

PWD Water Supply Planning: Introduction

Regulated Flow Advisory Committee May 24, 2018



PHILADELPHIA
WATER
— DEPARTMENT —

Presented to an advisory committee of the DRBC on May 24, 2018. Contents should not be published or re-posted in whole or part without permission of PWD.



Water Supply Planning Introduction

1. Utility overview
2. The need for planning
3. Planning scope

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PWD Water Supply Planning

- Multi-year water supply planning effort
- Designed to support parallel water and wastewater infrastructure planning efforts
- Critical need to understand the potential risks to infrastructure, regulatory compliance and public health of current and future water quality and quantity
- Water supply planning , specifically, is focusing on three critical drivers
 - Climate change
 - Ambient water quality changes
 - Policy changes

Philadelphia Water Department



Drinking Water

- 1.7 million drinking water customers
- 3 Water Treatment Plants



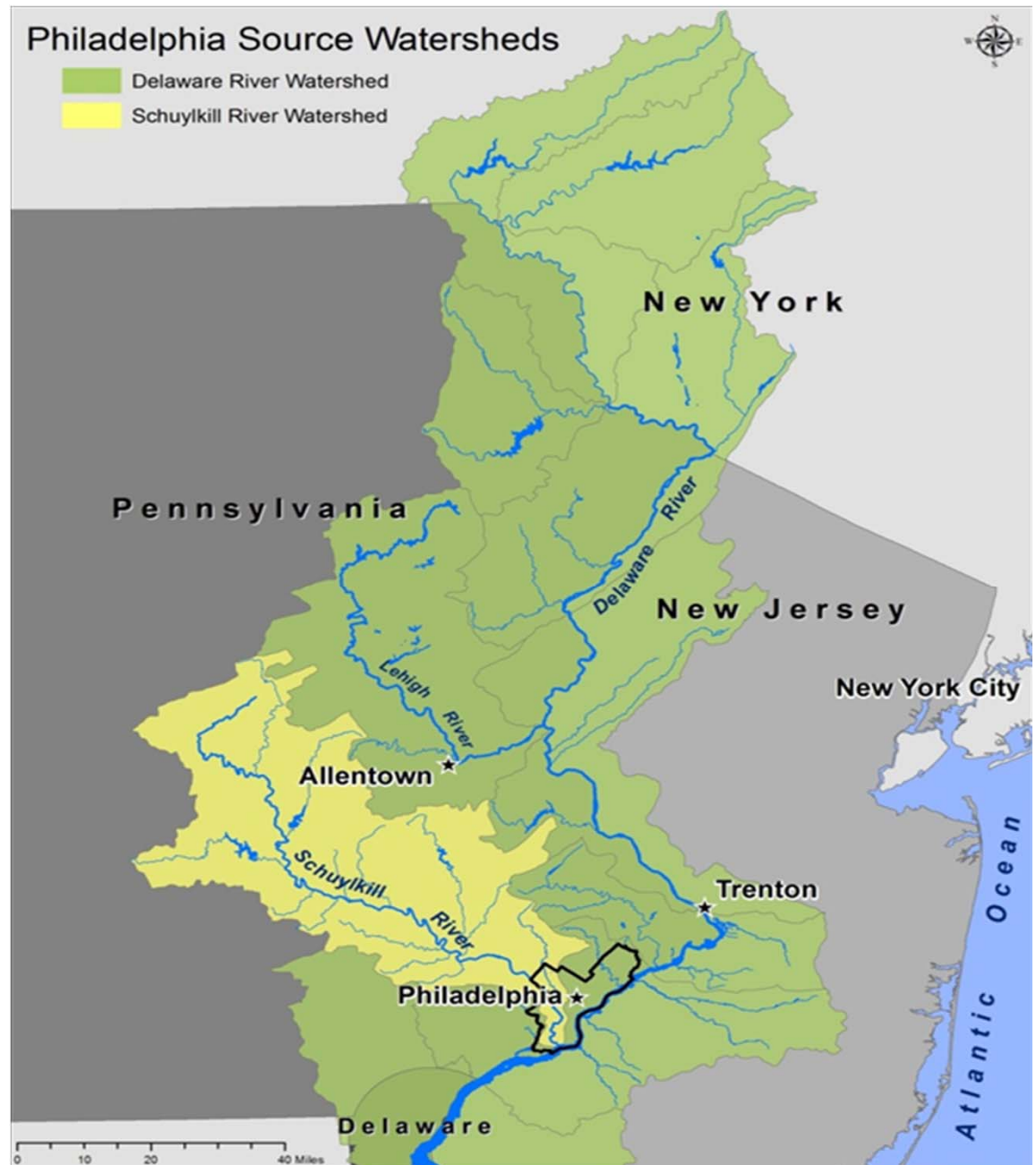
Wastewater

- 2.2 million wastewater customers
- 3 Water Pollution Control Plants



Stormwater

- 60% Combined, 40% Separate Sewers
- Large-scale green infrastructure pgm.



Why is Water Supply Planning Needed?

- **Climate changes – sea level has risen ~0.64 feet since 1960**
- Ambient water quality changes
- Policy changes

2020s	2050s	2080s
0.8 ft. (0.2 m)	2.4 ft. (0.7 m)	4.5 ft. (1.4 m)

