

Total Maximum Daily Loads for PCBs in the Trinity River

Segments 0829, 0806, 0841, & 0805

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PARSONS

under contract to the

Texas Commission on Environmental Quality

Introduction

- Section 303(d) of the federal Clean Water Act (CWA) requires States to identify water bodies that do not meet applicable water quality standards
- Pursuant to the CWA and development of the 303(d) list, the Texas Commission on Environmental Quality (TCEQ) is responsible for development of Total Maximum Daily Loads (TMDLs)

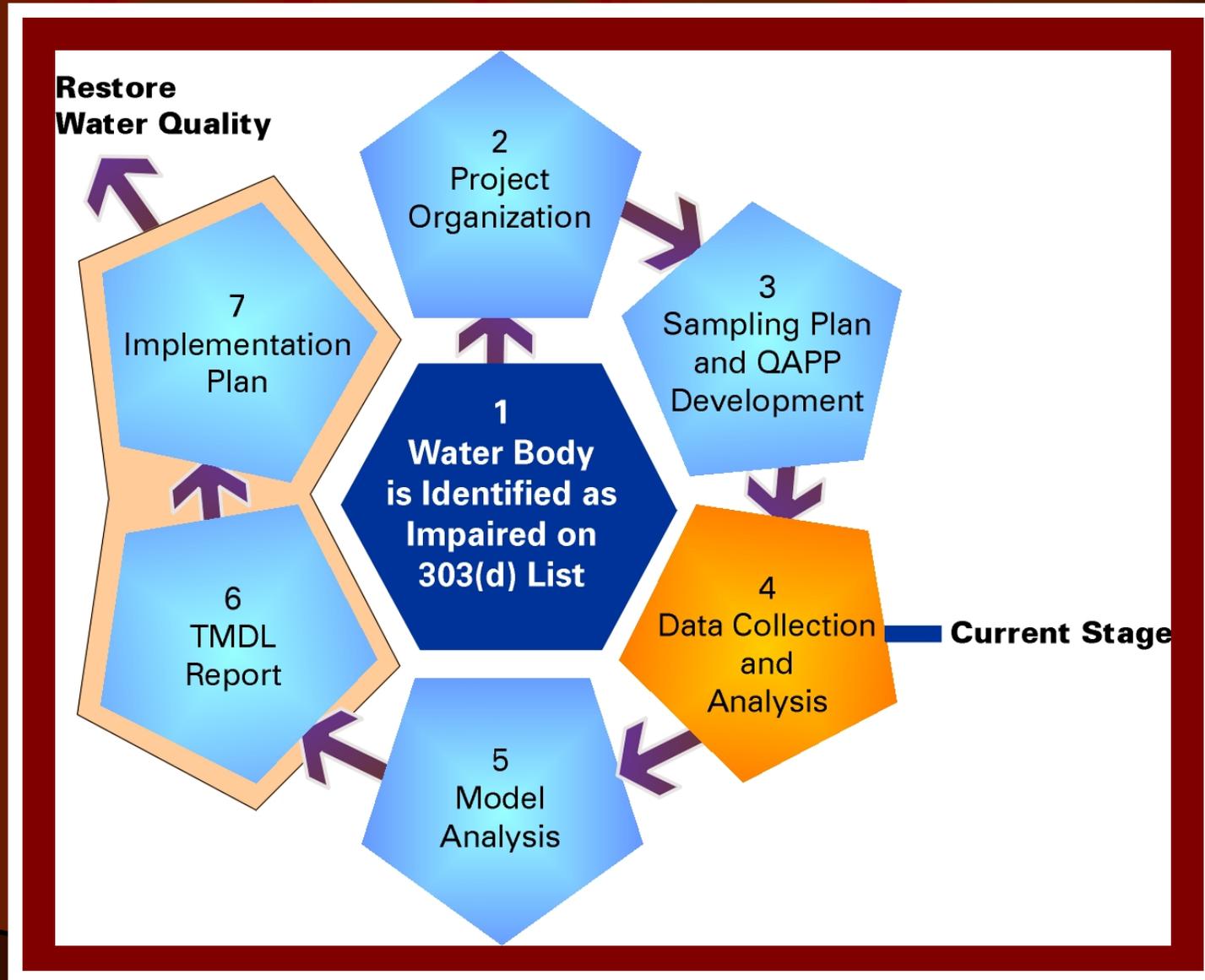
Introduction

- The goal of a TMDL is to determine the amount (or load) of a pollutant that a body of water can receive and still support its designated uses
- That allowable load is then allocated among all sources of pollution within the watershed
- Measures to reduce the pollutant loads are developed as necessary

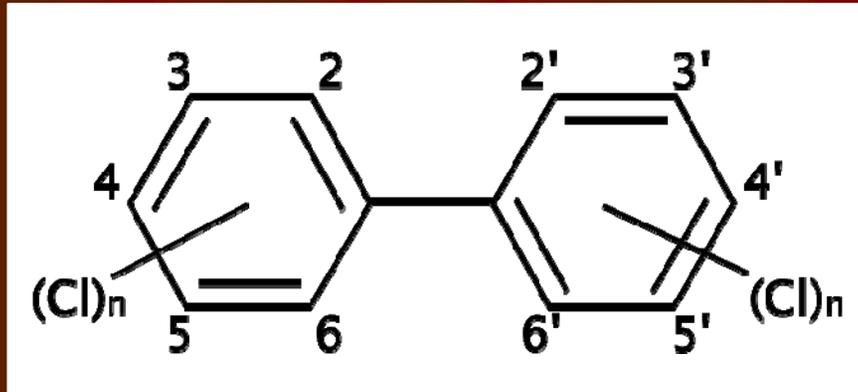
Impaired Segments/Assessment Units

- Texas Department of State Health Services (TDSHS) issued Aquatic Life Order 14 (AL-14) and Fish Consumption Advisory 25 (ADV-25) in 2002 due to “PCBs in fish tissue” for 150 miles of the Trinity River
- As a result the TCEQ placed four segments (nine Assessment Units (AU)) of the Trinity River on the CWA 303 (d) list due to impairment of the “fish consumption” designated use

TMDL Process and Project Schedule



Polychlorinated Biphenyls (PCBs)

