Watershed Approach to Toxics Assessment and Restoration

Addressing Chemical Contaminants and Legacy Pollutants

EPA/DNREC Water Program and 106 Grant Work-Plan Meeting
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- Context
- What is the approach, what makes it different?
- Partnerships – “WATAR”
- Methods
- Benefits
- Success stories
- Priority Projects

Background / Context

- Toxic substances in Delaware surface water are largely a legacy issue.
- Primary contaminants of concern are **P**ersistent, **B**ioaccumulative, and **T**oxic substances (e.g., PCBs, dioxins & furans, mercury, & organochlorine pesticides).
- Primary media affected are fish, sediments & soils; heaviest contamination is in areas of greatest industrial / urban land use.
- Although the situation is improving & programs have been effective overall, problems remain, partly due to a compartmentalized approach.

Same Goals – Different Approaches

- Site Investigation and Restoration (SIRS) – state level Superfund cleanup and oversight
  - List impacted sites & evaluate one at a time
  - Develop clean up plan that reduces risk & makes site usable
  - Remedy often eliminates off-site transport pathway but not always. Also, past release may have been missed which now resides in sediments
- Watershed Assessment Section (WAS) – state level Clean Water Act implementation
  - List impacted waters & address one at a time
  - Develop TMDL that defines point & nonpoint loads that can be added to water without exceeding water quality criteria
  - TMDLs not particularly effective in addressing legacy contamination in sediments. Also, in general, TMDLs aren't self-implementing.

-To overcome limitations in both programs, we built a bridge-

Let's call it W.A.T.A.R.

- **Watershed Approach to Toxics Assessment and Restoration**
- A broader (watershed scale) approach to the evaluation of contaminant sources, transport pathways, and receptors that will result in management actions that mitigate and/or eliminate the levels of toxins that individual sites release to the State's waterways.
- A mechanism to implement restoration actions (including Natural Resource Damage restoration) based upon site prioritization that considers the level of threat to public health, welfare and the environment and the expected resulting benefit to its watershed.

Plan Available at: *http://www.dnrec.delaware.gov/swc/wa/Pages/WatershedAssessment.aspx*

WATAR 5 Year Plan Objectives

- Compile existing toxics data for the surface waters, sediments, and biota
- Monitor to assess status and trends in priority watersheds; determine need for toxics TMDLs; develop Delaware sediment guidance through HSCA. Advanced forensics grade methods.
- Identify high priority remediation projects (upland & in water)
- Facilitate technology transfer to incorporate WATAR into management decisions
- Create a culture to address toxics using the WATAR approach

