United States Government Accountability Office

Report to Congressional Requesters

November 2018

INLAND WATERWAYS

Actions Needed to Increase Budget Transparency and Contracting Efficiency

Accessible Version

GAO-19-20

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GAO Highlights

Highlights of GAO-19-20, a report to congressional requesters

Why GAO Did This Study

The Corps is primarily responsible for operating and maintaining the nation's inland waterways, including maintaining locks and dams as well as rehabilitating, modernizing, or constructing new infrastructure as needed. Persistent schedule delays and cost overruns for inland-waterways construction projects have prompted some in Congress to explore funding and management alternatives.

GAO was asked to review options to change the management of inland waterways. Among other things, this report assesses how the Corps allocates funds for operations and maintenance for the inland waterways, describes how the Corps funds construction projects, and assesses the effect of the current funding approach on projects' costs and schedules. GAO reviewed Corps documents and data; interviewed officials from Corps headquarters, six districts, and representatives of regional and national stakeholder groups—including commercial and recreational interests as well as contributors to relevant literature—selected to achieve a variety of viewpoints; and developed a simulation of the effect of various funding approaches on the total funding requirements and timelines for a set of hypothetical construction projects.

What GAO Recommends

GAO is making two recommendations: that the Corps define and measure deferred maintenance for inland waterways and that it pursue changes to increase its ability to more efficiently use available funding for construction. The Department of Defense concurred with GAO's recommendations.

View GAO-19-20. For more information, contact Andrew Von Ah at (202) 512-2834 or VonAhA@gao.gov.

What GAO Found

The U.S. Army Corps of Engineers (Corps) allocates its appropriated funding for operations and maintenance projects for the inland waterways based on risk and economic benefits. However, the Corps does not know how much deferred maintenance exists for inland waterways because there is no agreed upon definition for deferred maintenance. Corps and ASA-CW officials identified several challenges related to developing a useful definition with which to measure deferred maintenance. For example, a single measure may not be useful to gauge the condition of the waterways because the effect of deferred maintenance projects on the reliability of the waterways will vary. However, without a measure or measures of deferred maintenance for inland waterways that (1) the Corps finds useful, (2) reflects its priorities, and (3) accurately conveys a consistent and well-defined measure of deferred maintenance, the Corps is limited in its ability to manage its maintenance efforts and accurately communicate its estimated maintenance costs to OMB and the Congress.

With regard to inland-waterways construction projects, the Corps prioritizes them based on expected costs and benefits. The Corps assesses the net economic benefits of inland-waterways construction projects' alternatives by comparing estimated direct costs (e.g., construction costs to build a new lock chamber) to estimated reductions in the waterway transportation costs (e.g., reduced travel costs related to a reduction in the time it might take for a barge to pass through a larger lock chamber). According to Corps officials and stakeholders, the current incremental-funding approach for prioritized projects, among other things, has resulted in schedule delays (as shown below) and cost increases. Although full upfront funding for capital projects is an important tool for effective management, inland-waterways construction projects have been funded incrementally, meaning the Corps requests—and Congress appropriates—annual funding that covers a portion of a project's estimated costs. Corps reports and academic studies have found that this approach results in increased project costs because the Corps must contract for construction in separable pieces. This approach is less efficient than contracting for the entire project at once. For example, Corps officials currently expect that the Kentucky Lock Addition project will cost at least $229 million more than the originally estimated cost as a direct result of this contracting approach. Without some change in the way inland-waterways construction projects are funded to either provide full funding or reduce the effects of incremental funding by concentrating funding on fewer projects at one time, current cost increases and schedule delays resulting from inefficient contracting are likely to continue.

Timelines for Ongoing New Construction Projects on Inland Waterways, Fiscal Year 2018

Project	Construction start	Estimated completion after authorization	Estimated completion[a]
Olmsted Locks and Dam: *Ohio River*	1993	2005	2018
Lower Monongahela Locks and Dams: *Monongahela River*	1994	2003	2023
Kentucky Lock Addition: *Tennessee River*	1998	2007	2024
Chickamauga Lock: *Tennessee River*	2007	2014	2023

Source: GAO presentation of U.S. Army Corps of Engineers information. | GAO-19-20

[a]Estimated completion refers to the date at which the facility is expected to be operational.

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Abbreviations

1978 Act	Inland Waterways Revenue Act of 1978
1986 Act	Water Resources Development Act of 1986
ASA-CW	Office of the Assistant Secretary of the Army for Civil Works
Board	Inland Waterways Users Board
OMB	Office of Management and Budget
RM	river mile
the Corps	U.S. Army Corps of Engineers
Trust Fund	Inland Waterways Trust Fund

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
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November 7, 2018

The Honorable John Barrasso, M.D.
Chairman
Committee on Environment and Public Works
United States Senate

The Honorable Bill Shuster
Chairman
The Honorable Peter DeFazio
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives

The Honorable James M. Inhofe
United States Senate

U.S. inland waterways are a critical component of the nation's freight transportation system, providing benefits related to the U.S. economy as well as national defense. According to the U.S. Army Corps of Engineers (the Corps), commercial operators transported approximately $194 billion worth of cargo throughout the inland waterways system in 2016. Additionally, the National Grain and Feed Association estimates that nearly 60 percent of U.S. grain and soybean exports are transported via waterways to ports in the Gulf of Mexico, with another 27 percent transported via waterways to ports in the Pacific Northwest. Inland waterways are especially important in transporting heavy, bulk commodities including coal, petroleum, chemicals, and grain, as the waterways provide cost-effective transportation while limiting the congestion and safety risks posed by transporting these goods via rail and truck. Navigation on the inland waterways for waterborne vessels, such as towboats and barges, is made possible by locks and dams: dams create pools for navigation and locks allow vessels to move from one river or pool to another. In addition to commercial transportation, other beneficiaries of the inland waterways system include recreational boaters, companies that provide hydroelectric power generated by dams, and municipal water supply and treatment facilities, among others. The Corps is primarily responsible for managing the nation's inland waterways, including operating and maintaining the system of locks and dams as well

as constructing new infrastructure or rehabilitating existing infrastructure when needed.[1] Commercial vessel operators that travel on portions of the inland waterways help pay the costs of constructing and rehabilitating inland waterways infrastructure by paying a tax on diesel fuel, and this revenue is deposited into the Inland Waterways Trust Fund (Trust Fund).

Persistent schedule delays and cost overruns for inland-waterways construction projects have prompted some in Congress to explore alternative approaches for managing and funding the Trust Fund. Among other things, you asked us to review options to change the management of inland waterways. In this report, we:

1. assess how the Corps allocates funds for operations and maintenance projects for the inland waterways system;
2. describe how the Corps prioritizes and funds construction projects, and assess the effect of the current funding approach on projects' costs and schedules; and
3. present stakeholders' opinions on proposed options for increasing available funding for inland-waterways construction projects and any associated limitations or tradeoffs.

The scope of our review focuses on Corps activities related to commercial navigation—including operations, maintenance, and construction—on the 27 inland waterways subject to the diesel fuel tax. These waterways include the navigable waterways of the Mississippi River and its tributaries, the Ohio River basin, the Gulf and Atlantic Intracoastal Waterways, and the Columbia-Snake Rivers (see app. I for a complete list of fuel-taxed inland waterways).[2]

For all objectives, we interviewed a range of Corps officials at the headquarters, division, and district levels, as well as national and regional

[1]The Corps has both a military and a civil works program. The military program provides, among other things, engineering and construction services to other U.S. government agencies and foreign governments, while the civil works program is responsible for investigating, developing, and maintaining water resource projects. This report discusses only the civil works program.

[2]Commercial navigation activities are those that facilitate the movement of traffic along the waterways for commercial purposes, such as the transportation of goods for sale.

stakeholders.[3] We interviewed district officials from a non-generalizable sample of 6 of the 24 Corps districts that manage fuel-taxed waterways within their district boundaries, which we selected to include a variety of geographic regions, waterway characteristics, primary commodities shipped, and history of construction projects funded through the Trust Fund. Based on these criteria, we selected the Corps districts in Little Rock, Arkansas; Mobile, Alabama; New Orleans, Louisiana; Pittsburgh, Pennsylvania; Rock Island, Illinois; and Walla Walla, Washington. In addition, we interviewed officials from the Corps' Northwestern Division office, which oversees the Walla Walla District, to understand the division-level role in coordinating districts' inland-waterways infrastructure projects. We also conducted semi-structured interviews with waterways stakeholders representing 43 national and regional entities and 12 researchers (academics, economists, and engineers). National stakeholders were identified by reviewing related literature and our prior reports and recommendations from the Transportation Research Board and the Waterways Council, Inc.[4] Regional stakeholders in the six selected districts were identified through recommendations from the Corps and national waterways-stakeholder organizations to represent a mix of commercial (such as barge companies and shippers with commercial interests in the U.S. inland waterways system); recreational; and industrial water users (such as municipal water authorities and hydropower entities). From those stakeholders, we selected entities to interview to achieve diversity of waterway user perspectives, and conducted interviews with both individual entities as well as associations representing a variety of users and companies. In addition to waterways users, we interviewed stakeholders who have conducted research regarding the management and funding of fuel-taxed waterways. See appendix II for a list of entities represented among the stakeholders we interviewed. We analyzed interviewee responses to identify common themes and the range of opinions that arose. Because we selected a non-generalizable sample of stakeholders, their responses should not be used to make inferences about a population. To characterize stakeholders' views throughout this report, we defined modifiers (e.g., "some") to quantify stakeholders as follows:

[3]The Corps Civil Works Program, under which the Corps manages the inland waterways system, is organized into three tiers: a headquarters in Washington, D.C.; eight regional divisions; and 38 local district offices.

[4]The Waterways Council, Inc. is an industry organization representing a range of waterway users including shippers, ports, energy providers, waterways operators, and other advocacy groups.

- "some" stakeholders represents stakeholders in 3 to 14 of the 42 interviews
- "many" stakeholders represents stakeholders in 15 or more of the 42 interviews.

To examine how the Corps allocates funds for operations and maintenance projects for the inland-waterways navigation system, we examined amounts requested for civil works in the President's budget requests and appropriations for civil works for fiscal years 1997 through 2018 as well as the Corps' budget-request development guidance to understand how the Corps develops its budget request and prioritizes operations and maintenance projects. We also interviewed officials from the Office of the Assistant Secretary of the Army for Civil Works (ASA-CW); the Office of Management and Budget (OMB); the Department of Transportation's Maritime Administration; and the Department of Homeland Security's U.S. Coast Guard to understand how the Corps coordinates with other agencies to fulfill its inland-waterways navigation mission. To assess the Corps' efforts related to deferred maintenance, we interviewed Corps officials about how deferred maintenance is measured and defined and compared these practices with pertinent federal internal-control standards.[5]

To describe how the Corps prioritizes and funds inland-waterways construction projects, we reviewed relevant statutes and agency policies and guidance related to planning and budgeting for inland-waterways construction projects. We compared the established method of funding inland-waterways construction projects with federal internal-control standards, OMB guidance,[6] and prior GAO work related to funding capital projects.[7] To examine the effect of the current funding approach on projects' costs and schedules, we reviewed relevant Corps documents, such as reports on ongoing construction projects and studies on construction cost increases, prior GAO reports, OMB guidance, and other academic studies. As part of our examination of the effect of the current funding approach on costs and schedules for inland-waterways

[5]GAO, *Standards for Internal Control in the Federal Government,* GAO-14-704G (Washington, D.C.: September 2014).

[6]Office of Management and Budget (OMB), *Capital Programming Guide, Supplement to OMB Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets* (2017).

[7]See, for example: GAO, *Budget Issues: Alternative Approaches to Finance Federal Capital*, GAO-03-1011 (Washington, D.C.: August 21, 2003)

construction projects, we developed a simulation of the effect of various funding approaches on the total funding requirements for a set of hypothetical construction projects. The simulation incorporates assumptions regarding the amount of total funding a project would require (including any cost overruns) due to the pattern and timing of funding made available. Additional information on our simulation methodology and the full results are included in appendix III.

Finally, to identify proposed options to alter inland waterways funding and management, we conducted a literature search to identify relevant studies and proposals. We reviewed relevant literature to identify the options most commonly proposed, reviewed proposals by recent administrations, and interviewed Corps officials and seven other entities including the Transportation Research Board and district and agency stakeholders to verify that we identified commonly proposed options. We interviewed the 55 stakeholders noted above about their general views on the potential benefits, limitations, and trade-offs of those options. We also reviewed available literature—including our prior reports—to identify potential benefits, limitations, and trade-offs of these options. Appendix IV provides additional information about our objectives, scope, and methodology.

We conducted this performance audit from June 2017 through November 2018 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Although less visible than other transportation modes and not as vast as they are, inland waterways allow shippers to transport goods, particularly bulk commodities, in a relatively cost-effective and environmentally friendly method between ports all along the waterways, and to coastal ports for transportation to international markets. For example, in a report prepared for the National Waterways Foundation, the Texas A&M Transportation Institute found that, for every gallon of fuel burned, 647 tons of cargo can be carried 1 mile by barge, but only 477 tons by train or 145 tons by truck. Additionally, if cargo transported on inland waterways each year were to be moved by truck, it would take an additional tens of millions of truck trips to carry that cargo—more than doubling the number

of trucks per day, per lane on a typical rural interstate.[8] Most of the goods moved on the inland and intracoastal waterways are bulk commodities, including coal; petroleum products; chemicals; aggregate construction materials such as sand, gravel and stone; as well as grain, soybeans, and other agricultural products.

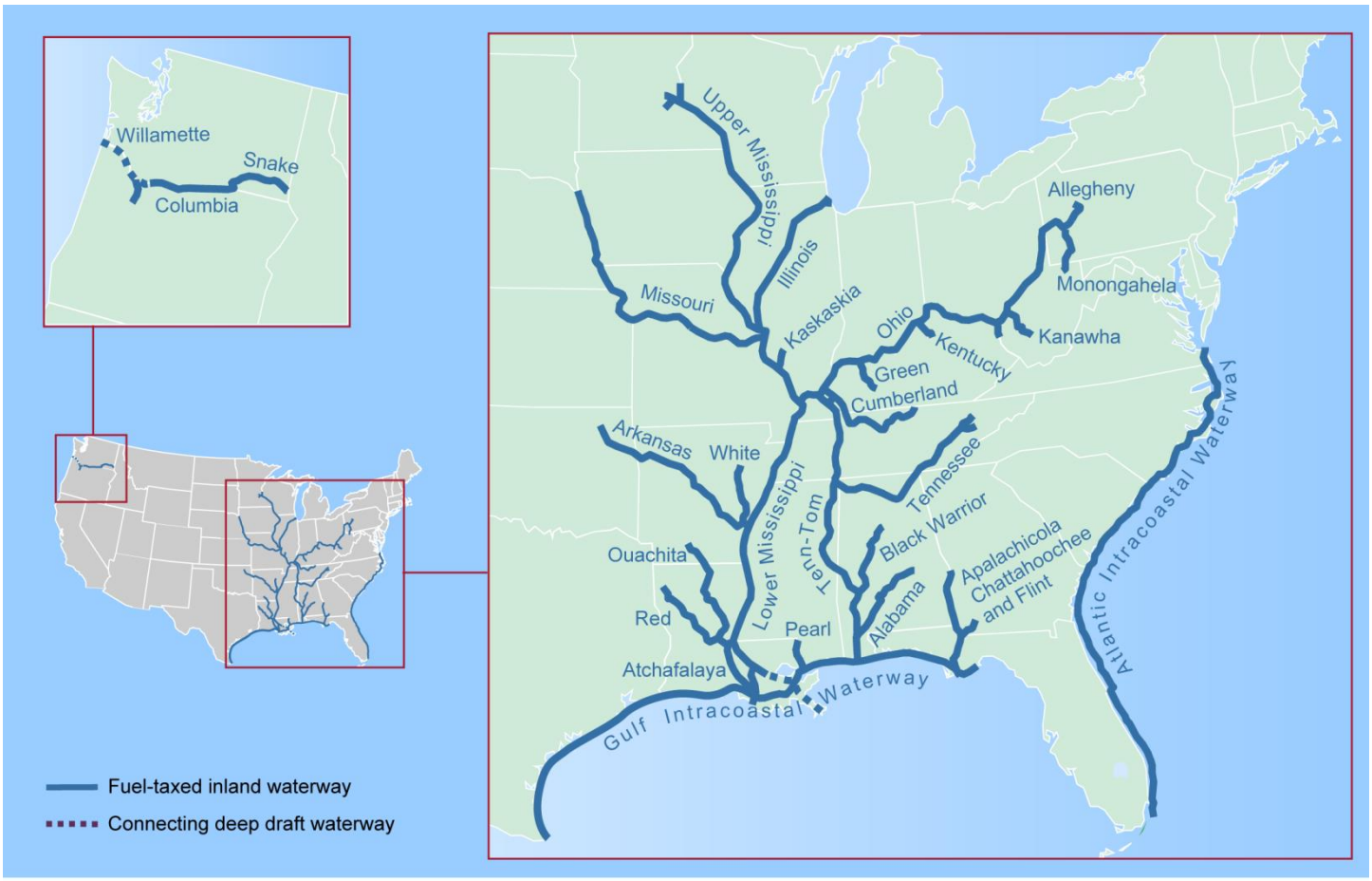
Approximately 12,000 miles of inland and intracoastal waterways and channels in the United States are commercially navigable and approximately 11,000 miles make up the fuel-taxed portion of the system, shown in figure 1.[9] The remaining approximately 1,000 miles of inland and intracoastal waterways and channels are not part of the taxable waterways and contain very few significant lock and dam structures. Some commercial waterways users, especially those on the Upper Mississippi and Ohio Rivers, may never leave the taxable portion of the system, but other vessel operators may navigate through taxable and non-taxable waterways, including connecting deep draft waterways.[10]

[8]Texas A&M Transportation Institute, Center for Ports and Waterways, *A Modal Comparison of Domestic Freight Transportation Effects on the General Public: 2001-2014,* (Houston, TX, January 2017) pp. 4, 6-7.