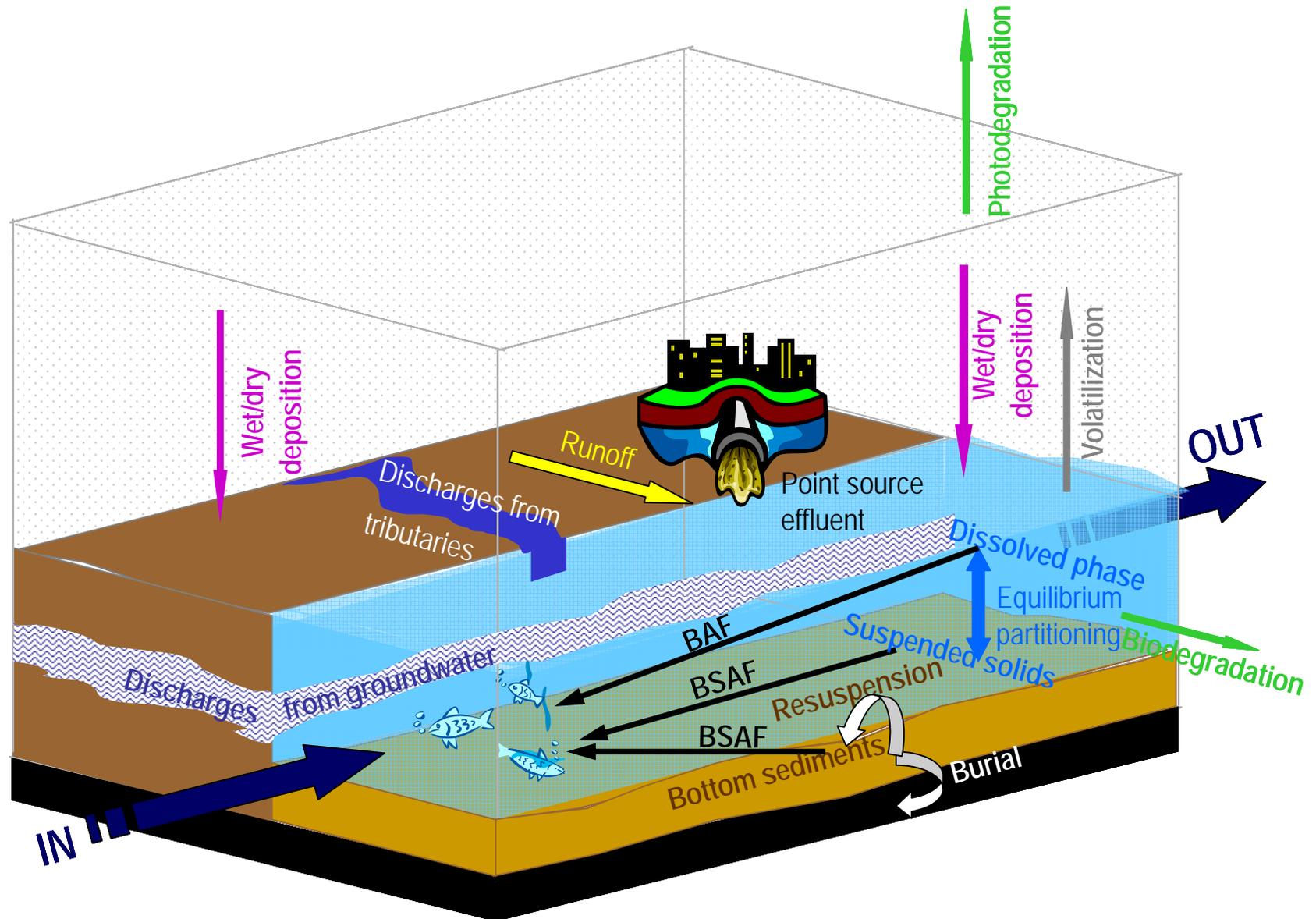


- A group of 209 compounds, known as PCB congeners
- From 1 to 10 chlorines on 2 connected benzene rings
- Properties and toxicity vary, but all poorly soluble in water
- Tend to be associated with sediments in aquatic systems
- Highly resistant to degradation
- Residence times in aquatic systems on the order of decades

Polychlorinated Biphenyls (PCBs)

- Sold under trade name Aroclor
- Used mainly as
 - Dielectric fluids in transformers
 - Heat transfer fluids
 - Heat-resistant hydraulic fluids
- Production, distribution and new use banned in 1976 by Toxic Substances Control Act (TSCA)

PCB Conceptual Model



PCB Conceptual Model

- TMDL Development Approach
 - Multiple-box mass balance analytical model
- Model Implementation
 - Quantification of PCBs levels in each segment and AU
 - Rate of PCBs exchange between segments / AUs
 - External PCBs loading to each segment / AUs
 - Estimate of removal mechanisms

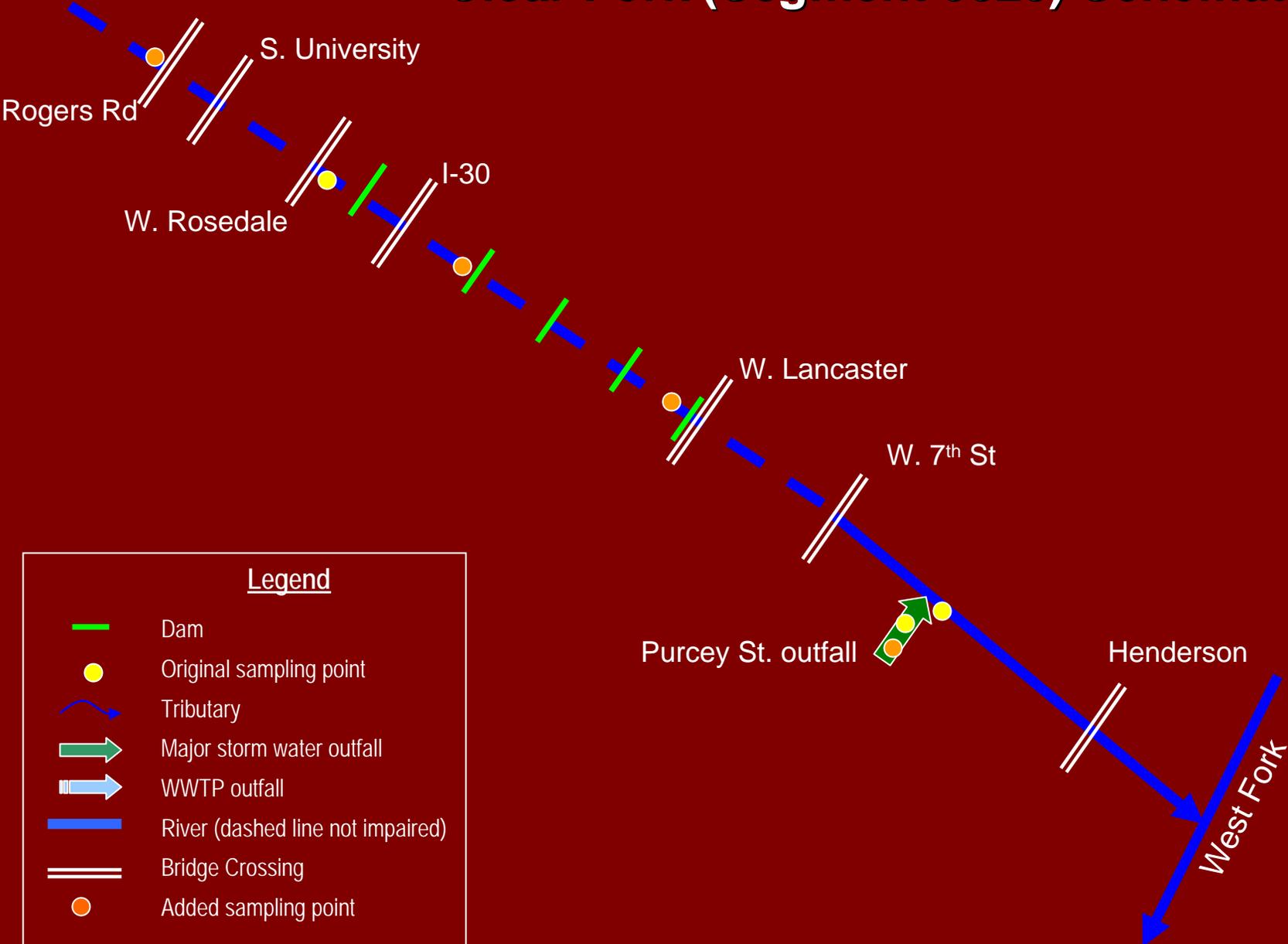
Data Collection

March 2008 – August 2008

- Flow data (USGS)
- In-stream water PCB concentration measurements
 - 18 measurements at 13 main stem sites
- Sediment PCB concentration measurements
 - 77 measurements at 32 main stem and 43 tributary sites
- PCB loads from wastewater discharges
 - 8 measurements at 4 facilities
- PCB loads from nonpoint-source runoff
 - 9 measurements at 5 sites
- Fish tissue PCB concentrations (TDSHS)
 - 130 fish samples at 12 main stem sites (samples collected 07-08/2008)

