2006 List of Impaired Surface Waters [303(d) List] and Integrated Assessment of Water Quality in Maryland

Submitted in Accordance with Sections 303(d), 305(b) and 314 of the Clean Water Act

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PROLOGUE

After the 45-day public comment period for the Draft 2006 Integrated Report (January 20 – March 8), some updates were made to this final version of the Integrated Report. These revisions fall into three categories: (1) responding to public comments or new data and information; (2) ensuring consistency with the state's listing methodologies; and (3) providing updates on the status of Total Maximum Daily Loads (TMDLs) and Water Quality Analyses (WQAs). The full comment response document is included in Appendix L and revisions of note are discussed below.

Multiple commentors provided verbal justification and photographic documentation to support listing the Anacostia River as impaired by trash. The Maryland Department of the Environment (MDE) concurred that the Anacostia violates state Water Quality Standards for excessive accumulations of trash and other debris (Code of Maryland Regulations §26.08.02.03-B(2)). However, recent developments in the watershed include a Potomac River Watershed Trash Treaty signed by Maryland Congressmen Hoyer, Wynn, and Van Hollen, leaders of Prince George's, Montgomery, Frederick, St. Mary's and Charles Counties, interested counties in Virginia, and mayors of interested cities. As a result of these commitments, Maryland initially listed the Anacostia in Category 4b of the Integrated Report as implementing a framework to ensure a trash free Potomac by 2013. However, upon review of Maryland's final Integrated Report, EPA requested that Maryland list the Anacostia River in category 5 as impaired by trash (Appendix M). EPA agreed that in the 2008 Integrated Report or beyond, Maryland should revisit this listing to determine whether to move the Anacostia back to category 4b based on progress made under the Trash Free Potomac Watershed Initiative.

After the public comment period, MDE staff noticed that some biological monitoring data were used for listing decisions that were inconsistent with our listing methodology for biology. As per the methodology (see Part G: Appendix II, section G.1.3.1), fish indices are not to be used in a watershed smaller than 300-acres because small headwater streams are often naturally low in fish diversity due to limited habitat and flow. Removing these fish scores from the decision-making process resulted in the following changes at the 8 and 12-digit watershed scale: 2 8-digit watersheds and 4 12-digit watersheds moved from Category 5 (impaired) to Category 3a (indeterminate); 6 8-digit and 4 12-digit watersheds moved from Category 3a to Category 2 (not impaired for biology); and, 1 8-digit watershed and 6 12-digit watersheds moved from Category 5 to Category 2. These changes resulted in an overall increase in the number of biologically impaired watersheds because a change in impairment status for an 8-digit listing often necessitates listing multiple smaller-scale 12-digit basins. See Appendix J for site-specific details.

Finally, 3 WQAs and 12 TMDLs were approved by EPA after the Draft Integrated Report was sent out for public review. In one case (Wills Creek), the WQA actually entailed two more separate listings for 12-digit watersheds (Jennings Run and an unnamed tributary to Jennings Run). See appendix K for details.

EXECUTIVE SUMMARY

Maryland's 2006 List of Impaired Surface Waters [303(d) List] and Integrated Assessment of Water Quality is submitted in compliance with section 303(d) of the federal Clean Water Act of 1972. This biennial report describes ongoing efforts to monitor, assess, track and restore the chemical, physical and biological integrity of State waters. This year marks a transition period for implementing Maryland's new Water Quality Standards and incorporating the Chesapeake Bay and its tidal tributaries as both water body segments and watersheds.

With Chesapeake Bay as its crown jewel, Maryland has been fortunate to have unprecedented public and private support for its water quality programs. In May 2004, Governor Ehrlich signed Senate Bill 320 (Bay Restoration Fund) which funds upgrades to Maryland's wastewater treatment plants and individual onsite treatment systems, as well as the planting of cover crops for reducing nitrogen loads to the Bay. Many of the impairments determined through additional monitoring are due to a combination of changes in land use and increased population density and resulting nonpoint source pollution, which is why the State has been proactive in correcting these issues. Governor Ehrlich's fiscal year 2007 budget includes more than $400 million to address nonpoint source pollution control programs including accelerating new funding for additional land preservation efforts and agricultural programs, nearly doubling the amount of cover crops planted; and more funding for the Tributary Strategies implementation; all of which play an important role in restoring the waters of the Bay. The budget also includes targeted investments to help restore the Chesapeake Bay, including the first-in-the-region Corsica River Restoration Project, which seeks to remove the Corsica from the EPA's list of impaired waters by concentrating federal, state, local and non-profit efforts on a single river.

Despite these successes, Maryland faces many challenges in controlling the nonpoint sources of pollution to small streams and rivers leading to Chesapeake Bay. An additional 149 impaired waters have been identified on Maryland's 2006 303(d) List (*i.e.*, category 5 waters). One-hundred thirteen of the new listings are for biological impairments in small to medium non-tidal streams with which many Marylanders are familiar. Of these 113 biologically impaired waters, 11 are 8-digit watersheds (approx. 90 $mi.^2$ drainage area) and the remaining 102 are 12-digit watersheds (approx. 11 $mi.^2$ drainage area). Identifying the causes of these biological impairments and working with local jurisdictions and interested stakeholders to develop/implement remedial actions in these watersheds is a top priority for the State.

Twenty-four of the new impairments are due to elevated bacterial concentrations in public beaches (11 listings), shellfish harvesting areas (9 listings) and recreational contact waters (4 listings). Of the twelve remaining new listings, seven are for PCBs in fish, two are for metals, and three are for pH.

The additional impairment listings reflect, at least in part, increased monitoring, newer water quality or resource data, and new improvements in assessment techniques, rather than a decline in water quality. The number of new listings in this biennium is similar to the 122 identified in 2004 and down from the 194 identified in 2002. Subsequent to the national lawsuits in the mid-1990s, MDE listed 303 and 48 new impairments in 1996 and 1998, respectively.

For the first time in Maryland history, volunteer monitoring information has been used to make an impaired waters listing (4 bacterial listings in Port Tobacco Creek). The Port Tobacco River Conservancy is an exemplary volunteer program that has worked closely with MDE on sample collection techniques (*i.e.*, all samples collected were submitted to Department of Health and Mental Hygiene Laboratories Administration for analysis). The State derives tremendous value from these cooperative relationships and looks forward to fostering similar efforts in the future.

Overall, 669 waters are now listed on the Integrated Report as impaired. The spatial scale of impairments ranges from 8 or 12-digit watersheds, to smaller areas related to recreational bathing (beaches) and shellfish harvesting restrictions. Since 1996, 48 formerly impaired waters have been shown to now meet water quality standards and Total Maximum Daily Loads (TMDLs) have been completed for 109 watersheds. These impaired waters cross jurisdictional boundaries and flow through every corner of the State. Maryland will need an unprecedented level of support among its citizenry, business leaders, local jurisdictions and federal partners to reverse this trend and restore the quality of life Marylanders deserve. The State looks forward to working with these parties to make Maryland a national model for water quality protection and restoration.

Recognizing that water pollution often originates from land, the 303(d) list has always listed watersheds, rather than specific stream lengths. However, the new Chesapeake Bay and tidal standards focus on the surface waters rather than the watershed. For example, the new Bay standards provide uses and criteria for the tidal fresh waters of a river that may be distinct from the upstream and downstream parts of the river, and without reference to the watershed. This is one reason that this report is a "transition" report for the new Chesapeake Bay water quality standards – the State needs additional time to solve the spatial jigsaw puzzle concerning how tidal segments relate to non-tidal watersheds.

Maryland has created a separate list for Bay segments for this transition report to:

- Allow time to reconcile the geographic issue;
- More clearly present the multiple uses and criteria that occur in each segment;
- Allow for the fact that many segments now also have vertical components;
- Clarify the count of impaired areas since the Maryland portion of the Bay was previously listed as just three segments, but has now been divided into 60 segments; and
- Enable simpler tracking of previously listed segments.

Three informational public meetings were held - this final report reflects the comments received from the participating public.

PART A: INTRODUCTION

In Maryland, the Departments of Natural Resources (DNR) and the Environment (MDE) are the two principal agencies responsible for water resources monitoring, assessment and protection. DNR is the primary agency responsible for ambient water monitoring and assessment. MDE sets water quality standards, regulates discharges to Maryland waters through environmental permitting, enforcement and compliance activities, and develops Total Maximum Daily Loads (TMDLs) for impaired waters. Historically, DNR reported water quality monitoring and assessment results via annual 305(b) reports and updates mandated by the federal Clean Water Act (CWA), while MDE listed polluted waters using the CWA's biennial 303(d) List. Since 2002 and in compliance with Environmental Protection Agency guidance on 303(d) listing and 305(b) reporting, these formerly independent responsibilities have evolved into a combined reporting structure referred to as the Integrated Report.[1]

The Integrated Report utilizes six reporting categories that not only include impaired waters requiring TMDLs, but also waters that are clean or need more monitoring data to make an assessment. These categories are:

I. **Category 1:** water bodies that meet all water quality standards and no use is threatened;

II. **Category 2:** water bodies meeting some water quality standards but with insufficient data and information to determine if other water quality standards are being met;

III. **Category 3:** Insufficient data and information are available to determine if any water quality standard is being attained. There are two subcategories within Category 3:
   - **Subcategory 3a:** includes waters having an insufficient data quantity to evaluate watershed attainment status; and,
   - **Subcategory 3b:** includes waters having insufficient data quality to evaluate watershed attainment status.

IV. **Category 4:** one or more water quality standards are impaired or threatened but a TMDL is not required. The following subcategories are included in category 4:
   - **Subcategory 4a:** TMDL already approved or established by EPA;
   - **Subcategory 4b:** Other pollution control requirements (*i.e.*, permits, consent decrees, etc.) are expected to attain water quality standards; and,
   - **Subcategory 4c:** Water body impairment is not caused by a pollutant.

V. **Category 5:** Water body is impaired, does not attain the water quality standard, and a TMDL is required. This is the part of the List historically known as the 303(d) List.

VI. **Category 6:** Maryland created a sixth category in order to maintain transparency in the listing process and to track waters that have been delisted. Generally, Category six is used to identify waters that have been delisted in the given reporting year due to reasons

[1] Since there is no public participation for the § 305(b) portion of the report it will be combined with 303(d) after the public comment period for joint submission to EPA.

other than a TMDL or Water Quality Analysis. In succeeding reporting years, Category 6 waters are then moved to the appropriate reporting category.

A.1 Maryland's Water Quality Standards

A water body is considered "impaired" when it does not attain its designated use [see Code of Maryland Regulations §26.08.02 at http://www.dsd.state.md.us/comar/subtitle_chapters/26_Chapters.htm#Subtitle08]. Maryland's Water Quality Standards (WQS) support the following designated uses:

1. **Use I waters*:** Water contact recreation, and protection of nontidal warmwater aquatic life;
2. **Use II waters#:** Support of estuarine and marine aquatic life and shellfish harvesting;
3. **Use III waters*:** Nontidal cold water; and,
4. **Use IV waters*:** Recreational trout waters.

*Uses I, III, and IV can also serve as public drinking water sources.
#See Section A.1.1 for details on new Chesapeake Bay water quality criteria.

Each of the four designated uses have narrative and numeric water quality criteria. Narrative criteria require, among other things, that all water bodies in Maryland shall "provide water quality for the designated uses of: water contact sports; play and leisure time activities where individuals may come in direct contact with the surface water; fishing; propagation of fish, other aquatic life, and wildlife; and, agricultural and industrial water supply"[2]. Numeric Water Quality Criteria establish threshold values, usually based upon scientifically defensible risk analysis or dose-response curves, for the protection of human health and aquatic life. These apply to pollutants that can be monitored and quantified to known levels of precision and accuracy, such as bacterial levels, toxics concentrations, pH, and nutrients.

The Clean Water Act requires that states update their water quality standards every three years, subject to review and approval by the US Environmental Protection Agency (http://www.mde.state.md.us/wqstandards/). Water quality standards are updated through regulatory changes that go through a normal promulgation (notification, public review/comment) process.

[2] Source: COMAR 26.08.02.02(1a-1f)

A.1.1 New Water Quality Standards for Chesapeake Bay and its Tidal Tributaries

Maryland has adopted new water quality standards for Chesapeake Bay to protect living resources. These revised standards are subcategories under Use II waters and establish five new designated uses (see Figure 1), including:

1. **Seasonal Migratory Fish Spawning and Nursery Designated Use** - includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival, growth, and propagation of balanced populations of ecologically, recreationally, and commercially important anadromous, semi-anadromous and tidal-fresh resident fish species from February 1 through May 31.
2. **Seasonal Shallow-Water Submerged Aquatic Vegetation Designated Use** –includes tidal fresh, oligohaline and mesohaline waters of the Chesapeake Bay and its tributaries that have the potential for or are supporting the survival, growth, and propagation of rooted, underwater bay grasses in tidally influenced waters between April 1 and October 1.
3. **Open-Water Fish and Shellfish Designated Use** - includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival, growth, and propagation of balanced, indigenous populations of ecologically, recreationally, and commercially important fish and shellfish species. This subcategory applies to two distinct periods: summer (June 1 to September 30) and the Rest of the Year (ROY) - October 1 through May 31. In summer, the open-water designated use in tidally influenced waters extends from shoreline to adjacent shoreline, and from the surface to the bottom or, if a pycnocline exists (preventing oxygen replenishment), to the upper measured boundary of the pycnocline. For the rest of the year (ROY), the boundaries of this use include all tidally influenced waters from the shoreline to adjacent shoreline and down to the bottom, except when the migratory spawning and nursery designation (MSN) applies.
   NOTE 1: If a pycnocline exists but other physical circulation patterns, such as the inflow of oxygen-rich oceanic bottom waters, provide oxygen replenishment to the deep waters, this use extends to the bottom. This is mostly prevalent in the Virginia portion of the Bay.
4. **Seasonal Deep-Water Fish and Shellfish Designated Use -** includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival, growth, and propagation of balanced, indigenous populations of important fish and shellfish species inhabiting deep-water habitats from June 1 through September 30:
   NOTE 1: In tidally influenced waters located between the measured depths of the upper and lower boundaries of the pycnocline, where a pycnocline is present and presents a barrier to oxygen replenishment; or
   NOTE 2: From the upper boundary of the pycnocline down to the sediment/water interface at the bottom, where a lower boundary of the pycnocline cannot be calculated due to the depth of the water column.
   NOTE 3: From October 1 to May 31, criteria for *Open Water Fish and Shellfish Subcategory* apply.

5. **Seasonal Deep-Channel Refuge Designated Use** - includes waters of the Chesapeake Bay and its tidal tributaries that have the potential for or are supporting the survival of balanced, indigenous populations of ecologically important benthic infaunal and epifaunal worms and clams, which provide food for bottom-feeding fish and crabs. This subcategory applies from June 1 through September 30 in tidally influenced waters where a measured pycnocline is present and presents a barrier to oxygen replenishment. Located below the measured lower boundary of the pycnocline to the bottom. **NOTE:** From October 1 to May 31, criteria for *Open Water Fish and Shellfish Subcategory* apply.

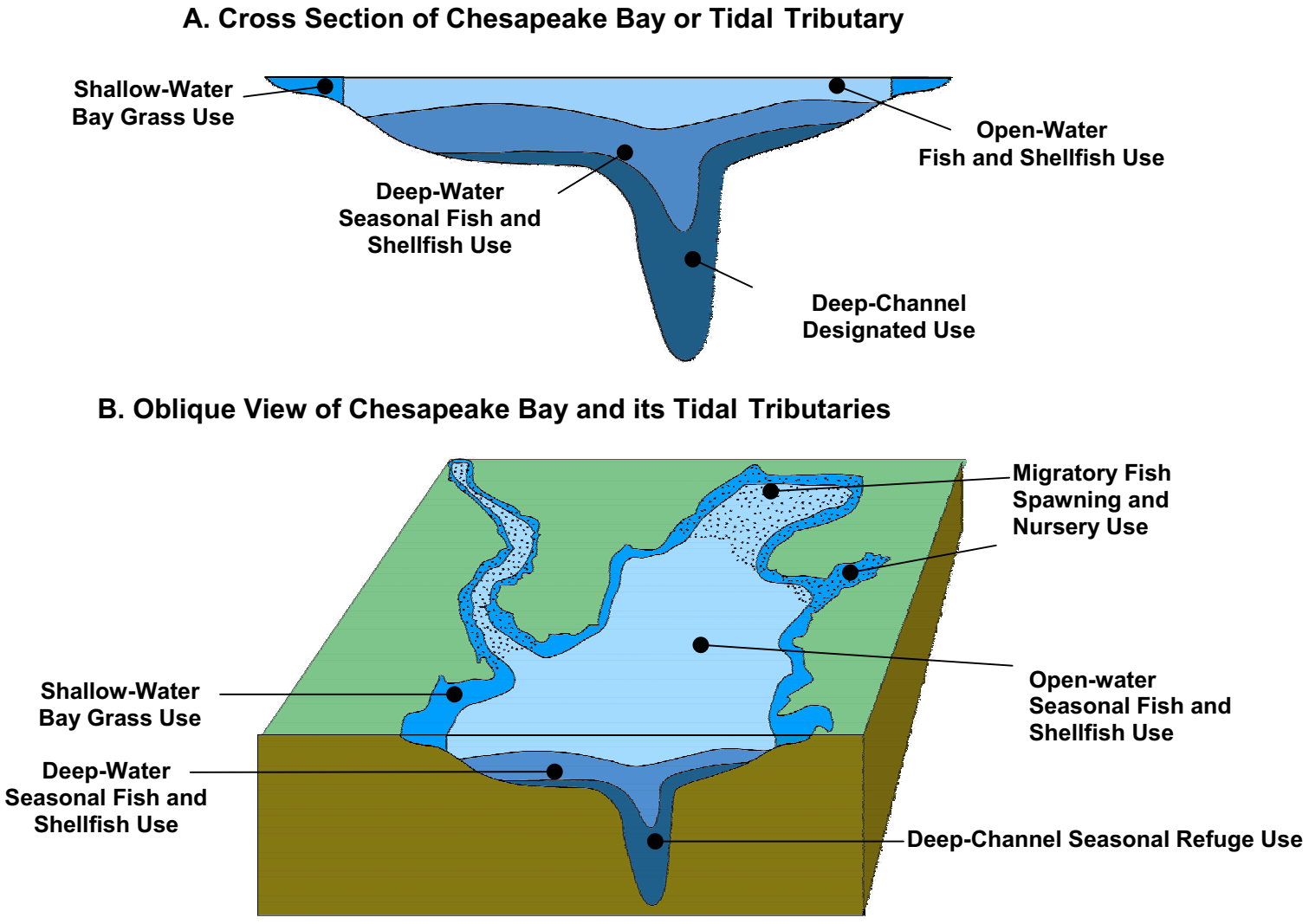

Figure 1: Illustration of the new designated uses for Chesapeake Bay (Chesapeake Bay Program, 1998). Uses are both overlapping and three-dimensional.

