Comment Response Document
Regarding the Total Maximum Daily Loads (TMDLs) of Nitrogen and Phosphorus for the Assawoman Bay, Isle of Wight Bay, Sinepuxent Bay, Newport Bay and Chincoteague Bay in the Coastal Bays Watershed in Worcester County, Maryland

The Maryland Department of the Environment (MDE) has conducted a public review of the proposed Nitrogen and Phosphorus TMDL for the Maryland Coastal Bays, Assawoman Bay, Isle of Wight Bay, Sinepuxent Bay, Newport Bay and Chincoteague Bay. The public comment period was open from January 2, 2014 through February 17, 2014. MDE received ten sets of written comments.

The commentors, their affiliations, the date comments were submitted, and the numbered references to the comments submitted are identified below. In the pages that follow, comments are summarized and listed with MDE's response.

List of Commentors

Author	Affiliation	Date	Comment Number
Kathy Phillips	Assateague Coastkeeper	January 3, 2014	1
		January 22, 2014	2
Robert Mitchell/Ed Tudor	Department of Environmental Programs/Department of Public Works, Worcester County, MD	February 14, 2014	3-11
Lora Harris	University of Maryland Center for Environmental Science Chesapeake Biological Laboratory	February 17, 2014	12-13
Liz McKercher/Craig Lott	Virginia Department of Environmental Quality (VADEQ)	February 14/17, 2014	14-17
Robert Ritter, Jr.	Town of Chincoteague, Virginia	February 10, 2014	18-24
Steve Miner, Ed. D.	Accomack County, Virginia	February 14, 2014	25-29
Kathy Phillips Abel Russ	Assateague Coastkeeper Environmental Integrity Project	February 17, 2014	30-34
Roman Jesien	On Behalf of the Maryland Coastal Bays Program (MCBP) Scientific and Technical Advisory Committee	February 18, 2014	35-41
Bruce Michael	Maryland Department of Natural Resources (DNR)	February 18, 2014	36, 38-46

Comments and Responses

1. The commentor requests an extension of the public comment period for an additional 60 days ending the public comment period on April 18, 2014.

Response: MDE recognizes the importance of public participation in the development of TMDLs and goes beyond the minimum regulatory requirements to promote public involvement. In MDE's written materials and oral presentations, staff clearly and proactively solicited the participation of anyone who wants to be involved in the technical aspects of the TMDL development process. In the present case, letters have been forwarded to interested parties at various points during the development process, various meetings have been conducted and updates provided during the development process. A public meeting was held on January 16, 2014 from 4:30PM – 6:30PM at the Ocean Pines Branch of the Worcester County Library to facilitate the public in their review of the TMDL documentation.

In addition to giving ample advanced notice of the TMDL development schedule and opportunity for interested stakeholders to engage the process, MDE conducted a public comment period longer than the statutory requirements for the draft TMDL. As part of the formal public review process, MDE conducted a direct mailing to interested parties, including the commentor. Of note, the TMDL is not a permit and a 60-day extension is not required under 1-606(d)(1)(ii) of the Environment Article in the Annotated Code of Maryland. In view of the substantial public outreach efforts described and the willingness of MDE to consider proposing changes to the TMDL based on findings of future independent reviews, MDE denied the request to extend the comment period. A determination on this matter is within the discretion of the Department. State law does not provide a right to a contested case hearing or other agency adjudication on this decision.

2. The commentor thanks the Department for hosting the public informational meeting on the referenced TMDL. The commentor continues stating that in reviewing the documentation the commentor noticed the appearance of increased loadings from the phosphorus baseline loads to the average annual TMDL for Assawoman Bay and Sinepuxent Bay. Please explain.

Response: After looking into the commentor's observations, it appears that there is a typo in the baseline load table. The typo has been corrected in Table 5 and Figure 4 has been modified. Figures in Appendices A and B were also corrected to accurately reflect the baseline load contributions. Thank you for identifying the error.

3. The commentor references Table B3 and states the Mountaire Poultry Processing Plant was listed as a point source. This plant discharges to the Selbyville WWTP which provides secondary and tertiary treatment and discharges treated effluent to the Atlantic Ocean through ocean outfall. The loading numbers look very high as well for outfall #2 to be stormwater outfall.

   Response: The allocation provided to this facility is for stormwater effluent only. Other surface discharges associated with the facility are as the commentor stated. Staff from Delaware DNREC estimated the TN and TP loads from outfall 002 based on an extrapolation of the annual DMR TN/TP concentrations and flow data to rainfall data over the same time period and the Outfall 002 drainage area. No delivery factor was assumed, since there is no means of estimating attenuation within the dry ditch and grass swale that conveys runoff from the holding area to the receiving stream.

4. The commentor references the Captains Cove community is not included in Table E3, in the list of point sources for the Chincoteague Bay watershed. This community has septics for the non-waterfront lots and the waterfront lots, the amenities, and a limited number of other homes have their sewage treated the [by] the community's wastewater facility. From past sanitary survey reports from Virginia, the commentor has seen numbers indicating 80% of the homes there are on septic, while the remaining 20% are sewered. They have an adjacent intensely developed property, Trails End Campground, which is situated upon 710 acres with 2,500 campsites, of which approximately 500+ have septic systems. They also have 24 existing comfort stations which service 108 lots each.

   Response: During the calibration and modeling time period, Captain's Cove had a permit type identified as VPA (Virginia Pollution Abatement). These permits may be issued by Virginia Department of Environmental Quality (VADEQ) whenever an owner handles waste and wastewater in a manner that does not involve discharging to a sewage treatment work, or to state waters pursuant to a valid Virginia Pollutant Discharge Elimination System (VPDES) permit. In general, land application of biosolids, industrial sludge or spray irrigation of industrial and municipal wastewater is covered by a VPA individual permit. For Captain's Cove, the permit number given to MDE was VPA01005. Since there is no available discharge information associated with VPA permits, MDE only included VPDES permits in the modeling. The septic units referenced by the commentor are captured by the methodology MDE used to identify, count, and estimate baseline septic loads.

5. The commentor has concerns with the assumption for the number of septic systems per watershed. The commentor has the following data to share and suggests that the data be exchanged to make sure the correct loadings are accounted for septics in the model:

Watershed	Septics Critical Area (TMDL Draft)	Septics Outside Critical Area (TMDL)	County # Septics Critical Area	County # Septics outside Critical Area
Assawoman/Grey's Creek	214	71	204	10
IOW & Tributaries	1350	458	631	1171
Sinepuxent Bay	251	95	173	99
Newport Bay	763	288	287	789
Chincoteague Bay	682	303	184	542

   Response: MDE thanks the commentor for providing the additional (recent) data. For septic numbers, MDE used data available for the modeling period (2001-2004). The data provided by the commentor indicate fewer septics at this later point in time. During the development and execution of the implementation plan, it will be important to track changing numbers of septics (and for that matter, changing loads from any sector). The change over time in the number of septics does not affect the system's capacity to assimilate nutrient loads. During implementation, various components of the load allocation may be rearranged, so long as the overall cap is not exceeded.

6. The commentor states the Manklin Creek sub-watershed shows an inordinate amount of septic influence when septics are not present in sufficient quantity in this sub-watershed to support the proposal loading presented in the TMDL. The majority of this sub-watershed is served by sewer.

   Response: As described in Comment 5, the modeling and baseline conditions reflect the simulation period of 2001 – 2004, and do not reflect changes since then. Again, tracking the changing loads from septic systems, as well as shifts in relative contributions among various source sectors, is important for tracking the implementation process.

7. The commentor attached two runs on the land cover /land use acreage for Worcester County from 2002 and 2010. The commentor wonders if this difference would allow for more precise inputs to the model.

   Response: MDE used Worcester County's land use/land cover data available for the model calibration time period, and further processing was necessary to render it compatible with the capabilities of the watershed model. As above, this new information will be useful during the implementation process.

8. The commentor references WSM segment (Table E5) 186 is not included in with MD or VA tables for septic loading. Is this segment 186 a part of any watershed in these 2 states? The commentor is wondering what are the boundaries because it does have a significant septic component and the WSM segment is not listed as part of MD or VA in Table E1.

   Response: In the public draft version of the document, Segment 186 is identified in Table B5 in the Isle of Wight Bay watershed.

9. The commentor states the Ocean Pines WWTP previously had a flow of 3.0 MGD in the TMDL for the Northern Coastal Bays system in 2001. Table B3 of this draft TMDL lists this as having an Isle of Wight Bay watershed a 2.5 MGD discharge. The commentor would like this point source's discharge to be more reflective of what the ultimate build out of the plant will become. This is especially relevant when the nutrient loading permitted in their discharge permit, coupled with their nutrient treatment level would allow for a higher discharge flow then is reflected in Table B3.

   Response: In the public draft of the document, this error has been fixed, and the documentation is consistent with current permits.

10. The commentor states they do understand the points that our partners made regarding phosphorus contributions from septics in their previous comments. Presently, Maryland does not calculate phosphorus contributions from septics other than to add 0.7lbs/system/year to the phosphorus loading of a point source WWTP for each septic hookup they complete. However, it is fair to point out that there are mechanisms for removing phosphorus in the soil system; they are complex not completely understood on a microscale. A cursory review of research that was done during Maryland's best available

technology (BAT) septic regulation process reveals that many times it is uncertain whether or not phosphorus is being absorbed or precipitated in the soil system. The research review also revealed that the removal and immobilization of phosphorus is dependent upon the ability of sorption sites to bind it. Many soil types have a high capacity too for sorption of phosphorus and these are the clay and organic fraction in the soil. It would follow that sandy solid typically have lower capacities than clayey soils. Absent a significant clay fraction, organic matter can provide phosphorus adsorption sites. The septic setback from the shorelines would also demonstrate that the septic effluent would flow with the groundwater for some time before joining surface waters, especially for systems outside the critical area. This would provide sorption possibilities after effluent water exited the vadose (unsaturated) zone. This would greatly increase the amount of soil available to sorb the phosphorus before it reaches surface waters. We have favorable conditions for sorption of phosphorus to occur in areas of concentrated septic installations within the predominant soil types in the Maryland Coastal Bays critical areas. On the Maryland side, the course sandy soils are predominantly not present in critical area locations where dense septic installations still exist. That is not the case on the Virginia side, where dense septic installations exist on sandy soils on the eastern and western shores of Chincoteague Bay. This may merit further investigation on the Maryland side, but if phosphorus contributions from septic were to be included, they should be included statewide on TMDLs, not just for the coastal bays.

