

Drinking Water Quality Impacts of Watershed Fires: A Case Study

Ryan Anderson,
Carollo Engineers, Inc.

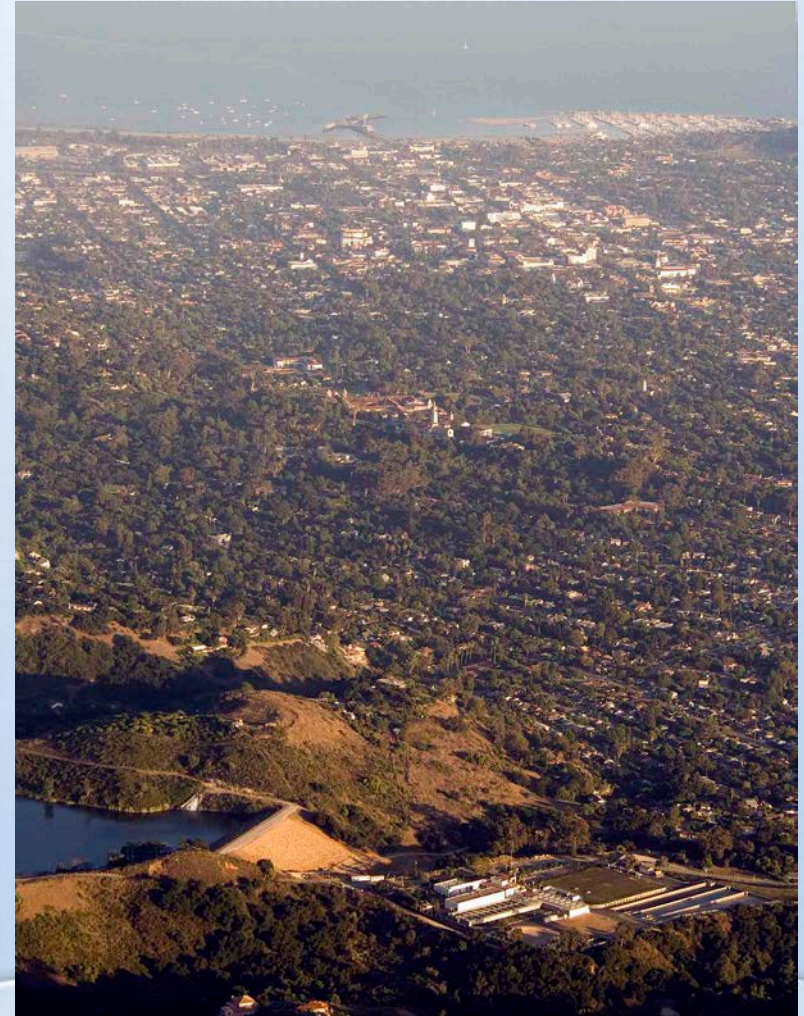
Andrew Rhodes, Cathy Taylor, Josh Haggmark
City of Santa Barbara

