Improved Channel Evaluation using Automatic Identification System and Hydrographic Survey Data

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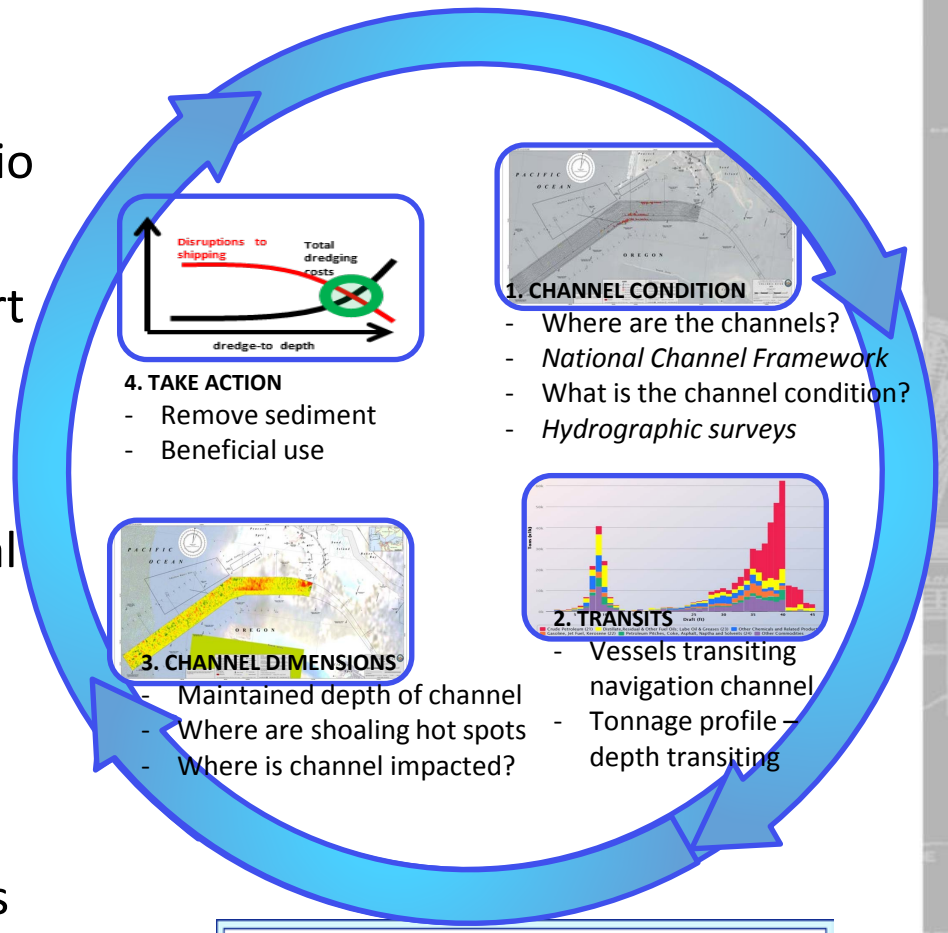
USACE Navigation Mission

- **Background:**
  - USACE maintains a vast, aging navigation infrastructure portfolio that is critical to national well-being.
  - Navigation projects facilitate marine transportation and support global supply chains.
- **Action:**
  - Leverage existing data, user-friendly tools, and robust analytical approaches to develop objective, quantitative, and systems based approaches for management of the Corps' large coastal navigation project portfolio.
  - Nation-wide, enterprise datasets
    - Automatic Identification System (AIS) identified mid 2000's as key to improving understanding and management.
    - Hydrographic surveys processed through eHydro and channel shoaling rates using Corps Shoaling Analysis Tool