Response: MDE appreciates the County's comment regarding phosphorus in septic effluent. In accounting for septics during TMDL development, Maryland uses loading assumptions developed by the Chesapeake Bay Program Office, based on research conducted by the Chesapeake Bay Partnership, and approved by the U.S. EPA (MDE 2009). This methodology assumes no phosphorus delivery. Additionally, MDE conducted an analysis to gauge the potential impact of including phosphorus contributions from septic systems. To do this, additional TP loads to the overall Coastal Bays system were estimated using the assumptions in the Delaware Inland Bays TMDL. Doing this would add 1,088 lbs/yr to the baseline, which is an increase of 0.73%, not including loss from a delivery factor. If including a delivery factor, the additional load would be 0.04% of the total phosphorus load. MDE thus concludes that the effect of including septic-sourced phosphorus in the TMDL analysis would be negligible in comparison to other sources.

11. The commentor states the nitrogen contribution from the wastewater spray systems is a derived nutrient load we have not seen before attributed to a "point source". We are wondering if the actual nitrogen concentrations were factored in for the non-growing season for all the forms of nitrogen after treatment. The ENR plants have advanced treatment and their concentration for soluble (or plant available-PAN) nitrogen are in fractions of parts per million. The whole numbers for total nitrogen after treatment at this level are predominantly organic nitrogen. This is not going to be a readily available form for uptake and will most probably remain in the soil until nitrified by soil bacteria and made available for plant uptake the next growing season.

    Response: Prior to application, spray irrigation facilities located in the Maryland Coastal Bays watershed do not treat effluent to the level accomplished with enhanced nitrogen reduction (ENR) techniques. While nitrogen loads are generally reported as total nitrogen (TN) in the TMDL documentation, the modeling used in the TMDL development did simulate various nitrogen species.

12. The commentor states that in collaboration with Dr. Mark Brush at Virginia Institute of Marine Science (VIMS), they have been working to develop a numerical modeling suite to predict water quality in the Delmarva coastal lagoons in an effort funded by the Sea Grant programs in Delaware, Maryland and Virginia. The commentor continues that many environmental management efforts underway consider multiple models. In addition to the HSPF computed loads that are included in the draft TMDL, the commentor would like to submit the following nitrogen loads estimated using a modified version of the "NLM" previously developed by Valiela et al. (1997). These estimates include poultry and tomato agriculture loads as amendments to the original model and are currently included in a manuscript in preparation (Brush et al. in prep). As can be expected based on the different model assumption and data used for parameterization, our estimates differ from those in the TMDL.

State	Watershed	WS Area (acres)	Bay Area (acres)	Annual Load (lbs N y^{-1})	WS Export (lbs N $acre^{-1}$ WS y^{-1})	Areal Load (lbs N $acre^{-1}$ WB y^{-1})
DE	Rehoboth	36,844	9,118	243,198	6.6	26.7
DE	Indian River	105,454	9,917	616,906	5.8	62.2
DE-MD	Little Assawoman	19,322	2,510	116,092	6.0	46.2
DE-MD	Assawoman	9,814	6,237	94,264	9.6	15.1
DE-MD	St. Martin's River	27,952	2,011	149,904	5.4	74.5
MD	Turville Creek	9,866	1,014	38,979	4.0	38.4
MD	Isle of Wight	1,717	4,279	56,620	33.0	13.2
MD	Sinepuxent	5,376	5,850	53,205	9.9	9.1
MD	Newport	25,025	3,537	175,302	7.0	49.6
MD-VA	Chincoteague	41,793	63,913	721,803	17.3	11.3
VA	Mosquito Creek	9,840		60,008	6.1	
VA	Simoneaston	583	247	3,325	5.7	13.5
VA	Bogues	3,517	2,181	57,491	16.3	26.4
VA	South Bogues	7,394		242,833	32.8	
VA	Kegotank	3,100	526	27,708	8.9	52.7
VA	Gargathy	6,823	295	50,537	7.4	171.1
VA	Metompkin	9,466	3,105	603,974	63.8	194.5
VA	North Burton	6,521		41,801	6.4	
VA	Burton's	14,013	4,106	108,007	7.7	26.3
VA	Bradford	998	1,615	13,271	13.3	8.2
VA	Upshur	681	3,815	21,255	31.2	5.6
VA	Hog Island	27,798	25,276	261,197	9.4	10.3
VA	Ramshorn	8,969	4,988	94,396	10.5	18.9
VA	Mockhorn	6,700	3,947	71,138	10.6	18.0
VA	Magothy	6,630	6,004	75,277	11.4	12.5

WS = Watershed WB=Water Body (lagoon)

Response: MDE appreciates the commentors' information regarding the NLM model. As the commentors indicate, different models, using differing assumptions, data, time periods and algorithms, will invariably arrive at estimates with some degree of disparity. MDE encourages the commentors to collaborate with various stakeholders and entities during the implementation process, as the use of multiple tools can result in a more robust implementation plan.

13. The commentor states they also have a water quality lagoon ecosystem model under development that examines the response of primary producers to changed nitrogen loads, including phytoplankton, benthic microalgae, macroalgae and SAV. The commentor suggests that an effort to discuss the differences and similarities in modeling approaches and simulation output might result in a broader understanding of the Coastal Bays response to nutrient management.

    Response: Again, MDE appreciates the work the commentors have underway. MDE encourages the use of any and all appropriate and available tools and techniques during the implementation process. If multiple approaches are used during the development of an implementation plan, that would be an appropriate venue in which to discuss comparisons among different models.

14. The commentor states they appreciate the consideration and the changes that MDE staff and contractors affected in the public comment version of the TMDL Report. VADEQ examined the draft TMDL and also examined how MDE implemented comments from VADEQ provided on an earlier draft version of the TMDL. VADEQ is resubmitting comments that are in need of further consideration. The most critical information to be resubmitted by VADEQ is a correct accounting of discharge permits in the Virginia portion of the watershed. To enable appropriate assessment and administrative planning, VADEQ requests electronic copies of the models, including input and output files, calculations, and maps used in TMDL development.

    Response: The information VADEQ is seeking will be provided after the review and final approval of the TMDL by EPA.

15. The commentor references permits identified in various locations throughout the reports and asks the following: were the average flows listed in the Tables based on actual flows, design flows or a combination of both and what data were used to calculate the estimated delivered loads some Virginia facilities did not have actual nutrient data for the years listed.

    Response: If data are available, MDE uses actual flow and loads in calculating baseline conditions. If actual discharge data are not available, MDE uses design flows and permitted loads. The Virginia municipal loadings were estimated using the facilities' Standard Industrial Classification (SIC) codes, identified flow, and methods used in the CBP-P5 model. Please see Table 19 in the Watershed Modeling Report for the more details of these loads.

16. The commentor states the following:
    i. Ray's Shanty no longer has a permit (permit terminated Jan 2012, and discharge ceased)
    ii. NASA Wallops Flight Facility: The Average Flow in Table 4 is reported at 0.3 MGD; this is the plant design flow; actual average flows have been significantly lower – probably in the .1 MGD or less range. I cannot verify the TN and TP loads because the permit does not require TN or TP monitoring, and I don't see where they have ever reported TN or TP concentrations to DEQ.
    iii. Comfort Suites Hotel – Chincoteague: The Average Flow in Table 4 is reported as 0.009 MGD; this is the design flow. The actual average reported flow is close to this value. DEQ cannot verify TN or TP loads because we do not know how the loads were calculated; there is no TN or TP monitoring in the permit, and no known TN or TP reported to DEQ.
    iv. Hampton Inn and Suites: The Average Flow in Table 4 is reported as 0.01 MGD; this is the design flow. Actual average flows have been significantly lower – 0.005 MGD is a closer estimate. No known TN or TP data to verify the loads calculated by MDE.
    v. Taylor Landing: The Average Flow in Table 4 is reported as 0.012 MGD; this is the design flow. This facility has never been built and has never had a discharge to State waters.
    vi. USCG Eastern Shore: The Average Flow in Table 4 is reported as 0.006 MGD; this is the design flow. Actual average flows have been significantly lower – 0.003 MGD is a closer estimate. There is no, known TN or TP data reported to DEQ, so the TN and TP loadings cannot be verified.
    vii. Chincoteague Landmark no longer has a permit, and the flows from this facility are now combined with Island Utilities as outfall 002 in that permit. This facility was never constructed and never had any flows prior to the permit being terminated.
    viii. Sunset Bay – North: is now called Island Utilities. The new design flow is 0.037 MGD. Outfall 001 has a design flow of 0.025 MGD and outfall 002 has a design flow of .012 MGD. Outfall 002 is the flow from the permit formerly listed as Chincoteague Landmark WWTP. This facility is not constructed and neither outfall has ever discharged to State waters.
    ix. Sunset Bay Utilities South: The Average Flow in Table 4 is reported as 0.040 MGD; the actual permitted design flow is 0.0395 MGD. Actual average flows have been significantly lower – 0.004 MGD is a closer estimate. There is no known TN or TP data reported to DEQ, so the TN and TP loadings cannot be verified.

Response: MDE appreciates the provision of this information. During TMDL modeling, data provided with the knowledge of/by VADEQ was used, which was appropriate for simulating conditions during the modeling period. MDE recognizes that changes in permits, loads, and relative contributions of various permitted entities may have occurred since that time. Since the allocation for Virginia's portion of the Chincoteague watershed is in aggregate form, such detailed reporting in the TMDL documentation is beyond Maryland's purview. This aggregate load may be allocated by Virginia among the different source sectors within Virginia's portion of the watershed based on the most current information and Virginia's regulatory policies regarding watershed management.

17. The commentor references the report, " HYDRODYNAMIC AND WATER QUALITY MODELING AND TMDL DEVELOPMENT FOR MARYLAND'S COASTAL BAYS SYSTEM (November 2013)" and states the following:
    a. 2. P 9. Section 2.2.2 second sentence, need to insert 'more' to make the sentence read correctly: "These sources are widespread and 'more' difficult to identify and quantify than point sources…"
    b. 3. P9. Paragraph 2. Please explain why the use of 2 USGS gauges with extensive AFOs would not bias the loading estimates for other areas.
    c. 4. P40. The sentence in the text above the figures that begins, "The wind-induced set down, shown as as examples …" has two consecutive 'as'.
    d. 5. P47 Figure has no label (there is text behind the figure displayed as (b) at the bottom of the page).
    e. 6. P122. End of first paragraph describes the MPAR as 'derived from the Chesapeake Bay TMDL's 'E3' Scenario (the maximum feasible reduction of Everything, Everywhere, by Everybody). It might be clearer to describe just what 'derived' means, what was changed here or used here from that if it was not identical to the E3 scenario…a brief summary would help.
    f. 7. P138. Figure 6.3 c : blank plots appear. It is unclear whether this is intentional.

