



Excerpts from

REPORT OF THE SECRETARY OF THE ARMY ON CIVIL WORKS ACTIVITIES FOR FY 06



INSTITUTE FOR WATER RESOURCES

BACKGROUND

The U.S. Army Engineer Institute for Water Resources (IWR) is a field operating activity under the staff supervision of the Director for Civil Works, Headquarters, U.S. Army Corps of Engineers (HQUSACE). The Institute is the USACE center of expertise for integrated water resources management (IWRM), focusing on planning analysis and hydrologic engineering and on the collection, management and dissemination of Civil Works and navigation information, including the Nation's waterborne commerce data.

IWR was established by the USACE Chief of Engineers in 1969 with the approval of the House and Senate Appropriations Committees and the Subcommittees on Public Works in order "to enhance the capability of the Corps of Engineers to develop and manage the Nation's water resources, within the scope of the Corps' responsibilities, by developing essential improvements in planning to be responsive to the changing concerns of our society."

The Institute's mission is to facilitate the adaptation of the Civil Works Program to future needs by providing the USACE with the capability for developing forward-looking analysis and state-of-the-art methodologies. IWR fulfills this mission by supporting the HQUSACE Civil Works Directorate and USACE Major Subordinate Commands (MSCs) and District offices by providing: (a) analysis of emerging water resources trends and issues; (b) state-of-the-art planning and hydrologic engineering methods, models and training and (c) national data management and results-oriented program and project information.

IWR CENTERS

IWR has offices at three locations, each of which is a USACE designated center of expertise (DX): the National Capital Region (NCR) and Navigation Data Center (NDC) offices in the Casey Building at the Humphreys Engineer Center, Alexandria, Virginia; the Hydrologic Engineering Center (HEC) in Davis, California and the Waterborne Commerce Statistics Center (WCSC) in New Orleans, Louisiana. WCSC is part of the Navigation Data Center (NDC).

National Capital Region Office: The IWR National Capital Region (NCR) office is the Corps designated

center of expertise for the development of planning methods and analytical tools. IWR fulfills this mission through a synergy of water resources planning and socio-economic expertise that blends practice with research, policy development and information. IWR planners, economists, social scientists, civil engineers and specialists in the physical sciences lead Civil Works strategic planning and technology transfer initiatives; conduct national and focused policy development studies; develop a broad range of partnering and investment decision-support techniques, methods and models for integrated water resources management and navigation system applications; interact with national and international members of the water resources community at-large and partner with the HQUSACE, Corps field offices and laboratories in solving complex technical water resources planning and evaluation problems. In particular, the Institute provides a critical mass of socio-economic expertise within the Corps and serves as the residence for the USACE Chief Economist position, which provides leadership for the Economics Community of Practice (CoP). Additional information about IWR is available on its web site at www.iwr.usace.army.mil.

Hydrologic Engineering Center (HEC): The primary goal of HEC from its inception in 1965 has been to support the Nation in its water resources management responsibilities by increasing the Corps technical capability in hydrologic engineering and water resources planning and management. An additional goal is to provide leadership for improving the state of the art in hydrologic engineering and analytical methods for water resources planning. Program efforts in research, training, planning analysis and technical assistance raise awareness of the problems and needs of the Corps and the Nation. HEC is committed to keep abreast of the latest developments throughout the water resources engineering profession and to make use of this information in a manner best suited to the needs of the USACE nationally and internationally. HEC increases the effectiveness of the Corps and the profession by bridging the gap between the academic community, practicing hydrologic engineers and planning professionals. HEC responsibly incorporates state-of-the-art procedures and techniques into manuals and comprehensive computer programs. The procedures are made available to the USACE, United States government and international professionals through an effective technology transfer system of technical assistance, publications, DVD's and training.

Technical specialty areas addressed by HEC include: precipitation-runoff processes, reservoir regulation, reservoir systems analysis, hydrologic statistics and risk analysis, river hydraulics and sediment transport, groundwater hydrology, water quality and analytical aspects of water resources planning. Application areas include: flood damage reduction, real-time water control, water control management, hydroelectric power, navigation, erosion control, water supply, watershed studies and ecosystem restoration. Additional information about HEC and its software is available on its web site at www.hec.usace.army.mil.

Navigation Data Center (NDC): NDC is the Corps designated center of expertise for the management of infrastructure, utilization and performance information for U.S. waterways and port and harbor channels. Because of the integrated nature of water resources, NDC also directly supports a range of related Civil Works business areas, including hydropower, recreation, environmental compliance, environmental stewardship, water supply, regulatory and homeland security, as well as other Federal, state and local agencies and the private sector. The primary operational arm of NDC is Waterborne Commerce Statistics Center (WCSC), which provides one-stop capability for national navigation information systems. NDC also provides integrated business information in support of Corps decision making including financial output, performance measurements and performance-based budgeting processes. Additional information about NDC is available on its web site at www.ndc.iwr.usace.army.mil.

FY 2006 SUMMARY

Post-Hurricane Context: FY06 proved to rank among the most challenging, productive and rewarding periods within the 37-year history of the Institute. In a very real sense, after years of preparatory planning and strategic refinement of IWR's capabilities and focus, FY06 represented the affirmation of the Institute as an absolutely essential intellectual asset for the Corps water resources mission during what turned out to be a crucial timeframe for the USACE. FY06 was particularly challenging for the Civil Works program given the tumultuous events occurring late in FY05, especially the devastation wrought along the U.S. Gulf Coast by Hurricanes Katrina, Rita and Wilma. During FY06 this resulted in the need to urgently restore hurricane protection for communities in the Gulf States while concurrently determining why the protection system didn't perform as intended and planning for

future rebuilding of the Gulf Coast based on the principles of IWRM.

These natural disasters precipitated a wide range of ex-post inquiries, investigations and analyses that not only focused on determining the circumstances and cause of these disasters, but also addressed broader issues of policy interest, such as: revisiting the Nation's approach to and commitment for protecting citizens against flooding and coastal storms; reinforcing the need for comprehensive, systems-wide approaches to water resources management, including the full integration of the social, economic and environmental goals of society; and questioning the confidence in and effectiveness of public engineering and USACE flood and coastal storm damage reduction programs.

The U.S. and its principal agencies and science academies (in partnership with other government agencies, non-government organizations, professional societies, universities, and international organizations) undertook a number of comprehensive post-flood audits aimed at identifying lessons-learned to inform future decisions on how to harden the hurricane protection system and strengthen flood preparedness and response processes. Aspects of the review encompassed the design and safety standards used for infrastructure, governance and institutional considerations, along with examining the analytical principles and policies used for determining project scope, formulation and justification. The Institute actively participated in this unprecedented array of ex-post initiatives, which involved technical experts drawn from across IWR and the entire USACE.

Key Post-Katrina Activities: In particular, IWR played a central role on aspects of seven key initiatives:

- the Interagency Performance Evaluation Task Force (IPET) investigation into the engineering physics of the hurricane protection failures during Katrina;
- leadership of the Hurricane Protection Decision Chronology (HPDC) assembly of the 50-year chronological record of planning, economic, policy, legislative, institutional and financial decisions that shaped the hurricane protection system for greater New Orleans;
- support of a team of scientists and engineers that developed the report "*A New Framework for Planning the Future of Coastal Louisiana after the Hurricanes of 2005*";
- facilitation of a variety of international technical assistance support activities, particularly through Memoranda of Agreement (MOA) with the Netherlands Rijkswaterstaat and the Japanese

Ministry of Land Infrastructure and Transport (MLIT) that each assisted the U.S. government on both the immediate post-flood recovery and the longer term setting of a future direction;

- provision of direct planning support to New Orleans District on the Congressionally authorized Louisiana Coastal Protection and Restoration (LACPR) study, which is developing the comprehensive, integrated plan for providing hurricane protection;
- formal establishment of the National Flood Risk Management Program (which pre-dated the occurrence of Hurricane Katrina) and its acceleration on a national basis subsequent to the Gulf Coast disaster; it was instrumental in promoting the need and garnering resources for initiating the National Levee Inventory and Assessment Program; and
- serving on the program development team for what ultimately became a key USACE response to the lessons learned from Hurricane Katrina—the Chief of Engineers' **Twelve Actions for Change** initiative.

Reconstitution of the Waterborne Commerce Statistics Center (WCSC): While supporting USACE's post-disaster activities in the Gulf, the Institute simultaneously proceeded through its own disaster recovery and mission reconstitution process for the Waterborne Commerce Statistics Center, co-located at the New Orleans District and victimized by Hurricane Katrina. All of WCSC's 39 people (and 15 resident contractor staff) safely evacuated from greater New Orleans the weekend prior to the landing of Hurricane Katrina; however, approximately half of the WCSC staff ultimately suffered devastating personal losses to their homes and property. During FY06 the Institute supported the WCSC workforce during their recovery from extensive personal losses. At the same time, WCSC staff worked tirelessly to successfully restore the collection and distribution of national waterborne commerce data.

Other Key FY06 Activities: Overall, IWR executed a FY06 program of over \$40 million with 152 in-house employees, primarily in professional disciplines with most possessing advanced degrees. IWR's in-house staff was supplemented by other experts detailed from USACE field offices and laboratories and Intergovernmental Personal Act visiting scholars from universities, state and local governments, policy think tanks and the private sector.

Additional IWR key accomplishments in FY06 include its technical role in supporting the USACE-wide implementation of the Civil Works Strategic Plan

(IWR previously led the completion and public release of the plan in FY04) and the concurrent initiation of strategic activities in support of the development of the next plan (to be completed in FY09); the continued completion of new research products and publications on maritime transportation economics flowing from the Navigation Economic Technologies (NETS) Research Program; conclusion of the Lake Ontario and St. Lawrence River Project and initiation of the Upper Great Lakes (Lake Superior) study for the International Joint Commission (IJC); fielding of new versions of HEC's flagship NexGen software products; expanded use of the Civil Works Program's Operations and Maintenance Business Information Link (OMBIL), including the deployment of the Regulatory Program Module (ORM 2.0); continuing emphasis on domestic water partnerships, including those with the IJC, U.S. Department of Interior (Bureau of Reclamation and U.S. Geological Survey), U.S. Department of Agriculture (Natural Resources Conservation Service), Federal Emergency Management Agency and the interagency Silver Jackets Program.

The Institute executed a wide range of technical assistance projects, such as HEC support of system-wide reservoir operations for the Lower Colorado River Authority (LCRA). IWR continued building international water partnerships with the appointment of IWR senior staff to the Governing Board of United Nations Educational, Scientific and Cultural Organization (UNESCO) Institute for Water Education (IHE-Delft) and the Advisory Board of the International Center for Water Hazard and Risk Management (UNESCO-ICHARM). IWR MOAs were executed with UNESCO-IHP (International Hydrological Programme) centers at ICHARM (Tsukuba, Japan) and CAZALAC (Center for Arid and Semi-Arid Zones in Latin America and the Caribbean in La Serena, Chile).

