

U.S. COMMISSION ON OCEAN POLICY



Reports of Site Visits Associated with the Northeast Regional Meeting Faneuil Hall, Boston, Massachusetts July 23-24, 2002

Background/Area of Site Visits

On July 22, 2002, the U.S. Commission on Ocean Policy held three simultaneous site visits in association with the Commission's Northeast Regional Public Meeting held in Boston, Massachusetts. The Northern site visit covered Maine, New Hampshire and Massachusetts; the Central site visit covered Connecticut, Rhode Island and Massachusetts; and the Southern site visit covered New Jersey.

Northern Site Visit: Maine, New Hampshire, Massachusetts

Central Site Visit: Connecticut, Rhode Island, Massachusetts

Southern Site Visit: New Jersey

Northern Site Visit: Maine, New Hampshire, Boston

The Northern site visit focused on several areas including habitat restoration, oil spill response, the fishing industry, coastal ocean mapping, ocean observing systems, cooperative research, Boston Harbor clean-up, global climate change, marine biological invasions. Commission stops included a wetland area in Portland, Maine; the Portland Fish Exchange; the University of New Hampshire in Durham; and the Massachusetts Institute of Technology in Boston.

Commissioners Participating in the Northern Site Visit:

Admiral James D. Watkins, USN (Ret.), Chairman

Dr. Andy Rosenberg

Mr. Larry Dickerson

Vice Admiral Paul G. Gaffney, II, USN

Commission staff:

Dr. Ken Turgeon

Mr. Frank Lockhart

Ms. Kate Naughten

Ms. Laura Cantral

Also in Attendance:

Dr. Dewitt John, Science Advisory Panel member
Ms. Ingrid Nugent (recorder)

Oil Spill Response, Portland Harbor, Maine

- Mr. Steve Lehman, HAZMAT Scientific Support Coordinator, NOAA
- Mr. David Sathe, State of Maine
- Captain Marc O'Malley, U.S. Coast Guard
- Mr. Frank Soulac, NOAA
- Mr. Seth Barker, State of Maine

Following introductions, Mr. Lehman recounted the 1996 Julie N oil tanker accident and the quick action that was taken to mitigate environmental damage from the 180,000 gallons of oil spilled into Portland Harbor. According to Lehman, a remarkable amount of the oil was recovered and habitat restoration efforts appear successful. However, there has been little opportunity to evaluate the success of the recovery. And, because of the lack of defensible correlation between aspects of the restoration, including grass height and health of the ecosystem, the level of damage to the marine resources is still unknown. Mr. Lehman noted the importance of balancing many factors when deciding the course of an oil spill clean-up. He used the example of experimental vegetation cutting, noting that it is effective for removing oil from the system, but is detrimental to bird populations. In response to a question, Lehman said that it was difficult to determine how re-growth is affected in the long term by heavy amounts of oil still found in sediment. Mr. Barker commented that the initial focus should be on the big picture indicators such as tides and typical marsh morphology. He also felt that a lack of resources had prevented continued monitoring of the recovery. In spite of this, his office is in the process of developing a monitoring program with the University of New Hampshire.

Mr. Soulac said that NOAA has been holding a series of workshops to coordinate studies. He also noted that the response to every spill must be unique due to the myriad of factors that arise with each spill. Mr. Lehman added that the State of Maine had been holding seminars for the past six years on the topic, adding that the Coast Guard had federal jurisdiction and that the state trustees each have their own areas of expertise. Captain O'Malley said that the Coast Guard is the initial responder, that they conduct assessments with NOAA, document costs, conduct biological studies and perform operational work.

Asked whether or not there was an ongoing effort to improve responses, Captain O'Malley explained that the Coast Guard -- and various competing spill response companies -- have R&D teams. This is a "cottage industry" with pull from the government and push from engineers, said Capt. O'Malley.

Mr. Lehman added that the only adequate test for prevention and cleanup technologies was a real situation. When real situations arise, however, people tend to fall back on known methods. For example, Norway conducts intentional spills and burns every two years in order to practice their responses. Mr. Soulac added that field simulations are no substitute for an actual spill.

Mr. Sathe emphasized the importance of prevention and added that the state's inability to regulate vessels meant that federal agencies, such as the Coast Guard, needed to do so. Captain O'Malley responded that training crews on ships is a great start, but that implementation is a challenge. Mr. Lehman expanded on the lack of

regulation and legislative Coast Guard authority over barges and tugs, an aspect that makes these vessels a popular method for oil transport.

Mr. Sathe recommended an active area committee. He added that the Oil Pollution Act (OPA) has a greater capability on paper than in reality. There should be regularly exercised standby capability and heightened expectations of oil spill response organizations, he said. He pointed out that the Coast Guard, which has great responsibility in this area, must now focus on the higher priority of homeland security. Captain O'Malley felt that private industry pulling its resources is one reason for the compliance problem. Mr. Lehman suggested a coordinating operational nexus and use of the Oil Spill Liability Fund as a strategic tool.

Portland Fish Exchange

- Mr. John Norton, President of the Portland Fish Exchange
- Ms. Barbara Stevenson, vessel owner
- Judy Harris, Deputy Director, Maine Dept. of Transportation

Following a brief tour of the facility, the Commissioners and presenters gathered in the Exchange's auction room where Ms. Stevenson made the following remarks to open the discussion:

- The concept of "best science" is flawed. The Magnuson-Stevens Act does not differentiate between unproven new hypotheses and a somewhat subjective label called best available science, but many don't realize the monetary costs associated with theories that are put in to practice simply because they are new. There is a difference between science and fact.
- Area management of fish is nonsensical because fish move.
- The different regulations in the U.S. and Canada may create management problems. The provision within the Magnuson-Stevens Act that allows international treaties to override domestic standards should also include agreements between Canada's Department of Fisheries and Oceans and the U.S. National Marine Fisheries Service.

A local participant mentioned a new proposal to change the structure of decision-making. She said that the present council system would be replaced by more localized groups of fisherman, with each permit holder having one vote. With this change, the mechanism for expression of minority interests would disappear with the loss of structure which the council now provides. Also, with each zone voting its own interests, there would be no mechanism for resolving conflicts between zones. She felt that government should make the decisions.

Mr. Norton, representing industry, felt that marine protected areas (MPAs), with their goal of increasing biodiversity, are diametrically opposed to the Magnuson Act which states that the ocean should be used for the "net" benefit of the nation in terms of food and recreation. He also felt that the New England Fishery Management Council should retain full authority because industry has great interest in the long-term health of fisheries. Another industry representative felt that closures should be more flexible and not permanent.

Asked whether individuals who don't necessarily benefit from the resource should help make the decisions, Ms. Harris said that the fishery councils don't always side with fisherman. She felt that only three or four active fishermen are on the councils,

giving industry an opportunity for representation while accommodating different schedules.

Ms. Stevenson felt that Individual Transferable Quotas (ITQs) on species don't work because the system encourages dishonesty. Transferable Days at Sea are enforceable but the fisherman need more days or the industry will not survive.

Asked about vessel monitoring, Ms. Stevenson supported the concept, but felt that the current system is unreliable. A participating fisherman added that there is no prohibition on being in closed areas, only on fishing in them. He wondered how anyone can determine whether a vessel is fishing or simply passing through.

Asked whether the fishery council is paying attention to the science, Ms. Stevenson said that the science is not being ignored. However, in her view, as science is based mostly on assumptions, reasonable people will not believe it

The University of New Hampshire/Coastal Ocean Mapping

- Dr. Larry Meyer, Director of the University of New Hampshire Center for Coastal and Ocean Mapping (C-Com)/ Joint Hydrographic Center

Dr. Meyer gave a presentation on the need for coastal mapping, including safety of navigation; national security; communications infrastructure; aid to exploitation industries; and exploration and discovery.

He noted that coastal mapping is crucial to ocean management and governance. The most accurate currently available map of the ocean floor has five-mile spacing, but recent technological developments can bring that spacing down to two kilometers. Also, older sonar maps only provide a tectonic scale picture, not the detail that is needed.

Asked about the need for more sophisticated technology in this area, Dr. Meyer stressed that new technology is able to map even the smallest details of the ocean floor with accuracy well beyond the simple bathymetric records we have now. He added that the technology has significance for the fishing industry since these systems can provide information about schools of fish passing near a vessel. The mapping systems also may enable the U.S. to make claims well beyond the current exclusive economic zone (EEZ) under the United Nations Law of the Sea Article 76. Claiming an extended EEZ would give the United States exclusive jurisdiction within an extended area, provided that we become signatories to the U.N. Law of the Sea. Most of the ocean can be mapped with low cost and in little time but there needs to be:

- incentives for agencies to collaborate;
- a national plan with standards for exchange and distribution of ocean mapping data; and
- a national database of marine geospatial data.

