U.S. S-100 IMPLEMENTATION UPDATE - May 2024

Darren Wright

Precision Marine Navigation Program Manager

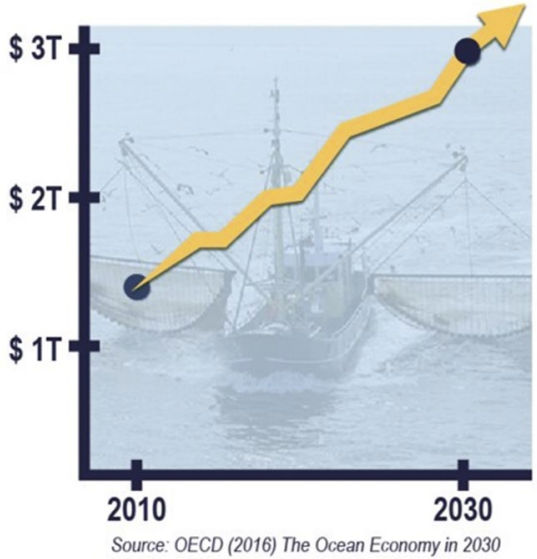
What is Precision Marine Navigation?

…the ability of a vessel to safely and efficiently navigate and operate in close proximity to the other vessels, seafloor, bridges, narrow channels, or other marine hazards.

NOAA Coast Survey

The Maritime Economy

Projected Global Growth by 2030



Source: OECD (2016) The Ocean Economy in 2030

Ship Sizes Continue to Increase!

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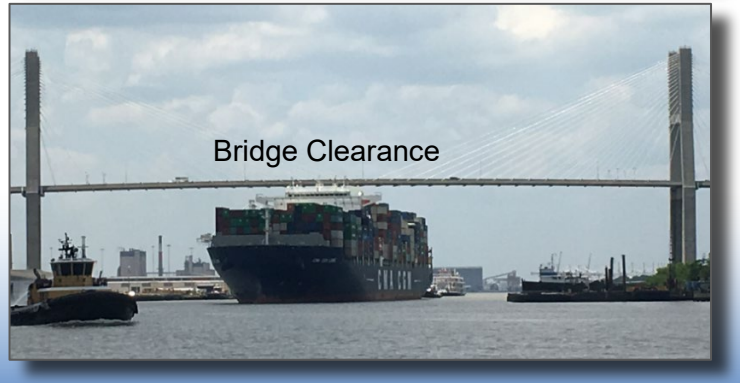
Increased Congestion and Clearance Issues

- Difficult navigation of deep draft ships in highly congested waterways
- Very tight harbors/berths
- Clearance Issues under bridges
- Demand for integrating environmental information into formats mariners can utilize to safely operate very high and very deep draft ships



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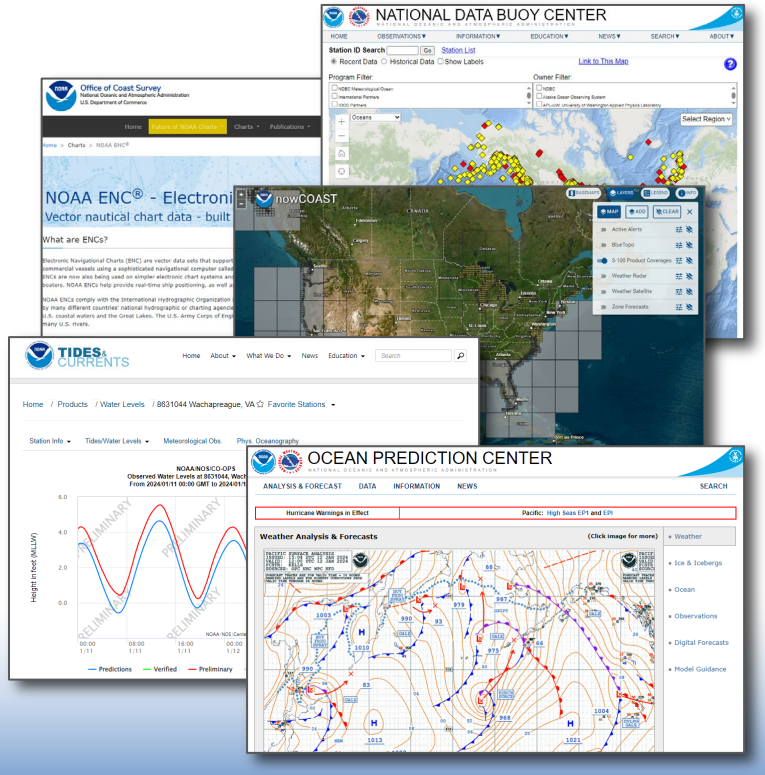
Navigation Data Challenges

Difficult to access and process NOAA's navigation data, due to:

- Multiple devices and systems required to access the data
- Datasets spread across various websites and data servers
- Datasets are encoded in different formats that are not navigation standards



NOAA's Precision Marine Navigation Program

- Leveraging International Standards (S-100)
- Machine to Machine capability
- Precision Marine Navigation Data and Dissemination Services - AWS Cloud
- marinenavigation.noaa.gov Website

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S-100 Data Standards

Phase 1/Route Monitoring

Phase 1
Route Monitoring Mode

S-101 ENC
S-102 Bathymetry
S-104 Water Levels
S-111 Surface Currents
S-124 Navigational Warnings
S-129 UKC Management

Critical Framework

IHO Geospatial Information Registry
S-98 Interoperability Specification
S-100 Universal Hydrographic Data Model
S-128 Catalogue of Nautical Products
S-164 Test Data Set for S-100 and ECDIS
Type Approval

Phase 2/Route Planning

Phase 2
Route Monitoring Mode

S-122 Marine Protected Areas
S-123 Marine Radio Services
S-125 Marine Aids to Navigation (AtoN)
S-126 Marine Physical Environment
S-127 Marine Traffic Management
S-131 Marine Harbour Infrastructure
S-411 Ice Information (WMO)
S-412 Weather and Wave Hazards (WMO)

+ S-100 Products used in Monitoring Mode

The IHO Navigational Package, for S-100 ECDIS, to be handled by the Interoperability Specification S-98. Additional layers and Phases may be added in the future.

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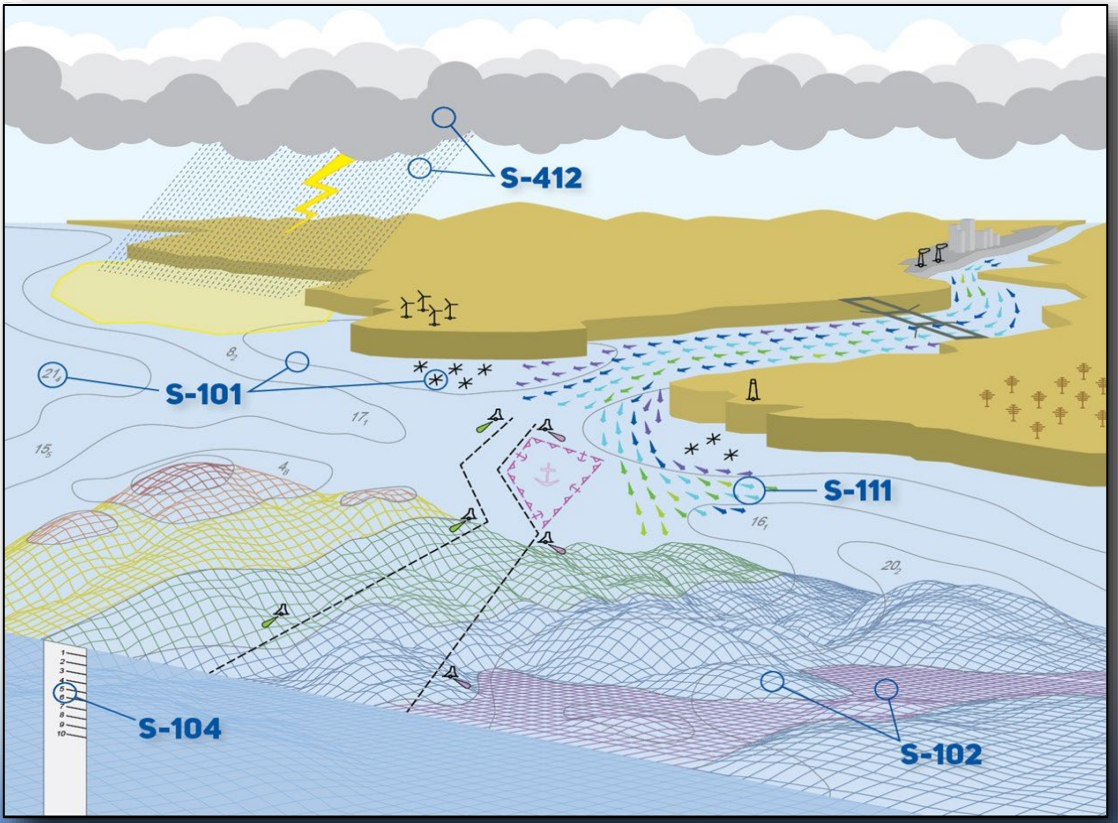
S-100 Data Framework



