



# Zone 2 Chloride Exceedances

John Yagecic, P.E.  
Manager, Water Quality Assessment

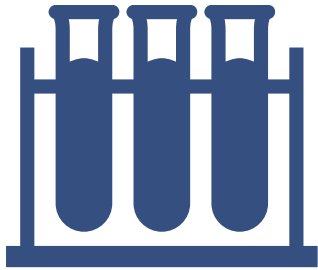
**May 20, 2025**  
*Subcommittee on  
Source Water Protection*



Presented to an advisory committee of the DRBC on May 20, 2025. Contents should not be published or re-posted in whole or in part without permission of the presenter or the DRBC.



## **Zone 2**

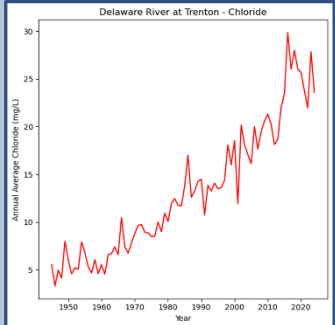
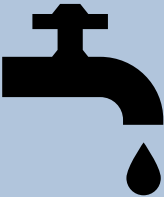
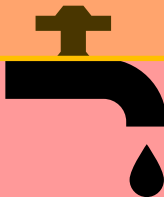
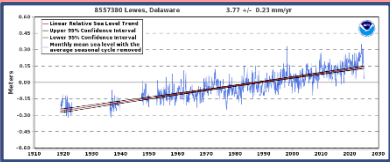


## **Monitoring & Analysis Results**

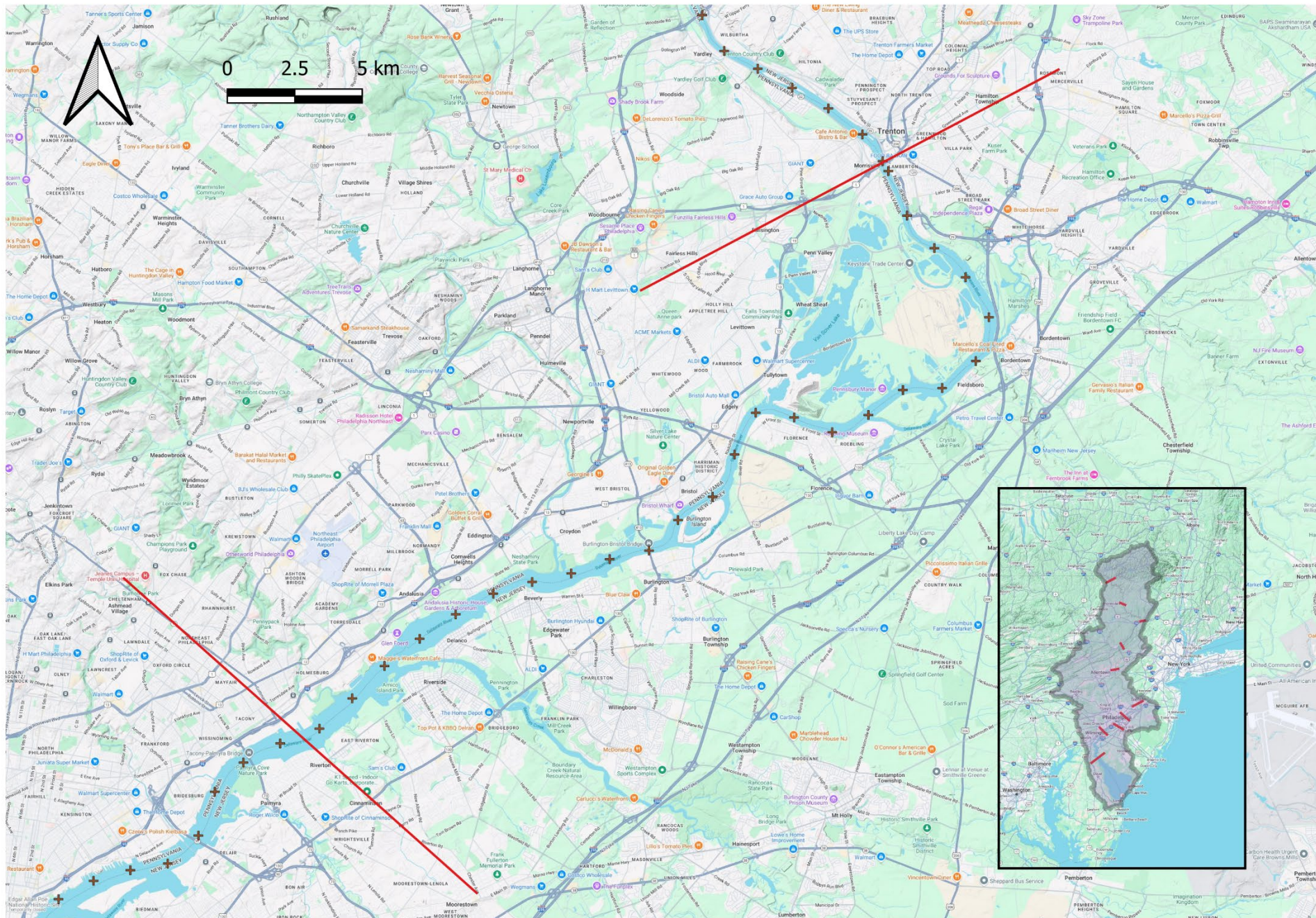


## **Next Steps**



Zone	Tidal Non-Tidal	Drivers	Status & Trends	Management Thresholds		Drinking Water Use?
1A	Non-tidal	Road De-icing Point Sources	Surface & Ground Water Concentrations <b>Increasing</b> 	Existing Water Quality (EWQ) under Special Protection Waters (SPW): <b>NOT a Criteria</b>		
1B						
1C						
1D						
1E						
2		Road De-icing Point Sources			<b>Chloride Criteria*</b>	
3	Tidal	Upstream Flow			<b>Chloride &amp; Sodium Criteria* @ RM 98</b>	
4		Channel Deepening*		Salt Front Monitoring  		
5					N/A	N/A
6		Ocean Salt				
			Sea Level Rising			



