# Changes to the Draft Basinwide Nutrient Target

**Water Quality Goal Implementation Team**

**Lancaster, PA Meeting**

September 29, 2009

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CBP Modeling Team

# Overview

- Review of decisions that have influenced the nutrient basinwide target loads.
- Reasons why these targets may change before the draft TMDL is established.
- Basinwide nitrogen and phosphorus loads.
- Revised detailed and summary stoplight plots for % DO criteria non-attainment by key loading scenarios.
- Summary plot and conclusions.

# Key point:

The critical period decision is based on technical reasons, but the decision on the critical period has implications for the target load.

# Decisions Made or Pending That Have or Will Influence the Nutrient Target Loads

- The new reference curves of Open Water (10%), Deep Water (refinements to curve), and Deep Channel (10%) have reduced the number of CB segments not achieving the DO WQS at the Target Scenario (175/14.1).
- Confirmation that some Open Water designated uses have a pycnocline with an attendant need for development of a Deep Water DU.
- Potential changes in the critical period.
- Potential changes in the ocean boundary condition.

# Eight Reasons Why We're Looking At "Aiming Points, or "Targets" or "Objective Points" for Nutrient Reductions Needed to Achieve the DO Water Quality Standards

- Phase 5.3 needs to be completed in December 2009 for final TMDL allocation decisions.
- The WQSTM needs to be calibrated to the Phase 5.3 loads in January 2010.
- Movement toward achieving the shallow water standard of clarity/SAV.
- Trade-offs between N and P that achieve the same water quality response.

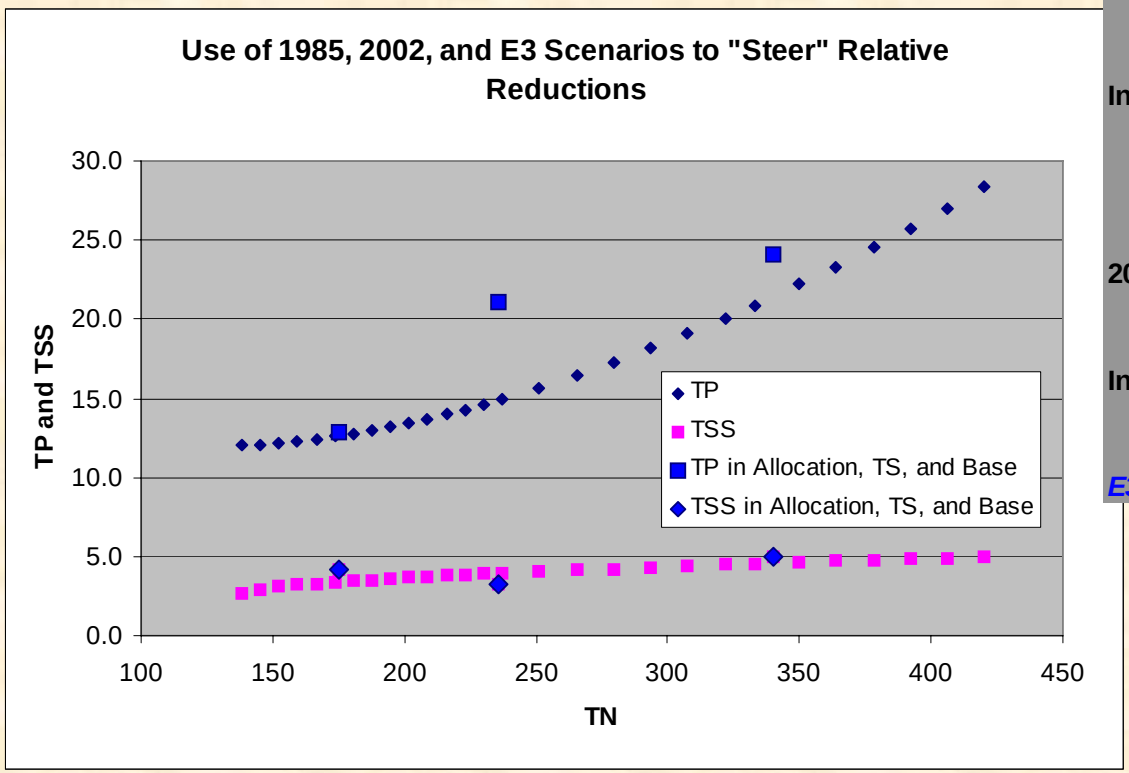
## Eight Reasons Why We're Looking At "Aiming Points, or "Targets" or "Objective Points" for Nutrient Reductions Needed to Achieve the DO Water Quality Standards *(cont.)*

