Charles County Biological Monitoring and Assessment Program

Round 1 – Year 1 (2025) Annual Report

KCI Technologies, Inc.
December 2025

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Annual Report

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Acknowledgements

The principal authors for this report are Hannah Girgente and Colin Hill of KCI Technologies and Matt Hedin of Coastal Resources Inc. Fieldwork was conducted primarily by Nancy Hofmann, Megan Anders, and Jacob Robinson, of KCI, and Matt Hedin, Sean Sipple, and Jeff Gring, of Coastal Resources Inc. Sample processing and taxonomic identification was conducted by EcoAnalysts. Megan Anders and Nancy Hofmann of KCI provided additional support with GIS analysis and mapping. Michael Pieper assisted with contract management oversight.

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Executive Summary

The Charles County Department of Planning and Growth Management initiated the Charles County Biological Monitoring and Assessment Program in the spring of 2025. The County initiated the monitoring program to establish a baseline ecological stream condition for the County's watersheds. The program involves monitoring the biological health and physical condition of the County's water resources and is designed to be completed on a five-year non-rotating basis such that a portion of all the County's major watersheds, or primary sampling units (PSUs), will be sampled annually.

Round 1 began in 2025 and includes sampling a minimum of one randomly selected site in each PSU annually for five years. The monitoring in Round 1 involves sampling instream water quality, collection and analysis of the biological community (benthic macroinvertebrates), and assessing physical habitat following Maryland Biological Stream Survey (MBSS) protocols.

All biological assessments occurred between March 1st and April 30th of 2025, as required by the MBSS protocols. The benthic macroinvertebrate community throughout the sampling sites visited during 2025 were as 'Good' (36%), followed by both 'Fair' and 'Poor' (both equaled 24%), and 'Very Poor' (16%). The range of BIBI scores at individual sites ranged from 1.29 ('Very Poor') to 5.00 ('Good') on a 1.00 to 5.00 scale. The mean BIBI value of all sites sampled in 2025 ($\bar{x}$ = 3.37) resulted in a 'Fair' average biological condition rating.

The majority of the sites received physical habitat ratings of 'Partially Degraded' (36%), 'Degraded' (32%), and 'Minimally Degraded' (20%). PHI scores ranged from 49.1 ('Severely Degraded') to 91.0 ('Minimally Degraded') on a 0.0 to 100.0 scale.

In situ water quality measurements fell within COMAR standards for temperature and turbidity. Forty-four percent of sites were below the minimum COMAR threshold of 6.5 for pH, and six sites had pH values marked as data outliers and removed from analysis due to suspected equipment malfunction; however, many of these sites appear to be within naturally occurring blackwater streams. Three sites fell below the 5 mg/L COMAR threshold for dissolved oxygen, and specific conductivity was elevated at four sites county-wide and exceeded 247 µS/cm, which is the critical threshold between 'Fair' and 'Poor' stream quality determined for Maryland streams, based on BIBI scores (Morgan et al., 2007).

Drainage areas to each sampling site ranged from a minimum of 22 acres to a maximum of 38,720 acres. The average percentage of impervious areas in the sites sampled in 2025 is 6.5%. Imperviousness for the areas draining to each sampling site range from 0% to 31.3%. Site ZEKI-134-25 had the highest impervious percentage, while site PRLT-098-25 had the lowest impervious percentage. Natural land cover classes were the dominant land uses across the sites ($\bar{x}$ = 71.3%) followed by land use categories in the broader developed land cover class ($\bar{x}$ = 18.78%).

1 Background and Objectives

The Charles County Biological Monitoring and Assessment Program was initiated in the spring of 2025 by the Charles County Department of Planning and Growth Management. The Program was designed to comply with the County's current Phase I National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit (number MD0068365, 22-DP-3322) requirement for County Watershed Assessment Monitoring for stream biology and habitat. The program involves monitoring the biological health and habitat conditions of the County's water resources and meets each of the mandatory and some of the voluntary sampling design considerations from the *2021 MS4 Monitoring Guidelines* document produced by the Maryland Department of the Environment (MDE).

Biological assessments are a highly effective approach to understanding the overall health and quality of streams. Changes in the resident biota (e.g., benthic macroinvertebrates, fish, herpetofauna, etc.) are ultimately caused by changes in their surroundings and immediate environment. By comparing the structure and function of biological assemblages in streams of interest to those of a known reference condition, it is possible to detect a change from natural conditions (i.e., impairment). The greater the difference between conditions measured in a stream of interest and the reference condition, the greater the extent of impairment, and vice versa. Therefore, biological responses are very useful for indicating changes in overall stream ecosystem health. In other words, by observing shifts in biological assemblages from their natural conditions it is possible to detect impairment in stream ecosystems.

As part of a comprehensive biological assessment program, physical habitat quality is assessed, and water quality samples are collected and analyzed to supplement biological data. While not directly identifying specific cause-effect relationships, combining the results of biological, chemical and physical habitat data can provide insight into the types of stressors and their potential sources impacting streams and watersheds of interest, allowing for prioritized implementation of more detailed, diagnostic investigations based on the severity of observed biological responses. For example, alterations in stream and watershed hydrology can potentially lead to accelerated stream channel erosion, which, in turn, leads to habitat degradation and reduces the capacity of the stream to support a fully functioning, diverse aquatic insect community.

The County was divided into 10 Primary Sampling Units (PSU), which are the watersheds used to stratify the site selection process, based on Maryland's 8-digit watersheds (Figure 1). Stratifying by 8-digit watersheds will ensure the greatest consistency with updates to Maryland's Integrated Report of Surface Water Quality (IR), Biological Stressor Identification (BSID), and Total Maximum Daily Loads (TMDL), which are at the 8-digit scale. Additionally, the County adopted a non-rotational sampling approach where a subset of sites are sampled in all 8-digit watersheds every year, with the full County being completed over a five-year period. This design consideration may help understand annual variability, which is likely to increase as climate change progresses.

Assessment methods follow those developed by Maryland Department of Natural Resources' (DNR) Maryland Biological Stream Survey (MBSS) and the Standard Operating Procedures (SOPs) found in the Quality Assurance Project Plan (QAPP) for the Charles County Biological Monitoring and Assessment Program (DPGM, 2025b).

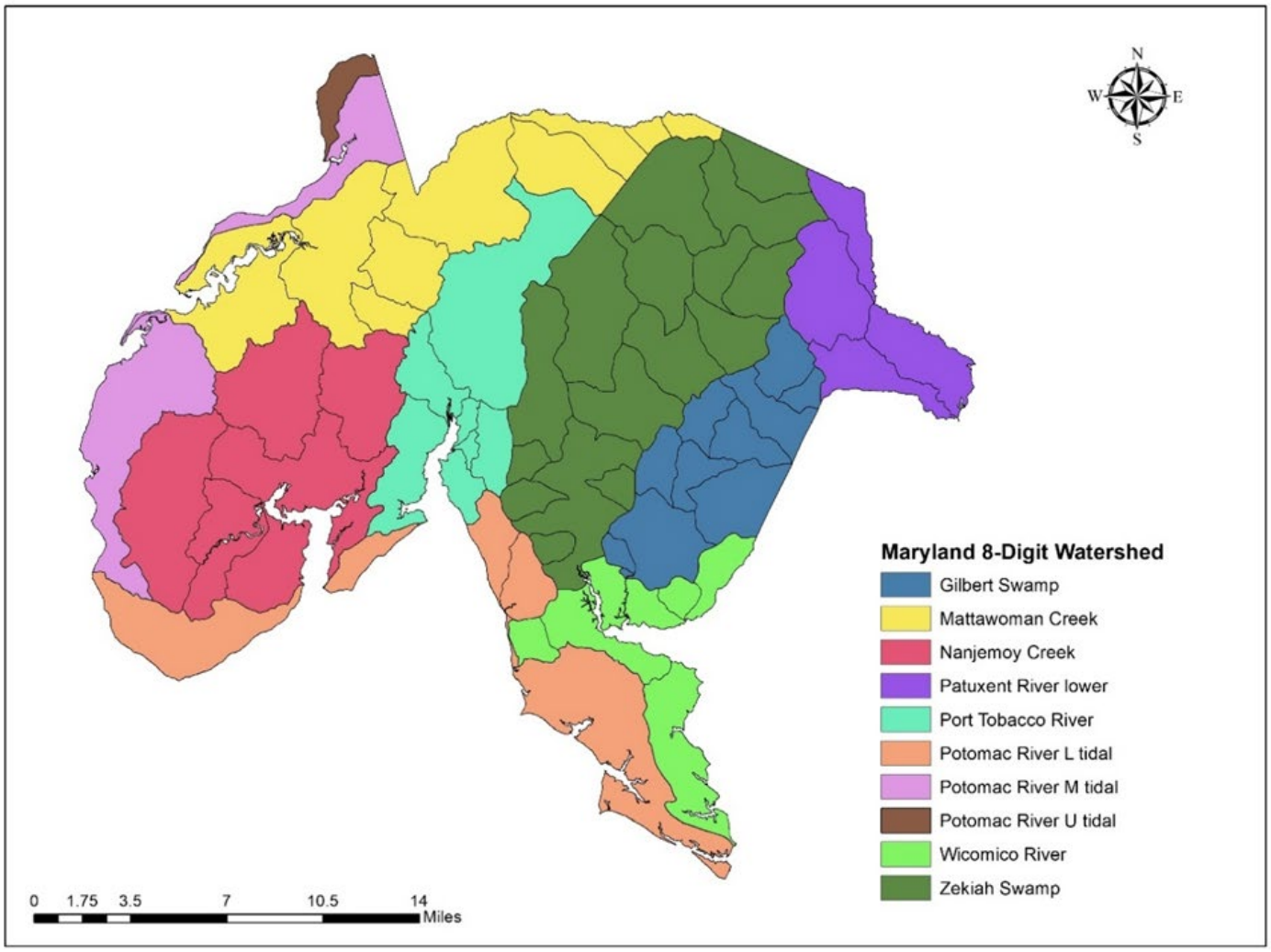

Figure 1. Map of the PSUs (Maryland 8-Digit Watersheds) within Charles County

2 Methodologies

Biological assessment methods within Charles County are designed to be consistent and comparable with the methods used by MDNR's MBSS program. Stream monitoring was conducted throughout the County and involved measuring instream water quality and collecting samples for laboratory analysis, sampling and assessing the biological community (benthic macroinvertebrates), and visually assessing the instream and riparian physical habitat. Monitoring was conducted at a total of 25 sites across the County. The assessment methods followed the current MBSS protocols (Harbold et al., 2024) and the SOPs described in the County's QAPP (DPGM, 2025b). Data collection occurred primarily between March 31 and April 22, 2025, within the designated Spring Index Period (March 1 to April 30) required by the MBSS sampling protocols. Sites were visited again during the Summer Index Period (June 1 – September 30), to perform supplemental physical habitat assessments as requested by Maryland Department of the Environment (MDE). However, it should be noted that the summer habitat data are not presented in this report and are only collected for submittal to MDE as part of the County Watershed Assessment Monitoring requirement in the County's MS4 permit.

Monitoring sites were marked in the field using survey flagging at each of the transects (i.e., 0m, 25m, 50m and 75m) within the limits of the reach. The position of each site was collected at the midpoint using a GPS unit. All field data were entered digitally into a tablet directly in the field. Photographs were taken to document conditions at the time of data collection. A summary of the methods used are documented in this report and can be found in the MDE-approved Biological Monitoring Plan (DPGM, 2025a).

2.1 Selection of Sampling Sites

The County has divided its watersheds into 10 Primary Sampling Units (PSUs; Figure 1), which were used as the basis for random site selection. The randomized approach was then applied within each PSU. The County utilizes USGS's 1:24,000 National Hydrography Dataset (NHD) Plus High-Resolution stream reach file as the targeted stream layer for sample site selection.

MDE's Monitoring Guidance recommends a minimum sample size of 25 sites per year (MDE, 2021). The County looked at multiple ways to determine how sites could be apportioned between each of the County's 10 PSUs. One PSU, The Upper Potomac River Tidal, which is a very small watershed in the northwest portion of the County, consisted of streams that were determined to be unsampleable and, therefore, excluded from monitoring (Table 1). The County calculated three measures: the percentage of county area made up by each 8-digit watershed, the percentage of each 8-digit watershed within Charles County, and the percentage of stream kilometers within Charles County's portion of each 8-digit watershed. The resulting number of sites per PSU are presented in Table 1.

Table 1. Proportion of Charles County characterized by Maryland 8-digit watersheds and stream kilometers.

MD 8-Digit	Percentage of County Area	Percentage of MD-8-Digit in County	Percentage of Stream Kilometers in 8-Digit within County	Site per PSU Each Year
Gilbert Swamp	8.4%	89.7%	93.2%	2
Mattawoman Creek	15.2%	71.9%	75.4%	4
Nanjemoy Creek	15.8%	94.7%	86.5%	4
Patuxent River lower	6.1%	7.5%	5.1%	2
Port Tobacco River	9.5%	93.3%	88.0%	2
Potomac River L tidal	9.6%	11.4%	16.1%	2
Potomac River M tidal	6.5%	40.1%	45.4%	2
Potomac River U tidal	0.7%	5.5%	4.7%	0
Wicomico River	5.9%	28.6%	23.3%	1
Zekiah Swamp	22.1%	93.3%	94.2%	6

The Generalized Random Tessellation Stratified (GRTS) methodology recommended in the MS4 Monitoring Guidelines ("*spsurvey*" in RStudio; Kincaid et al., 2011) was used to randomly select sites and ensure unbiased and spatially-balanced sampling. Sites were randomly selected from each of the County's 10 PSU's such that 25 sites will be sampled each year for a total of 125 sites over the five-year time period. Site selection involved oversampling such that at least 125 potential sites were identified each year to ensure that the target number of 25 sites can be achieved given the likelihood for property access permission issues. Each potential sampling site was then assigned a unique site code (e.g., MATT-005-25), containing the PSU code (e.g., MATT), a three-digit sequential number (e.g., 005) and the year the sampling was completed (e.g., 2025).

Permission was requested to access sites on both public and private land. Landowners were notified by mail if a site fell within their property or if crossing their property was necessary to access a site. Letters describing the sampling efforts were sent to each landowner that included a QR code to a website to simplify landowner response. Permission for public properties was secured through the agency owning or managing the properties, such as the Maryland Park Service for sites located within or adjacent to State Parks. Sampling sites were only accessed if permission was granted by all landowners whose property was required to access and/or sample within the stream corridor.

2.2 Impervious Surface and Land Use Analysis

An analysis was conducted using ArcGIS Pro to derive the proportion of impervious surfaces as well as the land use make up for each of the site drainage areas to evaluate their effect on biological condition. Drainage areas were first delineated to each sampling site using the U.S. Geological Survey StreamStats web application. Both impervious and land use values were derived from the Chesapeake Bay Land Use and Land Cover (LULC) Database 2022 Edition of the Chesapeake Bay Program (CBP) for Charles and Prince George's Counties (Claggett et al., 2025). Land use and impervious surface data for Prince George's County were included in analyses due to one site's drainage area encompassing land owned by Prince George's County. Land use data were intersected with each of the 25 site's drainage areas and exported into an Excel worksheet. Land use classifications outlined within the Chesapeake Bay Land Use/Land Cover (LULC) Database 2024 Edition User Guide were strictly followed (McDonald et al., 2025); consequently, each of the 56 land

uses that occurred within the drainage areas were assigned to one of four macro land use/land cover classes defined by the CBP: Natural, Water, Agricultural, and Developed. The CBP defines the developed land cover class *sensu lato* to include both pervious and impervious forms of development (e.g., recreational fields, turf, roads, and residential areas are all land use classes that occur within the developed land cover class). To obtain proportions of strictly impervious surface coverage in each drainage area, detailed land use classes that were defined to be impervious were used to calculate impervious surface coverage; therefore, the following land use categories contributed both to the proportion of a drainage area that is developed and the proportion of the drainage area that is impervious: Roads, Structures, Other impervious, Tree canopy over roads, Tree canopy over structures, Tree canopy over other impervious, Extractive impervious, and Solar field panel arrays. The proportions of land use classes that drain to each site as well as the proportion of each site's drainage area that is composed of impervious surfaces can be found in Appendix A.

2.3 Water Quality Sampling

Water quality grab samples for laboratory analysis were collected at each site during the spring sampling visit following the sampling protocols in the QAPP, which closely mirror MBSS procedures (Harbold et al., 2024). Samples were collected in triple-rinsed bottles from a suitable location along the thalweg with sufficient depth to submerge the bottle without disturbing the bottom sediments. Bottles were labeled prior to sampling with sample ID, date, time, and parameters for analysis. Samples were preserved on ice after collection and all transported to the lab within 48 hours. In addition, two duplicate samples were collected for quality assurance purposes. All grab samples were analyzed by University of Maryland Center for Environmental Science (UMCES) Appalachian Laboratory. The laboratory methods are consistent with Analytical Laboratory Standard Operating Procedures for the Maryland Biological Stream Survey (Kline and Morgan, 2006). A complete list of analytical parameters and methods, including method detection limits, is presented in Table 2 below.

Table 2. Water Quality Analysis Parameters

Parameter	Method Detection Limit*	Method Number
Acid Neutralizing Capacity (ANC) µeq/L	N/A	USGS-OWQ: NFM 6.6.4.C
Bromide	0.011	APHA 4500
Chloride	0.031	APHA 4110 B
Dissolved Organic Carbon (DOC)	0.1123	APHA 5310 C
Nitrate-N	0.008	APHA 4500-NO_3-F
Nitrite-N	0.001	APHA 4500-NO_2-B
Orthophosphate	0.001	APHA 4500-PG
Sulfate	0.002	APHA 4110 B
Total Ammonia Nitrogen	0.0049	USGS I-2522-90
Total Kjeldahl Nitrogen (TKN; calculated)	N/A	N/A
Total Nitrogen (TN)	0.024	APHA 4500-P J
Total Organic Carbon (TOC)	0.1123	APHA 5310 C
Total Phosphorus (TP)	0.006	APHA 4500-P J

* All values in mg/L unless noted

To supplement the water quality grab sampling, *in situ* physicochemical water quality measurements (i.e., temperature, pH, specific conductance, dissolved oxygen, and turbidity) were taken at each site during the spring visits. All measurements were collected from the upstream end of the site prior to

any other sampling activities to ensure that measurements were not influenced by sampling activities within the stream and were measured with either a YSI ProDSS or a YSI Professional Plus series multiparameter meter. At some sites turbidity was measured with a Hach® 2100 Turbidimeter. Water quality meters were regularly inspected, maintained, and calibrated to ensure proper usage and accuracy of the readings.

The water quality analytical parameters were compared against published acute and chronic water quality criteria for aquatic life, and criteria for toxic substances in surface waters (Table 3) for each corresponding parameter. MBSS established water quality ranges for nutrients from the distribution of concentrations from the MBSS dataset and published in Southerland et al. (2005), listed in Table 4. When an analyte value was reported to be at or below the method detection limit (MDL), the MDL value was used for all summary statistic calculations (i.e., mean and standard deviation). MDE has established water quality criteria for several of the water chemistry parameters measured in this study for each designated Stream Use Classification. All sites sampled during 2025 were located on streams listed as Use Class I waters (Nontidal Warmwater) in *Code of Maryland Regulations (COMAR) 26.08.02.08 – Stream Segment Designations.* Water quality data were compared to the criteria for the appropriate designated use listed in the *Code of Maryland Regulations (COMAR) 26.08.02.03-.03 - Water Quality* (Table 5). Specific designated uses for Use I streams include water contact sports, fishing, the growth and propagation of fish, and agricultural and industrial water supply. Currently, there is no COMAR criterion for specific conductance. However, data provided in Morgan et al. (2007) allowed the determination of a critical impairment threshold for BIBI scores (i.e., the break between Fair and Poor biological ratings) at a specific conductance value of approximately 247 µS/cm. These values are used as informal criteria for this parameter.

Table 3. Water Quality Criteria

Parameter	Criteria	
	Acute	**Chronic**
ANC (µeq/L)	none	none
Bromide (mg/L)	none	none
Chloride (mg/L) *	860	230
DOC (mg/L)	none	none
Specific Conductance (µS/cm)	none	none
Sulfate (mg/L)	none	none
TDS (mg/L)	none	none
TKN (mg/L)	none	none
TOC (mg/L)	none	none
Turbidity (NTU)**	150	50

* EPA National Recommended Water Quality Criteria for Aquatic Life

** COMAR 26.08.02.03-2: Numerical Criteria for Toxic Substances in Surface Waters

Table 4. MBSS Water Quality Ranges for Nutrients (Southerland et al. 2005)

Parameter*	Low	Moderate	High
Nitrate (NO3)	< 1.0	1.0 – 5.0	> 5.0
Nitrite (NO2)	< 0.0025	0.0025 – 0.01	> 0.01
Ammonia (NH3)	< 0.03	0.03 – 0.07	> 0.07
TN	< 1.5	1.5 – 7.0	>7.0
TP	< 0.025	0.025 – 0.070	> 0.070
Orthophosphate	< 0.008	0.008 – 0.03	> 0.03

Table 5. COMAR Water Quality Requirements and Blackwater Characterization Ranges

Parameter	Use I[1] (COMAR)	Blackwater Stream Characterization
Temperature	Maximum of 32°C (90°F) or ambient temperature, whichever is greater	No Range
pH	6.5 to 8.5	Less than 6.0
Dissolved Oxygen	Minimum of 5 mg/L	Less than 5.0 mg/L
Turbidity	Maximum of 150 NTU and maximum monthly average of 50 NTU	No Range
Specific Conductance	No Criteria	No Criteria
Dissolved Organic Carbon	No Criteria	Greater than 8.0 mg/L

2.4 Biological Sampling

Biological monitoring was conducted following methods detailed in the County's QAPP (DPGM, 2025b). Biological assessment methods within Charles County are designed to be consistent and comparable with the methods used by DNR in their MBSS (Harbold et al., 2024). The County has adopted the MBSS methodology to be consistent with statewide monitoring programs and programs adopted by other Maryland counties. The methods have been developed locally and are calibrated to Maryland's ecophysiographic regions and stream types. Locations of the bioassessment sites sampled in 2025 are shown in.

2.4.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrate sampling was conducted during the Spring Index Period (March 1st to April 30th) along a 75-meter stream reach. The multi-habitat D-frame net approach was used to sample a range of the most productive habitat types within the reach. In this sampling approach, a total of twenty jabs were distributed among the best available habitats within the stream system and combined into one composite sample. Sampled habitats include submerged vegetation, overhanging bank vegetation, leaf packs, mats of organic matter, stream bed substrate, submerged materials (i.e., logs, stumps, snags, dead branches, and other debris) and rocks.

Duplicate benthic macroinvertebrate samples are taken at eight percent of the total sites sampled each year to estimate sampling precision. Therefore, one additional benthic macroinvertebrate sample was collected as a quality assurance/quality control (QA/QC) sample from two randomly selected sites across the County. Comparisons of the differences between the results from these sites

provide estimates of the precision of the biological assessments and the consistency of sampling activity. An evaluation of QA/QC measures for biological assessments can be found in Appendix E.

2.4.2 Sample Processing and Laboratory Identification

Benthic macroinvertebrate samples were processed and subsampled according to methods described in the QAPP and are directly comparable to MBSS *Laboratory Methods for Benthic Macroinvertebrate Processing and Taxonomy* (Boward and Friedman, 2022). Subsampling is conducted to standardize the sample size and reduce variation caused by samples of different sizes. In this method, the sample is spread evenly across a 100-cell, gridded tray; grids are randomly selected and picked in their entirety. Subsampling concludes only when both the most recently sorted grid is void of organisms and a count of 120 individuals has been reached. The 120-organism target is used to allow for specimens that are missing necessary parts or are not late enough instar for proper identification.