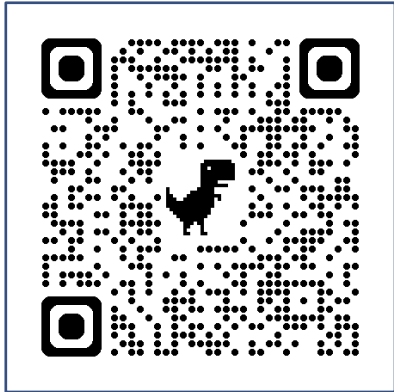
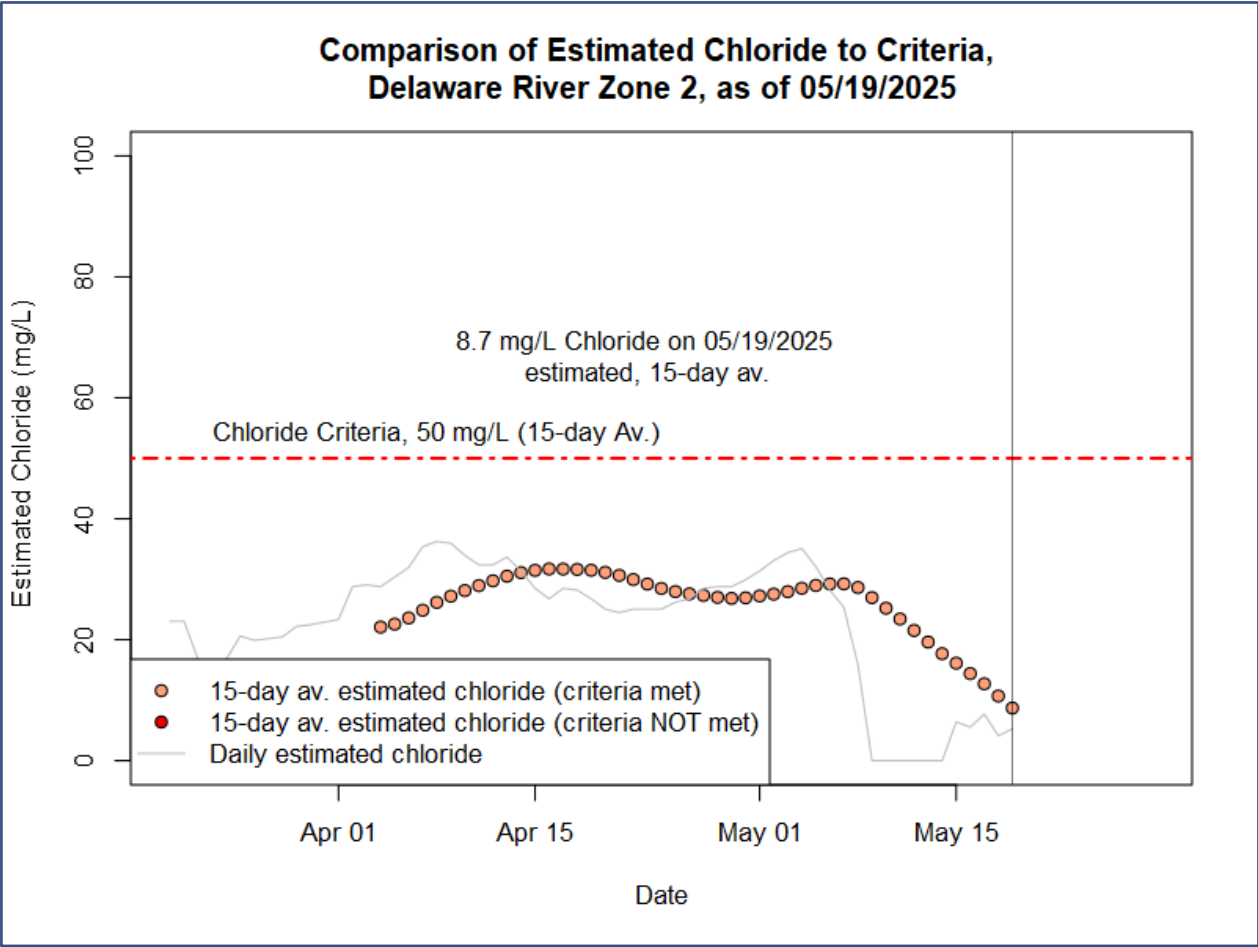
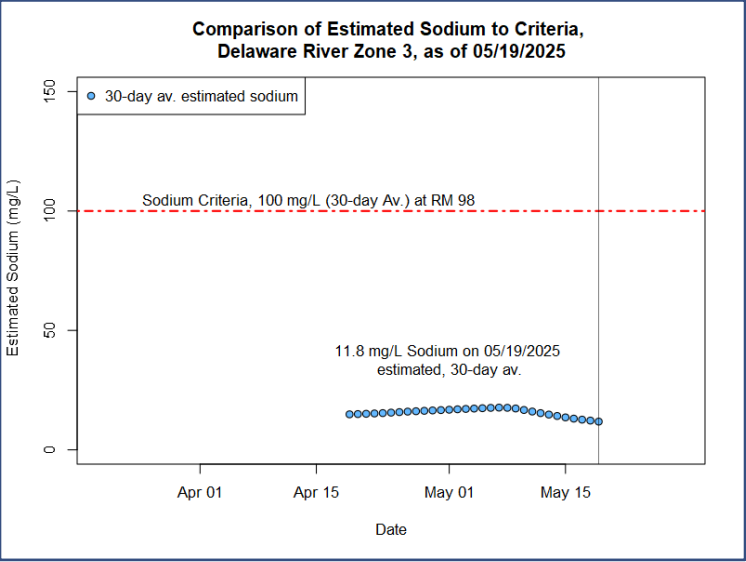
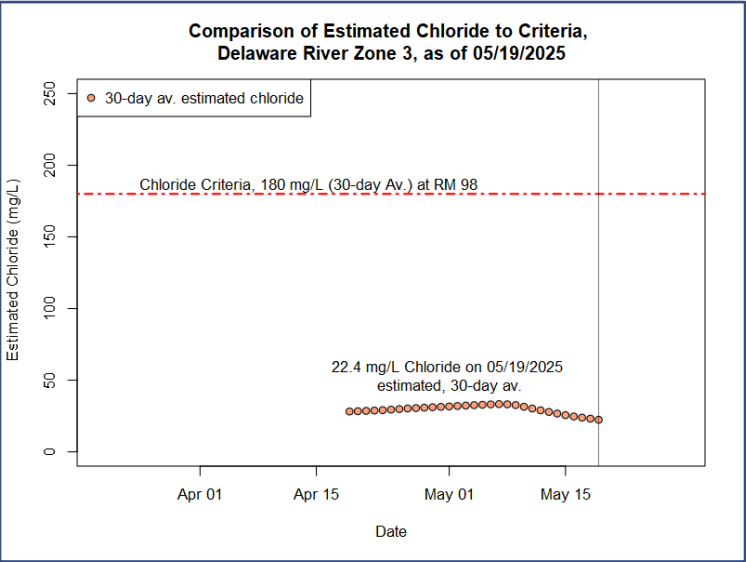


## Zone 2

RM 108.4  
to  
RM 133.4  
(head of  
tide)

