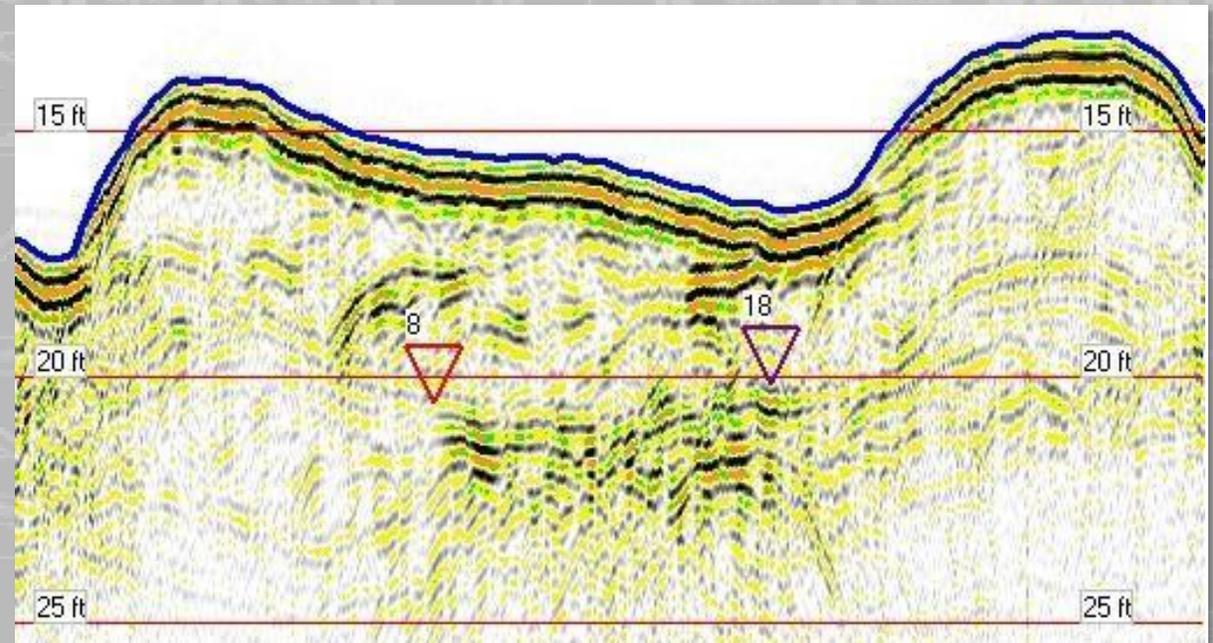


# RD&T UPDATE

Mr. Charles (Eddie) Wiggins  
Technical Director, Navigation  
USACE-ERDC

Date: 03 October 2019



US Army Corps  
of Engineers®





# CIVIL WORKS RD&T STRATEGIES



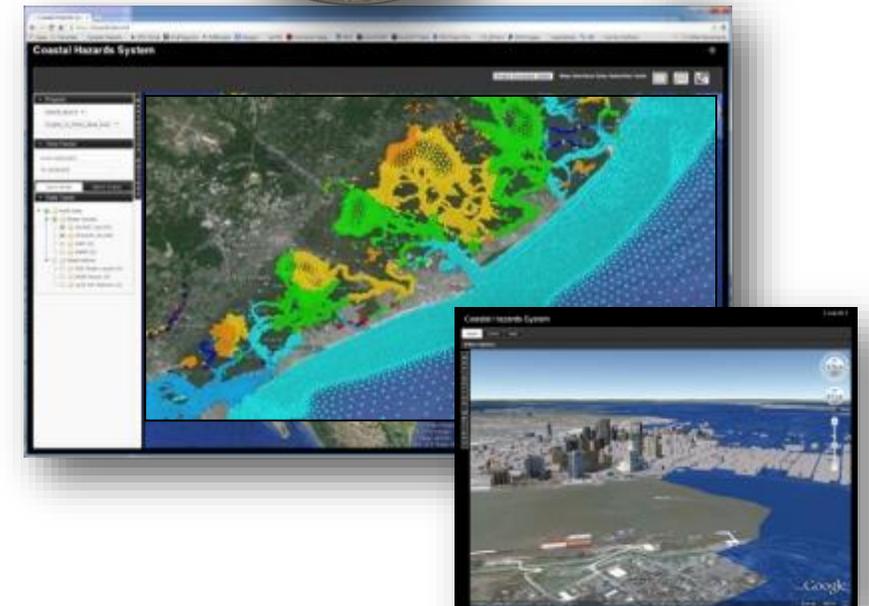
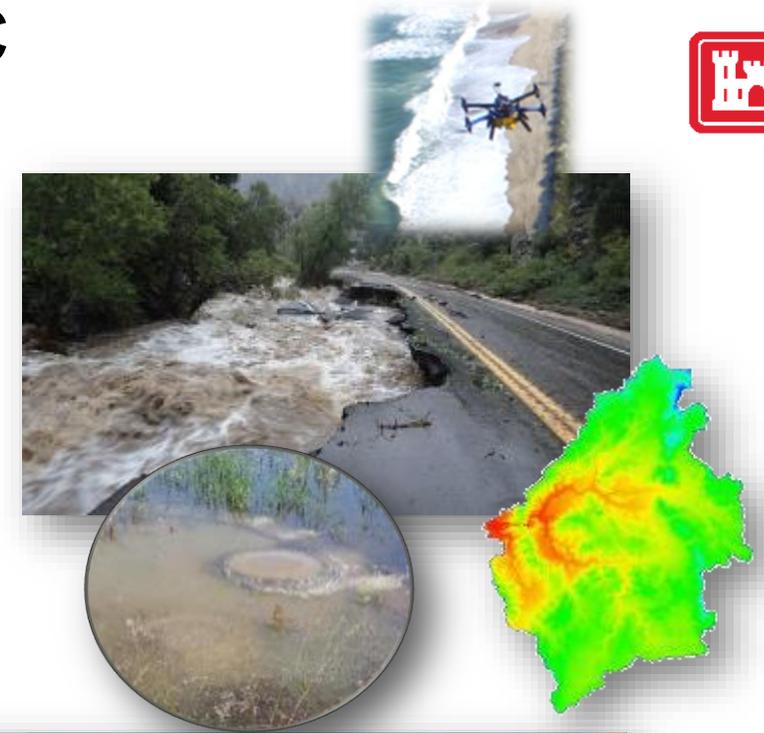
# FLOOD & COASTAL RD&T STRATEGIC NEEDS & PRIORITIES



- Develop tools for **lifecycle analysis** incorporating risk, uncertainty & consequences of alternatives
- Optimize design & management of **resilient coastal & estuarine systems**
- Assess comprehensive & multidisciplinary management of **watersheds**
- Improve FRM **infrastructure** resiliency & reliability
- Enable effective **Emergency Management** disaster preparation, response & recovery

## *Cross-cutting:*

- *Provide tools to enhance ecosystems, processes, benefits & services*
- *Collaborate & leverage via multidisciplinary teams*
- *Deliver sound engineering & scientific solutions that meet Planning Modernization guidelines*





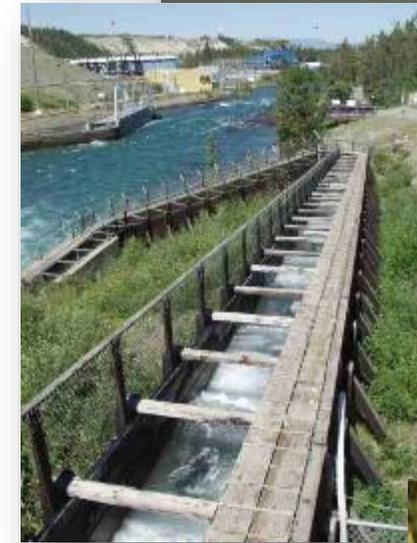
# ENVIRONMENTAL RD&T STRATEGIC NEEDS & PRIORITIES



