DO Water Quality Standard Stoplight Analysis of the Estimated Influence of Conowingo Infill on Chesapeake DO Using Linked WSM, ADH and WQSTM Simulations

Modeling Workgroup Quarterly Review

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Scenarios Used in April, 2013 Analysis*

- 2010 No Action N-Based
- 1985 Scenario
- Base Case – Calibration
- 2007 Progress
- 2009 Progress
- 2010 Progress
- 2010 Progress w/ simulated deposition and scour of the Conowingo reservoir removed from WSM loads.
- 2010 Progress w/ 0% N, 50% P, 100% TSS increase in annual loads
- 2010 Progress w/ 0% N, 70% P, 250% TSS increase in annual loads
- TMDL (Level of Effort)
- TMDL (LoE) w/ simulated deposition and scour of the Conowingo reservoir removed from WSM loads.
- TMDL (LoE) w/ 0% N, 50% P, 100% TSS increase in annual loads
- TMDL (LoE) w/ 0% N, 70% P, 250% TSS increase in annual loads
- 2010 E3 N-Based
- All Forest

* All scenarios are based on Phase 5.3.2 loads.

Additional Scenarios Examined in This Analysis*

- TMDL (Level of Effort)
- TMDL w/ ADH Scour and Hurricane Lee Level of Scoured Particulate Organic Nutrients in January 1996
- TMDL w/ ADH Scour and 1996 Big Melt Level of Scoured Particulate Organic Nutrients in January 1996
- January 1996 Big Melt Storm Eliminated
- TMDL w/ ADH Scour and Hurricane Lee Level of Scoured Particulate Organic Nutrients w/ January Storm Moved to June
- TMDL w/ ADH Scour and Hurricane Lee Level of Scoured Particulate Organic Nutrients w/ January Storm Moved to October
- TMDL w/ ADH Scour and 1996 Big Melt Level of Scoured Particulate Organic Nutrients w/ January Storm Moved to June
- TMDL w/ ADH Scour and 1996 Big Melt Level of Scoured Particulate Organic Nutrients w/ January Storm Moved to October

For Comparison:

- 2010 E3 N-Based
- All Forest

* All scenarios are based on Phase 5.3.2 loads.

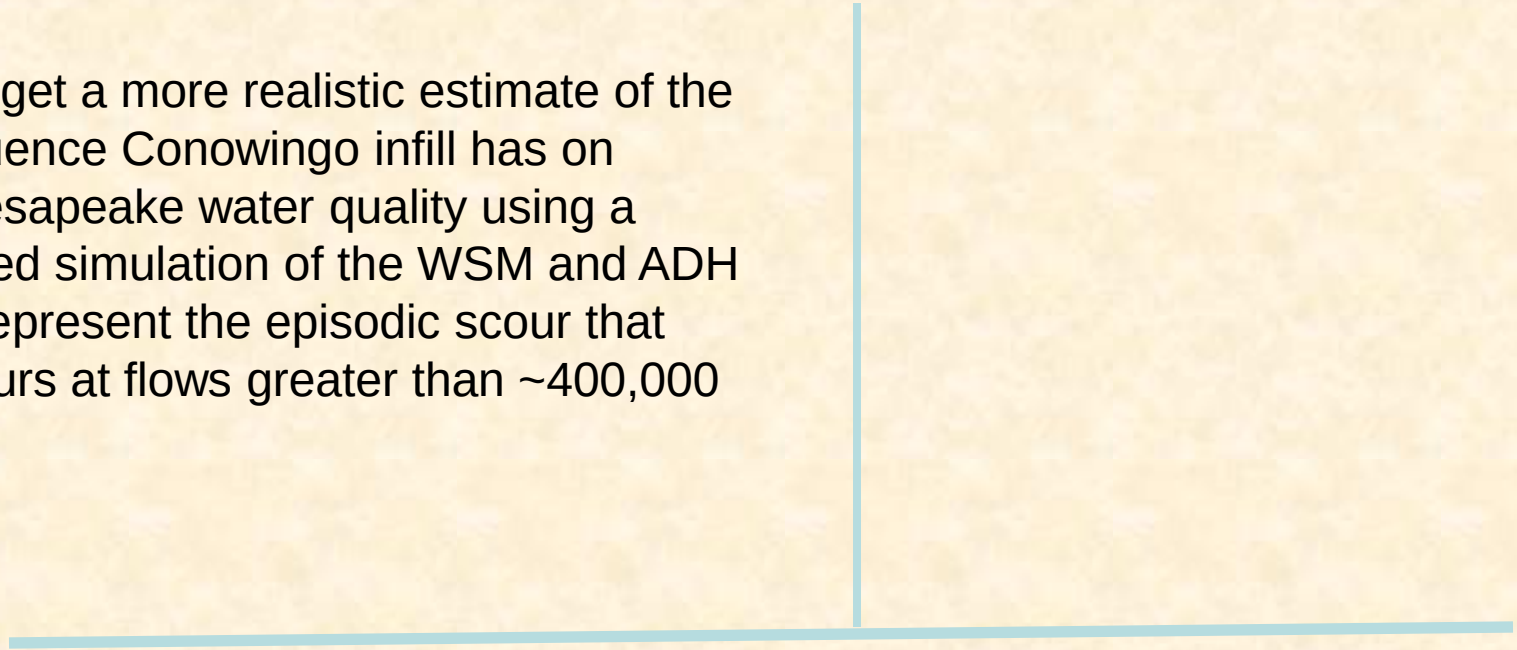
DO Stoplight Decision Rules:

- Applied standard Phase I & II Allocation decision rules of rounding to the nearest whole number of nonattainment and allowing 1% nonattainment for uncertainties in overall analysis procedure.
- A CB4MH and PATMH Deep Water variance of 7%.
- A CB4MH and EASMH Deep Channel variance of 2%.
- A CHSMH Deep Chanel variance of 16%.

When we used the WSM alone to represent scour from the infill state of the Conowingo we set the loads to 100%, 50%, and 0% above Conowingo base to represent loads at the estimated current level of Conowingo infill for TSS, TP, and TN respectively*.

1991 2000

We get a more realistic estimate of the influence Conowingo infill has on Chesapeake water quality using a linked simulation of the WSM and ADH to represent the episodic scour that occurs at flows greater than ~400,000 cfs.



1991 January1996 2000

*Source: Hirsch, R.M., 2012, Flux of nitrogen, phosphorus, and suspended sediment from the Susquehanna River Basin to the Chesapeake Bay during Tropical Storm Lee, September 2011, as an indicator of the effects of reservoir sedimentation on water quality: U.S. Geological Survey Scientific Investigations Report 2012–5185, 17 p.

DO Deep Channel

Where we were in April 2013 when we were using the WSM alone to represent Conowingo infill at 100% TSS increase (estimated current 90% Conowingo infill) and 250% TSS increase (estimated completely filled Conowingo pool).

Cbseg	Scenario → Year → State	2010 No Action N-Based Scenario 371 TN, 37.6 TP, 10630TSS '93-'95 DO Deep Channel	1985 Scenario 353 TN, 24.6 TP, 10100 TSS '93-'95 DO Deep Channel	'91 -'00 Base Scenario 318 TN, 20.3 TP, 9440 TSS '93-'95 DO Deep Channel	2007 Scenario 269 TN, 19.5 TP, 8770 TSS '93-'95 DO Deep Channel	2009 Scenario 266 TN, 19.1 TP, 8520 TSS '93-'95 DO Deep Channel	2010 Scenario 263 TN 19.4 TP 8360 TSS '93-'95 DO Deep Channel	2010 No Conowingo 272 TN 20 TP 9263 TSS '93-'95 DO Deep Channel	2010 scour100% '93-'95 DO Deep Channel	2010 scour250% '93-'95 DO Deep Channel	TMDL Scenario 191 TN 15 TP 6675 TSS '93-'95 DO Deep Channel	TMDL No Conowingo 200 TN 15 TP 7394 TSS '93-'95 DO Deep Channel	TMDL scour100% '93-'95 DO Deep Channel	TMDL scour250% '93-'95 DO Deep Channel	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS '93-'95 DO Deep Channel	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS '93-'95 DO Deep Channel
CB3MH	MD	22%	17%	14%	12%	11%	5%	7%	8%	7%	0%	0%	0%	0%	0%	0%
CB4MH	MD	54%	49%	46%	40%	38%	23%	26%	30%	30%	1.49%	2.73%	3.39%	4.25%	0%	0%
CB5MH	both	22%	17%	15%	10%	9%	0%	1%	2%	3%	0%	0%	0%	0%	0%	0%
CHSMH	MD	45%	39%	39%	36%	36%	28%	34%	31%	34%	15.01%	15.66%	15.66%	18.81%	5%	0%
EASMH	MD	38%	29%	27%	24%	24%	14%	15%	17%	16%	1.09%	2.49%	3.73%	5.33%	0%	0%
MD5MH	MD	31%	25%	24%	19%	17%	2%	4%	8%	8%	0%	0%	0%	0%	0%	0%
PATMH	MD	46%	42%	28%	25%	25%	18%	24%	23%	23%	0%	0%	0%	0%	0%	0%
POMMH	MD	27%	20%	20%	13%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
POTMH	both	27%	20%	20%	13%	10%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
RPPMH	VA	29%	23%	19%	6%	4%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
VA5MH	VA	12%	7%	4%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