A.1.1.1 New Chesapeake Bay Water Quality Criteria

New water quality criteria have been adopted to support the revised designated uses. These criteria are comprised of numeric thresholds for dissolved oxygen, water clarity, and acres of submerged aquatic vegetation. The criteria vary by designated use, season, and segment. Table 1 illustrates these differences.

A.1.1.1.1 Dissolved Oxygen

Five separate DO criteria have been established for Chesapeake Bay and tidal tributaries. These are: a 30-day mean, a 7-day mean, a 1-day mean, an instantaneous minimum, and a special sturgeon criterion to protect the endangered Atlantic Shortnose Sturgeon (*Acipenser brevirostrum*). For this Integrated Report, only the 30-day mean DO concentrations have been assessed. The methodology and associated reference curves necessary to assess the 7-day, 1-day, instantaneous minimum, and special sturgeon DO criteria have not been developed[3].

Table 1: Dissolved oxygen criteria that apply to each designated use.

New Designated uses	Season	Dissolved oxygen	Water clarity (Secchi)
1. **Use II** subcategory - Seasonal migratory fish Spawning/nursery	Feb 1 – May 31	≥ 6.0 mg/L for 7 day averaging period ≥ 5.0 mg/L as instantaneous minimum	***N/A***
	June 1 – Jan 31	same as Subcategory Open water fish and shellfish	
2. **Use II** subcategory - Seasonal shallow water submerged aquatic vegetation	April 1 – Oct 1	same as Subcategory Open water fish and shellfish	Shallow-water meets/exceeds percent-light-through-water (PLW) criteria expressed in Secchi depth equivalence at the segment specific application depth (see Reg. 08) - excluding no grow zones; Submerged aquatic vegetation (SAV) acreage meets/exceeds segment restoration goal; Shallow-water acreage meets/ exceeds Secchi depth requirements in combination with actual SAV acreage equal or exceed the restoration goal.

[3] The attainment of the dissolved oxygen criteria that apply to the Chesapeake Bay and tidally influenced tributary waters shall be determined consistent with the guidelines established in the 2003 U.S. Environmental Protection Agency publication "Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and its Tidal Tributaries (EPA 903-R-03-002)" and the "Ambient Water Quality Criteria for Dissolved Oxygen, Water Clarity and Chlorophyll a for the Chesapeake Bay and its Tidal Tributaries—2004 Addendum (EPA 903-R-04-005)".

Table 1: Continued …..

New Designated uses	Season	Dissolved oxygen	Water clarity (Secchi)
3. **Use II** subcategory - Open water fish and shellfish	Year round (assessed separately for the summer period – June 1 to Sept. 30 – and the rest of the year)	=5.5 mg/L for 30-day averaging period in tidal fresh waters (salinity<0.5 ppt) >5.0 mg/L for a 30-day averaging period when salinity >0.5 ppt >4.0 mg/L for a 7-day avg period >3.2 mg/L as an instantaneous minimum >4.3 mg/L as an instantaneous minimum when water temperature exceeds 29 degrees C to protect endangered shortnose sturgeon	***N/A***
4. **Use II** subcategory - Seasonal deep-water fish and shellfish	June 1 – Sept 30	≥ 3.0 mg/L for a 30-day avg period; ≥ 2.3 mg/L for a 1-day avg period ≥ 1.7 mg/L as an instantaneous minimum CB4MH and PATMH – not less than minimum over 7% of space/time	***N/A***
	Oct 1 - May 31	same as Open water fish/shellfish	
5. **Use II** subcategory - Seasonal deep-channel refuge	June 1 – Sept 30	≥ 1.0 mg/L as an instantaneous minimum CB4MH – not lower than above for more than 2 percent of time/space	***N/A***
	Oct 1 - May 31	same as Open water fish/shellfish	

A.1.1.1.2 Water Clarity and the SAV Restoration Goal

The measure for water clarity in Chesapeake Bay and its tidal tributaries applies only to the seasonal shallow water submerged aquatic vegetation (SAV) use. This use is established to protect SAV habitat and support its propagation and growth (see COMAR 26.08.02.03-3). The criterion states that attainment of the SAV water quality criteria for a Bay segment can be determined in one of three ways:

1. The shallow-water segment meets or exceeds the water clarity criterion (Table 2) at the specified application depth (excluding 'no-grow' zones);
2. Existing submerged aquatic vegetation (SAV) acreage meets or exceeds the acreage restoration goal (Table 3); or
3. The combined shallow-water clarity acreage and the existing SAV acreage equal or exceed the SAV restoration goal acreage. When using the combination SAV acreage and water clarity acreage approach, water clarity acreage must equal the remaining required SAV acreage multiplied by 2.5. For example, if a segment has an SAV restoration goal of 1200 acres and 800 acres of SAV are currently present, then 1000 water clarity acres are necessary to achieve the 1200-acre restoration goal. This number is generated by taking the remaining 400 acres that did not contain SAV and multiplying it by a factor of 2.5, which equals 1000 water clarity acres needed to achieve Water Quality Standards.

Water clarity has not been assessed in the SAV designated zones. As a result, unless the SAV acreage is already meeting the restoration goal, there are insufficient data this reporting cycle to assess whether the SAV use is attained.

Table 2: Numerical water clarity criteria (in Secchi depth equivalents) for general application to the shallow water submerged aquatic vegetation designated use. Source: COMAR 26.08.02.03-3

		Water clarity criteria application depth (m)				
Salinity Regime	Water clarity criteria – % light thru water	0.5	1.0	1.5	2.0	Seasonal application
		Secchi depth equivalents for criteria application depth				
Tidal Fresh	13%	0.4	0.7	1.1	1.4	Apr 1 – Oct 1
Oligohaline	13%	0.4	0.7	1.1	1.4	Apr 1 – Oct 1
Mesohaline	22%	0.5	1.0	1.4	1.9	Apr 1 – Oct 1

NOTE: Application depths given in 0.5 m attainment intervals. Based on application of the formula $PLW = 100^{(-KdZ)}$ *, the appropriate PLW criterion value and the selected application depth (Z) are inserted and the equation is solved for* K_d*. The generated* K_d *value is then converted to Secchi depth (meters) using the conversion factor* $K_d = 1.45/\text{Secchi depth}$*.*

Table 3: Submerged Aquatic Vegetation acreage restoration goals.

Chesapeake Bay Segment	Segment ID	Restoration Goal Acreage	Application Depth
Northern Chesapeake Bay	CB1TF2	12,149	2 meters
Northern Chesapeake Bay	CB1TF1	754	1.0 meters
Lower Pocomoke River Mesohaline	POCMH	877[2]	1.0 meters
Manokin River Mesohaline	MANMH1	4,294	2.0 meters
Manokin River Mesohaline	MANMH2	59	0.5 meters
Big Annemessex River Mesohaline	BIGMH1	2,021	2.0 meters
Big Annemessex River Mesohaline	BIGMH2	22	0.5 meters
Tangier Sound Mesohaline	TANMH1	24,683[2]	2.0 meters
Tangier Sound Mesohaline	TANMH2	74	0.5 meters
Middle Nanticoke River Oligohaline	NANOH	12	0.5 meters
Lower Nanticoke River Mesohaline	NANMH	3	0.5 meters
Wicomico River Mesohaline	WICMH	3	0.5 meters
Fishing Bay Mesohaline	FSBMH	197	0.5 meters
Middle Choptank River Oligohaline	CHOOH	72	0.5 meters
Lower Choptank River Mesohaline	CHOMH2	1,621	1.0 meters
Mouth of Choptank River Mesohaline	CHOMH1	8,184	2.0 meters
Little Choptank River Mesohaline	LCHMH	4,076	2.0 meters
Honga River Mesohaline	HNGMH	7,761	2.0 meters
Eastern Bay	EASMH	6209	2.0 meters
Middle Chester River Oligohaline	CHSOH	77	0.5 meters
Lower Chester River Mesohaline	CHSMH	2,928	1.0 meters
Chesapeake & Delaware (C&D) Canal	C&DOH	7	0.5 meters
Northeast River Tidal Fresh	NORTF	89	0.5 meters
Bohemia River Oligohaline	BOHOH	354	0.5 meters
Elk River Oligohaline	ELKOH1	1,844	2.0 meters
Elk River Oligohaline	ELKOH2	190	0.5 meters
Sassafras River Oligohaline	SASOH1	1,073	2.0 meters
Sassafras River Oligohaline	SASOH2	95	0.5 meters
Bush River Oligohaline	BSHOH	350	0.5 meters
Gunpowder River Oligohaline	GUNOH2	572	2.0 meters
Mouth of Gunpowder River	GUNOH1	1,860	0.5 meters
Middle River Oligohaline	MIDOH	879	2.0 meters
Patapsco River Mesohaline	PATMH	389	1.0 meters
Magothy River Mesohaline	MAGMH	579	1.0 meters
Severn River Mesohaline	SEVMH	455	1.0 meters
South River Mesohaline	SOUMH	479	1.0 meters
Rhode River Mesohaline	RHDMH	60	0.5 meters

Table 3: Continued …..

Chesapeake Bay Segment	Segment ID	Restoration Goal Acreage	Application Depth
West River Mesohaline	WSTMH	238	0.5 meters
Upper Patuxent River Tidal Fresh	PAXTF	205	0.5 meters
Middle Patuxent River Oligohaline	PAXOH	115	0.5 meters
Lower Patuxent River Mesohaline	PAXMH1	1,459	2.0 meters
Lower Patuxent River Mesohaline	PAXMH2	172	0.5 meters
Lower Patuxent River Mesohaline	PAXMH4	1	0.5 meters
Lower Patuxent River Mesohaline	PAXMH5	2	0.5 meters
Lower Potomac River Tidal Fresh	POTTF	2,142[2]	2.0 meters
Piscataway Creek Tidal Fresh	PISTF	789	2.0 meters
Mattawoman Creek Tidal Fresh	MATTF	792	1.0 meters
Lower Potomac River Oligohaline	POTOH1	1,387[2]	2.0 meters
Lower Potomac River Oligohaline	POTOH2	262	1.0 meters
Lower Potomac River Oligohaline	POTOH3	1,153	1.0 meters
Lower Potomac River Mesohaline	POTMH	7,088[2]	1.0 meters
Upper Chesapeake Bay	CB2OH	705	0.5 meters
Upper Central Chesapeake Bay	CB3MH	1,370	0.5 meters
Middle Central Chesapeake Bay	CB4MH	2,533	2.0 meters
Lower Central Chesapeake Bay	CB5MH	8,270[2]	2.0 meters

[1] The segments Upper Pocomoke Tidal Fresh (POCTF-application depth = 0.5 meters), Middle Pocomoke Oligohaline (POCOH-application depth = 0.5 meters), Upper Chester River Tidal Fresh (CHSTP-application depth = 0.5 meters), Back River Oligohaline (BACOH-application depth = 0.5 meters), and Western Branch Patuxent River (WBRTF-application depth = 0.5 meters), and Lower Patuxent River Mesohaline Subsegments 3 and 6 (PAXMH3 & PAXMH6-application depths = 0.5 meters), and the Anacostia River Tidal Fresh (ANATF-application depth = 0.5 meters) are not listed above because the SAV restoration goal for each segment is 0 acres, based on the required historical SAV presence criteria used to set the restoration goal for each segment. These segments have been assigned a water clarity criteria and application depth. Attainment of the shallow-water designated use will be determined using the method outlined in §C(9)(a)(i)—(iii) and (c) of this regulation.

[2]Maryland portion of the segment.

PART B: SURFACE WATER MONITORING, ASSESSMENT, AND LISTING

B.1 Maryland's Water Monitoring Strategy

In September 2004, Maryland updated its Comprehensive Water Quality Monitoring Strategy for all State waters consistent with current EPA guidance (see "Elements of a Water Monitoring and Assessment Program", EPA document 841-B-03-003). This Strategy describes Maryland's water quality monitoring framework and covers all State waters, including rivers and streams, lakes, tidal waters, ground water and wetlands.

These water quality monitoring programs support assessment of Maryland's designated uses as well as integrated reporting activities under sections 303(d) and 305(b) of the Clean Water Act. The State's strategy identifies the programs and protocols established to ensure that monitoring activities meet defined programmatic goals and objectives. The strategy also discusses current data management and quality assurance/quality control procedures established to ensure that data are of sufficient quality and quantity to assess designated use attainment. Samples sizes, confidence limits, analytical procedures and weight-of-evidence approaches to determining water body impairment status are also included therein.

In addition to discussing current water quality monitoring programs, the strategy includes a 10-year implementation timelime for strengthening existing programs, developing new assessment tools, as well as improving public access to and documentation of State water quality data. Resource and other constraints to program improvements are also discussed. For more details please see http://www.mde.state.md.us/assets/document/water/WQPlanning_MonitoringStrategy_Sep04.pdf .

B.2 Assessment Units

Maryland maintains the flexibility to assess water bodies at a scale that is appropriate for the designated use, the spatial extent of the impairment, and tailored to a management scale that facilitates accurate loading analyses and effective implementation. The listing scale must also take into account the heterogeneous nature of the impaired watershed as well as the chemical and physical properties of the impairing substance. For water contact recreation, this could mean 1,000 linear feet of swimming beach while for shellfish harvesting the assessment unit could comprise a mapped reef area or harvest zone. Despite the size of the assessed area, however, the State includes a watershed code (8 or 12-digit – Figures 2 and 3) as the larger frame of reference for modeling purposes, public outreach and consistency with EPA's "Watershed Approach" to water quality management.

This year, a new segmentation for Chesapeake Bay has been introduced based upon the salinity regime of a given tidal segment rather than a specified drainage area. As a result, the watershed and salinity-based boundaries cannot be aligned. To address this issue in the short-term, Maryland is maintaining separate lists of Bay segments and watersheds in this transition

Integrated report. It is anticipated that the technical integration of segments and watersheds will be complete by the 2008 report.

Maryland is in the process of implementing the federal National Hydrography Dataset (NHD) on a trial basis to see how transitioning from a watershed to a stream segmentation may affect the State's ability to assess all waters and develop timely TMDLs. As a transition measure, Maryland has added the 8-digit federal hydrologic unit code (HUC) to each Integrated Report and has concurrently started adding the NHD reach code to stream segments with impaired biological communities (*i.e.*, either fish or benthic)[4]. The inclusion of the federal watershed and stream segment coding should help improve consistency between the State and federal reporting on water quality status.

B.2.1 Maryland's Watershed-based Assessment Units

Maryland generally uses a hierarchical watershed scheme to characterize surface watersheds, similar to the federal Hydrologic Unit Codes (HUC). Some of these watershed codes are identified in COMAR 26.08.02.08 and are a key spatial variable in many State agency datasets, permits and reports addressing any number of watershed issues including water withdrawals, discharge permits, water quality and living resource databases, and geographic information system (GIS) data layers.

Maryland has two continental drainages (Atlantic Ocean, Gulf of Mexico) divided into four drainage basins (Chesapeake Bay/Atlantic Ocean[5], Susquehanna, Potomac and Youghiogheny Rivers) and 20 major river basins (Chesapeake Bay, Atlantic Coastal Bays, West Chesapeake Bay, Pocomoke, Nanticoke/Wicomico, Choptank, Chester, Elk, Bush, Gunpowder, Patapsco, Patuxent, and Youghiogheny Rivers, and the Lower, Middle, Upper and North Branch Potomac River and the Potomac Washington Metropolitan Area, and Conewago Creek). Within these, there are 138 tributary segments or 8-digit watersheds (Figure 2) and nearly 1,200 subsegments or 12-digit subwatersheds (Figure 3). Although a new salinity based segmentation has been adopted for Chesapeake Bay and its tidal tributaries, Maryland will continue to identify watersheds in this reporting cycle using the Maryland 8 and 12-digit watershed scheme.

[4] NHD reach codes are determined by plotting station coordinates on the 1:24,000 scale NHD coverage. Sometimes stations plot between several segments and there is uncertainty whether the correct NHD segment has been identified.

[5] A few waters on Maryland's Eastern Shore also drain to Delaware Bay.