Dr. Meyer estimated the cost of mapping the entire U.S. EEZ at \$2.5 billion. To map within 50 meters of the edge of the EEZ (or 88%) would cost roughly \$300 million.

Asked how the \$300 million would be prioritized, Dr. Meyer said that it would be the areas where the U.S. had the most to gain. Asked what the ramifications would be for not mapping the EEZ in relation to the UN Law of the Sea, Dr. Meyer said that there is currently enough data to make a significant claim, but that we may lose the

option to optimize that claim by not using the best technologies. The U.S. public would benefit from expanded rights and an estimated \$3 billion associated with the extended claim. Dr. Meyer noted that the report that had been presented to Congress showed much more constrained cost figures because only a much smaller corridor would need to be mapped to make a claim. The incremental costs of completing a bigger picture, however, are not that great.

Asked about the ability of the U.S. government to completely outsource hydrographic surveying to industry, Dr. Meyer's explained that work is being done with industry, but that in almost all cases academia was far ahead. He added that much of the work could be outsourced, but it should not be done at the cost of government capability. Government needs to be in charge of quality control, standards, research and development and pushing industry forward. Industry can do the actual work.

Asked about the economic benefit of additional mapping in terms of the current restrictions on resource exploration and extraction, Dr. Meyer noted that needs are ever-changing and knowing the location of such resources may prompt a legal shift.

Ocean Observing Systems

- Dr. Jonathan Pennock, Director of the Marine Program at the University of New Hampshire

Dr. Pennock began his presentation on Ocean Observing Systems (OOS) with a recommendation that the various regional participants be brought together under a national or international, effort. This integrated observing system should be regionally based and modeled on the Gulf of Maine Ocean Observing System (GoMOOS), a nonprofit membership organization that provides constantly updated data on the northeast oceans. A new national OOS effort needs to make use of and integrate extensive infrastructure that already exists at the private and university levels.

Asked what incentive industry could be given to join the government effort, Dr. Pennock said that industry readily participates when an effort relates to specific economic interests. He believes that there is a fine line between concrete deliverables -- such as monitoring costly algal blooms -- and research, but that industry must participate on this broader level.

Cooperative Research

- Mr. Troy Hartley, Executive Director of the Northeast Consortium and Assistant Director of the New Hampshire Sea Grant Program
- Captain Carl Bouchard, local fisherman
- Dr. Pingguo He, University of New Hampshire scientist

Mr. Hartley gave an overview of the Northeast Consortium, the northeast cooperative funding and capacity-building program. The goal of the consortium is to bring scientists, fisherman, educators and coastal managers together to produce innovative, cost-effective research and high quality data. According to Mr. Hartley, running the consortium's reports through a peer-review process and then integrating the results into the management decision-making process is the current challenge. He added that the expansion of these programs throughout the nation must be regionally based and that the coordinating agency must be flexible enough to adapt to the unique characteristics of each region.

Captain Carl Bouchard, a fisherman involved in one of the consortium's projects, explained that fishers have many ideas for improving gear and fishing methods, but cannot risk losing a day's catch testing these ideas. However, the consortium can take these new gear or other ideas through the testing process and find out if they work. He added that the consortium encourages fisherman involvement by producing concrete results while offering fishermen an opportunity to diversify their income sources and learn how to protect natural resources.

Dr. Pingguo He added that the program excelled at setting and abiding by priorities and holding educational workshops for fishermen at the conclusion of projects.

Asked how fishermen utilize the new improvements that the programs create, Captain Bouchard answered that it was mostly through word of mouth -- information about gear and methods spreads quickly when fishermen see results.

Asked about distribution of the consortium's money, Dr. Hartley explained that it was the responsibility a multi-stakeholder advisory group composed of fisherman, scientists, government managers and environmental groups to give recommendations to four representatives from Sea Grant who make the final distributive decision. Asked about the consortium's sources of and present need for engineers and other experts, Dr. Hartley expressed a tremendous need for this type of expertise. Dr. Pingguo He cited examples of small groups training at Massachusetts Institute of Technology and at the University of Rhode Island.

Massachusetts Institute of Technology (MIT)/Pollution Cleanup and the Boston Harbor Model

- Dr. Jerry Schubel, President of The Aquarium of the Pacific
- Dr. Judy Pederson, Manager of the Center for Coastal Resources at MIT
- Ms. Sally Yozell, Battelle Ocean Systems
- Mr. Carl Hunt, Battelle Ocean Systems

Dr. Schubel gave a presentation entitled, *Boston Harbor: From Worst to First In A Decade and One-Half, Well Almost*. An ever-expanding population and greater percentage of people living near coasts combine to make the task of managing pollution in urban coastal areas difficult, noted Dr. Shubel. However, the Boston Harbor cleanup had all of the necessary components for success, including:

- the ability for the Massachusetts Water Resources Authority (MWRA) to issue bonds;
- favorable water renewal rates and circulation patterns; and
- the majority of pollution coming from one point source.

That is not the case in the Chesapeake Bay where political will, funding and scientific understanding are strong, but water renewal rates are very slow, circulation patterns poor, and pollution comes from many non-point sources for which there is little mechanism for control, he noted. Any successful cleanup project requires strong leadership, public support and education, and a scientific community that can reach a consensus to clearly define problems and solutions. A monitoring program with an independent over-sight board is also critical, he said.

Asked whether the MWRA model of independence and bond-issuing authority can be used in complex situations, Dr. Schubel said that there probably will never be enough funding or political will to successfully tackle a multi-nonpoint source problem. Dr. Pederson added that it might work in areas with stormwater systems.

Ms. Yozell noted that the combination of taxes used in the south Florida effort come from different independent entities, but that few other areas have the authority to use such a model.

Global Climate Change

- Dr. Peter Stone, Professor of Climate Dynamics, Department of Earth, Atmospheric, and Planetary Sciences and Director of the Climate Modeling Initiative
- Cliff Goudey, MIT Sea Grant
- Dr. Jerome Milgram, Professor of Ocean Engineering at MIT

Dr Stone's presentation on climate modeling and global warming noted that there are no apparent solutions to this global problem, but there can be regional solutions to the impacts of climate change. There are two areas where the oceans play a major roll in shaping the effects of climate change:

- Global currents, such as the Gulf Stream, act as a heat transport. This means that despite a general warming trend, there will be cooling in some regions and heating in others. Different models show different specific impacts.
- Horizontal transfer of ocean heat will affect regional climates. He showed a model that demonstrates a range of projections for the amount of future sea level rise, with and without a policy, and taking all of the uncertainties into account.

Asked for an assessment of the role of global ocean, space and atmospheric monitoring in preventative policymaking, Dr. Stone said that it would be scientifically useful and that the most efficient monitoring may be done through acoustic techniques.

Asked where the momentum for a national movement on global warming would come from when the experts in the field cannot come to a consensus, Dr. Stone noted the importance of determining what proportion of the change is attributable to natural variability versus anthropogenic forces.

Asked about the credibility and the time frame for the prediction that the Gulf Stream may not replenish itself and simply shut off, Dr. Stone said that it is a scientifically viable theory and that the time frame would be 50 to 100 years. He added that sea ice melting lends credibility to this model.

Marine Biological Invasions

- Ms. Judy Pederson, Manager of the Center for Coastal Resources at MIT Sea Grant

Ms. Pederson gave a presentation on the biological invasion of non-indigenous species. She noted that every major coastal ecosystem in the U.S. is impacted by untracked, non-native species that arrive via ballast water. She stressed that the invasive species damage the seafood industry, aquaculture, commercial and recreational fishing, research and education, public aquaria, canals and open sea ways. Through legislation, Congress has created several severely underfunded programs that integrate activities and encourage the creation of exotic species management plans. She added that there is still no treaty regulating ballast water in vessels; guidelines are followed voluntarily. She recommended that the Commission

ask Congress to strengthen the existing regulations and programs or develop regulations that allow existing groups to coordinate their regulatory policies. To become international leaders in prevention and education, she said, the U.S. effort must include regulatory oversight and provide adequate funding for new technologies. Europe is looking to the U.S. for leadership, particularly through the International Marine Organization (IMO), she said.

