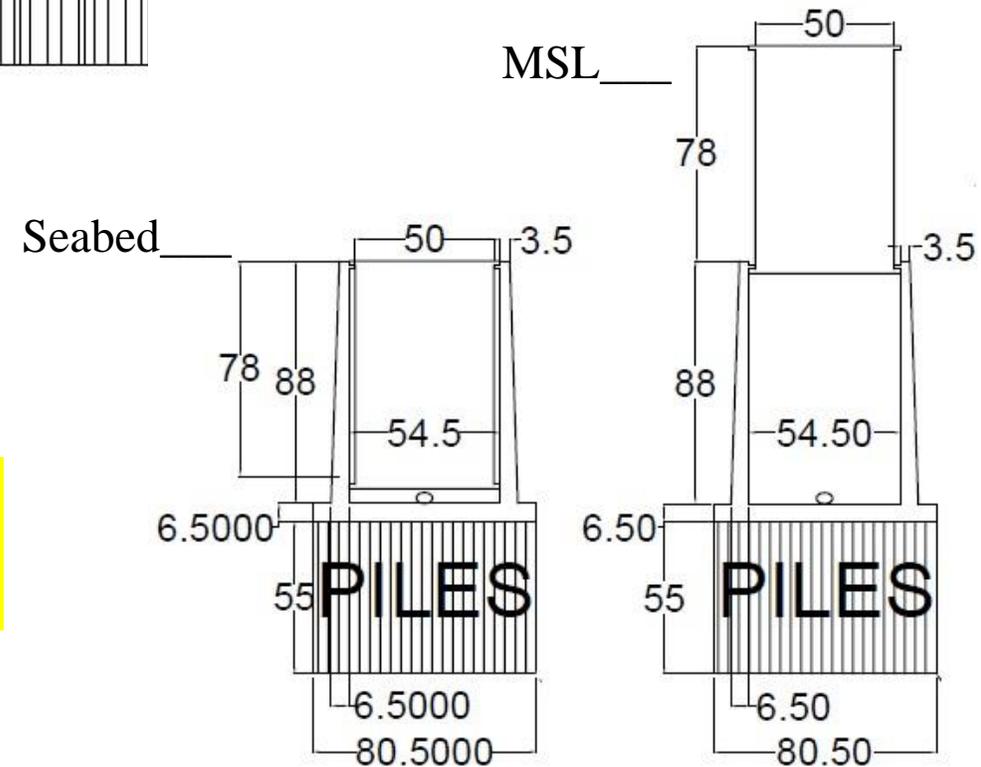
Dr. ir. B.C. van Prooijen
Dr. ir. E.C. van Berchum
Dr. J. Figlus

