

Twice-Cooked Pork: The Upper Mississippi River-Illinois Waterway Navigation Study

Executive Summary

The U.S. Army Corps of Engineers has proposed to build seven new locks and extend the length of five other locks on the Upper Mississippi and Illinois rivers. This \$2.3 billion proposal would be the most expensive waterway project in American history.

Congress should reject longer locks for several reasons:

- **River Traffic is Declining.** River traffic has been flat since 1980 and has actually declined significantly in recent years. But, the Corps assumes that traffic will grow dramatically in the next few decades. Two panels of the National Academy of Sciences have called the Corps' traffic "scenarios" unrealistic. Corps traffic forecasts have been wrong before – most recently for Lock and Dam 26 on the Mississippi River. In fact, only 2 of 14 waterway projects constructed since World War II have attracted as much commercial traffic as the Corps predicted.
- **Domestic Demand for Grain and Oilseeds is Growing** The fastest growing market for American grain is domestic processing facilities such as ethanol production plants, not foreign markets, and value-added products made from grain are shipped by truck and rail, not by barge. While exports have been on a flat trend line for more than two decades, value-added processing of grain has grown dramatically, creating jobs in rural communities. Unfortunately, the Corps is using economic models and assumptions that ignore or underestimate these alternatives to barge.
- **Most Locks Have Been Recently Rehabilitated.** The locks and dams are not falling into disrepair or "limping along", as the Corps contends. In fact, the Corps has rehabilitated many of the locks they now propose to replace over the past decade. Overall, the Corps has spent more than \$900 million rehabilitating locks and dams since 1975, extending the productive life of existing locks and dams for at least 30 years.
- **Congestion Management Measures Can Relieve Congestion Now.** Corps studies show that inexpensive small-scale measures like traffic scheduling and helper boats could reduce lockage times by 20 minutes or more. And, unlike new or expanded locks that will take decades to build, small-scale measures can be implemented right away at a fraction of the cost.

The Corps' \$2.3 billion lock expansion proposal grossly overestimates future river traffic, underestimates growing domestic demand for grain, and ignores the benefits of less expensive congestion management measures like traffic scheduling. In fact, river

traffic has been flat for more than two decades, and has actually fallen significantly in recent years. In addition, many of the locks the Corps would replace have been rehabilitated in recent years, extending their useful lives for decades.

Congress should instruct the Corps to implement small-scale congestion management measures like scheduling while the agency completes a credible assessment of longer locks. We have time. Construction on longer locks could not begin for a decade, and most river locks have been rehabilitated in recent years.

Background

The Mississippi and Illinois rivers are major arteries for commerce. While most of the rivers' locks are 600 feet long, most tows push 15 barges that are nearly 1,200 feet long when lashed together. This forces tow operators to push barges through locks in two steps, a 90-to-120 minute process. In 1992, the Corps of Engineers initiated a study to determine whether to extend the length of some river locks to reduce delays. The Corps has considered whether to extend the length of some locks to 1,200 feet and/or to replace some locks with new 1,200 foot locks.

In February 2000, Army Corps economist Donald Sweeney filed an affidavit with the Office of Special Counsel disclosing that senior Corps officials had ordered him to exaggerate the benefits of longer locks on the Mississippi River and Illinois Waterway. In particular, Sweeney disclosed that officials ordered him to underestimate how much grain would be shipped to alternatives non-barge destinations, such as inland rail and other processing facilities, as barge and grain prices change. The Office of Special Council and the Army's Inspector General confirmed Sweeney's disclosure finding that the Corps had deceptively and intentionally manipulated data in an attempt to justify the project. The Army IG also found an institutional bias that favored the construction of large water projects, and found that Corps staff itself had little confidence in the quality of Corps analysis.

In 2001, a National Academy of Sciences panel, called the Committee to Review the Upper Mississippi-Illinois Waterway Navigation System Feasibility Study, concluded that the study presented to them in September 2000 by the Corps relied upon overly optimistic barge traffic forecasts and an economic model that was based on flawed assumptions and data. In sum, the Committee concluded that the Corps' feasibility study underestimated the impact of changing prices on demand for barges, overestimated foreign demand for American grain, and thereby overstated the delays that would likely occur in the future at river locks.

