Evaluation of PCB TMDL Efforts in the Delaware Estuary

New Jersey Clean Water Council

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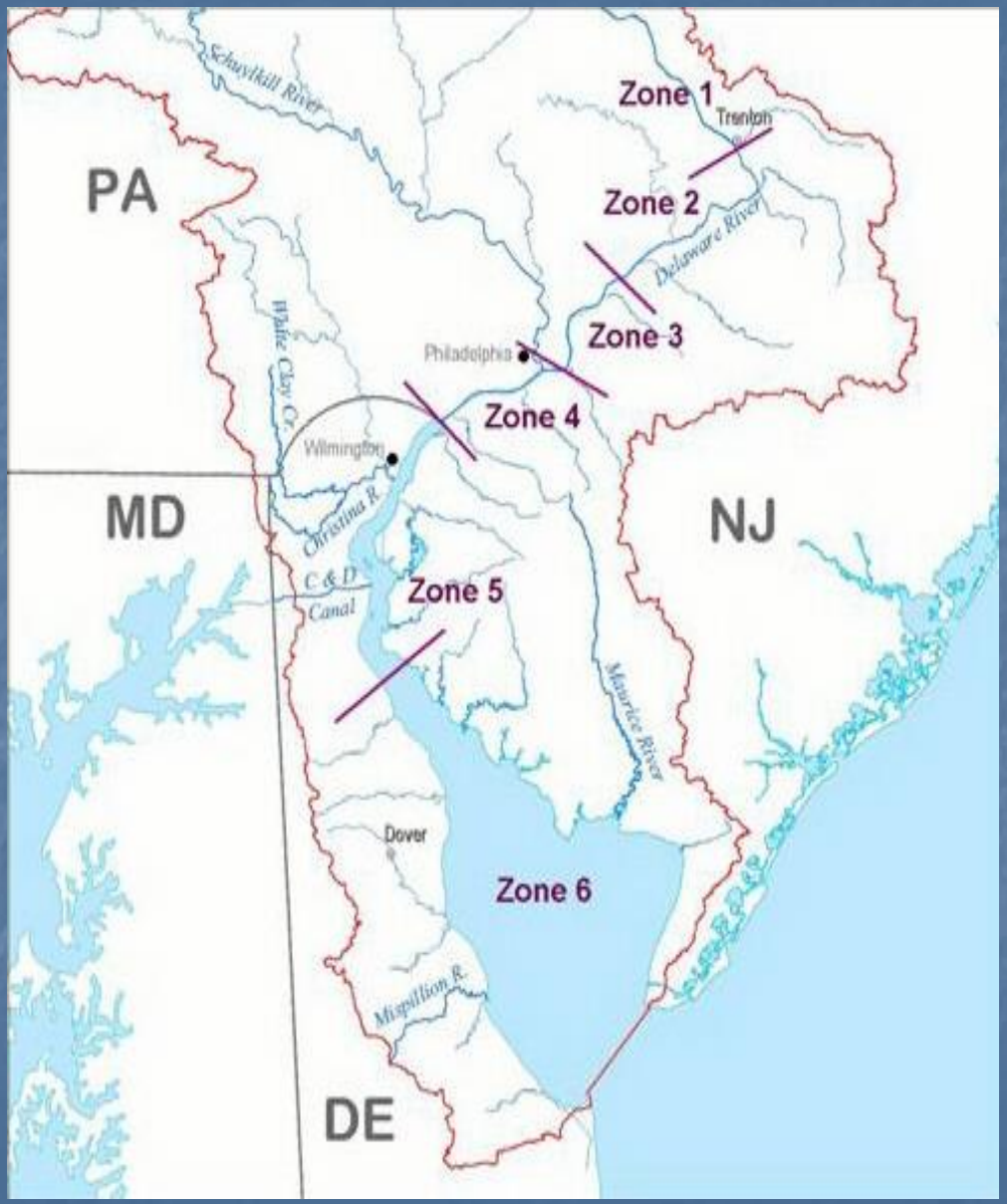
Modeling, Monitoring and Assessment Branch

Outline

- Background
- Analytical Methods
- Detection limits and trends in blanks
- PMP key elements and activities
- Point source initiatives
- Trends in point source loadings since 2005
- Non-point source initiatives
- Achieving individual WLA

Background

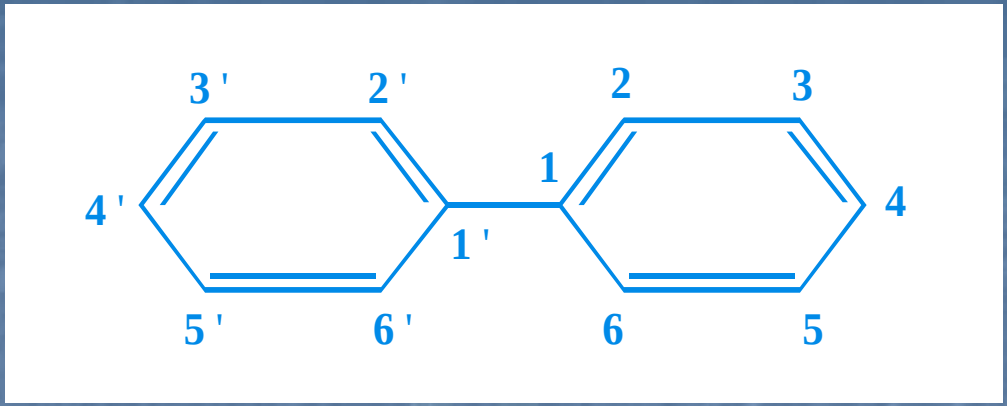
- Delaware Estuary portion of the Basin is 133 miles long and is bordered by DE, NJ and PA.
- It consists of 5 water quality management units called Zones.
- EPA Regions II & III establish Stage 1 TMDLs for Zones 2 – 5 in December 2003.
- EPA Regions II & III establish Stage 1 TMDL for Zone 6 in December 2006.



PCB Chemistry

- Man-made organic chemicals with a biphenyl base structure and 209 possible chlorine substitution patterns.
- Terminology: Aroclors, congeners, homologs.
- Properties: Hydrophobic, tend to accumulate in sediments and tissues

PCB Structure and Terminology



- Terminology:
  - Aroclors- Commercial mixtures
  - Congeners- Individual compounds (209)
  - Homolog- Group of compounds based on level of chlorination (10)

Homolog	# of congeners
Mono	3
Di	12
Tri	24
Tetra	42
Penta	46
Hexa	42
Hepta	24
Octa	12
Nona	3
Deca	1

PCB Toxicity

- Probable Human Carcinogen
- Disrupt hormone function
- Immunosuppressant
  - Like dioxin, PCBs bind to receptors that control immune system function, disturbing the amounts of some immune system elements like lymphocytes and T cells
- Developmental/Neurobehavioral Effects

Analytical and Monitoring Approaches

- DRBC's convened a Data Quality subcommittee to address issues regarding analytical and monitoring approaches.
- Participants included:
  - Industry, Municipal, Academic, Environmental and Laboratory representatives.
- DQ Subcommittee Recommended:
  - Sample identification protocols
  - Sample size and collection methods
  - Analytical methodology
  - Electronic data formatting and reporting