NOAA S-100 Data Products

- **S-101**: Electronic Navigational Charts (ENC)
- **S-102:** Bathymetric Surface
- **S-104:** Water Level Information
- **S-111:** Surface Currents
- **S-41X:** Weather Overlays

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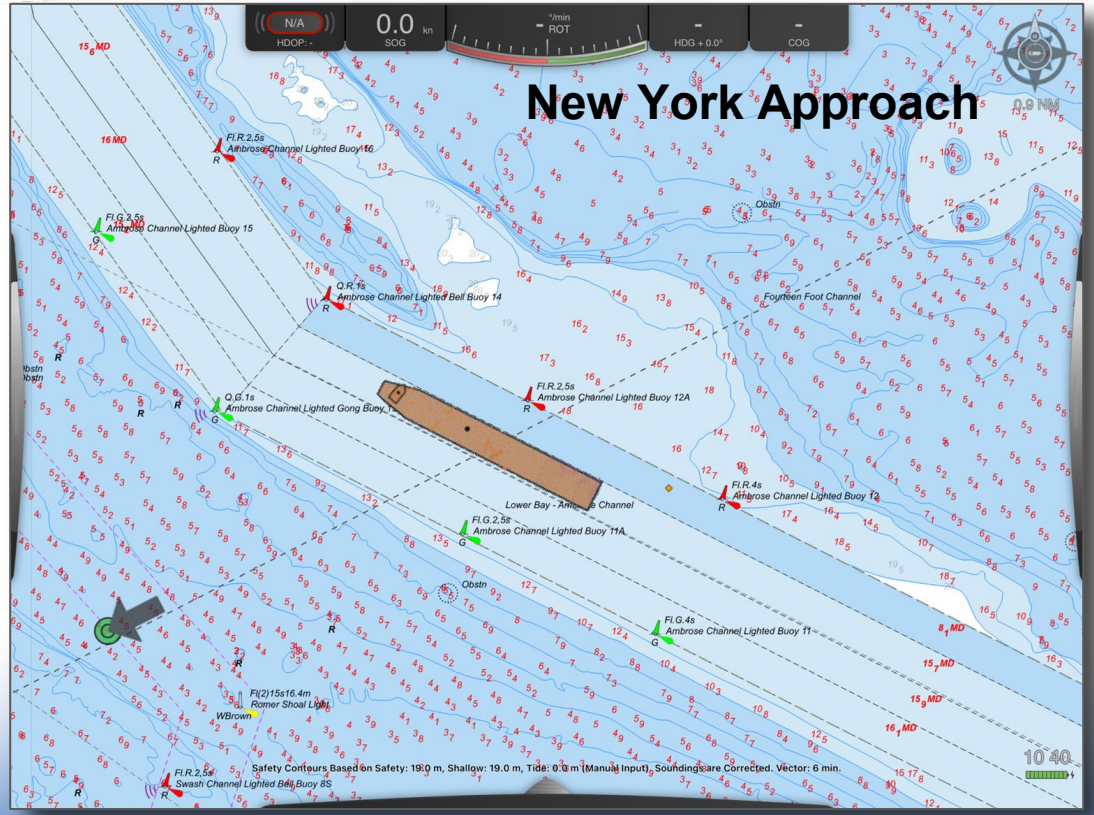
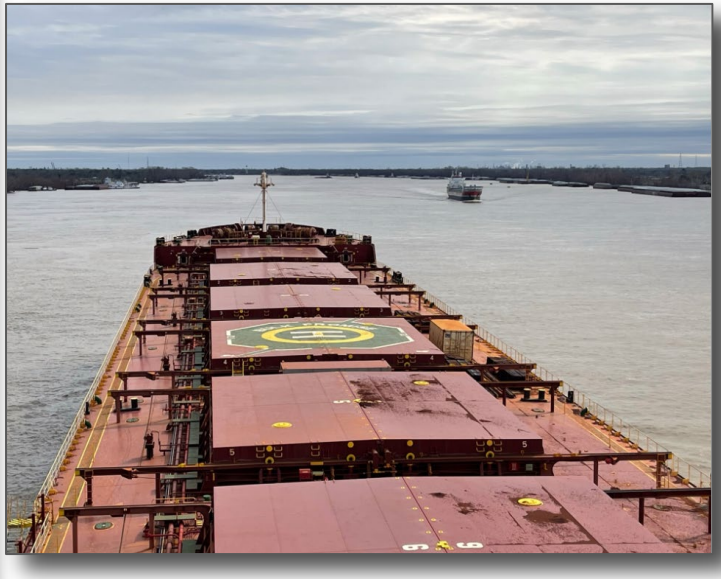
ENC of New York Approach





Trelleborg SafePilot - Portal Pilot Unit Display

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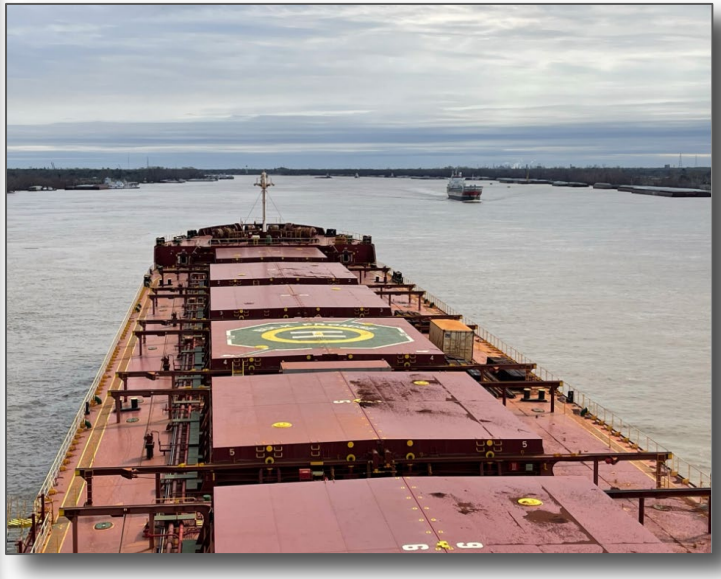
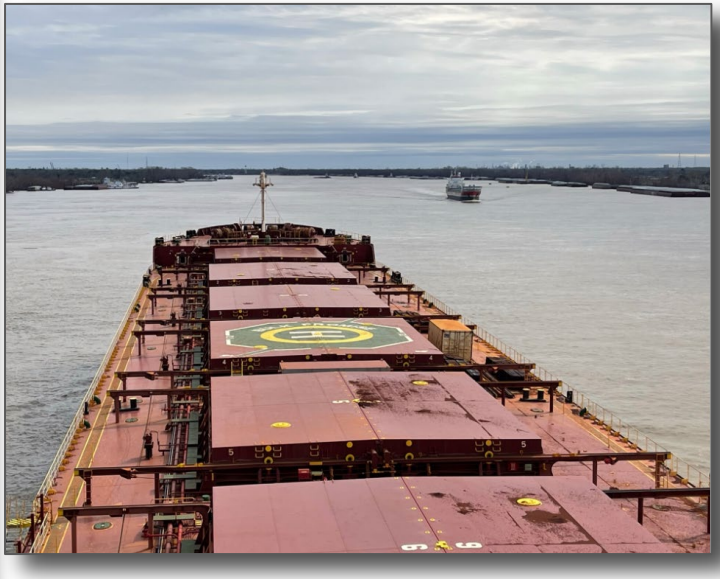
S-102 Bathymetry Data Overlay