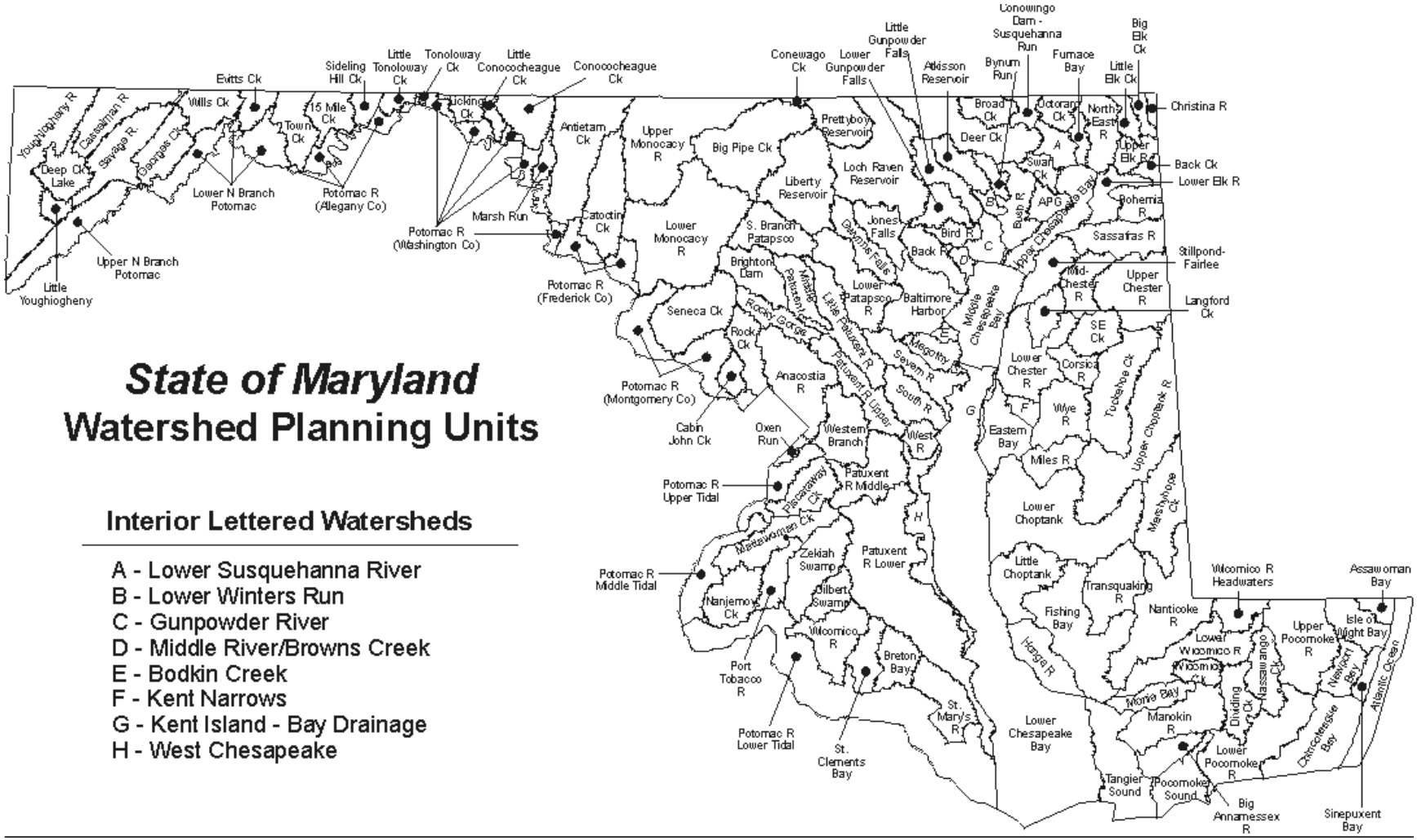

Figure 2: Maryland's 8-digit watersheds. The average size of these 138 watersheds is approximately 90 square miles.

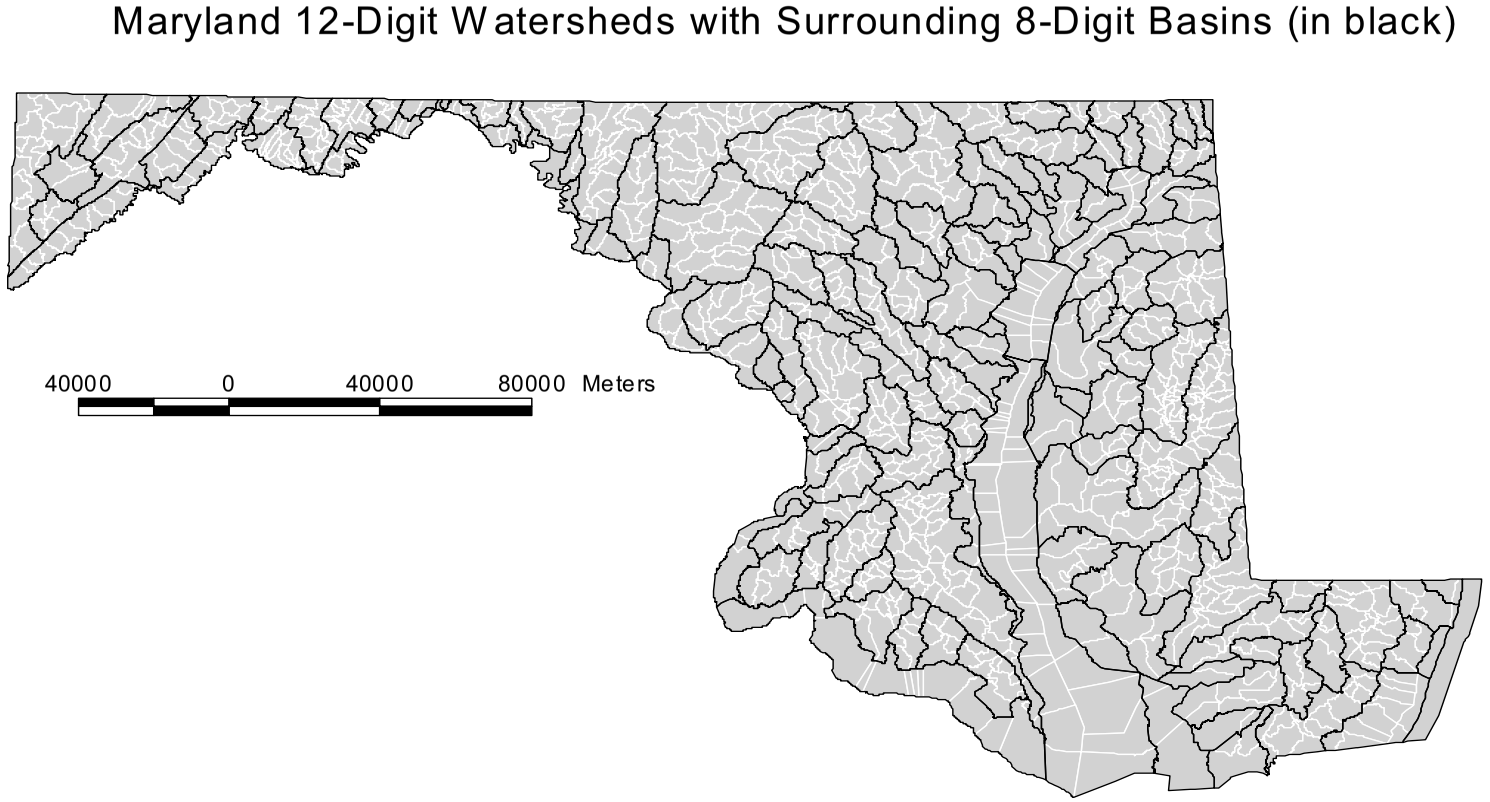

Figure 3: Maryland 12-digit subwatersheds superimposed on the 8-digit basins.

B.2.2 Chesapeake Bay Salinity-based Assessment Units

On August 29, 2005, EPA approved Maryland's new regulations for Chesapeake Bay and its tidal tributaries. These new regulations adopted a revised segmentation scheme (Figure 4) for Chesapeake Bay and tributaries. Estuarine segments in Maryland's Atlantic Coastal Bays have not been modified.

The new Bay segmentation scheme identifies 60 estuarine segments while the former 8-digit watershed segmentation system identified 82 segments. The mainstem Chesapeake Bay in Maryland is divided into six new segments (CB1TF, CB2OH, CB3MH, CB4MH, CB5MH, and TANMH), rather than three 8-digit segments (02139996, 02139997, 02139998). These segments may also be divided vertically into one to three layers (see Figure 1). The approximate relationship of 8-digit watersheds to Bay and tidal segments is shown in Figure 5 and Table 5. Maryland is using the transition approach of two lists of segments to allow time to align the watersheds and Bay segments.

The naming convention for the new salinity-based segments uses the first three letters as an abbreviation for the water body name, followed by a suffix (*e.g.*, TF, OH, MH, or PH). The suffix corresponds to the salinity regime for that particular segment (Table 5). In some cases, these suffixes are followed by a numeral indicating that the segment is further divided into subsegments, for example PAXMH5 (see COMAR 26.08.02.08 for details).

Table 4: Salinity class and corresponding range as adopted by the Chesapeake Bay Program.

Salinity Class	Salinity Range (in parts per thousand)
Tidal Fresh(TF)	0.0 – 0.5
Oligohaline(OH)	0.5 – 5.0
Mesohaline(MH)	5.0 – 18.0
Polyhaline(PH)	18.0 – 35.0

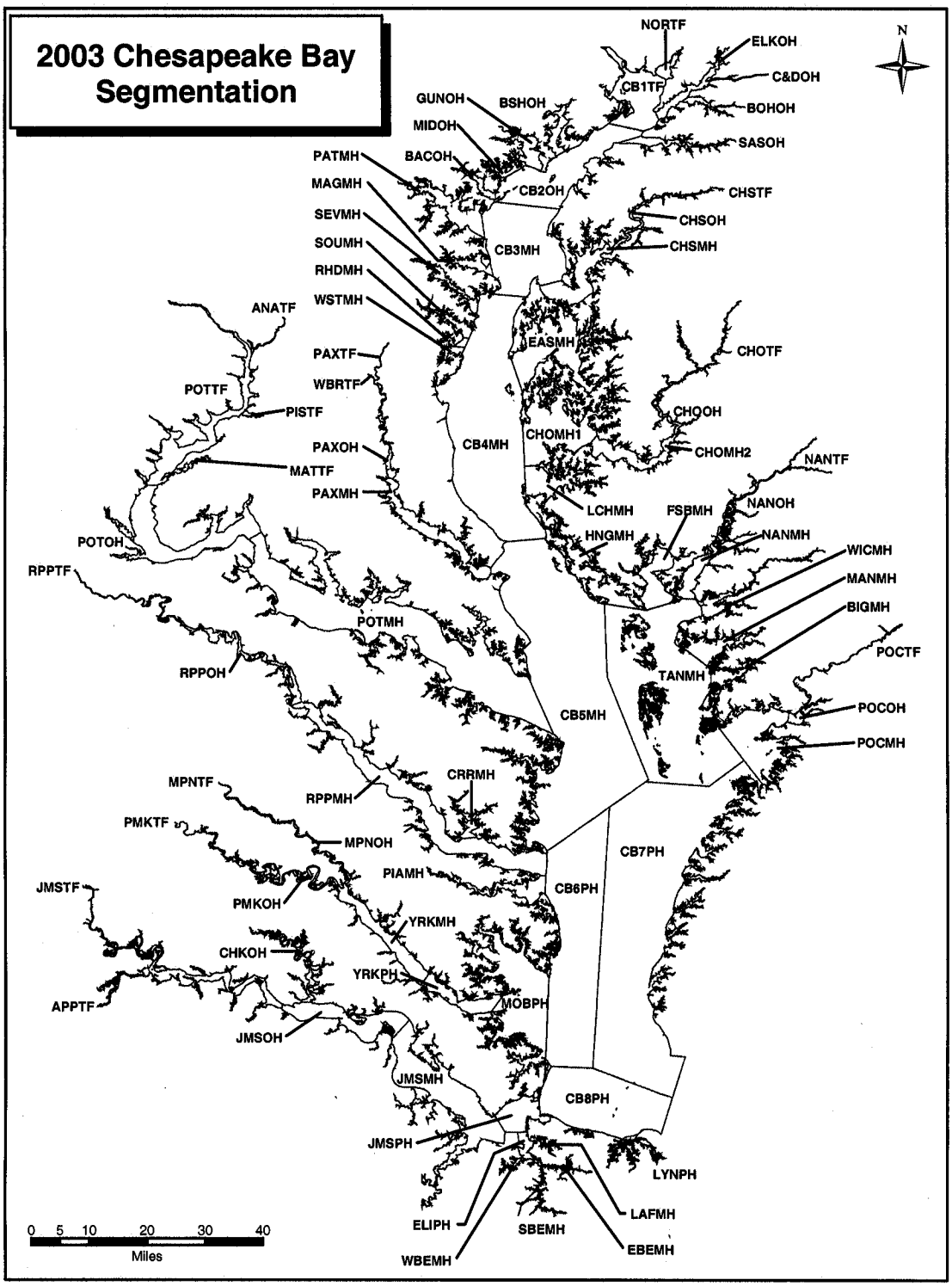

Figure 4: Chesapeake Bay segmentation scheme (Chesapeake Bay Program, 2003)

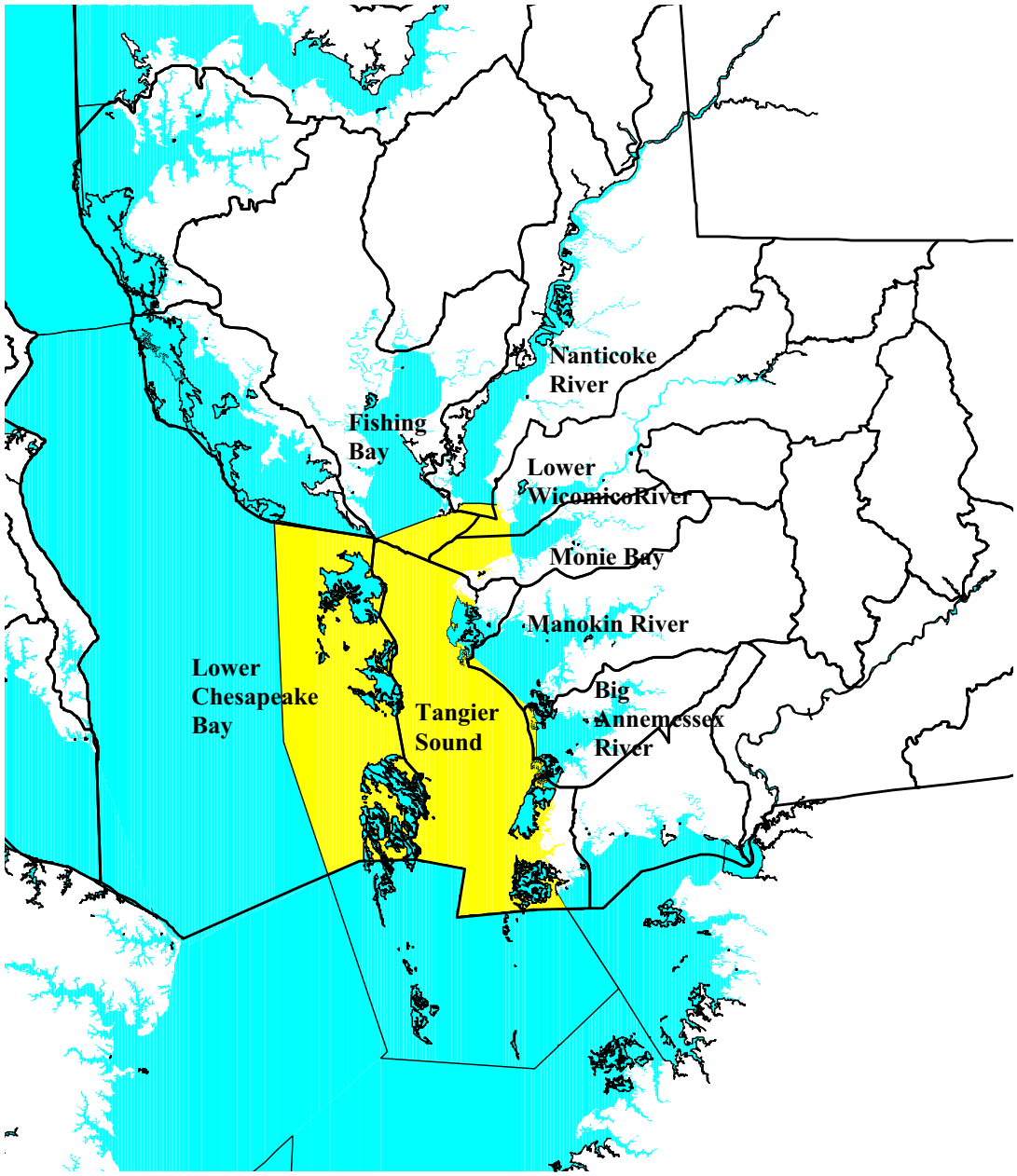

Figure 5: Comparison of the Chesapeake Bay salinity-based segmentation for TANMH (shown in light grey) with Maryland's 8-digit watersheds. TANMH contains portions of Fishing Bay (02130307), Nanticoke River (02130305), Lower Wicomico River (02130301), Monie Bay (02130302), Tangier Sound (02130206), Manokin River (02130208), Big Annemessex River (02130207), and Lower Chesapeake Bay (02139998).

Table 5: New Chesapeake Bay segmentation compared to Maryland's 8-digit watershed planning units. Close inspection of this table reveals that an 8-digit watershed can span multiple Chesapeake Bay segments. See Figure 5 above for a graphical illustration.

