



Fact Sheet

The Assessment and Development of Multimodal Analytical Models: Phase 1, Regional Routing Model

Start Date: Mar 2005

Projected

End Date: Jan 2007

POC:

[POC](#)

Problem Addressed:

Current Corps regulations recognize waterway traffic is dynamic and subject to change based upon services and costs of other modes (highway and railroad). Assuming constraints exist on the waterway segment but no such limits exist on competing modes may misrepresent the estimated modal diversion.

Objective:

To develop a methodology of developing cross modal analysis for Corps navigation studies. The work will be developed in partnership with other Federal entities to ensure the collection and integration of relevant information and explore common economic data and analytical methods. As part of the initial phase of development ORNL will develop a prototype Regional Routing Model (RRM) and supporting data base to assist USACE in linking economic (production and consumption) activity data on selected agricultural products to the movement of these products through the multi-modal (highway, rail, waterways) US transportation network. The resulting cost and flow matrices will provide a basis for further analysis of the effects of changes in inland and intra-coastal transportation costs and future network structure changes on the distribution of commodity movements through specific seaports. The model will be compared against other existing modal diversion models to examine both data needs and applicability. These models will be linked to other NETS modules, especially the multipoint and GIS work elements.

Benefits:

A multimodal framework would provide a method of examining potential modal changes along a corridor or port region based upon changing various operational and system metrics. Working with other government agencies may provide additional models and data sets, which may strengthen the Corps ability to assess multimodal diversion to non-waterway modes.

Status:

In Progress

Contract Data:

A1060, C1060

Progress:

[Paper by Frank Southworth, Dec 6, 2005
\(1.4 MB, pdf\)](#)

Products (Bookshelf/Toolbox):



[Peer Support Meeting, December 12, 2005 \(html\)](#)

[Report by Bruce Lambert, Jan 9,2005](#)

(112 KB, doc)

[Presentation by Frank Southworth, Sep 28,2006](#)

(18.4 MB, ppt)

[Paper by Frank Southworth and Bruce Lambert.](#)

[Dec 19,2006\(979 KB, pdf\)](#)

Related Links:

[Social Science Research Network](#)  nongovernment site

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Fact Sheet

Columbia-Snake Transportation Demands

Start Date: Oct 2003

POC:

Projected

End Date: Mar 2006

[POC](#)

Problem Addressed:

To project benefits resulting from waterway improvements, it is necessary to rely heavily on assumptions regarding demand for waterway services. The Corps currently uses a variety of planning models employing different assumptions about demand. Some of these models/assumptions have been heavily criticized by stakeholders.

Objective:

The researchers will develop a survey instrument that has the capability to provide estimates of pool level demands and also allow specific criticisms of previous Corps models to be assessed. Existing and potential shippers will be surveyed using the tool. The end result will be a summary report outlining major issues of demand as revealed through the survey.

Benefits:

The study will lead to the development of a database that can be used econometrically to examine demand decisions.

Status:

Completed

Contract Data:

IWR 2004

Progress:

Products (Bookshelf/Toolbox):

[Paper by Eric Jessup and Ken Casavant, July 24, 2004 \(386 KB, pdf\)](#)

[Report by Ken Casavant and Eric Jessup, May 2005 \(854 KB, pdf\)](#)

[Paper by Kenneth Train and Wesley Wilson, Dec 7, 2005 \(1.24 MB, pdf\)](#)

[Report by Kenneth Train and Wesley W. Wilson, March 2006 \(699 KB, pdf\)](#)

[Paper by Kenneth Train and Wesley W. Wilson, Nov 14, 2005 \(74 KB, pdf\)](#)



Related Links:

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Fact Sheet

Congestion and Spatial Equilibrium Models

Start Date: Jun 2004

Projected

End Date: Sep 2005

POC:

[POC](#)

Problem Addressed:

The Corps uses a variety of equilibrium models to assess the benefits and costs of improving the nation's inland waterway transportation system. Each of these models assess costs and benefits using a variety of assumptions relating to demand and to forecasts of future traffic both with and without the project. Commodities may be shipped by several alternative routes (truck, rail, barge or various combinations of the three). Equilibrium specifies what is shipped and how. Determining the equilibrium for waterways is quite complicated in that there are multiple commodities and multiple spatial locations of demanders and suppliers, all of which theoretically can be affected through shared transportation networks. For example, when the corn harvest hits Iowa, the corn can be exported through different ports to different foreign countries or to local markets within the US. It can be shipped by a variety of different modes e.g., truck, rail, and barge. Quite a lot of this corn travels by barge to New Orleans for export. This places pressure on the waterway system, increasing congestion and transit times. By so doing, shippers of other commodities e.g., a quarry in Saint Louis, steel shippers, coal shippers, etc- may be impacted by the upward pressure placed on rates and by transit times.

Objective:

The primary objective of the research is to develop an equilibrium model that will capture the effects of geographically dispersed suppliers and demanders of different commodities that share or could share the nation's inland waterway system.

Benefits:

That resulting model will allow for simulations of waterway improvements at the individual lock level or at a system level. If successful, this model also will allow a number of other assumptions to be evaluated, including theories about the reallocation of shipping from the waterways to trains after a certain threshold is hit.

Status:

Completed

Contract Data:

IWR 2004

Progress:

[Paper by Simon Anderson and Wesley Wilson.](#)

Products (Bookshelf/Toolbox):

[Paper by Simon Anderson and Wesley Wilson.](#)



[February 2005 \(303 KB, pdf\)](#)

[Paper by Simon Anderson and Wesley Wilson, April 2005 \(394 KB, pdf\)](#)

[Paper by Kenneth Train and Wesley W. Wilson, Oct 31,2006 \(114 KB, pdf\)](#)

[Presentation by Simon Anderson, Jan 5,2007 \(712 KB, ppt\)](#)

[Presentation by Simon Anderson and Wesley W. Wilson, Jul 9,2007. \(280 KB, ppt\)](#)

[November 2004 \(1.33 MB, pdf\)](#)

[Paper by Simon P. Anderson and Wesley W. Wilson, December 2005 \(569 KB, pdf\)](#)

[Paper by Simon Anderson and Wesley Wilson, September 2005 \(628 KB, pdf\)](#)

Related Links:

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Fact Sheet

Container Model and Analysis: Longer Term Analysis of Infrastructure Demands and Risks

Start Date: Nov 2005

Projected

End Date: Mar 2007

POC:

[POC](#)

Problem Addressed:

One of the fastest growing sectors in the world and North American shipping industry is container shipments. Shipping patterns and modes are changing very rapidly in response to changes in world economies, North American industry and consumer demands, as well as technology and economies of shipping. These changes have far-reaching impacts on port development as well as interior shipping infrastructure.

Objective:

The purpose of this study is to document changes in shipping patterns, both internationally and domestically, and to determine appropriate models for evaluating the impacts on these changes on infrastructure requirements. More specifically, the study will: 1) review previous studies on container shipping with a focus on infrastructure and projections; 2) describe historical movements in world trade; 3) describe and analyze historical movements in US markets as well as the rail market and ocean shipping economies; and 4) review and critique alternative models that can be used to analyze flows, restrictions, expansion possibilities and make projections. In addition, alternatives for handling and quantifying risk will be identified.

Benefits:

This will commence a longer term process of determining future demands for port and infrastructural development to serve the container shipping industry.

Status:

In Progress

Contract Data:

E5030

Progress:

[Report by William W. Wilson, Dec 31,2007 \(278 KB, pdf\)](#)

[Report by William W. Wilson and Eric DeVuyst, Dec 31,2007 \(222 KB, pdf\)](#)

[Report by William W. Wilson and Camilo Sarmiento, Jan 1,2005 \(464 KB, pdf\)](#)

Products (Bookshelf/Toolbox):



Related Links:

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Fact Sheet

Container/Cargo Carriage Life-Cycle Costing Evaluation

Start Date: Oct 2005

POC:

Projected

End Date: Sep 2007

[POC](#)

Problem Addressed:

Valuation of container or cargo carriage costs for unitized cargos is critical to valid assessment of capital asset costs incurred for waterborne cargo transportation. Available information indicates carriage asset costs can be significant relative to costs of other waterborne transport operations and under specific scenarios of analysis may vary with alternative vessel operating conditions uniquely attributable to waterway improvements.

Objective:

Objectives for studies and research include assessment of container and wheeled carriage life-cycle economic resource costs with consideration of costs for asset acquisition, maintenance and refurbishment, and eventual scrapping and divestiture at the end of practical service life. Carriage asset costs will be further refined or adjusted based on determination of what proportion of related resource costs are applicable to inclusion in vessel operating costs based on time for alternative modal use(s) versus time employed to or during waterborne transport.

Benefits:

Assessment of container or carriage costs as described will provide a basis for more accurate adjustment to overall vessel operating cost estimates as applied for USACE-sponsored economic studies based on time and costs for waterborne mode of employment versus time required for land-based use of containerized transport. Applied Products: Computerized report for findings containing downloadable table(s) for costs as developed for application to waterborne transportation cost analysis.

