

# Anne Arundel County Comprehensive Plan for Watershed Assessment Monitoring: Biological and Habitat Monitoring

As required by:  
Anne Arundel County NPDES MS4 Permit: 20-DP-3316  
(MD0068306)

October 2023



Anne Arundel County Comprehensive Plan for Watershed Assessment Monitoring:  
Biological and Habitat Assessment Monitoring

As required by:

National Pollutant Discharge Elimination System

Municipal Separate Storm Sewer System Discharge Permit

Anne Arundel County Permit Number: 20-DP-3316 (MD0068306)

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# I. Introduction

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As part of the State of Maryland's current generation of NPDES MS4 permits (Permit) issued for large Phase 1 jurisdictions, the Maryland Department of the Environment (MDE) has included new requirements for biological monitoring, chloride monitoring, and bacteria monitoring (Part IV.G.2. Watershed Assessment Monitoring). Jurisdictions have a choice to either complete the work themselves or opt into the Pooled Monitoring Program administered by the Chesapeake Bay Trust (CBT), in collaboration with MDE and others, where each jurisdiction provides funding towards the required sampling work which is then completed by others on MDE's behalf. Anne Arundel County (County) has chosen to participate in pooled monitoring regarding the required chloride and bacterial assessment work. However, the County will continue with its Countywide Biological Monitoring Program (Program) and use the data collected during Program execution to fulfill Permit requirements for biological and habitat assessment monitoring. With respect to this document, relevant language regarding biological and habitat assessment monitoring from Part IV.G.2.b of the Permit is reproduced below.

- b. The County shall submit a comprehensive plan for watershed assessment and trend monitoring by March 5, 2023 related to stream biology and habitat, bacteria, and chlorides and commence monitoring upon the Department's approval. The plan shall follow the 2021 Monitoring Guidelines and include:*
  - i. Biological and habitat assessment monitoring at randomly selected stream sites using MBSS protocols;*
  - ii. Bacteria (i.e., E. coli, Enterococcus spp., or fecal coliform monitoring); and*
  - iii. Chloride assessments at two locations.*

In addition to the Permit, MDE has provided guidance to jurisdictions on its expectations for how the monitoring should be conducted, with a mix of mandatory and recommended requirements. These are summarized in the 2021 MS4 Monitoring Guidelines (MDE 2021).

Because the County continues participation in the Pooled Monitoring Program for the required bacteria and chloride assessments, as allowed per MDE (2021), a comprehensive monitoring plan is not prepared for those Permit components. This document fulfills the Comprehensive Monitoring Plan requirement for stream biology and habitat monitoring.

## II. MDE Required and Recommended Program Elements

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Per MDE (2021), MDE has proposed a mix of required and recommended site selection and sampling methods for Phase 1 jurisdictions. The required activities, taken directly from MDE (2021) are listed below:

### A. Required Elements

#### 1. Probability sampling design

MDE requires random sampling design to ensure unbiased results.

#### 2. Adopt MBSS protocol

MDE requires adoption of MBSS protocols, specifically:

In the field, collect:

- a. benthic macroinvertebrates,
- b. in situ environmental data, including temperature, dissolved oxygen, pH, turbidity, and conductivity with a multi-parameter probe, and
- c. habitat information, including bar formation, channel alteration, embeddedness, epifaunal substrate condition, erosion severity, observe channelization, instream habitat condition, pool/glide/eddy quality, riffle/run quality, velocity depth diversity, check presence or absence of concrete/gabion and beaver dam, and shading.

Field personnel conducting the sampling should participate in MBSS training and acquire MBSS Benthic Macroinvertebrate and Physical Habitat Assessment Certification to ensure data quality and consistency (Stranko et al., 2019; DNR, 2017 - for measuring in situ dissolved oxygen).

### B. Recommended Elements

A variety of optional program design criteria and field assessment techniques are recommended for implementation. These criteria are discussed in more detail later, but are summarized below.

#### 1. Generalized Random Tessellation Stratified (GRTS) sampling

A randomized site selection procedure that provides for a spatially balanced distribution of the selected random sites.

#### 2. Non-rotation sampling

The level of sampling effort expended in a program is always a compromise between available resources and the need for data in a timely fashion. MDE has proposed that small numbers of

samples be collected across all 8-digit watersheds in the County, presumably waiting to interpret biological condition until the entire set of data for a particular 8-digit watershed has been collected at the end of the permit term.

