

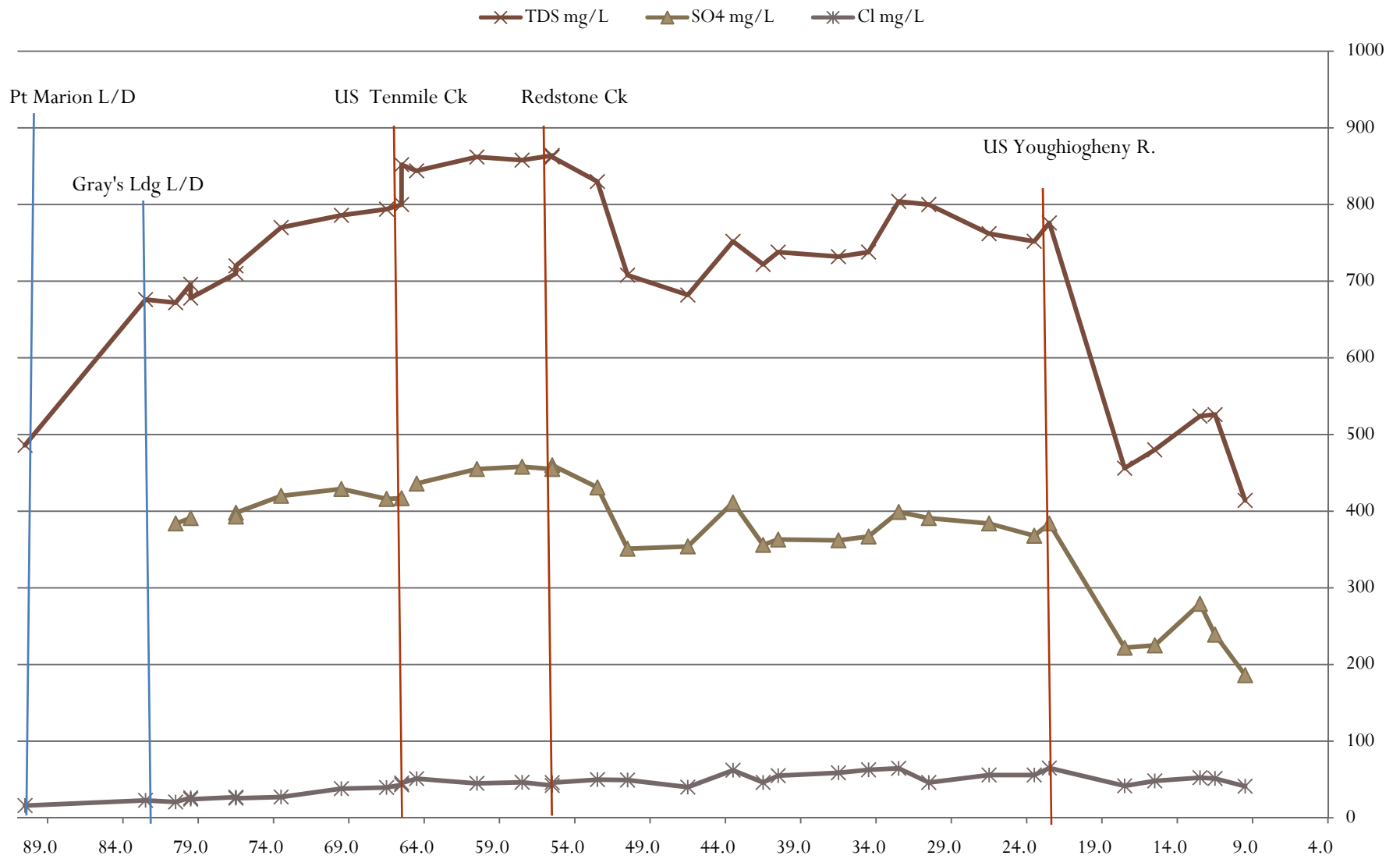
High TDS in the Monongahela River Analysis of Chemical Data