Status:

In Progress

Contract Data:

130465, E5070

Progress:

Products (Bookshelf/Toolbox):

Related Links:



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Fact Sheet

Determining System Capacity to Accommodate Grain Flows by Rail to the Mississippi River at St. Louis

Start Date: Sep 2005

POC:

Projected

End Date: Jun 2006

[POC](#)

Problem Addressed:

A global grain forecasting model has been built which forecasts production and consumption of grains by region and satisfies the 'excess' demand in one region by moving 'excess' supply from another region by the least cost route. Calibrating this model to historical data revealed a need to place constraints on certain low cost corridors. Of particular interest was the capacity of the system to accommodate grain flows by rail to the Mississippi river at St. Louis. Synthetic constraints were used to force the model to yield historical results. However, in order to forecast future flows, some understanding of the systems capacity and likely future capacity is needed.

Objective:

Identify the current capacity of the land transportation system to deliver grains to the Mississippi river just below St. Louis (below L&D 27). Identify the key components that govern this capacity, examine the likely future of those components to forecast the future capacity of this part of the system.

Benefits:

In order to forecast future flows, intermediate forecast 10-20 years for the short term and ultimate forecast to the year 2060, some understanding of the systems capacity and likely future capacity is needed. This information is vital in defining a framework and the parameters for developing a forecasting model for port handling capacity .

Status:

Completed

Contract Data:

130465, E5040

Progress:

Products (Bookshelf/Toolbox):

[Report by The Louis Berger Group, Inc., Nov 1, 2005 \(661 KB, pdf\)](#)

Related Links:



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Fact Sheet

Discrete Event Simulation Model of a Congested Segment of the Upper Mississippi River Inland Navigation System

Start Date: Jul 2003

Projected

End Date: Nov 2004

POC:

[POC](#)

Problem Addressed:

This study presents a simulation model that differs from prior waterways simulation models in two important dimensions. First, the simulation model developed explicitly embodies the fact that the Upper Mississippi River (UMR) system never achieves a steady state level of system performance. Therefore, the steady state queuing system models used to approximate the operating conditions of the UMR employed in Corps of Engineers system economic models may distort the evaluation of potential changes to the operating conditions or infrastructure of the system. Second, this UMR navigation system simulation model explicitly incorporates the fact that the production of water transportation movements cannot be independent of each other as the waterway transportation equipment needed to complete each movement must first be delivered to the origin of the movement from some other waterway location. Therefore, system performance characteristics such as queue sizes and transit times at system locks will be interrelated and modeling these locks as a series of independent servers is not appropriate.

Objective:

The purpose of this research is to create a discrete event-based simulation tool for use in investigating changes to the operational characteristics of an important segment of the inland navigation transportation system. The lower five 600-foot long locks of the UMR navigation system provide a useful setting for testing such a simulation model as these five locks experience periodic traffic congestion, are subject to seasonal changes in demands for service, and operate as a system in that they share a large amount of common interrelated commercial tow traffic.

Benefits:

The interdependency of lock operations created by the service of common tow traffic and the existence of periods of high and low levels of demand for use of the system provide currently untapped sources of efficiency improvements for the implementation of alternative traffic management policies in the operation of the UMR system. Specifically, system efficiencies can be created by scheduling traffic, re-sequencing vessels for processing at the locks or by providing economic incentives for decreasing system use during high demand periods and increasing system use during low demand periods. Existing system economic models used by the Corps of Engineers cannot properly evaluate these potential operational improvements.



Status: Completed

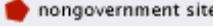
Contract Data: IWR 2003 **Progress:**

Products (Bookshelf/Toolbox):

[Report by Donald Sweeney, November 2004
\(1.4 MB, pdf\)](#)

[UMR Simulation Model \(8 KB, zip\)](#)

[Micro Saint software required to operate model.
For information, visit Micro Saint's web site \(html\)](#)

 [nongovernment site](#)

[Map of UMR Locks \(1.8 MB, bmp\)](#)

Related Links: [Center for Transportation Studies](#)  [government site](#)

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Fact Sheet

Event Study - Greenup

Start Date: Jun 2004

POC:

Projected

End Date: Feb 2005

[POC](#)

Problem Addressed:

In 2003 the main lock chamber at the Greenup Locks and Dam was closed for major maintenance and repair. The work, which was originally scheduled to last three weeks, ended up lasting seven weeks, due to unexpected, but necessary emergency repairs to the lock's main chamber. The extended closure forced shippers using the lock to make a number of short- and long-term decisions regarding transportation of their goods.

Objective:

Through a survey of shippers and carriers using the Greenup Locks and Dam, as well as analysis of other data, this study will assess how shippers responded to the closure, evaluate the economic impact of these decisions and determine if shippers made long-term operational adjustments as a result, such as switching to all-overland modes of transportation. The study will include a compilation of "lessons learned" from the experience and will identify any changes in operational or maintenance procedures that resulted from the closure.

Benefits:

The survey tool and data developed during the study will help Corps planners assess the potential impact of other such closures and to plan steps to limit this impact.

Status:

Completed

Contract Data:

IWR 2004

Progress:

Products (Bookshelf/Toolbox):

[Report by Planning Center of Expertise for Inland Navigation, February 2005 \(1.07 MB, pdf\)](#)

Related Links:

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Fact Sheet

Event Study - Hannibal Locks Closure

Start Date: Dec 2005

POC:

Projected

End Date: Jun 2006

[POC](#)

Problem Addressed:

A series of events in October and November 2005 led to unscheduled closure of the Hannibal Locks and Dam project and therefore the closure of the river at Hannibal to through traffic. The total river closure at Hannibal lasted for nearly five days until the 600 auxiliary lock chamber was reopened to traffic. The 1200 main lock chamber remained closed for another 11 days. The unscheduled closure disrupted transportation to/from riverside manufacturing plants and the operations of towing companies. The closure also tested the ability of the Corps to enact emergency notification procedures and to bring the project back to operable status in the shortest possible time.

Objective:

The objectives of the study are to describe the sequence of events that led to the unscheduled river closure, the effects of the closure on industry, and the measures performed by the Corps to return the project to operable status.

Benefits:

The benefit of the study is to add to the body of knowledge on the causes and consequences of unscheduled closures on the nations inland navigation transportation system. A potential use of the information is as a factor in decision-making on maintenance prioritization.

Status:

Completed

Contract Data:

130465, W105P&H

Progress:

Products (Bookshelf/Toolbox):

[Report by Planning Center of Expertise for Inland Navigation, May 1,2006 \(1.5 MB, pdf\)](#)

Related Links:

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Fact Sheet

Event Study - Lock 27 Closures

Start Date: Mar 2006

POC:

Projected End Date: Sep 2006

[POC](#)

Problem Addressed:

Lock 27 at Mississippi River Mile 185 experienced closures for repairs in 2004 and 2005. In 2004 the main chamber was closed between 26 July and 10 August for gate repairs. In 2005 the main and auxiliary lock chambers were sequentially closed to navigation traffic between October 2005 and February 2006 for needed replacement of gate operating machinery.

Objective:

Two surveys of shippers and carriers affected by the Lock 27 closures in 2004 and 2005 were conducted for the purpose of discerning total costs incurred and operational changes made by industry associated with each closure event.. The survey for the 2004 closure was conducted between 25 February and 28 March 2005. The survey for the 2005 closure was conducted between 14 April and 12 May 2006. In addition to the industry surveys, an analysis of the OMNI data for Lock 27 was be conducted by the St. Louis and Rock Island districts for each closure. The analysis examined the detailed OMNI data for the Lock 27 facility, particularly for the closure periods, to identify changes in operating procedures attributable to the closure and to draw comparisons with the industry survey responses. Separate closure event reports were compiled for the 2004 and 2005 closures of Lock 27.

Benefits:

The data will provide important information that will bear on future repair, rehabilitation or other construction-related decisions regarding the Lock 27 facility.

Status:

Completed

Contract Data:

130465, W1060

Progress:

Products (Bookshelf/Toolbox):

[Report by Planning Center of Expertise for Inland Navigation, Oct 17, 2006 \(521 KB, pdf\)](#)

[Report by Planning Center of Expertise for Inland Navigation, Oct 17, 2006 \(720 KB, pdf\)](#)



Related Links:

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Fact Sheet

Event Study - McAlpine

Start Date: Oct 2004

POC:

Projected

End Date: Sep 2005

[POC](#)

Problem Addressed:

Corps planners must prioritize maintenance activities and construction work on the nation's locks and dams to ensure that available dollars are used to the maximum effect on projects with the greatest need or the greatest potential return on investment. In order to do this, reliable data is needed.

Objective:

This study examines a recent maintenance event to gather data on Federal and non-Federal operational and maintenance costs. The study will include an overview of the work done, a detailed survey of shippers that use the facility; a more limited survey of the major towing companies in the area; and an analysis of Lock Performance Monitoring System Data during the time periods of the projects. The study will include an examination of lessons learned.

Benefits:

The study will help Corps planners better understand the costs and benefits of maintenance and construction projects on the nation's lock and dam systems. This understanding will enable the Corps to better prioritize projects and mitigate the effects of maintenance-related closures.

Status:

Completed

Contract Data:

120171, A1090

Progress:

Products (Bookshelf/Toolbox):

[Report by The Planning Center of Expertise for Inland Navigation, September 2005 \(3.18 MB, pdf\)](#)

[Report by Planning Center of Expertise for Inland Navigation, Sep 2005 \(517 KB, pdf\)](#)

Related Links:

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Fact Sheet

Forecasting River Traffic

Start Date: Oct 2003

POC:

Projected

End Date: Sep 2004

[POC](#)

Problem Addressed:

Forecasting anticipated river traffic over long time horizons is critical to the Corps ability to determine the potential benefits of waterway projects designed to increase the volume of traffic over time. Most previous attempts to forecast river traffic have relied heavily upon "structural modeling". These models often forecast future demand for river transportation by assessing demand for products that utilize river transportation such as grains and industrial products. Determining demand for these products requires researchers to develop a forecast for each of the determinants of demand for each of the products that is transported on the river. This is a large and complicated task that often requires questionable simplifying assumptions. The task is further complicated by the lack of available data on each of the many influences on the demand for each of the products transported on the river.

