Automation of Cartographic Production, realizing the power of GIS

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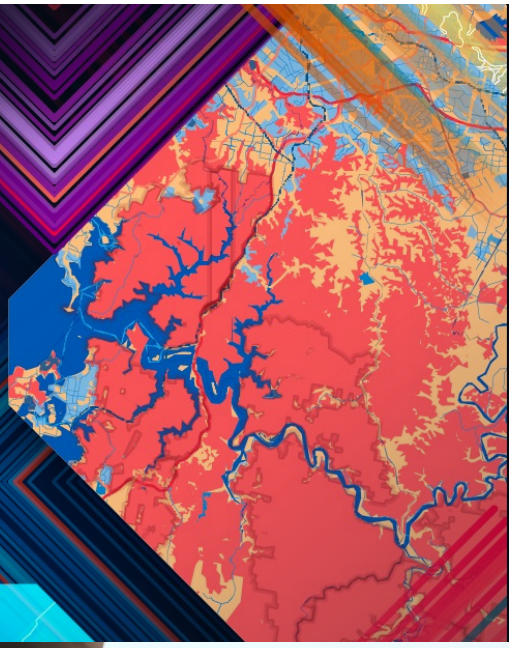
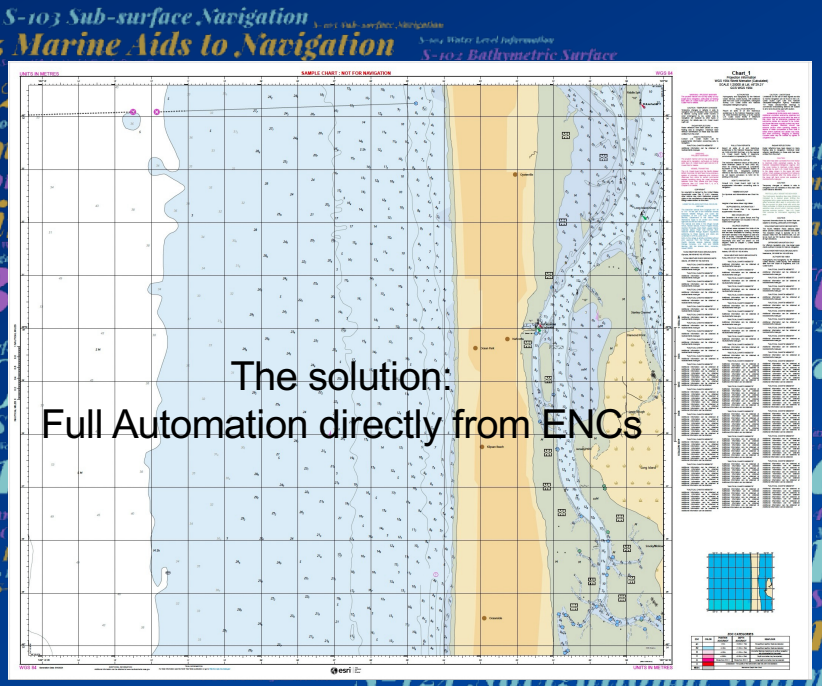


You need to produce those “paper charts”, and all otherS-100 hydrographic products; you better run!

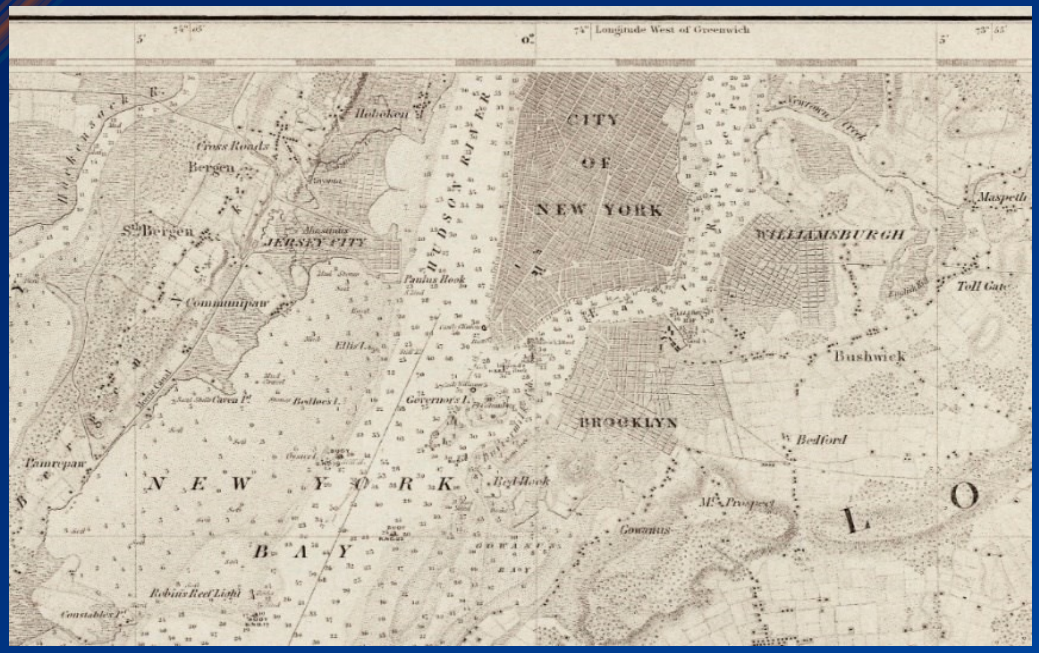
- Time consuming
- Secondary product



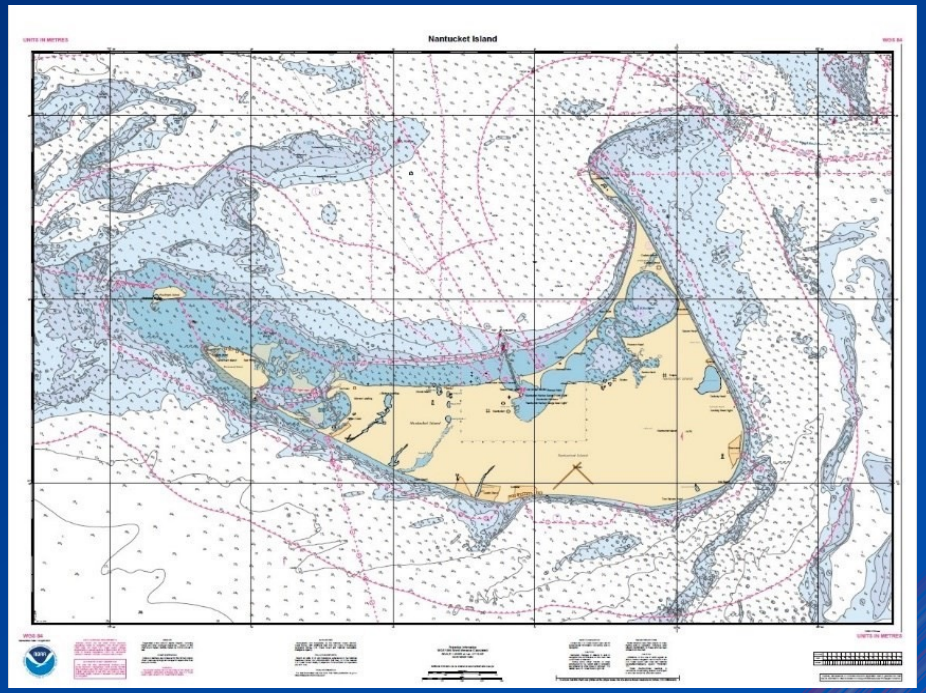
- Allowing support of S-100
- Saving time and resources

Paper charts of the past and present (and future?)

Clarity and Accuracy are (should be) the main criteria

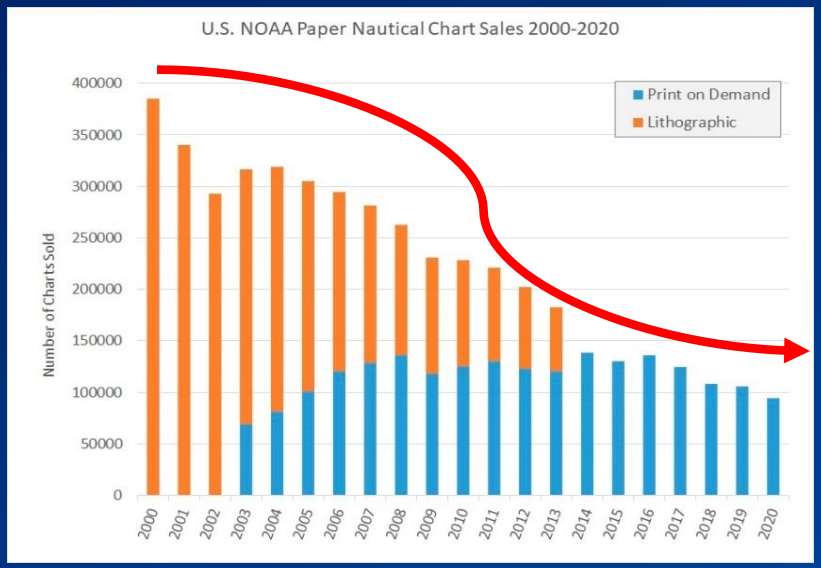


Detail from 1:80,000 scale chart, “New York Bay and Harbor and the Environs,” published in 1845 by the U.S. Survey of the Coast

