

CBM NERR Nutrient Metadata
April-December 2003
Latest Update: May 15, 2025

I. Data Set & Research Descriptors

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2) Research objectives –

The principal objectives are to collect and analyze water samples for nutrient concentrations for the Chesapeake Bay National Estuarine Research Reserve in Maryland (CBM NERR) in support of the National Estuarine Research Reserve's (NERR) System Wide Monitoring Program (SWMP). This nutrient information supplements water quality information taken at sites for the purpose of: 1) tracking and recording nutrient conditions useful to help understand and explain additional data (water quality and meteorological) collected concurrently 2) creating a database capable of detecting long-term changes in nutrient conditions of these systems 3) recording and identifying temporal and spatial differences in nutrient conditions to include changes on a diel time frame and to collect ancillary data in support of other research efforts.

At CBM NERR, water quality and nutrient data were collected at four sites during 2003. Three sites are at the Jug Bay Component of the Reserve and one site is at the Otter Point Creek Component. The three sites at Jug Bay were selected in an effort to examine water quality and nutrient information across different spatial scales and at sites demonstrating different levels of anthropogenic activities. The site at Otter Point Creek was selected to provide baseline information for the Otter Point Creek site and to use for comparison to one or more of the Jug Bay sites. Due to the location of the sites being 2 to 3 hours away from each other and because they are completely different systems, Otter Point Creek was not sampled on the same day as the other three sites, instead Otter Point Creek was sampled the following day after the other sites were sampled. Prior to 2003, water quality data was collected at two sites, JB and PR. Both sites were moved in 2003; however the old PR site was located about 500m downstream of the new RR site and therefore should not be significantly different from the new and old site. The old JB site was permanently removed due to concerns with adequate water depth, and no similar site exists.

a) Monthly Grab Sampling Program

The goals of the monthly grab samples are to create a long-term database of nutrient information at each site for the purpose of detecting changes over time and across sites.

b) Diel Sampling Program

The goal of the diel sampling is to catalog short-term variability in nutrient concentrations across different tidal cycles.

3) Research methods

a) Monthly Grab Sampling Program

Monthly nutrient grab samples were taken at the four principal water quality monitoring stations: Mataponi Creek, Railroad Bridge, Iron Pot Landing, and Otter Point Creek. NERR protocol calls for duplicate monthly nutrient grab samples taken at all four sites on the same day within 3 hours of slack tide. Due to the location of the Jug Bay sites being 2 to 3 hours away from the Otter Point Creek site and because they are completely different systems, Otter Point Creek was not sampled on the same day as the other three sites. Instead all three Jug Bay sites were sampled on the same day, while the Otter Point

Creek was sampled the following day. In addition, the collection of a duplicate sample at each site did not begin until July 29, 2003 but was conducted monthly thereafter. Additionally, nutrient samples at CBM NERR were collected at higher frequencies and for a larger number of parameters than required by the NERR System. At CBM NERR, nutrient samples were collected during the exchange of the YSI 6600EDS instruments. Samples were collected on a weekly basis from April through October. During these months a full suite of nutrients were processed and analyzed. In the month of November and December 2003 only the core NERR nutrients were collected and analyzed on a biweekly basis. At each sampling, whole water samples were collected using a horizontal Alpha Bottle lowered to the depth of the YSI instrument. A sample was captured in the Alpha Bottle at the same time the YSI 6600EDS logged a water quality reading. The sample was decanted from the Alpha Bottle to a one liter Nalgene bottle for filtering. Nalgene bottles are only washed with Liquinox laboratory soap, rinsed three to five times with tap water and then rinsed three to five times with DI water. Acid washing is not used due to Chlorophyll sampling from the same bottle in order to not kill any of the chlorophyll with residual acid. The filter units are acid washed, barring the chlorophyll filter frit, with liquinox soap, rinsed three times with tap water, rinsed three times with 10% HCl solution, rinsed three times with tap again, and finally a rinse of DI water three times. Samples are placed on ice and stored in a freezer at the office until courier transports them to the lab (transported on ice). Once monthly beginning with the July 29 sampling, field teams processed a duplicate nutrient sample in accordance to NERR protocol. Duplicate samples in 2003 were taken at the same time and depth as the original sample using a second Alpha Bottle, and within one foot of each other.

