# Recommendations for Improving the Delivery of Inland Waterway Capital Projects

Waterways Council, Inc.

WATERWAYS COUNCIL, INC.

*Prepared by HDR*

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# Contents

## Tables



## Figures



## Appendices

# Executive Summary

The nation's inland waterways, which are vitally important for commerce, face challenges related to aging infrastructure. The lock and dam network that allows commercial barges to carry cargo down the nation's major rivers and waterways is reaching the end of its useful life, with nearly 80 percent of the facilities over 50 years old and an overall average age of 70 years. However, in recent years, the U.S. Army Corps of Engineers (USACE) has faced challenges delivering projects to replace the locks and dams—with projects often experiencing substantial cost increases and schedule delays.

This study, commissioned by the Waterways Council, Inc. (WCI), involved interviews with stakeholders at USACE and other agencies to gather input on how to improve the delivery of lock and dam projects. Background research was also completed, including previous studies specifically related to inland waterway projects and more generally to the challenges of delivering large infrastructure projects on time and within budget.

The stakeholder interviews and background research revealed six themes for potential improvements, as discussed below:

**Overall Inland Waterways Program**: This theme focuses on treating the inland waterways as a system, prioritizing two to three large projects at a time, and fostering project team expertise.

**Funding**: This theme emphasizes using continuing contracts, taking a programmatic approach to funding (rather than project-by-project authorizations), and ensuring design maturity to produce better cost estimates.

**Project Planning**: This theme pertains to addressing the project information bottleneck posed by the Office of Management and Budget (OMB), engaging dedicated and experienced professionals within USACE and the broader industry for planning and management, identifying separable project elements that can be more easily funded and contracted out based on designer and contractor specialties, and ensuring consistent and focused "cradle-to-grave" project oversight.

**Scoping and Design**: This theme focuses on conducting more rigorous site investigations for high-risk items (such as geotechnical, seismic, dewatering, real estate, environmental, and other National Environmental Policy Act [NEPA] issues), creating a standard design for components requiring limited site adaptation, and completing collaborative design (in a three-dimensional [3D] model) and constructability reviews.

**Cost Estimates and Schedules**: This theme pertains to conducting independent external peer reviews of project costs and schedules, identifying and including high-risk items during the project feasibility stage for better contingency estimates, and conducting value studies/analyses during planning/feasibility and value engineering during design.

**Construction Contracting and Project Execution**: This theme covers exploring alternative delivery methods (rather than the traditional design-bid-build approach), maintaining a strategic reserve of key operation and maintenance (O&M) infrastructure components, and ensuring experienced resident engineers are assigned to large and complex projects.

Based on the study findings, WCI tasked HDR with outlining recommendations that could be reasonably implemented and would bring positive change for the delivery of inland

waterway projects. HDR provided several potential recommendations for Congress, and also provided recommendations for USACE and other parties to implement the Congressional actions that would transform how inland waterway projects are delivered.

| Recommendations |
| --- |
| ***Recommendations for Congress*** |
| • Treat inland waterways as a system and provide programmatic funding on an annual basis.<br>• Require the use of continuing contracts and/or incremental funding clauses for inland waterways projects.<br>• Direct the use of alternative delivery approaches and provide funding for pilot projects.<br>• Support USACE priority projects and do not request projects outside of the prioritized list. |
| ***Recommendations for Administration Outside USACE*** |
| • Rescind or modify Executive Order (EO) 12322 to address OMB's role in withholding critical information related to water resources projects needed by Congress for appropriation decision-making.<br>• Allow USACE to use continuing contracts again, on the condition that USACE provides detailed guidance for their use. |
| ***Recommendations for USACE Headquarters*** |
| • Create an inland navigation waterways system program management office (PMO) at USACE Headquarters, potentially separate from the current Navigation Branch and similar to the Hurricane Protection Office set up after Hurricane Katrina.<br>• As an annual update to the outyear funding baseline scenario of the Capital Investment Strategy (CIS), create and implement an Inland Navigation Investment Plan that reevaluates priorities based on prior year funding received and actual project execution. This includes allowing the Inland Waterways Users Board (IWUB) to prioritize Inland Waterways Trust Fund (IWTF) monies to perform feasibility efforts for identification of potential improvements to the inland waterway system.<br>• Update and consider additional methods/criteria for project prioritization, including the broader use of the CIS Operation Risk Assessment (ORA) and comprehensive benefit-cost analysis (BCA).<br>• Provide detailed guidance for and revive the use of continuing contracts and incremental funding clauses, with criteria related to project size, duration, and funding.<br>• Ensure project management continuity and technical capabilities/expertise through hybrid (in-person and virtual) competency centralization including creation of an inland navigation PMO, leveraging the existing Inland Navigation Design Center (INDC) and experienced construction engineers. Develop focused knowledge transfer and succession planning through training programs and direct project experience.<br>• Seek construction funding authorization only after design includes critical information to address elements with a high risk of change conditions, typically 35% design or a comparable stage of alternative delivery (for example, early contractor involvement [ECI], integrated design and construction [IDaC], or other design-build).<br>• Improve cost estimates by using the Bureau of Reclamation (BOR) process for cost estimating.<br>• Facilitate the use of reference class forecasting (RCF) by establishing a centralized database and providing access to cost data for completed projects.<br>• Use standard design for locks and dams to the extent possible.<br>• Identify pilot projects for ECI and IDaC.<br>• Enhance collaboration with industry and outside agencies for identification and adoption of best practices (for example, PIANC). |

| Recommendations |
| --- |
| ***Recommendations for USACE Headquarters (continued)*** |
| • Create a contracting plan for each project, identifying separable project elements and optimal delivery approach.<br>• Use 3D modeling and design and complete constructability reviews.<br>• Expand site investigation efforts as part of 35% design (or a comparable stage of alternative delivery) to better identify critical information/issues to address elements with high risk of change conditions.<br>• Improve cost estimating and value engineering by using independent cost estimators or independent reviewers, updating estimates, and encouraging collaboration between designers and cost estimators. |

# 1 Introduction

This study makes recommendations to improve the delivery of lock and dam projects on inland waterways under USACE jurisdiction. Commissioned by WCI, this report presents the findings of stakeholder interviews—including top leaders at USACE—and a review of similar research completed over the years regarding USACE lock and dam projects, and other large infrastructure projects, focusing on the cost and schedule aspects of project delivery.

WCI plans to present these recommendations to Congress to:

- Improve the reliability of the nation's inland waterway lock and dam network.
- Optimize the framework for continued and effective lock and dam project delivery.
- Support active and growing riverine commerce throughout the nation.

Recommendations have been tailored to meet the following criteria:

- Execution will have a high probability of effecting positive change.
- Congress, the Administration, and USACE can reasonably implement these recommendations.

**What Is the Waterways Council, Inc.?**

WCI was founded in 2003 and advocates for maintaining our nation's competitiveness and economic growth by supporting the inland waterways network.

Its members represent shipping and related companies that rely on our "marine highways" to transport valuable and essential cargo to U.S. and international markets.

The following subsections provide background information on the inland waterway system. Section 2 discusses the study approach, with Section 3 reporting the analysis and findings. Section 4 provides recommendations for improving the delivery of inland waterway lock and dam projects, followed by additional discussion and context for those recommendations in Section 5. Section 6 summarizes the study findings and recommendations.

## 1.1 Background

### 1.1.1 Importance of the Inland Waterway System

The nation's inland waterway system consists of an estimated 25,000 miles of navigable waterways, including both coastal and inland waterways. These waterways are a part of the country's Marine Transportation System, a complex network of coastal and inland waterways, ports, intermodal connections, and their commercial, military, and recreational vessels and users. The waterways and land access connectors of the system facilitate commerce, recreation, and national defense. Marine connections also affect roadway, rail, and pipeline traffic throughout the nation's entire supply chain. The inland waterway system is recognized as a key component in the National Strategy for the Marine Transportation System (U.S. Committee on the Marine Transportation System 2023).

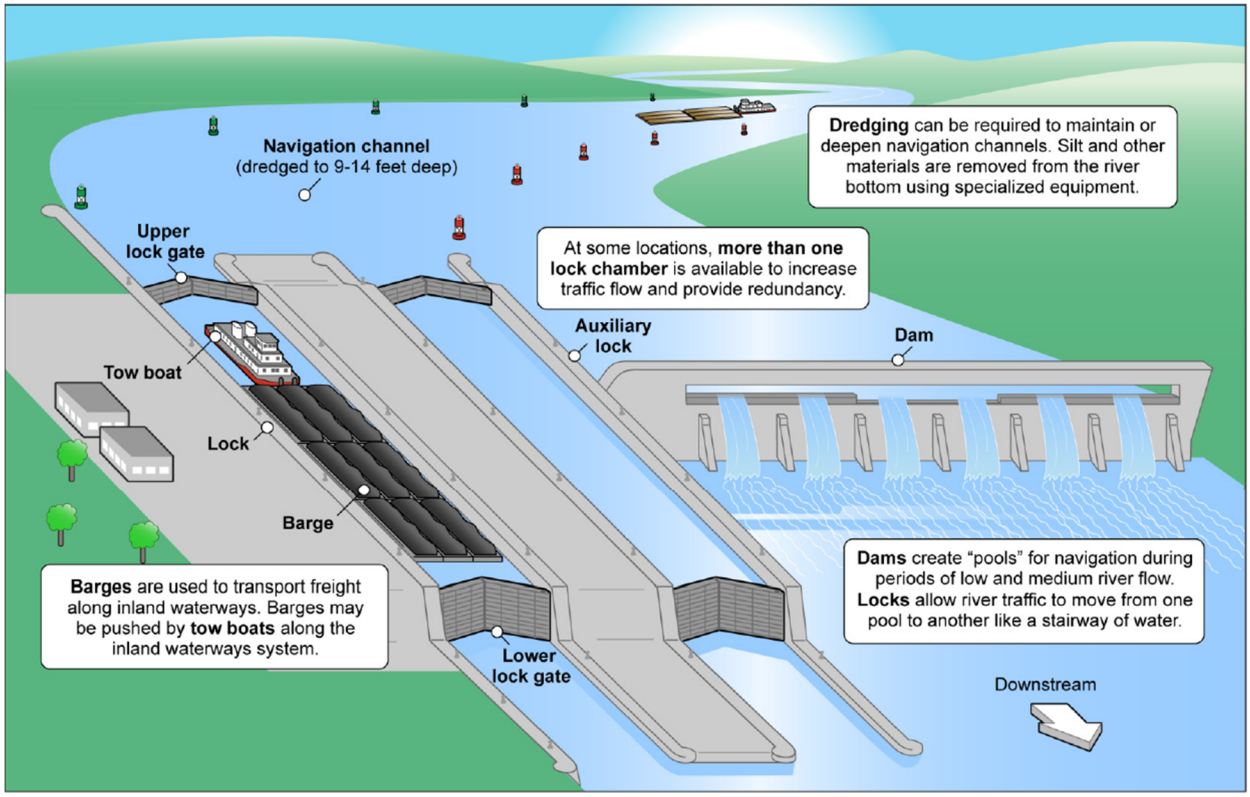
USACE is responsible for maintaining 12,000 miles of these waterways. These maintained waterways include rivers, intra-coastal waterways, and channels, as shown in Figure 1.

**Figure 1**. USACE-maintained inland waterways


Source: USACE (2025a)

Historically, the water levels in many rivers throughout the United States were too inconsistent to reliably support commercial marine traffic. Consequently, dams were built to create and maintain the water depth needed to support barge and boat traffic. In addition to supporting navigation, dams also support flood control, water supply, hydropower generation, and recreational uses. Because dams tend to block river traffic, locks were built alongside the dams to allow barges and boats to pass through. Boats and barges enter the lock and are lifted or lowered by pumping or releasing water in a lock chamber to the level of the water on either side of the dam. A lock may contain more than one chamber, allowing more than one boat to pass through the locks simultaneously. USACE currently operates and maintains 218 lock chambers at 176 sites (USACE 2019). Figure 2 illustrates a typical lock and dam system.

**Figure 2**. Illustration of a typical lock and dam system

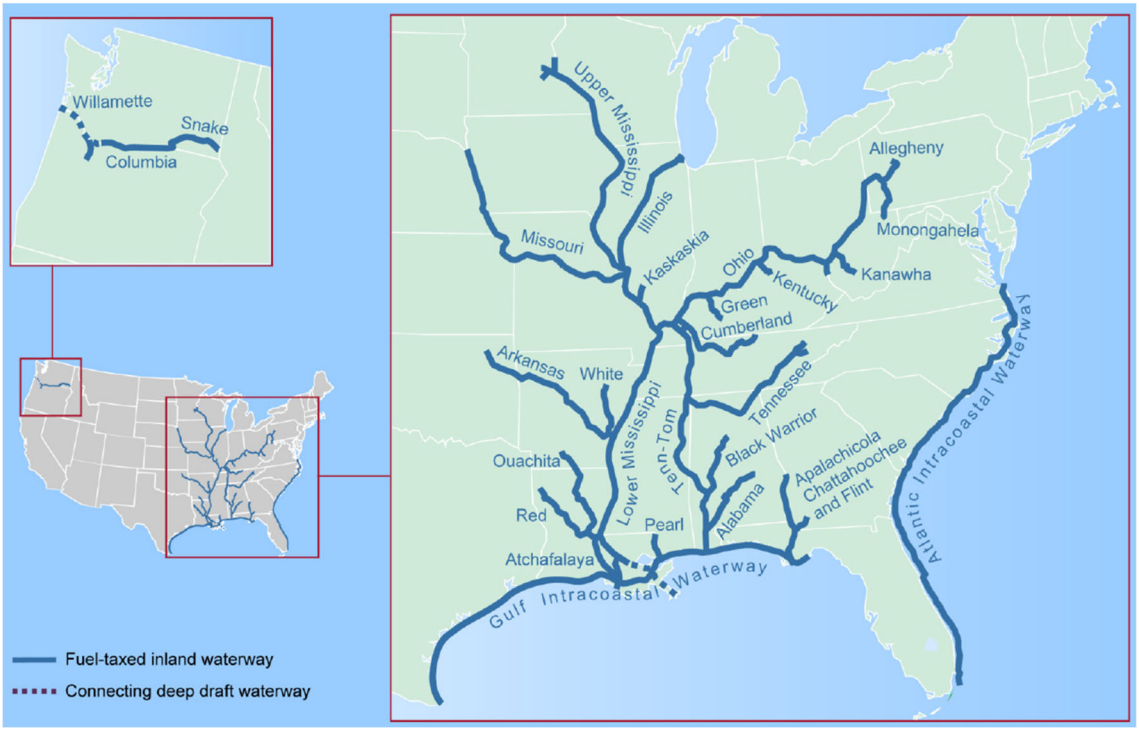



Source: From U.S. Government Accountability Office (2019)

The inland waterway system discussed in this report consists of commercially navigable waterways subject to fuel taxes (Figure 3), known as Fuel Taxed Waterways, accounting for approximately 11,000 miles of waterways. Another 1,000 miles of waterways are not part of the taxable system and have few lock and dam structures (U.S. Government Accountability Office 2019).

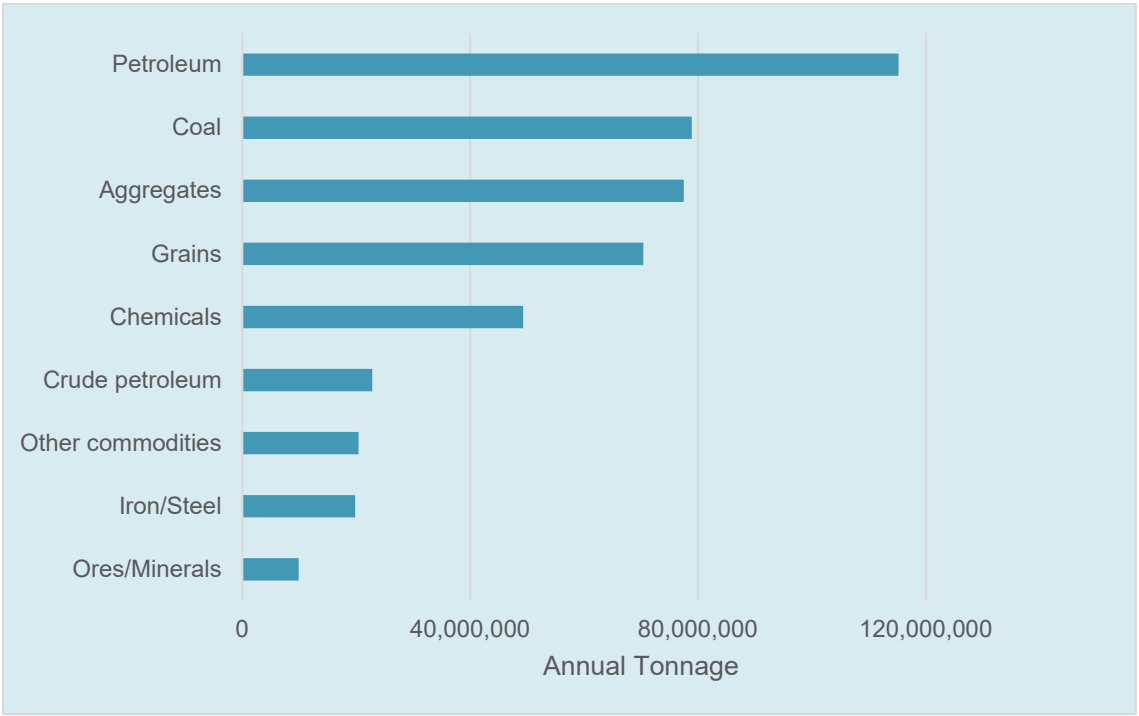
The Mississippi River Corridor alone covers 2,350 miles and includes the ports of St. Paul, St. Louis, Memphis, Baton Rouge, and New Orleans. Over 500 million tons of cargo are moved through this waterway annually, including around 60 percent of all U.S. grain exports for international shipment. Figure 4 shows the types of commodities shipped along the system.

**Figure 3**. Inland waterways subject to fuel tax




Source: From U.S. Government Accountability Office (2019)

**Figure 4**. Products shipped along the inland waterways




Source: USACE Waterborne Commerce Statistics Center (2023a)

A 2019 study by the U.S. Department of Agriculture emphasized the tremendous advantage the inland waterways system provides for U.S. farmers accessing the global export market. In 2016, the Mississippi River system handled 57 percent of U.S. corn exports valued at $4.8 billion and 59 percent of U.S. soybean exports valued at $12.4 billion, as well as 55 percent of soybean meal exports and 72 percent of distiller's dried grains with solubles exports. Because of efficiencies associated with bulk transportation by barge, the report estimates the inland waterways system saves $7 billion to $9 billion annually over the cost of shipping by other modes. The report emphasizes the critical importance of the inland waterways system to maintaining the global competitiveness of our agricultural sector and contributing to the U.S. balance of trade (U.S. Department of Agriculture 2019)

A 2024 study by the Eno Center for Transportation identified significant additional benefits to society resulting from federal investment in the nation's inland waterways, including: economic development (waterfront property developments, business attraction, job creation, tourism, and recreation); energy and sustainability (hydropower, irrigation, water supply, industrial cooling, and beneficial use of dredged materials); and safety, security, and resiliency (transportation safety, flood control, national security, and global competitiveness) (Eno Center for Transportation 2024)

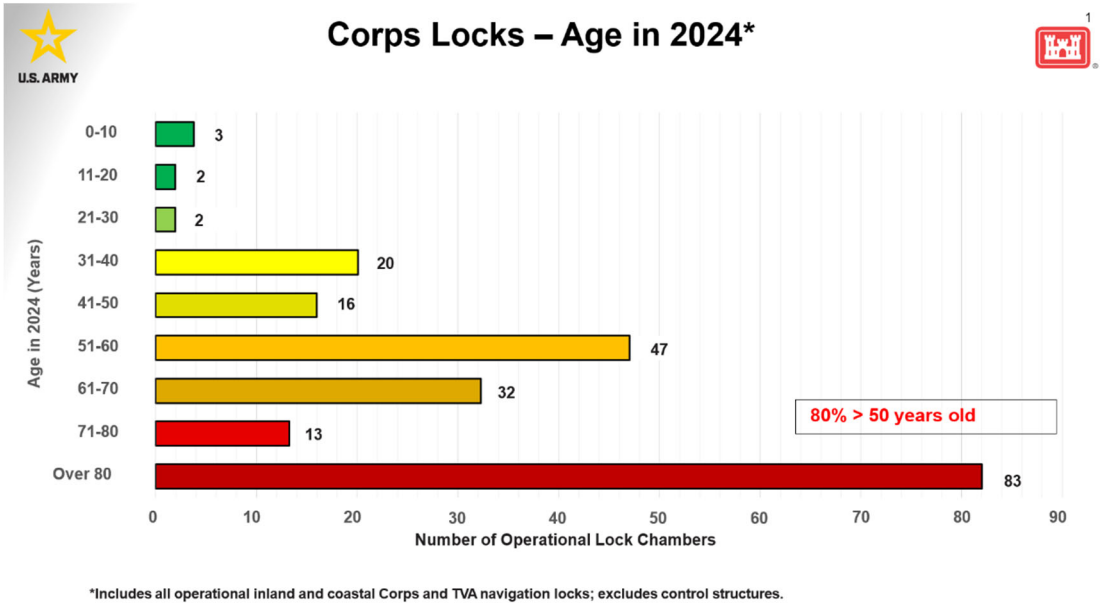
Delays caused by infrastructure failures or delays in inland waterway project delivery have significant consequences to inland waterway users. A study performed by the U.S. Government Accountability Office on the Olmsted Locks and Dam Project estimated that each year of delay in the opening of the new locks could result in $875 million per year in foregone benefits to commercial barge traffic (U.S. Government Accountability Office 2017).