CUSP 90th pcntl. projections for sea level rise from a 2000-2004 baseline

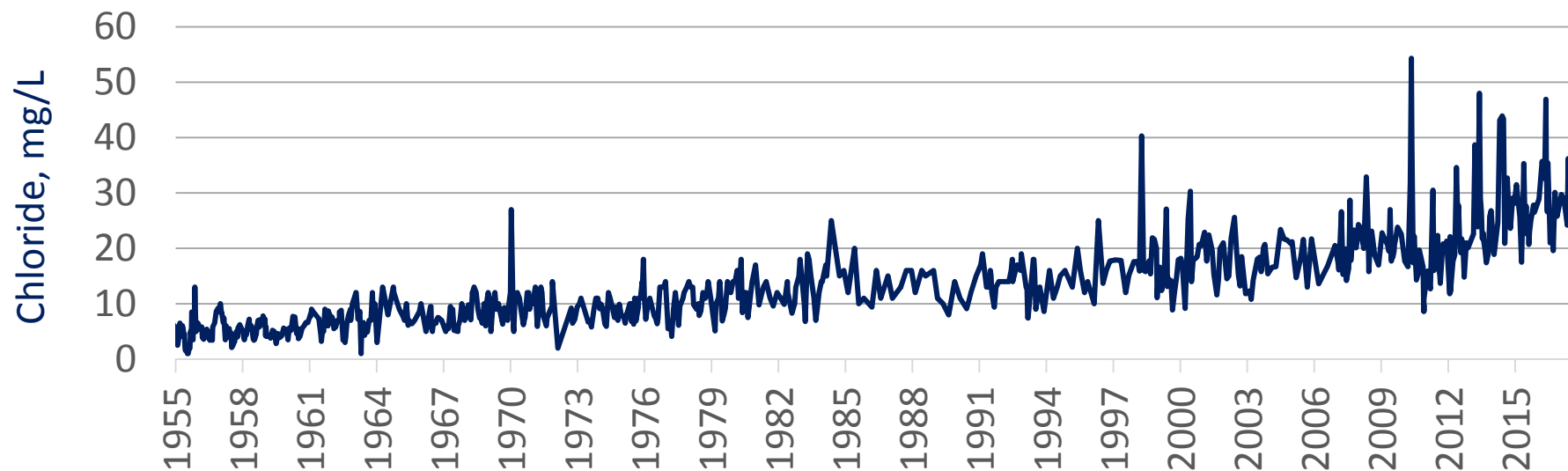


Source: Climate Central, 2017 (5 ft. SLR over MHHW)

Why is Water Supply Planning Needed?

- Climate changes
- **Ambient water quality changes**
- Policy changes

Delaware River at Trenton Chloride 1955-2018



Why is Water Supply Planning Needed?

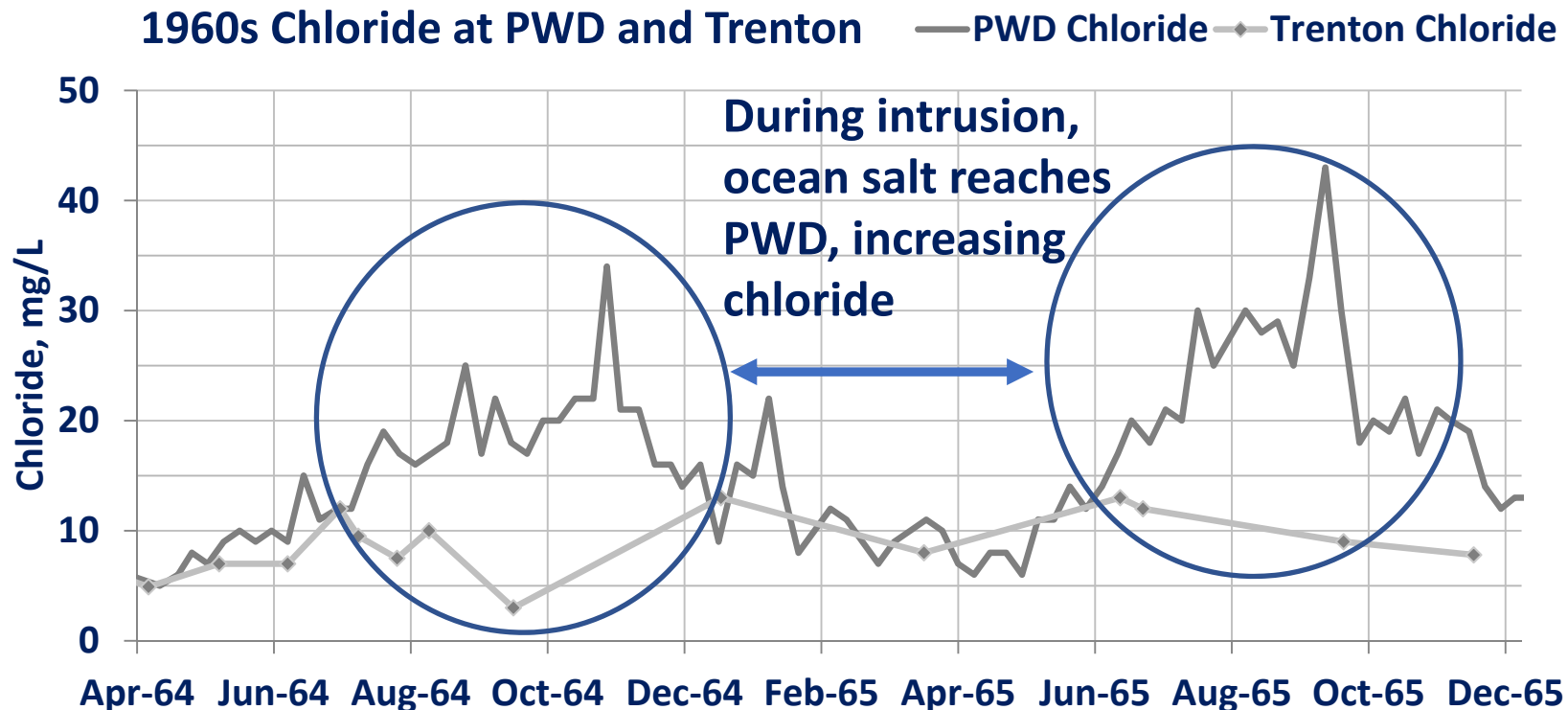
- Climate changes
- **Ambient water quality changes – chlorides have tripled**
- Policy changes

