Environment and Natural Resources Trust Fund
2009 Phase 2 Request for Proposals (RFP)

LCCMR ID: 087-C1

Project Title: Emergency Delivery System Development for Disinfecting Ballast Water

Total Project Budget: $ $125,000

Proposed Project Time Period for the Funding Requested: 9 months

Other Non-State Funds: $ $0.00

Priority: B4. Deep Water Lakes

First Name: Kevin **Last Name:** Reynolds

Sponsoring Organization: USGS

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Region:	County Name:	City / Township:
NE	Cook, Lake, St. Louis	

Summary: This study will test the viability of treating ballast water through tank access ports or air vents to prevent the spread of invasive species.

Main Proposal: 1008-2-059-proposal-Main Proposal.docm

Project Budget: 1008-2-059-budget-Budget.xls

Qualifications: 1008-2-059-qualifications-qualifications.pdf

Map:

Letter of Resolution: 1008-2-059-resolution-letter of submittal.doc

MAIN PROPOSAL

PROJECT TITLE: Emergency Delivery System Development for Disinfecting Ballast Water.

I. PROJECT STATEMENT

Background: Ballast water is the primary pathway for aquatic invasive species (AIS) introduction and spread to the Great Lakes and Lake Superior. At least one new invasive species is found in the Great Lakes each year. Many ballast water treatment technologies are currently undergoing research, development and various regulatory approvals. International, national and state laws are being established to mandate the use of ballast treatment; however it will be many years before effective ballast treatment devices are available or required for all vessels. Lake Superior will remain at risk for new AIS for many years unless simple cost effective emergency treatment is developed, especially for high risk vessels. High risk vessels include those that frequent Great Lakes ports with known infestations or active outbreaks of AIS. For example, viral hemorrhagic septicemia (VHS) has not been found in Lake Superior, but ships that take up ballast water in areas where there is an outbreak of VHS and then discharge untreated ballast water into Lake Superior pose a high risk. Development of methods to treat ballast water in high risk vessels would substantially reduce the risk of spreading VHS and other AIS to Lake Superior.

This study would build on existing efforts to reduce risks of introducing and spreading AIS through ballast water. An ongoing investigation at the Great Ships Initiative is bench testing the efficacy of active substances such as chlorine to treat ballast water. At the same time, other researchers are developing methods to identify high risk ports in the Great Lakes. This study will field test several emergency treatment methods in the absence of installed metering systems, including powered mixing devices and administering a biocide directly through the access ports. The methods must include protocols to ensure an environmentally sound discharge. The methods should also be practical for deployment on any vessel, economical, and cause minimal delays in the vessels' schedule.

The purpose of this study is three-fold: 1) assess the efficiency of methods to distribute an active substance into a ballast tank system that is applicable to a wide variety of vessel types; and 2) develop guidelines on how to administer emergency treatment to high-risk vessels; and 3) identify limitations relative to Clean Water Act relative to discharges, and active substance distribution within the tank using these methods. This study is driven by the need to slow the spread of VHS to Lake Superior, and builds on west coast ballast research. Vent and access port delivery systems are used in countries such as Argentina to reduce the spread of cholera, but there is no published data available on how well the active substance mixes within the tank, nor reliable data describing the discharge toxicity. This study will provide baseline data using a harmless dye that can be extrapolated and modeled for several chemicals targeting a specific aquatic nuisance species. Data from this dye study can be modeled for active substances for situations where a metering delivery system is not possible or available.

DESCRIPTION OF PROJECT RESULTS

The study will answer the following question: How effective are the emergency mixing techniques developed by a USGS team for deploying active substances and deactivation substances into a pressed up (full) ship's ballast tank. The mixing techniques will be tested to explore dosing through ballast tank vent access ports, sounding tubes, and in-line through the ballast water main. Efforts will also be made to develop and field test the practical deployment of mechanical mixing devices through ballast tanks manhole access points. This study will then allow the NPS/USGS team to focus on developing the most promising technique(s) for further trials, perhaps with the use of the actual active substance and neutralization chemical. Additional effort will be made to develop low-cost and routine methods for dosing an empty ship's ballast tank upon routine uptake procedures.