The samples were sent to an MBSS-certified lab (EcoAnalysts[1]) for processing and identification. Identification of the samples was conducted to the genus level for most organisms. Groups including Oligochaeta and Nematomorpha were identified to the family level while Nematoda was left at phylum. Individuals of early instars or those that were damaged were identified to the lowest possible taxonomic unit, which in most cases was family. Chironomidae was further subsampled depending on the number of individuals in the sample and the numbers in each subfamily or tribe. Most taxa were identified using a stereoscope; however, temporary slide mounts were used to identify Oligochaeta to family and Chironomidae to subfamily and tribe. Permanent slide mounts were then used for final genus level identification of Chironomid individuals. Results were logged on a bench sheet and entered into a spreadsheet for analysis.

[1] Address: 1420 S. Blaine St., Suite 14 Moscow, ID

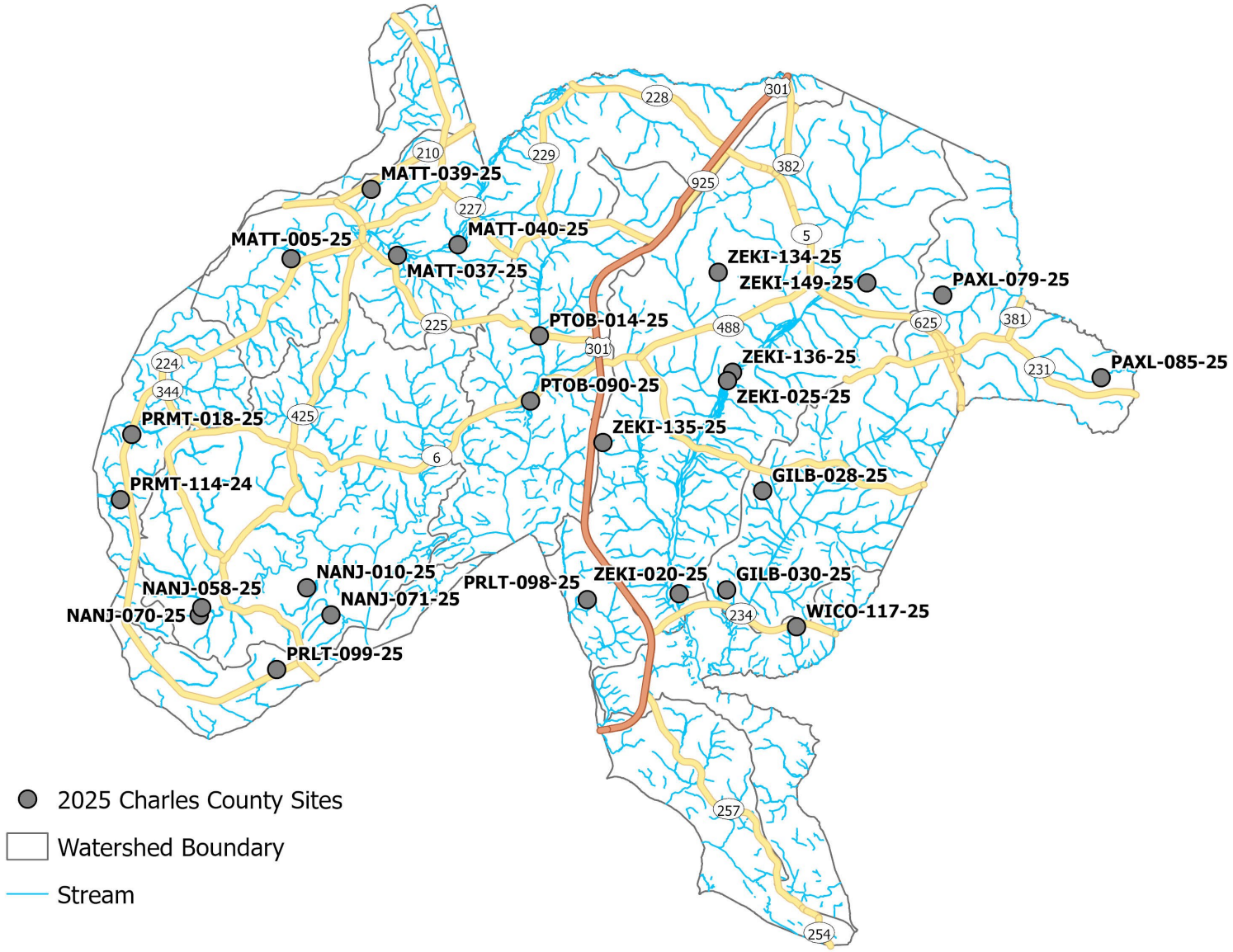

Figure 2. Charles County Bioassessment 2025 Sampling Locations

2.4.3 Biological Data Analysis

Data were analyzed using methods developed by MBSS as outlined in the *New Biological Indicators to Better Assess the Condition of Maryland Streams* (Southerland et al., 2005). The Benthic Index of Biotic Integrity (BIBI) approach involves statistical analysis using metrics that have a predictable response to water quality and/or habitat impairment. The metrics selected fall into five major groups including taxa richness, taxa composition, tolerance to perturbation, trophic (feeding) classification and taxa habit.

Raw values from each metric are assigned a score of 1, 3 or 5 based on ranges of values developed for each metric. The results are combined into a scaled BIBI score ranging from 1.0 to 5.0, and a corresponding narrative rating is applied. Three sets of metric calculations have been developed for Maryland streams based on broad physiographic regions. These include the coastal plain, piedmont and combined highlands ecophysiographic regions. All watersheds in Charles County occur in the coastal plain ecophysiographic region.

The following metrics and BIBI scoring were used for data analysis:

Coastal Plain BIBI Metrics:

Total Number of Taxa – Equals the richness of the benthic community in terms of the total number of unique taxa identified in a sample to genus or lower. Higher diversities of unique genera are typically correlated with better water quality, habitat diversity and/or suitability, and community health.

Number of EPT Taxa – Equals the richness of genera within the orders Ephemeroptera (mayflies), Plecoptera (stoneflies), or Trichoptera (caddisflies). EPT taxa are generally considered to be sensitive to pollution, thus higher levels of EPT taxa would be indicative of higher water quality.

Number of Ephemeroptera Taxa – Equals the total number taxa identified in the sample that belong to the order Ephemeroptera. Ephemeroptera are generally considered to be the most pollution sensitive, even among the EPT orders, thus communities dominated by Ephemeroptera usually indicate lower disturbances in water quality.

Percent Intolerant Urban – The percentage of taxa in the sample that are considered intolerant to the effects of urbanization. Equals the percentage of individuals in the sample with a tolerance value of 0-3. As impairment increases, the percentage of intolerant taxa decreases.

Percent Ephemeroptera – Equals the percent of Ephemeroptera individuals in the sample. Ephemeroptera are generally considered pollution sensitive, thus communities dominated by Ephemeroptera usually indicate lower disturbances in water quality.

Number Scraper Taxa – Equals the number of scraper taxa in the sample. Individuals in these taxa scrape food from the substrate. As the levels of stressors or pollution rise, there is an expected decrease in the numbers of scraper taxa.

Percent Climbers – Equals the percentage of the total number of individuals who are adapted to living on stem type surfaces. Higher percentages of climbers typically represent a decrease in stressors and overall better water quality.

Scoring criteria for the coastal plain BIBI is shown below in Table 6. The raw metric value ranges are given with the corresponding score of 1, 3 or 5. Table 7 provides the BIBI scoring ranges and corresponding biological condition ratings.

Table 6. Biological Index Scoring for Coastal Plain Sites

Metric	Score		
	5	3	1
Total Number of Taxa	≥22	14-21	<14
Number of EPT Taxa	≥5	2-4	<2
Number of Ephemeroptera Taxa	≥2	1-1	<1
Percent Intolerant Urban	≥28	10-27	<10
Percent Ephemeroptera	≥11.0	0.8-10.9	<0.8
Number of Scraper Taxa	≥2	1-1	<1
Percent Climbers	≥8.0	0.9-7.9	<0.9

Table 7. BIBI Scoring and Narrative Ratings

BIBI Score	Narrative Rating
4.0 – 5.0	Good
3.0 – 3.9	Fair
2.0 – 2.9	Poor
1.0 – 1.9	Very Poor

2.5 Physical Habitat Assessment

Physical habitat was visually assessed and characterized at each biological monitoring station using the MBSS Physical Habitat Index (PHI; Paul et al., 2003). Because MBSS protocols dictate that most habitat parameters are assessed in conjunction with fish surveys during the Summer Index Period, which the County does not conduct, habitat assessments were completed on separate visits during both the Spring Index Period and Summer Index Period. However, many sampling sites at the smaller 1:24,000 stream scale recommended by MDE are intermittent and may dry up during the summer, and no physical habitat data are collected from dry streams per MBSS protocols. Therefore, all data presented herein were collected during the Spring Index Period when the stream was wetted and sampleable for benthic macroinvertebrates to avoid missing crucial habitat data to complement the biological data.

The assessment techniques rely on subjective scoring of selected habitat parameters. To reduce individual sampler bias, the assessment was completed as a team with discussion and agreement of the scoring for each parameter. In addition to the visual assessments, photo-documentation of the assessment site was performed. Photographs were taken facing in the upstream and downstream direction from each of three locations within the sampling site (i.e., downstream end, mid-point, and upstream end) to document general site conditions. Additional photographs were occasionally taken to document important or unusual site features.

The PHI incorporates the results of a series of habitat parameters selected for coastal plain, piedmont, and highlands ecophysiographic regions. While all parameters were rated during the field assessment, the coastal plain parameters were used to develop the PHI score at the sites. In developing the PHI, MBSS identified six parameters that have the most discriminatory power for the Coastal Plain streams (Table 8). Each habitat parameter was given an assessment score ranging from 0-20, apart from shading (percentage), woody debris and rootwads (count) and riparian width (average riparian width of right and left banks). More details for each habitat parameter are available in the QAPP (PGM, 2025b) and the MBSS sampling manual (Harbold et al., 2024).

Table 8. Coastal Plain PHI Habitat Parameters

Parameters Assessed	Parameter Description
Remoteness	Distance from access or human activities
Shading	Percent of site throughout the day that is shaded from sunlight
Epifaunal Substrate	Relative quality of stream habitat for insects
Instream habitat	Relative quality of stream habitat for fish
Woody debris & rootwads	Count of instream woody debris and rootwads
Bank Stability	Relative impact of stream banks due to erosion

Source: Paul et al., 2003

Using the raw habitat values recorded in the field, a scaled PHI score (ranging from 0-100) for each parameter is calculated following the methods described in Paul et al. (2003). Several of the parameters (i.e., epifaunal substrate, instream habitat, and woody debris and rootwads) have been found to be drainage area dependent and are scaled according to the drainage area to each site. Calculated metric scores are then averaged to obtain the overall PHI index score, and a corresponding narrative rating of the physical habitat condition is applied (Table 9).

Table 9. MBSS PHI Scoring

Score	Narrative
81-100	Minimally Degraded
66-80.9	Partially Degraded
51-65.9	Degraded
0-50.9	Severely Degraded

Source: Paul et al. 2003

3 Results and Discussion

The findings of the aforementioned methodologies to fulfill the outlined objectives are detailed in the following section. Results are first presented by each data type collected across all sampling units and are followed by a more detailed discussion on comprehensive assessment results specific to each individual sampling site. Appendix A includes a summary of the land use and impervious cover results. Benthic macroinvertebrate data summaries for each site are included in Appendix B. Physical habitat data and PHI scores for each site are presented in Appendix C. Water quality sampling data is presented in Appendix D. Appendix E includes an in-depth discussion of the QA/QC results.

3.1 Biological Sampling

BIBI scores calculated for each site along with the narrative condition ratings can be found below in Table 10. The 2025 biological sampling efforts for benthic macroinvertebrates resulted in an overall average biological condition rating of 'Fair' ($\bar{x}$ = 3.38). Among the sites where benthic macroinvertebrates were sampled (n=25), 36% received a rating of 'Good' (n=9), 24% received a rating of 'Fair' (n=6), 24% received a rating of 'Poor' (n=6), and 16% of sites (n=4) received a 'Very Poor' rating (Figure 3). See Table 7 for information regarding the numerical scores that correlate to each narrative rating. Although distinct spatial clustering of similarly scoring sites is not evident, sites that received a narrative condition rating of "Very Poor" were generally concentrated in the western half of the County, west of U.S. Route 301 (Figure 4). Conversely, more sites that were rated to be in "Good" biologic condition occurred to the east of U.S. Route 301 (Figure 4).

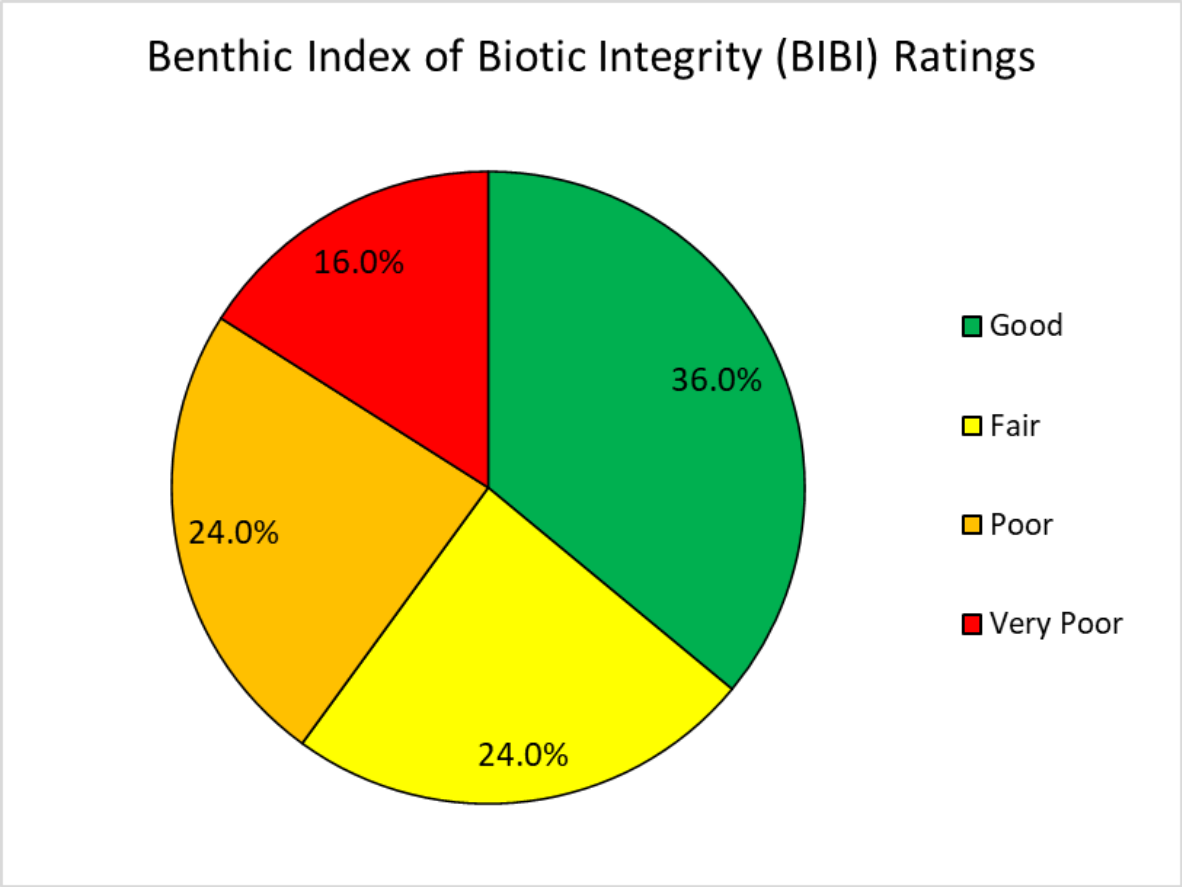

Figure 3. The percentage of sites in each BIBI category

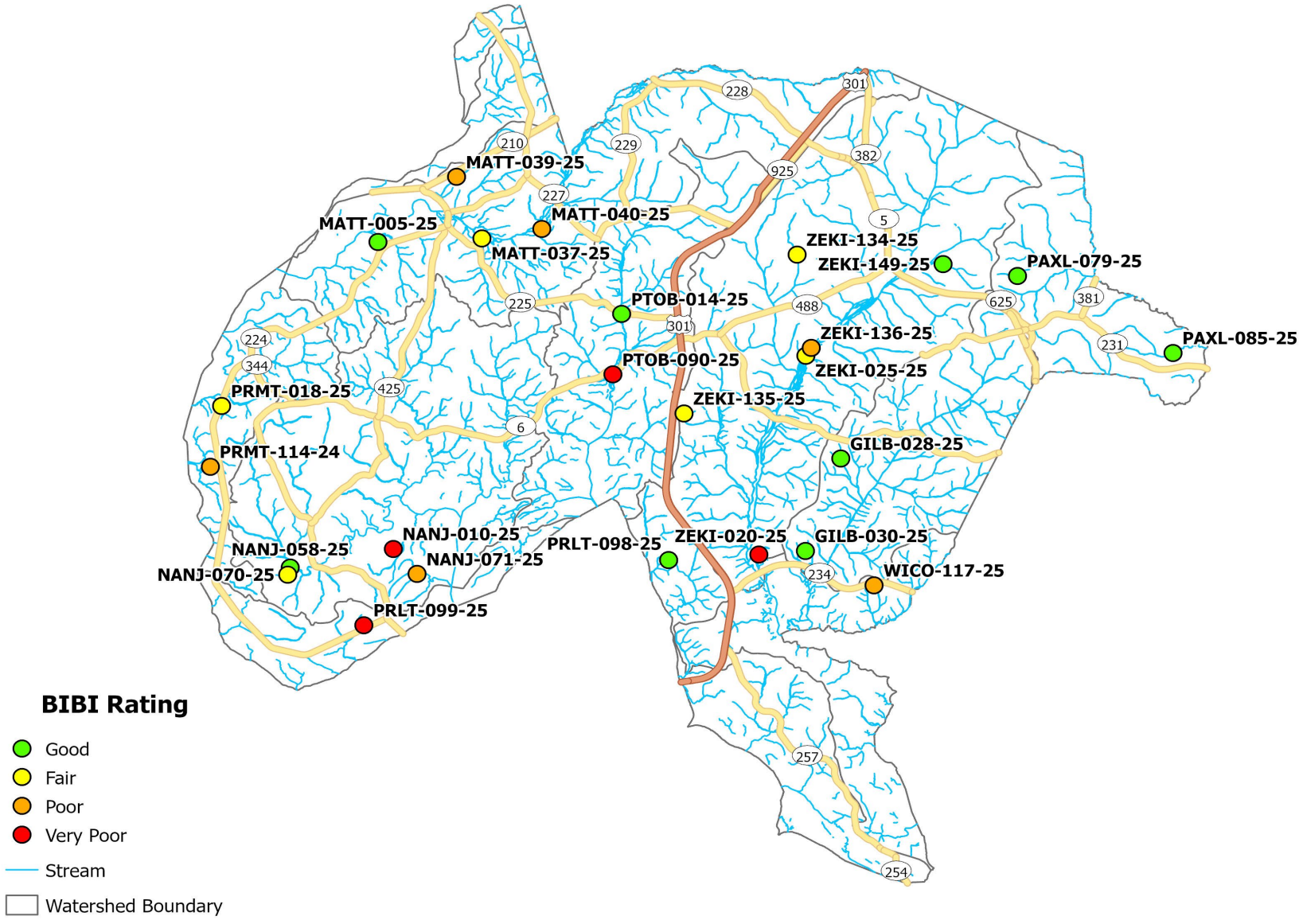

Figure 4. Biological Sampling Results

Overall, 10% (n = 2) of the sampled PSUs (Gilbert Swamp [GILB] and Patuxent River Lower watershed [PAXL]) received an average biological condition rating of 'Good'. A combined 10% (n = 2) of PSUs (Wicomico River [WICO] and Potomac River Middle tidal [PRMT]) had an average rating of "Poor" or "Very Poor," which is below the MBSS threshold for biological impairment. However, due to the small sample sizes for most PSUs (i.e., n=1 or n=2), the average BIBI conditions should be interpreted with caution until the full sampling round is completed.

Table 10. BIBI Summary Data

Site ID	BIBI Score	BIBI Rating	Site ID	BIBI Score	BIBI Rating
GILB-028-25	4.14	Good	PTOB-090-25	1.86	Very Poor
GILB-030-25	5.00	Good	PRLT-098-25	5.00	Good
MATT-005-25	4.43	Good	PRLT-099-25	1.29	Very Poor
MATT-037-25	3.29	Fair	PRMT-018-25	3.00	Fair
MATT-039-25	2.71	Poor	PRMT-114-25	2.71	Poor
MATT-040-25	2.71	Poor	WICO-117-25	2.71	Poor
NANJ-010-25	1.86	Very Poor	ZEKI-020-25	1.57	Very Poor
NANJ-058-25	5.00	Good	ZEKI-025-25	3.57	Fair
NANJ-070-25	3.57	Fair	ZEKI-134-25	3.86	Fair
NANJ-071-25	2.43	Poor	ZEKI-135-25	3.29	Fair
PAXL-079-25	5.00	Good	ZEKI-136-25	2.43	Poor
PAXL-085-25	4.14	Good	ZEKI-149-25	4.71	Good
PTOB-014-25	4.14	Good			

3.2 Habitat

Physical habitat was assessed at each sampling site to reflect the current physical complexity of the stream channel and estimate the stream's capacity to support healthy biota. Nearly one-third of sampling sites (n = 7) were deemed unsampleable for habitat during the summer visit primarily due to streams being dry (n = 6) or being unsafe to navigate (n = 1). For example, site PRMT-114-2025 became unsampleable during the summer visit due to a recently constructed beaver pond impoundment. Field crews were unable to reach the 0 m or 75m and the bottom could not be seen or safely navigated. Therefore, only habitat data collected concurrently with benthic macroinvertebrate sampling during the spring are presented and summarized herein.

Site specific PHI scores and narrative ratings from the Spring Index Period are presented below in Table 11. Physical habitat assessment data and metric scoring can be found in Appendix C. Among the 25 sites sampled during the Spring Index Period, 20% (n = 5) were rated as being 'Minimally Degraded' and 36% (n = 9) were determined to be 'Partially Degraded' (Figure 5). Thirty-two percent of sites (n = 8) were determined to be 'Degraded' and the remaining 12% of sites (n = 3) sampled received a rating of 'Severely Degraded' (Figure 5). PHI scores ranged from 49.1 ('Severely Degraded') to 91.0 ('Minimally Degraded') (Table 11). Eight of the 11 sites that scored poorly (i.e., receiving a PHI rating of Degraded or Severely Degraded) occurred to the west of U.S. Route 301, which bisects the County (Figure 6). Moreover, eight of the 14 sites that scored well (i.e., receiving a PHI rating of Partially or Minimally Degraded) occurred to the east of U.S. Route 301, following the general distributional patterns of biological conditions within the County (Figure 6). However, physical habitat was not always the limiting factor for biota in the case of the sites sampled in 2025. In fact, over 50% (n = 12) of all sites sampled during 2025 received a higher expected biological condition (BIBI) rating than predicted by the site's narrative PHI rating (Table 12). These results are likely due to a synergy of

factors such as land use legacy effects within the watershed, random variation in sampling and subsampling results, residual populations of intolerant species in deteriorating streams, or—vice versa—lack of recolonization efforts by intolerant taxa in improving drainage areas.