Delaware River at Trenton Chloride 1955-2018



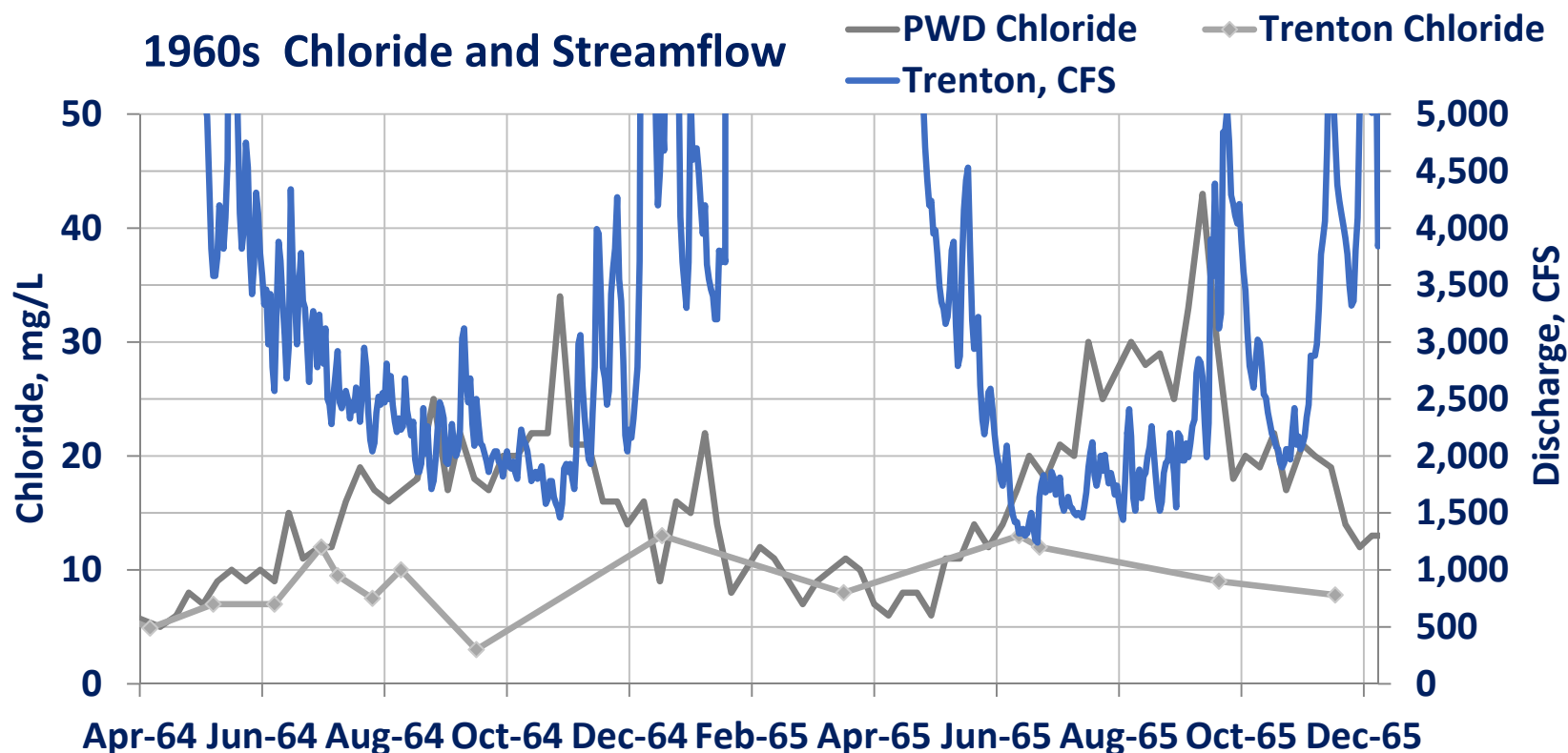
Why is Water Supply Planning Needed?

- Climate changes
- **Ambient water quality – 1960s drought led to salinity policies**
- Policy changes



Why is Water Supply Planning Needed?

- Climate changes
- **Ambient water quality – 1960s drought led to salinity policies**
- Policy changes



Why is Water Supply Planning Needed?

Major Takeaway #1

Ambient chloride concentrations today are equivalent to the worst salinity intrusion of record in the 1960s

Salinity intrusion chloride = ambient chloride + ocean salt

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FFMP Table 1

Interstate Operation Formula

NYC Storage Condition	Montague Objective, CFS	Trenton Objective, CFS
Normal (L1, L2)	1,750	3,000
Drought Watch (L3)	1,650	2,700
Drought Warning (L4)	1,550	2,700
Drought Emergency (L5)	1,100 - 1,650	2,500 - 2,900

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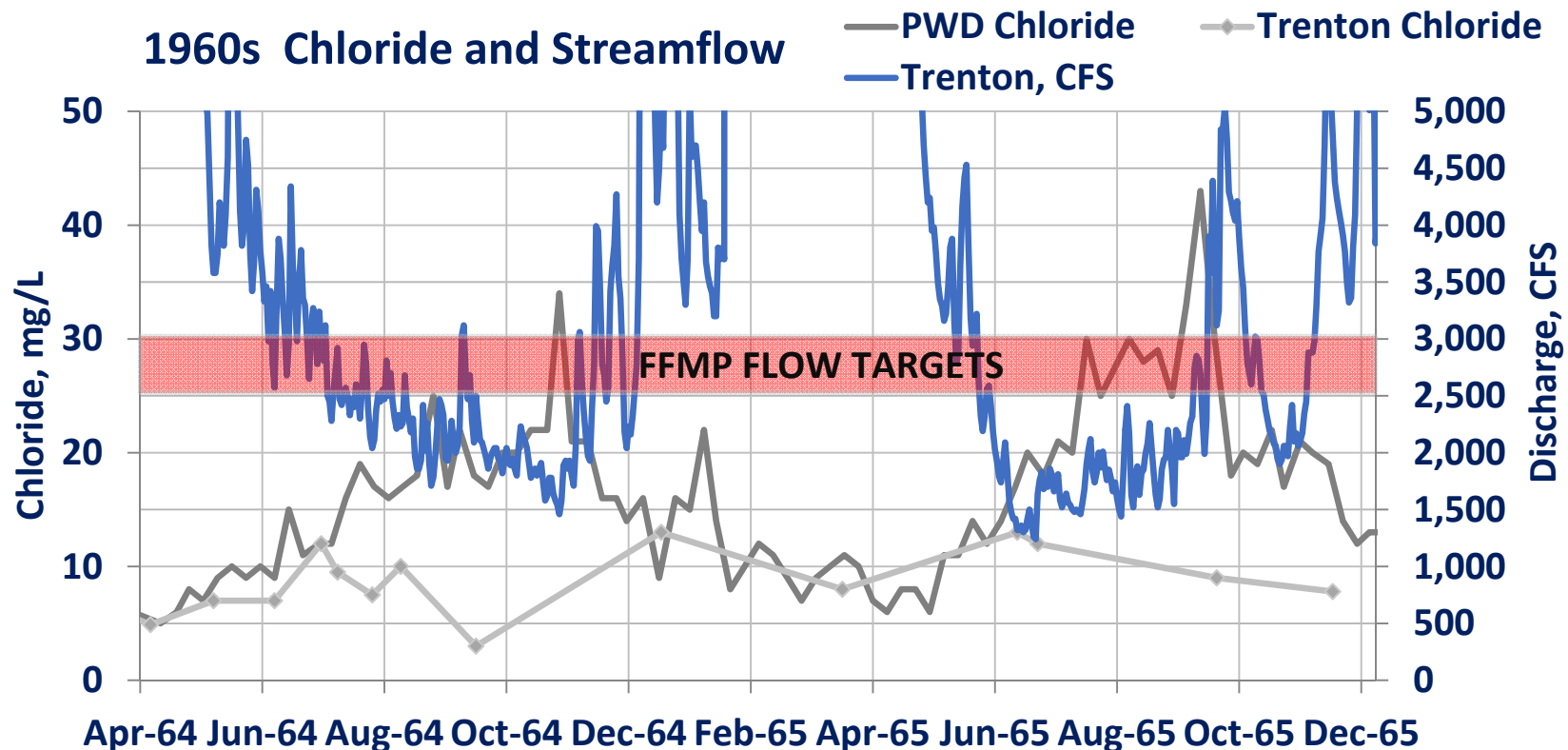
FFMP Table 2