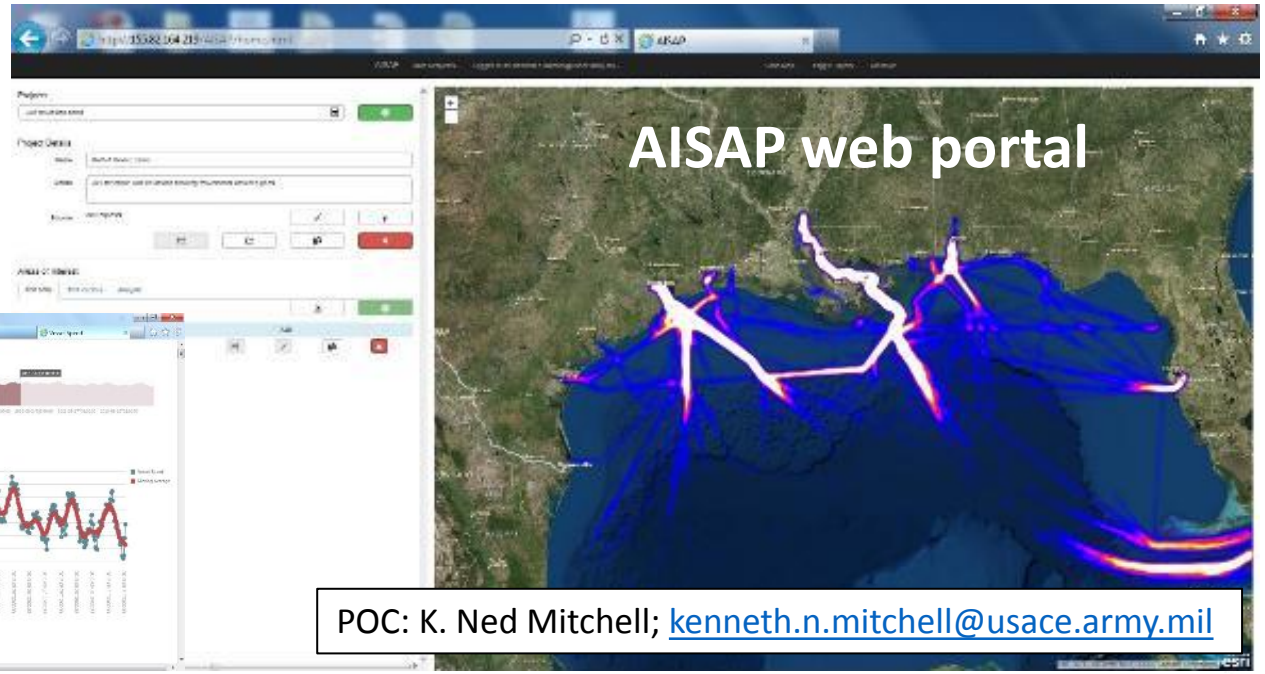
Quantify the relative effectiveness of maintained channel dimensions

AIS Analysis Package (AISAP)

- Builds on the USCG-USACE data sharing agreement (2012)
- Strategic tool provides analysis and visualization capabilities for archival AIS data
- Serves diverse navigation stakeholders:
  - Gives Corps project managers insight into project use
  - Allows Corps planners to investigate key navigation metrics
  - Communicates “When”, “Where”, “How many” of corps project users

