Water Quality Database

Database Design and Data Dictionary

Prepared For:
U.S. Environmental Protection Agency, Region III
Chesapeake Bay Program Office
July 1998

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BACKGROUND

Since the formation of the Chesapeake Bay Program in 1983, the Chesapeake Bay Program Office (CBPO) has acted as a central repository for environmental data related to the Chesapeake Bay and its tributaries. While this type of data management system has provided some level of control over the timely collection of data and the quality of those data, it also has created problems such as:

- *Data accessibility*
- *Database inconsistencies*
- *Duplication of effort*

Data located at the CBPO are physically stored on several different and disparate computing platforms running different operating systems. The data is stored in numerous formats including:

- *Semi-relational dBase databases*
- *Non-relational and non-normalized SAS data sets*
- *ASCII text files*
- *Spreadsheets and,*
- *Document tables*

This situation has made it difficult for data analysts to retrieve different types of data required to determine possible cause and effect relationships

Throughout the years, State and federal government agencies and several information technology companies have processed the different types of environmental data. Depending upon the type of data and the amount of resources devoted to managing it, at both the State and federal levels, different levels of quality assurance (QA) have been performed on the different types of data. In some cases, QA procedures performed at the CBPO duplicated efforts made at the State level.

A distributed data management system, the Chesapeake Information Management System (CIMS), is being developed to combat these problems. In contrast to the existing system in which all Chesapeake Bay environmental data is stored at the CBPO, CIMS will transfer ownership of the data back to the agencies that generate the data. These data generating agencies will in turn provide their own data quality assurance and adhere to mutually agreed upon data standards. These agencies will also have the opportunity to serve their data over the Internet, thereby enabling access to the data to any legitimate user that has access to the Internet. As part of the implementation of CIMS, a relational database structure for managing Chesapeake Bay related environmental data is being developed. The key to the success of a distributed, relational data management system lies in the willingness of the data generators to take ownership of and responsibility for their data and in their adherence to the established data standards for public access to the data. This document will describe in detail the components of this structure.

The benefits of a distributed data management system over the current, centralized data management system are many. The most obvious benefit is that a distributed system empowers data generators, allowing for easier access to their data and hopefully increasing the utility of the data beyond Chesapeake Bay Program activities. The other key benefits of the proposed CIMS structure relate to the implementation of a relational database structure. In a relational database, data are stored in tables that are related to one another by common fields. These common fields are set as primary and/or foreign keys. The creation of relationships between tables using key fields allows for the enforcement of referential integrity. Referential integrity prohibits the data manager from entering records into a child table containing a foreign key for which there is not an associated primary key in the parent table. While this document is not intended to provide a complete discussion of the concepts of a relational database, it is the intention of the CBPO to provide limited assistance to data managers at distributed data centers.

INTRODUCTION

I. Water Quality Data

Water quality data compiled by the Chesapeake Bay Program Office (CBPO) is currently processed using the Statistical Analysis System (SAS) programming language and stored as permanent SAS data sets. Each participating agency submits either a SAS data set or an ASCII delimited text file containing ambient water quality monitoring data associated with samples collected during a particular month or entire year. The data set is then processed using a quality assurance program called MONITOR, which performs a series of checks pertaining to station name, value ranges, method codes, etc.

The resulting data sets are then stored in the appropriate subdirectory on the CBPO DEC Alpha. There are currently over 400 SAS data sets comprising all of the Chesapeake Bay and tributary water quality monitoring data from 1983 to the present. A program called BAYSTATS allows users with DEC Alpha accounts to retrieve these data using an input form to narrow the data search.

This type of data management system is inefficient both in terms of its structure and its accessibility to users. Each agency's data are stored as individual monthly data sets with a predefined horizontal structure that precludes the entry of additional parameters and makes quality assurance procedures difficult to execute. Furthermore, there is a significant amount of redundant data. Each record in every data set contains information that pertains solely to the water quality station, not to the samples and resultant parameter values. Access to the data is also limited to those users with DEC alpha accounts.

Because of these weaknesses, the Chesapeake Bay Program has decided to develop a relational database management system (RDBMS) for water quality data. Referential integrity will be utilized to enforce "business rules" related to value qualifiers, method codes, problem codes, weather codes, etc. Additionally, the database will be made available via the World Wide Web to anyone with access to Internet browser software (e.g. Netscape, Internet Explorer).

II. The Relational Concept

Information obtained through water quality monitoring programs is most efficiently grouped into subsets that are related to one another through common elements. In the Chesapeake Bay Program relational database, water quality monitoring information is stored in the WQ_CRUISE, WQ_EVENT, WQ_CHLOROPHYLL, WQ_KD, WQ_DATA_BMDL and WQ_DATA tables. Information related specifically to monitoring stations (e.g. latitude, longitude, basin, etc.) is stored in the WQ_STATIONS table.

When an agency collects water quality samples at a group of stations over a period of one or more days, the information related to this "cruise" will be stored in the WQ_CRUISE table.

Information related to sampling events conducting at individual stations during a cruise will be stored in the WQ_EVENT table. Parameter values obtained either by field measurement or laboratory analysis will be stored in the WQ_CHLOROPHYLL table, the WQ_KD table, the WQ_DATA_BMDL table or the WQ_DATA table depending upon its type.

III. The Relational Database Structure

The following relational data structure for water quality data contains descriptions of the primary data tables as well as the numerous lookup tables required to define in detail the codes contained in the primary tables. The table columns in this document used to describe the fields in the database tables are described below.

- **FIELD** - *This column contains the field name in the database table as well as the designation of the field as either a primary key (PK), a foreign key (FK), a not null (NN) field, or an optional (O) field. Primary key fields, by definition, are not null. Foreign key fields are restricted to a set list of values in a lookup table. If the value is not known, it is null. However, if a foreign key field is also part of a combined primary key, it can't be null. Fields which are neither primary nor foreign key fields, but which have been designated as not null are those fields deemed essential to certain applications of the database. Optional fields will serve to increase the functionality of the database from a user interface perspective. It will be up to the individual database manger/administrator as to whether or not these fields will be included.*

- **DESCRIPTION** - *This column contains a description of the database table field.*

- **TYPE (FORMAT)** - *This column specifies the field type as text, number, small integer, or date/time; it also includes the format of the field or the precision of the numeric value where appropriate (primary tables only).*

- **LENGTH (BYTES)** - *This column specifies the maximum length, text or numeric, of a field as well as the internal database storage requirement (primary tables only). For text fields, the internal storage requirement is equal to its length.*

III. Water Quality Database Structure

Primary Tables

Within the proposed design, the primary tables WQ_EVENT and WQ_DATA are used to store the vast majority of the data contained within the database. The WQ_EVENT table contains all sampling event data that are not depth-dependent (i.e. weather parameters). It also contains fields specifying both the type and origin of the data. The WQ_DATA table contains all depth dependent ambient water quality sampling event data as well as secchi depth data (not depth dependent). The Data Management and Acquisition Workgroup (DMAW) requested that secchi depth be included in this table.

WQ_CRUISE table

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
AGENCY (PK, FK)	Code identifying agency responsible for submitting/serving the data	Text	10
CRUISE (PK, FK)	Agency cruise ID (YYYYMMA)	Text	8
BAY_CRUISE	CBP cruise ID	Text	6
PROGRAM (PK, FK)	Agency monitoring program code	Text	10
PROJECT (PK, FK)	Agency monitoring project code	Text	10
START_DATE	Starting date of cruise	Date/Time (MM/DD/YYYY)	8
END_DATE	Ending date of cruise	Date/Time (MM/DD/YYYY)	8
COMMENTS	Comments related to sampling event (e.g. parameters not sampled)	Memo	No limit

The CRUISE table is used to store information pertaining to an agency cruise. The COMMENTS field would be used to store information about the cruise that has historically been submitted as part of the DSDOC file. Stations not sampled during a cruise would be listed in this field along with the reason why samples were not collected.

