

REMAINING ITEMS

Investigations, Construction, & Operation and Maintenance^{1/}

REMAINING ITEM
(Ordered by Appropriation)

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1/ Remaining Items for the Mississippi River and Tributaries (MR&T) account are included with the Budget Justification Sheets for the MR&T account.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies with Other Agencies

Access to Water Data, Engineer Research and Development Center 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017 3/	Budgeted Amount for FY 2018
\$750,000	\$750,000	\$750,000	\$360,000	\$360,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$12,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2017 of Water Resources Development Act 2007 (33 USC 2342).

DESCRIPTION: Annual funding provided under this program is used to develop standard business processes, procedures and database models to manage water quality and quantity data generated by the full range of Corps water resources activities in conjunction with the Environmental Protection Agency (EPA), the U.S. Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) Water Control and Water Quality Programs. This may include water quality/quantity information associated with stream gages, water quality gages and other monitoring devices and water resources model and analytical tool output. These data include variables such as precipitation, water chemistry, temperature, evaporation, sedimentation, biological and habitat data, riverine discharges and stages, reservoir storage, inflows and outflow. This will include developing quality assurance/quality control processes and criteria for collected data. Water quantity and water quality data will be made available to the public through a standard web interface in a downloadable format as soon as quality assurance/quality control has been conducted by the USACE. The Corps routinely coordinates with other Federal agencies to solicit feedback on management and implementation of this program.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies with Other Agencies – Navigation

Committee on the Marine Transportation System, Institute for Water Resources 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$125,000	\$140,000	\$125,000	\$90,000 2/	\$50,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$52,000, all of which was committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

The Committee on the Marine Transportation System (CMTS) was established as directed by the President in the *Ocean Action Plan – The Administration’s Response to the U.S. Commission on Ocean Policy* – 17 December 2004. The CMTS held its first meeting in July 2005 and continues to meet three to four times per year. The Assistant Secretary of the Army for Civil Works has been named as the Department of Defense (DOD) representative to the CMTS. The Chief of Engineers was selected to be the initial chair of the CMTS Coordinating Board, which advises and implements directives of the CMTS. An interagency Executive Secretariat supports the day-to-day activities of the CMTS on behalf of the Coordinating Board. The Corps provides a full-time GS-15 liaison to the CMTS Executive Secretariat. This position reports to the Chief of Operations, HQUSACE, and HQ Operations has had the lead in CMTS coordination. The Corps has also been tasked by the CMTS to lead an interagency team to conduct an Assessment of the Current and Future State of the U.S. Marine Transportation System. With support from the Deputy Commanding General for Civil and Emergency Operations, this assessment effort was redirected into a new action team to form a consolidated CMTS response to the National Ocean Policy Task Force Report and other key maritime issues requiring interagency coordination. The need to support CMTS activities will continue annually as the Corps assumes the leadership role of the Ocean Policy Response Team. Dedicated funding to support Corps participation in the CMTS enables the Corps and DOD to be full participants with other Cabinet Departments and agencies in Committee activities and initiatives.

Over the past several years, annual funding has been used to support Integrated Action Teams such as Arctic Shipping - to analyze the challenges in the Arctic and share information and provide recommendations for safe and successful shipping in the Arctic Ocean; Infrastructure Investment - to enable Department of Transportation and Army to align transportation infrastructure investments; Resilience; e-Navigation - to enact implementation plans and provide reports to describe the application of e-Navigation integration; and Environment; Marine Transportation System; Marine Energy; Public Communication and Outreach.

Annual funding will be used to coordinate with other Departments and agencies participating in CMTS; provide support for studies and initiatives requested by the Cabinet-level CMTS; and support the DOD share of other initiatives requested by the Committee such as the Marine Transportation System (MTS) Data and Information Portal, MTS Research & Development Needs, as well as other Integrated Action Teams.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies with Other Water Resource Agencies, Other Coordination Programs

Coordination with Other Water Resource Agencies, Multiple Districts 1/ 2/

	Allocation in FY 2014	Allocation in FY 2015 3/	Allocation in FY 2016 3/	Allocation in FY 2017 4/ 5/	Budgeted Amount for FY 2018
Total	\$1,013,000	\$1,100,000	\$1,139,000	\$ 455,000	\$400,000
CALFED	\$ 100,000	\$ 100,000	\$ 81,000	\$ 21,000	
Chesapeake Bay	\$ 200,000	\$ 290,000	\$ 350,000	\$ 55,000	
Gulf of Mexico	\$ 100,000	\$ 100,000	\$ 250,000	\$ 84,000	
Lake Tahoe	\$ 100,000	\$ 100,000	\$ 50,000	\$ 30,000	
Pacific Northwest Forest Case	\$ 10,000	\$ 10,000	\$ 10,000	\$ 0	
Other Programs	\$ 503,000	\$ 500,000	\$ 398,000	\$ 265,000	

1/ These activities are funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ Chesapeake Bay line item includes an additional \$40,000 reprogrammed in FY 2015 and \$275,000 reprogrammed in FY 2016; CALFED line item reflects \$19,000 reprogrammed away from the line item in FY 2016.

4/ The actual unobligated carry-in from FY 2016 to FY 2017 on these efforts was \$178,000, including \$2,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

5/ In FY 2017, this remaining item consolidated six separate line items included in prior Budgets, which will enable improved execution of coordination funds by increasing the Corps' flexibility to administer these funds as needed and improve visibility of the suite of interagency coordination activities. Those programs are CALFED, Chesapeake Bay, Gulf of Mexico, Lake Tahoe, and Pacific Northwest Forest Case.

AUTHORIZATION: Fish and Wildlife Coordination Act of 1946 (16 USC 661 et seq.); Section 5 of the Watershed Protection and Flood Prevention Act of 1954, as amended (16 U.S.C 1005); Section 1 of the Flood Control Act of 1944 (33 U.S.C. 701-1; Section 7 of the Small Reclamation Projects Act of 1956 (43 U.S.C. 422a); Section 320 of the Water Quality act of 1987 (and Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended (43 U.S.C. 4332); Clean Water Act of 1972, as amended (33 U.S.C. 1251 et seq.)

DESCRIPTION: Funds provided under this program are used to enable efficient and effective coordination with other water resources agencies, which often support multi-agency, national initiatives and strategies such as a) reviewing the environmental impacts that would result from installation of Department of Agriculture project features; b) preparing estimates of flood control requirements, and benefits, and reservoir operating criteria for storage reservoirs to be constructed with Federal funds for Department of Interior (Bureau of Reclamation) projects; c) supporting actions related to the North American Waterfowl Management Plan, most recently revised in 2012; d) cooperate with Federal, state, and local agencies such as River Basin Compact Commissions; Interstate River Basin Compacts; and Regional Planning Commissions as well as for participation in Regional Planning Bodies of the National Ocean Council, as needed; and technical advisory committees of the National Estuary Program; and e) participating in specific regional initiatives, such as: i. Federal Leadership Committee for the Chesapeake Bay; ii. RESTORE, NFWF, and/or NRDA responses to Deep Water Horizon long term recovery; iii. Lake Tahoe Federal Interagency Partnership to restore ecosystems at Lake Tahoe while maintaining a viable economic climate; iv. ecosystem management of the public lands in the Pacific Northwest within the range of the Northern Spotted Owl; and v. the Southern Nevada Public Lands Management Act Program.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies with Other Agencies, Other Coordination Programs

Interagency and International Support 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$574,000	\$946,000	\$500,000	\$300,000 3/	\$400,000

1/ There are no non-Federal costs.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$767,000, including \$145,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 234 of the Water Resources Development Act of 1996 (33 U.S.C. 2323a), as amended.

DESCRIPTION: The Interagency and International Support (IIS) authority allows the Secretary of the Army, using the expertise of the Corps of Engineers, and after consulting with the Department of State (DOS) on activities supportive to international organizations or foreign governments, to support other Federal departments and agencies, non-governmental and international organizations, and foreign governments, to address problems of national significance, and to collaborate with these entities to address domestic and international problems related to water resources, infrastructure development, and environmental protection and restoration. DOS, the U.S. Agency for International Development (USAID) and international organizations such as the World Bank and the United Nations, international partners and governments often request USACE involvement in task forces, working groups, technical exchanges, training courses and workshops, and other capacity building collaborative activities to provide technical and managerial (water resource management) assistance in their strategic interactions with other nations. Through cooperation and collaboration, this authority allows the Army to more effectively meet national objectives using the expertise of the Corps of Engineers, especially as those objectives pertain to civil works missions such as water resources, infrastructure development, and environmental protection and restoration. Annual funding is based on emerging needs, subject to alignment with the National Security Strategy, and consultation with DOS.

Examples of prior accomplishments with these funds include continued participation in the WWC and the High-Level Panel on Water and Disasters; support for a Shared Vision Planning process in Dominican Republic; co-organization of a NASA-led training course on Remote Sensing for Water Resources Management for Latin America; strengthened transboundary co-operation and stability in Ukraine and Moldova; designed / executed a decision exercise for flood resilience in Thailand; USACE participation in 7th International Conference on Flood Management; regional workshops in Africa, the Caribbean and Latin America on techniques to address drought/water scarcity, achieve water security, and/or evaluate vulnerability and risk to changing conditions; published a new risk-based approach for water resources decision-making, completed a draft of Engineering Risk and Uncertainty Guidelines and Standards for Water Resources Infrastructure Planning, Design and Operations (with other IHP "Group 1" nations); had technical exchanges with Japanese and Dutch counterparts on water management and flood risk reduction.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies With Other Agencies, Other Coordination Programs

Interagency Water Resources Development 1/ 2/

Allocation in FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$950,000	\$955,000	\$955,000	\$721,000	\$175,000 3/	\$100,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$174,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

Funds provided under this program are used to cover activities including meeting with City, County and State officials to:

- a) help them solve water resources problems when they have sought advice;
- b) determine whether Corps programs are available and may be used to address the problems; and
- c) ensure they understand study cost-sharing and obtain an indication of their interest in participating in a future study.

Efforts are often part of or complementary to regional and local plans that address water resource problems.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies with Other Agencies, Other Coordination Programs – Flood and Coastal Storm Damage Reduction

Inventory of Dams, Institute for Water Resources 1/

Allocation in FY2014	Allocation in FY2015	Allocation in FY2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$400,000	\$400,000	\$400,000	\$400,000 2/	\$400,000

1/ All activities are funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$23,000, including \$19,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$ 0.

AUTHORIZATION: Section 215 of the Water Resources Development Act of 1996 (P.L. 104-303), as amended by Section 3001 of the Water Resources and Reform Development Act of 2014 (P.L. 113-121).

DESCRIPTION: The National Inventory of Dams (NID) was initially compiled in 1975 and is periodically updated to reflect construction of new dams, changes in ownership, major modifications to existing dams, decommissioning and removal of dams, and improvements in data accuracy and completeness. The current database includes 90,580 dams and uses current internet technology to provide ease of use, accuracy, and accessibility to the data. Annual funding is used to update dam data, improve information flow, and perform data quality control processes. The database provides a central source of information that can be used to track and manage dam safety efforts. The Secretary of Homeland Security and the National Dam Safety Review Board are required to use the dam inventory to allocate dam safety program assistance funds to the states in proportion to the number of regulated dams in each state. Dam inventory data is also included in the biennial report to Congress on the National Dam Safety Program and implementation of the Federal Guidelines for Dam Safety. The ongoing maintenance and publication of the NID is a coordinated effort involving data from the federal and non-federal dam safety community in cooperation with the Federal Emergency Management Agency, Interagency Committee on Dam Safety and the Association of State Dam Safety Officials.

Since 2016, the dam inventory is updated annually and includes inspection completion dates and condition assessment data provided by state and federal agencies. As a result of this data collection, almost 80 percent of the dams in the NID that have a high hazard potential contain an assessment of the dam's condition based on the last inspection, a 40 percent increase since 2009. Continuing efforts include routine maintenance on the inventory data and ensuring the internet based, searchable inventory remains available to all federal, state, and local government agencies and the public. The latest usage data shows that during calendar year 2016, the NID website was accessed by more than 20,900 users. According to the login selection, 20 percent are from academia, 19 percent federal government and 18 percent from engineering/construction businesses.

Annual funds are used to continue maintenance and publication of the NID, including coordination with state and federal dam safety agencies to provide their entire dam inventory using the web-based application, upgrade the Geographic Information System interface and increase integration with other dam and levee safety resources. Modifications to the web-based data submittal tool continue to improve ease of access and information updates by federal and non-federal dam safety agencies.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies with Other Agencies, Other Coordination Programs

Special Investigations 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$1,352,000 3/	\$2,310,000 4/	\$1,326,000 5/	\$1,300,000 6/	\$1,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ \$2,000 reprogrammed to this activity in FY 2014.

4/ \$40,000 reprogrammed away from this activity in FY 2015.

5/ \$24,000 reprogrammed away from this activity in FY 2016.

6/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$443,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

The funds provided under this program are used to respond to various special requests by local interests to conduct limited scope investigations of flooding and potential ecosystem restoration at multiple locations where a previously studied and/or authorized project does not exist as well as attendance at meetings with local interests and other agencies during the preliminary stages of project investigations.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Coordination Studies with Other Agencies, Other Coordination Programs

FERC Licensing 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$200,000	\$200,000	\$200,000	\$100,000 3/	\$100,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$49,000, including \$5,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Federal Power Act

DESCRIPTION: The funds provided under this line item enable the U.S. Army Corps of Engineers to conduct reviews of pre-applications for Federal Energy Regulatory Commission (FERC) preliminary permit and license applications for development of hydroelectric power at Corps and/or non-Corps projects to ascertain potential impacts to the Corps of Engineers' responsibilities and mission in operating projects for authorized purposes. Also, the Corps reviews applications for surrender or termination of licenses to ascertain impacts to Corps' responsibilities and mission. This work was funded under a different budget line item until 2012.

APPROPRIATION TITLE: Investigations, FY 2018

Coordination Studies with Other Agencies

Planning Assistance to States 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budget Amount for FY 2018
\$4,000,000	\$5,000,000	\$6,000,000	\$6,750,000 3/	\$5,000,000

1/ With limited exceptions, non-Federal sponsors are responsible for 50 percent of the cost of efforts undertaken with these funds.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$2,683,000, including \$267,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 22 of the Water Resources Development Act of 1974, as amended.

DESCRIPTION: The Planning Assistance to States program has continued to evolve into a highly effective tool for providing technical and planning assistance to states, local governments, and Indian tribes; annual funding is used to enable the Corps to provide planning and technical assistance to assist in a wide variety of water resource efforts, including environmental conservation/restoration, wetlands evaluation, water supply and demand, water quality, flood damage reduction, flood risk management, coastal zone management, navigation and dam safety. States, local governments, and Indian tribes recognize the need to develop locally directed solutions to their water resources problems, and this program provides a means of working with partners on broad water resources matters of interest to them and outside planning and authorization for site-specific studies and projects.

Annual funding is used to provide planning and technical assistance to States, such as development and updates to hazard mitigation plans, watershed plans and floodplain management plans. Funds could also be used to support the efforts of entities such as the Susquehanna River Basin Commission, Delaware River Basin Commission, and the Interstate Commission on the Potomac River Basin, which seek to improve management of regional water resources including through water supply allocation; water quality protection; regulatory review and permitting; water conservation; watershed planning; drought management; flood loss reduction; recreation; and energy development.

Examples of the type of studies that have recently been conducted under this program include flood risk through flood hazard information reports, restoring urban river environments, ecosystem restoration, accomplishing wetlands identification and mapping, and water quality. This program has been used to develop erosion control designs, supports the initiative to facilitate pre-disaster preparation and planning and post-disaster assistance and is a primary resource for the interagency Silver Jackets teams.

HQUSACE

Planning Assistance to States

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data

Automated Information Systems Support Tri-CADD, Engineer Research and Development Center 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$350,000	\$251,000	\$251,000	\$251,000 3/	\$250,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from 2016 to 2017 was \$52,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

DESCRIPTION: All Corps districts use Computer Automated Design (CAD) and Geospatial Information Systems (GIS) computer systems for Civil Works engineering, design, mapping, planning, and facility management. Many now use Building Information Modeling (BIM) and Civil Information Modeling (CIM) as an engineering and O&M tool. All engineering drafting tables have been replaced with CAD platforms or computer mapping systems and most Corps environmental and natural resource analysis are being performed on GIS platforms. The Tri-Service CAD/GIS Center (Center), located at the Engineer Research and Development Center in Vicksburg MS, develops geospatial data standards on behalf of USACE and the Army. These data standard efforts were coordinated with the American National Standards Institute (ANSI) to develop a National GIS Standard that was approved in November 2001 and includes civil works and homeland defense features. Standards and productivity enhancement tools developed by the Center are used for both in-house and contractor produced drawings, maps and analyses, which ensure that all Corps offices have the ability to exchange their work among themselves and with others, including the private sector. The Center is actively coordinating its A/E/C CAD Standard with the National Institute of Building Sciences' U.S. National CAD Standard, thus reducing the redundancy with the private sector, and reducing cost for both government and the private sector. In 2006, the Center began coordination and developmental support for the U.S. National BIM Standard. The BIM standard addresses the latest building information model technology within the US building and construction industry. The Center ensures that the Corps obtains the maximum return on its investment in BIM, CIM, CAD, and GIS by coordinating development efforts and distributing products to Corps offices. The BIM, CIM, CAD, and GIS systems at field offices achieve maximum productivity when they take advantage of the economies of scale offered by sharing the development and use of common data standards, procedures, and applications. This sharing is accelerated through a concerted effort by the Center, working with various field-working groups, to draw from field expertise and dissemination of this knowledge in the form of lessons learned and standards to benefit all Corps users. Comprehensive data standards supported by the Center permit government and industry users to produce equivalent designs, maps, and analysis on a variety of computer systems using commercial off-the-shelf BIM, CAD, and GIS software.

All work accomplished using these funds is limited to support for automated information system improvements.

Annual funding is used to support over 3,000 users of BIM/CIM/CAD/GIS and facility management technologies for Civil Works projects.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Flood and Coastal Storm Damage Reduction

Coastal Field Data Collection, Engineer Research and Development Center 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$2,314,000	\$2,000,000	\$1,000,000	\$1,000,000 2/	\$1,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ Estimated Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2016 to FY 2017 was \$2,800. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

The Coastal Field Data Collection program systematically measures, analyzes, and assembles long-term coastal data that field offices use to accomplish the Corps mission in coastal navigation and storm damage reduction. These are critical, high quality data sets, nationwide or regional in scope, which support multiple projects, but which no single project would have the mandate or funding to collect.

Inaccurate and insufficient observation data results in project design errors for coastal navigation and storm damage reduction. For example, wave data with a 20% error that are used to design a coastal rock structure will yield a 70% error rate in the stone size used to build the structure. Oversized stone makes initial construction costs much higher and undersized stone results in early failure and higher than necessary life cycle repair costs. Similarly, a 5 to 10 degree error in wave direction can result in an error, or even reversal, in predicted sediment transport, compromising the success of a regional sediment management strategy. Cost effective mission accomplishment in the coastal zone requires accurate and complete data. Long-term data are required to determine climatic changes that may impact Corps projects. Lack of available high-quality observation data was highlighted as a critical issue by the Coastal Working Group of the Hydraulics, Hydrology and Coastal community of Practice in a Corps-wide survey on data requirements in 2009 and reinforced in 2012.

Critical to measuring, analyzing and providing useful coastal data products for Corps districts is the collection of long-term, high-resolution data for improving project design and performance. The Field Research Facility (FRF) in Duck, North Carolina (<http://frf.usace.army.mil>), is a real-world coastal facility that collects a comprehensive suite of wave, current, meteorological, bathymetric, and topographic data, typically required, but often unavailable at a Corps project site. The facility is used to: evaluate oceanographic measurement techniques and equipment, collect high-resolution data during storms, and collect spatially and temporally-intensive long-term measurements required to better understand complex coastal processes and coastal climate. Collected data are made available online in real time to engineers and scientists in the Corps, other agencies (NOAA, NSF, Navy, USCG, USGS, etc.), universities, and the private sector. They are used for coastal research and for developing coastal engineering tools that predict wave environments and sediment movement affecting coastal projects, navigation safety, and dredging quantities. In addition, the facility serves as a testbed for evaluating and developing coastal numerical models (many models exist, but few have been rigorously evaluated). As a unique coastal observatory, the FRF is a significant Corps contribution to the Integrated Ocean Observing System (IOOS) as authorized in the Integrated Coastal and Ocean Observation System Act of 2009 (PL No. 111-11).

Recent activities at the FRF include the development and deployment of state-of-the-art lidar and radar systems for monitoring beach and nearshore changes in real-time including during storms; allowing highly accurate, temporally detailed observations. CLARIS, the Coastal Lidar and Radar Imaging System, is a mobile

Engineer Research and Development Center

Coastal Field Data Collection

system for rapidly mapping the beach, both alongshore and offshore. RIOS, the Radar Inlet Observation System, is a radar-based system for remotely mapping evolving inlet shoals in real-time for navigation safety and dredging activities. A permanently mounted Terrestrial Lidar system, which continuously maps the beach and breaking waves, captured the first ever hour by hour record of wave run-up and beach changes during Hurricane Irene as it passed Duck, NC in 2011.

Annual funding is being used to:

- Continue the long-term coastal ocean data collection program and support the data requirements of the real-time model test bed. These wave observation systems provide data to advance coastal wave modeling technology and coastal inundation predictions.
- Continue the long-term coastal morphology survey program. These observations provide insight to erosion, inundation, and dune resilience, and inform development of sediment transport, shoreline change, and beach morphology models.
- Continue the collection of estuarine data (waves, water levels, winds, etc.) that is critical to understanding sediment transport processes in estuarine environments and applies to research on Corps activities including: re-suspension due to dredging, dredge material placement, and ecosystem restoration.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Aquatic Ecosystem Restoration

Environmental Data Studies, Institute for Water Resources 1/

Allocation in FY2014	Allocation in FY2015	Allocation in FY016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$190,000	\$99,000	\$98,000	\$0 2/	\$80,000

1/ There are no non-Federal costs.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$42,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2036, Water Resources Development Act (WRDA) 2007 (P.L. 110-114)

DESCRIPTION: The Environmental Data Studies program includes general national or regional environmental data collection and support of field offices in the use of innovative information system technology, including geographic information systems to demonstrate the relationship between project-funded environmental activities with national or regional environmental issues. Environmental data includes biological, physical, and/or cultural resource components. The access to data systems that house information is both intra agency and interagency, involving all concerned Federal agencies, notably the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, U.S. Geological Survey, U.S. Forest Service, Natural Resources Conservation Service, Environmental Protection Agency, as well as State fish and wildlife and natural resource agencies, and non-governmental organizations like NatureServe. Coordination with other USACE data systems are also used to promote informed decision-making. The aim is to reduce costs, avoid duplication, improve procedures for complying with environmental statutes, and aid in addressing environmental issues of national and/or regional significance.

Annual funding is used to:

- improve the efficiency with which District staff assemble and analyze environmental information for Civil Works projects;
- develop new or updated linkages to ensure access to current data sources; and
- maintain and support the access and sharing of environmental information for national and regional inventories and assessments and train field personnel in its access and use.

Examples of prior year accomplishments include updated land cover maps and projected land cover changes up to 2050 and identification of wildlife corridors that align with waterways that improve evaluations of ecosystem restoration proposals; training and support to Districts on environmental data; development of the Civil Works Mitigation and Endangered Species Act (ESA) Compliance database; programming to link the environmental data system with the integrated Budget Evaluation Tool, and CorpsMap; and NatureServe data subscription renewal.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Flood and Coastal Storm Damage Reduction

Flood Damage Data, Institute for Water Resources 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$220,000	\$335,000	\$300,000	\$220,000 2/	\$230,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$10,000, including \$4,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 904, Water Resources Development Act (WRDA) 1986 (P.L. 99-662); Section 308, WRDA 1990 (P.L. 101-640)

DESCRIPTION: The Flood Damage Data Program is required to facilitate the collection and maintenance of basic flood damage data to support Corps field offices in accomplishment of flood damage reduction studies. The major purpose of the program is to improve the technical quality and accuracy of flood damage data, to improve the understanding of the interrelationships of the characteristics of flooding on property damage, and to improve the formulation of flood damage reduction projects. Planning and evaluation of flood damage reduction projects requires knowledge of actual damages caused to various types of properties. The relationships between flood depth, flood duration and velocity, value and type of property, and the amount of damage are essential to making accurate and supportable estimates of the value of projects. The distributions of damages resulting from the various factors involved are needed for the risk analysis framework adopted for water resource studies. Damage data are obtained in rare instances when a damaging event occurs and funded studies are underway. However, in most instances when flooding occurs there are no current studies in the area or other funding mechanism to collect the requisite data to be used in future analysis or to report and accurately record the damages incurred and account for the effect of the factors that caused the damages. Previously no centralized flood damage data source existed which retrieved basic data for research efforts and for specific project studies.

The activities of the program are to:

- (1) Conduct actual flood damage surveys following flood events for riverine and coastal events;
- (2) Develop, maintain, and improve the economic database for flood damage reduction projects;
- (3) Calculate flood depth-damage functions for riverine and coastal flooding based on actual damage data;
- (4) Collect data and derive damage relationships for roads, public building and facilities, and other public costs of flooding;
- (5) Develop and maintain a floodplain inventory application that would be used to apply flood damage estimation models to feasibility, reconnaissance, and continuing authority studies; and
- (6) Provide information to communities for hazard mitigation plans and grant applications.

Annual funding is used to update and maintain data collection survey forms and data collection techniques, to collect post-flood damage data, to employ the flood damage database to estimate National models where regional or local flood characteristics can be specified to estimate flood damage relationships, to update and

Division: Institute for Water Resources

Flood Damage Data Program

maintain a geospatial computer application for floodplain inventory data, and to certify a model for estimating residential and nonresidential structure values. Funds would also be used to facilitate collaboration in collecting and sharing of flood damage data within the Corps and between other agencies and to refine functions for estimating cleanup and relocation costs associated with flooding. Finally, funds are used to develop and refine depth-damage curves for coastal areas, for which the Corps has limited information, and for which effects (wave attack, erosion, storm surge, saline water) are markedly different from riverine flooding.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Flood and Coastal Storm Damage Reduction

Flood Plain Management Services 1/

	Allocation In FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017 2/	Budgeted Amount for FY 2018
Total	\$14,037,153	\$8,002,000	\$10,500,000	\$15,000,000	\$15,300,000	\$15,000,000
Non-Structural Alternatives	\$ 1,309,046	\$1,423,754	\$1,500,000	\$4,000,000	\$7,000,000	\$7,000,000
SAGE	\$ 1,000,000	\$ 930,233	\$1,000,000	\$2,000,000	\$1,000,000	\$ 400,000
National Hurricane Program	\$ 500,000	\$ 500,000	\$ 500,000	\$ 500,000	\$ 800,000	\$ 800,000
Nonstructural Flood Prfng Cmte.	\$ 275,992	\$ 187,000	\$ 420,000	\$ 420,000	\$ 500,000	\$ 500,000
Other Activities	\$10,452,115	\$4,461,013	\$4,580,000	\$6,080,000	\$6,000,000	\$6,300,000
Silver Jackets 3/	\$ 500,000	\$ 500,000	\$2,500,000	\$2,000,000	\$ 0	\$ 0

1/ These activities are funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$5,282,000, including \$3,940,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$400,000.

3/ The Silver Jackets Program for interagency coordination is being funded in the National Flood Risk Management Remaining Item beginning in FY 2017.

AUTHORIZATION: Section 206 of the 1960 Flood Control Act (P.L. 86 645), as amended.

DESCRIPTION: Flood Plain Management Services (FPMS) afford communities access to the expertise of the Corps. The information and guidance resulting from investments funded under this line item supports planning and implementing actions at the State and local levels that reduce flood risk through wise use of flood plains. Non-Structural Alternatives focus on flood risk reduction and protecting life safety, reducing or stemming increases in loss of property and repetitive losses, enhancing resiliency to flood events, and advancing flood risk management policy through use of non-structural measures. Examples of FPMS Non-Structural Alternatives studies are flood risk assessments, emergency planning, education, risk communications tool development, floodplain management planning, flood inundation mapping, and improvements to flood risk modeling and forecasting tools. Systems Approach to Geomorphic Engineers (SAGE) investigates hybrid engineering solutions that integrate ecosystem-based approaches and engineered infrastructure to achieve coastal resiliency on a landscape scale. The National Nonstructural Flood Proofing Committee provides technical expertise on all aspects of nonstructural flood risk reduction adaptive measures, focusing on reducing the consequences of flooding. The National Hurricane Program provides real time support in hurricane situations and delivers crucial input effecting emergency management, services, evacuation and actions to enhance preparedness.

Annual funding enables the Corps to provide technical assistance, information, and guidance to states and local communities in their application of flood plain management measures, optimizing use of our and our interagency partners' resources. It will provide site-specific flood and flood plain data and assistance; assist with efforts to identify flood hazards in communities under growth pressures; facilitate special studies that concentrate on reduction of the risk of future flood damages and life loss, giving increased emphasis to the application of non-structural measures; communicate the existing risk and alternatives to address the risk; and enable pre-disaster evacuation and preparedness studies for states and counties. The program emphasizes leveraging existing intergovernmental State Silver Jacket teams to support State and local flood plain management priorities.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Flood and Coastal Storm Damage Reduction

Hydrologic Studies 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$250,000	\$743,000	\$1,743,000	\$500,000 2/	\$500,000

1/ The activities funded under this remaining item are conducted at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$289,000, including \$204,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 7 of the 1944 Flood Control Act

DESCRIPTION: Major activities to be undertaken in the program generally include the collection of basic hydrologic data and the studies of these data for major storm events or certain special hydrologic processes. The information to be derived from this program will improve hydrologic engineering techniques for the planning, design, construction, and operation of water resources projects. The program consists of four sub items:

- 1) Storm Studies: Funds are used to gather comprehensive rainfall data used to refine the regional hydro-meteorological information throughout the nation. The up-to-date hydro-meteorological information is essential for design of new projects as well as for safety assessment of existing projects. Hydrologic data is used to inform water resources studies. These data are required in the evaluation of flood producing potentials of river basins, and constitute the major portion of the basic data used in probable maximum precipitation determinations.
- 2) General Hydrologic Studies: Funds are used to analyze rainfall runoff relationships, flood frequency, snowmelt studies, hydrograph development and routing at selected watersheds, model calibrations in urban areas, analyses of past floods, methods for the hydraulic analysis of non-gauged streams, and other studies of related hydrologic nature. Also included are planned upgrades to the internal Corps system of accounting for gages used largely both of control of water resources projects and also for studies of major hydrologic events.
- 3) Sedimentation Studies: These funds are used for conducting non-project sedimentation studies, and for the Corps share of the cooperative Interagency Sedimentation Project at the Hydraulics Laboratory, Waterways Experiment Station. The sedimentation studies include: promoting and supporting the standardization and development of equipment, criteria and methodology for the collection, analysis of suspended and bed load sediment characteristics of natural streams; and laboratory studies.
- 4) Stream Flow and Rainfall Data Analysis: Funds are used for installation and operation of hydrometeorology gages of non-project nature that are needed by the Corps in addition to the stations in the cooperative programs conducted by the U.S. Geological Survey and the National Weather Service for the Corps.

HQUSACE

Hydrologic Studies

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Flood and Coastal Storm Damage Reduction

International Water Studies, Multiple Districts 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount FY 2018
\$200,000	\$150,000	\$150,000	\$125,000 2/	\$125,000

1/ All activities are funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$19,000, including \$8,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

Annual funding is used to fund U.S. Army Corps of Engineers participation in and support of boundary water treaties and other international agreements between the United States and Canada. These Boards and Committees hold joint meetings, review report drafts and correspondence, make field inspections, obtain, collect, and analyze hydrologic and hydraulic data, and report their findings to the establishing parties. The degree of study activity varies depending upon the requirements of the Commission or Treaty under which they were established. These efforts assure better control, use, and orderly development of the jointly controlled water resources, and are of importance in attempting to meet water demands resulting from an expanding economy along the United States and Canadian border.

Under the Boundary Waters Treaty of 1909, the International Joint Commission (IJC) was established and empowered to establish local boards, which conduct investigations and assure adherence to orders of approval pertaining to use of boundary waters issued by the Commission. U.S. Corps of Engineers representatives serve on and chair the U.S. Sections of the following IJC Boards: Saint Croix River, Champlain Richelieu, Lake Champlain, St. Lawrence River, Niagara, Lake Superior, Lake of the Woods, Rainy Lake, Souris Red Rivers Engineering, Souris River Control, Kootenay Lake, and Osoyoos Lake. In support of the Saint Croix River Board of Control, the Corps retrieves and analyzes water data to assure compliance with IJC rules and annual inspection of dams and fish passage facilities. The Corps supports the IJC as it executes the reference from the report entitled “The IJC and the 21st Century” regarding investigating the feasibility of establishing a demonstration watershed board and its implementation of the reference on diversion, consumption and transfer of international waters.

The Niagara Treaty of 1950 governs the split of Niagara River Waters between the United States and Canada, and between the uses of the waters. Corps representatives serve on and chair the United States’ Sections of the International Niagara Committee and the International Lake Memphremagog Board. The Corps provides flow data and updates the rating curve used to verify compliance with Niagara Treaty requirements.

Together with Bonneville Power Administration and British Columbia Hydropower, and under the Columbia River Treaty of 1961, the Corps annually develops the Assured Operating Plan and the Detailed Operating Plan for the Columbia River Treaty storage projects. The Corps also supports the work of the Columbia River Treaty Permanent Engineering Board, including publication of its annual report to the Governments, the Columbia River Treaty Entities, and the Columbia River Treaty Operating Committee. The Corps undertakes special studies related to international impacts of evaluation of endangered species compliance related to Columbia River Treaty projects and coordinates operations of Libby Dam under the 2001 Libby Coordination Agreement.

HQUSACE/Multiple Districts

International Water Studies

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Flood and Coastal Storm Damage Reduction

Precipitation Studies 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$225,000	\$225,000	\$225,000	\$200,000 2/	\$200,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$15,000, including \$5,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

The funds provided under this program are used to fund the Corps of Engineers hydrometeorological studies program. The Corps performs analyses of storm rainfall and other meteorological data required to develop hydrologic criteria for use in planning, design and water control management of flood control and water resources development projects, and in floodplain management studies.

The funds provided under this program are used to:

- (1) compile and review the meteorological aspects of storm data;
- (2) conduct precipitation analyses including depth-duration-frequency estimation for regions and the nation;
- (3) estimate probable maximum precipitation (PMP);
- (4) develop meteorological parameters pertaining to hurricanes, northeasters and other wind phenomena; and
- (5) conduct other hydro-meteorological studies as necessary to accomplish the Corps mission.

Other examples of accomplishments under this program include updates to precipitation frequency estimates, maintaining the Precipitation Frequency Data Server (PFDS) web portal, and preparing and delivering the annual report on nationwide flooding and associated assessment of damages.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data

Remote Sensing/Geographic Information System Support Engineer Research and Development Center 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$75,000	\$425,000	\$350,000	\$75,000 3/	\$75,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$9,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Various authorities including Public Law 110-114.

DESCRIPTION: The Remote Sensing/GIS Center (Center) is the U.S. Army Corps of Engineers Center of Expertise for Civil Works Remote Sensing and GIS technologies that provides centralized management and support through technology transfer and applications development for the Civil Works program. Continuing interaction with other researchers and practitioners throughout the Corps, government, the private sector, and academia assures that knowledge of evolving trends that are relevant to Corps activities are available, and that duplication of effort is avoided.

The Center promotes sensors, data collection, analysis, and storage systems, building on commercial software, and integrating these with operational technologies that are then delivered to the USACE divisions, districts, and other agencies' activities. The Center develops approaches for the integration of data from disparate sources to inform comprehensive and collaborative land and water resources management and ensures that the necessary support can be rapidly directed toward solving operational problems that require specialized expertise. The Center provides guidance and technical support throughout the Corps and supports the transfer of technical knowledge to those who are, or soon will be, using these technologies via training conducted in the field through workshops, conferences, and distance learning. The Center also develops white papers; publications, including Engineering Letters, Circulars, and Manuals; etc. to transfer procedures and lessons learned to end users.

Annual funding is used to provide technical support and expertise throughout the Corps of Engineers for Civil Works remote sensing and GIS and continue to expand GIS and remote sensing capabilities to maintain technical leadership for USACE programs.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data

Scientific and Technical Information Centers, Engineer Research and Development Center 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$50,000	\$47,000	\$47,000	\$47,000 3/	\$50,000

1/ There are no non-Federal costs

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$85,000, including \$6,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$ 0.

AUTHORIZATION: Public Law 99-802, Federal Technology Transfer Act of 1986, requires technology transfer from Federal agencies to the private sector.

DESCRIPTION: The function of the five information analysis centers (coastal engineering, cold regions engineering, concrete technology, hydraulic engineering, and soil mechanics) located at the U.S. Army Engineer Research and Development Center (ERDC) is to acquire, examine, evaluate, summarize, and disseminate newly published scientific and technical information generated within the Corps of Engineers and other activities. These centers are a major technology transfer resource between the Corps of Engineers and the public and private sectors, including the scientific and engineering community and academia, for results of over 75 years of research results conducted by the ERDC laboratories in the fields of soil mechanics and foundation engineering, cold regions engineering, concrete technology, hydraulic engineering, and coastal engineering.

Each center, supported by their host laboratories, critically evaluate and summarize the technical validity and merits of published and unpublished research and technical publications on design, construction, or other technology utilization. User communities have been well established and distribution lists for technology transfer are continuously updated. Each center is supported by multi-disciplinary technical staff and has a comprehensive library of published materials. In a typical year, each Center responds to hundreds of information requests on subjects within its purview. These services are free to the users. In addition, services such as literature research, information synthesis, publication location, research reviews, and methodology comparisons on subjects of mutual interest to ERDC laboratories and other interested parties are available on a cost-reimbursable basis.

Annual funding is used to provide technical expertise in the form of copies of reports, arranging to speak with an expert, furnishing generalized technical advice, or giving updates on technical developments; digitize older ERDC research reports of significant technical value and place them on the internet for ready access by the public; and distribute reports, technical notes, computer programs, geographic information systems (GIS) data, abstracts, information bulletins, and other scientific and technical information to the Defense Technical Information Center (DTIC), Corps libraries, depository libraries, and identified user communities to ensure wide circulation and availability. The effectiveness of activities and services is evaluated on a continuing basis, and technology transfer products and methodology are revised when appropriate.

Engineer Research and Development Center

Scientific and Technical Information Centers

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Flood and Coastal Storm Damage Reduction

Stream Gaging, Institute for Water Resources 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY2018
\$550,000	\$550,000	\$1,097,000	\$750,000 2/	\$550,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$103,000, including \$100,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

The Corps makes extensive use of streamflow records in the planning, design, construction, and operation of water resources projects. For the optimum development and management of water resources, it is essential that continuous records of streamflow be maintained at specific sites over a long period of time to provide a reliable measure of water resources available for various uses. The basic network of stream gaging stations operated by the U.S. Geological Survey (USGS) under its normal functions is inadequate to meet all the special needs of the Corps water resource development responsibilities. The Corps established this continuing, cooperative program in March 1928, so that streamflow data would be available to meet special needs concerning the Corps water resources responsibilities. The data collected at these gages is also used by the National Weather Service as the basis for its public flood forecasts. In addition, the data are published on the Internet by the Corps and/or in a regular series of reports by the USGS and provide valuable information for many Federal and state agencies and the public.

Annual funding is used to continue the operation and maintenance of stations of special interest to the Corps that are not directly attributed to a specific Corps project. Funding for stations that are directly associated with a Corps project are budgeted within the cost of the authorized projects and/or studies.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Collection and Study of Basic Data – Navigation

Transportation Systems, Institute for Water Resources 1/

Allocation in FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$1,447,000	\$2,145,000	\$1,559,000	\$1,593,000	\$3,430,000 2/	\$1,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$480,000, including \$427,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 904, Water Resources Development Act (WRDA) 1986 (P.L.99-662); Section 334, WRDA 1992 (P.L.102-580); and Section 230, WRDA 1996 (P.L. 104-303).

DESCRIPTION: The process of planning improvements for waterway and harbor navigation projects necessitates consideration of needs, opportunities, benefits, and economic costs of project improvements in the context of the project-specific areas as well as the overall national transportation system. The Transportation Systems remaining item is used to fund information and technical services and support for navigation projects including viable and practical analytical techniques, sources of information, tools and methods including the development of deep draft and shallow draft vessel operating cost data; provision of timely information regarding the global deep draft vessel fleet; preparation of commodity and cargo flow forecasts; and the publication of reports documenting the results of research and program-wide investigations associated with the Transportation System Analysis Program. The goals for the use of these funds include: (1) improve the technical quality, accuracy and consistency of navigation planning studies and procedures; (2) improve the strategic planning and management of navigation improvements; and (3) reduce the costs of individual navigation studies through shared data, methodologies, and analytical applications.