### 3. Assessment/Management scale

The scale at which biological data are amalgamated for interpretation is a key component in any program design. MDE has proposed using the state 8-digit watershed as its assessment unit.

### 4. USGS 1:24,000 NHD usage

MDE suggests using USGS's 1:24,000 National Hydrography Dataset (NHD) as the base map from which sites are selected. It is believed that using a map at this scale will ensure better characterization of smaller streams and better matches map scales commonly used across jurisdictions to characterize stream presence and condition.

### 5. Additional in situ and chemical water quality assessment

Chemical grab sampling for major nutrients and metals and collecting additional in situ data using multiparameter probes (e.g.–chlorophyll, nitrate.) are suggested to better characterize stressors present at each site.

### 6. Fixed sites for trend analysis

MDE suggests jurisdictions compliment random biological and habitat monitoring with fixed sites to allow trend assessment over time.

### 7. Continuous trace study

To capture antecedent water quality conditions ahead of biological monitoring, MDE recommends collecting weekly water quality samples, for a period of 5 to 10 weeks prior to the conducting spring sampling.

## C. QA/QC Documentation and QAPP

While not specifically required, MDE has requested that jurisdictions develop a Quality Assurance Project Plan (QAPP) detailing all monitoring procedures (MDE 2021, p. 2) for all monitoring requirements. Additionally, MDE indicates that the MBSS Sampling Manual (p 7-11, Stranko et al., 2019) and the MDE Biological Data Quality Guidelines (MDE, 2013) be followed to enhance data quality.

# III. Countywide Biological Monitoring Program Elements

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Anne Arundel County has a comprehensive bioassessment program. Fish, benthic macroinvertebrates, instream and riparian habitat characteristics, baseflow water chemistry, and physical stability are all evaluated by the Program. The Program largely follows MBSS approaches.

The Program’s assessment unit is the Primary Sampling Unit or PSU. Since implementation, in 2004, the Program has used a rotating basin type of sampling approach where a subset of PSUs are randomly sampled each year. All sampling is completed, meaning all PSUs are sampled, within a 5-year timeframe called a Round. To date, three Rounds have been completed (Round 1: 2004-2008, Round 2: 2009-2013, Round 3: 2017-2021). In October of 2022, the County contracted with a consultant team to execute Round 4 of the Program. **MS4 Permit sampling will occur concurrently with Round 4 implementation, which began with the 2023 Spring Index Period and will conclude in 2027.**

While some methodological differences exist between the Program and MBSS, these differences will not prevent the County from providing high-quality data that is fully compliant with MDE requirements as described in MDE (2021). Please see Appendix A- for a detailed summary of Program approaches in comparison to MS4 Permit monitoring guidelines (MDE 2021). Specific discussions about compliance with required elements and which suggested elements will or will not be adopted into the Program are found below.

## A. Required Elements Compliance

Per MDE (2021), only two elements are required for a program to be in compliance with Permit conditions: probability sampling design and adoption of MBSS protocols for field data collection. Each of these elements is discussed below.

### 1. Probability sampling design

Since its inception, the Program has employed a random sampling approach, the details of which are described in AAC (2023). In summary, models were developed for the Program in ArcGIS (ESRI, Inc.) that parsed the stream coverage in each PSU into 75 meter segments. From these points, eight primary sites and approximately 20 backup sites are randomly selected, creating a list for use in making property owner contacts. Permission is sought to sample at all Primary sites until the target number of sites are achieved. Should a primary site be unsamplable for whatever reason, a backup site is selected to replace it. This process continues until the target number of sites for the PSU is reached.



The total number of samples per PSU was determined using a power analysis, as described in Southerland et al. (2016), our program design document ([aacounty.org/sites/default/files/2023-04/Design%20Update%20of%20the%20Anne%20Arundel%20County%20Biological%20Monitoring%20Program\\_Round%203.pdf](https://aacounty.org/sites/default/files/2023-04/Design%20Update%20of%20the%20Anne%20Arundel%20County%20Biological%20Monitoring%20Program_Round%203.pdf)). The analysis showed that 8 sites per PSU was sufficient to achieve the long-standing objective of detecting a 30% change in IBI scores, 80% of the time, with 95% confidence.

