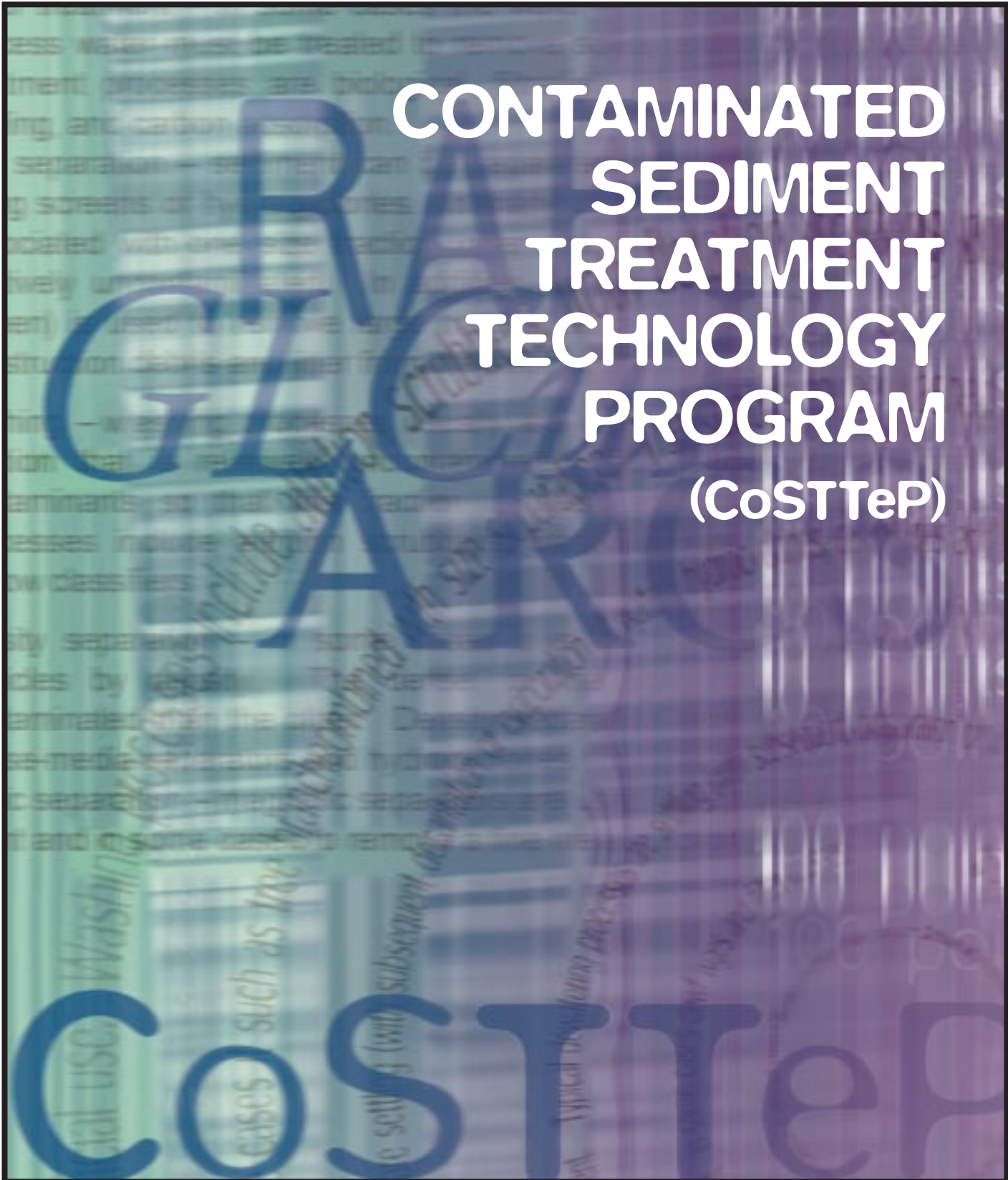


GREAT LAKES 2000  
CLEANUP FUND



FONDS D'ASSAINISSEMENT  
DES GRANDS LACS 2000



**CONTAMINATED  
SEDIMENT  
TREATMENT  
TECHNOLOGY  
PROGRAM  
(CoSTTeP)**



Environment  
Canada

Environnement  
Canada

Canada

The Great Lakes 2000 Cleanup Fund is a component of the federal government's Great Lakes 2000 Program. The Cleanup Fund provides resources to demonstrate and implement technologies and techniques to assist in the remediation of Areas of Concern and other priority areas in the Great Lakes. The report that follows was sponsored by the Great Lakes 2000 Cleanup Fund and addresses contaminated sediment issues in all Canadian Areas of Concern. Although the report was subject to technical review, it does not necessarily reflect the views of Environment Canada.

The Great Lakes 2000 Cleanup Fund wishes to acknowledge the contributions of the following persons to CoSTTeP over the years 1990-97: Griff Sherbin, Rob Booth, Ian Orchard, Steve Garbaciak, Paul Bucens, Wayne Randle, Deonarine Phagoo, Eric Vale, Benoit Lalonde, David Brendon and all of the technology developers/vendors. In particular, Great Lakes 2000 Cleanup Fund would like to recognize Craig Wardlaw, P. Eng., for his role in coordinating and reporting on the technology demonstration carried out under the program.

This report was authored by Craig Wardlaw on behalf of the Great Lakes 2000 Cleanup Fund.

