



**INTERNATIONAL HYDROGRAPHIC ORGANIZATION**

# **UNITED STATES OF AMERICA**

## **National Report**

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**17<sup>th</sup> South-West Pacific Hydrographic Commission (SWPHC)**  
**Wollongong, Australia**  
**12 - 14 February 2020**



Office of Coast Survey  
National Oceanographic & Atmospheric Administration  
<http://www.nauticalcharts.noaa.gov>



Maritime Safety Office  
National Geospatial-Intelligence Agency  
<http://msi.nga.mil/NGAPortal/MSI.portal>  
<https://www.nga.mil/Pages/Default.aspx>



Naval Meteorology and Oceanography Command  
United States Navy  
<http://www.navmetocom.navy.mil>  
<https://www.facebook.com/NavalOceanography/>

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# 1. HYDROGRAPHIC OFFICE/SERVICE

This National Report provides specific information pertaining to individual products services of primary interest to the South West Pacific Hydrographic Commission (SWPHC) Region. Five government agencies are responsible for the management of U.S. domestic and international hydrographic products, services, and maintenance.

## 1.1 Government Agencies with hydrographic responsibilities in the SWPHC Region

- 1.1.1 National Oceanic and Atmospheric Administration's (NOAA)<sup>1</sup> conducts hydrographic surveys and produces nautical charts and related hydrographic information within the nation's Economic Exclusion Zone (EEZ).
- 1.1.2 National Geospatial-Intelligence Agency (NGA)<sup>2</sup> provides nautical charts and related hydrographic information and is the mapping and charting authority for the U.S. Department of Defense (DOD) and commercial mariners in areas outside the U.S. where the U.S. is the designated charting authority.
- 1.1.3 The U.S. Navy<sup>3</sup> conducts oceanographic, bathymetric, and hydrographic surveys worldwide to satisfy DOD and national security requirements.

For more information on NOAA, NGA, and NAVY hydrographic activities, see [IHO Publication 5](#).

- a) Description: [*General description, including updates for the IHO Yearbook e.g. reorganization*]
- b) Submitted by: NOAA – [Jonathan.Justi@noaa.gov](mailto:Jonathan.Justi@noaa.gov); NAVY – [matthew.borbash@navy.mil](mailto:matthew.borbash@navy.mil); and NGA – [James.E.Rogers@nga.mil](mailto:James.E.Rogers@nga.mil).

## 1.2 United States Open Data Policy – Managing Information as an Asset

Access to data and services, usable to the public, can help fuel entrepreneurship, innovation, and scientific discovery – all of which improve lives and contribute significantly to job creation<sup>4</sup> - is the foundation of the [U.S. Open data policy](#). With the exception of some data collected and/or obtained by the U.S. Navy through bilateral agreements, the open data policy has led to the public availability of most hydrographic data, products, and services produced by U.S. Hydrographic Offices (HO's) for data downloads at no cost. Further information on U.S. Navy collected data is provided in Section 2.2, below.

Much of this open data information is available on the NOAA and NGA websites.<sup>5</sup> Additionally, NOAA makes ENC data available for use in GIS applications via their

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<sup>1</sup> Primarily the Office of Coast Survey

<sup>2</sup> Primarily Source Operations and Management Directorate, Foundation Group, Maritime Safety Office (MSO).

<sup>3</sup> Primarily, Commander, Naval Meteorology and Oceanography Command (COMNAVMETOCCOM) and the Hydrographer of the Navy

<sup>4</sup> Open Data Policy-Managing Information as an Asset. (2013). Retrieved from <https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2013/m-13-13.pdf>

<sup>5</sup> NOAA & NGA websites: <https://nauticalcharts.noaa.gov/index.html> & [https://msi.nga.mil/NGAPortal/MSI.portal?nfpb=true&st=&pageLabel=msi\\_faq\\_page](https://msi.nga.mil/NGAPortal/MSI.portal?nfpb=true&st=&pageLabel=msi_faq_page)

ENC direct to GIS website.<sup>6</sup> NGA also makes data available to support crisis events and various initiatives.<sup>7</sup>

## 2. SURVEYS

### 2.1 Surveys in U.S. Waters

NOAA provides nautical charts and related hydrographic information for the safe and efficient navigation of maritime commerce as well as providing basic data for engineering, scientific, and other commercial and industrial activities within the nation's 3.4 million square nautical mile EEZ ([US EEZ](#)) and along its 95,000 miles of shoreline.

NOAA is in the process of re-defining how hydrographic survey plans are generated and how survey priorities are identified in federal waters. NOAA hydrographic in-house field units or external contractors then conduct surveys to meet these priorities. Data acquired from these surveys must meet the NOS Hydrographic Surveys Specifications and Deliverables<sup>8</sup>, in compliance with the NOS data specification guide which is updated annually.

The main component of the new hydrographic survey priorities method is the hydrographic health model. The hydrographic health model is based on the idea of navigational risk. Navigational risk is the product of the likelihood of an adverse event and the consequence of that event occurring. The model incorporates likelihood parameters such as traffic density, known hazards to navigation, and reported ship groundings to estimate the likelihood of an adverse event. To estimate the consequence of an adverse event, the model incorporates parameters such as proximity to search and rescue stations, proximity to reefs or marine sanctuaries. The model also considers the necessary quality of data to support modern traffic relative to what is currently available, explicitly recognizing that the seafloor changes over time. Seafloor changeability takes into account the frequency of storms, current speed, and accumulation of marine debris, where the quality of data in highly changeable areas decreases faster than the quality of data in less changeable areas. Using historic knowledge of seafloor changeability, the model can also approximate the future quality of survey data and assess how often an area needs resurveying.

The results of this model are available online in a geographic information system (GIS) interface and summarized in an annual report made available on the internet in FY20. Current information about the model and survey prioritization can be found at: <https://nauticalcharts.noaa.gov/publications/national-hydrographic-survey-priorities.html>.

