

The Perfect Storm: **Ramifications of a Spring Thaw Runoff Event**



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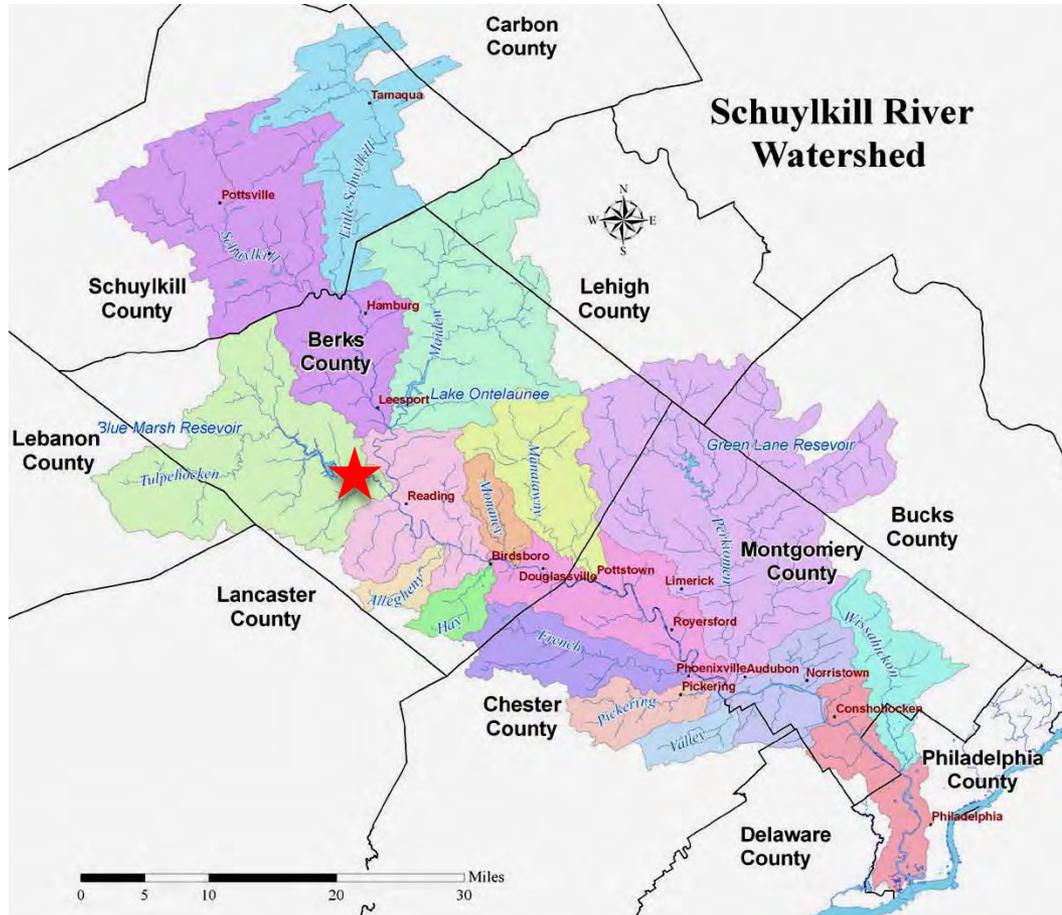
History of WBWA

- The boroughs of Shillington, West Reading, and Wyomissing created WBWA in 1969. Construction of the treatment plant was started in 1972, and the plant went into operations in June of 1974.
- The Authority Board consists of six total members, two members from each of the founding boroughs.
- The Authority processes and delivers water in bulk to the Boroughs of Shillington, West Reading, Wyomissing, and additionally supplies water to residents of Mohnton, Wernersville, and portions of Spring, Cumru, Bern, and Lower Heidelberg Townships.