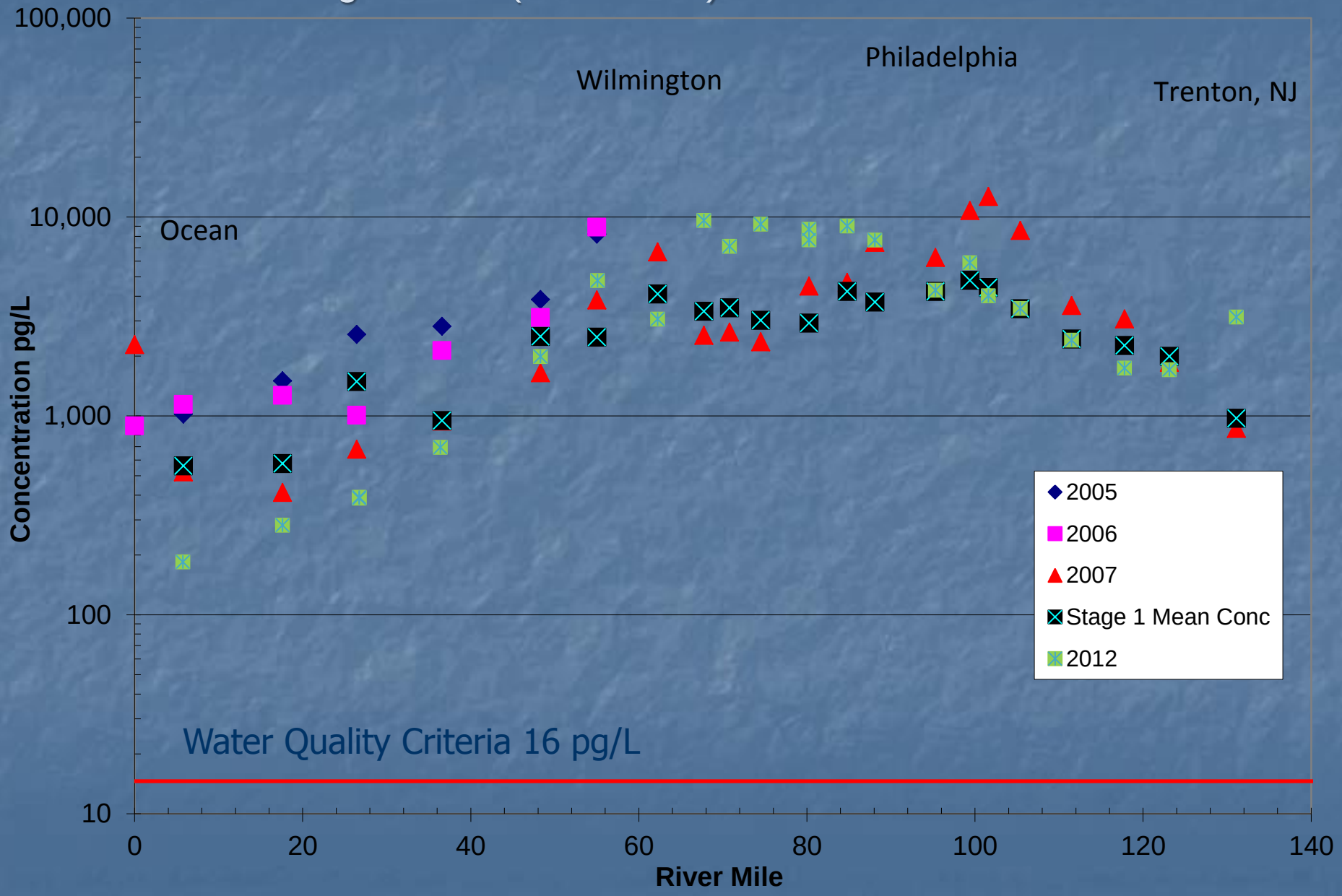
Measuring PCBs

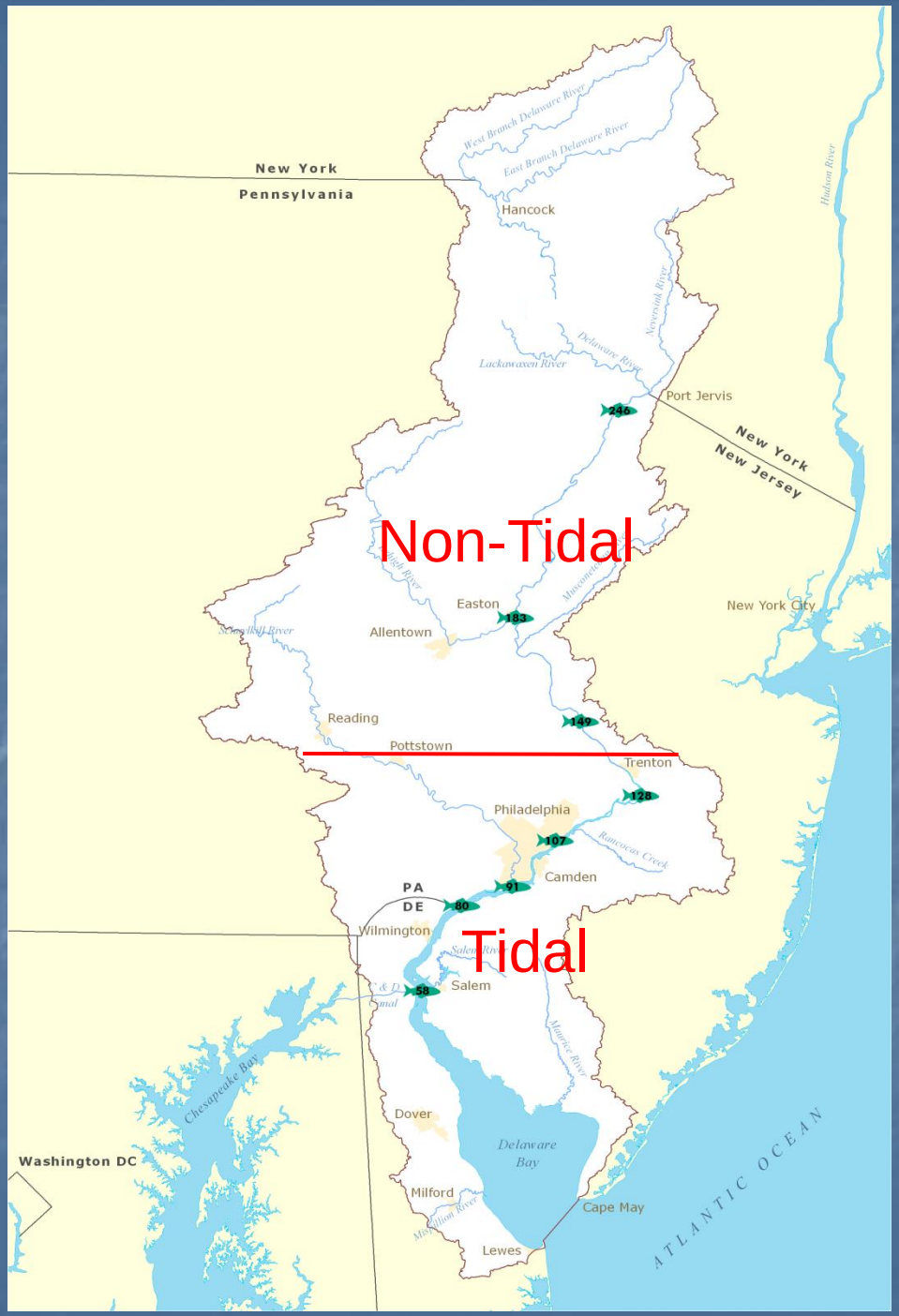
- To develop a more accurate Stage 2 TMDL by requiring better quantification of the concentrations from the various PCB source categories.
- A HRGC/HRMS analytical methodology capable of providing detection limits in pg/L (ppq)
  - EPA Method 1668 Rev. A
- Results:
  - Comparability of analytical results
  - Reduced analytical uncertainty
  - Greater accuracy in estimated loadings
  - More accurate long-term trends analysis
  - Better temporal and spatial evaluation of data