Planned surveys will be a combination of either 200% side scan sonar/ object detection multibeam coverage in regions of critical under keel clearance, or 100% side scan sonar / complete coverage multibeam surveys where there is a relaxed requirement for feature detection. These plans do not reflect emerging storm response work, for the South Western Pacific Ocean regions where NOAA/OCS is the Agency of Responsibility

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<sup>6</sup> NOAA ENC direct to GIS: <https://nauticalcharts.noaa.gov/data/gis-data-and-services.html#enc-direct-to-gis>

<sup>7</sup> NGA Crisis Support website: <https://nga.maps.arcgis.com/home/index.html>

<sup>8</sup> Current version is 2019, <https://nauticalcharts.noaa.gov/publications/docs/standards-and-requirements/specs/hssd-2019.pdf>

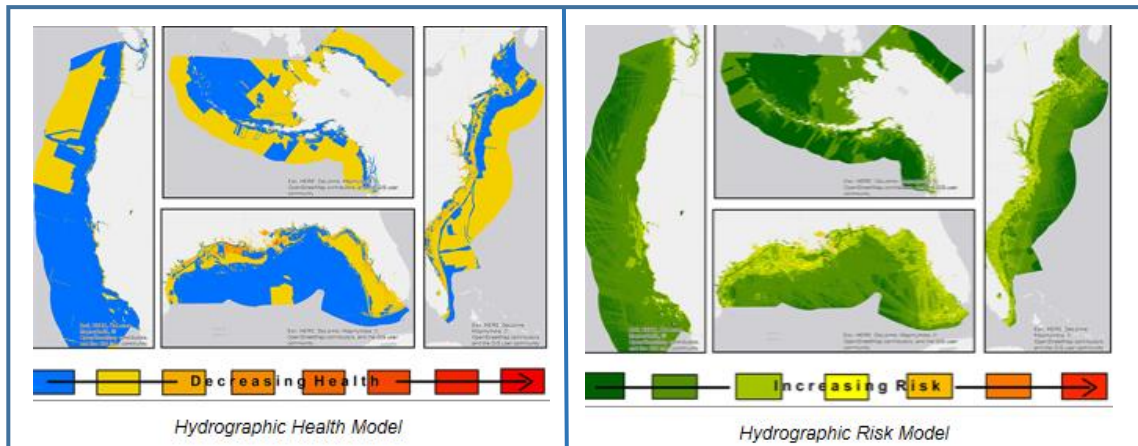


Figure 2.1: Hydrographic Health and Risk Conceptualization

In FY20, the NOAA Ship Rainier will complete survey work throughout the Commonwealth of the Northern Marianas Islands (CNMI). Waters from shore out to 1500 meters depth around Guam, Saipan, Rota, Tinian, and other islands in the northern part of the CNMI will be the primary focus for operations. Within this depth range, the team will map bathymetry and backscatter, and characterize habitat, while simultaneously performing coral reef assessment dives and collecting additional oceanographic observations.

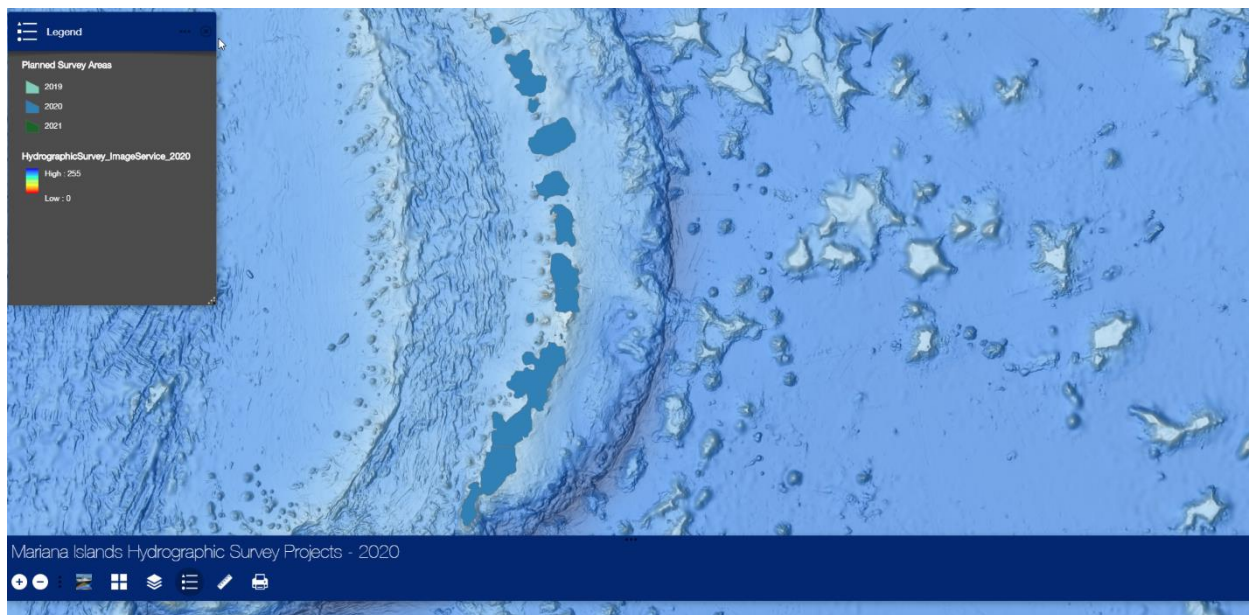


Figure 2.1: NOAA's planned surveys on the Northern Marianas Islands in FY20.

## 2.2 Surveys outside U.S. Waters

The U.S. Navy conducts hydrographic surveys outside the United States in international waters and in territorial waters of partner nations, through diplomatic channels and international agreements. These survey operations enhance maritime commerce and security and support relationship and capacity building initiatives.

By U.S. Navy, Commander, Naval Meteorology and Oceanography Command (COMNAVMETOCCOM) Instruction 5510.1, “Disclosure of Information to Foreign Governments and International Organizations”, it is policy to treat all data collected through bi-lateral agreements as restricted from public release. Accordingly, the Hydrographic Service or Port Authority of the respective country is the appropriate point of contact for inquiries or requests for data regarding any of these surveys.

## 2.3 U.S Hydrographic Survey Platforms

### National Oceanic and Atmospheric Administration (NOAA)

NOAA survey platforms include six 28-foot survey boats, a research vessel, a LIDAR-capable aircraft, and private contractors and the following ships: NOAA Ship Fairweather, NOAA Ship Rainier, NOAA Ship Thomas Jefferson, and NOAA Ship Ferdinand R. Hassler.

Additional information on NOAA’s hydrographic vessels can be found online at: <https://nauticalcharts.noaa.gov/about/survey-vessels.html>

### U.S. Navy

The Naval Oceanographic Office (NAVOCEANO), a subordinate command of COMNAVMETOCCOM, currently employs six Pathfinder Class 100-meter multi-purpose survey ships to conduct oceanographic, bathymetric, and hydrographic surveys in deep-ocean and coastal waters. Each ship carries two 10-meter hydrographic survey launches (HSLs).

