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# VIRGINIA CHESAPEAKE BAY MONITORING PROGRAM DATA DICTIONARY

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(Revised: November 12, 2017)

## ABSTRACT:

The Chesapeake Bay Program at Old Dominion University (ODU) collects data to support the objectives of the Virginia Department of Environmental Quality to restore the environmental health of the Chesapeake Bay. The Chesapeake Bay Monitoring Program, initiated in 1985, is a multi-purpose program that includes long-term studies conducted by ODU. The objective is to characterize the present state of the Bay, determine long-term trends, and provide insights into ecological interactions. The program provides information necessary to measure effectiveness of point and non-point source programs in reducing nutrient input to the Chesapeake Bay and determine progress towards achievement of living resources and water quality habitat goals. This program also provides data for calibration, validation, and verification of computer simulation models used for developing Chesapeake Bay restoration strategies. The primary objectives of the Virginia Chesapeake Bay Monitoring Program (of which the Benthic Program is a component) are:

- 1) To characterize the environmental health of regional areas of the Lower Chesapeake Bay.
- 2) To conduct trend analyses on long-term data to relate temporal trends in the living resources to changes in water and/or sediment quality.
- 3) To warn of environmental degradation by producing an historical database that will allow annual evaluations of biotic impacts.

Sampling parameters in the benthic component of the Virginia Chesapeake Bay Monitoring Program include water quality, sediment measurements, benthic infauna composition and abundance, and benthic infauna biomass. Sample collection is currently performed once a year.

## DATA FILE NAMING CONVENTION:

VABEyy_EV.TXT	Virginia Benthic Program Sampling Event Record
VABEyy_SMP.TXT	Virginia Benthic Program Sample Collection Record
VABEyy_WQ.TXT	Virginia Benthic Program Water Quality Data Record
VABEyy_SED.TXT	Virginia Benthic Program Sediment Data Record
VABEyy_TX.TXT	Virginia Benthic Taxonomic and Abundance Data Record
VABEyy_BM.TXT	Virginia Benthic Biomass Data Record
VABEyy_IBI.TXT	Virginia Benthic Index of Biotic Integrity Record

Data files are provided in comma delimited ASCII format with header line.

ASSOCIATED DATA FILES:

NEWCODE.TXT                      Species Code Supplement for the data reporting year  
MISSDOC.TXT                      Missing data for the reporting year

NAMES AND DESCRIPTIONS OF ASSOCIATED DATA DICTIONARY FILES:

There are no associated data dictionary files. For information on program organization and management, program objectives and design, and field collection and laboratory procedures, please visit the Chesapeake Bay Program at Old Dominion University website: <http://sci.odu.edu/chesapeakebay/index.shtml>

PROJECT TITLE:

Virginia Chesapeake Bay Benthic Monitoring Program

CURRENT PRINCIPAL INVESTIGATORS:

Program Manager: Cindy Johnson, Virginia Department of Environmental Quality, Richmond, Virginia.

Program Director: Dr. Daniel M. Dauer, Department of Biological Science, Old Dominion University (ODU)

Principal Investigators: Dr. Daniel M. Dauer, ODU

Data Coordinator: Mike Lane, ODU Benthic Laboratory

Lab Manager: Anthony Rodi, ODU Benthic Laboratory

CURRENT FUNDING AGENCIES:

Virginia Department of Environmental Quality as match grant to U.S. Environmental Protection Agency Chesapeake Bay Program.

CURRENT QA/QC OFFICER:

Mike Lane, ODU Benthic Laboratory

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#### LOCATION OF STUDY:

Chesapeake Bay and tidal tributaries in Virginia, U.S.A.

