Name of Organization: University of Wisconsin-Green Bay

Type of Organization: College or University

Contact Information: Dr. Kevin Fermanich

Natural and Applied Sciences

2420 Nicolet Drive

Green Bay WI 54311

Phone: (920) 465 - 2240 **Extension:**

Fax: (920) 465 - 2376

E-Mail: fermanik@uwgb.edu

Project Title: Field Scale Evaluation of Dredged Material as Topsoil

Project Category: Contaminated Sediments

Rank by Organization (if applicable): 0

Total Funding Requested ($): 189,870 **Project Duration:** 2 Years

Abstract:

Over the last thirty years the U.S. Army Corps of Engineers has used confined disposal facilities (CDFs) to contain dredged materials which were unsuitable for in-water disposal. Throughout the Great Lake Basin CDF capacity. During 1999, Mr. David Bowman of the Corps of Engineers - Detroit District, in partnership with the U.S. Army Waterways Experiment Station and the Great Lakes National Program Office conducted a project at Green Bay, Wisconsin in which dredged material moderately contaminated with polychlorinated biphenyls (PCBs), was treated by mixing with wood chips and manure. The dredged material was composted to evaluate whether PCB concentrations could be reduced and useable topsoil could be created. The proposed project will take the created topsoil from the CDF and place it in an upland environment to evaluate potential contaminant losses from upland placement. This project is a cooperative effort between the University of Wisconsin-Green Bay, the Corps of Engineers - Detroit District, the U.S. Army Engineering and Research Development Center at the Waterways Experiment Station (ERDC-WES), and the Brown County Port Authority. Studies to be conducted on the land-spread topsoil created from dredged material will include soil dissipation measurements, contaminant uptake by earthworms and shrews, and potential losses by runoff and leaching. These fate studies will be conducted over a 16-month period. Funding for the earthworm, runoff, and a portion of the topsoil monitoring studies will come from the Corps' Detroit District and WES. The project will be coordinated with the Wisconsin Department of Natural Resources (WDNR) and will provide information important to understanding the environmental impacts of the beneficial use of dredged material as topsoil.

Geographic Areas Affected by the Project

States:

- ☐ Illinois
- ☐ Indiana
- ☐ Michigan
- ☐ Minnesota
- ☐ New York
- ☐ Pennsylvania
- ☒ Wisconsin
- ☐ Ohio

Lakes:

- ☐ Superior
- ☐ Huron
- ☒ Michigan
- ☐ Erie
- ☐ Ontario
- ☒ All Lakes

Geographic Initiatives:

☐ Greater Chicago ☐ NE Ohio ☐ NW Indiana ☐ SE Michigan ☐ Lake St. Clair

Primary Affected Area of Concern: Fox River/Green Bay, WI

Other Affected Areas of Concern: Milwaukee, Sheboygan, and any other harbors with in-place, contaminated sediments.

For Habitat Projects Only:

Primary Affected Biodiversity Investment Area:

Other Affected Biodiversity Investment Areas:

Problem Statement:

Limited disposal options for contaminated sediments from navigational channels and recreational harbors threaten the viability of Great Lakes' ports and harbors. On average, over four million cubic yards of sediments are annually dredged from Great Lakes navigation channels and harbors. About half of these sediments are disposed of in confined disposal facilities (CDFs) due to the presence of high contaminant levels (GLWQB-IJC, 1997). In many instances (about half of the AOCs, including Green Bay, Milwaukee and Sheboygan harbors in Wisconsin) polychlorinated biphenyls (PCBs) are key contaminants of concern. Throughout the Great Lakes basin, CDF capacity is decreasing and few new facilities are being sited due to construction and environmental costs.

At the Milwaukee CDF and the Bayport CDF (Green Bay), the Corps of Engineers - Detroit District is partnering with the local Port Authorities, the U.S. Environmental Protection Agency, the U.S. Army Waterways Experiment Station (CE-WES), and local entities to test the feasibility of employing CDFs as storage and treatment facilities rather than disposal facilities. Disposal of treated dredged materials via land application is a beneficial use option that potentially offers a long-term disposal option for dredged material management in the Great Lakes Basin. In ongoing demonstration projects aimed at converting dredged materials from CDFs at Green Bay and Milwaukee into useful topsoil, the Corps is evaluating the effectiveness of composting (dredged materials mixed with organic wastes) to degrade contaminants in dredged material. Additional testing to be conducted by the Corps in 2000 will evaluate the suitability of the created topsoil to grow grasses and flowers.

The proposed work will continue the partnerships and initiatives currently underway and will be an important step in development of a beneficial use for a dredged material originally considered to be contaminated. The Corps and the Port Authority have been working with the WDNR for several years to develop alternatives for beneficial uses of the dredged material. The WDNR is proposing to issue regulations for PCB concentrations in soil amendments. The proposed work will assist in the understanding of the environmental impacts of landspreading of topsoil created from dredged material.

