Maritime Collaboration in the 4th Age

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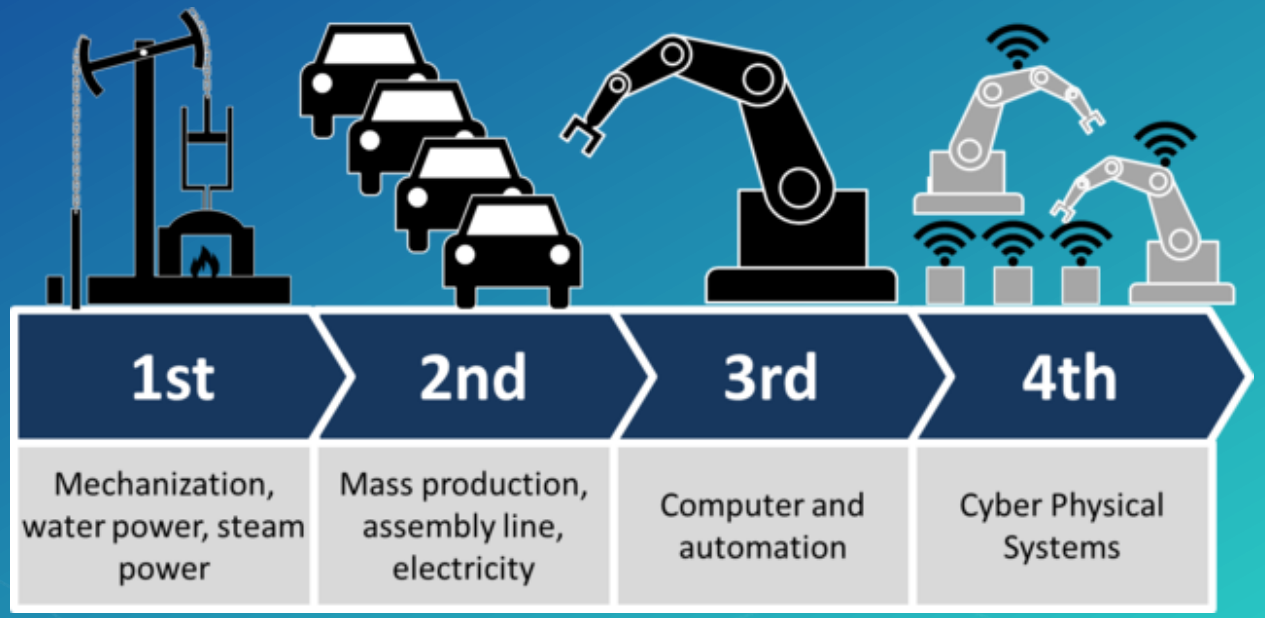
Esri - National Government Business Development (APAC)

UNWGIC – Deqing, China
21st November 2018

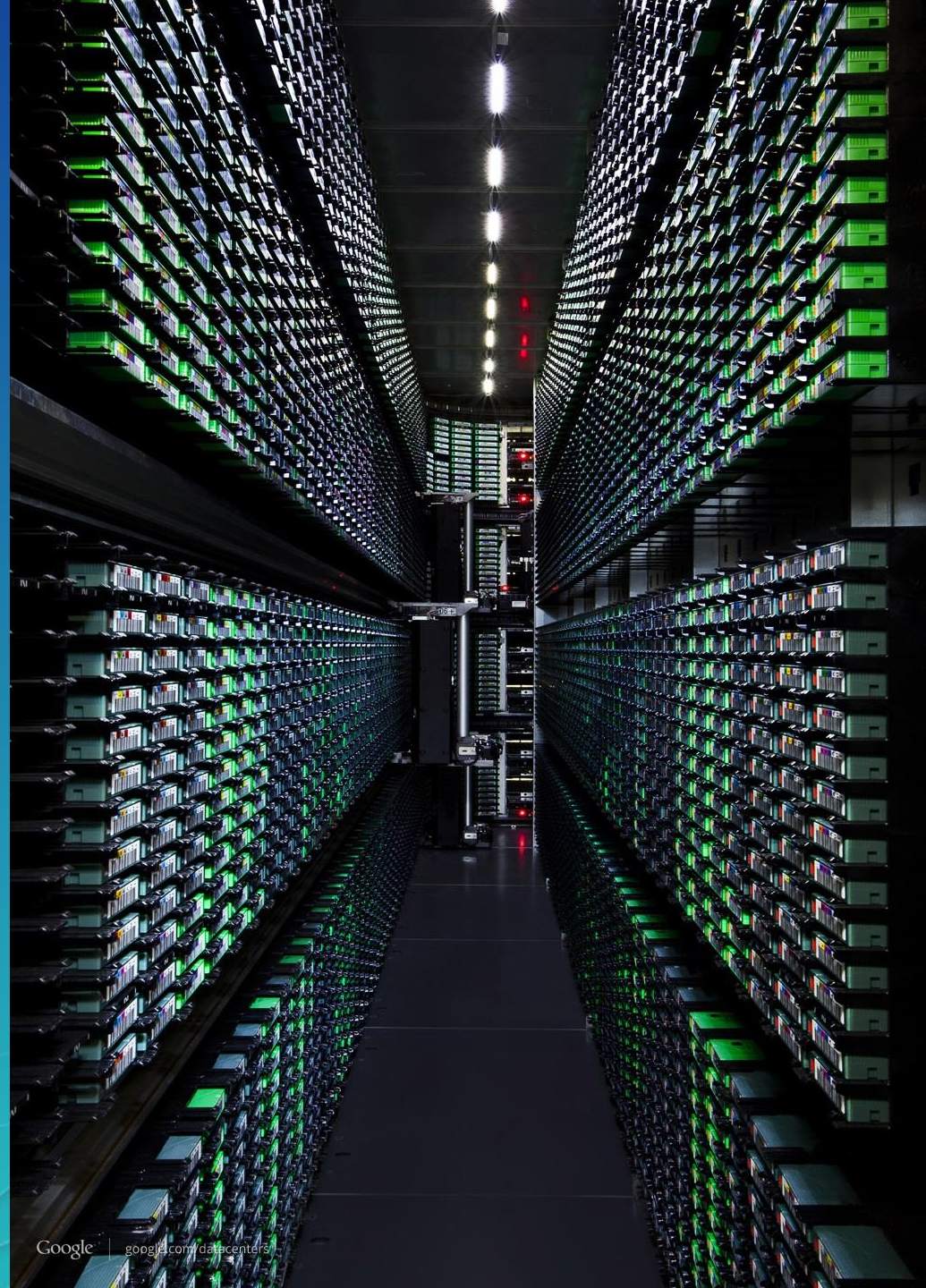
The Fourth Age

- Change is accelerating
  - Faster changes in the next 50 years than in the past few hundred
  - a new “Seaconomics” era
  - GDP and cargo volumes are decoupled
- Change creates new opportunities – new technologies
- A Digital Vision → powered by Data (in time and space)



Key technological factors

- Big Data
  - Volume, Velocity and Variety
- Internet of Things (IoT)
- Artificial Intelligence (AI)