Drought Emergency Flow Objectives

River Mile Location	Trenton Objective, CFS			Montague Objective, CFS		
	Dec. – Apr.	May - Aug.	Sept. - Nov.	Dec. – Apr.	May - Aug.	Sept. - Nov.
> RM 92.5	2,700	2,900	2,900	1,600	1,650	1,650
RM 87- 92.5	2,700	2,700	2,700	1,350	1,600	1,500
RM 82.9- 87	2,500	2,500	2,500	1,350	1,600	1,500
< RM 82.9	2,500	2,500	2,500	1,100	1,100	1,100

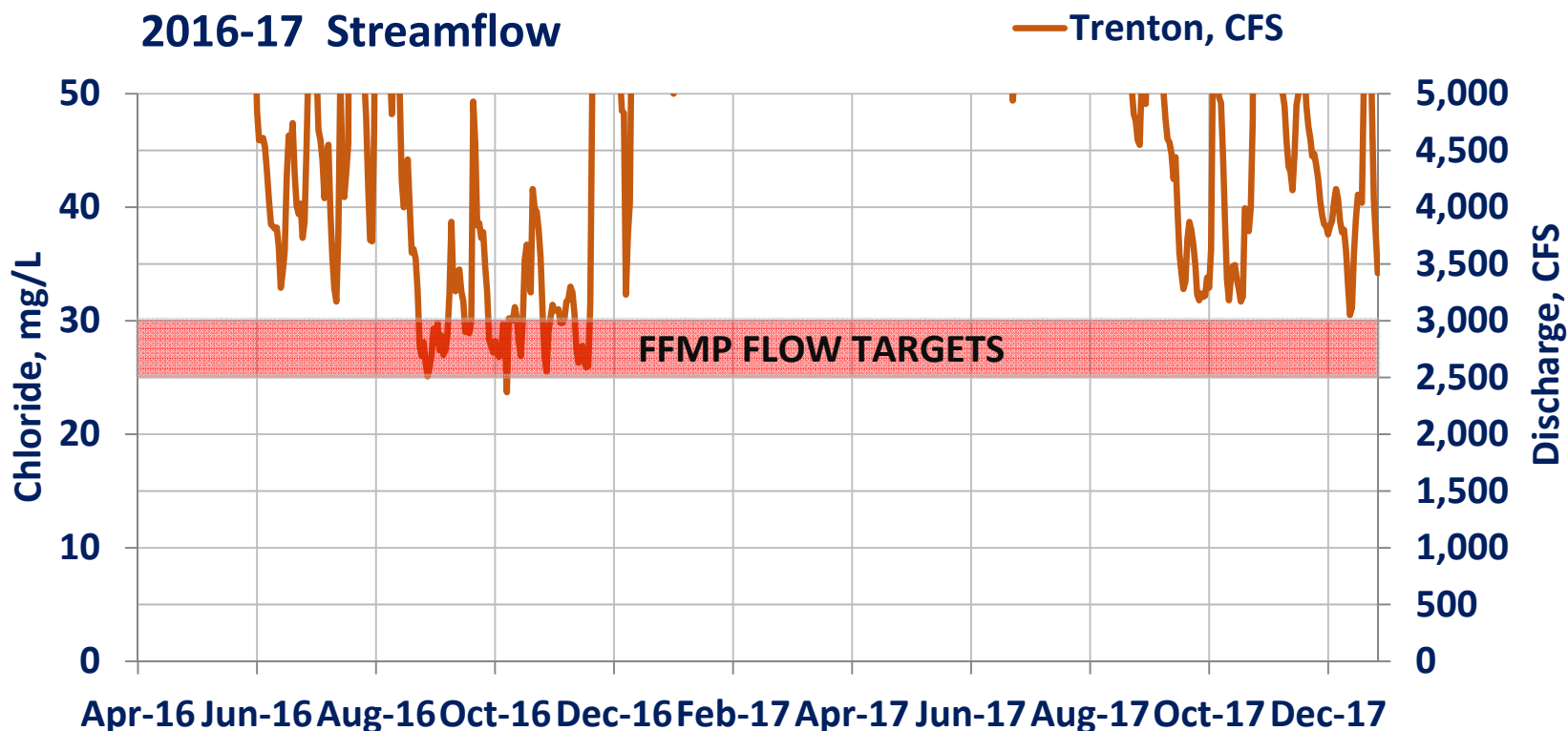
Why is Water Supply Planning Needed?

- Climate changes
- Ambient water quality changes
- **Policy changes – policies created in '84 to manage low flow**