Clear Fork (Segment 0829) Schematic

from Benbrook Lake



Legend

- Dam
- Original sampling point
- Tributary
- Major storm water outfall
- WWTP outfall
- River (dashed line not impaired)
- Bridge Crossing
- Added sampling point

from Lake Worth

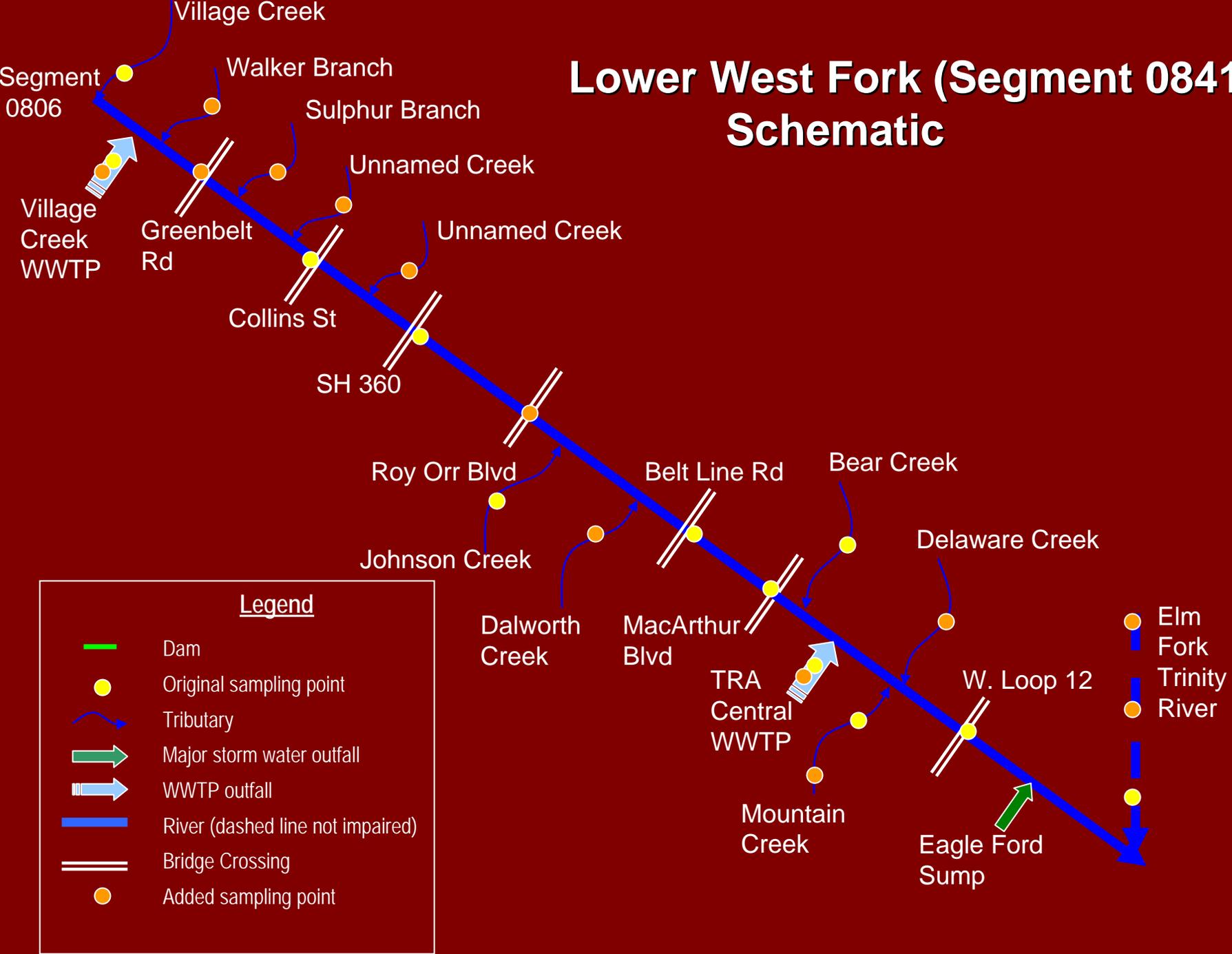
West Fork (Segment 0806) Schematic



Legend

-  Dam
-  Original sampling point
-  Tributary
-  Major storm water outfall
-  WWTP outfall
-  River (dashed line not impaired)
-  Bridge Crossing
-  Added sampling point

Lower West Fork (Segment 0841) Schematic

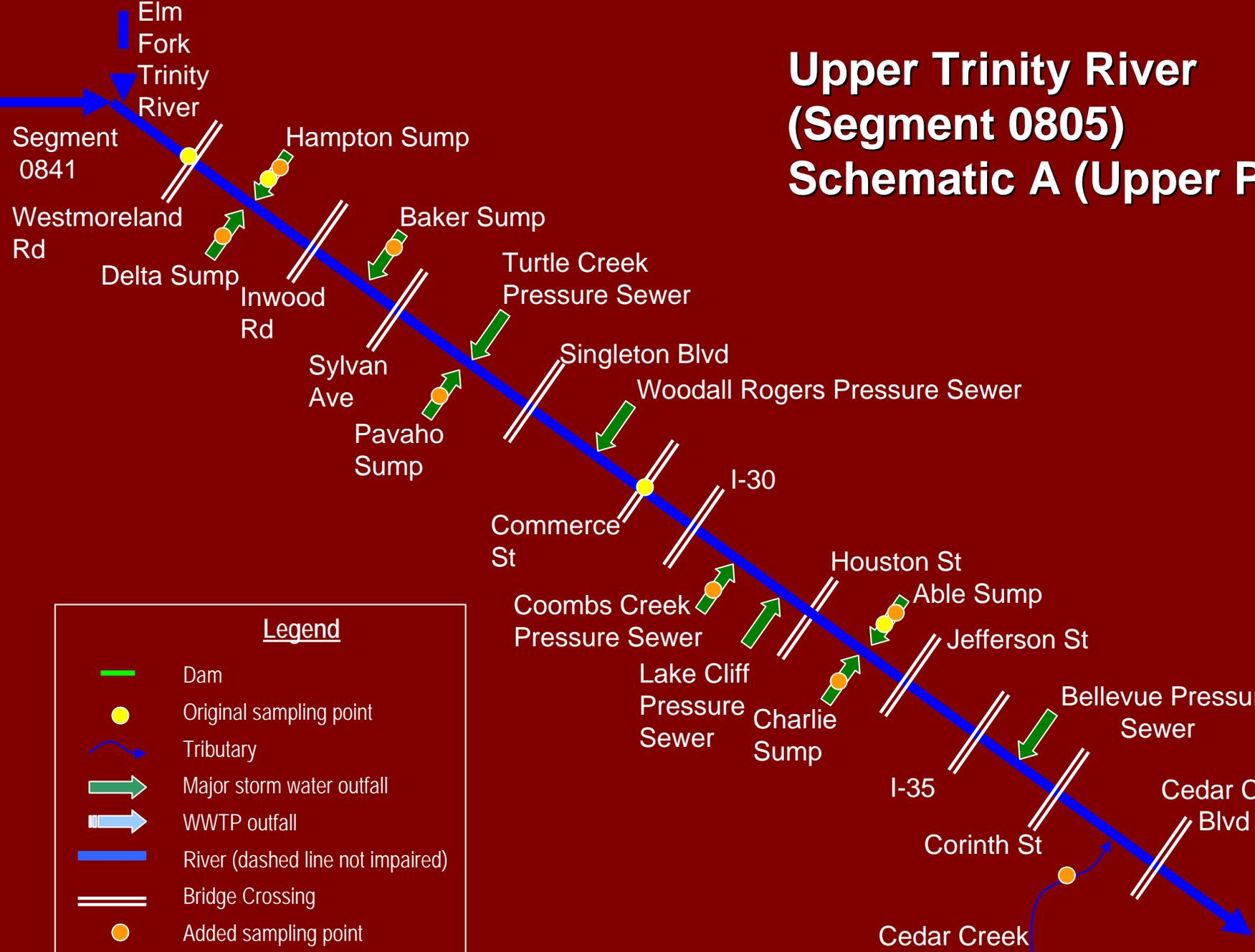


Legend

-  Dam
-  Original sampling point
-  Tributary
-  Major storm water outfall
-  WWTP outfall
-  River (dashed line not impaired)
-  Bridge Crossing
-  Added sampling point