Issam Najm,
Water Quality & Treatment Solutions

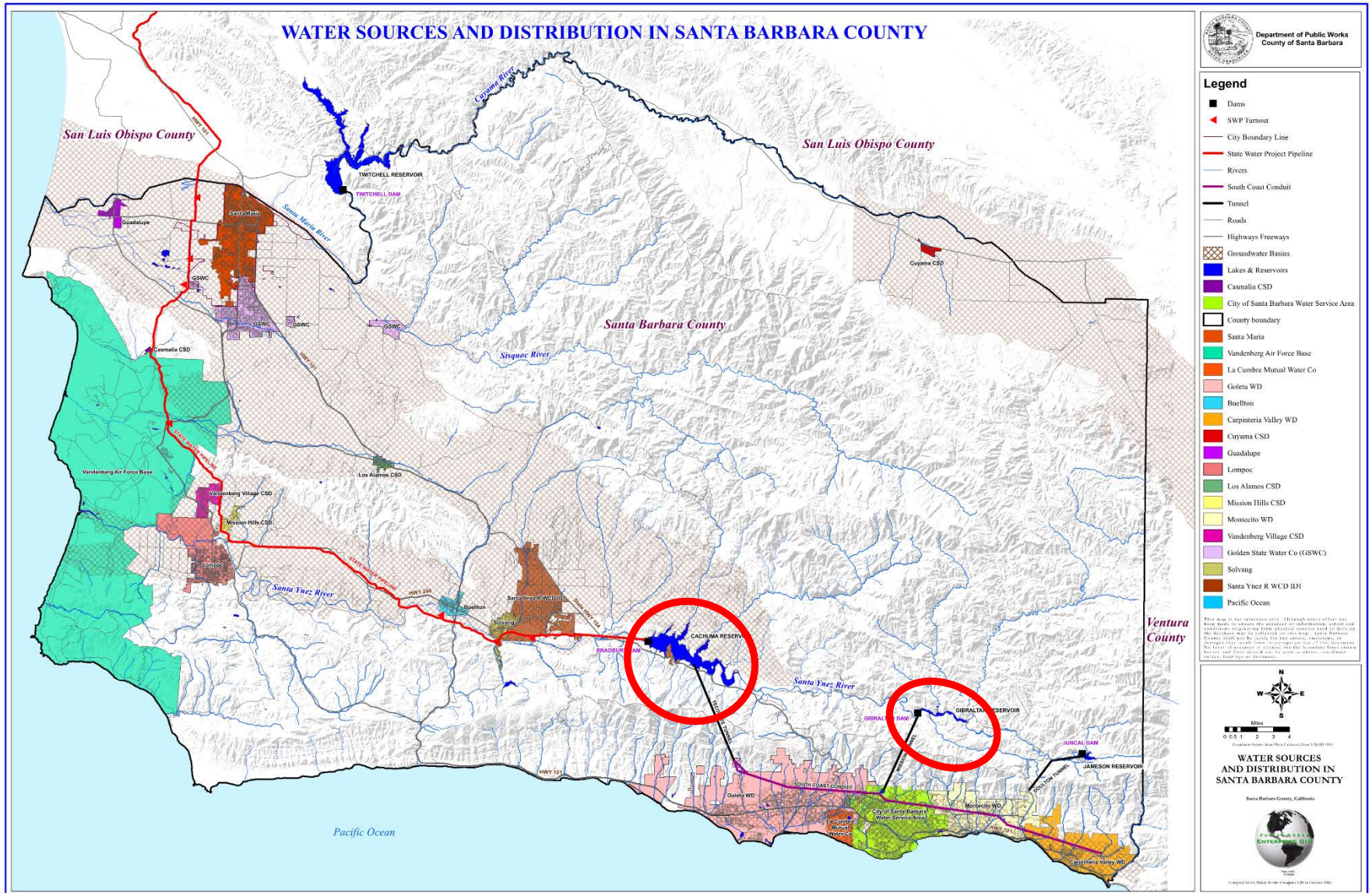


City of Santa Barbara

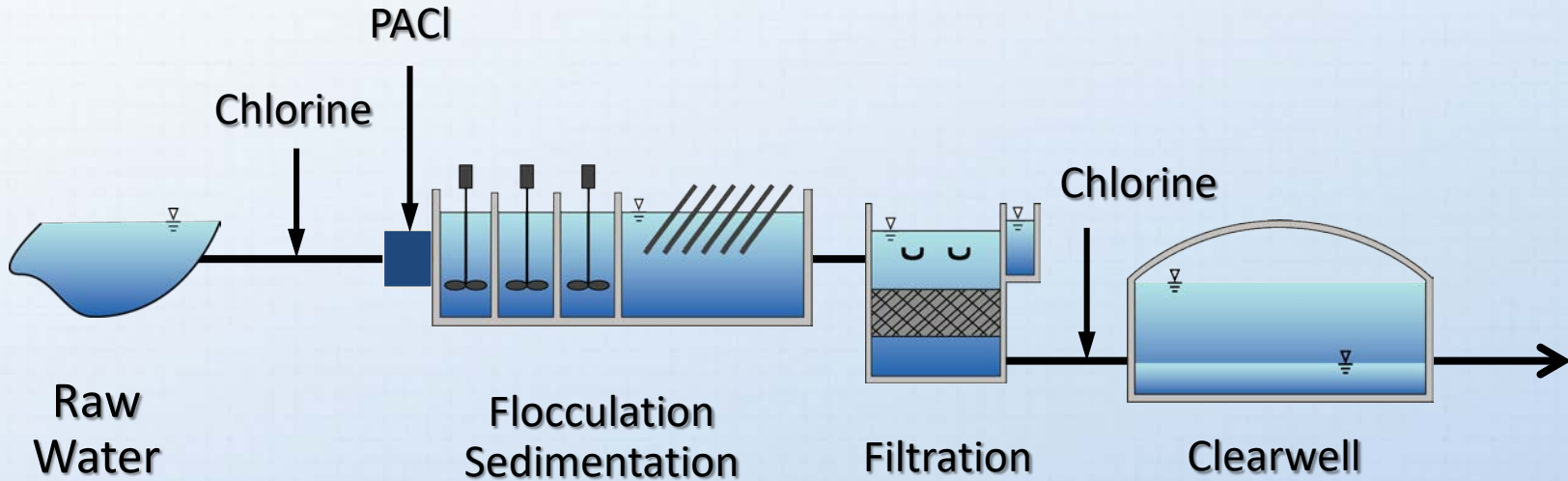
- Population ~100,000
- Water Sources
 - Surface Water (90 – 100%)
 - Groundwater
 - Desalination
- Provide water to other utilities
 - Montecito
 - Carpenteria
 - La Cumbre



City of Santa Barbara – Surface Water Sources



William B Cater WTP



Treats up to 37 million gallons per day

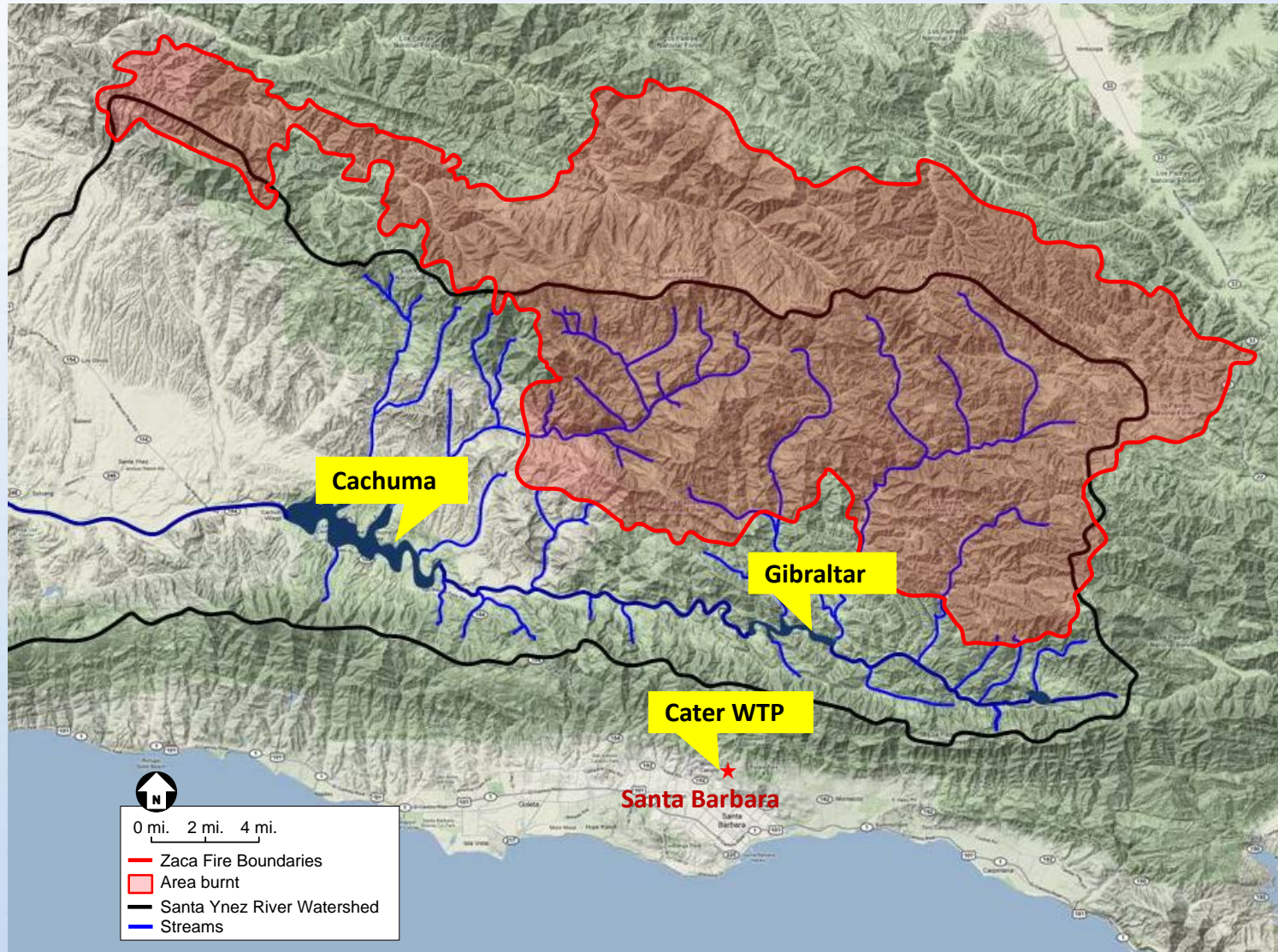
William B Cater WTP (c. 2006)