We can see their effects: Autonomous Ships

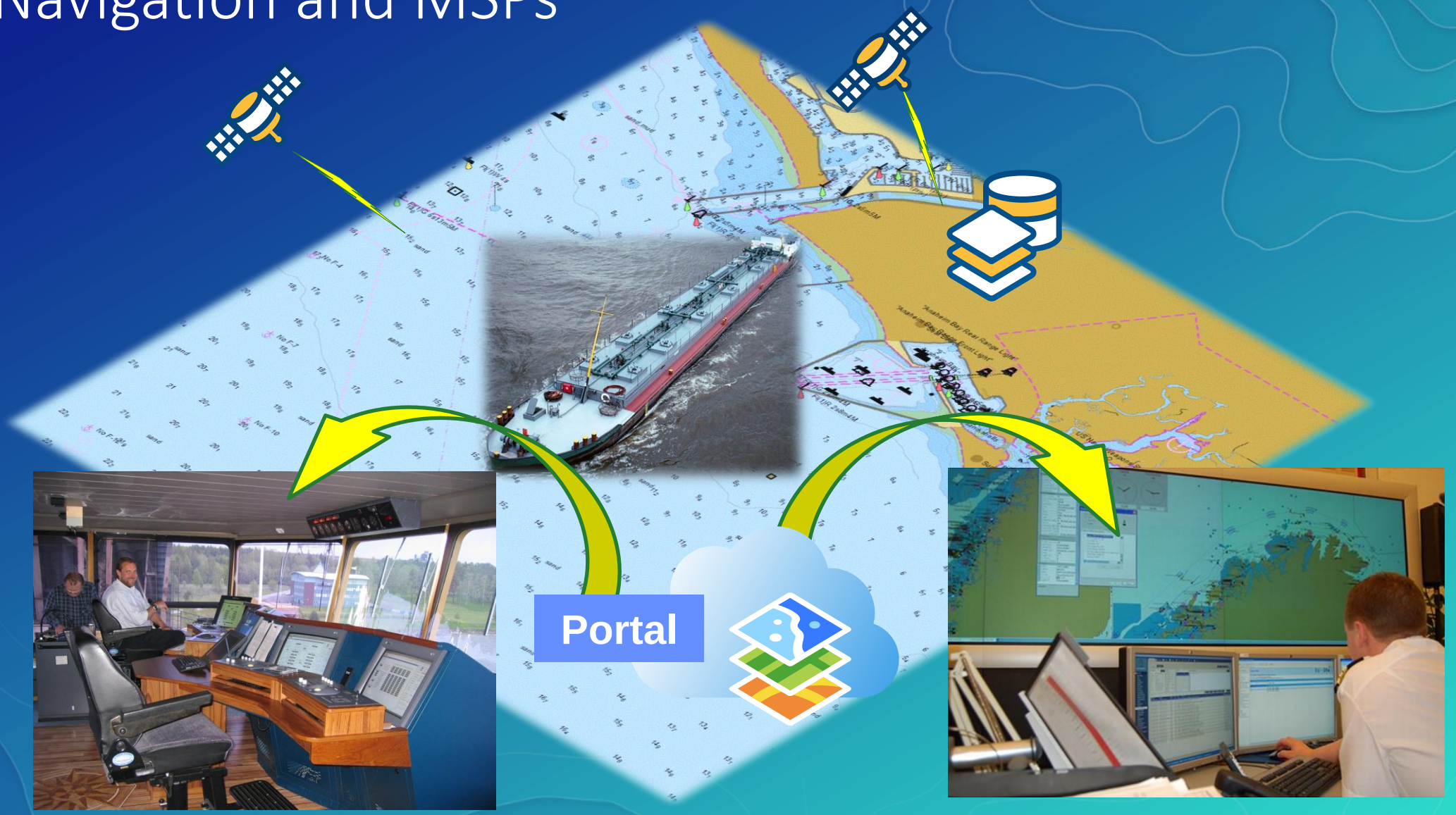
Fast developments around the world

Bigger, more efficient, more complex: new machine readable products

Smart Ports

- Maasvlakte2 terminal in the Port of Rotterdam
- Unmanned electric AGVs
- Remote operated unmanned cranes

E-Navigation and MSPs



Maritime Services Portfolios

- As part of the improved provision of services to vessels through e-navigation;
- The means of providing electronic information in a harmonized way

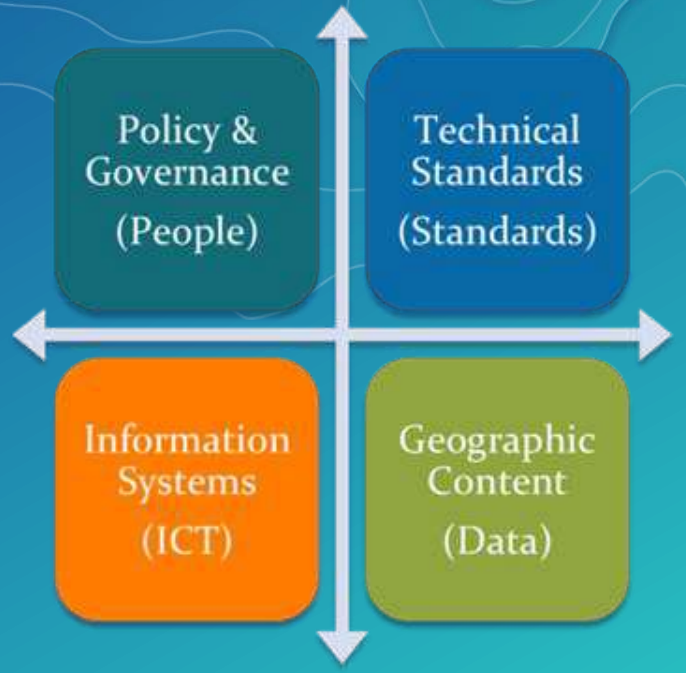
No.	Identified Service	Identified Responsible Service Provider
MSP1	VTS Information Service (IS)	VTS Authority
MSP2	Navigational Assistance Service	National competent VTS Authority/Coastal/Port Authority
MSP3	Traffic Organization Service (TOS)	National competent VTS Authority/Coastal/Port Authority
MSP4	Local Port Service (LPS)	Local Port/Harbor Operator
MSP5	Maritime Safety Information Service (MSI)	National competent authority
MSP6	Pilotage Service	Pilot Authority/Pilot Organization
MSP7	Tugs Service	Tug Authority
MSP8	Vessel Shore Reporting	National competent authority, Shipowner/Operator/Master

No.	Identified Service	Identified Responsible Service Provider
MSP9	Tele-medical Assistance Service (TMAS)	National Health Organization/dedicated Health Org.
MSP10	Maritime Assistance Service (MAS)	Coastal/Port Authority/Organization
MSP11	Nautical Chart Service	National Hydrographic Authority
MSP12	Nautical Publications Service	National Hydrographic Authority
MSP13	Ice Navigation Service	National competent authority
MSP14	Meteorological Information Service	National Meteorological Authority/WMO/Public Institutions
MSP15	Real-time Hydrographic and Environmental Service	National Hydrographic and Meteorological Authorities
MSP16	Search and Rescue	SAR Authorities

Image by Korea Hydrographic and Oceanographic Agency (KHOA)

Image by Korea Hydrographic and Oceanographic Agency (KHOA)

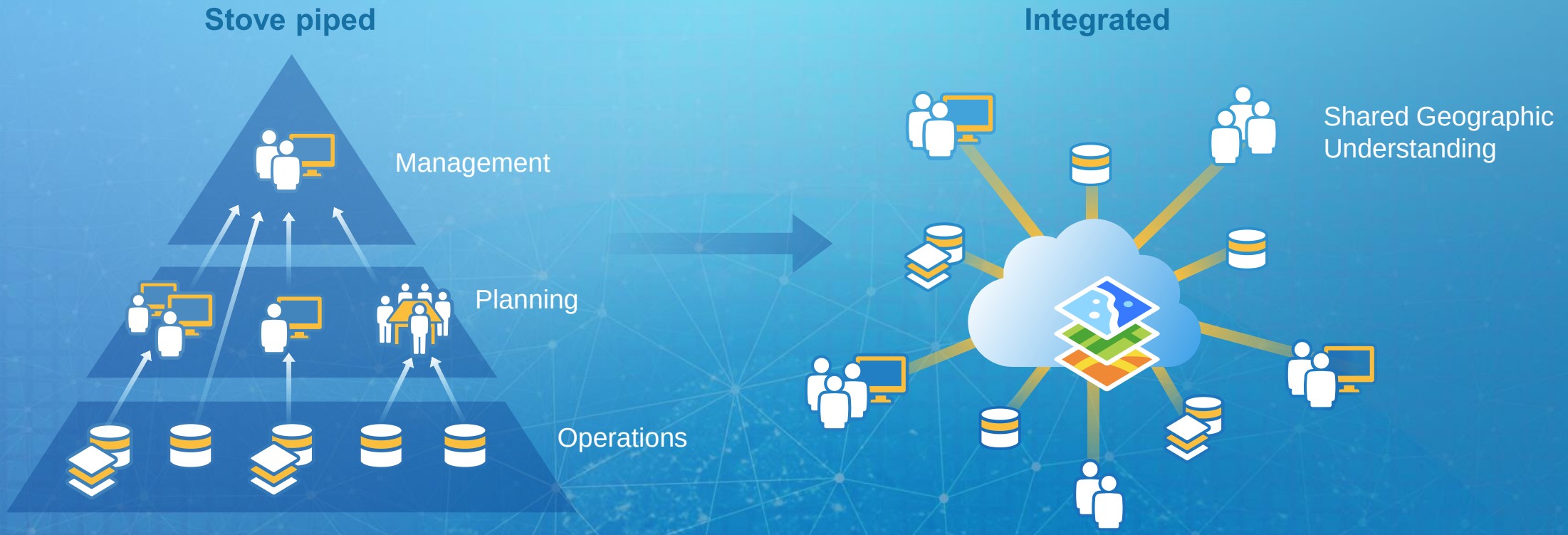
Foundation: Marine Spatial Data Infrastructures (MSDIs)



- SDI is “the relevant base collection of technologies, policies and institutional arrangements that facilitate the availability of and access to spatial data.”
- Processes that integrate technologies, policies, standards, organizations and people;
- Structure of working practices and relationships across data producers and users for access, sharing and analyzing geospatial information across government and commerce;
- Hardware, software and system components necessary to support the processes

Enterprise GIS Transforms Organizations

Focusing on end-use, decision support and insights



Opening Access and Engaging Everyone

An Enterprise GIS empowers a Maritime Community

Connecting People, Processes and Data

Web GIS Is Driving Digital Transformation

Interconnected Information, Processes, and Workflows . . .
. . . All Happening at the Same Time

Sequential Workflows

Digital Automation

Digital Transformation

Using the Power of Location to Integrate Everything

Simultaneous Integrated Operations

Creating Smart, Dynamic Organizations

Changing How Organizations as a Whole . . .
. . . Do Their Work

What's Next? Massive Transformation . . .

Interconnected Information, Processes, and Workflows . . .

. . . All Happening at the Same Time

Creating Smart,
Dynamic Organizations

Using the Power of Location to Integrate Everything

How Do We Take the Next Step?

Embrace Digital Transformation . . .