[9]The 27 fuel-taxed waterways segments are defined at 33 U.S.C. § 1804. See appendix I for a full listing of the fuel-taxed waterways.

[10]Draft refers to the depth of a vessel's keel below the water line.

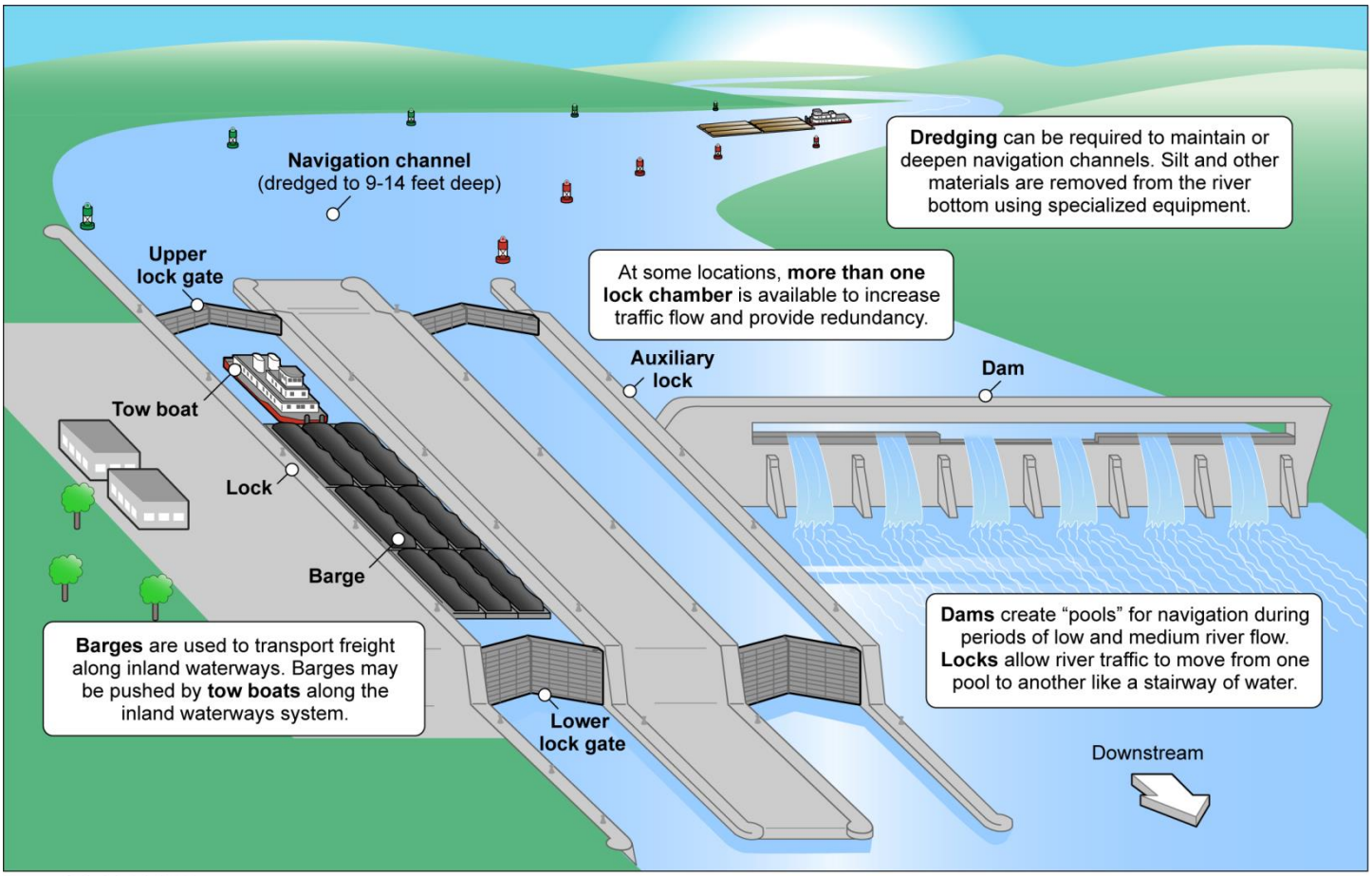
Figure 1: Fuel-Taxed Inland Waterways



Source: U.S. Army Corps of Engineers and GAO. | GAO-19-20

Navigation on inland waterways is made possible by locks and dams, navigation structures and aids (such as buoys), as well as channel maintenance and dredging where necessary to maintain a minimum channel depth of 9 feet to support commercial barge traffic. Dams form the foundation of the inland waterways system and create “pools” for navigation during periods of low and medium river flow. Locks at dam sites allow river traffic to move up or down from one pool to another much like a stairway of water. See figure 2 below.

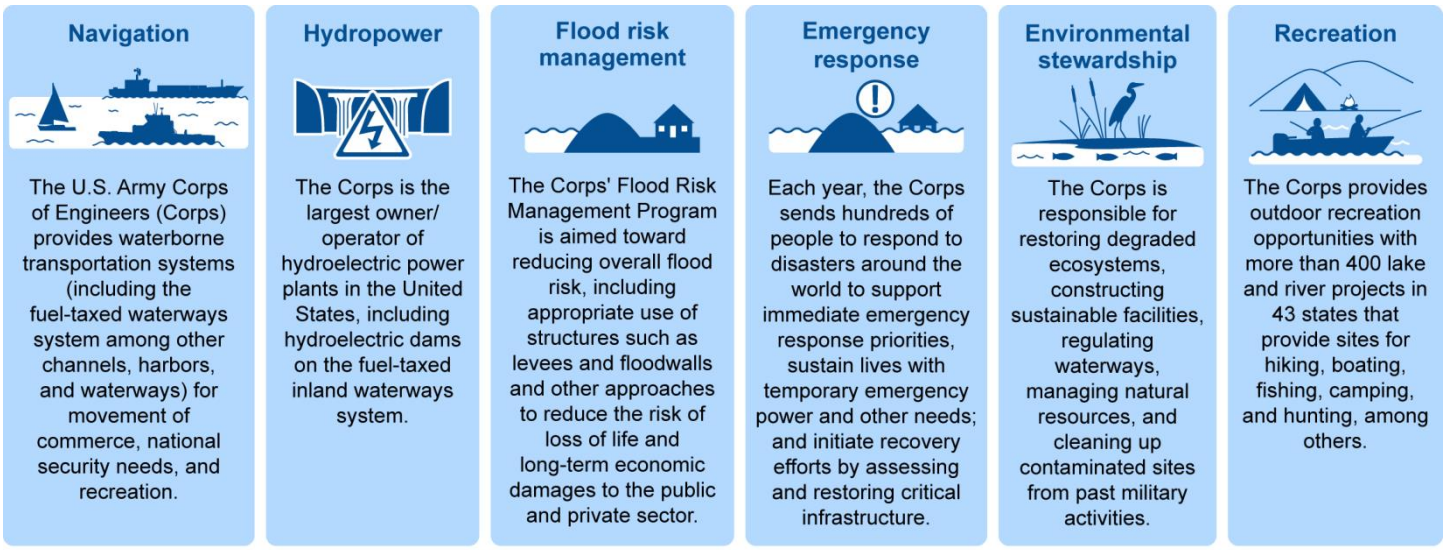
Figure 2: Illustration of Inland Waterways Barge Traffic Descending through a Lock at a Dam Site



Source: GAO. | GAO-19-20

As part of its Civil Works Program, the Corps operates and maintains the fuel-taxed inland waterways for the purpose of facilitating navigation. The Corps is responsible for balancing its navigation mission with other civil works missions, including hydropower generation, flood risk management, emergency response, environmental stewardship, and recreation (see fig. 3). For example, the Corps may consider the migration of fish when designing locks and dams that facilitate navigation.

Figure 3: U.S. Army Corps of Engineers' Civil Works Missions

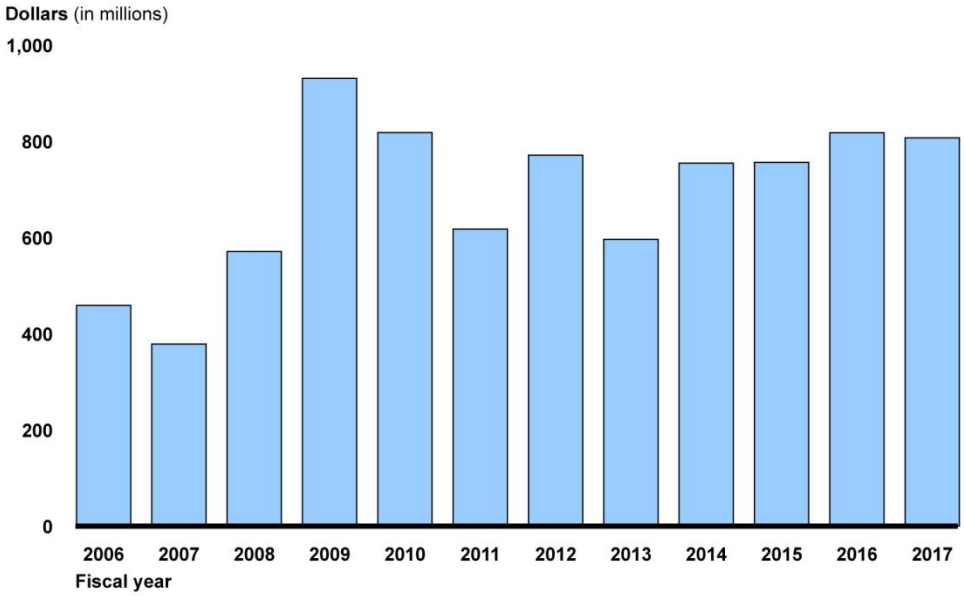


Source: GAO presentation of U.S. Army Corps of Engineers Information. | GAO-19-20

Congress appropriates funding for the Corps' Civil Works Program. For inland waterways, the Corps uses funding for two main purposes: (1) inland waterways operations and maintenance and (2) inland waterways construction. From fiscal years 2006–2017 (the years for which data were available), the Corps obligated an average of $690 million annually for operations and maintenance of the fuel-taxed inland waterways.[11] Funding for operations and maintenance is appropriated entirely from general revenues. Figure 4 shows annual obligations for inland waterways operations and maintenance for fiscal years 2006 through 2017.

[11]For operations and maintenance, we are reporting obligations rather than allocations because the Corps system for maintaining financial transactions—the Corps of Engineers Financial Management System—does not allow tracking of allocations by business line (that is, allocations could not be broken out specifically for navigation purposes). Data on obligations by business line are available only since 2006.

Figure 4: Annual Obligations for Inland Waterways Operations and Maintenance, Fiscal Years 2006–2017



Source: GAO presentation of U.S. Army Corps of Engineers financial data. | GAO-19-20

For construction projects, Congress appropriates funding from the Inland Waterways Trust Fund (Trust Fund) in addition to funds from general revenues. Since the Inland Waterways Revenue Act of 1978 (1978 Act), commercial waterway users have paid taxes on fuel used by commercial towboats and other vessels that typically move barges, revenues from which are deposited in the Trust Fund.[12] The Water Resources Development Act of 1986 (1986 Act) increased the initial fuel-tax rate per gallon and established a cost-sharing process for inland waterways expenditures.[13] Together, the 1978 Act and the 1986 Act established a means for the inland waterways industry to provide economic support for infrastructure development. These users currently pay a $0.29 per gallon tax on diesel fuel used on the fuel-taxed portion of the inland waterways,

[12]The Inland Waterways Revenue Act of 1978, Pub.:L. No. 95-502, tit. II, §§ 203 and 206, 92 Stat 1693, 1697-1702 (1978) codified at 26 U.S.C. § 9506 and 33 U.S.C. § 1804, created the Trust Fund and established which waterways are subject to the fuel tax.

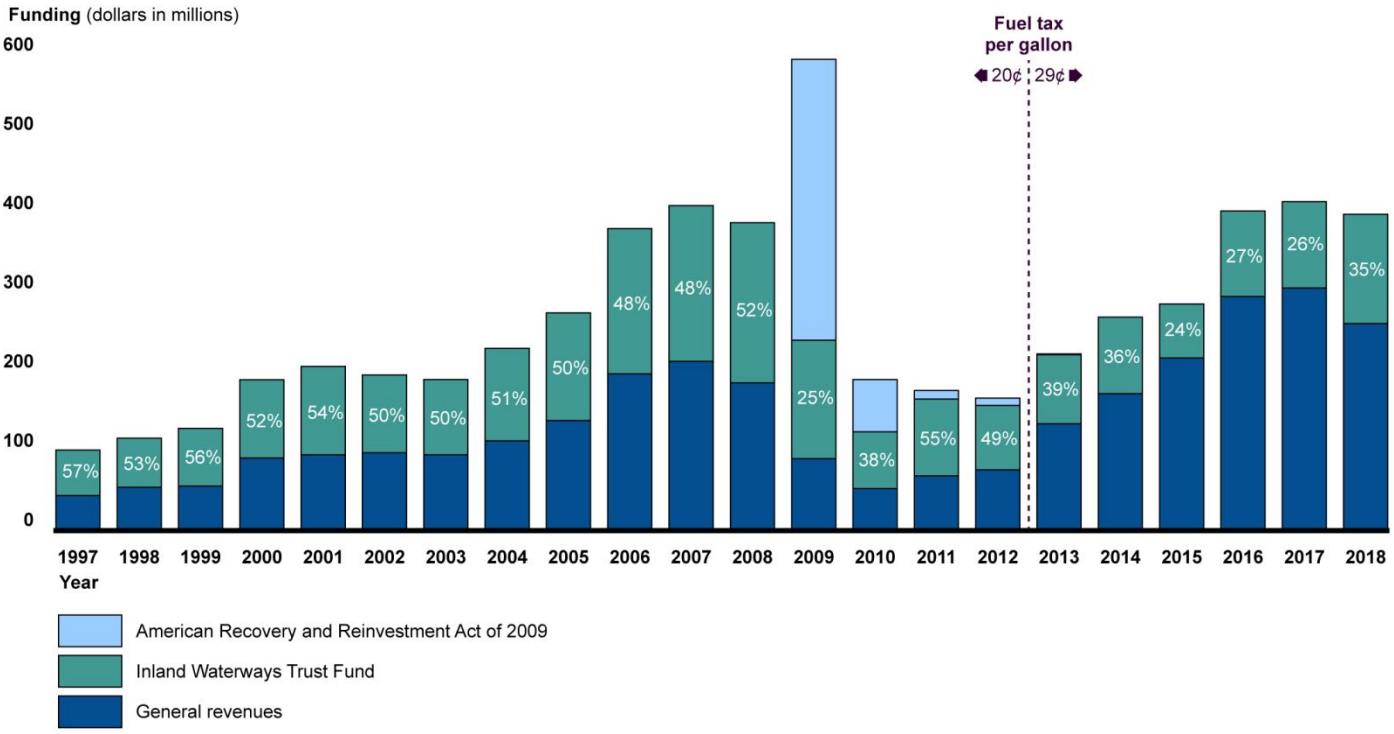
[13]Pub. L. No. 99-662, tit. I, § 102, 100 Stat. 4092,4094 (1986), established that inland waterways construction and major rehabilitation projects would be funded on a 50/50 basis, with 50 percent of the funds from the Inland Waterways Trust Fund and 50 percent from general revenues from the U.S. Treasury. Operation and maintenance costs (which typically exceed construction and major rehabilitation costs) were established as a 100 percent federal responsibility. 26 U.S.C. § 9506 and 33 U.S.C. § 2212.

revenue from which is then deposited into the Trust Fund.[14] Traditionally, 50 percent of a project's funding is appropriated from general revenues and 50 percent is appropriated from the Trust Fund, though Congress reduced the Trust Fund's cost share for the ongoing new construction of the Olmsted Locks and Dam project to 25 percent for fiscal year 2014 and to 15 percent for subsequent fiscal years.[15] In fiscal year 2018, commercial waterway users contributed about 35 percent of the $399 million allocated to various construction projects (see fig. 5). On average, from fiscal years 1997 through 2018, the Corps has allocated about $240 million annually for construction to repair or improve existing inland-waterways navigation infrastructure.

[14]For additional information on the Inland Waterways fuel tax, see GAO, *Inland Waterways Fuel Tax: Additional Data Could Enhance IRS's Efforts to Ensure Taxpayer Compliance,* GAO-16-682 (Washington, D.C.: July 29, 2016).

[15]Pub. L. No. 113-76, div. D, tit. I, 128 Stat. 5, 153 (2014) and Pub. L. No. 113-121 tit. II, §2006(a), 128 Stat. 1193. 1267 (2014). Prior to this change, the Olmsted project used the majority of trust fund appropriations, which constrained the amount available for other projects on the inland waterways system. According to a congressional committee report accompanying the Consolidated Appropriations Act of 2014—the act in which this change to the cost share was made—since the project affected the pace of other projects in need of recapitalization, the committee recommended a change in cost share to speed the pace of other projects on the inland waterways system. For additional information on the Olmsted Locks and Dam project, see GAO, *Army Corps of Engineers: Factors Contributing to Cost Increases and Schedule Delays in the Olmsted Locks and Dam Project,* GAO-17-147 (Washington, D.C.: Feb.16, 2017).

Figure 5: Annual Funding Allocated for Inland Waterways Construction Projects by Source, Fiscal Years1997–2018



Source: GAO analysis of U.S. Army Corps of Engineers financial data. | GAO-19-20

Notes: The percentages represent the percentage of annual construction funding appropriated from the Inland Waterways Trust Fund (Trust Fund).

