



# CORPS SHOALING ANALYSIS TOOL (CSAT) ADVANCEMENTS

## COASTAL NAVIGATION PORTFOLIO MANAGEMENT

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## COASTAL INLETS RESEARCH PROGRAM

*FY21 IN PROGRESS REVIEW*

**Tiffany Burroughs**

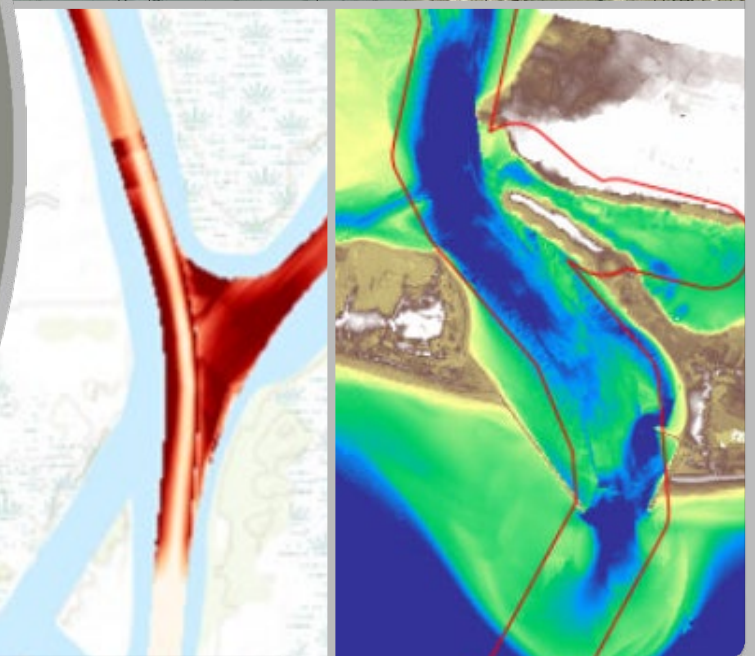
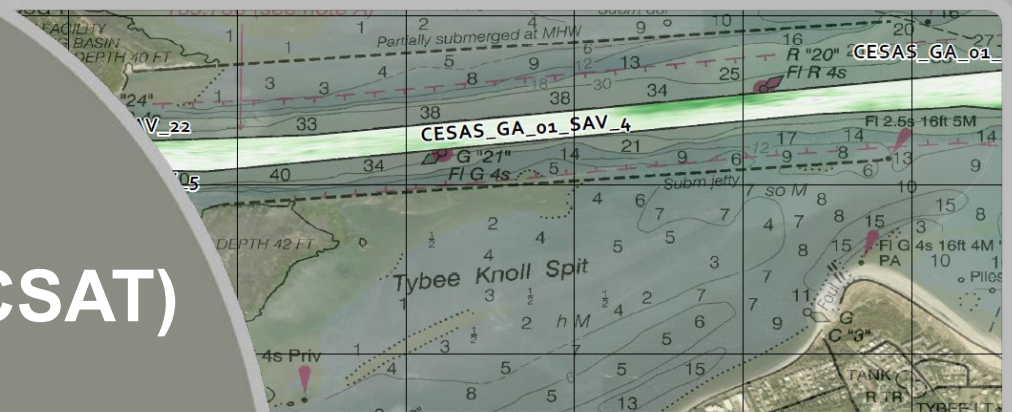
HQ Navigation  
Business Line  
Manager

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Technical Director, Navigation