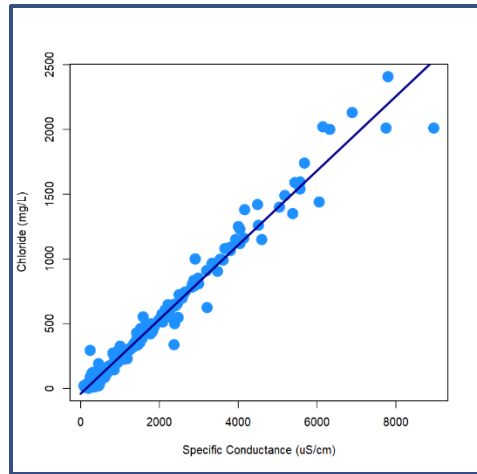


# Daily Dashboard Results for Estimated Chloride & Sodium



# Chloride Daily Assessment via DRBC Water Quality Dashboard

Continuous  
real-time  
Specific  
Conductance  
(USGS)

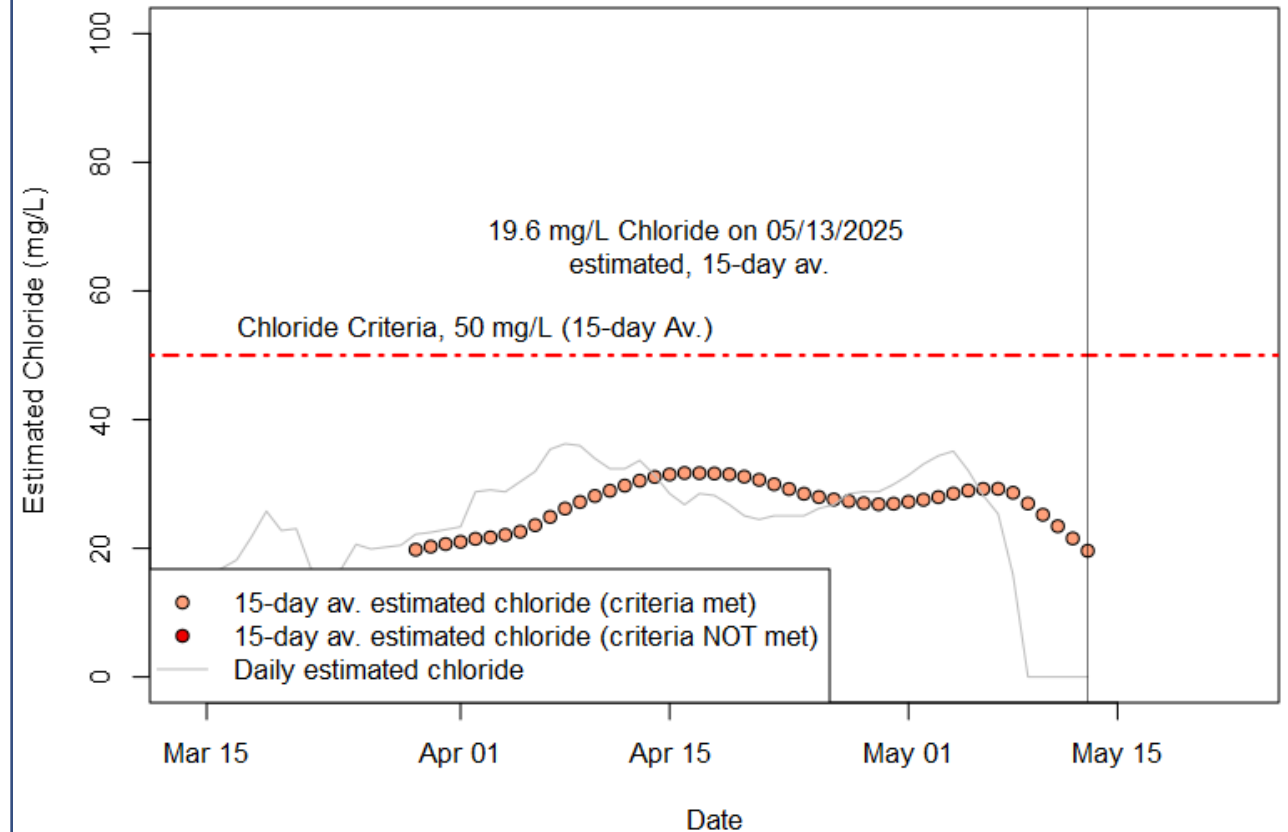