The Committee applauded the Corps for employing a spatial equilibrium model, and urged the Corps to revise the model, called ESSENCE, to (a) include accurate measurements of the quantity, origin, destination and price of grain shipments by barge, rail and other modes; (b) eliminate assumptions that shipment costs are proportional to distance and that agricultural yields are uniform; and (c) estimate demand and supply sensitivities to price from studies of current data. The Committee also urged the Corps to abandon traffic forecasts that were based on simple extrapolations of past traffic. The Committee further urged the Corps to immediately implement small-scale measures to relieve congestion, such as scheduling, congestion fees, and other measures that could cost-effectively reduce the time needed to move through a lock.

In July 2002, the Corps released an Interim Report on the Restructured Upper Mississippi River-Illinois Waterway Navigation System Feasibility Study, and subsequently released a series of memorandums outlining the assumptions underlying the revised feasibility

study. The Interim Report identifies six infrastructure alternatives, and five qualitative “scenarios” of “reasonably plausible” traffic growth in lieu of actual probability based traffic forecasts. The report also states that the Corps will employ two models to “estimate” the economic benefits of these infrastructure alternatives under each scenario. The alternatives include the construction of new 1,200-foot locks, the expansion of existing locks, the use of switch boats and mooring cells, congestion fees, and scheduling.

In December 2003, a second NAS panel reviewed the Corps revised study plan and renewed the basic objections set forth by the first NAS study. In particular, the panel noted that the Corps continues to use two discredited economic models – the Tow Cost model that was previously rejected by both the Corps and the NAS; and the ESSENCE model that was rejected by the NAS in 2001. The panel also found that the Corps continues to forecast increases in grain exports that are wholly inconsistent with flat export levels over the past 20 years, and that the Corps has failed to implement traffic scheduling and other congestion management measures prior to evaluating the benefits of any lock expansion. The NAS concludes that “it is not possible” to evaluate such benefits unless an efficient system for managing waterway traffic is in place.

In April 2004, the Corps announced that the agency would recommend the immediate design and construction of seven new locks, and a plan to evaluate the need of five lock extensions. The Corps also pledged to implement helper boats and scheduling while the new locks were designed and constructed, and pledged to continue to develop a new version of the ESSENCE model.

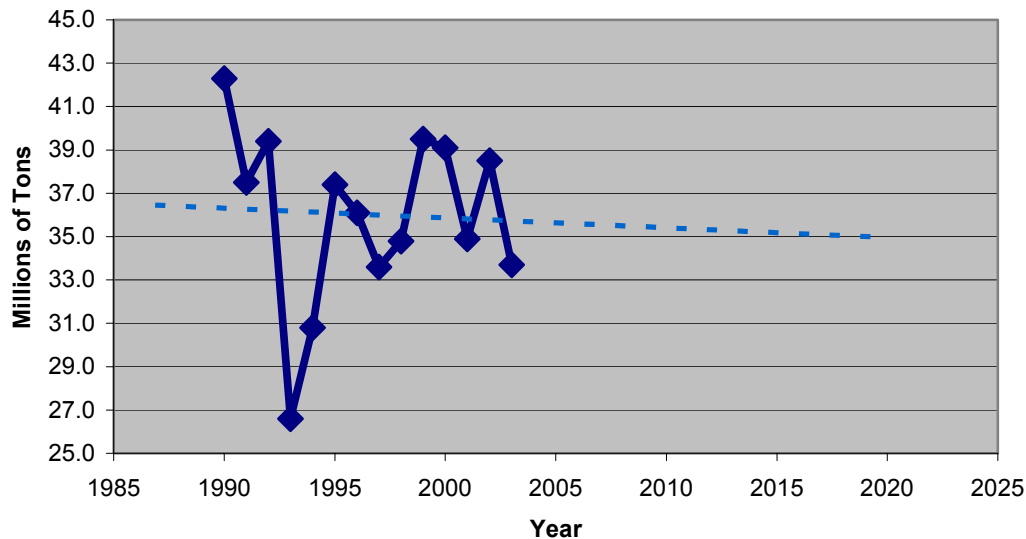
Corps Fails to Conduct Realistic Traffic Forecasts

The Corps has employed five traffic scenarios that ignore and contradict the real declining levels of river traffic and that make unsupportable assumptions about world agricultural trends.