Expected Benefits of WATAR

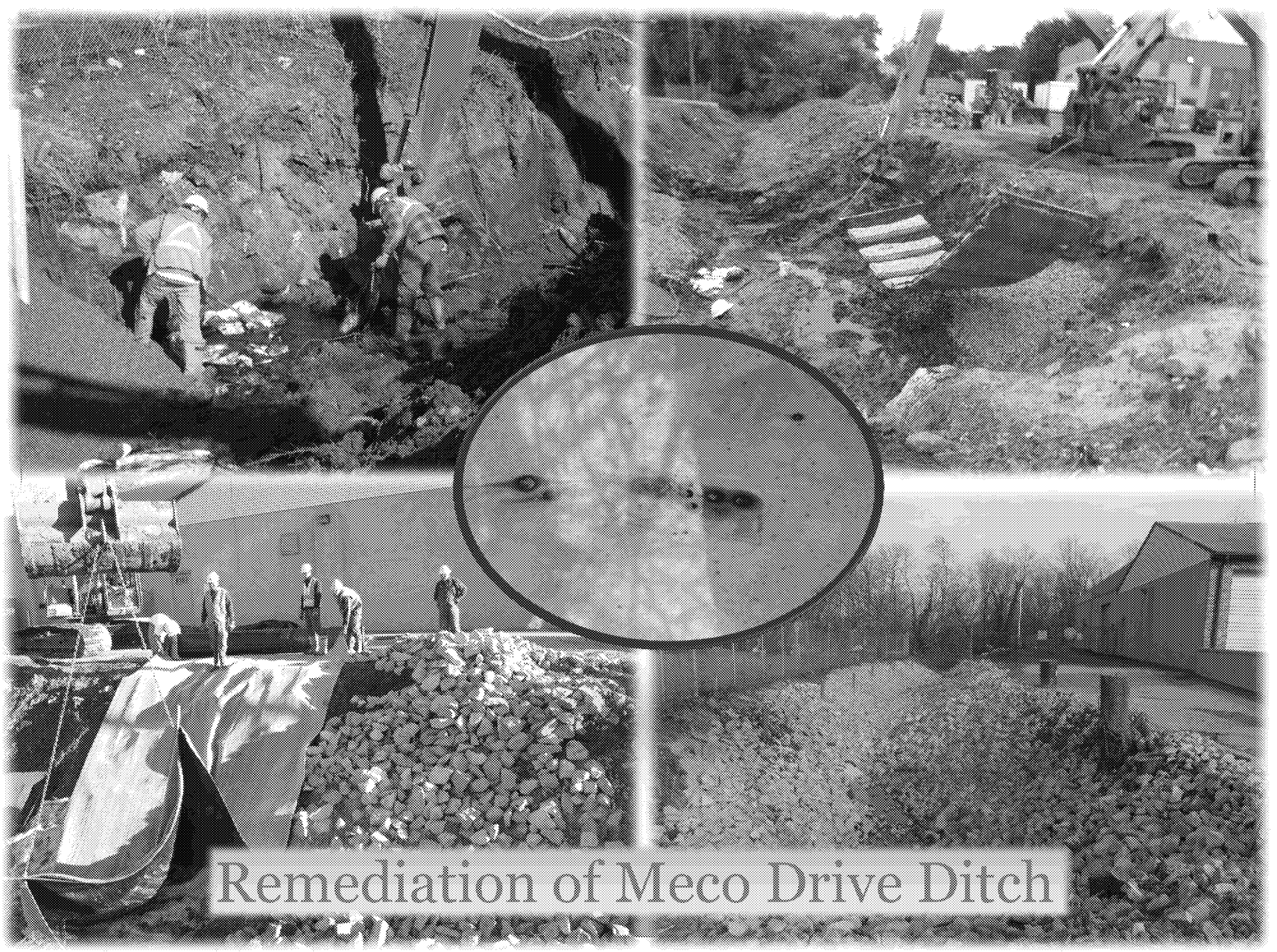
- Shorten time frame for removal of fish advisories
- Link contaminant sources and sinks to compel remediation
- Create a centralized location for ambient and site related toxics data
- Develop a framework to assess contaminated sediments
- Improve transparency and predictability
- Evaluate and advance state-of-the-art remediation and restoration techniques
- Engage partners