USCG-USACE
Interagency Security Agreement

Built-in analysis and visualization features



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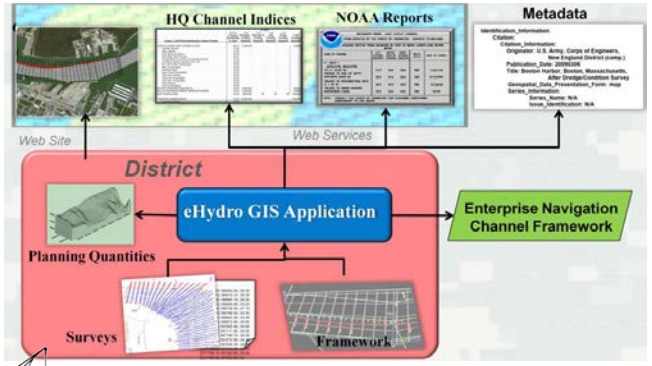
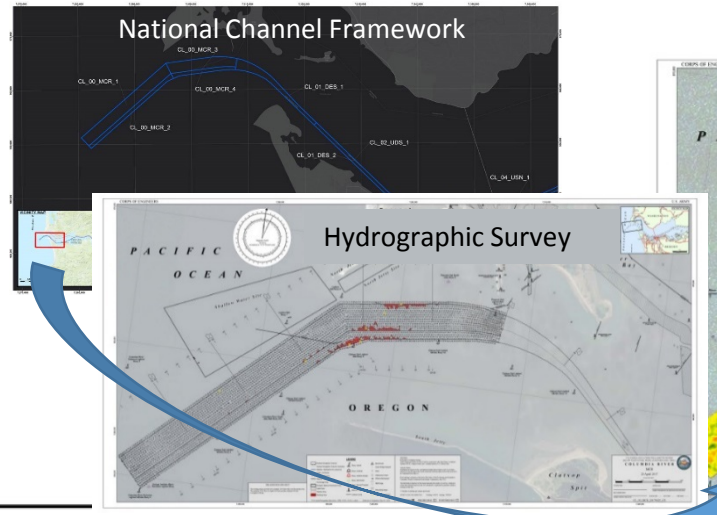
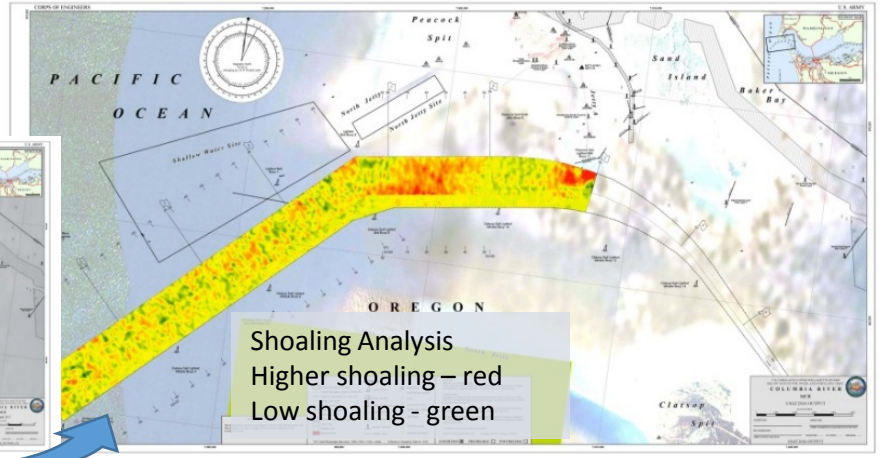
Enterprise Hydrographic Datasets: eHydro & CSAT

- **eHydro: Application and Reporting Process**
- *What is the present channel condition?*
- Geo-process hydrosurveys using automated GIS scripts
- Reports/Products generated
  - Channel Condition/Availability Reports
- Coastal districts using eHydro
  - National Channel Framework
  - Uploading surveys





- **CSAT: Corps Shoaling Analysis Tool**
- *What will the channels look like in the future?*
- estimates shoaling rates using hydrographic surveys within the boundary of the National Channel Framework.
- CSAT uses the historical shoaling rates to predict future dredging volumes at various channel depth intervals.

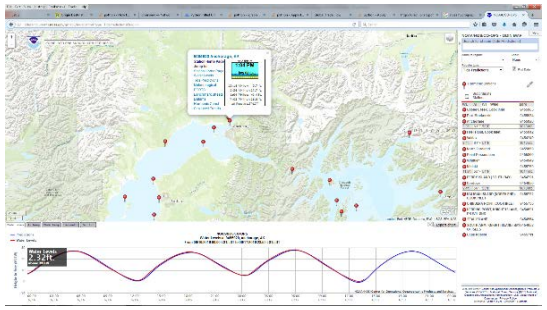


Incorporating Maintenance: Underkeel Clearance

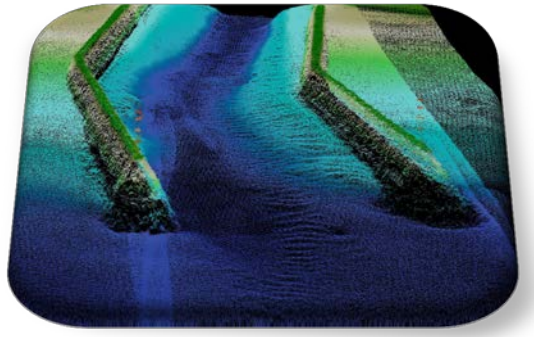
- Can we estimate how much depth was available during a transit?

