US Army Corps of Engineers

Navigation eNews

October 2011 **Volume 20**

The *Navigation eNews* is issued every two months. We hope it is an easily perused, useful newsletter. Please send us a paragraph or two when you've something to share with the navigation community: Dinah.N.McComas@usace.army.mil. All issues are available on the Navigation Gateway, http://operations.usace.army.mil/navigation.cfm .

LOMA - Lock Operations Management Application

The Lock Operations Management Application (LOMA) went into operation on 01 April 2011. For details see http://chl.erdc.usace.army.mil/loma1 LOMA uses the Automatic Identification System (AIS) to gather and disseminate navigation data to and from vessels operating in the vicinity of Corps locks. LOMA is currently operational at Bonneville Lock and Dam on the Columbia River, Cannelton Lock and Dam on the Ohio River and Lock & Dam 22 on the Mississippi River. LOMA also has access to AIS data on the Tenn-Tom Waterway. LOMA AIS to provide lock operators increased situational awareness of vessels approaching the lock. Additional capabilities are being developed to interface with other systems to automate manual data collection, and provide lock operators, Corps management, and industry with information to make waterway operations safer and more efficient and reliable.

LOMA servers, software and databases are up and running at the Engineer Research and Development Center's Information Technology Laboratory (ERDC-ITL). However, projects and Districts wishing to realize the benefits of LOMA must install specific LOMA units at their locks. These units, which consist of an AIS transceiver and suporting equipment, are to be purchased by the project or District and will be assembled and configured at ERDC. The completed unit will then be shipped to the lock for local installation, which consists of mounting the LOMA equipment convenient to power and network connection, mounting two antennas, and running the antenna cables. The cost for the LOMA on-site unit is about $5K. Contracting for these purchases is being handled through the Pittsburgh District. A detailed acquisition guide and installation procedures documents are being developed. The ERDC-CHL point of contact for equipment information is Danny Marshall (Danny.M.Marshall@usace.army.mil).

LOMA training is being incorporated into lock operator training developed by the Inland Marine Transportation System (IMTS) working group. This will be mostly

on-the-job and computer-based training. However, in-person training sessions will also be available. For more information on LOMA, please contact Brian Tetreault, Brian.J.Tetreault@usace.army.mil, or see these websites:

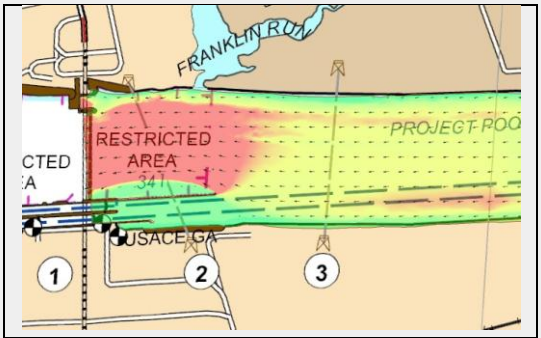
LOMA main site: https://loma.usace.army.mil/

LOMA wiki: http://cirp.usace.army.mil/navwiki/index.php/Lock_Operations_Management_Application_(LOMA)

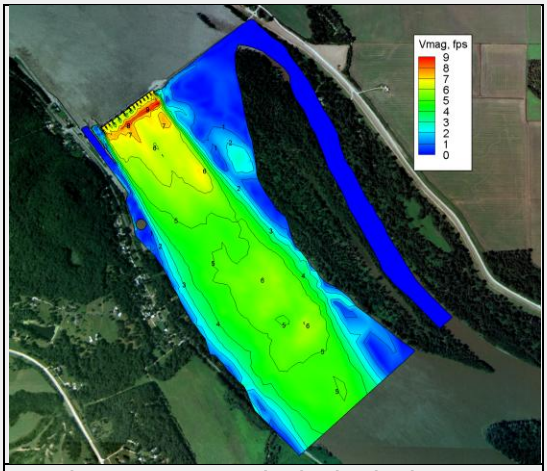
CHL e-Navigation: http://chl.erdc.usace.army.mil/chl.aspx?p=s&a=Groups;38

New Research Aims to Reduce Unscheduled Repair

Barge tow accidents are often attributed to an operator not being aware of the flow conditions in lock approaches. The frequency of accidents could possibly be reduced if tow boat pilots were provided river current information at lock approaches. Reduction of incidents will not only improve safety to project and tow personnel, it will also reduce the government and industry costs by reducing the number of unscheduled outages.