Asked to clarify what actions the U.S. has taken so far with the IMO, and what Europe wanted from the U.S. in terms of leadership, Dr. Pederson said that European and other countries want new ideas, technologies and funding.

Asked whether there is political will to require foreign vessels to take simple precautions such as mid-ocean ballast water changes, Professor Chryssostomidis said that it was less a matter of cost than of safety for the ships. There is a study being conducted by the three major shipping groups on ballasting and de-ballasting for supertankers. Dr. Pederson noted that there are two problems with ballast exchange:

- Ballast exchange, the standard choice, is usually estimated at between 60-90% effective. Only 20% of ships do this, however, because it is time consuming and poses safety risks.
- The alternatives technologies have only recently adopted certain standards and usually focus on only one species. The resulting need for employment of several technologies at once becomes quite expensive.

Appendix I

Participants:

- Mr. Steve Lehman, HAZMAT Scientific Support Coordinator, NOAA
- Mr. David Sathe, State of Maine
- Captain Marc O'Malley, U.S. Coast Guard
- Mr. Frank Soulac, NOAA
- Mr. Seth Barker, State of Maine
- Mr. John Norton, President of the Portland Fish Exchange
- Ms. Barbara Stevenson, vessel owner
- Judy Harris, Deputy Director, Maine Dept. of Transportation
- Dr. Jonathan Pennock, Director of the Marine Program at the University of New Hampshire
- Mr. Troy Hartley, Executive Director of the Northeast Consortium and Assistant Director of the New Hampshire Sea Grant Program
- Captain Carl Bouchard, local fisherman
- Dr. Pingguo He, University of New Hampshire scientist
- Dr. Jerry Schubel, President of The Aquarium of the Pacific
- Dr. Judy Pederson, Manager of the Center for Coastal Resources at MIT
- Ms. Sally Yozell, Battelle Ocean Systems
- Mr. Carl Hunt, Battelle Ocean Systems
- Dr. Peter Stone, Professor of Climate Dynamics, Department of Earth, Atmospheric, and Planetary Sciences and Director of the Climate Modeling Initiative
- Mr. Cliff Goudey, MIT Sea Grant
- Dr. Jerome Milgram, Professor of Ocean Engineering at MIT
- Ms. Judy Pederson, Manager of the Center for Coastal Resources at MIT Sea Grant

Central Site Visit: Connecticut, Rhode Island, Massachusetts

The Central site visit focused on several areas including discovery, exploration, undergraduate and graduate education, fisheries science, research and history. Commission stops included Mystic Seaport in Mystic, Connecticut; University of Connecticut, Avery Point, Groton, Connecticut; University of Rhode Island School of Oceanography, Narragansett Bay; and Woods Hole Oceanographic Institution (WHOI), Woods Hole, Massachusetts.

Commissioners Participating in the Central Site Visit:

Dr. Robert Ballard

Dr. Jim Coleman

Mr. Paul Kelly

Mr. Ed Rasmuson

Dr. Paul Sandifer

Commission staff:

Mr. Tom Kitsos, Executive Director

Ms. Angela Corridore

Mr. Malcolm Williams

Also in Attendance:

Ms. Jamie Marie Leff (recorder)

Mystic Seaport

- Retired Admiral Douglas H. Teeson, President of Mystic Seaport
- Dr. Susan Funk, Mystic Seaport

The first leg of the Central site visit was held at the Mystic Seaport in Mystic, Connecticut. Retired Admiral Doug Teeson, the director of Mystic Seaport, gave a tour of the marina, including a brief history of the Mystic Seaport since its founding as a maritime museum in 1929. Among its famous 500 watercraft, the Mystic Seaport is home to the *Charles Morgan* of New Bedford, built in 1841. The seaport also houses a large collection of marine photography, such as the works of Rosenfeld and Carlton Michelle. Admiral Teeson referred to Mystic Seaport as a “table of contents” for maritime history. He explained that that the museum is a viable research center and home to many graduate students. The Admiral also explained that the museum reflects the pride of the community, and boasts over 1,000 volunteers. Asked about the museum’s prominence in the region with over half a million visitors each year and over 90 publications, Admiral Teeson noted that the work Mystic Seaport performs in the community is very strong. He explained that Mystic Seaport maintains the integrity of many historic vessels including famous vessels that fished the Grand Banks, such as the *Dunton*, and is in the process of digitizing the collection. Asked about the source of lumber for the upkeep of these ships, Admiral Teeson responded that the wood is gathered or purchased as responsibly as possible. Asked about funding, Admiral Teeson stated that Mystic Seaport is a private institution fueled by endowments and public contributions.

In another presentation, Dr. Susan Funk gave an overview of the educational programs available to the public.

University of Connecticut, Avery Point, Groton, Connecticut

- Dr. Richard Cooper, Professor of Marine Science, UC-AVPT

- Dr. Jim O'Donnell, , Professor of Marine Science, Director of Marine Sciences, UC-AVPT
- Dr. Ivar Babb, Research Associate URI, National Undersea Research Center, UC-AVPT MSI
- Mr. Ed Monahan, , Professor of Marine Science, Director- Connecticut Sea Grant, UC-AVPT

The Central sit visit continued at the University of Connecticut's Marine Science School where Dr. Richard Cooper noted that renovations for a new building began in 1992 primarily due to Lowell Wiker. He also pointed out that the new facility, finished in 2000, is home to the marine science school with a primary focus on coastal marine studies.

Dr. Jim O'Donnell said that the programs include 40 majors, 900 students and over 35 graduate students. He discussed the current research being conducted in conjunction with the Navy using acoustic data in order to make surface current measurements.

Dr. Ivar Babb gave an overview of remotely operated vehicles. He stated that the University of Connecticut is a National Undersea Research Center with regional research focusing on the fate of materials. A particular interest is the impact of fishing on the seafloor of George's Bank.

Mr. Monahan, the school's Sea Grant director, gave an overview of the importance of education and outreach. Working in the Sea Grant program since the 1960's, he stressed the need for continued funding for the program.

University of Rhode Island School of Oceanography, Narragansett Bay

- Dr. David Farmer, Professor of Oceanography and Dean of the Graduate School of Oceanography, URI
- Assistant Dean Kenneth Hinga, Associate Marine Research Scientist and Assistant Dean of the Graduate School of Oceanography, URI
- Dr. Peter Cornillon, Professor of Oceanography, URI
- Dr. Tom Rossby, Professor of Oceanography, URI

Following the University of Connecticut visit, the Commissioners traveled to the University of Rhode Island's Graduate School of Oceanography where Dr. Farmer gave a tour of the campus. In the Pell Marine Science Library, he noted the multidisciplinary nature of the program and highlighted the interrelationships between departments. Asked about the work being done with marine policy and affairs, Dr. Hinga responded that some overlap does occur between the programs, but the geography department originally established the Marine Affairs program so there is some separation.

Following the tour, the group walked to the fluid dynamics laboratory where Dr. Peter Cornillon explained how weather fronts form and why currents occur.

Next, Dr. Tom Rossby, an experimental physicist explained what he calls ocean "snapping" as a potential force driving global warming.

Woods Hole Oceanographic Institution (WHOI), Woods Hole, Massachusetts

- Dr. Robert Gagosian, Director and President of the Institution Directorate, WHOI

- Dr. John Toole, Senior Scientist of Physical Oceanography, WHOI
- Dr. Robert Weller, Senior Scientist of Physical Oceanography, WHOI
- Dr. John Moran, Assistant Director of the Northeast Fisheries Science Center, WHOI
- Dr. Debbie Hutchinson, Scientist, United States Geological Survey (USGS) Woods Hole Field Center
- Dr. Susan Humphris, Senior Scientist Geology and Geophysics, WHOI
- Ms. Shelley M. Dawicki, Director of Public and Community Relations, WHOI

The final leg of the site visit was held at the Woods Hole Oceanographic Institution where Dr. Toole kicked off the panel with a presentation of the importance of looking at indicators of past temperature change, including ice core samples.

Dr. Weller discussed North Atlantic Deep Water (NADW) movements. He indicated that the NADW was being studied using several tools including Argo floats that drift and give information about temperature and salinity relayed to a satellite, profilers that look at the water column along with sensors on ships that can measure climate quality.

