

**Subactivity: Navigation Services**  
**Line Item: Mapping & Charting**

**GOAL STATEMENT:**

NOAA's National Ocean Service (NOS) will reduce the risks to life, property and the coastal environment and enhance NOS' role of coastal stewardship by providing a comprehensive set of products and services to meet the Nation's need for accurate and up-to-date marine navigation information.

**BASE DESCRIPTION:**

NOAA's Mapping and Charting Program is carried out by the Office of Coast Survey. Established by President Thomas Jefferson in 1807, the Coast Survey celebrates its 200<sup>th</sup> anniversary this year as the oldest scientific organization in the U.S., with a long history of supporting and facilitating maritime commerce. Today, it continues to support safe and efficient transportation in U.S. waters by delivering navigation products to meet the needs of vastly larger ships carrying people, cargo and hazardous materials. NOAA collects, manages, and maintains a variety of marine data important to navigators, including the nature and form of the coast, the depths of the water, general character and configuration of the sea bottom, locations of dangers to navigation, the rise and fall of the tides, and locations of aids to navigation. These data enable NOAA to construct and maintain the national suite of 1,000 nautical charts, and develop other products such as the Coast Pilot publication, which is a series of books that supplement the nautical charts with valuable information difficult to portray on a chart (e.g. channel descriptions, ice conditions, pilotage). These products support commercial shipping, the fishing industry, U.S. Navy deployment and Coast Guard Homeland Security operations, state and local governments, and recreational boaters throughout the United States. The Mapping and Charting Program also conducts research and development activities to improve the accuracy, efficiency, and productivity of data collection, chart compilation and chart production.

The Mapping and Charting Line Item consists of five primary program elements. Each program element within the Mapping and Charting Line directly supports NOAA's Commerce and Transportation, Weather and Water, and Ecosystems goals. The Mapping and Charting Line Item also includes grant funding for the Joint Center for Hydrographic Excellence (JHC) at the University of New Hampshire, which operates in partnership with NOS. The program serves as a learning center for government and private sector hydrographers, as well as a research and development center for new hydrographic technologies and applications. The JHC is a national center for expertise in ocean mapping and hydrographic sciences.

Program Assessment and Rating Tool (PART): NOAA's Mapping and Charting program was reviewed with OMB's PART during the FY 2005 budget process. As a result, NOAA's Mapping and Charting program continues to develop meaningful long-term outcome and improved efficiency measures.

Base activities support the objective, "Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs" under the Department of Commerce Strategic Goal of "Observe, protect, and manage the Earth's resources to promote environmental needs."

## **NAUTICAL CHARTING PROGRAM**

The Nautical Charting Program is carried out by NOS' Office of Coast Survey (OCS). NOAA is responsible for surveying and charting U.S. and territorial waters to the limits of the Exclusive Economic Zone (EEZ), an area of about 3.4 million square nautical miles. NOAA is authorized by the Coast and Geodetic Survey Act of 1947 to provide nautical charts and products for safe maritime commerce. Title 33 of the Code of Federal Regulations requires NOAA charts be carried on all self-propelled vessels greater than 1600 gross tons. Nautical charts and related navigation publications are the basic tools for marine navigation, ocean operations, and marine resources planning and management. NOAA's digital nautical charting products, such as Electronic Navigational Charts (ENCs), serve as the basic information component required to operate new electronic navigation systems that can meet demands for greater protection of life, property, and the environment, as well as significantly improve the efficiency of maritime commerce. Products like NOAA's ENCs give the user more complete and valuable information than the paper chart, and can provide much greater accuracy than existing chart products. More than just a picture, ENCs are essentially a database of chart features that can be intelligently processed and displayed by electronic charting systems. An ENC displayed by an electronic charting system, when combined with input from other sources such as GPS and real-time oceanographic data, is able to warn of hazards to navigation and situations where the vessel's current track will take it into danger. The U.S. Coast Guard will promulgate regulations for electronic chart carriage in U.S. waters in 2007.

## **HYDROGRAPHIC SURVEY PROGRAM**

The Hydrographic Survey Program is also carried out by OCS. The program addresses the critical hydrographic surveys needed in U.S. waters. These hydrographic surveys provide the most basic data for the production of nautical charts. Coastal and ocean hydrographic data are also fundamental components of the Nation's Integrated Ocean Observing System. NOAA is responsible for surveying and charting U.S. and territorial waters to the limits of the EEZ, an area of about 3.4 million square nautical miles. In 1994, NOAA identified approximately 510,000 square nautical miles of the U.S. Exclusive Economic Zone as navigationally significant and in need of resurvey. Since that time, NOAA has focused primarily on surveying in the highest priority areas, many of which carry heavy commercial traffic, are less than 30 meters deep, and change constantly. These characteristics significantly increase the risk to marine transportation. However, this critical area constitutes only a small portion (8%) of the entire navigationally significant area used by large commercial vessels and recreational boaters. NOAA's surveying activities employ the latest full bottom coverage sounding technologies to survey the nation's coastal areas for navigation. NOAA utilizes private contractors to supplement its internal resources to conduct hydrographic data collection. All funding for the operation and maintenance of NOAA's hydrographic survey vessels is requested by NOAA's Office of Marine and Aviation Operations.

## **MARINE MODELING AND GEOSPATIAL TECHNOLOGY PROGRAM**

OCS also carries out the Marine Modeling and Geospatial Technology Program, as the research and development focal point for NOAA's mapping and charting work. The program studies advancements in the cartographic, hydrographic, and oceanographic systems used by NOAA to provide products and services for the coastal marine community, particularly in support of safe and efficient navigation and the utilization and protection of the coast. The program develops techniques and methods for the analysis, simulation and accurate real-time prediction of oceanographic, atmospheric and water quality parameters. Projects include estuarine and port modeling and forecasting, coastal modeling and forecasting, and operational data resources. These models are an important contributor to the utility of a national Integrated Ocean Observing System, because they provide the capacity for data integration. The program also develops techniques and technology for improving nautical charts, providing vector data for marine Geographic Information Systems, efficiently and accurately measuring depths, shoreline and bottom characteristics, and locating underwater hazards. Efforts include bathymetric/topographic projects, vector electronic chart standards development, technology advances in shallow-water multibeam and high-speed high-resolution side-scan sonars, and on-the-fly Global Positioning System (GPS) for settlement and squat determination and vertical control of hydrographic surveys.

## **NAVIGATION SERVICES PROGRAM**

Finally, OCS connects with stakeholders through the Navigation Services Program. This Program provides a focal point for customer requests and associated responses on charting issues, conducts fast-response hydrographic surveys to verify chart changes and accuracies, and maintains the Coast Pilot, a supplemental aid to the nautical chart. NOAA Navigation Managers are regionally based representatives who resolve charting and navigation questions, educate constituents on emerging charting technologies and their uses, and solicit feedback on NOAA's navigation products and services from the commercial maritime industry. This face-to-face contact improves NOAA's response to customer needs and issues. NOAA's Navigation Response Teams (NRTs) are another crucial means of connecting with the maritime community. These teams have proven their worth in a number of ways. Established under the guidelines of the Hydrographic Services Improvement Act of 1998, the NRTs are designed to be fully mobile regional survey teams. The NRTs conduct ENC validation surveys, chart discrepancy and shoreline boundary examinations using diving operations, data collection, and mapping support capabilities. Because NRTs operate and are on call 365 days a year, at any hour, they also provide a critical emergency response role for stakeholder survey requests following natural or man-made disasters. NOAA's NRTs perform post-hurricane surveys to ensure safety of navigation and resumption of maritime commerce, survey in the wake of maritime accidents to locate cause and debris, and support Homeland Security efforts through the testing of equipment and the supply of sea bottom data for the Defense Technology Support Working Group, U.S. Coast Guard, and U.S. Navy Mine Counter Measures. NOAA deployed four of its NRTs to the Hurricane Katrina/Rita/Wilma response in order to locate hazards to navigation and re-open impacted ports to maritime commerce and recovery efforts.