The sources cited above highlight the importance of the inland waterway system to U.S. global competitiveness, the wider societal benefits of a healthy inland waterway system, and the importance of completing infrastructure projects such as lock and dam projects in a timely and cost-effective manner to avoid unexpected interruptions to inland waterway commerce.

### 1.1.2 Aging Infrastructure

As discussed above, the 11,000 miles of fuel-taxed navigable waterways are a crucial component of our nation's agriculture, energy, and manufacturing supply chains. However, the network of lock and dam infrastructure was constructed in the early twentieth century and has far exceeded its original 50-year design life, as evidenced in the "C minus" grade assigned to inland waterways in the American Society of Civil Engineers (ASCE) 2025 Report Card for America's Infrastructure (ASCE 2025). Of the 218 lock chambers in USACE's inland portfolio, 80+ (more than 35 percent) are over 80 years old and 170+ (nearly 80 percent) are over 50 years old (Figure 5). Infrastructure deterioration has made these facilities more susceptible to failures—resulting in unscheduled closures or stoppages. These delays increase congestion and the cost of transporting commodities, compounding the recent effects of inflation on consumers.

**Figure 5**. Age of USACE locks




Source: USACE

The inland waterway construction program that modernizes this aging infrastructure differs from others in USACE's Civil Works mission in several ways. Most Civil Works projects are cost-shared with a non-federal sponsor, such as a local or state government entity, but modernization and rehabilitation of infrastructure on the inland waterways is cost-shared with the IWTF. The IWTF is funded through a 29-cent-per-gallon fuel tax imposed on commercial users of the system (barge operators). The statutorily required cost share of 25 percent is appropriated—along with matching general treasury funds—in the annual Energy and Water Development Appropriations bill. In fiscal year 2024, the IWTF collected $123 million in revenues, making nearly $500 million available for future appropriations when matched with general treasury funds.

Another key difference is the role of the IWUB, an industry Federal advisory committee that was established to monitor the IWTF and to make recommendations to Congress and the Secretary of the Army on investment priorities using resources from the IWTF. USACE, in coordination with IWUB, developed a 20-year CIS that provides a planning framework for making capital investments on the inland and intracoastal waterways based on the application of objective prioritization criteria. Updated every 5 years, the latest CIS update was transmitted to Congress in January 2025 (USACE 2025b).

The CIS requirement, along with other statutory changes to the program, were the result of recommendations made in 2010 stemming from frustrations with the execution of the program and findings from a 2008 white paper that documented project performance issues at three inland navigation projects and identified lessons learned to help shape future navigation investment decisions (USACE 2008). While Congress and industry followed through by implementing the recommendations that required legislative action, other process improvements recommended in the 2010 *Inland Marine Transportation Systems (IMTS) Capital Projects Business Model* (IMTS Capital Investment Strategy Team 2010) remain unfulfilled by USACE.

Some of these recommendations require approval from OMB, whose lack of support for several of the recommended measures—such as using continuing contracts authority and innovative acquisition strategies—has stymied efforts to implement change. Some of these recommendations are still promising solutions, and a closer look at other opportunities to address the challenges and missteps that have been recurring in the inland waterway program for decades is merited.

### 1.1.3 Challenges Encountered during Recent Projects

Since 1987, 10 projects to modernize or expand locks on the inland waterway system have been completed. Seven of those projects began construction between 1987 and 1989 and were constructed in 8 years or less, with cost overruns averaging 33 percent. But over the last 28 years, only three projects have been completed. The most recently completed modernization project in 2018, Olmsted Locks and Dam, took 26 years to complete and increased in cost by 275 percent from its original estimate.

Figure 6 shows the current state of five major USACE lock and dam replacement projects underway at the end of 2024—with the projects experiencing cost increases ranging between approximately 110 and 300 percent.

**Figure 6**. Cost overruns and schedule slippages for USACE lock and dam projects

| Project | Year Authorized | Authorized Cost | 1st Year of Construction $ | Current Estimated Cost | Percentage Increase | Date Operational |
|---|---|---|---|---|---|---|
| **Lower Mon 2, 3, 4** | 1992 | $556.4 million | FY 1995 | $1.23 billion | 121.6% | December, 2024 |
| **Kentucky Lock** | 1996 | $393.2 million | FY 1999 | $1.56 billion* | 297% | July, 2029 |
| **Chickamauga Lock** | 2003 | $267.2 million | FY 2004 | $954.4 million* | 257.2% | November, 2027 |
| **L/D 25** | 2007 | $626 million | FY 2022 (IIJA) | $2.26 billion | 261% | October, 2034 |
| **Montgomery** | 2016 | $782.2 million | FY 2022 (IIJA) | $1.69 billion | 116.1% | October, 2032 |

* Current cost, but expected to increase

Source: WCI

For years, the blame was placed on inadequate or uncertain annual funding, with an emphasis that full up-front funding would address the risks of cost escalations and schedule delays. Certainly, having all the funding at the onset is ideal and would allow considerable flexibility on how the project is contracted and executed, but the reality of receiving such funding for all ongoing projects is unlikely, especially considering the recent outcome of $2.9 billion from the Infrastructure Investment and Jobs Act (IIJA). The IIJA funding was expected to fund six projects to completion; however, all six projects required additional funding, and only one of six now has adequate funding to be completed. Current projections estimate an additional $3 billion will be needed to complete the five remaining projects. Although the timing and inconsistency of funding

has been shown to cause inefficiencies in project delivery (U.S. Government Accountability Office 2017), the bulk of the problem lies elsewhere.

The interviews and background research revealed other issues that may contribute to USACE's inland navigation waterways project performance, including the duration, geography, and scarcity of lock and dam infrastructure replacement projects; across-the-board increases in construction costs experienced by many industries; the challenges related to governmental requirements that do not apply to private-sector projects; lack of schedule and cost incentives; inadequate initial cost estimates; and project team experience.

## Lock and Dam Replacement Project Characteristics

Lock and dam replacement projects on America's inland waterway system have a unique set of shared characteristics. The particular characteristics of these projects should be recognized to effectively address their associated challenges, with care taken to avoid "uniqueness bias" or the idea that these assets and projects are the only ones of their kind, as USACE maintains an extensive portfolio of similar assets and projects.

Some of the defining characteristics of lock and dam replacement projects are that they tend to be long-duration, taking anywhere from 8 to 33 years to complete. They are scarce, with only a few major projects happening in any given year (USACE 2025b). This scarcity contributes to a limited pool of experienced and knowledgeable designers and construction contractors. They are also geographically spread out in different states and regions of the country (USACE 2025b).

The complexities inherent in lock and dam replacement projects are further discussed below to help identify and address the root causes that may contribute to schedule and cost overruns:

- **Duration**. Projects that last a decade or longer can be considered "retirement" projects for those beyond the midpoint of their careers. As these highly experienced personnel retire or leave to pursue other opportunities, hard-earned experience and knowledge specific to lock and dam replacement is diminished or lost. The long duration of inland navigation projects can create challenges with respect to experience and knowledge transfer. However, the long duration of inland navigation projects also presents opportunities for on-the-job training and succession planning in order to accomplish this knowledge transfer.
- **Geography**. Contractors and project staff may spend 10 to 20 years developing expertise and learning the necessary lessons for effective delivery of a major lock and dam replacement project. When that project ends, if the location of the next major project is geographically close, it is easy for construction labor and management personnel to work on that next project, transferring their hard-earned knowledge and expertise as well. However, if the next major lock and dam project is several states away, some personnel may decide to relocate or work per diem at a new location, but invariably much of the hard-earned knowledge and expertise will be diminished or lost as these people look for opportunities closer to home.

  Many contractors also have strong presences in certain geographical areas, and "standing up" projects in remote locations and finding experienced people to staff

those projects can be challenging. Engineers and contractors also tend to keep lessons learned and project experience "close to the vest" because this defines their unique value in the contracting marketplace, which tends to inhibit knowledge transfer within the industry. As new contractors win new projects, a steep learning curve awaits most of their workforce. This can result in the types of failures associated with a learning curve, including lack of project definition, failure to identify risks, inadequate designs, and costly experimentation. Geographic distance between projects can create challenges with respect to experience and knowledge transfer.

- **Project scarcity**. Projects such as commercial and industrial buildings, roads, railways, bridges, and water treatment plants are common and relatively standardized across the country. An owner wanting to build a commercial building should not have much trouble finding experienced managers, engineers, and contractors with the necessary knowledge and experience. However, an owner wanting to replace a lock and dam structure may struggle to find managers, engineers, and contractors with experience on such projects, with their unique challenges of maintaining barge traffic on "working" rivers, flow and flood restrictions, sedimentation and scour, shoreline protection, flood-control levees, sand deposits, geotechnical complications, and unique marine structure components and equipment. Project scarcity can create challenges with respect to development and retention of an experienced and knowledgeable workforce.

  Project scarcity also means that there is a very limited pool of managers, designers, and contractors with the requisite experience on major lock and dam replacements available at any given time. Contractors will not maintain a "bench" of expertise for projects that may come along every 10 to 20 years. One approach to addressing this challenge could be sustainable contract timing strategies that take advantage of the available trained industry workforce as other projects wind down. There could also be value in limiting the number of major replacement projects USACE undertakes at any given time. If USACE has four large projects in progress, adding another large project would require a lot of knowledge transfer to a whole new project team, with implications for project definition, scheduling, quality, and risks. Attention could also be given to strategically developing capabilities of "new" designers and contractors through focused knowledge transfer and succession planning, training programs, and direct experience on smaller jobs so they can develop the necessary experience to compete on larger projects in the future.

## Challenges of Construction Cost Increases Across Industries

The study team also gathered data to qualify construction cost increases across a number of industries. Cost data were gathered from the following sources:

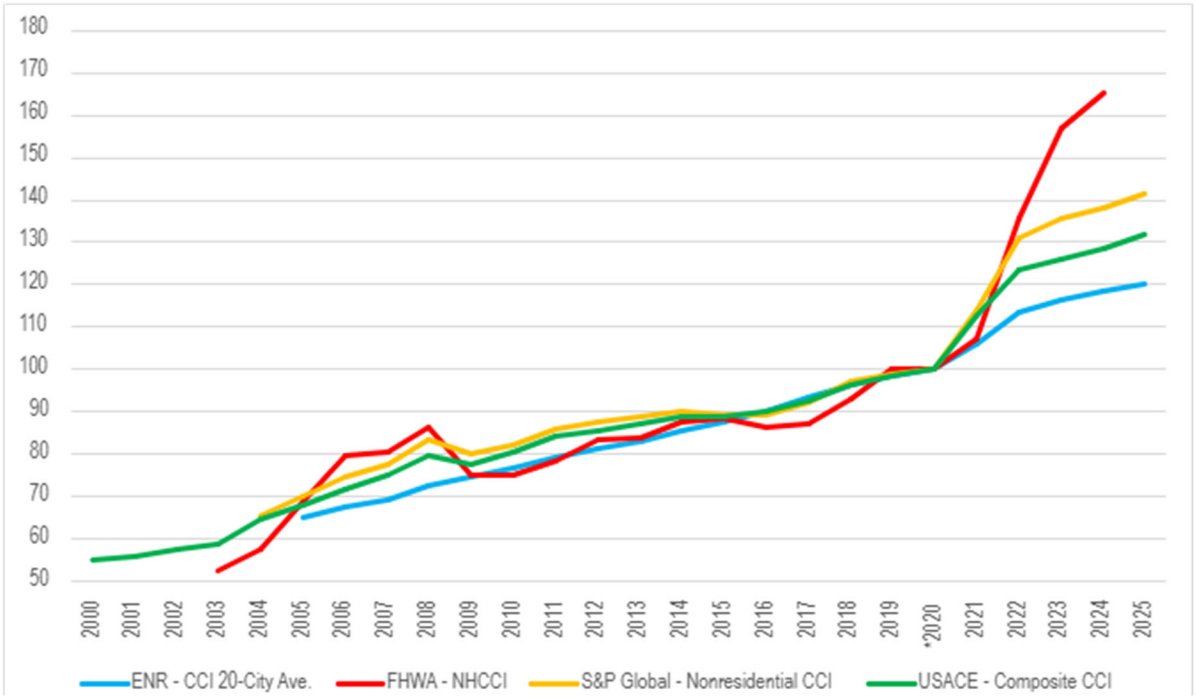
- ***Engineering News-Record*** **(ENR) Construction Cost Index – 20-City Average**. The ENR Construction Cost Index (CCI) for the 20-city average is a weighted index that tracks the cost of construction materials and labor. The CCI is based on the prices of structural steel, Portland cement, lumber, and common labor. The CCI is meant to monitor trends in construction costs and to assist with estimating project costs (hundred-weight).

- **Federal Highway Administration National Highway Construction Cost Index**. The National Highway Construction Cost Index (NHCCI) is a quarterly price index intended to measure the national average changes in highway construction costs over time. The Federal Highway Administration uses data from state website postings of winning bids on highway construction contracts. The data represent state- and project-level details on prices, and quantities of pay items for those winning contracts.
- **Standard & Poor's Global Market Intelligence**. Standard & Poor's Global Pricing and Purchasing service provides access to thousands of price and wage data series and projections, not only for the United States but also for Canada and Mexico. Annual forecasts are available for the next 10 years and updated every quarter, while quarterly forecasts are available for the next 2 years and updated every month. Since the fourth quarter of 2024, Standard & Poor's Global has accounted for tariffs in its forecasts.
- **USACE Civil Works Construction Cost Index System**. The basis for the development of these indices was derived from over 80 detailed government estimates. These estimates were used in developing the weighted relationship of labor, equipment, and material costs for various types of projects. This weighted relationship was used to develop a composite index for various projects. Data sources include the Bureau of Labor Statistics, BOR, RSMeans, ENR, and OMB.

Since 2000, the above-described construction cost indices have shown a steady increase, as shown in Figure 7. Note that the trend lines after 2020 show a more marked increase, but the data after 2020 are based on projections. Worth noting is that all cost indices illustrate similar steady increases over the timeframe evaluated, including the USACE Civil Works CCI, indicating that at least some of the continued increases in USACE Civil Works project costs are not uncommon—rather, they are aligned with other large infrastructure projects and industries.

These general industry market trends show an increase of 82 percent in project costs between 2000 and 2020 (4.1 percent per year), with increases of between 20 and 65 percent (4 to 13 percent per year) projected for 2020 through 2025.

**Figure 7**. Comparison of construction cost indices, 2000 to 2025




Source: HDR compilation of indices
Notes: Original indices have been rebased (base year 2020=100) to allow for comparison over time. Projection starts after 2020.

## Challenges Related to Governmental Requirements

In April 2025, USACE published a report, *Quantifying the MILCON Cost Premium*, that compared private versus government design and construction on similar facility types (USACE 2025c). The requirements for federal Military Construction (MILCON) design and construction were grouped into "controllable" and "uncontrollable" characteristics.

*Controllable* characteristics are elements or conditions within a project that can be influenced, adjusted, or managed by the design and construction agent or project managers. They include federal design requirements, staffing requirements, planning and scoping process, and quality management requirements.

*Uncontrollable* characteristics are elements or conditions beyond the influence or control of the organization or project managers. Uncontrollable factors are often dictated by external regulations, laws, or mandatory requirements that must be adhered to without modification. This includes wage determination, federal design requirements (such as anti-terrorism/force protection), bonding requirements (Miller Act), federal contract requirements (Federal Acquisition Regulation [FAR]/Defense Federal Acquisition Regulation Supplement [DFARS]), base security/access requirements, and limited federal procurement options.

The primary differences between private-sector and government-led construction delivery methods and the associated or perceived risks that affect cost and schedule can be summarized as follows:

- **Procurement Compliance**: U.S. Department of Defense (DOD) projects must adhere to strict procurement requirements, including the DFARS and Davis-Bacon

Act, ensuring transparency, fair competition, and fair wages, as well as limited contractor procurement options. Private-sector projects have more flexibility in procurement and contracting options but must still comply with local and state regulations.

- **Material Specifications and Design Complexity**: The Unified Facilities Guide Specifications ensures that materials used in DOD facilities meet high standards for durability and performance as well as manufacturing requirements, such as "Made in the USA." In addition, design complexities and standards related to cybersecurity, energy efficiency, and other unique federal project requirements introduce additional elements that affect cost and schedule. While standards and the standard of care for private-sector projects are generally similar to government projects, private-sector projects may have varying requirements related to material sourcing and availability, cybersecurity, and energy efficiency, depending on the project's scope and budget, that lessen cost and shorten schedule.
- **Contracting Requirements**: Government projects often include set-asides for small, women-owned, HUBZone, and veteran-owned businesses to promote diversity and economic growth. Private-sector projects may not have such requirements but may still engage in diverse contracting practices.
- **Labor Standards**: Federal Project Labor Agreements (PLAs) that outline pre-hire collective bargaining agreements are required for federal construction projects, with a total estimated cost of $35 million or more, and the Davis-Bacon Act ensures that workers on federal projects are paid prevailing wages. Private-sector projects may have different wage standards based on market conditions and company policies.
- **Cost and Schedule Incentives**: Another difference between private-sector and government design and construction raised by interviewees in our wider study, although not readily quantifiable, relates to cost and schedule incentives. Interviewees commented on a perceived lack of incentives and/or consequences in the government sector for meeting project cost and schedule goals. Private-sector projects, in comparison, typically have much stronger incentives driving project selection—projects must be financially viable prior to moving forward. Private-sector projects also typically have strong "do or die" incentives to achieve their project cost and schedule milestones and to realize their financial payback and time-to-market goals, with potentially severe consequences for failing to meet these goals.

For a dorm (barracks) project comparison, a third-party study commissioned by USACE (USACE 2025c) revealed the MILCON Cost Premium (MCP) for federal design and construction was 68 percent higher than the private sector. Of that amount, 41.6 percent was for administrative components (controllable and uncontrollable characteristics) and 8.6 percent was for installed components (HVAC, finishes, MEP, structural, etc.). The remaining 18 percent for the dorm MCP could not be defined by the study.

All facility categories evaluated (administration, dorm, hangar, medical, miscellaneous, physical fitness) in this report, except for miscellaneous, showed that private projects were cheaper to construct than MILCON projects. Administrative facilities showed the highest MCP, at 126.6 percent. Similarly, miscellaneous structures indicated a negative MCP, although this category was somewhat nebulous and may have been weighted toward one specific type of facility versus another. For the rest of the categories

(administration, dorm, and medical), results met expectations and reflected a range of premiums, with the lowest in medical at 31.9 percent and the highest in hangars, at 90 percent (again, the use case was skewed by the quantity of data and function).

### 1.1.4 Large Infrastructure Projects

One publication referenced by key interviewees in this study—and a major contributor to the general understanding of large project delivery—is the 2024 book, *How Big Things Get Done*, by Bent Flyvbjerg and Dan Gardner.