. . . and Leverage The Science of Where

Envision a Better Future

Inform & Educate

Take the Initiative

Work Together

Understand the Possibilities

Participate & Take Action

Create Solutions

Innovate

Embrace Technology

Learn Continuously

Societal GIS

Energy

Population

Food

Social Conflict

Water

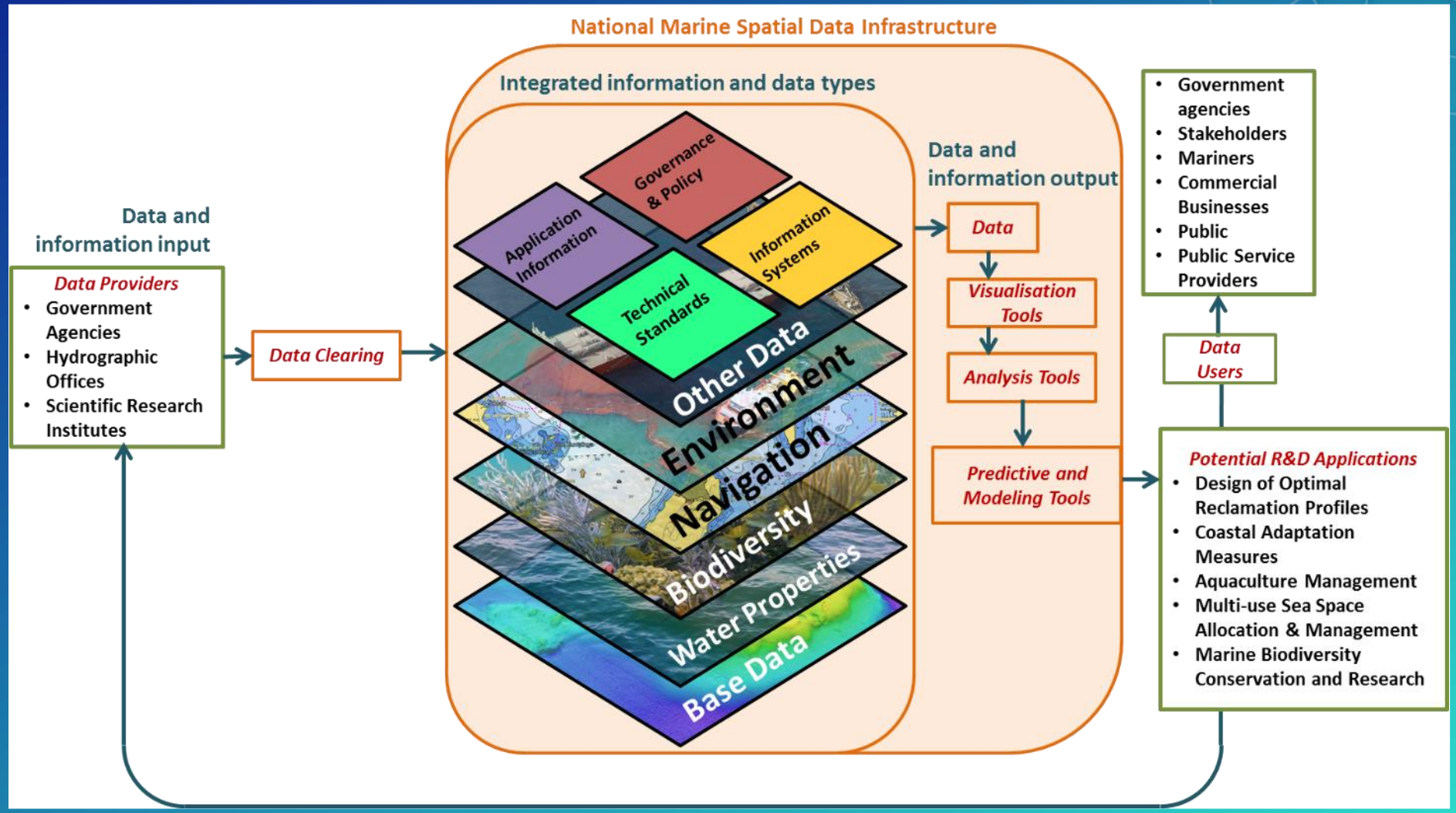
Urbanization

Climate Change

Biodiversity

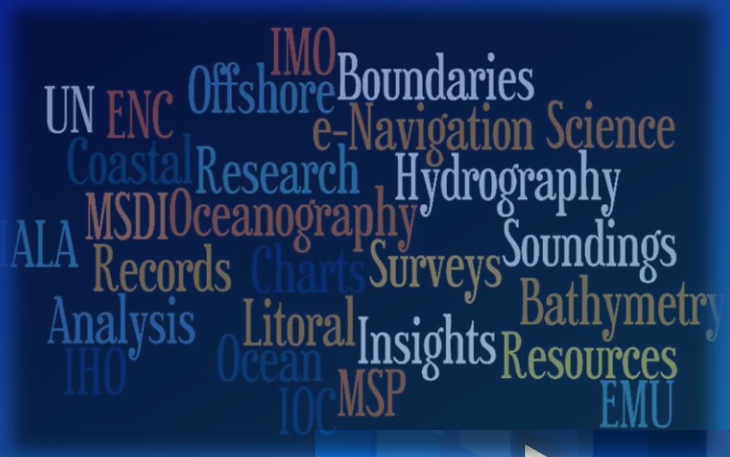
. . . Create a Geoscience-Based Foundation for Our Future

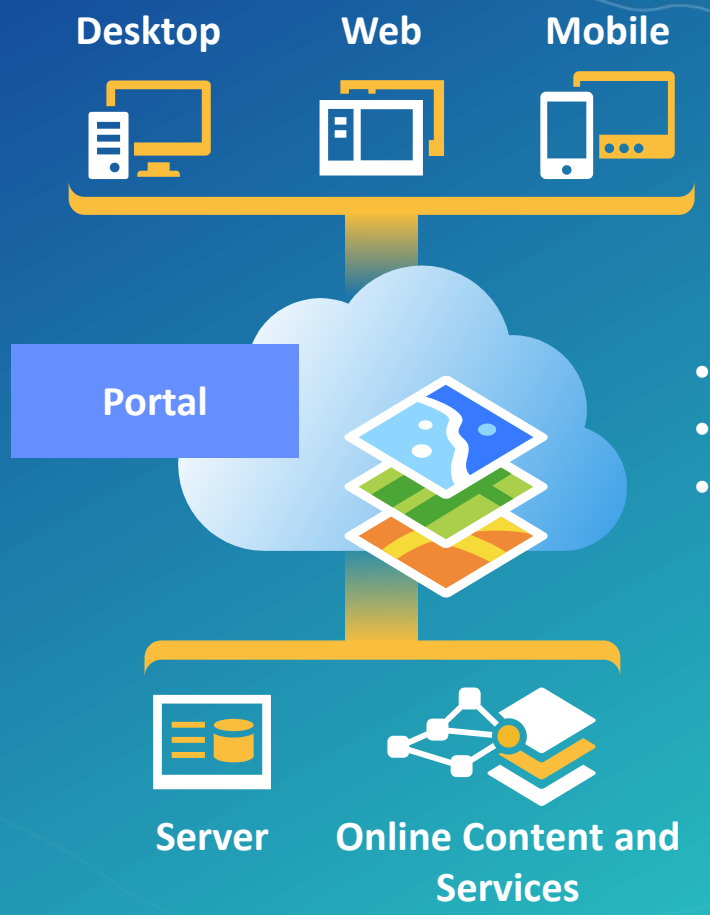
Foundation: Marine Spatial Data Infrastructures (MSDIs)
NMSDI Conceptual Model



A Platform for supporting the Maritime Community

ArcGIS at the foundation of MSDI





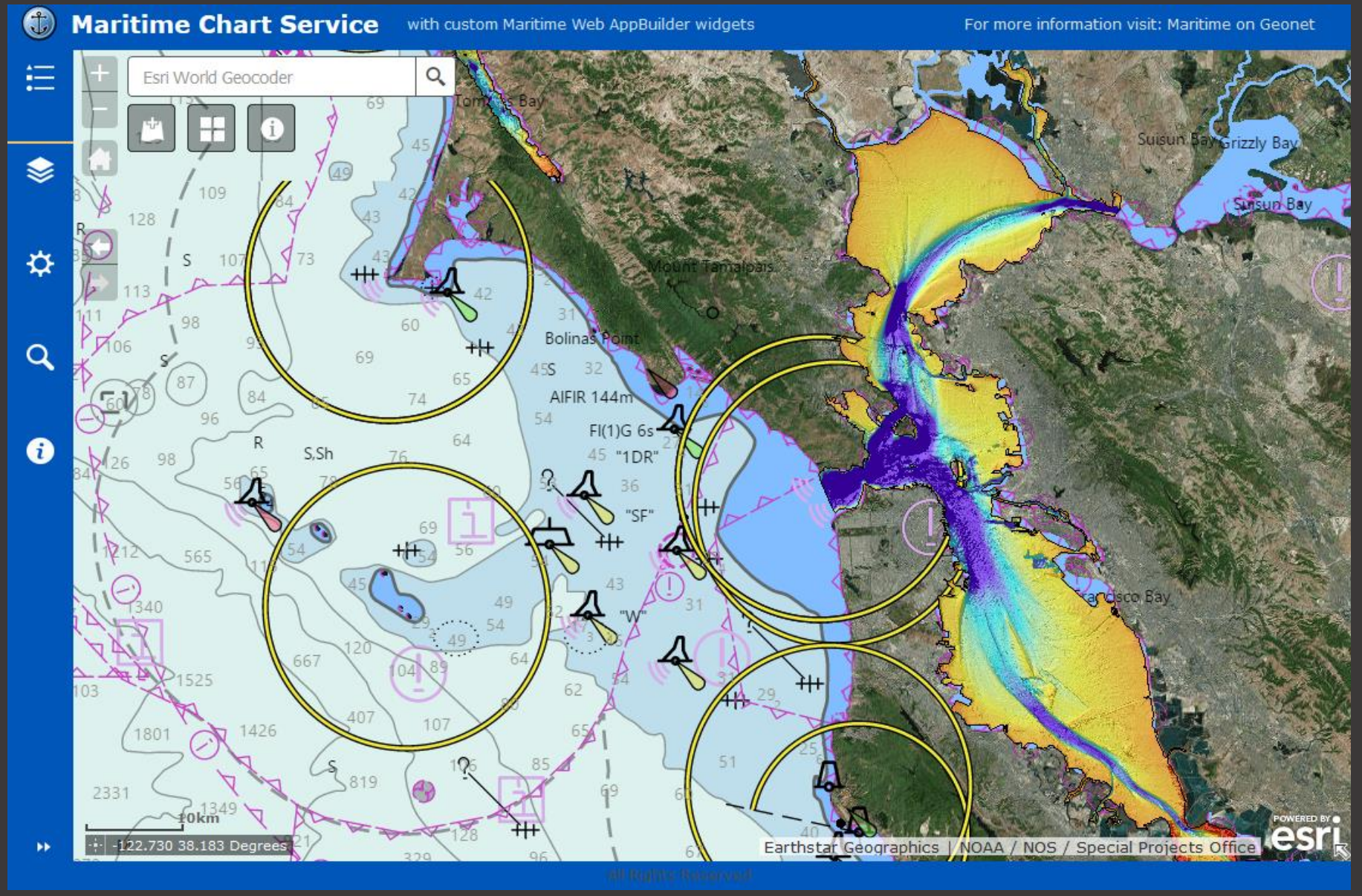
- System of Records
- System of Engagement
- System of Insights

