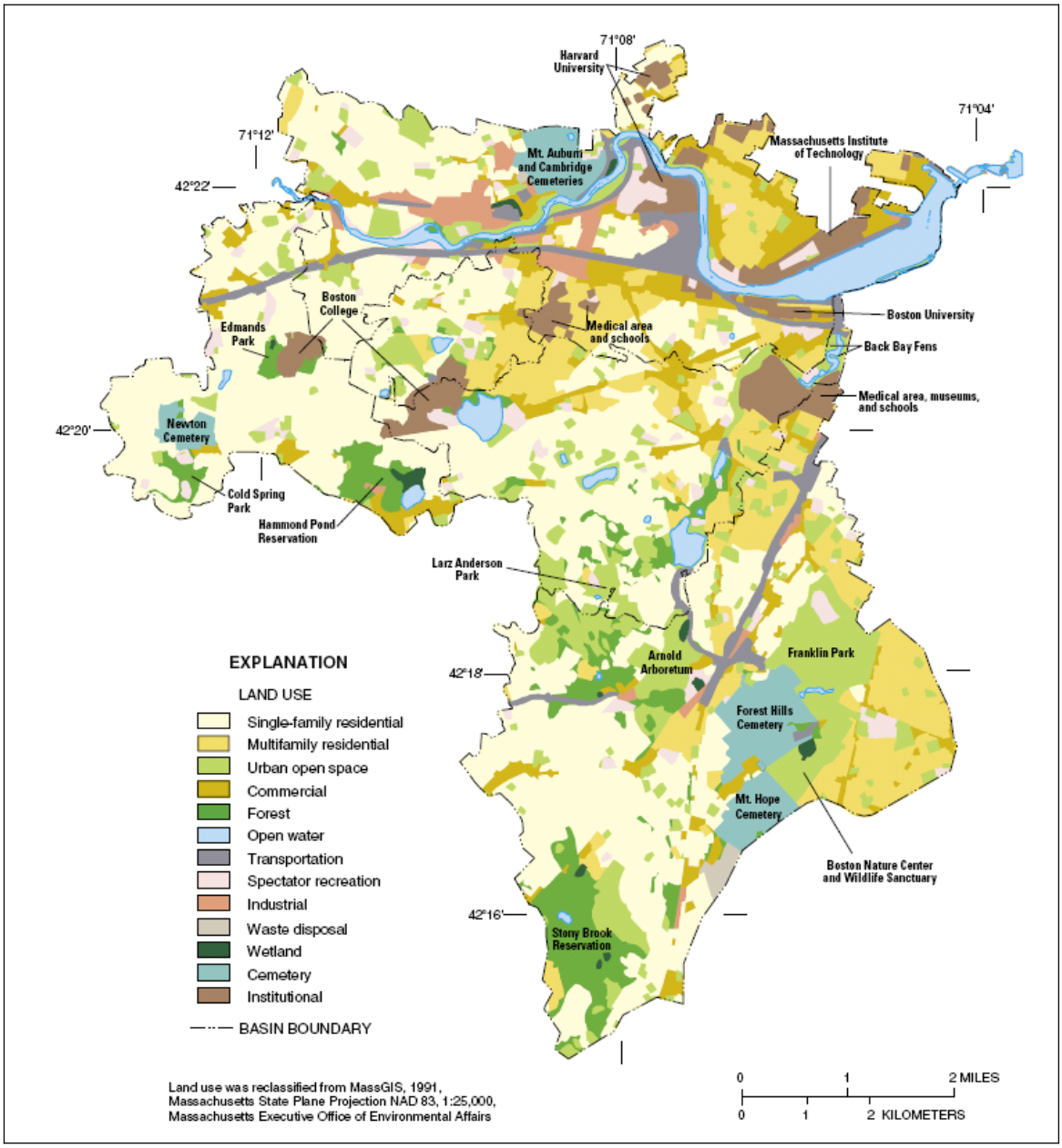


Figure 2-2 Land use types in the Charles River Basin (modified from Zarriello and Barlow 2002).

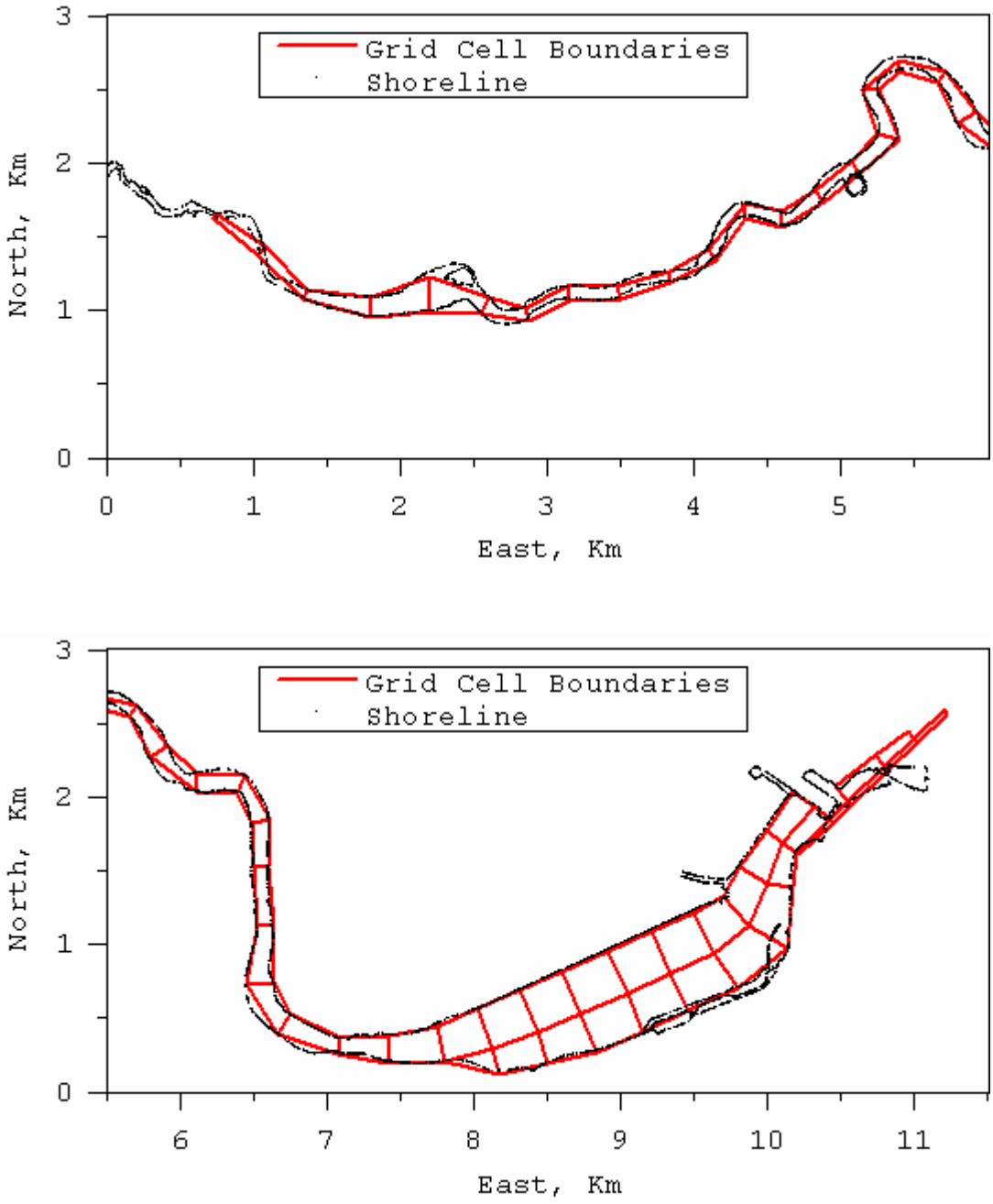


Figure 3.1. Hydrodynamic and Water Quality Model Grid for Lower Charles River.

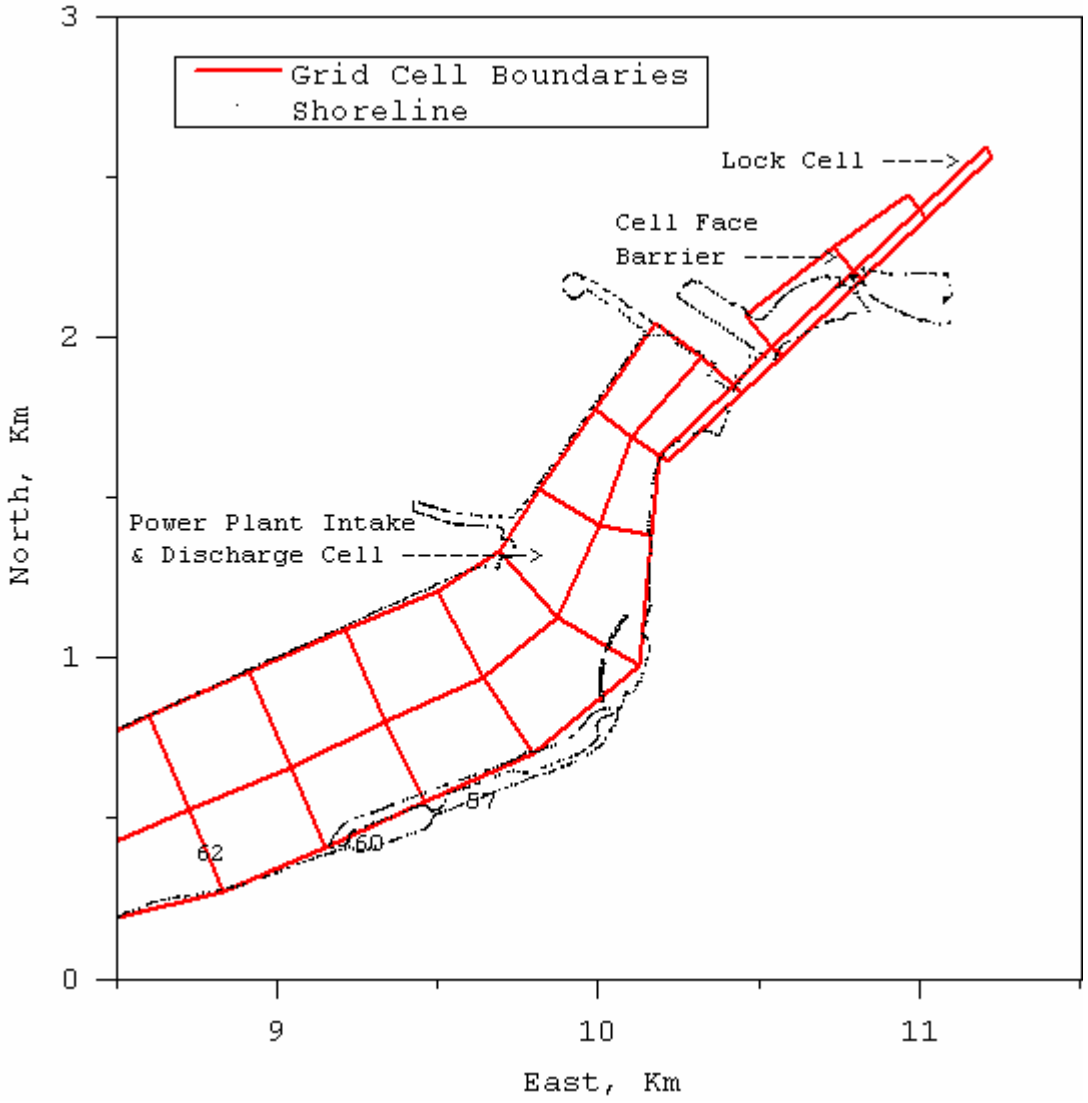


Figure 3.2. Eastern Region of Model Grid.

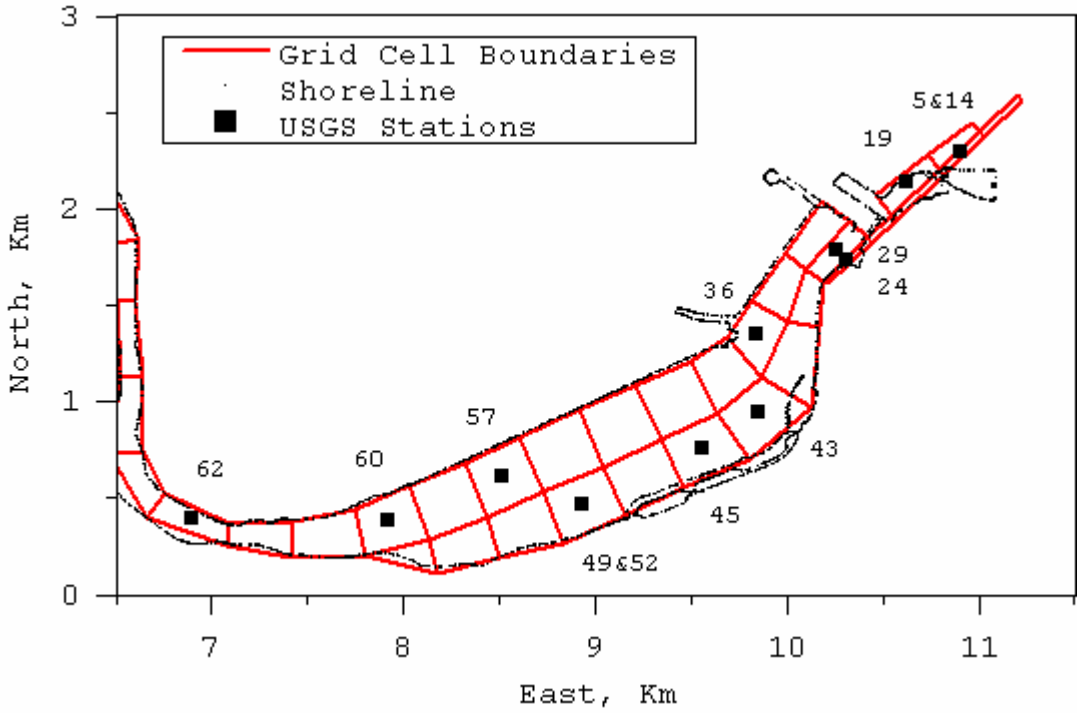


Figure 3.3. Location of USGS Salinity and Temperature Sampling Stations

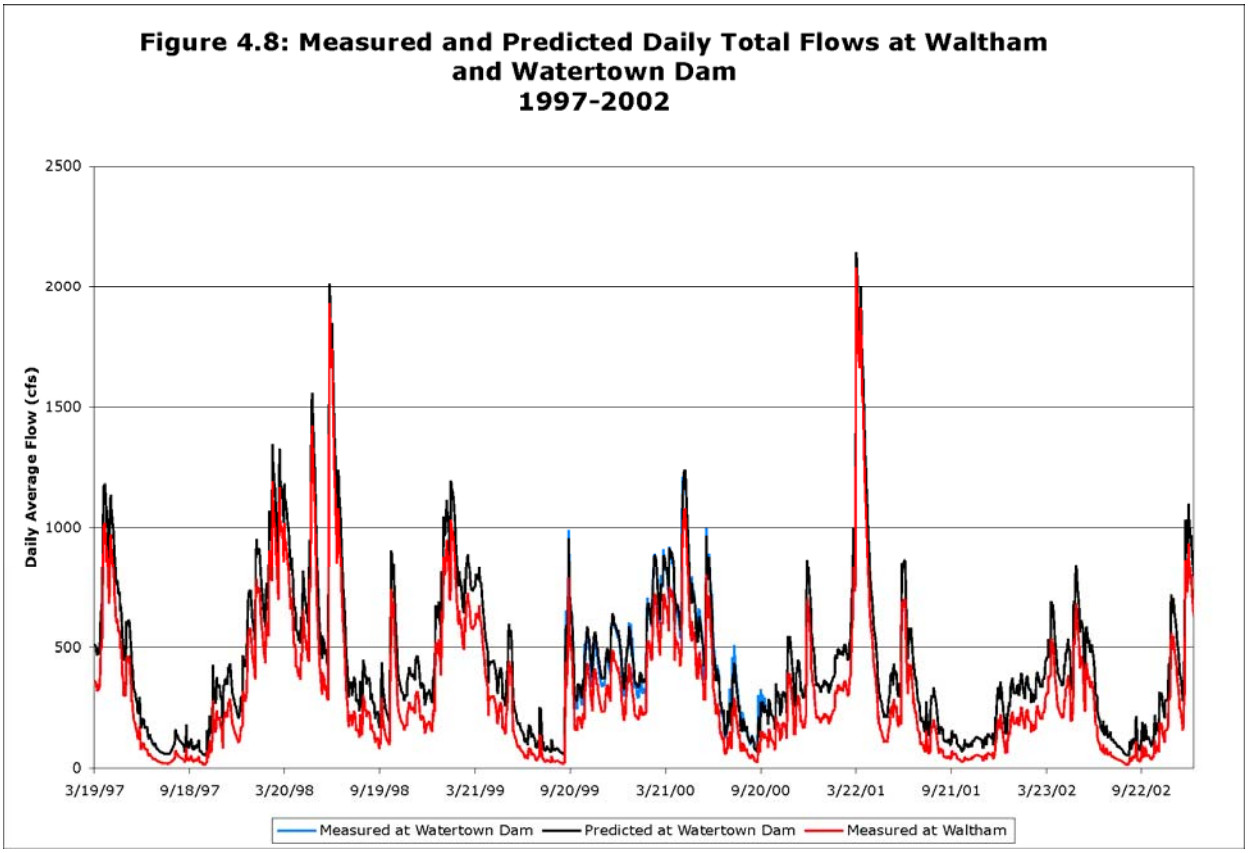


Figure 3.4. Flow at Watertown Dam

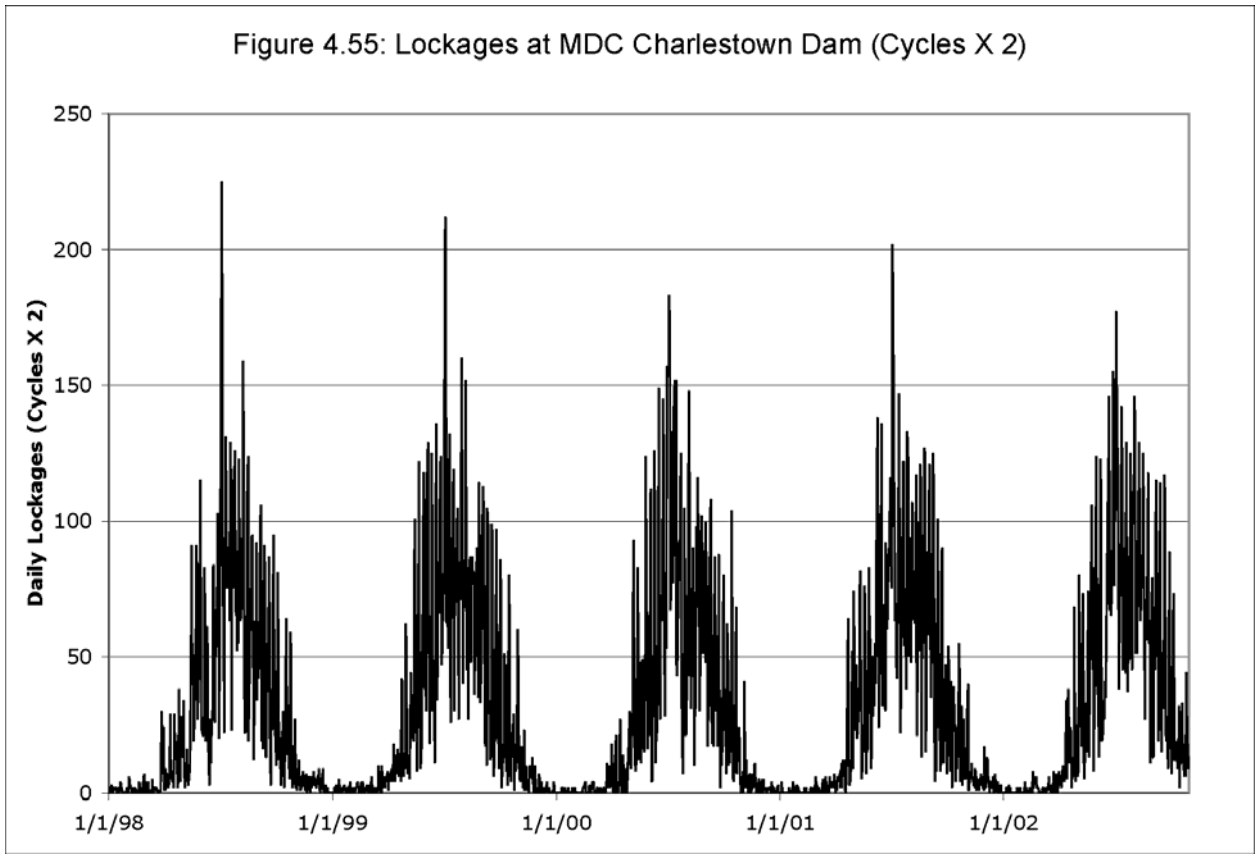


Figure 3.5. Lock Openings at Charleston Dam

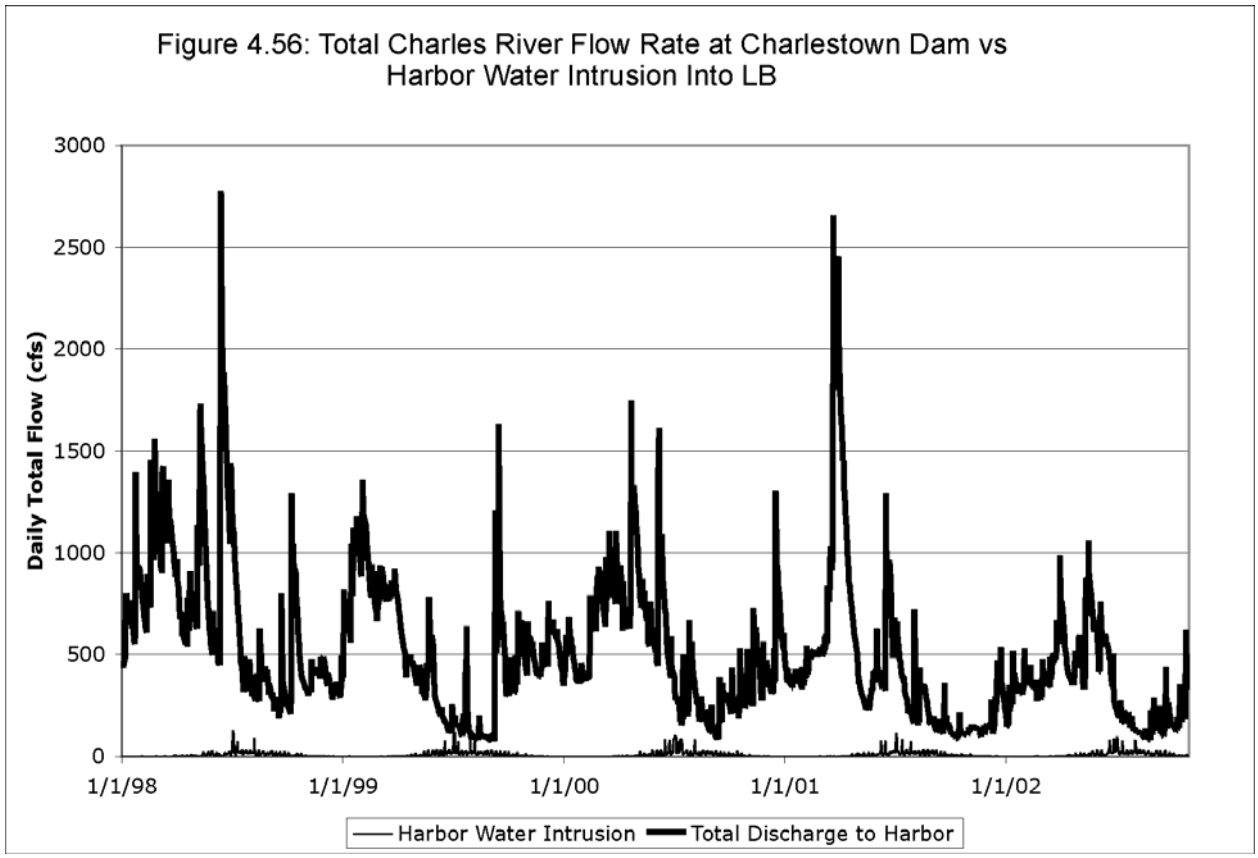


Figure 3.6. Outflow and Salinity Intrusion Flow at Charleston Dam

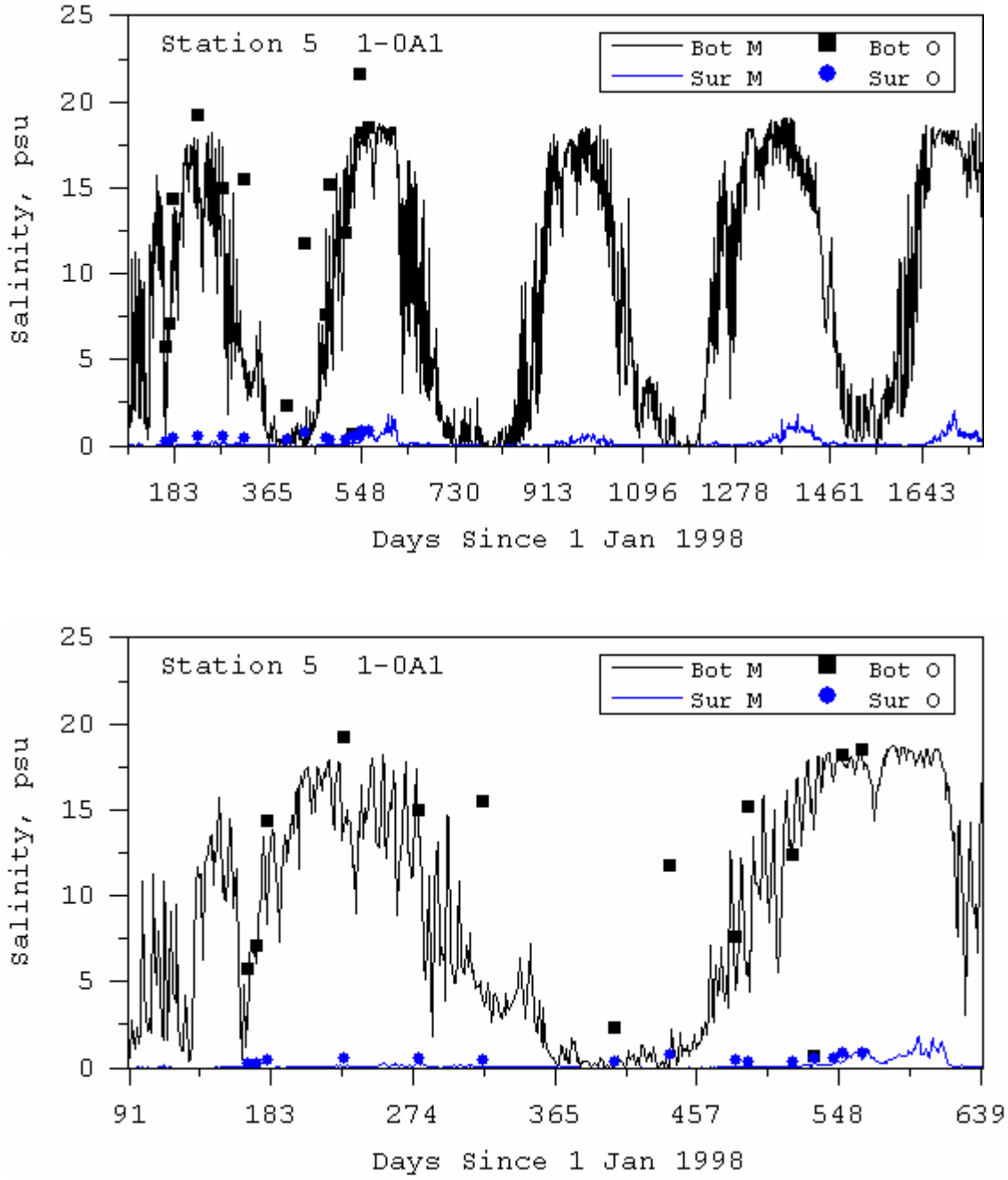


Figure 3.7 Model Predicted and Observed Salinity at USGS Station 5. (Note: Stations 5 and 14 are in same model cell)

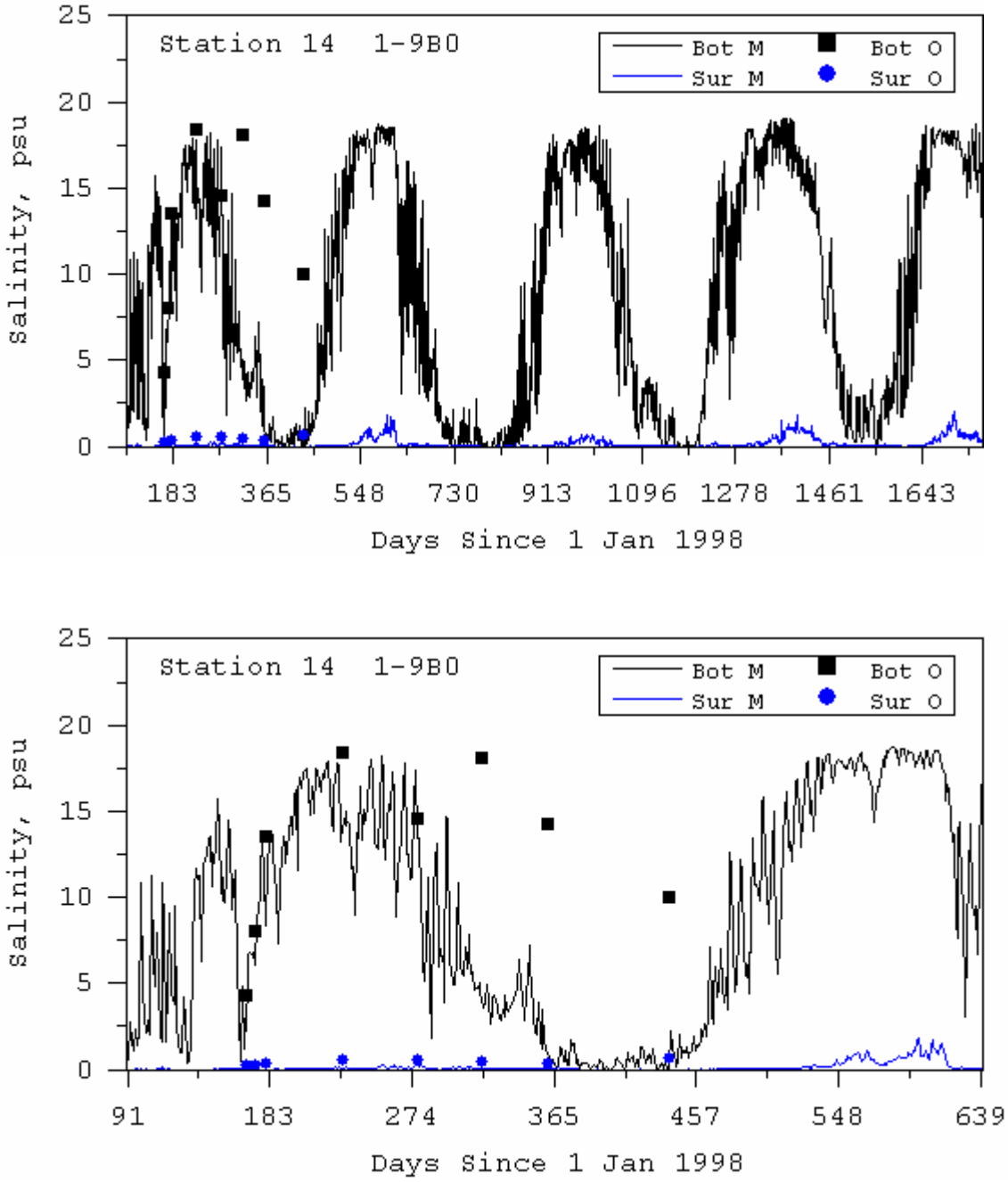


Figure 3.8. Model Predicted and Observed Salinity at USGS Station 14. (Note: Stations 5 and 14 are in same model cell)

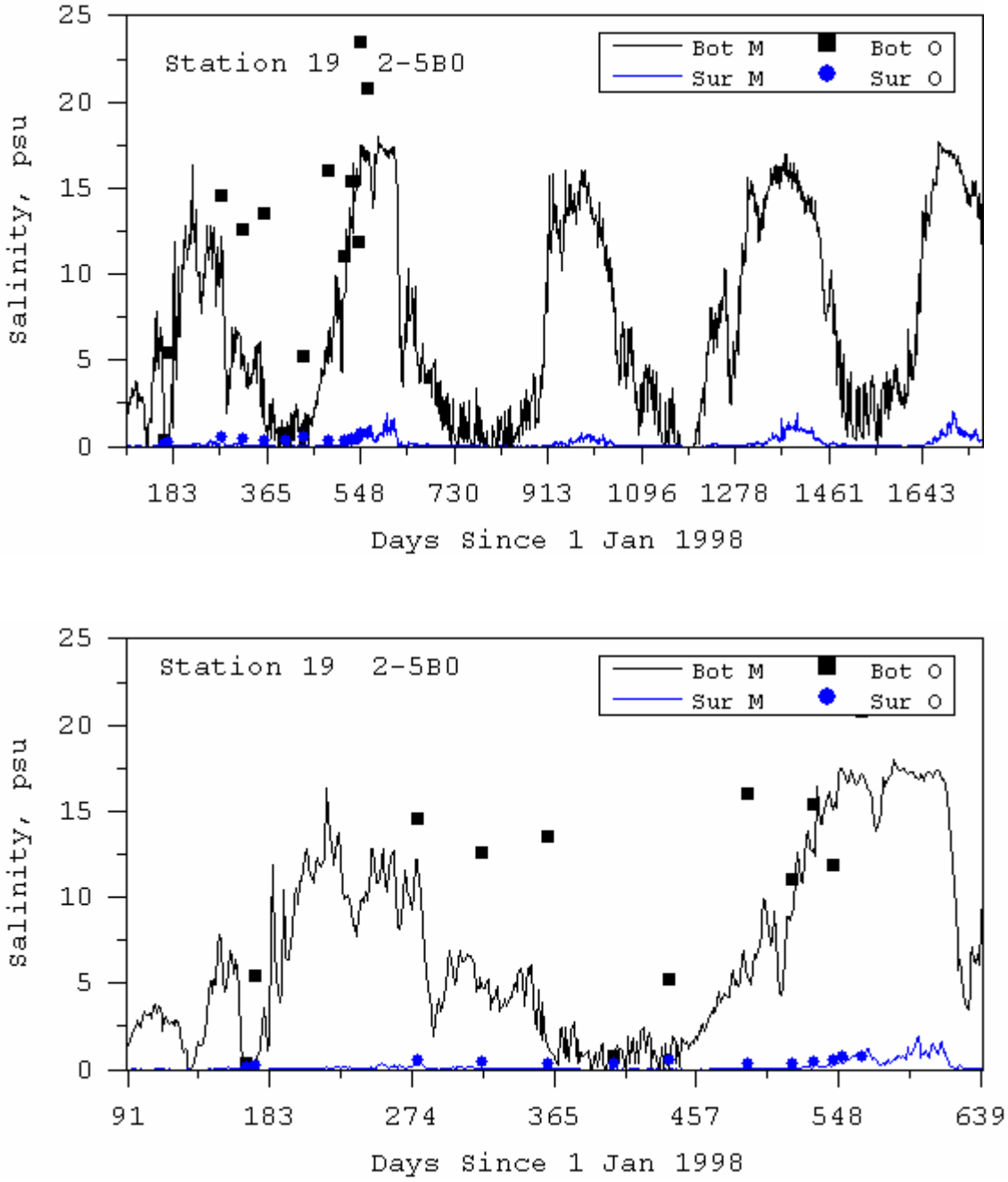


Figure 3.9. Model Predicted and Observed Salinity at USGS Station

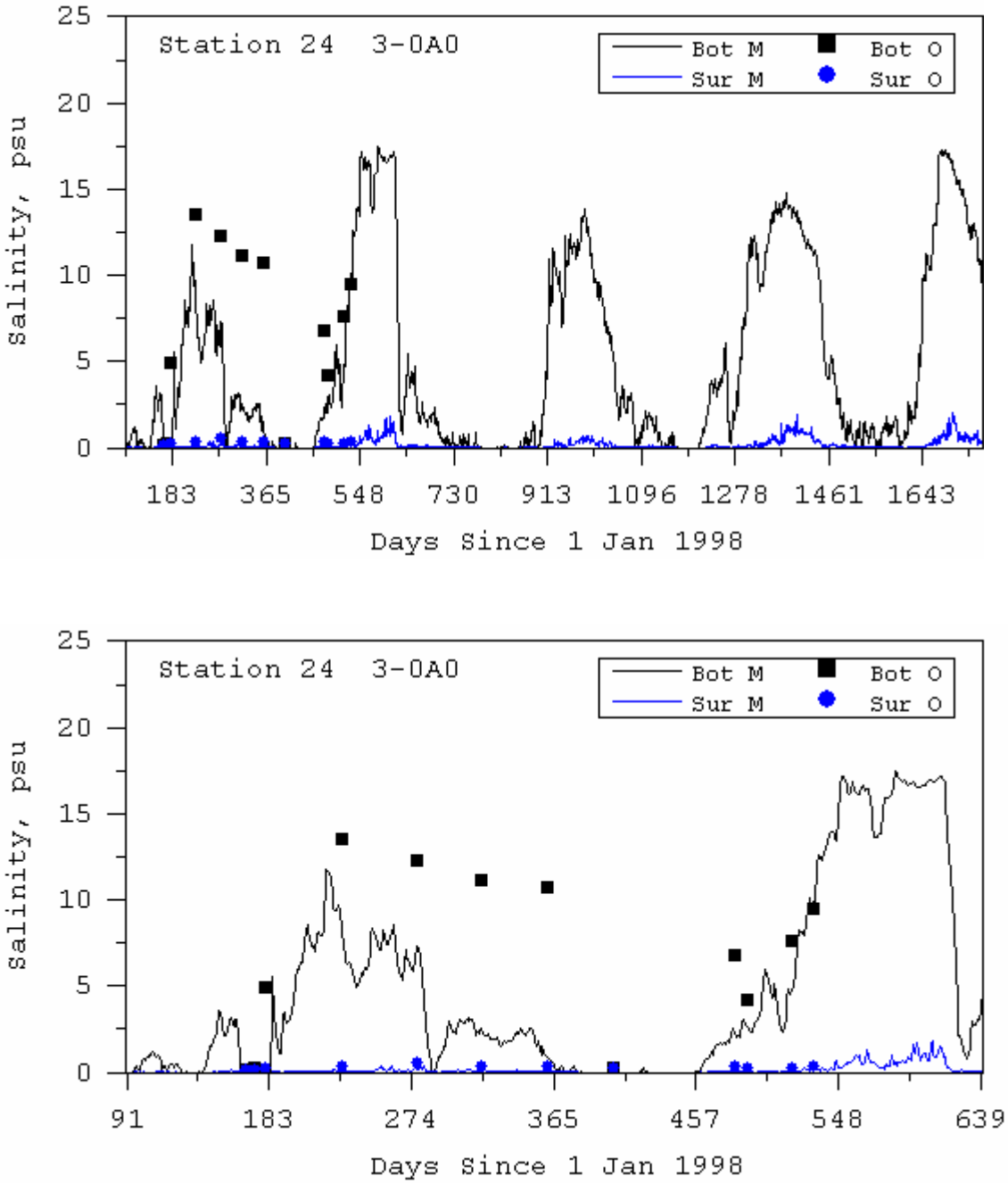


Figure 3.10. Model Predicted and Observed Salinity at USGS Station

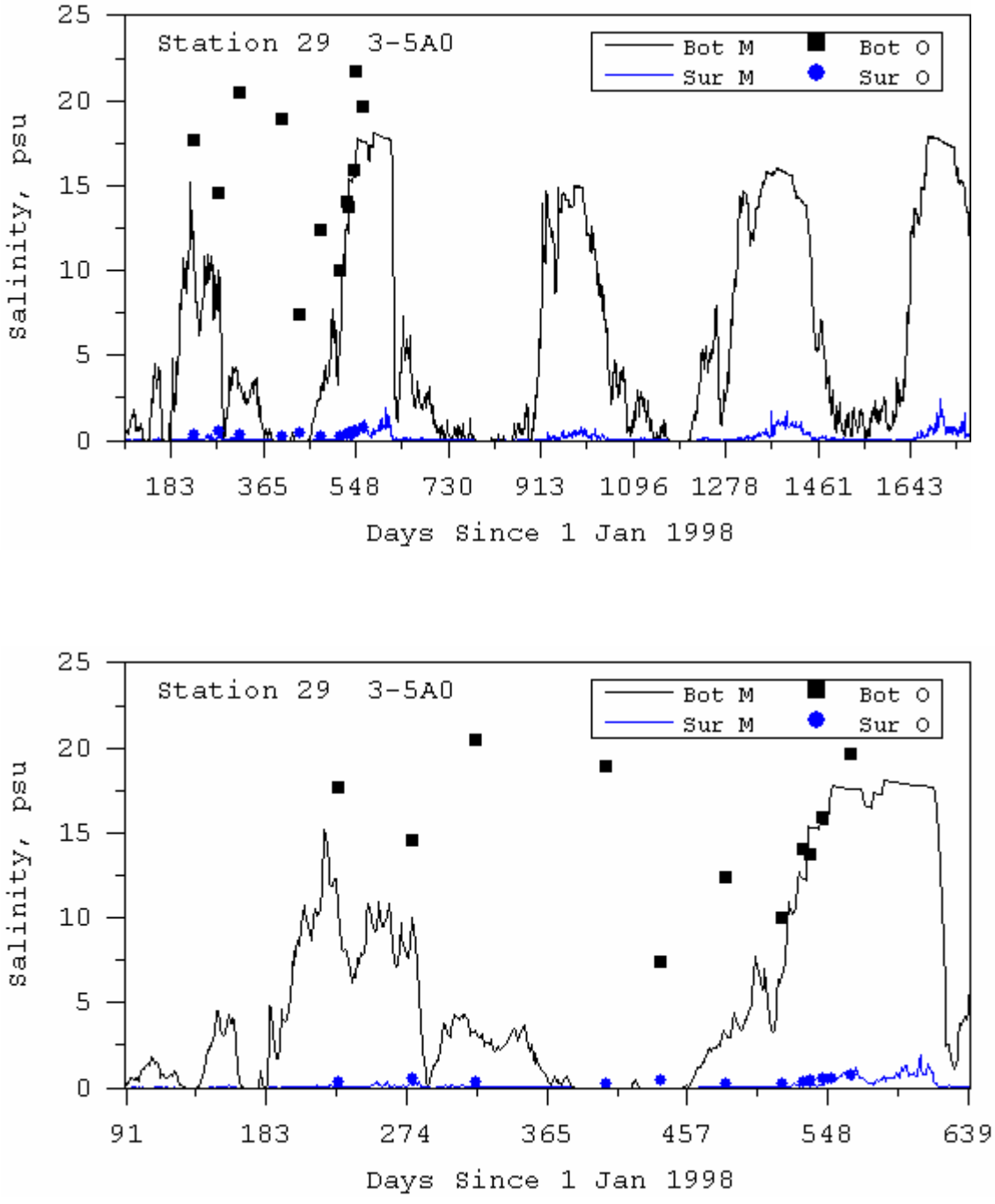


Figure 3.11. Model Predicted and Observed Salinity at USGS Station

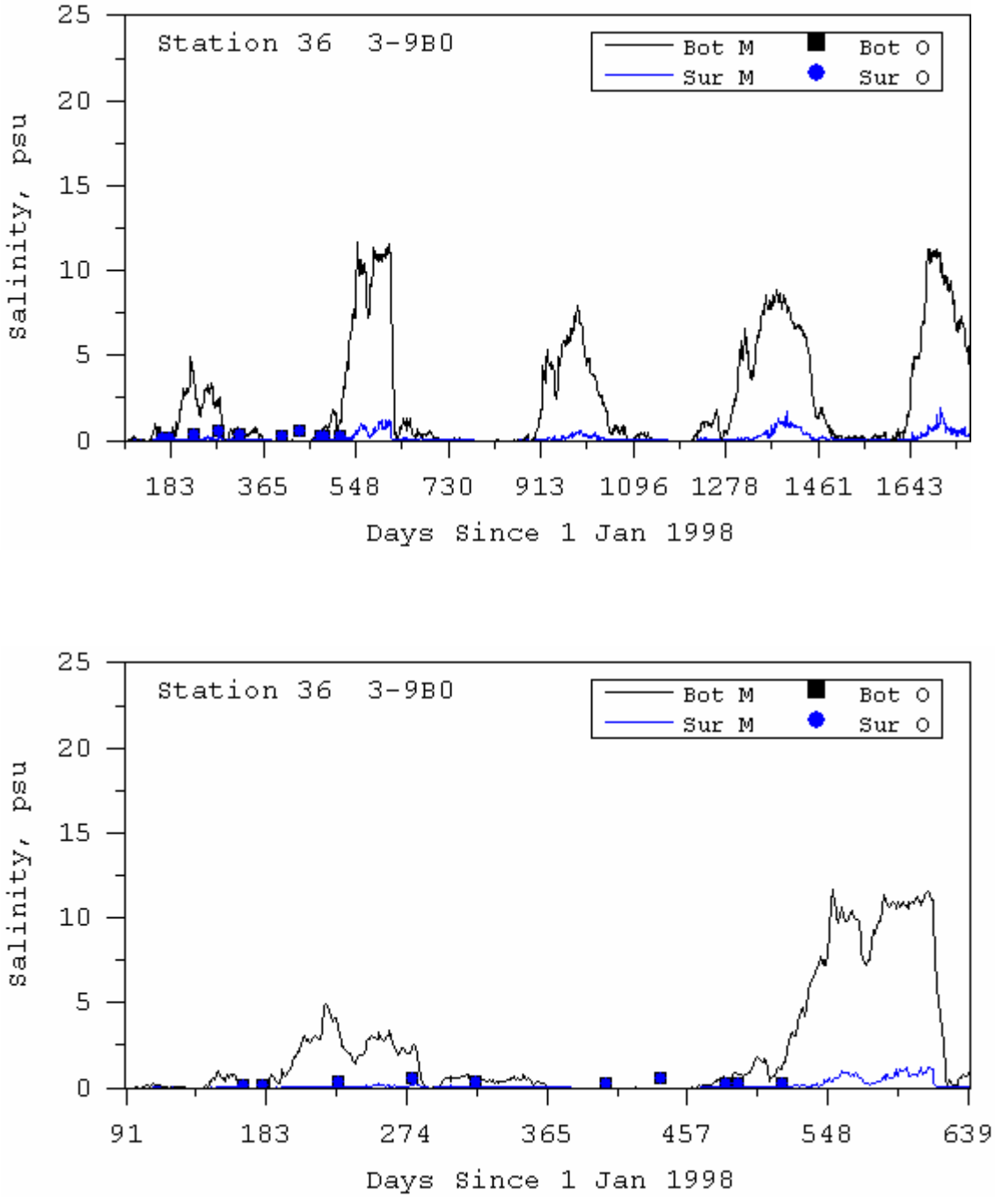


Figure 3.12. Model Predicted and Observed Salinity at USGS Station

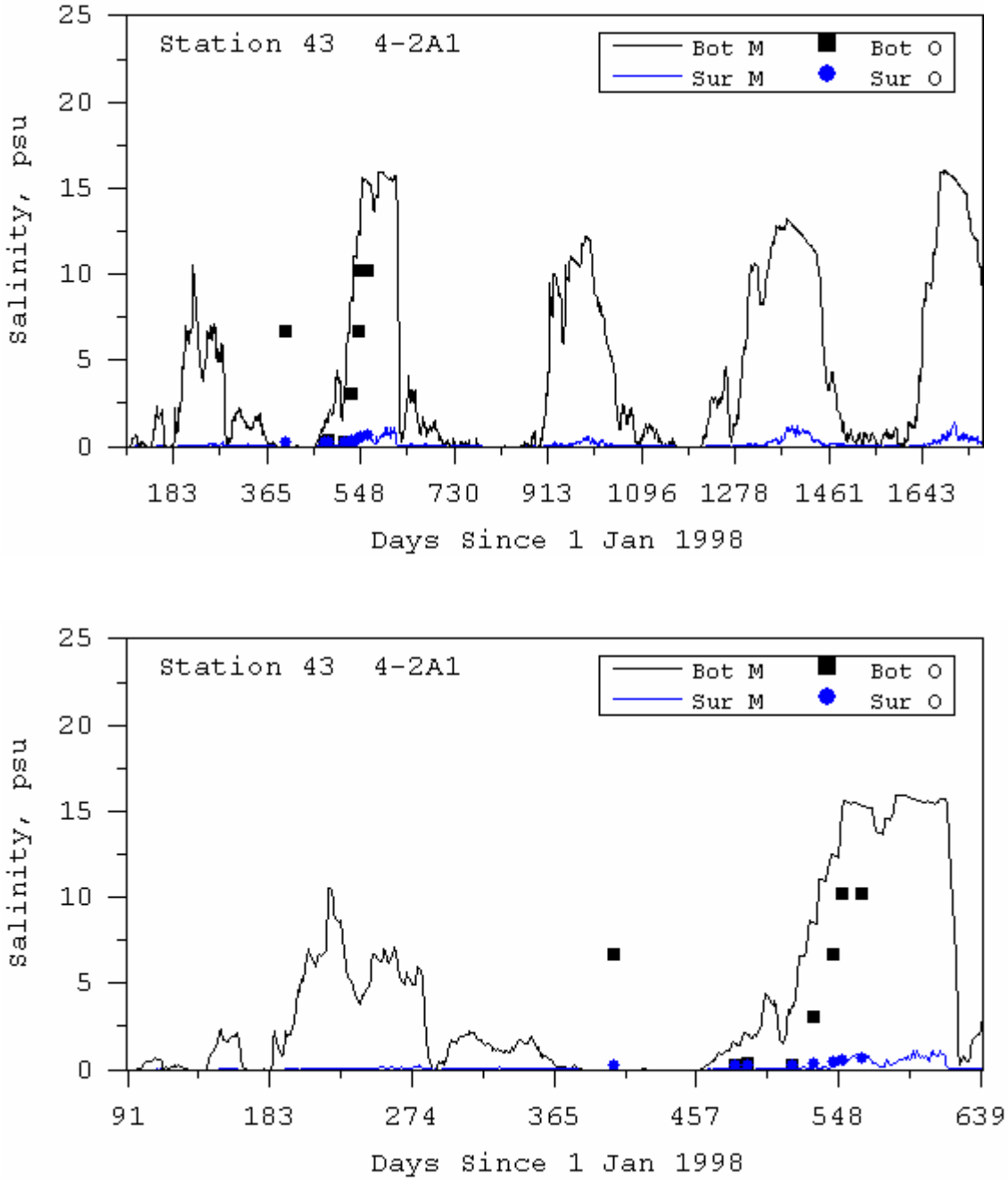


Figure 3.13. Model Predicted and Observed Salinity at USGS Station

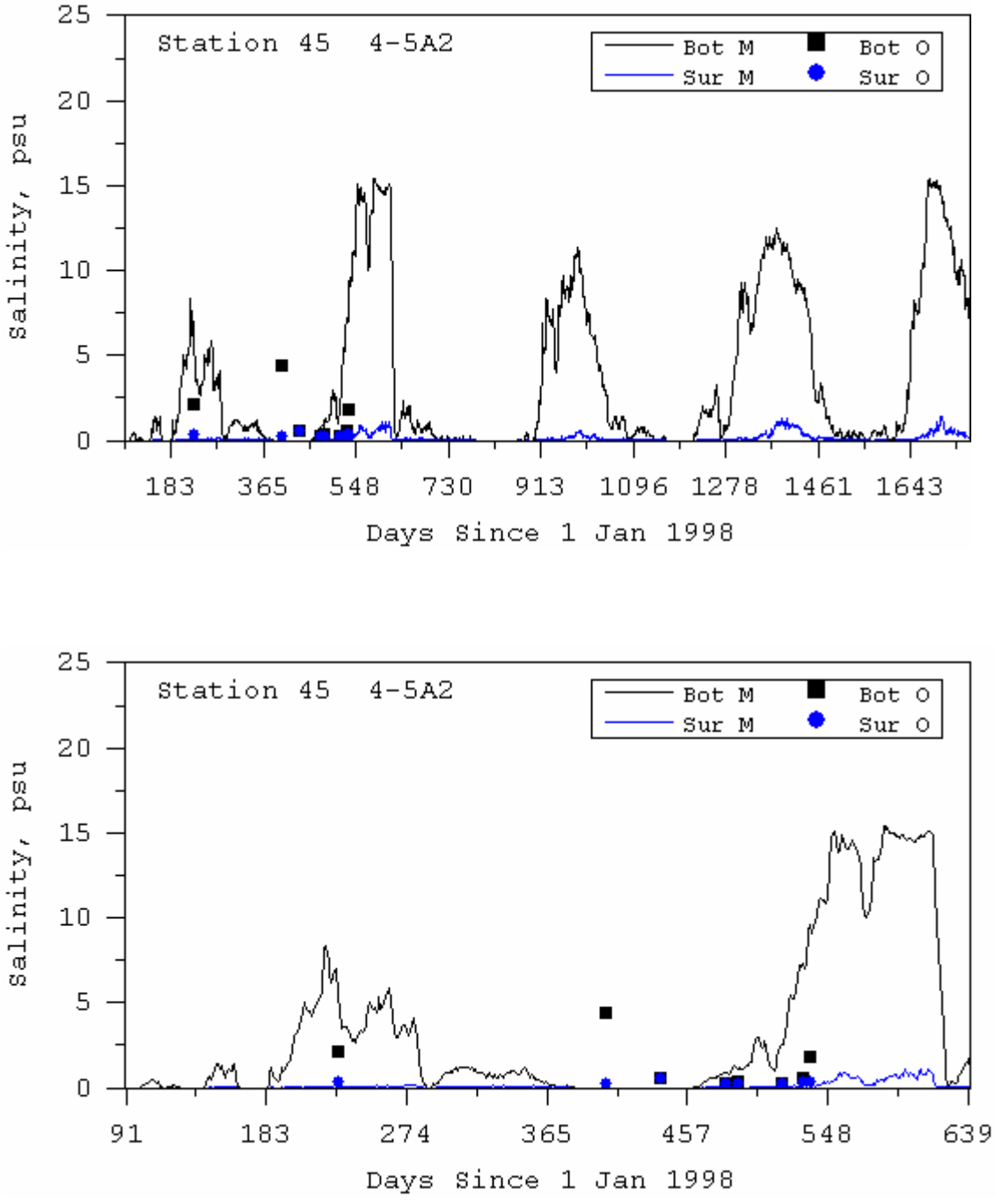


Figure 3.14. Model Predicted and Observed Salinity at USGS Station

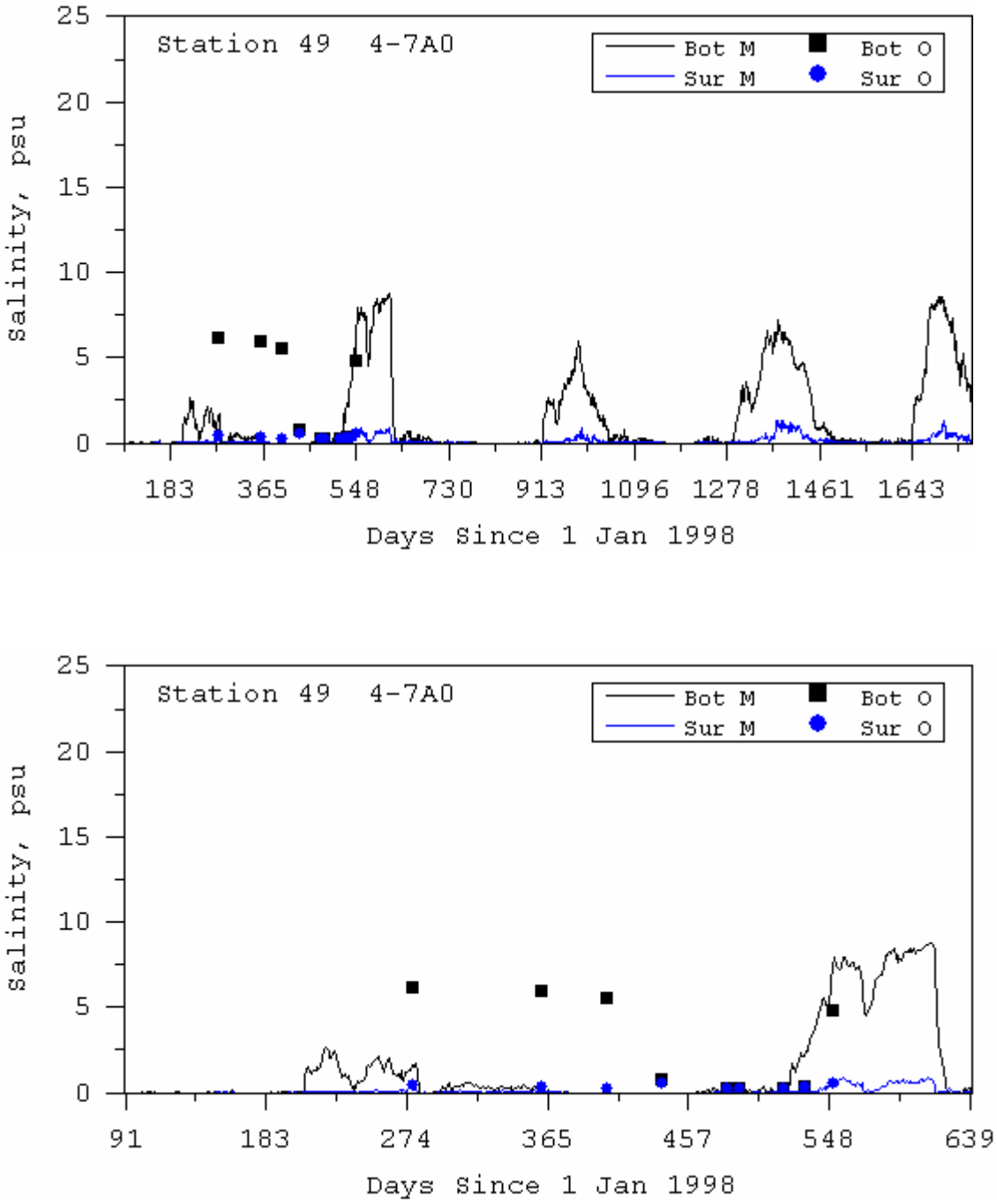


Figure 3.15. Model Predicted and Observed Salinity at USGS Station (Note: Stations 49 and 52 are in same model cell)