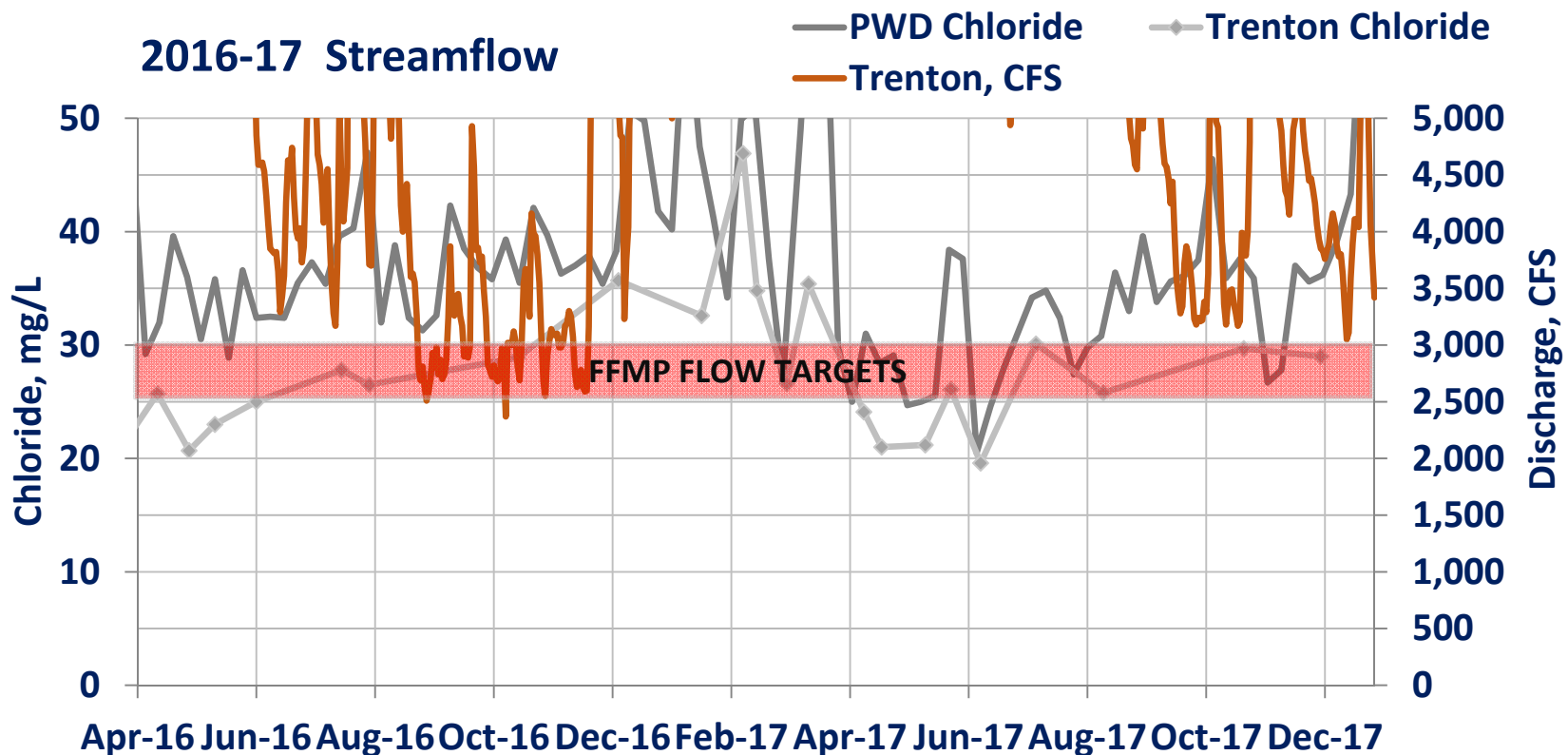
Why is Water Supply Planning Needed?

- Climate changes
- Ambient water quality changes
- **Policy changes – the ‘84 policies, now in FFMP, work well today**



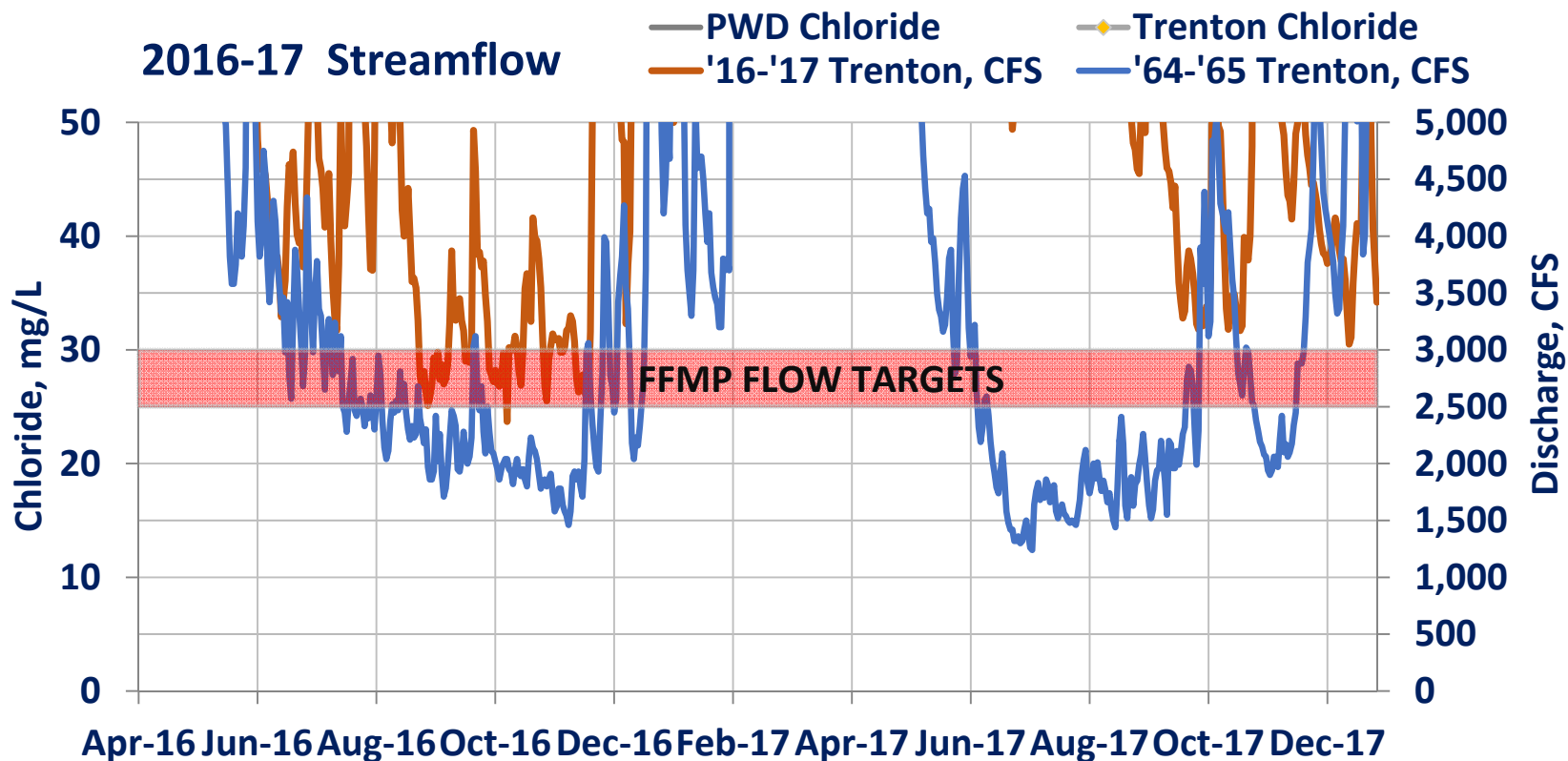
Why is Water Supply Planning Needed?