The County will continue utilizing this probability sampling design and random sampling, and employing the GRTS site selection technique described in MDE (2021). The County's consultant team that implements the Program has staff trained in the use of R and in GIS assessment work and are fully capable of implementing GRTS in this software environment. Sufficient primary and backup sites will be selected to ensure the target numbers of sites are realized each year of the permit.

Traditionally, the County has also employed order stratification in sample distribution, meaning that samples are distributed randomly, but sites are placed in proportion to the percentage of a particular stream order found in a particular watershed. To be consistent with prior sampling, order stratification will continue in Round 4. However, the order distribution will be expanded from first to third order to first to fourth order to be fully consistent with MBSS sample site selection procedures.

## 2. MBSS protocols

The Program has employed MBSS methodologies since its inception. Per various MBSS documents (see Stranko et al. 2019 for the most recent sampling manual), procedures for benthic macroinvertebrate field sampling prescribed by the County and followed by the consultant team include:

- All sampling conducted within the Spring index period (March 1 to April 30)
- Implementation of the 20 Jab method across best available habitats in the sampling reach
- Physiochemical readings are collected with a multiparameter probe at all reaches
- A grab sample for chemical analysis is collected
- All habitat variables, spring and summer, are collected in the spring season
- In addition to MBSS habitat work, the US EPA's Rapid Bioassessment Protocol habitat assessment for low-gradient streams is also scored in each assessment reach

Details about procedures used in the Program are found in AAC (2023), the QAPP for the Program. .

## B. Recommended Elements Compliance

In addition to required elements, a variety of suggested approaches for program implementation are found in MDE (2021). Each is discussed below. County decisions regarding compliance with particular

elements are highlighted in bold font. A comparison of MDE (2021) required and recommended elements with the County monitoring program is found in **Appendix A**.

### 1. GRTS sampling

As discussed previously, **the Program adopted this approach for random site selection in Round 4**. While this is a different procedure than the one used in prior Program sampling rounds, the same objective—unbiased site selection—is achieved. One difference in the Program approach from the recommended approach will be the continued inclusion of order stratification in our site selection process.

### 2. Non-rotation sampling

As stated previously, the County employs a rotating-basin type approach in the Program, sampling in PSUs that mirror State of Maryland 8-digit watershed boundaries. With this approach, the entire County (all PSUs) is sampled over a 5-year Round. As detailed in our most recent design document (Southerland et al. 2016), the current approach results in the ability to detect a 30% change in IBI scores, 80% of the time, with 95% confidence.

While the County sees the possible utility in a non-rotating basin sampling approach, during our last design exercise this change was not considered as an option, so no analysis was performed to compare this approach to the rotating basin approach in place since 2004. Consequently, the concern is that switching from the Program’s current approach will not allow for ready comparisons between data collected in Round 4 and data collected in the prior three sampling rounds. Given this uncertainty and the fact that the non-rotating basin approach is specifically listed as an optional component, **the County will continue to employ a rotating basin approach in Round 4**.

### 3. Assessment/Management scale

As stated previously, the Program uses as its management unit a watershed area called a Primary Sampling Unit, or PSU. These PSU boundaries were developed for the Program in 2004. These boundaries parallel the State’s 8-digit and 12-digit watershed boundaries (see Table 1 and Figure 1). There are 24 PSUs currently used by the Program, all of which are completely within an 8-digit watershed. **Consequently, data collected by the Program will comply with this suggested approach.**

The anticipated Round 4 sampling year for each PSU is listed in Table 1. In each PSU, eight samples will be collected (plus one QC duplicate, applicable to the BIBI work only) in the year it is to be sampled, with full coverage for each 8-digit watershed achieved by the end of the sampling round in 2027. For example, in Patuxent River Upper 8-digit watershed, the Stocketts Run PSU will be sampled in 2025, the Middle Patuxent PSU will be sampled in 2026, and the Upper Patuxent PSU will be sampled in 2027, for a total of 24 samples collected for this 8-digit watershed.