    Response: Regarding items a, c, d and f, these editorial issues have been addressed; we appreciate this being brought to MDE's attention. Regarding item b, the distribution of land use in these gauged segments—and therefore their source contributions, such as Animal Feeding Operations (AFOs)—is representative of the majority of segments in the watershed model. Thus, this should not be a source of bias in the model. The land use-specific loading rates within the model are similar to those in the CBP Phase 5 watershed model, as indicated in Table 29 of the watershed modeling report. Text has been added to the relevant section of the water quality modeling report to clarify this. Regarding item e, additional text has been added to the section.

18. The commentor states they appreciate the opportunity to learn more about water quality standards for Chincoteague Bay since their community shares the watershed across the State line. The commentor is concerned however, that the Town of Chincoteague does not share the same characteristics as Worcester County and should not be directly or indirectly regulated by the TMDL study or the approval of TMDL standards in Maryland. The Commonwealth of Virginia has not designated the Virginia side of Chincoteague Bay as 'impaired waters'. Due to the tidal influence of Chincoteague Inlet that helps to maintain excellent water quality around Chincoteague Island, we believe that this is not a mistake that needs to be corrected.

Response: Maryland recognizes that Virginia has not listed its portion of Chincoteague Bay as impaired. As the commentor indicates, the bay's dynamics do not recognize state boundaries; thus, during TMDL modeling and development, all sources must be taken into account. The water quality and hydrodynamic modeling conducted by VIMS used state-of-the-science tools and techniques, and there is a high degree of confidence that tidal dynamics around the Chincoteague Inlet are accurately simulated. While all suitable and available data were used in the model development and calibration process, Maryland did not assess water quality at any stations within Virginia's waters, but rather did so only at Maryland stations. Subsequent to discussions with Virginia DEQ during the Interagency Review period, Maryland conducted additional modeling scenario runs to determine the effect of loads from Virginia upon water quality conditions at stations within Maryland's portion of Chincoteague Bay. These scenarios indicated that load reductions to Virginia's portion of the watershed were not necessary to meet water quality standards in Maryland, and Virginia was given an upstream allocation equivalent to current, baseline conditions. This upstream allocation, specifying that loads shall not increase, is consistent with the Antidegradation Clause of the federal Clean Water Act. Maryland is making no statement regarding Virginia's attainment of its water quality standards.

19. The commentor states that even though this distinction between Maryland and Virginia is stated clearly in several portions of the public documents, they have specific concerns including references to Upstream Load allocations. Specifically that specific nutrient loads are being assigned to Virginia within a series of tables titled "TMDL Allocations" which may have the effect of creating indirect control over state lines. The commentor continues referencing page 36-37 (Tables 19-20), TMDL loading caps have been established for Chincoteague Bay including upstream sources (footnote #2). The commentor requests to please add to footnote #2 that upstream loading is a non-TMDL estimate. The commentor references pages 39-49 (Tables 21-26 and Summary Tables) – Footnote #1 "Upstream loads denotes loadings from outside Maryland's portion of the watershed". The commentor states please revise footnote #1 to say "this ~~allocation~~ estimate includes point and nonpoint sources". The commentor references page 50 and requests that the narrative to "The upstream loads ~~assigned to~~ estimated for Delaware and/or Virginia sources.

    Response: Maryland appreciates the commentor's viewpoint regarding the terminology as used in the documentation cited in the comment. MDE also recognizes that Maryland has no regulatory authority over Virginia's portion of the watershed. The aggregate allocation to Virginia does not require any reduction from current conditions. That said, TMDL development requires a complete accounting of all source sectors, which must be included in the overall TMDL equation ($TMDL = \sum (WLA) + \sum (LA) + MOS$).

20. The commentor states that even though this distinction between Maryland and Virginia is stated clearly in several portions of the public documents, they have specific concerns including water sample locations. Specifically, water sample location in the vicinity of Chincoteague Island (ASSA 8, 11, 12, and 13) are not consistent with the targeted water quality locations on page 17 (SAV beds). The Town of Chincoteague has consistently objected to these sample locations that were selected to obtain measureable results not

characteristic of the surrounding waters. The TMDL study notes similar conservative assumptions on Page 45 including: "Nutrient sequestration and/or transformation in wetlands is not considered". On Page 45, please add a conservative assumption #9: Water sample locations may indicate points of concentrated nutrient loads that are not characteristic of the overall watershed segment.

Response: It is unclear what exactly is meant by '…not consistent with targeted water quality locations…(SAV beds).' The stations referenced are in or near the SAV goal area. These stations have a long history and constitute a component of an expansive dataset. No water quality station or sampling site can be expected to be completely representative of a large area; thus, it is important to use as much suitable data from as many locations as possible. It is implicit in the very nature of environmental data that observations are representative of their locations. This is true of all stations in the Coastal Bays system; no special mention need be made regarding the stations referenced in the comment.

Regarding the passage quoted from p. 45, the statement applies to wetlands within the watershed model. Nutrient dynamics in SAV areas in a water quality model differ from that of wetlands in a watershed model in a number of important ways. The role of a watershed model is to simulate processes in runoff. In a wetland, some water flows through the soil substrate, with some nutrient uptake and biologically-mediated sequestration occurring in this zone. This process is not fully simulated in the watershed model; hence, it is appropriate to mention it as a conservative assumption. The role of the water quality model, which does have a sediment flux sub-routine, is to simulate processes within the water column. Unlike free-floating algae, SAV does not remove nutrients from the water column; the plants uptake nutrients via their roots. Furthermore, any direct effect the SAV did have on the water column would be readily apparent in observed data; such is not the case for runoff in the watershed model. Thus, the statement, which is appropriate to the watershed model, cannot be extended to apply as a conservative assumption within the water quality model.

21. The commentor states that even though this distinction between Maryland and Virginia is stated clearly in several portions of the public documents, they have specific concerns including references to concern for future growth and change in agriculture, commerce and vitality of communities. Specifically, the commentor states as a scientific model, an implicit 'margin of safety' (Sec. 4.6) was incorporated into the TMDL calculations to account for variables of pollutant load, precipitation and unknown factors of 'complex, natural waterbodies' all built upon static baseline conditions. For this model to apply to land use, it must incorporate flexibility for growth and change. The commentor suggests considering adding a section that helps to bridge between this work and reasonable projections of growth and change in the watershed. It will be important to understand whether the TMDL 'margin of safety' allows for any growth and change of land use in the watershed.

    Response: The role of the MOS is to account for potential uncertainties in the modeling process, and for potential knowledge gaps in the understanding of this highly complex aquatic system. The margin of safety (MOS) is not intended to be used as a reserve capacity for future growth. MDE provides aggregated load allocations to upstream jurisdictions in order to provide them with flexibility; Virginia may choose to sub-allocate that load among source sectors as it sees best fit. In the case of future growth, if increased nutrient loads will result in a total load greater than the aggregated allocation provided, jurisdictions must develop mechanisms to account for and manage new or increased loadings to ensure that the aggregated allocation is not exceeded. In Maryland, for example, in addition to reducing nutrient loads in order to restore the Coastal Bays and the Chesapeake Bay, the State must also hold the line against new pollution. Maryland's plan for addressing nutrient loads from new development centers on (1) the strategic allotment of nutrient loads to large wastewater treatment plants to accommodate growth, and (2) the requirement that all other new loads must be offset by reductions elsewhere. Please also see response to Comment #18 above.

22. The commentor states that even though this distinction between Maryland and Virginia is stated clearly in several portions of the public documents, they have specific concerns including references to State vs. EPA Water Quality Standards. Specifically the commentor states the measurement of current baseline conditions, capping nutrient loads and forcing new regulatory restrictions on watershed segments that do not currently exceed EPA water quality standards seems to go beyond the authority of Section 303(d)(1)(C) of the federal Clean Water Act as described in the TMDL Report. The commentor requests that it be identified where in the TMDL study results or report that the Chincoteague Bay watershed section baseline measurements exceed water quality criteria by 10% or more (USEPA guidance referenced in Sec. 4.2.3.1 and Sec. 4.2.3.2). If these criteria are not exceeded, should a TMDL be established for Chincoteague Bay?

    Response: The goal of this TMDL is to cap nutrient loads at a level that will result in the attainment of Maryland's water quality standards. Maryland has not assessed stations within Virginia for attainment of water quality standards, but rather has used data from these stations in the model calibration process. As indicated in responses to the above comments, Maryland makes no statement as to whether waters in Virginia attain or fail to attain that state's water quality standards. Maryland explicitly acknowledges that it has no regulatory authority over Virginia's portion of the watershed.

23. The commentor states that even though this distinction between Maryland and Virginia is stated clearly in several portions of the public documents, they have specific concerns including references to the TMDL study should not be applied to 'upstream' watersheds by EPA. Specifically, the TMDL water quality model has been calibrated for Worcester County, Maryland only (Fig. 4.4 of Study, pg 61) and adjustments made based on water sample stations not characteristic of the lower Chincoteague Bay (Fig. 5.4 of Study, pg 106). Study results and tabulations of estimated nutrient loads from adjacent states should not be considered as an acceptable or approved TMDL allocation for Virginia. A strong spatial gradient in water quality was observed, with the best condition generally near the inlets (Section 6.1.1 of Study, pg. 119). The study described nutrients (Sections 6.1.3 and 6.2) as forcing the HEM3D model through the simulations. The five categories of nutrient sources appear to be additive only and do not account for sea water from the Atlantic Ocean through the inlets as a source of nutrient reduction. The commentor requests a description of how

the hydrodynamic and water quality modeling adjusts for nutrient load sources in the vicinity of an ocean inlet.

Response: The ASSA 8-13 stations, within Virginia, were by necessity used in the calibration process. It is thus inaccurate to state that the model has only been calibrated for Worcester County, MD. The water quality and hydrodynamic models do in fact take into account synergistic effects, and ocean water input is included. For a thorough discussion on ocean inputs, please see the response to Comment 40 below. Again, Maryland makes no statement as to the impairment status of Virginia's waters. Maryland's portion of the Chincoteague, however, is listed as impaired for nutrients; since water mixes throughout the basin, and Virginia contributes to the load to Maryland's waters, it is appropriate for Maryland to assess water quality at the state line to ensure that Maryland's standards are attained.