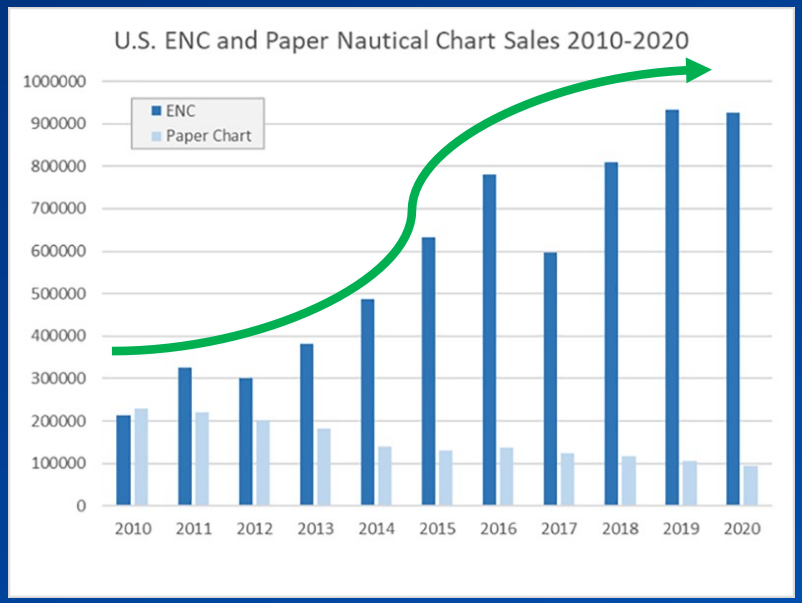


NOAA Custom Chart fully automated output for Nantucket Island, Massachusetts

Use of Paper charts vs Electronic charts

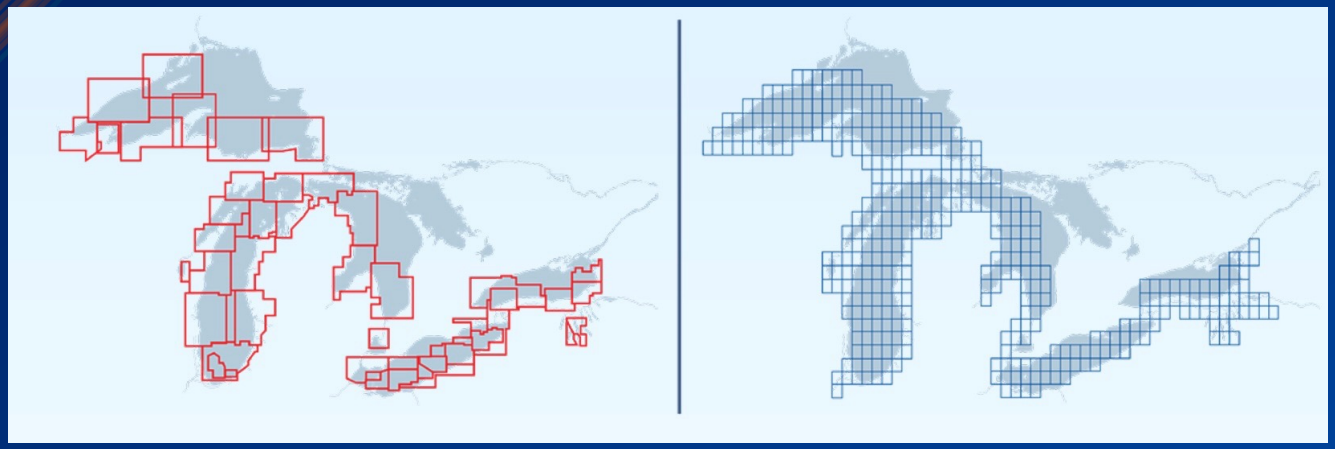


NOAA's Lithographic VS Print on Demand

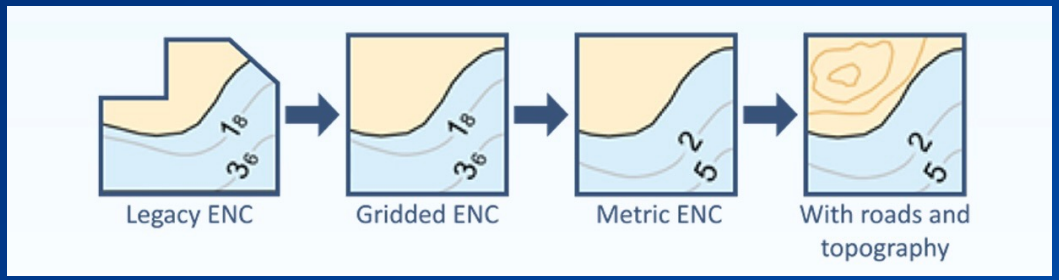


NOAA's Paper Chart sales VS ENC sales

NOAA's Nautical Charting Plan



Comparison of the old (red outlines) and new (blue rectangles) ENC band 4 schemes for the Great Lakes



General progression of rescheming process.

Band Number	ENC Usage Band Name	Reschemed ENC Scale
1	Overview	1:10,000,000 1:3,500,000
2	General	1:1,500,000 1:700,000
3	Coastal	1:350,000 1:180,000
4	Approach	1:90,000 1:45,000
5	Harbor	1:22,000 1:12,000
6	Berthing	1:4,000 1:2,000

Band Number	ENC Usage Band Name	Estimated number of reschemed cells
1	Overview	21
2	General	93
3	Coastal	351
4	Approach	2,385
5	Harbor	4,388
6	Berthing	22

Chart On Demand (COD) & Certified Printed ENC (CPENC)

Sebastian Carisio, NGA Maritime Safety Office

OCT 2022

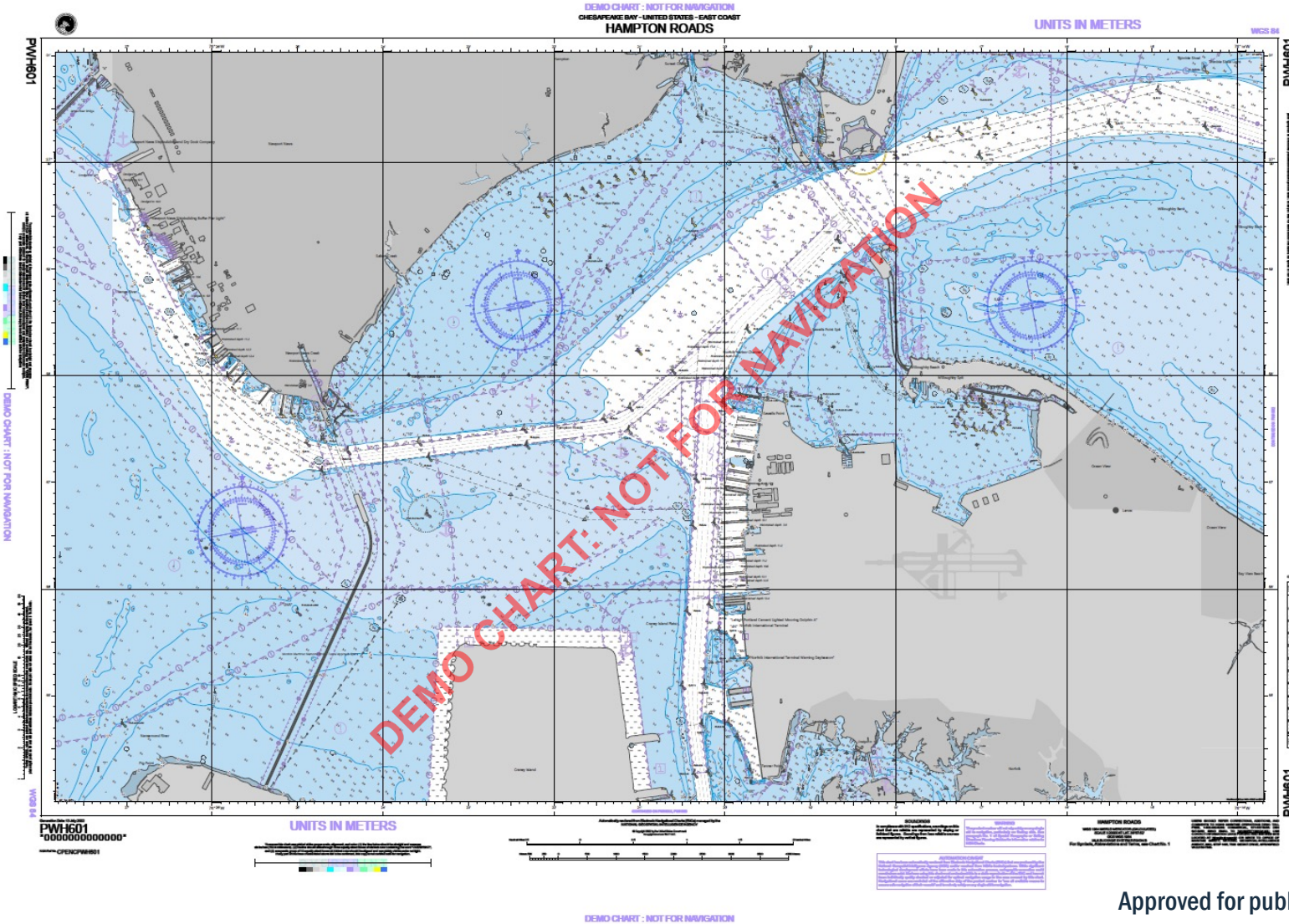
The overall classification of this presentation is:
Approved for public release, NGA-U-2022-02017