Additionally, from 2009 through 2012, funding provided under the American Recovery and Reinvestment Act was allocated for inland waterways construction; this funding was exempt from cost sharing with the Trust Fund.

While construction projects are traditionally funded equally from the Trust Fund and general revenues, allocation percentages represented here may not reflect a 50 percent contribution from the Trust Fund based on (1) recent changes to the Trust Fund cost sharing for one project, (2) the exemption of American Recovery and Reinvestment Act funds from cost sharing, and (3) the timing of allocation of funds from the Trust Fund and general revenues to reimburse relevant accounts.

In its 2017 annual financial report, the Corps notes that the number of instances of lock closures on inland waterways (including the fuel taxed inland waterways) due to preventable mechanical breakdowns and failures lasting longer than one day and lasting longer than one week have decreased since fiscal year 2010, but that the lock closures that do occur can result in substantial delays to shippers, carriers, and users, and

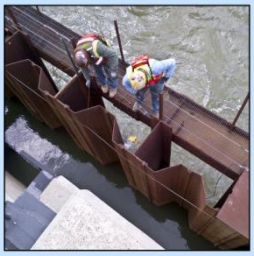
are a factor in the cost of shipping commodities on waterways.[16] According to the Inland Waterways Users Board (Board)—an advisory committee made up of industry stakeholders—U.S. inland waterways infrastructure is in need of modernization.[17] The Corps currently manages construction projects aimed at replacing, expanding, and modernizing existing locks and dams.[18] For fiscal year 2018, the Corps has allocated about $399 million from money Congress appropriated for civil works construction for a total of five inland waterways construction projects: four ongoing projects and one new project (see fig. 6). According to the Board, as of December 2017, 14 new lock and dam construction projects have been authorized by Congress but have not yet received construction funding.

[16]U.S. Army Corps of Engineers, *Fiscal Year 2017 United States Army Annual Financial Report: U.S. Army Corps of Engineers – Civil Works*, (Washington, D.C.: 2017). These measures focus on the performance of the main lock chambers (rather than auxiliary chambers) nationwide, on all inland waterways with a high level of commercial use or a medium level of commercial use.

[17]Inland Waterways Users Board, IWUB Advice and Recommendations regarding the FY 2017 President's Budget; (Washington, D.C.: April 8, 2016), https://www.iwr.usace.army.mil/Portals/70/docs/IWUB/IWUB_Advice_and_Recommendations_to_Congress_regarding_the_FY17_President.pdf?ver=2016-09-30-080204-387. The 11-member Board represents all geographic areas of and major commodities transported on the fuel-taxed inland waterways system. The Board was established to make recommendations to the Congress and the Secretary of the Army on the priorities and spending from the Inland Waterways Trust Fund for construction projects on the fuel-taxed system. Pub. L. No. 99-662 tit. III, § 302, 100 Stat.4082, 4111 (1986).

[18]Each individual construction project can include plans for just one structure, such as to build a new lock chamber, or plans for multiple structures, such as to build both a new lock and dam.

Figure 6: Inland Waterways Construction Projects, Fiscal Year 2018

Project	Olmsted Locks and Dam Ohio River	Lower Monongahela Locks and Dams Monongahela River	Kentucky Lock Addition Tennessee River	Chickamauga Lock Tennessee River	LaGrange Lock Illinois Waterway
Scope	 Construction of two new locks and one dam will replace two locks and dams on the Ohio River	 Two locks and one dam will be replaced and the lock and dam located between them will be removed	 Addition of a larger lock will be placed next to the existing lock chamber	 A new, larger, lock will replace the existing lock	 Existing lock will be rehabilitated
Construction start	1993	1994	1998	2007	2018 (estimate)
Estimated completion[a]	2018	2023	2024	2023	Unknown
Total allocation through May 2018	$2,775 million	$828 million	$503 million	$255 million	$10 million
2018 allocation	$175 million	$98 million	$39.5 million	$76.5 million	$10 million

Source: GAO presentation of U.S. Army Corps of Engineers information, photos, and financial data. | GAO-19-20

[a]Estimated completion refers to the date at which the facility is expected to be operational.

In addition to the Corps and the Board, several entities have roles related to the inland waterways:

- The Assistant Secretary of the Army for Civil Works (ASA-CW): the ASA-CW establishes policy direction and provides supervision of the Department of the Army functions relating to all aspects of the Corps' Civil Works program.
- Maritime Administration: within the Department of Transportation, the Maritime Administration promotes the use of waterborne transportation and its integration with other segments of the transportation system. It is also charged with maintaining the health of the merchant marine, since commercial mariners, vessels, and intermodal facilities are vital for supporting national security.
- The U.S. Coast Guard (Coast Guard): within the Department of Homeland Security, the Coast Guard is responsible for, among other things, facilitating the safe and efficient flow of commerce on the navigable waterways of the United States. For example, the Coast Guard regulates and enforces safety standards for inland waterways

vessels and operator licensing, conducts icebreaking to facilitate the flow of commerce and relieve flooding from ice dams, and installs and monitors aids to navigation that mark the navigable channel (such as buoys, beacons, and lights) to facilitate the safe movement of vessels. The Coast Guard coordinates with the Corps to ensure aids-to-navigation are properly installed and makes adjustments as channel conditions may dictate.

- Office of Management and Budget (OMB): Within the Executive Office of the President, OMB oversees the implementation of the President's policy, budget, management, and regulatory objectives. Related to inland waterways, OMB works with the Corps and the ASA-CW to formulate the annual President's budget request and issues policies related to the budget's implementation, project study, and prioritization.

The Corps Allocates Funds for Operations and Maintenance Based on Economic Benefits and Risk but Lacks a Method of Tracking Deferred Maintenance for Inland Waterways

The Corps Allocates Funds for Operations and Maintenance Projects Based on Economic Benefit and Risk

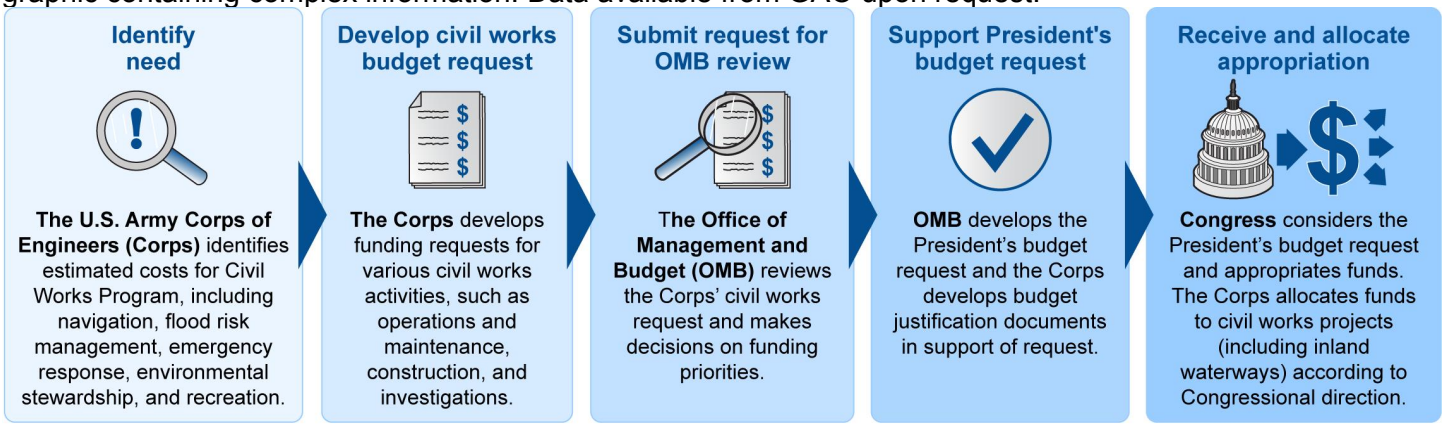
As part of its management of the inland waterways, the Corps budgets for the costs of operations and maintenance (which are funded from one appropriation account) and construction (funded from a separate appropriation account) and develops an annual budget request to submit to OMB. The Corps develops this budget request for all its civil works activities, including locks and dams on the fuel-taxed inland waterways system; this request is reviewed and finalized by the ASA-CW and OMB before being submitted to Congress as part of the annual President's budget request.

To prepare its annual budget request, the Corps identifies potential operations activities and maintenance projects and submits estimates of the costs to complete those activities, but not all identified maintenance projects are included in the budget request. According to Corps officials, as part of the budget request development process, the Corps provides OMB and the ASA-CW with a variety of funding proposals that would

enable different levels of service for all of its civil works assets, including inland waterways.[19] However, according to Corps officials, the President's budget request for civil works—including funding for inland-waterways maintenance projects—is based on broader administration priorities and does not request funding to complete all identified maintenance projects. The Corps then receives annual appropriations for its Civil Works Program, from which it allocates funding to each of its missions, including inland waterways navigation. Figure 7 illustrates the Corps' budget formulation and execution process.

Figure 7: U.S. Army Corps of Engineers' Budget Formulation and Execution Process

graphic containing complex information. Data available from GAO upon request.



Source: GAO presentation of U.S. Army Corps of Engineers information. | GAO-19-20

In 2008, the Corps began implementing an asset management process to guide its management of the Civil Works Program, including inland waterways. Under this process, the Corps determines the hours of operation for each lock, which maintenance activities to perform, and which construction projects to prioritize based on the economic value

[19]Specifically, beginning in 2017 with development of the fiscal year 2019 budget, the Corps began piloting a performance-based budgeting approach called "O&M 20/20," through which the Corps identifies the estimated costs for operations and maintenance to attain various levels of service for civil works assets, including each waterway, lock, and dam. Under this approach, the Corps requests the amount of funding needed to maintain some locks, dams, and waterways at full capacity—meaning that all identified maintenance is performed and there is no reduction in functionality—and others (such as those on low-use waterways) at less than full capacity. In some cases, locks and dams may be maintained only to ensure safety, such as security and monitoring activities. In its annual financial report, the Corps states that "USACE does not set 'acceptable condition standards'" for civil works assets, but instead focuses on identifying the risk and potential consequences of failures.

these activities will provide. The Corps ranks maintenance projects identified during the budget formulation process based on the value or level of service the project is expected to provide as well as how critical they are and funds as many of the priority projects as possible given available funding and the rest are deferred. The Corps assesses the value of inland waterways assets (such as waterways, locks, and dams) based primarily on the economic benefits derived from improved commercial navigation—that is, the benefits achieved by allowing shippers to transport commodities to both domestic and foreign markets more cost effectively than they would using other modes of transportation (such as truck and rail).[20] Economic benefits are generally determined using measures of commercial use, and assets are categorized as high, moderate, and low commercial use.[21] The Corps' approach to operations and maintenance is as follows:

- Operations: The Corps allocates funding for operations based on service priorities. The Corps operates locks at varying levels of service (i.e., hours of operation) based primarily on past commercial traffic volume, but also considering the volume of recreational traffic and available resources.[22] The Corps operates high-use locks continuously (24/7), while operating those with less commercial traffic and fewer economic benefits less frequently, sometimes by appointment only.
- Maintenance: The Corps allocates funding for maintenance projects based on the risk of not performing maintenance; this risk is determined by considering both the condition of an asset as well as the economic impact of a reduction in service should the asset fail (that is, the traffic that would be affected if a lock or dam were to become unusable).

[20]We did not assess the quality of the Corps' economic analysis or the related process of calculating the benefit-cost ratio for inland -waterways construction projects because this was beyond the scope of this report.

[21]For inland waterways navigation, high commercial use is defined as at least 3 billion ton-miles (one ton of cargo transported for one mile) of traffic annually, moderate commercial use is defined as at least 1 billion but fewer than 3 billion ton-miles annually, and low commercial use is defined as less than 1 billion ton-miles annually.

[22]For example, locks with more than 1,000 commercial lockages (passage of a vessel through the lock) per year are operated 24/7 (level of service 1). Locks with fewer than 500 commercial lockages and fewer than 500 recreational lockages per year are operated only by appointment for commercial vessels (level of service 6).

Lack of a Deferred Maintenance Measure for Inland Waterways Limits the Corps' Ability to Identify and Communicate Estimated Maintenance Costs

According to Corps and ASA-CW officials, the Corps does not know how much deferred maintenance exists for inland waterways, because there is no agreed upon definition for deferred maintenance.[23] Corps and ASA-CW officials identified several challenges related to developing a useful definition with which to measure deferred maintenance:

- Using the total cost to conduct all maintenance identified during the budget formulation process may not be useful as a budget tool because the Corps would not have the capacity to conduct all identified maintenance in one fiscal year.
- A single measure may not be useful to gauge the condition of the system, because not all deferred maintenance projects have the same effect on system reliability, for example:
    - Some identified maintenance, such as preventive maintenance conducted less frequently than preferred (like painting lock components to prevent future corrosion), may not affect reliability or function in the short term.
    - Deferring the replacement or rehabilitation of broken or malfunctioning components—such as a lock gate arm—on low use waterways may result in closures on those waterways or delays related to the condition of the lock, but would affect a relatively small amount of cargo and vessels and have a smaller economic impact than closures on high-use waterways.
    - Deferring the replacement or rehabilitation of broken or malfunctioning components on high-use waterways may result in closures that prevent traffic to large sections of the inland

[23]Federal financial accounting standards require agencies to report beginning and ending deferred maintenance and repair balances, see *Statement of Federal Financial Accounting Standards, 42: Deferred Maintenance and Repairs,* (Washington, D.C.: April 25, 2012). The Corps reports these balances in its annual financial report. In its fiscal year 2017 annual financial report the Corps reported a total of about $2 billion in estimated deferred maintenance for its entire civil works portfolio—of which inland waterways are one component—but the Corps cannot identify how much of this is related to navigation on the inland waterways. See U.S. Army Corps of Engineers, *Fiscal Year 2017 United States Army Annual Financial Report: U.S. Army Corps of Engineers – Civil Works*, (Washington, D.C.: 2017).

waterways system and affect a large portion of cargo transported via waterways.

- Some deferred maintenance projects may never be undertaken, while others are planned for the near future. Corps officials told us that, depending on the risk associated with not completing a particular maintenance project, the Corps may choose to never complete the project, such as mowing the grass at a low-use lock and dam facility. Conversely, some incomplete projects represent later phases of projects that are already under way and are planned for completion in the near term.

The lack of a definition and measure of deferred maintenance for inland waterways projects is inconsistent with federal internal-control standards, which call for agencies to identify information requirements needed to achieve objectives and address identified risks (such as reliability of the waterways) and to process relevant data to develop that information.[24] Further, internal control standards call for agencies to communicate information externally—such as to Congress and OMB—to achieve agencies' objectives. Corps and ASA-CW officials acknowledged that there is a lack of information on deferred maintenance provided to Congress. One Corps official suggested that the Corps may need more than one measure of deferred maintenance to capture differences in the type and consequences of various projects. Additionally, ASA-CW officials noted that once a meaningful definition or metric for deferred maintenance is identified, the Corps lacks a way to track this information. Without a measure—or measures—of deferred maintenance for inland waterways (1) that the Corps can use to budget for and manage the inland waterways, (2) that reflects its priorities, and (3) that accurately conveys a consistent and well-defined measure of deferred maintenance that can be communicated to outside stakeholders, the Corps is limited in its ability to identify preventive maintenance that could forestall more costly maintenance or rehabilitation in the future and communicate its estimated maintenance costs to OMB and the Congress. In turn, the lack of a measure could limit the ability of Congress to make informed funding decisions pertaining to the Corps.

Both the stakeholders we interviewed and the Corps have identified effects on the reliability of the inland waterways related to current funding levels for operations and maintenance. For instance, many stakeholders we spoke to said the funding the Corps receives for operations and

[24]GAO-14-704G.

maintenance on inland waterways has not been sufficient to maintain the stakeholders' desired level of reliability. Some stated that the Corps is currently operating using a "fix as fails" approach: that is, requesting enough funding to be able to respond to crises but not to conduct preventive maintenance. Further, many stakeholders said there is potential for some waterway users to switch to other modes of transportation based on unreliability. For instance, two stakeholders stated that businesses may be "chased away" because the inland waterways system continues to be unreliable due to unscheduled closures for maintenance. For example, during the course of our review, one lock on the Ohio River experienced repeated unscheduled closures. One such closure lasted from September 6, 2017, through September 14, 2017, during which time no vessels were able to travel through the lock. According to a June 2017 Corps report on the causes of mechanical breakdowns leading to unscheduled lock closures, routine maintenance occurs less frequently than in the past due to a lack of funding, and that delayed maintenance increases the risk of operational or catastrophic failure that results in lock closures.[25] Figure 8 illustrates the condition of both deteriorating and recently rehabilitated inland waterways' navigation facilities. Identifying and communicating about deferred maintenance could help Congress and OMB understand the extent of any problems with reliability that could affect the inland waterways system.

[25]U.S. Army Corps of Engineers, *Investigation of Mechanical Breakdowns Leading to Lock Closures* (June 5, 2017).

Figure 8: Examples Of Deteriorating and Rehabilitated Inland-Waterways Navigation Facilities

Crumbling concrete wall of lock chamber at Allegheny River Lock and Dam 2 in Pittsburgh, Pennsylvania, (left) and recently rehabilitated lock chamber wall at Emsworth Locks and Dams in Pittsburgh, Pennsylvania (right). Crumbling concrete walls may present safety risks associated with falling and unstable walls.

Deteriorating lock gate arm and supporting concrete at Allegheny River Lock and Dam 2 in Pittsburgh, Pennsylvania, (left) and recently rehabilitated lock gate arm at Emsworth Locks and Dams in Pittsburgh, Pennsylvania (right). Deterioration of lock gate components and surrounding concrete may lead to failure or reduced functionality of the gate and, as a result, could cause vessel delays or prevent vessels from passing through the locks.