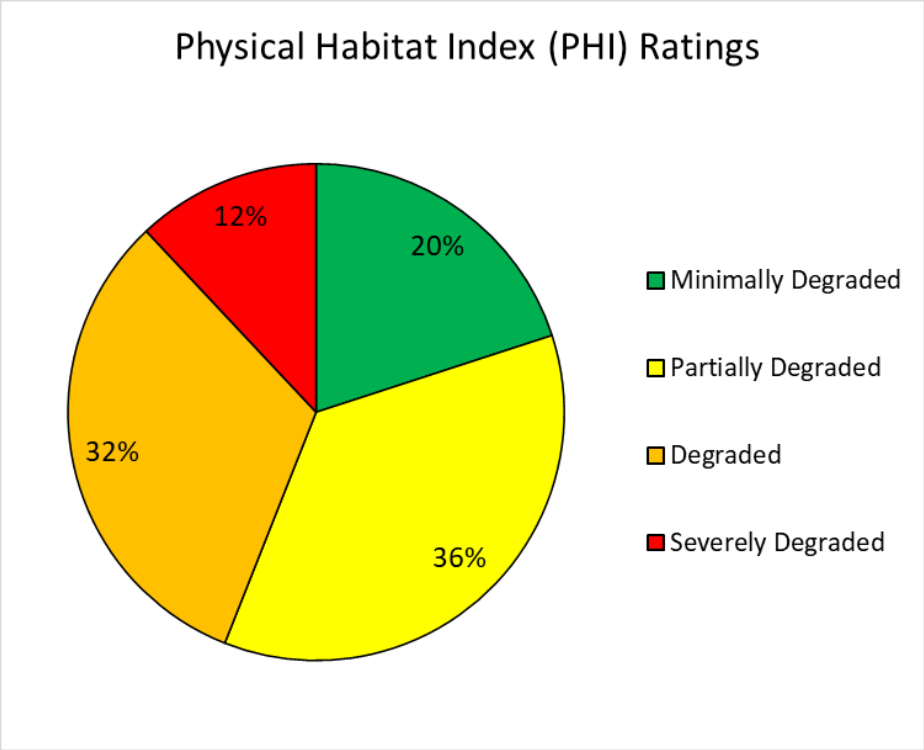

Figure 5. The percentage of sites in each PHI category

Table 11. PHI Summary Results from Spring Index Period

Site ID	PHI Score	PHI Rating	Site ID	PHI Score	PHI Rating
GILB-028-25	84.73	Minimally Degraded	PTOB-090-25	49.11	Severely Degraded
GILB-030-25	72.02	Partially Degraded	PRLT-098-25	72.26	Partially Degraded
MATT-005-25	70.56	Partially Degraded	PRLT-099-25	61.30	Degraded
MATT-037-25	61.79	Degraded	PRMT-018-25	50.86	Severely Degraded
MATT-039-25	63.63	Degraded	PRMT-114-25	54.27	Degraded
MATT-040-25	68.01	Partially Degraded	WICO-117-25	68.17	Partially Degraded
NANJ-010-25	84.18	Minimally Degraded	ZEKI-020-25	91.00	Minimally Degraded
NANJ-058-25	76.62	Partially Degraded	ZEKI-025-25	62.44	Degraded
NANJ-070-25	84.56	Minimally Degraded	ZEKI-134-25	64.56	Degraded
NANJ-071-25	64.11	Degraded	ZEKI-135-25	49.27	Severely Degraded
PAXL-079-25	77.20	Partially Degraded	ZEKI-136-25	80.15	Partially Degraded
PAXL-085-25	68.17	Partially Degraded	ZEKI-149-25	81.46	Minimally Degraded
PTOB-014-25	62.94	Degraded			

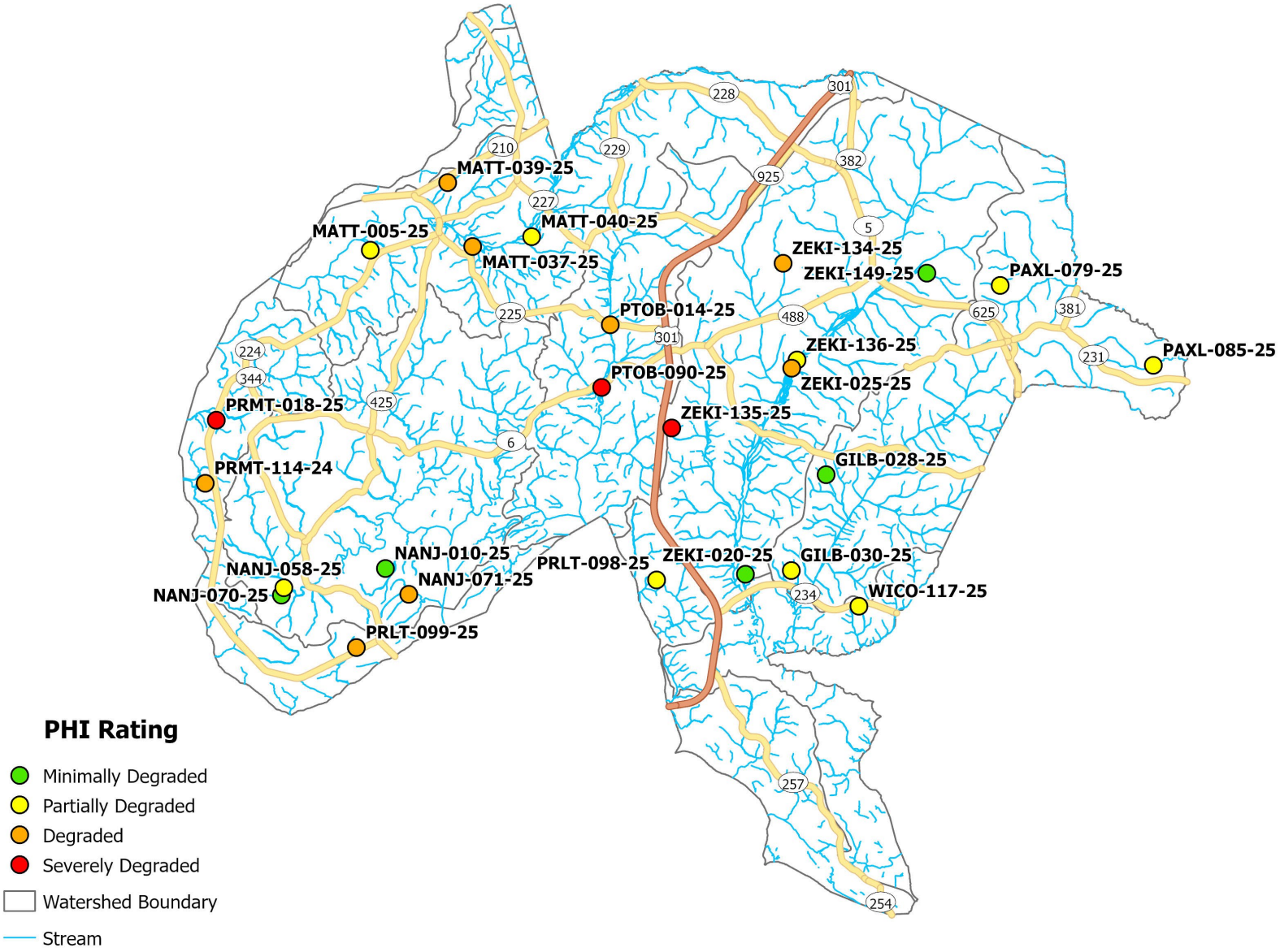

Figure 6. Physical Habitat Assessment Results

Table 12. Comparison of BIBI to spring-collected PHI habitat condition ratings.

MBSS PHI Rating	BIBI Rating			
	Good	**Fair**	**Poor**	**Very Poor**
Minimally Degraded	GILB-028-25 ZEKI-149-25	NANJ-070-25		**NANJ-010-25** **ZEKI-020-25**
Partially Degraded	GILB-030-25 MATT-005-25 NANJ-058-25 PAXL-079-25 PAXL-085-25 PRLT-098-25		MATT-040-25 WICO-117-25 ZEKI-136-25	
Degraded	**PTOB-014-25**	MATT-037-25 ZEKI-025-25 ZEKI-134-25	MATT-039-25 NANJ-071-25 PRMT-114-25	PRLT-099-25
Severely Degraded		**PRMT-018-25** **ZEKI-135-25**		PTOB-090-25

Blue cells: stations where the biological community was less impaired than the habitat scores would predict.
Gray cells: stations where biological community matched available habitat.

Orange cells: stations where the biological community was more impaired than the habitat scores would predict.

Bold type stations have biological conditions that differ by at least two qualitative habitat categories.

n=25

3.3 Water Quality

Water quality measurements provide additional data to characterize the health of streams throughout the County and to identify areas in need of restoration. Water quality measurements and sampling were conducted at all sites during the spring sampling season, concurrently with biological sampling and habitat assessments.

The results of the water quality grab samples are presented in Appendix D. No spring grab samples exceeded the COMAR standard for chloride (i.e., 230 mg/L). Only site PRLT-098-25-had an orthophosphate value that fell in the high category used by MBSS (i.e., > 0.03 mg/L) with a value of 0.131 mg/L. Across all sites, orthophosphate values ranged from 0.0019 to 0.1310 mg/L. Site PTOB-090-25 had a nitrite value of 0.0311 mg/L which fell into the high category used by MBSS (> 0.01 mg/L). Nitrite values ranged from 0.0016 to 0.0311 mg/L across all sites. Nitrate values ranged from 0.008 to 0.7737 mg/L, with one site falling at or below the analytical detection limit at 0.008 mg/L. None of the sites sampled had nitrate concentrations that fell within the high category used by MBSS (i.e., > 5.0 mg/L). Total ammonia nitrogen values ranged from 0.0064 to 0.1965 mg/L. Sites PTOB-090-25, ZEKI-134-25 and NANJ-071-25 had total ammonia nitrogen values of 0.1965, 0.0891 and,

0.0708 mg/L respectively, all of which fall into the high category used by MBSS (i.e., > 0.07 mg/L). Total nitrogen values fell in the low category used by MBSS (i.e., < 1.5 mg/L) at all sites sampled and ranged from 0.2889 to 1.4757 mg/L. Seven sites within the County had total phosphorus values that fell in the high category used by MBSS (i.e., > 0.070 mg/L), with all values ranging from 0.0226 to 0.2921 mg/L. No state or national water quality standards exist for acid neutralizing capacity (ANC), bromide, dissolved organic carbon (DOC), sulfate, total Kjeldahl nitrogen (TKN), or total organic carbon (TOC). Values ranged from -74.5648 to 724.5329 µeq/L for ANC; 0.0000 to 0.0072 mg/L for bromide; 2.8395 to 46.9452 mg/L for DOC; 1.7307 to 42.5655 mg/L for sulfate; 0.1955 to 1.4723 mg/L TKN; and 2.8894 to 47.4472 mg/L for TOC, across the entire County. Site specific water quality data can be found in Appendix D.

Results for *in situ* water quality measurements can be found in Table 13. All sites were within the allowable COMAR ranges for water temperature and turbidity. Values for pH fell within COMAR standards for values at eight (8) sites, while 11 of the 25 sites (44%) were below the minimum COMAR threshold of 6.5 (Figure 7). It should be noted that pH values from six (6) sites were considered extreme outliers and are not reported herein. These sites are suspected to be influenced by blackwater streams (due to >8mg/L DOC and observed dark tannic color; Maryland DNR, 2014), which are typically acidic, but the water quality meter recorded unusually high pH (i.e., basic) values, suggesting a malfunction (Figure 7). Dissolved oxygen fell below the COMAR limit of 5 mg/L at three (3) sites countywide. Specific conductivity was elevated at four (4) sites throughout the County, with values ranging from 33.1 to 923.0 µS/cm. While no COMAR standard for conductivity currently exists, a threshold for biological impairment in Maryland streams has been established at 247 µS/cm (Morgan et al., 2007). Thus, sites with mean values exceeding 247 µS/cm are not only indicative of increased anthropogenic disturbance, but also likely to experience impaired biological conditions.

It should be noted that many of the streams within Charles County are characterized as blackwater streams (DNR, 2016). This may explain some of the values that deviate from the established COMAR standards of pH. Blackwater streams are typically characterized by pH levels less than 6, dissolved organic carbon (DOC) greater than 8 mg/L and dissolved oxygen levels less than 5 mg/L (DNR, 2014) as shown in Table 5. However, it should be noted that some blackwater systems frequently display high variability in water characteristics (i.e., chemical and physical) due to receiving episodic surges of water from adjacent wetlands rich with organic acids (Flotemersch, 2023). Site values at PRMT-018-25 meet all three requirements for a blackwater stream with a pH value of 5.65, a DO value of 2.24 mg/L, and a DOC average value of 9.24 mg/ L (Figure 8, Appendix D). The average DOC value across the county was 9.79 mg/l with a range of 2.84 mg/L to 46.95 mg/L. Thirteen sites across the County exceeded the 8 mg/L threshold; however, elevated DOC can also originate from agricultural runoff and should not be taken as an indicator alone. County-wide, 15 sites met at least one of the three criteria for pH, DO, and DOC established by the MBSS to characterize blackwater streams (Table 5).

Table 13. Water Quality Measurement Results

Site ID	pH *SU*	Water Temperature *°C*	Dissolved Oxygen *mg/l*	Specific Conductivity µS/cm	Turbidity *NTU*
GILB-028-25	**6.28**	13.2	10.00	104.0	7.0
GILB-030-25	7.47	10.9	10.00	150.0	7.5
MATT-005-25	6.99	15.6	8.20	199.9	6.9
MATT-037-25	**6.33**	16.9	8.73	65.6	10.3
MATT-039-25	**6.46**	17.4	6.58	231.4	5.5
MATT-040-25	**5.58**	24.7	5.40	109.8	9.5
NANJ-010-25	N/A	19.6	**2.85**	62.8	11.3
NANJ-058-25	N/A	11.9	9.46	70.7	19.2
NANJ-070-25	N/A	11.4	7.91	33.1	23.0
NANJ-071-25	N/A	15.6	**3.14**	83.9	11.0
PAXL-079-25	**6.03**	14.0	10.00	90.0	6.3
PAXL-085-25	**6.29**	16.0	9.00	114.0	10.1
PRLT-098-25	**6.08**	14.9	8.00	596.0	27.5
PRLT-099-25	N/A	13.3	5.36	52.7	17.1
PRMT-018-25	**5.65**	10.9	**2.24**	135.2	5.8
PRMT-114-25	6.90	15.6	7.59	144.5	11.0
PTOB-014-25	7.41	20.9	10.03	183.3	5.4
PTOB-090-25	N/A	17.3	9.24	194.4	16.1
WICO-117-25	**6.48**	10.4	10.00	190.0	10.6
ZEKI-020-25	**6.11**	16.7	12.00	152.0	7.8
ZEKI-025-25	6.78	20.8	8.00	923.0	12.2
ZEKI-134-25	6.75	10.2	10.00	198.0	14.1
ZEKI-135-25	**6.13**	10.5	10.00	92.0	9.4
ZEKI-136-25	6.80	18.9	7.00	863.0	8.8
ZEKI-149-25	8.29	18.6	9.00	647.0	7.5

*Bold values indicate parameters outside of acceptable COMAR ranges.
Italicized sites had DOC >8.0 mg/L.

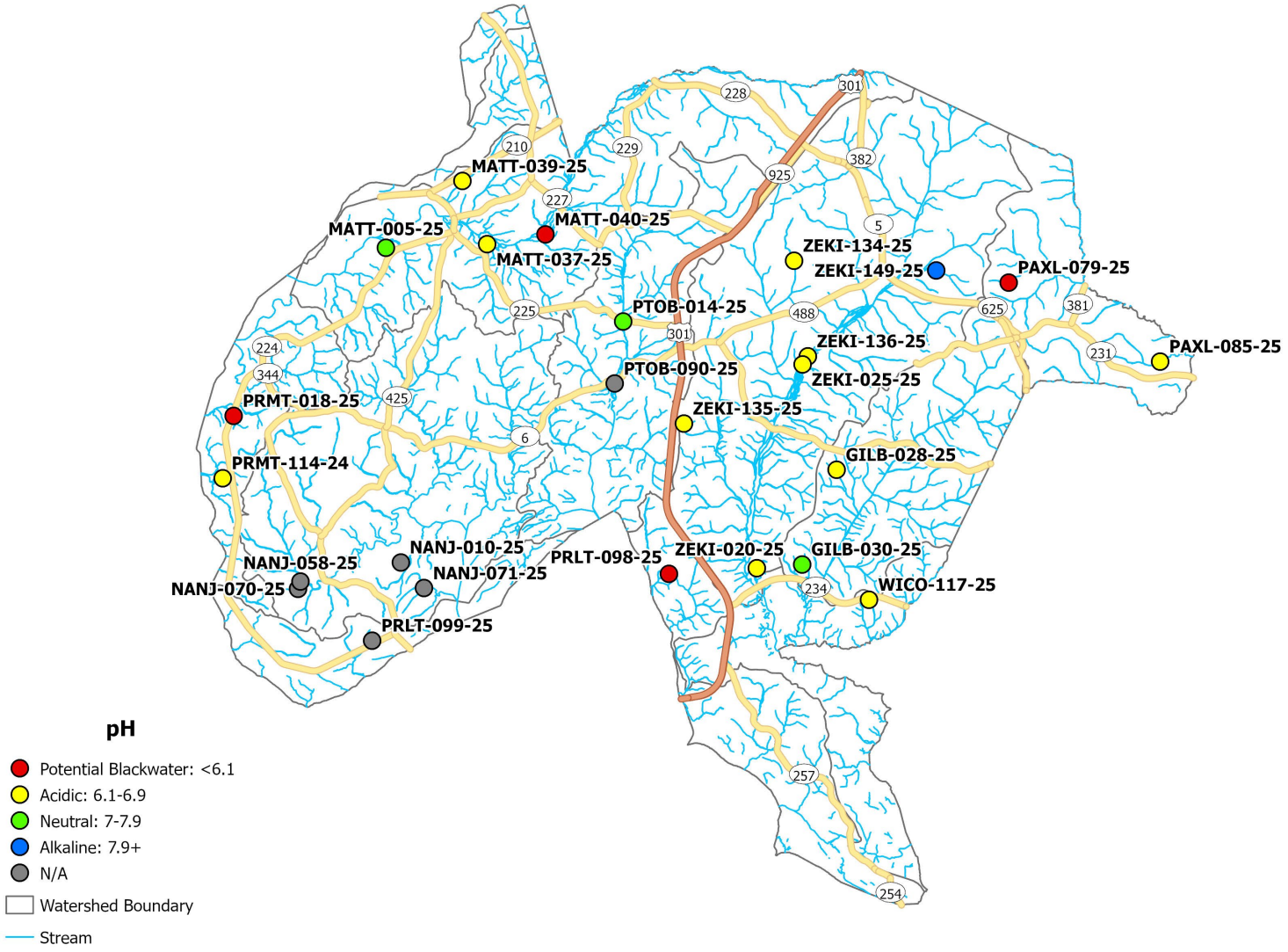

Figure 7. Water Quality results for pH measurements at each site

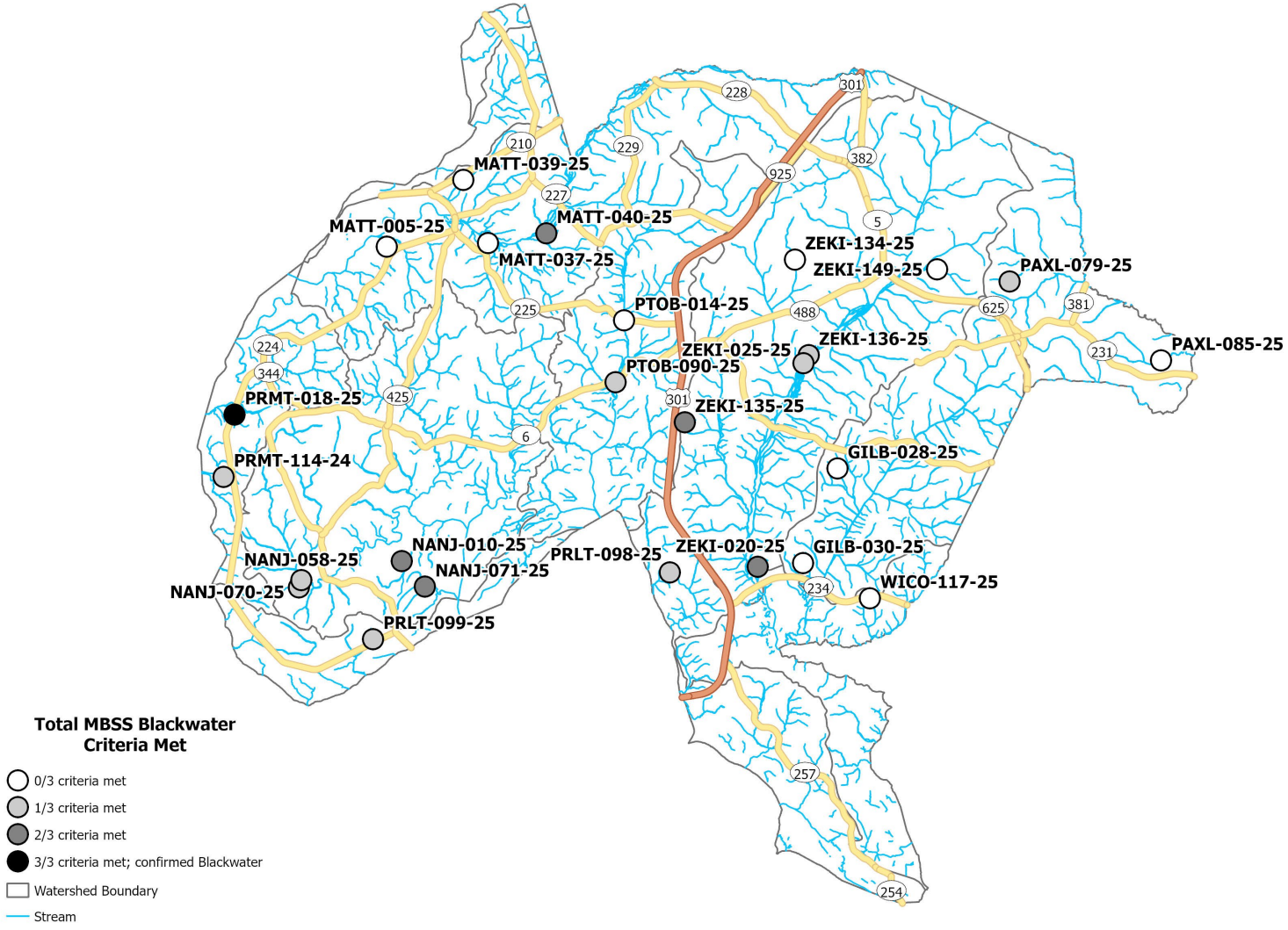

Figure 8. Total MBSS criteria met for Blackwater stream designation

3.4 Impervious Surface and Land Use Analysis

The average percentage of impervious cover across all sites sampled in 2025 was 6.5% with a range of 0 - 31.3% impervious cover across all sites (Table 14). Site ZEKI-025-25 had the largest drainage, totaling 38,720 acres and the smallest drainage area belonged to site PRLT-098-25 at 22 acres. The benthic community in a freshwater stream can be adversely affected by impervious cover and associated runoff at values as low as 10% (CWP, 2003). Only 20% of all sites sampled (n = 5) exceeded the aforementioned 10% impervious cover threshold that has shown to be the lower end at which adverse responses in the biological community become apparent.

Along with having the highest proportion of impervious cover, site ZEKI-134-25 also had the highest percentage of developed land use with 68.6% of its drainage area being characterized by developed land cover classes (Table 14).

Table 14. Summary of the proportional land use land cover categories that make up the drainage area of site's sampled in 2025.