DO Deep Channel

Scenario	TMDL Scenario 191 TN 15 TP 6675 TSS	LSRWA_21 TMDL ADH scour Lee nutrient	LSRWA_22 ADH scour 1996 nutrient	LSRWA_23 No storm	LSRWA_24 June storm	LSRWA_25 October storm	LSRWA_26 June storm 1996 nutrient	LSRWA_27 October storm 1996 nutrient	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS
Year	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995
Designated use	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel
CB3MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%
CB4MH	1.53%	1.52%	1.52%	1.52%	1.52%	1.52%	1.52%	1.52%	0%	0%
CB5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%
CHSMH	15.01%	15.01%	15.01%	15.01%	15.01%	15.01%	15.01%	15.01%	2%	0%
POTMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%
POMMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%
RPPMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%
EASMH	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	1.09%	0%	0%
MD5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%
VA5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%
PATMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0%	0%

DO Deep Channel

Scenario	TMDL Scenario 191 TN 15 TP 6675 TSS	LSRWA_21 TMDL ADH scour Lee nutrient	LSRWA_22 ADH scour 1996 nutrient	LSRWA_23 No storm	LSRWA_24 June storm	LSRWA_25 October storm	LSRWA_26 June storm 1996 nutrient	LSRWA_27 October storm 1996 nutrient	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS
Year	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998
Designated use	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel
CB3MH	1.10%	1.40%	1.09%	0.40%	1.47%	0.50%	1.47%	0.50%	0.00%	0.00%
CB4MH	0.47%	1.56%	0.73%	0.07%	3.85%	0.20%	2.53%	0.17%	0.00%	0.00%
CB5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	4.13%	5.27%	5.27%	2.84%	10.50%	5.27%	10.50%	4.13%	2.06%	0.00%
POTMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POMMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RPPMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EASMH	6.09%	6.75%	6.36%	4.46%	7.81%	5.19%	7.41%	5.14%	0.00%	0.00%
MD5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VA5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PATMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

DO Deep Channel

Scenario	TMDL Scenario 191 TN 15 TP 6675 TSS	LSRWA_21 TMDL ADH scour Lee nutrient	LSRWA_22 ADH scour 1996 nutrient	LSRWA_23 No storm	LSRWA_24 June storm	LSRWA_25 October storm	LSRWA_26 June storm 1996 nutrient	LSRWA_27 October storm 1996 nutrient	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS
Year	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000
Designated use	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel	Deep channel
CB3MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB4MH	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	26.46%	26.46%	26.46%	22.31%	26.46%	26.46%	26.46%	26.46%	1.28%	0.00%
POTMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POMMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RPPMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EASMH	1.56%	1.61%	1.56%	1.39%	1.59%	1.57%	1.56%	1.56%	0.00%	0.00%
MD5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
VA5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PATMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Initial DO Findings – Deep Channel:

- The linked WSM-ADH-WQSTM simulation is an improved representation of the dynamic nature of Conowingo scour. No effects of Conowingo are seen before a 400,000 cfs storm, with greatest influence on water quality estimated during the contiguous 3-year period containing the storm, and a subdued to no-effect influence in the subsequent 3-year period.
- Estimates with the refined method are less detrimental in time and space than previous (April 2013) estimates)
- In CB4MH Deep Channel the estimated effect of the 400 cfs event of the January 1996 Big Melt was a decrease in DO attainment of 1% or less for the 3 years following the storm (using the 1996-1998 hydrology).

Initial DO Findings – Deep Channel:

- The No-Storm Scenario Provides an estimate of the “large storm tax” on the CBP TMDL which is about 0.40% of additional DO nonattainment for about 3 years.
- The Big Melt event transposed to June is the most detrimental to DO water quality followed in decreasing influence by the January event, the October event, and the No-Storm event.

DO Deep Water

Where we were in April 2013 when we were using the WSM alone to represent Conowingo infill at 100% TSS increase (estimated current 90% Conowingo infill) and 250% TSS increase (estimated completely filled Conowingo pool).