24. The commentor thanks the Department for the opportunity to comment on this project. Their community must consider the study model in terms of its proximity to the Chincoteague Inlet, which has increased in width and tidal influence over the last 5-10 years, and which provides localized water quality conditions that are different than Worcester County, Maryland.

    Response: Maryland appreciates the comments from the Town of Chincoteague. Please refer to the response to the preceding comment regarding calibration within Virginia, as well as the hydrodynamic and water quality models.

25. The commentor states they have read, support and fully concur with Comments #18-24 and shares that commentor's concerns regarding the proposal to initiate TMDL limits within the Chincoteague watershed.

    Response: Please see the responses to Comments #18-24.

26. The commentor sincerely hopes their comments aren't seen as critical of the intent or purpose of the effort but are instead read as intended. The commentor feels strongly that this effort should not have any effect now or in the future on their County's homeowners. The commentor fears that these results could have that effect and wish to document their concerns for the record.

    Response: Maryland appreciates the County's comments and understands their need to express their concerns in a public forum.

27. The commentor states this report indicates that a high percentage of constituent loading affecting Maryland's portion of the Chincoteague Bay emanates from sources within Virginia. The report clearly indicates this in many of its charts in which it shows Virginia (and Delaware) as "downstream" of the Maryland portion and each chart allocates a portion of the loading going into the Maryland bay from the "downstream" portion. While the commentor cannot disagree that state waters are mixed, the commentor feels that the

published results were far from transparent in the methodologies involved in the study or the scientific basis of the claims made in the results.

Therefore, the commentor notes for the record that the documents do not appear to provide any direct support for its findings. As commentors, they therefore cannot know that the tables display appropriate, scientific figures for Virginia based contributions to Maryland's known pollution loadings. Without adequate background on the SELFE model, or the methodologies used in data collection or of the application of the data to the model, persons find it difficult to comment intelligently on the underlying premise of the report.

Response: Maryland appreciates the fact that the modeling work used to develop the TMDLs is highly technical and complex in nature. MDE has made detailed documentation, in the form of the watershed and water quality modeling reports, available to reviewers. By their very nature, the reports must themselves be technical and detailed in order to provide a thorough accounting of the methods used, as well as the scientific basis upon which they rest. Maryland is making all models, data, input and output files, documentation and maps, etc. available to Virginia DEQ after EPA review. Presumably, VADEQ may assist Accomack County, as well as the Town of Chincoteague, with their concerns.

Regarding the (upstream) allocations provided to Virginia and Delaware in aggregate form, this is customarily done so as to provide these jurisdictions with maximum flexibility to make their own decisions.

Regarding support and validity of cited works, please see the response to comment #28 below.

28. The commentor continues more particularly, the reports contain references to various scientific resource material and models. The published material only displays the results and makes reference to these models and supporting information. It claims that various models were followed and that these models produced the results shown in the report. Importantly, however, nothing in the listed documents provide a demonstrable nexus between those studies and the tables and statements contained in the report. While the underlying science is likely very sound, there is nothing demonstrating that the steps taken to produce these reports were done in a scientifically appropriate manner or that the models were appropriate for this application, with no demonstrated proof showing the applicability of the models used to the circumstances in the Chincoteague Bay watershed. While one certainly assumes that those doing the work are competent and qualified, again, commentors are offered the chance to comment on a report without seeing the full body of information upon which these results are based. It would seem appropriate that the notice provisions would have included direct access to the original source material and also some documentation by qualified experts that the works cited in the report were intended to document the sort of findings produced.

    Response: Development of this TMDL has been a transparent and public process. MDE has involved the Maryland Coastal Bays Program (MCBP) throughout the process. The

MCBP is staffed by highly qualified scientists, engineers, local and state government personnel and others intimately familiar with the Coastal Bays system and its watershed. The scientists within the MCBP are world-regarded experts in their fields. The MCBP is a partner in the U.S. EPA's National Estuary Program, and as such is subject to rigorous oversight. MDE has made numerous presentations to the MCBP and its Scientific and Technical Advisory Committee (STAC) during this process, and has received (and incorporated) many helpful suggestions resulting from the review of this work by these individuals as well as by the MCBP as an organization. This collaboration ensures the greatest scientific integrity possible.

The modeling and analysis were conducted by professors at the Virginia Institute of Marine Science (VIMS) at the College of William and Mary. These scientists, and VIMS as a whole, are world-renowned leaders in the area of estuarine modeling. They have conducted similar work on estuaries worldwide.

MDE has conducted a thorough outreach process, offering an extended public review period (47 days) and holding an open, public meeting within the watershed on January 16, 2014. MDE also included Virginia DEQ during the earlier, Interagency Review period; this is supplemental to the participants included as a matter of course during Interagency Review.

The scientific integrity of this effort has by necessity entailed building upon existing, peer-reviewed work. As is the case in general with scientific reporting, a substantial component of the TMDL documentation, as well as of the modeling reports, consists of a review of the relevant literature. The work cited appears in literature that has been thoroughly peer-reviewed, for exactly the reasons the commentor states, prior to publication. These books, reports, articles and other works are readily available at most university libraries, and in some cases can be found online. Due to the number of works cited and the immense volume of material, it is simply impractical for MDE to provide copies of the literature cited. The peer review process ensures a thorough vetting of the material, and it is routine convention for scientific background and relevant prior work to be conveyed via the process of review and citation in the main text, with full references enumerated in a dedicated reference section to facilitate acquisition and further review by the reader.

29. The commentor states in addition, scientific findings and particularly modeling has limitations and are less valuable under certain applications. Accepted practice in articles and scientific work is to identify these limitations and constraints. Nothing in the material identifies these limitations, nor was any attempt made to display any areas of scientific doubt which may exist in the literature, as applied in these instances of complex modeling. One is left to simply accept the results and also is left to one's own devices to learn about the science if one is to comment intelligently.

    The commentor continues if the state is going to claim results that have such implications, it would seem incumbent on it to provide more detail than that which it has provided in the matter. While one anticipates that the models are most likely appropriate for this particular use, and one also hopes that data was gathered and applied in a scientifically rigorous manner, there is scant documentation of this provided in the report or ancillary documents. The commentor realizes that much of the science is outside the knowledge base of most who might have an interest here, including this commentor, but truly meaningful comment cannot be taken unless there one has truly been informed as to the science behind the study and the practices and procedures followed in producing the study results. Please note the commentor's concerns in this regard and his questions as to the validity of the results as they appear to apply to Virginia waters.

Response: Maryland appreciates and notes the commentor's questions and concerns as requested. The modeling tools used in this analysis are state-of-the-art, and represent a significant improvement in accuracy and rigor over those used in the earlier TMDLs developed for portions of the Maryland Coastal Bays. The strengths, limitations, validity and appropriateness of the modeling tools are discussed in various sections of the modeling reports. The inherent detail of such a discussion is beyond the scope of the TMDL report itself. Please also see the response to Comment #28 above.

30. The commentor states the TMDL fails to provide adequate assurances of implementation from the agricultural sector. The commentor continues that the TMDL provides no assurance that agricultural loads will be reduced. This is a fundamental weakness in the TMDL given that agriculture is the dominant source of nutrient loads that Maryland has the ability to control.

The TMDL states that "The implementation of nonpoint source nutrient controls ... will be executed through changes in land use and cooperative reductions from the agricultural sector," and goes on to say that Nutrient Management Plans make it "reasonable to assume that nonpoint source reductions from the agricultural sector of the magnitude required by this inconsistent with experience, to assume that the desired reductions from the agricultural sector will spontaneously occur.

To begin with, there is little evidence that voluntary nutrient management plans reduce nutrient loads. The limited evidence that does exist suggests that any benefits are too small to detect. Researchers from the University of Maryland have observed that "the effectiveness of [Nutrient Management Plans] has never been demonstrated at any scale, and there is no monitoring to validate whether plans are being followed."} The one watershed to be effectively studied, a subwatershed of the Choptank basin on Maryland's Eastern Shore, found no change in base flow nitrogen (the dominant source of nitrogen loadings) 10 years after a targeted BMP implementation project.

This is consistent with the history of TMDLs across the country. In a recent report to Congress, the Government Accountability Office (GAO) found that while 83% of TMDLs have achieved point source pollution reduction targets, only 20% of TMDLs achieve nonpoint source targets, suggesting that the voluntary approach is not working. One major reason that the voluntary approach is not reducing nonpoint sources of pollution is that TMDLs, like this draft TMDL, frequently fail to include meaningful assurances of implementation. Experts consulted by the GAO identified the type of information that would provide "sufficient evidence that reductions in nonpoint source pollution will actually occur," and these included "identification of landowners willing to implement necessary projects to reduce nonpoint source pollution, "specific actors who are to support implementation," and "actions that need to occur to attain water quality standards." In one case, EPA Region 1 withdrew approval of a TMDL that did not show "quantitative reductions anticipated from specific projects" or "regulatory or other mechanisms ... to ensure compliance."

Evidence from Chesapeake Bay provides further grounds for skepticism. In spring of 2013, the Maryland Department of Agriculture reported on "agricultural progress toward meeting the TMDL 2012-2013." The report showed increasing animal numbers, declining Nutrient Management Plan compliance, and a net increase in nutrient loads from agriculture. Clearly the voluntary approach is not working well in the Chesapeake Bay watershed, and it is hard to imagine why the outcome would be any better in the Coastal Bays watershed.

The TMDL simply fails to provide any assurance that agricultural loads will be reduced. Relying on misplaced assumptions about the effectiveness of voluntary and confidential practices will only ensure that agricultural loads will continue unabated. Instead, MDE should follow the lead of EPA Region 1 and the experts consulted by the GAO, identify the landowners and the projects that will lead to the expected reductions from the agricultural sector, and quantify the expected reductions so that progress can be evaluated in the future.

Response: Maryland appreciates the commentor's thoughts on the challenges of TMDL implementation, especially regarding sources within the Load Allocation. However, the Assurance of Implementation is not intended to be a detailed implementation plan, nor is one required in a TMDL document. This report is not an optimal venue in which to discuss the relative efficacies of voluntary versus regulatory approaches. The TMDL documentation, including the Assurance of Implementation, provides an accounting of the loading sources and a summary description of various laws, programs, practices and other tools that are expected to be of use during implementation. The Clean Water Act does grant states more specific authority in addressing sources within the Waste Load Allocation, primarily via the permitting process. No regulatory analogue exists within the realm of the Load Allocation.