- Establish & Incorporate **Ecosystem Goods & Services** in Corps Planning and Environmental Benefits Evaluation
- Characterize Physical, Chemical and Biological Variations Affecting **Degradation in Coastal Environments**
- Improve Capabilities to Design and Implement **Aquatic Ecosystem Restoration** in Urban Settings
- **Optimize Management** of T&E and Invasive Species
- Optimize design & management of **resilient coastal & estuarine systems**

*Cross-cutting:*

- *Provide tools to enhance ecosystems, processes, benefits & services*
- *Collaborate & leverage via multidisciplinary teams*
- *Deliver sound engineering & scientific solutions that meet Planning Modernization guidelines*





# NAVIGATION RD&T STRATEGIC NEEDS & PRIORITIES



- **Extend the useful life** of existing navigation infrastructure
- Improve Navigation operations and **Multimodal Freight Flow** through systems optimization
- Optimize design & management of **resilient navigation systems**
- Develop and Deploy **eNavigation** capabilities

### *Cross-cutting:*

- *Provide tools to enhance ecosystems, processes, benefits & services*
- *Collaborate & leverage via multidisciplinary teams*
- *Deliver sound engineering & scientific solutions that meet Planning Modernization guidelines*





# EXAMPLE RD&T EFFORTS



# COASTAL MAPPING

**CZMIL Coastal Zone Mapping and Imaging Lidar**

**3<sup>rd</sup> generation coastal mapping and tactical charting system developed by ERDC**

- Collects bathymetry up to 60 m\*
- 15 cm 1 $\sigma$  precision bathymetry
- 10 cm RMSE topography
- 5 cm aerial photography (PhaseOne)
- 1-m, 48-band hyperspectral imagery (Itres CasI-1500)

400 m  
Dia: 290m

# National Coastal Mapping Program

## Goals

- Develop regional, repetitive, high-resolution, high-accuracy elevation and imagery data
- Build an understanding of how the coastal zone is changing
- Facilitate management of sediment and projects at a regional, or watershed scale

(500 m) Topo

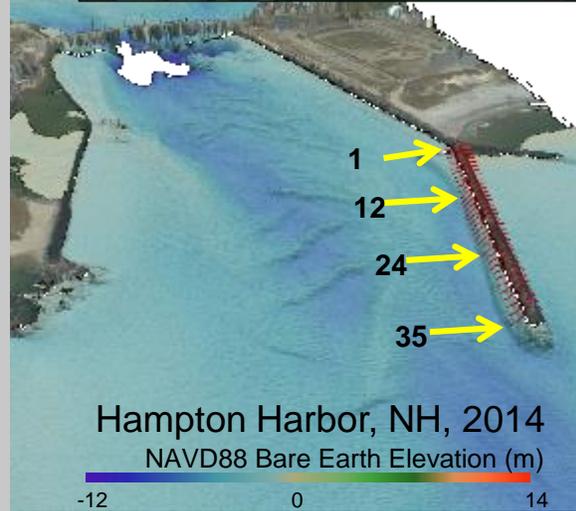
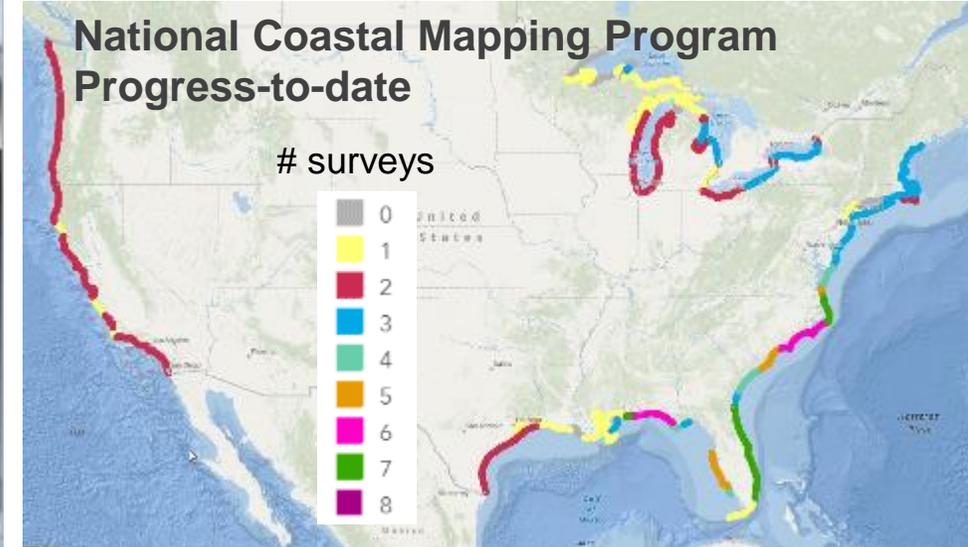
Hydro (1,000 m)

