

Maryland Fishing Bay Vertical Profiler Water Quality Monitoring Project – 2023

Metadata:

Identification_Information:

Citation:

Citation_Information:

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

Publication_Date: 20240227

Title: MD DNR Vertical Water Quality Profiler Project 2023 - Fishing Bay

Geospatial_Data_Presentation_Form: Spatial dataset

Description:

Abstract:

Water quality was monitored at a site in Fishing Bay, a tidal embayment on Maryland's lower eastern shore of the Chesapeake Bay. A vertical profiling system (YSI 6951), equipped with a YSI (EXO2) data sonde, was used to sample seven environmental parameters: water temperature, specific conductance, dissolved oxygen concentration, oxygen percent saturation, pH, turbidity, and fluorescence. Salinity and chlorophyll were derived from specific conductance and fluorescence, respectively. Depth below the water surface was also recorded with each set of sonde readings. Profiles were conducted hourly, with measurements recorded at approximate 1.0 meter depth intervals throughout the entire water column. Total depth at this station measured between 3.5-5.0 meters.

Purpose:

The 2023 MD DNR Vertical Water Quality Profiler Project characterized the vertical and temporal variability of water quality at a single site (station XCH7886) in Fishing Bay. Data from the project will be used to support a pilot assessment of the full range of dissolved oxygen criteria for a Chesapeake Bay water quality segment.

During the 2023 monitoring season, the MD DNR Shallow Water Monitoring Program deployed two additional continuous monitors at locations upstream and downstream of the vertical profiler. The additional monitors were positioned at a fixed depth 0.3 meters above the bay bottom and collected readings every 15 minutes. The upstream site was identified by station name XDH2399. The downstream site was initially named XCH6891, and then renamed XCI3607 after the station was relocated in May 2023. Together, data from these additional monitors and the vertical profiler help to characterize the temporal and spatial variability of water quality within Fishing Bay.

Supplemental_Information:

Prior to performing each hourly profile, the profiler data sonde collected water quality readings while resting in a parked position at 2.0 meter depth. The hourly 2.0m depth readings from the profiler sonde are reported as part of the MD DNR Continuous Water Quality Monitoring Project for 2023. The data collected at the upstream and downstream continuous monitoring sites in Fishing Bay are also included in the MD DNR Continuous Water Quality Monitoring Project. Citation information for the 2023 MD DNR Continuous Water Quality Monitoring Project is provided in the Cross Reference portion of this metadata record.

Site visits were conducted following the protocols of the MD DNR Shallow Water Monitoring Program. Detailed descriptions of the field procedures can be found in the following documentation:

1) "MDDNR Continuous Water Quality Monitoring Project Metadata" for 2023 can be found using publication type 'Metadata' to search the 'Monitoring News and Reports' page of the Eyes on the Bay website [<https://eyesonthebay.dnr.maryland.gov/eyesonthebay/stories.cfm>]

2) "Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2023 - June 30, 2028", can be found using publication type 'Quality Assurance Project Plan' to search the 'Monitoring News and Reports' page of the Eyes on the Bay website [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/SWM_QAPP_July2023.pdf]

Time_Period_of_Content:

Time_Period_Information:

Range_of_Dates/Times:

Beginning_Date: 20230413

Ending_Date: 20231220

Currentness_Reference: Ground condition

Status:

Progress: Complete

Maintenance_and_Update_Frequency: As needed

Spatial_Domain:

Bounding_Coordinates:

West_Bounding_Coordinate: -76.023400

East_Bounding_Coordinate: -76.023400

North_Bounding_Coordinate: 38.296767

South_Bounding_Coordinate: 38.296767

Keywords:

Theme:

Theme_Keyword_Thesaurus: Global Change Master Directory (GCMD). 2024. GCMD Keywords, Version 17.9 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 > Primary Production

Theme_Keyword: Earth Science > Terrestrial Hydrosphere > Surface Water > Surface Water Chemistry

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 > 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 > pH

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

Theme_Keyword: Earth Science > Terrestrial Hydrosphere > Water Quality/Water Chemistry > Water Characteristics > Saline Concentration

Theme_Keyword: Earth Science > Terrestrial Hydrosphere > Water Quality/Water Chemistry > Water Characteristics > Eutrophication

Place:

Place_Keyword_Thesaurus: Producer Defined

Place_Keyword: United States of America

Place_Keyword: United States

Place_Keyword: Maryland

Place_Keyword: Chesapeake Bay

Place_Keyword: Fishing Bay

Place_Keyword: Dorchester County

Place_Keyword: USA

Place_Keyword: MD

Temporal:

Temporal_Keyword_Thesaurus: Producer Defined

Temporal_Keyword: 2023

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: [<http://www.eyesonthebay.net>].