Services

- Historical
- Now cast
- Forecast

At all levels of the organization

ENC Viewer


Maritime Chart Service
with custom Maritime Web AppBuilder widgets
For more information visit: Maritime on Geonet
Esri World Geocoder
Mount Tamalpais
Bolinas Point
AIFIR 144m
Fl(1)G 6s
"1DR"
"SF"
"W"
Suisun Bay
Grizzly Bay
Suisun Bay
10km
-122.730 38.183 Degrees
Earthstar Geographics | NOAA / NOS / Special Projects Office
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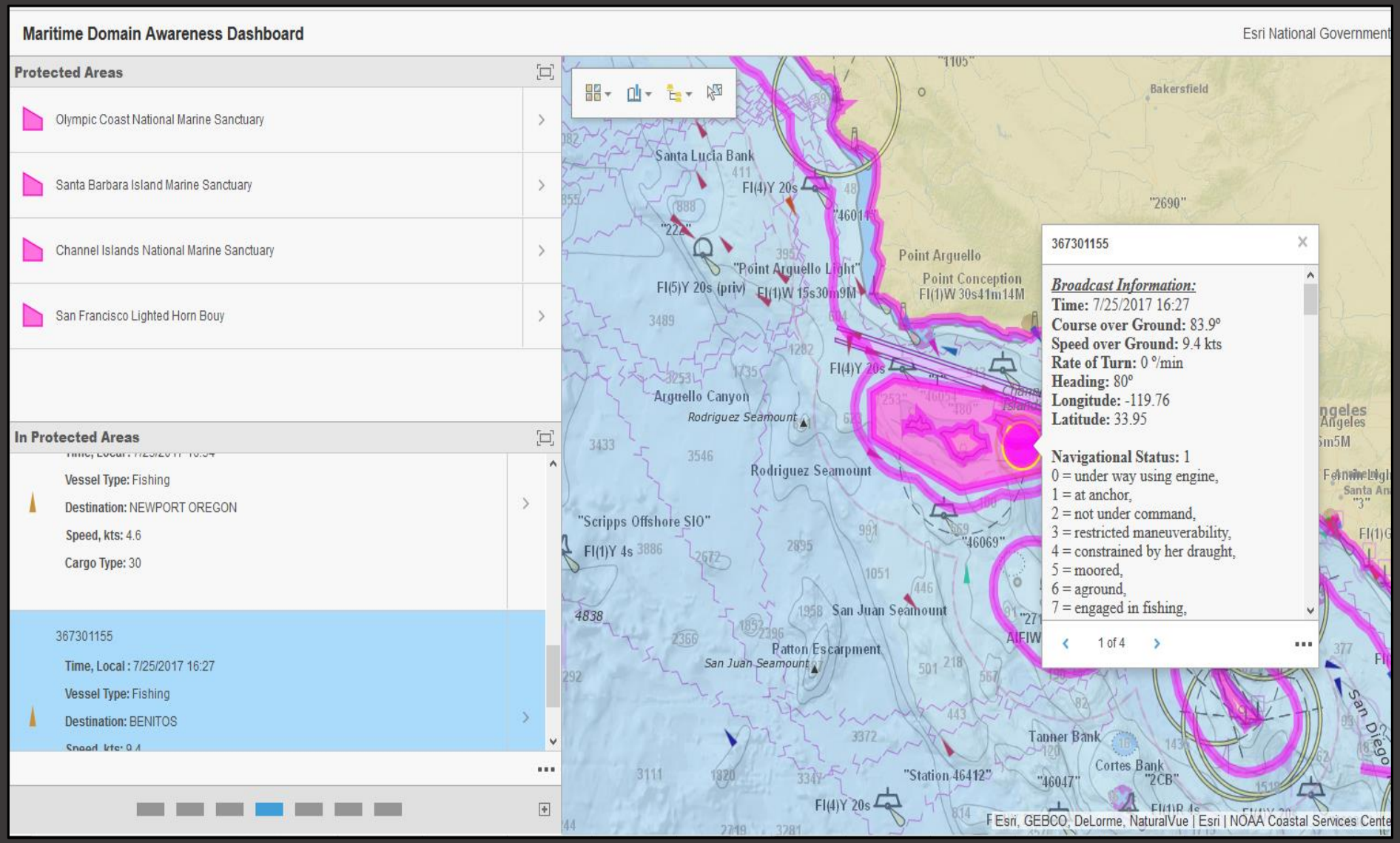
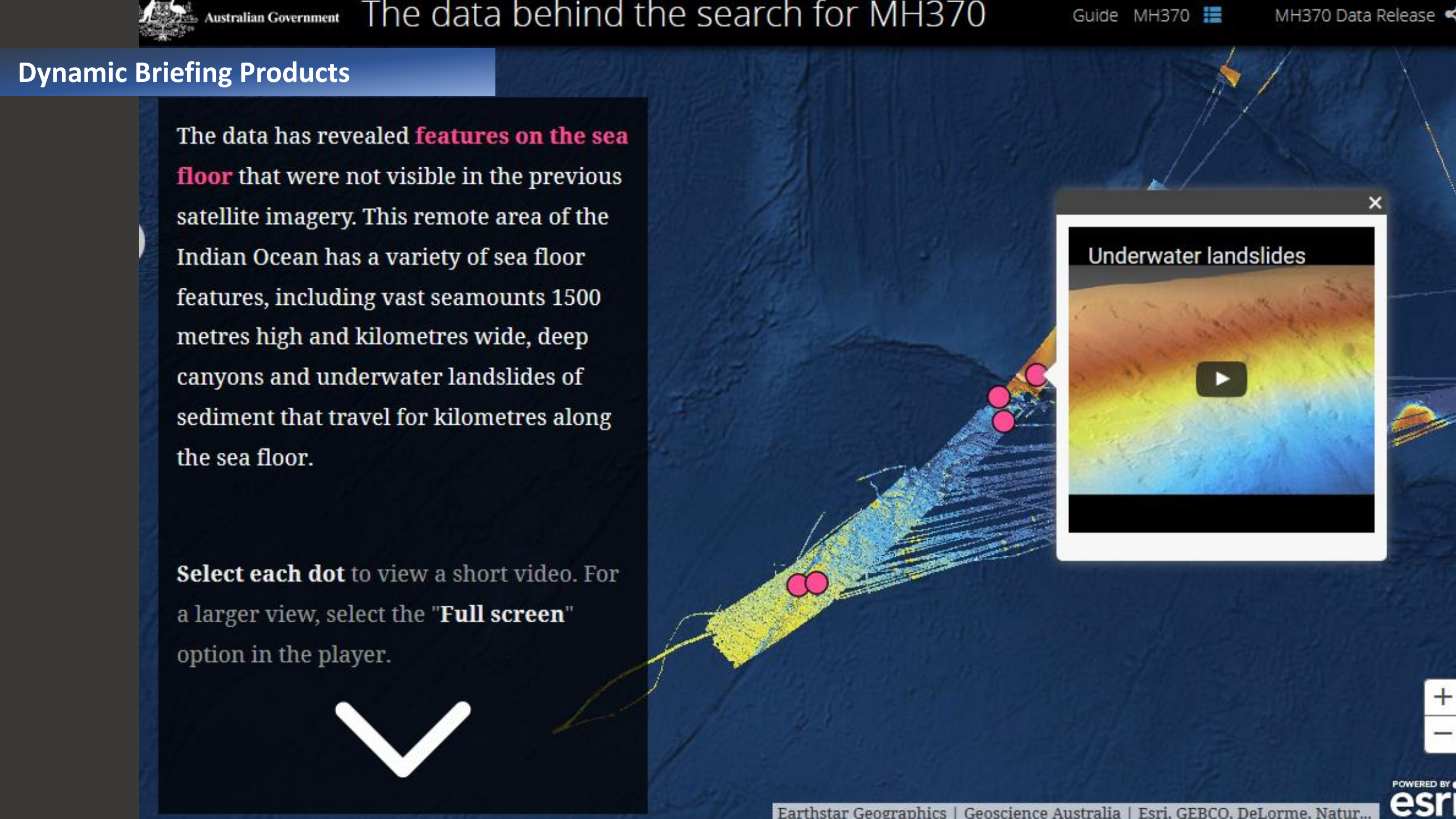
Real-time Situational Awareness



Dynamic Briefing Products



Maritime Observations

Maritime Contact Collector Geoform

Maritime incidents to allow naval security teams to collect events pertaining to maritime security.

