EPA Grant Number: R819165-01-0
Title: Bioremediation of Sediments: PVAMU Faculty and Student Participation in Technology Development and Transfer
Investigator(s): R. Radhakrishnan[1], Collaborator - C.H.Ward[2]
Institution(s): HSRC/S&SW, [1] Prairie View A&M University, [2] Rice University
Center Director: D. D. Reible
EPA Project Officer: Dale Manty
Project Period: 1995-1997
Project Amount: $73,000

Objectives/Hypothesis

The funded project involves: 1) research on the development of appropriate technology and the associated technology transfer; 2) student and faculty participation in the research and course development; and 3) presentation of obtained results at conferences and in refereed journals.

Approach

This collaborative research was a novel effort that combined the experience and expertise of the Environmental Engineering research groups at Rice University and the Department of Civil Engineering at PVAMU. This collaboration hopes to produce the following:

- enhance existing curriculum in Environmental Engineering at PVAMU and HSRC issues;
- advise undergraduate and graduate students in senior projects, and Master's and Ph.D theses in relevant subjects;
- expand existing visiting scientist/visiting professor program to include experts on issues relating to, pollutant-sediment interaction and transport; from government, national laboratories and industry;
- conduct summer programs/workshops for high school students and teachers as part of existing ESCI, MITE, etc. programs; and
- establish a "hands-on" laboratory for design and simulations.

Results

The following conclusions were reached based on this study:

- Relative adsorption rate of PAHs in the sediments is a function of the number of rings, and the organic content of the sediments. The higher number of rings the higher the adsorption in the matrix soil.
- Mechanisms of adsorption and desorption of PAHs in the sediments are independent from the time of contact between the PAHs and the soil matrix.
- Mechanisms of adsorption and desorption of PAHs in the sediments are a function of the grain size distribution. The finer the grain size is, the higher is the adsorption rate, and lower is the desorption rate.
- Biological treatment by itself is efficient for lower PAHs ring distribution compounds. Biological treatment did not show good removal efficiency for 4 to 6 ring PAHs, and carcinogenic PAHs.
- The use of Bio-Chem treatment showed higher significant removal efficiencies for all types of PAHs including carcinogenic (Table). However, complete PAHs

remediation even using Bio-Chem treatment is not feasible when the soil matrix organic content is high due to the high sorption and poor desorption of soil.

- Use of nonionic surfactants (with the exception of Triton X-100) is not recommended when using bioslurry treatment due to its toxic properties to bacterial population.
- Pre-treatment and treatment of contaminated sediments are strongly suggested before disposal Capping the sediments after being disposed in a aquatic or land environment and injection of anaerobic bacteria and nutrients should be sufficient for remediation in case where no aerobic remediation treatment has been performed during or after dredging operations.
- Feasibility of on-site bioremediation implementation in the case of dredged materials could be accomplished with the use of large barges with mixers that will pm-form as reactors. In case the use of a large barge is not feasible, truck-mobile mixers like the ones used for transporting ready-mix concrete might be a solution.

Supplemental Keywords
PAHs, remediation, and technology transfer