Point_of_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Mark Trice

Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service

Contact_Position: Chief, Water Quality Informatics

Contact_Address:

Address_Type: Mailing Address

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City: Annapolis

State_or_Province: MD

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Contact_Voice_Telephone: 410 260-8630

Contact_Electronic_Mail_Address: Mark.Trice_nospam_@maryland.gov[Remove _nospam_ for valid email address]

Browse_Graphic:

Browse_Graphic_File_Name: MD DNR Continuous Monitoring Project 2023 Station Map can be found using publication type 'map' to search the 'Monitoring News and Reports' page of the Eyes on the Bay website

[https://eyesonthebay.dnr.maryland.gov/contmon/stn_map/Cmon_stns_2023.jpg]

Browse_Graphic_File_Description: Map title: "Maryland Department of Natural Resources Shallow Water Monitoring: Continuous Monitoring Stations 2023". The vertical profiler is listed as "PRO: Fishing Bay - Profiler" (Station XCH7886).

Browse_Graphic_File_Type: JPG

Data_Set_Credit: Maryland Department of Natural Resources, Resource Assessment Service staff maintained the profiler and the data sondes, and processed the data. The project was made possible with funding provided by The State of Maryland and the National Oceanic and Atmospheric Administration Chesapeake Bay Program Office.

Cross_Reference:

Citation_Information:

Originator: Maryland Department of Natural Resources, Resource Assessment Service

Publication_Date: 20240227

Title: MD DNR Continuous Water Quality Monitoring Project 2023

Geospatial_Data_Presentation_Form: Spatial dataset

Online_Linkage: MD DNR Continuous Water Quality Monitoring Project data for 2023, including the hourly records collected at the Fishing Bay vertical profiler and the data collected at the upstream and downstream continuous monitoring stations in Fishing Bay, are available through the Continuous Monitoring Data page of the Eyes on the Bay website [<https://eyesonthebay.dnr.maryland.gov/contmon/ContinuousMonitoring.cfm>]. Access sonde data by following website instructions.

Data_Quality_Information:

Attribute_Accuracy:

Attribute_Accuracy_Report:

MD DNR followed specific procedures to ensure that the Vertical Water Quality Profiler Project 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 the proper use, calibration and maintenance of field equipment for the measurement of physical and chemical parameters.

The vertical profiler system consisted of a YSI 6951 pontoon platform fitted with a YSI 6960 Controller Assembly and a YSI 6955 Winch Assembly. A YSI EXO2 monitoring sonde was suspended from the vertical profiler to measure water quality.

The YSI EXO2 sonde was configured with the following probes: 599870-01(conductivity/temperature) or 599827 (wiped conductivity/temperature); 599702(unguarded pH); 599101-01(turbidity); 599100-01(optical dissolved oxygen); 599103-01(total algal chlorophyll and phycoerythrin). Resolution, range and accuracy specifications for the sonde and probes may be obtained from the manufacturer. [<https://www.ysi.com/products/multiparameter-sondes>]

Procedures used to control and assure the accuracy of field measurements consisted of equipment maintenance, calibration of field instruments, and verification of calibrations.

Details of how data acquired with YSI sondes were quality assured and quality controlled may be found in the process description elements in the Lineage portion of this metadata record.

Logical Consistency Report:

The Fishing Bay vertical profiler was set to conduct profiles every hour beginning at the top of the hour. Profiles were conducted in a "bottom up" manner, with the first reading for each profile taken at 3m below the surface. As the instrument rose through the water column, additional readings were taken at depths of 2.0m and 1.0m below the surface. The profiler moved to a new depth about every 1 minute and a complete profile took approximately 4 minutes to complete.

Due to the speed at which the instrument was operating, sequential depths in the profile were often sampled within one minute of each other, resulting in the same timestamp being assigned to readings at different depths throughout the 2023 dataset.

