Group #3

New text and major edits are highlighted in blue

Modernize Heights and Implement Real-time Water Level and Current Observing Systems in All Major Commercial Ports (pages 17-21)

Finding 3:
NOAA's Navigation Services are a critical component of the federal effort to build an Integrated Ocean Observing System (IOOS), delivering real-time data to a multitude of navigation and non-navigation users. The U.S. Ocean Commission and the President's Ocean Action Plan reiterate that IOOS should provide integrated observations in support of seven societal goals, the second of which is to support safe navigation (see IOOS Goals sidebar). Central to IOOS is the concept that measurements and predictions taken and made for a particular need can, in many cases, serve other national and regional needs.

As the lead agency for IOOS, NOAA has stated that the physical observations collected by the Navigation Services programs are a critical component of the IOOS backbone. The environmental parameters (meteorological, currents, water levels, hydrography, bathymetry, shoreline, and geopositioning) that NOAA Navigation Services gathers, integrates, and quality controls on behalf of the mariner are also baseline datasets for other stakeholders, including coastal zone managers, coastal engineers, researchers, and first responders. Some of these parameters also provide information critical to mitigating natural hazards, such as storm surge, tsunamis, and other extreme events. Thus the HSRP believes support for comprehensive expansion of the maritime components and building on existing capabilities to link users to useful and timely data should be the top priority for IOOS, and for NOAA.

From the U.S Marine Transportation System (MTS) perspective, the HSRP views NOAA's IOOS contributions to navigation as the means by which ships can safely exploit the existing capacity within U.S. ports and waterways. And exploit it we must; to maintain U.S. position in the global marketplace, the current — and future — demands of our nation's commerce, military sealift, and recreational uses require us to maximize the throughput of our MTS infrastructure. In years past, when vessels like the S.S. Normandie transited New York Harbor and other of our nation's waterways, the average steamship was 460 feet long and 63 feet wide, with a draft of 26 feet. Now modern ships are being built over 1400 feet long and 200 feet wide, with drafts of 60 feet or more — a keel depth equivalent to a five-story building plunging below the waterline. Today ships routinely transit our ports and harbors with 2 feet or less of underkeel clearance, risking contact with the seabed or other obstructions. In a number of ports, clearance under bridges (known as air gap) is also a concern, because bridges flex up and down (resulting in a variable air gap), and the tallest ships can gain access only during the lowest of tides without hitting the bridge. Due to these tight clearances below (to the sea floor) and above vessels (under bridge clearance), and because the water levels vary with time as a

result of tidal and non-tidal forces, it is critical to have real-time water level and air gap data; tide level predictions alone are not enough to ensure navigation safety. The potential for serious injury to people, property, and the environment is compounded by the fact that over half the cargo transported by ship in U.S. waters is oil or other hazardous material.

NOAA's marine observations help to address these concerns by enhancing a mariner's situational awareness for effective decision-making. In particular, water levels and currents are key parameters to know when navigating in tight conditions. NOAA's National Water Level Observation Network (NWLON) and National Current Observation Programs (NCOP) deliver this information through a variety of means, and provide the foundation for NOAA's Physical Oceanographic Real Time Systems (PORTS®). A critical component of IOOS, PORTS® is a localized sensor suite that disseminates observations and predictions of water levels, currents, salinity, winds, atmospheric pressure, and air and water temperatures for an area every six minutes. A recent addition to this suite of sensors is the air gap, or bridge clearance sensor, which addresses the emerging issue of ever taller vessels striking bridges. Each system installation is uniquely designed, tailored to the needs of local users. All PORTS® observations are quality controlled on a 24 X 7 basis so that mariners can use them with confidence. In addition to improving navigation safety, PORTS® also improves efficiency. With the benefit of reliable, accurate, and timely information, larger ships can load more heavily and time their arrivals and departures more efficiently, all while maintaining a high confidence in navigation safety. This margin of safety opens the limited channel depths available in most U.S. ports to larger commercial ships, allowing port operators to maximize throughput and economic gain with less risk to the environment. NOAA also develops and implements operational forecast models that leverage and extend the benefits of real-time data by accurately forecasting oceanographic conditions 24 to 30 hours into the future. These forecasts further improve the mariner's ability to make sound safety and efficiency decisions.