b) Diel Sampling Program

In addition to discrete grab samples taken at each of the four sites, additional diel data was collected once monthly beginning in July at the Railroad Bridge station located at the Jug Bay Component. Using an automated sampler (both ISCO and SIGMA samplers were used in 2003) field teams conducted diel sampling as per NERR protocol. These unattended samplers set at a depth of approximately 0.3 meters off the bottom, were programmed to sample every two and one half hours, over a twenty-four hour period, starting at a scheduled YSI 6600EDS interval. Using 1000mL plastic ISCO bottles, the bottles were only washed with Liquinox laboratory soap, rinsed three to five times with tap water and then rinsed three to five times with DI water. Acid washing is not used due to Chlorophyll sampling from the same bottle in order to not kill any of the chlorophyll with residual acid. The filter units are acid washed, barring the chlorophyll filter frit, with liquinox soap, rinsed three times with tap water, rinsed three times with 10% HCl solution, rinsed three times with tap again, and finally a rinse of DI water three times. Samples are placed on ice and stored in a freezer at the office until courier transports them on ice to the lab. A two-liter bottle of frozen water was placed in the sample compartment of these samplers to preserve collected samples over the 24hr deployment period. During each 24hr deployment, 11 whole water samples were collected and stored in the automated sampler until retrieved and taken back to the lab for processing.

All whole water samples (weekly, duplicate, and monthly diel) were collected in the field and either filtered at the site or preserved on ice and taken back to the lab for filtering and sample preparation later that same day. Once samples were filtered and prepared for the appropriate

nutrient analysis, samples were labeled with site, date, time and parameter and placed in a freezer until the office courier delivered the samples to Chesapeake Biological Laboratory (CBL) for analysis.

4) Site location and character –

The Chesapeake Bay National Estuarine Research Reserve in Maryland consists of three components; Otter Point Creek on the Bush River along the upper western shore of the Chesapeake Bay, Jug Bay along the Patuxent River in the middle Bay and Monie Bay on the lower eastern shore of the Chesapeake Bay. At CBM NERR, water quality and nutrient data are collected at four sites. Three sites are at the Jug Bay Component of the Reserve and one site is at the Otter Point Creek Component. The Jug Bay Component of the Reserve is located in the tidal headwaters of the Patuxent River. The watershed for this portion of the river includes portions of the DC Metropolitan area but has dense, tracks of protected riparian areas surrounding this portion of the river. Jug Bay itself, is a 722-acre tidal estuary providing a narrow transition zone between brackish marshes and upland freshwater wetlands. The broad, shallow waters of Jug Bay support a profusion of freshwater plants and animals. Vegetation crowds the river channel and forms an interlaced pattern of tidal and non-tidal marshes, swamps and forested wetlands surrounded by upland woods and fields. The Otter Point Creek Component of the Reserve is located along the tidal headwaters of the Bush River, which drains much of Harford County, including the rapidly growing town of Bel Air, Maryland. Otter Point Creek is a tributary of the Bush River in the upper Chesapeake Bay and consists of 672 acres of open water, tidal marshes, forested wetlands and upland hardwood forests, surrounded by major highways, large residential communities, and heavy commercial and industrial development.

The following is a list of sites with a detailed description of site characteristics and other relevant information.

Mataponi Creek (MC) 38° 44.599'N, 76° 42.446'W (NAD83) or 38.74331667, -76.70743333 (GIS format)

Site MC is located at the Jug Bay Component of the Reserve, in a small tributary (Mataponi Creek) off the upper tidal headwaters of the Patuxent River, Maryland. MC is 2.4 km upstream from the mouth and located in the midchannel of the creek, which is approximately 7m wide at that point. The southern bank is steep and covered mainly with hardwood trees while the Northern bank is tidal marsh. The YSI water quality sonde was deployed vertically in a perforated PVC pipe. Average depth at this site is roughly 0.7 meters with a mean tidal fluctuation of approximately 0.6 m. The YSI is deployed 0.25 m off of the creek bottom. Salinities at this site rarely exceed 0.1 ppt. The bottom habitat is soft sediment, and submerged macrophytes are abundant and dense during the summer months. Because this site is located along the main channel of the Mataponi Creek, water quality is reflective of the general quality of water flowing along the main portion of the creek. The submerged macrophyte community at this site is seasonally very dense and thus water quality is thought to be strongly influenced by the presence of SAV during the summer

months. Because of the dense submerged macrophyte community, limited degree of anthropogenic activities occurring within the watershed of this site, MC is thought to be a “reference” water quality site for the Reserve.