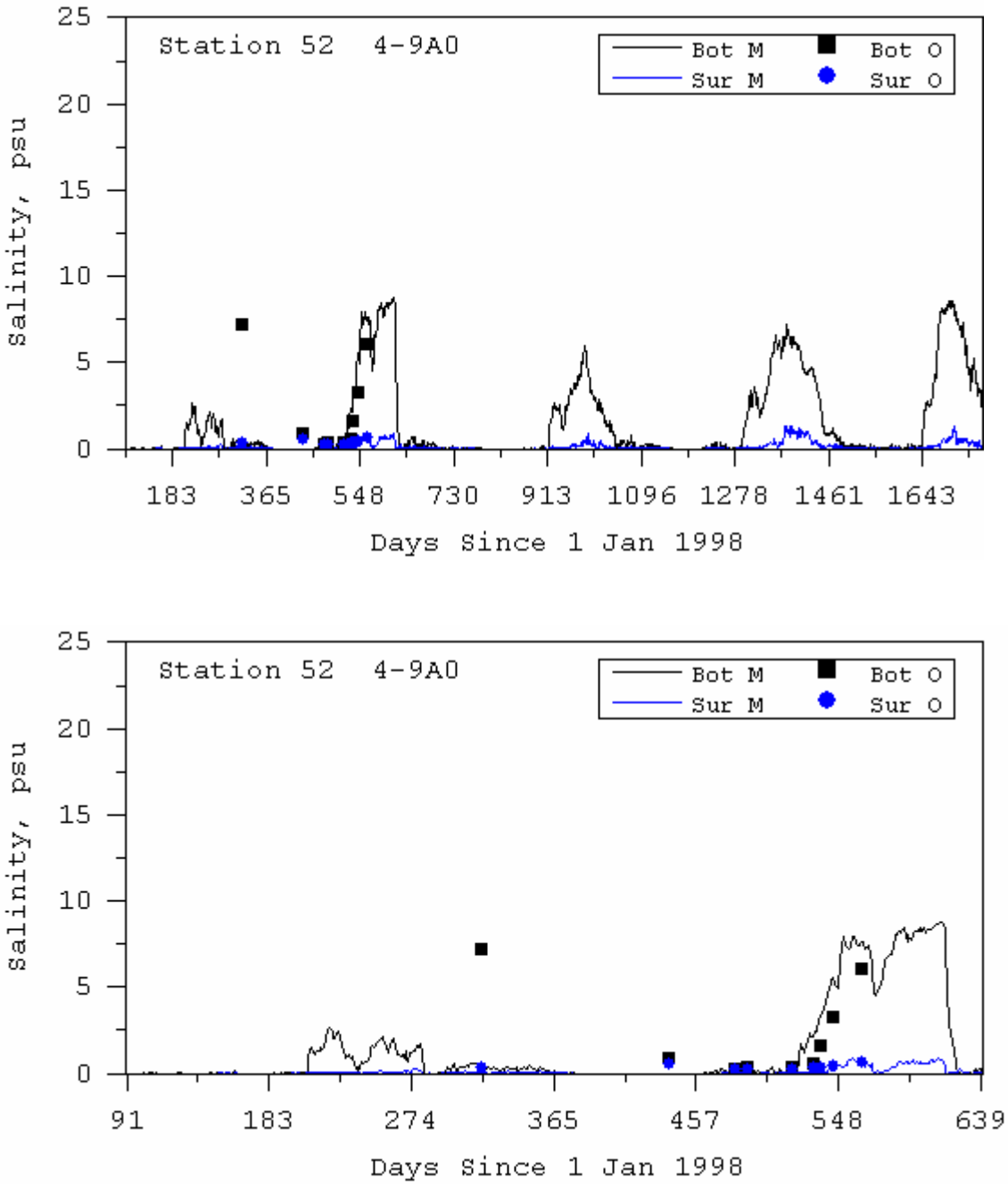


Figure 3.16. Model Predicted and Observed Salinity at USGS Station 52 (Note: Stations 49 and 52 in same model cell)

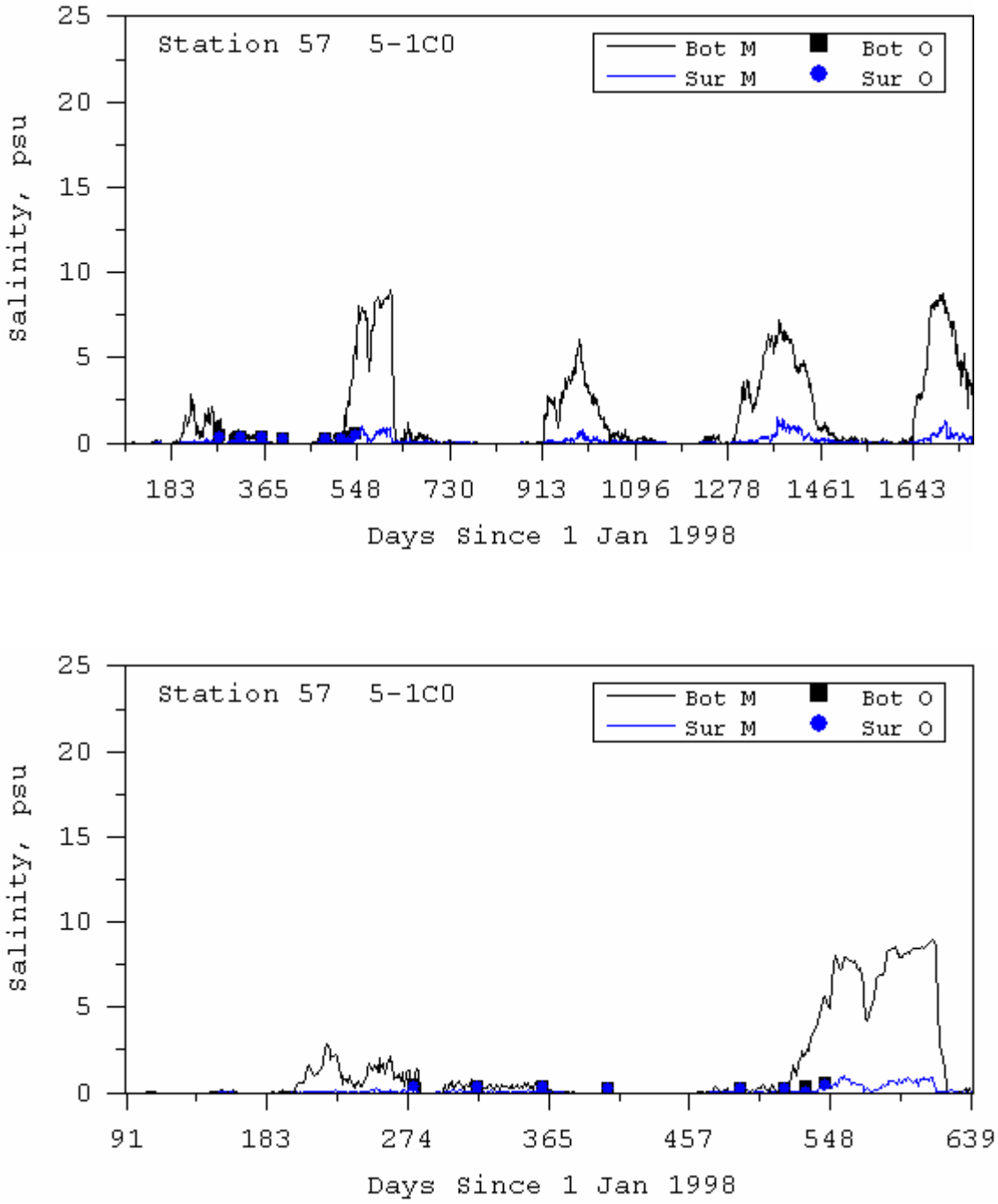


Figure 3.17. Model Predicted and Observed Salinity at USGS Station

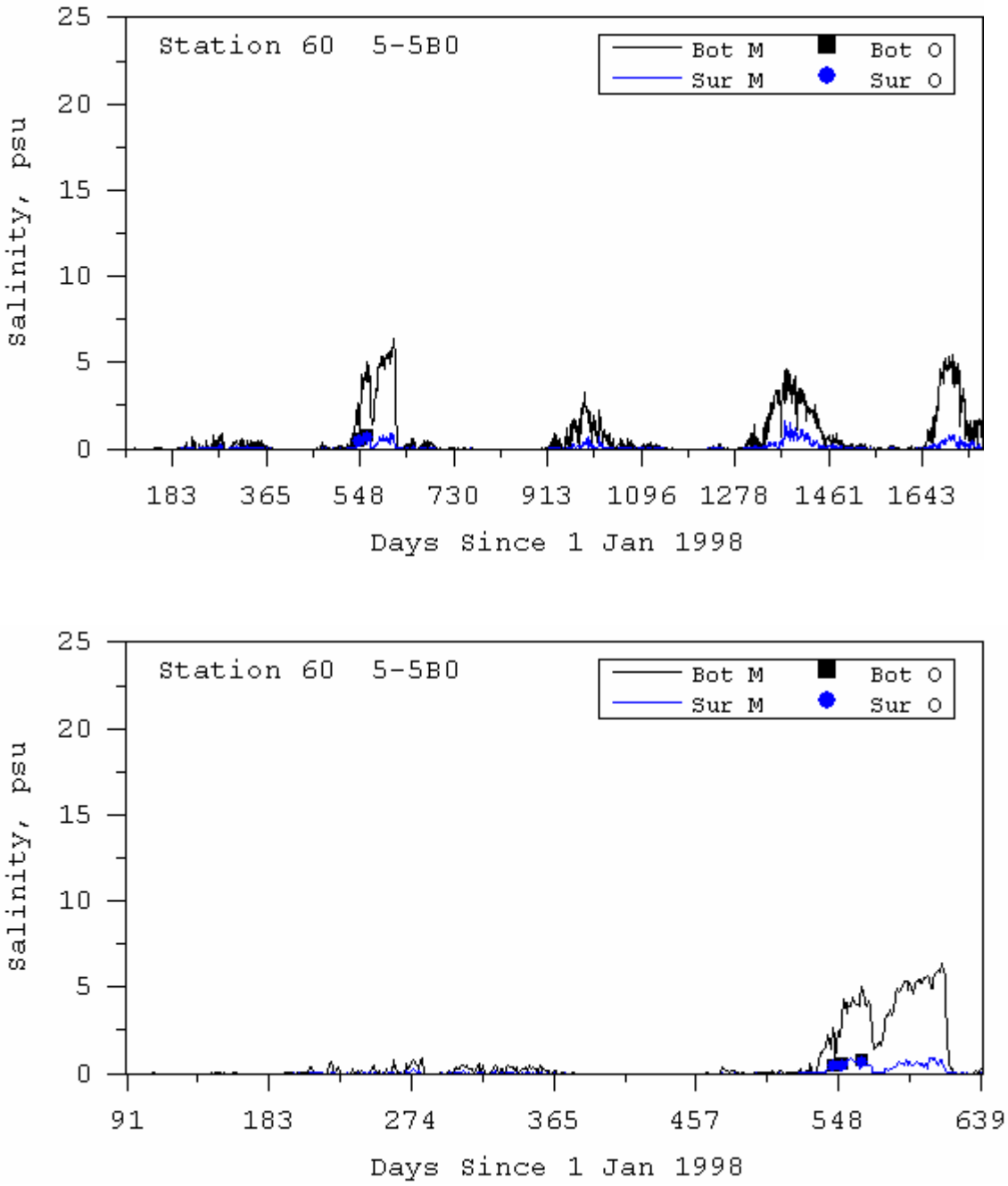


Figure 3.18. Model Predicted and Observed Salinity at USGS Station

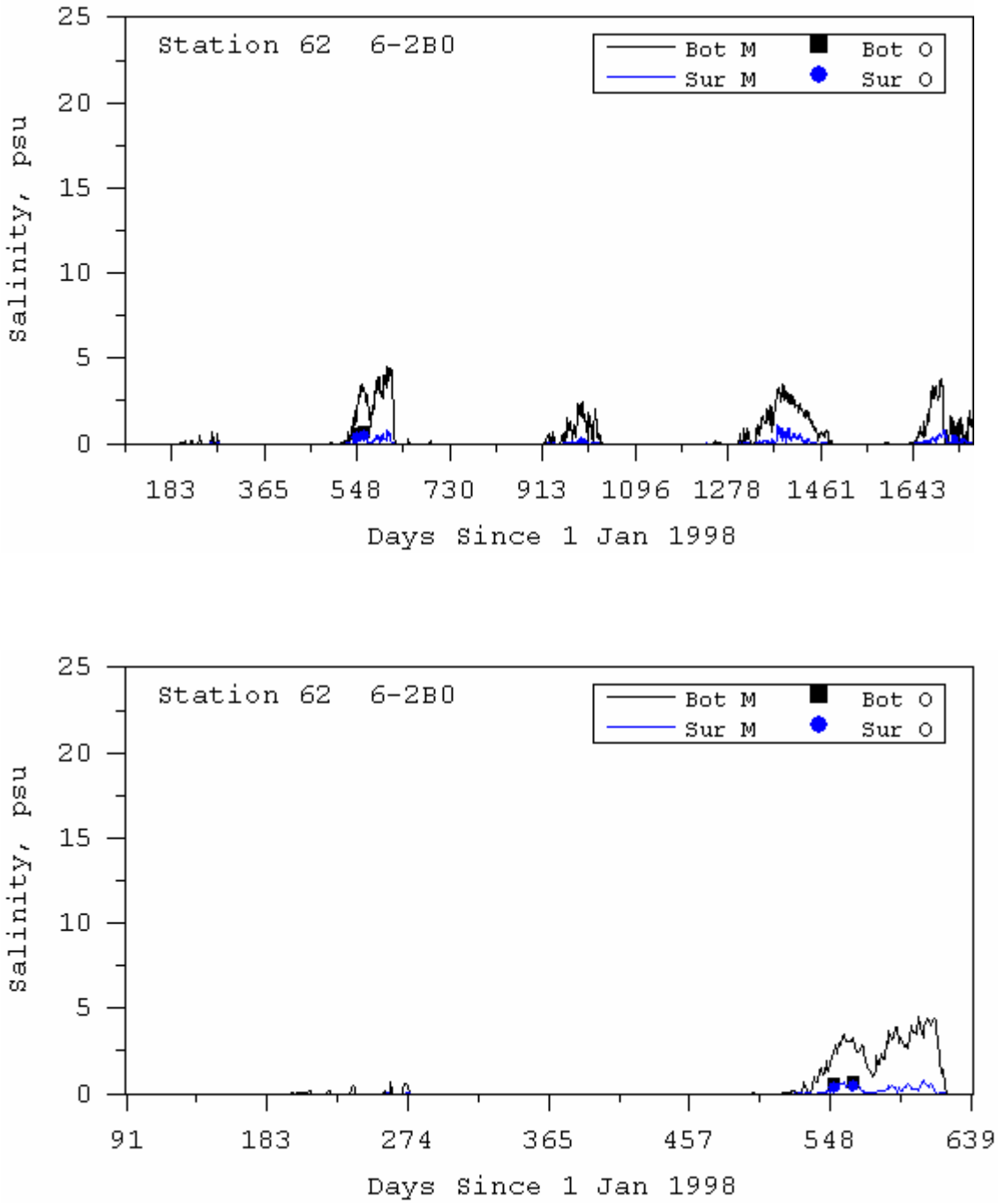


Figure 3.19. Model Predicted and Observed Salinity at USGS Station

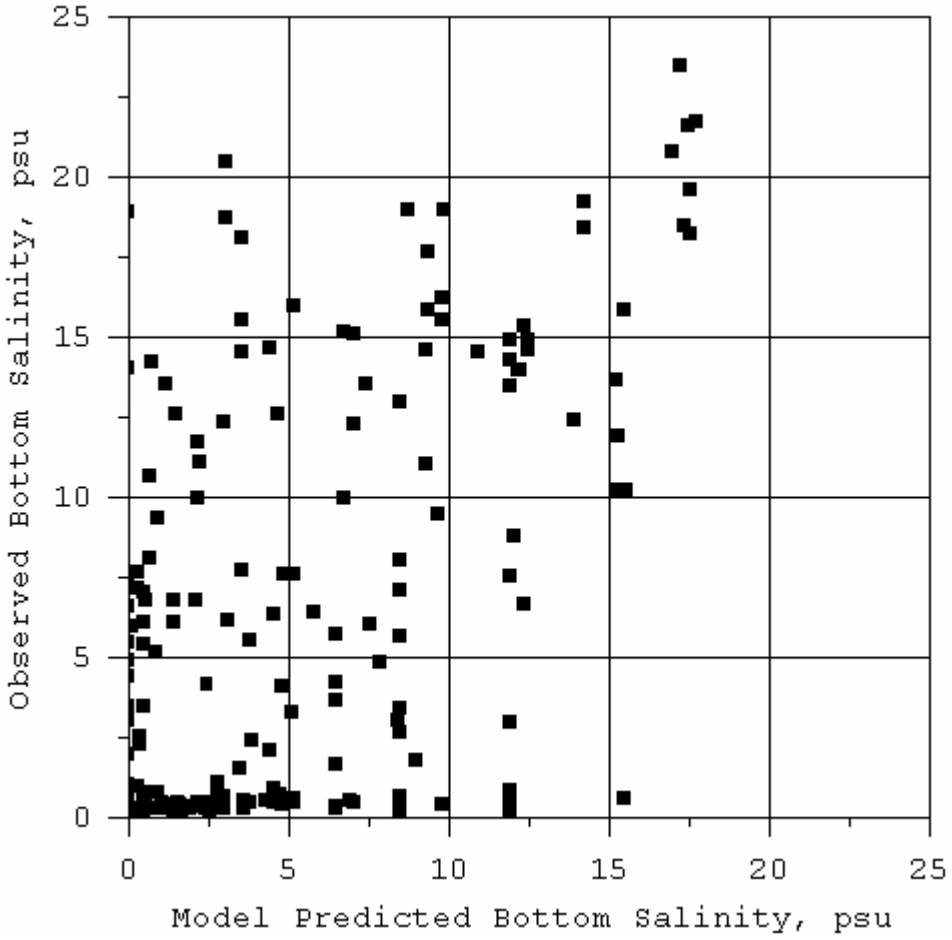


Figure 3.20. Observed and Predicted Bottom Salinity for All 1998-99 USGS Station Samples

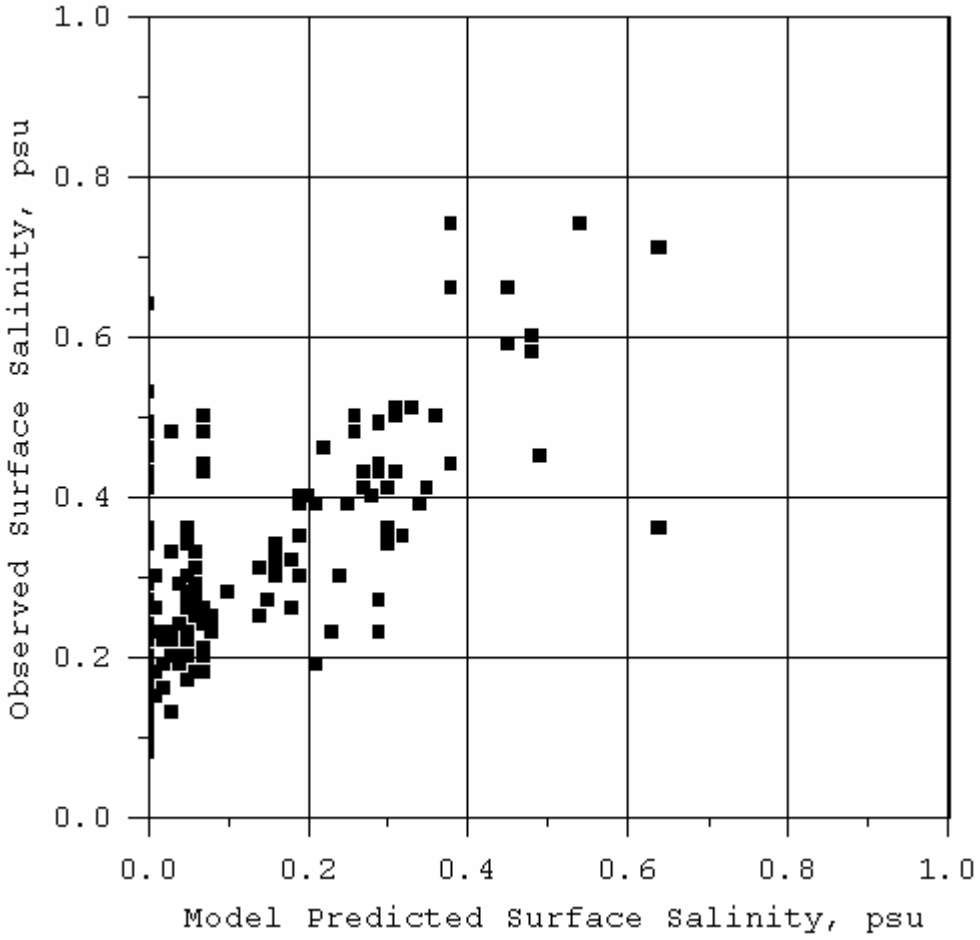


Figure 3.21. Observed and Predicted Surface Salinity for All 1998-99 USGS Station Samples

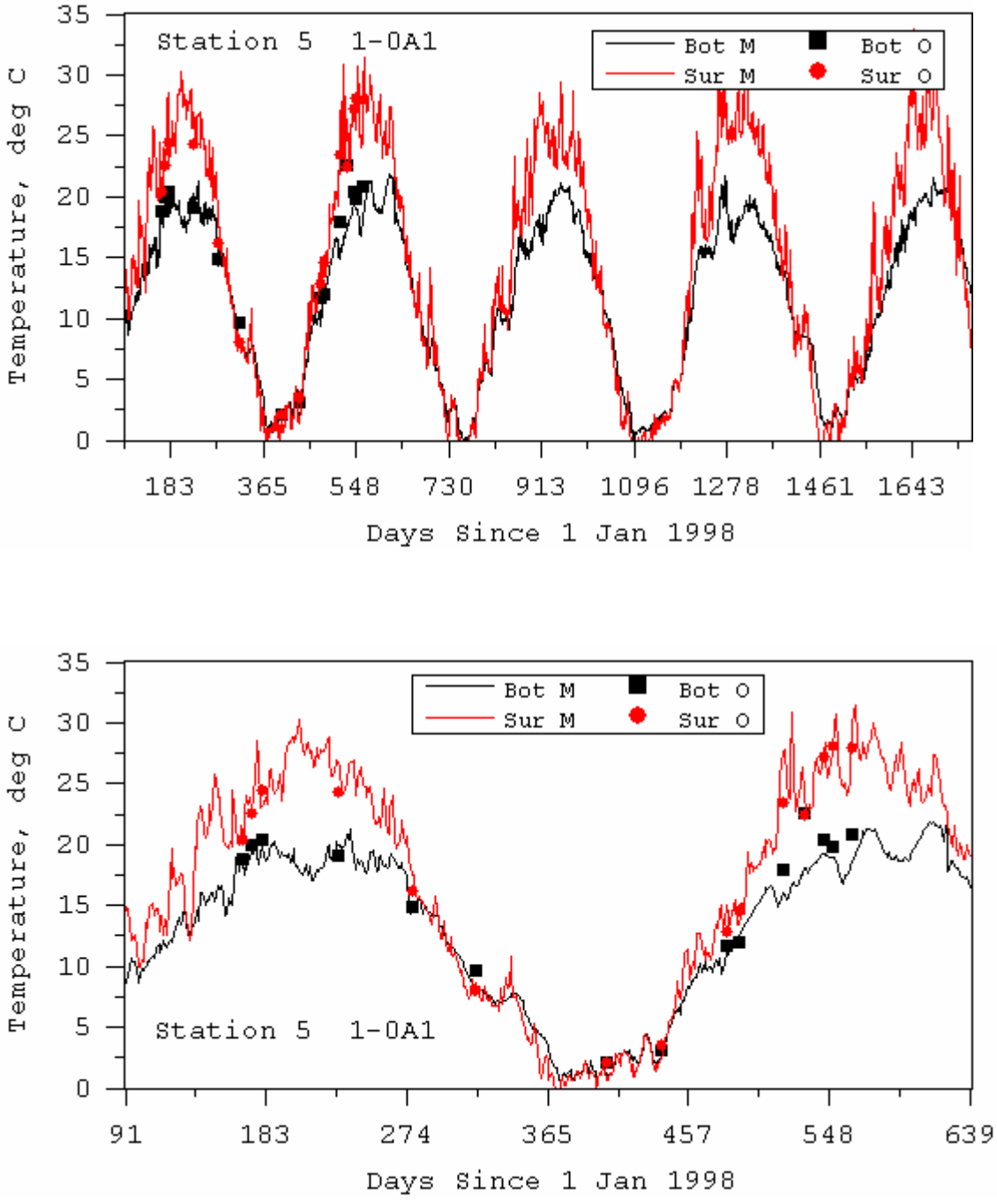


Figure 3.22. Model Predicted and Observed Temperature at USGS Station (Note: Stations 5 and 14 are in same model cell)

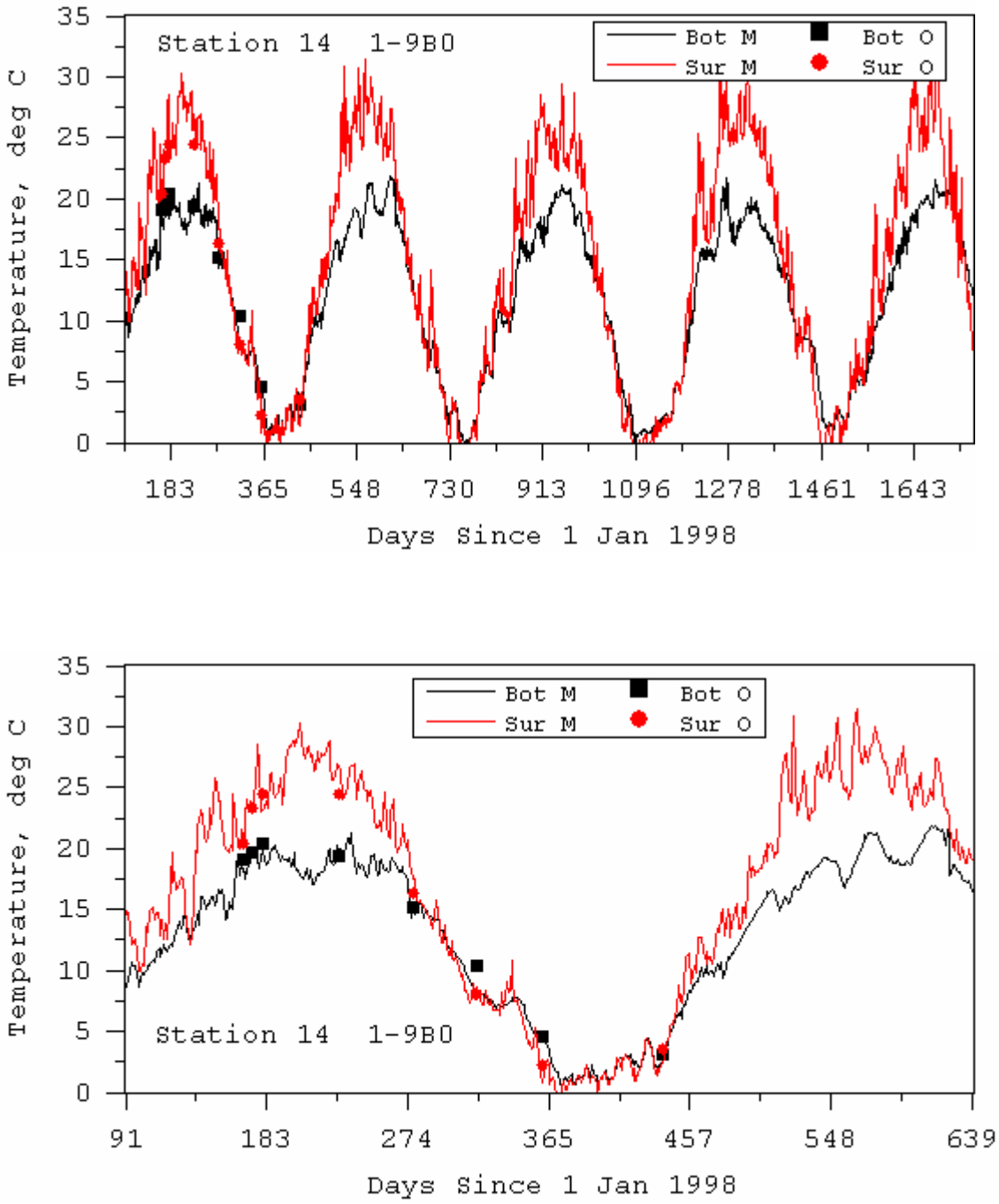


Figure 3.23. Model Predicted and Observed Temperature at USGS Station (Note: Stations 5 and 14 are in same model cell)

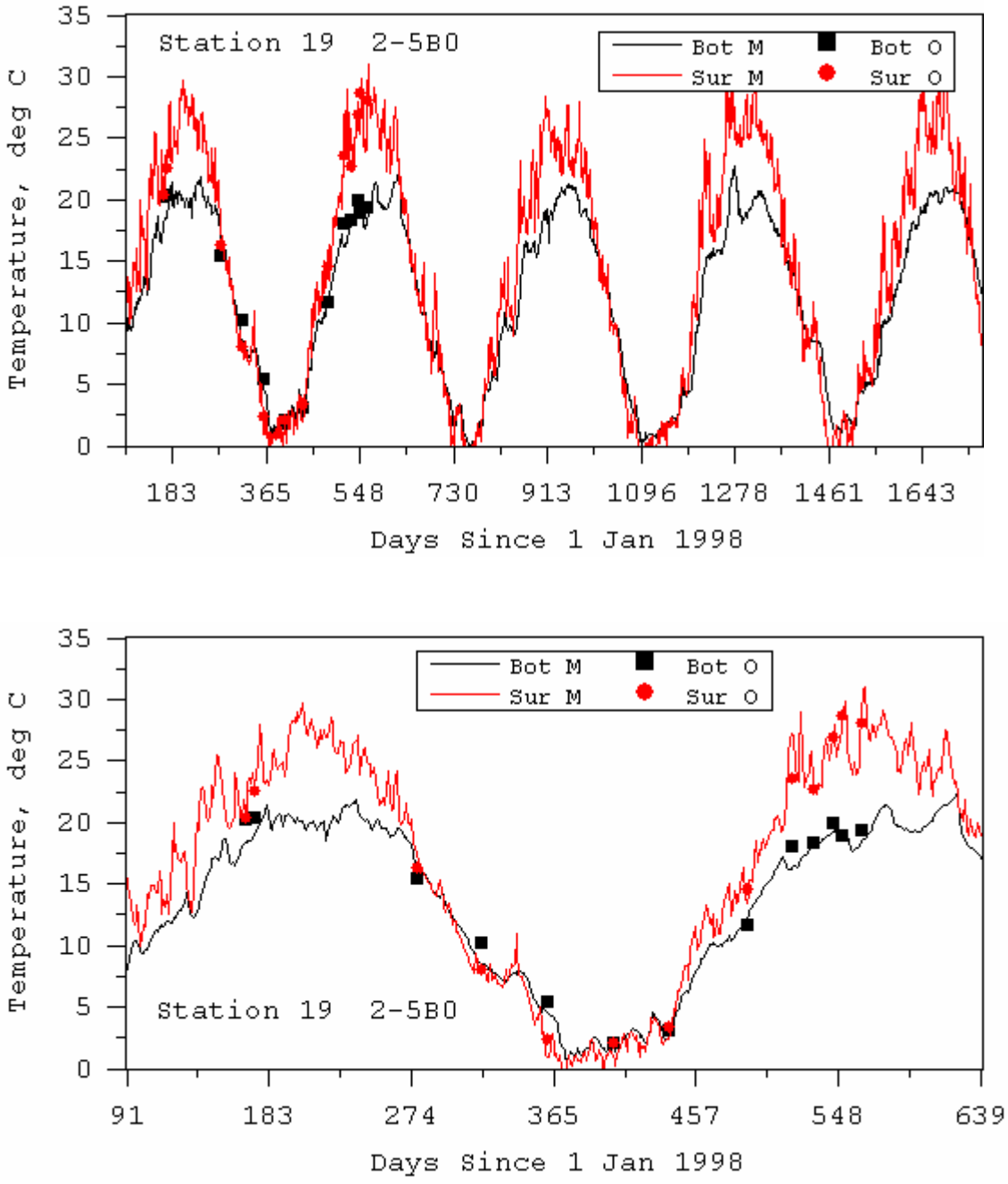


Figure 3.24. Model Predicted and Observed Temperature at USGS Station

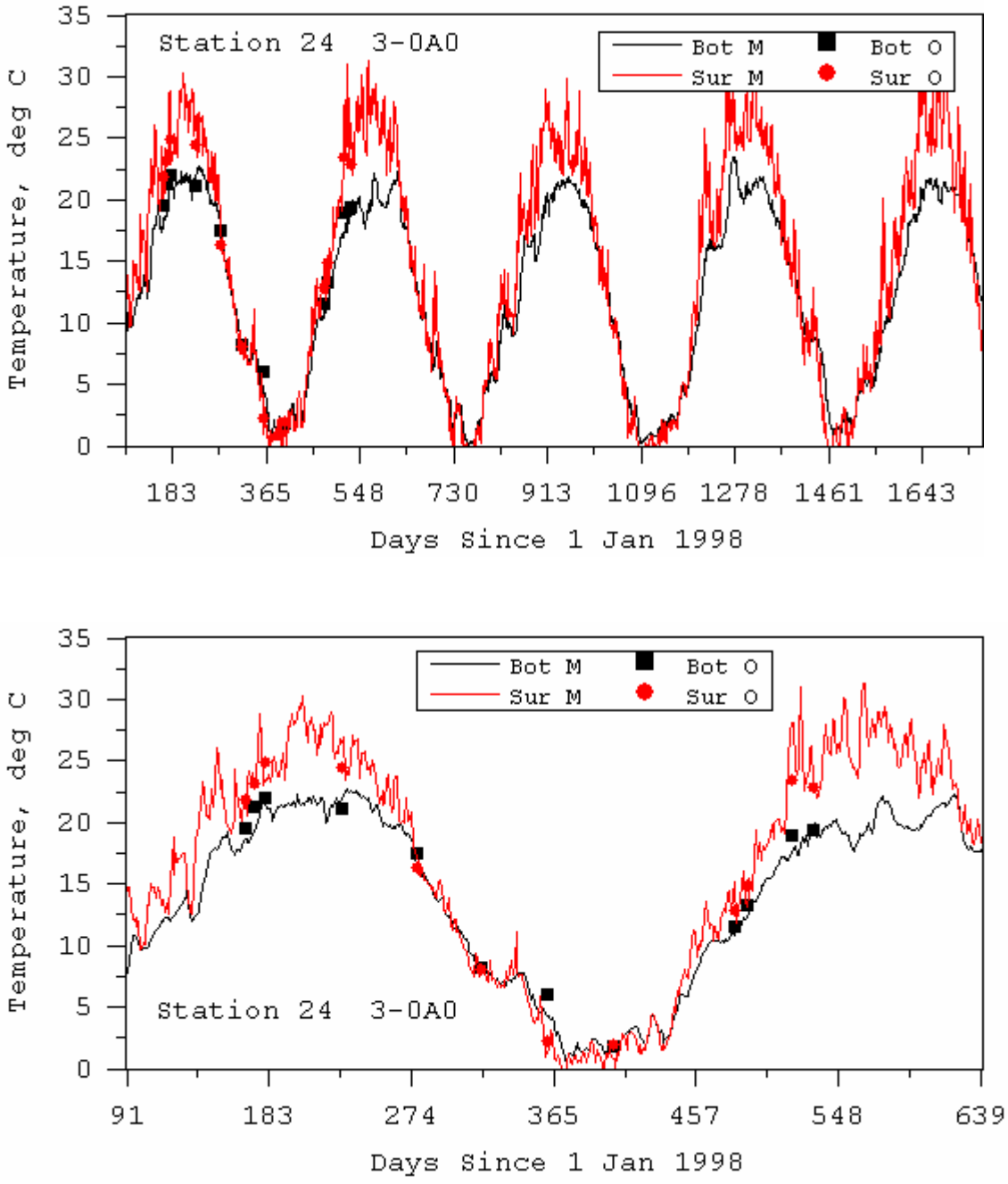


Figure 3.25. Model Predicted and Observed Temperature at USGS Station

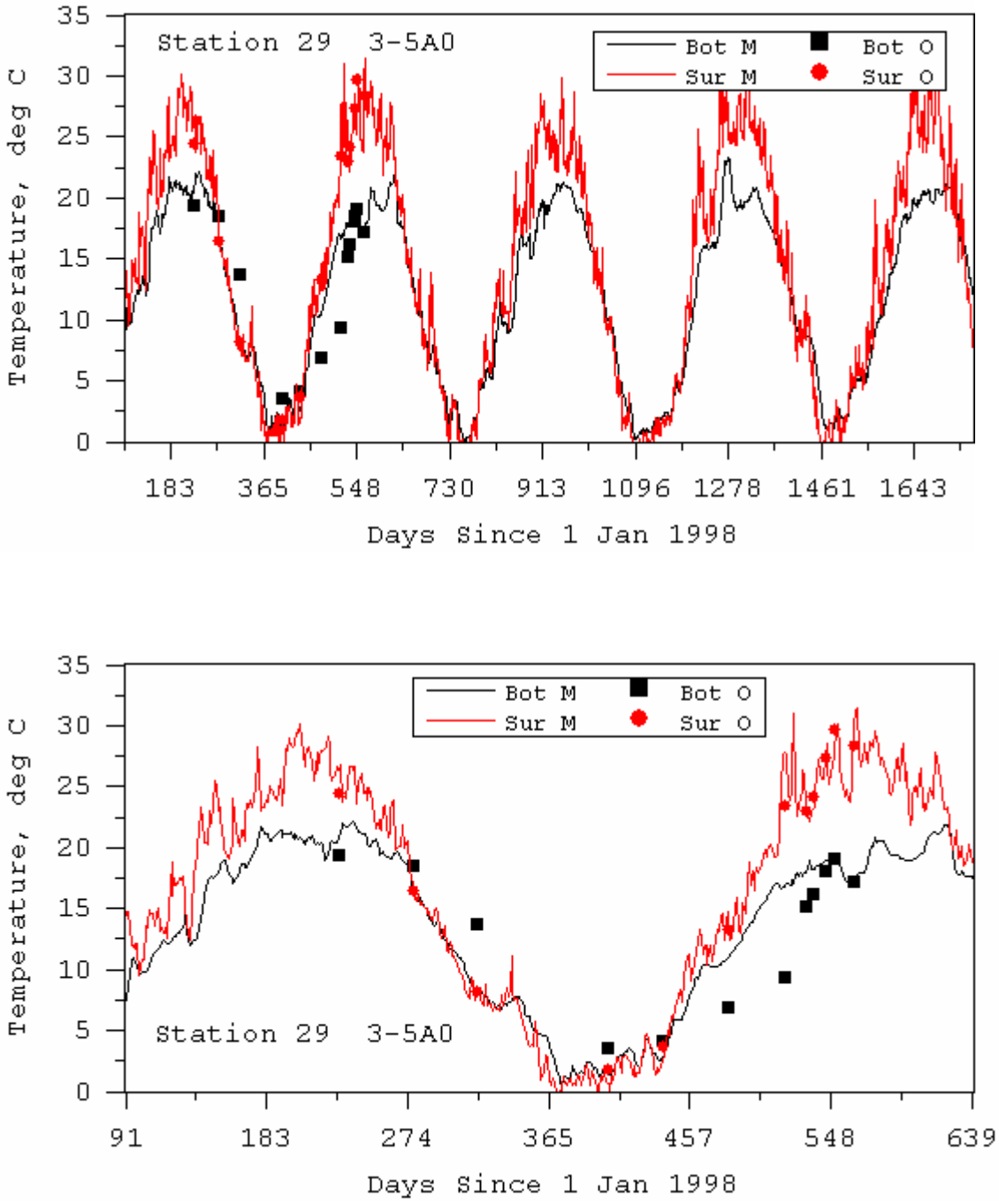


Figure 3.26. Model Predicted and Observed Temperature at USGS Station

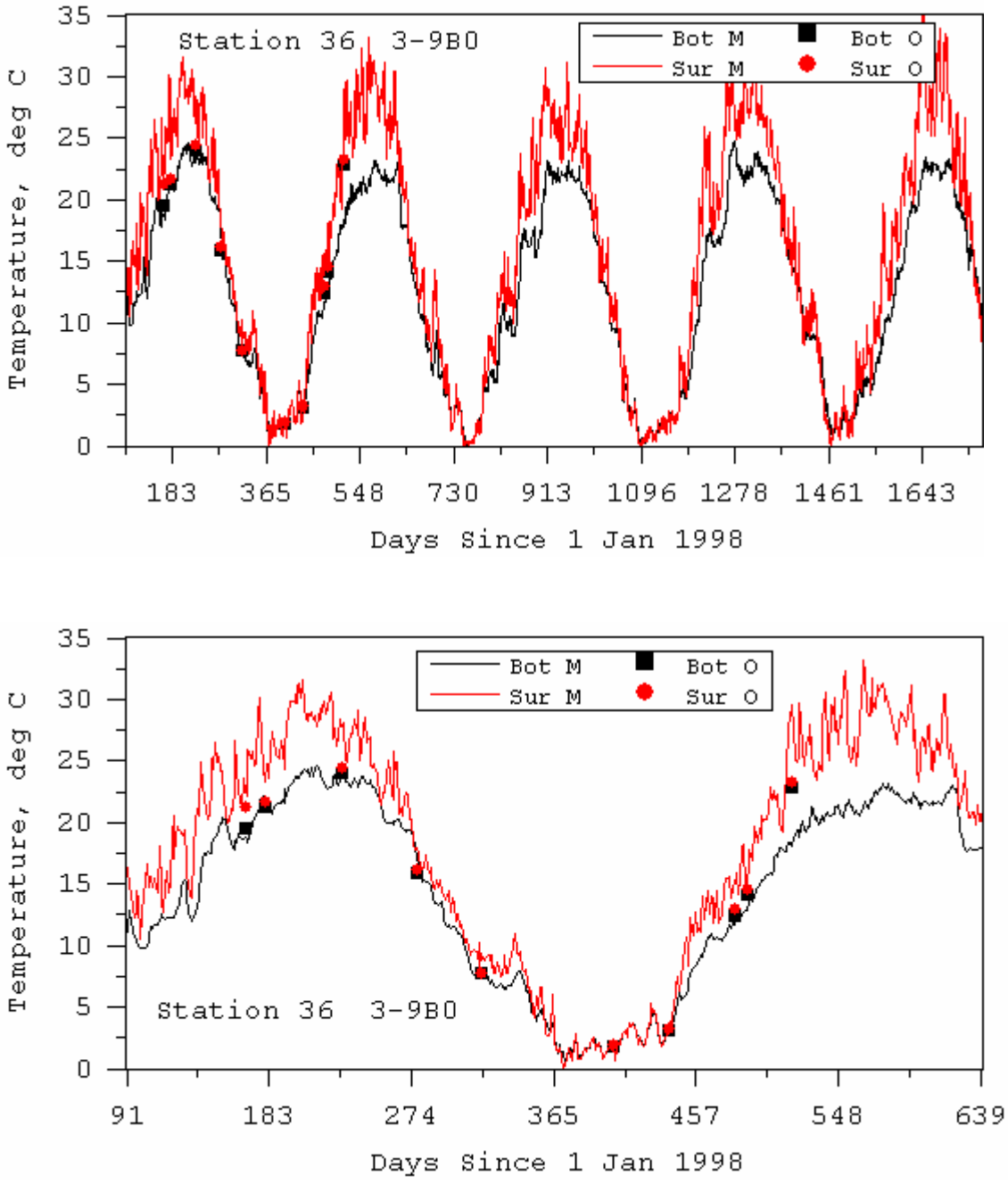


Figure 3.27. Model Predicted and Observed Temperature at USGS Station

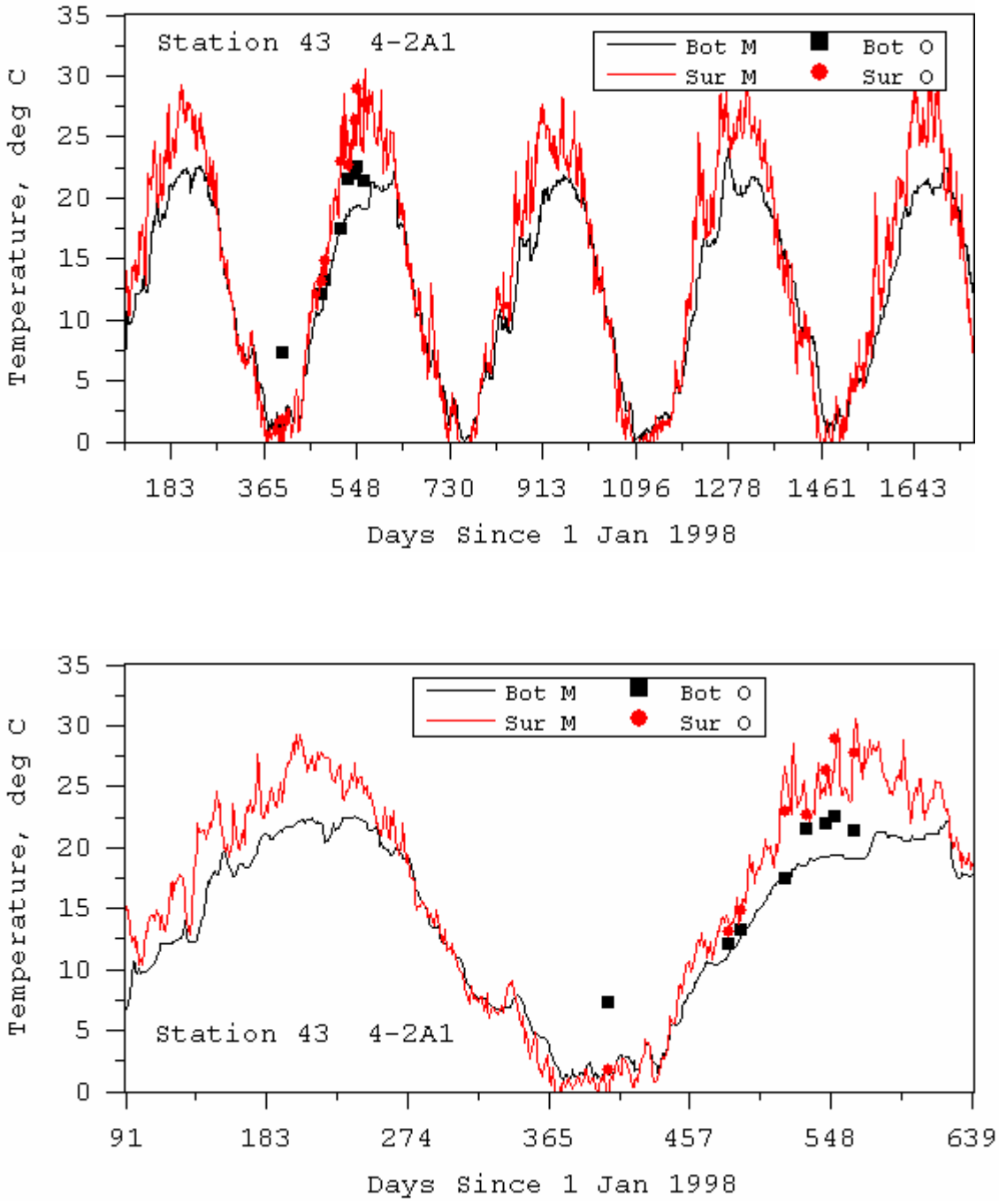


Figure 3.28. Model Predicted and Observed Temperature at USGS Station

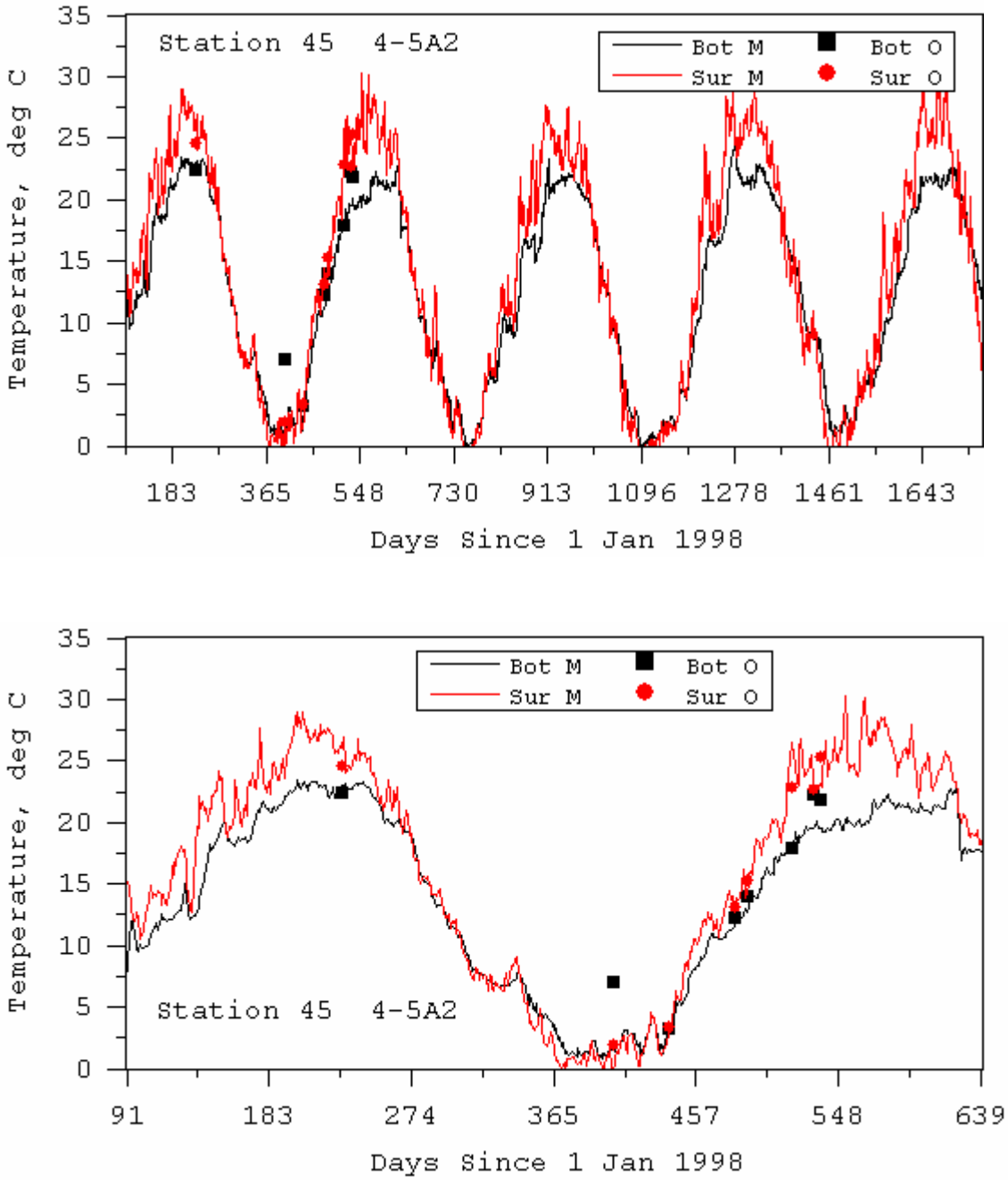


Figure 3.29. Model Predicted and Observed Temperature at USGS Station

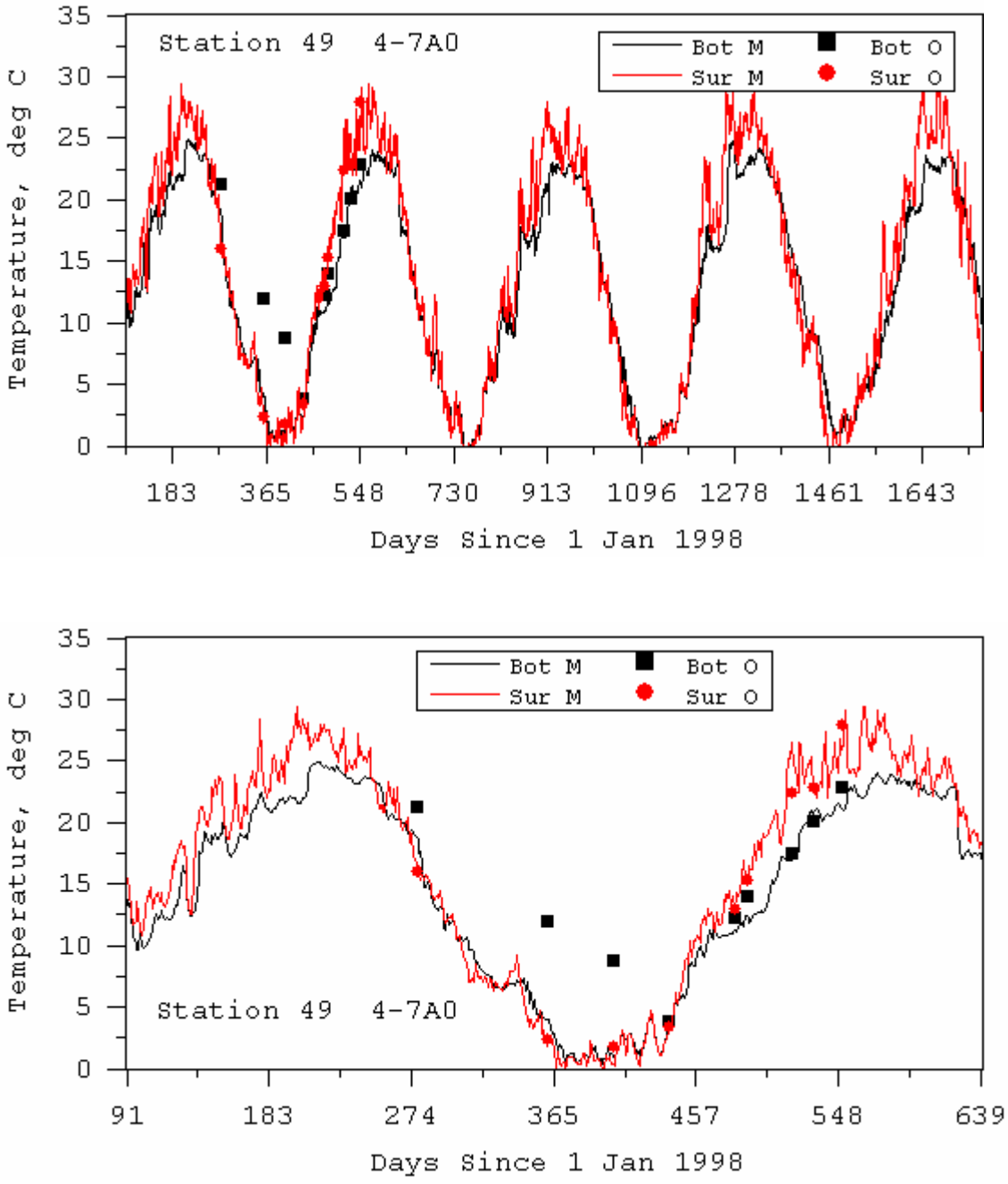


Figure 3.30. Model Predicted and Observed Temperature at USGS Station (Note: Stations 49 and 52 are in same model cell)