**Table 1. Crosswalk between County PSUs and State of Maryland 8-digit Watersheds**

<b>MD 8-digit Watershed Name</b>	<b>Countywide Program Primary Sampling Unit</b>	<b>Sample Year</b>	<b>Total Samples Per 8-digit Watershed when R4 completed</b>	<b>% area of MD 8-digit Watershed in County</b>
Patapsco River, Lower North Branch (02130906)	Piney Run	2027	24	20
	Stony Run	2026		
	Lower Patapsco	2024		
Baltimore Harbor (02130903)	Sawmill Creek	2024	16	41
	Marley Creek	2026		
Bodkin Creek (02130902)	Bodkin Creek	2027	8	100
Magothy River (02131001)	Upper Magothy	2025	16	100
	Lower Magothy	2023		
Severn River (02131002)	Severn Run	2026	16	100
	Severn River	2027		
South River (02131003)	Upper North River	2025	16	100
	Lower North River	2025		
West River (02131004)	Rhode River	2024	16	100
	West River	2023		
West Chesapeake Bay (02131005)	Herring Bay	2026	8	28
Little Patuxent River (02131105)	Little Patuxent	2023	8	43
Patuxent River Upper (02131104)	Upper Patuxent	2027	24	39
	Middle Patuxent	2026		
	Stocketts Run	2025		
Patuxent River Middle (02131102)	Rock Branch	2027	32	48
	Ferry Branch	2024		
	Lyons Creek	2023		
	Cabin Branch	2023		
Patuxent River Lower (02131101)	Hall Creek	2025	8	1