Source: GAO. | GAO-19-20

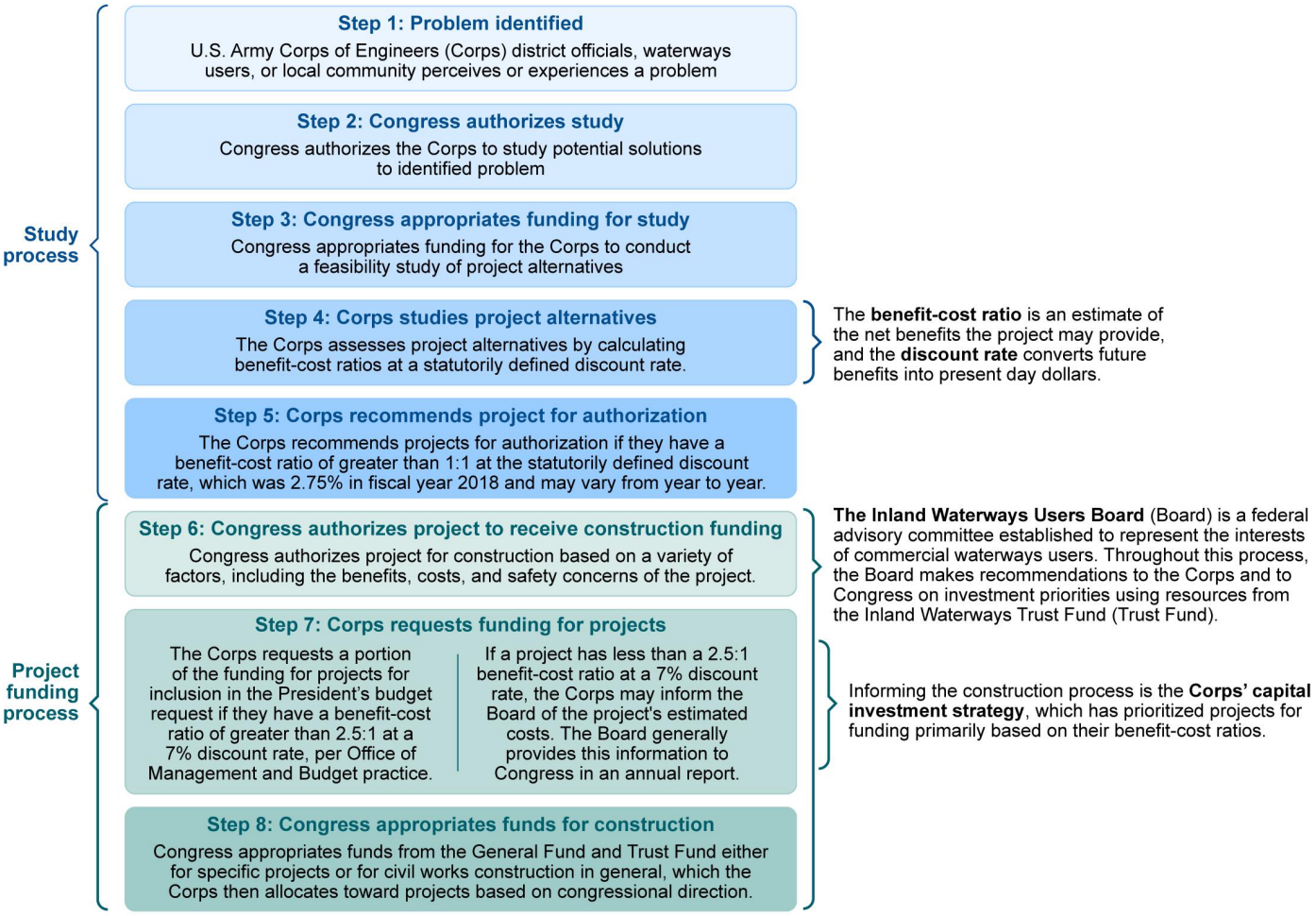
Incremental-Funding Approach for Inland-Waterway Construction Projects Contributes to Cost Overruns and Schedule Delays

Inland-Waterways Construction Projects Are Individually Funded according to Various Priorities

The Corps manages inland-waterways construction projects—the modernization and rehabilitation of existing locks and dams (called major rehabilitation), or the construction of new structures—to ensure the facilities continue to function and meet future requirements, and prioritizes these projects based on expected costs and benefits. As shown in figure 9, construction projects are developed in response to an identified problem. Congress then authorizes inland-waterways construction projects for study and construction and provides funding through the annual appropriations process, although some authorized projects may not receive funding.[26] Since 1996, Congress has appropriated construction funding that the Corps has allocated toward 20 projects, of which 15 have been completed.

[26]Multiple projects may be authorized under one program. For example, the Navigation and Ecosystem Sustainability Program was authorized at one time and includes multiple construction projects at different locks along both the Upper Mississippi River and Illinois Waterway.

Figure 9: Major Steps in Prioritizing and Funding an Inland-Waterways Construction Project



Source: GAO analysis. | GAO-19-20

The Corps assesses the net economic benefits of inland-waterways construction-project alternatives by comparing estimated direct costs (e.g., construction costs to build a new lock chamber) to estimated reductions in the waterway transportation costs (e.g., reduced travel costs related to a reduction in the time it might take for a barge to pass through a larger lock chamber). For the Corps to recommend construction, the project must have a benefit-cost ratio—that is, the ratio of estimated benefits to estimated costs—greater than 1 to 1 using a statutorily defined

discount rate that varies from year to year.[27] The project must then be authorized for construction by Congress through legislation to be eligible for funding, which typically occurs in a Water Resources Development Act.

The Corps—with advice from the Inland Waterways Users Board (Board)—prioritizes authorized inland-waterways construction projects according to estimated net economic benefits and an assessment of the economic and safety consequences of not doing the project.[28] In collaboration with Corps headquarters, division, and district offices, the ASA-CW determines which civil works construction projects will be prioritized to include in the budget request to OMB. OMB considers the recommendations of the ASA-CW and the Corps in deciding which projects to include in the President's budget request. While Corps projects with a benefit-cost ratio of at least 1 to 1 at the statutorily defined discount rate are eligible to seek funding, OMB assesses projects against a different threshold in determining which projects are included in the President's budget request. In line with OMB practice since the mid-2000s (and, according to OMB officials, consistent with their evaluation of most federal programs per their guidance set in 1992), generally only inland-waterways construction projects with a benefit-cost ratio of at least 2.5 to 1 using a 7 percent discount rate are included in the annual President's budget request. In recent years, only one of the Corps' ongoing construction projects—the Olmsted Locks and Dam project—has met this threshold.

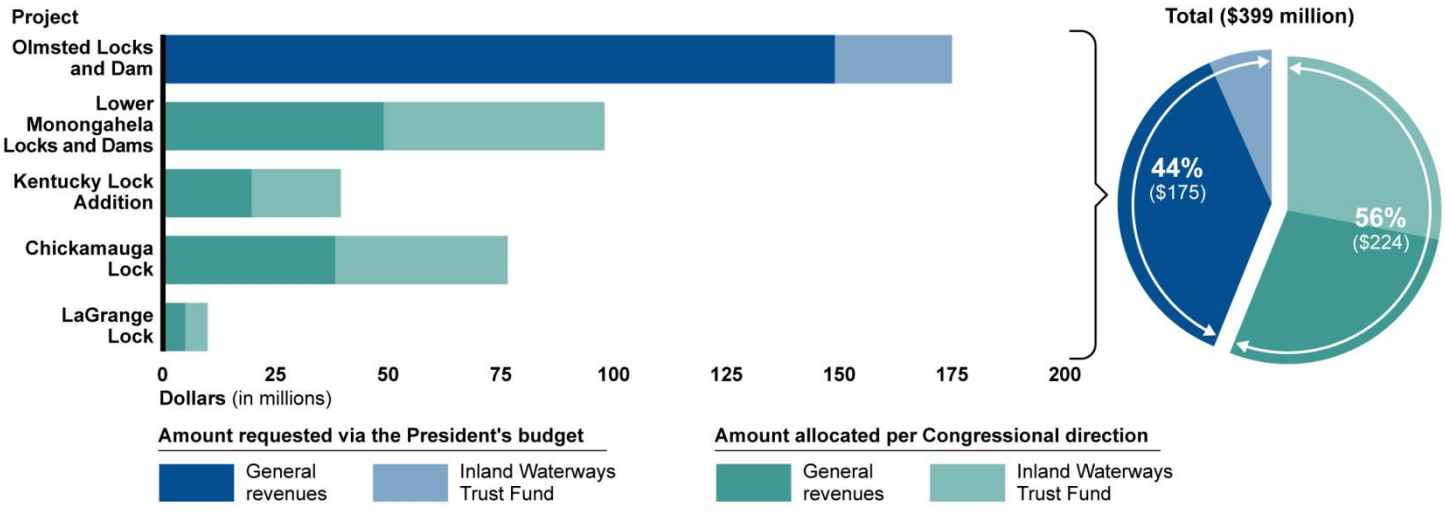
Congress appropriates funds to the Corps' Civil Works construction account, and the Corps allocates some of that funding to inland-waterways construction projects. In recent years, Congress has

[27]The discount rate is used to convert future benefits and costs into present values, which allows for a comparison between multiple projects at a time. 18 C.F.R. § 704.39 states that the interest rate shall be based on the average yield during the preceding fiscal year on interest-bearing marketable U.S. securities. This policy was established in the Water Resources Development Act of 1974, Pub. L. No 93-251, tit. 1, § 80, 88 Stat. 23, 34 (1974) codified at 42 U.S.C. § 1962d-17. For fiscal year 2018 the discount rate was 2.75 percent, and the rate has varied from 2.75 percent to 8.875 percent since 1975.

[28]The Corps' 2010 Capital Investment Strategy and the 2016 update to the strategy lay out the project prioritization process and results. See U.S. Army Corps of Engineers, *Inland and Intracoastal Waterways: Twenty-Year Capital Investment Strategy* (2016). The 2016 update prioritizes completion of the 4 ongoing new construction projects and 2 major rehabilitation projects to be funded through fiscal year 2021, and identifies 10 potential new construction projects and 6 major rehabilitation projects ready for funding through fiscal year 2036.

appropriated funds for projects included in the President's budget request and has directed the Corps to allocate appropriated amounts that exceed the amount requested in the President's budget request to other projects as depicted in step 8 in figure 9. For example, in fiscal year 2018, the Administration requested $175 million for the Olmsted Locks and Dam project, but five projects were funded that year. In the Joint Explanatory Statement accompanying the appropriations, Congress directed the Corps to allocate funds to inland-waterways construction projects prioritized by economic effect in such a way that the Corps uses all estimated Trust Fund revenues.[29] In accordance with this direction, the Corps allocated $399 million to inland-waterways construction projects, with more than half—$224 million— going toward the other three ongoing inland-waterways projects and a new major rehabilitation project (see fig. 10).

Figure 10: Comparison of Funding for Projects in President's Budget Request to Funding for Additional Inland-Waterways Construction Projects (in Millions), Fiscal Year 2018



Source: GAO analysis of U.S. Army Corps of Engineers financial data. | GAO-19-20

Stakeholders we spoke to stated that the process for determining which construction projects receive funding can be challenging. Some stated that the use of different discount rates and benefit-cost ratio thresholds for authorization and budgeting purposes can create confusion as to whether projects will be funded. Also, some stakeholders stated that because the

[29]Joint Explanatory Statement, 163 Cong. Rec. H3704 (2917) to accompany Pub. L. No. 115-31, 131 Stat. 135 (2017).

7 percent discount rate used by OMB to calculate the benefit-cost ratio is higher than the statutory rate used in recent years, use of the OMB discount rate can result in projects being excluded from the President's budget request, an exclusion that can reduce the likelihood of the project receiving funding.[30] According to the Board, as of December 2017, 14 construction projects have been authorized for construction but have not been allocated construction funding, and an additional 7 major rehabilitation projects are also candidates for construction over the next 20 years. However, Corps officials stated that, once the Olmsted Locks and Dam project is completed, none of the currently authorized projects will meet OMB's threshold for inclusion in the President's budget request. Further, some stakeholders told us that the Corps' policy—developed to provide additional information to OMB during budget development—to recalculate a project's benefit-cost ratio every few years, including while the project is under construction, can create challenges. For one, ongoing projects included in the President's budget request have subsequently been excluded in later years due to a lower updated benefit-cost ratio, which might reduce the likelihood of the project's being allocated funding.[31] For example, the Lower Monongahela Locks and Dams project had a benefit-cost ratio of 6.7 to 1 at a 7.75 percent discount rate when construction funds were first expended in fiscal year 1995 (based on benefits and costs as estimated when the project was authorized in fiscal year 1992) and has been allocated funding every year since. However, this project was not included in either the fiscal year 2017 or 2018 President's budget requests due in part to its updated benefit-cost ratio having fallen below the 2.5 to 1 threshold because of increased costs and changes to the expected benefits. Although it was not included in the President's budget request, the Corps ultimately allocated funding for the project in fiscal years 2017 and 2018 based on congressional direction.

[30]Since the late 1990s, the water planning discount rate has been lower than the OMB discount rate. Most water resource projects, such as inland waterways construction projects, have concentrated up-front costs and benefits that accrue over decades, so a 7 percent discount rate results in a lower benefit-cost ratio than the water planning discount rate.

[31]Ongoing projects are not assured to receive funding each year. According to Corps guidance, in support of funding requests during the annual budget development process, an ongoing project's benefit-cost ratio must have been updated within the previous 5 years in an economic update.

Incremental Funding of Inland-Waterways Construction Projects Contributes to Cost Overruns and Schedule Delays

Since at least 1995, all inland-waterways construction projects have been funded incrementally, meaning that annual appropriations have covered a portion of the project's estimated costs.[32] There are several reasons that the Administration may request and Congress may appropriate funding for inland-waterways construction projects incrementally—as they both have done in recent years—in lieu of full upfront funding.[33]

- Available annual funding is generally less than the amount required to cover the full cost of one new construction project. In addition, the Corps (like other federal agencies) cannot enter a contract that exceeds available funding unless authorized by law.[34] For example, based on average annual Trust Fund revenues since 2015 of about $107 million, a 50-50 cost share would provide about $214 million in construction funding annually, whereas the four ongoing construction projects were each originally estimated to cost more than that amount. Further, of the 10 new construction projects prioritized to be completed next in the Corps' capital investment strategy, as of 2016, 7 of them are estimated to cost at least $350 million.[35]
- Additionally, these projects—even once begun—must compete annually with other funding priorities across the federal government. We have previously reported that full upfront funding of capital assets can be challenging to obtain in an era of resource constraints;

[32]By "costs", we are referring to the appropriated dollars that will be required to complete a project.

[33]Corps civil works projects sometimes—such as in the case of emergencies—receive full upfront funding. For example, Congress appropriated $2.3 billion in December 2005 and almost $4 billion in June 2006 via emergency supplemental appropriations, which, according to Corps officials, allowed them to fully fund projects authorized in response to hurricanes Katrina and Rita.

[34]The Antideficiency Act, Pub. L. No. 97-258, 96 Stat. 923 (1982), prohibits agencies from entering into contracts that exceed currently available appropriations or that obligate appropriations not yet made.

[35]U.S. Army Corps of Engineers, *Inland and Intracoastal Waterways: Twenty-Year Capital Investment Strategy* (2016).

incremental funding can make it easier for agencies to meet mission capital demands within the constraints of their appropriation.[36]

- Further, while the Corps could carry over appropriations until they accrue sufficient funds to fully fund a project upfront (because their construction appropriations historically have not expired), Corps officials we spoke to had concerns about this practice. They stated that carryover funds may be seen as available and reprogrammed to other civil works efforts (such as rebuilding infrastructure in the wake of a natural disaster) and that Congress and the Board both expect the Corps to obligate appropriated funds. In addition, some stakeholders had concerns that delaying the start of construction until full upfront funding was appropriated could result in further deterioration or increased maintenance costs for those facilities.
- Finally, according to some stakeholders we spoke to, the current incremental funding approach has allowed construction projects on multiple waterways to occur at once—a way of spreading benefits across the system and providing some indication to local users and beneficiaries that their local facility will be repaired or replaced.

Nonetheless, incremental funding for inland waterways projects—among other factors such as engineering design changes—has contributed to increased costs and schedule delays because it results in inefficient contracting practices.[37] Corps reports and academic studies have found that incremental funding has resulted in inefficient contracting for construction projects,[38] in part because funding is not guaranteed beyond the current year and contractors must stop working once funds are

[36]GAO-03-1011.

[37]We have previously reported on factors contributing to cost increases and delays for the Olmsted Locks and Dam project; see GAO, *Army Corps of Engineers: Factors Contributing to Cost Increases and Schedule Delays in the Olmsted Locks and Dam Project,* GAO-17-147 (Washington, D.C.: Feb. 16, 2017). While other factors contribute to construction cost growth, such as site conditions differing from what was expected in project planning and design, those factors tend to be unpredictable, unlike the funding approach.