- Changes in the geographic distribution of the load reductions may change the absolute load.
- Changes in speciation of the TN or TP loads.
- Changes due to resolving problems in segments with persistent DO problems.
- Changes due to meeting water quality standards, other than DO, in basins for reasons of local water quality concerns.

# An Initial Look At What A Bay-Wide Allocation May Look Like

In gray are the Phase 5.1 scenarios we'll use to examine the loads leading up to, and in the neighborhood of, the nutrient and sediment loads needed to achieve the DO and chlorophyll water quality standards.

| Scenario | | TN | TP | TSS |
|---|---|---|---|---|
| *1985* | *1.000* | *420* | *28.4* | *4.97* |
| | 0.950 | 406 | 27.0 | 4.9 |
| | 0.900 | 392 | 25.8 | 4.84 |
| **Intermediate C** | **0.850** | **378** | **24.5** | **4.77** |
| | 0.800 | 364 | 23.3 | 4.70 |
| | 0.750 | 350 | 22.2 | 4.62 |
| **91-'00 Base** | | **340** | **24.1** | **4.97** |
| *2002* | *0.690* | *333* | *20.9* | *4.53* |
| | 0.650 | 322 | 20.1 | 4.47 |
| | 0.600 | 308 | 19.1 | 4.39 |
| | 0.550 | 293 | 18.1 | 4.31 |
| **Intermediate B** | **0.500** | **279** | **17.2** | **4.22** |
| | 0.450 | 265 | 16.4 | 4.13 |
| | 0.400 | 251 | 15.6 | 4.04 |
| | 0.350 | 237 | 14.9 | 3.94 |
| **Tributary Strategy)** | | **236** | **21.1** | **3.29** |
| | 0.325 | 230 | 14.6 | 3.89 |
| | 0.300 | 223 | 14.3 | 3.83 |
| | 0.275 | 216 | 14.0 | 3.78 |
| **Intermediate A** | **0.250** | **209** | **13.7** | **3.72** |
| | 0.225 | 202 | 13.4 | 3.65 |
| | 0.200 | 195 | 13.2 | 3.59 |
| | 0.175 | 188 | 13.0 | 3.52 |
| | 0.150 | 181 | 12.8 | 3.45 |
| **2003 Allocation** | | **175** | **12.8** | **4.20** |
| | 0.125 | 174 | 12.6 | 3.37 |
| | 0.100 | 167 | 12.4 | 3.28 |
| **Intermediate D** | 0.075 | 159 | 12.3 | 3.19 |
| | 0.050 | 152 | 12.2 | 3.07 |
| | 0.025 | 145 | 12.1 | 2.93 |
| *E3* | *0.000* | *138* | *12.0* | *2.62* |




Key scenarios have also been run on the Phase 5.2 model.