Regarding the reference to "…changes in land use…" in the Assurance of Implementation, MDE does not intend to suggest that land conversion such as from agricultural to developed land is a desirable method of improving water quality. The phrase has been changed to read "…changes in land management practices…"

It is incorrect to say that the TMDL "…simply fails to provide any assurance that agricultural loads will be reduced." The Assurance of Implementation does indeed, as intended, provide an overview of programs, practices and approaches that, if undertaken, will result in nutrient load reductions. The highly specific actions demanded by this commentor are inappropriate to include in a TMDL development report. Measures such as those described will be more efficient and effective when undertaken by a coalition of stakeholders in the context of a dedicated implementation plan that is thorough, detailed and deliberative. The commentor may not be aware that in Maryland, agriculture was the only sector to complete a comprehensive plan for the Chesapeake Bay TMDL Watershed Implementation Plan with commitments at the local level. Maryland agriculture has met and exceeded each of the last two years milestones by 106% and 126%. The most recent EPA Bay model run shows Maryland agriculture has reached its 2017 goal (60% reduction) for nitrogen and phosphorus four years ahead of schedule.

The commentor suggests there is little evidence that Nutrient Management Plans reduce load. However, fertilizer sales and tons of farm fertilizers applied are showing reduction over time. The commentor refers to a targeted study in one subwatershed on the Choptank that found no change in loading within 10 years, based on BMP implementation. A recent USGS study indicates that the response times of nutrient levels in groundwater on the Eastern Shore may be on the order of as little as a year to several decades, depending on location and distance to surface waters (USGS 2012).

The commentor expresses concern with voluntary actions to assure TMDL implementation in the agricultural sector, and may be unaware of the various regulatory programs in effect on agriculture in Maryland. In Maryland, farmers are subject to Confined Animal Feeding Operation (CAFO) and Maryland Animal Feeding Operation (MAFO) regulatory requirements. These cover all large animal operations (CAFO) and all medium animal operations (MAFO). Maryland’s Nutrient Management regulations are among the most comprehensive regulations in the USA. They require all operations over 10 acres or $2,500 in income to have and maintain a current nutrient management plan and keep farm records. Inspections are conducted on 10% of all operations each year. Annual reporting to the Maryland Department of Agriculture is required of all fertilizer, biosolids, and manure applications. Additionally, there are restrictions on fertilizer application near waterways (10’ and 35’ setbacks), restrictions on time of year for application, and required fencing of all livestock from streams.

31. The commentor states the draft TMDL omits key information and lacks transparency. The commentor continues with another part of the explanation for the failure of voluntary programs to reduce nonpoint loads is that EPA cannot track implementation. This is largely because they lack information on the location of agricultural best management practices (BMPs). According to the GAO:

> [W]ithout access to data on the location, type, and number of projects implemented by landowners who participate in conservation programs funded by the USDA in areas subject to a TMDL, EPA cannot track actions taken to implement TMDLs and subsequent changes in water quality associated with a core EPA program and a substantial federal investment.

The same data gap will limit the ability of MDE and the public to track progress in this sector, and aggregate, generic assumptions about land use are clearly inadequate. Instead, MDE should be using the information that MDE and/or the Maryland Department of

Agriculture (MDA) have on file for each farming operation in the Coastal Bays watershed. MDE could, for example, obtain manure application and other land use information from Nutrient Management Plans and Annual Implementation Reports. MDE could then use MDA's Nutrient Tracking Tool to estimate nutrient loads from each field in the watershed.

In addition, MDE should make this information publicly available at a geographic scale that allows for follow-up and verification. As currently written, the TMDL is explicit and transparent about baseline loads and expected load reductions from point sources. The same should be provided for other sectors so that the affected public is able to track TMDL progress with a consistent, 'apples-to-apples' metric.

Finally, there appear to be sources of information that MDE could have, but did not use. First, the nonpoint 'upstream' loads - the loads from VA and DE, unlike nonpoint loads from MD, are aggregated together in such a way that the public cannot see how much of the nonpoint upstream loads are assumed to come from each nonpoint category. For example, Table 5, on page 11 of the draft TMDL, shows MD loads broken out into forest/barren, mixed agricultural and urban land use. Upstream loads are shown as a single number that includes all categories. It is unclear whether this lack of detail is due to a data limitation, but we are under the impression that there was more information on VA loads when VA was involved in earlier stages of the TMDL process. If MDE still has access to that information, it should make use of it.

Another potentially useful source of information that does not appear in the TMDL is monitoring data from the miles of ditches that drain agricultural areas. If such monitoring were available, it would make it possible for MDE to replace assumptions about agricultural loads with real data. It would also provide additional upstream (here meaning upstream in the traditional sense, as in further from the Bay) reference points with which to validate the model, beyond the current downstream or open water reference points.

Response: The commentor suggests that MDE incorporate into the TMDL "monitoring data from the miles of ditches that drain agricultural areas." For every TMDL developed, MDE conducts an expansive data solicitation. No such data was provided during the data solicitation for this TMDL, nor was MDE made aware of any such dataset. Agricultural drainage ditches may be likened to extremely numerous and small intermittent streams; monitoring such a vast network of drainage ditches would be infeasible and unlikely to provide a useful dataset. Parameterization for various agricultural land uses within the watershed model simulates edge-of-field nutrient export, and capture contributions from drainage ditches.

Regarding transparency, please see responses to Comments #28 and #29. Maryland has followed accepted convention in making the state's documentation available to the public during the review period, and cited references are easily available. Please review the response to Comment #30 above regarding implementation planning and legal concerns. Most of the information and data the commentor describes as "lacking" are outside MDE's control, only available in aggregate form (much agricultural data), not available to the public or not legally disclosed (individual nutrient management plans fall under the latter two categories). While the Department appreciates the commentor's desire for greater access to data, MDE must operate within existing legal frameworks and must abide by the agreed-upon terms under which data may be shared among various entities.

On the subject of upstream load aggregation, please see the response to Comment #27, explaining the rationale for aggregation. While upstream load allocations are reported in the aggregate, source sectors are parsed out in the modeling process in the same way as conducted for in-state sources. This is a TMDL addressing impairments in Maryland waters only and is not inter-jurisdictional. Maryland has no authority to dictate the terms of implementation in another state; hence, it is appropriate for the out-of-state allocation to be expressed in aggregate form and allow other states to determine the best way to sub-allocate this load among various sources.

32. The commentor states the "Implicit Margin of Safety" in the draft TMDL is insufficient to account for the uncertainty in the model. The commentor continues TMDL models include many sources of uncertainty, and states are therefore required to incorporate Margins of Safety (MOS) into their TMDLs. Rather than apply a numeric MOS, MDE chose to assume that they had incorporated an "implicit MOS." According to MDE, the implicit MOS "incorporates [s] the MOS as conservative assumptions used in the TMDL analysis." However, MDE's list of conservative assumptions includes many items that are not conservative (and not assumptions):

    • *Extensive geographic coverage o/water quality monitoring stations.* This is not an assumption, nor is it conservative. The use of a robust dataset provides a relatively accurate characterization of water quality, and may thereby reduce uncertainty in this element of the model, but it does not address uncertainty in other elements of the model. Moreover, MDE has not demonstrated that the number of monitoring and calibration stations that they used is unusual, and has not demonstrated that the monitoring network has reduced uncertainty relative to any other TMDL. The existing monitoring and calibration points are standard features of a normal TMDL model. This element of the model does not provide any margin of safety.

    • *The 4-year simulation was run with two very wet years.* This might be a conservative assumption, but the TMDL does not provide enough information to demonstrate that it is. MDE assumed one 'normal' year, one dry year, and two wet years. MDE has not demonstrated that its weather assumptions are more likely to simulate increased nutrient loadings than normal weather variability would. It is certainly not a "worst-case condition" that the TMDL supporting documents claims to be using.

    • "Animal manure application to agricultural lands was taken into consideration at the local level, and the maximum application rates reported by Parker and Li (2006) were also applied." It is unclear what the first part of this sentence means. The TMDL suggests that generic manure application rates were applied to all land that fit into the appropriate land use category. Since this does not make use of local data, this does not appear to be a "local level" approach. Even if MDE had used real data, this would not be an assumption, and it would not be conservative (see first bullet above). The second part of the sentence does suggest a conservative assumption, but also highlights an important data gap - the lack of information about agricultural practices in the watershed. This data gap is one of several reasons that the assurances of implementation must be strengthened (see comment 31 above).

• "The post-processing of modeling results incorporates an accounting of the diel swing of dissolved oxygen." Again, this describes the incorporation of real data, and although it is a strong element of the model, it is not a conservative assumption.

• The analysis used a daily average. Again, this describes the incorporation of real data. It is not a conservative assumption. Moreover, the use of daily averages for Total Maximum Daily Load calculations should be routine. MDE did not, in fact, build a meaningful amount of conservatism into the model, and certainly did not model "worst-case conditions.” MDE must revise the TMDL to clarify that the items listed above are not conservative assumptions. MDE should also attempt to link the truly conservative assumptions to the key sources of uncertainty in the model. If, as is likely, there are remaining, unaddressed sources of uncertainty (e.g., uncertainty in the degree to which agricultural, nonpoint sources will be voluntarily reduced), then MDE must apply a numeric MOS to address these sources of uncertainty.

Response: The commentor calls attention to the word “assumption” in the context of the Margin of Safety (MOS), implying that it should be used only in its strictest definitional sense. MDE is reviewing relevant portions of the text and will clarify it as appropriate. With that said, given the scientific rigor of the modeling tools, and the technical detail and overall robustness of this effort, it is not only acceptable but desirable to incorporate an implicit MOS. The commentor seems to suggest that an explicit MOS is superior to an implicit one; this is perhaps the case when using extremely simple analytical tools coupled with data that are too few or sparse to reasonably bound the range of their parameters. These issues do not apply to the current TMDL. There is no basis on which to derive a specific numerical value for an explicit MOS, and to attempt to do so would be inappropriate and arbitrary. The commentor’s bulleted passages are addressed below:

- The commentor is correct that the use of the robust database is not, in the strictest sense, an “assumption.” However, the temporal and spatial extent of the database is much greater than that frequently available during TMDL development. Its use unquestionably reduces uncertainty and engenders a high degree of confidence in the monitoring and therefore the modeling efforts. These features are necessary components of an implicit MOS, and provide the basis for a much more rigorous analysis than that of the type to which an explicit MOS would be applied.