1. Enter Information

Time of Incident

Priority

Select...

Activity

Select...

Description of Event

Name of Ship

Country Flag

Select...

IMO

MMSI

Generic Ship Type

Select...

Upload pictures

Select File

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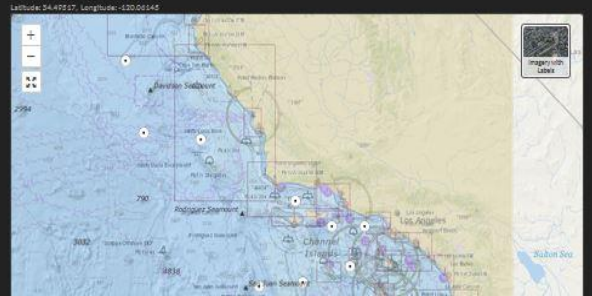
2. Select Location

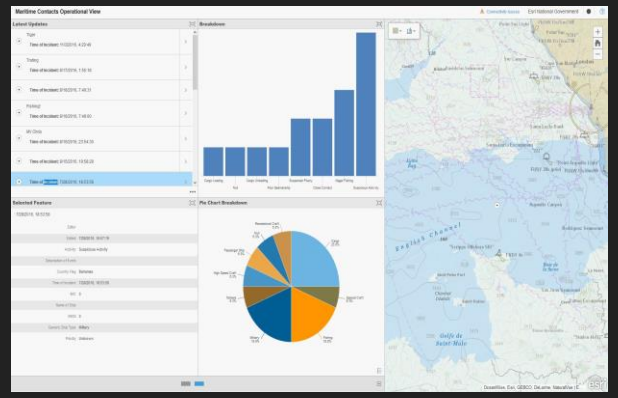
Specify the location for this entry by clicking/tapping the map or by using one of the following options.

Search | Lat/Lon | MGRS

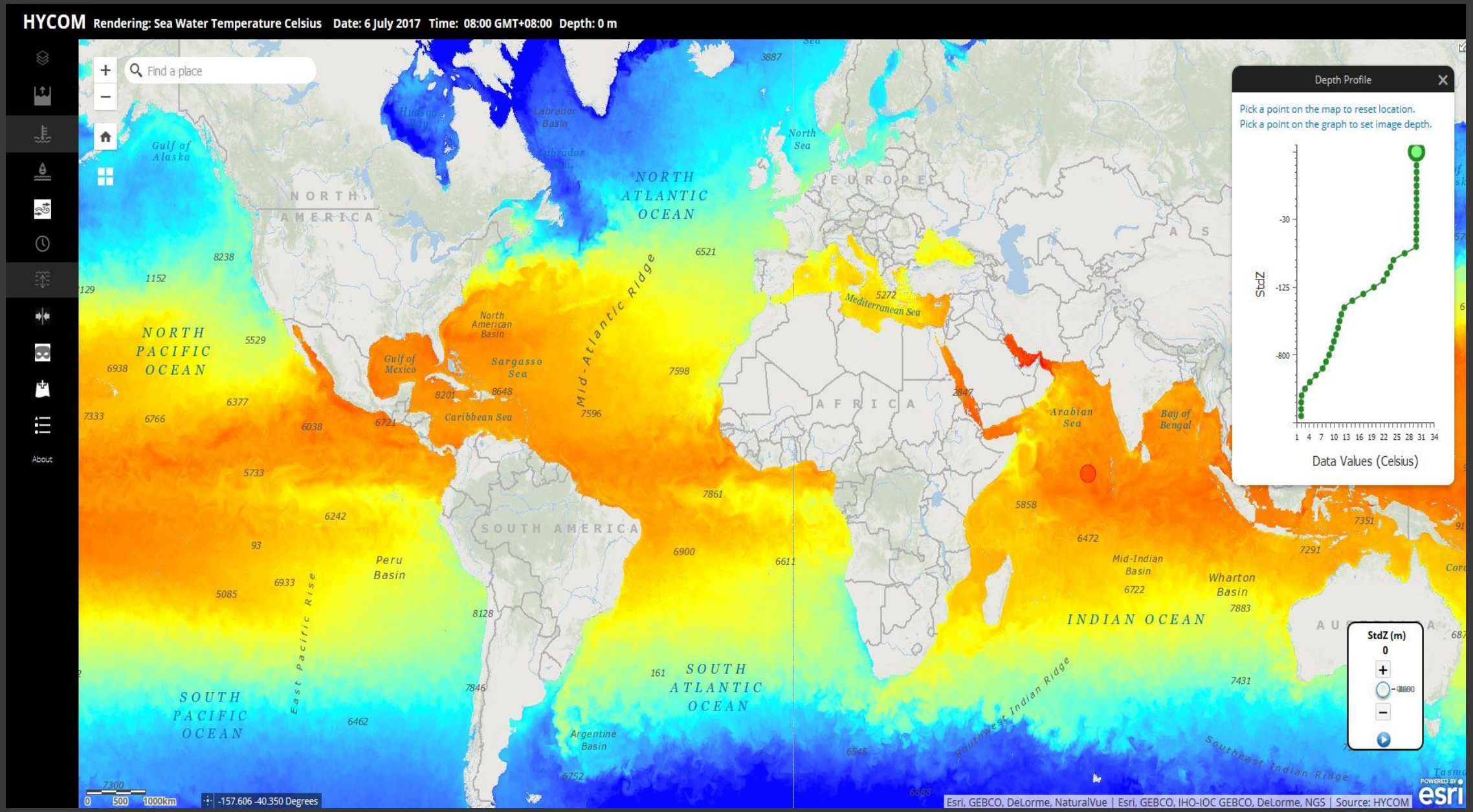
Find address or place

Locate Me



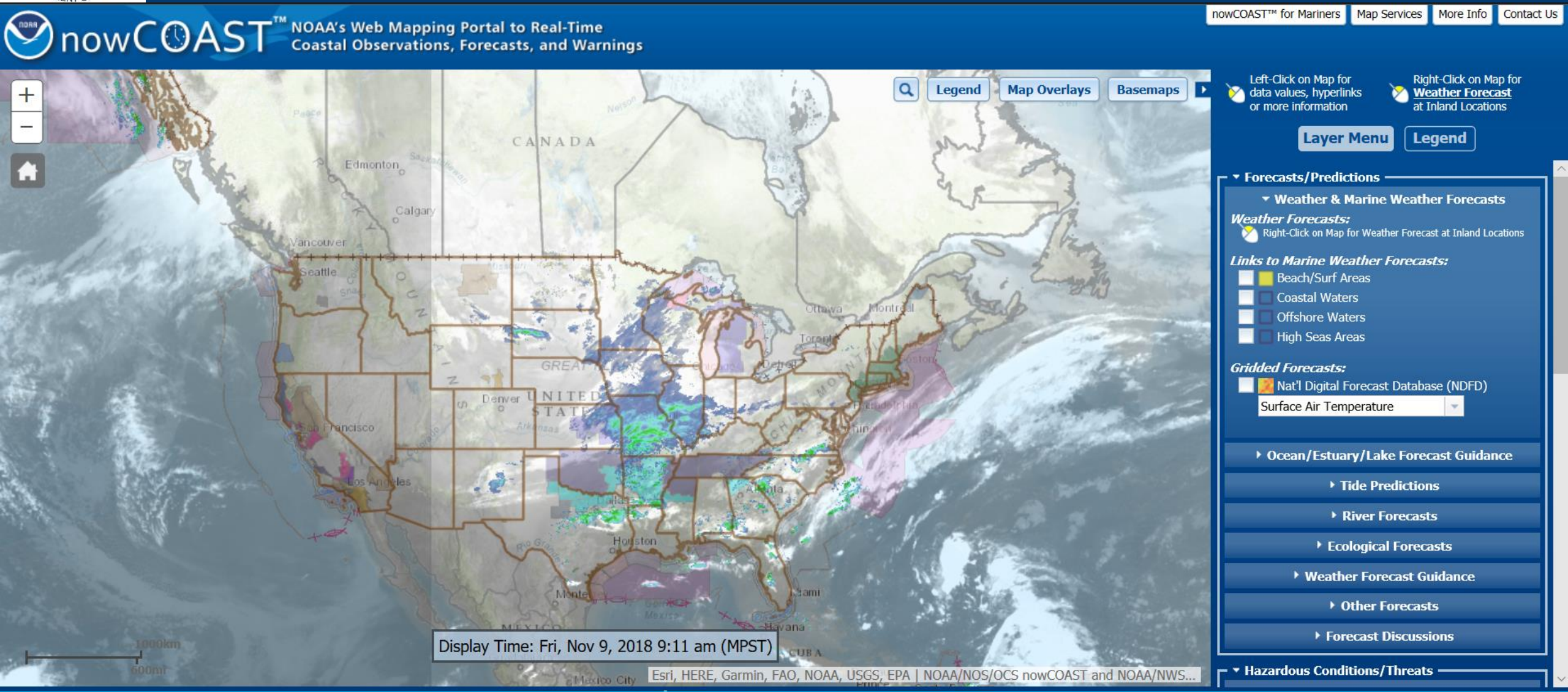


Oceanographic Data Analysis



MSDI in Action

NOAA nowCOAST



NOAA PORTS: Physical Oceanographic Real-Time System

NOAA CO-OPS PORTS

Physical Oceanographic Real-Time System®

Have you ever wondered how that new pair of tennis shoes arrived at your door? Or how those bananas got to your grocery store? Maybe you just bought a brand new car. How did it get here?

