USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Use of Plant-Based Natural Surfactants and Mineral-Oxide Adsorbents in Soil Remediation

Duration: 9/1/96 - 8/31/98

FY 1996 Federal Funds: $71,280 - - 36,140- Yrl & 35,140- Yr2

FY 1996 Non-Federal Funds: $142,560 - - 72,280- Yrl- & 70,280- Yr2

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Congressional District: 6th

Statement of Problem:

There exist a number Of Superfund sites in the Southeastern region of the United States which have sub surface and near-surface soils contaminated with a variety of organic and inorganic compounds. In addition, the contamination due to non-point sources such as agricultural run off is also of major concern in this region due to the extensive farming in the area. Specifically the State of Louisiana has a large number of these sites that are on the EPA Priority list. The largest site (called the Petro Processors Inc, or the PPI site) in the State of Louisiana is located in North Baton Rouge. Several industrial concerns have used this site for hazardous waste disposal over the past decades, and it is contaminated with many chlorinated compounds such as hexachlorobenzene, hexachlorobutadiene, trichloroethane and tetrachloroethylene. The extent of contamination in this area is wide spread and it threatens the groundwater aquifers, which are sources of water supply for many cities in the region. There is an immediate concern to protect the surface and groundwater sources from further contamination and remediate the existing contaminated aquifers. The current remedy involves the so-called Pump and Treat technology, which has as its primary drawback, the long time factor associated with the cleanup particularly, when residual saturation has been achieved in the sub surface soils. An appropriate cost-effective treatment technology for the groundwater aquifers and subsurface soils in the region could save billions of dollars of tax payers money in treatment costs.

Statement of Benefits, and/or Information:

The problem of an effective subsurface cleanup is common to many Superfund sites located in the Southeastern region. These involve mainly industrial disposal of hazardous/toxic wastes. The traditional remedy at most sites, Pump and Test technology, that involves the recovery of free-phase from the subsurface environment is hindered by the low aqueous solubility of the contaminants. Processes that accelerate the recovery of residual contaminants such as surfactants flushing of soils are currently being evaluated at several sites. The efficacy of such schemes depends not only on the recovery of contaminants from the subsurface but also on the seperation/treatment of the aqueous effluent resulting from the process. We envision a treatment scheme that employs plant-based natural surfactants to accelerate the cleanup of subsurface soils and groundwater aquifers. The use of plant-based natural surfactants will prove beneficial in that any residual surfactant left in the subsurface soils will be easily biodegraded. Our preliminary investigations showed that natural surfactant can serve as both carbon and energy sources and degrade considerably under aerobic and anoxic conditions.

A novel treatment scheme that utilizes a mineral oxide-based adsorbents is being proposed for the treatment of the aqueous effluent resulting from the surfactant flushing of soil. The mineral oxides such as alumina have similar adsorption characteristics as activated carbon, but distinct advantages as far their regenerability/reuse is concerned. The conventional activated carbon beds require as much as 80 % of the operating cost to regenerate. The proposed method will require a simple wash with aqueous solution of predetermined pH. Figure 1. shows the conceptual diagram of the proposed remedial/on scheme for groundwater aquifers and subsurface soils. The scheme will be tested on an actual waste from a Superfund site in Baton Rouge in collaboration with federal agencies and research teams from WRRIs in the region.