New Chesapeake Bay Segments	MD 8 digit Watershed Code	MD 8 digit Watershed Name
CB1TF - Chesapeake Bay 1 Tidal Fresh	02130705 02130601 02120201 02130609 02130706 02139996	Aberdeen Proving Ground (tidal) Lower Elk River (tidal) Lower Susquehanna River (tidal) Furnace Bay (tidal) Swan Creek (tidal) Upper Chesapeake Bay (tidal)
CB2OH - Chesapeake Bay 2 Oligohaline	02130901 02130701 02130801 02130807 02130611 02130705 02139996 02139997	Back River (tidal) Bush River (tidal) Gunpowder River (tidal) Middle River (tidal) Still Pond (tidal) Aberdeen Proving Grounds (tidal) Upper Chesapeake Bay (tidal) Middle Chesapeake Bay (tidal)
CB3MH - Chesapeake Bay 3 Mesohaline	02130511 02139998 02130505 02139997 02130903	Kent Island/Bay Area (tidal) Lower Chesapeake Bay (tidal) Lower Chester River(tidal) Middle Chesapeake Bay (tidal) Patapsco River (tidal)
CB4MH - Chesapeake Bay 4 Mesohaline	02130511 02139998 02131005	Kent Island/Bay Area (tidal) Lower Chesapeake Bay (tidal) Other West Chesapeake Area (tidal)
CB5MH - Chesapeake Bay 5 Mesohaline	02130401 02139998 02131101	Honga River (tidal) Lower Chesapeake Bay (tidal) Lower Patuxent River (tidal)
POCMH - Pocomoke River Mesohaline	02130201 02130206	Pocomoke Sound (tidal) Tangier Sound (tidal)
POCOH - Pocomoke River Oligohaline	02130201 02130202	Pocomoke Sound (tidal) Lower Pocomoke River (tidal)
POCTF - Pocomoke River Tidal Fresh	02130202 02130204 02130205	Lower Pocomoke River (tidal) Dividing Creek (tidal) Nassawango Creek (tidal)
TANMH - Tangier Sound Mesohaline	02139998 02130301 02130307 02130302 02130305 02130206 02130207	Lower Chesapeake Bay (tidal) Lower Wicomico River (tidal) Fishing Bay (tidal) Monie Bay (tidal) Nanticoke River (tidal) Tangier Sound (tidal) Big Annemessex River (tidal)
BIGMH - Big Annemessex Mesohaline	02130207	Big Annemessex River (tidal)
MANMH - Manokin River Mesohaline	02130208 02130206	Manokin River (tidal) Tangier Sound (tidal)
WICMH - Wicomico River Mesohaline	02130301 02130302 02130303	Lower Wicomico River (tidal) Monie Bay (tidal) Wicomico Creek (tidal)
NANTF - Nanticoke River Tidal	02130305	Nanticoke River (tidal)

New Chesapeake Bay Segments	MD 8 digit Watershed Code	MD 8 digit Watershed Name
Fresh		
NANOH - Nanticoke River Oligohaline	02130305 02130306	Nanticoke River (tidal) Marshyhope Creek (tidal)
NANMH - Nanticoke River Mesohaline	02130305	Nanticoke River (tidal)
FSBMH - Fishing Bay Mesohaline	02130307 02130308	Fishing Bay (tidal) Transquaking River (tidal)
HNGMH - Honga River Mesohaline	02130401	Honga River (tidal)
LCHMH - Little Choptank River Mesohaline	02130402	Little Choptank River (tidal)
CHOMH - Choptank River Mesohaline	02130403	Lower Choptank River (tidal)
CHOTF - Choptank River Tidal Fresh	02130404 02130405	Upper Choptank River (tidal) Tuckahoe Creek (tidal)
CHOOH - Choptank River Oligohaline	02130403 02130404	Lower Choptank River (tidal) Upper Choptank River (tidal)
EASMH - Eastern Bay Mesohaline	02130501 02130502 02130503 02130504	Eastern Bay (tidal) Miles River (tidal) Wye River (tidal) Kent Narrows/Prospect Bay (tidal)
CHSOH - Chester River Oligohaline	02130505 02130508 02130509	Lower Chester River (tidal) Southeast Creek (tidal) Middle Chester River (tidal)
CHSMH - Chester River Mesohaline	02130505 02130506 02130507	Lower Chester River (tidal) Langford Creek (tidal) Corsica River (tidal)
CHSTF - Chester River Tidal Fresh	02130510	Upper Chester River (tidal)
ELKOH - Elk River Oligohaline	02130601 02130603	Lower Elk River (tidal) Upper Elk River (tidal)
BOHOH - Bohemia River Oligohaline	02130602	Bohemia River (tidal)
C&DOH - C&D Canal Oligohaline	02130604	Back Creek (tidal)
NORTF - Northeast River Tidal Fresh	02130608	Northeast River (tidal)
SASOH - Sassafras River Oligohaline	02130610	Sassafras River (tidal)
BSHOH - Bush River Oligohaline	02130701	Bush River (tidal)
GUNOH - Gunpowder River Oligohaline	02130801 02130803 02130802 02130804	Gunpowder River (tidal) Bird River (tidal) Lower Gunpowder Falls (tidal) Little Gunpowder Falls (tidal)
MIDOH - Middle River Oligohaline	02130807 02130801	Middle River-Browns Creek (tidal) Gunpowder River (tidal)
BACOH - Back River Oligohaline	02130901	Back River (tidal)
PATMH - Patapsco River Mesohaline	02130902 02130903 02130905 02130906	Bodkin Creek (tidal) Gwynns Falls (tidal) Baltimore Harbor (tidal) Mainstem/Lower North Branch Patapsco River (tidal)
MAGMH - Magothy River Mesohaline	02131001 02139997 02139998	Magothy River (tidal) Middle Chesapeake Bay (tidal) Lower Chesapeake Bay (tidal)
SEVMH - Severn River Mesohaline	02131002 02139998	Severn River (tidal) Lower Chesapeake Bay

New Chesapeake Bay Segments	MD 8 digit Watershed Code	MD 8 digit Watershed Name
SOUMH - South River Mesohaline	02131003	South River (tidal)
WSTMH - West River Mesohaline	02131004	West River (tidal)
RHDMH - Rhode River Mesohaline	02131004	West River (tidal)
PAXOH - Patuxent River Oligohaline	02131101	Patuxent Mainstem-Mouth to Ferry Landing (tidal)
PAXMH - Patuxent River Mesohaline	02131101	Patuxent Mainstem-Mouth to Ferry Landing (tidal)
PAXTF - Patuxent River Tidal Fresh	02131102	Patuxent Mainstem-Ferry Landing to Rt 214 (tidal)
WBRTF - Western Branch Patuxent Tidal Fresh	02131103	Western Branch (tidal)
POTMH - Potomac River Mesohaline	02140101 02140103 02140104 02140105 02140106 02139998	Potomac-Smith Pt to Mouth (tidal) St. Mary's River (tidal) Breton Bay (tidal) St. Clements Bay (tidal) Wicomico River (tidal) Lower Chesapeake Bay (tidal)
POTOH - Potomac River Oligohaline	02140102 02140109 02140110 02140101	Potomac - Marshall Hall to Smith Pt (tidal) Port Tobacco River (tidal) Nanjemoy Creek (tidal) Potomac-Smith Pt to Mouth (tidal)
POTTF - Potomac River Tidal Fresh	02140201 02140204 02140202 02140102	Potomac - Marshall Hall to Chain Bridge (tidal) Oxon Run (tidal) Potomac River Montgomery Co. Potomac - Marshall Hall to Smith Pt (tidal)
PISTF - Piscataway Creek Tidal Fresh	02140203	Piscataway Creek (tidal)
MATTF – Mattowoman Creek Tidal Fresh	02140111	Mattawoman Creek (tidal)
ANATF - Anacostia River Tidal Fresh	02140205	Anacostia River (tidal)

B.3 Listing Methodologies

Starting in 2002, Maryland developed and enabled public review of the Listing Methodologies to document the State's interpretation of its water quality standards (WQS) and establish scientifically defensible approaches for determining water body impairment. Listing Methodologies are designed to provide consistency and transparency in Integrated Reporting so that the public and other interested stakeholders understand why listing decisions are made and can independently verify listing decisions. The methodologies are living documents that are revised as new statistical approaches, technologies, or other improved methods are adopted by the State. When changes are proposed to the Listing Methodologies, Maryland advertises the revised methodologies for public review via the biennial Integrated Report.

B.3.1 Data Sources and Minimum Requirements for Listing

Section 130.7(B)(5) of the Clean Water Act requires that states "assemble and evaluate all existing and readily available water quality-related data and information" when compiling their Integrated Report. This includes but is not limited to the following:

(i) Waters identified by the State in its most recent section 305(b) report as "partially meeting" or "not meeting" designated uses;

(ii) Waters for which dilution calculations or predictive models indicate nonattainment of applicable water quality standards;

(iii) Waters for which water quality problems have been reported by local, state, or federal agencies; members of the public; or academic institutions (see Appendix I); and,

(iv) Waters identified by the State as impaired in a nonpoint assessment submitted to EPA under section 319 of the CWA or in any updates of the assessment.

With the integration of sections 305(b) and 303(d) of the Clean Water Act and the adoption of a multi-category reporting structure, Maryland has developed a two-tiered approach to data quality. Tier 1 data is used to determine impaired waters (*e.g.*, Category 5 waters or the traditional 303(d) List) and is subject to the highest data quality standards. Maryland waters identified as impaired using Tier 1 data may require a TMDL or other regulatory actions on the part of the State. These data should be accompanied by a Quality Assurance Project Plan (QAPP) consistent with EPA data guidance specified in *Guidance for Quality Assurance Project Plans. Dec 2002. EPA /240/R-02/009* available at http://www.epa.gov/quality/qs-docs/g5-final.pdf. Tier 1 data interpretation must also be consistent with Maryland's Listing Methodologies.

Tier 2 data are used to assess the general condition of surface waters in Maryland and may include volunteer monitoring, land use data, visual observations of water quality condition, or data not consistent with the Maryland's Listing Methodologies. Such data may not have a QAPP or may have one that is not consistent with EPA guidance. Waters with this level of data may be placed in Categories 2 or 3 of the List, denoting that water quality is generally good or that there are insufficient data to make an assessment, respectively. However, Tier 2 data alone are not used to make impairment decisions (*i.e.*, category 5 listings requiring a TMDL) because the data are of insufficient quantity and/or quality.

Maryland supports the use of computer models and other innovative approaches to water quality monitoring and assessment. Maryland has relied heavily on the Chesapeake Bay model to develop loading allocations, assess the effectiveness of best management practices, and guide implementation of water quality programs. Several different modeling approaches have also been used in TMDL development. With the growing number of biological impairments in Category 5 of the List, Maryland will be relying more heavily on land use analyses, GIS modeling, data mining, and other non-traditional approaches to identify stressors, define ecological processes, and develop TMDLs.

Maryland has increased its efforts to make Integrated Reporting data available to the public in a real time environment. The Integrated Report database is now available online at http://www.mde.state.md.us/Programs/WaterPrograms/TMDL/Maryland%20303%20dlist/303d_search/. References to and summaries of the data used for impairment determinations are also included to give the public a better understanding of why specific decisions were made.

B.3.2 Updated Listing Methodologies for Maryland's Watershed-Based Assessment units

For this 2006 reporting cycle, four Listing Methodologies specific to Maryland's watershed-based assessment units are open for public review and comment. The first methodology for review is Maryland's bacterial Listing Methodology for public beaches, shellfish harvesting areas, and other recreational contact. The changes to the bacterial methodology include adopting enterococcus and or *E. coli* as indicator organisms, using a geometric mean for assessing impairments at beaches, and defining the beach season as full-body water contact from Memorial Day through Labor Day. Although the methodology for assessing shellfish harvesting waters has not changed, this part of the document has been updated.

The second methodology that has been revised is the fish tissue component of the toxics Listing Methodology. The incorrect PCB concentrations (39 parts per billion - ppb) were published with the 2004 Toxics Listing Methodology. The correct concentration of 88 ppb, as recommended by EPA, has been inserted. This correction has had no effect on current or past listings.

The third methodology open for public review and comment is the dissolved oxygen (DO) and chlorophyll *a* criteria in seasonally stratified water-supply reservoirs. This revised methodology includes a revised interpretation of the DO criteria in lakes as well new chlorophyll *a* criteria, including both a mean and a single sample maximum, to better protect our drinking water sources from nutrient-driven eutrophication.

Lastly, the final methodology open for public review is the pH methodology. The only change from the former methodology is that some unclear language with regard to natural conditions and atmospheric deposition were removed from the document. When developing TMDLs, Maryland is and will continue to consider atmospheric deposition as a nonpoint source load.

B.3.2.1 Revised Listing Methodology for Identifying Waters Impaired by Bacteria on Maryland's 303(d) List

B.3.2.1.1 Introduction

The rules used by MDE to interpret data and apply the water quality standards are discussed below in three sections. Each of those sections describes the application to a distinct water use: shellfish harvesting; recreational waters; and beaches. In each case a bacteriological indicator applies according to the nature of use. Data collected and analyzed using approved methods and in accordance with strict QA/QC guidelines may be utilized for decision making with respect to attainment status. All available data will be considered but may be used for prioritization, additional study, or revised monitoring.

B.3.2.1.2 Interpretation of Fecal Coliform Data in Use II, Shellfish Harvesting Areas

B.3.2.1.2.1 Restricted Waters

Those areas restricted for shellfish harvesting because they do not meet State requirements for Use II waters or do not meet the strict requirements under the National Shellfish Sanitation Program (NSSP) are listed. These requirements are found in the *National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish*, 2003 revision. Copies can be obtained from the U.S. Department of Health and Human Services, PHS, FDA or on FDA's website: USFDA/CFSAN NSSP- Guide for the Control of Molluscan shellfish 2003. Data used to determine these restrictions include routine bacteriological water quality sampling, sanitary survey, and strict adherence to the NSSP procedures, protocols and requirements.

B.3.2.1.2.1.1 Type A Restricted Areas

Those areas restricted for shellfish harvesting because they are located in the vicinity of a wastewater treatment plant (WWTP) outfall but where there is no evidence of actual bacteriological impairment are not listed. This restriction is an important application of the principals and practices of public health protection and is required under the NSSP. MDE also evaluates treatment plant performance and its impact on shellfish harvesting waters. These administrative closures are not based on water quality criteria but are designed to be protective buffer areas in case of a system failure. These areas meet the bacteriological portion of the standard.

B.3.2.1.2.1.2 Type B Restricted Areas

The upper Chesapeake Bay is restricted for shellfish harvesting for administrative reasons and is not listed. This area is designated as Use II waters; however, there is insufficient shellfish resource for harvesting due to freshwater input from the Susquehanna River. Since there are no oysters or clams to harvest and the NSSP requirements for sanitary survey are not met, the area is classified as restricted. In order to protect shellfish waters directly below this area, the shellfish harvesting water designation is a valuable protective measure. Water quality is routinely monitored in this area for fecal coliform and meets Maryland's bacteriological standards. If the collected data show violations with State standards the shellfish harvesting area will be listed appropriately.

B.3.2.1.2.2 Conditionally Approved Waters

Shellfish harvesting areas classified as conditionally approved are closed to harvesting for three days following a rainfall event of greater than or equal to one inch in twenty-four hours. This

happens an average of 10 - 15 times per year when it is not completely certain that bacterial levels are not elevated in response to rain. The rest of the time, these areas meet the water quality standards for shellfish harvesting waters and are determined to meet the designated use.

B.3.2.1.2.3 Approved Waters

Areas classified as approved for harvesting meet the water quality standards for shellfish harvesting.

B.3.2.1.3 Interpretation of Bacteria Data for General Recreational Use

Maryland has implemented the EPA recommended enterococcus (marine or freshwater and *E. coli* (freshwater only) standards for all waters except shellfish harvesting waters, where the more stringent FDA fecal coliform standard must be met. The fecal coliform standard equivalent to the EPA water quality standards for recreational waters is 200 MPN per 100 ml, based on the risk analysis derived from the epidemiological studies conducted by EPA. Because shellfish may concentrate bacteria, the FDA standard of a median fecal coliform MPN of 14 and a 90th percentile of 43 or 49, for a 5-tube or 3-tube test respectively, is significantly more stringent than the EPA criteria, therefore wherever the FDA standard for shellfish harvesting is met, and no site-specific data using enterococcus is available, the recreational standard will also be met.

According to EPA's *Ambient Water Quality Criteria for Bacteria -1986*, the indicators *E. coli* and enterococcus have been found through epidemiological studies to have the best quantifiable relationship between the density of an indicator in the water and the potential human health risks associated with swimming. "Indicator organisms are a fundamental monitoring tool used to measure both changes in environmental (water) quality or conditions and the potential of hard-to-detect pathogenic organisms. An indicator organism provides evidence of the potential presence or absence of a pathogenic organism that survives under similar physical, chemical, and nutrient conditions. (EPA Beach Guidance, June 2002).

Maryland's bacteria indicator criterion is used to inform regarding the potential health risks associated with swimming and other primary contact recreation activities when the criterion is exceeded. A few high values of the indicators may or may not be indicative of impairment. Therefore, it is necessary to evaluate the results from indicator organisms from multiple sampling events to adequately quantify water quality conditions.

B.3.2.1.3.1 Recreational Waters[6]

A steady state geometric mean will be calculated with available data where there are at least 5 representative sampling events. The data shall be from samples collected during steady state conditions and during the beach season (Memorial Day through Labor Day) to be representative of the critical condition. If the resulting steady state geometric mean is greater than 35 coliform units (cfu)/100 ml enterococci in marine/estuarine waters, 33 cfu/100 ml enterococci in freshwater or 126 cfu/100 ml *E. coli* in freshwater, the water body will be listed as impaired. If fewer than 5 representative sampling events for an area being assessed are available, data from the previous two years will be evaluated. If the resulting steady state geometric mean of the available data for each year is greater than 35 cfu/100 ml enterococci in marine/estuarine waters, 33 cfu/100 ml enterococci in freshwater or 126 cfu/100 ml *E. coli* in freshwater, the water body or beach will be listed as impaired.