# Loads of the Coupled Phase 5.1 and WQSTM Scenarios By Basin

## Total Nitrogen Loads by Basin (millions of pounds/year)

| Basin | 1985 Scenario | Intermediate C Scenario | 1991-2000 Base Scenario | 2002 Scenario | Intermediate B Scenario | 2010 Tributary Strategy Scenario | Intermediate A-C Scenario | Intermediate A Scenario | Intermediate A-B Scenario | Target Load Scenario | Intermediate D Scenario | E3 2010 Scenario |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Susquehanna | 162.0 | 146.3 | 136.0 | 136.1 | 109.5 | 88.0 | 88.3 | 83.2 | 76.9 | 76.3 | 64.8 | 56.9 |
| Eastern Shore | 43.0 | 38.7 | 36.5 | 34.4 | 28.7 | 26.3 | 22.9 | 21.5 | 19.8 | 14.8 | 16.5 | 14.4 |
| Western Shore | 28.4 | 25.1 | 18.8 | 16.0 | 17.5 | 10.9 | 13.1 | 12.1 | 10.8 | 11.1 | 8.2 | 6.6 |
| Patuxent | 5.2 | 4.7 | 4.6 | 4.5 | 3.7 | 3.9 | 3.1 | 3.0 | 2.8 | 2.4 | 2.4 | 2.2 |
| Potomac | 111.1 | 99.2 | 84.7 | 87.1 | 71.5 | 60.4 | 55.5 | 51.7 | 46.9 | 34.3 | 37.8 | 31.8 |
| Rappahannock | 12.8 | 11.7 | 10.5 | 10.5 | 9.0 | 8.1 | 7.5 | 7.1 | 6.7 | 5.1 | 5.8 | 5.3 |
| York | 11.0 | 10.0 | 9.1 | 9.1 | 7.7 | 7.2 | 6.4 | 6.0 | 5.7 | 5.5 | 4.9 | 4.4 |
| James | 46.9 | 42.3 | 39.4 | 36.1 | 31.8 | 30.9 | 25.7 | 24.3 | 22.5 | 25.7 | 19.0 | 16.8 |
| **Total** | **420.4** | **378.1** | **339.6** | **333.9** | **279.4** | **235.7** | **222.5** | **208.8** | **192.0** | **175.1** | **159.5** | **138.3** |

# Loads of the Coupled Phase 5.1 and WQSTM Scenarios By Basin

## Total Phosphorus Loads by Basin (millions of pounds/year)

| Basin | 1985 Scenario | Intermediate C Scenario | 1991-2000 Base Scenario | 2002 Scenario | Intermediate B Scenario | 2010 Tributary Strategy Scenario | Intermediate A-C Scenario | Intermediate A Scenario | Intermediate A-B Scenario | Target Load Scenario | Intermediate D Scenario | E3 2010 Scenario |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Susquehanna | 6.27 | 5.32 | 5.32 | 4.94 | 3.51 | 4.02 | 3.37 | 2.62 | 2.66 | 2.76 | 2.27 | 2.21 |
| Eastern Shore | 4.03 | 3.40 | 3.66 | 2.73 | 2.21 | 2.37 | 2.11 | 1.63 | 1.65 | 1.72 | 1.40 | 1.36 |
| Western Shore | 1.82 | 1.48 | 1.07 | 0.95 | 0.83 | 0.75 | 0.69 | 0.52 | 0.50 | 0.57 | 0.39 | 0.37 |
| Patuxent | 0.54 | 0.45 | 0.45 | 0.40 | 0.27 | 0.33 | 0.24 | 0.18 | 0.18 | 0.20 | 0.15 | 0.14 |
| Potomac | 6.02 | 5.29 | 6.19 | 5.29 | 3.92 | 4.71 | 4.10 | 3.26 | 3.38 | 3.26 | 2.99 | 2.94 |
| Rappahannock | 1.36 | 1.24 | 1.29 | 1.11 | 1.02 | 1.27 | 1.13 | 0.91 | 0.96 | 0.92 | 0.86 | 0.86 |
| York | 1.07 | 0.91 | 0.83 | 0.67 | 0.62 | 0.69 | 0.60 | 0.47 | 0.48 | 0.49 | 0.41 | 0.40 |
| James | 7.25 | 6.43 | 5.27 | 4.89 | 4.86 | 6.82 | 5.15 | 4.10 | 4.28 | 4.22 | 3.80 | 3.75 |
| **Total** | **28.36** | **24.52** | **24.08** | **20.97** | **17.24** | **20.96** | **17.40** | **13.70** | **14.10** | **14.13** | **12.27** | **12.04** |