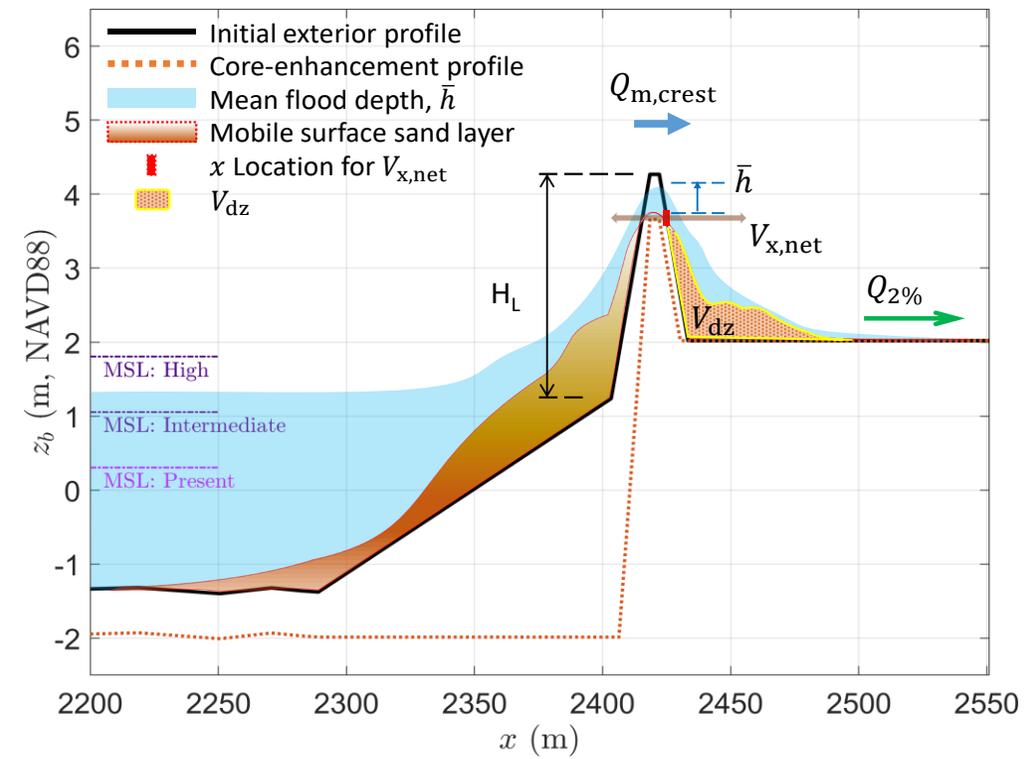
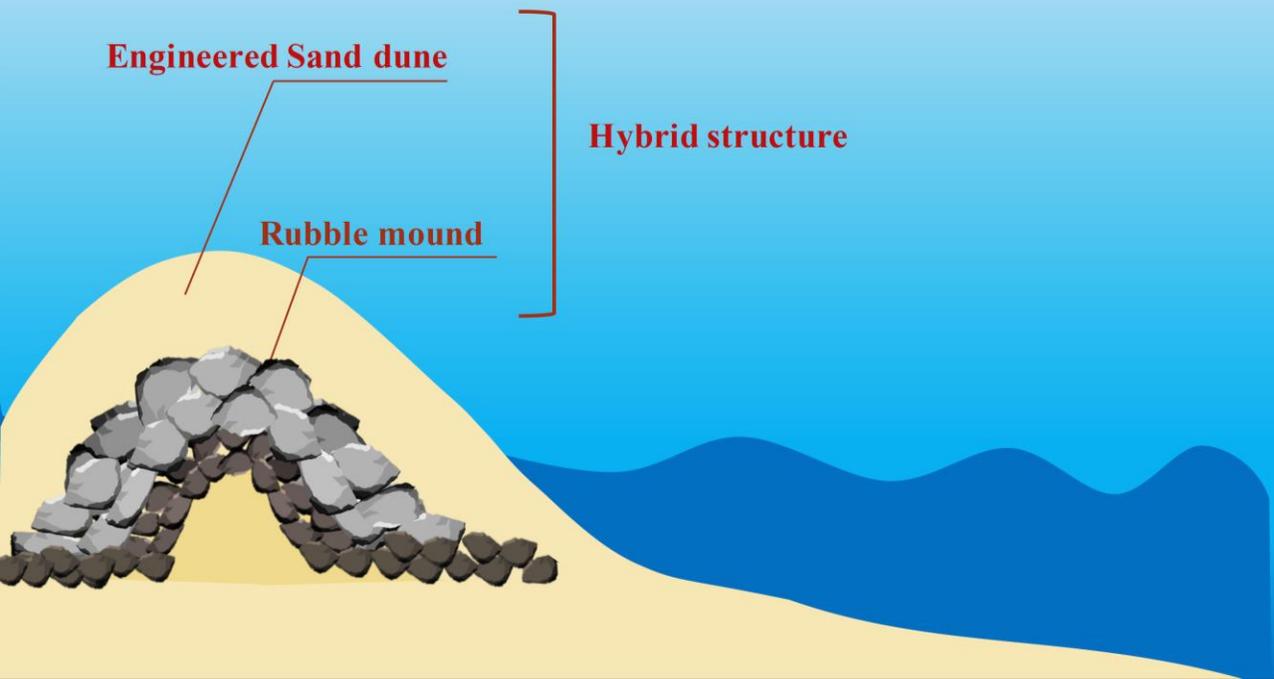
TU Delft
Arcadis
Texas A&M University