Dr. Moran gave an overview of the fisheries work conducted at WHOI. He highlighted a diagram of the George's Banks trophic dynamics, stating that it is not a clear picture of productivity. He also noted that economic considerations -- such as social cost of preservation -- need to be determined. Dr Moran also said that the biodiversity of the Gulf of Maine has increased and added that fishery stock assessment needs to be rethought in terms of natural history.

Dr. Hutchinson of used the example of the Gulf of Maine to explain the roles of USGS in the Northeast. She highlighted the stewardship role played by the agency, specifically as a partner in monitoring the Boston Harbor clean-up and developing a plan, along with Massachusetts Water Resource Authority and WHOI, which resulted in dramatic changes in the marine environment. Among the achievements was the lowering of the lead concentration by over 50 percent. She also covered exploration through satellite imaging, the mapping of the seabed surface and geology. Dr Hutchinson also covered the role of prediction at USGS in determining coastal vulnerability to sea level rise, and the use of information in management plans such as those of National Sea Shores. Finally, she mentioned that the implications for the Law of the Sea also are important because new discoveries could extend the shelf out further, changing boundaries for the harvest of natural resources.

Dr. Humphris gave an overview of deep-sea exploration. She summarized important discoveries over the past that would not have been possible without deep-sea exploration. Among these were hydrothermal vents, gas hydrates and volcanic and tectonic processes. She introduced her website, "Dive and Discover", which brings scientific cruises into the home through Seanet (a high speed communications system) via satellite.

Appendix I

Participants:

- Dr. Richard Cooper, Professor of Marine Science, UC-AVPT
- Dr. Jim O'Donnell, , Professor of Marine Science, Director of Marine Sciences, UC-AVPT

- Dr. Ivar Babb, Research Associate URI, National Undersea Research Center, UC-AVPT MSI
- Mr. Ed Monahan, , Professor of Marine Science, Director- Connecticut Sea Grant, UC-AVPT
- Dr. David Farmer, Professor of Oceanography and Dean of the Graduate School of Oceanography, URI
- Assistant Dean Kenneth Hinga, Associate Marine Research Scientist and Assistant Dean of the Graduate School of Oceanography, URI
- Dr. Peter Cornillon, Professor of Oceanography, URI
- Dr. Tom Rossby, Professor of Oceanography, URI
- Dr. Robert Gagosian, Director and President of the Institution Directorate, WHOI
- Dr. John Toole, Senior Scientist of Physical Oceanography, WHOI
- Dr. Robert Weller, Senior Scientist of Physical Oceanography, WHOI
- Dr. John Moran, Assistant Director of the Northeast Fisheries Science Center, WHOI
- Dr. Debbie Hutchinson, Scientist, United States Geological Survey (USGS) Woods Hole Field Center
- Dr. Susan Humphris, Senior Scientist Geology and Geophysics, WHOI
- Ms. Shelley M. Dawicki, Director of Public and Community Relations, WHOI

Southern Site Visit: New Jersey

The Southern site visit focused on several areas including marine science, coastal observatories, federal-state interaction, coastal development, habitat protection, habitat restoration, education, public involvement, port security, port operations, port development conflicts and beneficial use of dredged materials. Commission stops included the Rutgers University Marine Field Station in Tuckerton; and the Port Newark-Elizabeth Marine Terminal, in Newark.

Commissioners Participating in the Southern Site Visit:

Mrs. Lillian Borrone
 Mr. Ted A. Beattie
 Ms. Ann D'Amato
 Professor Marc J. Hershman
 Dr. Frank Muller-Karger

Commission staff:

Capt. David Titley, USN
 Mr. Peter Hill
 Ms. Roxanne Nikolaus

Also in Attendance:

Ms. Patricia Ramey from Rutgers University (recorder)

Rutgers University Marine Field Station (Tuckerton, NJ)

- Dr. Frederick Grassle, Director of the Institute of Marine and Coastal Sciences (IMCS) at Rutgers University

Welcome and Introduction

Dr. Grassle provided opening comments and an overview of the Institute and the Rutgers University Marine Field Station (RUMFS). IMCS provides national and

international leadership in marine science and is dedicated to developing, communicating and understanding processes governing change and sustainability in coastal ecosystems. It offers an undergraduate major and graduate program in oceanography. The RUMFS is located at the mouth of the Mullica River Great Bay Estuary, sandwiched between the Delaware and Hudson/Raritan Estuaries and is the location of the Long-term Ecosystem Observatory (LEO-15) which has been in place for seven years. Over the last five years, predictive skill experiments have been conducted at the station with support from the Office of Naval Research. Dr. Grassle outlined several projects of importance to the state and local jurisdictions.

Science Objectives of Coastal Observatories

- Dr. Scott Glenn, Professor, Institute of Marine and Coastal Sciences, Rutgers University
- Dr. Oscar Schofield, Associate Professor, Institute of Marine and Coastal Sciences, Rutgers University

Dr. Glenn and Dr. Schofield gave an overview of coastal observatories using the Long-term Ecosystem Observatory at Rutgers Marine Field Station as a successful prototype. Over 50 researchers and 20 institutions have been involved with LEO-15. The observatory collects real-time data for fast environmental assessment and physical/biological forecasting in coastal waters. Data are collected via satellites, aircrafts, ships, fixed/relocatable moorings and autonomous underwater vehicles (AUVs). The observatory collects continuous real-time data, which allows adaptive sampling of episodic events (e.g., storms, phytoplankton blooms) and assimilation of such events into ocean models. LEO-15's existing 30 x 30 kilometer research space is being expanded to 300 x 300 kilometers. This is possible because of the recent development of remote sensing technology, surface current radar, and AUV technology. This new system will be a central component of the proposed North East Observing System (NEOS) which is expected to include 25 observatories distributed around the region. The new system will provide maps of data to be assimilated into the new generation physical/biological ocean models for hind-cast and real-time continental shelf predictive experiments. It will attract a variety of users including water quality managers, the U.S. Navy, the U.S. Coast Guard, industry and the public.

What is missing?

1. Funding. Existing sources (standard science budgets, National Oceanographic Partnership Program (NOPP) partnerships, Congressional plus-ups, and the National Science Foundation (NSF) Major Research Equipment and Facilities Construction (MREFC) Account) are not entirely satisfactory.
2. People with practical training in operational oceanography.
3. A governance plan. How will this system operate? For example, how does one maintain open (shared?) oversight between academic, federal and industrial sectors, and how does one operate 24 hours a day, seven days a week while still allowing for innovation?

Fisheries Habitat

- Dr. Ken W. Able, Director, Marine Field Station, Rutgers University

Dr. Able asserted that there is a growing awareness by a diversity of groups of the role of fish habitat as a critical component in the recovery and management of U.S. fisheries. He stressed that survival during the early life history stages (egg, larval, juvenile) is critical to the subsequent contribution of adults to the fisheries and that

this relationship is based on the quality and quantity of habitat. He indicated that we often lack sufficient information to identify the most important habitats to conserve and restore. Such information is essential, he said, especially with the ongoing development along the U.S. coasts. He pointed out that one of the greatest shortcomings in our understanding of the oceans is the lack of long-term data that would help us identify the effects of overfishing, climate change, pollution and other factors. Dr. Able put forth several recommendations including:

- The organizational structure and funds necessary to address/refine Essential Fish Habitat (EFH) are critical to the future health of our fisheries;
- There is a need for collaborative programs between federal, state and academic scientists;
- Research and monitoring programs need to be long term if we are to understand the effects of changes in the ocean, whether natural or human-induced;
- Habitat research should be conducted with high frequency because of the dynamic use of habitats due to movements/migrations on a variety of temporal scales;
- Research to address the role of habitat, as it influences population fluctuations, have to be conducted at the landscape/ecosystem scales; and
- Habitat conservation and restoration should receive enhanced support at all levels of government.

When asked how the U.S. Fish and Wildlife Service and the National Marine Fisheries Service are involved with sampling and academic work, Dr. Able said that the agency projects vary from state to state. There is a regular groundfish survey that has been conducted since 1965. However, the inshore area is not sampled. The fish species that people want to harvest are highly mobile and migratory; that is why a system of observatories is so desirable, he explained. He commented on the need to manage on an ecosystem level, and that there is a need for long term sampling programs. He also noted the desire to see this done with federal support.