#### DATE INTERVALS:

The Virginia Chesapeake Bay Benthic Monitoring Program was implemented in July 1984. This web site currently serves summer data from July 1995 through September 2016 (1995 was the year probability-based sampling started in Maryland; in Virginia, it started in 1996). Additional data from previous years, spring sampling (see below), and the Elizabeth River Biological Monitoring Program, can be obtained by contacting the Virginia Program Director (see above), or from the Chesapeake Bay Program at the Old Dominion University website:

<http://sci.odu.edu/chesapeakebay/data/benthic/index.shtml>

#### STUDY DESIGN:

The sampling design of this survey changed several times to accommodate changes in the State of Virginia's objectives for this program.

With the current design (July 1996 to present), two types of sites are sampled: (1) fixed sites sampled to identify temporal trends and (2) spatially random sites sampled to assess bay-wide benthic community status. Site selection criteria for random sites, and sample collection and laboratory methods have remained the same for the data series. Beginning in June 1984 through December 1995, fixed sites were sampled four times a year, in March, June, September, and December. From 1996 through 2004, fixed sites were sampled in June and September. After 2004, fixed sites were sampled once per year during the period of July 15 through September 30. This website does not serve the March, June or December data. Random sites are sampled once a year during the period of July 15 through September 30 at a new set of locations every year. Three replicate sediment samples for benthos are collected at each of 21 fixed sites with a box corer (surface area of 184 cm<sup>2</sup>) since 1984. The third replicate of a fixed site is partitioned into two sediment layers: 0-5 cm, and 5-25 cm below the sediment-water interface. One sample is collected at each randomly selected site using a Young grab with a surface area of 440 cm<sup>2</sup>. Twenty five random samples per sampling stratum are collected every year for a total of 100 samples in four strata. Samples are sieved on a 0.5-mm screen and preserved in the field.

Site selection, strata, and the name, position, and physical characteristics of fixed sites can be found in the Quality Assurance Project Plan (QAPP) at:

<http://sci.odu.edu/chesapeakebay/data/benthic/index.shtml>

(pending as of November 2017)

#### VARIABLE NAMES AND DESCRIPTIONS FOR DATA FILES:

##### VIRGINIA BENTHIC PROGRAM SAMPLING EVENT RECORD

File: VABE\_EV.TXT

<u>Name</u>	<u>Description</u>
STATION	Sampling Station
SAMPLE_DATE	Sampling Date (YYYY-MM-DD)
SAMPLE_TIME	Time of Station Positioning/initial sampling (HH:MM)
STRATUM	Sampling Stratum or Tributary Designation (see below for strata)
SITE	Internal Database Station Designation
LATITUDE	Latitude (decimal degrees)
LONGITUDE	Longitude (negative decimal degrees)
LL_DATUM	North American Datum Code
SITE_TYPE	Sampling Site Type (Fixed, Random)
TOTAL_DEPTH	Bottom Depth of Station (meters)
SOURCE	Data Collection Institution
CRUISENO	Sampling Cruise Number
SAMP_TYPE	Sample Collection Type (F =Fixed, M =Bay-wide Random)

#### VIRGINIA BENTHIC PROGRAM SAMPLE COLLECTION RECORD

File: VABE\_SMP.TXT

<u>Name</u>	<u>Description</u>
STATION	Sampling Station
SAMPLE_DATE	Sampling Date (YYYY-MM-DD)
SAMPLE_NUMBER	Sample Replicate Number
GMETHOD	Gear Method Code (BC=box corer, VV-YM = Van Veen-modified Young grab)
NET_MESH	Screen Mesh Opening (millimeter)
PENETR	Sampling Gear Penetration Depth (centimeters)
SOURCE	Data Collection Institution
CRUISENO	Sampling Cruise Number
STRATUM	Sampling Stratum or Tributary Designation (see below for strata)
SITE	Internal Database Station Designation

#### VIRGINIA BENTHIC PROGRAM WATER QUALITY DATA RECORD

File: VABE\_WQ.TXT

<u>Name</u>	<u>Description</u>
STATION	Sampling Station
SAMPLE_DATE	Sampling Date (YYYY-MM-DD)
TIME	Sample Collection Time (HH:MM)
SAMPLE_NUMBER	Sample Replicate Number
SAMPLE_DEPTH	Sample Collection Water Depth (meters)