## **COASTAL MAPPING PROGRAM**

The Coastal Mapping Program is carried out by NOS' National Geodetic Survey (NGS). The primary objective of the program is to define the national shoreline in support of nautical charting, although the program performs a number of other activities with important applications. The national shoreline is the delineation of the 95,000 miles of U.S. shoreline on a map or in a digital database. Since it is the official U.S. shoreline, measurements must be accurate, consistent, and up-to-date. The national shoreline provides the critical baseline data for defining America's marine territorial limits, including its EEZ, and for the geographic reference needed to manage coastal resources and many other uses. These shoreline data are considered authoritative when determining the official shoreline for the United States. The Hydrographic Services Improvement Act of 1998 provides NOAA with explicit authority to promulgate national standards for all information acquired for nautical charting purposes, which includes shoreline. NOAA recommends that critical portions of the national shoreline around port areas be redefined on a 5-year cycle (a 10-year cycle is recommended for other areas). Products of the Coastal Mapping Program are essential to NOAA's nautical charting program and other environmental programs dealing with the coastal zone.

## **PROPOSED LEGISLATION:**

NOAA will work with Congress to pass the Ocean and Coastal Mapping Integration Act.

**SUMMARIZED FINANCIAL DATA**

(Dollars in thousands)

Subactivity: Navigation Services	FY 2005 ACTUALS	FY 2006 CURRENTLY AVAILABLE	FY 2007 BASE PROGRAM	FY 2007 ESTIMATE	INCREASE / DECREASE
Line Item: Mapping & Charting					
Mapping & Charting Base (CT)	27,233	38,350	36,729	41,839	5,110
Mapping & Charting Base (WW)	-	-	1,879	1,879	-
Seacoast Science Center (COA)	493	-	-	-	-
Joint Hydrographic Center	7,492	7,397	7,424	7,424	-
Marine Modeling & Geospatial Technology	1,084	-	-	-	-
Hydrographic Surveys	1,282	-	-	-	-
Electronic Navigational Charts	4,239	4,241	4,238	6,128	1,890
Nautical Charting	6,406	-	-	-	-
Navigational Services	1,858	-	-	-	-
Shoreline Mapping	2,413	2,415	2,424	2,424	-
Shoreline Mapping-Chesapeake Bay	986	-	-	-	-
Shoreline Mapping-Aerial	986	-	-	-	-
Payment to OMAO	2,753	-	-	-	-
Address Survey Backlog/Contracts	18,727	20,711	20,686	31,173	10,487
Address Survey Backlog-EEZ Outer Continental Shelf Ocean Bottom Claims	2,168	2,170	-	-	-
Address Survey Backlog-Gulf of Alaska	2,463	3,451	-	-	-
Address Survey Backlog-North Pacific	986	-	-	-	-
Address Survey Backlog-North Pacific Maritime Boundary Line	986	-	-	-	-
MS/LA Digital Coast	789	986	-	-	-
Vessel/Time Charter	1,971	11,687	-	-	-
Dune System Assessment & Shoreline Change Analysis	-	493	-	-	-
Coastal Environmental Mapping Consortium	-	789	-	-	-
River Studies	-	740	-	-	-
Subtotal: Mapping & Charting	85,315	93,430	73,380	90,867	17,487
<b>TOTAL</b>	<b>85,315</b>	<b>93,430</b>	<b>73,380</b>	<b>90,867</b>	<b>17,487</b>
FTE	246	318	318	323	5

Note: The dollars in this table represent budget authority.

## **PROGRAM CHANGES FOR FY 2007:**

**Mapping and Charting (5 FTE and +\$5,110,000):** An increase of \$5,110,000 and 5 FTE, for a total of \$41,839,000, is requested to improve NOAA's service delivery to users of marine navigation information. The increase will support NOAA Navigation Response Team (NRT) emergency response capability, the expansion of the National Vertical Datum Transformation Tool, and a reduction in the time it takes to collect, process, and deliver new navigation data to the mariner.

The 2005 hurricane season – particularly Hurricanes Katrina and Rita – highlighted the reliance of the maritime community on NOAA products and services. The NRTs worked for months after the Gulf storms passed, surveying the waters to re-open ports to maritime commerce and facilitate relief and recovery operations. The damage to New Orleans also highlights the need to implement the National Vertical Datum Transformation Tool, or VDatum, to help establish accurate heights for rebuilding levees to adequately protect against a Category 3 or better storm surge. Finally, the rapid changes in water depths, island configurations, and hazards to navigation in the Gulf emphasize the importance of delivering updated navigation data into the hands of mariners as quickly as possible. Hydrographic and shoreline data are the most critical and time-sensitive elements of a nautical chart. Technology advances in data acquisition have created a situation wherein NOAA is able to collect more data than can be processed and applied to charting products in a timely manner. This request for additional investments in hydrographic and shoreline processing and chart application operations will improve the balance between NOAA's capacity to acquire data and its capacity to process that data. The proposed areas of study contribute to NOAA's efforts to: build an Integrated Ocean Observing System (IOOS); modernize ocean data and information systems, and support marine commerce and transportation; and support the President's Ocean Action Plan with respect to IOOS and improving the U.S. Marine Transportation System (MTS).

### **Statement of Need**

MTS users rely on NOAA for navigation products and services to operate in a safe, efficient and environmentally sound manner. The observations that NOAA collects to build its products are also backbone datasets for many other real-world and scientific uses. Storm surge, tsunami modeling, hurricane evacuation route planning, habitat restoration, harmful algal bloom modeling to warn of health risks – a host of coastal and ocean-related activities rely heavily on NOAA's navigation data to protect and improve our lives and the coastal environment.

Supporting safe maritime commerce is NOAA's primary mapping and charting requirement. A fundamental lifeline for the nation's economy, the MTS is growing rapidly. From 1990 to 2003, the value of U.S. international merchandise trade increased an average 6% annually, from \$889 billion to about \$2 trillion (in current dollars). The MTS carried 78% of this trade by weight and 41% by value in 2003, more than any other transportation mode. In fact, two-thirds of all goods purchased in the U.S. come to us via the MTS. These statistics translate into increased commercial ship traffic in all U.S. ports, particularly major ports like Los Angeles/Long Beach, Houston, and New York. Transport of hazardous cargo such as oil, chemicals and liquified natural gas is on the rise as our demand for energy increases.

Vessels in use today have deeper drafts that exceed the depths of many of our ports and harbor channels at lower tides. As these risk factors grow, MTS stakeholders state repeatedly that their highest priority is the need for accurate, timely and reliable navigation information to give a complete picture of the dynamic environment in which they operate.

NOAA's mapping and charting responsibilities include defining the National Shoreline and surveying and charting the 3.4 million square nautical miles of the U.S. Exclusive Economic Zone (EEZ). These responsibilities were first established in 1807 by Thomas Jefferson, and later by the Coast and Geodetic Survey Act of 1947, which requires that NOAA "provide charts and related information for the safe navigation of marine ... commerce." As the nation's dependence on the MTS grows, better navigation information protects lives, cargo and the environment. It is crucial for mariners to know where and when changes occur in the Nation's ports, harbors, waterways, and offshore waters to help prevent accidents and groundings. Reducing these risks can be achieved, in part, by improving the navigation information that NOAA provides to the nation.

### **Proposed Actions**

*VDatum (2 FTE and +\$2,000,000):* NOAA requests \$2,000,000 and 2 FTE to implement the National Vertical Datum Transformation Tool database, or VDatum. This tool supports NOAA's requirement to acquire hydrographic and shoreline data for nautical charting products and to continually improve surveying and data delivery techniques. VDatum will benefit NOAA's modernization efforts in shoreline measurement and hydrographic surveying for navigation safety. In addition, the tool will enable the blending of geospatial datasets among federal/state/local agencies and academia that currently cannot be shared due to disparate reference datums. In places like New Orleans and the Gulf, where the vertical reference system was rendered obsolete by the hurricanes, an accurate VDatum tool is critical to rebuilding adequate protections against certain strength storms.