Cbseg	Scenario → Year → State	2010 No Action N-Based Scenario 371 TN, 37.6 TP, 10630TSS '93-'95 DO Deep Water	1985 Scenario 353 TN, 24.6 TP, 10100 TSS '93-'95 DO Deep Water	'91 -'00 Base Scenario 318 TN, 20.3 TP, 9440 TSS '93-'95 DO Deep Water	2007 Scenario 269 TN, 19.5 TP, 8770 TSS '93-'95 DO Deep Water	2009 Scenario 266 TN, 19.1 TP, 8520 TSS '93-'95 DO Deep Water	2010 Scenario 263 TN 19.4 TP 8360 TSS '93-'95 DO Deep Water	2010 No Conowingo 272 TN 20 TP 9263 TSS '93-'95 DO Deep Water	2010 scour100% '93-'95 DO Deep Water	2010 scour250% '93-'95 DO Deep Water	TMDL Scenario 191 TN 15 TP 6675 TSS '93-'95 DO Deep Water	TMDL No Conowingo 200 TN 15 TP 7394 TSS '93-'95 DO Deep Water	TMDL scour100% '93-'95 DO Deep Water	TMDL scour250% '93-'95 DO Deep Water	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS '93-'95 DO Deep Water	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS '93-'95 DO Deep Water
CB3MH	MD	4%	2%	2%	2%	2%	1%	1%	1%	1%	0%	0%	0%	0%	0%	0%
CB4MH	MD	28%	22%	20%	17%	16%	11%	11%	12%	12%	4.7%	5.5%	5.7%	5.9%	3%	0%
CB5MH	both	7%	5%	4%	3%	3%	2%	2%	2%	2%	0%	0%	0%	0%	0%	0%
CB6PH	VA	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
CHSMH	MD	39%	32%	26%	21%	19%	11%	13%	13%	13%	0%	2.7%	3.3%	3.9%	1%	0%
EASMH	MD	34%	14%	6%	4%	4%	2%	2%	2%	2%	0.90%	1.2%	1.1%	1.1%	0%	0%
MD5MH	MD	14%	10%	9%	7%	7%	4%	4%	5%	5%	0.86%	1.2%	1.3%	1.5%	0%	0%
PATMH	MD	31%	21%	13%	11%	11%	6%	9%	7%	7%	0%	0.9%	1.0%	1.0%	0%	0%
PAXMH	MD	23%	12%	7%	4%	3%	0%	1%	4%	3%	0%	0%	0%	0%	0%	0%
POMMH	MD	10%	5%	4%	2%	2%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
POTMH	both	9%	5%	4%	2%	2%	0%	1%	1%	1%	0%	0%	0%	0%	0%	0%
RPPMH	VA	13%	8%	6%	3%	1%	0%	0%	1%	1%	0%	0%	0%	0%	0%	0%
SBEMH	VA	5%	3%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
VA5MH	VA	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
YRKPH	VA	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

DO Deep Water

Scenario	TMDL Scenario 191 TN 15 TP 6675 TSS	LSRWA_21 TMDL ADH scour Lee nutrient	LSRWA_22 ADH scour 1996 nutrient	LSRWA_23 No storm	LSRWA_24 June storm	LSRWA_25 October storm	LSRWA_26 June storm 1996 nutrient	LSRWA_27 October storm 1996 nutrient	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS
Years	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995	1993-1995
Designated use	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water
CB3MH	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.0%	0.0%
CB4MH	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	0.9%	0.0%
CB5MH	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.0%	0.0%
CB6PH	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%
EASMH	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.9%	0.0%	0.0%
PAXMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
POTMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
POMMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
RPPMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SBEMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
YRKPH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
MD5MH	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	0.0%	0.0%
VA5MH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
PATMH	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.0%	0.0%
SOUMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
SEVMH	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

DO Deep Water

Scenario	TMDL Scenario 191 TN 15 TP 6675 TSS	LSRWA_21 TMDL ADH scour Lee nutrient	LSRWA_22 ADH scour 1996 nutrient	LSRWA_23 No storm	LSRWA_24 June storm	LSRWA_25 October storm	LSRWA_26 June storm 1996 nutrient	LSRWA_27 October storm 1996 nutrient	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS
Years	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998
Designated use	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water
CB3MH	0.69%	0.92%	0.77%	0.69%	0.91%	0.72%	0.69%	0.69%	0.02%	0.00%
CB4MH	6.33%	6.83%	6.44%	5.96%	7.46%	6.25%	7.12%	6.09%	2.99%	0.00%
CB5MH	0.48%	0.53%	0.50%	0.44%	0.61%	0.47%	0.56%	0.46%	0.18%	0.00%
CB6PH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB7PH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EASMH	0.49%	0.49%	0.49%	0.48%	0.54%	0.49%	0.54%	0.49%	0.28%	0.00%
PAXMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POTMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POMMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RPPMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SBEMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
YRKPH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MD5MH	1.37%	1.46%	1.41%	1.29%	1.62%	1.36%	1.52%	1.33%	0.48%	0.00%
VA5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PATMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MAGMH	50.41%	50.41%	50.41%	50.41%	50.41%	50.41%	50.41%	50.41%	0.00%	0.00%
SOUMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SEVMH	5.38%	5.38%	5.38%	4.39%	5.38%	5.38%	5.38%	5.38%	0.00%	0.00%

