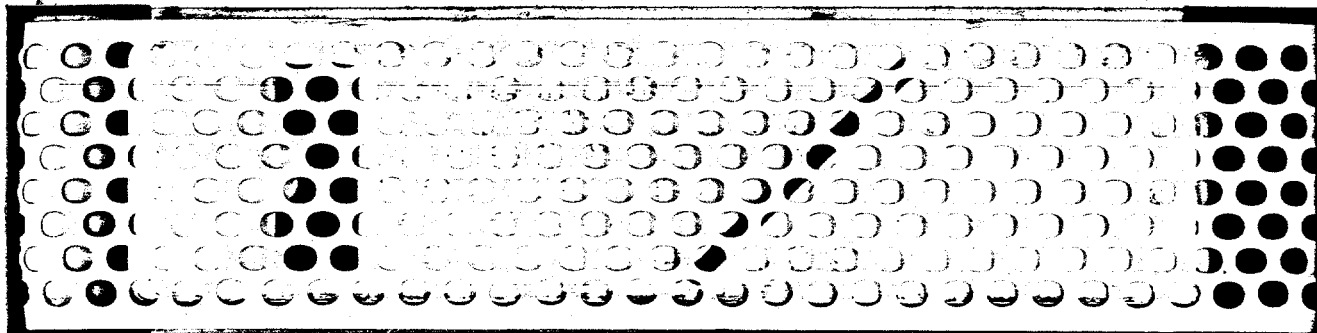


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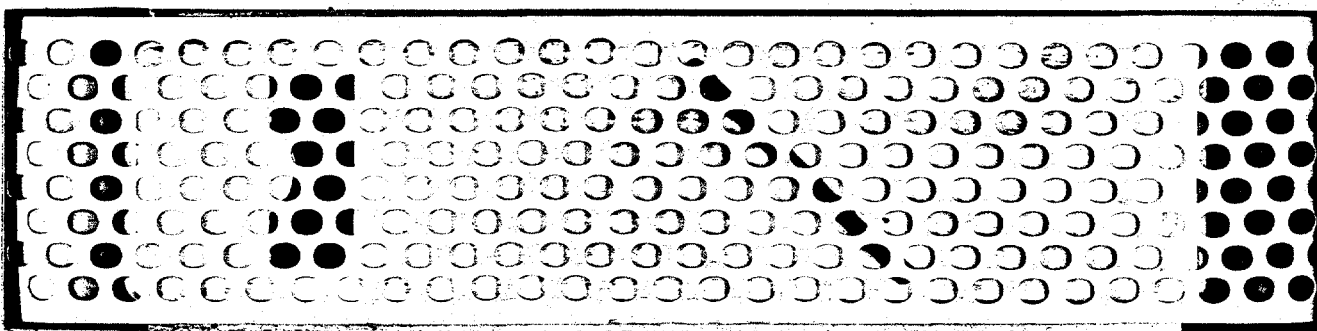


Anaerobic Bioremediation Products, Technologies & Support Services

ERIC CHRISTIAN HINCE, P.G.
CTO, President

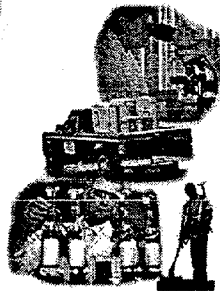
468 Route 17A, Florida, NY 10921 Phone (845) 651-4141 Fax (845) 651-0040
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Innovative Solutions to Environmental Problems™



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Innovative Solutions to Environmental Problems™

BioGeoChemix™

**Anaerobic
Bioremediation
Technology**

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GEOVATION

BioGeoCheMix™

FORM

FIT

FUNCTION

BioGeoCheMix™ works by:

- (1) Increasing contaminant bioavailability
- (2) Creating and maintaining highly anaerobic and stable low-Eh conditions; and
- (3) Providing a complex, sustained-release source of substrates, electron acceptors, nutrients, metals and geochemical amendments to promote anaerobic biodegradation processes

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GEOVATION Product/Technology Focus:

BioGeoCheMix™

FORM

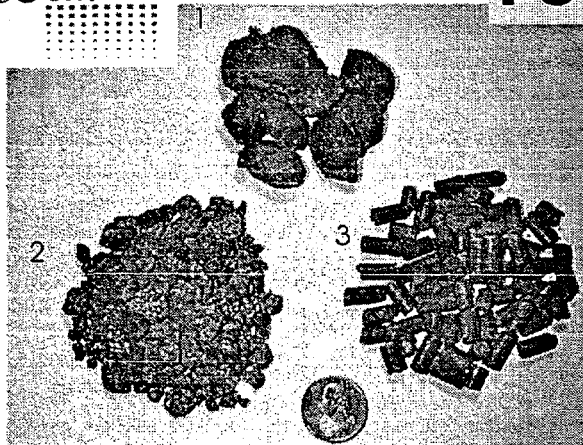
- BioGeoCheMix™ is an advanced solid-chemical composition which incorporates a complex suite of both organic and inorganic amendments.
- BGC Mix is designed for the anaerobic bioremediation and biologically mediated chemical reduction of extremely recalcitrant contaminants such as DDT, toxaphene, and PCBs.
- BGC Mix is manufactured in value-added forms such as pellets, granules and briquettes to simplify its application to contaminated soils and sediments.

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BioGEOCheMix™

FORM



BGC Mix can be applied in the forms of (1) briquettes, (2) granules, and (3) pellets which can be used to treat soils and sediments in lakes, rivers, lagoons and other difficult-to-treat environments

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BioGEOCheMix™

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- The BioGEOCheMix™ product forms are designed to sink in water and into aqueous sediments.
- BGC Mix can be used to treat contaminated sediments present in difficult environments such as wetlands, rivers, lakes, lagoons and the like.

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FORM FIT

- After application to an aqueous or wet environment, Geovation's BioGeoCheMix™ granules disintegrate to a fine matrix.
- BioGeoCheMix™ provides the surface-area enhanced benefits of a fine powder without the storage, handling and application-related disadvantages of a powder.

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FUNCTION

- BGC Mix works first via a solid-phase extraction process whereby hydrophobic contaminants partition to the particulate organic matrix of the BGC Mix.
- After exposure to water, the organic matrix of the BGC Mix biodegrades, which thereby increases the bioavailability and biogeochemical reactivity of the contaminants.

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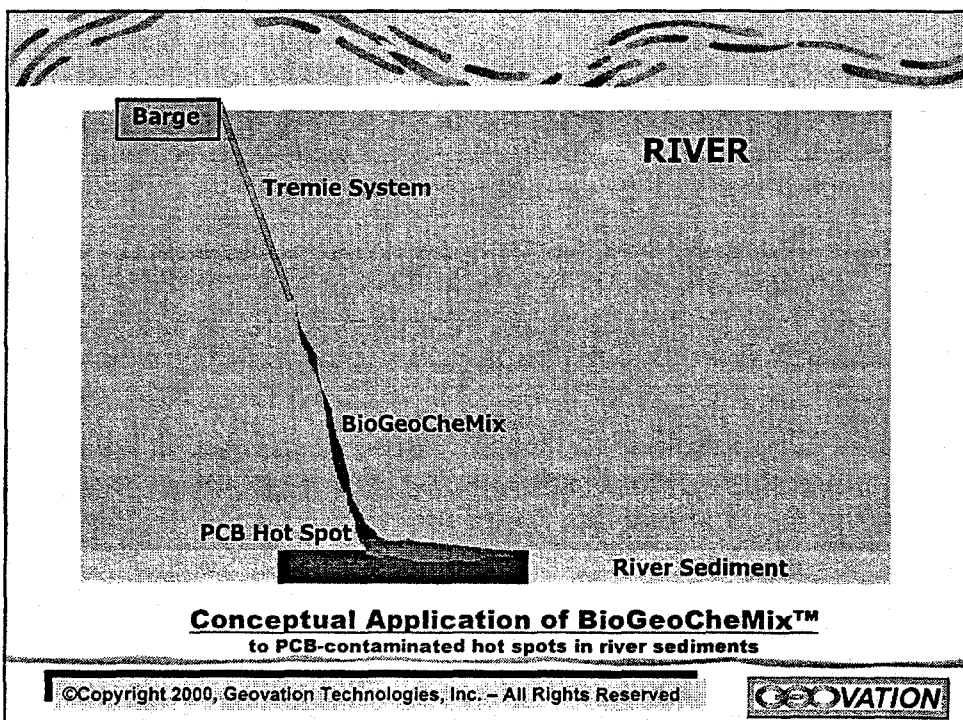


FUNCTION

- In parallel with the biodegradation of the organic components of the BGC Mix, the geochemical components help optimize and maintain stable, low-Eh conditions to enhance chemical-reduction processes, including biologically mediated reductive dechlorination.
- The BGC Mix provides a sustained release of substrates, electron acceptors and nutrients to promote the growth and activity of anaerobic microorganisms.

