



## Coastal Navigation Portfolio Management

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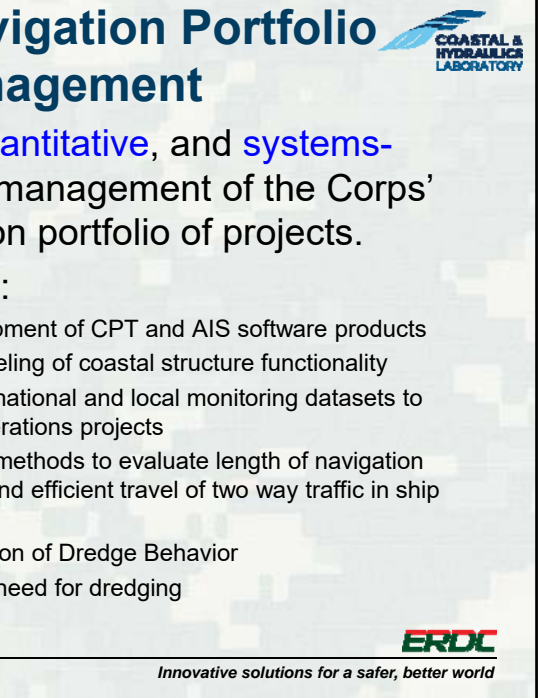
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Technical Director

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Associate TD




**US Army Corps of Engineers**




## Coastal Navigation Portfolio Management

Advance **objective**, **quantitative**, and **systems-based** approaches to management of the Corps' large coastal navigation portfolio of projects.


- **Statements of Need:**
  - ▶ 2017-N-52 Further Development of CPT and AIS software products
  - ▶ 2016-N-14 Long-term modeling of coastal structure functionality
  - ▶ 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-38 - AIS investigation of Dredge Behavior
  - ▶ 2015-N-40 - Reducing the need for dredging




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## Overview of FY18 Products



- Cloud-based version of AISAP - <http://ais-portal.usace.army.mil>)
- Updates to CPT interface - <https://cpt.usace.army.mil>
- Assessing Structure Sheltering via Statistical Analysis of AIS Data, Young, D. & Scully, B., Mar 12, 2018, ASCE Journal of Waterway, Port, Coastal, and Ocean Engineering
- Assessing Jetty Effectiveness via Statistical Analysis of AIS Data, Young, D. & Scully, B., ERDC/CHL TN (in review)
- Corps Shoaling Analysis Tool: Predicting Channel Shoaling, Dunkin, L.M., Coe, L., ERDC/CHL TR (with editor)
- AISAP webinars – USCG Navigation Center and District 1
- CPT webinar - SPN
- CSAT webinars – SAC, SAS, SWG, NAO, NAE
- CSAT executable and documents added to CIRP page
- Poster at Super RARG




2017-N-52 Further Development of CPT and AIS software products




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## CPT/AISAP Hosting Support and Development





- **Channel Portfolio Tool - CPT**
  - 2017 Waterborne Commerce data loaded
  - CPT interface updates –
    - spatial map (leveraged with NavSys)
    - hover text added for user support and help
  - 200+ registered users across ALL Districts containing Navigation projects
    - Users at other Federal agencies
- **Automatic Identification System Analysis Package – AISAP**
  - AISAP registered users – 150; 5000 unique requests (2014-2018)
  - Migration to cloud
- **FY 18 funding and leverage support**
  - OP-J - \$135K
  - ERDC CHL- \$50K
  - ERDC ITL - \$75K
  - NavSys and Asset Management support leveraged to complete hosting and development tasks

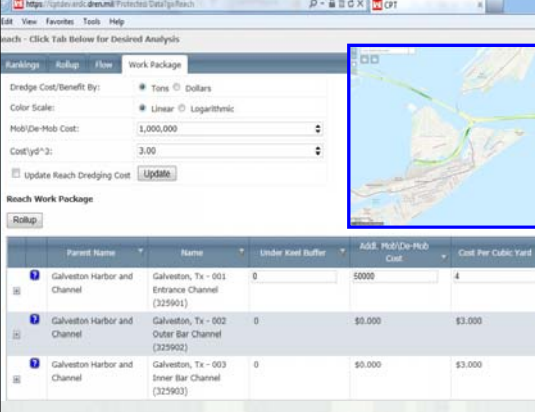
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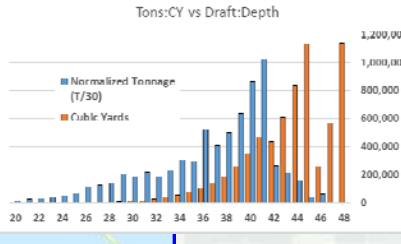
## Channel Portfolio Tool