 Elm Fork
 Trinity River

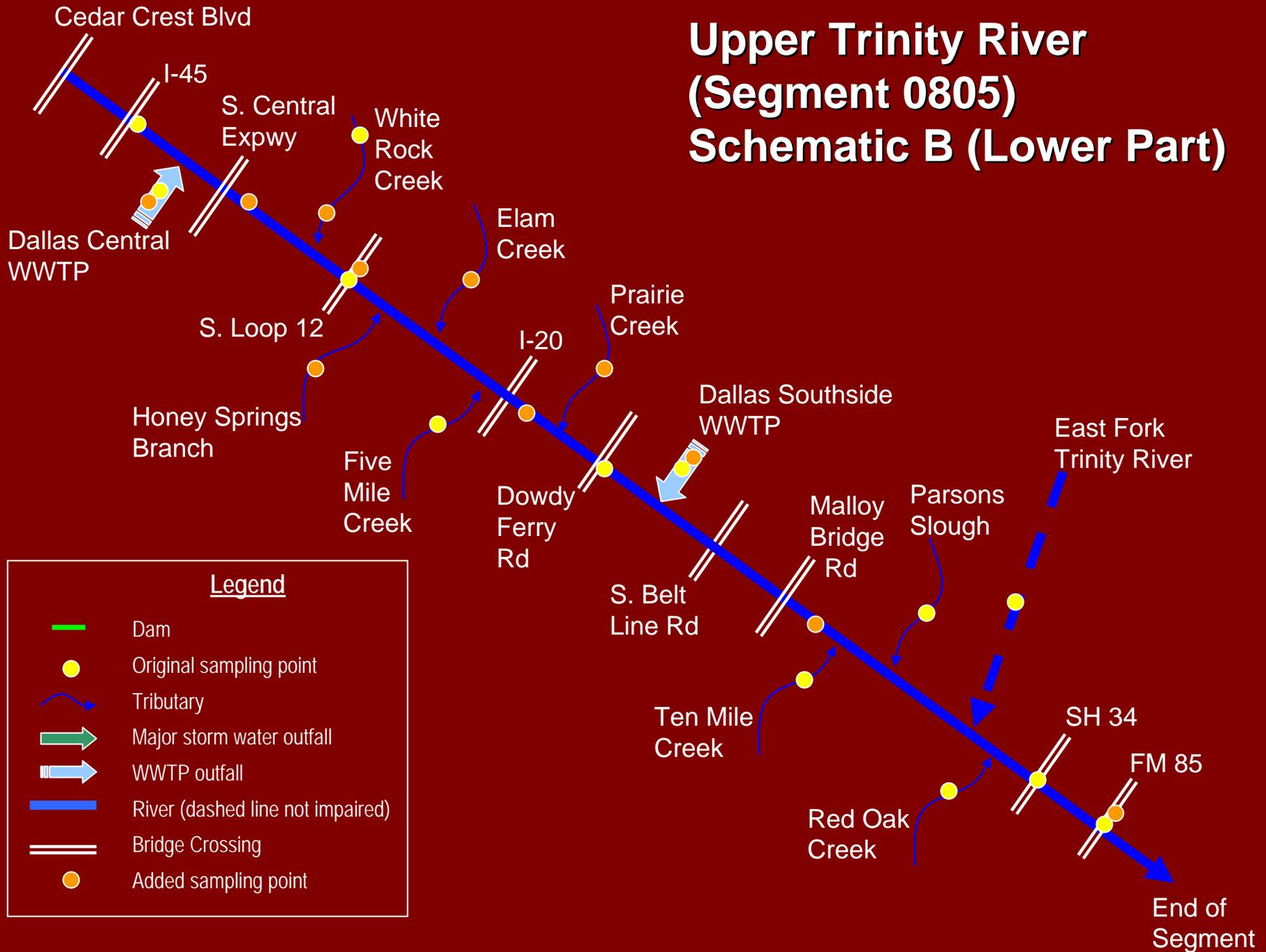
Upper Trinity River (Segment 0805) Schematic A (Upper Part)



Legend

-  Dam
-  Original sampling point
-  Tributary
-  Major storm water outfall
-  WWTP outfall
-  River (dashed line not impaired)
-  Bridge Crossing
-  Added sampling point

Upper Trinity River (Segment 0805) Schematic B (Lower Part)



Legend

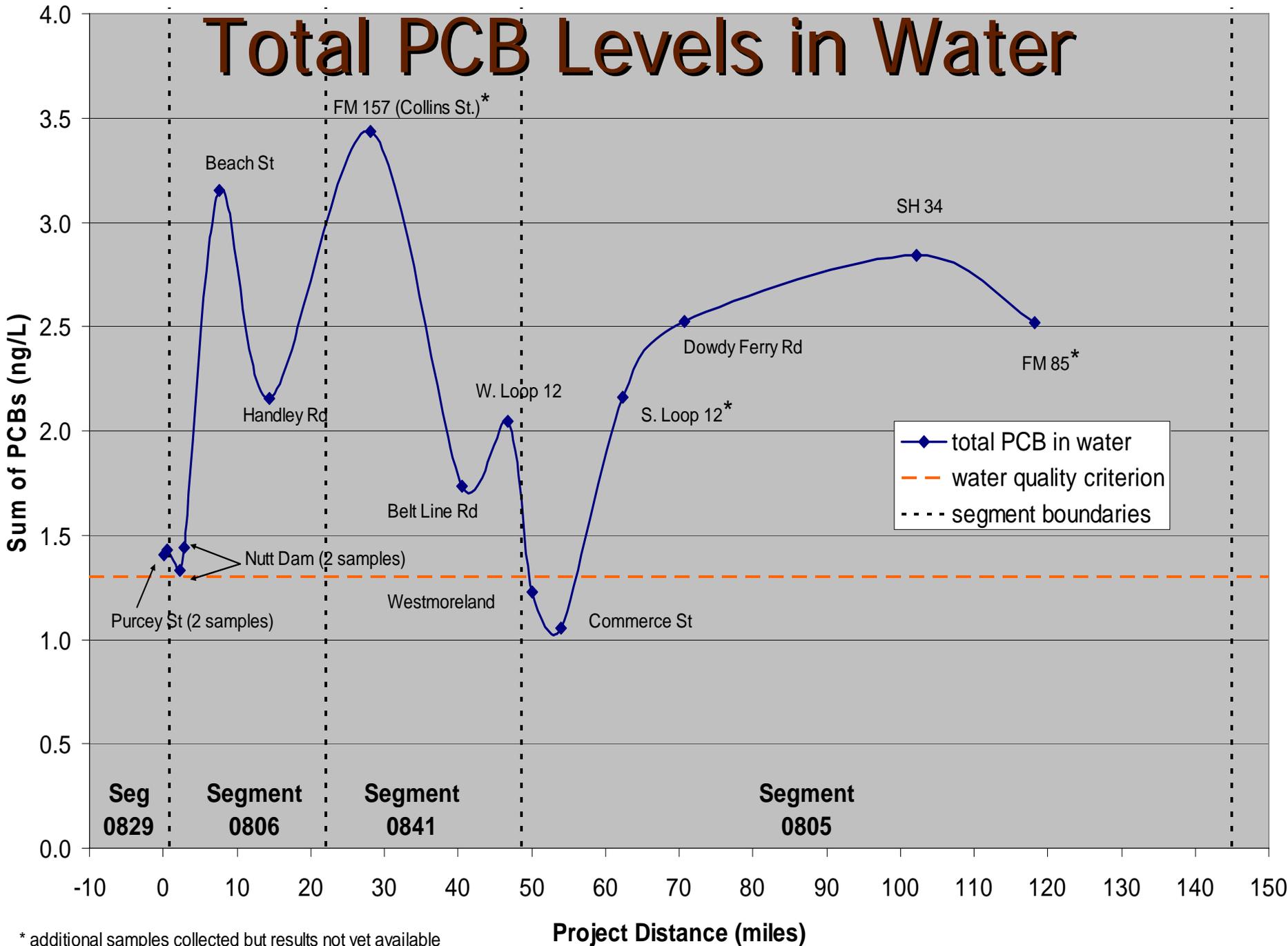
- Dam
- Original sampling point
- Tributary
- Major storm water outfall
- WWTP outfall
- River (dashed line not impaired)
- Bridge Crossing
- Added sampling point