NATIONAL GEOSPATIAL NGA INTELLIGENCE AGENCY

CPENC (or ENC-derived paper chart) Use Cases

- For ECDIS backup (on ECDIS mandated vessels)
  - Reduced geographic coverage (i.e. sea buoy to sea buoy).
  - Reduced number of scales.
  - Fixed footprint to support paper navigation.
  - Divergence from S-4 requirements (e.g. hybrid INT/ECIDS portrayal).
  - SOLAS update process required.
- For Safety of Navigation (SoN) by non ECDIS mandated vessels
  - Supporting all scales and geographic coverage for SoN as determined by appropriate authority.
  - Fixed footprint coverage to support SoN on paper nautical charts.
  - Limited divergence from S-4 requirements.
  - Regulated updated processes required.
- For all other non-SoN uses, planning etc.
  - No requirement to meet S-4.

NGA



***Note**: Once activated, this CPENC was generated from the latest ENC, in the MCS, in about 1-2 minutes.*

Production & Maintenance Resource Comparison: CPENC vs. Standard Nautical Charts (SNCs)

Production Comparison

► CPENC

- **≈10-15 min.** initial activation + **≈1-2 min.** of generation **per chart** (new edition) and for every new edition thereafter.
- **≈12-24 new charts per day, per analyst**
  1 analyst *could* scheme and produce a small region of charts (1-2 dozen) in an *uninterrupted* workday.
- **Hundreds** of new edition charts possible **per 24-hour period** *for activated charts*.

► SNC

- **≈150 hours** (average) of manual finishing **per chart** (new edition)
- **≈1.33 new charts per month, per analyst**
  1 cartographic analyst + **1-2 reviewing analyst(s)** on multiple teams + **group reviewers**
- **≈100 charts per year** depending on team size, chart complexity, etc.

Maintenance Comparison

► CPENC: Corrected CPENCs

- Corrected versions of **entire CPENC catalog** produced within **24-hour period** from the **most up-to-date ENC.**
- Corrections produced **inline with ENC.**
- **Maritime Analysts Team** (small-size team) processing ENC change detection results + **CPENC Team** (small-size team) to monitor Corrected CPENC generation.

► SNC: Notice To Mariners

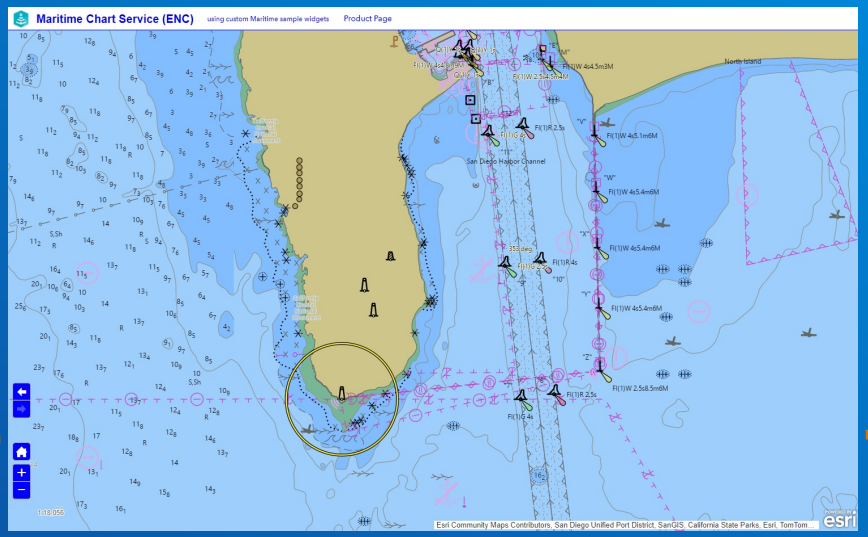
- **Weekly notices** with **multiple source analysis/processing.**
- **SNCs** are **maintained separately** from ENC.
- **Multiple regionally-focused teams** (branch-size), for analysis and publication.

*Takeaway: time and resource savings with CPENC is **MASSIVE**.*

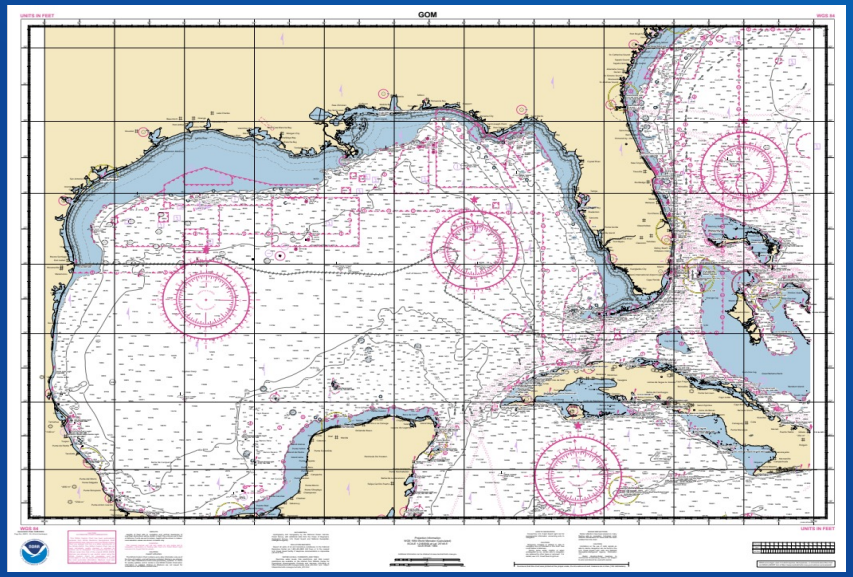
NGA

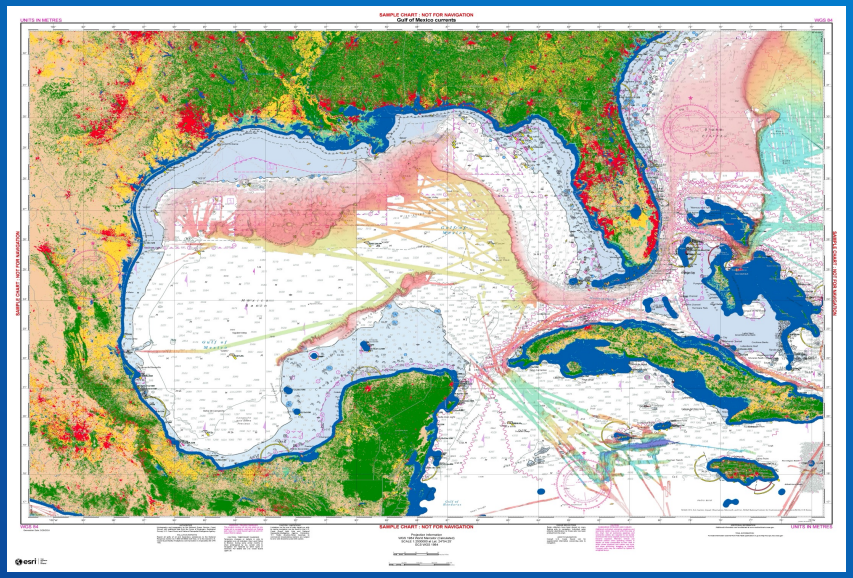
The ArcGIS Maritime Server – Custom Chart Builder

ArcGIS Maritime Server



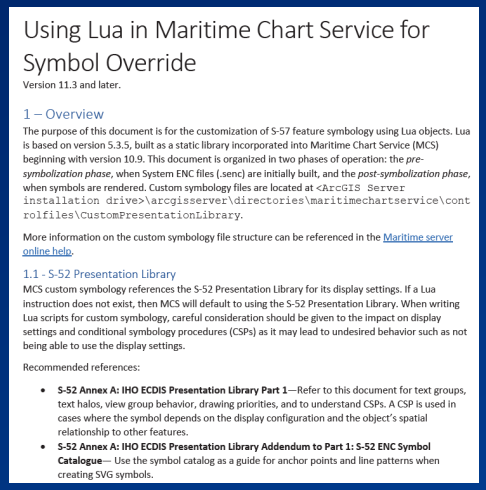
MSDI





Representation rules configuration

For Full Automation



Using Lua in Maritime Chart Service for Symbol Override

Version 11.3 and later.

