

Maryland Chesapeake Bay Tributary Water Quality Monitoring Program – 2024

Metadata:

Identification_Information:

Citation:

Citation_Information:

Originator: Maryland Department of Natural Resources (MD DNR), Resource Assessment Service

Publication_Date: 20250508

Title: MD DNR Chesapeake Bay Tributary Water Quality Monitoring Program 2024

Geospatial_Data_Presentation_Form: Spatial dataset

Online_Linkage:[<https://www.chesapeakebay.net/what/data>]

Description:

Abstract:

One of the main goals of the Chesapeake Bay restoration is to reduce the impacts of excess nutrients on the Bay and its tributaries. In accordance with this goal, the Chesapeake Bay Program jurisdictions have agreed to reduce nitrogen, phosphorus, and sediment pollution to the Bay. The Maryland Chesapeake Bay Tributary Water Quality Monitoring Program evaluates the physical/chemical component of water quality at sixty-eight tributary stations. By measuring levels of nutrients and closely related habitat characteristics such as dissolved oxygen and water clarity, the monitoring program provides some of the most direct linkages to management actions that are reducing nutrient loads to the Bay.

Samples are collected monthly at each tributary station with the following exceptions:

1) Samples are not routinely collected at stations EE3.3 and XAK7810 in January and February, and

2) For logistical reasons, station LE2.3 is routinely sampled as part of the Chesapeake Bay mainstem monitoring project. Thus, station LE2.3 follows the mainstem sampling schedule and is sampled twice monthly during June, July, and August. The second sampling in July at station LE2.3 includes field readings only; no samples are collected for laboratory analyses.

The number of stations sampled by the MD DNR Chesapeake Bay Tributary Water Quality Monitoring Program has fluctuated through the years. Due to changes in funding availability and/or information needs, sampling at some stations has been interrupted or discontinued over the course of the program as follows:

1) Tributary water quality monitoring project sampling ceased in January 2014 at stations BXK0031, CCM0069, MNK0146, XDJ9007, POK0087, XAK7810, TRQ0088, TRQ0146, TRQ0203, TRQ0224, WIW0141 and XCI4078. Sampling was reinstated at station WIW0141

in July 2014, and resumed at BXK0031, CCM0069, MNK0146, XDJ9007, POK0087, XAK7810, TRQ0088, TRQ0146 and XCI4078 in January 2020.

2) In January 2017, sampling was discontinued at station XHH4742.

Purpose:

The Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program is part of a cooperative effort between the Federal government and State and local governments in the Chesapeake Bay watershed to assess the status and trends of nutrient and sediment concentrations in Maryland's Chesapeake Bay mainstem and its tidal tributaries.

The information is integrated with data from other Bay water quality stations and living resources monitoring projects and used to understand linkages, temporal variation and long-term trends.

Water quality data are also used to refine, calibrate and validate Chesapeake Bay ecological models. The models are used to develop and assess water quality criteria with the goal of removing the Chesapeake Bay and its tidal rivers from the list of impaired waters.

Supplemental Information:

The target audiences for this information include Resource Managers, Technical/Scientific Users, Government, Educators, Students and General Public.

Data users who desire very detailed information about Water Quality Monitoring data definition, sampling procedures and data processing are encouraged to refer to four documents listed below. The first three documents may be obtained from The Chesapeake Bay Program Office. The fourth document is available via The Maryland Department of Natural Resources "Eyes on the Bay" web site [<https://eyesonthebay.dnr.maryland.gov/>].

Water Quality Database - Database Design and Data Dictionary, Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/cbwqdb2004_rb.pdf]. An updated version of the data dictionary is a Chesapeake Bay Program work in progress.

Guide to Using Chesapeake Bay Program Water Quality Monitoring Data, EPA 903-R-12-001, February 2012, CBP/TRS 304-12 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/wq_data_userguide_10feb12_mod.pdf].

Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs. Chesapeake Bay Program, May 2017, CBP/TRS-319-17 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Methods_Manual.pdf].

The Quality Assurance Project Plan for the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component, May 2023

[https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MdDNR_MTQAPP_May2023.pdf].