Result 1*:* Assess the efficiency of a delivery system for treating ballast water of high risk vessels
Budget: $125,000 Completion Date: Day 1=Day Funds available
Deliverable
1. Secure testing equipment and develop a detailed study plan 43K 30 days, 2009
USGS will lead the acquisition of off-shelf pumps and mixing systems. USGS will supply all equipment and personnel required to set-up and deploy various mixing techniques.

2. Test dye dispersal of treatment substances and neutralizers **60K 60 days, 2009**
USGS and Naval Architectural firm crew will conduct dye tests and sample tank ballast water over time. Testing will determine: a) dispersal of dye through the tank to correct dosage levels; and b) dispersal of a neutralizing agent if added in the same manner.

3. Report Results **22K 90 days, 2009**
The collected data will be analyzed using chemical kinetic techniques to estimate the mixing profile of each technique tested. A final report will review the literature, present the results of all testing, discuss the efficiency and applicability of tested treatment methods, and make recommendations for use of effective emergency ballast water treatment.

PROJECT STRATEGY AND TIMELINE

A. Project Partners The NPS/USGS team is working with a NOAA sponsored Naval Architectural firm to develop the most promising technique(s) for enhancing active substance and deactivation substances within a ballast tank. USGS and NA firm to conduct tests and analyze data; USGS and NPS to present data to agencies with authority to act and to commission phase three.

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B. Project Impact
Providing a means to kill a wide variety of AIS species within a ballast tank with an interim emergency cost effective delivery technique can reduce risk of the spread of highly problematic AIS at any commercial port in the Great Lakes. It can save millions of dollars in control measures by preventing the introduction and spread of AIS, as well as prevent irreversible damage to Lake Superior.

C. Timing
This study can commence immediately after funding is secured. If funding was available in October, 2008- shipboard tests would be conducted prior to the close of the shipping season on the Great Lakes. NPS would coordinate with agencies with the authority to implement emergency regulations and quarantine over the winter in order to have treatments on line for high risk ships prior to the start of the shipping season. With 09 funding the same timeline is expected to be followed with results in 2010.

D. Long-Term Strategy (if applicable)
This emergency option, with efficacy and discharges defined, can be used to dose high risk ship. It could be used in specific ports or at specific locations where neutralizing a known problematic AIS is critical. It is a way to insert a biocide into ballast tanks through the air vents or via other mechanical methods. For emergency treatment options, this represents phase two of a three phase project. Phase one is underway with results expected by early November. Long term there is a need for sophisticated treatment systems within the interior of ships using metering systems for a high degree of accuracy. Development of these systems is underway but wide-scale installation is not expected for 3-7 years.
Phase 1: Includes ship specific protocol development for two ships, fluid flow analysis of off-the-shelf pumps to enhance mixing within the tanks and a complete literature search to support development of best management practices of this methodology. Estimated cost $25,000. **Funded.**
Phase 2: Ship board trial of a generic protocol which can be applied to a 1,000 foot vessel or vessels in the 600-800 foot range. Estimated cost $125,000. **2009 Proposal.**