Paul Ziemkiewicz, PhD

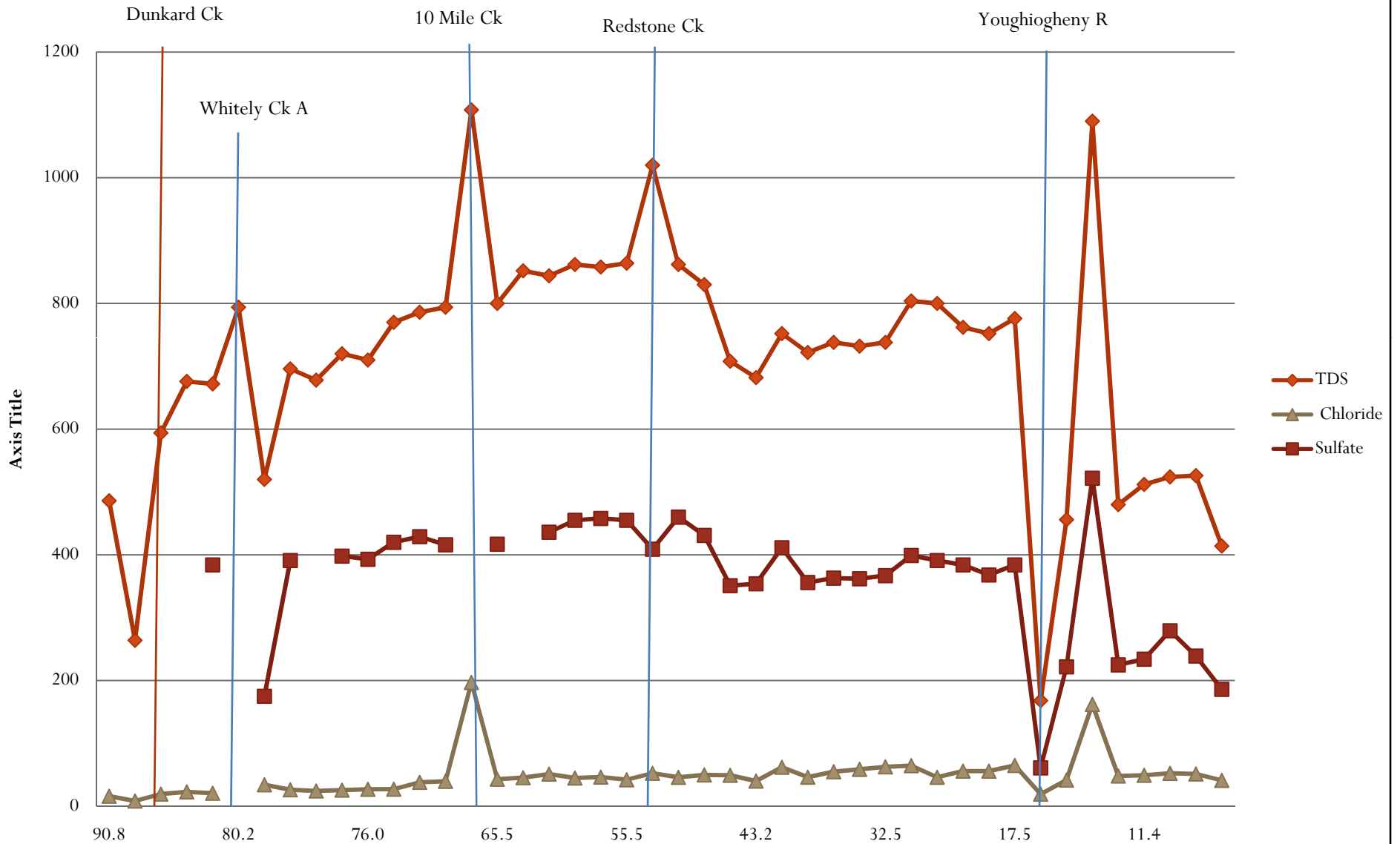
Director, West Virginia Water Research Institute