Time_Period_of_Content:

Time_Period_Information:

Range_of_Dates/Times:

Beginning_Date: 20240103

Ending_Date: 20241211

Currentness_Reference: Ground Condition

Status:

Progress: Complete

Maintenance_and_Update_Frequency: As needed

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -79.4938

East_Bounding_Coordinate: -75.0405

North_Bounding_Coordinate: 39.7425

South_Bounding_Coordinate: 37.8713

Keywords:

Theme:

Theme_Keyword_Thesaurus: Global Change Master Directory (GCMD). 2025.

GCMD Keywords, Version 21, Greenbelt, MD: Earth Science Data and Information System, Earth Science Projects Division, Goddard Space Flight Center (GSFC), National Aeronautics and Space Administration (NASA). URL (GCMD Keyword Forum Page):

[<https://forum.earthdata.nasa.gov/app.php/tag/GCMD+Keywords>].

Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOSYSTEMS>MARINE ECOSYSTEMS>ESTUARY

Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOLOGICAL DYNAMICS>ECOSYSTEM FUNCTIONS>NUTRIENT CYCLING

Theme_Keyword: EARTH SCIENCE>BIOSPHERE>ECOLOGICAL DYNAMICS>ECOSYSTEM FUNCTIONS>PRIMARY PRODUCTION

Theme_Keyword: EARTH SCIENCE>OCEANS>SALINITY/DENSITY>PYCNOCLINE

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>SURFACE WATER>SURFACE WATER FEATURES>RIVERS/STREAMS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>SURFACE WATER>SURFACE WATER PROCESSES/MEASUREMENTS>WATER DEPTH

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>ALKALINITY

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>BIOCHEMICAL OXYGEN DEMAND (BOD)

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>CHLOROPHYLL CONCENTRATIONS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>CONDUCTIVITY

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>GASES>DISSOLVED OXYGEN

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>EUTROPHICATION

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>LIGHT TRANSMISSION

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>NITROGEN

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>NITROGEN COMPOUNDS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>NITROGEN COMPOUNDS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>pH

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>NUTRIENTS>PHOSPHOROUS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>PHOSPHOROUS COMPOUNDS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>SALINE CONCENTRATION

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>SOLIDS>SUSPENDED SOLIDS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>SOLIDS>TOTAL DISSOLVED SOLIDS

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>TURBIDITY

Theme_Keyword: EARTH SCIENCE>TERRESTRIAL HYDROSPHERE>WATER QUALITY/WATER CHEMISTRY>WATER CHARACTERISTICS>WATER TEMPERATURE

Place:

Place_Keyword_Thesaurus: Producer Defined

Place_Keyword: Chesapeake Bay

Place_Keyword: Maryland

Place_Keyword: Monitoring Segment

Place_Keyword: Tidal Tributaries

Place_Keyword: Back River

Place_Keyword: Big Annemessex River

Place_Keyword: Bohemia River

Place_Keyword: Bush River

Place_Keyword: C&D Canal

Place_Keyword: Chester River

Place_Keyword: Choptank River

Place_Keyword: Eastern Bay

Place_Keyword: Elk River
Place_Keyword: Fishing Bay
Place_Keyword: Gunpowder River
Place_Keyword: Little Choptank River
Place_Keyword: Magothy River
Place_Keyword: Middle River
Place_Keyword: Manokin River
Place_Keyword: Nanticoke River
Place_Keyword: Northeast River
Place_Keyword: Patapsco River
Place_Keyword: Patuxent River
Place_Keyword: Pocomoke River
Place_Keyword: Pocomoke Sound
Place_Keyword: Potoc River
Place_Keyword: Rhode River
Place_Keyword: Sassafras River
Place_Keyword: Severn River
Place_Keyword: South River
Place_Keyword: Susquehanna River
Place_Keyword: Tangier Sound
Place_Keyword: West River
Place_Keyword: Wicomico River

Temporal:

Temporal_Keyword_Thesaurus: USGS Thesaurus
Temporal_Keyword: autumn
Temporal_Keyword: spring (season)
Temporal_Keyword: summer
Temporal_Keyword: winter

Access_Constraints: None

Use_Constraints: Acknowledgement of the MD Department of Natural Resources, Resource Assessment Service as a data source would be appreciated in products developed from these data. Please use the following citation: Maryland Department of Natural Resources, Resource Assessment Service. Eyes on the Bay.

URL: [<https://eyesonthebay.dnr.maryland.gov/>].