Although the profiler was programmed to collect profile readings at 3.0m, 2.0m, and 1.0m, the actual depths for data collection varied slightly due to wave action and water currents displacing the sonde in the water column. Generally, the depths at which readings were taken were within +/- 0.1m of the programmed depth.

During the routine site visit on November 15, the sonde was not exchanged because depth readings on the replacement sonde were not accurate. The currently deployed sonde was cleaned and left deployed.

In addition to conducting profiles, the vertical profiler recorded hourly readings at 5 minutes before each hour while the sonde was resting in a parked position at a depth of 2.0m. Usually, if mechanical issues prevented the instrument from performing profiles, hourly data collection at the parked depth continued, thus creating a more complete data record.

Completeness_Report:

The vertical profiler was deployed and began taking readings on April 13, 2023.

The profiler did not record a 3m reading on April 25, 2023 for six consecutive readings between 9:00AM and 2:00PM.

There were multiple instances during 2023 that the profiler switched to standby mode and stopped conducting profiles, which led to a gap in profile records until the profile was restarted and normal functioning resumed. This occurred from May 16 to May 19, June 17 to June 21, and from July 29 to August 1.

On August 2 and August 4, several profiles were missed when the profiler switched into "standby" mode and had to be restarted. No profiles were then conducted between August 5 and August 14 when the profiler switched into "standby" mode and could not be remotely restarted. These problems were caused by heavy fouling of the sonde, which was blocking the depth ports, and were resolved when a replacement sonde was deployed during the routine site visit on August 14.

Several profiles were missed, usually during the night and early morning hours, between November 14 and December 5, with no profile readings taken at all between December 1 and December 4. The suspected cause of this problem was bird guano covering the solar panels, which was precluding the vertical profiler battery from fully recharging. This problem was addressed when the battery was replaced with a freshly charged battery on December 5. Profiles continued to be missed, usually during overnight and morning hours, between December 12 and December 19, presumably due to the solar panels not fully charging the battery

On December 20, 2023, the vertical profiler platform was removed from the water to prevent damage from winter ice and to perform annual cleaning and maintenance.

Additional profiles may appear in the data record on dates when DNR field biologists exchanged sondes at the profiler site. During field visits, biologists often triggered a profile to be performed in order to test that the instrument was operating properly. Additional profiles may also appear in the data record when profiles were triggered remotely during troubleshooting exercises.

All other sonde attribute values that are missing from the dataset were censored during the data quality control process. Analysts examined the data and masked values that were determined to be unreliable.

Lineage:

Process_Step:

Process_Description:

SONDE CALIBRATION and POST-CALIBRATION

The Yellow Springs Instrument (YSI) EXO2 data sondes were maintained and calibrated before and after each deployment in accordance with YSI recommendations. [<https://www.ysi.com/customer-support>]

KOR(TM) software (a YSI product) was used to calibrate the instruments.

FIELD MEASUREMENTS

The vertical profiling system consisted of the YSI 6951 pontoon platform fitted with the YSI 6960 Controller assembly and the YSI 6955 Winch assembly. A YSI EXO2 data sonde was suspended from the profiler system to monitor water quality. The monitoring sonde at the profiler site recorded seven water quality parameters at the following depths: 3.0m, 2.0m, and 1.0m. Profiles were conducted every hour, with new depth and parameter readings recorded approximately every minute. Along with depth, the seven water quality parameters measured were: water temperature, specific conductance (used to calculate salinity), dissolved oxygen concentration, oxygen percent saturation, turbidity (FNU), fluorescence (used to estimate chlorophyll), and pH. For modifications to the vertical profiler setup and operation, please refer to the Logical Consistency Report section of this metadata record.

The YSI EXO2 sonde was configured with the following probes: 599870-01(conductivity/temperature) or 599827 (wiped conductivity/temperature); 599702(unguarded pH); 599101-01(turbidity); 599100-01(optical dissolved oxygen); 599103-01(total algal chlorophyll and phycoerythrin). The sonde logged data onto a Campbell Scientific CR1000 datalogger, and the data were stored on the CR1000 until retrieval. The station was equipped with a cellular telemetry unit, which allowed data to be accessed remotely and transmitted to a server computer at DNR. Data were retrieved every hour and made available publicly on DNR's web site [<http://www.eyesonthebay.net>].