AIS Vessel Details

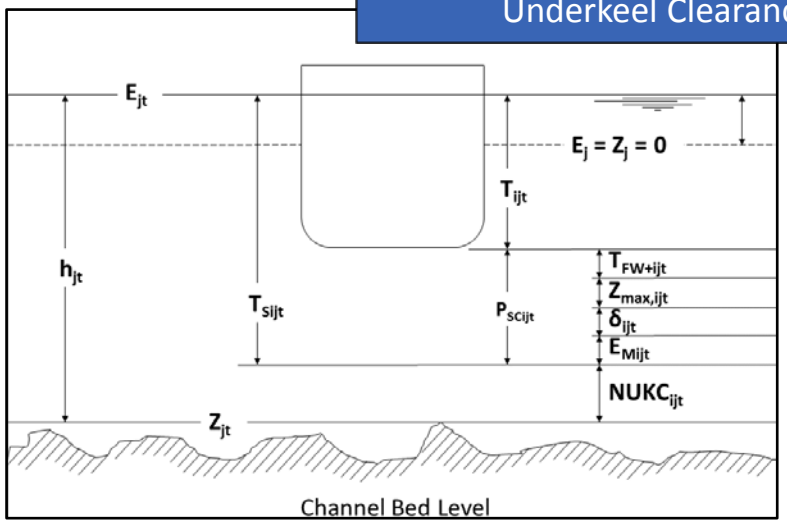
Water Level



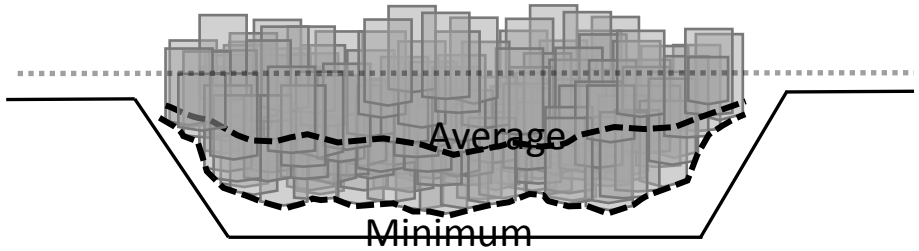
Bathymetric Evolution



Underkeel Clearance



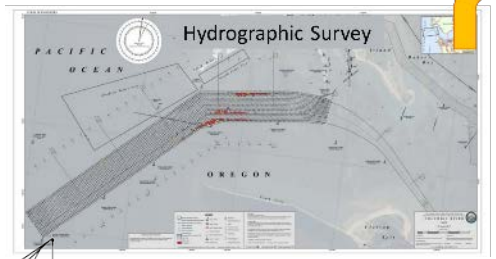
Underkeel Clearance Time stack



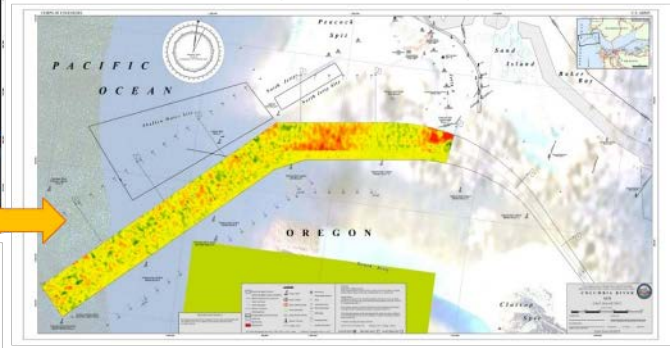
Resolving Length and Beam: Modeling Vessels

- Draft is no longer the only vessel dimension of concern.
- AIS has sufficient detail to resolve vessel hulls.
- Treat AIS data like the spatio-temporal record of a physical object.
- Contingent on managing AIS data quality
  - Validating vessel particulars
  - AIS draft provides conservative keel location