The U.S. marine transportation system consists of more than 25,000 miles of navigable waters and is the backbone for the movement of goods, services, and people throughout the nation and abroad. Huge cargo ships transport goods through different ports across the country, but how do ship operators know if they can fit under bridges or through narrow channels safely? These ships use real time information provided by NOAA's Physical Oceanographic Real-Time System® (PORTS®) to make it happen! Find out more about how water level and other oceanographic data are critical for maritime commerce, economic efficiency, and coastal resource protection below.

PORTS® is an Information System

To assist mariners, NOAA's Center for Operational Oceanographic Products and Services (CO-OPS), part of the National Ocean Service, developed the Physical Oceanographic Real-Time System (PORTS®), a robust integrated real time information system that provides them with a comprehensive situational awareness of the operating environment, enabling the best safety and operational decisions. Through a partnership with CO-OPS and it's users, PORTS® delivers accurate and reliable environmental observations to users in over 25 of the nation's major ports and is a critical decision support tool for maritime commerce and coastal resource management.

About PORTS®

PORTS® sensors measure oceanographic and meteorological conditions, such as water levels, currents, salinity, wind, and bridge clearance. Each integrated system of sensors, concentrated in seaports, is tailored to the specific needs of the local community. PORTS® systems come in a variety of sizes and configurations, each specifically designed to meet local user requirements. The largest of the existing PORTS® installations is comprised of over 50 separate sensors; the smallest consists of a single water-level gauge and meteorological instruments to measure winds, air temperature, barometric pressure, etc.

https://arcg.is/1v14Dn

NOAA PORTS: Physical Oceanographic Real-Time System

Physical Oceanographic Real-Time System (PORTS®)

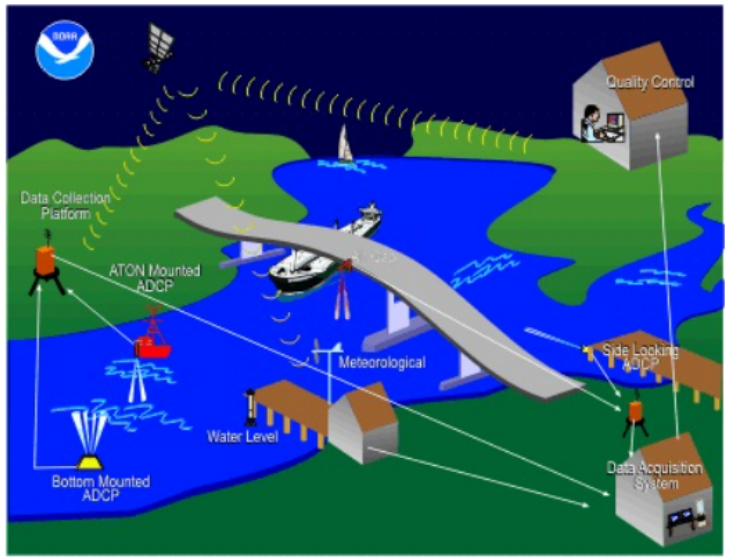
The United States maritime transportation system consists of over 25,000 miles of waterways, ports, and other navigable waters. It is the backbone for moving goods, services, and people throughout the U.S. and abroad. More than 95% of all U.S. trade involves some form of maritime transport, and ships move $1.4 trillion worth of products in and out of U.S. ports every year. Ship operators across the globe rely on accurate information about ocean conditions, including water levels, currents, and winds, so they can plan efficient shipping routes, maximize cargo onboard, and safely navigate narrow shipping lanes.

PORTS® is an integrated system of sensors concentrated in seaports that provide commercial vessel operators with accurate and reliable real-time information about environmental conditions. PORTS® measures and disseminates observations, predictions and nowcast/forecasts for water levels, currents, bridge air gap, salinity and meteorological parameters (e.g., winds, waves, atmospheric pressure, visibility, air and water temperatures).

This data improves navigation safety by reducing groundings and collisions by up to 60% for commercial and recreational vessels and preventing oil spills. It can also increase shipping efficiency by reducing transit delays and allowing mariners to optimize their cargo load. Mariners need these data, tools, and services to make critical navigation decisions, especially as significantly larger vessels transit through U.S. ports because of the Panama Canal expansion.

PORTS®: Select a PORT

MyPORTS - An application designed to let you customize your own PORTS® page (select what data you want to see from any PORTS®).



An example of the sensors that make up the Physical Oceanographic Real-Time System (PORTS®).

Tides & Water Levels

Harmful Algal Bloom Forecasts

PORTS®

Sea Level Info

Contact Us

Coastal & Great Lakes Conditions Forecast

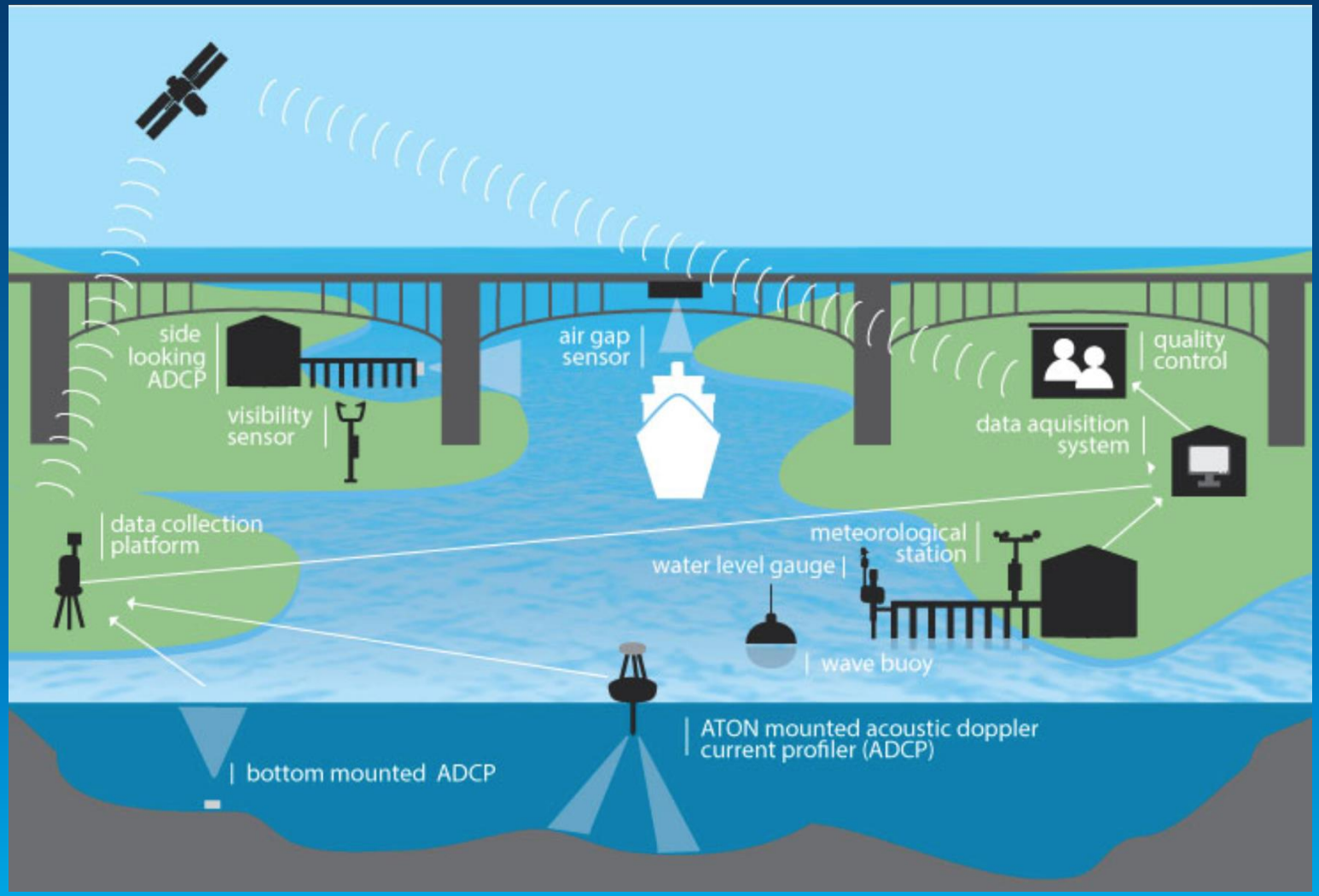
Meteorological & Other Oceanographic Data