In response to a question regarding whether technology is coming online to assist with fish counts, Dr. Able noted that technology is not yet at the point where it can be of assistance. Acoustics offer some possibilities

Regional Structure of a Coastal Ocean Observing System

- Mr. Evan D. Richert, President, Gulf of Maine Ocean Observing System

Mr. Richert gave an overview of the Gulf of Maine Ocean Observing System (GoMOOS), a system which is designed to deliver real-time ocean observations and forecasts to a wide variety of users. He also highlighted what GoMOOS is not. It is not a research project or an observatory. He stated that the Gulf of Maine's goal is to achieve ongoing, collection, management and conversion of data into products and forecasts that are delivered to users over the internet. The GoMOOS web site has had thousands of hits and the Coast Guard is one its largest users. He compared GoMOOS to AT&T, pointing out that GoMOOS functions like a cooperative utility. GoMOOS is the first multipurpose system governed by its users and is structured as a nonprofit corporation. GoMOOS has 28 member institutions (e.g., universities, industry and government agencies). Each pay membership fees. GoMOOS also includes a small staff and a board of directors, elected by the membership, which has the final say on design and financing of the system.

Mr. Richert stated that GoMOOS's future vision is to expand and ultimately become nested within a larger, regional system covering the Northeast. He recognized Dr. Grassle as a leader in this effort and indicated that the two groups were eager partners. Subsystems would be tied together by common standards and protocols, by overlapping coverage and by common systems to access, archive and retrieve data. He indicated that steps are being taken toward this end; however, implementing such a system could not be achieved through research grants. He stressed that the Federal government needs to create and fund a national ocean observing system which would be a partnership between federal agencies and a federation of regional observatories, such as GoMOOS. Mr. Richert commented on the estimated costs for GoMOOS: capitalization - \$12 million over three years; operations and maintenance - \$4 million per year; and total costs - \$6-7 million per year. The estimated benefit of GoMOOS in the sectors of search and rescue, oil spills, commercial and recreational fishing and transportation is \$33 million per year.

Regional Business and Policy Applications of Observing System Information and Organizational Structure Concerns

- Dr. Mary Altalo, Corporate Vice President, Energy Solutions, Science Applications International Corporation

Dr. Altalo addressed regional business and policy applications of observing system information as well as organizational structure concerns. She indicated that the focus of Global Ocean Observing System (GOOS) efforts should be toward sustainable development in that observing systems should aim to improve economies and societies as well as the environment. She pointed out that allowing observing system products to inform national policy, guide market decisions and safeguard the environment will help gain support from governments and businesses. She stated that GOOS should engage the business leaders of the region and that an optimal operational organization needs to be created to achieve the 24 hours a day, seven days a week operation needed for successful services. She talked about GoMOOS as one possible organizational model.

One question she highlighted was, how can an environmental forecast be changed into a business forecast? She indicated that there is a need to match an industry problem or need with something already being produced at an observatory. She pointed out that this can be accomplished through business and policy trials which demonstrate by the case study approach on how environmental information can impact operations and planning. For example, sea breeze forecasts from the coastal observing systems can be integrated into the operations and strategic planning of power generation and distribution activities of the Public Service Enterprise Group. Dr. Altalo stated that such plans are already being discussed. She also indicated that a number of businesses have demonstrated a willingness to participate in such trials for the Mid-Atlantic Region and planned case studies include the energy, water, tourism and transportation sectors.

When asked whether she sees a specific role for the Commission in an international set-up of observatories, Dr. Altalo replied affirmatively, stating that there are already eight observatories being planned on an international basis in Europe, Africa and Asia. She noted that it is necessary to find the best design metrics and a way to standardize and exchange data.

Observing System Recommendations

- Dr. Frederick Grassle, Director, Institute of Marine and Coastal Sciences, Rutgers University

Dr. Grassle addressed observing systems and highlighted how these systems give scientists the capability to forecast changes in the environment. Observing systems monitor what is going on in the environment and tell scientists when and where to sample, so researchers are not sampling random points and missing important information. He indicated that sensors for biology are now being put on the LEO-15 instrument nodes. He also highlighted the Census of Marine Life (CoML) which is a 10-year international research program aimed at assessing and explaining the diversity, distribution and abundance of marine organisms throughout the world's oceans.

Dr. Grassle provided several recommendations to the Commission including the following:

- Funding is needed for the infrastructure required to observe the ocean and foster regional partnerships among industry, academia and government to sustain observing systems. Elements of an integrated ocean observing system have been defined and the recommendations of the Ocean.US Workshop should be implemented.
- Integrated Ocean Observing System (IOOS) should provide the rationale for a cross-cutting budgetary initiative to take advantage of the revolution in national undersea capability. The IOOS needs to have linkages to research efforts such as the CoML-Ocean Biogeographic Information System (OBIS), the global ocean ecosystems dynamics (GLOBEC), the Coastal Ocean Processes (CoOP) Program, and the Global Ocean Data Assimilation Experiment (GODAE). Biological sensor technology development is needed on a full range of platforms (i.e. ships, buoys, AUV's, floats, gliders and bottom observatories).
- CoML provides a way of achieving many of the scientific goals of the global observing system. The new approaches developed by CoML should be incorporated into IOOS and individual agency budgets. The OBIS international approach to developing advanced information systems should be incorporated into data systems development.
- Biological research programs, such as those planned by CoML, will benefit from ship and submersible time. NOAA's Office of Ocean Exploration must be equipped to provide regular access to ships and submersibles to meet this challenge. A formal partnership with the National Undersea Research Program (NURP) can help provide access to these assets.

See Appendix II for more detailed recommendations.

Problems and Challenges Associated with Coastal Development

- Mr. Bradley M. Campbell, Commissioner, Department of Environmental Protection, State of New Jersey

Mr. Campbell addressed the problems and challenges associated with coastal development. He urged the Commission to focus on concrete steps to strengthen coastal and ocean resources. He spoke on the issue of governance and indicated that

there is a need for leadership and funding. He indicated that although there are leaders for ocean policy such as NOAA, there is currently no one in charge of ocean policy. He stated that this has led to delays in action and is a fundamental constraint impairing good management of coastal/ocean resources. He stated that there is a need to strengthen the states' involvement under the Coastal Zone Management Act (CZMA), excluding navigation and domestic security, and give them a stronger voice. There also is a need for international leadership. Mr. Campbell indicated that inadequate resources have been devoted to water quality, marine protected areas and habitat protection -- especially with the increased levels of population density along the coast. New development is not in stride with or being matched by investments in habitat protection, he said. Different but equal problems exist for fisheries resource management and living resource management. There is an international by-catch problem beyond the Exclusive Economic Zone (EEZ).

Asked how he would implement a regional approach that would strike a balance between states' roles and recognition of regional issues, Mr. Campbell responded that giving states more power allows dialogue that leads to action. There is an important role for a strong federal leadership, he added. The greatest success in regionalism, he stressed, takes place when states have greater supervision at the federal level.

When asked whether he sees the states having more responsibilities beyond three nautical miles, Mr. Campbell commented that three nautical miles is an arbitrary number and is a boundary that does not make sense from a resource management perspective. States should have the authority to raise objections under the CZMA throughout the EEZ.

Mr. Campbell was asked how he would get the public more interested in ocean issues and connect ocean data to real world issues. He noted that this is a difficult question and that so many resource issues differ from place to place. Part of the issue comes from governance and authority. When there is more clarity of authority, then agencies see public education and engagement as their role and responsibility.

Asked how to address the problem of a lack of leadership, Mr. Campbell replied that the bottom line is that there is a need for a greater federal leadership role on these issues. He added that NOAA should be relocated to the Department of the Interior.

Coastal Development Recommendations

- Mr. Mike P. De Luca, Senior Associate Director, Institute of Marine and Coastal Sciences

Mr. De Luca gave several recommendations to the Commission addressing the challenge of how to educate the public on environmental issues and how to translate research into findings that are meaningful to the public and environmental managers.

- Enrich ocean science education and outreach by promoting the effective use of information technology to enhance and integrate research and education. A high priority needs to be given to involving scientists and educators in the translation of data and information from coastal observatories and National Science Foundation-funded projects in the Mid-Atlantic region into instructional materials and products for educators and the public. Regional

Centers for Ocean Science Education Excellence, a National Science Foundation initiative, offer an opportunity to implement this.