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Renee Karrh

Contact_Position: Program Manager

Contact_Address:

Address_Type: mailing and physical

Address: 580 Taylor Avenue, C2

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: USA

Contact_Voice_Telephone: 410.260.8630

Contact_Electronic_Mail_Address: renee.karrh_nospam_@maryland.gov[Remove_nospam_ for valid email address]

Browse_Graphic:

Browse_Graphic_File_Name: MDDNR Tributaries Monitoring Project 2024 Station Map [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/metadata/MdDNR_TribsStns2024.pdf].

Browse_Graphic_File_Description: Map of sixty-eight, year 2024, Maryland Chesapeake Bay tributary water quality monitoring sites.

Browse_Graphic_File_Type: PDF

Data_Set_Credit:

Maryland Department of Natural Resources (MDDNR) Resource Assessment Service (RAS) staff collected the majority of samples and processed the data. The Nutrient Analytical Services Laboratory (NASL) at the University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory analyzed chlorophyll, nutrient, and suspended solids samples. The Maryland Department of Health (MDH) analyzed biological oxygen demand, turbidity, and alkalinity samples for Potomac River sites.

The project was made possible with funding provided by The State of Maryland.

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

QUALITY ASSURANCE/QUALITY CONTROL

Maryland Department of Natural Resources followed specific procedures to ensure that the Tributary component of the Chesapeake Bay Water Quality Monitoring Program design was properly implemented and managed with sufficient accuracy, precision, and detection limits. Accuracy (closeness to the true value) of collected data was controlled and assured by proper use, calibration and maintenance of both field and laboratory equipment for the measurement of physical and chemical parameters.

The procedures used to control and assure the accuracy of field measurements involved the calibration of field instruments, the verification of calibrations, and equipment maintenance. Most of the details of how data acquired with YSI sondes and Hydrolab sondes were quality assured and quality controlled are described in the process description elements in the Lineage portion of this metadata record.

Daily quality control checks which included the running of blanks and standards were used to control and assure laboratory accuracy.

Accuracy of Chesapeake Biological Laboratory, Nutrient Analytical Services Laboratory (CBL NASL) results was also assessed through DNR's participation in the Chesapeake Bay Coordinated Split Sample Program (CSSP) a split sampling program in which five laboratories involved in Chesapeake Bay monitoring analyze the coordinated split samples. CSSP was

established in June 1989 to establish a measure of comparability between sampling and analytical operations for water quality monitoring throughout the Chesapeake Bay and its tributaries. DNR followed the protocols in the Chesapeake Bay Coordinated Split Sample Program Implementation Guidelines (EPA 1991) and its revisions. Split samples were collected quarterly. Results were analyzed by appropriate statistical methods to determine if results differed significantly among labs. If a difference occurred, discussions began regarding techniques and potential methods changes to resolve discrepancies.

ADDITIONAL COMMENTS

In September 2021, the Baltimore Gas and Electric company began work rebuilding a transmission line that runs across the Bush River in Harford County, Maryland. The project involves the replacement of three double circuit steel lattice towers (one on each shore and one located within Bush River) and four single circuit wood H-frames (two on each side of the river) with nine steel galvanized monopoles. MD DNR tributary monitoring station WT1.1 is located on the Bush River within 1000ft downstream of the project, and water quality at that station may be impacted by the ongoing construction activities. This work was completed on or before April 2023.

January 2024: A pycnocline was not detected at stations ET5.2, LE2.2, and EE3.2. Above pycnocline and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. The surface conductivity at stations RET2.4 and LE2.2 changed during sampling. Ice was visible along the shoreline at stations WXT0001, TF1.4 and TF1.3. Road salt left over from the snowstorm on January 15 was also evident at station TF1.3. The Secchi disk depth measurement at station TF1.3 was greater than the total depth.

February 2024: Samples at stations EE3.2 and RET2.4 were collected at 1/3 and 2/3 depths due to the absence of a pycnocline. Foggy conditions were noted at stations RET2.4 and RET2.2. The surface of the water at station RET2.2 was reported to be foamy. Tree debris was observed at stations TF2.2 and TF2.4.

March 2024: Due to the absence of a pycnocline at stations EE1.1, EE2.1, EE3.2, and ET5.2, above and below pycnocline samples were collected from 1/3 and 2/3 of total station water column depths. Specific conductance changed during sampling at station LE2.2. The Secchi disk depth measurement at station TF1.3 was greater than the total depth.