Preliminary Data Results

March 2008 – June 2008

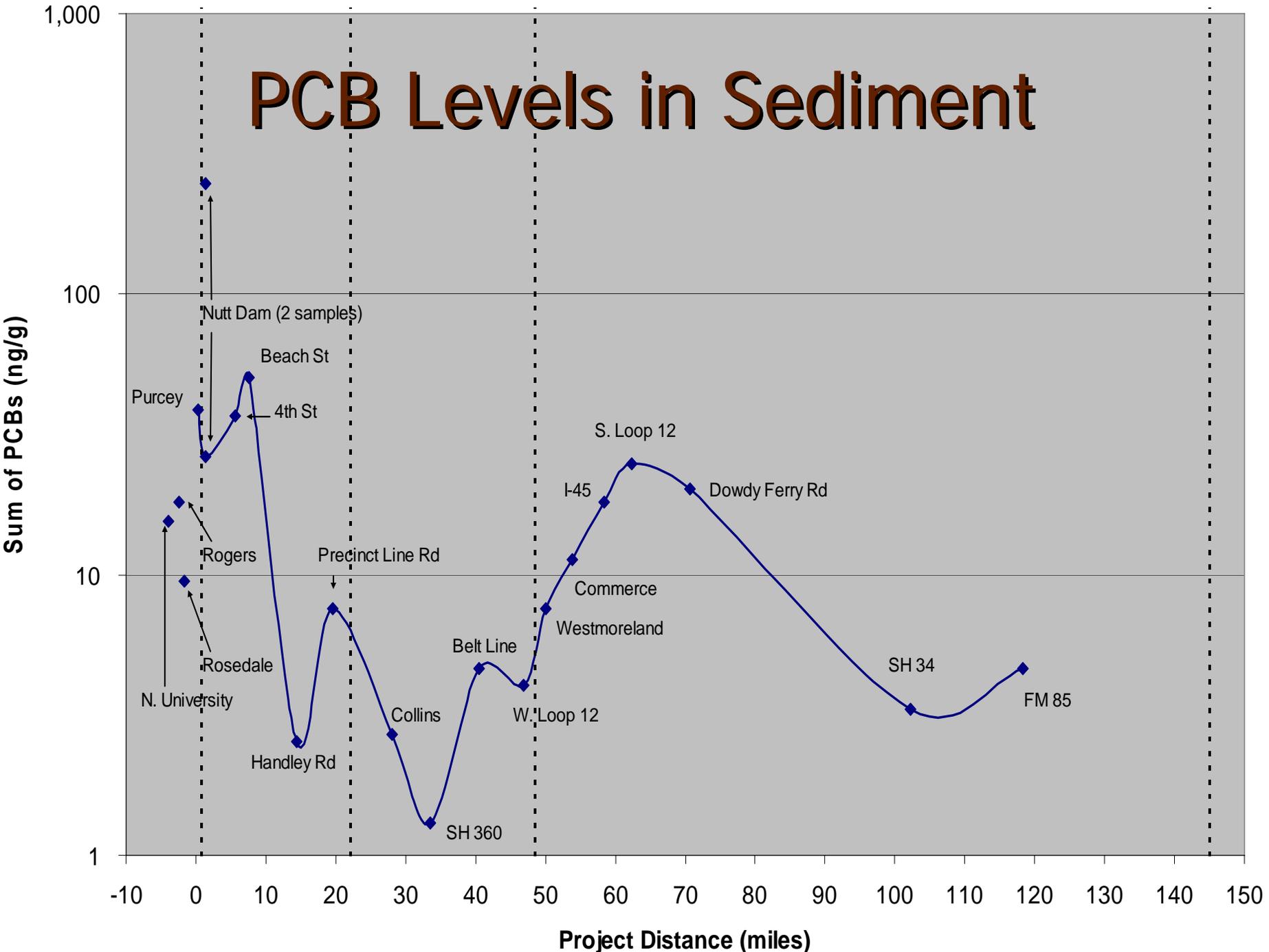
- In-stream PCB concentration measurements
 - 15 measurements at 13 main stem sites
- Sediment PCB concentration measurements
 - 37 measurements at 20 main stem and 14 tributary sites
- PCB loads from wastewater discharges
 - 4 measurements at 4 facilities
- PCB loads from nonpoint-source runoff
 - 6 measurements at 5 sites
- Individual PCB congeners measured by EPA Method 1668A
 - results presented reflect sum of “detected” congeners