1 – Overview

The purpose of this document is for the customization of S-57 feature symbology using Lua objects. Lua is based on version 5.3.5, built as a static library incorporated into Maritime Chart Service (MCS) beginning with version 10.9. This document is organized in two phases of operation: the *pre-symbolization phase*, when System ENC files (.senc) are initially built, and the *post-symbolization phase*, when symbols are rendered. Custom symbology files are located at `<ArcGIS Server installation drive>\arcgisserver\directories\maritimechartservice\controlfiles\CustomPresentationLibrary`.

More information on the custom symbology file structure can be referenced in the Maritime server online help.

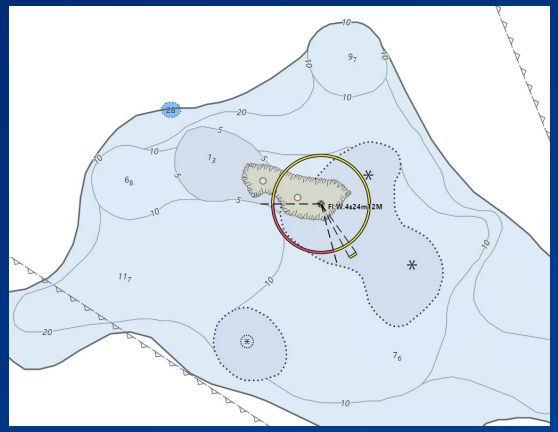
1.1 - S-52 Presentation Library

MCS custom symbology references the S-52 Presentation Library for its display settings. If a Lua instruction does not exist, then MCS will default to using the S-52 Presentation Library. When writing Lua scripts for custom symbology, careful consideration should be given to the impact on display settings and conditional symbology procedures (CSPs) as it may lead to undesired behavior such as not being able to use the display settings.

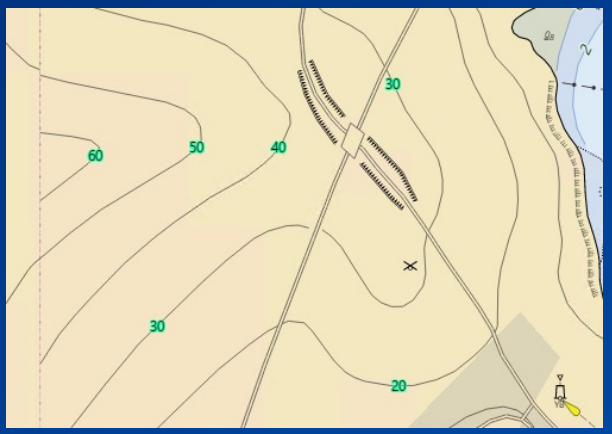
Recommended references:

- **S-52 Annex A: IHO ECDIS Presentation Library Part 1**—Refer to this document for text groups, text halos, view group behavior, drawing priorities, and to understand CSPs. A CSP is used in cases where the symbol depends on the display configuration and the object's spatial relationship to other features.
- **S-52 Annex A: IHO ECDIS Presentation Library Addendum to Part 1: S-52 ENC Symbol Catalogue**— Use the symbol catalog as a guide for anchor points and line patterns when creating SVG symbols.