Objective:

This study will examine an alternative approach to forecasting anticipated river traffic that avoids structural modeling of complicated real-world behavioral relationships. The study will use "time series" techniques to characterize the relationship between river traffic and "co-integrated" economic variables. With co-integrated variables there is a long-term relationship that ties the variables together over time. For instance the study will examine the link between growth in lock capacity and growth in the Gross Domestic Product .

Benefits:

If successful, this model will allow researchers to more accurately and completely forecast anticipated river traffic over long-time periods.

Status:

Completed

Contract Data:

IWR 2004

Progress:

[Report by Mark Thoma and Wesley Wilson, November 14 2004 \(166 KB, pdf\)](#)

[Report: Appendix A, December 2004 \(347 KB, pdf\)](#)

[Report by Mark Thoma and Wesley Wilson,](#)

Products (Bookshelf/Toolbox):

[Paper by Mark Thoma and Wesley Wilson, July 2004 \(413 KB, pdf\)](#)

[Report by Mark Thoma and Wesley Wilson, Aug 21, 2005 \(612 KB, pdf\)](#)



[December 2004 \(125 KB, pdf\)](#)

[Report by Mark Thoma and Wesley Wilson,
December 2004 \(166 KB, pdf\)](#)

[Paper by Mark Thoma and Wesley Wilson, Aug
21, 2005 \(98 KB, pdf\)](#)

[Reviewer Comments by Reviewers, August
21, 2005 \(59 KB, pdf\)](#)

Related Links:

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Fact Sheet

Great Lakes Reliability Study

Start Date: Oct 2005

Projected

End Date: Sep 2008

POC:

[POC](#)

Problem Addressed:

Funding constraints have impeded efforts to complete necessary maintenance activities on harbor channels and associated infrastructure on the Great Lakes. Corps planners must prioritize maintenance activities and construction work to ensure that the available dollars are used to the maximum effect on projects with the greatest need or the greatest potential return on investment. In order to do this, reliable data and models are needed to efficiently and effectively measure project performance. In the Great Lakes the data readily available for review is often lacking in sufficiency to make informed decisions. In the near term, this initiative will seek to develop the data sources and methods necessary to develop more consistent, more complete and more robust estimates of Great Lake navigation project benefits and costs. The longer-term goal is to work through the CXIN with the Institute for Water Resources (IWR) and Transport Canada in developing non-traditional benefit estimates, state-of-the art and current engineering cost projections, and more robust system investment prioritization models.

Objective:

This study is the first step in a planned multi-phase effort aimed at improving the level of data available related to harbor maintenance projects on the Great Lakes and developing tools to assess the risk and reliability of harbor components. The study will develop methods to evaluate and prioritize proposed budgeted Great Lake harbors maintenance activities to include channel dredging and breakwater and jetty repair and rehabilitation. The study will look at shoaling rates, variable lake levels, vessel characteristics, vessel costs, harbor, lock, and connecting channel depths, age and rehabilitation related shore protection structure characteristics. A computer model will be developed to easily assess the economic consequences of maintaining harbor channels based on transportation cost differences using harbor current shipping data.

Benefits:

The first phase of study will provide initial evaluation tools and method to prioritize proposed Great Lakes maintenance activities. It will assess data requirements and method to efficiently update and maintain relevant databases. Also, it will lay the groundwork for a risk and reliability framework to evaluate and prioritize the existing infrastructure repair and rehabilitation projects. The second phase of the study will be to develop a detailed methodology to identify non-traditional benefit measures, develop a methodology for estimating non-traditional benefits; make estimates of non-traditional benefits; assist in preparation of conceptual model capable of measuring individual traditional and non-traditional project benefits in a system context; develop methods and process for keeping engineering cost information current and projecting



reliability of channels, harbor, and other infrastructure supporting their use; assist in development of detailed comprehensive model, including required data sets, description of validation process, and output reports suitable for prioritizing investment options under unconstrained and constrained budget conditions.

Status: In Progress
Phase 1 in process. Phase 2 not yet initiated

Contract Data: 120171, A1200 **Progress:** **Products (Bookshelf/Toolbox):**

Related Links:

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Fact Sheet

HarborSym: Simulation Model for Deep Draft Navigation Improvements

Start Date: Sep 2004

Projected

End Date: Oct 2007

POC:

[POC](#)

Problem Addressed:

The Corps is responsible for maintaining navigable channels leading into the nation's coastal ports and harbors. As new, larger ships enter the world fleet, existing channels may require deepening or widening or new channels may need to be created. Establishing the need for such modifications requires detailed economic analyses. Assessing the benefits of such modifications requires a holistic examination of vessel traffic into the port, which can best be achieved through a simulation model.

Objective:

This study focuses on the development of HarborSym, a simulation model that allows planners to analyze the economic impact of channel-widening projects. HarborSym calculates transit times and transportation costs by predicting vessel interactions based on user-provided vessel trip data and harbor transit rule information. Unproductive wait times result when vessels are forced to delay sailing due to transit rules and the movement of other ships within the system. HarborSym captures these delays. Using the model, analysts can calculate changes in transportation costs that will result from proposed modifications to channel physical dimensions. Additional modules are being developed to support HarborSym deep draft navigation analyses. To assist with the input data requirements and development of future shipment lists, a Vessel Call Analyzer and Commodity Driven Forecast Tool will be created. The HarborSym Animation Module (HSAM) provides post processing visualization of HarborSym outputs through three dimensional avatars. After the widening version of HarborSym is fielded, a version will be developed to calculate the benefits of deepen a channel.

Benefits:

HarborSym will allow users to analyze changes within a port system without modifying complex computer codes. Users will be able to create models for specific harbors using a graphic interface and populate and manage information related to port infrastructure, traffic movements and harbor rules. Vessel movements will be animated during the simulation making it easier for users to determine if the model is accurately representing their system. Through the post processing visualization module, HSAM, the model capabilities and outputs can be demonstrated to decision makers and stakeholders. The model will enable planners to more accurately predict the benefits of channel-widening projects. It will provide a "transparent" approach to channel-widening analyses that can be duplicated by outside researchers.



Status:**In Progress**

The beta version of the HarborSym widening model and HSAM visualization tool can be downloaded from the HarborSym website (see below). Training has been conducted successfully and is offered through the DD-PCX in Mobile, AL. The model is currently being fielded on two USACE channel widening studies. Work has begun on the Vessel Call Analyzer, Commodity Driven Forecast Tool, and deepening version of the model.

Contract Data:

130465, C2000, C5010

Progress:[Presentation by Shana Heisey Oliq \(2.0 MB, ppt\)](#)[Presentation by David Moser, Keith Hofseth, Shana Heisey, Richard Males, and Cory Rogers \(5.0 MB, ppt\)](#)[Presentation by Keith Hofseth, Shana Heisey-Oliq, Cory Rogers, William Woelbeling, Richard Males, October 20, 2005 \(2.51 MB, ppt\)](#)[Presentation by Richard Males, Mar 12, 2006 \(5.9 MB, ppt\)](#)[Conference Poster by Cory Rogers, Keith Hofseth, May 15, 2006 \(1.1 MB, pdf\)](#)[Presentation by Richard Males, Keith Hofseth, Cory Rogers, Shana Heisey, May 15, 2006 \(2.8 MB, pdf\)](#)[Design Document\(Initial Draft\) by Richard M. Males, May 3, 2007 \(387 KB, pdf\)](#)[Paper by Keith Hofseth, Cory Rogers, Shana Heisey, and Richard Males, Sep 25, 2007 \(410 KB, pdf\)](#)[Presentation by Keith Hofseth, Sep 25, 2007 \(3.2 MB, ppt\)](#)**Products (Bookshelf/Toolbox):**[Paper by David Moser, Keith Hofseth, Shana Heisey, Richard Males, Cory Rogers, July 2004 \(716 KB, pdf\)](#)[Paper by Shana Heisey, July 2005 \(1.04 MB, pdf\)](#)[HarborSym Model \(web link\) \(html\)](#)[Paper by Cory Rogers, William Woelbeling, Richard Males, Keith Hofseth, and Shana Heisey, October 20, 2005 \(674 KB, pdf\)](#)[Paper by Keith Hofseth, Shana Heisey, Richard Males, Cory Rogers, Jul 15, 2006 \(580 KB, pdf\)](#)[Paper by Keith Hofseth, Shana Heisey, Richard Males, Cory Rogers, Jul 15, 2006 \(1.1 MB, pdf\)](#)**Related Links:**[HarborSym](#)

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Fact Sheet

Incorporation of Inelastic Movement Level Demands in ORNIM

Start Date: Jan 2006

Projected

End Date: Sep 2007

POC:

[POC](#)

Problem Addressed:

Models currently employed by the Corps are partial equilibrium annual models, with the waterway annual demand forecasts and implicit shipping plan modal splits (origin-destination-route) determined external to the modeling process. In the current Corps planning models, transportation price changes are explicitly modeled for the waterway routing, but are not modeled for alternate non-waterway routing; waterway shippers respond only when waterway prices rise above the least-cost all-overland transportation price which serves as the willingness-to-pay for water (barge) transportation. The shipper response is basically to either ship the annual demand tonnage by water or not, depending upon its least-costly all-overland route rate. It is understood, however, that: 1) the next best transportation option for a water-routed movement is not necessarily the least-costly all-overland routing option (e.g. pool hop, shift of origin and/or destination); 2) the water ship or not ship decision can be made at less than the annual volume size; 3) the water ship or not ship decision can be sensitive to not only water transportation costs, but also water transportation time changes; 4) the willingness-to-pay for barge transportation may exceed the least-cost all-overland rate; and 5) the waterway transportation demand can also be sensitive to land transportation cost and time changes. The desire is to more dynamically link equilibrium waterway traffic demand forecasts with shipper specific transportation cost and time sensitivities.

