

REMAINING ITEMS

Investigations

Construction

Operation and Maintenance

Harbor Maintenance Trust Fund

Mississippi River and Tributaries

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REMAINING ITEMS	PAGE
(Ordered by Appropriation)	
INVESTIGATIONS	
COORDINATION WITH OTHER WATER RESOURCE AGENCIES	1
DISPOSITION OF COMPLETED PROJECTS	3
ENVIRONMENTAL DATA STUDIES	7
FERC LICENSING	8
FLOOD DAMAGE DATA	9
FLOOD PLAIN MANAGEMENT SERVICES	11
INTERAGENCY WATER RESOURCES DEVELOPMENT	13
INTERNATIONAL WATER STUDIES	14
INVENTORY OF DAMS	15
NATIONAL FLOOD RISK MANAGEMENT PROGRAM	17
PLANNING ASSISTANCE TO STATES	19
PLANNING SUPPORT PROGRAM	20
PRECIPITATION STUDIES	21
RESEARCH AND DEVELOPMENT	23
SPECIAL INVESTIGATIONS	27
STREAM GAGING	28
TECHNOLOGY APPLICATION PROGRAMS	29
TRANSPORTATION SYSTEMS	33
TRIBAL PARTNERSHIP PROGRAM	35
CONSTRUCTION	
CONTINUING AUTHORITIES PROJECTS NOT REQUIRING SPECIFIC LEGISLATION:	43
AQUATIC ECOSYSTEM RESTORATION (SECTION 206)	
SMALL FLOOD CONTROL PROJECTS (SECTION 205)	
PROJECT MODIFICATIONS FOR IMPROVEMENT OF THE ENVIRONMENT (SECTION 1135)	
DAM SAFETY AND SEEPAGE/STABILITY CORRECTION PROGRAM	45
EMPLOYEES COMPENSATION	47
INLAND WATERWAYS USERS BOARD	48

REMAINING ITEMS	PAGE
(Ordered by Appropriation)	
OPERATION AND MAINTENANCE	
AQUATIC NUISANCE CONTROL RESEARCH	49
ASSET MANAGEMENT/FACILITIES AND EQUIPMENT MAINTENANCE	53
CIVIL WORKS WATER MANAGEMENT SYSTEM (CWMS)	55
COASTAL OCEAN DATA SYSTEM (CODS) PROGRAM	57
COASTAL INLETS RESEARCH PROGRAM	59
CULTURAL RESOURCES	69
CYBERSECURITY	70
DREDGING DATA AND LOCK PERFORMANCE MONITORING SYSTEM	71
DREDGING OPERATIONS AND ENVIRONMENTAL RESEARCH (DOER) PROGRAM	73
DREDGING OPERATIONS TECHNICAL SUPPORT (DOTS) PROGRAM	77
EARTHQUAKE HAZARDS REDUCTION PROGRAM	79
FISH & WILDLIFE OPERATING FISH HATCHERY REIMBURSEMENT	80
FACILITY PROTECTION	81
INLAND WATERWAY NAVIGATION CHARTS	83
INSPECTION OF COMPLETED FEDERAL FLOOD CONTROL PROJECTS	85
INSPECTION OF COMPLETED WORKS	86
MONITORING OF COMPLETED NAVIGATION PROJECTS (MCNP)	87
NATIONAL COASTAL MAPPING PROGRAM	91
NATIONAL DAM SAFETY PROGRAM (PORTFOLIO RISK ASSESSMENT)	93
NATIONAL EMERGENCY PREPAREDNESS PROGRAM (NEPP)	95
NATIONAL (LEVEE) FLOOD INVENTORY	96
NATIONAL (MULTIPLE PROJECT) NATURAL RESOURCES MANAGEMENT ACTIVITIES	97
NATIONAL PORTFOLIO ASSESSMENT FOR REALLOCATIONS	101
OPTIMIZATION TOOLS FOR NAVIGATION	103
PERFORMANCE BASED BUDGETING SUPPORT PROGRAM	105
RECREATION MANAGEMENT SUPPORT PROGRAM	107
REGIONAL SEDIMENT MANAGEMENT PROGRAM	109
REVIEW OF NON-FEDERAL ALTERATIONS OF CIVIL WORKS PROJECTS (SECTION 408)	111

REMAINING ITEMS	PAGE
(Ordered by Appropriation)	
OPERATION AND MAINTENANCE (continued)	
SCHEDULING RESERVOIR OPERATIONS	112
STEWARDSHIP SUPPORT PROGRAM	113
SUSTAINABLE RIVERS PROGRAM	115
VETERANS CURATION PROGRAM AND COLLECTIONS MANAGEMENT	116
WATERBORNE COMMERCE STATISTICS	117
WATER OPERATIONS TECHNICAL SUPPORT (WOTS)	118
HARBOR MAINTENANCE TRUST FUND	
CONTINUING AUTHORITIES PROJECTS NOT REQUIRING SPECIFIC LEGISLATION:	
BENEFICIAL USES OF DREDGED MATERIAL (SECTION 204)	119
DREDGE MCFARLAND READY RESERVE	120
DREDGE WHEELER READY RESERVE, LA	121
EMERGENCY RESPONSE	122
HARBOR MAINTENANCE FEE DATA COLLECTION	123
PROJECT CONDITION SURVEYS	124
SURVEILLANCE OF NORTHERN BOUNDARY WATERS	125
MISSISSIPPI RIVER AND TRIBUTARIES	
COLLECTION AND STUDY OF BASIC DATA	126
INSPECTION OF COMPLETED WORKS, AR, IL, KY, LA, MS, MO, and TN	127
MISSISSIPPI RIVER COMMISSION	128

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APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Coordination Studies with Other Water Resource Agencies, Other Coordination Programs

PROJECT NAME: Coordination with Other Water Resource Agencies 1/ 2/

	Allocation in FY 2017 \$ 3/ 4/	Allocation in FY 2018 \$ 5/	Allocation in FY 2019 \$ 6/ 7/	Presumed Allocation in FY 2020 \$ 8/	Budgeted Amount in FY 2021 \$
Total	2,155,000 4/	2,160,000	1,250,000	6,400,000	350,000
CALFED	21,000	15,000	18,000	25,000	
Chesapeake Bay	55,000	104,000	97,000	250,000	
Gulf of Mexico	84,000	80,000	51,000	100,000	
Lake Tahoe	30,000	30,000	0	0	
Interagency and International Support	300,000	400,000	400,000	465,000	
National Shoreline Management Study	1,400,000	1,310,000	400,000	5,000,000	
Other Programs	265,000	221,000	284,000	560,000	

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

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

3/ \$50,000 was reprogrammed to this line item in FY 2017.

4/ 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.

5/ \$50,000 was reprogrammed to this line item in FY 2018.

6/ \$50,000 was reprogrammed to this line item in FY 2019.

7/ In FY 2019, this remaining item consolidated two additional separate line items included in prior budgets – Interagency and International Support and the National Shoreline Management Study.

8/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 on these efforts was \$776,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

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.); Section 234 of the Water Resources Development Act of 1996 (33 U.S.C. 2323a), as amended; Section 215 of Water

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Coordination with Other Water Resource Agencies

Resources Development Act of 1999.

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) cooperate with Federal, state, and local agencies such as River Basin Compact Commissions; Interstate River Basin Compacts; and Regional Planning Commissions; and technical advisory committees of the Environmental Protection Agency's National Estuary Program;
- d) supporting, after consulting with the Department of State, international organizations and foreign governments efforts to address domestic and international problems related to water resources, infrastructure development, and environmental protection and restoration; and
- e) participating in specific regional initiatives, such as:
 - i. Chesapeake Bay restoration;
 - ii. Gulf of Mexico coastal environment restoration;
 - iii. 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 economic and environmental impacts of that erosion and accretion and to improve our understanding of long-term regional trends.

The funding provided in FY 2020 for the National Shoreline Management Study will be used to support the Coastal Systems Portfolio Initiative by conducting assessments of erosion and accretion on the coasts and impacts on the economy and the environment, expanding the Coastal Systems Portfolio Initiative database of all coastal projects in the Corps for systems management purposes, and supporting coastal Districts experiencing measureable changes to their coast in developing a long term coastal strategy for USACE to improve decision making, collaboration with federal and state partners, and engagement with partners to address the needs of coastal communities.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Other, Miscellaneous – Navigation

PROJECT NAME: Disposition of Completed Projects, Multiple Districts 1/ 2/

	Total Estimated Federal Cost \$	Allocations thru FY 2018 \$	Allocation in FY2019 \$	Unobligated Carry-in to FY2020 \$ 3/	Presumed Allocation in FY2020 \$ 3/	Budgeted Amount in FY2021 \$ 3/	Balance to Complete After FY2021 \$
Upper St. Anthony Falls, Mississippi River, MN	\$1,250,000	\$546,000	\$350,000	\$281,000	\$354,000	\$0	\$0
Lower St. Anthony Falls, Mississippi River, MN	\$1,250,000					\$186,000	\$1,064,000
Salinas Reservoir (Santa Margarita Lake), CA	\$1,250,000	\$495,000	\$350,000	\$532,000	\$326,000	\$79,000	\$0
Cape Fear Locks and Dams 1-3, NC	\$1,250,000	\$445,000	\$210,000	\$365,000	\$485,000	\$110,000	\$0
Savannah River Below Augusta, GA	\$450,000		\$300,000	\$249,000	\$0	\$150,000	\$0
Los Angeles County Drainage Area (Channels), CA	\$1,250,000	\$0	\$0		\$535,000	\$715,000	\$0
Apoon Mouth of Yukon, AK	\$150,000	\$0	\$0		\$150,000	\$0	\$0
St. Michael Canal, AK	\$150,000	\$0	\$0		\$150,000	\$0	\$0
Bayou Cocoderie and Tributaries, LA	\$500,000					\$500,000	\$0
Peoria Small Boat Harbor, IL	\$110,000					\$110,000	\$0
Suisen Channel (Slough), CA	\$150,000					\$150,000	\$0
Unallocated Funds		\$225,000	\$0		\$0	\$0	\$0

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

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

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$1,446,126. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is \$0.

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.

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 2021 funds are being used to complete the Salinas Reservoir (Santa Margarita Lake), CA; Cape Fear Locks and Dams 1-3, NC; Savannah River Below Augusta, GA; Los Angeles County Drainage Area (Channels), CA; Bayou Cocoderie and Tributaries, LA; Peoria Small Boat Harbor, IL; and Suisen Channel (Slough), CA disposition studies.

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.

In keeping with direction in Section 1225 of WRDA 2018 the St. Anthony Falls disposition study was modified to provide a separate report for Upper St. Anthony Falls and Lower St. Anthony Falls, with the Upper St. Anthony Falls study being prioritized. The Upper St. Anthony Falls disposition study is scheduled to complete in December 2020. The Lower St. Anthony Falls Disposition Study will begin in FY 2021.

Salinas Dam, California 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 Corps of Engineers lease and is water supply storage for the city of San Luis Obispo. The Salinas Dam disposition study is scheduled to complete in December 2020.

Cape Fear Locks and Dams 1-3, North Carolina 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. The Cape Fear Locks and Dams 1-3 disposition study is scheduled to complete in December 2021.

Los Angeles County Drainage Area (LACDA), California is a series of flood risk management features operated and maintained in concert by agencies and entities located in southern California. The channel portions of LACDA no longer function efficiently and provide a diminished level of flood risk management. The Los Angeles County Drainage Area disposition study is scheduled to complete in December 2021.

Apoon Mouth of Yukon River, Alaska was originally authorized to provide for a channel through bars located in Apoon Mouth, bend widening and a channel through the bar located in Pastol Bay. The need for waterborne transportation in this area was eliminated by construction of the Alaska Railroad and modern transportation systems. Apoon Mouth of Yukon River no longer supports navigation traffic. The Apoon Mouth of Yukon River disposition study is scheduled to complete in August 2021.

St. Michael Canal, Alaska provided a channel from St. Michael Bay to the St. Michael Canal north and south branches. The need for waterborne transportation in this area was eliminated by construction of the Alaska Railroad and modern transportation systems. St. Michael Canal no longer supports navigation traffic. The St. Michael Canal disposition study is scheduled to complete in August 2021.

Savannah River Below Augusta, Georgia is a training wall and navigation feature constructed in the early 1900s as part of the federally authorized Savannah River Below Augusta (SRBA) Navigation Project. The Federal purpose of commercial navigation, for which the project was originally constructed, no longer exists and the current use of the channel is limited to recreation. Because there is no longer any commercial navigation, the training wall system is no longer needed. The Savannah River Below Augusta disposition study is scheduled to complete in December 2021.

Bayou Cocodrie and Tributaries, Louisiana provides flood risk management in the Bayous Rapides, Boeuf, and Cocodrie watershed. Three flood control features of the Federal project (Bayou Rapides Drainage Structure, Lamourie Control Structure, and Lecompte Control Structure) have already been turned over to the Red River, Atchafalaya, and Bayou Boeuf Levee District (RRAB). The RRABB is interested in assuming ownership of the project and project features. The Bayou Cocodrie and Tributaries disposition study is scheduled to complete in December 2021.

Peoria Small Boat Harbor, Illinois does not support commercial traffic. The Federal purpose of commercial navigation, for which the project was originally constructed doesn't exist and the current use of the channel is limited to recreation. Operation and maintenance has not been performed by the USACE since the channel was constructed in 1948. The Peoria Small Boat Harbor disposition study is scheduled to complete in April 2021.

Suisun Channel (Slough), California is a shallow draft navigation channel and turning basin that no longer supports commercial traffic. The Suisun Channel (Slough) disposition study is scheduled to complete in April 2021.

ACCOMPLISHMENTS:

	Total Allocation Through FY 2019	Unobligated Carry-in to FY 2020
Programmatic Management	\$100,000	\$0
West Pearl River Navigation Project, MS & LA	\$433,000	\$0
Kentucky River Locks and Dams, 1-4, KY	\$400,000	\$14,000
Willamette Falls Locks, OR	\$535,000	\$4,000
Allegheny River Locks 5-9, PA	\$450,000	\$0
Upper Monongahela River, PA	\$450,000	\$0

Programmatic management funds were used to develop implementation guidance for this remaining item.

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Disposition of Completed Projects

The West Pearl River Navigation Project, Mississippi & Louisiana disposition study was terminated when Congress deauthorized and directed conveyance of the Pearl River, MS & LA project in Section 1321 of the Water Resources Development Act of 2016.

The Kentucky River Locks and Dams 1-4, Kentucky disposition study was completed in April 2018. Congress deauthorized and directed conveyance of the Locks and Dams 1 through 4, Kentucky River, Kentucky project to the State of Kentucky in Section 1331 of the America's Water Infrastructure Act of 2018.

The Allegheny Locks 5-9, Pennsylvania and Upper Monongahela River, Pennsylvania disposition studies are closed out with no path forward to disposition.

The Willamette Falls Locks, OR disposition study was completed in May 2019 with a Director's Report signed and forwarded to the Office of the Assistant Secretary of Civil Works in July 2019.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Collection and Study of Basic Data– Aquatic Ecosystem Restoration

PROJECT NAME: Environmental Data Studies 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 1	\$ 80,000	\$ 80,000	\$ 80,000 2/	\$ \$80,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,500. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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. The program supports the development of the Civil Works Mitigation and Endangered Species Act Compliance Database and the Ecosystem Restoration Business Line Database, which summarizes important information on projects and informs 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:

- Maintain and support upgrades to the Holistic Ecosystem Restoration Online Network (HERON), the Civil Works Mitigation and ESA Compliance Database and Ecosystem Restoration Business Line Database
- 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 through the USACE environmental databases.

Examples of prior year accomplishments include; training and support to Districts on environmental data; NatureServe data subscription; and support upgrades to the HERON.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Coordination Studies with Other Agencies, Other Coordination Programs

PROJECT NAME: FERC Licensing 1/ 2/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 100,000	\$ 100,000	\$ 100,000	\$ 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/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$43,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 (Corps) 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.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

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

PROJECT NAME: Flood Damage Data 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 220,000	\$ 230,000	\$ 230,000	\$ 230,000 2/	\$ 280,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 Corps uses this funding to collect and maintain basic flood damage data, improve the technical quality and accuracy of the available flood damage data, and improve our understanding of the interrelationships of the characteristics of flooding on property damage. The probabilities and damages associated with various flood events reflect multiple factors and are key elements of the risk-based analytical framework used in water resource studies. The evaluation and formulation of options to reduce flood risks require knowledge of the relationships between flood depth, flood duration and velocity, and the value and type of damageable property in the floodplain. In estimating the flood risk, the Corps uses standard damage-frequency integration techniques, and computer programs that relate hydrologic and hydraulic flood variables (such as discharge and stage) to damages and the probability of their occurrence.

A centralized, objective source of depth-damage relationships using empirical data results in the standardization of flood damage estimates across the Corps and reduces the need for Districts to compute the relationships themselves for each separate study, resulting in substantial savings as well as reducing likelihood of bias.

The activities of the program are to:

- (1) Conduct actual flood damage surveys following riverine and coastal flood events;
- (2) Provide this post-flood damage information to the affected and nearby communities for their use in managing their flood risks;
- (3) Develop, maintain, and improve the general economic database of flood damages that the Corps uses to develop its depth-damage relationships for a variety of structure occupancy types;
- (4) Calculate flood depth-damage functions for riverine and coastal flooding based on empirical damage data;
- (5) Collect data and derive damage relationships for the flooding of roads, public buildings and facilities, and other public infrastructure;
- (6) Develop and maintain a floodplain inventory software tool that organizes floodplain information, which is then exported to the Corps' Flood Damage Assessment software tool; and
- (7) Collect data on clean-up costs, evacuation costs, relocation costs and other costs associated with flood events.

The Corps also uses this funding to update and maintain data collection survey forms and other data collection techniques, to develop and share a flood damage database, to update and maintain a geospatial computer application for floodplain inventory data, and to certify models for estimating residential and nonresidential structure values. In addition, it uses this funding 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, the Corps uses these funds 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 2021

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

PROJECT NAME: Flood Plain Management Services 1/

	Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$ 2/	Budgeted Amount in FY 2021 \$
Total	15,300,000	15,000,000	\$17,000,000	15,000,000	15,000,000
Interagency Nonstructural Alternatives	7,000,000	6,919,000	6,725,000	6,500,000	6,500,000
Other Technical Services	6,000,000	6,326,000	698,000	7,000,000	7,000,000
Systems Approach to Geomorphic Engineering (SAGE)	1,000,000	400,000	494,000	500,000	500,000
National Hurricane Program (NHP)	800,000	855,000	936,000	500,000	500,000
National Nonstructural Committee (NNC)	500,000	500,000	357,000	500,000	500,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$9,518,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

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

DESCRIPTION: The Corps uses this funding to provide technical assistance (information, analysis, guidance) to states, tribes and local communities that are taking, or considering, actions to improve their flood plain management, and the planning and implementation of actions at the state and local levels that reduce flood risk through wise use of floodplains. Examples include evaluating site-specific flood and flood plain data; hydraulic and hydrologic modeling services; identifying potential flood hazards in areas where a community expects future development to occur; technical support on ways to enhance resiliency to flood events; helping develop a flood warning plan; and technical assistance for a pre-disaster evacuation and preparedness study.

The Corps provides this technical assistance based on the flood and floodplain concerns that the local community has identified. The Corps uses this funding to supports locally based planning efforts, providing them access to the most current technology, research and skills on flood risk and floodplain management, including small communities that may have limited expertise in this area. For example, the Corps could help to interpret flood and floodplain data, or to identify options for addressing local flood or floodplain management concerns. The Corps could provide guidance that will help the local community and the private sector to improve the way that they are now managing their flood risks. This guidance could cover all or particular aspects of floodplain management planning, such as off-flood plain use changes, communications conveying, and fostering public understanding of flood hazards, and of the options for achieving flood plain management goals.

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Flood Plain Management Services

The Corps funds five related activities under this remaining item:

- Through its Interagency Nonstructural Alternatives program, the Corps promotes collaborative, small-scale efforts emphasizing nonstructural approaches to manage and reduce specific flood risks. The program leverages inputs of multiple partners to achieve benefits that any single partner could not achieve alone.
- Through its Other Technical Services, the Corps provides a full range of information, services, and planning assistance to local officials on floods and flood plain issues. This assistance may include consideration of options for structural approaches. Examples include assistance in obtaining, developing, and interpreting flood and flood plain data; assistance in improving local flood plain management planning in other ways; or a study of a particular issue to inform local flood risk management decisions. The Corps also uses this funding to respond to general and specific inquiries from local agencies and the public on flood and flood plain issues that are not related to the preparation for, response to, or recovery from a specific recent flood.
- Through its Systems Approach to Geomorphic Engineering (SAGE) program, the Corps uses this funding to work with other agencies and stakeholders to investigate and support coastal resiliency on a landscape scale.
- Through its National Nonstructural Committee (NNC), the Corps uses this funding to provide technical expertise on all aspects of nonstructural flood risk reduction adaptive measures, focusing on reducing the consequences of flooding.
- Through its National Hurricane Program (NHP), the Corps uses this funding to provide real-time support in hurricane situations and input affecting emergency management, services, evacuation, and actions to enhance preparedness. The NHP works closely with FEMA and other emergency management organizations to maintain the capability to respond to the threats posed by coastal storms.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Coordination Studies With Other Agencies, Other Coordination Programs

PROJECT NAME: Interagency Water Resources Development 1/ 2/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 177,000 3/	\$ 100,000	\$ 100,000	\$ 100,000 4/	\$ 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/ \$2,000 was reprogrammed to this line item in FY 2017.

4/ The actual unobligated carry-in from FY 2019 to FY 2020 was \$99,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 33 U.S.C. 2323a; 42 USC 1962d-16.

DESCRIPTION: 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 2021

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

PROJECT NAME: International Water Studies, Multiple Districts 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 150,000	\$ 125,000	\$ 125,000	\$ 125,000 2/	\$ 125,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$5,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

The Corps uses this funding to prepare studies that support the participation of the United States in boundary water treaties and other international agreements with Canada. Under these treaties and agreements, various Boards and Committees, consisting of officials from both nations, hold joint meetings, review report drafts and correspondence, 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 management, use, and orderly development of the shared water resources of the river basins that cross 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 ensure adherence to orders of approval pertaining to use of boundary waters issued by the IJC. Corps officials serve on and chair the United States 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 Niagara Treaty of 1950 between United States and Canada supports the most beneficial use of waters of the Niagara River. Corps officials 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 flow 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.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

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

PROJECT NAME: Inventory of Dams 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 400,000	\$ 400,000	\$ 400,000	\$ 400,000 2/	\$ 400,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$30,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 Corps uses this funding to maintain and update data on dams in the United States, using a database called the National Inventory of Dams (NID). The Corps initially compiled the NID in 1975, and has been updating it periodically since then with information provided by the state dam safety agencies, other Federal agencies that own or regulate dams, and the Corps (for its dams). The updates reflect changes such as the 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 NID now includes 91,468 dams, most of which are privately owned. The Corps uses the internet to provide ease of use, accuracy, and accessibility for the data in the NID.