[38]See, for example: U.S. Army Corps of Engineers, Great Lakes and Ohio River Division, *Inland Navigation Construction Selected Case Studies* (July 17, 2008) and Texas A&M Transportation Institute, *Predictable Funding for Locks and Dams* (April 2018).

exhausted.[39] Because the Corps receives annual appropriations for a portion of the total estimated cost of a project, the Corps awards contracts for separable elements that can be constructed and left for a period of time with minimal damage and safety risks if further funding is unavailable (such as a contract to build part of a lock wall). According to Corps district officials, this practice has resulted in the Corps entering into many more contracts for each project than they would if they had full upfront funding. For example, Corps officials told us that due to incremental funding, the Lower Monongahela Locks and Dams project is currently on its 14th construction contract even though it was originally planned to be completed using only two contracts. Corps officials told us that this contracting practice is inefficient and can lead to cost overruns due to, for example:

- contractor mobilization and demobilization, such as moving heavy equipment on and off the construction site, at the beginning and end of each contract;
- prolonged construction due to multiple contractors unable to work at the same worksite during the same time;
- extra administrative expenses associated with letting multiple contracts;
- increased cost of fuel and construction materials (e.g., steel and cement) from year to year;
- higher costs of buying construction materials in smaller quantities; and,
- inflation due to prolonged construction.

[39]From 1922 to 2005, as authorized by statute, Army policy allowed for the Corps to enter into continuing contracts that spanned more than 1 fiscal year even though the Corps may not have received appropriations to cover the full contract amount at the time the contract was awarded. This gave contractors the option to continue work after funds were exhausted in a given fiscal year, in effect obligating Congress to fund the full cost of a project even though full funding had not been appropriated. In the Energy and Water Development Appropriations Act of 2006, Congress restricted the way the Army Corps could use continuing contracts. To ensure compliance with this restriction, the Corps developed a new clause for continuing contracts that specifically requires contractors to stop work once they have expended the funding set aside for the fiscal year. Pub.L. No.109-103, tit I, § 108, 119 Stat. 2247, 2254 (2005). For additional information about the Corps' use of continuing contracts, see GAO, *Army Corps of Engineers: Recent Changes Have Reduced the Use of Continuing Contracts, but Management Processes Need to Be Improved,* GAO-09-552 (Washington, D.C.: June 22, 2009).

Further, according to Corps officials and stakeholders, additional challenges related to the timing and amount of funding allocated in a given fiscal year can exacerbate inefficiency related to incremental funding. For example, while under a continuing resolution, the Corps does not allocate funding to projects that were not included in the President's budget, per OMB policy, which can delay funding for projects until Congress provides appropriations for the remainder of the fiscal year.[40] Thus, in fiscal year 2018, funding was delayed for the three ongoing projects that were not included in the President's budget request. Although project work can continue if the Corps has some carryover funds, Corps officials told us that, if they exhaust their funds, a continuing resolution could mean they won't be able to exercise the next option on a construction contract.[41] As a result, the contractor would have to stop work and shut down the construction site, and the Corps would need to close the existing contract, repackage the remaining work, and re-advertise the contract—all tasks that can increase the full cost of a project. Additionally, according to Corps officials, when projects receive smaller portions of funding than estimated for the upcoming fiscal year, the amount may not be enough to allow a contractor to continue on the most efficient construction schedule for that contract or contract option which can have the effect of increasing costs. Moreover, according to Corps district officials, the benefit-cost ratios for some ongoing projects have decreased in recent years in part because the projects have experienced increased costs (relative to expected benefits) due to a number of factors, including inefficient contracting stemming from incremental funding, which may affect the project's priority status and inclusion in the President's budget request.[42]

All four of the Corps' ongoing construction projects have experienced cost overruns and, as shown in figure 11, schedule delays. According to Corps

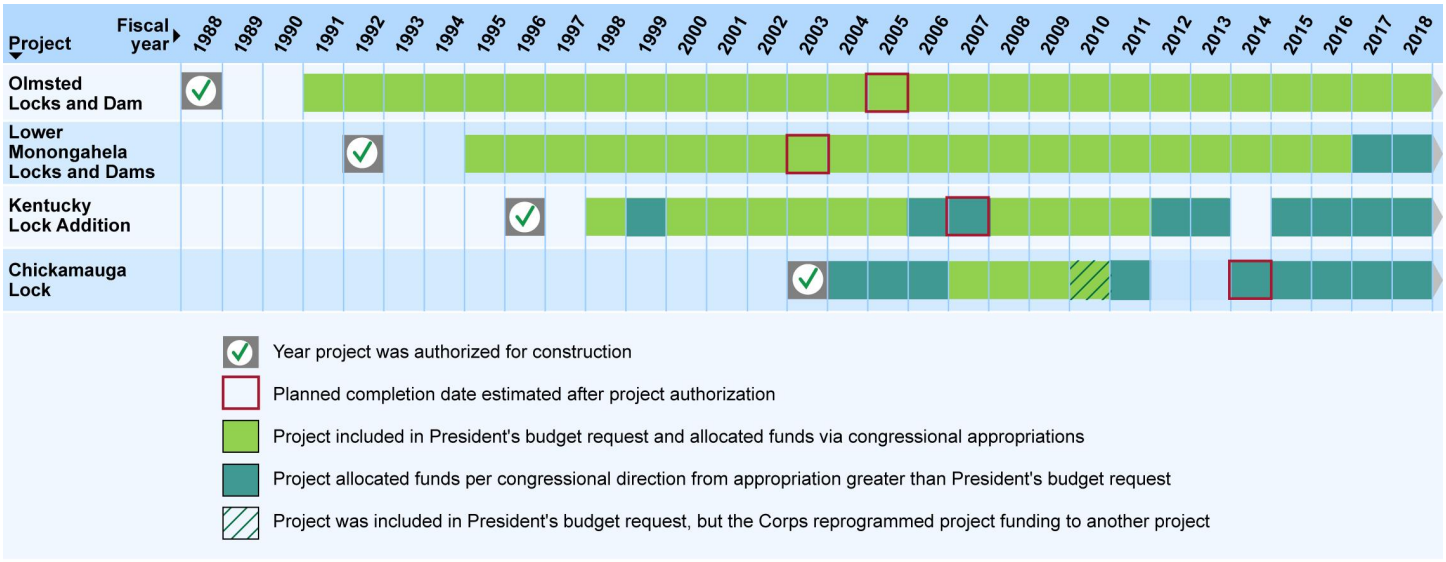
[40]According to officials in the Office of the ASA-CW, in the absence of an appropriation directing otherwise, the Corps adheres to priorities set forth in the President's budget request.

[41]Carryover funds refer to the amount of appropriations that remain unobligated toward a specific project at the end of a fiscal year. The Corps has historically received "no-year" appropriations—that is, funds that are available for obligation until expended—and this funding for construction projects may be carried over to subsequent fiscal years.

[42]Some stakeholders have therefore suggested that ongoing projects be assessed based on a remaining benefit to remaining cost ratio, which considers only the expected remaining cost to finish the project, rather than the total expected cost, in comparison to the benefits expected from completion.

officials, some of these cost increases and delays were due to inefficient contracting stemming from incremental funding. For example, Corps officials currently expect that the Kentucky Lock Addition project will require at least $229 million more (about 19 percent above the original estimated cost) as a direct result of inefficient contracting and be completed 17 years later than planned. Similarly, the Corps estimates that the Chickamauga Lock project will need at least $170 million more (about 24 percent above the original estimated cost) due to inefficient contracting and be completed at least 13 years later than planned. The amount of estimated cost overruns for just these two projects could potentially fund an entire additional project.

Figure 11: Timeline of Construction Authorization and Funding for Ongoing Inland Waterways Construction Projects, as of 2018



Source: GAO analysis of U.S. Army Corps of Engineers information. | GAO-19-20

Timing and Distribution of Funding Could Reduce Cost Increases and Schedule Delays for Inland-Waterways Construction Projects

In the absence of full funding, our funding simulation demonstrates that contracting efficiency for inland-waterways construction projects could be increased by funding fewer projects at a time. We developed a simulation for a set of four hypothetical new construction projects under different funding approaches to explore the effects of different funding patterns

and timing on total project costs and timeframes.[43] We assumed that all four hypothetical projects could be completed for $2 billion ($500 million each, with expected funding of $100 million per year) within 5 years of construction.[44] For our simulation, we assumed that $200 million would be available to allocate each year across the four projects—an amount roughly similar to recent funding levels for actual inland waterways projects. We developed five funding approaches that varied in the pattern and timing of funding allocated toward each project. Given these patterns of funding, we also incorporated cost effects that we hypothesized would occur.[45] For example, for each year that a project did not receive full funding—that is, the entire remaining costs of the project were not provided—we assumed the remaining funding required to complete the project would increase to account for contracting inefficiencies that were likely to occur due to incremental funding, such as increased contractor mobilization and demobilization. Also, for any year that a project received funding in smaller amounts than expected, we assumed that funding required to complete the project would rise due to exacerbated contract inefficiencies due to such factors as having to buy materials in smaller quantities or break work into smaller separable elements. In addition, we incorporated inflation into projects' remaining costs when funding for those projects was delayed. See appendix III for more detailed information regarding our methodology for this simulation.

While fully funding projects up front would help to avoid cost increases or delays due to inefficient contracting, we found that, even with incremental funding, varying the timing and amount of funding can reduce inefficiency (see fig. 12). For example, we found that compared to other approaches, an incremental funding approach that concentrates all available funding to one of the four projects at a time—as in Approach A, shown in figure 12—

[43]By "costs," we are referring to the appropriated dollars that will be required to complete a project. In this funding simulation, we are not discounting each project's hypothetical expenditures over the time frames and comparing present value costs. Rather, we are illustrating the budgetary effect of reduced efficiency associated with incremental funding.

[44]Major rehabilitation projects are generally estimated to cost significantly less than new construction projects—according to the Corps, to date, all have been less than $100 million. We have considered only new construction projects to inform our analysis.

[45]We based these hypothesized cost effects on the results of a Corps analysis of actual new construction project cost growth, and Corps officials we spoke to about this simulation generally agreed with our assumptions. *See*, U.S. Army Corps of Engineers, Great Lakes and Ohio River Division, *Inland Navigation Construction Selected Case Studies* (July 17, 2008).

results in lower cost overruns and faster construction than an approach that funds more projects simultaneously with smaller amounts of funding, as in Approach B (see app. III for results for all five approaches). In addition, concentrating funding toward one project could lead to greater years of benefits—as measured by the Corps as the number of years a facility has been constructed and available for use by vessels.[46] However, according to Corps officials and stakeholders we spoke to, there may be risks associated with concentrating funding on one project at a time due to concerns with delaying the start of other high priority projects. For example, during the time in which a project is waiting for funding, the infrastructure may experience further deterioration, and vessels using the facility may experience increased delays. Corps officials we spoke to about this simulation generally agreed that the Corps' current funding approach most closely resembles Approach B, with most funding going to the Olmsted Locks and Dam project while the remaining three ongoing projects receive smaller amounts (see also fig. 6).

Figure 12: Comparison of Hypothetical New Construction Project Costs, Time Frames, and Years of Benefits for Two Different Funding Approaches over a 15-Year Period

Source: GAO analysis. | GAO-19-20

[a]By "costs", we are referring to the appropriated dollars that will be required to complete a project. We are not comparing present value costs of these hypothetical projects, but rather are illustrating the budgetary effect of incremental funding.

OMB and GAO have advocated for full upfront funding of capital projects as a way to recognize full budgetary commitments, but, as discussed, fiscal pressures on both the Corps and Congress may make it difficult to

[46]This is shown in figure 12 in relation to the 15-year span of our simulation of 2020 through 2034, but these projects would provide many years of benefits beyond this time frame.

request and appropriate full funding. OMB's Capital Programming Guide states that full funding can

- help ensure that all costs and benefits are taken into account at the time decisions are made to provide resources,
- increase the opportunity to use more competitive contracts, and
- allow for more efficient work planning.[47]

Further, we have previously reported that full funding is an important tool for maintaining government-wide fiscal control, because failure to recognize the full costs of proposed commitments during budget decisions could lead to distortions in the allocation of resources.[48] We have also reported that incremental funding of capital projects can reduce available funding for future projects and erodes future program flexibility because funding is dedicated to projects begun in previous years.[49] Though providing full upfront funding would likely reduce the overall costs of inland waterways construction over the long term, it may require a significant increase in annual appropriations in the short term, which Corps officials consider to be highly unlikely.[50]

Both OMB and GAO have acknowledged the challenges associated with "spikes" in appropriations that would be required for full funding and have suggested that innovative funding mechanisms could be used to mitigate this challenge.[51] In 2010, we recommended that the Corps work with Congress to develop a more stable project-funding approach for Civil Works projects that provides more efficient use of funds, but the Department of Defense only partially concurred with the recommendation,

[47]Office of Management and Budget, 2017.

[48]See GAO, *Budget Issues: Incremental Funding of Capital Asset Acquisitions,* GAO-01-432R (Washington, D.C.: February 26, 2001).

[49]GAO-01-432R.

[50]As noted, based on the traditional 50/50 cost share, the total available funding (approximately $200 million based on estimated annual Trust Fund revenue of $100 million) would be less than the full cost of many authorized inland waterways new construction projects.

[51]See Office of Management and Budget, 2017 and GAO-01-432R.

stating that it will support budget decisions made by the administration.[52] However, without some change in the way inland-waterways construction projects are funded to either provide full funding or reduce the effects of incremental funding by concentrating on fewer projects at one time, current cost increases and schedule delays resulting from inefficient contracting are likely to continue. For example, according to the Corps' 2016 capital investment strategy, under a scenario in which construction funding is limited only by available Trust Fund revenues, in the next 20 years the Corps could complete 16 of the 22 major rehabilitation and new construction projects identified as priority projects for approximately $7 billion; however, because these estimates do not account for cost overruns due to the current incremental funding approach, the Corps is unlikely to meet this goal.

Stakeholders Identified Limitations and Trade-offs Associated with Proposed Options for Increasing Available Funding for Inland-Waterways Construction

In addition to adjusting the timing and distribution of funding, according to some of the stakeholders we interviewed, increasing available funding for construction would provide more upfront funding to enable more efficient contracting. Stakeholders said that with additional funding, the Corps may be able to complete ongoing inland waterways projects more quickly and begin other construction projects. We asked stakeholders representing 55 national and regional entities and researchers about options to increase available funding for inland waterways construction that have been proposed by policymakers and in relevant literature including:

- altering the cost share between the Trust Fund and federal appropriations,
- requiring other users and beneficiaries of the waterways to contribute to the Trust Fund,

[52]GAO, *Army Corps of Engineers: Organizational Realignment Could Enhance Effectiveness, but Several Challenges Would Have to Be Overcome*, GAO-10-819 (Washington, D.C.: September 1, 2010). This recommendation was not implemented by the Corps. In its November 2010 letter in response to our report, the Corps stated it would work with the Office of Management and Budget during its budget process to ensure that project funding is as efficient as possible.

- increasing or adding fees for commercial users,
- expanding opportunities for local sponsors to contribute to funding specific projects, and
- pursuing alternative financing arrangements.

While each option has potential benefits, stakeholders we interviewed identified limitations or trade-offs that could affect the feasibility of each option.

Altering the Trust Fund cost share. Altering the percentage of the Trust Fund cost share for construction projects could increase available funding to complete construction projects. For example, in 2014 the Trust Fund's cost share for the Olmsted Locks and Dam project was reduced by statute from 50 to 25 percent for fiscal year 2014, and to 15 percent for subsequent fiscal years—thereby increasing the federal share to 85 percent—to speed the pace of other inland-waterways construction projects (by increasing the overall funding available for those projects) and to reduce the costs to commercial users.[53] The Inland Waterways Users Board (Board), in its April 2018 annual letter to Congress, proposed making such a change for all future projects. Specifically, the Board proposed increasing the federal government's share of construction costs from 50 percent to 75 percent.[54] According to the Board and some stakeholders, this could increase the available funding for Corps construction projects on the inland waterways system. Because each Trust Fund dollar would be matched by three dollars from general revenues as opposed to one dollar under a 50/50 split, overall funding may be increased. The Board stated that this approach may also enable the Corps to start and complete projects more quickly. For example, as shown in figure 12, with more upfront funding available for each project, the Corps may be able to contract for projects more efficiently than if it received smaller amounts of funding each year. However, some stakeholders said additional appropriations for inland waterways construction from general revenues would be required to achieve the benefits of this option, an approach that could, in turn, reduce funding

[53]Pub. L. No. 113-76, div. D, tit. I, 128 Stat. 5, 153 (2014) and Pub. L. No. 113-121 tit. II, §2006(a), 128 Stat. 1193. 1267 (2014). Congress also reduced the cost share for the Chickamauga Lock project to 15 percent for fiscal year 2019. Pub. L. No. 115-244, div. A, tit. I 132 Stat. 2897 (2018).

[54]Inland Waterways Users Board, *Fourth Annual Post Budget Submission Advice and Recommendations Concerning Investment in the Nation's Inland Waterways System*, (Apr. 13, 2018).

available for other congressional priorities or increase the federal deficit. Absent additional appropriations, however, the amount of funding for construction could be reduced. For example, if appropriations from general revenues were $100 million per year under both scenarios, total funding for inland waterways under a 75/25 split would be only about $133 million, instead of $200 million under the traditional 50/50 split. To provide the same $200 million for construction, but reduce the costs to commercial users under a 75/25 split, appropriations from general revenues would need to increase to $150 million.

Require other users and beneficiaries of the waterways to contribute to the Trust Fund. Some stakeholders we spoke to proposed requiring that other users of the waterways contribute to the Trust Fund. Recreational boaters, municipal water utilities, and hydropower utilities already pay fees associated with their use of inland waterways, but this revenue is not directed toward the Trust Fund, for example:

- recreational users, such as recreational boaters and fishermen, on all waterways pay fees of about $628 million annually on fishing equipment and taxes on fuel used in motorboats that are currently deposited into the U.S. Fish and Wildlife Sport Fish Restoration and Boating Trust Fund, which is used to sustain sport-fishing populations;[55]
- municipal water utilities that have Corps' water storage contracts on the inland waterways pay fees that are currently deposited into the general fund of the Treasury;[56] and
- power generated by federally owned hydroelectric dams (including those owned by the Corps on the inland waterways) is sold at rates intended to cover the government's costs of operating and maintaining the dams, among other things.