A datum is the reference level to which geospatial data is gathered. NOAA collects its hydrographic data to a vertical datum of Mean Lower Low Water (MLLW) and shoreline data to Mean High Water (MHW) in the interest of charting for safe maritime commerce and transportation. However, geospatial data is routinely collected at a variety of vertical reference datums for different purposes by other parts of NOAA and many other agencies and entities. FEMA, for example, received \$200M in 2005 and again in 2006 from Congress to collect shoreline data for the purpose of improving flood hazard mapping. Without the ability to correct the vertical datum reference, this wealth of shoreline information is currently unusable to NOAA's charting program. The American taxpayer is poorly served by numerous agencies collecting data that could serve multiple missions but for differing standards of data collection.

To address this problem, NOAA has developed VDatum, a revolutionary vertical datum transformation tool. VDatum translates geospatial data between vertical reference systems and removes the most serious impediments to data sharing. This allows for the easy and accurate transformation of elevation data from one vertical datum to another. VDatum gives NOAA and other mapping agencies the ability to seamlessly integrate geospatial data for numerous critical applications to the benefit of the U.S. public. For example, NOAA, USGS, FEMA, the National Geospatial-Intelligence Agency, and state mapping agencies can share and integrate elevation data for applications such as Homeland Security and natural disaster preparedness.

Developing VDatum to combine onshore and offshore data in a seamless geodetic framework was the primary recommendation of a 2003 National Academy of Sciences report titled A Geospatial Framework for the Coastal Zone that assessed national needs for coastal mapping and charting.

Likewise, the efficiencies and accuracies that could result from kinematic GPS systems cannot occur without National VDatum to transform the data obtained using the Global Positioning System reference system to the appropriate vertical datums required by law for specific data types. To improve the efficiency and accuracy of a hydrographic survey and eliminate the need for time-consuming activities such as tide gauge installation, vessel settlement and squat corrections, and inefficient post-survey-processing, one can use VDatum to transform GPS-referenced depth soundings to MLLW “on the fly,” or while out surveying on the vessel. To not only efficiently derive shoreline from topographic LIDAR (which is now being collected by numerous agencies), but also to derive a shoreline that is more consistently and accurately defined than by any previous measurement technique, one needs VDatum to transform the LIDAR data to the MHW datum.

The requested increase will enable NOAA to transition VDatum from successful demonstration projects in areas such as Tampa Bay, Delaware Bay and South East Louisiana, to a national scale. Airborne, land, and marine platforms will be able to exploit GPS technology for vertical location, fuse GPS height with other remote sensing technologies, and map the national coastline, both above and below water, with greater ease and accuracy. The tool will also improve the efficiency and accuracy of hydrographic surveys for nautical charts by eliminating the need for time-consuming water level corrections and post-processing. VDatum models have multiple uses in addition to mapping. For example, models recently developed for Puget Sound are being used for tsunami inundation applications. They also support sea level rise impact studies and more accurate storm surge inundation maps. In New Orleans and surrounding areas, as new levees are built and old ones are repaired to meet the safety needs of the residents and structures, VDatum will help determine that a levee is at the correct and accurate height.

With the requested increase, NOAA will expand the National VDatum models to approximately 20% of the contiguous U.S. in FY 2007, reaching 100% coverage by 2011. The requested funds will be used to contract for tidal and geophysical modeling expertise, the design and construction of a Web-accessible multi-resolution database, temporary tide gauge installations around the country, and GPS referencing equipment to validate the models. Two FTE are requested to provide modeling expertise across different program areas (oceanographer, geodesist), as well as contract oversight.

Navigation Response Teams (2 FTE and +\$1,810,000): NOAA requests an increase of \$1,810,000 and 2 FTE to maintain and expand the regional component of its Navigation Response Teams (NRTs). The requested increase will allow NOAA to fully staff, train, and implement NRTs 5, 6, and 7, and begin building NRT 8 in FY 2007. The increase request will restore contract support and FTE for full staffing, as well as some funds for NRT launch maintenance and routine equipment replacement. Eight regional NRTs will fulfill the requirement for an adequate distributed capacity to respond within 24 hours to incidents in all contiguous U.S. ports.

NRTs support critical ENC field verification, emergency response activities associated with natural and man-made disasters, support to National Homeland Security activities, and Marine Transportation System constituent requirements. These teams have proven their worth time and again for rapid response surveys of U.S. ports and waterways to reopen ports for relief, recovery, and the restoration of commerce after hurricanes and maritime accidents.

NRT contributions during the response and recovery efforts following the devastating Hurricanes Katrina, Rita and Wilma were widely acknowledged by maritime community stakeholders such as the American Association of Port Authorities and the U.S. Coast Guard. NOAA's response capability is currently compromised by having only six of the planned eight teams up and operating.

The six existing teams are distributed along the Northeast and Southeast Atlantic, the West Coast and Puget Sound, the Great Lakes, and the eastern Gulf of Mexico. NOAA assembled equipment for NRT 7 through an innovative partnership with the Department of Defense technology Support Working Group to test sonar systems for use in Homeland Security assessments. NRT 7 is slated to fill the mid-Atlantic gap. Ports in this area contribute significantly to the economy of the country and homeland security; the largest Navy base in the world is located in Hampton Roads, Virginia. NRT 8 will operate in the central and western Gulf. The charting requirements of the western Gulf have not been addressed in years by NOAA field units. This area is part of the petroleum and chemical products corridor of the country. Spills or other interruptions to cargo movement in this area will significantly impact the nation's environment and economy.

The additional NRTs are also essential to support rotations in and out of a stricken area. As NOAA learned with Hurricane Katrina, the duration of the response required that teams move in and out to avoid exhaustion and health issues from 18-hour days in rough conditions. All NRT personnel were used in this response. If another incident had happened somewhere else in the country, the NRT response capability would not have been there to assist. It is easy to imagine a scenario where NOAA is responding to a major hurricane in 2006, and an oil tanker hits an obstruction in Puget Sound. Without the NRT 7/8 capability, NOAA could not man both incidents adequately.

*Hydrographic and Shoreline Data Efficiencies (1 FTE and +\$1,000,000):* NOAA requests an increase of \$1,000,000 and 1 FTE to develop and operationalize data collection and processing improvements for hydrographic and shoreline data. NOAA's observations and remote sensing work fuel many MTS products and services, but uneven advancement of resources in some parts of the program now necessitates growth in others to smooth the pipeline that puts this information into the hands of users. Recent technology advancements in data acquisition have created a situation wherein NOAA is able to collect more data than can be processed and applied to charting products in a timely manner. For example, the ability to collect hydrographic data has outstripped the program's capacity to collect shoreline data that is also needed to update the same nautical charting products. Rapid and accurate processing of hydrographic data is the key to future success in nautical charting, as emerging technologies acquire terabytes of data per year. Implementing technology improvements now will eliminate the processing backlog and allow data to be collected and processed more efficiently for identifying dangers to navigation.

With the requested funds, NOAA will invest approximately \$560,000 in data management research and technology development to improve the speed and accuracy of data acquisition, and accelerate the delivery of navigation information to the maritime community for safe, efficient, and environmentally sound marine transportation. NOAA will begin to operationalize its research into the benefits of new technologies and delivery mechanisms such as geographic information systems and web-based interactive programs. For example, NOAA is currently developing a prototype Automated Tide Window web-based tool to optimize shoreline data collection flight times.

Eliminating the need for case-by-case determinations of high and low water, the Automated Tide Window will provide direct access to tide information via the Internet and will result in time savings for the flight crew and support personnel, as well as more efficient use of the plane.