Plot estimated Rolling  
Mean Chloride  
Compared to Criteria

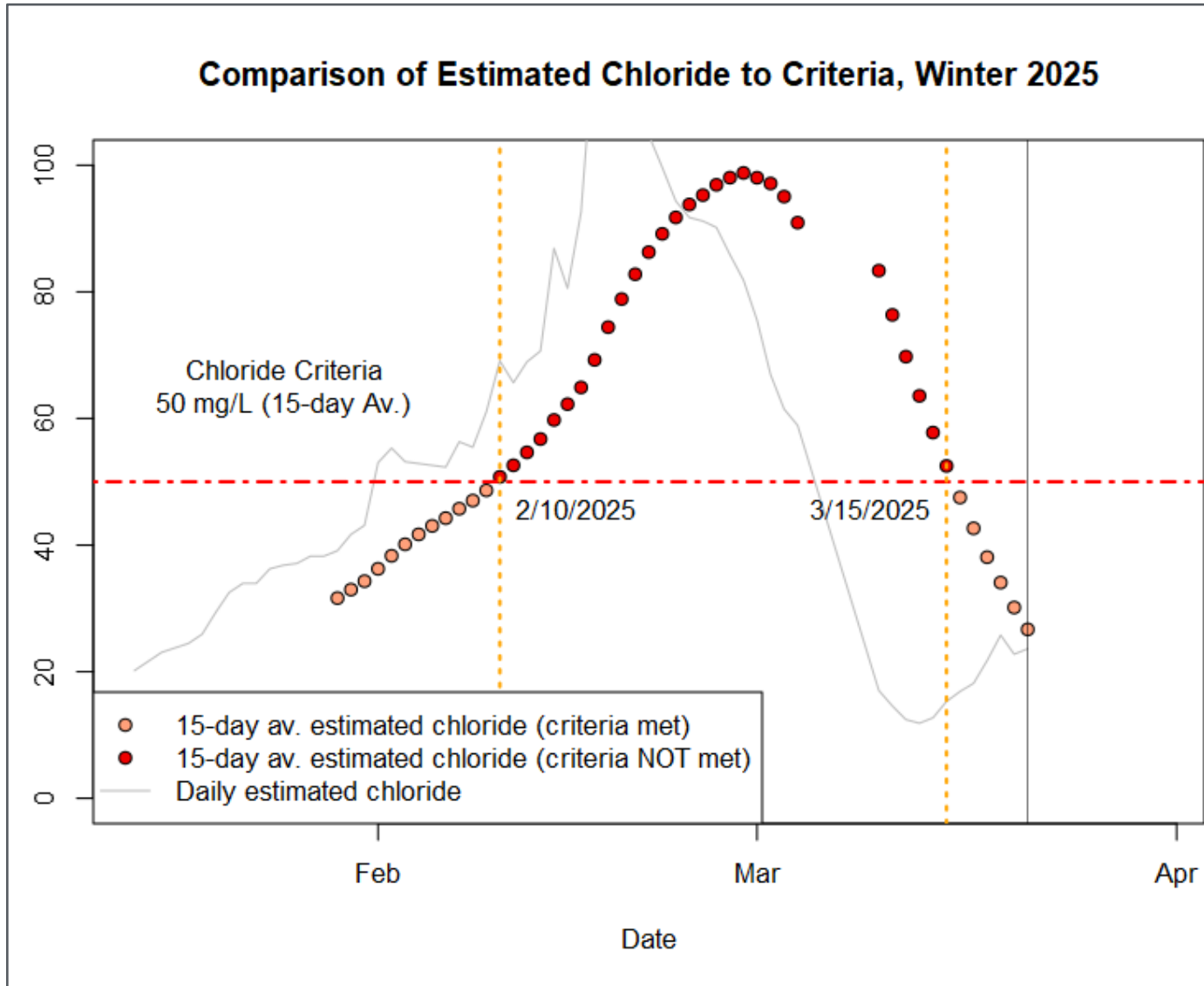


Compute  
estimated  
Rolling Mean  
Chloride

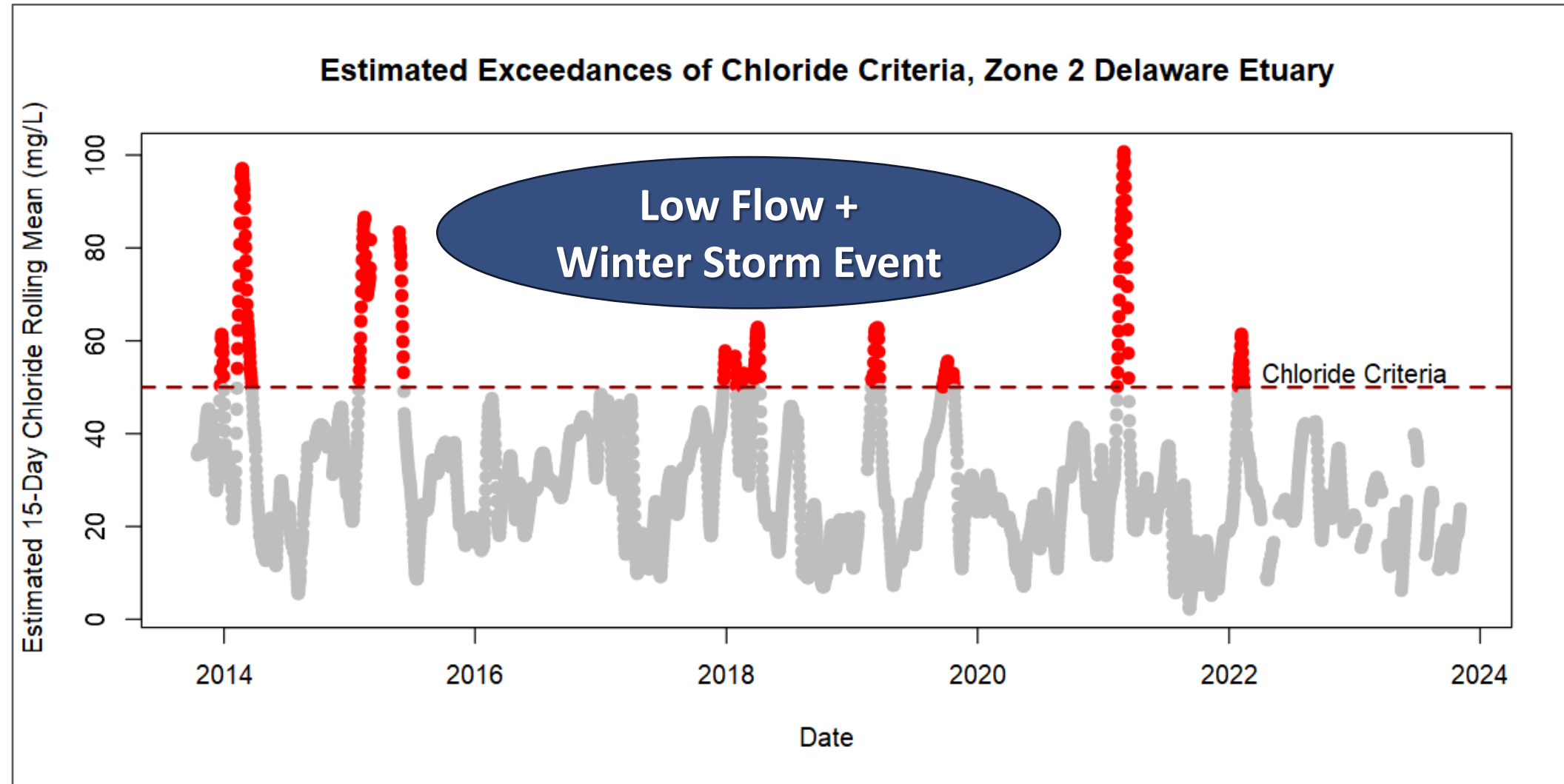
**Comparison of Estimated Chloride to Criteria,  
Delaware River Zone 2, as of 05/13/2025**