PARAMETER	Sampling Parameter (DO, SALINITY, WTEMP, see below)
VALUE	Sampling Parameter Value
UNITS	Reporting Units of Value
SOURCE	Data Collection Institution
CRUISENO	Sampling Cruise Number
STRATUM	Sampling Stratum or Tributary Designation (see below for strata)
SITE	Internal Database Station Designation
SITE_TYPE	Sampling Site Type (Fixed, Random)

VIRGINIA BENTHIC PROGRAM SEDIMENT DATA RECORD

File: VABE\_SED.TXT

<u>Name</u>	<u>Description</u>
STATION	Sampling Station
SAMPLE_DATE	Sampling Date (YYYY-MM-DD)
SAMPLE_NUMBER	Sample Replicate Number
PARAMETER	Sampling Parameter (SAND, SILTCLAY, VOLORG, see below)
VALUE	Sampling Parameter Value
UNITS	Reporting Units of Value
SOURCE	Data Collection Institution
CRUISENO	Sampling Cruise Number
STRATUM	Sampling Stratum or Tributary Designation (see below for strata)
SITE	Internal Database Station Designation
SITE_TYPE	Sampling Site Type (Fixed, Random)

VIRGINIA BENTHIC TAXONOMIC AND ABUNDANCE DATA RECORD

File: VABE\_TX.TXT

<u>Name</u>	<u>Description</u>
STATION	Sampling Station
SAMPLE_DATE	Sampling Date (YYYY-MM-DD)
SAMPLE_NUMBER	Sample Replicate Number
SPEC_CODE	Agency Taxon Code
LBL	Label or Taxon Name
TSN	ITIS Taxon Serial Number
PARAMETER	Sample Parameter (COUNT, see below)
VALUE	Sample Parameter Value
UNITS	Reporting Units of Value
SOURCE	Data Collection Institution

GMETHOD	Gear Method Code (BC =Box corer; VV-YM =Van Veen-modified Young grab)
NET_MESH	Screen Mesh Opening (millimeter)
CRUISENO	Sampling Cruise Number
STRATUM	Sampling Stratum or Tributary Designation (see below for strata)
SITE	Internal Database Station Designation
SAMP_TYPE	Sample Collection Type (F =Fixed, M =Bay-wide Random)

#### VIRGINIA BENTHIC BIOMASS DATA RECORD

File: VABE\_BM.TXT

<u>Name</u>	<u>Description</u>
STATION	Sampling Station
SAMPLE_DATE	Sampling Date (YYYY-MM-DD)
SAMPLE_NUMBER	Sample Replicate Number
SPEC_CODE	Agency Taxon Code
LBL	Label or Taxon Name
TSN	ITIS Taxon Serial Number
PARAMETER	Sample Parameter (AFDW, see below)
VALUE	Sample Parameter Value
UNITS	Reporting Units of Value
SOURCE	Data Collection Institution
GMETHOD	Gear Method Code (BC=box corer; VV-YM =Van Veen-modified Young grab)
NET_MESH	Screen Mesh Opening (millimeter)
CRUISENO	Sampling Cruise Number
STRATUM	Sampling Stratum or Tributary Designation (see below for strata)
SITE	Internal Database Station Designation
SITE_TYPE	Sampling Site Type (Fixed, Random)

#### VIRGINIA BENTHIC INDEX OF BIOTIC INTEGRITY RECORD

File: VABE\_IBI.TXT

<u>Name</u>	<u>Description</u>
STATION	Sampling Station
SAMPLE_DATE	Sampling Date (YYYY-MM-DD)
SOURCE	Data Collection Institution
SITE_TYPE	Sampling Site Type (Fixed, Random)
IBI_SALZONE	Bottom Salinity Class (TF =Tidal Fresh, O =Oligohaline, LM =Low Mesohaline, HM =High Mesohaline, P =Polyhaline, see below)