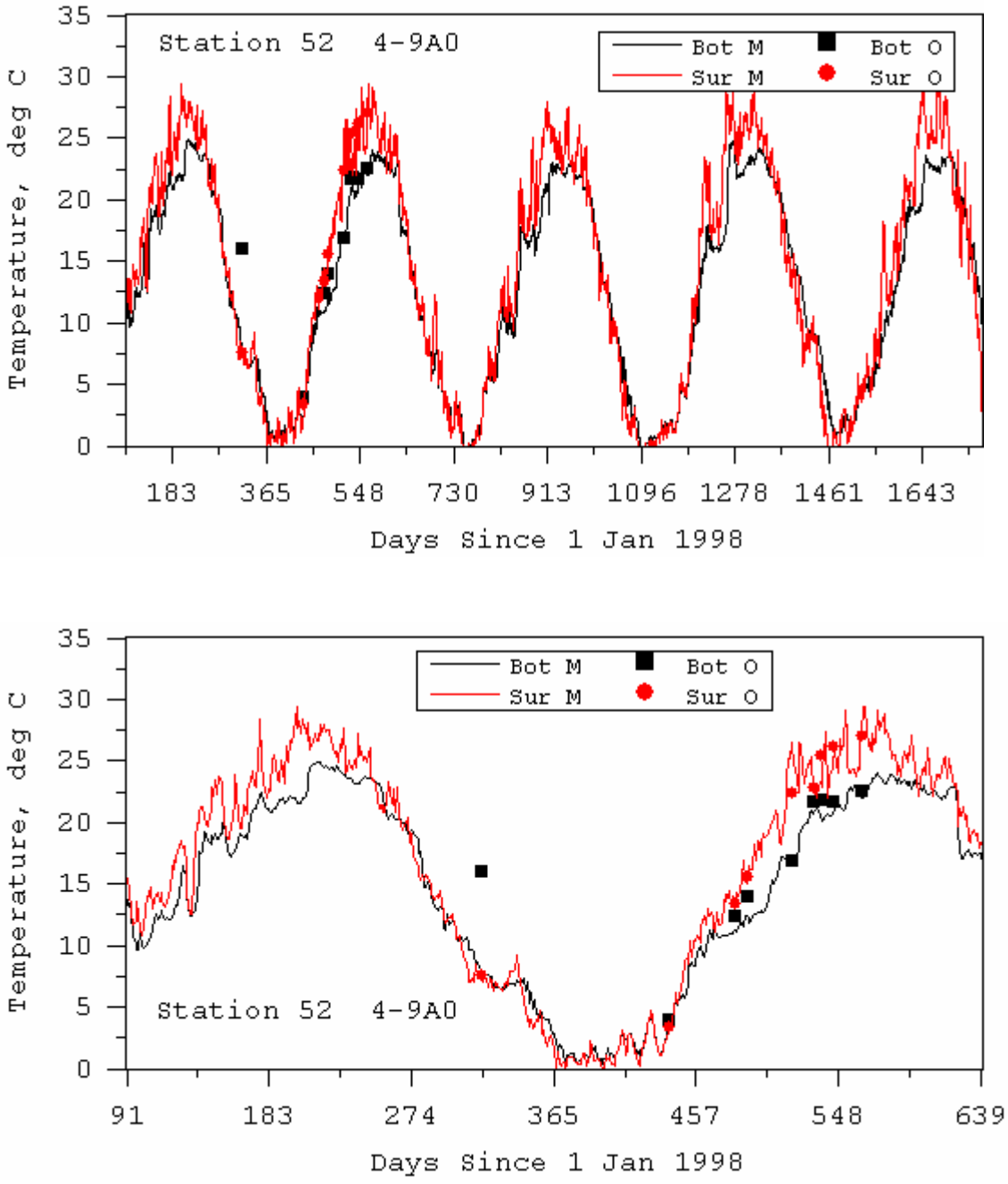


Figure 3.31. Model Predicted and Observed Temperature at USGS Station (Note: Stations 49 and 52 are in same model cell)

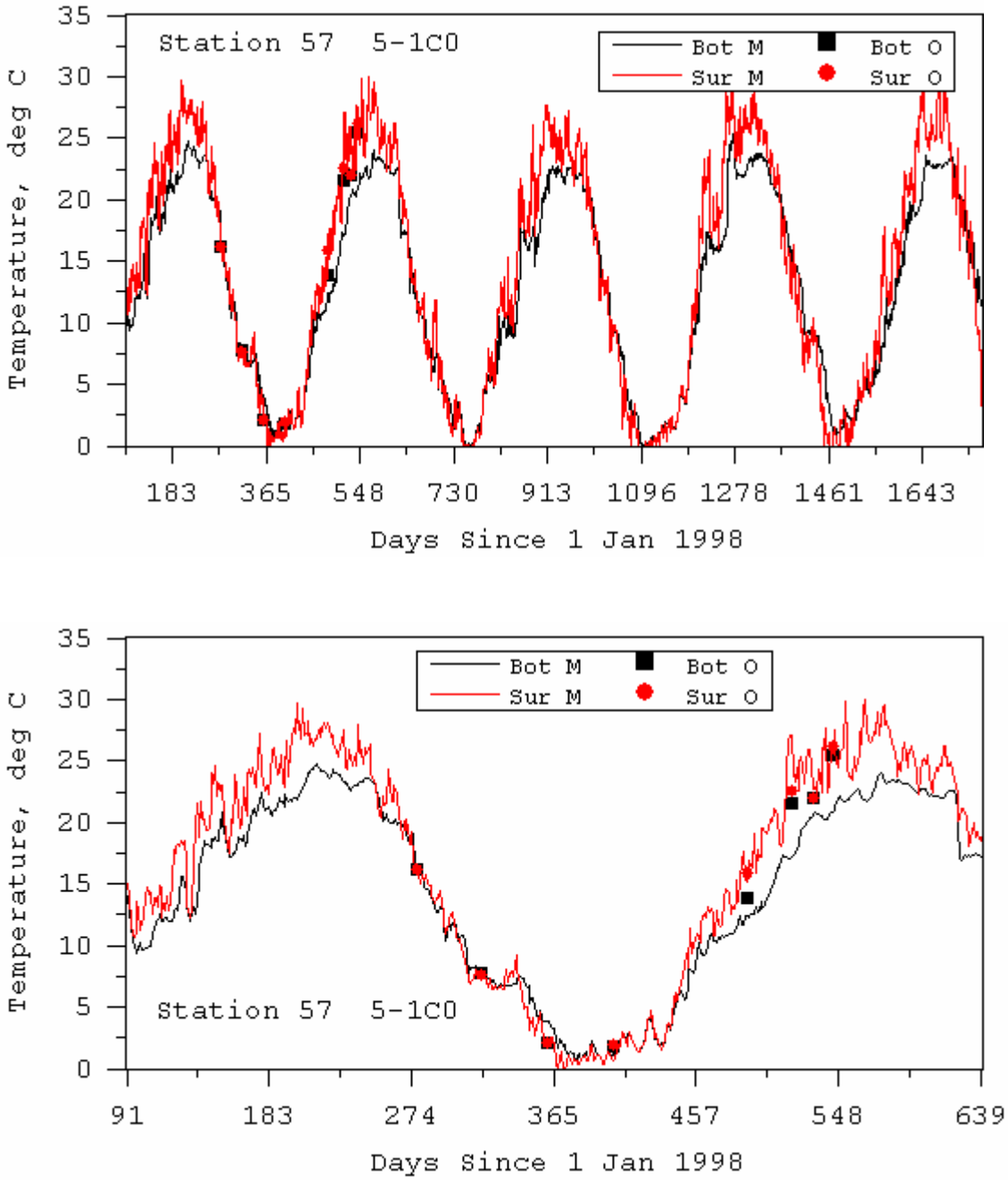


Figure 3.32. Model Predicted and Observed Temperature at USGS Station

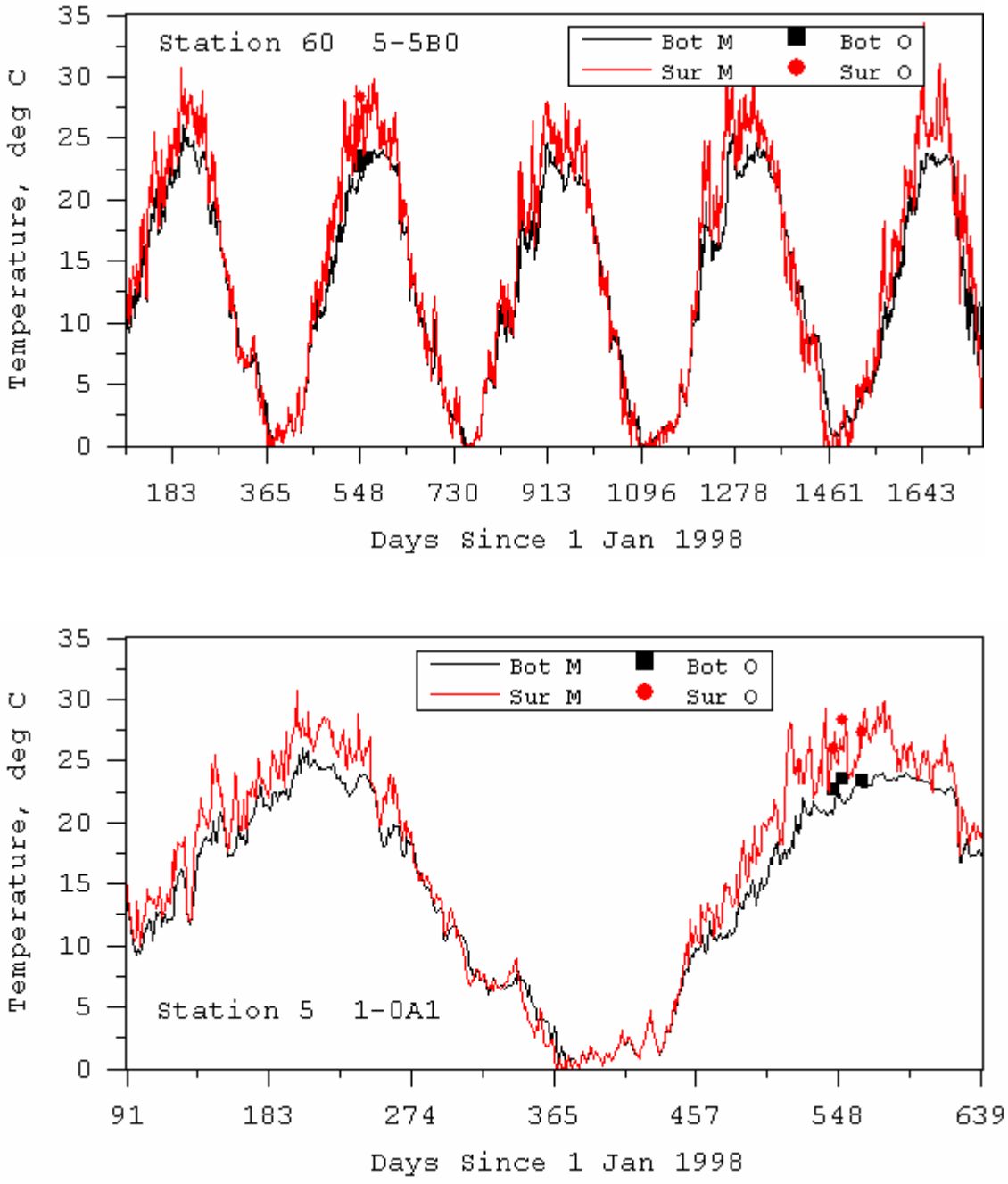


Figure 3.33. Model Predicted and Observed Temperature at USGS Station

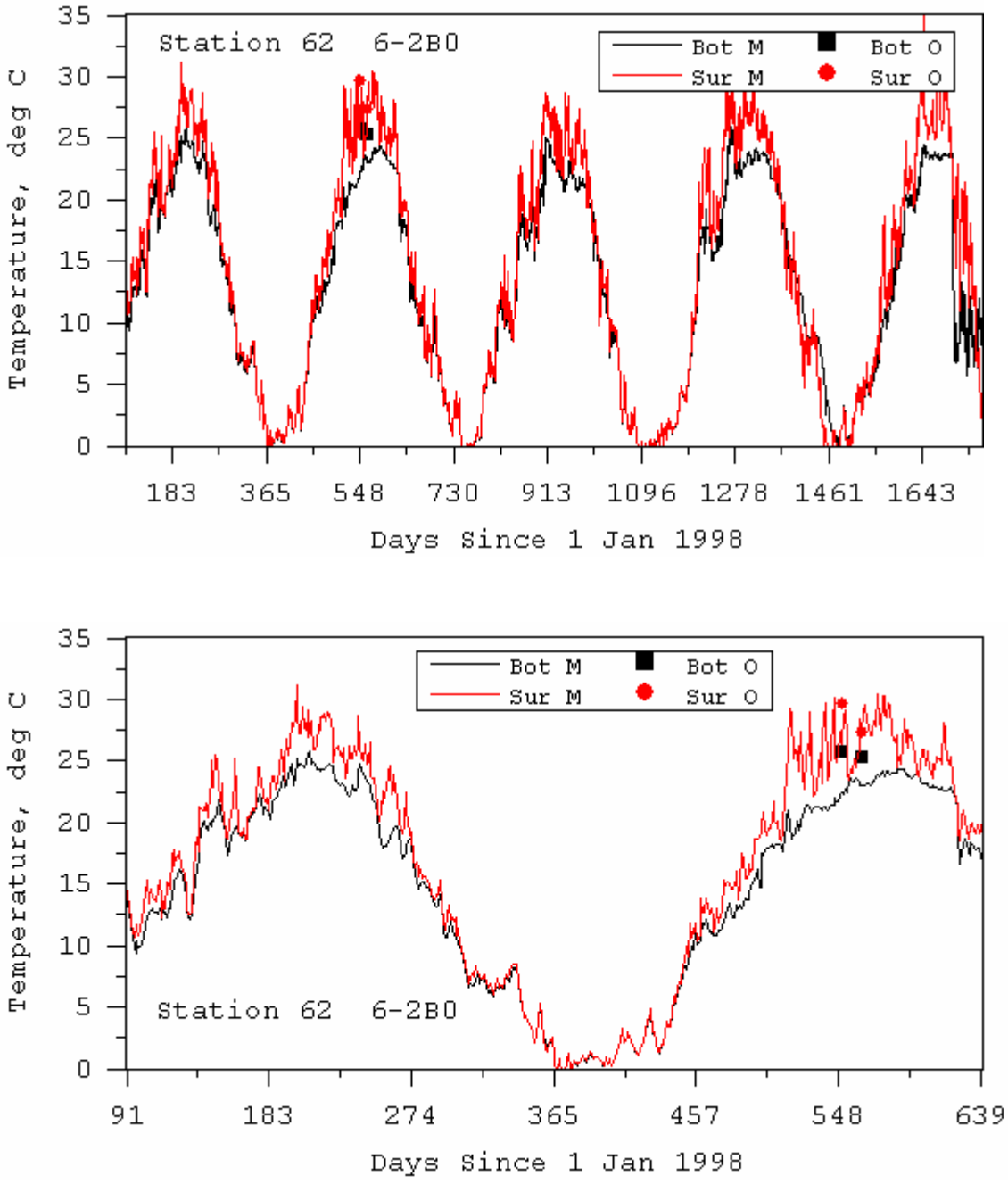


Figure 3.34. Model Predicted and Observed Temperature at USGS Station

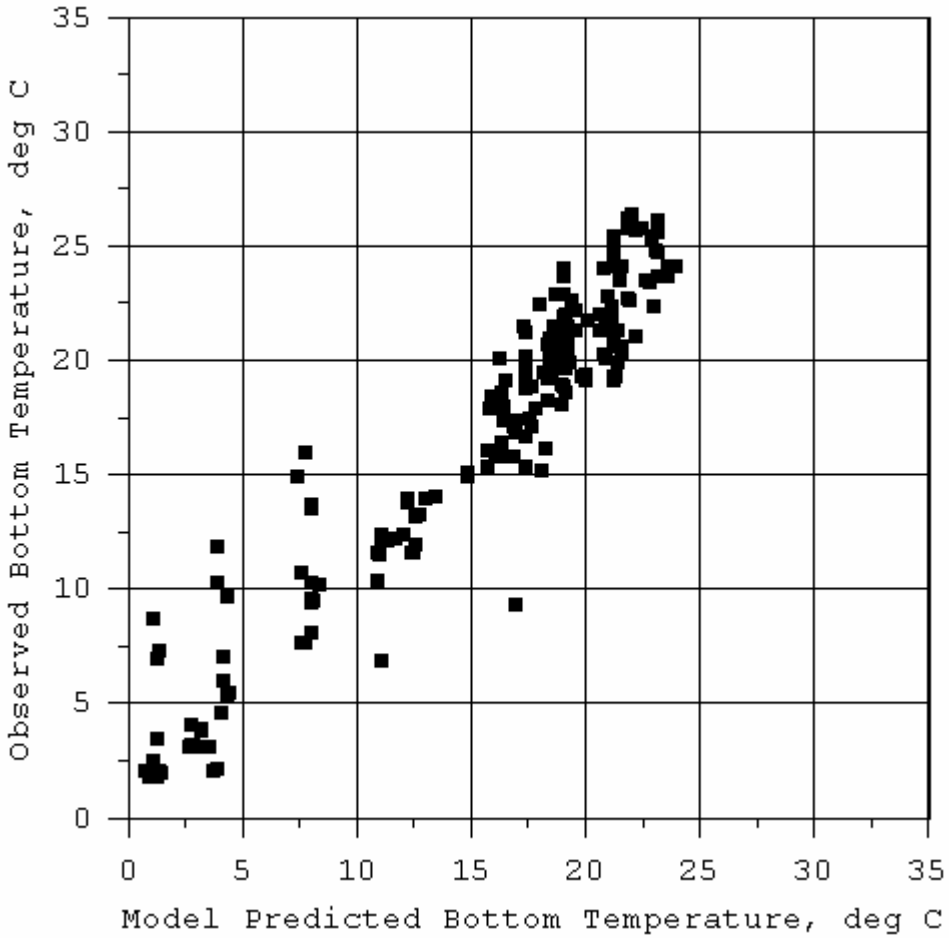


Figure 3.35. Observed and Predicted Bottom Temperature for All USGS 1998-99 Station Samples.
(Observed = 0.978414 * Pedicted + 1.48899, Reg Coef = 0.923)

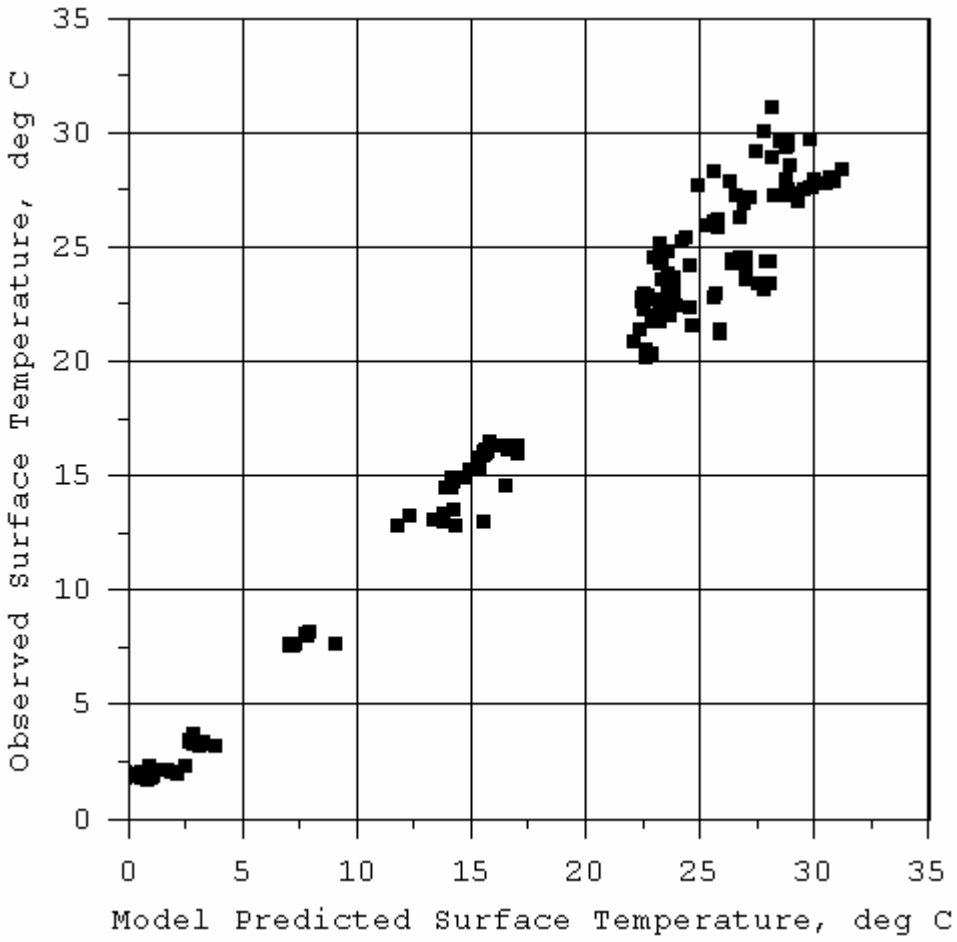


Figure 3.36. Observed and Predicted Surface Temperature for All USGS 1998-99 Station Sampels.
(Observed = 0.917033 * Predicted + 0.937788, Reg Coef = 0.976)

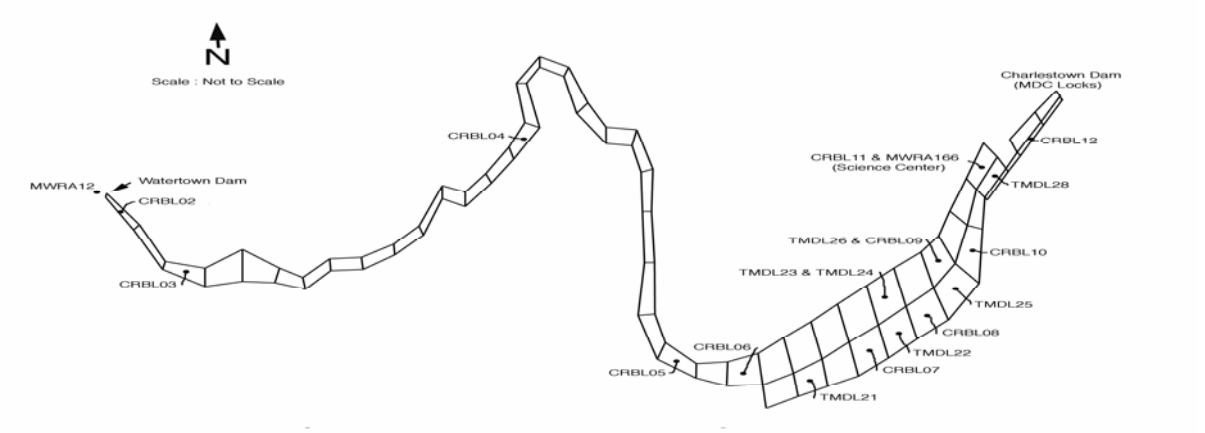


Figure 3.37. Model Grid and EPA Monitoring Data Locations

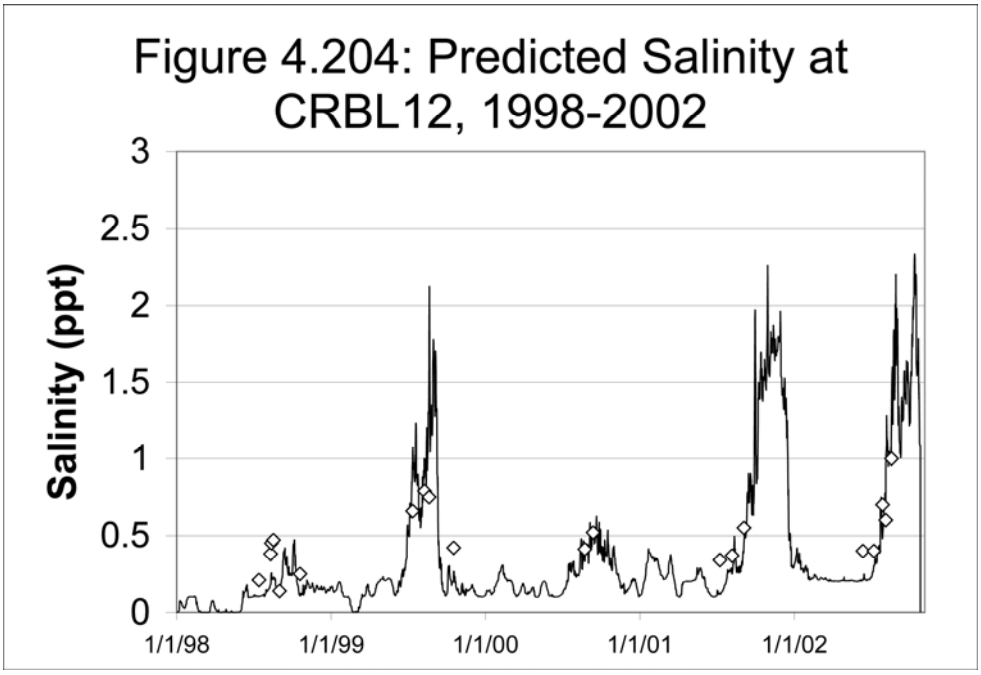


Figure 3.38. Surface Salinity at CRBL12. (Near USGS Stations 5 and 14)

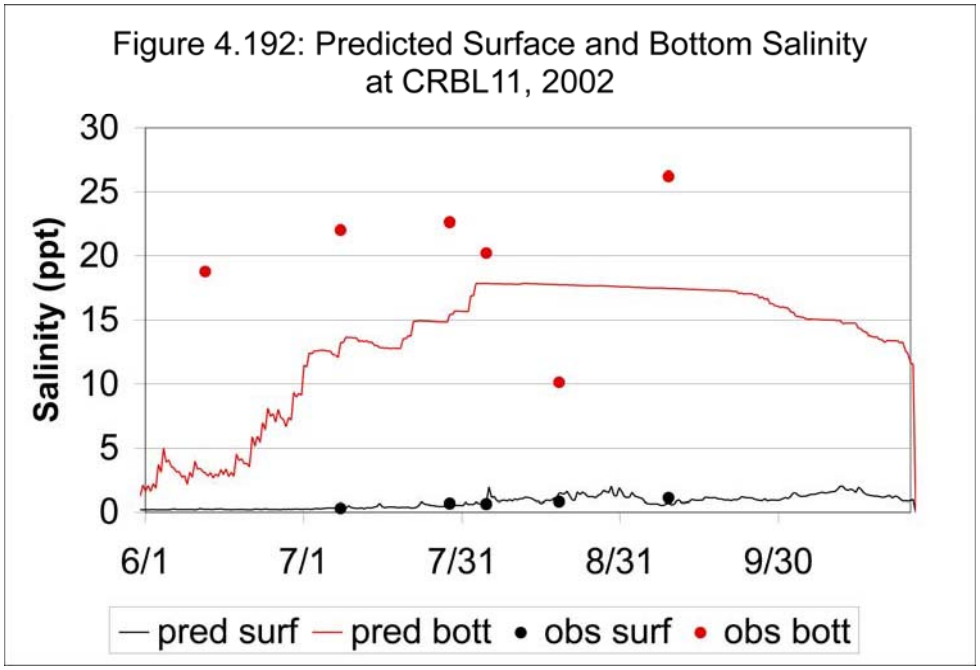


Figure 3.39. Surface and Bottom Salinity at CRBL11. (Near USGS Stations 24 and 25)

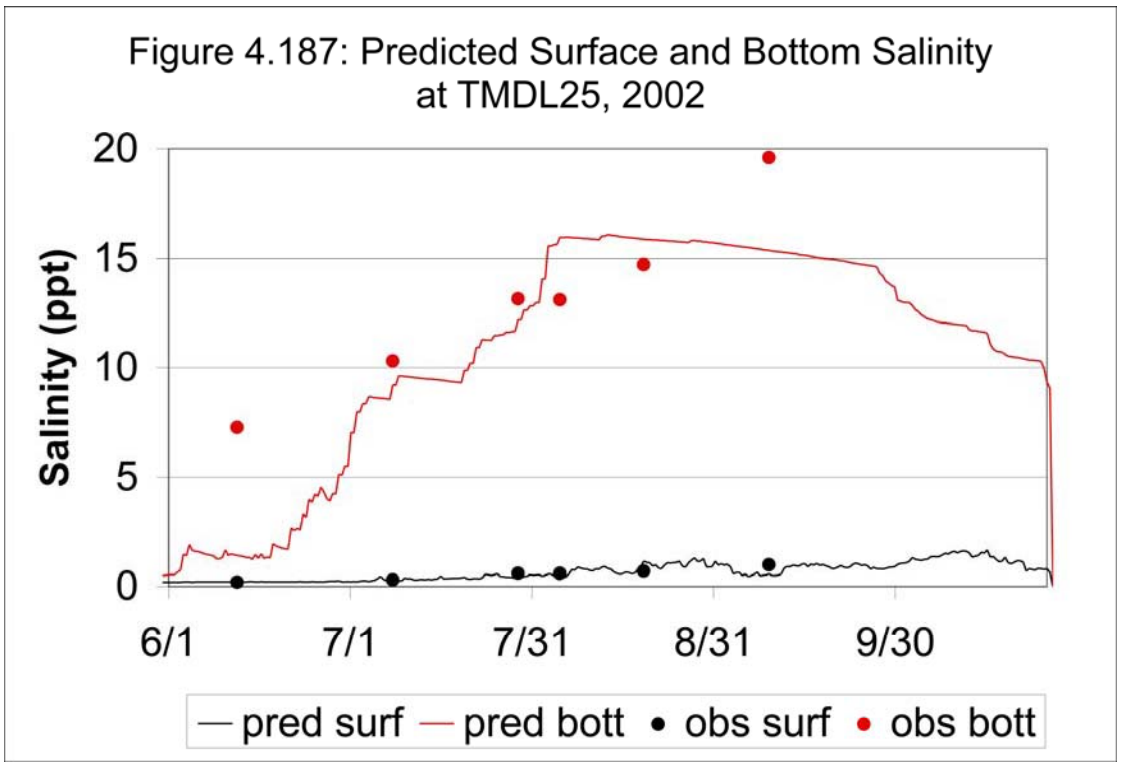


Figure 3.40. Surface and Bottom Salinity at TMDL25. (USGS Station 43)

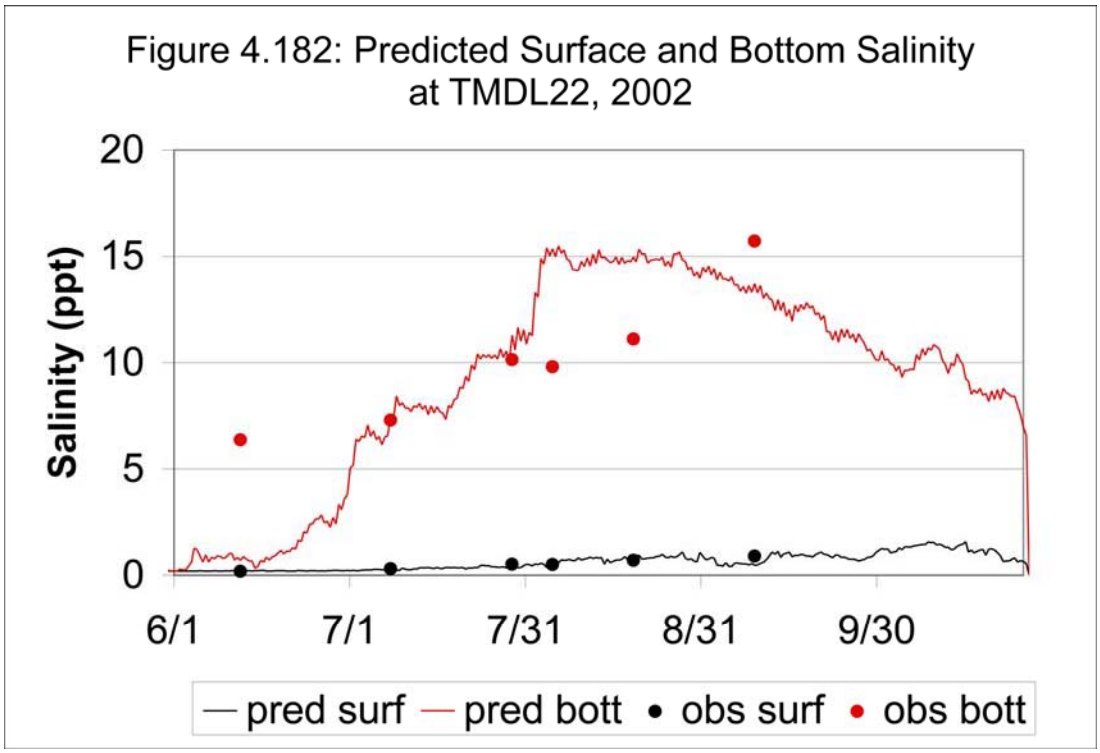


Figure 3.41. Surface and Bottom Salinity at TMDL22. (Near USGS Stations 45, 49, 52)

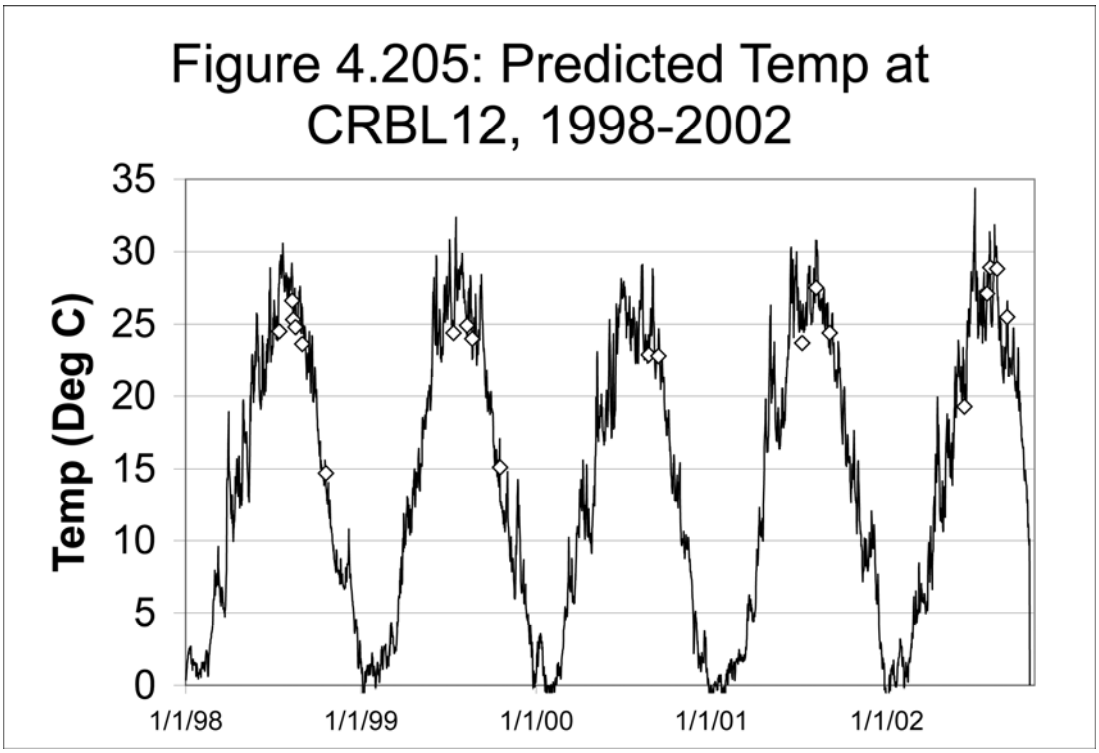


Figure 3.42. Surface Temperature at CRBL12. (Near USGS Stations 5 and 14)

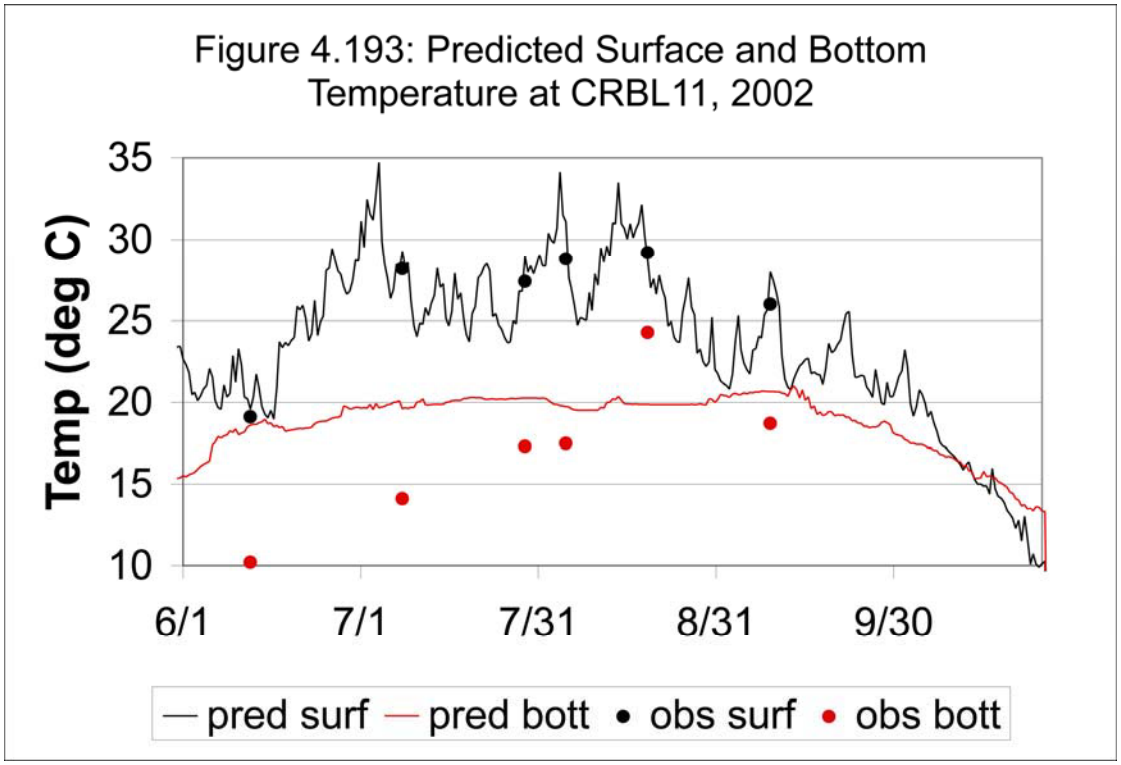


Figure 3.43. Surface and Bottom Temperature at CRBL11. (Near USGS Stations 24 and 25)

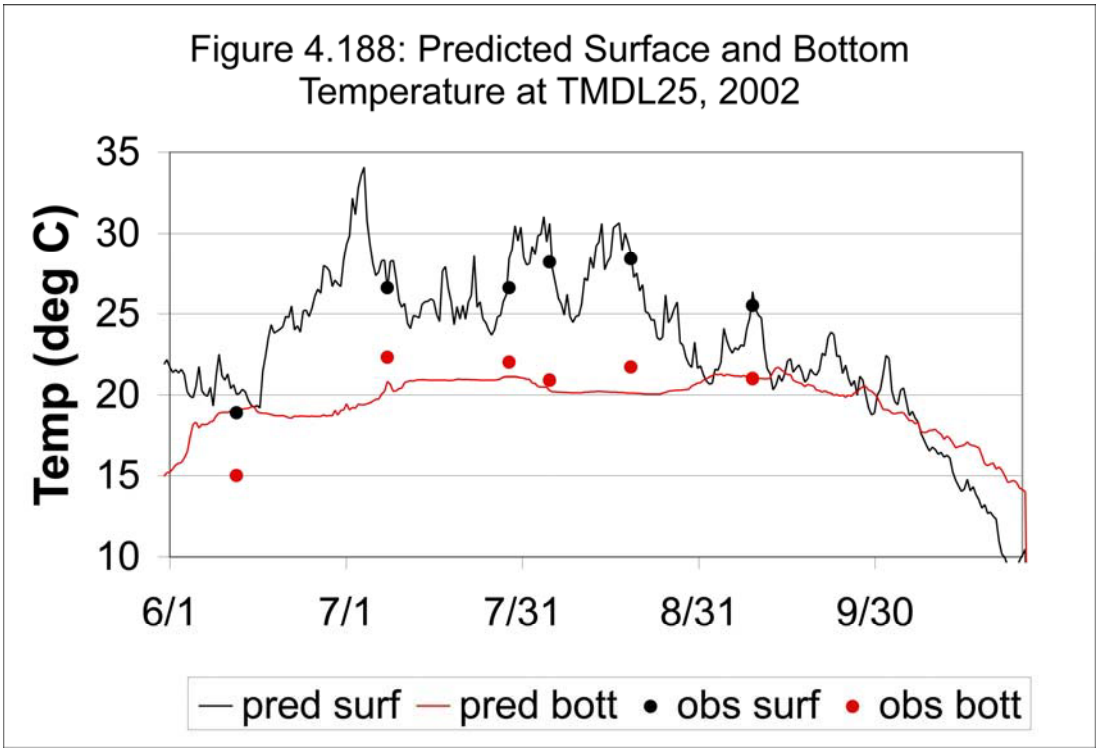


Figure 3.44. Surface and Bottom Temperature at TMDL25. (USGS Station 43)

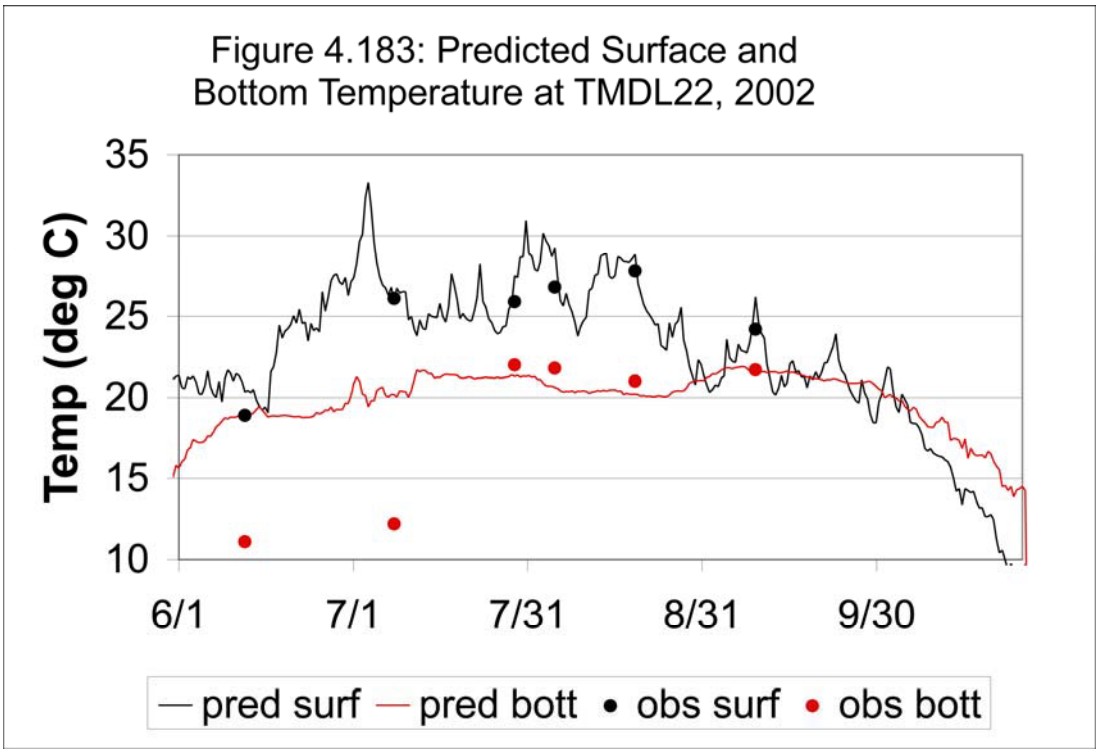


Figure 3.45. Surface and Bottom Temperature at TMDL22. (Near USGS Stations 45, 49, 52)

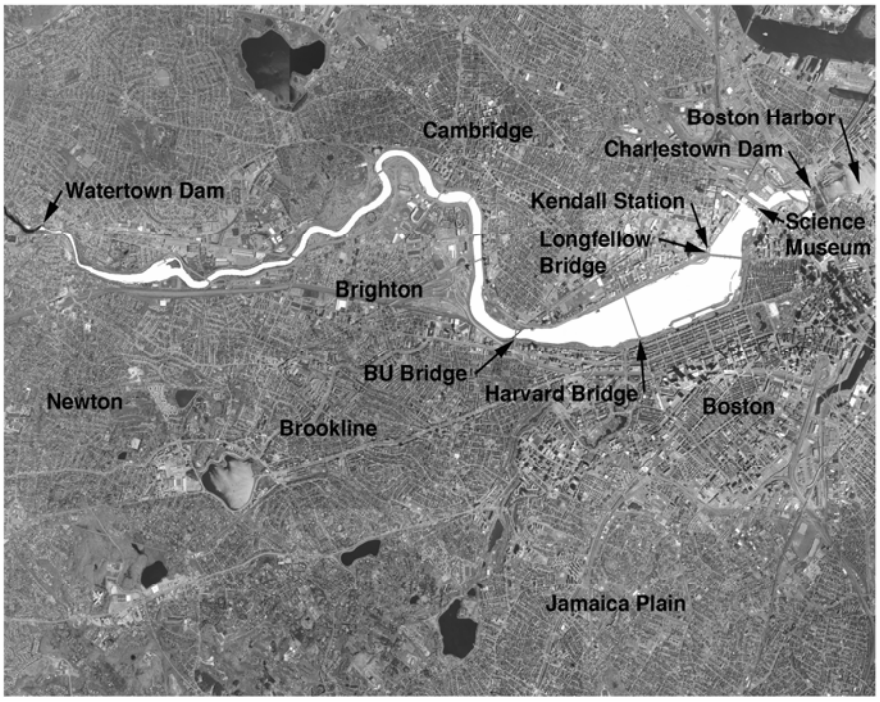


Figure 4.1. Base Map of Lower Charles River Basin (LB)

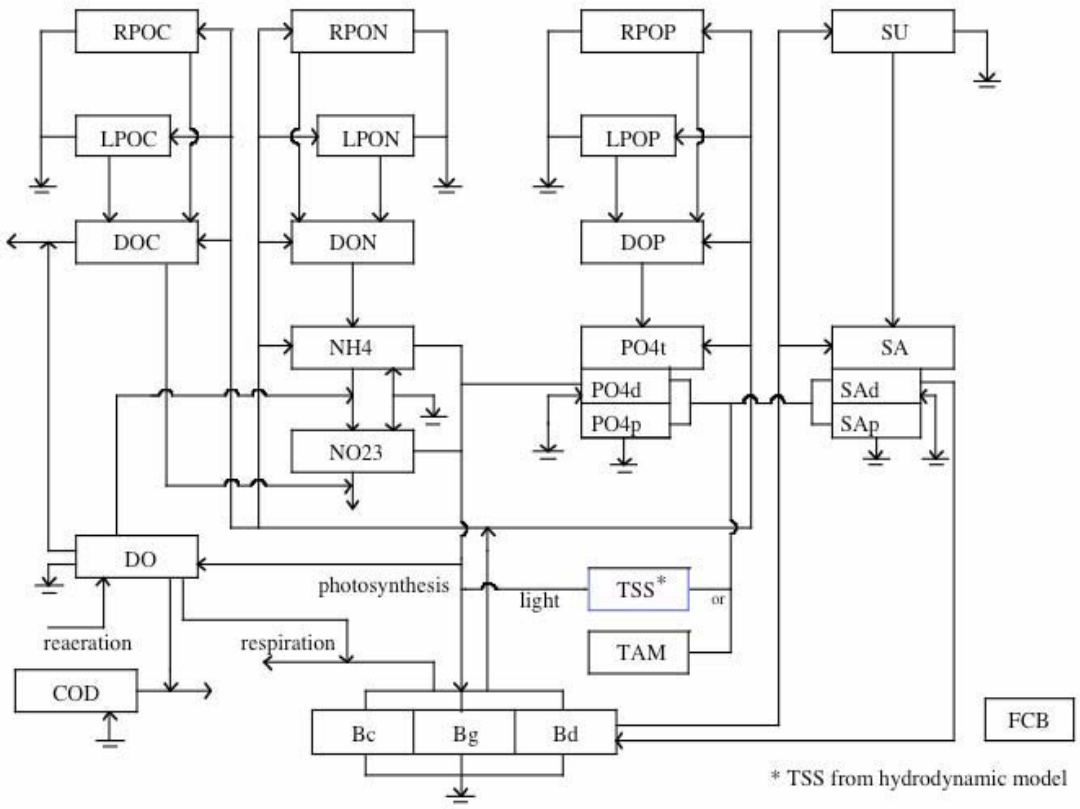


Figure 4.2. Schematic of EFDC Water Column Sub-Model

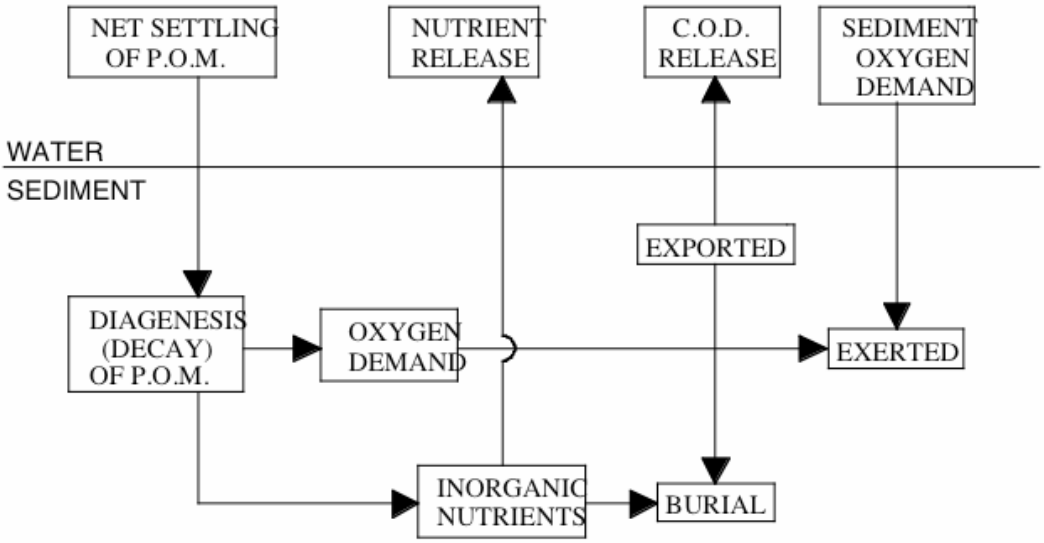


Figure 4.3 Schematic of EFDC Benthic Sediment Sub-Model

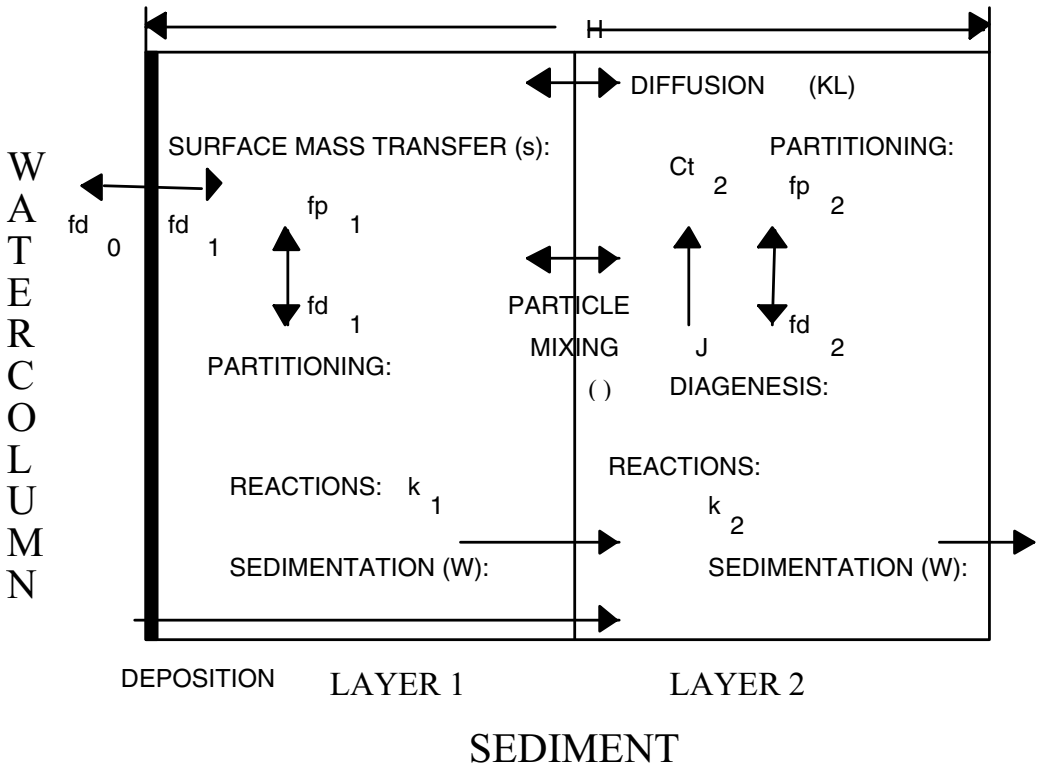


Figure 4.4. EFDC Sediment Sub-Model Processes and Layers

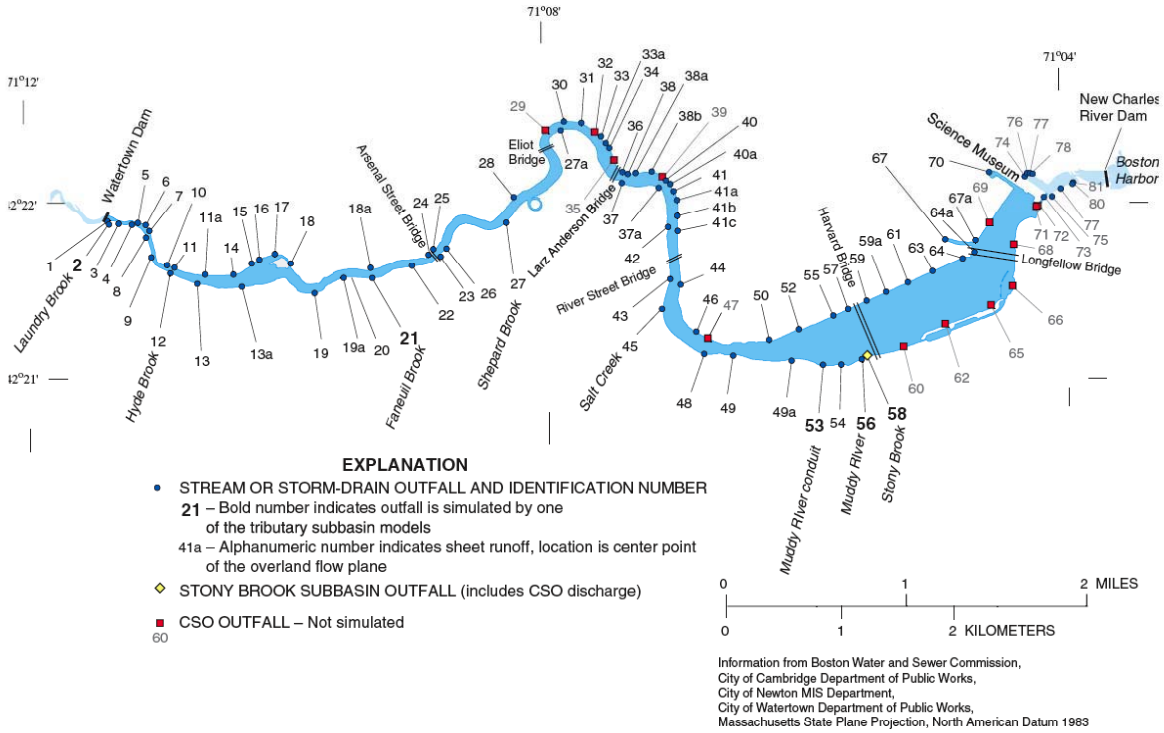


Figure 4.5. Location of Flow and Load Inputs to Lower Basin (USGS, 2002)