Flyvbjerg and Gardner estimate that 99.5 percent of all large projects fail to be completed within budget and on schedule—and fail to deliver the stated benefits. Stated another way, it can be shown statistically that only 1 of 200 large projects delivers on the anticipated cost, time, and benefit commitments. These failings are largely attributed to over-optimistic initial estimates related to the project's cost, schedule, and expected benefits, and they show that USACE is not alone in its struggle with cost and schedule overruns.

To help those approaching large and complex projects, Flyvbjerg and Gardner summarize some important heuristics, or "rules of thumb," that are common to successful projects, as briefly summarized below:

- **Planning**. Success has been demonstrated when projects deliberately build upon the experimentation and experience of past projects. Learning takes place through experimentation, repetition, and testing. Good planning happens when the painful learning curve and lessons learned from past projects are successfully applied to new projects, and when the plans for new projects are thoroughly vetted and tested before implementation. Sufficient time should be allotted for planning, so that the project plan is solid, and implementation can take place in the smallest time "window" possible, thereby avoiding the "black swans"—big, unforeseen events that can throw a project off. "Think slow, act fast" encapsulates the idea that the longer a project takes to implement, that is, the bigger the "window," the greater the chance that things can go wrong.
- **Experience**. The book highlights that "...in both planning and delivery, there is no better asset for a big project than an experienced leader with an experienced team." Flyvbjerg and Gardner explain how instructions can be passed to another person through classrooms and textbooks, but it is the hard-earned "tacit" knowledge that comes with personal experience that is not easily conveyed. They state that project leaders with the necessary practical wisdom, or "phronesis," are the "single greatest asset a project can have." They also point out the value of an experienced project team. The entire project team, including contractors, should be carefully selected, and attention should be given to team dynamics and motivation.
- **Modularity**. Flyvbjerg and Gardner show that the best performing projects in their database are wind and solar projects. These projects have the least "fat tailed" statistical performance distribution, meaning they might go somewhat over budget and over schedule, but not dramatically. They have the least probability of going disastrously wrong. The reason, they posit, is modularity. They are large projects, but they are made up of small, standardized, modular elements. A large solar project is

just a scaled-up number, maybe hundreds or thousands of individual solar panels, which are very modular and standardized in their manufacture and installation.

- **Reference-class Forecasting**. RCF is a cost estimating method in which planned projects are compared to the actual outcomes of a reference class of similar projects. Instead of relying on "bottoms-up" cost estimates, which are typically optimistic, contain a lot of biases (optimism bias, political bias), lack definition, and underestimate risks (the mode and distribution of the cost performance bell curve), Flyvbjerg and Gardner show that RCF is far more effective at predicting a project's total cost. The methodology has been adopted by the United Kingdom, Denmark, Sweden, Switzerland, Norway, the Netherlands, South Africa, and Australian governments for large infrastructure projects (Agard 2023).

The interviews conducted for this study correlated with many of the points listed above:

- Interviewees identified challenges in the current project planning process, such as insufficient project definition resulting in inadequate cost estimates at the time of project authorization.
- The critical importance of experienced managers and project teams was also a common theme. Although not elaborated in the interviews, the very nature of large lock and dam replacement projects, executed in geographically distinct USACE Districts and taking sometimes 20 years or more to complete, presents serious challenges in capturing the hard-earned "phronesis" among the entire project team and then transferring this experience and knowledge to the planning and implementation of future projects.
- Modularity, or "standardization," was also identified in the interviews. Standardization of lock and dam design details and components is something USACE has pursued for many years, although application across projects has been a challenge.
- Interviewees also discussed ideas to improve cost estimating. USACE has rigorous protocols and centers of excellence for cost estimating, but, as can be seen from the current project cost overruns, there appears to be a serious disconnect between authorized costs and current estimated costs—far in excess of market price escalations. Given the readily available historical data, RCF could be a valuable tool in improving USACE's ability to predict large project cost outcomes.

## 1.2 Current Funding and Economic Framework

Funding for inland navigation projects is appropriated by Congress on a project basis, rather than USACE receiving a certain amount of funding on an annual basis that can be applied toward an overall program of projects (a programmatic approach). A recurring challenge facing the upkeep of the inland navigation system is the uncertainty regarding the timing of when annual funding appropriations will be received. Since 2010, USACE has operated under 54 Continuing Resolutions. Most of the uncertainty relates to *when* the funds will become available, rather than *if* funds will be received at all. The inland waterways construction program continues to receive substantial investment from Congress. Since 2016, Congress has fully funded project capabilities expressed by

USACE for ongoing inland waterways projects. Nevertheless, the uncertainty regarding the timing of annual funding appropriations has complicated USACE's efforts to plan ahead. Additionally, requests from Congress members to prioritize projects that may not be top priorities within USACE's long-range planning efforts can divert USACE's efforts away from completing the most pressing projects.

Another challenge within the economic framework is the budgetary criterion for achieving a favorable BCR. The BCR shows the relationship between the costs of a project and the expected benefits, with a BCR greater than 1 indicating that the benefits will outweigh the costs. Inland navigation projects have traditionally not competed well under this framework because the narrow definition of benefits is limited primarily to transportation cost savings; however, the inland navigation system actually yields much broader benefits across the areas of economic development, energy and sustainability, and safety/security/resilience (Ferrell, Husain, and Davis 2024). USACE has attempted to address this challenge by requiring a comprehensive benefit-cost analysis (BCA) be completed that includes social, environmental, and economic benefits, although this requirement has been overshadowed by the National Economic Development requirement. The high cost of lock and dam projects often makes them "unbudgetable" based on the traditionally narrow BCR standpoint—they may never "pencil out," and this could lead to a crisis where projects may not get authorized. Only one lock and dam project is currently on the presidential docket for funding based on a favorable BCR.

As discussed previously in Section 1.1.2, *Aging Infrastructure*, inland navigation projects are funded through a 25 percent cost share with the IWTF, which is funded through a 29 cent-per-gallon fuel tax imposed on commercial users of the system (barge operators). The statutorily required cost share of 25 percent is appropriated—along with matching general treasury funds—in the annual Energy and Water Development Appropriations bill.

## 1.3 Current Administrative Framework

Other administrative hurdles not only lengthen the time for critical projects to be executed but also increase the costs of these projects—ultimately placing a large burden on the taxpayer. Two primary administrative areas pose challenges for the inland waterways program. The first is EO 12322. This 1980s order mandates that any federal or federally assisted water and related land resources project proposal must first be submitted to OMB for review before being presented to Congress for approval.

While originally intended to improve coordination and remove duplicative processes, the EO has created a bottleneck for basic, fact-based data and information. OMB has broadened its interpretation of the EO to withhold nearly all information—including outyear funding needs, up-to-date project capabilities, approval of innovative acquisition strategies, and other information—critical to Congressional decision-makers. This information is often not budget-sensitive or based on policy, and OMB's role in restricting access to important information has been perceived as overruling the judgement of technical experts, economists, scientists, and professional engineers.

This restriction eliminates transparency between the executive and legislative branches of government, ultimately preventing the best decisions to be made regarding appropriations for large, complex projects and programs.

The second area that impedes efficient execution also stems from this outdated EO and relates to the inability to use continuing contracts. Currently, no mechanism exists for USACE to approach OMB (and then Congress) and recommend the use of continuing contracts for large-scale civil works projects. Billion-plus dollar projects cannot be constructed in a single year. A recommendation for a huge project to be fully funded is not in the best interest of the taxpayer. The amount that should be funded is what could be executed in any given year, freeing up funding for other projects and maximizing the dollar's value for taxpayers. OMB has historically not allowed continuing contracts because of concerns regarding making financial commitments for future Administrations. This concern limits the proper use of appropriated dollars.

Considering the challenges related to EO 12322, the EO could be adjusted or eliminated by the current Administration, or Congress could legislatively address the issue.

## 1.4 Project Selection and Delivery

Inland navigation project selection and delivery is currently handled by 17 USACE Districts.[1] The Districts provide their input on needed projects, and the CIS provides recommendations for prioritizing projects based on their condition. However, the CIS recommendations are not always consistently followed as projects are authorized and appropriated. Once a project receives new start funding, that tends to move it up in the budget ranking regardless of the CIS prioritization framework.

USACE's 2025 *Capital Investment Strategy Report* describes some of USACE's ongoing efforts to improve capital investment planning and project delivery. The report describes a comprehensive and ongoing Operational Condition Assessment (OCA) program, initially completed in 2010 on over 166,000 lock and dam components, and the ORA program, which uses the OCA rating data, failure probabilities, and economic data to compare risks and consequences of failure associated with each facility. Starting in fiscal year 2023, USACE began examining systems in terms of reliability—that is, their ability to perform their intended task without failure for a given time period, evaluating the "true risks" in a way that allows project comparisons and improves overall investment planning. USACE Civil Works' intent was to initiate the process of collaborating with stakeholders to establish reliability expectations during fiscal year 2025.

USACE's 2022 *Civil Works Strategic Asset Management Plan* outlines 60 strategic recommendations for improving the USACE Civil Works budgeting, acquisition, management, and disposal of capital assets, and addresses gaps in cross-functional integration, asset management, and investment planning.

Regarding the design and construction elements of project delivery, the Districts' staff may have varying levels of experience and expertise with designing and building lock and dam projects. USACE has worked to improve the delivery of inland navigation projects by establishing the INDC Mandatory Center of Expertise, one of nine USACE Centers of Standardization for various U.S. Army facilities. The INDC handles engineering, design, analysis, and review for the construction, rehabilitation, maintenance, and operation of lock and dam projects. It focuses on supporting technical

[1] Chicago, Galveston, Huntington, Kansas City, Little Rock, Louisville, Memphis, Mobile, Nashville, New Orleans, Pittsburgh, Rock Island, St. Louis, St. Paul, Savannah, Tulsa, and Vicksburg Districts (USACE 2025d)

competency within USACE while also communicating with waterway users and the navigation industry to stay abreast of any problems and issues arising along inland navigation waterways (USACE 2025e).

The INDC's establishment was approved by the USACE Command Council in 2012. The concept was that one center, in two primary locations with additional virtual staff, would exercise command-and-control through the USACE Mississippi Valley Division. The two geographic locations are the Rock Island and Pittsburgh Districts.

While the INDC has fostered technical competency for the design of lock and dam projects, it must request staffing resources from the individual Districts to work on individual projects. And, as noted above, the INDC responds to project priorities set by the individual Districts rather than a more encompassing vision for improving inland waterway infrastructure that targets the most urgent needs in a systematic way.

# 2 Study Approach

HDR conducted interviews with stakeholders from various agencies—including top leadership at USACE—and reviewed previous studies that pertain to the challenges associated with large project delivery in general, USACE project delivery, and the inland navigation system.

Stakeholders from the following agencies, including HDR staff who have worked closely with the agencies as consultants, were interviewed:

- USACE:
  - Chief's Office
  - Civil Works Engineering
  - Great Lakes and Ohio River Division (LRD) and Mississippi Valley Division (MVD) Programs
  - INDC
  - Programs Integration Division
  - Risk Management Center
- U.S. Navy
- BOR
- California Department of Water Resources (DWR)
- Ontario Province
- Bonneville Power Authority (BPA)
- Tennessee Valley Authority (TVA)

The interviews focused on six topics that WCI wished to explore with this study:

- **Topic 1**: Comparison of cost and schedule outcomes between large-scale federal construction projects executed by USACE and other federal agencies

- **Topic 2**: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules
- **Topic 3**: Examples of federal agencies successfully using innovative acquisition strategies such as ECI, IDaC, and other contracting approaches that mitigate cost and schedule risks
- **Topic 4**: Comparison of cost and timelines between using architecture and engineering (A/E) services for design versus USACE performing the design in-house
- **Topic 5**: Recommendations on how USACE can identify and provide realistic outyear funding capabilities based on engineering sequencing and technical judgement
- **Topic 6**: Benefits of standardizing lock replacement designs across the enterprise

In addition to the interviews focused on the six topics, HDR conducted research to gather more context surrounding the issues discussed.

Interview notes are summarized in Appendix A, by topic, and the following section identifies themes that emerged from the interviews. Appendix B summarizes the previous study documents reviewed for this study.

# 3 Analysis and Findings

Table 1 summarizes the information gathered from interviews with USACE stakeholders and outside agencies. Six general themes were identified:

- overall inland waterways program
- funding
- project planning
- scoping and design
- cost estimates and schedules
- construction contracting and project execution

As shown in the table, each theme includes a number of subthemes discussed by the interviewees.

**Table 1**. Stakeholder interview themes

| Subtheme | Practice/Recommendation |
|---|---|
| ***Theme: Overall Inland Waterways Program*** | |
| Asset assessment and planning | Implement system-wide asset assessment and planning. Inventories and condition assessments are needed to identify capital needs. |
| Master schedule and planning | Develop a master schedule and plan with recommendations for the inland navigation waterways program. Allow planning for multiple projects/paths; don't put "all eggs in one basket." |
| Investment planning | Develop an Inland Navigation Investment Plan as an annual update to the outyear funding baseline scenario of the CIS to prioritize and schedule feasibility reports and major rehabilitation reports, feeding a comprehensive investment strategy. The flexibility to absorb emergencies and other funding diversions is needed. |
| Investment plan buy-in | Overall investment plan will need buy-in from all USACE Districts, IWUB, and WCI to help prevent unplanned diversions of funds. |
| Limited number of projects | Plan for two or three large inland navigation projects at a time. Do not include more than two large projects in a systems study. Three projects at one time can be done with IWUB cost share. Also need to consider the capacity of a limited pool of contractors. |
| Centralize competencies | Consider INDC as the designer of record for inland navigation projects, with two production centers: Rock Island and Pittsburgh. This approach centralizes competencies and ensures the teams get maximum "reps and sets." Fully fund the INDC and invest in lead engineers (hired by INDC) and lead component/discipline engineers (approved by INDC). |
| Talent management | USACE needs "master builders" and expert-level personnel in management. Need to address talent/knowledge retention. Turnover, lack of long-term project management continuity, and overall lack of project management experience are ongoing challenges. |
| Capability outlook | USACE should be able to provide a 3- to 5-year capability outlook to Congress and the IWUB, potentially in the form of more frequent (for example, annual) updates to the CIS. |

| Subtheme | Practice/Recommendation |
|---|---|
| ***Theme: Funding*** | |
| Continuing contracts clause | This is not currently an option for inland navigation projects; however, some view it as proven and efficient in the past. This vehicle was eliminated because of perceived abuse. While some suggest there is no point in revisiting the topic, others recommend re-implementing this clause for projects meeting certain project size, duration, and funding type criteria. |
| Incremental funding clause | Use of the incremental funding clause could contribute to mitigating risk and could potentially reduce contractor contingencies. |
| Programmatic funding | Provide pots of money for specific "programs." Programs could be regional, District, Division, or USACE Headquarters. This would allow program managers to move money between projects as needed. Consideration should be given to the approval of changes. |
| Design maturity and cost classification determination | When a project is authorized, ensure the project matures to an 80% confidence level with 100% of the project scope prior to appropriation. Take the feasibility level of design to 35% (or a comparable stage of alternative delivery) to include critical information to address elements with a high risk of change conditions. |
| Sponsor cost-share | Allow state and local sponsors to use early implementation work as their cost share for other projects. Cost-share amount is usually the limiting factor for capability. |
| Preconstruction engineering and design (PED) | Congress should fund PED for only those projects slated for construction within 5 years. |
| Appraisal studies | Some agencies do "appraisal" reports and cost estimates early in the planning stages to determine whether more detailed investigations of a potential project are justified. |
| Public-private partnerships | Public-private partnerships (P3s) may be a good option where government funding is limited and there are mechanisms for private funding and commitments for financing payments. P3s offer good long-term returns for investors. Consider whether the inland waterway fuel tax or guaranteed government lease payment can be turned into financing payback. National security concerns and the potential for user fees/tolls to be prohibitive for users may limit this option. |

| Subtheme | Practice/Recommendation |
|---|---|
| ***Theme: Project Planning*** | |
| Master planners | Select a dedicated, focused, and experienced group or entity to do master planning on all similar projects rather than individual Districts performing planning that may only occur once in 20+ years at a particular District. |
| Outside planning and collaboration | Enhance outreach and collaboration with the international waterway agencies/organizations, such PIANC, who build critical navigation and closure structures around the world to discuss best practices. |
| Separable project elements | Consider breaking a project into separate elements and contracting based on designer and contractor specialties (for example landside civil, buildings, and marine work packages). |
| Program/project management | For complex and multi-project programs, consider an internal or contracted program manager to see the project through from start to finish. |
| Annual funding strategy | USACE budget constraints in the construction general program may limit available annual funding to $500 million to $600 million. May be impossible to fully fund a $1.5 billion to $2.5 billion project. Either break projects into multiple separate contracts or use base-plus-options contracts. |
| Outside design contracting | Contracting the design to A/E consulting firms, including reviews, had higher upfront design costs but faster and lower overall capital expenditure for one agency, ultimately providing overall cost savings when considering construction schedule. One agency is doing a study that shows state and local sponsors can deliver design and construction much cheaper than USACE. One agency has transitioned from all in-house to all external design (except for specific elements). |
| Project management/leadership | Assign a project/program manager for construction. Other agencies assign a project manager for cradle-to-grave project oversight, including planning, design, and construction. Clarify roles of team leaders, project managers, and resident engineers. |
| Industry collaboration | Consider ways to get industry input during design such as “industry days” or external consultant review boards to provide periodic, high-level review and feedback. Consider posting designs publicly and soliciting industry input. Hold design and construction summits/workshops with USACE, A/E firms, and contractors. |

| Subtheme | Practice/Recommendation |
|---|---|
| ***Theme: Scoping and Design*** | |
| Site investigation | Perform more rigorous site investigations as part of 35% design (or a comparable stage of alternative delivery) to better identify critical information with a high risk of change conditions, such as geotechnical, seismic, dewatering, real estate, environmental, and other NEPA issues. |
| Real estate | Identify land acquisition requirements and risks early. |
| Community issues | Conduct community outreach to identify tribal lands, routing concerns, labor availability issues, and wage issues. |
| NEPA/Environmental issues | Conduct cultural and environmental investigations to identify risks early. Engage environmental regulatory agencies and interest groups. |
| Fully design locks | Fully design every lock, as opposed to designing in pieces. This approach may incur minimal design rework as future packages are executed, but will result in better overall scope definition. |
| Design standardization | Create a standard set of drawing details, models, and specifications for proven components that require little or no site adaptation. |
| 3D modeling | Design every lock in a 3D CAD model. Use tools such as 3D Subsurface and 3D Glasses. Design in 3D from the start, not just making a conversion at the end of the job. |
| Design reviews | Conduct design reviews in 3D for conflict analysis. Include facility end users in design reviews. Allow state and local sponsors to hire A/E firms to do their own design reviews. |
| Design collaboration | Keep designs and models in the cloud and use common collaboration platforms, being mindful of security challenges. |
| Constructability reviews | Conduct constructability reviews on all designs. |

| Subtheme | Practice/Recommendation |
|---|---|
| ***Theme: Cost Estimates and Schedules*** | |
| Independent external peer review | Recommend an independent external peer review (IEPR) of cost and schedule estimates. |
| Independent cost estimates | Obtain third-party independent cost estimates. Use ECI if needed for greater cost certainty. |
| Risk management | Identify high risks during feasibility stage and provide funding and time for the project team to conduct further research to clarify the risk. Ensure the correct, knowledgeable groups are on board to manage risks. |
| Value Studies/Analyses | Conduct “value studies/analyses,” including during feasibility and conceptual design, similar to BOR, to optimize project elements and costs. |
| Schedule development | Involve project managers in schedule development. |
| Construction cost data | Update cost databases quarterly, rather than just indexing. |
| Value engineering | Conduct value engineering during feasibility and design phases. Use subject matter experts. |
| Designer/estimator collaboration | Co-locate designers and cost estimators in the same office to facilitate collaboration. |
| Schedule incentives | Develop incentives for teams and individuals to maintain design and construction schedules. |
| Design stage cost estimates | In addition to including critical items with a high risk of change conditions as part of 35% design (or a comparable stage of alternative delivery) cost estimates, continue to refine the cost estimates at regular design stage intervals (for example, 60% and 95%) after the project is authorized and appropriated (post 35% design). |
| Benchmarking | Benchmark similar projects for comparison purposes based on actual construction costs. |
| Design and construction contingencies | Set aside contingency funding for future design and construction phases based on cost risks identified as part of feasibility and 35% design phases (must include critical information to address elements with a high risk of change conditions). |
| Centralized cost and schedule cell | Consider developing a “cost and schedule cell” at INDC that oversees all cost estimating and scheduling for inland navigation waterways projects. |

| Subtheme | Practice/Recommendation |
|---|---|
| ***Theme: Construction Contracting and Project Execution*** | |
| Non-traditional delivery methods | Explore delivery methods other than the traditional design-bid-build (DBB) approach. Some agencies prefer the engineering, procurement, and construction (EPC) approach for schedule advantages, while some agencies are moving toward design-build or construction manager at risk (CMAR). IDaC was used on the Base Realignment and Closure (BRAC) program, but some in USACE do not see it as useful. |
| Early contractor involvement | ECI can provide value engineering as well as cost and schedule certainty and allocation of risk. |
| Incentive fees | Consider incentive fees based on schedule. |
| Economic price adjustments/ cost indexing | Consider contractual price adjustments based on published indices for labor and materials. |
| Early start packages | Consider early-start design and construction packages to help advance the schedule. |
| Qualifications based contracting | Some agencies prefer to select contractors based on qualifications. |
| Progressive delivery methods | Use focused analysis to determine whether construction manager/general contractor (CM/GC), CMAR, or progressive design-build (PDB) are a fit for a particular project element. Some agencies use EPC to shift risk onto the contractor and accelerate the schedule, with some additional cost. |
| Base-plus-options contracts | Base-plus-options contracts drives the contractor to execute work in a sequence defined by USACE. It has the disadvantage of eliminating contractor input and contractor control of construction sequencing. |
| Corrective action studies | When unforeseen conditions arise, implement the appropriate corrective action studies. |
| Component reserve | In light of supply chain issues, maintain a strategic reserve of key O&M infrastructure components that includes long-lead items. |
| Resident engineers | Assign qualified, experienced resident engineers. The best resident engineers are needed on large projects. |
| Lessons learned/after action reviews | Conduct lessons learned reviews for each project. Review previous lessons learned on relevant large projects. |

# 4 Recommendations

Based on the stakeholder interviews, literature review, and other research, the following recommendations are presented for consideration.

