AGGRESSIVELY MAP the Nation's Shorelines and Navigationally Significant Waters: (page 7-11)

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Group #1 Aggressively Map the Nation's Shorelines and Navigationally Significant Waters

Finding 1:

NOAA is unable to meet the nation's need for updated marine navigation information, primarily because NOAA resources to deliver Navigation Services have not kept pace with U.S. Marine Transportation System (MTS) growth.

U.S. waters and coasts have never been fully surveyed, including significant navigation areas, leaving the Marine Transportation System at risk when transiting U.S. waters. At current production levels, NOAA is unable to meet the nation's need for marine navigation information, primarily because NOAA funding for Navigation Services has never been at adequate levels and production levels continue to decline with reduced or static funding.

Since 1970 when NOAA was established, the number of commercial, military, and recreational vessels sailing in U.S. waters has increased significantly. More than 95% of U.S. foreign trade by weight moves by sea, and 2 billion tons of cargo moves each year through U.S. ports. Since 1955, maritime trade has doubled and the nation's volume of international trade has nearly quadrupled. In addition, changes in the Arctic are leading to the emergence of new Arctic trade routes. Despite the recent decline in economic growth, container traffic coming in to the U.S. is never-the-less expected to increase substantially particularly with the project to expand the capacity of the Panama Canal. As the world's leading trading nation, the United States' future depends on the quality of our port infrastructure and our ability to deliver goods efficiently, safely, and cost-effectively. Significantly, the Department of Transportation's *1999 Report to Congress: An Assessment of the U.S. Marine Transportation System* noted, "The greatest safety concern voiced at the Regional Listening Sessions and the November MTS National Conference related to the availability of timely, accurate, and reliable navigation information."

Ironically, NOAA's in-house hydrographic survey capacity decreased 64% in the 1990's, from a highwater mark of 11 NOAA hydrographic ships operating in US waters. Today NOAA operates three hydrographic surveying ships, two of which are over 40 years of age, with one additional ship scheduled to come on-line in 2010. Contract support has replaced some of the lost survey ship capacity, but the scope of NOAA's surveying responsibility of U.S. waters is extremely vast. In fact, U.S. coastal waters have never been completely surveyed, and for the areas that have been surveyed, approximately 50% of the sounding data shown on NOAA nautical charts is pre-1940, and was collected by antiquated leadline soundings and wire drags. With three to four ships plus current funding levels for complementary contract efforts, it will take NOAA over 100 years to fully update, using modern sonar technology, hydrographic data for the navigationally significant areas of U.S. waters that have currently have charts partly composed of data obtained by obsolete methods such as leadine soundings.

It is NOAA's hydrographic surveys that form the basis of the navigation data on official nautical charts required on vessels greater than 1600 gross tons. It is NOAA's full-bottom coverage surveys that alert mariners to the depths, rocks, wrecks, and other obstructions they must avoid to reduce risk of accident and damage to life, property, and the environment. But against the backdrop of even NOAA's priority surveying focus — the 500,000 square nautical miles of navigationally significant EEZ waters deemed most in need of survey — NOAA has resources to accomplish roughly only 3000 SNM a year between contract and in-house vessels. This equates to less than 1% of navigationally significant area surveyed each year. At this rate, it will take over 100 years to survey just the areas routinely transited by commercial shipping, ferries, cruise ships, Navy and Coast Guard vessels, and other ships whose contributions to the economy and defense are so critical. This is a concern, as mariners continue to strike uncharted obstructions and NOAA hydrographic surveys discover over 2.5 hazards per day. Furthermore, each year additional areas are identified for resurvey due to natural shifts in sea bottoms and water depths caused by such phenomena as currents, hurricanes, glacier melts, and earthquakes. To help address these concerns, NOAA's current goal, which is fully supported by the HSRP, is to achieve the capacity to both survey and process the data for 10,000 square nautical miles (SNM) of seafloor annually. This would put the navigationally significant areas on a 50-year resurvey cycle – arguably still an inadequate schedule from the commercial shipping perspective - but an objective the HSRP believes achievable with current technologies and sufficient resources.

Comment [rla1]: Still need to fact check this information. HSD referred me to MCD.