IBI_BOTTOM_TYPE STRATUM	Sediment Type (M =mud, S =sand) Sampling Stratum or Tributary Designation (see below for strata)
SITE	Internal Database Station Designation
SAMPLE_NUMBER	Sample Replicate Number
IBI_SCORE	Benthic Index of Biotic Integrity Value for Sample
AVE_IBI_SCORE	Fixed Station Replicate Averaged Benthic Index of Biotic Integrity Value
IBI_PARAMETER	Benthic Index of Biotic Integrity Parameter (BIOM>5CM, PCT_CAR_OMN, PCT_DEPO, PCT_PI_ABUND, PCT_PI_BIO, PCT_PI_F_ABUND, PCT_PI_O_ABUND, PCT_PS_ABUND, PCT_PS_BIO, PCT_PS_O_ABUND, PCT_TANYPODINI, SW, TAXA>5CM, TOLERANCE, TOT_ABUND, TOT_BIOMASS, see below)
VALUE	Benthic Index of Biotic Integrity Parameter Value
SCORE	Benthic Restoration Goal Score for Parameter
R_DATE	Benthic Index of Biotic Integrity Run Date

**SAMPLING STRATUM OR TRIBUTARY DESIGNATION:**

Probability sites are allocated according to a stratified random sampling scheme designed to produce an annual estimate of area meeting the Benthic Community Restoration Goals for the tidal waters (>1 m MLLW) of the Virginia Chesapeake Bay as well as estimates for four subdivisions or strata. Samples are allocated equally among strata. The following are the sampling strata (see <http://www.baybenthos.versar.com/docs/LTBStrata.pdf> for a map of strata):

JAM = James River  
RAPP = Rappahannock River  
VBY = Virginia Bay Main Stem  
YRK = York River

Fixed stations, which are not part of these strata, are designated as HIS = Historical.

**LIST OF PARAMETERS AND METHODS:**

**Parameter:** AFDW (Taxon ash free dry weight in grams)  
**Collection Method:** Benthic grab (184 cm<sup>2</sup> surface area box corer, 440 cm<sup>2</sup> Young grab). Contents sieved through 0.5-mm screen and preserved in the field.

Sample Preservatives: 10% buffered formalin with Rose Bengal transferred to 70% isopropyl alcohol after sorting.

Sample Storage: Cloth bags within 5 gallon buckets until commencement of processing.

Laboratory Technique: Ash-free dry weight biomass is measured directly for each species by drying the organisms to a constant weight at 60°C and ashing in a muffle furnace at 500°C for four hours and re-weighing (ash weight). The difference between dry weight and ash weight is the ash-free weight. The shells of large bivalves are removed. Some bivalves (approximately <3mm) are crushed to expose the animal to drying and ashing (shells included).

**Parameter:** **COUNT**

Collection Method: Benthic grab (184 cm<sup>2</sup> surface area box corer, 440 cm<sup>2</sup> Young grab). Contents sieved through 0.5-mm screen and preserved in the field. The box corer is used for fixed stations and the Young grab for the random sites.

Sample Preservatives: 10% buffered formalin with Rose Bengal transferred to 70% isopropyl alcohol after sorting.

Sample Storage: Cloth bags within 5 gallon buckets until commencement of processing.

Laboratory Technique: Organisms are separated (sorted) from the sediment residue using binocular dissecting microscopes. After sorting, the organisms are stored in 70% isopropyl alcohol and subsequently identified to the lowest practical taxonomic level (usually species) and counted. Fragments without heads are eliminated from the counts but included in biomass determinations.

**Parameter:** **DO** (Dissolved oxygen in ppm, equivalent to mg/l)

Collection Method: YSI Model 85 handheld oxygen, conductivity, salinity, and temperature system with automatic temperature and salinity compensation, air calibration.

Sample Preservatives: N/A

Sample Storage: N/A

Laboratory Technique: N/A

**Parameter:** **SALINITY** (Salinity in practical salinity units, equivalent to ppt)

Collection Method: YSI Model 85 handheld oxygen, conductivity, salinity, and temperature system with temperature compensation.