SONDE DATA CHECKS

The monitoring sonde was retrieved, calibrated, and replaced regularly throughout the monitoring season. For logistical reasons, sonde replacement for the vertical profiler usually coincided with service visits to the upstream and downstream continuous monitoring sites in Fishing Bay. At each deployment, sondes were replaced with clean, recalibrated units. Dates of sonde replacement in 2023 were: April 13 (initial deployment), May 5, May 22, June 15, July 6, July 26, August 14, August 29, September 7, September 21, October 5, and October 25. During the routine site visit on November 15, the sonde was not exchanged because depth readings on the replacement sonde were not accurate. The entire vertical profiler platform was removed from the water on December 20, 2023 to prevent damage from icing and to perform equipment maintenance prior to the next monitoring season.

In the field, before an instrument was replaced, field biologists allowed both the new (freshly calibrated) sonde and the old (deployed) sonde to log simultaneous readings side by side at the same depth. In addition, data were recorded from a discrete instrument - usually a HydroLab or EXO water quality sonde. This three-way comparison assured that the "new" and "old" sondes were both reading each parameter within a certain tolerance. The HydroLab or EXO reading was used as a "double-check", and since it was a discrete reading, it allowed biologists to watch the display and note whether the parameters were fluctuating or stable.

Data were evaluated using both three-way in-situ comparison results and data from sonde calibrations. The comparison tolerances were as follows for both pre- and post-calibration and in-situ comparisons: Temperature (degrees C) +/- 0.2; Specific Conductance (uS/cm) +/- 5%; Dissolved Oxygen (mg/l) +/- 0.5 mg/l; pH +/- 0.2; Turbidity (FNU) +/- 5% or 5.0 FNU (whichever is greater); Chlorophyll (ug/l) +/- 5% or 5.0 ug/l (whichever is greater). Excessive drift between pre- and post- calibration values of sonde probes, variance from in-situ measurements or probe failures caused data to be flagged. When post-calibration drift exceeded the limits stated above in both the post-calibration and the in-situ comparables, the questionable data were masked within the data set with an error code.

Process_Date: Unknown

Process_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Kristen Heyer

Contact_Organization: Maryland Department of Natural Resources, Resource

Assessment Service

Contact_Position: Program Manager, Water Quality Monitoring

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Address_Type: mailing and physical

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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:

DATA REVIEW

Data downloaded from the sonde were subjected to quality assurance/quality control checks to ensure that values outside the range of possibility were identified in the published dataset. Loggernet(TM) software (a Campbell Scientific product [https://www.campbellsci.com/]) was used to download the data collected by the profiler. Using SAS statistical software, the raw .txt file of sonde data was queried to select dates that corresponded with each sonde deployment. Also, data columns were rearranged to achieve a format expected by an Excel(R) macro used for post-processing. The resulting data file was saved as a .csv file.

Each .csv file of sonde data was then post-processed using the aforementioned Excel(R) macro. The file was opened and renamed. Rows of data acquired before and after deployment were deleted. Records (if any) were also deleted if instrument error codes indicated invalid data. The macro rearranged columns and inserted error-tracking columns and headings. Macro statements flagged negative values, missing values and highlighted values outside each

parameter's normal range. The macro also returned a report summarizing range exceedances. Event and instrument information was appended to each record.

Flagged values were evaluated. Common anomalies included spikes in fluorescence and turbidity, dips in specific conductance, and high dissolved oxygen readings. Instrument post-calibration results, in-situ comparisons with HydroLab or EXO discrete readings, and survey crew remarks were used to determine whether sensor values were acceptable.

In cases where data were determined to be unreliable, the reason(s) were documented with error codes and comments. Unreliable data were masked. No data were discarded. Only data considered reliable were published in reports.

MD DNR scientists reviewed profiler monitoring data several times a week. If a problem was identified, a field biologist was dispatched to address the issue as soon as possible.

VERIFICATION AND DATA MANAGEMENT

At the end of the monitoring season, DNR data analysts and field biologists conducted additional data QA/QC procedures. All of the data were plotted and outliers and anomalous values were thoroughly researched. Staff compared unusual values to values from nearby sites in the Bay. Weather events were considered, event logs were reviewed, and field staff were consulted regarding possible legitimate causes for the values. In cases where values were not considered legitimate, error codes were assigned. All data were retained in the archive data set. After field staff and the Quality Assurance Officer reviewed error flags, the values were masked within the published dataset.