## 4.1 Recommendations for Congress

| Goal | Action | Examples |
|---|---|---|
| Treat inland navigation waterways as a system and provide programmatic funding | Congress recognizes the inland navigation waterways as a system.<br>Congress funds the system on a programmatic basis, providing annual amounts for the following accounts:<br>• I – investigation (includes feasibility)<br>• PED – preconstruction, engineering, and design<br>• C – construction (includes contingency funding)<br>• O&M – operations and maintenance<br>Funding has no project-specific line items (fund as a system).<br>This addresses fiscal year funding gaps (caused by continuing resolutions) that can cause contractor demobilizations and uncertainties and handles changes related to design issues and construction contingencies. | Other agencies that have programmatic funding include:<br>• USACE Hurricane Protection Office<br>• U.S. Air Force Natural Disaster Recovery Mission, which has addressed storm damage at Tyndall, Offutt, and Langley Air Force Bases<br>• U.S. Air Force Sentinel Program<br>• USACE Mississippi River and Tributaries Project<br>• USACE Civil Works Dam Safety Program<br>• BOR Safety of Dams Program |
| Require continuing contracts and/or incremental funding | Congress mandates (will or must) that continuing contracts and/or incremental funding clauses be used for the inland navigation waterways system. | • USACE MILCON uses continuing contracts and incremental funding. |
| Direct use of alternative delivery approaches | Congress directs and provides funding to USACE to pursue pilot projects for the inland navigation waterways system using alternative delivery methods such as ECI, design-build (DB), PDB, IDaC, and other transaction authority (OTA). | The following entities and projects have used alternative delivery methods:<br>• USACE MILCON<br>• USACE New Orleans levees project<br>• U.S. Veterans Administration Aurora and Fort Belvoir hospitals<br>• U.S. Air Force BRAC Program |
| Support USACE priority projects | Congress commits to supporting USACE priorities, as expressed in the CIS. Congressional members will not request specific projects outside of the prioritized list. | • Other agencies with programmatic funding, such as BPA, are able to pursue a program of projects based on the greatest need. |

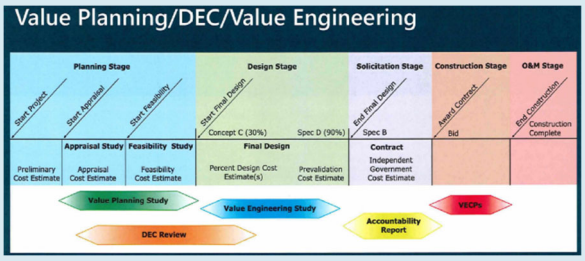
## 4.2 Recommendations for Administration Outside USACE

| Theme | Action | Examples |
|---|---|---|
| Rescind or modify EO 12322 | The Administration rescinds or modifies EO 12322 to address OMB's role in withholding critical information related to water resources projects needed by Congress for appropriation decision-making. | • Administration has recently rescinded other EOs seen as imposing unnecessary regulatory burdens |
| Allow use of continuing contracts clause | OMB allows USACE to use continuing contracts clause once again, on the condition that USACE establishes detailed guidance providing accountability through criteria related to project size, duration, and funding. | • USACE MILCON program currently uses continuing contracts<br>• Previously used for USACE Civil Works until mid-2000s |

## 4.3 Recommendations for USACE Headquarters

| Goal | Action | Examples |
|---|---|---|
| Create an inland navigation waterways system program | USACE Headquarters will create a separate program for inland navigation waterways system projects, potentially separate from the current Navigation Branch and similar to the Hurricane Protection Office set up after Hurricane Katrina. Establish a PMO for the entire inland waterways navigation system, including all stages of design, construction, operations, and maintenance.<br>Program should ensure that CIS implementation occurs, as follows:<br>• inventory and condition assessment to identify capital needs<br>• master scheduling and planning<br>• overall investment plan that provides a 3- to 5-year capability outlook to Congress and IWUB<br>• strategy to obtain buy-in from Congress, Districts, and IWUB, to prevent diversion of funds<br>• allow IWUB to prioritize IWTF funds to perform feasibility efforts for identification of potential improvements to the inland waterway system | • The USACE Regional Planning and Environmental Center combines environmental and planning functions across three Districts. |
| Follow the CIS | As an annual update to the outyear funding baseline scenario of CIS, the USACE PMO for inland navigation waterways creates and implements an Inland Navigation Investment Plan to prioritize and schedule feasibility reports and major rehabilitation reports based on prior year funding received and actual project execution, thus guiding a comprehensive investment strategy:<br>• No more than two to three projects should be in construction in any given year.<br>• Prioritize all work with associated funding by year.<br>• Fund up to two to three construction projects each year while staying within the programmatic funding amount (currently ~$500 million to $600 million) | Other agencies that have programmatic funding include:<br>• U.S. Air Force Natural Disaster Recovery Division, which has addressed storm damage at Tyndall, Offutt, and Langley Air Force Bases<br>• U.S. Air Force Sentinel Program<br>• USACE Mississippi River and Tributaries Project<br>• USACE Civil Works Dam Safety Program<br>• BOR Safety of Dams Program |

| Goal | Action | Examples |
|---|---|---|
| Update criteria for project prioritization | USACE will consider additional methods for evaluating and prioritizing projects:<br>• Operational Risk Assessment: As a supplement to the BCR approach, consider use of the ORA outlined in the CIS for additional categories, including Future Design (Category 2) and Ongoing Studies, Re-evaluations and Major Rehabilitations (Categories 3a and 3b), and Future Work (Category 4).<br>• Comprehensive Benefit-cost Analysis: Develop new models to appropriately consider the widespread benefits of lock and dam projects to fully capture the potential social, environmental, and economic benefits including the macro-economic elements of economic disruption risks (for example, Francis Scott Key Bridge collapse) and broader benefit areas. | • ORA Approach: USACE CIS Category 4 (Future Work)<br>• Comprehensive BCA: USACE/SAFCA Yolo Bypass Program (water management) and USACE/Harris County SAFER Program (flood risk management) |
| Revive the use of continuing contracts and/or incremental funding clauses | USACE provides detailed guidance for the use of continuing contracts to allow incremental funding for large projects, providing accountability through criteria related to project size, duration, and funding. | • USACE MILCON uses continuing contracts and incremental funding. |
| Centralize competencies and deepen knowledge base | USACE ensures project management continuity and technical capabilities/expertise exist as related to the design and construction of the inland navigation waterways system through a hybrid (in-person and virtual) approach:<br>• Project management – skilled project manager reaches out to groups within overall matrix (PMO at USACE Headquarters in conjunction with the Divisions and Districts) and oversees project “cradle to grave”<br>• Design (enhance existing INDC and production centers) – ensure experienced lead and component/discipline engineers<br>• Construction – ensure experienced resident engineers<br>• Focused knowledge transfer and succession planning through training programs and direct project experience | • USACE already operates with numerous centers of expertise for Civil Works (Risk Management Center, Dam Safety Modification, etc.) through hybrid models—build on INDC and Planning Center of Expertise for Inland Navigation<br>• USACE Risk Management Center for Dam & Levee Safety education and training program/curriculum provides model for knowledge transfer and succession planning |
| Ensure design maturity before requesting appropriations | USACE submits Chief’s report for authorized construction funding amount only after design includes critical information to address elements with a high risk of change conditions, typically 35% design or a comparable stage of alternative delivery (for example, ECI, IDaC, or other DB).<br>When a project is authorized, USACE ensures the project matures to an 80% confidence level in 100% of the project scope prior to appropriation. | • USACE CECW-EC Guidance on Cost Engineering Products, related to ER 1110-2-1302 |

| Goal | Action | Examples |
|---|---|---|
| Improve cost estimates | USACE follows BOR's process for improving project cost estimates, using the steps below throughout the project lifecycle:<br>• value planning<br>• design, cost estimating, and construction (DEC)<br>• value engineering<br>  | • BOR Safety of Dams Program |
| | Separately, USACE facilitates the use of RCF by establishing a centralized database and providing access to cost data for completed projects. | • USACE P2 system |
| Use standard designs | USACE uses standard designs for locks and dams to the extent possible. Uses standard and/or prefabricated components, such as for gates and lock monoliths.<br>USACE creates a standard set of drawing details, models, and specifications for proven components that require little or no site adaptation. Maintains a strategic reserve of key components that may be long-lead-time items. | • USACE MILCON programs<br>• BPA Hydropower Program |
| Encourage the use of ECI/IDaC and design-build | USACE identifies pilot projects that may benefit from the ECI and IDaC approaches, allowing the contractor to collaborate with the designer during the design phase, resulting in better outcomes related to cost, schedule, and quality. USACE has also piloted Civil Works DB projects. | • USACE MILCON<br>• USACE Civil Works pilot projects |
| Collaborate with industry and outside agencies | USACE enhances identification and adoption of best practices from outside designers, agencies, contractors, and foreign countries with expertise in inland waterway projects. | • Enhance existing USACE outreach and collaboration with international waterway agencies/organizations, such as PIANC |
| Create contracting plans | Regardless of project delivery method, USACE develops a contracting plan specific to each project, identifying separate project elements and the optimal delivery mechanism for each project element. Garners input from potential industry delivery partners, and tailors the plan to the available contractor pool, experience, and capacities. Identifies early-start packages. Incorporates incentives to maintain cost and schedule. | • USACE Lock 25 project (new 1,200-foot lock) |

| Goal | Action | Examples |
|---|---|---|
| Use 3D modeling and design and conduct constructability reviews | USACE designs every lock from the start in 3D CAD. Conducts design and constructability reviews in 3D for clash analysis. Includes facility end users in design reviews. Uses common collaboration platforms, being mindful of cyber security. Fully designs each lock as a system, as opposed to designing in pieces. | • USACE MILCON and Civil Works Programs already use 3D CAD/BIM |
| Expand site investigation efforts | USACE performs more rigorous site investigations as part of 35% design (or a comparable stage of alternative delivery) to better identify critical information with a high risk of change conditions such as geotechnical, seismic, dewatering, real estate, environmental, and other NEPA issues. Identifies any land acquisition requirements and risks early. Conducts community outreach to identify tribal issues, routing concerns, labor availability, and wage issues. Conducts cultural and environmental investigations and engage environmental agencies and interest groups early in the process. | • BOR Dam Safety and Value Analysis |
| Improve cost estimating and value engineering | USACE engages independent cost estimators and/or conduct IEPR of cost and schedule estimates. Update cost databases quarterly rather than just indexing. Develops project cost estimates at 35%, 60%, and 95% design stages and conducts risk workshops and value engineering with subject matter experts at each stage. Benchmarks completed projects and compiles industry “reference class” data for estimate checking. Co-locates designers and cost estimators in the same office to facilitate collaboration. | • BOR and TVA use independent and/or external reviews<br>• Build on existing USACE IEPR approach |

# 5 Further Discussion of Recommendations

This section provides additional details on the previously presented recommendations.

## 5.1 System Approach and Programmatic Funding

The top recommendation is to view the inland navigation waterways as a *system*, versus a series of individual projects, similar to the USACE and BOR dam safety programs. With a system approach, the inland waterways can be administered as a program, with funding centrally managed. This could also be effective in the change management arena.

Realizing reliable funding streams in a fiscally constrained environment, with so many competing priorities, is a challenge. The recommendation to implement programmatic funding—where USACE receives an annual funding amount not tied to specific projects—will provide more flexibility and allow USACE to avoid project construction interruptions. Better maximizing the appropriations to achieve the greatest benefit may require a shift in the traditional approach, which is founded on expressing a capability (what can be obligated in a fiscal year).

When funds are requested, a percentage of the amount includes “contingencies” to deal with changes to the project. If the waterways were treated as a system and managed programmatically, USACE would have greater flexibility to deal with changes by directing funds to the projects, thus mitigating potential cost and time growth.

Additionally, project cost estimates are predicated upon construction schedules that assume steady and efficient funding. When anticipated funding levels are not realized or are interrupted, the consequences can include schedule delays and increased costs—potentially by 10 percent or more. These are largely uncontrollable risks. Additionally, such delays can trigger other unforeseen impacts, such as shifts in policy or funding frameworks, as well as other uncertainties, all of which may influence overall project costs.

## 5.2 Continuing Contracts

Continuing contracts make a difference in terms of better quality and better cost and schedule risk management with fewer contractors. The recommendation to reimplement the continuing contracts clause would help with predictability and cost control. As noted by Mack (2025), continuing contracts establish a framework for incremental funding, which is essential for large, multiyear projects. USACE may award a construction contract for a project that will take several years, noting in the contract that future year funding relies on future appropriations. Mack suggests: “The major advantage to this approach is that funds are not sitting idle” (2025: 3). With large lock and dam projects that may cost several billion dollars, this pay-as-you-go approach allows projects to proceed without tying up substantial amounts of funding as the projects go through the construction process.

## 5.3 Alternative Delivery

The recommendation regarding alternative delivery approaches is based on examples of federal agencies successfully using innovative acquisition strategies such as ECI, IDaC, and other contracting approaches that mitigate cost and schedule risks.

### 5.3.1 Design-Bid-Build

For large Civil Works projects and, specifically, the inland navigation waterway projects, USACE uses the traditional DBB acquisition strategy. Most of the design portion of the large complex projects is done in-house, with USACE sometimes using A/E firms to complete components of the overall design. Before designing the project, USACE can spend years on project planning—evaluating alternatives, analyzing the BCR, and determining whether there is an overall federal interest.

Funding from Congress many times dictates the acquisition strategy. Funding for Civil Works projects is distributed in discrete pots used for planning (Investigations), design (PED—sometimes Investigations money, sometimes Construction money), and construction (Construction).

### 5.3.2 Design-Build

USACE MILCON and DOD O&M will often use the DB acquisition strategy. Usually planning and design funds are used to complete the design to 35%. A construction cost estimate is determined at this level and the programmed amount will be authorized and appropriated. The MILCON appropriated amount will include funds for the completion of the design and construction. O&M infrastructure work does not distinguish between design and construction, and O&M projects are not line items in the Defense Bill as projects are in the MILCON bill; therefore, using DB is easily accomplished. Under DB, the contract will be awarded to a construction company (partnered with an A/E firm) to complete the project's design and construction. USACE could use more DB in Civil Works, but that would require USACE feeling confident that the design-builder would meet all the Civil Works requirements and design standards specified by the federal government and USACE. The authorized and appropriated amount for the project would also need to include the design work, not only the construction funds.

The Federal Bureau of Investigation (FBI) constructed a large-scale facility at Redstone Arsenal by successfully using a DB to Cost strategy. The agency has bulk no-year funds, versus line-item projects. For inland waterways projects, programmatic bulk funding would be essential in allowing the success of the DB strategy. The FBI allowed some of the decision authority to be delegated to the DB procurement team in terms of accepting alternative solutions. This would be a mindset change for USACE. The FBI also provided a stipend to unsuccessful offerors, allowing for more competition. Programmatic funding allowed for this.

Also, using no more than 10% to 15% design in the Request for Proposals (RFP) allowed for maximum innovation from industry in the allowed budget. The FBI avoids the use of bridging documents to maximize industry's ability to bring multiple innovative solutions within budget. The following strategy was used:

- **Regulatory Process**: Follows the Design Build Institute of America's best practices. Complies with the FAR Part 36 Two-Phase Design Build procedures, resulting in a firm fixed-price contract. There are no unique FBI exclusions to the FAR-based requirements.
- **Design-Build to Budget**: Specifies design-build to budget amount in RFP. Offerors are informed that the best value does not mean the lowest price, and offerors are required by the RFP to optimize the budget. This drives the offerors to concentrate their efforts on providing as much technical innovation as possible (for example, Leadership in Energy and Environmental Design [LEED] Gold versus LEED Silver) rather than lowering the proposed price below the budget amount.
- **Incentivizing Competition**:
    - One of these best practices notes the selection of no more than three offerors to proceed in Phase Two.
    - Utilization of stipends (approximately 1 percent) to unsuccessful offerors that meet the minimum requirements of the RFP. This encourages quality contractor participation and maximizes the number of design solutions brought to the table.

- **Proprietary Meetings**: Holds three "proprietary meetings" or early exchanges of information with offerors prior to submission of Phase Two technical and price proposals, which drives better understanding of requirements/customer needs.
- **Incentivizing Post-Award Performance**: Uses incentives (approximately 1 percent) under post-award fee plan to encourage contractor performance tied to six areas of risk (objectives/milestones) during performance of the contract. Release of claims signed prior to payout.

The FBI effort began in July 2021, developed the RFP in February 2022, awarded the DB contract in August 2022, and completed the project in June 2024. In total, just under 3 years passed from design authorization to project completion.

USACE is piloting some military projects using this process and lessons learned from the FBI. Note that while this example was a $55 million project, the process is potentially independent of the project size for projects with a well-defined scope and schedule. For projects with complicated design and scheduling issues such as inland waterway projects, PDB may be a better alternative (see next section).

### 5.3.3 Progressive Design-Build

The American Council of Engineering Companies (ACEC) Research Institute developed a white paper distributed in May 2025 discussing PDB, a project delivery method in which design-builders are selected based on qualifications and work, with the owner in an exclusive contractual arrangement to subsequently agree-upon guaranteed DB pricing after the team develops an adequate design. The process typically consists of two phases: a preconstruction phase, where the team collaboratively advances preliminary design and validates the project scope, costs, and schedule, and a construction phase that begins after a general agreement on the project technical aspects and final DB pricing. PDB emphasizes early and continuous collaboration between the owner and the design-builder, allowing for flexibility and informed decision-making as the design, scope, budget, and schedule evolve together.

PDB has emerged as an innovative project delivery method emphasizing collaboration, transparency, and balanced risk allocation. The white paper examines how PDB is adopted, perceived, and practiced. The perspectives are drawn from research literature and a survey of 581 practitioners from 439 organizations, including owners, owner advisors, design-builders, architects, engineers, and subcontractors across six key sectors: aviation, industrial, private buildings, public buildings, transportation, and water/wastewater. The research reveals growth in PDB project volumes and construction values and widespread stakeholder satisfaction. The survey results also show that PDB outperforms other alternative delivery methods in balancing risk allocation. Despite this momentum, the results also show barriers to broader adoption, including regulatory constraints, owner hesitancy, and a lack of experience for some practitioners and owners.