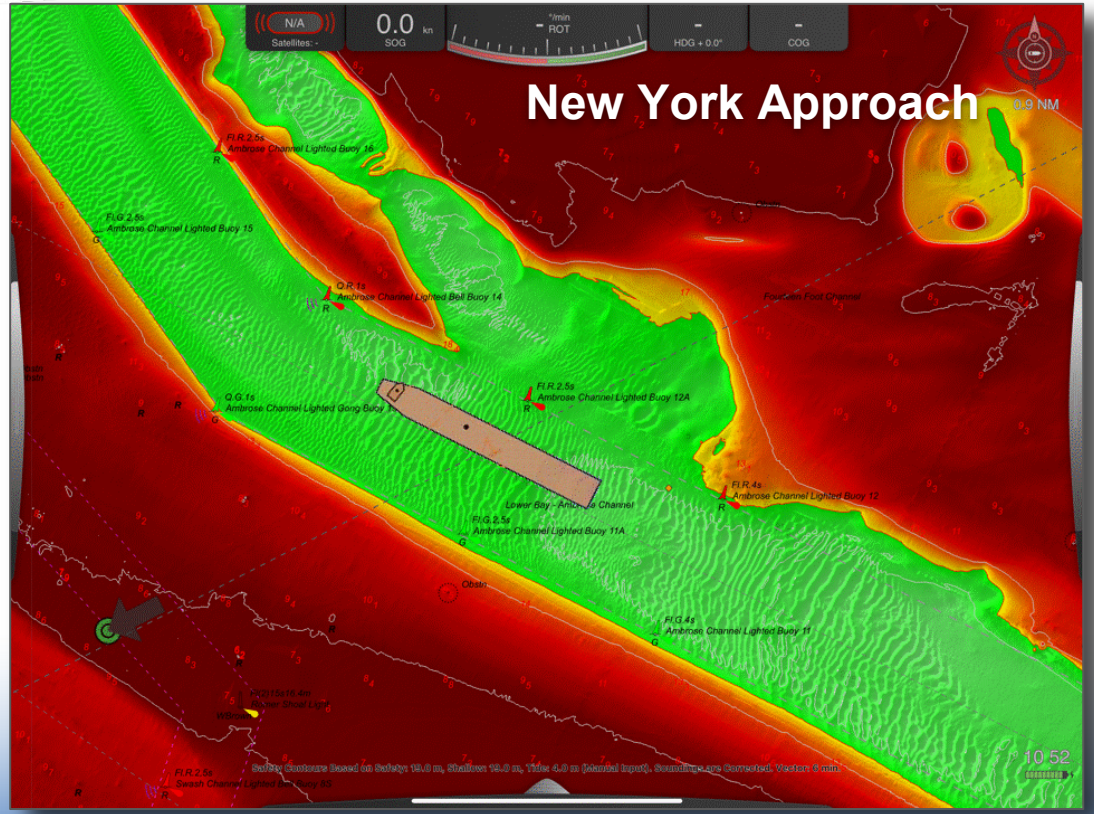
Trelleborg SafePilot - Portal Pilot Unit Display

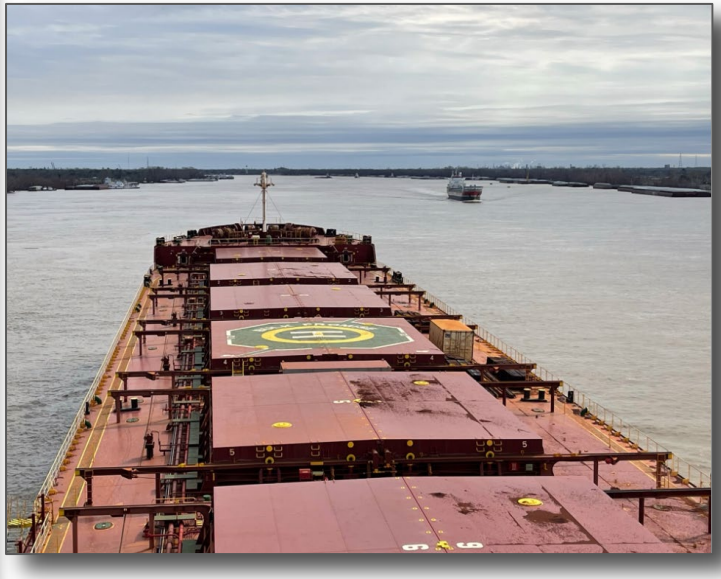
Integrated Water Level and Bathymetry



Trelleborg SafePilot - Portal Pilot Unit Display
(Potential Future Capability)

NOAA Integrated Water Level and Bathymetry Heatmap





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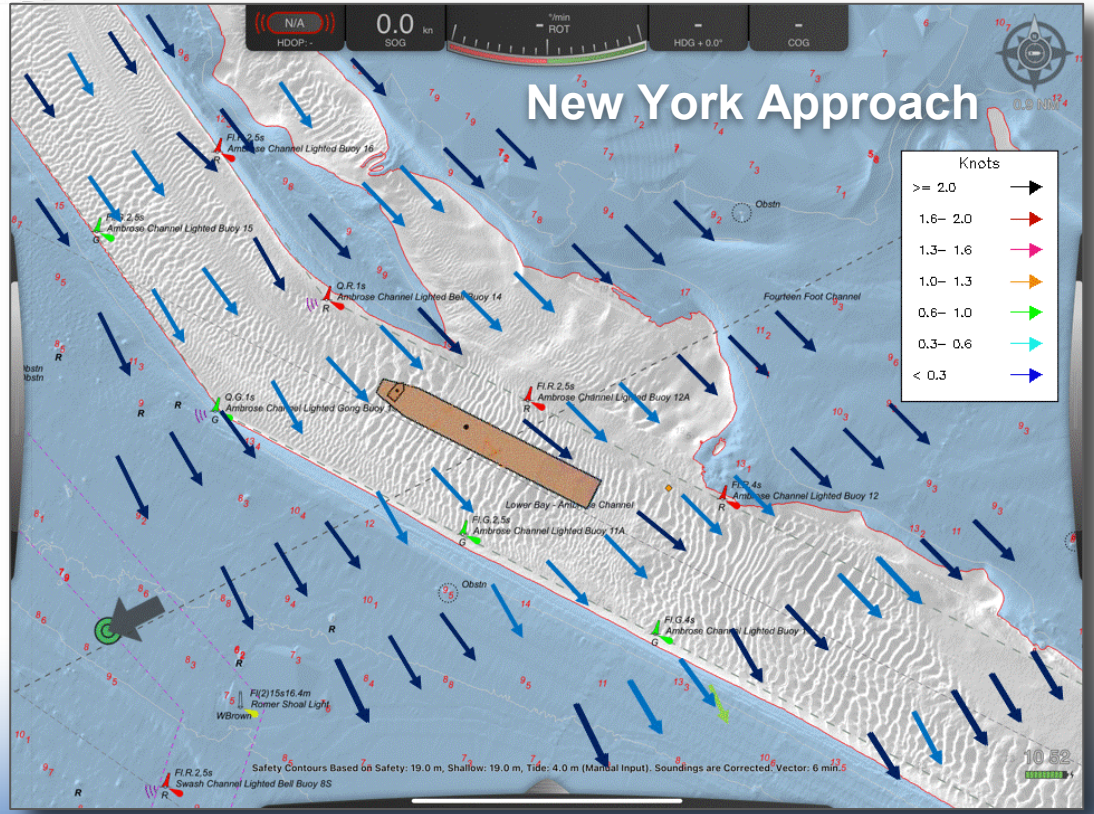
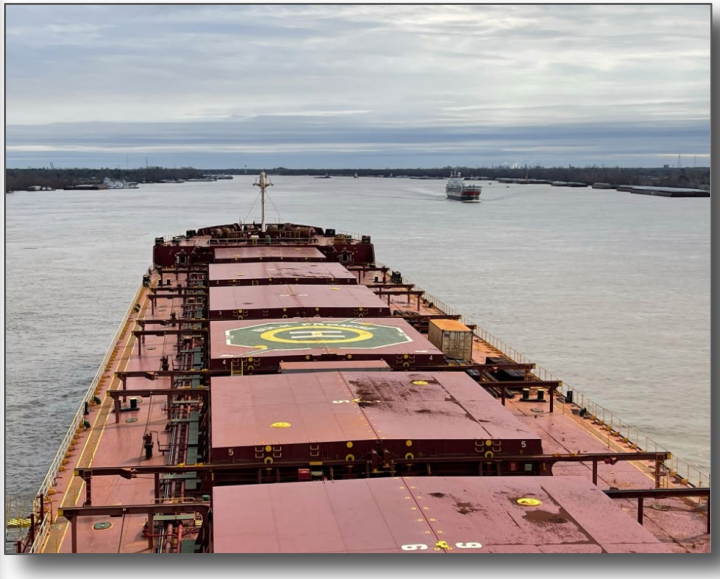
Integrated Surface Currents





Trelleborg SafePilot - Portal Pilot Unit Display
(Potential Future Capability)