- *Actual river traffic is declining.*

The number of barges processed on locks on the Upper Mississippi and Illinois rivers has fallen for the fifth straight year, and declined since the Navigation System Feasibility Study began. That’s despite the fact that grain production in the region has increased steadily. The number of barges processed at some locks has fallen by 20 percent or more during the study period. In 1993, the Corps predicted that barges would wait more than 16 hours to pass through Lock and Dam 24 in the year 2000. But, barges at the river's most congested lock only waited 4.6 hours (LaGrange on the Illinois), on average, in 2000. Delays at other presumably "congested" locks were even lower – between 2.2 and 3.6 hours at locks 20 through 25, far less than Corps predictions. These declines reflect that fact that farmers can find other, more financially attractive destinations for grain – a fact the Corps routinely ignores.

Lock 25 - Upper Mississippi River
Actual and Trend Traffic through 2003



- *Corps “scenarios” are grossly optimistic*

The Corps has abandoned realistic traffic forecasts in favor of five qualitative “traffic scenarios” developed by a private consultant. Four of these scenarios of traffic growth are as grossly over optimistic as the original traffic forecasts previously developed for the Corps. The original traffic forecasts were emphatically rejected by the NAS in 2001. In general, these scenarios overstate the likely foreign demand for American grain in the world’s markets, understate the historically increasing domestic and foreign demand for value-added uses of raw agricultural products, disregard increased shipments of grain and oilseeds through West Coast ports, and ignore the increasing capacities of Brazil, Argentina, China and other grain producing nations to produce and export grain more cheaply than American producers.

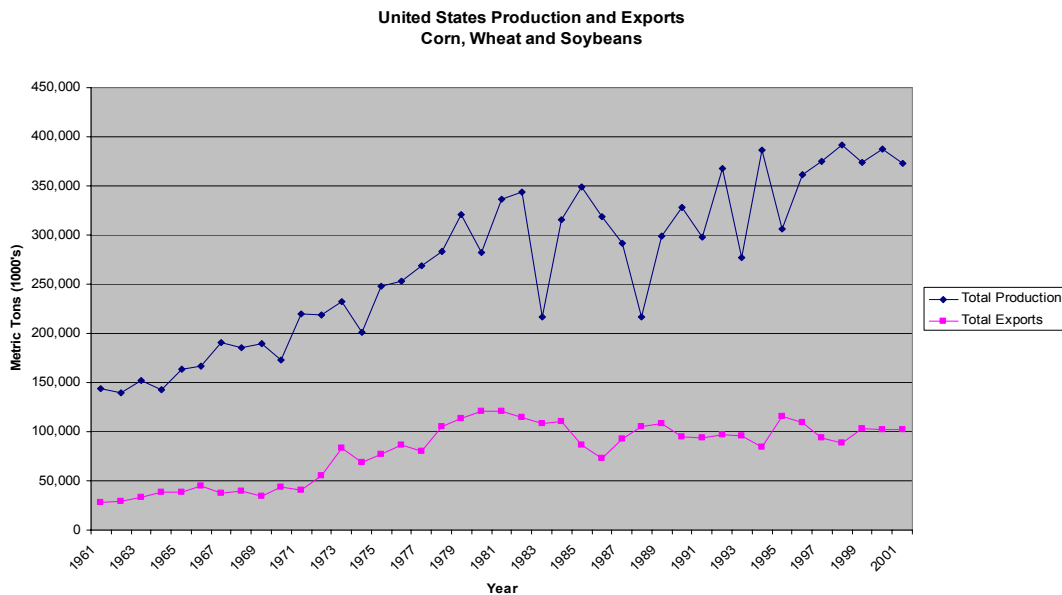
- *Corps “scenarios” are based upon unsupportable assumptions.*