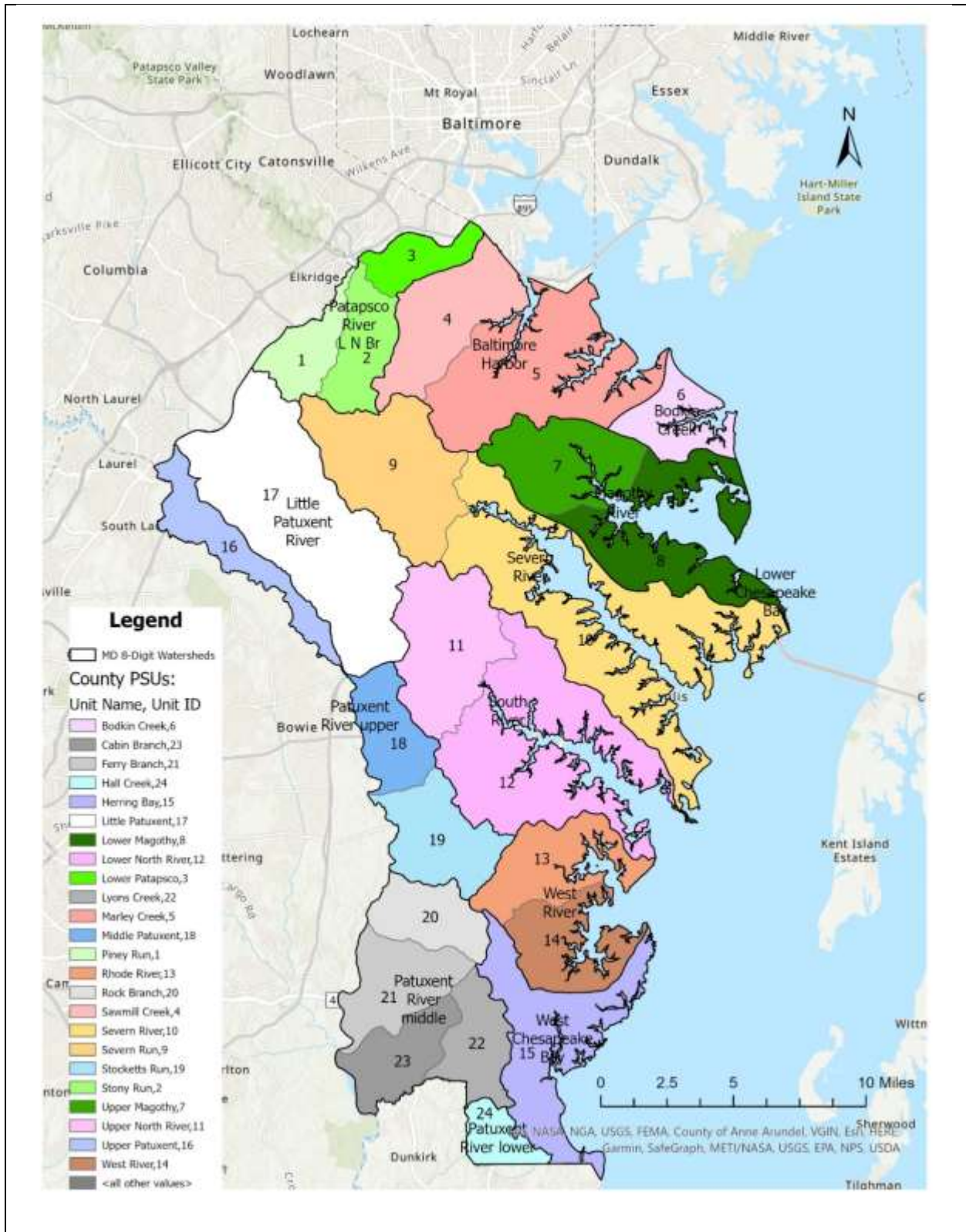


Figure 1. Illustration of nesting by County PSUs (colored and numbered) within MD 8-digit watersheds (names, with black borders).

#### 4. Use a 1:24,000 [scale-stream] map

Since its inception, the Program has used a 1:100,000 scale coverage obtained from MBSS in 2003 during Round 1 implementation. This coverage has been used for the three completed sampling rounds. In Round 3, a second coverage based upon a stream layer used by the County was concurrently sampled. The purpose of having two strata is to evaluate the applicability of the current BIBI metrics to streams found in finer scale coverage; this is a project slated to begin in mid-2023 and is outside of these Permit-required monitoring protocols.

MDE (2021) suggests using USGS’s 1:24,000 NHD layer for site selection. As the original metrics were developed on a 1:100,000 stream coverage, it remains an open question if the current BIBI metrics adequately characterize conditions in these smaller streams. Also, the County has concerns about data comparability across rounds by sampling sites across a different coverage scale. **Despite these concerns, the Program adopted the 1:24,000 coverage for use in Round 4.**

#### 5. Additional in situ and chemical water quality assessment

MDE (2021) suggests in situ collection of parameters like chlorophyll, DOM, and nitrate using ion-specific sensors, presumably installed on the multiparameter instruments used to collect mandatory physiochemical parameters listed previously. MDE (2021) further suggests collection of water quality grab samples for analyses of major nutrients and certain ions. **The Program currently collects a water quality grab sample that identifies many of the in situ parameters and all of the chemical grab sample parameters suggested in MDE (2021). As such, the County will not collect the recommended in situ parameters in real time.** The list of Round 4 Program water quality grab sample analytical parameters, methods, and detection limits is found in Table 2.

**Table 2. Current parameter list for water quality grab sample analysis**

Parameter	Maximum Reporting Limit (mg/L)	Method Number
Orthophosphate	0.05	APHA 4500-PG
Total Phosphorus	0.05	APHA 4500-P J
Dissolved Organic Carbon	0.5	APHA 5310 C
Total Organic Carbon	1.0	APHA 5310 C
Ammonia-N	0.2	USGS (1993) NWQL I-2525
TKN (calculated)	0.2	N/A
Nitrate-Nitrogen	0.05	APHA 4500-NO3-F
Nitrite-Nitrogen	0.05	APHA 4500-NO2-B
Total Nitrogen	0.2	APHA 4500-P J
Total Hardness	1.0	APHA 2340 B
Total Alkalinity	1.0	EPA 310.1
Total Zinc	0.03	APHA 3125
Chloride	0.02	APHA 4110B
Sodium	0.03	APHA 3111 B

Parameter	Maximum Reporting Limit (mg/L)	Method Number
Boron	0.01	APHA 3125
Sulfate	Not yet determined	Not yet determined
Total Dissolved Solids	Not yet determined	Not yet determined
Acid Neutralizing Capacity	Not yet determined	Not yet determined

## 6. Fixed sites for trend analysis

MDE (2021) suggests the addition of fixed sites where repeat visits are made. In Round 3, the Program revisited a handful of sites sampled in Rounds 1 and 2. It is possible that the County may, in the future, engage in a fixed site assessment program, but given the uncertainty expressed in MDE (2021) regarding the ratio of random to fixed sites, **the County declines to commit to revisiting past sites for the Round 4 Program.**

## 7. Continuous trace study

The cost for this type of assessment would be considerable and of limited utility at random sites. It is suggested that this work be performed at trend sites, but even then it is unclear how beneficial this additional information would be for understanding overall watershed conditions at the 8-digit watershed scale. **Consequently, the County will not perform continuous trace studies in concert with biological and habitat assessment monitoring.**

## C. QA/QC Documentation and QAPP

**The Program currently follows procedures that exceed the recommended minimum QA/QC suggestions in MDE (2021).** A QAPP (AAC 2023) has been in place for the Program since its inception. At the beginning of each sampling Round, the QAPP is reviewed and updated with any important changes to MBSS or Program methods. Any changes resulting from Program redesign activities are also included in these updates. For example, fish sampling was incorporated into the program for Round 3, so new SOPs and other updates were required and included.