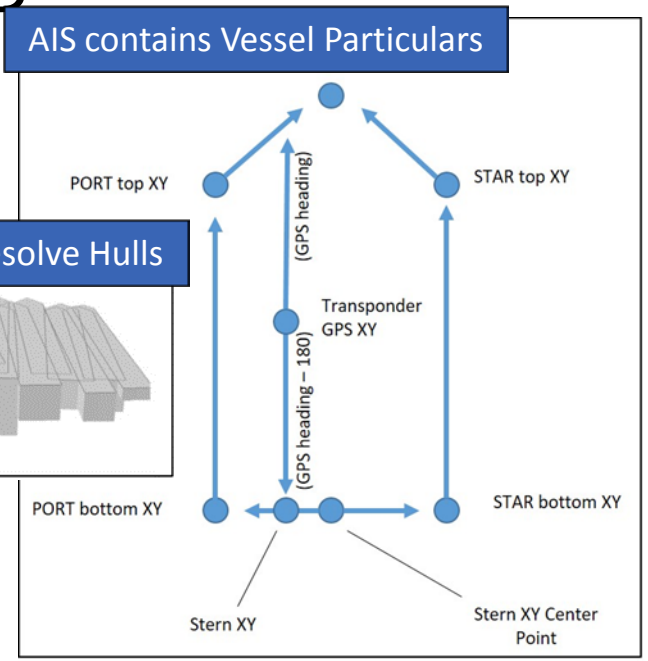
Develop Bathymetric Shoaling Rates



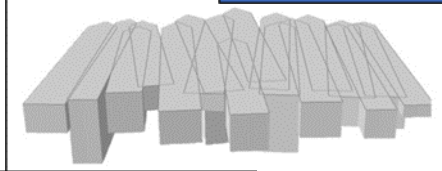
Shoaling Rate – CSAT Output



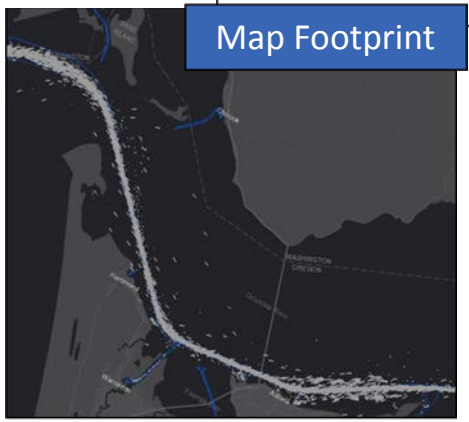
AIS contains Vessel Particulars



Resolve Hulls



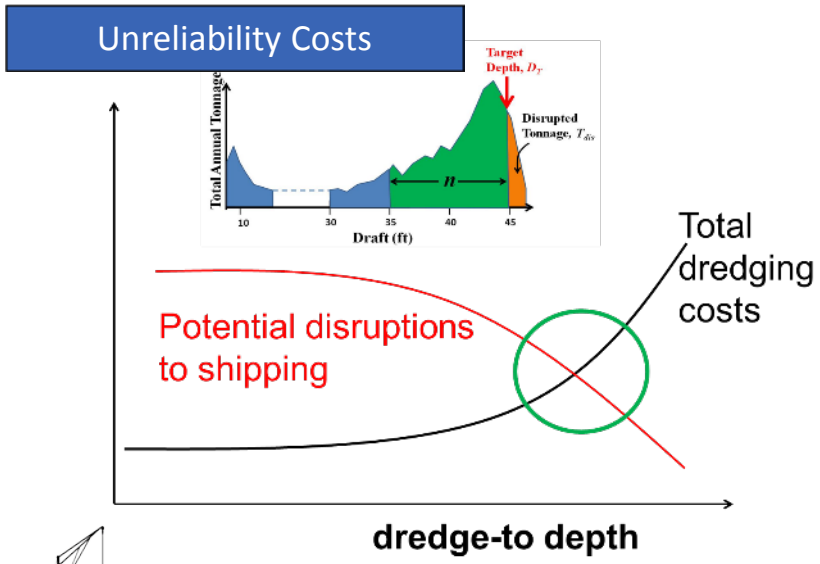
Map Footprint

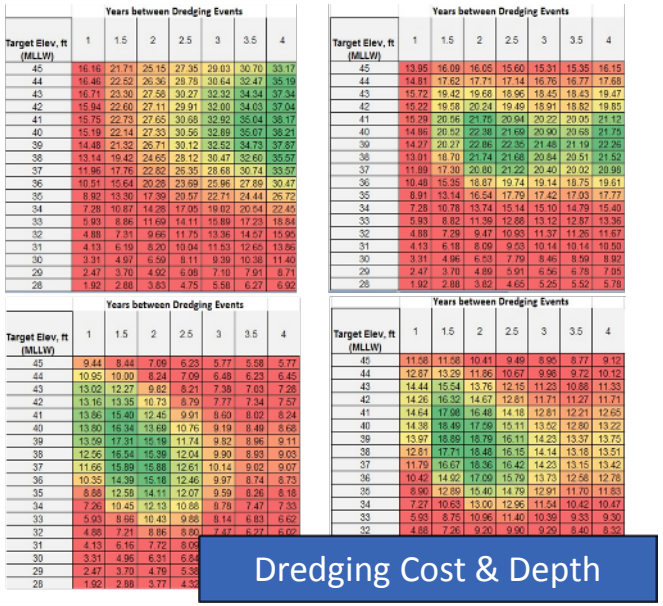


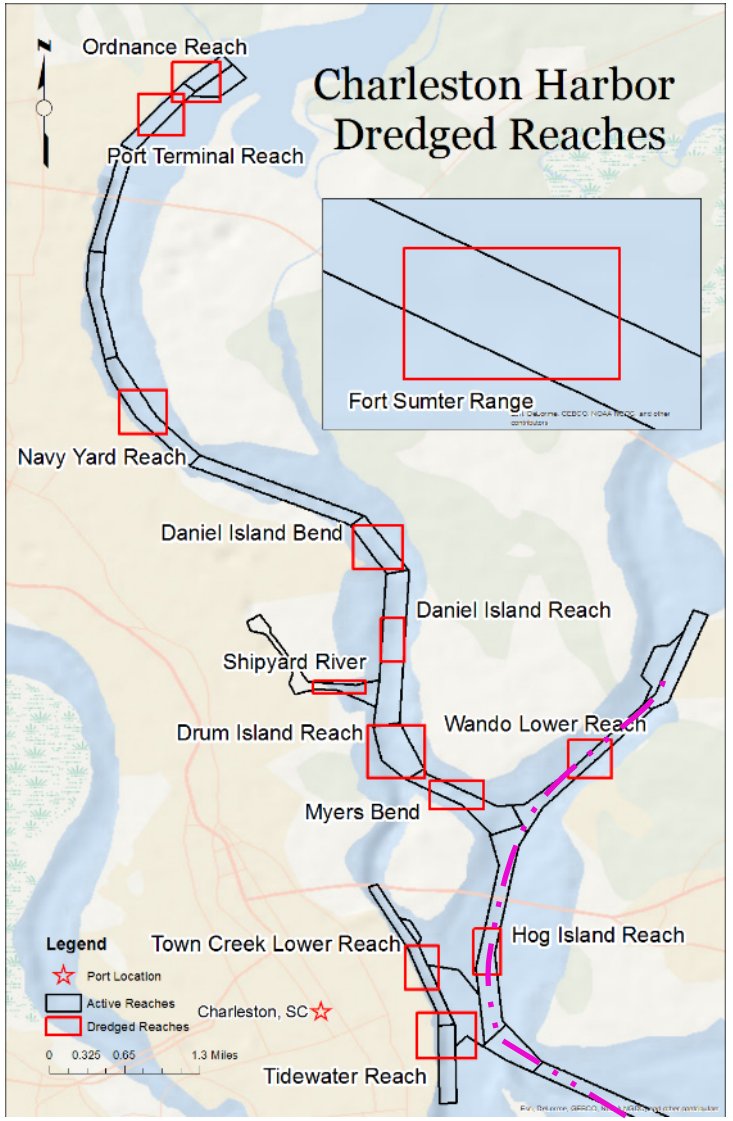
Result is Vessel Operating Picture

Measuring and Managing Reliability

- A transit is reliable if it has “enough” clearance in transit.
- The sequence of transited shoals and the available clearance can be tracked.
- A transit is “unreliable” if not “enough” clearance, “reliable” otherwise.
- A project’s reliability is the reliable fraction of all transits.
- Assess the potential impacts to commodity flows based on dredging decisions vs. unreliability costs.