WQ_EVENT table

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
SOURCE (PK, FK)	Code identifying agency/contractor that generated the data	Text	10
AGENCY (PK, FK)	Code identifying agency responsible for submitting/serving the data	Text	10
PROGRAM (PK, FK)	Agency monitoring program code	Text	10
PROJECT (PK, FK)	Agency monitoring project code	Text	10
CRUISE (FK)	Agency cruise ID	Text	8
STATION (PK, FK)	CBP station name	Text	15

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
SAMPLE_DATE (PK)	Date on which the sample was collected	Date/Time (MMDDYYYY)	8
SAMPLE_TIME (PK)	Time at which the sample was collected	Date/Time (HH24:MM)	8
TOTAL_DEPTH	Total station depth	Number (Single)	5,1 (4)
UPPER_PYCNOCLINE	Depth of upper pycnocline	Number (Single)	5,1 (4)
LOWER_PYCNOCLINE	Depth of lower pycnocline	Number (Single)	5,1 (4)
AIR_TEMP	Air temperature (degrees Celsius) measured at beginning of sampling event	Number (Single)	4,1 (4)
WIND_SPEED	Code identifying wind speed range estimated at beginning of sampling event	Text	2
WIND_DIRECTION	Code identifying wind direction estimated at beginning of sampling event	Text	3
WAVE_HEIGHT	Code identifying wave height range estimated at beginning of sampling event	Text	2
CLOUD_COVER	Code identifying percent cloud cover range estimated at beginning of sampling event	Text	2
PRECIP_TYPE	Code identifying type of precipitation at beginning of sampling event	Text	2
TIDE_STAGE	Code identifying tide stage at the beginning of sampling event	Text	2
COMMENTS	Comments related to sampling event (e.g. parameters not sampled)	Memo	No limit

WQ_DATA table

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
SOURCE (PK, FK)	Code identifying agency or contractor that generated the data	Text	10
PROJECT (PK, FK)	Agency monitoring project code	Text	10
STATION (PK, FK)	CBP station name	Text	15
SAMPLE_DATE (PK)	Date on which the sample was collected	Date/Time (MMDDYYYY)	8
SAMPLE_TIME (PK)	Time at which the sample was collected	Date/Time (HH24:MM)	8
DEPTH (PK)	Depth at which the sample was collected	Number (Single)	5,1 (4)
SAMPLE_TYPE (PK, FK)	Code identifying type of sample collected (e.g. D=discrete, C=composite, etc.)	Text	5
SAMPLE_ID	Code identifying the sample description and number (e.g. FS1=first subsample of field split sample)	Text	7
LAYER (PK, FK)	Code identifying water column layer at which sample was collected	Text	2

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
PARAMETER (PK, FK)	Code identifying parameter name	Text	8
QUALIFIER (FK)	Parameter value qualifier code (e.g. > = less than)	Text	3
VALUE	Parameter value	Number (Single)	12,4 (4)
UNITS (FK)	Abbreviation for units of parameter value	Text	10
PROBLEM (FK)	Problem code associated with parameter value	Text	2
METHOD (FK)	Method code identifying field/laboratory test procedure	Text	5
COMMENTS	Comments related to sampled parameter value	Memo	No limit

Both these tables are used to store data which is essential to water quality data analysts in their daily tasks. The tables are linked or related by their five common fields (i.e. SOURCE, PROJECT, STATION, SAMPLE_DATE, and SAMPLE_TIME). Creating this one-to-many relationship between WQ_EVENT and WQ_DATA prevents the data manager from entering parameter values into the WQ_DATA table without first entering the associated sampling event data in the WQ_EVENT table. This provides an automatic layer of quality assurance to the database.

WQ_DATA_BMDL table

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
SOURCE (PK, FK)	Code identifying agency or contractor that generated the data	Text	10
PROJECT (PK, FK)	Agency monitoring project code	Text	10
STATION (PK, FK)	CBP station name	Text	15
SAMPLE_DATE (PK)	Date on which the sample was collected	Date/Time (MMDDYYYY)	8
SAMPLE_TIME (PK)	Time at which the sample was collected	Date/Time (HH24:MM)	8
DEPTH (PK)	Depth at which the sample was collected	Number (Single)	5,1 (4)
SAMPLE_TYPE (PK, FK)	Code identifying type of sample collected (always D=discrete)	Text	5
SAMPLE_ID	Code identifying the sample description and number (e.g. FS1=first subsample of field split sample)	Text	7
LAYER (PK, FK)	Code identifying water column layer at which sample was collected	Text	2
PARAMETER (PK, FK)	Code identifying parameter name	Text	8
VALUE	Parameter value	Number (Single)	12,4 (4)
UNITS (FK)	Abbreviation for units of parameter value	Text	10

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
PROBLEM (FK)	Problem code associated with parameter value	Text	2
METHOD (FK)	Method code identifying field/laboratory test procedure	Text	5
COMMENTS	Comments related to sampled parameter value	Memo	No limit

This table is used to store parameter values below the method detection limit (MDL). Because of their sensitive nature, these data will be available only by request of the Chesapeake Bay Program Water Quality Data Manager. The table structure is identical to that of the WQ_DATA table except that the QUALIFIER field has been eliminated.

WQ_CHLA table

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
SOURCE (PK, FK)	Code identifying agency or contractor that generated the data	Text	10
PROJECT (PK, FK)	Agency monitoring project code	Text	10
STATION (PK, FK)	CBP station name	Text	15
SAMPLE_DATE (PK)	Date on which the sample was collected	Date/Time (MM/DD/YYYY)	8
SAMPLE_TIME (PK)	Time at which the sample was collected	Date/Time (HH24:MM)	8
DEPTH (PK)	Depth at which the sample was collected (meters)	Number (Single)	5,1 (4)
SAMPLE_TYPE (PK, FK)	Code identifying type of sample collected (D = discrete sample, ISM = in-situ measurement)	Text	5
SAMPLE_ID (PK, FK)	Code identifying the sample description and number (e.g. S1=first sample, FS1 = first sub-sample of field split sample)	Text	7
LAYER (PK, FK)	Code identifying water column layer at which sample was collected	Text	3
SAMPLE_VOLUME	Chlorophyll sample volume (liters)	Number (Single)	4,2 (4)
EXTRACT_VOLUME	Chlorophyll extract volume (milliliters)	Number (Single)	4,2 (4)
LIGHT_PATH	Light path used in analysis(centimeters)	Integer	1 (2)
OD630B	Optical density reading (uE/m**2/s) taken at a wavelength of 630 nm, before acidification	Number (Single)	6,3 (4)
OD645B	Optical density reading (uE/m**2/s) taken at a wavelength of 480 nm, before acidification	Number (Single)	6,3 (4)
OD647B	Optical density reading (uE/m**2/s) taken at a wavelength of 647 nm, before acidification	Number (Single)	6,3 (4)
OD663B	Optical density reading (uE/m**2/s)	Number (Single)	6,3 (4)

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
	taken at a wavelength of 663 nm, before acidification		
OD664B	Optical density reading (uE/m**2/s) taken at a wavelength of 664 nm, before acidification	Number (Single)	6,3 (4)
OD665A	Optical density reading (uE/m**2/s) taken at a wavelength of 665 nm, after acidification	Number (Single)	6,3 (4)
OD750A	Optical density reading (uE/m**2/s) taken at a wavelength of 750 nm, after acidification (corrected for turbidity)	Number (Single)	6,3 (4)
OD750B	Optical density reading (uE/m**2/s) taken at a wavelength of 750 nm, before acidification (corrected for turbidity)	Number (Single)	6,3 (4)
PROBLEM (FK)	Problem code associated with chlorophyll analysis	Text	2
LAB (FK)	Lab code identifying where the analysis was conducted	Text	10
COMMENTS	Comments related to chlorophyll analysis	Memo	No limit

Note: OD480B and OD510B will be added if required.

The WQ_CHLA table contains optical density readings used to calculate total chlorophyll-a, active chlorophyll-a, pheophytin, trichromatic chlorophyll-a, trichromatic chlorophyll-b, and trichromatic chlorophyll-c.

WQ_KD table

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
SOURCE (PK, FK)	Code identifying agency or contractor that measured the data	Text	10
PROJECT (PK, FK)	Agency monitoring project code	Text	10
STATION (PK, FK)	CBP station name	Text	15
SAMPLE_DATE (PK)	Date on which the PAR readings were taken	Date/Time (MM/DD/YYYY)	8
SAMPLE_TIME (PK)	Time at which the PAR readings were taken	Date/Time (HH24:MM)	8
DEPTH (PK)	Depth at which the PAR readings were taken (meters)	Number (Single)	5,1 (4)
EPAR_S	PAR reading measured from the boat while or just before PAR readings were taken at depth	Number (Single)	6,3 (4)
EPARU_Z	PAR reading taken at depth (up sensor)	Number (Single)	6,3 (4)
EPARD_Z	PAR reading taken at depth (down sensor)	Number (Single)	6,3 (4)
UNITS (FK)	Units for PAR (always UM/M**2/S)	Text	10
METHOD (FK)	Method code identifying field	Text	4

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
	measurement procedure		
COMMENTS	Comments related to the collection of PAR readings	Memo	No limit

Photosynthetic active radiation (PAR) readings are taken in order to calculate a light attenuation coefficient for the water column. Because these data are collected using the same type of meter (i.e. one method for all) and have the same units, they can be stored in one data record.

Lookup Tables

Primary tables contain many "code" fields that are described or defined in detail in related lookup tables. By creating one-to-many relationships between the many lookup tables and the primary data tables and enforcing referential integrity, data managers are restricted to entering only valid lookup table values into the primary data tables. Again, this provides an automatic layer of quality assurance that will improve the utility of the database for all users.

