NY/NJ Harbor and Passaic River Sediment Decontamination
BioGenesis℠ Sediment Technology

Presented to
Passaic River Community Advisory Group
March 10, 2011
Presentation Outline

- **BioGenesis℠ Sediment Technology**
- **Technology Validation**
  - NY/NJ Harbor Full-Scale – Lower Passaic River Sediment
  - Housatonic River Bench-Scale
- **Regional Processing Facility Approach**
- **Questions**
BIOGENESIS℠ SEDIMENT TECHNOLOGY
Process Flow Diagram

Dredged Material from Barge
- Slurry Tank
- Wetscreen
- Debris
- Dredged Material Preparation

Upfront Sediment Storage
- Cleaning Chemicals
- Mixing Tank
- Preprocessor
- High Pressure Water
- Preprocessing

Solid/Liquid Separation
- Centrifuge #1
- Effluent Storage
- Polymer
- Hydrocyclone/Screen

Organic Contaminant Oxidation
- Oxidant
- Cavitation/Oxidation Unit
- Organics
- Floatable Organic Material Removal
- Micro-Floatation Unit
- Collision Chamber
- Application of Collision Impact Forces
- High Pressure Water

Wastewater Treatment
- Clarifier
- Sand Filters
- Carbon Filters
- Filter Press
- Wastewater Treatment Sludge
- Treated Solids for Soil Manufacturing
- Solids
- Wastewater to POTW or NPDES Discharge
Sediment Dredge and Delivery
Screening, Offloading, and Storage
Preprocessing
Application of Impact Forces
Collision Chamber
Floatable Organic Removal
Organic Contaminant Oxidation
Liquid/Solid Separation – Hydrocyclones
Liquid/Solid Separation – Centrifuge
Topsoil Manufacturing

- Decontaminated Sediment
  - Lower Passaic River
- Mix with Organics, Sand and Clay
- Add Organic Fertilizer/Stabilizer and Lime
Finished Product

- High-end Topsoil
Topsoil Use – Montclair State University
TECHNOLOGY VALIDATION
NY/NJ HARBOR FULL-SCALE – LOWER PASSAIC RIVER SEDIMENT
NJ Full-Scale Demonstration Project

- Full-Scale Operations
  - Site Selection
  - Permitting
  - Construction
  - Offloading, Screening, Storage
  - BioGenesis™ Sediment Process
  - Beneficial Use

- Sediment Sources
  - Raritan River ~ 3,400 CY
  - Arthur Kill ~ 8,900 CY
  - Lower Passaic River ~ 2,300 CY
Facility Operations - Uptime
Metals Results

Bar graphs showing the arsenic, lead, and mercury levels in untreated sediment and manufactured soil, compared to the NJRSCS standards (19 mg/kg, 400 mg/kg, and 2 mg/kg, respectively).
PCB and Dioxin Results

![Bar chart showing Total PCBs (µg/kg) and Dioxin TEV (pg/g) for Untreated Sediment and Manufactured Soil, with NJRSCS (200 µg/kg) and Not Established thresholds.]
Understanding PAHs – Passaic

- PAH results – Counter-Intuitive
  - PAH Concentrations Higher in Treated Coarser-Grain Fractions
- 19 Bench Test Runs on Lower Passaic Sediment to Test Treatment Methods

Results:
- PAHs were Primarily Absorbed in Organic Detritus and **NOT** on the Surface of the Sediment Particles
- Micro-flotation Techniques Can be Used to Remove Organic Detritus
Intermediate PAH Results

![Bar chart showing Benzo(a)pyrene (µg/kg) levels in various samples including untreated sediment, >1/2 inch, >1/16 inch, >400 microns, >300 microns, slt/clay, waste fines, and manufactured soil. The chart compares these levels to the NJRDCSRS (200 µg/kg) standard.]
Final PAH Results

![Bar charts showing PAH results for different samples and standards.](image-url)
## Topsoil Analysis