With this funding, the Corps updates the data on these dams, improves information flow, and performs data quality control processes. The database provides a central nationwide source of publicly available information used to track and manage dam safety efforts. The data in the NID informs a nationwide, coordinated effort to improve dam safety. This effort involves the entire federal and non-federal dam safety community, in cooperation with the Interagency Committee on Dam Safety, and the Association of State Dam Safety Officials.

The Secretary of Homeland Security and the National Dam Safety Review Board use the NID to allocate dam safety program assistance funds among the states, in proportion to the number of regulated dams in each state. The Corps provides summaries and analysis of the dam inventory data (such as inspections, emergency action plans, etc.) to the Federal Emergency Management Agency (FEMA) for its use in preparing the Biennial Report to Congress on the National Dam Safety Program. FEMA also uses this information in its oversight of the implementation of the Federal Guidelines for Dam Safety. The Corps pays all of the costs of the ongoing administration, maintenance, and publication of the NID.

The Corps now updates the NID each year, based on information that it collects from each of the state and federal agencies with dam safety responsibilities, such as inspection completion dates and condition assessment data. (Prior to 2016, the Corps updated the NID roughly once every 2 years - 3 years.) As a result of this data collection, almost 80 percent of the dams in the Nation that are known to have a high hazard potential now contain an assessment in the NID of the dam's condition based on the last inspection (compared to only 40 percent in 2009). Continuing efforts include routine maintenance on the inventory data and ensuring that the

Institute for Water Resources

Inventory of Dams

internet based, searchable inventory remains available to all federal, state, and local government agencies, and the public. With the 2019 NID and improved web site interface, users can easily download the NID by state, for the entire nation, or by a specific query using the 'Advanced Search' option. The 'Interactive Map & Charts' option allows users to query specific states and counties. Customized maps showing dams using different measures or options may include "Hazard Potential Classification", "Height", "Owner Type", and "Purpose". Based on website statistics, the website traffic increased to more than 200 percent once the previous restrictions were lifted and with the launch of the new interface.

The Corps also uses this funding to upgrade the Geographic Information System interface used by the NID and to increase the integration of the NID 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 2021

Other, Miscellaneous – Flood and Storm Damage Reduction

PROJECT NAME: National Flood Risk Management Program 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 5,175,000	\$ 5,300,000	\$ 5,000,000	\$ 5,000,000 2/	\$ 5,000,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$481,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The Corps uses this funding to support its participation in interagency technical and policy coordination groups on issues of flood risk management at the national and state levels. This work of the Corps involves coordinating the existing Federal programs that affect flood risk (for example, federally funded mitigation activities); ensuring that they complement the primary roles of the states and local communities in flood risk management; sharing data, knowledge, and lessons learned; and eliminating duplicative or conflicting Federal activities or policies. For example:

- At the national level, the Corps uses this funding to support its participation in the FEMA-chaired National Mitigation Framework Leadership (MitFLG). Specifically, the Corps participates on one of the formal sub-teams to further the coordination of various Federal programs for flood and other hazard mitigation activities and to develop a national mitigation investment strategy. Also at the national level, the Corps uses this funding to support its participation in the work of the Federal Interagency Floodplain Management Task Force (FIFM-TF). The FIFM-TF, co-chaired by FEMA and the Corps, is a national level task force of agency representatives from Federal agencies with major water resources 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 flood risks, including residual risks and the risk of loss of life of flood plain residents. Quarterly meetings of the FIFM-TF provide an opportunity for FEMA, the Corps, and other Federal agencies to coordinate their flood risk management programs, policies and activities to improve overall federal flood risk management program implementation. 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, the Corps uses this funding to support its involvement in intergovernmental teams during the long-term recovery phase of a major flood. These regional intergovernmental teams provide a venue to facilitate the development of a coordinated regional long-term strategy that integrates post-flood emergency actions and pre-flood mitigation strategies including promising nonstructural alternatives, in order to improve the ability of the affected local communities to manage their future flood risks. This intergovernmental effort complements the typically shorter-term Emergency Support Function support that the Corps and other agencies provide to FEMA during and immediately after a flood, and the assistance that the Corps provides local communities under its Public Law 84-99 program.
- At the state level, the Corps uses this funding to provide direction and oversight to its involvement in the Silver Jackets program. Under this program, teams of Federal and state staff from multiple agencies with flood risk management expertise work to identify ways to help address the state's flood

risk management and hazard mitigation priorities. For example, this would include assisting state agencies and local communities in identifying opportunities to leverage information and resources, helping them to improve their processes for public risk communication, and showing them ways to approach flood risk management issues holistically and implement workable solutions at the state and local levels.

The Corps also has used this funding to improve its approach to flood risk management and to develop supporting technical products. For example:

- Developing and initiating a management framework to improve internal communication both within the Corps and with FEMA's Headquarters and Regions on policy, practices, and guidance for flood risk management.
- Developing tools and methods for communicating flood risk and encouraging public involvement in flood risk management planning.
- Developing recommendations that will enhance the ability of the Corps both to manage flood risk within its own programs and to be an effective partner with other federal agencies, non-federal governments, and communities that help manage flood risks.

The Corps develops its priorities for the use of this funding (across the multiple potential activities included in its scope) through its Senior Executive National Flood Risk Management Program Steering Committee, with input from FEMA and other federal partners. The Corps also takes into consideration 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 when setting these priorities.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Coordination Studies with Other Agencies

PROJECT NAME: Planning Assistance to States 1/ 2/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount In FY 2021
\$ 6,750,000	\$ 8,000,000	\$ 9,000,000	\$ 9,000,000 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 Budget accounts for this activity under the Flood and Storm Damage Reduction program.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$6,017,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 22 of the Water Resources Development Act of 1974, as amended, 42 U.S.C. 1962d-16.

DESCRIPTION: The Corps uses this funding to provide technical assistance to states, local governments, Indian tribes, and regional and interstate water resources authorities to assist them in their water resources planning efforts. The Corps would use the requested funds for work related to flood risk management.

States, local governments, Indian tribes, and regional and interstate water resources authorities that are working to develop locally directed solutions to their water resources problems are eligible to compete for this funding. The program provides a means for Corps staff to work with them on the water resources issues that are of interest to them, outside of the Corps process for the planning and authorization of a specific proposed Corps project. The Corps does not use this funding to conduct project or watershed studies, or to develop analyses intended as preparation for a Corps project or watershed study.

Through this program, the Corps generally provides technical analysis to a community that is working on a specific water resources issue, such as where a local authority seeks to develop or update its hazard mitigation plan, or otherwise to improve the way that it is managing its flood risk. The Corps also is able under this program to provide technical analysis to support a broader effort by a state, regional, or interstate authority (such as the Susquehanna River Basin Commission River Basin Commission, Delaware River Basin Commission, or the Interstate Commission on the Potomac River Basin) that is evaluating options involving a range of issues across a large watershed.

Examples of the kinds of issues on which the Corps has provided such assistance include floodplain management, coastal zone management, water conservation, drought management, restoring urban river environments, water quality, and pre-disaster emergency planning.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Other, Miscellaneous

PROJECT NAME: Planning Support Program 1/ 2/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 3,150,000 3/	\$ 3,500,000	\$ 3,500,000	\$ 3,500,000 4/	\$ 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/ \$150,000 was reprogrammed to this remaining item in FY 2017.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$884,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 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, 156 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.

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Planning Support Program

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

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

PROJECT NAME: Precipitation Studies 1/

Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$	Budgeted Amount in FY 2021 \$
200,000	200,000	200,000	200,000 2/	200,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$41,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 206 of the Flood Control Act of 1960, P.L. 86-645, 33 USC 709a

DESCRIPTION: The Corps uses these funds to perform hydrologic and meteorological analyses of a general nature. These analyses focus on the specific regions of the country that are most likely to experience widespread flooding. With these funds, the Corps will also:

- (1) Compile and review the meteorological aspects of storm data;
- (2) Develop meteorological parameters pertaining to hurricanes, northeasters, and other wind phenomena;
- (3) Develop hydrologic criteria for use in evaluating flood risks, and in floodplain management generally;
- (4) Update precipitation frequency estimates for regions and the nation;
- (5) Conduct precipitation analyses including depth-duration-frequency estimation for regions and the nation; and
- (6) Maintain the Precipitation Frequency Data Server portal.

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APPROPRIATION TITLE: Investigations, Fiscal Year 2021

PROJECT NAME: Research and Development 1/ 2/

Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$	Budgeted Amount in FY 2021 \$
22,150,000 3/	25,000,000	25,154,000	27,115,000 4/	15,000,000

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

2/ The costs of this activity are shared between the Aquatic Ecosystem Restoration, Flood and Coastal Storm Damage Reduction, and Navigation business lines coincident with the Environmental, Flood and Coastal Systems, and Navigation subtotals detailed herein.

3/ \$150,000 was reprogrammed to this program during FY 2017.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,318,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 uses these funds to research and develop technologies and techniques that will promote monetary savings and greater reliability, safety, enhanced efficiency, and environmental sustainability in planning, design, construction, operations, and maintenance of civil works activities. This funding is categorized and managed by program area, as follows: Navigation, Flood and Coastal Systems (including Flood and Coastal Storm Damage Reduction, Emergency Management, Water Supply, and Recreation), and Environmental (including Aquatic Ecosystem Restoration, Regulatory, and Environmental Stewardship).

The Corps applies the results of this Civil Works Research and Development (R&D) in 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 conducts Civil Works R&D through the U.S. Army Engineer Research and Development Center's (ERDC) seven 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

a. Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 8,936,648	\$ 9,800,000	\$ 9,954,000	\$ 8,987,550	\$ 5,850,000

Navigation research delivers products that improve efficiency and reliability of the waterborne transportation network. The research framework integrates infrastructure engineering, 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, and dams to optimize among life-cycle and reliability trade-offs, support defensible economic assessment, and provide better investment decision tools for predicting navigational performance and deterioration with time, and for scheduling and prioritizing maintenance and repairs considering the consequences of delays. Essential to this effort is the development of tools for determining the condition of infrastructure components and for enabling risk-based prioritization of operation and maintenance needs. 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. The Corps also uses this funding to develop improved navigation economic technologies that can be used to support better-informed decision analyses and management of the deep-draft coastal ports and of the inland waterways.

This R&D area provides advanced and innovative tools and technology for the Corps to improve navigation functional performance, reduce unit costs, and improve safety. On the inland waterways, for example, R&D efforts are used to 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. Through the R&D program, the Corps is better able 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 used 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.

b. Flood and Coastal Systems

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 7,376,820	\$ 8,530,000	\$ 8,530,000	\$ 9,335,300	\$ 5,100,000

The principal purpose of many Corps projects is to help reduce the risk of flooding and storm damage. In the daily and seasonal operation of many of its reservoirs, the Corps seeks to balance this objective with other authorized project purposes such as hydropower, water supply, recreation, environmental stewardship, and fish

and wildlife. The Corps works to improve the efficiency and effectiveness of these projects by incorporating the best available knowledge and capabilities in planning, design, construction, operation, and maintenance. Through this R&D funding, the Corps develops technology that optimizes daily operation of water resources projects to meet multiple objectives, including water supply and environmental stewardship. The flood and coastal systems work of the Civil Works R&D program seeks to create new solutions to challenging infrastructure engineering problems in building, maintaining, upgrading, and operating water resources infrastructure such as dams, locks, spillways, channels and levees. Through this R&D, the Corps provides guidance and tools to understand the natural setting of its water resources projects, incorporate environmental and economic objectives, manage flood risk, assess alternative solutions, and improve operational decisions. The Corps also uses this funding to improve its emergency management operations by developing technology and tools that will support rigorous planning and preparedness and more efficient and effective response assessment, and recovery.

As enabling technologies are developed, the Corps may use that information to upgrade and improve its existing water resources projects, assess the risk of alternative operational scenarios, and assess the economic and environmental effects of alternative plans for new projects to inform selection of the most balanced and sustainable solutions. R&D delivers efficient and effective capabilities that improve the ability of the Corps to plan, design, construct, operate, maintain, evaluate, and improve its water resources projects in all climates and settings, from warm to ice-affected, and from inland to coastal.

Capabilities that reduce the risk of loss of life and of property damage, and reduce the life-cycle costs of projects 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 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.

c. Environmental

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 5,940,000	\$ 6,670,000	\$ 6,670,000	\$ 8,792,150	\$ 4,050,000

The Corps has ecosystem restoration and environmental stewardship and management responsibilities on more than 11 million acres of land and water resources. The Corps focuses these funds on the development and application of cost-effective, time-saving technologies. There is a growing emphasis on “integrated” ecological restoration and management that couples the requirements for ecological restoration and stewardship with other attainable services that ecosystems can provide. For example, ecological restoration efforts that achieve not only environmental benefit, but provide flood risk reduction, and reservoir management protocols that achieve not only a reliable water supply, but necessary environmental flows and water quality objectives. The current research portfolio can be categorized into seven (7) broad categories that generally capture the breadth and focus of the current environmental research program:

- 1) Maximizing value of ecosystem restoration projects;
- 2) Restoring ecological integrity and sustainability;
- 3) Management of inland aquatic and interdependent terrestrial resources;
- 4) Ensuring resilience, function and value of coastal ecosystems;
- 5) Management of Threatened and Endangered and Invasive Species in Ecosystem Restoration projects;
- 6) Providing modeling tools and decision frameworks for evaluation and comparison of ecological restoration alternatives; and
- 7) Ecological Infrastructure - assessing the ecological role, function and design of natural and nature-based features in "integrated" multi-objective (ENV, NAV, FRM) projects.

User-oriented products will provide scientifically defensible and field validated solutions to the highest priority environmental problems facing the Corps.

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 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. The Corps uses this funding to develop more robust assessment tools that: incorporate modern ecosystem principles that are easy to apply, offer significant user flexibility to meet individual project requirements, and provide quantifiable output relevant to the Corps performance measures. The Corps shares these tools through 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.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Coordination Studies with Other Agencies, Other Coordination Programs

PROJECT NAME: Special Investigations 1/ 2/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 1,300,000	\$ 1,000,000	\$ 999,964	\$ 1,000,000 3/ 4/	\$ 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/ \$36 was reprogrammed away from this line item in FY 2019.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$254,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 33 USC 2282(f)

DESCRIPTION: The Corps uses this funding to answer general inquiries from members of the public on the work of the civil works program, outside the scope of a specific Corps study, project, or program. For example, the Corps would use this funding to attend a meeting to explain to a potential local sponsor of a Corps study or the public how the Corps study process works.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

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

PROJECT NAME: Stream Gaging, Institute for Water Resources 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 750,000	\$ 550,000	\$ 550,000	\$ 4,550,000 2/	\$ 550,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$0. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is approximately \$900,000.

The Corps uses this funding to pay the U.S. Geological Survey (USGS) to operate, maintain, and gather data from roughly 80 existing stream gage stations, sited at locations that are not directly associated with a project that the Corps owns or with a particular Corps study. The Corps funds these gages to track stream flows in these specific locations, and uses this information to improve our general understanding of flood risks in those watersheds. The National Weather Service also uses the data collected at these gages in developing its public flood forecasts.

The Corps makes extensive use of the streamflow records collected through these gages in the planning, design, construction, and operation of water resources projects. For this purpose, it is best to have continuous records of streamflow at specific sites over a long period, in order to provide a more reliable measure of the likely water resources that are available for various uses. The Corps started working cooperatively with the USGS to install these gages in March 1928, with a focus on collecting data that would assist the Corps in implementing its water resources responsibilities.

The funding provided in FY 2020 will also be used, in coordination with USGS, to identify optimal locations and install approximately 80 new stations for stream gaging purposes, at locations that are not directly associated with a project that the Corps owns or with a particular Corps study, where such data are needed to support a general understanding of flood risks in those watersheds. As per the Committee report accompanying the Senate appropriations bill for FY 2020, the Corps will use up to \$1,000,000 of the FY 2020 funding to work with the National Resources Conservation Service and the States of Montana, North Dakota, South Dakota, and Wyoming on soil moisture and snowpack monitoring in the Upper Missouri River basin.

The Corps funds stream gages associated with the projects that it owns or with a particular Corps study under those projects or that study. The Corps also funds certain stream gages at non-Corps projects through its Operation and Maintenance program, under Scheduling Reservoir Operations.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Collection and Study of Basic Data

PROJECT NAME: Technology Application Programs 1/ 2/

	Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$ 3/	Budgeted Amount in FY 2021 \$ 4/
Total	2,233,000	2,235,000	2,235,000	4,235,000	2,485,000
Access to Water Data	360,000	360,000	360,000	360,000	
Coastal Field Data Collection	1,000,000	1,000,000	1,000,000	2,500,000	
Hydrologic Studies	500,000	500,000	500,000	500,000	
Remote Sensing/GIS Support	75,000	75,000	75,000	575,000	
Scientific and Technical Information Center	47,000	50,000	50,000	50,000	
Tri-Service CADD/GIS Technology Center	251,000	250,000	250,000	250,000	

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

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

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$244,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

4/ Starting in the FY 2021 Budget, the Corps combined the funding for these technology application programs into a single remaining item. This reform reflects the scope of the overall Civil Works involvement in these technology applications, enables improved execution of the available funds, and increases the flexibility to address emerging opportunities among these programs as needed.

AUTHORIZATION: Section 2017 of Water Resources Development Act 2007 (33 USC 2342) as amended; Section 7 of the 1944 Flood Control Act, 33 U.S.C. 709; Water Resources Development Act of 2016 (Public Law 114-322, section 1135); Public Law 99-802, Federal Technology Transfer Act of 1986.

DESCRIPTION: The Corps uses this funding to conduct six technology application programs. Under these programs, the Corps develops processes and procedures; and collects, manages, and shares basic hydrologic and coastal data including data related to water quality, water quantity, storms, precipitation, rainfall, snowmelt, sedimentation, streamflow, floods, and coastal data including waves, current, oceanographic, bathymetric, and topographic data. The six major components of this program are:

Access to Water Data. The Corps uses this funding 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.

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Technology Application Programs

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 once the Corps has completed quality assurance/quality control. The Corps routinely coordinates with other Federal agencies to solicit feedback on management and implementation of this program.

Coastal Field Data Collection. The Corps uses this funding to measure, analyze, and assemble long-term, high-resolution coastal data sets that are nationwide or regional in scope. The Coastal Working Group of the Hydraulics, Hydrology and Coastal community of Practice, in response to two Corps-wide surveys on data requirements (in 2009 and 2012), has highlighted the need for the systematic collection of these high-quality coastal observation data.

The Corps uses these data sets in its storm damage reduction and its commercial navigation programs to improve project design and performance. Inaccurate and insufficient observation data can lead to project design errors. For example, when designing a coastal rock structure, wave data with a 20% error will yield a 70% error rate in the stone size used to build the structure. Oversized stone makes initial construction costs much higher, while undersized stone results in early failure and higher than necessary life cycle repair costs. Similarly, a 5 degree 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. High-quality data sets can also assist in the development and evaluation of options where climatic changes may impact Corps projects.

The Corps 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. At this facility, the Corps evaluates oceanographic measurement techniques and equipment, collects high-resolution data during storms, and collects spatially and temporally intensive long-term measurements to improve our understanding of complex coastal processes and coastal climate. The FRF makes these data available online in real time to the other engineers and scientists of the Corps, other agencies (NOAA, NSF, Navy, USCG, USGS, etc.), universities, and the private sector. They and the Corps use these data for coastal research and for developing coastal engineering tools that predict wave environments and sediment movement affecting coastal storm damage reduction projects, coastal navigation safety, and coastal navigation 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 contributes to the Integrated Ocean Observing System (IOOS) as authorized in the Integrated Coastal and Ocean Observation System Act of 2009 (Public Law 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 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. This system, the only one of its kind in the world, has captured an hourly record of wave run-up and beach change during hurricanes and tropical storms since its permanent deployment in 2013.

The Corps also uses this funding to:

- Continue this long-term coastal ocean data collection, and 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.) to assist in understanding sediment transport processes in estuarine environments, which supports research on various Corps activities including: re-suspension of sediment due to dredging, dredge material placement, and ecosystem restoration.

Hydrologic Studies. The Corps uses this funding to perform engineering analyses of hydrologic data on one or more specific storm events, outside of the scope of a Corps project study. It conducts these analyses to advance our general understanding of the hydrology of major storm events and certain special hydrologic processes. The Corps also applies the conclusions that it derives from these analyses to improve the hydrologic engineering techniques that it uses in the planning, design, construction, and operation of water resources projects. The program consists of four items:

- 1) Storm Studies: The Corps uses these funds to gather comprehensive rainfall data in order to refine regional hydro-meteorological information throughout the nation. This up-to-date hydro-meteorological information informs Corps water resources studies, and supports the design of proposed projects. The Corps also uses these data in its safety assessments of existing Corps projects, the evaluation of flood producing potentials of river basins, and the development of probable maximum precipitation determinations.
- 2) General Hydrologic Studies: The Corps uses these funds to analyze rainfall runoff relationships; to estimate flood frequencies; and in hydrograph development and routing at selected watersheds, model calibrations in urban areas, analyses of past floods, snowmelt studies, the development of methods for the hydraulic analysis of non-gauged streams, and other studies of a related hydrologic nature.
- 3) Sedimentation Studies: The Corps uses these funds in non-project sedimentation studies, and for the Corps share of the cost of the cooperative Interagency Sedimentation Project at the Hydraulics Laboratory, Waterways Experiment Station. For example, these studies have supported the standardization and development of equipment, criteria, and methodology for the collection and analysis of suspended and bed load sediment characteristics of natural streams; and related laboratory studies.
- 4) Stream Flow and Rainfall Data Analysis: The Corps also uses these funds to install and operate hydrometeorology gages unrelated to a specific Corps project, where needed to support the studies described above.

Remote Sensing/GIS Support. The Remote Sensing/GIS Center (Center) is the Corps Center of Expertise for Civil Works Remote Sensing and GIS technologies. Continuing interaction with other researchers and practitioners throughout the Corps, government, the private sector, and academia ensures that knowledge of evolving trends that are relevant to Corps activities is available, and reduces any duplication of effort.

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 Corps 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.

The Corps also uses this funding to provide technical support and expertise throughout the Corps for Civil Works remote sensing and GIS and continue to expand GIS and remote sensing capabilities to maintain technical leadership for Corps programs.

Scientific and Technical Information Centers. The Corps uses this funding 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.