Demonstrated Success WATAR - 2013

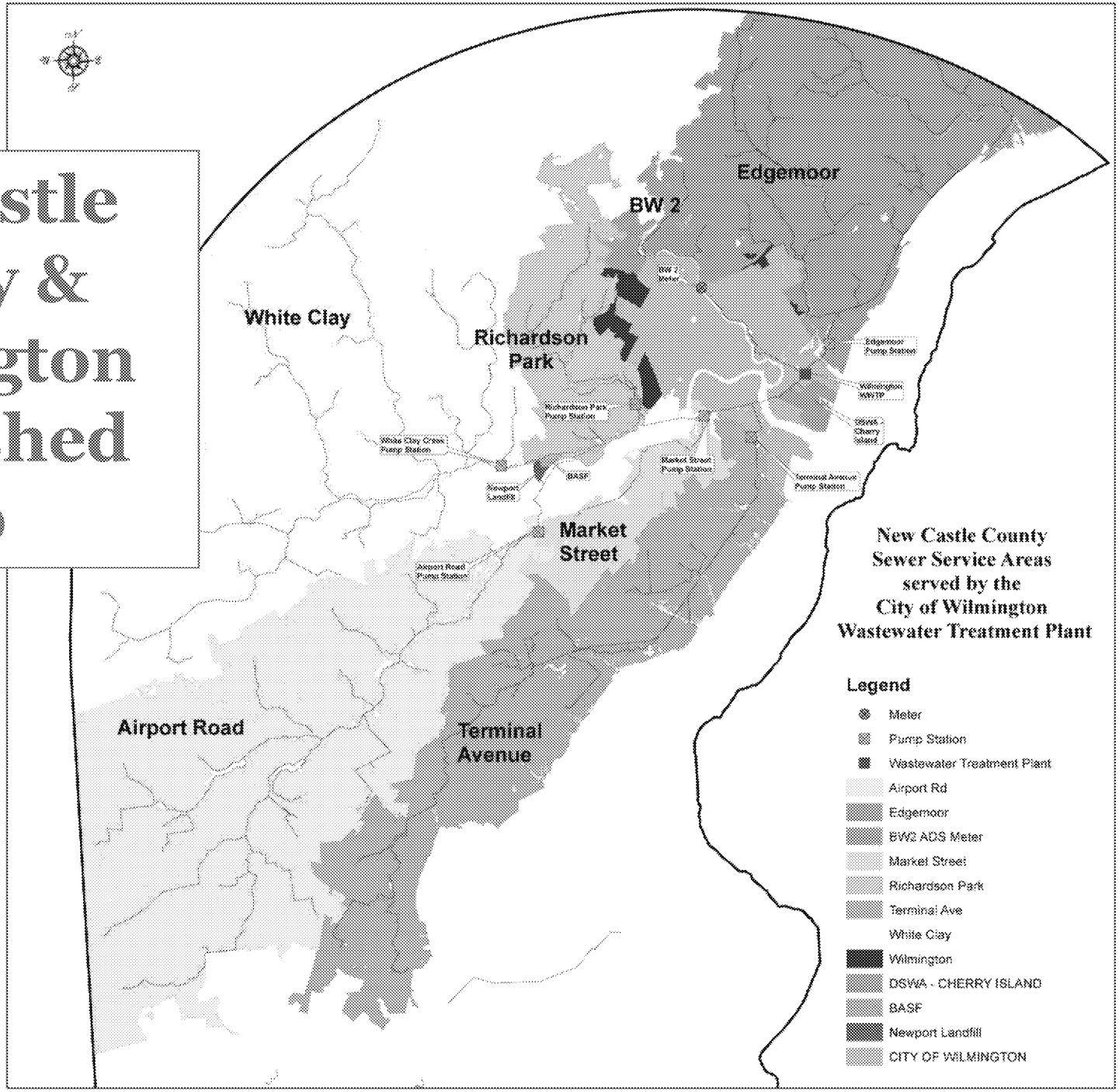
- **Meco Ditch**
- **PCB Trackdown Study – CoW / NCC sewage collection system**
- **Mirror Lake Remediation/Restoration – Innovative Technology**
- AMTRAK Wilmington Maintenance Yard
- NVF Yorklyn/Red Clay Creek Zinc - Remediation/Restoration
- Delaware River Mercury Methylation Study

Supplied Flash Drive contains details of these and other successes.

Little Mill Creek / Meco Ditch

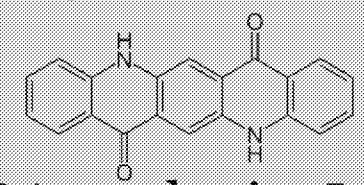

Remediation of Meco Drive Ditch

New Castle County & Wilmington Sewer-shed Map

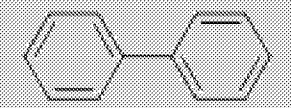


Inadvertent Production of PCBs at Pigment Facility

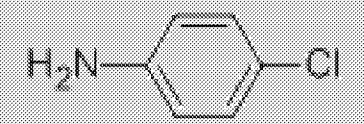
- Pigment plant manufactures Quinacridone pigment (QA).



