MarTREC
Maritime Transportation Research & Education Center

MarTREC UTC Project Information Form
USDOT Tier 1 University Transportation Center
Agency ID or Contract Number DTRT13-G-UTC50

Project Title: Optimal Dredge Fleet Scheduling within Environmental Work Windows
Project Abstract (Brief Description): The U.S. Army Corps of Engineers (USACE) annually dredges hundreds of navigation projects through its fleet of government dredges and individual contracts with private industry. The research presented here seeks to examine the decision of allocating dredge resources to projects system-wide under necessary constraints including environmental restrictions concerning when dredging can take place due to migration patterns of turtles, birds, fish, and other wildlife, dredge equipment resource availability, and varying equipment productivity rates that affect project completion times. Building on previous research with USACE, this project is specifically motivated by the need to apply recently developed scheduling optimization tools to provide comprehensive sensitivity analysis regarding the impact of varying dredge job sizes, available dredge equipment and the size of environmental windows. Beyond sensitivity analysis, this project will expand the previously developed optimization tools to allow for multiple dredge resources to work on a single job, environmental windows to be dredge specific and environmental windows to serve as soft constraints. Finally, while previous work has assumed that the demand for dredging, availability of dredge equipment and length of environmental windows are known with certainty, this research will explore how dredge planning is impacted when these factors are treated as stochastic components. The goal of this research is to offer a robust decision tool that can be used by USACE to determine the appropriate dredge fleet and the optimal operations associated with that fleet for a given set of jobs.
Describe Implementation of Research Outcomes (or why not implemented): The beta version of the tool was used in the decision-making process for west coast dredge fleet scheduling at a meeting in Portland, OR in July 2015. Added secondary objective function to decision tool that allows user to consider maximizing cubic yards dredged and minimizing equipment travel time simultaneously. New module was incorporated into optimization tool and installed on UASACE servers in spring 2016. First dredge scheduling meeting with updated tool was held with Vicksburg, MS administrators to brief leadership on the tools capabilities for upcoming planning cycles.
Impacts/Benefits of Implementation (actual, not anticipated) *To be determined upon conclusion of the project:*
Web Links: martrec.uark.edu
Budget (Funding) Amounts & Source(s) (US DOT +Match(s) =Total Costs): $151,153 MarTREC + $75,925 =$227,078
Project Start and End Dates: 08/01/14-08/15/16
Principal Investigator(s) and Contact Information: Chase Rainwater Ph.D and Heather Nachmann Ph.D
Principal Investigator Institution (University): University of Arkansas