The five information analysis centers (coastal engineering, cold regions engineering, concrete technology, hydraulic engineering, and soil mechanics) of the U.S. Army Engineer Research and Development Center (ERDC) acquire, examine, evaluate, summarize, and disseminate newly published scientific and technical information generated within the Corps. These centers are a major technology transfer resource between the Corps and the public and private sectors, including the scientific and engineering community and academia, for the results of over 75 years of research 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 its host laboratories, critically evaluates and summarizes 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.

Automated Information Systems Support Tri-CADD. All Corps districts use Computer Automated Design (CAD), Building Information Modeling (BIM), Civil Information Modeling (CIM), and Geospatial Information Systems (GIS) computer systems for Civil Works engineering, design, mapping, planning, and facility management. All manual engineering design practices have been replaced with automated computerized design platforms or automated electronic mapping systems and most Corps environmental and natural resource analyses are being performed using GIS platforms. Standards and productivity enhancement tools are used for both in-house and contractor produced drawings, maps and analyses, which assure that all Corps offices have the ability to exchange their work among themselves and with others, including the private sector. The deployment of these automated systems at field offices achieve maximum productivity when users leverage 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, CIM, CAD, and GIS software.

The Corps uses this funding to coordinate development efforts, distribute products to Corps offices, and to support over 3,000 users of BIM/CIM/CAD/GIS and facility management technologies for Civil Works projects. All work accomplished using these funds is limited to support for automated information system improvements.

APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Collection and Study of Basic Data

PROJECT NAME: Transportation Systems 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 3,430,000	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000 2/	\$ 1,000,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$12,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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.

Annual funding is used to update shallow and deep-draft vessel operating costs; to create, update, and certify new navigation models, to recertify existing navigation models; to acquire trade and shipping subscriptions used for navigation feasibility studies; and to work on navigation studies. These include the Congressionally-directed Port Modernization Study, which is scheduled to complete in FY 2021, a container vessel deployment study which is also expected to complete in FY 2021, and updates to the computer models and analyses related to the impacts of the Panama Canal expansion.

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APPROPRIATION TITLE: Investigations, Fiscal Year 2021

Other, Miscellaneous

PROJECT NAME: Tribal Partnership Program 1/ 2/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 1,750,000	\$ 1,500,000	\$ 2,500,000	\$ 2,548,000 3/	\$ 500,000

1/ The non-Federal sponsor is generally responsible for 50 percent of the costs of all feasibility studies and technical assistance and 25 percent of the costs of all watershed studies funded out of this remaining item with the exception of a \$484,000 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 Storm Damage Reduction business lines.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,584,832, including \$624,602 for coordination or unallocated. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is \$500,000.

AUTHORIZATION: Section 203 of Water Resources Development Act (WRDA) of 2000, as amended by Section 2011 of WRDA 2007; Section 1002 and 1031 of the Water Resources and Reform Development Act of 2014; and Section 1156 of WRDA 1986 as amended by Section 1119 of the Water Infrastructure and Investment Act of 2016 and Section 1156 of the America's Water Infrastructure Act of 2018.

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 assessments. Prior to FY 2008, these activities were funded in the Construction account.

Feasibility Studies focus on a specific problem area (e.g. Flood and Storm Damage Reduction) within a limited geographic area and result in a specifically recommended project. Technical assistance includes stand-alone water-related planning activities independent of feasibility studies and watershed assessments and does not result in a specifically recommended study or 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. All studies follow the standard Civil Works planning process.

Two watershed assessments and one feasibility study have been completed under this program. The Pueblo of Santa Clara, NM Watershed Assessment was completed in FY 2018, the Acoma Pueblo, NM, Watershed Assessment was completed in FY 2019, and the Lower Brule Sioux Tribe feasibility study was completed in FY 2020.

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Tribal Partnership Program

There are currently seven on-going feasibility studies, six on-going watershed assessments, and two technical assistance activities 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 the termination of 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.

The total FY 2020 appropriations, FY 2020 unobligated carry-in funding, and the FY 2021 budgeted funds will be applied as follows:

On-going watershed assessments

State	Study Title	Local Sponsor	Funding through FY 2018	Allocation in FY 2019	Unobligated Carry-In to FY 2020	Presumed Allocation in FY 2020	Budget Amount in FY 2021	Date of Cost-Sharing Agreement
AZ	Bird Springs Watershed Assessment	Navajo Nation at Bird Springs	\$302,525	\$0	\$134,394	\$147,125	\$50,000	October 2017
ME	Meduxnekeag Watershed Assessment Management Plan	Houlton Band of Maliseets	\$339,025	-\$977	\$193	\$0	\$0	April 2017
NM	Pueblo of San Felipe, NM Watershed Assessment	Pueblo of San Felipe	\$515,084	\$209,470	\$217,010	\$35,000	\$0	March 2013
NM	Pueblo of Santo Domingo, NM, Watershed Assessment	Pueblo of Santa Domingo	\$691,683	\$191,488	\$212,483	\$35,000	\$0	June 2014
NM	Pueblo of Santa Ana, NM Watershed Assessment	Pueblo of Santa Ana	\$913,335	\$100,000	\$106,226	\$0	\$0	June 2013
NM	Pueblo of Zia, NM Watershed Assessment	Pueblo of Zia	\$514,793	\$0	\$116,829	\$50,000	\$50,000	March 2017

On-going feasibility studies

State	Study Title	Local Sponsor	Funding through FY 2018	Allocation in FY 2019	Unobligated Carry-In to FY 2020	Presumed Allocation in FY 2020	Budget Amount in FY 2021	Date of Cost-Sharing Agreement
AK	Elim Subsistence Harbor	Kwethluk Native Village of Elim	\$300,000	\$600,000	\$232,312	\$250,000	\$110,000	March 2018
CA	Clear Creek Ecosystem Restoration, CA	Mechoopda Indian Tribes of Chico Rancheria	\$0	\$228,000	\$81,567	\$0	\$100,000	September 2018
ID	Sweetwater Creek Restoration	Nez Perce Tribe	\$0	\$510,000	\$214,848	\$271,875	\$100,000	January 2019
KS	Soldier Creek Watershed	Prairie Band Pottawatomie	\$100,000	\$0	\$0	\$90,000	\$45,000	November 2017
MI	Bay Mills Shoreline Erosion	Bay Mills Indian Community	\$23,500	\$127,000	\$48,645	\$175,000	\$45,000	Feb 2019
MN	Prairie Island Sturgeon Lake Habitat Restoration	Prairie Island Indian Community	\$0	\$238,106	\$97,151	\$112,000	\$0	October 2018
WI	Big Sand Lake Shoreline Stabilization	St. Croix Chippewa Indians of Wisconsin	\$0	\$200,000	\$143,982	\$0	\$0	September 2018

On-Going Technical Assistance:

State	Study Title	Local Sponsor	Funding through FY 2018	Allocation in FY 2019	Unobligated Carry-In to FY 2020	Presumed Allocation in FY 2020	Budget Amount in FY 2021	Date of Cost-Sharing Agreement
ID	Fort Hall Bottoms Resource Inventory & Management Plan	Shoshone-Bannock Tribe	\$131,070	\$244,000	\$212,217	\$0	\$0	December 2017
MN	Little Minnesota Fish Passage Investigation	Sisseton Wahpeton Oyate of the Lake Traverse Reservation	\$238,106	\$11,894	\$55,999	\$0	\$0	March 2018

The following feasibility studies are expected to commence with signed cost-sharing agreements in FY 2020 or FY 2021:

State	Study Title	Local Sponsor	Funding through FY 2018	Allocation in FY 2019	Unobligated Carry-In to FY 2020	Presumed Allocation in FY 2020	Budget Amount in FY 2021	Anticipated Date of Cost-Sharing Agreement
AK	Atka Navigation Improvements	Native Village of Atka	\$0	\$0	\$0	\$255,000	\$0	FY 2020
CA	Torres-Martinez Ecosystem Restoration Study	Torres-Martinez Desert Cahuilla Indians	\$132,302	\$0	\$25,848	\$0	\$0	FY 2021
CA	Blue Creek Habitat Enhancement, CA	The Yurok Tribe	\$0	\$0	\$0	\$10,000	\$0	FY 2020
MN	Minnesota River Bank Stabilization	Upper Sioux Community	\$0	\$0	\$0	\$100,000	\$0	FY 2020
MN	Minnesota River Bank Stabilization	Lower Sioux Community	\$0	\$0	\$0	\$100,000	\$0	FY 2020
ME	Half Moon Cove, Passamaquoddy	Passamaquoddy Tribe at Pleasant Point	\$0	\$0	\$0	\$50,000	\$0	FY2020
NM	Pueblo of Isleta Feasibility Study, Pottery Mound, NM	Pueblo of Isleta	\$0	\$0	\$0	\$217,000	\$0	FY 2021

OR-WA	Lower Columbia River Tributary Confluences Restoration Feasibility Study	Columbia River Intertribal Fish Commission, Confederated Tribes & Bands of the Yakima Nation, Confederated Tribes of Warm Springs, Confederated Tribes of the Umatilla Indian Reservation, and the Nez Perce Tribe	\$0	\$0	\$0	\$300,000	\$0	FY 2020
SD	Lower Brule Ecosystem Restoration Northeast	Lower Brule Sioux Tribe	\$0	\$0	\$0	\$150,000	\$0	FY 2020

The following eight reconnaissance studies were completed under this program at 100 percent Federal expense: 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).

The following watershed assessments have been completed:

State	Study Title	Local Sponsor	Funding through FY 2018	Allocation in FY 2019	Unobligated Carry-In to FY 2020	Date of Cost-Sharing Agreement	Date Completed
NM	Santa Clara Pueblo, NM, Watershed Assessment	Pueblo of Santa Clara	\$1,304,189	\$0	\$18,696	Sept 2011	Sept 2018
NM	Acoma Pueblo, NM, Watershed Assessment	Pueblo of Acoma	\$1,331,299	\$70,000	\$29,522	March 2013	Sept 2019

The following feasibility study has been completed:

State	Study Title	Local Sponsor	Funding through FY 2018	Allocation in FY 2019	Unobligated Carry-In to FY 2020	Date of Cost-Sharing Agreement	Date Completed
SD	Lower Brule Sewage Lagoon, SD	Lower Brule Sioux Tribe	\$355,000	\$100,000	\$7,895	October 2017	Dec 2019

The following studies are inactive or terminated:

State	Study Title	Local Sponsor	Net allotment through FY 2019	Unobligated Carry-In to FY 2020
AK	Villages Erosion Studies		>\$707,882	
AK	Kuskokwim-Middle River Watershed Study	Kuskokwim Corporation	\$86,391	
AZ	Middle Gila and Lower Santa Cruz River, AZ Watershed Study	Gila River Indian Community	\$91,286	
AZ	Tohono O'odham Flood Risk Management Study	Tohono O'odham Nation	\$144,802	
AZ	Polacca Wash Feasibility Study	Hopi Tribe	\$74,727	
AZ & NM	Navajo Nation – Little Colorado (Upper Puerco), NM & AZ, Watershed Assessment	Navajo Nation, Little Colorado (Upper Puerco)	\$79,038	
AZ, NM, & UT	Navajo Nation – San Juan (Chinle), NM, AZ & UT, Watershed Assessment	Navajo Nation, San Juan (Chinle)	\$57,832	
CT	Mohegan Tribe, CT	Mohegan Tribe	\$71,575	
MA	Santuit Pond Restoration Shoreline Erosion Study 5/	Mashpee Wampanoag Tribe (MA)	\$67,774	

ME	Shoreline Erosion Study	Passamaquoddy Tribe, Pleasant Point Reservation	\$100,000	\$1,737
NM	Navajo Nation – Rio Puerco (Arroyo Chico), Ojo Encino Chapter, NM, Watershed Assessment	Navajo Nation, Rio Puerco (Arroyo Chico)	\$61,966	
NM	Pueblo of Laguna Watershed Assessment	Pueblo of Laguna	\$29,141	
NM	Pueblo of Picuris, NM, Watershed Assessment	Picuris Nation	\$56,099	
NY	St Lawrence River, Akwesasne, St Regis Mohawk Tribe	St. Regis Mohawk Tribe	\$100,000	
OR	Willamette Basin Pacific Lamprey Study	Grand Ronde Tribe	\$14,618	
WA	Hoh Tribal Partnership Project	Hoh Tribe	\$84,718	
WA	Makah Tribal Partnership Study	Makah Tribe	\$2,070	
WA	Lower Elwha Klallam Tribal Partnership Project	Lower Elwha Tribe	\$1,638	
WA	Jamestown S'Klallam Watershed Study Project	Jamestown S'Klallam Tribe	\$99,989	
WA	Quileute Tribal Watershed Study	Quileute Nation (WA)	\$160,974	
WA	Sauk-Suiattle Tribal Partnership	Sauk-Suiattle Tribal Partnership	\$24,842	
WA	White Swan Tribal Partnership Study	Yakama Nation	\$92,227	
WI	Buffalo Bay Fishing Pier	Red Cliff Band of Lake Superior Chippewa	\$11,947	\$1,988

APPROPRIATION TITLE: Construction, Fiscal Year 2021

PROJECT NAME: Continuing Authorities Projects Not Requiring Specific Legislation (Continuing Authorities Program (CAP))

Aquatic Ecosystem Restoration (CAP Section 206)

	Allocation for FY 2017	Allocation for FY 2018	Allocation in FY 2019	Allocation in FY 2020 2/	Budgeted Amount in FY 2021
CAP Section 206 1/	\$ 8,000,000	\$ 8,000,000	\$ 12,000,000	\$ 10,000,000	\$1,000,000

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/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$13,142,600. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is approximately \$7,500,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

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 \$62,500,000 may be appropriated annually to the Section 206 program.

Flood Control (CAP Section 205)

	Allocation for FY 2017	Allocation for FY 2018	Allocation in FY 2019	Allocation in FY 2020 2/	Budgeted Amount in FY 2021
CAP Section 205 1/	\$ 8,000,000	\$ 8,000,000	\$ 8,000,000	\$ 12,000,000	\$1,000,000

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/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$16,909,800. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is approximately \$8,800,000. 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.

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Continuing Authorities Program

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 \$68,750,000 may be appropriated annually to the Section 205 program.

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

	Allocation for FY 2017	Allocation for FY 2018	Allocation in FY 2019	Allocation in FY 2020 2/	Budgeted Amount in FY 2021
CAP Section 1135 1/	\$ 3,000,000	\$ 4,000,000	\$ 8,000,000	\$ 8,000,000	\$1,000,000

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/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$4,794,800. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is less than \$2,000,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

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 \$50,000,000 may be appropriated annually to the Section 1135 program.

APPROPRIATION TITLE: Construction, Fiscal Year 2021

PROJECT NAME: Dam Safety and Seepage/Stability Correction Program 1/ – Flood and Storm Damage Reduction

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$21,000,000	\$34,300,000	\$100,405,000	\$38,000,000 2/	\$13,000,000

1/ Issue Evaluation Studies (IES) and Dam Safety Modification Studies (DSMS) are funded at 100 percent Federal Expense. The non-Federal cost for Pre-construction Engineering and Design (PED) 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/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$11,314,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2 of National Dam Inspection Act of 1972, P.L. 92-367 (authorized the Secretary of the Army to inspect dams across the country; and to issue a report to the Congress that includes an inventory of all dams in the United States, and provides recommendations for a comprehensive national program for the safety of dams), Section 215 of the Water Resources Development Act of 1996, P.L. 104-303 (authorized FEMA to lead the National Dam Safety Program, a Federal interagency to encourage the Federal agencies with dams, and the States, to establish effective dam safety programs); Section 1 of Dam Safety Act of 2006, P.L. 109-460 (authorized the Secretary of the Army to maintain and update the national inventory of dams, including any available condition assessments performed by a Federal agency or a State dam safety agency); and Section 3001 of Water Resources Reform and Development Act of 2014, P.L. 113-121 (reauthorizing National Dam Safety Program, which FEMA leads).

DESCRIPTION: The Corps uses this funding to evaluate and study options for addressing dam safety assurance, seepage control, and static instability concerns at completed dams that the Corps owns and operates. The Corps owns 715 such dams and appurtenant structures, which are located at 555 of its projects. Based on the available information on these risks, the Corps has assigned a Dam Safety Action Classification (DSAC) to each of its dams. Many of these dams have the potential, either now or in the future, to pose a life safety, economic, or environmental risk to the downstream population centers and floodplains. The Corps uses a risk-based approach to dam safety management to reduce this risk, with the goal of ensuring that all of its dams are designed, constructed, regulated, operated, and maintained as safely and effectively as practicable. Central to this approach is a process for establishing priorities among the potential investments, by addressing first the concerns that pose the greatest potential risk, when viewed from the perspective of the entire portfolio of Corps dams as a whole. The Corps also uses this risk-informed approach to the management of the portfolio of its dams to ensure compliance with “FEMA 93 - Federal Guidelines for Dam Safety”.

The Federal Guidelines for Dam Safety (FEMA 93), which FEMA issued pursuant to a presidential memorandum from President Carter dated April 23, 1977, require each Federal agency with responsibility for the operation and maintenance of dams to have a dam safety program including provisions for dam safety modification. Dam safety ensures the integrity and viability of dams such that they do not present unacceptable risks to the public, property, or 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 determined solely by its original design and construction. While no Corps dam is in imminent danger of failure at this time, some of these dams have been identified as having a higher risk of a dam safety incident than originally anticipated based on new data, inherent flaws or defects that manifest over time, or the potential adverse effects that could occur from extreme flood or seismic loads. In FY 2019, the Corps has approximately 270 dams under consideration for

HQUSACE and Institute for Water Resources

Dam Safety and Seepage/Stability Correction Program

potential evaluation and study, based on the currently available information on the risks that they may pose.

The Corps uses this funding to perform non-routine dam safety evaluations and studies; and to support engineering analysis required to ensure these structures comply with risk-informed engineering criteria. The program focuses on Corps dams with a rating of extremely high risk or very high risk (DSAC 1 and DSAC 2), but also will evaluate and study safety concerns at some dams with a rating of moderate to high risk (DSAC 3). Through Issue Evaluation Studies (IES), the Corps evaluates high-risk dams identified from the Portfolio Risk Analysis program, makes risk-informed decisions on the need for their modification or reclassification, and evaluates the risks of dam safety incidents that manifest over time or exhibit unsatisfactory performance during high pools or seismic events. Through Dam Safety Modification Studies (DSMS), the Corps investigates dam safety deficiencies that could result in loss of life, formulates one or more alternatives that reduce the risks to tolerable levels. Where the Corps recommends a project to reduce the safety risk, it will conclude the DSMS by issuing a Dam Safety Modification Report. The Corps would then undertake Pre-construction Engineering and Design (PED) activities prior to construction.

The Corps funds the construction of dam safety modifications through project-specific line items in the Construction account. Starting in FY 2019, the Corps has also budgeted all new DSMS studies through project-specific line items in the Investigations account.

DESCRIPTION OF WORK FOR FY 2020: Funds are being used to initiate or continue DSMS studies at Keystone Dam, Lookout Point Dam, Prado Dam, Garrison Dam, Foster Dam, and Green Peter Dam and complete the DSMS at Proctor Lake Dam and Bolivar Dam (Magnolia Levee). Funds will also be used to initiate PED at Proctor Lake Dam and Bolivar Dam (Magnolia Levee) and complete PED at Moose Creek Dam, Whittier Narrows Dam, General Edgar Jadwin Dam, and Pipestem Dam. Multiple IES studies will continue and new IES studies initiated to perform the preparatory work that provides the technical basis for DSMS studies, risk assessments, DSAC characterizations, and risk informed portfolio management. The total amount available for obligation in FY 2020, including carry-in, is being allocated as follows:

Pre-Construction Engineering and Design	\$ 14,150,000
Dam Safety Modification Studies	\$ 6,355,000
Issue Evaluation Studies	<u>\$ 28,809,000</u>
Total	<u>\$ 49,314,000</u>

DESCRIPTION OF WORK FOR FY 2021: Funds will be used to continue and initiate new IES studies to perform the preparatory work that provides the technical basis for the DSMS studies, risk assessments, DSAC characterizations, and risk informed portfolio management.

Issue Evaluation Studies	<u>\$ 13,000,000</u>
Total	<u>\$ 13,000,000</u>

APPROPRIATION TITLE: Construction, Fiscal Year 2021

PROJECT NAME: Employees Compensation (Payments to the Department of Labor) 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$19,000,000	\$17,000,000	\$17,000,000	\$17,000,000 2/	\$17,000,000

1/ There are no non-Federal costs.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$3,710,685. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: This program is conducted under the general authority of 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 budget request for Fiscal Year 2021 represents the total estimated cost of benefits and other payments made from the Employees Compensation Fund during the period July 1, 2018, through June 30, 2019, 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 2021

PROJECT NAME: Inland Waterways Users Board, Institute for Water Resources 1/

	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY2019	Allocation in FY 2020	Budgeted Amount in FY 2021
Total	\$325,000	\$335,000	\$335,000	\$335,000	\$335,000
Board Expense	\$50,000	\$60,000	\$60,000	\$60,000 2/	\$60,000
Corps Expense	\$275,000	\$275,000	\$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/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$47,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$289,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 and Congress, 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 and other inland marine transportation matters. 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: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Aquatic Nuisance Control Research – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 668,000	\$ 668,000	\$ 2,970,000	\$ 15,840,000 1/	\$ 675,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (Public Law 101-646), as amended by the National Invasive Species Act of 1996 (Public Law 104-332)

JUSTIFICATION: Annual funding is used to address invasive aquatic species that impact the Nation's waterways infrastructure. Funding 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 carp and other ANS (e.g. sea lamprey) 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 detection and control methods for harmful algal blooms (HABs);
- 4) Corps personnel training in recognition and control methods of ANS on Corps lands/waters;
- 5) Web-based regional lists of aquatic invasive species at Corps projects; and
- 6) Methods that reduce invasive species impacts to threatened and endangered species and provide restoration of natural habitats.

ACCOMPLISHMENTS IN FY 2019:

- Completed lab and field studies to analyze jumping characteristics and burst speeds of invasive silver carp. These studies provided first time documentation and quantification of height, distance, angle and escape velocity of jumping carp; the data are directly applicable to developing new specifications for hydraulic and vertical barriers to prevent invasive carp dispersal.
- Utilized new Asian carp datasets on maximum burst speeds, jumping characteristics, salinity responses, and longevity, to assess and optimize management strategies for Asian carp impacts to aquatic ecosystems.
- Completed studies to assess population-level impacts of invasive Asian carp on native paddlefish in the lower Mississippi River. This combination of bio-energetic and population modeling objectively demonstrated that Asian carp cause long-term declines in paddlefish populations.