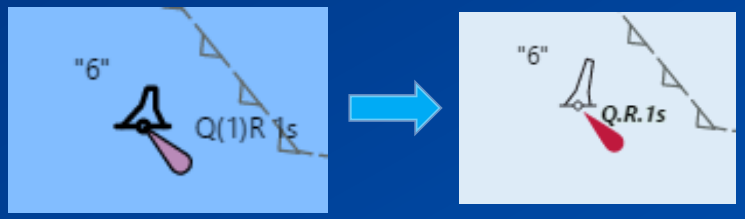
Custom symbology documentation



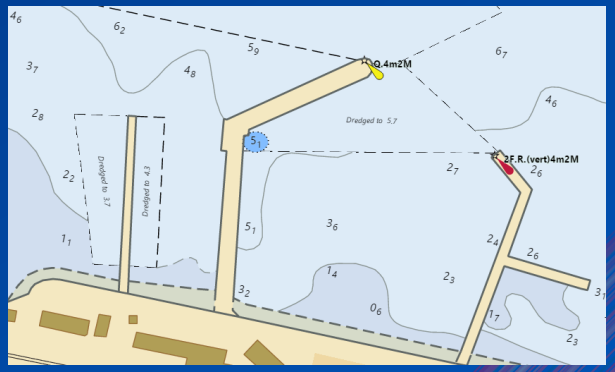
Display of unreliable soundings



Halo color parameters

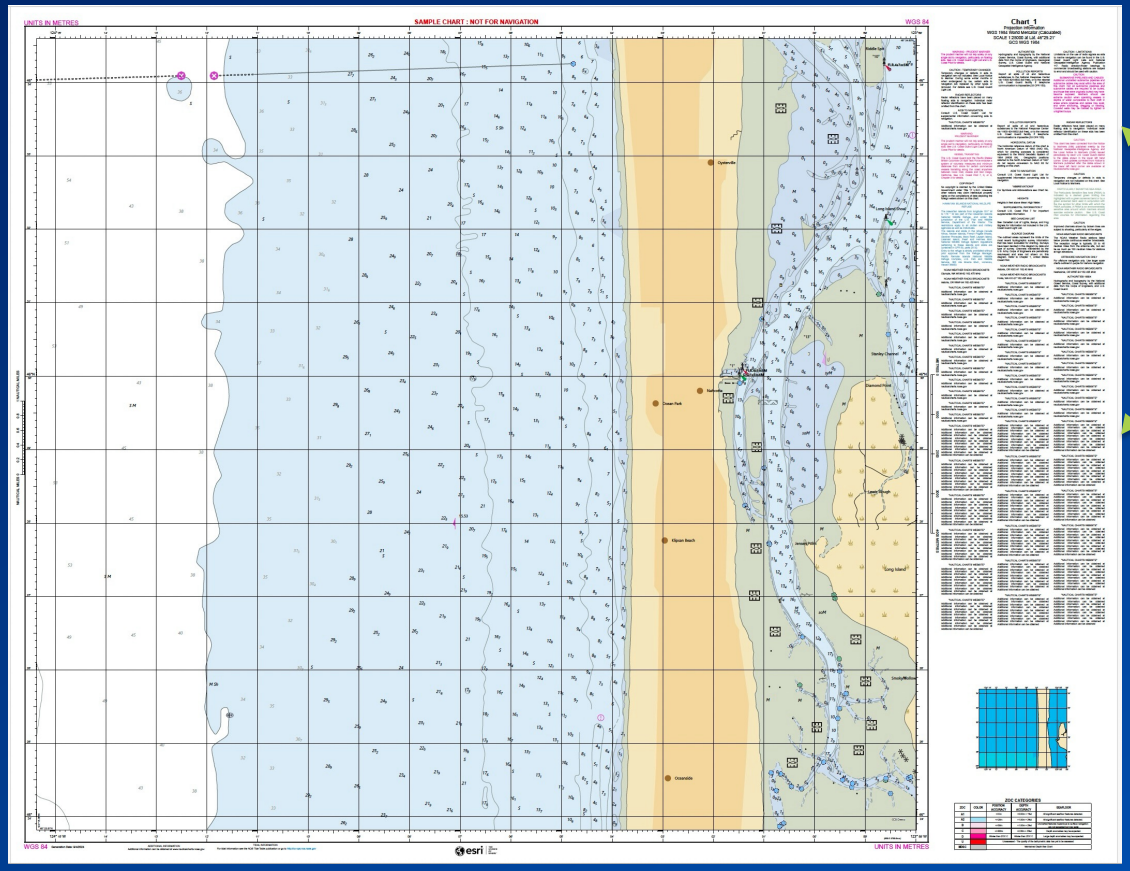


From S-52 to SVG INT1



Text rotation controls

Single page layout

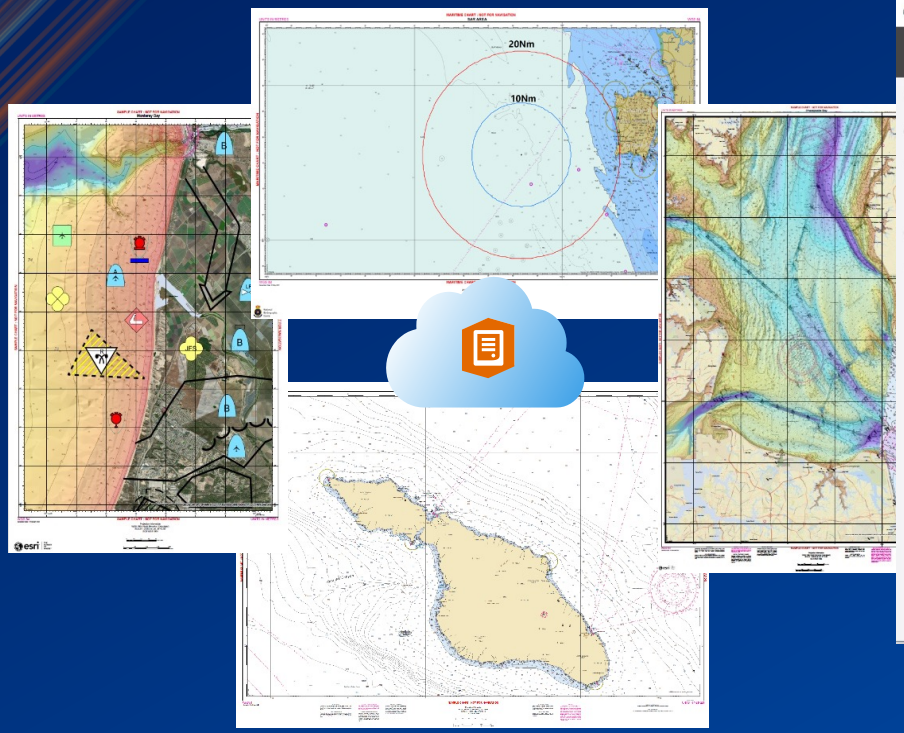


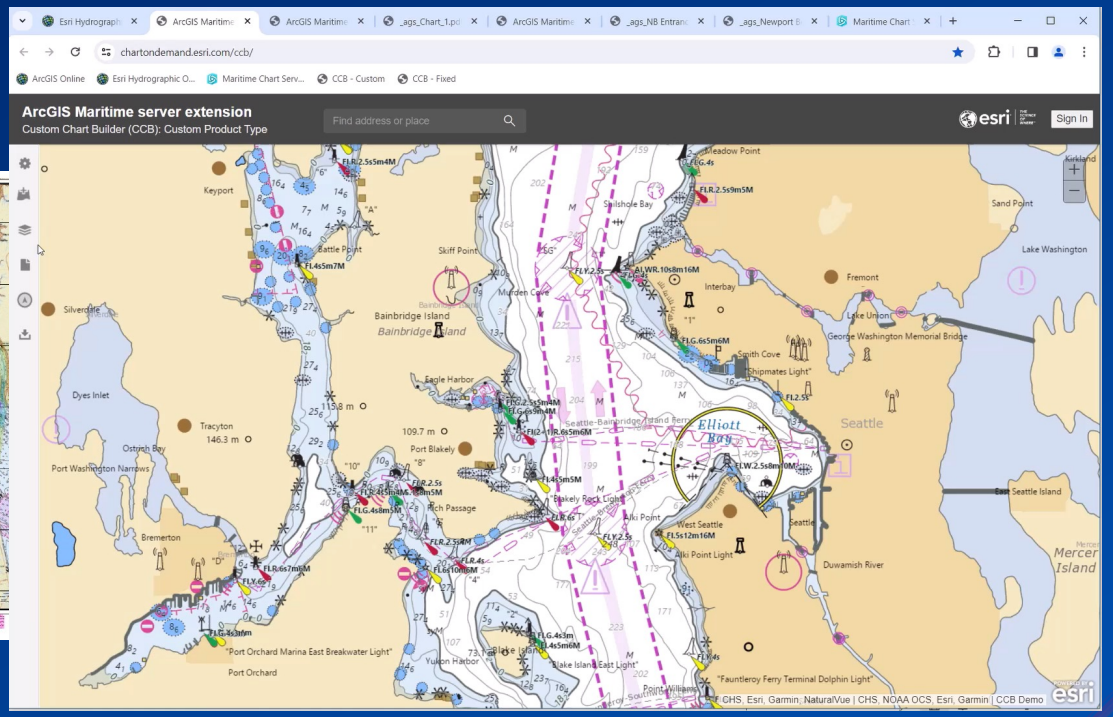
Breaking paradigms: CCB vs. Traditional

Efficiency VS Beauty

	Traditional	Maritime server
New Chart	150 hours	1-2 min
Per analyst	1.33 charts/month	12-24 charts/day
Overall capacity	100/year	Hundreds/day