Figure 4.6: Daily Total Flow Corellation at Watertown Dam and Waltham USGS Gages 1999-2000

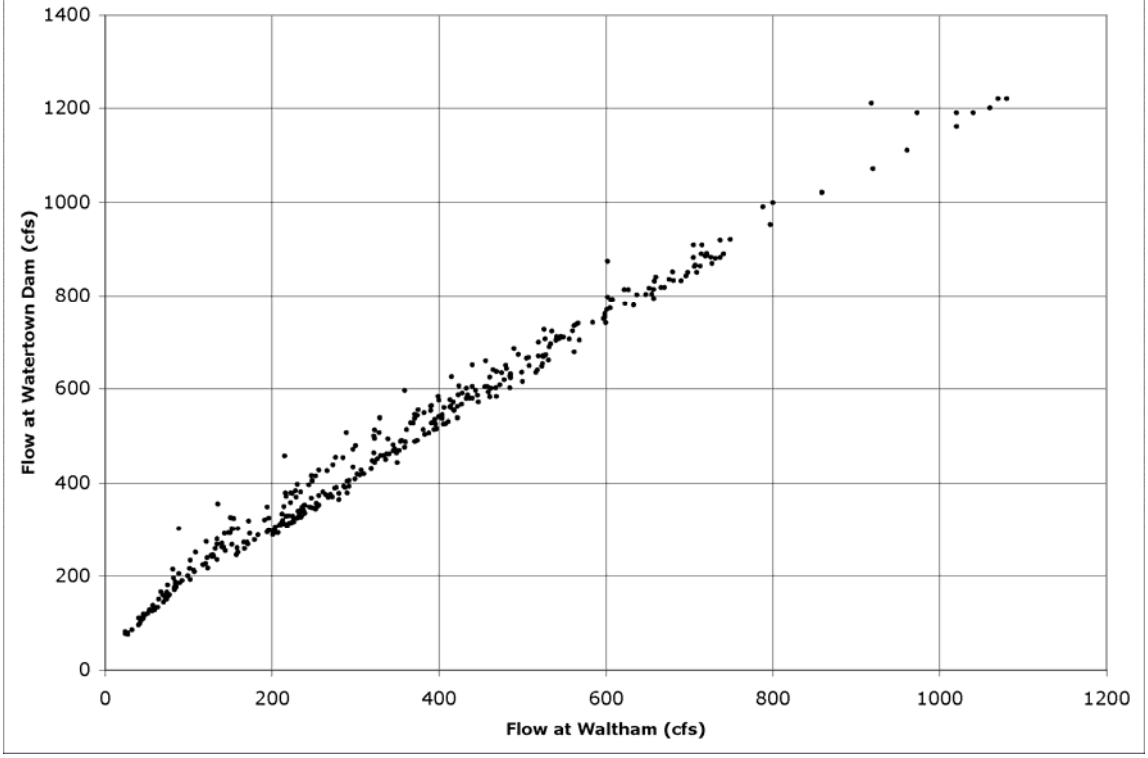


Figure 4.7: Measured and Predicted Daily Total Flows at Waltham and Watertown Dam 1999-2000

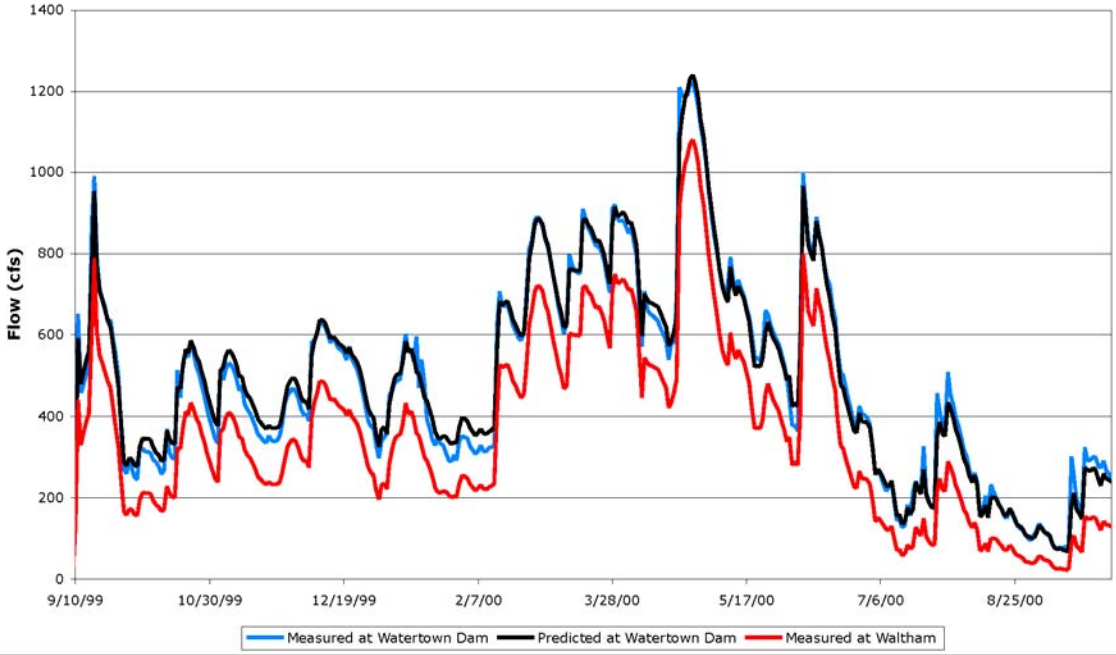


Figure 4.8: Measured and Predicted Daily Total Flows at Waltham and Watertown Dam 1997-2002

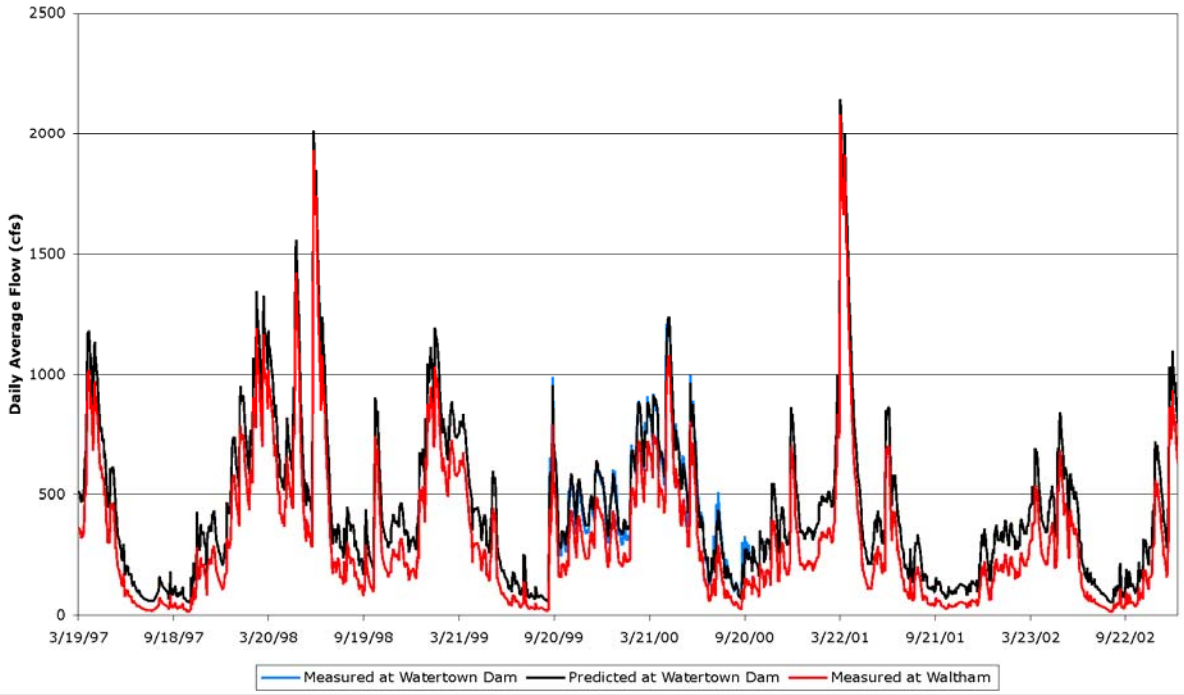


Figure 4.9: DO Data at Watertown Dam

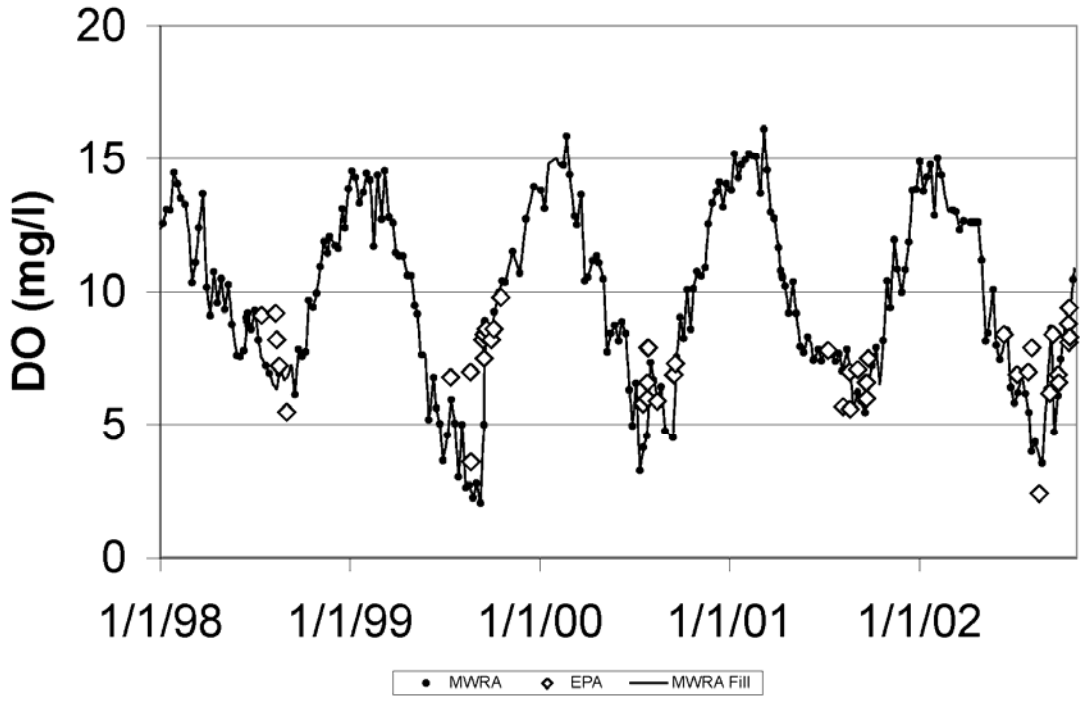


Figure 4.10: Chlor-a Data at Watertown Dam

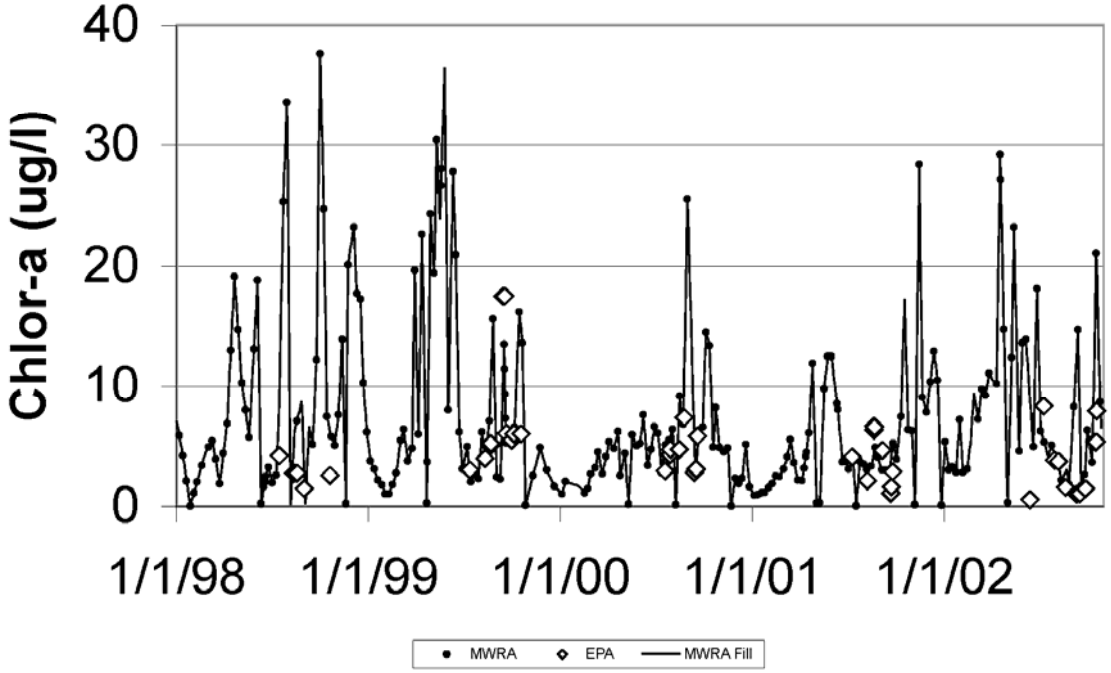


Figure 4.11: PO4-P Data at Watertown Dam

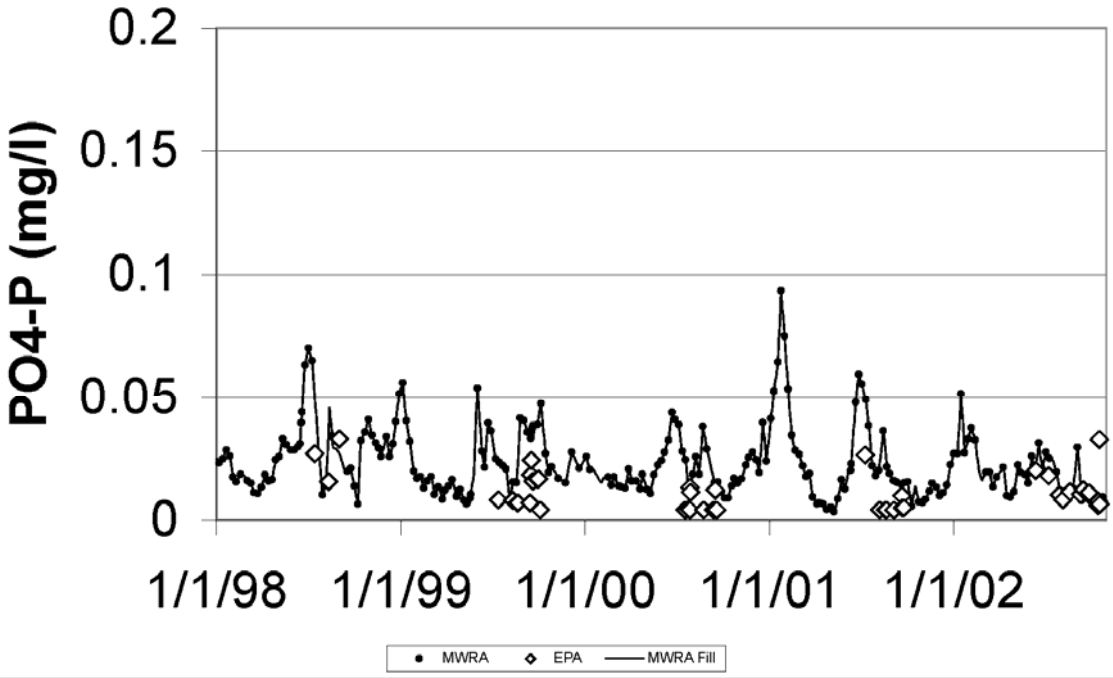


Figure 4.12: Org-P Data at Watertown Dam

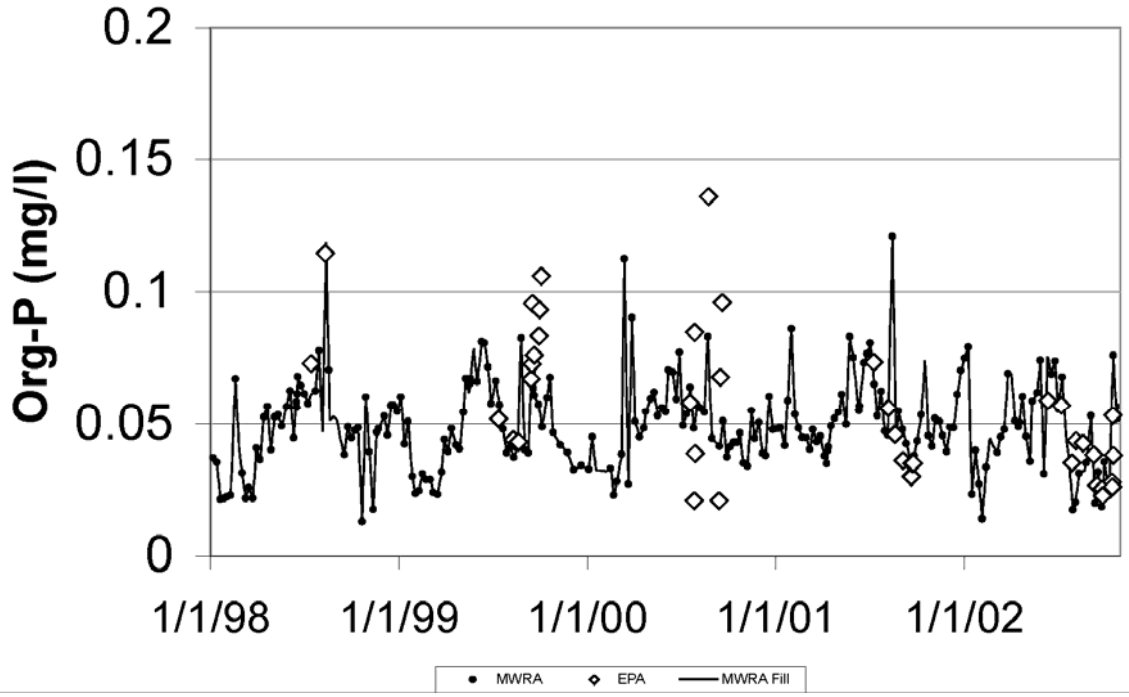


Figure 4.13: TP Data at Watertown Dam

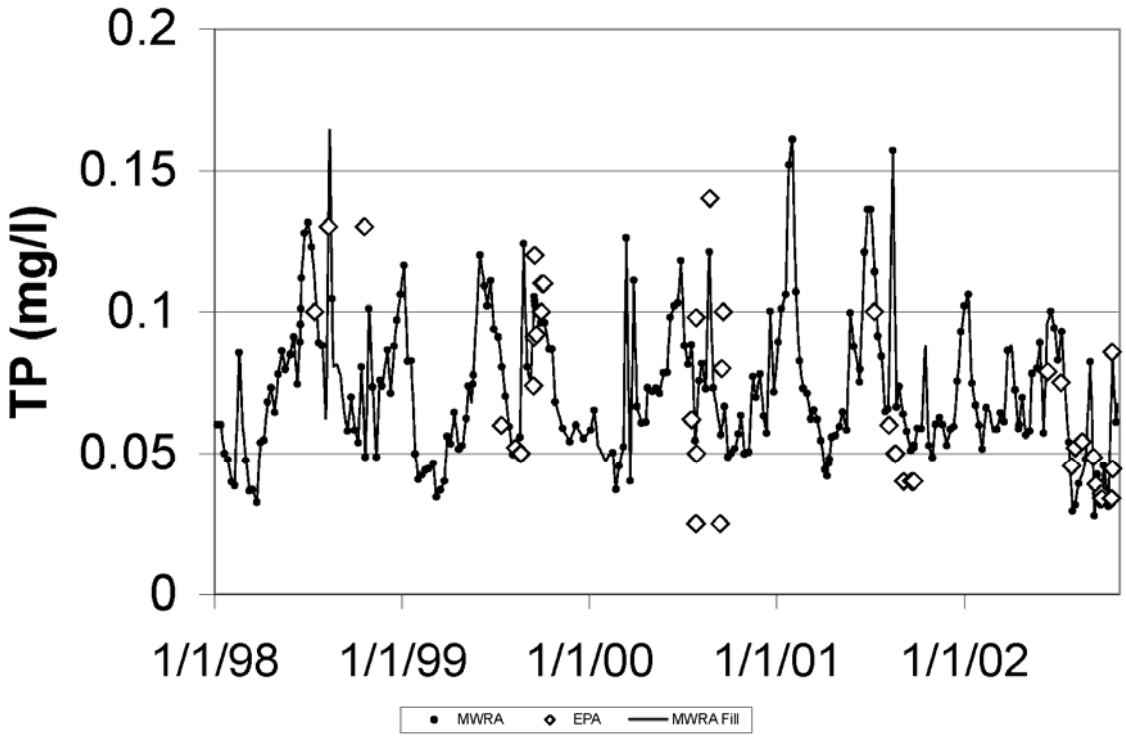


Figure 4.14: NH4-N Data at Watertown Dam

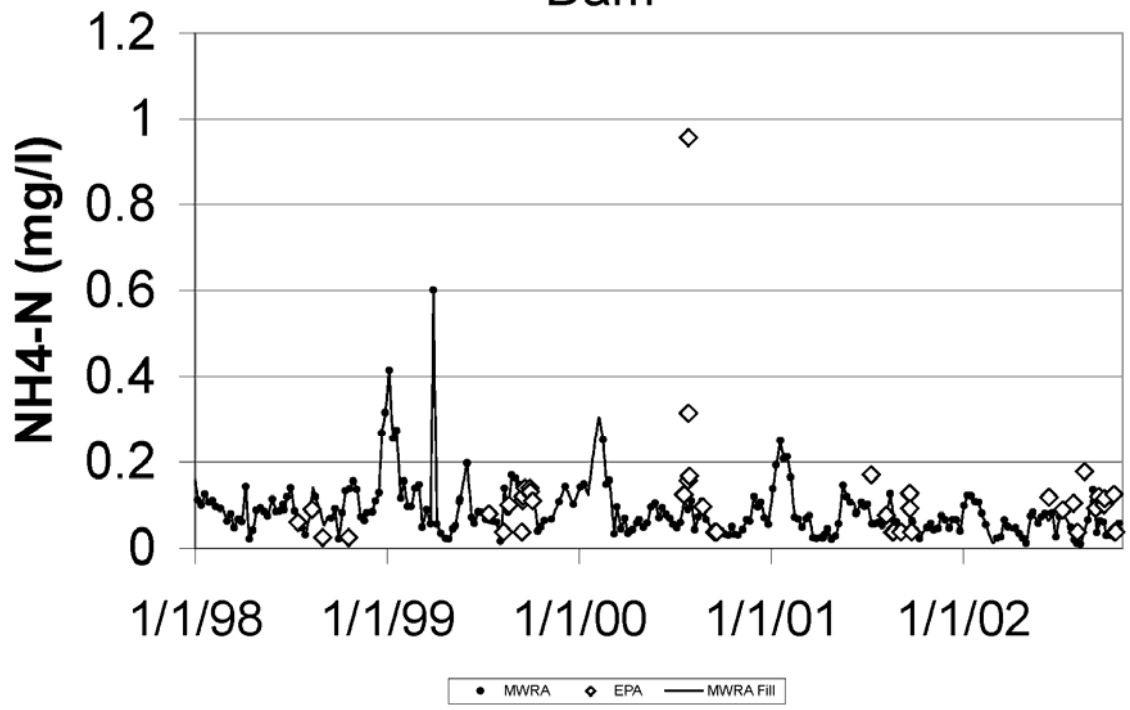
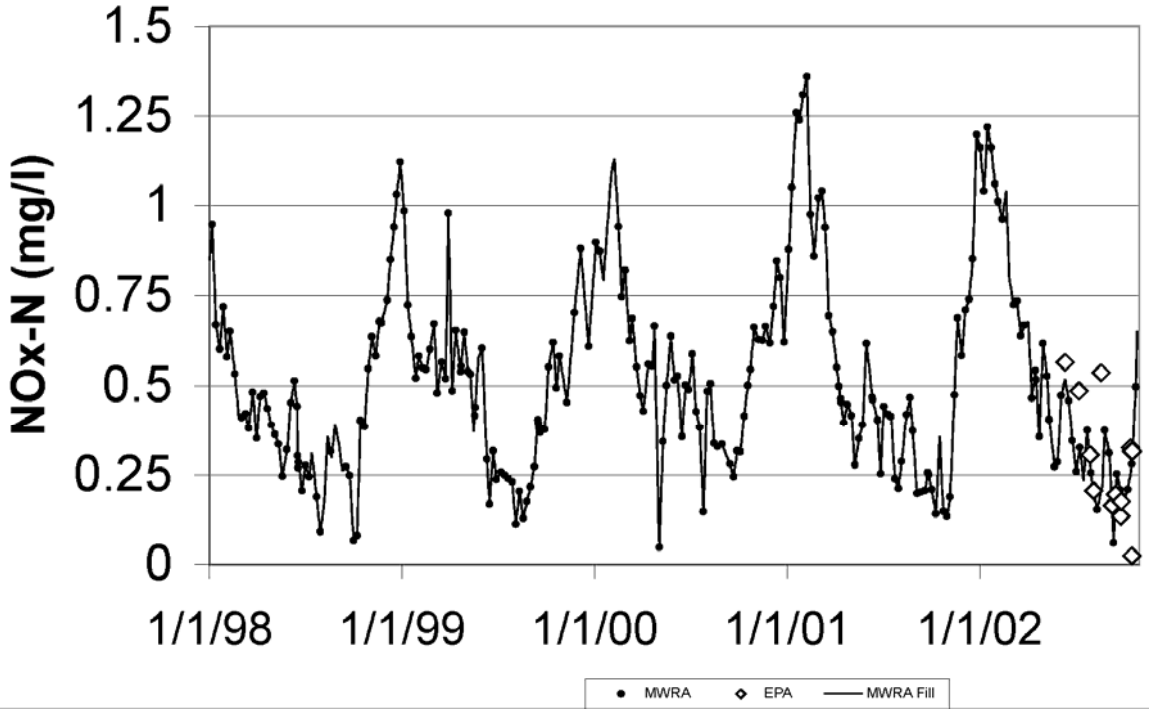


Figure 4.15: NOx-N Data at Watertown Dam



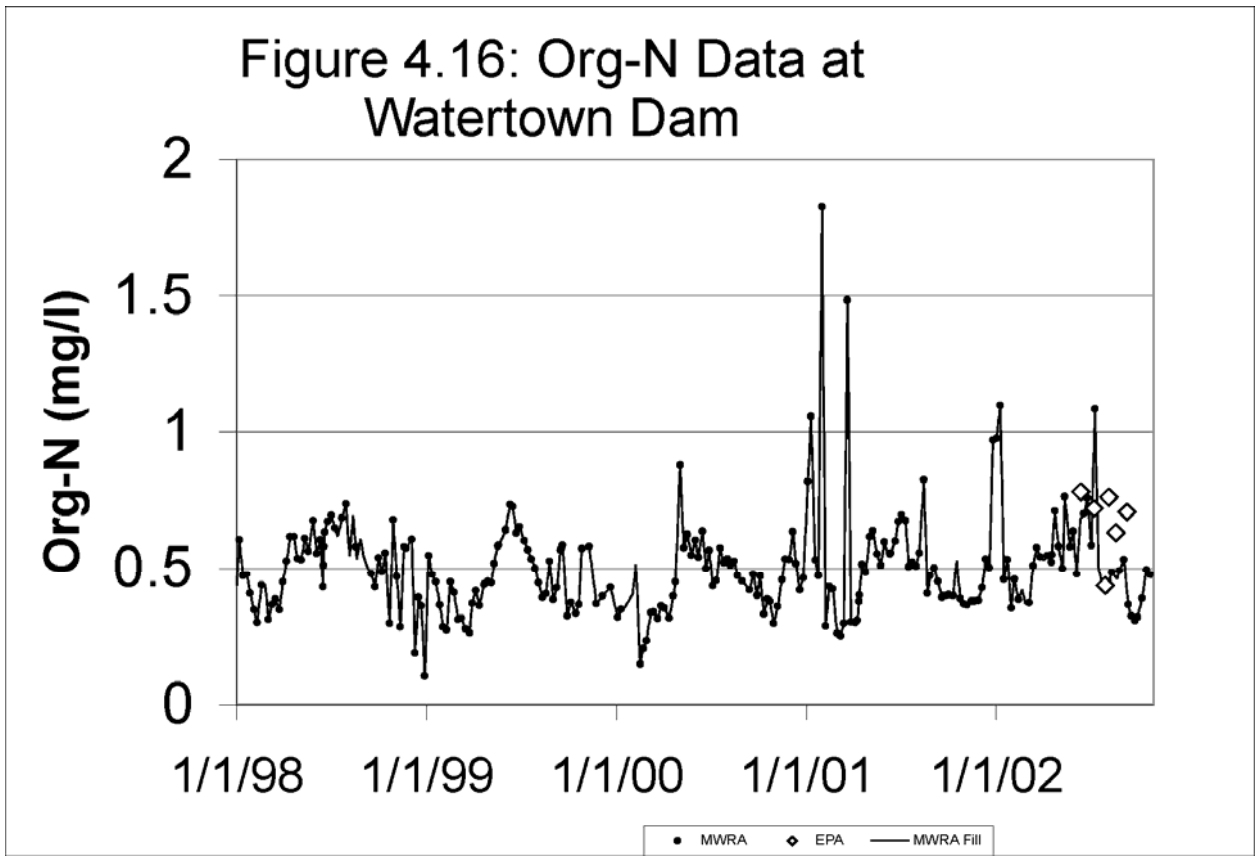


Figure 4.16: Org-N Data at Watertown Dam
Org-N (mg/l)
2
1.5
1
0.5
0
1/1/98
1/1/99
1/1/00
1/1/01
1/1/02
MWRA
EPA
MWRA Fill

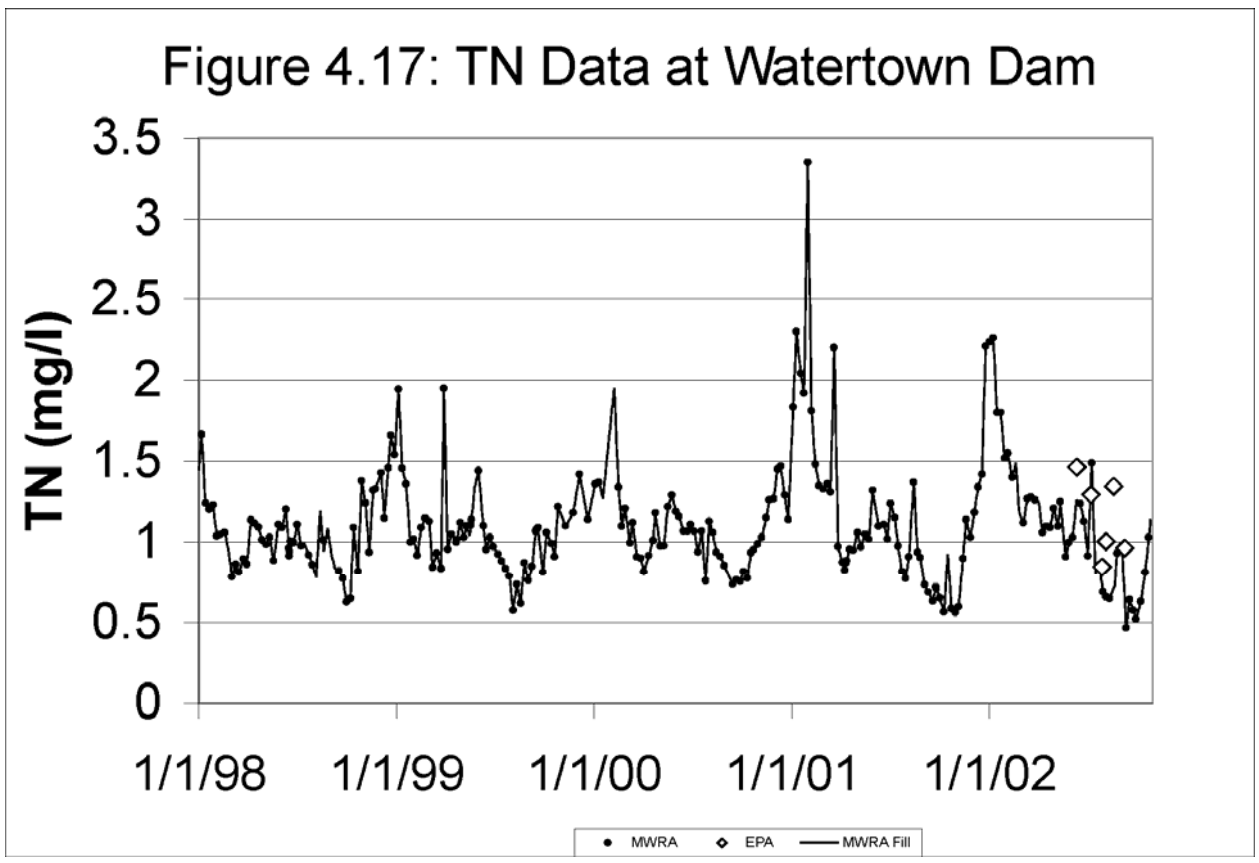


Figure 4.17: TN Data at Watertown Dam
TN (mg/l)
3.5
3
2.5
2
1.5
1
0.5
0
1/1/98
1/1/99
1/1/00
1/1/01
1/1/02
MWRA
EPA
MWRA Fill

Figure 4.18: TOC Data at Watertown Dam

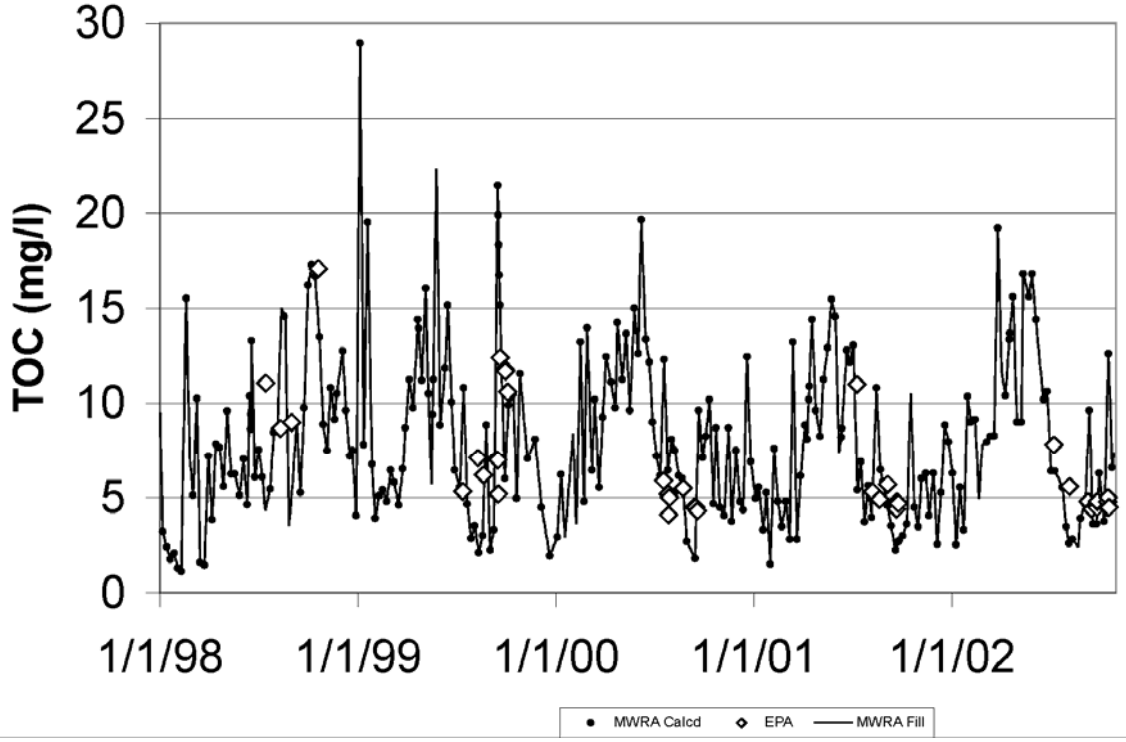


Figure 4.19: Salinity Data at Watertown Dam

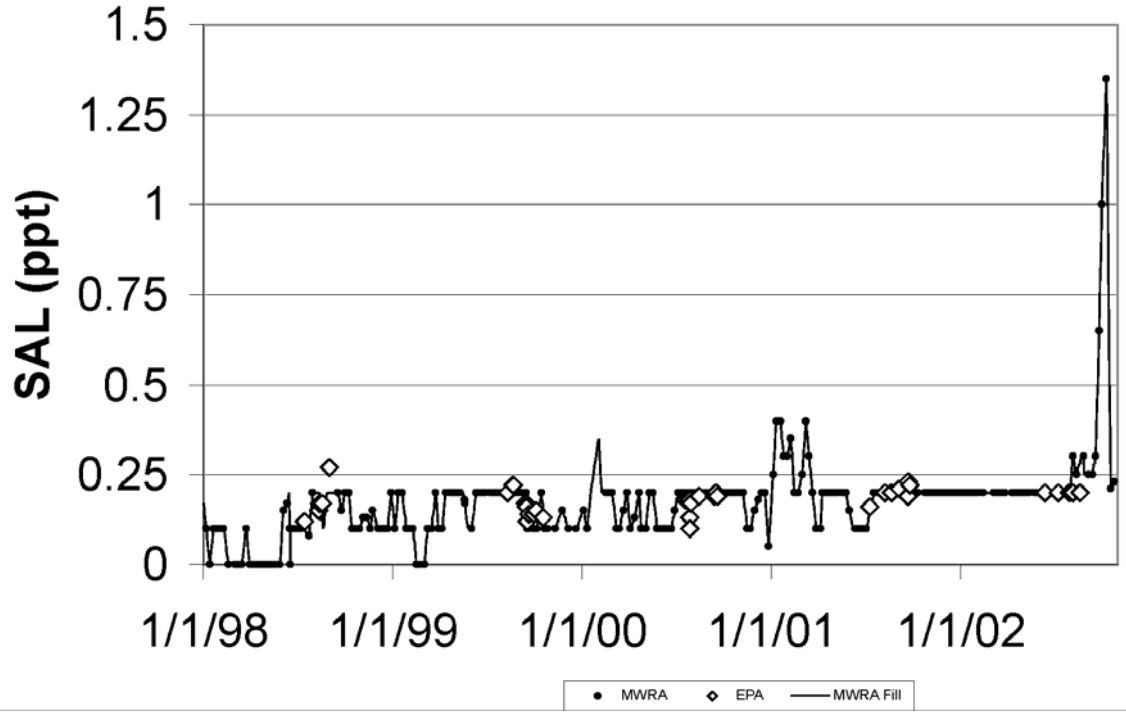


Figure 4.20: Temperature Data at Watertown Dam

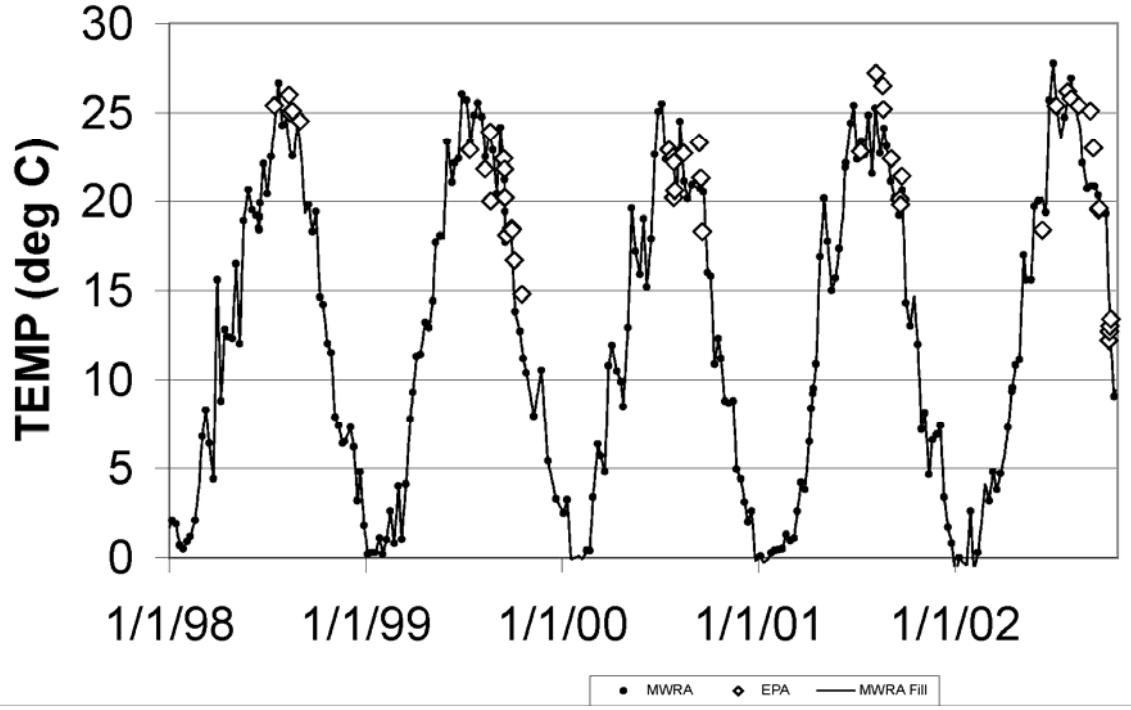
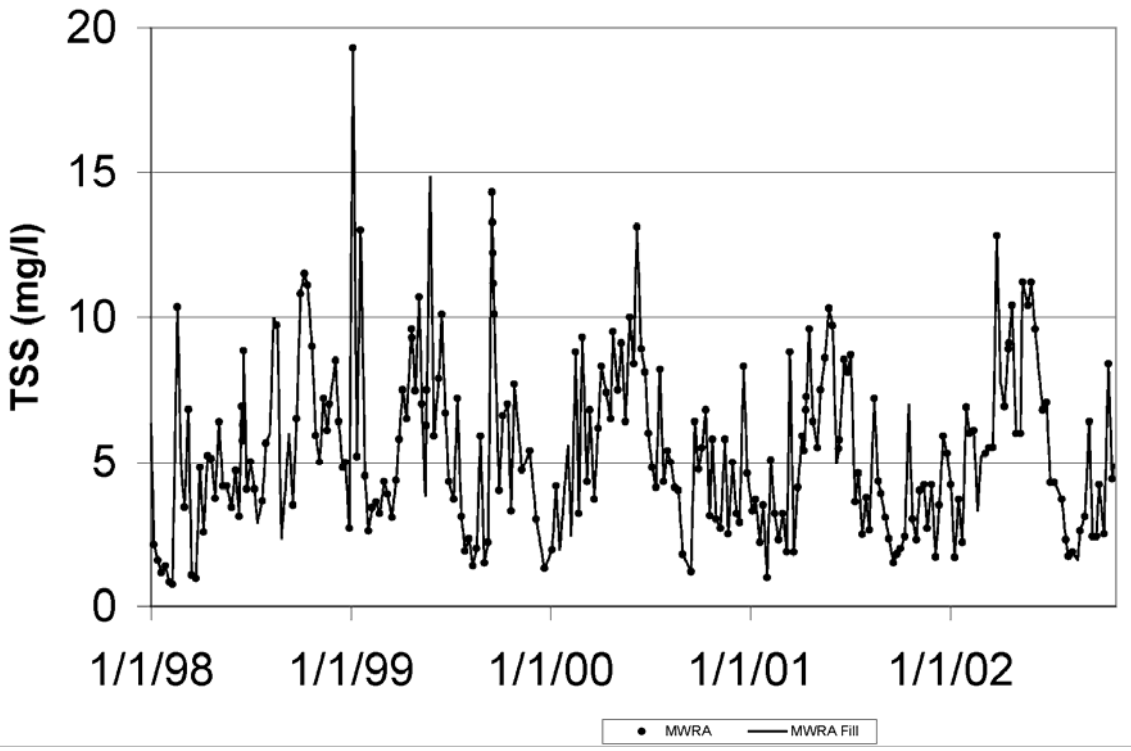


Figure 4.21: TSS Data at Watertown Dam



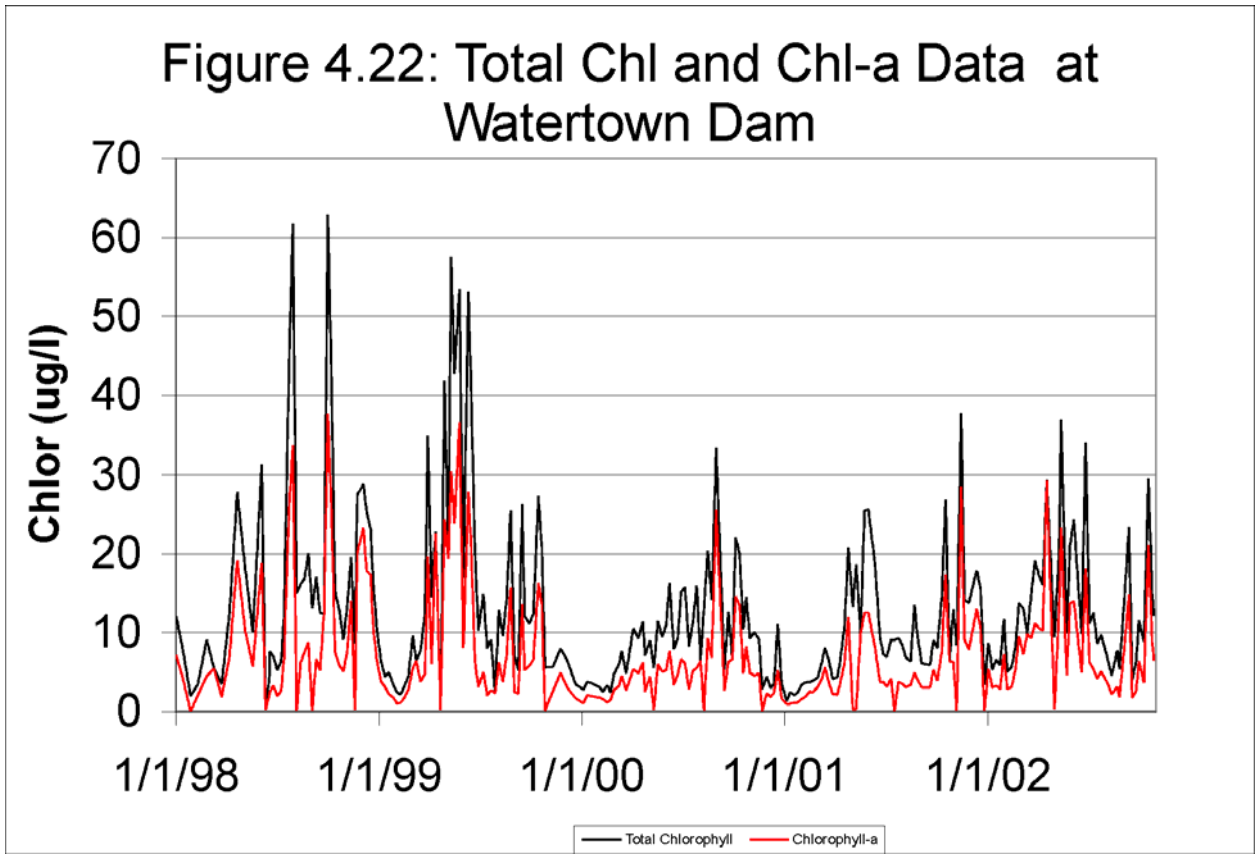


Figure 4.22: Total Chl and Chl-a Data at Watertown Dam
Chlor (ug/l)
70
60
50
40
30
20
10
0
1/1/98
1/1/99
1/1/00
1/1/01
1/1/02
Total Chlorophyll
Chlorophyll-a

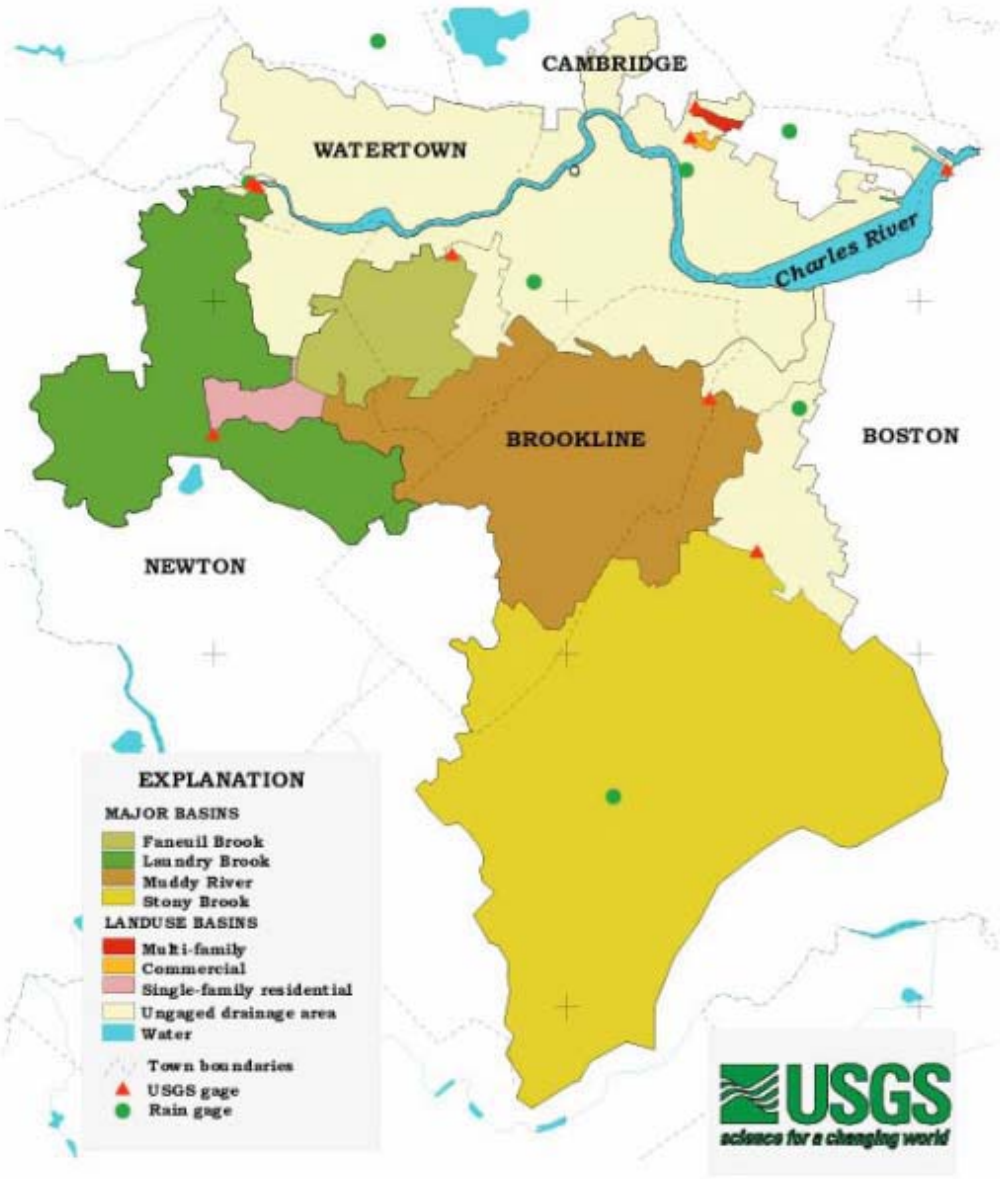


Figure 4.23. Major Sub-Basins Tributary to the Lower Charles River

Figure 4.24: Predicted Daily Flow at Watertown Dam and Predicted Daily Total Stormwater Flow to LB