- CPT – linked with CSAT - SoN 2013-N-22; SoN 2017-N-52
- Interface improvements include access to datasets from CSAT for the shoaling rates and eHydro to include the latest channel conditions.





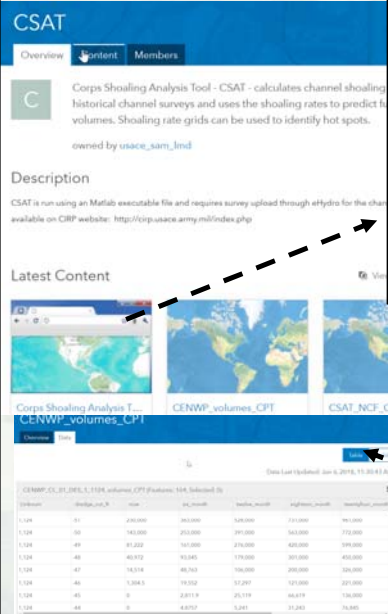
### Tons:CY vs Draft:Depth



Dredge Cut (ft)	New (CY)	6 months (CY)	12 months (CY)	18 months (CY)	24 months (CY)	30 months (CY)	36 months (CY)
-45	195,320	271,020	373,070	492,200	624,800	771,000	911,220
-44	125,140	173,140	238,620	311,710	444,910	572,680	713,460
-43	76,240	109,860	153,260	210,570	293,080	399,730	522,310
-42	43,628	65,635	95,990	135,350	186,480	258,070	336,920
-41	24,409	37,093	56,313	83,402	119,100	165,270	227,370
-40	14,958	22,022	31,470	48,147	72,041	104,370	146,170
-39	10,060	14,941	22,250	36,832	54,017	81,922	114,000
-38	7,083	9,092	13,945	23,084	34,035	50,823	73,059
-37	5,194	6,480	9,241	13,728	20,312	29,888	43,576
-36	3,865	4,787	6,944	9,496	13,784	20,000	29,000
-35	2,806	3,555	5,412	7,845	11,443	16,751	24,457

## Corps Shoaling Analysis Tool



**CSAT**

Overview Content Members

Corps Shoaling Analysis Tool - CSAT - calculates channel shoaling historical channel surveys and uses the shoaling rates to predict future volumes. Shoaling rate grids can be used to identify hot spots.

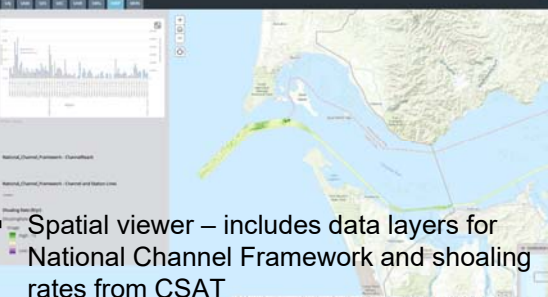
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Description

CSAT is run using a Matlab executable file and requires survey upload through eHydro for the channels available on CIRP website: <http://cirp.usace.army.mil/index.php>


Latest Content

Channel	Volume (CY)	Volume (CY)	Volume (CY)	Volume (CY)	Volume (CY)
1124	41	140,000	140,000	140,000	140,000
1124	30	140,000	200,000	290,000	340,000
1124	49	81,222	101,000	174,000	400,000
1124	40	40,972	93,345	174,000	300,000
1124	47	14,014	46,762	100,000	200,000
1124	40	1,044	10,000	10,000	10,000
1124	45	0	2,011.9	20,119	100,000
1124	48	0	4,023.8	1,041	11,463




Spatial viewer – includes data layers for National Channel Framework and shoaling rates from CSAT


- Available for download and viewing:
  - <https://arcg.is/094Lur>
  - Executable available for Districts
- ‘Live’ in December – 580 views to site
- Rest services created for CSAT output files
  - Volume tables linked within CPT