Fiscal Year 2017 funds are being used to update and distribute shallow and deep-draft vessel operating costs guidance; begin to develop methodologies for preparing a national inland waterway traffic demand forecast; purchase trade subscriptions and forecasts; conduct industry and commodity profiles which will ultimately be used in a national inland waterways traffic demand forecast; update and improve the data and methods used to estimate shipper response to price changes on the inland waterways; complete HarborSym refinements as well as other Deep Draft Navigation Planning Center of Expertise products; update computer models related to global grain movements; purchase data to track vessel movements in ports throughout the world, provide enhancements to the vessel emissions model; undertake an incidents of port benefits evaluation; and make improvements to the Regional Economic System model.

Fiscal Year 2018 funds will be used to update shallow and deep-draft vessel operating costs; to continue certifying several navigation models; complete a draft national inland waterway traffic forecast, and to purchase trade and shipping subscriptions used for navigation feasibility studies. In addition, funds will be used to update and improve the data and methods used to estimate shipper response to cost changes on the inland waterways as well as to update computer models and analyses related to the impacts of the Panama Canal's expansion.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Research and Development – Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation 1/

Engineer Research and Development Center

Allocation in FY 2012	Allocation in FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$18,025,000	\$26,760,000	\$24,183,000	\$22,489,000	\$27,711,000	\$22,000,000 2/	\$16,145,000

1/ The activities under this line item are funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$4,385,000, including \$3,963,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 10 U.S.C. 2358 ("The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development.")

DESCRIPTION: The Corps must pursue an aggressive R&D effort to take advantage of rapidly developing technologies and techniques that will promote significant monetary savings and greater reliability, safety, enhanced efficiency, and environmental sustainability in planning, design, construction, operations and maintenance of civil works activities.

The Civil Works R&D program is formulated to directly support the established Business Lines of the Civil Works Program including: flood and coastal storm damage reduction, inland and coastal navigation, environment (including natural resources, compliance, mitigation, restoration, and stewardship), water supply, hydropower, recreation, emergency management, and regulatory. The Civil Works R&D needs and requirements are identified based on the USACE Campaign Plan, Civil Works Program Strategic Plan, Corps SES and General Officer Steering Committee, division and district input, and the existing WRDA authorities. Corps R&D also must address the challenges facing the Corps' portfolio of water resources infrastructure; aging structures, changing demands, changing environmental conditions, and constrained budgets. Corps R&D examines new ideas, develops approaches, techniques, and technology to solve problems, and transfers field-ready products. The Fiscal Year 2017 funds will be focused on the very highest priority R&D needs. Additional high priority requirements identified above the base program by practicing District and Division technical experts and by HQUSACE proponents are incorporated into the program as funding becomes available. The FY 2017 program would continue efforts started in FY 2016 that will lead to better management of water resources projects, promote public safety, reduce risk, improve operational efficiencies, sustain the environment, and position our water resource systems to be managed as systems and to be adaptable due to the implications of climate change. The Program continues a focused science and technology effort to address needs for resilient water resources infrastructure.

Results of the Corps' GI R&D are directly incorporated into practice within the Civil Works Program through revisions or additions to Engineer Regulations, Engineer Manuals, Technical Guidance Manuals, Engineer Technical Letters, or Guide Specifications. Numerous other means of technology transfer are also used such as training courses, workshops, demonstrations, technology availability in commercial tools and services, and other professional contacts. The Corps Civil Works R&D Program provides essential Product Lines with field ready end products and a high return on investment for the Corps, other Federal agencies and the Nation.

Engineer Research and Development Center

Research and Development

COORDINATION: The Corps conducts Civil Works R&D through the U.S. Army Engineer Research and Development Center (ERDC) and the Institute for Water Resources (IWR). The ERDC consists of seven research laboratories:

Coastal and Hydraulics Laboratory, Vicksburg, MS
Cold Regions Research and Engineering Laboratory,
Hanover, NH Construction Engineering Research
Laboratory, Champaign, IL Environmental Laboratory,
Vicksburg, MS
Geospatial Research Laboratory, Alexandria, VA
Geotechnical & Structures Laboratory, Vicksburg,
MS Information Technology Laboratory,
Vicksburg, MS

The IWR is located in Alexandria, VA, and its Hydrologic Engineering Center (HEC) in Davis, CA. Policy guidance and executive oversight are provided by the Civil Works R&D Steering Committee co-chaired by the Director of Research and Development and the Deputy Director of Civil Works and comprised of CW division chiefs. The Director of Research and Development is responsible for developing the annual program. The Directors of ERDC and IWR are responsible for execution of the CW R&D program.

In order to most effectively use the limited R&D resources and to avoid unnecessary duplication of research effort, the Civil Works R&D Program maintains external technical exchange and technology transfer efforts with other Federal and major water resource agencies including the TVA, Bonneville Power Administration, Western Area Power Administration, EPA, NSF, Department of Agriculture (NRCS), Park Service, NOAA, DOI (USBR, Forest Service, FWS, USGS, DHS (USCG, FEMA, US Border Patrol), DOT (FHWA, FAA, MARAD), NASA, International Boundary Water Commission, International Joint Commission, DOE (NRC, FERC), the Navy, and state and local governments.

Corps researchers also maintain contact with the research activities of universities and industry through regular membership in such organizations as the American Society of Civil Engineers, the Civil Engineering Research Foundation, the American Concrete Institute, the American Society of Testing and Materials, the International Conference on Coastal Engineering, the American Association of Port Authorities, the American Society for Photogrammetry and Remote Sensing, Society of Environmental Toxicology and Chemistry, the Coastal Society, the Offshore Technology Conference, International Society of Soil Mechanics and Foundation Engineering, U.S. Society of Dams, and International Committees on Large Dams, the International Association for Hydraulic Research, the Association of American Geographers, Western Dredging Association and the International Navigation Association. The Corps also participates extensively with the Transportation Research Board, the Water Science and Technology Board, and the National Research Council in coordinating and leveraging research activities.

The proposed FY 2018 R&D Program directly supports the Civil Works Business Lines, their mission requirements, and established performance objectives at project, watershed, or river basin scales. The technical foundation of the R&D program includes:

- a. Navigation (including Hydropower)
- b. Flood and Coastal Storm Damage Reduction (including Emergency Management, Water Supply, and Recreation)
- c. Environmental (including Regulatory)

Engineer Research and Development Center

Research and Development

Navigation (including Hydropower)

The Corps provides inland and coastal navigation critical to the national economy and defense. Navigation research delivers environmentally sustainable products that improve efficiency, reliability, and capacity of this complex, aging transportation/power network. The research framework integrates infrastructure engineering, power physics, economics, innovative construction, coastal and riverine hydrodynamics and processes, monitoring and sensing technologies, operations research, environmental solutions, and emerging technologies to create effective solutions in concert with the multiple demands, requirements, and constraints of real world commodity transport and power production problems. Research efforts target navigation channels, locks, jetties, breakwaters, harbors, dams and power plants to optimize among life-cycle and reliability trade-offs, assure defensible economic assessment, and provide better investment decision tools for predicting performance and deterioration with time, and for scheduling and prioritizing maintenance and repairs balanced with the consequences of delays. Essential to this effort is the development of tools for determining the condition of infrastructure components to make risk-based prioritizations for funding. R&D efforts for development of condition index products include: Developing a standardized method and associated computer program for life-cycle engineering analysis of coastal rubble mound breakwaters, Improved Condition Indexing for Coastal Structures, Monitoring of Concrete Navigation Structures, Inspection and Condition Assessment of Steel Hydraulic Structures, and Condition Monitoring and Predictive Maintenance for Infrastructure. Significant investment is also being directed toward developing improved navigation economic technologies that can be used to support better-informed decision analyses and management of the United States inland and deep-draft navigation system.

Flood and Coastal Storm Damage Reduction (including Emergency Management, Water Supply, and Recreation)

Corps projects across the Nation prevent flooding and storm damage. In the daily and seasonal operation of hundreds of Corps projects, national requirements for water supply and opportunities for recreation and environmental stewardship are also balanced. The Nation expects the Corps to guarantee that its existing projects maximize efficiency and effectiveness, and that new projects incorporate the most advanced knowledge and capabilities in planning, design, construction, operation, and maintenance. Through R&D, the Corps develops technology that optimizes daily operations of water resources projects to meet multiple objectives, including water supply and environmental stewardship. The Corps' R&D creates new solutions to challenging infrastructure engineering problems in building, maintaining, upgrading, and operating the Nation's water resources infrastructure such as dams, locks, spillways, channels and levees. Through R&D, the Corps provides guidance and tools to understand the natural setting of water resource projects, to incorporate environmental & economic objectives, to manage flood risk, to assess alternative solutions, and to make optimal decisions. The technological requirements of emergency management are addressed to make possible the most rigorous planning and preparedness and the most efficient and effective response and recovery.

Environmental (including Restoration, Regulatory and Stewardship)

The Corps has ecosystem restoration and environmental stewardship and management responsibilities on more than 11 million acres of land and water resources. Due to the enormous scope of this mission, it is imperative that Corps field personnel can apply the latest technologies for ecosystem restoration and natural resource inventory. The scale of these activities ranges from large projects such as the Florida Everglades down to much smaller, local wetlands/stream restoration projects. The broad scope of these environmental activities (as well as the frequent changes to the legislative mandates that govern them) demands sound research and development to address these critical needs. The goal of this R&D is to provide cost-effective/innovative technologies for project planning, design, engineering/construction, and operation/maintenance. Product lines include Ecosystem Restoration, Ecosystem Functional Assessment (with an emphasis on Environmental Assessment and Evaluation), Environmental Stewardship, and Management. Products include concise, how-to guidance documents that provide rapid/low-cost technologies and methods for high priority field needs as well as sophisticated ecological process assessment models that are critical to the success of the Corps' Ecosystem Restoration business line.

PROJECTED CIVIL WORKS R&D FUNDING ALLOCATIONS (FY 2018)

<u>BY RESEARCH AREA</u>	<u>FY 2018 ALLOCATION</u>
a. Navigation (including Hydropower)	\$ 6,330,000
b. Flood and Coastal Storm Damage Reduction (including Emergency Management, Water Supply, and Recreation)	\$ 5,508,000
c. Environmental (including Regulatory)	\$ 4,307,000
	\$ 16,145,000

a. Commercial Navigation

Allocation in FY 2012	Allocation in FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$7,991,000	\$12,426,000	\$12,586,000	\$10,708,000	\$12,511,000	\$8,580,000 2/	\$6,330,000

The Corps' commercial navigation mission facilitates navigation through investments in waterborne transportation systems (channels, harbors, and waterways) that are cost-effective and environmentally sustainable. On the inland waterways, for example, Research and Development (R&D) can help reduce the costs associated with delays due to closures for both scheduled and unscheduled repairs, as well as reduce the risk of catastrophic failure of a major infrastructure component.

This R&D area provides advanced and innovative tools and technology for the Corps to improve navigation functional performance, reduces unit costs, and improves safety. The Corps is expected to apply robust, reliable, and comprehensive capabilities to assess all impacts of alternative plans for projects and to select the most balanced and sustainable solutions. R&D delivers efficient and effective capabilities to plan, design, construct, operate, maintain, and upgrade transportation projects in inland and coastal locations and in all climates, from warm to ice-affected. Capabilities to improve system reliability are needed in an asset management framework to extend project life and reduce life cycle costs. Engineering and environmental aspects are integrated in the development of processes and design models, decision support software, infrastructure condition assessment techniques, risk frameworks, infrastructure and design guidance, and innovative monitoring, operation and maintenance technologies.

Fiscal Year 2017 funds are being used to:

Keep Inland Waterways Locks Reliable and Resilient R&D efforts to determine the condition, extend the life, and enable rapid repair of infrastructure.

- Initiate efforts to improve debris management systems used at locks and update associated guidance documents.
- Initiate efforts to verify and validate methods to determine load carried by grout-protected post-tensioned anchor rods.
- Initiate efforts to identify or develop a coating system that performs as well as the vinyl paint system used on many water resource infrastructure assets.

- Continue effort to develop state-of-the-art Load and Resistance Factor Design methods and guidance for reinforced concrete hydraulic structures and their foundations under static loading.
- Continue efforts to develop methods and techniques to predict the life cycle of hydraulic structures to better inform asset management investments.
- Continue prototype testing of alternative hydraulic structure component design(s) that offer greater durability and longer lifespan than traditional designs.
- Integrate and demonstrate non-traditional sensing technologies for structural health monitoring and providing real-time decision support information.
- Deliver an unmanned capability to autonomously collect in confined spaces data depicting infrastructure condition.

Keep the Coastal Navigation Structures and Systems Reliable and Resilient R&D efforts to determine the condition, extend the life, and enable rapid repair of aging and storm-impacted infrastructure.

- Deliver improved tools to quantify ship wake effects on adjacent shorelines.
- Verify and validate numeric modeling tools for providing coastal structure design performance analysis.

Connect Navigation Data with Data from Other Agencies Develop a navigation data integration framework that sustains data lifecycle use and management of the range of data used for project operation and maintenance decision support capabilities and tools

- Develop informational architecture, methodologies and tools for receiving and analyzing navigation data to generate optimized decision support information for navigation channel maintenance planning.

Design an Efficient Network of Ports Create a new paradigm comprised of major ports, feeder ports, and regional intermodal freight movement. Develop a risk-based capability that incorporates coastal hazards and supply chain dynamics to predict regional scale navigation channel shoaling, navigation structure condition, dredging, and project maintenance requirements.

- Continue efforts to improve feasibility level analysis of channel design options by streamlining ship simulator processes.
- Continue efforts to extend accessibility of tools used for channel design and evaluation to provide greater support to and efficiency of the USACE Districts.

Fiscal Year 2018 funds will be used to:

Keep the Inland Waterways Locks Reliable and Resilient R&D efforts to determine the condition, extend the life, and enable rapid repair of infrastructure.

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- Integrate and demonstrate non-traditional sensing technologies for structural health monitoring and providing real-time decision support information.
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- Provide an improved feasibility level analysis of channel design options by streamlining ship simulator processes.
- Continue efforts to extend accessibility of tools used for channel design and evaluation to provide greater support to and efficiency of the USACE Districts.

b. Flood and Coastal Systems

Allocation in FY2012	Allocation in FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation for FY 2017	Budgeted Amount for FY 2018
\$5,631,000	\$9,034,000	\$6,815,000	\$6,712,000	\$9,800,000	\$7,480,000 2/	\$5,508,000

Under its Flood and Coastal Storm Damage Reduction mission, the Corps of Engineers operates over 400 major lakes and reservoirs, maintains 8,500 miles of levees, and has periodically re-nourishes numerous beaches along the Nation’s coasts. Flooding in the United States now costs, on average, about \$4 billion annually. Despite a large investment by the Corps and others in flood and coastal storm damage reduction infrastructure through the Nation, annual damages in inland and coastal flood plains continue to rise – among other reasons, due to changes in land use and urban development.

The Corps manages many of its existing water resources projects around the country to reduce the risk of flood damage, but also seeks to balance this objective in many cases with other purposes including hydropower, navigation, water supply, environmental stewardship, and recreation. As enabling technologies are developed, the Corps upgrades and improves many of its water resource projects, uses the most advanced capability to assess the risk of alternative operational scenarios, and applies robust, reliable, and comprehensive capabilities to assess the economic and environmental effects of alternative plans for projects and to select the most balanced and sustainable solutions. R&D delivers efficient and effective capabilities to plan, design, construct, operate, maintain, and improve water resource projects in all climates and settings, from warm to ice-affected, and from inland to coastal.

Capabilities that prevent loss of life, minimize property damage, and reduce the life-cycle costs of projects are supported through research and development. These capabilities include advanced processes and design models, economic models and decision support software, infrastructure condition and risk assessment tools, infrastructure design guidance, innovative operation and maintenance technologies, flood-alert instrumentation and expedient emergency response capabilities, and the capability to take advantage of new real-time data sources (e.g. precipitation radar) to accurately forecast real-time flow and stages.

This R&D component provides advancements in hydrologic and hydraulic simulation, water resources project optimization, tools for effective alternative analyses for solutions, infrastructure safety, structural design and performance, assessment of the risk and uncertainty associated with project designs, and assessment of non-

structural, natural, and nature-based features to reduce flood risk. This R&D component also improves the technology available to emergency managers for emergency planning, preparedness, response, recovery, and assessment.

Fiscal Year 2017 funds are being used to:

Emergency Management and Critical Infrastructure R&D efforts to enhance national interoperable systems for use in emergency operations during floods and coastal storms

- Continue efforts in data acquisition, analysis, and reporting capability for improved early warning and response
- Continue development of tools to aid USACE National Response Plan missions and contingency operations.
- Development of rapid pre-storm coastal survey capability for improved storm impact and recovery assessments.

Coastal Systems R&D efforts to support the Corps and stakeholder roles in sustainable coastal management

- Further research into critical physical, social, and ecological processes unique to coastal and estuarine systems, including impacts due to relative sea level rise.
- Continue improvement of prediction of coastal storm physical processes and effects on coastal systems, including tools for risk assessment and reduction and design parameter characterization.
- Continue development of tools to mitigate the effects of storm surge and waves using natural ecosystem processes and nature-based features.

Optimize Alternatives Analysis and Assess Project Risk and Uncertainty R&D efforts to develop water resources project collaborative planning, risk assessment technologies, and decision support tools.

- Continue development of decision support frameworks to evaluate alternatives with regard to system response to loadings, failure, and consequences (economic, social, and environmental).
- Develop tools for efficient model optimization, calibration, and incorporation of risk estimation.
- Develop methodologies for efficient updating of damage functions and life-loss computation capabilities for use in flood risk management and coastal storm damage assessments.

Hydraulics, Hydrology and Integrated Water Resource Management Tools R&D efforts to develop and enhance H&H tools in support of project planning, design and risk assessment

- Research on methods for physics-based estimation of probable maximum floods, drought recurrence intervals, and impacts due to climate change.
- Continue development of models for integrated hydraulic, hydrologic, estuarine, sedimentation, water quality, and ecologic processes.
- Continue improvement of tools for multi-purpose project planning and implementation.

Water Resources Infrastructure R&D efforts to determine the condition, extend the life, and enable probabilistic analysis of aging infrastructure.

- Develop methods to analyze and quantify risks and probabilities associated with defects and failure mechanisms that could lead to catastrophic failure.
- Investigate methodologies for load and resistance factor design in flood and retaining structures.
- Continue efforts to improve physics-based analysis of internal erosion, breach formulation and transient seepage analysis to extend the useful life, resilience and sustainability of earthen structures.

Fiscal Year 2018 funds will be used to:

Emergency Management and Critical Infrastructure R&D efforts to enhance national interoperable systems for use in emergency operations during floods and coastal storms

- Continue efforts in data acquisition, analysis, and reporting capability for improved early warning and response
- Continue development of tools to aid USACE National Response Plan missions and contingency operations.
- Development and deployment of rapid pre-storm coastal survey capability for improved storm impact and recovery assessments.

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- Continue improvement of prediction of coastal storm physical processes and effects on coastal systems, including tools for risk assessment and reduction and design parameter characterization.
- Continue development of tools to mitigate the effects of storm surge and waves using natural ecosystem processes and nature-based features.

Optimize Alternatives Analysis and Assess Project Risk and Uncertainty R&D efforts to develop water resources project collaborative planning, risk assessment technologies, and decision support tools.

- Continue development of decision support frameworks to evaluate alternatives regarding system response to loadings, failure, and consequences (economic, social, and environmental).
- Develop tools to improve risk assessment methods and modeling to identify areas of highest consequences, including impacts to populations, socio-cultural assets, economies, critical infrastructure and ecosystems.
- Development of methodologies for efficient updating of damage functions and life-loss computation capabilities for use in flood risk management and coastal storm damage assessments.

Hydraulics, Hydrology and Integrated Water Resource Management Tools R&D efforts to develop and enhance H&H tools in support of project planning, design and risk assessment

- Conduct research on methods for physics-based estimation of probable maximum floods, drought recurrence intervals, and impacts due to climate change.
- Conduct research to understand the interrelationship of hydrologic, hydrodynamic, water quality and sediment processes within large scale systems.
- Develop modeling tools and procedures to rapidly and/or more easily conduct robust analyses of multiple planning alternatives and operational scenarios for flood reduction systems.

Water Resources Infrastructure R&D efforts to determine the condition, extend the life, and enable probabilistic analysis of aging infrastructure.

- Develop methods to analyze and quantify risks and probabilities associated with defects and failure mechanisms that could lead to catastrophic failure.
- Develop tools for load and resistance factor design in flood and retaining structures.
- Conduct research to improve physics-based analysis of internal erosion, breach formulation and transient seepage analysis to extend the useful life, resilience and sustainability of earthen structures.

c. Environmental

Allocation in FY 2012	Allocation in FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted amount in FY 2018
\$4,403,000	\$5,300,000	\$4,782,000	\$5,069,000	\$5,400,000	\$5,940,000 2/	\$4,307,000

Since the Water Resources Development Act of 1986, there have been dramatic increases in authorized ecosystem restoration studies, projects, and programs. At the same time, the Corps has continued to operate and maintain 25,000 miles of inland and coastal navigation waterways, 5,500,000 surface acres of reservoirs, 237 navigation locks, over 1300 ports and harbors, 75 hydropower projects, 879 flood control projects, and thousands of acres of adjacent lands as part of its water resource mission. Wide-ranging environmental compliance, management, and restoration efforts have become crucial parts of the Corps water resource management mission. The Corps must consider environmental issues related to the operation and maintenance of its existing water resources projects as well as the restoration of degraded ecosystems; e.g., Chesapeake Bay, Everglades, Gulf Coast, Bay Delta, Great Lakes, Puget Sound, Columbia River, Missouri River, Upper Mississippi River and Hudson-Raritan Estuary. In addition, the Corps must proactively address potential negative environmental impacts resulting from proposed activities. This research area addresses the Corps' highest priority environmental issues through the development and application of state-of-science, cost-effective, time-saving technologies including: 1) Maximizing value of ecosystem restoration projects; 2) Restoring Ecological Integrity and Sustainability; 3) Urban Stream Restoration and Management; 4) Coastal Ecosystem Restoration; and 5) Threatened and Endangered Invasive Species Impacts on Ecosystem Restoration Projects. These user-oriented products will provide scientifically defensible and field validated solutions to the Corps' highest priority environmental problems. They will also reduce unnecessary regulatory burdens, provide environmental benefits, and maintain a high return on taxpayer investment.

Quantifying the environmental benefits and ecological outputs of proposed Corps ecosystem restoration projects is essential for decision makers to be able to select those projects that will yield the highest social, economic, and environmental services. The scientific community has criticized current state-of-the-science assessment approaches regarding the underlying model assumptions, oversimplified relations, excessive data requirements, complexities in integrating impacts, and the lack of meaningful metrics to permit biologically-effective decisions. Moreover, current assessments are static and frequently insensitive to important system dynamics, not applicable across multiple scales, and incapable of predicting future conditions. Corps decision makers need robust assessment tools that: incorporate modern ecosystem principles that are easy to apply, offer significant user flexibility to meet individual project requirements, and that provide quantifiable output relevant to the Corps' Performance Measures. These tools will be provided in brief user-focused technical guidance documents, web-based decision support systems, webinars (interactive web presentations between R&D Scientists and Engineers and Corps Practitioners), classroom and internet based training, and product technical support, as required. Additional high priority research and investments in developing Ecosystem Planning Models will be conducted as funding becomes available.

Fiscal Year 2017 funds are being used to:

Maximize Value of the Corps' Aquatic Ecosystem Restoration Program to the Nation

- Develop a user's guide for Ecosystem Goods and Services tools in a geographic information system (GIS) based web environment
- Develop guidance for watershed level approach to evaluating cumulative effects of individual ecosystem restoration projects.
- Release of beta version of 2D nutrient transport and vegetation interaction module for HEC-RAS.
- Completion and public release of HEC-EFM 4.0 and HEC-GeoEFM 2.0, including all required user guidance, demonstration projects, website content, and release notes.
- Development of preliminary model selection guidance targeting both technical and non-technical users, and beta-version of consolidated modeling library

Engineer Research and Development Center

Research and Development

Ensure Ecological Integrity and Sustainability of Aquatic Ecosystem Restoration Projects

- Development of a beta release 1D temperature modeling capability in ResSim, as precursor to operational policy changes in which water quality informs reservoir operations/releases.
- Draft approaches for integrating variability and ecosystem response into ecosystem restoration modeling.
- Certification of integrated HEC-RAS riparian vegetation simulation model to support riverine ecosystem management and restoration.
- Assess current modeling practice and needs; develop a beta-version of a habitat benefits calculator for Corps Planning Model Integration.
- Preliminary scoping of watershed assessment tool needs
- Watershed cumulative benefits studies documenting watershed scale benefits of ecosystem restoration and inform development of preliminary benefits assessment tools.

Enhance Resilience and Reliability of Coastal Ecosystem Restoration

- Release a certified and demonstrated model for assessing vulnerability of barrier islands, screening sites and restoration approaches, and developing adaptive management plans for sustainability.
- Synthesis of data from multiple field demonstration projects; development of a preliminary framework for best practices in coastal marsh restoration to offset sea level rise.

Impact and Relationship of Species (Threatened, Endangered, and Invasive) on Ecosystem Restoration

- Development of fish movement algorithms supporting modeling to estimate fish passage benefits,
- Preliminary guidelines for monitoring and invasive plant control strategies.

Fiscal Year 2018 funds will be used to:

Maximize Value of the Corps' Aquatic Ecosystem Restoration Program to the Nation

- Release of integrated HEC-RAS 2D aquatic nutrient simulation modules (NSM) and riparian vegetation interaction modules (RVSM) for improved management of riverine ecosystems.
- Improved capabilities for assessing ecosystem responses spatially, including enhancing the ability of ecological restoration and management teams to consider seasonal habitat sequences and animations of ecosystem dynamics.
- Final model selection guidance and consolidated modeling library
- Expanding water quality modeling capabilities to inform reservoir operations for multiple objectives

Ensure Ecological Integrity and Sustainability of Aquatic Ecosystem Restoration Projects

- Provide a final model calculator platform for Corps Planning Model integration
- Release of fully functional 1D ResSim temperature modeling capability, as precursor to water quality informing reservoir operations/releases.
- Tools to assess benefits of watershed-scale stream stabilization on navigation, flood risk management and ecosystem restoration.
- Techniques for monitoring and modeling variability of hydrological processes, ecosystem process rates and demographic/population level outcomes in ecosystem restoration.

- Final guidance - watershed assessment tools

Enhance Resilience and Reliability of Coastal Ecosystem Restoration

- Development of a technical framework for best practices in coastal marsh restoration in the face of sea level rise

Impact and Relationship of Species (Threatened, Endangered, and Invasive) on Ecosystem Restoration

- Development of computational fluid dynamics (CFD)/Bayesian network model for evaluation of fish passage through dams.
- Field monitoring and adaptive management guidelines for control of invasive species in ecosystem restoration projects.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Other, Miscellaneous – Navigation

Disposition of Completed Projects, Multiple Districts 1/

	Total Estimated Federal Cost	Allocation in FY 2016 2/	Allocation in FY 2017 3/ 4/	Budgeted Amount for FY 2018 4/	Balance to Complete After FY 2018
Programmatic Management	\$80,000	\$50,000	\$30,000	\$0	\$0
West Pearl River Navigation Project, MS & LA	\$727,000	\$350,000	\$377,000		\$0
Kentucky River Locks and Dams, 1-4, KY	\$400,000	\$116,000	\$284,000	\$0	\$0
Willamette Falls Locks, OR	\$500,000	\$ 60,000	\$420,000	\$0	\$0
Allegheny River Locks 5-9, PA	\$450,000	\$100,000	\$350,000	\$0	\$0
Upper Monongahela River, PA	\$450,000	\$100,000	\$350,000	\$0	\$0
St. Anthony Falls, Mississippi River, MN	\$1,250,000	\$0	\$0	\$350,000	\$850,000
Salinas Reservoir (Santa Margarita Lake), CA	\$1,250,000	\$0	\$0	\$350,000	\$850,000
Cape Fear Locks and Dams 1-3, NC	\$600,000	\$0	\$0	\$300,000	\$250,000
Unallocated funds		\$1,284,000	\$473,000		

1/ These studies are conducted at 100 percent Federal expense.

2/ This effort was initiated in FY16. There were no allocations prior to FY 2016.

3/ The total unobligated carry-in to FY 2017 was \$1,745,988. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from FY 2017 for use on this effort is \$473,000 given the restriction in the FY 2017 Explanatory Statement that appropriated funds should only be allocated to reviews included in the budget request. Should approval be granted, these funds can be used to initiate and advance work on the St. Anthony Falls, Salinas Reservoir, and Cape Fear study efforts.

4/ FY 2017 and FY 2018 funding allocations reflect the best estimates available at the time this justification sheet was prepared. Final funding allotments will be determined by the needs of each study effort.

AUTHORIZATION: Flood Control Act of 1970, Section 216 – Review of Completed Projects.

DESCRIPTION: The Corps uses an asset-based and risk-informed investment strategy for the lifecycle management of civil works assets. Asset management includes developing consistent, transparent, and repeatable tools and processes to inform strategic maintenance; performing condition and risk assessments and identifying associated consequences; and using that information to prioritize investments. Cost savings from asset management can be derived from reductions of project operation and maintenance or divestiture of assets that are no longer providing benefits that warrant continued Federal investment.

Program execution is currently aligned with the scope and schedule of the Interim Guidance issued on August 22, 2016. The timing of guidance

HQUSACE/Multiple Districts

Disposition of Completed Projects

late in the fiscal year resulted in less work being accomplished in FY 2016 than was originally planned. However, after development of program guidance, program execution accelerated. It is anticipated that program execution will continue to accelerate in FY 2017 and no obstacles to continued progress have been identified.

Annual funding will be used to undertake disposition studies needed to identify necessary actions to safely dispose of infrastructure; ensure compliance with laws and regulations, including the National Environmental Policy Act; and verify interest in future ownership of the properties. Deauthorization and disposal of the facilities will eliminate future Federal operation and maintenance funding requirements after the facilities have been turned over to a non-Federal entity or removed. Prior to disposing of the facilities, the purpose of the infrastructure would be deauthorized. In some cases, ecosystem restoration may be a viable path toward disposal of the projects and that will be considered in the disposition study.

The study of each disposition will follow the current planning process. Disposition studies will be selected from facilities for which the Corps has ongoing maintenance responsibilities. Disposition studies will be focused on facilities that are expected to result in a net cost savings to the Federal government. In some cases, facilities have been identified as candidates for disposition, but a non-Federal interest has not expressed interest in assuming responsibility for the facility. While it is preferred to have an identified end user, a disposition study may continue without a committed end user.

Fiscal Year 2016 funds were used to further develop and implement the process to determine the highest priority candidates for disposition and to initiate feasibility studies on five of the highest priority projects – West Pearl River Navigation Project, MS & LA; Kentucky River Locks and Dams 1-4, KY; Willamette Falls Locks, OR; Allegheny Locks 5-9; and Upper Monongahela River, PA. Fiscal Year 2017 funds will be used to complete the disposition study for Kentucky River Locks and Dams 1-4 and continue the disposition studies for the West Pearl River Navigation Project and Willamette Falls Locks, OR. Fiscal Year 2018 funds will be used to finalize the Disposition Studies and disposal of West Pearl River Navigation Project, MS & LA; Willamette Falls Locks, OR; Allegheny Locks 5-9; and Upper Monongahela River, PA, and to initiate Disposition Studies on St. Anthony Falls, Mississippi River, MN and Salinas Reservoir (Santa Margarita Lake), CA.

The West Pearl River Navigation Project has been in caretaker status, meaning only minimal funding has been applied to the project in order to ensure safety of the project, since 1995. The Louisiana Department of Wildlife and Fisheries is interested in taking over the facility and plans to incorporate the project's lands into their Wildlife Management Area. Section 1321(a) of the Water Infrastructure Improvements for the Nation (WIIN) Act, 2016 deauthorized the West Pearl River Navigation Project and authorized the Secretary to convey all right, title, and interests of the United States including land and improvements. In order to convey the property, a disposal report must be prepared and approved by the Directorate of Real Estate at HQUSACE. FY 2017 funding allocation includes \$125,000 for the disposition study that is being terminated and \$252,000 to prepare the disposal report.

The Kentucky River Authority currently operates the Locks and Dams 1-4 on the Kentucky River and is interested in assuming ownership of the Locks. The existing navigation facilities no longer perform their authorized Federal navigation purpose, and it is highly unlikely that this condition will ever improve. In 1988, the Corps completed the Lower Kentucky River Navigation Modernization Feasibility Study, concluding that modernization of the navigation system on the Lower Kentucky River (Locks and Dams 1-4) would not be economically justifiable, and does not warrant further study of rehabilitation or modernization of the system. Navigation data through Locks and Dams 1-4 has not been collected or monitored by the Corps since 2002. The recommended plan is anticipated to be finalized in September 2017.

Upper Monongahela River, PA consists of nine lock and dams, two of which are gated. There is no commercial traffic. A contributed funds agreement is in place to provide for recreational use. This study will be brought to a logical conclusion in FY 2017 due to existing benefits at the project, public input, and lack of a path forward to disposition.

Allegheny River Locks 5-9, PA have a contributed funds agreement in place. Lock and Dam 5 has commercial traffic, but Locks 6-9 are limited to recreational traffic. Hydropower facilities are in operation at Lock and Dams 5, 6, 8 and 9. This study will be brought to a logical conclusion in FY 2017 due to existing benefits at the project, public input, and lack of a path forward to disposition.

The Willamette Falls Locks were added to the National Register of Historic Places in 1974 and primarily service recreational boats. American Recovery and Reinvestment Act funds were used to re-open the locks in 2009 after having been closed, but additional needed repairs resulted in the locks being closed again in 2011. The recommended plan is anticipated to be finalized in August 2017.

St. Anthony Falls is located at Mississippi River 853.3 in Minnesota. The Corps' original involvement at St. Anthony Falls followed the Eastman Tunnel collapse when the Corps built dams, a dike and apron to prevent the destruction of St. Anthony Falls. Subsequently, the Corps constructed the Upper Harbor Project consisting of horseshoe and chord dams and the Upper and Lower Locks. In June 2015, the St. Anthony Upper Lock was closed per WRRDA 2014, in an effort to prohibit Asian carp's upstream migration. The Lower St. Anthony Falls Lock continues to be operated on a limited basis.

Salinas Dam impounds the Salinas Reservoir (Santa Margarita Lake). Salinas Dam was originally constructed by the War Department in 1941 to create a water supply for Camp San Luis Obispo. Salinas Reservoir was transferred to the Corps in 1947. Salinas Reservoir is currently operated by San Luis Obispo County Flood Control and Water Conservation District under a COE lease and is water supply storage for the city of San Luis Obispo.

Cape Fear Locks and Dams 1-3, located on the Cape Fear River, were originally constructed in support of commercial navigation. After construction these were authorized for recreation. Commercial navigation traffic has ceased. The facilities now provide recreational opportunities, and a minimal level of service to ensure safety.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Other, Miscellaneous – Flood and Coastal Storm Damage Reduction

National Flood Risk Management Program, Institute for Water Resources 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$5,000,000	\$5,000,000	\$6,000,000	\$5,150,000 2/	\$5,000,000

1/ The activities under this remaining item are funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$747,000, including \$420,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

The Nation faces a growing flood risk crisis. As new information becomes available, many communities are learning that they are subject to increased flood risk due to aging flood management infrastructure, inadequate maintenance, changing climate, and more people and structures potentially in harm's way. Confronted with both immediate and future risks to human safety, public infrastructure and private investments, states and communities are seeking Federal assistance in managing their flood risks. The National Flood Risk Management Program (NFRMP), supported by this line item, coordinates existing Federal agency programs and funding to assist states and communities in identifying and addressing flood risks by leveraging agency resources, identifying opportunities to jointly implement complementary programs, sharing data and knowledge, and eliminating duplicative or conflicting activities or policies. The NFRMP also supports similar Federal – non-Federal agency coordination activities to ensure that federally funded mitigation activities are coordinated with and complement State and local programs and policies that affect flood risk.

Nationwide, States and communities urgently seek Federal assistance in addressing a growing flood risk crisis. Extensive existing development and newly developing areas are located behind aging levee systems not intended to protect large populations, or behind inadequately maintained levees that no longer provide the levels of flood risk reduction for which they were designed. New and improved information reveals previous reliance on outdated or insufficient flood risk information, and many communities also anticipate increased flood hazards influenced by a changing climate. At a time of historic demands on Federal resources, USACE, Federal Emergency Management Agency (FEMA) and other Federal agencies with a role in managing flood risks, recognize the need to coordinate their expertise and leverage their resources to more cost-effectively assist states and communities in developing flood risk reduction measures. Such coordination and leveraging yields better support for state and local capability to implement long term flood risk management and resiliency strategies, which will ultimately reduce reliance on Federally funded disaster assistance and investments in new, large-scale flood management works. Through the National Flood Risk Management Program (NFRMP), Federal and non-Federal partners have successfully developed flood risk mitigation solutions by leveraging agency resources, identifying opportunities to jointly implement complementary programs, sharing data and knowledge, and eliminating duplicative or conflicting activities or policies. These accomplishments are described below.

The NFRMP establishes partnerships at the Federal, regional, and state levels through which regular and sustained coordination occur. Annual funding will build on these successful collaborative partnership efforts to reach communities nationwide. Specifically, the range of continuing activities involved in this effort includes:

Institute for Water Resources

National Flood Risk Management Program

- At the national level, sustaining the work of the Federal Interagency Floodplain Management Task Force (FIFM-TF). The FIFM-TF, co-chaired by USACE and FEMA, is a national level task force of agency representatives from Federal agencies with major water resource programs. The task force is responsible for updating and maintaining a Unified National Program for Floodplain Management; coordinating Federal agency policies for flood risk management; and identifying, developing, and recommending actions and policies by the Federal government necessary to reduce losses due to flooding and protect the safety of flood plain residents. Quarterly meetings of the FIFM-TF provide an opportunity for USACE, FEMA, and other Federal agency leadership to coordinate flood risk management programs, policies and activities to improve federal program implementation for the flood risk management community. In between the quarterly meetings, the FIFM-TF Working Group, composed of senior staff from the member agencies, implements the FIFM-TF Work Plan activities.
- At the regional level, supporting regional and watershed intergovernmental partnerships during recovery from major flood/disaster events. USACE-led Regional Flood Risk Management teams provide a venue for interagency and intergovernmental coordination at the regional level to manage flood risks by integrating pre-flood mitigation with a long-term strategy to plan and implement pre- and post-flood emergency actions, while developing promising nonstructural alternatives and other flood risk mitigation actions.
- At the state level, providing direction and oversight to the Silver Jackets program to support existing and establish new intergovernmental teams in each state in order to leverage and coordinate federal and state programs to address state flood risk management and hazard mitigation priorities. Silver Jackets teams bring together Federal agency representatives at the state level to develop and implement solutions to state flood risk management priorities by assisting state agencies and local communities in leveraging information and resources, improving public risk communication, and creating a mechanism to collaboratively solve flood risk management issues and implement initiatives at the State and local levels.
- Developing and initiating a management framework to improve internal communication between USACE's Headquarters (HQ) and Districts and FEMA's HQ and Regions on flood risk management policy, practices and guidance.
- Developing tools and methods for communicating flood risk and encouraging public involvement in flood risk management planning.

Priorities across the multiple activities included in this scope will be set by the USACE Senior Executive National Flood Risk Management Program Steering Committee with input from FEMA and other federal partners. Input from key groups such as the Association of State Floodplain Managers, the National Association of Flood and Storm Water Management Agencies, and the Association of State Dam Safety Officials will be taken into consideration when setting these priorities.

ACCOMPLISHMENTS IN PRIOR YEARS:

- Through the Silver Jackets program, cooperating with FEMA, other Federal agencies, and states to support interagency teams initiated in 43 states and the District of Columbia and ongoing development of teams for the remaining 7 states. By establishing state level teams including representatives of multiple Federal and State agencies, the Silver Jackets program has created the opportunity for optimized delivery of Federal flood plain management and mitigation services through leveraging information and resources, resulting in increased and improved public risk communication, and combined efforts to address flood risk management challenges in States and communities. Specific interagency examples include: data sharing across agencies to support mapping studies; emergency response and evacuation planning assistance; combined and coordinated use of models, gage data and multiple agencies' databases to create a flood inundation model allowing for more effective flood response and mitigation; synthesis of existing studies and knowledge from different agencies to develop a comprehensive flood risk mitigation plan for a community without requiring any new study effort; supporting community recovery through short and long term mitigation strategies focused on nonstructural approaches and planning assistance; development of flood warning systems; integrating post-wildfire impacts into flood

risk management approaches; evaluating buildings in flood hazard areas for nonstructural mitigation measures; and assistance in risk-informed decision-making.