Lidar Bathymetry and Topography  
Marquette Harbor, Michigan, 2019

**Coastal Structures Database**

- Database of structures
- imagery
- digital elevation models
- metrics
  - Length of crest
  - Crest elevations
  - Cross sections

[https://gis.sam.usace.army.mil/server/rest/services/JA\\_LBTCX/JALBTCX\\_Structures/MapServer](https://gis.sam.usace.army.mil/server/rest/services/JA_LBTCX/JALBTCX_Structures/MapServer)





# SEDIMENT MAPPING

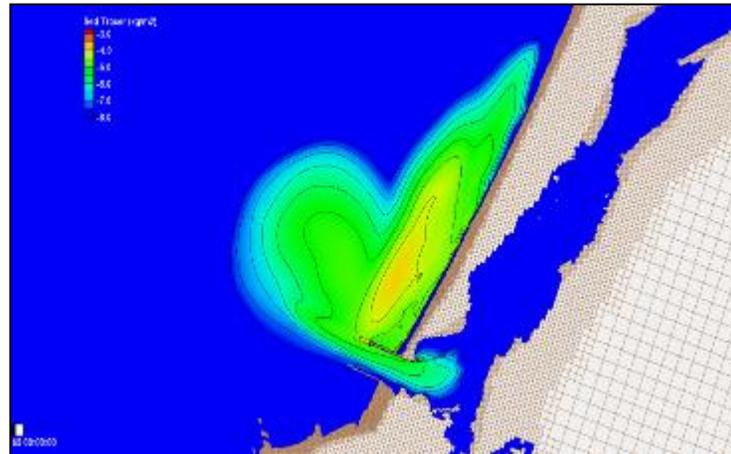


Concern: Fate of sediments placed in ocean dredged material disposal sites (ODMDS) is sometimes unknown

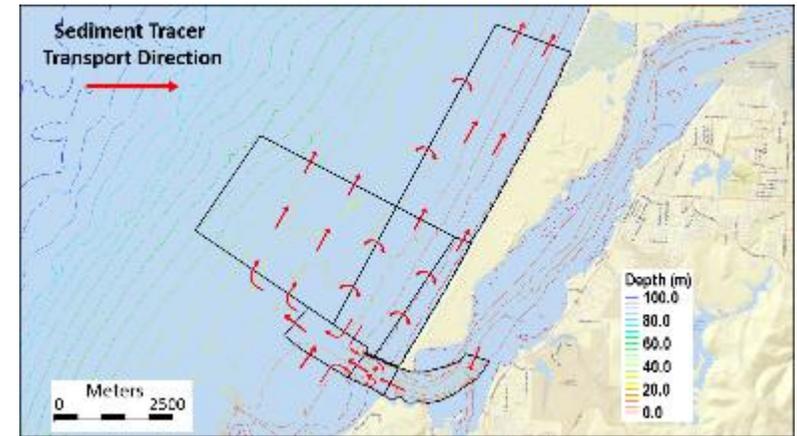
Capability: Sediment tracing and Coastal Modeling System combine to better predict where and how sediment moves, which enables better project designs and sediment management practices