The Corps’ scenarios are based upon unsupportable assumptions about world grain trends. In particular, the Corps scenarios assume global acceptance of genetically-modified grain. In fact, many of the world’s largest markets for grain – including the European Union –have refused to accept genetically-modified grain. In addition, the Corps optimistically assumes that China and India will become large importers of American grain, and assumes that imports to China and India would go down the Mississippi rather than be shipped by rail to West Coast ports. But, economists remain unsure whether China and India will become net importers or exporters, and US grain destined for Asia is shipped more quickly and cheaply by rail to the West Coast. The Corp also underestimates the ability of Brazil and other low-cost (*e.g.*, low labor costs, low land costs) producers to enter and dominate those markets rather than high-cost U.S. producers. The Corps also incorrectly assumes that the number of acres enrolled in

easement programs will remain constant. In fact, USDA will enroll 5 million new acres of land into the Conservation Reserve Program and 2 million new acres of land into the Wetlands Reserve Program by 2007. The Corps also ignores the impact of federal mandates on the growth in ethanol production, and the effect additional ethanol mandates now under consideration by Congress would have on grain shipments.

- *Corps ignores the continuing growth of value-added processing.*

Most grain is shipped to domestic processing facilities, creating skilled jobs in rural communities. But, the Corps' analysis fails to recognize increasing domestic grain shipments to produce value-added products which themselves are ultimately shipped by rail and truck, not by barge. Unlike barge shipments, rail and truck shipments of value-added products like corn oil and ethanol have increased dramatically in the last two decades. As mentioned above, the Corps failed to consider the impact of the ethanol mandate proposed in the Energy Bill or the impact of phasing out the gasoline additive MTBE. Value-added processing creates jobs in rural communities rather than shipping these skilled jobs overseas.