Site ID	Drainage Area (ac.)	Percent Impervious	Percent Natural	Percent Developed	Percent Agricultural	Percent Water
GILB-028-25	115	8.5	56.0	39.2	5.2	0.0
GILB-030-25	53	4.1	43.8	16.0	40.2	0.0
MATT-005-25	378	11.7	53.9	45.1	0.9	0.1
MATT-037-25	2,278	2.9	87.8	9.6	2.5	0.1
MATT-039-25	1,210	19.1	60.7	39.2	0.0	0.1
MATT-040-25	851	3.5	83.8	12.7	3.4	0.1
NANJ-010-25	122	2.1	94.6	5.4	0.0	0.0
NANJ-058-25	9,728	2.2	89.6	7.1	3.2	0.1
NANJ-070-25	563	0.4	98.2	1.8	0.0	0.0
NANJ-071-25	186	0.0	100.0	0.0	0.0	0.0
PAXL-079-25	256	6.7	61.8	22.5	16.2	0.0
PAXL-085-25	1,421	5.5	79.8	19.1	0.8	0.1
PTOB-014-25	10,688	11.9	65.4	27.4	6.9	0.4
PTOB-090-25	15,232	12.4	64.1	29.0	6.6	0.3
PRLT-098-25	22	1.0	92.3	1.7	6.0	0.0
PRLT-099-25	96	0.2	99.7	0.3	0.0	0.0
PRMT-018-25	346	1.6	94.4	5.5	0.0	0.1
PRMT-114-25	115	6.6	74.6	25.4	0.0	0.0
WICO-117-25	37	3.6	15.2	9.4	75.4	0.0
ZEKI-020-25	262	3.2	59.5	9.5	30.3	0.2
ZEKI-025-25	38,720	7.8	67.9	20.6	10.3	0.8
ZEKI-134-25	806	31.3	28.4	68.6	0.0	2.7
ZEKI-135-25	198	4.5	70.2	17.2	11.7	0.4
ZEKI-136-25	38,400	7.8	67.8	20.6	10.3	0.8
ZEKI-149-25	998	4.5	72.6	15.6	11.0	0.3

Only one site, NANJ-071-25 had no developed land use and, conversely, comprised of the highest amount of "natural" land cover at a total of 100% (Figure 8). No sites lacked natural cover; indeed, 88% of all sites sampled (n = 22), had greater than 50% of their drainage areas composed of a natural land use category. Natural and developed land cover classes were the most dominant land cover categories with an average of 71.3% and 18.7% cover, respectively, across all drainage areas (Figure

9). Site WICO-117-25 was composed of the highest percentage of agricultural land use with 75.4% of its drainage area categorized as agricultural land cover categories, while eight sites had no agricultural land use present (Figure 9). Water was the least common land use category across all sites sampled, with an average composition of only 0.3%; indeed, site ZEKI-134-25 comprised the highest proportion of coverage by water land use categories at 2.7%. All other sites sampled had less than one percent coverage by the general water land cover category (Figure 9). Despite its low contribution to the overall landscapes that drain to the 25 sites sampled, water was retained as a general land cover category for analysis to remain consistent with the methods and intended uses outlined for the database (McDonald et. Al, 2025).

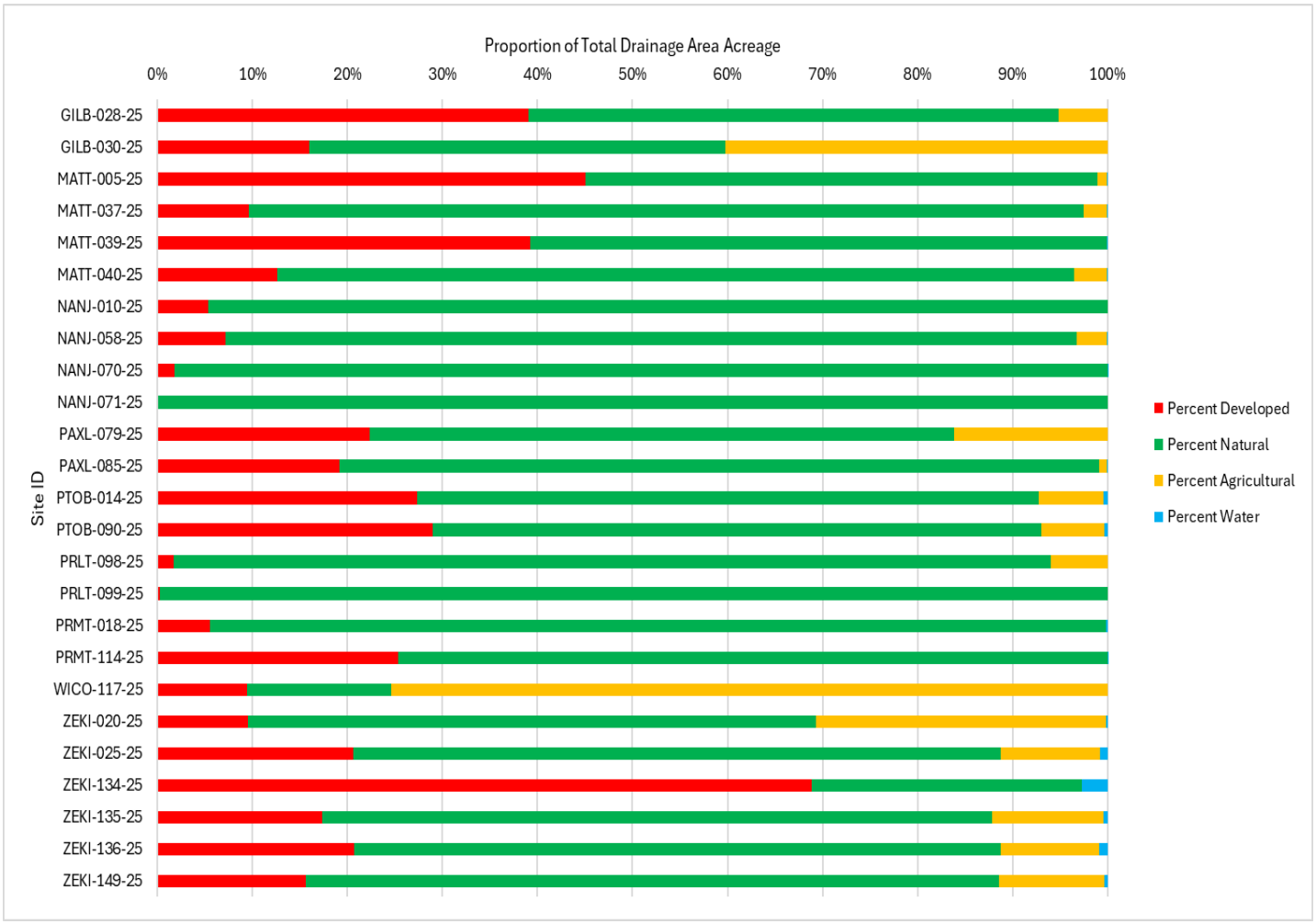

Figure 9. Land use/ land cover composition of each site's total drainage area

3.5 Individual Site Summaries

A total of 25 sites were sampled in the County in 2025. The summary results of the habitat assessment, biological assessment, water quality measurements and land use are organized by PSU and are presented in detail in this section. A map displaying the combined results of the habitat assessment and BIBI are presented in Figure 10. Combined summary data for each site is included in Table 15.

Gilbert Swamp Site Descriptions:

GILB-028-25

This sampling reach is located on Saint Stephen Run. Within the 115-acre drainage area, the predominant land uses are natural and developed (56% and 39.2%, respectively). Impervious land cover accounted for 8.5% of the drainage area, above the average of 6.5%. The PHI score was 84.73 with a rating of 'Minimally Degraded' with all metrics except 'remoteness' and 'shading' contributing individual scores that meet the criteria for 'Minimally Degraded'. A total of 28 taxa were identified in the benthic macroinvertebrate sample, five of which belonged to EPT orders. Thirty-five percent of the sample consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 4.14 and a 'Good' biological condition rating. *In situ* water quality results indicated all parameters were within acceptable COMAR standards except for pH (6.28), which failed to meet the minimum threshold of 6.5. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.44 mg/L.

GILB-030-25

This site is located on Peach Run after it crosses under Newport Church Road. At 53 acres, this site had 4.1% impervious land cover, below the average of 6.5%. The predominant land use is natural (43.8%) followed by agricultural (40.2%). The reach received a PHI score of 72.02, rating it as 'Partially Degraded'. A very low score for 'remoteness' and low percentage of shading prevented this site from receiving a PHI rating of 'Minimally Degraded'. Despite this, the station received an overall BIBI score of 5.00 and a 'Good' condition rating. Thirty-three total taxa were found in the benthic macroinvertebrate sample, with eleven EPT taxa and three Ephemeroptera taxa present. Among all identified benthic macroinvertebrates, 32.5% of individuals identified were considered intolerant to urban stressors. Water quality results indicated all parameters were within acceptable COMAR standards. Lab results for the water quality grab sample indicated that TP was high according to MBSS standards with a value of 0.091 mg/L. Additionally, TN values fell into the low category as defined by MBSS with a value of 0.87 mg/L.

Mattawoman Creek Site Descriptions:

MATT-005-25

This sampling reach is located on an unnamed tributary to Mattawoman Creek with a drainage area of 378 acres. Natural land uses account for 53.9% followed by developed (45.1%). Impervious land cover accounted for 11.7% of the drainage area, above the average of 6.5%. The site received a PHI score of 70.56, with a narrative rating of 'Partially Degraded' in part due to lack of bank stability and a low 'remoteness' score. This site received an overall BIBI score of 4.43 and a 'Good' classification. There were a total of 27 taxa present within the benthic macroinvertebrate sample. Four EPT taxa were present within the sample, one of which belonged to the order Ephemeroptera. Thirty-five percent of the sample was comprised of individuals intolerant to urban stressors. Water quality

results indicated all parameters were within acceptable COMAR standards. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 1.02 mg/L.

MATT-037-25

This site is located on an unnamed tributary to Mattawoman Creek near the Mattawoman Wastewater Treatment Plant. The surrounding 2278-acre drainage area is primarily composed of natural land uses that account for 87.8% of the drainage area. Impervious land cover for this drainage is 2.9%, below the average of 6.5%. The PHI score was 61.79, with a narrative rating of 'Degraded' because of low scoring for instream habitat, riffle quality, and epifaunal substrate. This site received an overall BIBI score of 3.29 and a 'Fair' biological condition rating. There were only ten taxa present in the benthic macroinvertebrate sample; however, six of the ten total taxa belonged to an EPT order and one of the six EPT taxa belonged to order Ephemeroptera. Water quality results indicated that pH was the only parameter that failed to meet acceptable COMAR standards with a pH value of 6.33. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.29 mg/L.

MATT-039-25

This sampling reach is located on an unnamed tributary of Mattawoman Creek. Within the 1210-acre drainage area, the predominant land uses are natural and developed (60.7% and 39.2%, respectively). Impervious land cover accounted for 19.1% of the drainage area, well above the average of 6.5%. The PHI score was 63.63 with a rating of 'Degraded' due to all metrics scoring marginally and particularly low scores for epifaunal substrate. Despite 86% of the individuals in the benthic sample collected at this site being intolerant to urban stressors and four taxa belonging to an EPT order, none of those taxa belonged to the order Ephemeroptera and only 16 total taxa were present in the sample. Consequently, this site received an overall BIBI score of 2.71 and a 'Poor' biological condition rating. Water quality results indicated that pH was the only parameter that failed to meet acceptable COMAR standards with a pH value of 6.46. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.40 mg/L.

MATT-040-25

This site is located on an unnamed tributary of Mattawoman Creek. Within the 851-acre drainage area, the predominant land uses are natural, accounting for 83.8% of the drainage area. Impervious land cover accounted for 7.7% of the drainage area, slightly above the average of 6.5%. The PHI score was 68.01 with a rating of 'Partially Degraded' due to low scoring epifaunal substrate, instream habitat and a lack of shade. A total of 12 taxa were identified in the benthic macroinvertebrate sample, three of which belonged to EPT orders; however, 87.6% percent of the sample consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 2.71, which constitutes a 'Poor' biological condition rating. Water quality results indicated that pH was the only parameter that failed to meet the COMAR standard with a pH value of 5.58; however, dissolved organic carbon (DOC) exceeded the 8.0 mg/L threshold that indicates possible status as a blackwater stream. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.56 mg/L.

Nanjemoy Creek Site Descriptions:

NANJ-010-25

This sampling reach is located on an unnamed tributary of Nanjemoy Creek. Within the 122-acre drainage area, the primary land uses are natural (94.6%). Impervious land cover accounted for 2.1% of the drainage area, below the average of 6.5%. The PHI score was 84.18 with a biological condition rating of 'Minimally Degraded' with all metrics achieving scores that meet the criteria for 'Minimally Degraded' except for lower scoring instream habitat and epibenthic substrate. Only nine taxa were identified in the benthic macroinvertebrate sample, one of which belonged to an EPT order. Less than half (47.8%) of the sample consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 1.86 and a 'Very Poor' biological condition rating. Water quality results indicated that DO was below the acceptable COMAR standards of 5 mg/L. Additionally, DOC was elevated above the 8 mg/L threshold and tannic coloration was observed, suggesting this is likely a blackwater stream. However, the pH measurement was omitted from the data set due to erroneous values from probable equipment malfunction, which could help confirm blackwater status. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 1.45 mg/L.

NANJ-058-25

This sampling reach is located downstream of the confluence of Hancock Run and Beaverdam Creek in an unnamed, forested tributary to Nanjemoy Creek. Within the 9728-acre drainage area, the dominant land use is natural (89.6%). Impervious land cover accounted for 2.2% of the drainage area, below the average of 6.5%. The PHI score was 76.62 with a rating of 'Partially Degraded' with all metrics scoring marginally to high with the exception of low-scoring instream habitat. Twenty-seven total taxa were identified in the benthic macroinvertebrate sample. Nine of the 27 taxa belonged to EPT orders and three of those nine EPT taxa belonged to order Ephemeroptera, which generally considered sensitive to stressors and pollutants. Of all taxa, 51.6% were intolerant to urban stressors. This site received an overall BIBI score of 5.00 and a 'Good' biological condition rating. Water quality results indicated all parameters were within acceptable COMAR standards, although the measurement for pH was removed from this site due to erroneous values from probable equipment malfunction. Additionally, visual observations of tannic coloration and DOC exceeding 8 mg/L indicate the potential status as a blackwater stream. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.91 mg/L.

NANJ-070-25

This sampling reach is located on an unnamed tributary to Nanjemoy Creek. The 563-acre drainage area is dominated by natural land cover (98.2%). Impervious land cover accounted for 0.4% of the drainage area, well below the average of 6.5%. The PHI score was 84.56 with a rating of 'Minimally Degraded' in part due to marginally scoring woody debris and shading and bank stability. A total of 16 taxa were identified in the benthic macroinvertebrate sample, five of which belonged to EPT orders and two of which were in the order Ephemeroptera; however, only 6.7% of the organisms identified consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 3.57 which corresponds to a 'Fair' biological condition rating. Water quality results indicated all parameters were within acceptable COMAR standards, although the measurement for pH was removed from this site due to erroneous values from probable equipment malfunction. Additionally, visual observations of tannic coloration and DOC above 8 mg/L indicate the potential status as a

blackwater stream. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.39 mg/L.

NANJ-071-25

This sampling reach is located on an unnamed tributary of Nanjemoy Creek. The 186-acre drainage is completely dominated by natural land cover (100%). Impervious land cover accounted for 0% of the drainage area, the lowest among any of the drainage areas sampled. The PHI score was 64.11 with a rating of 'Degraded' due to particularly low-quality instream habitat, benthic substrate and low scores for shading. A total of 18 taxa were identified in the benthic macroinvertebrate sample, two of which belonged to EPT orders, and one belonged to Ephemeroptera. Among all taxa identified within the sample, 23.7% consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 2.43, which constitutes a 'Poor' biological condition rating. Water quality results indicated that only dissolved oxygen fell below COMAR standards with a value of 3.14 mg/L, although the measurement for pH was removed from this site due to erroneous values from probable equipment malfunction. DOC was elevated above 8 mg/L, which may indicate the potential status as a blackwater stream. Additionally, this site had a total ammonia nitrogen value of 0.0708 mg/L, which fell into the high category used by MBSS. Lab results for the water quality grab sample indicated that the total ammonia nitrogen value was high according to MBSS standards with a value of 0.071 mg/L. Additionally, TN values fell into the low category as defined by MBSS with a value of 0.54 mg/L.

Patuxent River Lower Site Descriptions:

PAXL-079-25

This sampling reach is located on Swanson Creek near Woodridge Ct. Within the 256-acre drainage area, the predominant land use is natural (61.8%) followed by developed (22.5%). Impervious land cover accounted for 6.7% of the drainage area, in line with the average of 6.5%. This site received a PHI score of 77.2 and a rating of 'Partially Degraded' due to an exceptionally low value for remoteness. Twenty-nine total taxa were identified in the benthic macroinvertebrate sample, 11 of which belonged to EPT orders, and four taxa belonged to the order Ephemeroptera. Of the 29 taxa identified, 63.9% of the sample consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 5.00 and a 'Good' biological condition rating. Water quality results indicated that pH failed to meet acceptable COMAR standards with a pH value of 6.03. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.77 mg/L.

PAXL-085-25

This sampling reach is in a residential area on an unnamed tributary of the Patuxent River near Maxwell Rd. Within the 1421-acre drainage area, the predominant land use is natural (79.8%) followed by developed (19.1%). Impervious land cover accounted for 5.5% of the drainage area, below the average of 6.5%. The PHI score was 68.17 with a rating of 'Partially Degraded' with poor scores for remoteness and shading contributing to a lower overall PHI score. Forty-two total taxa were identified in the benthic macroinvertebrate sample, six of which belonged to EPT orders and two that belonged specifically to the order Ephemeroptera; however, only 8.5% of the sample consisted of taxa that are intolerant to urban stressors. Despite this, the site received an overall BIBI score of 4.14 and a 'Good' biological condition rating. Water quality results indicated that pH failed to meet acceptable COMAR standards with a pH value of 6.29. Lab results for the water quality grab

sample indicated that TP was high according to MBSS standards with a value of 0.072 mg/L. Additionally, TN values fell into the low category as defined by MBSS with a value of 0.38 mg/L.

Port Tobacco River Site Descriptions:

PTOB-014-25

This sampling reach is located on Port Tobacco Creek after it flows underneath State Route 225. Within the 10688-acre drainage area, the predominant land use is natural (65.4%) followed by developed (27.4%). Impervious land cover accounted for 11.9% of the drainage area, above the average of 6.5%. The PHI score was 62.94 with a rating of 'Degraded' with all metrics measured contributing marginal to poor scores. A total of 14 taxa were identified in the benthic macroinvertebrate sample. Five of the 14 taxa belonged to EPT orders, two of which belonged to the order Ephemeroptera. Of all taxa within the sample, 70.4% consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 4.14 and a 'Good' biological condition rating. Water quality results indicated all parameters were within acceptable COMAR standards. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.49 mg/L.

PTOB-090-25

This sampling reach is located on Port Tobacco Creek near the Port Tobacco Court House. Within the 15,232-acre drainage area, the predominant land use is natural (64.1%) followed by developed (29.0%). Impervious land cover accounted for 12.4% of the drainage area, above the average of 6.5%. The PHI score was 49.11 with a rating of 'Severely Degraded' with all metrics scoring poor to exceptionally poor. A total of 14 taxa were identified in the benthic macroinvertebrate sample, none of which belonged to EPT orders. Additionally, only 2.3% of the sample consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 1.86 and a 'Very Poor' biological condition rating. Water quality results indicated all parameters were within acceptable COMAR standards, although the measurement for pH was removed from this site due to erroneous values from probable equipment malfunction. DOC values were elevated which may indicate the potential status as a blackwater stream. Additionally, this site had nitrite and total ammonia nitrogen value of 0.0311 mg/L and 0.1965 mg/L, respectively, both of which fell into the high categories used by MBSS. Lab results for the water quality grab sample indicated that several water quality parameters were high according to MBSS standards. Total phosphorus was high according to MBSS standards with a value of 0.163 mg/L, in addition to total ammonia nitrogen (0.197 mg/L) and nitrite (0.031 mg/L). On the other hand, TN values fell into the low category as defined by MBSSwith a value of 0.94 mg/L.

A duplicate QC sample was collected within the same reach. The QC sample received the same BIBI score of 1.86, resulting in an identical 'Very Poor' biological condition rating. The duplicate water grab sample also showed high levels of TP, total ammonia nitrogen, and nitrite according to MBSS standards with values of 0.144 mg/L, 0.195 mg/L. and 0.030 mg/L, respectively.

Potomac River Lower Tidal Site Descriptions:

PRLT-098-25

This sampling reach is located on an unnamed tributary to the Potomac River. Within the 22-acre drainage area, the dominant land use is natural (92.3%). Impervious land cover accounted for 1.0% of the drainage area, well above the average of 6.5%. The PHI score was 72.26 with a rating of 'Partially Degraded' due to poor benthic substrate, bank stability and a low remoteness score. A total of 35

taxa were identified in the benthic macroinvertebrate sample, ten of which belonged to EPT orders and four were taxa in the order Ephemeroptera. Almost half, 45.9%, of the sample consisted of taxa that are intolerant to urban stressors. As a result, this site received an overall BIBI score of 5.00 and a 'Good' biological condition rating. Water quality results indicated that pH did not meet COMAR standards with a value of 6.08, although DOC values were elevated. Specific conductivity was also elevated at 596.0 µS/cm. Lab results for the water quality grab sample indicated that TP was high according to MBSS standards with a value of 0.292 mg/L. Orthophosphate also fell in the high category used by MBSS with a value of 0.131 mg/L. In contrast, TN values fell into the low category as defined by MBSS with a value of 0.52 mg/L.

PRLT-099-25

This sampling reach is located on a tributary to Halfway Creek before flowing into the Potomac River. The 96-acre drainage area is dominated by natural land cover (99.7%). Impervious land cover accounted for only 0.2% of the drainage area, well below the average of 6.5%. The PHI score was 61.30 with a rating of 'Degraded' due to particularly low scores for instream habitat, epifaunal substrate, shading, and remoteness. A total of 11 taxa were identified in the benthic macroinvertebrate sample; among the 11 taxa identified, only one belonged to an EPT order. Only 25.2% of the sample consisted of taxa that are intolerant to urban stressors. As a result, this site received an overall BIBI score of 1.29 and a 'Very Poor' biological condition rating. Water quality results indicated all parameters were within acceptable COMAR standards, although the measurement for pH was removed from this site due to erroneous values from probable equipment malfunction. DOC was elevated above the 8 mg/L potentially indicating blackwater stream status. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.75 mg/L.

Potomac River Middle Tidal Site Descriptions:

PRMT-018-25

This sampling reach is located on an unnamed tributary to the Potomac River. Within the 346-acre drainage area, the dominant land use is natural (94.4%). Impervious land cover accounted for 1.6% of the drainage area, below the average of 6.5%. The PHI score was 50.86 with a rating of 'Severely Degraded' with all metrics rating poor or marginal except woody debris and bank stability. A total of 22 taxa were identified in the benthic macroinvertebrate sample, four of which belonged to EPT orders. Among the individuals identified in the sample, 41.4% consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 3.00 and a 'Fair' biological condition rating. Water quality results indicated that both dissolved oxygen and pH did not meet acceptable COMAR standards, with values of 2.24 mg/L and 5.65. respectively. Additionally, DOC exceeded 8 mg/L indicating the potential status as a blackwater stream. Lab results for the water quality grab sample indicated that TP was high according to MBSS standards with a value of 0.094 mg/L. On the other hand, TN values fell into the low category as defined by MBSS with a value of 0.68 mg/L.