Railroad Bridge (RR) 38° 46.877'N, 76° 42.822'W (NAD 83) or 38.78128333,
-76.7137 (GIS format)

Site RR is located in the mainstem of the upper tidal headwaters of the Patuxent River, Maryland. The site is slightly upstream (roughly 0.3km) from Jackson's Landing at the Patuxent River Park (previous PR site). This section of the Patuxent River is approximately 70m wide and average depth at the site is 1.4m. The YSI sonde is deployed 0.25 m off of the river bottom. Bottom habitat is soft sediment, and submerged macrophyte grassbeds are evident in the shallow areas (<0.5m MLW) during summer months. Mean tidal fluctuation is approximately 0.6 m. Salinity in 2003 ranged from 0.05 - 0.4 ppt. In 2003 this site was moved from 38° 46' 50.6" N, 76° 42' 29.1" W (Jug Bay) to its present location because of the shallow nature of the old site. The new site location (RR) is at the end of the old railroad bed and is deployed vertically in a perforated PVC pipe near midchannel of the Patuxent River. Because this site is located along the main channel of the Patuxent River, water quality is reflective of the general quality of water flowing along the main portion of the river. The site is roughly 1km downstream of the confluence of the Western Branch tributary and the Patuxent River Mainstem, thus water quality is influenced by Western Branch. A large wastewater treatment plant (averaging 10-20 mgd) discharges directly into the Western Branch tributary of the Patuxent River just upstream of IP. Because of the location of this site along the main portion of the Patuxent River, this site is thought to be characteristic of this portion of the Patuxent River.

Iron Pot Landing (IP) 38° 47.760'N, 76° 43.248' W (NAD 83)
or 38.796, -76.7208 (GIS Format)

Site IP is located 2.09km from the mouth of Western Branch. IP is attached vertically off of a small pier near midchannel of the river and has an average depth of 1.6m. The YSI is deployed 0.25 m off of the river bottom. The site is roughly 1km downstream of a large (10-20 mgd) wastewater treatment plant effluent discharge site. The river is approximately 15m wide and flows through extensive riparian buffers. Both banks of the river are flanked by hardwood flora. Tides are semi-diurnal and mean tidal fluctuation is approximately 0.6 m. Salinity at this site is generally 0.1 ppt. Bottom habitat is soft sediment, and narrow submerged macrophyte grassbeds are occasionally evident in the shallow areas downstream during the summer months. Because of the proximity of this site to the discharge location for a large WWTP, this site is considered an “impacted” site for the reserve. This site is part of the NERR build out and is new for 2003.

Otter Point Creek (OC) 39° 27.047'N, 76° 16.474'W (NAD 83)
or 39.45078333, -76.27456667 (GIS Format)

Site OC is located within the Otter Point Creek Component of the Reserve, in the tidal headwaters of the Bush River. The Otter Point Creek component is a large but shallow tidally flooded marsh with average depths less than 1m on low tide. The site is approximately 0.3km from the Anita C. Leight Estuary Center. Site OC is deployed vertically in a perforated PVC pipe and has an average depth of 0.7m. The YSI is deployed 0.25 m off of the creek bottom. Bottom habitat is extremely soft sediment, and submerged macrophyte grassbeds inundate the site during summer months, creating a dense and almost impenetrable ground cover. Salinity at this station rarely rises above 0.1 ppt. Tides in Otter Point Creek are semi-diurnal and have a mean range of about 0.3 m. The average water levels are generally lower in the winter due to north and northwest winds that increase the egress from Chesapeake Bay. The sonde was periodically exposed to very low tides, and sediments at the site are extremely fine and flocculent. Because of the shallowness of the tidal marsh, coupled with the dramatic daily changes in the depth, deployments at the site presented many problems. These problems included periodic exposure of the sonde, very high turbidity and sedimentation rates associated with tidal infiltration and wind and wave generated resuspension, which caused severe fouling of the probes. Water quality at the site represented extreme shallow water habitats. Thus it is not uncommon to see very large fluctuations in temperature and dissolved oxygen at this site ranging from complete anoxia to full saturation, due in part to the shallow nature of the site and the effects of marsh processes on water quality. Additionally, the site was dominated by dense SAV communities from June-October 2003 and thus water quality conditions were likely influenced by the presence of these macrophytes. This site is thought to be representative of water quality within the Otter Point Creek component throughout most of the year, with the exception of the summer months when dense submerged macrophyte communities greatly influence the site.