One of the requirements associated with the Program is that all consultant staff be certified in MBSS methods (benthic, habitat, and fish) by successfully completing the training offered by the State and passing both a written test and field audit. The consultant field teams consist entirely of members who have successfully completed MBSS training and certification.

It should be noted that a QAPP, by definition, is a project specific document. The changes needed to make the Round 4 Program compliant with MDE (2021) are addressed in the 2023 QAPP found here: [aacounty.org/sites/default/files/2023-09/AA%20County\\_BioMonitoring\\_Round%204\\_QAPP.pdf](http://aacounty.org/sites/default/files/2023-09/AA%20County_BioMonitoring_Round%204_QAPP.pdf) and submitted to MDE with this document for review and approval.

In addition to the QAPP, the County developed a Method Quality Objectives document (Hill and Pieper 2010) for BIBI data collection (see: [aacounty.org/sites/default/files/2023-03/Method%2520Performance%2520Characteristics\\_2011.pdf](https://aacounty.org/sites/default/files/2023-03/Method%2520Performance%2520Characteristics_2011.pdf)). MQOs are numerical criteria developed to evaluate overall data quality and used to produce a QA/QC report for each sampling year, which details any issues encountered during the work and describes the steps used to rectify them. Data for this evaluation is generated by collecting duplicate samples at 10% of monitoring sites. In addition to duplicate sample collection, 10% of all samples are re-identified by a second taxonomic laboratory to ensure data quality produced by the primary taxonomists. The MQOs are used to develop a QA/QC report for each sampling year that details the outcome of these evaluations and describes procedures needed to correct any errors with the data. These QA/QC reports will be submitted with each permit year's data submission.

## D. Miscellaneous Elements

In comments dated September 15, 2023, responding to the first version (November 2022) of this document, MDE indicated a desire to obtain additional information, should a particular program collect it. A summary of additional elements collected by the County during implementation of the Program, which are neither required nor recommended by MDE (2021), are listed below:

**Fish Sampling.** The Program added fish sampling during the Round 3 redesign. As detailed in the QAPP, Program methods mirror MBSS procedures. The Program scores two multimetric habitat assessments—the US EPA's RPB habitat assessment (Barbour et al. 1999) for low-gradient streams and the Maryland Physical Habitat Index (Paul et al. 2003)—in both spring and summer, in addition to any other assessment requirements related to MBSS protocols for summer sampling.

**Geomorphic Assessment.** The Program performs a Rosgen Level II classification (Rosgen 1994) at every sampling reach. Data collected during this work includes a modified Wolman pebble count, and an abbreviated longitudinal profile. A monumented cross section is installed at each site to facilitate repeat measurements should a future opportunity arise.

The County is happy to provide this additional information to MDE. Most of this information is provided to the County in a geodatabase prepared by our consultant team.

## IV. References

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Appendix A Summary comparison between the Anne Arundel County Biological Monitoring Program (Program) and MS4 Permit biological and habitat assessment monitoring guidelines