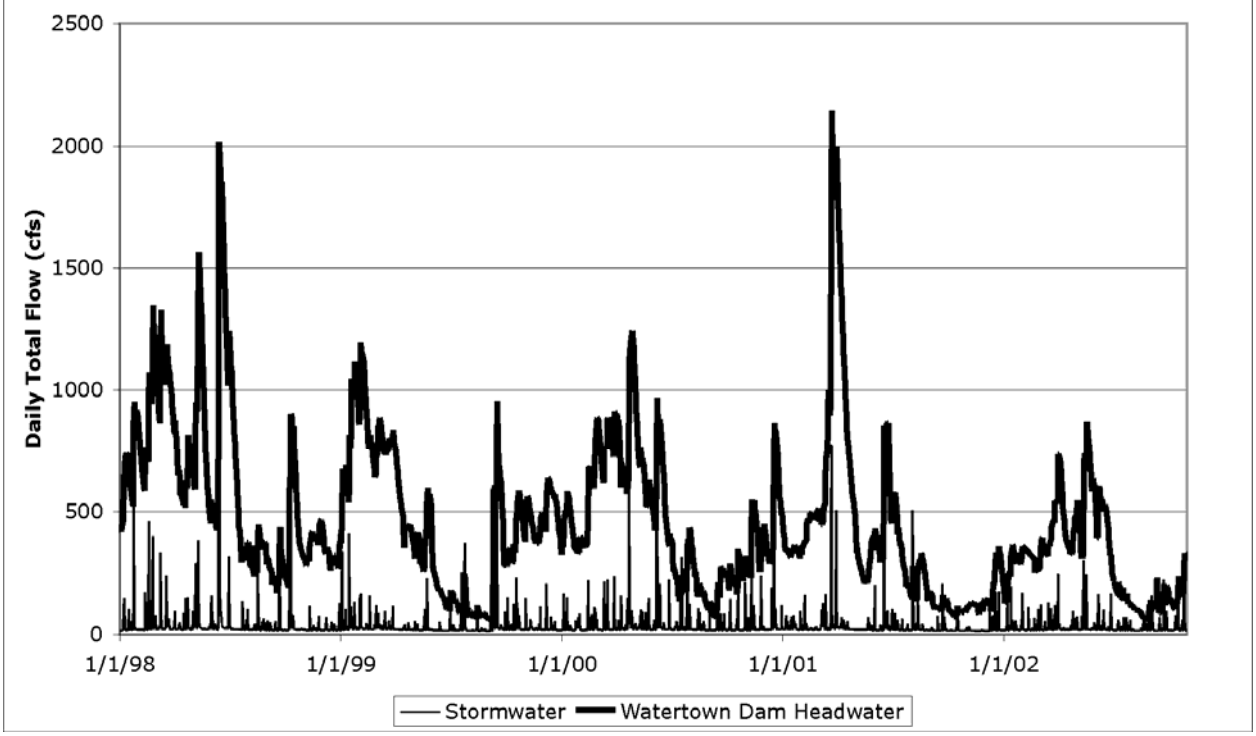


Figure 4.25: Daily Rainfall - MWRA Ward Street Headwork, 1998-2002

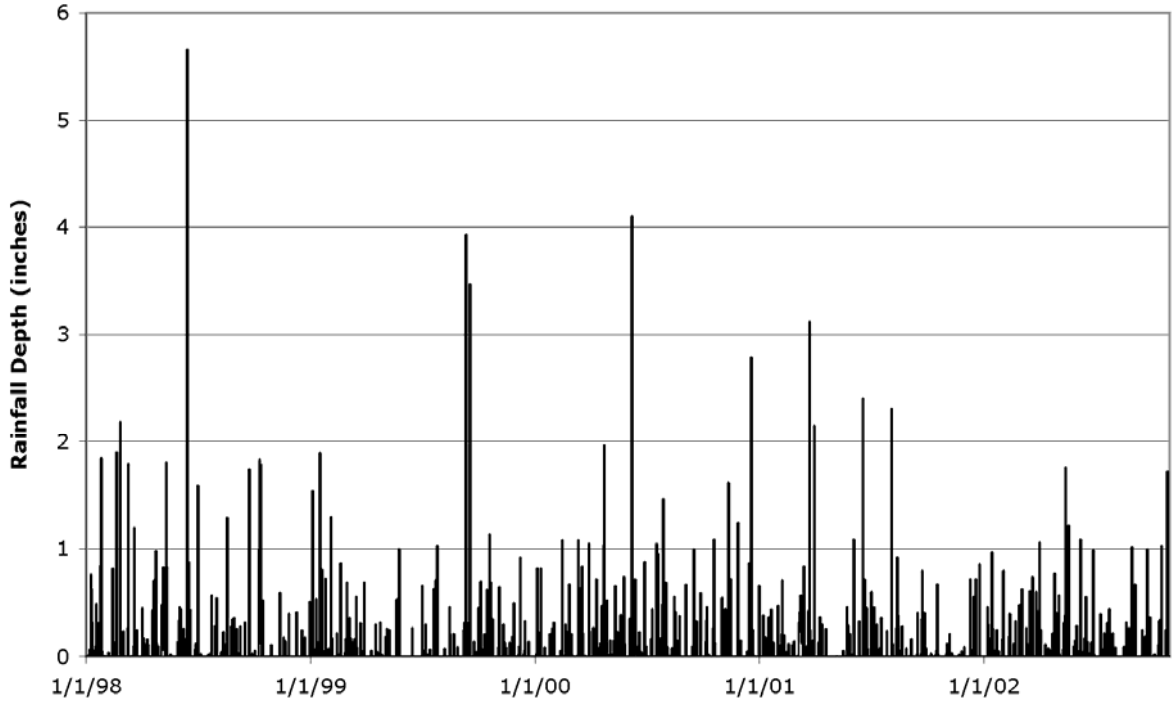


Figure 4.26: Stony Brook - Predicted vs Measured Specific Conductivity

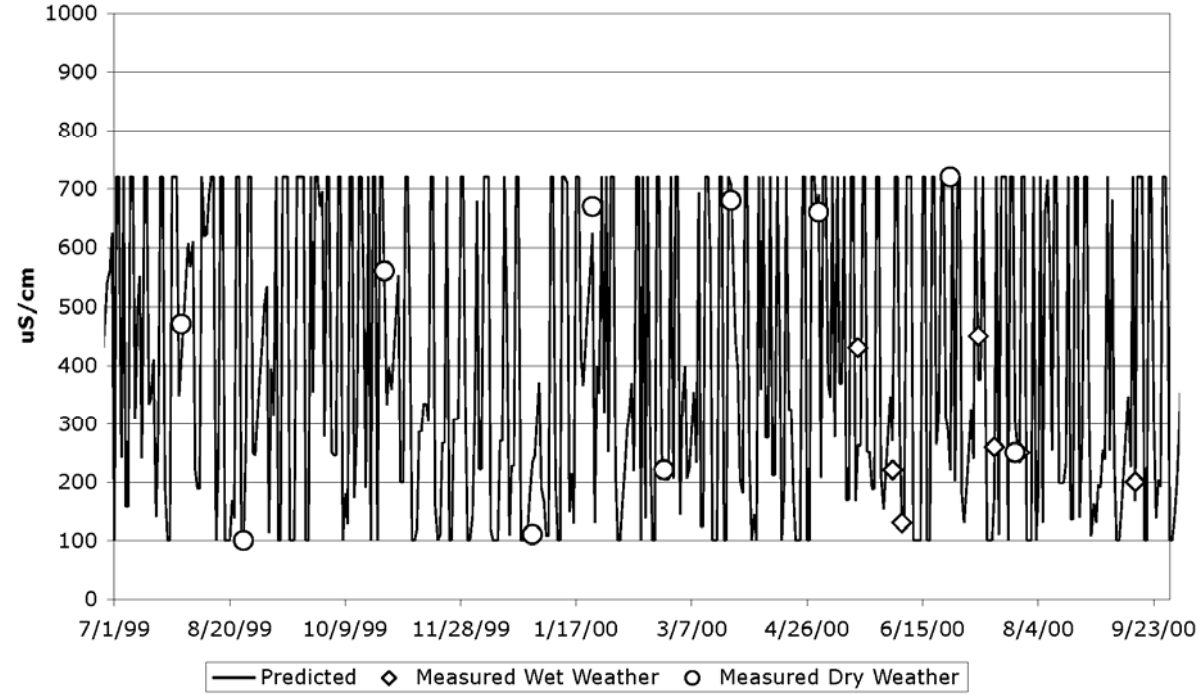


Figure 4.27: Stony Brook - Predicted vs Measured BOD5

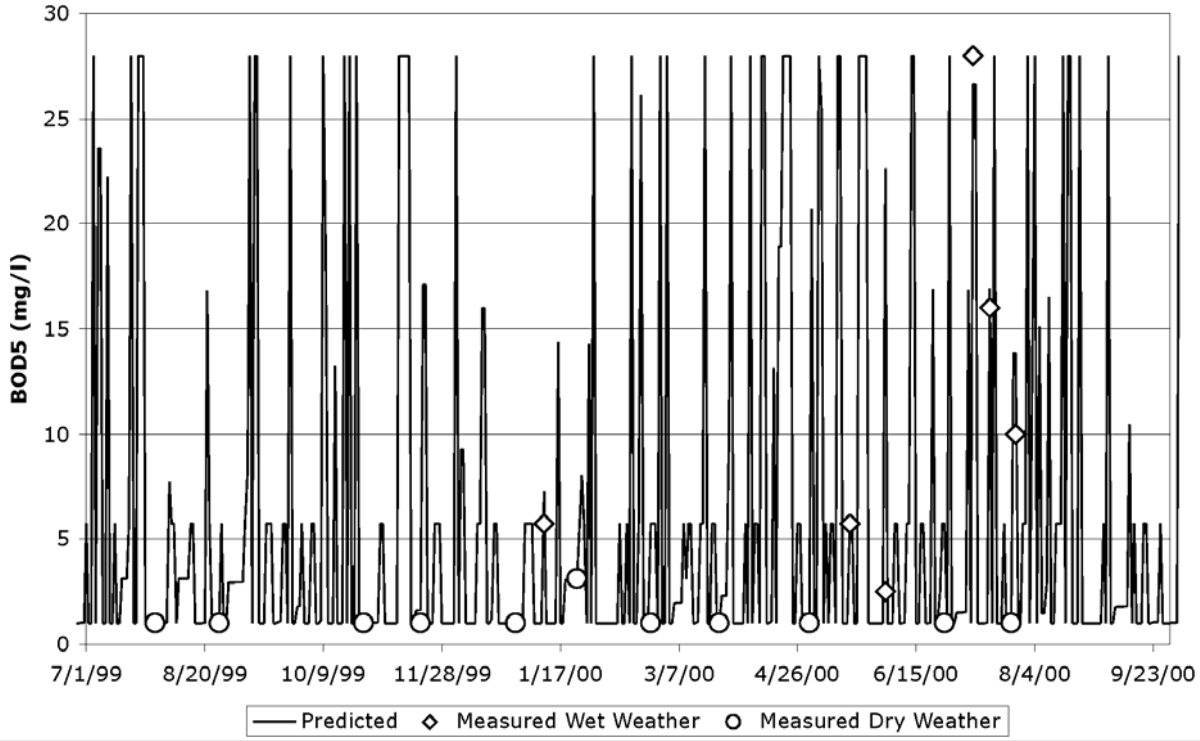


Figure 4.28: Stony Brook - Predicted vs Measured TSS

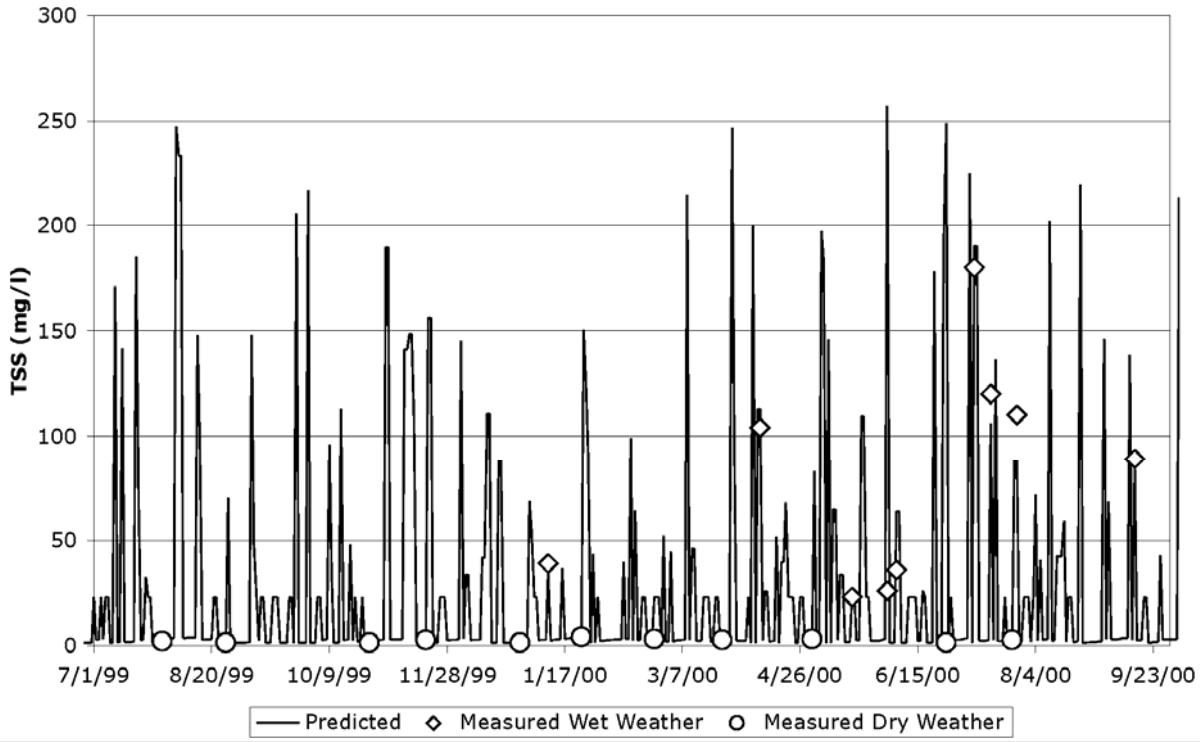


Figure 4.29: Stony Brook - Predicted vs Measured NOX-N

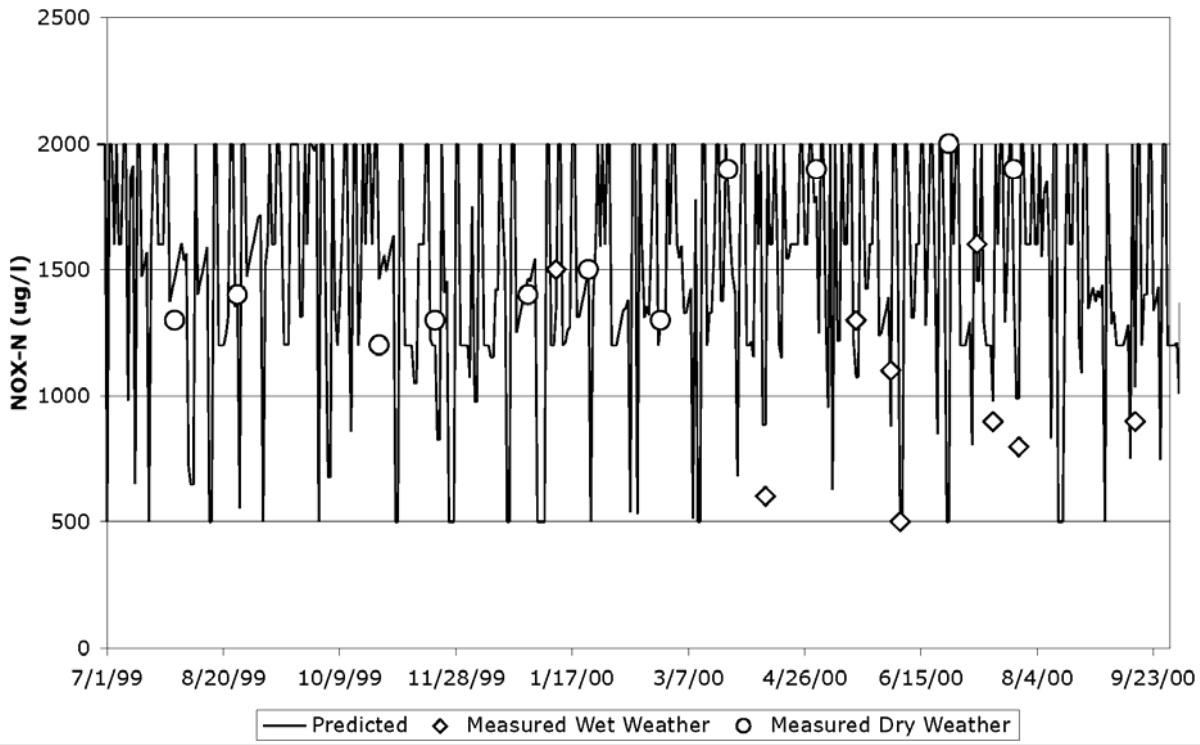


Figure 4.30: Stony Brook - Predicted vs Measured NH4-N

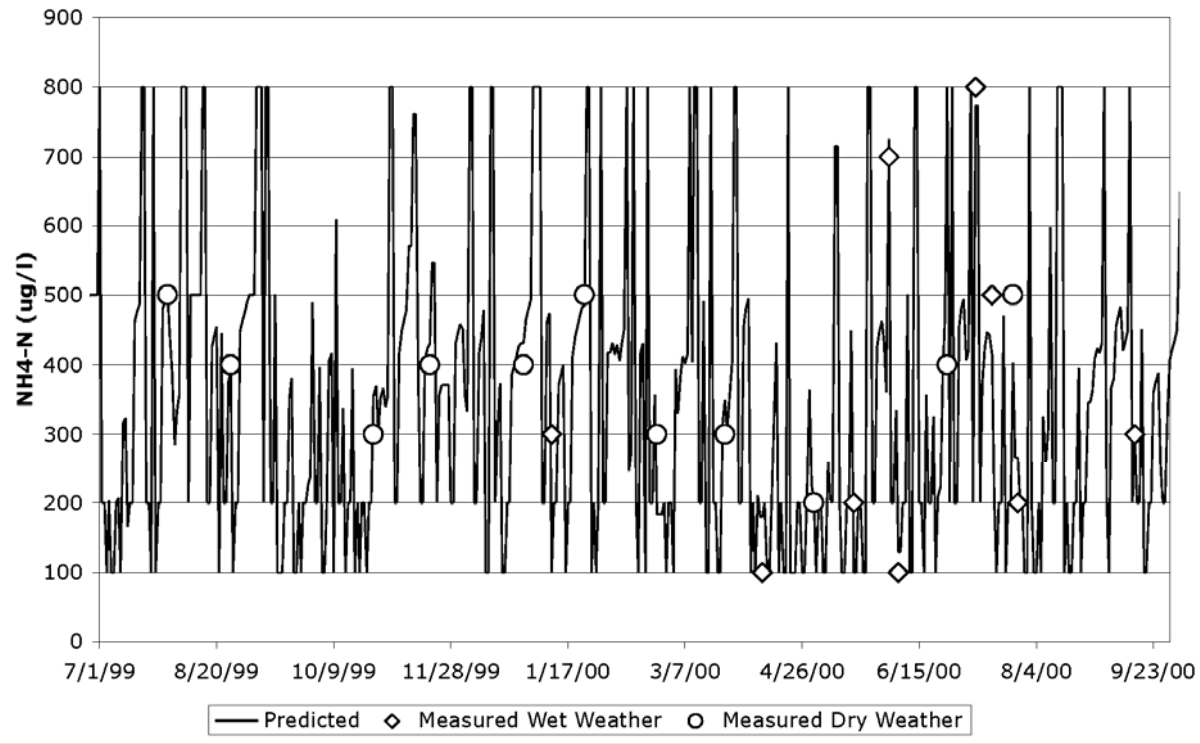


Figure 4.31: Stony Brook - Predicted vs Measured TKN

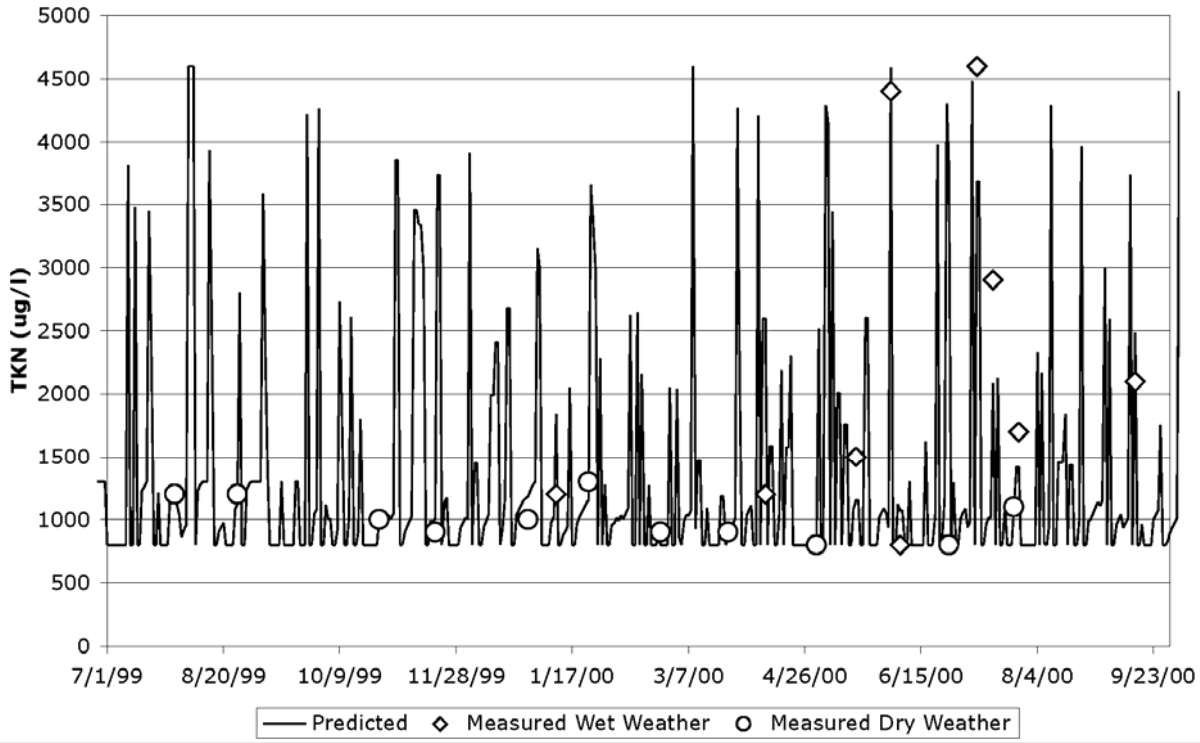


Figure 4.32: Stony Brook - Predicted vs Measured TP

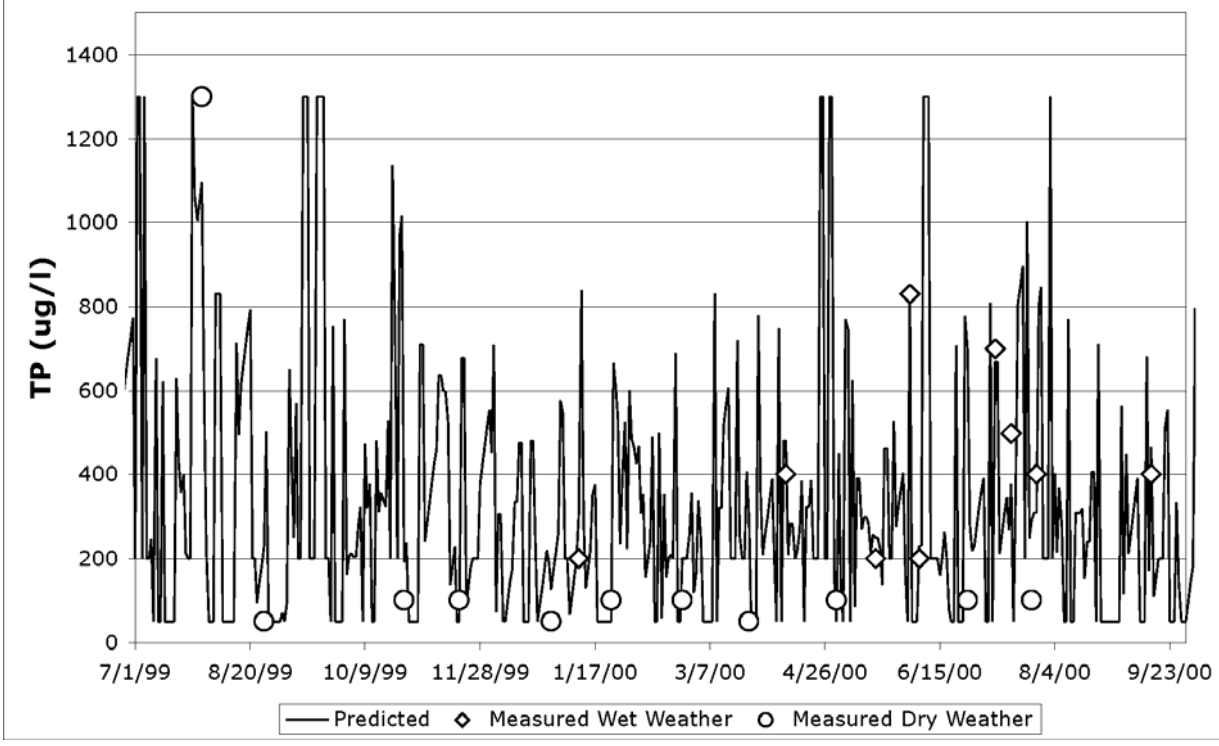


Figure 4.33: Muddy Brook - Predicted vs Measured Specific Conductivity

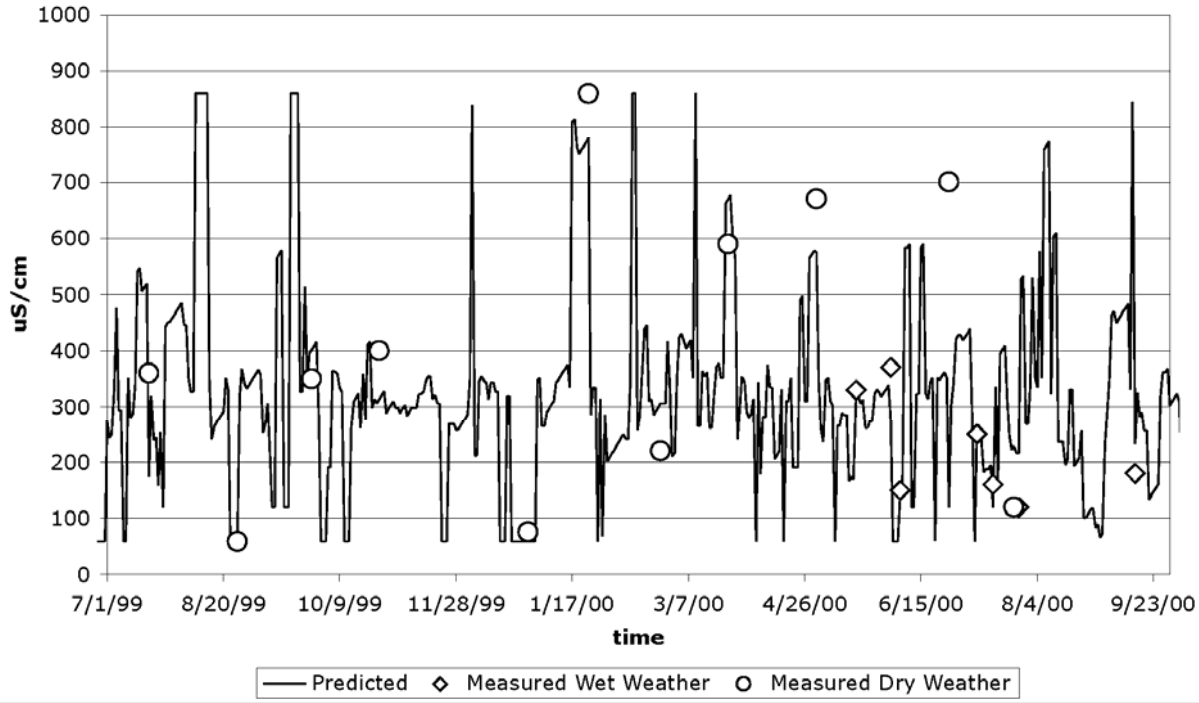


Figure 4.34: Muddy Brook - Predicted vs Measured BOD5

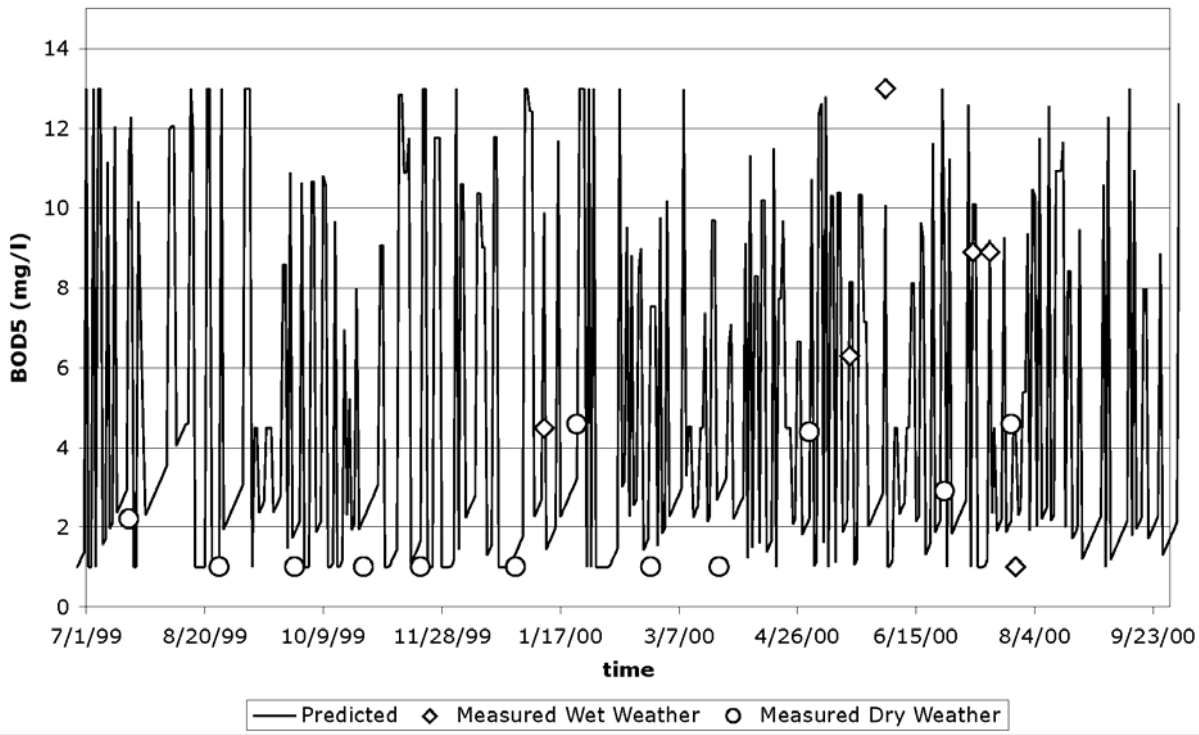


Figure 4.35: Muddy Brook - Predicted vs Measured TSS

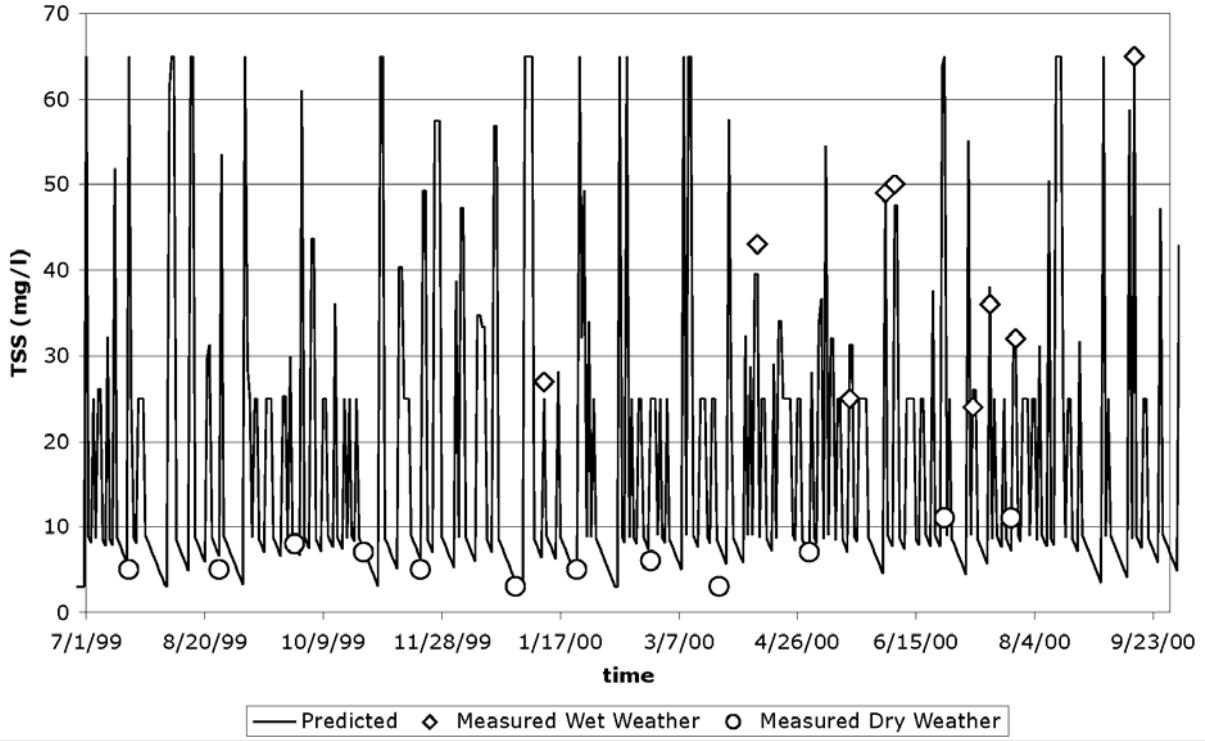


Figure 4.36: Muddy Brook - Predicted vs Measured NOX-N

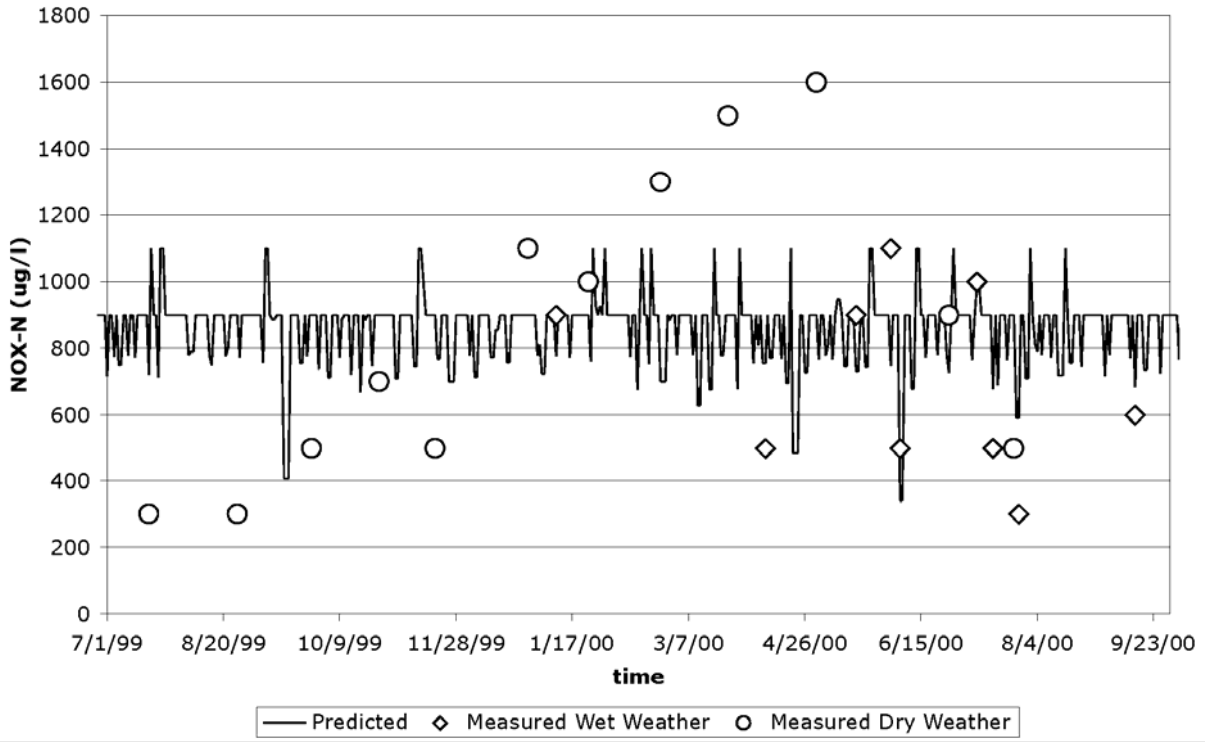


Figure 4.37: Muddy Brook - Predicted vs Measured NH4-N

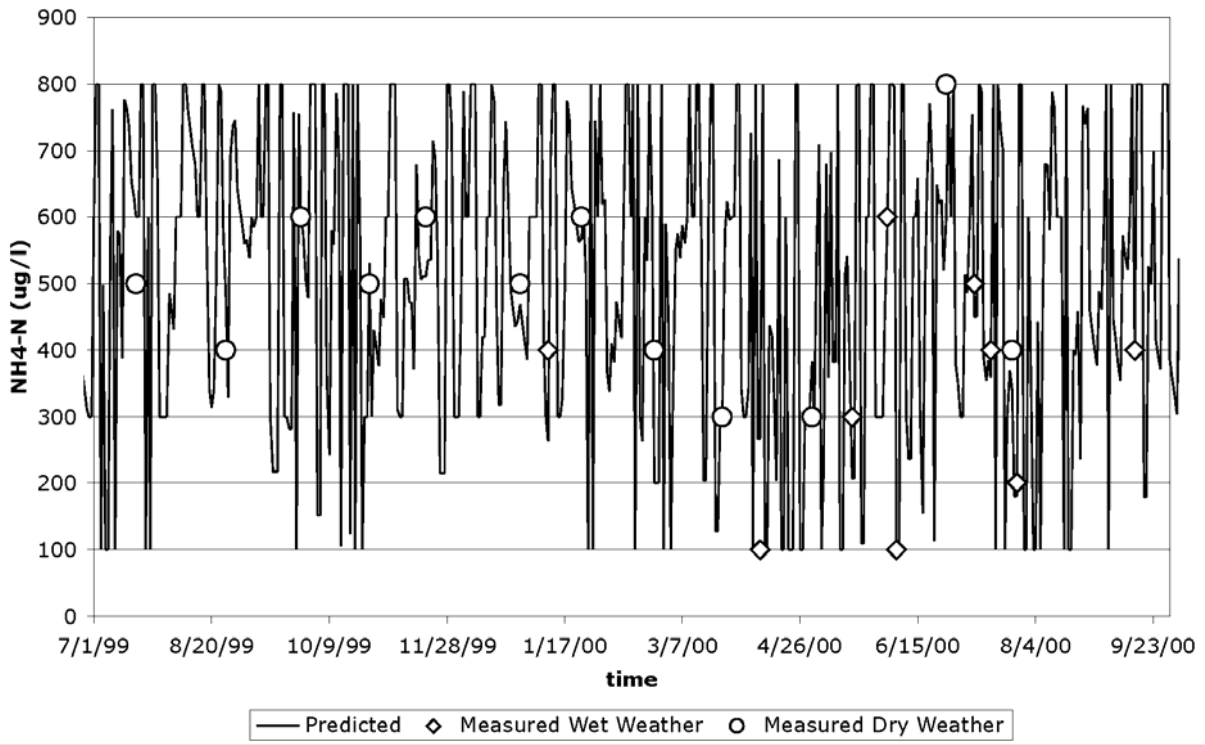


Figure 4.38: Muddy Brook - Predicted vs Measured TKN

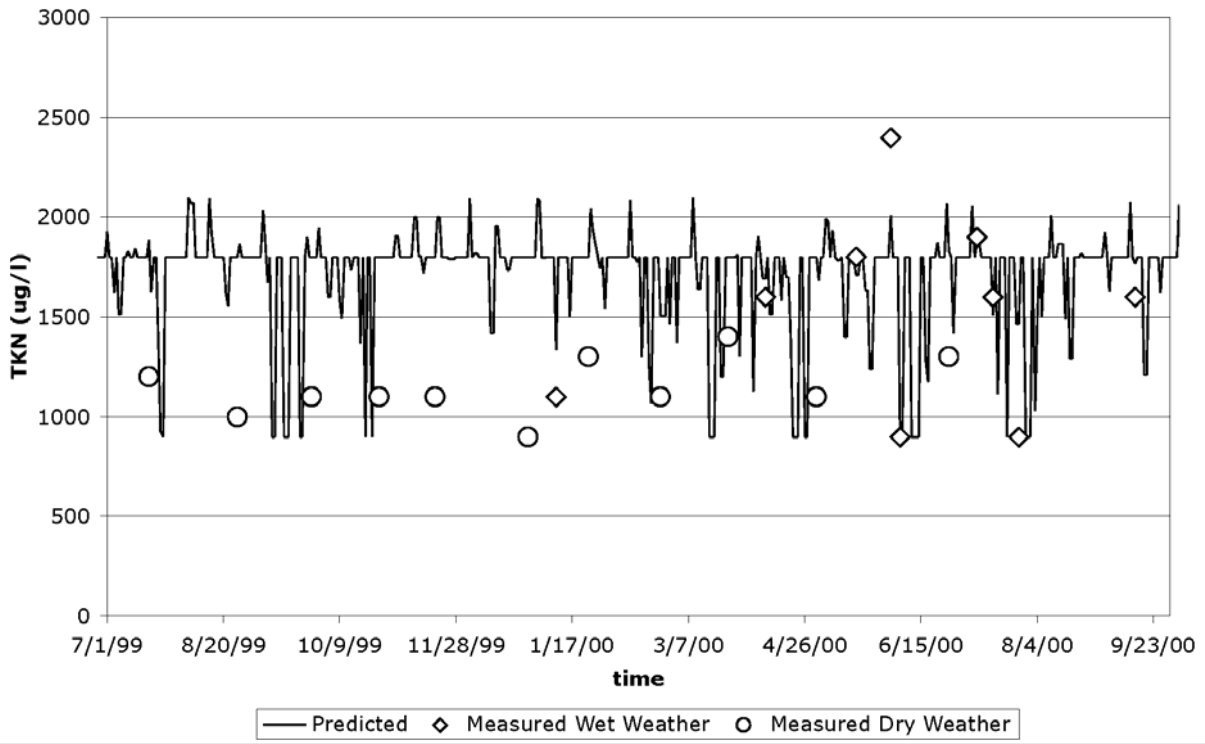


Figure 4.39: Muddy Brook - Predicted vs Measured TP

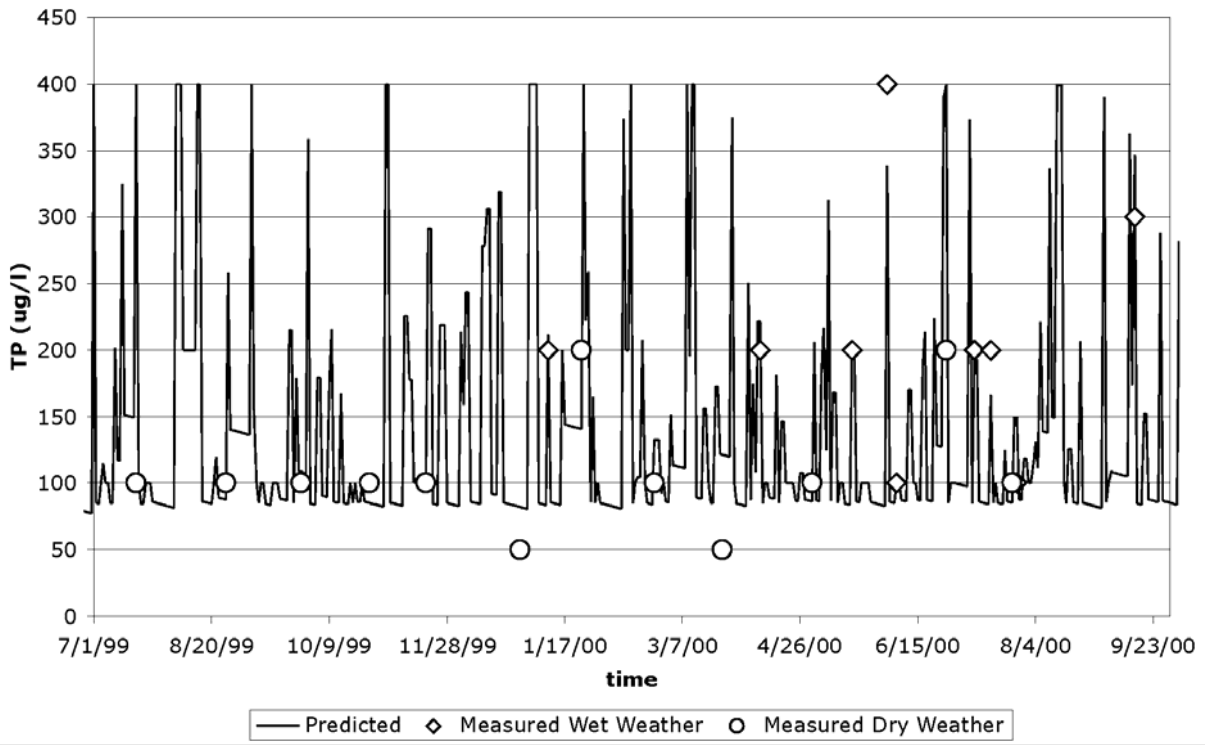


Figure 4.40: Laundry Brook - Predicted vs Measured Specific Conductivity