FY06 marked the conclusion of Dr. Leonard Shabman's tenure as the IWR Arthur Maass-Gilbert White Visiting Scholar. Dr. Gerald Galloway, University of Maryland, was appointed his successor for FY07. Dr. Shabman remained with IWR throughout FY06 and into FY07 to work with Dr. Douglas Woolley (recently retired from Radford University) on the HPDC investigation. FY06 also manifested the initiation of two new IWR post-doctoral fellowship programs: the National Research Council (NRC) Research Associateship Program (RAP) and the American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellows program.

IWR accomplishments during FY06 are described below in accord with its major focus areas.

FUTURE DIRECTIONS

The Institute's Future Directions activities include the identification of emerging water challenges and opportunities and the tactical engagement of USACE senior leaders on these issues to stimulate "strategic thinking." Such critical thinking is seen as an essential prerequisite to strategy development and planning. IWR employs a variety of approaches to encourage strategic thinking, including the development of water resource outlook papers and the conduct of topic specific provocation sessions with senior leaders. Outlook papers commissioned in FY06 include: "*U.S. Water Demand, Supply and Allocation: Trends and Outlook*" and "*Maritime Transportation System: Trends and Outlook*." Emerging issues identified in these studies and implications for the Nation and USACE will be presented during FY07 in the form of "provocation sessions" with external and internal subject matter experts (SME) and stakeholders.

In FY06 IWR developed two new instruments to engage senior leaders strategically: the "Castle Forum" and the "Lunch Roundtable." The Castle Forum, an off-site event for senior leaders and external thought leaders where they can engage in out-of-the-box thinking regarding subjects not usually addressed by them specifically, is intended to provide a venue for leaders to recognize (previously undetectable) signals of weakness and anticipate potential implications. The first Castle Forum was held in September 2006. The Lunch Roundtable will bring in water experts from outside the Corps to provide different perspectives on issues familiar to senior leaders.

Strategic Planning: FY06 strategic activities addressed the continued implementation of the current Civil Works Strategic Plan and informed the intellectual development of the next strategic plan through research, scenario development, and identification of new challenges, key success factors and policy responses. In FY06 four future scenarios were utilized to frame the evaluation of alternative agency strategic direction. Key success factors were enumerated and utilized in conjunction with Corps senior leader assessments and prioritizations of potential future water challenges. The Institute's technical experts and OMBIL national data management systems supported the formulation of the yearly budget guidance, the five-year development plan and the evaluation of USACE Civil Works program business areas in conjunction with the Office of Management and Budget's Program Assessment

Rating Tool. *Note: The release of the inaugural Civil Works Strategic Plan in 2004 represented the culmination of a multi-year effort aimed at establishing a new direction for the Civil Works Program based on the contemporary IWRM "watershed" planning approach. The plan's five strategic goals are firmly grounded in the "systems" perspective of IWRM and are fully aligned with the principle of environmental sustainability.*

Post-Katrina Studies: The planning for what ultimately became the Interagency Performance Evaluation Task Force (IPET) was initiated at the end of FY05 following the devastating effects of Hurricane Katrina. IWR/HEC staff participated in developing the IPET study plan, helping to organize the overall study within a risk analysis framework. During FY06 IWR provided leadership on two of the ten interrelated tasks, "Interior Drainage" and "Consequences," and led or participated in a wide variety of related post-Katrina investigations. IWR also provided planning support to the Louisiana Coastal Protection and Restoration (LACPR) study. This congressionally authorized 24-month study will produce a report documenting the development and analysis of a comprehensive hurricane protection system. As part of that support, IWR has been assisting the LACPR team to develop a risk-informed planning and decision making framework that is intended to also have national application.

Interagency Performance Evaluation Task Force (IPET): The results of the analysis and technical documentation for the IPET Interior Drainage and Consequences tasks are included in *Volume VI: The Performance—Interior Drainage and Pumping* and *Volume VII: The Consequences*. The Consequences report developed information on the full range of consequences from Hurricane Katrina. The analysis and report were completed by a team of over 50 economists, sociologists and environmental scientists from IWR/HEC, ERDC, Corps districts, academia and consultants. Direct flood damages to private property were estimated using an innovative GIS census block based assessment for the 5-parish greater New Orleans area. The approach allowed the estimation of potential flood damages at flood stages both below and beyond those experienced during Katrina. The impact of the Katrina flooding on the New Orleans community infrastructure was documented. Scientists from ERDC provided the analysis of the environmental impacts of Katrina flooding and the subsequent unwatering of the flooded parishes. This neighborhood infrastructure supported the local society and culture and enhanced the quality of life in the greater New Orleans region.

Volume VII: Consequences was one of the first volumes released as final by IPET.

Planning Framework for Coastal Louisiana: Early in FY06, IWR facilitated the activities of a team of nationally recognized scientists and engineers co-lead by Dr. Donald Boesch, University of Maryland, and Dr. Leonard Shabman, Resources for the Future and IWR's Maass-White Visiting Scholar. The team developed the report "A New Framework for Planning the Future of Coastal Louisiana after the Hurricanes of 2005." It advocated a comprehensive framework based on a multi-purpose systems approach to future planning and embraced an IWRM context that utilizes the natural land creation processes within the Mississippi River-Gulf Coastal region as integral components of providing future hurricane protection. The team's findings were briefed to the HQUSACE Director of Civil Works, HQUSACE senior civilian planning staff, the Assistant Secretary of the Army (Civil Works), State of Louisiana officials (including the Chair of the Coastal Protection and Restoration Authority), the Louisiana Department of Natural Resources, the Chair of the Governor's Advisory Commission on Coastal Restoration and Conservation, the New Orleans District office and in Congressional testimony. The report web site continues to be used as a reference document for the LACPR planning effort.

Hurricane Protection Decision Chronology: In FY05, IWR developed the study plan, formed the study team and initiated the Hurricane Protection Decision Chronology (HPDC) investigation. The HPDC team is composed of external experts on water resources policy and planning and non-Federal flood and storm water protection. The team interviewed individuals and reviewed 50 years of documentation to assemble a chronological record of planning, economic, policy, legislative, institutional and financial decisions that influenced the design, scale, configuration and condition of the Greater New Orleans hurricane protection system.

During FY06, the team produced a draft report that underwent internal independent technical reviews (ITRs) and an external review by a panel of experts convened by the National Association of Stormwater and Flood Management Agencies (NAFSMA). It made briefings to Corps leadership and the Assistant Secretary of the Army (Civil Works). The final report is expected to be released in the third quarter of FY07 after undergoing a third independent technical review and a Department of Justice review. The HPDC was established at the direction of HQUSACE and is complementary to IPET.

Twelve Actions for Change: During FY06 the Chief of Engineers announced his intent for the USACE to develop and to promulgate **Twelve Actions for Change** to address the lessons learned from the Hurricane Katrina and Rita disasters. The goals of the Twelve Actions are to improve public safety and the Nation's water resources infrastructure by providing expert and professional services to the Nation. To implement the Twelve Actions, a program development team that was familiar with IPET and HPDC results and implications was constituted, composed of senior technical experts from HQ, IWR, ERDC and the Corps field offices. IWR actively participated in the development of the Twelve Actions for Change and led development of a key risk-informed planning and decision making framework component, leveraged through IWR's work in support of the LACPR study.

Louisiana Coastal Protection and Restoration (LACPR): IWR partnered with ERDC to provide technical assistance to the Corps New Orleans District and Mississippi River Division on the congressionally authorized LACPR study in FY06 and continuing on into FY07. This support served a complementary purpose of developing a nationally consistent risk-informed planning framework in response to the implementation of the risk-based concepts in planning, design, construction, operations, and major maintenance action of **Twelve Actions for Change**. IWR involvement was concentrated in implementation, using the LACPR study as a test-bed demonstration. The developed framework weaves quantitative risk assessment, scenario planning and risk-informed decision making with active and transparent stakeholder involvement. IWR senior staff identified how risk-informed planning could be developed and integrated within the USACE traditional six-step planning process, then led risk workshops for LACPR staff to enhance understanding and implementation of the framework for Coastal Louisiana. IWR involvement in the LACPR study will continue in FY07 with an IWR senior economist temporarily re-locating to New Orleans to lead the risk-informed planning implementation.

USACE Chief Economist: Dr. David Moser of IWR is the USACE Chief Economist and leader of the Economics CoP. During FY06, the Chief Economist was co-lead of the IPET Hurricane Katrina consequences evaluation team and served as senior technical expert on the LACPR risk-informed planning framework development and the Twelve Actions for Change formulation team.

The Chief Economist's leadership engaged to build and advance the economic analysis capability across the USACE, holding two national meetings and regular teleconferences with senior economists.

A subject matter expert (SME) database of all Corps economists was developed in FY05, identifying economists by experience and expertise for each economic activity conducted by the USACE. This SME database is used by MSC economists, planning centers of expertise and others to identify resources for feasibility studies, ITRs and special purpose teams. In FY06, the senior economist group started the expansion of the SME database to include more detailed knowledge, skills and abilities (KSAs).

As a complementary activity to building capacity, the Chief Economist focused on enhancing technical guidelines and economic manuals available to field practitioners. In FY06 work proceeded on the update of water resources planning National Economic Development (NED) Manuals. A new, web-based NED manual for flood damage reduction was completed and published on the HQ Civil Works Planning CoP web page.

The USACE Chief Economist participated in selection boards for senior economists throughout the Corps and was involved in issues relating to NED evaluation of externalities, agricultural water supply and value of time saved. At the request of the Corps Sacramento District and the Directorate of Civil Works, the USACE Chief Economist formed a "tiger team" of economists drawn from across the nation to perform an independent evaluation and recommend actions on the Folsom Dam Project. The team's recommendations included expanding the performance metrics used to evaluate the alternative to include the potential loss of life.

National Shoreline Management Study: The National Shoreline Management Study, authorized in 2000, remains a collaborative, interagency effort that is adapting to the recent surge in coastal and ocean initiatives. The study is intended to describe the extent and causes of erosion and accretion along the shores of the U.S., the economic and environmental effects caused by erosion and accretion and the systematic movement of sand along the shores. It will describe the resources committed by Federal, state and local governments to restore and nourish shores, recommend appropriate levels of Federal and non-Federal participation in shore protection and use a systems approach to sand management.