- Established a permanent, standing Upper Mississippi Regional Flood Risk Management Team (RFRMT) to facilitate interagency coordination at the regional level to integrate long-term flood risk mitigation planning with pre- and post-flood emergency actions. The team has focused, in particular, on identifying nonstructural alternatives to reduce flood risk within the region. Examples of team successes include elevating or removing USACE lease cabins incurring repetitive losses and claims on the National Flood Insurance Program and developing a non-structural alternative to a proposed structural repair by combining the use of different agency programs.
- Established the Mississippi River and Missouri River Interagency Flood Recovery Task Forces to facilitate interagency coordination at the watershed levels on the Mississippi and Missouri Rivers during the recovery and repair of flood damage reduction systems resulting from the FY 2011 historic flooding in those watersheds.
- Co-led the Federal Interagency Floodplain Management Task Force (FIFM-TF) to provide a forum for Federal coordination of agency programs and policies for flood risk management and develop a common approach among Federal agencies when implementing water resource authorities and programs, and to harmonize communication messages and strategies.
- Through a FIFM-TF effort to survey Federal agencies regarding current implementation of EO 11988, the Federal agencies obtained insight into strengths and weaknesses of the current version of EO 11988 and identified aspects of implementation of EO 11988 that could be improved. This insight informed the development of the revised interagency Guidelines for EO 11988 after EO 11988 was amended by EO 13690.
- FIFM-TF agencies took a lead role, serving as flood risk subject matter experts to the MitFLG, in developing the Federal Flood Risk Management Standard (FFRMS) and revising the interagency Guidelines for EO 11988, which was amended by EO 13690 to incorporate the FFRMS.
- Through FIFM-TF efforts, developed new, technical assistance products for coastal flood risk managers that will be made available by National Oceanic and Atmospheric Administration through their Digital Coast website. This effort also improved understanding of remaining gaps and needs in available coastal technical assistance.
- Improved coordination of the USACE nation-wide levee inventory and assessments and improvements to the USACE levee inspection program, USACE emergency response policies, and USACE levee certification policies with FEMA's levee accreditation policies and nationwide RiskMAP program implementation.
- Convened policy discussion forums involving experts in flood risk management from the private sector as well as Federal and non-Federal agencies leading to the development of new policy and guidance to address institutional, policy and planning barriers to effective flood risk management.
- Initiated work to improve flood risk communication and ensure public involvement in flood risk management planning, working in coordination with Federal and non-Federal flood risk management partners.
- Worked with communities to identify options to remediate deficient levees or otherwise address the resulting public safety hazards in a comprehensive flood risk management planning context.
- Participated in the development of a levee risk screening methodology and tool to conduct risk screenings on levees in the USACE levee safety program. Additionally, developed a Life Safety Hazard Index screening tool to assist in identifying and prioritizing planning studies that provide risk reduction to areas with high life loss flood risks.
- As requested by the Administration, acted as lead federal agency in developing a report to present the results of an intensive Federal interagency effort initiated to assess the status of the efforts of each major Federal agency actively addressing the flooding in the area of Devils Lake, North Dakota and options for additional near-term actions within existing authorities.

- Completed the “From Flood Damage Reduction to Flood Risk Management: Implications for U.S. Army Corps of Engineers Policy and Programs” report that presents preliminary policy and program recommendations that would allow USACE to be more effective in sharing responsibility with other federal agencies, non-federal governments, and stakeholders in the management of flood risk.
- Developed a tool for characterizing flood risk on a national and regional basis for use in prioritizing flood risk management budget needs and future evaluation of proposed flood risk management policy changes; in use internally, this prototype tool has been tested and refined within USACE and other interested federal agencies.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Other, Miscellaneous – Flood and Coastal Storm Damage Reduction

National Shoreline Management Study, Institute for Water Resources 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$925,000	\$950,000	\$400,000	\$1,400,000 2/	\$400,000

1/ This study effort is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$3,000, which was all committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The basic study was authorized by Section 215 of Water Resources Development Act (WRDA) of 1999. Work on the regional changes to the coast was authorized in Section 816 of WRDA 1986.

DESCRIPTION: The study is an interagency effort, including collaboration with NOAA, USGS, and the Coastal States Organization, to describe the extent and cause of shoreline erosion and accretion on all the coasts of the United States and describe the regional economic and environmental impacts of that erosion and accretion and to ultimately recommend means to conserve and efficiently manage the effects of erosion in the coastal zone. The study was initiated with FY 2002 funding.

Prior year funding was used to:

1. Complete an overview assessment of eight coastal regions in FY 2012, including a set of tentative conclusions about the future of shore protection and sediment management. This information was used as a starting point for engaging the states and other Federal agencies in a new dialogue about coastal protection and systems approaches.
2. Update the report “Technical Review of Corps Coastal Projects (Flood and Coastal Storm Damage Reduction, Navigation, and Ecosystem Restoration)” in 2014.
3. Link the Coastal Systems Portfolio Initiative (CSPI) database with the database systems for integrated Budget Evaluation Tool (iBET), Corps Map, and Coastal Asset Management enabling the Corps to incorporate Regional Sediment Management principles into coastal analyses.
4. Collaborate with Virginia, Hawaii, and California, and the Great Lakes States to develop regional strategies for adaptation, given the realistic prospects for coastal change.

Fiscal Year 2017 and Fiscal Year 2018 funding will be used to maintain the Coastal Systems Portfolio Initiative database nationally and build regional functionality in Mid Atlantic and California; update the report “Technical Review of Corps Coastal Projects (Flood and Coastal Storm Damage Reduction, Navigation, and Ecosystem Restoration)” ; and continue other work on the National Shoreline Management Study.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Other, Miscellaneous

Planning Support Program 1/ 2/

Allocation in FY 2013	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$4,000,000	\$4,900,000	\$5,210,000	\$3,100,000	\$3,000,000 3/	\$3,500,000

1/ The activities supported by this remaining item are funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$1,128,000, including \$526,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 936, WRDA 1986; Section 216, WRDA 2000; Section 2033(e), WRDA 2007

DESCRIPTION: The Planning Support Program provides technical and managerial assistance for project planning, development, and implementation; peer reviews of new major methods, models, or analyses used in feasibility studies; and support independent peer review panels as well as maintaining core planning competency within the workforce. The key components of this program are as follows:

1. Planner Capability and Training. The Planning Community of Practice is comprised of Corps of Engineers employees who share best planning practices, test innovative solutions, and coach and mentor each other. The Planning Associates Program is an advanced training program for journeyman level water resource planners in the Corps. The program includes 20 instructional units held at various locations and extends over 1-3 week increments for 11 months. The goals of the program are to broaden the planners' competencies in solving complex water resources problems; to strengthen their leadership skills; and to retain critical planner capability as they progress toward expert planner. Since 2003, 97 planners have completed this training.
2. Planning Centers of Expertise: Six national Planning Centers of Expertise for inland navigation, deep draft navigation, ecosystem restoration, coastal and storm damage reduction, flood damage reduction, and water management and reallocation have key roles in maintaining and strengthening the competency of the Planning Community of Practice by providing technical assistance, conducting or managing peer review, and transferring the latest technology or methodologies and sharing lessons learned and best practices throughout the planning community.
3. Planning Modernization: The current planning process - Specific, Measurable, Attainable, Risk Informed, Timely (SMART) Planning - for feasibility studies is risk-informed and decision focused and utilizes the 6-step planning process (identify problems and opportunities, inventory and forecast conditions, formulate alternatives, evaluate alternatives, compare alternatives, select the recommended plan) while deliberately scoping analyses to what is necessary for decisions. SMART planning provides a framework to allow for the identification of a recommended plan through more direct collaboration between the District, Division, Headquarters and the non-Federal sponsor, and eliminates extraneous analysis while improving the quality of the decision.

APPROPRIATION TITLE: Investigations, Fiscal Year 2018

Other, Miscellaneous

Tribal Partnership Program 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$1,000,000	\$2,500,000	\$1,432,925 3/	\$1,750,000 4/	\$500,000

1/ The non-Federal sponsor is generally responsible for 50 percent of the costs of all feasibility studies and 25 percent of the costs of all watershed studies funded out of this remaining item with the exception of a \$455,000 waiver for Federally-recognized Tribes that is subject to inflation.

2/ The costs of this remaining item are accounted for in the Aquatic Ecosystem Restoration and Flood and Coastal Storm Damage Reduction business lines.

3/ \$67,075 was reprogrammed away from this line item in FY 2016.

4/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$2,211,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$200,000.

AUTHORIZATION: Sec. 203 of Water Resources Development Act (WRDA) of 2000, as amended by Section 2011 of WRDA 2007; Section 1156 of the Water Resources Development Act of 1986 as amended by Section 1119 of the Water Infrastructure and Investment Act of 2016; Section 1002 and 1031 of the Water Resources and Reform Development Act of 2014.

DESCRIPTION: Funds provided under this program may be used, in cooperation with Indian Tribes (as defined by 25 U.S.C 450b) and heads of other Federal agencies, to carry out water-related planning activities and study and determine the feasibility of carrying out water resources development projects that will substantially benefit Indian tribes and are located primarily within Indian country or in proximity to Alaska Native villages. A study under this authority “may address (A) projects for flood damage reduction, environmental restoration and protection, and preservation of cultural and natural resources; (B) watershed assessments and planning activities; and (C) such other projects as the Secretary, in cooperation with Indian Tribes and the heads of other Federal agencies, determines to be appropriate.” Various activities may be considered pursuant to this broad authority such as floodplain mapping, water control management, self-reliance and economic capacity building, technical capacity building, erosion control, cultural resources, comprehensive planning, emergency management, water quality, water supply, community infrastructure, and hazardous and toxic waste assessment. Prior to FY 2008, these activities were funded in the Construction account.

Reconnaissance studies have previously been completed under this program: Land Augustine Watershed Study, Coachella (CA), Lapwai Creek Reconnaissance Study (ID), the Kickapoo Tribe (KS), Menemsha Pond Restoration (MA), Indian Island Feasibility Study (ME), Nottawaseppi Band of Huron Potawatomi Indians (MI), Forest Potawatomi Watershed Study (MI), and Stockbridge Munsee Indian Community (WI).

Feasibility Studies focus on a specific problem area (e.g. Flood and Coastal Storm Damage Reduction) within a limited geographic area and result in a specifically recommended project. Watershed Studies examine a broad array of watershed challenges, identify an array of potential corrective actions, and result in a Watershed Management Plan as the final product. Watershed Management Plans do not result in specifically recommended projects. Studies follow the standard Civil Works planning process. Separate authorization and appropriations are required from

HQUSACE

Tribal Partnership Program

Congress to proceed to preconstruction engineering and design for recommended projects whose Federal share is greater than \$10,000,000. No feasibility studies or watershed studies have yet been completed under this program.

There are currently two on-going feasibility studies and eight on-going watershed assessments with cost-sharing agreements signed between the Department of the Army and the non-Federal sponsor.

Annual funding and prior year appropriations will be used to continue and complete work on feasibility studies and watershed assessments with signed cost-sharing agreements, including termination of negative activities where appropriate; to develop, negotiate and execute cost sharing agreements for new feasibility studies and/or watershed assessments; and for program coordination. The majority of the Tribal Nations are not located near Corps District Offices and require greater levels of coordination due to the remote geographic location of the Tribes.

On-going watershed assessments are as follows:

State	Study Title	Local Sponsor	Funding through FY 2014	Allocation in FY 2015	Allocation in FY 2016	Planned Allocation in FY 2017	Budgeted Amount in FY 2018	Date of Cost-Sharing Agreement
ME	Meduxnekeag Watershed Assessment Management Plan	Houlton Band of Maliseets	\$215,000	\$0	\$20,000	\$50,000	\$25,000	April 2017
NM	Santa Clara Pueblo, NM, Watershed Assessment	Pueblo of Santa Clara	\$1,011,018	\$35,000	\$50,171	\$45,000	\$40,000	Sept 2011
NM	Pueblo of San Felipe, NM Watershed Assessment	Pueblo of San Felipe	\$100,407	\$380,000	(-\$127,293)	\$100,000	\$40,000	March 2013
NM	Acoma Pueblo, NM, Watershed Assessment	Pueblo of Acoma	\$530,344	\$220,000	\$244,582	\$145,000	\$35,000	March 2013
NM	Pueblo of Santo Domingo, NM, Watershed Assessment	Pueblo of Santa Domingo	\$100,738	\$141,000	\$266,652	\$100,000	\$35,000	June 2014
NM	Pueblo of Santa Ana, NM Watershed Assessment	Pueblo of Santa Ana	\$351,106	\$200,000	\$235,927	\$75,000	\$35,000	June 2013
NM	Pueblo of Zia, NM, Watershed Assessment	Pueblo of Zia	\$0	\$50,000	\$117,206	\$200,000	\$30,000	March 2017
WA	Quileute Tribal Watershed Study	Quileute Nation (WA)	\$70,233	\$55,000	\$152,222	\$0	\$25,000	April 2016

On-going feasibility studies are as follows:

State	Study Title	Local Sponsor	Funding through FY 2014	Allocation in FY 2015	Allocation in FY 2016	Planned Allocation in FY 2017	Budgeted Amount in FY 2018	Date of Cost-Sharing Agreement
KS	Soldier Creek Watershed	Prairie Band Pottawatomie	\$0	\$0	\$0	\$0	\$20,000	April 2017
ME	Shoreline Erosion Study	Passamaquoddy Tribe, Pleasant Point Reservation	\$50,000	\$0	\$50,000	\$50,000	\$25,000	May 2016

The following watershed assessments are anticipated to commence with signed cost-sharing agreements in FY 2018:

State	Study Title	Local Sponsor	Funding through FY 2014	Allocation in FY 2015	Allocation in FY 2016	Planned Allocation in FY 2017	Budgeted Amount in FY 2018
AZ	Bird Springs Watershed Assessment	Navajo Nation at Bird Springs	\$0	\$109,225	\$38,300	\$0	\$12,000
AZ	Middle Gila and Lower Santa Cruz River, AZ Watershed Study	Gila River Indian Community	\$114,200	(-\$9,200)	\$0	\$0	\$0

The following feasibility studies are expected to commence with signed cost-sharing agreements in FY 2017 or FY 2018:

State	Study Title	Local Sponsor	Funding through FY 2014	Allocation in FY 2015	Allocation in FY 2016	Planned Allocation in FY 2017	Budgeted Amount in FY 2018	Anticipated Date of Cost-Sharing Agreement
AK	Elim Subsistence Harbor	Kwethluk Native Village of Elim	\$0	\$0	\$0	\$300,000	\$27,000	FY 2017

AZ	Tohono O'odham Flood Risk Management Study	Tohono O'odham Nation	\$195,000	(-\$35,000)	\$333	\$0	\$15,000	FY 2018
AZ	Polacca Wash Feasibility Study	Hopi Tribe	\$82,925	\$60,475	(-\$65,475)	\$0	\$0	FY 2018
CA	Torres-Martinez Ecosystem Restoration Study	Torres-Martinez Desert Cahuilla Indians	\$99,000	\$51,000	\$867	\$0	\$15,000	FY 2018
CA/ NV	Washoe Tribal Lands along the Carson River, NV	Washoe Tribe of NV and CA	\$0	\$0	\$0	\$0	\$30,000	FY 2018
ID	Fort Hall Bottoms Resource Inventory & Management Plan	Shoshone-Bannock Tribe	\$0	\$0	\$0	\$0	\$10,000	FY 2018
MA	Santuit Pond Restoration Shoreline Erosion Study	Mashpee Wampanoag Tribe (MA)	\$29,594	\$31,906	\$0	\$111,500	\$20,000	FY 2017
MN	Little Minnesota Fish Passage Investigation	Sisseton Wahpeton Oyate of the Lake Traverse Reservation	\$0	\$0	\$0	\$15,000	\$10,000	FY 2018
MN	Prairie Island Sturgeon Lake Habitat Restoration	Prairie Island Indian Community	\$0	\$0	\$0	\$10,000	\$10,000	FY 2018
SD	Lower Brule Sioux Study	Lower Brule Sioux	\$0	\$0	\$0	\$19,000	\$41,000	FY 2017
WA	Hoh Tribal Partnership Project	Hoh Tribe	\$55,000	\$45,000	\$0	\$0	\$0	FY 2018

HQUSACE

Tribal Partnership Program

The following studies are inactive:

State	Study Title	Local Sponsor	Net allotment through FY 2016	Unobligated Carry-in to FY 2017
AK	Villages Erosion Studies		>\$707,882	\$647,277
AK	Kuskokwim-Middle River Watershed Study	Kuskokwim Corporation	\$95,319	\$8,928
AZ & NM	Navajo Nation – Little Colorado (Upper Puerco), NM & AZ, Watershed Assessment	Navajo Nation, Little Colorado (Upper Puerco)	\$79,038	\$0
AZ, NM, & UT	Navajo Nation – San Juan (Chinle), NM, AZ & UT, Watershed Assessment	Navajo Nation, San Juan (Chinle)	\$57,832	\$0
CT	Mohegan Tribe, CT	Mohegan Tribe	\$85,500	\$27,210
NM	Navajo Nation – Rio Puerco (Arroyo Chico), Ojo Encino Chapter, NM, Watershed Assessment	Navajo Nation, Rio Puerco (Arroyo Chico)	\$61,966	\$0
NM	Pueblo of Laguna Watershed Assessment	Pueblo of Laguna	\$29,924	\$1,321
NM	Pueblo of Picuris, NM, Watershed Assessment	Picuris Nation	\$56,099	\$0
NY	St Lawrence River, Akwesasne, St Regis Mohawk Tribe	St. Regis Mohawk Tribe	\$100,000	\$0
WA	Makah Tribal Partnership Study	Makah Tribe	\$2,070	\$0
WA	Lower Elwha Klallam Tribal Partnership Project	Lower Elwha Tribe	\$1,638	\$0
WA	Jamestown S'Klallam Watershed Study Project	Jamestown S'Klallam Tribe	\$99,989	\$0
WA	Sauk-Suiattle Tribal Partnership	Sauk-Suiattle Tribal Partnership	\$24,842	\$0
WA	White Swan Tribal Partnership Study	Yakama Nation	\$92,227	\$0
OR	Willamette Basin Pacific Lamprey Study	Grand Ronde Tribe	\$14,618	\$0

APPROPRIATION TITLE: Construction, Fiscal Year 2018

Continuing Authorities Projects Not Requiring Specific Legislation (Continuing Authorities Program (CAP))

Aquatic Ecosystem Restoration (CAP Section 206) – Ecosystem Restoration

	Allocation for FY 2014	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017 2/	FY 2018 Budget
CAP Section 206 1/	\$8,000,000	\$8,000,000	\$8,000,000	\$ 8,000,000	\$ 6,500,000

1/ Non-Federal interests are required to share in a minimum of 35 percent of the implementation cost of construction including provision of all lands, easements, rights-of-way, and necessary relocations. Non-Federal interests pay 100 percent of the cost of operation, maintenance, replacement and rehabilitation.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$4,860,000, including \$41,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is less than \$100,000.

AUTHORIZATION: Section 206 of the Water Resources Development Act of 1996 (PL 104-303), as amended.

DESCRIPTION: Annual funding is used to investigate, design, and construct aquatic ecosystem restoration projects that will improve the quality of the environment, are in the public interest and are cost-effective. Not more than \$10,000,000 in Federal funds may be allocated to a project at a single locality. Up to \$50,000,000 may be appropriated annually to the Section 206 program.

Beneficial Uses of Dredged Material (CAP Section 204) – Ecosystem Restoration

	Allocation for FY 2014	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017 4/	FY 2018 Budget
CAP Section 204 3/	\$6,995,000	\$3,500,000	\$ 500,000	\$ 1,000,000	\$ 500,000

3/ Non-Federal interests are required to share in a minimum of 35 percent of the implementation cost of each project.

4/ The actual unobligated carry-in from FY 2016 into FY 2017 was \$5,334,000, including \$31,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$160,000.

AUTHORIZATION: Section 204 of the Water Resources Development Act (WRDA) of 1992 Public Law (PL 102-580), as amended.

DESCRIPTION: Annual funding is used to investigate, design, and construct projects for the reduction of storm damages and protection, restoration and creation of aquatic and ecologically related habitats, including wetlands, in connection with dredging for construction, operation, or maintenance of an authorized navigation project. Not more than \$10,000,000 in Federal funds may be may be allocated to a single modification or measure. Up to \$50,000,000 may be appropriated annually to the Section 204 program.

HQUSACE/Multiple Districts

Continuing Authorities Program

Flood Control (CAP Section 205) – Flood and Coastal Storm Damage Reduction

	Allocation for FY 2014	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017 6/	FY 2018 Budget
CAP Section 205 5/	\$15,000,000	\$10,000,000	\$ 8,000,000	\$ 8,000,000	\$ 1,000,000

5/ Non-Federal interests are required to share in a minimum of 35 percent of the implementation cost of each project.

6/ The actual unobligated carry-in from FY 2016 into FY 2017 was \$18,543,000, including \$134,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$1,600,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

AUTHORIZATION: Section 205 of the Flood Control Act of 1948 (PL 80-858), as amended.

DESCRIPTION: Annual funding is used to investigate, design, and construct flood and coastal storm damage reduction projects, including structural and/or nonstructural measures that are designed to provide the same complete project and same degree of protection provided under regular authorization procedures. Each project selected must be economically justified and complete within itself. Federal cost participation is limited to \$10,000,000 per project at a single locality. Up to \$55,000,000 may be appropriated annually to the Section 205 program.

Project Modifications for Improvement of the Environment (CAP Section 1135) – Ecosystem Restoration

	Allocation for FY 2014	Allocation for FY 2015	Allocation for FY 2016	Allocation for FY 2017 8/	FY 2018 Budget
CAP Section 1135 7/	\$10,500,000	\$6,600,000	\$ 3,000,000	\$ 3,000,000	\$ 1,000,000

7/ Non-Federal interests are required to share in a minimum of 25 percent of the implementation cost of each project.

8/ The actual unobligated carry-in from FY 2016 into FY 2017 was \$12,057,000, including \$1,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$639,000.

AUTHORIZATION: Section 1135 of the Water Resources Development Act of 1986 (PL 99-662), as amended.

DESCRIPTION: Annual funding is used to review Corps water resources projects to determine the need for structural or operational modifications for the purpose of improving the quality of the environment in the public interest; to determine if the operation of such projects has contributed to the degradation of the quality of the environment; and to carry out a program of such modifications that are feasible and consistent with authorized project purposes. Not more than \$10,000,000 in Federal funds may be expended on any single modification or measure pursuant to Section 1135. Up to \$40,000,000 may be appropriated annually to the Section 1135 program.

APPROPRIATION TITLE: Construction, Fiscal Year 2018

Dam Safety and Seepage/Stability Correction Program 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$45,000,000	\$34,000,000	\$ 31,200,000	\$ 21,000,000 3/	\$ 34,300,000

1/ Dam Safety Studies are funded at 100 percent Federal expense. The non-Federal cost for Pre-construction Engineering and Design activities varies and is identified and calculated in the decision documents prepared during the Dam Safety Modification Study in accordance with either the Water Resources Development Act of 1986 as amended, or the Reclamation Safety of Dams Act (P.L. 98-404) as amended.

2/ All costs associated with this remaining item are attributed to the Flood and Coastal Storm Damage Reduction business line.

3/ The actual unobligated and uncommitted carry-in from FY 2016 to FY 2017 was \$27,300,000, including \$21,000,000 committed within in the Corps for scheduled ongoing requirements in FY2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$8,400,000.

AUTHORIZATION: Water Resources Development Act of 1986; Dam Safety Act of 2006; Executive Order of the President; and the Federal Guideline for Dam Safety.

DESCRIPTION: The Dam Safety and Seepage/Stability Correction Program provides for studies and modification of completed Corps of Engineers dams. The studies are located in various states. There are 715 dams and appurtenant structures that the Corps owns and operates at 555 projects, which have the potential to pose life safety, economic, and environmental risk to the downstream population centers and floodplains. The Corps has implemented a risk informed approach for dam safety management to protect life, property, lifelines, and the environment, with the goal of ensuring that all dams are designed, constructed, regulated, operated, and maintained as safely and effectively as practicable, by prioritizing investments to maximize the reduction of risk across the entire portfolio. The Dam Safety and Seepage/Stability Correction Program provides the funding necessary to perform all non-routine dam safety evaluations and studies to support the risk informed management of the portfolio and ensure that USACE dams and appurtenant structures are in compliance with “ FEMA 93 - Federal Guidelines for Dam Safety”. Each dam has a Dam Safety Action Classification (DSAC) based on a risk assessment. The Dam Safety Seepage/Stability Correction Program supports engineering analysis required to ensure the structures are in compliance with updated engineering criteria and essential engineering guidelines, perform Issue Evaluation Studies (IES), Dam Safety Modification Studies (DSMS), and Pre-construction Engineering and Design for the highest risk dams in the USACE national portfolio. NEPA documentation will be or has been included in the various DSMR’s.

JUSTIFICATION: The Federal Guidelines for Dam Safety (FEMA 93) issued by Executive Order 12148 of President Carter require each Federal agency with responsibility for the operations and maintenance of dams to have a dam safety program to include dam safety modification. Dam safety ensures the integrity and viability of dams such that they do not present unacceptable risks to the public, property, and the environment. It requires the collective application of engineering principles and experience, and a philosophy of risk management that recognizes that a dam is a structure whose safe functioning is not explicitly determined by its original design and construction. While no Corps dam is in imminent danger of failure at this time, some dams have been identified as having a higher risk of a dam safety incident than originally anticipated based on new data, inherent flaws and defects that manifest over time, or the potential adverse effects that could occur from extreme flood or seismic loads.

The Dam Safety and Seepage/Stability Correction Program provides for evaluation of completed Corps of Engineers dams with emphasis on those having very high risk or high risk of a dam-safety incident (DSAC I and II) and also those having a moderate risk of a dam-safety incident (DSAC III). Dam Safety Issue Evaluation Studies (IES) are conducted to further evaluate high risk dams identified from the Portfolio Risk Analysis program and make risk informed decisions on the need for modification or reclassification, and evaluate the risks of dam safety incidents that manifest over time or exhibit unsatisfactory performance during high pools or seismic events. Dam Safety Modification Studies (DSMS) are conducted to investigate dam safety deficiencies that could result in loss of life, formulate one or more alternatives that reduce the risks to tolerable levels, and recommend, in a Dam Safety Modification Report, an appropriate solution. Pre-construction Engineering & Design (PED) activities are performed to advance final design and limited construction activities until funding appropriations are received. Construction of dam safety modifications are funded by project specific line items in the Construction account in accordance with the existing project authorization.

FISCAL YEAR 2016: The allocation of \$31,200,000 was applied as follows:

Dam Safety Modification Studies	\$ 10,200,000
Pre-Construction Engineering & Design (PED)	\$ 5,300,000
Issue Evaluation Activities	\$ 15,700,000
Total	\$ 31,200,000

Program Accomplishments: Completed 3 Dam Safety Modification Studies and 18 Issue Evaluation Studies or Risk Assessments recommending either “DSAC Change”, “No Further Action”, or “Additional Investigations Required”. No projects were identified as having actionable potential failure modes that justified immediate advancement to a Dam Safety Modification Study. Some projects require additional studies or investigations to reduce uncertainty in conditions and loading. Continued work efforts on 7 multi-year Dam Safety Modification Studies, 38 multi-year Issue Evaluation Studies, and preparatory work in advance of more detailed studies on the remainder of the higher priority DSAC 2 & DSAC 3 dams listed below. The Dam Safety Investment Plan was updated in FY 2016 to reflect the current needs of the national portfolio based on the results of the completed dam safety studies, on-going construction activities, and recently completed construction activities.

FISCAL YEAR 2017: The appropriated amount of \$21,000,000, plus the unobligated carry-in funding of \$27,300,000, are being applied as follows:

Dam Safety Modification Studies	\$ 5,990,750
Pre-Construction Engineering & Design	\$ 4,400,000
Issue Evaluation Activities	\$ 27,909,250
Total	\$ 48,300,000

Description of Work: Risk assessment and multi-year dam safety studies will continue in FY 2017 as part of the Dam Safety Seepage and Stability Correction Program on the projects listed below. It is anticipated that 1 ongoing Issue Evaluation Study (General Edgar Jadwin) will be approved and recommended for Dam Safety Modification Study to evaluate appropriate corrective

actions. It is also anticipated that 2 DSMS studies (Lewisville and Mohawk) will be completed in FY17 and both of those may be approved for PED activities while awaiting FY19 CG Line Item construction funding. One DSMS study, Martis Creek, will be suspended indefinitely while long term (routine O&M) performance monitoring is conducted to confirm performance issues.

FISCAL YEAR 2018: The budgeted amount of \$34,300,000, plus the carry-in funds of \$8,400,000, will be applied as follows:

Dam Safety Modification Studies	\$ 8,050,000
Pre-Construction Engineering & Design	\$ 4,200,000
Issue Evaluation Activities	\$ 30,450,000
Total	\$ 42,700,000

Description of Work: Multi-year dam safety studies will continue in FY 2018 on the projects listed below as part of the Dam Safety Seepage and Stability Correction Program. Ongoing IES and DSMS studies will be completed, new IES and DSMS studies will be initiated, and there will be a continuance of preparatory work that provides the technical basis for the dam safety studies, DSAC characterization, and risk informed portfolio management. It is anticipated that 3 DSMS projects (Lewisville, Mohawk, and Moose Creek) may be approved for PED activities while awaiting FY19 and FY20 CG Line Item Construction Funding.

PROPOSED ACTIVITIES FOR FISCAL YEAR 2018: Fiscal Year 2018 funding will be used for high priority studies on high risk dam safety assurance, seepage control, and static instability correction projects and to initiate preconstruction engineering and design on those projects once their decision documents are approved.

The Corps Screening Portfolio Risk Analysis has identified 326 high risk dam safety projects for potential study and evaluation. These dams are the highest priority projects where detailed studies have not been completed in prior years. A tentative list of identified Dam Safety projects that would receive this funding in FY 2018 is provided below:

Dam Safety Projects (DSMS, PED and IES Summary)

<i>Project</i>	<i>DSAC</i>	<i>Activity Description</i>	<i>Funding Allocated Through FY 2016 for All prior studies (DSMS and IES)</i>	<i>FY 2017 Funding Allocation</i>	<i>FY 2018 Funding Allocation</i>	<i>Balance to Complete (BTC) 4/</i>	<i>Scheduled Completion Date</i>
Lewisville Dam, TX	2	DSMS in FY17/PED in FY18	\$16,471,679	\$2,550,000	\$2,000,000	0	DSMS in FY17/PED in FY19
Mohawk Dam, OH	3	DSMS in FY17/PED in FY18	\$10,083,024	\$525,000	\$1,000,000	\$1,000,000	DSMS in FY17/PED in FY20
Moose Creek Dam, Chena River, AK	3	DSMS in FY17/PED in FY18	\$9,743,884	\$1,968,750	\$1,200,000	2,000,000	DSMS in FY18/PED in FY20
Whittier Narrows Dam, CA	1	DSMS	\$10,269,184	\$1,300,000	\$2,000,000	0	FY19
Cherry Creek Dam, CO	2	DSMS	\$11,115,391	\$1,175,000	\$200,000	0	FY18
General Edgar Jadwin, PA	2	DSMS	\$1,789,807	\$172,000	\$1,600,000	\$2,000,000	FY20
Pipestem Dam, ND	2	DSMS	\$476,950	0	\$1,500,000	\$2,000,000	FY20
Trinidad Dam, CO	2	DSMS	\$298,227	0	\$1,500,000	\$2,000,000	FY20
Keystone Dam, OK	2	DSMS	\$5,632,352	0	\$1,250,000	\$2,250,000	FY20
Various Issue Evaluation Studies 5/	DSAC 2 & 3 Dams	Risk Assessment and hazards analysis (Hydrologic, Seismic, Inundation Mapping, Consequence analysis) on over 200 DSAC 2 & 3 Dams.	\$150,930,125	\$13,309,250	\$22,050,000	N/A	N/A

4/ Funds estimated as balance to complete on Whittier Narrows, Keystone, Pipestem, General Edgar Jadwin, and Trinidad do not include PED estimates. Risk Reduction alternative formulation not yet complete.

5/ Allocations for IES Studies since the implementation of the EC 1156 draft guidance in FY 2008.

APPROPRIATION TITLE: Construction, Fiscal Year 2018

Employees Compensation 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation for FY 2017	Budgeted Amount for FY 2018
19,000,000	19,000,000	17,530,000	19,000,000 3/	17,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are equally attributed to the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, Navigation, and Hydropower business lines.

3/ The actual carry-in from FY 2016 to FY 2017 was \$340,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Public Law 94-273, approved April 21, 1976, 5 USC 8147b.

DESCRIPTION: The Employees Compensation program (Payments to the Department of Labor) provides that each agency shall include in its annual budget estimates a request for an appropriation equal to costs previously paid from the Employees Compensation Fund on account of injury or death of employees or persons under the agency's jurisdiction. The Fiscal Year 2018 Budget represents the total estimated cost of benefits and other payments made from the Employees Compensation Fund during the period July 1, 2015, through June 30, 2016, due to injury or death of persons under the jurisdiction of the Corps of Engineers civil works functions and also includes \$1,100,000 for the investigation of fraudulent claims for workers' compensation benefits.

APPROPRIATION TITLE: Construction, Fiscal Year 2018

Inland Waterways Users Board, Institute for Water Resources 1/

	Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
Total	\$860,000	\$860,000	\$325,000	\$325,000	\$335,000
Board Expense	\$60,000	\$60,000	\$50,000	\$50,000 2/	\$60,000
Corps Expense	\$800,000	\$800,000	\$275,000	\$275,000 3/	\$275,000

1/ This activity is funded at 100 percent Federal expense. All costs associated with this remaining item are attributed to the Navigation business line.

2/ The actual unobligated balance from 2016 into 2017 for Board Expenses was \$79,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

3/ The actual unobligated balance from 2016 into 2017 for Corps Expenses was \$407,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Board was established by Section 302 of the Water Resources Development Act of 1986, (PL 99-662) and pursuant to the Board's charter, originally approved by the Secretary of the Army on March 3, 1987. The Board is an advisory committee subject to the requirements of the Federal Advisory Committee Act (PL 92-463 as amended).

DESCRIPTION: The Inland Waterways Users Board (Board) is an advisory committee representing the interests of the commercial navigation users of the inland and intracoastal waterways of the United States. Its purpose is to make recommendations to the Secretary of the Army, reflecting its independent judgment, regarding construction and rehabilitation priorities and spending levels on commercial navigation features of these waterways. Generally, issues regarding the Inland Waterways Trust Fund fall within the scope of the advisory role of the Board. The Deputy Commanding General for Civil and Emergency Operations has been designated Executive Director to the Board, and he has designated staff members to provide continuing Board support.

Annual funding for the Corps expense are used for personnel costs for administrative Board meeting support, including coordinating meetings, staff travel, clerical, and related administrative needs, travel to Board meetings, and to provide objective analyses related to potential investments in the inland waterways and the financial outlook for the Inland Waterways Trust Fund. These funds are not used for any personnel or travel expenses incurred by Expenses account funded staff or the Office of the Assistant Secretary of the Army.

Annual funding for the Board expense are used for the 11-member Board's travel, meetings and other needs to meet the requirements of the charter. The Board has requested they meet four times annually.

APPROPRIATION TITLE: Operations & Maintenance, Fiscal Year 2018

Aquatic Nuisance Control Research, Engineer Research and Development Center – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$683,000	\$675,000	\$668,250	\$675,000 2/	\$675,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$2,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (PL 101- 646). The National Invasive Species Act of 1996 (PL 104-332) reauthorized and amended the Non- indigenous Aquatic Nuisance Prevention and Control Act.

JUSTIFICATION: Annual funding under the ANCR is used to address invasive aquatic species that impact the Nation’s waterways infrastructure and associated resources including development of control strategies for: navigation structures, hydropower and other utilities, vessels and dredges, and water treatment, irrigation, and other water control structures.

The ANSRP provides Corps managers and operational personnel with innovative technologies regarding risk assessment, prevention strategies, species life history/ecological data, and cost-effective, environmentally-sound options for managing aquatic nuisance species (ANS). Program research focuses on:

- 1) The evaluation of potential control/barrier methods to prevent the transfer of Asian carps and other ANS between the Mississippi River and Great Lakes Basins;
- 2) New techniques for control of zebra and quagga mussels moving westward past the 100th meridian;
- 3) Improved control methods for harmful algal blooms through new chemicals and life cycle sensitivity analysis; ;
- 4) Corps personnel training in recognition and control methods of ANS on Corps lands/waters;
- 5) Web-based regional lists of aquatic invasive species on Corps projects; and
- 6) Methods that reduce invasive species impacts to threatened and endangered species and provide restoration of natural habitats.

ACCOMPLISHMENTS IN FY 2016:

- Completed field trials to evaluate performance of a deployed electrolytic system designed to minimize invasive mussel fouling on USACE infrastructure.
- Completed laboratory evaluations to assess voltage strength, frequency and duration on performance of electric barrier systems for preventing movement of invasive fishes of interest to USACE, including Asian carp.
- Initiated laboratory studies to assess the use and application of submersed metals on the passage of sea lamprey.

Engineer Research and Development Center

Aquatic Nuisance Species Research

- Completed studies to validate the use of videography and projectile physics to estimate burst swim speeds and jump characteristics of silver carp.
- Completed annual reporting requirements to the National Invasive Species Council on USACE Invasive Species expenditures.
- Provided technology transfer (reports, webinars, and training) to Corps Districts and Divisions on effective and environmentally sound management and prevention strategies against problem aquatic nuisance species.

DESCRIPTION OF WORK FOR FY 2017:

- Complete laboratory evaluations to assess the effects of submersed metals on swimming performance of sea lamprey.
- Complete field monitoring and laboratory studies to determine salinity responses to bighead and silver carp. Data will be used to establish persistence and growth of Asian carp in brackish ecosystems following USACE operations of water diversion studies as well as indicate the ability of Asian carp species to use estuarine systems as trans-coastal conduits for dispersal.
- Develop improved methods and procedures for accurately identifying and assessing USACE annual invasive species expenditures for required reporting to the National Invasive Species Council.

DESCRIPTION OF WORK FOR FY 2018:

- Complete field studies to monitor and determine longevity and fecundity estimates for Asian carp populations. Data will be used to re-parameterize and improve existing population models for assessing Asian carp impacts to aquatic ecosystems.
- Complete field studies to evaluate the performance of deployed traps and barriers retrofitted with submersed metals to prevent passage of sea lamprey.
- Evaluate the efficacy of deployed complex noise systems for reducing passage of invasive fish species through USACE lock operations.
- Investigate effective control strategies for reducing Asian clam populations in western waterbodies.
- Complete annual reporting requirements to the National Invasive Species Council on USACE Invasive Species expenditures.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Asset Management/Facilities and Equipment Management 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$10,000,000 2/	\$10,055,794 2/	\$7,142,000	\$3,250,000 3/	\$3,650,000

1/ The costs of this activity are accounted for and evenly divided between the Navigation, Flood and Coastal Storm Damage Reduction, and Hydropower business lines.

2/ Prior to FY 2016, this remaining item was used to source the Civil Works Water Management System, which is now funded as a separate line item.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$3,627,000, including \$1,473,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The Corps of Engineers is responsible for managing a portfolio of water resources infrastructure consisting thousands of projects with assets valued at over 265 billion dollars in replacement value. This diverse infrastructure provides a broad range of critical services supporting the Nation’s economy, security, and quality of life. As the service life of these assets continues to extend, it is imperative to develop an integrated national strategic plan for managing them through a lifecycle portfolio analysis to improve reliability, minimize risk, and meet the current and projected needs of the Nation. These assets and projects must also be analyzed through a comprehensive systems approach to ensure Corps projects work together and with non-Corps projects or assets to deliver planned benefits.

Lifecycle Portfolio Management (LCPM) is emphasized in the Civil Works Strategic Plan and the USACE Campaign Plan as a required key enabler to achieving Integrated Water Resource Management. Its goal is the development of an enterprise lifecycle strategy to create, sustain, or increase the delivery of national benefits from Civil Works water resources. Effective LCPM mandates the use of a system view across the Civil Works enterprise, using risk as a common measure to inform investment decisions during the entire lifecycle of Civil Works projects, including inception, significant lifecycle decision points, and ultimately disposition.