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RECENT PCB-1260 FIELD-TRIAL RESULTS

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Summary of PCB Field Trial Activities

- Geovation's BioGeoCheMix and N-Blend (a denitrification-based nutrient blend) were applied to approximately 2 tons of PCB- and PAH- contaminated industrial sludge materials in a treatment cell.
- The treated sludge was "incubated" from 9/99 to 5/00 with little to no efforts made to maintain optimal treatment conditions. No subsequent BGC or N-Blend applications or sludge mixing were conducted after 9/99.
- Sampling was conducted prior to treatment and at two timepoints thereafter: 10/99 and 5/00. Sampling was conducted using a composite-sampling scheme to minimize matrix variability. Sampling of the treated materials was conducted in triplicate. Untreated materials were segregated and sampled to provide an experimental control.
- Samples were analyzed for Green Bay Method PCB congeners, Method 8082 PCB congeners and aroclors, Method 8270 PAHs and Method 8015 total hydrocarbons.

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Summary of PCB Field Trial Results

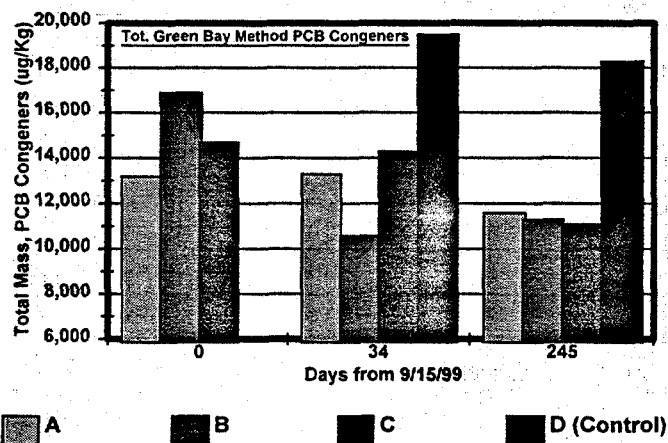
- On average, a 38% decrease in total Green Bay Method PCB congeners was documented in the treated sludge samples relative to the control samples.
- On average, a 40% decrease in total Method 8082 PCB congeners and a 44% decrease in total Method 8082 PCB aroclors were documented in the treated sludge samples relative to the control samples.
- No significant, pattern-selective changes in the homolog distribution of PCB congeners were observed.
- PAHs decreased by an average of 48% in the treated sludge relative to the control.
- The data and trends therein suggest that the observed contaminant reductions were a function of a broad-spectrum, co-metabolic biodegradation process.