Engineer Research and Development Center

Aquatic Nuisance Species Research

- Evaluated new antifouling coatings/paints to determine impact on mussel fouling performance metrics and environmental toxicology.
- Developed a risk assessment framework to determine priority species impacting USACE projects to assist and prioritizing decision making of operational funds for ANS management activities.
- Executed a pilot-scale research demonstration to assess the engineering performance and scalability of a new system for removing and disposing of blue-green algae from large water bodies. This new system, named HABITATS (Harmful Algal Bloom Interception, Treatment and Transformation System) was field tested at Lake Okeechobee, FL.
- Assessed the hydrothermal liquefaction process at bench scale using algae harvested from the HABITATS field-scale demonstration project.
- Developed an open-source R-Software tool for detection and quantification of HABs and water quality parameters to enhance existing water quality monitoring practices as an early warning forecasting tool for HAB outbreaks.
- Completed a case study to evaluate and compare the use of Landsat 8 and Sentinel-2 satellite imagery for predicting spatial pattern and temporal variability of lake and reservoir water quality data for the Louisville District. In addition, the study determined the utility of multispectral satellite remote sensing systems for forecasting HAB events.
- Completed field studies to assess the efficacy of peroxide-based algaecides as a rapid response management strategy for controlling harmful algal blooms.
- Completed in-lake mesocosm studies to evaluate the role of nutrient (nitrogen species and phosphorus) manipulation on the biodiversity of cyanobacteria and associated microorganisms during pre-bloom, bloom and post-bloom events in Lake Okeechobee. These studies are also characterizing the role of nutrients on toxin gene expression in these organisms.
- Completed monthly water sample collection from Lake Okeechobee, FL and metagenomic and meta-transcriptomic data analyses to improve our understanding of environmental factors that affect cyanobacteria diversity, toxin production, and bloom dynamics in the Okeechobee system.

DESCRIPTION OF WORK FOR FY 2020:

- Develop and evaluate new, non-toxic antifouling (zebra and quagga mussels) antifouling technologies for protection of Corps hydraulic structures to reduce the corrosion risk and maintenance costs associated with invasive mussels (zebra and quagga mussels) and other aquatic invasive macro-fouling organisms.
- Develop operational guidance for peroxide-based algaecides for effective mitigation of harmful algal blooms (HABs) on USACE projects.
- Develop a USACE user group for discussions of operational needs with respect to HABs; collect historical water quality data from 15 selected study sites; and, review existing water quality model performance on HAB events and operational activities to mitigate HAB events.

- Recode the open-source R-Software tool for HAB detection and quantification into Python to create an ArcGIS workflow tool with pre-set options for image types, pre-processing, algorithms, and statistical comparisons that will expand and improve the capabilities for USACE District users.
- Complete field studies to monitor and determine longevity and fecundity estimates for Asian Carp populations. Publish Silver Carp leap characteristics journal article.
- Complete field studies to evaluate the performance of deployed traps and barriers retrofitted with submerged metals to prevent passage of sea lamprey.

DESCRIPTION OF WORK FOR FY 2021:

- Correlate water quality and operational practices with Harmful Algal Bloom (HAB) data from 15 selected sites and select a water quality model for development of an HAB operation tool; validate the modeling tool.
- Develop guidance for operational reservoir management practices to minimize impacts of HAB events.
- Design and complete a beta-testing strategy among USACE Districts to evaluate the application, usability and cost-effectiveness of remote sensing-based software tools (R software and ArcGIS workflow) developed to assist with water quality monitoring and HAB indicators.

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APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Asset Management/Facilities and Equipment Maintenance 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 3,218,000	\$ 7,464,000	\$ 3,747,000 2/	\$ 4,242,000 3/	\$ 3,300,000

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/ The Critical Infrastructure Cyber Security Center of Expertise (CICS-CX) and cybersecurity activities were funded through this Remaining Item through FY 2018. In FY 2019 a separate Remaining Item was established to fund the CICS-CX and its activities.

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,531,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The Corps of Engineers is responsible for managing thousands of water resources infrastructure projects. This infrastructure provides critical services supporting the Nation, primarily in terms of commercial navigation, flood and storm damage reduction, and aquatic ecosystem restoration. Effective asset management informs planning, design, construction, operations, maintenance, recapitalization and disposition decision-making.

The Corps' asset management program includes Maintenance Management Improvement Plans (MMIPs) that are used to inventory existing assets, Project Maintenance Management Plans (PMMPs) that provide a detailed plan for maintenance of a specific project, and tools such as Operational Condition Assessments (OCA), Operational Risk Assessments (ORA), and the Corps Value Model, which help define risk. Its goal is the development of a strategy to create, sustain, or increase the delivery of benefits from Civil Works water resources by using risk as a common measure to inform investment decisions during the entire life cycle of Civil Works projects, including inception, significant decision points, and ultimately disposition.

In addition to the specific examples provided below, annual funding is used to:

- maintain a current asset inventory;
- assess benefits, risks, and consequences of failure among similar projects and similar assets through risk-based assessments;
- develop tools and processes to reduce risk and improve performance;
- develop and utilize quantitative information to prioritize the use of available Federal resources;
- formalize business processes that standardize best practices, promote accountability, and predict work requirements; and
- train Corps staff on how to implement pertinent methodologies.

ACCOMPLISHMENTS IN FY 2019:

1. Implemented ORA and refinements for flood risk management and coastal storm damage reduction.
2. Initiated and scoped strategic asset management plan and guidance alignment with international standard ISO 55000.
3. Reviewed, revised, and implemented the draft Corps Value Model for FY22 budget development.

HQUSACE

Asset Management/Facilities and Equipment Maintenance

4. Reviewed results of PMMP efforts at 10 pilot sites, including automation of data between the Facilities and Equipment Maintenance system and the Enterprise Data Warehouse.
5. Continued to assist the HAC with system modeling on Missouri River hydropower system to improve Hydropower Modernization Initiative results for 20-year capital investment strategy.
6. Continued to complete automated hydrographic survey condition automation via eHydro, and linking to Shoaling Assessment Tools and Channel Prioritization Tool to assist in developing risk information for coastal and inland Navigation Channels.
7. Implemented Dredge Project Selection and Dredge Schedule Optimization for high and moderate use coastal navigation channels.
8. Scoped development of baseline OCA and ORA for environmental stewardship assets.
9. Continued implementation and refinement of MMIP, including developing better reports and metrics for measuring progress.

DESCRIPTION OF WORK FOR FY 2020:

1. Begin implementation of asset management throughout the Civil Works program based on completed guidance, and continue achievement/completion of associated tasks.
2. Refine the draft Corps Value Model.
3. Apply results of PMMP pilots to selected operating projects nationally, including automation of data between the Facilities and Equipment Maintenance system and the Enterprise Data Warehouse.
4. Continue to complete automated hydrographic survey condition automation via eHydro, and linking to Shoaling Assessment Tools and Channel Prioritization Tool to assist in developing risk information for coastal and inland Navigation Channels.
5. Complete transition of O&M 20/20 task into Asset Management effort.
6. Continue implementation and refinement of MMIP, including developing better reports and metrics for measuring progress.

DESCRIPTION OF WORK FOR FY 2021:

1. Complete USACE CW Strategic Asset Management Plan, align agency standards for “return on asset” management systems with ISO 55000.
2. Inventory Business line metrics and test same as a common value for risk evaluation and “return on asset” valuation across asset classes.
3. Update O&M 20/20 prioritization for FY23 budget development, provide measurable level of performance criteria for funding increments.
4. Continue incorporation of level of performance tools and processes to assist with investment decisions.
5. Develop facility-level asset management maturity model to discipline/accelerate implementation of international standards of practice.
6. Coordinate enterprise guidance for Asset Management.
7. Complete National Quality Assurance process for condition assessment (Navigation & Flood Risk Management OCA) of Corps assets.
8. Publish and roll-out OCA tool, training, and guidance for recreation assets.
9. Pilot OCA tool, training, and guidance for environmental stewardship assets.
10. Peer review and update economic inputs for navigation lock & dam ORA tool.
11. Evaluate use of the certified Navigation Investment Model (NIM) as a life-cycle risk tool for navigation capital investment planning.
12. Complete geospatial dredge optimization approach.
13. Scope operational risk models for flood risk management.
14. Continue training for 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.
15. Continue implementation and refinement of MMIP Phases 1-3, including reports and metrics for measuring progress.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Civil Works Water Management System (CWMS) – Flood and Storm Damage Reduction 1/

Total Estimated Federal Cost \$	Allocations Prior to FY 2018 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$	Budgeted Amount in FY 2021 \$	Additional to Complete after FY 2021 \$
128,000,000	39,161,000	9,900,000	9,900,000	7,574,000 2/	8,000,000	53,389,000

1/ From FY 2012 through FY 2015, funding for the activities covered by this remaining item were sourced out of other programs, projects, and activities within the Civil Works program. Since FY 2016, the Corps has funded these activities through a separate line item to provide transparency of the costs of this program. The amount shown for Allocations Prior to FY 2018 includes all funding provided prior to FY 2018 for this effort, which started in FY 2012.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$439,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The River and Harbors Act and 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: The Corps is using this funding to develop a suite of state-of-the-art watershed models called the Civil Works Water Management System (CWMS), which its project managers use to help achieve the authorized purposes the projects that the Corps owns and operates, and which its planners use to help identify options for addressing water resources issues. These models provide a direct, accountable means for updating data that the Corps uses to assess and manage the operation of its projects, communicate the risk associated with those projects, and apply lessons learned consistently across the nation. These models support multiple Corps programs including Dam Safety, Levee Safety, Planning, the Operations Center/Flood Risk Management of the Corps, and its Critical Infrastructure Protection and Resilience program.

For example, the Corps has used these models to produce inundation maps for the affected Corps districts and provide them consequence data (structures impacted, potential loss of life, damage values) during the December 2015/January 2016 flooding of the Mississippi River. The Corps may use these models after a flood as well, for example, in its “after action” reporting. It also may use these models when planning for a future flood fight in a watershed. The Corps also has used these models to inform decisions on the operation of Corps reservoirs. The models are able to incorporate lessons learned from extreme events (such as Hurricane Katrina, Hurricane Sandy, the 2012-2013 drought, the greater Mississippi River Basin flood of 2011, the Nashville flood of 2010, Hurricanes Harvey, Florence, Irma and Maria). The Corps also uses CWMS hydrologic models to run multiple scenarios. The Dam and Levee Safety community has used these hydrologic models in developing dam break models, and in some Semi-Quantitative Risk Assessments and some Issue Evaluation Studies.

The Corps has identified 201 watersheds across the Nation in which it has an active role in water management through its reservoir operations. Over the long-term, the Corps is working to develop a CWMS model for each of these 201 basins. The CWMS models are a tool that is helping the Corps to improve how it approaches water resources management. They are part of the broader Corps effort to move from an investment strategy based on individual projects and individual program areas to a systems-oriented approach across all Corps projects in the watershed and multiple Corps programs.

DESCRIPTIONS OF WORK FOR FY 2020: 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 the 18 basins started in FY 2019 and continue work on two basins that will be completed in FY 2021. An additional 10 basins will be started in FY 2020; due to size and complexity, 9 of these basins will be completed in FY 2021 and one will be completed in FY 2022. At the end of FY 2020, the Corps expects to have completed modeling 163 of the 201 basins. In addition, the funding will be used to help establish continuity of operations capabilities that fully support the water management mission and complies with U.S. Army Corps of Engineers and Department of Defense Corporate Information Assurance and Security requirements. With the basins scheduled for completion through FY 2020, the Corps will have completed modeling 89% of the Corps reservoirs, 82% of the total land area that the Corps owns surrounding these reservoirs, and 87% of the river miles associated with these projects.

DESCRIPTIONS OF WORK FOR FY 2021: 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 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. Funds from this account will be used to complete the two basins started in FY 2019 and 9 of the basins started in FY20. An additional 9 basins will be started in FY 2021; due to size and complexity, all of these basins will be completed in FY 2022. At the end of FY 2021, the Corps expects to have completed modeling 175 of the 201 basins. With the basins scheduled for completion through FY 2021, the Corps will have completed modeling 92% of the Corps reservoirs, 88% of the total land area that the Corps owns surrounding these reservoirs, and 89% of the river miles associated with these reservoirs. 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 and Maintenance, Fiscal Year 2021

PROJECT NAME: Coastal Ocean Data System (CODS) Program 1/ 2/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 5,940,000	\$ 5,940,000	\$ 6,435,000	\$ 7,425,000 3/	\$ 2,250,000

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

2/ Prior to the FY 2019 Budget, the Corps funded this program under the title Coastal Data Information Program (CDIP).

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$66,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: 33 USC 426a, which originated with the River and Harbor Act of 1945, which originated in the River and Harbor Act of 1930.

DESCRIPTION: The Corps uses this funding 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 year to 50 year periods on the coasts of the Atlantic, the Pacific, the Gulf of Mexico, and the Great Lakes. This wave climate information is combined with storm wave information to produce validated hindcast wave data to inform our next generation risk-based coastal models.

Ocean waves deliver energy to the coast and impact Corps projects and operations. The Corps uses this funding to collect high quality wave information observations for the development and validation of new hindcast wave models and for storm analysis; improve the design of storm damage reduction and coastal navigation projects; inform regional sediment management strategies; and provide 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 evaluate the effects of climatic changes and extreme events on Corps projects and operations.

Because of the Corps interest and expertise in waves, the Corps also has used this funding in support of 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.

The latest Engineering Regulation governing implementation of the CODS program is ER 1110-2-1406 dated 1990.

For example, the Corps uses this funding to support the following CODS activities:

- (1) 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 (<http://cdip.ucsd.edu>). These observations are high resolution and of appropriate accuracy for use in Corps wave information hindcast

Engineer Research and Development Center

Coastal Ocean Data Systems Program (CODS)

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. In 2009, the Interagency Ocean Observation Committee (IOOC) finalized the first National Operational Wave Observation Plan developed by the Corps in collaboration with the NOAA Integrated Ocean Observing System (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 FY 2016 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. Annual funding is used to support the directional wave measurements presently conducted by the NOAA NDBC program and the Scripps Institution of Oceanography under CODS; continue intra-measurement evaluations conducted under the Joint Oceanographic Commission of Oceanography and Marine Meteorology; and 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.

- (2) Wave Information Studies. The objective of 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 routinely use these datasets for coastal studies. The long-term hindcast wave data are accessible through a website that receives over 16,000 monthly requests for data downloads and over 1 million visits per year (<http://wis.usace.army.mil/>). 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. Annual funding is used to provide annual updates to the hindcast for all domains (Atlantic, Pacific, Gulf of Mexico, Great Lakes).
- (3) 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.
- (4) The Integrated Ocean Observing System Participation. CODS observations are a Corps contribution to the 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. Annual funding is used to support the activities of IOOS by participating in the IOOC; promote the involvement of Corps District and Division offices in their local IOOS regional associations through meetings and workshops; and to serve on the IOOS Quality Assurance or Real-time Oceanographic Data Board of Advisors and other IOOS Committees.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Coastal Inlets Research Program – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 2,673,000	\$ 2,945,000	\$ 7,895,000	\$ 10,865,000 1/	\$ 2,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$3,271,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 1,000 coastal navigation projects that cover 13,000 miles of coastal navigation channels. 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, with consideration of ecological and sustainable practices. In Fiscal Year (FY) 2018, the Corps spent approximately \$1.547 billion for new construction and routine Operations and Maintenance (O&M) dredging of 222.6 million cubic yards from Federal navigation channels, and an additional \$235.9 million for the supplemental and emergency dredging of 26.1 million cubic yards. Adjusted for inflation, dredging costs have increased approximately from \$2.80 to \$6.50 per cubic yard from FY 1963 through FY 2018. Additionally, as harbors and ports deepen and widen navigation channels to accommodate larger vessels, due to the increased ship sizes allowed by the expanded Panama Canal, the channels become more efficient sediment traps, thereby increasing shoaling and O&M costs as well as impacts to adjacent shorelines.

A resilient navigation portfolio requires the optimization of coastal navigation design, sustainable and cost-efficient dredging and placement methods, and long-term, risk-informed predictions of coastal and inlet environments. Modifications to coastal inlet channels and jetties can have a profound effect on the integrity of the navigation structures, adjacent beaches, estuaries, and ecosystems. 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 and inland waterways.

Annual funding for the Coastal Inlets Research Program is used to advance knowledge and tools to better predict future channel shoaling, to provide quantitative and practical predictive tools and data to reduce the cost of maintaining Federal navigation channels and structures, identify potential unintended consequences, mitigate for engineering activities related to navigation channels, and optimize the Corps' O&M practice.

ACCOMPLISHMENTS IN FY 2019:

Structures and Navigation Focus Area

- **Critical Dredging Needs in Navigation Portfolio (Research Statement of Need (SoN) 2017-N-52).** Continued with improvements to the Channel Portfolio Tool (CPT) to better support the districts/divisions with a more efficient and robust tool that identifies critical dredging needs for navigation channels within the national USACE navigation portfolio. Efficiencies to process large data queries is essential for continued utility. In addition, the spatial interconnection of the data in CPT, vessel transit pathways via the Nationwide Automated Identification Analysis Package (AISAP), and Channel Shoaling Analysis Tool (CSAT) were explored with the goal of identifying new coastal navigation metrics. Continued support of the server maintenance activities to ensure CPT, AISAP, and CSAT tools are functioning and readily available to all Corps employees.
- **Coastal Navigation Portfolio Management: CPT, AISAP, CSAT (SoN 2017-N-52).** Developed a portfolio-scale capability to characterize navigation structures. The navigation structure characterization was based on timing, proximity, and composition of nearby vessel traffic as recorded by archival AIS data. This capability leverages interagency investment in the Nationwide AIS system and prior CIRP research to provide a more direct and streamlined approach to characterizing structures and aligning maintenance activity with level of use than is currently employed by USACE. Further developed a portfolio-scale capability to estimate critical clearances to vessels in transit from Nationwide AIS data combined with data generated through standard USACE navigation business practices or available through federal partner agencies. This capability enables direct estimates of the service provided to transiting vessels through deepening and widening (by dredging) of navigation channels potentially improving alignment between use and maintenance of navigation channels.
- **Upgrade Web-based Metocean Data Access, Processing and Analysis Tools: WaveNet and TideNet (SoN 2017-N-1).** The web-based interface was upgraded to the ESRI maps for data handling modules, maps, GIS protocols, and adaptation of data analyses capabilities. Extended WaveNet and TideNet tools include directional wave spectral data sources, and two-dimensional current, wind and pressure fields. The upgrades provided comprehensive input data for circulation and wave models preferred by the Hydrology, Hydraulics, & Coastal (HH&C) CoP and supported by the USACE.
- **Investigation of Surface Wind Input for Coastal Zone Applications (SoN 2017-N-1).** Developed methods and new formulas to generate a 2-D wind field for model input and compared to field measurements in Superior Bay and Chesapeake Bay for validation. Investigated spatial mapping and distance-based interpolation methods for providing the most appropriate wind input to wave and flow models on coastal and bay waters.
- **Develop and enhance capabilities of steady-state coastal wave models (SoN 2017-N-01).** Continued verification and validation (V&V) of the Coastal Modeling System (CMS), with extended data sets, coastal forcing, and settings, using available field data sets. Used existing field data to evaluate skills of CIRP wave models for wave processes including multi-directional wind-waves and long-period infra-gravity waves on harbor operations, surges, navigation issues, and wave effects on reefs, and structural design in District projects. Developed new wave model that expands the capabilities of CMS-Wave and documented initial findings in technical guidance.
- **Validate Tool to Quantify Erosion Caused by Vessel Wake (SoN 2017-N-09).** 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. Expanded on previous work that developed a desktop application to determine the potential effects of vessel wake on shoreline erosion, this work focused on model validation and identification of types of vessels for which the tool can be used in applications.

Sediment Management Focus Area

- **Nearshore Berm Migration Methods (SoN 2016-N-4).** Methods explored in FY 2018 to relate wave parameters to nearshore berm morphodynamics were applied to the morphology data from the 2009 nearshore berm and documented in a Technical Report.
- **Physical Model of Nearshore Nourishment Sediment Transport Adjacent to Submerged Canopy (SoN 2016-N-4, SoN 2017-N-69, and SoN 2017-N-70).** A two-phase physical model was conducted to improve the understanding of wave energy dissipation and sediment transport in vegetation with variable submergence. High resolution velocity measurements were conducted using Acoustic Doppler Velocimeters (ADV's) and Particle Image Velocimetry (PIV) to quantify the mean cross-shore undertow profile, wave-induced setup (storm surge), and turbulent characteristics responsible for sediment settling or mobilization. Results from this effort will be documented into three journal papers, one of which was published in July, and may be used for numerical model validation.
- **Investigation into Nationwide Sediment Grain Information from Imagery (2017-N-69).** This study investigated different methods to determine grain size information from imagery of sediment. Several procedures were investigated for both wavelet analysis and thresholding/watershed analysis and compared with sieve results for a variety of samples.
- **Coastal Inlet Database Update (SON 2017-N-67).** The CIRP's Coastal Inlet Database web application was updated to include tidal delta volume computations and published in a Technical Note.
- **Develop Long-term Predictive Capability in a Selected Inlet System (SoN 2017-N-71; SoN 2017-N-59).** Studies were built upon existing work in long-term morphodynamic predictions in a selected inlet system using the CMS wave, current, and morphology modeling system. This work predicted physical coastal change under varying scenarios of inlet/bay morphology. This study incorporated multiple bay morphologies through an empirically derived hypsometric generation function to determine the long-term sediment transport patterns in the system. The work concluded that hypsometry has a leading order effect on flood versus ebb dominance and associated sediment transport pathways.
- **Continue Applications and Validation of the Coastal Modeling System (CMS) (SoN 2016-N-4; SoN 2016-N-10; SoN 2017-N-1).** Continued applications of the CMS in a number of district/R&D projects (LRE, LRB, POH, NWS, SAC, SWG). Continued verification & validation of the CMS/C2SHORE, with extended data sets, model forcing, and settings, using available analytical, laboratory, FRF Coastal Model Test Bed (CMTB), and field data sets (Oregon Inlet Study). Implemented CMS-Flow within the CMTB for automated validation.
- **Technical Transfer of Predictive Coastal Models (SoN 2017-N-67; SoN 2017-N-1).** A CMS and Gencade workshop was conducted at the Detroit District offices from 26-29 November 2018 and had attendance of 12 engineers from 5 coastal/lake districts. Additionally, two 5-day webinars were conducted (May 2019, Sep 2019) covering both Basic and Advanced topics on the Coastal Modeling System.
- **Test New CMS Features (SoN 2017-N-1).** Tested new features implemented in CMS. These features included newly merged CMS code, C2SHORE sediment transport formulas, sea level change implementation, online dredging module, sediment mapping, and mixed-sized sediment routine. New GUI interfaces for the Surface-water Modeling System (SMS) version 13.0 were developed for the dredging module, sea-level change, and interfaces for four CMS structure types were created to be integrated in the SMS v13.1. A new tool for sediment management alternatives was implemented and will be available in SMS v13.1.