West Virginia University

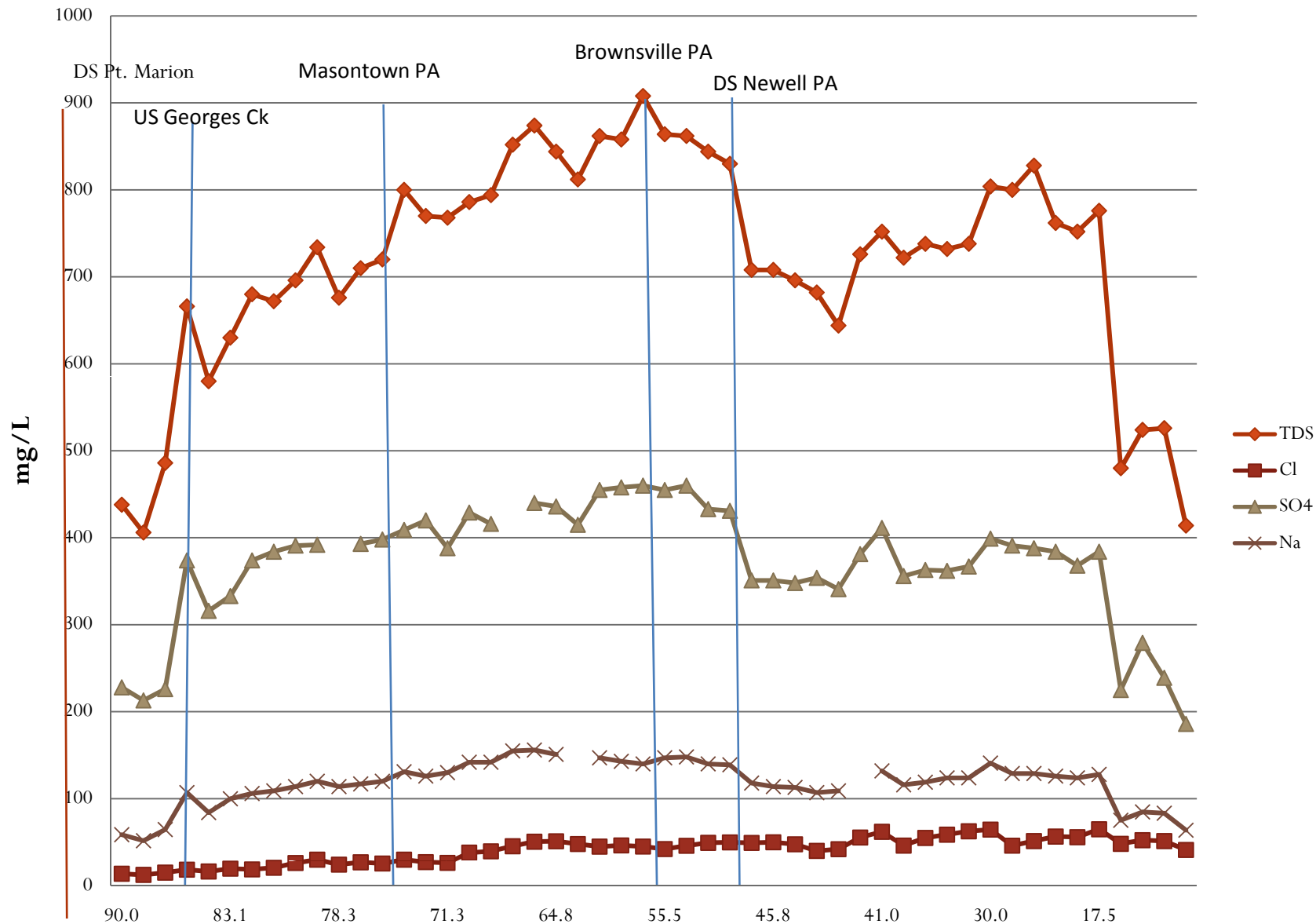
Monongahela River Only. PaDEP sampling A: Oct 08