Objective:

The model used to estimate system benefits (transportation rate-savings) for the Ohio River System is the Ohio River Navigation Investment Model (ORNIM). ORNIM is used to estimate the annual quantity and cost of accommodated waterborne traffic given a user specified waterway infrastructure. The waterway infrastructure scenarios can then be compared to analyze and optimize investments in maintenance and new construction activities across time and multiple sites by comparison of incremental waterway transportation rate-savings to the investment costs. Under NETS, there has been considerable research on developing shipper response functions, regional routing models and in defining their proper place within a three tier modeling framework. The intention is to build upon and extend this work of movement origin-destination-route choice and apply the research by integrating equilibrium forecasting and shipper rate and time response into the USACE planning process. The first step of this work effort is to develop a design document for integrating the origin-destination-route choice shipper response functions into the USACE planning process. There are two methods of expanding the shipper response in the USACE modeling process: 1) input total origin-destination-commodity demands (instead of unconstrained waterway traffic demands) into ORNIM and expand ORNIM (a Tier 3 model) with the Train-Wilson origin-destination-route choice logic; or 2) apply the Train-Wilson



origin-destination-route choice logic into a regional routing model (a Tier 2 model), input the regional routing model equilibrium waterway traffic into ORNIM and remove ORNIM's economic equilibrium / diversion logic (versus an unscheduled closure diversion). The second step of this work effort is to provide proof of concept tests for the uncovered methods. The third step of this work effort is to modify the USACE planning modeling process with the selected incorporation method.

Benefits: This will make for more defensible investment decisions, although it is yet to be determined whether the recommendations from the planning process will be significantly different or improved.

Status: In Progress
FY06 and FY07 design document scope of work negotiated and executed. Code work on ORNIM conversion has begun and preliminary results expected mid-December 2006.

Contract Data:	Progress:	Products (Bookshelf/Toolbox):
130465, W1040		

Related Links:

Revised 17 Sep 2008

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Fact Sheet

Independent Peer Review

Start Date: Jun 2005

POC:

Projected

End Date: Dec 2006

[POC](#)

Problem Addressed:

Independent peer review is a cornerstone of the NETS program. All NETS-related studies are to be reviewed by members of the NETS team. Significant works will be reviewed by a team of independent peer reviewers to ensure the validity, quality and accuracy of the procedures, data, etc.

Objective:

The goal of this effort is to establish a team of independent peer reviewers, to create and implement a process for review of NETS studies.

Benefits:

An effective independent peer review process will help verify the validity of NETS studies and address concerns raised by outside stakeholders.

Status:

In Progress

The team of independent peer reviewers has been created and significant NETS products are being subjected to this independent peer review process.

Contract Data:

120171, A1360

Progress:

[Report, January 14, 2005 \(14 KB, pdf\)](#)

Products (Bookshelf/Toolbox):

Related Links:

Revised 15 Sep 2008

Source: Navigation Economic Technologies Program ©2008



Source: Navigation Economic Technologies Program ©2007



Fact Sheet

An Industrial Organization Study of the Inland Waterway Transportation System

Start Date: Apr 2004

POC:

Projected End Date: Mar 2005

[POC](#)

Problem Addressed:

The nation's inland waterway system consists of three primary components: a federally-funded and operated navigation system, quasi-private sector ports, and private sector barge/towing firms (known as the waterway carrier industry). Over the years a great deal of information has been accumulated about the first two components of the system, but comparatively little data is available on the waterway carrier industry. Given the crucial role that the inland waterway system plays in the nation's economy it is important to better understand the waterway carrier industry, including such issues as pricing behavior, profitability, concentration, etc.

Objective:

The goal of this project is to develop a basic understanding of the organization of the waterway carrier industry in terms of its structure, conduct and performance. The study will use secondary data sources including annual reports, business data banks, etc. Data will be collected for a minimum of 10 years.

Benefits:

A more in-depth understanding of the waterway carrier industry will help the Corps develop better models for forecasting future use of the inland waterway system and the impact of changes to the system. Traditionally, Corps models have assumed largely constant returns to scale and competitive pricing on the waterways. This research will allow for more refined assessments of such issues.

Status:

Completed

Contract Data:

IWR 2004

Progress:

Products (Bookshelf/Toolbox):

[Report by Kim Vachal, Jill Hough, Gene Griffin, March 15, 2005 \(10.0 MB, pdf\)](#)

Related Links:

[Upper Great Plains Transportation Institute](#)

nongovernment site



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Fact Sheet

Inland Navigation Animation Module (INAM)

Start Date: Mar 2005

Projected

End Date: Jan 2008

POC:

[POC](#)

Problem Addressed:

The Corps of Engineers, as custodian of the nations navigable waterways, has access to very large datasets such as the Lock Performance Monitoring System and Waterborne Commerce Statistics Center data. The models created and executed by the Corps also produce very large data sets. These large data sets are much too large to understand in tabular form. Queries which break the data into smaller more focused groups of information are one way to ease the analysis process. Charting and other visual representations of the data are other tools analysts use to understand the data. However, these methods are not well suited to understanding a large dataset that contains data which represents variations over time and space.

Objective:

Advances in Human Computer Interface technology have allowed large, dense datasets to be interacted with in a fashion that enhances understanding of patterning in large datasets. Advanced visualization of LPMS data will allow Corps analysts to be more effective and efficient as they seek to understand the temporal and spatial patterning of navigation traffic flow. The Navigation System Simulation model (NaSS), which is another element of the NETS program, will be designed to efficiently feed INAM. Therefore this module will allow an analyst to visually review and understand both LPMS data and NaSS output, and to easily compare the two datasets.

Benefits:

One benefit of the INAM will be that it can serve as a teaching tool to help those who don't understand the lockage process. By watching the animation, a person should be able to easily understand various concepts related to the lockage process. The INAM can also serve as a error checking tool. Data errors will be revealed as a knowledgeable user reviews the data in an animation format. The INAM will also be used as a debugging tool for the NaSS model. Since output from NaSS can be fed into INAM, the output can be reviewed in the animation and errors in programming logic will be revealed. On a larger scale, region and basin wide traffic patterns and carrier behavior will be able to be analyzed. This will be especially useful for analyzing carrier response to scheduled and unscheduled closures. For example, the McAlpine Event Study found very few tows arrived at McAlpine during the river closure. The INAM will be able to easily show where the tows operated or tied up during the closure. This information will help the NaSS team develop shipper and carrier response algorithms in NaSS.



Status: Completed

Contract Data:

120171, A1230;
130465, C3200

Progress:

[Software by INAM Team, Jan 14, 2008](#) (120.4
MB, exe)

Products (Bookshelf/Toolbox):

Related Links:

[McAlpine Event Study](#)
[NaSS Model](#)

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Fact Sheet

Inland Navigation Appointment System

Start Date: Oct 2003

Projected

End Date: Sep 2005

POC:

[POC](#)

Problem Addressed:

Delays caused by congestion on the inland waterway system are costly for shippers and have a negative impact on the economy and the environment. Appointment systems are one proposed solution to dealing with the problem.

Objective:

This study examines the potential use of an appointment systems to reduce wait times and congestion. Under such a system barges would be assigned times to pass through a lock and dam system. The researchers intend to develop a robust simulation tool to measure the effects of a variety of appointment strategies and to prepare the groundwork for additional operational testing of an appointment system. The study also will examine the economic benefits and costs of an appointment system.

Benefits:

The development of a workable appointment system would be a cost-effective way to reduce congestion and wait times, and could potentially lead to a positive economic impact due to more efficient movement of commodities and lower fuel costs. A more efficient system could also reduce pollution and environmental damage.

Status:

Completed

Contract Data:

120171, A1010

Progress:

[Summary of Presentation by Don Sweeney
\(22 KB, pdf\)](#)

[Presentation by Ray Mundy \(659 KB, ppt\)](#)

[Paper by Ray Mundy, June 2005 \(3.92 MB, pdf\)](#)

Products (Bookshelf/Toolbox):

[Study Results by Ray Mundy, July 29, 2005 \(html\)](#)

[Presentation by Ray Mundy, June 15, 2005 \(html\)](#)

Related Links:

Revised 15 Sep 2008

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Fact Sheet

Lock Performance

Start Date: Jun 2004

POC:

Projected

End Date: Jun 2005

[POC](#)

Problem Addressed:

The efficiency of the nation's inland waterway system depends heavily on the performance of lock and dam systems and how timely they are in passing barges through their pools. Additional data on the performance time and relative efficiency of the nation's various lock and dam systems is therefore critical to effective planning

Objective:

This study will develop a model for evaluating lock performance by analyzing a number of relevant factors including: structural design, size of tows, equipment in the lock and on the barges, weather conditions, river levels, etc.