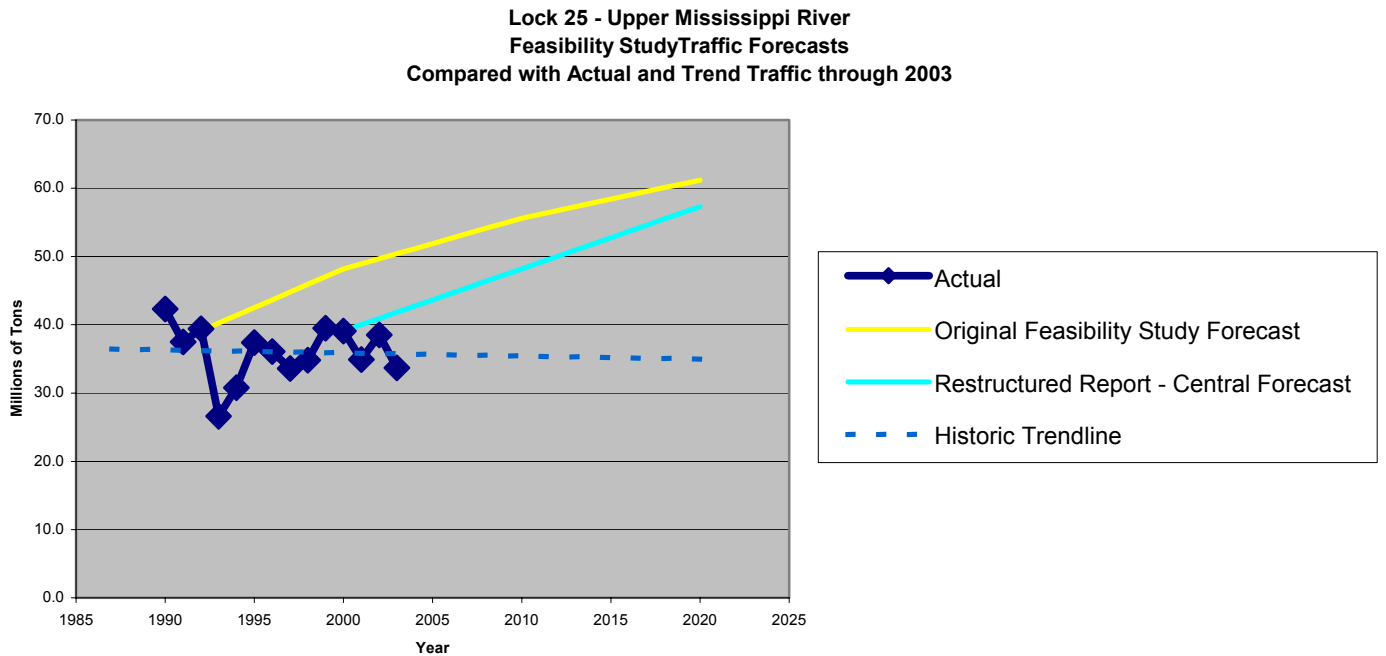


- *Earlier Corps traffic forecasts for the Mississippi are wrong.*

As the NAS noted in 2001, the traffic levels predicted by earlier Corps forecasts have simply not materialized. For example, a Corps consultant predicted in 1997 that some 50 million tons of barge traffic would move through Lock and Dam 25 by 2003. Lock 25, just north of St. Louis, is the most heavily use 600-foot lock in the Upper Mississippi River navigation system. In stark contrast to the overly optimistic forecast, only some 34 million tons moved through that lock in 2003, the most recent year for which data is available. Traffic levels have continued to fall and have reached their lowest levels since the study began. This decline is not due to limited capacity or the condition of the locks.

In fact, the Corps completed major \$25.9 million rehabilitation of the Lock and Dam 25 in 2001, according to the NAS.

The new “scenarios” developed by the same Corps contractor, however, are only slightly less optimistic than the original discredited forecasts – the Corps’ “central scenario” now assumes that traffic levels through Lock and Dam 25 would have reached some 42 million tons in 2003, less than the originally forecast 50 million tons but far more than



the actual amount of traffic that used that lock last year. Only one of the five scenarios, labeled the “least favorable” by the Corps, can possibly reflect current and plausible future traffic trends.

- *The NAS explicitly rejected “scenarios” as a substitute for forecasts.*

As the NAS noted in 2001 (page 65), a scenario based analysis “can produce insights but it rarely produces useful estimates.” The Committee then identified the steps it believed were needed to complete useful traffic demand forecasts. Unfortunately, the Corps has chosen to ignore these recommendations and thus far the Corps has undertaken none of these steps.

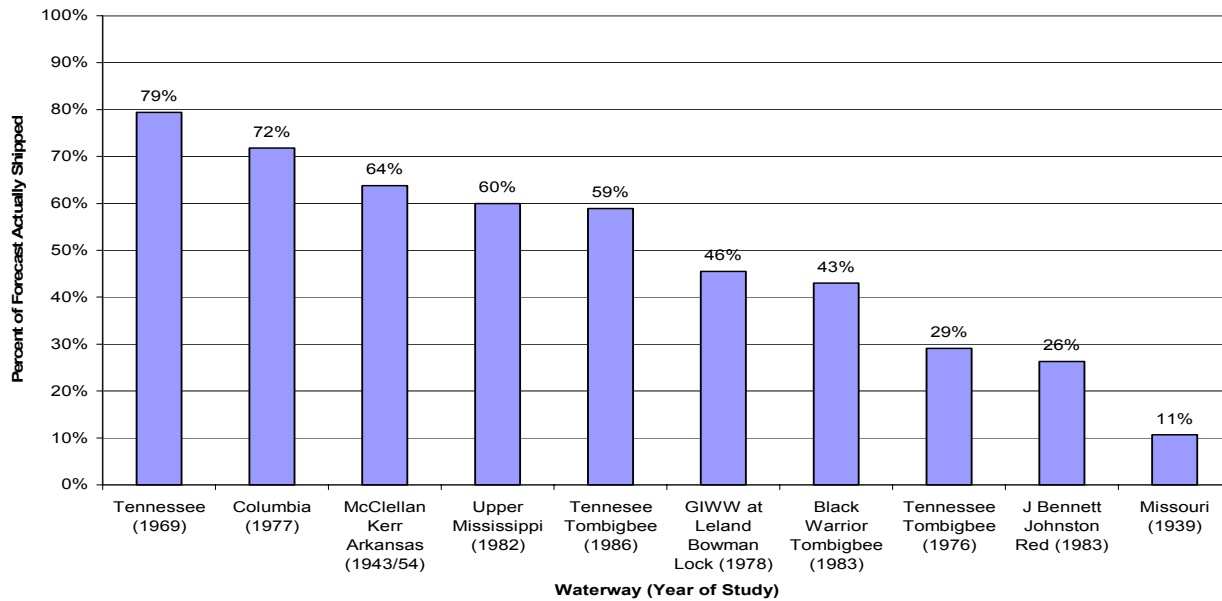
The NAS recommended that the Corps conduct traffic forecasts by: (1) forecasting world grain import demands and potential US grain export supplies, explicitly including likely grain production and export trends in Argentina, Brazil and other important grain-producing countries; (2) forecasting the amount of grain producers would want to send to each potential market at various market prices, including domestic grain processing markets; (3) aggregating the net revenue maximizing decisions of individual grain