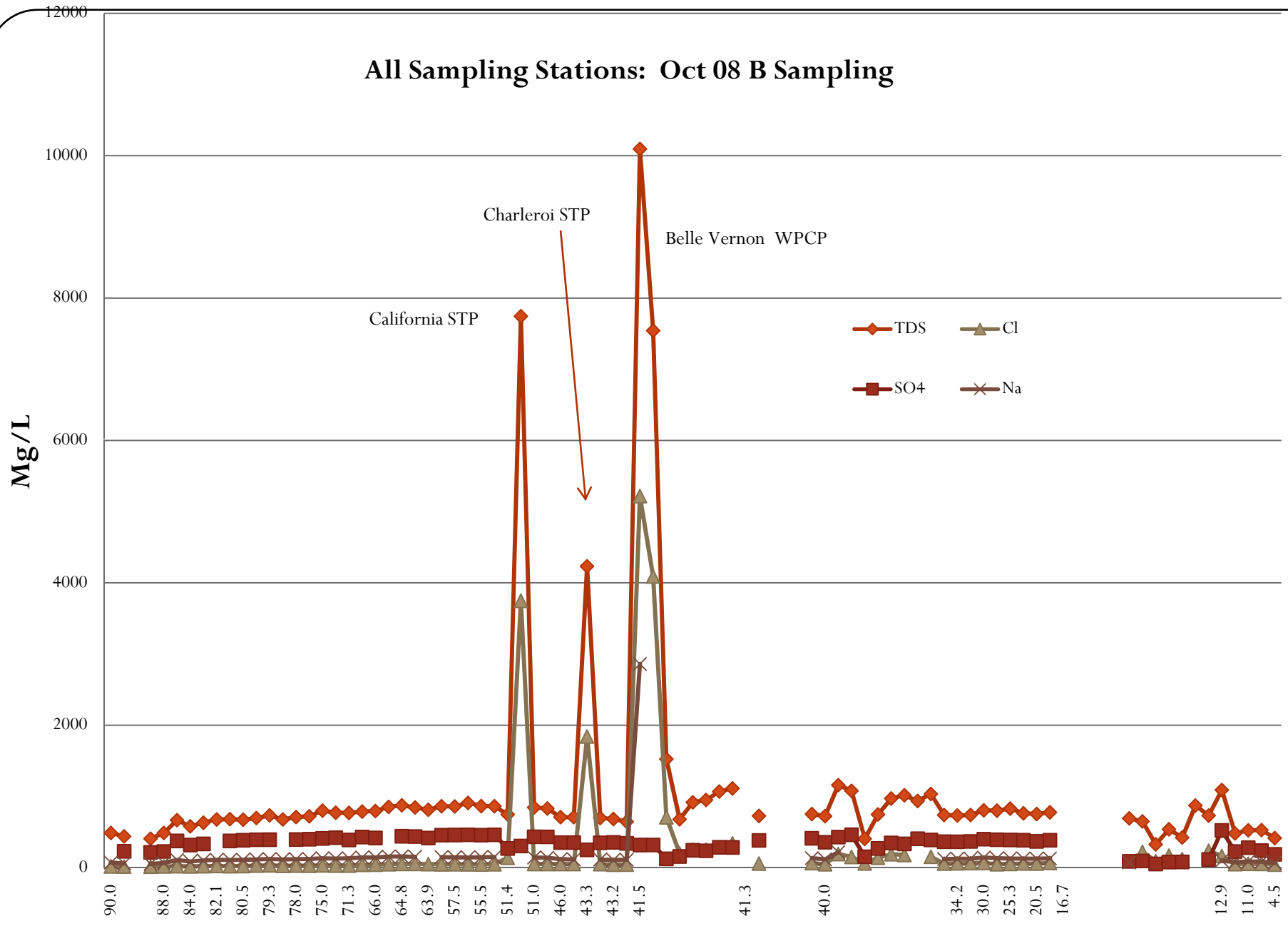
PaDEP Monongahela R. and Tributaries A Sampling