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: Tawes State Office Building, 580 Taylor Avenue, D-2

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]

Spatial_Data_Organization_Information:

Indirect_Spatial_Reference: Chesapeake Bay, Maryland, USA

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

Vertical_Coordinate_System_Definition:

Depth_System_Definition:

Depth_Datum_Name: No correction

Depth_Resolution: 0.001

Depth_Distance_Units: meters

Depth_Encoding_Method: Attribute values

Entity_and_Attribute_Information:

Overview_Description:

Entity_and_Attribute_Overview:

This metadata record is a description of a vertical profiler water quality monitoring project in Fishing Bay, a tidal embayment on the eastern shore of the Chesapeake Bay. Water quality data were collected at 1.0 meter depth intervals at a single station (XCH7886) during 2023.

The data are comprised of the attributes: SAMPLE_DATE: date (month/day/year) SAMPLE_TIME: Eastern Standard Time, 24 hour format (hour:minutes) STATION: station name (text) SONDE: sonde identifier (text) TOTAL_DEPTH: depth below water surface (meters) BATT: battery charge (Volts) WTEMP: water temperature (degrees Celsius) SPCOND: specific conductance (micro Siemens per centimeter) SALINITY: salinity (parts per thousand) DO_SAT: dissolved oxygen percent saturation (percent) DO: dissolved oxygen (milligrams per liter) PH: pH (pH units) TURB_FNU: turbidity (Formazin Nephelometric Units) FLUOR: fluorescence (Relative Fluorescence Units) TCHL_PRE_CAL: chlorophyll (micrograms per liter) CHLA: No data - all data values blank COMMENTS: comments (text).

Entity_and_Attribute_Detail_Citation:

The Vertical Water Quality Profiler Project was conducted in a manner consistent with the procedures established for the MD DNR Shallow Water Monitoring Program. Data users who desire very detailed information about data definition, sampling procedures, and data processing are encouraged to refer to the document listed below.

"Quality Assurance Project Plan for the Maryland Department of Natural Resources, Chesapeake Bay Shallow Water Quality Monitoring Program, for the period July 1, 2023 - June 30, 2028", can be found using publication type 'Quality Assurance Project Plan' to search the 'Monitoring News and Reports' page of the Eyes on the Bay website [https://eyesonthebay.dnr.maryland.gov/eyesonthebay/documents/SWM_QAPP_July2023.pdf].

Distribution_Information:

Distributor:

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

Address: Tawes State Office Building, 580 Taylor Avenue, D-2

City: Annapolis

State_or_Province: Maryland

Postal_Code: 21401

Contact_Voice_Telephone: 410-260-8630

Contact_Electronic_Mail_Address: Mark.Trice_no_spam_@maryland.gov[Remove _nospam_ for valid email address]

Resource_Description: Downloadable data

Distribution_Liability: None of the Maryland Department of Natural Resources (MD DNR) partners or any of their employees, contractors, or subcontractors makes any warranty, expressed or implied, nor assumes 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 MD DNR partners.

Standard_Order_Process:

Digital_Form:

Digital_Transfer_Information:

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

Format_Information_Content: Vertical profiler monitoring sonde data

File-Decompression_Technique: No compression applied

Digital_Transfer_Option:

Online_Option:

Computer_Contact_Information:

Network_Address:

Network_Resource_Name:

[<https://eyesonthebay.dnr.maryland.gov/contmon/VerticalProfilerData.cfm>]

Access_Instructions: Vertical profiler data (sonde data) are available through the vertical profiler data download page of the MD DNR "Eyes on the Bay" website. Sonde data can be accessed through the link provided under "Network Resource Name" in this metadata record. A file containing one week of data is approximately 150 kb in size with download times dependent upon computer connection speed. The complete record of vertical profiler data for 2023, including masked data values, error codes, and comments, can also be obtained from the MD

DNR Resource Assessment Service. Contact information is provided in the "Distributor" portion of this metadata record.

Fees: None

Metadata_Reference_Information:

Metadata_Date: 20240621

Metadata_Contact:

Contact_Information:

Contact_Person_Primary:

Contact_Person: Brian Smith

Contact_Organization: Maryland Department of Natural Resources, Resource Assessment Service

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City: Annapolis

State_or_Province: MD

Postal_Code: 21401

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Contact_Electronic_Mail_Address: brianr.smith_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