[6] Note: This paragraph was edited on Jan. 23, 2006 after the public comment period began to reflect an oversight in editing.

B.3.2.1.3.2 Beaches

Beaches are designated as "Beaches" from Memorial Day through Labor Day (Beach Season). During this period, beaches are monitored closely using a tiered approach based on health risk associated with swimming since these are places identified as areas where people are likely to swim. High, Medium, and Low priority beaches are monitored weekly, biweekly, and monthly, respectively. Low priority beaches will be re-evaluated regularly to determine if they should be prioritized higher or removed from the list of beaches. This will mean that eventually, all beaches will have more than the necessary number of sampling events performed to adequately assess them.

MDE has delegated the authority for monitoring and notifying the public regarding beach water quality conditions to local health departments. MDE's role is to assure that beaches state-wide are managed uniformly. MDE maintains a database of all beaches in Maryland including latitude and longitude coordinates of the endpoints identifying the beach segment, sanitary survey information provided by the local health departments, and monitoring results (all beach monitoring samples are submitted to the Department of Health and Mental Hygiene - DHMH - for laboratory analysis). These data, along with all other available data, will be used to determine which areas are to be listed as impaired.

The listing methodology for general recreational use also applies to beaches (Section B.3.2.1.3.1). If the steady state geometric mean exceeds 35 cfu/100 ml enterococci in marine/estuarine waters, 33 cfu/100 ml enterococci in freshwater or 126 cfu/100 ml *E. coli* in freshwater, the beach area segment, as defined by the endpoint latitudes and longitudes, will be listed as impaired. The single sample maximum criteria apply only to beaches and are to be used by the local health department for closure and advisory decisions based on short-term exceedances of the standard during the bathing season.

B.3.2.1.4 Discussion

It is critical that the sampling be carried out in a way that is representative of conditions in time and space. Per EPA's *Ambient Water Quality for Bacteria - 1986*, the calculated "densities are for steady state dry weather conditions." A sampling event means samples taken at a beach, or other water body to characterize bacterial concentrations with the number and placement of sampling stations sufficient to characterize conditions in the full extent of the beach area or water body. High spatial and temporal variability suggests that infrequent or moderately elevated bacteriological levels alone do not necessarily represent a human health risk or impairment. The bacteriological standard is descriptive and includes numerical criteria. The intent of the criteria is to allow the 'number' to be judged in conjunction with the sanitary survey that identifies probable sources of bacteria and allows regulators to assess the probability of human health risk. The standard recognizes the inherent variability of the bacterial measurement and recognizes the inadequacies of indicator organisms. The Most Probable Number (MPN) or Colonies Forming Units (CFU) test used to determine the level of bacteria is not a direct count but a statistical estimation subject to a high degree of variability.

B.3.2.2 Revised Listing Methodology for Fish Tissue

B.3.2.2.1 **Background**

Section 101(a)(2) of the Clean Water Act established as a national goal the attainment of "water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and recreation in and on the water." This is commonly referred to as the "fishable/swimmable" goal of the Act. Additionally, Section 303(c)(2)(A) requires water quality standards to protect the public health and welfare, enhance the quality of water, and serve the purposes of the Act. The EPA, along with MDE, interprets these regulations to mean that not only should waters of the State support thriving and diverse fish and shellfish populations, but they should also support fish and shellfish which when caught are safe for human consumption.

Some of the contaminants found in Maryland waters (mainly mercury and PCBs) tend to bioaccumulate to elevated levels in the tissues of gamefish (*e.g.* largemouth bass) and bottom-feeders (*e.g.,* catfish). When tissue levels of a specific contaminant are elevated to concentrations that increase the risk of chronic health effects, the State has the responsibility to issue a fish consumption advisory. Fish consumption advisories are designed to protect the general as well as sensitive populations (*i.e.*, young children; women who are or may become pregnant). In addition to such advisories, which usually stop at 4 meals per month, the Department provides fish consumption recommendations (these stop at 8 meals per month). These additional recommendations are issued in order to protect the frequent fish consumers.

It has been accepted that if a fish consumption advisory (not a recommendation) is issued for a water body, the designated use of that water body is not being supported. This usually results in listing the water body as impaired for the specific contaminant. To determine if a water body is impaired, a geometric mean of the contaminant level from the edible portion of the common recreational fish species is compared to the established threshold. If the threshold is exceeded, the water body's designated use is not met, and the water body is listed as impaired. The existing fish tissue criteria are used as the listing thresholds (*e.g.* methylmercury fish tissue criterion: 300 ppb). For the contaminants that do not have an existing criterion (*e.g.* PCBs), MDE has defined "fishable" as the general population's ability to safely consume AT LEAST 4 meals per month of common recreational fish species. In such cases, the fish tissue concentration threshold used for impairment listing is the upper concentration level that results in 4-meals-per-month advisory (see Section C.3.2.3).

B.3.2.2.2 **Data Requirements**

Data requirements used to list a water body as impaired are similar to the data requirements for the development of a fish consumption advisory. These include:

1. All available data (measured in the edible portion of fish and shellfish) should be used when making impairment decisions.
2. The data need to be collected from the specific water body in question.
3. The size of the fish sampled should be within the legal slot limit. If no slot limit exists for a specific species, best professional judgment for a minimum size of a given species will be applied.
4. Minimum data requirement: 5 fish from a given species (individual or composite) for a given water body. At times, in order to protect more sensitive populations MDE might issue an advisory that is based on an incomplete dataset (less than 5 fish), existence of such an advisory does not automatically result in an impairment listing. In other words, the minimum data requirement needs to be met in order to list a water body as impaired.

5. Species used to determine impairment should be representative of the water body. Migratory and transient species may be used if they are the dominant recreational species, but should only be used in conjunction with resident species, especially in the case of tidal rivers of the Chesapeake Bay.
6. To ensure that the advisory was not due to a localized condition, and that the impairment is temporally relevant, impairments based on the minimum required samples will be re-sampled prior to TMDL development.

B.3.2.2.3 Contaminant Thresholds

The acceptable contaminant thresholds (Table 6) are based on a risk assessment calculation that incorporates numerous risk parameters such as contaminant concentration, reference dose/cancer slope factor, exposure duration, lifetime span, and (for some contaminants) cooking loss.

Table 6: The current concentration thresholds for the contaminants of concern.

Contaminant	Threshold	Bases	Group
Mercury	300 ppb	EPA/MDE Fish Tissue Human Health Consumption Criteria	-
PCBs	88 ppb	4 meals/month concentration level	General Population

Over time, advances in science may require changes in risk assessment parameters that may increase or decrease the currently used contaminant thresholds, and consequently the levels at which impairment decisions are made. When this happens, water bodies that were listed as impaired may no longer be considered impaired, or new water bodies may need to be listed.

B.3.3 Guidelines for Interpreting Dissolved Oxygen and Chlorophyll a Criteria in Maryland's Seasonally Stratified Water-Supply Reservoirs

B.3.3.1.1 Dissolved Oxygen

B.3.3.1.1.1 Introduction

Maryland's non-tidal water quality standards provide for a minimum dissolved oxygen (DO) criterion of 5.0 mg/l for all waters at all times (COMAR 26.08.02.03-3A(2)), except as resulting from natural conditions (COMAR 26.08.02.03A(2)). Bottom waters in thermally stratified lakes may naturally become depleted of DO during periods of stratification (Wetzel 2001).

New standards approved for the State's tidal waters, including the Chesapeake Bay, recognize the significance of thermal/salinity stratification, and the physical and natural impact thereof on deeper waters. The new standards for estuarine waters recognize three layers: (1) open water (surface); (2) deep water (below the upper pycnocline); and (3) deep channel (bottom waters).

All of Maryland's water-supply reservoirs undergo periods of seasonal thermal stratification similar to that in Chesapeake Bay. In the absence of a standard specifically addressing stratified lakes, MDE (1999) developed an interim interpretation of the existing standard, utilizing the percentage of oxygen saturation in the hypolimnion as a metric. This document updates that interim interpretation, providing a framework for additional technical analyses with respect to hypolimnetic DO in thermally stratified lakes.

B.3.3.1.1.2 Background

In idealized cases, lakes stratify into three distinct layers—the epilimnion, metalimnion and hypolimnion. The epilimnion is the well-mixed surface layer of relatively warm water. The metalimnion, the middle layer, is a zone of a distinct downward temperature gradient. The hypolimnion is the bottom layer of relatively cold and undisturbed water. Various analytical methods, typically involving measurement of temperature change over depth, exist to identify and define these layers. (Wetzel, 2001).

Thermal stratification is a seasonal phenomenon resulting from the lower density of warm surface waters, beginning in late spring or early summer, intensifying as summer progresses, decreasing in early fall, and finally ending with the fall turnover, as the lake becomes thermally uniform with depth. Therefore, data from May or June will generally show less stratification and higher hypolimnetic DO levels than data from August and September.

Often, stratified lakes do not exhibit this idealized separation into three distinct layers, but may still exhibit clear temperature gradients from surface to bottom. This phenomenon may be particularly true in the case of artificial impoundments, given the variability in basin and watershed morphometry and geometry. The formulaic determination of the exact point at which one layer grades into another may thus be difficult or impossible, and in such cases, managers may need to explore alternative methodologies or resort to professional judgment.

Various factors affect the 'natural' degree of oxygen depletion in a lake or impoundment. These include the degree or 'strength' of stratification; the morphometry of the water body itself (*i.e.*, the depth and geometry of the basin); and watershed characteristics, such as watershed size, land cover, and naturally occurring allochthonous loads of organic material.

Chapra (1997) describes hypolimnetic DO saturation as a function of lake trophic status[7]. This relationship, upon which Maryland based its interim interpretation, is summarized in Table 1 below.

Table 7: Relationship between Lake Trophic Status and Dissolved Oxygen Saturation in the Hypolimnion of a Thermally Stratified Lake

Trophic Status	Hypolimnetic Dissolved Oxygen Saturation
Eutrophic	0% - 10%
Mesotrophic	10% - 80%
Oligotrophic	80% - 100%

Adapted from Chapra (1997)

Maryland has no natural lakes; all are artificial impoundments—typically either larger, water-supply reservoirs, or smaller, recreational-use lakes. [In this document, the terms "lake" and "impoundment" are used interchangeably.] In impoundments, the factors outlined above (especially basin morphometry and watershed size) differ inherently from those in natural lakes. Natural lakes are typically deepest in the center with a gradual increase in depth to that point, while impoundments are usually deepest at the downstream extent—the point of impoundment—and exhibit an abrupt increase in depth at that point. Watershed size is also often proportionately greater in the case of impoundments, resulting in a correspondingly larger 'natural' load of watershed-derived materials (Wetzel 2001). For these reasons, Chapra's saturation-based method may not apply well to impoundments.

[7] When conducting analyses specifically to assess lake trophic status, Maryland generally uses other, more reliable, metrics (e.g., chlorophyll *a* concentration).

B.3.3.1.1.2.1 Dissolved Oxygen Guidance for Thermally Stratified Lakes in Maryland

MDE is adopting the following general approach to establish dissolved oxygen guidelines for lakes exhibiting seasonal thermal stratification:

- A minimum dissolved oxygen concentration of 5.0 mg/l will be maintained in the surface layer at all times, including during periods of thermal stratification, except during periods of overturn or other naturally-occurring disruption of stratification.

- A minimum dissolved oxygen concentration of 5.0 mg/l will be maintained throughout the water column during periods of complete and stable mixis.

- Hypolimnetic hypoxia will be addressed on a case-by-case basis. In the event of hypoxia observed in the deeper portions of lakes during stratification, Maryland will conduct an analysis to determine if current loading conditions result in a degree of hypoxia that significantly exceeds (in terms of frequency, magnitude and duration) that associated with natural conditions in the lake and its watershed. This analysis may vary from one lake to another in terms of type, approach and scope. Examples may include a review of setting, source assessment and land use, so as to assess current loads; a comparison of estimated current loads exported from the watershed with analogous load estimates under 'natural' land cover; and model scenario runs simulating natural conditions. This list is not exhaustive, and Maryland expressly reserves the right to determine and conduct the most appropriate type of analysis on a case-by-case basis.

The primary application of this approach is for use in conducting analyses to support development of Total Maximum Daily Loads (TMDLs) and Water Quality Analyses (WQAs), in satisfaction of the State's obligations under Section 303[d] of the federal Clean Water Act (CWA). It is also envisioned that these guidelines, or natural outgrowths thereof, may be used in the context of listing and inventorying water bodies under Sections 303 and 305 of the CWA.

B.3.3.1.1.3 Chlorophyll *a*

B.3.3.1.1.3.1 Introduction and Background

Maryland's General Water Quality Criteria prohibit pollution of waters of the State by any material in amounts sufficient to create a nuisance or interfere directly or indirectly with designated uses. Maryland's water quality standards presently do not impose a limit on the concentration of nutrients in the water column.[8] Rather, Maryland manages nutrients indirectly by limiting their effects expressed in terms of excess algal growth and low DO. In impoundments, chlorophyll *a* concentrations serve as a useful surrogate for quantifying the effects of excess nutrient loading.

In establishing chlorophyll *a* guidelines for water-supply reservoirs, Maryland has adopted a two-pronged approach. First, a chlorophyll *a* concentration of 10 µg/l is generally recognized as a boundary between mesotrophic and eutrophic conditions (Carlson, 1977). In water-supply reservoirs, preventing a shift to eutrophic conditions reduces the frequency, duration and

[8] Maryland does limit the ammonia form of nitrogen from wastewater treatment plants, due to its toxic effects on some aquatic organisms.

magnitude of nuisance conditions—e.g., algal scums (Walker, 1984). Secondly, a mean concentration of chlorophyll a not to exceed 10 µg/l is correlated with an absence of instantaneous values exceeding 30 µg/l (see Figure 1). Exceedences of the 30 µg/l threshold are associated with a shift to cyanobacteria (blue-green algae) assemblages, and associated taste/odor treatment costs. Thus, maintaining chlorophyll a concentrations below these respective values ensures that the drinking water designated use will be supported.

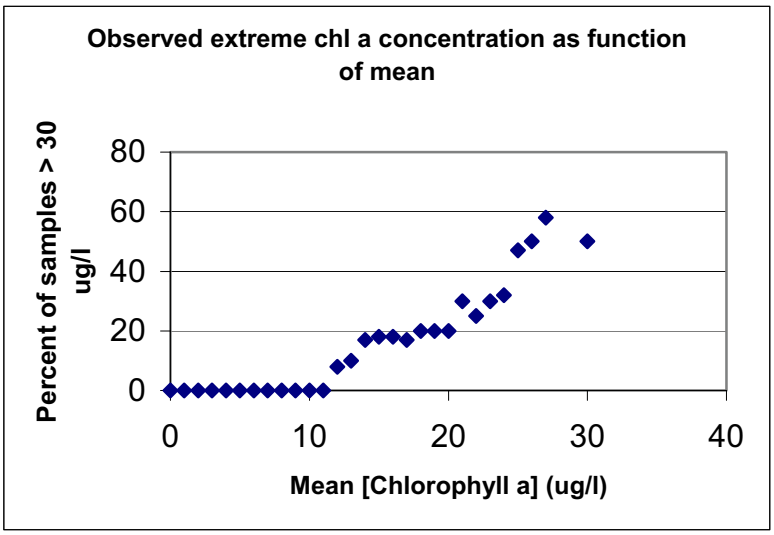

Figure 6: Correlation of instantaneous and growing season mean Chlorophyll *a* concentrations (adapted from Walker, 1984).

B.3.3.1.1.3.2 Chlorophyll *a* Guidelines for Water-Supply Reservoirs in Maryland

MDE is adopting the following general approach to establish chlorophyll *a* guidelines for water-supply reservoirs:

- Mean concentrations of chlorophyll *a* in representative surface waters shall be maintained at 10 µg/l or less. This may be as measured over a growing season, as a 30-day moving average, or in any other period appropriate to the impoundment of interest.

- The 90th percentile of chlorophyll *a* in representative surface waters shall be maintained at 30 µg/l or less.

B.3.3.1.1.4 References

Carlson, R.E., 1977. A trophic state index for lakes. Limnology and Oceanography 22:361-369.

Chapra, Steven C. 1997. Surface Water Quality Modeling. McGraw – Hill, Inc. Boston, U.S.A.

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Walker, William W., 1985. Statistical bases for mean chlorophyll *a* criteria. Lake Reserv. Manage. 2:57-62.

Wetzel, R. G. 2001. Limnology: Lake and River Ecosystems. Academic Press, Inc., San Diego, U.S.A.

B.3.3.2 Listing Methodology for pH and Mine Impacted Waters

All pH impairments are identified based on COMAR §26.08.02.03, which states that: "Normal pH values may not be less than 6.5 or greater than 8.5" in Use I, IP, II, III, IIIP, IV, or IVP waters. It is undesirable to incorrectly identify a water body as impaired when the observed condition is of a natural origin. Factors such as the presence of a peat or black water bog or swamp would be considered as natural conditions, and therefore, not impaired under the CWA §303(d) listing process.

Another natural condition which should not be used to identify a water body as pH impaired is an abundance of algae or aquatic plants that elevate pH levels above 8.5 as a result of photosynthetic-driven chemical reaction, unless the condition is being caused by a defined nutrient enrichment source. Certain conditions in close proximity to limestone springs may also have natural pH values outside of the standards. Streams that do not meet the criterion for pH, and which cannot be demonstrated to have failed as a result of natural conditions, will be listed as impaired.

Streams influenced by abandoned coal or clay mining operations (those that predate the permitting authority or designated as "pre-law") and having a pH below 6.5 would be listed as impaired.