WQ_STATIONS table

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
STATION (PK)	CBP station name	Text	15
LATITUDE (NN)	Latitude of station (decimal degrees)	Number (Double)	9 (8)
LONGITUDE (NN)	Longitude of station (negative decimal degrees)	Number (Double)	10 (8)
HUC8 (NN, FK)	8-digit USGS hydrologic unit code	Text	8
FIPS (NN, FK)	Federal Information Processing System code identifying the state and county in which the station is located	Text	5
ZIP (FK)	Zip code in which the station is located	Text	9
SEG_1985 (FK)	Code specifying the 1985 monitoring segment in which the station is located	Text	6
SEG_1998 (FK)	Code specifying the 1998 monitoring segment in which the station is located	Text	6
WATER_BODY (NN)	Water body (e.g. river, bay, creek, run) in which the station is located	Text	30
CBP_BASIN (O,FK)	Chesapeake Bay Program basin in which the station is located	Text	25
TS_BASIN (O, FK)	Tributary Strategy basin with which the station is associated	Text	25
BASIN (O)	Largest drainage basin (aside from Chesapeake Bay) with which the station is associated	Text	30
SUBBASIN (O)	Second largest drainage basin with which the station is associated (some stations will not have this attribute)	Text	30
SUBBASIN2 (O)	Third largest drainage basin with which the station is associated (some stations will not	Text	30

FIELD	DESCRIPTION	TYPE (FORMAT)	LENGTH (BYTES)
	have this attribute)		
WSM_SEG (O, FK)	Code specifying the watershed model segment in which the station is located	Text	3
LL_DATUM (O)	Associated datum of the latitude and longitude values (NAD27 or NAD83)	Text	5
FALL_LINE (O)	Code specifying whether the station is located above or below the geologic fall line or the zone of tidal influence (river input) (A = above, B = below)	Text	1

The WQ_STATIONS table contains CBP water quality station names and associated attributes. Its primary use will be to establish common geographic referencing across data types. Because the Chesapeake Bay Program has historically used several "basin" designations (e.g. CBP_BASIN, TS_BASIN) to provide summary information to program participants and the public, these naming conventions must be preserved in order to maintain historical perspectives of the data. The newly proposed "basin" designations (e.g. WATER_BODY, BASIN, SUBASIN, SUBASIN2) are meant to provide the user with a more detailed geographic representation of point data to the subwatershed or local level. By doing so, users will be able to retrieve information for water quality stations located within small creeks possibly in their neighborhoods. They will no longer be restricted to large basins.

WQ_STATIONS_AKA table

FIELD	DESCRIPTION	TYPE	LENGTH
AGENCY (PK)	Agency	Text	10
STATION (PK)	CBP station name	Text	15
AGENCY_NAME	Agency station name	Text	15

This table contains CBP stations for which at least one collecting agency has a different station name. This table will be provided to the agencies serving their own data. It will be used by the various data generating agencies to provide users accessing the database via the Internet with a consistent set of station references. This table has not yet been finalized.

USGS	CB1.0	01578310
USGS	ET5.0	01491000
USGS	TF1.0	01594440
USGS	TF2.0	01646580
MDDNR	CB1.0	SUS0109
MDDNR	CB3.3C	XHF1373
MDDNR	CB5.1W	XCF9575
MDDNR	EE3.4	EE3.1
MDDNR	EE3.5	EE3.2
MDDNR	ET5.0	CHO0626
MDDNR	LE1.1	XDE5339
MDDNR	LE1.2	XDE2792
MDDNR	LE1.3	XDF0407

MDDNR	LE1.4	XCF8747
MDDNR	RET1.1	XDE9401
MDDNR	RET2.1	XDA4238
MDDNR	RET2.2	XDA1177
MDDNR	RET2.3	XDB3321
MDDNR	RET2.4	XDC1706
MDDNR	TF1.0	PXT0603
MDDNR	TF1.2	WXT0045
MDDNR	TF1.3	PXT0494
MDDNR	TF1.4	PXT0456
MDDNR	TF1.5	PXT0402
MDDNR	TF1.6	XED9490
MDDNR	TF1.7	XED4892
MDDNR	TF2.0	PR01
MDDNR	TF2.1	XFB2470
MDDNR	TF2.2	XFB1433
MDDNR	TF2.3	XEA6596
MDDNR	TF2.4	XEA1840
VADEQ	TF3.0	TF3.1
VADEQ	TF4.0M	TF4.3
VADEQ	TF4.0P	TF4.1
VADEQ	TF5.0A	TF5.4A
VADEQ	TF5.0J	TF5.1
PADEP	WQN0202	WQN0201
PADEP	WQN0206	WQN0204
PADEP	WQN0218	WQN0217
PADEP	WQN0241	WQN0214
PADEP	WQN0303	WQN0302
PADEP	WQN0304	WQN0303
PADEP	WQN0312	WQN0311
PADEP	WQN0436	WQN0426
ODU	CB5.4	9A
ODU	CB6.4	8
ODU	CB7.1N	9H
ODU	CB7.1S	9I
ODU	CB7.2E	9E
ODU	CB7.3	6
ODU	CB7.3E	7
ODU	CB7.4	4
ODU	CB7.4N	5
ODU	CB8.1	2
ODU	CB8.1E	3
ODU	LE3.7	9B
ODU	LE5.5	1
ODU	WE4.1	9C
ODU	WE4.2	9F
ODU	WE4.3	9G
ODU	WE4.4	9D
VIMS	EE3.4	EE3.1
VIMS	EE3.5	EE3.2

The WQ_STATIONS_AKA table will be used by grantee agencies and their contractors to ensure that data submitted to the CBPO contain the proper station codes. If an agency has already adopted CBP station names, this table will not need to be included in their database.

WQ_EVENT lookup tables

The following lookup tables are related exclusively to the WQ_EVENT table (SOURCE and PROJECT can also be related to the WQ_DATA table). They include data origin codes, sampling event weather codes, and agency cruise codes.

SOURCES table

FIELD	DESCRIPTION	TYPE	LENGTH
SOURCE (PK)	Data source code	Text	10
DESCRIPTION	Description/definition of SOURCE	Text	100
CONTACT	Contact person	Text	50

The SOURCE code provides the agency/company that collected the water quality samples.
The following SOURCE codes, taken directly from the SAS data sets in BAYSTATS, are currently in the water quality database. As data from other sources are added, their SOURCE codes must first be added to this table.

MDDNR	MARYLAND DEPARTMENT OF NATURAL RESOURCES
ODU	OLD DOMINION UNIVERSITY
VADEQ	VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (FORMERLY VIRGINIA STATE WATER CONTROL BOARD)
VIMS	VIRGINIA INSTITUTE OF MARINE SCIENCES
DCDH	DISTRICT OF COLUMBIA DEPARTMENT OF HEALTH (FORMERLY DEPARTMENT OF CONSUMER AND REGULATORY AFFAIRS
USGS	UNITED STATES GEOLOGICAL SURVEY
SRBC	SUSQUEHANNA RIVER BASIN COMMISSION

AGENCIES table

FIELD	DESCRIPTION	TYPE	LENGTH
AGENCY (PK)	Agency code	Text	**10**
DESCRIPTION	Description/definition of AGENCY	Text	**100**
CONTACT	Contact person	Text	**50**

The following AGENCY codes were added to the database to identify the agencies that are ultimately responsible for ensuring the proper processing and storage of water quality data. In cases where a particular agency collects, processes, and stores the data, the SOURCE and AGENCY code will be identical.

MDDNR	MARYLAND DEPARTMENT OF NATURAL RESOURCES

VADEQ VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
DCDH DISTRICT OF COLUMBIA DEPARTMENT OF HEALTH (FORMERLY DEPARTMENT OF CONSUMER AND REGULATORY AFFAIRS
USGS UNITED STATES GEOLOGICAL SURVEY
SRBC SUSQUEHANNA RIVER BASIN COMMISSION

PROGRAMS table

FIELD	DESCRIPTION	TYPE	LENGTH
PROGRAM (PK)	Agency monitoring program code	Text	10
DESCRIPTION	Description/definition of PROGRAM	Text	100
MANAGER	Program manger	Text	50

The PROGRAM code was added to the database design because Maryland DNR has adopted a project-oriented approach to water quality data management. This approach relies upon the use of PROGRAM and PROJECT codes. Currently, there is only one PROGRAM code in the water quality database. As other data from programs such as the fall line monitoring program, the citizens monitoring program, etc. are added to the database, new codes will be generated.

WQMP WATER QUALITY MONITORING PROGRAM

PROJECTS table

FIELD	DESCRIPTION	TYPE	LENGTH
PROJECT (PK)	Agency monitoring project code	Text	10
DESCRIPTION	Description/definition of PROJECT	Text	100

The PROJECT code is used to distinguish Chesapeake Bay water quality data from tributary water quality data.

MAIN CHESAPEAKE BAY
TRIB TRIBUTARY

WAVE_HEIGHTS table

FIELD	DESCRIPTION	TYPE	LENGTH
WAVE_HEIGHT (PK)	Wave height range code	Text	2
DESCRIPTION	Description/definition of WAVE_HEIGHT	Text	20

The WAVE_HEIGHT codes represent the best estimate of the wave conditions experienced during a sampling event.

0 0 TO <0.1 METERS
1 0.1 TO <0.3 METERS
2 0.3 TO <0.6 METERS
3 0.6 TO <1.0 METERS
4 1.0 TO <1.3 METERS

5 >1.3 METERS

CLOUD_COVERS table

FIELD	DESCRIPTION	TYPE	LENGTH
CLOUD_COVER (PK)	Percent cloud cover range code	Text	2
DESCRIPTION	Description/definition of CLOUD_COVER	Text	20

The CLOUD_COVER codes represent the best estimate of the percent cloud cover experienced during a sampling event.