Sediment containing tracers is placed in both nearshore and offshore ODMDS and tracked over time



Coastal Modeling System predicts sediment movement and results are verified with field observations



Material movement trends are represented by arrows in this diagram

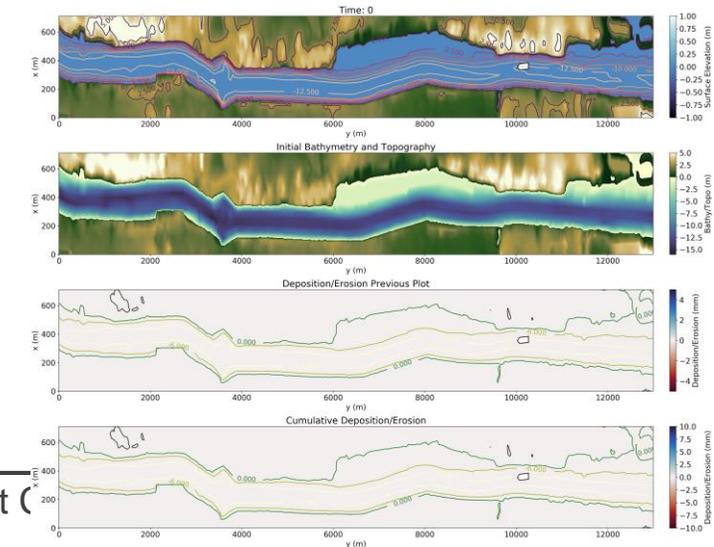
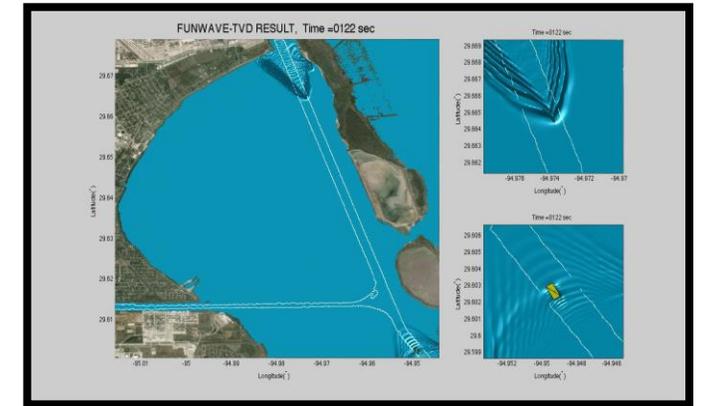
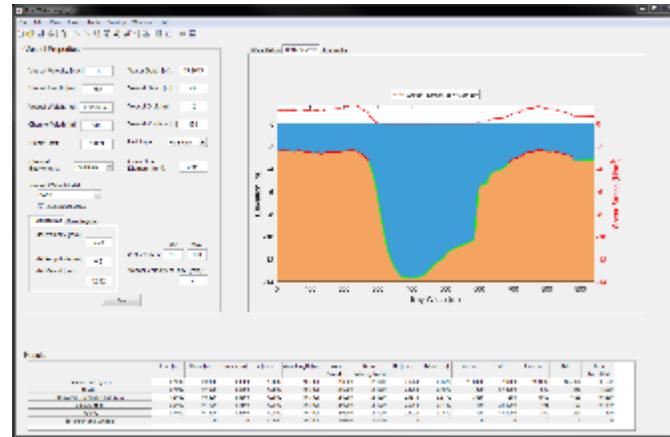


# SHIP WAVES AND SEDIMENT TRANSPORT



Concern: Stability of shorelines and features adjacent to channels, and sediment resuspension near channels