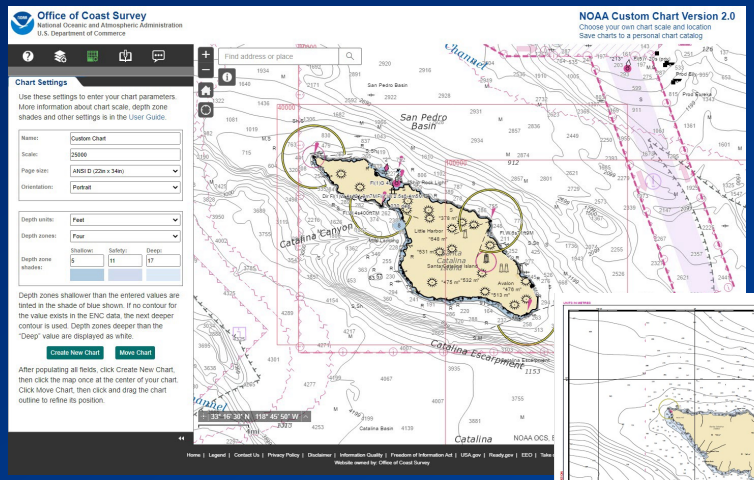
Custom Chart Builder – some examples

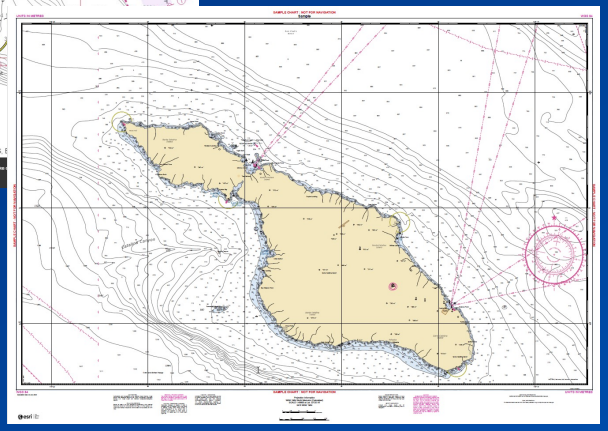




Web-based charting

User group meeting





SHOM

L'océan en référence

AUSTRALIAN HYDROGRAPHIC OFFICE

UK Hydrographic Office

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NOAA

U.S. DEPARTMENT OF COMMERCE

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY

UNITED STATES OF AMERICA

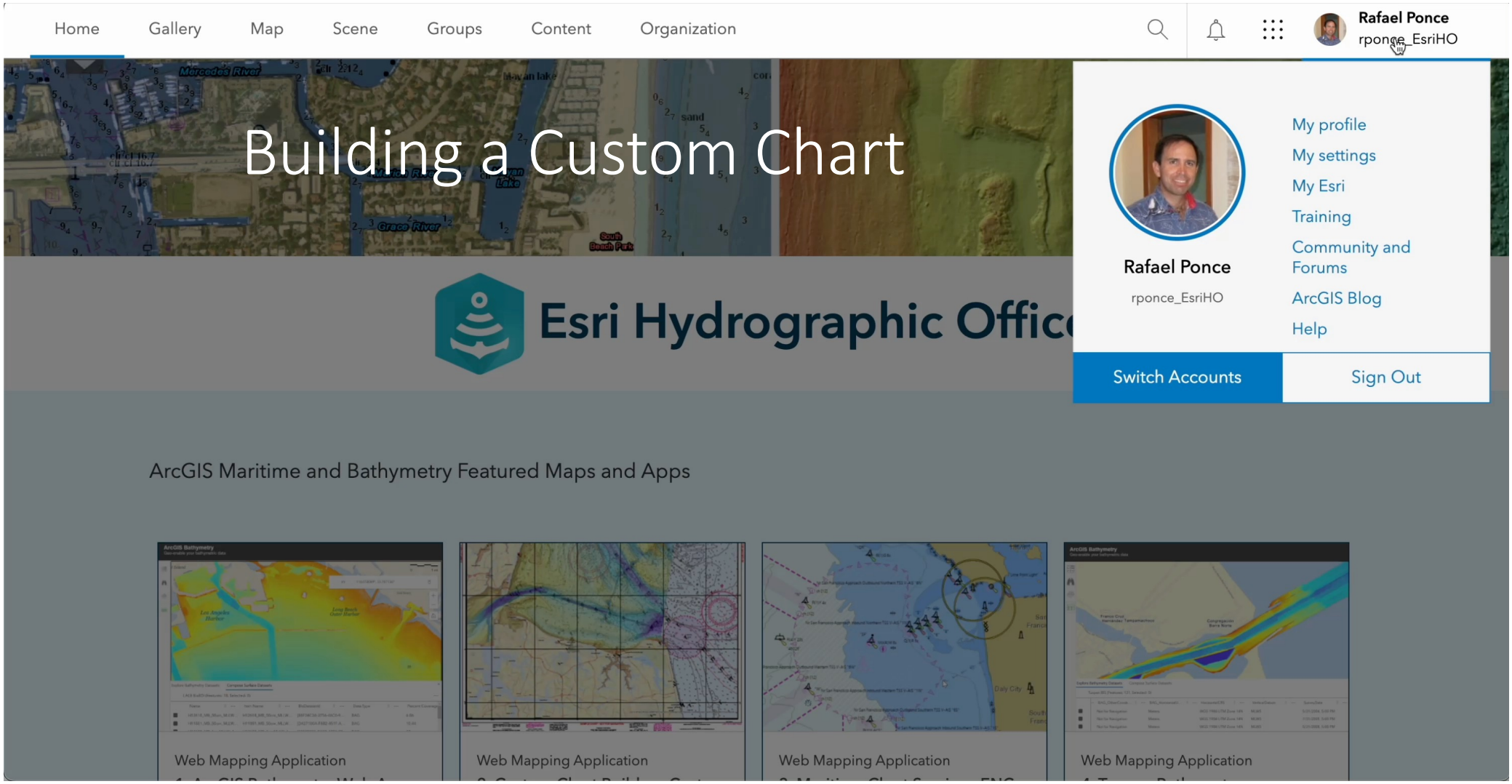
CANADIAN HYDROGRAPHIC SERVICE

SERVICE HYDROGRAPHIQUE DU CANADA

OFFICE OF NAVAL INTELLIGENCE

1882

Some users around the world


Home
Gallery
Map
Scene
Groups
Content
Organization
Rafael Ponce
rponce_EsriHO
Building a Custom Chart
My profile
My settings
My Esri
Training
Community and Forums
ArcGIS Blog
Help
Rafael Ponce
rponce_EsriHO
Switch Accounts
Sign Out
Esri Hydrographic Office
ArcGIS Maritime and Bathymetry Featured Maps and Apps
Web Mapping Application
Web Mapping Application
Web Mapping Application
Web Mapping Application

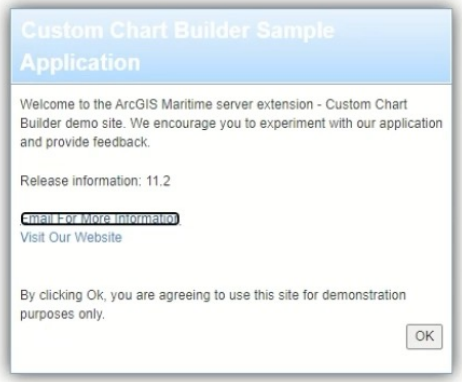
https://chartondemand.esri.com/ccbfixed/

ArcGIS Maritime server extension

Custom Chart Builder (CCB): Fixed Product Type

Find address or place

Building a Paper Nautical Chart

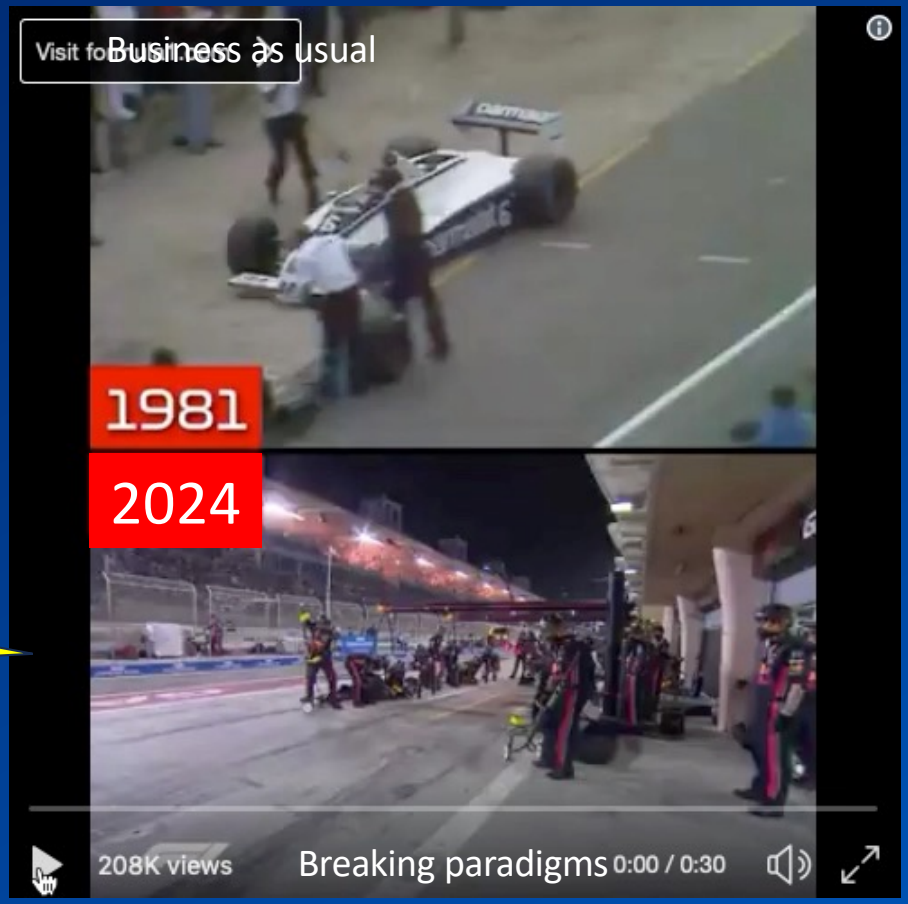


Old vs. New ways of production

Pay attention to the bottom frame…

Traditional Hydrography

Modern Hydrography
Data and Products at the *speed of trust*



Real world example of using CCB (and ArcGIS Enterprise) for emergency situations

GIS Collaboration in the Key Bridge Response

Leveraging GIS for a Whole of Government Approach in Crisis Response

Collaboration

USCG Portal

NOAA Portal

Partnered
Collaboration
Group

USACE Portal

KBR Hub

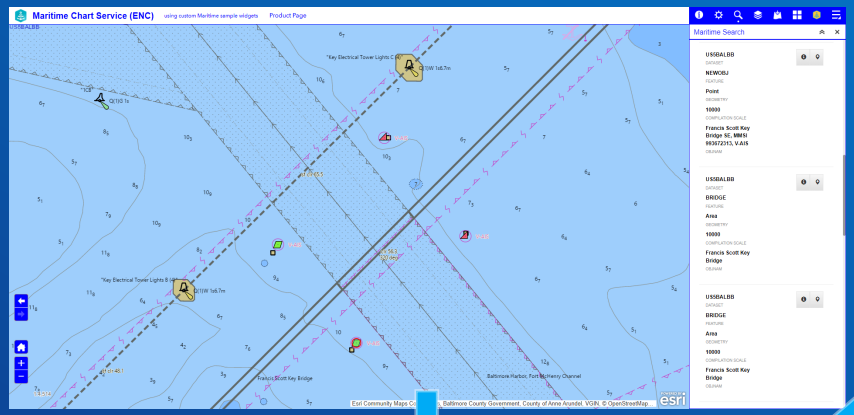
MD DoIT Portal

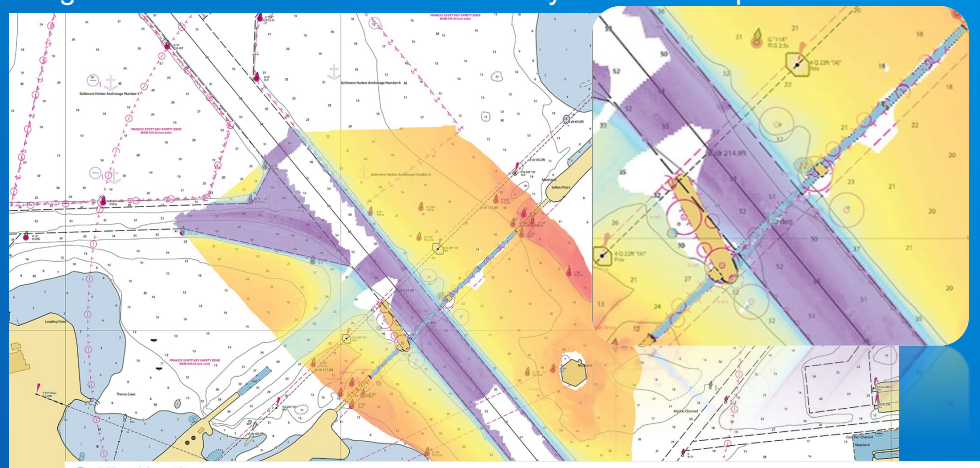
KBR Responders

MD DNR
Maritime Law
Enforcement
Network
(AIS/RADAR)

Key Bridge Rapid Response

Image from NOAA Office of Coast Survey News and Updates website.