[55]According to the U.S. Fish and Wildlife Service, in fiscal year 2016, about $108 million in revenue to this fund was from taxes on fishing equipment and about $309 million was from taxes on fuel used in motorboats on all types of waterways across the U.S that include the inland waterways, non-fuel taxed inland waterways, coastal waters, and lakes. 26 U.S.C. § 9504.

[56]District officials stated that generally, municipal water utilities that draw from pools on fuel-taxed inland waterways do not pay fees for their use because the Corps is not operating the waterways specifically for that purpose and those users have no guarantee of access to water from those pools. For instance, they may not be allowed to draw water from the waterway if it would have a negative effect on navigation.

Other infrastructure trust funds are supported in part through user fees paid by both commercial and non-commercial users. For example, excise taxes, primarily on motor fuels and commercial trucks and tires, are deposited into the Highway Trust Fund, which is used to provide grants to state highway or transportation agencies. Some stakeholders said that all users who benefit from the pools created by navigation dams should bear some portion of the costs of the infrastructure, and revenue collected from these users could potentially be redirected to the Trust Fund. However, some other stakeholders said that these users as well as U.S. taxpayers that do not use the waterways already contribute to inland waterways construction, operations, and maintenance costs through their federal tax contributions to general revenues. We have previously found that in theory, the extent to which a program is funded by user fees should generally be guided by who primarily benefits from the program; however, the extent to which a program benefits users or the general public is not usually clear cut.[57] In addition, redirecting revenue from fees currently paid by other users of the waterways to inland waterways would reduce funding available for other congressional priorities, as these funds are currently being directed towards other uses.

Increasing or adding fees for commercial users. Past administrations as well as entities such as the Congressional Budget Office have proposed increasing revenue for inland waterways construction by increasing existing fees or imposing additional fees, such as lockage fees, for commercial users of the inland waterways—the only group that is currently paying the fuel tax—as they are the primary beneficiaries.[58] For instance, in a legislative proposal accompanying the fiscal year 2019 President's budget request, the current administration proposed increasing the number of waterways subject to the fuel tax, which could have the effect of increasing the amount some users pay or increasing the number of commercial users subject to the tax. However, some stakeholders pointed out that increasing or adding fees for these users would raise the costs of transportation on the waterways, which could lead shippers to switch to other modes of transportation (such as trucks and rail, which are less efficient) and ultimately reduce both waterways

[57]GAO, *Federal User Fees: A Design Guide*, GAO-08-386SP (Washington, D.C.: May 29, 2008).

[58]Congressional Budget Office, *Reducing the Deficit: Spending and Revenue Options* (Washington, D.C.: 2011).

traffic and Trust Fund revenue. Specific proposals for increasing or adding to existing fees are described in more detail below.

- Index fuel tax to inflation: Two stakeholders said that indexing the fuel tax to inflation could help the Trust Fund retain its purchasing capability over time. In fiscal year 1994, the fuel tax was set at $0.20 per gallon, and it was not raised again until 2015, when Congress increased the tax to $0.29 per gallon with the support of commercial users[59]–close to the inflation adjusted-level of the 1994 rate.[60] However, the rate was not set to automatically rise with future inflation, which reduces the purchasing power of the fuel tax over time. For example, according to our analysis of fuel tax revenue for 1994–2014, if the fuel tax had been indexed to inflation as of 1994, about $400 million in additional revenues would have been raised over the 20-year period between 1994 and 2014. If the additional $400 million were matched by general revenues dollar for dollar, a total of $800 million more would have been available to the Corps for construction projects.
- Annual vessel fee: Citing the insufficiency of existing revenue to pay the users' share of capital investment costs, the current administration has proposed a new annual per vessel fee for commercial users to help finance future construction projects and cover a portion of the cost of operating and maintaining them (operations and maintenance has historically been a federal responsibility).[61] The current administration expects this fee would raise approximately $1.78 billion in new revenue from fiscal years 2019–2028 ($178 million annually) to supplement revenue from the existing fuel tax.[62] In its annual letter to Congress, the Board said this proposal is similar to what the prior administration proposed and that Congress has repeatedly rejected because it would more than double the amount collected from

[59]Pub. L. No. 113-295 div. B. title II. § 205, 128 Stat. 4010, 4065 (2014), codified at 26 U.S.C. § 4042(b)(2)(A).

[60]If the fuel tax had been indexed to inflation when it was increased from $0.20 to $0.29 in 2014, users would pay $0.294 (just over $0.29) per gallon in 2017.

[61]As previously mentioned, the federal government currently pays for 100 percent of operations and maintenance of inland waterways infrastructure. In contrast, this proposal would direct Trust Fund revenue to cover 10 percent of operations and maintenance, in addition to funding a share of construction costs. The amount of the annual per vessel fee was not specified in the Administration's proposal.

[62]Office of Management and Budget, *Fiscal Year 2019 Efficient, Effective, Accountable, An American Budget* (Washington, D.C.: February 2018).

commercial users of the inland waterways system each year, with associated consequences for shipping costs and traffic diverted to other modes.

- Lockage fees: Various groups have proposed collecting lockage fees from commercial users to tie fees more closely to use of the infrastructure and increase available funding. For example, prior administrations' budget proposals have recommended replacing or supplementing the fuel tax with lockage fees.[63] According to the Transportation Research Board, lockage fees could increase available funding for construction, are moderately easy to administer, and could be implemented on a system-wide basis, with lock operators keeping track of lock use. However, some stakeholders stated that the relative unknowns of how a lockage fee would be implemented make it less appealing than the current, familiar fuel tax, which they are able to incorporate into their operating budgets. Additionally, some stakeholders told us adding lockage fees—just like increasing the fuel tax or adding other fees—would increase shipping costs, and could reduce traffic on the inland waterways. Further, some stakeholders raised concerns about the equity of lockage fees, as all users benefit from the system as a whole, but not all users frequently pass through locks. For example, as one stakeholder pointed out: the Mississippi River has zero locks and dams from St. Louis to New Orleans, so users that operate chiefly on that part of the system may not need to pay lockage fees. As such, lockage fees would affect some commercial users more than others: if the fuel tax were replaced with lockage fees, some users (those that do not routinely pass through locks, but benefit from the pools created) may ultimately pay much less than they currently do, while others (those operating on areas of the system with a high number of locks) would pay much more.

Expanding the use of contributed funds. Expanding the Corps' authority to allow local sponsors—generally state and local governments or interstate agencies—to contribute to the costs of project construction, as is the case for other types of water resource projects, could increase available funding.[64] The Water Resources Reform and Development Act of 2014 established a pilot project that enabled the Corps to accept

[63]See Department of the Treasury, *General Explanations of the Administration's Fiscal Year 2011 Revenue Proposals* (February 2010).

[64]In return for contributing to construction costs, local sponsors have a key role in project planning and design. Corps navigation projects at coastal ports, for example, have project sponsors that contribute 20, 35, or 60 percent of construction costs depending on the length of the harbor.

contributed funds from nonfederal interests to pay for the costs of operating inland waterways facilities but does not allow such contributions for maintenance or construction.[65]

Some stakeholders said expanding the current use of contributed funds for operations expenses by enabling local sponsors to contribute funds for construction could potentially benefit some communities and increase available funding. However, the costs for construction and maintenance of facilities on high-use waterways would likely be too high for local sponsors to offset. Moreover, we have reported that state and local governments face long-term fiscal pressures, which may limit their ability to contribute to costs for navigation locks in their jurisdictions.[66]

Pursuing alternative-financing arrangements. The current administration and others have proposed alternative-financing options that could enable the Corps to leverage either private capital or other available funds in order to provide full upfront funding for inland waterways construction projects. Numerous proposals call for the Corps to leverage private capital, such as public-private partnerships or debt financing, to access full funding at the beginning of inland-waterways construction projects. The Water Resources Redevelopment Act of 2014 authorized the Corps to implement pilot programs to explore the use of debt financing, such as low interest loans provided under the Water Infrastructure Finance and Innovation Act of 2014,[67] and public-private

[65]Under this pilot project, the Department of the Army entered into two contributed funds agreements with the Armstrong County Board of Commissioners in Pennsylvania (for the upper Alleghany River) and with the Monongahela County Commission in West Virginia (for the upper Monongahela River). Under these agreements, local non-profit groups pay the Corps to increase operating times to facilitate recreational boating and fishing for locks on low-use waterways that had previously been operated by appointment only for commercial lockages. Pub. L. No. 113-121, tit. I. § 1017(a), 128 Stat. 1223 (2014) codified as 33 U.S.C. § 2212 note. A non-Federal interest is a private entity with the consent of the local government in which the project is located or that is otherwise affected by the project. 42 U.S.C. § 1982d–5b.

[66]GAO, *State and Local Government's Fiscal Outlook 2016 Update,* GAO-17-213SP (Washington, D.C.: 2016).

[67]The Water Infrastructure Finance and Innovation Act of 2014 (WIFIA) Pub. L. No. 113–121, title V, subtit. C. § 5026,128 Stat. 1193, 1334. (2014) established the WIFIA program, a federal credit program administered by the Environmental Protection Agency for eligible water and wastewater infrastructure projects. If legislation was enacted to implement this type of program for inland waterways construction projects, eligible borrowers—such as federal, state, and local government entities—could take out low-cost loans to provide upfront funding for construction.

partnerships for civil works water resources projects. Similarly, the current administration's 2018 Legislative Outline for Rebuilding Infrastructure in America proposes authorizing the Secretary of the Army to execute agreements with non-federal public or private entities for civil works water resources construction projects.

While some stakeholders stated that alternative-financing arrangements could increase available funding for inland-waterways construction projects, they were unsure of whether these agreements would work in practice. According to some stakeholders, public-private partnerships and debt-financing would provide upfront funding with an expectation of either a profitable return to a private equity partner or repayment of debt; however, according to some stakeholders, there is limited interest in entering into these financing arrangements among private sector investors because there is no clear and viable revenue stream to provide such returns.[68] For instance, some stakeholders told us that increasing fees for commercial users to provide a revenue stream could have the effect of reducing traffic on waterways, which would reduce the revenue potential of fees.

Alternative-financing arrangements would also require congressional action to implement. Specifically, depending on the structure of these financing agreements, alternative financing would require legislative changes, which could include granting the Corps authority to: (1) enter into public-private partnerships, (2) use debt financing, (3) use contract authority to obligate funding beyond what is appropriated in a given year,[69] or (4) collect and retain revenue such as lockage fees. While the Water Resources Reform and Development Act of 2014 authorized the pilot programs to explore the use of public private partnerships and debt financing, Corps officials told us that they cannot enter into agreements of this type without specific appropriations, which they have not yet

[68]We have previously reported that one of the limitations of using public-private partnerships for construction includes generating sufficient revenues to be financially viable. GAO, *Highway Public-Private Partnerships: More Rigorous Up-front Analysis Could Better Secure Potential Benefits and Protect the Public Interest*, GAO-08-44 (Washington, D.C. Feb. 8, 2008).

[69]The Corps would need to obtain congressional authorization for contract authority, which is specific statutory authority to incur an obligation in advance or in excess of an appropriation. Contract authority is unfunded, and a subsequent appropriation is needed to liquidate the obligation. This authority could be used to enable the Corps to obligate the full contract amount at the time of award prior to receiving an appropriation for the full amount.

received. Corps officials stated that they are currently developing a high level policy to provide general direction about the use of alternative financing but according to them, the lack of a clear revenue source may make it more difficult to execute alternative-financing strategies that include private partners for inland waterways infrastructure.

In contrast, the President recently proposed establishment of a Federal Capital Revolving Fund, which could enable federal agencies to access full upfront funding for certain construction projects without leveraging private capital.[70] According to the proposal, the revolving fund would transfer funding to agencies to finance large-dollar real-property capital projects designated in appropriations acts if the project receives an appropriation for the first of a maximum of 15 required annual repayments. If those conditions are met, the revolving fund would transfer funds to agencies to cover the full cost to acquire the capital asset—in the case of inland waterways, the full cost to construct the project. Purchasing agencies would repay the fund using annual appropriations—for inland waterways, this approach likely would mean that repayments could be made using appropriations from either the Trust Fund or general revenues. While Corps inland-waterways construction projects would not be eligible for funding under this proposal, this type of approach to alternative financing could potentially be used to enable the Corps to contract for inland waterways construction more efficiently. However, only projects included in the President's budget request would be eligible to receive this funding. At present, only one inland waterway project—Olmsted Locks and Dam—meets that requirement, and the Corps does not anticipate other authorized projects meeting the current benefit-cost ratio threshold for inclusion. Congressional action would be required to implement the proposed Federal Capital Revolving Fund, as well as authorize eligibility of inland-waterways construction projects, or a separate fund that would include Corps infrastructure projects.

Conclusions

The inland waterways are a critical component of the nation's freight transportation system, and the Corps must manage the system within the

[70]Under the President's proposal, the fund would be capitalized initially by a $10 billion mandatory appropriation and anticipates outlays over a 10-year budget window. Office of Management and Budget, *Efficient, Effective, Accountable: An American Budget, Budget of the United States Government, Fiscal Year 2019*.

context of competing priorities and limited resources. To effectively manage those resources, the Corps must accurately identify, assess, and communicate its priorities for operations, maintenance, and construction funding. The Corps cannot quantify deferred maintenance for inland waterways because it lacks a definition and measure (or measures) of deferred maintenance that reflects priorities and how deferral will affect system reliability. As such, the Corps is unable to clearly communicate its funding needs related to operating and maintaining the inland waterways.

As with many federal programs, the Corps manages inland-waterways-construction and major-rehabilitation projects within some fundamental constraints, including available Trust Fund revenue, which is less than the amount that would be needed to fully fund the estimated costs of any of the four ongoing new construction projects. Accordingly, Congress and the President have instead incrementally funded multiple construction projects at a time. However, this incremental-funding approach can lead to construction delays and increasing costs. As a result, other priority projects cannot be started, construction backlogs grow, and delays and closures continue to affect vessels at locks and dams that continue to deteriorate while waiting for replacement or rehabilitation. The Corps' capital investment strategy identifies an approach to funding priority projects given estimated Trust Fund revenue, but given the constrained fiscal environment and the unpredictable nature of the annual appropriations process, cost increases and schedule delays are likely to continue. Should Congress decide that additional funding is warranted to reduce this inefficiency, our report includes several options stakeholders have identified for doing so, such as increasing the federal share of construction costs for these projects. In the absence of increased funding, however, stakeholders we spoke to identified actions the Corps could take in coordination with Congress to increase the efficiency of contracting for inland waterways projects. The Corps could explore changes—such as sequencing project construction or legislative changes to enable more upfront funding prior to starting construction, among other options discussed in this report—that would enable the Corps to contract for inland waterways construction in a more efficient way. However, all of the options we discuss have important policy trade-offs and other challenges that the Corps and Congress would need to carefully consider.

Recommendations for Executive Action

We are making the following two recommendations to the Corps:

The Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers should define and measure deferred maintenance for inland waterways in a way that enables the Corps to clearly communicate estimated costs for maintenance needs. (Recommendation 1)

The Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers should pursue ways to increase the Corps' ability to use available funding for inland waterways construction more efficiently and, should changes to the Corps' authority be necessary, develop a legislative proposal to request such authority. (Recommendation 2)

Agency Comments

We provided a draft of this report to the Secretaries of Defense, Transportation, and Homeland Security and the Director of the Office of Management and Budget for review and comment. The Department of Defense provided written comments that are reprinted in appendix V; the department concurred with our recommendations. The Department of Homeland Security and Office of Management and Budget provided technical comments, which we incorporated as appropriate. The Department of Transportation had no comments on the draft report.

We are sending copies of this report to appropriate congressional committees; the Secretaries of Defense, Transportation, and Homeland Security; and the Director of the Office of Management and Budget. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or VonAhA@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this statement. GAO staff who made key contributions to this report are listed in appendix VI.

Andrew Von Ah
Director, Physical Infrastructure Issues

Appendix I: Inland and Intracoastal Fuel-Taxed Waterways of the United States

1. Alabama-Coosa Rivers: From junction with the Tombigbee River at river mile (hereinafter referred to as RM) 0 to junction with Coosa River at RM 314.
2. Allegheny River: From confluence with the Monongahela River to form the Ohio River at RM 0 to the head of the existing project at East Brady, Pennsylvania, RM 72.
3. Apalachicola-Chattahoochee and Flint Rivers (ACF): Apalachicola River from mouth at Apalachicola Bay (intersection with the Gulf Intracoastal Waterway) RM 0 to junction with Chattahoochee and Flint Rivers at RM 107.8. Chattahoochee River from junction with Apalachicola and Flint Rivers at RM 0 to Columbus, Georgia at RM155 and Flint River, from junction with Apalachicola and Chattahoochee Rivers at RM 0 to Bainbridge, Georgia, at RM 28.
4. Arkansas River (McClellan-Kerr Arkansas River Navigation System): From junction with Mississippi River at RM 0 to Port of Catoosa, Oklahoma, at RM 448.2.
5. Atchafalaya River: From RM 0 at its intersection with the Gulf Intracoastal Waterway at Morgan City, Louisiana, upstream to junction with Red River at RM 116.8.
6. Atlantic Intracoastal Waterway: Two inland waterway routes approximately paralleling the Atlantic coast between Norfolk, Virginia, and Miami, Florida, for 1,192 miles via both the Albermarle and Chesapeake Canal and Great Dismal Swamp Canal routes.
7. Black Warrior-Tombigbee-Mobile Rivers: Black Warrior River System from RM 2.9, Mobile River (at Chickasaw Creek) to confluence with Tombigbee River at RM 45. Tombigbee River (to Demopolis at RM 215.4) to port of Birmingham, RM's 374-411 and upstream to head of navigation on Mulberry Fork (RM 429.6), Locust Fork (RM 407.8), and Sipsey Fork (RM 430.4).