The government has not used PDB because of funding stream restrictions, but Congress could set aside particular large projects and fund them in a manner such that PDB could be used.

### 5.3.4 Early Contractor Involvement

Under the ECI method of delivery, the contractor/construction manager is engaged for a fee. Upon entering into the contract, the actual cost of construction is unknown. This is typically because the design is yet to be finalized or has not been priced. An ECI delivery method allows the project owner to:

- have discrete parts of the work performed—and long-lead items ordered—before all design elements have been finalized,
- gain input from the contractor/construction manager on the design as it is developed,
- achieve greater transparency in subcontractor/trade contractor pricing, and
- complete the project faster.

ECI can be used for construction only, or for design and construction (or for design completion and construction).

The obvious difference between an ECI delivery method and a lump sum contract is that, at the time when the contractor/construction manager is engaged, the owners has less certainty about the project's likely final cost (because trade/subcontractor pricing has not yet been obtained).

The ECI approach offers faster completion, subcontract transparency, and early input from the builder. Lump sum contracts provide competitive pressure around price at the head contract level, greater certainty regarding price (assuming the project is well-documented), but potentially less control once the project is underway.

While USACE has limited experience with ECI (for example, specific projects for the Hurricane Protection Office after Hurricane Katrina), USACE has not used ECI with any frequency and, therefore, it is not a "go-to" delivery method. It is a sophisticated approach and requires familiarity to execute successfully. There is risk that needs to be managed leading up to defining the contract and converting to a firm, fixed-price contract. There is an art to achieving this successfully, in terms of achieving the desired outcome for both the owner and the industry partner.

### 5.3.5 Integrated Design and Construction

IDaC is a relatively new construction contracting method under development by USACE to maximize integration, collaboration, and partnering between the designer of record and construction contractor during the design phase and subsequently through construction completion. IDaC is a simplification of the more complex version of ECI (FAR 16.403-2 – Fixed-price incentive [successive targets] contracts). The IDaC methodology is tailored for construction. The key difference is that the owner's risk is minimized because the award and execution of the construction option may occur *only* as a firm fixed price, similar to traditional construction contracts. The owner awards two contracts: one to a designer (that is, A/E contractor) and one to a construction contractor (that is, IDaC contractor) prior to completion of the design documents.

IDaC allows for the award of the construction contract early in a project's development through a competitive process. The owner retains the IDaC contractor during design to work with the A/E contractor to provide preconstruction services such as constructability

reviews and cost estimating. The contractor is not responsible for any design services. The responsibility of the design remains entirely with the designer of record.

IDaC provides an opportunity for the designer of record and construction contractor to collaborate with the owner and stakeholders to solve problems early in the process. With problems resolved sooner, greater project savings can be achieved and potential delays can be avoided.

The benefits of IDaC include:

- improved design quality and constructability
- better understanding of market conditions
- receipt of pricing feedback during design development
- incentives to collaborate and meet cost objectives
- opportunity for small businesses to serve as “prime” contractors

IDaC has been used in USACE military programs and has proved to be beneficial. Because there is a separate planning and design account, the contractor may be brought in during design using these funds. Then construction funds are used to award the project to the accepted contractor as the project completes design and moves toward construction. USACE Civil Works, on the other hand, faces more challenges in using IDaC because of funding restrictions. Ideally, the contractor would be paid under PED, but since PED is provided by line-itemed project, it is challenging. If PED could be structured similarly to MILCON planning and design, the use of IDaC by Civil Works could be more beneficial and effective.

IDaC is currently being used for USACE Civil Works Dam Safety Program projects, specifically for the Howard A. Hanson, Prado, and Whittier Narrows Dams. A preconstruction phase service contract has been executed for Howard A. Hanson Dam. The use of IDaC aligned with the benefits listed above, with the primary objective being to mitigate risk and its associated cost growth. Additionally, by engaging the contractor, there is significant benefit in gaining a greater understanding regarding the sequencing of work, which better informs schedules that should result in project completion by December of 2030 (contingent on funding). For the Prado and Whittier Narrows Dams, the IDaC methodology has been approved for use.

### 5.3.6 Other Transaction Authority

OTA is a special procurement mechanism that allows U.S. federal agencies, particularly DOD, to enter into agreements for research, development, and prototyping without the constraints of the FAR. OTA is designed to foster innovation and collaboration with non-traditional defense contractors, small businesses, and academic institutions by providing a flexible framework for engaging in research and development activities. This flexibility makes OTA an attractive option for projects that require rapid development and deployment of cutting-edge technologies.

Section 843 of the 2023 National Defense Authorization Act amended 10 U.S. Code Section 4022 to define a “prototype project” as including a proof of concept, model, or process (including a business process); reverse engineering to deal with obsolescence;

a new application of commercial technologies for defense purposes; agile development activity; the creation, design, development, or demonstration of operational utility; or any combination of the aforementioned. DOD has used this authority for its MILCON and O&M projects. A barracks renovation project at Ft. Campell is using OTA, administered by the Defense Innovation Unit and USACE, and both the U.S. Navy and U.S. Air Force are using OTA for child development center projects under MILCON. The innovative aspect of these projects was that they needed to be net zero[2]—precipitating the need for creative design and construction.

USACE has taken initial steps to use the OTA approach. The Water Resources Development Act (WRDA) of 2022 granted USACE authority to use OTAs to implement prototype projects and follow-on production contracts or transactions to support basic, applied, and advanced research activities for Civil Works projects. Policy guidance was issued in early 2024, and in May 2024, USACE issued its initial solicitation using OTA in support of the Civil Works program, seeking development of a proof of concept and design for a large-scale hydraulic structures prototype model. In October 2024, USACE awarded the OTA to the selected offeror. The execution and assembly is ongoing and is dependent on annual budget and appropriations processes. The USACE Engineer Research and Development Center holds the authority and is the lead for this transaction.

Similar to what the National Defense Authorization Act and MILCON appropriation committees have done, the authorizing (WRDA) and appropriations (Energy and Water) committees could dictate pilot projects for USACE Civil Works, especially for inland waterways, to use innovative acquisition strategies. Funding must be available at appropriate times to support this innovation.

### 5.3.7 Public Private Partnerships

P3s are long-term arrangements between a government agency and private sector organization for all or various portions of the project life cycle: design, build, finance, own, operate, and maintain. Typically, it involves private capital financing for government projects and services up-front, and then draws revenues from taxpayers and/or users for profit over the course of the P3 contract. P3s have been implemented in multiple countries and are primarily used for infrastructure projects.

While a few DOD P3 projects have occurred (for example, U.S. Air Force C-130 hangars delivered by a municipality and private developer and then leased to federal government, and the USACE Fargo Moorhead Diversion Project, which split project delivery between USACE and a local sponsor, the Metro Flood Diversion Authority), the need for a long-term (typically 20+ years) revenue source is challenging for Civil Works projects, especially inland locks, given the federal appropriations framework and infeasible alternative sources (that is, user fees/tolls would likely be prohibitive for users). In addition, national security concerns exist with potential private operation of inland navigation waterway infrastructure required for mass movements of commodities used for energy, manufacturing, and agriculture. Therefore, P3s are not recommended for additional consideration.

[2] Net zero buildings produce enough on-site renewable energy to meet 100 percent of their energy demand.

## 5.4 Investment Plan

Given the substantial investment required for infrastructure projects—such as those along the inland navigation system, which often amount to several billion dollars—it is prudent to reassess the number of concurrently active projects. This consideration is especially relevant when viewed against the historical timelines typically associated with delivering such projects.

Creating an Inland Navigation Investment Plan as an annual update to the outyear funding baseline scenario of the CIS would provide a vehicle for prioritizing and scheduling feasibility reports and major rehabilitation reports based on prior year funding received and actual project execution, thus guiding a comprehensive investment strategy. The plan should specify no more than two to three projects in construction at any given time in accordance with the CIS.

## 5.5 Improved Cost Estimates

In our efforts to better understand how to achieve a greater confidence level in the design/cost arena, we engaged other agencies to identify best practices that could be useful to USACE. A best practice that could be of value to USACE is one used by BOR, documented in Value Program CMP-05. A rigorous analysis is performed on projects valued between $1 million and $10 million and for those $10 million and greater. The projects above $10 million are required to have a minimum of two value studies performed: one in the planning stage and the other in the design stage.

USACE should pursue a systematic process of reviewing and analyzing the requirements and functions of processes, systems, equipment, facilities, services, and supplies to achieve the essential functions at the lowest life cycle cost, while meeting the requirements for performance, reliability, quality, and safety. A multidisciplinary team consisting of in-house agency personnel and/or contractor personnel generally perform this value analysis/engineering process in a workshop environment. The term *value management* is often used when conducting value analysis studies of administrative procedures, organizational structures, or management systems.

### 5.5.1 Value Analysis

The value analysis process includes the following phases throughout the life cycle of a project and beginning at the planning/feasibility stage:

1. **Information phase**, where the team gathers information to understand the project and constraints that may be impeding performance.
2. **Functional analysis phase**, where the team identifies basic project functions and goals and identifies any performance shortcomings or mismatches between identified functions and customer needs for further study.
3. **Creative phase**, where the team conducts brainstorming to generate new ideas and alternatives/proposals for improvement in a project, product, or process, with particular focus on high-cost variables, speed of execution, quality, and performance.
4. **Evaluation phase**, where the team ranks ideas to find those best suited to meet the project value objectives.

5. **Development and presentation phase**, where the team develops the best ideas into viable alternatives/proposals with net life-cycle cost savings and implementation details and presents them to stakeholders.
6. **Implementation phase**, where the agency incorporates selected alternatives/ proposals into the project.

Value analysis studies may be tailored to meet the individual needs of the project or program. For example, the level of effort for each phase of the analysis may be scaled, as appropriate, based on factors such as the cost or complexity of the project, the stage of project planning or development, and the project schedule.

### 5.5.2 Value Engineering

A value engineering study occurs at the design stage when the design process and documentation is approximately 30% to 50% complete (design and contract documents are in draft form). A thorough review of existing design documents and plans identifies major asset components/systems and proposes changes for reasons of performance, reliability, quality, and value. The value engineering study provides proposals to modify the design based on value analysis principles.

By leveraging this process, BOR is able to achieve a greater confidence level when making its recommendations for construction funding.

## 5.6 Design Maturity

In recent years, USACE has placed significant emphasis on “getting the engineering and cost right.” This initiative addresses a complex, multivariable equation shaped by evolving policy and compounded by current market dynamics. To enhance decision-making during the feasibility phase of authorized projects, USACE has undertaken critical steps to ensure that engineering efforts are sufficiently developed. These efforts directly inform the formulation of reliable project cost estimates and support a higher level of confidence when engaging with stakeholders and Congress. This approach was formalized in a memorandum issued by the Chief of Engineering and Construction on June 5, 2023 (USACE 2023b), which also included a supplemental document outlining the criteria for determining design maturity.

As projects transition beyond the feasibility phase, an alternative to immediately requesting construction funding is being considered. This alternative involves deferring the request for construction general funds and instead seeking additional resources to advance design maturity to an appropriate level—typically between 35% and 40% design (or a comparable stage of alternative delivery) to better identify critical information/issues to address elements with high risk of change condition. This approach allows for improved cost accuracy when ultimately requesting construction appropriations. Furthermore, it facilitates the alignment of project execution with funding timelines, thus contributing to more efficient scheduling. The desired outcome of this strategy is to mitigate risks associated with time and cost growth—factors over which USACE retains a measure of control.

Moreover, it is imperative that USACE Districts and Major Subordinate Commands (MSCs) clearly articulate their capabilities considering available resources across their

entire portfolios. This includes evaluating workforce constraints, industry capacity within specific construction windows, and the regional—not merely local—availability of labor and materials needed to fulfill contract requirements.

The value engineering study functions as a system of checks and balances for validating the design maturity of deliverables. As stated above, the design is at the 30% to 50% stage of completion. During the study phase (feasibility), USACE also validates the design maturity and cost but the level of design can range between 10% and 15% when expressing a cost in the feasibility report and subsequently in the Chief's Report that has a recommendation to Congress for the project. The level of design maturity during the study phase is process/policy driven.

To achieve a greater understanding of the solution required for the project, consideration should be given to either extending the feasibility study timeframe to achieve a far greater design maturity (for example, 35% to 40%) or, after the project is authorized by Congress, request PED funds *only* for the purposes of progressing the design to achieve a greater confidence level before requesting construction funding. The mechanism to achieve this alternative funding approach may require the establishment of a new funding account. The value proposition in this alternative approach could lead to mitigation of cost and schedule growth of the inland navigation waterways system.

## 5.7 Standard Design

### 5.7.1 Standard Design Objectives

The use of standard design through the Centers of Standardization in military programs has been ongoing for nearly 20 years. Standardization is meant to achieve savings and benefits in the programming, design, and construction of U.S. Army facilities. The objectives, as outlined in USACE ER-1110-3-113, are listed below:

1. Increased credibility with the Congress through more consistent construction program development.
2. Increased consistency in facility types with equal treatment among ACOM, installations, and users.
3. Improved master planning and site development activities, improved design quality, and the promotion of design excellence.
4. Simplified programming activities.
5. Simplified design and construction project management, reduced design costs and time, reduced construction costs and time, and reduced change orders during construction.
6. Increased stakeholder satisfaction through improved responsiveness to the user's functional and operational requirements.

The term "standardization" is often understood to mean the complete duplication of a facility's design that is adapted from site to site. But standard design is generally only a facility concept that is a 10% to 20% design solution consisting of required elements (for example, room data sheets, adjacency matrixes, some floor plans). This standard design is issued as design criteria at the start of design for design-bid-build, or as the DB standard operating procedure. Standardization of a facility's design can include drawings

and/or criteria that delineate space allocations, functional layouts, and the facility's basic configuration, and can guide specific design and construction drawings or serve as adapt-build models, which can include drawings, specifications, and design analysis that are sufficiently detailed to serve as contract documents after modifications are made for site-specific requirements.

Once a standard design is done, user requirements should be validated, site/project specific requirements should be incorporated, and the rest of the design must be completed. Facility standardization is meant to maximize the delivery of facilities that meet the mission. Ideally, it:

- ensures consistent levels of quality and performance across the U.S. Army portfolio
- provides the basis of a consistent feedback loop for continued improvement
- ensures greater understanding of the final product to allow for better master planning
- shortens design durations (allows a head start)
- shortens construction durations (with fewer change orders)
- provides consistency in bid packages, promoting more consistent/lower construction bids

Savings related to standard designs have been documented through several years of MILCON data collection. Many factors influence the design and construction duration growth and cost growth (such as weather, site conditions, contractor/subcontractor performance, material availability), but holding those factors constant, savings did occur using standard designs, as shown in Figure 8.

**Figure 8**. Comparison of design and construction durations and costs for non-standardized and standardized projects

| | Non-Standardized | Standardized | Difference |
|---|---|---|---|
| Design Duration | 612 Days | 518 Days | 15% Less Design Time |
| | | | |
| Design Cost | 9.0% | 6.8% | 24% Less Design Cost |
| | | | |
| Construction Duration Growth | 48.2% | 43.1% | 11% Less Construction Time |
| | | | |
| Construction Cost Growth | 7.1% | 6.4% | 10% Less Construction Cost |

Source: USACE presentation, based on P2 database

### 5.7.2 Centers of Standardization

The INDC, discussed previously in Section 1.4, was identified as an avenue for standardization and quality design. Stakeholders voiced support for INDC and recommended that it receive full funding to invest in lead engineers and lead component engineers. The INDC was also identified to achieve project scope and design maturity to inform cost estimates and to support skilled project schedulers, given that scheduling is often a weak part of project efforts. It was also recommended that the hiring of lead engineers and lead component engineers be reviewed and approved by INDC.

One existing example of standardization and commonality of components for inland waterway infrastructure has been the programmatic replacement of miter gates and associated mechanical components throughout the Upper Mississippi River system. Through INDC and collaboration across the Upper Mississippi USACE Districts, a standard design was developed and used as a template for programmatic replacement at numerous lock locations over the past decade. Not only did this allow for streamlined design and construction, it also provides the potential for reduced operation and maintenance costs through the use of interchangeable and replicable components.

### 5.7.3 Standardization of Locks

With few exceptions, a new lock adjacent to an existing facility has been proven during feasibility to be in the federal interest. A standard full lock replacement design is not feasible since most existing locks are unique. However, many features within the lock could very easily be standardized. Also, two or three “standards” could be implemented over most of the USACE portfolio based on foundation conditions, hydraulic flow, and head conditions. USACE has begun the process of standardizing components. They are categorized into simple, moderate, and complex designs, where the simple designs are complete standards with little to no site adaptation (for example, check posts, light standards) to include the design computations, specifications, and drawings. A complex design (for example, miter gate) would result in standard specifications, some standards sections and details, and a design guide, which would be adapted to the site adapted on the gate height. USACE is also investigating design efficiencies, such as building lock walls on caissons and prefabricating lock monoliths off site to have them floated on top of the caisson, reducing the lock closure time of the adjacent lock and expediting the construction time.

The benefits of lock standardization would result in increased cost accuracy during feasibility, reduced cost during design, and, potentially, a more competitive construction contractor pool, resulting in better bids and reduced construction time.

# 6 Summary

This report recommends changes that would transform how USACE delivers its inland waterway projects. By treating the inland waterways as a system and funding improvements programmatically, Congress would give USACE the flexibility it needs to pursue the most urgent projects without interruption. Reviving the use of continuing contracts—with the necessary guardrails—would give USACE the means to pursue projects without leaving substantial amounts of money unspent for extended periods of time. By directing USACE to use alternative delivery methods, Congress would prompt the agency to adopt new approaches that would foster collaboration, improve cost estimates, and accelerate schedules. Finally, by supporting USACE priorities—as outlined in the CIS—Congress would allow USACE to focus on a program of projects that addresses the greatest needs first and thus promotes a resilient system that can provide better service and more reliability for its users well into the future.

These changes would require that USACE Civil Works restructure its funding, programming, and delivery methods for inland waterway projects. In keeping with the saying of “plan slow and act fast,” should Congress implement some or all of the recommendations outlined here, USACE should carefully consider how to implement the changes. The implementation process should include efforts to gather input and build consensus within the agency—and should allow for adjustments after implementation. USACE has the talent and capacity to remake itself while continuing to deliver some of the biggest projects in the world, and this transformation would allow the nation to continue benefiting from the vast economic engine that relies on our inland waterways.

