APPLICATIONS OF THE CSAT TO EVALUATE DEPTH RESTRICTIONS AT SELECTED ENTRANCE CHANNELS

COASTAL NAVIGATION PORTFOLIO MANAGEMENT

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COASTAL INLETS RESEARCH PROGRAM

FY20 IN PROGRESS REVIEW

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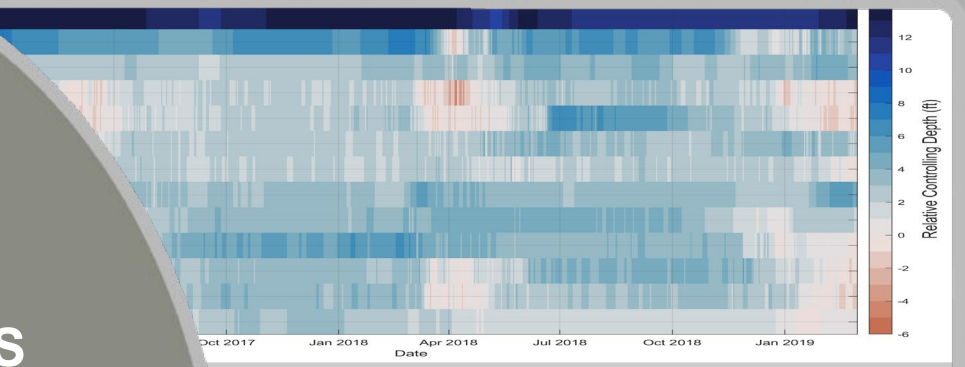

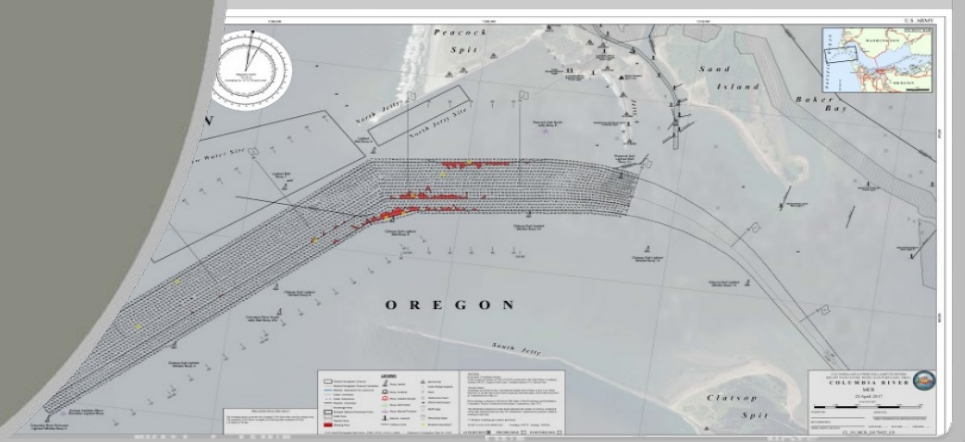

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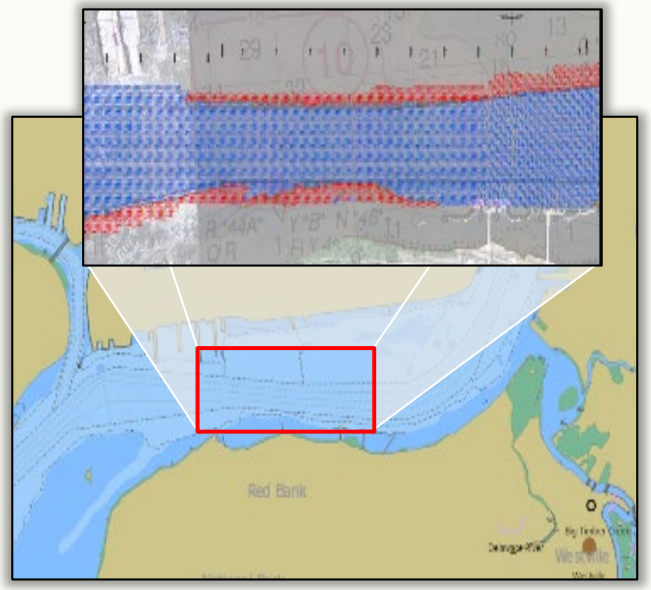
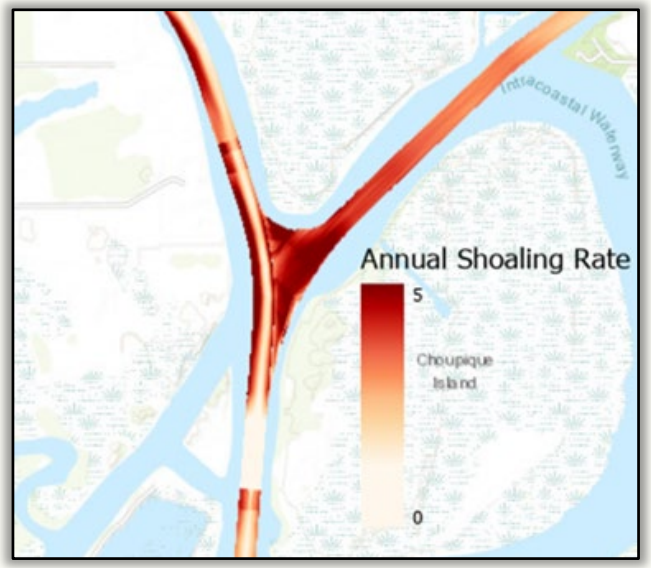
Problem

- Quantitative analysis of navigation channel conditions is critically important to supporting the USACE Navigation Mission area.
- Hydrographic survey data maintained by eHydro can be used to answer questions like:
  - What is the current channel availability across the USACE portfolio?
  - What are the historic channel infilling rates in the channels?