Zaca Fire – Summer/Fall 2008



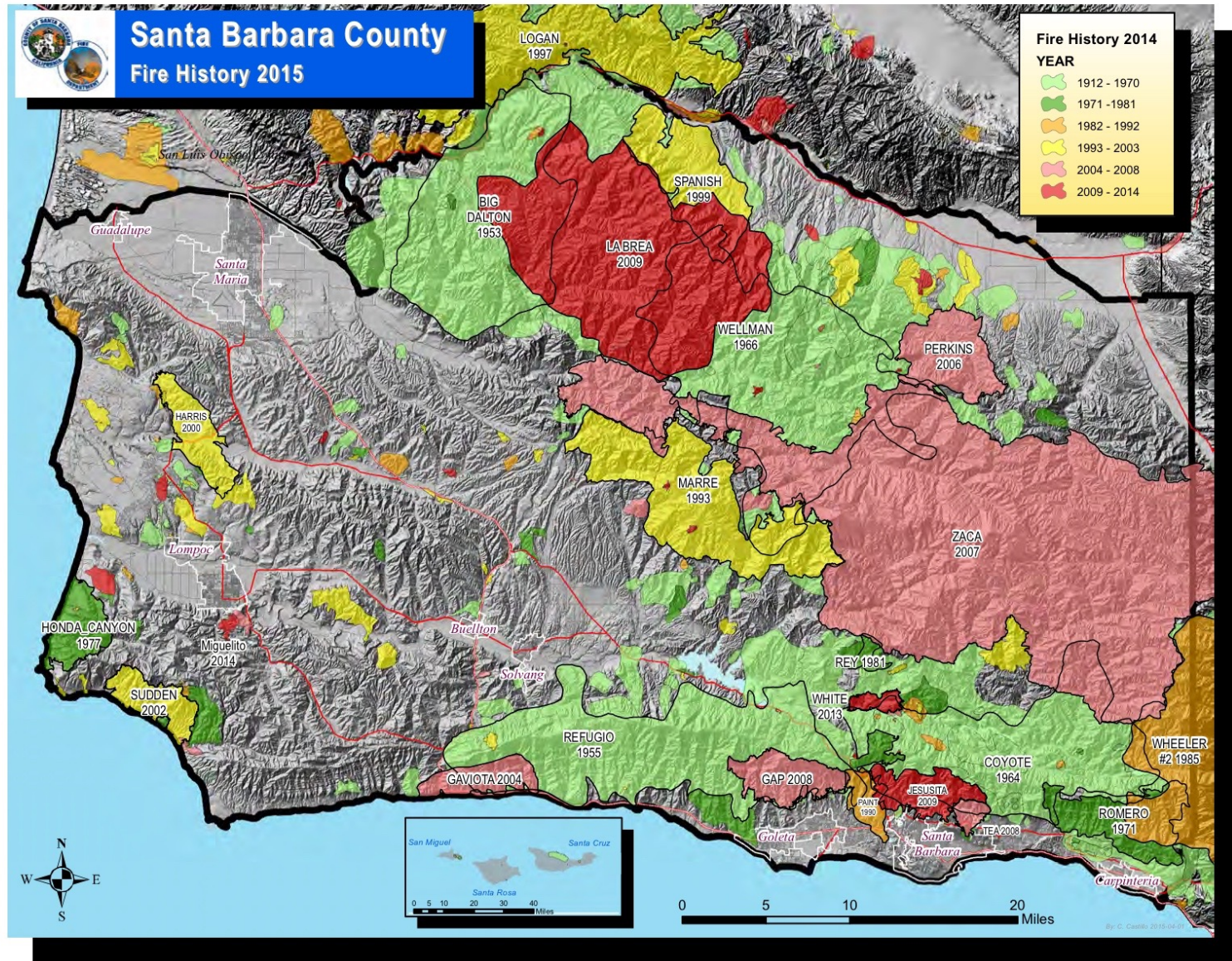
Zaca Fire Burn Area



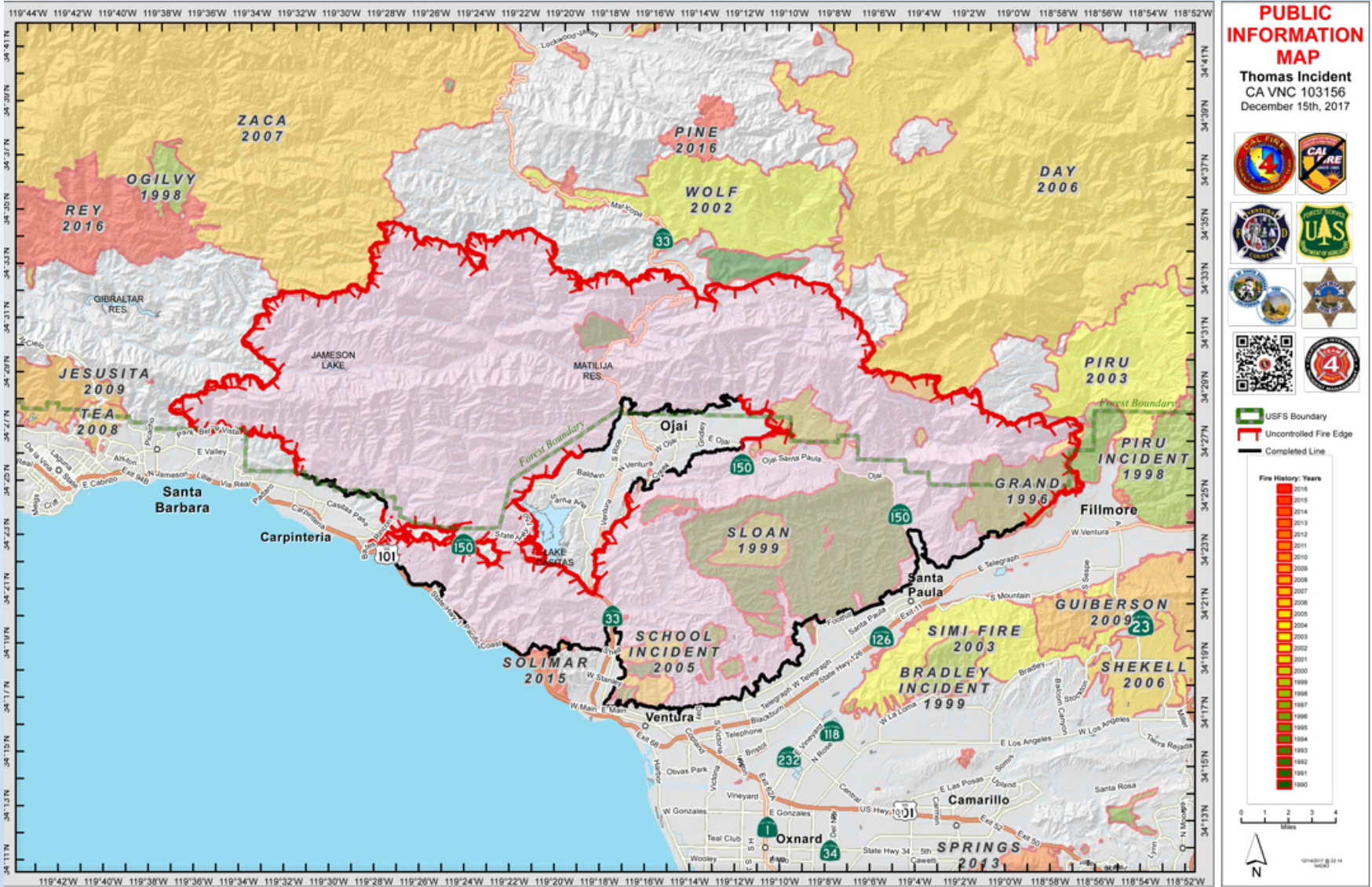
The Aftermath...