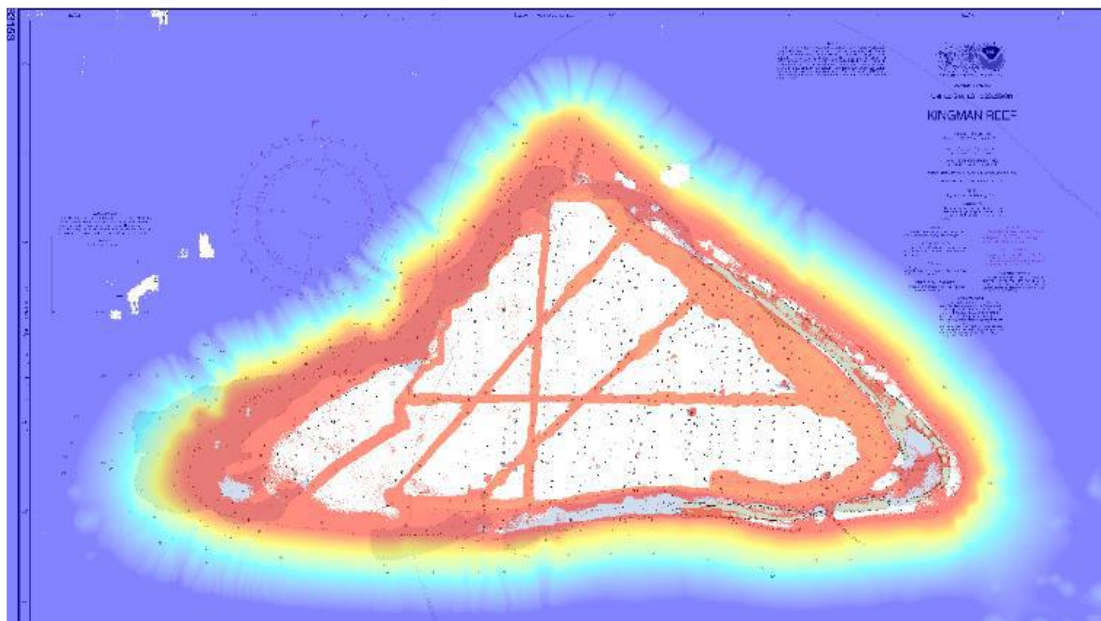
NAVOCEANO also maintains the Airborne Coastal Survey (ACS) capability with the Optech, Inc., “Coastal Zone Mapping and Imaging” LIDAR (CZMIL) system. A Basler BT-67, a refurbished DC-3, serves as the airborne system that carries the CZMIL system. NAVOCEANO’s subordinate command, Fleet Survey Team (FST), employs various survey vehicles for survey including two 9 meter Workskiff with amidships transducer moon pools; four Teledyne Z-Boat 1800 Unmanned Surface Vessels (USV) equipped with multi-beam; two Iver3 580 Unmanned Underwater Vehicles fixed with Bathymetric Interferometric Side Scan Sonar; and rapid littoral survey vehicles (RLSVs) (personal water craft fitted with a single beam echo sounder and side scan sonar). C-130 aircraft provide rapid deployment transportation capability for all FST craft. FST also maintains a year-round stand by “Fly-Away Team” consisting of four personnel and survey gear to outfit boats of opportunity. This capability enhances standard Navy survey requirements and provides capacity to maintain navigable approach corridors in support of humanitarian aid and disaster relief.

Since SWPHC16, the U.S. did not conduct any new survey work in the SWPHC regional waters. There are extensive holdings of bathymetric data available, collected for missions other than traditional hydrographic surveying. The review and application of this data



will produce a substantial modernization of the data coverage on many US charts. Kingman Reef is representative of many areas in the South West Pacific, with sparse soundings and substantial white space on the chart, that have been surveyed with modern multibeam sonars, but for purposes other than safety of navigation.

While it will take time to assess and apply these data holdings, US charts will see substantial improvements in the SWPHC region in the coming years.



*Figure 2.3 Kingman Reef*

## 3 NEW CHARTS AND UPDATES

### 3.1 National Charting Plan (NCP)

On November 1, 2017, NOAA released the National Charting Plan, a strategy to improve NOAA nautical chart coverage, products, and distribution. It describes the evolving state of marine navigation and nautical chart production, and outlines actions that will provide the customer with a suite of products that are more useful, up-to-date, and safer for navigation. It is not a plan for the maintenance of individual charts, but a strategy to improve all charts.

NOAA has started to rescheme its suite of 1266 ENC's into a regular gridded set of rectangular cells. The current ENC scheme is based on the extents of the paper nautical charts from which ENC's were originally digitized. Rescheming will replace this puzzle-piece layout with a rectangular grid of ENC's, often providing larger scale, more detailed coverage than the existing paper charts. The final product suite is expected to exceed 9,000 ENC's. The current status of the creation of the new gridded ENC product layout is available online at:

<https://noaa.maps.arcgis.com/apps/webappviewer/index.html?id=ab6ad790ac3f411f8ef96cb26d0c4868>

Since 2018, NOAA produced 55 new ENC's based on the gridded chart scheme described within the National Charting Plan. NOAA is currently re-scheming portions of New York Harbor, Alaska North Slope, the Great Lakes, and Florida. The re-scheme effort aims to standardize cell size and scales using a gridded framework.

### 3.2 Electronic Navigational Chart (ENC)

The NOAA currently maintains 1,245 ENC's in U.S. domestic waters and 209 (figure 3.2) in waters within the SWPHC region. NGA produces ENC's in areas where the U.S. functions as the Prime Charting Authority (PCA) outside U.S. domestic waters. These ENC's are maintained by NGA with new source information from the U.S., and our foreign partners as it becomes available. NGA is working to expand its ENC Portfolio within the SWPHC Region in areas where the U.S. acts as the PCA.

U.S. produced ENC's are available as free downloads from the internet. Mariners who wish to download NOAA ENC's directly and use the data to fuel ECDIS or ECS may do so. The ENC's, including newly created NGA ENC's, are distributed directly from the following:

- i. NOAA website at: <https://nauticalcharts.noaa.gov/charts/noaa-enc.html>.
- ii. International Center for ENC's Distributors at: <http://www.ic-enc.org/Distribution.html>.
- iii. PRIMAR Distributors at: <https://www.primar.org/home>

ENC Band	1	2	3	4	5	6
Number of U.S. ENC's existing in SWPHC Region (NOAA)	4	1	1	14	28	0
Number of U.S. ENC's existing in SWPHC Region (NGA)	0	0	1	7	22	0

### 3.4 Raster Navigational Charts (RNC) & Electronic Navigational Charts (ENC) Distribution

NOAA provides nautical products, services, and web deliveries of digital versions of most data, which are available free to the public.

For access to survey data:

<https://nauticalcharts.noaa.gov/data/hydrographic-survey-data.html>

For access to RNC Charts:

<https://nauticalcharts.noaa.gov/charts/noaa-raster-charts.html>

For access to ENC Charts:

<https://nauticalcharts.noaa.gov/charts/noaa-enc.html>

For access to the Coast Pilot:

<https://nauticalcharts.noaa.gov/publications/coast-pilot/index.html>

In November 2019, NOAA released a Federal Register Notice (FRN) announcing the five-year program to end all raster and paper nautical chart production. Ultimately, production of all NOAA paper nautical charts, raster navigational charts (NOAA RNC®), and related products, will cease. More details are available in the Sunsetting Traditional NOAA Paper Charts document.



