

### Summary of Five Scenarios for the Conowingo

<b>Scenario 1. Constrained Scenario</b>	
Geographic Extent	Counties in the Susquehanna Watershed plus counties in other N-Effective Geobasins.
Primary BMPs	Forest Buffers, Wetland Restoration, Stream Restoration, Living Shorelines
States Included	Maryland, Pennsylvania
N Reduction	6,000,026
Total Annualized Cost	\$367,838,818
Cost Per Pound	\$61.31

<b>N LOADS FOR SCENARIO 1. CONSTRAINED SCENARIO</b>				
<b>STATE</b>	<b>Sector</b>	<b>WIP 3 N EOT</b>	<b>WIP3 Plus 25 N EOT</b>	<b>N Reduction</b>
<b>MD</b>	Agriculture	13,840,672	12,989,629	851,043
	Developed	7,684,437	7,674,370	10,067
	Natural	6,271,233	6,089,006	182,227
	Septic	2,545,801	2,545,801	-
	<b>MD Total</b>	<b>30,342,143</b>	<b>29,298,806</b>	<b>1,043,337</b>
<b>PA</b>	Agriculture	39,428,949	35,123,923	4,305,026
	Developed	14,874,103	14,798,709	75,394
	Natural	17,459,042	16,882,773	576,269
	Septic	1,985,752	1,985,752	-
	<b>PA Total</b>	<b>73,747,846</b>	<b>68,791,157</b>	<b>4,956,689</b>
<b>TOTAL</b>		<b>104,089,990</b>	<b>98,089,964</b>	<b>6,000,026</b>

Annualized Costs by State and Sector for Scenario 1. Constrained Scenario				
	Agriculture	Developed	Natural	Total
<b>MD</b>	7,127,298	2,388,661	55,299,681	64,815,641
<b>PA</b>	73,290,317	12,003,399	217,729,462	303,023,178
<b>Total</b>	80,417,615	14,392,061	273,029,143	367,838,819

Proposed BMPs in Scenario 1 - Constrained Scenario				
Practice	Unit	Maryland	Pennsylvania	Total
<i>Agriculture Practices</i>				
Forest Buffers on Fenced Pasture Corridor	Acres in Buffers	8,580	95,804	104,384
Forest Buffers	Acres in Buffers	16,111	44,960	61,071
Wetland Restoration	Acres	6,586	34,326	40,912
Non Urban Stream Restoration	Feet	419,995	2,959,918	3,379,913
Non Urban Shoreline Management	Feet	773,022	-	773,022
<i>Urban Practices</i>				
BioSwale	Acres	2,415	12,137	14,552
Urban Stream Restoration	Feet	324,384	1,358,957	1,683,341

Scenario 2. WIP Implementation Enhancement	
Geographic Extent	Susquehanna Basin Plus N-Effective LRSs outside the Susquehanna.
Primary BMPs	All BMPs at the WIP3 Implementation Level
N Reduction	6,098,728 lbs.
Total Annualized Cost	235,908,443
Cost Per Pound	\$38.68

N LOADS FOR SCENARIO 2. WIP 3 PLUS 25%				
STATE	Sector	WIP 3 N EOT	WIP3 Plus 25 N EOT	N Reduction
DE	Agriculture	1,206,209	1,075,719	130,489
	Developed	264,208	250,857	13,352
	Natural	176,331	173,131	3,199
	Septic	56,121	53,468	2,653
	<b>DE Total</b>	<b>1,799,438</b>	<b>1,649,745</b>	<b>149,694</b>
MD	Agriculture	3,571,216	3,233,321	337,895
	Developed	2,147,369	2,099,466	47,903
	Natural	1,557,861	1,533,448	24,412
	Septic	837,096	825,800	11,296
	<b>MD Total</b>	<b>8,874,894</b>	<b>8,453,387</b>	<b>421,507</b>
NY	Agriculture	4,918,504	4,654,984	263,520
	Developed	1,398,622	1,248,440	150,182
	Natural	2,844,262	2,814,968	29,295
	Septic	176,675	176,675	-
	<b>NY Total</b>	<b>11,432,120</b>	<b>10,989,124</b>	<b>442,996</b>
PA	Agriculture	35,795,450	31,291,008	4,504,443
	Developed	14,064,630	13,847,623	217,007
	Natural	16,487,560	16,284,325	203,235
	Septic	1,767,113	1,722,399	44,714
	<b>PA Total</b>	<b>76,100,989</b>	<b>71,131,590</b>	<b>4,969,399</b>
VA	Agriculture	590,902	512,982	77,920
	Developed	132,627	125,614	7,012
	Natural	198,344	192,908	5,436
	Septic	28,758	27,046	1,712
	<b>VA Total</b>	<b>968,785</b>	<b>876,704</b>	<b>92,081</b>
WV	Agriculture	219,951	208,491	11,460
	Developed	148,966	148,234	732
	Natural	282,158	280,795	1,363
	Septic	27,776	27,279	497
	<b>WV Total</b>	<b>813,682</b>	<b>799,630</b>	<b>14,052</b>
<b>TOTAL</b>	<b>99,989,907.74</b>	<b>99,989,907</b>	<b>93,900,179</b>	<b>6,089,728</b>