# Apparent Zone 2 Chloride Criteria Exceedance Winter 2025

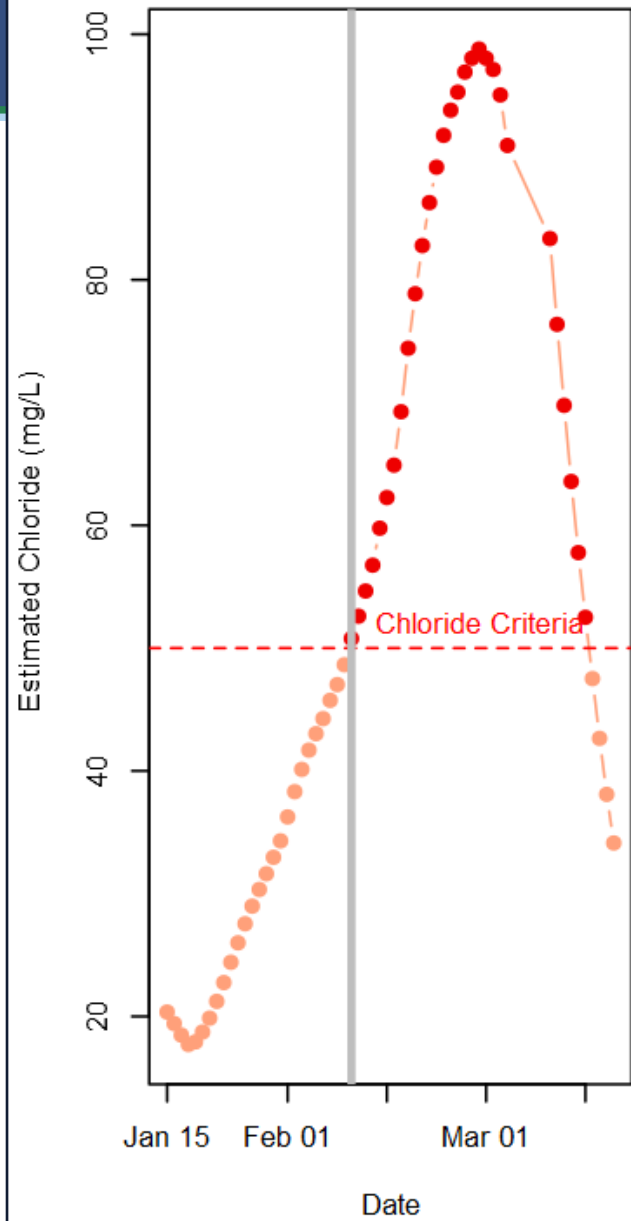


# Historic Apparent Zone 2 Chloride Exceedances

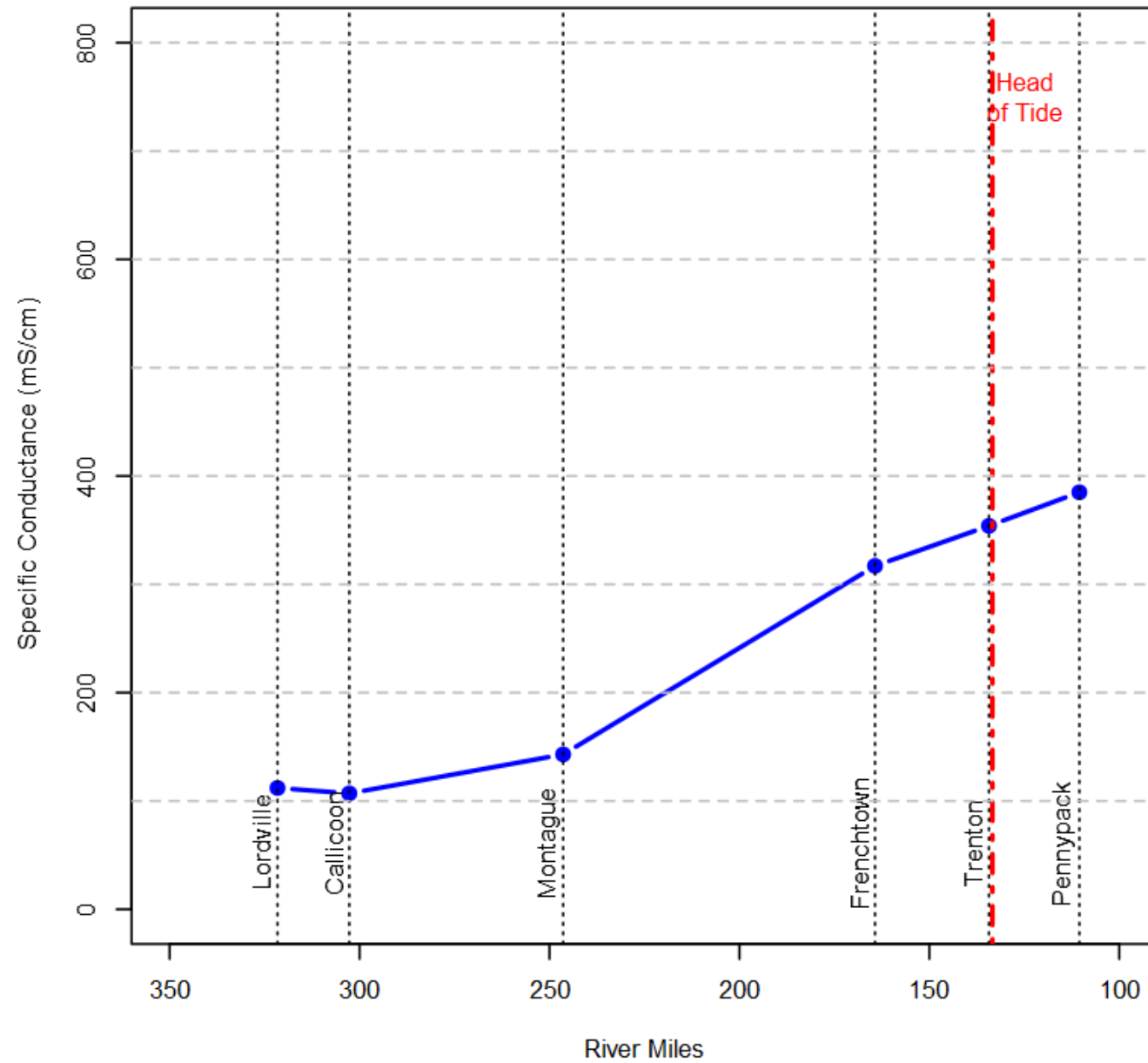




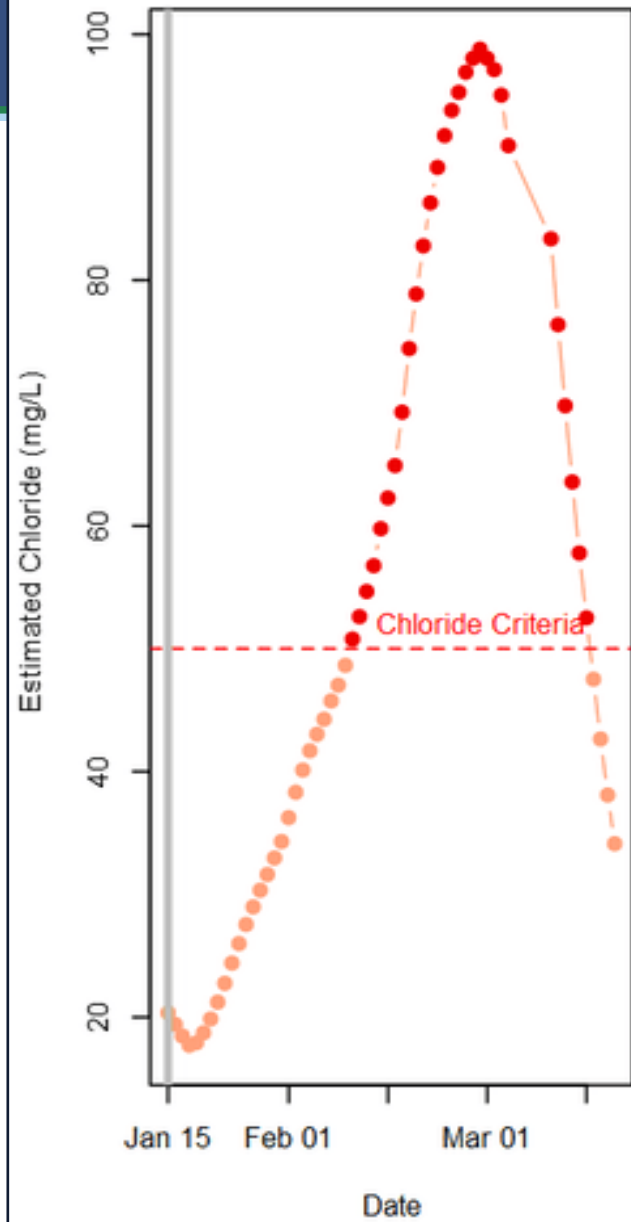
Estimated Chloride, Zone 2