Asset Management (AM). AM concepts, tools, and processes support LCPM by focusing on the performance of new and existing CW infrastructure through maintenance management, operational condition assessments, operational risk assessment, and investment prioritization; as well as the associated tools & processes applicable to each. This mandates a broader view than focusing individually on real property, personal property, installations, or facilities; and in fact includes all of those along with other organizational assets. Effective AM is designed to:

- Provide a framework for enterprise-level strategic planning, design, construction, operations, maintenance, recapitalization and disposition decision-making
- Utilize quantitative information to develop defensible budgets
- Right-size asset inventory by fully considering life cycle benefits, risks, and consequences of failure within a system of assets and projects
- Help identify alternative capital investment strategies and quantify corresponding risks

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Asset Management/Facilities and Equip Maint

- Help USACE Civil Works improve reliability, minimize risk, and meet projected infrastructure demands
- Formalize business processes that standardize best practices, promote accountability, and predict work requirements
- Help USACE Civil Works optimize resource decisions based on what is best for the nation
- Enable USACE Civil Works to communicate asset inventory and risk-based assessments to external stakeholders and decision makers
- Formalize AM data requirements as part of a unified lifecycle data management plan to enable the flow of relevant technical information using geospatial engineering technologies (e.g. GIS, BIM) from other phases of a project's life cycle

Critical Infrastructure Cyber Security Center of Expertise (CICSCX). The CICSCX provides critical support for Industrial control system (ICS) security to each USACE Division/District in CONUS. The CICSCX serves as the premier organization within USACE for all matters related to ICS cybersecurity in Civil Works (CW). The CICSCX was established in October 2013 as a regional center to provide services related to the cybersecurity of ICS within the Southwestern Division. The role of the CICSCX has evolved and the center is now providing critical support for ICS security to each USACE Division in CONUS. During FY15 and FY16, the CICSCX provided cybersecurity services to projects in LRD, MVD, NWD, SAD, SPD, NAD, and SWD. Services ranged from providing assistance with documentation preparation in support of DIACAP certification efforts to serving as the lead organization responsible for complete system certification and accreditation. The CICSCX has taken a proactive approach as the DoD transforms the traditional Certification and Accreditation (C&A) process (DIACAP) into the six-step RMF, and center personnel will continue developing the processes and procedures necessary to ensure proper and consistent application of the revised standards across CW ICS.

ACCOMPLISHMENTS IN FY 2016:

ASSET MANAGEMENT

1. Completed Asset Management Portfolio Analytics (AMPA) initial implementation of AMPA tool in support of FY17 budget development for Hydropower, Flood Risk Management (FRM), and Navigation.
2. Completed system-wide demonstrations of Lifecycle Portfolio Management (LCPM) tools and processes on selected watersheds in Mississippi Valley Division (MVD), Great Lakes and Ohio River Division (LRD), and Southwestern Division (SWD) and incorporated findings to refine investment strategies for budget development.
3. Continued completion of condition assessments for Corps assets.
4. Continued development of baseline operational condition and risk assessments for FRM, Coastal navigation structures, Navigation channels, Hydropower, Recreation, and Environmental Stewardship.
5. Continued to train Major Subordinate Command (MSC) teams and implement maintenance management, condition and risk assessment, and consequence methodologies across portfolio of infrastructure assets which will feed future budget work packages.
6. Integrated LCPM results to date from Maintenance Management Improvement Plan, Operational Condition and Operational Risk Assessments, and Asset Management Portfolio Analytics for USACE infrastructure into FY17 Budget Guidance.

CIVIL WORKS CYBER SECURITY CONTROL SYSTEMS

1. During FY16, the Critical Infrastructure Cyber Security Center of Expertise (CICSCX) provided cybersecurity services to projects in LRD, MVD, Northwestern Division (NWD), South Atlantic Division (SAD), South Pacific Division (SPD), North Atlantic Division (NAD), and SWD. Services ranged from providing assistance with documentation preparation in support of DoD Information Assurance Certification and

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Asset Management/Facilities and Equip Maint

Accreditation Process (DIACAP) certification efforts to serving as the lead organization responsible for migration methodology for moving to the Risk Management Framework (RMF).

2. To this end, CICSCX conducted a mock Risk Management Framework (RMF) audit of the National Supervisory Control And Data Acquisition (SCADA) Test Lab in cooperation with both of the Security Controls Assessors-Validators that will assess security status of control systems within the U.S. Army Corps of Engineers (USACE). This was completed to ensure consistency in validation approach and gain consensus on the means and methods that will be utilized to transition to the RMF Assessment and Authorization Process. RMF Authorization activities have been initiated and completed for multiple projects in SWD, MVD, SAD, and LRD.
3. CICSCX developed the Physical Security Minimum Standards for facilities that contain cyber assets. The CICSCX has begun to foster a closer relationship with the Office of the Secretary of Defense (OSD) in all matters related to RMF for control systems. Sample architectures of typical of systems deployed in USACE were provided to the OSD for inclusion in the RMF Knowledge Service (KS), and the Center also provided tools developed for data collection on control systems to the OSD for review and possible inclusion on the RMF KS.
4. The Center began developing a standardized risk assessment methodology in coordination with the Critical Infrastructure Protection & Resilience program based on the Common Risk Model for Dams (CRM-D) risk methodology. The CRM-D Cyber Risk Module became available for use in FY 16. Members of the CICSCX participated in the JBASICS (Joint Base Architecture for Secure Industrial Control Systems) testing of the Advanced Cyber Industrial Control System Tactics, Techniques, and Procedures (ACI TTP) for Department of Defense (DoD) Industrial Control Systems (ICS) for securing industrial control systems across DoD. The TTP was released for implementation in January, 2016.
5. In FY16, the CICSCX began a joint project with the 154/156 Cyber Protection Teams (CPTs) for developing, testing, and commissioning a Network Monitoring System (NMS) that could detect adversarial presence on networks utilized for the control and monitoring of Hydropower Generation and Delivery Equipment across the organization. The initial and second NMS deployments were completed in February. Additional deployments are planned. The CICSCX is also working closely with the Electronic Security Systems (ESS) Technical Center of Expertise (TCX) at US Army Support Center at Huntsville (HNC) to ensure consistent application of RMF requirements for electronic security and surveillance systems that will be deployed at Civil Works (CW) project sites.
6. In FY16, the CICSCX led efforts to ensure all Civil Works control systems that are reportable under the Federal Information Security Management Act (FISMA) were operating with a current Authority to Operate (ATO).
7. The final analysis of the Civil Works control system inventory refresh established in Daily Tasking Order (DTO) 16-08-23 Annex A and Annex B was completed in FY 16. Currently there are 71 infrastructure control systems identified by the CW inventory results over the seven CONUS Divisions, 31 of those systems are currently registered in the Army Portfolio Management System (APMS).

DESCRIPTION OF WORK FOR FY 2017:

ASSET MANAGEMENT

1. Completing Maintenance Management Improvement Plan (MMIP) implementation of Phase 3 – Work Orders/Work Flow, including development of training and education support; developing Material Management strategy and developing implementation guidance in support of MMIP.
2. Initiating 7 Alternative Financing Demonstration Projects.
3. Developing a draft P3/P4 Program and policy framework.
4. Issuing new guidance towards accelerating Contributed Funds agreements.

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5. Initiating analysis of portfolio for potential divestiture options and identifying and funding 5 initial divestiture projects.
6. Continuing completion of condition assessments for Corps assets.
7. Continuing data QA/QC in the real property information database and system to meet annual FRPP requirements.
8. Continuing development of baseline operational condition and risk assessments for FRM, Coastal navigation structures, Navigation channels, Hydropower, Recreation, and Environmental Stewardship.
9. Continuing to train MSC teams and implement maintenance management, condition and risk assessment, and consequence methodologies across portfolio of infrastructure assets which will feed future budget work packages.
10. Integrating LCPM results to date from Maintenance Management Improvement Plan, Operational Condition and Operational Risk Assessments, and Asset Management Portfolio Analytics for USACE infrastructure into FY18 Budget Guidance.
11. Completing the initial development of the STAC/CLOS (O&M 20/20) concept.
12. Delivering 45-Day P3 Report to Congress (Omnibus Bill).

CIVIL WORKS CYBER SECURITY CONTROL SYSTEMS

1. RMF Authorization activities have been initiated and completed for additional multiple projects in SWD, MVD, SAD, and LRD during FY 17.
2. The CICSCX continues to work closely with the OSD in all matters related to RMF for control systems.
3. The Center began implementing the standardized risk assessment methodology in coordination with the Critical Infrastructure Protection & Resilience program based on the Common Risk Model for Dams (CRM-D) risk methodology. The CICSCX continued the joint project with the 154 CPT for testing, and commissioning the Network Monitoring System that could detect adversarial presence on networks utilized for the control and monitoring of Hydropower Generation and Delivery Equipment across the organization. This is currently operating on Tulsa Hydropower Control System, Omaha Hydropower Control System, and Little Rock Hydropower Control System. Additional deployments are currently planned in Fort Worth Hydropower.
4. The CICSCX is working closely with the ICS TCX and ESS TCX at HNC to ensure consistent application of RMF requirements for electronic security and surveillance systems and other facility-related systems that will be deployed at CW project sites.
5. The CICSCX authored DTO 17-05-23 which captures all data on electronic metering systems in operation within USACE.
6. CICSCX implemented the physical security test bed in the National Supervisory Control And Data Acquisition (SCADA) Test Lab. The Center continues to build the Lab's capabilities to meet the security needs of USACE control systems.

DESCRIPTIONS OF WORK AND JUSTIFICATIONS FOR FY 2018:

LCPM Activities:

1. Continue implementation of Maintenance Management Improvement Plan including continued development of FEM in support of this, and methods for identification of key components for project or system maintenance and/or replacement based on risk reduction strategies.
2. Complete refinement of operational condition and risk assessments for all navigation assets, and continue development and implementation of operational condition and risk assessments for remaining Corps of Engineers infrastructure. Continue direct support of and alignment with O&M 20/20 and Budget Reformation efforts in accordance with the FY18-20 Budget Transformation Glide Path outline, including integration of risk-informed tools and processes with O&M budget development to improve both risk assessments and prioritization of investment choices. In conjunction with lifecycle portfolio management objectives, development of an overall assessment of current USACE water resources infrastructure portfolio to determine appropriate and effective

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divestiture strategies and potential streamlined procedures.

Cybersecurity CICSCX:

1. Conduct cybersecurity posture assessments of industrial control systems (ICS) including FISMA security reviews for systems currently in service which are utilized for the operation and monitoring of infrastructure at USACE CW projects nationwide, and the access control and surveillance systems utilized to monitor the same.
2. Support the development of specific engineered solutions to improve project readiness and reduce the probability of ICS compromise from the increasing cyber threats directed at hydropower, lock, dam, flood protection, water supply, and environmental infrastructure and assets.
3. Coordinate and conduct security risk assessments as required by the RMF utilizing the Cyber Risk Module of the Common Risk Model for Dams which integrates physical and cybersecurity and supports the evaluation of ICS cybersecurity readiness.
4. Utilize the results of the cybersecurity risk assessments to identify specific cybersecurity protective measures and/or enhancements to ensure the probability of system compromise is minimized.
5. Bench test newly released or modified network security appliances and associated software that have wide application potential and could possibly improve the security posture of the infrastructure control systems and facility-related control systems in service or in design at USACE projects.
6. Perform adequate operational verification in a test environment prior to deployment of the equipment.
7. Coordinate and cooperate with Army's 154/156 Cyber Protection Teams in development, installation, and commissioning of network monitoring and response infrastructure IAW OPORD 2015-366 (Building Fence) at hydropower generating stations across the organization. Additional deployments are currently planned, including Kansas City Hydropower.
8. Coordinate and collaborate with Office of Secretary of Defense and Army CIO/G6 in the means and methods to apply the Risk Management Framework for authorization of control systems controlling or monitoring critical infrastructure in the Civil Works portfolio.
9. Develop authorization supporting documentation that will be applied to systems across USACE as the transition to the DoD Information Assurance Risk Management Framework (DIARMF) process for system authorization is fully implemented.
10. Conduct assessments for system authorization under RMF and serve in the Security Controls Assessor – Validator (SCA-V) role when that role can be performed by the system-owning organization per Army guidance.
11. Provide guidance and assistance to all of CW with eMASS registration and each step of the RMF process; to provide national training opportunities for USACE personnel appointed to information assurance (IA) duties to obtain and maintain IA certification qualification standards as mandated by DoD and DA; to provide critical training to new personnel to develop the expertise necessary to support the cybersecurity mission across the organization, and to provide training for experienced personnel to ensure our organization stays abreast of changes in tactics and methodologies used by persons and organizations who might desire to conduct a cyber-attack against CW critical infrastructure.
12. Utilize the expertise and capability of the Information Assurance (IA) Division, U.S. Army School Cyber Leader College out of Fort Gordon to organize and conduct the training at a USACE facility to minimize the overall cost to the organization.
13. Perform duties as the cyber incident first responder for all USACE control systems. This role requires additional training and certifications for CICSCX personnel.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Civil Works Water Management System (CWMS), Institute for Water Resources – Flood and Coastal Storm Damage Reduction 1/ 2/

Total Estimated Federal Cost	Allocations Prior to FY 2015	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018	Balance to Complete after FY 2018
\$128,000,000 2/	\$26,842,812 2/	\$9,107,750 2/	\$14,850,000 2/	\$10,000,000 3/	\$10,000,000	\$57,199,438

1/ This activity is funded at 100 percent Federal expense.

2/ Prior to FY 2016, funding for the activities covered by this remaining item were sourced out of other programs, projects, and activities within the Civil Works program. An individual line item to capture the cost and improve the transparency of those costs was created in FY 2016.

3/The actual unobligated balance from FY 2016 into FY 2017 for this project is \$2,096,000, including \$1,766,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Various authorities including River and Harbors Act & Flood Control Act of 1948, Section 102 of the Rivers and Harbors Act of 1962, Section 216 of the River and Harbor and Flood Control Act of 1970, Section 731 of the Water Resources Development Act of 1986, Section 729 of the Water Resources Development Act of 1986, specific project and purpose authorizations, Executive Order 13653, and Executive Order 13514.

DESCRIPTION: CWMS models will be used by Corps water managers to achieve the authorized purposes on all Corps projects, which include flood control, hydropower, navigation, recreation, irrigation, water quality, water supply, and environmental restoration and stewardship. CWMS suite of models were used to produce inundation maps as well as provide consequence data (structures impacted, potential loss of life, damage values) for the December 2015/January 2016 flood for districts along the Mississippi River. Districts will continue to use CWMS models during future flood events should CWMS models exist in the basin experiencing flooding. The CWMS models will continue to be utilized in FY 2017 and beyond to support multiple Corps programs including Dam Safety, Levee Safety, Planning, USACE Operations Center/Flood Risk Management, and Critical Infrastructure Protection and Resilience program.

Incorporation of lessons learned and new information is crucial for an engineering organization that provides services whose performance can be tested by extreme events, such as floods, droughts, and coastal storms. The program objective is to improve the public safety and performance of USACE’s built infrastructure based on gaps, weaknesses and lessons learned from events including Hurricane Sandy, the 2012-13 drought, the greater Mississippi River Basin flood of 2011, the Nashville flood of 2010, and other extreme events dating back to Hurricane Katrina and its lessons learned efforts (the Interagency Performance Evaluation Taskforce – IPET, and the Hurricane Protection Decision Chronology- HPDC). An integrated, comprehensive, sustainable, and systems-based approach that places the highest priority on protection of public health and safety is the most effective way for USACE to provide safe, reliable projects with increased economic and environmental benefits.

Updating and improving methods to estimate, assess, manage, and communicate risk are critical to planning, design, operation, and management of water resources infrastructure to meet the Nation’s evolving needs. Recent extreme events have highlighted the need to implement state-of-

the-art systems-based watershed modeling consistently across the nation, to optimize operation of our reservoirs to maximize benefits, including flood risk management and public safety, water supply, navigation, recreation, irrigation, hydropower, ecosystem restoration and water quality. These extreme events also highlighted the need for enhanced interagency collaboration efforts such as those initiated under the Integrated Water Resources Science and Services (IWRSS) business model to improve real-time data sharing and development consistent national modeling and mapping capabilities such as those found in CWMS. Some of these capabilities included the importing of USGS ratings and time series directly into CWMS, many upgrades to the software that creates flood inundation maps, improvements to the precipitation visualization, estimation and forecasting tool HEC-MetVue or Meteorological Visualization, and improvements to report generation tools like REGI (Report Generation).

These tools will improve how the Corps performs its water management mission and assist in sharing data, models, and computational results across agencies. Perhaps more importantly, this effort will support the Corps Civil Works Transformation by moving from an individual project and business line investment plan to a systems-oriented approach with collaboration of multiple USACE programs. This effort benefits planning modernization, methods of delivery, budget development and infrastructure strategy. The CWMS models created in FY 2016 continue to support multiple Corps programs including Dam Safety, Levee Safety, Planning, USACE Operations Center/Flood Risk Management, and Critical Infrastructure Protection and Resilience. The planning community has utilized CWMS models for several feasibility study efforts and expects to continue doing so. Districts have used the suite of CWMS models during flood events and the Dam and Levee Safety community has used CWMS models for numerous dam break models, multiple Semi-Quantitative Risk Assessments, and a number of Issue Evaluation Studies.

ACCOMPLISHMENTS IN FY 2016: CWMS suites of models were completed for 16 basins where the Corps has water management responsibilities. An additional 37 basins will be started in FY 2016; due to size and complexity, all of these basins will be completed in FY 2017. At the end of FY 2016, 71 of the 201 basins will be implemented. 173 USACE personnel from 31 of the 36 USACE offices have been trained and are assisting with the CWMS national implementation. CWMS models were used by Corps water managers achieve authorized purposes on Corps projects, which include flood control, hydropower, navigation, recreation, irrigation, water quality, water supply, and environmental restoration and stewardship. CWMS suite of models were used to produce inundation maps for the March 2016 flood event in Texas. With all basins completed through FY 2015, 35% of the total USACE land area has been modeled, 49% of the USACE river miles have been modeled, and 57% of the USACE reservoirs modeled.

DESCRIPTIONS OF WORK FOR FY 2017: Funds are being used to continue to the nationwide CWMS modeling effort to enhance the operational decision making for floods, droughts, operations planning and real-time operations. This will include developing the hydrologic and hydraulic models required for a watershed approach to effectively meet authorized purposes. Data collection, data dissemination, and modeling and analysis capabilities will be addressed on a national level. Funds from this account will be used to complete 27 of the 37 basins started in FY 2016 as well as begin 6 new basins in FY 2017. The other 10 basins under development in FY 2016 will continue in FY 2017 and finish in early FY 2018. At the end of FY 2017, 98 of the 201 basins will be implemented. CWMS suite of models were used to produce inundation maps for the October 2016 flood event in North and South Carolina due to Hurricane Matthew. This work also included providing consequence data (structures impacted, potential loss of life, and damage values) for the flooded areas. In addition, the funding will be used to help establish continuity of operations capabilities that fully support the water management mission and complies with US Army Corps of Engineers and Department of Defense Corporate Information Assurance and Security requirements. With all basins completed through FY 2016, 56% of the total USACE land area has been modeled, 70% of the USACE river miles have been modeled, and 71% of the USACE reservoirs modeled.

DESCRIPTIONS OF WORK FOR FY 2018: Funds will be used to carry out a concentrated program to enhance the operational decision making for floods, droughts, operations planning and real-time operations. This will advance the implementation of the Corps Water Management System

(CWMS) nationwide, including developing the hydrologic and hydraulic models required for a watershed approach to effectively meet authorized purposes. Data collection, data dissemination, and modeling and analysis capabilities will be addressed on a national level. Funds from this account will be targeted for the most critical watersheds that have not yet moved into the CWMS environment. The 10 basins being modeled at the end of FY 2017 will be completed in FY 2018. There will also be a minimum of 20 new basins funded for implementation in FY 2018. In addition, the funding will be used to help establish a National Enterprise Water Management System with continuity of operations capabilities that fully supports the water management mission and complies with US Army Corps of Engineers and Department of Defense Corporate Information Assurance and Security requirements.

APPROPRIATION TITLE: Operation & Maintenance, Fiscal Year 2018

Coastal Data Information Program (CDIP), Engineer Research and Development Center 1/ 2/ 3/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$4,950,000	\$5,346,000	\$5,346,000	\$6,000,000 4/	\$2,500,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for in the Flood and Coastal Storm Damage Reduction and Navigation business lines.

3/ This program has also been budgeted under the title Coastal Ocean Data System (CODS).

4/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$203,000, including \$93,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Authorization for the Corps of Engineers Engineer Research and Development Center (ERDC) to collect coastal field data is 33 USC 426a which originated with the River and Harbor Act of 1945, which originated in the River and Harbor Act of 1930. The latest Engineering Regulation governing the program is ER 1110-2-1406 dated 1990.

DESCRIPTION: The over-arching objective of the CDIP is to provide high-quality long-term coastal wave information along with storm-event data nationwide, to develop and provide tools for using wave and other data for managing coastal sediment, and to support sustainable coastal and navigation projects under a changing climate.

Ocean observations are used to validate numerical hindcast models that calculate wave information over 30 to 50 year periods on the Atlantic & Pacific coasts, Gulf of Mexico and Great Lakes. This wave climate information is combined with storm wave information producing validated long-term and storm waves that drive our next generation risk-based coastal models.

Ocean waves deliver energy to the coast and impact Corps projects and operations. Wave information is imperative for products for operational guidance of USACE dredging, navigation, maintenance, and emergency operations. Wave observations are used in the development and validation of new hindcast wave models and for storm analysis and new wave products are transforming how the Corps, other Federal Agencies, States, Academia, Public, and the Nation use and access accurate wave information. High quality wave information is required for the design of storm protection and navigation projects; to implement Regional Sediment Management (RSM) strategies; and as boundary conditions for all coastal modeling. Inaccurate and insufficient coastal wave data can result in project operation and design uncertainty. Long-term (multiple decades) wave and storm information are also required to determine how climatic changes and extreme events will impact Corps' facilities, projects and mission operations.

Because of the Corps interest and expertise in waves, this program has been involved in the global effort to test and evaluate various wave-measuring systems. Evidence indicates that differences in the quality of wave parameters depend on the platform/sensor combination being used, with the potential that during extreme storm scenarios, there could be as much as a 50% over-estimation in the significant wave height from

commonly used platforms. This activity is guided under the international Intergovernmental Oceanographic Commission (of UNESCO), and the World Meteorological Organization.

Coastal Data Information Program activities include: 1) Wave Observations, 2) Wave Information Studies, 3) Comprehensive storm-event data sets, and 4) Participation in the Integrated Ocean Observing System (IOOS).

Wave Observations: Observation efforts are conducted in partnership with the NOAA National Data Buoy Center (NDBC, www.ndbc.noaa.gov) and through the state of California, the Scripps Institution of Oceanography that maintains a network of shallow-water coastal gauges under their Coastal Data Information Program (CDIP, <http://cdip.ucsd.edu>). These observations are high resolution and of appropriate accuracy for use in Corps wave information hindcast efforts for validation. The data are automatically provided to national data servers of NOAA and are publically available. The popularity of the program is evident from the usage statistics, daily hits averaged 330,000 (2015) and increased significantly during El Nino (415,000) with an average data download of 15 gigabytes per day. While CDIP observations have been concentrated in California, recent additions have expanded the coverage nationally including locations relative to major US ports. Much of the recent CDIP expansion has occurred through collaborating with the regional associations of IOOS, where they purchase, deploy, and maintain a buoy, leveraging the Corps investment. In 2009, the Interagency Ocean Observation Committee (IOOC) finalized the first National Operational Wave Observation Plan developed by the USACE in collaboration with the NOAA IOOS program office. This was a science-based assessment of the nation's wave observation requirements that identified observation gaps and for the first time, defined a measurement accuracy requirement sufficient to satisfy the directional resolution required by the Corps and others. The plan has already led to national improvements. An update to the Plan was completed in FY16 and is a milestone requirement of the National Ocean Policy (NOP). The update includes a re-assessment of the number, location, and priority for new locations; tighter integration between wave observations and wave modeling; and strategic recommendations for new products to meet national needs for wave information.

Wave Information Studies. The objective of the Wave Information Studies is to provide high-quality coastal wave information, wave analysis products, and decision tools nationwide. The focus is to integrate measurements with model results so that the Corps has access to all available wave information (real-time observations, model hindcasts, and long-term archives) to perform their mission. Wave hindcasts use high quality wind fields and the latest wave modeling technology. To satisfy the Corps requirement for risk-based designs, at least 20-30 years of continuous wave climatology data are required. Hindcast datasets provide hourly wave information for locations every few miles along the coast. Because of this coverage, the Corps, the coastal engineering community, and the public for coastal studies routinely use these datasets. The long-term hindcast wave data are accessible through a website that receives over 16,000 monthly requests for data downloads. Available observations are used to confirm and validate the hindcast/model data, for quantifying actual conditions, and for understanding long-term wave climatology. Under this activity, wave data users are able to access either hindcast or observed wave data transparently and select powerful analysis products and tools for wave climate and extreme event planning and for decision making using either observations or model estimates, or both.

Storm Event Data Sets. Corps project designs require estimates of the extreme conditions that define and quantify an acceptable level of risk. Because project life cycles can be 50-100 years, it is desirable to extend the extreme event climatologies to be as long as possible, much longer than the maximum wave observation record, which is only ~35 years. This also suggests going back in time, defining extreme events (meteorological, and/or hydrodynamic), develop the wind forcing, and perform wave hindcasts. The wave climatology (similar to that now used by FEMA) based on storm events could be extended over possibly 60 to 70 years. Storm event data of interest besides waves include storm track, wind fields, atmospheric pressure, surge levels, wave run up and beach/channel response.

The Integrated Ocean Observing System Participation: CDIP observations are a Corps contribution to the Integrated Ocean Observing System (IOOS). They support the Coastal Hazards topic under the National Ocean Policy. IOOS is an interagency activity with NOAA as the lead agency. Participating agencies pool, share and coordinate their ocean observations for the benefit of all. To facilitate this coordination, the Corps participates in IOOS workshops, regional associations, and meetings. The Corps has also established a liaison with the IOOS program office.

DESCRIPTION OF WORK FOR FY 2017:

- Continue to support the activities of IOOS by participating in the Interagency Ocean Observation Committee (IOOC). Promote the involvement of USACE District and Division offices in their local IOOS regional associations through meetings and workshops. Continue to serve on the IOOS Quality Assurance or Real-time Oceanographic Data (QUARTOD) Board of Advisors and other IOOS Committees.
- Continue support of the directional wave measurements presently conducted by the NOAA NDBC program and the Scripps Institution of Oceanography (SIO) under CDIP. Continue intra-measurement evaluations conducted under the Joint Oceanographic Commission of Oceanography and Marine Meteorology (JCOMM).
- Update the WIS Hindcast for all domains (Atlantic, Pacific, Gulf of Mexico, Great Lakes) through the calendar year 2016. Revise the Western Alaska Hindcast (1980-2014) increasing the model's directional resolution and incorporating mean daily ice concentration fields. Implement improvements to WIS evaluation including satellite-based altimeter and scatterometer estimates compare to model estimates. Investigate interrogation of far-field storm estimates impacting coastal wave values. Complete extreme storm analysis for the Atlantic and Gulf of Mexico from 1900 through 2015.
- Complete evaluation of the FLOSSIE intra-measurement experiment in Monterey Bay - experiment measured response of different buoys and sensor packages to optimize spectral data capabilities. Incorporate results to WaveEval Tools (spectral analysis methods investigating differences in various wave measurement systems). Conduct evaluation of ultra-high resolution remote sensing technologies for wave estimates in the Great Lakes.
- Continue Nearshore Berm Experiment at the Field Research Facility (FRF) to investigate the fate of dredged sediment placed in the nearshore. The multiple investigator research experiment evaluated problems associated with dredging and placement of mixed grain size sediments including; 1) fines in the water column which attenuate remote sensing signals thereby obscuring measurements and information needed for civil and military interests, 2) dredging plumes that are perceived to be hazardous to fauna, particularly hard-bottom environments, and 3) beach fill composed of mixed sand and silts which often requires substantial approval and incurs commensurate costs.
- Continue to populate model and measurement databases to CSTORM-DB.
- Continue development of the Corps Navigation and Coastal Databank and data integration framework to ensure Corps data are available to the coastal community.
- Continue development of coastal model test-bed at the Field Research Facility. Model test-bed allow operation of numerical models in real-time providing standardization of model validation and verification and promoting implementation of data assimilation in model development. Development of the model test-bed allows for the analysis of error and uncertainty associated with coastal numerical models, development of

numerical code consistent with the controlling physical processes, and data assimilation to improve model initiation and reliability.

- Continue to utilize Coastal Lidar and Radar Imaging System (CLARIS), a mobile vehicle from which terrestrial lidar and X-Band radar data can be collected to evaluate extra-tropical storm response at the Field Research Facility. Daily surveys were conducted during storm events along a 20 km study site for continuous monitoring to build data sets that can be used to test and improve storm erosion metrics as well as test numerical model skill at predicting alongshore variations in inundation and erosion.
- Continue evaluation of the Field research Facility Dune Lidar Scanner for observations on the water surface. Analyzed the inner-shore zone wave processes and beach response under a wide variety of environmental conditions. Improved the existing data processing workflow to incorporate QA/QC metrics and incorporate filtering/classification.
- Continue development of a multi-sensor approach for estimation of water quality parameters and depths in optically deep estuarine waters of the Currituck Sound. Whereas remote sensing technology can provide direct benefits for water quality monitoring, optically complex waters have proven to be a challenge with regards to establishing robust relationships between in-situ data and imagery-derived parameters. The FRF's location on the Currituck Sound offers a unique test-bed for a multi-sensor approach with repeated observations of water quality in optically complex estuarine waters. As part of the effort, a hyperspectral camera was tower-mounted over the study area to acquire near-continual imagery.

DESCRIPTION OF WORK FOR FY 2018:

- Continue to support the activities of IOOS by participating in the Interagency Ocean Observation Committee (IOOC). Promote the involvement of USACE District and Division offices in their local IOOS regional associations through meetings and workshops. Continue to serve on the IOOS Quality Assurance or Real-time Oceanographic Data (QUARTOD) Board of Advisors and other IOOS Committees.
- Continue support of the directional wave measurements presently conducted by the NOAA NDBC program and the Scripps Institution of Oceanography (SIO) under CDIP. Continue intra-measurement evaluations conducted under the Joint Oceanographic Commission of Oceanography and Marine Meteorology (JCOMM). Continue monitoring sand level changes on several southern California beaches to evaluate response to variable wave conditions. These observations, and long term observations at the Field Research Facility in Duck, NC are being used in the development of coastal process models.
- Update the WIS Hindcast for all domains (Atlantic, Pacific, Gulf of Mexico, Great Lakes) through the calendar year 2017. Update WIS data management and delivery system – current website is over 10 years old and experiences up to 1 million visits per year downloading 16,000 files per month. Processing algorithms will be migrate from Matlab code to python to reduce software costs. Improved interoperability through refined graphical displays and data download capabilities will facilitate increased utility of WIS data for USACE district engineers.
- Results from the FLOSSIE intra-measurement experiment in Monterey Bay (the experiment measured response of different buoys and sensor packages to optimize spectral data capabilities) will be used to determine the quality of the past three decades of NOAA's NDBC 6N (NOMAD) buoy data. These 6N buoy systems are generally deployed in deep water and are the basis of altimeter algorithms to estimate wave height from satellite data. Updated WaveEval Tools will be used for rigorous spectral analysis evaluation of historical data.

APPROPRIATION TITLE: Operations & Maintenance, Fiscal Year 2018

Coastal Inlets Research Program, Engineer Research and Development Center – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$574,000	\$946,000	\$3,173,000	\$2,700,000 2/	\$2,700,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$30,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Authorization for the Corps of Engineers' Engineer Research and Development Center (ERDC) to conduct research and development is codified in 10 U.S.C. 2358: "The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development."

DESCRIPTION: The Corps operates and maintains more than 1000 coastal navigation projects that cover 13,000 miles of coastal navigation channels, with a limited O&M budget. Coastal inlet navigation channels must be maintained in a complex environment of waves, tidal and wave-induced currents, sediment transport, and vessel-induced flow and wake. In FY 2014, the Corps spent approximately \$734 million in maintenance dredging of 142 million cubic yards from Federal navigation channels, and an additional \$450 million for supplemental and emergency dredging of 27 million cubic yards. Adjusted for inflation, dredging costs have increased approximately \$5.9 million/year (from \$1.53 to \$2.97 per cubic yard) from FY 1963 through FY 2012. Dredging costs are likely to increase in the future because of increasing fuel, mobilization, and demobilization expenses. Additionally, to remain competitive, harbors and ports must deepen and widen navigation channels to accommodate larger vessels as required for New Panamax vessels; however, deeper and wider channels are more efficient sediment traps, therefore increasing shoaling and O&M costs. Modifications to coastal inlet channels and jetties can have a profound effect on the integrity of the navigation structures, adjacent beaches, estuaries, ecosystems and regions. Demand for regional sediment management practices and mitigation for engineering activities include innovative projects such as creation of nearshore berms with dredged sediment intended as a source to nourish neighboring beaches. Renewable, cost-effective placement sites for dredging must also be designed such that sand moves onshore, fine sediments are dispersed offshore, and re-deposition into the navigation channel is minimized. Such projects require characterization of hydrodynamics, wave forcing, sediment transport, and morphology change, as well as geomorphologic approaches. Thus, navigation project O&M, structure integrity and implications of ongoing and future dredging actions must be considered within a sediment-sharing system including the inlet, navigation channels, structures, and adjacent beaches. The Corps needs to advance knowledge and tools to better predict future channel shoaling, and to make transparent and uniform decisions on prioritization of funding. This applied research and development is necessary to provide quantitative and practical predictive tools and data to reduce the cost of dredging for Federal navigation projects, maintain jetties, identify potential unintended consequences, mitigate for engineering activities related to navigation channels, prioritize maintenance options within budget constraints and support national security to protect waterways and ports. The Coastal Inlets Research Program provides tools to engineers and decision makers for developing resilient solutions and practices to reduce the cost of maintenance and operation of Federal navigation projects.

ACCOMPLISHMENTS IN FY 2016:

Structures and Navigation Focus Area

- **Identified Critical Dredging Needs in Navigation Portfolio (Addresses Statement of Need (SoN) 2009-N-8).** With the Channel Portfolio Tool (CPT), identified critical dredging needs for deep-draft navigation channels within the USACE navigation portfolio. Used the channel condition data and shoaling forecast capabilities completed during FY15, populated the full national portfolio of deep-draft navigation channels, and completed a national picture of critical dredging needs at large and mid-sized commercial ports.
- **Incorporated CPT Dredging Work Package Formulator within FY16 USACE Navigation Budgeting (SoN 2009-N-8).** In tandem with the Asset Management initiative, formally included the CPT Dredging Work Package formulator within the USACE Navigation budgeting process via guidance published in the annual Budget Engineering Circular.
- **Developed Advanced Waterborne Fluidity Metrics (SoN 2012-N-5).** Used travel time and vessel wait time data for deep-draft entrance channels provide by the Automated Information System (AIS) Analysis Package (AISAP), developed advanced waterborne freight fluidity metrics that incorporate annual tonnage throughput rates (as \$-value of cargo) for major commodity groupings.
- **Established Guidance and Best Practices for Efficiency of Deep-Draft Channels.** Compared deep- draft entrance channels nationally in terms of the efficiency with which waterborne freight (imports, exports, and domestic shipments) moves through the marine transportation system. Used knowledge gained, established guidance, and recommended best practices for deep-draft navigation channel maintenance dredging and maintenance of coastal jetties and breakwaters.
- **Continued Analysis of Effects of Relative Sea Level Change (RSLC) on Five High-Use Navigation Systems (SoN 2013-N-11).** Continued analyses initiated in FY15 analyzing the effects of RSLC on navigation channel infilling for five of the high-use (>10M tons annually) navigation systems in the Nation. Estimated adjacent beach erosion, changes in tidal prism, and navigation channel shoaling with the Coastal Modeling System (CMS), and compared results with depth-utilization profiles of the corresponding deep-draft navigation channels in order to determine potential impacts on commercial shipping.
- **Updated the Coastal Structure Management, Analysis, and Ranking Tool (CSMART).** Continued populating datasets relating to commercial shipping, commercial fishing, US Coast Guard Incident reports, cruise and ferry data, and structure condition ratings, to keep CSMART output current and timely. Wherever practical, incorporated new datasets (e.g. vessel counts from AIS, Census figures, recreational fishing, etc.) to serve as proxy metrics for the socio-economic significance of coastal jetty and breakwater structures in supporting resilient coastal communities.
- **Developed a Coastal Inlet Navigation Vessel Behavior Atlas (2012-N-5).** Developed a coastal inlets navigation atlas that provides detailed statistical profiles of vessel movement patterns within high-use coastal channels, based on aggregated datasets compiled from the AIS vessel position reports archive. Atlas includes information on the influence of tidal elevations on the timing of vessel transits, as well as observations of vessel behavior (e.g. speeds, headings, course over ground, etc.) during periods of high wind, waves, and current profiles. Any observed seasonal changes in track headings, traffic lane orientation, or changes in course due to the formation of channel obstructions are also included.

- **Incorporated Vegetation Effects on Wave Propagation (SoN 2014-N-12).** Incorporated and validated vegetation effects on wave propagation in CMS-Wave, a wave model in Coastal Modeling System (CMS). Vegetation effects for Natural and Nature-based Features (NNBF) are included in the reduction of waves and storm surges in coastal areas. Model wave damping effects as a function of water level, wave height and period, and vegetation characteristics. Quantified and documented the protective sheltering effects of islands and emergent NNBF in regional wave predictions in guidance documents.
- **Implemented Design Procedures for Navigation Structures in Wave Models.** Included methods and engineering guidelines in wave models to optimize performance and design of navigation structures. Provided additional capabilities for design of structures to protect navigation channels, inlets, harbors, and adjacent beaches. Summarized advancements in guidance documents.
- **Developed Web-based Metocean Data Access, Processing and Analysis Tools (SoN 2013-N-22).** Developed, tested, and released two web-based metocean data tools, WaveNet and TideNet, for District applications. These tools, using the web- and GIS-technologies with custom-developed engineering analyses and statistical models, allow USACE Districts to access available winds, waves, water levels, tides, and currents from different data sources seamlessly. Tools facilitate selection, formatting, and analyses of data for use in District projects and numerical models. Accomplished technical transfer via CHETNs, DOTS trainings, and webinars.
- **Developed and enhanced capabilities of CIRP wave models for West Coast Applications (SoN 2015-N-35, 2009-N-5).** Used existing field data and evaluated skills of CIRP wave models for wave processes common to applications in West Coast, Pacific Islands, and Alaska. Validated models with recent field data near and at inlets and ports, and investigated impacts of multi-directional wind-waves and long-period infra-gravity waves on harbor surges, navigation, reefs, and structural design in District projects. Incorporated combined forcings of the short-period seas and swells in models to quantify their impacts on navigation safety, harbor surges, ship transits, moorings, and infrastructure design and maintenance. Documented findings in technical guidance.

Sediment Management Focus Area

- **Designed placement of a Full-Scale Nearshore Berm composed of Mixed-Sized Sediments (SoN 2011-N-15).** The majority of sediment dredged in the USACE is of mixed sand-silt-clay composition. Predicting transport of these mixed-sediments is an active area of research, and of keen interest to resource agencies that often restrict placement of dredged material in the nearshore. Nearshore berms are created through placement of sediment in the nearshore and are desirable to keep sand in the littoral system and facilitate “engineering with nature” to sort fines offshore and transport coarser sand to the nearshore. However, there is little guidance to design and evaluate the spatial and temporal characteristics of nearshore berm migration, and resource agencies are not allowing placement because of concerns of dispersion of fines during and following placement. Completed the design for the placement and monitoring of a large-scale berm. The plan includes monitoring through the placement process and subsequent evolution to develop logistical and design guidance. The study will monitor evolution of the morphologic feature, dispersion of fines and coarser sediments, and evaluate dredging and placement implications on submerged aquatic habitat. The experiment will support a growing area of research in utilizing known metrics of the dredge’s operations as a means of changing the ultimate sediment grain size distribution at its final placement location. Universities, USACE districts, and research agencies will collaborate in support of this large-scale berm study.