The decision process for evaluating pH in Maryland waters is summarized in the following flowchart shown in Figure 7.

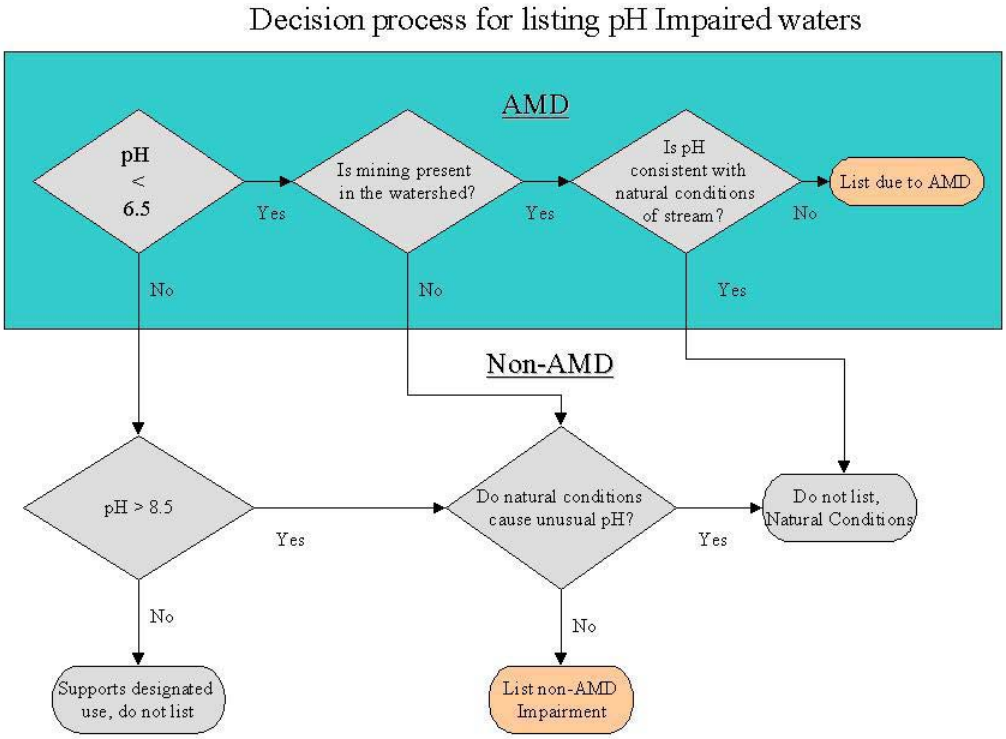

Figure 7: Flow chart of pH decision process.

1. The flow chart applies to Maryland 8-digit watersheds evaluated for the 303(d) list.
2. Ideally, an impairment decision should be based on a sufficient number of samples to adequately characterize potential diurnal and seasonal variations.
3. If 10% or more of the samples violate the pH numeric criteria and cannot be traced to naturally occurring conditions, the 8-digit stream watershed will be considered to not meet the standards for its designated uses and listed as impaired.
4. If less than 10% of the samples violate the pH numeric criteria, best professional judgement will be used to determine if the 8-digit watershed should be listed as impaired. In the event the water body is not listed, additional samples will be collected for future consideration.

B.3.4 New Listing Methodologies specific to Chesapeake Bay's Salinity-based Assessment Units

For 2006, three new Listing Methodologies for the new Chesapeake Bay salinity-based segments are presented for public review and comment. The methodologies are for dissolved oxygen, submerged aquatic vegetation and biological integrity.

B.3.4.1 Dissolved Oxygen and Submerged Aquatic Vegetation Listing Methodologies

Beginning in May of 2005, staff from the Maryland Departments of Environment and Natural Resources met with staff from EPA's Chesapeake Bay Program Office, EPA Region 3 and the Virginia Department of Environmental Quality, to develop an interim approach for interpreting the new Chesapeake Bay Water Quality Standards. These discussions are referred to as the Criteria Assessment Protocols (CAP) process and are aimed at developing Listing Methodologies and standard operating procedures for interpreting Chesapeake Bay Program monitoring data in a manner consistent with each member state's Water Quality Standards. The Listing Methodology described in the following paragraphs was developed by consensus of the CAP workgroup and forms the interpretive basis for Maryland's 2006 Integrated Report. The CAP workgroup will continue to meet on an ad-hoc basis to refine the Bay Listing Methodology and incorporate the latest science and monitoring data. For more details on the CAP process, visit the Chesapeake Bay Program's Web page at http://www.chesapeakebay.net/wqcaw.htm. For technical details regarding development and interpretation of Chesapeake Bay's new Water Quality Standards visit http://www.chesapeakebay.net/uaasupport.htm.

B.3.4.1.1 **Open-Water, Deep-Water and Deep-Channel Designated Uses**

These three uses cover the vast majority of Chesapeake Bay and its tidal tributaries, both spatially and temporally. As such, Maryland considers these three uses the most appropriate surrogates for the original Use II designation upon which the Bay was initially listed. In other words, Chesapeake Bay and tidal tributary waters that were listed for nutrients in prior years will continue to be listed for nutrients under the open-water, deep-water and deep-channel designated use segments until all dissolved oxygen (DO) criteria are attained (see Table 7). Adoption of these new uses ensures continued monitoring and assessment activities during the critical period when waters are most likely to experience chronic to severe low dissolved oxygen levels.

The exceptions to this rule are the Big Annemessex River Mesohaline (BIGMH), Pocomoke River Mesohaline (POCMH), Nanticoke River Tidal Fresh (NANTF), Nanticoke River Oligohaline (NANOH), Nanticoke River Mesohaline (NANMH), and Fishing Bay Mesohaline (FSBMH) segments, which were never listed in Category 5 of the 303(d) list for nutrients, and will be placed in Category 3a (*i.e.*, insufficient data) until there are enough data to make an impairment determination. For all open-water, deep-water and deep channel areas, only the 30-day dissolved oxygen data have been evaluated. Data for the 7-day, 1-day, instantaneous minimum, and special sturgeon areas are not currently available, but will be phased in as they become available in successive reporting years.

Table 8: 2006 Listing Methodology for Open-Water, Deep-Water and Deep-Channel Designated Use Segments. Once sufficient data are available to assess the specific criteria, the list will be modified to show criteria attainment.

Designated Use Segment	Segment Results	305(b) Assessment	303(d) Listing
Open-Water Summer	30-day DO criterion	Inconclusive	Remains in category 5 of

Designated Use Segment	Segment Results	305(b) Assessment	303(d) Listing
	attained, while 7-day, instantaneous minimum, and special sturgeon DO criteria are unassessed		the List
Open-Water Summer	30-day DO criterion not-attained, while 7-day, instantaneous minimum, and special sturgeon DO criteria are unassessed	Impaired	Remains in category 5 of the List
Open-Water ROY	30-day DO criterion attained, while 7-day, instantaneous minimum, and special sturgeon DO criteria are unassessed	Inconclusive	Remains in category 5 of the List
Open-Water ROY	30-day DO criterion not-attained, while 7-day, instantaneous minimum, and special sturgeon DO criteria are unassessed	Impaired	Remains in category 5 of the List
Deep-Water Summer	30-day DO criterion attained, while 1-day, instantaneous minimum, DO criteria are unassessed	Inconclusive	Remains in category 5 of the List
Deep-Water Summer	30-day DO criterion not-attained, while 7-day, instantaneous minimum, and special sturgeon DO criteria are unassessed	Impaired	Remains in category 5 of the List
Deep-Channel Summer	Instantaneous minimum DO criterion is unassessed	Inconclusive	Remains in category 5 of the List
Deep-Channel Summer	Instantaneous minimum DO criterion is unassessed	Impaired	Remains in category 5 of the List

B.3.4.1.2 Migratory Spawning and Nursery (MSN) Area Designated Use

The MSN designated use is limited temporally from the February 1st to May 31st timeframe and is designed to protect the juvenile life history stages of commercially and recreationally important fish. Maryland considers MSN an entirely new designated use that has never been evaluated prior to the adoption of the new Bay Water Quality standards. Accordingly, Maryland is incorporating assessment results calculated by the Bay Program for all MSN use segments (see Table 8).

Dissolved oxygen levels during these cooler months rarely show exceedances typical of summer. However, insufficient data are currently available to evaluate the 7-day and instantaneous minimum DO criteria for the MSN areas. As a result, all MSN use segments will be placed in category 3a as inconclusive, indicating there are insufficient data to make an assessment.

Table 9: 2006 Listing Methodology for Migratory Spawning and Nursery Area Designated Use Segments.

Segment Results	Segment Assessment	Segment Listing
7-day and instantaneous minimum DO criteria are	Inconclusive	Placed in category 3a of the list as inconclusive

unassessed		

B.3.4.1.3 Shallow Water Submerged Aquatic Vegetation Designated Use

Use support will be evaluated following the methods outlined in (COMAR §26.08.02.03-3(C)(9)(a)(i)-(iii) and COMAR §26.08.02.03-3(C)(9)(c)). For 2006 assessment/listing, water clarity measures (Secchi application depth) are not available; the only applicable assessment method is COMAR §26.08.02.03-3(C)(9)(a)(ii) – comparing actual SAV acreage to SAV restoration goal acreage.

Table 10: 2006 Listing Methodology for Bay segments with defined shallow water SAV use.*

Segment Results**	Segment Assessment	Segment Listing
SAV Acreage less than Restoration goal No clarity data available	Inconclusive (need clarity data to use other assessment options)	Placed in category 3a of the list as inconclusive
SAV Acreage greater than or equals Restoration goal No clarity data available	Fully supports SAV use (clarity data not necessary)	Placed in category 2 of the list as meeting restoration goal

*Because clarity measures are not available for the 2006 assessment/listing process, the shallow water SAV use cannot be evaluated for those Bay segments identified as having a restoration goal of 0 (zero) acres (COMAR §26.08.02.03-3(C)(9)(c)-Table 2), even if SAV coverage has been observed.

**No-grow zones can be present within segments having a restoration goal acreage.

Table 11: 2006 Listing Methodology for Bay segments with defined shallow water SAV acreage goal of 0 (zero)

Segment Results	Segment Assessment	Segment Listing
SAV Acreage is zero or not reported No clarity data available	Unknown (there are no clarity data available)	Placed in category 3a of the list as inconclusive
SAV Acreage is greater than 0. No clarity data available	- same -	- same -

State water quality criteria (COMAR §26.08.02.08(A)(5)) states that '…no-grow zones shall be excluded from the assessment of the shallow water designated use.' A number of Bay segments are identified as having some portion of their shallow waters designated as 'no-grow zones' (see Table 11). These specific, shallow water subsegments (or segment in the case of CHOTF) will not be assessed for SAV or water clarity. However, the larger Bay segment will be assessed for clarity and/or SAV goals, as appropriate.

Table 12: **Underwater bay grasses no-grow zones acreage by Chesapeake Bay Program segment (Chesapeake Bay Program, October 2003).**

Segment Name	Segment Code	Acres in No-Grow Zones	Reason Codes*
Northern Chesapeake Bay	CB1TF	679	1
Upper Chesapeake Bay	CB2OH	1,564	1
Upper Central Chesapeake Bay	CB3MH	4,537	1
Middle Central Chesapeake Bay	CB4MH	14,590	1
Lower Central Chesapeake Bay	CB5MH	5,061	1
Patapsco River	PATMH	5,701	2
Magothy River	MAGMH	199	1
South River	SOUMH	102	1
Rhode River	RHDMH	375	1
West River	WSTMH	132	1
Lower Potomac River	POTMH	19	1
Northeast River	NORTF	<1	1
Sassafras River	SASOH	2	1
Eastern Bay	EASMH	134	1
Upper Choptank River	CHOTF	2,200	4
Middle Choptank River	CHOOH	984	4
Mouth of the Choptank River	CHOMH1	37	1
Little Choptank River	LCHMH	6	1
Upper Nanticoke River	NANTF	1,138	3
Wicomico River	WICMH	708	3
Big Annemessex River	BIGMH	4	1
Upper Pocomoke River	POCTF	988	3
Middle Pocomoke River	POCOH	2,466	1
Lower Pocomoke River	POCMH	13,293	1
Tangier Sound	TANMH	6,198	1

*Reason Codes:
1 - Extreme physical wave energy.
2 - Permanent physical alteration to near-shore habitat.
3 - Natural, extreme coloration of the water.
4 - Natural river channelization.

B.3.4.2 New Biological Integrity Listing Methodology for Chesapeake Bay

A project has been completed in cooperation among environmental management staff with the State of Virginia (VADEQ), State of Maryland (MDE, MDNR), and EPA (RIII and CBLO) to assess Chesapeake Bay benthic community health. The project examined Chesapeake Bay program benthic monitoring data collected during the 5-year time period of 2000 – 2004 with the goal of determining the status of this living resource in relation to Clean Water Act sections 305b and 303d (2006 303(D) Assessment Methods For Chesapeake Bay Benthos, Final Report Submitted to: Virginia Department of Environmental Quality, Roberto J. Llansó, Jon H. Vølstad Versar, Inc., Daniel M. Dauer Michael F. Lane, Old Dominion University, September 2005). This document describes the final agreed upon decision protocol on how to use the data analyses results and summarizes the key results for use in the 2006 305b/303d Integrated Reports of Maryland and Virginia.

B.3.4.2.1 **Protocol**

The overall decision protocol is shown in Figure 7. Phase I consists of the evaluation of the sample size (*i.e.*, number of B-IBI scores) available from the water body segment during the five-year assessment window. If the sample size satisfies the requirements of the statistical method ($N \geq 10$), a formal assessment of status (*i.e.*, impaired vs. supports aquatic life use) is determined utilizing the "percent degraded area" statistical methodology (Phase II). If the sample size requirement is not met, an impairment assessment based solely on these analyses is not possible. Results for segments with insufficient sample size should still be examined for possible use in conjunction with other assessment data of the 305b/303d reporting process.

Phase II consists of the impairment assessment of aquatic life use attainment based on a comparison of Benthic Index of Biotic Integrity (B-IBI) scores and can only be performed when the number of B-IBI scores within a specified water body segment is sufficient to meet the sample size requirement of the approved statistical method (sample size ≥ 10). Phase II can result in one of two possible outcomes: (1) the segment is not impaired for aquatic life use due to benthic community status (note that the segment may still be impaired for aquatic life use due to failure of other aquatic life use criteria), or (2) the segment fails to support aquatic life use due to benthic community status and is assessed as impaired. Best professional judgment can be applied to override (reverse) the outcome of the formal statistical analysis results, but such reversals must be justified and documented.

Phase III consists of the identification of probable causes of benthic impairment of the water body segment based upon benthic stressor diagnostic analyses. It is a two-step procedure that involves (1) Site Classification, and (2) Segment Characterization.

1. Site classification: The first step is to assign probable cause of benthic degradation to each individual "degraded" benthic sample. For the purposes of these diagnostic analyses, a sample is considered degraded if the B-IBI score is less than 2.7.

   Site Classification - Step 1a: The application of a formal statistical linear discriminant function calculates the 'inclusion probability' of each degraded site belonging to a 'contaminant caused' group or an 'other causes' group, based upon its B-IBI score and associated metrics. If a site is assigned to the 'Contaminant' Group with a probability $\geq$ 0.9, this site is considered impacted by contaminated sediment and no further classification is required.

Site Classification - Step 1b: If a site is classified as degraded due to 'other causes' (*i.e.*, not contaminant-related), an evaluation of the relative abundance (and/or biomass) of the benthos is examined. Scores for both abundance and biomass are considered to be bipolar for the Chesapeake Bay Benthic IBI. For either metric a high score of 5, indicating desirable conditions, falls in the mid-range of the abundance/biomass distributions, while a low score of 1, indicating undesirable conditions, can result either from insufficient abundance/biomass or excessive abundance/biomass. The scoring thresholds for these two metrics vary with habitat type (salinity regime and substrate type) as summarized in Table 12. In this process, a site is classified as degraded by "low dissolved oxygen" if the abundance (and/or biomass) metric scores a 1 due to insufficient abundance (and/or biomass). Alternatively, if the abundance (and/or biomass) metric scores a 1 because of excessive abundance (and/or biomass) the site is classified as degraded by "eutrophication".

2. Segment classification: The assignment of probable causes of benthic degradation for the overall segment is accomplished using a simple 25% rule. If the percent of total sites in a segment impacted by a single cause (*i.e.*, sediment contaminants, low dissolved oxygen, or eutrophication) exceeds 25%, then that cause is assigned. If no causes exceed 25%, the cause is considered unknown. The cause(s) should be identified as a suspected (vs. verified) cause of benthic community degradation in the ADB database.