Benefits:

A better understanding of lock and time performance will enable Corps planners to better prioritize maintenance and construction projects and better understand the benefits and costs of planned projects.

Status:

Completed

Contract Data:

120171, A1280

Progress:

[Paper by Wesley Wilson \(104 KB, pdf\)](#)

[Presentation by Wesley Wilson \(160 KB, ppt\)](#)

Products (Bookshelf/Toolbox):

[Report by Wesley W. Wilson, Nov 14, 2005 \(447 KB, pdf\)](#)

Related Links:

Revised 15 Sep 2008

Source: Navigation Economic Technologies Program ©2008



Source: Navigation Economic Technologies Program ©2007



Fact Sheet

Lock Reliability

Start Date: Oct 2004

POC:

Projected

End Date: Sep 2005

[POC](#)

Problem Addressed:

Corps planners must prioritize maintenance activities and construction work on the nations locks and dams to ensure that the available dollars are used to the maximum effect on projects with the greatest need or the greatest potential return on investment. In order to do this reliable data is needed.

Objective:

This study is the first step in a planned multi-phase effort aimed at improving the level of data available related to maintenance projects for the nations locks and dams. The study will examine lock unavailability and processing delay times on the Upper Mississippi River in 2003. The study also will look at age and rehabilitation related lock characteristics. Finally, the study team will cross-check and verify data and describe level of confidence in the data.

Benefits:

This study will lay the groundwork for future efforts aimed at developing better and more complete data related to the repair and maintenance of the nations locks and dams. Ultimately, this research will help Corps planners understand the costs and benefits of maintenance and construction projects on the nations locks and dams. This will enable the Corps to better prioritize projects and mitigate the effects of construction-related closures.

Status:

Completed

Contract Data:

120171, A1200

Progress:

Products (Bookshelf/Toolbox):

[Report by The Planning Center of Expertise for Inland Navigation, September 2005 \(3.26 MB, pdf\)](#)

Related Links:

Revised 15 Sep 2008



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Source: Navigation Economic Technologies Program ©2008



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Fact Sheet

Long-Term Forecasting of Commodity Flows Method with Application to Mississippi River Grains and World Trade

Start Date: Sep 2003

POC:

Projected

End Date: Sep 2007

[POC](#)

Problem Addressed:

The international distribution of grains is influenced by many factors, including agricultural production, popular tastes, population and income growth, and agricultural and trade policies. Changes in any of these variables will impact the international distribution of grains and oilseeds, and shipments through the US waterways.

Objective:

The purpose of this study is to develop a spatial equilibrium model to forecast international commodity flows from a specific region. The methodology will be generally applicable to a broad range of commodities or regions, but the focus will be on the world grain trade and expected market responses to evolving competitive pressures and structural changes.

Benefits:

This model will enable planners to estimate service-induced demand changes and the likely impact on navigation in specific regions.

Status:

In Progress

Contract Data:

120171, A1370

Progress:

[Summary of Presentation by William Wilson
\(23 KB, pdf\)](#)

[Presentation by William Wilson, June 21, 2004
\(2.0 MB, pdf\)](#)

[Presentation by William Wilson, July 6, 2005
\(1.7 MB, ppt\)](#)

[Report by William Wilson, Erik DeVuyst, Won Koo,
Bruce Dahl, and Skip Taylor, September 30, 2005
\(570 KB, pdf\)](#)

[Report Appendix by William Wilson, Erik DeVuyst,](#)

Products (Bookshelf/Toolbox):

[Paper by William Wilson, Won Koo, Richard
Taylor, and Bruce Dahl, July 30, 2004
\(480 KB, pdf\)](#)

[Paper by William Wilson, Won Koo, Richard
Taylor, and Bruce Dahl, November 15, 2004
\(470 KB, pdf\)](#)

[Report by William W Wilson, Eric DeVuyst,
Richard Taylor, Bruce Dahl and Won Koo, Dec
15, 2006 \(3.3 MB, pdf\)](#)



[Won Koo, Bruce Dahl, and Skip Taylor,
September 30, 2005 \(941 KB, pdf\)](#)

[Paper by William W. Wilson, Won Koo, Bruce
Dahl, Richard Taylor, Sep 14.2007 \(268 KB, pdf\)](#)

Related Links:

[Longer-Term Forecasting of Grain Flows and Delay Costs on the Mississippi River](#)



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Fact Sheet

Mid-America Grain Study: Upper Mississippi River Implementation

Start Date: Jun 2005

Projected

End Date: Sep 2006

POC:

[POC](#)

Problem Addressed:

Current Corps economic models designed to assess the potential benefits of proposed navigation projects rely heavily on assumptions about demand (i.e. how much the waterways will be used by shippers). These assumptions relate in large part to how shippers will respond to changes in transportation costs and times. Estimates of benefits from improving the waterways vary considerably depending on the assumptions that are made.

Objective:

The goal of this investigation is to incorporate the results found in "Shippers Responses to Changes in Transportation Costs and Times: the Mid-America Study" authored by Kenneth Train and Wesley Wilson into the framework of the existing economic system model ESSENCE. The ESSENCE model was one of two economic models used in the Upper Mississippi River-Illinois Waterway System Navigation Study completed in 2004. The ESSENCE model in its current form specifies a demand for transportation that allows for the possibility that shippers might reduce their desired quantities of water transportation at rates less than their next best transportation alternative. However, due to a lack of definitive data on the precise magnitude of this response, evaluations to date have relied on assumed values to complete the demand specification. The Train and Wilson paper generates data that can be used to fill the recognized data gap, but the paper presents a representation of grain transportation demand that is significantly more complex than the representation of transportation demand that can be currently accommodated in ESSENCE. Consequently, structural and input changes to the ESSENCE model will be implemented so as to capture the fundamental results of the Train and Wilson investigation.

Benefits:

A properly specified and empirically based shippers' demand for water transportation will enable the Corps to improve its economic models and better estimate projected benefits related to waterway improvements.

Status:

In Progress

Contract Data:

130465, W0520

Progress:

[Presentation by Dr. Wes Wilson, Jul 1,2004](#)

Products (Bookshelf/Toolbox):

[Paper by Dr. Donald Sweeney, Jul 1,2005](#)



(105 KB, ppt)

[Presentation by John Carr, Feb 21, 2006](#)
(6.2 MB, ppt)

(130 KB, pdf)

[Paper by Drs. Kenneth Train & Wes Wilson, Sep 1, 2004](#) (40 KB, pdf)

Related Links:

[Shippers Responses to Changes in Transportation Rates and Times: The Mid-American Grain Study](#)

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Fact Sheet

Mississippi River Transportation Demand Survey of Grain and Non-Grain Movements

Start Date: Aug 2005

POC:

Projected

End Date: Nov 2006

[POC](#)

Problem Addressed:

Modal choices for demand estimation need to be determined under various conditions. This project accumulates data on river use decisions by both agricultural and non agricultural shippers. These data will underly and allow precise demand estimation models to be determined by the ACOE and its researchers.

Objective:

Determine and develop lists of agricultural and non agricultural shippers on the Mississippi and Illinois Rivers. Develop a questionnaire dealing with model choice and demand for river transportation. Conduct a survey of the shippers in both situations. Clean and construct data sets of responses for analysis. Present a report on the general characteristics of respondents as well as the data set itself to Corp researchers.

Benefits:

The outcome will be demand models that are dependable and are based on statistically defensible data sets.

Status:

In Progress

Lists are being developed and the questionnaire finalized. Questions dealing with the activities under Katrina are being considered.

Contract Data:

130465, E5000

Progress:

Products (Bookshelf/Toolbox):

Related Links:

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Fact Sheet

Model of Spatial Market Areas and Transportation Demand

Start Date: Oct 2004

Projected

End Date: Sep 2005

POC:

[POC](#)

Problem Addressed:

The Corps current navigation planning models define demand (i.e. shippers use of the waterways) in terms of origin (i.e. where a commodity is shipped from) and destination (i.e. where it is shipped to) points. These models make assumptions about how the demand changes in relation to changes in rates. These models typically assume that demand is constant up to a threshold level at which point all traffic moves to an alternative mode of shipping (train, truck, etc.). Concerns about the validity of this assumption have led researchers to investigate other theories.

Objective:

This study investigates the theory that demand is not constant but rather will fall as prices increase until a threshold point is reached at which point all traffic will move to an alternative mode of shipping. The study will examine the responsiveness of port facilities to barge rates, which are a determinant of the price that port facilities offer to shippers located off the river. To the extent that these shippers have alternatives or respond to price changes, the river terminal may ship less down river. The study also will examine market area size, including the influence that the nearness to competition and the price of alternative modes of transportation has on market size and how in turn this effects demand. The study is being conducted using data from the Upper Mississippi River.

Benefits:

The study will help Corps planners to better understand and project demand which will allow for more accurate projections of the cost and benefits of proposed changes to the nations waterways.