The HSRP recognizes that NOAA needs funding to correct the fundamental problem of the agency's aging fleet of survey vessels. NOAA's current 20 ships support a wide range of operational and research missions, from fisheries services to oceanography, and atmospheric research programs to hydrographic surveying, but each platform is essentially single purpose. These ships, along with available commercial charters and contracts, meet less than 40% of NOAA's total platform-dependent data collection requirements. These 20 ships are also the only platforms NOAA has to train personnel, build expertise, and test new technologies for efficiency and capacity gains. In addition, they are often pressed into duty to respond to emergency events and Homeland Security support. The NOAA fleet is not young. Over the next 14 years, 13 of NOAA's ships will reach or exceed their 30-year service lives; two of NOAA's four hydrographic ships fall into this category, and in fact are currently both over 40 years old. While the HSRP is glad to see that NOAA has developed a fleet replacement plan, we are concerned that it does not fully address the needs for hydrographic survey vessels. For example, the Fairweather is scheduled to be retired at an age of 50 years in 2018, but a replacement vessel is not scheduled to begin operations until 2024, a gap of six years.

Building, maintaining and fostering hydrographic expertise is a primary HSRP concern. The HSRP believes it is in the best interest of the Nation for NOAA to maintain and build on its current core competencies in hydrographic surveying in order to protect valuable coastal resources and promote safe maritime commerce. The Nation looks to NOAA for it's expertise in hydrography. However, recruiting new staff and maintaining seasoned hydrographers and physical scientists is currently a challenge for NOAA. Fostering a robust core capability in hydrography through hands-on experience aboard NOAA ships, providing educational opportunities to advance careers, and establishing a lifetime career path with set goals and milestones builds a seasoned staff of dedicated hydrographers competent not only to conduct surveys and analyze tides, but also to provide oversight of contract surveys, evaluate new

equipment, and provide national and international leadership. By defining a career path in hydrography, NOAA will attract new recruits, retain talented staff and develop hydrographers into seasoned professionals that will continue the NOAA tradition of providing selfless service to the Nation and lead the international hydrographic community. In the HSRP's view, maintaining NOAA's core hydrographic competency necessarily includes a fleet of modern hydrographic survey vessels. NOAA must replace its aging hydrographic survey ships on schedule to sustain current capability and avoid diminishing critical expertise in a function so key to U.S. economic security. The HSRP recommends that NOAA further consider the replacement schedule for hydrographic survey vessels before implementing their fleet recapitalization plan, in order to chart the course for a sustainable solution to NOAA's hydrographic survey fleet requirements.

NOAA should also look internally for efficiencies, such as fully equipping its entire fleet with bathymetric surveying capability, overhauling its vessel operational and staffing models for maximum efficiency, and replacing its aging single-purpose vessels with new multi-mission platforms to increase productivity and minimize redundant efforts. Mobilization to a project area is often the single largest cost borne by a program, so the more missions that can be served by one project, the greater the value per dollar spent. Modern survey platforms equipped with an array of modern sensors will not only efficiently obtain detailed bathymetric data for updating nautical charts, but also provide data for many other uses and reduce the redundancy of data collection efforts by other agencies. From the HSRP's perspective, enabling more NOAA platforms to function as hydrographic survey vessels expands the reach and capacity of NOAA to map U.S. waters, even if only on transits to and from distant research destinations.

Equally important, NOAA must increase its capacity to contract for hydrographic surveys. There is simply no way to achieve surveying10,000 square nautical miles of navigationally significant waters a year without contract support. The HSRP has scrutinized NOAA's updated policy on contracting for hydrographic surveying (NOAA policy on Ocean and Coastal Mapping) and applauds NOAA's commitment to leverage its own surveying capabilities through contracting. Since 1994, NOAA's funding for survey contracts has risen from $0 to approximately $30 million per year, roughly half of its budget for hydrographic data collection. Through supplemental funding from the Gulf of Mexico Marine Debris Project for hurricane debris mapping and the American Recovery and Reinvestment Act (ARRA), hydrographic surveying efforts reached an all time high of 4,677 square nautical miles in 2009, with 1,459 square nautical miles of survey work accomplished through ARRA funding. Despite this impressive progress, the base funding levels for NOAA remain the same, supporting a survey rate of less than 3,000 square nautical miles per year. NOAA needs to continue to aggressively pursue increased funding levels and efficiencies in its contracting process to increase its capability to expeditiously contract for hydrographic services.