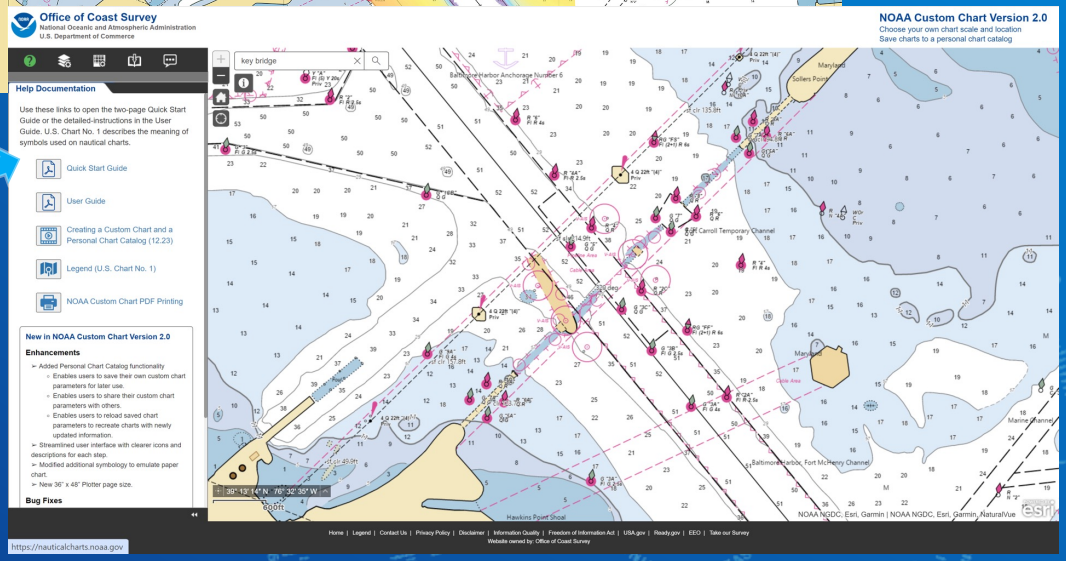
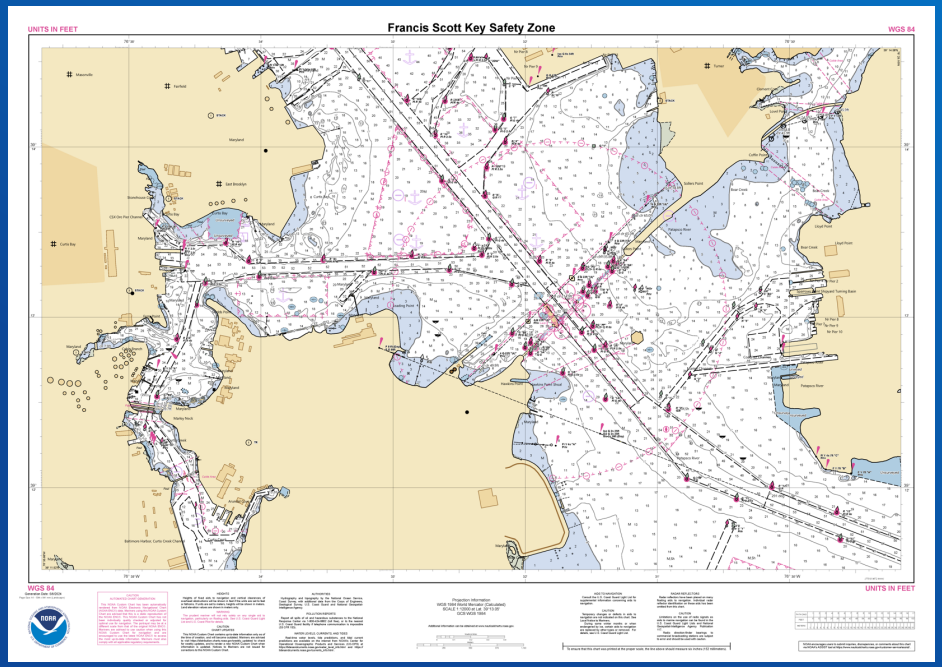
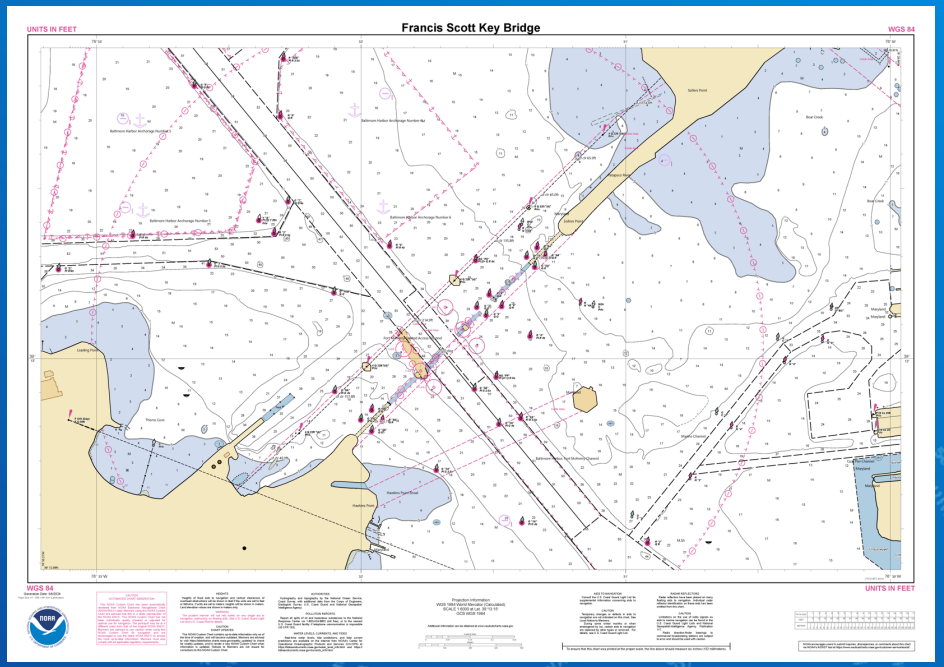


Image from NOAA Office of Coast Survey News and Updates website.

Key Bridge Rapid Response



1:12K Scale chart



1:6K Scale chart

Data driven products and automated services

Key Bridge Response Common Operating Picture (Public Example)

Search by Vessel Name
All Vessels

Wind

0.5 kts

from 320 ° T

Curtis Bay Ent Wx buoy

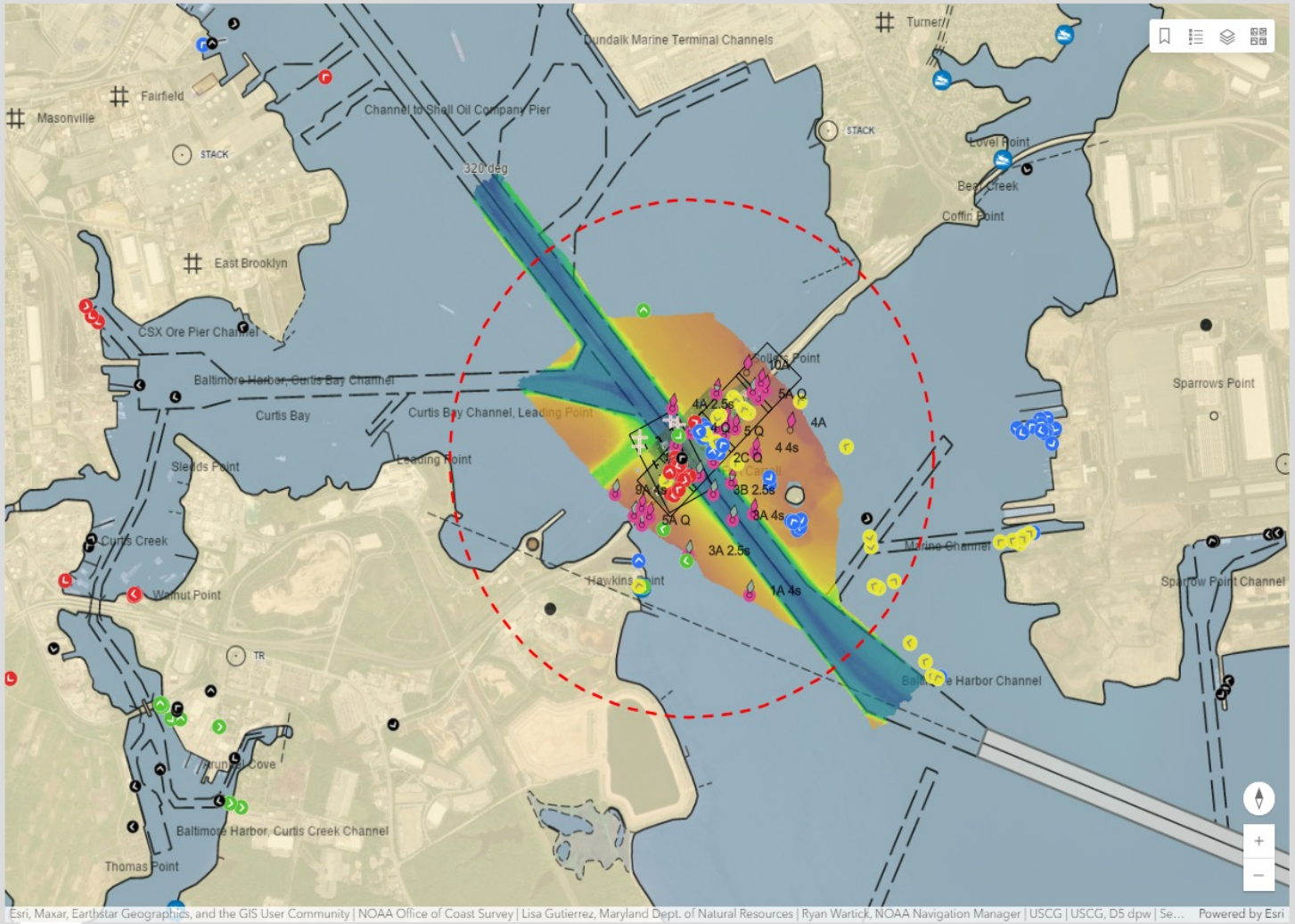
Last update: 1 minute ago

Air Temp

33°F

Curtis Bay Ent Wx buoy

Last update: 1 minute ago



COP | NWS Weather Threat

AIS with Joined Data (sanitized for public)