DO Deep Water

Scenario	TMDL Scenario 191 TN 15 TP 6675 TSS	LSRWA_21 TMDL ADH scour Lee nutrient	LSRWA_22 ADH scour 1996 nutrient	LSRWA_23 No storm	LSRWA_24 June storm	LSRWA_25 October storm	LSRWA_26 June storm 1996 nutrient	LSRWA_27 October storm 1996 nutrient	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS
Years	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000	1998-2000
Designated use	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water	Deep water
CB3MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB4MH	4.61%	5.03%	4.72%	4.46%	4.82%	4.76%	4.65%	4.59%	0.50%	0.00%
CB5MH	0.02%	0.06%	0.02%	0.01%	0.03%	0.03%	0.02%	0.02%	0.00%	0.00%
CB6PH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB7PH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.75%	0.00%
EASMH	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.23%	0.00%	0.00%
PAXMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POTMH	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
POMMH	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
RPPMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SBEMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
YRKPH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MD5MH	0.41%	0.53%	0.41%	0.35%	0.44%	0.44%	0.41%	0.39%	0.00%	0.00%
VA5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
PATMH	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	0.00%	0.00%
MAGMH	35.92%	35.92%	35.92%	35.92%	35.92%	35.92%	35.92%	35.92%	5.93%	0.00%
SOUMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
SEVMH	6.78%	6.78%	6.78%	5.60%	6.78%	6.78%	6.78%	6.78%	0.00%	0.00%

Initial DO Findings – Deep Water:

- As in the case of Deep Channel, no effects of Conowingo infill are estimated before a 400,000 cfs storm event, with greatest influence on water quality estimated during the contiguous 3-year period containing the storm, and a subdued to no-effect influence in the subsequent 3-year period.
- Estimates with the refined method are less detrimental in time and space than previous (April 2013) estimates)
- In CB4MH Deep Water the estimated effect of the 400 cfs event of the January 1996 Big Melt was a decrease in DO attainment of 0.5% or less for the 3 years following the storm (using the 1996-1998 hydrology) followed by a decrease in DO attainment of about 0.4% in the subsequent 1998-2000 period.

Open Water

Scenarios	TMDL Scenario 191 TN 15 TP 6675 TSS	LSRWA_21 TMDL ADH scour Lee nutrient	LSRWA_22 ADH scour 1996 nutrient	LSRWA_23 No storm	LSRWA_24 June storm	LSRWA_25 October storm	LSRWA_26 June storm 1996 nutrient	LSRWA_27 October storm 1996 nutrient	E3 2010 N-Based Scenario 135 TN, 10.4 TP, 4850 TSS	All Forest Scenario 54 TN, 2.6 TP, 1340 TSS
Years	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998	1996-1998
Designated Use	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water	Open Water
CB1TF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB2OH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB3MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB4MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB5MH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB6PH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB7PH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CB8PH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHOMH1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHOMH2	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHOOH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHOTF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHSMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
CHSOH	0.00%	0.00%	0.00%	0.00%	0.20%	0.00%	0.20%	0.00%	0.00%	0.00%
CHSTF	0.00%	0.00%	0.00%	0.00%	0.72%	0.00%	0.72%	0.00%	0.00%	0.00%
EASMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
EBEMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
ELIPH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JMSMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JMSOH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JMSPH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JMSTF	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JMSTFL	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
JMSTFU	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
LAFMH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MOBPH	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Initial DO Findings – Open Water:

- Estimating unchanged DO response and full attainment levels for Open Water DO at the TMDL level of reductions and for all Conowingo scoping scenarios.

Conclusions:

- These are refined findings compared to the previous April results.
- The scoping scenarios of 100% and 250% scour fail to represent the dynamic nature of large storm scour and should be discounted as an unrealistic representation of Conowingo infill's influence on Chesapeake water quality
- The scour of Conowingo Pool under current infill conditions is estimated to have an ephemeral detrimental influence of at most about 1% nonattainment for a few years.