0 CLEAR (0-10%)
1 SCATTERED TO PARTLY CLOUDY (10-50%)
2 PARTLY TO BROKEN (50-90%)
3 OVERCAST (>90%)
4 FOGGY
5 HAZY
6 CLOUD (NO PERCENTAGE)

WIND_SPEEDS table

FIELD	DESCRIPTION	TYPE	LENGTH
WIND_SPEED (PK)	Wind speed range code	Text	2
DESCRIPTION	Description/definition of WIND_SPEED	Text	20

The WIND_SPEED codes represent the best estimate of the wind speed experienced during a sampling event.

0 0 TO 1 KNOT
1 >1 TO 10 KNOTS
2 >10 TO 20 KNOTS
3 >20 TO 30 KNOTS
4 >30 TO 40 KNOTS
5 >40 KNOTS

WIND_DIRECTIONS table

FIELD	DESCRIPTION	TYPE	LENGTH
WIND_DIRECTION (PK)	Wind direction code	Text	3
DESCRIPTION	Description/definition of WIND_DIRECTION	Text	30

The WIND_DIRECTION codes represent the prevailing wind direction experienced during a sampling event.

E FROM THE EAST (90 DEGREES)
ENE FROM THE EASTE NORTHEAST (67.5 DEGREES)
ESE FROM THE EAST SOUTHEAST (112.5 DEGREES)

N	FROM THE NORTH (0 DEGREES)
NE	FROM THE NORTHEAST (45 DEGREES)
NNE	FROM THE NORTH NORTHEAST (22.5 DEGREES)
NNW	FROM THE NORTH NORTHWEST (337.5 DEGREES)
NW	FROM THE NORTHWEST (315 DEGREES)
S	FROM THE SOUTH (180 DEGREES)
SE	FROM THE SOUTHEST (135 DEGREES)
SSE	FROM THE SOUTH SOUTHEAST (157.5 DEGREES)
SSW	FROM THE SOUTH SOUTHWEST (202.5 DEGREES)
SW	FROM THE SOUTHWEST (225 DEGREES)
W	FROM THE WEST (270 DEGREES)
WNW	FROM THE WEST NORTHWEST (292.5 DEGREES)
WSW	FROM THE WEST SOUTHWEST (247.5 DEGREES)

PRECIP_TYPES table

FIELD	DESCRIPTION	TYPE	LENGTH
PRECIP_TYPE (PK)	Precipitation type code	Text	2
DESCRIPTION	Description/definition of PRECIP_TYPE	Text	20

The PRECIP_TYPE codes represent the type of precipitation experienced during a sampling event.

10	NONE
11	DRIZZLE
12	LIGHT RAIN
13	HEAVY RAIN
14	SQUALLY
15	FROZEN PRECIPITATION
16	MIXED RAIN AND SNOW

TIDE_STAGES table

FIELD	DESCRIPTION	TYPE	LENGTH
TIDE_STAGE (PK)	Tidal stage code	Text	2
DESCRIPTION	Description/definition of TIDE_STAGE	Text	10

The TIDE_STAGE codes represent the tidal stage experienced during a sampling event.

E	EBB TIDE
F	FLOOD TIDE
H	HIGH TIDE
L	LOW TIDE

WQ_DATA lookup tables

The following lookup tables are related exclusively to the WQ_DATA table. They include codes related to parameter names, sampling methods and problems encountered during laboratory analysis of water quality samples.

PARAMETERS table

FIELD	DESCRIPTION	TYPE	LENGTH
PARAMETER (PK)	Parameter ID	Text	8
DESCRIPTION	Parameter description/definition	Text	15
UNITS	Parameter Units	Text	100

The following list of parameters represents those parameters that are either directly measured in the field or analyzed in the laboratory. Calculated parameters will not be included in the database. Users will be able to calculate such parameters themselves or they will be provided through the user interface to the database.

Physical parameters

COND	CONDUCTIVITY CORRECTED FOR TEMPERATURE (25 DEG C) AND SALINITY	UMHOS/CM
DO	DISSOLVED OXYGEN CORRECTED FOR TEMPERATURE (25 DEG C) AND SALINITY	MG/L
FLOW_AVG	STREAM FLOW, MEAN DAILY	CFS
FLOW_INS	STREAM FLOW, INSTANTANEOUS	CFS
PH	PH CORRECTED FOR TEMPERATURE (25 DEG C)	SU
SALINITY	SALINITY	MG/L
SECCHI	SECCHI DEPTH	M
WTEMP	WATER TEMPERATURE	DEG C

Laboratory parameters

BIOSI	BIOGENIC SILICA	MG/L
BOD20F	20-DAY BIOCHEMICAL OXYGEN DEMAND (FILTERED SAMPLE)	MG/L
BOD20W	20-DAY BIOCHEMICAL OXYGEN DEMAND (WHOLE SAMPLE)	MG/L
BOD5F	5-DAY BIOCHEMICAL OXYGEN DEMAND (FILTERED SAMPLE)	MG/L
BOD5W	WHOLE 5-DAY BIOCHEMICAL OXYGEN DEMAND	MG/L
CHL_A	TRICHROMATIC CHLOROPHYLL-A	UG/L
CHL_B	TRICHROMATIC CHLOROPHYLL-B	UG/L
CHL_C	TRICHROMATIC CHLOROPHYLL-C	UG/L
CHLA	ACTIVE CHLOROPHYLL-A	UG/L
CHLF	FLOUROMETRIC CHLOROPHYLL	UG/L
COD	CHEMICAL OXYGEN DEMAND	MG/L
DOC	DISSOLVED ORGANIC CARBON	MG/L
DON	DISSOLVED ORGANIC NITROGEN	MG/L
DOP	DISSOLVED ORGANIC PHOSPHORUS	MG/L
FCOLI	FECAL COLIFORMS	MPN/100 ML
FSS	FIXED SUSPENDED SOLIDS	MG/L
HARDNESS	HARDNESS AS CACO3	MG/L
IBOD5F	INHIBITED 5-DAY BIOCHEMICAL OXYGEN DEMAND (FILTERED SAMPLE)	MG/L
IBOD5W	INHIBITED 5-DAY BIOCHEMICAL OXYGEN DEMAND (WHOLE SAMPLE)	MG/L
NH4F	AMMONIUM NITROGEN AS N (FILTERED SAMPLE)	MG/L
NH4W	AMMONIUM NITROGEN AS N (WHOLE SAMPLE)	MG/L
NO23F	NITRITE+NITRATE NITROGEN AS N (FILTERED SAMPLE)	MG/L
NO23W	NITRITE+NITRATE NITROGEN AS N (WHOLE SAMPLE)	MG/L
NO2F	NITRITE NITROGEN AS N (FILTERED SAMPLE)	MG/L
NO2W	NITRITE NITROGEN AS N (WHOLE SAMPLE)	MG/L
NO3F	NITRATE NITROGEN AS N (FILTERED SAMPLE)	MG/L

NO3W	NITRATE NITROGEN AS N (WHOLE SAMPLE)	MG/L
ORP	OXIDATION REDUCTION POTENTIAL	MG/L
PC	PARTICULATE CARBON	MG/L
PHEO	PHEOPHYTIN	UG/L
PIP	PARTICULATE INORGANIC PHOSPHORUS	MG/L
PN	PARTICULATE NITROGEN	MG/L
PO4F	ORTHOPHOSPHATE PHOSPHORUS AS P (FILTERED SAMPLE)	MG/L
PO4W	ORTHOPHOSPHATE PHOSPHORUS AS P (WHOLE SAMPLE)	MG/L
PP	PARTICULATE PHOSPHORUS	MG/L
SIF	SILICA AS SI (FILTERED SAMPLE)	MG/L
SIW	SILICA AS SI (WHOLE SAMPLE)	MG/L
SO3	TOTAL SULFITE AS SO3	MG/L
SO4	TOTAL SULFATE AS SO4	MG/L
SOD	SEDIMENT OXYGEN DEMAND	
TALK	TOTAL ALKALINITY AS CACO3	MG/L
TCOLI	TOTAL COLIFORMS	MPN/100 ML
TDN	TOTAL DISSOLVED NITROGEN	MG/L
TDP	TOTAL DISSOLVED PHOSPHORUS	MG/L
TIN	TOTAL INORGANIC NITROGEN	MG/L
TKNF	TOTAL KJELDAHL NITROGEN (FILTERED SAMPLE)	MG/L
TKNW	TOTAL KJELDAHL NITROGEN (WHOLE SAMPLE)	MG/L
TOC	TOTAL ORGANIC CARBON	MG/L
TON	TOTAL ORGANIC NITROGEN	MG/L
TOP	TOTAL ORGANIC PHOSPHORUS	MG/L
TP	TOTAL PHOSPHORUS	MG/L
TSS	TOTAL SUSPENDED SOLIDS	MG/L
TSSED	TOTAL SUSPENDED SEDIMENT	MG/L
TURB_FTU	TURBIDTY, TURBIDIMETER	FTU
TURB_JTU	TURBIDITY, JACKSON CANDLE METHOD (FORWARD SCATTER)	JTU
TURB_NTU	TURBIDITY, NEPHELOMETRIC METHOD	NTU
VSS	VOLATILE SUSPENDED SOLIDS	MG/L