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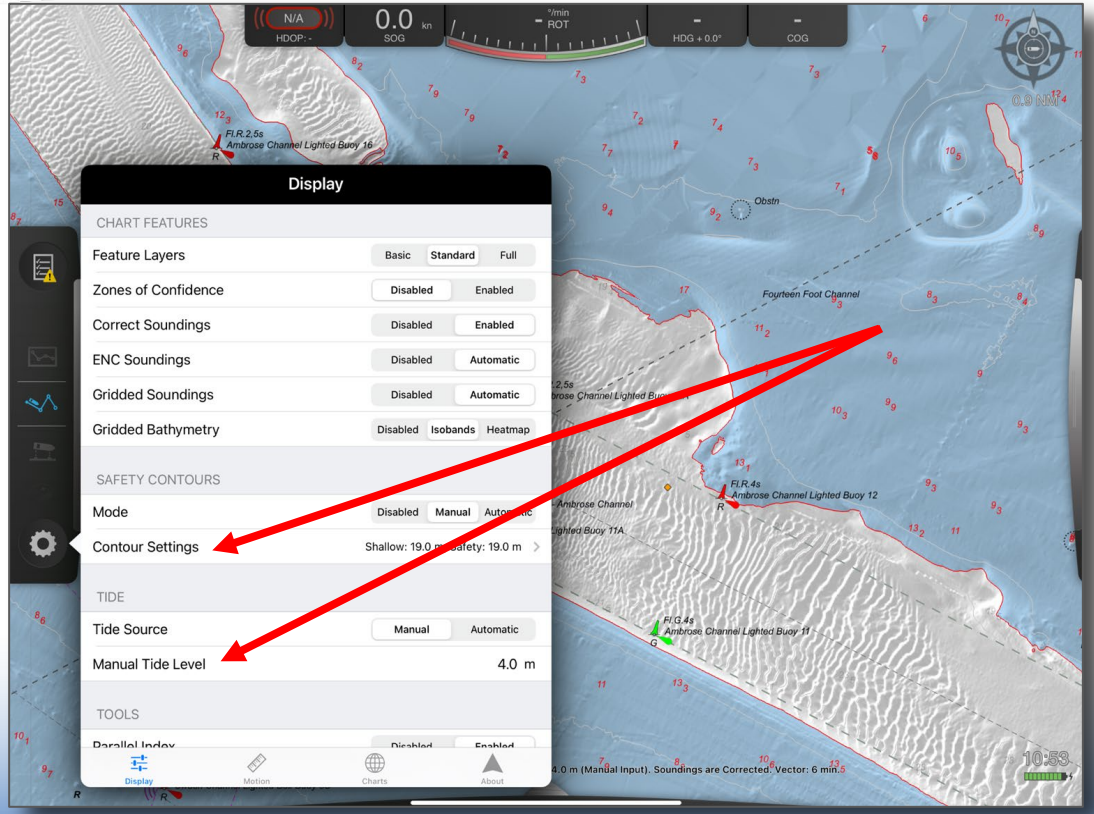
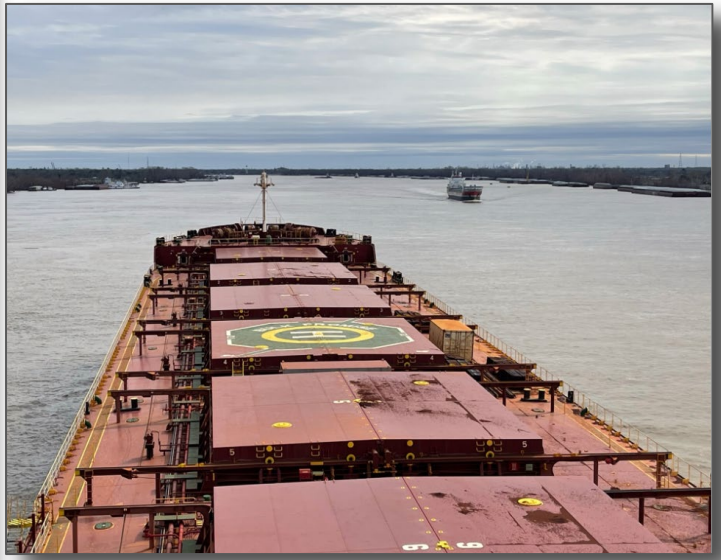
Configurable PPU





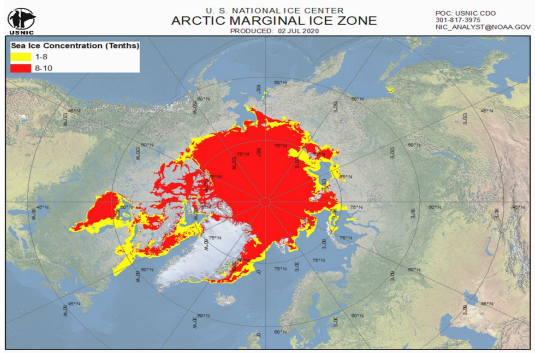
Trelleborg SafePilot - Portal Pilot Unit Display

S41X Waves and Weather

S - 411

Ice Hazards and Information

Portrayal Pending



S - 412

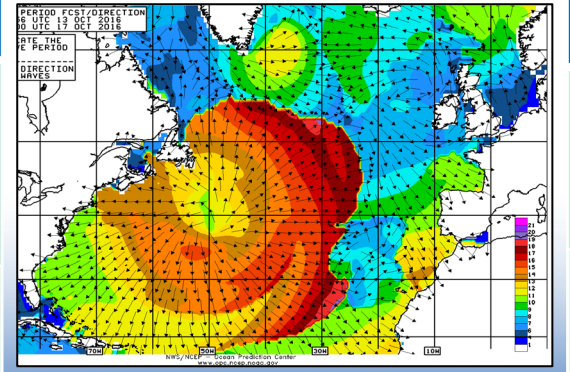
Weather and Wave **Warnings**

Polygons

S - 413

Weather and Wave **Conditions**

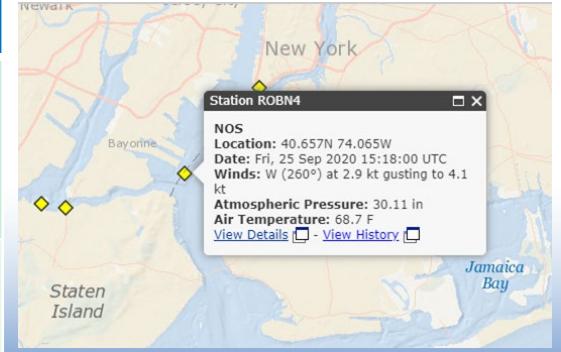
Graphics & Gridded Data



S - 414

Weather and Wave **Observations**

Point Based Data



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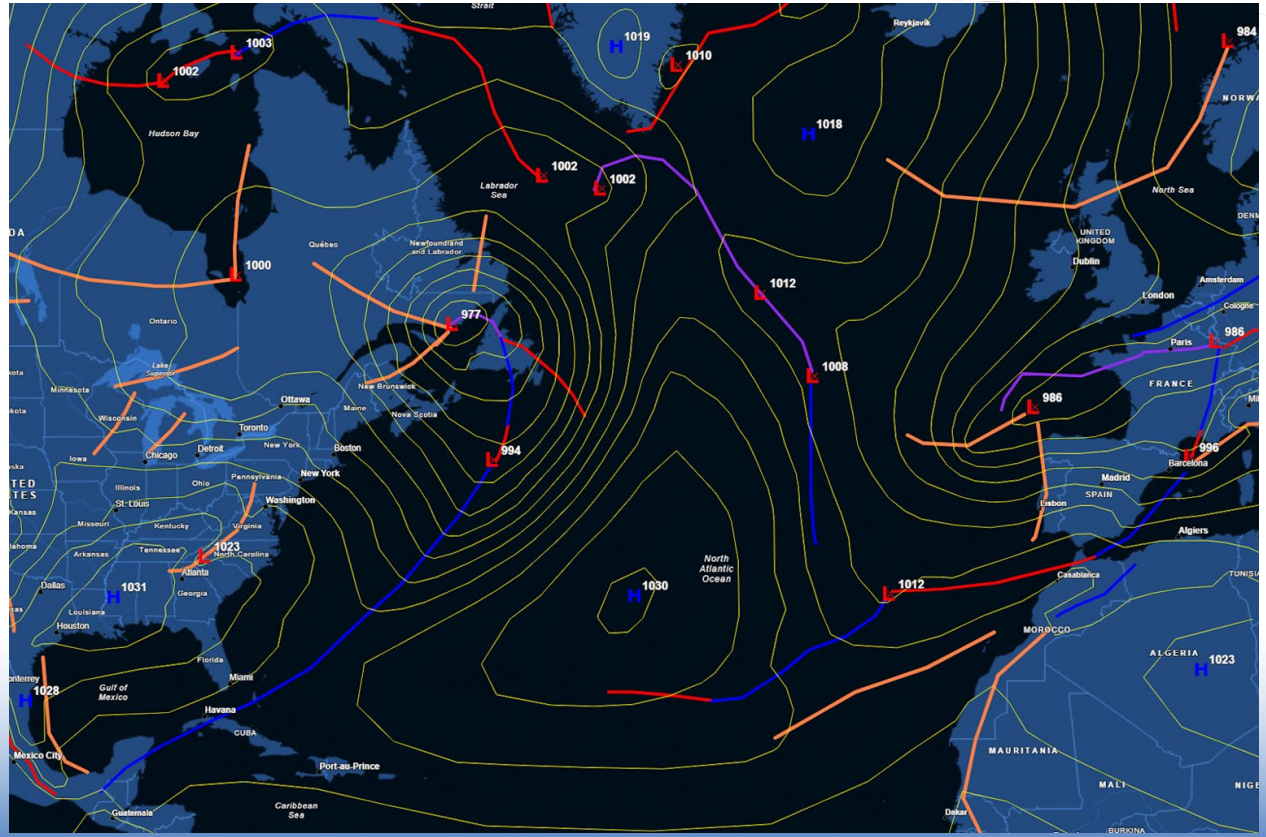
Wind and Wave Warning Polygons