- **Evaluating Remote Sensing Capabilities for Application to Numerical Calibration and Validation (SoN 2016-N-10; SoN 2017-N-01).** Utilized surface current measurements in combination with wave radiation stress and surface wind shear stress estimates to estimate the surf-zone current profile along the length of the USACE Field Research Facility (FRF) property.
- **Rollout Operational Tool to Quantify Erosion Caused by Vessel Wake (SoN 2017-N-09).** Deployed an operational tool to quantify the potential effects of vessel wake to shoreline erosion. The tool was distributed as an executable and vetted based on feedback from USACE planners and engineers. The tool is maintained on the CIRP website with user guidance documentation. Operational effectiveness is gauged by monitoring use statistics and feedback from District's applications.
- **Quantifying Dune Resilience (2017-N-72; 2018-F-1192).** Enhanced tools for estimating dune erosion and growth at short and long time-scales to District engineers to better support sediment management near inlets. The work included the incorporation of improved physics-based dune response (erosion and accretion) inside of BeachFx as well as the creation of new tools for simulating dune response to potential storms and wind/wave climates for planning and vulnerability assessments to better inform District planning. The work also considered the impacts of infragravity waves on dunes. Submitted a journal article on tool performance in different environments and conditions.
- **Mixed Sediment Aggregates (SoN 2018-N-20; SoN 2018-N-24).** In a number of environments such as reservoirs and navigation channels, the primary physical state of sediment is in the form of mixed aggregates. Unlike individual grains or flocs, aggregates form on the bed and are transported in suspension in tightly bonded groups. Completed flume work that investigated the disaggregation process for mixed sediment. Completed a Technical Report.
- **Implementation of Monte Carlo Method to GenCade for uncertainty analysis and sea level change (SoN 2017-N-71 and SoN 2017-N-67).** Addressed uncertainty requirements in engineering design to provide confidence in management and engineering decisions based on GenCade model application to projects. The capability included Monte Carlo simulation in GenCade based on a random wave climate. This approach was extended to sea level change scenario analyses.
- **Verification and Validation of GenCade Model application using Field Research Facility (FRF) long-term shoreline survey data (SoN 2017-N-71 and SoN 2017-N-67).** Based on analyses of FRF transect survey database, processes in GenCade model were evaluated, including longshore transport, which is the major process for GenCade. GenCade Model application for 2000 - 2007 was verified and validated for the shoreline in vicinity of the FRF.
- **USCRP Nearshore Processes Initiative.** Supported the development, coordination, and implementation of a plan for conducting nearshore coastal processes research in collaboration with other federal agencies, academics, industry, and non-government organizations. The three major research thrusts of the USCRP are long-term coastal evolution, physical processes during extreme events, and physical/biological/chemical processes impacting human and ecosystem health.
- **National Water Center (NWC) Collaboration with ERDC:** Supported research to improve the fidelity and timeliness of hydrologic models for operational support (two journal publications submitted); data management; and reservoir operation in continental-scale flood models. The research effort also funded ERDC-CHL participation in the Summer Institute (held at the NWC) as well as direct collaboration between ERDC-CHL and the NWC for flood events affecting

the Carolinas (Hurricane Florence), coastal Louisiana (Hurricane Barry), and riverine flood events in Oklahoma/Arkansas. A Standard Operating Procedure was also drafted under this research effort to facilitate future collaborative efforts between ERDC-CHL and the NWC during national flood events.

DESCRIPTION OF WORK FOR FY 2020:

Structures and Navigation Focus Area

- **Coastal Navigation Portfolio Management: (SoN 2017-N-52).** Use demonstrated enterprise analysis capabilities for critical vessel clearances, coupled AISAP, CSAT and eHydro tools/datasets to support improved alignment of vessel traffic and maintenance activity. This analysis capability provides direct estimates of services provided to user vessels through navigation channel deepening and widening (through dredging).
- **Investigation of Surface Wind Input for Coastal Zone Applications (SoN 2017-N-1).** Conduct additional validation to wind fields from field measurements in Duck, NC and Matagorda Bay, TX for validation. Investigate impacts of estimated wind field on wave and flow model predictions (Test sites: Superior Bay, Chesapeake Bay, FRF, Matagorda Bay, Grays Harbor, Hilo Harbor, Chicago Harbor).
- **Assessing an Engineering with Nature (EWN) Approach for Navigation Structures in Wave and Circulation Models (SoN 2018-N-1198, 2018-N-1218).** Use wave and hydrodynamic numerical models to evaluate combined benefits of engineering and Natural and Nature-Based Features (NNBF) with conventional navigation structures. The goal is to produce cost-effective and sustainable EWN solutions for reducing operation and maintenance (O&M) costs of the structural measures.
- **Vessel Wake Analysis System (SoN 2018-N-20; SoN 2018-N-21 2017-N-09).** Channel deepening to support larger commercial vessels has led to a number of new and planned field campaigns to monitor currents and water levels due to vessel wake. Extract the vessel wake signal from time series is cumbersome, and new techniques to automate extraction are needed. The work continues development of an automation system that can extract the vessel wake signal from time series data. Work is focused on vessel-generated currents and algorithms to cross-correlate vessel wake with AIS ship data and to develop statistical metrics to relate shoreline energy dissipation and erosion to vessel traffic patterns.

Sediment Management Focus Area

- **Develop Long-term Predictive Capability in Multiple Inlet Systems (SoN 2017-N-71).** This effort will produce a model of empirically derived morphology change as a function of hypsometry and sediment supply that can be used to evaluate existing inlet/bay systems. The effort will produce a new methodology that can be used to evaluate a wide range of existing inlet/bay systems for inlet stability, sediment import/export, and the potential for sedimentation fluxes within tidal inlets and navigation channels.
- **Quantification of the impact of nearshore placement shape on hydrodynamics and shoreline response (SoN 2017-N-70, SoN 2016-N-04).** Material can be placed in the nearshore by a variety of methods, resulting in several different general shapes. This task numerically simulates three idealized nearshore placement shapes with CMS: linear berm, undulated berm, and discrete mounds. This provides a quantifiable comparison between the different shapes, and

thus the different construction techniques. In addition to the shape, testing parameters include the placement depth, hydrodynamic conditions, and placement volume.

- **Physical Model of Nearshore Nourishment Sediment Transport Adjacent to Submerged Canopy (SoN 2016-N-4, SoN 2017-N-69, and SoN 2017-N-70).** Complete publication process for three journal articles initiated in FY 2019 on the two-phase physical model investigating wave energy dissipation and sediment transport in vegetation with variable submergence.
- **Influence of seasonality on nearshore placement (SoN 2016-N-04; SoN 2017-N-69; SoN 2017-N-70).** Seasonal wave climate variations greatly impact the transport of sediment placed in the nearshore. Additionally, sediment from active nearshore placement projects are commonly equilibrated from distinguishable features to become indistinguishable from the nearshore profile within a few months. This task investigates the addition of including the time of placement (monthly or seasonally) into the user input for the Sediment Mobility Tool (SMT). The frequency associated with sediment mobility will assist planners and engineers to optimize project timing.
- **Effect of wave transformation techniques on nearshore nourishment model results (SoN 2016-N-04; SoN 2017-N-69; SoN 2017-N-70).** Narrow-banded approximations have been shown to yield substantially larger alongshore sediment transport rate estimates. An investigation is being conducted in which output from the SMT could be impacted by using a radiation-stress conserving transformation of spectral wave data and to what degree. SMT output has been found to be substantially impacted by wave transformation methodology leading to the evaluation of the usefulness of reconstructed spectra. The option for more accurate wave transformation techniques also improves the usefulness of scoping level tools such as the SMT.
- **Develop next generation of sediment transport 2D/3D model (2017-N-01).** Develop new coastal model that incorporates Coastal Modeling System (CMS), C2Shore, and other nearshore coastal sediment transport modules and features into a prototype model. CORSED will be the Corps' next generation sediment transport library that will be applicable to all hydrodynamic models. The next step in development is to bridge gaps in methods and consolidate sediment transport formulations for the nearshore, inlets, and estuaries. This will be tested in multiple 2-D hydrodynamic drivers with varying grid capabilities for initial verification to analytical solutions. Initial documentation on technical advancements are being provided in a report.
- **Test New CMS Features, Validate, and Tech Transfer (SoN 2017-N-1).** Test new features implemented in CMS. These features included newly merged CMS code, C2SHORE, dredging module, sediment mapping, mixed-sized sediment routine, and a quasi-3D formulation for sediment transport under waves and currents. CMS is being validated with extended data sets, coastal forcing, and settings, using available analytical, laboratory, and field data sets. A suite of new verification and validation cases are being collected and cataloged. Several tech transfer workshops and webinars on the Coastal Modeling System (CMS) and Particle Tracking Model (PTM) are being given, and the CMS users' manual and technical reports, technical notes, eNewsletters, and website/wiki updates are being published.
- **Investigate Morphology Change in a Dynamic Inlet (SoN 2017-N-1).** Participate in a comprehensive field program that includes radar-imaging remotely sensed datasets, conduct a numerical modeling study, analyze Hydrodynamic, wave, and sediment sampling data, and further develop CMS to investigate inlet and shoreline morphodynamics.

- **Swash Zone Waves, Current, and Sediment Transport (SoN 2018-N-05; SoN 2017-N-1).** FRF Coastal Model Test Bed (CMTB) simulations are being conducted and results compared by C2SHORE sediment transport formula with those by LUND-CIRP swash zone module. Results of beach profile changes are being analyzed and compared by two swash zone modules at Ogden Dunes. CMS model performance in swash zones is being evaluated and the CMS wave and current model component is being compared with the detailed data from the FRF array for CMS improvements.
- **Evaluating Remote Sensing Capabilities for Application to Numerical Calibration and Validation (SoN 2016-N-10; SoN 2017-N-01).** Surface current measurements in combination with wave radiation stress estimates and surface wind shear stress estimates are being utilized to estimate the surf-zone current profile along the length of the FRF property. CMS is being evaluated in detail with the data collected during the experiment in the DUNEX pilot to better understand confidence and limitations in use of optical current measurements. A journal paper is being published.
- **Develop GenCade Model application for Regional Coastlines (SoN 2017-N-71 and SoN 2017-N-67).** New regional coastline modeling domains will be tested to simulate long-term effects of coastal inlet and adjacent beach sediment management practices. The littoral coastline shares sediment between regions, and therefore each region will be connected to improve predictive capabilities on continental scales. This application is being developed for the Delaware coast between Rehoboth Beach and Ocean City Beach. The Delaware coast includes 4 major shore protection projects—Rehoboth Beach, Dewey Beach, Bethany/South Bethany, and Fenwick Island. The Indian River inlet navigation and sand bypass project has been the focus of previous studies investigating navigation management techniques including sand bypassing and dredging. Shoreline survey data and wave data are being analyzed and a GenCade model application that couples these features is being developed for a long-term prediction.
- **Develop of unified cross-shore transport processes modules in GenCade Model (SoN 2017-N-71 and SoN 2017-N-67).** The cross-shore transport module in GenCade is being unified, combining rudimentary overwash and dune erosion as well as cross-shore transport by wave asymmetry.
- **Develop of linkages between GenCade Model and CMS Model (SoN 2017-N-71 and SoN 2017-N-67).** Resolving shoreline morphodynamics remains a challenge in sediment transport modeling due to the limitations of depth-averaged hydrodynamics and sediment continuity in the swash zone. GenCade can provide shoreline change to CMS while CMS can provide wave and bathymetry change to GenCade. A linkage between the GenCade and CMS Models is being developed to take advantages of both models and improve fidelity of shoreline morphodynamics for coastal projects.
- **Aeolian Sediment Transport Near Inlets (2017-N-72; 2018-F-1192).** The Aeolis model is being further developed to include additional processes relevant for complex coastal inlet systems. Coastal management alternatives are being added in the 2D model and Aeolis is being coupled in an offline mode with C2Shore to simulate the co-evolution of the subaqueous and subaerial beach profile.
- **Quantifying Dune Resilience (2017-N-72; 2018-F-1192).** Develop web-based Dune Erosion Forecasting Tool and continue testing the tool for refinement.
- **Mixed Sediment Aggregates (SoN 2018-N-20; SoN 2018-N-24).** In a number of environments such as reservoirs and navigation channels, the primary physical state of sediment is in the form of mixed aggregates. Unlike individual grains or flocs, aggregates form on the bed and are transported in suspension in tightly bonded groups. In addition to the flume work that investigated the disaggregation process for mixed sediment, an algorithm is being developed that relates shear stress to disaggregation for multiple mixed sediment mixtures. Research is presented at international conference and is published in a Technical Report and a journal article.

- **USCRP Nearshore Processes Initiative:** Support the development, coordination, and implementation of a National Science Plan for conducting nearshore coastal processes research in collaboration with other federal agencies, academics, industry, and non-government organizations. The three major research thrusts of the USCRP are long-term coastal evolution, physical processes during extreme events, and physical/biological/chemical processes impacting human and ecosystem health.
- **National Water Center (NWC) Collaboration with ERDC:** Continues to support research to improve the fidelity and timeliness of hydrologic models for operational support (two journal publications submitted); data management; and reservoir operation in continental-scale flood models. ERDC-CHL participates in the Summer Institute (held at the NWC), and collaborates with the NWC for future flood events.

DESCRIPTION OF WORK FOR FY 2021:

Structures and Navigation Focus Area

- **Coastal Navigation Portfolio Management: CPT, AISAP, CSAT (SoN 2017-N-52).** Improve the overall user experience of the portfolio tools to provide a consistent and streamlined approach. Continue the integration of CPT, AISAP, and CSAT products to better inform the overall dredging strategy. Develop a predictive algorithm to identify where sediment accumulation in navigation channels is likely from archival vessel position data and dredging activity information. This algorithm will allow navigation managers to better forecast dredging workloads and potential impacts to navigation arising from channel maintenance needs within the budget cycle.
- **Vessel Wake Analysis System (SoN 2018-N-20; SoN 2018-N-21 2017-N-09).** Recent work in this area has shown that it is difficult to transfer the vessel wake signal from the vessel or measurement platforms offshore to estimates of erosion at the shoreline. The Corps will continue this work by improving the transfer of wake energy from the vessel to the shoreline to better constrain erosion potential predictions. In addition, the vessel wake prediction tool will be validated using higher fidelity numerical models to produce uncertainty metrics for wake height.
- **Assessing a EWN Approach for Navigation Structures in Wave and Circulation Models (SoN 2018-ID-1198, 2018-ID-1218).** Use wave and hydrodynamic models to evaluate combined benefits of engineering and Natural and Nature-Based Features (NNBF) with conventional navigation structures. The goal is to produce cost-effective and sustainable EWN solutions for reducing operation and maintenance (O&M) costs of the structural measures.
- **Rapid Assessment Models for Tsunami Damage (SoN 2018-F-1228).** Develop wave and flow models integrated with historical tsunami data from NOAA Deep-ocean Assessment and Reporting of Tsunamis (DART) and harbor 1-Hz surge data to provide rapid damage assessment in coastal infrastructures impacted by tsunamis. Develop guidelines for damages for quick response and recovery efforts and identify potential obstruction of Federal channels.

Sediment Management Focus Area

- **Develop next generation of sediment transport 2D/3D model (2017-N-01).** Initiate development of a new coastal model that incorporates Coastal Modeling System (CMS), C2Shore, and other nearshore coastal sediment transport modules and features into a prototype model. CORSED will be the Corps' next

generation sediment transport library that will be applicable to all hydrodynamic models. The next step in development is to bridge gaps in methods and consolidate sediment transport formulations for the nearshore, inlets, and estuaries. This will be tested in multiple 2DH drivers with varying grid capabilities for initial verification to analytical solutions.

- **Develop Long-term Predictive Capability in a Selected Inlet System (SoN 2017-N-71).** This effort has produced a model of empirically derived morphology change as a function of hypsometry and sediment supply that can be used to evaluate existing inlet/bay systems. The new methodology to evaluate an inlet/bay systems for inlet stability, sediment import/export, and the potential for sedimentation fluxes within tidal inlets and navigation channels will be published through a peer-reviewed journal article and technical note, and tech-transferred to the field for analysis capability in numerical modeling using the CMS via webinar.
- **Continue to Test New CMS Features, Conduct Model Validation, Tech Transfer, and User Support (SoN 2017-N-1).** As requested by district applications new features implemented in CMS will be tested. These features included newly merged CMS code, C2SHORE, dredging module, sediment mapping, mixed-sized sediment routine, and quasi-3D. Continue Applications and Validation of the Coastal Modeling System (CMS) (SoN 2017-N-1; 2016-N-4; 2016-N-10; 2014-N-7). Continue verification & validation of CMS, with extended data sets, coastal forcing, and settings, using available analytical, laboratory, and field data sets, also collect/create a suite of new verification and validation cases. Continue technology transfer. Provide tech transfer workshops and webinars on the Coastal Modeling System (CMS) and Particle Tracking Model (PTM).
- **Continue the Investigation of Inlet Morphology Change at Oregon Inlet (SoN 2017-N-1).** Continue the field data analysis/interpretation and the modeling effort. Further examine formation and evolution of flood- and ebb-tidal shoals and investigate inlet morphology changes and inlet shoreline migration. Extend FRF datasets for nearshore process investigation using CMS/C2SHORE. Use the modeling tool and measured data to validate bathymetric measurements by RIOS. Publish a journal paper.
- **Continue the Evaluation of Swash Zone Wave, Current, and Sediment Transport Modeling (SoN 2018-N-05; SoN 2017-N-1).** Continue to evaluate surf/swash zone sediment transport processes using existing swash zone modules in the CMS. Develop new laboratory and field datasets for model evaluation. Improve the CMS model performance in swash zones and understand physical mechanisms on beach profile changes and nearshore bar migration.
- **Develop GenCade Model application for Regional Coastlines (SoN 2017-N-71 and SoN 2017-N-67).** The work will focus on refining model parameters for different coastline types. The two primary tuning parameters (K1, K2) that regulate the degree of alongshore transport will be validated based on coastline type, average wave conditions, the relative contribution of cross-shore versus longshore transport, regional coastline slope, and the degree of bar formation in the near-shore. This will provide users with new and more accurate guidance on how to apply GenCade at project sites.
- **Develop Long-term Predictive Capability in Multiple Inlet Systems (SoN 2017-N-71).** This effort will produce a model of empirically derived morphology change as a function of hypsometry and sediment supply that can be used to evaluate existing inlet/bay systems. The effort will produce a new methodology that can be used to evaluate a wide range of existing inlet/bay systems.

- **Aeolian Sediment Transport Near Inlets (2017-N-72; 2018-F-1192).** Initiate two-way, 2D coupling between Aeolis and C2Shore/CMS to allow for comprehensive simultaneous modeling of subaqueous and subaerial landscape change. Refine algorithms for parameterizing coastal management alternatives (e.g., sand fencing, plantings in 2D).
- **Evaluating Remote Sensing Capabilities for Application to Numerical Calibration and Validation (SoN 2016-N-10; SoN 2017-N-01).** Evaluate the results of the surface current measurement and results of the DUNEX datasets and apply the measurements to the CMS model to better understand performance. Investigate coupling HH&C CoP approved flow models to select wave models to understand how different CoP-approved wave models affect circulation predictions.
- **USCRP Nearshore Processes Initiative:** Support the development, coordination, and implementation of a plan for conducting nearshore coastal processes research in collaboration with other federal agencies, academics, industry, and non-government organizations. The three major research thrusts of the USCRP are long-term coastal evolution, physical processes during extreme events, and physical/biological/chemical processes impacting human and ecosystem health. Activities in FY21 will focus on leveraging products from the FY 2019 and FY 2020 academic research projects and completion of the DUNEX full study.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Cultural Resources 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 1,485,000	\$ 990,000	\$ 990,000	\$ 891,000 2/	\$ 900,000

1/ The costs of this activity are accounted for between the Navigation, Flood Risk Management, Hydropower, and Environmental Stewardship business lines.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$18,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 3001 et seq.), NAGPRA implementing regulations (43 CFR Part 10), the Curation of Federally Owned and Administered Archeological Collections (36 CFR Part 79), the Monuments, Ruins and Objects of Antiquity (54 U.S.C. 320301-320303), the Preservation of Historical and Archeological Data (54 U.S.C. 312501-312508), the National Historic Preservation Act (54 U.S.C. 300101 et seq.) and the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm) require Civil Works programs and projects to properly house their archaeological collections to federal standards.

DESCRIPTION: Annual funding is used to provide overall management of the Corps' NAGPRA programs and serves as a centralized base for compliance, an information source, and contracting. The Corps 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 artifacts, including human remains and objects, collected from its water resources development projects, and associated records. NAGPRA review and proper storage of these materials, which are over 80 percent of the total DoD collections and one the largest volume of all Federal agencies responsible for this activity, is required by a number of public laws including NAGPRA with implementing guidance in 43 CFR Part 10 and 36 CFR Part 79. Through FY 2019, a total of 85 NAGPRA compliance notices were published, resulting in the repatriation of over 1,800 individuals and over 250,000 objects. The costs are to accomplish NAGPRA work and to fund compliance support to the districts, including Native American consultation. Funding this item will ensure full Corps 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.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Cybersecurity

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ N/A 1/	\$ N/A 1/	\$ 4,075,000	\$ 4,964,000 2/	\$ 4,000,000

1/ Prior to FY 2019, Civil Works Cyber Security Control Systems was funded as part of the Asset Management/FEM and CIPR Remaining Item.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$700,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

DESCRIPTION: The Critical Infrastructure Cyber Security Center of Expertise was established in October 2013 as a regional center of expertise to provide services related to the cybersecurity of control systems (CS) within the Southwestern Division. The USACE Critical Infrastructure Cybersecurity (UCIC) now operates as a national mandatory center providing guidance and oversight for CS cybersecurity policy and regulation implementation and compliance, monitoring cybersecurity status and reporting to the appropriate Command, providing assessment and authorization assistance and services, integrating control system physical security with cybersecurity, and educating the workforce for the entire Corps. The UCIC serves as the organization within the Corps for all matters related to cybersecurity of all Corps owned and operated control systems.