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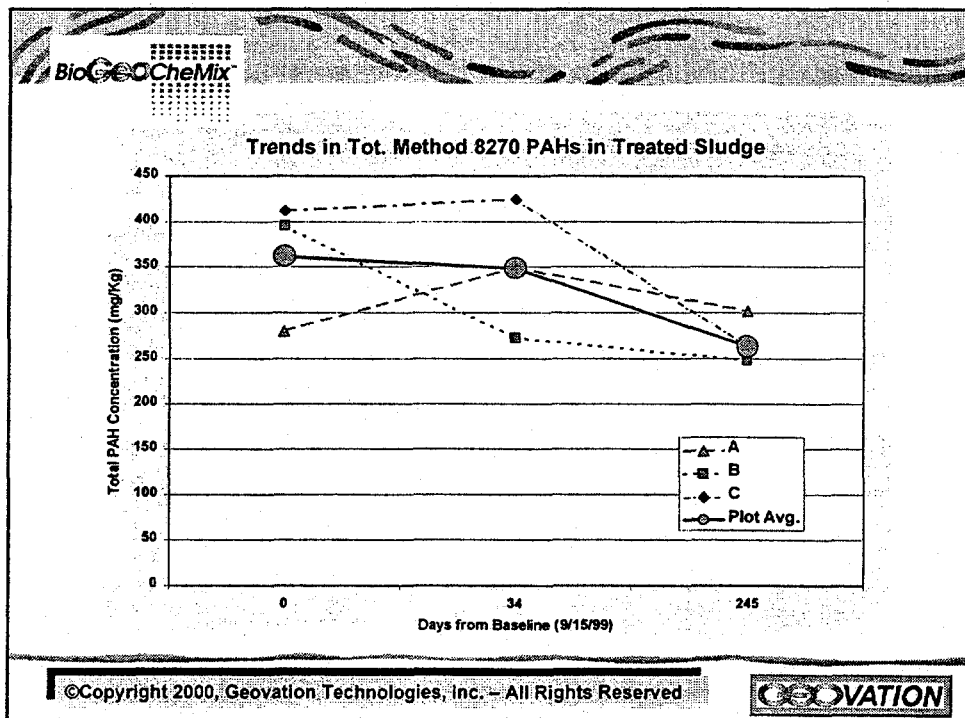
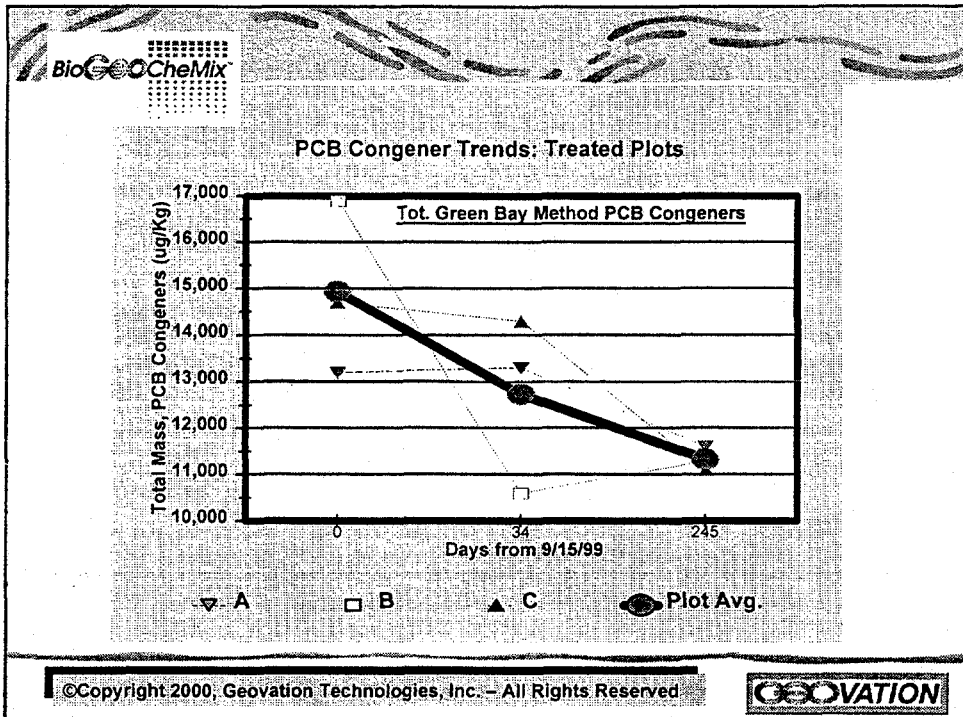
BioGEOChemix

Tot. PCB Congeners in Plots, Control



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PCB-1248 and Chlorinated Hydrocarbon Treatability Study

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Summary of Treatability Study Activities

- Approximately 14 g of Geovation's BioGeoCheMix was applied to each of several microcosms containing approximately 1-Kg of Great Lake Sediments contaminated with high levels of PCB-1248 and chlorinated aromatic hydrocarbons.
- The treated sediments were "incubated" from July – September 2000 at 40° F to mimic lake-bottom conditions. No subsequent BGC applications or sediment mixing were conducted after July.
- The microcosms and control samples were sacrificed for laboratory analysis at 43 days in August and 74 days in September.
- Samples were analyzed for Method 8081A PCB aroclors and Method 8121 chlorinated hydrocarbons.