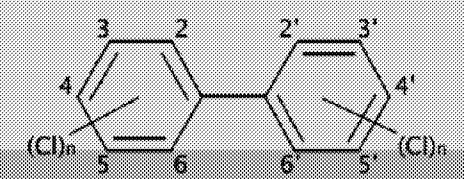
- Therminol VP-1 is used in QA synthesis. It contains ~26.5% Biphenyl, the basic building block of PCBs.



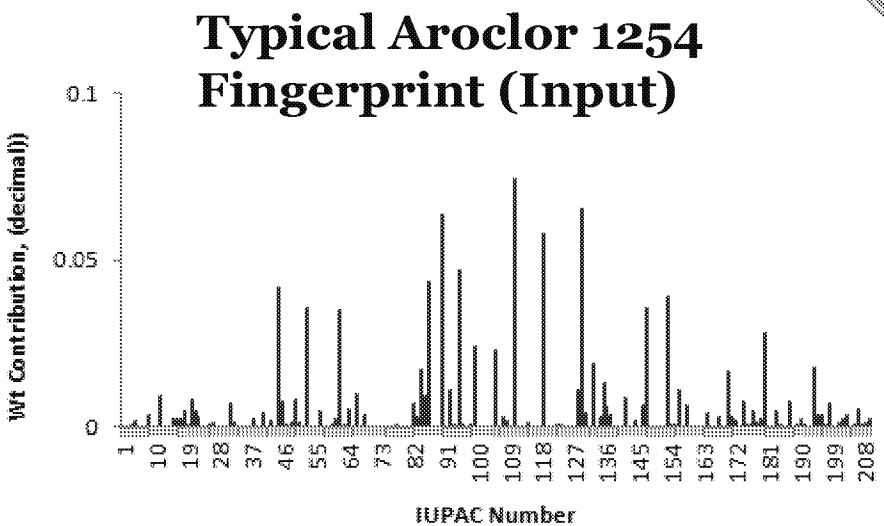
- Manufacturing process also involves chlorinated anilines (*used as a diazo component*).

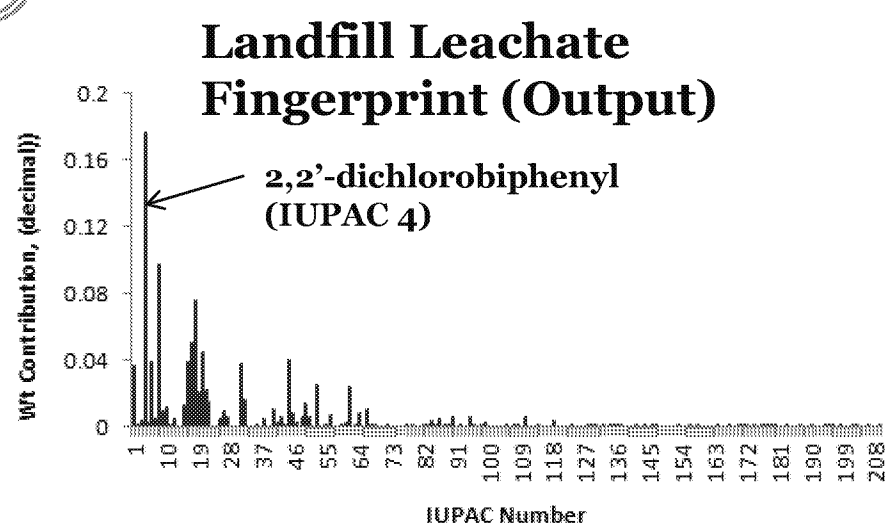


- Side-reaction of chloroanilines in the presence of biphenyl may produce PCBs through a free radical mechanism or other means.