**Morgan Johnston**

Acting Associate Technical Director,  
Navigation

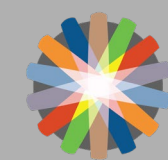


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# CHL

COASTAL &  
HYDRAULICS  
LABORATORY

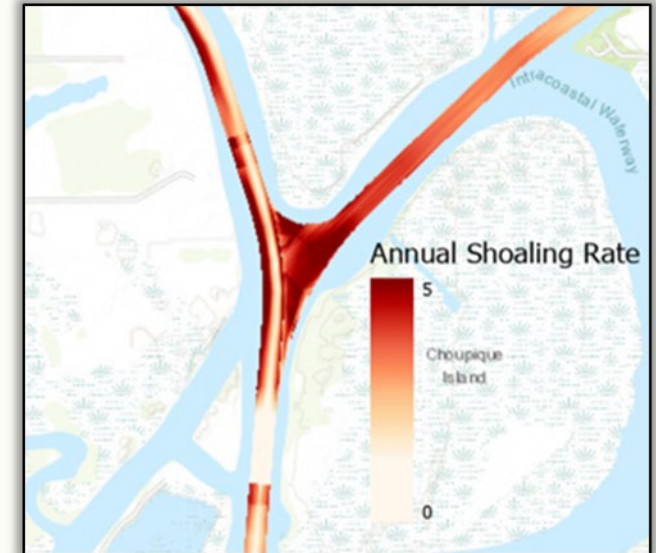
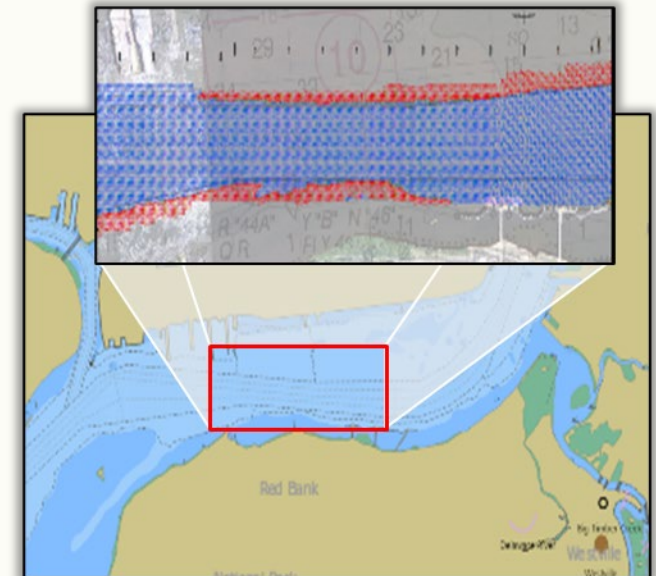


# ERDC

ENGINEER RESEARCH & DEVELOPMENT CENTER

# Problem

- Quantitative analysis of navigation channel conditions is critically important to supporting the USACE Navigation Mission area.
- Accurate shoaling estimation is critical for designing various aspects of navigation projects:
  - Advanced maintenance depth selections
  - Dredged material management plan development
  - Erosion control and sediment training structure designs.
- **Statements of Need:**
  - **2021-N-1671** - Corps Shoaling Analysis Tool (CSAT) Enhancement (#1 Ranked submission)
  - **2015-N-15** - Integration of national and local monitoring datasets to support navigation and operations projects
  - **2015-N-34** - Incorporating methods to evaluate length of navigation channel required for safe and efficient travel of two way traffic in ship simulations



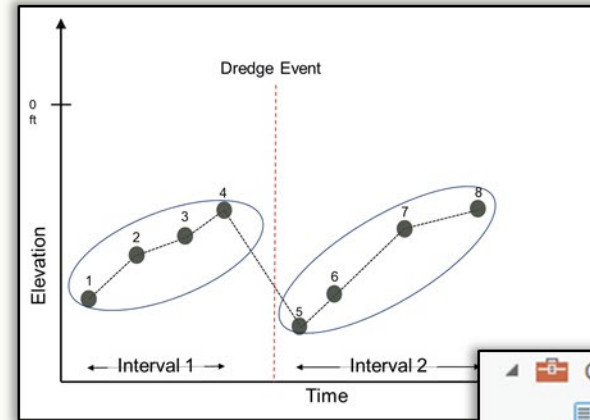
# Capability and Strategic Impact Statement

Shoaling rates can be used to identify hot spots or areas of increased sedimentation, ***allowing engineers and scientists to evaluate environmental and human-induced changes on the Navigation portfolio.*** Additionally, CSAT shoaling rates and channel navigability supports decision makers efforts to ***maximize the use of Operations and Maintenance (O&M) funding*** in the Navigation Business Line.