NOAA is in the early phases of developing and improving a NOAA Custom Chart web-based application that will enable users to download and print raster chart backup files created from the most up-to-date ENC data. These chart backup files will look somewhat different than traditional paper nautical charts, but will provide a similar functionality. The NOAA Custom Chart prototype is available at <https://devgis.charttools.noaa.gov/pod>.

Additionally, as of April 2014, NOAA no longer produces lithographic paper charts with traditional print cycles for new editions. With the announcement of retiring raster products, NOAA will apply critical updates to paper charts on a weekly basis and make them available for download as Print-on-Demand (POD) products or in paper form from one of 34 NOAA-certified chart-printing agents (see Annex A for NOAA certified chart printing agents). NOAA is working with POD certified chart-printing agents on developing ways to print large format charts created with the NOAA Custom Chart application; this service model is still in development.

U.S. ENCs may be downloaded for free at [www.nauticalcharts.noaa.gov](http://www.nauticalcharts.noaa.gov) and mariners can use this data to fuel their ECDIS or ECS. ENCs are also available through International Center for ENC (IC-ENC) distributors at <http://www.ic-enc.org/Distribution.html>.

### **3.5 Raster Navigational Charts (RNC) and Paper Charts**

The NOAA RNC® are geo-referenced, digital images of NOAA navigational charts. Because the images are geo-referenced, the end user can display a vessel's position on the chart image if a computer-based navigation system is connected to a global positioning system (GPS). RNCs, developed under the IHO S-61 product specification, are unique to NOAA. NGA does not produce RNCs.

NGA produces 350 paper charts for the SWPHC region. Most of these charts are not available via public sale but can be requested by bilateral partners via bilateral agreements. The only charts that NGA distributes to the public are those where NGA serves as the primary charting authority. These charts are in areas where the U.S. conducts the surveys, compiles and issues charts, and there is no fully functioning national authority or NGA has specific authority (e.g. Trust Territory of the Pacific).

A detailed catalog of RNC coverage can be downloaded at:  
<http://charts.noaa.gov/ChartCatalog/webimages/pdf/GulfCoastCatalog.pdf>.

U.S. RNCs are downloadable from a list at <http://www.charts.noaa.gov/RNCs/RNCs.shtml> or through the Coast Survey's Nautical Products Catalog at: <http://www.charts.noaa.gov/InteractiveCatalog/nrnc.shtml>

### **3.6 International (INT) Charts**

The U.S produces INT charts within the SWPHC region, primarily over U.S. Trust Territories and builds its chart schema and DNC library limits from these INT schema, if practical.

### 3.7 Digital Nautical Chart (DNC)

The U.S. produces many DNCs in SWPHC waters. The DNC, produced by the National Geospatial-Intelligence Agency (NGA), is an unclassified, vector-based, digital database containing maritime significant features essential for safe marine navigation. The DNC uses the Vector Product Format, which is a NATO standard for digital military map and chart data.

Additional details can be located at <http://msi.nga.mil/NGAPortal/DNC.portal>.

DNC consists of libraries in a variety of scales for complete worldwide coverage. SWPHC data is included in DNC regions 4, 5, and 6. See coverage below.

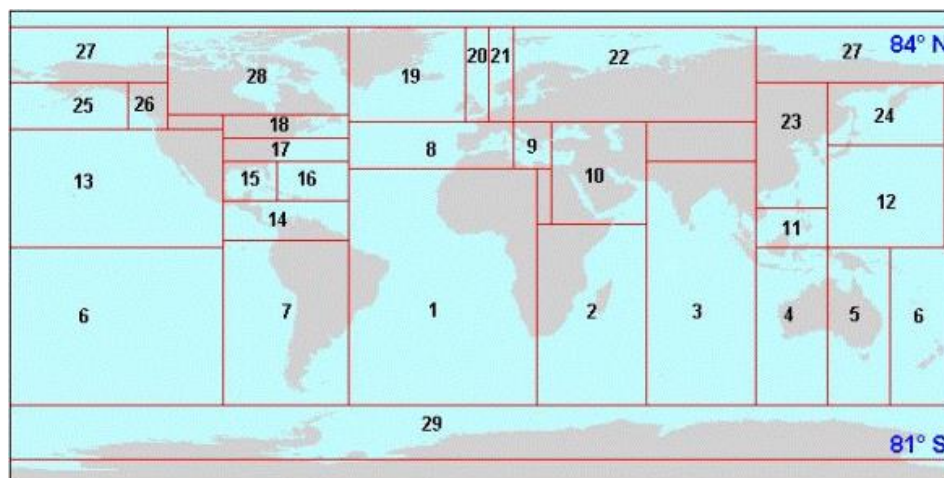


Figure 3.5: DNC Worldwide Coverage

DNC is maintained with new source information from the U.S. and foreign primary charting authorities. The DNC product is Limited Distribution and are not available for public sale or download except for those that are within U.S. territorial waters or in areas where source data restrictions allow them to be released. However, DNC data can be shared with host nations for coverage in their territorial waters through formal bilateral exchange agreements.

For requests regarding DNC data, please contact: [maritime.international@nga.mil](mailto:maritime.international@nga.mil)

## 4 NEW PUBLICATIONS AND UPDATES

### 4.1 New Publications

None for comment.

### 4.2 Updated Publications

The American Practical Navigator, first published in 1802 describes in detail the principles and factors of navigation, including piloting, electronic navigation, celestial navigation, mathematics, safety, oceanography and meteorology. It also contains various tables used in typical navigational calculations and solutions, including the formulas used to derive the tabular data. The 2019 edition of the American Practical Navigator consists of a two-volume format,

which can be downloaded as complete PDF documents from the following website:

<https://msi.nga.mil/Publications/APN>

- i. The **United States Coast Pilot** consists of a series of nine regionally- focused nautical books that cover a variety of useful information important to navigators for coastal and intra-coastal waters and the U.S. Great Lakes. *Coast Pilots 7 (2019)* provides information for the U.S. west coast, Hawaii, and the Pacific, including Trust Territories of the Pacific Islands. U.S. Coast Pilots, updated on a weekly basis, can be downloaded at:  
<https://nauticalcharts.noaa.gov/publications/coast-pilot/index.html>
- ii. **NGA Sailing Directions** consist of useful information important to navigators of coastal waters. Information for the SWPHC region is contained in following Publications:

Digital updates can be downloaded from NGA at: <http://msi.nga.mil/>.

