Research Project: SP109B4E
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RESEARCH SUMMARY

EVALUATION OF WASTE CONCRETE ROAD MATERIALS FOR USE IN OYSTER AQUACULTURE

Problem

The Maryland State Highway Administration (SHA) has a commitment to maintaining at least 84 percent of the SHA pavement network in acceptable overall condition. The SHA also intends to increase the use of recycled materials and to use products in an environmentally responsible manner. One way of meeting these objectives is by incorporating recycled materials in an environmentally responsible project. As roads and bridges are resurfaced, old concrete is removed and is usually discarded. It would be in the best interest of SHA and the environment if these materials were recycled into an alternative use, such as to condition portions of the Chesapeake Bay bottom to support spat-on-shell aquaculture projects.

Recycled concrete aggregate (RCA) is created by crushing and milling old concrete pavement or road infrastructure. The material is processed and sorted for reuse as base, sub-base, fill material for embankments, and new concrete mix. For RCA to be used within the aquatic setting of the Chesapeake Bay, its chemical behavior under saturated conditions must be understood to avoid potential adverse impacts to the bay's aquatic ecosystem.

Objective

The primary objective of this study was to determine the suitability of recycled concrete from road projects as conditioning material for on-bottom oyster aquaculture in the Chesapeake Bay. The testing was designed to

- evaluate the impact on water chemistry from the introduction of RCA
- evaluate the effect of RCA on the survivorship and growth of oyster spat

Description

This study evaluated the potential leachability of chemicals from RCA. The saturated RCA's water chemistry was evaluated through a sequential extraction, toxicity characteristic leaching procedure (TCLP), tank test (EPA method 1315), and flow-through leaching test. De-

RESEARCH SUMMARY

ionized water with different salinities was used for the tank test. RCA leaching was also observed using a flow-through column setup to simulate a range of naturally occurring flow conditions with brackish water.

Approximately 5 cubic yards of 2-inch and 4-inch crushed, recycled concrete were collected and used for this project from the P. Flanigan and Sons Inc. facility in Baltimore, Maryland. Additional laboratory recycled concrete material samples were collected from a building demolition site near Morgan State University in Baltimore, Maryland, representing a known, homogenous sample.

The oyster shells used as a control were collected from a stockpile at the Morgan State University Estuarine Research Center. Prior to testing, the shells were washed to remove surface debris.

Results

The results of this project showed that using RCA as a base material for oyster reefs did not adversely affect oyster spat growth and survival, or the surrounding environment. None of the metals leached at a rate that exceeded the Environmental Protection Agency (EPA) drinking water standards. This standard is more stringent than the current EPA total maximum daily loads (TMDLs) for Chesapeake Bay waters. There was no statistical difference between shell and RCA on the growth, survivorship, average length, or recruitment of young oysters. Initial pH was slightly higher for the RCA (8.20 to 8.36) than the oyster shell control (8.0 to 8.2), but pH stabilized to around 7.6 to 7.8 for all treatments after seven days.

Based on the findings of this study, SHA is sponsoring a second phase that places RCA on test plots in the Chesapeake Bay to validate the laboratory tests in a real environment.

Report Information

Kelton L. Clark, Ph.D.
Morgan State University Estuarine Research Center
10545 Mackall Road
St. Leonard, MD 20685
kelton.clark@morgan.edu