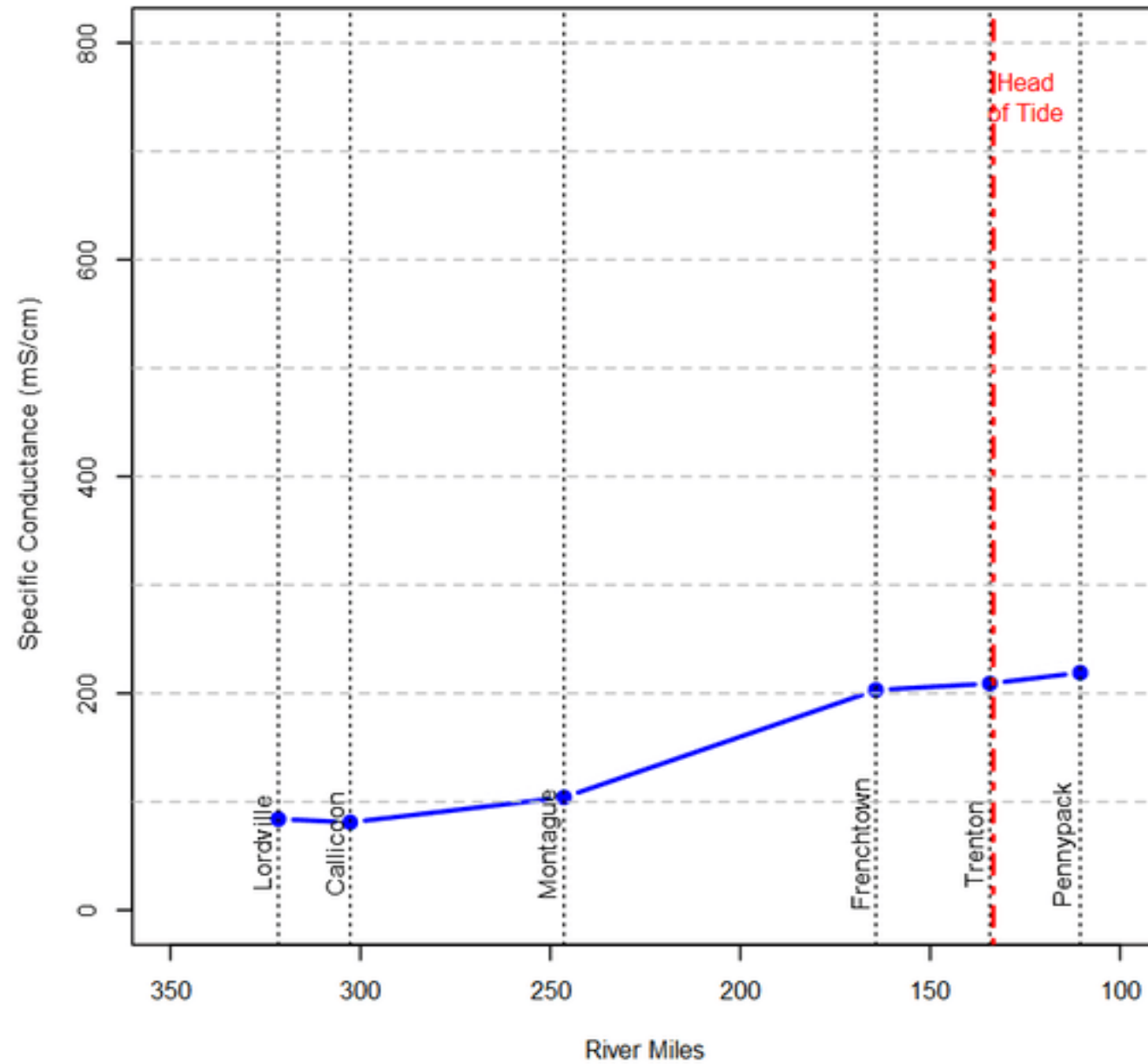
Delaware River Specific Conductance  
2025-02-10



Estimated Chloride, Zone 2



Delaware River Specific Conductance  
2025-01-15



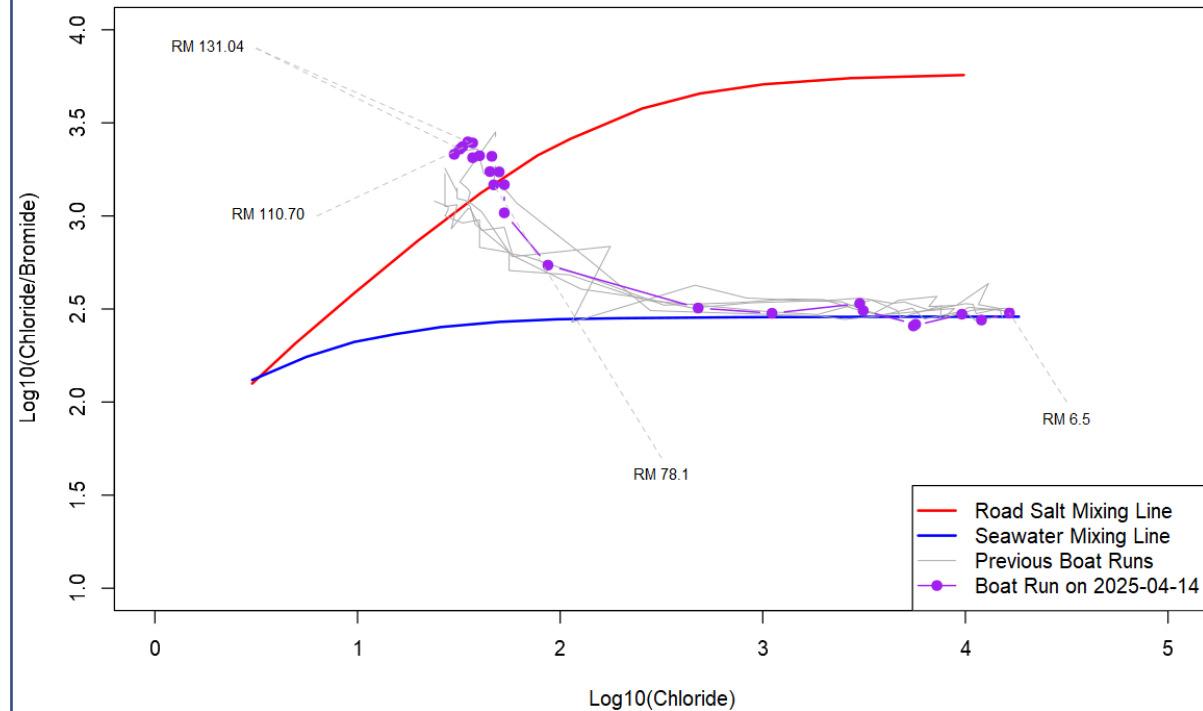
# Typical Clean Water Act Remedy for Criteria Exceedances