Publication	Edition Date
<i>Sailing Directions 120 – Pacific Ocean and Southeast Asia (Planning)</i>	2018 Edition
<i>Sailing Directions 126 – Pacific Islands (Enroute)</i>	2017 Edition
<i>Sailing Directions 127 – East Coast of Australia and New Zealand (Enroute)</i>	2017 Edition
<i>Sailing Directions 171 – East Africa and South India Ocean (Enroute)</i>	2018 Edition
<i>Sailing Directions 175 – North, West, and South Coasts of Australia (Enroute)</i>	2017 Edition

- iii. **World Port Index (Pub150)** is a publication maintained by NGA. It contains the location and physical characteristics as well as the facilities and services offered by major ports and terminals worldwide. Digital updates are available to the public and posted at the NGA Maritime Safety website, at:  
<https://msi.nga.mil/Publications/WPI>.
- iv. The **NGA List of Lights** and their digital updates are available to the public and posted at the NGA Maritime Safety website, at:  
<https://msi.nga.mil/Publications/NGALOL>.

One volumes of List of Lights cover the SWPHC region:

Publication	Edition Date
List of Lights Pub. 111 (W. Coast N & S America (excluding USA), Australia, Tasmania, NZ, and Islands in the N/S Pacific Ocean	2019 Edition

- v. The **NGA Radio Aids and Fog Signals (Pub 117)** and their digital updates are available to the public and posted on the NGA Maritime Safety website at:

<https://msi.nga.mil/Publications/RNA>.

#### **4.3 Means of Delivery**

- i. All the publications are available digitally in PDF format from the NGA website at: <https://msi.nga.mil/Publications>.
- ii. Users can enroll in a Publication Updates Subscription Service to receive e-mail notifications of nautical publication updates and new editions.
- iii. Additionally, NGA publications can be ordered from commercial vendors found on the NGA website at: <https://msi.nga.mil/Products>.

## **5 MARITIME SAFETY INFORMATION (MSI)**

### **5.1 Existing infrastructure for transmission**

Maritime Safety Information (MSI) is navigational and meteorological warnings, meteorological forecasts and other urgent safety-related messages broadcast to ships in accordance with the International Convention for the Safety of Life at Sea, 1974, as amended. NGA monitors NAVAREA IV and XII Warnings via Inmarsat antennas located in Springfield, Virginia (primary) and St. Louis, Missouri (back up). NGA promulgates warnings via Inmarsat's SafetyNET II service. USCG promulgates coastal warnings for the United States via NAVTEX. There are 11 NAVTEX stations, five on the West Coast and six on the East Coast. All NAVTEX stations except Puerto Rico are remotely controlled via USCG Communications Command in Norfolk, Virginia

Another component of MSI is the U.S. Notice to Mariners, which provides timely information for the correction of all U.S. Government navigation charts and publications from a wide variety of sources, both foreign and domestic. Information published in Notice to Mariners provides for the correction of unclassified nautical charts, the unclassified NGA/DLA Catalog of Hydrographic Products, United States Coast Pilots, NGA List of Lights, U.S. Coast Guard (USCG) Light Lists, and other related nautical publications produced by NGA, NOAA, and the USCG.

### **5.2 Notice to Mariners**

The U.S. Coast Guard issues Local Notices to Mariners for NOAA charts, while NGA issues Notices to Mariners for NGA charts in the SWPHC region.

Local Notice to Mariners are updated weekly and available for download in several formats. Mariners can download applicable Notices from the web at <https://www.navcen.uscg.gov/?pageName=lnmMain>

The U.S. Notice to Mariners are posted at the NGA Maritime Safety website at <https://msi.nga.mil/NTM>.

### 5.3 Navigation Warnings

The NAVAREA coordinator is the authority charged with coordinating, collating, and issuing navigational warnings for a designated NAVAREA within the IMO/IHO World-Wide Navigational Warning Service (WWNWS).

SWPHC Waters primarily lie within NAVAREA X (Australia is Regional Coordinator, NAVAREA XIV (New Zealand is Regional Coordinator) and NAVAREA XI (Japan is Regional Coordinator).

#### World Wide Navigational Warning Service (WWNWS)

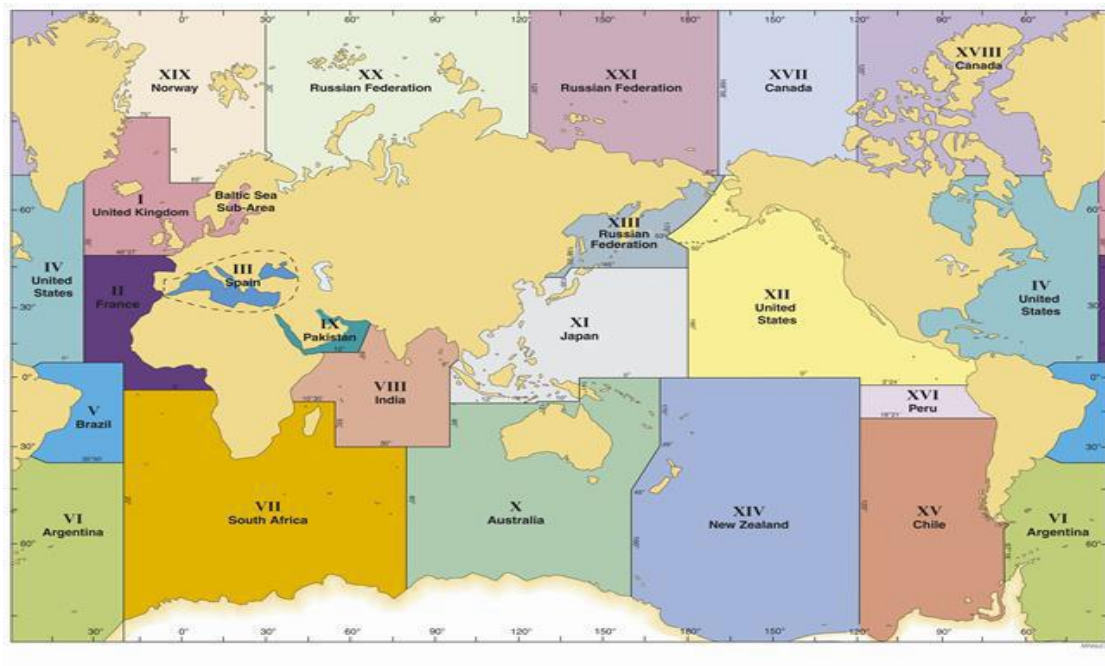


Figure 5.1: NAVAREAS for coordinating and promulgating navigational warnings under the WWNWS program

### 5.4 New NGA MSI Website Interface:

NGA has just updated the MSI interface to reorganize the information and improve the efficiency of the user. The information found on the MSI website includes Notice to Mariners, Publications, Navigational Warnings, Piracy, Drill Rigs, the Product Catalog, and several miscellaneous products and calculators. Users can also submit questions or subscribe to update services for some of following products as well.