Total PCB Levels in Water

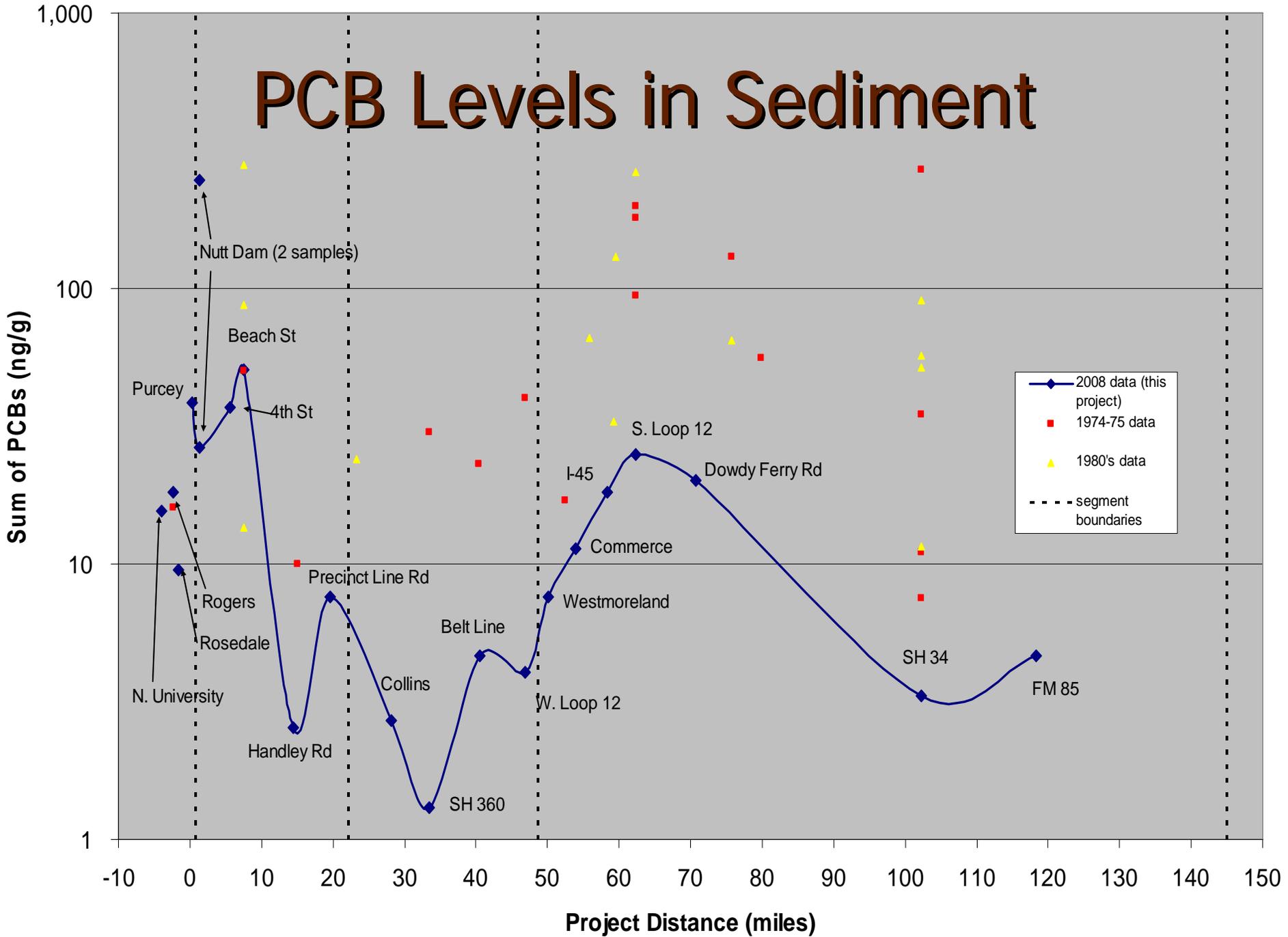


* additional samples collected but results not yet available

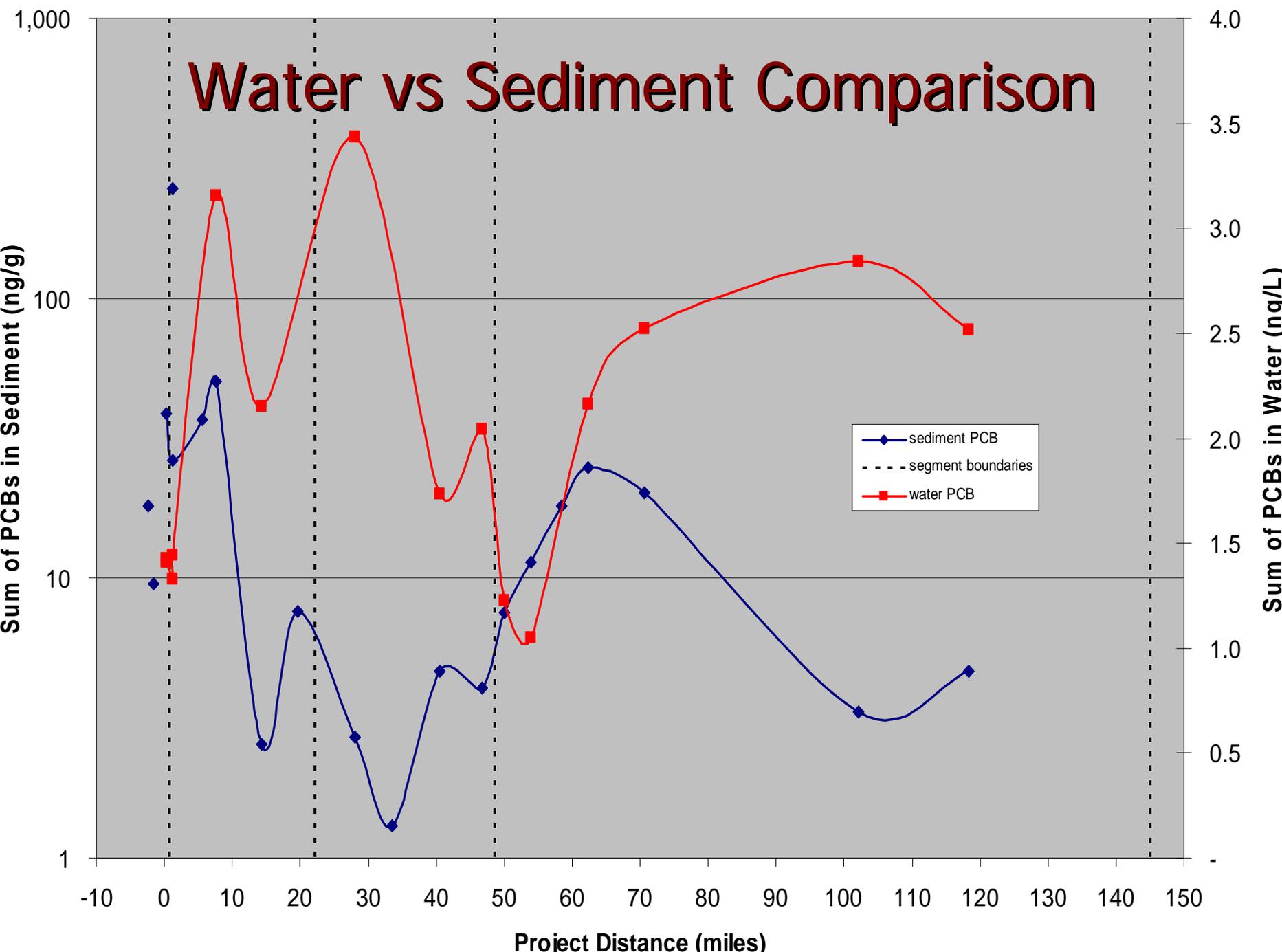
PCB Levels in Sediment



PCB Levels in Sediment

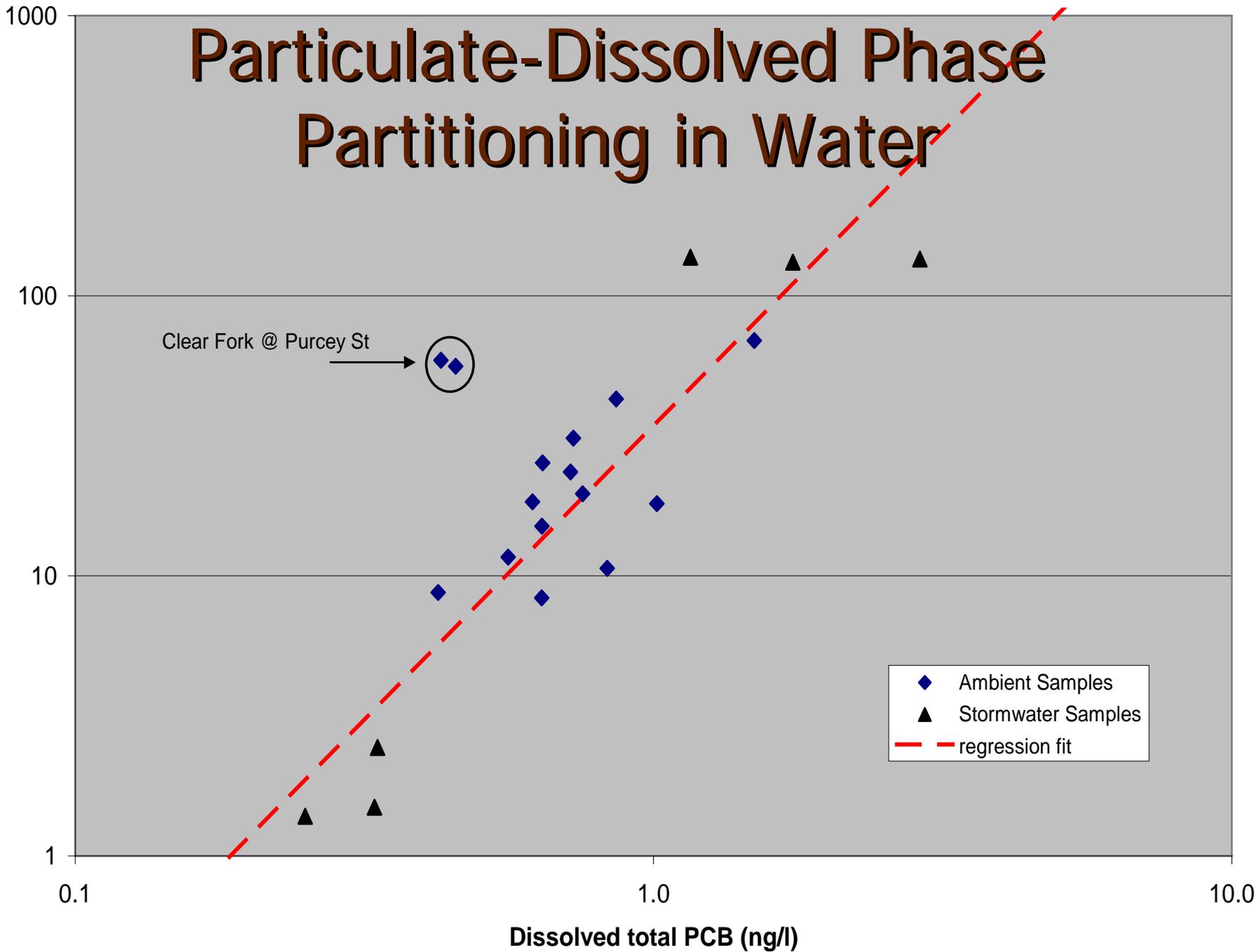


Water vs Sediment Comparison



Particulate-Dissolved Phase Partitioning in Water

Particulate total PCB (ng/g)