- The commentor claims that the hydrologic and meteorological conditions of the modeled time period either do not comprise part of the implicit MOS or are insufficiently justified as such. Simulating a four-year period during which two of the years were extremely wet does indeed result in a runoff-driven load estimate at or near the upper boundary of that which could be expected over any four-year period, and certainly over longer time periods. It is well known and accepted within the aquatic science community that runoff and the constituents it delivers to an aquatic system increase with increased precipitation. MDE does not intend to claim that this represents a ‘worst case scenario,’ and that language will be altered.

- Regarding simulated manure applications, MDE did assume that maximum reported rates were applied throughout the modeling domain. Since actual application rates will vary by location, conditions and circumstance, and in most cases will be below maxima, this is, patently, a conservative assumption. The rates are obtained from peer-reviewed work and are appropriate for this application. This assumption is summarized in the Margin of Safety, and is discussed at greater length in Section 2.1.4.2 (Nonpoint Source Loads) of the TMDL document. Full details may be found in the Watershed Modeling Report.

- As in the case of the robustness of the dataset, the inclusion of the diel DO variation may not in the strictest sense be an assumption, but it does enhance the accuracy of the replication of the DO dynamics, and it provides an additional measure of protection to aquatic life. It is thus valid and appropriate to consider it a component of an implicit MOS.

- On the subject of the use of a daily average, numerous TMDLs have been developed using steady-state models that directly simulate conditions only over annually or seasonally-averaged conditions. It would be more appropriate to use an explicit MOS for such a TMDL, given those models’ limited capacity to simulate conditions over shorter periods. In the present case, the water quality model simulates conditions every four hours and at five layers within each individual cell, providing thirty simulations per day. This greatly increases the certainty and rigor of the modeled result, and is appropriate to consider as part of an implicit MOS.

33. The commentor states the nitrogen and phosphorus allocation in the TMDL are impermissibly high and insufficient to attain Water Quality Standards. The commentor continues Federal TMDL regulations state that "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical [Water Quality Standards (WQSS)].” The authors of the TMDL, through extensive modeling, established the levels necessary to attain WQSs, and presented these in the form of Bay-specific "reduction percent needed to meet Water Quality Standards.” These same levels appear in a support document, where they are defined as "Final TMDL reductions needed to meet WQS incorporating Geographic Isolation Scenarios.” These reductions are, by definition, the reductions that the TMDL is legally obligated to include. However, the actual reductions in the final TMDL are smaller than those calculated to be necessary. Table 1, below, shows the Baseline Loads, TMDLs, and reduction percentages from the Bay-specific Appendices to the TMDL, and compares these reductions to the "reduction percent needed," described above. Table 1 shows that most of the TMDL reductions are inadequate to attain Water Quality Standards.

Table 1: TMDL reductions in the draft Coastal Bays TMDL. Highlighted reductions are less than those required to attain water quality standards.

	Total Nitrogen			Total Phosphorus			
	Baseline Load (lbs/yr)	TMDL (lbs/yr)	Total Reduction	Baseline Load (lbs/yr)	TMDL (lbs/yr)	Total Reduction	*Reductions required to attain Water Quality Standards*
Assawoman Bay	360,653	300,669	**17%**	23,924	19,985	**16%**	*20%*
Bishopville Prong (Isle of Wight Bay)	128,760	54,619	**58%**	9,095	5,603	**38%**	*55-58%*
Shingle Landing Prong (Isle of Wight Bay)	106,055	58,520	**45%**	7,065	5,317	**25%**	*55-58%*
Isle of Wight Bay	425,192	276,986	**35%**	29,523	25,931	**12%**	*40%*[21]
Newport Bay	216,382	185,471	**14%**	14287	13589	**5%**	*20%*
Sinepuxent Bay	90,037	90,278	**0%**	6,229	6,381	**2% increase**	*0%*
Chincoteague Bay	1,233,856	1,166,469	**5%**	84,809	82,304	**3%**	*20%*

Response: In the table above, created by the commentor, "Reductions required to attain Water Quality Standards" is the reduction to controllable loads, which is the reduction most frequently referred to within the documentation, and is that reduction specified in the modeling scenarios. The "Total Reduction" indicates the reduction applied to all baseline loads within the specified segment.

34. The commentor states the TMDL impermissibly allows an increase in nonpoint phosphorus loads to Assawoman and Sinepuxent Bays. The commentor continues for both Assawoman and Sinepuxent Bays, the TMDL load allocations for nonpoint sources are higher than baseline nonpoint load estimates. This means that the TMDL will allow net increases in phosphorus loads to nutrient-impaired waters. This is clearly contrary to the intent and legal requirements of the Clean Water Act, and undermines the ability of the Coastal Bays TMDL to restore the water quality of the Coastal Bays.

    Demonstrating this imbalance requires values from several parts of the draft TMDL. We begin by looking at Assawoman Bay. The baseline nonpoint phosphorus loads from Maryland sources to Assawoman Bay are presented in Appendix A and in the TMDL itself. Appendix A states that the "estimated average annual total phosphorus load" is 23,9241bs/yr. Atmospheric deposition, shoreline erosion, mixed agriculture, and urban sources add up to 22% of that total, or 5,263 lbs/yr. Alternatively, one could add the Maryland nonpoint phosphorus loads to Assawoman Bay shown on page 11 of the draft TMDL (2,160 pounds) to the Maryland atmospheric deposition and shoreline erosion estimates on pages 13 and 14 (2,249 and 1,008 pounds, respectively) to arrive at a total of approximately 5,417 lbs/yr. The TMDL average annual phosphorus Load Allocation for Assawoman Bay is 6,428 lbs/yr. This is 19-22% higher than the baseline estimated calculated above.

Similar calculations for Sinepuxent Bay are more straightforward since this Bay has no upstream or point sources. The baseline phosphorus load from Appendix C (6,229 lbs/yr) is therefore all from Maryland nonpoint sources. The draft TMDL estimates on pages 11, 13, and 14 add up to the same number: 6,229 lbs/yr. The TMDL Load Allocation for phosphorus from Sinepuxent Bay is 6,370 lbs/yr, a 2% increase. Allowing nonpoint sources of phosphorus to increase their loadings to nutrient-impaired waters is illogical and contrary to the Clean Water Act. It is also inequitable in that it shifts the burden of restoring the Coastal Bays ecosystem to other sectors. MDE must amend the TMDL to require phosphorus reductions from sources in the Assawoman and Sinepuxent Bay watersheds.

Response: This comment stems from a typographical error in Table 5 of the TMDL report. The distribution of TP among the sources is presented below. However, the total land use loads for the identified watersheds were correct.

TP-lbs/yr					
MD 8-Digit Waterbody	**Upstream**	**MD 8-Digit Contribution**			
		Forest/ Barren	**Mixed Agricultural**	**Urban**	**Total Land Use Load for Watershed**
Assawoman Bay	16,527	80	1,103	2,038	19,748

35. The commentor states their group is comprised of researchers and managers from federal, state and county agencies and universities to represent a balance of scientific disciplines with expertise in the following areas: nutrients/toxicities; transport and fate, including modeling; ecological and human health effects; and living resources. The commentor has been involved in the TMDL process since 2007 and we certainly appreciate the efforts of The Department of Environment and Virginia Institute of Marine Science in the development of this TMDL. It has been a long process but they consider it well worth the effort. The commentor especially appreciates the Department’s willingness to work with the commentor on this effort. The inclusion of Upstream areas to include portions of Delaware and Virginia in the Coastal Bays watershed is a reasonable attempt to provide more complete coverage than previous TMDL calculations. Also, inclusion of the more extensive dissolved oxygen modeling and atmospheric deposition of phosphorus certainly improves load estimations.

    Response: MDE thanks the commentors for their collaboration and assistance throughout this project. The Department expects to continue this productive working relationship.

36. The commentor states they do not feel that two attainment levels for chlorophyll a (CHL) in Chincoteague Bay based on the 2,500 foot buffer of the submerged aquatic vegetation (SAV) goal is sufficient for providing habitat conditions that are needed. The commentor understands that the Department previously stated that this doubles the area required for 15ug/l attainment. However, in order to achieve the SAV goal in the Chesapeake (when acreage alone does not meet the goal), there must be sufficient acres where water clarity meets 2.5 times the SAV goal or a combination of acreage and clarity (i.e meet 50% of SAV goal and have at least 150% of SAV goal area having sufficient clarity). Perhaps something similar is needed for CHL, because the outer edges of an SAV bed would be most vulnerable to degraded water quality coming from the areas that might be assessed at 50ug/l. Furthermore, in the coastal bays these nearshore areas are actually further away from nutrient loadings (and resultant higher CHLs) since they are predominantly on the eastern side of the bay, while sources come mostly from the western shores.

    In addition concerning Chlorophyll, several stations in St. Martin's River, Newport Bay, Chincoteague Bay and Turville Creek that have been identified as being assessed at 50 µg/L rarely fail this level (less than 5% of time, from Table 11) and current chlorophyll status at these stations shows levels are between 7-15 µg/L [Department of Natural Resources (DNR) water quality data from Eyes on the Bay]. Why not use assessed levels for these areas which are more realistic (15ug/l) based on current conditions? The commentor understands that consistent rules throughout the coastal bays and feels strongly that the 15 µg/L Chlorophyll a endpoint should be applied to all open water stations in the bays. Since the endpoint is to protect living resources, more than 15 µg/L Chl consisting of chlorophyll from brown tide would negatively affect shellfish. Use of a 2500 ft buffer around SAV grow zones does not acknowledge water movement in this system which is influenced by winds.

    Response: The SAV goal area, around which was extended the 2,500' buffer, was based on the maximum areal extent of SAV growth as provided to MDE by DNR/MCBP. The total area is about 120% that of the SAV goal area alone. Thus, this additional area under the 15 µg/L attainment level effectively adds an additional areal component analogous to the attainment scheme in the Chesapeake, and essentially accomplishes what the commentor describes. While the commentor is correct that more nutrient loads probably originate on the western rather than the eastern side of the bays, a review of the data suggests only a slight difference in chlorophyll *a* concentrations in the more western, as compared to the eastern, stations in the Chincoteague. Additionally, implementation activities would focus on areas of higher loading (e.g., adjacent to the western part of the bays). In order to further inform this issue, we have assessed baseline conditions (calibrated model output, before any reductions) to determine the extent of exceedance of the 15 µg/L endpoint at any and all stations within the Chincoteague Bay (regardless of their endpoint being either 50 µg/L or 15 µg/L). The maximum exceedance was 8.15%, at Station ASSA 7 during the growing season. Given the fact that reductions are to be applied to this baseline condition, one can reasonably expect that water clarity as quantified by chlorophyll *a* concentrations should not limit SAV growth in Chincoteague Bay under TMDL conditions.