Operational Overview

- Western Berks Water Authority operates a surface water treatment plant in Berks County, water is taken from the Tulpehocken Creek, ½ mile downstream of Blue Marsh Dam.
- The plant's capacity is 16 MGD, permitted flow is 7.5 MGD, the plant is currently producing between 3.5 & 4.5 MGD
- The plant was designed with Upflow clarification, but in 2001 was retro-fitted with DAF (Dissolved Air Flootation) Units.
- The plant has eight multi-media filters each rated for 2 MGD.
- The process includes chemical addition for Potassium Permanganate, Powdered Activated Carbon, Coagulant (DF-801), Fluoride, Chlorine, Potassium Hydroxide, Phosphate, and Ammonium Sulfate

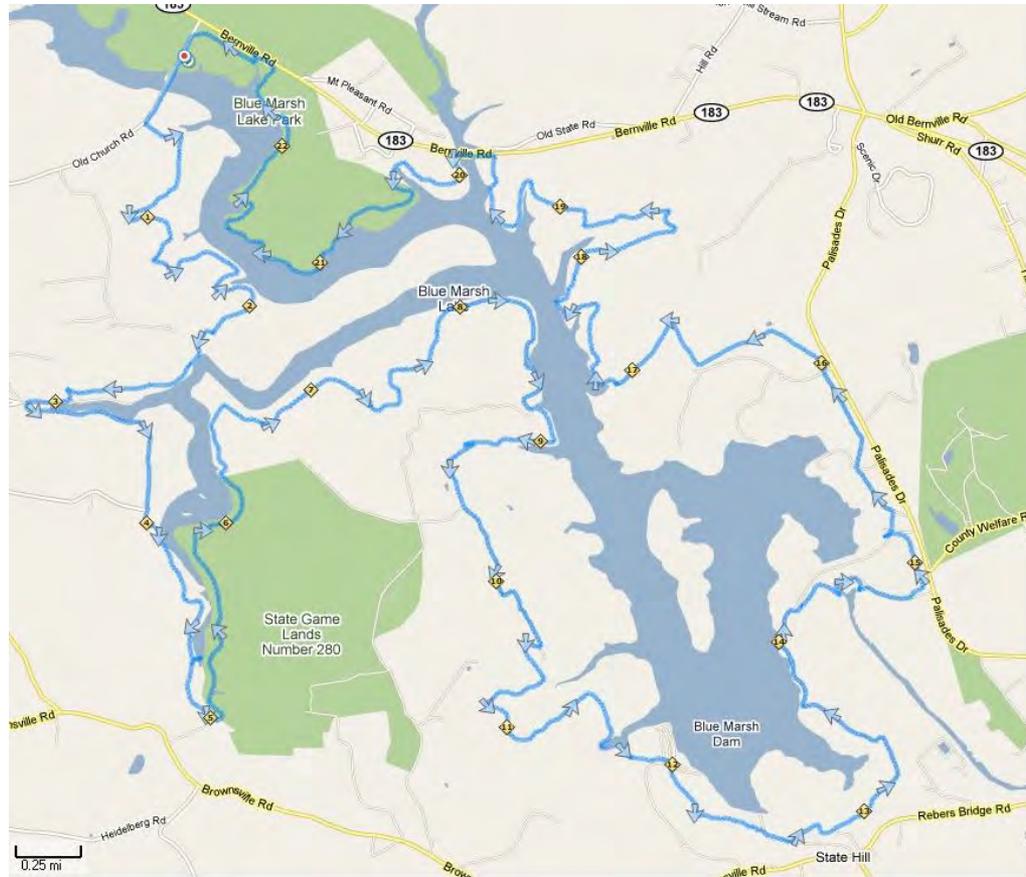
Schuylkill River Watershed



Geographic Timeline

- The Blue Marsh Dam Project was authorized in the early 1960's
- Treatment Plant Project was authorized in the mid 1960's
- Construction of the water treatment plant started in 1972 and was designed to connect directly to the dam.
- Construction of the dam started in 1974 and was designed to have a public water system connected directly to it's outlet works
- The water treatment was put into operation in 1974
- The Blue Marsh Project was put into operation in 1979

Map of Blue Marsh



Blue marsh Lake



Blue Marsh Lake Stilling Basin



Blue Marsh Dam

- The project's water control practices benefit the downstream communities of Reading, Birdsboro, Pottstown, Conshohocken and sections of Philadelphia
- The project covers more than 5,000 acres of land and 1,147 acres of water
- The dam is an earthfill dam that is 1,775 feet long, 98 feet high, and can hold more than 16.28 billion gallons of water.
- The summer pool elevation is 290 feet above sea level, and the winter pool elevation is 285 feet above sea level.