PCB Sources: Stormwater and WWTP Effluent

Total PCB (ng/L)

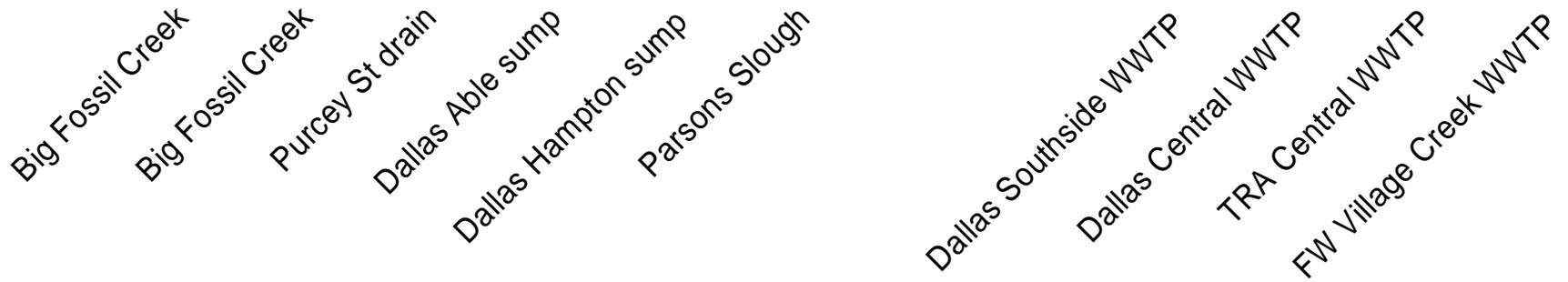
Stormwater

WWTP Effluent

River Max

River Avg

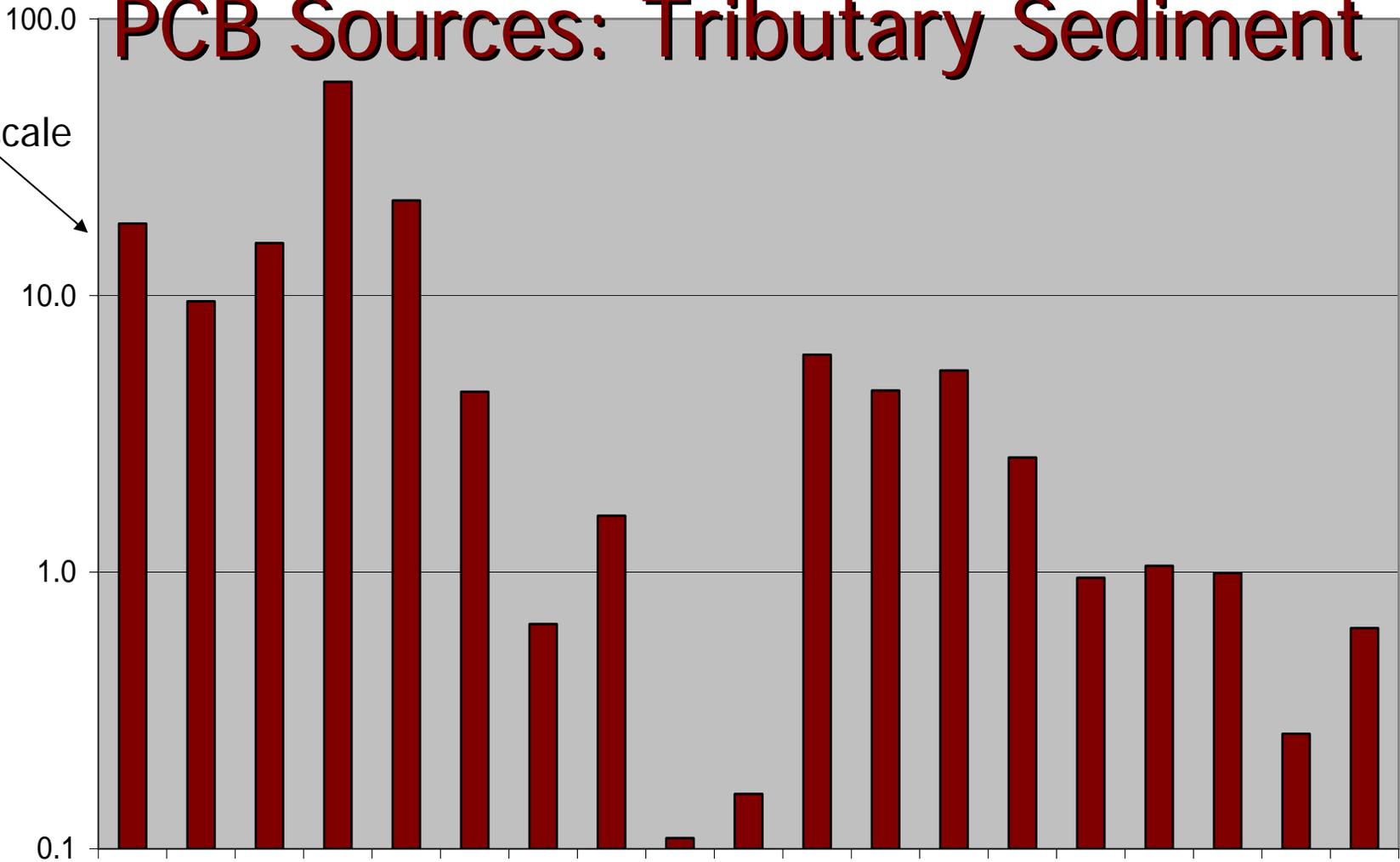
River Min



PCB Sources: Tributary Sediment

Note log scale

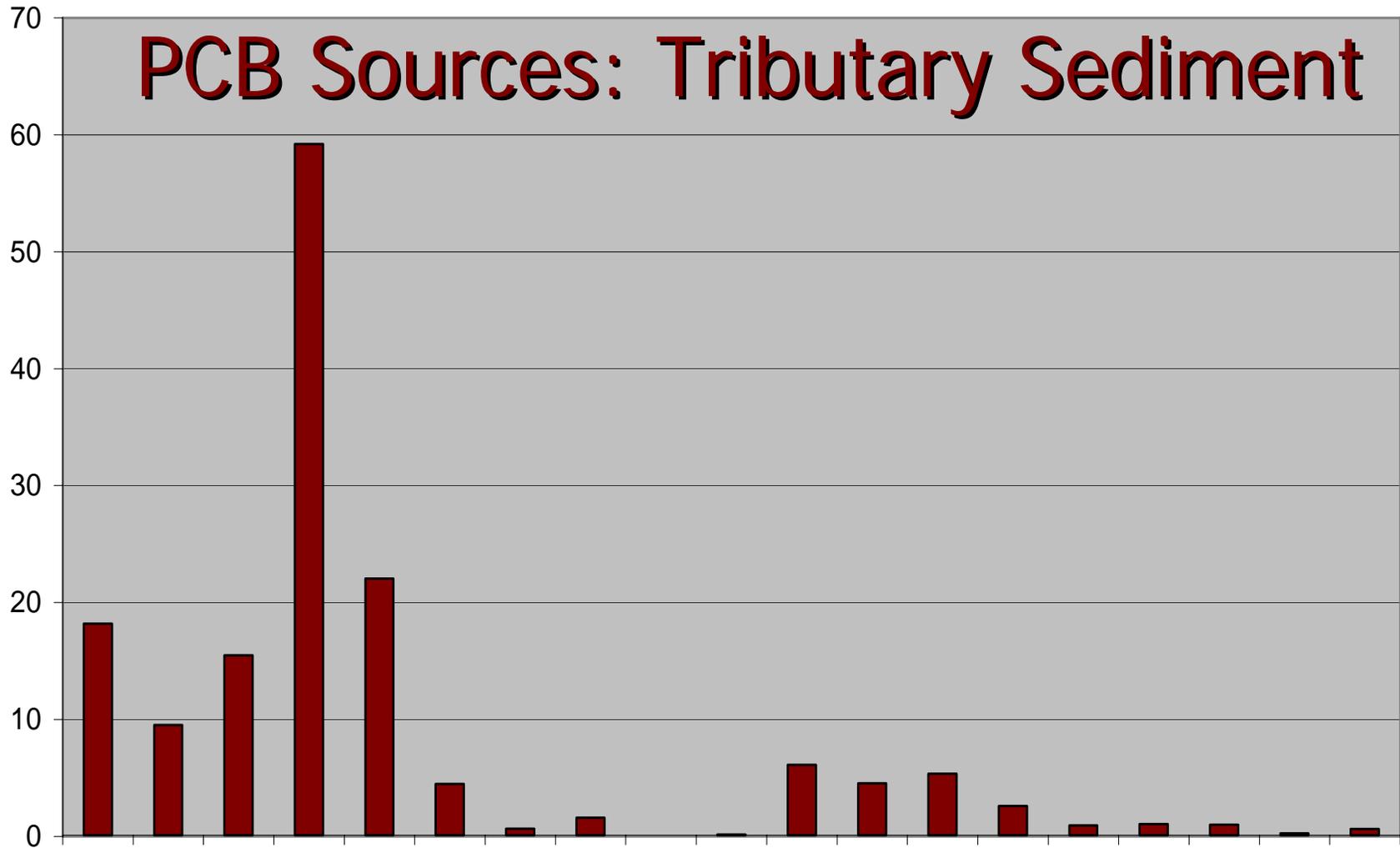
Total PCB (ng/g)



Clear Fork at Rogers Rd
Clear Fork at Rosedale
West Fork at University
Marine Creek
Sycamore Creek
Big Fossil Creek
Village Creek
Johnson Creek
Bear Creek
Bear Creek
Mountain Creek
Elm Fork
White Rock Creek
Five Mile Creek
Ten Mile Creek
Parsons Slough
Parsons Slough
East Fork
Red Oak Creek

PCB Sources: Tributary Sediment

Sum of PCBs in Sediment (ng/g)



Clear Fork at Rogers Rd
Clear Fork at Rosedale
West Fork at University
Marine Creek
Sycamore Creek
Big Fossil Creek
Village Creek
Johnson Creek
Johnson Creek
Bear Creek
Bear Creek
Bear Creek
Mountain Creek
Mountain Creek
Elm Fork
White Rock Creek
Five Mile Creek
Ten Mile Creek
Parsons Slough
Parsons Slough
East Fork
East Fork