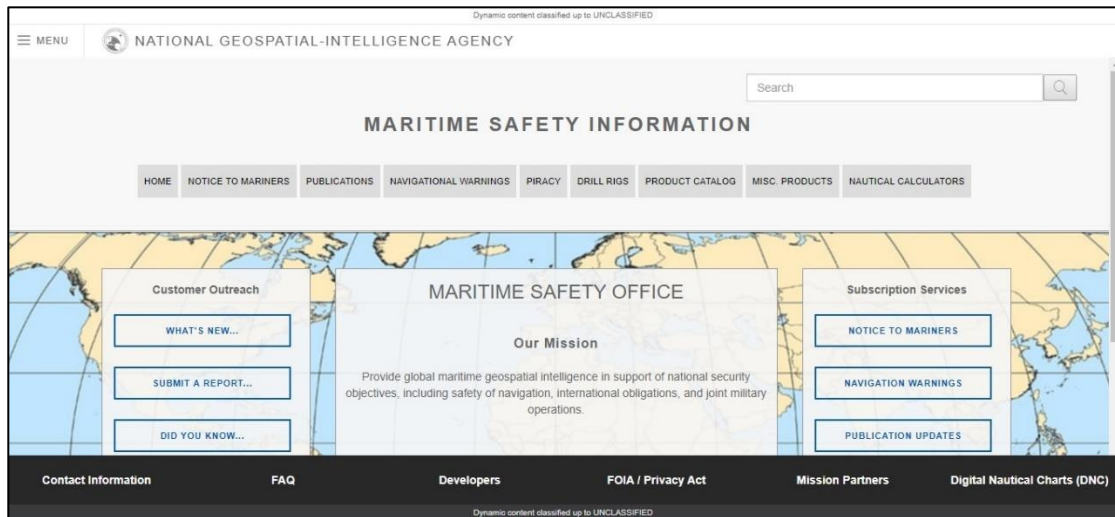


Figure 5.3: New NGA MSI website interface

## 6. CAPACITY BUILDING

### 6.1 Offer of and/or Demand for Capacity Building

The United States is an active participant in the IHO Capacity Building Sub-Committee (CBSC). The US (NGA) directly supports the IHO Maritime Safety Information (MSI) training course as well as provides support to nations through on site and remote guidance and advice as they grow their hydrographic capacity.

### 6.2 Training offered

#### i. Category-A Competence Training for Hydrography

Training opportunities are available at various institutions in the United States. Two Category A certified hydrographic programs are available through:

- The University of Southern Mississippi (USM) in partnership with U.S. Navy
- The University of New Hampshire (UNH)

#### ii. Category-B Competence Training for Nautical Cartography

The National Geospatial-Intelligence Agency (NGA) commenced training with an IHO/ICA/FIG IBSC approved portable S-8 Category B Nautical Cartography class in 2017. NGA teamed up with IIC Technologies to provide training to analysts with a comprehensive 20-week instructor led course and a six-week final project. Each session will run for one to three weeks at a time over the course of two years. The pilot session started in June 2017 in Springfield, VA and consisted of 10 students. The second session started in St. Louis, MO in January 2018, also with 10 students. A combination of lectures, hands-on compilation techniques, and homework assignments will prepare the students for the final project, the creation of a finished ENC product for NGA users. NGA plans to add several additional sessions of the training.

The IBSC approved the NOAA program for Category B in Cartography in March

of 2017. Eleven students graduated from the first class during the period of August 2017 through August 2018. Twelve students graduated from the second class during the period of August 2018 through August 2019, including one foreign national student from the Nigerian Navy. The third class began in August 2019 with 10 students. An announcement for the fourth class (August 2020 until August 2021) will be in early 2020.

Capt. Andrew Armstrong, NOAA (ret.), NOAA co-director of the Joint Hydrographic Center at UNH, is a member of the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers. As a member of the board, Capt. Armstrong is available to advise institutions on establishing hydrographic training curricula and preparing submissions to the International Board for Category A or Category B recognition. (andy.armstrong@noaa.gov).

iii. Chart Adequacy Workshop

NOAA's Office of Coast Survey hosts an annual week-long workshop on nautical chart adequacy assessment for approximately one dozen students from around the world. The participants receive training in techniques to evaluate the suitability of nautical chart products using chart quality assessment techniques with publicly available information. For more information, please contact Dr. Shachak Peeri (shachak.peeri@noaa.gov).

iv. Category-B Competence Training for Hydrography

U.S. Navy offers a six-month, IBSC approved Category B International Hydrographic Management and Engineering Program (IHMEP), commencing annually in February, via COMNAVMETOCCOM and the Information Warfare Training Group in Gulfport, Mississippi. COMNAVMETOCCOM also offers mobile hydrographic training via NAVOCEANO. COMNAVMETOCCOM's U.S. Navy's Category A and B programs and mobile training all qualify for Security Cooperation Assistance

### **6.3 Status of National, Bilateral, Multilateral or Regional Projects with a Hydrographic Component.**

- i. Palau Technical Visit - NGA Analysts representing the IHO participated in a Technical Visit to Palau during the week of 12-15 AUG 2019 to assess the Maritime situation in reference to the IHO Capacity Building process. The itinerary for the visit was arranged by the Acting Director of the Bureau of Marine Transportation, William "Hayes" Moses. The itinerary included visits with Palau Automated Land Resources Information Systems (PALARIS), the Coral Reef Research Foundation, Department of Law Enforcement and Conservation, Bureau of Tourism, Bureau of Marine Resources, Bureau of Marine Transportation and multiple other stakeholders during the Technical Visit. It was clear during the Technical Visit that Palau has made some advances in hydrographic capability during the last few years. This will help move them further in the direction of one day building a fully functional Hydrographic Office doing everything from MSI, to hydrographic surveys, to producing nautical charts.