Metals

AG	TOTAL SILVER	UG/L
AS	TOTAL ARSENIC	UG/L
CD	TOTAL CADMIUM	UG/L
CR	TOTAL CHROMIUM	UG/L
CU	TOTAL COPPER	UG/L
FE	TOTAL IRON	UG/L
MN	TOTAL MANGANESE	UG/L
NI	TOTAL NICKEL	UG/L
PB	TOTAL LEAD	UG/L
SI	TOTAL SILICON AS SI	UG/L
SN	TOTAL STRONTIUM	MG/L
ZN	TOTAL ZINC	UG/L

SAMPLE_TYPES table

FIELD	DESCRIPTION	TYPE	LENGTH
SAMPLE_TYPE (PK)	Sample type code	Text	5
DESCRIPTION	Description/definition of SAMPLE_TYPE	Text	50

The SAMPLE_TYPE code is used to identify the type of sample collected. The current water quality database contains data associated with field measurements of physical parameters taken at a specified depth and lab analysis of discrete samples collected at a specified depth.

D	DISCRETE (GRAB) SAMPLE
ISM	IN-SITU MEASUREMENT, NO SAMPLE COLLECTED

SAMPLE_IDS table

FIELD	DESCRIPTION	TYPE	LENGTH
SAMPLE_ID (PK)	Sample ID code	Text	5
DESCRIPTION	Description/definition of SAMPLE_ID	Text	100

The SAMPLE_ID code is used to further define the sample collected so that the user will be better able to manipulate the data correctly. Other codes will be added as monitoring protocols changes dictate.

M1	FIRST FIELD MEASUREMENT
M2	SECOND FIELD MEASUREMENT
S1	FIRST SAMPLE COLLECTED
S2	SECOND SAMPLE COLLECTED
S3	THIRD SAMPLE COLLECTED
FS1	FIRST SUBSAMPLE OF A FIELD SPLIT SAMPLE
FS2	SECOND SUBSAMPLE OF A FIELD SPLIT SAMPLE
FS3	THIRD SUBSAMPLE OF A FIELD SPLIT SAMPLE
FS_AVG	VALUE REPRESENTS THE AVERAGE OF TWO FIELD SPLIT SAMPLES
LS1	FIRST SUBSAMPLE OF A LAB SPLIT SAMPLE
LS2	SECOND SUBSAMPLE OF A LAB SPLIT SAMPLE

LAYERS table

FIELD	DESCRIPTION	TYPE	LENGTH
LAYER (PK)	Water column layer code	Text	1
DESCRIPTION	Description/definition of LAYER	Text	20

The LAYER code defines the water column layer at which the sample was collected.

S	SURFACE
B	BOTTOM
AP	ABOVE PYCNOCLINE
BP	BELOW PYCNOCLINE
M	MID-DEPTH

UNITS table

FIELD	DESCRIPTION	TYPE	LENGTH
UNITS (PK)	Units abbreviation	Text	10
DESCRIPTION	Description/definition of UNITS	Text	50

MG/L	MILLIGRAMS PER LITER
UG/L	MICROGRAMS PER LITER
SU	STANDARD UNITS
UMHOS/CM	MICROMHOS PER CENTIMETER
MPN/100 ML	MOST PROBABLE NUMBER PER 100 MILLILITERS
CFS	CUBIC FEET PER SECOND

UM/M**2/S	MICROMOLES PER METER SQUARED PER SECOND
UE/M**2/S	MICROEINSTEINS PER METER SQUARED PER SECOND
DEG C	DEGREES CELCIUS
PPT	PARTS PER THOUSAND
NTU	NEPHELOMETRIC TURBIDITY UNITS
M	METERS

QUALIFIERS table

FIELD	DESCRIPTION	TYPE	LENGTH
QUALIFIER (PK)	Parameter value qualifier code	Text	1
DESCRIPTION	Description/definition of QUALIFIER	Text	50

The QUALIFIER code is used to describe the parameter value as less than or greater than the method detection limit.

<	LESS THAN THE LOWER METHOD DETECTION LIMIT (MDL)
>	GREATER THAN THE UPPER METHOD DETECTION LIMIT (MDL)

METHODS table

FIELD	DESCRIPTION	TYPE	LENGTH
PARAMETER (PK)	Parameter ID	Text	15
METHOD (PK)	Field/lab method code	Text	5
TITLE	Title of the method	Text	100
EPA_METHOD	EPA method number	Text	20
DESCRIPTION	Description/definition of METHOD	Memo	No limit
REFERENCE1	METHOD reference #1	Memo	No limit
REFERENCE2	METHOD reference #2	Memo	No limit
REFERENCE3	METHOD reference #3	Memo	No limit
REFERENCE4	METHOD reference #4	Memo	No limit

The METHOD code is used to define the field or lab procedure used to obtain the parameter value. This table is currently being generated and will be distributed to AMQAW and DMAW for review and approval upon its completion.

PROBLEMS table

FIELD	DESCRIPTION	TYPE	LENGTH
PROBLEM (PK)	Analysis problem code	Text	2
DESCRIPTION	Description/definition of PROBLEM	Text	50

The PROBLEM code is used to define any lab analysis problems that were encountered during measurement of the parameter value. DMAW indicated that this field should be included in the database for parameter values that were retained despite the associated lab analysis problem.

The database does not currently contain records that have problem codes because BAYSTATS did not retain them.

A	LABORATORY ACCIDENT
B	CHEMICAL MATRIX INTERFERENCE
C	INSTRUMENT FAILURE
D	INSUFFICIENT SAMPLE
E	SAMPLE RECEIVED AFTER HOLDING TIME
H	ANALYSIS RUN BY ANOTHER LAB
J	INCORRECT SAMPLE FRACTION FOR ANALYSIS
R	SAMPLE CONTAMINATED
U	INCONSISTENT RELATIONSHIP BETWEEN VARIABLES
V	SAMPLE RESULTS REJECTED DUE TO QC CRITERIA
X	SAMPLE NOT PRESERVED PROPERLY
Z	ANALYZED BY METHOD OF STANDARD ADDITIONS
BB	TORN FILTER PAD
DD	SAMPLE SIZE NOT REPORTED
FF	POOR REPLICATION BETWEEN PADS, MEAN REPORTED
GG	SAMPLE ANALYZED AFTER HOLDING TIME
HH	SAMPLE NOT COLLECTED
JJ	AMOUNT FILTERED NOT RECORDED
MM	OVER 20% OF SAMPLE ADHERED TO POUCH AND OUTSIDE OF PAD
NN	PARTICULATES FOUND IN FILTERED SAMPLE
QQ	VALUE EXCEEDS A THEORETICAL EQUIVALENT YET WITHIN ANALYTICAL PRECISION
SS	SAMPLE REJECTED, HIGH SUSPENDED SEDIMENT CONCENTRATION
VV	STATION WAS NOT SAMPLED DUE TO BAD FIELD CONDITIONS
WW	HIGH OPTICAL DENSITY (750 NM); ACTUAL VALUE RECORDED

LABS table

FIELD	DESCRIPTION	TYPE	LENGTH
LAB (PK)	Code identifying the laboratory at which the sample was analyzed	Text	10
DESCRIPTION	Full description of lab code	Text	100

The LABS table contains codes that identify the laboratory at which the sample was analyzed.

AMRL	OLD DOMINION UNIVERSITY APPLIED MARINE RESEARCH LABORATORY
CBL	CHESAPEAKE BIOLOGICAL LABORATORY
CRL	USEPA-CENTRAL REGIONAL LABORATORY
MDDHMH	MARYLAND DEPARTMENT OF HEALTH AND MENTAL HYGIENE
USGS	UNITED STATES GEOLOGICAL SURVEY
VADCLS	VIRGINIA DIVISION OF CONSOLIDATED LABORATORY SERVICES
VCU	VIRGINIA COMMONWEALTH UNIVERSITY
VIMS	VIRGINIA INSTITUTE OF MARINE SCIENCE

WQ_STATIONS lookup tables

The following lookup tables are related exclusively to the WQ_STATIONS table. They include codes related to the various geographic references. Values for several of these fields will be populated using GIS polygon coverages that reside at the CBPO. The GIS Team has agreed to perform ARCINFO overlays for this purpose.