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# 8 Qualifications

The table below lists the qualifications and experience of the report preparers.

| Contributor | Qualifications |
|---|---|
| Christine Altendorf, PhD, PE<br>HDR Federal Director of Program Management<br>BS, MS, PhD, Biosystems and Agricultural Engineering (Water Resources), Oklahoma State University | Dr. Altendorf has over 30 years of experience working for the U.S. Army and USACE and is now working in the Federal Business Group with HDR. While at USACE, she was a leader in both Civil Works and Military Programs and was in the Senior Executive Service for 15 years at locations across the globe. She received the Distinguished Presidential Rank Award twice during her tenure and led large, complex, multibillion dollar programs.<br>She is a Professional Civil Engineer, registered in OK. |
| Paul Dierking, PE<br>HDR USACE Water Business Program Manager and Senior Water Resources Project Manager<br>BS, Civil Engineering, University of Nebraska<br>MS, Civil & Environmental Engineering (Hydraulics), University of Iowa | Mr. Dierking has 25 years of experience leading complex water resources and civil works projects and programs for USACE and other inland waterway users/organizations. He has led multidisciplinary teams through the full project life cycle—from policy and planning to design, construction, and operations and maintenance—and has provided programmatic leadership for both technical experts and public/political stakeholders.<br>He is a Professional Civil Engineer, registered in NE and IL. |
| Pete Perez, PE<br>HDR Army Civil Works Program Manager<br>BS, Civil Engineering, Texas A&M University<br>MS, Environmental Science, University of Texas at San Antonio | Mr. Perez has 40 years of industry experience, including the last 33 years with USACE serving in various capacities, culminating as the Chief of Engineering and Construction for USACE Headquarters.<br>He is a Professional Engineer, registered in TX. |
| Andrew Thiess, PE<br>HDR Ports and Maritime Program Manager<br>BS, Civil Engineering, Vanderbilt University | Mr. Thiess has 35 years of industry experience, including serving as Construction Manager on the Port of Houston's Bayport Terminal, Construction Director on the South Carolina Port Authority's Hugh K. Leatherman Terminal, and Program Manager on the Port of New Orleans' Louisiana International Terminal.<br>He is a Professional Engineer, registered in TX, SC, LA, and AL. |

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# Appendix A. Stakeholder Interview Summary

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## Topic 1: Comparison of cost and schedule outcomes between large-scale federal construction projects executed by USACE and other federal agencies

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • This comparison will be of significant benefit. While the USACE cost process merits confidence, on a mega project, there are always opportunities to learn from others and combine with experience from USACE. An IEPR [independent external peer review] of USACE cost and schedule estimations and outcomes in NAV would be useful. The funding situation is absolutely part of the problem; however, scheduling is probably the weakest area and that has implications to cost. | • Large project challenges<br>• Independent/outside review<br>• Cost and schedule estimates<br>• Funding process |
| **Role**: Headquarters<br>**Agency**: USACE | • When comparing to other agencies, identify the funding commitment/reliability to ensure that there are no issues executing the contract. There is a need to revisit the unwillingness to leverage CCC [continuing contracts clause], and commit to incremental funding, which would contribute to mitigating risk, potentially reducing the contingency that industry includes in bid proposals.<br>• USACE leverages familiar acquisition strategies for CW, design-bid-build. While there is movement to leverage design-build and integrated design and construction, those means and methods are non-traditional delivery methods. It would be prudent to understand how other agencies execute similar types of “mega” projects and how cost and schedules commitments are met. | • Funding process<br>• Alternative delivery<br>• Large project challenges |
| **Role**: Hydropower Consulting<br>**Agency**: HDR experience with TVA | • No large, greater than $1 billion projects have been pursued since 2000 (aside from one current pumped storage project).<br>  ○ Only small rehabilitation/upgrade projects have occurred, ranging from $10 million to $50 million.<br>• Pumped storage is the only current greater than $1 billion project.<br>  ○ Reviewing delivery models because they see EPC (engineering, procurement, and construction) as likely more expensive.<br>  ○ $3.5 billion estimate in December 2024 was based on feasibility/concept level (pre-30% design).<br>  ○ Independent cost estimate is being done.<br>• Boone Dam Project<br>  ○ Larger dam safety rehabilitation to address seepage issues.<br>  ○ Cost/schedule overruns occurred. | • Large project challenges<br>• Alternative delivery<br>• Design maturity<br>• Independent/outside review |

## Topic 1: Comparison of cost and schedule outcomes between large-scale federal construction projects executed by USACE and other federal agencies

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Transmission Engineering<br>**Agency**: BPA | • BPA borrowing authority is several billion.<br>• One recent project was a rebuild of the radio network for safety. It started 15 years ago and ran out of money this year. $100 million was needed, then another $120 million to finish it. Vice president asked if it was needed, which triggered a new process that would flag the issue earlier. Now there are checkpoints throughout the process.<br>• Funding is provided by ratepayers.<br>• Land challenges are experienced, especially on tribal lands. May spend years getting land and cost estimates.<br>• Scope creep is an issue.<br>• Planning uses a risk calculator.<br>• There are limited resources, in terms of people, budget, and time. Planning does the prioritization. They rank the projects with an associated dollar amount, generally a “back of the napkin” estimate. Then the project is moved to scoping and the “real” cost estimate is done.<br>• BPA has a programmatic pot of money that is recouped from ratepayers.<br>• Facilities include a new control center that cost close to $1 billion.<br>• Before COVID, BPA went to “just in time” delivery, but after COVID they couldn’t get items and they still have difficulty with long lead time items (4 to 5 years). Buying extra for those items is now the approach.<br>• Project schedules have become disciplined during the last 2 years. Planning sends the work, then project managers estimate if they could do the work, using Microsoft Project. | • Funding process<br>• Cost and schedule estimates<br>• Land acquisition challenges<br>• Risk evaluation<br>• Part/component availability |

## Topic 1: Comparison of cost and schedule outcomes between large-scale federal construction projects executed by USACE and other federal agencies

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Dam Safety and Value Analysis<br><br>**Agency**: BOR | • Value Analysis Division set up a program 5 years ago to enforce consistency for costs across all of BOR. Estimating Process Review is a required program across BOR and started in 2020. Everyone was trained on it and now does it. They update costs regularly rather than just indexing.<br>• Value engineering after 35% for projects over $1 million. It is totally internal to BOR, versus more external to USACE. If there are large cost overruns, BOR will go back and do value studies.<br>• Value planning is done for projects over $10 million<br>• Quarterly construction pricing updates are completed.<br>• Dam safety program is lump sum (authorized). Then at 30% or so, they will identify the specific project and identify money needed out of that lump to do the project.<br>• Designers and cost estimators are in the same office, so there is no finger pointing.<br>• Example projects:<br>  ○ Indian Dam – new dam for water supply – estimate was $153 million and after BOR value study was $500 million<br>  ○ Cahuilla and Romana IWRS Water Supply (southern California)<br>  ○ Durango – Lake Nighthorse – was $300 million and ended up at $500 million; project would ensure water supply for Indian lands<br>  ○ Yakima Basin – fish passage and water supply project – HDR cost estimate was $500 million, and after value study the estimate was over $2 billion | • Cost and schedule estimates<br>• Value engineering<br>• Funding process |

## Topic 1: Comparison of cost and schedule outcomes between large-scale federal construction projects executed by USACE and other federal agencies

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Dam Safety and Value Analysis<br><br>**Agency**: BOR | • **Project example**: Bull Lake 1934 dam spillway replacement in central Wyoming – major modifications were slated in 2003. It was not designed yet. Folsom took the money, so this project was delayed.<br>  ○ The project came back in 2011 and BOR had to do a whole new alignment.<br>  ○ Design was completed in 2014 with a comfortable cost estimate. It was put on the shelf because of access to tribal land issues. Limited geotechnical wells because of cultural resources.<br>  ○ It was then solicited in 2017 for 3-year construction. Updated costs and specifications were completed. It was awarded in 2018 and took 6 years for construction. The project was $44 million at time of solicitation. Construction contract came in at $41 million to $42 million. Then an increase of $20 million of “noncontract” costs occurred. Had to go back and get approval for increased costs.<br>  ○ Delays were related to groundwater issues and significant dewatering issues. Tribal road followed river, and tribes didn’t want contractors because they were afraid of contamination. Other issues were concrete quality by contractor, COVID, and contractor from California that lacked personnel. Tribe wanted contractor to use tribal personnel or pay tribe money.<br>  ○ Final cost of project was about $140 million, or 200% more. Project was on a reservation, very remote, which led to concrete and steel price escalation.<br>  ○ Negotiating claims right now. Lessons learned has not been started but will be done within the next year. | • Tribal land access challenges<br>• Limited geotechnical<br>• Cost estimating<br>• Challenges of remote project location |

## Topic 1: Comparison of cost and schedule outcomes between large-scale federal construction projects executed by USACE and other federal agencies

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Dam Safety and Value Analysis<br>**Agency**: BOR | • **Project example**: Sisk (Caleb) in Central Valley of California. Originally completed in 1967 with 2.1 million acre-feet of storage. Important to agricultural community.<br>○ In early 2000s, BOR initiated an issue evaluation to consider seismic risk, which was completed from 2003 to 2009. It was a corrective action study with a consultant review board. DWR/BOR Central Valley (BOR) and State Water Project (DWR).<br>○ BOR said that a correction action study must be performed and split it with DWR. It was 3.5-mile-long dam. Loads of investigations needed to be done. There was also discussion to raise the dam. URS did lots of work until 2015, when it was pulled back fully into BOR. BOR made the decision to move from study (alternatives) to design. Cost estimate was done around 2011 and then a cost estimate was done when transferring from CAS to design. It was $500 million, but then geotechnical concerns were raised and it went up to $1 billion, all before OMB submittal for an authorized amount.<br>○ The project was originally planned to be a single contract, but was broken into three contracts. First contract was awarded in 2022 with no berm in design at $119 million, plus $20 million for modifications. It had a lot of environmental mitigation costs.<br>○ Phase 2 involves 20 million cubic yard berm for earthquake protection, with a $250 million to $500 million cost, and is out for solicitation now.<br>○ Phase 3 will raise 10 feet for freeboard and then another 10 feet for storage (cost shared with users). It is kicking off now.<br>○ $1.3 billion is authorized. | • Cost estimating<br>• Geotechnical and environmental issues<br>• Project broken into smaller projects |
| **Role**: Dam Safety and Value Analysis<br>**Agency**: BOR | • **Project example**: Fresno – North Central Montana – near Canada, built in 1937 to 1939. Differential settlement was noticed in 2011, but it was discovered that it actually settled during construction.<br>○ Lessons learned from Red Willow Dam that had differential settlement and lots of cracks. Issue evaluation from 2022 to 2024 (excavation and analysis done). Corrective action study (CAS) will include value planning. 30% design results. BOR finished the CAS in 2018 ($45 million) and decided to go into final design. At 60% design the cost was $45 million. Finished design in December 2022. Awarded at $46 million in May 2023. Finished in summer of 2025.<br>○ Oroville happened, and from lessons learned they looked at the spillway. Decided to do modification and do separate contract for spillway modification for $32 million. Design is at 90% but BOR lost whole team due to DOGE reduction in force. BOR wanted to have it solicited and awarded in summer/fall of 2025, but it may be delayed. | • Corrective action study<br>• Loss of experienced project team |

## Topic 1: Comparison of cost and schedule outcomes between large-scale federal construction projects executed by USACE and other federal agencies

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Senior Executive Services<br><br>**Agency**: U.S. Navy | • This discussion of the NAVFAC SIOP (Shipyard Infrastructure Optimization Program) focused on four shipyards: Norfolk, VA; Pearl Harbor, HI; Portsmouth, ME; and Puget Sound, WA.<br>• The last drydock construction was at Pearl Harbor in 1962. The shipyards are old, outdated, and have difficulty supporting the current missions.<br>• The SIOP will expend tens of billions of dollars over the next 20 years.<br>• Funding will be MILCON and SRM. Mark would like to look at SRM (O&M projects) over $100 million and see if he could get those converted to MILCON. SRM funds expire in 1 year. MILCON is 5-year money. CW money for USACE is no year money, meaning it does not expire.<br>• Master Planning is being done for each shipyard. Pearl Harbor is completed and the others will follow. One firm did all the master planning for all four locations.<br>• 3 LOEs for each of the four shipyards:<br>  ○ LOE 1 – MILCON – make it so current equipment fits and works<br>  ○ LOE 2 – fix the existing buildings – HVAC, fire protection, etc.<br>  ○ LOE 3 – Equipment<br>• For each shipyard – there are at least six “packages.” Each package consists of many projects and, ideally, they would like each package to be programmatic funding so they could move money between projects, if needed, but have not received approval from Congress.<br>• The drydock alone at Portsmouth is $2.5 billion to construct (ongoing). The original cost estimate was around $900 million. Navy went to USACE Cost Center to evaluate its cost processes to determine what was missed. AARs were done.<br>• Construction for Pearl Harbor drydock will be at least $4.5 billion. This is based on the cost area index but the assumption is that this drydock will be much higher because there will be modifications during construction because of Hawaii challenges.<br>• Intend to use advanced procurement strategies—ECI, award fees based on schedules, Economic Price Adjustments (materials and labor).<br>• The PEO is looking for consistency across planning, design, and construction management (using the same firms as much as possible). They want to use LL from one shipyard to another. Navy wants the ability to be creative with contracting and allow incentives. They want programmatic funding. They need to ensure designs are mature before cost estimates are given. | • Packages of projects<br>• Desire for programmatic funding<br>• Cost estimating<br>• Alternative delivery methods<br>• Desire for consistent project teams |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • This again will certainly be a useful look, particularly if combined with capturing and documenting the lessons learned from USACE Civil Works projects. However, the lessons should come from comparing mega projects. Smaller projects are easier to recover from if there are difficulties; these less complex projects are not going to be as informative to these huge and complex projects.<br>• The Dutch and others that build NAV and closure structures are going to be a lot more relevant than other federal agencies.<br>• Three immediate ideas USACE has moved to, but need widespread support:<br>  ○ FULLY DESIGN every lock before starting construction. Complete design and not design by pieces as done on KY and Chick (and others). Given how long these take to build, this means there may be a little “rework” to do design updates, but those are much easier to manage if necessary than designing only to the next contract. This is a major cost driver. This has happened not because anyone thought it was the best way to go, but has been driven by work packages, timelines, deadlines, and limited funding.<br>  ○ COMMONALITY and STANDARDIZATION – a base set of standard drawings and models will increase quality and make cost estimates better. Nothing will be exact from lock to lock, particularly where USACE is retrofitting or updating, but a standard set of drawings and models for the components will save significant design time.<br>  ○ Every lock should be designed in a 3D CAD model. A complete set of components with the standard drawings is needed. This absolutely needs to be combined with the use of 3D subsurface, and using tools like 3D glasses. For the Soo, USACE changed the design of the lockmaster building based on having the lockmasters look at the model in 3D space. These models should be in the cloud and fully take advantage of the collaboration tools (still a cyber and IT security challenge). Every designer, A/E or USACE, should have a common model to work with and from. It will increase speed and quality to start designs in 3D, rather than 2D CAD. BIM has shown that 3D design results in better quality. This shouldn’t be something done late it design, it should be the starting point. | • Collaboration with other countries<br>• Design maturity<br>• Standard design<br>• Use of 3D CAD and models |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • Consider the concept of treating inland navigation as a system, from a programmatic perspective. Under a programmatic concept, contingencies for the program would be managed at USACE headquarters. This would allow for funds to be programmed to those projects that require additional funds to deal with changes. Discipline action would be exercised, as Districts/Divisions would have to go through a Cost Control Board (current practice) to explain the "why" behind the need/request.<br>• Revisit a topic discussed at USACE Executive Governance Meeting held in May 2024: as USACE continues to implement the Design Maturity/Cost Classification Determination to get the engineering and cost right, an approach to control cost is, when a project is authorized, do not request the project be appropriated until the design has been further matured to ensure greater confidence that 100% of the scope can be delivered with 80% confidence.<br>• Consider separable elements for projects. As documents are developed, an approach would be to separate features of work that require heavy civil works and put them on one contract and then award a separate contract for other elements of the project (for example, operations building). | • System approach for inland navigation<br>• Programmatic approach to funding<br>• Accountability regarding costs<br>• Design maturity<br>• Separable elements for projects |
| **Role**: Power Consulting<br>**Agency**: HDR experience with BPA and USACE | • In HDR's experience with BPA's hydropower and nuclear program and with performing a BPA program review, the following issues were identified:<br>  ○ Develop/identify more granular chunks of work.<br>  ○ Address lack of schedule/planning and project prioritization.<br>  ○ Identify ways to navigate challenges of FAR.<br>• BPA system asset planning helps drive approach based on dedicated customer revenue (USACE lacks dedicated funding), which:<br>  ○ Allows scheduling and resource planning, and<br>  ○ Allows planning for multiple projects/paths—don't put all eggs in one basket (that is, plan for one large construction project, then it slips).<br>• Regarding execution, the following issues were identified:<br>  ○ Standardization and availability of components – maintain a strategic reserve for key components, to keep parts available "off the shelf."<br>  ○ Contracting – still a challenge.<br>  ○ Schedule slip in-house – no consequences for USACE, should develop mechanisms to incentivize maintaining schedules.<br>• Challenges within USACE include:<br>  ○ Internal conflicts between CXs, Districts, Headquarters, etc.<br>  ○ Lack of master schedule/plan for inland navigation program.<br>  ○ Need for inventory and condition assessment to identify capital needs.<br>  ○ Need for internal "above the line/below the line drills" review of processes. | • Separable project elements<br>• Long-range planning and prioritization<br>• Programmatic funding<br>• Standard design<br>• Stockpile of components<br>• Consequences for schedule slips<br>• Need for master schedule and plan for inland navigation<br>• Need for inventory and condition assessments<br>• Internal reviews |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

<table>
<tr><th>Stakeholder</th><th>Feedback</th><th>Takeaways</th></tr>
<tr><td>Role: Dam Safety and Value Analysis<br><br>Agency: BOR</td><td>
<ul>
<li>BOR provided helpful information on processes/procedures the team leverages to ensure there is complete understanding of the scope of work, the right level of design maturity is achieved, and how each project cost is validated.</li>
<li>Following table identifies the official levels of estimates and displays where they occur in the project development timeline.</li>
</ul>
<table>
<tr><th>PROJECT STATUS</th><th>PROJECT STAGE</th><th>OFFICIAL LEVEL OF COST ESTIMATE</th></tr>
<tr><td>Planning</td><td>Planning</td><td>Preliminary</td></tr>
<tr><td>Appraisal<br>Feasibility</td><td></td><td></td></tr>
<tr><td>Construction</td><td>Final Design</td><td>Percent [%] Final Design</td></tr>
<tr><td>Prevalidation of Funds</td><td></td><td></td></tr>
<tr><td>Solicitation</td><td></td><td>Independent Government Cost Estimate [Award]</td></tr>
<tr><td>Construction</td><td></td><td>Independent Government Cost Estimate for Contract Modifications</td></tr>
<tr><td>Operation and Maintenance</td><td>Operations</td><td>One or more of the previously identified estimates</td></tr>
</table>
<ul>
<li>Key difference between USACE feasibility level of design (10% to 15%, maybe) and BOR (35%), and that is significant when communicating the appropriators. The other is when project costs are communicated to the appropriators. USACE does this with the Chief’s report, when not enough is known to inform the engineering and cost.</li>
</ul>
</td><td>
<ul>
<li>Definition of project scope</li>
<li>Design maturity</li>
</ul>
</td></tr>
<tr><td>Role: Dam Safety and Value Analysis<br><br>Agency: BOR</td><td>
<ul>
<li>Types of estimates:
<ul>
<li>Appraisal: Appraisal cost estimates are used in appraisal reports to determine whether more detailed investigations of a potential project are justified. These estimates are intended to be used as an aid in selecting the most economical plan by comparing alternative features such as dam types, dam sites, canal or transmission line routes, and powerplant or pumping plant capacities.</li>
<li>Feasibility: sufficient information to permit the preparation of preliminary layouts and designs from which approximate quantities for each kind, type, or class of material, equipment, or labor may be obtained. These estimates are used to assist in the selection of a preferred plan, to determine the economic feasibility of a project, and to support seeking construction authorization from the Congress.</li>
<li>When it comes to construction, two cost estimates are developed. One is done for the final design and the other is a “pre-validation,” which is another step in the iterative process that provides assurances to the contracting officer that cost is correct to continue toward the solicitation phase of the project delivery</li>
<li>The rigor and discipline applied to cost validation/value engineering process is similar to ITR/ATR where the group of subject matter experts gather for a weeklong effort to review the scope of work, design that informs whether the team got the engineering and cost right and thus can avoid reputational risk.</li>
</ul>
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</td><td>
<ul>
<li>Appraisal cost estimates to justify projects</li>
<li>Feasibility cost estimates to determine economic justification</li>
<li>Construction cost estimates</li>
<li>Cost validation and value engineering reviews</li>
</ul>
</td></tr>
</table>