# DO Stoplight Plot for Monthly Deep Water Showing Two Potential Critical Periods '96-'98 and '93-'95 of the 1991-2000 Simulation.

| | 1985 Scenario, 420TN 28.4TP '96-'98 DO Deep Water | Intermediate C Scenario 378TN 24.5TP '96-'98 DO Deep Water | 91 -'00 Base Scenario, 340TN 24.1TP '96-'98 DO Deep Water | Intermediate B Scenario 279TN 17.2TP '96-'98 DO Deep Water | Tributary Strategy 2010a Scenario, 236TN 21.1TP '96-'98 DO Deep Water | Intermediate A-C Scenario 222TN 17.4TP '96-'98 DO Deep Water | Intermediate A Scenario, 209TN 13.7TP '96-'98 DO Deep Water | Intermediate A-B Scenario 192TN 14.1 TP '96-'98 DO Deep Water | Target Load Scenario, 175TN 14.1 TP '96-'98 DO Deep Water | Intermediate D Scenario 159TN 12.3TP '96-'98 DO Deep Water | E3 2010 Scenario, 138TN 12.0TP '96-'98 DO Deep Water |
|---|---|---|---|---|---|---|---|---|---|---|---|
| APPTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BACOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BIGMH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BOHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BSHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB1TF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB2OH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB3MH | 3.3% | 2.0% | 1.9% | 0.9% | 0.4% | 0.4% | 0.3% | 0.1% | 0.2% | 0.0% | 0.0% |
| CB4MH | 22.9% | 20.1% | 19.9% | 15.6% | 12.4% | 10.6% | 9.4% | 4.4% | 6.7% | 5.5% | 4.4% |
| CB5MH | 7.9% | 5.8% | 5.6% | 2.5% | 1.2% | 0.9% | 0.7% | 0.1% | 0.2% | 0.1% | 0.0% |
| CB6PH | 1.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB7PH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB8PH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