8. Columbia River (Columbia-Snake Rivers Inland Waterways): From the Dalles at RM 191.5 to Pasco, Washington (McNary Pool), at RM 330, Snake River from RM 0 at the mouth to RM 231.5 at Johnson Bar Landing, Idaho.
9. Cumberland River: Junction with Ohio River at RM 0 to head of navigation, upstream to Carthage, Tennessee, at RM 313.5.
10. Green and Barren Rivers: Green River from junction with the Ohio River at RM 0 to head of navigation at RM 149.1.
11. Gulf Intracoastal Waterway: From St. Mark's River, Florida, to Brownsville, Texas, 1,134.5 miles.
12. Illinois Waterway (Calumet-Sag Channel): From the junction of the Illinois River with the Mississippi River RM 0 to Chicago Harbor at Lake Michigan, approximately RM 350.
13. Kanawha River: From junction with Ohio River at RM 0 to RM 90.6 at Deepwater, West Virginia.
14. Kaskaskia River: From junction with Mississippi River at RM 0 to RM 36.2 at Fayetteville, Illinois.
15. Kentucky River: From junction with Ohio River at RM 0 to confluence of Middle and North Forks at RM 258.6.
16. Lower Mississippi River: From Baton Rouge, Louisiana, RM 233.9 to Cairo, Illinois, RM 953.8.
17. Upper Mississippi River: From Cairo, Illinois, RM 953.8 to Minneapolis, Minnesota, RM 1,811.4
18. Missouri River: From junction with Mississippi River at RM 0 to Sioux City, Iowa, at RM 734.8.
19. Monongahela River: From junction with Allegheny River to form the Ohio River at RM 0 to junction of the Tygart and West Fork Rivers, Fairmont, West Virginia, at RM 128.7.
20. Ohio River: From junction with the Mississippi River at RM 0 to junction of the Allegheny and Monongahela Rivers at Pittsburgh, Pennsylvania, at RM 981.
21. Ouachita-Black Rivers: From the mouth of the Black River at its junction with the Red River at RM 0 to RM 351 at Camden, Arkansas.
22. Pearl River: From junction of West Pearl River with the Rigolets at RM 0 to Bogalusa, Louisiana, RM 58.
23. Red River: From RM 0 to the mouth of Cypress Bayou at RM 236.

24. Tennessee River: From junction with Ohio River at RM 0 to confluence with Holstein and French Rivers at RM 652.
25. White River: From RM 9.8 to RM 255 at Newport, Arkansas.
26. Willamette River: From RM 21 upstream of Portland, Oregon, to Harrisburg, Oregon, at RM 194.
27. Tennessee-Tombigbee Waterway: From its confluence with the Tennessee River to the Warrior River at Demopolis, Alabama.

Appendix II: Inland Waterways Stakeholders GAO Interviewed

Stakeholder Type	Entity
Federal advisory entities	American Association of State Highway and Transportation Officials
Federal advisory entities	American Society of Civil Engineers
Federal advisory entities	Inland Waterways Users Board
Commercial waterways industry associations	American Farm Bureau Federation
Commercial waterways industry associations	The American Waterways Operators
Commercial waterways industry associations	Big River Coalition (New Orleans)
Commercial waterways industry associations	Gulf Intracoastal Canal Association (New Orleans)
Commercial waterways industry associations	Illinois Corn Growers Association (Rock Island)
Commercial waterways industry associations	National Association of Manufacturers
Commercial waterways industry associations	National Grain and Feed Association
Commercial waterways industry associations	Pacific Northwest Waterways Association (Walla Walla)
Commercial waterways industry associations	River Industry Action Committee (Rock Island)
Commercial waterways industry associations	Soy Transportation Coalition
Commercial waterways industry associations	Warrior-Tombigbee Waterway Association (Mobile)
Commercial waterways industry associations	Waterways Association of Pittsburgh (Pittsburgh)
Commercial waterways industry associations	Waterways Council, Inc.
Commercial waterways operators and shipping companies	Archer Daniels Midland Company (Rock Island)
Commercial waterways operators and shipping companies	Campbell Transportation Company, Inc. (Pittsburgh)

Stakeholder Type	Entity
Commercial waterways operators and shipping companies	Canal Barge Company, Inc. (New Orleans)
Commercial waterways operators and shipping companies	Channel Shipyard Companies (New Orleans)
Commercial waterways operators and shipping companies	Cooper Marine & Timberlands Corp (Mobile)
Commercial waterways operators and shipping companies	J. Craig Stepan, formerly of U.S. Steel (Mobile)
Commercial waterways operators and shipping companies	The Dow Chemical Company
Commercial waterways operators and shipping companies	LafargeHolcim
Commercial waterways operators and shipping companies	Parker Towing Company (Mobile)
Commercial waterways operators and shipping companies	Shaver Transportation (Walla Walla)
Commercial waterways operators and shipping companies	Tidewater Barge Lines (Walla Walla)
Commercial waterways operators and shipping companies	Turn Services (New Orleans)
Ports and other regional and local authorities	Arkansas Waterways Commission (Little Rock)
Ports and other regional and local authorities	Little Rock Port Authority (Little Rock)
Ports and other regional and local authorities	The Port of New Orleans (New Orleans)
Ports and other regional and local authorities	The Port of Pittsburgh Commission (Pittsburgh)
Ports and other regional and local authorities	Washington Grain Commission (Walla Walla)
Recreational waterways users	Alabama Scenic River Trail (Mobile)
Recreational waterways users	Allegheny River Development Corporation (Pittsburgh)
Recreational waterways users	Boat Owners Association of the United States (BoatUS)
Recreational waterways users	Little Rock Yacht Club (Little Rock)
Recreational waterways users	Upper Monongahela River Association (Pittsburgh)
Other waterways users	Allegheny County Sanitary Authority (Pittsburgh)
Other waterways users	Clarksville Light & Water Company (Little Rock)
Other waterways users	National Hydropower Association
Other waterways users	National Water Resources Association
Other waterways users	Southwestern Power Resources Association (Little Rock)
Researchers	C. James Kruse, Texas A&M University
Researchers	Chris Hendrickson, Ph.D., Carnegie Mellon University

Stakeholder Type	Entity
Researchers	Craig Philip, Ph.D., Vanderbilt University
Researchers	Dennis Lambert, COWI Marine North America
Researchers	Edward Dickey, Ph.D., Dawson & Associates
Researchers	Gary Loew, Dawson & Associates
Researchers	Jill Jamieson, Jones Lang LaSalle
Researchers	Leonard Shabman, Ph.D., Resources for the Future
Researchers	Paul Bingham, Economic Development Research Group, Inc.
Researchers	B. Starr McMullen, Ph.D., Oregon State University
Researchers	Stephen Fitzroy, Ph.D., Economic Development Research Group, Inc.
Researchers	Stephen Godwin, Transportation Research Board

Source: GAO. | GAO-19-20

Appendix III: Technical Appendix for GAO's Funding Simulation for Inland-Waterways Construction Projects

To illustrate the effects associated with the current-funding approach, which was consistently discussed as a challenge in interviews with agency officials and stakeholders, we developed a funding simulation for hypothetical projects using assumptions that were anchored in findings from a 2008 Corps study on factors contributing to cost increases for inland-waterways construction projects.[1] This funding simulation was intended to demonstrate the effects of the pattern and timing of funding on total project costs and construction schedules. To inform our assumptions, we analyzed the results of the Corps study, which examined three inland-waterways construction projects and identified the many factors that contributed to cost increases and schedule delays for each project. One of the factors the report identified that led to higher funding requirements (that is, cost overruns) was inefficient contracting driven by the amount and timing of funding provided to each project.

We developed five hypothetical scenarios that represent different funding approaches of a set of four identical construction projects (including a control scenario in which full upfront funding for all projects is available) based on the following information:

- each project requires $500 million in funding;
- each project takes 5 years to construct if it is fully funded with $500 million upfront;

[1]Department of Defense, U.S. Army Corps of Engineers, Great Lakes and Ohio River Division, *Inland Navigation Construction Selected Case Studies* (July 17, 2008).

- absent full upfront funding, projects were structured to expect funding of $100 million per year for the project;
- once started, funding is not interrupted over the period of our simulation;
- total amount of available funding to fund these projects is $200 million per year;[2] and;
- the number of years the projects provide benefits—that is, the number of years a facility has been constructed and is available for use by vessels—varies within the period of time selected for the simulation (2020 through 2034).

To illustrate the effects of the different funding approaches on total project costs and time frames, we made assumptions about the effect of various funding structures on total funding requirements.[3] These assumptions were informed by our review of the findings of the Corps' study related to the effects of incremental funding and discussions of these issues with Corps officials. These assumptions include:

- Remaining required project funding was assumed to increase by 2 percent each year due to inefficient contracting that results from less than full upfront funding—that is, if the full $500 million of estimated project funding is not provided in year 1.
- Remaining required project funding was also assumed to increase by 0.5 percent each year if projects received less funding than is expected in a given year (less than $100 million) due to exacerbated project-contracting inefficiencies.
- An increase of 2 percent per year of remaining required project funding was applied if the project's start was delayed beyond its intended starting year due to inflation.

We applied increases to funding requirements where appropriate under the five different funding approaches:

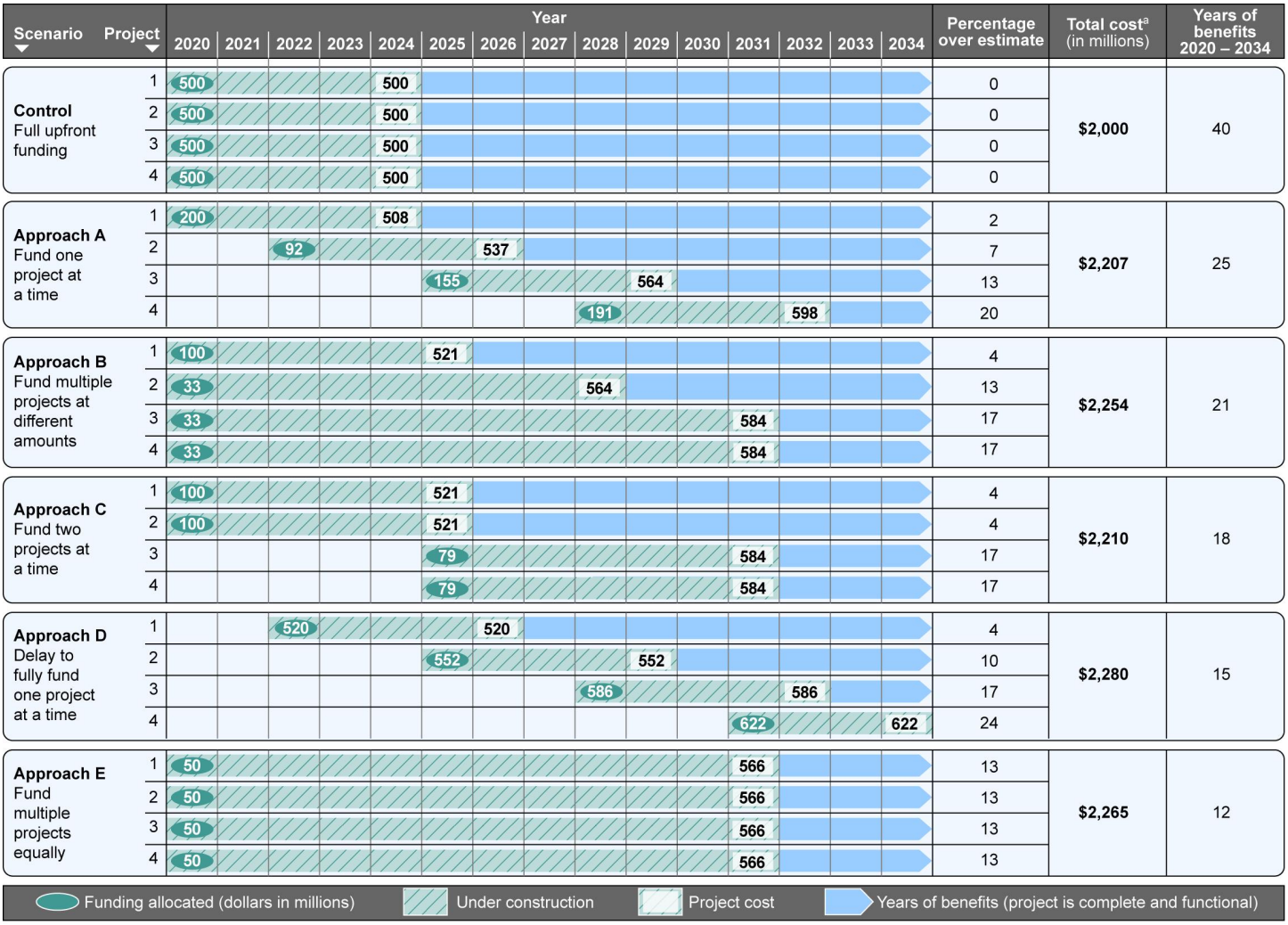
[2]We built this assumption based on the fact that the Inland Waterways Trust Fund generally receives about $100 million in revenue from commercial barge/towboat fuel tax receipts annually, and this funding is generally matched 1 to 1 for construction projects by general revenues, bringing total expected annual funds to $200 million.

[3]By "costs," we are referring to the appropriated dollars that will be required to complete a project. In this funding simulation, we are not discounting each project's hypothetical expenditures over the time frames and comparing present value costs. Rather, we are illustrating the budgetary effect of reduced efficiency associated with incremental funding.

- Approach A: Fund One Project at a Time—Funding only one project at a time with all available funding ($200 million). Once the first project has been fully funded, all available funding is provided to the second project, and so on.
- Approach B: Fund Multiple Projects at Different Amounts—Funding one project at a time at the expected level—that is, at $100 million each year until it is finished—then dividing remaining available funding equally to the remaining three projects. After the first project is complete, the second project receives $100 million each year until completion and the remaining funding is divided evenly, and so on.
- Approach C: Fund Two Projects at a Time—Available funding is divided among two projects; two projects receive funding at the expected level ($100 million) and the start of funding for the remaining projects is delayed until the first 2 are completed.
- Approach D: Delay Construction to Fully Fund One Project at a Time—Full upfront funding for one project at a time: allocation of funds is delayed until the entire remaining funding required ($500 million plus increases due to inflation) is available.
- Approach E: Fund Multiple Projects Equally—Equally funding all four projects at once: since the overall budget is $200 million, each project is funded at $50 million per year.

We found that the timing and amount of incremental funding resulted in varying degrees of cost overruns (see fig. 13). In addition, the different funding approaches led to varying years of benefits—as measured by the Corps as the number of years a facility has been constructed and available for use by vessels—counted over a 15-year span of our simulation. This variation is shown in figure 13, but these projects would provide many years of benefits beyond this timeframe. For example, we found that—compared to other approaches—an incremental funding approach that concentrates all available funding to one of the four projects at a time, as in Approach A, below, can reduce inefficiency.

Figure 13: Comparison of Hypothetical New Construction Project Costs, Timeframes, and Years of Benefits for Different Funding Approaches over a 15-Year Period



Source: GAO analysis. | GAO-19-20

[a]By "costs," we are referring to the appropriated dollars that will be required to complete a project. We are not comparing present value costs of these hypothetical projects, but rather are illustrating the budgetary effect of incremental funding.

To validate our findings, we solicited feedback from Corps officials from the Pittsburgh District, Pennsylvania and Rock Island District, Illinois—based on their past and current experience with inland-waterways construction projects—from the Corps' Cost Estimating Center of Expertise in Walla Walla, Washington; and representatives from the Waterways Council, Inc. to understand the perspectives of industry

stakeholders. They all generally agreed that our assumptions, approaches, and results were reasonable.

Appendix IV: Objectives, Scope, and Methodology

In this report, we (1) assess how the Corps allocates funds for operations and maintenance projects for the inland waterways system; (2) describe how the Corps prioritizes and funds construction projects, and assess the effect of the current-funding approach on projects' costs and schedules; and (3) present stakeholder opinions on proposed options to alter the funding and management of inland waterways and any associated limitations or trade-offs. The scope of our review includes Corps activities related to managing commercial navigation—including operations, maintenance, and construction—on the 27 inland waterways subject to the inland waterways diesel fuel tax. The fuel-taxed inland waterways system is made up of the navigable waterways of the Mississippi River and its tributaries, the Ohio River basin, the Gulf and Atlantic Intracoastal Waterways, and the Columbia-Snake Rivers, among others (see app. I for a list of fuel-taxed inland waterways). Commercial navigation activities are those that facilitate the movement of traffic along the waterways for commercial purposes, such as the transportation of goods for sale. For contextual information on operations, maintenance, and construction spending, we analyzed Corps financial data on obligations for operations and maintenance for inland-waterways navigation projects for fiscal years 2006 through 2017 (the only years for which data were available) and allocations for construction and major rehabilitation of locks and dams for fiscal years 1997 through 2018 from the Corps of Engineers Financial Management System.[1] To determine the reliability of this data for the purposes of this report, we reviewed the data to identify obvious errors and missing data and interviewed appropriate Corps officials about related internal controls and procedures and the limitations of the data. We found these data to be sufficiently reliable for the purpose of providing contextual information about funding for inland waterways operations and maintenance and construction over time.