Capability: Both lower and higher fidelity models of ship waves to drive sediment transport and morphology change models



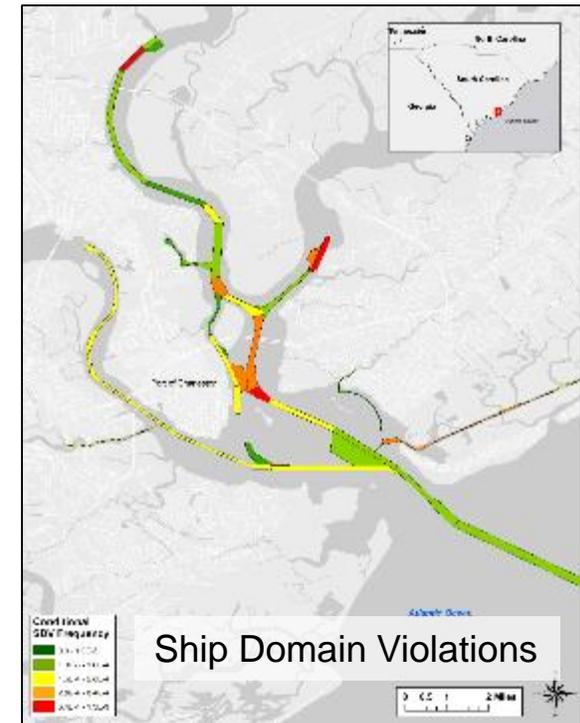
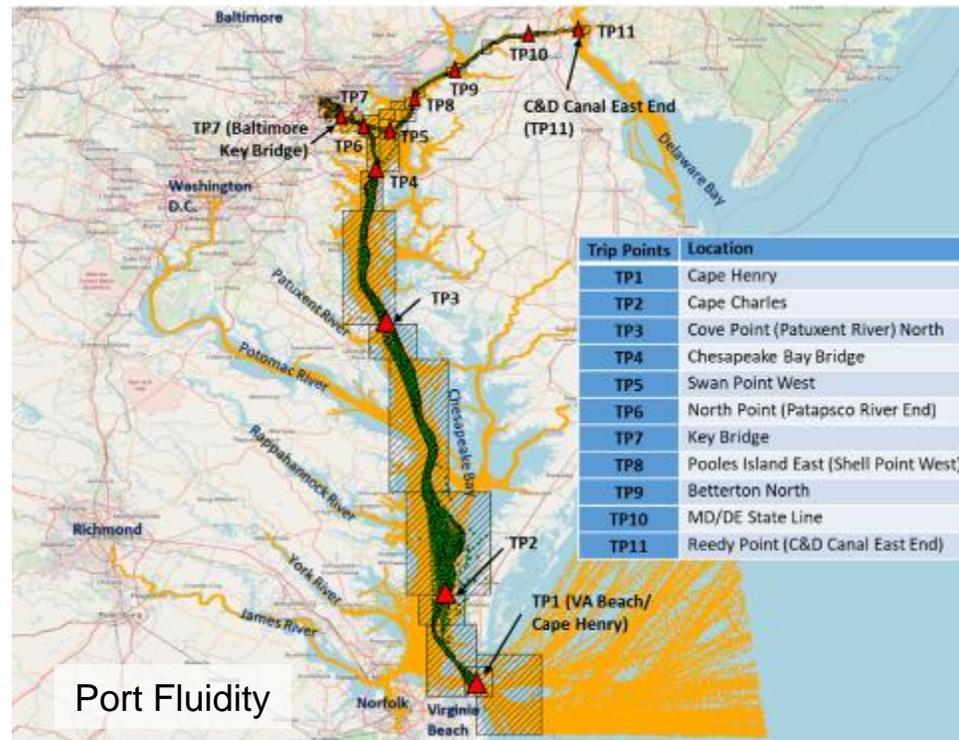
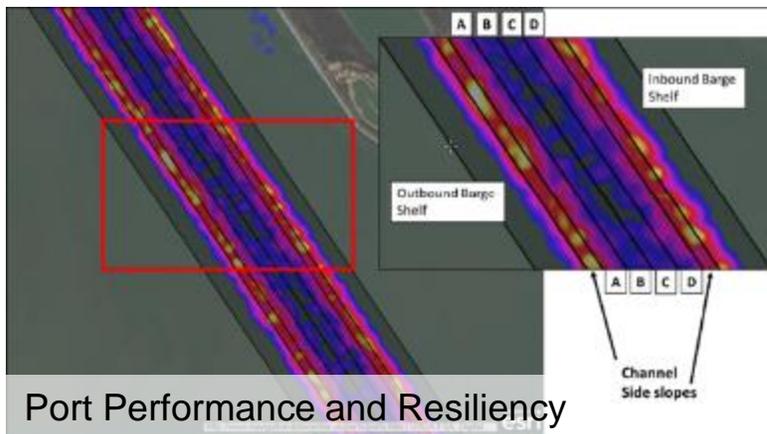
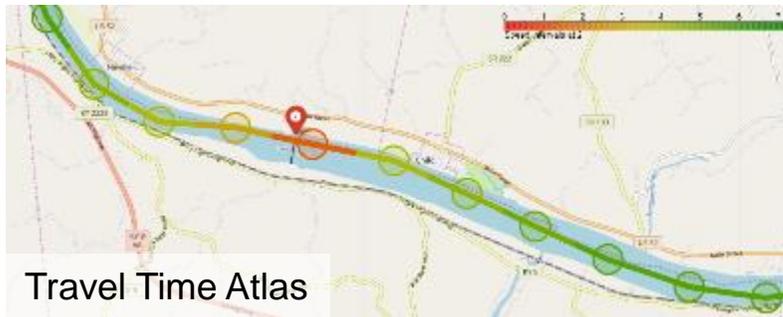