Initiatives and events have influenced the future course of national shoreline management. These include the

President's formation of a Committee on Ocean Policy and associated new ocean governance structure; the Gulf hurricane events of 2004 and 2005 and subsequent government responses and studies; the 2004 Indian Ocean tsunami; U.S. Geological Survey publication of the results of shoreline change studies; initiation of a National Coastal Data Bank; joint coastal mapping initiatives; emerging joint Federal coastal science and technology collaborations; and the formation of regional coastal collaborations to address ocean and coastal management in an ecosystems context. By the end of FY06, the study management team began engaging partner agencies in discussions of how the study could best serve and integrate ongoing initiatives to improve agency program integration and effectiveness with emphasis on systems approaches to Federal and non-Federal roles in shoreline management.

Policy Development: IWR Report 06-PS-1 "*Water Supply Database 2005 Update*," published in FY06, provided current storage volumes, costs, information on reallocations and local non-Federal sponsors of storage space under contract or with assurances for the future. A new effort on "The Nature of Policy Studies," accomplished via a contract with Virginia Tech, will result in a white paper and primer scheduled in FY07. Additional policy activity took place in specific program areas such as flood risk management, where issue papers led to proposals for a national levee assessment and closer coordination with Federal Emergency Management Agency (FEMA).

COLLABORATION AND PARTNERING

The USACE recognizes that Civil Works missions must be carried out in collaboration with multiple partners and stakeholders with differing authorities, capabilities and perspectives. Thus a major IWR focus is its role as the unofficial USACE center of expertise for collaboration, partnering and public participation. IWR serves as the USACE lead for multiple national partnerships and is committed to developing new technologies, processes and policies to further collaborative planning and partnering. In FY06 IWR shepherded a review of current practices in environmental conflict resolution and initiated the National Cooperative Modeling and Collaborative Planning Demonstration programs with multiple Federal, state, university and non-governmental partners. IWR also developed guidance on collaborative planning in support of HQUSACE, led execution of Corps-wide Memoranda of Understanding and engaged the academic community through the Maass-White, UCOWR, NRC and AAAS visiting scholar programs.

National Partnerships: Forming strategic alliances, both through formal agreements and informal working relationships, is becoming a way of doing business in the USACE, government agencies and NGOs. Driving this movement are the complexity and far-reaching impacts of today's water resource problems juxtaposed with the limited financial and intellectual resources of any single organization. The USACE is increasingly committed to partnerships as a means of accomplishing common goals. In FY06 IWR initiated several new MOAs and MOUs and furthered work on existing agreements.

Natural Resources Conservation Service Partnership: A partnership agreement was signed between the Natural Resources Conservation Service (U.S. Department of Agriculture) and the Corps on July 7, 2005. The purpose of the agreement is to promote a long-term working relationship and collaborative efforts to improve the management of water and related natural resources under the missions and authorities of NRCS and USACE. Initially, collaboration focused on three areas: (1) watershed planning and implementation; (2) wetland creation, restoration and enhancement and (3) natural disaster recovery. The agencies agreed to coordinate other programs and activities, including the Wetland Conservation Compliance (Swampbuster) and the Regulatory Program (Section 404 of the Clean Water Act). In FY06 liaisons were established by both agencies to coordinate implementation of the agreement. A draft action plan was jointly developed and is currently undergoing review at both agencies.

U.S. Geological Survey Partnership: Significant activities for the U.S. Geological Survey (U.S. Department of the Interior) MOA included senior level meetings addressing streamgaging issues, coastal and environmental research and collaboration on international activities.

U.S. Bureau of Reclamation Partnership: In June 2006, a meeting was held in Folsom, California between Corps Headquarters, IWR and Bureau of Reclamation management to discuss the existing USACE-Bureau of Reclamation (U.S. Department of the Interior) MOA, provide additional definition to the agreement and discuss details of current collaboration projects, the most visible being Folsom Dam. A similar meeting is planned for FY07.

Oak Ridge National Laboratories Partnership: IWR signed an MOU with the U.S. Department of Energy's Oak Ridge National Laboratories and ERDC on September 11, 2005 that centers on energy, security and environmental sustainability. Initial thrusts of the

agreement are joint work on regional energy and water management, transportation modeling, emergency response, homeland security and environmental sustainability.

Other Partnerships: IWR is working closely with Sandia National Laboratories through the National Cooperative Modeling Demonstration Program and is developing an MOU. IWR represented both the USACE and the Office of the Secretary of Defense through participation in the National Science and Technologies Council's interagency Subcommittee on Water Availability and Quality (SWAQ) and its Subcommittee on Disaster Reduction. IWR actively participated in the development of the SWAQ Strategic Plan for Federal Research and Development to ensure adequate water availability and quality and is leading development of the resultant interagency Federal Initiative on Collaborative Tools and Processes for U.S. Water Solutions.

FEMA; Silver Jackets: Through the Silver Jackets program, managed by IWR, the USACE cooperates with FEMA and other Federal agencies to create Federal interagency teams which engage at the state level to develop and implement solutions to the state's natural hazard priorities. The Silver Jackets program's primary goals are to leverage information and resources, improve public risk communication through a united effort and create a mechanism to collaboratively solve issues and implement initiatives. To date, Silver Jackets has initiated pilot programs in Ohio, Indiana and California. These teams have succeeded not only in improving communication, but also in leveraging resources and programs between Federal agencies. For example, coordination through the Ohio team has enabled the small community of Marietta to acquire detailed mapping of its community at nominal cost by tapping into an ongoing regional watershed study. Through the same Silver Jackets team, an opportunity was discovered to integrate two different programs by utilizing the USACE Planning Assistance to States program to provide resources and FEMA's Flood Mitigation Assistance (FMA) program to outline the requirements—resulting in the town gaining eligibility for FEMA flood mitigation funds. Silver Jackets remains in the pilot stage. The program will continue team development on a state by state basis, ultimately establishing an interagency team in every state.

Ocean Action Plan: The USACE is participating in implementation of the President's Ocean Action Plan through integrated networks and partnerships of Federal, state, local, territorial and tribal authorities, the private sector, international partners and ocean

communities. In 2006, IWR coordinated USACE participation in regional ocean governance initiatives, co-leading USACE support to the Gulf of Mexico Alliance with ERDC. The Corps is one of thirteen Federal agencies supporting the Governors' Action Plan for Healthy and Resilient Coasts. IWR staff lead USACE support to Subcommittee on Management of Ocean Resources (SIMOR) work plan actions related to best practices in dredging and sediment management, including organizing and co-sponsoring the National Dredging Team-SIMOR conference on *Managing Sediments in the Watershed: Bringing Dredged Material and Watershed Managers Together*. Through participation on the Joint Subcommittee on Ocean Science and Technology, IWR staff contributed to development of the Ocean Research Priorities Plan and its implementation strategy.

National Ocean Service Partnership: The USACE and the National Ocean Service formed a collaborative partnership as an outgrowth of Ocean Action Plan initiatives, 2005 post-storm experiences, and recognition of mutually beneficial advances and synergies that could be effected through collaboration. The partnership is leveraging each agency's programs and talents through joint centers for coastal mapping, instrument testing, evaluation and training; improving data sharing capabilities; coordinating vertical datum systems and improving tidal measurement and information; and improving natural hazard risk communication that incorporates consideration of community resilience.

Interagency Committee on the Marine Transportation System: The Corps is coordinating with the Maritime Administration (MARAD), National Oceanic and Atmospheric Administration (NOAA), the Coast Guard and other Federal departments and agencies to stand up the new Committee on the Marine Transportation System (CMTS). In FY06 the Director of Civil Works was selected to chair the Coordination Board for the CMTS and the Assistant Secretary of the Army (Civil Works) was designated as the Department of Defense principal to the CMTS. IWR provides logistics support and participates on Integrated Action teams. IWR staff develops Condition and Performance Reports for inland waterway and Great Lakes navigation and supports activities of the Marine Transportation System National Advisory Committee.

President's Wetland Initiative: IWR participated on the White House Wetlands Working Group staff to develop a status report on *Conserving America's Wetlands 2006: Two Years of Progress Implementing the President's Goal*.

Regional Sediment Management: The USACE has adopted the Regional Sediment Management (RSM) approach in carrying out many of its programs. Sediment management spans the USACE Navigation, Flood and Coastal Storm Damage Reduction, and Ecosystem Restoration missions and responsibilities. The RSM approach implements the watershed perspective and the principles of integrated water resources management. The USACE applies this perspective and approach as a major stakeholder in many of the Nation's inland and coastal watersheds. In 2006, IWR staff advanced the understanding and implementation of the RSM approach in a number of regions—e.g. the Pacific Northwest, North Atlantic and the Gulf of Mexico. IWR staff participated in defining and addressing policy and institutional concerns associated with this systems approach and co-chaired an interagency team that organized a conference with over 200 participants on *Managing Sediments in the Watershed: Bringing Dredged Material and Watershed Managers Together*. Additional partnerships with academia are helping to advance the RSM approach.

Environmental Advisory Board: The Institute has led the USACE technical team supporting the Chief of Engineer's Environmental Advisory Board (EAB) since FY04. In FY06, the EAB focused on six themes requested by the Chief under the overarching theme of ecosystem restoration through water resources management: (1) the adequacy of legislative authorities for USACE ecosystem restoration, (2) USACE application of adaptive management principles in ecosystem restoration, (3) creating an environment for improving USACE outreach and partnering, (4) improving the USACE Regulatory Program, (5) alternative frameworks for determining environmental benefits and measuring performance and (6) the success of peer review processes implemented by the USACE. The Board found that USACE had adequate ecosystem legislative authority, USACE implementation of adaptive management could be improved by establishing a center for ecosystem restoration, USACE outreach and partnering needs improvement, and peer review implementation was too recent to provide sufficient information for review. The EAB closed FY06 in the process of developing environmental benefits and performance measures findings. In FY07 it will concentrate on the continued need for Regulatory Program improvements and USACE regulatory jurisdiction issues associated with court cases, including the Rapanos-Carabell U.S. Supreme Court decisions.

Inland Waterways Users Board: The Institute continued its technical and administrative support of the Inland Waterways Users Board (IWUB) in FY06, including the analysis of and reporting on the financial status and capability of the Inland Waterway Trust Fund, assistance with drafting of the IWUB Annual Report to Congress, evaluation of candidates nominated for Board membership and the administration of three IWUB meetings including No. 50 on October 13, 2005 in Vancouver, WA, No. 51 on February 22, 2006 in Alexandria, VA and No. 52 on July 13, 2006 in Paducah, KY.

Collaborative Planning: The National Cooperative Modeling & Collaborative Planning and Management Demonstration programs work together to develop, test and demonstrate collaborative modeling tools and concepts. Although IWR has a long history of applying collaborative modeling tools through its signature **Shared Vision Planning (SVP)** process, IWR is developing new conceptual and methodological foundations as well as documenting, vetting and publicizing advances and experiences.