Wind Warnings:

Gale Force

Storm Force

Hurricane Force

Wave Warnings:

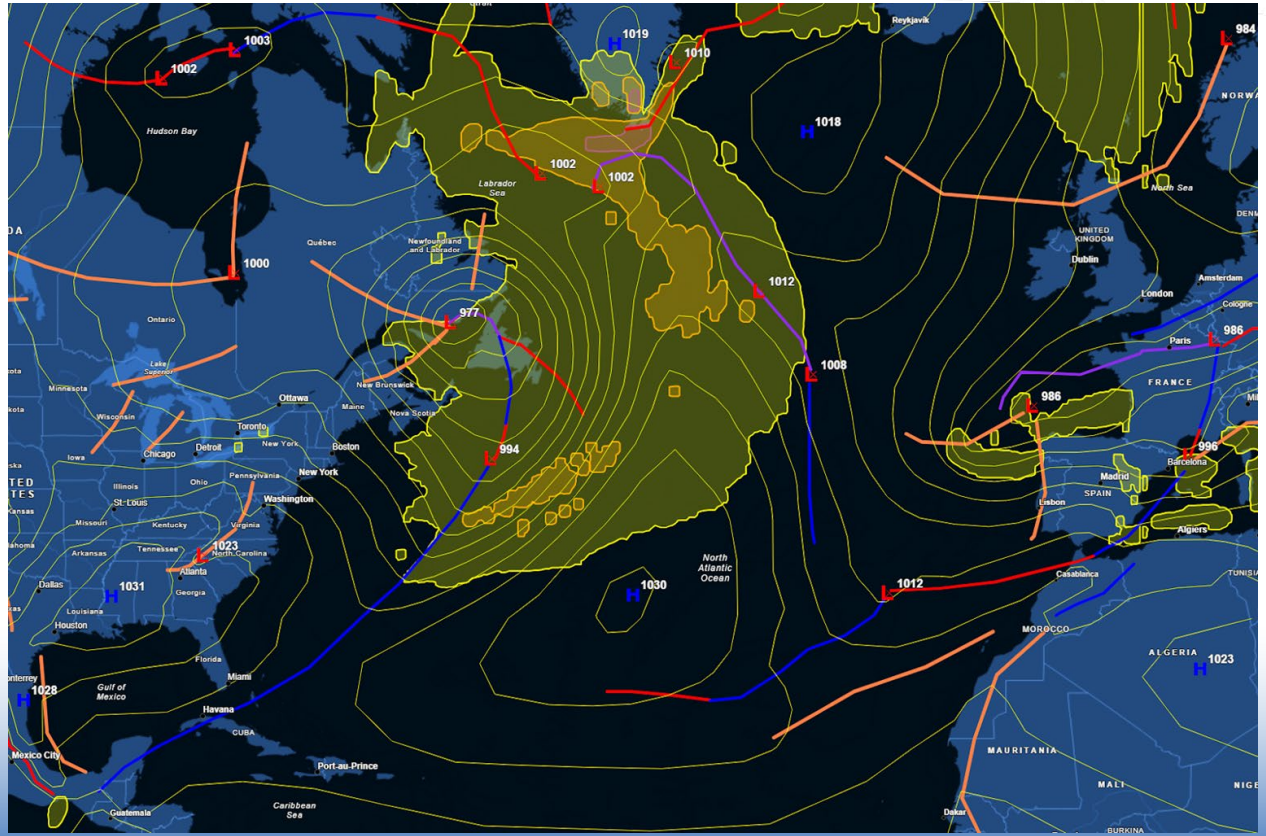
4-6 M

6-9 M

9-14 M

14+ M

Wind and Wave Warning Polygons



Wind Warnings:

- Gale Force
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Wave Warnings:

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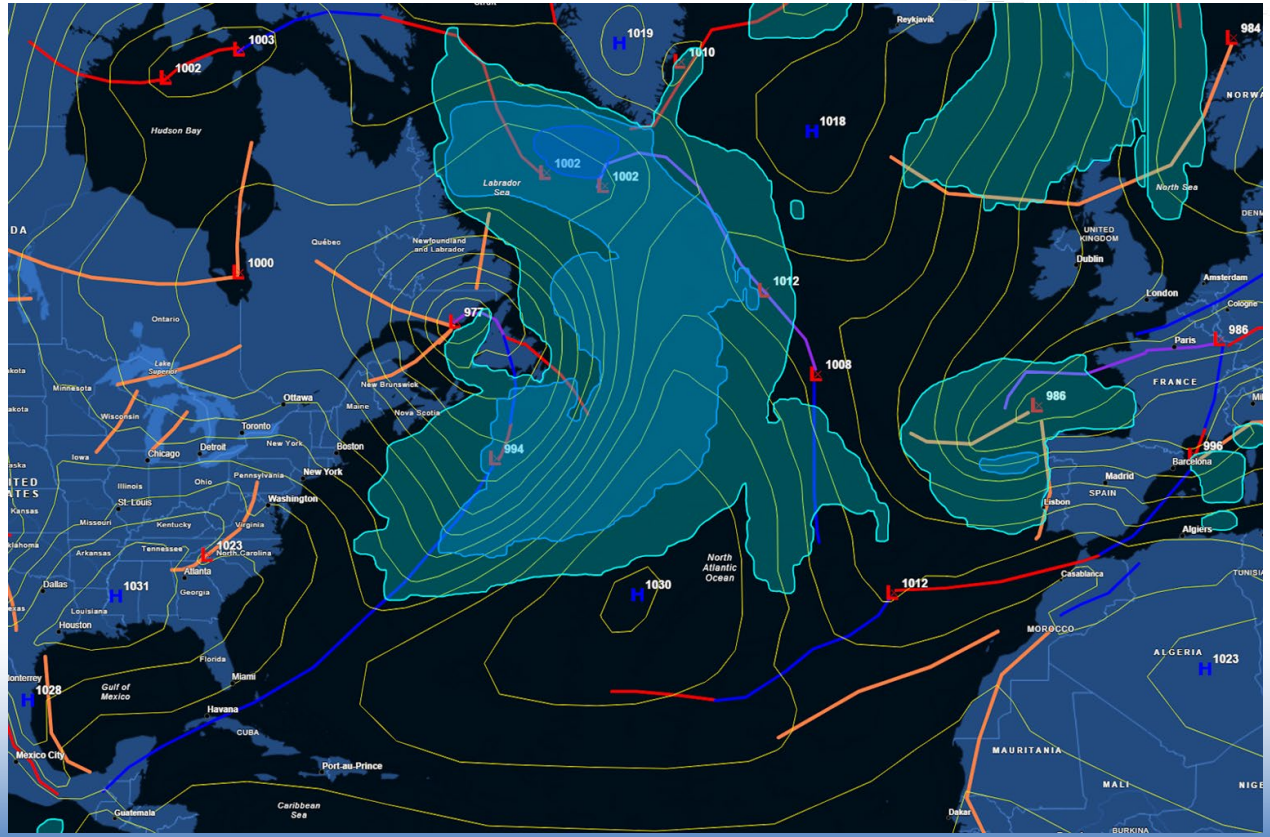
Wind and Wave Warning Polygons



Wind Warnings:

Gale Force

Storm Force

Hurricane Force

Wave Warnings:

4-6 M

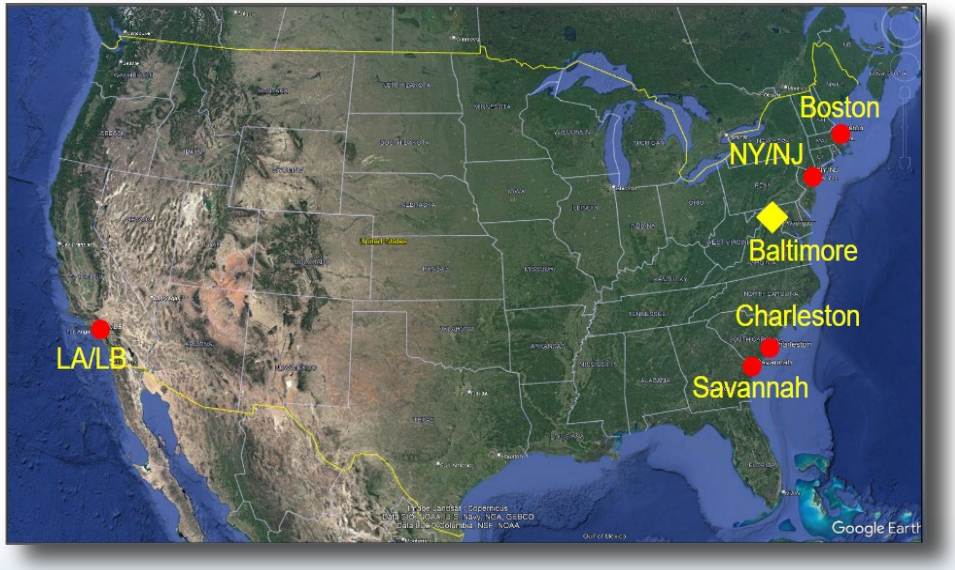
6-9 M

9-14 M

14+ M

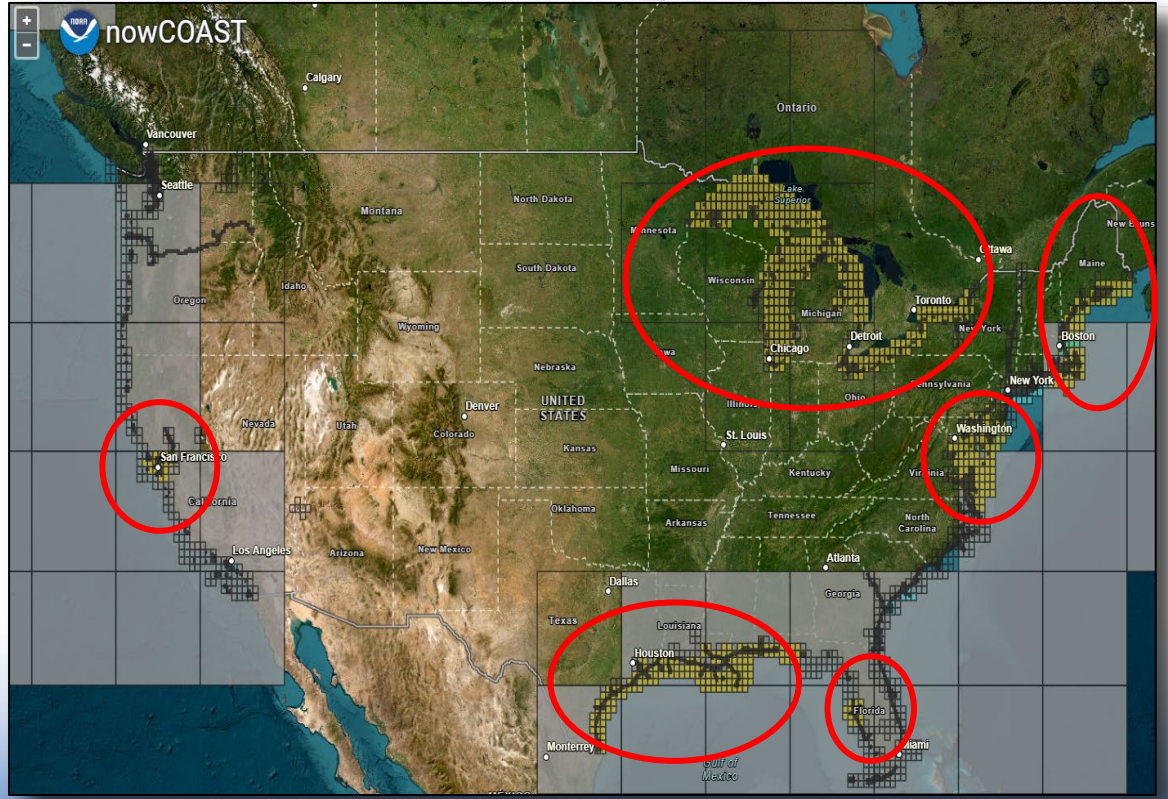
Test S-102 Bathymetry Availability

- S-102 Edition 2.1.0 available in the following locations
  - LA/LB, NY/NJ, Boston, Baltimore, Charleston, Savannah, working on LMR
- Testing Edition 2.2.0 that will work with S-100 metadata upgrade (5.1.0)
- Operation version of S-102 standard released by 12/2024
- S-102 expansion will be put on hold until final standard is established
- Expansion to other locations should start Q2 FY25



Test S-111 Surface Currents

- We have test Surface Current Data in locations where we have Operational Forecast Systems
- Data is currently in ver. 1.2.0
- Operational standard ver. 2.0.0 is expected by the end of the 2024



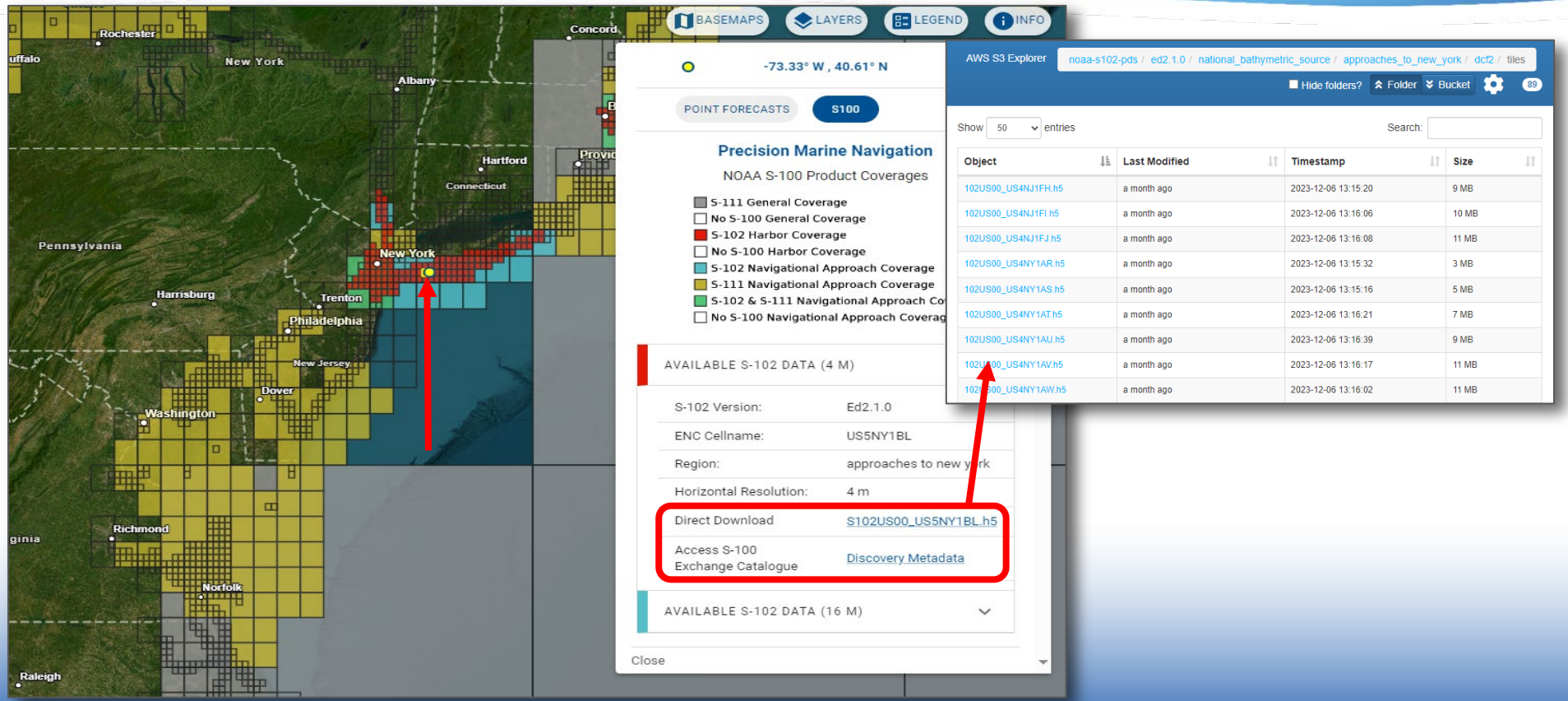
Test S-104 Water Level Forecast Data

- Developing prototype S-104 water level forecast data using Global STOFS model
- S-104 Operational Standard, ver. 2.0.0 expected by end of 2024
- Test data availability in early/mid 2025