PRMT-114-25

This sampling reach is located on an unnamed tributary to the Potomac River. Within the 115-acre drainage area, the predominant land use is natural (74.6%) followed by developed (25.4%). Impervious land cover accounted for 6.6% of the drainage area, in line with the average of 6.5%. The PHI score was 54.27 with a rating of 'Degraded' due to low scores for remoteness, shading, epifaunal substrate, and instream habitat. A total of 22 taxa were identified in the benthic macroinvertebrate sample, one of which was in the order Ephemeroptera, one of the particularly sensitive EPT orders.

Within the sample, only 6.5% belonged to taxa that are intolerant to urban stressors. This site received an overall BIBI score of 2.71 and a 'Poor' biological condition rating. Water quality results indicated all parameters were within acceptable COMAR standards. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.50 mg/L.

Wicomico River Site Descriptions:

WICO-117-25

This sampling reach is located on the headwaters of Jenkins Run, a tributary to the Wicomico River. Within the 37-acre drainage area, the predominant land use is agricultural (75.4%) followed by natural (15.2%). Impervious land cover accounted for 3.6% of the drainage area, below the average of 6.5%. The PHI score was 68.17 with a rating of 'Partially Degraded' due to particularly low scores for remoteness and shading. A total of 27 taxa were identified in the benthic macroinvertebrate sample, three of which belonged to EPT orders. Of all the individuals identified, 26.3% of the sample consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 2.43 and a 'Poor' biological condition rating. Water quality results indicated that pH was the only parameter that did not meet acceptable COMAR standards with a pH value of 6.48. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 1.05 mg/L.

Zekiah Swamp Site Descriptions:

ZEKI-020-25

This sampling reach is located on Old Mill Branch within the Zekiah Swamp Natural Environmental Area. Within the 262-acre drainage area, the predominant land use is natural and agricultural (59.5% and 30.3%, respectively). Impervious land cover accounted for 3.2% of the drainage area, below the average of 6.5%. The PHI score was 91.0 with a rating of 'Minimally Degraded' with only the metric shading contributing a score that correlates to a narrative rating less than 'Minimally Degraded'. Despite the high habitat score, only six taxa were identified in the benthic macroinvertebrate sample, none of which belonged to EPT orders; however, almost all individuals identified in the sample, 96.3%, consisted of taxa that are intolerant to urban stressors. This site received an overall BIBI score of 1.57 and a 'Very Poor' biological condition rating. Water quality results indicated that pH did not meet COMAR standards with a value of 6.11. Additionally, visual observations of slightly tannic coloration were observed, and DOC was elevated above 8 mg/L, which may indicate the potential status as a blackwater stream. Lab results for the water quality grab sample indicated that TP was high according to MBSS standards with a value of 0.110 mg/L. Additionally, TN values fell into the low category as defined by MBSS with a value of 1.28 mg/L.

ZEKI-025-25

This sampling reach is located on an unnamed tributary to Zekiah Swamp Run. Of the 38,720-acre drainage area, 7.8% was comprised of impervious land cover, above the 6.5% average. The predominant land use is natural (67.9%) followed by developed (20.6%). This site received a PHI score of 62.44 resulting in a rating of 'Degraded.' The PHI score was due to poor scores in remoteness and shading, and sub-optimal scores in woody debris and instream habitat. There was a total of 17 taxa present in this benthic macroinvertebrate sample, four of which were EPT taxa. Three Ephemeroptera taxa were identified within the sample. Only 8.9% of the sample consisted of taxa that are intolerant to urban stressors, resulting in a BIBI score of 3.57 and corresponding rating of 'Fair.' Water quality results indicated all parameters were within acceptable COMAR standards,

although specific conductivity was elevated at 923.0 µS/cm, the highest among all sites. Visual observations of tannic coloration and DOC above 8 mg/L may indicate potential status as a blackwater stream. Lab results for the water quality grab sample indicated that TP was high according to MBSS standards with a value of 0.077 mg/L. TN values fell into the low category as defined by MBSS with a value of 0.54 mg/L.

ZEKI-134-25

This sampling reach is located on an unnamed tributary to Zekiah Swamp Run. Land use in the 806-acre drainage area is primarily developed (68.6%) followed by natural land uses (28.4%). The overall imperviousness in this drainage area is 31.3%, the largest proportion among all drainage areas sampled. For PHI, this site received a score of 64.56 and a corresponding rating of 'Degraded,' due to sub-optimal scores in remoteness, bank stability, and marginal scores in woody debris and epibenthic substrate. Of the 27 taxa present in the sample, nine were EPT taxa, three of which were Ephemeroptera taxa. A total of 2.73% of individuals in the sample belonged to taxa that are considered intolerant to urban stressors. The site received a BIBI score of 3.86 and corresponding rating of 'Fair'. Water quality results indicated that all parameters were within acceptable COMAR standards, although slightly tannic coloration was observed. Lab results for the water quality grab sample indicated that the total ammonia nitrogen value was high according to MBSS with a value of 0.089 mg/L. Additionally, TN values fell into the low category as defined by MBSS a value of 0.84 mg/L.

A duplicate QC sample was collected within the same reach. The QC sample received a higher BIBI score of 4.14 and a 'Good' biological condition rating due to a higher percentage of the QC sample being characterized by Ephemeroptera taxa. The duplicate water grab sample also showed high levels per MBSS standards of total ammonia nitrogen with a value of 0.090 mg/L.

ZEKI-135-25

This sampling reach is located on Spring Hill Branch adjacent to an agricultural field. At 198 acres, the primary land use is natural (70.2%) followed by developed (17.2%) and agricultural (11.7%). Impervious surfaces covered 4.5% of the drainage area, below the average 6.5%. This site received a PHI score of 49.27 and rating of 'Severely Degraded.' The PHI score was due to marginal ratings in woody debris and sub-optimal scores in the other five metrics that calculate the PHI. This site received a 'Fair' biological condition rating with a corresponding BIBI score of 3.29. Of the 17 taxa present in the benthic macroinvertebrate sample, three were EPT taxa and one was an Ephemeroptera taxon. Over half of the individuals present in the sample, 70.9%, were intolerant to urban stressors. Water quality results indicated that pH fell below the acceptable COMAR standard with a value of 6.13, while DOC exceeded 8 mg/L and slightly tannic coloration was observed, which may indicate potential status as a blackwater stream. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist. TN values fell into the low category as defined by MBSS with a value of 0.32 mg/L.

ZEKI-136-25

This sampling reach is located on the mainstem of Zekiah Swamp Run. At 38,400 acres, the primary land use is natural (67.8%) followed by developed (20.6%) and agricultural (10.3%). Impervious surfaces covered 7.8% of the drainage area, above the 6.5% average. This site received a PHI score of 80.15 and rating of 'Partially Degraded,' lowered only by poor scores in shading and instream habitat. This site received a BIBI score of 2.43 and a corresponding narrative rating of 'Poor.' Of the ten taxa present in the benthic macroinvertebrate sample, there was one representative of the EPT orders,

which belonged to the order Ephemeroptera. Only 2.3% of individuals were intolerant to urban stressors. Water quality results indicated no parameters that exceeded acceptable COMAR standards, although specific conductivity was elevated at 863.0 µS/cm, DOC exceeded 8 mg/L, and tannic coloration was observed. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist, although TN values fell into the low category as defined by MBSS with a value of 0.54 mg/L.

ZEKI-149-25

This sampling reach is located on Mill Dam Run. At 998 acres, the primary land use is natural (72.6%) followed by developed (15.6%) and agricultural (11.0%). The drainage area was comprised of 4.5% impervious surfaces, below the average of 6.5%. This site received a PHI score of 81.46 and rating of 'Minimally Degraded.' A poor score in remoteness and a sub-optimal score in instream habitat contributed to the PHI score. This site received a BIBI score of 4.71 and a corresponding narrative rating of 'Good.' Of the 31 taxa present in the benthic macroinvertebrate sample, 11 were EPT taxa and 4 Ephemeroptera taxa were identified within the sample. Nearly half of the individuals present, 49.2%, were intolerant to urban stressors. Water quality results indicated no parameters that exceeded acceptable COMAR standards, although specific conductivity was elevated at 647.0 µS/c. Lab results for the water quality grab sample indicated that all parameters met acceptable criteria where established criteria exist. TN values fell into the low category as defined by MBSS with a value of 1.07 mg/L.

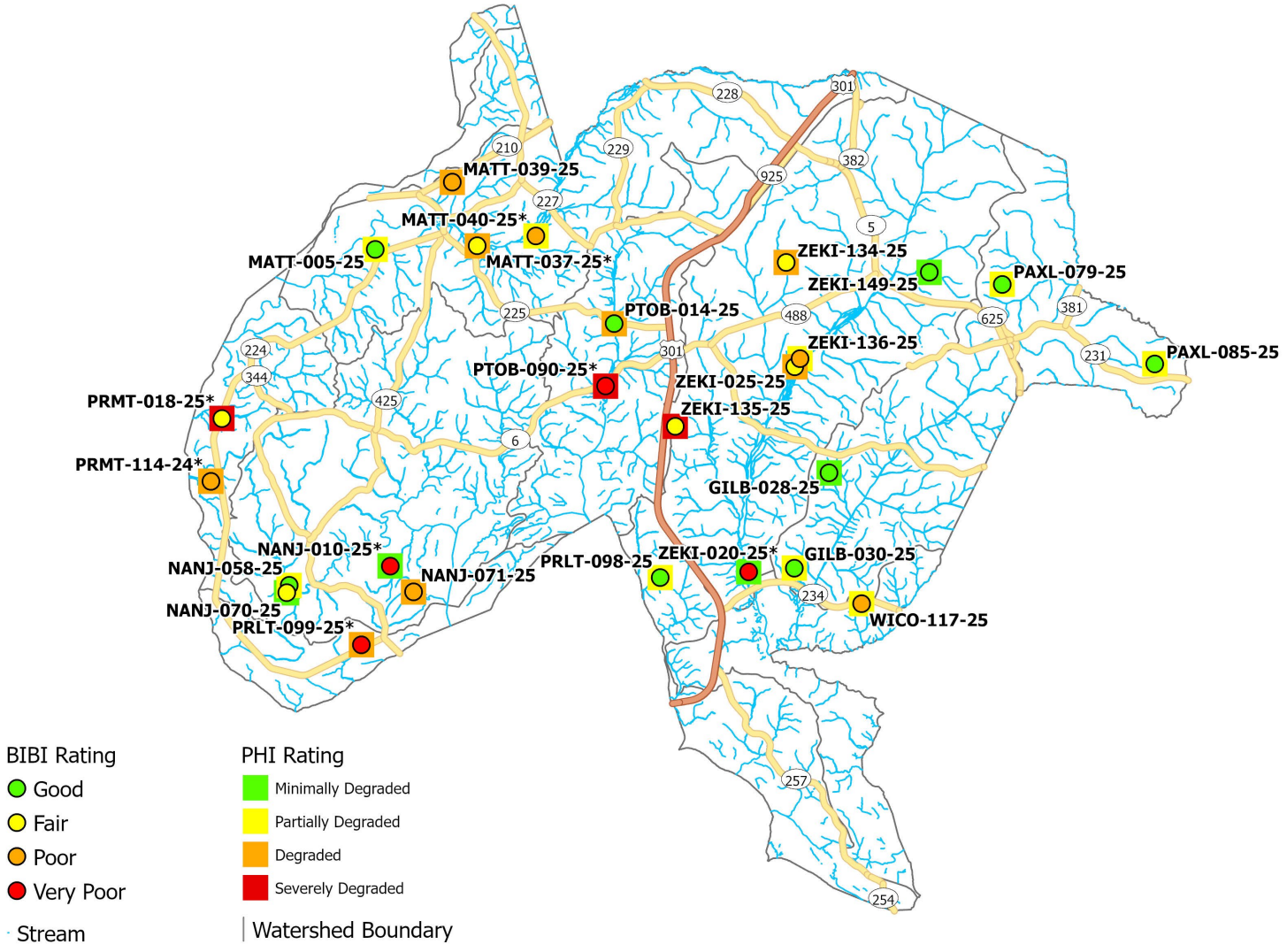

Figure 10. Combined results for the biological (BIBI) and physical habitat (PHI) condition ratings at each site. *Sites that were dry or otherwise unsampleable during summer

Table 15. Charles County Site Summary Data

Site ID	Drainage Area (ac.)	Impervious Surface Percent	BIBI Score	BIBI Rating	PHI Score	PHI Rating
GILB-028-25	115	8.5	4.14	Good	84.73	Minimally Degraded
GILB-030-25	53	4.1	5.00	Good	72.02	Partially Degraded
MATT-005-25	378	11.7	4.43	Good	70.56	Partially Degraded
MATT-037-25*	2,278	2.9	3.29	Fair	61.79	Degraded
MATT-039-25	1,210	19.1	2.71	Poor	63.63	Degraded
MATT-040-25*	851	3.5	2.71	Poor	68.01	Partially Degraded
NANJ-010-25*	122	2.1	1.86	Very Poor	84.18	Minimally Degraded
NANJ-058-25	9,728	2.2	5.00	Good	76.62	Partially Degraded
NANJ-070-25	563	0.4	3.57	Fair	84.56	Minimally Degraded
NANJ-071-25	186	0.0	2.43	Poor	64.11	Degraded
PAXL-079-25	256	6.7	5.00	Good	77.2	Partially Degraded
PAXL-085-25	1421	5.5	4.14	Good	68.17	Partially Degraded
PTOB-014-25	10,688	11.9	4.14	Good	62.94	Degraded
PTOB-090-25*	15,232	12.4	1.86	Very Poor	49.11	Severely Degraded
PRLT-098-25	22	1.0	5.00	Good	72.26	Partially Degraded
PRLT-099-25*	96	0.2	1.29	Very Poor	61.3	Degraded
PRMT-018-25*	346	1.6	3.00	Fair	50.86	Severely Degraded
PRMT-114-25*	115	6.6	2.71	Poor	54.27	Degraded
WICO-117-25	37	3.6	2.71	Poor	68.17	Partially Degraded
ZEKI-020-25*	262	3.2	1.57	Very Poor	91.0	Minimally Degraded
ZEKI-025-25	38,720	7.8	3.57	Fair	62.44	Degraded
ZEKI-134-25	806	31.3	3.86	Fair	64.56	Degraded
ZEKI-135-25	198	4.5	3.29	Fair	49.27	Severely Degraded
ZEKI-136-25	38,400	7.8	2.43	Poor	80.15	Partially Degraded
ZEKI-149-25	998	4.5	4.71	Good	81.46	Minimally Degraded
Minimum	22	0	1.29	Very Poor	49.11	Severely Degraded
Maximum	38,720	31.9	5.00	Good	91.0	Minimally Degraded
Mean	4,923.3	6.5	3.38	Fair	68.93	Partially Degraded
Standard Deviation	10,840.8	0.07	1.14	-	11.60	-

*Indicates site was dry or otherwise unsampleable during summer visit
Bold indicates sites where benthic QC samples were collected

4 Conclusions

This report is the first annual report of Round 1 of the Charles County Biological Monitoring and Assessment Program. These conclusions provide context for interpreting results and identifying potential areas in need of restoration or conservation. Assessments at the PSU level are not possible until completion of the sampling Round due to an insufficient sample size for extrapolating results.

The benthic macroinvertebrate community throughout the sampling sites visited during 2025 were mostly categorized as 'Good' (36%), followed by both 'Fair' and 'Poor' (both 24%), and 'Very Poor' (16%). The range of BIBI scores at individual sites ranged from 1.29 ('Very Poor') to 5.00 ('Good') on a 1.00 to 5.00 scale. The mean BIBI value of all sites sampled in 2025 ($\bar{x}$ = 3.37) resulted in a 'Fair' average biological condition rating. The state of biotic conditions as of the 2025 spring index period

can likely be attributed to the availability and presence of adequate habitat for benthic macroinvertebrates due to, in part, the extensive natural land use throughout the drainage areas sampled; however, a broader spatiotemporal scale is needed. Future years of sampling will assist in building a more comprehensive narrative regarding the status of Charles County's streams.

A majority of the sites received physical habitat ratings of 'Partially Degraded' (36%), 'Degraded' (32%), and 'Minimally Degraded' (20%). PHI scores ranged from 49.1 ('Severely Degraded') to 91.0 ('Minimally Degraded') on a 0.0 to 100.0 scale. Although a narrative rating of 'Degraded' (i.e., PHI score between 51 and 65.9) was the second most common narrative rating among the sampled sites, seven of the eight sites received this rating scored on the higher end of the narrative rating with a numerical score above 60. Only six metrics are calculated in the overall Coastal Plain PHI scoring; therefore, each metric has a large contribution to the overall habitat score. For example, remoteness scored the lowest, on average, of all parameters across the 25 sites and was a frequent contributor to lower scoring sites. However, remoteness is not a true measure of instream or riparian habitat conditions, but rather a measure of the site's proximity to the nearest road. Physical habitat of the stream channel can be affected by farming operations, increased housing density, and other urban-suburban developments; all of which may cause degradation of riparian vegetation, increased storm flows, increased sedimentation, and bank instability, leading to reduced overall habitat quality (Richards et al., 1996).

Most water quality parameters analyzed in the grab samples that were collected at each site met established criteria; however, seven sites had high values of TP per MBSS standards. Four of the seven sites occurred in the eastern portion of the County (east of U.S. Route 301). Three sites had high values of total ammonia nitrogen according to MBSS standards, two of which occurred in the western portion of the County. All sites reported values for total nitrogen that are defined as 'low" by MBSS standards. *In situ* water quality measurements consistently fell within COMAR standards for temperature and turbidity. However, 44% of sites were below the minimum COMAR threshold of 6.5 for pH, and six sites were marked as erroneous outliers and removed from analysis due to suspected equipment malfunction. Three sites fell below the 5 mg/L COMAR threshold for dissolved oxygen, although all sites exhibited additional criteria suggesting possible blackwater conditions. Specific conductivity was elevated at four sites county-wide, although no established criterion for this metric currently exists under COMAR.

A possible explanation for the relatively high number of sites outside of COMAR threshold values for pH and DOC is that some of the sites appear to be influenced by blackwater streams. Elevated DOC can also be a symptom of agricultural runoff and cannot define a stream as blackwater alone. In combination with low pH values, low dissolved oxygen, and the low percentages for agricultural land cover types in the drainage areas, it is possible that these values represent natural conditions are not the result of anthropogenic disturbance. Zekiah Swamp Natural Environmental Area is a noted blackwater stream and is proximal to some sites in the survey (DNR, 2014). Blackwater streams naturally exhibit lower pH values due to geochemical and biological conditions in the surrounding environments. These streams typically drain forested wetlands, and organic rich soils produce high concentrations of dissolved organic carbon and tannins from decomposing vegetation. The accumulation of organic matter leads to increased bacterial respiration, which releases CO_2 as a byproduct that causes acidification. Consequently, blackwater streams often exhibit pH, DOC, and dissolved oxygen levels less than COMAR water quality requirements; therefore, the COMAR standards may not be useful for identifying areas of concern for these streams in the County that are inherently acidic rather than in response to anthropogenic influences.

Despite the influence blackwater has on a stream's ability to meet COMAR regulations, it does not impact the stream's ability to meet the designated criteria for BIBI and PHI scores in the coastal plain ecoregion. Blackwater is a function of water chemistry and has no impact on physical habitat structure; additionally, the biotic communities that occur within blackwater streams are well adapted to these specific water quality conditions. There are approximately 1,275 miles of Blackwater Streams in Maryland (DNR, 2016).

Biological communities respond to a suite of destructive environmental factors, commonly known as stressors. Stressors can be organized according to five major determinants of biological integrity in aquatic ecosystems: water chemistry, energy source, habitat structure, flow regime, and biotic interactions (Karr et al., 1986; Angermeier and Karr, 1994; Karr and Chu, 1998). The cumulative effects of human activities within the County's sampling units often result in an alteration of one or more of these determinants with detrimental consequences for the aquatic biota. Identifying the responsible stressors for observed degradation within a stream or PSU can prove challenging, given that many stressors co-exist and interact, which can result in synergistic, antagonistic or other effects to occur. Furthermore, an added challenge in identifying the stressors affecting stream biota is that the water quality and physical habitat data collected by the County's monitoring program are not comprehensive and, therefore, cannot identify or address all possible stressors that may be acting within a system. Stressor relationships with stream biota, and their derived indices (i.e., BIBI), are often difficult to partition from complex spatiotemporal data sets due to the potential array of multiple stressors working at the reach to landscape scale in small streams (Helms et al. 2005; Miltner et al., 2004; Morgan and Cushman, 2005; Volstad et al., 2003; Morgan et al., 2007). Therefore, it should be noted that the current level of analysis cannot identify all stressors for the impaired sites, nor will the stressors identified represent all stressors present in a system.