Budgeted funds are used for: conducting cybersecurity assessments of Corps CS currently in service; maintaining a comprehensive inventory of Corps CS; managing and directing the Corps' CS risk management strategy; developing and maintaining policy guidance directing/supporting cybersecurity activities for CS in order to obtain an Authority To Operate (ATO); providing guidance and assistance in using the Enterprise Mission Assurance Support System for system registration and implementation of the Risk Management Framework (RMF) process; assisting system owners with the mitigation and remediation of vulnerabilities listed on the system's Plan of Action and Milestones (POA&M); serving as the first point of contact of any cyber event or incident on a Corps CS; maintaining a test lab to support the development and testing of CS-specific engineered cybersecurity solutions; providing oversight for the physical security of control systems; maintaining the Physical Security Minimum Standards for the Corps; providing oversight and guidance on continuous monitoring strategies; executing multi-tier training on control system cybersecurity in accordance with Department of Defense and Army regulations; operating as an official representative of Corps CS cybersecurity and sharing information with internal and external stakeholders; participating in cybersecurity working groups and seminars; and providing Federal support to the Department of Homeland Security Dams Sector working group in accordance with Presidential Policy Directive 21; and improvements, expansions, additions and repairs to the existing facility and grounds.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Dredging Data and Lock Performance Monitoring System – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 1,108,000	\$ 1,284,000	\$ 1,609,000	\$ 2,693,000 1/	\$ 1,120,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$68,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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.

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. Provide uninterrupted database access by migrating to a Department of Defense approved cloud based computing site. Deploying approved Common Access Card enabling for dredging and lock data collection applications. Work with the other

Institute for Water Resources

Dredging Data and Lock Performance Monitoring System

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: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Dredging Operations and Environmental Research (DOER) Program – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 6,386,000	\$ 6,386,000	\$ 6,886,000	\$ 9,900,000 ^{1/}	\$ 5,250,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$77,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 use of dredged sediment to enhance habitat, ecosystems, and coastal recreation 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 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 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 use 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, 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.

Engineer Research and Development Center

Dredging Operations Environmental Research Program

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.

The funds under this program are not used for work at specific projects, but are used to fund activities that can be used to benefit both current and future projects. Major focus areas of DOER include:

(1) Sediment and Dredging Processes:

- a. Develop improved understanding of dredged sediment properties and transport processes associated with mixtures of sand, silt, and clay to support regulatory compliance, habitat protection, habitat enhancement, dredged material management, beneficial use of dredged sediment, natural and nature-based features (NNBF), regional sediment management (RSM), and Engineering With Nature® (EWN®);
- b. Develop more accurate characterization methods for transport and deposition of suspended sediment to support environmental evaluations of dredging projects, beneficial use of dredged sediment, and engineering design for wetland and other habitat creation using dredged material;
- c. Develop engineering and operational practices that enable more mixed-grain sediments from navigation projects to be used for beach and nearshore nourishment;
- d. Develop experimental results demonstrating the use of strategic sediment placement to achieve reduced operational costs while supporting coastal resilience;
- e. Develop tools to support sustainable open-water dredged sediment placement strategies that reduce risks related to shoreline erosion and flooding;
- f. Improve dredged sediment fate models used to evaluate regulatory compliance, long term management strategies, beneficial use options, and risk characterization;
- g. Measure and predict sediment processes at beneficial use sites; and
- h. Develop guidance for quantifying environmental risk from dredging and placement operations to sensitive species such as coral, submerged aquatic vegetation, and other species/habitats.

(2) Dredged Material Management:

- a. Provide tools that allow for internal and external collaboration and cost saving opportunities for beneficial use, NNBF, EWN®, and RSM;
- b. Provide web-based applications to support efficient assessment and collaboration in partnership with other federal and state agencies and the private sector;
- c. Develop guidance for implementing thin layer placement to enhance and increase beneficial use of dredged material;
- d. Provide an improved barge measurement system to allow more accurate quantification of dredged material to optimize project management and incentivize dredging contractors to maximize production;
- e. Improve understanding of the physical processes involved in placement, dewatering and settlement of dredged material in wetland environments to improve placement practices and optimize delivered ecosystem and resilience services;
- f. Expand modeling capabilities to predict dredged material settlement over time to optimize attainment of the design elevation(s) and facilitate maintenance of sustainable wetlands via thin layer placement of dredged material;
- g. Expand the technology base to support increased beneficial use of dredged material;
- h. Develop methods and guidance for district engineers to evaluate and use innovative, sustainable, lower-cost sediment management options for channels and reservoirs; and
- i. Expand suite of planning tools for applying EWN® and innovative solutions that save time and money while delivering economic, social and environmental benefits from sediment management.

(3) Environmental Resource Management:

- a. Develop design guidance for incorporating NNBF for engineered resilience;
- b. Develop quantitative methods for incorporating ecological resilience into beach nourishment;
- c. Develop a quantitative models for modeling episodic sediment pulses into marsh dynamic models;
- d. Develop technology that integrates remote sensing data and ecological models to manage critical habitat and endangered species near Corps operations;
- e. Develop a framework for managing risk related to underwater sound produced by dredging;
- f. Develop guidance on incorporating section 7(a)(1) of the Endangered Species Act;
- g. Improve model integration to determine environmental benefits from beneficial use and other EWN® projects;
- h. Enhance modeling capabilities for quantifying multiscale impacts and benefits from Corps projects;
- i. Demonstrate methods for using landscape architecture to incorporate EWN® into existing USACE infrastructure;
- j. Develop quantitative modeling tools to determine storm-generated sediment loads on marsh dynamics; and
- k. Quantify the benefits and risks associated with alternative technologies to reduce risks to sea turtles and other aquatic animals.

(4) Risk Management:

- a. Develop risk-based methods and technology to improve cost efficiencies and sustainability of the navigation dredging program;
- b. Develop risk management strategies for contaminated dredged materials to reduce long-term O&M costs and environmental liabilities;
- c. Improve model and laboratory evaluations for the design and implementation of innovative risk management strategies for contaminated dredged material to reduce maintenance costs;
- d. Improve environmental test procedures and interpretative tools to reduce operational costs by enhancing the accuracy and reliability of dredged material assessments;
- e. Develop science to address risks associated with emerging contaminants in dredged materials; and
- f. Provide decision-making tools that facilitate stream-lined, cost effective, risk-informed decision making.

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APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Dredging Operations Technical Support (DOTS) Program – Navigation

Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$	Budgeted Amount in FY 2021 \$
2,792,000	2,792,000	2,792,000	6,059,000 1/	2,450,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$108,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 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 and is intended to maximize cost effectiveness and facilitate expeditious and consistent implementation of national policies and laws. 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. DOTS fosters productive, collaborative relationships with other Federal and state agencies with missions relevant to navigation. The DOTS Program also fosters application of new and existing technologies and ongoing research for high priority problems identified by field offices, including short-term work efforts to address generic Corps-wide technical problems encountered during maintenance of navigable waterways and infrastructure.

The Dredging Innovations Group (DIG), within DOTS, fills an important functional gap for the Corps 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 Corps' navigation mission. The DIG engages Corps interests to anticipate and identify priority problems, needs, and opportunities; address requirements; translate R&D program knowledge and products into best practice; lower technical execution barriers under changing conditions; inform decision-making with credible, defensible science; and build and sustain USACE institutional capacity.

Annual funding is used to:

- 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.
- Conduct face-to-face training sessions at the regional level. Tailor the training to meet regional needs including sessions providing dredged material management, in-water assessment and management, upland and aquatic placement, regional threatened and endangered species dredging issues, and

Engineer Research and Development Center

Dredging Operations Technical Support Program

emerging research and development from the Dredging Operations Environmental Research Program.

- Continue to sponsor the Webinar Series that 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 Corps.
- DOTS and DIG will continue to be proactive by updating existing tools and databases to maintain functionality and compatibility with emerging Information Technology 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 2021

PROJECT NAME: Earthquake Hazards Reduction Program 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 99,000	\$ 297,000	\$ 297,000	\$ 297,000 2/	\$ 300,000

1/ The Budget accounts for this activity under the Flood and Storm Damage Reduction program.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$255,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Earthquake Hazards Reduction Act of 1977, as amended (42 USC 7701); Section 1151 of the Water Infrastructure Improvements for the Nation Act (33 USC 2353); and Executive Order 13717 (Establishing a Federal Earthquake Risk Management Standard).

DESCRIPTION: The Corps uses this funding primarily to provide technical support to Corps offices about the seismic risk of the buildings that the Corps owns or operates, and ways to reduce that risk. The Corps has adopted a risk-based approach to the seismic risk at the buildings that it owns or operates, consistent with the overall Federal approach to seismic risk outlined in Executive Order 13717. The Corps uses these funds to assess the ability of its buildings to withstand an earthquake. Through these evaluations, the Corps identifies the buildings that are most at risk. It uses the Seismic Safety Action Classification System (SSAC) to rank them on this basis. The SSAC, which considers both the probability of a range of possible earthquakes at that location, and the likely consequences for each such event (in terms of loss of life and economic loss), is the main focus of this funding.

The Corps also uses this funding to support the work of a group of Corps experts (composed primarily of structural engineers, geotechnical engineers, and geologists) called the Army Corps Seismic Safety Committee. This group provides advice and direction to the Corps on seismic risks and the technology and strategies available for addressing them. The Corps has issued preliminary general guidance for use by the Corps districts and divisions. The Corps also is working on criteria for civil works buildings seismic design and evaluation, which will include powerhouses and pump stations. The Corps also uses these funds to prepare seismic evaluation and mitigation seminars and webinars for district and division personnel, provide technical support on specific issues to districts and divisions as needed upon request, and facilitate information exchange with the United States Geological Survey (USGS). In addition, the Corps will use these funds to develop a design guide for non-structural component design for RC III, IV and V buildings; to determine the best computer software to be used in seismic design and evaluation; to develop a User's Guide and document the assessments of the SSAC program. Non-building criteria will also continue to be updated.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Fish & Wildlife Operating Fish Hatchery Reimbursement 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 5,346,000	\$ 5,346,000	\$ 5,346,000	\$ 5,346,000 2/	\$ 5,400,000

1/ The costs of this activity are accounted for between the Flood Risk Management and Hydropower business lines.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$54,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 operation and maintenance 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 2021

PROJECT NAME: Facility Protection – Flood and Coastal Storm Damage Reduction

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 3,960,000	\$ 5,937,000	\$ 5,940,000	\$ 4,182,000 1/	\$ 4,200,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,153,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Presidential Policy Directive/PPD-21, Critical Infrastructure Security and Resilience; Executive Order 13636, Improving Critical Infrastructure Cyber Security; Executive Order 13800, Strengthening the Cybersecurity of Federal Networks and Critical Infrastructure; Presidential Policy Directive/PPD-8 National Preparedness Goal, the National Security Strategy of the United States; and Army regulations relating to critical infrastructure security and resilience. In addition, the Robert T. Stafford Disaster Relief and Emergency Assistance Act (Public Law 100-707), signed into law on November 23, 1988, as amended on February 23, 2018, which constitutes the statutory authority for most Federal disaster response activities; and the Disaster Relief Act of 1974 (Public Law 93-288), as amended.

DESCRIPTION: This funding supports security risk assessment and prioritization efforts for Civil Works projects under the Critical Infrastructure Protection and Resilience (CIPR) Program using a risk-based approach, in order to enhance the security, protection, and resilience of Civil Works projects. As established by ER1110-2-1156 (Dam Safety Policy and Procedures), the CIPR program security risk assessment framework is fully aligned with national policy as provided in PPD-21, Executive Order 13636, Executive Order 13800, and PPD-8. These goals will be attained by developing solutions, methodologies, and tools to address key vulnerabilities to man-made incidents, implementing effective programs to minimize consequences, improving the response and recovery capabilities, and prioritizing security life-cycle investments.

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APPROPRIATION: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Inland Waterway Navigation Charts – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 4,455,000	\$ 4,455,000	\$ 4,455,000	\$ 5,250,000 1/	\$ 4,350,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$28,000. There was an additional \$239,000 of unobligated funds that are committed within the Corps for scheduled ongoing requirements in FY 2020. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Public Law 85-480, approved 2 July 1958, authorizes the Commander, U.S. 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 Corps provides Electronic Navigational Chart (ENC) data for all inland waterways and other federal navigation channels maintained by the Corps 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 Corps 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. The Corps also coordinates 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. The standardization of these products has been made possible through the implementation of eHydro, which uses Navigation Channel Framework (NCF) as its foundational data. NCF is a GIS geodatabase which contains channel limits, construction centerlines, top of slope lines, channel reach positions, and inside channel quarters for all Corps-maintained navigation channels. In addition to providing foundational data for eHydro, NCF supports the Dredging Quality Management program, and other applications and connects to the Corps Project Notebook, providing consistent inventory of projects and subprojects across the Navigation business line.

HQUSACE

Inland Waterway Navigation Charts

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.

ACCOMPLISHMENTS IN FY 2019: Updated and maintained 107 navigational charts on a monthly basis. On a weekly basis, charted over 12,000 buoy locations provided by the US Coast Guard. Provided over 2 million chart downloads to public through Amazon Web Services (AWS). Migrated all chart services from AWS to Microsoft Azure Cloud. Held annual IENC Program Review meeting to review all aspects of the program including quality control and collecting new features for charts. Presented IENC briefings at several national conferences. Attended international meetings regarding inland standards. Began the development of IEHG S-401, the product specification for IENCs that aligns with the International Hydrographic Organization's S-100 Universal Hydrographic Data Model. S-401 development is anticipated to be a long-term (5 year) task, as migration to S-401 cannot occur until S-101, the Electronic Navigational Chart Product Specification (for maritime) is completed. Continued making all updated paper navigational charts available for Print On Demand through the Government Publishing Office website. Implemented eHydro application for all Corps Districts with a navigation mission. Used eHydro survey data to create 374 IENC overlay files to the US Coast Guard to enable more efficient and accurate placement of buoys and increase safety to navigation.

DESCRIPTION OF WORK FOR FY 2020: Continue to update all existing IENCs on a monthly basis. Subject to chart production software capability, convert charts from IENC 2.3 to IENC 2.4 Product Specification. Investigate new ways to migrate all IENC maintenance to the same software platform: CARIS Hydrographic Production Database (HPD). Expand the capability of the on-line IENC Quality Control interface to include direct linkage to CARIS HPD. Continue international coordination and development of IEHG S-401, the product specification for IENCs that aligns with the International Hydrographic Organization's S-100 Universal Hydrographic Data Model. S-401 development is anticipated to be a long-term (5 year) task, as migration to S-401 cannot occur until S-101, the Electronic Navigational Chart Product Specification (for maritime) is completed. Create an IENC 2.5 Product Specification to fill gaps in required chart encoding as S-401 is being developed. Continue development of a semi-automated tool for the production of IENC overlay files for the U.S. Coast Guard (USCG) using survey data downloaded from eHydro. Coordinate with the USCG the best means with which to transfer IENC overlay files. Work with the USCG to develop an IENC overlay containing lights and beacons on the inland waterways, similar that produced weekly for buoys.

DESCRIPTION OF WORK FOR FY 2021: Continue to update all existing IENCs on a monthly basis. 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 Universal Hydrographic Data Model. S-401 development is anticipated to be a long-term (5 year) task, as migration to S-401 cannot occur until S-101, the Electronic Navigational Chart Product Specification (for maritime) is completed. Begin developing a mechanism for providing IENC overlay products to the towing industry. Collaborate with NOAA to establish a website for downloading all US electronic charts (NOAA ENC and USACE IENC). Continue technical assistance to districts and end users.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Inspection of Completed Federal Flood Control Projects – Flood Damage Reduction

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$	\$	\$	\$	\$
30,196,000	19,800,000	19,800,000	19,800,000 1/	32,307,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$1,710,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATIONS: Section 221 of the Flood Control Act of 1970, as amended (84 Stat. 1831, 42 U.S.C. 1962d-5b).

DESCRIPTION: The Corps uses this funding to provide central oversight and support for its nationwide effort to enable local communities to understand the risks associated with the levee systems that the Corps constructed for them. These local communities are responsible for the operation, maintenance, repair, replacement, and rehabilitation of those levee systems. The Corps uses this funding to maintain an effective governance framework for its participation in this effort, by funding the following four categories of activities.

- First, the Corps uses this funding for basic program management of the Corps levee safety program. The activities that fall within this category include the work of two programmatic decision groups, the Army Corps Levee Senior Oversight Group and the Army Corps Levee Safety Steering Committee. They provide quality control and ensure national consistency in the risk assessments of levee systems that the Corps performs, and provide direction to guide overall implementation of the Corps levee safety program.
- Second, the Corps uses this funding for program policy development, including policy and procedures to provide consistent implementation of programmatic activities, such as for inspections, emergency action plans, and interim risk reduction measures.
- Third, the Corps uses this funding to support technical training, such as workshops on consequence modeling, and joint support training with the Bureau of Reclamation on best practices in risk assessments; and to fund developmental positions for early career professionals.
- Fourth, the Corps uses this funding for data management, mainly for the development and management of search engines between levee safety databases and other Corps databases, and for the maintenance of the file management systems that store working documents such as reports.

The Corps also uses this funding to conduct risk assessments of certain high-risk federally authorized levee systems. The Corps provides the results of these risk assessments to the local authorities that are responsible for these levee systems, in order to help them in managing their flood risk. The Corps also uses this risk-based information to guide the development of options for improving its overall approach to flood risk management nationwide.

OTHER INFORMATION: Pursuant to Section 221 of the Flood Control Act of 1970, as amended, the Corps enters into a written agreement with the non-federal sponsor, before undertaking a water resources project, which identifies the responsibilities of each party. These "items of local cooperation" include that the non-Federal sponsor will be responsible for all future operation, maintenance, repair, replacement, and rehabilitation work, and associated costs.

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Inspection of Completed Federal Flood Control Projects

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Inspection of Completed Works – Flood and Storm Damage Reduction

Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$	Budgeted Amount in FY 2021 \$
31,632,000	29,903,000	30,096,000	32,456,000 1/	18,000,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$6,185,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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)

DESCRIPTION: The Corps uses this funding to inspect locally maintained levee systems that the Corps constructed. The local communities are responsible for the operation, maintenance, repair, replacement, and rehabilitation of these levee systems.

During the inspection, the Corps notes any changes in the condition of the levee system since the last inspection, and identifies any deficiencies or other concerns that may warrant repair or monitoring. The Corps and the local authorities use this information to understand the key risk drivers of each levee system. The Corps provides the results of the inspection to the local entity, and updates this information in the National Levee Database.

The Corps also uses the information that it collects through these inspections to decide whether it will undertake a more detailed risk assessment of a particular levee system. Where it does so, the Corps would use funding provided under the Inspection of Completed Federal Flood Control Projects remaining item to perform that risk assessment.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Monitoring Completed Navigation Projects (MCNP)

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 7,920,000	\$ 9,855,000	\$ 9,801,000	\$ 11,880,000 1/	\$ 3,800,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$294,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Authorization for the U. S. Army 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.")

JUSTIFICATION: 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 assessment tools and technologies for structural managers. Previously, application of such tools and techniques for SHM at large civil navigation infrastructure has been exceedingly limited.

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 ERDC develop monitoring plans jointly.

Engineer Research and Development Center

Monitoring Completed Navigation Projects

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 2020:

Focus Area 1: Monitoring Existing Structures

Reliability Analysis of Coastal Rubble-Mound Structures

- Develop reliability metrics for design guidance of coastal rubble-mound structures.
- Finalize report for reliability methodology with test cases using a cross-shore numerical model and empirical equations for run-up, overtopping, transmission, armor stability, and damage progression.
- Leverage existing Coastal Hazards System (CHL) databases to radically simplify the design and assessment process of coastal navigation structures, and document methodology for application in coastal areas not covered by existing databases.
- Compute hazard metrics for structures in the USACE databases to identify hazard exposure to aid in coastal structure assessment.
- Create Matlab script library with select codes and user manuals for distribution within the USACE.
- Leverage existing databases on coastal structures, including aerial surveys by the USACE Airborne Center of Expertise and coastal structure database, and
 - Work in conjunction with the Corps' Coastal Engineering Branch to acquire aerial survey data for select demonstration coastal structures using tools developed by the Coastal Engineering Branch, and
 - Define structure data, damage computation, quality assurance, and extraction process for coastal structures for streamlined application with reliability and design tools.
- Create a web-based interface that will facilitate use of the coastal structure reliability tools across the USACE, along with user manual, technical documents, and application examples.

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

- Continue laboratory testing on remaining accelerated weathered fiber reinforced polymer samples.
- Conduct supplemental inspections on demonstration sites of composite wicket gates, polymer slides, and composite miter blocks.
- Complete photogrammetry wear analysis.
- Finalize material degradation prediction algorithms and plots, and prepare Interim Technical Report to include all data, results, and recommendations.
- Refine and update cost-benefit analysis based on latest results and conclusions.

Monitoring Effectiveness of Coatings, and Corrosion Prevention and Control (CPC) Systems, at Lock Hydraulic Steel Structures (HSS)

- Continue evaluating ruggedness of remote monitoring equipment installed at Selden, Holt, and Clairborne Locks, AL; and The Dalles Lock, OR; by one inspection visit to each site to monitor condition of CPC sensors and Remote Monitoring Units (RMUs).
- Continue collecting Cathodic Protection (CP) and water quality data at the 4 field data collection sites by automatic data collection system, and by manual spot measurements to verify accuracy of the automated measurements. Manual measurements will be made to determine accuracy of the automated measurements, and to compensate for the natural aging of the monitoring system.

- Continue evaluating capability of new sensor technology to monitor sacrificial CP systems to determine condition of CP sensors and RMUs.
- Implement CPC remote monitoring data analysis algorithms in Process Information (PI) Vision (Structural Health Monitoring (SHM) software).

Focus Area 2: River Information Services (RIS)

Enhancing Inland Waterway and Traffic Information to Users

- Deploy updated River Information Services (RIS) capabilities that have been developed and tested in RIS proof-of-concepts and test beds.
- Finalize deployment of the Lock Operations Management Application version 2 equipment, and ensure all River Information Service data are being transmitted accurately to the version 2 equipment, to ensure navigation safety for river traffic passing through the locks.
- Continue interagency coordination and implementation of enhanced navigation information services, including rapid prototyping and evaluation of emergency technologies.
- Continue U.S. participation in international efforts by developing RIS standards to ensure U.S. priorities and requirements are addressed: Enhance existing U.S. standards, or develop new standards as needed, to support U.S. RIS implementation.

Focus Area 3: Structural Health Monitoring (SHM)

Advancing Structural Health Monitoring (SHM) Methods for USACE Infrastructure

- Improve lock project life-cycle performance projections for use by Asset Management.
- Define quantitative performance metrics for civil works infrastructure performance for asset management and SHM tool use.
- Model and demonstrate crack propagation computations for hydraulic steel structures (HSS).
- Demonstrate crack initiation predictions for use in lock maintenance planning.
- Develop capabilities to incorporate visual inspections and sensor data to compute asset reliability.

DESCRIPTION OF WORK FOR FY 2021:

Focus Area 1: Monitoring Existing Structures

Reliability Analysis of Coastal Rubble-Mound Structures

- Will incorporate near-structure morphology within Monte Carlo life-cycle modeling of structure reliability for quantifying effects of sediment deposition in navigation channels and areas surrounding the structures.
- Will conclude analysis for a complete set of structures in USACE inventory, and prepare Final Technical Report.
- Will complete online script library with all numerical models and model documentation, and examples for applying the models to determine reliability of coastal rubble-mound structures.
- Will deploy the web interface tools with Coastal Hazards System (CHS) integration.