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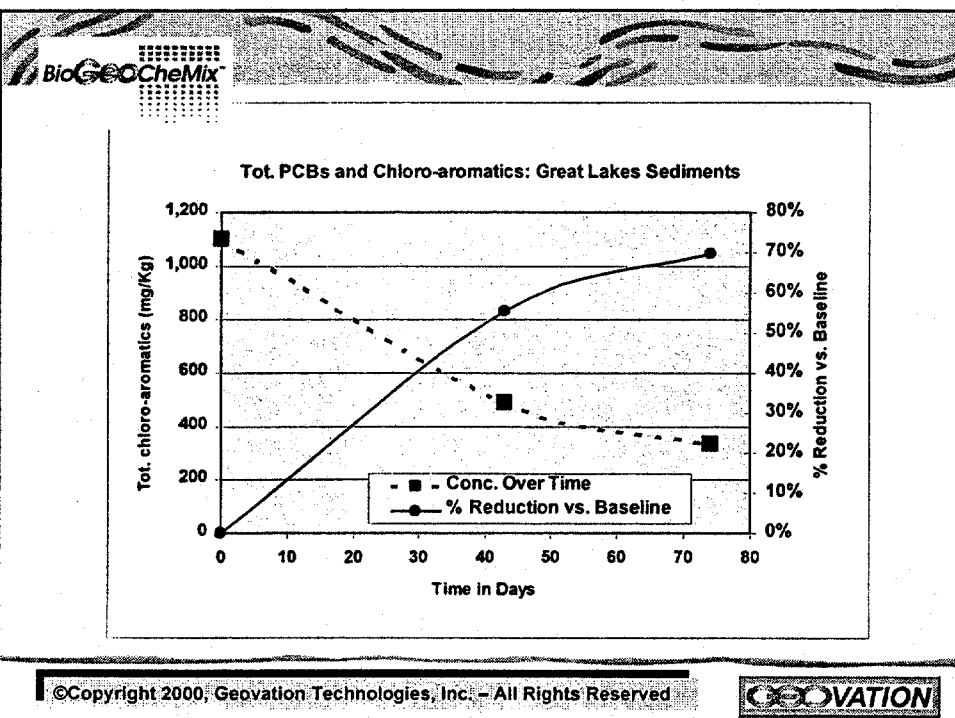
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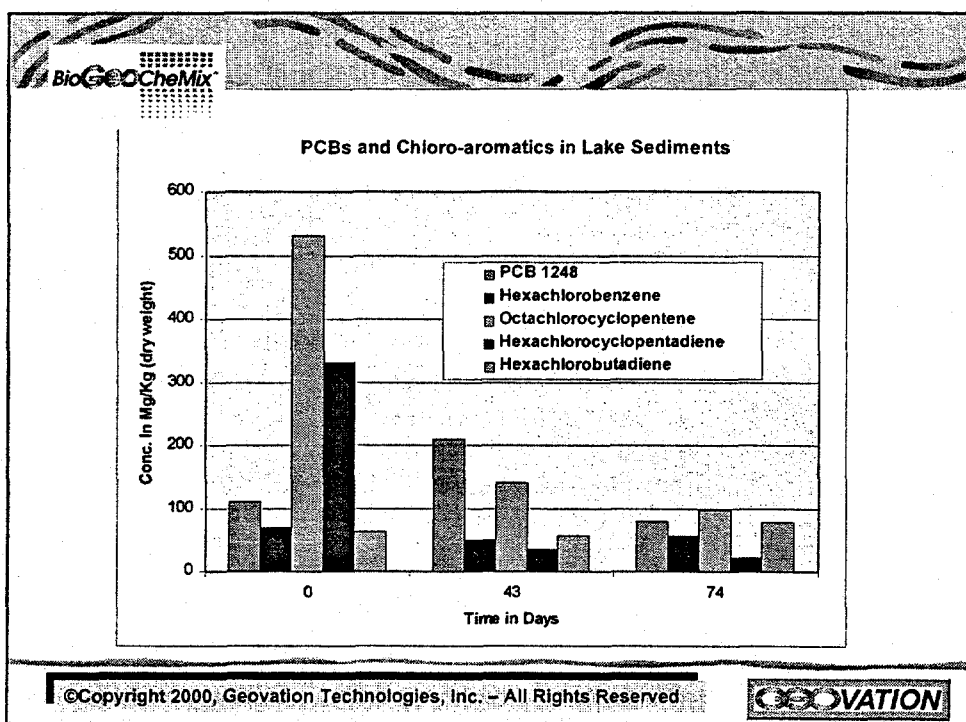
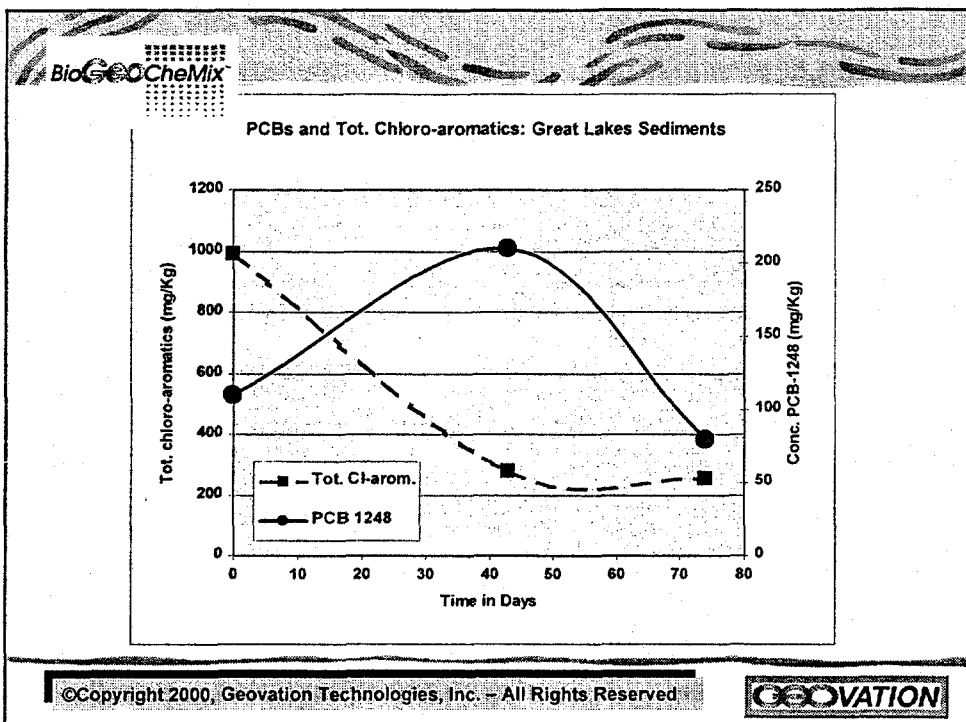
Summary of Treatability Study Results