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Appendix A: Land Use and Imperviousness

Site ID	Drainage Area (Acres)[1]	%WATR	%ROAD	%IMPS	%IMPO	%TCIS	%TCTG	%TURF	%PDEV	%EXTR	%FOR	%FORO	%NATS	%HARF	%RIVW	%TERW	%TDLW	%CROP	%PAST	% Impervious[2]
GILB-028-25	115		1.70	1.80	3.56	1.46	3.19	23.34	4.15		43.51	4.87	7.58	0.09					5.19	8.5
GILB-030-25	53		0.44	0.67	1.31	1.63	0.55	7.40	4.01		26.05	5.41	12.31					35.41	4.83	4.1
PAXL-079-25	256		1.50	0.98	3.36	0.82	2.17	10.47	3.15		54.23	4.17	2.63	0.67		0.10		9.25	6.98	6.7
PAXL-085-25	1,421	0.09	1.80	0.89	1.96	0.83	2.10	9.16	2.39		71.55	3.03	4.47	0.65	0.12			0.80	0.00	5.5
PRLT-098-25	22		0.29	0.06	0.07	0.63	0.12	0.52			87.80	0.02	4.51						5.99	1.0
WICO-117-25	37		2.78		0.55	0.24	0.01	2.92	2.95		4.68	7.84	2.45			0.22		61.86	13.52	3.6
ZEKI-020-25	262	0.20	1.30	0.41	1.14	0.36	0.30	5.00	1.01		54.03	1.07	2.90	0.14	0.12	0.54	0.70	26.61	3.72	3.2
ZEKI-025-25	38,720	0.83	2.04	1.48	3.51	0.63	2.06	6.95	3.43	0.45	56.35	2.57	6.52	1.33	0.97	0.14		7.72	2.63	7.8
ZEKI-134-25	806	2.70	9.30	8.09	13.27	0.62	3.59	26.54	7.19		18.04	4.40	5.15	0.75	0.01	0.03				31.3
ZEKI-135-25	198	0.40	1.00	0.81	1.70	0.96	2.03	5.50	5.23		61.70	4.23	2.41	1.55		0.30		9.50	2.19	4.5
ZEKI-136-25	38,400	0.84	2.05	1.48	3.53	0.64	2.07	6.93	3.45	0.45	56.25	2.57	6.48	1.34	0.98	0.14		7.72	2.62	7.8
ZEKI-149-25	998	0.31	1.27	0.74	1.90	0.63	1.46	4.86	4.70		64.39	2.60	5.13	0.27	0.04	0.16		9.73	1.31	4.5
MATT-005-25	378	0.11	3.77	2.30	3.97	1.64	4.98	24.86	3.55		39.34	6.43	7.76	0.33					0.95	11.7
MATT-037-25	2,278	0.06	0.97	0.58	0.88	0.45	1.24	3.89	1.58		79.50	1.53	4.76	1.91	0.13	0.01		0.01	2.49	2.9
MATT-039-25	1,210	0.10	6.44	3.87	7.04	1.78	5.21	12.43	2.45		53.94	4.08	2.16	0.02	0.31	0.18				19.1
MATT-040-25	851	0.11	0.86	0.53	1.56	0.57	1.20	4.68	3.25		77.08	1.77	4.81	0.09	0.04				3.44	3.5
NANJ-010-25	122		0.82	0.34	0.68	0.24	0.83	2.03	0.45		92.67	0.24	1.24	0.01	0.45	0.00				2.1
NANJ-058-25	9,728	0.10	0.76	0.35	0.73	0.35	0.69	3.43	0.84		81.73	1.17	4.00	1.10	1.58	0.00		0.41	2.76	2.2
NANJ-070-25	563	0.01	0.06	0.08	0.10	0.14	0.25	1.04	0.14		96.17	0.47	1.47	0.08						0.4
NANJ-071-25	186										92.67		1.34	4.15	1.82		0.01			0
PRLT-099-25	96		0.16		0.00	0.00			0.09		59.47		35.43	1.19	3.66					0.2
PRMT-018-25	346	0.13	0.39	0.21	0.48	0.52	0.44	1.17	2.29		87.37	0.21	4.50	2.29						1.6
PRMT-114-25	115	0.01	1.95	1.05	2.76	0.87	2.60	13.89	2.24		66.59	4.07	1.78	0.38	1.79	0.00				6.6
PTOB-014-25	10,688	0.39	3.00	2.49	5.45	0.94	2.98	9.94	2.56		56.74	3.42	4.28	0.54	0.35	0.03		3.93	2.95	11.9
PTOB-090-25	15,232	0.32	3.17	2.62	5.72	0.92	3.14	10.42	2.97		54.71	3.50	4.99	0.48	0.36	0.02	0.03	3.55	3.07	12.4

WATR: Water (11-14) [2,3]
ROAD: Impervious Roads (20)
IMPS: Impervious Structures (21)
IMPO: Impervious Other (22, 32)
TCIS: Tree Canopy over Impervious Surfaces (23-25)
TCTG: Tree Canopy over Turf Grass (26)
TURF: Turf Grass (27)
PDEV: Pervious Developed (28; 33-38)
EXTR: Extractive (30-31)
FOR: Forest (40, 54, 64, 74)
FORO: Forested Other (41, 53, 63, 73)
NATS: Natural Succession (15; 42-44)
HARF: Harvested Forest (45-46, 55,65,75)
RIVW: Riverine Wetlands, Non-forested (50-52)
TERW: Terrene Wetlands, Non-Forested (60-62)
TDLW: Tidal Wetlands, Non-Forested (70-72)
CROP: Cropland (80-84)
PAST: Pasture and Hay (85-86)

1 Drainage areas provided are delineated to each sampling site.
2 Land use is based on Maryland Department of Planning (MDP) 2010 data.
land cover.
3 Numbers in parentheses correspond to CBP land use codes.

Appendix B: Benthic Macroinvertebrate Data

Project Name:	Charles Countywide Biomonitoring 2025		
Project Number:	172008407.24		
Prepared by:	HEG	Checked by:	CRH
Prepared date:	11/21/2025	Checked date:	11/21/2025

KCI TECHNOLOGIES

Site ID	Total Number of Taxa	Number of EPT Taxa	Number of Ephemeroptera Taxa	Percent Intolerant Urban	Percent Ephemeroptera	Numer Scraper Taxa	Percent Climbers	Total Number of Taxa	Number of EPT Taxa	Number of Ephemeroptera Taxa	Percent Intolerant Urban	Percent Ephemeroptera	Numer Scraper Taxa	Percent Climbers	BIBI Score	Narrative Rating
GILB-028-25	28	5	1	35.3	0.9	2.0	6.0	5	5	3	5	3	5	3	4.14	Good
GILB-030-25	33	11	3	31.9	11.3	3.0	13.1	5	5	5	5	5	5	5	5.00	Good
MATT-005-25	27	4	1	35.3	31.3	5.0	18.7	5	3	3	5	5	5	5	4.43	Good
MATT-037-25	11	7	1	73.6	2.5	1.0	1.9	1	5	3	5	3	3	3	3.29	Fair
MATT-039-25	16	4	0	86.3	0.0	2.0	0.0	3	3	1	5	1	5	1	2.71	Poor
MATT-040-25	12	3	1	87.6	0.7	1.0	7.3	1	3	3	5	1	3	3	2.71	Poor
NANJ-010-25	9	1	0	47.8	0.0	0.0	2.2	1	1	1	5	1	1	3	1.86	Very Poor
NANJ-058-25	27	9	3	51.6	25.4	6.0	14.3	5	5	5	5	5	5	5	5.00	Good
NANJ-070-25	16	5	2	6.7	1.7	3.0	5.0	3	5	5	1	3	5	3	3.57	Fair
NANJ-071-25	18	2	1	23.7	0.8	0.0	3.8	3	3	3	3	1	1	3	2.43	Poor
PAXL-079-25	29	11	4	63.9	23.3	5.0	14.3	5	5	5	5	5	5	5	5.00	Good
PAXL-085-25	42	6	2	8.5	4.2	2.0	10.2	5	5	5	1	3	5	5	4.14	Good
PRLT-098-25	35	10	4	45.9	24.8	4.0	15.8	5	5	5	5	5	5	5	5.00	Good
PRLT-099-25	11	1	0	25.2	0.0	0.0	0.0	1	1	1	3	1	1	1	1.29	Very Poor
PRMT-018-25	22	4	0	41.4	0.0	2.0	0.7	1	5	5	1	5	1	3	3.00	Fair
PRMT-114-25	22	1	1	6.5	0.7	1.0	18.1	5	1	3	1	1	3	5	2.71	Poor
PTOB-014-25	14	5	2	70.4	30.4	5.0	0.0	3	5	5	5	5	5	1	4.14	Good
PTOB-090-25	14	0	0	2.3	0.0	1.0	7.0	3	1	1	1	1	3	3	1.86	Very Poor
PTOB-090-25-QC	15	1	0	2.4	0.0	2.0	5.7	3	1	1	1	1	5	3	2.14	Poor
WICO-117-25	27	3	0	26.3	0.0	1.0	0.9	5	3	1	3	1	3	1	2.43	Poor
ZEKI-020-25	6	0	0	96.4	0.0	0.0	0.0	1	1	1	5	1	1	1	1.57	Very Poor
ZEKI-025-25	17	4	3	8.9	12.5	2.0	1.8	3	3	5	1	5	5	3	3.57	Fair
ZEKI-134-25	27	9	3	2.7	4.5	4.0	3.6	5	5	5	1	3	5	3	3.86	Fair
ZEKI-134-25-QC	26	7	2	2.4	11.2	6.0	7.2	5	5	5	1	5	5	3	4.14	Good
ZEKI-135-25	17	3	1	70.9	0.9	2.0	0.0	3	3	3	5	3	5	1	3.29	Fair
ZEKI-136-25	10	1	1	2.3	3.8	2.0	1.5	1	1	3	1	3	5	3	2.43	Poor
ZEKI-149-25	31	11	4	49.2	13.1	5.0	6.9	5	5	5	5	5	5	3	4.71	Good

Coastal Plain (CP) Scoring Criteria	**Score**		
Metric	**5**	**3**	**1**
Total Number of Taxa	22	14-21	14
Number of EPT Taxa	5	2-4	2
Number Ephemeroptera Taxa	2	1-1	1
Percent Intolerant Urban	28	10-27	10.0
Percent Ephemeroptera	11	0.8-10.9	0.8
Number Scraper Taxa	2	1-1	1.0
Percent Climbers	8	0.9-7.9	0.9

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_CRI_Sites_11.19.25.xlsx
Version: 1
Site Name: GILB-028-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	2	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I	1	Predator	sw, dv	5.4
Arthropoda	Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	1	Scraper	cn	2.7
Arthropoda	Insecta	Diptera	0	0	Diptera	I	1	0	0	6
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	1	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	2	Collector	sp	7
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	P/I	3	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	3	Shredder	0	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	3	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	3	Collector	sp	6.1
Arthropoda	Insecta	Diptera	Chironomidae	Heterotrissocladius	Heterotrissocladius	I	1	Collector	sp, bu	2
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	P	1	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	4	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	1	Collector	bu	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	3	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	4	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	2	Collector	cb, sp, cn	4.2
Arthropoda	Insecta	Diptera	Chironomidae	0	Tanytarsini Genus A	I	30	0	0	n/a
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	1	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1
Arthropoda	Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	5	Filterer	cn	5.7
Arthropoda	Insecta	Diptera	Limoniidae	Pseudolimnophila	Pseudolimnophila	I	2	Predator	bu	2.8
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Arthropoda	Insecta	Plecoptera	Chloroperlidae	0	Chloroperlidae	I	1	Predator	cn	1.6
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	35	Shredder	sp, cn	3
Arthropoda	Insecta	Trichoptera	Lepidostomatidae	Lepidostoma	Lepidostoma	I	1	Shredder	cb, sp, cn	0
Arthropoda	Insecta	Trichoptera	Limnephilidae	0	Limnephilidae	I	1	Shredder	cb, sp, cn	3.4
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	1	Filterer	bu	5.7

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_CRI_Sites_11.19.25.xlsx
Version: 1
Site Name: GILB-030-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I	3	Predator	sw, dv	5.4
Arthropoda	Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	1	Shredder	cn	3.1
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	4	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	4	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	7	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Natarsia	Natarsia	I	2	Predator	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	1	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	1	Collector	sp	2.1
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	P/I	6	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	2	Collector	cb, sp, cn	4.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	P/I	14	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	4	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Tribelos	Tribelos	I	1	Collector	bu	7
Arthropoda	Insecta	Diptera	Chironomidae	Trissopelopia	Trissopelopia	I	2	Predator	sp	4.1
Arthropoda	Insecta	Diptera	Ptychopteridae	Ptychoptera	Ptychoptera	I	2	Collector	0	4
Arthropoda	Insecta	Diptera	Limoniidae	Pseudolimnophila	Pseudolimnophila	I	5	Predator	bu	2.8
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	16	Scraper	cn, sp	4.5
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	n/a
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	0	Leptophlebiidae	I	1	Collector	sw, cn	1.7
Arthropoda	Insecta	Plecoptera	Chloroperlidae	0	Chloroperlidae	I	2	Predator	cn	1.6
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	26	Shredder	sp, cn	3
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	2	Filterer	cn	2.7
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	4.9
Arthropoda	Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Arthropoda	Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Arthropoda	Insecta	Trichoptera	Philopotamidae	Wormaldia	Wormaldia	I	1	Filterer	cn	1.8
Arthropoda	Insecta	Trichoptera	Thremmatidae	Neophylax	Neophylax	I	1	Scraper	cn	2.7
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	29	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	5	0	0	0.4
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	7	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	1	Filterer	bu	5.7

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 1
Site Name: MATT-005-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	4	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I/A	3	Scraper	cn	5.4
Arthropoda	Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I/A	3	Scraper	cn	2.7
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	3	Scraper	cn	7.1
Arthropoda	Insecta	Diptera	0	0	Diptera	I	1	0	0	6
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Diamesa	Diamesa	I/P	3	Collector	sp	8.5
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I/P	4	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I/P	6	Collector	sp	6.1
Arthropoda	Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	14	Scraper	sp	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	4	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	3	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	1	Collector	bu	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	17	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I/P	5	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	P	1	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	1	Filterer	cn	2.4
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	5	Filterer	cn	5.7
Arthropoda	Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	2	Filterer	cn	2.4
Arthropoda	Insecta	Diptera	Tipulidae	Tipula	Tipula	I	2	Shredder	bu	6.7
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	47	Collector	sw, cn	2.6
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	2	Filterer	cn	6.5
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	4.9
Arthropoda	Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	1	Filterer	cn	4.4
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	N/A	3	Shredder	sp	6.7
Mollusca	Gastropoda	Basommatophora	Physidae	Physella	Physella	N/A	10	Scraper	cb	8
Nemertea	Enopla	Hoplonemertea	Tetrastemmatidae	Prostoma	Prostoma	N/A	3	Predator	0	7.3

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 12/2/2025 Checked date: 12/2/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 1
Site Name: MATT-037-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	6	Scraper	sp	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	26	Collector	sp	5.1
Arthropoda	Insecta	Ephemeroptera	Baetidae	Callibaetis	Callibaetis	I	4	Collector	sw, cn	2.3
Arthropoda	Insecta	Plecoptera	Nemouridae	0	Nemouridae	I	26	Shredder	sp, cn	2.9
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	83	Shredder	sp, cn	3
Arthropoda	Insecta	Plecoptera	Perlodidae	0	Perlodidae	I	1	Predator	cn	2.2
Arthropoda	Insecta	Plecoptera	Perlodidae	Isoperla	Isoperla	I	1	Predator	cn, sp	2.4
Arthropoda	Insecta	Trichoptera	Limnephilidae	0	Limnephilidae	I	3	Shredder	cb, sp, cn	3.4
Arthropoda	Insecta	Trichoptera	Rhyacophilidae	Rhyacophila	Rhyacophila	I	2	Predator	cn	2.1
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	2	Collector	sp	6.7
Arthropoda	Malacostraca	Isopoda	0	0	Isopoda	N/A	5	Collector	0	3.3

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Project Name: Charles Countywide Biomonitoring
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Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 1
Site Name: MATT-039-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	0	Enchytraeidae	N/A	1	Collector	bu	9.1
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	1	Collector	bu	8.5
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	Larvae	3	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Bryophaenocladius	Bryophaenocladius	Larvae	1	Collector	sp	6
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	Larvae	1	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	Larvae	8	Scraper	sp	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	Larvae	1	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	Larvae	5	Filterer	cn	2.4
Arthropoda	Insecta	Diptera	Limoniidae	Gonomyia/Idiocera/Ellipte	Gonomyia/Idiocera/Ellipteroides	Larvae	1	Collector	sp, bu	n/a
Arthropoda	Insecta	Plecoptera	Capniidae	0	Capniidae	Larvae	1	Shredder	sp, cn	3.7
Arthropoda	Insecta	Plecoptera	Leuctridae	0	Leuctridae	Larvae	5	Shredder	sp, cn	0.8
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	Larvae	106	Shredder	sp, cn	3
Arthropoda	Insecta	Trichoptera	Thremmatidae	Neophylax	Neophylax	Larvae	1	Scraper	cn	2.7
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	1	0	0	0.4
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	2	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	0	Sphaeriidae	N/A	1	Filterer	bu	6.5

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
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Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

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Version: 1
Site Name: MATT-040-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I	2	Predator	sw, dv	5.4
Arthropoda	Insecta	Diptera	Chironomidae	Heterotrissocladius	Heterotrissocladius	I	1	Collector	sp, bu	2
Arthropoda	Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	1	Collector	bu	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	5	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Arthropoda	Insecta	Ephemeroptera	Baetidae	Callibaetis	Callibaetis	I	1	Collector	sw, cn	2.3
Arthropoda	Insecta	Lepidoptera	0	0	Lepidoptera	I	3	0	0	6.7
Arthropoda	Insecta	Trichoptera	Limnephilidae	0	Limnephilidae	I	1	Shredder	cb, sp, cn	3.4
Arthropoda	Insecta	Trichoptera	Polycentropodidae	Polycentropus	Polycentropus	I	9	Filterer	cn	1.1
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	1	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	2	0	0	0.4
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	107	Collector	sp	2.6
Mollusca	Gastropoda	Lymnaeida	Planorbidae	Micromenetus	Micromenetus	N/A	3	Scraper	cb	

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Project Name: Charles Countywide Biomonitoring
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Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 1
Site Name: NANJ-010-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	0	Lumbriculidae	N/A	3	Collector	bu	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Bryophaenocladius	Bryophaenocladius	I	1	Collector	sp	6
Arthropoda	Insecta	Diptera	Chironomidae	Omisus	Omisus	I	4	0	0	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	3	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Tribelos	Tribelos	I	2	Collector	bu	7
Arthropoda	Insecta	Diptera	Culicidae	Aedes	Aedes	I	7	Filterer	sw	8
Arthropoda	Insecta	Trichoptera	Polycentropodidae	Polycentropus	Polycentropus	I	7	Filterer	cn	1.1
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	51	Collector	sp	6.7
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	58	Collector	sp	2.6

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
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Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 1
Site Name: NANJ-058-25

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	0	Lumbriculidae	N/A	2	Collector	bu	6.6
Arthropoda	Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	1	Scraper	cn	5.4
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	2	Scraper	cn	7.1
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	3	Scraper	cn	7.1
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	2	Scraper	cn	4.4
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	2	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	1	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I/P	14	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	2	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	4	Collector	cb, sp, cn	4.2
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	2	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Xenochironomus	Xenochironomus	I	1	Predator	bu	n/a
Arthropoda	Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I/P	7	Filterer	cn	2.4
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	12	Filterer	cn	5.7
Arthropoda	Insecta	Ephemeroptera	Baetidae	0	Baetidae	I	1	Collector	sw, cn	2.3
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	23	Collector	sw, cn	2.6
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	8	Scraper	cn	n/a
Arthropoda	Insecta	Plecoptera	Nemouridae	0	Nemouridae	I	1	Shredder	sp, cn	2.9
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	18	Shredder	sp, cn	3
Arthropoda	Insecta	Plecoptera	Perlidae	Eccoptura	Eccoptura	I	1	Predator	cn	0.6
Arthropoda	Insecta	Plecoptera	Perlidae	Perlesta	Perlesta	I	5	Predator	cn	1.6
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	1	Filterer	cn	7.5
Arthropoda	Insecta	Trichoptera	Odontoceridae	Psilotreta	Psilotreta	I	2	Scraper	sp	0.9
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	7	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	2	Filterer	bu	5.7

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: NANJ-070-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	4	Scraper	cn	7.1
Arthropoda	Insecta	Diptera	Chironomidae	Djalmabatista	Djalmabatista	I	1	Predator	sp	n/a
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	5	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	11	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	10	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	1	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I	4	Filterer	cn	2.4
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	69	Filterer	cn	5.7
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	n/a
Arthropoda	Insecta	Megaloptera	Corydalidae	Nigronia	Nigronia	I	1	Predator	cn, cb	1.4
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	1	Shredder	sp, cn	3
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	6	Filterer	cn	7.5
Arthropoda	Insecta	Trichoptera	Leptoceridae	0	Leptoceridae	P	2	Collector	0	4.1
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	1	0	0	0.4
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	1	Collector	sp	2.6

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: NANJ-071-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	6	Collector	bu	8.5
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	5	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	1	Collector	sp	7
Arthropoda	Insecta	Diptera	Chironomidae	Kiefferulus	Kiefferulus	I	1	Collector	bu	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Larsia	Larsia	I	2	Predator	sp	8.5
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	18	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	4	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	4	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Zavreliella	Zavreliella	I	3	0	bu	n/a
Arthropoda	Insecta	Diptera	Tabanidae	Chrysops	Chrysops	I	1	Predator	sp, bu	2.9
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	1	Collector	sw, cn	2.6
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	3	Shredder	sp	4.9
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	2	Collector	sp	6.7
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	N/A	47	Shredder	sp	6.7
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	29	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	0	Sphaeriidae	N/A	2	Filterer	bu	6.5
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	1	Filterer	bu	5.7

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Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_CRI_Sites_11.19.25.xlsx
Version: 1
Site Name: PAXL-079-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Dryopidae	Helichus	Helichus	A	1	Scraper	cn	6.4
Arthropoda	Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	10	Scraper	cn	2.7
Arthropoda	Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	7	Shredder	cn	3.1
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	5	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Apsectrotanypus	Apsectrotanypus	I	1	Predator	bu, sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	1	Collector	cb, sp	2.1
Arthropoda	Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	2	Filterer	cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Natarsia	Natarsia	I	1	Predator	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	5	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	9	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	5	Collector	cb, sp, cn	4.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	P/I	3	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3
Arthropoda	Insecta	Diptera	Limoniidae	Hexatoma	Hexatoma	I	2	Predator	bu, sp	1.5
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	21	Collector	sw, cn	2.6
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	7	Collector	cn, sw	2.3
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	0	Heptageniidae	I	1	Scraper	cn	2.6
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	0	Leptophlebiidae	I	2	Collector	sw, cn	1.7
Arthropoda	Insecta	Plecoptera	Capniidae	0	Capniidae	I	1	Shredder	sp, cn	3.7
Arthropoda	Insecta	Plecoptera	Chloroperlidae	0	Chloroperlidae	I	18	Predator	cn	1.6
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	15	Shredder	sp, cn	3
Arthropoda	Insecta	Plecoptera	Perlidae	Eccoptura	Eccoptura	I	1	Predator	cn	0.6
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	4	Filterer	cn	2.7
Arthropoda	Insecta	Trichoptera	Thremmatidae	Neophylax	Neophylax	I	3	Scraper	cn	2.7
Mollusca	Bivalvia	Veneroida	Pisidiidae	0	Sphaeriidae	N/A	2	Filterer	bu	6.5
Mollusca	Gastropoda	Lymnaeida	Planorbidae	Micromenetus	Micromenetus	N/A	1	Scraper	cb	

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Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_CRI_Sites_11.19.25.xlsx
Version: 1
Site Name: PAXL-085-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	0	Lumbriculidae	N/A	1	Collector	bu	6.6
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	1	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Dryopidae	Helichus	Helichus	A	1	Scraper	cn	6.4
Arthropoda	Insecta	Coleoptera	Elmidae	Ancyronyx	Ancyronyx	I	1	Scraper	cn, sp	7.8
Arthropoda	Insecta	Coleoptera	Gyrinidae	Gyrinus	Gyrinus	A	1	Predator	sw, dv	4
Arthropoda	Insecta	Coleoptera	Hydrophilidae	Sperchopsis	Sperchopsis	I	1	Collector	cn	4.1
Arthropoda	Insecta	Diptera	0	0	Diptera	I	1	0	0	6
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	5	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	0	Tanypodinae	P	2	Predator	0	7.5
Arthropoda	Insecta	Diptera	Chironomidae	Ablabesmyia	Ablabesmyia	I	2	Predator	sp	8.1
Arthropoda	Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	1	Collector	sp	7
Arthropoda	Insecta	Diptera	Chironomidae	Chironomus	Chironomus	I	1	Collector	bu	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	1	Filterer	0	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Cryptotendipes	Cryptotendipes	I	2	Collector	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Arthropoda	Insecta	Diptera	Chironomidae	Limnophyes	Limnophyes	I	1	Collector	sp	8.6
Arthropoda	Insecta	Diptera	Chironomidae	Odontomesa	Odontomesa	I	10	Collector	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	2	Collector	sp	2.1
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	1	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	2	Collector	bu	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	5	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Pseudorthocladius	Pseudorthocladius	I	1	Collector	sp	6
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	P/I	11	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	1	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	3	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	2	Collector	sp	5.1
Arthropoda	Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	26	Predator	sp	5.3
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	5	Filterer	cn	5.7
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	3	Collector	sw, cn	2.6
Arthropoda	Insecta	Ephemeroptera	Siphlonuridae	0	Siphlonuridae	I	2	Collector	sw, cb	7
Arthropoda	Insecta	Odonata	Aeshnidae	Boyeria	Boyeria	I	1	Predator	cb, sp	6.3
Arthropoda	Insecta	Odonata	Gomphidae	0	Gomphidae	I	1	Predator	bu	2.2
Arthropoda	Insecta	Plecoptera	Perlodidae	Isoperla	Isoperla	I	2	Predator	cn, sp	2.4
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	4.9
Arthropoda	Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Arthropoda	Insecta	Trichoptera	Phryganeidae	Ptilostomis	Ptilostomis	I	1	Shredder	cb	4.3
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	1	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	2	0	0	0.4
Mollusca	Bivalvia	Veneroida	Pisidiidae	0	Sphaeriidae	N/A	4	Filterer	bu	6.5
Mollusca	Gastropoda	0	0	0	Gastropoda	N/A	1	0	0	n/a