Status:

Completed

Contract Data:

IWR 2004

Progress:

[Memo by Kevin Henrickson and Wesley Wilson, January 25, 2005 \(43 KB, pdf\)](#)

Products (Bookshelf/Toolbox):

[Paper by Kevin Henrickson and Wesley Wilson, January 25, 2005 \(1.27 MB, pdf\)](#)

[Paper by Kevin E. Henrickson and Wesley W. Wilson, Jul 31 2005 \(668 KB, pdf\)](#)

[Report by Kevin Henrickson, September 2005](#)



Related Links:

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Fact Sheet

Modeling Preferences for Upper Mississippi Grain Movements: The Mid-American Grain Study

Start Date: Jul 2003

Projected

End Date: Nov 2004

POC:

[POC](#)

Problem Addressed:

Current Corps planning models designed to assess the potential benefits and costs of proposed navigation projects on the inland waterways, rely heavily on assumptions about demand, (i.e. how much the waterways will be used by shippers). These assumptions relate in large part to how shippers will respond to changes in transportation costs and times. Estimates of benefits from improving the waterways vary considerably depending on the assumptions that are made. Recent experience has pointed to the need to carefully evaluate the current assumptions being used.

Objective:

The goal of this study is to survey shippers regarding their use of the waterways. The researchers will survey grain shippers on the Upper Mississippi. A related study is looking at coal shippers on the Ohio River. The survey will gather information regarding shippers' current practices including: which mode or modes they use for each shipment (i.e. barge, truck, train, etc.) and the origin/destination of the shipment; the total volume of shipments that are generated annually; and the location of the shippers' facilities. The study also will examine how the shippers would change their operations in response to changes in transportation rates and times. The study will include an analysis of the implications of the findings for planning and investment in navigation projects.

Benefits:

A better understanding of the factors influencing shippers' use of the inland waterways will enable the Corps to improve its planning models and better estimate projected benefits and costs related to waterway improvements.

Status:

Completed

Contract Data:

IWR 2003

Progress:

[Presentation by Kenneth Train and Wesley Wilson
\(290 KB, ppt\)](#)

[Report by Kenneth Train and Wesley W. Wilson,
Dec 29, 2006 \(808 KB, pdf\)](#)

Products (Bookshelf/Toolbox):

[Report by Kenneth Train and Wesley Wilson,
November 2004 \(666 KB, pdf\)](#)

[Paper by Kenneth Train and Wesley Wilson,
November 9, 2004 \(409 KB, pdf\)](#)



[Presentation by Kenneth Train and Wesley W. Wilson, Jan 5.2007 \(5.8 MB, ppt\)](#)

[Presentation Discussion by Kenneth Boyer, Jan 5.2007 \(30 KB, ppt\)](#)

[Presentation Discussion by Van Kolpin, Jan 5.2007 \(42 KB, ppt\)](#)

[Presentation by Wesley W. Wilson and Kenneth Train, Jan 14.2008 \(568 KB, ppt\)](#)

[Report by Kenneth Train and Wesley W. Wilson, May 1.2007 \(revised\) \(2.7 MB, pdf\)](#)

[Report by Kenneth Train and Wesley W. Wilson, May 1.2007 \(1.5 MB, pdf\)](#)

[Paper by Kenneth Train and Wesley W. Wilson, Nov 1.2007 \(834 KB, pdf\)](#)

Related Links:

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Fact Sheet

Navigation System Simulation Model

Start Date: Jun 2005

Projected

End Date: Sep 2009

POC:

[POC](#)

Problem Addressed:

The Waterways Analysis Model is currently the most procedurally developed lock simulation model used by the Corps. However, the WAM is limited in several regards. It is a difficult model to use, which is being addressed by another NETS project (WAM BPP). More importantly, the WAM is written in a proprietary language which makes it difficult to understand and revise; it is not well suited to analysis of a system of locks; it is not well suited for analysis of shipper and carrier behavior in reaction to disruptive lock closures; it is not well suited for analysis of various traffic management schemes; it does not include engineering reliability modules; and it cannot optimize navigation system investments and management actions.

Objective:

This effort will develop an entirely new system simulation and optimization model that builds upon the capabilities of WAM and addresses the shortcomings identified above. NaSS is intended to be the most advanced navigation system simulation tool available to the Corps and general public.

Benefits:

The work effort will lead to better decisions regarding navigation system improvements and management through the use of a model that better simulates real world operations and optimizes potential investments and traffic management actions.

Status:

In Progress

Prototyping, Genetic Algorithm modification, NaSS LPMS schema creation, Prototype BasinSym, and Phase 1 Detailed Lock Model coding is complete. In FY08 the team will focus on enhancing the BasinSym model, implementing statistically generated shipment lists, and completing development of the Detailed Lock Model. A GUI will be developed, equipment reservoirs will be implemented, and WCSC data will be added to the DAPP. Enhanced outputs, and the notion of alternative improvement projects will also be implemented.

Contract Data:

A1310; 130465,
W1010, W1030,

Progress:

[Paper by Mark Lisney, September 2005](#)
(43 KB, pdf)

Products (Bookshelf/Toolbox):

[Report by Dr. Richard Males, Jul 12, 2006](#)
(787 KB, pdf)



- [Design Document by Dr. Richard M. Males, Feb 5, 2006 \(457 KB, pdf\)](#) [Report by Shiaaulir Wang and Paul Schonfeld, Nov 7,2006 \(596 KB, pdf\)](#)
- [Report by Paul Schonfeld, Shiaaulir Wang, Apr 17,2006 \(494 KB, pdf\)](#)
- [Design Document Review Comment by Design Document Reviewers, May 1,2006 \(236 KB, pdf\)](#)
- [DD Comments and Responses by Various NaSS Team Members, Jul 27,2006 \(261 KB, pdf\)](#)
- [Announcement by NETS Team, Feb 12,2007 \(15 KB, pdf\)](#)
- [Report by Shiaaulir Wang, Ning Yang, Paul Schonfeld, Jun 18,2007 \(677 KB, pdf\)](#)
- [Update by Mark Lisney, Sep 18,2007 \(51 KB, pdf\)](#)
- [Presentation by Mark Lisney, Sep 20,2007 \(463 KB, ppt\)](#)
- [Presentations and MFR by NaSS Team, Dec 12,2007 \(8.0 MB, zip\)](#)
- [Instructions by Mark Lisney, Feb 20,2008 \(1.2 MB, pdf\)](#)
- [Software by Mark Lisney, Feb 20,2008 \(12 KB, zip\)](#)
- [Software by Mark Lisney, Feb 20,2008 \(265 KB, zip\)](#)

Related Links:

Revised 15 Sep 2008

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Fact Sheet

Ohio River Basin Shipper Response Survey

Start Date: Oct 2005

Projected

End Date: Sep 2008

POC:

[POC](#)

Problem Addressed:

The traditional approach to navigation system modeling is to assume that waterway commodity movements are relatively unresponsive (inelastic) to changes in waterway transportation prices, when this may or may not be the case. The current work allows the estimation of shipper reactions through the development of specific shipper response functions, which can then be incorporated into system modeling.

Objective:

The fundamental work is the development of shipper response functions, by major industrial category, enabling the estimation of shipper reactions to changes in transportation costs. The work entails a broad description of shipping and shipping practices both over time and across key commodities. The description is the result of published information as well as personal interviews with shippers across the commodities. This information is used to develop a broad-based survey of a sample of current and potential users of the Ohio River System that provides the information necessary to estimate the demands for waterway traffic. The particular approach in modeling demand is grounded in choice theory and the use of both revealed and stated preference data. This enables demand functions to be estimated not only of the existing set of shipment attributes (e.g., rates), but also provides demands over a wider range of attributes than is observed in the revealed data. The resulting demand functions are also directly affected by the spatial environment of shippers. Shippers located on the river are far more likely to use barge than alternatives, while shippers located greater distances from the waterway are less likely to use barge. The results can be used to illustrate the behavior of demanders across space and can be aggregated to provide pool level demands by commodity. This latter is important in that the existing planning models define markets at a pool to pool level by commodity

Benefits:

The output of this study effort will provide Corps planners with tools that better identify shipper responses to changes in waterway transportation prices, which can then be incorporated into system modeling and benefit estimation.

Status:

In Progress



[Contract Data](#)

[Program Data](#)

[Program Description](#)

130465, W1020
[Report by Ken Casavant, Kent Miller, Danna L. Moore, and Wesley W. Wilson, Jan 31, 2008 \(2.2 MB, pdf\)](#)

Related Links:

Revised 15 Sep 2008

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Fact Sheet

Port Development, Internal Transport Systems and International Trade

Start Date: May 2005

Projected

End Date: Jun 2006

POC:

[POC](#)

Problem Addressed:

Improvements to internal transport systems (i.e. the nation's ports and waterways) can reduce the costs of serving international shippers, which in turn can lead to new trading partners and/or an increase in the volume of international trade. Currently, there is little data available analyzing the links between improvements to ports and waterways and the effect such changes will have on imports and exports.

Objective:

The goal of this study is to develop a model for determining which ports shippers will choose and for estimating import and export trade volumes for U.S. ports. The study will examine the role of: costs associated with ocean travel between international ports; costs associated with port/harbor service; and costs associated with moving commodities from inland to a port and vice versa.

Benefits:

This study will enable the Corps to more accurately project the impact on international trade --and the resulting economic benefits--that will flow from improvements to the nation's ports and waterways.