producers to calculate the market equilibrium for both the uses of grain and the shipping modes to those possible markets; and, (4) forecasting the performance of each shipping mode and alternative route in response to possible demands placed upon the modes and routes. The NAS further recommended explicitly identifying the risk and uncertainties inherent in completing long-range traffic forecasts.

- *Most Corps Waterway Projects Have Failed to Attract Predicted Traffic, including Lock and Dam 26 on the Mississippi.*

Only two of 14 waterway projects constructed since World War II for which data is available attracted as much commercial traffic as the Corps predicted in their [original?] feasibility study analyses. This is because the Corps has routinely employed the flawed Tow Cost Model (or other similar models) to predict how many barges would use new or expanded waterways. The best example is Lock and Dam 26 on the Mississippi River near Saint Louis, where the original 600-foot lock was replaced with a new 1,200-foot lock. To justify that new construction, in 1982 the Corps predicted that 123.2 million tons of traffic would flow through Lock-and-Dam 26 in 1998. Actual traffic flows in 1998 was 73.7 million tons. In that particular study, the Corps' predictions significantly overestimated shipments of industrial chemicals and petroleum products.

Corps Studies Where Actual Traffic, 2000, Was Less Than 80 Percent of Forecast



Corps Models Overstate Economic Benefits of Lock Expansion

The revised Navigation Study employs two economic models that were rejected by the NAS. The Corps used these discredited models to estimate the benefits of six limited alternatives designed to reduce congestion, including lock expansion.

- *Discredited Tow Cost Model Ignores Alternative Modes, Destinations*

One of the economic models employed by the Corps in this study is the Tow Cost Model. This model was rejected by the original Corps study team, by the National Academy of Sciences in 2001, by members of the Corps' own Institute for Water Resources (IWR), and by the Bush Administration in their proposed Fiscal Year 2004 federal budget.

The fundamental problem with the Tow Cost Model is that it does not incorporate the full range of alternatives available to shippers to respond to changes in the price of water transportation. The Tow Cost Model represents shippers' decisions as "all or nothing decisions" between inland water transportation and some other mode of transportation from a fixed origin market to a fixed destination market for a fixed quantity. The Tow Cost Model does not consider the more likely real responses to increased water transportation prices such as altering the desired quantities of water shipments or altering the origin or destination markets for portions of water shipments.

By limiting the shippers' decisions to all or nothing transportation modal choice decisions, the Tow Cost Model overestimates the willingness to pay for water transportation and, therefore, biases upward the estimated National Economic Development (NED) benefits of inland water transportation infrastructure improvements. This overestimate of the willingness to pay for inland water transportation can create an order of magnitude overstatement of estimated system NED benefits, especially in a system such as the UMR-IW, where real shippers have a broad range of options available to them to respond to changes in water transportation prices.