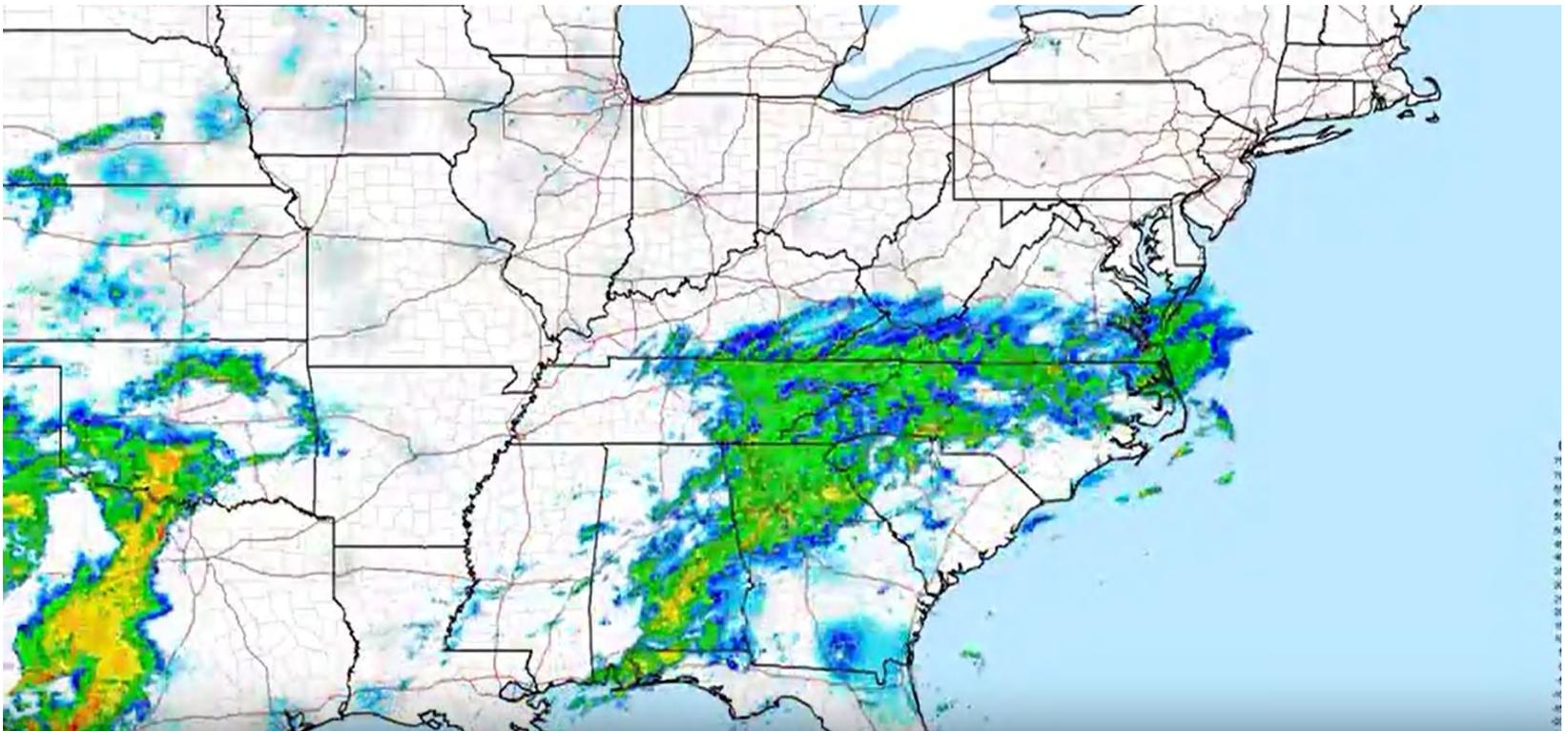
Winter Storm

February 23-24, 2016

Near the end of February 2016, a storm complex developed and produced both a winter storm and the second-largest February tornado outbreak ever recorded. The outbreak produced numerous strong tornadoes across the Gulf Coast and East Coast of the United States, killing 7 people. A total of 61 tornadoes were confirmed as a result of the outbreak.