- **Documented Nearshore Berm Data Sets (SoN 2011-N-15).** Data sets are necessary for developing theoretical and empirical relationships for the evaluation of nearshore placement tools, numerical and physical models. The data sets are also required for validation of such tools. A database including nearshore berm sediment information, wave and current information and local bathymetry in the region of a nearshore placement site is needed to evaluate and validate guidance. Five such sites were identified as quality and complete data sets. These data were prepared in a uniform database to allow multiple researchers to gain easy access to numerous nearshore placement data sets and to reduce duplication of effort and inconsistencies of data applications.
- **Documented Nearshore Berm Literature Review.** Published a comprehensive review of the documents that discuss Nearshore Berm studies. The review included theoretical studies and equation development that relate to nearshore berms, numerical models and physical models that studies that evaluate nearshore berms, and field monitoring studies that document nearshore berms.
- **Modeled Cross-shore Berm Migration.** Evaluated the capacity for numerical models to predict the cross-shore evolution of nearshore berms by application of existing wave asymmetry and wave undertow algorithms. This study focused on seasonal transformation of sandbars, beach berms, and dunes (winter loss and summer recovery). Field data included Ocean Beach, CA and CIRP nearshore berm monitoring sites in Perdido Key and Ft. Myers Beach, FL, as well as other quality berm data sets.
- **Released Version 3 of the Regional Shoreline and Inlet Sand Sharing Model, GenCade (SoN 2008-N-6).** Released Version 3 of the regional shoreline and inlet shoal evolution model, GenCade with upgraded channel infilling and transport relationship enhancements. Documented application in wiki User's Guide. Released Technical Reports describing the integration of GenCade with an external wave model (CMS-Wave) and the recommended calibration procedure. Parameter estimation and uncertainty analysis were conducted and results are documented in a Technical Note. Conduct a webinar short-course to transfer recent upgrades.
- **Developed a model focusing on the improving the widening and closing mechanisms of breaching (SoN 2014-N-14).** Improved the formulation of breach widening by implementing the method used in river bank/channel erosion. Improved the closing mechanism by incorporating spit growth. Conducted a tech-transfer webinar to describe the concept and results.
- **Documented Dune Guidance (SoN 2014-N-10).** Finished the investigation of short- and long-term dune recovery processes at the FRF. Documented the procedure, analysis, and results in a TR.
- **Upgraded the Coastal Modeling System with Particle Tracking Model (CMS-PTM).** Incorporated bed-load algorithms into PTM to simulate properly the sand particle movement in a coastal environment.
- **Eulerian and Lagrangian Method.** Conducted comparisons between Eulerian (CMS, sediment mapping) sediment transport model and Lagrangian (CMS-PTM, sand particle pathways) models.
- **Documented Application and Guidance for the Coastal Sediment Mapping Capability.** Applied and documented technology developed in FY15 to 'tag' sediment in one location and map its path and fate through the end of simulations. Provided guidance for District transfer.

- **Continued Applications and Validation of the Coastal Modeling System (CMS) (SoN 2008-N-6).** Continued validation of CMS, with extended data sets, coastal forcing, and settings, using available analytical, laboratory, and field data sets.
- **Documented and Released Portable Numerical Modeling Libraries.** Documented libraries of highly portable numerical modeling modules, such as friction, structure, sediment transport, turbulence developed in FY15.

DESCRIPTION OF WORK FOR FY 2017:

Structures and Navigation Focus Area

- **Identify Critical Dredging Needs in Navigation Portfolio (Addresses Statement of Need (SoN) 2009-N-8).** Incorporate international cargo and country of origin/destination information into the Channel Portfolio Tool (CPT). In addition, the user interface was updated to improve functionality for Corps employees.
- **Develop Advanced Waterborne Fluidity Metrics (SoN 2012-N-5).** Using travel time and vessel wait time data for deep-draft entrance channels provided by the Automated Information System (AIS) Analysis Package (AISAP), develop advanced waterborne freight fluidity metrics that incorporate annual tonnage throughput rates (as \$-value of cargo) for major commodity groupings.
- **Establish Guidance and Best Practices for Efficiency of Deep-Draft Channels.** Compare deep-draft entrance channels nationally in terms of the efficiency with which waterborne freight (imports, exports, and domestic shipments) moves through the marine transportation system. Using knowledge gained, establish guidance, and recommend best practices for deep-draft navigation channel maintenance dredging and maintenance of coastal jetties and breakwaters.
- **Update the Coastal Structure Management, Analysis, and Ranking Tool (CSMART).** Continue populating datasets relating to commercial shipping, commercial fishing, US Coast Guard Incident reports, cruise and ferry data, and structure condition ratings, to keep CSMART output current and timely. Develop functional performance indices to capture the influence of coastal structures on navigating vessels. Wherever practical, incorporate new datasets (e.g. vessel counts from AIS, Census figures, recreational fishing, etc.) to serve as proxy metrics for the socio-economic significance of coastal jetty and breakwater structures in supporting resilient coastal communities.
- **Continue Development of Coastal Inlet Navigation Vessel Behavior Atlas (SoN 2016-N-14, 2016-N-16).** Expand a coastal inlets navigation atlas that provides detailed statistical profiles of vessel movement patterns within high-use coastal channels, based on aggregated datasets compiled from the AIS vessel position reports archive. Atlas update expands coverage to critical harbors of refuge, and includes information on number and proximity of vessels to coastal structures to support prioritizing rehabilitation. Also include observed seasonal changes in number of vessels or proximity to structures.
- **Assess historical trends in channel shoaling with regard to channel deepening.** Leverage work completed by the Dredging Innovations Group in FY16 to utilize over 100 years of dredging records and determine the resulting impacts to O&M dredging requirements from harbor deepening or constriction of coastal structures. Results enable navigation managers to better understand how to balance the need for harbor deepening with the cost to maintain deeper harbors through dredging.

- **Optimize the Corps Shoaling Analysis Tool (CSAT) for server application (SoN 2013-N-17).** Leverage the Asset Management work completed in FY16 to integrate CSAT into a server application to better align with the standard eHydro process and allow for efficient management of the large datasets by optimizing the frequency of CSAT analyses to meet O&M needs with flexibility for specific project objectives.
- **Develop Method to Track Channel Shoal Boundary using CSAT datasets (SoN 2013-N-17).** Develop a methodology to identify channel shoal boundary using the CSAT input datasets and track the changes to size or location through time to provide output that is valuable for determining the projected location of the shoal.
- **Implement Design Procedures for Navigation Structures in Wave Models (SoN 2014-N-4).** Include methods and engineering guidelines in wave models to optimize performance and design of navigation structures. Provide additional capabilities for design of structures to protect navigation channels, inlets, harbors, and adjacent beaches. Summarize advancements in guidance documents.
- **Develop Web-based Metocean Data Access, Processing and Analysis Tools (SoN 2013-N-22).** Develop, test, and release two web-based metocean data tools, WaveNet and TideNet, for District applications. These tools, using the web- and GIS-technologies with custom-developed engineering analyses and statistical models, allow USACE Districts to access available winds, waves, water levels, tides, and currents from different data sources seamlessly. Tools facilitate selection, formatting, and analyses of data for use in District projects and numerical models. Accomplish technical transfer via CHETNs, DOTS trainings, and webinars.
- **Develop Guidance for Reducing Surge within Ports and Harbors (SoN 2012-N-10, 2016-N-13).** Develop improved design guidance by modifying infrastructures for reducing surge within port and harbor basins. Utilize advanced numerical models with previous physical model results and field data to optimize siting and sizing (orientation, length, width, and elevation) to control and manage the surge impacts to port and harbor operations. Use field data from several west coast applications and evaluate the skills of harbor wave models for generation and growth of infragravity waves which cause surge within ports, harbors and marinas. Investigate impacts of multi-directional wind-waves and long-period infra-gravity waves on harbor surge, navigation, reefs, and structural design using recent field data at inlets and ports. Include short-period seas and swells in wave model forcings to study potential effects on navigation safety, harbor surges, ship transits, moorings, structural design and repair. Implement new analyses capabilities in models and document findings in user guides.
- **Develop Tool to Evaluate a Critical Harbor of Refuge (SoN 2016-N-16).** Develop a port planning and design tool to evaluate requirements for a USACE and U.S. Coast Guard (USCG) Harbor of Refuge. Coordinate interagency outreach to determine USCG and USACE requirements, including port layout, facility, safety, draft, helicopter, and lifeboat rescue. The Critical Harbor of Refuge Tool requires an integrated system with advanced numerical modeling capabilities coupled to Geographic Information System (GIS) and USCG Automated Information System (AIS) data.
- **Quantify Potential Influence of Infragravity Waves (SoN 2016-N-13).** Utilize time- and frequency-domain analyses of National Oceanographic and Atmospheric Administration (NOAA) 1-Hz data at selected sites to identify the contribution and influence of infragravity wave (IG) phenomena in the recorded water levels. Establish a District-led advisory Project Delivery Team (PDT) to identify project-specific conditions and problems experienced at each selected test-bed site. Evaluate capabilities of existing models at test sites with comparison to field data to develop guidance for application of models. Identify modeling deficiencies with the help of data to develop improvements to numerical models. Implement new features in predictive tools, document findings for the field in technical notes, reports, and journal articles. Incorporate findings into design

guidance through Engineering Manuals to advance the state-of-the-art for design procedures.

Sediment Management Focus Area

- **Link Sediment Mobility Tool with NACCS Data (SoN 2011-N-15, SoN 2011-N-19, and SoN 2016-N-4).** In FY16, a scoping level tool, the Sediment Mobility Tool (SMT), was developed to determine frequency of sediment mobility and general sediment transport direction of sediment placed in the nearshore. The tool is available online as a web application. In FY17, update the tool to include the North Atlantic Coast Comprehensive Study (NACCS) data, which ran 1,050 synthetic storms using the ADvanced CIRCulation (ADCIRC) model for currents coupled with the STeady WAVE (STWAVE) model for waves. The NACCS data were included in the SMT web application as a static layer from the 19,000 save points that were created in the study, so that District engineers in NAD can use the data to aid in siting nearshore placements.
- **Quantify Uncertainty in the Sediment Mobility Tool (SoN 2011-N-15, SoN 2011-N-19, and SoN 2016-N-4).** Quantify the aleatory and epistemic uncertainties from the forcing and sediment movement in this model for future use in the SMT. The ERDC developed StormSim software system applied a Monte Carlo simulation to the WIS wave hindcasts, and the epistemic uncertainties from the empirical equations used in the tool are being quantified using the originally derived documentation of the equation derivation.
- **Update GTRAN Model for Nearshore Berm Migration and Deflation (SoN 2011-N-15, SoN 2011-N-19, and SoN 2016-N-4).** GTRAN is an ERDC developed 2-D sediment transport model that has been used to site the nearshore placement of dredged material at Tybee Island, Georgia, Sand Island, Mississippi, and Grays Harbor, Washington. This model has historically used forcing conditions from the ADCIRC circulation model and STWAVE wave model. The dredged sediment's grain size distribution and cohesive sediment erosion resistance, if applicable, can be input into GTRAN. The sediment transport is calculated using one of three methods depending on the hydrodynamic conditions (current dominated, waves and currents, and high energy, wave dominated). The model is being updated to create an easy to use interface for a simple nearshore berm with basic input from the user and applied WIS wave hindcast to calculate sediment transport and deflation of a nearshore berm. GTRAN is a slightly higher fidelity and more computationally expensive model compared to the SMT, making it a logical next step for engineers to predict the transport of sediment placed in the nearshore.
- **Initiate Field Studies of Nearshore Berm Placements (SoN 2011-N-15, SoN 2011-N-19, and SoN 2016-N-4).** Monitor and evaluate two nearshore berm placement sites were at Fort Myers Beach, Florida and Sand Island, Mississippi. The data will be used to validate several models including SMT, GTRAN, and the Particle Tracking Model (PTM).
- **Release Version 3 of the Regional Shoreline and Inlet Sand Sharing Model, GenCade (SoN 2008-N-6).** Release Version 3 of the regional shoreline and inlet shoal evolution model, GenCade with upgraded inlet configurations, channel evolution, transport relationship enhancements, and sea level change. Document application in wiki User's Guide. Release Technical Reports describing the integration of GenCade with an external wave model (STWAVE) and the recommended calibration procedure. Conduct a webinar short-course to transfer recent upgrades. Investigate implementation of a curvilinear grid/shoreline to better resolve regional morphological trends.
- **Develop a Verification and Validation (V&V) strategy for GenCade (SoN 2008-N-6).** In order to obtain a greater level of confidence in GenCade, conduct an acceptable V&V protocol similar to established procedures for other models.
- **Develop a model focusing on the improving the widening and closing mechanisms of breaching (SoN 2014-N-14).** Improve the formulation

of breach widening by implementing the method used in river bank/channel erosion. Improve the closing mechanism by incorporating spit growth. Implement computer-based Parameter Estimation for the most sensitive input variable for the model. Develop a method to take into account the uncertainty related to the future wave climate. Adapt existing research codes into a stand-alone tool in the form of a user-friendly Graphical User Interface (GUI) package with visualization.

- **Document Dune Guidance (SoN 2014-N-10).** Finish the investigation of meso-scale dune recovery processes at the Field Research Facility (FRF) using 30-year beach profile and Argus video imaging data sets. Complete terrestrial lidar based monitoring of short-term dune erosion and recovery processes at a developed and undeveloped dune field site. Publish results in peer-reviewed journal article. Develop and test a probabilistic model to predict dune erosion and accretion over short to meso-scales. Publish results in a peer-reviewed journal article.
- **Upgrade the Coastal Modeling System with Capability in Sediment Mapping (SoN 2016-N-4; 2011-N-19).** Apply the Eulerian approach to “tag” sediment in one location and map its path and fate through the model simulation, and identify sediment pathways. Validate model results against sediment tracer studies on the west coast, the east coast, and the Gulf of Mexico.
- **Document Application and Guidance for the Coastal Sediment Mapping Capability.** Apply and document technology developed in FY16 to “tag” sediment in one location and map its path and fate through the end of simulations. Provide guidance for District transfer.
- **Upgrade the Coastal Modeling System with C2SHORE (SoN 2016-N-10).** Incorporate C2SHORE in CMS to enhance CMS’s capability in modeling sediment transport processes in swash zone and surf zone.
- **Upgrade the Coastal Modeling System with USACE’s Next-Generation Breach Models – Applicable to Inlets, Dams, and Levees (SoN 2014-N-14).** Implement dam/levee/barrier breach algorithms in CMS to predict breach formation and development.
- **Add Cohesive Sediment and Mixed Sediment Capabilities to the CMS (SoN 2016-N-4; 2011-N-15; 2011-N-19).** Incorporate CHL’s mixed sediment bed model in CMS to simulate the transport of cohesive and mixed sediments.
- **Continue Applications and Validation of the Coastal Modeling System (CMS) (SoN 2016-N-4; 2016-N-10; 2014-N-7; 2008-N-6).** Continue verification & validation of CMS, with extended data sets, coastal forcing, and settings, using available analytical, laboratory, and field data sets.
- **Release Beta-Version Tool to Quantify Erosion Caused by Vessel Wake (SoN 2014-N-6; 2011-N-24).** Release beta-version tool to quantify the vessel wake-induced erosion to assist District planners and engineers in designing and improving navigation channels and determining mitigation alternatives for erosion. The tool includes physics-based approaches to determine erosion potential based on statistical distributions of vessel traffic as well as methods to aid in channel design and shoreline protection strategies.
- **Continue technology transfer.** Continue tech transfer through workshops, webinars, publication of technical reports and notes, eNewsletters, and website/wiki updates.

DESCRIPTION OF WORK FOR FY 2018:

Engineer Research and Development Center

Coastal Inlets Research Program

Structures and Navigation Focus Area

- **Identify Critical Dredging Needs in Navigation Portfolio (Addresses Statement of Need (SoN) 2009-N-8).** With the Channel Portfolio Tool (CPT), identify critical dredging needs for deep-draft navigation channels within the national USACE navigation portfolio. Using the latest channel condition data and shoaling forecast capabilities of the Corps Shoaling Analysis Tool (CSAT, which was integrated with CPT during FY15), populate the full national portfolio of deep-draft navigation channels to complete a national picture of critical dredging needs at large and mid-sized commercial ports.
- **Establish Guidance and Best Practices for Efficiently Maintained Deep-Draft Channels (SoN 2009-N-8).** Compare deep-draft entrance channels nationally in terms of the efficiency with which waterborne freight (imports, exports, and domestic shipments) transports through the marine transportation system, in terms of cumulative dredging costs relative to commerce supported. Using the knowledge gained, establish guidance and recommend best practices for cost-effective (relative to national baselines) deep-draft navigation channel maintenance dredging and coastal navigation structure upkeep.
- **Develop a Coastal Inlet Navigation Vessel Behavior Atlas Dashboard (SoN 2012-N-5).** Develop a user interface for navigation managers to observe changes in vessel use patterns within high-use coastal channels, based on aggregated datasets compiled from the USCG's Automated Information System (AIS) vessel position reports archive. Interface will include summary information on the timing and frequency of vessel movements and of vessel behavior (e.g. speeds, headings, course over ground, etc.). Comparative metrics (i.e. year over year call frequency, vessel counts, tidal delay, etc.) will provide insight into user behavior for waterway managers to better inform operational decisions at high-use navigation channels.
- **Integration and Support of CPT/CSMART/AISAP/CSAT (SoN 2013-N-22).** Automatically link CSAT output to CPT, CSMART, and AISAP for efficient transfer of data between the tools. Continue support of the server maintenance activities to ensure these tools are functioning and readily available to all Corps employees.
- **Develop long-term predictive capability to examine the effects of changes in sea level to coastal navigation (SoN 2013-N-11).** Studies will build upon existing work in long-term morphodynamic predictions using the CMS wave, current, and morphology modeling system. This work will include evaluating model performance, efficiency, and accuracy in the context of predicting the response of coastal inlet systems to changes in sea level. Specific response metrics may include changes to tidal prism, water levels, bay area, and navigation channel sedimentation under a regime of rising sea level. The research will aid long range planning efforts by developing quantitative methodologies to predict physical coastal change over the next century.
- **Develop and Release Portable Numerical Modeling Libraries.** Develop and document libraries of highly portable numerical modeling modules, such as friction, structure, wind, turbulence.
- **Upgrade the Coastal Modeling System with Lab-Based Bedload Algorithms.** Develop bedload algorithms based on lab experiments and incorporate the new formulations to calculate bedload transport process in CMS.
- **Upgrade Tool to Quantify Erosion Caused by Vessel Wake (SoN 2014-N-6; 2011-N-24).**

Based on District feedback, upgrade tool to quantify the erosion created by vessel wakes. With the arrival of New Panamax vessels and projected increases in US seaport traffic and other navigation activities, the effects of vessel wake on shoreline erosion and water quality is an increasing concern for the USACE Civil Works mission. The beta tool will be revised based on feedback from planners and engineers. The tool includes physics-based approaches to determine erosion potential based on statistical distributions of vessel traffic as well as methods to aid in channel design and shoreline protection strategies.

- **Develop Web-based Metocean Data Access, Processing and Analysis Tools (SoN 2013-N-22).** Continue to develop, test, and update of WaveNet and TideNet tools for District applications. Major additions will include both data and numerical modeling databases of directional wave spectra, two-dimensional currents, and two-dimensional wind and pressure fields, the upgrades will provide input data for circulation and wave models supported by the USACE.
- **Develop Guidance for Reducing Surge within Ports and Harbors (SoN 2012-N-10, 2016-N-13).** Continue to use time- and frequency-domain analyses of NOAA 1-Hz data at selected sites to identify the contribution and influence of infragravity wave (IG) phenomena in the recorded water levels. The study will be steered by a District-led advisory PDT to identify project-specific conditions and problems experienced at each selected test-bed site. Evaluation of capabilities will build on existing models at test sites with comparison to field data to develop guidance for application of models. Modeling deficiencies will be identified with the help of data to develop improvements to numerical models. New features will be added to predictive tools and findings will be documented in technical notes, reports, and journal articles. Study results will be incorporated into design guidance through Engineering Manuals to advance the state-of-the-art for design procedures.

Sediment Management Focus Area

- **Release Version 4 of the Regional Shoreline and Inlet Sand-Sharing Model, GenCade (SoN 2008-N-6).** Version 4 of GenCade will include the implementation of a curvilinear grid/shoreline to better resolve regional morphological trends; Technical Reports and the CIRP Wiki will provide documentation. The process of integrating GenCade with the breaching model (2014-N-14) will begin in FY18. Ten new GenCade videos will be produced describing advanced cards, post-processing, calibration strategies, and other advanced topics.
- **Develop inlet breaching code as a stand-alone model (2014-N-14).** Conduct a tech-transfer webinar to describe the concept and introduce the GUI package. The tool will be available in a form that allows engineers and managers to make a rapid assessment of the breach growth and closure potential. Will write a Technical Report/User's Guide describing the breaching tool and a journal paper describing the theory.
- **Quantifying Dune Resilience (SoN 2014-N-11; 2015-N-11; 2014-N-10).** Develop and transition an approach to quantify engineering resilience of coastal dunes which utilized the R&D knowledge gained in the field studies and data analysis during FY14-18. This will include testing and evaluating the probabilistic model in other locations and development of a web-based tool that can be used by the Districts to both design more resilient systems and adequately assess and predict the resilience of their existing coastlines with proper uncertainty quantification. Results will be published in either a technical report and/or peer reviewed journal article documenting model performance and use.
- **Monitor a Full-Scale Nearshore Berm composed of Mixed-Sized Sediments (SoN 2011-N-15, SoN 2011-N-19, and SoN 2016-N-4).** The majority of sediment dredged in the USACE is composed of mixed sand, silt, and clay. Predicting transport of these mixed-sediments is an active area of research, and of keen interest to resource agencies that often restrict placement of dredged material in the nearshore. Nearshore berms are created through placement of sediment in the nearshore and are desirable to keep sand in the littoral system and facilitate "engineering with

nature" to sort fines offshore and transport coarser sand to the nearshore. However, there is little guidance to design and evaluate the spatial and temporal characteristics of nearshore berm migration, and resource agencies are presently not allowing placement because of concerns of dispersion of fines during and following placement. This research task will conduct a large scale sediment transport experiment on a nearshore berm at a location that will be determined. Nearshore sediment transport processes will be studied to aid in modeling for nearshore berm placements and future design guidance.

- **Sediment Mobility Tool (SMT) Web Application Improvements (SoN 2011-N-15, SoN 2011-N-19, SoN 2016-N-4).** The web application for the Sediment Mobility Tool (SMT) will be improved by incorporating the methodology created in FY17 to calculate the aleatory and epistemic uncertainties in the model equations. The addition of the uncertainties in the web application will provide users with more knowledge to make informed decisions using the results of the SMT.
- **GTRAN Nearshore Berm Web Application (SoN 2011-N-15, SoN 2011-N-19, SoN 2016-N-4).** Districts have regularly asked for more tools to be converted to web applications so software is not required to be installed on their computers. GTRAN can be developed into a web application to make the use of the sediment transport model more accessible and easily applied to nearshore berms. The web application will use hindcast data from the Wave Information Study (WIS) as input for the tool which will be applied to a simple nearshore berm created by the user input. The web application will calculate the sediment transport and berm deflation.
- **Continue technology transfer.** Continue tech transfer through workshops, webinars, publication of technical reports and notes, eNewsletters, and website/wiki updates.

APPROPRIATION TITLE: Operation and Maintenance Fiscal Year 2018

Cultural Resources 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017 4/	Budgeted Amount in FY 2018
3/	3/	3/	\$1,500,000	\$1,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ Prior to FY 2017, funding for this activity was appropriated under the Cultural Resources (NAGPRA/Curation) line item.

3/ The costs of this activity are accounted for evenly between the Navigation, Hydropower, Flood and Coastal Storm Damage Reduction, and Environmental Stewardship business lines.

4/ The actual unobligated carry-in from FY 2016 into FY 2017 was \$23,200, including \$3,200 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars to be carried into FY 2018 from prior appropriations for use on this effort is estimated to be \$0.

AUTHORIZATION: The Native American Graves Protection and Repatriation Act (NAGPRA) enacted on 16 November 1990, and the implementing regulations at 43 CFR Part 10, contains data gathering, reporting, consultation, repatriation, and permitting provisions that have near-term and long-term implications for Civil Works programs and projects. The Curation of Federally Owned and Administered Archeological Collections (36 CFR Part 79), required by the Antiquities Act (16 U.S.C. 431-433), the Reservoir Salvage Act (16 U.S.C. 469-469c), National Historic Preservation Act (16 U.S.C. 470h-2), and the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm), requires Civil Works programs and projects to properly house their archaeological collections to federal standards including NAGPRA-related materials.

DESCRIPTION: Archaeological collections owned and administered by USACE are cared for as part of the agency's obligations under the Native American Graves Protection and Repatriation Act (NAGPRA), 43 CFR Part 10, and 36 CFR Part 79. These collections were amassed in the course of water resource development projects under the Navigation, Flood Risk Management, Hydropower and Environmental Stewardship Business Lines. Native American Graves Protection and Repatriation Act (NAGPRA) addresses the recovery, treatment, and repatriation of Native American and Native Hawaiian cultural items by Federal agencies. As defined by the Act, cultural items are human remains, associated funerary objects, unassociated funerary objects, sacred objects, and objects of cultural patrimony, all of which are part of USACE's archaeological collections. In FY 1994, the Corps began the process of inventorying human remains and associated funerary objects and completing summaries as mandated by the legislation, while also assessing the extent, condition, and location of all archaeological collections to locate NAGPRA materials and to ensure they were properly housed to the standards set forth in 36 CFR Part 79. A Mandatory Center of Expertise (MCX), located at the St. Louis District, provides overall management of the Corps' NAGPRA programs and serves as a centralized base for compliance, an information source, and contracting. The MCX facilitates consistent nationwide NAGPRA program implementation and operation, which includes inventorying and summarizing collections, consulting with Indian tribes, researching cultural affiliation and aboriginal occupation, and returning NAGPRA collections to the appropriate Indian tribes. The Corps is responsible for the management of at least 46,255 cubic feet of artifacts collected from its water resources development projects and at least 3,511 linear feet of associated records. NAGPRA review and proper storage of these materials, which are over 80 percent of the total DoD collections and the largest volume of all federal agencies responsible for this

Mississippi Valley Division

St. Louis District

Cultural Resources

activity, is required by a number of public laws including NAGPRA with implementing guidance in 43 CFR Part 10 and 36 CFR Part 79. Corps wide NAGPRA collections are estimated to include 5,000 individual sets of human remains and 200,000 objects. The costs are to accomplish NAGPRA work and to fund compliance support to the districts. Funding this item will ensure full USACE compliance with NAGPRA legislation, facilitate Native American consultation, and will enable districts to repatriate Native American human remains and NAGPRA cultural items to the affiliated and aboriginal Indian tribes.

ACCOMPLISHMENTS IN FY 2016: The MCX CMAC directly supported 10 Districts with NAGPRA compliance activities. This support included research and reports on aboriginal occupancy to determine the appropriate claimant tribes, inventory and review of NAGPRA related collections, preparation of compliance documents, and facilitation of consultation with Indian tribes. Coordination with the National NAGPRA Program of the Department of the Interior resulted in the publication of 10 compliance documents. Over 360 individuals and 108,000 funerary objects were returned to Indian tribes, of which 308 individuals and 5,889 objects were reburied on Corps property. MCX CMAC also initiated data collection to address a newly published NAGPRA regulation that requires Corps-wide reporting. MCX CMAC provided updated Corps-wide data to National NAGPRA and represented USACE at NAGPRA Review Committee Meetings.

DESCRIPTION OF WORK FOR FY 2017: The MCX CMAC is working directly with Districts to support inventories, consultation, compliance documentation, and repatriations. MCX is facilitating consultation, including face-to-face consultation meetings, telephonic conferences, and electronic mail correspondence. Aboriginal occupancy research is being completed and reported on for two districts and over 12 operating projects. MCX CMAC is working with HQUSACE and Indian tribes to draft policy guidance on the new NAGPRA regulation. MCX CMAC provides updated Corps-wide data to National NAGPRA and represented USACE at NAGPRA Review Committee Meetings.

PROPOSED ACTIVITIES FOR FY 2018: The Mandatory Center of Expertise (MCX) and Corps Commands will continue the process of inventorying Native American and Native Hawaiian human remains and associated funerary objects and will complete summaries of unassociated funerary objects, sacred objects, and objects of cultural patrimony as mandated by the NAGPRA legislation. Cultural affiliation and aboriginal occupancy research and determinations will continue, which is required by the law to identify which Indian tribes have valid claims. Through MCX-provided funding, districts will continue to be engaged in formal consultation with Indian tribes for the legislated purpose of returning human remains and cultural objects for which there are legitimate claims. Information will be made available to interested individuals and groups through notices published in the Federal Register. MCX will maintain and update the Corps-wide NAGPRA dataset, represent the Corps at national meetings of the NAGPRA Review Committee established by the Act, and ensure submittal of compliance documents to the National NAGPRA Program of the Department of the Interior for publication in the Federal Register. For all initiatives, the MCX will act as a source of expertise for NAGPRA compliance and NAGPRA-related activities.

APPROPRIATION: Operation and Maintenance, Fiscal Year 2018

Dredge McFarland Ready Reserve – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$11,722,000	\$11,573,100	\$11,573,000	\$11,690,000 2/	\$11,690,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$0. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this project is \$0.

AUTHORIZATION: Water Resources Development Act of 1996 (PL 104–303) as modified by Section 2047 of Water Resources Development Act of 2007 (PL 110-114), which limits use of the dredge solely for urgent and emergency purposes and limited training days.

DESCRIPTION: The Government dredge MCFARLAND was placed in a Ready Reserve status in December 2009. The dredge will be placed in an active status in order to perform work in those instances when private industry fails to submit a responsive or responsible bid for advertised dredging, or where industry has failed to perform under an existing contract or other urgent or emergency requirements as determined by the Secretary. The dredge remains available for any activation requests throughout FY 2018.

This funding is used to maintain the dredge MCFARLAND in ready reserve status with sufficient crew to respond within 72 hours when directed by higher authority for urgent and emergency purposes, and to perform 70 days of required training work in the Delaware River and Bay as specified in the authorization, with dredging work charged to the project dredged.

In FY 2016, the Government dredge McFARLAND performed 70 days of training work in the Delaware River and Bay with dredging work charged to the project dredged. The dredge was also activated for a total of 69 days of dredging under the raise the Red Flag process as a result of not receiving any bids for urgent and compelling dredging work for both the New Orleans District in the Southwest Pass of the Mississippi River and the Wilmington District in the Wilmington Harbor Bar Channel Entrance.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Dredge Wheeler Ready Reserve, LA – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$14,880,000	\$14,850,000	\$14,850,000	\$15,000,000 2/	\$15,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$0. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 237 of the Water Resources Development Act of 1996 contained a provision requiring the Corps Hopper Dredge Wheeler placed in a ready reserve status

DESCRIPTION: The Hopper Dredge Wheeler is docked at the USACE – New Orleans District. Section 237 requires that no individual project funds may be used to fund the dredge in its ready reserve status unless the dredge is specifically used in conjunction with a project. The dredge WHEELER is funded out of project funds when it is performing dredging during readiness exercises or when the dredge is activated to perform work on a project. Thirty years ago, the dredge was placed in an active service status in order to perform work in those instances when private industry fails to submit a responsive or responsible bid for advertised dredging, or where industry has failed to perform under an existing contract. The Wheeler has been called out to perform urgent dredging to assist industry dredges in restoring navigation channels and waterways most years since it was placed in Ready Reserve on October 1, 1997.

This funding is used to maintain the Hopper Dredge Wheeler in ready reserve status, and will not be assigned any scheduled hopper dredging work other than 70 days of maintenance dredging that will be completed in conjunction with readiness exercises to maintain the skills of the crew, and ensure that the Wheeler remains in a fully operational state, ready to respond to any emergent dredging requirements. The Hopper Dredge Wheeler will remain at the dock, with sufficient crew to respond within 72 hours when directed by higher authority.

During FY 2016, the Wheeler completed 125 days dredging through a combination of readiness exercises and multiple deployments by USACE Headquarters to perform urgent dredging on the Mississippi River’s Southwest Pass.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

PROJECT NAME: Dredging Data and Lock Performance Monitoring System, Institute for Water Resources – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$1,138,000	\$1,107,810	\$1,283,000	\$1,119,000 2/	\$1,120,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated balance from FY 2016 into FY 2017 for this project is \$242,000, including \$60,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The authority for the U.S. Army Corps of Engineers to collect data on vessel operations and cargo transiting navigation locks is contained in 33 C.F.R Part 207.800 Collection of Navigation Statistics (b)(2)(F)(3)(iv). These data are necessary to provide dredging and lock data for efficient management of Congressionally authorized navigation projects, to meet the Office of Management and Budget performance requirements, to supply data for analysis and modeling, as well as to respond to specific public laws, including P.L. 96-269 (Minimum Dredge Fleet), P.L. 100-656 (Small Business Set-Aside), and to meet the Government Performance and Results Act (GPRA), the Government Paperwork Elimination Act (GPEA) and Clinger-Cohen/IT Management Reform Act.

DESCRIPTION: The dredging and lock data collection and processing programs provide baseline navigation information and analysis to support operational and strategic management decisions, the budget formulation process and performance measures for the Corps navigation projects and program. This includes lock operations on the inland waterways; the operation and maintenance of federally authorized navigation channels; performance measures to determine the quality and level of service and meet Office of Management and Budget performance measures; implementation of findings from Government Accountability Office review of the Corps Dredging program, support for the projections of capital investments, and justification and validation of future national navigation needs. Information includes Corps performed and contracted dredging (location, quantity, cost etc.); all lock activities (barges and tons of commodities, chamber unavailability, processing times, delays etc.), and physical descriptions of all the Corps owned/operated locks. The funds support the database management, operation, quality control, user assistance, training, compliance with security requirements and Corps-centric information technology services. The Lock Performance Monitoring System (LPMS) is the sole source of lock data information for the Corps, Federal government and industry. LPMS and Dredging Information System databases are transactional systems within the Corps centralized Operation and Maintenance corporate information system.

Technological change in the shipping industry is a continual process requiring ongoing analytical efforts to estimate the nation's future maintenance dredging needs. Update of current and future vessel characteristics, channel dimensions, commodity origins-destinations, vessel cost parameters, and other shipping data are needed to support the Corps dredging program.

This funding is used to continue to support the Corps Navigation responsibilities and respond to changing data needs by maintaining the Lock and Dredging information systems and data warehouse; providing essential upgrades, security and user support; maintaining and upgrading the automatic data recording of lock timing data, and developing additional data warehouse reports within the Enterprise Data Warehouse to support emerging data requirements for the performance based budget. Maintain the standardized National Notice to Navigating Interests (NTNI) database and continue coordinating with the Coast Guard to integrate their notice system. Enhance the search capabilities on the NTNI public website. Prototype the use of voice activated data recording for lock operators. Provide uninterrupted database access by migrating to a Department of Defense approved cloud based computing site. Develop and implement an approved method to Common Access Card enable the dredging and lock data collection applications. Work with the other Federal agencies (including U.S. Coast Guard, National Oceanic and Atmospheric Administration, Federal Communications Commission) to enhance the LPMS to identify vessels not currently in the database. Work with the Lock Operators Management Application team to deploy additional capabilities for the navigation information portal for Corps and industry; maintain a working relationship with the Inland Marine Transportation System to update the data entry portion of the Lock Operators User Guide and to monitor performance as implementation progresses. Through the Navigation Data Integration Framework effort coordinate and share data with other navigation information databases such as Dredging Quality Management, Asset Management, and Resident Management System to reduce data redundancy and provide more robust information. Continue tracking forecasts for the world vessel fleet, commodities and trade; expand voyage ports-of-call information for containerships; and continue analyses of marine transportation system current and future channel and infrastructure requirements for coastal harbors and inland waterways. Provide dredging and lock analytical, technical, and data support for Corps Headquarters, division and district offices.

APPROPRIATION TITLE: Operations & Maintenance, Fiscal Year 2018

Dredging Operations and Environmental Research (DOER), Engineer Research and Development Center – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$6,886,000	\$6,950,000	\$6,385,000	\$6,450,000 2/	\$6,450,000

1/ This activity is funded at 100 percent Federal expense.

2/ Estimated Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2016 to FY 2017 was \$113,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Clean Water Act; the Marine Protection, Research and Sanctuaries Act; and Water Resources Development Acts from 1986 and following contain numerous requirements and provisions addressing contaminated sediments in navigation channels, dredged material management, and beneficial uses of dredged sediments that focus the continued need for innovation and technology development.

DESCRIPTION: The Dredging Operations and Environmental Research (DOER) program is the only research program in the Federal government that addresses the science, engineering, and technology needs related to dredging and managing between 200 and 300 million cubic yards of sediment that must be removed from navigation channels, ports, and harbors in the United States every year. The risks and opportunities related to 1) contaminated sediments in navigation channels and harbors, 2) optimizing dredged material management, and 3) beneficial uses of dredged sediment to restore habitat, ecosystems, and coastal recreational services mandate a continuing need for developing and applying innovative practice and technology. Contaminant detection limits are now so low that sub-trace levels of toxic substances are identified. High profile contaminants continue to plague numerous Federal and permitted dredging projects. Traditional upland disposal areas have reached or are rapidly approaching capacity with few opportunities for new facilities. Aquatic placement of dredged material, which can provide both economic and environmental benefits, must be performed in a sustainable manner that addresses and manages the risks associated with contaminant exposures, the presence of threatened and endangered species, and other uses of the water body. Innovative management practices are required to ensure that environmental standards can be achieved for dredging operations in a way that minimizes costs while maximizing sustained environmental benefits from using dredged material to accomplish habitat and ecosystem restoration and produce recreational benefits. Existing knowledge gaps in relevant physical, chemical, biological, and engineering processes lead to inefficient operations, higher management costs, and limited management and beneficial use options. Performance standards and guidance for existing and improved practices are critical needs. Risk-based assessment and management practices are needed to ensure both the economic and environmental viability of navigation dredging operations. Beneficial use/reuse of dredged material is a priority and environmental resource protection is a mandate; however, costs are increasing due to the constraints noted above. Continued economic viability and security of the Nation will depend upon our ability to remove, manage and beneficially reuse dredged material in a cost-effective and environmentally responsible manner. Continued engineering and environmental innovation will be essential to managing costs and risks.

The DOER Program is an integral and highly beneficial component of the Corps' navigation dredging and environmental protection missions. Dredging and dredged material management must be accomplished within a climate of increased dredging workload, fewer placement sites,

Engineer Research and Development Center

Dredging Operations Environmental Research Program

increased environmental constraints, and decreasing fiscal and manpower resources. Balancing environmental protection, restoration opportunities and critical economic needs, while maintaining and enhancing navigation infrastructure, presents significant technical challenges. The DOER program has validated innovative technologies for managing high profile contaminants and developed risk-based assessment and management practices that will significantly reduce costs for all navigation projects, ports, and harbors. Advancing the assessment and management practices used by the U.S. Navigation Program is critical to sustaining the economic and environmental benefits produced by the USACE dredging program.

Major focus areas of DOER include: (1) sediment and dredging processes, (2) environmental resource management, (3) dredged material management, and (4) risk management.

ACCOMPLISHMENTS IN FY 2016:

Sediment and Dredging Processes: The SDP Focus Area developed 1) improved models to design nearshore placement of dredged material to support Engineering with Nature and habitat creation, 2) guidance for using geochemical tracers to improve environmental assessments of suspended sediment plumes, 3) more accurate monitoring methods for assessing suspended sediment exposures and impacts, 4) evidence supporting nautical depth in the presence of fluid mud in order to reduce dredging costs, 5) methods supporting science-based regulation of suspended sediment, 6) evidence of the efficacy of a new technique to protect sea turtles during hopper dredging. Specific FY16 products included:

- Published improved nearshore sediment model
- Documented methods for geochemical tracers methods
- Published results of monitored exposures to suspended sediment plumes
- Published guidance for implementing nautical depth to optimize management (reduce costs and increase safety) of channels with fluid mud
- Published results documenting the contribution of dredging to total suspended sediment loads
- Documented results of a study to evaluate the performance of a new technique to protect sea turtles during hopper dredging

Dredged Material Management: The DMM Focus Area developed 1) an updated Dredging Portal to support efficient operational design and management, 2) an improved database-model integration to increase productivity of operations, 3) a GIS tool for identifying and ranking dredged material beneficial use opportunities, 4) an analytical tool to identify management opportunities to reduce channel in-filling in order to reduce dredging needs, 5) an improved sediment transport model for nearshore environments and watersheds, 6) a tool to optimize dredged material transport. Specific FY16 products included:

- Published updated Dredging Portal to support efficient operations
- Documented database-model integration to increase productivity of operations
- Published GIS tool for identifying and ranking dredged material beneficial use opportunities
- Demonstrated identification of opportunities to reduce channel in-filling
- Published improved sediment transport modeling for nearshore environments and watersheds
- Published new optimization tool for dredged material transport.