Annualized Costs by State and Sector for Scenario 2. WIP 3 Plus 25%					
	Agriculture	Developed	Natural	Septic	Total
<b>DE</b>	2,635,272	2,063,607	1,644,871	1,405,222	<b>7,748,972</b>
<b>MD</b>	4,160,624	11,394,309	11,247,559	4,177,592	<b>30,980,084</b>
<b>NY</b>	14,736,078	57,419,493	288,990	-	<b>72,444,561</b>
<b>PA</b>	41,749,277	45,334,120	22,519,019	6,211,214	<b>115,813,630</b>
<b>VA</b>	1,824,054	3,931,166	1,585,852	1,046,643	<b>8,387,715</b>
<b>WV</b>	180,534	286,337	15,115	51,495	<b>533,481</b>
<b>Total</b>	<b>65,285,839</b>	<b>120,429,032</b>	<b>37,301,407</b>	<b>12,892,165</b>	<b>235,908,443</b>

Scenario 3. Bay-Wide Cost-Effective Agriculture	
Geographic Extent	N-Effective Segments Throughout the Bay Watershed
Primary BMPs	<ul style="list-style-type: none"> <li>• Nutrient Application Management Core Nitrogen, Rate, Placement, and Timing</li> <li>• Conservation, High-Residue, and Low-Residue Tillage</li> <li>• Prescribed Grazing</li> <li>• Grass and Forest Buffers</li> <li>• Wetland Restoration</li> <li>• Soil and Water Conservation Plan</li> <li>• Manure Incorporation</li> <li>• Barnyard Runoff Controls</li> </ul>
N Reduction	6,376,678 lbs/yr
Total Annualized Cost	\$50,987,795/yr
Cost Per Pound	\$7.99

N LOADS FOR SCENARIO 3. BAY-WIDE COST-EFFECTIVE AGRICULTURE <sup>1</sup>				
STATE	Sector	WIP 3 N EOT	WIP3 Plus 25 N EOT	N Reduction
DE	Agriculture	2,104,913	2,104,332	581
	Developed	427,933	427,933	-
	Natural	316,614	316,589	25
	Septic	114,768	114,768	-
	<b>DE Total</b>	<b>2,964,228</b>	<b>2,963,622</b>	<b>606</b>
MD	Agriculture	14,379,353	13,080,247	1,299,106
	Developed	7,620,554	7,620,554	-
	Natural	6,230,638	6,184,525	46,113
	Septic	2,551,945	2,551,945	-
	<b>MD Total</b>	<b>30,782,491</b>	<b>29,437,272</b>	<b>1,345,219</b>
PA	Agriculture	42,335,501	37,608,018	4,727,483
	Developed	14,878,339	14,878,339	-
	Natural	17,575,268	17,410,473	164,795
	Septic	1,985,768	1,985,768	-
	<b>PA Total</b>	<b>76,774,876</b>	<b>71,882,598</b>	<b>4,892,278</b>
VA	Agriculture	7,619,879	7,496,459	123,420
	Developed	4,351,743	4,351,743	-
	Natural	5,013,391	5,008,026	5,365
	Septic	1,063,019	1,063,019	-
	<b>VA Total</b>	<b>18,048,032</b>	<b>17,919,247</b>	<b>128,785</b>
WV	Agriculture	2,407,593	2,398,867	8,726
	Developed	1,008,137	1,008,137	-
	Natural	2,176,604	2,175,540	1,064
	Septic	284,212	284,212	-
	<b>WV Total</b>	<b>5,876,547</b>	<b>5,866,757</b>	<b>9,790</b>
<b>TOTAL</b>	<b>99,989,907.74</b>	<b>134,446,174</b>	<b>128,069,495</b>	<b>6,376,678</b>
1: The loads reported in this table are adjusted to equate to nitrogen reductions from the Susquehanna, using the methods described in Appendix XX.				