FY06 activities included collaborative development of an integrated system model to facilitate a common understanding of linkages between reservoir operations, water quality, ecology and economics on Oregon's Willamette River; initiatives to support the USACE 404 regulatory role and state water planning processes on the James River in Virginia and on the front range of Colorado; a multi-year reservoir operations plan evaluation study on the Mississippi Headwaters featuring combined use of optimization, simulation and a spreadsheet-based dynamic evaluation tool to collaboratively and iteratively develop a multi-reservoir operation plan; and development of an MOA with the California Department of Water Resources to provide assistance in using the Shared Vision Planning approach to engage stakeholders in advance of its next semi-decadal water plan.

Ongoing methodological and tool development in 2006 included drafting of a definitional peer-reviewed paper on Shared Vision Planning, a *Shared Vision Planning Primer*, development of a framework for documenting lessons learned in collaborative modeling studies and a literature review of collaborative modeling tools and techniques. A direct outgrowth of 2006 activities was the formation of an interagency Center on Computer Aided Dispute Resolution (CADRe) with a mission to avoid or manage water resource conflicts through the application of transparent technically informed decision-support computer models within open, structured public

involvement processes. The Center is part of a National Science and Technology Council sponsored initiative on collaborative tools and processes for U.S. water solutions. Other collaborative planning work focused on cases studies, surveys and guidance to help the USACE implement a more collaborative approach.

The Nature Conservancy Sustainable Rivers Project: Launched in July 2002, the Sustainable Rivers Project (SRP) is a nationwide partnership between the USACE and The Nature Conservancy (TNC) to improve the integrity and life of rivers by changing the operations of USACE dams while maintaining or enhancing project benefits. The SRP is working towards this goal through a combination of partnered activities, including demonstration projects, training, software development and a staff exchange that assigned an engineer from the HEC to the SRP through an Intergovernmental Personal Act (IPA). February 2006 concluded the two-year exchange that was instrumental in promoting the partnership, providing direct support to project sites and initiating a joint software development project and joint training program. As of 2006, joint HEC/TNC training has been provided to 219 students, including representatives from seven different agencies, nearly 90% of USACE districts and all eight USACE divisions. Training agendas in 2006 included a series of increasingly difficult topics and workshops in which course participants gained experience using six different software tools, including the new HEC Regime Prescription Tool (HEC-RPT). A product of the first software collaboration between the USACE and the Conservancy, HEC-RPT is designed to help groups of scientists, engineers and water managers access hydrologic data and draft flow recommendations while they formulate different ways to manage rivers. Another 2006 accomplishment was the official approval of the SRP-devised interim operational plan for the Green River Dam in Kentucky, which has successfully provided more natural flow regimes and stream temperatures. HEC plans to explore other emerging partnership opportunities such as removal of small dams and river-floodplain reconnections.

National Flood Risk Management Program: In May of 2006 in an IWR-led effort, the USACE established the National Flood Risk Management Program for the purpose of integrating and synchronizing USACE flood risk management programs and activities both internally and with counterpart activities of FEMA and other Federal, state, regional and local agencies. Its vision is to lead collaborative, comprehensive and sustainable national

flood risk management to protect the public and reduce flood damages to our country.

Since its inception, the National Flood Risk Management Program continues to build on coordination work that has already taken place between FEMA and USACE to ensure consistent FEMA-USACE communication to the public on the MapMod Program and related flood risk issues and to leverage resources when working on similar activities or within the same geographic area. Some of the specific accomplishments that have taken place under the umbrella of the National Flood Risk Management Program include:

- Conducting an inventory of 13,000 miles of levees nationwide that are part of a USACE project or are inspected as part of a USACE program and developing a methodology for risk assessments of levee systems.
- Cooperating with FEMA to notify owners of levees that pose a threat to public safety based on past inspection results.
- Working with communities to identify options to remediate deficient levees or otherwise address the resulting public safety hazards.
- Providing ongoing support of both FEMA regions and levee owners at the USACE district level by providing data for the flood mapping studies and information to communities affected by efforts to update flood maps under FEMA's MapMod program.
- Collaborating with FEMA to develop levee certification guidance for USACE Districts and FEMA regions.
- Developing a consistent inspection methodology and procedures to strengthen the USACE Inspection of Completed Works program under which USACE constructed levees are inspected.
- Continuing to coordinate quarterly meetings of FEMA and USACE leadership as part of the Interagency Flood Risk Management Committee to ensure that the two agencies maintain complementary policies and practices as the FEMA MapMod Program and USACE Flood Risk Management Program progress.
- Cooperating with FEMA and other Federal agencies through the Silver Jackets program to create interagency teams at the state level to develop and implement solutions to state natural hazard priorities.

- Supporting and participating in policy research and discussion forums to develop policy proposals for improving national flood risk management.
- Working with FEMA to jointly develop a risk communications plan to convey the purpose and specifics of ongoing activities to improve levee safety, including MapMod, a strengthened Inspection of Completed Works program and the levee inventory and risk assessment.

IWR Visiting Scholar Programs: Each Visiting Scholar program seeks to bring the foremost water resources experts from academia, private industry and other agencies and laboratories to residence at IWR or HEC for periods of six months to one year. Visiting scholars are expected to infuse new energy, perspectives and ideas to the IWR program, while the practical work environment at IWR/HEC provides a stimulating context for mutual exploration of potential advances in hydrologic engineering and planning analysis.

FY06 marked the fifth year for the Institute's Maass-White Visiting Scholar program, established in 2001 in recognition of the contributions of and the Institute's intellectual alignment with two of the founders of modern water resources analytical theory—Professors Arthur Maass, Harvard University, and Gilbert White, University of Colorado. FY06 was the third year for two other designated visiting scholar positions, both established in 2004: one in partnership with the Universities Council on Water Resources (UCOWR) and the other HEC's Leo R. Beard program, named after the founding director of HEC. FY06 marked the initiation of two new post-doctoral Fellows programs: the National Research Council (NRC) Research Associateship and the American Association for the Advancement of Science (AAAS) Science and Technology Policy Fellows program. IWR and HEC had to undergo a rigorous certification process by independent reviewers in order to qualify for these two prestigious programs.

IWR's visiting scholars have included:

- Maass-White Visiting Scholars: Dr. Daniel (Pete) Loucks, Cornell University (2001-2002), Dr. Peter Rogers, Harvard University (2003-2004) and Dr. Leonard Shabman, Resources for the Future, (2004-2006).
- UCOWR Fellow: Dr. Bruce Hooper, Southern Illinois University (2004-2005).
- Leo R. Beard Visiting Scholar: Mr. Tony Thomas, founder and president of Mobile Boundary Hydraulics (2004), followed by

Professor Jerry Stedinger, Cornell University (2005).

- IWR NRC Research Associateship: The first IWR NRC Fellow was Dr. Peter Rogers, Colorado State University (2006), while HEC selected Dr. Jason Giovanettone, Duke University (2006).
- AAAS Fellow: Dr. Alexey Voinov, University of Vermont, was the 2006 AAAS Fellow.

In FY06, former U.S. Army Brigadier General Dr. Gerald Galloway, now a University of Maryland professor, was appointed a Maass-White Fellow to engage in the wide-ranging post-Katrina water resources policy discussions on the national scene.

WATER RESOURCES METHODS AND MODELS

Two major IWR focus areas are (1) the evaluation of engineering, economic, social, institutional and environmental needs and, to address those needs, (2) the development, transfer and application of improved water resources analytical techniques, models and information systems. The goal is to produce state-of-the-art multi-purpose planning and hydrologic engineering methods and models to support investment decisions. This is accomplished by means of programs in research, training, planning analysis and technical assistance.

Planning Models Improvement Program: In 2004 HQUSACE Director of Civil Works approved the recommendations of the Planning Model Improvement Program (PMIP) Task Force, which was co-directed by IWR. HQUSACE guidance (EC 1105-2-407) was published in 2005 prescribing a corporate business process and policy for the development, certification, training and on-going support for planning models, with the certification process based on internal and external peer support and review and with the responsibility for establishing priorities and managing the certification process residing with the planning centers of expertise in coordination with the findings of the Strategic Engineering and Technology Initiative. In FY05 and FY06 IWR, with input from other Corps laboratories and the planning centers of expertise, developed protocols for model certification that include the processes and criteria to be used for certifying planning models. The protocols were tested on two planning models and the results will be used to finalize and publish the protocols for certification. The tests were led by IWR with the participation of the planning centers of expertise.

Navigation Economic Technologies Research: For more than a century the USACE has played a key role in maintaining a robust national economy by ensuring that farmers, manufacturers and businesses can easily transport goods up and down our Nation's rivers and out to sea via coastal ports. The Navigation Economic Technologies (NETS) Research Program supports the navigation mission by developing state-of-the-art, credible, independently verified economic models, tools and techniques to be used by USACE field planners in informing investment decision making at all levels of the agency. The knowledge and tools developed by the NETS research program are based on reviews of economic transportation and market theory, current best practices both within and outside of the USACE; data needs and availability; and peer recommendations.

In FY06, the centerpiece of NETS research was a suite of simulation models that included:

- The Global Grain forecasting model, modified in FY06 to respond to independent peer review comments.
- A repeat of the Mid-America Grain study, expanded to include non-grain waterway freight. Findings have been incorporated into a new annual "Survey Model" designed to respond to the criticisms made by the National Academy of Science to the structure and inputs of previous models. It is currently being evaluated for certification by the planning center of expertise for inland navigation.
- The survey techniques and shipper response econometric techniques that were developed for the Mid-America study were sharpened and applied to shippers utilizing the Columbia River.
- The Oak Ridge National Laboratory produced an alpha version of the Regional Routing Model to identify annual quantities of commodities from various origins and routes used to satisfy forecasted demand at each destination.
- Model certification has begun on the HarborSym widening model. Prototypes for suite modules have been developed for the Navigation System Simulation (NaSS).
- The Inland Navigation Animation Module (INAM) will allow for the visualization of LPMS data and, in the future, Navigation System Simulation analysis. The HarborSym Animation Model (HSAM) animates HarborSym analysis.
- Work has begun to incorporate NETS research findings into legacy models. In

conjunction with the Oak Ridge National Laboratory, NETS is working to incorporate "shipper response" into the Ohio River Navigation Investment Model (ORNIM). In a related effort, NETS is working with the planning center of expertise for inland navigation to conduct surveys to estimate the shape of the shipper response curves on the Ohio River, needed inputs for the modified version of ORNIM.