Greenup Lock & Dam, Ohio River. Example - AdH results overlaying a navigation chart.



Lock & Dam 22, Mississippi River. Example - Model velocity magnitudes

An on-going research effort seeks to develop a means of illustrating current conditions in lock approaches. A computational modeling method is being developed to simulate flow conditions in the vicinity of a lock and dam using the 2-D module of the AdH flow solver (http://adh.usace.army.mil/). The models will account for gate operations, ported and solid guard walls, submerged dikes, and the tow. Model solutions will be validated with field and laboratory data to ensure that the model reproduces current directions and magnitudes.

Site- and discharge-specific results will be generalized, tables of conditions, and

information storage and retrieval methods can be developed. The envisioned product will be a plan view of the flow conditions at projects illustrating the currents that a tow must navigate. The resulting electronic picture will be broadcast as an industry-friendly aid to tow operators as they approach or leave a lock. A field site with an active USACE Real Time Current Velocity (RTCV) system will be selected to demonstrate the capabilities. Production runs to generate data needed for generalizations will then be completed. POC: Richard Stockstill, Richard.L.Stockstill@usace.army.mil .

CMTS and TRB Conference - Diagnosing the Marine Transportation System: Measuring Performance and Targeting Improvement

The Committee on the Marine Transportation System, the Transportation Research Board and the Marine Board of the National Academies are co-sponsoring the conference, *Diagnosing the Marine Transportation System: Measuring Performance and Targeting Improvement.*

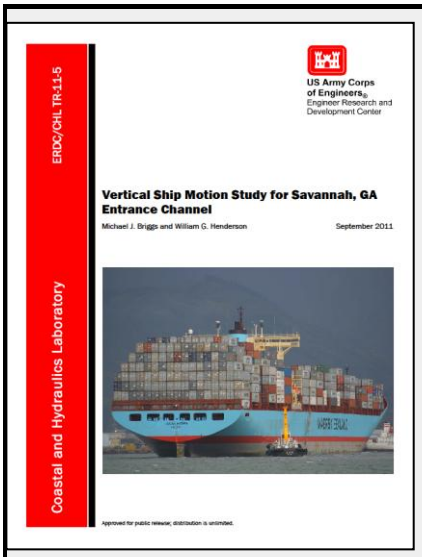
This conference will serve as a forum to examine the use of performance metrics in maritime transportation and waterways management. Through collaborative input from stakeholders in government, academia, and the private sector, conference participants will explore how the Marine Transportation System and intermodal connectors perform through the application of performance metrics.

CALL FOR ABSTRACTS

You are invited to share your knowledge and expertise. If you are interested in submitting a paper or presenting relevant research, please submit an abstract of 300 words or less to *CMTSmeetings@cmts.gov by* ***MARCH 31, 2012****.*

Questions may be directed to the CMTS Staff at 202-366-3612 or *CMTSmeetings@cmts.gov*

http://onlinepubs.trb.org/onlinepubs/Conferences/2012/Metrics/Call.pdf



ERDC/CHL TR-11-5
Vertical Ship Motion Study for Savannah, GA Entrance Channel

Michael J. Briggs, William G. Henderson

The Savannah District (SAS) is preparing a Final Engineering Appendix for the Savannah Harbor Expansion project. Initial vertical motion studies addressed extension of the entrance channel to deeper water along the existing alignment. After initial channel design, shallower offshore shoals were identified that could influence the safety and efficiency of navigation on the proposed channel alignment. The U.S. Army Engineer Research and Development Center (ERDC), Coastal and Hydraulics Laboratory (CHL), conducted a vertical ship motion study to evaluate three proposed channel alignments: S-1, S-3, and S-8. These alignment changes (doglegs) are proposed to allow ships to reach deeper water in less distance, with reduced dredging costs. The Channel Analysis and Design Evaluation Tool (CADET) was used to predict vertical ship motions due to wave-induced heave, pitch, and roll. PIANC and Ankudinov ship squat were calculated and compared with the CADET squat predictions. The CADET days of accessibility, vertical ship motion allowances, and net underkeel clearance were calculated based on these vertical ship motion components to provide a risk-based method of evaluating different channel depths. POC: Michael Briggs, Michael.J.Briggs@usace.army.mil