- Incorporate coastal ocean sciences in reform efforts aimed at creating a scientifically-literate populace. Focus efforts on providing role models, mentors and researchers who can assist in reality-based learning, career advice and provide hands-on laboratory and field opportunities that complement the existing variety of excellent existing science education curricula. Infrastructure is needed to encourage and facilitate interactions between scientists and educators. Specifically, we need to develop links between research, coastal management and education communities in order to allow for collaboration and partnerships that would complement and enrich our exemplary science programs with real-world science experiences (i.e. National Estuarine Research Reserve System Coastal Training Program, Center for Ocean Sciences Education Excellence).
- Build local capacity to foster science-based decision making. Reauthorization of the CZMA should recognize the need to support local delivery of training programs and services, and enable local decision makers to access, interpret and use science-based information easily. NERRS coastal training program is a good model for this. Financial incentives are needed to scale-up such training and education efforts into an intra-agency program among state agencies (i.e. NERRS, Sea Grant, Environmental Protection Agency, Department of the Interior, U.S. Department of Agriculture) and education community (i.e. COSEE, Consortium for Oceanographic Research and Education, National Science Teachers Association, National Marine Educators Association) that can be delivered at regional and local scales.
- Strengthen the role of the NERRS to acquire, protect, and restore critical coastal habitat. Specifically, amend CZMA to recognize this stewardship role.

When asked whether COSEE is going to work, Mr. De Luca replied that the intent is to capitalize on existing curriculum; we do not need to duplicate it. Getting real-time data into the classroom will enrich science education. It will expose students to and prepare them for what is happening in the real world. Decision making needs to be tied with a long range plan.

Port Newark-Elizabeth Marine Terminal

Introduction

- Mr. Rick Larrabee, Director, Port Commerce Department

Mr. Larrabee greeted the Commissioners upon their arrival at the New Jersey Marine Terminal Administration Building and provided background information on port operations. He noted that 95 percent of U.S. trade comes through ports. He explained that the New Jersey facilities are part of three larger port complexes on the East Coast. He added that cargo coming through the port will double over the next 10 years. Mr. Larrabee noted that port security is a very important issue, especially after the World Trade Center incident. The port is now undergoing a very aggressive program to rebuild and increase security. There are three dimensions to this plan:

1. Dredging has been going on here for a long time and the plan is to deepen port channels to 50 feet over the next 10-15 years;

2. Increase the capacity of terminals to handle cargo; and
3. Diversify and enhance distribution. Right now 87 percent of cargo goes out on trucks. The plan is to reduce this by using rail and barge.

Maier Terminals, Inc.

- Mr. Anthony Murrello, Director of Operations, Tripoli Street Terminal, Maier Terminals, Inc.
- Mr. Joseph Curto, Executive Vice President-Operations, Maier Terminals, Inc.

Maier Terminals' representatives, Mr. Murrello and Mr. Curto, gave the Commissioners a tour of the Maier Terminals Electronic Gate System. Maier Terminals, Inc., is a family-owned New Jersey business that has a 30 year lease to do business at Port Newark. Maier is participating in the Port Master Plan under which they are transforming their two existing terminals into one 450-acre terminal which will increase their capacity to move containers through the terminals.

Mr. Curto and Mr. Murrello showed the operations surrounding the Electronic Gate System. They noted that the system was created to effectively move trucks throughout the terminal and is designed to collect electronically the information needed to process cargo in and out of the terminal. Moreover, this system may prove useful in developing security measures. In response to Commissioners' questions, it was noted that between the two terminals, 5,000 to 6,000 trucks per day are handled by the system, and that there is only one system like this in existence.

When asked how many mistakes are found each day and whether any information about the cargo manifest is taken, it was noted that there are few mistakes. Right now there is no end-to-end security of cargo. It also was noted that the cargo is in Maier Terminal approximately five days out of its entire journey.

Maersk Sealand

- Mr. Thomas Andersen, Maersk Inc.
- Mr. Philip V. Connors, Executive Vice President, Maersk Sealand
- Ms. Karen Tobia, Manager of Technology Planning in the Port Commerce Department at the Port Authority of New York and New Jersey
- Ms. Bethann Rooney, Manager of Port Security in the Port Commerce Department at the Port Authority of New York and New Jersey
- Capt. Craig Bone, Captain of the Port, U.S. Coast Guard
- Mr. Ronald J. Borsellino, P.E., Deputy Director for Operations, Division of Environmental Planning and Protection, Region 2, U. S. Environmental Protection Agency
- Mr. Thomas Wakeman, General Manager, Development Division, Port Commerce Department, Port Authority of New York and New Jersey
- Mr. Chris Ward, Commissioner, New York City Department of Environmental Protection
- Dr. Dennis Suskowski, The Hudson River Foundation; and
- Colonel John O'Dowd, New York District Manager, U.S. Army Corps of Engineers.

The Commissioners visited the Maersk Sealand Marine Operation Building where they were greeted by Mr. Andersen and Mr. Connors. To begin, Ms. Tobia gave a presentation on the Freight Information Real-Time System for Transport (FIRST). She explained how it fits into movement of cargo and port security. FIRST is an internet-based, real-time network that provides cargo and port information from multiple sources in one format at a single location. This system is a port community

project developed by members of the port community such as truckers, brokers, trucker operators, etc. The project is sponsored by the Port Authority along with the I-95 Corridor Coalition, New York State air quality program, the New Jersey Department of Transportation, the New York Department of Transportation, and municipal agencies. The purpose of FIRST is to consolidate data/information and make it available in real-time to the trucking community and other interested parties. It will increase productivity.

Asked whether there is a linkage for customs, Ms. Tobia replied that there is no linkage at this time. The future goal is to establish a link and get customs information directly.

Captain Bone addressed port security. He indicated that one thing that has changed since September 11, is that shippers must provide 96 hour notice of what they plan to ship into U.S. ports. Information must be provided about the vessel, cargo and people and collated on a national level. High risk and high maintenance vessels are identified and targeted to be boarded and undergo a safety and security inspection. He described a new concept called "Sea Marshal" where Coast Guard personnel man critical spaces such as the navigation bridge and engineering control in order to assure the vessel's ultimate destination and intentions. Certain vessels may have escorts. Boardings are conducted seven days a week. He indicated that they work closely with state and federal authorities. He stated that operations in the port have always been risk-based and the new risk becomes that of security. What is needed is an entire supply chain form of management where the manifest is followed right from the manufacturer and loaded in the box to its final destination. He indicated that there are efforts now under way for Operation Safe Commerce which is looking at how to prototype and put into place an entire supply chain security system.

Ms. Rooney spoke more on supply chain security. She indicated that vulnerability tests, conducted by the Coast Guard as well as internally, showed that the greatest risk today is a container being used to transport a weapon of mass destruction, weapon components or terrorists into the U.S. She added that steps are being taken on several levels to prevent this from happening. The Coast Guard is doing its part through Water Waves Security and Operation Safe Commerce. Once again, a layered approach to security was called for with management and security going back to the point of origin. Ms. Rooney indicated that U.S. Customs has a variety of programs that are underway at this time that are looking at supply chain security and integrity. In terms of legislation she stated that the Port Authority was in a very unique position in that they have no control over the vessels that come into their facilities or the cargo and people that come on the ships and are therefore want to play a very active role in guiding and directing the flow of the legislation and improving maritime security policy.

Mr. Connors gave a carrier's perspective on some of the issues Ms. Rooney discussed. He stated that he supports what Ms. Rooney said, and that it is difficult to disconnect information and legislation. He indicated that we need all of the information we can get to make intelligent laws and that the carriers would like to see the law focus on shipment to processing. He also agreed that security needs to go back to the point of origin, to the manufacturers. He stated that the only thing the carriers rely on is documents they receive from shipment. He said that carriers do not know what cargo is being loaded on ships today and that the manifest does not even provide this information.

Colonel O'Dowd stated that -- as the port has developed -- there has been recognition of its responsibility to the environment in which it operates. He noted that as the port has become cleaner and that the standards for addressing environmental issues have been raised significantly. He discussed the issues of dredging, using dredged material in beneficial ways and the impact on the estuary. He indicated that the U.S. Army Corps of Engineers (USACE) is most interested in discussing the issue of how to balance all of this.

Mr. Wakeman discussed the dredging program for the port. He stated that industry is going to larger and deeper draft vessels and, if the port is going to continue international shipping in the next 10 years, that there is a need to create deeper channels to support this change in the transportation system. He stated that the challenge of digging those channels is both a local and federal issue. To successfully complete this program there is a need for cooperation between scientific and environmental communities, as well as coordination between the two states, the Port Authority and the federal government. He indicated that there is a need to focus on disposal of dredged material. He estimated that there will be approximately 65 million cubic yards of this material for this project and indicated that a portion of this material is still acceptable for ocean placement as remediation material. Another portion can be placed on land to cap landfills, etc. He stated that the bottom line for the dredging program from the Port Authority's point of view is time, and stated that the channels need to be dug today.