FIPS table – contains Federal Information Processing System codes identifying state and county or incorporated city

FIELD	DESCRIPTION	TYPE	LENGTH
FIPS (PK)	Federal Information Processing System code	Text	5
STATE	Two-letter state abbreviation	Text	2
NAME	County/city name	Text	25

10001	DE	KENT
10003	DE	NEW CASTLE
10005	DE	SUSSEX
11001	DC	DISTRICT OF COLUMBIA
24001	MD	ALLEGANY
24003	MD	ANNE ARUNDEL
24005	MD	BALTIMORE
24009	MD	CALVERT
24011	MD	CAROLINE
24013	MD	CARROLL
24015	MD	CECIL
24017	MD	CHARLES
24019	MD	DORCHESTER
24021	MD	FREDERICK
24023	MD	GARRETT
24025	MD	HARFORD
24027	MD	HOWARD
24029	MD	KENT
24031	MD	MONTGOMERY
24033	MD	PRINCE GEORGES
24035	MD	QUEEN ANNES
24037	MD	SAINT MARYS
24039	MD	SOMERSET
24041	MD	TALBOT
24043	MD	WASHINGTON
24045	MD	WICOMICO
24047	MD	WORCESTER
24510	MD	BALTIMORE CITY
36003	NY	ALLEGANY
36007	NY	BROOME
36011	NY	CAYUGA
36015	NY	CHEMUNG
36017	NY	CHENANGO
36023	NY	CORTLAND
36025	NY	DELAWARE

36043	NY	HERKIMER
36051	NY	LIVINGSTON
36053	NY	MADISON
36065	NY	ONEIDA
36067	NY	ONONDAGA
36069	NY	ONTARIO
36077	NY	OTSEGO
36095	NY	SCHOHARIE
36097	NY	SCHUYLER
36101	NY	STEUBEN
36107	NY	TIOGA
36109	NY	TOMPKINS
36123	NY	YATES
42001	PA	ADAMS
42009	PA	BEDFORD
42011	PA	BERKS
42013	PA	BLAIR
42015	PA	BRADFORD
42021	PA	CAMBRIA
42023	PA	CAMERON
42025	PA	CARBON
42027	PA	CENTRE
42029	PA	CHESTER
42033	PA	CLEARFIELD
42035	PA	CLINTON
42037	PA	COLUMBIA
42041	PA	CUMBERLAND
42043	PA	DAUPHIN
42047	PA	ELK
42055	PA	FRANKLIN
42057	PA	FULTON
42061	PA	HUNTINGDON
42063	PA	INDIANA
42065	PA	JEFFERSON
42067	PA	JUNIATA
42069	PA	LACKAWANNA
42071	PA	LANCASTER
42075	PA	LEBANON
42079	PA	LUZERNE
42081	PA	LYCOMING
42083	PA	MCKEAN
42087	PA	MIFFLIN
42093	PA	MONTOUR
42097	PA	NORTHUMBERLAND
42099	PA	PERRY
42105	PA	POTTER
42107	PA	SCHUYLKILL
42109	PA	SNYDER
42111	PA	SOMERSET
42113	PA	SULLIVAN
42115	PA	SUSQUEHANNA
42117	PA	TIOGA
42119	PA	UNION

42127	PA	WAYNE
42131	PA	WYOMING
42133	PA	YORK
51001	VA	ACCOMACK
51003	VA	ALBEMARLE
51005	VA	ALLEGHANY
51007	VA	AMELIA
51009	VA	AMHERST
51011	VA	APPOMATTOX
51013	VA	ARLINGTON
51015	VA	AUGUSTA
51017	VA	BATH
51019	VA	BEDFORD
51023	VA	BOTETOURT
51029	VA	BUCKINGHAM
51031	VA	CAMPBELL
51033	VA	CAROLINE
51036	VA	CHARLES CITY
51037	VA	CHARLOTTE
51041	VA	CHESTERFIELD
51043	VA	CLARKE
51045	VA	CRAIG
51047	VA	CULPEPER
51049	VA	CUMBERLAND
51053	VA	DINWIDDIE
51057	VA	ESSEX
51059	VA	FAIRFAX
51061	VA	FAUQUIER
51065	VA	FLUVANNA
51069	VA	FREDERICK
51071	VA	GILES
51073	VA	GLOUCESTER
51075	VA	GOOCHLAND
51079	VA	GREENE
51085	VA	HANOVER
51087	VA	HENRICO
51091	VA	HIGHLAND
51093	VA	ISLE OF WIGHT
51095	VA	JAMES CITY
51097	VA	KING AND QUEEN
51099	VA	KING GEORGE
51101	VA	KING WILLIAM
51103	VA	LANCASTER
51107	VA	LOUDOUN
51109	VA	LOUISA
51111	VA	LUNENBURG
51113	VA	MADISON
51115	VA	MATHEWS
51119	VA	MIDDLESEX
51121	VA	MONTGOMERY
51125	VA	NELSON
51127	VA	NEW KENT
51131	VA	NORTHAMPTON

51133	VA	NORTHUMBERLAND
51135	VA	NOTTOWAY
51137	VA	ORANGE
51139	VA	PAGE
51145	VA	POWHATAN
51147	VA	PRINCE EDWARD
51149	VA	PRINCE GEORGE
51153	VA	PRINCE WILLIAM
51157	VA	RAPPAHANNOCK
51159	VA	RICHMOND
51161	VA	ROANOKE
51163	VA	ROCKBRIDGE
51165	VA	ROCKINGHAM
51171	VA	SHENANDOAH
51177	VA	SPOTSYLVANIA
51179	VA	STAFFORD
51181	VA	SURRY
51187	VA	WARREN
51193	VA	WESTMORELAND
51199	VA	YORK
51510	VA	ALEXANDRIA CITY
51530	VA	BUENA VISTA CITY
51540	VA	CHARLOTTESVILLE CITY
51550	VA	CHESAPEAKE CITY
51560	VA	CLIFTON FORGE CITY
51570	VA	COLONIAL HEIGHTS CITY
51580	VA	COVINGTON CITY
51600	VA	FAIRFAX CITY
51610	VA	FALLS CHURCH CITY
51630	VA	FREDERICKSBURG CITY
51650	VA	HAMPTON CITY
51660	VA	HARRISONBURG CITY
51670	VA	HOPEWELL CITY
51678	VA	LEXINGTON CITY
51680	VA	LYNCHBURG CITY
51683	VA	MANASSAS CITY
51685	VA	MANASSAS PARK CITY
51700	VA	NEWPORT NEWS CITY
51710	VA	NORFOLK CITY
51730	VA	PETERSBURG CITY
51735	VA	POQOUSON CITY
51740	VA	PORTSMOUTH CITY
51760	VA	RICHMOND CITY
51790	VA	STAUNTON CITY
51800	VA	SUFFOLK CITY
51810	VA	VIRGINIA BEACH CITY
51820	VA	WAYNESBORO CITY
51830	VA	WILLIAMSBURG CITY
51840	VA	WINCHESTER CITY
54003	WV	BERKELEY
54023	WV	GRANT
54027	WV	HAMPSHIRE
54031	WV	HARDY

54037 WV JEFFERSON
54057 WV MINERAL
54063 WV MONROE
54065 WV MORGAN
54071 WV PENDLETON
54077 WV PRESTON
54093 WV TUCKER

HUCS8 table

FIELD	DESCRIPTION	TYPE	LENGTH
HUC8 (PK)	8-digit USGS hydrologic unit code	Text	8
REGION	Region associated with the first two digits of HUC8	Text	25
SUBREGION	Sub-region associated with the first four digits of HUC8	Text	25
ACCOUNTING_UNIT	Accounting unit associated with the first six digits of HUC8	Text	25
CATALOGING_UNIT	Cataloging unit associated with HUC8	Text	35

The HUC8 code is the 8-digit USGS hydrologic unit code in which the station is located. The list that follows contains only the HUC and the associated cataloging unit description. Additional lookup tables related to this table may or may not be included in the final database design. These tables contain specific information related to the REGION, SUBREGION, ACCOUNTING_UNIT, and CATALOGING_UNIT fields (i.e. detailed description, states covered, and area in square miles).