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Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

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Version: 4
Site Name: PRLT-098-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Dryopidae	Helichus	Helichus	A	2	Scraper	cn	6.4
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I	1	Predator	sw, dv	5.4
Arthropoda	Insecta	Coleoptera	Hydrophilidae	Cymbiodyta	Cymbiodyta	A	1	Collector	bu	4.1
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	5	Scraper	cn	4.4
Arthropoda	Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	1	Shredder	cn	3.1
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	1	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	1	Filterer	0	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	7	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	4	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Arthropoda	Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	5	Filterer	cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	2	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	1	Collector	sp	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	16	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	4	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	4	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Tribelos	Tribelos	I	1	Collector	bu	7
Arthropoda	Insecta	Diptera	Chironomidae	Trissopelopia	Trissopelopia	I	3	Predator	sp	4.1
Arthropoda	Insecta	Diptera	Dolichopodidae	0	Dolichopodidae	I	1	Predator	sp, bu	7.5
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Arthropoda	Insecta	Diptera	Limoniidae	Pseudolimnophila	Pseudolimnophila	I	3	Predator	bu	2.8
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	n/a
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	0	Leptophlebiidae	I	30	Collector	sw, cn	1.7
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	Habrophlebia	Habrophlebia	I	1	Collector	sw, cn, sp	1.7
Arthropoda	Insecta	Odonata	Cordulegastridae	Cordulegaster	Cordulegaster	I	2	Predator	bu	2.4
Arthropoda	Insecta	Plecoptera	Capniidae	0	Capniidae	I	1	Shredder	sp, cn	3.7
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	11	Shredder	sp, cn	3
Arthropoda	Insecta	Trichoptera	Dipseudopsidae	Phylocentropus	Phylocentropus	I	2	Collector	bu	5
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	8	Filterer	cn	2.7
Arthropoda	Insecta	Trichoptera	Limnephilidae	Pycnopsyche	Pycnopsyche	I	1	Shredder	sp, cb, cn	3.1
Arthropoda	Insecta	Trichoptera	Philopotamidae	Wormaldia	Wormaldia	I	4	Filterer	cn	1.8
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	2	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	2	0	0	0.4
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	1	Filterer	bu	5.7

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Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: PRLT-099-25

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I	1	Predator	sw, dv	5.4
Arthropoda	Insecta	Coleoptera	Dytiscidae	Copelatus	Copelatus	I	2	Predator	sw	5
Arthropoda	Insecta	Coleoptera	Hydrophilidae	Cymbiodyta	Cymbiodyta	A	2	Collector	bu	4.1
Arthropoda	Insecta	Coleoptera	Dytiscidae	Helocombus	Helocombus	I	2	0	0	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I	1	Collector	cn	8.7
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	5	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Culicidae	Aedes	Aedes	I	20	Filterer	sw	8
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	3	Shredder	sp	4.9
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	58	Collector	sp	6.7
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	1	0	0	0.4
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	31	Collector	sp	2.6

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: PRMT-018-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Haplotaxidae	0	Haplotaxidae	N/A	1	0	0	n/a
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	0	Lumbriculidae	N/A	2	Collector	bu	6.6
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	16	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I	2	Predator	sw, dv	5.4
Arthropoda	Insecta	Diptera	0	0	Diptera	I	1	0	0	6
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	7	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Bryophaenocladius	Bryophaenocladius	I	1	Collector	sp	6
Arthropoda	Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	3	Collector	sp	7
Arthropoda	Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	2	Scraper	sp	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	2	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	3	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Dolichopodidae	0	Dolichopodidae	I	1	Predator	sp, bu	7.5
Arthropoda	Insecta	Diptera	Limoniidae	Erioptera	Erioptera	I	1	Collector	bu	4.8
Arthropoda	Insecta	Plecoptera	Nemouridae	0	Nemouridae	I	3	Shredder	sp, cn	2.9
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	5	Shredder	sp, cn	3
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	2	Shredder	sp	4.9
Arthropoda	Insecta	Trichoptera	Thremmatidae	Neophylax	Neophylax	I	1	Scraper	cn	2.7
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	9	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	15	Collector	sp	6.7
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	49	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	0	Sphaeriidae	N/A	12	Filterer	bu	6.5
Nematoda	0	0	0	0	Nematoda	N/A	1	0	0	n/a

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: PRMT-114-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	0	Enchytraeidae	N/A	1	Collector	bu	9.1
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	1	Collector	bu	8.5
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	5	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	4	Collector	sp	7
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	3	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Larsia	Larsia	I	1	Predator	sp	8.5
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	5	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I	8	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	1	Collector	sp	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Paratendipes	Paratendipes	I	2	Collector	bu	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	9	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	2	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I	22	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	18	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	I	1	Predator	sp	5.3
Arthropoda	Insecta	Diptera	Tabanidae	Chrysops	Chrysops	I	1	Predator	sp, bu	2.9
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	0	Leptophlebiidae	I	1	Collector	sw, cn	1.7
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	5	Collector	sp	6.7
Arthropoda	Malacostraca	Amphipoda	Hyalellidae	Hyalella	Hyalella	N/A	1	Shredder	sp	4.2
Arthropoda	Malacostraca	Isopoda	0	0	Isopoda	N/A	35	Collector	0	3.3
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	7	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	1	Filterer	bu	5.7
Mollusca	Gastropoda	Basommatophora	Physidae	Physella	Physella	N/A	3	Scraper	cb	8

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: PTOB-014-25

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	A	1	Scraper	cn	5.4
Arthropoda	Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I/A	11	Scraper	cn	2.7
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	A	1	Scraper	cn	7.1
Arthropoda	Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I/P	13	Collector	sp	6.1
Arthropoda	Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	1	Scraper	sp	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	15	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Simuliidae	Prosimulium	Prosimulium	I/P	16	Filterer	cn	2.4
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	6	Filterer	cn	5.7
Arthropoda	Insecta	Diptera	Simuliidae	Stegopterna	Stegopterna	I	2	Filterer	cn	2.4
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	3	Collector	sw, cn	2.6
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	35	Collector	cn, sw	2.3
Arthropoda	Insecta	Plecoptera	Nemouridae	0	Nemouridae	I	1	Shredder	sp, cn	2.9
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	18	Shredder	sp, cn	3
Arthropoda	Insecta	Plecoptera	Taeniopterygidae	Taenionema	Taenionema	I	2	Scraper	sp, cn	2

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 9/11/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: PTOB-090-25

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	36	Collector	bu	8.5
Arthropoda	Insecta	Diptera	Chironomidae	0	Chironomini	I	1	0	0	5.9
Arthropoda	Insecta	Diptera	Chironomidae	0	Tanypodinae	P	1	Predator	0	7.5
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	2	Shredder	cn, bu	9.6
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	4	Shredder	0	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	3	Collector	bu	9
Arthropoda	Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I	12	Scraper	sp	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	3	Collector	cb, sp	2.1
Arthropoda	Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	2	Filterer	cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I/P	50	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Paratanytarsus	Paratanytarsus	I	1	Collector	sp	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I/P	4	Collector	cn	8.7
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I/P	5	Filterer	cb, cn	4.9
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	1	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	N/A	1	Shredder	sp	6.7

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: NJH Checked by: CRH
Prepared date: 12/2/2025 Checked date: 12/2/2025

Charles_Countywide_BIBI_CP_v5_KCI_Sites_11.19.25.xlsx
Version: 4
Site Name: PTOB-090-25-QC

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	105	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	I	1	Scraper	cn	2.7
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	5	Collector	bu	9
Arthropoda	Insecta	Diptera	Chironomidae	Hydrobaenus	Hydrobaenus	I/P	22	Scraper	sp	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Micropsectra	Micropsectra	I	5	Collector	cb, sp	2.1
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I/P	81	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Phaenopsectra	Phaenopsectra	I	2	Collector	cn	8.7
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I/P	11	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Tanytarsus	Tanytarsus	I/P	8	Filterer	cb, cn	4.9
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	1	Filterer	cn	5.7
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	N/A	2	Shredder	sp	6.7
Nematoda	0	0	0	0	Nematoda	N/A	1	0	0	n/a

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_CRI_Sites_11.19.25.xlsx
Version: 1
Site Name: WICO-117-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Enchytraeidae	0	Enchytraeidae	N/A	4	Collector	bu	9.1
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	0	Lumbriculidae	N/A	1	Collector	bu	6.6
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	5	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Dryopidae	Helichus	Helichus	A	1	Scraper	cn	6.4
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I/A	2	Predator	sw, dv	5.4
Arthropoda	Insecta	Coleoptera	Hydrophilidae	0	Hydrophilidae	I	2	0	0	4.1
Arthropoda	Insecta	Diptera	0	0	Diptera	I/P	3	0	0	6
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	1	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Chaetocladius	Chaetocladius	I	30	Collector	sp	7
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	6	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Larsia	Larsia	I	1	Predator	sp	8.5
Arthropoda	Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	1	Collector	sp	2.1
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	1	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Sarcophagidae	0	Sarcophagidae	I	6	0	0	n/a
Arthropoda	Insecta	Diptera	Tabanidae	Chrysops	Chrysops	I	2	Predator	sp, bu	2.9
Arthropoda	Insecta	Diptera	Limoniidae	Erioptera	Erioptera	I	1	Collector	bu	4.8
Arthropoda	Insecta	Diptera	Limoniidae	Gonomyia/Idiocera/Ellipteroi	Gonomyia/Idiocera/Ellipteroides	I	3	Collector	sp, bu	n/a
Arthropoda	Insecta	Diptera	Limoniidae	Hexatoma	Hexatoma	I	1	Predator	bu, sp	1.5
Arthropoda	Insecta	Diptera	Limoniidae	Ormosia	Ormosia	I	1	Collector	bu	6.3
Arthropoda	Insecta	Diptera	Limoniidae	Pseudolimnophila	Pseudolimnophila	I	9	Predator	bu	2.8
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	3	Shredder	sp, cn	3
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	2	Shredder	sp	4.9
Arthropoda	Insecta	Trichoptera	Philopotamidae	Wormaldia	Wormaldia	I	1	Filterer	cn	1.8
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	8	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Synurella	Synurella	N/A	10	0	0	0.4
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	3	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	1	Filterer	bu	5.7
Platyhelminthes	Turbellaria	0	0	0	Turbellaria	N/A	4	Predator	sp	4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_CRI_Sites_11.19.25.xlsx
Version: 1
Site Name: ZEKI-020-25

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Dytiscidae	0	Dytiscidae	I	2	Predator	sw, dv	5.4
Arthropoda	Insecta	Coleoptera	Dytiscidae	Matus	Matus	A/I	2	0	0	5.4
Arthropoda	Insecta	Odonata	Libellulidae	0	Libellulidae	I	1	Predator	0	9
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	2	Collector	sp	6.7
Arthropoda	Malacostraca	Decapoda	Cambaridae	0	Cambaridae	N/A	2	Shredder	sp	2.8
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	183	Collector	sp	2.6

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
Prepared date: 9/19/2025 Checked date: 10/7/2025

Charles_Countywide_BIBI_CP_v5_CRI_Sites_11.19.25.xlsx
Version: 4
Site Name: ZEKI-025-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	2	Collector	bu	8.5
Arthropoda	Insecta	Diptera	Chironomidae	Benthalia	Benthalia	I	1	0	0	n/a
Arthropoda	Insecta	Diptera	Chironomidae	Labrundinia	Labrundinia	I	2	Predator	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	1	Filterer	cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Nanocladius	Nanocladius	I	2	Collector	sp	7.6
Arthropoda	Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	1	Predator	sp	8.2
Arthropoda	Insecta	Ephemeroptera	Baetidae	0	Baetidae	I	1	Collector	sw, cn	2.3
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acentrella	Acentrella	I	1	Collector	sw, cn	4.9
Arthropoda	Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	11	Collector	sw, cn	n/a
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Eurylophella	Eurylophella	I	1	Scraper	cn, sp	4.5
Arthropoda	Insecta	Plecoptera	Taeniopterygidae	Taeniopteryx	Taeniopteryx	I	1	Shredder	sp, cn	4.8
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	8	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	13	Collector	sp	6.7
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	N/A	54	Shredder	sp	6.7
Arthropoda	Malacostraca	Decapoda	Palaemonidae	0	Palaemonidae	N/A	1	0	0	7
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	9	Collector	sp	2.6
Mollusca	Gastropoda	Basommatophor	Physidae	Physella	Physella	N/A	1	Scraper	cb	8
Nematoda	0	0	0	0	Nematoda	N/A	1	0	0	n/a

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

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Version: 4
Site Name: ZEKI-134-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	A	1	Scraper	cn, cb	5.7
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	7	Scraper	cn	7.1
Arthropoda	Insecta	Coleoptera	Hydrophilidae	Helochares	Helochares	I	1	0	0	n/a
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	4	Scraper	cn	4.4
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	1	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	2	Shredder	cn, bu	9.6
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Meropelopia	Meropelopia	P	1	0	0	6.8
Arthropoda	Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	1	Filterer	cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Nilotanypus	Nilotanypus	I	2	Predator	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	6	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	P/I	56	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Potthastia	Potthastia	I	1	Collector	sp	0
Arthropoda	Insecta	Diptera	Chironomidae	Rheocricotopus	Rheocricotopus	I	1	Collector	sp	6.2
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	3	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Tribelos	Tribelos	I	1	Collector	bu	7
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	2	Filterer	cn	5.7
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	1	Collector	sw, cn	2.6
Arthropoda	Insecta	Ephemeroptera	Baetidae	Procloeon	Procloeon	I	1	Collector	0	2.3
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	3	Scraper	cn	n/a
Arthropoda	Insecta	Odonata	Coenagrionidae	Argia	Argia	I	1	Predator	cn, cb, sp	9.3
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	1	Filterer	cn	6.5
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	2	Filterer	cn	7.5
Arthropoda	Insecta	Trichoptera	Leptoceridae	Oecetis	Oecetis	I	1	Predator	cn, sp, cb	4.7
Arthropoda	Insecta	Trichoptera	Leptoceridae	Triaenodes	Triaenodes	I	1	Shredder	sw, cb	5
Arthropoda	Insecta	Trichoptera	Limnephilidae	Ironoquia	Ironoquia	I	1	Shredder	sp	4.9
Arthropoda	Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	6	Filterer	cn	4.4
Nematoda	0	0	0	0	Nematoda	N/A	1	0	0	n/a

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Prepared date: 9/19/2025 Checked date: 10/7/2025

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Version: 4
Site Name: ZEKI-134-25-QC

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Coleoptera	Elmidae	Ancyronyx	Ancyronyx	I	1	Scraper	cn, sp	7.8
Arthropoda	Insecta	Coleoptera	Elmidae	Dubiraphia	Dubiraphia	A	1	Scraper	cn, cb	5.7
Arthropoda	Insecta	Coleoptera	Elmidae	Macronychus	Macronychus	I	1	Scraper	cn	6.8
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	3	Scraper	cn	7.1
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	2	Scraper	cn	4.4
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus	Cricotopus	I	1	Shredder	cn, bu	9.6
Arthropoda	Insecta	Diptera	Chironomidae	Cricotopus/Orthocladius	Cricotopus/Orthocladius	I	1	Shredder	0	7.7
Arthropoda	Insecta	Diptera	Chironomidae	Cryptochironomus	Cryptochironomus	I	1	Predator	sp, bu	7.6
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	2	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Arthropoda	Insecta	Diptera	Chironomidae	Nilotanypus	Nilotanypus	I	2	Predator	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Orthocladius	Orthocladius	I	4	Collector	sp, bu	9.2
Arthropoda	Insecta	Diptera	Chironomidae	Parakiefferiella	Parakiefferiella	I	1	Collector	sp	2.1
Arthropoda	Insecta	Diptera	Chironomidae	Parametriocnemus	Parametriocnemus	I/P	62	Collector	sp	4.6
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	4	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Rheotanytarsus	Rheotanytarsus	I	1	Filterer	cn	7.2
Arthropoda	Insecta	Diptera	Chironomidae	Thienemanniella	Thienemanniella	I	1	Collector	sp	5.1
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	5	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	2	Filterer	cn	5.7
Arthropoda	Insecta	Ephemeroptera	Baetidae	0	Baetidae	I	1	Collector	sw, cn	2.3
Arthropoda	Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	2	Collector	sw, cn	n/a
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	11	Scraper	cn	n/a
Arthropoda	Insecta	Odonata	Calopterygidae	Calopteryx	Calopteryx	I	2	Predator	cb	8.3
Arthropoda	Insecta	Plecoptera	Chloroperlidae	0	Chloroperlidae	I	1	Predator	cn	1.6
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	4	Filterer	cn	6.5
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Hydropsyche	Hydropsyche	I	2	Filterer	cn	7.5
Arthropoda	Insecta	Trichoptera	Leptoceridae	Oecetis	Oecetis	I	2	Predator	cn, sp, cb	4.7
Arthropoda	Insecta	Trichoptera	Philopotamidae	Chimarra	Chimarra	I	4	Filterer	cn	4.4

1 Life Stage, I - Immature, P- Pupa, A - Adult, U - Undetermined; 2 Functional Feeding Group; 3 Primary habit or form of locomotion, includes bu - burrower, cn - clinger, cb - climber, sk - skater, sp - sprawler, sw - swimmer; 4 Tolerance Values, based on Hilsenhoff, modified for Maryland. An entry of "0" indicates information for the particular taxa was not available.

Project Name: Charles Countywide Biomonitoring
Project Number: 172008407.24
Prepared by: MLA Checked by: CRH
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Version: 4
Site Name: ZEKI-135-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Lumbriculida	Lumbriculidae	0	Lumbriculidae	N/A	3	Collector	bu	6.6
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	5	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	1	Scraper	cn	7.1
Arthropoda	Insecta	Coleoptera	Psephenidae	Psephenus	Psephenus	I	1	Scraper	cn	4.4
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	1	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	2	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Dicrotendipes	Dicrotendipes	I	1	Collector	bu	9
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Pseudorthocladius	Pseudorthocladius	I	1	Collector	sp	6
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	3	Filterer	cn	5.7
Arthropoda	Insecta	Diptera	Limoniidae	Pseudolimnophila	Pseudolimnophila	I	1	Predator	bu	2.8
Arthropoda	Insecta	Ephemeroptera	Leptophlebiidae	0	Leptophlebiidae	I	1	Collector	sw, cn	1.7
Arthropoda	Insecta	Plecoptera	Leuctridae	0	Leuctridae	I	6	Shredder	sp, cn	0.8
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	55	Shredder	sp, cn	3
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	10	0	sp	6
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	15	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	Pisidium	Pisidium	N/A	3	Filterer	bu	5.7

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Site Name: ZEKI-136-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Arthropoda	Insecta	Diptera	Chironomidae	Cladotanytarsus	Cladotanytarsus	I	1	Filterer	0	6.6
Arthropoda	Insecta	Diptera	Simuliidae	Simulium	Simulium	I	2	Filterer	cn	5.7
Arthropoda	Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	5	Collector	sw, cn	n/a
Arthropoda	Malacostraca	Amphipoda	0	0	Amphipoda	N/A	16	0	sp	6
Arthropoda	Malacostraca	Amphipoda	Crangonyctidae	Crangonyx	Crangonyx	N/A	1	Collector	sp	6.7
Arthropoda	Malacostraca	Amphipoda	Gammaridae	Gammarus	Gammarus	N/A	100	Shredder	sp	6.7
Arthropoda	Malacostraca	Decapoda	Cambaridae	0	Cambaridae	N/A	1	Shredder	sp	2.8
Arthropoda	Malacostraca	Isopoda	Asellidae	Caecidotea	Caecidotea	N/A	2	Collector	sp	2.6
Mollusca	Bivalvia	Veneroida	Pisidiidae	0	Sphaeriidae	N/A	1	Filterer	bu	6.5
Mollusca	Gastropoda	Basommatophora	Lymnaeidae	0	Lymnaeidae	N/A	1	Scraper	cb	6.9
Mollusca	Gastropoda	Basommatophora	Ancylidae	Ferrissia	Ferrissia	N/A	1	Scraper	cb	7

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Version: 4
Site Name: ZEKI-149-25

KCI TECHNOLOGIES

Phylum	Subphylum/ Class	Order	Family	Genus	Final ID	Note[1]	# of Org	FFG[2]	Habit[3]	Tolerance Value[4]
Annelida	Oligochaeta	Haplotaxida	Naididae	0	Naididae	N/A	3	Collector	bu	8.5
Arthropoda	Insecta	Coleoptera	Elmidae	Microcylloepus	Microcylloepus	I	2	Collector	0	4.8
Arthropoda	Insecta	Coleoptera	Elmidae	Optioservus	Optioservus	I	9	Scraper	cn	5.4
Arthropoda	Insecta	Coleoptera	Elmidae	Oulimnius	Oulimnius	A/I	19	Scraper	cn	2.7
Arthropoda	Insecta	Coleoptera	Elmidae	Stenelmis	Stenelmis	I	1	Scraper	cn	7.1
Arthropoda	Insecta	Coleoptera	Ptilodactylidae	Anchytarsus	Anchytarsus	I	16	Shredder	cn	3.1
Arthropoda	Insecta	Diptera	Ceratopogonidae	0	Ceratopogoninae	I	5	Predator	sp, bu	3.6
Arthropoda	Insecta	Diptera	Chironomidae	Ablabesmyia	Ablabesmyia	I	1	Predator	sp	8.1
Arthropoda	Insecta	Diptera	Chironomidae	Corynoneura	Corynoneura	I	1	Collector	sp	4.1
Arthropoda	Insecta	Diptera	Chironomidae	Diplocladius	Diplocladius	I	1	Collector	sp	5.9
Arthropoda	Insecta	Diptera	Chironomidae	Eukiefferiella	Eukiefferiella	I	1	Collector	sp	6.1
Arthropoda	Insecta	Diptera	Chironomidae	Labrundinia	Labrundinia	I	1	Predator	sp	6.6
Arthropoda	Insecta	Diptera	Chironomidae	Microtendipes	Microtendipes	I	1	Filterer	cn	4.9
Arthropoda	Insecta	Diptera	Chironomidae	Polypedilum	Polypedilum	I	6	Shredder	cb, cn	6.3
Arthropoda	Insecta	Diptera	Chironomidae	Stempellinella	Stempellinella	I	1	Collector	cb, sp, cn	4.2
Arthropoda	Insecta	Diptera	Chironomidae	Thienemannimyia group	Thienemannimyia group	I	2	Predator	sp	8.2
Arthropoda	Insecta	Diptera	Chironomidae	Tribelos	Tribelos	I	1	Collector	bu	7
Arthropoda	Insecta	Diptera	Chironomidae	Tvetenia	Tvetenia	I	1	Collector	sp	5.1
Arthropoda	Insecta	Diptera	Chironomidae	Zavrelimyia	Zavrelimyia	P/I	5	Predator	sp	5.3
Arthropoda	Insecta	Ephemeroptera	Baetidae	Acerpenna	Acerpenna	I	7	Collector	sw, cn	2.6
Arthropoda	Insecta	Ephemeroptera	Baetidae	Plauditus	Plauditus	I	1	Collector	sw, cn	n/a
Arthropoda	Insecta	Ephemeroptera	Ephemerellidae	Ephemerella	Ephemerella	I	8	Collector	cn, sw	2.3
Arthropoda	Insecta	Ephemeroptera	Heptageniidae	Maccaffertium	Maccaffertium	I	1	Scraper	cn	n/a
Arthropoda	Insecta	Plecoptera	Chloroperlidae	Haploperla	Haploperla	I	16	Predator	cn	1.6
Arthropoda	Insecta	Plecoptera	Leuctridae	0	Leuctridae	I	1	Shredder	sp, cn	0.8
Arthropoda	Insecta	Plecoptera	Nemouridae	Amphinemura	Amphinemura	I	4	Shredder	sp, cn	3
Arthropoda	Insecta	Plecoptera	Perlidae	0	Perlidae	I	1	Predator	cn	2.2
Arthropoda	Insecta	Plecoptera	Perlidae	Eccoptura	Eccoptura	I	1	Predator	cn	0.6
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Cheumatopsyche	Cheumatopsyche	I	4	Filterer	cn	6.5
Arthropoda	Insecta	Trichoptera	Hydropsychidae	Diplectrona	Diplectrona	I	7	Filterer	cn	2.7
Arthropoda	Insecta	Trichoptera	Leptoceridae	Triaenodes	Triaenodes	I	1	Shredder	sw, cb	5
Mollusca	Gastropoda	Lymnaeida	Planorbidae	Micromenetus	Micromenetus	N/A	1	Scraper	cb	