Supporting Documentation

- Adopted Recommendations available at:
  - http://www.state.nj.us/drbc/quality/toxics/pcbs/monitoring.html
- Additionally, the Commission in cooperation with select point source dischargers developed an Access database to organize the information.
- Commission maintains the database for all discharge data
- Benefits:
  - Provide a basis for determining effectiveness of pollutant reduction measures.
  - An open and transparent database will provide for direct and candid communication between the regulated community and the regulatory agencies.

PCB Ambient Water Surveys Stage 1 data (2001-2003) vs Stage 2 data (2005-2012) Total PCB Concentrations





Sampling Locations 2004 - 2006

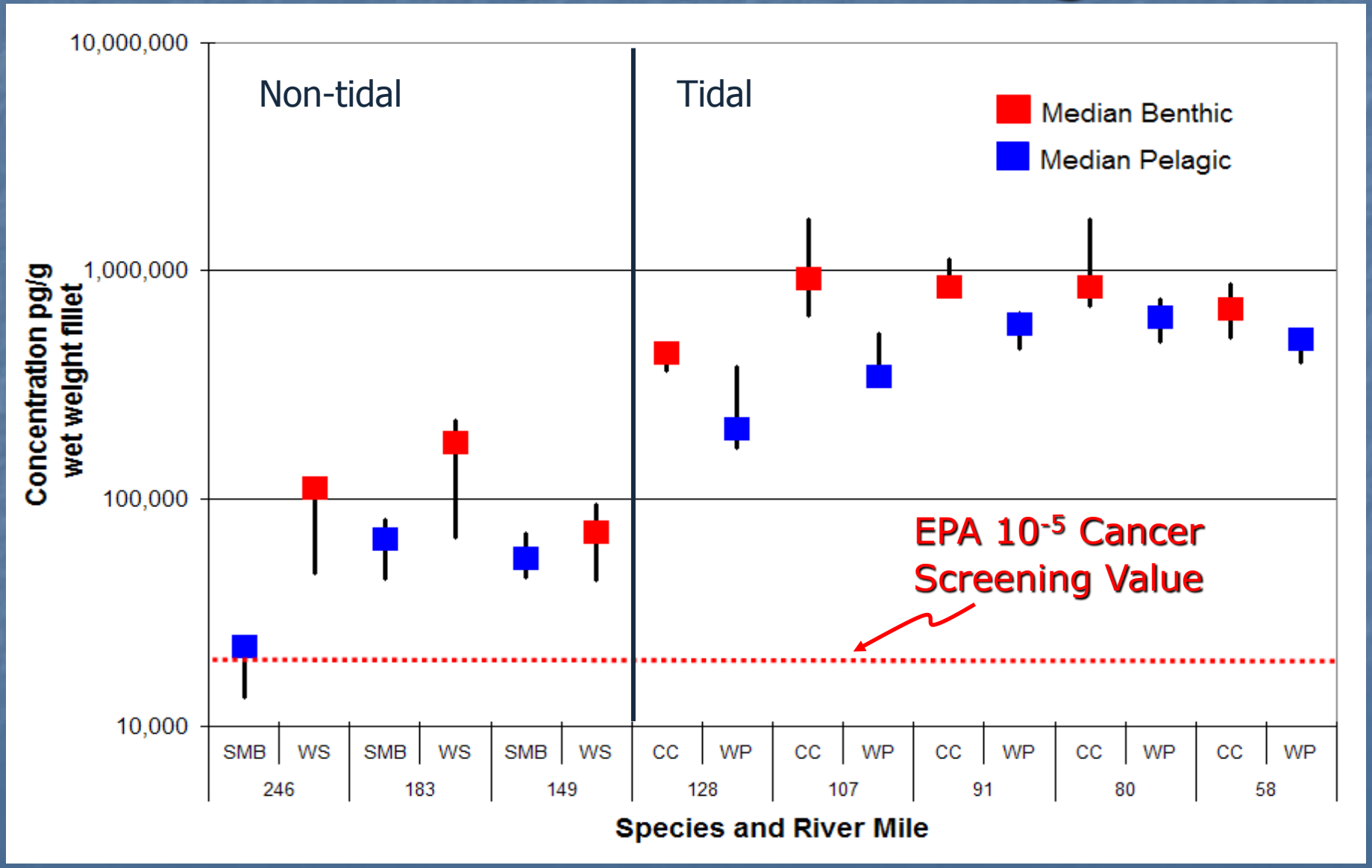
Species

Channel Catfish	CC	Benthic
White Perch	WP	Pelagic

Tidal Locations

Crosswicks Creek	RM 128
Tacony-Palymra Br.	RM 107
Woodbury Creek	RM 91
Raccoon Creek	RM 80
Salem River	RM 58

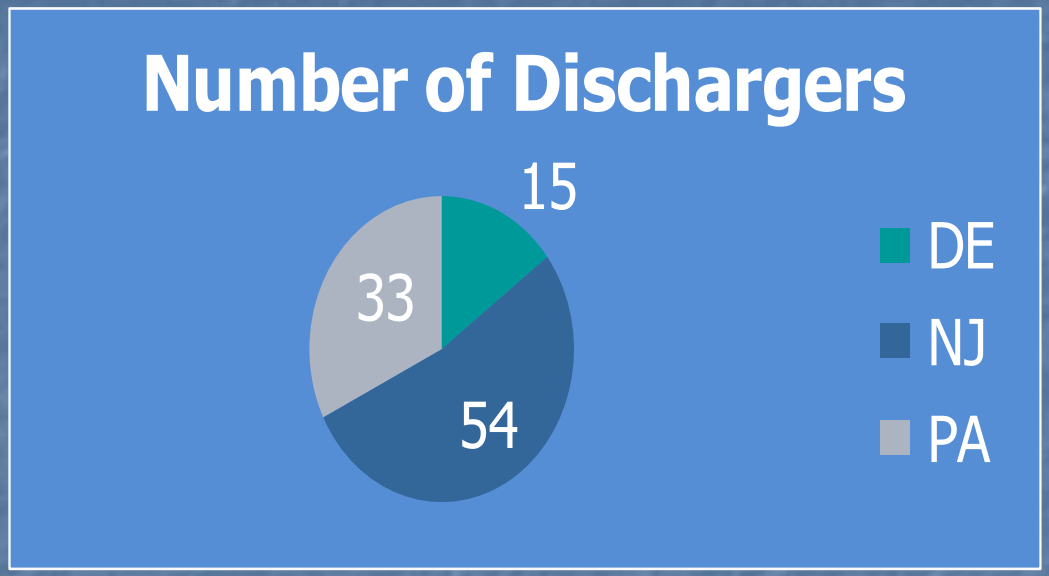
Total PCBs
2004-2006 (n=3), 209 congeners