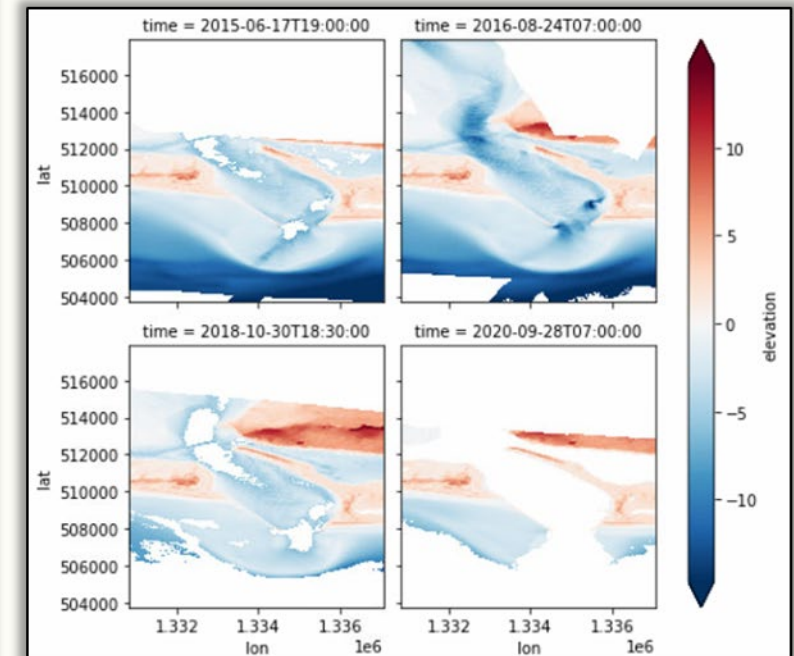
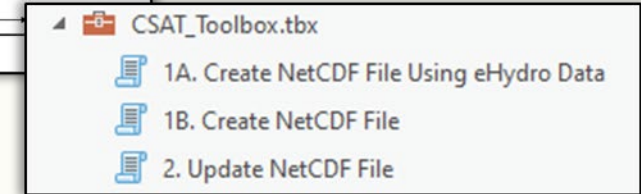
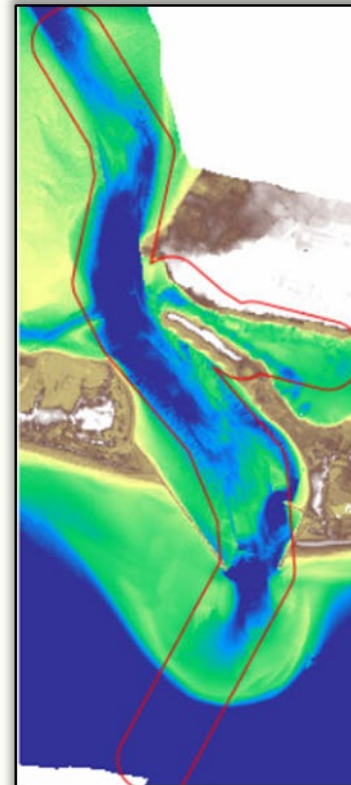
# Approach and Methods

- Additional shoaling rate methods were introduced to reduce influence of depth changes related to high surveying frequency.
- Extending analysis beyond National Channel Framework (NCF):
  - Existing capabilities were closely linked to eHydro surveys and NCF, with some workarounds
  - User feedback expressed need to support user-provided AOIs, non-eHydro surveys
  - Solution:
    - ▶ ArcGIS Toolbox to prepare local surveys
    - ▶ Workflow to obtain NCMP lidar data through existing JALBTCX web services
- Cloud-based input creation and CSAT execution:
  - SAM Spatial Data Branch + Microsoft FastTrack
  - Azure Functions + Blob based triggers + HTTP Triggers
  - Unexpected challenge: ESRI Product Licensing in the cloud → Move towards Open Source alternatives



$$\bar{m} = \frac{\sum(w_i \Delta z_i)}{\sum w_i}$$

$$\bar{m} = \text{mean}(m_{14}, m_{58})$$



# Summary

## FY21 Major Advances in Capability

- **New shoaling rate estimation methods**
  - ▶ Weighted Average, Weighted Average (MedFilt), End Point Method
- **Extended CSAT capabilities beyond the NCF**
  - ▶ ArcGIS Toolbox for preparing local survey data from non-eHydro sources
  - ▶ Workflow for integrating JALBTCX lidar data (Jupyter Notebook)
- **Improved QA/QC Tools**
  - ▶ GUI components built inside Jupyter Notebooks
  - ▶ Input Survey Viewer
  - ▶ Shoaling Rate Output Explorer

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## Planned Outyear Products/Advances

- Fully automated input generation from eHydro
- Continued development of JALBTCX integration
- Improved Datum Transformation Support

## FY21 Major Products & Collaborations

- Updated CSAT inputs/outputs being hosted using Azure Blob Storage Containers
- 1 JA: ASCE Special Issue
- 1 TN: Shoaling rate estimation methods (draft)
- Direct District support: CESAS, CESWG
- CSAT Training Webinars: (60+22) attendees
- 3 Webinars: eHydro CoP, CEPOH, CESAJ
- CIRP TD: February 9, 2021
- RD20 Presentation: Channel Availability
- Collaborations: Microsoft FastTrack program, NavPortal
- Leveraging to other Programs:
  - ▶ DIG – Dredging Data Fusion
  - ▶ DIG – Dredge Project Selection Optimization
  - ▶ RSM – Alternatives in SWP
  - ▶ RSM – Calcasieu River Sediment Fingerprinting