02050101 UPPER SUSQUEHANNA
02050102 CHENANGO
02050103 OWEGO-WAPPASENING
02050104 TIOGA
02050105 CHEMUNG
02050106 UPPER SUSQUEHANNA-TUNKHANNOCK
02050107 UPPER SUSQUEHANNA-LACKAWANNA
02050201 UPPER WEST BRANCH SUSQUEHANNA
02050202 SINNEMAHONING
02050203 MIDDLE WEST BRANCH SUSQUEHANNA
02050204 BALD EAGLE
02050205 PINE
02050206 LOWER WEST BRANCH SUSQUEHANNA
02050301 LOWER SUSQUEHANNA-PENNS
02050302 UPPER JUNIATA
02050303 RAYSTOWN
02050304 LOWER JUNIATA
02050305 LOWER SUSQUEHANNA-SWATARA
02050306 LOWER SUSQUEHANNA
02060001 UPPER CHESAPEAKE BAY
02060002 CHESTER-SASSAFRAS
02060003 GUNPOWDER-PATAPSCO
02060004 SEVERN

02060005 CHOPTANK
02060006 PATUXENT
02060007 BLACKWATER-WICOMICO
02060008 NANTICOKE
02060009 POCOMOKE
02070001 SOUTH BRANCH POTOMAC
02070002 NORTH BRANCH POTOMAC
02070003 CACAPON-TOWN
02070004 CONOCOCHEAGUE-OPEQUON
02070005 SOUTH FORK SHENANDOAH
02070006 NORTH FORK SHENANDOAH
02070007 SHENANDOAH
02070008 MIDDLE POTOMAC-CATOCTIN
02070009 MONOCACY
02070010 MIDDLE POTOMAC-ANACOSTIA-OCCOQUAN
02070011 LOWER POTOMAC
02080101 LOWER CHESAPEAKE BAY
02080102 GREAT WICOMICO-PIANKATANK
02080103 RAPIDAN-UPPER RAPPAHANNOCK
02080104 LOWER RAPPAHANNOCK
02080105 MATTAPONI
02080106 PAMUNKEY
02080107 YORK
02080108 LYNNHAVEN-POQUOSON
02080109 WESTERN LOWER DELMARVA
02080201 UPPER JAMES
02080202 MAURY
02080203 MIDDLE JAMES-BUFFALO
02080204 RIVANNA
02080205 MIDDLE JAMES-WILLIS
02080206 LOWER JAMES
02080207 APPOMATTOX
02080208 HAMPTON ROADS

CBP_BASINS table

FIELD	DESCRIPTION	TYPE	LENGTH
CBP_BASIN (PK)	Chesapeake Bay Program basin (12 total)	Text	25
DESCRIPTION	Description/definition of CBP_BASIN	Text	50

The CBP_BASIN code provides the Chesapeake Bay Program basin in which the station is located. These basin designations have been used by the Chesapeake bay Program since its inception to summarize watershed model loads from all sources. Point related data naturally fall into one of these basins, so this field has been retained in order to maintain the ability to summarize information using this scheme. For stations located within Chesapeake Bay, the CBP may want to consider assigning the most proximal CBP_BASIN to these stations as a means of providing the ability to determine cause and effect relationships. The CBP_BASIN code OUTSIDE WATERSHED is included because there are point source facilities located outside the watershed that are tracked for modeling purposes.

CHESAPEAKE BAY	LOCATED DIRECTLY IN CHESAPEAKE BAY
MD EASTERN SHORE	MARYLAND EAST OF CHESAPEAKE BAY
MD WESTERN SHORE	MARYLAND WEST OF CHAESAPEAKE BAY, EXCLUDING THE POTOMAC AND PATUXENT WATERSHEDS
JAMES RIVER	JAMES RIVER WATERSHED
OUTSIDE WATERSHED	OUTSIDE OF THE CHESAPEAKE BAY WATERSHED
PATUXENT RIVER	PATUXENT RIVER WATERSHED
POTOMAC RIVER	POTOMAC RIVER WATERSHED
RAPPAHANNOCK RIVER	RAPPAHANNOCK RIVER WATERSHED
SUSQUEHANNA RIVER	SUSQUEHANNA RIVER WATERSHED
VA WESTERN SHORE	VIRGINIA WEST OF CHESAPEAKE BAY, EXCLUDING THE POTOMAC, JAMES, RAPPAHANNOCK AND YORK WATERSHEDS
VA EASTERN SHORE	VIRGINIA EAST OF CHESAPEAKE BAY
YORK RIVER	YORK RIVER WATERSHED

TS_BASINS table

FIELD	DESCRIPTION	TYPE	LENGTH
TS_BASIN (PK)	State Tributary Strategy basin	Text	25
DESCRIPTION	Description/definition of TS_BASIN	Text	50

The TS_BASIN code identifies the state tributary strategy in which a particular station is located. The appropriate state abbreviations are included in parentheses for informational purposes only. They are not part of the field value. Although part of Maryland actually drains to the Susquehanna River, these sections were placed in the UPPER EASTERN SHORE and UPPER WESTERN SHORE tributary strategy basins. For stations located within Chesapeake Bay, the CBP may want to consider assigning the most proximal TS_BASIN to these stations as a means of providing the ability to determine cause and effect relationships.

CHESAPEAKE BAY
CHOPTANK RIVER (MD)
JAMES RIVER (VA)
LOWER EASTERN SHORE (MD)
LOWER POTOMAC RIVER (MD)
LOWER WESTERN SHORE (MD)
MIDDLE POTOMAC RIVER (MD)
PATAPSCO/BACK RIVERS (MD)
PATUXENT RIVER (MD)
POTOMAC RIVER (PA, VA)
RAPPAHANNOCK RIVER (VA)
SUSQUEHANNA RIVER (PA)
UPPER EASTERN SHORE (MD)
UPPER POTOMAC RIVER (MD)
UPPER WESTERN SHORE (MD)
VA EASTERN SHORE (VA)
VA WESTERN SHORE (VA)
YORK RIVER (VA)

SEGS_1985 table

FIELD	DESCRIPTION	TYPE	LENGTH
SEG_1985 (PK)	1985 monitoring segment	Text	5
DESCRIPTION	Description/definition of SEG_1985	Text	50

The SEG_1985 code provides the monitoring segment in which the station is located. It is based upon the original 1985 segmentation scheme.

AFL	NON-TIDAL AREAS OF THE CHESAPEAKE BAY WATERSHED
CB1	SUSQUEHANNA FLATS
CB2	UPPER PORTION OF THE CHESAPEAKE BAY MAINSTEM
CB3	UPPER-MOST ESTUARINE ZONE IN THE CHESAPEAKE BAY MAINSTEM
CB4	UPPER PORTION OF THE CENTRAL CHESAPEAKE BAY MAINSTEM
CB5	CENTRAL PORTION OF THE CHESAPEAKE BAY MAINSTEM
CB6	LOWER WEST-CENTRAL PORTION OF THE CHESAPEAKE BAY MAINSTEM
CB7	LOWER EAST-CENTRAL PORTION OF THE CHESAPEAKE BAY MAINSTEM
CB8	SOUTHERN-MOST PORTION OF THE CHESAPEAKE BAY MAINSTEM
EE1	EASTERN BAY, MILES RIVER, AND WYE RIVER
EE2	CHOPTANK RIVER WEST OF CASTLE HAVEN, INCLUDING THE TRED AVON RIVER, BROAD CREEK, HARRIS CREEK, AND THE LITTLE CHOPTANK RIVER
EE3	TANGIER AND POCOMOKE SOUNDS
ET1	NORTHEST RIVER
ET2	ELK AND BOHEMIA RIVERS
ET3	SASSAFRAS RIVER
ET4	CHESTER RIVER
ET5	CHOPTANK RIVER, EXCLUDING EE2
ET6	NANTICOKE RIVER
ET7	WICOMICO RIVER
ET8	MANOKIN RIVER
ET9	BIG ANNEMESSEX RIVER
ET10	POCOMOKE RIVER
LE1	PATUXENT RIVER, LOWER ESTUARINE SEGMENT
LE2	POTOMAC RIVER, LOWER ESTUARINE SEGMENT
LE3	RAPPAHANNOCK RIVER, LOWER ESTUARINE SEGMENT
LE4	YORK RIVER, LOWER ESTUARINE SEGMENT
LE5	JAMES RIVER, LOWER ESTUARINE SEGMENT
RET1	PATUXENT RIVER, RIVERINE-ESTUARINE TRANSITION ZONE
RET2	POTOMAC RIVER, RIVERINE-ESTUARINE TRANSITION ZONE
RET3	RAPPAHANNOCK RIVER, RIVERINE-ESTUARINE TRANSITION ZONE
RET4	YORK RIVER, RIVERINE-ESTUARINE TRANSITION ZONE
RET5	JAMES RIVER, RIVERINE-ESTUARINE TRANSITION ZONE
TF1	PATUXENT RIVER, TIDAL FRESHWATER SEGMENT
TF2	POTOMAC RIVER, TIDAL FRESHWATER SEGMENT
TF3	RAPPAHANNOCK RIVER, TIDAL FRESHWATER SEGMENT
TF4	YORK RIVER, TIDAL FRESHWATER SEGMENT
TF5	JAMES RIVER, TIDAL FRESHWATER SEGMENT
WE4	MOBJACK BAY
WT1	BUSH RIVER
WT2	GUNPOWDER RIVER
WT3	MIDDLE RIVER AND SENECA CREEK
WT4	BACK RIVER

WT5 PATAPSCO RIVER
WT6 MAGOTHY RIVER
WT7 SEVERN RIVER
WT8 SOUTH, RHODE, AND WEST RIVERS

SEGS_1998 table

FIELD	DESCRIPTION	TYPE	LENGTH
SEG_1998 (PK)	1998 Chesapeake Bay segment ID	Text	6
DESCRIPTION	Description/definition of SEG_1998	Text	50

The SEG_1998 code provides the monitoring segment in which the station is located. It is based upon the new 1998 segmentation scheme.