# AIS ANALYSIS PACKAGE



Concern: Valuable data within AIS records are difficult to extract

Capability: Tool that enables retrieval of desired data from AIS data to produce decision support information – Training is available – Extracted data often consumed by other tools and models





# COMPOSITE MATERIALS INFRASTRUCTURE



Concern: Growing maintenance costs and decreasing system reliability stemming from corrosion

Capability: Composite material infrastructure that is not susceptible to corrosion

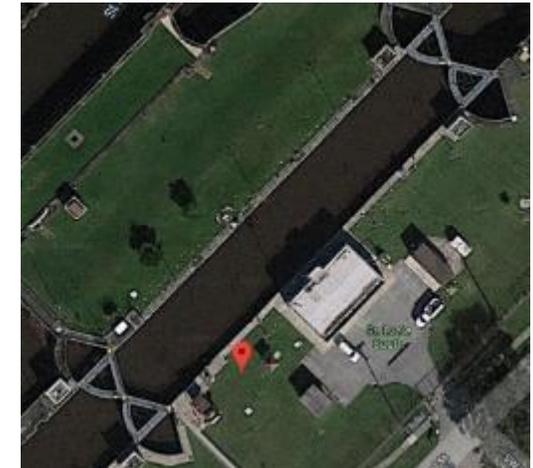
Chittenden Locks FRP Miter Blocks (NWS)



Illinois Waterway FRP Wicket Gates (MVR)

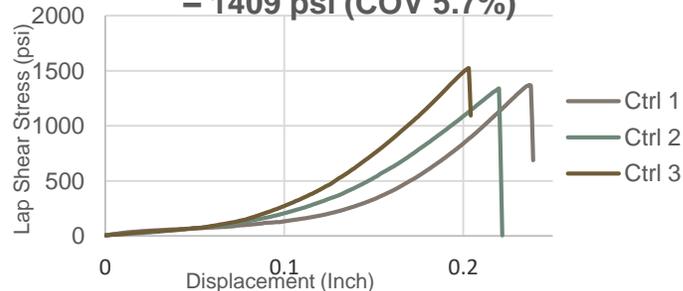


St. Lucie Lock: Okeechobee Waterway



*Preliminary estimate of \$12M total savings by using composite materials for sector gate replacement project*