Environmental Resource Management: The ERM Focus Area developed 1) case studies on using dredged material to develop natural and nature-based features, 2) case studies documenting the success of Engineering with Nature to reduce costs of managing threatened and endangered species issues associated with navigation projects, 3) methods for characterizing risks related to underwater sound produced by

dredging, 4) guidance for using new detection technologies for reducing operational costs for managing risks to marine mammals, 5) new modeling methods to improve assessments and reduce operational constraints due to environmental windows, 6) use of remotely sensed data to estimate endangered sea turtle habitat, 7) Predicting temporal dynamics of physical and environmental response to dredge material placement. Specific FY16 products included:

- Documented case studies for using dredged material to create natural and nature-based features
- Published examples documenting use of Engineering with Nature practices to address threatened and endangered species issues associated with navigation projects
- Published method for characterizing risks related to underwater noise produced by dredging
- Published new detection technologies for reducing operational costs and risks to marine mammals
- Documented techniques to facilitate development of innovation in operational practice
- Published new conceptual methodology for modeling dynamics of episodic dredge material placement

Risk Management: The RM Focus Area developed 1) improved model for designing caps for contaminated dredged material in order to reduce management costs, 2) improved toxicity test methods to increase the accuracy and reliability of environmental assessments, 3) navigation mission sustainability improvements, 4) case studies demonstrating successes and lessons learned from Engineering with Nature demonstration projects, and 5) partnerships and collaborations with other agencies and NGOs on Engineering with Nature. Specific FY 2016 products included:

- Published improved model and laboratory evaluations for designing caps for managing contaminated dredged material
- Published methods for improved toxicity tests that increase the accuracy and reliability of environmental assessments
- Published national guidance manual on large wood usage for river restoration in collaboration with the Bureau of Reclamation
- Published peer-reviewed journal article related to sustainability improvements for the USACE navigation mission
- Documented partnerships and collaborations with other federal agencies (e.g., NOAA) and NGOs on Engineering with Nature
- Published joint proceedings report documenting USACE and NOAA natural and nature-based features workshop
- Engaged the USACE Philadelphia District as the third Engineering with Nature 'Proving Ground'
- Documented five new Engineering with Nature projects (use of native plants, breakwaters, locks and dams, species management and activated carbon usage) demonstrating successes and lessons learned

DESCRIPTION OF WORK FOR FY 2017:

Sediment and Dredging Processes: The SDP Focus Area will develop 1) improved process understanding for nearshore sediment transport supporting dredged material beneficial use, natural and nature-based features, and Engineering with Nature, 2) more accurate characterization methods for transport and deposition of suspended sediment supporting environmental evaluations of dredging projects and engineering design for wetland and other nearshore habitat creation using dredged material, 3) engineering and operational practices that enable more mixed-grain sediments from navigation projects to be used for beach nourishment, 4) experimental results demonstrating the use of strategic sediment placement associated with dredging operations to support coastal resilience, 5) physical model experimental results measuring hopper dredge suction velocities to facilitate better entrainment risk assessment of threatened and endangered species. Specific FY17 products will include:

- Publish results of nearshore placement experiments supporting model development and engineering design
- Document methods for sediment plume characterization and deposition
- Publish results of beach nourishment demonstration using mix-grained sediments
- Publish guide for strategic sediment placement to support coastal resilience

- New, remote methods for monitoring water quality for regulatory compliance
- Document physical model results of hopper dredge suction flow-field

Dredged Material Management: The DMM Focus Area will develop 1) new capability for the Dredging Portal to support efficient operational design and management, 2) improved database and model integration to improve system-scale management of dredging operations, 3) case study demonstration of GIS tool for identifying and ranking dredged material beneficial use opportunities, 4) case study demonstration of channel in-filling tool to predict and reduce dredging needs, 5) demonstrate sediment transport modeling for nearshore environments and watersheds, 6) tools for optimizing dredged material management and beneficial use. Specific FY17 products will include:

- Publish new capability for Dredging Portal to support efficient operations
- Document case study application of channel in-filling tool
- Publish demonstration of improved sediment transport modeling for nearshore environments and watersheds
- Publish new capability for optimizing dredged material management and beneficial use
- Deliver unstructured grid version of LTFATE, long-term fate of dredged sediment model to improve capabilities to quantify fate in complex environments

Environmental Resource Management: The ERM Focus Area will develop 1) design guidance for incorporating natural and nature-based features for engineered resilience, 2) quantitative methodology for incorporating ecological resilience into beach nourishment, 3) a framework for managing risks related to underwater sound produced by dredging, 4) a quantitative methodology for modeling episodic sediment pulses into marsh dynamic models, 4) case studies and guidance on incorporating 7(a)(1) of the Endangered Species Act into USACE planning and operations, 5) Engineering with Nature case studies illustrating the use of dredged material management to create environmental benefit, 6) enhanced modeling capabilities for quantifying multiscale impacts and benefits from USACE projects. Specific FY17 products will include:

- Publish additional methods for using natural and nature-based features for engineered resilience
- Publish case studies documenting use of Engineering with Nature practices to address threatened and endangered species issues associated with navigation projects
- Publish method for characterizing risks related to underwater sound produced by dredging
- New technology for reducing operational costs and risks to marine mammals
- Document techniques to facilitate development of innovation in operational practice
- Publish new quantitative methodology for modeling dynamics of episodic dredge material placement

Risk Management: The RM Focus Area will develop 1) enhanced model and laboratory evaluations for designing innovative caps for contaminated dredged material in order to reduce management costs, 2) validated toxicity test methods to increase the accuracy and reliability of environmental assessments, 3) navigation mission sustainability improvements, 4) case studies demonstrating successes and lessons learned from Engineering with Nature demonstration projects, and 5) partnerships and collaborations with other agencies and NGOs on Engineering with Nature. Specific FY17 products will include:

- Publish peer-reviewed journal article and conference presentation related to sustainability improvements for the USACE navigation mission
- Publish validation results for more accurate and reliable toxicity tests
- Engage Engineering with Nature 'Proving Grounds' to support stakeholder partnering
- Publish successes and lessons learned of five Engineering with Nature projects involving use of native plants, breakwaters, locks and dams, species management and use of carbon to reduce contaminant exposure

- Publish enhanced model and laboratory evaluations for designing caps for managing contaminated dredged material
- Document partnerships and collaborations with other federal agencies and NGOs on Engineering with Nature

DESCRIPTION OF WORK FOR FY 2018:

Sediment and Dredging Processes: The SDP Focus Area will continue to 1) develop improved process understanding for nearshore sediment transport supporting dredged material beneficial use, natural and nature-based features, and Engineering with Nature, 2) develop more accurate characterization methods for transport and deposition of suspended sediment supporting environmental evaluations of dredging projects and engineering design for wetland and other nearshore habitat creation using dredged sediment, 3) develop engineering and operational practices that enable more mixed-grain sediments from navigation projects to be used for beach and nearshore nourishment, 4) develop experimental results demonstrating the use of strategic sediment placement associated with dredging operations to support coastal resilience 5) develop more accurate understanding of hopper dredge entrainment risk to special status species.

Specific FY18 products will include:

- Draghead flow model to facilitate quantification of entrainment risk
- Documentation of methods to feed mudflats and marshes using muddy dredged sediments
- Sandy sediment color change index to increase permitting of dredged sediment placement on beaches and in littoral zone
- Publish guidance for inclusion of mud clods in dredged sediment fate predictions for improved management methods

Dredged Material Management: The DMM Focus Area will develop 1) the Dredging Portal to support efficient operational design and management, 2) tools to optimize design of wetland restoration using dredged material beneficially 3) numerical models for improved management of dredged sediment 4) planning tools to facilitate increased beneficial use of dredged sediments, 5) improved database and model integration to improve system-scale management of dredging operations. FY18 products will include:

- Publish Dredging Portal to support management and improved database-model integration to increase productivity of operations
- Release model and publish guidance to design wetland restoration projects using dredged material beneficially
- Model for optimization of dredged material placement in the offshore
- Publish database and model integrated platform

Environmental Resource Management: The ERM Focus Area will develop 1) design guidance for incorporating natural and nature-based features for engineered resilience, 2) a quantitative model for modeling episodic sediment pulses into marsh dynamic models, 4) case studies and guidance on incorporating 7(a)(1) of the Endangered Species Act into USACE planning and operations, 5) improved multi-model integration to improve determining environmental benefits from beneficial use and other Engineering with Nature projects. Specific FY18 products will include:

- Publish compendium of using natural and nature-based features for engineered resilience
- Publish case studies documenting using 7(a)(1) of Engineering with Nature practices to address threatened and endangered species issues associated with navigation projects
- Document techniques to facilitate development of innovation in operational practice
- New quantitative model for modeling dynamics of episodic dredge material placement

Risk Management: The RM Focus Area will continue to: 1) enhance models and laboratory evaluations for designing innovative caps for contaminated dredged material in order to reduce management costs, 2) validate toxicity test methods to increase the accuracy and reliability of

environmental assessments, 3) develop tools and case studies to support navigation mission sustainability, 4) document case studies demonstrating successes and lessons learned from Engineering with Nature demonstration projects, and 5) develop partnerships and collaborations with other agencies and NGOs on Engineering with Nature. Specific FY18 products will include:

- Publish peer-reviewed journal article and conference presentation related to sustainability improvements for the USACE navigation mission
- Publish peer-reviewed journal article and technical document on marine zooplankton species sensitivity to metals and ammonia
- Engage partners and stakeholders through Engineering with Nature 'Proving Grounds' to develop new sediment management and beneficial use opportunities

APPROPRIATION TITLE: Operations & Maintenance, Fiscal Year 2018

Dredging Operations Technical Support (DOTS) Program, Engineer Research and Development Center – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$2,792,000	\$2,820,000	\$2,792,000	\$2,820,000 2/	\$2,820,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$380,000, including \$377,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 10 U.S.C. 2358 ("The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development.")

DESCRIPTION: Maintenance of the nation's navigation infrastructure requires compliance with numerous complex environmental statutes and Presidential Executive Orders. The Dredging Operations Technical Support (DOTS) Program fosters a "one-door-to-the-Corps" clearinghouse for access to comprehensive information on technology related to navigation O&M functions, including technology demonstrations and training essential to all stakeholders involved in Federal and permitted navigation projects. DOTS is structured as a centralized source for technology transfer that maximizes cost effectiveness and facilitates expeditious and consistent implementation of national policies and laws based on complex technical requirements. The DOTS Program fosters application of state-of-the-art technologies and ongoing research results for high priority problems identified by field offices. Emerging environmental concerns often cause uncertainty and unanticipated difficulties in the administration of the Corps' navigation dredging program. The DOTS program's technology transfer function provides access to an extensive, up-to-date, consistent technology base whereby timely, proactive responses to technical issues can be made as they emerge. This approach promotes networking and solutions to common problems confronting the navigation dredging community. DOTS supports knowledge-based exchange of information throughout the interagency coordination process. Short-term work efforts to address generic Corps-wide technical problems encountered during maintenance of navigable waterways and infrastructure are major features of the DOTS Program. Technology transfer and demonstration of new techniques with potentially high returns on investment for management of Corps navigation maintenance projects are critical DOTS functions. The DOTS Program continues to perform a critical technology transfer role in support of all O&M navigation projects. DOTS fosters productive, collaborative relationships with other federal and state agencies with missions relevant to navigation.

In the last decade, new problems have emerged for the USACE Navigation Program as a result of elapsed project life cycle considerations, growing project work backlogs under fixed budgets, increasing expenses to dredge, and a changing workforce with diminishing technical expertise with attrition. Moreover, in a scenario where increased funds become available through changes to how the Harbor Maintenance Trust Fund is administered, there are challenges to improve the efficiency of execution. To comprehensively address these issues and concerns and to formulate the most efficient and nationally coordinated program, the USACE Dredging Program requires the development and transfer of tools, methodologies, and practices that transfer ERDC technology to create best practices in District business processes. The Dredging Innovations Group (DIG), within DOTS, fills an

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Dredging Operations Technical Support Program

important functional gap for the USACE Dredging Program through highly responsive and adaptive management for the delivery of innovative solutions to the most pressing problems and evolving issues affecting the execution of the USACE' navigation mission. The DIG leverages existing ERDC R&D Program products and strategically engages USACE interests through DOTS to anticipate and identify priority problems, needs, and opportunities, address challenging Field and Program requirements, infuse ERDC R&D knowledge and technologies into best practice, lower technical execution barriers under changing conditions, inform decision-making with credible, defensible science, and build and sustain USACE institutional capacity.

ACCOMPLISHMENTS IN FY 2016:

- DOTS continued to expand web-based tools and access to existing knowledge pertaining to the broad navigation mission. This activity allows incorporation of rapid advances in information sharing technologies and growing dependence on internet resources. A database dedicated to thin layer placement of dredged material was launched. In addition, the newly modernized Biota-Sediment Accumulation Factor Database was launched. The Environmental Residue-Effects Database will continue to be refined.
- Expanded DOTS promotion activities to service an increasing number of technical responses from Corps districts encountering problematic navigation and dredging challenges.
- DOTS continued the Webinar Series to appeal to those operating in the new virtual paradigm and incorporated face-to-face seminars were that were also accessible remotely. There were six webinars/seminars related to dredging and other critical mission processes. The topics were:
 - Comprehensive Monitoring Study of a Beneficial Reuse Project at Egmont Key, Florida
 - Monitoring, Modeling, and Conservation Planning: USACE Contributions to Recovery of an Endangered Species (Interior Least Tern)
 - Engineering With Nature Pilot Concepts and Candidate Projects within the USACE New Orleans District
 - Risk-Informed Decision Making in the Australian Context
 - Increased Liquefaction Vulnerability Due to Ground Subsidence Caused by the 2010 to 2011 Canterbury Earthquake Sequence and Ground Improvement Trials Outcomes
 - Changing Sea Levels and the Consequences on Liquefaction: A Case Study on Multi-Hazard Interactions from the Canterbury Earthquake
- DOTS increased the number of technical documents (listed below) published as part of the DOTS technical document collection.
 - ERDC Technical Report: *Birds of the Savannah Harbor Navigation Project, Dredged Material Disposal Areas, 1994 – 2012*
 - ERDC Technical Report: *A User's Manual for the Short-Term Fate (STFATE) Model*
- DOTS continued to conduct hands-on training for Corps districts to provide close instruction on a variety of models, tools, etc. There were eight training request fielded for the following capabilities:
 - Particle Tracking Modeling,
 - Dredged Material Management Decisions Tool,
 - Coastal Modeling System Wave and Flow
 - Bouss-2D Modeling, and
 - ISSDOTv2 Bedload Program.

- The Dredging Innovations Group (DIG) led development and implementation of a dredge fleet scheduling optimization model that can dramatically reduce mobilization costs program-wide. Versions of the model have been applied to the west coast hopper fleet work schedule for FY16. Also, within the South Atlantic Division, the fleet scheduling mode was used in tandem with a Regional Sediment Management pilot project that realizes efficiency gains across both the Navigation and Flood Risk Management business lines.
- DIG continued development of structured dredging datasets and archival resources to help extract long-term, high-level trends and performance measures for the Corps' dredging program. The Dredge Quality Management (DQM) archive of hopper dredge activity was used to build summary roll-up tables that are searchable across Divisions, Districts, navigation projects, and individual dredge plants.
- DIG developed a portfolio maintenance optimization formulation of the navigation inventory of dredged channels, ports, and waterways. The approach applies established methods from operations research and systems engineering fields to produce optimized slates of projects for given budget scenarios. To-date, the approach has been applied to several hundred navigation projects nationwide, and results reinforce the business line practice of focusing limited dredging resources at those portions of the system handling the largest levels of waterborne cargo throughput. Eventually this approach can be coupled to the fleet scheduling model, giving the Navigation business line a robust, scalable maintenance dredging budget development capability.
- DIG maintained a database for Corps dredging managers of U.S. dredging fleet specifications, equipment type, past production rates, and size considerations. This general-purpose repository of dredge fleet information is valuable to District and Division practitioners when needing ready access to data quickly for decision support and operational awareness related to the execution of the Navigation dredging mission.
- The DIG program supported development of an advanced navigation channel performance evaluation technique that will employ detailed hydrographic survey data coupled to vessel track information derived from archived Automatic Identification System (AIS) vessel position reports. This approach will allow for maintained channel dimensions to be directly compared to the projected paths of vessels transiting the respective portions of waterway. Underkeel clearances and sideslope clearances can then be evaluated statistically and through time, to help provide a quantitative understanding of maintained channel performance and dredging program efficiency.

DESCRIPTION OF WORK FOR FY 2017:

- In response to the growing need for training opportunities amongst new employees in the navigation and dredging field, conduct one face-to-face training session at the regional level. The training is tailored to meet regional needs including sessions such as dredged material management, in-water assessment and management, upland and aquatic placement, regional threatened and endangered species dredging issues, and emerging research and development from the Dredging Operations Environmental Research Program. Continue to sponsor the Webinar Series which has proven to be an efficient and effective technology transfer mechanism to communicate advances in the navigation and dredging community.
- Continue to support the collaborative effort of the USACE and U.S. Environmental Protection Agency to update and combine the Inland and Ocean Testing Manuals. These documents have not been revised since the 1990's and will be revised to reflect the various advancements related to testing, evaluation and management of dredged material. Publish the final product as a joint USACE-USEPA document which will be disseminated widely.

- Update specific DOTS databases and models and modernize associated websites. Focus on the platforms which provide data related to environmental residue effects. The Automated Dredging and Disposal Alternatives Management Systems (ADDAMS) model is a set of continually evolving, state-of-the-art computer- based tools that increase the accuracy, reliability, and cost-effectiveness of dredge material management activities in a timely manner. Update ADDAMS to address compatibility of executable files with modern computers.
- DIG to pursue rollout an enhanced version of the dredge fleet scheduling optimization model to all six of the Pacific coast Districts (Los Angeles, San Francisco, Portland, Seattle, Alaska, and Hawaii) as well as to all of the South Atlantic Division (Wilmington, Charleston, Savannah, Jacksonville, and Mobile Districts). Both efforts are at the request of field-level practitioners seeking to inform their dredging business practices and budget development processes via the robust mathematical formulations and insights afforded by the dredge fleet scheduling model. Conduct data gathering efforts for project dredging requirements, environmental work windows, and dredge fleet production rates and costs in close coordination with district practitioners.
- DIG to conduct several data mining studies using readily available archival databases of Corps dredging activities. These data sets include those of the Dredge Quality Management (DQM) program as well as the DOTS-funded Ocean Disposal Database. Both databases are structured and offer a wealth of information concerning historical trends and baseline performance measures that could be used to inform dredging operations. They will also serve to inform high-level, programmatic questions concerning the overall efficiency and cost-effectiveness of the USACE dredging program in support of the Navigation mission. Complete a separate effort extracting historic, quantitative dredging data from scanned versions of the annual Chief of Engineers' Reports to Congress dating to the early 20th century.

DESCRIPTION OF WORK FOR FY 2018:

- Continue expansion of technical response support to field offices encountering problematic navigation and dredging issues and increase vital investments in training of Corps staff in dredging and other navigation mission processes
- In response to the growing need for training opportunities amongst new employees in the navigation and dredging field, conduct two face-to-face training sessions at the regional level. Tailor the training to meet regional needs including sessions such as provide dredged material management, in-water assessment and management, upland and aquatic placement, regional threatened and endangered species dredging issues, and emerging research and development from the Dredging Operations Environmental Research Program. Continue to sponsor the Webinar Series which has proven to be an efficient and effective technology transfer mechanism to communicate advances in the navigation and dredging community.
- DOTS and DIG will continue to document good navigation and dredging practices to be shared across the USACE
- DOTS and DIG will continue to be proactive by updating existing tools and databases to maintain functionality and compatibility with emerging IT requirements
- DIG will continue technology transfer and dissemination of significant research findings to dredging practitioners at all levels of Corps management.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Earthquake Hazards Reduction Program – Flood and Coastal Storm Damage Reduction 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$270,000	\$270,000	\$270,000	\$100,000 2/	\$300,000

1/ This activity is funded at 100 percent Federal expense.

2/ Estimated Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2016 to FY 2017 was \$394,250, including \$2,250 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: This program is being conducted under the authority of Public Law 101-614, November 1990, National Earthquake Hazards Reduction Program Re-Authorization Act.

DESCRIPTION: The objective of Public Law 101-614 is to establish and initiate, for buildings and lifelines, a systematic approach designed to reduce the loss of life, reduce injuries and to reduce the economic costs resulting from earthquakes occurring in the United States. This program also supports the Seismic Safety Committee which is made up of expert structural engineers, geotechnical engineers and geologist.

These funds are used to develop and implement a Seismic Safety Action Classification System (SSAC) for buildings. This program provides evaluation procedures for ranking civil works buildings in order of greatest seismic risk. This program will meet the executive order requirements, while continuing to develop technical seismic building evaluation and mitigation procedures. Funds are also used to provide seismic input to Headquarters publications as needed, provide interpretation of seismic codes and criteria as needed, maintain technical seismic expertise, supplement development of guidance for seismic design of Civil Works projects, address lifeline systems not previously covered in commercially available standards or existing USACE guidance, and to develop guidance for operations personnel.

Over 12,000 owned buildings and powerhouses have been inventoried. Seismic screenings of over 700 buildings in all seismic regions have been accomplished. Seismic evaluations have been performed on over 200 buildings and powerhouses in various geographic regions, primarily in high and moderate seismic regions. Reports have been developed for FEMA to be forwarded to Congress on buildings and powerhouses. Criteria has been developed and published for the evaluation and mitigation of buildings and lifelines. In addition, building evaluation criteria, powerhouse evaluation criteria and lifeline criteria for intake towers, navigation locks, and powerhouses have all been developed. Seismic evaluation and mitigation seminars have been conducted for district and division personnel. Technical support has been provided to the districts and divisions in accomplishing evaluations.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Fish & Wildlife Operating Fish Hatchery Reimbursement 1/ 2/

Allocation in FY 2016	Allocation in FY 2016	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$4,700,000	\$4,700,000	\$5,346,000	\$5,400,000 3/	\$5,400,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for evenly between the Flood and Coastal Storm Damage Reduction and Hydropower business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$1,146,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Public Law 111-85

DESCRIPTION: The U.S. Fish and Wildlife Service (USFWS) was authorized by Congress in 2008 to seek reimbursement from the U.S. Army Corps of Engineers (Corps) for O&M costs incurred by National Fish Hatchery System for mitigation of certain Corps dam projects which typically predated the National Environmental Policy Act. Subsequent congressional direction as well as concurrence by the Office of Management and Budget and the Assistant Secretary of the Army for Civil Works has resulted in a specific line item in the Corps budgets to meet the Corps mitigation requirements. This funding is transferred to the USFWS to produce and release approximately 12 million mitigation fish at 45 different receiving waters impacted by 37 Corps dams to meet mitigation requirements.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Facility Protection – Flood and Coastal Storm Damage Reduction 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$5,445,000	\$3,965,000	\$3,960,000	\$4,000,000 2/	\$4,500,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$1,845,000, including \$1,331,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$100,000.

DESCRIPTION: This funding supports security risk assessment and prioritization efforts for Civil Works projects in order to enhance project security, protection, and resilience and mitigate risks against physical and cyber security threats and ultimately to improve the risk profile of Civil Works projects. These goals will be attained by developing solutions, methodologies, and tools to address key vulnerabilities to manmade incidents, implementing effective programs to minimize consequences, improving the response and recovery capabilities, and prioritizing life-cycle investments.

This funding will be used to support consequence-based screening to identify and prioritize high-consequence (critical) Civil Works projects; develop consequence analysis studies and system-based interdependency assessments at Civil Works projects in support of consequence-based screening efforts through USACE’s Modeling, Mapping, and Consequence Estimation Production Center (MMC); conduct USACE’s Common Risk Model for Dams (CRM-D) physical security risk assessments at Civil Works critical projects; complete CRM-D risk assessment methodology cyber security model enhancements supporting the implementation of an integrated physical and cyber security risk management strategy at Civil Works projects; implement comprehensive training program on tools and methods supporting CRM-D security risk assessments at Civil Works projects; and develop analytical tools and methods to support the identification of risk mitigation measures to physical and cyber threats in collaboration with the Critical Infrastructure Cyber Security Center of Expertise (CICS CX).

In FY 2017, USACE will use the Dams Sector Consequence-Based Top Screen (CTS) methodology to identify and prioritize those high-consequence facilities in USACE’s Civil Works portfolio whose potential failure, damage, or disruption could lead to the most severe impacts to the Nation’s public health and safety, economy, and/or national security. This identification and relative prioritization informs which projects represent the highest priority to conduct CRM-D security risk assessments, and guides the CICS CX in the implementation of cyber security accreditation requirements at industrial control systems associated to Civil Works projects in order to achieve “Authority to Operate”. Additional accomplishments in FY 2017 will include implementation of national efforts to reduce cyber security risks to industrial control systems associated with Civil Works critical infrastructure; sustaining enhancements of web-based capabilities (Corps of Engineers Security Assessment Tool) that consolidate analysis and data collection tools to support screening, prioritization, and risk characterization of dam infrastructure; supporting MMC’s development of consequence and interdependency-analysis studies of Civil Works projects supporting consequence-based screening efforts; conducting training of the CRM-D security risk assessment methodology to MSC/District security and operations personnel; providing subject-matter support to MSCs and Districts on CRM-D implementation at USACE Civil Works projects; and, promoting interagency collaboration with Department of Homeland Security Office of Infrastructure Protection and Office of Cybersecurity and Communications, and other Dams Sector stakeholders on the coordination and implementation of critical infrastructure security and resilience initiatives.

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Facility Protection

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Harbor Maintenance Fee Data Collection, Institute for Water Resources – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$816,750	\$837,050	\$787,000	\$795,000 2/	\$795,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated balance from FY 2016 into FY 2017 was \$174,000, including \$136,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 3 of the 1945 River and Harbor Act (as amended by Section 915 (g) of the Water Resources Development Act of 1986).

DESCRIPTION: Up to \$5,000,000 is authorized to be used annually for the administration of the Harbor Maintenance Trust Fund (HMTF). Most of these funds are used by U.S. Customs and Border Protection (CBP). The Corps performs analyses of the HMTF revenues and transfers to document the operation of the trust fund and to prepare and distribute the Annual Report to Congress on the Status of the Harbor Maintenance Trust Fund. Analysis of waterborne commerce shipments and vessel movement data is also needed to respond to legal questions to the Harbor Maintenance Tax (HMT); to analyze alternative funding options; and to assess the economic and competitiveness impacts of other potential funding sources. The Corps is also required to collect data on foreign and domestic shippers subject to the fee. Therefore, the Corps requires a portion of the administrative funding to continue its ongoing HMTF support efforts. The General Accountability Office (GAO) issued its final report (GAO-08-321), which recommended that the CBP and the Corps improve their coordination and procedures in order to increase HMT collections by auditing domestic shippers failing to pay or underpaying the HMT mandated by law. This item is reported under CWBI in ITIPS and the OMB 300b.

Fiscal Year 2018 funds will be used by the Corps to prepare and distribute the Annual Report to Congress on the Status of the Harbor Maintenance Trust Fund, document the operation of the trust fund, analyze waterborne commerce shipments and vessel movement data to respond to legal questions to the HMT and the increasing requests for HMTF data/analyses, collaborate with CBP to improve CBP-Corps data communication systems to target delinquent domestic shippers for audit to increase HMT collections, continue ongoing HMT data collection and analysis programs, and to develop and implement improved data collection processes and systems and data analysis models and program computer enhancements to provide more complete/accurate domestic shipper information, as well as, the origin/destination of the vessel movements in order to more accurately identify those moves subject to the HMT.

APPROPRIATION: Operation and Maintenance, Fiscal Year 2018

Inland Waterway Navigation Charts – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$3,470,000	\$3,945,922	\$4,455,000	\$4,500,000 2/	\$4,500,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$337,000, including \$324,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Public Law 85-480, approved 2 July 1958, authorizes the Commander, US Army Corps of Engineers (Corps) to publish information pamphlets, maps, brochures, and other material on river and harbor, flood control, and other civil works activities, including related public park and recreation facilities that may be of value to the general public.

DESCRIPTION: The US Army Corps of Engineers (USACE) provides Electronic Navigational Chart (ENC) data for all inland waterways and other federal navigation channels maintained by the USACE to be used by commercial Electronic Chart Systems (ECS), which when combined with the existing Differential Global Positioning System (DGPS), will improve the safety and efficiency of marine navigation in both inland and coastal waterways of the United States. The use of ENC data with commercial ECS will allow for safe navigation through bridge openings during fog and other bad weather conditions as well as during heavy traffic situations, and provide an accurate base display for other systems such as radar and Automatic Identification Systems (AIS).

Within inland waterways (rivers), the USACE is responsible for the creation and provision of navigation charts in both paper and electronic format. Where the paper chart products are updated every 2-5 years, the Inland Electronic Navigational Chart (IENC) data are updated on a monthly basis, and as such, help to tremendously improve safety of navigation. The IENC data format is based on the S-57 international data exchange format, the electronic data transfer standard prepared by the International Hydrographic Organization, however additional inland features have been added to the standard to allow for proper encoding of all real-world features. The IENC standard is consistent with electronic chart products produced by the National Oceanic and Atmospheric Administration (NOAA) and the chart products produced by the two agencies are coordinated for compatibility in adjoining areas. USACE will also coordinate with the U.S. Coast Guard for aids to navigation information and collaboration on rules for chart carriage by inland waterway users.

In coastal and Great Lakes areas, the Corps produces and provides standardized channel condition chart products and hydrographic survey data to NOAA which ensures consistent and reliable information to NOAA for chart updates, in accordance with Water Resources Development Act of 2000, Section 558. Similar channel chart products will be provided to the navigation industry, and these coastal and Great Lakes channel condition chart products will also follow the S-57 or IENC standard format. Such development and publication activities are in accordance with National Transportation Safety Board recommendations to the Corps, and subsequent commitments made by the Chief of Engineers.

DESCRIPTION OF WORK FOR FY 2017: Continue to update all existing IENCs on a monthly basis. Convert charts from IENC 2.3 to IENC 2.4

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Inland Waterway Navigation Charts

Product Specification. Incorporate all IENCs into government website hosting all electronic charts from NOAA and NGA. Continue to investigate the use of AIS for reporting chart discrepancies. Expand Amazon Web Services to include the performance of Quality Control on-line. Continue international coordination to include the development of IEHG S-401, the product specification for IENCs that aligns with the International Hydrographic Organization's S-100 standard for maritime chart production. Begin operational status of eHydro for inland waterways. Continue operational reporting and data services for coastal waterways using eHydro. Integrate low use waterways into NCF. Integrate survey data for past years in coastal districts into eHydro and continue technical assistance to districts and end users.

DESCRIPTION OF WORK FOR FY 2018: Continue to update all existing IENCs on a monthly basis. Migrate IENC maintenance from contractor maintained server to USACE-maintained server and fully implement maintenance using CARIS Hydrographic Production Database (HPD). Implement the use of AIS for reporting chart discrepancies. Continue international coordination to include the development of IEHG S-401, the product specification for IENCs that aligns with the International Hydrographic Organization's S-100 standard for maritime chart production. Using eHydro, maintain operational reporting and data services for all high, moderate, and low use coastal channels and for all inland waterways. Integrate inland waterway survey data for past years into eHydro. Continue technical assistance to districts and end users.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Inspection of Completed Federal Flood Control Projects – Flood and Coastal Storm Damage Reduction 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$29,700,000	\$27,720,000	\$27,720,000	\$30,500,000 2/	\$20,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$2,737,000, including \$2,562,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 221 of the Flood Control Act of 1970, as amended (84 Stat. 1831, 42 U.S.C. 1962d-5b), requires that a written agreement be executed between the Secretary of the Army and the non-federal sponsor to identify the "items of local cooperation" for U.S. Army Corps of Engineers (USACE) projects, including operation and maintenance requirements necessary to ensure the project will function as intended, as well as preserve the value of the federal investment. To determine whether the non-federal sponsor is performing as it has agreed and preserve the federal interest, USACE undertakes inspections and assessments of completed projects. Section 100226 of the Moving Ahead for Progress in the 21st Century Act (MAP-21) enacted on July 6, 2012, calls for USACE and the Federal Emergency Management Agency (FEMA) to establish and implement processes that improve alignment between the two agencies, specifically identifying data collected by USACE under the Inspection of Completed Works (ICW) Program. Section 5 of the Flood Control Act of 1941, as amended, (33 U.S.C. 701n) (69 Stat. 186), commonly referred to as Public Law (PL) 84-99, authorizes an emergency fund to be expended at the discretion of the Chief of Engineers for: preparation for natural disasters; flood fighting and rescue operations; repair or restoration of flood risk management projects emergency protection and restoration of federally authorized hurricane or shore protection. Information collected through the ICW Program contributes to implementation of PL 84-99.

DESCRIPTION: Due to potential life safety consequences, federally authorized levee systems are the priority for this program. The number of miles of federally authorized/locally operated and maintained levees within the USACE Levee Safety Program is approximately 11,750 miles with a total population at risk of over 10 million people. Channel projects associated with levee systems are also included under the Levee Safety Program. The USACE Levee Safety Program has the mission to work with stakeholders to assess, communicate, reduce and then manage the risks to people, the economy, and the environment associated with the presence of levee systems.

This funding is primarily used for levee screenings and risk assessments. USACE is currently performing risk screenings of all levees within USACE's levee portfolio to support an initial risk characterization of the portfolio and set priorities. USACE plans to complete all initial risk screenings for all levees within the USACE Levee Safety Program in FY 2017. A screening is a coarse risk assessment that relies on existing data, historical performance, engineering judgment, and consequence estimation to quickly characterize the risks posed by levees. In addition, USACE will communicate directly with the public sponsor to explain the risk and provide information suitable for the public sponsor to use for local

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Inspection of Completed Federal Flood Control Projects

communication with the population within the leveed area. To complete some systems, USACE will review and perform screening on non-project segments linked to some USACE federally authorized levee systems. Levees identified as having high to very high life safety risk are eligible for a higher level risk assessment. Higher level risk assessments are more rigorous than screenings and are conducted to refine and quantify the risk drivers associated with a levee system. Risk assessment information is key for effective risk management as well as for support of federal investment decisions and prioritization.

These funds will also be used for other activities to sustain the program, including development of implementation guidance, development of technical competencies, and coordination with FEMA and other stakeholders.

APPROPRIATION TITLE: Operation & Maintenance

Monitoring Completed Navigation Projects, Engineer Research and Development Center – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$7,801,000	\$7,920,000	\$6,440,000	\$8,000,000 2/	\$3,300,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$946,000, including \$894,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Authorization for the Corps of Engineers Engineer Research and Development Center (ERDC) to conduct R&D is codified in 10 U.S.C. 2358 ("The Secretary of Defense or the Secretary of a military department may engage in basic research, applied research, advanced research, and development projects that are necessary to the responsibilities of such Secretary's department in the field of research and development.")

DESCRIPTION: These monitoring efforts, governed by Engineer Regulation 1110-2-8151 (Monitoring Completed Navigation Projects [MCNP]), are essential for providing data for efficient and effective management of critically important Federal shallow- and deep-draft navigation projects and infrastructure for both national economic and military sealift security reasons. The Corps operates and maintains more than 1,000 navigation projects encompassing more than 25,000 miles of waterways. The Corps requires a national program to identify the best navigation project practices, and to use them to improve all other navigation project performance. Optimizing Civil Works navigation infrastructure performance requires that they be monitored upon completion, evaluated against preconstruction and present needs, and lessons learned translated into proactive operations management and design guidance for Corps Districts. Information gained from the MCNP program, including changes in sediment transport, water levels, currents, waves, flushing, river flows, ice, structure deterioration, and other coastal and river hydraulic phenomena with associated marine transportation and environmental impacts, will be used to verify design expectations, determine benefits, and identify operational and maintenance efficiencies. Information collected will significantly improve projects' performance, and optimize opportunities for marine transportation and environmental enhancement. The MCNP program collects valuable navigation data, documents successful designs, disseminates data and lessons learned on projects with problems, and provides upgraded field guidance for solutions that will reduce life-cycle costs on a national scale.

The MCNP program includes development of a real-time monitoring capability of the navigation system through River Information Services, to improve inland navigation reliability and address the Administration High Priority Performance Goal for USACE Navigation that calls for decreasing unscheduled navigation lock closures on the inland waterways. Additionally, MCNP enhances research and development specific to Navigation Structures and USACE Infrastructure to link the knowledge gained through navigation project monitoring with emerging technology and materials, to reduce unscheduled repairs and increase system efficiency and reliability. No other programs in the USACE or Federal sector address these critical requirements. Non-destructive techniques for Structural Health Monitoring (SHM) are being developed to provide damage detection and condition

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Monitoring Completed Navigation Projects

assessment tools and technologies for structural managers. Application of such tools and techniques for SHM at large civil navigation infrastructure has been exceedingly limited. Low-cost and rapidly deployable systems and tools also are being developed to assess biological characteristics of USACE low-use locks and dams to assist managers in operating USACE infrastructure optimally for navigation, recreation, and ecosystem benefits.

Shallow- and deep-draft navigation projects located in ports, harbors, rivers, reservoirs, lakes, estuaries, and in the coastal zone are included in this program. Projects that provide maximum cost savings are identified, and those that best address high-priority life-cycle O&M project cost savings are selected for monitoring and evaluation. The Corps Districts and the Engineer Research and Development Center develop monitoring plans jointly.

Coordination between the Corps and other Federal, state, and local agencies and with industry is essential for proper accomplishment of this program. In addition to satisfying Corps' requirements, the data are made available through publications and electronic technology transfer, and will be of great value to local, state, and other Federal agencies with navigation management policies. Results are communicated immediately to other member agencies of the Marine Transportation System (MTS).

DESCRIPTION OF WORK FOR FY 2017:

Focus Area 1: Monitoring Existing Structures

Reliability Analysis of Coastal Rubble-Mound Structures

- Define specific MCNP and other project data where structure performance has been accurately measured, and wave and water level conditions are known with high fidelity. Use data to validate updated empirical and numerical methods for computing primary responses, and validate reliability methods.
- Assess and publish guidance on contribution of uncertainty in application reliability to CNSAM design and risk analysis.
- Refine StormSim software components for Monte Carlo simulation of storms by computing structure response for various performance functions with either empirical equations or numerical hydrodynamic software, and computing reliability for each performance function and each limit state.
- In light of validated reliability methods, review generalized partial safety coefficients for primary failure modes including wave run up, overtopping, seaside stability, leeside stability, and damage progression, and make prescriptive recommendations for CNSAM design and risk analysis.

Monitoring Fiber Reinforced Polymer (FRP) Composite Material Demonstrations at Navigation Lock and Dams

- Conduct a second inspection of 6 field demonstrations of different FRP composites used for 6 various navigation lock components, and document weathered conditions.
- Conduct a first inspection at 2 field sites where baseline monitoring had been conducted in FY16.
- Continue all laboratory-scale long-term testing, and correlate all field and laboratory FRP data.
- Continue development of all material degradation prediction algorithms/plots.

Focus Area 2: River Information Services (RIS)

Enhancing Inland Waterway and Traffic Information to Users

- Build on existing services in cooperation with other agencies and through international standards and coordination bodies, including the Committee on Marine Transportation System (CMTS), PIANC, International Association of Lighthouse Authorities (IALA), U.S. Coast Guard, NOAA, and other

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Monitoring Completed Navigation Projects

inland navigation entities.

- Complete report of PIANC Working Group 156 (WG156) “e-Navigation for Inland Waterways” that includes a comparison of RIS services with e-Navigation developments in the maritime world and recommended work items for PIANC WG125 “River Information Services”.
- Continue work with the navigation industry to improve information and data sharing, to include development of electronic reporting capabilities for "single window" reporting of fairway information, vessel traffic information and management, calamity abatement support, and transport logistics support for the inland waterways.
- Develop proposals for RIS pilot projects to be presented to the Inland Marine Transportation System (IMTS) Board of Directors (BoD). Establish a RIS working group under the IMTS BoD.
- Establish a prototype industry-reporting portal for the automatic electronic reporting of required navigation information for USACE and other government agency use. Incorporate this capability into existing test beds and proof-of-concept efforts to evaluate its ability to meet requirements.

Focus Area 3: Structural Health Monitoring (SHM)

Advancing Structural Health Monitoring (SHM) Methods for USACE Infrastructure

- Develop enhanced in-field analytical capabilities utilizing hardened data acquisition hardware in conjunction with a data-to-decision system.
- Work with contractor to develop computational and database systems that will provide capabilities for high-fidelity numerical models at the sensor locations to reduce total cost, installation time, communication costs, and improve robustness and system reliability.
- Design techniques to effectively impact all remote monitoring systems used in CW SHM.