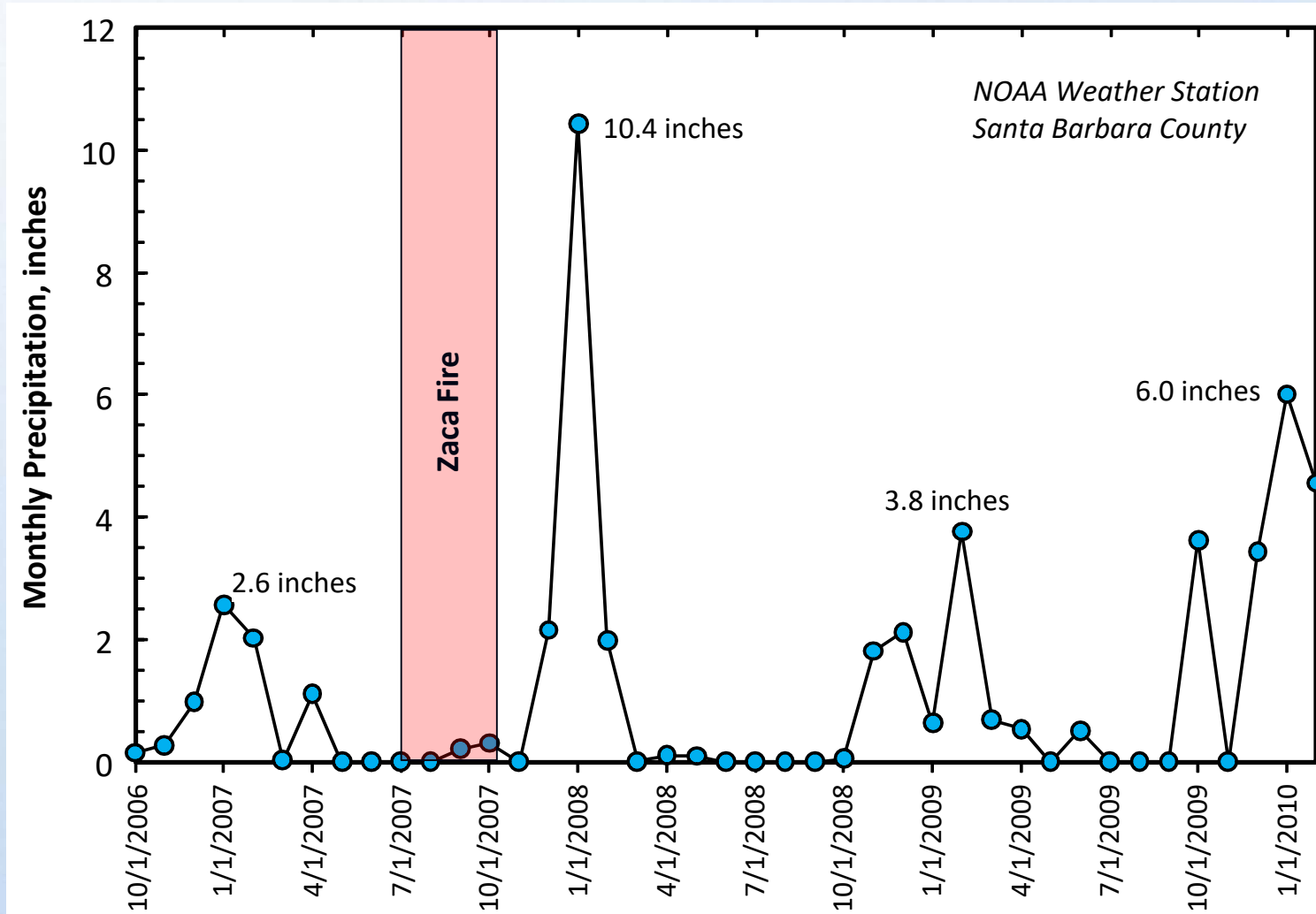
Watershed Fires – The Norm



2017 Thomas Fire

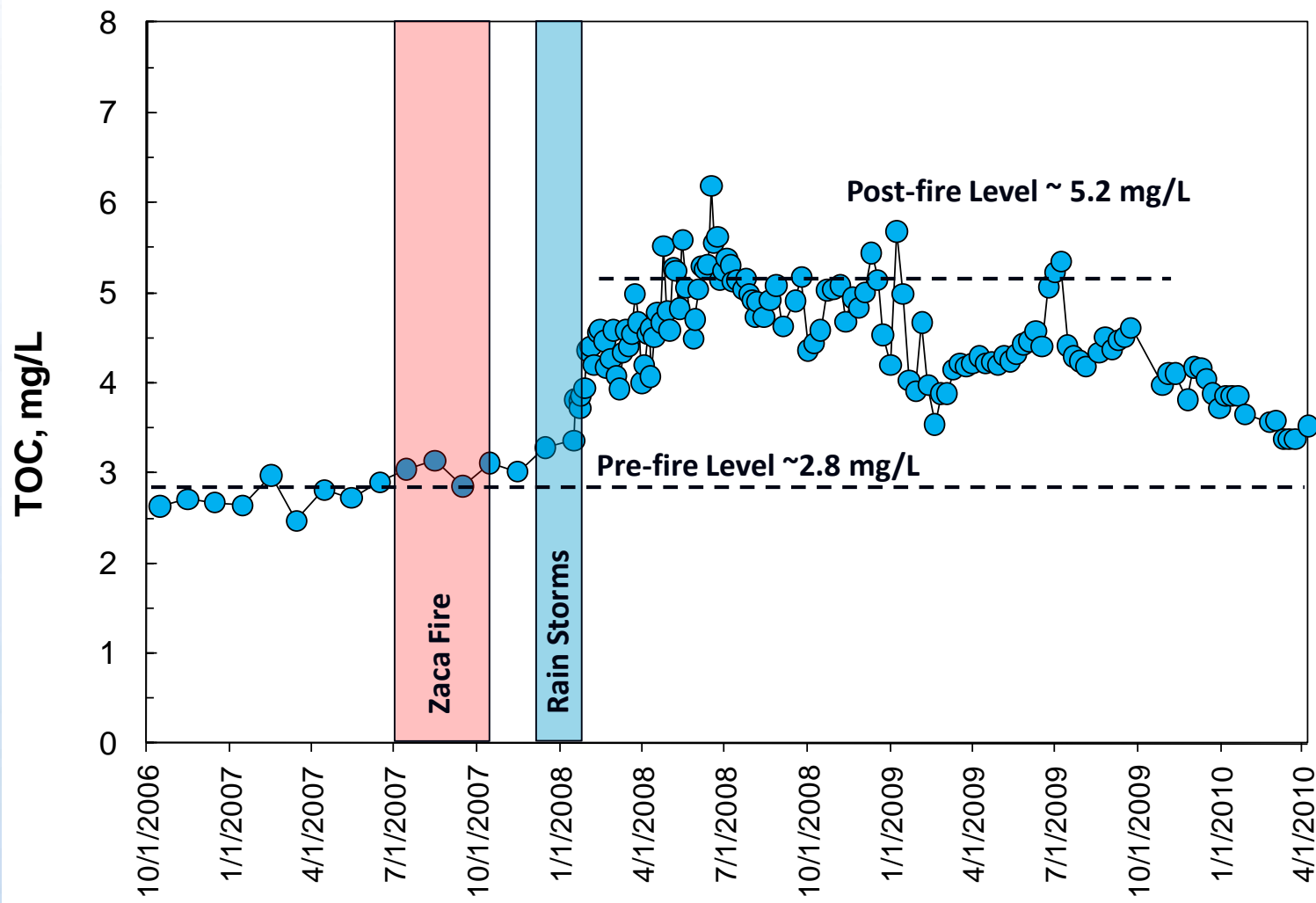


Subsequent Large Rain Event