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

- Will conduct final laboratory testing on last remaining accelerated weathered samples.
- Will conduct last demonstration site field inspections.
- Will complete and submit project Final Technical Report.

Engineer Research and Development Center

Monitoring Completed Navigation Projects

- Will consolidate all laboratory and field results, and write comprehensive Field Guidance for USACE District use of FRP composite materials as various components of navigation locks.
- Will present a final update to the cost savings analyses table, and transfer technology to USACE Districts.

Monitoring Effectiveness of Coatings, and Corrosion Prevention and Control (CPC) Systems, at Lock Hydraulic Steel Structures (HSS)

- Will continue evaluating the ruggedness of remote monitoring equipment installed at Selden, Holt, and Clairborne Locks, AL; and The Dalles Lock, OR; by two inspection visits to each site to monitor condition of CPC sensors and Remote Monitoring Units (RMUs).
- Will continue collecting Cathodic Protection (CP) and water quality data at the 4 field data collection sites by automatic data collection system, and by manual spot measurements to verify the accuracy of the automated measurements. Manual measurements will be made to determine the accuracy of the automated measurements and compensate for the natural aging of the monitoring system.
- Will continue evaluating capability of new sensor technology to monitor sacrificial CP systems at the quoin region of a navigation lock gate by twice-yearly site inspections to determine condition of CP sensors and RMUs.
- Will continue verifying and optimizing predictive maintenance algorithms to account for variations in CP system rectifier, and anode currents and corrosion potentials.
- Will develop Preliminary Mordecai Island BU model to determine optimal future BU placement sites and re-nourishment intervals.

Focus Area 2: River Information Services (RIS)

Enhancing Inland Waterway and Traffic Information to Users

- Will finalize the Lock Operations Management Application version 4 software development for improved user interface and performance, increased interoperability and flexibility, and integration of operational capabilities that are currently separated.
- Will continue to participate in national and international navigation information and technology standards development.
- Will continue to coordinate in development of new, and enhance existing, navigation information and RIS technologies.

Focus Area 3: Structural Health Monitoring (SHM)

Advancing Structural Health Monitoring (SHM) Methods for USACE Infrastructure

- Will improve infrastructure life-cycle performance for use by Asset Management.
- Will calibrate trade-off equations for comparing dissimilar infrastructure performance metrics.
- Will develop reliability based lifecycle modeling approach for hydraulic steel structures based on fracture and fatigue.
- Will incorporate corrosion into crack propagation models.
- Will demonstrate fully operational SHM systems for lock gate monitoring.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: National Coastal Mapping Program – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 6,737,000	\$ 6,237,000	\$ 12,870,000	\$ 7,425,000	\$ 5,000,000 1/

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from Fiscal Year (FY) 2019 to FY 2020 was \$0. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 516 of Water Resources Development Act of 1996

DESCRIPTION:

The National Coastal Mapping Program (NCMP) 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 require 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 Corps has used these funds to collect 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 National Oceanic and Atmospheric Administration (NOAA) nautical chart production. NCMP funding is used to extract new information products quantifying shoreline, sediment volume, infrastructure, and habitat changes from consecutive datasets collected on the Great Lakes (Ontario, Erie) shorelines from 2006 to 2011. Survey data 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. 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 and are also used to inform formulation of plans for potential new projects as well as for management of existing Corps assets. 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,

Division: South Atlantic

District: Mobile

National Coastal Mapping Program

improves navigation hazard detection, and improves overall data accuracy. Engineering and scientific analyses of the National Coastal Mapping Program historical dataset advance USACE capability to quantify coastal resilience and provide tools to produce regionally and nationally consistent metrics describing beach and dune geomorphology, dune vegetation, and coastal resilience.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: National Dam Safety Program (Portfolio Risk Assessment)

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 9,900,000	\$ 9,900,000	\$ 13,770,000	\$ 13,761,000 1/	\$ 10,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,361,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 2 of National Dam Inspection Act of 1972, P.L. 92-367 (authorized the Secretary of the Army to inspect dams across the country; and to issue a report to the Congress that includes an inventory of all dams in the United States, and provides recommendations for a comprehensive national program for the safety of dams); Section 215 of the Water Resources Development Act of 1996, P.L. 104-303 (authorized FEMA to lead the National Dam Safety Program, a Federal interagency effort to encourage the Federal agencies with dams, and the States, to establish effective dam safety programs); Section 1 of Dam Safety Act of 2006, P.L. 109-460 (authorized the Secretary of the Army to maintain and update the national inventory of dams, including any available condition assessments performed by a Federal agency or a State dam safety agency); and Section 3001 of the Water Resources Reform and Development Act of 2014 , PL 113-121 (reauthorized the National Dam Safety Program, which FEMA leads).

DESCRIPTION: The Corps uses this funding to manage its overall effort to help reduce risks of loss of life and property damage that would occur from the failure of a Corps dam. The Corps Risk Management Center (RMC) leads this effort based on a Corps-wide Portfolio Risk Assessment (PRA) process covering the 720 dams and appurtenant structures that the Corps owns, which are located at 555 of its projects. For each of these dams, the Corps performs a risk assessment to estimate the probability of failure and consequences for each identified potential initiating event. In addition, the Corps formulates risk reduction measures where needed, and estimates their cost and effectiveness in reducing the risk of failure. It uses the results of these detailed PRA's at the national level to further formulate study plans, identify appropriate corrective actions, and determine the urgency of such actions.

The Corps also uses this funding to update its Dam Safety Investment Plan (DSIP), with the goal of determining short-term and long-term strategies for modification and repair of the dams in the portfolio that pose the highest risk. The Corps uses the DSIP to demonstrate the effects of each of these potential strategic investments, with the objective of reducing the overall risk of the portfolio of Corps dams in the most efficient and cost-effective manner. The dam safety work of the Corps supports 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 Corps also updates its technical manuals and policy guidance to reflect the state-of-the-art in these disciplines.

The Corps uses these funds to perform Periodic Assessments (PA) of Corps dams; review Semi-Quantitative Risk Assessment and PA reports; review dam instrumentation; update and publish dam safety policy and guidance; conduct dam safety training and workshops for Corps staff; review, respond to, and implement Independent External Peer Review (IEPR) comments; develop modeling, inundation mapping, and consequence work products through the Modeling, Mapping, and Consequences Center; cover the cost of Corps staff attendance at meetings of the Interagency Committee on Dam Safety (ICODS); and cover the cost of the membership of the Corps (as a participating organization) in various national and international dam organizations.

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National Dam Safety Program (Portfolio Risk Assessment)

The Corps began to manage its dam safety efforts centrally in FY 2011. From FY 2011 through the end of FY 2019, the Corps has used this funding to facilitate Periodic Assessments (PA) at 362 of its projects, covering about 65% of the 559 Corps projects with a Corps dam. The Corps also used this funding to conduct IEPRs of its dam safety program in FY 2013 and FY 2017, and to address the IEPR comments from those reviews; and to publish several guidance documents relating to dam safety.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: National Emergency Preparedness Program (NEPP) – Emergency Management

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 4,484,000	\$ 5,445,000	\$ 5,445,000	\$ 53,297,000 1/ 2/	\$ 5,000,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,070,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

2/ Includes \$50,000,000 in supplemental funding provided to the Corps in the Operation and Maintenance account in the Coronavirus Aid, Relief, and Economic Security Act (Public Law 116-136) to prevent, prepare for, and respond to coronavirus, domestically or internationally.

AUTHORIZATION: Executive Order 10480 (August 14, 1953); Executive Order 12656 (November 18, 1988); the National Security Presidential Directive-51/Homeland Security Presidential Directive-20 (NSPD-51/HSPD-20) (May 9, 2007); the National Continuity Policy Implementation Plan (NCP/IP)(August 2007); the National Emergencies Act (NEA), PL 94-412, 50 USC § 1601-1651; and authority provided the Department of Homeland Security, 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 NCP/IP, the Army Corps of Engineers (Corps) NEPP program ensures that the Corps 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 and its governmental missions during such a disaster. More specifically, these funds ensure that the Corps work force is capable of shifting rapidly 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 FEMA exercises, and coordination within the Department of Defense, other Federal agencies, and state and local governments. Preparation also includes Corps 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 builds upon, but differs from, the preparedness work that the Corps performs with the funding provided to prepare for flood, hurricane, and other natural disasters through the Flood Control and Coastal Emergencies (FCCE) appropriation. The two programs are complementary.

Annually, this funding is used to support the Corps national-level requirements for preparedness training with regard to man-made disasters (to include acts of terrorism), catastrophic disaster planning (review/revision of no-notice disasters, i.e., earthquakes along known seismic zones and pandemics), and fund requirements for continuity of government (COG) and continuity of operations (COOP) equipment and exercises. With regard to our COOP and COG requirements, these funds provide the means to annually exercise the displacement of our emergency operations centers to an alternate location, in addition to providing essential upgrades, security and user support for maintaining communications. The end goal is to ensure the Chief of Engineers is able to provide uninterrupted command and control of all Corps activities and missions, should the need arrive.

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National Emergency Preparedness Program (NEPP)

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: National (Levee) Flood Inventory – Flood Damage Reduction

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 4,950,000	\$ 9,900,000	\$ 4,950,000	\$ 14,850,000 1/	\$ 4,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$471,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Title IX of the Water Resources Development Act (WRDA) 2007, as amended.

DESCRIPTION: Since 2011, the Corps has maintained a publicly available database called the National Levee Database (NLD), a central source of information on the condition of and risks associated with levee systems in the United States. The principal purposes of this effort are: (1) to encourage communities to improve their flood risk management; (2) to inform decisions on the ground by state and local emergency management officials as they plan for a specific expected flood; and (3) to improve our overall understanding of these risks, viewed from a national perspective.

The Corps uses this funding to operate, maintain, and update the NLD to reflect the best available risk-based information on levee systems, and to implement software revisions to improve its functionality and usability based on user feedback. Operation and maintenance activities for the NLD include supporting NLD related tools such as the Levee Inspection System (LIS) Tool and the Levee Screening Tool (LST), including training for these tools.

The Corps also uses this funding to continue its ongoing work with other Federal agencies to develop a common set of guidelines, criteria, and best practices for their use on the levees that are subject to their jurisdiction and to develop strategies to improve risk communication. The Corps also uses some of this funding to work at the State and Tribal levels, on a voluntary basis, on information transfer of inspection and assessment practices in order to help them establish or improve their own levee safety programs.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: National (Multiple Project) Natural Resources Management Activities 1/

Allocation in FY 2017 \$	Allocation in FY 2018 \$	Allocation in FY 2019 \$	Allocation in FY 2020 \$	Budgeted Amount in FY 2021 \$
4,562,000 2/	3,341,000 2/	5,146,000 2/	3,297,000 3/	3,500,000

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

2/ \$248,000 was reprogrammed away from this line item in FY 2017, \$322,000 in FY 2018, and \$2,000 in FY 2019

3/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$4,615,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

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 2019: A wide variety of national program initiatives were accomplished such as, the park ranger uniform contract was funded at nearly \$625,000; \$310,000 supported the national partnership program including six “Handshake” partnerships; \$700,000 supported the Water Safety MCX and national programs; \$400,000 supported environmental compliance work; \$150,000 supported the printing and publishing of a wide array of NRM materials; \$100,000 supported volunteer clearinghouse; \$150,000 supported national sign program activities; \$250,000 supported the Career Assignment Program; and \$1,000,000 supported a variety of sustainability work efforts including energy audits, Energy Savings Performance Contract (ESPC) work, sustainable buildings assessments, campground metering, and data management to support USACE Sustainability Plan, year-end report, and Scorecard submission.

DESCRIPTION OF WORK FOR FY 2020: A similar set of national recreation program initiatives will be accomplished such as the funding of: the park ranger uniform contract; approximately nine “Handshake” partnerships; the Water Safety MCX and associated national programs; environmental compliance work; the printing and publishing of NRM materials; support to the volunteer program; and a variety of cost saving measures including sustainable building assessments, power purchase agreements, utility metering, and data management to support USACE implementation of Executive Order 13834, *Efficient Federal Operations*.

DESCRIPTIONS OF WORK FOR FY 2020:

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

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$	\$	\$	\$	\$
\$2,262,000	\$2,310,000	\$4,113,000	\$2,406,000	\$2,550,000

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 MCX 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.

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.

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, Career Assignment Development Program, and Bilingual Support Team.

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

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$	\$	\$	\$	\$
\$2,300,000	\$1,031,000	\$1,033,000	\$891,000	\$950,000

Navigation and Flood and Coastal Storm Damage Reduction 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 energy, water and petroleum efficiency 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 sustainable acquisition, electronics stewardship, waste reduction/recycling, and various federal energy, water and petroleum related accounting and reporting requirements under EO 13834. Funding these requirements as a nationwide activity allows USACE to reduce costs and improve performance by implementing standardized compliance, efficiency and cost reduction policies, procedures, and tools for auditing, data management, metrics, reporting, and management review at USACE facilities. Specific requirements include:

- a. Centralized utility cost and consumption data management, tracking and reporting capability;
- b. Preparing and submitting energy and water utility and petroleum related submittals in accordance with Administration and federal statutory requirements. Examples of annual, recurring submittals include the Sustainability Report and Implementation Plan (SRIP), the USACE Annual Sustainability and Energy Data Report, and the OMB Sustainability and Energy Scorecard.
- c. Advanced metering system operation and maintenance serving all facilities that trigger the Federal Energy Management Program advanced metering requirements under Energy Policy Act (EPAAct) Section 103.

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APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: National Portfolio Assessment for Reallocations – Water Supply

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 792,000	\$ 792,000	\$ 495,000	\$ 565,000 1/	\$ 500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$32,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

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 Corps Reservoirs and to conduct initial assessments of pending reallocation requests. These assessments represent a streamlined approach to obtaining the information necessary to determine Federal interest.

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 Corps was considering two other national surveys, one on the water management aspects of Corps reservoir projects and another on sedimentation management concerns. Corps 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 Corps 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 as information gained through collaboration with other Corps work efforts. Major products developed include (1) a portfolio of Corps projects that identified the best candidates for opportunities for operational changes and/or reallocation opportunities to ensure existing Corps 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, (3) a final report on the National Portfolio Assessment of Data for Reallocations: Status and Challenges for USACE Reservoirs, and (4) training modules to assist Corps staff in completing water supply storage reallocation studies.

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APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Optimization Tools for Navigation – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 319,000	\$ 319,000	\$ 444,000	\$ 594,000 1/	\$ 392,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$36,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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) has been 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 allows 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.

The budgeted funding will be used 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 maintenance of a comprehensive vessel lines library to allow use of CADET without proprietary hull line information and to ensure technology transfer so that USACE can independently support general update and maintenance of the algorithms integral to CADET. Funds will also be used to provide technical input and support for ongoing development or improvements 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. Funding will also be used to assess the feasibility of expanding NNOMPEAS and availability of data for including inland harbors.

ACCOMPLISHMENTS IN PRIOR YEARS: Funding for this ongoing activity has allowed for initiation of development for capabilities to account for primary factors for horizontal vessel motion within CADET with limited additions to support physical specifications and vessel motion response parameters for evolving vessel classes. In addition, efforts for scoping of horizontal motion requirements for CADET have been updated and are 90 percent complete and preliminary technical review has been conducted for simplifying wave transformation inputs in cooperation with NAVSEA-Carderoc. Ongoing CADET activities also includes field

Institute for Water Resources

Optimization Tools for Navigation

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 and availability of funding. Continued development of NNOMPEAS to evaluate the validity of expansion beyond the harbor projects currently covered totaling approximately 225 coastal harbor projects and continuing efforts for development of data error checking or validation routines for critical parameters. Development of routines for more efficient statistical analysis of the world deep draft cargo fleet have been initiated in addition to development of routines to allow comparative analysis of the deep draft fleets serving coastal regions of the United States. On-going efforts for NNOMPEAS include additional updates of ocean-going distances between domestic and foreign ports for domestic ports were added and annual update of coastal deep draft transit statistics as subject information and data become available. Continued use of NNOMPEAS allowed for further development of efforts to measure incremental transportation costs and benefits including update of estimated benefits 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.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Performance Based Budgeting Support Program

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 4,158,000	\$ 4,158,000	\$ 1,980,000 1/	\$ 3,000,000	\$ 2,000,000

1/ *Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$195,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.*

AUTHORIZATION: Modernizing Government Technology Act

DESCRIPTION: The success rate of government digital services improves when agencies utilize resources to provide modern design, software engineering, and product management. To ensure the U.S. Army Corps of Engineers (Corps) Finance Center can effectively build and deliver important digital services, Digital IT funding supports modernization of the Corps of Engineers Financial Management System (CEFMS). CEFMS fully supports USACE business processing, project and financial management, reporting and audit readiness with ten consecutive, unqualified unmodified opinions, but needs to move to support budgeting. An FY 2017 contract award in support of the CEFMS modernization effort will provide the Corps with a prototype system architecture to support CEFMS as a modern enterprise system, improve user interface capability and provide improvements and benefits to the overall IT structure of USACE as well as other USACE information systems. The production application of this modernization architecture will enable the Corps to improve the support for budgeting, execution and transparency in financial reporting of Civil Works Appropriations and support the continued improvements for DATA ACT reporting to USASPENDING.gov. CEFMS modernization will provide new capability to systematically produce mock SF133 and automated reconciliations of the mock SF133 to the SF132 prior to financial information being submitted to the Government-wide Treasury Account Symbol system (GTAS). This will improve and ensure the integrity of the financial data in OMB MAX A-11 system. CEFMS modernization will also provide automated capability to readily produce monthly/quarterly or annual execution and status of fund reports that will provide Public Law level detail data. Stakeholders will have access to modern enterprise financial reporting, data analytics and dashboards for management and transparency of Civil Works Programs and Projects.

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APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Recreation Management Support Program – Recreation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 1,532,900	\$ 1,534,500	\$ 1,534,500	\$ 1,386,000 1/	\$ 1,450,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$343,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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: Annual funding 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. Funding also supports strategic planning for and performance monitoring of the Corps recreation business program, subject to the Government Performance and Results Act.

The Recreation Management Support Program (RMSP) has 5 major components, which together provide comprehensive support to the Corps Recreation Business 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 Community of Practice 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. RMSP supports nationwide recreation visitation surveys. Accurately estimating 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.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Regional Sediment Management Program – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 1,782,000	\$ 8,915,000	\$ 3,465,000	\$ 8,415,000 1/	\$ 3,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$5,422,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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.

DESCRIPTION: The Regional Sediment Management (RSM) Program objectives are to establish regional sediment management strategies that link sediment management actions across multiple authorized U.S. Army Corps of Engineers (Corps) 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. The improved regional approach to the navigation program assists nationally to identify common issues that are better solved on a regional basis, improving channel availability and subsequently life cycle costs and project benefits through more efficient practices, and improving regional efficiencies by engaging cross-mission objectives of the Corps (i.e., navigation, flood risk management, and environmental restoration regarding sediments). 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.

The funds under this program are not used for work at specific projects, but are used to fund activities that will benefit the entire Civil Works program.

Annual funding is used to:

- Coordinate RSM efforts nationally to promote systems-based approaches to improve the management and use of sediments across multiple projects to benefit a region in support of the Civil Works mission, including coordination and support across the Corps to implement regional and local studies which result in RSM strategies and solutions to improve the use of sediments, cost savings, increased benefits, and improved relationships.
- Conduct the annual RSM In-Progress-Review and Workshop to review on-going initiatives, promote program goals, share knowledge and experiences, and technology transfer among RSM practitioners; conduct bi-monthly Corps-wide webinars to share knowledge, tools, and case studies; and conduct workshops to educate and outreach RSM practices, tools, and address challenges.
- Develop and enhance tools and technologies for implementing RSM approaches;

Engineer Research and Development Center

Regional Sediment Management Program

- Continue support of the USACE Data Integration Framework (DIF) effort to populate National enterprise databases and integrate tools and models that utilize the data.
- Participate in regional and national initiatives to promote the RSM concepts and approach; and
- Document successes, benefits, challenges and lessons learned through technical reports.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

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

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 3,465,000	\$ 8,415,000	\$ 8,625,000	\$ 8,415,000 2/	\$ 9,000,000

1/ The Budget accounts for these funds under the flood and storm damage reduction program. However, the Corps also uses these funds to review requests to alter a commercial navigation project. The Corps will execute these funds under the appropriate business line, based on the Section 408 requests actually received.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$230,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 14 of the Rivers and Harbors Appropriations Act of 1899, as amended, 33 U.S.C. 408 (Section 408) authorizes the Secretary of the Army to grant permission to other entities for the temporary or permanent alteration or use of a U.S. Army Corps of Engineers 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: In FY 2016, the Corps established this remaining item to improve transparency over its management and use of funds to review requests under Section 408 to alter an authorized Corps project. With this funding, the Corps reviews these proposed alterations, and works with the requester and others to facilitate the Corps review of these proposals. 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 authorized Corps project. The number of Section 408 requests in any year depends on many factors – primarily on actions, schedules, and resources external to the Corps. In its review of Section 408 requests, the Corps considers a range of factors, such as the effects of the proposed alteration on the reduction of risk to life safety, the reduction of the risk of flood damages, the environment, the project’s ability to meet its other authorized purpose(s), and tribal considerations. The Corps also uses this funding for program management (such as coordination and tracking) for construction oversight (as needed to ensure compliance of the conditions of the approved Section 408 request).

The Corps does not use these funds to review requests under Section 408 for the development or alteration of a non-Federal hydropower project at a Corps dam. The Corps funds its review of those proposals with Federal Energy Regulatory Commission licensees' annual payments collected as provided pursuant to 16 U.S.C. 810(a).

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Scheduling Reservoir Operations

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 6,427,000	\$ 6,947,000	\$ 7,157,000	\$ 13,428,000 2/	\$ 8,331,000 1/

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$386,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

2/ FY 2020 amount includes \$5,000,000 to fund water control manual updates for non-Corps owned high hazard dams where: (1) the Corps has a responsibility for flood control operations under section 7 of the Flood Control Act of 1944; (2) the dam requires coordination of water releases with one or more other high-hazard dams for flood control purposes; and (3) the dam owner is actively investigating the feasibility of applying forecast-informed reservoir operations technology.

AUTHORIZATION: Section 7 of the Flood Control Act of 1944, 33 U.S.C. 709 (directing Secretary of the Army to prescribe regulations for use of storage allocated for flood control or navigation at reservoirs constructed wholly or in part with Federal funds provided for those purposes).