April 2024: Stations EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. The bottom sample and below-pycnocline samples at station LE2.2 were taken at the same depth. Lots of pollen was visible on the surface of the water at stations POK0087 and TF1.4.

May 2024: Conditions at station RET2.4 were recorded as being 100% fog. A pycnocline was not detected at stations EE2.1, ET5.2, and RET2.4. Above pycnocline and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively. Dissolved oxygen readings at station LE2.2 were double-checked with a second meter. Specific conductivity was flagged at stations MAT0078 and PIS0033, but data appear normal. The Secchi disk depth measurement at station TF1.3 was greater than the total depth.

June 2024: Stations EE3.1, EE3.2, ET5.2 and RET2.4 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. Morning showers occurred at stations WT7.1 and WT6.1.

July 2024: Due to the absence of a pycnocline, samples were collected at 1/3 and 2/3 depths at the following stations: EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, and ET5.2. Very hot and humid conditions were reported at stations ET10.1, BXK0031, and POK0087. The dissolved oxygen (DO) values were double-checked and deemed valid at the following stations: station ET3.1 at 5.0 meters of depth, station TF2.2 at 4.6 meters of depth, and at all depths at station ET8.1. The meter was unable to be post-calibrated for DO for the following stations: LE1.2, LE1.3, and LE14, but the data appear normal.

August 2024: Stations EE1.1, EE3.1, EE3.2, ET4.2, and ET5.2 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline. Bottom readings were double-checked at stations TF2.3 and ET1.1.

September 2024: Foggy conditions were noted at stations ET2.2, ET2.3, and ET3.1. A pycnocline was not detected at stations EE2.1, ET5.2, and RET2.4; therefore, samples at these stations were collected at 1/3 and 2/3 depths. Dolphins were seen on station at XCI4078. The dissolved oxygen readings at EE2.2 and at 2.0 meters at MAT0016 were double-checked.

October 2024: Stations EE2.1, EE3.1, ET4.2, and ET5.2 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline.

November 2024: A pycnocline was not detected at stations EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, RET2.4, and WT5.1. Above and below pycnocline samples at these stations were collected at 1/3 and 2/3 depths, respectively.

December 2024: Dense fog was reported at stations XCI4078, WT4.1, XAK7810, WT2.1, WT3.1, EE3.0, EE3.3, ET 5.1, ET6.2, ET8.1, ET9.1, and WT1.1. Stations EE1.1, EE2.1, EE3.1, EE3.2, ET4.2, ET5.2, and LE2.2 were sampled at 1/3 and 2/3 depths due to the absence of a pycnocline.

Logical Consistency Report:

For logistical reasons, station LE2.3, a Potomac River water quality sampling station, is routinely sampled during Chesapeake Bay mainstem sampling cruises.

Tributaries monitoring project boat stations are sampled using small boats for most of the year. The larger mainstem sampling vessel is used when weather and safety are concerned. One or more of the following tributaries project stations may be sampled using the larger vessel during December, January and February surveys: EE1.1, EE2.2, EE2.1, ET4.2, and WT5.1.

Enhanced safety protocols and social distancing guidelines adopted during the COVID-19 pandemic required the Potomac River and Patuxent River monitoring to be conducted by two separate boat crews beginning with the June 2020 cruises. On the Potomac cruises, these protocols resulted in sample filtration at stations MAT0016, TF2.3, TF2.2, TF2.1, and XFB1986

being done with equipment that was used for all programs instead of the dedicated Potomac equipment. In addition, the holding times for all Potomac samples increased. In April 2022, sampling on the Potomac River returned to using just one boat. Sampling on the Patuxent River continued to use two boats throughout 2022 and 2023.

Additional comments:

January 2024: The above-pycnocline sample was taken at 0.5 meters depth at station EE3.1. A duplicate bottom sample was taken at station ET3.1. At station EE2.1 the surface and above-pycnocline samples were both taken from the same bottle.

February 2024: At station EE2.1 the bottom sample and the below-pycnocline sample were taken at the same depth, but from different bottles. The above-pycnocline sample from station LE2.2 should have been taken at 2.0 meters depth.

March 2024: The bottom reading at station ET4.1 should have been taken at 5.2 meters depth, and at station ET6.1 should have been taken at 3.9 meters depth. The surface and above-pycnocline samples at station ET4.2 were taken at the same depth.