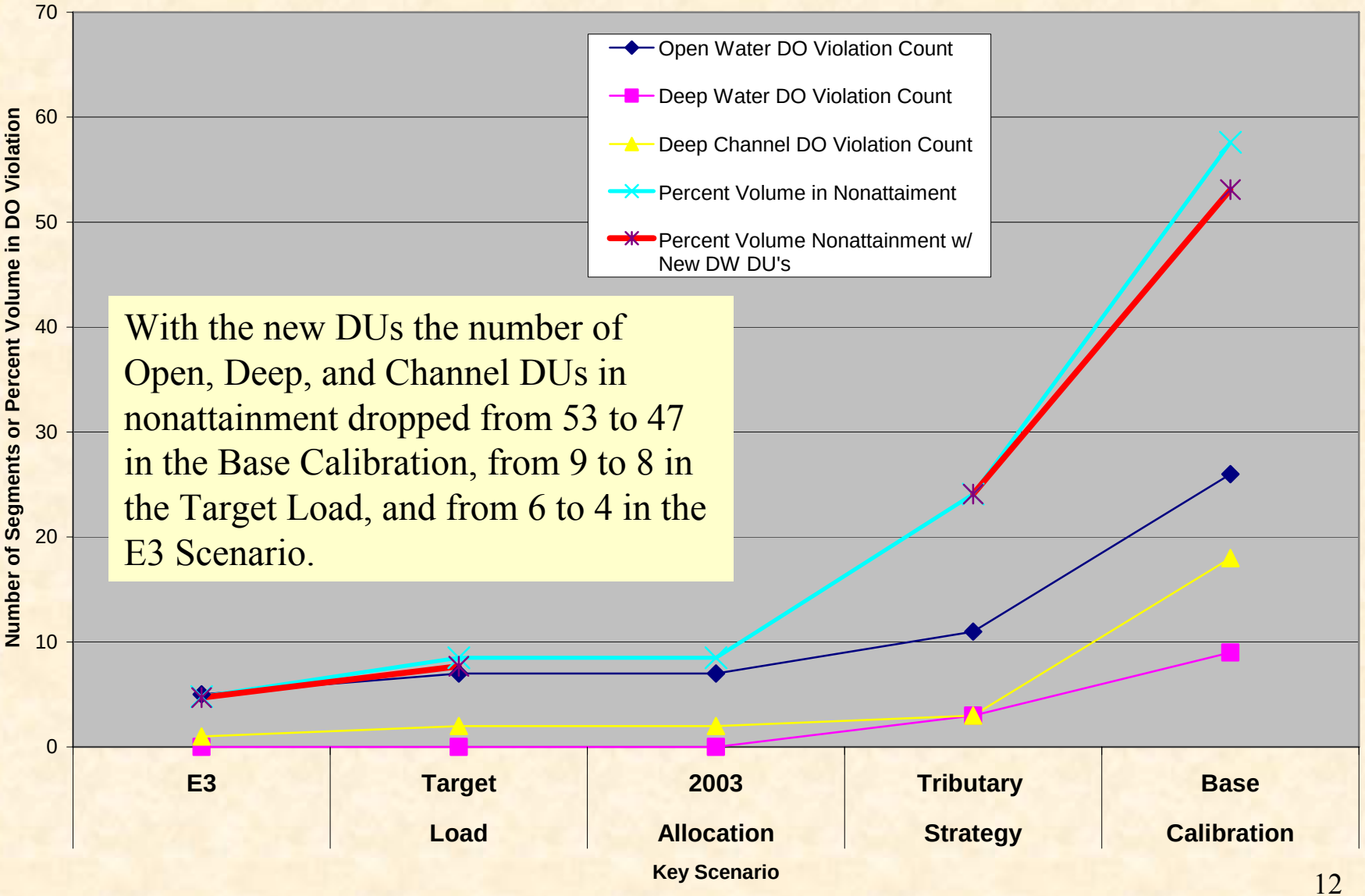
| | 1985 Scenario, 420TN 28.4TP '93-'95 DO Deep Water | Intermediate C Scenario 378TN 24.5TP '93-'95 DO Deep Water | 91 -'00 Base Scenario, 340TN 24.1TP '93-'95 DO Deep Water | Intermediate B Scenario 279TN 17.2TP '93-'95 DO Deep Water | Tributary Strategy 2010a Scenario, 236TN 21.1TP '93-'95 DO Deep Water | Intermediate A-C Scenario 222TN 17.4TP '93-'95 DO Deep Water | Intermediate A Scenario, 209TN 13.7TP '93-'95 DO Deep Water | Intermediate A-B Scenario 192TN 14.1 TP '93-'95 DO Deep Water | Target Load Scenario, 175TN 14.1 TP '93-'95 DO Deep Water | Intermediate D Scenario 159TN 12.3TP '93-'95 DO Deep Water | E3 2010 Scenario, 138TN 12.0TP '93-'95 DO Deep Water |
|---|---|---|---|---|---|---|---|---|---|---|---|
| APPTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BACOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BIGMH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BOHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BSHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB1TF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB2OH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB3MH | 2.8% | 2.0% | 2.5% | 0.8% | 0.5% | 0.3% | 0.2% | 0.1% | 0.0% | 0.0% | 0.0% |
| CB4MH | 21.2% | 18.3% | 19.4% | 12.7% | 9.3% | 7.8% | 6.6% | 5.2% | 3.7% | 2.4% | 1.5% |
| CB5MH | 5.9% | 4.5% | 4.9% | 1.9% | 0.7% | 0.4% | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB6PH | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB7PH | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB8PH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

# DO Stoplight Plot for Monthly Deep Channel Showing Two Potential Critical Periods ’96-’98 and ’93-’95 of the 1991-2000 Simulation.