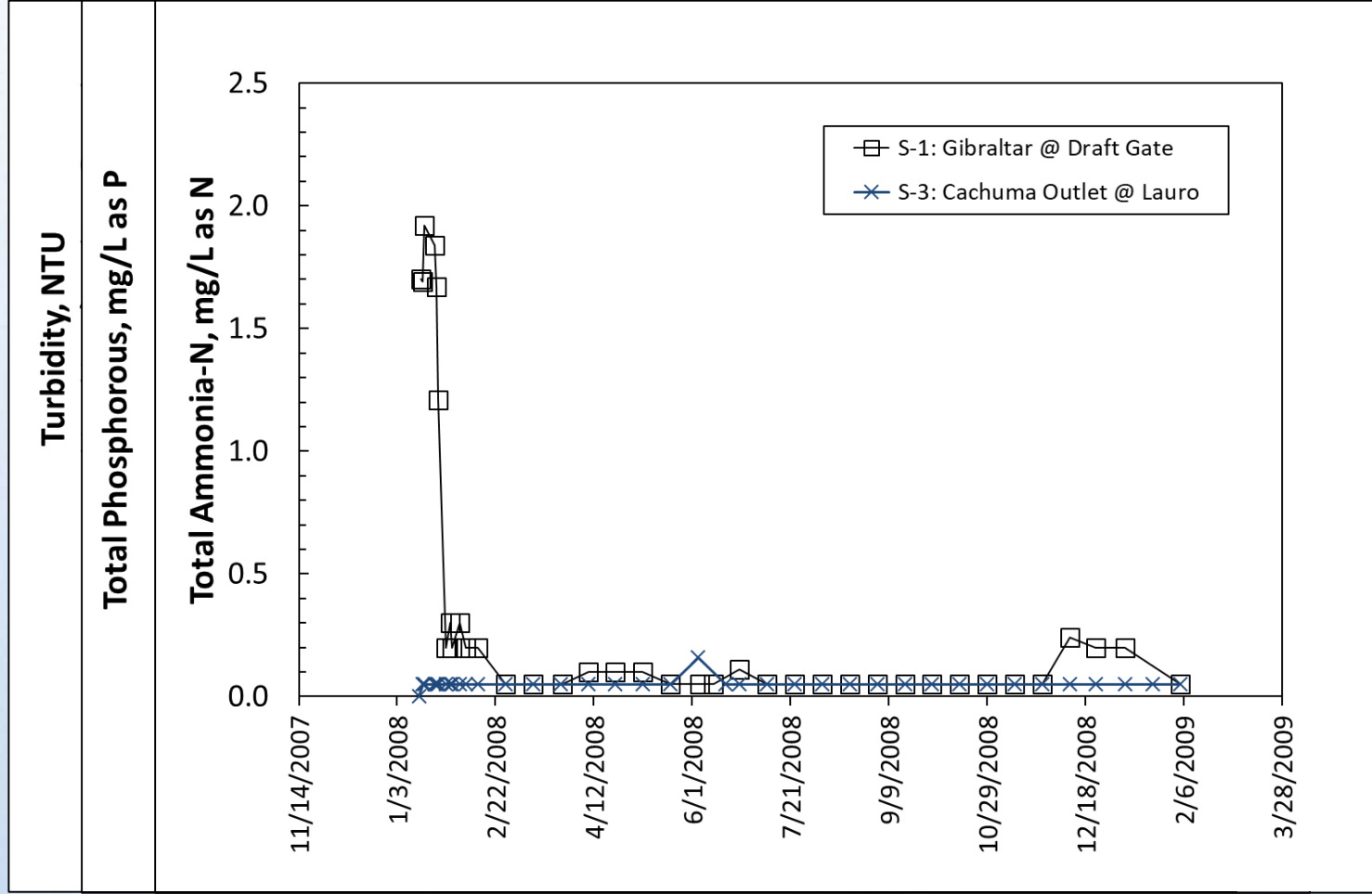




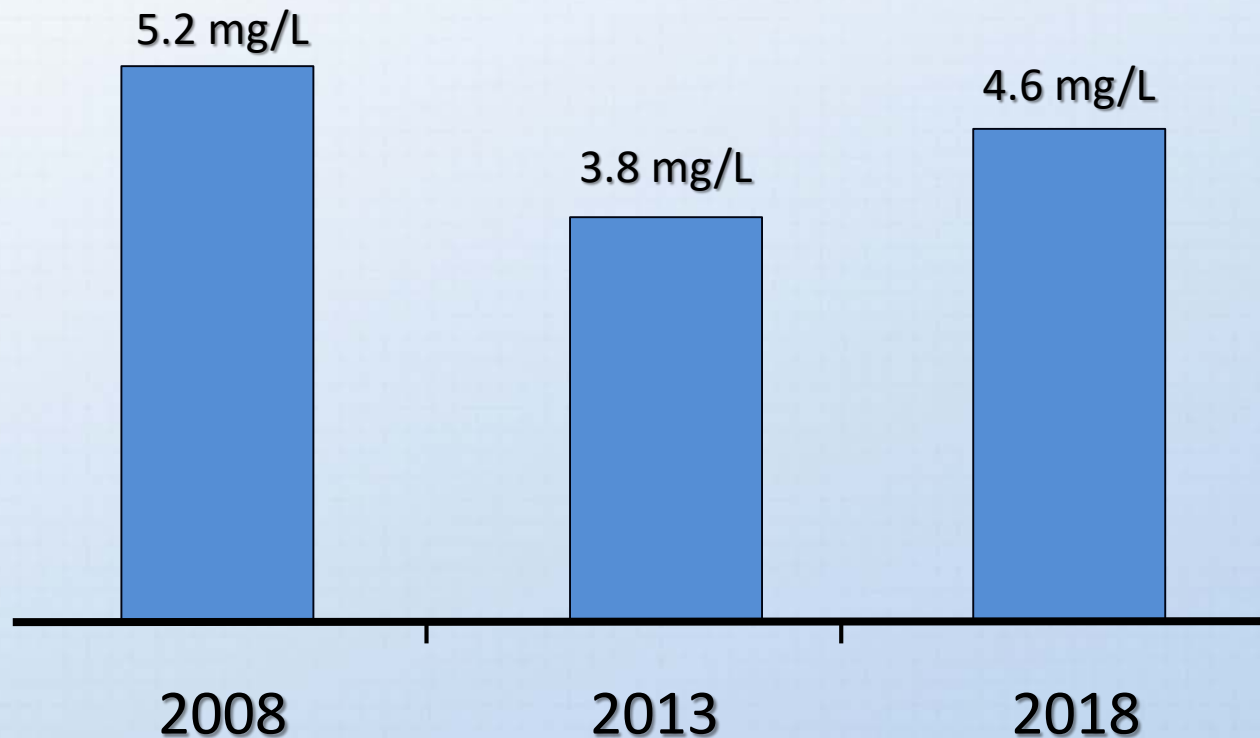
Cater WTP – Historical Water Quality Measured Through Raw Water Total Organic Carbon