Approximately \$200,000 will be used to improve shoreline data updates by procuring commercial satellite shoreline imagery for change analysis. Satellite imagery is a valuable tool for identifying where significant shoreline change has occurred and new data collection is needed. \$240,000 will be used to procure and deploy GPS-enabled buoys to improve the collection of hydrographic data. This effort will reduce the time required to post-process hydrographic data for tide correctors, thereby accelerating delivery of the survey for application to the chart by up to 10 days per survey— a 5% improvement over the delivery time.

**Socioeconomic Analysis (0 FTE and +\$300,000):**

NOAA requests an increase of \$300,000 to analyze its efforts in supporting the nation's commerce with information for safe, efficient and environmentally sound transportation. The increase will enable NOAA to study the socioeconomic value of its products and services in order to validate its requirements and responsibilities, better articulate and quantify the benefits of its programs, and more effectively prioritize NOAA's resource investments.

Industry, public, and government entities involved with commerce and transportation depend on a wide range of NOAA information, products and services. These include NOAA's navigation products and services; weather information for air, marine and surface transportation; positioning capabilities; emergency response to oil/chemical spills and natural disasters; and commercial remote sensing licensing. NOAA knows that these programs provide value to the nation – they help save lives and property, protect the environment and support the economy – but NOAA has not effectively quantified that value, nor can it articulate well the extent to which users rely on these services. Data on the economic value and utility of NOAA's suite of "Commerce and Transportation" goal products and services will help NOAA to set funding priorities and better allocate taxpayer resources.

With the requested increase, NOAA will contract with independent research firms to systematically collect, compile and analyze new or existing data from industry, academia and other Federal, state or local agencies relating to the national socioeconomic benefit of NOAA's Commerce and Transportation-goal related programs. Using a consistent, rigorous, and scientifically defensible methodology, this approach will generate information about the social and economic effects, benefits, and costs of NOAA programs, information and services. NOAA will use these analyses to prioritize products/services/uses, as well as to identify areas requiring more focused research into economic benefits and social science information to meet future user needs.

**Benefits**

Funding the VDatum request will result in VDatum coverage for the contiguous U.S. by 2011 to support more efficient mapping, multi-purpose use of existing datasets, and improved rebuilding of infrastructure dependent on accurate heights. The investment in data collection and processing will improve the accuracy of data acquisition, and accelerate the delivery of navigation information to the maritime community for safe, efficient, and environmentally sound marine transportation.

Currently it takes over 15 months to collect hydrographic data, process it, apply it to the chart and disseminate the chart to mariners. NOAA’s goal is to make the process more efficient such that new data moves to navigation products within 3 months by 2013. A complement of eight NOAA NRTs will ensure adequate response to the surveying emergencies in the nation’s ports and waterways, in order to keep maritime traffic moving, and commerce flowing.

The primary function of NOAA’s mapping and charting data is to support safe and efficient marine navigation, but it also supports multiple NOAA missions and applications, and provides basic data for engineering, scientific and other commercial and industrial activities. NOAA’s hydrographic data is incorporated into the Integrated Ocean Observing System strategy with bathymetric data for marine and coastal areas. In addition, the data addresses the International Hydrographic Organization objective of safety in navigation and the protection of the marine environment. By collecting data more efficiently, NOAA will be better able to meet these requirements.

**Performance Goals and Measurement Data**

This increase will support the objective, “Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs” under the Department of Commerce Strategic Goal of “Observe, protect, and manage the Earth's resources to promote environmental needs. It supports the NOAA Strategic Goal to “Support the Nation's Commerce with Information for Safe, Efficient, and Environmentally Sound Transportation.” The increase will provide NOAA with new technologies that will improve the collection of mapping and charting data, allow for quicker distribution of information to the maritime community and support the following performance measures.

<b>Performance Goal: Commerce and Transportation</b>						
<b>Performance Measure:</b> Average number of days from hydrographic survey data acquisition to navigation product delivery	<b>FY 2005</b>	<b>FY 2006</b>	<b>FY 2007</b>	<b>FY 2008</b>	<b>FY 2009</b>	<b>FY 2010</b>
Without Increase	460	440	400	360	320	280
With Increase	--	--	380	320	260	180
<b>Performance Measure:</b> Cumulative percentage of continental U.S. (coastal areas) included in the National VDatum database						
Without Increase	8%	10%	12%	14%	16%	18%
With Increase	--	--	20%	40%	60%	80%

**Electronic Navigational Charts (0 FTE and +\$1,890,000):** NOAA requests an increase of \$1,890,000 for a total of \$6,128,000 for Electronic Navigational Charts (ENCs) to continue the planned incremental investment in the effort to provide full contiguous ENC coverage of U.S. waters.

NOAA's role in providing the Nation with safe navigation tools is more important than ever, given the rapid growth of the U.S. Marine Transportation System (MTS). As the Nation's dependence on the MTS grows, better navigation information is critical to protect lives, cargo and the environment. It is crucial for mariners to know where and when changes occur in the nation's ports, harbors, waterways, and offshore waters to help prevent accidents and groundings. Reducing these risks would, in part, be achieved by improving the navigation information that NOAA provides to the Nation. GPS technology has advanced to such a degree that mariners are now able to plot their positions on a traditional nautical chart to a degree of accuracy that oftentimes far surpasses the accuracy of the soundings and features on the chart itself.

### **Statement of Need**

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Supporting maritime commerce is NOAA's primary mapping and charting requirement. A fundamental lifeline for the nation's economy, the MTS is growing rapidly. From 1990 to 2003, the value of U.S. international merchandise trade increased an average 6% annually, from \$889 billion to about \$2 trillion (in current dollars). The MTS carried 78% of this trade by weight and 41% by value in 2003, more than any other transportation mode. In fact, two-thirds of all goods purchased in the U.S. come to us via the MTS. These statistics translate into increased commercial ship traffic in all U.S. ports, particularly major ports like Los Angeles/Long Beach, Houston, and New York. Transport of hazardous cargo such as oil, chemicals and liquified natural gas is on the rise as our demand for energy increases. Vessels in use today have deeper drafts that exceed the depths of many of our ports and harbor channels at lower tides. As these risk factors grow, MTS stakeholders state repeatedly that their highest priority is the need for accurate, timely and reliable navigation information to give a complete picture of the dynamic environment in which they operate.

### **Proposed Actions**

At current funding levels, NOAA can maintain only the existing 550 ENC's – only about half of the number required to provide coverage equivalent to NOAA's traditional paper chart suite. The priority is to keep all existing ENC's in continual maintenance rather than to build new ENC's; thus NOAA will stop building ENC's in FY 2006, so that the existing 550 ENC's will not fall behind. Mariners will be able to use ENC's to navigate in the major seaports, but not between them. This increase will allow NOAA to recommence building ENC's in FY 2007, for a total of 620 built and maintained, in order to provide seamless coverage between ports. By 2007, when the U.S. Coast Guard is slated to promulgate electronic chart carriage regulations, NOAA will have 90 percent of all U.S. commercial waters covered by ENC's.

At the requested funding level, NOAA should achieve complete Electronic Navigational Chart coverage for the nation in FY 2010. This funding level will allow NOAA to keep the full chart suite under continuous cartographic maintenance. 100% of the additional funds would be used for ENC maintenance and verification activities.

**Benefits**

ENC's represent a major step forward in providing chart data to mariners for safe navigation in U.S. ports and waterways. They give the user more complete and valuable information than the paper chart, and can provide much greater accuracy than existing chart products. More than just a picture, ENCs are essentially a database of chart features that can be intelligently processed and displayed by electronic charting systems. An ENC displayed by an electronic charting system, when combined with input from other sources such as GPS and real-time oceanographic data, is able to warn of hazards to navigation and situations where the vessel's current track will take it into danger. These highly advanced and accurate digital navigation tools are in demand by mariners to support the electronic bridges now on board ships. NOAA's ENCs are available for free download on NOAA's website at [nauticalcharts.noaa.gov](http://nauticalcharts.noaa.gov).