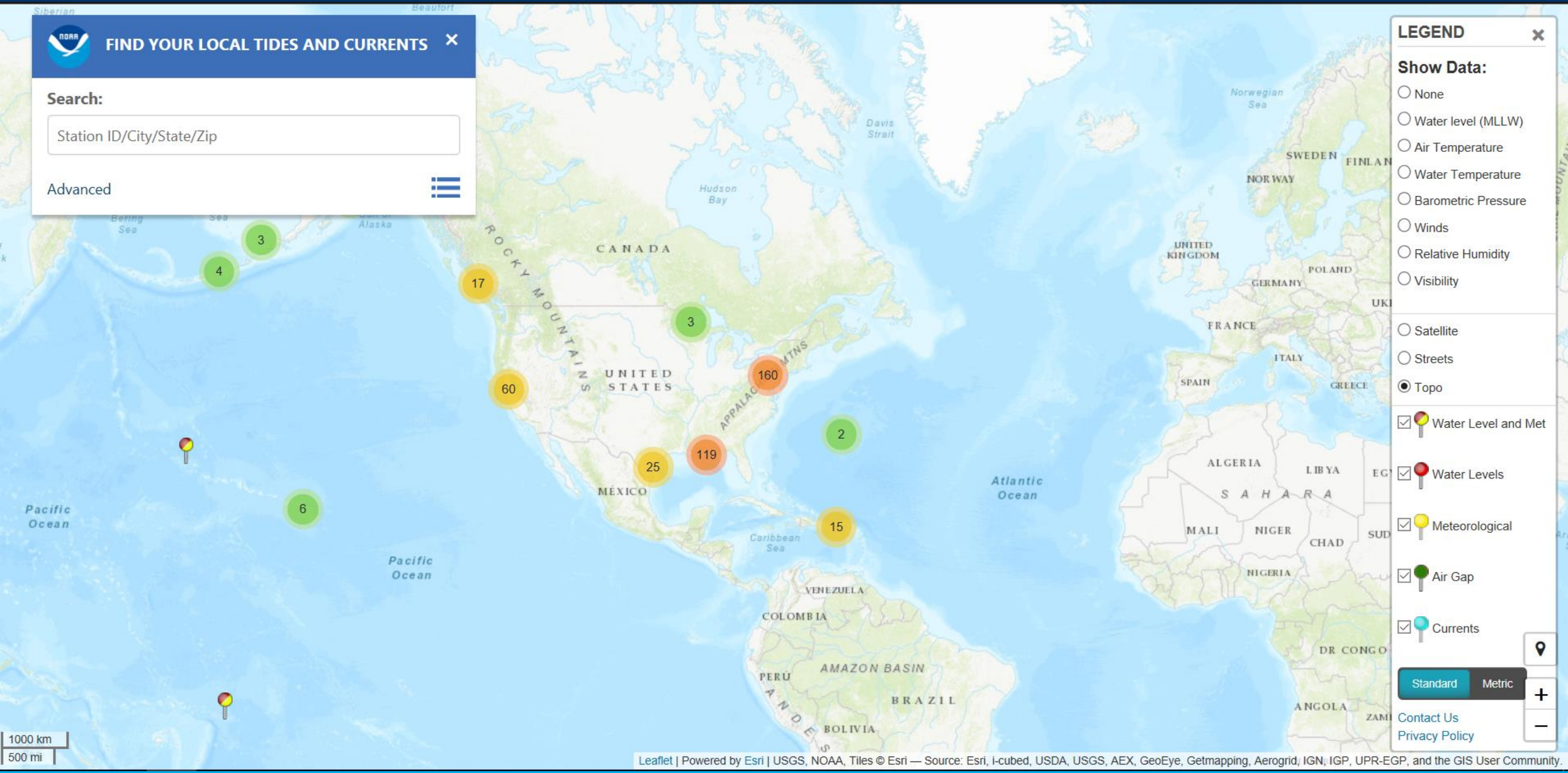
Currents

News

Web Services

NOAA CO-OPS PORTS




FIND YOUR LOCAL TIDES AND CURRENTS
Search:
Station ID/City/State/Zip
Advanced
LEGEND
Show Data:
None
Water level (MLLW)
Air Temperature
Water Temperature
Barometric Pressure
Winds
Relative Humidity
Visibility
Satellite
Streets
Topo
Water Level and Met
Water Levels
Meteorological
Air Gap
Currents
Standard
Metric
Contact Us
Privacy Policy
3
4
17
3
60
160
2
119
25
15
6
CANADA
UNITED STATES
MÉXICO
ROCKY MOUNTAINS
APPALACHIAN MTNS
Pacific Ocean
Pacific Ocean
Atlantic Ocean
Caribbean Sea
Hudson Bay
Davis Strait
Norwegian Sea
SWEDEN
NORWAY
UNITED KINGDOM
GERMANY
POLAND
FRANCE
SPAIN
ITALY
GREECE
ALGERIA
LIBYA
SAHARA
MALI
NIGER
CHAD
NIGERIA
VENEZUELA
COLOMBIA
PERU
BRAZIL
BOLIVIA
AMAZON BASIN
ANGOLA
DR CONGO
1000 km
500 mi
Leaflet | Powered by Esri | USGS, NOAA, Tiles © Esri — Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getmapping, Aerogrid, IGN, IGP, UPR-EGP, and the GIS User Community.

FIND YOUR LOCAL TIDES AND CURRENTS

Search:

Station ID/City/State/Zip

Advanced

The Narrows [n03020]

Station Home | More Data

Today's Currents as of
11/19/2018 10:22 AM Local Time

Speed: 1.43 kts

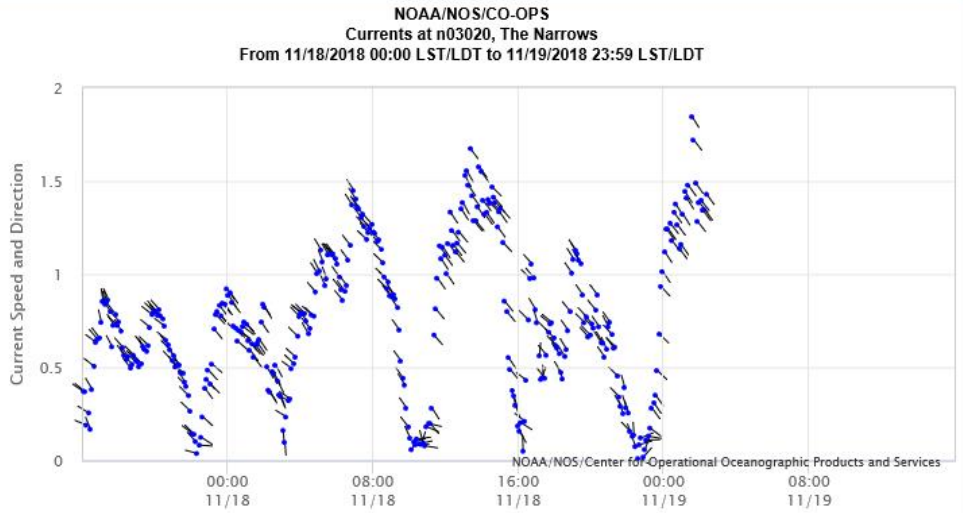
Direction: 144°

Currents measured at: 16.6 ft below the surface

Plot Data | Standard | Metric | Auto-Refresh:

Currents

1.43 kts 144°



LEGEND

Show Data:
- None
- Water level (MLLW)
- Air Temperature
- Water Temperature
- Barometric Pressure
- Winds
- Relative Humidity
- Visibility

- Satellite
- Streets
- Topo

- Water Level and Met
- Water Levels
- Meteorological
- Air Gap
- Currents

Standard | Metric

Contact Us
Privacy Policy

FIND YOUR LOCAL TIDES AND CU

Search:

Station ID/City/State/Zip

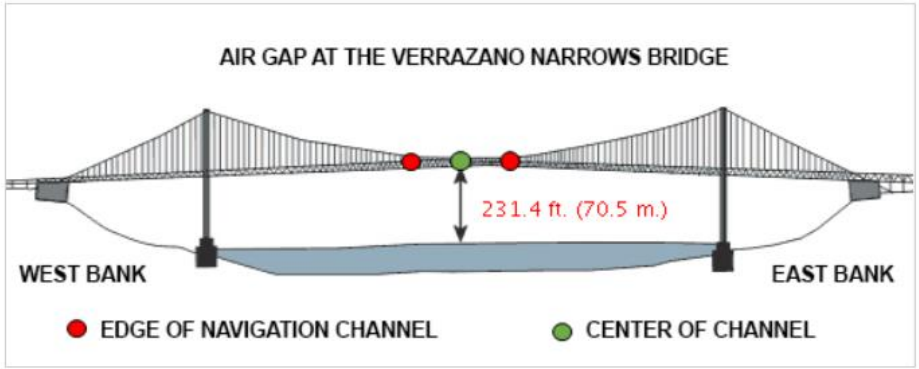
Advanced

Verrazano-Narrows Air Gap, NY

[8517986]

Station Home | More Data

Distance between current water level and bridge is 231.5 ft as of 11/19/2018 10:24 AM Local Time



Plot Data | Standard | Metric | Auto-Refresh:

LEGEND

Show Data:

- None
- Water level (MLLW)
- Air Temperature
- Water Temperature
- Barometric Pressure
- Winds
- Relative Humidity
- Visibility

- Satellite
- Streets
- Topo

- Water Level and Met
- Water Levels
- Meteorological
- Air Gap
- Currents

Standard | Metric

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SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY

2 ZERO HUNGER

3 GOOD HEALTH AND WELL-BEING

4 QUALITY EDUCATION

5 GENDER EQUALITY

6 CLEAN WATER AND SANITATION

7 AFFORDABLE AND CLEAN ENERGY

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

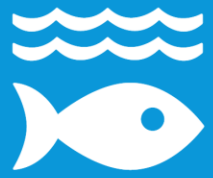
10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