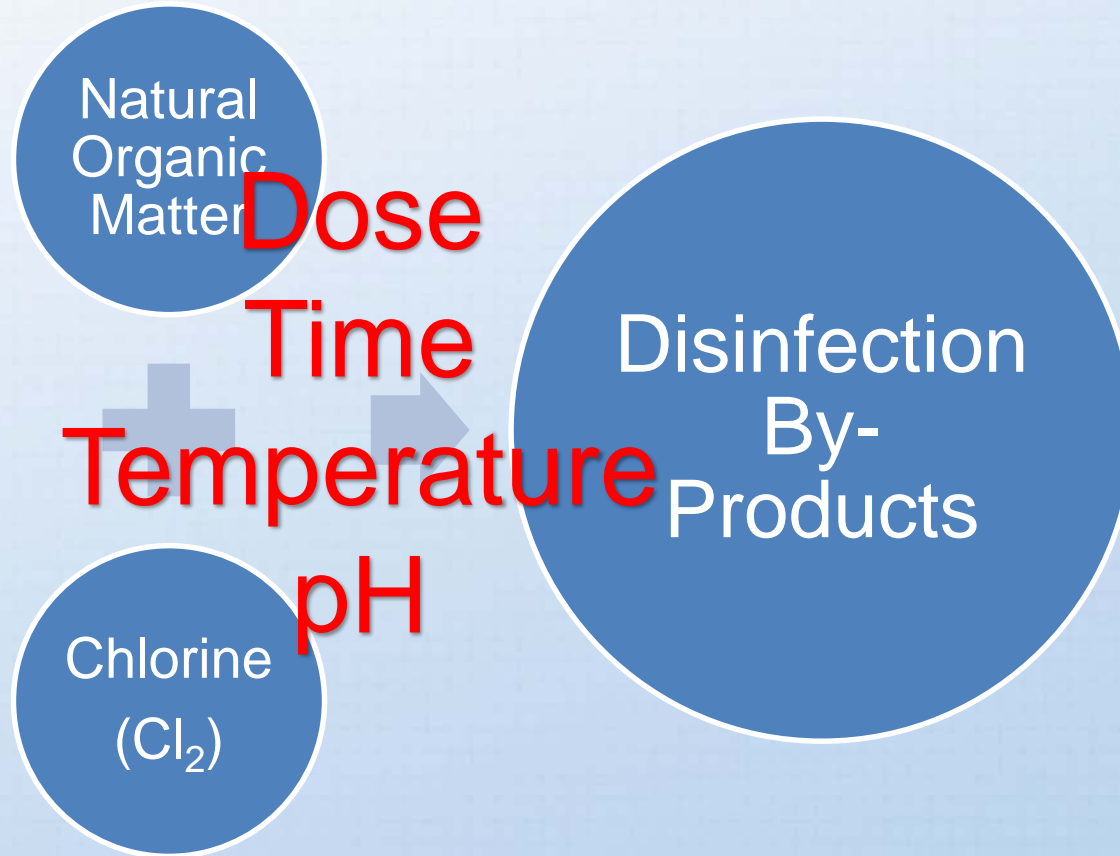
Other impacts of fire on source water quality



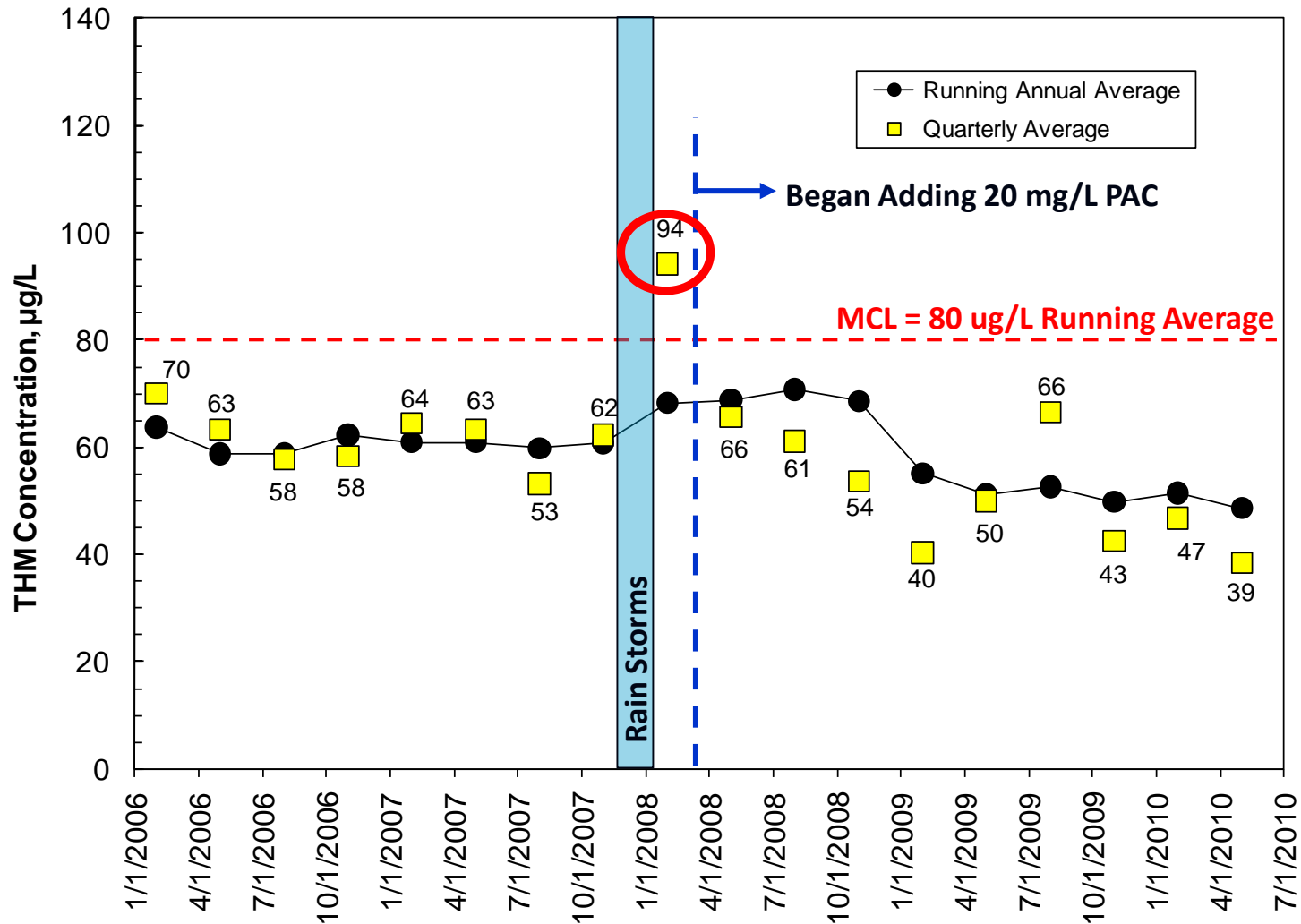
Raw water TOC levels have remained a treatment challenge at the plant