- *Unfinished ESSENCE Model Employs Arbitrary Data, Assumptions*

The Navigation Study also employs the ESSENCE system economic model, but does not address the serious flaws identified by the NAS in 2001. In particular, the Corps has not updated ESSENCE to include current and accurate data regarding the quantity, origin, destination and price of grain shipments by barge, rail and other modes. The Corps has not eliminated assumptions that shipment costs are proportional to distance and that agricultural yields are uniform, and the Corps has not used current data to estimate demand and supply sensitivities. Instead, the Corps has simply proposed to use ESSENCE as developed in the original feasibility study, and has arbitrarily populated the model with two hypothetical measurements of the elasticity of demand for barge transportation.

Corps Ignores Benefits of Small-Scale Measures

The Corps has identified a wide range of relatively inexpensive small-scale measures, including lock scheduling, congestion fees, switch boats, mooring cells, industry self help, excess lockage time charges, deck crew training, and power-assisted winches that could be quickly implemented to better manage the existing navigation system infrastructure. Despite the low costs and significant benefits of these alternatives, the

Corps has not implemented any small-scale measures, as proposed by the NAS. The Corps has only recently initiated efforts to assess traffic scheduling after years of delay.

- *Helper Boats Could Reduce Lockage By 20 Minutes and Be Implemented Immediately*

Installing mooring cells and implementing helper boats could reduce a 90-minute lockage by more than 20 minutes. Installing mooring cells at Locks 12, 14, 18, 20, 22 and at LaGrange and employing helper boats at Locks 20 through 25 would pose a one-time cost of \$84 million, and annual operating costs of \$40.2 million. What's more, this solution could be implemented immediately and would produce more than \$50 million in annual economic benefits, according to the Corps. In contrast, longer locks would cost at least \$2.3 billion, could not be implemented for several decades, and would only produce modestly more annual economic benefits than mooring cells and helper boats.

- *Corps Failed to Assess Small-Scale Measures Like Lock Scheduling*

The Corps' analysis of small-scale measures, conducted by the Volpe Center of the Department of Transportation, failed to assess scheduling the arrival of tows. Although Volpe noted in their draft report that lock scheduling was promising, Volpe failed to analyze a scheduling system for the Upper Mississippi and Illinois rivers. Independent experts at the University of Missouri-Saint Louis have found that scheduling on other waterways such as the Panama Canal has successfully managed system traffic and reduced congestion and transportation costs and that lock scheduling implemented through an appointment system could produce substantial time and fuel cost savings on the Upper Mississippi and Illinois rivers.

- *Corps Underestimated Benefits of Excess Lock Time Charges*

Tow operators who properly train and equip their deck crew move through locks as much as 30 minutes faster than their competitors. Incentive systems could be created to reward operators who use locks quickly - and to penalize those operators who use locks slowly.

Volpe grossly underestimated the impact excess lockage time charges would have on tow operators who fail to "process" their tows as quickly as the most efficient operators. In their analysis of excess lockage time charges, Volpe assumed that excess time charges would only encourage the slowest 25 percent of tow operators to "process" their barges as fast as the second slowest 25 percent of tow operators. In fact, charges could be set at levels that would ensure that all tow operators had the financial incentive to "process" their barges as quickly as the fastest 25 percent of tow operators, thereby dramatically increasing the benefits of this measure.

- *Corps Failed to Link Congestion Fees to Actual Traffic Levels*

The Corps considered and rejected a year-round fee designed to reduce congestion rather than a real time congestion fee that would be implemented during periods when system

use is high and lock delays are their greatest. The fee considered by the Corps would have imposed charges on river users regardless of their location on the system, but would have produced significant economic benefits, according to Corps studies. The Corps rejected this option without explanation. A better alternative might be to assess a congestion toll only during periods when delays are significant, and assess tolls only at those locks with significant delays.