NowCoast S-100 Product Coverage Viewer

https://nowcoast.noaa.gov/

Accessing Data on the AWS Cloud



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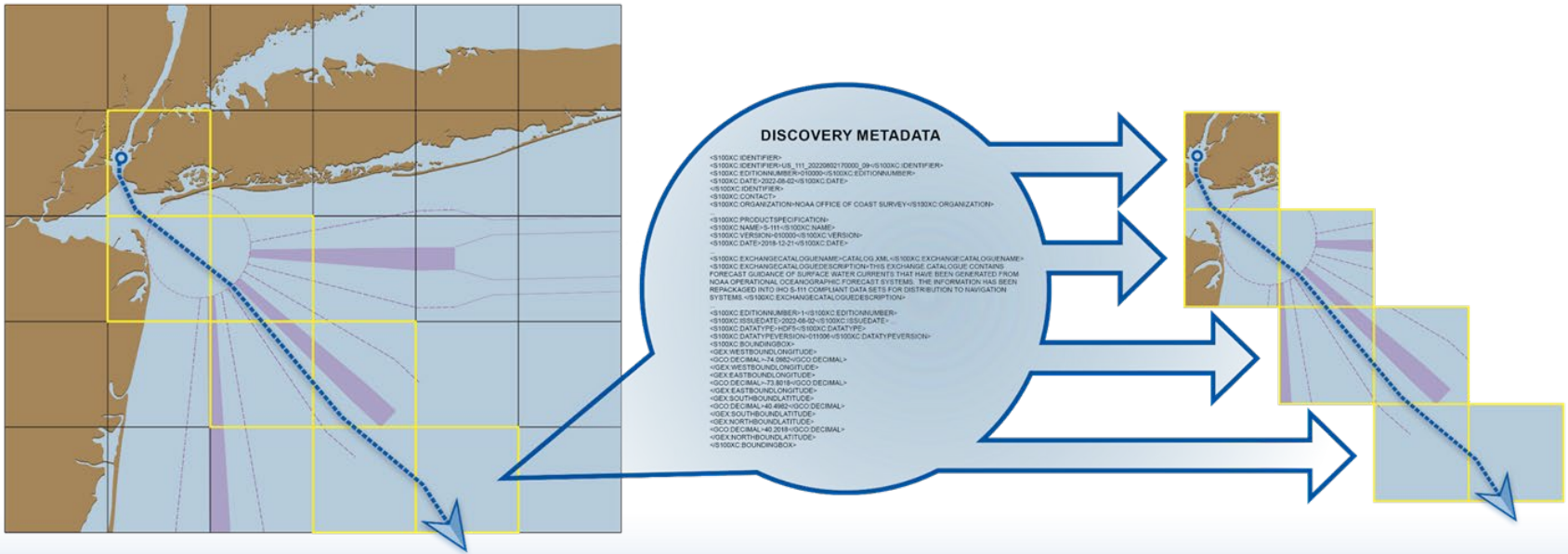
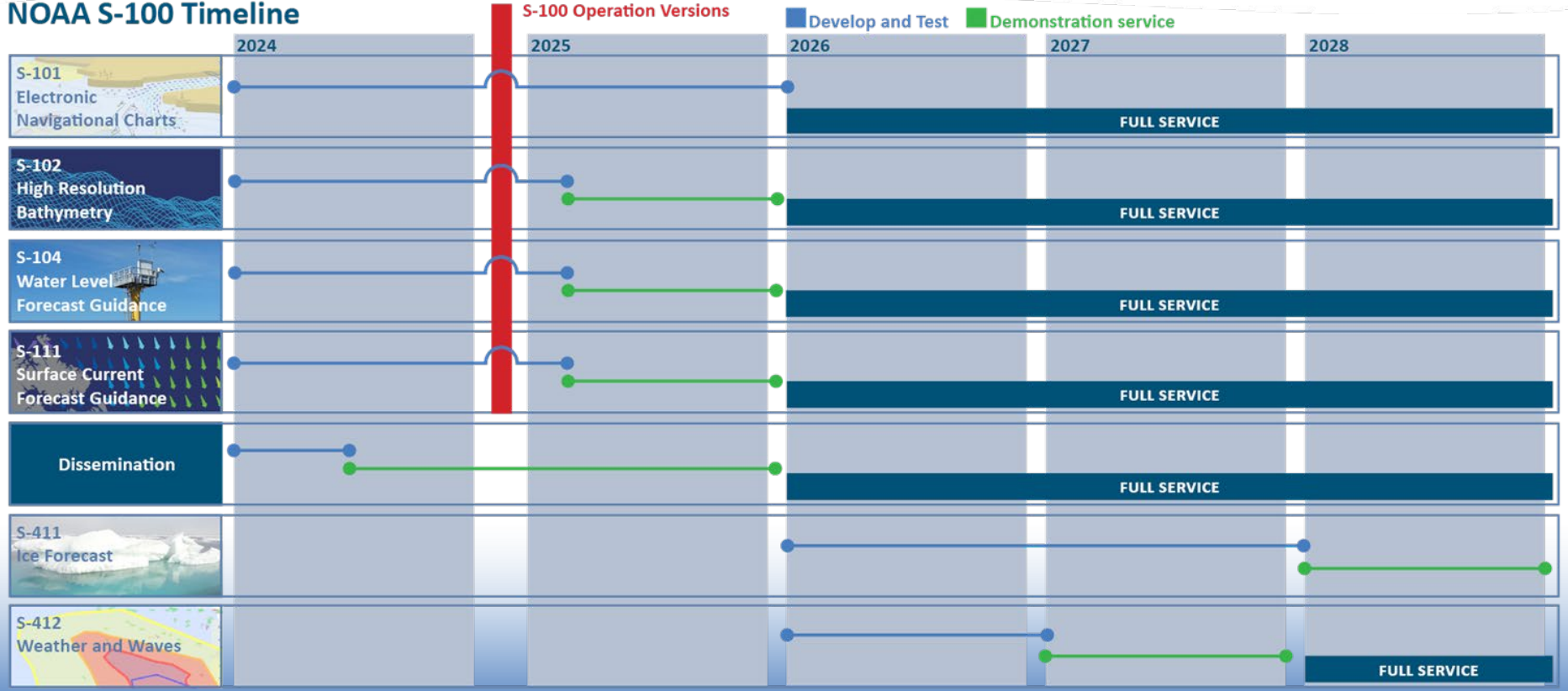
S-100 and the Power of Discovery Metadata



NOAA S-100 Development Timeline



S-100 and the IMO

- In 2022, the International Maritime Organization (IMO), amended its Electronic Chart Display and Information System (ECDIS) standard to leverage S-100 based ENCs beginning in 2026.
- S-100 ECDIS will be voluntary starting **1 January 2026**
- From **1 January 2029** new systems must comply with the new IMO Resolution on ECDIS Performance Standards (MSC.530(106))
- New ECDIS aim to be “dual fuel” capable – able to display both S-57 and S-101 for a smooth transition period.

Thank you! Questions?