For more information on the Great Lakes 2000 Cleanup Fund, additional copies of this report or more information on contaminated sediments contact:

**John Shaw**  
**Manager, Great Lakes 2000 Cleanup Fund**  
**Environment Canada**  
**867 Lakeshore Rd., Burlington, Ontario**  
**L7R 4A6**

# Technology Facts BIOGENESIS WASHING PROCESS

## Biogenesis Washing Process

Biogenesis Enterprises, Inc. of Fairfax Station, Virginia, USA have developed a soil and sediment washing technology that is capable of removing virtually all organic and inorganic contaminants. It is different from most other soil washing technologies in that it washes all of the soil or sediment, not just the sand fraction. The process uses only water and a variety of cleansing chemicals known as surfactants. The surfactants used are non-harmful to the environment and can, in fact, aid in bioremediation of the organic contaminants in the liquid phase after extraction from the soil or sediment.

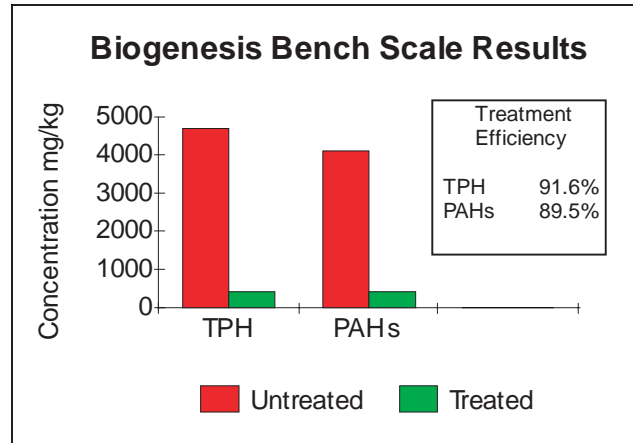
The technology uses the same types of unit processes as traditional soil washing; hydrocyclones, gravity separators, centrifuges and flotation units. However the technology has, at its core, a very different type of whole sediment washing unit. The washing unit has two stages. In the first stage sediment is heated to between 30 and 95°C, subjected to a pressure of 68,950 kpa and vigorously mixed. In the second stage the slurry is mixed with the Biogenesis surfactants and cleaned in a collision scrubber. This scrubber breaks the chemical bonds between the contaminants and the solid particles so that the contaminants enter the liquid phase.

After scrubbing the solids are separated from the liquid using hydrocyclones and centrifuges. The water phase, containing organic contaminant, is fed to a bioreactor where the organic contaminants are degraded. When metals are present in the liquid phase, the metals are removed by precipitation and filtration.

## Great Lakes Demonstration Program

Biogenesis conducted a bench-scale demonstration of the technology with Thunder Bay harbour sediment in 1992. Thunder Bay sediment from from the vicinity of the Northern Wood Preservers dock is contaminated with creosote which contains high levels of PAHs.

Biogenesis conducted preliminary tests to determine the preferred treatment path, process variables and chemical additives. Grain size, settling properties, and chemical



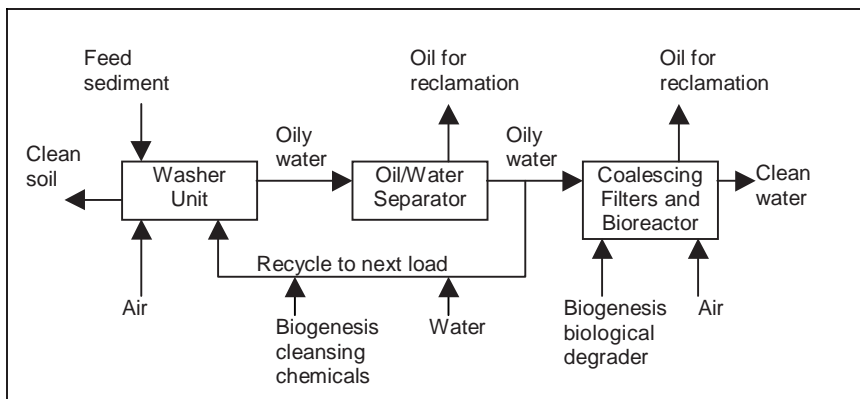
characteristics were determined first. Tests with different surfactants were then conducted on the oily extract from the sediment and appropriate ones selected. A treatment processing plan was then designed. This plan is shown schematically.

The bench-scale test was conducted in Milwaukee, Wisconsin. Sediment was cycled through the scrubber system three times. It was then dewatered using two hydrocyclones. Biological treatment of the aqueous phase was not conducted in this demonstration.

The results of the demonstration were very good, and proved that whole sediment including the finest particles could be treated. PAH levels in the untreated sediment solids were just over 4000 mg/kg. After the first cleaning cycle PAH levels in the solids were 3412 mg/kg, after the second cycle PAH levels were 659 mg/kg, and after the third cycle PAH levels were 424 mg/kg. The total reduction of PAHs in the solids was 89.5%.

## Future Directions

Biogenesis has completed a demonstration at an oil refinery site for the U.S. SITE Program. Other demonstrations and full scale projects have been completed. The technology is fully mobile, is easily set up and has a fairly small footprint.



## More Information

Chuck Wilde  
Biogenesis Enterprises Inc.  
10626 Beechnut Court  
Fairfax Station, Virginia, 22039

or

Great Lakes 2000 Cleanup Fund  
Environment Canada  
P.O. Box 5050, Burlington, Ont., L7R 4A6  
Tel: 905-336-4459 Fax: 905-336-6272