Status:

Completed

Contract Data:

120171, A1340

Progress:

[Paper by Bruce Blonigen and Wesley Wilson, July 22.2005 \(315 KB, pdf\)](#)

[Paper by Bruce Blonigen and Wesley Wilson, May 1. 2006 \(174 KB, pdf\)](#)

[Presentation by Bruce Blonigen, Jan 5.2007 \(300 KB, ppt\)](#)

Products (Bookshelf/Toolbox):

[Report by Bruce Blonigen and Wesley Wilson, Feb 2006 \(491 KB, pdf\)](#)

[Report by Bruce A. Blonigen and Wesley W. Wilson, Nov 20.2006 \(474 KB, pdf\)](#)

Related Links:



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Fact Sheet

Recent Trends in Output, Industrial Organization, and the Willingness to Pay in the US Inland Waterway Commercial Transportation Industry

Start Date: Oct 2002

Projected

End Date: Sep 2003

POC:

[POC](#)

Problem Addressed:

Engineer Regulation (ER) 1105-2-100, 22 April 2000, requires a National Economic Development (NED) evaluation of all potential Corps of Engineers major resource actions. The measurement standard for the values of goods and services created by a Federal water resource project is defined to be the willingness of users to pay for each increment of output provided by a plan. This research identifies historic trends in the observed willingness to pay for inland water transportation using publicly available data so that forecasts of the future willingness to pay for water transportation may be evaluated in the context of the historic data.

Objective:

The purpose of this research is to identify and examine recent historical trends evidenced in the inland waterborne transportation industry of the United States. The research is narrowly focused on three trends evidenced in publicly-available data for the industry: (1) trends in total industry size as measured by both the total tons transported by the industry and the total ton-miles produced (a ton-mile represents the movement of one ton of cargo a distance of one mile) by the industry; (2) trends in the industrial organization of inland water transportation as measured by the proportion of barges managed by the four largest providers of inland water transportation; and (3) trends regarding the observable willingness of shippers to pay for inland water transportation as measured by historic revenues of publicly reporting firms engaged in inland water transportation.

Benefits:

The analysis of publicly-available historic data regarding the domestic inland water transportation industry reveals a national industry best characterized by: (1) historically decreasing rates of growth in total industry output culminating in the current virtual stagnation of long term industry output levels; (2) continuing horizontal integration of inland water transportation providers leading to an increased concentration of industry market power into a handful of national carriers; and (3) slowly decreasing real levels of marginal willingness to pay for water transportation. Together, these three trends have profound implications for the management of the existing inland navigation system infrastructure.

Status:

Completed



Contract Data:

IWR 2003

Progress:

Products (Bookshelf/Toolbox):

[Report by Donald Sweeney, July 2003
\(1.85 MB, pdf\)](#)

Related Links:

[Center for Transportation Studies](#)  government site

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Fact Sheet

Revealed Choice Estimate of the Demand for Barges on the Mississippi River

Start Date: Sep 2003

POC:

Projected

End Date: Mar 2005

[POC](#)

Problem Addressed:

Shippers' use (demand) of the inland waterways is elastic, meaning it is influenced by a variety of factors, including what alternative means of transporting commodities are available and what they cost, what it costs to ship by barge, etc. Understanding the factors that affect demand is crucial to accurately project the costs and benefits of proposed changes to the waterway systems. Current planning models do not adequately address demand elasticity.

Objective:

The goal of the study is to develop a model for assessing demand on the Upper Mississippi River system and how it might be affected by proposed changes to the waterways. The model will incorporate key factors that influence shippers choices, which will allow for a better understanding of the elasticity of demand. The model will be developed based on the decisions of individual shippers as revealed in data available from the Corps, the U.S. Department of Agriculture and other sources.

Benefits:

The study will assist the Corps in more accurately projecting demand and how it will be affected by various proposed changes to the waterways. This in turn will enable the Corps to more effectively estimate the benefits of proposed changes.

Status:

Completed

Contract Data:

120171, A1080

Progress:

[Presentation by Kenneth Boyer \(123 KB, ppt\)](#)

[Paper by Kenneth Boyer, April 3, 2004 \(98 KB, pdf\)](#)

Products (Bookshelf/Toolbox):

[Report by Kenneth Boyer and Wesley Wilson, March 14, 2005 \(1.25 MB, pdf\)](#)

[Paper by Kenneth Boyer and Wesley Wilson, July 27, 2004 \(467 KB, pdf\)](#)

Related Links:



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Fact Sheet

Tide Cycle Analysis & Underkeel Clearance (UKC) Verification

Start Date: Oct 2005

POC:

Projected

End Date: Sep 2007

[POC](#)

Problem Addressed:

Underkeel clearance and evaluation of tide cycle characteristics are important considerations for analysis for most deep-draft or coastal harbor studies, especially those that address needs for increased depth. Understanding requirements for vessel clearance and scheduling of vessel movements to take advantage of tidal elevation to provide marginal waterway depth helps to explain the limitations for fleet or vessel service imposed by waterway specifications. Requirements for clearance and use of tides have direct impact on the needs for increased depths and related improvements and often represent considerable marginal costs for plan formulation.

Objective:

Development of a computerized application to allow for consistent and cost-efficient assessment of vessel clearance based on input of data for actual operating conditions respective to timing of vessel movement or transit, tidal elevation, and waterway specifications.

Benefits:

Computerized application will enable planners to more objectively and efficiently assess valid allowances or requirements for vessel clearance as a critical input for economic analysis and design specifications for planning of coastal waterway system improvements. Applied Products: Computerized and downloadable application for analysis of commonly available data to assess vessel management practices for transit and clearance as an input to economic analysis and plan formulation of waterway systems.

Status:

In Progress

Contract Data:

130465, E5074

Progress:

Products (Bookshelf/Toolbox):

Related Links:



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Fact Sheet

Towboat Operating Area Analysis

Start Date: Oct 2005

POC:

Projected

End Date: Mar 2006

[POC](#)

Problem Addressed:

It is well known that most towboats operating on the Upper Mississippi River from March through November depart the area during December through February. This phenomenon occurs because operating conditions become extremely difficult or impossible due to winter ice conditions. This migration of towboats and barges into the area in spring and out of the area in fall is constitutes an unsteady state condition. If an analyst seeks to mathematically model this type of state, modeling techniques applicable to such systems must be used. Knowing that most towboats and barges depart the Upper Mississippi in winter leads an inquisitive observer to ask "Where do they go?" Do the departing vessels simply tie-up somewhere and cease operating? Do they move to other parts of the inland waterway and continue operating? If they migrate to other parts of the system, does their migration cause the recipient areas to act as unsteady state systems? This scope of work seeks to answer these questions by performing the following tasks: Task 1. Assemble OMNI, LPMS and WCSC data for the years 2000 through the most recent year available. Task 2. Determine the number of unique towboats that operate on the Upper Mississippi during the March-November time period. Task 3. Sort the towboats, in descending order, by number of lockages Task 4. Determine the number of towboats required to account for 90% of all tow lockages on Upper Mississippi locks. Task 5. Determine where the towboats in the 90% group operate during the December-February time frame. Task 6. For those towboats in the 90% group that operate in areas where they make lockages through locks, determine the percent of lockages attributable to the 90% group. The lockages attributable to the 90% group will be displayed for each lock where the 90% group operates. For each lock where the 90% group operates, determine whether steady state modeling techniques are sufficient, or must non-steady state techniques be used. Task 7. The results of the analysis will be presented in a report suitable for publication on the Navigation Economic Technologies web site.

Objective:

The objectives are to determine where (if anywhere) the towboats leaving the Upper Mississippi River in winter go to work and how that affects the stability of operations in the U.S. inland waterways. A report quantifying the results was prepared.

Benefits:

The report quantifying the seasonal migration of towboats among U.S. inland waterways supports future analyses of the waterway system. In particular, the results support the development of the NaSS model by providing inputs on the seasonality of traffic, on the appropriateness of steady-state approximations for



various components of the U.S. inland waterway network, and on the conservation of equipment (i.e., towboats) in this network.

Status: Completed

Contract Data: 130465, W1000 **Progress:**

Products (Bookshelf/Toolbox):

[Report by Min Wook Kang, Paul Schonfeld, Mar 16, 2006 \(1.00 MB, pdf\)](#)

[Report by Mark Lisney, Oct 17, 2006 \(463 KB, pdf\)](#)

Related Links:

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Fact Sheet

Tradable Permits

Start Date: Sep 2004

POC:

Projected

End Date: Dec 2005

[POC](#)

Problem Addressed:

Delays caused by congestion on the inland waterway system are costly for shippers and have a negative impact on the economy and the environment. Tradable permits are one proposed non-structural solution for dealing with the problem. Tradable permits involve regulators determining an overall level of tolerable activity, in this case on the nation's inland waterways, then allocating tradable rights, permits, or quotas to operators generating the trips, up to a tolerable level. Companies that keep their trip levels below the allotted level could sell their surplus permits to other firms or use the allotment for one of their other facilities to offset excess trips there. Firms that run out of allowance must buy them from other companies or face legal penalties. In either case it is in the financial interest of the participating firms to reduce trips as much as they efficiently can.

Objective:

The goal of this study is to establish a reference report describing tradable permit systems in theory and practice and to design a system of tradable locking permits for the inland waterway system. It is anticipated that the study will result in a tradable permit system that can be tested at a Corps lock and dam. The study will attempt to anticipate potential implementation problems for such a system and develop proposals for resolving them.