Baseline Embedded Steel - 1409 psi (COV 5.7%)



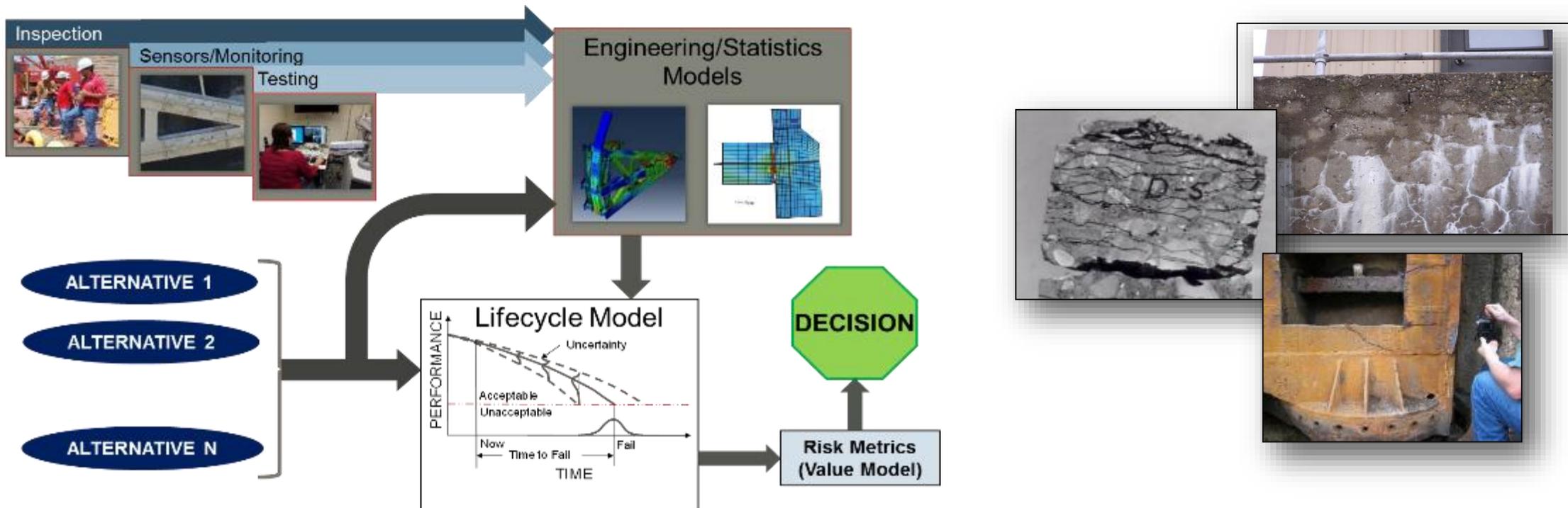


# STRUCTURAL HEALTH MONITORING



Concern: Lack of knowledge regarding present conditions and remaining capacity of structures and their operating machinery increase the risk of unscheduled closures or catastrophic failure

Capability: Observation data enable detection of problems prior to failure, and better quantified of structure deterioration will allow for better informed investment decisions





# OTHER RD&T TOPICS AND WORK EFFORTS



- CFRP materials for repairs
- Alternative coating systems
- UAS for open areas and confined spaces
- Robotic data collection systems
- Acoustic camera applications
- Post wildfire hydraulics
- Water Injection Dredging
- Bedload Interceptor Technology
- Tickler Chains
- Extending use of CPT, eHydro and CSAT
- Improved understanding of wind-driven sediment transport and how to reduce it
- Methods for monitoring dredged material near coral reefs
- Total Watershed Decision Support - ability of levees to perform under simulated flow conditions
- Practices for managing environmental risks



# QUESTIONS



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