- **SoNs:**
  - **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
  - **2015-N-40** - Reducing the need for dredging





Capability and Strategic Impact Statement

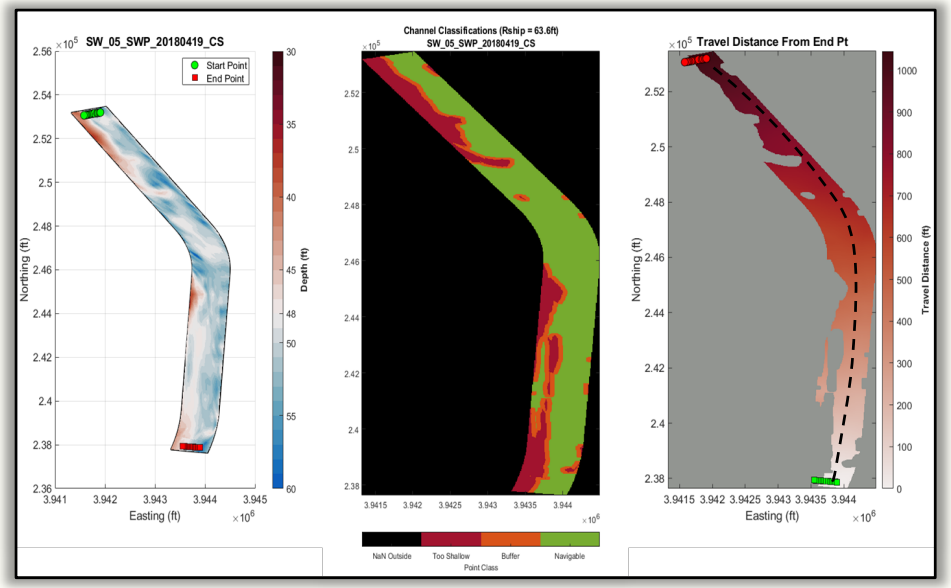
Shoaling rates can be used to identify hot spots or areas of increased sedimentation, ***allowing engineers and scientists to evaluate environmental and human-induced changes on the Navigation portfolio***. Additionally, CSAT shoaling rates and channel navigability supports decision makers efforts to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

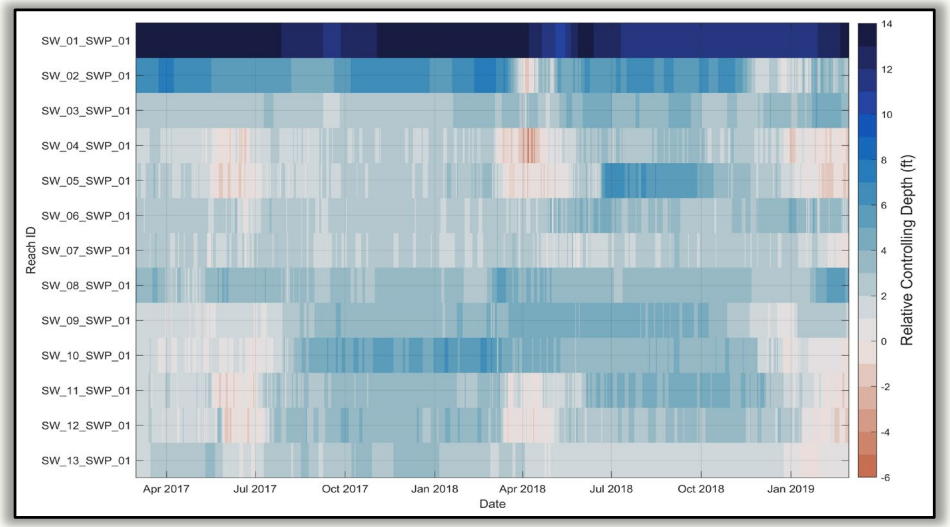
Approach – Channel Availability

- **Channel Availability Analysis:**

```
if controllingDepth < maintainedDepth
        channelAvailable = false;
else
        channelAvailable = true;
end
```

  - Shallowest Observed Depth approach is overly conservative
  - Path planning approaches offer some considerations of vessel maneuverability
    - Turning limitations and proximity to shallow depths
  - Analysis of three navigation channel systems performed:
    - Southwest Pass
    - Pascagoula Harbor
    - Lower Columbia River
  - Developed using COTS software (MATLAB)





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Summary

FY20 Major Advances in Capability

- Added Optimized Rapidly-Exploring Random Trees (RRT*) for controlling depth
- CSATpy includes nearly all features of the original Matlab version
- New CSAT output products to streamline further analysis and integration with other tools

FY20 Major Products & Collaborations

- 1 Journal Article: Navigation Channel Infilling and Availability Trends (ASCE Waterways, Draft)
- 1 TN: CSATpy User Manual
- SAD Meeting
- CSAT Training Workshop (SWG, 6 participants)
- 9 Webinars (CWG, eHydro CoP, LRE, MVN, NAN, NAO, SAM, SPN, SWG)
- 1 CIRP TD: March 2020
- Supported Asset Management and USACE HQ Requests
- Reimbursable Studies:
  - DOTS – MVN (Calcasieu River)
  - LRE – Lexington Harbor
  - SWP – Morphologic Time Series Visualizations

FY21 Products/Advances

- New shoaling forecasting methods
- Improve QA/QC process using Jupyter Notebooks
- Consideration of shoaling outside NCF boundary
- Scale new availability to full USACE portfolio
  - Sensitivity analysis of input parameters