Regarding the second part of this comment, MDE developed specific chlorophyll *a* endpoints to be used in conjunction with specific components of the aquatic life use of the waterbody—in this case, 15 µg/L for protection of SAV, and 50 µg/L for protection of aquatic life. The latter endpoint was derived from the work of Thomann and Mueller (1983), who recommended a chlorophyll *a* goal of 50 µg/L, with maximum values not to exceed 100 µg/L. In the Coastal Bays, MDE has specified a maximum of 50 µg/L. This at the lower end of the range deemed permissible to support aquatic life by ensuring sufficient DO. These endpoints, which are the Department's numeric interpretation of the narrative water quality criteria for the Coastal Bays, were developed with these specific designated uses in mind, in a deliberative, methodologically scientific manner, and for the purposes of consistency should be applied according to their intended goals.

37. The commentor states confusion exists in the atmospheric component of the TMDL calculations: Page 16 of the Hydrodynamic and Water Quality Modeling and TMDL Development for Maryland's Coastal Bays System (Nov 2013) indicates that TN (7.42 lb/acre) and TP (0.37 lb/acre) would be used as the atmospheric loading for the TMDL. However, based on the acreage presented in Table 8 in the Maryland Coastal Bays Watershed Modeling Report (February 2013) and the atmospheric loadings presented in Table 13 from the Watershed Modeling Report, it appears the nitrogen atmospheric loadings range from 8.2 to 23.1 lb/acre (see Table below) and not the 7.42 lb/acre that was to be used.

Watershed	Water acreage (from Landuse Table 8)	TN (lbs/yr) (from Atmospheric Deposition Table 13)	Calculated TN (lbs/ac): TN/acres
Assawoman	7,766.41	63,362.00	8.2
Ile Of Wight	4,874.85	51,901.00	10.6
Sinnepuxent	1,881.66	43,396.00	23.1
Newport Bay	4,869.30	30,214.00	8.9
Chincoteague	34,963.44	547,573.00	15.7
Total	54,355.66	736,446.00	13.5

Response: The water acreage specified in the second column in this table includes wetland acreage within the watershed model, but does not include open water area within the watershed model. MDE has checked and verified this, and the areal atmospheric deposition rates as reported in the documentation are correct.

38. The commentor states the surface water file used to determine number of septics within and outside of 1000ft is not representative of the reach of surface water in the coastal bays. If the stream file is used, the commentor believes more systems will be within 1000 feet.

Response: The methodology used to determine the number of septics within 1000ft buffer and outside of the 1000ft buffer used the NHD 100K stream file, which the Department believes to be the same coverage to which the commentor refers. This is the same scale that was applied in determining septics within and outside of 1,000 ft. in the Chesapeake Bay model.

39. The commentor states the assumption that there is zero phosphorus in septic loading is no longer considered accurate. The MD Coastal Bays STAC and a report by Delaware Dept of Natural Resources and Environmental Control (http://www.gaelwolf2.com/dnrec/fact_ib_septic_system_loading.pdf) assert that that P discharged from onsite systems are not retained in this area due to the shallowness of the groundwater table, the very sandy soils that cannot retain much nitrogen or phosphorus, and the decreased capacity of the soil to absorb additional P due to decades of excess P fertilization. The nearby Nanticoke watershed estimates that each septic system contributes 18.25 lbs of N per year and 0.7 lbs of P (NOTE the N loads are lower than mentioned in comment #43).

    The Contributions of phosphorus by septic tanks to water quality have been approved by at least nine State management agencies (WA, SD, ID, MI, UT FL, NH, MA, NY, DEL) and the Canadian Environmental Ministry. Idaho Department of Environmental Quality (IDEQ) has taken the 50th percentile value for ortho-P concentration of wastewater effluent data compiled by McCray et al (2005) and divided by 0.85 to adjust for the percentage contributing to total P in wastewater effluent. This median value is 12,000 µg/L. The Washington State Department of Health has established an average P concentration of 14,600 µg/L. Perhaps phosphorus loadings by septic systems should be re-evaluated.

    Response: Please see response to Comment #10.

40. The commentor states that recent data suggest the ocean boundary conditions may be incorrect. See table below.

	Model boundary	XDN0146 2001-2012 MAY avg	XDN0146 2001-2012 AUG avg	May 2011 Offshore	Aug 2012 Offshore
CHL (ug/L)	1	3.6	10.9	3.19	4.01
DO (mg/l)	5				
Salinity	30	30.3	30.4		
TN (mg/L)	0.2	0.424	0.549	0.33	5.67 uM
TP (mg/L)	0.02	.0392	0.056	0.03	1.23 uM
TDN (mg/L)	0.1	0.28	0.315	0.23	
TDP (mg/L)	0.01	0.0209	0.0293	0.02	
Secchi (m)	4.0	1.0	0.8		

    Response: The open boundary condition for MCBs hydrodynamic and water quality model was specified at the outer edge of the model domain encompassing the MCBs coast, as shown in Figure 1 below. For most of the boundary, it is about 9 km (5 nautical miles) offshore into the mid-Atlantic Bight.

    The purpose of the open boundary condition is to represent the status of the variables in the ocean far away enough that it is free of the effects by the discharges from the land. Specifically, when the current is flowing toward the coast from the ocean, for example, during flood tide, the specified concentration shown in the table will be used. Otherwise, the concentration calculated from the interior of the domain will be the values used at the boundary. Thus, the open boundary condition values can be higher than the values used in the table above if the concentration in the interior of the domain is higher.

The choice of concentrations as the boundary value is based on EPA's report: http://www2.epa.gov/nutrient-policy-data/criteria-development-guidance-estuarine-and-coastal-waters. Based on 1999 and 2000 summer nutrient surveys, EPA's protocol recommended the following values: TN=0.175 mg/l, TP=0.025 mg/l, Chlorophyll=0.09 μg/l, shown in page H-6, H-5, H-7 of the report respectively. These are very close the values used at the open boundary. The measured Secchi data which was cited as not conclusive is shown in Figure 2. The author took the Secchi values of 4 m, which is optimal, and used at the boundary. The TDN and TDP values used by model were obtained by extrapolating values from UMCES's near shore measurement (collected at around 5 km offshore) further offshore to 9 km, representing the best available data.

The Department appreciates the data provided by the commentor as listed in the table above. The CHL, TN, TP, TDN and TDOP concentration obtained at XDN0146 were measured at the Ocean City Inlet and thus were affected by the nutrients coming out of the Maryland Coastal Bays and has higher concentration values. It, however, may not be a proper representation of the offshore condition. For May 2011 and August 2012 offshore data, authors understand that the data were obtained by the joint University of Maryland and EPA cruise in 2011 and 2012. During this cruise, samples were collected at several transects along Delmarva Peninsula with the farthest station goes offshore around 5 km. The boundary concentrations at 9 km offshore, in general, should be lower than the values cited above considering they are further away from the influence of the land and the river flume from Ocean City Inlet. Overall, the authors do recognize that large uncertainties exist on the specification of the open boundary condition, given that few measurements are available. However, the location of the boundary condition is far from the shore, and the "open boundary" concept is used to minimize these uncertainties and their influence on the modeling simulations within the Coastal Bays system.

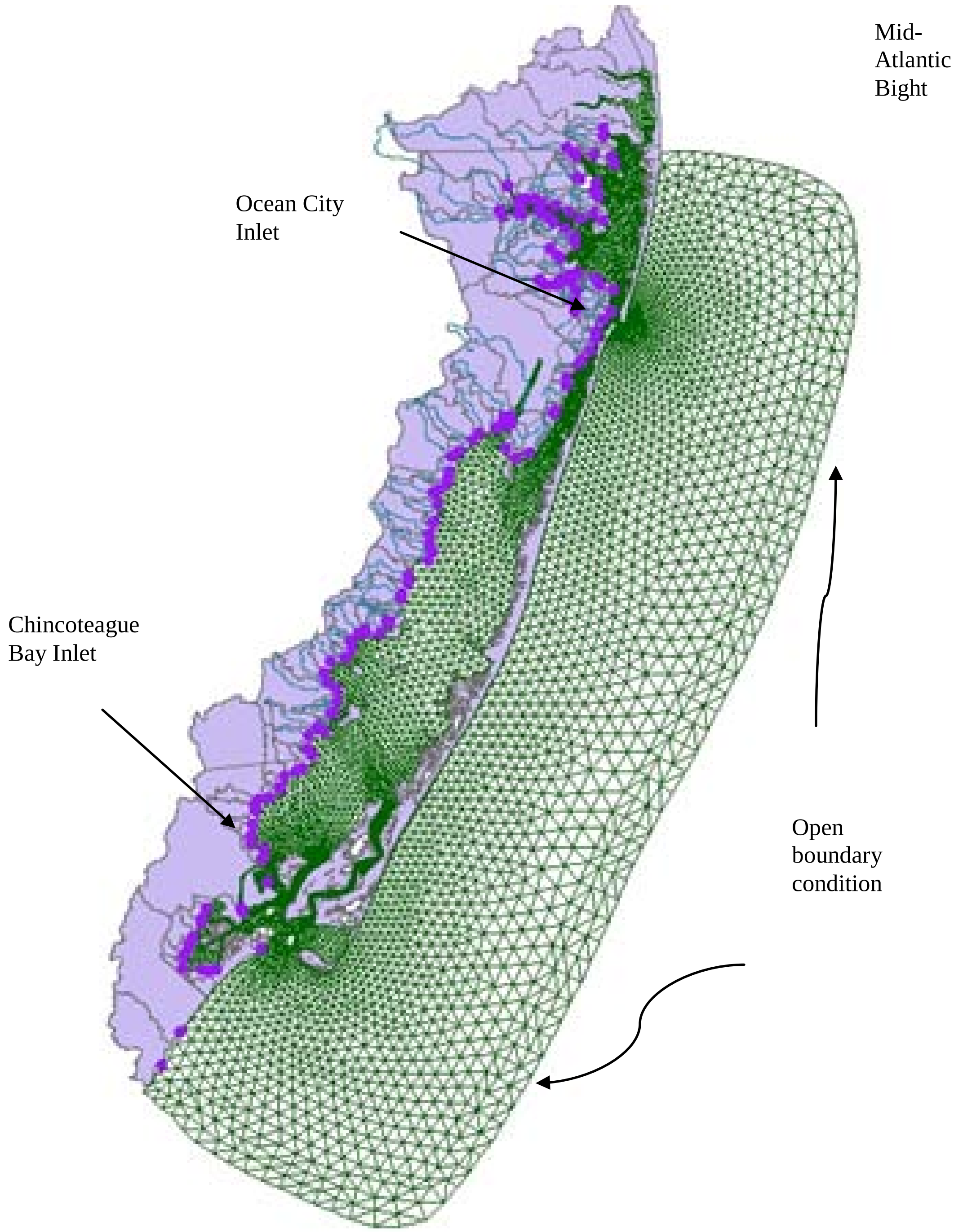

Figure 1: Maryland Coastal Bays modeling grid overlaid with the watershed in the land boundary and extended to the open boundary condition in the mid-Atlantic Bight coastal ocean.