Looking forward to 2007, NETS is transitioning from research to practice. Several NETS tools will be certified by the USACE planning centers of expertise for use in current navigation studies. The HarborSym channel-widening model is being used in field study and the team is extending its functionality to include channel-deepening analysis. The NETS team continues to focus on outreach and communications via the NETS web site (www.nets.iwr.usace.army.mil), NETS Newsletter and participation at conferences around the world.

Cost Effectiveness and Incremental Cost Analysis:

The Institute deployed a completely new version of IWR-PLAN software, now called IWR Planning Suite, Version 1.05, a water resources investment decision-support tool that performs cost-effectiveness and incremental cost analyses associated with the formulation and evaluation of planning alternatives that produce non-monetary or a combination of monetary and non-monetary outputs. Developed in partnership with the Social Sciences Institute and the Natural Resources Conservation Service (NRCS), IWR-PLAN was originally designed to assist with the development and comparison of alternative plans for ecosystem restoration and watershed planning studies. The program can now be applied to a wide variety of integrated water resources planning and management problems by identifying which plans are the best financial investments, then displaying and comparing the effects of each plan on a range of decision variables. A new IWR Planning Suite User's Guide was published to accompany the software. The new modular framework will enable future modules to be "plugged in" to IWR Planning Suite, such as a "Multi-Criteria Decision Analysis" module, an "Annualizer" module and a "Risk and Uncertainty" module, all undergoing testing or development.

Transportation Systems: IWR's Transportation Systems Program supports HQUSACE and USACE districts in accomplishing waterborne navigation project planning and evaluation responsibilities through the provision of (1) uniform and consistent maritime transportation data concerning costs of

operation and replacement of foreign-flag and domestic commercial vessels and (2) comprehensive statistics on the composition and physical parameters of the world deep draft fleet and the domestic shallow-draft inland fleet. Macro-level world trade and cargo flow forecasts are also provided. Plans for FY07 will include updating of vessel operating costs for both the deep and shallow-draft fleets with an increase in statistical samples and the number of ship-types covered compared to previous years; world trade and commodity flow forecasts; distribution of updated materials and statistics from various maritime industry data subscriptions; update of general reporting statistics for the inland navigation system and updated subscriptions for barge, rail and truck alternative transportation modal models. Affiliated efforts will include a first edition of the vessel operating cost primer, which will detail the context and use of vessel operating costs and development or procedures for evaluation of bunkering costs for dredge plant operations.

Flood Damage Data: The Flood Damage Data Collection program is intended to produce generic relationships for computing expected annual flood losses and tools for the collection and management of floodplain inventory data. In FY06, IWR initiated the development of a geospatial floodplain inventory tool for residential, business and public property. IWR also initiated a post-Katrina data collection effort for the New Orleans Metropolitan area. Work continued on the development of nonresidential damage functions, vehicle damage functions and generic relationships for the public costs of flooding.

National Economic Development Manuals: IWR is in the process of updating the National Economic Development (NED) Manuals series, originally published between 1987 and 1991. The manuals are important basic references for economists and others involved in planning and analysis of Federal water resource projects. The manuals discuss the principles and concepts associated with NED benefits and provide detailed procedures to measure and calculate benefits. The updated manuals will be exclusively web-based to increase accessibility for field personnel; facilitate the maintenance and update of the manuals; improve the efficiency and effectiveness of providing up-to-date information to the field; and be responsive to a diverse audience. The web-based interactive manuals will provide links to relevant and timely guidance, data sources and case examples from USACE and non-USACE sources. The framework for the web-based manuals was completed in FY06. The Flood Damage Reduction manual is complete and

available for use. Coastal Storm Damage and Deep Draft Navigation manuals are under development.

System-Wide Water Resources Research: System-Wide Water Resources Research (SWWRP), a joint effort between IWR (led by HEC) and ERDC laboratories, is focused on expanding research activities to the “System Wide” perspective, reflecting a concerted effort by USACE to follow concepts of sustainable development in a watershed context. Funding from SWWRP supports the development of multiple software packages that are widely used throughout the USACE and the professional engineering community, including HEC-HMS, HEC-RAS, HEC-WAT, HEC-PRM and HEC-EFM.

Flood and Coastal Storm Damage Reduction Research (FCSDR): The Flood and Coastal Storm Damage Reduction Research (FCSDR) program is a collaborative effort between ERDC and IWR, led by HEC. FCSDR looks at methods to improve the analysis of and development of tools relating to modeling of flood damage and flood damage reduction techniques. Funds from FCSDR support the development of HEC-WAT, HEC-ResSIM, HEC-DSSVue, HEC-SSP, HEC-FDA, HEC-FIA, HEC-GeoRAS and HEC-GeoHMS. Additional funds are provided for research topics, including extreme flood events, groundwater/surface water interaction and real-time forecasting.

NexGen Software: HEC continued to enhance many software products and introduce new products. Released in FY06 were:

- HEC-HMS version 3.0, a major update to HMS. New features and a new user interface provide newly designed functionality. The companion GIS utility package (HEC-GeoHMS) has been updated to be compatible with ArcGIS 9.x versions.
- HEC-RAS, beta version 4.0. Additional features include water quality temperature modeling, sediment transport, gate rules and modeling of the Katrina event. The companion GIS utility package (HEC-GeoRAS) has been updated to be compatible with ArcGIS 9.x versions
- HEC-SSP, beta release. HEC-SSP is a new Statistical Software package that will replace the multiple DOS statistical software programs developed in the 1980’s.
- HEC-RPT. The Regime Prescription Tool will assist decision makers as they define competing flow recommendations. The tool allows visualization of large amounts of flow

data and helps define consolidated flow recommendations. The ultimate goal is to combine it with the ResSim software to enhance planning and real-time operational decision making.

- HEC-EFM, beta release (Corps only), is the new Ecosystem Functions Model. Used on several USACE studies, it is emerging as a valuable link between traditional flow-based watershed analysis and ecosystem response. An official release is expected in FY 2007.

FY06 also saw improvements to HEC-FDA, the major flood damage and risk analysis software package; HEC-FIA, Flood Impact Analysis; and HEC-ResSim, Reservoir Simulation Model. FY07 will see release of HEC-FDA, version 1.4; HEC-EFM, and a beta version of the new HEC-WAT, Watershed Analysis Tool (which will update HMS, RAS, SSP, ResSim and FIA software).

HEC entered into a MOA with Lower Colorado River Authority (LCRA) supporting its use of CWMS. HEC also prepared and executed a new MOA with the National Weather Service under the Economy Act for the purpose of developing, incorporating and utilizing models and techniques developed by HEC into National Weather Service operational software. ERDC-CHL and HEC have drafted a proposal to integrate HEC-ResSim and CEQUAL-W2 for modeling of water-quality constraints on the operations of one or more reservoirs.

INTEGRATED CIVIL WORKS SYSTEMS

Performance-based budgeting, performance measures and program assessment ratings are increasingly important. In response, IWR created a corporate data warehouse of financial and inventory data, lock characteristics, navigation project profiles, OMBIL outputs, waterborne commerce, lock performance, hydropower, recreation, water supply, National Recreation Reservation System and environmental stewardship data. Data from these sources is linked, integrated and combined to generate performance measures, which are then used in the budget process.

OMBIL: The Operations and Maintenance Business Information Link (OMBIL) Plus, a centralized performance management information system, encompasses the Civil Works businesses of navigation, hydropower, recreation, environmental compliance, environmental stewardship, water supply and regulatory. The OMBIL decision support system distributes data to support a variety of Corps

management initiatives, performance-based budgeting and Federal and public data requirements.

In support of the Civil Works business performance measurements, NDC extracts expenditure data from the USACE financial management system (CEFMS) and combines it with business output data to generate efficiency and effectiveness measurements, including submissions to the Office of Management and Budget. NDC data supports and is a source for the Corps "Value to the Nation" and the Federal government's recreation access site "rec.gov." Navigation data is also integrated with CorpsMap, providing an intranet web-based GIS interface. All of NDC's publicly available navigation and water transportation data is available via a single gateway at www.ndc.iwr.usace.army.mil or on its annual CD-ROM.

Corps Water Management System (CWMS): The Corps Water Management System (CWMS), formally identified as an Army Automated Information System, has been updated at roughly annual intervals at the thirty plus USACE offices with water control management responsibilities. CWMS supports field-level decision making within the Corps water management mission. It embodies data acquisition, validation, transformation and management; forecasting, simulation and decision support analysis; and information dissemination. Improvements to the system continue via a field-prioritized betterments program. The current fielded version of CWMS (v 1.4) was released in January 2006. An update (v 1.5) to the fielded version is planned for early 2007 and will principally address known program flaws and the new Daylight Savings Time rules that take effect in spring 2007. Version 2.0, planned for release in mid-2007, will include important revisions to the basic database structures, allowing water control users more direct access to their data and enabling them to make more effective use of the features inherent in the commercial Oracle database at the center of CWMS. Information about CWMS and other HEC software is available on the HEC web site www.hec.usace.army.mil/cwms/.

WATER RESOURCES TRAINING AND EDUCATION

The Institute for Water Resources, including HEC, has always been a leader in innovation within the Corps of Engineers family. IWR has been responsible for developing techniques and approaches for economic analysis, risk analysis, planning methodologies, public involvement, conflict dispute resolution, water conservation and other topic areas. HEC, through the

development of hydraulic, hydrologic and planning analysis methods and models, has built a reputation recognized throughout the world in the fields of hydraulics and hydrology. Over the course of their existence, both IWR and HEC have made considerable effort to build appropriate training for the use of the various tools they have developed. As a result, each office routinely offers eight to twelve courses per year through the Proponent-Sponsored Engineer Corps Training (PROSPECT) program and/or through other training venues, such as workshops and seminars.

PROSPECT Program and Specialty Workshops: IWR continued the USACE Proponent-Sponsored Engineer Corps Training (PROSPECT) program in 2006 by presenting 23 week-long courses (fourteen led by the IWR NCR and nine by HEC). The courses covered a wide range of civil works water resources topics: Public Involvement and Teaming in Planning; Public Involvement-Communications; Regulatory for New Regulators; Regulatory-Procedural Issues; Regulatory-Decision-Making; Regulatory Executive Seminar; Planning for Ecosystem Restoration; and a full menu of hydrologic engineering and planning analysis topics, including courses on HEC-HMS, HEC-RAS, GIS applications, flood hydrology and frequency analysis, watershed/river and wetlands restoration courses (using HEC-EFM and HEC-RPT) and advanced courses in unsteady flow with HMS-RAS and HMS applications. Specialty workshops on HEC software were conducted at meetings and conferences and for special interest groups. Two ResSim week-long workshops were conducted, one basic and one on advanced topics. Three-day HEC-RAS training was provided for an IPET team and half-day training was provided for the Floodplain Managers Association. A GeoHMS and HMS half-day workshop was conducted for the Federal Interagency Hydrologic Modeling conference and a one-day CWMS database working session was conducted for the CWMS User Representative Group. Additionally, six weeks of specialized hydrologic and hydraulic training were provided at HEC to 10 engineers from Iraq's Ministry of Water Resources. Topics included use of HEC-DSSVue, GIS, HEC-HMS, HEC-RAS, HEC-ResSim and other software as applied to Iraqi rivers and water resources projects.