Response Vessels by Contrator

- DONJON
- RESOLVE
- SKANSKA
- Government Vessel
- Non-Response Vessels

SAFETY ZONE

KBR-COP Dive Zone 5 sub boxes

Dali Anchor Positions

Dive Safety Zones

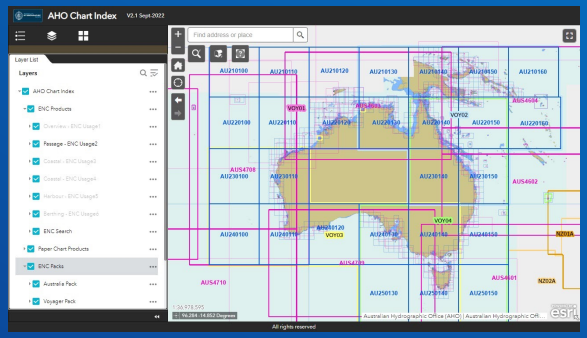
NOAA 24April combined

High: 58

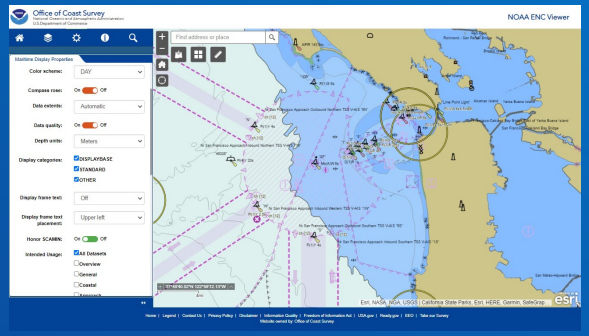
Low: 12

Imagery updated: 23 Apr
Survey Updated: 23 Apr

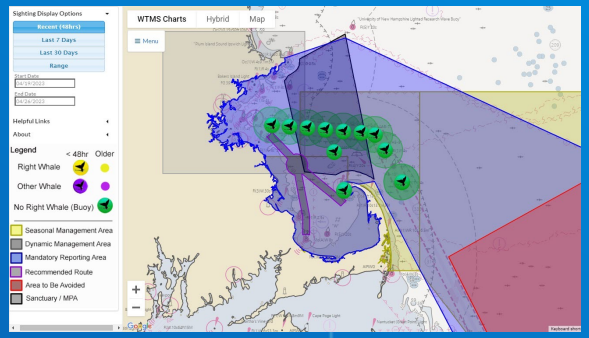
Ejemplos públicos de uso de MCS



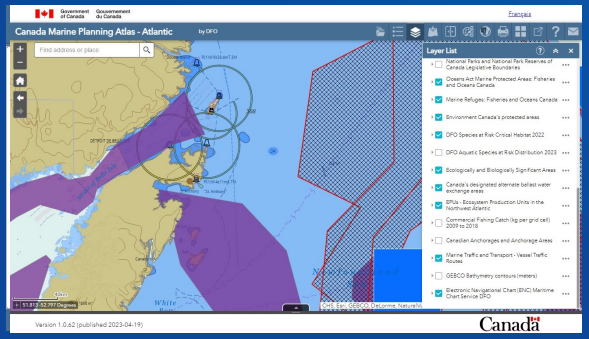
Australian Hydrographic Office: Chart Index
https://services.hydro.gov.au/AHOChartIndexPUBLICApplication/



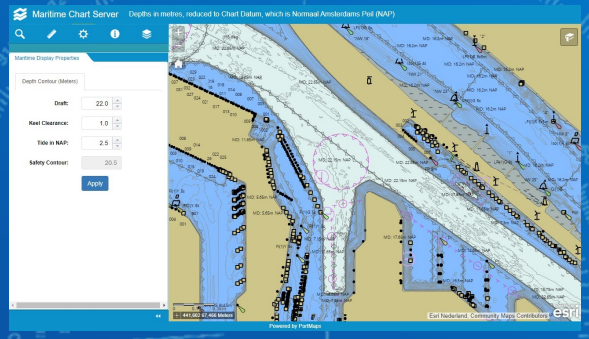
NOAA ENC Online Viewer
https://nauticalcharts.noaa.gov/enconline/enconline.html



ConserveIO: Whale Alerts
https://whalealert.conserve.io/

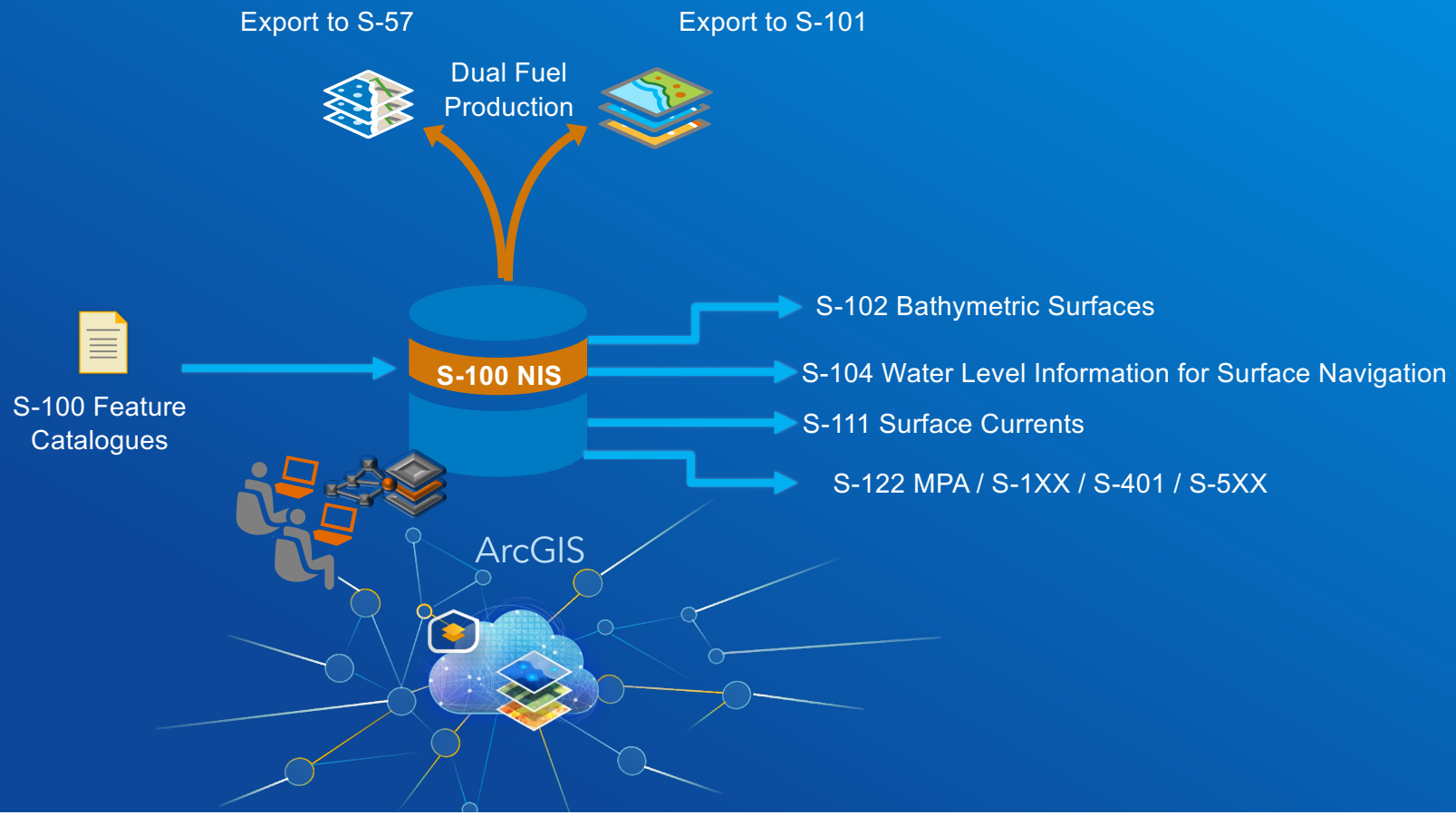


Canada Marine Planning Atlas: Atlantic
https://gisp.dfo-mpo.gc.ca/apps/Atlantic-Atlas/?locale=en



Port of Rotterdam: Harbour Masters
https://gis.portofrotterdam.com/apps/mcs_nap/

…And get ready for Data Exchange and Collaboration in S-100



What *automated* production of paper nautical charts means?

- Faster and easier paper chart production
- Custom and ad hoc charts in minutes
- Efficient distribution
- Run production at the speed of trust
- Prepare for the Hydrospatial era