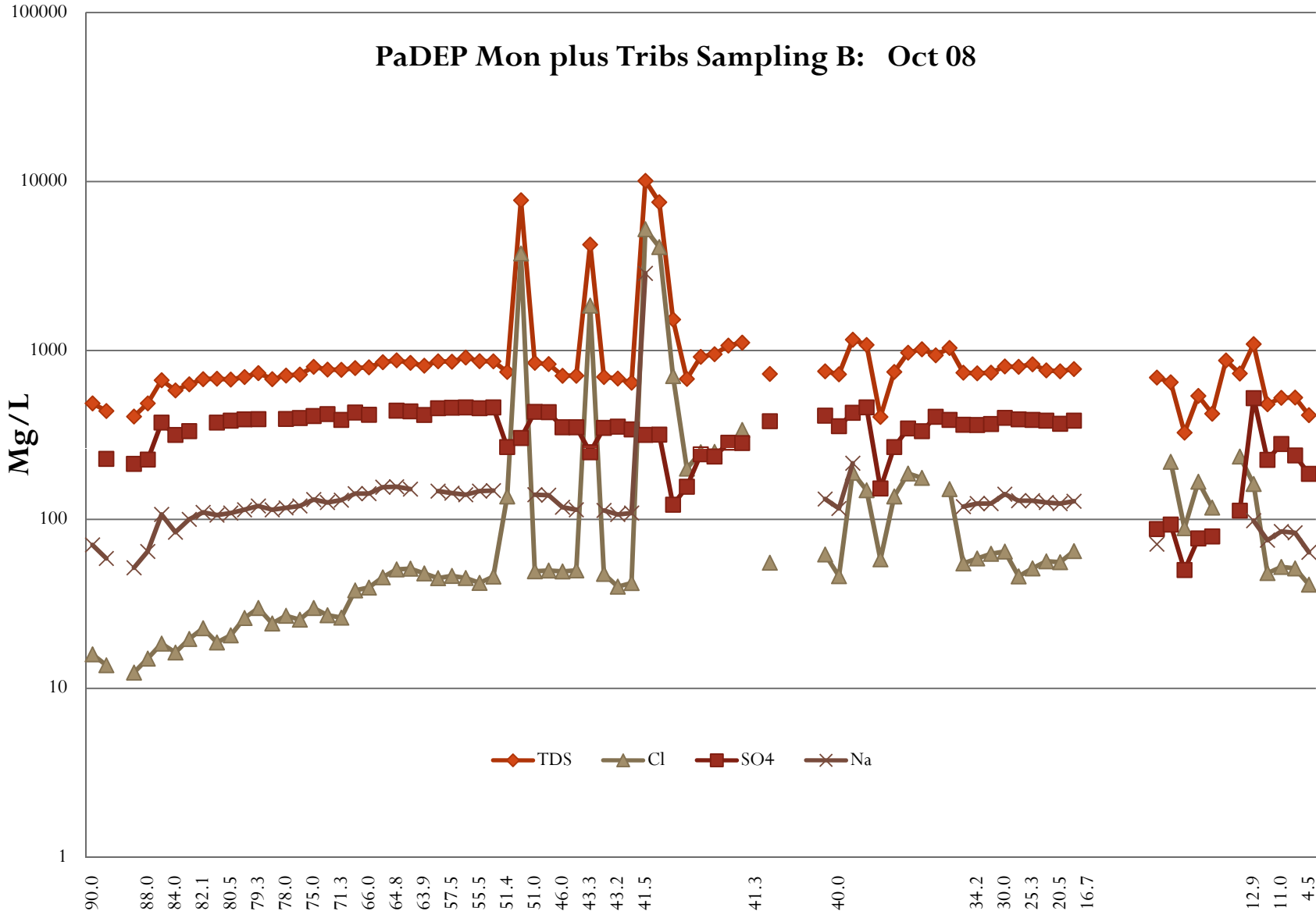
Monongahela River Sampling B: Oct 08



All Sampling Stations: Oct 08 B Sampling



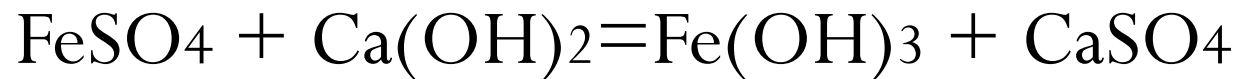
PaDEP Mon plus Tribs Sampling B: Oct 08



Chemical Signatures:

There appear to be two types of water

- CaSO_4 : Treated Mine Drainage



- NaCl : Brine

Contributions to TDS

Averages of stations reporting all ions

	mg/L	% TDS
TDS	981	100%
SO₄	371	38%
Na	192	20%
Cl	189	19%
Ca	84	9%
Mg	24	2%
Total	860	88%

River vs. STP outfalls

Proportion of TDS

	Cl	SO₄	Na	Ca	Mg	Total
River	6%	52%	16%	10%	3%	87%
STPs	34%	20%	23%	7%	2%	87%

Water Use Implications: Perspective

Estimated Marcellus Frac Water Demand:

WV-2008

If 1,200
wells

developed: gal/well gpm cfs

1,200 2,500,000 5708 12.7

Recommendations: Managing TDS in the Mon Things that can be done in the near term

- Develop relationship between flow and TDS/other ions
- Management tools:
 - Dilution?
 - Coordinate release of treated
 - mine water
 - Frac water
 - With higher river flows