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Federal Consulting<br><br>**Agency**: HDR experience with U.S. Navy | • Based on experience with the Global TransPark project in North Carolina, the Navy/Marine Corps designated Global TransPark as the repair facility for its C-130 aircraft. The Fleet Readiness Center East (FRCE) is an aircraft repair depot under the Naval Air Systems Command. FRCE leases the buildings from Global TransPark, an agency of the state of North Carolina, which is a multimodal industrial and business park. The state is funding the $350 million project. This is a first-of-its kind innovative partnership between the State of North Carolina and FRCE, within the U.S. Department of Defense.<br>  ○ The project is funded by the state, with a federal tenant.<br>  ○ Project is being delivered through a CMAR contract because contractor input was needed on design and cost.<br>  ○ The scope was broken down into early-start design packages, with adjustments made to early packages based on design changes.<br>  ○ This approach allowed the contractor selection to be based on qualifications.<br>  ○ The pre-construction phase is under a lump sum contract.<br>  ○ The focus of the CMAR is management of construction and working with designers on cost and value engineering.<br>  ○ HDR established the preliminary budget, which was validated by the CMAR. The CMAR estimates actually came in under the engineer's estimate.<br>• Getting the right, knowledgeable groups on board to manage risks is important. | • State and federal partnership<br>• Alternative delivery method<br>• Early start design packages<br>• Knowledgeable team to manage risks |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Transportation Consulting<br><br>**Agency**: HDR experience with Ontario Province | • Private industry is moving toward progressive delivery methods: CM/GC, CMAR, PDB. Agencies struggle with how to run these. May need focused analysis to determine whether alternative methods are a fit with any particular project.<br>• P3 is a good option when there is a mechanism for private funding. P3 consortium can fund the project, with guaranteed repayment over time, which would have to span fiscal years.<br>• Ontario Line had P3 elements. The Ontario Teacher's Union liked the long-term return and invested.<br>• Ontario Line had 28 different contracts:<br>  ○ Two big P3s – Tunnel boring consortium reimbursed through the Province committing to financing payments. Rolling Stock was Hitachi to build-own-operate the entire system, paid through Province long-term payment financing scheme.<br>  ○ Two big PDBs.<br>  ○ Three large design-bid-builds ($400 million to $500 million).<br>  ○ Slew of advanced/early works design-bid-builds.<br>• WCI may want to consider taking a programmatic look at delivery. Program oversight may help to juggle the various project pieces.<br>• Initial estimates are never good.<br>• Need to evaluate who can best manage the risks; need sufficient evaluation up front.<br>• Consider whether WCI fuel tax be turned into finance pay-back.<br>• With MetroLinks as the project owner, there was a huge gap in people with any kind of actual construction or project management experience, and a tremendous amount of owner turnover. Need to think about how to engage people with experience. | • Alternative delivery methods, including P3<br>• Project broken into multiple contracts<br>• Poor initial cost estimates<br>• Need for experienced project teams |
| **Role**: Hydropower Consulting<br><br>**Agency**: HDR experience with TVA | • TVA uses EPC approach for most projects:<br>  ○ Pushes risk onto construction contractor.<br>  ○ Accomplishes accelerated schedule with additional cost (construction cost increased to cover risk).<br>• Hydropower:<br>  ○ USACE owns/operates assets and external power marketing agencies deliver power.<br>  ○ TVA owns/operates assets and markets power, directly receiving revenues that can be used for capital investments (differs from USACE).<br>• Funding/Appropriations:<br>  ○ Federal appropriations ended in 2000s and only very small portions remain.<br>  ○ Power system/revenues fund TVA, which currently has Congressionally mandated debt ceiling ($30 billion, which was set in 1970s without inflation factor). TVA is working to revise/increase the ceiling through Congress. | • Alternative delivery methods<br>• Use of revenues for capital investments |

### Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Transmission Engineering<br>**Agency**: BPA | • Outages are an issue; BPA is having a hard time keeping up with repairs for aging infrastructure. Emergency replacement is the approach, rather than sustaining infrastructure. Customer projects tend to prioritize sustainability.<br>• There is a large backlog of projects, but it is very rare that a project is totally declined or denied.<br>• Customers want to build their own stuff because they think they can do it cheaper and faster. They think they can bypass NEPA but they can't, and they have to build it to BPA standards, similar to CW cost-share sponsors.<br>• BPA created a large process for projects 10 to 15 years ago. All projects had to check off all the boxes. The process was created for the most complicated project ever, but caused a huge bottleneck for small projects. Now that process needs to be revisited.<br>• With 100% contracted, including reviews, it is way more expensive but faster. This was done because of manpower issues, compared to traditional methods where BPA does the work and reviews.<br>• Lessons-learned processes dropped off during COVID, but are coming back now.<br>• 4,000 people are going through DOGE stuff.<br>• TVA produced very detailed cost estimates very early, and then they weren't good. BPA did it after scoping. | • Challenge of aging infrastructure<br>• Project backlogs<br>• Environmental requirements<br>• Agency standards<br>• Lessons learned process<br>• Cost estimating<br>• Design maturity |
| **Role**: LRD Programs<br>**Agency**: USACE | • When a contract is a solicited with base plus options, what this does is drive the contractor to execute the work in a sequence which USACE has identified in terms of how the work is delivered. This eliminates any input for how the contractor sees how the work can be executed. An example of this approach is it may require the contractor to keep major pieces of equipment on site for an extended period of time whether being used or not (baked into the mobilization cost). | • Need for contractor input |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Inland Navigation Design Center<br><br>**Agency**: USACE | • Outyear funding recommendations in the Construction General Program face different challenges during the three phases of a project. Recommendations below exclude Major Rehabilitation Projects.<br>• Generic Project Timeline:<br>  ○ FY:Request funding for a feasibility Study<br>  ○ FY+2: Funding Received for Feasibility Study (assume efficient funding)<br>  ○ FY+6: Feasibility Study Complete/Approved by ASA (CW)<br>  ○ FY+8: Authorized in WRDA (assume included in next WRDA)<br>  ○ FY+10: Funding for PED Received (assume efficiently funded)<br>  ○ FY+13: Contract awarded (assume efficiently funded)<br>  ○ FY+20: Contract Completed<br>  ○ FY+27: Contract for Second Project in System Study Completed (assume design completed while first project under construction and constructing efficiently funded) | • Recommended project timeline |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Inland Navigation Design Center<br><br>**Agency**: USACE | • **Generic Feasibility Schedule:**<br>• FY+2: Funding Received for Feasibility Study (assume received in March since it was not funded in prior years and therefore could not receive funds its first year in October, assume efficient funding)<br>  ○ PDT members identified<br>  ○ PMP completed<br>  ○ Begin scope alternatives<br>• FY+3: Alternatives developed<br>  ○ Alternatives developed<br>  ○ Preliminary costs developed<br>  ○ Risks developed<br>  ○ Preliminary economic data started<br>• FY+4: NED Plan<br>  ○ Top plans undergo further design, economic analysis, environmental risk etc.<br>  ○ CSRA completed for NED Plan<br>  ○ PCXIN starts NED economic analysis<br>  ○ Optional work on high-risk items (physical model, hydraulic computer model, geotechnical investigations, etc.) to inform design and cost.<br>• FY+5: Reviews and Responses<br>  ○ All products undergo DQC, ATR reviews<br>  ○ Receive MSC approval<br>• FY+6: Feasibility Study Complete/Approved by ASA (CW)<br>  ○ Route for review and approval through USACE Headquarters to ASA (CW)<br>• Determination of the NED plan is typically done when the design is at less than 35% maturity. For inland navigation projects, this requires assumptions that contingencies must cover for known/unknown design/construction risks. Historically, these estimates have not been accurate. USACE policy requires estimates to assume efficient funding once the project is authorized and that authorization will occur quickly, which has not happened in the past 30 years and that contingency correctly covers all risks to include inflation. | • Recommended feasibility schedule<br>• Design maturity |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Inland Navigation Design Center<br><br>**Agency**: USACE | • **Recommendations**:<br>• Develop an inland navigation investment plan (iNIP) in alignment with the CIS to lay out where/when (what facility based on reliability with a risked base schedule) the next feasibility report needs to be completed along with where/when the next Major Rehabilitation Report needs to be completed in conjunction with an investment strategy. This investment strategy should include when major maintenance is needed on facilities as well. This would need to be adjusted annually since emergencies may arise directing funds away from this plan and appropriations may not align. It should be at a level of detail where it could provide direction but not too much that it becomes impossible to maintain. (Result: This would clearly show USACE, WCI, and the CODEL when investments need to be made in order to maintain the system.)<br>• To reduce the risk that appropriations don't align with the iNIP, get buy-in from all USACE Districts with projects in the plan to speak with one voice in support of the plan to the CODEL. Also receive buy-in from the IWUB and WCI. (Result: The CODEL will not fund projects out of cycle if they never hear Districts state what their capability number is outside the investment strategy.)<br>• Do not include more than two projects in a system study. Under an efficient funding scenario (shown above) it would take 21 years to complete two projects after the feasibility report has been completed. Economic analyses are developed based upon a 50-year window. More than two projects would bring into question the economics and there are also greater risks to unknowns in the economy, regulation changes, etc., increasing the uncertainty of the cost estimates and requiring funding requirements. (Result: It would make the cost estimates more accurate since the window for their construction is much smaller.)<br>• Identify high risks during feasibility and provide funding and time for the PDT to conduct further research to clarify the risk. One example may be the high risk of foundations. Allowing the PDT to either complete or conduct 80% to 100% of the borings will uncover issues allowing the team to adjust the design. This could easily save 1 year of design time and also solidify the total project cost. | • Need for inland navigation investment plan<br>• No more than two projects in system study<br>• Cost estimating<br>• Identify risks to feasibility |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Inland Navigation Design Center<br><br>**Agency**: USACE | • **Generic Design Schedule**<br>• FY+10: Funding for PED Received (assume received in March since it was not funded in prior years and, therefore, could not receive funds its first year in October)<br>  ○ PDT members identified<br>  ○ PMP completed<br>  ○ Review Plan completed<br>  ○ Draft Integrated Master Schedule developed-begin working critical path items<br>  ○ ERDC physical model begins (1 year)<br>  ○ Hydraulic computer model begins (1 year)<br>  ○ Contract for additional borings begins (1year)<br>• FY+11<br>  ○ Charettes completed for all features (foundation, electrical, mechanical, etc.)<br>  ○ Feature designs begin and are updated/validated after receipt of model and boring results<br>  ○ Real Estate needs finalized and handed over to real estate, begin Real Estate Plan<br>  ○ Environmental assessment started<br>  ○ Cost and Schedule Risk Analysis by Cost Risk Center (required every 2 years)<br>  ○ ATR 30%/BCOES 30% completed<br>  ○ MSC DCE required<br>  ○ Begin meeting with industry<br>• FY+12<br>  ○ Feature designs continue after response to 30% ATR/BCOES<br>  ○ Real Estate Plan developed/approved and real estate action commence<br>  ○ Environmental assessment complete and out for review at state level.<br>  ○ ATR 60%/BCOES 60% completed and comments incorporated into design<br>  ○ Develop acquisition strategy and receive approval<br>  ○ Continue meeting with industry<br>• FY+13<br>  ○ Real Estate actions complete<br>  ○ Environmental assessment approved<br>  ○ ATR 95%/BCOES 95% completed comments incorporated by January<br>  ○ Handoff to contracting by January with award in September | • Timeline for design |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Inland Navigation Design Center<br><br>**Agency**: USACE | • **Recommendations**:<br>• A key component in the development of the iNIP is the Acquisition Strategy. The WRDA cost share change for the funding of these projects made the opportunity for more funding possible. The reality is that the USACE budget constraints in the Construction General program will most likely limit the annual funding available for inland navigation projects to $500 million to $600 million. Generally, a project's total cost ranges between $1.5 billion and $2.5 billion, making it impossible to fully fund a single contract. Within these constraints, the only acquisition options available for these large construction projects are to either break the project out into multiple separate contracts or use a base plus options contract.<br>• Multiple Contracts – Increases total project cost due to inability to take advantage of economies of scale, paying for multiple mobilization/demobilizations, overlapping contractors in the same footprint create safety issues and slow down the progress of each contractor, etc.<br>• Base Plus Options – Limit the contractor's ability to take advantage of economies of scale, procure materials early to avoid potentially high inflation costs, limit the contractor's ability to use equipment efficiently and therefore demobilize/remobilize equipment, and the options restrict their ability to create their own efficiencies.<br>• Continuing Contract Clause – Currently not an option for inland navigation project. However, this was a proven, economical, and efficient tool before it was removed more than 20 years ago. A comparison of Kentucky Lock Acquisition alone showed that its use could save up to $500 million. There is an entire paper on its benefits, but at a minimum, it reduces the annual funding requirements to a predetermined funding amount within which the contractor can adjust its work. It also has the potential to reduce the amount of annual contingency carryout since it would only be needed for the work performed during the upcoming fiscal year.<br>• Using either or both add time and cost to the project along with safety and quality issues of using multiple contractors in a limited space. Efficiencies cannot be obtained because role in determining the most efficient. The key to identifying and providing realistic outyear funding capabilities is based on the development of an iNIP. A relatively stable plan reduces the risk of engineering sequencing and technical judgement. | • Need for acquisition strategy<br>• Funding challenges<br>• Need for multiple contracts<br>• Usefulness of continuing contracts |

## Topic 2: Funding frameworks, best practices, and strategies implemented by other federal agencies that could be applied to the USACE Civil Works Program to improve efficiency, control costs, and reduce risk to construction schedules

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Flood Control<br>**Agency**: DWR | • They are pushing "early implementation" using 408, 204, and 203 authorities. They have a study out that will show the cost differences between California with their sophisticated sponsors doing the design and construction vs. USACE doing it, and it is much cheaper when the state and local sponsors do it.<br>• They have spent loads of time and money training themselves and local sponsors to really understand the USACE processes, designs, and construction of flood control projects. They have built up local capacity.<br>• They want to use the early implementation work as their cost share for other projects.<br>• USACE still must review and approve all work, but it takes forever and does not seem to be a priority for USACE. They would like the ability to have an A/E firm do the reviews (similar to what HDR is doing for AFCEC).<br>• They would like USACE to be more flexible with acquisition strategies and environmental mitigation strategies.<br>• Too much turnover at USACE has caused a lot of issues. These projects take years—someone's lifetime, and every time a project manager or technical expert leaves, they feel like they have to start from scratch. Major lack of continuity of project managers. | • Lower cost of state and local projects versus USACE projects<br>Capable local sponsor<br>• Use of A/E firms for reviews<br>• Need for flexibility with acquisition and environmental mitigation strategies<br>• Need for project managers overseeing projects from start to finish |
| **Role**: Construction<br>**Agency**: DWR | • They have five offices across the state, with three construction offices for the State Water Project (flood control, contract administration, construction oversight).<br>• Partnering, Issue Resolution, Cost Estimating, Scheduling, Team<br>• Cost increases always seem to be a result of schedules.<br>• Function like a utility – 29 State Water contractors – they pay into the pot – funded by their water users.<br>• They have 30 to 35 active construction projects going on at one time. The projects are prioritized at DWR using the "programmatic" centralized pot.<br>• When there is a cost overrun or "bust," there is a detailed process that must be followed and a request for change must be approved at the senior levels. Depending on the dollar amount, it depends who can approve. Tries to get changed approvals done in 30 days.<br>• They do constructability reviews on all the designs. They have started to push cost estimates be performed at 30%-60%-90% reviews. Historically, they were just doing at 90%, which is too late.<br>• Water contractors have little say in the prioritization. DWR does that.<br>• Example of a bust: a big contract that only had one bidder and the bid came in at two times the cost estimate. DWR pulled it back, did contractor outreach, and repackaged it. Then it was awarded.<br>• They mainly do DBB, but have been doing more DB over the past 5 years. Never did it before that. They would like to do more DB in the future. | • Cost increases related to schedule delays<br>• Programmatic funding approach<br>• Accountability for cost overruns<br>• Constructability reviews<br>• Alternative delivery methods |

### Topic 3: Examples of federal agencies successfully using innovative acquisition strategies such as early contractor involvement, integrated design and construction, and other contracting approaches that mitigate cost and schedule risks

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • Joint risk registers should also be considered. | • Risk assessment |
| **Role**: Headquarters<br>**Agency**: USACE | • Consider challenges with IDaC and the commitment by OMB to support CCC and incremental funding that industry needs to have reasonable assurance there will be no stoppage of work. For these types of multibillion projects on the inland navigation system, a phased funding approach to execute/modernize the system will limit competition and result in un-awardable projects. | • Alternative delivery methods<br>• Phased funding may limit competition |
| **Role**: Power Consulting<br>**Agency**: HDR experience with BPA and USACE | • BPA is experimenting with various delivery models to see what works and has not settled on a particular model. | • Alternative delivery methods |
| **Role**: Risk Management Center<br>**Agency**: USACE | • BOR uses LTPA (lowest price technically acceptable) as its acquisition strategy.<br>• BOR KOs know that only 27 companies can be bonded to execute the work.<br>• Recommend that USACE use IFB (invitation for bid) to identify the companies that have the capability and capacity to do the work.<br>• IDaC is not seen as a useful tool. | • Acquisition strategy<br>• Limited pool of contractors<br>• |
| **Role**: Hydropower Consulting<br>**Agency**: HDR experience with TVA | • TVA uses EPC approach for most projects:<br>  ○ Pushes risk onto construction contractor.<br>  ○ Accomplishes accelerated schedule with additional cost (construction cost increased to cover risk). | • Alternative delivery methods<br>• Shared risk |

### Topic 4: Comparison of cost and timelines between using A/E services for design versus USACE performing the design in-house

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • Make sure you are looking at the amount of rework and spreading the design over time.<br>• Blended teams working at the same time is fine and will work. But a lot of rework was done on many of our projects from contracts that ended at "35%" design that were then kicked back up again from USACE and from A/E. | • Need for rework<br>• Use of A/E services |
| **Role**: Headquarters<br>**Agency**: USACE | • Consider INDC maturation and being the Designer of Record for the inland navigation projects. Two production centers are being established, providing capacity and capability to execute the project. This also highlights an important factor, which is centralizing competencies and ensuring the team gets the "reps and sets."<br>• Think differently about how many projects the industry can execute. Maybe the plan should be two to three. This is something for a broader discussion with USACE when it comes to planning the execution of the program. | • Experienced project team<br>• Number of projects in progress |
| **Role**: Management Consulting<br>**Agency**: HDR experience with BPA and USACE | • Regarding USACE design costs, a USACE SSR (special salary request) provides a higher salary range for special services, such as hydropower, with a 25% increase in salaries. A 1.67 multiplier was used that does not include SSR and may not include fringe benefits—likely not a large enough delta between A/E and in-house costs to be primary focus.<br>• USACE HDC is generally quite efficient, with the multiplier actually lower than for A/Es. Outside HDC, it is less efficient. | • Costs of A/E services versus in-house |
| **Role**: Hydropower Consulting<br>**Agency**: HDR experience with TVA | • TVA has transitioned from doing all work in-house to nearly all external design:<br>  ○ Remaining in-house are power delivery and dam safety.<br>  ○ Shift to external has generally been balanced—reduction in staff saved money, although recent A/E contracts have been questioned regarding consulting money.<br>  ○ Schedule comparisons are a question. | • Costs of A/E services versus in-house |
| **Role**: Transmission Engineering<br>**Agency**: BPA | • In-house labor: 10 people oversee contractors, for project management, scoping, cost estimates, owner's consultant.<br>• Single design-build contractors for projects over $10 million.<br>• Internal designers and in-house staff for operations and maintenance (sustainment work).<br>• Internal scoping that they contract out for design and/or option to build.<br>• Test and energization group does in-house commissioning.<br>• For greenfield work and new lines, tariffs are hitting now, and steel will have a 25% increase.<br>• Long lead time items got longer, even after COVID.<br>• In terms of resources, all utilities are using the same contractors, so it is hard to get all the A-team people. | • Combination of internal and A/E allows USACE to potentially get best experts<br>• Cross pollination and knowledge transfer can develop better project |

### Topic 5: Recommendations on how USACE can identify and provide realistic outyear funding capabilities based on engineering sequencing and technical judgement

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • Referenced the book, *How Big Things Get Done*, which benchmarks large worldwide projects and notes that big, complex projects have long tails.<br>• The message is: plan slow, build fast.<br>• Chief's report should not be signed until design is at least 35%.<br>• Benchmark similar projects.<br>• Regionalize planning across USACE.<br>• Make comparisons between government and private-sector construction projects.<br>• Do design-build and design-build to budget.<br>• Three projects at one time can be done with IWUB cost share.<br>• Should have two contingencies: design and construction.<br>• Pittsburgh District could provide input on base plus options.<br>• Continuing contracts.<br>• Programmatic funding for Ohio and tributaries: bucket it.<br>• Federal construction cost drivers include small business, Davis-Bacon.<br>• INDC does design and is Designer of Record. Rock Island and Pittsburg are production centers. Project manager of construction, for lock and dam.<br>• Helps with lessons learned and standard design and best practices.<br>• With design-build, how do you get good cost estimates without going to 35%?<br>• Talent management—need master builders and expert level. Need less attrition for that level—if 10%, that is too much.<br>• Soo has people doing it that worked in Kentucky.<br>• Cost share amount is the limiting factor for capability. | • Design maturity<br>• Benchmarking of similar projects<br>• Comparison of government and private-sector projects<br>• Up to three projects can be done at one time<br>• Federal cost premiums related to small business, labor requirements<br>• Talented project teams<br>• Capability limited by cost-share amount |
| **Role**: Headquarters<br>**Agency**: USACE | • The feasibility problem, and letting programs dictate the costs we are going to design to is backwards. We need to design, then figure out the best way to break up into contracts and sequence and then make adjustments to what funding we can expect to get.<br>• Continuing contracts make a difference. Better quality and better cost and schedule risk management with fewer contractors. | • Design informing contracts and sequencing<br>• Value of continuing contracts |
| **Role**: Headquarters<br>**Agency**: USACE | • See responses for Topic 2.<br>• Consider how to appropriately use the Capital Investment Strategy. Others within USACE can elaborate on this question. | • Use of the Capital Investment Strategy |