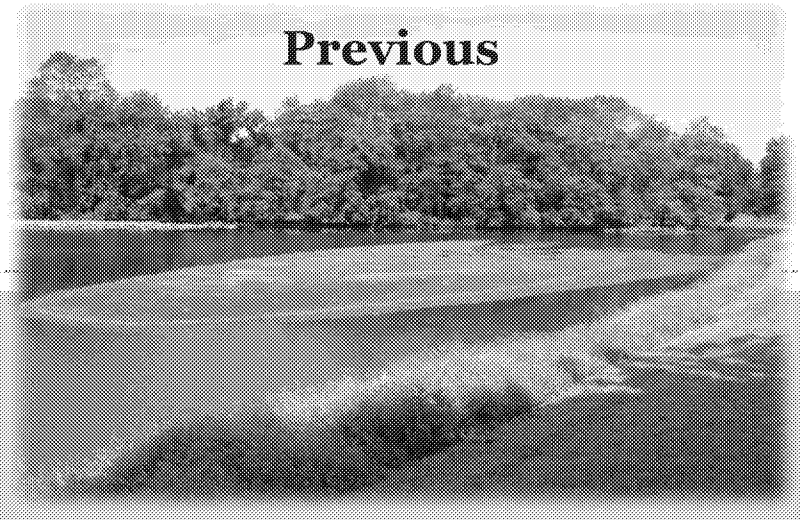
Partitioning & Dechlorination of PCBs in Large Regional Landfill