Gate Alternative Designs: Buoyant Piston Storm Surge Gate (Sweetman)

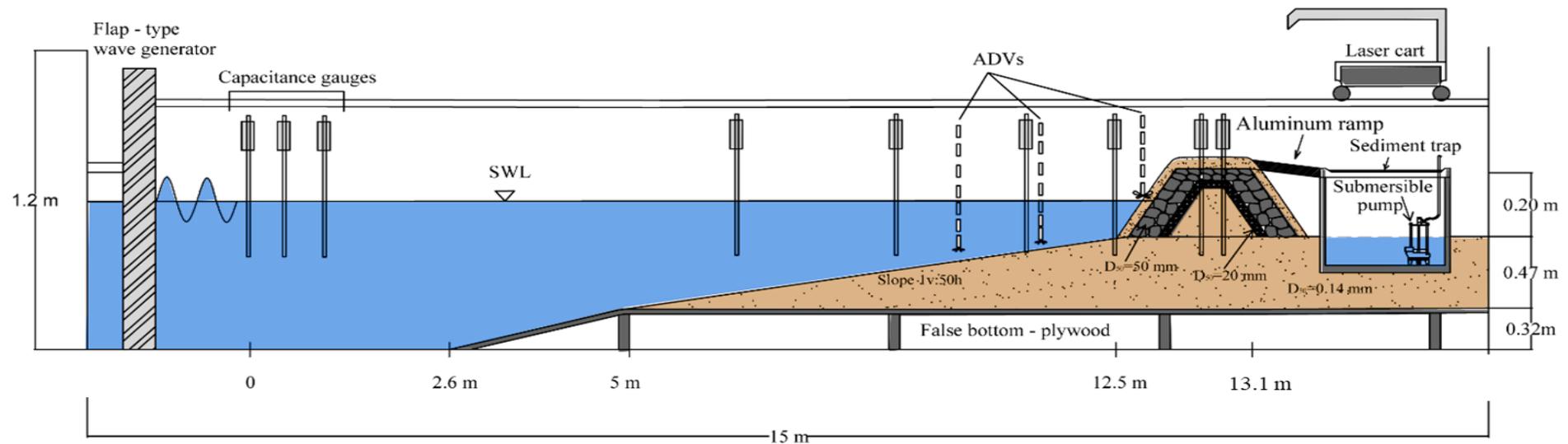