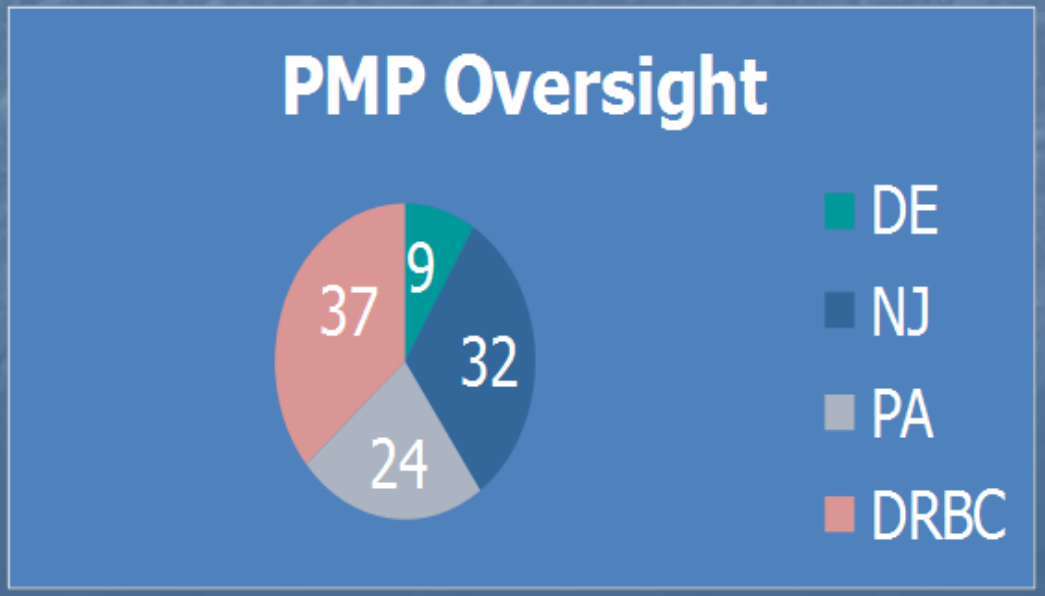


Reducing PCB Loadings to the Estuary Pollutant Minimization Plans (PMPs)

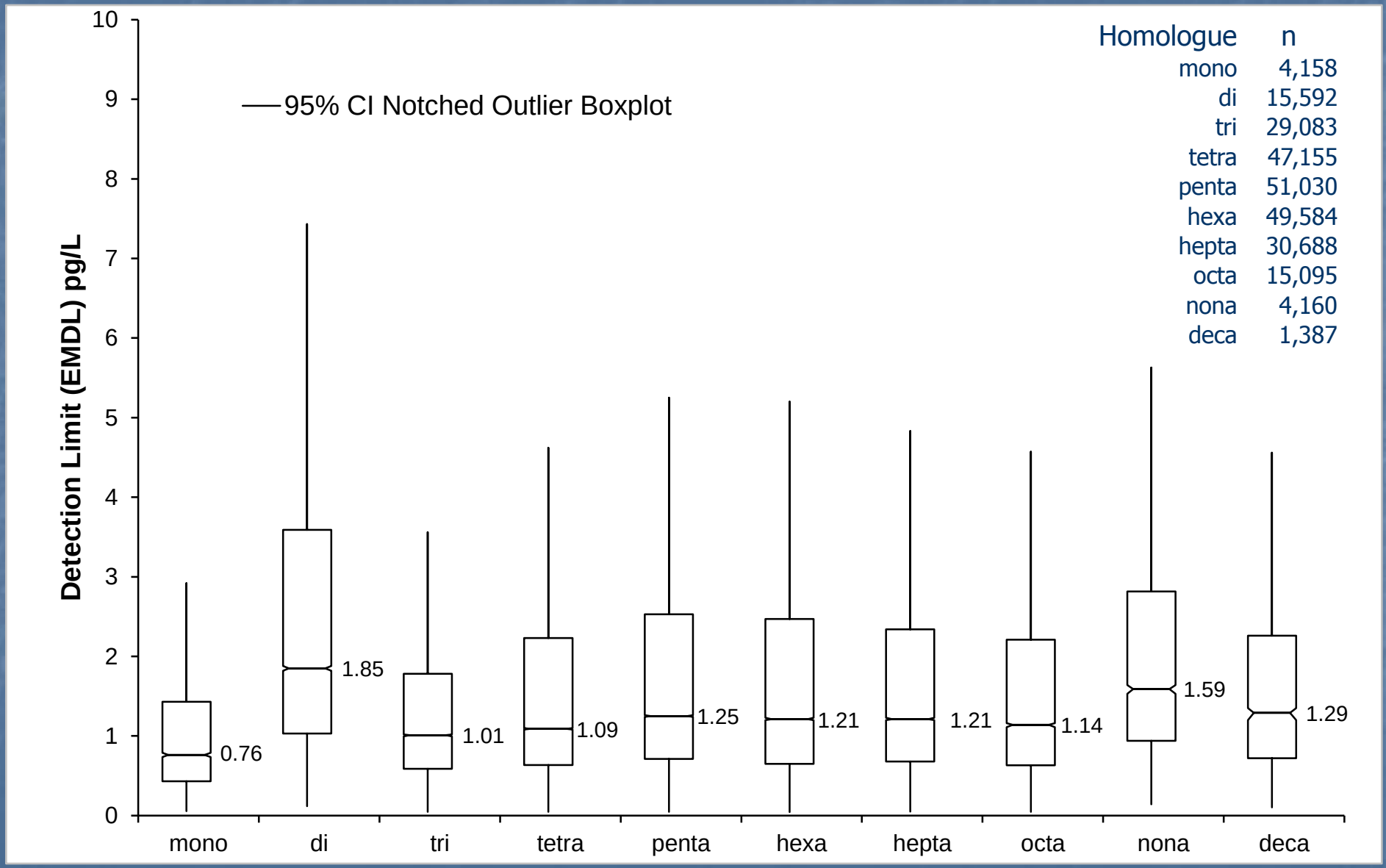
- Key PMP Elements
  - Source identification and reduction
  - Monitoring and progress report
  - Remediation activities
- PMP Approaches:
  - Remove PCB transformers and capacitors
  - Trackdown studies to identify and remove sources
  - Contaminated sediment control or removal