Winter Storm

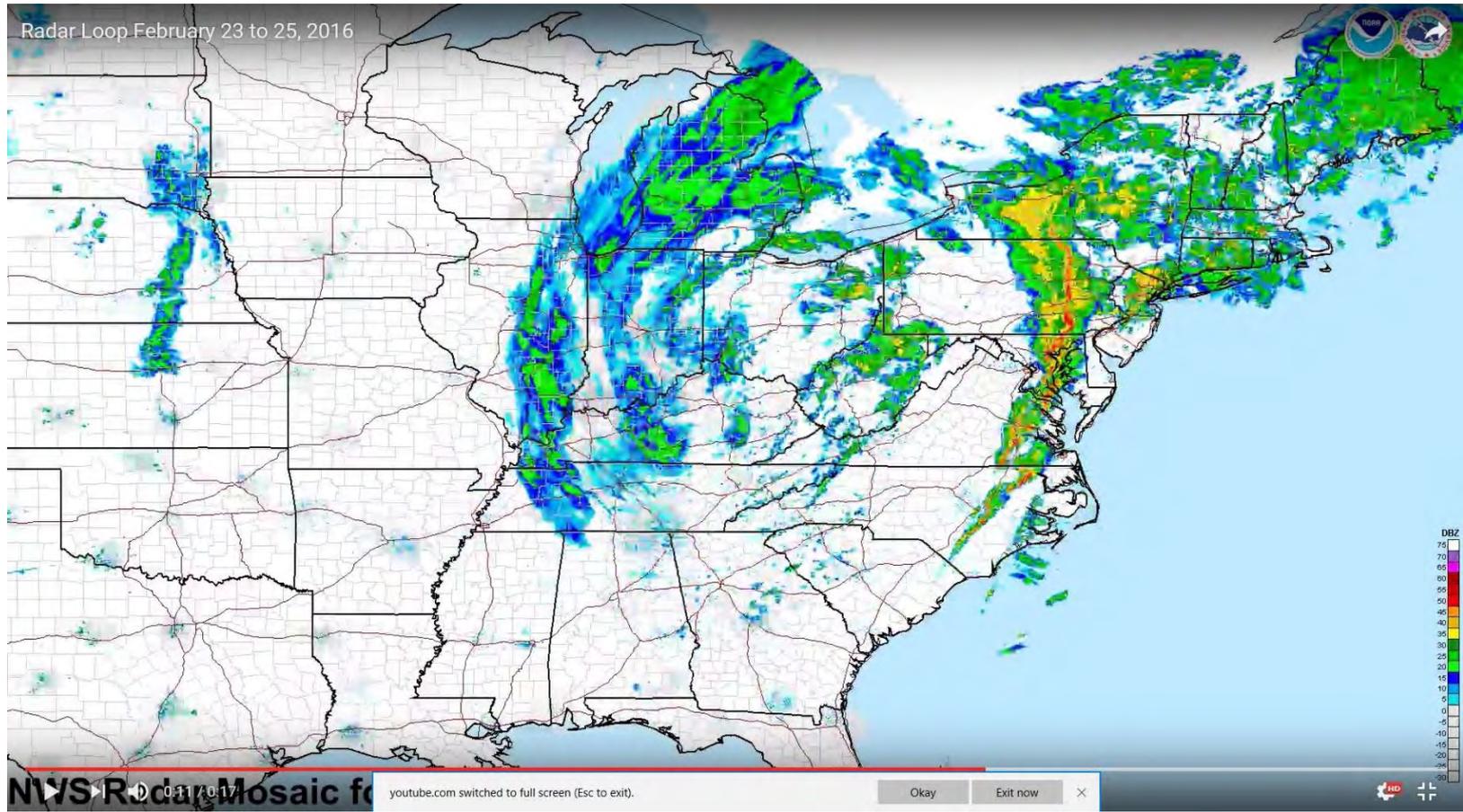
Radar Image of storm February 22, 2016



<https://youtu.be/iR3PCpzPOdo>

Winter Storm

Radar Image of Storm February 24, 2016



<https://youtu.be/iR3PCpzPOdo>

What Happened?

- The storm and the precipitation did not actually cause any immediate issues. Raw water turbidity remained under 10 NTU and the treatment process was unaffected.
- The real problem was the swing in temperature in combination with 2” snow on the ground and frozen soil.