- Add to 303d List (list of impaired water bodies, states-only function)
- Prepare a Total Maximum Daily Load (TMDL)
- **HOWEVER....**
  - Zone 2 chloride criteria reflects Flow Management Goal (not human health or aquatic life)
    - DRBC's criteria established under DRBC's authority (not Clean Water Act)
  - Historic preference for direct-measurement of exceedances (not derived) for inclusion on 303d list
  - Balancing risk management (driver safety and drinking water)
  - CWA tools oriented toward point sources

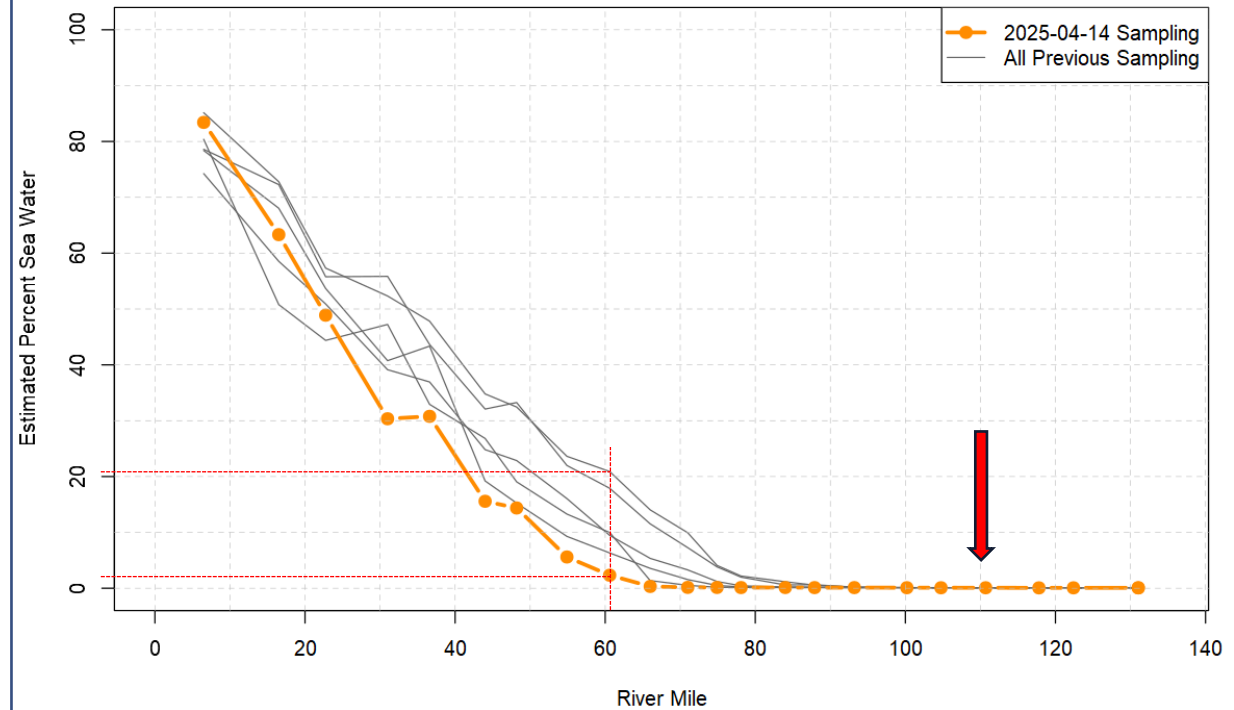


# Using Chloride / Bromide Ratios to Estimate Contributions of Ocean vs. Terrestrial Salt

Boat Run Chloride / Bromide vs. Chloride on 2025-04-14

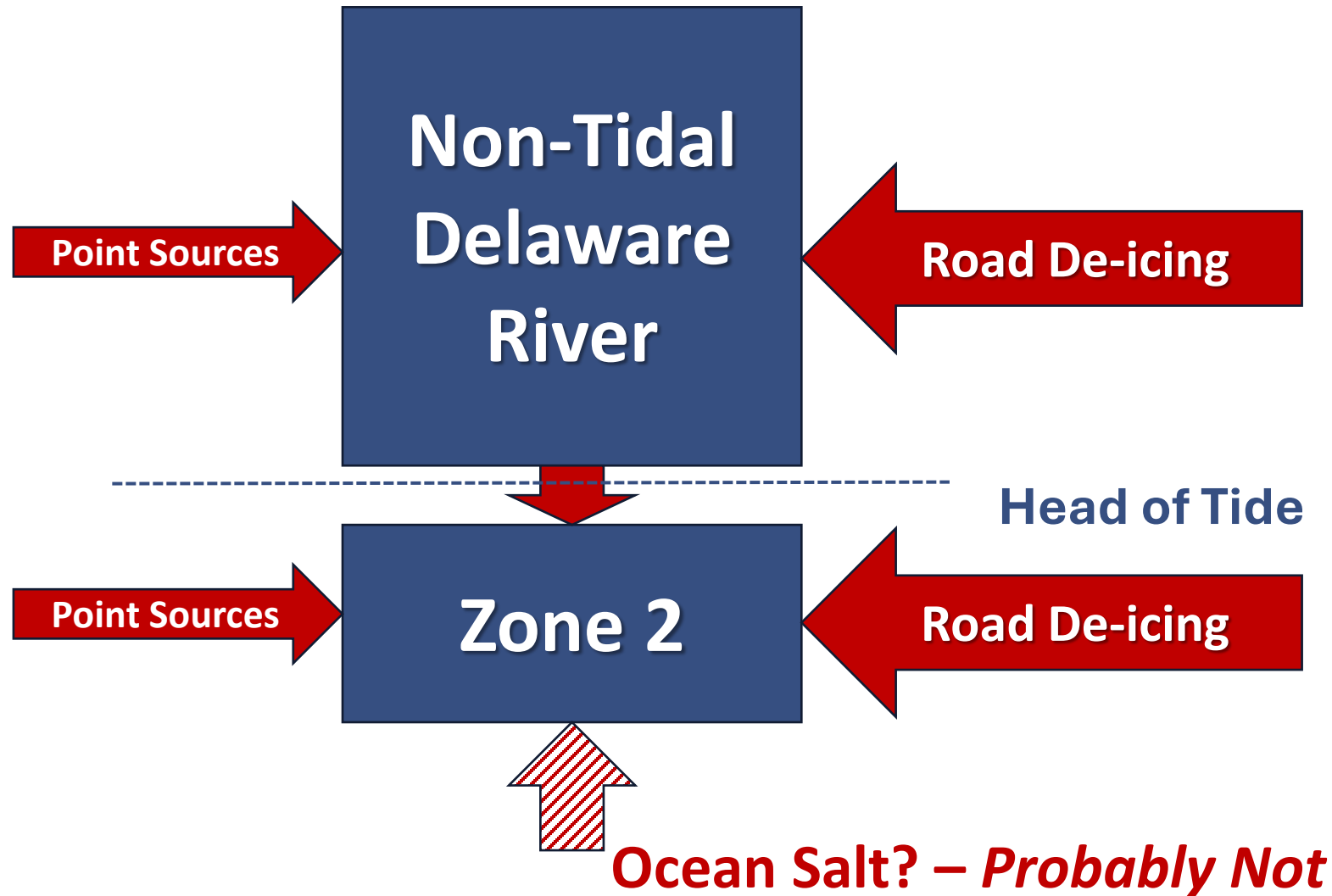