Colonel O'Dowd stated that the goal of the program is to improve navigation capabilities in the port while keeping in mind the landsite construction and the environment. He stated that in terms of navigation, the port needs to be able to handle the newest line of container ships. He commented on beneficial uses of the 65 million cubic yards of dredged material that will be created. A portion of this material will be used to cap-off the Stored Area Remediation Site, which is a site 13 miles offshore that has been used as a disposal site for a variety of materials. Dredged materials can be used to cap landfills or build golf courses. He concluded by stating that such projects are still looked at only in one dimension and that there is a need to look at this not only as a navigation project but as one that takes into account the environment, infrastructure and navigation. All three of these issues need to be brought together for a successful project. The final two points were that it is beneficial to bring together all these communities and that there are legal constraints with the way the projects are authorized.

Colonel O'Dowd noted that another issue is the disposition of approximately two million cubic yards of dredge material produced each year through maintenance dredging. The goal is to reduce the cost of using the material beneficially. One strategy being studied is how to remove the pollutants from the sediment. USACE is working closely with the scientific community to look at the sources of those pollutants. Specifically, the Corps is focusing on PCBs and mercury, looking at where they are coming from and how to reduce the pollutants early.

Mr. Ward spoke about the Harbor Wetlands Program which is trying to reduce wetland loss. He indicated that a historic problem is the prioritization of a legal, regulatory, scientific and then community based form of management. He stated that there is not yet a capacity to integrate these three circles, which leads to an incongruity of prioritization in time. He indicated that the testing protocols for dredged materials, the complete revamping of the Coastal Zone Management Plan and the ratios of wetland takings to wetland restoration must be addressed. He

stated that meaningful integration is derived from prioritization of the following questions:

1. What is the harbor?
2. What do you want it to be from an environmental perspective?
3. What resources are necessary to restore what you want?
4. How much is it going to cost?
5. What are the legal boundaries?

He stated that all of this needs to be addressed and the answer lies not in a national policy, but a regional plan.

When asked what is needed to get this process started, Mr. Ward stated that a strong federal recognition that the way the Army Corps does business in terms of channel deepening should not be on a case by case basis. The regions should be asked to suggest how they would build up this port in its entirety, authorize that plan in its entirety, and allow the regions to, prioritize their economies. He added that the next step would be to ask the environmental community what would be the current set of priorities they would want and determine what federal resources are available to help. The environmentalists need to see a concurrent environmental strategy that is prioritized, proved and funded. He noted that the final step would involve the business community matching its investments for terminal development.

Mr. Andersen commented that the Commission could look at a comparison of ports and examine how to make the best use of resources. He noted that the three issues of concern from a terminal operator's perspective are safety, security and facility utilization.

Appendix I

Participants:

- Dr. Frederick Grassle, Director of the Institute of Marine and Coastal Sciences (IMCS) at Rutgers University
- Mr. Evan D. Richert, President, Gulf of Maine Ocean Observing System
- Dr. Mary Altalo, Corporate Vice President, Energy Solutions, Science Applications International Corporation
- Mr. Bradley M. Campbell, Commissioner, Department of Environmental Protection, State of New Jersey
- Mr. Mike P. De Luca, Senior Associate Director, Institute of Marine and Coastal Sciences
- Mr. Rick Larrabee, Director, Port Commerce Department
- Mr. Anthony Murrello, Director of Operations, Tripoli Street Terminal, Maher Terminals, Inc.
- Mr. Joseph Curto, Executive Vice President-Operations, Maher Terminals, Inc.
- Mr. Thomas Andersen, Maersk Inc.
- Mr. Philip V. Connors, Executive Vice President, Maersk Sealand
- Ms. Karen Tobia, Manager of Technology Planning in the Port Commerce Department at the Port Authority of New York and New Jersey
- Ms. Bethann Rooney, Manager of Port Security in the Port Commerce Department at the Port Authority of New York and New Jersey
- Capt. Craig Bone, Captain of the Port, U.S. Coast Guard
- Mr. Ronald J. Borsellino, P.E., Deputy Director for Operations, Division of Environmental Planning and Protection, Region 2, U. S. Environmental Protection Agency

- Mr. Thomas Wakeman, General Manager, Development Division, Port Commerce Department, Port Authority of New York and New Jersey
- Mr. Chris Ward, Commissioner, New York City Department of Environmental Protection
- Dr. Dennis Suskowski, The Hudson River Foundation; and
- Colonel John O'Dowd, New York District Manager, U.S. Army Corps of Engineers.

Appendix II

Issues and Recommendations for the Satellite Component of an Ocean Observing System

**Fred Grassle, Scott Glenn, Oscar Schofield and Dr. John Wilkin
Rutgers University Institute of Marine and Coastal Sciences (IMCS)**

As part of the Oceans Act, the Commission on Ocean Policy is charged with assessing present and planned ocean observation infrastructure including satellites. In this context, the present situation regarding the space-based component of an observing system requires attention.

Because the inherent time scales of ocean variability are long, decadal-scale time series and longer are required to observe many ocean processes, even those that may not be directly relevant to climate research. Similarly, coastal issues and processes have very short time and space scales, and require different technologies than presently available to observe the ocean from space. Thus any satellite observing strategy for the ocean must encompass the needs to resolve short-term variability within a framework of long-term change.

Earth observing research missions, such as those developed and operated by the National Aeronautics and Space Administration (NASA) and those operated by the National Oceanic and Atmospheric Administration (NOAA), typically take 5-10 years or longer to develop. However, there rarely has been a planning effort that integrates the requirements of the ocean science and the operational communities.

The NASA research missions frequently are scoped to last from 1-7 years in terms of funding support as well as physical integrity of the spacecraft and sensors. In many instances, missions outlast the funding period initially planned for them. These missions frequently provide data that are integrated into operational programs at both NOAA and the Department of Defense (DoD), but they lack support within these agencies for continuation and continuity once the missions expire at NASA.

Developing a multi-decadal record requires both the political and programmatic development of separate missions with sufficient temporal overlap to avoid undersampling and to intercalibrate the sensors for a consistent data record. Missions developed and operated by operational agencies, such as NOAA, have several advantages in this regard. These include:

- Continuous coverage
- Real-time data 24 hours a day, 7 days a week
- Commitment to support long-term data continuity for environmental monitoring and global change assessment

At this stage, there is no agency or office with responsibility for observing system strategies and, specifically, strategies that include design and implementation of satellite missions. The U.S. Global Change Research Program (GCRP) never really went after this, and the individual agencies worry about agency issues. This is something the Commission could touch on over the next several months.

With this in mind, there are some issues of concern about ocean remote sensing in the U.S.:

1. Planned Missions:

There does not appear to be a long-term ocean observing plan from space, save for the National Polar-orbiting Operational Environmental Satellite System (NPOESS). DoD, NASA, and NOAA have formed an Integrated Project Office (IPO) which is evaluating bids for a “converged” Earth observation NPOESS satellite series. This would combine the requirement of the operational communities within DoD and NOAA. Here are some of the issues that need consideration:

a) At this point, it is unclear who will be responsible for development, testing, and processing of new algorithms (lines of new products): NPOESS will acquire many observations that are relevant for ocean research. Given the long-term commitment to NPOESS, there is a possibility of developing multi-decadal time series. The NPOESS approach is to define “Environmental Data Records (EDR),” which are used by private industry to develop specific sensors and algorithms. The EDRs have specified “thresholds,” (minimum performance requirements) and “objectives” (desired performance requirements). In many cases, ocean research needs can only be satisfied if the sensors and algorithms meet the thresholds, but doing so will be more costly for NPOESS. Moreover, long, consistent data records that span many sensors (even copies of the same sensor) will require continuing research and analysis, leading to improved understanding of sensor characteristics, improved algorithms that incorporate better understanding, and reprocessing of the entire data set. None of the agencies have committed to development, testing, and processing of new algorithms.

b) Coordination of various complementary missions: The capabilities of NPOESS represent a significant step forward from the present generation of polar-orbiting satellites, Polar-orbiting Operational Environmental Satellites (POES) and Defense Meteorological Satellite Program (DMSP), in regards to ocean observations. Moreover, the present set of research satellites developed by NASA and its international partners (TOPEX/Poseidon, QuikScat, SeaWiFS, MODIS, Jason-1) has greatly advanced our understanding of the ocean. The challenge is to coordinate these two types of missions where the requirements process and the level of scientific involvement are significantly different.