Benefits:

An effective tradable permit system could reduce congestion on the nation's inland waterways, leading to lower transportation costs and a positive economic impact.

Status:

Completed

Contract Data:

120171, A1350

Progress:

[Presentation by Jim Fawcett \(44 KB, ppt\)](#)

[Presentation by Charles Plott and Joseph Cook \(315 KB, ppt\)](#)

[Presentation by Joseph Cook and Charles Plott.](#)

Products (Bookshelf/Toolbox):

[Report by Charles Plott and Joseph Cook, Oct 24.2005 \(614 KB, pdf\)](#)



Related Links:

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Fact Sheet

Transportation Market Equilibrium: A Theoretical Approach

Start Date: Aug 2005

POC:

Projected

End Date: Dec 2005

[POC](#)

Problem Addressed:

Traditional demand models describe basic demands in a market economy. These models are greatly simplified and do not take all conditions into consideration. Transportation causes price differences between the regions to be arbitrated in equilibrium, so that prices differ across regions by the transportation costs whenever trade occurs. In this model, all markets are competitive and the regions fixed. Transportation enters the market model through the addition of a fixed transportation price or through the addition of a demand and supply function for transportation.

Objective:

The main objective of this project is to allow for market power and to remove fixed regions in the canonical models. Each of these are considered in this paper with an eye towards evaluating policy actions to improving the transportation sector when both market power and endogenous regions are present. This allows the welfare consequences of improvements to the transportation infrastructure to be explicitly identified.

Benefits:

Transportation aspects of market demands are considered in this paper with an eye towards evaluating policy actions to improving the transportation sector when both market power and endogenous regions are present.

Status:

Completed

Contract Data:

120171, A1440

Progress:**Products (Bookshelf/Toolbox):**

[Paper by Simon Anderson and Wesley Wilson, September 2005 \(554 KB, pdf\)](#)

Related Links:

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Fact Sheet

Vessel Fleet Forecast Methodology Unit

Start Date: Oct 2005

Projected

End Date: Sep 2006

POC:

[POC](#)

Problem Addressed:

Deep-draft vessel fleet forecasts which define relevant parameters for vessel type, cargo capacity and physical dimensions are critical to analysis and planning of improvements for waterway systems. While fleet forecasts based on stratification of the overall world fleet are available from various sources at any given time; such forecasts are often difficult or impractical for USACE civil works analysts to meaningfully apply as they tend to be capacity-driven as measured by general estimations of deadweight tonnage (DWT). Characteristically, little information is provided within the context of such forecasts regarding corresponding hull dimensions such as draught, length, and breadth needed for dimensional specifications in waterway design. In addition, highly aggregated world fleet forecasts typically provide little or no information or means for viable adaptation or adjustment of projections or methodology to meet region or project-specific planning needs. Accordingly, a framework is needed that will facilitate the derivation of initial or baseline region or project-specific fleet forecasts which analysts can directly apply for economic analysis of individual waterway improvement projects.

Objective:

The objective of this work unit is to develop a process and framework for the practical and efficient derivation of baseline deep-draft fleet forecasts for application to waterway system improvement studies. Commensurate with this objective, research efforts are being undertaken to review and extend the logic of preliminary investigations initiated under the deep-draft Navigation Trends Unit (NTU) completed in 2000-2001. Within the scope of the NTU conducted with primary support of the U.S. Naval Academy, the primary directive of the NTU was to review existing and foreseeable characteristics of the world fleet according to general vessel type and determine the predominant trend(s) for self-propelled vessel design. Associated research identified the most significant trend across nearly all vessel types was evolution of hull design and construction toward increased blockiness with research efforts culminating in general recommendations for more definitive research applicable to fleet forecasts.

Benefits:

Development of a practical and effective baseline fleet forecast framework that will enhance USACE civil works planning through time and cost efficiencies for project analysis and lead to more accurate estimates of the economic benefits of deep-draft navigation improvements.



Status:

In Progress

Contract Data:

120171, E5072

Progress:

Products (Bookshelf/Toolbox):

Related Links:

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Fact Sheet

Vessel Load Factor Analysis

Start Date: Aug 2004

POC:

Projected

End Date: Sep 2006

[POC](#)

Problem Addressed:

The development of viable fleet forecasts and economic benefit analysis of vessel operations requires understanding of vessel loading and lading management relationships relative to type of vessel employed, the nature of cargo and associated requirements for handling and transfer, and the regime for vessel operations management given logistical requirements and limitations for cargo services. Historically and presently many USACE waterway system analyses do not include efforts to reconcile critical load factors for projected or potential variances in vessel immersion and capacity relative to cargo volume and weight or the disposition of non-cargo components of vessel loading such as bunkerage, requirements for ballast, and carriage for unitized cargos. Non-cargo components often represent significant requirements for vessel loading by weight and therefore directly impact immersed hull draft and corresponding needs for waterway improvements in regard to increased channel depth, width, or reach. The limited load factor information as contained in the existing IWR deep-draft manual is no longer considered sufficient in detail or representative given the nature of vessel operations as they prevail today due to changes in transportation technology, level of transportation information reporting, and maritime industry practice(s). Continuation of current analytical practice without better understanding and address of vessel load factor relationships can result in significant uncertainty and error in the formulation of vessel fleet forecasts and associated determination of requirements for waterway improvements such as increased depth or width.

Objective:

The objective of investigations for vessel load factors is to develop a reference of valid relationships and parameters for estimating the disposition of cargo and non-cargo components of vessel loading to in turn better estimate requirements for vessel immersion and draught. This will include review and update of information concerning typical industry practices for management of vessel capacity and utilization according to significant vessel type and both cargo and non-cargo loading with particular consideration of non-cargo allowances for ballast, bunkerage, and any other load factor significant to reasonably estimating hull immersion. Supporting efforts will entail research and development of general relationships for a variable immersion factor applicable to varying hull geometry corresponding to the working range of hull immersion for cargo loading.

Benefits:

Improved analysis of waterway improvements and estimation of associated economic benefits via a more consistent and verifiable approach for the estimation of vessel loading and immersed draught under variable or alternative



specifications for waterway system design.

Status: In Progress

Contract Data: 120171, E5076 **Progress:** **Products (Bookshelf/Toolbox):**

Related Links:

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Fact Sheet

Vessel Motion in Confined Waterways/ Enhancements to ERDC-WES Channel Analysis and Design Evaluation Tool (CADET)

Start Date: May 2005

Projected

End Date: Sep 2006

POC:

[POC](#)

Problem Addressed:

The vessel motion unit is being structured to address vessel characteristics for vertical motion (notably dynamic sinkage or squat) during operation or transit within confined waterways. Existing relationships or engineering equations for prediction of squat do not perform adequately across varying hull shapes or channel conditions. Historically, virtually all such numerical models or relationships were derived from captive-towed models and recent physical modeling investigations of captive-towed and self-propelled model hulls indicates that self-propelled hulls may render more realistic portrayal of dynamic vessel vertical motion. Poor predictive methods for vessel squat often leads to significant uncertainty and error in assessment of specifications for waterway depth and possible overstatement or understatement of requirements for vessel underkeel clearance as it relates to waterway depth(s). Such error in estimation of requirements for depth can result in significant excess costs for transit channel construction.

Objective:

The scope of investigations will involve physical model testing of either 1-to-48 scale (at USACE facilities located at ERDC-WES) or 1-to-64 scale (at facilities of the U.S. Naval Academy) model vessels within varying model channel configurations and at varying speeds for measurement of actual squat. Models will be tested in both captive-towed and self-propelled modes and rendered data and information will in turn be analyzed to refine engineering guidance for waterway design, economic analysis, and algorithms for virtual simulation of vessel operations. Efforts are also tentatively planned to help implement changes and improvements to CADET (developed by the U.S. Naval Surface Warfare Center - Carderoc) to provide information compatible with procedures and guidance for economic analysis of waterway improvements.

Benefits:

Improved methods and numerical relationships for prediction of dynamic squat or hull sinkage under varying channel conditions which can be applied to both economic and engineering analysis of waterway planning and design; derivation of improved or more valid vertical motion algorithms for improvement of computerized or virtual simulation of vessel response to confined waterways; refinement of computerized systems for engineering analysis of waterway design (i.e., CADET)



Status: In Progress

Contract Data: 120171, E5078 **Progress:** [Report by Jennifer Waters, Jan 1,2005
\(4.2 MB, pdf\)](#) **Products (Bookshelf/Toolbox):**

Related Links:

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Fact Sheet

WAM Batch Processing Program

Start Date: May 2005

POC:

Projected End Date: Sep 2007

[POC](#)

Problem Addressed:

The Waterways Analysis model is currently the most procedurally developed lock simulation model used by the Corps. However, model use is difficult and time consuming due to the nature of WAM input development and description, model execution, and output structure.

Objective:

This effort seeks to make WAM easier to use by streamlining the way input is prepared, model runs are executed and managed, and output is accumulated and analyzed.

Benefits:

The work effort will lead to decreased time and resources needed to conduct lock capacity studies.

Status:

In Progress

Beta version available August 2007

Contract Data:

120171, A1300;
130465, P3000

Progress:

[WAMBPP Users Guide by WAMBPP Team, Aug 8,2007 \(1.3 MB, pdf\)](#)

Products (Bookshelf/Toolbox):

[Beta Software by WAMBPP Team, Aug 8,2007 \(87.0 MB, exe\)](#)

Related Links:

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