DESCRIPTION: The Corps uses this funding to support its participation in the flood operations of certain dams, which the Corps does not own, during a flood. Through its involvement in these operational decisions during a flood, the Corps helps to manage the overall water releases in the watershed, balancing the flows to reduce the risk of flood damage and loss of life.

The Corps also uses these funds to install, manage, and operate certain technical instruments at these dams (such as stream gages, rain gages, and reservoir level gages) in order to collect technical data for use in flood forecasting and to inform decisions on water releases from these dams during a flood. The owner of the dam could use these data for other purposes as well, such as in deciding whether to take a drought contingency action. The Corps also uses this funding for flood training exercises at these dams.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Stewardship Support Program – Environmental Stewardship

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 940,500	\$ 891,000	\$ 891,000	\$ 891,000 1/	\$ 900,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$152,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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, in monitoring program performance and risk analysis, and in development of strategies to improve program outputs and outcomes.

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, a knowledge management tool for the NRM community, for information and technology exchange. The Gateway continues to be the central location of program knowledge within the Corps to quickly share policy updates, emerging issues and technical support. 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 FY 2002 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 Environmental 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. 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 stakeholders to improve interagency efficiencies and focus on habitats of national concern. Examples include geospatial decision tools for use at the projects and nationally to address land use challenges such as threats to resources including property and boundary line encroachments; request to use federal property and impacts due to rapidly increase adjacent development which aid in prioritizing preventative

Institute for Water Resources

Stewardship Support Program

measures to reduce encroachments and prioritization of project master plan updates.

(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 program development manual to provide emphasis on new environmental threats or nationally significant resources that adjust to administration initiatives and priorities, national pollinator strategy and supporting land, water conservation, overall asset management, and continue efforts to prioritize Federal investment in environmental stewardship activities across the Nation. 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: Components of the Environmental Stewardship portion of the NRM Gateway have been completed, including 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 imminent threats to Corps projects.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Sustainable Rivers Program – Aquatic Ecosystem Restoration

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 396,000	\$ 396,000	\$ 396,000	\$ 4,950,000 1/	\$ 500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$4,480. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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 and is implemented in partnership with The Nature Conservancy and numerous other Federal, state, and nongovernmental partners. SRP efforts complement other reservoir-centric water resource projects by demonstrating that a strategic and science-based approach can be used at Corps reservoirs to maintain or enhance the environmental benefits and reduce negative environmental consequences of downstream flows.

The Corps prioritizes work on reservoirs based on level of downstream influence, authorized purposes, operational flexibility, and several other factors. The SRP process for implementation includes the following steps:

- Define flows needed to maintain ecosystems in sustainable condition below USACE reservoirs;
- Perform trade-off analyses to quantify effects of potential reservoir reoperations;
- Implement and monitor operational changes specifically made to meet the defined environmental flow needs;
- Assess the economic impacts or enhancements that result from operational changes; and
- Update reservoir management policies for operating purposes related to the environment.

Annual funding is used to evaluate flows below specific USACE reservoirs, apply resulting information to inform project operations, and refine best management practices for broader implementation at USACE reservoirs. These funds will be used to accomplish national and site work in accordance with the following SRP principles: 1) Build capacity within the water management community to implement environmental flows with little or no direct involvement of SRP resources; 2) Engage partners to focus on sustainability and avoid conflict, including Endangered Species Act (ESA) consultations; and 3) Advance innovative efforts to implement environmental flows.

As of 2019, SRP involved work on 66 Corps reservoirs in 16 river systems. The additional funding provided in FY 2020 will be used to initiate work in 4 additional river systems as well as advance on-going work.

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Veterans Curation Program and Collections Management 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 6,435,000	\$ 6,435,000	\$ 6,435,000	\$ 6,435,000 2/	\$ 5,500,000

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

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$31,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Curation of Federally Owned and Administered Archeological Collections (36 CFR Part 79), the Monuments, Ruins and Objects of Antiquity (54 U.S.C. 320301-320303), Preservation of Historical and Archeological Data (54 U.S.C. 312501-312508), the National Historic Preservation Act (54 U.S.C. 300101 et seq.), and the Archaeological Resources Protection Act (16 U.S.C. 470aa-mm), require Civil Works programs and projects to properly house their archaeological collections to federal standards.

DESCRIPTION: The Corps is responsible for the curation of artifacts collected from its water resources development projects, and associated records. Curation of these materials, which are over 80 percent of the total DoD collections and one of 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 150 curation facilities across the nation.

The Veterans Curation Program (VCP), initiated in 2009, serves as a primary means of rehabilitating and processing archaeological collections owned and administered by the Corps to meet Federal standards through the training and employment of veterans. The VCP program has employed 646 veterans since 2009. In 2017, the Corps established a Mandatory Center of Expertise (MCX) for the Curation and Management of Archaeological Collections, which is located at the St. Louis District and encompasses the VCP. The MCX is comprised of approximately 64% veterans and 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, 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 and reduce the number of repositories housing Corps archaeological collections. Data for Corps archaeological collections derived from prior year surveys of districts and has also been used to populate an updated collections dataset that provides accurate accounting information for the total collections holdings of the Corps.

Annual funding is used to fund labor and administrative expenses of veterans participating in the Veterans Curation Program.

Division: Mississippi Valley

District: St. Louis

Veterans Curation Program and Collections Management

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Waterborne Commerce Statistics – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 4,622,000	\$ 5,534,000	\$ 6,148,000	\$ 4,628,000 1/	\$ 4,670,000

1/ *Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$278,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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.

The budgeted funding 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 using software tools for program analysis, diagnostics and quality control. Implementation, with continued modification of Corps automated systems, to accept new 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 U.S. Customs and Border Protection (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. The International Trade Data System provides 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 datasets.

Institute for Water Resources

Waterborne Commerce Statistics

APPROPRIATION TITLE: Operation and Maintenance, Fiscal Year 2021

PROJECT NAME: Water Operations Technical Support (WOTS) – Flood and Storm Damage Reduction

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 5,445,000	\$ 5,445,000	\$ 7,920,000	\$ 5,445,000 1/	\$ 500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$234,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The basic authority for this program is 33 U.S.C. 426a, which originated with the River and Harbor Act of 1945, which in turn originated in the River and Harbor Act of 1930. In addition, Public Law 99-802, Federal Technology Transfer Act of 1986, requires technology transfer from Federal agencies to the private sector.

DESCRIPTION: The Corps uses this funding to identify, develop, and share innovative concepts and technologies that will support sustainable engineering solutions to complex environmental problems at Corps projects nationwide. The Corps also uses these funds to manage its efforts to apply these concepts and technologies consistently, both at the project level and when responding to requests by others for technical assistance.

This research and technology transfer is part of the overall effort of the Corps to comply with the environmental laws that apply to its projects. It uses this funding to assist that effort on environmental issues such as: 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 operational concerns related to environmental and water quality. For example, the Corps uses this funding to support the incorporation of Green Infrastructure and Low Impact Development (GI-LID) technologies at its projects, through integration of Engineering with Nature (EWN) principles, in support of environmental objectives.

The Corps conveys these concepts and technologies through the best available mechanisms, such as direct technical assistance, specialty workshops, information bulletins, technical notes, executive notes, technical reports, webinars, miscellaneous papers, instruction manuals, videos, meetings, seminars, briefings, and the Internet.

From FY 2015 through FY 2020, the Corps also has used this funding for a study of atmospheric rivers and their effects on possible options to improve Corps reservoir operations. This study involved research and development of a concept called Forecast Informed Reservoir Operations (FIRO). This effort involves investigating the feasibility of using predictive capabilities of atmospheric river events to inform reservoir operations at Corps reservoirs in the Western United States. Initially, the Corps used these funds primarily to: 1) quantify the predictability of atmospheric rivers in timing and location of precipitation and the resulting stream flow; and 2) develop a prototype reservoir operations simulator for a pilot watershed and reservoir, Lake Mendocino, California, on which to test alternative operations scenarios. More recently, the Corps has used these funds primarily to: 1) conduct retrospective evaluations of events over the past 20 years of record using potential alternative operations scenarios; and 2) design a demonstration prototype system for conducting quantitative evaluation of a FIRO-based system.

Engineer Research and Development Center

Water Operations Technical Support (WOTS)

APPROPRIATION TITLE: Harbor Maintenance Trust Fund - Construction, Fiscal Year 2021

PROJECT NAME: Continuing Authorities Projects Not Requiring Specific Legislation (Continuing Authorities Program (CAP))

Beneficial Uses of Dredged Material (CAP Section 204)

	Allocation for FY 2017	Allocation for FY 2018	Allocation for FY 2019	Allocation for FY 2020 2/	Budgeted Amount in FY 2021
CAP Section 204 1/	\$ 1,000,000	\$ 1,500,000	\$ 10,000,000	\$15,000,000	\$1,000,000

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.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$9,711,700. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is approximately \$8,000,000. This amount will be used to perform work on the project as follows: Continue planning, design, coordination, and construction activities.

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

DESCRIPTION: Annual funding made available under the Section 204 program is used to make beneficial use of sediment obtained through the construction, operation or maintenance of an authorized Federal water resources project, including a project authorized for flood control, to construct, repair, modify, or rehabilitate Federal water resources projects for the reduction of storm damages to property; the protection, restoration and creation of aquatic and ecologically related habitats, including wetlands; and the transportation and placement of suitable sediment for the purposes of improving environmental conditions in marsh and littoral systems, stabilizing stream channels, enhancing shorelines, and supporting State and local risk management adaptation strategies. Annual funding can also be used (limited to \$5 million per fiscal year) for cooperation with States in the development of State or regional sediment management plans. In addition, per Section 204(d) of WRDA 1992, as amended by Section 1038(2) of WRRDA 2014 and Section 1122(i)(2) of WRDA 2016, in developing and carrying out a Federal water resources project involving the disposal of dredged material, the Secretary of the Army may select, with the consent of the non-Federal interest, and provided a qualified non-Federal interest is willing to share in the excess costs, a disposal method (placement) that is not the least cost option if the Secretary determines that the incremental costs of the disposal method are reasonable in relation to the environmental benefits, including the benefits to the aquatic environment to be derived from the creation of wetlands and control of shoreline erosion, or in relation to the flood and storm damage and flood reduction benefits, including shoreline protection, protection against loss of life, and damage to improved property. Not more than \$10,000,000 in Federal funds may be allocated to construction of a single modification or measure. Up to \$62,500,000 may be appropriated per fiscal year to the Section 204 program.

APPROPRIATION: Harbor Maintenance Trust Fund, Fiscal Year 2021

PROJECT NAME: Dredge McFarland Ready Reserve – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$	\$	\$	\$	\$
11,573,000	11,573,000	11,573,000	10,416,000 1/	11,300,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from Fiscal Year (FY) 2019 to FY 2020 was \$0. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Water Resources Development Act (WRDA) of 1996 (PL 104–303) as modified by Section 2047 of WRDA 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 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.

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

In FY 2019, the Government Dredge McFarland performed 70 days of required training work in the Delaware River and Bay with dredging work charged to the project dredged. The dredge was also activated for an assignment in New Orleans District in the Mississippi River Southwest Pass project, for a combined total of 85 days of effective dredging.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2021

PROJECT NAME: Dredge Wheeler Ready Reserve, LA— Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 14,850,000	\$ 14,850,000	\$ 14,850,000	\$ 13,365,000 1/	\$ 14,500,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$1,125,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Section 237 of the Water Resources Development Act (WRDA) of 1996 contained a provision requiring the Corps Hopper Dredge Wheeler be placed in a Ready Reserve status.

DESCRIPTION: The hopper Dredge Wheeler is docked at the U.S. Army Corps of Engineers' New Orleans District. Section 237 of WRDA 1996 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. When dredging, the Dredge Wheeler operates on a 24 hour per day basis. In September 1982, the dredge was placed into active service. In October 1997, the dredge was placed in Ready Reserve 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. Since being placed in Ready Reserve, the Dredge Wheeler has been called out to perform urgent dredging to assist industry dredges in restoring navigation channels and waterways most years. In addition, the Wheeler completes 70 days of maintenance dredging in conjunction with readiness exercises to maintain the skills of the crew.

This funding is used to perform routine maintenance of the Dredge Wheeler and maintain sufficient crew to respond within 72 hours when directed to do so.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2021

PROJECT NAME: Emergency Response – Navigation

Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 0	\$ 0	\$ 0 1/	\$ 50,000,000

AUTHORIZATION: Public Law 84–99, as amended (33 U.S.C. 701n)

DESCRIPTION: The Corps would use the requested funding only for eligible harbor maintenance emergency response work under PL 84-99 resulting from major disasters declared pursuant to the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5121 et seq.) after the date of enactment of the appropriations act for the Corps covering all of FY 2021. If the Corps has not been able to obligate this emergency response funding by the end of the fiscal year, it could use the funds in the following fiscal year for other eligible harbor maintenance work. This is the first time the Budget is requesting funds for this purpose.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2021

PROJECT NAME: Harbor Maintenance Fee Data Collection – Navigation

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 787,000	\$ 787,000	\$ 932,000	\$ 787,000 1/	\$ 795,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$39,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 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.

Annual funding will be used by the Corps to 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 TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2021

PROJECT NAME: Project Condition Surveys

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$	\$	\$	\$	\$
18,915,000 2/	19,094,000 2/	17,727,000 2/	19,886,000 1/ 2/	21,417,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$5,294,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into FY 2021 from prior appropriations for use on this effort is \$0.

2/ Funded out of the Operation and Maintenance account.

AUTHORIZATION: Public Law 85-480, approved in 1958 authorizes the Chief of Engineers to publish information, including condition surveys that may be of value to the general public.

DESCRIPTION: This national program consists of performing hydrographic and topographic project condition surveys (PCS) for Federally-authorized navigation projects, including navigation channels, inlets, anchorages, structures such as jetties and breakwaters, and other navigation features within the states. The surveys are used to ascertain channel and structure conditions and disseminate the conditions to users of the waterways and to plan future channel and structure maintenance activities. Funds are also used to respond to unanticipated needs, including concerns raised by the U.S. Coast Guard, local harbor masters, or other agencies regarding projects that have become shoaled as a result of severe storms and/or abnormal deposition rates that may have compromised safe navigation. The selection of which projects to survey and scheduling of surveys is based upon channel usage, shoaling rates, maintenance dredging schedules, and when that project was last surveyed. The surveys are generally conducted on a rotational basis, taking into account the expected sedimentation rates and historic maintenance. This generally includes projects that do not routinely receive O&M appropriations and that are not regularly maintained. For those projects scheduled to be dredged or maintained in the budget year, funds for PCS of the project are included within that project.

APPROPRIATION TITLE: Harbor Maintenance Trust Fund, Fiscal Year 2021

PROJECT NAME: Surveillance of Northern Boundary Waters 1/ 2/

	Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
	\$	\$	\$	\$	\$
Columbia River Treaty 2024 Implementation, Oregon	5,076,000	8,075,000	10,106,000	9,799,000	3/
All Other Work	4,878,000	6,839,000	5,486,000	6,213,000	6,555,000
Total	11,928,000	14,914,000	15,592,000	16,012,000 4/	6,555,000

1/ The cost of this activity is accounted for in the Flood and Storm Damage Reduction program.

2/ Funding shown on this table for Columbia River Treaty 2024 Implementation was appropriated in the Operation and Maintenance account under Surveillance of Northern Boundary Waters since FY 2017. However, since FY 2018 the Budget has proposed that the Congress appropriate the continued funding for this effort under a separate, new line item (called Columbia River Treaty 2024 Implementation) due to the nature, magnitude, and duration of the required work, which is by its nature investigations work. Consistent with the Budget proposal to improve accountability over the use of funding for Corps activities financed through the two navigation trust funds, and to ensure that these funds are being used for the purposes for which Congress intended, the Budget is requesting that the Congress appropriate the funding requested for this Columbia River Treaty 2024 Implementation investigations work in the Harbor Maintenance Trust Fund account.

3/ The funds for this effort are used to inform the Department of State on options for the United States regarding reservoir operations throughout the Basin (in both countries) post 2024, including how to operate and potentially pay for changes to the operation of Canadian reservoirs to benefit flood risk management in the United States. The focus of this work is to evaluate flood risk management options and potential changes in reservoir operations, develop updated joint operating plans with Canada, and related U.S. operating plans, and complete technical and environmental compliance on new operations prior to September 2024.

4/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$5,169,000, of which \$4,779,000 is for the Columbia River Treaty 2024 Implementation effort. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: Boundary Waters Treaty of 1909

DESCRIPTION: The Corps uses this funding for its work on the waters that cross or are along the Canada-United States northern boundary, including the Great Lakes, Puget Sound, the Columbia River, Lake Champlain, and the Bay of Fundy. These waters are subject to International Boundary Waters Treaties and other agreements between the U.S. and Canada. The Corps conducts this work mainly under the Boundary Waters Treaty of 1909, including the U.S. share of technical and secretarial support of the International Joint Commission (IJC), its Boards of Control, Committees, and other various study boards. These activities support the principles and mechanisms to help resolve disputes and to prevent future ones, primarily those concerning water quantity and water quality, along the boundary between Canada and the United States.

The Corps uses this funding to monitor and approve international apportionments of water; forecast lake levels and river flows during periods of high water and periods of low water; collect, analyze, and maintain hydrometeorological data, including post-flood reports; monitor flood operations; assist in transboundary dispute resolution; and prepare and disseminate related information to the public. For example, the Corps uses this funding for the U.S. share of technical support of activities associated with the Board of Control for the Great Lakes. This Board considers water levels and outflows in the Great Lakes, which affect shipping and dredging costs.

National

Surveillance of Northern Boundary Waters

APPROPRIATION TITLE: Mississippi River and Tributaries, Fiscal Year 2021

PROJECT NAME: Collection and Study of Basic Data, Investigations – Flood Damage Reduction

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 7,000,000	\$ 5,660,000	\$ 7,803,000 1/	\$ 11,160,000 2/	\$ 5,710,000

1/ \$3,000 reprogrammed to this line item in FY 2019.

2/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$2,083,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2020 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Flood Control Act of 1928.

DESCRIPTION: The Corps uses this funding to collect and analyze system-wide data on the water and related land resources of the lower Mississippi River and its alluvial valley, develop the modeling capabilities and other tools and techniques needed to support that analysis, and replace and repair stage gages. This work will improve our basic understanding of the river, its impacts, and the way that it has evolved and is changing. These analyses will inform how the Corps manages the interrelated features of the Lower Mississippi River Main Stem (LMRMS) project to achieve their authorized purposes. The LMRMS project helps to reduce the risk of flood damage to a large region and to human safety, while supporting commercial navigation.

This data collection and analysis will support a more risk-informed, system-wide approach by the Corps to its management of this river. For example, the Corps is conducting system-wide geomorphic, hydraulic, and sedimentation technical investigations that improve our understanding of the stage-discharge relationships, and their effects on river stages and sedimentation. The Corps is evaluating the transport of water and sediment throughout the complex system at the lower end of the river (which includes the Old River Control Complex, Mississippi River, Atchafalaya River, and Red River) to inform options for addressing excess sediment deposition and increased flood risk, and support water control operations. The Corps also uses this funding for system-wide scientific field evaluations that will support conservation measures to maintain and improve habitat values for the recovery of listed species on this river.

Division: Mississippi Valley

District: Memphis, Vicksburg, and New Orleans

Collection and Study of Basic Data,
AR, IL, KY, LA, MS, MO, and TN

APPROPRIATION TITLE: Mississippi River and Tributaries, Fiscal Year 2021

PROJECT NAME: Inspection of Completed Works, AR, IL, KY, LA, MS, MO, and TN (Flood and Storm Damage Reduction) – Operation and Maintenance

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ 3,117,000	\$ 2,924,000	\$ 1,694,000	\$ 2,768,000 1/	\$ 972,000

1/ Unobligated Carry-in Funding: The actual unobligated carry-in from FY 2019 to FY 2020 was \$165,000. As of the date this justification sheet was prepared, the total unobligated dollars estimated to be carried into Fiscal Year 2021 from prior appropriations for use on this effort is \$0.

AUTHORIZATION: The Rivers and Harbors Act of 1899 (30 Stat. 1151) and the Flood Control Act of May 15, 1928 (70th Congress, 1st session, Ch. 596).

DESCRIPTION: The Corps uses this funding to inspect levee systems that it constructed on the main stem of the Lower Mississippi River and on its tributaries. In this watershed, the Corps generally is responsible for major maintenance of these levee systems, while local entities such as a levee district generally are responsible for routine maintenance.

During the inspection, the Corps notes any changes in the condition of the levee system since the last inspection, and identifies any deficiencies or other concerns that may warrant repair or monitoring. The Corps and the local authorities use this information to understand the key risk drivers of each levee system. The Corps provides the results of the inspection to the local entity, and updates this information in the National Levee Database.

The Corps also uses the information that it collects through these inspections to decide whether it will undertake a more detailed risk assessment of a particular levee system. Where it does so, the Corps would use this funding to perform that risk assessment.

The Corps also uses this information to develop an emergency action plan for each project. These plans identify, based on the condition of each levee system, the flood stages that will guide or trigger actions by the Corps, and state and local authorities, to reduce the risk of loss of life and property damage during a flood.

Division: Mississippi Valley

Districts: Memphis, Vicksburg, and New Orleans

Inspection of Completed Works,
AR, IL, KY, LA, MS, MO, and TN

APPROPRIATION TITLE: Mississippi River and Tributaries, Fiscal Year 2021

PROJECT NAME: Mississippi River Commission (New) 1/

Allocation in FY 2017	Allocation in FY 2018	Allocation in FY 2019	Allocation in FY 2020	Budgeted Amount in FY 2021
\$ N/A	\$ N/A	\$ N/A	\$ N/A	\$ 90,000

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

LOCATION: Mississippi Valley Division

DESCRIPTION: The Mississippi River Commission (MRC) works with stakeholders in the lower Mississippi River valley and its tributaries, and with the U.S. Army Corps of Engineers, on the flood damage reduction challenges posed by the river. The MRC would use the requested funds to pay the annual stipend (\$21,500) that each of the three presidentially appointed civilian members of the Commission receives for serving as a member of the MRC; and to cover the travel expenses of these civilian members and of the four military officers who serve on the MRC associated with their work with the MRC.

AUTHORIZATION: The Mississippi River Commission (MRC) was established by the 1879 Mississippi River Commission Act, Sixth Congress, Session I Ch. 43. 1879 (now codified in 33 U.S.C. 641). The Commission's authorities include those codified in 33 U.S.C. 641 – 653a and 33 U.S.C. 702h.

JUSTIFICATION: The purpose of this line item is to provide transparency on the expenses incurred by the Mississippi River Commission and to keep track of those costs over time.

FISCAL YEAR 2021: The budget amount of \$90,000 will be applied as follows:

Stipend for the three civilian members	\$64,500
Travel expenses for all seven members	\$25,500
Total	\$90,000