Planning Excellence Program: Throughout FY06, IWR provided managerial and technical support to the Civil Works Planning CoP in the execution of the Planning Excellence Program. This included the management of the Planning Associates (PA) program and conduct of the three-week "Washington DC Experience" module for the FY06 class. The goal of the PA program is to develop planning leaders who

can manage complex planning studies that lead to quality decision documents and who will provide water resources technical and professional leadership in the future. IWR, in coordination with HQUSACE, is responsible for the implementation of the program, including setting up the criteria for selection of candidates, development and delivery of training sessions and financial management and logistical support. IWR also provided support to the local delivery of selected Planning Core Curriculum Courses by the Corps MSCs. These eight courses provide the basic, full-performance training needed by entry level planners across the USACE as the means to accelerate their progress to the journeyman stage of their career development.

Further progress was made on the development of distance learning components of the Advanced Degree Program in Integrated Water Resources Management, which is offered at five universities: Johns Hopkins, Southern Illinois University, University of Florida, Harvard University and University of Arizona.

REIMBURSABLE TECHNICAL ASSISTANCE

Reimbursable project work was undertaken for USACE field offices as well as: HQUSACE Civil Works Planning, Engineering, Operations-Regulatory and Office of Homeland Security; the HQUSACE Office of Interagency and International Activities; the Corps Engineering Research and Development Center (ERDC) - Coastal and Hydraulics and Environmental Labs; the Federal Emergency Management Agency; the International Joint Commission (IJC); the U.S. Agency for International Development (USAID); the National Weather Service; the U.S. Geological Survey; the Natural Resources Conservation Service; other Federal agencies; and approved Thomas Amendment Agreement technical support to the Lower Colorado River Authority, Texas and the Tampa Bay Water Authority, Florida. Other projects for IWR's USACE clients included navigation systems economic evaluation, technical advice and guidance on plan formulation, incremental cost and cost effectiveness analysis, risk analysis, watershed and reservoir system modeling, water quality, river hydraulics, wetlands hydrology, water control management, regional statistical analysis, flood damage analysis, flood warning response systems, GIS applications in hydrology and hydraulics, groundwater modeling and water supply in support of interagency investigations.

IWR worked on a variety of projects including: post-Katrina IPET support and hydraulic analysis; Ft. Worth Flood Warning modeling; development of an

integrated forecasting model for the National Weather Service for joint operations on Feather and Yuba Rivers, CA; Tooele & Ft. Huachuca groundwater modeling; Bill Williams River ecosystem restoration and hydraulic modeling; shared vision collaborative planning on St. Paul District's Reservoir Operating Plan Evaluation (ROPE) Study for Mississippi Headwaters; environmental/water supply storage study for the Jacksonville District; providing additional features in RAS software for the Tampa Bay Water Authority; helping the Lower Colorado River Authority implement CWMS for their water management needs; contributing to the revision of Bulletin 17B; writing levee certification guidance; working with the Corps Screening Portfolio Risk Assessment teams evaluating the safety of our Nation's dams; and numerous miscellaneous consultations.

Internationally, IWR conducted work in Iraq and Afghanistan. USAID funded both of the Middle East efforts. In Iraq, IWR/HEC worked with the Iraq Ministry of Water Resources on the Strategy for Water and Land Resources in Iraq project. This effort extended the Iraq water management tool for the Tigris-Euphrates River basins, which included the reconstruction of historical data and completion of the HEC-ResSim model. HEC also collaborated with the U.S. Geological Survey to begin the renovation of Iraq's stream gage network. This effort should be completed in early 2007. In Afghanistan, HEC is developing an operations manual and performing a water budget analysis for the Kajakai Reservoir in the Helmand Valley of Afghanistan. Both the Iraq and Afghanistan work included training of our international partners.

CIVIL WORKS PROGRAM AND PROJECT INFORMATION

IWR provides a full range of international, national and USACE data and information for key Civil Works activities. National water resources database concept development, design, implementation, operation and maintenance activities are provided through a combination of in-house and private sector systems analysts, statisticians, engineers and scientists who work in close coordination with USACE users.

Navigation Data Center: The Navigation Data Center (NDC) is the central manager of navigation, hydropower, recreation, environmental stewardship, water supply and regulatory data for the Nation. Information provided by NDC directly supports the USACE annual Civil Works performance-based

budgeting program. NDC is responsible for national level executive oversight and management responsibilities, including the development of Federal and USACE Engineering Regulations, the Code of Federal Regulations and their enforcement. OMB, acting on legislative mandates, recognizes USACE, acting through NDC, as the Federal collection agent for waterborne commerce, vessel activities and waterway infrastructure data and statistics.

NDC accomplishes its objectives of supplying timely and accurate data through the following activities: assessing user requirements; developing, designing, operating and maintaining systems to collect, process and store data and information; developing and disseminating data, information and statistics products; training providers and users; maintaining technological and content interoperability and currency.

As a national statistical center, NDC coordinates extensively with other Federal statistical agencies and data users, representing the U.S. government to foreign governments in the development of data and information standards and protocols and in the negotiation of data exchanges. NDC actively participates in corporate information integration and coordination within the USACE and plays a lead role in developing, coordinating and disseminating water resources information for performance measurement and management purposes. It leads the development of strategic communication with both internal communities of practice and external water resources interests, stakeholders and communities. Key information and data provided in FY06 include:

Waterborne Commerce and Vessel Statistics: Under the authority of the River & Harbors Act of 1922, as amended and codified in 33 U.S.C. 555, the USACE is to collect, process, distribute and archive waterborne commercial vessel trip and cargo data. These data and statistics are used to analyze the feasibility of new water transportation projects and activities; to set priorities for new investment and rehabilitation; and for management of the operations and maintenance of existing projects.

Under Federal law, vessel-operating companies must report domestic waterborne commercial vessel movements directly to the USACE. The types of vessels include: dry cargo ships and tankers, barges (loaded and empty), towboats (with or without barges in tow), tugboats, crew boats and supply boats to offshore locations and newly constructed vessels from the shipyards to the point of delivery. Vessels remaining idle during the monthly reporting period are also reported. U.S. foreign waterborne import, export

and in-transit cargo and vessel movement data is provided to the Corps by the U.S. Customs and Border Protection, the U.S. Bureau of the Census and the Port Import Export Reporting Service.

Movement data acquired by the NDC Waterborne Commerce Statistics Center is primarily for the use of the USACE and other governmental agencies. Since 2004, data have been incorporated into the USACE budget preparation process, providing the navigation project outputs and performance measures used to rank and justify operation and maintenance funding requests. Summary statistics, which do not disclose movements of individual companies, are also released to private companies and to the general public.

Navigation Infrastructure Inventory: Navigation Infrastructure Inventory information supports the USACE Federal Central Collection Agency responsibility for documenting the Nation's commercial port infrastructure served by Federal channels. In 2006 data for the ports of Pittsburgh PA, Huntington WV, Galveston and Texas City TX, Tampa and Port Manatee FL and the ports of Southern New England were updated into the central database. Data for over 9,280 individual docks is available in published reports and on the Internet in summary form and as data files. Data are updated and posted as each port area is re-surveyed and verified as current.

A new initiative to survey the ports of Southern Louisiana (west of New Orleans and east of Lake Charles, LA) was begun. This included a portion of the Gulf Intracoastal Waterway, Vermillion River including Intracoastal City, Port Fouchon, Port Iberia, West St. Mary, the Barataria Waterway, Houma and Morgan City.

Navigation Infrastructure Inventory information is used to identify industries served by the Federal channels and is part of the budgetary process of prioritizing projects. The Coast Guard is another prime user of the information in the execution of its homeland security mission. Another new initiative is the establishment of a central database of all USACE navigation projects (Navigation Project Profile) with the critical attributes required for the budget prioritization process. The information uses OMBIL to more fully describe all aspects of a project.

Lock Performance and Characteristics: The lock performance database provides the USACE access to individual lock near-real-time information as well as summary and performance statistics. The data are entered into the database by the lock operator as the vessel is locking through the chamber. A national data

warehouse deployed in FY 2005 provides all USACE users direct access to current and historical data and summaries. The data is used by the USACE and other agencies, such as the Coast Guard and TVA, in the execution of their missions and in the formulation of the USACE budget. Lock characteristics data and the physical descriptions of all the USACE owned and operated locks are updated as information changes. Lock characteristics and performance data and information are available on the public web site. The lock databases are feeder systems to the OMBIL decision support system.

Dredging Statistics: This web-based ORACLE database is successful in supplying information on all USACE performed and contracted dredging to the USACE, industry and private users. Data entry and report generation is accomplished via the USACE intranet and enables all USACE members to access the central system information. Data is used to generate the Small Business Report for dredging contracts. Biweekly reports are posted on the public web site to inform the industry and public of Corps and contracted dredging activities. Standard reports and summaries plus custom queries and reports are quickly generated to meet Corps and user needs. Use of the information has resulted in improved bidding competition and more efficient utilization of dredging equipment. The dredging database is a feeder system to the OMBIL decision support system.

Recreation: Recreation data for the 4300 USACE recreation areas are collected and maintained within the OMBIL database. Recreation inventory (recreation areas, visitor centers, facilities and amenities), outputs (e.g. visitors, visitor hours) and activities (e.g. citations and interpretive contacts) are combined with revenues and expenditures to produce performance measures that assist the USACE in making management decisions for the Recreation program. The recreation data are furnished to public web sites such as Value to the Nation, www.vtn.iwr.usace.army.mil, CorpsLakes, www.CorpsLakes.us and the Federal recreation web site, www.recreation.gov. In FY06, an enhanced user interface was developed to provide more effective quality control for recreation data accuracy and completeness. OMBIL also supported the budget process by continuing to supply data to the RECreation Budget Evaluation SysTem (Rec-BEST), developed by ERDC.

IWR, in collaboration with ERDC, has provided additional technical support to USACE Recreation business line activities. The activities that were accomplished in FY06 include: continuing to support the performance-based budget development for

Recreation business line; regional economic impact analysis of Recreation; GIS Application and the implementation of Google Earth application for all USACE Recreation projects; and other miscellaneous technical support to USACE Natural Resources management activities.

IWR worked with OMB to revise and obtain the approval for public surveys for recreation planning and resource management. IWR also provided technical support for individual survey submissions and updated its web site with the revised compendium of OMB-approved surveys.