Similarly, NOAA's shoreline mapping effort is also falling short due to the scarcity of funding. The HSRP recognizes that shoreline and hydrographic surveys are closely linked. Shoreline data is integral to NOAA's Electronic Navigational Chart requirements for digital data — ensuring the accuracy of this electronic product — as well as for innumerable uses in Geographic Information Systems. Outdated shoreline information depicted on nautical charts poses significant hazards to the nation's commerce, transportation, and recreational boating sectors navigating along the coast. Frequently hydrographers engaged in survey operations to update

Comment [rla2]: This paragraph might do well to have some reorganizing so the flow makes better sense.i.e. discuss the national shoreline before the problems with the shoreline. Someone is free to take a crack at this.

nautical charts find that they are navigating across areas charted as land. In addition, due to these large shoreline changes, the hydrographers are discovering dangers to navigation (such as wrecks or pipes either emerging from the water or shallowly submerged) which on current charts are displayed as being on land, but in reality, are in the water. The rate of change of shoreline is faster than the rate of shoreline surveying, resulting in miles of difference between shorelines depicted on charts and the real world location of the current shoreline. One of NOAA's critical missions is to survey the 95,000 miles of U.S. coastline and to provide the nation with an accurate, consistent, up-to-date national shoreline. The national shoreline provides the baseline data for demarcating U.S. marine territorial limits, including the EEZ (exclusive economic zone), and the geographic reference and detail needed to manage coastal resources, respond to emergencies, and perform damage assessments, along with many other uses, not the least of which is marine navigation. NOAA's shoreline data are considered authoritative when determining the official boundaries for the United States. Therfore, an accurate shoreline is critical.

Despite the growing need for accurate shoreline across many disciplines, NOAA's Shoreline Mapping base budget has remained relatively static for many years. NOAA's ability to collect hydrographic data has outstripped its capacity to collect shoreline data, but both datasets are required to update the same nautical charting products. This means that charts showing updated bathymetry do not always have updated shorelines, decreasing the overall accuracy of the updated product. Currently NOAA and its contractors can evaluate and remap only 12% of priority port area shoreline annually, falling well short of NOAA's program target of 20% each year. The bulk of the 95,000 miles of U.S. coast is open shoreline, which NOAA can currently map at a rate of only 3% a year. Some U.S. shoreline, primarily in Alaska, has never been mapped to modern standards (see Figure X). There are also many charted areas that have changed significantly since they were last mapped (see Figure X). The HSRP strongly supports NOAA's stated goal of mapping the shoreline of major port areas every 5 years, with open shoreline surveyed on a 10-year cycle.

The HSRP also notes that NOAA's future success in nautical charting depends on its ability to both collect and rapidly process more data. NOAA must accelerate its data flow "pipeline" to reduce the time it takes to get information charted and disseminated in a timely manner. The most costly and labor-intensive elements of a nautical chart are hydrographic and shoreline data collection and processing efforts, including applying the needed water level correctors so that soundings can be corrected to the chart datum MLLW(Mean Lower Low Water). However, technology advances in data acquisition have created a situation wherein, given its current allocation of resources, and even with improvements in the process, NOAA still collects data much faster than it can process and compile the data into navigation products. For example, modern multibeam sonar surveys obtain millions of soundings per hour, resulting a vast amount of data, and in 2007, NOAA had over 350 surveys in the queue awaiting verification and compilation (data processing) and it took on average 16 months to fully package and disseminate the data to the mariner. Today, NOAA has less than 200 surveys in the queue and production time has been cut in half. The HSRP is pleased to see the significant improvement in the time period from data collection to chart delivery, but urges NOAA to continue to take steps to remedy the situation.