- The rain and high temperatures began to melt the snow, thaw the soil and a massive runoff event began. The entire lake turned brown.
- Following the rain event, the dam released 2000 cfs from February 26 until March 21. Turbidities immediately following the release averaged between 60 to 80 NTU.

Winter Storm

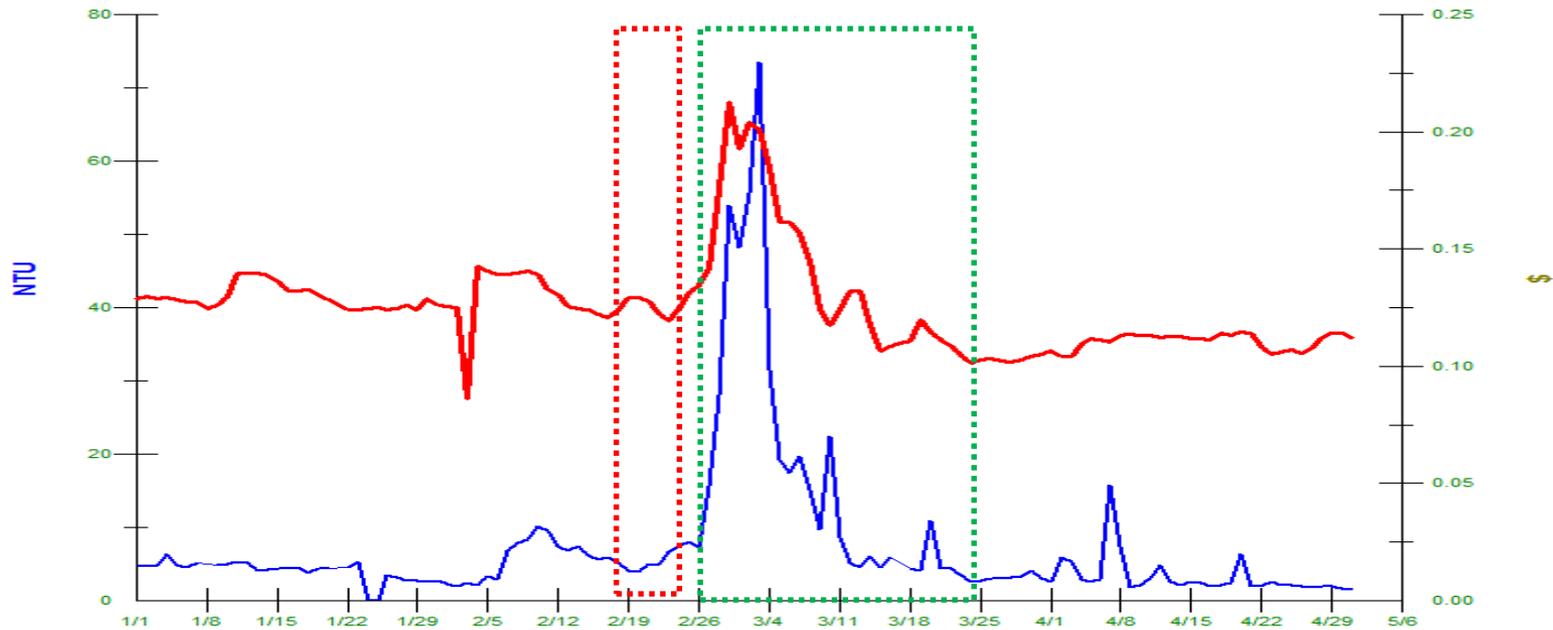
- WBWA measured rainfall:
 - February 230.41”
 - February 241.40”
 - February 250.25”
 - February 260.00”
- WBWA measured max daily temperature:
 - February 2336.8°F
 - February 2461.7°F
 - February 2559.5°F
 - February 2636.8°F