### Topic 5: Recommendations on how USACE can identify and provide realistic outyear funding capabilities based on engineering sequencing and technical judgement

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: LRD<br>**Agency**: USACE | • For budget requests, this is more a systemic issue when it comes to expressing a capability. The continued ask for funding that may be above what is needed can be made to ensure a District/project remains in the budget. Behavior drives decisions that may have manifested themselves over time where a need may not have been expressed for doing the right thing because there was plenty of carryover, only to be penalized with no funding in later years. This leads to carryover budgets that cannot be realigned to other projects because of how projects are appropriated, thus impacting future investment along the navigation system. This is a policy/process items that warrants more discussion.<br>• Another issue is the reality of what can truly be delivered concurrently. Need to think about the appropriate sequencing of projects based on the reality of funding. Maybe the right strategy is one to two projects with staggered starts. What is the appropriate stagger behind projects, 3 to 4 years? The benefit of evaluating the reality of the constrained environment may lead to better forecasting of cost and development of schedules.<br>• Consider viewing Inland Navigation as an entire system, giving USACE programmatic flexibility to realign carryover/contingencies to projects dealing with emergent issues. This is policy; a potential legislative action. | • Funding requests that perpetuate projects<br>• Consider only one to two projects at a time, leading to better cost forecasts and schedules<br>• Treat inland navigation as a system<br>• Use a programmatic approach |

### Topic 6: Benefits of standardizing lock replacement designs across the enterprise

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • Support standard design if it is deemed necessary. | • Standard design |
| **Role**: Headquarters<br>**Agency**: USACE Headquarters | • Consider commonality of components and composites, but others could provide a more comprehensive response. | • Consider components and composites |
| **Role**: Power Consulting<br>**Agency**: HDR experience BPA and USACE | • Standardization and availability of components – maintain a strategic reserve for key components, similar to strategic petroleum reserve, to keep parts available “off the shelf.” | • Create a strategic reserve of key components |
| **Role**: LRD<br>**Agency**: USACE | • While standardization is helpful, each lock is unique, but there are opportunities to standardize some elements of the lock and dams. Consider where are the designs of the future locks and dams, where they are in the queue, and evaluate whether there are opportunities to incorporate some element of standardization.<br>• Another observation is the tendency to want to redesign all components for the new lock and dam. This statement may be better aligned under time/schedule for the front of the deliverable and not so much with the cost/schedule objective of task. | • Balance unique nature of locks with the opportunity to standardize some elements<br>• Consider the design stage when planning to use standardization<br>• Tendency to redesign components of locks and dams |

### Topic 6: Benefits of standardizing lock replacement designs across the enterprise

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Inland Navigation Design Center<br><br>**Agency**: USACE | • With few exceptions, a new lock adjacent to the existing facility has been proven during feasibility to be the NED plan. A standard full lock replacement design is not feasible since the majority of existing locks are unique. However, there are many features within the lock that could very easily be standardized.<br>• There also can be two or three “standards” that could be implemented over most of our portfolio based on foundation conditions, hydraulic flow, and head conditions.<br>• USACE has begun the process of standardizing components. They are categorized into simple, moderate, and complex designs where the simple designs are complete standards with little to no site adaptation (check posts, light standards, etc.) to include the design computations, specifications, and drawings.<br>• A complex design (for example, miter gate) would result in standard specifications, some standards sections and details, and a design guide which would be site-adapted based on the gate height.<br>• Investigate design efficiencies, such as building lock walls on caissons and prefabricating lock monoliths off site to have them floated on top of the caisson, saving lock closure time of the adjacent lock and expediting construction time.<br>• The benefits would result in increased cost accuracy during feasibility, reduced cost during design, and potentially a more competitive construction contractor pool—resulting in better bids and reduced construction time. | • Use standard design for features within the lock<br>• Standards tied to foundation conditions, hydraulic flow, and head conditions<br>• Use simple, moderate, and complex standard designs<br>• Investigate design efficiencies to shorten lock closure time and speed up construction<br>• Standard design related to better cost estimates, lower design cost, and more competition for contracts |

### Topic 7: Other recommendations

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • 1. Fully support INDC, including key staffing. We need them to be a fully supported powerhouse, not halfway funded. They need to be driving innovation, standardization, and cost/schedule monitoring.<br>• 2. Build fewer than four at a time—there is a limited pool of contractors, and this is driving up costs when we bite off too many at once. Continuing contract clauses would help with predictability and cost control.<br>• 3. Invest in lead engineers and lead component engineers. These people will make or break a project.<br>• 4. INDC needs a cost/schedule cell that oversees all the projects. It is more than "making sure we are following our process" certifications. It involves making sure we have scope and design maturity right from the beginning, and managing the changes over time. Change management in the design ensures we are better designing to cost. There are alternatives that work, but are more expensive than others. And schedulers are the weakest parts of our teams. We have some great ones, but not enough. Same with dedicated contracting cell. "Reps and sets" matter. Ensure that numbers communicated to stakeholders, Congress, etc. are always vetted by INDC and NAV BL.<br>• 5. Continue with INDC and two production centers, but all lead engineers need to be hired by INDC and all component leads need to be approved by INDC. These larger teams can be supplemented by District and A/E designers, but we need people who have delivered these kinds of projects. This is a specialty skill.<br>• 6. Resident engineers matter. We need the best on mega projects. | • Support of INDC<br>• Limit the number of projects to less than four<br>• Need for good lead engineers and component engineers approved by INDC<br>• Design maturity<br>• Need for good schedulers<br>• Vet numbers communicated to stakeholders and Congress<br>• Need for best resident engineers |

### Topic 7: Other recommendations

| Stakeholder | Feedback | Takeaways |
|---|---|---|
| **Role**: Headquarters<br>**Agency**: USACE | • 7. Consider posting our designs for contractors to see much sooner to allow the industry to take a look sooner. Provide a small amount of money for any contractor with bond capability and qualified technical capability to review at 30% and 60% and allow them to provide industry comments. Money for review is contingent on providing comments to the design. It's not a huge pool, and the funding doesn't have to be large. But these are $2 billion projects, and the key to cost control is a really tight design. Consider using their comments and contributions as a factor in contractor selection. It could build in a little of the goodness of design-build, paying them for their time, which may result in much more competitive bids if industry sees and can participate in the process but in a little more controlled and distributed way than we see in ECI where we pick one contractor.<br>• 8. Have design and construction summits/workshops with USACE, A/Es and industry on lock design and construction. This has worked well with DFI for barrier walls. Contractors have learned a lot as well about how to better collaborate. Partnership outside of the actual contracts gives us all a chance to learn from each other and build relationships that will matter during construction.<br>• 9. TL needs to be clearly and cleanly in charge of quality, cost estimates, and how to break up contracts. That is just not a PM function with how we work.<br>• 10. We need experienced TLs, REs, and PMs and we need to listen to them. | • Collaborate with contractors to receive feedback on design<br>• Hold workshops on lock design and construction<br>• Need for experienced team members |

# Appendix B. Summary of Previous Studies

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## Summary of Previous Studies

| Document | Summary and Takeaways |
|---|---|
| *Reclamation Manual: Directives and Standards*<br><br>Prepared by U.S. Bureau of Reclamation<br><br>2007 | • This manual consists of a series of policies, directives, and standards that establish BOR's business methods. The following documents focus on cost estimating and independent oversight:<br>  ○ FAC P09: Establishes a policy for ensuring cost estimates are effectively prepared, reviewed, and properly used.<br>  ▪ FAC 09-01: Discusses the development and use of cost estimates, focusing on six levels of cost estimates: Preliminary, Appraisal, Feasibility, Percent (%) Final Design, Prevalidation of Funds, and Independent Government Cost Estimate.<br>  ▪ FAC 09-02: Discusses the development of a construction cost estimate and project cost estimate.<br>  ▪ FAC 09-03: Sets forth the requirements for the representation, referencing, and control of cost estimates.<br>  ○ FAC P10: Establishes a policy for implementing an independent oversight process to inform decisions and products related to design, cost estimating, and construction.<br>  ▪ FAC 10-01: Outlines how to identify projects that require an independent oversight review and how to perform such reviews. |
| *Inland Navigation Construction Selected Case Studies: Marmet Locks & Dam, Monongahela River Locks and Dams 2, 3, 4, Olmsted Locks and Dam*<br><br>Prepared by USACE Great Lakes and Ohio River Division<br><br>July 2008 | • This white paper documents project performance for three inland navigation projects and identifies lessons learned to inform future navigation investment funding decisions.<br>• The case studies illustrated the dramatic impact resulting from cost growth and the lost benefits that result from construction delays.<br>• The following future goals were identified:<br>  ○ Realistic, achievable, accurate, and risk-based cost and schedule estimating<br>  ○ Efficiently built infrastructure<br>  ○ Continued long-term project prioritization for infrastructure capital improvements<br>  ○ Commitment to optimum, timely, and appropriately disbursed funding stream to projects<br>  ○ Benefits realized ASAP<br>  ○ Uninterrupted construction start-to-finish |

## Summary of Previous Studies

| Document | Summary and Takeaways |
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| *Report to Congressional Committees Army Corps of Engineers: Factors Contributing to Cost Increases and Schedule Delays in the Olmsted Locks and Dam Project*<br><br>Prepared by U.S. Government Accountability Office<br><br>February 2017 | • This report explores cost overruns for the Olmsted Locks and Dam project, located on the Ohio River, 17 miles upstream of the Mississippi River. The project was initially authorized under the WRDA of 1988 for $775 million, with a construction duration of 7 years. In 2012, USACE sought to increase the project's authorized cost to $2.918 billion, with an estimated operational date of 2020 and full completion date of 2024.<br>• Factors that contributed to the project's cost increases and schedule delays included construction method (in-the-wet method), contract type (cost-reimbursement contract), and several other factors (limited funding, changes in market conditions, and design changes). |
| *Report to Congressional Requesters Inland Waterways: Actions Needed to Increase Budget Transparency and Contracting Efficiency*<br><br>Prepared by U.S. Government Accountability Office<br><br>November 2018 | • The report was prepared to examine delayed schedules and cost overruns for USACE's inland waterway construction projects and to recommend alternatives for funding and managing such projects.<br>• The report assessed how USACE allocates funding for operations and maintenance, how it funds its construction projects, and how the current funding approach has affected project costs and schedules.<br>• Two recommendations were made:<br>  ○ USACE should define and measure deferred maintenance for inland waterways in such a way that clearly communicates estimated costs for maintenance.<br>  ○ USACE should pursue ways to increase its ability to more efficiently use available construction funding and, if needed, develop a legislative proposal to request changes to its authority. |
| *Inland Navigation Design Center: Cost Saving Initiatives*<br><br>Prepared by Fred Joers, Director, Inland Navigation Design Center, USACE<br><br>2019 | • This presentation provides an overview of cost-saving efforts undertaken by USACE's INDC. The INDC strengths are identified as:<br>  ○ Building teams of experienced people<br>  ○ Taking an enterprise-wide approach to projects<br>  ○ Standardizing designs, inspections, and repairs<br>  ○ Leveraging lessons learned, best practices, and methods and technology<br>  ○ Implementing design charrettes to achieve quality and cost savings<br>• Cost savings for three locks on the Upper Ohio River are highlighted, with the original cost of $2.7 billion being reduced to $1.5 billion, and the construction duration being reduced from approximately 8 to 6 years. Revised concepts produced by the INDC included:<br>  ○ Replacing a coffer box construction with a hanging form system solution for walls<br>  ○ Replacing new tainter gates with labyrinth weirs<br>  ○ Replacing drilled shafts with rock excavation and use of spread footings<br>  ○ Using through-the-wall filling and emptying |

## Summary of Previous Studies

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| *Guidance on Cost Engineering Products update for Civil Works Projects in accordance with Engineer Regulation 1110-2-1302 – Civil Works Cost Engineering*<br><br>Prepared by Pete G. Perez, Chief, Engineering and Construction, USACE<br><br>June 2023 | • This memorandum focuses on the effective development, management, and control of cost estimates. It provides guidance on cost engineering products, noting the issue of design maturity and recommending that three areas be addressed when considering the level of design: geotechnical data quality, hydrology and hydraulics model type, and survey data quality.<br>• A matrix is provided to determine the level of cost engineering product required for Civil Works projects during various project phases. |
| *The History of the Inland Waterways Trust Fund*<br><br>Prepared by Jeff Davis, Eno Center for Transportation<br><br>August 2023 | • This article provides a history of the inland waterways trust fund, noting that upon the nation's founding, the inland waterways were designated for free travel—without taxes, tolls, or fees. However, in the 1970s, Senator Pete Domenici began seeking ways to tax the barge industry. The barge industry benefitted from substantial federal investment in dredging and clearing the inland waterways, while the competing railroads bore the cost of their track upgrades and maintenance without federal help. In 1978, a law was passed establishing a fuel tax supporting the inland waterways trust fund. |
| *How Big Things Get Done: The Surprising Factors Behind Every Successful Project, from Home Renovations to Space Exploration*<br><br>Prepared by Bent Flyvbjerg and Dan Gardner<br><br>2023 | • This book examines how megaprojects, ranging from high-speed rail to iconic buildings, can succeed or fail. It offers the following principles for minimizing risks associated with big projects:<br>  ○ Understand the challenges.<br>  ○ Plan slow and act fast.<br>  ○ Start with goal, then identify the steps to get there.<br>  ○ Apportion large projects into smaller components.<br>  ○ Establish a strong team.<br>  ○ Consider unknown challenges that may arise.<br>  ○ Manage expectations. |
| *Process for U.S. Army Corps of Engineers (USACE) Projects*<br><br>Prepared by Congressional Research Service<br><br>March 2024 | • This report outlines the process for USACE water resource development projects, highlighting the following topics:<br>  ○ Authorization and Appropriations<br>  ○ Federal Water Resource Projects<br>  ○ Assistance for Nonfederal Environmental Infrastructure |

## Summary of Previous Studies

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| *2025 Capital Investment Strategy – Presentation to Inland Waterways Users Board, Meeting No. 102*<br><br>Prepared by USACE<br><br>April 2024 | • This presentation provides an overview of the 2025 Capital Investment Strategy, highlighting changes since 2020, outcomes since 2020, 2025 updates, schedule, and key assumptions. It describes a new categorization scheme for project status, providing more detail on some categories. The presentation also presents three draft scenarios for ongoing projects:<br>o Scenario 1 – Constrained<br>o Scenario 2 – Accelerated<br>o Scenario 3 – BIL [Bipartisan Infrastructure Law] Projects 100% Federal |
| *Inland Waterways Users Board 36th Annual Report to the Secretary of the Army and the United States Congress*<br><br>Prepared by Inland Waterways Users Board<br><br>December 2024 | • This annual report provides the Inland Waterways Users Board's input on USACE inland navigation projects and issues. The Board is an advisory committee consisting of industry representatives who provide input on project prioritization and current and future transportation needs of the inland navigation system.<br>• The report made numerous recommendations regarding overall system issues and several project-specific situations. The following recommendations for fiscal year 2025 focused on the overall system:<br>o Congress should appropriate all estimated receipts into the Inland Waterways Trust Fund, including excess balances from previous years.<br>o Congress should increase funding for the operation and maintenance activities to address a backlog of routine work.<br>o USACE should continue proactive dredging and adopt a federal water management plan to reduce shutdowns resulting from low water conditions on inland waterways.<br>o Given cost overruns and delays at Kentucky and Chickamauga Locks, Congress should increase oversight over "mega" construction projects.<br>o Congress should follow regular order and enact the Energy and Water Development and Related Agencies Appropriations Act by September 30.<br>o Congress should engage the Administration to avoid disruption to the operation and continuity of the Inland Waterways Users Board.<br>o USACE should provide a 3- to 5-year capability outlook to Congress and the Board.<br>o Congress should prioritize capital investment over major rehabilitation.<br>o Congress should only fund PED for projects slated for construction within 5 years. |

## Summary of Previous Studies

| Document | Summary and Takeaways |
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| *U.S. Army Corps of Engineers: Actions Taken to Develop Water Resources Research Prototypes*<br><br>Prepared by U.S. Government Accountability Office<br><br>December 2024 | • This letter report outlines USACE's progress since 2023 in using agreements known as "other transaction agreements" (OTAs) to conduct prototype projects and implement follow-on contracts or transactions to support research efforts for its Civil Works mission.<br>• The report notes that USACE issued a revised policy for using OTAs on prototype projects in February 2023, and issued its first solicitation using OTA for the Civil Works program in May 2024 for a large-scale hydraulics structure prototype model. The OTA was awarded to an offeror in November 2024. A follow-on may be possible based on whether the proof of concept and design are successful and whether funding is available. |
| *Five-year Review and Update of the Inland and Intracoastal Waterways Twenty-year Capital Investment Strategy: 2025 Capital Investment Strategy Report*<br><br>Prepared by USACE<br><br>January 2025 | • This report is a 5-year update to USACE's 20-year capital investment strategy for the inland and intracoastal waterways. It discusses completed, ongoing, and proposed capital investments.<br>• The following project outcomes were predicted for the 20-year period from fiscal years 2025 to 2044, under the 2025 funding scenario:<br>  ○ Ten construction projects could be funded to completion, one project would be ongoing, and several major rehabilitations could be completed for a total of $11.3 billion. Major rehabilitation project funding would be $720 million. |
| *Quantifying the MILCON Cost Premium (MCP): Evaluation and Cost Comparison of Barracks Design and Construction Cost, Private vs Government and similar MILCON facility types*<br><br>Prepared by MOCA Systems, Inc., for USACE and NAVFAC<br><br>February 2025 | • This study examined the costs of design and construction for private-sector versus federal government projects, in the context of MILCON. Factors potentially resulting in the higher costs for MILCON projects were examined, including federal requirements related to sustainability and energy standards, labor agreements and wages, design, staffing, bonding, contracting, procurement, base security and access, planning and scoping, and quality management.<br>• The study compared costs for military barracks projects and their private-sector counterparts—student dormitories. It found that the barracks were constructed at a premium of 68.3 percent, compared with the dormitories. The two primary factors contributing to the higher costs for the barracks projects were administrative (legal, regulatory, guidance) and installed components (facility features). |
| *The Continuing Contracts Clause: Balancing Efficiency and Fiscal Responsibility in U.S. Army Corps of Engineers Civil Works Contracting*<br><br>Prepared by Thomas E. Mack, PE<br><br>March 2025 | • This white paper discusses the role of continuing contracts for USACE projects in ensuring the efficient use of funding for large projects that span multiple years.<br>• The paper argues that the failure to use continuing contracts on large navigation projects has caused USACE to "have nearly $3 billion unexpended on existing contracts and is annually costing the program $30 million to $50 million in purchasing power."<br>• Mack argues that the efficient use of the continuing contracts clause would allow USACE to more effectively deliver the program and provide benefits to the nation sooner. He encourages USACE to adopt specific criteria for using continuing contracts related to (1) project size (only the largest projects), (2) duration (at least 5 years), and (3) funding type (Construction General/Trust Fund dollars). |

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| *Progressive Design-Build: Practice, Perception, and Potential*<br><br>Prepared by ACEC Research Institute<br><br>May 2025 | • This white paper discusses the PDB project delivery approach, drawing upon research literature and a survey of 581 practitioners from 439 organizations in the fields of aviation, industrial, private buildings, public buildings, transportation, and water/wastewater.<br>• The research found that the number and value of projects using PDB has grown. According to the survey results, PDB is believed to perform better than other alternative delivery approaches in terms of balanced risk allocation. However, it also found that broader adoption of PDB is hampered by "regulatory constraints, owner hesitancy, and a lack of experience for some practitioners and owners." |