- Climate changes
- Ambient water quality changes
- **Policy changes – targets prevent intrusion, not ambient chl.**



Why is Water Supply Planning Needed?

- Climate changes
- Ambient water quality changes
- **Policy changes**



Why is Water Supply Planning Needed?

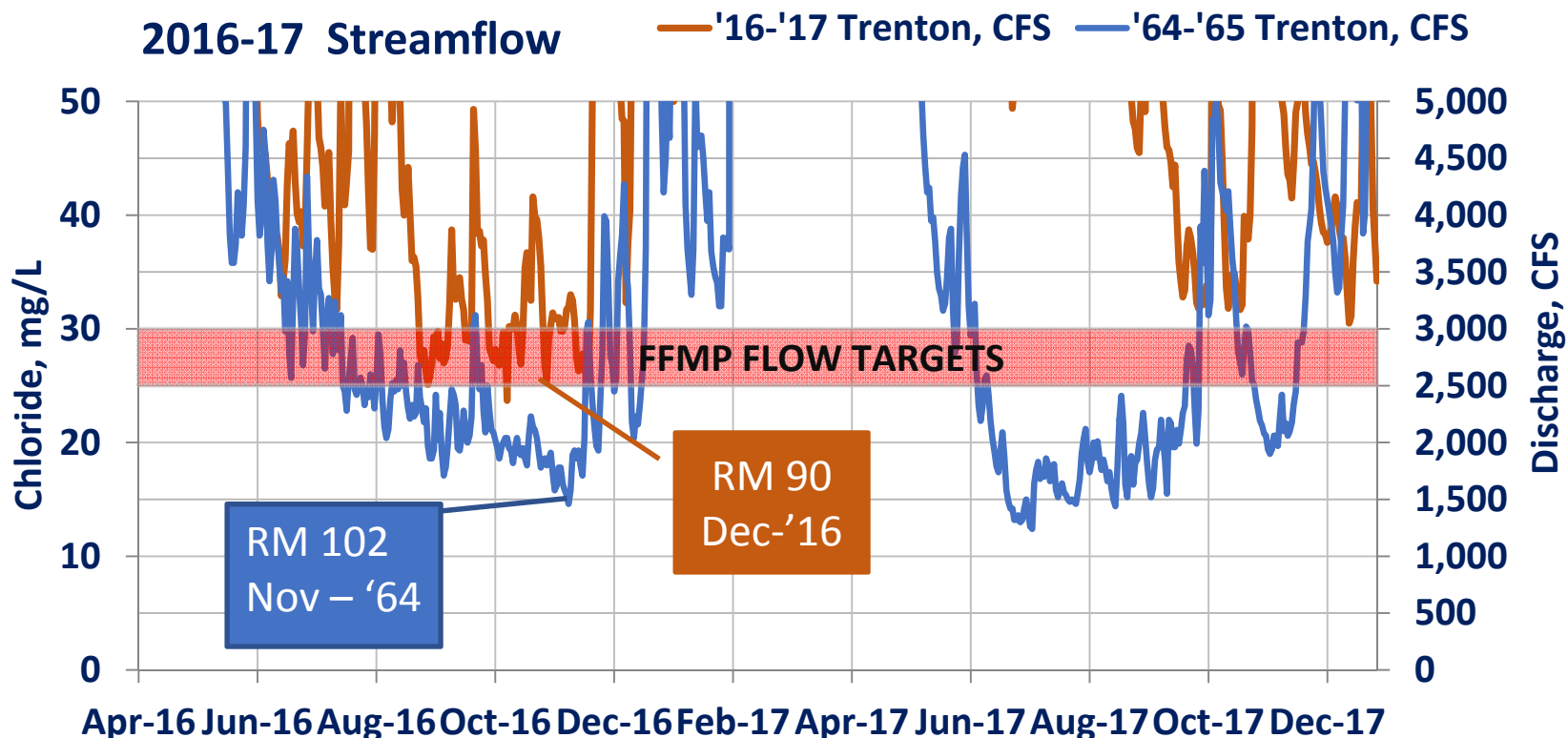
Major Takeaway #2

Current flow targets in FFMP are critical to manage intrusion of ocean salt

Salinity intrusion chloride = ambient chloride + ocean salt

Why is Water Supply Planning Needed?