Sample Preservatives: N/A

Sample Storage: N/A

Laboratory Technique: N/A

**Parameter:** **SAND** (Sand content in percent by weight)



Collection Method: One sediment subsample of approximately 120 ml is taken from the surface of an extra benthic grab, not used for biological sampling, and analyzed for percent silt-clay, sand, and volatile organics determination.

Sample Preservatives: None

Sample Storage: Frozen until processing

Laboratory Technique: Sand is separated from silt-clay particles (<63 um) by wet sieving, and the percent sand fraction is determined by weighing.

**Parameter:** **SILTCLAY** (Silt-clay content in percent by weight)

Collection Method: One sediment subsample of approximately 120 ml is taken from the surface of an extra benthic grab, not used for biological sampling, and analyzed for percent silt-clay, sand, and volatile organics determination.

Sample Preservatives: None

Sample Storage: Frozen until processing

Laboratory Technique: Silt-clay is separated from sand by wet sieving through a 63 um screen, and the percent silt-clay fraction is determined by weighing.

**Parameter:** **VOLOGR** (Volatile organic content in percent)

Collection Method: One sediment subsample of approximately 120 ml is taken from the surface of an extra benthic grab, not used for biological sampling, and analyzed for percent silt-clay, sand, and volatile organics determination.

Sample Preservatives: None

Sample Storage: Frozen until processing

Laboratory Technique: Volatile organic content is the ratio of ash weight to dry weight expressed as a percentage. The sediment subsample is dried for a minimum of 48 hours at 60°C to a constant weight (dry weight) and ashed in a muffle furnace at 500°C for four hours and re-weighed (ash weight). The difference between dry weight and ash weight is the volatile organic content of the sample. No acid is applied.

**Parameter:** **WTEMP** (Water temperature in deg. C)

Collection Method: YSI Model 85 handheld oxygen, conductivity, salinity, and temperature system.

Sample Preservatives: N/A

Sample Storage: N/A

Laboratory Technique: N/A

**IBI\_PARAMETER** **DESCRIPTION**

**BIOM>5CM** Percent biomass of organisms found >5 cm below the sediment-water interface

PCT_CAR_OMN	Percent abundance of carnivore and omnivores
PCT_DEPO	Percent abundance of deep-deposit feeders
PCT_PI_ABUND	Percent abundance of pollution-indicative taxa
PCT_PI_BIO	Percent biomass (AFDW) of pollution-indicative taxa
PCT_PI_F_ABUND	Percent abundance of tidal fresh pollution-indicative taxa
PCT_PI_O_ABUND	Percent abundance of oligohaline pollution-indicative taxa
PCT_PS_ABUND	Percent abundance of pollution-sensitive taxa
PCT_PS_BIO	Percent biomass (AFDW) of pollution-sensitive taxa
PCT_PS_O_ABUND	Percent abundance of oligohaline pollution-sensitive taxa
PCT_TANYPODINI	Tanypodinae to Chironomidae percent abundance ratio
SW	Shannon-Wiener species diversity index (log-base =2)
TAXA>5CM	Percent number of taxa found >5 cm below the sediment-water interface
TOLERANCE	Pollution Tolerance Score
TOT_ABUND	Total species abundance (number per meter squared)
TOT_BIOMASS	Total species biomass (grams AFDW per meter squared)

<b>IBI_SALZONE</b>	<b>DESCRIPTION</b>	<b>RANGE (PSU)</b>
TF	Tidal freshwater	0-0.5
O	Oligohaline	≥0.5-5
LM	Low mesohaline	≥5-12
HM	High mesohaline	≥12-18
P	Polyhaline	≥18

<b>IBI_BOTTOM_TYPE</b>	<b>DESCRIPTION</b>	<b>RANGE (% SILT-CLAY)</b>
M	Mud	>40
S	Sand	0-40

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**END OF THE DATA DICTIONARY**

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