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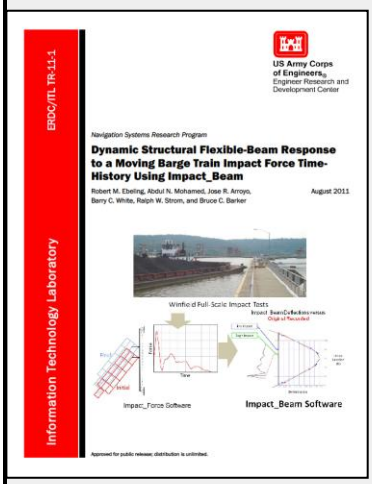

ERDC/ITL TR-11-1
Dynamic Structural Flexible-Beam Response to a Moving Barge Train Impact Force Time-History Using Impact_Beam

Robert M. Ebeling, Abdul N. Mohamed, Jose R. Arroyo, Barry C. White, Ralph W. Strom, and Bruce C. Barker

To design simply-supported, flexible impact beams spanning between cells or bents for lock approach walls, a dynamic structural analysis of the beam under impact time-history loads for design- specific barge trains is required. At several locks, this flexible structural feature is the primary structural member resisting the

glancing-blow impact event of a barge train as it aligns itself with a lock. This technical report describes an engineering methodology used to conduct this dynamic structural analysis and visualize the resulting deflections, moments, and shears. This engineering methodology is implemented with a PC-based FORTRAN program and visual modeler named Impact_Beam. The engineering formulation for Impact_Beam uses time-history force data that are scaled for design specific barge trains to perform a dynamic structural response analysis for either a single degree of freedom system or a modal timehistory analysis for the simply supported beam subjected to a impact load that is travelling along the beam. Time-history force data has been collected from the interpretation of the results from the 1997 full-scale barge train impact prototype experiments conducted at Old Lock and Dam 2 just north of Pittsburgh, PA, and of the 2008 full-scale barge train impact experiments conducted at Winfield Lock and Dam, Winfield, WV. This database of pulse time-history can be scaled for site specific design barge trains with approach angle and velocity using the companion software Impact_Force. It is also possible to use force time-histories from other impact simulation software (e.g., dBEAS). The engineering formulation for Impact_Beam is verified against the original Winfield experiments using modal time-history analysis and dBEAS simulations using single degree of freedom analysis. POC: Bob Ebeling, Robert.M.Ebeling@usace.army.mil

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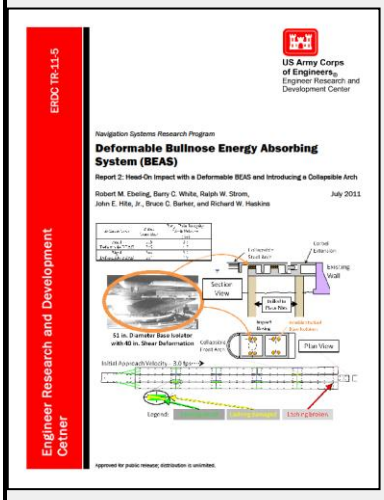

ERDC/ITL TR-11-5
Deformable Bullnose Energy Absorbing System (BEAS)

Report 2: Head-On Impact with a Deformable BEAS and Introducing a Collapsible Arch

Robert M. Ebeling, Barry C. White, Bruce C. Barker, Richard W. Haskins, John E Hite, Jr.

An impact between a tow and the bullnose of a lock approach wall can result in the tow breaking up with loose barges moving out of control toward the lock or navigation dam with serious consequences. Project operations can be severely affected or even shut down. The loose barges can cause a high safety risk to personnel involved and if the navigation pool is lost or the lock is damaged, significant economic impacts may result. This Technical Report discusses the second stage of research into the development of a Deformable Bullnose Energy Absorbing System (BEAS) impact structure that would help reduce or prevent lashing failures and loose barges due to an impact between a tow and a lock approach wall bullnose.