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## Distributed AIS-derived Inlet Structure Metrics



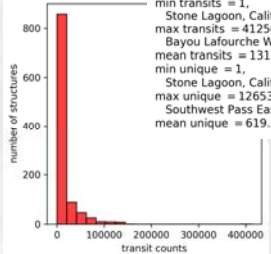
- Research aims to augment subjective, qualitative structure performance metric (OCA), and proxy project maintenance prioritization metrics (tonnage, value).
- Structure design/performance metrics typically exceed vessel operating conditions.
- AIS-derived spatio-temporal characteristics quantitatively relate vessels to structures.
- A meaningful management approach requires portfolio-wide treatment.
- The scale of vessel time history (6 years) and structure portfolio (~1,200) dictate a parallel approach to analyzing vessel behaviors near structures to achieve.



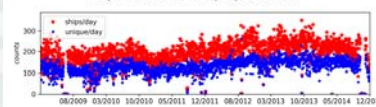
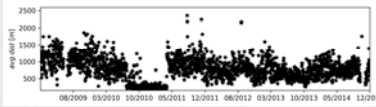
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**STATISTICS**


min transits = 1,  
Stone Lagoon, California  
max transits = 412500,  
Bayou Lafourche West Jetty, Louisiana  
mean transits = 13123.52  
min unique = 1,  
Stone Lagoon, California  
max unique = 12653,  
Southwest Pass East Jetty, Louisiana  
mean unique = 619.50




Bayou Lafourche West Jetty, Louisiana


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## Overview of FY19 R&D and SoNs



- Coupling of CPT, AISAP, and CSAT with other navigation related tools/datasets
  - ▶ provide enterprise capability for research aimed at understanding and quantifying channel optimization, jetty functional performance metrics, and other opportunities to connect within CIRP models/tools.
  - ▶ **2017-N-52** interface enhancements and improved capabilities for both CPT and AISAP
    - #1 ranked submittal for inland and coastal groups
- AIS on HPC
  - ▶ AIS data on the HPC
  - ▶ **2016-N-14** Long-term modeling of coastal structure functionality
- Integration for the CNPM tools
  - ▶ Modularized component of each tool linked with a spatial map
  - ▶ Improvement to the CSAT codes and new user interface
  - ▶ Functionality restored to CSMART data





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## CNPM Tool/Data Integration

- Integration and Support of CPT/SMART/AISAP/CSAT (SoN 2017-N-52)
- Long term goal for full data/tool integration

**shoaling**

Warm colors – higher shoaling rates  
Cool colors – lower shoaling rates

**surveys**

Profile	Year	1 month	2 months	3 months	4 months	5 months	6 months
-41	275,320	275,220	275,220	275,220	275,220	275,220	275,220
-42	225,240	225,240	225,240	225,240	225,240	225,240	225,240
-43	79,240	79,240	79,240	79,240	79,240	79,240	79,240
-44	65,520	65,520	65,520	65,520	65,520	65,520	65,520
-45	28,400	28,400	28,400	28,400	28,400	28,400	28,400
-46	19,080	19,080	19,080	19,080	19,080	19,080	19,080
-47	2,080	2,080	2,080	2,080	2,080	2,080	2,080
-48	5,180	5,180	5,180	5,180	5,180	5,180	5,180
-49	3,880	3,780	3,880	3,780	3,880	3,780	3,880
-50	2,080	1,050	4,610	5,400	6,340	6,700	11,400



**tonnage**

**vessel**

**structures**

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## CSAT

- user interface on a web-based platform to run CSAT and allow district functionality to support specific shoaling questions - SoN 2017-N-52
- FY 19 Goal

**CSAT Input Files**

elevation, latitude, longitude, reference time

Access to Surveys

**GUI**

Date Range, ROI

Que data for analysis

Data Analysis


Change	Year	1 month	2 months	3 months	4 months	5 months	6 months
-41	275,320	275,220	275,220	275,220	275,220	275,220	275,220
-42	225,240	225,240	225,240	225,240	225,240	225,240	225,240
-43	79,240	79,240	79,240	79,240	79,240	79,240	79,240
-44	65,520	65,520	65,520	65,520	65,520	65,520	65,520
-45	28,400	28,400	28,400	28,400	28,400	28,400	28,400
-46	19,080	19,080	19,080	19,080	19,080	19,080	19,080
-47	2,080	2,080	2,080	2,080	2,080	2,080	2,080
-48	5,180	5,180	5,180	5,180	5,180	5,180	5,180
-49	3,880	3,780	3,880	3,780	3,880	3,780	3,880
-50	2,080	1,050	4,610	5,400	6,340	6,700	11,400