- ii. Marshall Islands Technical Visit - NGA Analysts representing the IHO participated in a Technical Visit to the Marshall Islands during the week of 19-23 AUG 2019 in order to assess the Maritime situation in reference to the IHO Capacity Building process. The itinerary for the visit was arranged by the Port Authority for RMI, Mr. Thomas Madison. The itinerary included visits with the Marshall Islands Marine Resources Authority, Coastal and Community Affairs, Office of Maritime Administrator, RMI Environmental Protection Authority, the US Embassy, USAID, the National Disaster Management Office, RMI Port Authority, and other stakeholders during the Technical Visit. It was clear during the Technical Visit that the Marshall Islands has made some advances in hydrographic capability during the last few years. This will help move them further in the direction of one day building a fully functional Hydrographic Office doing everything from MSI, to hydrographic surveys, to producing nautical charts.
- iii. Maritime Safety Information (MSI) Training – NGA provided instructors to facilitate MSI Training in Jakarta, Indonesia during the week of 09-13 SEP 2019. The MSI course is an important first step for building that phase 1 Capacity Building capability within a country. The MSI training course consisted of students from throughout the EAHC and SWPHC regions, hosting 21 participants from 12 different countries. These MSI training courses are coordinated between the CBSC and the Regional Hydrographic Commission (RHC). There is a vetting and enrollment process that takes place for this course between the CBSC and RHC.



*Figure 7.1: Indonesia MSI Training Photo*

## 7. OCEANOGRAPHIC ACTIVITIES

### 7.1 Crowdsourced Bathymetry

Crowdsourced bathymetric data can be used to identify areas where nautical charts are inadequate and proper hydrographic surveys are needed or can be applied to nautical charts when the source and uncertainties of the data are well understood. The key to

successful CSB efforts are volunteer observers who operate vessels-of-opportunity in places where charts are poor or where the seafloor is changeable and hydrographic assets are not easily available.

NOAA provides financial support for the IHO-initiated project to develop a global database for crowdsourced bathymetry hosted by the IHO Data Centre for Digital Bathymetry (IHO DCDB). The IHO DCDB, co-located with NOAA's National Centers for Environmental Information (NCEI), is building the infrastructure necessary to provide archiving, discovery, display and retrieval of global crowdsourced bathymetry data from mariners around the world. The online database can be found at [https://maps.ngdc.noaa.gov/viewers/iho\\_dcdb/](https://maps.ngdc.noaa.gov/viewers/iho_dcdb/).

The vision is to tap into the enthusiasm for mapping the ocean floor by enabling trusted mariners to easily contribute data to fill the gaps in our current bathymetric coverage. NOAA and NGA are active participants in the IHO Crowd-Sourced Bathymetry Working Group (CSBWG), and together, with other CSBWG members, they have written a CSB Guidance Document for layman mariners who wish to collect and contribute CSB data to the IHO DCDB. This document will provide volunteer collectors with information about CSB, the installation and use of CSB data loggers, data quality issues, and instructions for submitting the data to the IHO data repository.

## **7.2 GEBCO/IBC's activities, GEBCO Seabed 2030 activities**

The United States participates on the IOC-IHO Guiding Committee for GEBCO, and hosts the IHO Data Centre for Digital Bathymetry at NOAA's National Centers for Environmental Information (NCEI) (formerly the National Geophysical Data Center, NGDC).

Seabed 2030 was officially launched at the United Nations Ocean Conference in 2017. Seabed 2030 (<https://seabed2030.gebco.net/>) aims to bring together all available bathymetric data to produce the definitive map of the world ocean floor, at the best possible resolution within practical limits, by 2030 and make it available to all. It builds on more than 100 years of GEBCO's history in global seafloor mapping. The project seeks to encourage both data collectors and data managers of governmental, academic and private interests to work together to improve the quality of publicly available data and grids of the ocean floor.

The Seabed 2030 project has great potential to create partnerships and cooperation between interested parties, significantly improving our understanding of the sea floor and empower sustainable ocean management in the coming century.

# **8. SPATIAL DATA INFRASTRUCTURE**

## **8.1 Status of MSDI**

The United States actively supports MSDI within the country as well as regionally, and internationally. The MSDI capability is important for supporting those non-traditional users of Maritime Safety data to allow them to complete their environmental research, port development, or disaster support projects. The US MSDI efforts help build a larger

community of users for this marine data than the traditionally intended hydrographers and cartographers making Safety of Navigation products and data.

## 8.2 Involvement in Regional or Global MSDI efforts

- i. IHO - The International Hydrographic Organization Data Centre for Digital Bathymetry (IHO DCDB) was established in 1988 to steward worldwide bathymetric data on behalf of the IHO Member States. The Centre provides long term archive of and access to single and multibeam deep and shallow water ocean depths contributed by a range of mariners. The IHO DCDB welcomes bathymetric data and metadata, accepts descriptions and spatial footprints of data that is already online and of data that are not publicly available to provide easy search and discovery. Information can be obtained at <https://www.ngdc.noaa.gov/iho/>.

The U.S. holds active roles in supporting the work of several international MSDI-focused working groups:

- IHO MSDIWG
  - UN-GGIM Marine Geospatial Information Working Group (MGIWG)
  - Open Geospatial Consortium Marine Domain Working Group (Marine DWG)
- ii. Marine Spatial Data Infrastructures – Concept Development Study (MSDI-CDS) - NGA is supporting and organizing a project along with the Open Geospatial Consortium (OGC) on behalf of the IHO and international marine communities. The aim of this project is to assess the current state of data/product management and exchange technologies used in the marine domain. The knowledge gained from the CDS is now captured in a technical report that will provide the foundation for development of a potential future pilot that will in turn advance the state of Spatial Data Infrastructures (SDIs) that support marine data across the globe. Over the last year there have been several workshops, meetings, and a survey completed to support this effort. The survey responses will provide identification of gaps, and definition of core components of an SDI to be referenced by IHO MSDIWG and used to define reference use-cases and scenarios for use in future pilot activities.

The final engineering report can be found on OGC's website here:

<https://www.opengeospatial.org/docs/er>

Direct link to download PDF here: [https://portal.opengeospatial.org/files/?artifact\\_id=88037](https://portal.opengeospatial.org/files/?artifact_id=88037)

## 8.3 MSDI National Portal

National Marine Spatial Data Infrastructures (NMSDI) - The Federal Geospatial Data Committee (FGDC) is an organized structure of federal geospatial professionals that provide executive, managerial, and advisory direction and oversight for geospatial decisions and initiatives across the United States federal government. FGDC works collaboratively with federal, state, and local governments, non-Federal collaborates,



communities, constituents, and professional bodies providing the enabling foundation of standards, data catalogs, partnerships, and tools that make up the National SDI (NSDI). For more information visit: <https://www.fgdc.gov/>.

Related to MSDI is the U.S., “MarineCadaastre.gov.” This is an integrated marine information system that provides data, tools, and technical support for ocean planning. The team for MarineCadaastre.gov continually works “to increase access to data through data and map services. The services are designed to deliver data without replication and directly from the 21 sources.” MarineCadaastre.gov supports complementary efforts: Digital Coast, Data.gov, and Geoplatform.gov (a FGDC initiative). For more information see: <https://marinecadaastre.gov/>.