**Rutgers, New Jersey Agricultural Experiment Station**

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.15</td>
</tr>
<tr>
<td>Texture</td>
<td>Sandy Loam</td>
</tr>
<tr>
<td>Soluble Salt</td>
<td>1.43 mmho/cm</td>
</tr>
<tr>
<td>Macro-nutrients</td>
<td>Above Optimum</td>
</tr>
<tr>
<td>Micro-nutrients</td>
<td>Adequate</td>
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</tbody>
</table>
TECHNOLOGY VALIDATION
BENCH STUDY – HOUSATONIC RIVER SOIL AND SEDIMENT
Housatonic River Samples

<table>
<thead>
<tr>
<th>Sample</th>
<th>PCB Concentration</th>
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<tbody>
<tr>
<td>SED-A</td>
<td>63 – 80 mg/kg</td>
</tr>
<tr>
<td>SED-B</td>
<td>110 – 177 mg/kg</td>
</tr>
<tr>
<td>SO-A</td>
<td>45 – 55 mg/kg</td>
</tr>
</tbody>
</table>

Grain Size Distribution

- Sand
- Silt
- Clay
Individual Test Results

PCB Concentration = 0.2322 \times \text{Starting Concentration} \times e^{-0.33(n-1)}
Extrapolation of Results to 2 mg/kg
REGIONAL PROCESSING FACILITY APPROACH
Vision and Implementation

● Regional Processing Concept
  - Service for all Dredging Markets
  - Tipping Fee Approach ($/CY)
  - Sediment Decontamination and Recycle to Topsoil, with Potential for Other High Value Products
  - Eliminates Long Term Liabilities

● What is Needed
  - Volume Commitment
  - BioGenesis will Finance, Design, Site, and Build a Regional Processing Facility to meet the Needs of the Region
Facility Requirements

- **Site Requirements**
  - 15 to 25 acres
  - Waterfront access
  - Truck access
  - Rail access (desirable)

- **Processing Facility**
  - 35,000 sft process building (all processing indoors)

- **Waterfront Facilities**
  - Minimum of 11 feet of water (mean low tide)
  - 1,000 linear feet of bulkhead
Facility Inputs & Outputs

- Top Soil: ~80 tons/hr
- Water Supply: 250 – 300 gpm
- Sediment Processing: 80 cyd/hr
- Power Supply: 4,000 – 5,000 kW
- Waste solids: 1 – 10 tons/hr
- Treated Wastewater: 350 – 400 gpm

550,000 CY per Year Facility
Projected Costs – NY/NJ Harbor

- **30,000 CY Project**
- **250,000 CY per year Plant**
- **500,000 CY per year Plant**

**Plant Capacity**
- 20 cy/hr
- 40 cy/hr
- 80 cy/hr

**Treatment Costs**
- $200
- $180
- $160
- $140
- $120
- $100
- $80
- $60
- $40
- $20
- $0

**Initial Capital Investment** ($25 – 30 MM)

**Additional Capital Investment** ($5 -10 MM)

**Projected Full-Scale Treatment Costs**
- $50 – $150 per CY
Vision for the Future

BioGenesis Team Commitments
- Finance facility
- Permit, build, & operate facility
- Accept business risk

Serving All Markets
- Superfund/RCRA
- Maintenance Dredging
- Private Dredging

BioGenesis Regional Sediment Processing Facility

Tipping Fee Concept
- Predictable
- Transparent
- Competitive

Government Team Commitments
- Support regional concept to solve long term problem
- Commit to facility jumpstart

Tailored Beneficial Use Products
- High value topsoil
- Roadbase
- Construction fill
- Other products needing fine grained solids
Summary

- BioGenesis℠ Sediment Technology can clean organic and inorganic contaminants
- BioGenesis℠ Sediment Technology produces decontaminated sediment which can be used in range of beneficial use products
- BioGenesis℠ Sediment Technology can be implemented cost effectively
- Regional Facility will reduce overall costs and be a resource for the Harbor
Thank you

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