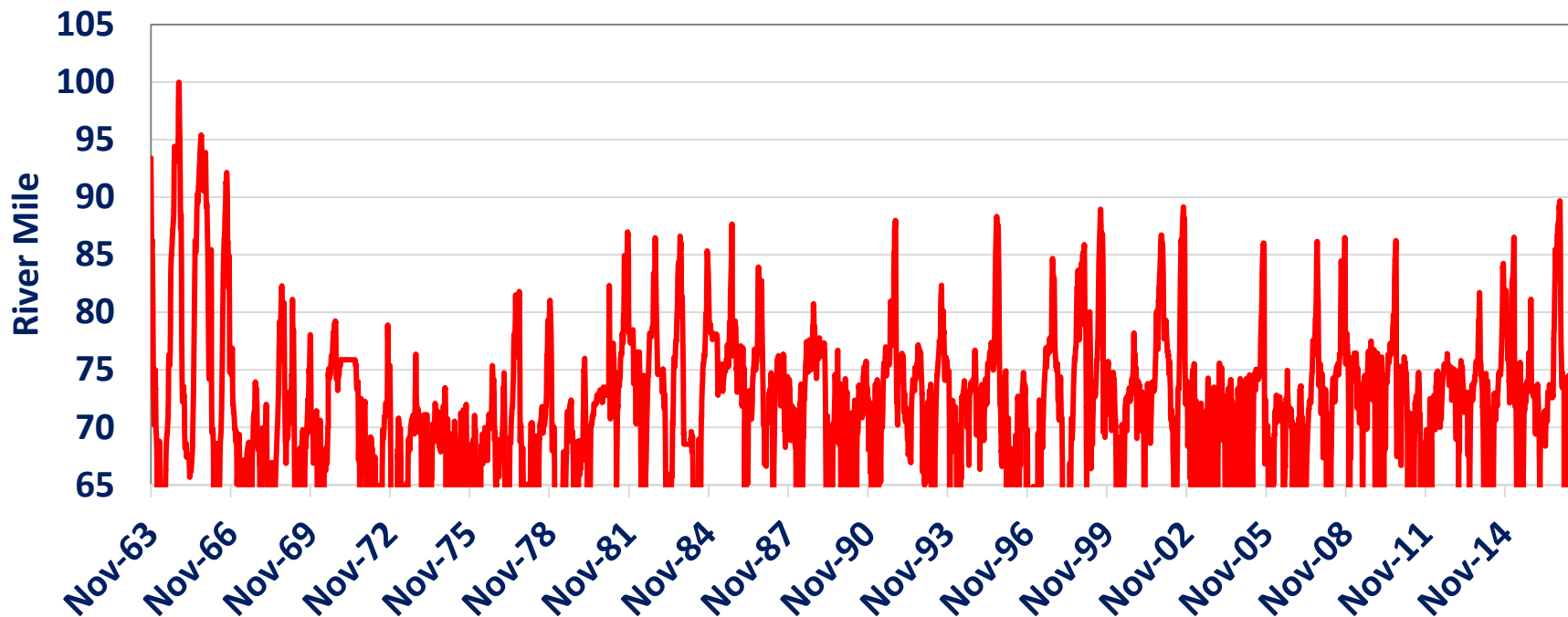
- Climate changes
- Ambient water quality changes
- **Policy changes – current targets have worked for 35 years.**



Why is Water Supply Planning Needed?

- Climate changes
- Ambient water quality changes
- **Policy changes**

Salt Line River Mile, 1963 – 2016, 7-day average 250 mg/L chloride

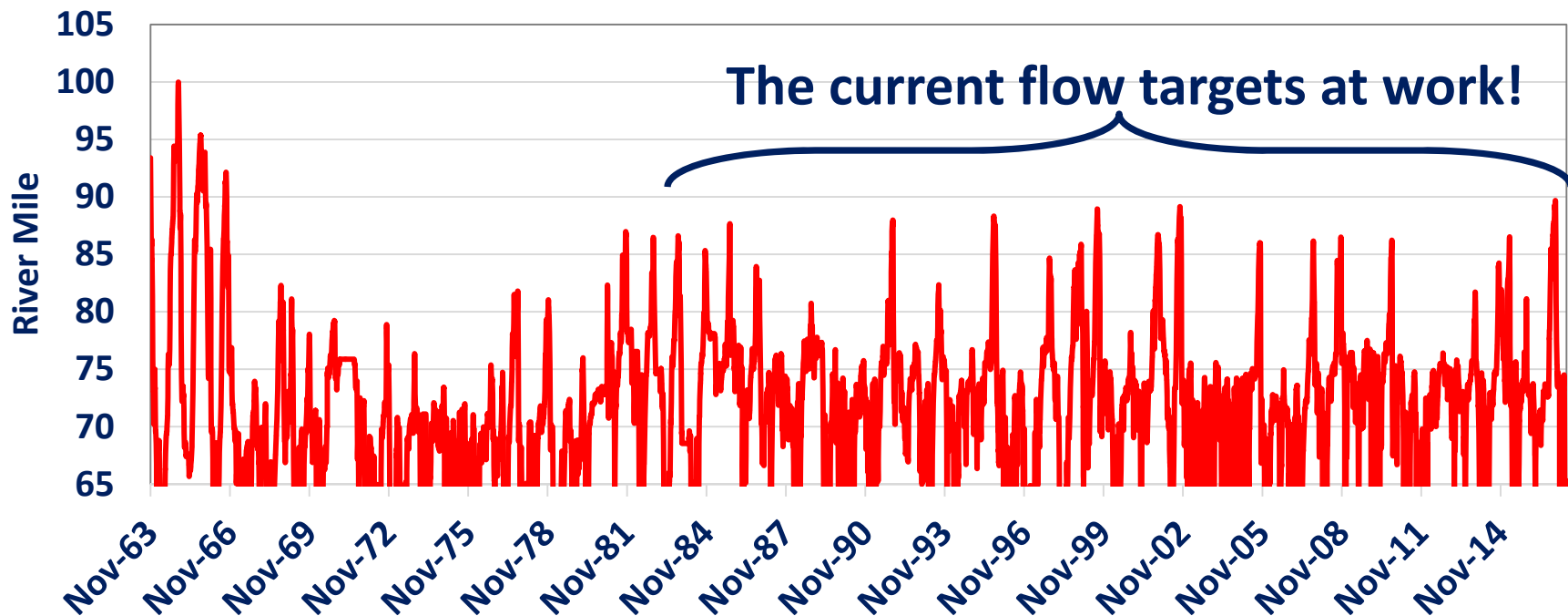


Data Source: DRBC

Why is Water Supply Planning Needed?

- Climate changes
- Ambient water quality changes
- **Policy changes**

Salt Line River Mile, 1963 – 2016, 7-day average 250 mg/L chloride



Data Source: DRBC

Why is Water Supply Planning Needed?

Major Takeaway #3

Any attempt to alter current flow targets needs a carefully crafted assessment of intrusion impacts on public health and infrastructure

Why is Water Supply Planning Needed?

- Climate changes
- Ambient water quality changes
- **Policy changes**
 - **The flow targets work, yet they are under consideration to be changed**

Pre-2017 FFMPs

- Same salinity policy since 1983 (35 yrs.)

Current FFMP

- Flow targets anticipated to be reduced in 5 years

FFMP 2017 Most Significant Section IV.3.b

“The studies identified in subdivision (a) above will evaluate the impacts to: the salt front, aquatic and fishery resources in the Basin, and projections of future sea level rise to salinity...

If studies by the Decree Parties or external entities on behalf of a Decree Party support that detachment provides comparable protection for existing resources and uses within the Basin and does not cause significant adverse impacts, then detachment will be implemented between June 1, 2023 and May 31, 2028... “

Comparable Protection vs. Significant Adverse Impacts...