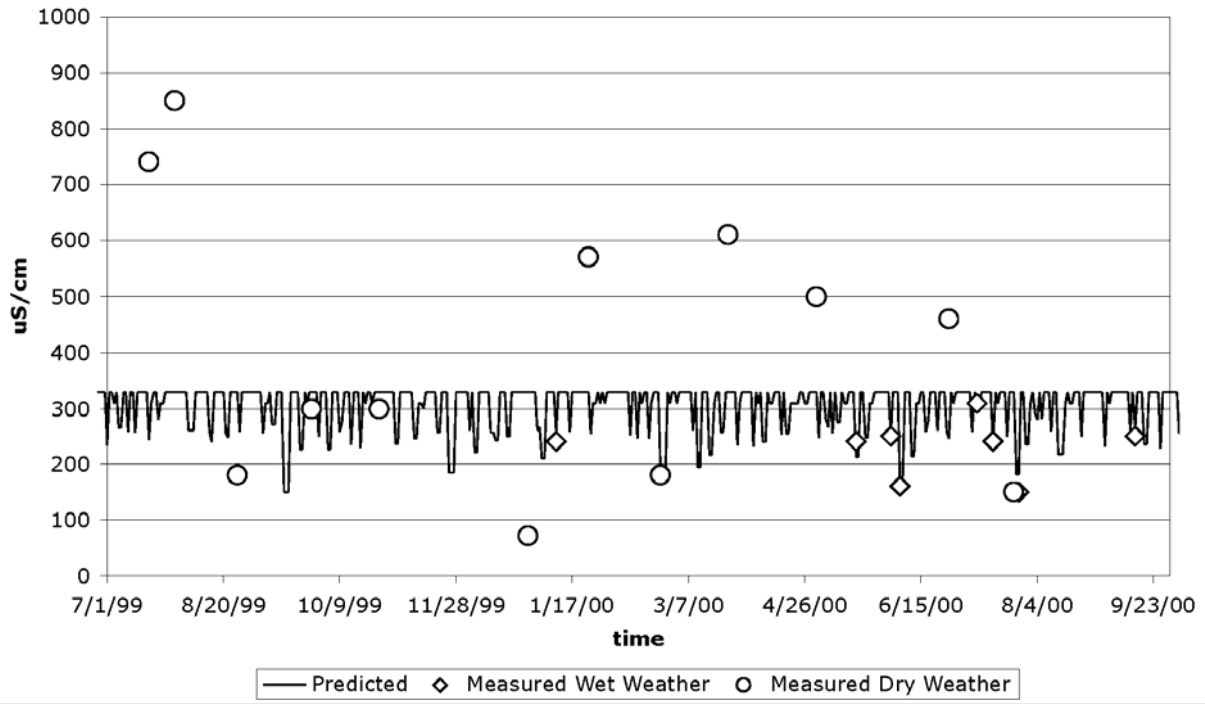


Figure 4.41: Laundry Brook - Predicted vs Measured BOD5

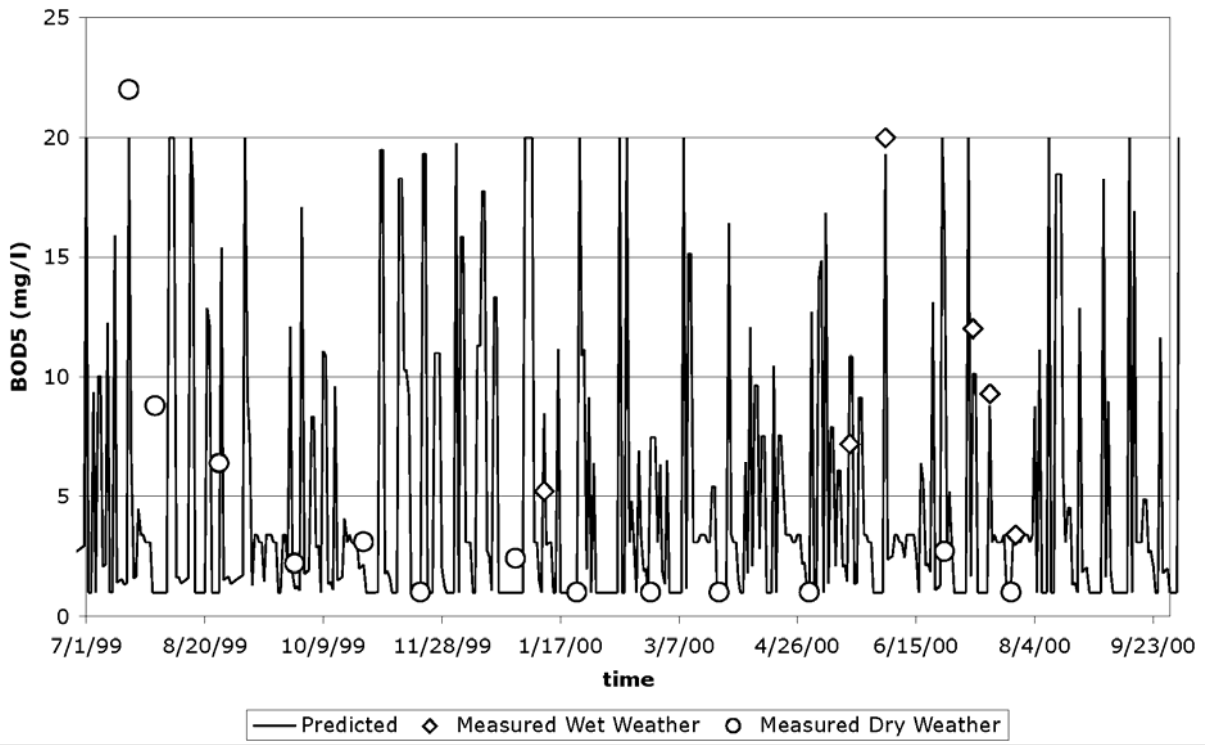


Figure 4.42: Laundry Brook - Predicted vs Measured TSS

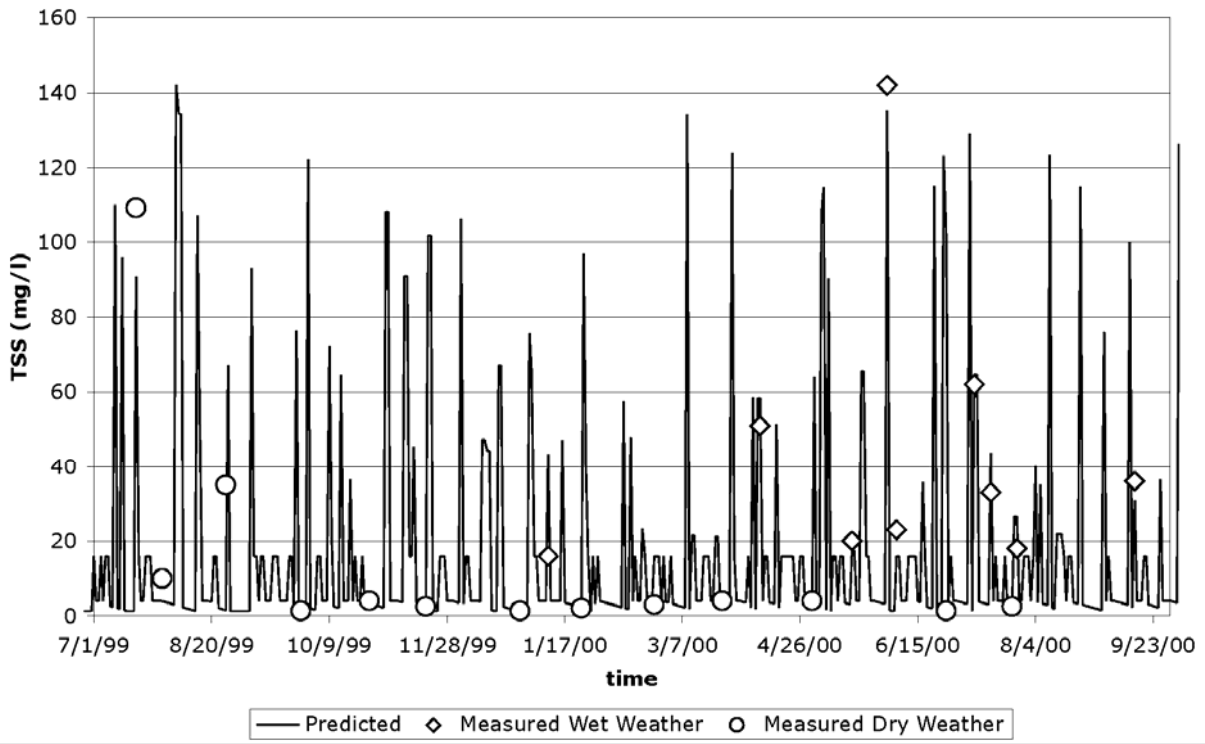


Figure 4.43: Laundry Brook - Predicted vs Measured NOX-N

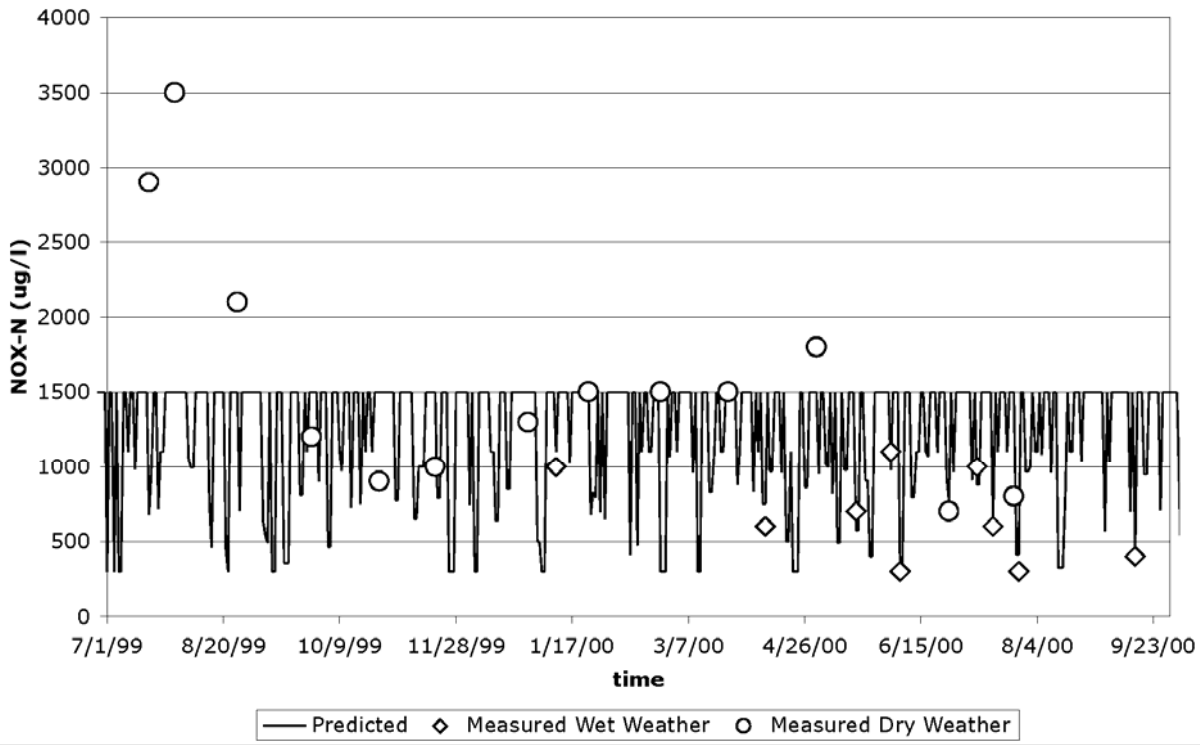


Figure 4.44: Laundry Brook - Predicted vs Measured NH4-N

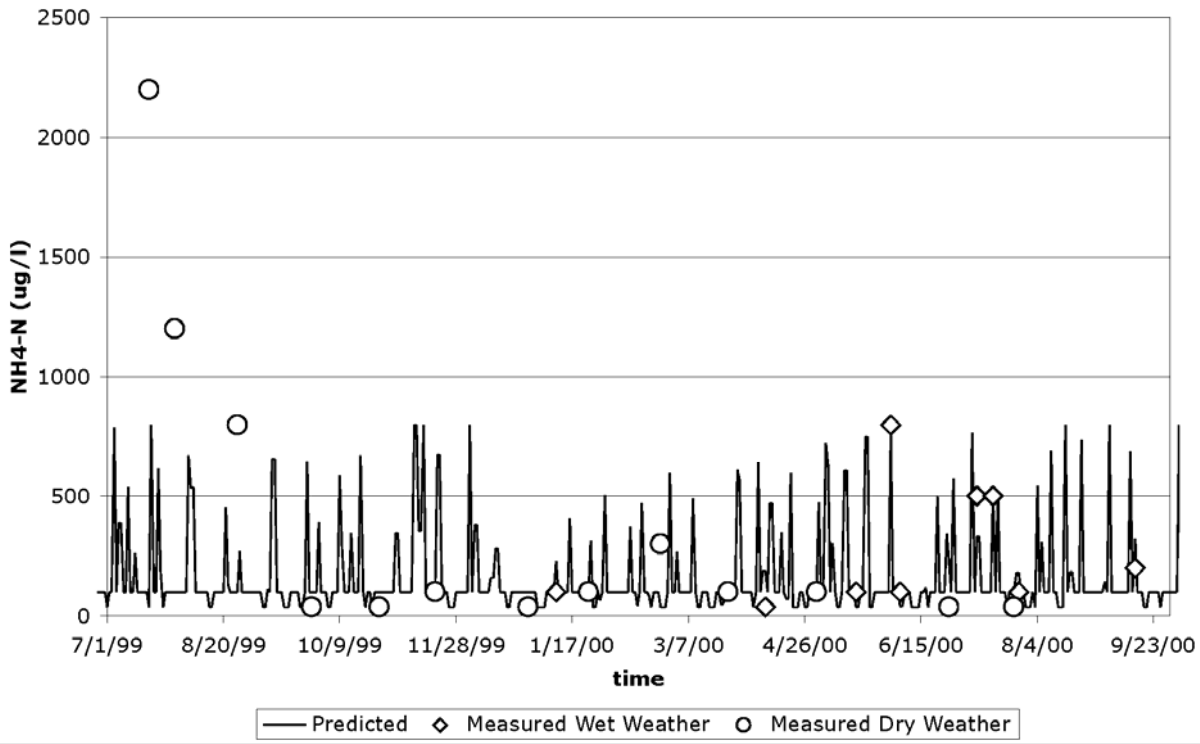


Figure 4.45: Laundry Brook - Predicted vs Measured TKN

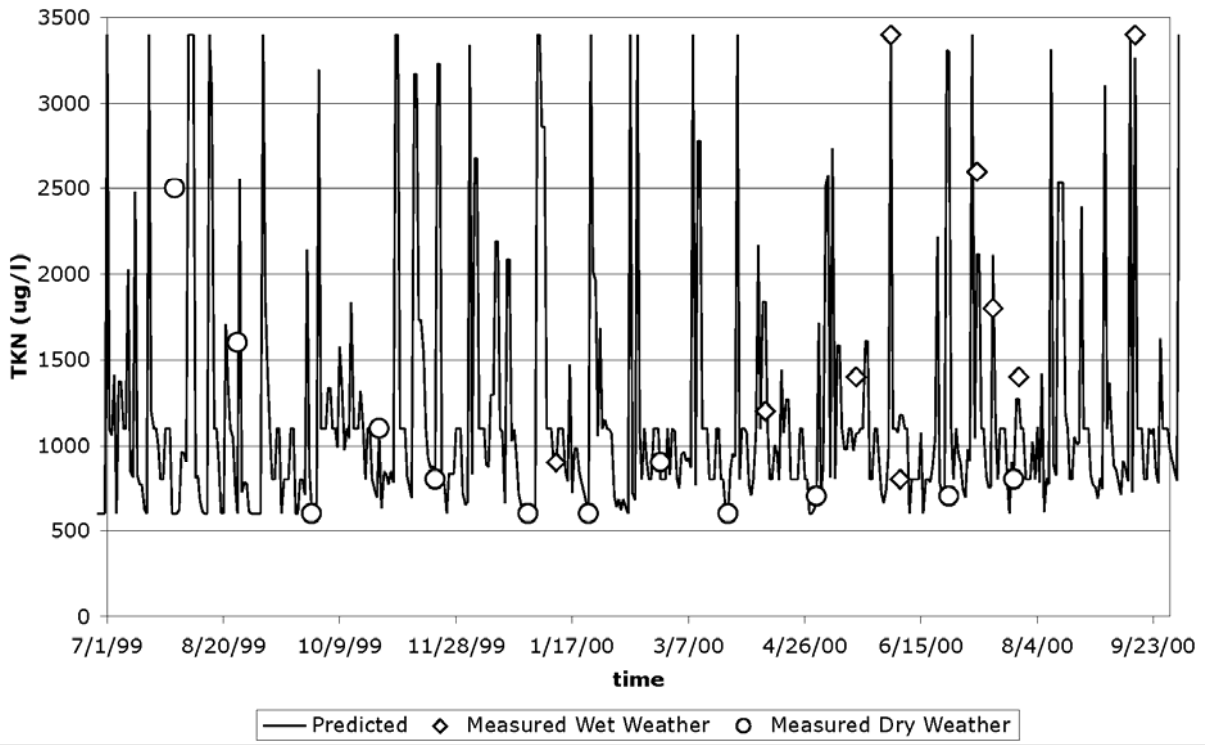


Figure 4.46: Laundry Brook - Predicted vs Measured TP

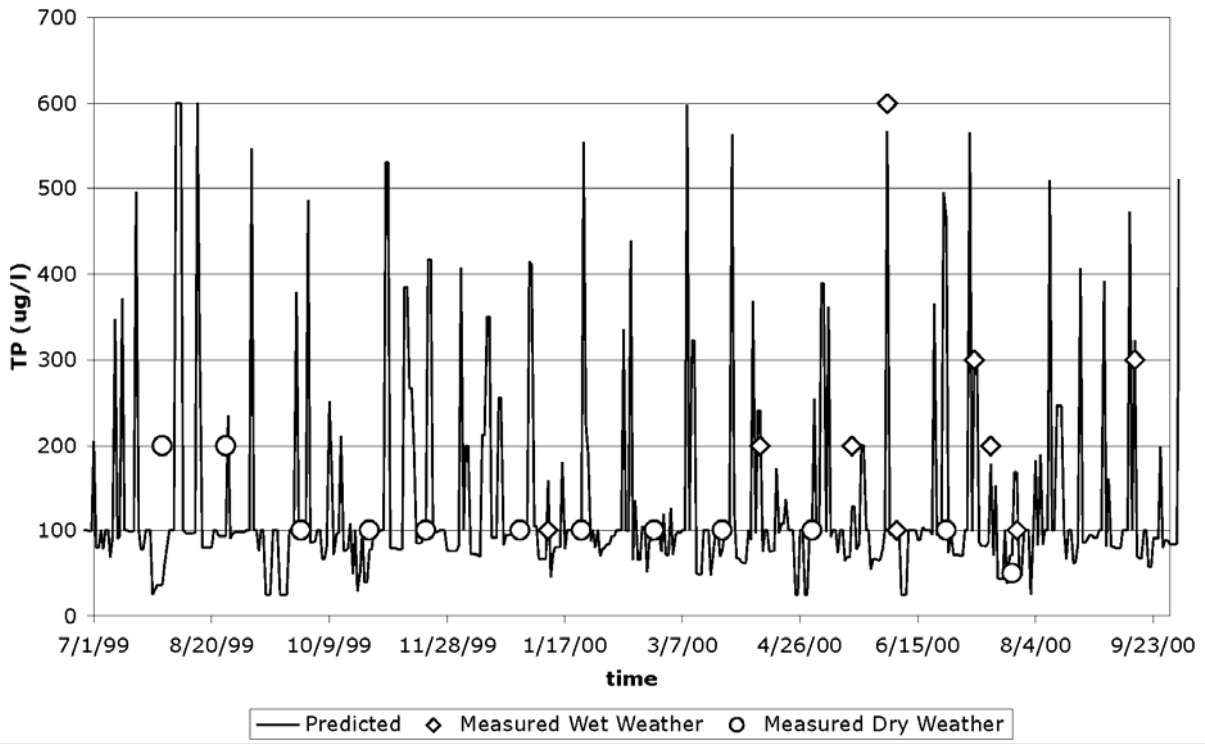


Figure 4.47: Faneuil Brook - Predicted vs Measured Specific Conductivity

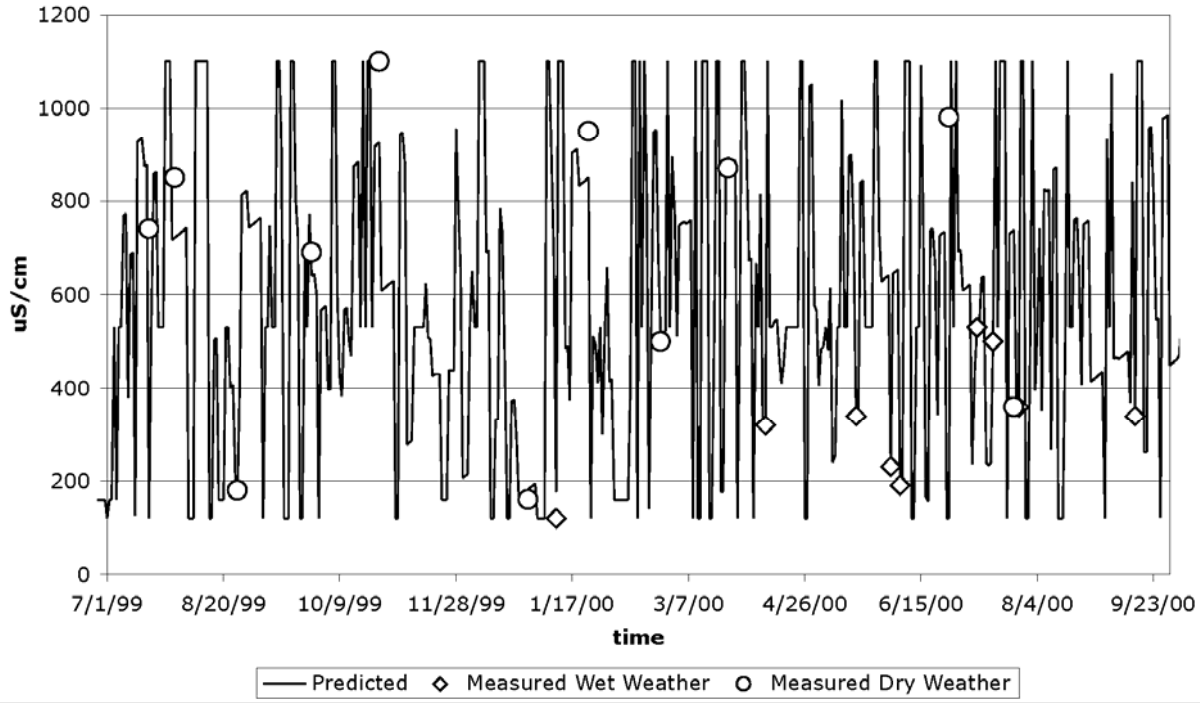


Figure 4.48: Faneuil Brook - Predicted vs Measured BOD5

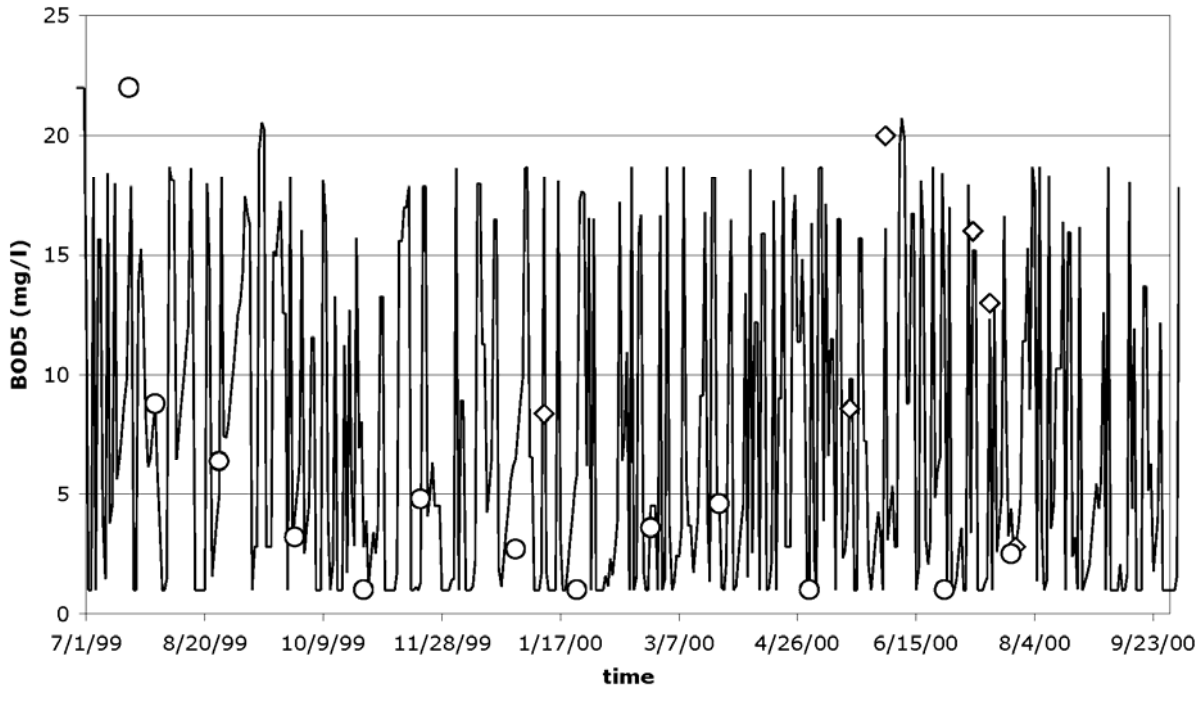


Figure 4.49: Faneuil Brook - Predicted vs Measured TSS

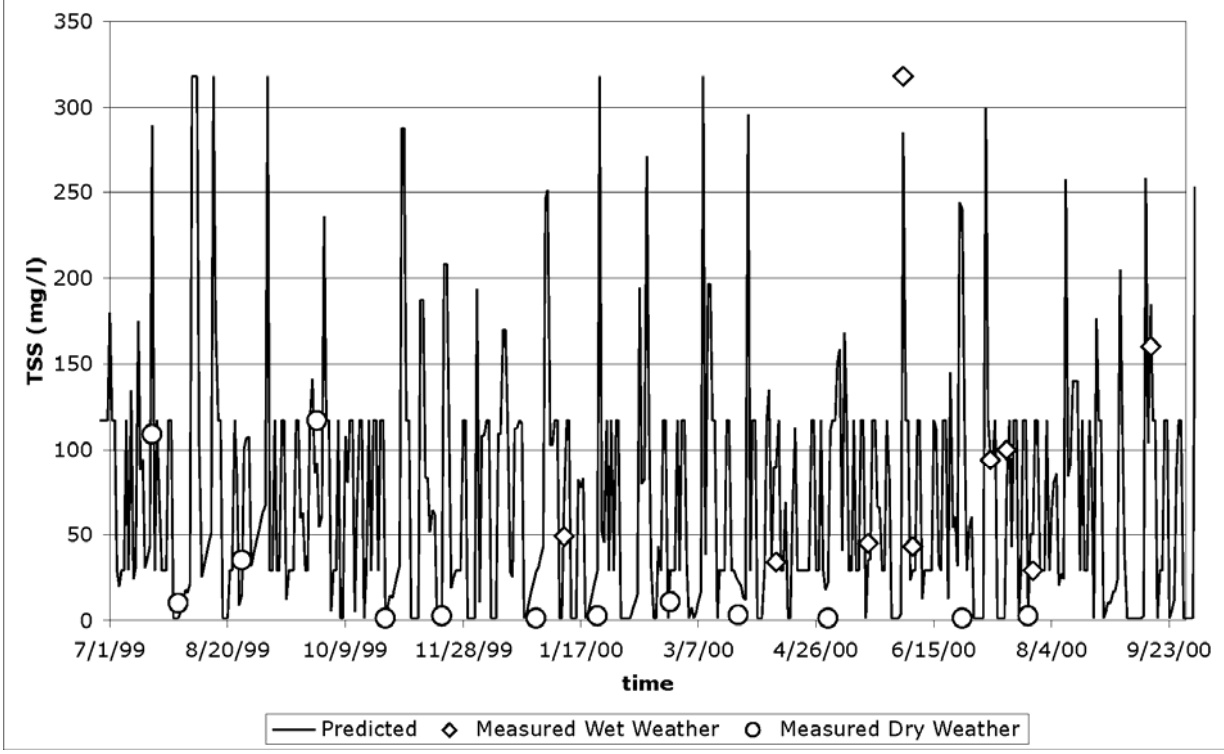
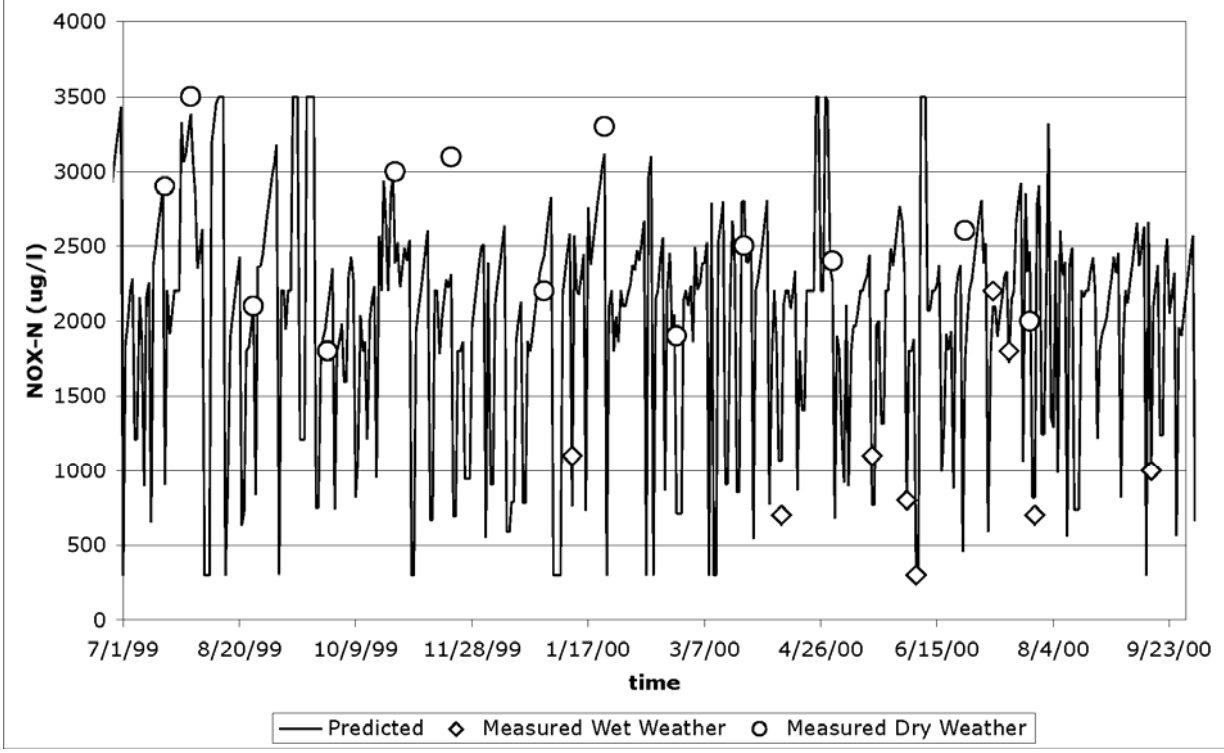


Figure 4.50: Faneuil Brook - Predicted vs Measured NOX-N



Fiure 4.51: Faneuil Brook - Predicted vs Measured NH4-N

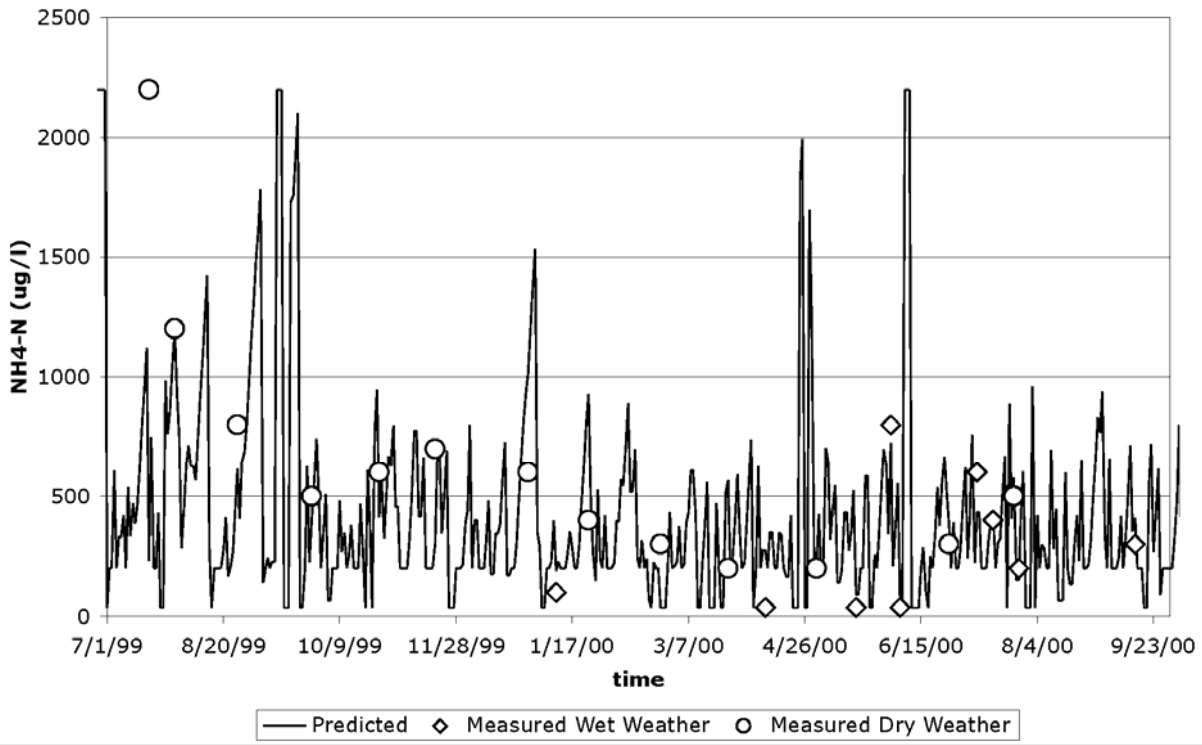


Figure 4.52: Faneuil Brook - Predicted vs Measured TKN

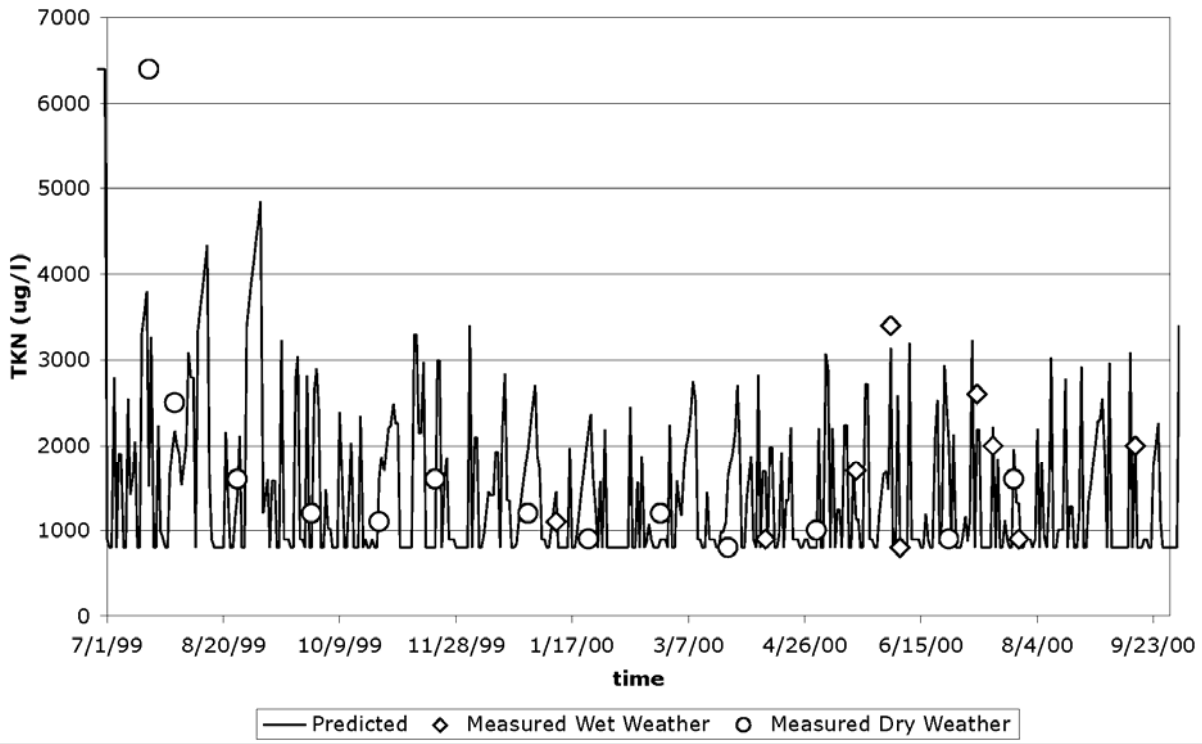


Figure 4.53: Faneuil Brook - Predicted vs Measured TP

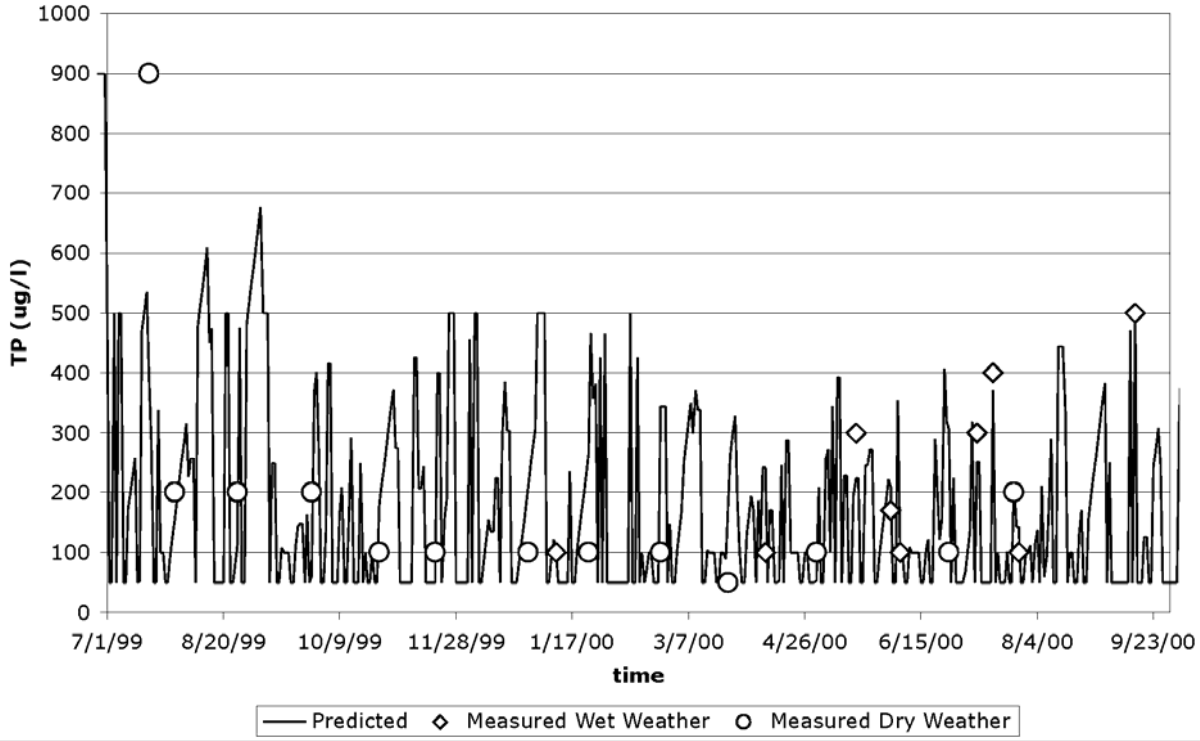


Figure 4.54: Predicted Daily Total CSO Flow to LB

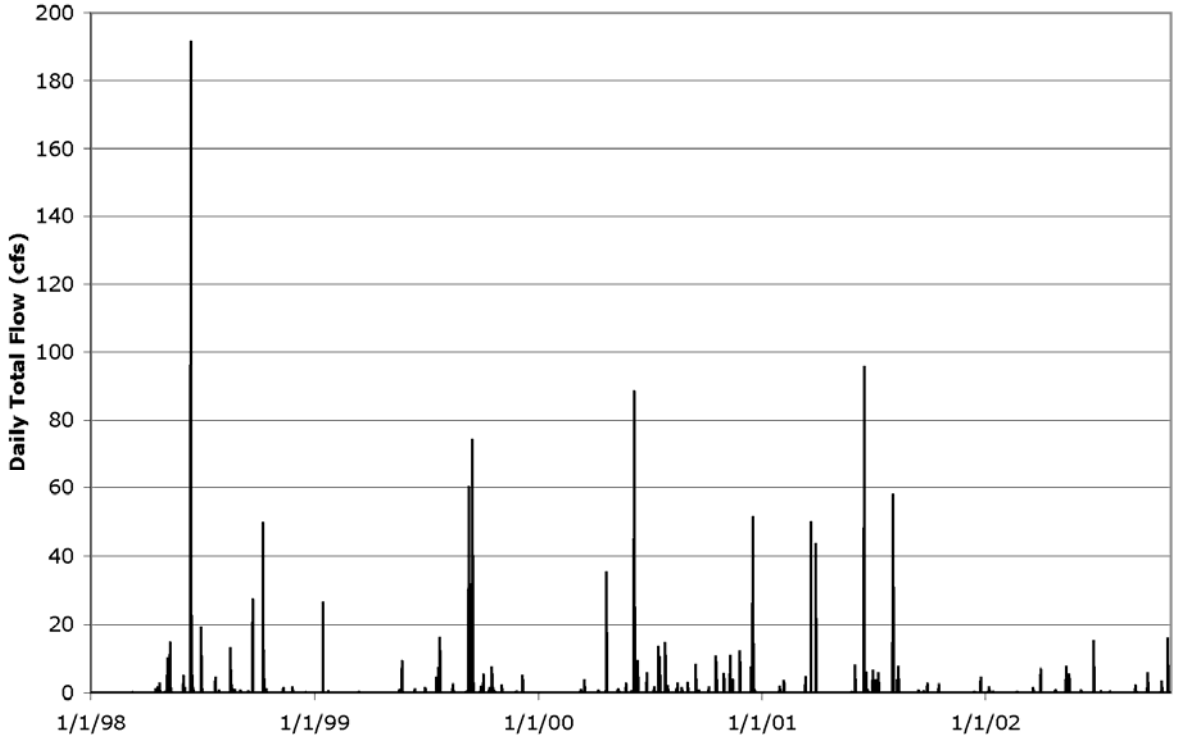


Figure 4.55: Lockages at MDC Charlestown Dam (Cycles X 2)

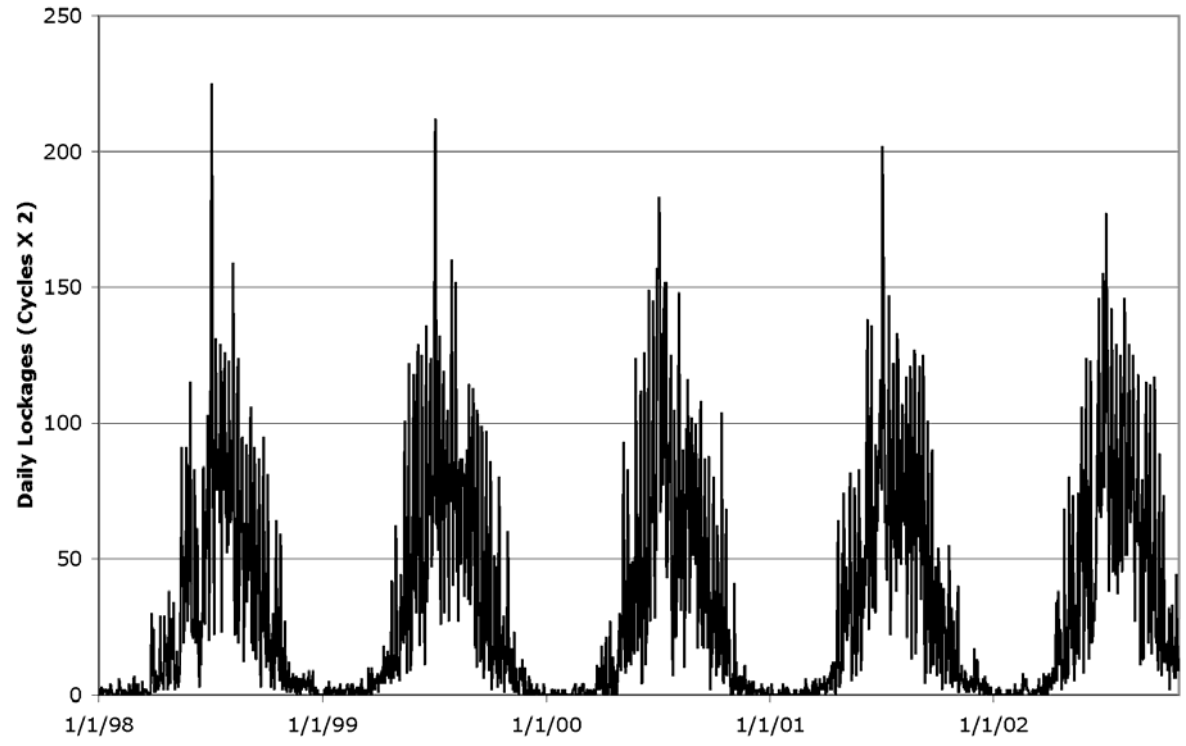


Figure 4.56: Total Charles River Flow Rate at Charlestown Dam vs Harbor Water Intrusion Into LB