Dischargers in PCB TMDL (n=102)

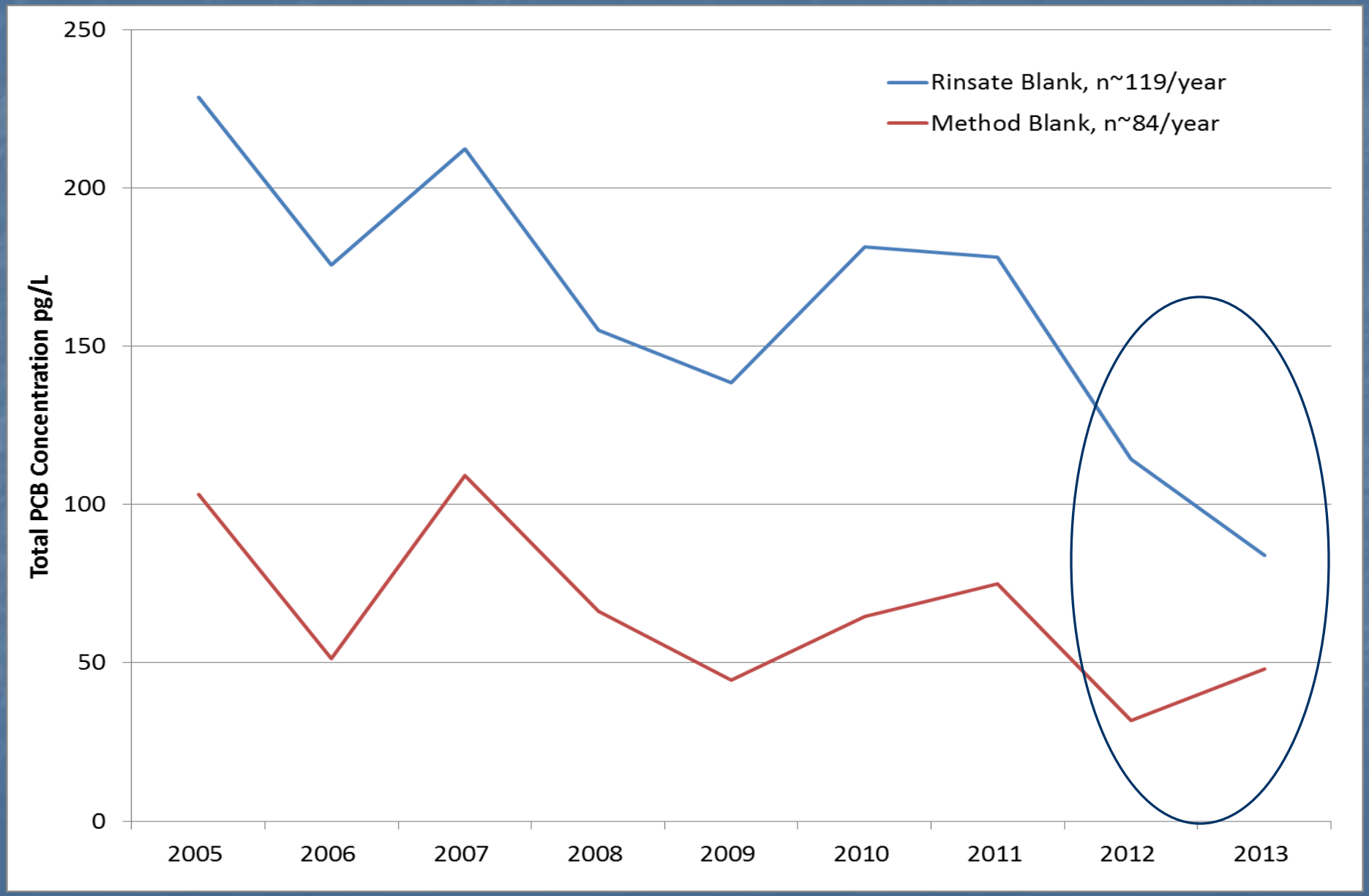




1668A Detection Limits by Homolog



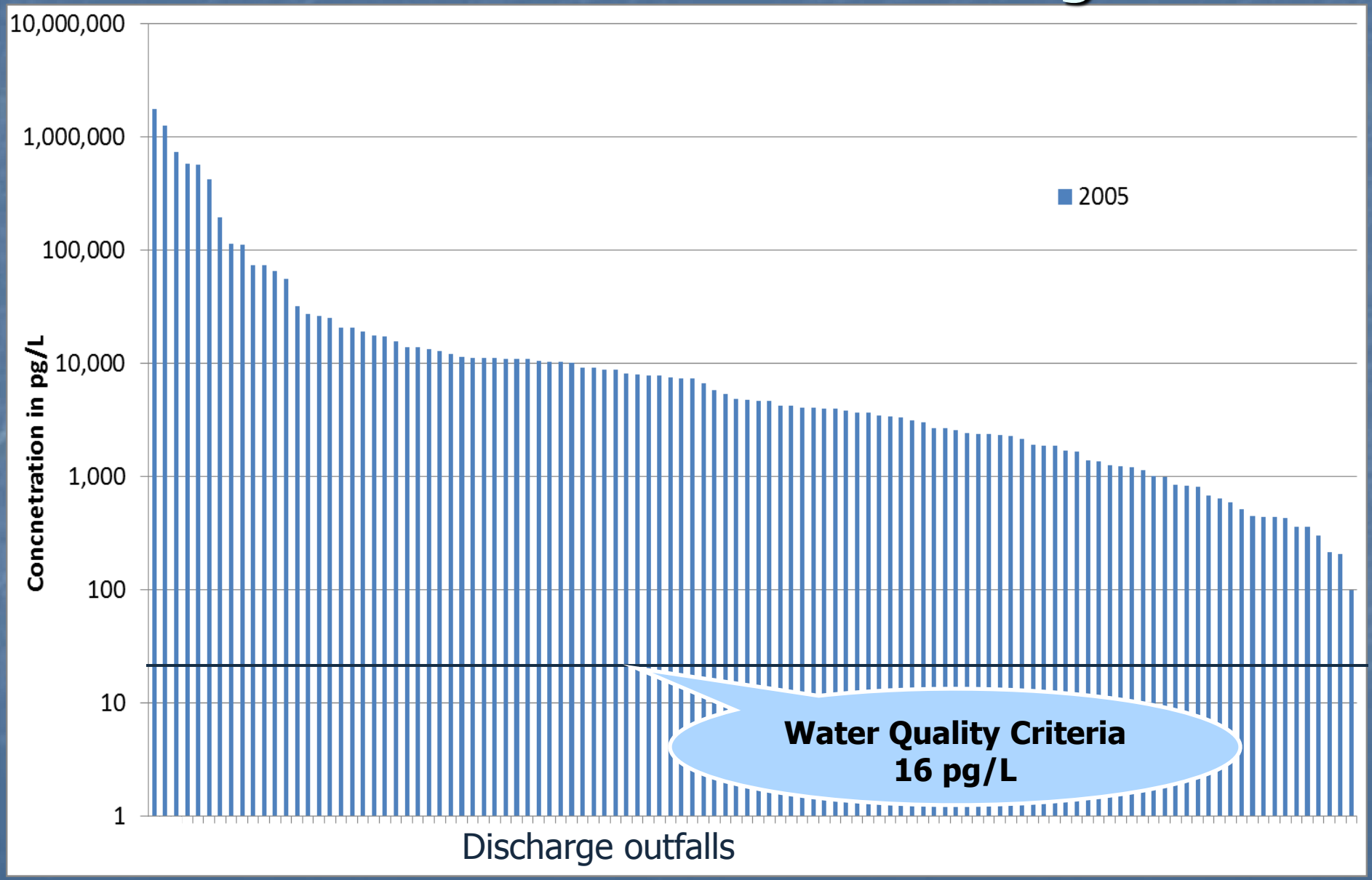
Rinsate and Method Blank Results



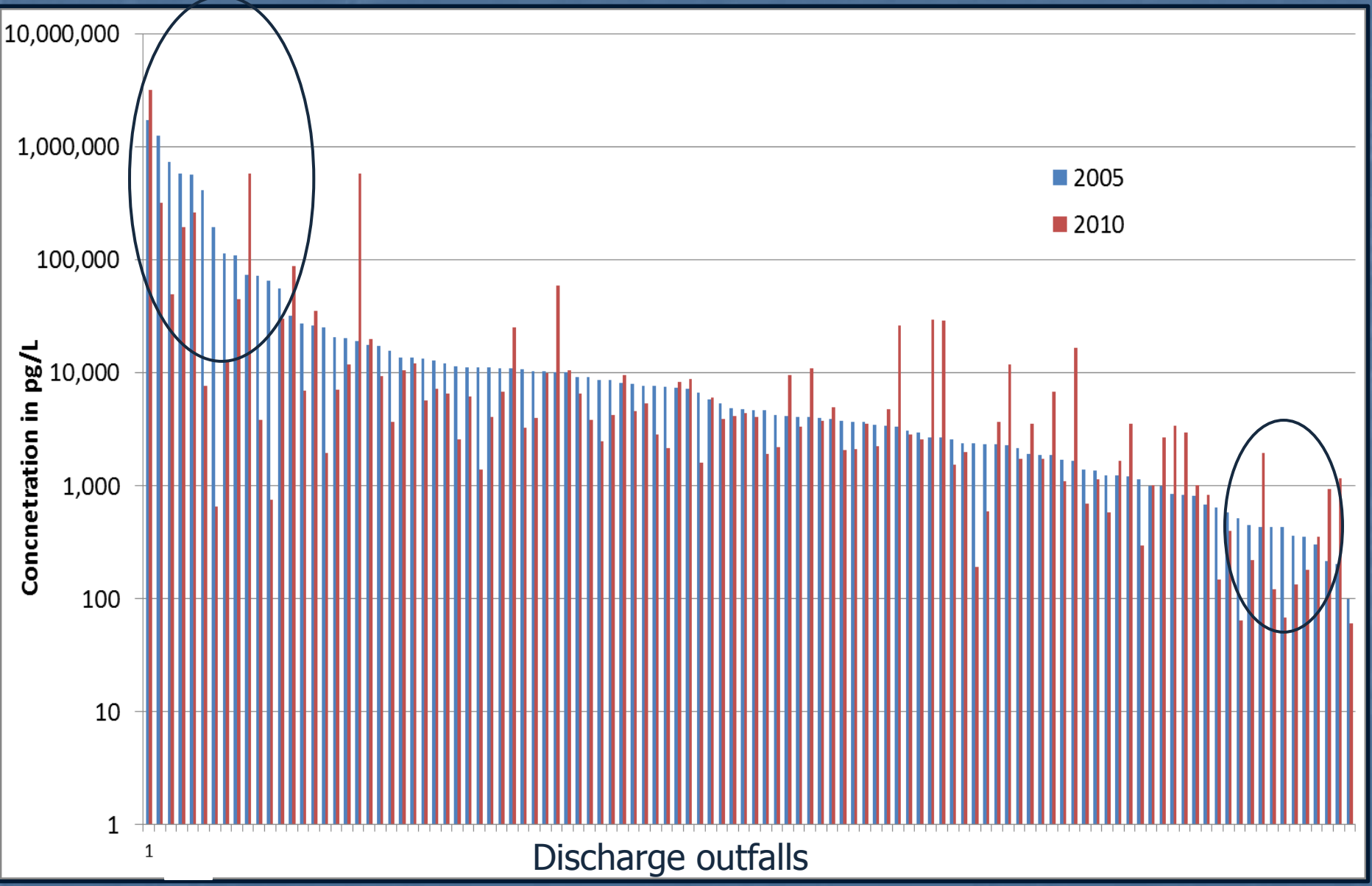
Commission PMP Activities

- Workshops were provided for dischargers in 2005, 2007 and 2012 to assist in:
  - Preparation and approval of PMPs
  - Preparation and submittal of Annual Reports
  - Illustrate effectiveness of remedial measures
- Training sessions were provided by DRBC for PADEP and NJDEP staff to foster a consistent approach for PMP evaluation.
- Commission staff have provided technical assistance to dischargers and their consultants.
- PMP resources available at:
  - http://www.state.nj.us/drbc/programs/quality/pmp.html

2005 Ranked Point Source PCB Concentrations in All Discharges



Ranked Point Source PCB Concentrations



Municipal Initiatives

- Tinicum Township
  - Increased solids removal efficiency at WWTP
  - Annual sediment removal at pump stations
  - Trackdown studies have identified a major source of PCBs Airport Business Complex (ABC)
    - Sewer line relining to eliminate infiltration
- Camden County Municipal Authority (CCMUA)

  Trackdown studies identified:
  - Sewer interceptors with elevated PCB sediment concentrations
  - Existing and abandoned industries contributing PCBs.