- **A burden of proof in favor of detachment**

Critical Planning Baseline Observations

- 1. Ambient chloride concentrations today are equivalent to the worst salinity intrusion of record in the 1960s**
- 2. Current flow targets in the FFMP are critical to manage intrusion of ocean salt**
- 3. Any attempt to alter current flow targets needs a carefully crafted assessment of intrusion impacts on public health and infrastructure**

What Does Water Supply Planning Entail?

Salinity Modeling

- What streamflow regime is protective of downstream drinking water supply given oceanic and meteorological influences

Watershed Modeling

- What reservoir policies optimize the use of limited water resources during drought

What Does Water Supply Planning Support?

Infrastructure Planning – PWD Water Master Plan

- Alignment of the life cycle of infrastructure, water quality and regulatory compliance

Water Supply Planning Team

PWD Programs

- Watershed Protection Program
- Water Quality Compliance Modeling
- Climate Change Adaptation Program
- Bureau of Laboratory Services

Consulting Support

- Woods Hole Group
- CDMSmith Inc.
- Sage Services LLC
- SciTek Consultants Inc.
- Tetra Tech

Salinity Focus Area

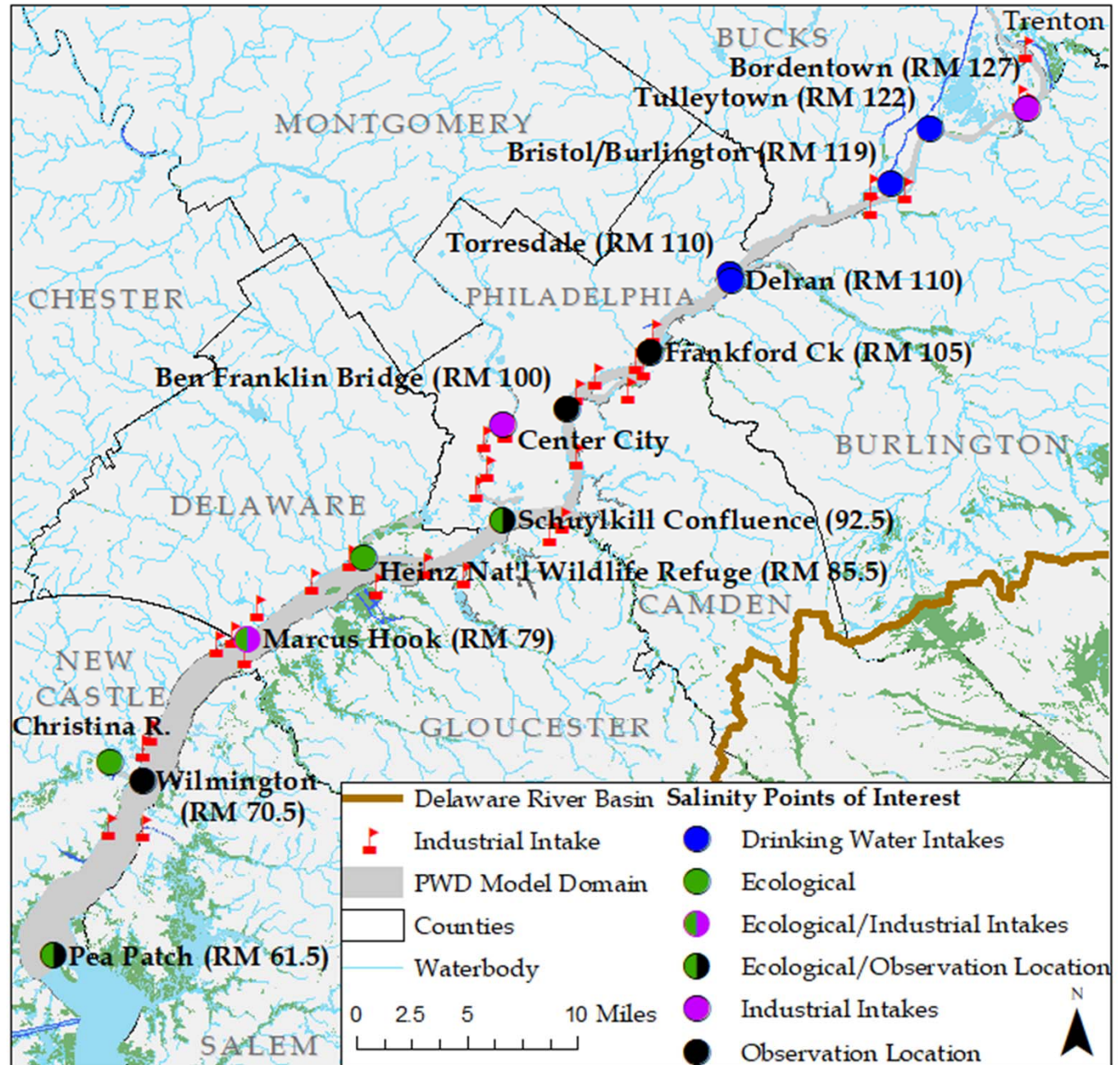
Diverse Uses and Resources

Water Supply

- Drinking
- Industrial
- Power
- Refining
- Manufacturing

Ecological

- Fish Habitat
- Shellfish Habitat
- Wetlands



Project Scope

What PWD is Studying	How this Relates to the FFMP
Ambient water quality before and during salinity intrusion at Baxter	Informs the incremental increase in chloride due to varying intensities of intrusion now and in the future
Differences in salinity driven by varied Schuylkill River and Trenton streamflow	Informs whether or not releases from Blue Marsh have a neutral role in salinity repulsion, and if the ‘Trenton equivalent flow’ is a valid policy concept
Streamflow patterns that lead to intrusion	Informs how droughts on tributaries downstream of Trenton, and managed flow at Trenton contribute to salinity repulsion
Streamflow patterns that can manage intrusion	Increases understanding of protective ranges of streamflow, informs if increasing the flow target given the salt line location is a valid policy concept

Project Timeline – Ongoing Work

June 2018

- Completion of calibration and validation

July 2018-June 2019

- Completion of validation report
- Numerical experiments, post processing
- Begin PST2 refinements, research into alternative policies

July 2019-June 2020

- Sea level rise salinity model set up and numerical experiments scheduled to begin

July 2020-June 2021

- Numerical experiments with PST and synthesis of findings

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Series of Presentations

- 1. Planning Introduction (today)**
- 2. Model Selection, Data Collection and Set Up**
- 3. Calibration Approach and Validation**
- 4. Simulation Approach**

And much more to come!



THANK YOU!

www.phila.gov/water/sustainability

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