- *Corps Failed to Analyze Small-Scale Measures in Tandem*

The Corps has not evaluated the estimated economic benefits of small-scale measures implemented in tandem. The Corps has only considered two small-scale system measures – (1) annual congestion fees, and (2) helper boats and mooring cells at some system locks, and is only considering and evaluating these two system small-scale measures for implementation in isolation. That is, one alternative will consider only the benefits of congestion fees, and a second alternative will consider only the benefits of switch boats and mooring cells.

Even in isolation, small-scale measures can provide significant lockage time savings and reduce delays at the system locks. Implementing small-scale measures in tandem could further reduce lockage times by 25 minutes or more, thereby further reducing delays.

Locks and Dams Have Been Rehabilitated

The Corps and barge advocates contend that the locks and dams are in danger of falling apart. In fact, the Corps has spent \$900 million since 1975 rehabilitating locks, according to a recent Corps report, and additional rehabilitation projects are underway.

Four of the five locks the Corps would replace have been recently rehabilitated, and the fifth lock has been undergoing “major” rehabilitation since 1996. This lock, Lock and Dam 24, is frequently characterized by the Corps and navigation proponents as a poster-child for “crumbling locks.”

The Corps has not explained why the agency would replace a lock that is now undergoing “major” rehabilitation. The rehabilitation of Lock and Dam 24 will cost almost \$88 million -- the most expensive major rehabilitation even undertaken of a lock and dam. Replacing the lock would cost an additional \$224.5 million, even though the number of barges processed through Lock and Dam 24 has fallen 23.4% between 1993 and 2002.

The Corps notes, in the same recent report that “the life of existing locks and dams and their components can be extended with normal periodic rehabilitation for another 50 years and match the design life of any new construction.” The Corps anticipates that locks will only need to be rehabilitated once or twice in the next 50 years, and that future rehabilitation needs will be only \$25 to \$30 million per lock, and \$15 million per dam, for each rehabilitation cycle. Overall, annual rehabilitation cost will average only \$65 million, according to the Corps. By contrast, construction of new locks will cost at least three times as much.

According to the Corps, the following locks have been rehabilitated in recent years:

L/D 25	Complete	2002
L/D 24	Underway since 1996	2008
L/D 22	Complete	1990
L/D 21	Complete	1990
L/D 20	Complete	1992
L/D 19	FY02 Proposed New Start	2006
L/D 18	Complete	1993
L/D 17	Complete	1993
L/D 16	Complete	1994
L/D 15	Complete	1995
L/D 14	Complete	2002
L/D 13	Complete	1996
L/D 12	FY00 New Start	2004
L/D 11	FY01 New Start	2005

Note: Locks in bold letters are locks the Corps recently rehabilitated but that the Corps now proposes to replace.

Corps Should Conduct Credible Analysis, Implement Small-Scale Measures

The fate of the Mississippi River is too important to rest on incorrect and incomplete economic analyses. Congress should implement small-scale measures like helper boats that can improve navigation right now while the Corps takes the time needed to complete a credible economic analysis.

The Corps has already begun to develop a version of the ESSENCE model that includes real data on price elasticities that will be completed in the next 18 months. The Corps could also complete realistic, unbiased traffic forecasts during that same period.

Some lock advocates say this issue has been “studied to death” and ask what more we could learn after spending \$70 million. Instead, they should be outraged that the Corps has wasted so much time and money using economic tools that the agency knows will provide self-serving and incorrect results.

Conclusion

In sum, the Corps’ \$2.3 billion lock expansion proposal grossly overestimates likely future river traffic, underestimates the growing domestic demand for grain, and ignores the benefits of less expensive congestion management measures like traffic scheduling. In fact, river traffic has been flat for more than two decades, and has actually fallen in recent years. The fastest growing market for American grain is not overseas but domestic processing facilities like ethanol plants. In addition, many of the locks the Corps would replace have been rehabilitated in recent years, extending their life for decades.

Congress should instruct the Corps to implement small-scale congestion management measures like scheduling while the agency completes a credible assessment of longer locks. We have time. Construction on longer locks can not begin for a decade, and most river locks have been rehabilitated in recent years.