ENC data may also be used in geographic information systems for a multitude of applications beyond navigation, including port planning, port security, habitat mapping and coastal zone management. In FY 2004 NOAA released a version of the ENC designed for non-navigation users such as coastal zone managers. This version translates the ENC data to a GIS-friendly format so that the resulting product can be used for a variety of non-navigational purposes that involve geospatial analyses.

**Performance Goals and Measurement Data**

This increase will support the objective, "Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs" under the Department of Commerce Strategic Goal of "Observe, protect, and manage the Earth's resources to promote environmental needs. It supports the NOAA Strategic Goal to "Support the Nation's Commerce with Information for Safe, Efficient, and Environmentally Sound Transportation." The increase will provide NOAA with the capacity to maintain more Electronic Navigational Charts to support the maritime community and the following performance measure.

<b>Performance Goal: Commerce and Transportation</b> <b>Performance Measure:</b> ENCs comparable to paper chart suite in continual maintenance (cumulative)	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Without Increase	510	550	550	550	550	550
With Increase	--	--	620	710	840	1000

**Address Survey Backlog/Contracts (0 FTE and +\$10,487,000):** NOAA requests \$10,487,000, for a total of \$31,173,000 to maintain its planned FY 2007 survey schedule to collect and process approximately 3000 square nautical miles of hydrographic data. Specifically, this shift in resources consolidates funds into the Address Survey Backlog line in order to ensure a more efficient and effective Vessel Time Charter program . Funds are requested in this line so the program has the flexibility to address surveying needs and the type of contracts required to support it.

### **Statement of Need**

NOAA's mapping and charting responsibilities include defining the National Shoreline and surveying and charting the 3.4 million square nautical miles of the U.S. Exclusive Economic Zone (EEZ). These responsibilities were first established in 1807 by Thomas Jefferson, and later by the Coast and Geodetic Survey Act of 1947, which requires that NOAA "provide charts and related information for the safe navigation of marine ... commerce." As the nation's dependence on the MTS grows, better navigation information protects lives, cargo and the environment. It is crucial for mariners to know where and when changes occur in the Nation's ports, harbors, waterways, and offshore waters to help prevent accidents and groundings. Reducing these risks can be achieved, in part, by improving the navigation information that NOAA provides to the nation.

Supporting maritime commerce is NOAA's primary mapping and charting requirement. A fundamental lifeline for the nation's economy, the MTS is growing rapidly. From 1990 to 2003, the value of U.S. international merchandise trade increased an average 6% annually, from \$889 billion to about \$2 trillion (in current dollars). The MTS carried 78% of this trade by weight and 41% by value in 2003, more than any other transportation mode. In fact, two-thirds of all goods purchased in the U.S. come to us via the MTS. These statistics translate into increased commercial ship traffic in all U.S. ports, particularly major ports like Los Angeles/Long Beach, Houston, and New York. Transport of hazardous cargo such as oil, chemicals and liquified natural gas is on the rise as our demand for energy increases. Vessels in use today have deeper drafts that exceed the depths of many of our ports and harbor channels at lower tides. As these risk factors grow, MTS stakeholders state repeatedly that their highest priority is the need for accurate, timely and reliable navigation information to give a complete picture of the dynamic environment in which they operate.

NOAA is responsible for surveying and charting U.S. and territorial waters to the limits of the Exclusive Economic Zone (EEZ), an area of about 3.4 million square nautical miles. Because the scope of mapping the entire EEZ is so far beyond NOAA's current capacity, NOAA has evaluated the EEZ to determine which areas are navigationally significant (approximately 510,000 square nautical miles), and of these, which are the top priority for surveying. NOAA has focused primarily on surveying in the highest priority areas, many of which carry heavy commercial traffic, are less than 30 meters deep, and change constantly. Given NOAA's current capacity, it will take over 12 years to survey the most critical areas just once. These critical areas constitute only a small portion (8%) of the navigationally significant area of the U.S. EEZ used by large commercial vessels and recreational boaters. Many mariners rely on outdated or incomplete charting information in navigationally significant areas. NOAA's current capacity to survey the highest priority areas falls well short of national needs for new, highly accurate full-bottom coverage data to support safe navigation.

## Proposed Actions

NOAA will contract the requested funds for hydrographic data acquisition using Brooks Act Architect and Engineering procedures. This increase will allow NOAA to collect approximately 500 additional square nautical miles of data (+20%) in FY 2007. The request will fund turnkey contracts for data acquisition, and does not include funding for a vessel time charter. Turnkey contracts have proven to be the most effective and efficient mechanism for NOAA to complement its in-house capacity to collect hydrographic data.

## Benefits

Hydrographic survey data is the foundation of NOAA's nautical charts, as well as a basic parameter of our national Integrated Ocean Observing System. NOAA is working to reduce the backlog of charted areas in need of survey, and to improve the accuracy of the data collected. NOAA effectively uses contract and in-house resources to survey U.S. waterways for safe maritime transit. Ninety-five percent of America's non-NAFTA trade moves through the marine transportation system. The combination of high vessel traffic, hazardous cargo, and ships operating close to the ocean bottom make accurate navigation information ever more essential for the safety of lives, property and the environment. Requested funding provides critical survey data to directly enhance the safety of mariners, the public, and the Nation's economy.

## Performance Goals and Measurement Data

This increase will support the objective, "Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs" under the Department of Commerce Strategic Goal of "Observe, protect, and manage the Earth's resources to promote environmental needs. It supports the NOAA Strategic Goal to "Support the Nation's Commerce with Information for Safe, Efficient, and Environmentally Sound Transportation." The increase will provide NOAA with the capacity to collect mapping and charting data to improve the accuracy and reliability of navigation information distributed to the maritime community. The increase supports the following performance measure.

<b>Performance Goal: Commerce and Transportation</b> <b>Performance Measure:</b> Reduce the hydrographic survey backlog within navigationally significant areas (snm per year)	FY 2005	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010
Without Increase	3079	2500	2500	2500	2500	2500
With Increase	--	--	3000	3100	3100	3100

**TERMINATIONS FOR 2007:**

The following programs have been terminated in FY 2007: EEZ Outer Continental Shelf Ocean Bottom Claims (\$2,170,000); Alaska Surveys, Current and Tide Data (\$3,451,000); MS/LA Digital (\$986,000); Vessel Time Charter (\$11,687,000); Dune System Assessment and Shoreline Change Analysis (\$493,000); Coastal Environmental Mapping Consortium (\$789,000); River Studies (\$740,000).

**Subactivity: Navigation Services**  
**Line Item: Geodesy**

**GOAL STATEMENT:**

Within the United States and its territories, anyone should be able to obtain centimeter level accuracy in positions (latitude, longitude, and height) anywhere, anyplace, anytime.

**BASE DESCRIPTION:**

The mission of the NOAA Geodesy Program is to evolve and deliver the nation's foundation of reference for positioning activities to support public safety, economic prosperity, and environmental well being. NOAA's Geodesy Program is carried out by the National Geodetic Survey (NGS), which manages the National Spatial Reference System (NSRS) – the national coordinate system that specifies latitude, longitude, height, scale, gravity, and orientation throughout the nation. NSRS must continually evolve to meet the growing demand for more accurate, timely, and consistent positioning services. The Geodesy Line Item can be grouped into five major overlapping program elements: Permanent Network infrastructure, Continuously Operating Reference Stations (CORS) support, Height Modernization, Data Access and Outreach, and Tool and Model Development. Each program element within the Geodesy Line directly supports NOAA's Commerce and Transportation Goal.

Base activities support the objective, "Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs" under the Department of Commerce Strategic Goal of "Observe, protect, and manage the Earth's resources to promote environmental needs."

**PERMANENT NETWORK**

A major component of NSRS is a network of permanently marked points including the Federal Base Network (FBN), the Cooperative Base Network, and the User Densification Network. These networks form a crucial foundation for all geographically referenced activities conducted in the U.S.