In simulations, the first improvement for limiting approach velocity to maintain barge integrity was achieved by the proper selection of lashing layout. The second improvement was achieved by the introduction of the Deformable BEAS. For a head-on collision between a three by five barge train at 3.3 feet per second and a rigid bullnose, barge train integrity is lost. For the same barge train, this report shows that the addition of an impact nosing with double stacked, soft base isolators for a Deformable BEAS extends the maintenance of barge train integrity to 4.5 feet per second. For a head-on collision between a three by four barge train at 3.0 feet per second and a rigid bullnose, barge train integrity is lost. For the same barge train, this report shows that the addition of the collapsible front arch to an impact nosing with double stacked, soft base isolators for a Deformable BEAS extends the maintenance of barge train integrity to 4.7 feet per second. These results imply that the addition of other innovative energy absorbing features could allow for even higher approach velocities. POC: Bob Ebeling, Robert.M.Ebeling@usace.army.mil

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ERDC/CHL-TR-11-4
Lock Culvert Valves: Hydraulic Design Considerations

Richard L. Stockstill, E. Allen Hammack, and John E. Hite, Jr.

This report presents a review of design guidance and hydraulic parameters associated with lock culvert valves. Many locks are beyond their design life, and the filling- and emptying-culvert valves are being replaced to keep the lock in service. Valve selection has begun for several new locks and lock extension projects. This report provides general information on three valve types: vertical lift, conventional tainter, and reverse tainter valves. The positive and negative aspects of each valve type as well as particular features are discussed. This report focuses on reverse tainter valves as these are the most common valve design used in locks on United States waterways. POC: Richard Stockstill, Richard.L.Stockstill@usace.army.mil

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ERDC/CHL CHETN-IX-26
Design Concept and Analysis for a Navigation Dam Gate Guard


ERDC/CHL CHETN-IX-26
March 2011

US Army Corps of Engineers

Design Concept and Analysis for a Navigation Dam Gate Guard

by E. Allen Hammack, Richard L. Stockstill, and Jane Vaughan

PURPOSE: Accidents on navigable waterways in the United States can cause barge tows to break up and, subsequently, individual barges to be carried downstream by the current. As a breakaway barge approaches a navigation structure, its path is essentially determined by the flow patterns around the lock and dam. A primary concern is that a barge will travel to the dam, pass between spillway gate piers, and either strike a gate or become jammed. Either way, the result can be the loss of gate control and perhaps the loss of a navigable pool. Hite (2008) reports on recent closures of U.S. Army Corps of Engineers navigation projects attributed to tow/barge accidents. These accidents have been costly to the towing industry due to closures and to the government due to expensive structural repairs. Examples of accidents that have occurred in the last decade include events on the Ohio River at Belleville Locks and Dam (Figure 1) and at Montgomery Lock and Dam both in January 2005, Smithland Locks and Dam in April 2005, Lock and Dam No. 2 on the Red River in December 2004, and Cheatham Lock and Dam on the Cumberland River in March 2002 (Figure 2).

Figure 1. Barge accident, Belleville Locks and Dam, Ohio River, January 2005

E. Allen Hammack, Richard L. Stockstill, and Jane Vaughan

Accidents on navigable waterways in the United States can cause barge tows to break up and, subsequently, individual barges to be carried downstream by the current. As a breakaway barge approaches a navigation structure, its path is essentially determined by the flow patterns around the lock and dam. A primary concern is that a barge will travel to the dam, pass between spillway gate piers, and either strike a gate or become jammed. Either way, the result can be the loss of gate control and perhaps the loss of a navigable pool. Hite (2008) reports on recent closures of U.S. Army Corps of Engineers navigation projects attributed to tow/barge accidents. These accidents have been costly to the towing industry due to closures and to the government due to expensive structural repairs. Examples of accidents that have occurred in the last decade include events on the Ohio River at Belleville Locks and Dam (Figure 1) and at Montgomery Lock and Dam both in January 2005, Smithland Locks and Dam in April 2005, Lock and Dam No. 2 on the Red River in December 2004, and Cheatham Lock and Dam on the Cumberland River in March 2002 (Figure 2). Removing the barges from the gates can be a difficult, time-consuming, and expensive operation (Hite et al. 2006). Designers and operators of locks and dams need a means of arresting breakaway barges and avoiding their impact on critical structural and mechanical components. A device to protect spillway gates from breakaway barges would be an asset to Corps of Engineers navigation projects. POC: Allen Hammack, Allen.Hammack@usace.army.mil