Red Oak Creek

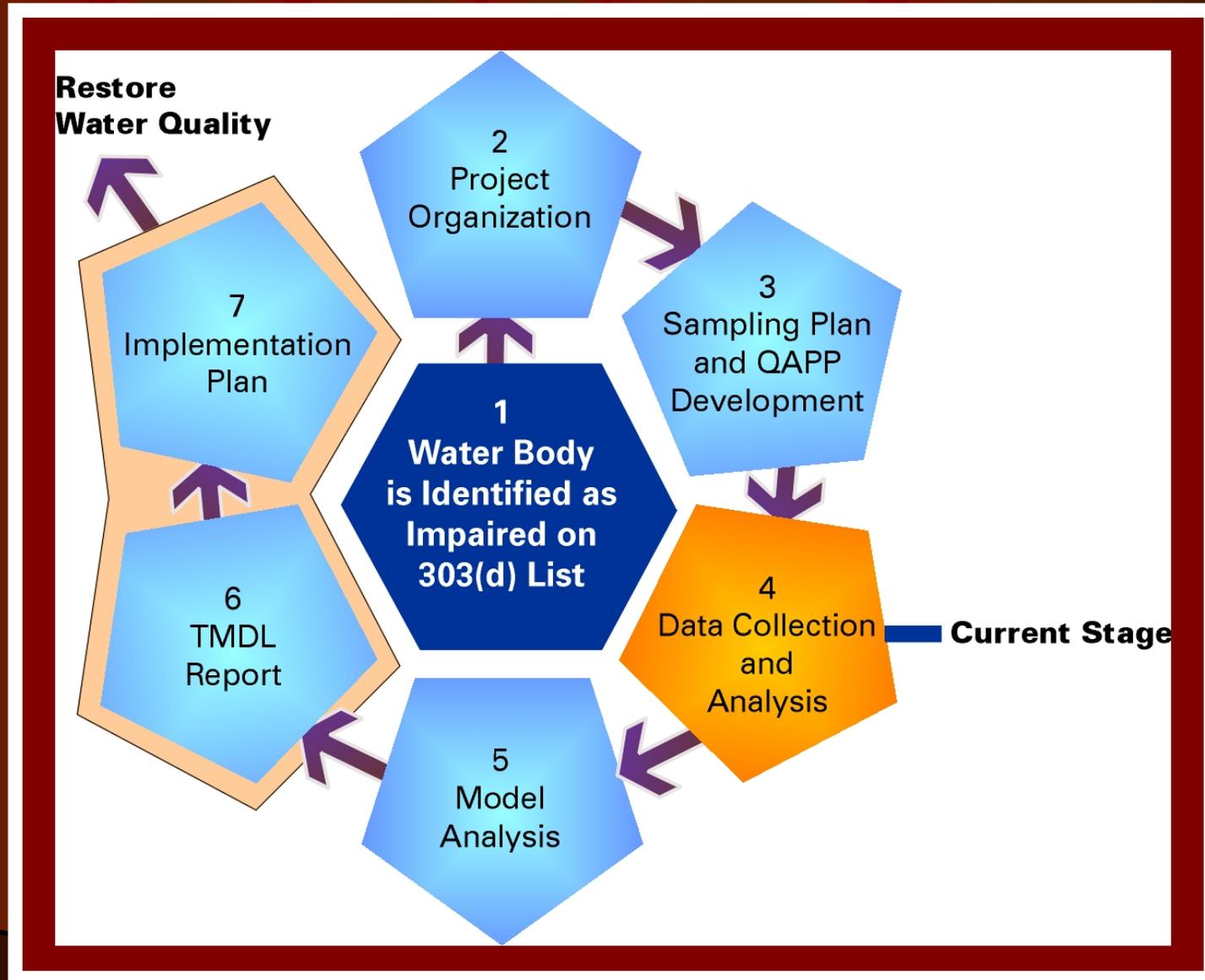
Preliminary Observations

- PCB levels in water exceeded water quality criteria in 13 of 15 samples from the Trinity River
- PCB levels in stormwater from older, densely developed urban areas are much higher than those in-stream, indicating continuing PCB impacts, but low in rural and suburban areas
- PCB levels in wastewater effluent were lower than ambient levels in the river

Preliminary Observations

- Peaks and dips in the spatial distribution of PCB levels in ambient waters occur downstream of those in sediment, perhaps indicating gradual flux of PCBs from sediment to water
- PCB levels in sediment appear to have declined since the 1970s and 1980s in Segment 0805 and 0841, but perhaps not in Segment 0806
- The variability in PCB levels in tributary sediments indicates continuing local sources in some areas

TMDL Process and Project Schedule



Questions?

- For further questions:

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