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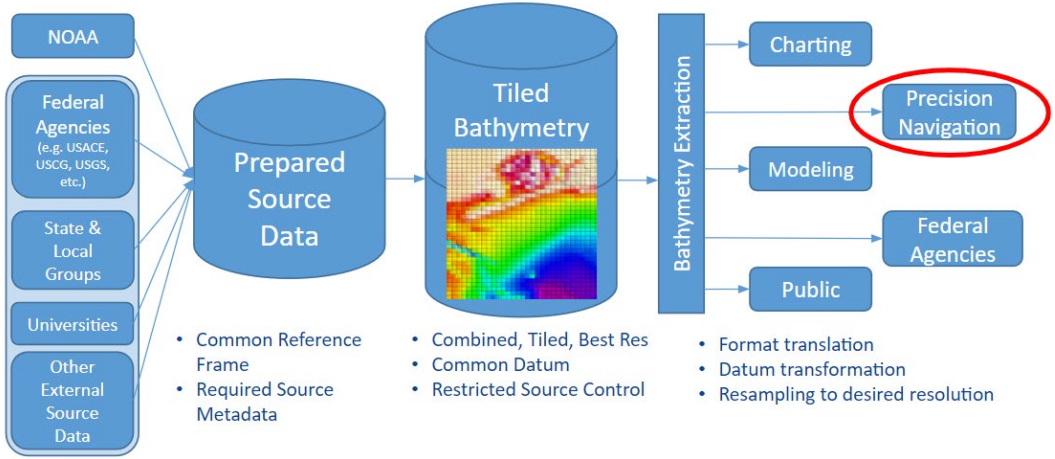
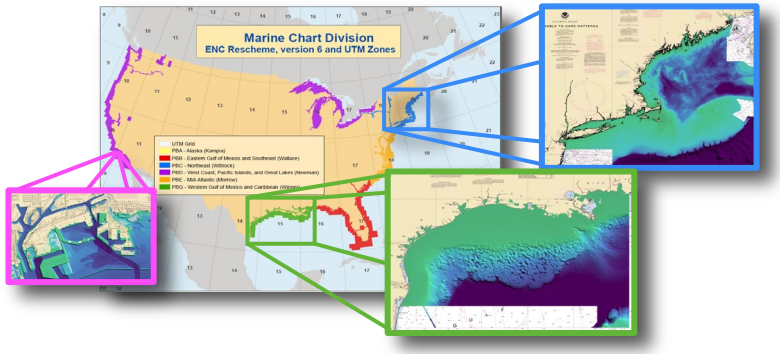
NOAA Major Infrastructure Development Necessary for PMN

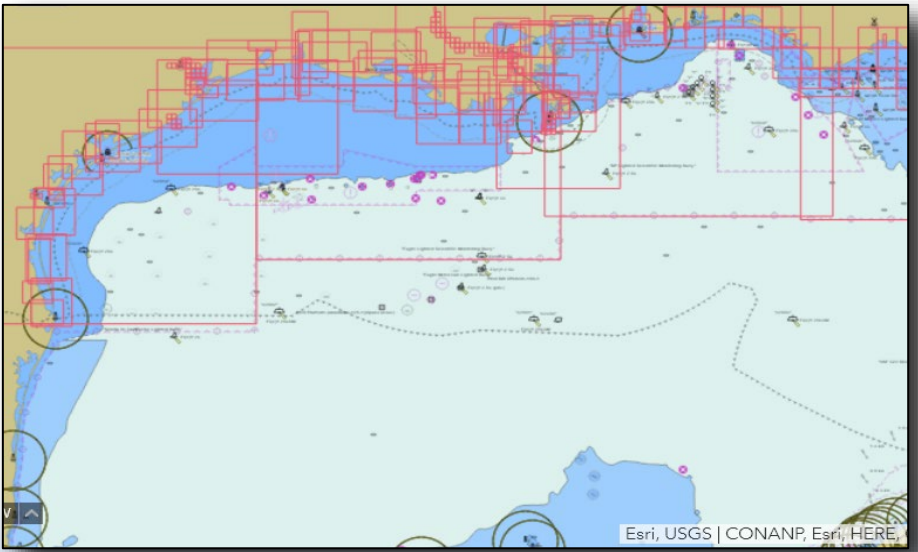
National Bathymetric Source (NBS)

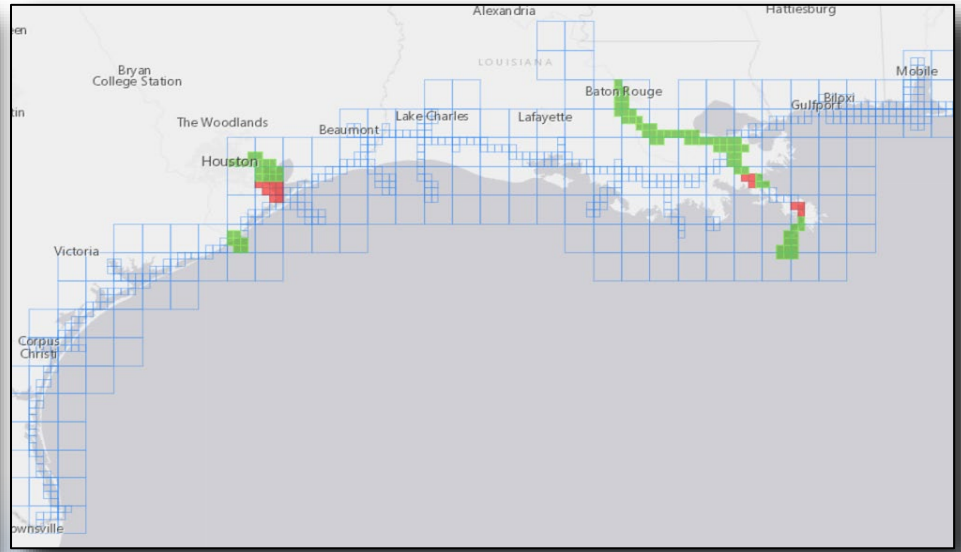




Major Infrastructure Development Necessary for PMN

ENC Regridding





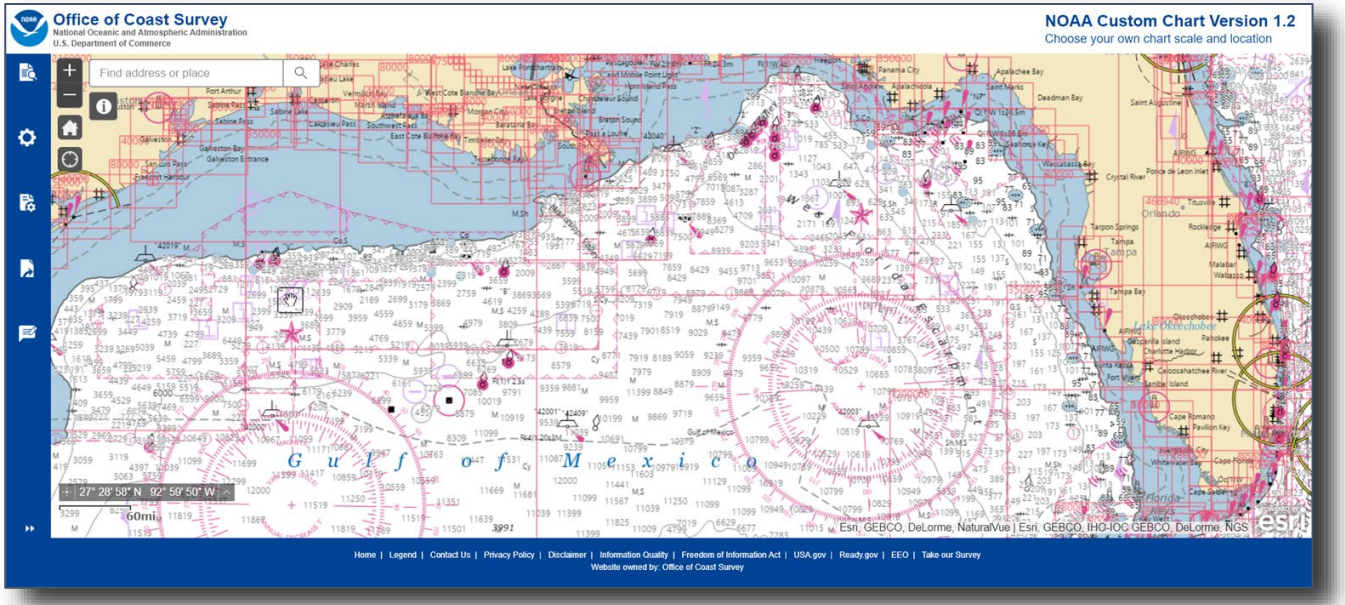
Ending Paper Nautical Chart Production

- NOAA's traditional paper chart production line is being shut down, enabling the redirection of resources to improve NOAA's premier nautical navigation product, the electronic navigational chart (NOAA ENC®).
- This ongoing five-year process to end traditional paper nautical chart production was announced in November 2019.
- The expected cancellation date of these products and services is January 2025.

NOAA Custom Chart Tool

NOAA Custom Chart (NCC) is a web app that enables users to create their own customized nautical charts directly from the latest official NOAA electronic navigational chart (NOAA ENC®) data.

NCC outputs geospatially referenced Portable Document Format (PDF) files using the paper size, scale, and location selected by the user. Depths can be displayed in meters, feet, or fathoms and there are a few other display options, such as changing the depth at which a shallow water blue tint is applied and the depiction of a "safety contour" based on a vessel's draft.



NOAA Custom Chart Tool