- Significant reductions in the total mass of chlorinated organic contaminants (PCBs + chlorinated aromatic hydrocarbons) were documented. The total mass of chlorinated organic contaminants was reduced by 70% relative to baseline conditions and by 52% relative to the average of the untreated control samples within 74 days.
- PCB levels in the treated sediments were reduced by 27% relative to baseline conditions and by 43% relative to the average of the untreated control samples within 74 days.
- Chlorinated aromatic hydrocarbon levels in the treated sediments were reduced by 74% relative to baseline conditions and by 54% relative to the average of the untreated control samples within 74 days.
- The data and trends therein suggest that the observed contaminant reductions were a function of a broad-spectrum, co-metabolic biodegradation process.

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BioGeoCheMix™

FORM

FIT

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Origins of BioGeoCheMix™

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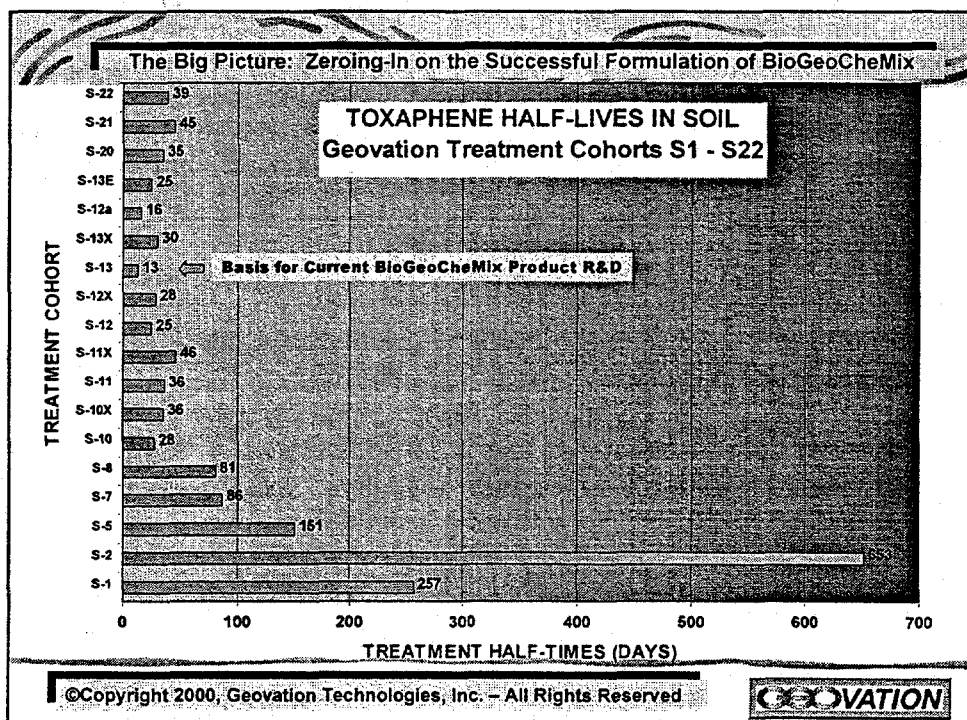
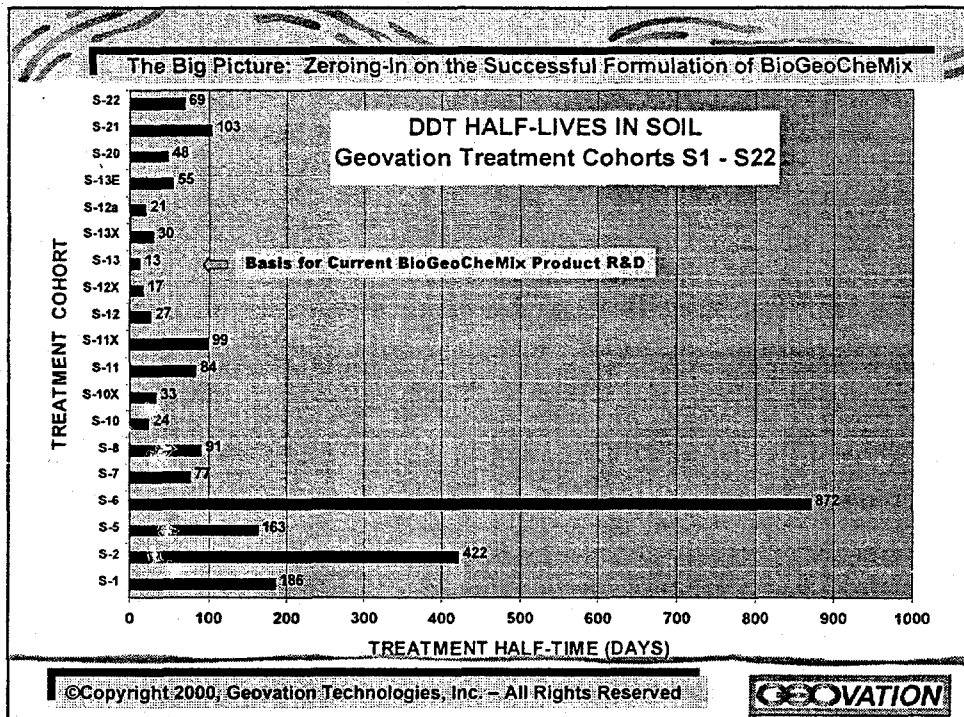
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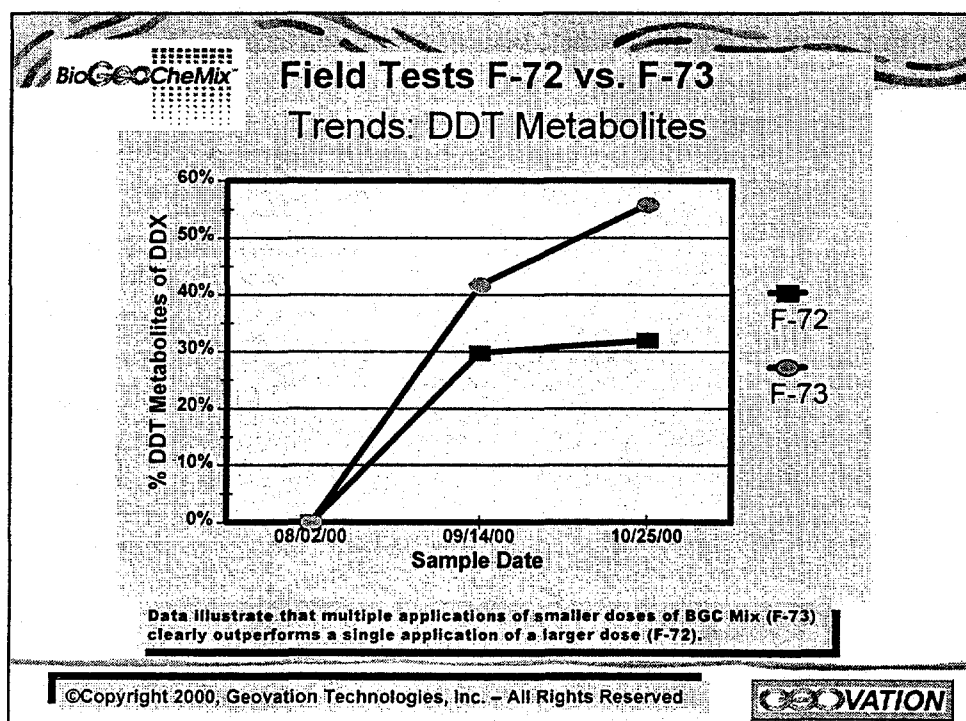
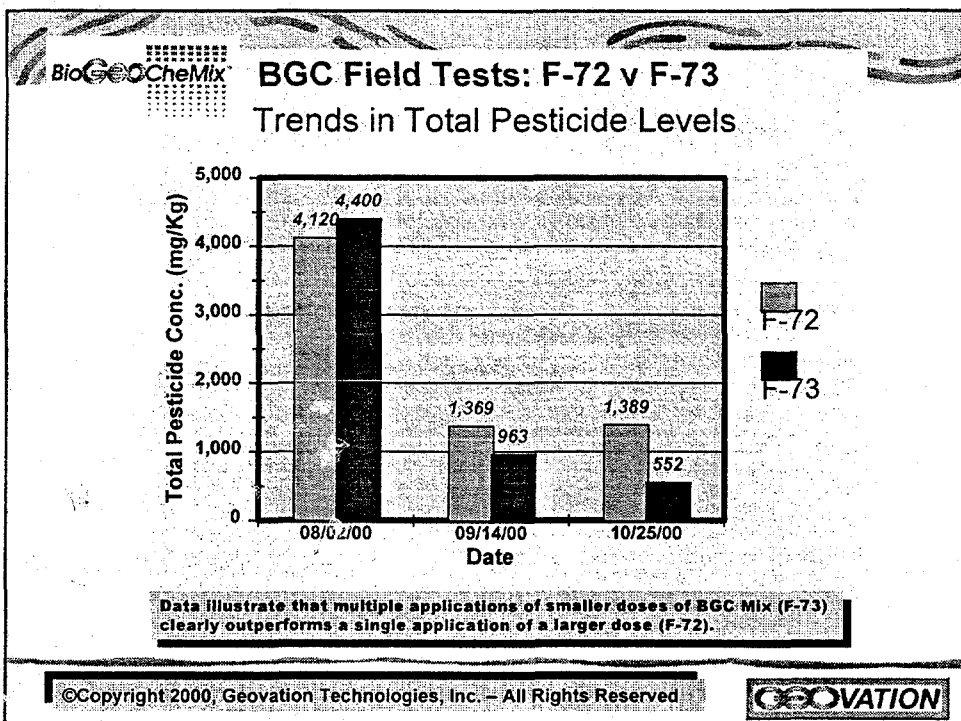
Origins of BioGeoCheMix™