| | 1985 Scenario, 420TN 28.4TP '96-'98 DO Deep Channel | Intermediate C Scenario 378TN 24.5TP '96-'98 DO Deep Channel | 91 -'00 Base Scenario, 340TN 24.1TP '96-'98 DO Deep Channel | Intermediate B Scenario 279TN 17.2TP '96-'98 DO Deep Channel | Tributary Strategy 2010a Scenario, 236TN 21.1TP '96-'98 DO Deep Channel | Intermediate A-C Scenario 222TN 17.4TP '96-'98 DO Deep Channel | Intermediate A Scenario, 209TN 13.7TP '96-'98 DO Deep Channel | Intermediate A-B Scenario 192TN 14.1 TP '96-'98 DO Deep Channel | Target Load Scenario, 175TN 14.1 TP '96-'98 DO Deep Channel | Intermediate D Scenario 159TN 12.3TP '96-'98 DO Deep Channel | E3 2010 Scenario, 138TN 12.0TP '96-'98 DO Deep Channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| APPTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BACOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BIGMH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BOHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BSHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB1TF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB2OH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB3MH | 9.0% | 7.1% | 6.8% | 4.8% | 3.5% | 2.4% | 1.3% | 0.0% | 0.2% | 0.0% | 0.0% |
| CB4MH | 56.3% | 52.7% | 52.2% | 42.0% | 25.5% | 16.6% | 10.6% | 1.3% | 0.6% | 0.0% | 0.0% |
| CB5MH | 24.1% | 19.5% | 17.6% | 4.7% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