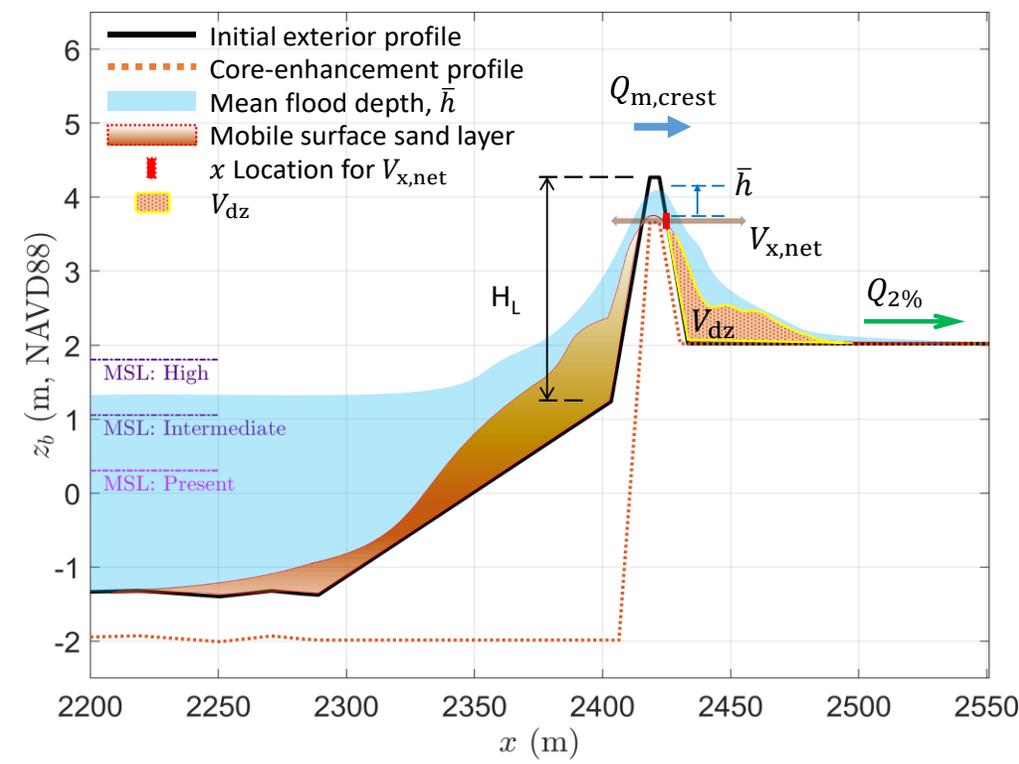
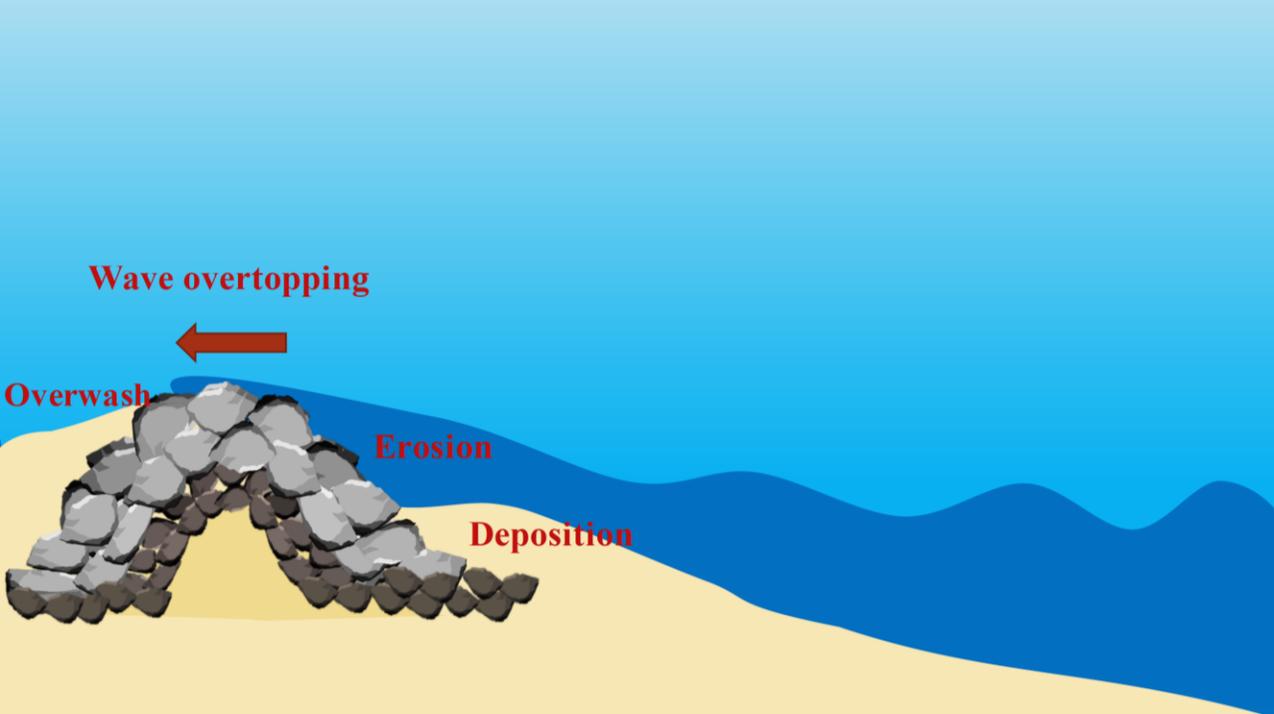
Arch Gate Rendering (TUD)