  Coordinating efforts with NJDEP, EPA and City of Camden

Industrial Initiatives

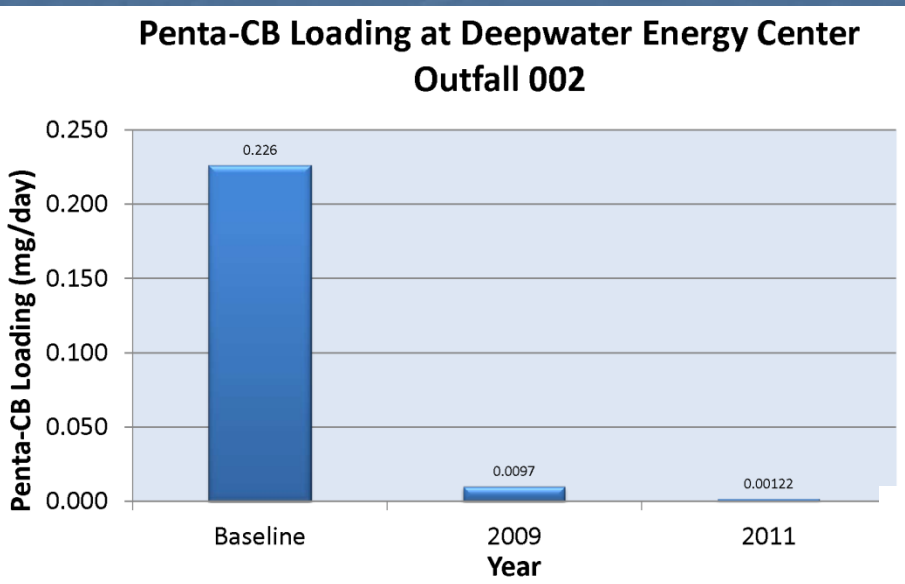
- USX Steel Fairless Hills, PA
  - Removed 700,000 lbs. of PCB transformer oil
  - Removed 440,000 lbs. of PCB debris and capacitors
  - Removed contaminated sediment initiated stormwater control
- Amtrak Wilmington, DE
  - Sediment removal from sewer lines (60 tons)
  - Redesigned stormwater system to reduce direct discharge
  - Considering additional sediment removal

Specific Example

- Calpine Deepwater Energy Facility
  - Legacy contamination (built 1929)
- Two stormwater outfalls monitored
  - PCB transformers removed
  - Catchments and stormwater lines cleaned
  - Geotextile filter baskets and filter guards deployed at drains

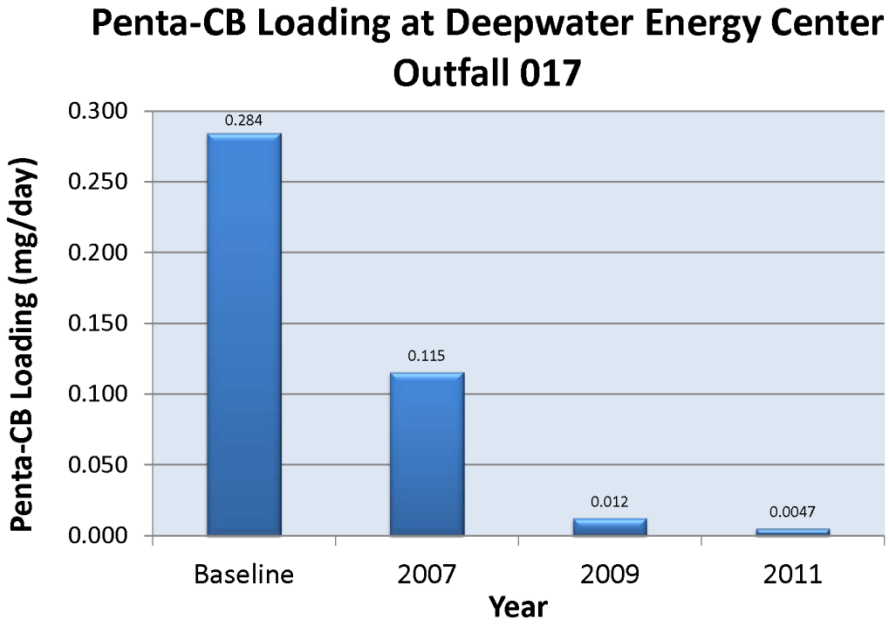
Slides courtesy Calpine Energy and Cardno ENTRIX

Deepwater Results



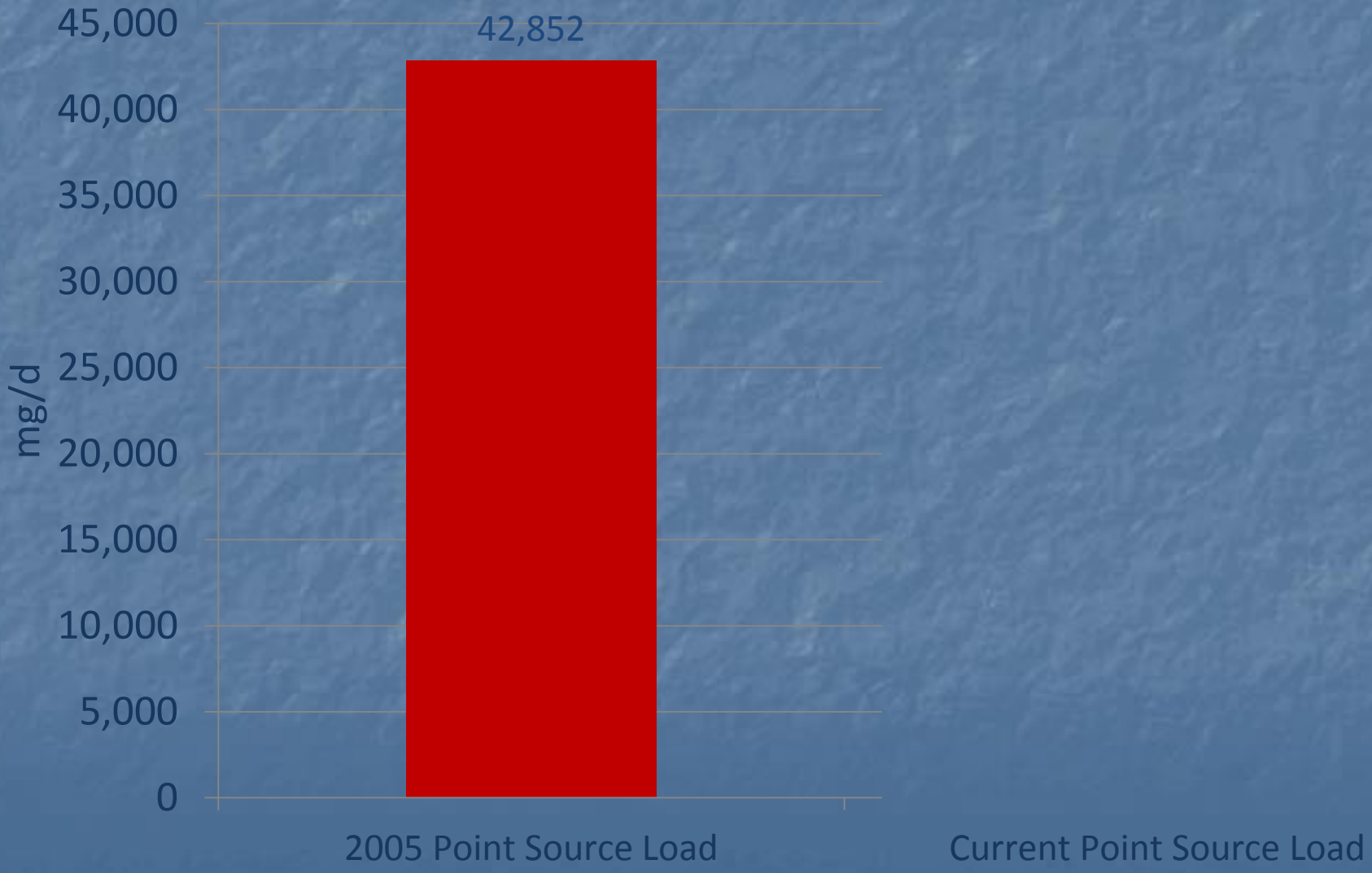
Cumulative Reduction of Penta-CBs: 99.5%