14 LIFE BELOW WATER



15 LIFE ON LAND

16 PEACE, JUSTICE AND STRONG INSTITUTIONS

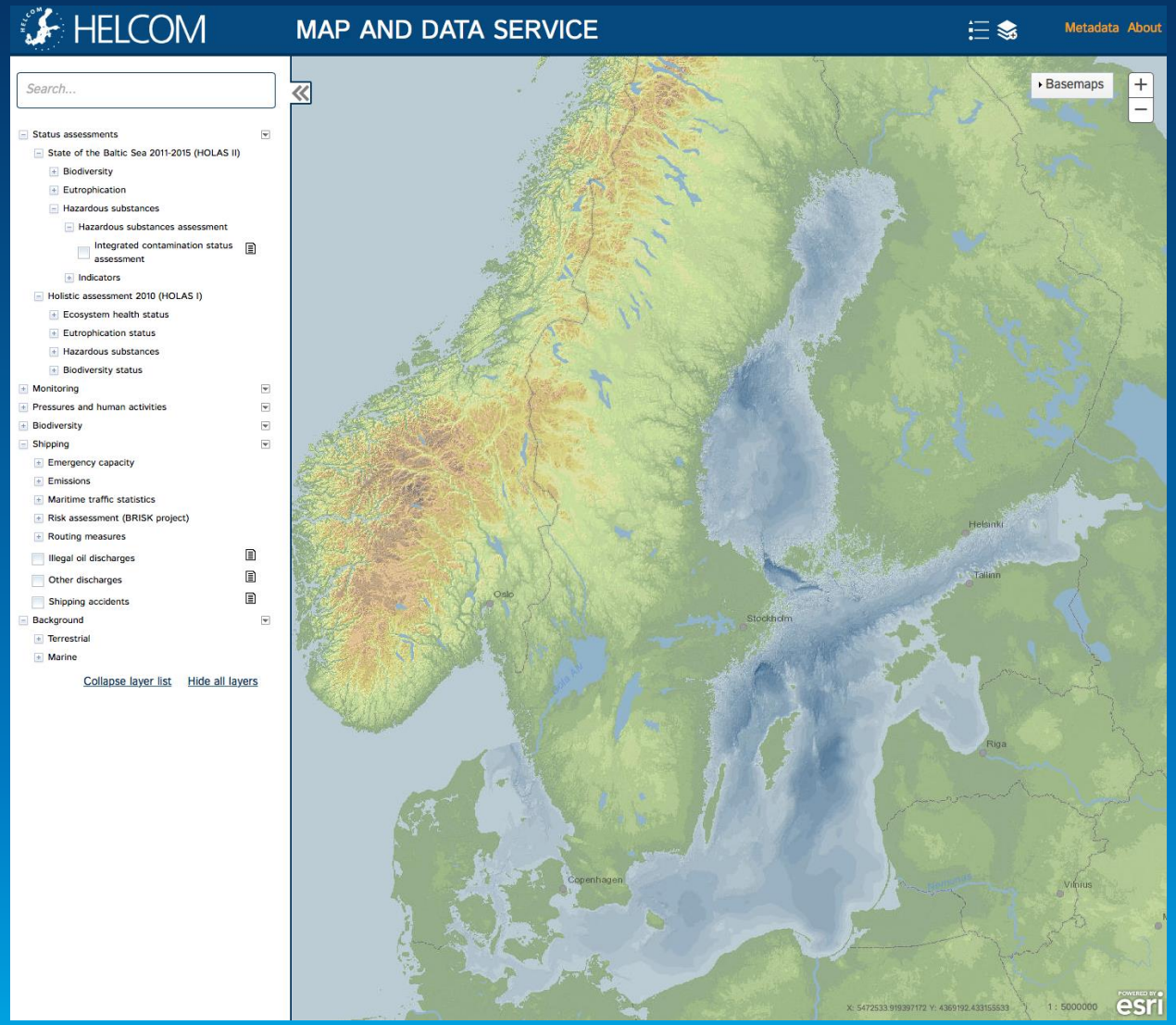
17 PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS

HELCOM Map and Data Services

Baltic Marine Environment Protection Commission – Helsinki Commission

- Governing body of the Helsinki Convention
- Denmark, Estonia, The EU, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden;
- Established four decades ago;
- The 1992 Helsinki Convention entered into force on January 17, 2000;
- Eight main groups: Gear, Maritime, Pressure, Response, State & Conservation, Fish, Agri, Maritime Spatial Planning;
- Its vision for the future is a healthy Baltic Sea environment with diverse biological components functioning in balance, resulting in a good ecological status and supporting a wide range of sustainable economic and social activities.



HELCOM MAP AND DATA SERVICE

Metadata About

Search...

- Status assessments
- Monitoring
  - Assessment units
  - Monitoring stations in Monitoring manual
  - Monitoring stations
  - HELCOM Grids
- Pressures and human activities
- Biodiversity
  - Ecosystem components (BSII)
    - Benthic species
    - Birds
    - Broadscale habitats
    - Fish
    - Mammals
    - Natura habitats
    - Pelagic habitats
      - Productive surface waters
      - Availability of deep water habitat, based on occurrence of H2S
        - 0 - 0,2
        - 0,2 - 0,4
        - 0,4 - 0,6
        - 0,6 - 0,8
        - 0,8 - 1
- Red List
- Physical features
- Protected areas

Collapse layer list Hide all layers

Basemaps

Oslo
Riga
Moscow
Vilnius
Minsk
Dublin
Amsterdam
Berlin
Warsaw
Kiev
London
Brussels
Prague
Luxembourg
Paris
Vienna
Bratislava
Budapest
Chisinau

X: 4557866.055445397 Y: 4501503.886704935

1000000

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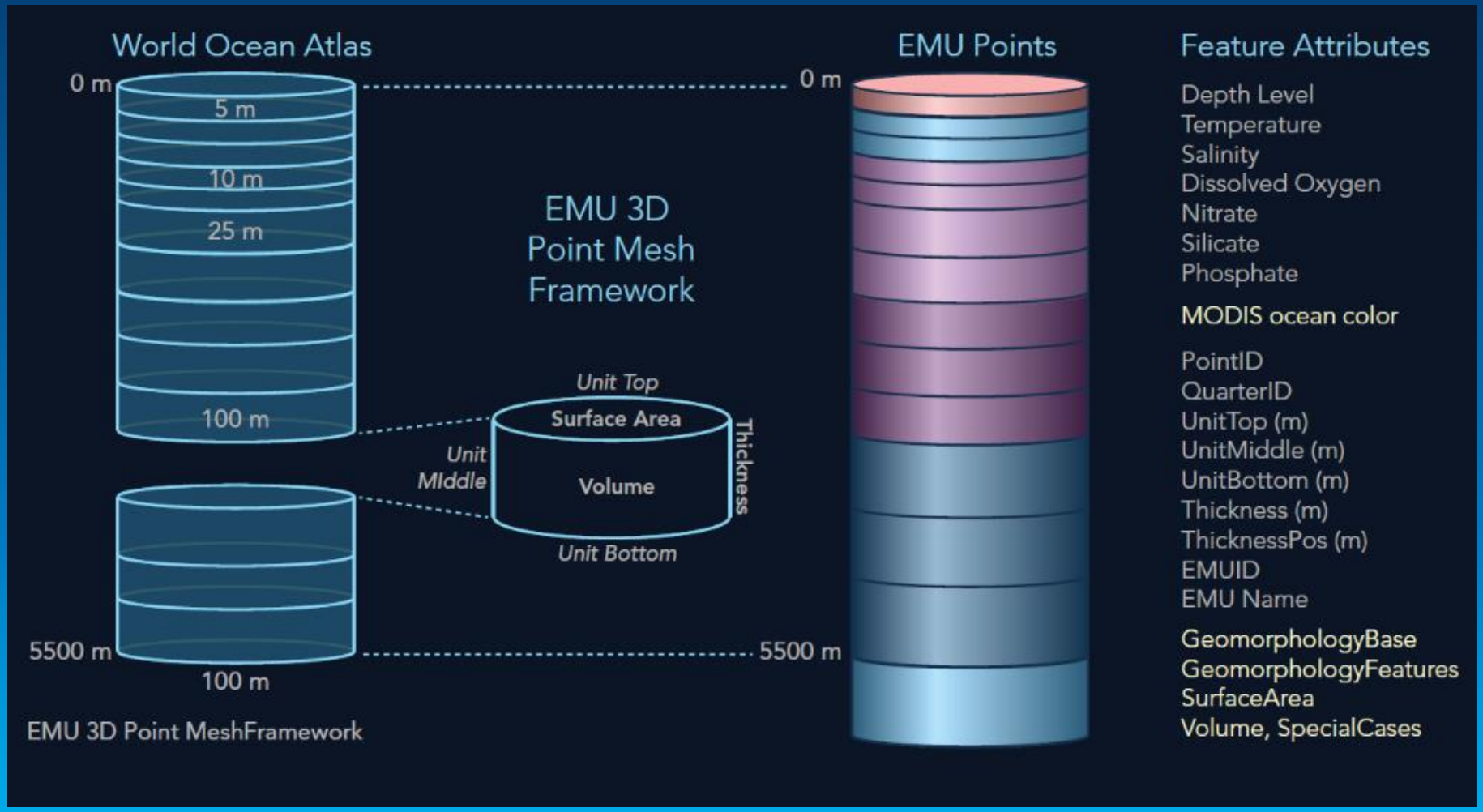
Ecological Marine Units (EMUs)

EMU 3D Point Mesh Framework

- 52,000,000 points
- ¼ degree by ¼ degree in the horizontal
- Variable z depth (z thickness ranges from 5 m to 5,500 m)
- Data values represent the average of five “prominent decadal means”
- No temporal component related to seasonality
- The point mesh lives in ArcGIS Pro



They all come together for the future of Maritime…

…and the future is here

A Platform for supporting the Maritime Community

MSDI in action, take a look!

- NOAA PORTS Storymap https://arcg.is/1v14Dn
- Ecological Marine Units Project https://arcg.is/00WTXn
- Living Atlas of the World by Esri www.esri.com/livingatlas
- Atlas of Ocean Wealth OECS http://maps.oceanwealth.org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THE
SCIENCE
OF
WHERE