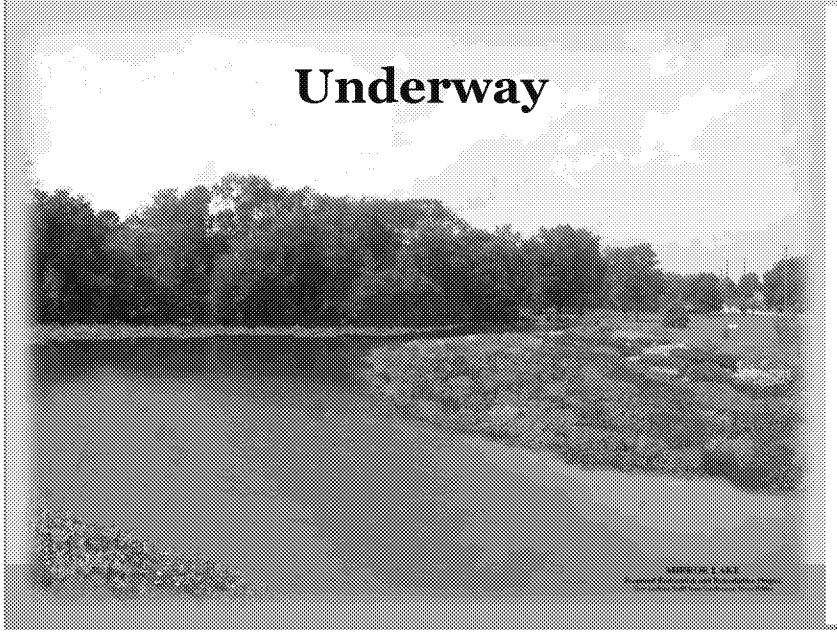


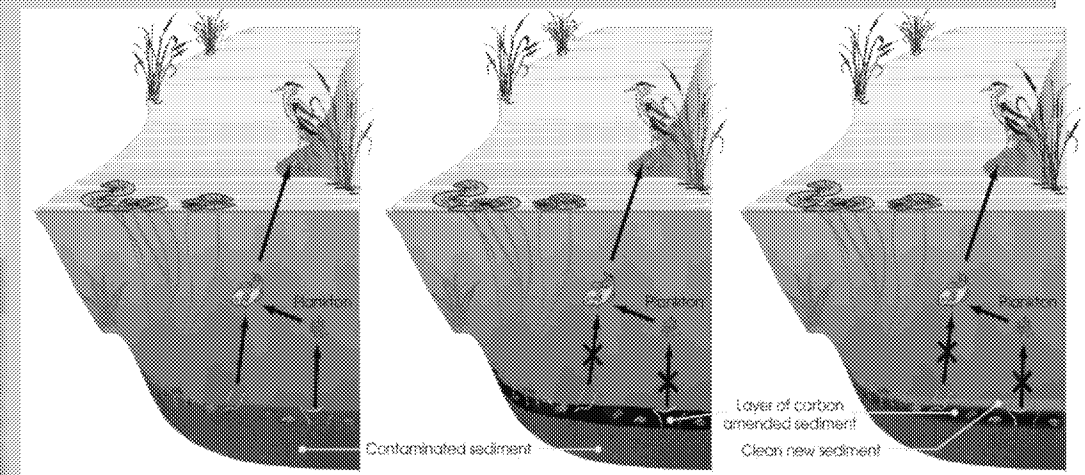
- Congener pattern of PCB input bears no resemblance to that of the leachate. Why?
- Landfills are rich in OC which acts as a sorbent. Landfills also act as large bioreactors where microorganisms help break down organic compounds.
- PCB **sorption** increases with chlorination. Heavier PCBs retained in the landfill and lighter PCBs released in the leachate.
- Further, **reductive dechlorination** selectively eliminates meta & para substituted congeners, leaving ortho PCBs.

Mirror Lake Remediation/Restoration



- Rather than dig it out, contaminants will be sequestered in place with SediMite
- Reduced recovery time expected
- Sand bar also to be converted to wetlands
- Construction Complete