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Appendix C: Habitat Assessment Data

Project Name: Charles County Biomonitoring 2025
Project Number: 17200840724

		Raw Data									Calculated Value		Scaled Metrics						Scores & Rating	
Site	Subshed Area (acres)	Instream Habitat	Epifaunal Substrate	Velocity Depth Diversity	Pool Glide Eddy Quality	Embeddedness	Percent Shading	Aesthetics (Trash)	# Woody Debris/ Rootwads	Max Depth	Bank Stability	Remoteness Score	Instream Habitat	Epibenthic Substrate	Bank Stability	Shading	Remoteness	# Woody Debris/ Rootwads	PHI	PHI Rating
GILB-028-25	115	11	11	10	10	35	80	17	10	35	18	10	93.14	89.19	93.99	78.67	55.83	97.56	84.73	Minimally Degraded
GILB-030-25	53	11	11	10	9	50	45	12	10	32	16	1	100.00	94.24	89.07	45.47	3.31	100.00	72.02	Partially Degraded
MATT-005-25	378	13	10	11	12	5	90	14	8	80	5	7	92.09	75.65	50.00	91.34	36.10	78.20	70.56	Partially Degraded
MATT-037-25	2,278	4	5	6	6	40	85	18	10	28	10	17	23.76	34.89	70.71	84.56	93.06	63.77	61.79	Degraded
MATT-039-25	1,210	10	5	7	6	10	65	17	13	28	10	12	63.53	39.02	69.52	63.55	66.34	79.81	63.63	Degraded
MATT-040-25	851	2	3	2	4	100	60	17	26	40	20	18	22.74	29.69	100.00	58.94	96.72	100.00	68.01	Partially Degraded
NANJ-010-25	122	6	7	3	6	100	85	20	29	29	20	17	64.85	65.60	100.00	84.56	90.06	100.00	84.18	Minimally Degraded
NANJ-058-25	9,728	14	13	16	14	10	75	17	27	72	10	15	64.39	71.91	70.71	73.32	81.76	97.63	76.62	Partially Degraded
NANJ-070-25	563	13	15	13	13	5	75	20	10	74	9	20	88.00	100.00	66.46	73.32	100.00	79.59	84.56	Minimally Degraded
NANJ-071-25	186	2	2	3	1	30	50	20	0	24	20	20	38.33	33.80	100.00	49.95	100.00	62.58	64.11	Degraded
PAXL-079-25	256	12	12	10	10	40	85	17	13	38	19	1	90.52	89.80	97.64	84.56	3.31	97.39	77.20	Partially Degraded
PAXL-085-25	1,421	11	11	11	11	100	50	13	21	54	14	7	67.43	72.83	83.67	49.95	35.14	100.00	68.17	Partially Degraded
PRLT-098-25	22	5	5	6	6	65	90	19	4	20	7	8	76.64	65.02	59.16	91.34	42.98	98.38	72.26	Partially Degraded
PRLT-099-25	96	0	1	0	1	100	50	20	9	11	20	10	33.98	32.29	100.00	49.95	54.93	96.66	61.30	Degraded
PRMT-018-25	346	0	1	1	1	100	50	7	7	7	20	6	20.87	23.94	100.00	49.95	34.14	76.24	50.86	Severely Degraded
PRMT-114-25	115	2	5	6	3	100	0	20	1	21	20	11	43.21	54.34	100.00	0.00	57.14	70.93	54.27	Degraded
PTOB-014-25	10,688	14	12	14	14	2	65	17	18	107	8	10	63.42	65.49	61.24	63.55	54.01	69.94	62.94	Degraded
PTOB-090-25	15,232	14	14	15	13	5	25	19	9	82	3	11	59.80	74.80	35.36	26.57	58.85	39.30	49.11	Severely Degraded
WICO-117-25	37	6	6	8	6	55	80	16	11	11	3	9	76.92	67.48	35.59	78.67	50.35	100.00	68.17	Partially Degraded
ZEKI-020-25	262	14	14	5	11	100	55	20	68	26	20	17	100.00	100.00	100.00	54.42	91.57	100.00	91.00	Minimally Degraded
ZEKI-025-25	38,720	16	16	12	14	90	30	19	23	72	20	6	61.35	80.34	100.00	31.57	31.22	70.15	62.44	Degraded
ZEKI-134-25	806	10	10	11	11	65	85	16	9	59	5	7	67.68	70.71	51.48	84.56	40.34	72.57	64.56	Degraded
ZEKI-135-25	198	5	5	11	11	35	60	15	2	58	7	1	54.29	50.79	60.55	58.94	3.31	67.74	49.27	Severely Degraded
ZEKI-136-25	38,400	17	17	15	18	100	45	20	29	82	20	18	66.98	86.21	100.00	45.47	94.27	88.00	80.15	Partially Degraded
ZEKI-149-25	998	12	12	11	11	90	85	18	17	50	19	10	76.59	80.93	96.61	84.56	56.27	93.82	81.46	Minimally Degraded

Score	Narrative Rating
81-100	Minimally Degraded
66.0-80.9	Partially Degraded
51.0-65.9	Degraded
0-50.9	Severely Degraded

Appendix D: Water Quality Data

Charles County Biomonitoring 2025

Water Quality Grab Samples

Sample ID	Date	Time	Date Rec.	ANC (µeq/L)	Chloride (mg/L)	Bromide (mg/L)	Sulfate (mg/L)	DOC (mg/L)	TOC (mg/L)	TP (mg/L)	TN (mg/L)	PO4-P (mg/L)	NH3-N (mg/L)	NO2-N (mg/L)	NO3-N (mg/L)	TKN (mg/L)
GILB-028-25	4/14/2025	12:40	4/17/2025	123.1	17.67	0.00	8.31	3.55	3.61	0.028	0.444	0.009	0.014	< 0.002	0.248	0.196
GILB-030-25	4/14/2025	10:45	4/17/2025	237.6	19.59	0.00	10.21	4.79	4.96	0.091	0.866	0.039	0.037	0.002	0.552	0.311
MATT-005-25	3/31/2025	8:37	4/2/2025	477.7	47.88	0.00	7.38	6.71	6.96	0.030	1.022	0.003	0.022	0.005	0.612	0.405
MATT-037-25	3/31/2025	10:17	4/2/2025	138.3	12.35	0.00	7.91	4.63	5.74	0.030	0.289	0.003	0.012	< 0.002	0.002	0.286
MATT-039-25	3/31/2025	12:17	4/2/2025	327.4	67.27	0.00	6.96	3.81	5.76	0.028	0.395	0.003	0.015	< 0.002	0.101	0.293
MATT-040-25	3/31/2025	14:20	4/2/2025	65.3	22.31	0.00	16.11	11.51	12.47	0.046	0.562	0.006	0.016	< 0.002	0.001	0.559
NANJ-010-25	4/1/2025	15:12	4/2/2025	-74.6	5.55	0.00	9.41	46.95	47.45	0.050	1.476	0.005	0.030	0.008	< 0.003	1.472
NANJ-058-25	4/2/2025	11:13	4/3/2025	178.7	15.30	0.00	2.85	20.97	21.87	0.065	0.909	0.003	0.017	0.002	< 0.003	0.906
NANJ-070-25	4/2/2025	10:15	4/3/2025	155.0	4.85	0.00	1.73	8.08	9.54	0.033	0.388	0.002	0.012	< 0.002	0.004	0.383
NANJ-071-25	4/2/2025	13:42	4/3/2025	410.8	4.40	0.00	6.40	12.12	13.03	0.068	0.538	0.008	0.071	0.002	< 0.003	0.535
PAXL-079-25	4/14/2025	14:40	4/17/2025	126.9	12.10	0.00	9.02	5.39	5.53	0.035	0.767	0.013	0.018	< 0.002	0.507	0.259
PAXL-085-25	4/14/2025	17:00	4/17/2025	214.2	12.74	0.00	15.32	4.27	4.61	0.072	0.383	0.009	0.057	0.002	0.136	0.245
PRLT-098-25	4/22/2025	8:30	4/24/2025	156.0	9.17	0.01	9.90	7.77	8.14	0.292	0.518	0.131	0.006	< 0.002	< 0.003	0.515
PRLT-099-25	4/1/2025	13:15	4/2/2025	-24.4	7.18	0.00	8.54	20.18	21.04	0.060	0.749	0.006	0.027	0.004	< 0.003	0.747
PRMT-018-25	4/1/2025	8:08	4/2/2025	335.4	7.26	0.00	42.57	9.24	9.51	0.094	0.680	0.002	0.027	0.002	0.038	0.640
PRMT-114-25	4/1/2025	10:54	4/2/2025	724.5	24.97	0.00	6.01	8.77	9.24	0.029	0.502	0.004	0.028	0.003	0.093	0.406
PTOB-014-25	3/31/2025	16:30	4/2/2025	347.1	44.54	0.00	11.85	4.82	4.88	0.063	0.485	0.022	0.017	0.005	0.170	0.310
PTOB-090-25	4/1/2025	16:49	4/2/2025	556.4	41.18	0.00	13.76	8.08	8.34	0.163	0.944	0.043	0.197	0.031	0.250	0.663
PTOB-090-25-DUP	4/1/2025	16:49	4/2/2025	556.8	41.20	0.00	13.79	7.80	8.18	0.144	0.885	0.044	0.195	0.030	0.252	0.603
WICO-117-25	4/14/2025	9:15	4/17/2025	209.7	34.67	0.00	11.76	2.84	2.89	0.023	1.054	0.006	0.017	< 0.002	0.774	0.279
ZEKI-020-25	4/17/2025	14:00	4/18/2025	213.5	16.01	0.00	21.71	12.88	13.14	0.110	1.279	0.054	0.020	0.004	0.543	0.731
ZEKI-025-25	4/22/2025	13:00	4/24/2025	367.2	16.30	0.00	8.40	11.59	12.01	0.077	0.538	0.009	0.011	< 0.002	0.018	0.518
ZEKI-134-25	4/17/2025	8:45	4/18/2025	476.6	31.49	0.00	10.19	5.40	5.79	0.038	0.835	0.005	0.089	0.007	0.423	0.404
ZEKI-134-25-DUP	4/17/2025	8:45	4/18/2025	478.2	31.45	0.00	10.29	5.46	5.81	0.038	0.840	0.005	0.090	0.007	0.423	0.410
ZEKI-135-25	4/17/2025	12:00	4/18/2025	69.7	18.27	0.00	4.58	9.04	9.36	0.030	0.321	0.007	0.012	< 0.002	0.008	0.313
ZEKI-136-25	4/22/2025	12:00	4/24/2025	375.7	16.45	0.00	8.21	11.54	11.96	0.060	0.536	0.007	0.015	0.002	0.026	0.507
ZEKI-149-25	4/22/2025	14:50	4/24/2025	153.4	9.28	0.00	9.88	6.26	6.39	0.027	1.072	0.006	0.011	0.003	0.771	0.299

Appendix E: Quality Assurance/Quality Control

Quality Assurance/Quality Control Procedures and Results

The biological monitoring program includes chemical, physical, and biological assessments conducted throughout nine watersheds. The sampling methods used are compatible with the Design of the Biological Monitoring and Assessment Program for Charles County Maryland (DPGM, 2025) and the Quality Assurance Project Plan (QAPP) for Charles County Department of Public Works (DPGM, 2025). A summary of the Quality Assurance/Quality Control (QA/QC) procedures and results are presented in this Appendix.

A quality assurance and quality control (QA/QC) analysis was completed for the biological assessment work conducted in 2025 by KCI Technologies, Inc. and Coastal Resources, Inc. This analysis included performance characteristics of precision, accuracy, bias and completeness. Performance measures include:

- Precision (consistency) of field sampling and overall site assessments using intra-team site duplication
    - median relative percent difference (mRPD)
    - coefficient of variability (CV)
- Sensitivity of overall site assessments
    - 90% confidence interval (CI)
- Precision of taxonomic identification and enumeration
    - percent taxonomic disagreement (PTD)
    - percent difference in enumeration (PDE)
- Bias of sample sorting and subsampling
    - percent sorting efficiency (PSE)
- Completeness
    - number of valid data points obtained as a proportion of those planned

Data that do not meet performance or acceptable criteria are re-evaluated to correct any problems or investigated further to determine the reason behind the results.

Field Sampling

All field crew leaders were trained annually in MBSS Spring and Summer sampling protocols and held valid MBSS certifications. Benthic macroinvertebrate sampling was conducted only by crew members certified in MBSS benthic macroinvertebrate sampling.

All subjective scoring of physical habitat assessment parameters was completed by staff holding current MBSS Habitat Assessment certifications. The input of all habitat assessment certified team members was considered at the sampling site to reduce individual sampler bias. The field crew leader had final say in habitat scoring disagreements. Preference was given to crew members with most experience and exposure to the full gradient of conditions in Maryland's Coastal Plain streams.

Benthic macroinvertebrate sample buckets contained both internal and external labels. All chain-of-custody procedures were followed for transfer of the samples between the field and the identification lab.

Replicate (duplicate) benthic macroinvertebrate samples were collected at two sites, one per sampling team. These samples were collected within the same 75-meter stream site if similar undisturbed habitat was available for duplicate sampling. If not enough similar habitat to the

primary sample was left undisturbed in the 75-meter site, similar habitat types just upstream of the primary site were sampled and included in the duplicate sample. The QC site was selected at random to avoid any potential bias from selecting duplicate sites in the field. Duplicate samples included collection and analysis of the benthic macroinvertebrate community only. No duplicate samples or data were collected for physical habitat assessments.

Precision

Performance characteristics calculated for the consistency of field sampling and overall site assessments using intra-team site duplication were:

- Median relative percent difference (mRPD) and relative percent difference (RPD)
- Coefficient of Variability (CV)

Acceptable measurement quality objectives (MQO) are listed in Table 1 below. DNR's MBSS protocols were used for the collection and analysis of macroinvertebrate data. Results are shown for sites where a duplicate sample (i.e., sample pair) was collected and analyzed.

Table 1. Measurement Quality Objectives (QAPP, 2024)

Metric or Index	Precision	Accuracy	Completeness (%)
GPS		± 25m	100
Dissolved Oxygen		± 0.2 mg/L	≥ 85
pH		± 0.2 units	≥ 85
Temperature		± 0.15 ˚C	≥ 85
Conductivity		± 1% of value	≥ 85
Macroinvertebrate taxa			100
Metric Scores	RPD ≤ 20% CV≤ 100%		
BIBI Scores	RPD ≤ 20% CV≤ 50%		
Sorting Efficiency	SE ≥ 90%		

Both metric values and index scores were compared to MQOs to determine exceedances (Table 2). Three metrics, Percent Ephemeroptera, Number of Scraper Taxa, and Percent Climbers exceeded the MQO for mRPD. The high RPD values for Number of Scraper Taxa were due to relatively few Scraper taxa present in the samples which tend to skew RPD values upward when comparing small values to large values. For example, a sample pair with 1 vs 2 taxa yielded an RPD of 66.7, despite an absolute value difference of only one taxon. The high mRPD for the Percent Ephemeroptera metric was likely due to the variability within this metric between sites sampled in which values range from 0% to 11.2%. The high RPD values for Percent Climbers were also due to relatively few climbers present in the samples which tend to skew RPD values upward. There were four metrics scores that also exceeded the MQO, but these can be attributed to minor differences in metric values that fell across the scoring thresholds for those metrics for a single sample pair, which automatically resulted in either 25% (for 3 vs 5) or 50% (for 1 vs 3). However, the overall BIBI fell below the acceptable ranges for both mRPD and CV, suggesting good agreement and overall data quality.

Two additional metrics, EPT Taxa and Ephemeroptera Taxa, exceeded the MQO for CV only; however, this is primarily due to the fact that one sample pair had zero taxa while the other pair did not, which will inflate the value. Percent Ephemeroptera also exceeded the MQO for CV, which can also be attributed to a sample pair with zero percent Ephemeroptera.

It is important to note that these exceedances show the innate variability that is possible within a given sampling reach and throughout the sample processing and data reduction. Although all samples were collected by a certified benthic macroinvertebrate sampler, variation within a reach (primary site vs. field replicate) is likely due to slight variations in habitat availability (e.g., instream woody debris, quality of leaf packs and riffles), patchy distributions of the organisms, and sample processing and subsampling within the laboratory.

Table 2 – Individual Metric Values and Related Measures of Precision. Bold values exceed MQOs.

Site	Total Taxa	EPT Taxa	Ephem Taxa	% Intol	% Ephem	Scraper Taxa	% Climber
ZEKI-134-25	27	9	3	5.5	4.5	4.0	3.64
ZEKI-134-25-QC	26	7	2	11.2	11.2	6.0	7.20
PTOB-090-25	14	0	0	2.3	0.0	1.0	7.03
PTOB-090-25-QC	11	0	0	1.7	0.0	2.0	5.00
Median RPD	13.9	12.5	0.0	16.9	**42.3**	**53.3**	**49.8**
CV	42.0	**117.3**	**120.0**	84.2	**134.5**	68.2	29.9

Table 3 – Individual Metric Scores and IBI Scores. Bold values exceed MQOs.

Site	Total Taxa	EPT Taxa	Ephem Taxa	% Intol	% Ephem	Scraper Taxa	% Climber	BIBI	Rating
ZEKI-134-25	5	5	5	1	3	5	3	3.86	Fair
ZEKI-134-25-QC	5	5	5	3	5	5	3	4.43	Good
PTOB-090-25	3	1	1	1	1	3	3	1.86	Very Poor
PTOB-090-25-QC	1	1	1	1	1	5	3	1.86	Very Poor
Median RPD	**50.0**	0.0	0.0	**50.0**	**25.0**	**25.0**	0.0	13.9	-
CV	54.7	77.0	77.0	66.7	76.6	22.2	0.0	44.6	-

Laboratory Sorting and Subsampling

All sorting was completed following the SOPs described in the QAPP. A total of 19 samples underwent quality control procedures for sorting, exceeding the ten percent requirement. Average percent sorting efficiency was 100% (n=19). All samples sorted by laboratory personnel in training (i.e., not consistently achieving >90% sorting efficiency) were checked, while a minimum of ten percent of samples sorted by experienced laboratory personnel were also checked. This procedure ensures that all sorted samples either initially exceed the MQO of >90% for PSE, or will exceed the MQO following QC checks by experienced sorters.

Taxonomic Identification and Enumeration

Two samples (MATT-039-25and NANJ-010-25) were randomly selected for QC identification and enumeration by an independent lab. All samples were sorted and subsampled according to MBSS protocols by individuals who held valid MBSS lab certifications. Initial identification of the

samples was performed by EcoAnalysts, Inc. The QC reidentifications were performed by by Mike Cole (Cole Ecological, Inc.). Specimens were identified to the genus level or the lowest taxonomic unit possible when the genus could not definitively be identified. In particular, some Chironomidae individuals and several non-insect taxa that are commonly not identifiable to genus were identified to subfamily, tribe, or family level following current MBSS laboratory procedures (DNR, 2024).

Precision

Measures of precision, specifically percent difference in enumeration (PDE) and percent taxonomic disagreement (PTD), were calculated to determine the consistency in identifications made for the selected samples.

The PDE compares final specimen counts made by each taxonomist, whereas PTD compares the extent of agreement in final specimen identifications between the two taxonomists. The MQOs for a sample recommended by the EPA for PDE and PTD must be equal to or less than 5% and 15%, respectively (Hill and Pieper, 2011). Results for the taxonomic comparison and resulting values for PDE and PTD for both samples are found in Table 3 and

Table 4. Dashes shown in the '# of agreements' column signify hierarchical disagreements, which counts as an agreement for PTD calculations. For example, if the primary laboratory identified a specimen as Ceratopogonidae and the secondary laboratory identified the same specimen as *Bezzia/Palpomyia* (a genus within the family Ceratopogonidae) this would be considered only a hierarchical disagreement.

For both reidentified samples, the values for PDE and PTD were within the recommended threshold values of 5% and 15%, respectively, indicating consistent taxonomic agreement between labs. The average PDE for all samples was 3.6% with a range between 2.1% and 5.0%. The average PTD was 6.2% with a range between 1.4% and 11.0%.

Table 3 - Taxonomic Identification and Enumeration Results: MATT-039-25

Order	Family	Tribe	Final ID	Taxonomist 1	Taxonomist 2	# of agreements
Sphaeriida	Sphaeriidae		Sphaeriidae	1	1	1
Isopoda	Asellidae		Caecidotea sp.	2	2	2
Amphipoda	Crangonyctidae		Synurella sp.	1	1	1
Tubificida	Naididae		Naididae	1	0	1
			TUBIFICIDAE	0	1	-
Haplotaxida	Enchytraeidae		Enchytraeidae	1	1	1
Plecoptera	Nemouridae		Amphinemura sp.	106	107	106
	Nemouridae		Nemouridae	0	1	0
	Leuctridae		Leuctridae	5	0	5
			LEUCTRA SP.	0	7	-
	Capniidae		Capniidae	1	0	0
Trichoptera	Rhyacophilidae		Rhyacophila sp.	0	1	0
	Uenoidae		Neophylax sp.	1	1	1
Diptera	Limoniidae		Gonomyia/Idiocera/Ellipteroides	1	2	1
	Chironomidae	Metriocnemini	Bryophaenocladius sp.	1	0	0
	Chironomidae	Metriocnemini	Gymnometriocnemus sp.	0	1	0
	Chironomidae	Metriocnemini	Hydrobaenus sp.	8	8	8
	Chironomidae		Corynoneura sp.	1	1	1
	Chironomidae	Orthocladiini	Orthocladius sp.	1	1	1
	Ceratopogonidae		Ceratopogoninae	3	3	3
	Simuliidae	Simuliini	Stegopterna sp.	5	6	5
			Total	139	145	137
			PDE			2.1
			PTD			1.4

Table 4 - Taxonomic Identification and Enumeration Results: NANJ-010-25

Order	Family	Tribe	Final ID	Taxonomist 1	Taxonomist 2	# of agreements
Isopoda	Asellidae		Caecidotea sp.	58	57	57
Amphipoda	Crangonyctidae		Crangonyx sp.	51	39	39
Lumbriculida	Lumbriculidae		Lumbriculidae	3	3	3
Trichoptera	Polycentropodidae		Polycentropus sp.	7	6	6
Diptera	Chironomidae	Metriocnemini	Bryophaenocladius sp.	1	0	0
	Chironomidae	Metriocnemini	Gymnometriocnemus sp.	0	1	0
	Chironomidae	Chironomini	Polypedilum sp.	3	3	3
	Chironomidae	Chironomini	Tribelos sp.	2	2	2
	Chironomidae	Chironomini	Omisus sp.	4	4	4
	Culicidae		Aedes sp.	7	8	7
			Total	136	123	121
			PDE			5.0
			PTD			11.0

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