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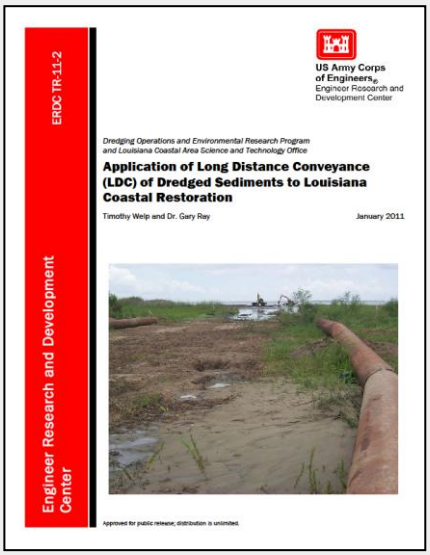
ERDC TR-11-2
Application of Long Distance Conveyance (LDC) of Dredged Sediments to Louisiana Coastal Restoration

Timothy Welp



Restoration of Louisiana's marshes and other coastal habitats will, in many cases, require dredged sediments. Potential restoration sites are often at great distances from the sediment source that will require special efforts, referred to as long distance conveyance (LDC), to pump sediment to the sites. In this report, LDC projects are defined as those Louisiana coastal restoration projects that involve hydraulic transport of slurry (mixture of sediment and water) through pipelines for distances of 16 km (10 miles) or greater. Long distance transport is a mature technology that has been used efficiently for applications like coal and iron ore transport. At the workshop "Long-Distance Pipeline Transport of Dredged Material to Restore Coastal Wetlands of Louisiana," the consensus of national and international experts in the field of long-distance transport of dredged sediment and other materials by pipeline, was that there were no fundamental technological challenges to the delivery of sediment via LDC (Hales et al. 2003). Engineering challenges will be to optimize LDC design, operation, and maintenance to achieve respective strategic restoration goals in the most efficient, cost-effective, and environmentally acceptable manner possible.

This report describes dredging and transport methodologies in relation to state-of- practice LDC design and economic considerations, and discusses respective potential environmental impacts of long distance pipeline transport across Louisiana wetlands. Scientific and engineering uncertainties related to the optimization of LDC of dredged sediment for Louisiana coastal restoration are identified. Uncertainty, as used in this context, implies a lack of predictability, structure, and information (Rogers 1995). The objective of this report is to identify these uncertainties to personnel involved in planning, designing, constructing, monitoring, and assessing future LDC demonstration projects. If efforts are applied to reduce the levels of these uncertainties in future LDC demonstration projects by applying an adaptive management approach, then the increased predictability, structure, and information gained from these demonstrations may be used to optimize subsequent full-scale LDC Louisiana coastal restoration projects. POC: Tim Welp, Timothy.L.Welp@usace.army.mil

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Conferences, etc.

Know of a meeting of interest to our readers? Email details to Dinah.N.McComas@usace.army.mil.

- 29-30 November 2011. eNavigation Conference. Seattle, WA.
- 22-26 January 2012. Transportation Research Board 91st Annual Meeting. Washington, DC.
- 20-24 February 2012. 8th PIANC-COPEDEC Conference on Coastal and Port Engineering in Developing Countries, Chennai (formerly known as Madras), India.
- 26-28 June 2012. TRB-CMTS Conference – Diagnosing the Marine Transportation System: Measuring Performance and Targeting Improvement. Washington, D.C.
- 23-27 September 2012. Inland Waterways International World Canals Conference. Yangzhou, China.
- 22-25 October 2012. Dredging 2012 Conference. San Diego, CA.

etceteras

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And remember, the **USACE Navigation Gateway** is a good place to look for navigation-related information within the Corps (http://operations.usace.army.mil/navigation.cfm).

Remember! Your Comments are Welcome

Any comments that you, our readers wish to provide will be more than welcome and will assist us in improving our efforts to provide you with Corps Navigation news. Please send your comments via e-mail to Navigation eNews Editor.