Slides courtesy of Calpine Energy and Cardno ENTRIX



Cumulative Reduction of Penta-CBs: 98.3%

10 Dischargers Representing 90% of Point Source PCB Loadings in the Estuary



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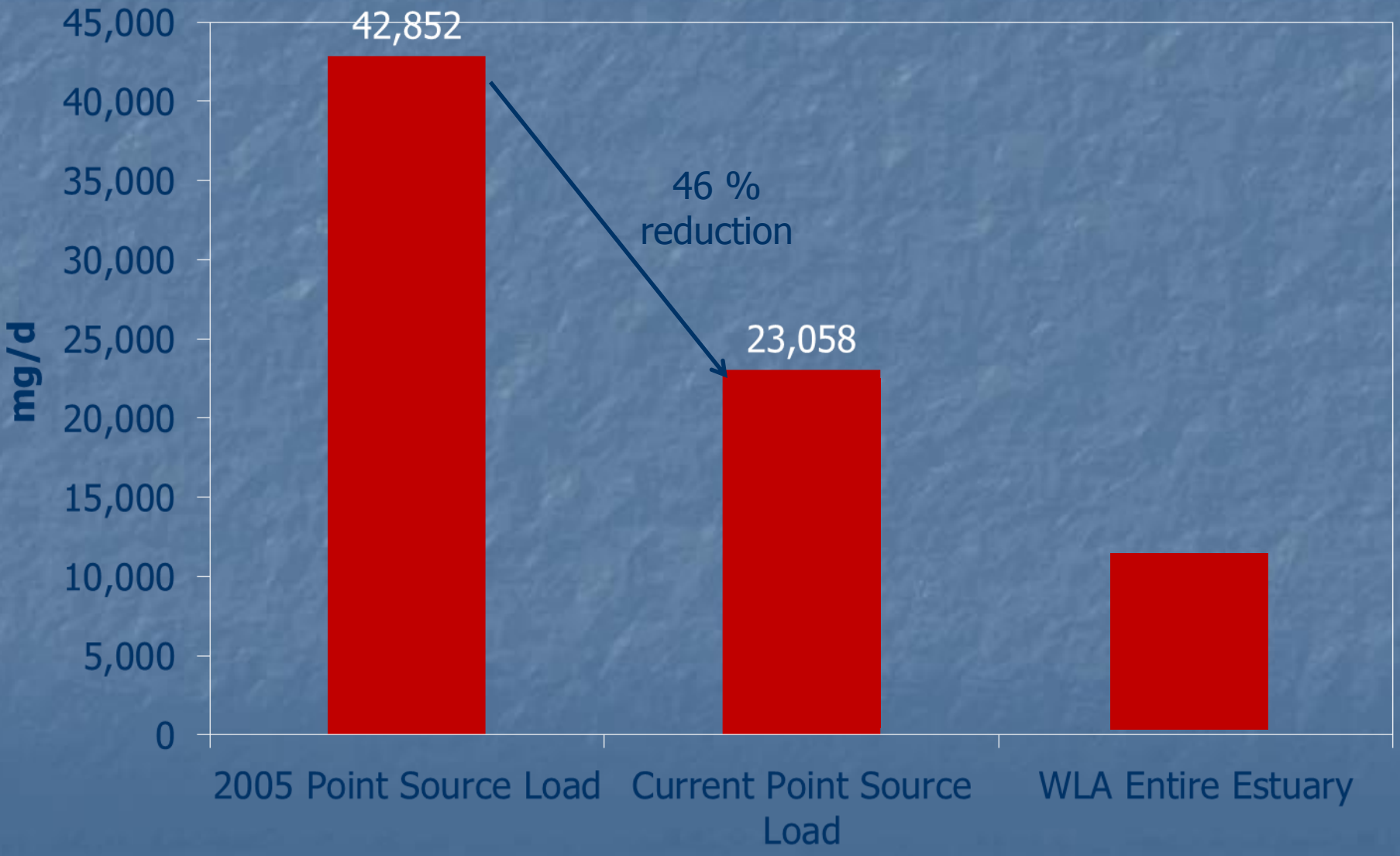

Non-Point Sources Success

- Exxon Mobil, Paulsboro NJ
  - 16 acre tidal wetland containing contaminated PCB aluminosilicate pellets
  - Excavated 120,000 tons of material
  - Estimated 30-40,000 lbs. of PCBs removed
- Metal Bank, Philadelphia PA
  - 10 acre industrial site (NPL listed)
  - Excavated 1,500 tons of material
  - Approximately 800 lbs. of PCBs removed

Exxon Mobil Site 2004

Remedial Efforts 2008-09

Slides Courtesy of Alan Motter NJDEP


Gloucester Co. • East Greenwich Twp
295
130
18
295
Mantua
Creek
Approximately
30-40,000 lbs. of
PCBs Removed
Mantua Creek 2010

O&M Requirements

- Why is O&M necessary?
  - Prevention of backsliding i.e. increasing loading after an initial reduction
- Example: US Pipe and Foundry
  - Manufactured iron pipe from recycled and new material
  - Stored scrap metal on-site
  - Legacy site >100 years old
  - Storm water effluent contaminated with PCBs

U.S. Pipe and Foundry (Outfall 004)

Year	PMP Initiatives	Analytical Results
2007	Existing sedimentation basin no treatment	118,923 pg/L
2008	Sediment removed from basin and filtration system added	847 pg/L
2009	Filtration system failed and demolition of facility began	47,651 pg/L
2010	Demolition continues increasing sediment load	94,821 pg/L
2011	Demolition completed and rerouting of additional stormwater to sedimentation basin. Increased sediment trapping in stormwater drains	35,086 pg/L
2012	Filtration system under repair (during sample collection). Identification of remaining potential sources	33,434 pg/L
2013	Filtration system repairs completed. Continued system Maintence. Begin re-grading and seeding to reduce runoff	1,519 pg/L

Dischargers Approaching Individual WLA

- Degussa Corporation (NPDES #PA0051713)
  - Manufactures inorganic industrial products
  - Discharge is treated by Industrial Waste Water Treatment Plant
    - Neutralized
    - Solids removed
- BP Paulsboro (NJPDES #NJ0005584)
  - Former refinery, since demolished undergoing ground water remediation
  - Discharge is treated by Groundwater Treatment Plant
    - Air stripping
    - Carbon filtration

Summary

- The majority of facilities that are implementing a PMP are reporting lower concentrations/loadings of total PCBs in their discharges.
- The top ten dischargers that contribute 90% of the point source PCB loading have reduced their loadings by 46% since 2005.
- The PMP approach is demonstrating progress in reducing PCB loadings from point source discharges.
- Selected dischargers are close to achieving their WLA
- Continuation of this cooperative approach is an essential component of a long-term strategy to achieve the PCB TMDLs.

Questions?

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