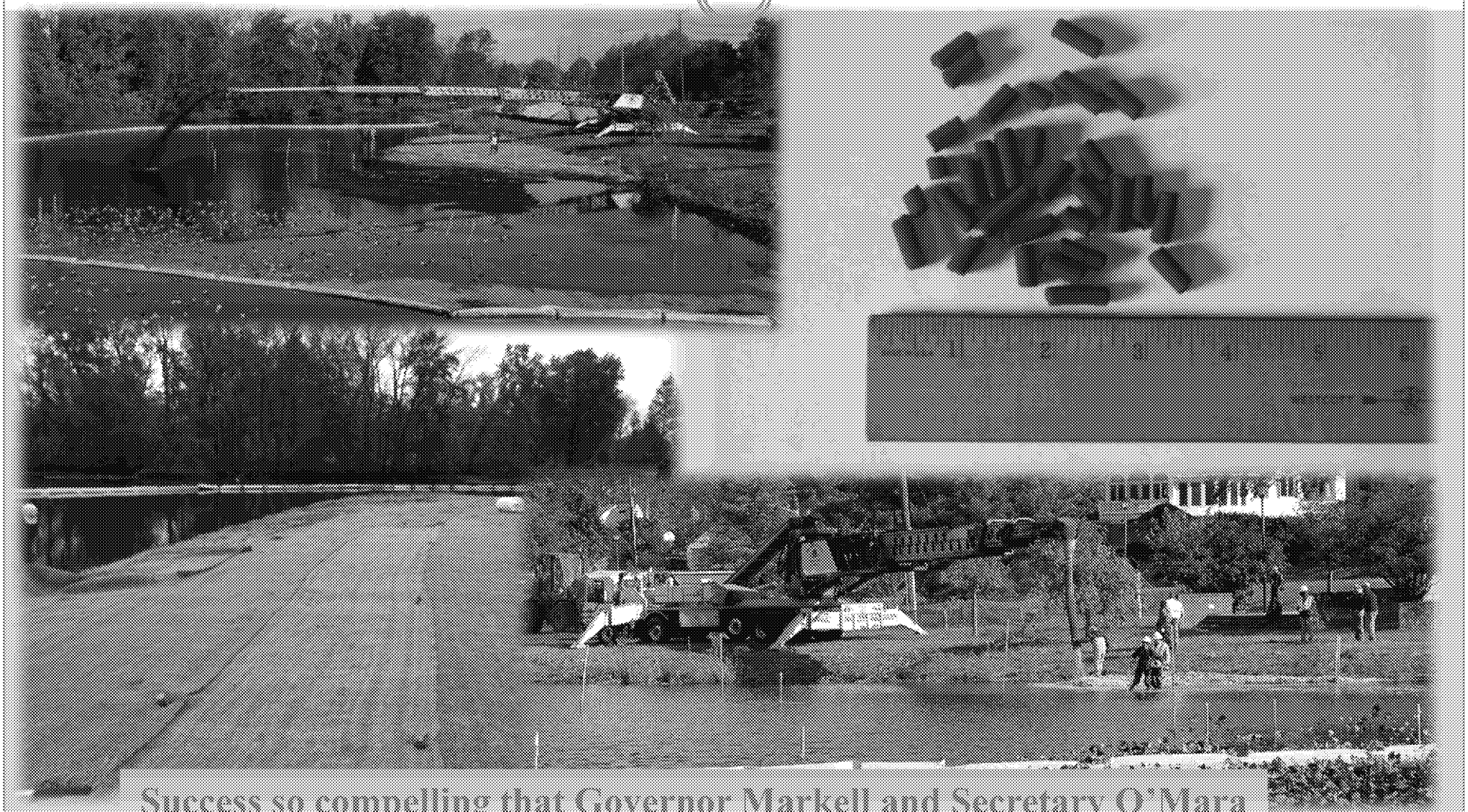


Legacy contaminants in exposed sediment contaminate the food chain through bioaccumulation in benthic organisms, flux into the water column, and uptake in the pelagic food web.

Activated carbon amended to surficial bioactive sediments reduces contaminant exposure to food chain through reduced bioaccumulation in benthic organisms and reduced flux into water column and uptake in the pelagic food web.

In the long term (>5 years), the carbon amended layer is covered with clean new sediment deposit and continues to serve as a barrier to the release of legacy contaminants to surficial sediments and water column.

Mirror Lake Remediation / Restoration



Success so compelling that Governor Markell and Secretary O'Mara asked for a list of priority projects.

WATAR Implementation Priority Projects

1. **Amtrak Wilmington Maintenance Yard -** Eastern Drainage Ditch Source Removal*
2. **Amtrak West Yard -**Remediation of site to eliminate mass loading pathway
3. **South Wilmington Wetland Assessment –** "A" Street Ditch Investigation and Remediation
4. **Former NVF Yorklyn facility adjacent to Red Clay Creek –**Long Term monitoring of surface water and sediment in Red Clay Creek to prove effectiveness of remedy at Former NVF Yorklyn*
5. **Governor Bacon-** Treatment following large removal to polish and eliminate mass loading to Delaware River from F.U.D.S. site
6. **Red Lion Creek Sediment Contamination –**Treatment of waterway sediments following USEPA Removal and Bio-stimulation at SCD/ Metachem Superfund site
7. **Shellpot Creek Sediment Contamination -** Sediment remediation through application of activated carbon
8. **PCB Sewer-shed track-back -** Treatment facility at large regional landfill leachate discharge*
9. **Little Mill Creek –** Monitoring and characterization related to source remediation*
10. **PCB mass loading analysis-** Accelerated schedule for contaminated sites*
11. **Del Chapel Zinc** - supplemental remedial treatment
12. **Scull Property/Tar Branch -** City of Dover maintenance yard - Meco Ditch style project
13. **Hot Spot Removal of Sediments -** Delaware River, tidal Brandywine, and tidal Christina; Army Creek.

- **TOTAL OF ABOVE: $75M over 10 years**

WATAR Development Team

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WATAR

Questions or Comments?