Summary of County compliance with MDE requirements and recommendations for MS4 biological monitoring.					
Element	Permit Status	MDE Guidance	Round 3 County Approach	County Status	Round 4 Actions for MS4 Compliance
Probability sampling design	Required	No specific approach for sample selection required.	Random sampling done as routine part of Program. Consultant-developed methodology used.	Compliant with MDE guidance.	Compliant: No changes needed
Adopt MBSS protocols	Required	Collect or perform the following: BIBI In situ Phys Chem data: pH, DO, turbidity, SC, temp. Habitat (looks like the list for MPHI). MBSS certification required.	Current Protocols require collection of the following: BIBI FIBI RBP and MPHI habitat assessment, both index periods. Rosgen Level II assessment. WQ sample and complete phys chem. MBSS certification required for all consultants. Rosgen training required for all consultants.	Compliant with MDE guidance.	Compliant: No significant changes needed QAPP and other Program documents updated to reflect procedures and practices applied for Round 4
GRTS Sampling	Recommended	Use Generalized Random Tessellation Stratified (GRTS) survey design to select sites ("spsurvey" in R is suggested) to avoid clustering. 5X oversampling to ensure enough sites.	Two stream coverages: MBSS and edited County coverage (Small stream sites). Random sample site selection method developed by consultants. Not GRTS. Stratified by stream order (1st to 3rd per old MBSS guidelines), as determined by the 1:100K coverage. 2X oversampling for both strata No order stratification for the Small Stream sites.	Not compliant with MDE guidance.	Accepted: Round 4 site selection utilizes GRTS. Will increase order stratification to 1st to 4th order streams, per MBSS's approach. QAPP will be updated to reflect this approach to site selection.
Non-rotation sampling	Recommended	All 8 digit State HUC watersheds are recommend for sampling at least once per year. A minimum of 25 samples will be required per year (per Table 2 of MDE	Rotating basin design. Primary Sampling Unit (PSU) is basis for sampling distribution. Nested in 8 digit HUCs. 24 PSUs total. 4-5 PSUs per year sampled in 5 year round.	Not compliant with MDE guidance.	Declined: The County has practiced rotating basin sampling since its beginnings. Concerns exist about compatibility with prior data if this change were adopted.

Summary of County compliance with MDE requirements and recommendations for MS4 biological monitoring.					
Element	Permit Status	MDE Guidance	Round 3 County Approach	County Status	Round 4 Actions for MS4 Compliance
		2021).			
Stratified with at least 8-digit watersheds	Recommended	Sampling is stratified at the 8-digit HUC scale. Localities can use a finer scale and MDE will aggregate this up to the 8-digit scale.	Primary Sampling Unit (PSU) is basis for sampling distribution. All PSUs are nested within MD 8-digit HUCs. 24 PSUs total. Samples stratified by stream order.	Compliant with MDE guidance.	Compliant: MDE can aggregate Program data up to the 8-digit HUC as needed. Stream order stratification will be preserved in County site selection procedures.
Use a 1:24,000 scale [stream] map	Recommended	Suggest using USGS 1:24,000 NHD.	Two coverages in use: 1,100,000 MBSS non-tidal stream coverage. County stream layer (scale unknown, but likely finer than 1:24,000)	Not compliant with MDE guidance.	Accepted: The County has moved to the recommended 1:24,000 coverage. QAPP is updated to reflect usage of this new stream coverage.
Additional in situ data	Recommended	Suggest collecting chlorophyll, DOM, and nitrate [presumed via handheld multimeters].	Basic phys chem currently collected (pH, DO, temp, SC, and turbidity).	Not compliant with MDE guidance.	Declined: Significant costs are associated with meter upgrades to measure these parameters. The collected WQ grab sample analyzes for some of these parameters.
Chemical grabs	Recommended	A grab sample for: NO <sub>3</sub> <sup>-</sup> , NH <sub>3</sub> <sup>+</sup> , P, TN, Chloride, and others.	Grab sample collected that is analyzed for nitrogen and phosphorus species, metals, some organics (DOC), and other parameters, including chloride.	Partially Compliant with MDE guidance.	Accepted: Parameter list found in Table 1 of main document. All listed parameters in Part B.8 of MDE (2021) will be collected.
Fixed sites for trend analysis	Recommended	MDE currently working on power analysis to determine the number of revisits needed.	R1 and R2 revisits as part of R3. Unclear on implementation for R4.	Potentially compliant with MDE guidance.	Declined: Uncertainty regarding implementation. Consider revisiting for Round 5

Summary of County compliance with MDE requirements and recommendations for MS4 biological monitoring.					
Element	Permit Status	MDE Guidance	Round 3 County Approach	County Status	Round 4 Actions for MS4 Compliance
Continuous trace study	Recommended	5-10 discrete WQ samples per site leading up to biomonitoring work in spring.	Not done.	Not compliant with MDE guidance.	Declined: This would be a costly addition to Program
QA/QC plan	Recommended	MBSS Sampling manual QC guidelines and MDE's Biological Data Quality Guidelines shall [exact language] be followed to enhance data quality.	Each Round has a fully formed Quality Assurance Project Plan (QAPP) that includes all the elements mentioned in the MBSS manual and addresses the requirements described in the MDE document.	Compliant with MDE guidance.	Compliant: See R4 QAPP (2023).