Although NOAA forwards dangers to navigation to the mariner in short order, the delay in delivering the full data set is unacceptable. Implementing technology improvements to the data flow supply chain now will help eliminate the processing backlog and reduce the risk of accident due to outdated navigation information. A significant contribution to delays in getting soundings on the chart can be eliminated by the use of space based technology (GPS) to determine water levels in near real time, improving vertical accuracy and reducing the time required to get data on the chart. To this end, HSRP supports NOAA's efforts to increase partnerships with qualified private contractors and collaborations with the private sector and academia, such as the NOAA/University of New Hampshire Joint Hydrographic Center on technology research and development, to achieve its goals.

To conclude, NOAA should take a more aggressive approach to shoreline and hydrographic data collection and processing. The HSRP recognizes that resources are scarce government-wide, but the cost of adequately funding NOAA to do its job pales beside the costs of incident response, clean-up, environmental damage, litigation, and the lost lives, property, and revenues that can result if a passenger ship, oil tanker or other vessel grounds or strikes an obstruction. The HSRP strongly believes that the critical and growing national needs for updated hydrographic surveys and shoreline maps demand an increase in productivity and justify the necessary increase in public investment. In an ever-changing marine environment, modern and up-to-date hydrographic products significantly reduce operational risk and improve safety for users of NOAA navigation data.

Recommendation 1

The HSRP recommends that NOAA aggressively survey and map the 500,000 square nautical miles of navigationally significant areas at a rate of 10,000 square nautical miles per year and the 95,000 miles of shoreline at a rate of 9,500 miles per year (this including evaluating and remapping 20% of the priority port area shoreline) by:

- Expanding funding for NOAA's in-house and contract survey capabilities to acquire and process more hydrographic and shoreline mapping data;
- Developing a lifetime career program that fosters the hydrographic profession and continues the NOAA tradition of National and International leadership in hydrography;
- Implementing more efficient surveying, mapping and processing techniques and technologies through the application of both in-house and external development; and
- Replacing aging single-purpose hydrographic ships with modern, multi-purpose vessels to further maximize use and reach of NOAA resources.

Graphs/Diagrams

a) ~~**Exclusive Economic Zone**~~ – Replace with *image that depicts age of navigation data around us. (Jim Crocker OCS is good resource) want to show the age of navigational data in the US – map like that we saw for AK, need to see if this will show data well – another option is show age of oldest data in areas – if this does not work out – still delete the image*

b) **NOAA's Charting and Surveying Responsibility in Square Nautical Miles** (Redo graphic in to bar graph or pie chart – current figure seems over clever and hard to understand. See if there

are other images available that could be used instead. 12/8/09: If not time to redo, go ahead and use the figure as is. (this is the most likely scenario)

c) ~~**NOAA Ship Projected End of Service Without Designated Replacements**~~ (DELETE: This graphic is no longer relevant –remove –as now have a replacement plan, updating the figure not relevant.(
d) **State of the National Shoreline** (12/8/09: If possible, see if Mike Aslasken can update the figure. If not , go ahead and use as is.
e) **Satellite Image showing shoreline changes** (Get a better shoreline picture if possible from Mike A. See what he might have. Otherwise – still use the image.)
f) ~~**Figure of chart showing chart corrections**~~ Delete: Replace with Columbia River example – this will be in sidebar – so do not need this photo as a stand along anymore.
g) ~~**Photo of NOAA cartographer updating ENC:**~~ Delete – image is outdated – i.e. see computer screen
h) **New image:** take Jon Dasler image (pdf) from old report showing NOAA funding through the years and other charts (if applicable) and update and add to the chapter. Unlikely to occur given time constraints.

Photo: consider adding photo of Secretary Locke at Norfolk ARRA event – one of him on ship with equipment…contact OCS folks for good photos and consider using.

Sidebars

~~**Recent NOAA Research and Development Technology/Process Improvements in Collaboration with the Public/Private Sector**~~ 12/8/09: DELETE Group decided to remove the current sidebar and replace it with a more generic sidebar providing specifics on an example or two. Andy Armstrong planning to write this. Jon Dasler sent him the Oct 2009 Professional Surveyor article about NOAA AUV use as a possible example. (at this point – probably best to move on without the sidebar)

NEW sidebar: Shoreline Surveys not Keeping Pace with Rate of Shoreline Change

(Add this new sidebar written by Jon Dasler)