The HSRP is a strong proponent of PORTS® and NOAA's other observing systems that enhance commerce, support marine models and flood predictions, and provide fast response support to natural or manmade hazards (such as storms or oil spills) or Homeland Security events. As with hydrographic and shoreline mapping mission challenges, funding gaps limit the expansion of these networks, a situation that must be remedied given the benefits they provide to safety and the economy. NOAA is far from achieving adequate coverage of NWLON, with only 210 established stations of the 300 water level stations required to meet national program targets, and only 20 PORTS® partnerships servicing just 39 of the top 175 U.S. seaports. NOAA has been able to implement operational forecast models at only 5 of the 20 existing PORTS® systems [New York/New Jersey Harbor; Chesapeake Bay; St Johns River/Jacksonville, FL; Houston/Galveston Bay; and Soo Locks between Lake Superiorand Lake Huron]. Often in financial jeopardy, the PORTS® depend on both NOAA and its port partners to obtain their funding shares each year. For example, port funding shortfalls forced the Delaware Bay and River PORTS® offline for 6 months in 2004, and the San Francisco Bay PORTS® has barely avoided shutdown, with much of its sensor suite no longer

Comment [rla1]: CO-OPS: Please check -- This is not listed as a PORTS on the webpage.

operating. Although the 2002 Hydrographic Services Improvement Act authorized full federal funding for these systems to enhance navigation safety and efficiency, regrettably, sufficient funding has not been appropriated to fund even the NOAA portion under the partnership funding agreements.

Comment [V2]: CO-OPS/OCS: Update with 2008 Hydro services improvement act language if different or relevant.

Comment [rla3]: CO-OPS: Perhaps need to clarify how the PORTS systems are currently funded – what is the current funding and maintenance agreement?

The HSRP recommends the expansion of the PORTS® program to additional major U.S. seaports be made a high priority for future IOOS funding appropriated to NOAA, including the ability to implement operational forecast models coupled with each PORTS® system. PORTS® is already a well-developed NOAA capability, a demonstrated success with documented benefits, and has high visibility with the user community and Congress. The 2005 Tampa Bay economic study and its $7 million in quantifiable economic benefits demonstrate the potential of PORTS®, its relatively low cost, and the benefits from avoiding accidents and damage to the environment. Similarly, a 2007 study of the Houston/Galveston PORTS® identified $18 million in benefits to the Gulf Region.

The HSRP also supports NOAA's management of the National Spatial Reference System (NSRS) as a primary element of IOOS infrastructure, given that precise positioning information is an essential component of all observing systems. The NSRS allows Global Positioning System (GPS) receivers to determine positional coordinates to centimeter-level accuracy anywhere on the surface of the Earth. Unfortunately, NOAA's efforts to improve the height element in GPS positioning and provide better nationwide access to accurate and reliable height information have not been efficient, as much of the funding available for this function comes from state specific earmarks. Thus far, 11 states have received funds in the President's Budget and/or through earmarks to begin work on updating their heights. An increase in funds for a National Height Modernization program would allow NOAA more discretion in obtaining accurate heights in the most efficient manner.

Comment [rla4]: NGS: please verify this number.

The collection of aerial gravity data is a very efficient method to obtain elevations for Height Modernization efforts. Currently this data is severely lacking, especially along the coasts where it is perhaps most critical. As a result of insufficient resources to collect gravity data, unreliable elevation data is being used for floodplain mapping and storm surge modeling. The HSRP recommends increased resources be dedicated to this effort, the results of which would also assist in improving current predictions, VDatum transformations in coastal regions, storm surge modeling, hydrographic surveying, shoreline mapping via "GPS surveying, and various IOOS observations.

Many states have indicated a strong interest in NOAA's National Height Modernization Program to address regional or national problems, such as coastal and river flooding in the mid-Atlantic and subsidence (sinking) along the Gulf of Mexico. Height Modernization is critical for the calculation of sea level rise and climate-change impacts, vessel underkeel and bridge air gap measurements, safe hurricane evacuation routes determination, subsidence and crustal motion monitoring, storm surge modeling, and restoration of coastal habitats. In addition to the benefits Height Modernization provides along the coast, it is also critical to inland applications such as precision agriculture, flood

plain mapping, construction, and stream gauge monitoring. As with PORTS®, investments in improving our ability to obtain accurate heights are relatively low in relation to the possible benefits and return on investment. As cited in a 1998 Report to Congress, improved height data from GPS has cost benefits to the nation of over $9 billion. To fully realize the benefits of Height Modernization, the HSRP believes NOAA needs more resources and flexibility in allocating the Height Modernization funds it receives, and greater attention paid to collecting aerial gravity data.

Recommendation 3
The HSRP recommends that NOAA expand and fund real-time water-level and current observations, such as its National Water Level Observation Network (NWLON), and Physical Oceanographic Real Time Systems, or PORTS®, in commercial ports. The HSRP also recommends NOAA provide funding to the National Geodetic Survey as a means of expanding the Height Modernization Program. This program will add new National Spatial Reference System (NSRS) monuments with accurate heights where needed and update existing NSRS network heights. Accurate nationwide heights are critical components of the Integrated Ocean Observing System.