April 2024: The bottom reading and bottom sample from station ET6.1 should have been collected at 4.2m depth. The air temperature values recorded at stations PIS0033 and MAT0078 were estimated from the Oxon Hill weather station.

May 2024: At station TRQ0088 the sample was collected from the boat ramp. The water sample collected at station CCM0069 was processed at the Vienna Boat Ramp in Vienna, Maryland.

June 2024: The bottom reading at station XCI4078 should have been taken at 2.7 meters depth.

July 2024: The above-pycnocline sample at station WT5.1 should have been at 10.0 meters.

August 2024: The above-pycnocline sample at station LE2.2 should have been taken at 5.0 meters.

September 2024: Boats were blocking station TF2.4, so sampling was conducted under the powerlines.

November 2024: Station WIW0141 was sampled off the wall. The sample collected at station TF1.0 was filtered at station TF1.2.

December 2024: The above pycnocline sample taken at station WT5.1 should have been at 0.5 meters, and the bottom sample taken at station ET10.1 should have been at 5.6 meters. Station TRQ0088 was sampled from the ramp.

There were no known Logical consistency issues in October 2024.

Completeness_Report:

Biological Oxygen Demand (BOD), turbidity and alkalinity samples were collected at a subset of Potomac River Tributaries project stations: MAT0016, MAT0078, PIS0033, RET2.4, RET2.2, RET2.1, TF2.4, TF2.3, TF2.2, TF2.1 and XFB1986. When the Monday following Biological Oxygen Demand sample collection was a holiday, samples were not collected. BOD samples were discontinued in November 2023.

Tributary samples are not routinely collected at stations EE3.3 and XAK7810 during January and February.

The second sampling in July at station LE2.3 includes readings only; no samples are collected.

ADDITIONAL COMMENTS

January 2024: No LI-COR readings were collected from stations LE1.2, LE1.3, or LE1.4.

March 2024: Due to rough conditions LI-COR readings were not taken at stations RET1.1, LE1.1, LE1.2, or LE1.3. A bottom sample was not collected at station ET6.1. No Volatile Suspended Solid (VSS) sample was collected at station TF1.5.

April 2024: Total depth was not recorded at station WIW0141, as sampling was conducted from the ferry.

May 2024: The meter used at stations TF1.0, TF1.2, TF1.3, and TF1.4 failed post-calibrated for specific conductance; following QA/QC protocols the specific conductance data for these stations were deleted. Total depth was not recorded at station WIW0141, as sampling was conducted from the ferry.

June 2024: Because station WIW0141 was sampled from the ferry, total depth was not measured.

July 2024: Secchi disk depth was not recorded at station XCI4078. Because station WIW0141 was sampled from the ferry, total depth was not measured. Wave height was not recorded at station WT8.2. The meter used at stations ET1.1, ET2.1, ET2.2, and ET2.3 was unable to be post-calibrated for specific conductance; following QA/QC protocols the specific conductance data for these stations were censored.

August 2024: Station WIW0141 was sampled from the ferry and total depth, wind direction, wind velocity, and wave height were not recorded. Station WXT0001 was not sampled because the park was closed. Secchi disk depth was not recorded at station ET5.2.

September 2024: Sea conditions were too rough for LI-COR measurements to be taken at stations LE1.1, LE1.3, LE1.4, and RET1.1. Wind direction was not recorded at TF1.3.

October 2024: Because station WIW0141 was sampled from the ferry, total depth was not measured. Secchi disk depth was not recorded at station ET10.1. Due to rough conditions

EE3.2 was not sampled. Due to a broken instrument, LI-COR measurements were not able to be taken at stations LE1.2, LE1.3, and LE1.4.

November 2024: Due to instrument malfunction, LI-COR measurements were not taken at stations LE1.2, LE1.3, and LE1.4. Secchi disk depth was not recorded at station TF1.5.

December 2024: LI-COR measurements were not taken at station LE1.1 due to rough conditions. It was also too rough to sample station ET1.1. At station BXK0031 wave height, Secchi disk depth, wind direction, wind velocity, and total depth were not recorded.