NOAA's primary network responsibility is the development of the national geodetic framework, the FBN. NOAA is committed to establishing, observing, monitoring, and maintaining a very high-accuracy, four-dimensional network of monumented stations at a 1 degree by 1 degree (75 km to 125 km) nominal spacing throughout the U.S. and its territories. The network contains additional stations as needed in areas of crustal motion in support of Federal aircraft navigational requirements. The goal of the FBN is to supply the highest level accuracies of geodetic latitudes, longitudes, and heights to benefit all users of positioning services.

## **NATIONAL CORS**

NOAA collects and distributes GPS observational data from a nationwide network of permanently operating GPS receivers. The CORS System, consisting of these stations, a central data facility and a mirror-site in Boulder, CO, make observational data available over the Internet from the network presently consisting of over 500 GPS receivers, with 100% of the conterminous U.S. being within 200 km of at least one CORS. The primary objective of National CORS is to provide local users with ties to the NSRS for post-processing position determination. CORS stations have been positioned, three dimensionally, at the 1-to 3-centimeter level (1/2 to 1 1/2 inches), and are used to greatly improve the accuracy of users' GPS positioning activities through the use of Differential GPS (DGPS) techniques. National CORS primarily serves the surveying, civil engineering, and geographic information system communities for locating, building, monitoring, and maintaining the nation's physical infrastructure in support of the broader national economy.

The US Department of Transportation operates the Coast Guard Maritime DGPS and the Nationwide DGPS. Both systems are used for transportation and navigation and both systems are incorporated into the National CORS network. NOAA, through National CORS, provides the integrity monitoring for these systems, helping to ensure their reliability for real-time transportation applications.

## **HEIGHT MODERNIZATION**

Height Modernization is an NGS-led effort to enhance the vertical aspect of NSRS through the establishment of accurate, reliable heights using GPS technology in conjunction with traditional leveling, gravity work, and remote sensing information. Height Modernization can provide better access to accurate and consistent height data at the local level. Applications that benefit include:

- Sea level rise monitoring,
- Coastal erosion rates,
- Floodplain mapping,
- Storm surge modeling,
- Subsidence and uplift monitoring,
- Pollution trajectory modeling,
- Navigation: under-keel and under-bridge clearance,
- Precision agriculture,
- Structural monitoring: bridges, dams, and buildings,
- Intelligent transportation systems, and
- Surveying and mapping.

NOAA administers the national Height Modernization program through four cornerstone states: California, Wisconsin, Louisiana, and North Carolina (partnering with South Carolina).

In NOAA's plan for national implementation of Height Modernization, these four states will serve as regional leaders for nationwide expansion of the Height Modernization program. Establishing one regional center to serve several states with common issues will establish the program management structure that is more likely to optimize the resources, technology, and benefits.

To fully expand Height Modernization nationwide is an enormous undertaking that will take many years. The task cannot be carried out entirely by the Federal Government. NOAA has been implementing Height Modernization since 1999 through collaboration with state governments, local partners, the private sector, and other federal agencies. NOAA has determined that rather than implementing Height Modernization on a state-by-state basis, a regional approach is preferable for a number of reasons. Many of the elevation issues addressed by Height Modernization are regional in nature. Issues such as coastal and riverine flooding in the Mid-Atlantic, tectonic movement along the West Coast, post-glacial rebound and improved efficiencies of intermodal transportation in the Great Lakes, and subsidence along the Gulf of Mexico, reach across state boundaries to affect entire geographical regions. A regional approach is also a more efficient use of both NOAA and partner funds and workforce.

#### **NSRS TOOLS AND MODELS**

NOAA's NGS develops standards, specifications, guidelines, and best practices for the surveying and positioning industry, as well as a variety of models describing geophysical and atmospheric phenomena that affect spatial measurements. These tools and models are crucial to scientific and commercial positioning activities.

#### **NSRS DATA ACCESS AND OUTREACH**

NOAA's NGS archives and provides access to geodetic control, shoreline, and aeronautical survey data from its own surveys and from cooperating organizations. These data are made available via the Internet on a full time basis. As part of its technology transfer efforts, NGS conducts a series of workshops and constituent forums in various parts of the country. NGS also manages the State Geodetic Advisor Program, which is a cost-sharing program that provides a liaison between NOAA and the host state to guide and assist the state's geodetic and surveying programs. This program covers over half the states, and responds to the states' desire to improve their surveying techniques to meet Federal standards and specifications.

#### **PROPOSED LEGISLATION:**

No legislation is proposed.

**SUMMARIZED FINANCIAL DATA**

(Dollars in thousands)

Subactivity: Navigation Services	FY 2005 ACTUALS	FY 2006 CURRENTLY AVAILABLE	FY 2007 BASE PROGRAM	FY 2007 ESTIMATE	INCREASE / DECREASE
Line Item: Geodesy					
Geodesy Base	20,004	20,016	22,029	21,729	(300)
National Spatial Reference System	1,971	1,943	-	-	-
Height Modernization Regional Expansion - NGS Implementation	247	230	231	231	-
Height Modernization Regional Expansion - AL	-	1,943	-	-	-
Height Modernization Regional Expansion - CA	493	920	924	924	-
Height Modernization Regional Expansion - NC	986	920	924	924	-
Height Modernization Study - MS	591	591	-	-	-
Height Modernization Regional Expansion - SC	-	461	462	462	-
Height Modernization - TX	739	740	-	-	-
Geodetic Survey - AL	1,971	-	-	-	-
Geodetic Survey - AZ	-	494	-	-	-
Geodetic Survey - LA	490	-	-	-	-
Geodetic Survey - KY	493	493	-	-	-
Geodetic Survey - WI	2,957	2,959	-	-	-
Geodetic Survey - WA	493	-	-	-	-
<b>TOTAL</b>	<b>31,435</b>	<b>31,710</b>	<b>24,570</b>	<b>24,270</b>	<b>(300)</b>
<b>FTE</b>	<b>147</b>	<b>183</b>	<b>183</b>	<b>183</b>	<b>-</b>

Note: The dollars in this table represent budget authority.

**PROGRAM CHANGES FOR FY 2007:**

**Geodesy Base (0 FTE and -\$300,000):** NOAA requests a one-year decrease of \$300,000 to fund higher priority projects.

**TERMINATIONS FOR 2007:**

The following programs have been terminated in FY 2007: Height Modernization Study, MS (\$591,000); Height Modernization Regional Expansion Texas (\$740,000); Geodetic Survey, WI (\$2,959,000); Height Modernization Regional Expansion, AL (\$1,943,000); Geodetic Survey, KY (\$493,000); Geodetic Survey, AZ (\$494,000).

**Subactivity: Navigation Services**  
**Line Item: Tide & Current Data**

**GOAL STATEMENT:**

Provide the navigation community with access to real-time data and predictions of current speed and direction, water levels, and meteorological data (wind speed and direction, gusts, barometric pressure, etc.) to enable safer and more efficient vessel routing, flood warnings, emergency response operations to spills of hazardous materials, homeland security, and for real-time control of harbor maintenance dredging.

**BASE DESCRIPTION:**

The Tide and Current Data Program (TCDP) is a significant component of the integrated, comprehensive suite of NOAA information products required by the maritime community to ensure safe and efficient navigation, homeland security, improve oil and other hazardous material spill response, and support coastal resource management. NOAA is statutorily authorized to collect, analyze, and provide datums related to tide and water levels. The Act of August 6, 1947 (61 STAT, 787) 33 U.S.C. §§ 883 a-f authorizes collection and dissemination of water level data; Section 883a authorizes NOAA to conduct "Hydrographic ... tide and current observations;" Section 883b authorizes NOAA "to analyze and predict tide and current data, and process and publish data, information, compilations, and reports." The TCDP is operated by the Center for Operational Oceanographic Products and Services (CO-OPS). Observations and predictions of water levels and currents are collected, quality controlled, and distributed to the marine transportation community and other users. The Tide and Current Data Line Item is composed of four primary program elements, each of which contributes to NOAA's Commerce and Transportation Goal and Weather and Water Goal.