Blue Marsh Lake Winter Pool?

The summer pool elevation is 290 feet above sea level, and the winter pool elevation is 285 feet above sea level.



Turbidity Event After Storm



Chemical Cost per 1,000 Gallons

Turbidity



How did we do?

IFE Max Turbidities

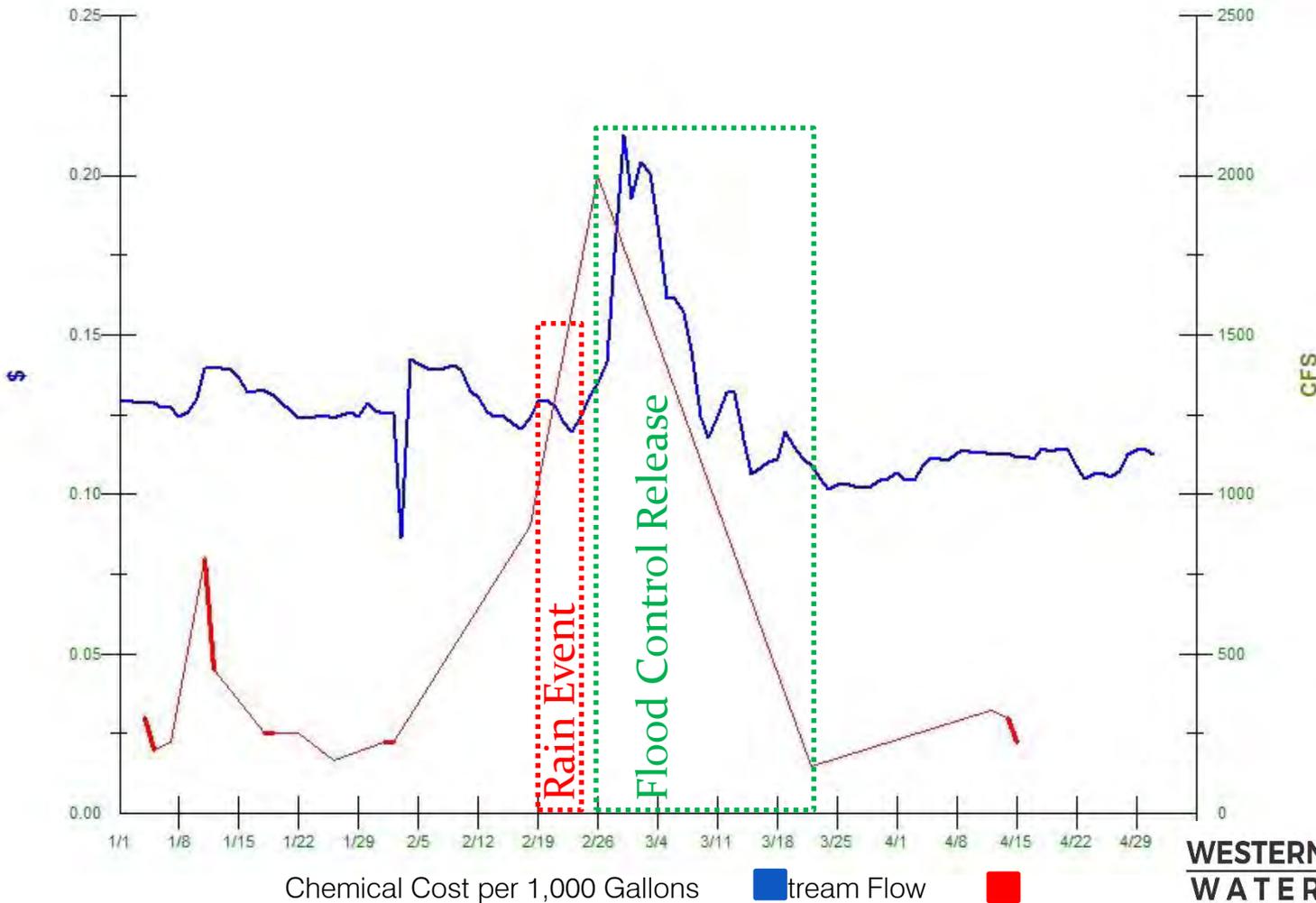
February 2016

Date	F01 Turbidity 15min NTU	F02 Turbidity 15min NTU	F03 Turbidity 15min NTU	F04 Turbidity 15min NTU	F05 Turbidity 15min NTU	F06 Turbidity 15min NTU	F07 Turbidity 15min NTU	F08 Turbidity 15min NTU
Maximum	0.036	0.034	0.028	0.047		0.020	0.026	
Time	2/28 - 12:00	2/12 - 09:00	2/12 - 21:00	2/23 - 12:15		2/14 - 10:15	2/18 - 21:00	
Average	0.027	0.025	0.020	0.016		0.014	0.020	

- The maximum Individual Filter Turbidity during the event was 0.047 NTU.
- The Partnership for Safe Water has forced us to look at ways to make our treatment process more robust, and we were able to beat all Partnership goals during this event.

Dam Release After Storm

This was not a typical rain event. We experienced high turbidity (>50 NTU) raw water for 16 days.



How do you plan for this?

- Extensive Source Water Protection Plan
- Extensive Partnerships (SAN, PWD, US ACE, BCWSA, etc.)
- MS4 initiative in Berks County

The Problem: This is FEDERAL PROPERTY

This is FEDERAL PROPERTY

They have their own set of rules and will proudly tell you that it will take an act of congress to change them.

What's Next

- We realized that extreme weather events are becoming more likely.