<b>Annualized Costs by State and Sector for Scenario 3 - Cost-Effective Agriculture in the Chesapeake Watershed</b>	
	<b>Agriculture</b>
<b>DE</b>	(2,059)
<b>MD</b>	6,241,295
<b>NY</b>	--
<b>PA</b>	44,385,635
<b>VA</b>	169,432
<b>WV</b>	193,491
<b>Total</b>	<b>50,987,795</b>

<b>BMPs Implemented In Scenario 3.</b>			
<b>Cost-Effective Agriculture in the Chesapeake Watershed</b>			
<b>Practice</b>	<b>Duration</b>	<b>Unit</b>	<b>Amount</b>
Nutrient Application Management Core Nitrogen	annual	Acres	497,108
Nutrient Application Management Rate Nitrogen	annual	Acres	680,286
Nutrient Application Management Placement Nitrogen	annual	Acres	230,891
Nutrient Application Management Timing Nitrogen	annual	Acres	644,867
Conservation Tillage	annual	Acres	160,978
High Residue Tillage	annual	Acres	63,263
Low Residue Tillage	annual	Acres	81,069
Prescribed Grazing	cumulative	Acres	127,102
Forest Buffers	cumulative	Acres in Buffers	11,882
Wetland Restoration	cumulative	Acres	14,480
Grass Buffers	cumulative	Acres in Buffers	46,762
Soil and Water Conservation Plan	cumulative	Acres	432,625
Manure Incorporation	annual	Acres	166,857
Barnyard Runoff Control	cumulative	Acres	1,309



Scenario 4. Susquehanna Watershed Cost-Effective Agriculture	
Geographic Extent	N-Effective Segments Within the Susquehanna Watershed
Primary BMPs	<ul style="list-style-type: none"> <li>• Nutrient Application Management Core Nitrogen, Rate, Placement, and Timing</li> <li>• Conservation, High-Residue, and Low-Residue Tillage</li> <li>• Prescribed Grazing</li> <li>• Grass and Forest Buffers</li> <li>• Wetland Restoration</li> <li>• Soil and Water Conservation Plan</li> <li>• Manure Incorporation</li> <li>• Barnyard Runoff Controls</li> </ul>
N Reduction	6,615,658 lbs/yr
Total Annualized Cost	\$51,032,822/yr
Cost Per Pound	\$7.71

N LOADS FOR SCENARIO 4. SUSQUEHANNA COST-EFFECTIVE AGRICULTURE				
STATE	Sector	WIP 3 N EOT	WIP3 Plus 25 N EOT	N Reduction
MD	Agriculture	783,258	628,688	154,569
	Developed	338,577	338,577	-
	Natural	261,156	254,545	6,610
	Septic	198,843	198,843	-
	<b>MD TOTAL</b>	<b>1,581,834</b>	<b>1,420,654</b>	<b>161,180</b>
NY	Agriculture	5,980,815	5,832,273	148,541
	Developed	1,398,622	1,398,622	-
	Natural	2,922,999	2,915,574	7,425
	Septic	176,675	176,675	-
	<b>NY Total</b>	<b>10,479,111</b>	<b>10,323,144</b>	<b>155,966</b>
PA	Agriculture	38,269,615	32,142,759	6,126,856
	Developed	13,936,730	13,936,730	-
	Natural	16,439,618	16,268,052	171,566
	Septic	1,724,857	1,724,857	-
	<b>PA Total</b>	<b>70,370,820</b>	<b>64,072,398</b>	<b>6,298,422</b>
<b>TOTAL</b>		<b>82,431,764</b>	<b>75,816,196</b>	<b>6,615,658</b>

<b>Annualized Costs by State and Sector for Scenario 4 - Cost-Effective Agriculture in the Susquehanna Basin</b>				
	<b>Agriculture</b>	<b>Developed</b>	<b>Natural</b>	<b>Total</b>
<b>MD</b>	1,073,475.53	3,813	-	1,073,475
<b>NY</b>	1,742,223.20	65,371	-	1,742,223
<b>PA</b>	48,216,777.10	5,133,682	348	48,217,124
<b>Total</b>	<b>51,032,475.83</b>	<b>5,202,867</b>	<b>348</b>	<b>51,032,822</b>