Base activities support the objective, "Enhance the conservation and management of coastal and marine resources to meet America's economic, social, and environmental needs" under the Department of Commerce Strategic Goal of "Observe, protect, and manage the Earth's resources to promote environmental needs."

**NATIONAL WATER LEVEL PROGRAM**

CO-OPS operates and maintains the National Water Level Observation Network (NWLON), a system of 187 long term observation stations located in U.S. coastal areas, the Great Lakes, and U.S. Territories and possessions. Information from the NWLON ranges from the high frequency content in the record (tsunamis and storm surge) to the long-term content (sea level trends and lake level trends). It provides vertical reference datums for all marine boundary applications, for national shoreline and nautical chart products, for coastal construction, dredging, for habitat restoration projects and for hurricane evacuation route planning. The NWLON system provides a nation-wide capability for storm surge monitoring, and serves as an observing system for the NOAA Tsunami Warning System. Some of the record stretch over 1.5 centuries and represent some of the longest geophysical records in the U.S. The data are becoming increasingly valuable to climate change researchers.

CO-OPS performs quality assurance procedures on the data from NWLON stations, computes tidal and Great Lakes datums and predicts tides for all U.S. coastal areas. NWLON is a critical underpinning for tools such as the Physical Oceanographic Real-Time System (PORTS®) and also serves as a federal backbone for the Integrated Ocean Observation System. NOAA is in the process of enhancing all of the NWLON stations to provide real-time data. Data collected by the NWLON supports all four of NOAA's Strategic Mission Goals.

### **NATIONAL CURRENT PROGRAM**

NOAA and its predecessor agencies have been collecting information on the currents in various ports and harbors, and the Gulf Stream, since the mid 1800's. The Coast and Geodetic Survey first published tidal current predictions for the use by mariners in 1890 for the East Coast and 1898 for the West Coast. The program is presently operated by NOAA's Center for Operational Oceanographic Products and Services. NOAA's tidal current prediction tables are used by the largest ship operators down to the fishing industry, and the small recreational boater, kayakers, and wind surfers. Updated, accurate predictions are essential for these users to support safe and efficient navigation and for fishers to determine best catch times. In addition, accurate measurements of the currents are essential to test oil spill response strategies and provide onsite response to an emergency spill. The data are used to fine tune strategies and verify current trajectories for models.

### **PHYSICAL OCEANOGRAPHIC REAL TIME SYSTEMS (PORTS®)**

Physical Oceanographic Real Time Systems (PORTS®) is a decision support tool that integrates and disseminates real-time environmental observations, forecasts and other geospatial information. In partnership with local port authorities, pilot associations, the U.S. Coast Guard, the U.S. Army Corps of Engineers, the U.S. Navy, academia, and others, PORTS® has been implemented in various bays and harbors in the U.S. to measure and disseminate water levels, currents, salinity, winds, and atmospheric pressure to various users. PORTS® is a cost-sharing program requiring local partners to bear the cost of installation, operation and maintenance of the sensor systems. This recognizes the local benefits of such systems. NOAA's responsibility is to provide the basic oceanography and design for the systems, as well as the ongoing quality control of the real time data. Thirteen PORTS® (Tampa, New York, San Francisco, Narragansett Bay, Chesapeake Bay, Anchorage, Soo Locks (MI), Los Angeles/Long Beach, Delaware Bay, Houston/Galveston, Tacoma, New Haven, and Columbia River) are currently operating around the U.S. These PORTS® service 39 U.S. seaports through which 42% of U.S. cargo by tonnage transits on an annual basis. PORTS® information is used by mariners, port authorities, and the shipping industry to support safe and efficient navigation. Access to accurate real-time water level data and model forecast guidance allows U.S. port authorities and maritime shippers to make sound decisions regarding maximizing tonnage (based on available bottom clearance), and limiting passage times, without compromising safety.

### **OPERATIONAL FORECAST MODELS PROGRAM**

CO-OPS also operates nowcast and forecast models, typically in conjunction with PORTS®, that provide short term water level and other environmental forecasts that enable better planning and decision making, particularly for vessel transits.

Historically, mariners in the United States have had only NOAA's Tide and Tidal Current Prediction Tables to depend on for the best estimate of expected water levels and currents at a given time in the future. While these tables provide accurate predictions of the astronomic tide, they do not account for a number of other physical factors that can affect water levels, such as wind, air pressure, and river flow. NOAA has developed and is currently operating three dimensional hydrodynamic models which take such variables into account, and are able to forecast water levels and currents up to 24 hours in advance. Operational Systems currently exist for the Chesapeake Bay, the Port of New York / New Jersey, Houston/Galveston, the St. John's River, and for Lakes Erie and Michigan. NOAA's models of oceanographic and atmospheric conditions, which are provided through PORTS<sup>®</sup>, provide crucial advance data for re-routing of vessel traffic, port conditions forecasts, and low visibility navigation to keep traffic moving and prevent congestion or delays in other less affected areas. Marine modeling also supports predictions of the oceanic and atmospheric dispersion of hazardous materials to protect people and the environment.

**PROPOSED LEGISLATION:**

No legislation is proposed.

**SUMMARIZED FINANCIAL DATA**

(Dollars in thousands)

Subactivity: Navigation Services	FY 2005 ACTUALS	FY 2006 CURRENTLY AVAILABLE	FY 2007 BASE PROGRAM	FY 2007 ESTIMATE	INCREASE / DECREASE
Line Item: Tide & Current Data					
Tide & Current Data Base (CT)	18,401	18,161	22,027	22,742	715
Tide & Current Data Base (WW)	-	-	228	2,228	2,000
PORTS (CT)	2,938	1,479	-	-	-
Great Lakes NWLON	1,971	1,972	-	-	-
Alaska Current & Tide Data	1,479	-	-	-	-
National Water Level Observation Network	2,463	2,466	-	-	-
<b>TOTAL</b>	<b>27,252</b>	<b>24,078</b>	<b>22,255</b>	<b>24,970</b>	<b>2,715</b>
<b>FTE</b>	<b>101</b>	<b>107</b>	<b>107</b>	<b>107</b>	<b>-</b>

Note: The dollars in this table represent budget authority.

**PROGRAM CHANGES FOR FY 2007:**

**Tide and Current Data (0 FTE and +\$2,715,000):** NOAA requests an increase of \$2,715,000 for a total of \$24,970,000, to improve and expand the delivery of real time and forecasted navigation information through the National Water Level Program (NWLP) and the Physical Oceanographic Real Time Oceanographic System (PORTS®) Program. Accurate, reliable, and timely information is critical to ensure that marine transportation at U.S. ports is safe and efficient, thus enhancing commerce and economic growth, and protecting the environment from marine accidents that can spill hazardous materials and cause other damage. Through the NWLP, NOAA provides water level data, predictions and vertical control (tidal datums) to support safe marine navigation by users of the US Marine Transportation System (MTS). Data provided by the National Water Level Observation Network (NWLON), the observing component of the NWLP, is also critical for protecting life and property by improving NOAA storm surge forecasts and emergency response efforts when hurricanes, tsunamis and other extreme events threaten the Nation's coastal areas. Tidal datums provided by the NWLON are an essential vertical reference for ensuring that coastal infrastructure (such as levees) is constructed to elevations adequate for flood inundation levels, and are particularly critical for recovery efforts. PORTS® is a cost shared partnership program that provides MTS users with access to quality controlled real time oceanographic and meteorological data critical for safe and efficient navigation. PORTS® is a decision support tool that integrates and disseminates real-time environmental observations, forecasts and other geospatial information.