Sidebars and Photos

a) **IOOS Goals**
- Detecting and forecasting oceanic components of climate variability
- Facilitating safe and efficient marine operations
- Ensuring national security
- Managing resources for sustainable use
- Preserving and restoring healthy marine ecosystems
- Mitigating natural hazards
- Ensuring public health

Comment [rla5]: Fact checked with IOOS – Zdenka and they are the same. KEEP in the document as is.

b) **20 OPERATIONAL PORTS® list**
Cherry Point, WA • Chesapeake Bay • Delaware Bay and River • Gulfport, MS • Houston/Galveston, TX • Lake Charles, LA • Los Angeles/Long Beach, CA • Lower Columbia River, OR/WA • Lower Mississippi River, LA • Mobile Bay, AL • Narragansett Bay, RI • New Haven, CT • New York/ New Jersey Harbor • Pascagoula, MS • Port of Anchorage, AK • Sabine Neches, LA/TX • San Francisco Bay, CA • Soo Locks, MI • Tacoma, WA • Tampa Bay, FL

Comment [rla6]: CO-OPS: Do we need to add St Johns River/Jacksonville, FL? It is listed in a paragraph above as a PORTS with an operational forecast model.

c) **THE POTOMAC TRADER (text and figure of water levels – observed vs. predicted)**
On March 14, 1993, New York Harbor experienced an abnormally large tidal range, rising 6 feet above predicted, then falling 12 feet when the wind suddenly changed — all within a matter of hours (see graph to the right). The Potomac Trader, a 634-foot tanker using NOAA's predicted tides, ran aground in Hell Gate. Had a real-time NOAA

Comment [rla7]: Keep – this is an oldie but goodie. Keep text and figure.

PORTS® been in place, this could have been averted. The vessel master would have obtained real-time environmental data, showing the observed tide was over 6 feet less than the predicted. Fortunately, the vessel was a double-bottom tanker and none of its cargo — 7 million gallons of crude oil — spilled into the harbor. Otherwise, the disaster could have been the mid-Atlantic Coast equivalent of the Exxon Valdez.

d**) Proven Benefits: PORTS® Studies Show Savings (also figure of NOAA bathymetry and USGS elevation data for Tampa Bay, FL)**
Thirty-five lives were lost in 1980, when a vessel lost in fog hit the Tampa Sunshine Skyway Bridge. The tragedy prompted NOAA to develop PORTS® to supply critical navigation information. The system went operational in 1991, and since then, vessel groundings in Tampa Bay have decreased by half. A recent NOAA sponsored study also found that the Tampa Bay region derives more than $7 million a year in benefits as a result of the real-time environmental information. A similar study of the Houston/Galveston PORTS® in 2007 found that the system generated $18 million in annual benefits, along with a 50% reduction in groundings when the system came online. The benefits center mostly on avoided costs (increased producer surplus, or profit) for Houston/Galveston commercial shipping, and avoided costs (or increased consumer surplus) for recreational users of Galveston Bay.

Comment [rla8]: Keep text and photos.

e) **NEW SIDEBAR: The Importance of Up-to-date Elevation Data: Flooding from Hurricane Ike** – see sidebar document for text and photo

f) **NEW SIDEBAR: Nueces Delta Restoration Study, Nueces Delta, Texas** - see sidebar document for text and photo

Photos:

a) three photos of ships showing sizes and changes over the years – page 18

1 – ~~**S.S. Normandie**~~ – DELETE: replace with other photos – see notes under b)
2 – ~~**Emma Maersk**~~ – DELETE: replace with photo giving better sense of scale – see note under b)
3 – **Ship Size has Increased Greatly Over the Years** – KEEP: replace with better graphic if can find one

b) ~~Photo of large container ship~~ – page 21

Replace this and photos on page18 with new photos as provided by Tom Jacobsen and Andrew McGovern. Ships going under bridge are good ones – showing close clearance. Photos should show scale of ships and clearances so they make sense. Include photos showing damaged ships post accident (Andrew McGovern provided a bunch to look at). The group like photo from Tom J: MSC Texas 095. Also consider photo from CO-OPS showing nice scale between the small rec boats and the large commercial vessel.

c) ~~Photos in header~~ – page 17

Replace with a photo giving a better sense of the scale of the ship relative to the bridge – and the small air gaps between bridge and ship. See b) above for more info.