Proposed Work Outcome:

The UW-Green Bay and the Corps of Engineers, in cooperation with the Brown County - Department of Port and Solid Wastes, proposes to investigate the environmental losses of contaminants from land applied dredged materials by measuring the dissipation, biota uptake, and losses in runoff and leaching under field conditions. Mr. David Bowman of the Corps' Detroit District will coordinate the transport of composted and non-composted dredged materials from the 1999 pilot scale project at the Bayport CDF, to a landfill area currently owned by Brown County. The created-topsoil will be spread on small plots, tilled into the soil, and seeded. The landfill site is a level area within a fence and would provide a disposal facility if it were determined that the created-topsoil is not suitable for upland placement.

Soil Monitoring

Soil PCB concentrations will be measured prior to application and at three times within 16 months after application. Soil analysis will involve complete physical and chemical characterization and will include determination of heavy metal and organic contaminants. A contract laboratory, in accordance with a quality assurance plan, will perform all sample analyses for the project. A significant portion of the project is dessignated to high quality sample analysis. Mr. David Bowman of the Detroit District will coordinate soil monitoring and contract laboratory services.

Uptake in Biota

The uptake of PCBs and other contaminants in earthworms and shrews will be measured pre-application and at three times periods following application. Mr. Richard Price of the Corps' Engineering and Research Development Center at the Waterways Experiment Station (ERDC-WES) would conduct the earthworm study in congjuction with the UW-Green Bay. Mr. Price would use a predictive bioavailability test currently under development at ERDC-WES on the topsoil and then conduct earthworm studies to calibrate the test. Earthworms are one the preferred foods of shrews. The bioconcentration of soil contaminants in shrews (and other organisms at the same trophic level) via earthworms is major pathway of concern when setting soil contaminant criteria. This work will measure bioconcentration factors under field settings. Shrew sampling and tissue preparation will by conducted by the UW-Green Bay.

Runoff and Leaching Losses

Under the Dredging Operations and Environmental Research (DOER) program, ERDC-WES would evaluate losses using a field version of the Rainfall Simulator Unit. Data from the rainfall simulation studies will be used to develop runoff enrichment ratios relative to soil PCB concentrations, as well as apparent distribution ratios between sediment, dissolved, and DOM-associated phases.

The UW-Green Bay would evaluate leaching losses through the soil. Soil water percolating beneath the plots will be sampled with porous stainless steel tension lysimeters. Transport of PCBs in soil water will likely be in association with dissolved organic matter (DOM). The composted materials have the potential to generate significant DOM. Therefore, significant effort will placed on determining of the impact of this transport pathway.

Other Outcomes

The project will provide opportunities and information in support of efforts to model the environmental fate of contaminants in soil. The estblishment of this pilot project also provides an opportunity for long term monitoring of applied dredged materials beyond the time frame of the proposed budget. These activities will provide excellent graduate research projects for students at the UW-Green Bay.

Project Milestones:	**Dates:**
Project Start	10/2000
Define Roles/QAPP	01/2001
Coordinate with WDNR and contractors	04/2001
Site assesment/applications/monitoring	06/2001
Rainfall simulations/biota uptake	10/2001
Complete monitoring	08/2002
Data summary/reports	09/2002
Project End	10/2002

☐ Project Addresses Environmental Justice

If So, Description of How:

☒ Project Addresses Education/Outreach

If So, Description of How:

The Detroit District and WES maintain web pages to describe current projects of interest. This project would be featured on those pages. Corps personnel also typically publish Tech Notes and Engineering Research papers that describe innovative dredged material handling.

Project Budget:

	Federal Share Requested ($)	Applicant's Share ($)
Personnel:	13,000	58,300
Fringe:	4,400	1,430
Travel:	830	15,000
Equipment:	2,800	0
Supplies:	6,800	1,500
Contracts:	154,560	56,000
Construction:	0	0
Other:	0	10,000
Total Direct Costs:	182,390	142,230
Indirect Costs:	7,480	2,460
Total:	189,870	144,690
Projected Income:	0	0

Funding by Other Organizations (Names, Amounts, Description of Commitments):

Applicant Partner contributions total 43% of the total budget.

The 5% nonfederal match comes from UW-Green Bay: $9,690 [personnel=$4300, fringe (33.3%)=$1430, indirect (43% of salary and fringe)=$2460, supplies=$1500]

Army Corps of Engineers-Detroit: $80,000 [personnel=$32000, travel=$10000, contracts=$28000, other (earth moving) =$10000]

Army Corps of Engineers-WES: $55,000 [personnel=$22000, travel=$5000, contracts=$28000]

In addition to the above, Mr. Chuck Larsheid, Director of Brown County Department of Port and Solid Waste will be contributing $2500 of in-kind services in the form of local coordination and oversight.

Due to variations in the level of Federal funding it is difficult for the Corps to provide an exact dollar contribution. The Detroit District would fund the cost of transferring the dredged material to the landfill and spreading the topsoil. The Detroit District and the DOER program would fund much of the cost of the Rainfall Simulator. The District would also likely fund some of the monitoring of the topsoil. The Corps has additional authorities under Section 401 of the Water Resources Development Act of 1990 to match any non-Federal contribution in the development and implementation of Remedial Action Plans. The authority to use that program to fund some of the work under this proposal would be investigated.

Description of Collaboration/Community Based Support:

Partners in this project include:

University of Wisconsin Green Bay
Army Corps of Engineers - Detroit District
Army Corps of Engineers - Engineering Research and Development Center at the Waterways Experiment Station
Brown County Department of Port and Solid Waste