This investment is one of the high priority investments required for NOAA's implementation of the Integrated Ocean Observing System (IOOS) as the coastal and open ocean component of the Global Earth Observing System of Systems (GEOSS). Combined with other like-identified IOOS investments across NOAA, it is part of NOAA's strategy to provide initial benefits of an integrated ocean observing system, focusing on enhancing key observational capabilities throughout NOAA, and our ability to provide customers with enhanced coastal data and information.

### **Statement of Need**

The US Coast and Geodetic Survey Act of 1947 mandates that NOAA collect tide and current data to support safe and efficient marine navigation. The 1999 Assessment of the Marine Transportation System report provided to Congress by the interagency Marine Transportation System Task Force noted that the highest priority for MTS stakeholders was the need for accurate, reliable, and timely navigation information. The Hydrographic Services Improvement Act Amendments of 2002 provided that NOAA "shall, subject to the availability of appropriations, design, install, maintain, and operate real-time hydrographic monitoring systems to enhance navigation safety and efficiency." The Nation's commerce, which passes through our seaports, is an economic lifeline of our country. More than 95% of U.S. overseas trade by volume and 37% by value, including nine million barrels of imported oil daily, transits through our seaports. Over 98% of the over 2.3 billion tons passes through the top 150 (out of almost 300) U.S. seaports. Increasingly, U.S. seaports are becoming chokepoints in our Nation's intermodal transportation system. Mariners need decision support tools that provide them with a complete understanding of the physical environment in which they operate.

### **Proposed Actions**

*National Water Level Program (+\$2,000,000)*: The requested increase of \$2,000,000 will rebuild and strengthen the National Water Level Observation Network's (NWLON) ability to provide critical navigation and storm tide information throughout extreme weather and water events. Hurricanes Katrina, Rita and Wilma destroyed a total of nine tide gauges in the Gulf and southern Florida, and inflicted serious damage across the rest of the regions' NWLON. NOAA's storm tide observing capacity was totally destroyed in the state of Mississippi and seriously degraded across Florida, Alabama, Texas and Louisiana. The funds will re-establish destroyed stations and make other needed system wide repairs. In addition to filling observation gaps, the funds will significantly improve the NWLON's ability to continue operation and provide critical real time data for storm surge forecasts and emergency response throughout a storm's duration by "hardening" stations. Hardening a station involves elevating and strengthening the underlying support platform so that extreme water levels do not destroy the station or exceed sensor heights. The only two (out of thirty two) existing hardened NWLON stations in the Gulf (Dauphin Island, Alabama and Grand Isle, Louisiana) successfully operated and provided critical data through both Katrina and Rita despite being outer coast stations exposed directly to the brunt of wind and wave action.

With the requested funding NOAA will:

- Fill observation gaps at nine Gulf Coast locations in FY 2007 (\$450,000 for observing equipment and supplies, \$950,000 for contracts): The requested funds would utilize local contract services to construct nine hardened NWLON stations to fill critical observation gaps left by the hurricanes and repair other damaged stations.
- Harden existing Gulf Coast NWLON stations (\$600,000 for contracts): The requested funds would utilize local contract services to harden up to eight additional NWLON stations by constructing elevated strengthened platforms and relocating equipment to them.

*Physical Oceanographic Real Time System® (+\$715,000)*: The requested increase will allow NOAA to maintain and continue expanding the cost shared PORTS® program with local partners such as port authorities, pilot associations, the U.S. Coast Guard, the U.S. Army Corps of Engineers, the U.S. Navy, academia, and others. Thirteen PORTS® have been implemented in various bays and harbors in the U.S. to measure and disseminate quality controlled real time water levels, currents, salinity, winds, air gap (bridge clearance) and atmospheric pressure to users. Access to accurate real-time water level data allows U.S. port authorities and maritime shippers to make sound decisions regarding vessel safety, maximize tonnage (based on available bottom clearance), and limit passage times, without compromising safety. The thirteen PORTS® provide access to real time data to 39 of the Nation's top 150 seaports; these 150 ports transit over 99% of the Nation's cargo (by tonnage) on an annual basis. The increase will enable NOAA to maintain the existing thirteen PORTS® as well as continue expanding the system. A number of ports important to the transport of vital energy supplies to the Nation, such as New Orleans, Louisiana, Port Arthur, Texas and Cherry Point, Washington have expressed strong interest in establishing PORTS®.

With the requested increase, NOAA will fully support contracts that provide watchstanders for the 24x7 quality control of real time data, conduct data management system operation and maintenance, support development and integration of new technology and products, continue ongoing software development and maintenance, and other infrastructure maintenance activities associated with PORTS®.

## **Benefits**

In a typical large port, the shipping and port industries alone may have an economic impact of approximately \$12 billion dollars to the local economy. The safe and efficient transit of the ever-larger and deeper draft vessels in our Nation's constricted ports and harbors relies on accurate and timely navigation tide and current data. Knowledge of accurate tides and currents can help vessels avoid groundings, collisions, and allisions with stationary objects such as bridges, rocks, docks, etc. The economic and environmental consequences of a marine accident, particularly when hazardous materials are spilled, can run into the millions or even billions of dollars as evidenced by the *Exxon Valdez*.

Accurate and timely navigation data can be used to increase the efficiency of ship transits, as well as reduce the risk of economic and environmental impacts. Accurate water levels can enable vessels to optimize how much cargo is loaded – or not loaded. The ability to load just one extra foot of cargo based on available depth can increase revenues ranging from the tens to the hundreds of thousands of dollars depending on the cargo and vessel size per transit (each additional foot of draft available to commercial ships has estimated revenue ranging from \$36,000 to \$288,000 per transit).

Alternatively, accurate water levels can allow the decision to be made to not load additional cargo and transit port on schedule. Moreover, many ships approach or even exceed the channel depths at low tide, thus must delay their transit until periods of higher predicted tides. Estimates for an idle ship are reported to be on the order of \$72,000 per day. A recent economic benefit study performed for the Tampa Bay PORTS® identified the presently realized quantifiable benefit to be between \$4.4 to \$7.0 million per year and noted this is a lower bound on total benefits since not all uses of PORTS® data can be quantified. Accurate tidal current predictions improve transit efficiency by allowing schedules to be aligned with, instead of against, current flows. Accurate tidal current predictions can help vessels conserve on fuel, as well as maintain schedule, a critically important factor with today’s overcrowded dockside space.

**Performance Goals and Measurement Data**

By enabling increased efficiency of the U.S. marine transportation system, this increase will support the objective, “Advance understanding and predict changes in the Earth’s environment to meet America’s economic, social and environmental needs” under the Department of Commerce strategic goal of “Observe, protect, and manage the Earth’s resources to promote environmental needs.” This increase supports the Commerce and Transportation Performance Goal and the Performance objective “Enhance navigational safety and efficiency by improving information products and services” and the following performance measures.

<b>Performance Goal: Commerce and Transportation</b>						
<b>Performance Measure:</b> Increase the number of NWLON stations to fill observation gaps (cumulative)	<b>FY 2005</b>	<b>FY 2006</b>	<b>FY 2007</b>	<b>FY 2008</b>	<b>FY 2009</b>	<b>FY 2010</b>
Without Increase	187	196	196	196	196	196
With Increase	--	--	200	205	210	215
<b>Performance Measure:</b> Number of NWLON stations hardened to survive extreme events (per year)						
Without Increase	0	0	0	0	0	0
With Increase	--	--	8	10	10	8
<b>Performance Measure:</b> Increase the number of top 150 US seaports with access to quality controlled real time data for safe and efficient navigation.						
Without Increase	39	39	TBD*	TBD*	TBD*	TBD*
With Increase	--	--	46	50	50	50

\* Criteria are being developed to determine which PORTS® would be terminated in the event funding is not restored in FY 2007. A PORTS® may service more than one seaport, therefore the number of seaports that would no longer have access to PORTS® data will depend on which PORTS® are terminated.

**TERMINATIONS FOR 2007:**

The following program has been terminated in FY 2007: Great Lakes NWLON (\$1,972,000).