APPTF APPOMATTOX RIVER-TIDAL FRESH REGION
BACOH BACK RIVER-OLIGOHALINE REGION
BIGMH BIG ANNEMESSEX RIVER-MESOHALINE REGION
BOHOH BOHEMIA RIVER-OLIGOHALINE REGION
BSHOH BUSH RIVER-OLIGOHALINE REGION
C&DOH C&D CANAL-OLIGOHALINE REGION
CB1TF CHESAPEAKE BAY-TIDAL FRESH REGION
CB2OH CHESAPEAKE BAY-OLIGOHALINE REGION
CB3MH CHESAPEAKE BAY-MESOHALINE REGION
CB4MH CHESAPEAKE BAY-MESOHALINE REGION
CB5MH CHESAPEAKE BAY-MESOHALINE REGION
CB6PH CHESAPEAKE BAY-POLYHALINE REGION
CB7PH CHESAPEAKE BAY-POLYHALINE REGION
CB8PH CHESAPEAKE BAY-POLYHALINE REGION
CHKOH CHICKAHOMINY RIVER-OLIGOHALINE REGION
CHOMH1 CHOPTANK RIVER-MESOHALINE REGION 1
CHOMH2 CHOPTANK RIVER-MESOHALINE REGION 2
CHOOH CHOPTANK RIVER-OLIGOHALINE REGION
CHOTF CHOPTANK RIVER-TIDAL FRESH REGION
CHSMH CHESTER RIVER-MESOHALINE REGION
CHSOH CHESTER RIVER-OLIGOHALINE REGION
CHSTF CHESTER RIVER-TIDAL FRESH REGION
CRRMH CORROTOMAN RIVER-MESOHALINE REGION
EASMH EASTERN BAY-MESOHALINE REGION
EBEMH EAST BRANCH ELIZABETH RIVER-MESOHALINE REGION
ELIMH ELIZABETH RIVER-MESOHALINE REGION
ELIPH ELIZABETH RIVER-POLYHALINE REGION
ELKOH ELK RIVER-OLIGOHALINE REGION
FSBMH FISHING BAY-MESOHALINE REGION
GUNOH GUNPOWDER RIVER-OLIGOHALINE REGION
HNGMH HONGA RIVER-MESOHALINE REGION
JMSMH JAMES RIVER-MESOHALINE REGION
JMSOH JAMES RIVER-OLIGOHALINE REGION
JMSPH JAMES RIVER-POLYHALINE REGION
JMSTF JAMES RIVER-TIDAL FRESH REGION
LAFMH LAFAYETTE RIVER-MESOHALINE REGION
LCHMH LITTLE CHOPTANK RIVER-MESOHALINE REGION

LYNPH	LYNNHAVEN RIVER-POLYHALINE REGION
MAGMH	MAGOTHY RIVER-MESOHALINE REGION
MANMH	MANOKIN RIVER-MESOHALINE REGION
MATTF	MATTAWOMAN CREEK-TIDAL FRESH REGION
MIDOH	MIDDLE RIVER-OLIGOHALINE REGION
MOBPH	MOBJACK BAY-POLYHALINE REGION
MPNOH	MATTAPONI RIVER-OLIGOHALINE REGION
MPNTF	MATTAPONI RIVER-TIDAL FRESH REGION
NANMH	NANTICOKE RIVER-MESOHALINE REGION
NANOH	NANTICOKE RIVER-OLIGOHALINE REGION
NANTF	NANTICOKE RIVER-TIDAL FRESH REGION
NORTF	NORTHEAST RIVER-TIDAL FRESH REGION
PATMH	PATAPSCO RIVER-MESOHALINE REGION
PAXMH	PATUXENT RIVER-MESOHALINE REGION
PAXOH	PATUXENT RIVER-OLIGOHALINE REGION
PAXTF	PATUXENT RIVER-TIDAL FRESH REGION
PIAMH	PIANKATANK RIVER-MESOHALINE REGION
PISTF	PISCATAWAY CREEK-TIDAL FRESH REGION
PMKOH	PAMUNKEY RIVER-OLIGOHALINE REGION
PMKTF	PAMUNKEY RIVER-TIDAL FRESH REGION
POCMH	POCOMOKE RIVER-MESOHALINE REGION
POCOH	POCOMOKE RIVER-OLIGOHALINE REGION
POCTF	POCOMOKE RIVER-TIDAL FRESH REGION
POTMH	POTOMAC RIVER-MESOHALINE REGION
POTOH	POTOMAC RIVER-OLIGOHALINE REGION
POTTF	POTOMAC RIVER-TIDAL FRESH REGION
RHDMH	RHODE RIVER-MESOHALINE REGION
RPPMH	RAPPAHANNOCK RIVER-MESOHALINE REGION
RPPOH	RAPPAHANNOCK RIVER-OLIGOHALINE REGION
RPPTF	RAPPAHANNOCK RIVER-TIDAL FRESH REGION
SASOH	SASSAFRAS RIVER-OLIGOHALINE REGION
SBEMH	SOUTH BRANCH ELIZABETH RIVER-MESOHALINE REGION
SEVMH	SEVERN RIVER-MESOHALINE REGION
SOUMH	SOUTH RIVER-MESOHALINE REGION
TANMH	TANGIER SOUND-MESOHALINE REGION
WBEMH	WEST BRANCH ELIZABETH RIVER-MESOHALINE REGION
WBRTF	WESTERN BRANCH-TIDAL FRESH REGION
WICMH	WICOMICO RIVER-MESOHALINE REGION
WSTMH	WEST RIVER-MESOHALINE REGION
YRKMH	YORK RIVER-MESOHALINE REGION
YRKPH	YORK RIVER-POLYHALINE REGION

WSM_SEGS table

FIELD	DESCRIPTION	TYPE	LENGTH
WSM_SEGMENT (PK)	Watershed model segment number	Text	3
DESCRIPTION	Description/definition of WSM_SEGMENT	Text	50

The WSM_SEG code defines the watershed model segment in which the station is located. However, because the watershed model doesn't include tidal waters in its segmentation scheme, many water quality monitoring stations aren't located within a model segment. However, the

CBP may want to consider assigning the most proximal watershed model segment to these stations as a means of providing the ability to determine cause and effect relationships.

10	UPPER SUSQUEHANNA RIVER
20	UPPER SUSQUEHANNA RIVER
30	UPPER SUSQUEHANNA RIVER
40	UPPER SUSQUEHANNA RIVER
50	UPPER WEST BRANCH SUSQUEHANNA RIVER
60	WEST BRANCH SUSQUEHANNA RIVER
70	LOWER WEST BRANCH SUSQUEHANNA RIVER
80	SUSQUEHANNA RIVER
90	JUNIATA RIVER
100	JUNIATA RIVER
110	LOWER SUSQUEHANNA RIVER
140	LOWER SUSQUEHANNA RIVER
160	NORTH BRANCH POTOMAC RIVER
170	NORTH BRANCH POTOMAC RIVER
175	UPPER POTOMAC RIVER
180	UPPER POTOMAC RIVER
190	SOUTH BRANCH SHENANDOAH RIVER
200	SHENANDOAH RIVER
210	LOWER POTOMAC RIVER
220	LOWER POTOMAC RIVER
230	UPPER RAPPAHANNOCK RIVER
235	UPPER MATTAPONI RIVER
250	PAMUNKEY RIVER
260	PAMUNKEY RIVER
270	UPPER JAMES RIVER
280	UPPER JAMES RIVER
300	UPPER APPOMATTOX RIVER
330	PATUXENT RIVER
340	PATUXENT RIVER
370	BOHEMIA RIVER
380	CHESTER RIVER
390	WYE RIVER
400	CHOPTANK RIVER
410	NANTICOKE RIVER
420	WICOMICO RIVER
430	POCOMOKE RIVER
440	VA EASTERN SHORE
450	MOUTH OF SUSQUEHANNA RIVER
470	GUNPOWDER RIVER
480	BALTIMORE HARBOR
490	PATAPSCO RIVER
500	PATUXENT RIVER
510	SEVERN RIVER
540	ANACOSTIA RIVER
550	OCCOQUAN RIVER
560	RAPPAHANNOCK RIVER
580	GREAT WICOMICO RIVER
590	YORK RIVER
600	JAMES RIVER

610	CHICKAHOMINY RIVER
620	NANSEMOND RIVER
630	ELIZABETH RIVER
700	UPPER SUSQUEHANNA RIVER
710	LOWER SUSQUEHANNA RIVER
720	LOWER SUSQUEHANNA RIVER
730	UPPER POTOMAC RIVER
740	UPPER POTOMAC RIVER
750	LOWER POTOMAC RIVER
760	BACK RIVER
770	CHOPTANK RIVER
800	UPPER EASTERN SHORE-MD
810	UPPER EASTERN SHORE-MD
820	UPPER EASTERN SHORE-MD
830	UPPER EASTERN SHORE-MD
850	BACK RIVER
860	BACK RIVER
870	BACK RIVER
880	UPPER WESTERN SHORE-MD
890	POTOMAC RIVER
900	POTOMAC RIVER
910	POTOMAC RIVER
920	POTOMAC RIVER
930	MOUTH OF RAPPAHANNOCK RIVER
940	MOUTH OF RAPPAHANNOCK RIVER
960	MOUTH OF JAMES RIVER
970	POTOMAC RIVER
980	POTOMAC RIVER
990	PATUXENT RIVER