Estimated Percent Sea Water as of 2025-04-14 using Ratios of Bromide to Chloride, Compared to Previous Sampling

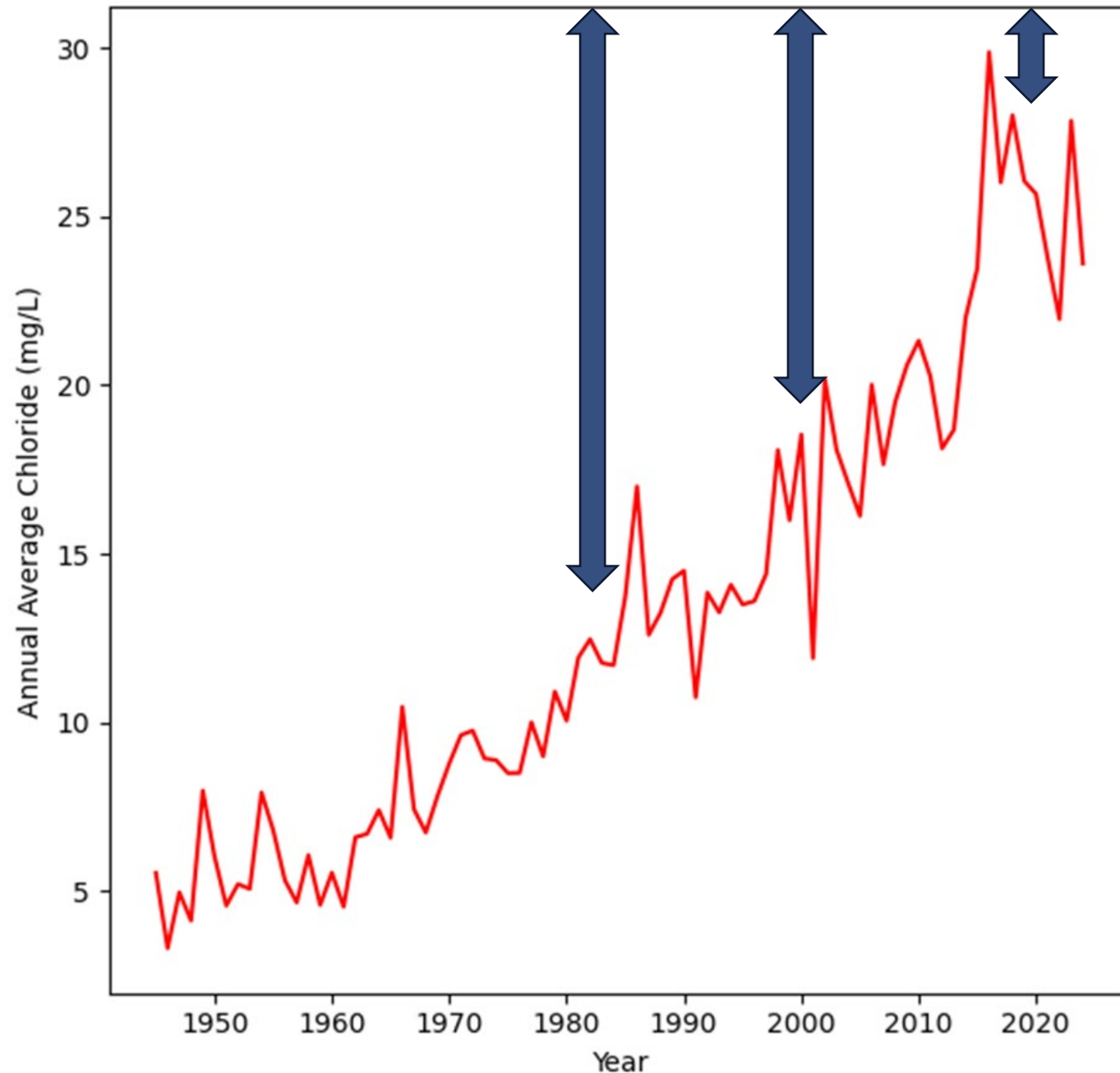


***DRAFT – Revisions Anticipated***

# Sources of Zone 2 Salt (Hypothesis)



Delaware River at Trenton - Chloride



- As non-tidal chloride concentration *increases*, available assimilative capacity in Zone 2 *decreases*



# Zone 2 Salt Management

- Exceedances of Zone 2 Chloride Criteria most likely due to road de-icing (terrestrial salt) and point sources
  - Probably not ocean salt
- Other pollutants also have societal benefit – still need to control
- Challenges to implementing typical CWA approach
- Looking toward salt reduction efforts in non-tidal as path forward



[John.Yagecic@drbc.gov](mailto:John.Yagecic@drbc.gov)  
[www.drbc.gov](http://www.drbc.gov)