Lineage:

Process_Step:

Process_Description:

SONDE CALIBRATION and POST-CALIBRATION

The Yellow Springs Instrument (YSI) data sondes and HydroLab multi-parameter sondes were maintained and calibrated before and after each cruise in accordance with manufacturer's recommendations. During 2024, YSI series 6820 V2, YSI EXO1, YSI EXO2, Hydrolab series 5 and HL4 sondes were deployed. Field sheet dissolved oxygen method and equipment-set unit number values were used to track sondes used for station water quality measurements.

SONDE PROFILE SAMPLING PROTOCOLS

A profile of temperature, specific conductance, dissolved oxygen, and pH was obtained from the water column at 0.5 m, 1.0 m, 2.0 m and 3.0 m depth intervals below the surface. Thereafter readings were taken at 2.0 m intervals and at the bottom. Tributary bottom equals total depth minus one meter (not rounded). If the change in dissolved oxygen exceeded 1.0 mg/L or if the change in specific conductance equaled or exceeded 1,000 microsiemens/cm over any 2.0 m interval, readings were taken at 1.0 m intervals between these two readings. For total depths less than or equal to 10.0 m, readings were taken at 1.0 m intervals.

GRAB SAMPLING DEPTH PROTOCOLS

At stations where two depths were sampled, collections were taken at 0.5 m below the surface, and 1.0 m above the bottom. If the station total depth was equal to 1.5 m, the bottom sample was also collected at 0.5 m. Great caution was exercised when taking bottom samples; if the bottom was disturbed and bottom sediments appeared to have been included, the sample was dumped out and collected after the sediments had settled. Alternately, the sample was collected slightly higher in the water column and the new bottom sample depth was noted.

At stations where 4 depths were sampled and a pycnocline existed, collections were taken at 0.5 m below the surface, 1.5 m above the upper boundary of the pycnocline, 1.5 m below the lower boundary of the pycnocline, and 1 m above the bottom.

At stations where 4 depths were sampled and there was no discernable pycnocline, samples were taken at 0.5 m below the surface, at the closest profile depth one third the distance from the surface to the bottom, at the closest profile depth two thirds the distance from the surface to the bottom, and 1 m above the bottom.

Note that six Patuxent River stations, at which samples are also collected from four depths, use a different fixed-depth protocol for sampling mid-water depths. At station TF1.5 and RET1.1, samples are collected at 3 m and 6 m. Mid-water-column samples at stations LE1.1 and LE1.4 are collected at 3 m and 9 m. Samples are collected at 3 m and 12 m depths at stations LE1.2 and LE1.3.

LIGHT ATTENUATION SENSOR CALIBRATION

Once every two years, per LI-COR Bioscientific recommendations, the ambient and underwater sensors (used to measure Photosynthetic Active Radiation (PAR)) were factory re-calibrated. Upon return from the factory, updated, sensor specific, correction values were entered into the displays before the equipment was deployed. A LI-COR equipment tracking maintenance log was used to provide a permanent record of all re-calibrations, battery replacements, lowering-line checks and equipment repairs.

LIGHT ATTENUATION SAMPLING PROTOCOLS

Vertical profiles of light penetration were obtained. An initial reading with the underwater sensor just below the surface of the water (0.1 m) was followed by measurements at either 0.25 m or 0.5 m intervals until a value less than ten percent (10 %) of the surface reading (0.1 m) was attained.

SECCHI DEPTH

Water transparency was determined, to the nearest 0.1 m using a 20 cm standard Secchi disk lowered into the water column with a calibrated rope. Observations were made on the shady side of the sampling location.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Kristen Heyer

Contact_Position: Manager, Water Quality Monitoring

Contact_Address:

Address_Type: mailing and physical

Address: 1919 Lincoln Drive

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: USA

Contact_Voice_Telephone: 410.263.3369

Contact_Electronic_Mail_Address: kristen.heyer_nospam_@maryland.gov[Remove
nospam for valid email address]

Process_Step:

Process_Description:

LABORATORY ANALYSIS - CBL

University of Maryland Center for Environmental Science (UMCES) Chesapeake Biological Laboratory (CBL), Nutrient Analytical Services Laboratory (NASL) analyzed total dissolved nitrogen, particulate nitrogen, nitrite, nitrite + nitrate, ammonium, total dissolved phosphorus, particulate phosphorus, orthophosphate, dissolved organic carbon, particulate carbon, total suspended solids, and volatile suspended solids.