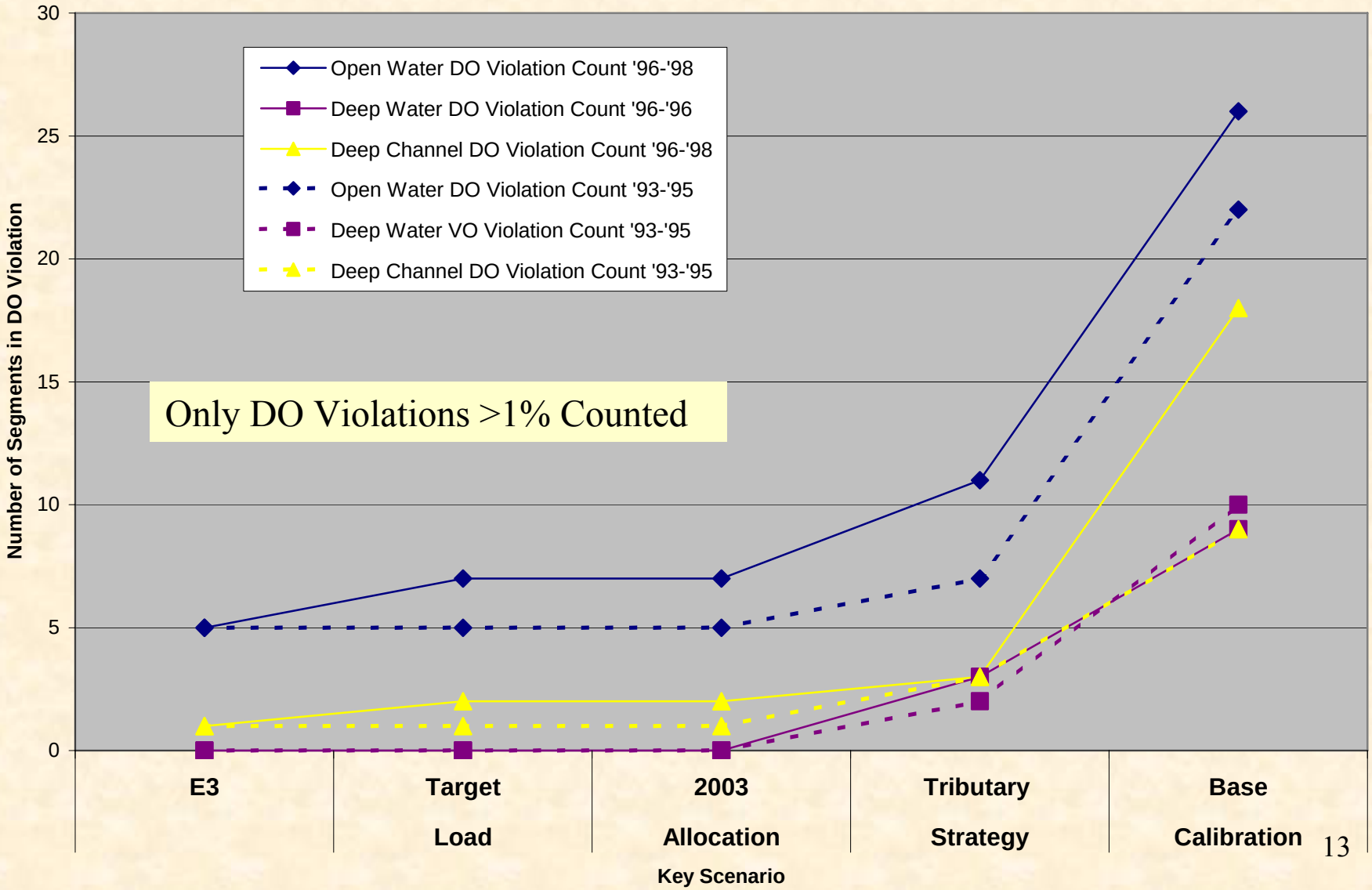
| | 1985 Scenario, 420TN 28.4TP '93-'95 DO Deep Channel | Intermediate C Scenario 378TN 24.5TP '93-'95 DO Deep Channel | 91 -'00 Base Scenario, 340TN 24.1TP '93-'95 DO Deep Channel | Intermediate B Scenario 279TN 17.2TP '93-'95 DO Deep Channel | Tributary Strategy 2010a Scenario, 236TN 21.1TP '93-'95 DO Deep Channel | Intermediate A-C Scenario 222TN 17.4TP '93-'95 DO Deep Channel | Intermediate A Scenario, 209TN 13.7TP '93-'95 DO Deep Channel | Intermediate A-B Scenario 192TN 14.1 TP '93-'95 DO Deep Channel | Target Load Scenario, 175TN 14.1 TP '93-'95 DO Deep Channel | Intermediate D Scenario 159TN 12.3TP '93-'95 DO Deep Channel | E3 2010 Scenario, 138TN 12.0TP '93-'95 DO Deep Channel |
|---|---|---|---|---|---|---|---|---|---|---|---|
| APPTF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BACOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BIGMH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BOHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| BSHOH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB1TF | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB2OH | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| CB3MH | 8.4% | 6.0% | 7.1% | 1.8% | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| CB4MH | 48.5% | 43.4% | 45.2% | 31.3% | 18.5% | 10.6% | 5.2% | 1.9% | 0.0% | 0.0% | 0.0% |
| CB5MH | 15.6% | 10.2% | 12.5% | 1.8% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

# DO Stoplight Plot Summary Information




With the new DUs the number of Open, Deep, and Channel DUs in nonattainment dropped from 53 to 47 in the Base Calibration, from 9 to 8 in the Target Load, and from 6 to 4 in the E3 Scenario.

# DO Violation Counts for the ’96-’98 and ’93-’95 Critical Periods



# Key Points:

- The critical period decision is based on technical reasons, but the decision on the critical period has implications for the target load).
- There are many reasons why these target loads are not TMDL loads. These target loads could change before the draft TMDL is established.
- In using a critical period of ’93-’95 the Intermediate A Scenario achieves water quality standards including CB4 Deep Water (with a 7% variance) at a load of 209TN/13.7TP but for achieving Deep Channel water quality standards further reductions to the Intermediate A-B Scenario are needed (192 TN/14/1TP
- Using round numbers, a target load may be taken to be around 200 TN & 15 TP.

# Decision Requested

WQGIT approval of revised basinwide nutrient target loads for distributing loads among major basin/jurisdictions.