With regard to all of our reporting objectives, we interviewed a range of Corps officials at the headquarters, division, and district levels, as well as

[1]Congress appropriates funds for the Corps' Civil Works Program, and the Corps then allocates those appropriated funds among the various missions, including for inland waterways construction projects.

national and regional stakeholders.[2] We interviewed district officials from a non-generalizable sample of 6 of the 24 Corps districts that manage fuel-taxed waterways within their district boundaries; we selected the districts to include a variety of geographic regions, waterway characteristics, primary commodities shipped, and history of construction projects funded through the Trust Fund. Based on these criteria, we selected the Corps districts in Little Rock, Arkansas; Mobile, Alabama; New Orleans, Louisiana; Pittsburgh, Pennsylvania; Rock Island, Illinois; and Walla Walla, Washington. In addition, we interviewed officials from the Corps' Northwestern Division office, which oversees the Walla Walla District, to understand the division-level role in coordinating districts' inland-waterways infrastructure projects. We also conducted a total of 42 semi-structured interviews with waterways stakeholders representing 43 different regional and national entities including commercial, recreational, and other waterway users and 12 researchers (academics, economists, and engineers) for a total of 55 stakeholders. National stakeholders were identified by reviewing related literature and our prior reports and recommendations from the Transportation Research Board and the Waterways Council, Inc. (an industry organization representing a range of waterway users including shippers, ports, energy providers, waterways operators, and other advocacy groups). Regional stakeholders in the six selected districts were identified through recommendations from agencies and national waterways stakeholder organizations to represent a mix of commercial users (such as barge companies and shippers with commercial interests in the U.S. inland waterways system); recreational users; and industrial water users (such as municipal water authorities and hydropower entities). From those stakeholders identified, we selected entities to interview to achieve diversity of waterway users' perspectives and conducted interviews with both individual entities as well as associations representing a variety of users and companies.[3] In addition to waterways' users, we also interviewed stakeholders who have conducted research regarding the management of and allocation of funding for fuel-taxed waterways, selected based on their contributions to the relevant literature on options for funding and managing inland

[2]The Corps Civil Works Program, under which the Corps manages the inland waterways system, is organized into three tiers: a headquarters in Washington D.C., eight regional divisions, and 38 local district offices.

[3]Specifically, we conducted interviews with representatives of at least three entities within each of the selected districts, and overall we conducted interviews with at least three regional entities and one national entity in the following categories: barge operators, shippers, recreational waterway users, and other waterway users.

waterways, including academics, economists, and engineers who were knowledgeable about a range of topics including commodities transportation (agricultural, energy products, and other materials), engineering, and water resources. See appendix II for a list of entities represented among the stakeholders we interviewed.

We asked agency officials and stakeholders open-ended questions and did not conduct a survey in which a response was provided irrespective of whether a certain issue was relevant to the interviewee, so not every topic was brought up or discussed by every interviewee. We analyzed the responses to identify common themes and the range of opinions that arose in interviews, which we have reported on. To identify these themes and summarize the opinions of agency officials and stakeholders, potential themes were identified via review of a sample of interviews. Two analysts then conducted a content analysis to identify the themes discussed in each interview and categorize the opinions of the interviewees. For each interview, one analyst independently reviewed the record of interview, and the other analyst later verified that coding. If there was disagreement, the analysis discussed their assessment and came to a final determination on the categorization. Because we selected a non-generalizable sample of stakeholders, their responses should not be used to make inferences about a population. To characterize stakeholders' views throughout this report, we defined modifiers (e.g., "some") to quantify stakeholders as follows:

- "some" stakeholders represents stakeholders in 3 to 14 of the 42 interviews
- "many" stakeholders represents stakeholders in 15 or more of the 42 interviews.

To examine how the Corps allocates funds for operations and maintenance projects for the inland waterways system, we examined the President's budget request for civil works and appropriations for fiscal years 1997 through 2018 as well as the Corps' budget request development guidance to understand how the Corps develops its budget request and prioritizes operations and maintenance projects. We conducted site visits to Mobile, Alabama; New Orleans, Louisiana; and Pittsburgh, Pennsylvania, to interview Corps officials and various regional stakeholder groups in person, and to observe the condition of waterway infrastructure. We also interviewed officials from the Office of the Assistant Secretary of the Army for Civil Works (ASA-CW), the Office of Management and Budget (OMB), the Department of Transportation's Maritime Administration, and the Department of Homeland Security's U.S.

Coast Guard to understand how the Corps coordinates with other agencies to fulfill its inland-waterways navigation mission. To assess the Corps' efforts related to deferred maintenance we interviewed Corps officials about how the Corps measures and defines deferred maintenance and compared these practices with federal internal-control standards related to control activities and quality information.[4]

To describe how the Corps prioritizes and funds inland-waterways construction projects and to examine the effect of the current funding approach on projects' costs and schedules, we reviewed relevant statutes, agency policies and guidance, the Corps' capital-investment strategy documents prepared in conjunction with the Inland Waterways Users Board, as well as the Corps' Civil Works budget justification documents in support of President's budget requests, congressional appropriations, and accompanying conference reports. We also reviewed relevant Corps documents, such as reports on ongoing construction projects and studies on construction cost increases; prior GAO reports; OMB capital funding guidance; and other academic studies to gather information on capital project funding approaches, including for inland waterways projects. We analyzed data from the Corps of Engineers Financial Management System to identify sources of funding for inland-waterways construction projects from fiscal years 1996 through 2018. As discussed above, we found these data sufficiently reliable for the purposes of providing contextual information about the Corps' funding sources. In addition to interviewing Corps officials and stakeholders, as described above, we also interviewed officials from the office of the ASA-CW and OMB for their views regarding the prioritization and funding processes for inland waterways-infrastructure projects, and the roles their organizations play in those processes. We compared the established method of funding inland-waterways construction projects with federal internal-control standards, OMB guidance,[5] and prior GAO work related to funding capital projects.[6]

[4]GAO, *Standards for Internal Control in the Federal Government,* GAO-14-704G (Washington, D.C.: September 2014).

[5]Office of Management and Budget (OMB), *Capital Programming Guide, Supplement to OMB Circular A-11: Planning, Budgeting, and Acquisition of Capital Assets* (2017).

[6]See, for example: GAO, *Budget Issues: Alternative Approaches to Finance Federal Capital*, GAO-03-1011 (Washington, D.C.: August 21, 2003)

To illustrate the effects of the current funding approach on costs and schedules for inland-waterways construction projects, we developed a simulation of the effects of various funding approaches on the total funding requirements for a set of hypothetical construction projects. The simulation incorporates assumptions regarding the amount of total funding a project would require (including any cost overruns) due to the pattern and timing of funding made available. Our assumptions were anchored in findings from a 2008 Corps study on factors contributing to cost increases for three inland-waterways construction projects, and Corps officials and other industry stakeholders generally agreed that our assumptions and results were reasonable.[7] Additional information on our methodology for developing this simulation and the full results are included in appendix III.

Finally, to identify proposed options to alter the funding and management of inland waterways, we conducted a literature search—including scholarly/peer-reviewed journals, government reports, congressional hearings' transcripts, and associations' and think tanks' publications—to identify relevant studies and proposals about inland waterways' financing in the United States, published between 2007 and 2017. Through our literature search, we reviewed the abstracts for 103 potentially relevant studies and identified 24 for further review. For each of these 24 studies, we reviewed the entire study and determined 13 studies were relevant. We then reviewed these 13 studies to identify the options most commonly discussed or proposed. For the purposes of this report, we have divided those options into broad categories:

- altering the cost sharing between the Trust Fund and federal appropriations,
- requiring other users and beneficiaries of the waterways to contribute to the Trust Fund,
- increasing or adding fees for commercial users,
- expanding opportunities for local sponsors to contribute to funding specific projects, and
- pursuing alternative-financing arrangements.

[7]Department of Defense, U.S. Army Corps of Engineers, Great Lakes and Ohio River Division, *Inland Navigation Construction Selected Case Studies* (July 17, 2008).

In addition, we reviewed proposals by recent administrations, including the fiscal year 2018 President's budget request, and interviewed Corps officials and other entities including the Transportation Research Board and district and agency stakeholders selected as described above to ensure we had identified the most relevant options. During interviews with stakeholders (as discussed above) we asked about their general views on the potential benefits limitations, and trade-offs of those options. See appendix II for a list of the stakeholders we interviewed.

We conducted this performance audit from June 2017 through November 2018 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix V: Comments from the Department of Defense

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
CIVIL WORKS
108 ARMY PENTAGON
WASHINGTON DC 20310-0108

OCT - 2 2018

Mr. Andrew J. Von Ah
Director
Physical Infrastructure
U.S. Government Accountability Office
441 G Street, NW
Washington, D.C. 20548

Dear Mr. Von Ah:

This is the Department of Defense (DoD) response to the GAO Draft Report, GAO-19-20, "INLAND WATERWAYS: Actions Needed to Increase Budget Transparency and Contracting Efficiency," dated September 14, 2018 (GAO Code 102112).

The DoD concurs with comment to the two recommendations in the GAO report. Specifics regarding our planned efforts are listed in Enclosure 1. The DoD appreciates this opportunity to review the draft report. My point of contact is Mr. Theodore Kerr who can be reached at theodore.e.kerr.civ@mail.mil and 703-697-6985.

Sincerely,

JOSEPH P. BENTZ
Deputy Assistant Secretary of the Army
Management and Budget

Encl

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ENCLOSURE 1

GAO DRAFT REPORT DATED SEPTEMBER 14, 2018
GAO-19-20 (GAO CODE 102112)

"INLAND WATERWAYS: ACTIONS NEEDED TO INCREASE BUDGET TRANSPARENCY AND CONTRACTING EFFICIENCY"

DEPARTMENT OF DEFENSE COMMENTS
TO THE GAO RECOMMENDATION

RECOMMENDATION 1: The GAO recommends that the Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers should define and measure deferred maintenance for inland waterways in a way that enables it to clearly communicate estimated costs for maintenance needs.

USACE RESPONSE: Concur, with comment. The Assistant Secretary of the Army (Civil Works) will direct the U.S. Army Corps of Engineers (USACE) Director of Civil Works to define and measure deferred maintenance for inland waterways in a way that enables the Corps to clearly communicate estimated costs for maintenance needs.

USACE will continue to coordinate appropriate actions to further develop, adopt and enhance measures to assess accomplishments of maintenance and repairs.

RECOMMENDATION 2: The GAO recommends that the Chief of Engineers and Commanding General of the U.S. Army Corps of Engineers should pursue ways to increase the Corps' ability to use available funding for inland waterways construction more efficiently and, should changes to the Corp's authority be necessary, develop a legislative proposal to request such authority.

USACE RESPONSE: Concur, with comment. The Assistant Secretary of the Army (Civil Works) will direct the U.S. Army Corps of Engineers (USACE) Director of Civil Works to pursue ways to increase the Corps' ability to use available funding for inland waterways construction more efficiently. Should changes to the Corps' authority be necessary, the Army will develop a legislative proposal to request such authority.

Appendix VI: GAO Contact and Staff Acknowledgments

GAO Contact

Andrew Von Ah, (202) 512-2834 or Vonaha@gao.gov.

Staff Acknowledgments

In addition to the contact named above, the following individuals made important contributions to this report: Susan Zimmerman, Assistant Director; Katie Hamer, Analyst-In-Charge; Amy Abramowitz; Faisal Amin; Krister Friday; Carol Henn; Hannah Laufe; Sara Ann Moessbauer; Josh Ormond; Cheryl Peterson; Amy Rosewarne; Alexandra Rouse; Lisa Shibata; and Pamela Snedden.

Appendix VII: Accessible Data

Data Tables

Accessible Data for Figure 4: Annual Obligations for Inland Waterways Operations and Maintenance, Fiscal Years 2006–2017

Fiscal year	Operations and maintenance
2006	458702
2007	378417
2008	570787
2009	930601
2010	818018
2011	617525
2012	771065
2013	595944
2014	754413
2015	755923
2016	817666
2017	807068

Accessible Data for Figure 5: Annual Funding Allocated for Inland Waterways Construction Projects by Source, Fiscal Years1997–2018

Year	General Revenues (dollars in millions)	Inland Waterways Trust Fund (dollars in millions)	American Recovery and Reinvestment Act Funds (dollars in millions)	Inland Waterways Trust Fund as percentage
1997	44.0846	57.318	0	57
1998	54.449	62.015	0	53
1999	56.131	72.655	0	56
2000	91.538	98.8	0	52
2001	95.3925	111.581	0	54
2002	98.0889	98.0589	0	50
2003	95.3767	94.9687	0	50

Year	General Revenues (dollars in millions)	Inland Waterways Trust Fund (dollars in millions)	American Recovery and Reinvestment Act Funds (dollars in millions)	Inland Waterways Trust Fund as percentage
2004	113.055	116.815	0	51
2005	138.672	136.061	0	50
2006	197.688	183.302	0	48
2007	213.473	196.473	0	48
2008	186.239	202.161	0	52
2009	90.5585	149.469	354.671	25
2010	52.7871	71.696	65.8696	38
2011	68.8866	97.0387	10.6711	55
2012	76.5256	81.3368	9.15907	49
2013	134.681	87.2094	0.933973	39
2014	172.541	96.6553	0	36
2015	217.54	68.3086	0	24
2016	295.199	108	0	27
2017	306	109	0	26
2018	261	138	0	35

Accessible Data for Figure 10: Comparison of Funding for Projects in President's Budget Request to Funding for Additional Inland-Waterways Construction Projects (in Millions), Fiscal Year 2018

Category	President's budget request (General Revenue) (dollars in millions)	President's budget request (Inland Waterways Trust Fund) (dollars in millions)	Allocated by Congressional direction (General Revenue) (dollars in millions)	Allocated by Congressional direction (Inland Waterways Trust Fund) (dollars in millions)
Olmsted Locks and Dam	149	26	0	0
Lower Monongahela Locks and Dams	0	0	49	49
Kentucky Lock Addition	0	0	19.75	19.75
Chickamauga Lock	0	0	38.25	38.25
LaGrange Lock			5	5

President's budget request total	President's budget request percentage	Allocated by Congressional direction total	Allocated by Congressional direction percentage
175	44	224	56

Accessible Data for Figure 11: Timeline of Construction Authorization and Funding for Ongoing Inland Waterways Construction Projects, as of 2018

Category	Year project was authorized for construction	Planned completion date estimated after project authorization	Project included in President's budget request and allocated funds via congressional appropriations	Project allocated funds per congressional direction from appropriation greater than President's budget request	Project was included in President's budget request, but the Corps reprogrammed project funding to another project
Olmsted Locks and Dam	1988	2005	1991-2018	Not applicable	Not applicable
Lower Monongahela Locks and Dams	1992	2003	1995-2016	2017-2018	Not applicable
Kentucky Lock Addition	1996	2007	1998, 2000-2005, 2008-2011	1999, 2006-2007, 2012-2013, 2015-2018	Not applicable
Chickamauga Lock	2003	2014	2007-2010	2004-2006, 2011, 2014-2018	2010

Accessible Data for Figure 12: Comparison of Hypothetical New Construction Project Costs, Time Frames, and Years of Benefits for Two Different Funding Approaches over a 15-Year Period

Approach	Percent over estimate	Total cost (dollars in millions)	Years of benefits, 2020-2034
Fund one project at a time , approach A1	2	2207	25

Approach	Percent over estimate	Total cost (dollars in millions)	Years of benefits, 2020-2034
Fund one project at a time , approach A2	7	2207	25
Fund one project at a time , approach A3	13	2207	25
Fund one project at a time , approach A4	20	2207	25
Fund multiple projects at different amounts, approach B1	4	2254	21
Fund multiple projects at different amounts, approach B2	13	2254	21
Fund multiple projects at different amounts, approach B3	17	2254	21
Fund multiple projects at different amounts, approach B4	17	2254	21

Accessible Data for Figure 13: Comparison of Hypothetical New Construction Project Costs, Timeframes, and Years of Benefits for Different Funding Approaches over a 15-Year Period

Approach	Percent over estimate	Total cost (dollars in millions)	Years of benefits, 2020-2034
Control (full upfront funding) , approach 1	0	2000	40
Control (full upfront funding) , approach 2	0	2000	40
Control (full upfront funding) , approach 3	0	2000	40
Control (full upfront funding) , approach 4	0	2000	40
Fund one project at a time , approach A1	2	2207	25
Fund one project at a time , approach A2	7	2207	25
Fund one project at a time , approach A3	13	2207	25
Fund one project at a time , approach A4	20	2207	25

Approach	Percent over estimate	Total cost (dollars in millions)	Years of benefits, 2020-2034
Fund multiple projects at different amounts, approach B1	4	2254	21
Fund multiple projects at different amounts, approach B2	13	2254	21
Fund multiple projects at different amounts, approach B3	17	2254	21
Fund multiple projects at different amounts, approach B4	17	2254	21
Fund two projects at a time, approach C1	4	2210	18
Fund two projects at a time, approach C2	4	2210	18
Fund two projects at a time, approach C3	17	2210	18
Fund two projects at a time, approach C4	17	2210	18
Delay to fully fund one project at a time, approach D1	4	2280	15
Delay to fully fund one project at a time, approach D2	10	2280	15
Delay to fully fund one project at a time, approach D3	17	2280	15
Delay to fully fund one project at a time, approach D4	24	2280	15
Fund multiple projects equally, approach E1	13	2265	12
Fund multiple projects equally, approach E2	13	2265	12
Fund multiple projects equally, approach E3	13	2265	12
Fund multiple projects equally, approach E4	13	2265	12

Agency Comment Letter

Accessible Text for Appendix V Comments from the Department of Defense

Page 1

OCT - 2 2018

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Physical Infrastructure

U.S. Government Accountability Office

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Washington , D.C. 20548

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JOSEPH P. BENTZ

Deputy Assistant Secretary of the Army

Management and Budget

Encl

Page 2

ENCLOSURE 1

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