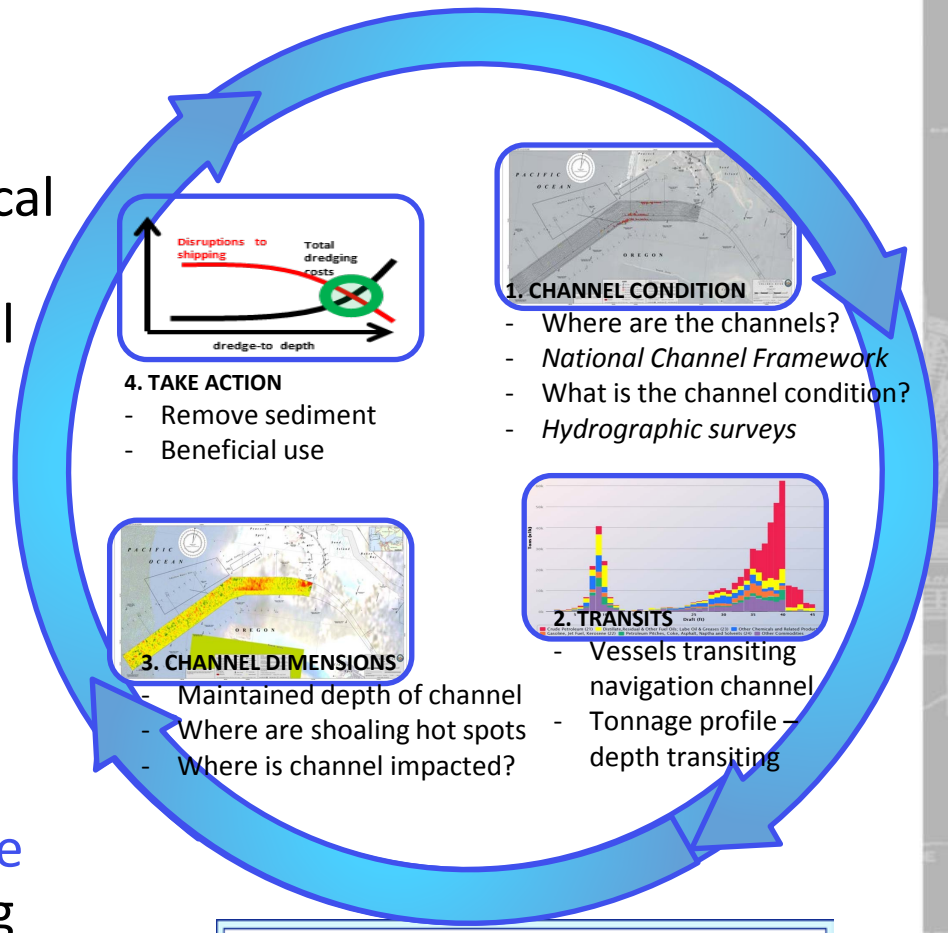






Summary

- USACE is working to improve waterway management using a data driven approach
- Leverage existing data, user-friendly tools, and robust analytical approaches to develop objective, quantitative, and systems based approaches for management of the Corps' large coastal navigation project portfolio.
- Nation-wide, enterprise datasets
  - Automatic Identification System (AIS)
  - Hydrographic surveys processed through eHydro and channel shoaling rates using Corps Shoaling Analysis Tool
- The goal is to objectively and consistently quantify the relative effectiveness of maintained channel dimensions in supporting the Navigation mission requirement for safe, reliable, and cost-effective marine transportation.



Quantify the relative effectiveness of maintained channel dimensions

Thank you!

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