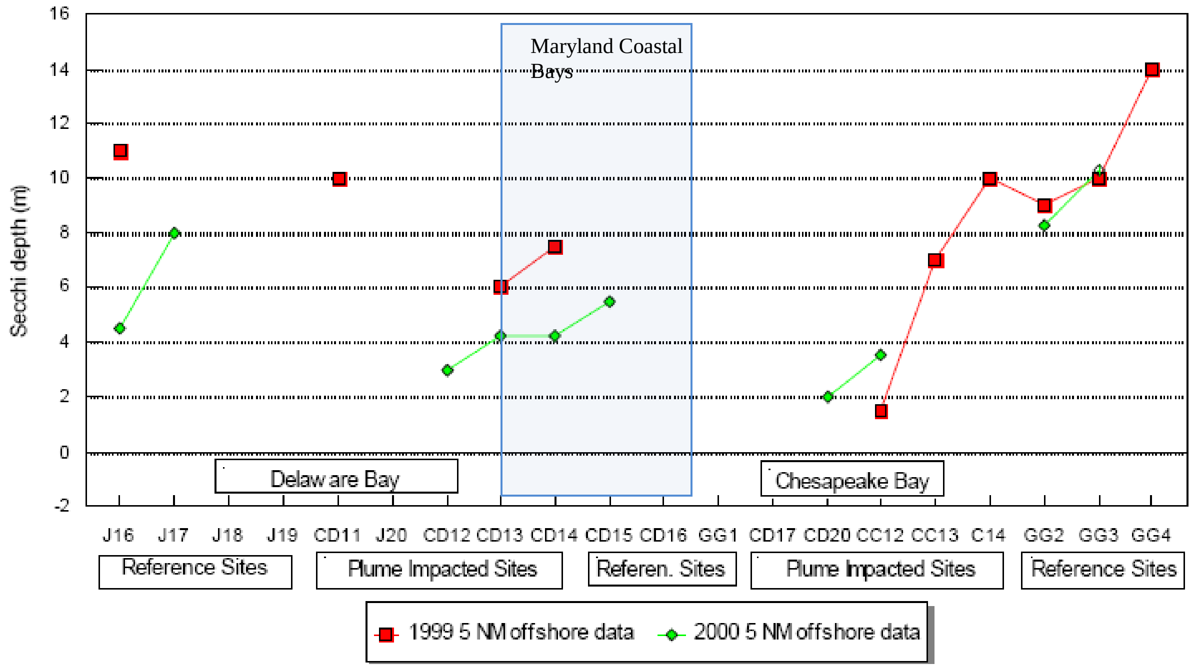

Figure 2: Two year summer nutrient survey results using a sampling design illustrated in the report. Secchi depth data are inclusive because of missing observation during night-time operation.

41. The commentor states that the State Variables do not appear to account for brown algae (Aureococcus) that is a primary bloom species in the southern bays annually in late Spring/early Summer. Only cyanobacteria diatoms and green algae are phytoplankton variables.

    Response: It is recognized that brown algae, *Aureococcus anophagefferens*, a potentially harmful algae, do bloom in late spring and early summer in the Southern Coastal Bays. While *Aureococcus* is not represented as a specific state variable in the model, its growth and blooms are implicitly represented via chlorophyll *a* in both the model and the TMDL endpoints. *Aureococcus* can out-compete co-occurring phytoplankton in estuaries with elevated levels of dissolved organic matter and turbidity, and low level dissolved inorganic nitrogen based on the recent study (Gobler et al. 2011; http://www.ncbi.nlm.nih.gov/pubmed/21368207).

    The brown algal bloom can have negative impacts on ecosystem through its toxic effect on fishery and SAV and thus there is a great interest in mitigating the occurrence of harmful algal blooms (HABs). However, the science regarding the relationship among variables influencing the proliferation of one phytoplankton species over another is quite limited, and the model is not capable of predicting the individual-species-based harmful algal bloom. In the Maryland Coastal Bays, based on an analysis of MD DNR and ASIS data, the contribution of *Aureococcus* bloom to the eutrophication problems seems to be limited. The chlorophyll *a* level in the southern Coastal Bays seldom reached the level of 50 µg/l and has not been seen to directly tie to the low bottom DO concentration and to the elevated TN, TP and TOC concentration. This is one of the reasons that the model did not specifically include brown tide species as a separate state variable. The predicted chlorophyll *a* concentration, however, implicitly includes *Aureococcus* within the spring/early summer diatom assemblage.

42. The commentor appreciates the extensive work that has been done to develop the model used to generate the proposed MD Coastal Bays Total Maximum Daily Load, TMDL. While the TMDL provides important load reductions needed to protect the bays, the commentor is concerned that it does not make enough reductions to effectively drive desired water quality improvements. Some data is over a decade old and more recent information is available. The commentor suggests approval of the current TMDL in order to begin implementation of needed nutrient reductions, but that the data inputs should be revised on a time-frame agreed upon in advance, and an updated TMDL completed in the next 5 years. The main updates that are required include water quality to protect seagrasses, inputs of phosphorus via groundwater, the inclusion of Aureococcus (Brown Tide) in the phytoplankton State variables, and updated values for land use, septics, and ocean boundary conditions.

    Response: It is not MDE's policy to specify a timeframe during which a TMDL may be updated. However, the modeling tools used in this effort will be available should stakeholders wish to employ them. Work such as described in the comment may be appropriate for tracking the efficacy of implementation efforts.

43. DNR also recommends that all monitoring stations should be represented for attainment purposes in Tables 14-17 even if they are not covered by the model. These data are extremely relevant to State assessments including the 305B report and 303D listings for these watersheds. Finally, working with regional scientists on merging the TMDL model and the user friendly Delmarva lagoons model presented by Harris & Brush may be extremely useful to local governments in implementing nutrient reductions.

    Response: MDE appreciates the commentors' desire to provide as much information as possible. For the purposes of clarity, the tables referenced include data from monitoring stations, within the Coastal Bays *per se*, that are used directly in support of TMDL development. The monitoring stations to which the commentors refer lie within ungauged streams within the watershed, and therefore would not be included in these tables. In order for streams to be simulated within the watershed model (HSPF), flow data must be available. Since these stations are in ungauged streams, they cannot be incorporated into the watershed model. Other assessments such as those included in the State's Integrated Report may be appropriate for the stations in the ungauged streams. MDE agrees on the value of collaboration among stakeholders during the implementation process.

44. The commentor states the nitrogen loading rate for septics is low compared to Delaware's 39 lb/year (59.3mg/l NO3-N) and EPA's 63 mg/l NO3 (average nitrate load in septic effluent).

    Response: Maryland's method of deriving TN loads for septics, developed for use in TMDL analyses, yields an estimated TN load from the septic system, rather than a concentration in the effluent from the dwelling. Maryland uses population numbers derived from the U.S. Census—an average of 3.2 individuals per septic-serviced dwelling—to estimate the average load per septic unit per year. This annual load per septic is 30 lbs. per year. There are likely many different approaches to estimating loads from septic systems, with varying site-specific inputs, assumptions and methodologies. Maryland's methodology has been peer-reviewed and vetted by the EPA Chesapeake Bay Program Office, and is consistent with management activities under the Bay TMDL and numerous other local TMDLs in the state.

45. The commentor states baseline loading estimates are likely underestimated due to the increase in septics across the lower eastern shore of MD over the last 15 years (http://www.baystat.maryland.gov/sources2.html), and in Worcester County and the coastal bays specifically. Additionally, the county estimates an additional 454 septic systems will be installed by 2025 (while an additional 683 systems are predicted to connect to an existing WWTP- mostly in Isle of Wight and Sinepuxent watersheds).

    Response: MDE used the best readily available data regarding the number of septics for the modeling time period. While the number of septic systems may have increased since 2005, the number used in the baseline period (2001-2005) is accurate. Tracking changes in the number of septic systems over time can be incorporated into the implementation plan to demonstrate whether or not progress is being made toward implementation.

46. The commentor states because of ground water transport lag times, land use and land practices that occurred 15 or more years ago have impacts on the groundwater loading of nutrients to the bays that should be incorporated into the model.

    The decreased ability of the soil to retain phosphorus due to decades of excess P fertilization needs to be considered for groundwater inputs. Soil phosphorus indices for this watershed may be helpful for the model and in helping assessing baseflow conditions. In addition, the MCBP has collected stream baseflow nutrient levels which should be evaluated.

    Response: MDE appreciates the complexity that groundwater transport lag times add to the tracking and understanding of surface water quality responses to managerial efforts. Data such as that described by the commentors will be useful throughout the implementation process, and MDE would appreciate their being made available. Groundwater lag is discussed in Section 2.1.3 of the main TMDL report under Geology, as well as in Section 5.2 (Sensitivity Analysis) of the water quality modeling report. This is reiterated in the Assurance of Implementation section.

The models used in developing the TMDLs for the Coastal Bays used the best information and data currently available. Constituents within groundwater discharging to the Coastal Bays are implicitly included in the simulation of transport in the interflow component of the watershed model, as well as via model calibration to ambient water quality data. The modeling of groundwater lag times and groundwater nutrient transport are issues of ongoing interest and active research within the Coastal Bays watershed and other areas, with a better understanding of the dynamics being steadily gained. MDE recommends that this issue be taken into consideration during the implementation process as this knowledge base evolves and becomes more complete.

References:

Maryland Department of the Environment (MDE). 2009. *Maryland's Nitrogen-Reducing Septic Upgrade Program a Success*. Baltimore, MD.: MDE. Also available at: http://www.mde.maryland.gov/programs/pressroom/pages/1216.aspx

United States Geological Survey (USGS). 2012. *The Influence of Groundwater on Nitrogen Delivery to the Chesapeake Bay*. USGS Fact Sheet FS-091-03. Available at: http://md.water.usgs.gov/publications/fs-091-03/html/. Accessed April 23, 2014.