The NASL began performing chlorophyll analyses in the year 2009. Prior to 2009, chlorophyll analyses were performed by the Maryland Department of Health and Mental Hygiene.

Further information about laboratory analytical procedures may be obtained from the "Process_Contact".

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Jerry (Jerome) Frank

Contact_Position: Manager, Nutrient Analytical Services Laboratory

Contact_Address:

Address_Type: mailing and physical

Address: University of Maryland Center for Environmental Science, Chesapeake Biological Laboratory, 146 Williams Street, P.O. Box 38

City: Solomons

State_or_Province: Maryland

Postal_Code: 20688

Country: USA

Contact_Voice_Telephone: 410.326.7252

Contact_Electronic_Mail_Address: frank_nospam_@umces.edu[Remove_nospam_for valid email address]

Process_Step:

Process_Description:

VERIFICATION AND DATA MANAGEMENT:

Each month DNR Tawes Office and Field Office personnel conducted data QA/QC procedures. All of the water quality calibration "grab" sample data were plotted. Outliers and anomalous values were thoroughly researched. Staff compared unusual values to historic values from the site and values from nearby sites. Weather events were considered, event logs were reviewed and CBL analytical laboratory staff and DNR field staff members were consulted regarding possible legitimate causes for outlying values. In cases where values were not considered to be legitimate, they were masked from the published dataset with the approval of the field staff and the Quality Assurance Officer.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service

Contact_Position: Program Chief, Water Quality Informatics

Contact_Address:

Address_Type: mailing and physical

Address: 580 Taylor Avenue, D2

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: USA

Contact_Voice_Telephone: 410.260.8630

Contact_Electronic_Mail_Address: mark.trice_nospam_@maryland.gov [Remove _nospam_ for valid email address]

Process_Step:

Process_Description:

MDH DES ECL LABORATORY ANALYSIS

Maryland Department of Health, Division of Environmental Sciences, Environmental Chemistry Laboratory, Baltimore, MD, analyzed biological oxygen demand, total alkalinity, and turbidity for Potomac River stations.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Lara Phillips

Contact_Position: Supervisor, Inorganics Laboratory

Contact_Address:

Address_Type: mailing and physical

Address: 1770 Ashland Ave.

City: Baltimore

State_or_Province: Maryland

Postal_Code: 21205

Country: USA

Contact_Voice_Telephone: 443.681.3863

Contact_Electronic_Mail_Address: lara.johnson_nospam_@maryland.gov [Remove _nospam_ for valid email address]

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference: Back River, Big Annemessex River, Bohemia River, Bush River, C&D Canal, Chesapeake Bay, Chester River, Choptank River, Corsica River, Eastern Bay, Elk River, Fishing Bay, Gunpowder River, Little Choptank River, Magothy River, Manokin River, Middle River, Nanticoke River, Northeast River, Patapsco River, Potomac River, Patuxent River, Pocomoke River, Pocomoke Sound, Rhode River, Sassafras River, Severn River, South River, Tangier Sound, West River and Wicomico River.

Direct_Spatial_Reference_Method: Point

Spatial_Reference_Information:

Horizontal_Coordinate_System_Definition:

Geographic:

Latitude_Resolution: 0.0001

Longitude_Resolution: 0.0001

Geographic_Coordinate_Units: Decimal degrees

Geodetic_Model:

Horizontal_Datum_Name: North American Datum of 1983

Ellipsoid_Name: Geodetic Reference System 80

Semi-major_Axis: 6378137

Denominator_of_Flattening_Ratio: 298.257

Entity_and_Attribute_Information:

Overview_Description:

Entity_and_Attribute_Overview:

This metadata record is a description of the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component Database for the Maryland Chesapeake Bay Tributaries. Project data are an aggregation of data collected at sixty-eight Maryland tributaries stations during 2023.

The data are contained in five related entities (tables): *Light_Attenuation_Data*, *Monitoring_Event_Data*, *Optical_Density_Data*, *Station_Information*, and *Water_Quality_Data*. Each table contains attributes (fields).

The entity *Light_Attenuation_Data* is comprised of the attributes: Agency, BiasPC, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, TotalDepth, Unit, and UpperPycnocline.