- We realized that no matter how much we plan, or invest in our planning, you need to focus on your treatment process and we were able to achieve success through the Partnership's optimization process.
- We realized that we have zero control of our raw water source, and that our needs as a water supplier are not at the top of the Army Corps of Engineer's list.
- We have continued to push for our project to connect directly to the dam and utilize its selective withdrawal system.

Raw Water Pipeline Project

Why Not (1980-2010)

- Original construction costs exceeded projected cost estimates
- The belief that the stream provided water quality benefits

Why (2011-Present)

- Water quality
- Cost savings
 - Electrical
 - Chemical
- Improved design for pipeline
- High flow events have widened stream which has made more shallow and increased temperature

Project Rationale

- Location of WBWA water treatment plant property (map)
- Original design of Blue Marsh Project
- Continuing financial contribution of WBWA to Blue Marsh construction costs
- Stream intake issues
- Cost savings to WBWA and public (chemicals, electricity)
- Water Quality to Public



Takeaways

- You need to watch the weather and extended forecasts.
- The partnerships created with the Source Water and MS4 planning are extremely important and need to be continuously evolving.
- You need combat complacency and embrace the idea of making your treatment facility “bulletproof” so that if all else fails, the treatment process can handle these types of upsets.
- Continually assess the tools available to you and your staff and look for new or better treatment techniques.

Questions