## 9. INNOVATION

### 9.1 Use of New Technologies

- i. NGA Data Centric Production Transition – NGA is in the process of moving to a data centric production environment from the traditional product centric production environment. This development will create some efficiencies in the production process by removing some of the duplication found in the product centric model.
- ii. NGA DNC to ENC Production Transition – In the next few years NGA will transition from producing the DNC product as the primary digital navigation product to ENC. This will bring NGA into line with the international community and allow for easier sharing of digital data with other hydrographic offices and provide a common operating picture when working together with other foreign partners.

## 10. OTHER ACTIVITIES

### 10.1 EarthDEM

NGA is teaming up with the University of Illinois, the University of Minnesota, and The Ohio State University to produce digital elevation models of the world via a project called EarthDEM being worked through the National Science Foundation (NSF). The project will be accomplished by feeding images from different angles into the Blue Waters supercomputer for processing and creation of a 3-D Model of the Earth’s surface. This supercomputer is capable of performing more than 13 quadrillion calculations per second. This project comes after recent successes with creating DEMs over the large Arctic and Antarctic regions in the last few years. This EarthDEM data is important for allowing more accurate geospatial modelling around the world.

## 11. CONCLUSIONS

The multiple agencies, responsible for the management of U.S. domestic and international hydrographic products, services, and maintenance must continue to strive to work with one another to achieve proper balance of management of U.S. domestic and international hydrographic products, services, and maintenance. With the ever-increasing maritime commerce, this is especially important in the SWPHC Region.

# ANNEX A

## NOAA CERTIFIED RASTER CHART (PAPER CHART) PRINTERS

Company	Contact	BC	FO	UO	WP
<a href="#">1-World Globes &amp; Maps</a>	877-884-2402				
<a href="#">Bluewater Books &amp; Charts</a>	954-763-6533				X
<a href="#">Datema Nautical Safety</a>	+31 (0)596 63 52 52				
<a href="#">Eagle Enterprises Safety Solutions</a>	800-478-2331				
<a href="#">East End Blueprint and Reprographics Services, LLC</a>	631-726-2583				
<a href="#">East View Geospatial</a>	877-856-6705	X	X	X	X
<a href="#">Frugal Navigator</a>	509-426-4472		X		
<a href="#">Granville Printing</a>	203-254-3090				
<a href="#">HanseNautic / NV Chart Group GmbH</a>	+49 (0)4351 46 999 50				
<a href="#">Hyannis Marina</a>	508-790-4000 x 2				
<a href="#">Map House</a>	tstromberg@maphousestudio.com				
<a href="#">Maptown</a>	403-266-2241 / Toll-free 1-877-921-6277				
<a href="#">Marine Press</a>	514-866-8342			X	
<a href="#">Maritime Services Ltd.</a>	888-387-8667				
<a href="#">Milwaukee Map Service, Inc. (Meacham Enterprises)</a>	800-525-3822				
<a href="#">My Nautical Chart</a>	401-499-3842				
<a href="#">Nautischer Dienst</a>	49431331772				
<a href="#">Nautisk - A StormGeo Company</a>	4.41455E+11				
<a href="#">OceanGrafix</a>	877-562-4278	X	X	X	X
<a href="#">Pacific Publishers</a>	912-472-4373				X
<a href="#">Paradise Cay Publications</a>	707-822-9063	X	X		X
<a href="#">Richardson's Maptech (Edgewater Marine Ind., LLC)</a>	508-990-9020				X
<a href="#">Stanfords</a>	+44(0) 207 759 7150				
<a href="#">The Binnacle</a>	800-665-6464				
<a href="#">The Blueprint Shop</a>	850-224-2699				
<a href="#">The Copy Shop</a>	770-682-6600				
<a href="#">The Great Frame Up</a>	(843) 815-4661				
<a href="#">The Mailbox Store</a>	910-399-8550				
<a href="#">The Map Shop</a>	800-532-6675	X		X	X
<a href="#">Todd Navigation</a>	+44(0) 28 9146 6640				
<a href="#">TrakMaps</a>	1-877-861-8725				X
<a href="#">Waypoints</a>	510-769-1547				
<a href="#">Weilbach A/S</a>	+45 33 34 35 60				
<a href="#">William &amp; Heintz Map Corporation</a>	800-338-6228		X		

Additional Services:

Book Chart (BC), Folio Charts (FO), User Overlays (UO), Waterproof Charts (WP)

## ANNEX B

### US IHO Representation (2020)

Acronym	Name	NGA Rep.	NOAA Rep.	NAVY Rep.
<b>IRCC</b>	Inter-Regional Coordination Committee	Keith Dominic	John Nyberg	Matthew Borbash
<b>HSSC</b>	Hydrographic Services and Standards Committee	Albert Armstrong	Dr. Neil Weston	Ray Sawyer
<b>S-100WG</b>	S-100 Working Group	Josh Clayton	Julia Powell	David Brazier
<b>ENCWG</b>	S-101 ENC (S-101) Working Group	Eric Lee	Megan Bartlett	
<b>S-102 subWG</b>	S-102 Sub Working Group	Dave Armstrong	Julia Powell	
<b>ENCWG (S- 101)</b>	ENC	Albert Armstrong	Megan Bartlett	
<b>NIPWG</b>	Nautical Information Provision	Mike Kushla	Tom Loeper	
<b>NCWG</b>	Nautical Cartography	Sean` McGurgan	Colby Harmon	
<b>DQWG</b>	Data Quality	Chris Petrof	Sean Legeer	
<b>MSDIWG</b>	Marine Spatial Data Infrastructure	Sebastian Carisio	Patrick Keown	
<b>TWLCWG</b>	Tides & Water Levels and Surface Currents	Doug Roush	Kurt Hess Peter Stone	
<b>HDWG</b>	Hydrographic Dictionary	Albert Armstrong		
<b>ABLOS</b>	Advisory Board on Law of the Sea	Steve Keeting		
<b>WWNWS</b>	World Wide Navigational Warning Service	Chris Janus		
<b>CBSC</b>	Capacity Building Sub-Committee			Calvin Martin
<b>WEND</b>	World Wide ENC Database	Gerry Walter	John Nyberg	
<b>IBSC</b>	Int'l Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers		Andy Armstrong	
<b>GEBCO</b>	General Bathymetric Charts of the Ocean	Russ Ives		Ray Sawyer
<b>CSBWG</b>	Crowd Sourced Bathymetry Working Group	Whitney Anderson	Jennifer Jencks	
<b>SCRUM</b>	Sub Committee on regional undersea mapping	Russ Ives		
<b>TSCOM</b>	Technical Sub Committee on Ocean Mapping	Russ Ives		
<b>SCUFN</b>	GEBCO Sub Committee on Undersea Feature Names	Trent Palmer		