Project Budget

IV. TOTAL PROJECT REQUEST BUDGET

BUDGET ITEM *(See list of Eligible & Non-Eligible Costs, p. 17)*	**AMOUNT**	**% FTE**
Personnel:	$ -	%
USGS technical support for equipment fabrication and testing	$ 25,000	10%
Contracts: *With whom and for what? List out by item.*	$ -	
Phase 1 - Protocol and Methods Development (Glosten). Develop test protocol. Support USGS mixing methods development. Literature search.	NOAA Funded Project	
Phase 2 - Test Preparation Efforts (Glosten). Revise Test Protocol based on Selected Vessel. Prepare Equipment for Deployment.	$ 13,409	
Phase 3 - Deployment (Glosten). Perform shipboard testing based on revised protocol. Support USGS mixing equipment efforts. Demobilization.	$ 49,907	
Phase 4 - Clean-up & Analysis (Glosten). Decommission equipment. Analysis of data and report.	$ 21,903	
Equipment/Tools: *Glosten will supply equipment and tools required for dye testing, with cost included in above estimates. USGS equipment and tools includes purchase of 3 dosing and mixing devices.*	$ 10,000	
Restoration: *List # of acres.*	$ -	
Other: *List by item and explain.*	$ -	
permits and associated costs of deployment	$ 4,781	
TOTAL PROJECT BUDGET REQUEST TO LCCMR	$ 125,000	

V. OTHER FUNDS

SOURCE OF FUNDS		
Other Non-State $ Being Leveraged During Project Period: *What additional non-state cash $ will be spent on the project during the funding period? For each individual sum, list out the source of the funds, the amount, and indicate whether the funds are secured or pending approval.*	**AMOUNT**	**Status**
In-kind Support: NPS will provide assistant for all interagency coordination and permits needed to meet regulatory requirements.	$ -	*Unspent or Not Legally Obligated*
USGS will include preliminary modeling for each device to estimate their hydrodynamic function within a sample ballast tank design; and actual onboard evaluations of promising devices. USGS staff will also work with Glosten to synthesize the data and produce the final report.	$ -	*Secured or Pending*
Past Spending: *List money spent or to be spent on this specific project, cash and/or in-kind, for 2-year timeframe prior to July 1, 2009*	$ -	*Secured or Pending*
Phase 1:Glosten contract funded by NOAA	$ 3,000	secured
Phase 1:Inkinds support from NPS and USGS personnel	$ 10,000	secured
	$ -	
	23,950	

THE GLOSTEN ASSOCIATES
Consulting Engineers Serving the Marine Community

PROJECT MEMORANDUM

Biography for Kevin J. Reynolds, P.E.

TO: General
DATE: March 2008
FILE No.: 08904.02
FROM: Kevin J. Reynolds

Through education, training and work experience Kevin Reynolds has accomplished professional status in three key areas of the maritime industry: engineering and design, construction and operation. Kevin currently serves The Glosten Associates in vessel engineering and design as a professional engineer with licensure in the State of Washington and as a naval architect/marine engineer. Prior to joining Glosten, he served MARCO shipyard as a new construction project engineer, focusing on building processes including materials management and modular fabrication techniques. Lastly, Kevin gained the highest operations licensure in a sea-going capacity as a U.S. Coast Guard license Chief Engineer, Motor and Gas Turbine, of vessels of any horsepower, any tonnage, oceans.

This combination of experiences, ranging from large ocean going vessels to harbor craft, has provided Kevin a unique perspective resulting in his being sought for challenging projects. These projects include traditional ship design aspects, e.g. engine selection, piping systems, HVAC, control systems, navigation equipment. Since 2000, he started, and now leads, an internal work group at Glosten focusing on environmental initiatives. The stated goal of the workgroup is: "to provide Glosten's clients with practical engineering solutions that minimize ecological impact and align with regulatory initiatives." In the past several years, this effort has thrust Kevin into regional, national and international debates on how to practically minimize the environmental impact of maritime shipping.

Specific efforts with regard to marine vessel effluent discharges include:

- Responsible operating engineer for discharges incidental to vessel operations as an operating engineer aboard 13 different marine vessels. These discharges were conducted in compliance with foreign and domestic port requirements as required by geographic location of effort. These discharges included: oily bilge water, gray and black water, galley drains, ballast water, engine circulation and cooling water, deck drains, and chain locker wash.

- Responsible new construction project engineer for the construction and installation of various marine vessel effluent management systems. Actively managed systems included black water treatment and oily bilge water processing; other incidental discharges were not required to be managed.

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