The entity *Monitoring_Event_Data* is comprised of the attributes: Agency, AirTemp, CBSeg2003, CBSegmentShed2009, CloudCover, Cruise, Details, EventId, FieldActivityEventType, FieldActivityRemark, FieldActivitySiteTypeCodeDescription, FIPS, FlowStage, GaugeHeight, HUC8, HUC12, Latitude, Longitude, LowerPycnocline, MonitoringStation, PrecipType, Pressure, Program, Project, SampleDate, SampleTime, Source, Station, TideStage, TierLevel, TotalDepth, UpperPycnocline, WaveHeight, WindDirection, and WindSpeed.

The entity *Optical_Density* is comprised of the attributes: Agency, BiasPC, CBSeg2003, CBSegmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, TotalDepth, Unit, and UpperPycnocline.

The entity *Station_Information* is comprised of the attributes: CBSeg2003, CBSeg2003Description, CBSegmentShed2009, CBSegmentShed2009Description, CountyCity,

FallLine, FIPS, HUC12, HUC8, Latitude, LLDatum, Longitude, State, Station, StationDescription, USGSGage, UTMX, and UTMY.

The entity Water_Quality_Data is comprised of the attributes: Agency, BiasPC, CBSEg2003, CBSEgmentShed2009, Cruise, Depth, Details, EventId, FIPS, HUC8, HUC12, Lab, Latitude, Layer, Longitude, LowerPycnocline, MeasureValue, Method, MonitoringStation, Parameter, PrecisionPC, Problem, Program, Project, Qualifier, SampleDate, SampleReplicateType, SampleTime, SampleType, Source, Station, TierLevel, TotalDepth, Unit, and UpperPycnocline.

Entity_and_Attribute_Detail_Citation:

Water Quality Database - Database Design and Data Dictionary, Prepared For: U.S. Environmental Protection Agency, Region III, Chesapeake Bay Program Office, January 2004 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/cbwqdb2004_rb.pdf]. An updated version of the data dictionary is a Chesapeake Bay Program work in progress.

The Quality Assurance Project Plan for the Maryland Department of Natural Resources Chesapeake Bay Water Quality Monitoring Program - Chemical and Physical Properties Component, May 2023 [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/MdDNR_MTQAPP_May2023.pdf].

Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs. Chesapeake Bay Program, May 2017, CBP/TRS-319-17 [https://d18lev1ok5leia.cloudfront.net/chesapeakebay/documents/Methods_Manual.pdf].

Distribution_Information:

Distributor:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mike Mallonee

Contact_Position: Water Quality Database Manager

Contact_Address:

Address_Type: Mailing and Physical

Address: 1750 Forest Drive, Suite 130

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: USA

Contact_Voice_Telephone: 410.267.5785

Contact_Electronic_Mail_Address: mmallonee@_no_spam_chesapeakebay.net[Remove _nosпам_ for valid email address]

Resource_Description: Downloadable data

Distribution_Liability: None of the Chesapeake Bay Program partners nor any of their employees, contractors, or subcontractors make any warranty, expressed or implied, nor assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information or data contained within the web site. Reference to any specific commercial

products, processes, or services or the use of any trade, firm, or corporation name is for the information and convenience of the public and does not constitute endorsement, recommendation or favoring by the Chesapeake Bay Program partners.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

Format_Name: ASCII file, formatted for text attributes, declared format

Format_Information_Content: Light_Attenuation_Data, Monitoring_Event_Data, Optical_Density_Data, Station_Information and Water_Quality_Data.

File-Decompression_Technique: No compression applied

Transfer_Size: 15.4

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name:

[https://www.chesapeakebay.net/what/downloads/cbp_water_quality_database_1984_present]

Access_Instructions: Data are available through the Chesapeake Bay Program Water Quality Database. Select CBP Water Quality Database (1984-Present). Access the data by following web site (see Network Resource Name) instructions.

Fees: None

Metadata_Reference_Information:

Metadata_Date: 20250618

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service

Contact_Position: Program Chief, Water Quality Informatics

Contact_Address:

Address_Type: Mailing and Physical

Address: 580 Taylor Avenue, D2

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Country: USA

Contact_Voice_Telephone: 410.260.8630

Contact_Electronic_Mail_Address: mark.trice_nospam_@maryland.gov[Remove_nospam_ for valid email address]

Metadata_Standard_Name: Content Standards for Digital Geospatial Metadata

Metadata_Standard_Version: FGDC-STD-001-1998