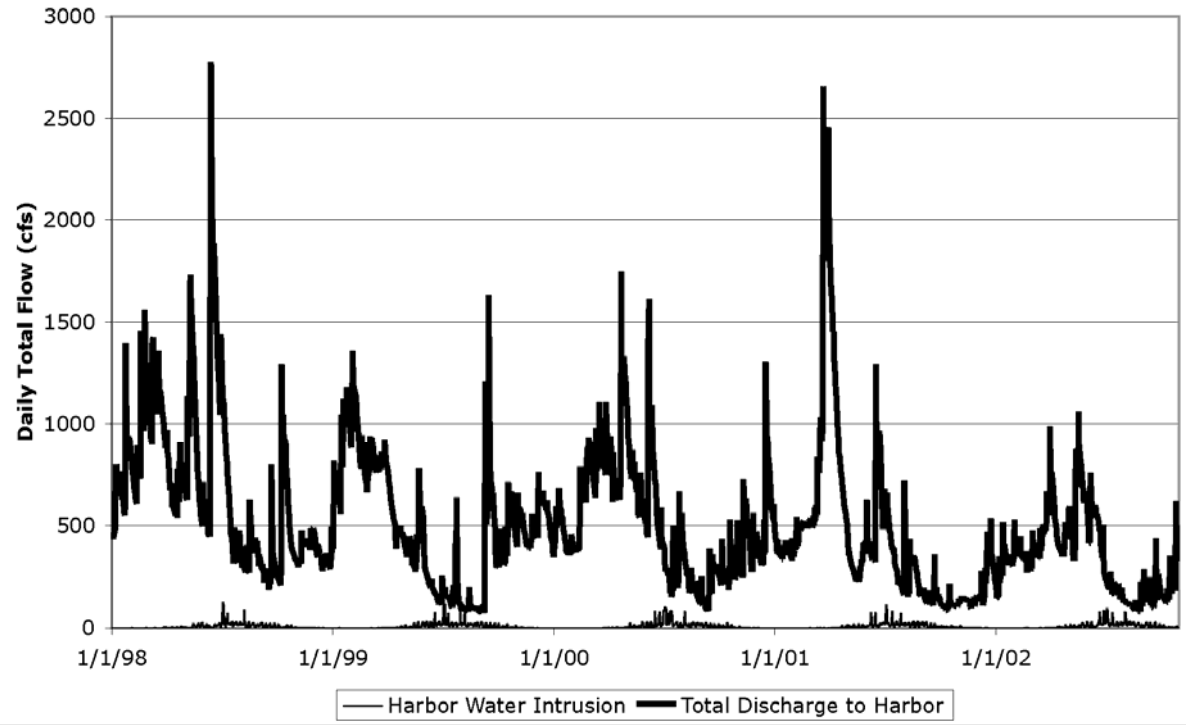


Figure 4.57: MWRA Surface DO Data Near Aquarium

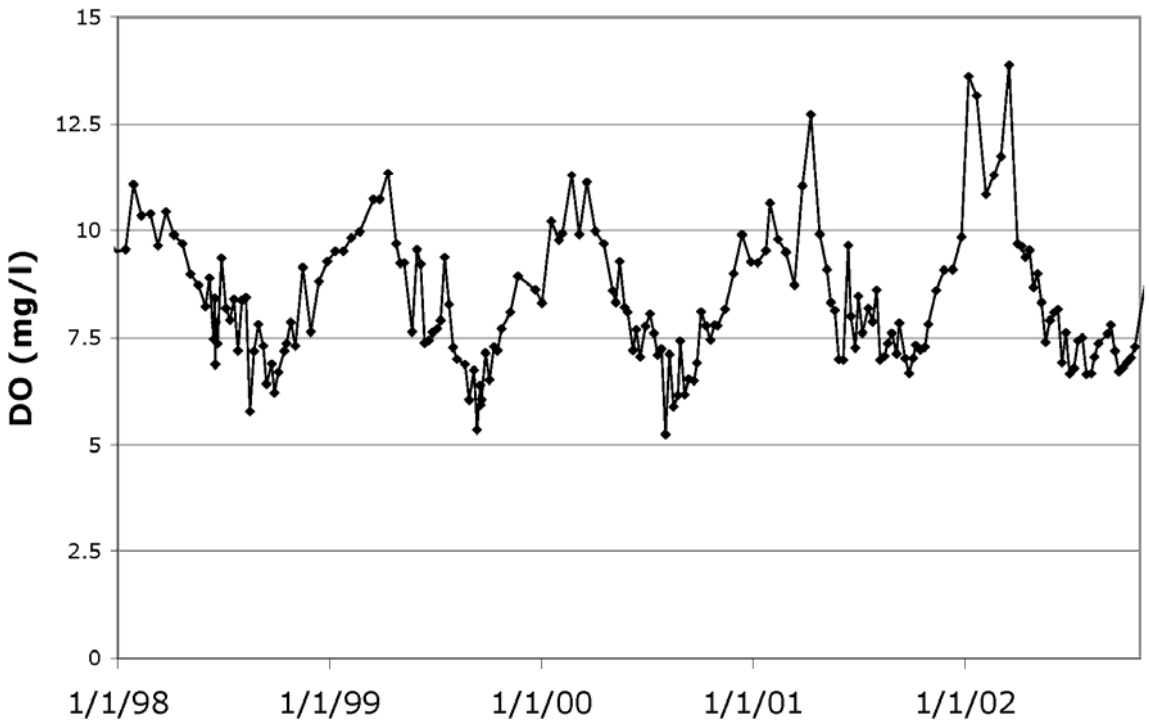


Figure 4.58: MWRA Surface Chlorophyll-a Data Near Aquarium

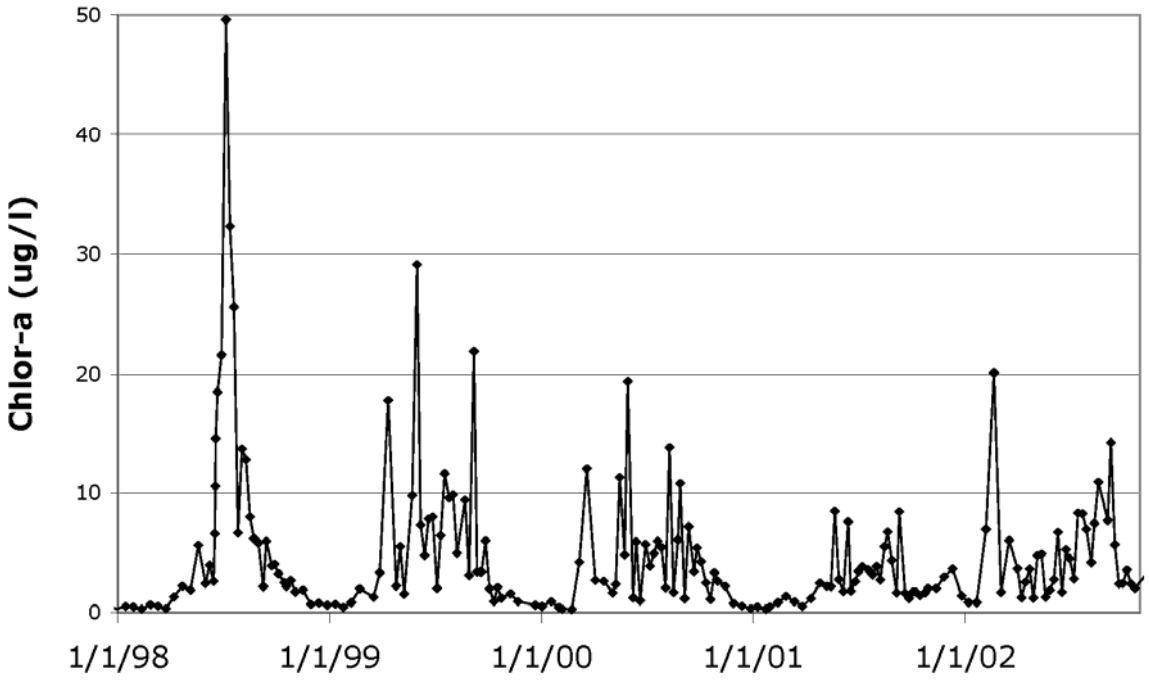


Figure 4.59: MWRA Surface PO4-P Data Near Aquarium

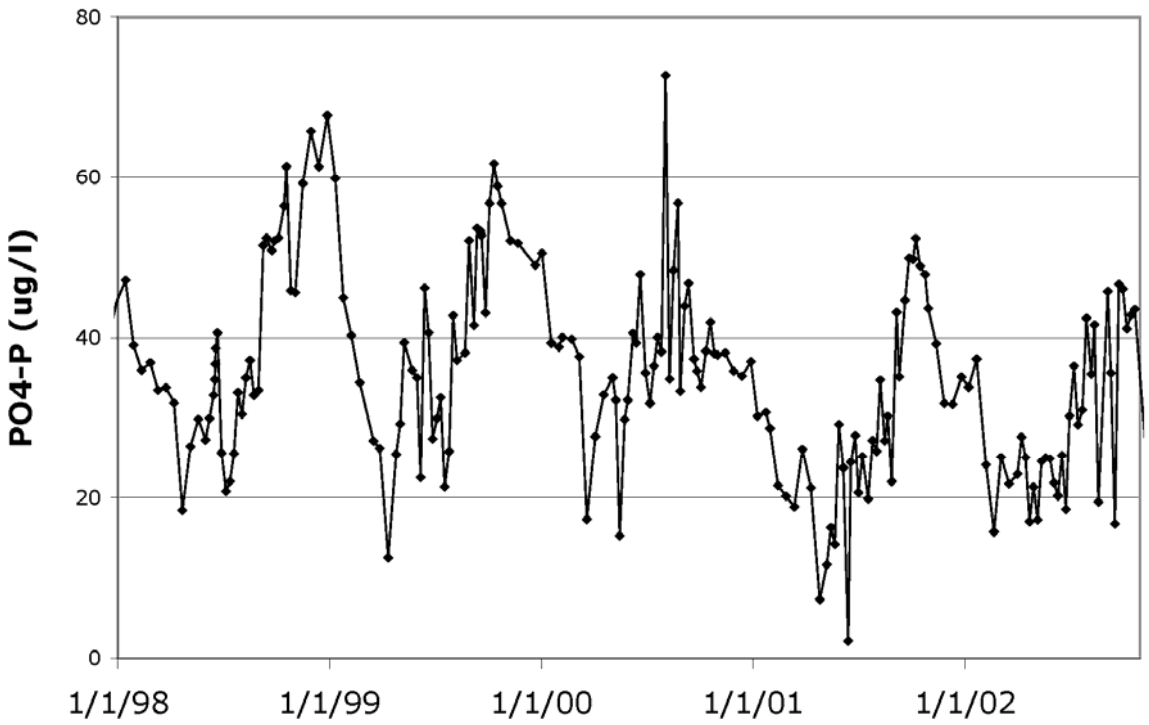


Figure 4.60: MWRA Surface TP Data Near Aquarium

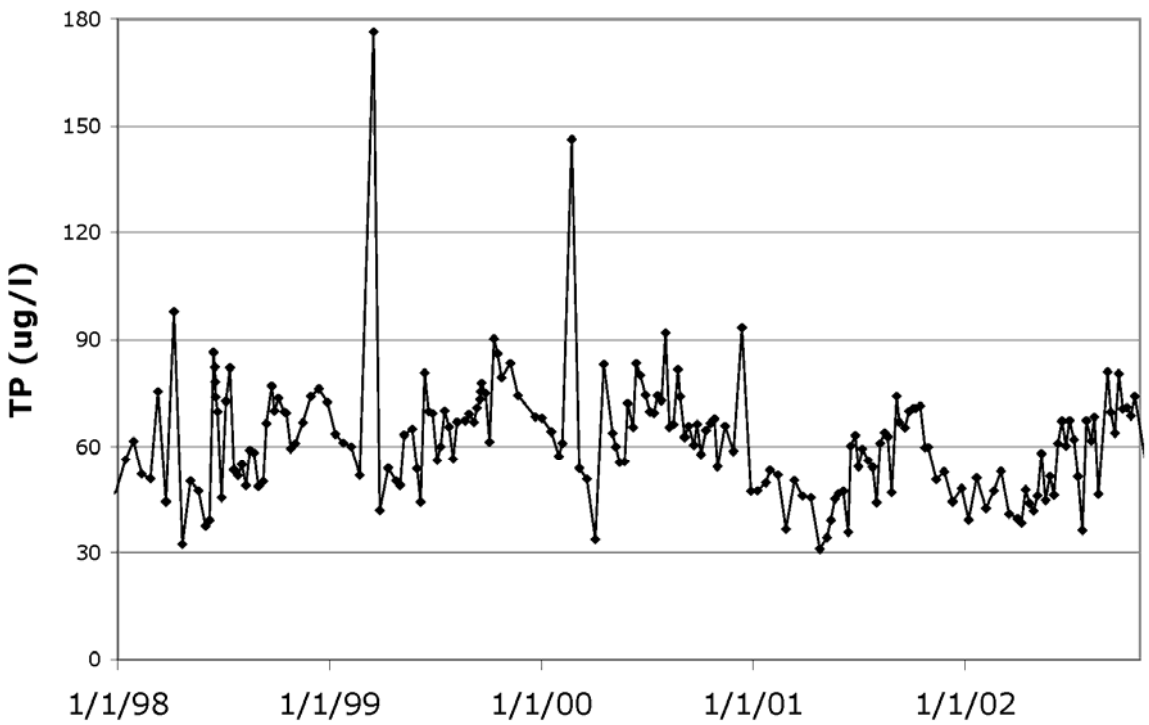


Figure 4.61: MWRA Surface NH4-N Data Near Aquarium

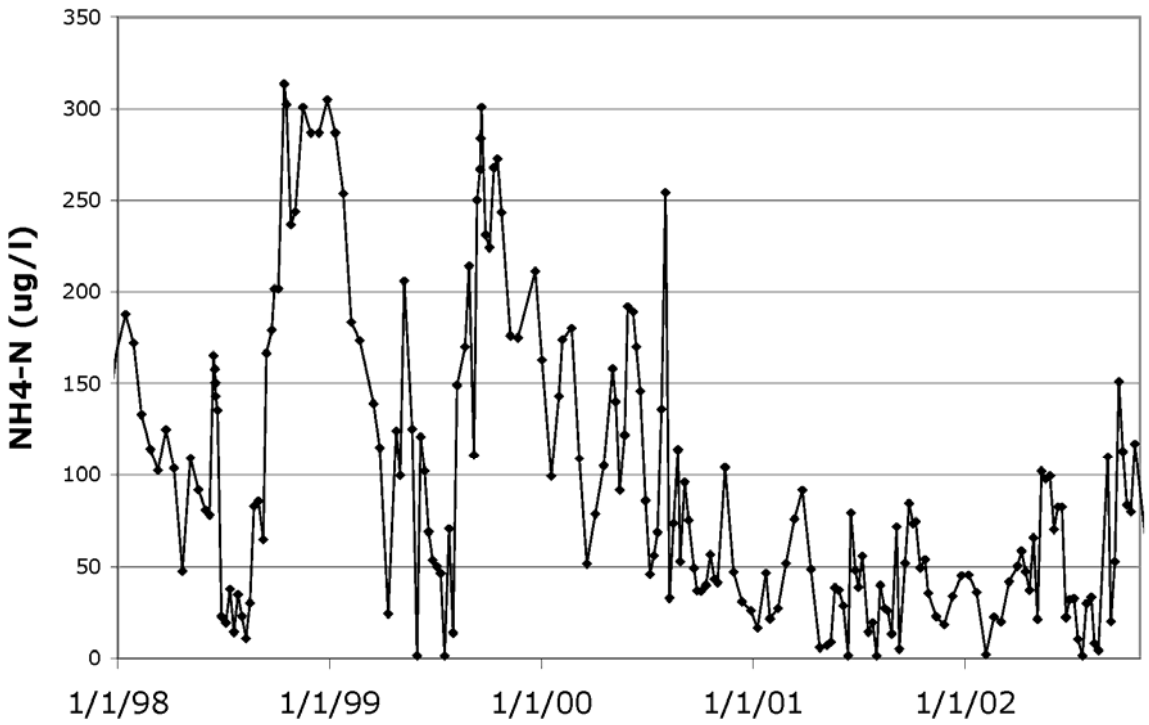


Figure 4.62: MWRA Surface NOx-N Data Near Aquarium

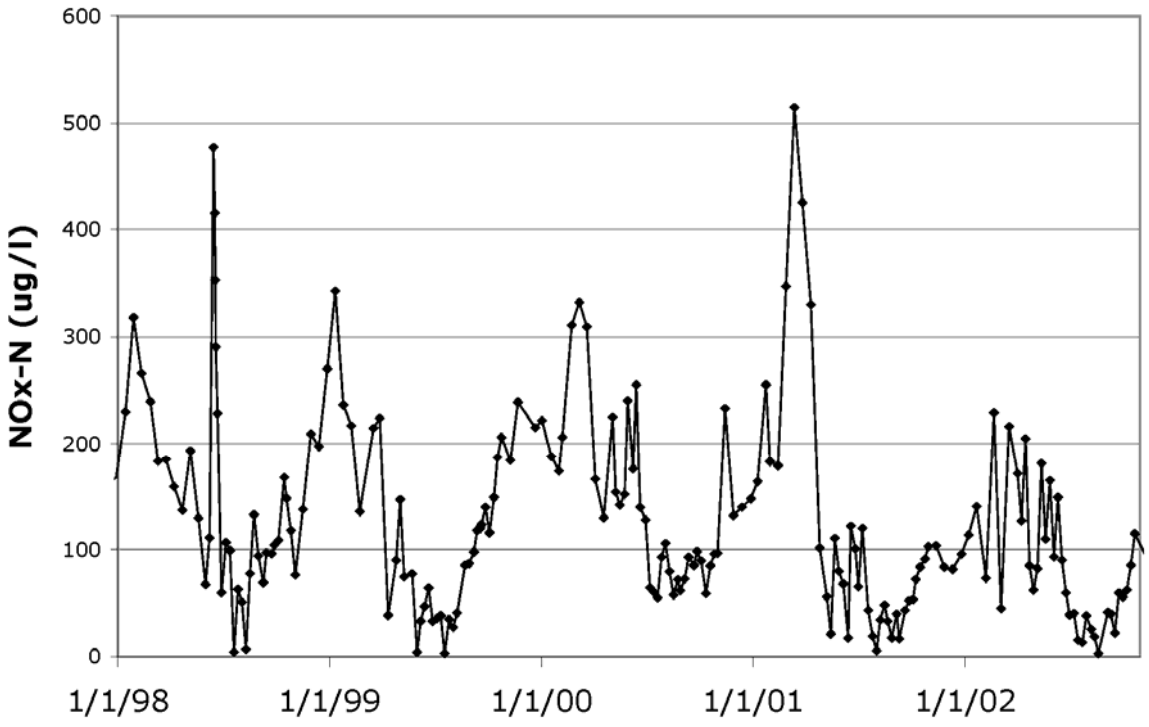


Figure 4.63: MWRA Surface TN Data Near Aquarium

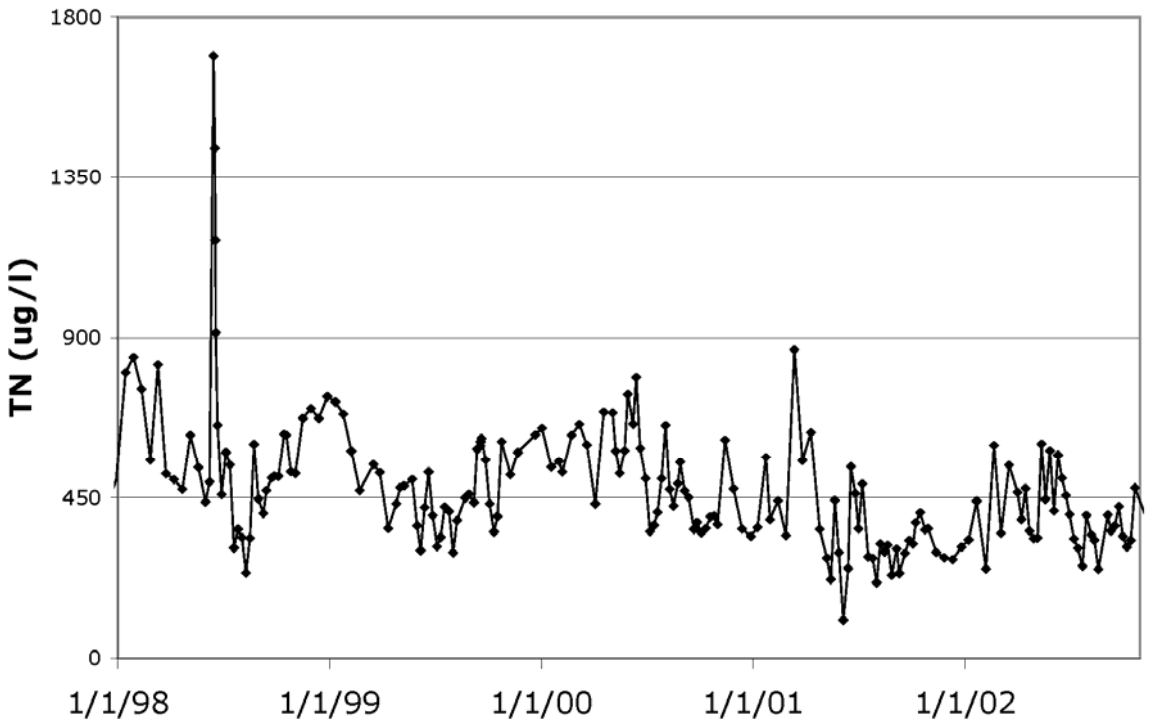


Figure 4.64: MWRA Surface POC Data Near Aquarium

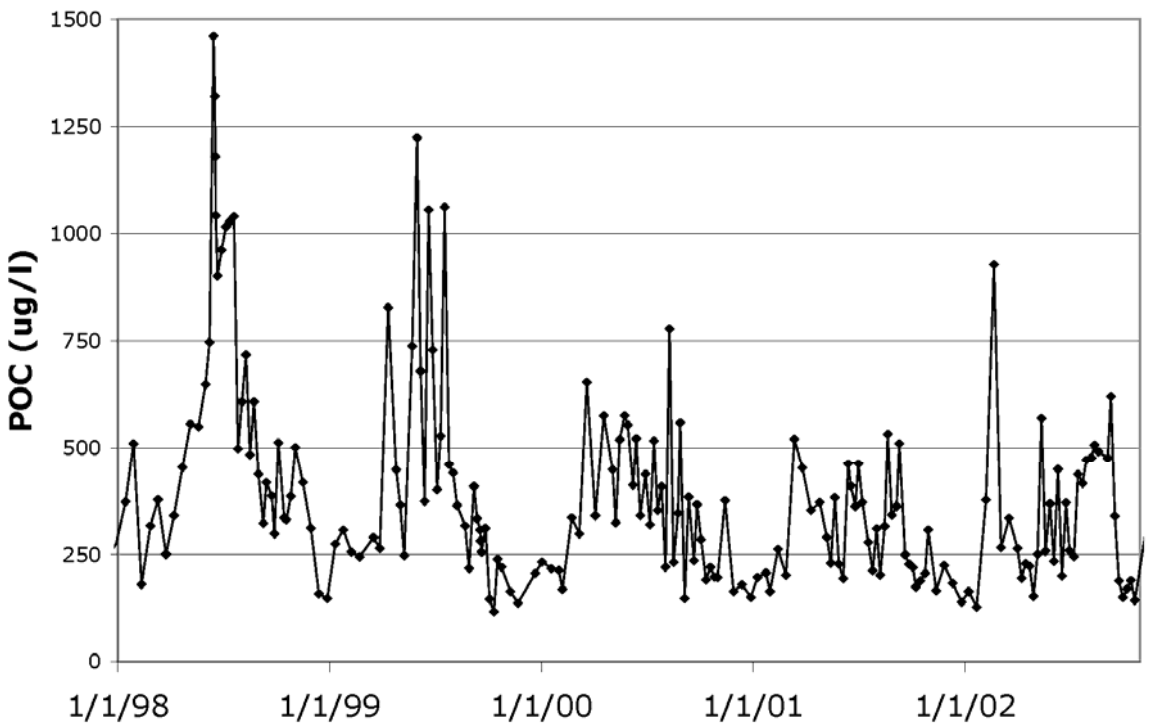


Figure 4.65: MWRA Surface Salinity Data Near Aquarium

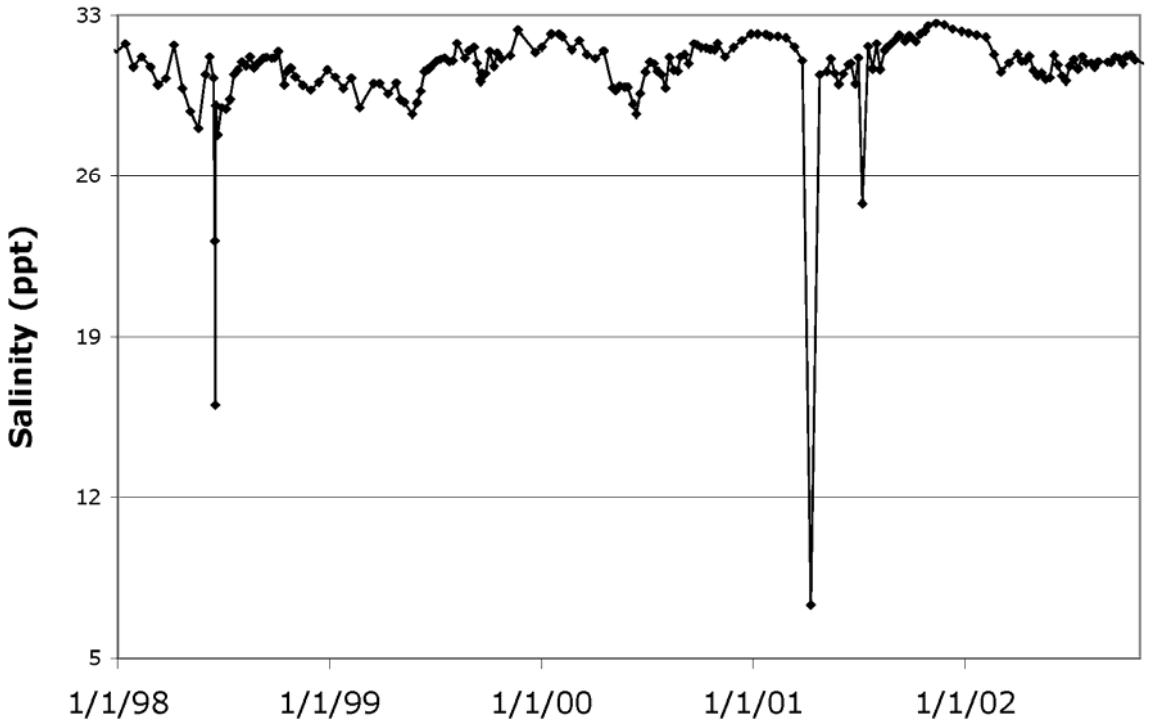


Figure 4.66: MWRA Surface Temperature Data Near Aquarium

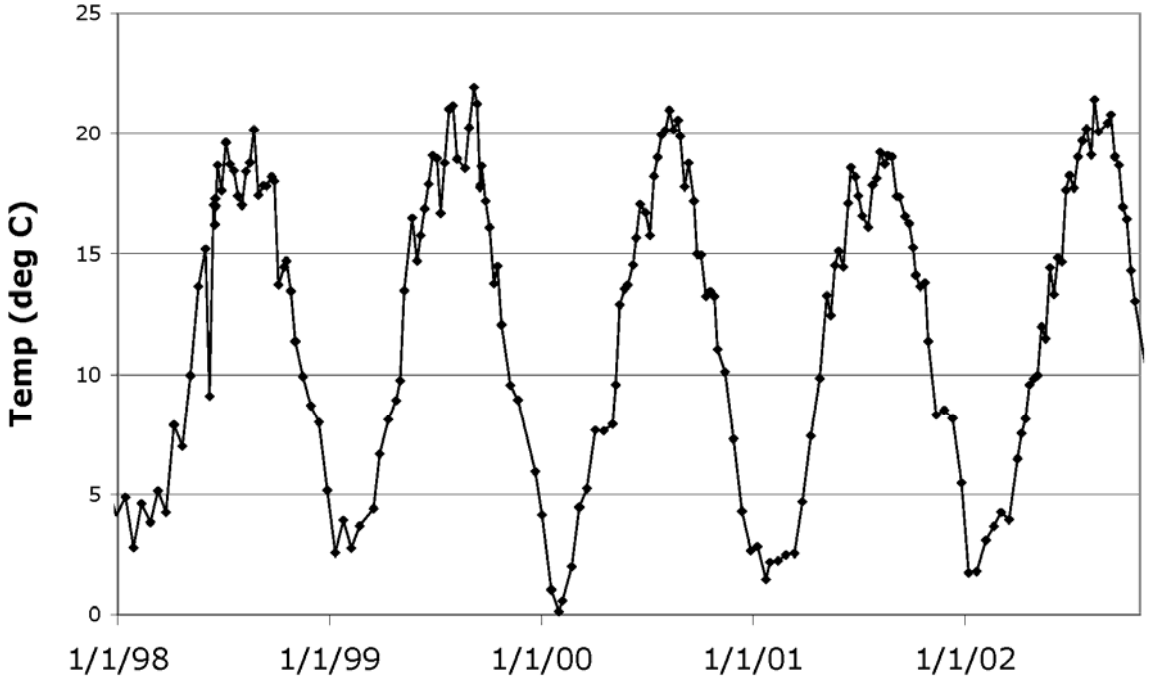
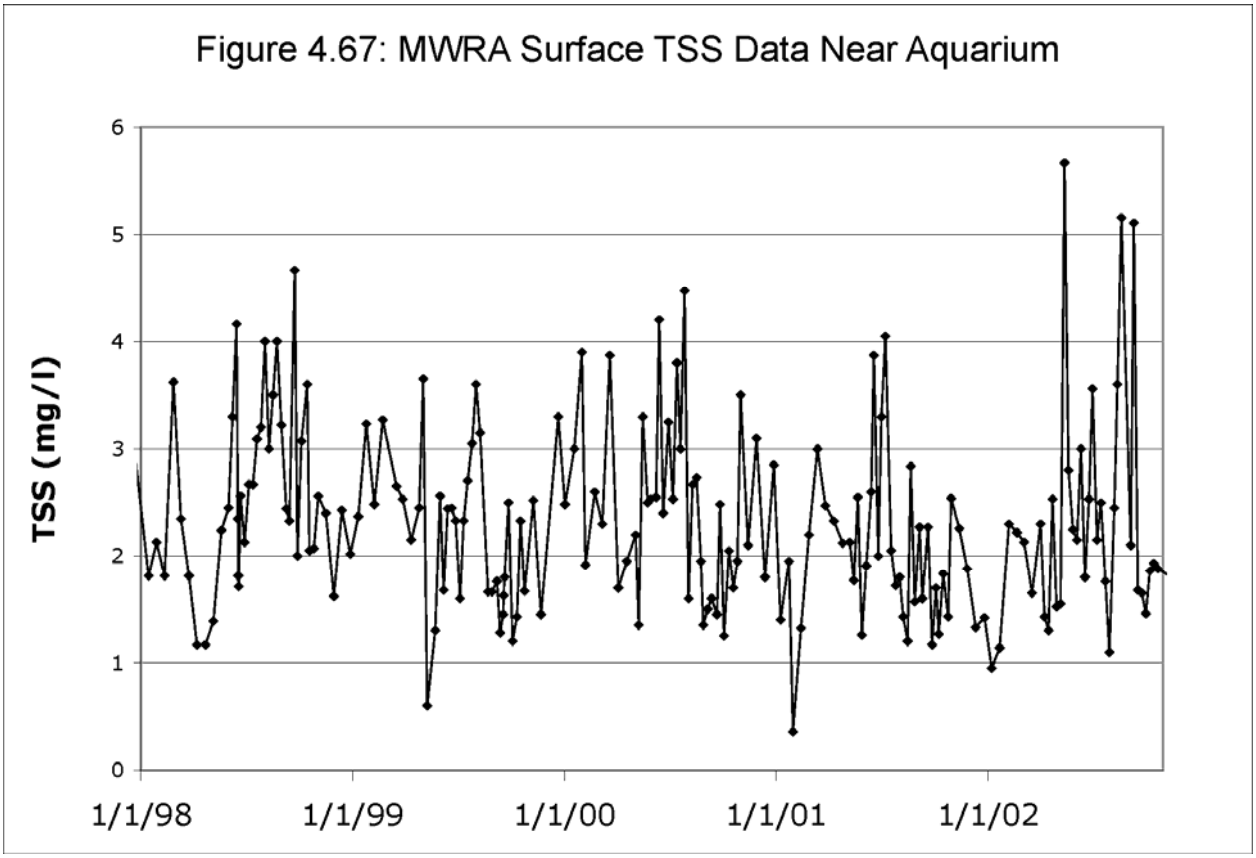


Figure 4.67: MWRA Surface TSS Data Near Aquarium



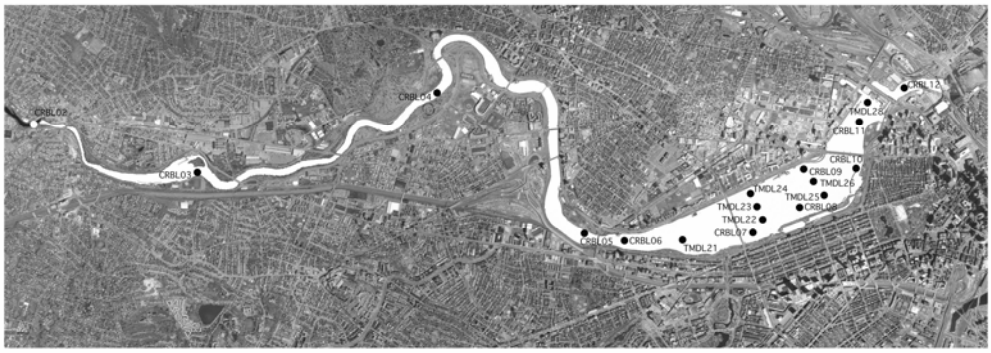


Figure 4.68. EPA Core Monitoring Stations Within LB

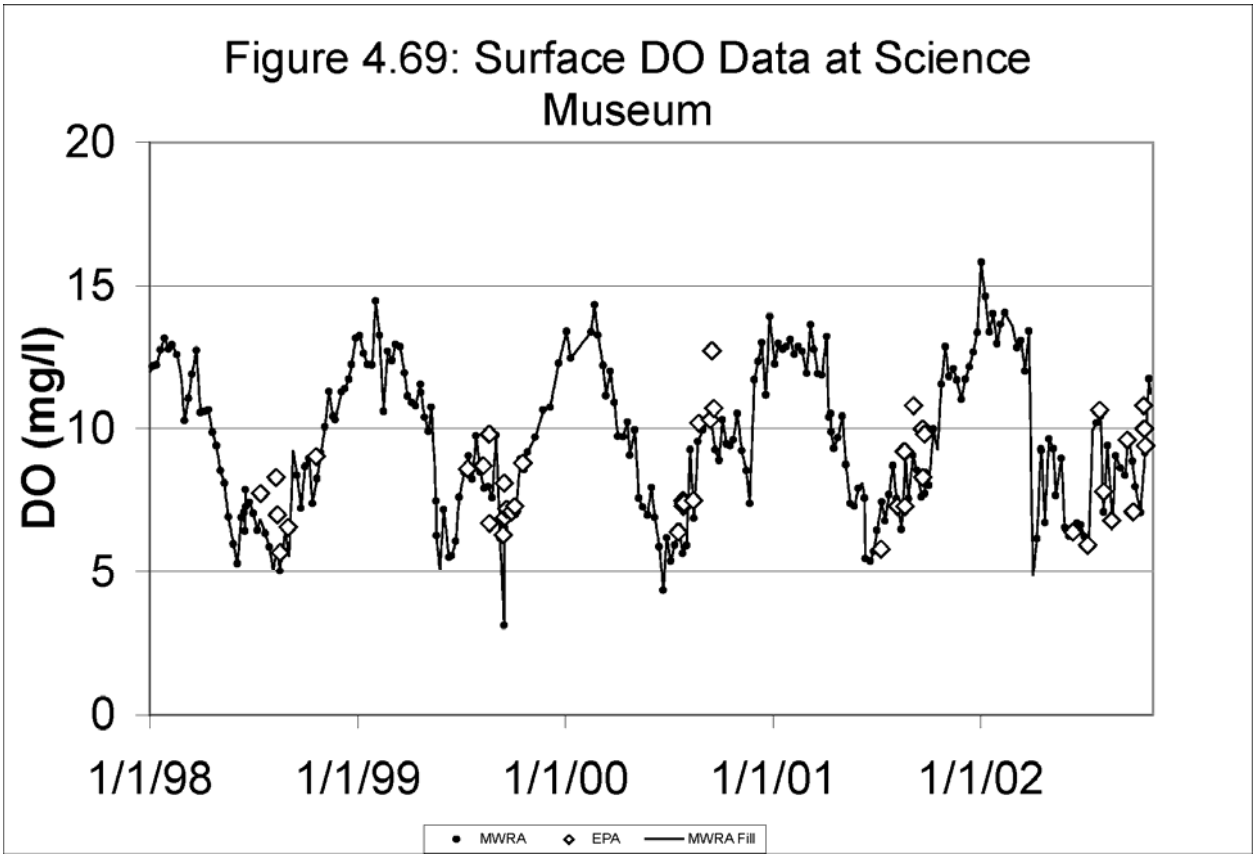


Figure 4.69: Surface DO Data at Science Museum
DO (mg/l)
20
15
10
5
0
1/1/98
1/1/99
1/1/00
1/1/01
1/1/02
MWRA
EPA
MWRA Fill

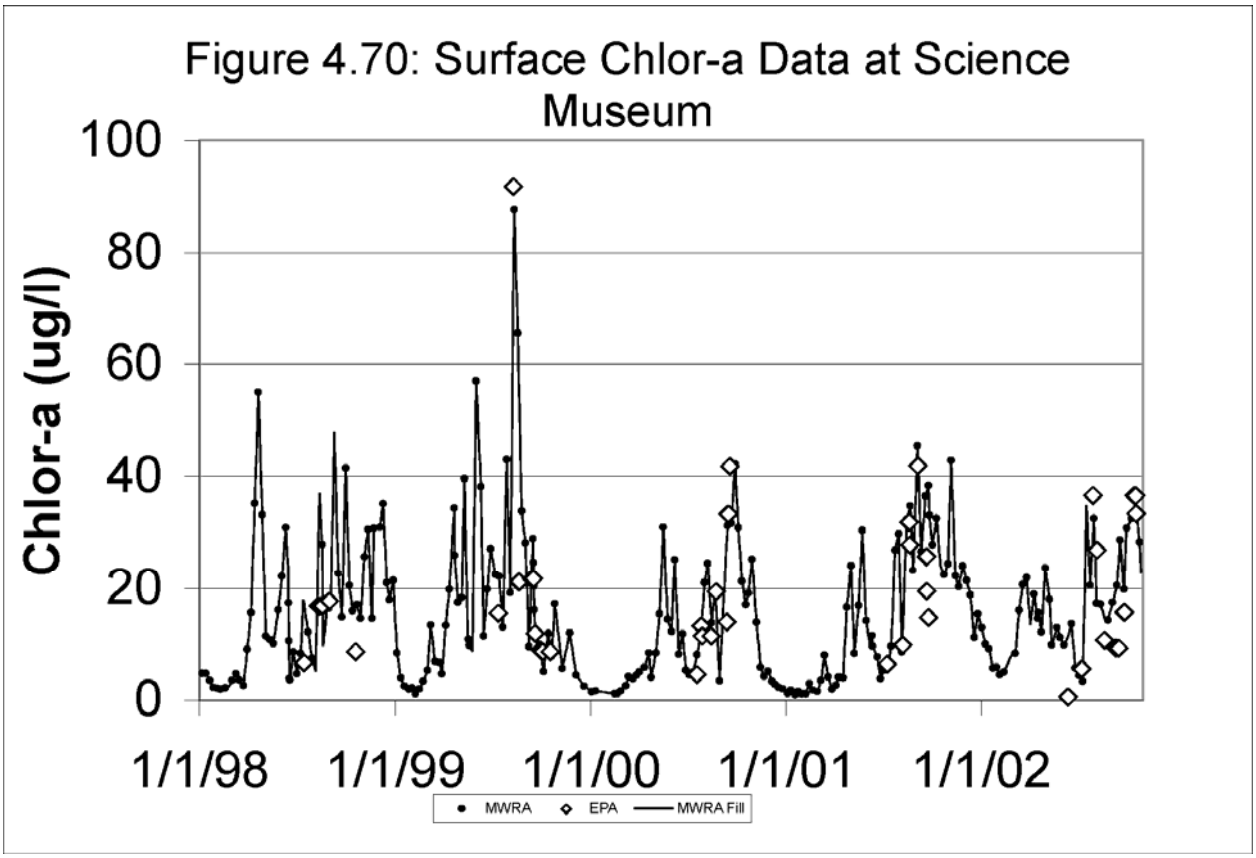


Figure 4.70: Surface Chlor-a Data at Science Museum
Chlor-a (ug/l)
100
80
60
40
20
0
1/1/98
1/1/99
1/1/00
1/1/01
1/1/02
MWRA
EPA
MWRA Fill

Figure 4.71: Surface PO4-P Data at Science Museum

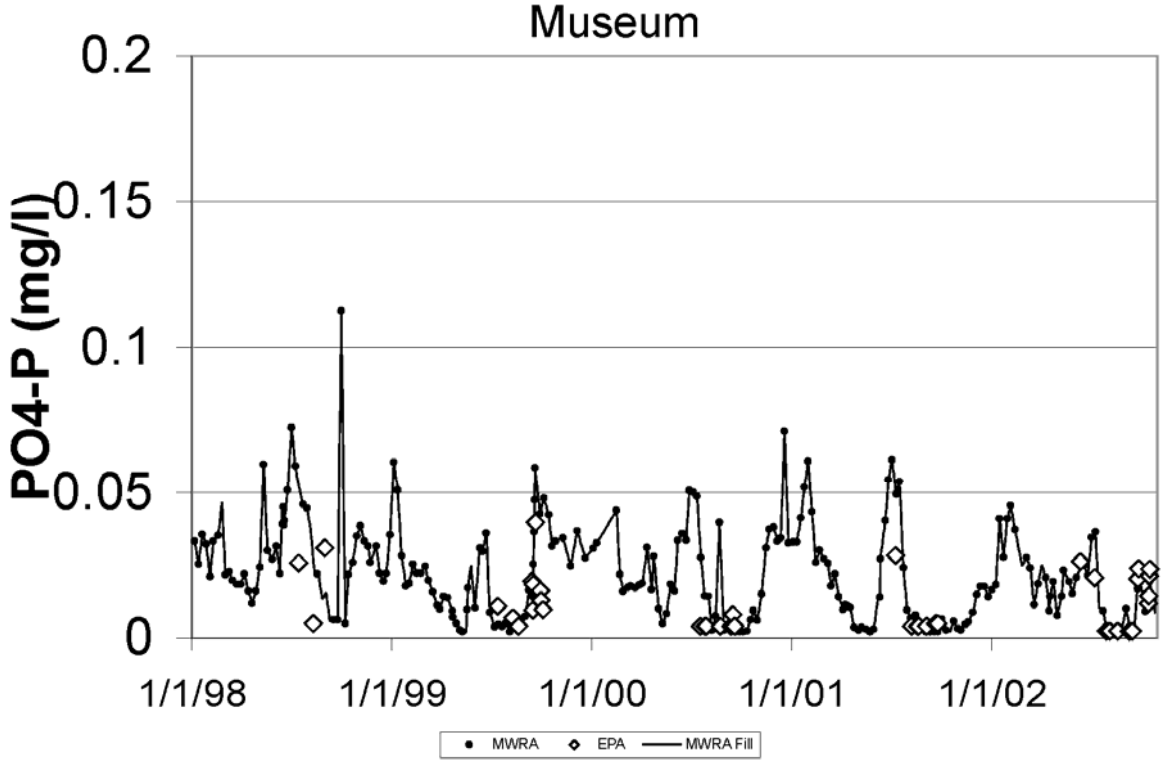


Figure 4.72: Surface Org-P Data at Science Museum

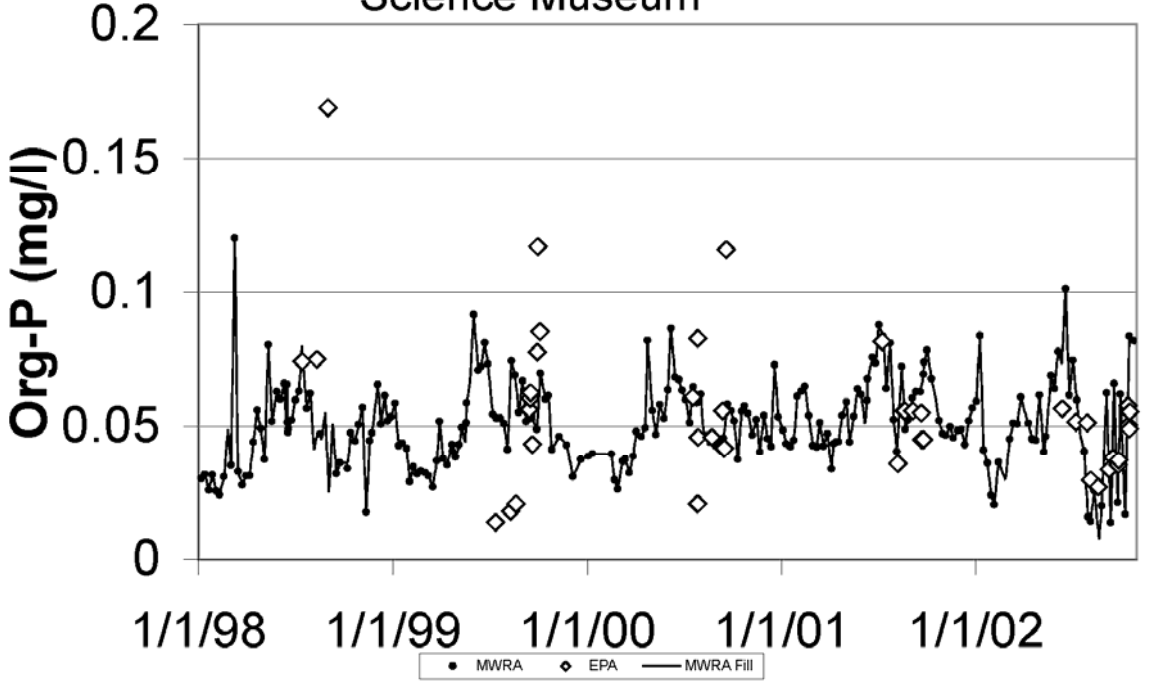


Figure 4.73: Surface TP Data at Science Museum

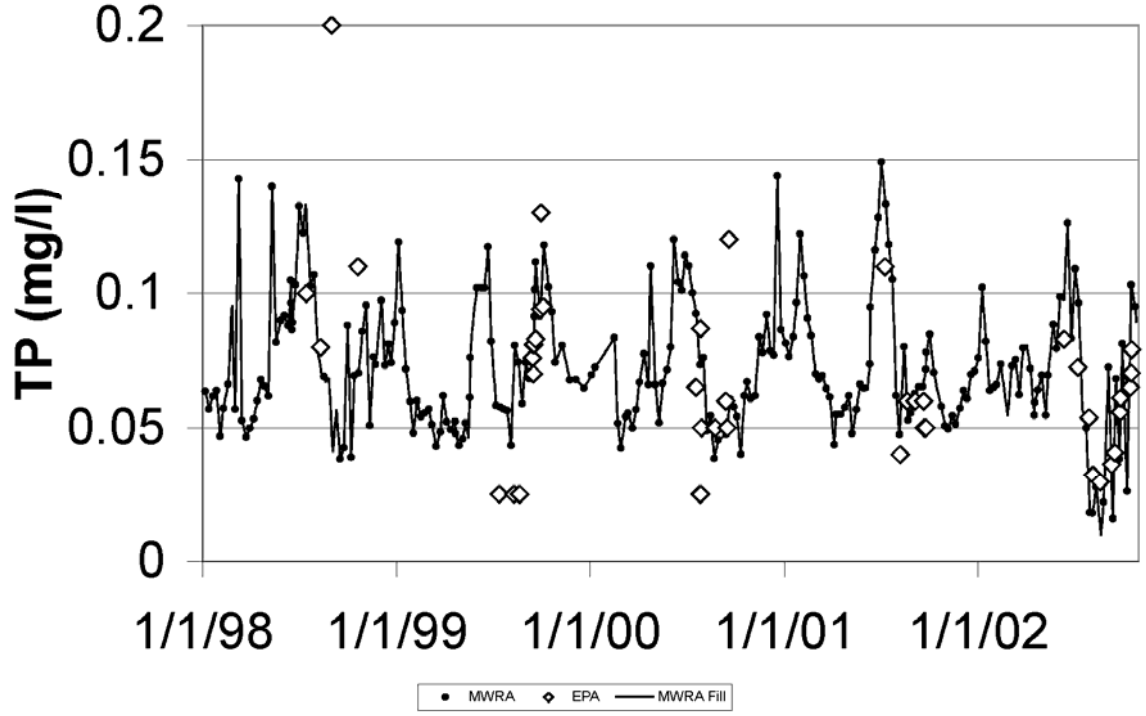


Figure 4.74: Surface NH4-N Data at Science Museum

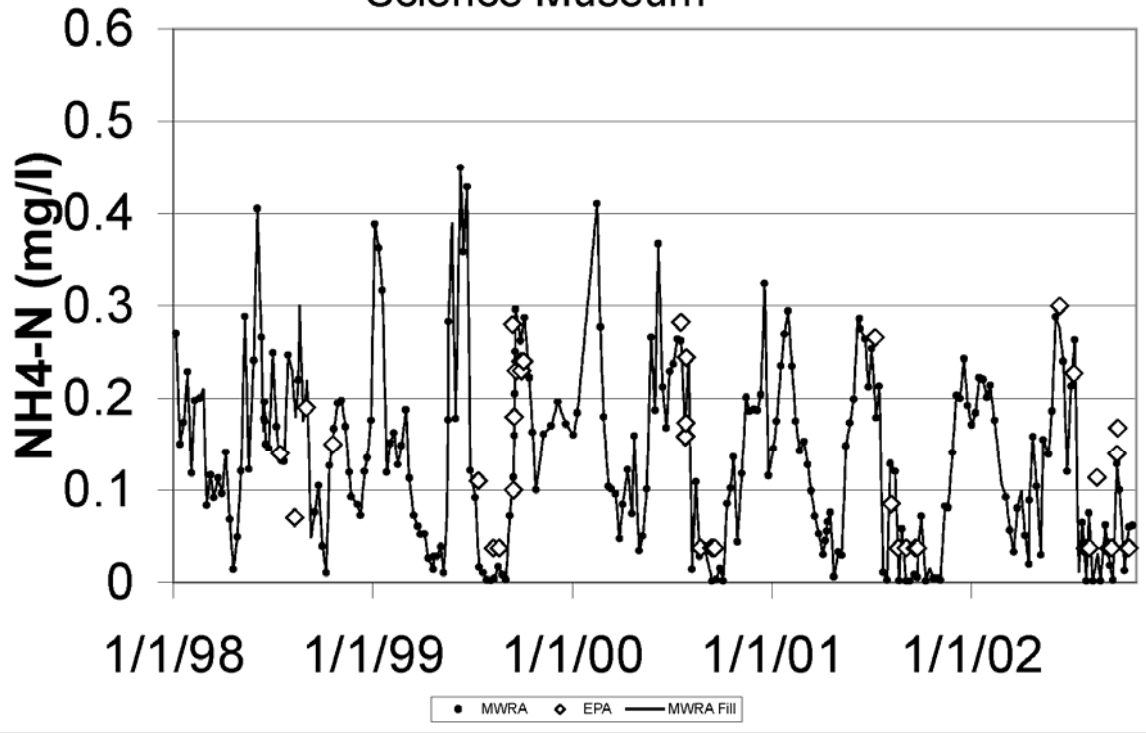


Figure 4.75: Surface NOx-N Data at Science Museum

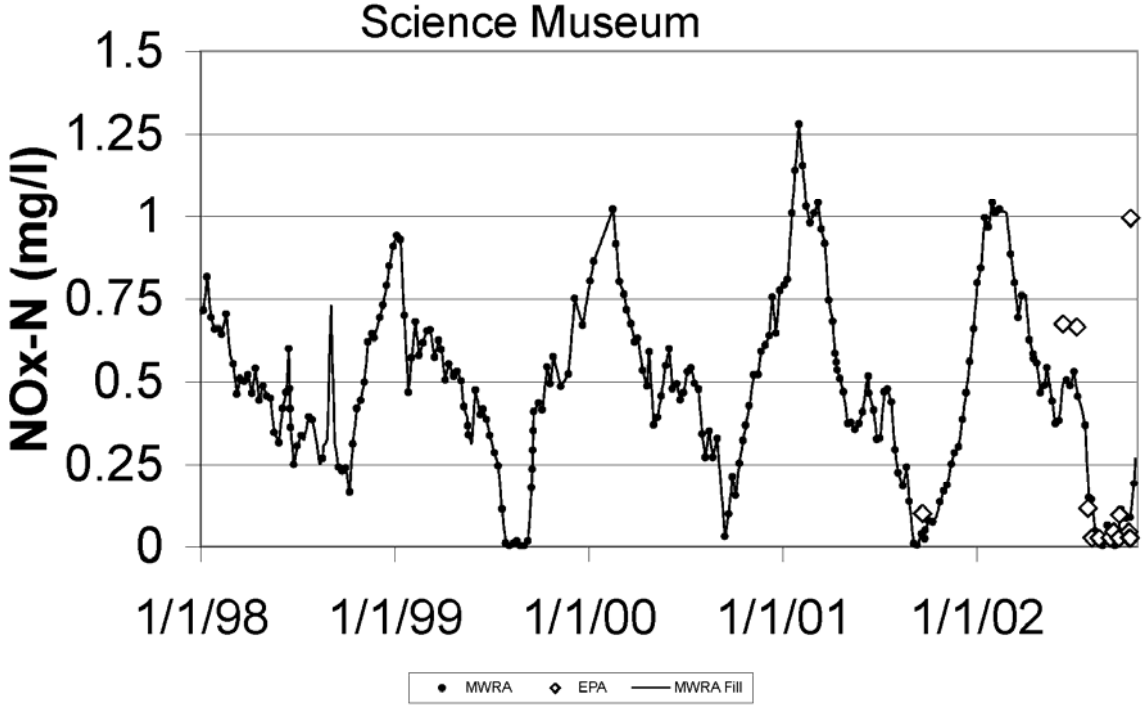


Figure 4.76: Surface Org-N Data at Science Museum

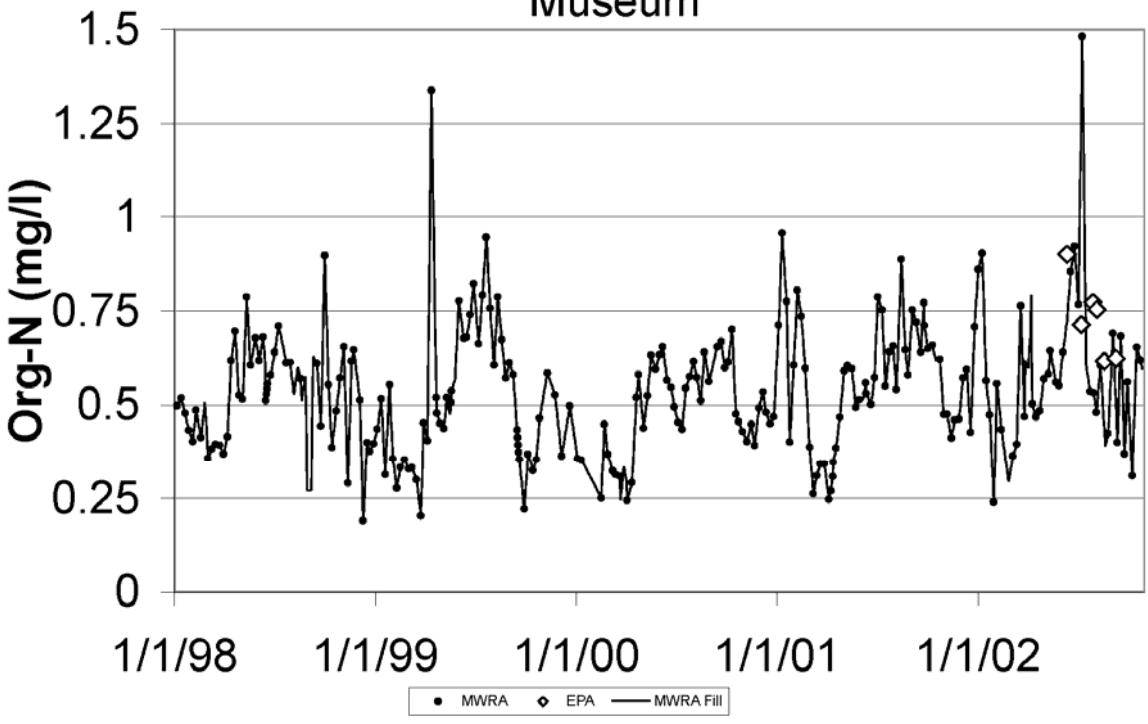


Figure 4.77: Surface TN Data at Science Museum

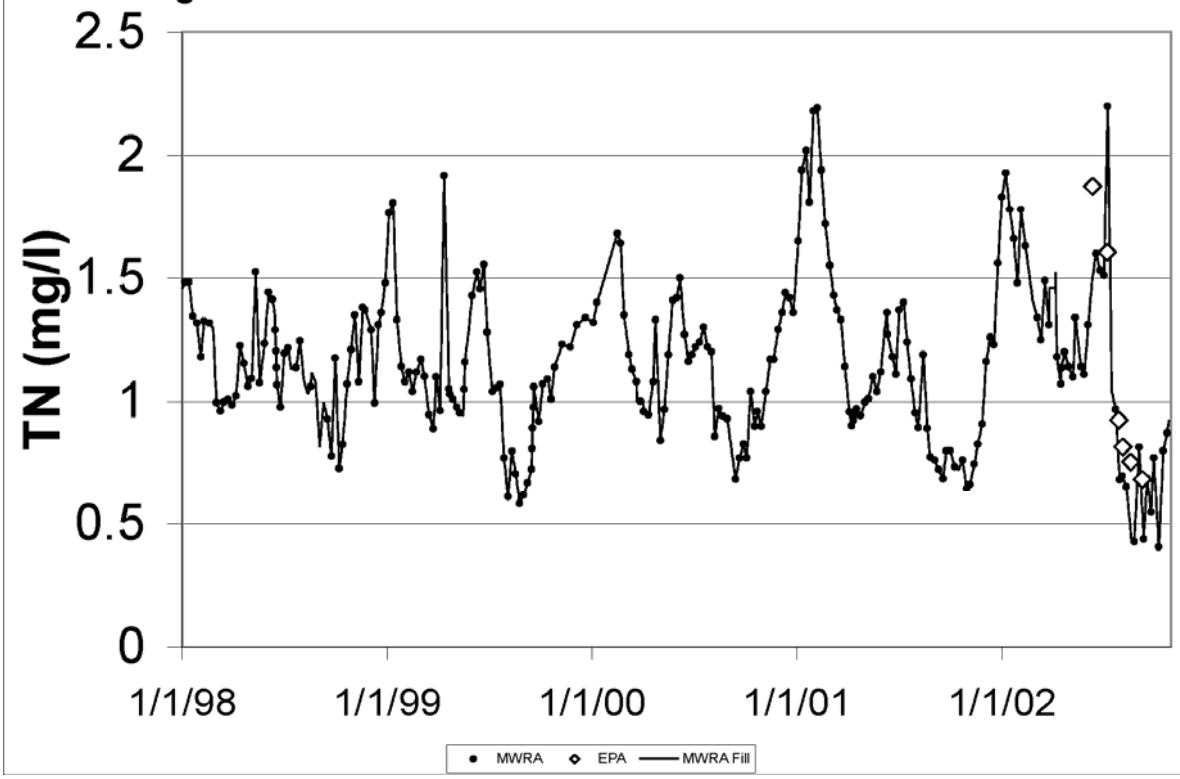


Figure 4.78: Surface TSS Data at Science Museum

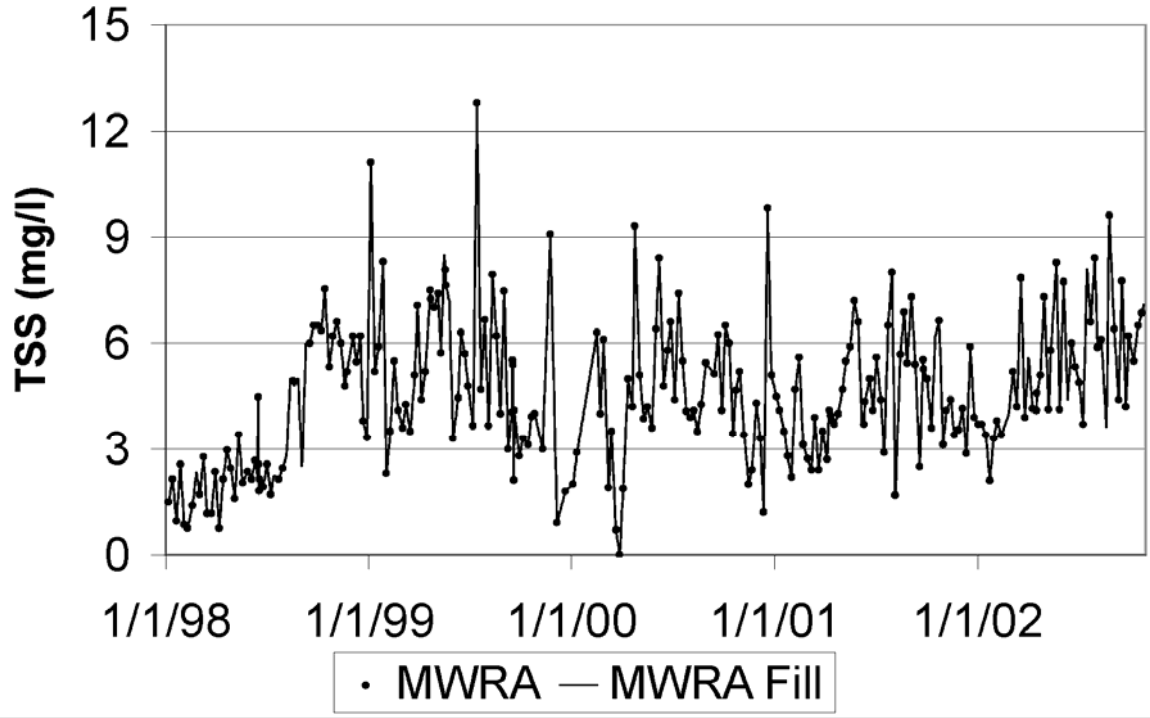


Figure 4.79: Surface Salinity Data at Science Museum

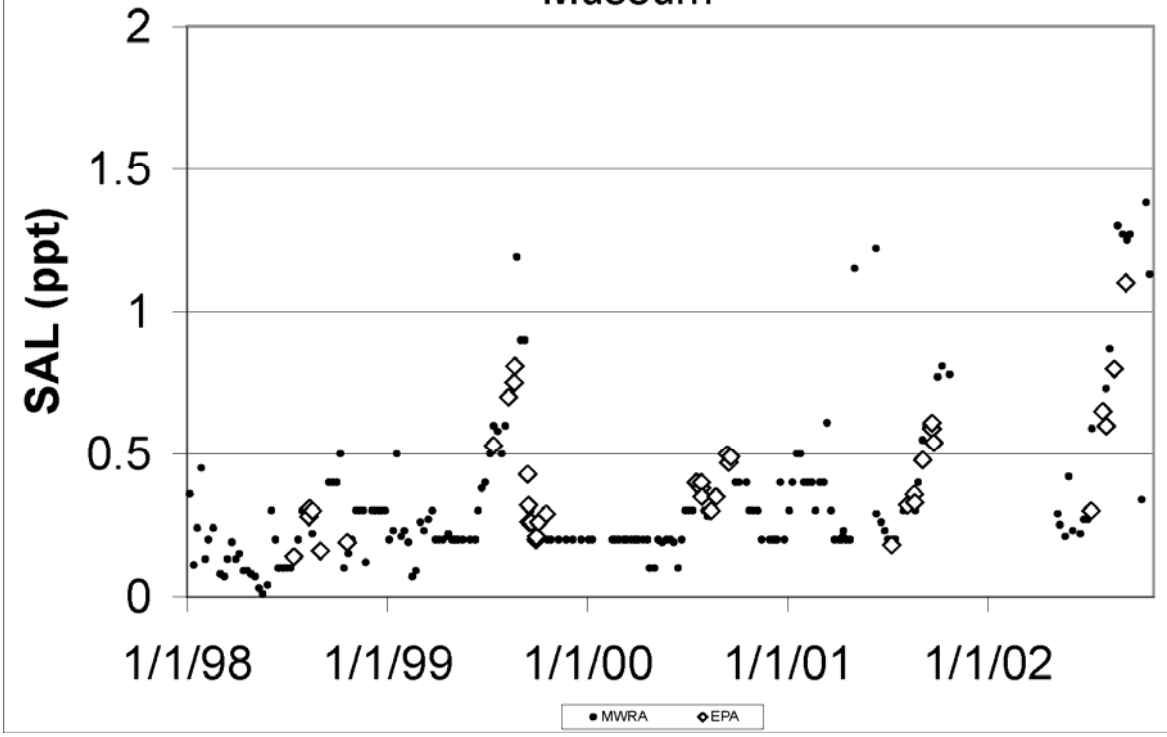
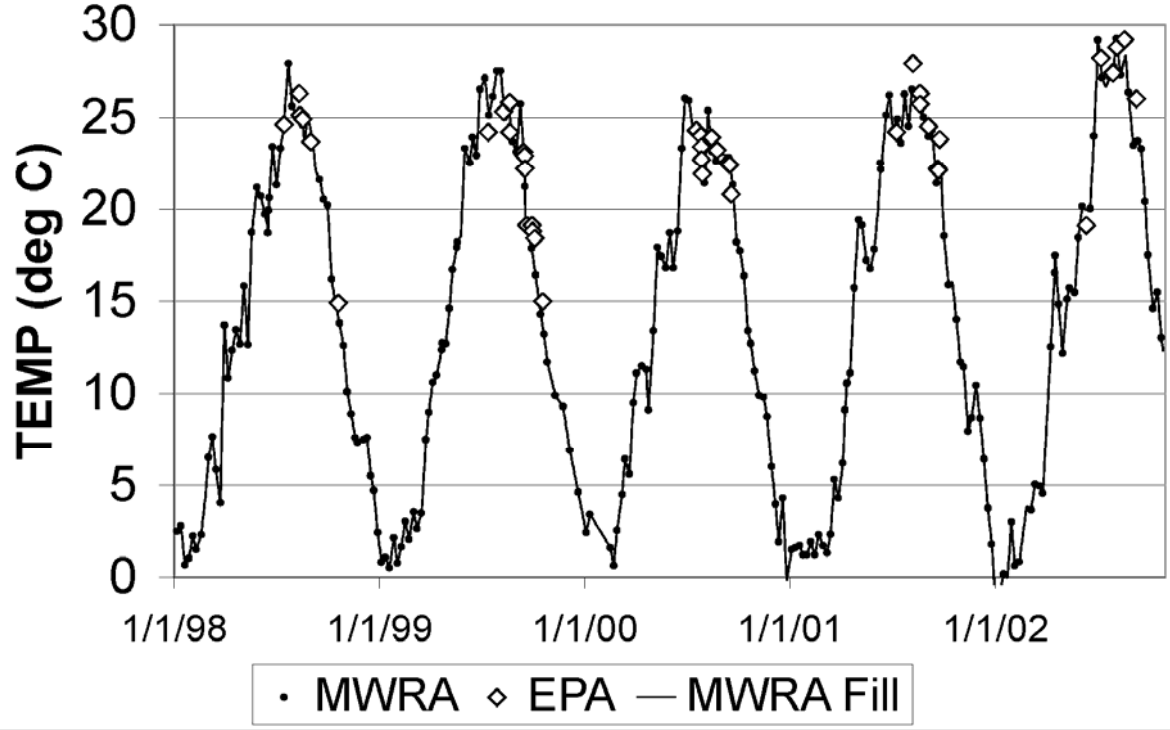


Figure 4.80: Surface Temperature Data at Science Museum



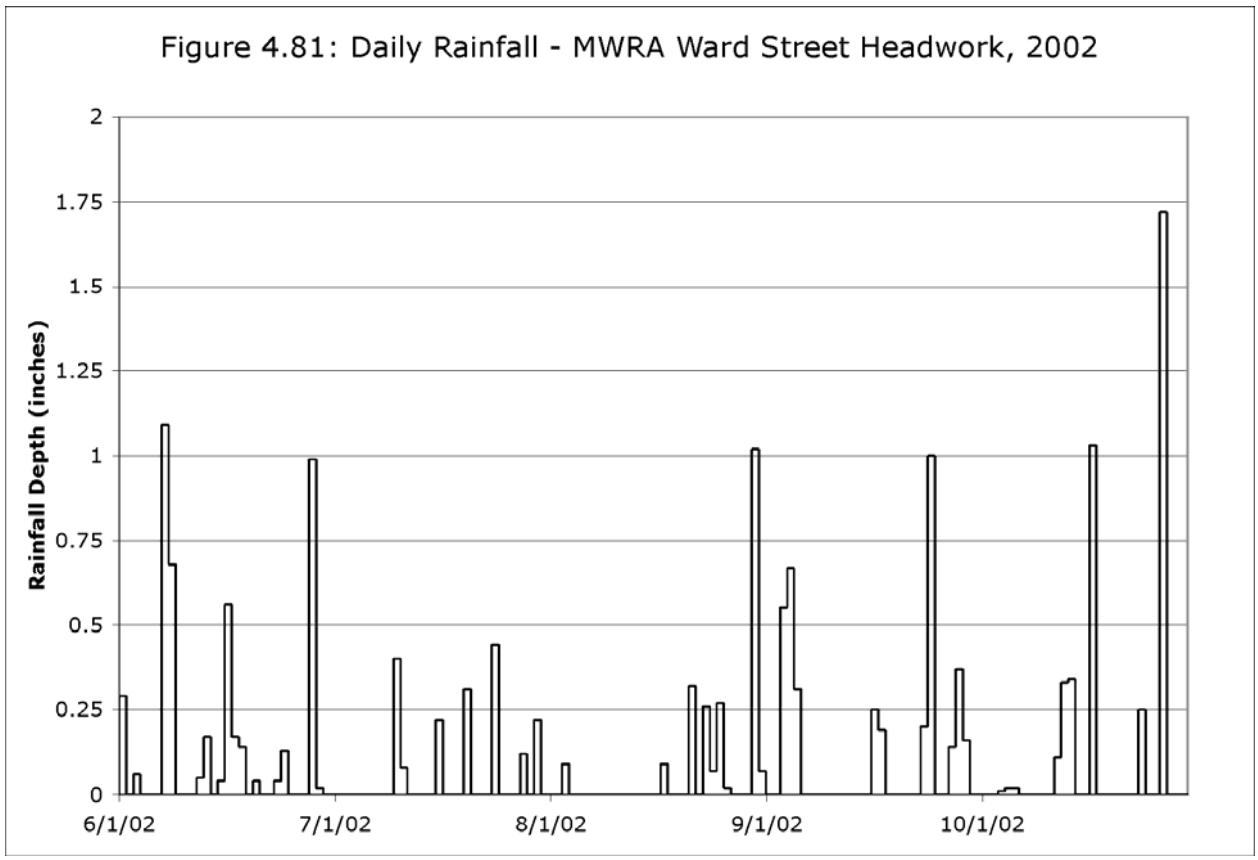


Figure 4.81: Daily Rainfall - MWRA Ward Street Headwork, 2002
Rainfall Depth (inches)
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
6/1/02
7/1/02
8/1/02
9/1/02
10/1/02