Hydropower: Hydropower data from the 75 Corps power plants is collected and maintained within the OMBIL database. For those power plants in Northwestern Division that have automated control systems (GDACS), electronic upload of generation data is in place. Data such as power generation statistics, unit availability and revenue generated enable the Corps Hydropower program to determine its performance, make budgeting decisions and furnish OMB with program performance information. In FY06, all five hydropower performance measures for the FY08 budget process were supplied by OMBIL Hydropower data. Also in FY06, OMBIL added the new measure of peak availability as an indicator of performance during periods of high demand for electricity.

Water Supply: IWR serves as the HQUSACE national program manager for the Water Supply business program. In this capacity, the yearly budget and the five-year development plan for that portion of the USACE Water Supply budget is developed in coordination with the MSCs and the strategic plan as presented in the Program Assessment Rating Tool. It is necessary to develop yearly budget guidance to the MSCs, collect their data, prioritize it in conjunction with the seven other business lines and eight program areas, present the data to the senior leaders of Civil Works, the Assistant Secretary of the Army (Civil Works) and a panel of water supply examiners from OMB. The yearly program must then be modified and adjusted as necessary based on OMB comments and directives.

IWR is responsible for the development and maintenance of the USACE database of Water Supply projects. This database was originally developed in 1996, updated in 2004 and again in 2005. The data for Water Supply is currently in the process of being loaded into a Water Supply module in OMBIL. This process, once loaded, will enable a continual update of the OMBIL data, similar to other business lines. The

2005 database shows there are 136 Corps multipurpose projects which contain storage space for municipal and industrial water supply. These projects are located in 25 states, Puerto Rico and in 23 of the 38 Corps districts. In these projects the Corps has 307 repayment agreements representing some 9.76 million acre-feet of storage space and an investment cost of \$1.46 billion. The storage space is capable of providing some 5 billion gallons of water per day for use by municipalities and industries which have signed repayment agreements. All monies collected by the repayment agreements are deposited into the Treasury of the United States.

INTERNATIONAL WATER RESOURCES

The Institute formed the International Water Resources program in 2006 as a means to better coordinate the various international initiatives that are under its purview. These initiatives fall into three categories: global water resources strategies, international partnerships, and technical and advisory support. These initiatives and the major projects that fall under them are:

Lake Ontario and St. Lawrence River Study: The international Lake Ontario-St. Lawrence River Study was conducted and completed by IWR for the International Joint Commission (IJC). A final report was submitted to the Commission, recommending three alternative plans for their consideration. The purpose of the study was to assess and evaluate the Commission's *Order of Approval*, developed in the late 1950's and used to regulate outflows from Lake Ontario through the St. Lawrence River. During the course of the 50 years of operation, there were many changes in the operating plans; changes of flow regime; ecology and other new uses, such as recreational boating. This five-year, \$20 million study developed numerous options and recommended three candidate plans after evaluating the impacts of changing water levels on shoreline communities, domestic and industrial water users, commercial navigation, hydropower production, the environment and recreational boating and tourism, along with forecasted effects of climate change. The study was conducted in full partnership with Canada, utilizing a transparent planning process pioneered by IWR and known as Shared Vision Planning (SVP). The open citizen and public participation process was guided by a volunteer Public Interest Advisory Group appointed by the IJC, while the study team of approximately 150 scientists and engineers was composed of a broad assembly of multi-disciplinary technical experts on nine technical working groups and led by co-directors

from Canada and the U.S. The U.S. co-director was Dr. Eugene Stakhiv of IWR.

International Upper Great Lakes Study: As the Lake Ontario-St. Lawrence River Study ended, in May 2006 USACE/IWR signed a MOA with the International Joint Commission for initiation of a new 5-year, \$15M study focusing on the Lake Superior Regulation Plan and the potential erosion problems associated with the St. Clair River channel (thought to cause the long-term lowering of Lake Michigan/Lake Huron levels). Dr. Eugene Stakhiv was appointed as U.S. co-Director and IWR was again selected to lead the U.S. contributions to the study, emphasizing the success of the Shared Vision Planning approach in the previous effort.

IWR plans to initiate activities related to investigating whether the current Lake Superior outflow management procedures could be improved, considering evolving Upper Great Lakes interests and climate change, and investigating St. Clair River flow characteristics, determining how the natural regime of the river has been changed by human activities. Further on-going changes may affect the water level relationship between Lakes Michigan, Huron and Erie. The work planned for the conduct of this study was approved by the IJC and includes:

- A workshop to investigate models and frameworks as possible replacements for the current water levels management plan for Lake Superior.
- A workshop to investigate techniques that can be used to evaluate the flow characteristics of the St. Clair River.
- Bathymetric/topographic data collection at selected sites around the Upper Great Lakes and throughout the St. Clair River.
- Initial investigations to determine the indicator species impacted by water level and flow variations.
- Establishment of hydrologic data sets to be used throughout the study, particularly when evaluating plan alternatives—historic, stochastic and altered climates.
- Establishment of technical work groups to evaluate specific impacts related to coastal processes, commercial navigation, hydropower, recreational boating, water uses and environmental factors.
- Development and implementation of a communications plan.

World Water Council: The World Water Council (WWC) is an international association of over 400 private and public organizations involved in water-related activities. Formed in 1996, the WWC includes the principal United Nations water agencies and international banks as its founder organizations. The main activity of WWC is hosting the World Water Forum, which is held once every three years. As the main international event on water, it seeks to enable multi-stakeholder participation and dialogue to influence water policy making on a global scale, thus assuring better living standards for people all over the world and a more responsible social behavior towards water issues in line with the pursuit of sustainable development. The 4th World Water Forum (WWF) was held in Mexico City in March 2006 with the theme "Local Actions for a Global Challenge," featuring keynote speaker LTG Carl Strock. An IWR technical specialist, Mr. George Alcala, on detail from the Corps Galveston District, served in residence for one year at the WWF in Mexico City to lead U.S. Government preparations for the forum. Several USACE representatives participated in that event.

In 2006, Mr. Steven Stockton, Deputy Director for Civil Works, was elected as a WWC governor and an alternate on the Board of Governors. Dr. Delli Priscoli (IWR) serves as the alternate and is a representative on the Executive Committee. Ongoing WWC activities involve close liaison with the U.S. Department of State on the dialogues and content of WWF, particularly the Bureau of Near Eastern Affairs and the Bureau of Oceans and International Environmental and Scientific Affairs, to assist U.S. interests. During this period, Dr. Delli Priscoli continued to serve as Editor-in-Chief for *Water Policy*, which is a peer-reviewed international journal that is published six times per year.

UNESCO Partnerships: A large number of UNESCO-related activities are sanctioned by the U.S. Government; in particular those related to the U.S. National UNESCO Commission and the U.S. International Hydrological Programme (IHP) Committee. In support of those activities, USACE has four MOUs with IHP and its UNESCO water centers: an umbrella agreement with IHP; a second MOU with UNESCO-IHE (Institute for Water Education at Delft); and newer IWR agreements with ICHARM (International Center for Hazard and Risk Management) at Tsukuba, Japan and CAZALAC ((Centre for Arid and Semi-arid Zones of Latin America and the Caribbean) in Chile. IWR manages these agreements and is also engaged with the Global Water Partnership (GWP) and its efforts to implement integrated water resources management in developing countries. GWP is an international NGO with the

financial support of the European Union and the World Bank. IWR has been working with select members of the GWP Technical Working groups to develop protocols for IWRM.

During 2006, IWR (Dr. Stakhiv) delivered the Kovacs Lecture at the UNESCO IHP General Assembly Meeting in Paris. Two IWR NRC Fellows were also selected to work on UNESCO-CAZALAC joint projects. IWR Director Robert Pietrowsky attended the IHP General Assembly Meeting and formalized MOUs with both UNESCO-ICHARM and UNESCO-CAZALAC. The U.S. IHP Committee formally appointed Dr. Stakhiv as Region Representative to the ICHARM Advisory Board and IWR Director Robert Pietrowsky was formally appointed to the UNESCO-IHE Board. IWR also attended the formal opening of UNESCO-ICHARM at Tsukuba, Japan where Dr. Stakhiv was elected chairman of the ICHARM Advisory Board. FY06 saw the continued training of an additional 11 in-residence Master's and Doctoral Degree water specialists from the Iraqi Ministries of Water Resources, Agriculture and Public Works at the IHE-Delft, Netherlands.

In 2007 the USACE will take a more active role in international water-related research and policy issues. UNESCO, IHP and GWP serve to develop and implement innovative ideas, tools and policies related to improved water management. Active involvement in these forums enhances the stature of the USACE and works as a two-way technology transfer mechanism. IWR's involvement in these forums has substantially elevated the USACE international profile.

UNESCO—IHP: In FY 2006, the IWR Director was selected to be one of six permanent Federal agency members of the newly established U.S. National IHP Committee. He was also part of the U.S. Government delegation attending the 17th Session of the UNESCO-IHP Intergovernmental Council in Paris, France, 1-6 July 2006. At this IHP Council Meeting, the Director of IWR signed two MOUs with UNESCO Center directors of ICHARM and CAZALAC.

Dutch Rijkswaterstaat: The Corps signed an MOA with the Dutch Rijkswaterstaat (RWS) in May 2004 as a means to more effectively exchange information and resources. The RWS has a mission quite similar to that of the USACE and much collaboration has transpired regarding flood and coastal management and protection measures and policies in the aftermath of Hurricanes Katrina and Rita.

The first of a planned series of technical workshops was conducted in The Hague. Representatives from

ERDC, HQUSACE, USACE Districts, the State of Louisiana and IWR exchanged views on a broad range of topics, including risk-informed decision making, advanced dredging technologies, soft soil improvement, non-structural floodplain management and navigation. A Dutch delegation interested in U.S. dam removal policies and projects was hosted. Also, the Assistant Secretary of the Army (Civil Works) personally thanked a large contingent of Dutch managers, scientists and technicians in The Hague for the help that was provided to the U.S. in response to the 2005 hurricanes.

Workshops between the two organizations on matters related to floodplain and coastal zone management will continue in FY07. Plans are underway to devise a more strategic approach to the agreement to allow for broader USACE engagement beyond the coastal Louisiana focus. The newly-formed Dutch institute Deltaris was commissioned to conduct an independent study on coastal protection and restoration for Louisiana. The Dutch have developed unique approaches to a broad range of relevant topic areas, such as levee and sea wall integrity, operations and maintenance, soft soil technology, dredging techniques and risk assessment methodologies.