SHM for Remaining Fatigue Life of Hydraulic Steel Structures

- Evaluate existing USACE design guidance for predicting remaining fatigue life of lock gates and other steel structures.
- Verify and validate remaining fatigue life analysis procedures.
- Update guidance to incorporate SHM system measurements, and transfer technology to field offices.

Focus Area 4: Efficient Solutions for Fish Movement Challenges at Locks

Conceptual model development

- Compile existing field data and studies to develop a conceptual model of fish movement near and through USACE locks and dams
- Recommend specific actions and knowledge gaps to better define the options for enhanced navigation and ecosystem benefits.

Ecosystem benefits predictive model

- Use conceptual model of system behavior to produce quantitative ecosystem benefits model.
- Develop alternative navigation scenarios using stakeholder input and USACE management objectives.
- Predictive ecosystem benefits for various navigation event scenarios.

Numerical model development

- Compile existing river and structure data necessary model USACE infrastructure.

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- Develop detailed numerical models of hydraulic environment near navigation structures.
- Relate hydraulic environment to biological performance curves to assess fish behavior near USACE infrastructure.
- Use results to inform ecosystem benefits predictive model.

Behavior and performance assessment

- Develop neurological sensor to assess behavior transitions in fish.
- Conduct acceleration based transition test and integrated this information with biological performance curves and numerical models to assess fish movement near and through USACE locks.

Enhanced data collection tools

- Develop multibeam sonar system capable of long term deployment and detection of fishes at USACE infrastructure.
- Deploy system to demonstrate capability at a lock and dam.
- Integrate system with RIS to provide long term biological data collection capability needed for system and navigation benefits assessment.

DESCRIPTION OF WORK FOR FY 2018:

Focus Area 1: Monitoring Existing Structures

Reliability Analysis of Coastal Rubble-Mound Structures

- Complete StormSim software components for Monte Carlo simulation of storms by computing response for various performance functions with either empirical equations or numerical hydrodynamic software, and compute reliability for each performance function and each limit state.
- Enhance rubble-mound structure analysis methods (numerical, empirical) by reducing epistemic uncertainty to improve reliability of coastal structures.
- Provide guidance update through the Guidance Update and Mapping Projects (GUMP) program for computed response and reliability for primary failure modes.

Monitoring Fiber Reinforced Polymer (FRP) Composite Material Demonstrations at Navigation Lock and Dams

- Conduct final inspection of 6 field demonstrations of different FRP composites used for 6 various navigation lock components, and document weathered conditions.
- Conduct a second inspection of 2 field sites and document weathered conditions.
- Finalize laboratory-scale long-term testing for the first 6 field demonstrations, and correlate all field and laboratory FRP data.
- Finalize material degradation prediction algorithms/plots and prepare interim Technical Report to include all data and results for the first 6 field demonstrations.
- Provide study results and recommendations for update to field guidance for use of FRP composite materials as various components of navigation locks.
- Continue laboratory-scale long-term testing of the last 2 field demonstration materials, and correlate all field and laboratory data.
- Continue material degradation prediction algorithm/plots for last 2 field demonstration materials.

Engineer Research and Development Center

Monitoring Completed Navigation Projects

Navigation Pile-Dike Structures: Monitoring for Repair and Maintenance Guidance (new study initiated FY18)

- Survey coastal and Great Lakes District offices for locations and types of pile-dike structures 50-100 years old to implement asset management, requested by USACE Coastal Navigation Structure Asset Management Team.
- Initiate on-the-ground visual and photographic documentation of deterioration and partial failures to ascertain functional condition, to the point of requiring full replacement.
- Begin developing techniques for determining best repair and replacement options for various structure types.
- Initiate formulation of design elements to prioritize pile-dike repair actions and prevent critical structure failure.

Focus Area 2: River Information Services (RIS)

Enhancing Inland Waterway and Traffic Information to Users

- Continue interagency and international work to implement RIS services in alignment with existing standards and guidelines. Will participate in applicable bodies to provide USACE input on new and evolving standards and guidelines.
- Participate in PIANC WG125 “River Information Services” to work on updates to PIANC RIS guidelines incorporating output of WG156.
- Conduct RIS test beds and pilot projects under the IMTS BoD, and provide recommendations on development of RIS capabilities to be implemented USACE-wide based on outcomes of the pilot projects.

Focus Area 3: Structural Health Monitoring (SHM)

- Demonstrate spillway gate trunnion friction and uneven hoisting monitoring systems at 1 to 3 District sites.
- Expand spillway gate trunnion friction monitoring to include non-conventional strut arm geometries.
- Enhance trunnion friction system to include uneven hoisting monitoring capability.
- Model and demonstrate crack initiation on a miter gate, leveraging existing SMART Gate systems.
- Investigate efficient methods for predicting crack growth and remaining life for lock gates based on sensor data.
- Update expired design guidance for modeling fatigue in miter lock gates.

APPROPRIATION TITLE: Operation and Maintenance

National Coastal Mapping Program – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$8,212,291	\$6,511,280	\$6,737,000	\$6,300,000 2/	\$6,300,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$0. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Regional Sediment Management (RSM) activities are authorized by Section 516 of Water Resources Development Act of 1996.

DESCRIPTION: The National Coastal Mapping Program is the only Federal coastal mapping program that produces regional, operational data along the coast of the U.S. on a re-occurring basis. Regional Sediment Management and Quantifying Coastal Resilience requires regional measuring and monitoring to provide engineering, environmental, and economic data and information for decision makers and managers. No other program in the Corps (or other Federal agencies) provides consistent, re-occurring, regional data to characterize physical, environmental, and economic conditions along the shoreline, and their changes over time. Quantification of regional conditions and changes leads to improved management practices of entire regions and projects within those regions. Without these data, the Corps cannot fulfill its goal of a resilient, systems approach to coastal management, including navigation, coastal flood risk reduction, and ecosystem restoration projects. The National Coastal Mapping Program also continues evolution of technologies for regional characterization and change detection of engineering, environmental, and economic conditions along the shoreline. Coastal Zone Mapping and Imaging Lidar (CZMIL) advances the state-of-the-art in data exploitation workflows, algorithms, hardware, and software, and provides a sustained focus and collaboration among academia, industry, and the federal government to constantly review, refine, and expand our capability to produce a wider range of engineering, environmental, and economic data and products over a broader range of operating environments.

Since 2004, the NCMP has collected re-occurring data along the Gulf of Mexico, Atlantic, Great Lakes, and Pacific coasts. The data collected during these surveys have been developed into products that are widely used by the Corps for regional sediment management, regulatory, flood damage reduction, asset management, emergency operations, and environmental stewardship in the coastal zone, and by other agencies: for the FEMA RiskMap modeling efforts; the USGS Coastal and Marine Geology Program’s National Assessment of Shoreline Change and extreme storm studies; and NOAA nautical chart production. The NCMP is the backbone of the Interagency Working Group on Ocean and Coastal Mapping’s National Coastal Mapping strategy. The data are made available to the public through NOAA’s Digital Coast website and to emergency responders through the USGS Hazard Data Distribution System. State and local agencies use the data for shoreline management, environmental permitting, emergency management, marine spatial planning, and planning for resilient communities. The CZMIL effort has resulted in new airborne technologies and supporting software that improves operational efficiency, decreases time between data collection and final decision-support product, expands the variety of products derived from the basic datasets in a data fusion approach, improves performance in very shallow and turbid waters, improves navigation hazard detection, and improves overall data accuracy.

South Atlantic Division

Mobile District

National Coastal Mapping Program

ACCOMPLISHMENTS IN FY 2016: \$6,737,000 was used to continue NCMP survey operations on the U.S. Gulf Coast and begin operations on the U.S. Southeast Atlantic Coast. This data will help quantify coastal changes that have occurred since previous surveys in 2004 and 2010 for the formulation of sediment budgets, quantifying area change of sensitive habitats like submerged aquatic vegetation and wetlands, identifying patterns of erosion and accretion, and for assessing the condition of coastal infrastructure. CZMIL development improved data fusion processing required to accurately delineate benthic habitat and characterize water quality parameters. Automated procedures were developed to extract key engineering and environmental metrics of importance to the Great Lakes shorelines. Coastal structures metrics were extracted for all US coastal structures, from data collected between 2010 and 2015. This is the second set of coastal structure metrics extracted from NCMP data. The first set was extracted from data collected between 2004 and 2009.

\$500,000 was used for research and development activities to improve airborne sensor operation and data processing, and to generate physical and environmental metrics from mapping data that help quantify coastal resilience.

DESCRIPTION OF WORK FOR FY 2017: \$6,300,000 are being used to continue NCMP survey operations on the U.S. East Coast. These survey operations will collect the third consecutive engineering and environmental dataset for the US Atlantic Coast (2005, 2010, 2017). This will be the first regional coastal survey in the Federal Government to document coastal recovery of the Hurricane Sandy Impact Area. New information products quantifying shoreline, sediment volume, infrastructure, and habitat changes will be extracted from consecutive datasets collected on the Great Lakes (Ontario, Erie) shorelines from 2006 to 2011. Development under CZMIL will focus on automating extraction of key resilience metrics like dune vegetation density and submerged aquatic vegetation density and metrics to support evaluation of functional performance of navigation structures. Evolution of airborne hardware will improve performance in challenging conditions like turbid water, shallow water, muddy seafloor, and glassy water surface. Evolution of processing software will produce uncertainty metrics for lidar bathymetry that can be propagated into engineering analyses, and shorten timelines between data collection and product delivery.

DESCRIPTION OF WORK FOR FY 2018: \$6,300,000 will be used to commence NCMP survey operations on the U.S. Great Lakes shorelines. At the current level of funding, the program takes 7 years to cover the entire U.S. Coast. These survey operations will collect the third consecutive engineering and environmental dataset for the Great Lakes (2006-2008, 2011-2013, 2018-2020). This data will help quantify coastal changes that have occurred since previous surveys for the formulation of sediment budgets, quantifying area change of sensitive habitats like submerged aquatic vegetation and wetlands, identifying patterns of erosion and accretion, and for assessing the condition of coastal infrastructure. New information products quantifying shoreline, sediment volume, infrastructure, and habitat changes will be extracted from consecutive datasets collected on the Great Lakes shorelines (Huron, Michigan) from 2006 to 2011. Development under CZMIL will focus on more sophisticated information products to support a resilient, systems approach to navigation project management, identify opportunities to employ regional sediment management and engineering with nature practices, and quantify the condition of coastal infrastructure. Hardware and software evolution will improve operational and processing efficiency.

APPROPRIATION TITLE: Operation & Maintenance, Fiscal Year 2018

National Dam Safety Program – Portfolio Risk Assessment (Flood and Coastal Storm Damage Reduction) 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$9,900,000	\$10,000,000	\$9,900,000	\$10,000,000 2/	\$10,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated balance from FY 2016 into FY 2017 for this project is \$997,000, including \$898,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Dam safety legislation Public Law (P.L.) 92-367 and P.L. 99-662, and the National Dam Safety Program (Section 215 of P.L. 104-303), the Dam Safety and Security Act of 2002 (P.L. 107-310) and the Dam Safety Act of 2006 (P.L. 109-460). The National Dam Safety Program (NDSP) codified the Interagency Committee on Dam Safety (ICODS) to coordinate the Federal actions under the National Dam Safety Program.

DESCRIPTION: Nationwide Corps program that helps reduce risks of loss of life and property damage that would occur from failure of a Corps dam. The NDSP accomplishes this through the direction and management of Corps-wide Portfolio Risk Assessment (PRA) efforts by the Risk Management Center (RMC) and implementation of a risk analysis program for all Corps dams, including recurring mapping and interim risk reduction work. The Corps has 715 dams and appurtenant structures located at 555 projects. For each of these dams, the risk assessment provides estimates of the probability of failure and consequences by each initiating event. In addition, risk reduction measures are formulated and their cost and effectiveness estimated. The results of the detailed PRA's are used at the national level to further formulate study plans for inclusion in regular budget cycles, identify appropriate corrective actions, and determine the urgency of such actions. The program also supports updates to the Dam Safety Investment Plan (DSIP) with the goal of determining short and long term construction strategies for modification and repair of the high risk dams in the portfolio as needed. The DSIP is used to demonstrate how these strategic investments reduce the overall risk of our national portfolio in the most efficient and cost effective manner. The DSIP also provides short and long term budget forecasting requirements for requesting both Dam Safety and Seepage/Stability Correction Program funds and project-specific funds in the Construction account as part of the normal budgeting cycle. The NDSP also supports other advancements in technical areas related to dams such as investigations of dam internal erosion, filtering materials, seepage and piping incidents, dam grouting, spillway systems reliability, dam instrumentation, and hydrologic methodology development. The NDSP helps ensure our technical manuals and policy guidance keeps pace with the state-of-the-art in these disciplines.

ACCOMPLISHMENTS IN FY 2016: In FY 2016, the NDSP continued PRA efforts, including detailed risk analysis on the highest risk dams in the portfolio and identification of appropriate studies and corrective actions necessary to meet the Corps dam safety responsibilities. Fifty-six periodic assessments (Pas) were completed in FY 2016. The program also supported effective coordination of dam safety activities across the various regions of the Corps and provided for Corps participation at national dam safety events, including participation with other agencies such as the Interagency Committee on Dam Safety (ICODS). Through ICODES, the NDSP supported development of Federal guidelines for dam safety; promotion of public awareness programs, publications, training materials, and workshops; and participation in post dam failure forensic teams. The NDSP also provided for archival research that is

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National Dam Safety Program

supported by Federal dam-owning agencies through ICODS and the National Performance of Dams Program. The account also provided for Corps districts to participate in the National Dam Safety Steering Committee, which advises the Corps Dam Safety Officer and Special Assistant for Dam and Levee Safety. The program supported Corps membership and participation in various national and international dam organizations, including the Association of State Dam Safety Officials (ASDSO), the US Society on Dams (USSD) and the Dam Safety Interest Group (DSIG). The Corps also provided a representative on behalf of the Secretary of Defense to the National Dam Safety Review Board. The NDSP provided trained PA Facilitators to assist Corps districts in completing their PAs; issued revisions to the hydrologic loading study methodology; continued RMC-hosted training and workshops related to Dam Safety, including the Best Practices Workshop for Dam and Levee Safety; worked with and helped fund the Modeling, Mapping, and Consequences (MMC) Center to complete dam modeling, inundation mapping, and consequence work products in support of the PAs; continued to implement responses to recommendations from a 2013 independent external peer review; awarded a new contract for a renewed independent external peer review of the program; and continued to support updates of Corps dam safety policy and technical manuals (Engineering Regulations, Manuals, Circulars, etc.), such as spillway design, cutoff wall construction, and instrumentation of embankment dams.

DESCRIPTIONS OF WORK FOR FY 2017: FY 2017 funding is being used to continue detailed risk analysis on the highest risk dams in the portfolio and to identify appropriate studies and corrective actions necessary to meet the Corps dam safety responsibilities. PAs will occur on 46 dams in the portfolio. The program will continue support of ICODS and Corps membership and participation in various national and international dam organizations; will continue to provide trained PA Facilitators to assist districts in completing their PAs; continue training on dam safety related topics; continue revisions to the hydrologic loading study methodology; will continue to work with and help fund the MMC Center to complete dam modeling, inundation mapping, and consequence work products in support of the PAs; will fund an independent external review of the NDSP (similar to a review completed in 2013); and will continue to support updates of Corps dam safety policy and technical manuals (Engineering Regulations, Manuals, Circulars, etc.) such as Safety of Dams – Policy and Prodecures, spillway design, cutoff wall construction, seismic design considerations, and temporary cofferdam design.

DESCRIPTIONS OF WORK FOR FY 2018: FY 2018 funding will continue efforts from FY 2017, including support of PAs, membership/participation in dam organizations, dam safety training, MMC work, and updates to dam safety policy and technical manuals. Forty-seven PAs are scheduled for FY 2018. Funds may also be used to begin to address new comments received from the FY 2017 independent peer review of the dam safety program.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

National Emergency Preparedness Program (NEPP) – Emergency Management 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$6,680,000	\$4,500,000	\$4,455,000	\$4,500,000 2/	\$5,500,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$1,269,000, including \$61,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Executive Orders 10480 and 12656, National Security Presidential Directive-51/Homeland Security Presidential Directive-20 (NSPD-51/HSPD-20), the National Continuity Policy Implementation Plan (NCPIP) and the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA) under the Robert T. Stafford Disaster Relief and Emergency Assistance Act, 42 USC 5121 et seq.

DESCRIPTION: In accordance with NSPD-51/HSPD-20 and the NCPIP, the NEPP program helps the Corps prepare so that it is ready to respond rapidly to a catastrophic disaster, should one arise, whether caused by natural phenomena or man-made disaster (acts of terrorism), and includes planning to provide for continuity of operations of the Corps during such a disaster. More specifically, these funds assure that the Corps' work force is capable of shifting from routine missions to crisis operations, with the organizational command and control structure(s) necessary to provide a coordinated comprehensive response in the critical early stages of a catastrophic disaster. Preparedness activities supported by these funds include development of national level preparedness plans; training employees; and conducting national level training exercises, including support to Federal Emergency Management Agency (FEMA) exercises and coordination within DOD, other Federal agencies, and state and local governments. Preparation also includes the USACE Headquarters sponsored Corps-wide programs necessary to provide the capabilities and operational command and control required by Corps field commands in order to accomplish their NEPP responsibilities, both routinely and in specific emergency response situations. NEPP is complementary to the preparedness funding provided through the Flood Control and Coastal Emergencies (FCCE) appropriation.

With Fiscal Year 2016 funds, the Corps developed and participated in building-block exercises/workshops in preparation for NEPCE-16. USACE Combined Response Mission Exercise (CRME) was planned and executed in conjunction with state partners in the U.S. Army Corps of Engineers (USACE) Great Lakes and Ohio River Division (LRD) with FEMA Region V, DOD and other Federal interagency partners and was used to prepare and train our emergency power, infrastructure assessment, enterprise emergency information technology (IT) response, and logistics Planning and Response Teams (PRTs). The Corps participated in the Cascadia Rising 16 in conjunction with Ardent Sentry 16 whose scenario is based on a catastrophic earthquake in the Pacific Northwest; conducted a Regional exercise in South Pacific Division based on Southern California (SoCal) catastrophic earthquake; and engaged in Vibrant Response with an Improvised Nuclear Device (IND) scenario. The Corps tested and validated our Headquarters Continuity of Operation /Devolution Plan during Eagle Horizon 16, which will be a component exercise of NEPCE-16.

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National Emergency Preparedness Program (NEPP)

Fiscal Year 2017 funds are being used to conduct National Exercise Program (NEP) building block exercises in preparation for NEPCE-18, Gotham Shield 2017 in conjunction with Vibrant Response 17 and Ardent Sentry 17 focusing on an Improvised Nuclear Device scenario in New York City, and National Disaster Recovery Framework recovery exercises, Three Regional Power Mission Exercises (RPME), New Madrid Seismic Zone planning and exercises, as well as Cascadia Subduction Zone planning, Power Grid Catastrophic Planning (Mass Power Outage Annex) with state and interagency partners in the Pacific Northwest, Catastrophic planning for Guam Typhoon Annex, in conjunction with FEMA's 5-year Plan Alignment and HQ Continuity of Operations Program (COOP)/Devolution Plan during Eagle Horizon 17. Training includes five USACE Urban Search & Rescue Structures Specialist training classes.

Fiscal Year 2018 funds will be used for training, participation in and conducting national level exercises, interagency and intergovernmental coordination, catastrophic disaster planning and updating and exercising continuity of operations plans. USACE continues to play a key role in national security planning, as demonstrated by support to Department of Homeland Security strategic planning efforts, Secretary of Defense's Complex Catastrophe Initiative, development of the National Capitol Region Response Plan, updates to both the National Response Framework (NRF) and National Disaster Recovery Framework (NDRF), development of catastrophic hurricane and earthquake plans, and other man-made contingencies with national-level implications. Exercises include National Exercise Program Capstone Exercise 2018 involving interagency partners on federal, state, local, tribal and private sector, Vibrant Response 18 which tests and validates DOD's specialized response forces in their mission to assist civilian authorities in saving lives and relieving suffering following a catastrophic CBRN (Chemical, Biological, Radiological and Nuclear)/ Improvised Nuclear Device (IND) incident, Ardent Sentry 18 that tests and validates DOD's ability to support DSCA (Defense Support to Civil Authorities), San Francisco Bay Area Earthquake Exercise, New Madrid Seismic Zone Rehearsal of Concept, Wabash Valley Earthquake Workshop, Alaska Shield Catastrophic Exercise, Cascadia Subduction Zone Tabletop Exercise. Training includes four USACE Urban Search & Rescue Structures Specialist training classes.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

National (Levee) Flood Inventory – Flood and Coastal Storm Damage Reduction 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$10,000,000	\$10,000,000	\$15,840,000	\$5,000,000 2/	\$10,000,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated balance from FY 2016 into FY 2017 for this project is \$1,962,000, including \$1,832,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Title IX of the Water Resources Development Act (WRDA) 2007, as amended by Section 3016 of the Water Resources Reform and Development Act (WRRDA) of 2014.

DESCRIPTION: The National Levee Database (NLD), which has been accessible to the public since October 2011, serves as the national resource of levee information to be used for activities such as flood risk management and risk communication and currently includes detailed information on 14,600 miles of U.S. Army Corps of Engineers program levees and 170 miles of Bureau of Reclamation program levees.

This funding is being used to operate and maintain the NLD and includes implementing upgrades and software revisions to improve functionality and usability based on user feedback. Operation and maintenance activities for the NLD include supporting additional data integration into the NLD, maintaining the current data set, and supporting NLD related tools such as Levee Inventory System and Levee Screening Tool. In addition USACE continues with the nation-wide inventory and review of levees to be included in the NLD, which is being provided by a combination of data collection efforts and volunteer sources such as state agencies, other federal agencies, local communities and tribes.

In Fiscal Year 2016, the Corps completed 560 screening approvals up through the Levee Senior Oversight Group and 50 remaining federally authorized levee system periodic inspections; completed quality control and assurance for Federal Emergency Management Agency levee information for inclusion into the NLD; continued to operate, maintain, and improve the NLD; and continued with the nation-wide inventory and review of levees to be included in the NLD, which was provided by a combination of data collection efforts and volunteer sources such as state agencies, other federal agencies, local communities and tribes.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

National (Multiple Project) Natural Resources Management Activities 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$8,673,000	\$6,800,000	\$6,492,000	\$5,000,000 3/	\$3,700,000

1/ This activity is funded at 100 percent Federal expense.

2/ This activity is accounted for in the Recreation, Navigation, and Flood and Coastal Storm Damage Reduction business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$4,538,000, including \$896,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$900,000.

AUTHORIZATION: Flood Control Act of 1944 (58 Stat. 887), Public Law 78-534.

DESCRIPTION: This remaining item is used to conduct certain, specified operation and maintenance activities, such as procurement of park ranger uniforms through a contract administered by the National Park Service, that benefit all or a majority of operating Civil Works projects. This project is an agency-wide project that is directed by HQUSACE.

ACCOMPLISHMENTS IN FY 2016: A wide variety of national program initiatives were accomplished such as, the park ranger uniform contract was funded at \$700,000; \$500,000 supported the national partnership program including 16 “Handshake” partnerships; \$750,000 supported the Water Safety MCX and national programs; \$400,000 supported environmental compliance work; \$375,000 supported the printing and publishing of a wide array of NRM materials; \$140,000 supported volunteer clearinghouse; \$300,000 supported national sign program activities; \$130,000 supported the Career Assignment Program; and \$2,300,000 supported a variety of sustainability work efforts including energy audits, Energy Savings Performance Contract (ESPC) work, campground metering studies, and data management to support USACE Sustainability Plan development and Scorecard submission.

DESCRIPTION OF WORK IN FY 2017: A similar set of national recreation program initiatives will be accomplished such as the funding of: the park ranger uniform contract; a dozen “Handshake” partnership; the Water Safety MCX and associated national programs; environmental compliance work; the printing and publishing of NRM materials; support to volunteer clearinghouse; and a variety of sustainability work efforts including more energy audits, ESPC work, power purchase agreements, and data management to support USACE Sustainability Plan development and Scorecard submission.

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National Natural Resource Management Activities

DESCRIPTIONS OF WORK FOR FY 2018:

1. National NRM Activities work that will be accomplished with these funds include the following:

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$4,980,000	\$4,500,000	\$3,247,000	\$2,700,000 3/	\$2,700,000

The National (Multiple Project) Natural Resources Management Activities supports many national programs, including:

- a. Water & Public Safety Program. The Water and Public Safety Program is centrally managed at the Corps Water Safety National Operating Center (NOC) which provides national guidance, programs, educational materials, media outlets, and printed and electronic information to ensure a nationally coordinated and consistent safety campaign is delivered to the public.
- b. Park Ranger/Manager Uniforms. The Corps Uniform Program is managed centrally out of HQUSACE. Implementation of national policy and oversight of an interagency uniform contract administered by the National Park Service ensures program cost effectiveness and adherence to uniform standards across the Corps. The Corps purchases uniforms for field personnel through the interagency contract. Since this arrangement was established in 1984, significant economies of scale have been achieved. Costs include the authorized employee allowance funds, NPS contract administration costs, buy out of discontinued items, program management/committee support, and the purchase of required emblems.
- c. Sign Program. The Corps Sign Program is managed centrally at the Sign Program Center of Excellence (MCX). The MCX ensures consistent implementation of Corps Sign Standards and oversees the management, use, and implementation of national sign standard policies. The MCX works with project, district and MSC sign program coordinators to resolve policy and legal issues. The MSX provides technical support and assistance to all projects and maintains the Sign Standards Program Manual and software. These efforts allow the Corps to maintain consistent standards for public safety and information.
- d. Partnership Program. The National Partnership Program oversees the management and implementation of national partnership and volunteer policies to ensure coordinated and consistent program execution nationwide, including the deployment of training opportunities. The program leverages the financial and human resources provided by partners and volunteers to support recreation and environmental stewardship programs.
- e. Volunteer Clearinghouse Operation. The Volunteer Clearinghouse that coordinates volunteer recruitment and data collection is operated under contract with Goodwill Industries to support volunteer efforts at all Corps projects. Use of a single nationwide contract achieves economies of scale and reduces administrative costs by eliminating the need to transfer funds from each project.

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National Natural Resource Management Activities

- f. Printing and Publishing. The centralized printing of regulations, forms, and public information and interpretive materials used by all Corps projects achieves economies of scale and reduces total administrative and procurement costs. Printed materials are stored at the Corps Publications Depot for distribution to all projects upon request.
- g. Other Nationwide NRM Activities. The following centrally-managed program initiatives are supported at the national level: Environmental Compliance support; Challenge Partnership Funds; Natural Resources Management Website Information (Gateway); Nationwide Recreation Visitation Surveys (Visitation Estimation and Reporting System (VERS)); and support for the Partnership Advisory Committee, Recreation budget Coach, Assist and Train Team, Career Assignment Development Program, and Bilingual Support Team.

2. Energy Sustainability and Environmental Management System (EMS) Implementation work that will be accomplished with these funds include:

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$3,693,000	\$2,300,000	\$3,245,000	\$2,300,000 3/	\$1,000,000

Navigation and Flood Reduction Management Projects: The latest revision of Engineering Regulation (ER) 200-2-3 in October 2010 expanded the coverage of the USACE EMS to include all Civil Works missions and facilities with significant environmental compliance requirements, and also incorporated Federal statutory and executive order-based sustainability and energy requirements.

In addition to traditional water, air, waste and materials compliance requirements, the USACE EMS includes the energy, water and petroleum efficiency requirements of the Energy Independence and Security Act of 2007 and the Energy Policy Act of 2005, as well as the sustainable acquisition, electronics stewardship, waste reduction/recycling, and greenhouse gas accounting and reporting requirements of Executive Orders 13693 - Planning for Federal Sustainability in the Next Decade. Funding these requirements as a nationwide activity allows USACE to reduce costs and improve performance by implementing standardized compliance and sustainability policies, procedures, and tools for auditing, data management, metrics, reporting, and management review at USACE facilities. Specific requirements include:

- a. Centralized energy and sustainability data management, tracking and reporting capability;
- b. Preparing and submitting sustainability and energy submittals in accordance with Administration and congressional requirements. Examples of annual, recurring submittals include the Strategic Sustainability Performance Plan (SSPP), Comprehensive Greenhouse Gas Inventory, Energy Management Report, and federal Sustainability/Energy scorecards
- c. Advanced metering system operation and maintenance serving all facilities that trigger the Federal Energy Management Program advanced metering requirements under Energy Policy Act (EPA) Section 103.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

National Portfolio Assessment for Reallocations – Water Supply 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$574,000 3/	\$946,000 3/	\$1,060,000 3/	\$800,000	\$800,000

1/ This activity is funded at 100 percent Federal expense.

2/ Estimated Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2016 to FY 2017 is \$1,063,000, including \$1,050,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

3/ Prior to FY 2017, this remaining item included funds for the Sustainable Rivers Program, which is now funded under its own remaining item.

AUTHORIZATION: Specific project authorizations, Section 216 of the River and Harbor and Flood Control Act of 1970.

DESCRIPTION: These funds are used to assess data and develop a consistent national approach to achieving consistent and sustainable water withdrawals (permanent reallocations and surplus water) including identification of status and challenges for USACE Reservoirs and to conduct initial assessments of reallocation requests.

The National Portfolio Assessment for Reallocations began as a two year appraisal, initiated in FY 2008, to develop a portfolio of existing Corps of Engineers multipurpose projects to be used as a screening tool to identify the best candidates for opportunities for operational changes and/or reallocation opportunities. During the development of the survey for the National Portfolio Assessment, the USACE was considering two other national surveys, one on the water management aspects of Corps reservoir projects and another on sedimentation management concerns. USACE leaders recognized that combining these efforts would result in cost and time savings. This combined effort provided not only data for the Portfolio but also created a database to examine the status of USACE water management from local, regional, and national perspectives, an engineering and scientific foundation for a national adaptive management program, a baseline data set for investigating the evolution of operational water management policies, an assessment of sediment infilling, its impacts to operating purposes and management practices, and a database for sediment data collection efforts.

These efforts have proven relevant to the assessment of reallocation opportunities at multi-purpose reservoirs where any change in operation affects multiple purposes. As a result, after the initial Portfolio Report was completed, this effort was transformed into an Assessment of Data study for FY 2011 and FY 2012 and included the water supply, water management, and sediment management components as well information gained through collaboration with other USACE work efforts. Major products developed include a portfolio of USACE projects that identified the best candidates for opportunities for operational changes and/or reallocation opportunities to ensure existing USACE reservoirs contribute to enhance economic and ecosystem values as water demands evolve and a better understanding of climate change issues are gained, (2) a paper on alternative funding arrangements for water supply reallocation studies, and (3) a final draft report on the National Portfolio Assessment of Data for Reallocations: Status and Challenges for USACE Reservoirs.

The report, which leveraged data gathered and analyzed as part of the National Portfolio for Reallocations and from other collaborative efforts, described the steps necessary to reach the ultimate goal of the data assessment:

- Developing a project by project projection of water supply availability and sustainability over the next 10, 20 and 50 year periods.
- The ability to roll the developed data up into basin and regional projections which can support watershed based efforts.
- Developing a program to keep the data current.

In conjunction with the implementation of the next steps, select MSC's will conduct initial assessments of pending reallocation requests. These assessments represent a streamlined approach to obtaining the information necessary to determine Federal interest. In addition, funds will be used to evaluate surplus water withdrawals; how they can affect existing water supply storage and future reallocations is a critical piece of the Portfolio of USACE projects with water supply. This information is needed to analyze requests for reallocations and understand current and future water availability. We must be able to identify who is withdrawing surplus water, under what authorities, in what quantities, and at what price. This information is not readily available and funding will be used to continue obtaining and analyzing this information as well as to clarify terms for small surplus water withdrawals and permissible water uses.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Optimization Tools for Navigation – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$388,080	\$322,000	\$319,000	\$322,000 2/	\$322,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$6,682. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

DESCRIPTION: This funding is necessary to provide practical quantitative and predictive tools and data for minimizing and optimizing the costs of dredging of Federally-sponsored navigation projects. The objective is to be able to identify more efficient and effective management strategies for existing navigation infrastructure and to improve the analysis of proposals to deepen and widen channels. These efforts will help lead to an improvement of channel design criteria across the Corps, the U.S. Navy, and other government and academic institutions. The National Navigation Operation & Maintenance Performance Evaluation Assessment System (NNOMPEAS) is being developed to demonstrate whether such a metric can be provided across all coastal deep-draft harbors and waterways. This tool uses domestic and foreign trade data to determine and analyze the loaded or immersed drafts and related utilization of vessel cargo-carrying capacity for all recorded cargo vessel calls for individual harbors and channels. The system in turn can provide for the estimation of incremental transportation cost benefits foregone with reduction or absence of maintenance for waterway depth, and of the transportation cost savings with a limited increase in depth. This could offer the potential to optimize maintenance dredging requirements for individual channel reaches and across much of the overall USACE dredging program. A companion tool being developed under the OTN program is the Channel Analysis Design Evaluation Tool (CADET), which will allow sophisticated vessel hull modeling not previously available. The Institute for Water Resources (IWR) is conducting this modeling activity jointly with the USACE Engineering Research and Development Center and the U.S. Naval Surface Warfare Center. CADET will render advanced technologies for methods of analysis and compilation of new physical and numerically-generated data sets descriptive of vessel movement and response within confined waterways and offshore channel areas subject to significant wave climate.

This funding will be used for to continue the deployment and maintenance of the NNOMPEAS capabilities and methodology and further its use as a budgeting tool and general navigation project evaluation tool. Funding will also be used for continued maintenance of the CADET and development of a comprehensive vessel lines library to allow use of CADET without proprietary hull line information and to ensure technology transfer to USACE so that USACE can independently support general update and maintenance of the algorithms integral to CADET. Funds will also be used to continue compiling dredging cost and quantity data at the channel segment level through implementation of changes to the Resident Management System database and to expand the system structure, and to implement changes to NNOMPEAS deemed critical by field analysts to more efficiently facilitate project evaluation and analysis.

ACCOMPLISHMENTS IN PRIOR YEARS: Funding for this ongoing activity in FY 2017 allowed for general completion of the deep-draft self-propelled hull vessel lines library for CADET with limited additions to support evolving vessel classes. In addition, efforts for primary technical transfer for basic support of CADET from NAVSEA-Carderoc to USACE IWR were completed along with scoping for enhanced capabilities for evaluation of confined waterways. Ongoing of CADET also includes field verification and tests on current studies and providing technical support to Districts in helping to determine need or applicability with associated support to be extended for the subject fiscal year with availability of funding. Work continued on development of NNOMPEAS to expand the number of harbors covered to approximately 180 coastal deep-draft projects and continuing efforts for development of data error checking or validation routines for critical parameters. Additional routines are being developed to support data extraction per request from analysts at the District level. NNOMPEAS was enhanced with updates of ocean-going distances between ports for more ports than previously available and included additional enhancements to the capability for probabilistic tide cycle evaluation for estimation of vessel delays due to limitations on project depth versus availability of tidal advantage. Continued use of NNOMPEAS allowed for further development of efforts to measure incremental transportation costs and benefits, and development of relative rankings based on Return of Investment (ROI) for major coastal harbors under annual ongoing initiatives for Value-to-the-Nation and for HQUSACE O&M Program budgeting input. NNOMPEAS was also employed for evaluation of vessel calling patterns and supporting load factor analysis (LFA) critical to coastal deep-draft studies, and as an input to prioritization of survey work performed by NOAA and evaluations by MARAD. Correspondingly, efforts for CADET involved continued deployment and training for use on coastal waterway projects, which supported better evaluation of depth needed in offshore environments with simultaneous objectives of minimizing related dredging costs.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Performance Based Budgeting Support Program 1/ 2/

Allocation in FY 2016	Allocation in FY 2016	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$4,441,000	\$3,999,000	\$3,917,000	\$4,200,000 3/	\$4,200,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs of this activity are accounted for between the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, Navigation, and Hydropower business lines.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$963,000, including \$730,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Government Performance and Results Act of 1993 (GPRA) and under general authorities contained in various laws.

DESCRIPTION: This funding supports Civil Works Operation and Maintenance (O&M) program integrated business line information systems; centrally distributed performance measures, outputs and system inventory information; and evaluation of new measures through the Performance Based Budgeting Support Program. Funds will also support development of cross business output-result oriented performance measures of the incremental return on investment in the Corps' Civil Works program area including the investigation, acquisition and integration of decision-making software and tools. The funding provides support for all business lines, focusing on flood risk management, navigation, hydropower, and aquatic ecosystem restoration for the data entry modules and integration. The President's management agenda and GPRA Modernization Act require that the Corps implement performance based budgeting for Civil Works Operation and Maintenance. The Performance Based Budgeting Support Program supports this requirement through the collection, management and distribution of data; by seeking new methods for linking performance to annual budget requests; and by analyzing the potential economic impacts on service to customers of varying budget levels. Data from these analyses are automatically loaded into the Civil Works Integrated Financial Database (CWIFD) for budget analysis and defense. Civil Works Business Intelligence (CWBI) is the U.S. Army Corps of Engineers (USACE) Automated Information System (AIS) responsible for acquisition, management, integration, visualization and analysis of all operational data in support of the civil works mission. CWBI enables performance based and evidence based decision support. In addition to supporting a wide variety of USACE programs, CWBI supports the response to reporting requirements and infrastructure performance metrics and is the USACE system of record for Enterprise Geographic Information Systems (EGIS). CWBI data sets are centralized, standardized, and managed collectively. CWBI interfaces with other information systems and provides various functional views of enterprise data to meet specific mission requirements, such as levee inspections, topographic survey activities, navigation and hydrographic survey activities, vulnerability assessments, regulatory action tracking, and dam/levee/bridge asset tracking. By managing core USACE data sets collectively, using standard software, and supporting Department of Defense (DoD) mandated open system interoperability, CWBI enables USACE to reduce costs and enables data to be easily integrated into various views maximizing the use and reuse of data and information. This funding is used as follows:

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Performance-Based Budgeting Support Program

- a. Civil Works Business Function Information (\$2,000,000): Provide data and information related to Civil Works project inventories, outputs and performance measures, which is critical for the operational and strategic management of Corps' projects, programs, budget development and studies that directly support the Navigation, Flood Risk Management, Ecosystem Restoration, Hydropower, Recreation, Environment (Stewardship and Compliance), and Water Supply Business Line missions. This information supports the Corps O&M program and is the sole source for the Corps, other Federal agencies, partners, stakeholders, and public. These funds support the collection, database management, integration, standardization, operation, enhancement, quality control, user assistance, training, software, and compliance with security requirements for ACE-IT services. These data were collected under the Operation and Maintenance Business Information Link (OMBIL Plus) which has since been converted to Civil Works Business Intelligence (CWBI). The Information Technology activities support data reporting requirements, including the Office of Management and Budget (OMB) 300b reporting. Funding for this program increases the Corps' ability to produce efficient, effective, and timely performance measures for budgeting, management and the prioritization of capital investment decisions.
- b. Civil Works Performance Measurements (\$800,000): Improve and integrate business line performance measurements to be incorporated into the budget decision-making process; support for the OMB's performance driven initiatives; and support for the future Corps budget preparation process. Efforts focus on the refinement of corporate performance principles and program and project-level performance measures that focus on anticipated performance and output at different levels of funding. Aligns and integrates with the O&M business processes - navigation, flood risk management, hydropower, recreation, water supply and environment. These measurements, at different organizational levels, provide the analytical basis to identify the incremental return on investment in Corps programs at various funding levels and to make adjustments in priorities both at the program and project levels concerning efficiency of facilities or services. Comparison of across-business lines measurements among projects at all levels helps focus management attention on the priorities of programs and projects related to capital investments principles.
- c. Civil Works Business Analysis (\$1,000,000): Analyze data using statistical and other analytical techniques and tools to uncover relationships among budget, expenditures and performance within and between Corps business line processes. The relationships and statistics drawn from the data will provide evidence to support capital investment priorities and decisions, increasing the Corps ability to deliver business line service in the most efficient and effective manner. This task will also develop effective products to explain relationships found in the data and allow decision-makers to visualize cause and effect. This task links the data gathering, collection and distribution, and use of data in the decision-making process.
- d. Program Development Technical Support (\$200,000): The automated information system P2 has replaced the Automated Budget System (ABS) for budget development processes. The transition to P2 from ABS has aligned all Civil Works budget requests within one automated information system (AIS). Previously, the ABS supported gathering, analyzing and submitting project funding requests to respond to all authorized missions within the Corps' Operation and Maintenance program. The work will continue to assist Civil Works program development for budget submissions, identify needed changes and recommend new analytical program development tools and procedures to support Civil Works program development. In addition to providing the base system for program development capability previously provided by ABS, review and development of procedures and tools using P2 data continues to evolve in order to be responsive to ongoing programs and associated budgeting requirements. Work under this activity ensures that all relevant business processes and monitoring needs are incorporated into databases, data requirements are reviewed and refined for relevance, and analytical capabilities support management of the Corps' budgeting process. Additionally, the deployment of P2 and updated versions has shifted program efforts towards developing methods and procedures for setting program priorities.