<b>BMPs Implemented In Scenario 4. Cost-Effective Agriculture in the Susquehanna Watershed</b>			
<b>Practice</b>	<b>Duration</b>	<b>Unit</b>	<b>Amount</b>
Nutrient Application Management Core Nitrogen	annual	Acres	305,137
Nutrient Application Management Rate Nitrogen	annual	Acres	668,563
Nutrient Application Management Placement Nitrogen	annual	Acres	227,905
Nutrient Application Management Timing Nitrogen	annual	Acres	673,548
Conservation Tillage	annual	Acres	214,027
High Residue Tillage	annual	Acres	45,579
Low Residue Tillage	annual	Acres	9,616
Prescribed Grazing	cumulative	Acres	94,269
Forest Buffers	cumulative	Acres in Buffers	22,729
Wetland Restoration	cumulative	Acres	12,479
Grass Buffers	cumulative	Acres in Buffers	24,117
Soil and Water Conservation Plan	cumulative	Acres	204,016
Manure Incorporation	annual	Acres	200,029
Barnyard Runoff Control	cumulative	Acres	755

Scenario 5. Susquehanna Watershed Cost-Effective Agriculture – Urban Equity	
Geographic Extent	N-Effective Segments Within the Susquehanna Watershed
Primary BMPs	<u>Agricultural</u> <ul style="list-style-type: none"> <li>Nutrient Application Management Core Nitrogen, Rate, Placement, and Timing</li> <li>Conservation, High-Residue, and Low-Residue Tillage</li> <li>Prescribed Grazing</li> <li>Grass and Forest Buffers</li> <li>Wetland Restoration</li> <li>Soil and Water Conservation Plan</li> <li>Manure Incorporation</li> <li>Barnyard Runoff Controls</li> </ul> <u>Urban</u> <ul style="list-style-type: none"> <li>Forest Planting</li> <li>Forest Buffers</li> </ul>
N Reduction	6,601,250 lbs/yr
Total Annualized Cost	\$51,298,783/yr
Cost Per Pound	\$7.77

N LOADS FOR SCENARIO 5. SUSQUEHANNA COST-EFFECTIVE AG PLUS URBAN EQUITY				
STATE	Sector	WIP 3 N EOT	WIP3 Plus 25 N EOT	N Reduction
MD	Agriculture	783,258	640,063	143,195
	Developed	338,577	337,807	770
	Natural	261,156	255,091	6,065
	Septic	198,843	198,843	-
	<b>MD TOTAL</b>	<b>1,581,834</b>	<b>1,431,804</b>	<b>150,030</b>
NY	Agriculture	5,980,815	5,839,376	141,438
	Developed	1,398,622	1,393,111	5,510
	Natural	2,922,999	2,916,291	6,708
	Septic	176,675	176,675	-
	<b>NY Total</b>	<b>10,479,111</b>	<b>10,325,454</b>	<b>153,657</b>
PA	Agriculture	38,269,615	32,704,182	5,565,433
	Developed	13,936,730	13,299,229	637,501
	Natural	16,439,618	16,344,989	94,629
	Septic	1,724,857	1,724,857	-
	<b>PA Total</b>	<b>70,370,820</b>	<b>64,073,256</b>	<b>6,297,563</b>
<b>TOTAL</b>		<b>82,431,764</b>	<b>75,830,514</b>	<b>6,601,250</b>

Annualized Costs by State and Sector for Scenario 5 - Susquehanna Agriculture Plus Urban				
	Agriculture	Developed	Natural	Total
<b>MD</b>	968,173	3,813	-	971,986
<b>NY</b>	1,613,846.37	65,371	-	1,679,217
<b>PA</b>	43,513,566	5,133,682	330	48,647,578
<b>Total</b>	<b>46,095,585</b>	<b>5,202,867</b>	<b>330</b>	<b>51,298,783</b>

BMPs Implemented In Scenario 5. Cost-Effective Agriculture in the Susquehanna Watershed			
Practice	Duration	Unit	Amount
<i>Agricultural Practices</i>			
Nutrient Application Management Core Nitrogen	annual	Acres	305,137
Nutrient Application Management Rate Nitrogen	annual	Acres	668,563
Nutrient Application Management Placement Nitrogen	annual	Acres	227,905
Nutrient Application Management Timing Nitrogen	annual	Acres	673,548
Conservation Tillage	annual	Acres	214,027
High Residue Tillage	annual	Acres	45,579
Low Residue Tillage	annual	Acres	9,616
Prescribed Grazing	cumulative	Acres	94,269
Forest Buffers	cumulative	Acres in Buffers	22,729
Wetland Restoration	cumulative	Acres	12,479
Grass Buffers	cumulative	Acres in Buffers	24,117
Soil and Water Conservation Plan	cumulative	Acres	204,016
Manure Incorporation	annual	Acres	200,029
Barnyard Runoff Control	cumulative	Acres	755
<i>Urban Practices</i>			
Urban Forest Planting	annual	Acres	17,148
Urban Forest Buffers	annual	Acres	48,858