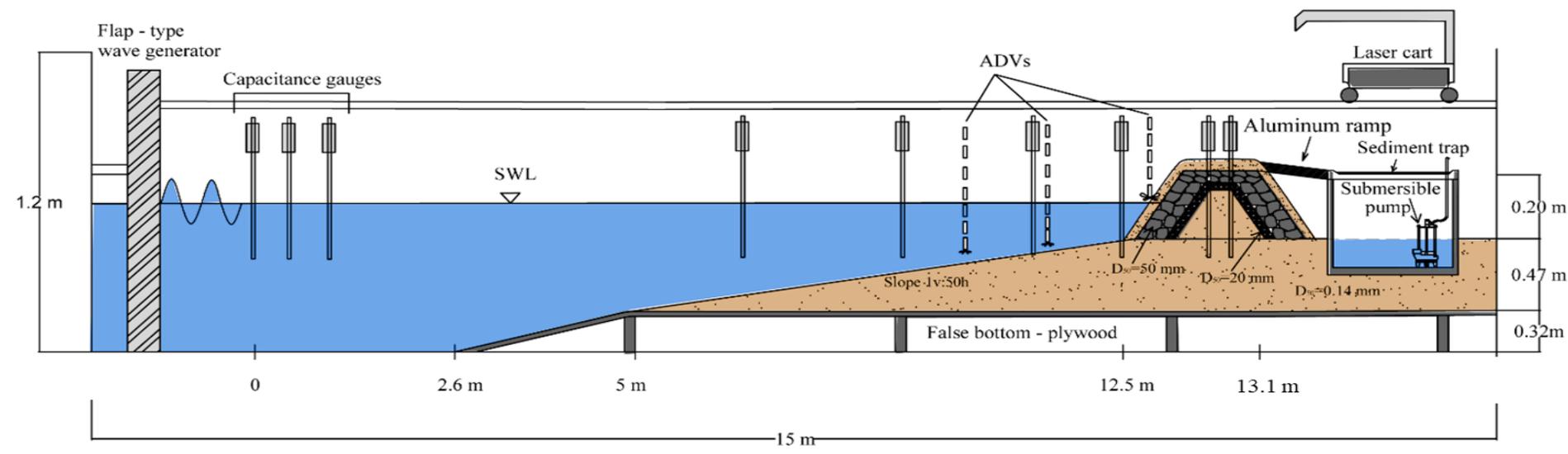


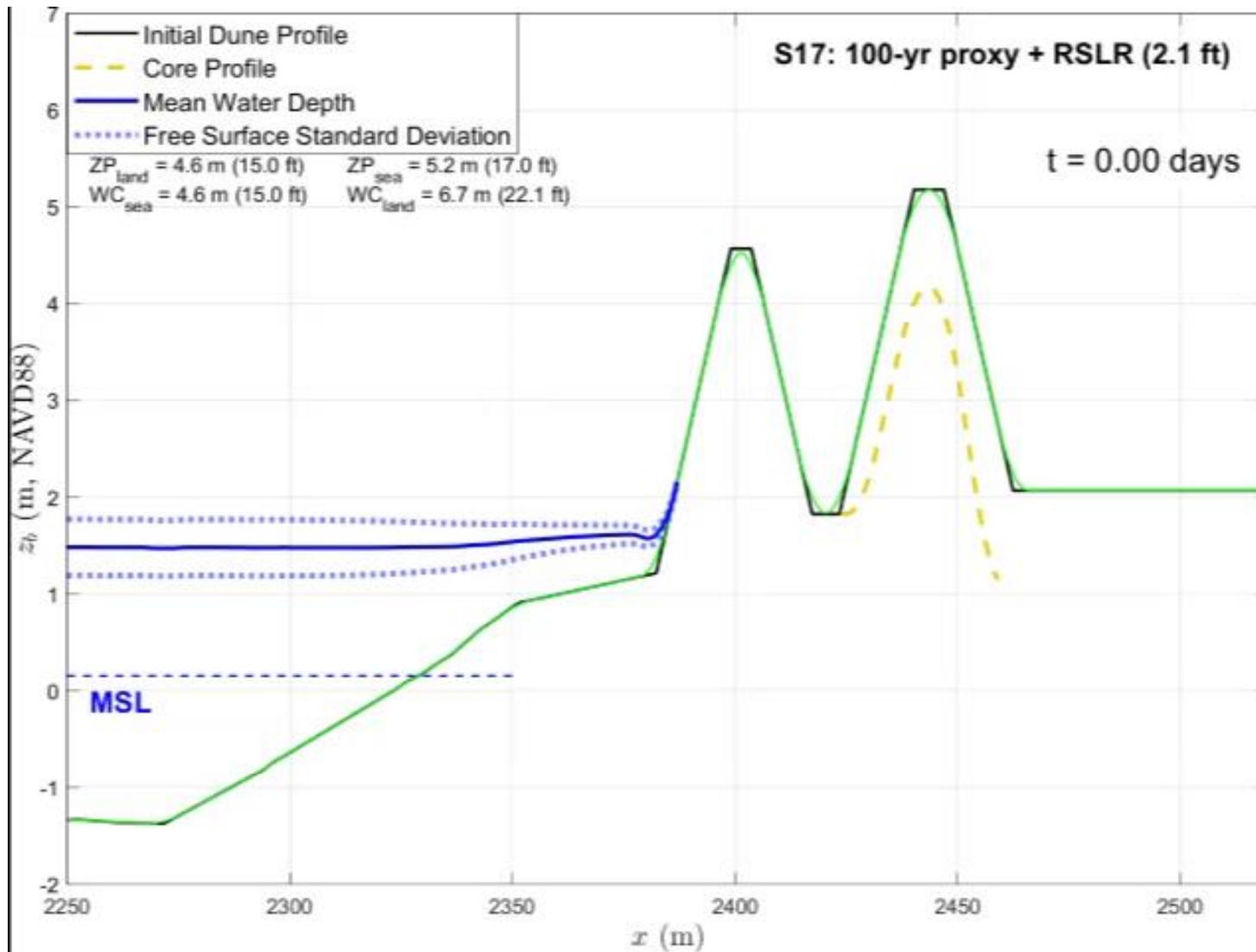
Hybrid coastal structures / enhanced sand dunes for the land barrier.





Hybrid coastal structures / enhanced sand dunes for the land barrier.





Ongoing research to better understand options for the land barrier portion of the coastal spine

Research and Development Needs

Engineering and natural sciences

- ❑ Innovative barrier and nature-based solutions: design, testing, monitoring, and modelling (physical and numerical); infrastructure resilience
- ❑ Hydraulics, sedimentation, ecology, maritime logistics
- ❑ Adaptive planning, sequencing, financing, governance, contracting, and management of interventions over time
- ❑ Combination with other plans: urbanization, energy, port, environmental

Communication and Education

- ❑ Develop educational programs, sand box physical demonstration models, full-scale beach dune living lab, interactive website

Socio-economics and planning

- ❑ Public perception, stakeholder involvement
- ❑ Quantifying synergistic benefits at different spatial and temporal scales
- ❑ Simulate land use change and development under different scenarios of surge protection

Take-Home Messages and Food for Thought

- ❑ The Greater Houston-Galveston Metropolitan Area in Texas is anticipating a large storm surge suppression system to be built over the next decades (coastal spine, ring barrier, in-bay measures, incorporate nature-based solutions, etc.)
- ❑ While basic design ideas are on the table, much more research to optimize the proposed system and establish monitoring baselines is needed in many areas (multidisciplinary, cross-disciplinary, convergent research)
- ❑ Texas needs to apply lessons learned from Italy (MOSE) and collaborate with international partners on strategic topics including management and operation
- ❑ We need to work together to excite, educate, and train the next generation workforce and problem solvers to meet future flood risk reduction challenges
- ❑ Creative ways to fund international research activities need to be sought and developed

Mille grazie!
Avete domande?



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Coastal
Engineering
Laboratory



IDRT

Contact Info:

Jens Figlus, Dipl.-Ing., Ph.D.

Associate Professor

Department of Ocean Engineering
Texas A&M University – Galveston Campus

figlusj@tamu.edu | 409-741-4317

<http://figluscoast.tamu.edu>