Examples include analytical applications to support risk-based cost trade-offs of variances in scope and cost for coastal navigation channels, and verification of deep draft waterborne traffic statistics used to estimate project value or return.

e. Agency Digital Service Teams (\$200,000): The success rate of government digital services improves when agencies have digital service experts on staff with modern design, software engineering, and product management skills. To ensure the agency can effectively build and deliver important digital services, the FY 2017 funding was provided for staffing costs to build a Digital Service team that will focus on transforming the agency's digital services with the greatest impact to citizens and businesses so they are easier to use and more cost-effective to build and maintain. These digital service experts will bring best practices in the disciplines of design, software engineering, and product management to bear on the agency's most important services. The positions will be term-limited to encourage a continuous influx of up-to-date design and technology skills into the agency. The digital service experts will be recruited from among America's leading technology enterprises and startups, and will join with the agency's top technical and policy leaders to deliver meaningful and lasting improvements to the services the agency provides to citizens and businesses. Funds will be used to develop an information technology strategy to support redesigns to the Corps of Engineers Financial Management System (CEFMS). This would support future interface and capability changes and would facilitate DATA Act implementation activities.

ACCOMPLISHMENTS IN PRIOR YEARS: Included were new data requirements relating to natural resource management, flood risk management and water supply collection system in CWBI data entry and access. These changes maintain the Corps' ability to provide data relating to water storage, irrigation, and wild fire activity as related to Corps' project sites. CWBI serves the entire USACE organization as a means for entering and accessing data and information related to O&M budgets, expenditures, activities, and performance. The one-stop access for much of Civil Works performance information was expanded to support data for budget submissions in lieu of separate data entry and analysis. An integrated data set for all business lines was created with data for FY1999-2016 providing trend information. Performance data and outputs were migrated to the standard integrated corporate environment. Using these new standards, enhanced data linkages between CWBI and other Corps' systems (financial information, asset management information, etc.) made significant advancement and allowed increased visibility and decision support.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Recreation Management Support Program – Recreation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017 2/	Budgeted Amount for FY 2018
\$1,633,000	\$1,633,500	\$1,633,000	\$1,550,000	\$1,550,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$327,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Flood Control Act of 1944 (58 Stat. 887), Public Law (P.L.) 78-534.

DESCRIPTION: These funds will support the implementation of the Recreation Strategic Plan which will guide many of the support activities performed this fiscal year, particularly in the areas of efficiency evaluation, communication and partnerships, including support to Recreation One Stop. These activities are designed to adapt a suite of tools from year to year to provide the capability to evolve the program to changing requirements and evaluate resulting program performance improvement. The Recreation Budget Evaluation System (Rec-BEST) will continue to be adapted and refined to respond to administration priorities and adjustments in the CE budget development process. Improvements were made to increase the capability to monitor and report Recreation performance measures and to evaluate and prioritize budget submissions in response to OMB guidance. Efforts also continue to better link with the Asset Management and risk informed budget process. The Recreation module of the Natural Resource Management Gateway will be further developed to address high priority needs. Demonstrations will be conducted to identify and communicate the benefits of the Corps recreation program and improve effectiveness in addressing the needs of ethnic minority visitors. Emphasis will be placed on improving recreation use monitoring procedures that will be incorporated into recreation performance measures. Customer satisfaction instruments and sampling approach will be refined and deployed to all CE projects for implementation by field staff at hundreds of CE managed parks nationwide. Results will be processed and benchmarked and fully integrated into program performance measures. Technical support will be provided to field staff to implement improved procedures. Support will be provided to standing Natural Resource Management (NRM) committees and task forces including: Partnership Advisory Committee, Ranger Community of Practice (CoP), Water Safety, Recreation Leadership Advisory Team and Career Development. Support will be provided to Headquarters Recreation program staff regarding strategic planning, development of program evaluations, staffing evaluation and other high priority Headquarters initiatives. Provides resources for evaluation tasks associated with the implementation of the National Recreation Program Road Map.

The RMSP supports the recreation program through the conduct of focused management studies to improve operational efficiencies and the provision of technical assistance, to include technology transfer and technology support and maintenance for recreation-specific automated information systems. The RMSP supports strategic planning for and performance monitoring of the Corps recreation business program, subject to the Government Performance and Results Act (GPRA) and subsequent Administration initiatives in this area.

The RMSP has 5 major components, which together provide comprehensive support to the Corps Recreation Business Program:

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Recreation Management Support Program

1. Focused Management Studies. RMSP provides focused management studies and reports to acquire and analyze information about recreation trends, accessibility, emerging issues, user conflicts, visitor diversity, use fee impacts and similar elements affecting the Corps recreation program. Analyses are conducted to support the recreation area modernization program, implementing facility and service standards, and in similar product delivery improvement efforts. Information and technology transfer pursuant to these studies is funded by the RMSP. Ongoing trends analysis provides valuable data on which to base decisions about necessary short and long term adjustments to the program to meet public needs.
2. Management/Technical Assistance. RMSP provides technical assistance to the Recreation CoP in the development of management tools, which quantify recreation program outputs and relate them to customer needs and budget allocations for the purpose of measuring performance. This includes gathering and analyzing information about customer satisfaction with the Corps recreation program. RMSP assures the field workforce is equipped with "state-of-the-art" skills and knowledge to deal with a rapidly changing public. RMSP provides technical support and maintenance of performance based budgeting tools, visitation monitoring and analysis systems, fee collection and reporting, economic analysis, facility inventory and condition assessment, and similar automated information programs. RMSP provides short-term assistance to projects in solving specific technical problems.
3. Support to Recreation Program Strategic Planning. Funding to support the activities of the Recreation Leadership Advisory Team (RLAT) is included in this program. The RLAT is composed of representatives from the division, district and project levels of the Corps natural resources management program. It provides input, advice and support to the Corps strategic planning for the recreation business program.
4. RMPS supports nationwide recreation visitation surveys. Accurately estimating of the number of visitors to our projects is key to making wise investment and management decisions. The Visitation Estimation and Reporting System (VERS) modernization effort is centrally managed within RMSP to bring greater accuracy to our visitor estimates across the Corps.
5. Recreation.gov and Volunteer.gov are two initiatives designed to improve access to recreation-related information from the Federal government, streamline the systems used to manage that information, and increase sharing of recreation-related information among government and non-government organizations. Providing a nationwide funding source at HQUSACE for centralized procurement of these items used by all operating projects having a natural resources management program precludes the need for funds to be transferred by each project or district to a single procurement agent, a savings of from 60 to 300 transactions a year. Funding for these initiatives is sufficient to also cover the costs of the Recreation One-Stop Initiative, which was previously funded as a separate line item in the Budget.

ACCOMPLISHMENTS IN PRIOR YEARS: Recent accomplishments include conducting a National Recreation Assessment Program (NRAP), which we have adapted into Recreation Infrastructure Investment Strategy and incorporated into the budget prioritization process. NRAP is a strategic investment and quality assurance program that focuses on our facility condition assessment and operational efficiency. Also include the development and implementation of a national survey of recreation visitors that will be used in the modernization of the Visitation Estimation and Reporting System (VERS), which will update the agency visitation estimation process and provide more credible counts of our visitation, refinement of the CWBI Recreation module, and development of platforms to market the Corps of Engineers (CE) recreation program on social media websites. Other past products include tool development and analysis of results from the annual application of the following ongoing tools; a) Recreation Budget Evaluation System (RecBEST), b) VERS and analysis and reporting modules, c) economic impact methodology and analysis tools, d) customer satisfaction survey and benchmarking tools implemented at all CE projects, studies on recreation preferences of ethnic groups including cross-cultural communication issues, and e) support for development of a strategic context as a foundation for transitioning to a performance based environment, to include performance based budgeting.

The Natural Resources Management Gateway was developed as a knowledge management tool for the NRM CoP and is compatible with other Corps Knowledge Management (KM) and Community of Practice initiatives. The Gateway is used by the CoP to improve program performance using information generated by the management tools described above. The Corps Lakes Gateway was developed and provides information to millions of visitors annually on recreation opportunities at Corps projects (in FY 2014 almost 58 million page views). The Corps Lakes Gateway also delivers Corps recreation information to the interagency Rec.gov and volunteer.gov projects in support of the Administration's E-GOV initiative. Guidance and appropriate tools were developed to improve interpretive services associated with the CE recreation program that advance the public's understanding of the environment and the Corps Environmental Operating Principles. Support to Headquarters was provided to refine the recreation business program strategic plan, utilizing input from the Recreation Leadership Advisory Team (RLAT) and stakeholders. Actions identified in the Recreation Strategic Plan resulted in a national analysis of the status of park ranger safety and the status of Recreation program staffing levels, and operation efficiency assessments at all CE projects.

APPROPRIATION TITLE: Operation & Maintenance, Fiscal Year 2018

Regional Sediment Management Program, Engineer Research and Development Center Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$3,960,000	\$2,300,000	\$2,282,000	\$1,800,000 2/	\$3,500,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$581,000, including \$579,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 516 of the Water Resources Development Act of 1996 authorizes the development of long-term strategies for the management and control of sediments through studies and operational activities.

JUSTIFICATION: The RSM Program objectives are to establish regional sediment management strategies that link sediment management actions across multiple authorized U.S. Army Corps of Engineers (USACE) projects, and to coordinate management activities with other Federal agencies, State, and local governments within the boundaries of physical systems including inland watersheds, rivers, estuaries, and the coast. The goal is to demonstrate short- and long-term cost savings and increased economic and environmental benefits through adaptive management of sediments from a regional perspective. The approach provides opportunities to achieve greater effectiveness and efficiency and to realize significant cost savings relative to traditional project management practices. Cost savings may be realized from leveraging multiple project resources (funding, sediments), reduced re-handling of material, reduced sedimentation, optimized beneficial use or placement of material, extended dredging cycles and combined equipment mobilization and demobilization for linked projects (e.g., dredging and shore protection). Costs may also be reduced by sharing information, improved data management, and reduced duplication of field data collection, or by reducing duplication in model and tool development and application.

DESCRIPTION OF WORK FOR FY 2017:

- Continue to coordinate efforts to promote systems-based technologies and approaches to improve sediment management practices and optimize use of sediments in support of the USACE Civil Works mission. Major RSM National Program activities include: continue partnership with SAD RSM Regional Center of Expertise to assist USACE districts with the implementation of RSM and calculate value added and benefits through RSM approaches; coordination across the USACE districts and divisions to share knowledge and lessons learned; sponsor the annual RSM Workshop and In-Progress-Review to promote program goals, share knowledge and experiences, and technology transfer among RSM practitioners; participate in regional and national initiatives to promote the RSM concepts and approach; and present RSM Program benefits and goals to national audiences.
- Complete evaluation of the sediment dynamics of the USACE and NJDOT managed Barnegat inlet and channel system in order to provide more efficient placement operations and improve short-term dredging and placement actions. Developed a strategy, based on the evaluation, to

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Regional Sediment Management Program

better inform future management as well as O&M decisions.

- Develop a database and web-based viewer of USACE projects constructed using RSM principles and a catalog of the tools, models, technologies, and guidance used to identify, evaluate, and construct the projects. Include final reports and documents to share with the RSM Community.
- Complete development of Web-based Sediment Mobility Tool to predict frequency of sediment mobilization and general transport direction to assist with siting and design of nearshore berms.
- The Mobile and Jacksonville Districts along with ERDC and the Bureau of Ocean Energy Management are conducting studies to improve our understanding of the losses of fined grained material through the process of dredging and placing in the nearshore environment. This effort to improve the science understanding will improve the Corps ability to place dredged sediment along our Nation's shorelines while reducing overall costs.
- The Mobile and Jacksonville Districts are implementing pilot projects to evaluate projects constructed applying agreed upon turbidity thresholds for Florida Department of Environmental Protection (FDEP) permits for beneficially place dredged material in the nearshore.
- Develop strategy for construction of the identified Sandy Hook Federal Navigation Channel RSM opportunities through coordination with the stakeholders.
- Shoaling in the Lower Columbia River limits navigation throughout the Columbia River, especially during periods of low water. Due to limited funding and the availability of dredge plant, this shoaling annually causes the Columbia River Pilots to issue draft restrictions in the river. These restrictions cause an economic impact to the region. Develop RSM strategy to ensure that dredging and placement of material is done in the most efficient manner practicable, to prevent re-shoaling and to ensure a reliable Federal navigation channel.
- Perform evaluations to quantify the regional sediment management effects of three decades of USACE bank stabilization projects (i.e. how much sediment was prevented from entering the waterways) and distill lessons learned on the performance of those projects that could improve future projects from a regional sediment management perspective as well as an emergency streambank protection perspective.
- Sediment in USACE reservoirs has been decoupled from downstream river channels and coastal deltas for decades. A rebalancing of sediment from reservoir storage into rivers and subsequently transported to coastal areas could reduce both riverine and coastal degradation resulting in navigation, habitat, and coastal protection benefits. Perform analysis of the projected impacts of increasing the sediment supply downstream of the Missouri River Reservoir system to determine benefits to inland and coastal water systems.
- Explore and evaluate methods to better understand the benefits of beneficially using dredged material to enhance ecosystems and the environment.
- Continue to expand regional approaches developed for the operation and maintenance of navigation projects to a Corps-wide capability. The improved regional approach to the navigation program assists nationally to identify common issues that are better solved on a regional basis, improve channel availability and subsequently life cycle costs and project benefits through more efficient practices, and improve regional

efficiencies by engaging cross-mission objectives of the Corps (i.e., navigation, flood risk management, and environmental restoration regarding sediments).

- Outreach and apply lessons learned through the inland RSM initiatives to apply regional approaches to link multiple projects (navigation, shore protection, environmental enhancement) across a region resulting in improved use of sediments, optimized operational efficiencies, increased benefits, cost savings, and collaboration with federal and non-federal partners.
- Coordinate and implement sediment management actions identified through the FY 2016 efforts across the districts. Identified actions will optimize the use of sediments to improve operational efficiencies while keeping sediments in the system, reducing shoreline erosion, reducing sedimentation, and/or improve environmental habitat while reducing overall costs by linking projects, reducing timelines, and leveraging data, information, and resources. Actions will be coordinated with partners and stakeholders to ensure needs are met.
- Continue integration of Corps dredging, environmental, sediment, and monitoring related databases to provide data access and tools to assist in the management of sediment and dredging information, project information, etc. to provide the capability to identify needs and opportunities to implement sediment management strategies.
- Continue support of the USACE Data Integration Framework (DIF) effort to populate National enterprise databases with USACE data and integrate the tools and models that utilize the data. The goal is to provide data access and tools to assist in the management of sediment and dredging information and project information to provide the capability to identify needs and opportunities to implement sediment management strategies. The RSM Program will continue to enhance the Galveston District efforts to bring together dredging and environmental datasets and integrate tools into a web-based CE-Dredge Viewer to improve Galveston District's ability to make dredging management decisions on a daily basis and for the long-term.
- Continue development of district regional sediment budgets, building the sediment budget repository, and enhancing the Sediment Budget Analysis System.
- Continue integration and implementation of riverine and reservoir initiatives to improve the management of sediments on the inland systems.
- Continued to develop comprehensive RSM strategies across districts and divisions to proactively identify and address opportunities to implement RSM approaches to enhance systems resilience to coastal storms and flood risks and long-term sustainability which create overall healthy systems. The RSM strategies identify opportunities to improve the use of sediments while reducing costs and increasing environmental and social benefits. The strategies promote resilient coastal areas and sustainable projects by including navigation projects, shore protection projects, riverine, and reservoir projects to optimize use of sediments and dredged material through utilization of RSM practices.

DESCRIPTION OF WORK FOR FY 2018: Funds will be used to continue implementation of RSM through support to Districts and Divisions to include, but not be limited to:

- Continue to expand regional approaches developed for the operation and maintenance of navigation projects to a Corps-wide capability. The improved regional approach to the navigation program assists nationally to identify common issues that are better solved on a regional basis, improve channel availability and subsequently life cycle costs and project benefits through more efficient practices, and improve regional

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efficiencies by engaging cross-mission objectives of the Corps (i.e., navigation, flood risk management, and environmental restoration regarding sediments).

- Outreach and apply lessons learned through the inland RSM initiatives to apply regional approaches to link multiple projects (navigation, shore protection, environmental enhancement) across a region resulting in improved use of sediments, optimized operational efficiencies, increased benefits, cost savings, and collaboration with federal and non-federal partners.
- Coordinate and implement sediment management actions identified through the FY 2017 efforts across the districts. Identified actions will optimize the use of sediments to improve operational efficiencies while keeping sediments in the system, reducing shoreline erosion, reducing sedimentation, and/or improve environmental habitat while reducing overall costs by linking projects, reducing timelines, and leveraging data, information, and resources. Actions will be coordinated with partners and stakeholders to ensure needs are met.
- Continue support of the USACE Data Integration Framework (DIF) effort to populate National enterprise databases with USACE data and integrate the tools and models that utilize the data. The goal is to provide data access and tools to assist in the management of sediment and dredging information and project information to provide the capability to identify needs and opportunities to implement sediment management strategies.
- Continue development of district regional sediment budgets, building the sediment budget repository, and enhancing the Sediment Budget Analysis System.
- Continue integration and implementation of riverine and reservoir initiatives to improve the management of sediments on the inland systems.
- Integrate methods to quantify benefits of beneficially using dredged material for ecosystems and the environmental enhancement into RSM strategy tools.
- Initiate integration of RSM Strategy into the Lower Columbia River operations and maintenance to prevent re-shoaling of sediments into the navigation channel.
- Complete an RSM study to determine the feasibility of using the Saco River dredged sand for beach fill to address the Section 111 beach fill needs, and also for back passing the Scarborough Inlet dredged material to the Saco beaches. Initiate coordination for construction.
- Complete analysis of the projected impacts of increasing the sediment supply downstream of the Missouri River Reservoir system to determine benefits to inland and coastal water systems
- Continue to develop comprehensive RSM strategies across districts and divisions to proactively identify and address opportunities to implement RSM approaches to enhance systems resilience to coastal storms and flood risks and long-term sustainability which create overall healthy systems. The RSM strategies identify opportunities to improve the use of sediments while reducing costs and increasing environmental and social benefits. The strategies promote resilient coastal areas and sustainable projects by including navigation projects, shore protection projects, riverine, and reservoir projects to optimize use of sediments and dredged material through utilization of RSM practices.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Review of Non-Federal Alterations of Civil Works Projects (Section 408) – Flood and Coastal Storm Damage Reduction 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017 3/	Budgeted Amount for FY 2018
2/	2/	\$4,000,000	\$3,000,000	\$8,500,000

1/ This activity is funded at 100 percent Federal expense. The total funding is accounted in the Flood Risk Management (FRM) business line but will be allocated to the appropriate business line based on the Section 408 requests actually received.

2/ Prior to FY 2016, funding for the activities covered by this remaining item were sourced out of other programs, projects, and activities within the Civil Works program.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$271,000, which was all committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 14 of the Rivers and Harbors Appropriations Act of 1899 and codified in 33 U.S.C. 408 (Section 408) authorizes the Secretary of the Army to grant permission to any private, public, tribal, or other federal entities for the temporary or permanent alteration or use of a U.S. Army Corps of Engineers (USACE) civil works project if the Secretary determines that the alteration or use will not be injurious to the public interest and will not impair the usefulness of the project.

DESCRIPTION: Since 2006, USACE has seen an increase in requests by non-Federal interests to alter USACE civil works projects. In FY 2016, this remaining item was established to improve transparency over the management and use of funds used to review requests under Section 408 to alter a Corps project. For larger alterations the need for coordination with the requester as they compile their request package can require significant Federal resources. Through Section 408 reviews, the Corps ensures that the alteration will not adversely impact the public interest and will not impair the usefulness of the Federal project.

Reviews are conducted for both flood and coastal storm damage reduction projects and commercial navigation projects. However, most of the current requests involve Federally authorized flood and coastal storm damage reduction projects. Review of Section 408 requests that are for non-Federal hydropower development at USACE facilities will continue to be funded in the Maintenance and Operation of Dams account using existing Federal Energy Regulatory Commission licensees' annual payments.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Stewardship Support Program, Insitute for Water Resources – Environmental Stewardship 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017 2/	Budgeted Amount in FY 2018
\$990,000	\$990,000	\$986,000	\$950,000	\$900,000

1/ This activity is funded at 100 percent Federal expense.

2/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$289,000, including \$33,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

DESCRIPTION: These funds will be used to conduct focused management action studies and recommend guidance to address high priority program efficiency and effectiveness concerns, including responses to new protocols for asset and risk management, regulation changes, and administration priorities through the Stewardship Support Program (SSP). Efforts will continue in support of performance based budgeting including further development of performance measures, development of strategies to improve program outputs and outcomes, and refinement of Environmental Stewardship Budget Evaluation System (E-S BEST) and related guidance to monitor program performance and risk analysis. Progress in recent years on developing standards, published protocols, and web-based data entry programs have resulted in improvements in advancing completion of the inventories and will result in expanded data from national GIS analysis to prioritize work. The SSP will also continue support of the Environment-Stewardship CoP including further development of the Natural Resources Management (NRM) Gateway for information and technology exchange. These activities will provide benefits in increased program effectiveness through implementation of assessment recommendations. Improved program performance will be facilitated through increased CoP access to best practices and policy guidance and effective development and execution of performance based budgets.

The SSP was established by regulation in FY02 to provide broad support to Environment-Stewardship function at operating projects by assisting in the identification of national program needs, the development of new national program activities, strategic program planning, and the recommendation of national stewardship program funding priorities. Support will be provided in refining the Environment–Stewardship business program strategic plan and goals, and budget processes, to address the targeted outcomes of the overall Corps Civil Works Strategic Plan, using input from the Stewardship Advisory Team, other associated Corps business programs and stakeholders. Goals and objectives have been refined, and actions will be identified to achieve them. Funding this program from a single source reflects the nationwide application and supports standardization in program direction and outputs.

The three basic components of the SSP are:

(1) Focused Management Actions and Studies. These activities are to implement a course of action or practice within field office activities, a region, or nationwide. Management actions may include collaboration and participation with Landscape Conservation Cooperatives to improve

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Stewardship Support Program

interagency efficiencies and focus on habitats of national concern. Examples of management studies include geospatial decision tools for use at the projects or conducting studies on management of threatened and endangered species and meeting biological opinion requirements. In FY 2018, a focus on national initiatives will strive to transfer understanding of national interagency program and initiatives, best management practices, and knowledge that improves the link of the Corps with other agencies in these national natural resource initiatives.

(2) Policy Guidance and Management Support. Such activities relate to the development and/ or implementation of guidance. Specific work will include amending the annual Budget Engineer Circular and the Environmental Stewardship budget development manual to provide emphasis on new environmental threats or nationally significant resources that adjust to administration initiatives in natural resources resiliency, national pollinator strategy and supporting land and water conservation. Continuing integrated watershed and asset management will be a focus for FY 2018 as well as implementation of focused habitat work related to climate change adaptation. Funding to support the activities of the Stewardship Advisory Team (SAT) is included in this program. The SAT is composed of representatives from the division, district, and project levels of the Corps Environmental Stewardship Program. It provides input, advice, and support to the Corps strategic planning for the Environment-Stewardship business program.

(3) Information Exchange. These activities are designed to build, integrate, and share our knowledge base to support greater understanding of the environment and the impacts of program work. The development of the NRM Gateway to provide technical knowledge as well as improved understanding of interagency national programs that contribute to national priorities.

ACCOMPLISHMENTS IN PRIOR YEARS: The allocation of project operation and maintenance funds to conduct specified nationwide (multiple project) activities to improve the efficiency and cost effectiveness of the Environment-Stewardship business program. Specifically in FY 15, the program assisted Headquarters in adjusting the program to focus on Environmental Stewardship activities and completed the transfer of endangered species and biological opinions to other business lines and incorporate those costs as part of the business process for all business lines. Adjustments were made to all budget development policies, guidance and data input systems including cost expenditure financial systems. Components of the Environment–Stewardship portion of the NRM Gateway, a knowledge management tool for the NRM community, have been completed, including a pollinator initiatives such as the National Pollinator Strategies and pollinator best management practices; posting of guidance, training modules and examples of Master Plan revisions to support increasing Master Plan development; and content specific information on invasive species especially those species that are causing eminent threats to Corps projects. The Gateway continues to be the central location of program knowledge within the Corps to quickly share policy updates, emerging issues and technical support. Support to Headquarters was provided to develop and refine the Environment-Stewardship business program objectives and budget criteria, the program management plan for the Environment-Stewardship Community of Practice, and the revision of the Environment-Stewardship program regulation. Formulation of program decision tools to evaluate the threats to, and significance of CE managed natural resources pilot projects were continued at Ft. Worth District and began setup for division wide testing in FY 2015 with transition to Southwestern Division in FY 2016 and incorporation into national decision making in FY 2017.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Sustainable Rivers Program, Institute for Water Resources 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
2/	2/	2/	\$400,000 3/	\$400,000

1/ This activity is funded at 100 percent Federal expense.

2/ Prior to 2017, Sustainable Rivers Program was funded as part of the National Portfolio Assessment for Reallocations.

3/ The actual unobligated carry-in from FY 2016 to FY 2017 was \$0. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Specific project authorizations, Section 216 of the Rivers and Harbors and Flood Control Act of 1970.

DESCRIPTION: The Sustainable Rivers Program (SRP) was initiated in 2002. In FY 2017, this remaining item was established to improve transparency over the management and use of funds used to assess ecosystem needs downstream of USACE projects, to evaluate opportunities for operational changes and/or reallocations that enhance aquatic ecosystems while maintaining or improving other project purposes (e.g. flood risk reduction, water supply, and hydropower), and to implement environmental flows where feasible. This remaining item is now the only national funding source for SRP. The SRP is implemented in partnership with The Nature Conservancy and numerous other Federal, state, and nongovernmental partners.

SRP involves work on 58 USACE reservoirs in 14 river basins. It is the largest scale and most comprehensive project for implementing environmental flows below USACE reservoirs. SRP funding has been used to define environmental flows for 20 reservoirs and implemented environmental flows at 10, thereby affecting ecological conditions for approximately 600 river miles. SRP efforts complement other reservoir-centric water resource projects by demonstrating that a strategic and science-based adaptive management approach can be used at USACE projects to maintain or enhance the benefits they provide to the nation while reducing negative environmental consequences.

Lessons learned at existing sites will be used to inform new and existing efforts to modify project operations, ensure consideration of environmental implications of existing and current operations and refine the practices for evaluating evolving water demands.

Site work will define ecological needs and environmental implications, model potential operational changes and environmental implications, implement and monitor ecological outcomes resulting from changes to the operation of particular reservoir systems, and assess economic impacts or enhancements as a result of the changes in operation. Site work follows a national strategy, executed to demonstrate opportunity and illustrate the steps required to implement environmental flows at reservoirs. A prioritization of USACE reservoirs based on size, level of downstream influence, authorized purposes, and several other factors, identifies reservoirs with high potential for environmental flow implementation and informs which are used as demonstrations. The SRP process for implementation follows:

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Sustainable Rivers Program

- Define the environmental flows needed to ensure sustainable biodiversity below USACE reservoirs;
- Perform trade-off analyses to quantify effects of reservoir reoperations;
- Implement operational changes to meet environmental flow needs at existing and new sites; and
- Monitor and advance processes to update reservoir management policies to ensure operations reflect current, increasing, and competing demands for water and associated effects on biodiversity.

These funds will be used to accomplish national and site work in accordance with the following SRP principles:

- Build capacity within the water management community to advance implementation of environmental flows with little or no direct involvement of SRP resources;
- Engage partners to focus on sustainability and avoid conflict, including Endangered Species Act (ESA) consultations; and
- Advance innovative efforts to implement environmental flows.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Veterans Curation Program and Collections Management 1/ 2/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017 4/	Budgeted Amount in FY 2018
3/	3/	3/	\$6,500,000	\$6,500,000

1/ This activity is funded at 100 percent Federal expense.

2/ The costs for this activity are accounted for evenly between the Navigation, Hydropower, Flood and Coastal Storm Damage Reduction, and Environmental Stewardship business lines.

3/ Prior to FY 2017, funding for this activity was appropriated under the NAGPRA/Curation line item.

4/ The actual unobligated carry-in from FY2016 to FY 2017 was \$20,000. As of the date this justification sheet was prepared, the total unobligated dollars to be carried into FY 2018 from prior appropriations for use on this effort is estimated to be \$0.

AUTHORIZATION: The Curation of Federally Owned and Administered Archeological Collections (36 CFR Part 79), required by the Antiquities Act (16 U.S.C. 431-433), the Reservoir Salvage Act (16 U.S.C. 469-469c), the National Historic Preservation Act (16 U.S.C. 470h-2), and the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm), requires Civil Works programs and projects to properly house their archaeological collections to federal standards. On 6 July 2016, H.R. 3114, a bill to support Wounded Warriors and Veterans through the formal recognition of the Chief of Engineers' Veterans Curation Program was signed by President Obama and is now Public Law 114-189.

DESCRIPTION: The Veterans Curation Program serves as a primary means of rehabilitating and processing archaeological collections owned and administered by USACE collections to meet federal standards. The Corps is responsible for the curation of an estimated 46,255 cubic feet of artifacts collected from its water resources development projects and an estimated 3,511 linear feet of associated records. Curation of these materials, which are over 80 percent of the total DoD collections and the largest volume of all federal agencies responsible for this activity, is required by a number of public laws with implementing guidance in 36 CFR Part 79. These extensive collections are located in over one hundred fifty curation facilities across the nation. The Mandatory Center of Expertise (MCX), located at the St. Louis District, provides overall management of the Corps' collections management programs and serves as a centralized base for curation and collection compliance, an information source, and for contracting collections related services. The MCX leads the implementation of an agency-wide long-term plan for the curation and collections management of USACE archeological collections, which involves addressing the rehabilitation needs of USACE's most critical archeological collections through the Veterans Curation Program (VCP). The MCX has been operating the Veterans Curation Program since 2009 to ensure proper processing of Corps archaeological collections through the employment and training of veterans. The MCX facilitates consistent nationwide curation and collections management programs implementation and operation. The MCX has accelerated the process of effectively managing the Corps curation effort with the Veterans Curation Program, which provides disabled veterans with employment and additional job skills in archaeological collections management, while providing for the rehabilitation of the fragile collections. The MCX, in providing collections assessments, has assisted in establishing the extent and locations of Corps holdings. The MCX has established standardized, uniform curation assessment procedures, which were used to assess all Corps collections, and is working to verify the long-term curatorial responsibilities for all collections. A phased task plan using the Veterans Curation Program for appropriate processing and curation has been developed and is being

Mississippi Valley Division

St. Louis District

Veterans Curation Program

implemented on at-risk collections. Data for USACE archaeological collections derived from prior year surveys of districts and from the VCP laboratories has also been used to populate an updated collections dataset that provides accurate accounting information for the total collections holdings of the USACE. These funds are used to fund MCX's operation of the Veterans Curation Program laboratories and expedite collection stabilization, proper storage, and collection management support to all Districts.

ACCOMPLISHMENTS IN FY 2016: The staffing of veterans and the rehabilitation of at-risk archaeological materials and associated records was increased in FY 2016 with 81 veterans employed by the three labs, which included the expansion of the Alexandria laboratory. At the end of FY2016, the program will have employed 322 veterans since its inception in 2009. In addition to the expansion of the Alexandria Lab, two smaller VCP labs were established, one at Arizona State University and one at the reservation for the Confederated Tribes of the Colville Reservation, which will begin employing veterans in FY2017. For the collections management program, MCX continued to populate a database that was developed to track Corps collections. Data in the database is being drawn from the VCP, consolidation research, and data provided by districts. MCX continues to work with Major Subordinate Commands (MSCs) on consolidation plans for their collections. MCX has drafted a Project Management Plan for Corps-wide curation. Northwestern Division (NWD) and South Pacific Division (SPD) continued their real estate research to identify the collections for which they have long-term responsibility. For Mississippi Valley Division (MVD), the MCX developed a Quality Management System (QMS) for consolidation, prepared informational letters that were provided to all Native American tribes within MVD to begin the process of consultation for this effort, continued to refine real estate information to determine which collections are the Corps' long-term responsibility, and began contracting processes to refine identification of Corps records collections at certain repositories. The MCX hosted a meeting with MVD cultural resource managers and tribal liaisons.

DESCRIPTION OF WORK FOR FY 2017: Fiscal Year 2017 funds are being used to increase staffing of veterans to over 90 individuals. This includes the first full year of staffing at the expanded Alexandria laboratory and at the two smaller VCP laboratories established in FY 2016. At the end of FY 2017, the program is expected to have employed more than 410 veterans since its inception in 2009. The MCX continues to lead in the implementation of an agency-wide long-term plan for the curation of USACE archeological collections focused on achieving efficiencies through regional consolidation. NWD and SPD are developing a consolidation plan for their collections, and cultural resources personnel in Southwestern Division (SWD), South Atlantic Division (SAD), North Atlantic Division (NAD), and Great Lakes and Ohio River Division (LRD) are meeting with MCX to begin the consolidation studies within their geographic boundaries. MVD continues with the consolidation program through tribal consultation, real estate research, collections assessments, records consolidation, and the identification of regional repositories.

DESCRIPTION OF WORK FOR FY 2018: The staffing of veterans and the rehabilitation of at-risk archaeological materials and associated records will continue in FY 2018 with approximately 90-100 veterans. VCP graduate veterans are also being hired by other contractors working on rehabilitation of collections under the consolidation effort. The MCX also will continue working with MSCs to create division-wide curation plans for the consolidation and long-term care of MSC collections. Consolidation studies for LRD, NAD, and POD will be started, and work on the consolidation plans in other divisions will continue. Collections assessments and identification of regional repositories will continue. The MCX will continue to update the Corps curation dataset maintained by the center, which will provide for out-year budgeting and planning. These initiatives will lead to greater long-term efficiencies. For all initiatives, the MCX will act as a source of expertise for processing and housing USACE collections, and managing the VCP.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Waterborne Commerce Statistics, Institute for Water Resources – Navigation 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount for FY 2018
\$4,723,000	\$4,622,310	\$4,772,000	\$4,669,000 2/	\$4,670,000

1/ This activity is funded at 100 percent expense.

2/ The actual unobligated balance from FY 2016 into FY 2017 for this project is \$727,000, including \$657,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 3 of the 1945 River and Harbor Act (as amended by Section 915 (g) of the Water Resources Development Act of 1986); Sections 15, 19, and 20 of the Rivers and Harbors Act of 1899, as amended; River and Harbor Act of 1922 as amended; Public Law (P.L.) 103-182.

DESCRIPTION: The Corps serves as the Federal central collection agency, and is the sole U.S. Government source for U.S. domestic waterborne commerce and vessel statistics. The Office of Management and Budget (OMB) pursuant to Title 44 U.S.C. 3509 and 3510 transferred primary responsibility for U.S. foreign waterborne transportation statistics mission from the Bureau of the Census to the Corps in 1998. Funding for this activity is used to develop data that provide essential information for navigation project investment analyses and annual funding prioritization for operation and maintenance of existing projects; as project output information for computation of performance measures; for input into the U.S. National Accounts; and for regulatory compliance, emergency management decisions, and homeland defense. Activities supporting this national statistics mission include:

- a. Collecting and reporting of water transportation statistical data. Under Federal law, vessel operating companies must report domestic waterborne commercial movements to the Corps;
- b. Developing and operating automated systems (transactional systems within Operation and Maintenance corporate information system), processing, compiling, and publishing statistical data and information on waterborne commerce and vessels moving on the internal U.S. waterways, the Great Lakes, and through all U.S. ocean channels and ports;
- c. Documenting and publishing the Nation’s commercial port infrastructure served by Federal channels;
- d. Documenting and publishing the U.S. vessels available for operation in waterborne commerce, their principal trades and zones of operation; and
- e. Acquiring and using software tools for program analysis, diagnostics and quality control. This item is reported under Civil Works Business Intelligence (CWBI) in Information Technology Investment Portfolio System (ITIPS) and the OMB 300b; and

Fiscal Year 2018 funds will be used to perform operation, maintenance and necessary enhancements of the nation’s waterborne commerce, vessel and shipper data and statistics programs. Funds will also be used to increase project detail data requirements for budget submission and economic justification and to collaborate with partner agencies to improve navigation data from a Federal perspective including, acquiring and

Institute for Water Resources

Waterborne Commerce Statistics

using software tools for program analysis, diagnostics and quality control. Implementation, with continued modification of Corps automated systems, to accept new real-time domestic electronic data to improve accuracy of domestic statistics; and modification of programs to integrate U.S. foreign import/export data from the International Trade Data System and CBP to improve processing efficiency and accuracy of foreign transportation statistics in accordance with Executive Order 13659, *Streamlining the Export/Import Process for American's Businesses* (Executive Order), signed on February 19, 2014 by President Obama. Among other things, this Executive Order mandated the completion and government-wide utilization of the International Trade Data System by December 31, 2016. When implemented, the International Trade Data System will provide an automated and electronic single window for businesses to provide the information required by government for the export or import of cargo and for government agencies to download their required datasets.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2018

Water Operations Technical Support (WOTS), Engineer Research and Development Center – Flood and Coastal Storm Damage Reduction 1/

Allocation in FY 2014	Allocation in FY 2015	Allocation in FY 2016	Allocation in FY 2017	Budgeted Amount in FY 2018
\$495,000	\$2,500,000	\$5,445,000	\$5,500,000 2/	\$500,000

1/ This activity is funded at 100 percent Federal expense.

2/ Estimated Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2016 to FY 2017 was \$106,000, including \$90,000 committed within the Corps for scheduled ongoing requirements in FY 2017. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2018 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The purpose of this program is to maintain the environmental and water quality conditions at 562 Corps reservoirs (5,500,000 surface acres), 237 navigation locks, 926 harbors, 75 hydropower projects, and 25,000 miles of inland and coastal waterways, which requires compliance with numerous statutes and State standards. Providing the technology and knowledge base necessary to broadly address environmental requirements in accordance with laws and regulations can best be accomplished through a comprehensive centralized program that will maximize cost effectiveness, and ensure broad dissemination and implementation of technology and information. In FY 2015, Congress added \$2,000,000 for the study of atmospheric rivers and their possible effects upon the Corps' reservoir operations. Congress added \$5,000,000 for the continuing study in FY 2016.

These funds are used to provide effective environmental and water quality management technologies to address a wide range of issues at Corps reservoir and waterway projects, and in river systems nationwide. A key component of the program is to offer sustainable innovative engineering solutions to complex environmental problems. The program supports the incorporation of Green Infrastructure and Low Impact Development (GI-LID) technologies through integration of Engineering with Nature (EWN) principles to support USACE environmental objectives. The program provides technology to address: problems caused by aquatic invasive species; water quality impacts of land use, sediment and nutrient loadings, erosion, and reservoir sedimentation; tailwater fisheries concerns at pump-back hydropower projects; enhancement of habitat for aquatic endangered species at risk; and project operations related to environmental and water quality issues. WOTS provides technical support to the Corps' mission-related project responsibilities, with special emphasis on the transfer of technology. The program ensures that the technologies developed by the Corps and other Federal agencies are current and readily available to all Corps field offices. The effective use of technologies will be secured through direct technical assistance, specialty workshops, information bulletins, technical notes, executive notes, technical reports, webinars, miscellaneous papers, instruction manuals, videos, meetings, seminars, briefings, congressional testimony, and the Internet.

Funds are also used for research and development of Forecast Informed Reservoir Operations (FIRO), an effort investigating the feasibility of using predictive capabilities of atmospheric river events to inform reservoir operations at Corps dams in the Western United States. Prior year funds focused on two main areas: 1) quantifying the predictability of atmospheric rivers in timing and location of precipitation and the resulting stream flow; and 2) developing a prototype reservoir operations simulator for the pilot watershed and reservoir, Lake Mendocino, on which to test alternative operations scenarios. Current efforts include: 1) conducting retrospective evaluations of events over the past 20 years of record using potential alternative operations scenarios; and 2) designing a demonstration prototype system for conducting quantitative evaluation of a FIRO-based system.

Engineer Research and Development Center

Water Operations Technical Support (WOTS)