Data access for other tools


**USACE Navigation Portal**

USACE Logo

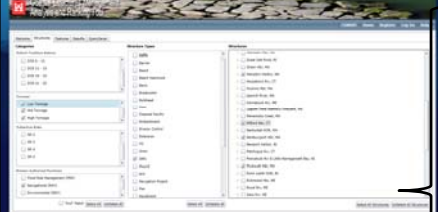

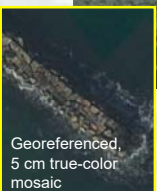

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# CSMART




- Web-based application to support prioritization of coastal jetties and breakwaters in O&M budget development - **SoN 2017-N-52**
- Data migrated to supported platform (include in CPT)
- Link to other datasets (vessel counts from AIS, aerial imagery, lidar grids, census figures)









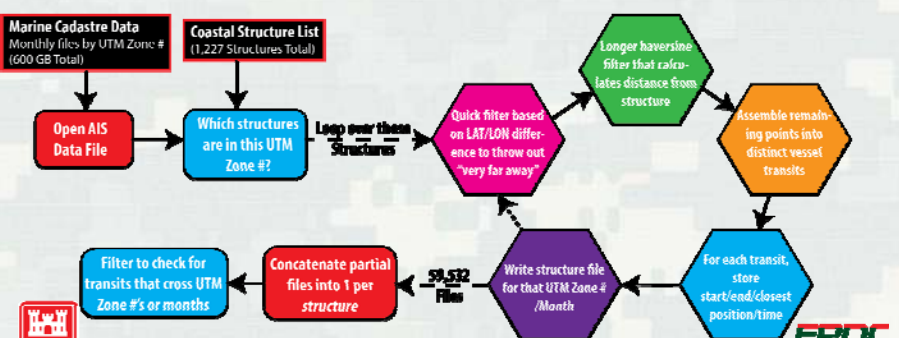
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# Distributed AIS-derived Inlet Structure Metrics





- Working at scale strategically positions CNPM to explore other AIS-derived portfolio-wide metrics
  - 4-D around-ship clearance – FY 19 goal
  - Vessel-based infrastructure classification







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## Reimbursable Studies utilizing w.u. technology

- **Asset Management – FY 18 - \$175K**
  - ▶ ERDC support for CPT and CSAT development
  - ▶ OP-J support for integration of CSAT within CPT and eHydro workflow
- USCG District 1- AISAP outputs to support an existing USCG study on a section of the Hudson River. *Kress*
- SWG – CSAT – shoaling analysis to support DMMP for HSC, MSC & Corpus Christi. *Dunkin*
- **DOTS requests:**
  - ▶ DOTS – SWG (CSAT support). *Dunkin*






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## Collaborations


- AISAP development is leveraged with [Navigation Systems](#) research program.
- CPT development leveraged with [Navigation Systems](#) research program and [Asset Management](#) program.
- CSAT work is being leveraged with [Asset Management](#) program.

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## Conclusion





FY 18

- Tech Transfer: JP, TR, TN, presentations/webinars (USCG, SWG, SAS, SAC, NAO, SPN) and DOTS request
- CPT-AISAP in-person workshop
- CSAT web map and data accessibility
  - ▶ Rest Services linking data to CPT
  - ▶ Data accessible via AGOL (<https://arcg.is/1z9P9G>)
- AISAP
  - ▶ Cloud-based environment

FY 19

- Improvements to the CPT and AISAP interface and underlying data structures
  - ▶ Spatial map viewer with shoaling rates and volume tables
  - ▶ Migration of AIS data to HPC for more robust, nation-wide research of structures and channel evaluation
- Improved access to CNPM tools/data
  - ▶ Coupled, web-based access to tools and data
  - ▶ CSMART – data migrated to new interface

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