Disinfection By-Product Formation



Impact on Drinking Water Quality – Disinfection By-Products



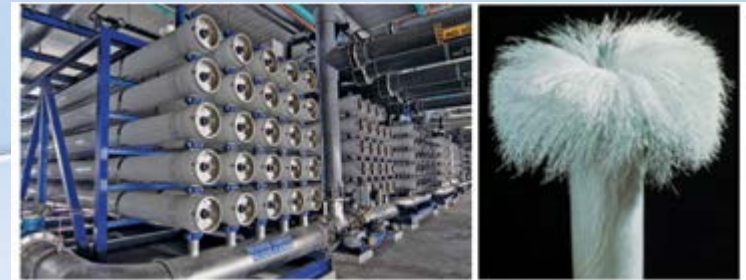
Available TOC Removal Options

Enhanced
Coagulation

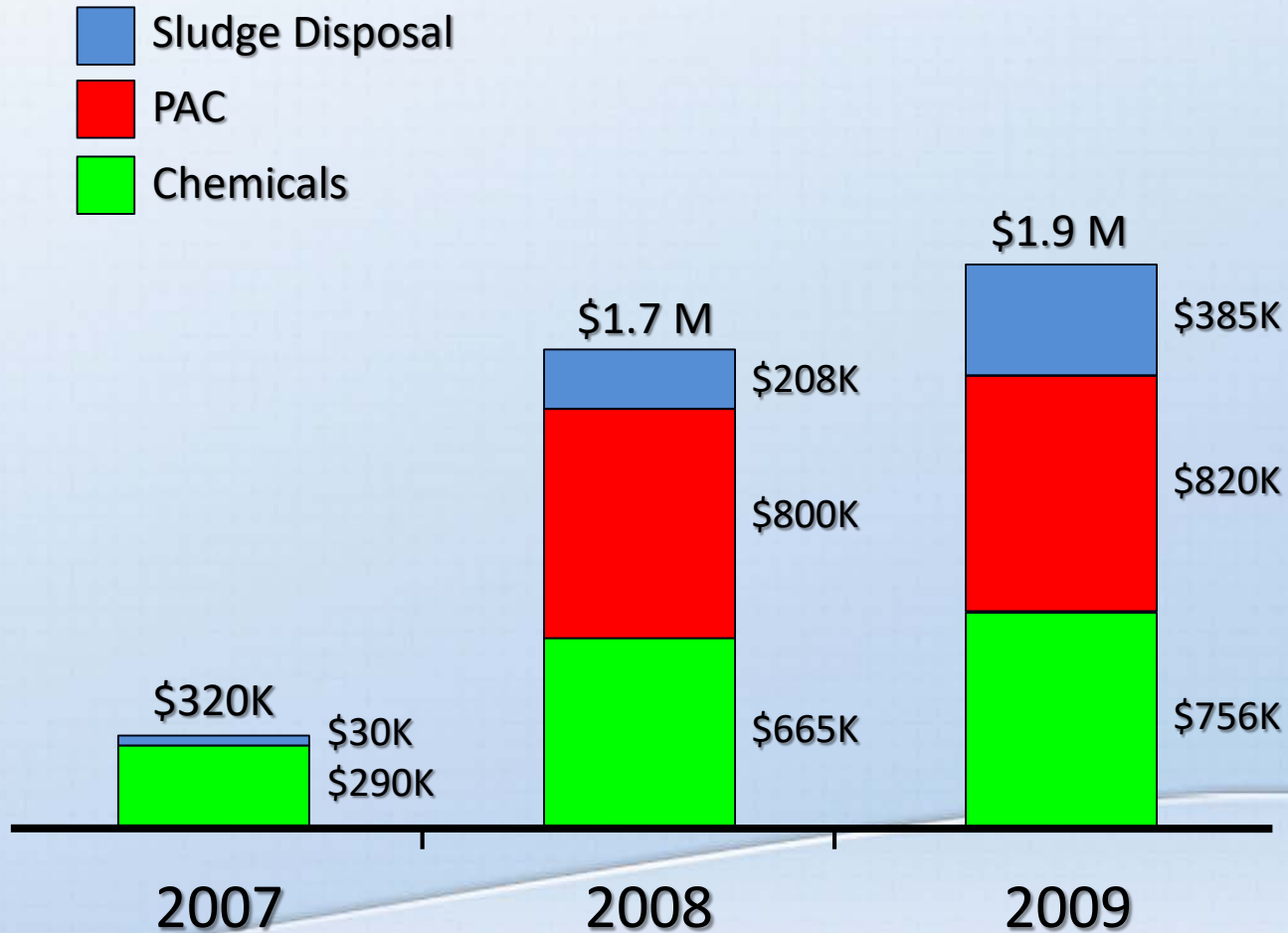


Activated
Carbon

Membrane
Filtration

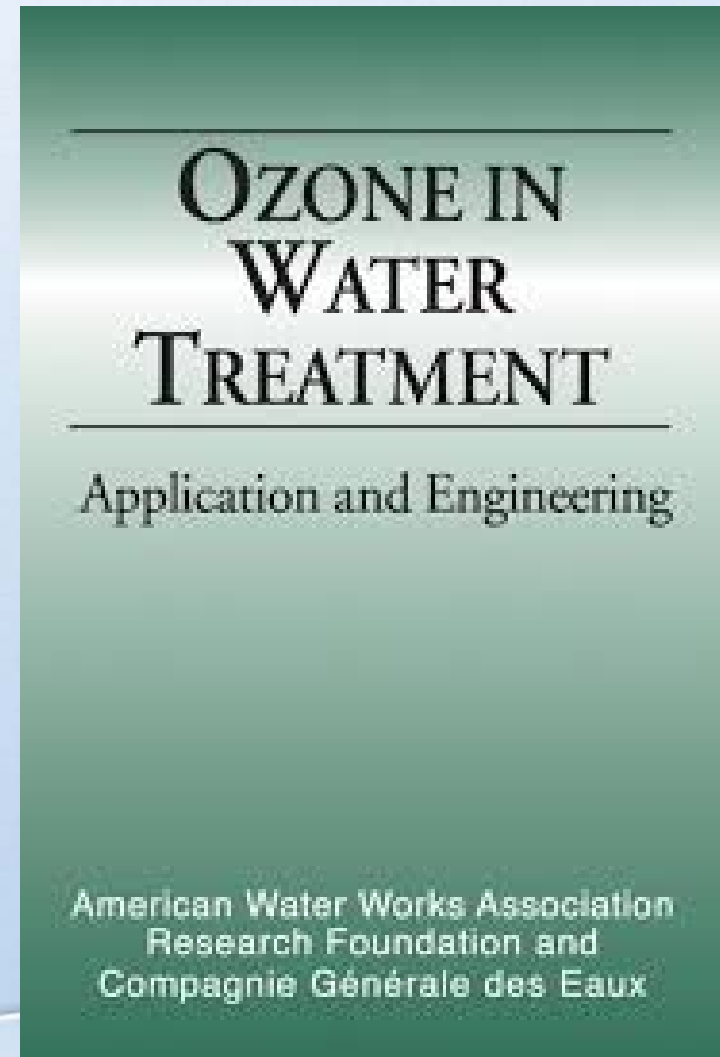


Impact to Operations Cost – Impacted Water

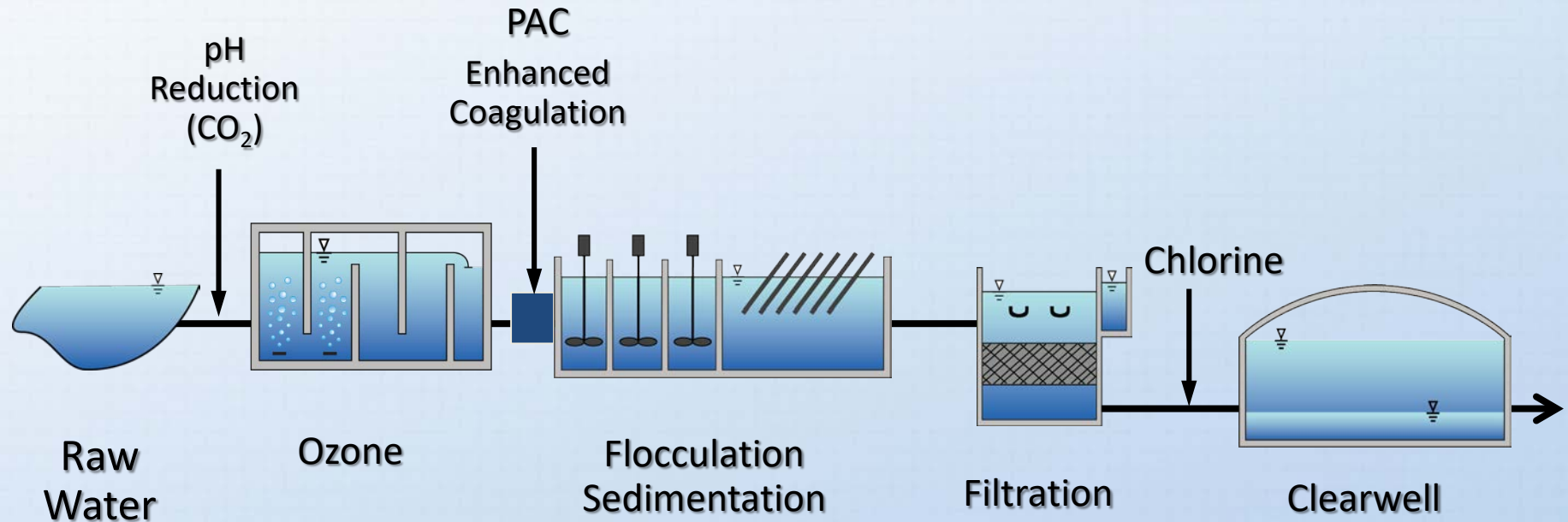


What about ozone?

- Ozone does not remove organics, but changes its reactivity (sometimes) through oxidation of compounds.
- Oxidize Algal Toxins, T&O
- Works for Cater WTP



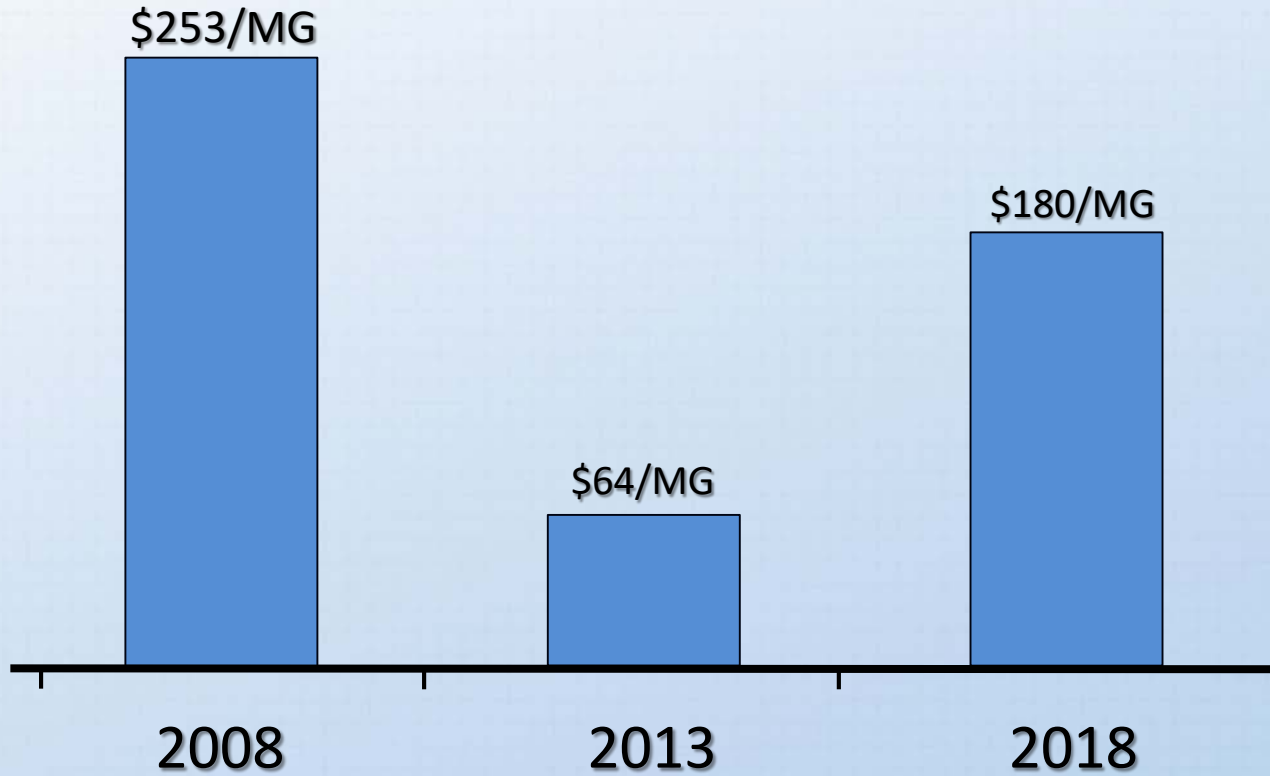
2013 William B Cater WTP – More Tools



Cater WTP – c. 2014



Current Treatment Costs – Chemicals Only



2018 Update

- Continued Use of CO₂, PAC, and Ozone for DBP control
- Gibraltar Reservoir
 - Difficult to Treat
 - Recently ~25 mg/L of Total Organic Carbon
 - Currently 12-14 mg/L TOC
 - Primarily Still Use Cachuma as Surface Water Source
- Drought Resistant Source –
 - Desalination Facility through RO Treatment

In Conclusion...

- Fires impacting raw water quality can have significant cost for treatment
- TOC removal (DBP Compliance) was the largest driver for increased water treatment costs at Santa Barbara's Cater WTP as a result of the Zaca Fire
- Disposal residuals can be a significant component of overall treatment costs

Drinking Water Quality Impacts of Watershed Fires: A Case Study

Questions?

