

Cost and Performance Analysis of a Sediment Removal and Processing System for the Lower Susquehanna River Dams

Saqib Qureshi, Raymond Fontaine, Samuel Saleeb, and Joel Stein

George Mason University,
Department of Systems Engineering & Operations Research (SEOR)
Fairfax, Virginia

Corresponding Author's Email: squires14@gmu.edu, rfontain@gmu.edu, ssaleeb2@gmu.edu, jstein7@gmu.edu

The views expressed herein are those of the author and do not reflect the position of the United States Military Academy, the Department of the Army, or the Department of Defense.

Author Note: The authors would like to thank the following individuals for assistance in this study: Dr. George L. Donohue, Faculty Advisor; Jeff Holland of the West/Rhode Riverkeeper, Sponsor; and Dr. Kuo-Chu Chang, GMU SEOR Professor.

Abstract: A series of three major dams and reservoirs located along the Lower Susquehanna River have historically acted as a system of sediment and nutrient pollution traps. However, episodic pulses of these pollution loads are released following short-term extreme storm events, affecting subaquatic vegetation, benthic organisms, and the overall water quality in the Upper Chesapeake Bay. In addition, all reservoirs have reached a state of near maximum storage capacity termed as dynamic equilibrium. Based on prior research, this study seeks to regain the trapping capacity of the dams through a sediment removal and processing operation, and thereby reduce the ecological impact of major storms. A set of regression curves and a stochastic lifecycle cost model were used to evaluate the resulting effect on storm scour and the economic feasibility of processing and dredging amount alternatives. Results indicate that a Cement-Lock processing plant at moderate dredging is the most cost-performance effective solution.

Keywords: Lower Susquehanna River, Environment Restoration, Decision Analysis, Life-cycle Cost Analysis