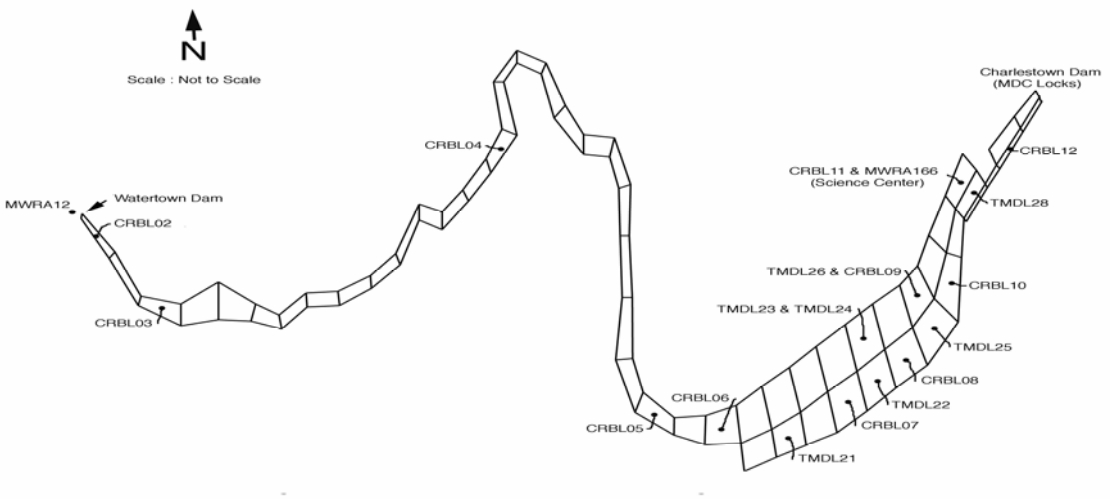


Figure 4.82. Water Quality Model Grid and Monitoring Data Locations

Figure 4.83: Predicted DO at CRBL12, 2002

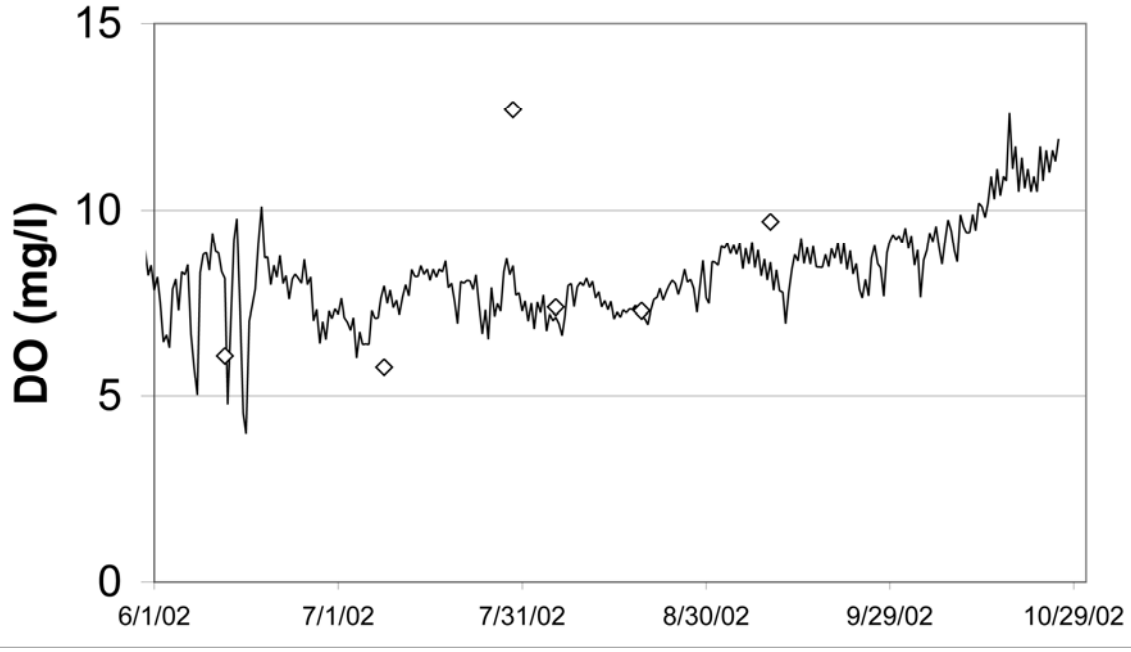


Figure 4.84: Predicted Chlor-a at CRBL12, 2002

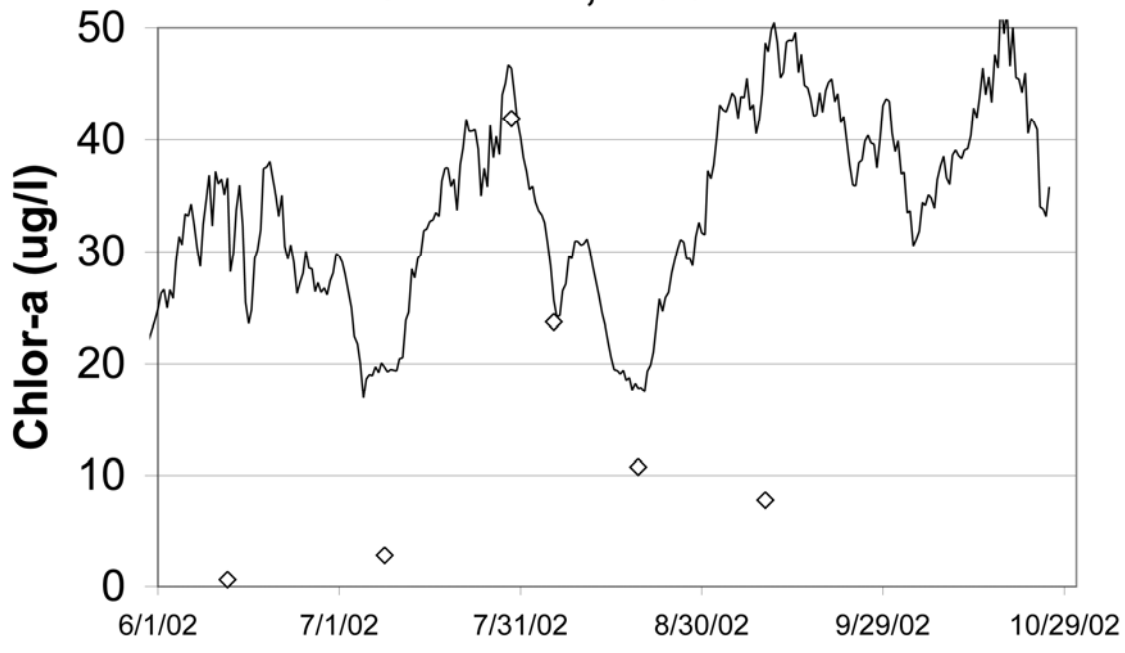


Figure 4.85: Predicted PO4-P at CRBL12, 2002

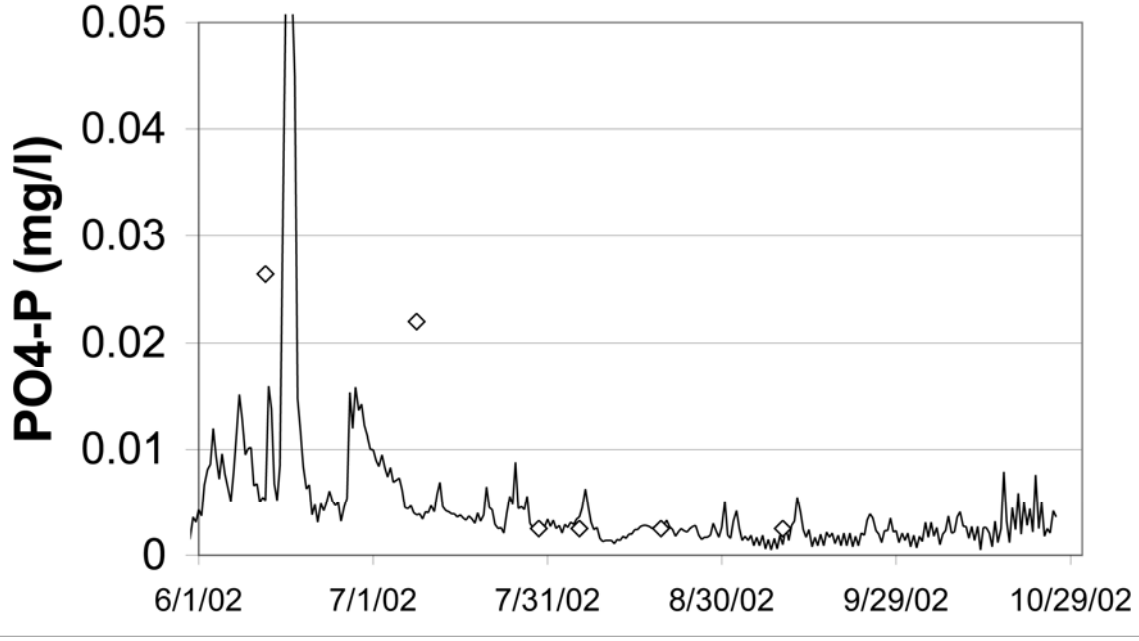


Figure 4.86: Predicted TP at CRBL12, 2002

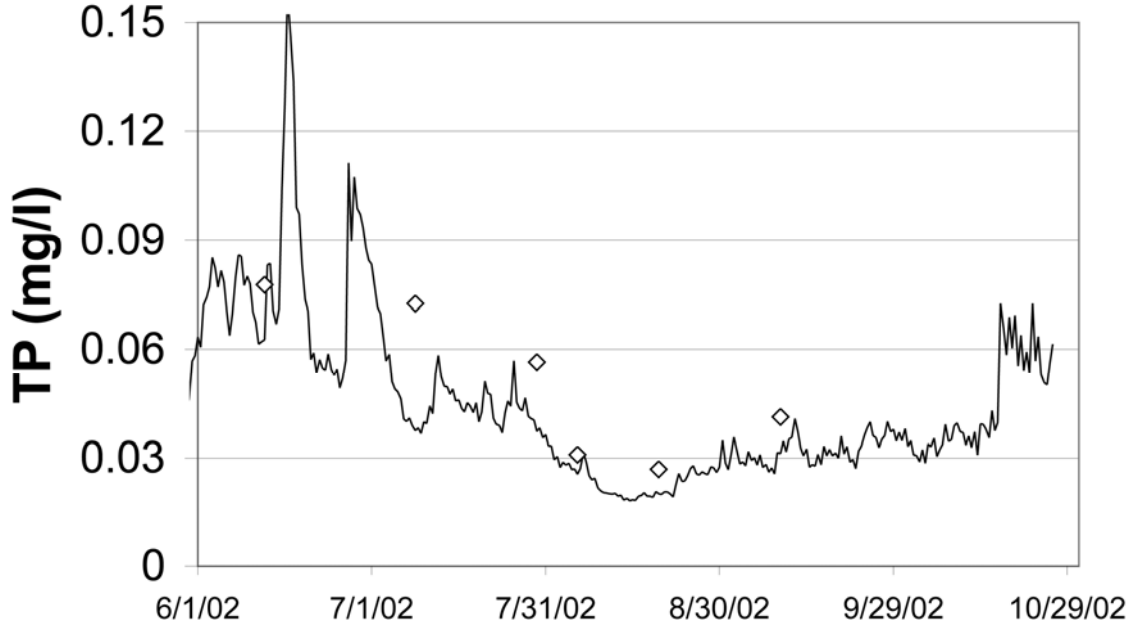


Figure 4.87: Predicted Organic-P at CRBL12, 2002

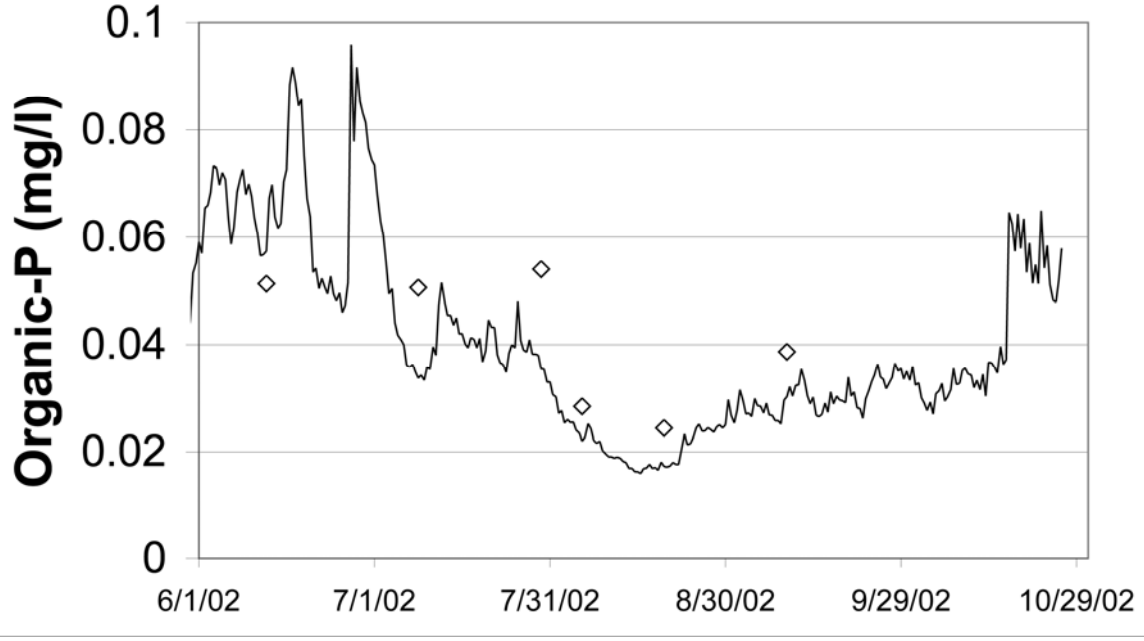


Figure 4.88: Predicted NH4-N at CRBL12, 2002

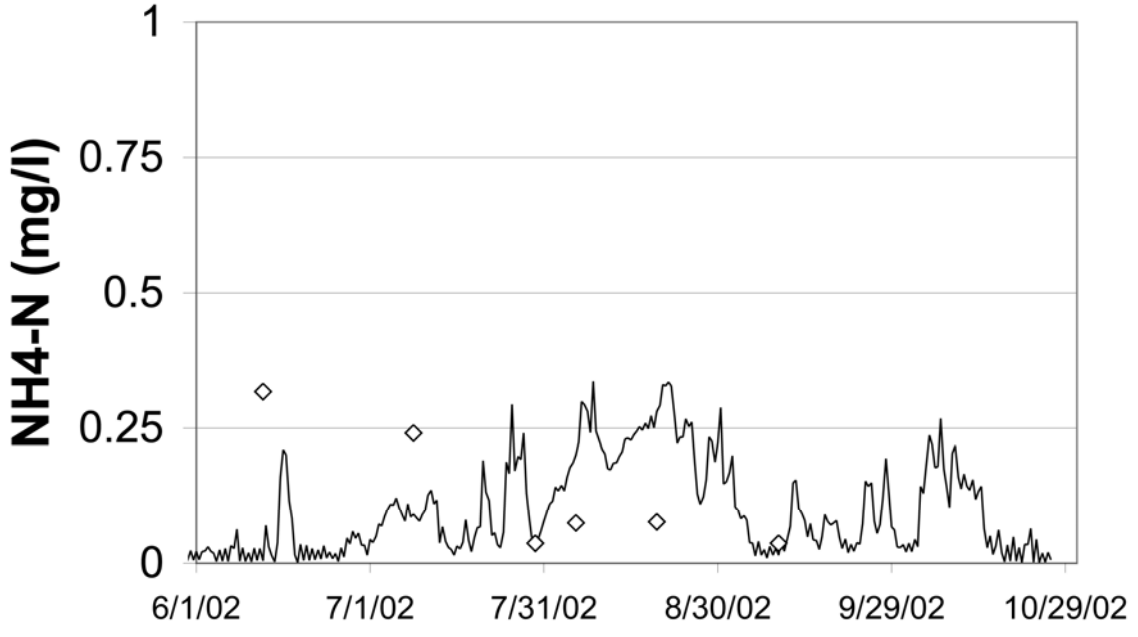


Figure 4.89: Predicted NOx-N at CRBL12, 2002

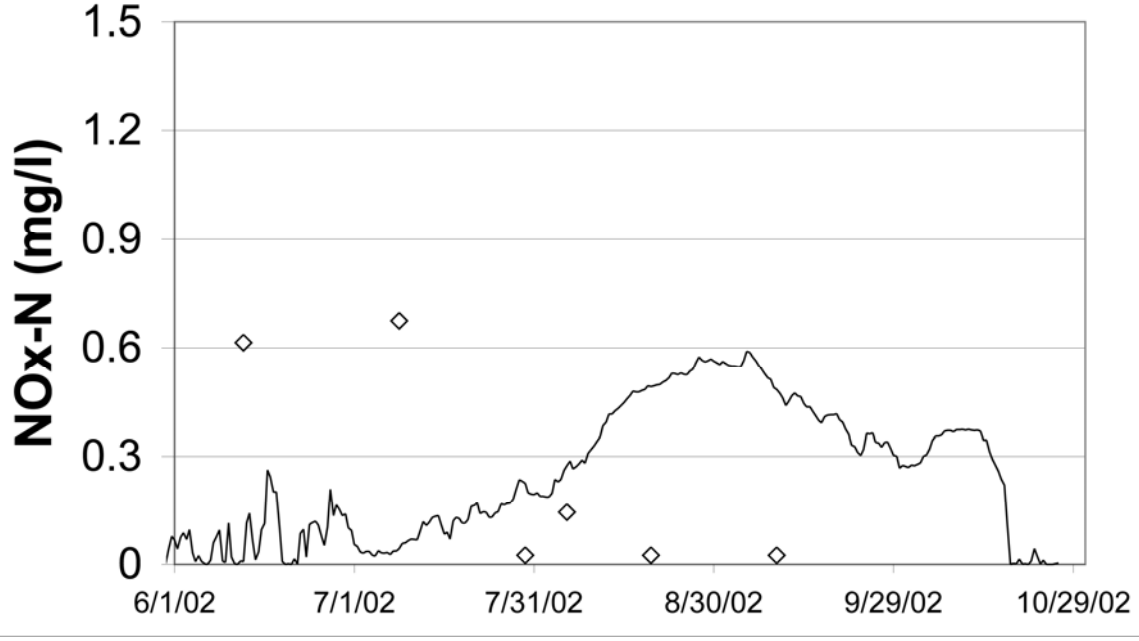


Figure 4.90: Predicted TN at CRBL12, 2002

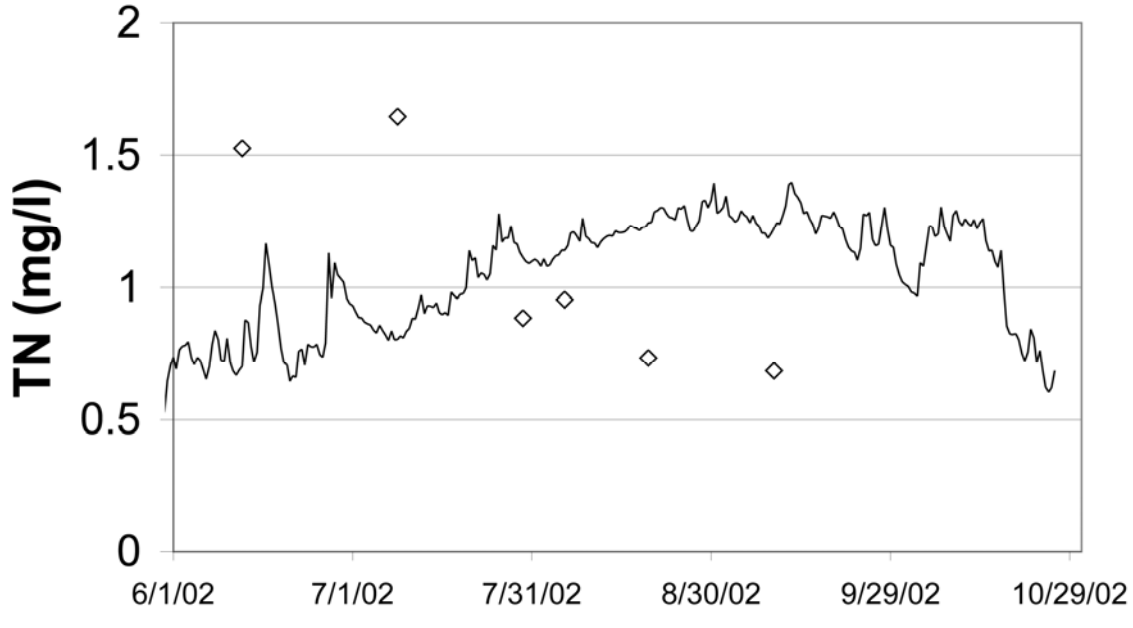


Figure 4.91: Predicted Organic-N at CRBL12, 2002

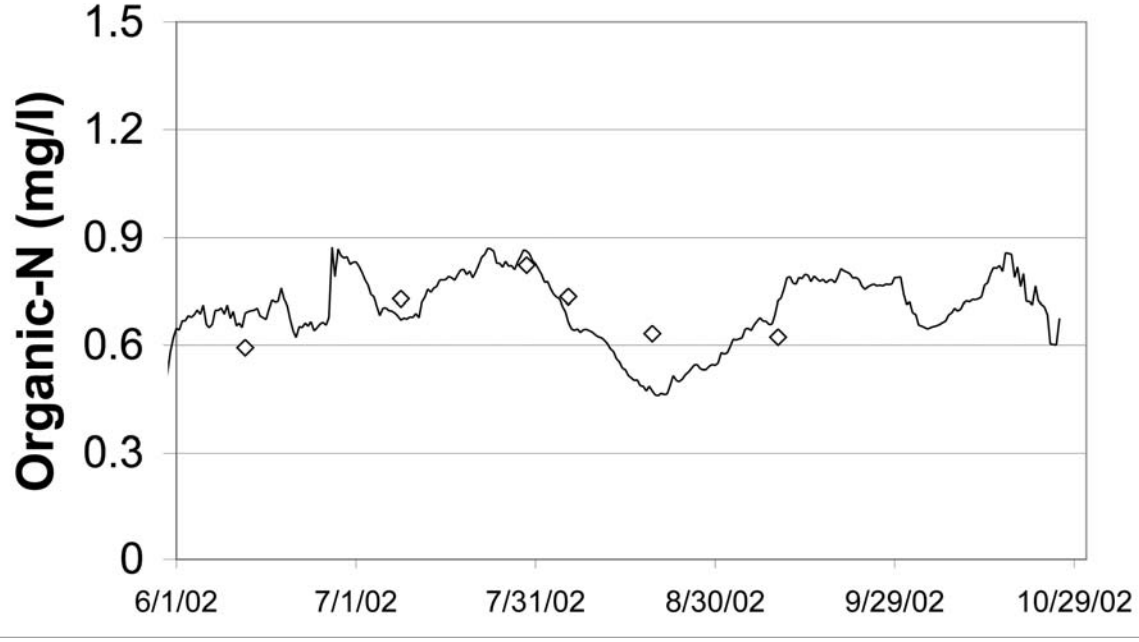


Figure 4.92: Predicted Organic-C at CRBL12, 2002

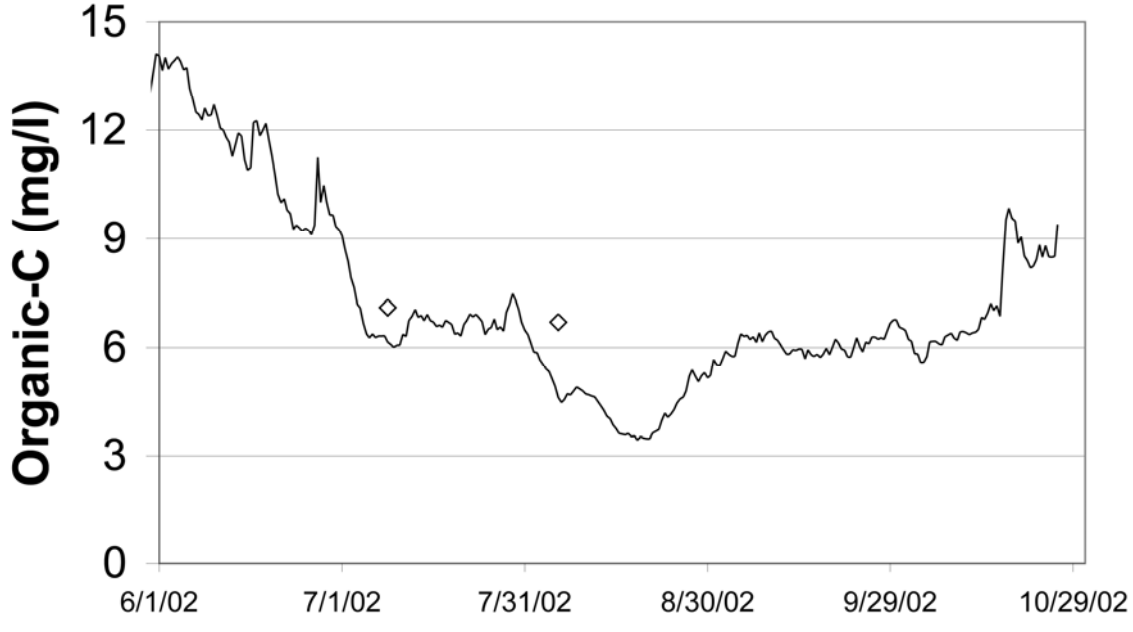


Figure 4.93: Predicted Salinity at CRBL12, 2002

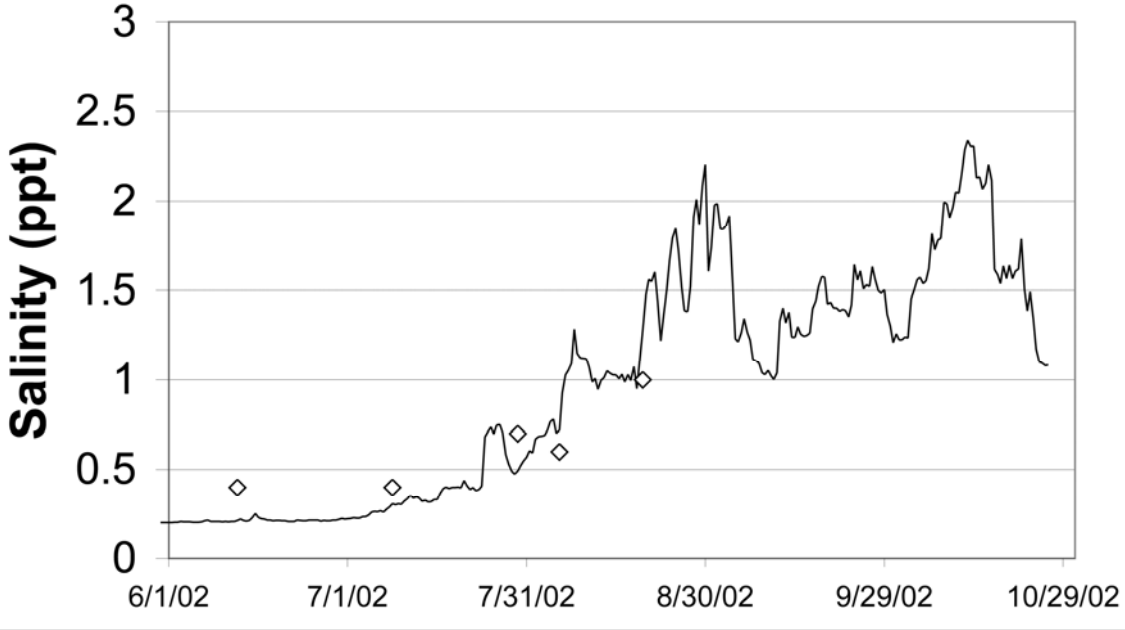


Figure 4.97: Predicted PO4-P at Science Center, 2002

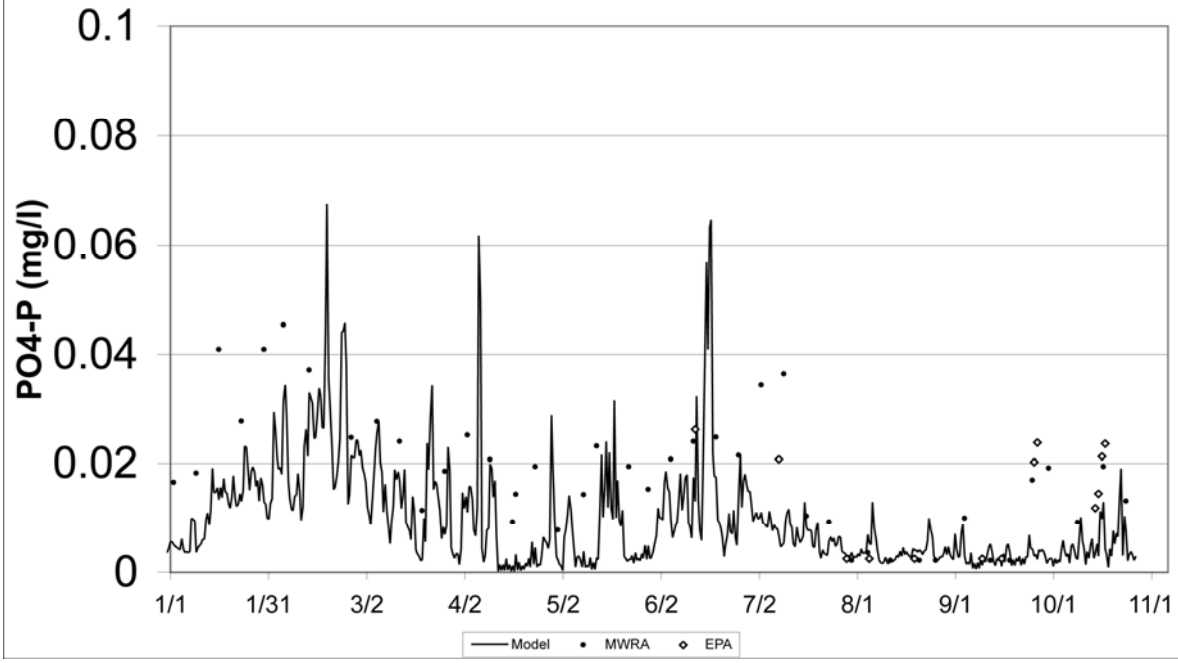


Figure 4.95: Predicted Dissolved Oxygen at Science

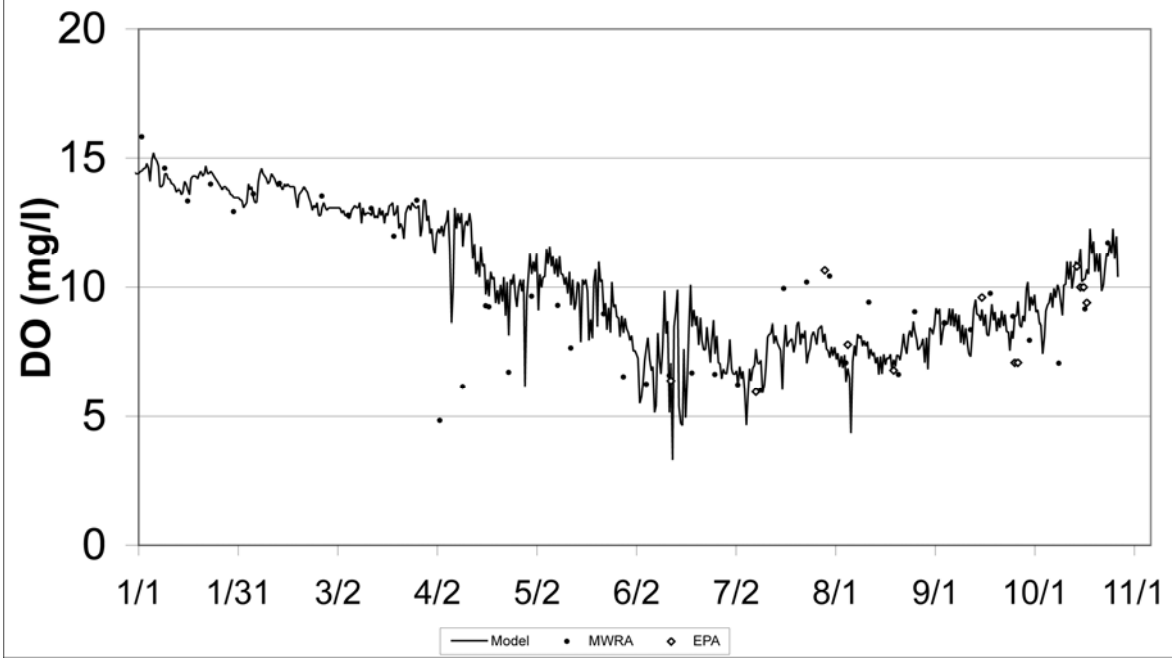


Figure 4.96: Predicted Chlorophyll-a at Science Center, 2002

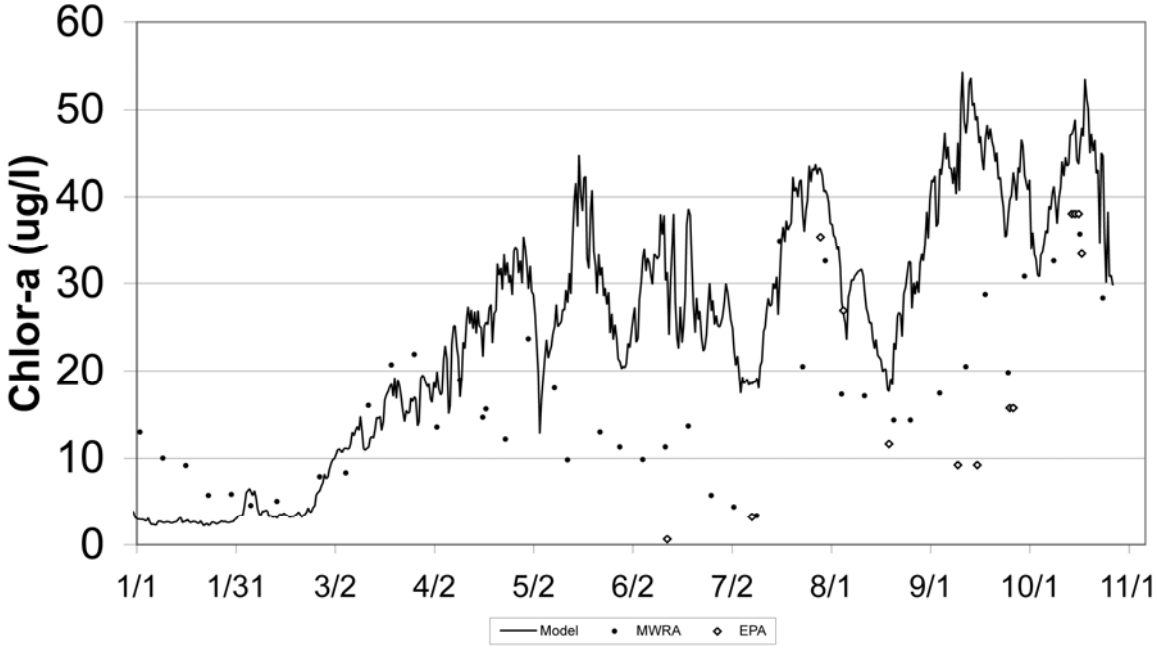


Figure 4.97: Predicted PO4-P at Science Center, 2002

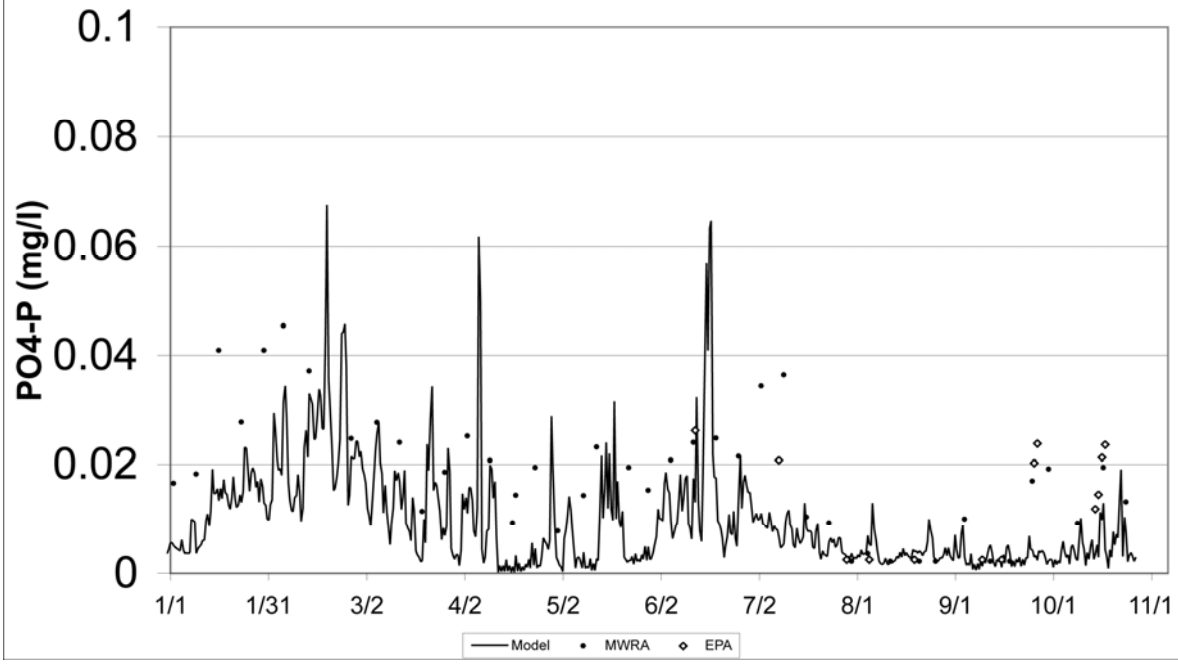


Figure 4.98: Predicted Organic-P at Science Center, 2002

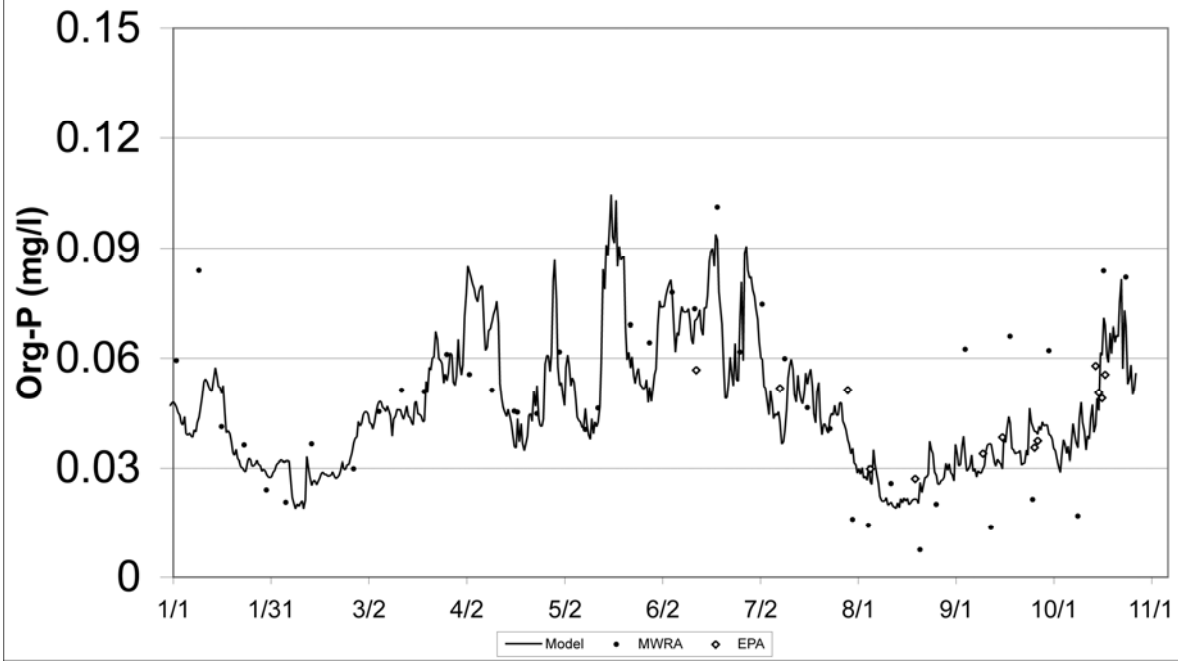


Figure 4.99: Predicted TP at Science Center, 2002

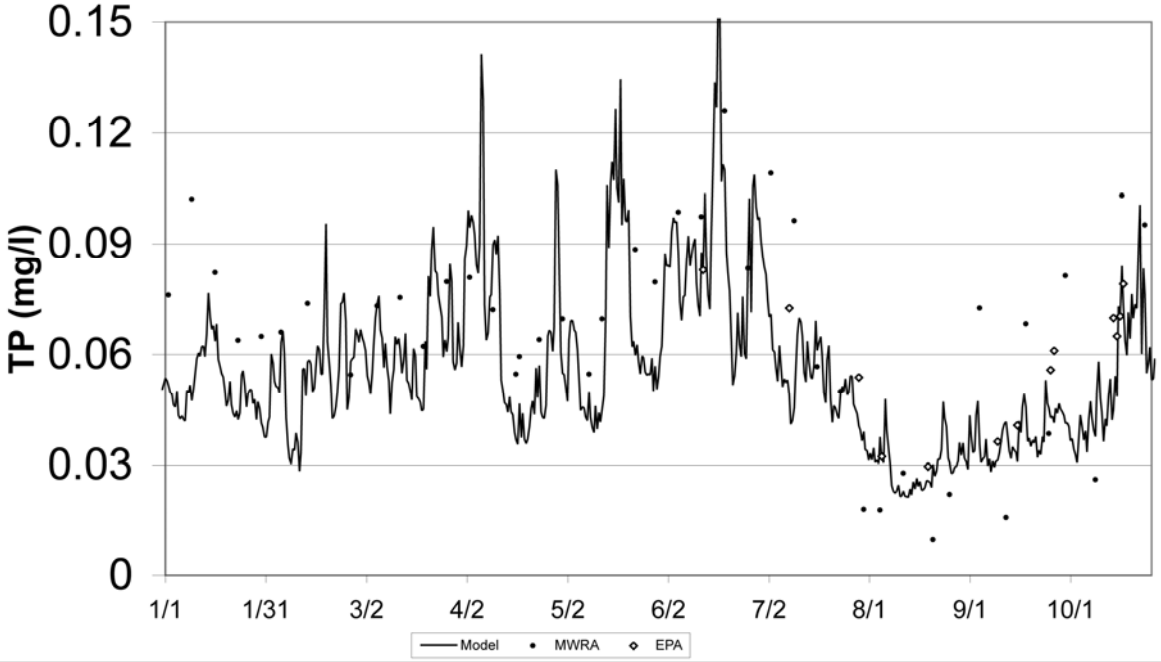
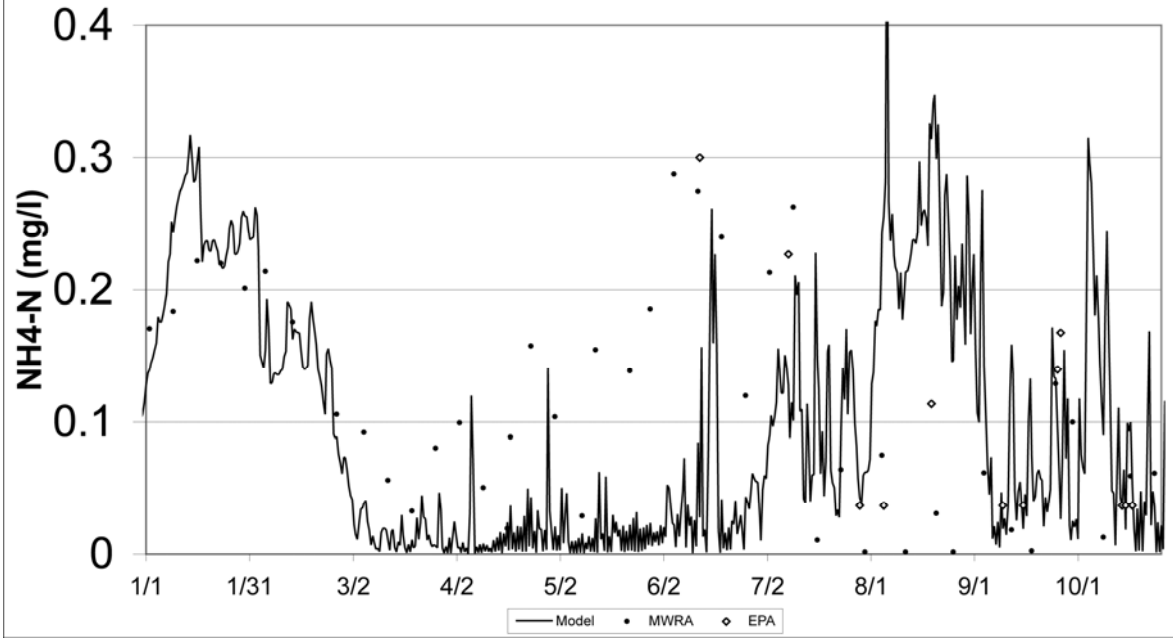


Figure 4.100: Predicted NH4-N at Science Center, 2002



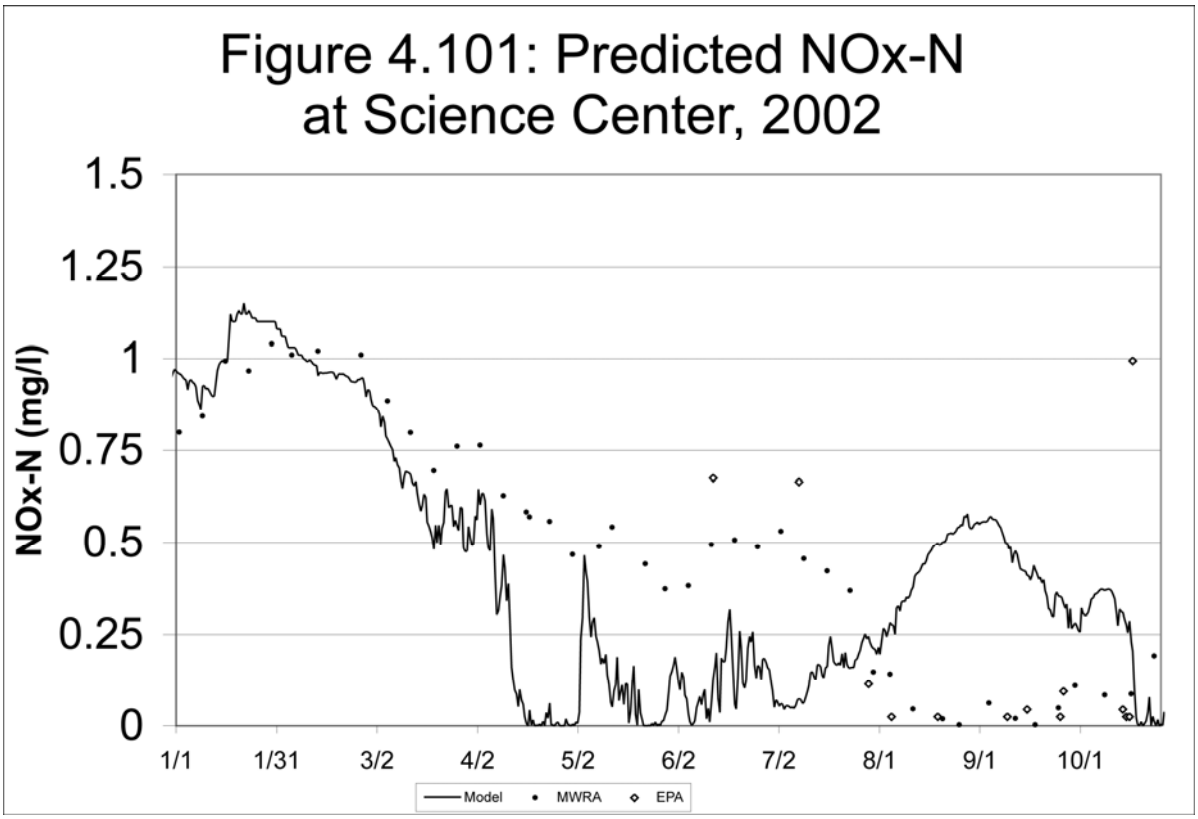


Figure 4.101: Predicted NOx-N at Science Center, 2002
NOx-N (mg/l)
1.5
1.25
1
0.75
0.5
0.25
0
1/1
1/31
3/2
4/2
5/2
6/2
7/2
8/1
9/1
10/1
Model
MWRA
EPA

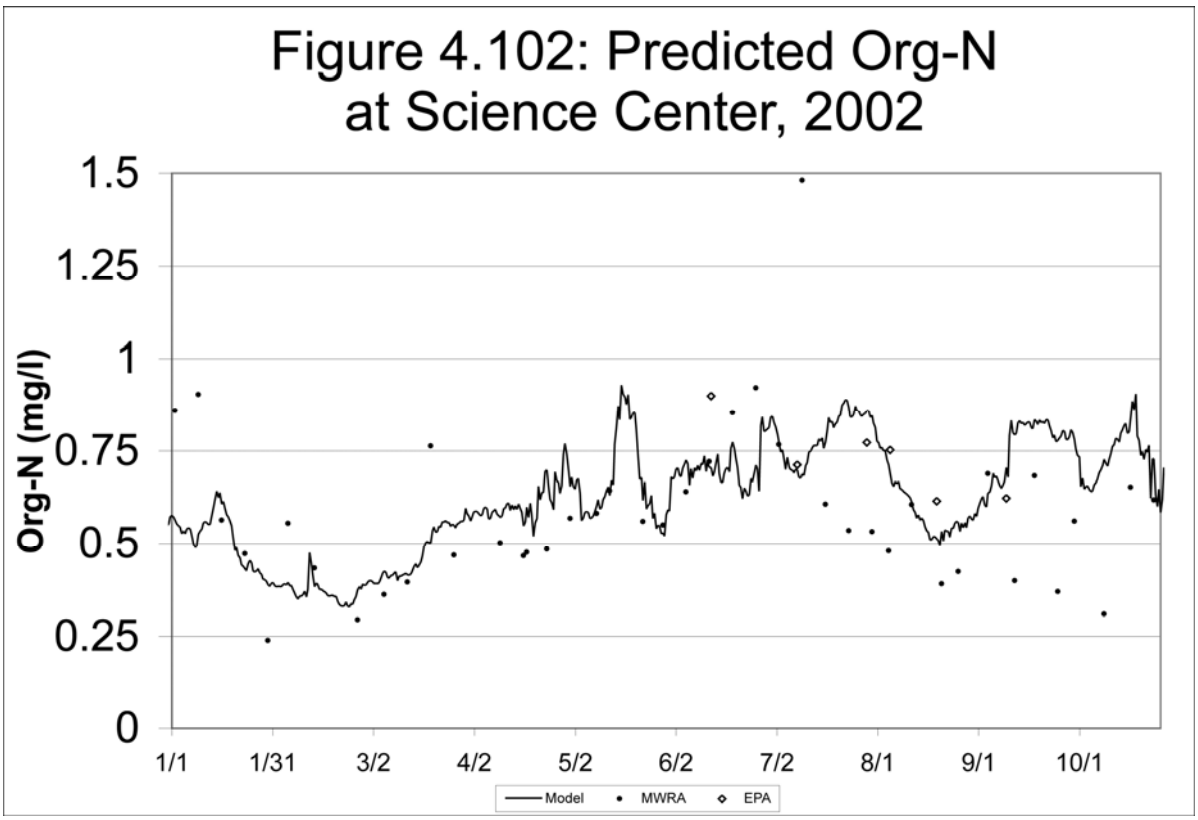


Figure 4.102: Predicted Org-N at Science Center, 2002
Org-N (mg/l)
1.5
1.25
1
0.75
0.5
0.25
0
1/1
1/31
3/2
4/2
5/2
6/2
7/2
8/1
9/1
10/1
Model
MWRA
EPA

Figure 4.103: Predicted TN at Science Center, 2002

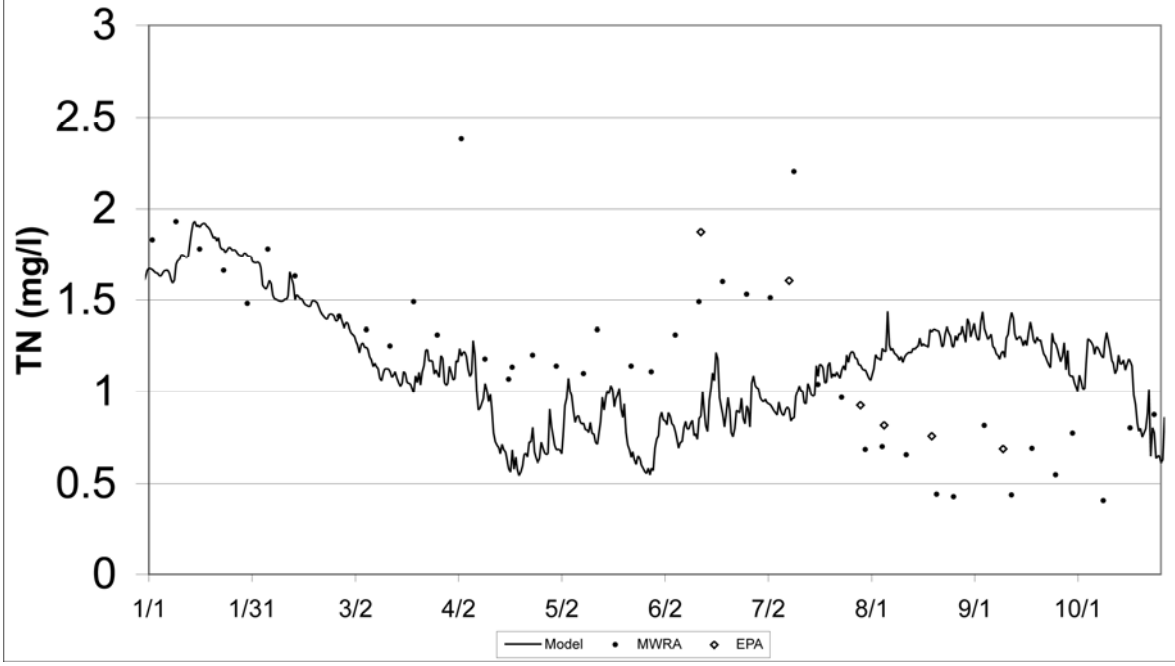


Figure 4.104: Predicted TOC at Science Center, 2002