c) Openness and documentation: The most recent set of EDR requirements from NPOESS are greatly improved, as they now include long-term stability requirements as well as improved measurement

characteristics. The Integrated Program Office, which is managing NPOESS, is also developing a calibration and validation strategy, although a strategy for long-term data records is by necessity significantly different than a strategy designed to verify the initial operation of a specific sensor and its data products. The scientific community must have complete access to sensor design, operations, algorithms, and calibration/validation data. Given the nature of the NPOESS procurement, this is a serious challenge.

d) Continuity and product calibration: Mission operations will also need to be examined. NPOESS has only six critical variables that are essential. If a sensor designed to deliver one of these critical variables fails, then a replacement satellite will be launched. However, many of the non-critical NPOESS measurements are essential for ocean research, and this strategy will lead to long gaps, compromising the statistical robustness of the time series. Moreover, slow degradation of the sensors is more common, rather than outright failure, so the quality of the time series may also be diminished. On the other hand, a replacement satellite may be launched although the existing satellite may still be delivering useful data from a scientific as opposed to an operational perspective. How will these residual assets be managed, given the cost constraints of NPOESS? When will a satellite be declared "inoperable" and a replacement launched? Overlap between successive sensors of up to one year is essential to eliminate time-dependent biases in long data records. At present, there are no plans within NPOESS to provide any sort of overlap.

e) Linkages: Although NPOESS represents a potentially critical platform for ocean remote sensing, there are many other outstanding issues that must be resolved. In a sense, the existing linkages between the research and operational agencies are far too tenuous. The systematic, long-term observation requirements for ocean research depend on the long-term, continuous measurements as embodied in NPOESS, but equally they require the open, scientific inquiry and insight as represented by NASA missions. It is not apparent that the necessary coordination can be sustained in the present agency structures. "Partnerships" and "leveraging" are no substitute for leadership and funding, and the Ocean Commission could play an important role in developing effective frameworks for ocean remote sensing.

f) Missed opportunities: Here, there may be a "missed opportunity." That is, there are some potential benefits to ocean science presented by NPOESS, but they require some serious investment and work if they are to be realized.

2. Coastal Ocean Remote Sensing:

There is presently no plan to build a "coastal ocean" observation satellite mission. The technology has not yet been developed to address rapidly changing coastal phenomena (short time and space scales), and this is an area where active research could be focused.

NPOESS is talking about something called an Ocean Observer (OO), a copy of the "Ocean Observer User Requirements Document / October 2001" was submitted to the Commission earlier this year. In this NOAA document requirements are outlined in the form of specifications for environmental parameters to be measured (Environmental Data Requirements). The OO study outlines some of the requirements for observation of processes in coastal zones from space. The document shows that the Ocean Observer would also include land surface, cryospheric, hydrologic, and atmospheric measurement requirements to complement NPOESS. However, the Ocean Observer mission is still undefined and the support within the agencies remains unclear. A concerted effort is required to encourage satellite data integration with in situ data and meteorological forecasts with the objective of improving products for coastal ocean hindcasting and forecasting.

3. Data Continuity:

In regards to NASA research missions, they are generally developed without regard to the needs of the operational agencies in terms of cost or capability. NASA missions provide the highest quality data because the design incorporates science-driven requirements. These high-quality observations have repeatedly been proven to also best serve private concerns and operations. Successful missions generally also lead to scientific support for repeated or continued operations, which are difficult to manage in a research-driven enterprise. NASA Headquarters has gone on record stating that NASA is not in the business of providing data continuity. Perhaps the long-term systematic applications of every NASA mission should be evaluated at the outset, even for exploratory missions. Such a review should include the operational agencies as well as NASA.

"Operationalizing" ocean measurements has some upside potential. A concern is NASA stepping away from these data sets (in terms of calibration/validation, algorithm development, reprocessing, analysis, etc.) once they move into the operational arena. The need for continued science insight and involvement is critical, or the data and product quality will degrade. Data continuity is an issue that the National Research Council is again looking into and the Commission might be able to help with.

NOAA has not yet committed to taking over the newer technologies developed by NASA for precise and repeated ocean observation. Handshaking between NOAA and NASA such as seen for QuikScat could be a model for interaction between the agencies on oceanographic satellites. Much additional work is needed to define how the agencies work with each other and with the science community and the public in releasing oceanographic satellite data.

4. Mission Terminations:

Scientists highlighted the present situation at NASA, where the option of terminating some key oceanographic missions within the next 1-2 years is seriously being considered. While commissioners present were uncertain as to whether the Commission should inject itself into the process being followed at NASA at this stage, the issues brought up by the scientists are listed below:

SeaWiFS, QuikSCAT and TOPEX are missions with significant life expectancy, but they may be cut short. These are among the most important satellites for the research, operational, and management communities today.

Their longer life expectancy is needed to bridge gaps in missions, provide continuing inter-satellite/sensor calibration/validation, and to observe both very low frequency temporal (from the long time series) as well as higher spatial oceanic variability (using multiple platforms).

-SeaWiFS (ocean color)

Termination of the mission is planned for December 19, 2002, based on perceived budget threats within NASA and the fact that NASA's newer mission (MODIS on Terra and Aqua) is planned to substitute for SeaWiFS. MODIS data are turning out to be of exceptional high quality. However, SeaWiFS provides capabilities that complement MODIS, including the capability to tilt and therefore provide increased coverage. SeaWiFS and MODIS observe the ocean at different times of the day, so that continuation of SeaWiFS allows for greater global coverage and avoidance of clouds. Both SeaWiFS and MODIS data can be captured real-time via direct broadcast from the satellites, but the antennas to capture SeaWiFS remain relatively inexpensive and are widespread around the world. Antennas to capture MODIS data are typically 3-10 times more expensive and there still is no publicly available software to process MODIS ocean products. The software to process the SeaWiFS data is public and widely available. At this point, and for the next few years, SeaWiFS data may be more widespread than ocean MODIS data.

-TOPEX (or T/P - ocean topography and circulation)

NASA has formally agreed to continue T/P at least through this fiscal year which should allow calibration/validation with Jason-1, which has just been launched. NASA is considering the merits of tandem altimeter mission, with Jason-1 flying first in the same orbit as T/P and then possibly in a parallel orbit. The parallel orbit tandem mission is not yet approved but would provide very significant improvement in coverage of the global ocean over a shorter time period than is possible with a single altimeter, since these altimeters provide data only in a narrow track underneath the satellite orbit.

-QuikSCAT (QSCAT - global winds)

With respect to QSCAT and the SeaWinds mission planned for launch on the Japanese ADEOS-2 (A-2) satellite (launch date of November, 2002 still uncertain): while initially NASA proposed to terminate QSCAT at the end of FY'02, Ghassem Asrar has formally stated that NASA is committed to continuing QSCAT at least long enough to perform joint calibration/validation with SeaWinds on ADEOS-2 for at least 6 months. The present A-2 launch date from Japan is November, 2002, and ADEOS-2 will have a lengthy 4-month spacecraft commissioning period (during which there will be little useable scatterometer data), so the minimum time to extend the QSCAT mission will be approximately 10 months to 1 year after A-2 launch. NASA has basically agreed to do this. Both the scientific, and also the operational weather communities (the NOAA and DoD forecasters, not yet the Numerical Weather Prediction (NWP) General Circulation Model (GCM) modelers) have highlighted the benefits of improved sampling from tandem scatterometer missions, and NASA Headquarters is presenting such tandem missions to OMB. Further, NASA and NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) are negotiating regarding NOAA's paying for additional extensions of QSCAT even after the calibration/validation overlap with A-2. Greg Withee (NOAA/NESDIS) was a prime initiator of this plan.

There is, however, no clear plan of what to do with QSCAT after this period, i.e. starting about October-December, 2003.

We are presently limited by a lack of experience using satellite data in the coastal ocean, rather than being limited by data availability itself. More practice using satellite data "quantitatively" with models and integrated analysis with *in situ* data is needed. There are many advantages to maintaining multiple satellites in coastal observation and prediction systems,. For example, atmospheric conditions may change rapidly. Real-time access to a morning satellite allows placement of ships, AUVs, and aircraft on the right location for simultaneous data collection during an afternoon satellite passage. In this context, the international constellation of satellites is valuable even though older and/or foreign satellites may not have the absolute latest in sensor design.