- Geovation conducted an anaerobic bioremediation pilot-study from 1996-1997 on a one-acre plot of DDT and toxaphene contaminated soils at a former crop-dusting airport.
- Upwards of 98 - 99% biodegradation of DDT and toxaphene were achieved in the best test plots.
- Geovation subsequently conducted a site-wide RI/FS and site-remediation program based on the successful techniques employed in the 1996-1997 pilot study.
- Geovation has conducted more 30 bench-scale experiments and field-trials to optimize the treatment of "hot" soils containing from 500 mg/Kg to more than 4,000 mg/Kg of DDT and toxaphene. These results of this work resulted in the development of BioGeoCheMix™.
- Upwards of 90-95% biodegradation of the total mass of DDT and toxaphene and treatment half-lives of less than 2 weeks have been achieved with BioGeoCheMix™ in treating such highly pesticide-contaminated soils.

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- The data indicate that BioGeoChemix™
- Demonstrably increases the bioavailability and biogeochemical reactivity of hydrophobic contaminants, e.g., DDT, toxaphene, PCBs and PAHs.
 - Substantially reduces the mass of such contaminants and dramatically increases their rates of biodegradation without the accumulation of recalcitrant daughter products.
 - Repeated applications of small doses of BGC Mix outperforms a single, large application.

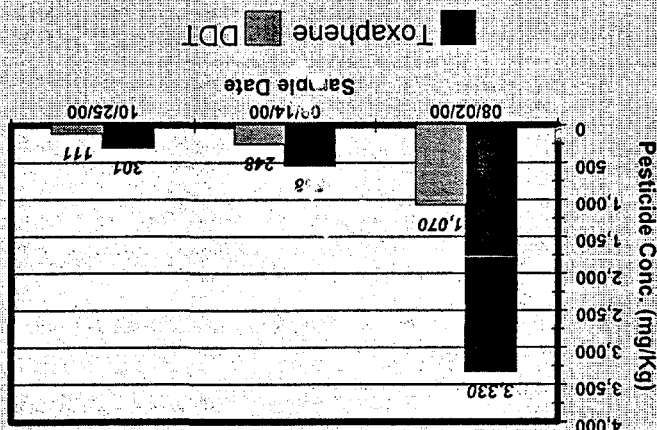
PESTICIDE / PCB BIODEGRADATION

FUNCTION

FIT

FORM

BioGeoChemix



BioGeoChemix