Scenario 6. Conowingo Geography Cost-Effective Agriculture and Urban	
Geographic Extent	Conowingo Shell Geography
Primary BMPs	<u>Agricultural</u> <ul style="list-style-type: none"> <li>• Nutrient Application Management Core Nitrogen, Rate, Placement, and Timing</li> <li>• Conservation, High-Residue, and Low-Residue Tillage</li> <li>• Prescribed Grazing</li> <li>• Grass and Forest Buffers</li> <li>• Wetland Restoration</li> <li>• Soil and Water Conservation Plan</li> <li>• Manure Incorporation</li> <li>• Barnyard Runoff Controls</li> </ul> <u>Urban</u> <ul style="list-style-type: none"> <li>• Forest Planting</li> <li>• Forest Buffers</li> <li>• Bioswales</li> <li>• Tree Planting</li> </ul>
N Reduction	6,243,685 lbs/yr
Total Annualized Cost	\$123,619,243 /yr
Cost Per Pound	\$19.80/lb

N LOADS FOR SCENARIO 6. CONOWINGO GEOGRAPHY COST-EFFECTIVE AGRICULTURE AND URBAN				
STATE	Sector	WIP3NEOT	WIP3Plus25NEOT	N Reduction
DE	Agriculture	1,983,262	1,983,262	0
	Developed	427,933	412,816	15,117
	Natural	312,818	313,378	(560)
	Septic	114,768	114,768	-
	<b>DE TOTAL</b>	<b>2,838,782</b>	<b>2,824,224</b>	<b>14,557</b>
MD	Agriculture	13,753,701	12,431,894	1,321,808
	Developed	7,506,292	7,409,499	96,793
	Natural	6,150,235	6,102,731	47,504
	Septic	2,487,337	2,487,337	-
	<b>MD TOTAL</b>	<b>29,897,565</b>	<b>28,431,460</b>	<b>1,466,105</b>
NY	Agriculture	5,943,637	5,820,242	123,394
	Developed	1,398,622	1,329,096	69,525
	Natural	2,919,663	2,908,578	11,085
	Septic	176,675	176,675	-
	<b>NY Total</b>	<b>10,438,596</b>	<b>10,234,592</b>	<b>204,004</b>
PA	Agriculture	39,428,949	35,469,786	3,959,164
	Developed	14,874,103	14,440,619	433,483
	Natural	17,459,042	17,292,670	166,372
	Septic	1,985,752	1,985,752	-
	<b>PA Total</b>	<b>73,747,846</b>	<b>69,188,828</b>	<b>4,559,019</b>
<b>TOTAL</b>		<b>116,922,790</b>	<b>110,679,104</b>	<b>6,243,685</b>

Annualized Costs by State and Sector for Scenario 6 - Conowingo Geography Cost-Effective Agriculture and Urban			
	Agriculture	Developed	Total
DE	1	1,717,564	1,717,565
MD	8,079,028	16,889,962	24,968,990
NY	1,497,349	9,507,169	11,004,518
PA	52,828,830	33,099,340	85,928,171
<b>Total</b>	<b>62,405,207.83</b>	<b>61,214,035.51</b>	<b>123,619,243</b>

BMPs Implemented In Scenario 6. Conowingo Geography Cost-Effective Agriculture and Urban			
Practice	Duration	Unit	Amount
<i>Agricultural Practices</i>			

Nutrient Application Management Core Nitrogen	annual	Acres	431,387
Nutrient Application Management Rate Nitrogen	annual	Acres	947,997
Nutrient Application Management Placement Nitrogen	annual	Acres	262,838
Nutrient Application Management Timing Nitrogen	annual	Acres	881,464
Conservation Tillage	annual	Acres	309,116
High Residue Tillage	annual	Acres	94,744
Low Residue Tillage	annual	Acres	296
Prescribed Grazing	cumulative	Acres	202,221
Wetland Restoration	cumulative	Acres	19,574
Grass Buffers	cumulative	Acres in Buffers	63,640
Soil and Water Conservation Plan	cumulative	Acres	671,244
Manure Incorporation	annual	Acres	85,798
Barnyard Runoff Control	cumulative	Acres	2,104
<i>Ur ban Practices</i>			
Bioswales	Cumulative	Acres Treated	58,837
Urban Forest Buffers	Cumulative	Acres in Buffers	19,323
Urban Forest Planting	Cumulative	Acres	13,206
Urban Forest Buffers	Cumulative	Acres	13,519