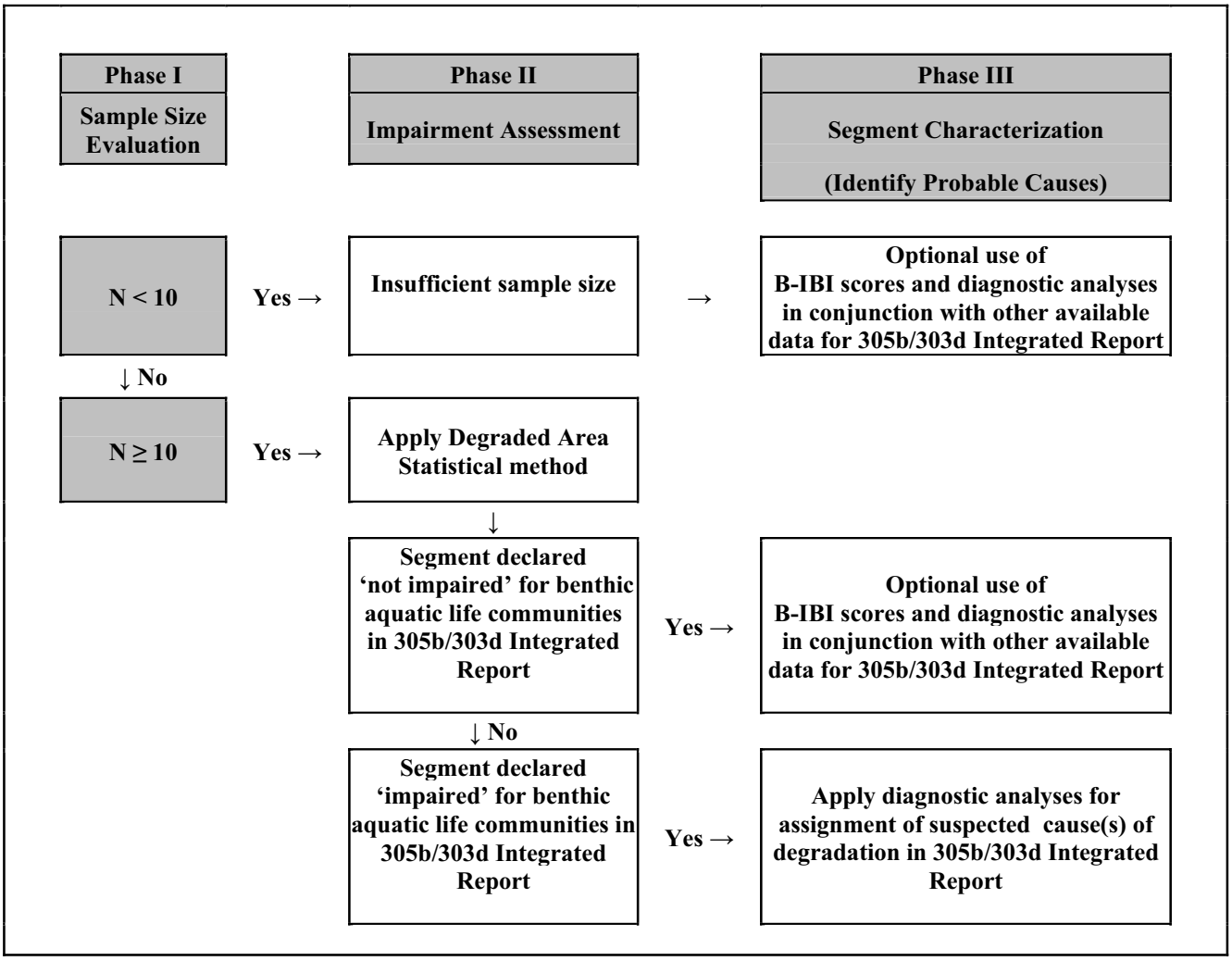

Figure 8: Overall Decision Protocol

Table 13: Limiting Values for Abundance and Biomass Metric Scores Used to Differentiate Between Eutrophication and Low DO Causes.*

Habitat	Metric	Lower Limit (metric score = 1)	Upper Limit (metric score = 1)
Tidal Fresh	Abundance (# m^{-2})	<800	≥5,500
	Biomass (g m^{-2})	---	---
Oligohaline	Abundance (# m^{-2})	<180	≥4,050
	Biomass (g m^{-2})	---	---
Low Mesohaline	Abundance (# m^{-2})	<500	≥6,000
	Biomass (g m^{-2})	<1	≥30
High Mesohaline Sand	Abundance (# m^{-2})	<1,000	≥5,000
	Biomass (g m^{-2})	<1	≥50
High Mesohaline Mud	Abundance (# m^{-2})	<1,000	≥5000
	Biomass (g m^{-2})	<0.5	≥50
High Polyhaline Sand	Abundance (# m^{-2})	<1,000	≥8000
	Biomass (g m^{-2})	<1	≥50
High Polyhaline Mud	Abundance (# m^{-2})	<1,000	≥
	Biomass (g m^{-2})	<0.5	≥

* [From Llanso, 2002. Methods for Calculating the Chesapeake Bay Index of Biological Integrity]

B.3.4.2.2 Results

Table 13 shows the possible conclusions from following the above protocol. Table 15 shows the actual results summarized from the Versar report using this protocol. Note that both tables refer to the original source of results in the technical report titled "2006 303(D) Assessment Methods For Chesapeake Bay Benthos, Final Report Submitted to: Virginia Department of Environmental Quality, Roberto J. Llansó, Jon H. Vølstad - Versar, Inc., Daniel M. Dauer Michael F. Lane - Old Dominion University, September 2005." Analysts should review these results as well as the extensive detail provided in the technical report to ensure that conclusions are rational and reasonable. Best professional judgment, common sense, and ancillary information about each segment should be utilized as necessary and available.

Table 14: Possible conclusions (n>=10 - sufficient sample size for assessment).

	Impairment Analysis		Stressor Diagnostic Analyses		
Scenario	**CL-L ($P-P_0$) (Table 3 of VERSAR Technical Report)**	**Impaired: Degraded Area method? (Table 3 of VERSAR Technical Report)**	**Samples with contaminant Posterior Prob. p>= 0.90; % of Total (Table 5 of VERSAR Technical Report)**	**Degraded Samples with excessive Abundance/Biomass; % of Total w/o Cont. (Table 5 of VERSAR Technical Report)**	**Degraded Samples with Insufficient Abundance/Biomass; % of Total w/o Cont. (Table 5 of VERSAR Technical Report)**
1	≤0	No	review as supplemental info	review as supplemental info	review as supplemental info

- A small, non-significant fraction of IBI scores are within or below the lower range of the reference distribution so water quality conditions in this segment support the benthic community (no impairment).
- Where community samples are degraded, the stressor analyses may provide information that supports other assessment data.

2	>0	Yes	≤ 25% of Total Samples	≤ 25% of Total Samples	≤ 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses do not suggest dominant stressors affecting community composition. Cause of degradation is “unknown”.

3	>0	Yes	> 25% of Total Samples	≤ 25% of Total Samples	≤ 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses suggest sediment contaminants as a likely pollutant affecting benthic community structure.

4	>0	Yes	> 25% of Total Samples	> 25% of Total Samples	≤ 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses suggest sediment contaminants as a likely pollutant affecting benthic community structure. Observation of high biomass or abundance is indicative of eutrophic conditions as an additional stressor affecting the benthic community.

5	>0	Yes	> 25% of Total Samples	≤ 25% of Total Samples	> 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses suggest sediment contaminants as a likely pollutant affecting benthic community structure. Samples observed with low biomass or abundance are indicative of low dissolved oxygen as an additional stressor affecting the benthic community.

6	>0	Yes	≤ 25% of Total Samples	> 25% of Total Samples	≤ 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses do not suggest sediment contaminants as a stressors affecting community composition. Samples observed with high biomass or abundance are indicative of eutrophic conditions (excessive nutrients) as a stressor affecting the benthic community.

7	>0	Yes	≤ 25% of Total Samples	> 25% of Total Samples	> 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses do not suggest sediment contaminants as stressor affecting community composition. Samples observed with high biomass or abundance are indicative of eutrophic conditions within the segment while other samples observed with low biomass or abundance are indicative of low dissolved oxygen as another stressor within the segment.

8	>0	Yes	≤ 25% of Total Samples	≤ 25% of Total Samples	> 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses do not suggest sediment contaminants as a stressor affecting community composition. Samples observed with low biomass or abundance are indicative of low dissolved oxygen as a stressor affecting the segment.

9	>0	Yes	> 25% of Total Samples	> 25% of Total Samples	> 25% of Total Samples

- A large, significant fraction of IBI scores are within or below the lower range of the reference distribution, so water quality conditions in this segment do not support the benthic community (impaired condition).
- Stressor diagnostic analyses suggest sediment contaminants as a likely pollutant affecting benthic community structure. Samples observed with high biomass or abundance are indicative of eutrophic conditions within the segment while other samples observed with low biomass or abundance are indicative of low dissolved oxygen as an additional stressor within the segment.

1	n/a	Unknown, Not Assessed	review as supplemental info	review as supplemental info	review as supplemental info

- There are too few samples to define the confidence interval of benthic sample IBIs, so in this segment – the biological community condition is unknown.
- Where community samples are identified as degraded, information from the stressor diagnostic analyses may provide supplemental information that may support other assessment data.

PART C: Assessment Results and Integrated Reporting

C.1 Assessment and Listing Results for Chesapeake Bay Salinity-Based Segments

This 2006 Integrated Report is a transition document for assessing the new Chesapeake Bay salinity-based segments. During this transition process, Maryland has decided to use both the watershed framework (*i.e.*, 8-digit watersheds) for category 5 listings and a Bay segment approach. This was done to give the State time to resolve the boundary discrepancies between the watershed and salinity-based assessment units as well as to ensure the public that impairments have not been omitted based solely on revised segmentation scheme.

Maryland will continue working with the Criteria Assessment Workgroup to align the State's watershed boundaries with the new salinity-based segmentation for Chesapeake Bay. This boundary reconciliation should help minimize 8 and 12-digit watershed overlaps with Chesapeake Bay segments and prevent any duplicate listings in future Integrated Reports.

C.1.1 Dissolved Oxygen, Submerged Aquatic Vegetation and Water Clarity

The table that follows presents the Chesapeake Bay Program's assessment results for dissolved oxygen (DO) and submerged aquatic vegetation (SAV) by new segment and use. These assessment results are derived from 77 (22 mainstem bay and 55 tidal tributary) water quality monitoring stations in Maryland's portion of Chesapeake Bay (see http://www.chesapeakebay.net/pubs/maps/2004-149.pdf).

The assessment results are represented in the table by the shaded cells. How these assessment results translate to Maryland's Integrated Report, and to the 303(d) List specifically, is described on the right side of the table. In many cases there are insufficient data to assess criteria attainment. As a result, the historical 303(d) listed impairments for nutrients in the mainstem Bay as well as the tidal tributary listings for nutrients and/or sediments cannot be updated until all criteria have been monitored and assessed (see Section C3.3 for more details).

C.1.1.1 DO and SAV Assessment Table Format and Structure

Table 14 presents the assessment and listing results for DO and SAV in Chesapeake Bay and tidal tributaries. This table has two distinct parts, the assessment side and the listing side. The assessment side is presented on the left-hand portion of the table under the heading "Bay Program Assessment". The assessment results are based upon a data analysis framework that is still being refined by the Chesapeake Bay Program and the Criteria Assessment Protocols work group. More of the applicable criteria will be assessed as the Bay Program revisits its monitoring and analysis protocols.

Most areas have already been listed as impaired by sediments and/or nutrients in prior 303(d) Lists and will not be changed until there are sufficient data to assess all DO and clarity criteria. Consequently, the assessment results may not support the listing category reported on the right-hand portion of the table (for example, waters with a Bay Program assessment of insufficient data may nevertheless remain in category 5 of the Integrated Report).

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
7D = 7-day DO criterion
1D = 1-day DO criterion
IM = Instantaneous minimum DO criterion
MSN = Migratory Spawning/Nursery Area
SWSAV = Shallow Water Submerged Aquatic Vegetation
OW = Open Water
DW = Deep Water

Table 15: Chesapeake Bay Pogram Assessment Results for Dissolved Oxygen and Water Clarity

Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS						303(d) LISTING DECISION		
		Dissolved Oxygen Criteria					SAV/Water Clarity Criteria	Listing Status	Listing Category	Impairment Category or pollutant
		30D	*7D*	*1D*	*IM*	*Special Sturgeon*				
CB1TF	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
CB2OH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Attains standards	2	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
CB3MH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
	DW - Summer							Already listed, supported by data	5	nutrients
	DC - Summer							Already listed, supported by data	5	nutrients
CB4MH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
	DW - Summer							Already listed, supported by data	5	nutrients
	DC - Summer							Already listed, supported by data	5	nutrients
CB5MH - MD	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
	DW - Summer							Already listed, supported by data	5	nutrients
	DC - Summer							Already listed, supported by data	5	nutrients
BSHOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Attains standards	2	Suspended solids

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
7D = 7-day DO criterion
1D = 1-day DO criterion
IM = Instantaneous minimum DO criterion
MSN = Migratory Spawning/Nursery Area
SWSAV = Shallow Water Submerged Aquatic Vegetation
OW = Open Water
DW = Deep Water

Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS						303(d) LISTING DECISION		
		Dissolved Oxygen Criteria					SAV/Water Clarity Criteria	Listing Status	Listing Category	Impairment Category or pollutant
		30D	*7D*	*1D*	*IM*	*Special Sturgeon*				
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
GUNOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
MIDOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
BACOH	MSN							Insufficient Data	3a	nutrients
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
PATMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
MAGMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
SEVMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
SOUMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
7D = 7-day DO criterion
1D = 1-day DO criterion
IM = Instantaneous minimum DO criterion
MSN = Migratory Spawning/Nursery Area
SWSAV = Shallow Water Submerged Aquatic Vegetation
OW = Open Water
DW = Deep Water

Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS: Dissolved Oxygen Criteria 30D	7D	1D	IM	Special Sturgeon	SAV/Water Clarity Criteria	303(d) LISTING DECISION: Listing Status	Listing Category	Impairment Category or pollutant
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
RHDMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
WSTMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
PAXTF	MSN							Insufficient Data	3a	nutrients
	SWSAV							Attains standards	2	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
WBRTF	MSN							Insufficient Data	3a	nutrients
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
PAXOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
PAXMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
	Deep Water							Already listed, supported by data	5	nutrients
POTTF -	MSN							Insufficient Data	3a	nutrients

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
7D = 7-day DO criterion
1D = 1-day DO criterion
IM = Instantaneous minimum DO criterion
MSN = Migratory Spawning/Nursery Area
SWSAV = Shallow Water Submerged Aquatic Vegetation
OW = Open Water
DW = Deep Water

Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS: Dissolved Oxygen Criteria 30D	7D	1D	IM	Special Sturgeon	SAV/Water Clarity Criteria	303(d) LISTING DECISION: Listing Status	Listing Category	Impairment Category or pollutant
MD	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
ANATF	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
PISTF	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
MATTF	MSN							Insufficient Data	3a	nutrients
	SWSAV							Attains standards	2	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
POTOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
POTMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
	DW - Summer							Already listed, supported by data	5	nutrients
	DC - Summer							Already listed, supported by data	5	nutrients
NORTF	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
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SWSAV = Shallow Water Submerged Aquatic Vegetation
OW = Open Water
DW = Deep Water

Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS						303(d) LISTING DECISION		
		Dissolved Oxygen Criteria					SAV/Water Clarity Criteria	Listing Status	Listing Category	Impairment Category or pollutant
		30D	*7D*	*1D*	*IM*	*Special Sturgeon*				
	OW - Summer							TMDL Approved	4a	nutrients
	OW - ROY							TMDL Approved	4a	nutrients
C&DOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Attains standards	2	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
BOHOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Attains standards	2	Suspended solids
	OW - Summer							TMDL Approved	4a	nutrients
	OW - ROY							TMDL Approved	4a	nutrients
ELKOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
SASOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Attains standards	2	Suspended solids
	OW - Summer							TMDL Approved	4a	nutrients
	OW - ROY							TMDL Approved	4a	nutrients
CHSTF	MSN							Insufficient Data	3a	nutrients
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
CHSOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
CHSMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
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Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS						303(d) LISTING DECISION		
		Dissolved Oxygen Criteria					SAV/Water Clarity Criteria	Listing Status	Listing Category	Impairment Category or pollutant
		30D	*7D*	*1D*	*IM*	*Special Sturgeon*				
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
	DW - Summer							Already listed, supported by data	5	nutrients
	DC - Summer							Already listed, supported by data	5	nutrients
EASMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
	DW - Summer							Already listed, supported by data	5	nutrients
	DC - Summer							Already listed, supported by data	5	nutrients
CHOTF	MSN							Insufficient Data	3a	nutrients
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
CHOOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
CHOMH1	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
CHOMH2	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
LCHMH	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
7D = 7-day DO criterion
1D = 1-day DO criterion
IM = Instantaneous minimum DO criterion
MSN = Migratory Spawning/Nursery Area
SWSAV = Shallow Water Submerged Aquatic Vegetation
OW = Open Water
DW = Deep Water

Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS: Dissolved Oxygen Criteria 30D	7D	1D	IM	Special Sturgeon	SAV/Water Clarity Criteria	303(d) LISTING DECISION: Listing Status	Listing Category	Impairment Category or pollutant
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
HNGMH	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
FSBMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Never listed, Insufficient Data	3a	nutrients
	OW - ROY							Never listed, Insufficient Data	3a	nutrients
NANTF	MSN							Insufficient Data	3a	nutrients
	OW - Summer							New listing	5	nutrients
	OW - ROY							Never listed, Insufficient Data	3a	nutrients
NANOH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							New listing	5	nutrients
	OW - ROY							Never listed, Insufficient Data	3a	nutrients
NANMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Never listed, Insufficient Data	3a	nutrients
	OW - ROY							Never listed, Insufficient Data	3a	nutrients
WICMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
MANMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							TMDL Completed	4a	nutrients
	OW - ROY							TMDL Completed	4a	nutrients

New Chesapeake Bay Water Quality Standards Assessment and Listing Results

Legend

	Not Applicable
	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Abbreviations

30D = 30-day DO criterion
7D = 7-day DO criterion
1D = 1-day DO criterion
IM = Instantaneous minimum DO criterion
MSN = Migratory Spawning/Nursery Area
SWSAV = Shallow Water Submerged Aquatic Vegetation
OW = Open Water
DW = Deep Water

Bay Segment ID	Designated Use	BAY PROGRAM ASSESSMENT RESULTS						303(d) LISTING DECISION		
		Dissolved Oxygen Criteria					SAV/Water Clarity Criteria	Listing Status	Listing Category	Impairment Category or pollutant
		30D	*7D*	*1D*	*IM*	*Special Sturgeon*				
BIGMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Never listed, Insufficient Data	3a	nutrients
	OW - ROY							Never listed, Insufficient Data	3a	nutrients
POCTF	MSN							Insufficient Data	3a	nutrients
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
POCOH	MSN							Insufficient Data, new listing	3a	nutrients
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, supported by data	5	nutrients
POCMH	MSN							Insufficient Data	3a	nutrients
	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, insuff. data to delist	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients
TANMH - MD	SWSAV							Insufficient Data	3a	Suspended solids
	OW - Summer							Already listed, supported by data	5	nutrients
	OW - ROY							Already listed, insuff. data to delist	5	nutrients

C.1.2 Biological Integrity in Chesapeake Bay

Bay benthic data was reevaluated using a new interpretative methodology for 2006 Listing decisions. Bootstrap statistical analysis was applied to benthic data collected from 85 Chesapeake Bay segments in both Maryland and Virginia. This technique was adopted in place of the Wilcoxon Rank Sum Test because it provides a more robust interpretive tool that accounts for the natural variance inherent in healthy, non-stressed ecosystems.