Japanese Ministry of Land Infrastructure and Transport: USACE participates in an ongoing technical exchange program with the River Bureau of the Japanese Ministry of Land Infrastructure and Transport (MLIT). The program is governed by an Implementing Arrangement (IA) under the *Agreement between the Government of the United States of America and the Government of Japan on Cooperation in Research and Development in Science and Technology*, signed in Toronto on June 20, 1988, as amended and extended. The IA was signed by the USACE Chief of Engineers at the World Water Forum in March 2003. It names the Chief of Hydrology and Hydraulics at the St. Louis District as the Technical Program Officer, responsible for the technical exchange on the USACE side and names the Director of Civil Works as the oversight authority for the exchange. The project management oversight authority has been delegated to IWR and within IWR to HEC. To date, the exchange has consisted of annual technical exchange meetings alternating between sites in the U.S. and Japan and some facilitation of requests for information between USACE and the River Bureau. The present IA five-year term will expire in March 2008.

In February 2006, a delegation from USACE visited Japan for meetings under the agreement. IWR, in its role as executive director supporting HQUSACE for

the Hydrology, Hydraulics and Coastal CoP, was represented by an HEC staff member.

International Technical Reimbursable Projects: FY06 continued to yield major growth in technical assistance projects undertaken in cooperation with USACE, Federal and non-Federal organizations. This collaboration included work in Iraq and Afghanistan for USAID, its contractors and local government agencies.

Specifically, HEC partnered with USAID and the Iraq Ministry of Water Resources to assist them with the development of a Water Resources Strategy Plan for Iraq. In Phase I of this effort, HEC compiled and reconstructed the water resources database and developed a water management model for the Ministry using the HEC-ResSim software. Partnering with the USGS, HEC also assisted with the renovation of the Iraq stream gage program.

The Institute worked in collaboration with the USACE Gulf Region District and the Iraqi Ministry of Water Resources to facilitate U.S. Government sponsorship of Iraqi professors attending the Master's Degree program in residence at UNESCO-IHE (the United Nations Institute for Water Education at The Delft, Netherlands).

HEC also performed a similar study for the Afghanistan Ministry of Energy and Water in the Helmand Valley watershed of Afghanistan. A water budget was created for the Helmand system using the HEC-ResSim software. With the assistance of the Portland District office, HEC is developing a draft operations manual for the Kajakai Reservoir on the Helmand. To complete the operations manual, HEC has been working with the USACE Cold Regions Research and Environmental Laboratory to complete the snowmelt modeling. In early FY07, engineers from HEC and the Wilmington District will go to Kabul, Afghanistan to provide hydrologic, hydraulic and reservoir modeling training. HEC-HMS, HEC-RAS and HEC-ResSim software will be featured.

HEC continues to participate in the Civil and Military Emergency Response Preparedness Program. In this program, GIS and hydraulic engineers from the USACE work with former Eastern Block nations to perform exercises to develop plans to prepare for emergencies such as dam failures. An interesting aspect of the work is that the watersheds often cross international boundaries.

INTERNATIONAL NAVIGATION ASSOCIATION (PIANC)

The International Navigation Association (PIANC) is an organization consisting of approximately 40 member nations. From its headquarters in Brussels, Belgium, it acts as a clearinghouse of technology and experiences relating to ocean and inland navigation improvements which are exchanged among engineers, scientists, port operators and marina and vessel owners, to name a few. Its objective is to advance, on a worldwide basis, the sustainable development of all kinds of navigation through the exchange of technical information on port and waterway development. The objective of the Association is met by holding International Congresses and by publishing technical bulletins and special reports. Special reports are published describing the results of the work of international research teams, or working groups, composed of those national members interested in the particular subject under study. The organization also serves as an excellent source of identifying individual and corporate expertise throughout the world on PIANC-related subjects.

The United States, a member of PIANC since 1902, provides an annual appropriation for the support and maintenance of the organization. This includes an annual subvention to PIANC and payment of a portion of the travel expenses of officially appointed U.S. delegates (Commissioners) to meetings of the Annual General Assembly and Congresses. Total annual appropriation for the U.S. Section PIANC is currently \$45,000, including the annual subvention of approximately \$15,000. The U.S. Section is administered by law under the auspices of the USACE. It is located at the IWR NCR Humphreys Engineer Center facility. The U.S. Section is composed of dues-paying individual and corporate members. U.S. Section membership on September 30, 2006 totaled 230, consisting of 195 individual members and 35 corporate members.

United States National Commission: The United States National Commission constitutes the governing body of the U.S. Section. In 2006 the ex-officio officers of the U.S. National Commission were: Chairman, John P. Woodley, Jr., Assistant Secretary of the Army (Civil Works); President, MG Don T. Riley, Director of Civil Works; and Secretary, Mr. Bruce Lambert, an employee of IWR.

In 2006, U. S. National Commissioners were: Mr. Shiv Batra, Vice President representing the Western Region and President, INCA Engineers, Inc.; Dr. Thomas H. Wakeman, III, Vice President representing

the Eastern Region and Program Manager, Regional Port Programs, Port Authority of New York and New Jersey; Mr. Charles C. Calhoun, Jr., Vice President representing the Central Region and consultant; Ms. Doris J. Bautch, Director, Great Lakes Region, Maritime Administration, U.S. Department of Transportation; Mr. John Headland, Senior Vice President and Regional Manager, Moffatt and Nichol Engineers; Mr. Joseph H. Pyne, President, Kirby Corporation; Dr. Robert H. Randall, Texas A&M University, and Mr. Dave Sanford, Director of Navigation Policy and Legislation, American Association of Port Authorities.

PIANC Activities: In February of 2006, Mr. John P. Woodley, Jr. made a presentation on the role of ports to the American Association of Port Authorities Latin American Executives Meeting in Houston, Texas. This activity was part of the Inter-American Initiative being led by the U.S. Section PIANC. Mr. Lambert also presented a session on life cycle costing.

In May of 2006, the PIANC International Annual General Assembly was held in Lisbon, Portugal. The U.S. Delegation composed of Mr. John P. Woodley, Jr., MG Don T. Riley, Mr. Bruce Lambert, Mr. Shiv Batra, Mr. Harry Cook, Mr. John Headland, Mr. Tom Wakeman, Mr. Thorndike Saville, Dr. Robert Engler and Dr. Sandra Knight also attended. The major resolution was "Honoring the Past, Serving the Future", recognizing PIANC adoption of its strategic plan for 2006-2010. Lisbon was also the host of a PIANC Congress, which occurs every four years. The U.S. was a leading delegation with over 50 members attending and/or participating in technical sessions.

Continuing efforts included the development of a new strategic plan for the U.S. Section of PIANC and work on the MOU signed with the American Association of Port Authorities (AAPA) in 2005. A MOU was signed with the Organization of American States, Inter-American Committee on Ports (OAS-CIP) in December 2005. Through these agreements, PIANC USA received formal letters to develop technical visits to both El Salvador and Argentina in FY07.

Mr. Lambert participated in the Regional Navigation Design Team (RNDT) meeting in Portland, Oregon, held to examine ways that PIANC can work with USACE inland navigation offices to improve technical exchanges with groups outside the United States. Mr. Lambert also participated in the AAPA Annual meeting in New Orleans, per terms of the AAPA MOU, and attended OAS-CIP meetings in Algeciras.

Representatives to Committees and Commissions:

The principal business of PIANC is the sponsorship of technical working groups. The U.S. Section is represented by Principal and Co-Principal Members of the Commissions managing technical working group activities. The representatives were:

Environmental Commission—Mr. Edmond Russo, U.S. Army Corps of Engineers, New Orleans District.

Inland Navigation Commission—Mr. Shiv Batra, President of INCA Engineers, Inc.

Maritime Navigation Commission—Mr. E. Dan Allen, Moffatt & Nichol.

Recreational Navigation Commission—Bob Nathan, Moffatt & Nichol and Jack C. Cox, TetraTechFW.

New Technical Working Groups: In 2006, thirteen new Working Groups were formed. The groups are listed below along with the name of the Principal U.S. Representative.

- InCom 30—Robert Willis and YP Chad Linna
- InCom 31—Deidre McGowan and Jim McCarville
- InCom 32—William Harder
- MarCom 50—Bill Paparis
- MarCom 51—Timothy L. Welp
- MarCom 52—Dan Allen
- MarCom 53—John R. Headland and Michael Briggs
- MarCom 54—Robert Weeks and Majid Yavary
- MarCom 55—Larry Cunningham and YP Larry Wise
- MarCom 56—Doug Gaffney, P.E.
- MarCom 57—Margaret Boshek
- EnviCom 16—Douglas Clarke
- CoCom 2—No U.S. Rep

Working Group Reports Published in 2006:

InCom report of WG 25—Maintenance and Renovation of Navigation Infrastructure.

Incom report of WG 26—Design of Movable Weirs and Storm Surge Barriers:

MarCom report of WG 44—Accelerated Low Water Corrosion.

MarCom report of WG 36—Catalogue of Prefabricated Elements.

EnviCom report of WG 8—Biological Assessment Guidance for Dredged Material.

Active Working Groups and the names of the U. S. Representatives:

- InCom 27—Dr. Thomas Keevin
- InCom 28—James McCarville
- InCom 29—John Clarkson and Dale Miller
- InCom 30—Robert Willis and YP Chad Linna
- InCom 31—Deidre McGowan and Jim McCarville
- InCom 32—William Harder
- MarCom 39—James D. Prehn
- MarCom 42—Valery M. Buslov
- MarCom 43—John Headland
- MarCom 46—Doris Bautch
- MarCom 47—Dr. Jeffrey A. Melby
- MarCom 48—Marcel Hermans and Gary Greene
- MarCom 49—Michael J. Briggs
- MarCom 50—Bill Paparis
- MarCom 51—Timothy L. Welp
- MarCom 52—Dan Allen
- MarCom 53—John R. Headland and Michael J. Briggs
- MarCom 54—Robert Weeks and Majid Yavary
- MarCom 55—Larry Cunningham and YP Larry Wise
- MarCom 56—Doug Gaffney
- MarCom 57—Margaret Boshek
- RecCom 1—Ron Stone
- RecCom 15—Terrence Browne
- RecCom 16—Jack Cox
- RecCom 17—Dennis Kissman
- EnviCom 11—Dr. Michael Palermo and Dr. Paul Schroeder
- EnviCom 12—Dr. Craig Fischenich and John Clarkson
- EnviCom Expert Group 2—No U.S. Rep
- EnviCom 13—r. Douglas Clarke and Thomas Wang
- EnviCom 14—Richard Gorini and Jack Word
- EnviCom 15—Dr. Mark Sudol and Russ Kaiser
- EnviCom 16—Dr. Douglas Clarke
- EnviCom Expert Group 3—Dr. James Corbett
- CoCom 1—Bengt Bostrom
- CoCom 2—No U.S. Rep