In addition to producing defensible results that can be used for listing decisions, the bootstrap method also has the ability to identify causes of stress and quantify the magnitude of degradation. Perhaps more importantly, it can distinguish stress from contaminants versus stress from other factors. The Wilcoxon Rank Sum Test cannot do this.

The Chesapeake Bay benthic community monitoring program also changed its analytical protocols to align with the new Chesapeake Bay segmentation. As a result, different geographical areas are being assessed and, in many cases, there are insufficient data available to assess the entire segment. Similar to the approach for the Chesapeake Bay DO and SAV assessments, Maryland will retain its watershed-based listings until monitoring and segmentation discrepancies between the watershed and salinity-based segments are resolved.

C.1.2.1 Benthic Community Assessment Table Format and Structure

Table 15 presents the assessment and listing results for the benthic community in Chesapeake Bay and its tidal tributaries. Similar to the DO and SAV assessment, this table also has two distinct parts, the assessment side and the listing side. The assessment side is presented on the left-hand portion of the table under the heading "305(b) Assessment". The Listing side is presented on the right-hand portion of the document under the heading "303(d) Listing Decision".

Some tidal areas were listed as impaired for biology in the 2004 303(d) List. Maryland will retain these 8-digit watershed listings until discrepancies with the Chesapeake Bay Program's salinity-based assessment units can be addressed. Accordingly, some assessment results may not support the listing category reported on the right-hand portion of the table.

Legend

	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Table 16: 305(b) and 303(d) Assessment and Listing Results for the Bay IBI.

Segment ID	Designated Use	305(b) Assessment Results	303(d) Listing Decision		
		Assessment Result for Bay Index of Biological Integrity	Listing Status	Listing Category	Suspected Sources of Benthic Degradation
CHOMH2	Aquatic Life Use		Already Listed	5	Sediment Contaminants
MAGMH	Aquatic Life Use		Already Listed	5	Low DO
CB4MH	Aquatic Life Use		Already Listed	5	Low DO
CHSMH	Aquatic Life Use		Already Listed	5	Low DO
CB5MH	Aquatic Life Use		Already Listed	5	Low DO
PATMH	Aquatic Life Use		Already Listed	5	Low DO
CB3MH	Aquatic Life Use		Already Listed	5	Low DO
POTMH	Aquatic Life Use		Already Listed	5	Low DO
PAXMH	Aquatic Life Use		Already Listed	5	Low DO
MATTF	Aquatic Life Use		Insufficient Data	3a	Sediment Contaminants
CHSTF	Aquatic Life Use		Insufficient Data	3a	Eutrophication
CHOTF	Aquatic Life Use		Insufficient Data	3a	Unknown
POCTF	Aquatic Life Use		Insufficient Data	3a	Sediment Contaminants
BOHOH	Aquatic Life Use		Insufficient Data	3a	Unknown
WSTMH	Aquatic Life Use		Insufficient Data	3a	Low DO
SASOH	Aquatic Life Use		Insufficient Data	3a	Unknown
MIDOH	Aquatic Life Use		Insufficient Data	3a	Unknown
NANOH	Aquatic Life Use		Already Listed, Insufficient Data	5	Unknown
BACOH	Aquatic Life Use		Insufficient Data	3a	Unknown
EASMH	Aquatic Life Use		Insufficient Data	3a	Low DO

Legend

	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Segment ID	Designated Use	305(b) Assessment Results	303(d) Listing Decision		
		Assessment Result for Bay Index of Biological Integrity	Listing Status	Listing Category	Suspected Sources of Benthic Degradation
FSBMH	Aquatic Life Use		Insufficient Data	3a	Low DO
NORTF	Aquatic Life Use		Insufficient Data	3a	Eutrophication and Low DO
CHOOH	Aquatic Life Use		Insufficient Data	3a	Unknown
BIGMH	Aquatic Life Use		Insufficient Data	3a	Unknown
HNGMH	Aquatic Life Use		Insufficient Data	3a	Unknown
PAXTF	Aquatic Life Use		Insufficient Data	3a	Unknown
CHSOH	Aquatic Life Use		Insufficient Data	3a	Unknown
LCHMH	Aquatic Life Use		Insufficient Data	3a	Low DO
PAXOH	Aquatic Life Use		Insufficient Data	3a	Unknown
POCOH	Aquatic Life Use		Already Listed, Insufficient Data	3a	Sediment Contaminants
RHDMH	Aquatic Life Use		Insufficient Data	3a	Sediment Contaminants
CHOMH1	Aquatic Life Use		Already Listed, Insufficient Data	5	Low DO
ELKOH	Aquatic Life Use		Insufficient Data	3a	Eutrophication
SOUMH	Aquatic Life Use		Insufficient Data	3a	Sediment Contaminants
POCMH	Aquatic Life Use		Already Listed, Insufficient Data	5	Unknown
NANMH	Aquatic Life Use		Already Listed, Insufficient Data	5	Unknown
WICMH	Aquatic Life Use		Insufficient Data	3a	Sediment Contaminants
BSHOH	Aquatic Life		Insufficient	3a	Unknown

Legend

	Does Not Meet Criterion
	Insufficient Data
	Meets Criterion

Segment ID	Designated Use	305(b) Assessment Results	303(d) Listing Decision		
		Assessment Result for Bay Index of Biological Integrity	Listing Status	Listing Category	Suspected Sources of Benthic Degradation
	Use		Data		
POTTF	Aquatic Life Use		Already Listed, Attains Standards	5	NA
MANMH	Aquatic Life Use		Attains Standards	2	NA
SEVMH	Aquatic Life Use		Attains Standards	2	NA
GUNOH	Aquatic Life Use		Attains Standards	2	NA
CB1TF	Aquatic Life Use		Attains Standards	2	NA
POTOH	Aquatic Life Use		Already Listed, Attains Standards	5	NA
CB2OH	Aquatic Life Use		Attains Standards	2	NA
TANMH	Aquatic Life Use		Already Listed, Attains Standards	5	NA

C.2 Assessment and Listing Results for Maryland's Watershed-Based Segments (*i.e.*, 8 and 12-digit watershed)

C.2.1 Waters Impaired by Bacteria

Maryland implemented the EPA recommended enterococcus (marine or freshwater) and *E. coli* (freshwater only) standards for all waters except shellfish harvesting waters, where the more stringent NSSP standard must be met (see Appendix II). This methodology is open for comment during the 303(d) public review period.

C.2.1.1 Shellfish Harvesting Waters

Nine new water body segments (Table 16) were listed for shellfish impairments in 2006 because the fecal coliform monitoring results did not meet the criteria and these areas were reclassified from approved or conditionally approved to restricted. The Monie Bay impairment was split into two separate listings due to Maryland's segmentation conventions. Three separate stations within the mouth of Monie Bay all revealed shellfish impairments. Separate listings were required as one station was located toward the southern extent of Monie Bay, in watershed 021303020543, while the other two stations were further north in watershed 021303020544.

Table 17: Category 5 Shellfish Harvesting Waters for the 2006 Integrated Report.

River Name	Station ID	LAT	LONG	DNR12DIG	Basin Code	Basin Name
Tedious Creek, Fishing Bay	1404002	38 14 40.42	-76 02 24.60	021303070546	02130307	Fishing Bay
Tar Bay (Near Hoopers Islands)	1403009	38 22 14.76	-76 15 38.28	021304010446	02130401	Honga River
Miles River	801033	38 47 18.46	-76 08 22.35	021305020439	02130502	Miles River
Wye River	802019	38 52 26.00	-76 09 57.00	021305030432	02130503	Wye River
Monie Bay	1801013	38 12 12.68	-75 52 46.17	021303020543	02130302	Monie Bay
Monie Bay	1801019	38 13 24.93	-75 51 39.67	021303020544	02130302	Monie Bay
	18001108A	38 13 24.15	-75 50 33.69			
St. Clements Bay	1302005F	38 16 45.66	-76 42 27.54	021401050726	02140105	St Clement Bay
Combs Creek, Breton Bay	1302033F	38 16 08.76	-76 41 19.86	021401040720	02140104	Breton Bay
Pearson Creek (PNAS)	905102	38 18 13.98	-76 24 18.66	021311010871	02131101	Patuxent River Lower

C.2.1.2 Bathing Beaches

Eleven bathing beach impairments (Table 17) are identified on the 2006 303(d) List. This list was prepared by analyzing recreational bacteriological data for all bathing beaches under the Maryland Beaches Program during the 2005 beach season. The beach season in Maryland is designated from Memorial Day to Labor Day.

Table 18: Category 5 Beaches for the 2006 Integrated Report.

County	Beach Name	Geomean	Lat_Start	Lon_Start	Lat_Stop	Lon_Stop	12_Dig	Station_ID	Lat	Long
AA	Annapolis Landing	45.4	38.94172	-76.57829	38.94214	-76.57808	021310030988	AAAnnapLand	38.94202	-76.57814
KE	Bay Country Campground & Beach	48.7	39.09401	-76.23336	39.09634	-76.23444	021305050389	KEBayCounty	39.09607	-76.23408
KE	Bogles Wharf	41.2	39.03217	-76.20946	39.03236	-76.21000	021305050389	KEBogles	39.03300	-76.21000
KE	Chester River Yacht and County Club Beach	72.1	39.19030	-76.07262	39.18937	-76.07220	021305080399	KEChester	39.12000	-76.04110
KE	Rockhall Beach	53.7	39.13793	-76.25849	39.13651	-76.25701	021305050388	KERockHall	39.13770	-76.25690
SM	Golden Beach - Community	38.5	38.48893	-76.67454	38.48987	-76.67375	021311010884	SMGoldComm	38.48893	-76.67454
SM	Golden Beach – boat ramp	47.5	38.49105	-76.67204	38.49188	-76.67060	021311010884	SMGoldRamp	38.48690	-76.67590
SM	St. Clement Shores S/D – Community Beach	46.2	38.28098	-76.70981	38.28082	-76.70950	021401030719	SMStClemComm	38.27920	-76.49990
SM	Wicomico Shores (Luckton Point)	38.7	38.38131	-76.85711	38.38112	-76.85695	021401060732	SMWic	38.38530	-76.86870
WI	Cherry Beach	50.6	38.54557	-75.71734	38.54505	-75.71840	021303050584	WICherry	38.54557	-75.71734
WI	Schumaker Pond	72.8	38.34919	-75.56761	38.35125	-75.57031	021303010560	WISchu	38.34919	-75.56761

A steady-state geometric mean was calculated for monitoring results using enterococcus as the indicator organism. The calculated geometric mean was compared with the marine steady state bacteria indicator criteria of 35 CFU for all tier beaches (Tier 1, 2 and 3).
If significant rainfall (greater than 1") occurred within 48 hours prior to the sampling event, the sampling data for that date was not used in the assessment calculation. The observations of rainfall data were determined using maps created by the National Weather Service's Multisensor Precipitation Estimator.

Limited data for two other beaches, Wellington Beach and Raccoon Point (Table 18), show possible impairment. These beaches will be placed on Category 3 of the list (insufficient data). Sample collection for these two beaches will not be available until the beach season begins in 2006.

Table 19: Category 3 Beaches for the 2006 Integrated Report.

County	Beach Name	Geomean	Lat_Start	Lon_Start	Lat_Stop	Lon_Stop	12_Dig	Station_ID	Lat	Long
SO	Wellington	28.4	37.99153	-75.85655	37.99242	-75.85619	021302060616	SOWell	37.99153	-75.85641
SO	Raccoon Point	30.8	38.13989	-75.78685	38.14124	-75.78685	021302080659	SORacc	38.14124	-75.78685

C.2.1.3 Other Recreational Uses

Four new water bodies within the Port Tobacco River basin (02140109) were placed in Category 5 for bacteria in accordance with the recreational waters listing methodology. Bacteriological data collected from fixed stations throughout the Port Tobacco watershed during the 2005 beach season (Memorial Day to Labor Day) revealed significant breaches of the enterococcus standard. It should be noted that two unnamed tributaries, one to the north and one to the south of Route 6 that both join Port Tobacco Creek, are included within the Port Tobacco Creek Category 5 listing.

Table 20: Category 5 Recreational Waters for the 2006 Integrated Report.

Stream Name	Geomean	DNR12DIG	Station ID	LAT	LONG
Port Tobacco Creek	169 cfu/100ml	021401090774	PT15 PT26 PT28 PT29	38.514550 38.520667 38.582017 38.524067	-77.021867 -77.013883 -76.986800 -77.012600
Jennie Run	368 cfu/100ml	021401090774	PT21 PT27	38.563750 38.547250	-76.988717 -77.014833
Hoghole Run	156 cfu/100ml	021401090773	PT14	38.511833	-77.027950
Will's Branch	154 cfu/100 ml	021401090771 021401090772	PT25	38.482483	-77.016217

C.2.2 Maryland Biological Stream Survey (MBSS) Data

To better assess Maryland streams, biological indices that accurately characterize stream condition in more stream classes were needed. With completion of the second statewide monitoring round in 2004, the MBSS had collected data from approximately 2500 stream sites, more than doubling the number of sites that were available for the original IBI development. Development of new fish and benthic macroinvertebrate IBIs was undertaken with the more robust dataset.

Applying the original MBSS fish and benthic indices of biological integrity (IBIs) to 2000-2004 data, 40 watersheds (*i.e.*, 8-digit watersheds) fail, 37 are inconclusive, and 7 pass biological criteria; using the new MBSS IBIs, 31 watersheds fail, 41 are inconclusive, and 12 pass. Overall, 22% fewer watersheds fail biological criteria with the new IBIs. The most frequent changes in the designation of individual watersheds are the 17 watersheds that failed with the original IBIs, but are inconclusive with the new IBIs. In addition, among the 37 watersheds that were inconclusive with the original IBIs, 24 (65%) remain inconclusive with the new IBIs, while 5 pass and 8 fail.

C.2.3 New Toxics Listings

Seven water bodies were added to Category 5 of the 303(d) List for high levels of PCBs in Fish Tissue (Table 20). See Section B.3.3 for details on fish tissue listing methodology and fish consumption advisories.

Table 21: New Toxics Listings Based Upon Fish Tissue Analysis.

8- Digit Basin Name	8-Digit Code	Listing Year	Toxin
Anacostia River	02140205	2006	PCB – Fish Tissue
Bynum Run	02130704	2006	PCB – Fish Tissue
Gunpowder River	02130801	2006	PCB – Fish Tissue
Magothy River	02131001	2006	PCB – Fish Tissue
Middle River	02130807	2006	PCB – Fish Tissue
Rhode & West Rivers	02131004	2006	PCB – Fish Tissue
Severn River	02131002	2006	PCB – Fish Tissue

In addition, the old Elk River (021306) PCB impairment was moved to Category 6 in favor of listing this watershed at a more refined scale. As a result, this impairment was split into four separate listings, all at the 8-digit scale (Table 21). Since these areas are not new impairments, they will retain the listing year (2002) of the original PCB impairment.

Table 22: 8-Digit Scale Fish Tissue Listings Used in Place of the 6-Digit Elk River Listing.

8 – Digit Basin Name	8 – Digit Code	Listing Year	Toxin
Upper Elk River	02130603	2002	PCB – Fish Tissue
Back Creek/C&D Canal	02130604	2002	PCB – Fish Tissue
Northeast River	02130608	2002	PCB – Fish Tissue
Lower Elk River	02130601	2002	PCB – Fish Tissue

PART D: PUBLIC PROCESS RELATED TO THE 303(d) LIST

MDE utilizes a public participation process for 303(d) listing similar to that used for promulgation of new regulations. The Administrative Procedures Act mandates that a minimum of 45 days from the date of publication in the Maryland Register must be allowed for the adoption of new regulations [see Annotated Code of Maryland, State Government Article, § 10-111(a)]. Thirty of those 45 days must be available for public review and comment. The Department feels that public participation is a vital component of List development and therefore grants 45 days for public review alone. The draft Integrated List is made available in CD format to the public via the Internet (www.mde.state.md.us), through distribution to local libraries, and by direct mailing (see Informational Public Meeting Announcement memo in Appendix I).

During this open comment period for the Integrated List, informational public meetings are held in the western (Hagerstown), eastern (Salisbury), and central (Baltimore) regions of the State to facilitate dialogue between MDE and stakeholders concerning the format, structure, and content of the draft List. MDE also engages interstate river basin commissions, Maryland tributary teams, and watershed councils during the public comment period and gives full presentations on the Maryland 303(d) program as requested.

Comments or questions may be directed in writing to the Department. All comments submitted during the public review period are fully addressed in a comment-response document included with the final List submitted for EPA approval. Sufficient time is built into 303(d) List development to allow MDE to receive and fully respond to all public comments on the List.