5) Code variable definitions –

Site definitions:

cbmrrnut = Chesapeake Bay Maryland Reserve nutrient data for Railroad Bridge
cbmmcnut = Chesapeake Bay Maryland Reserve nutrient data for Mataponi Creek
cbmipnut = Chesapeake Bay Maryland Reserve nutrient data for Iron Pot Landing
cbmocnut = Chesapeake Bay Maryland Reserve nutrient data for Otter Point Creek

Monitoring Program Codes:

1 = Monthly (weekly) grab sample
2 = Diel sampling

Rep Codes:

1 = Routine sampling
2 = Duplicate sampling

6) Data collection period –

Nutrient samples were collected using an Alpha Bottle or ISCO Sampler. At Railroad Bridge (Jug Bay Wetlands Sanctuary)(RR) sampling began on April 4, 2003 and continued through December 23, 2003; Mataponi Creek (MTI) began April 22, 2003 and continued through December 23, 2003; Iron Pot Landing (IP) began April 4, 2003 and continued through December 23, 2003; and Otter Point Creek (OC) began April 15, 2003 and continued through December 09, 2003.

(RR) Railroad Monthly Grab Sampling

Date	Time Collected	
4/4/2003	13:00	
4/8/2003	8:15	
4/15/2003	10:45	
4/22/2003	7:15	
4/29/2003	7:45	
5/6/2003	10:15	
5/13/2003	8:15	
5/20/2003	8:15	
5/28/2003	9:00	
6/3/2003	10:30	
6/10/2003	8:00	
6/17/2003	8:30	
6/24/2003	8:30	
7/1/2003	6:45	
7/8/2003	8:30	
7/15/2003	7:45	
7/22/2003	7:30	
7/29/2003	8:15	
7/29/2003	8:15	*
8/5/2003	8:00	
8/12/2003	8:30	
8/19/2003	8:30	
8/26/2003	9:45	
8/26/2003	9:45	*
9/2/2003	12:00	
9/10/2003	7:30	
9/23/2003	8:15	
9/23/2003	8:15	*
10/1/2003	8:15	
10/7/2003	8:30	

10/14/2003	8:00	
10/22/2003	9:00	
10/28/2003	9:30	
10/28/2003	9:30	*
11/13/2003	9:30	
11/26/2003	9:45	
11/26/2003	9:45	*
12/11/2003	10:15	
12/23/2003	10:00	
12/23/2003	10:00	*

* Duplicate Sample

(RR) Railroad Diel Grab Sampling

Begin Date	Begin Time		End Date	End Time
7/29/2003	10:00		7/30/2003	11:00
9/24/2003	11:30		9/25/2003	12:30
10/1/2003	9:30		10/2/2003	10:30
*10/28/2003	11:30		10/29/2003	12:30
12/2/2003	10:30		12/3/2003	11:30

*Late October (10/28 - 10/29) diel samples used as November sampling due to scheduling conflicts.

(MC) Mataponi Creek

Date	Time Collected	
4/22/2003	9:30	
4/29/2003	10:15	
5/6/2003	12:45	
5/13/2003	11:15	
5/20/2003	10:45	
5/28/2003	11:30	
6/3/2003	13:30	
6/10/2003	15:30	
6/17/2003	11:00	
6/24/2003	10:45	
7/1/2003	9:15	
7/8/2003	11:00	
7/15/2003	11:00	
7/22/2003	9:45	

7/29/2003	11:45	
7/29/2003	11:45	*
8/5/2003	10:15	
8/12/2003	11:00	
8/19/2003	11:00	
8/26/2003	12:45	
8/26/2003	12:45	*
9/2/2003	14:15	
9/10/2003	10:00	
9/18/2003	8:15	
9/23/2003	12:15	
9/23/2003	12:15	*
10/1/2003	11:00	
10/7/2003	10:45	
10/14/2003	11:15	
10/22/2003	11:30	
10/28/2003	11:15	
10/28/2003	11:15	*
11/13/2003	11:45	
11/26/2003	12:45	
11/26/2003	12:45	*
12/11/2003	0:15	
12/23/2003	8:00	
12/23/2003	8:00	*

* Duplicate Sample

(IP) Iron Pot Landing

Date	Time	
4/4/2003	14:00	
4/8/2003	9:45	
4/15/2003	12:30	
4/22/2003	8:00	
4/29/2003	9:00	
5/6/2003	11:30	
5/13/2003	9:45	
5/20/2003	9:30	
5/28/2003	10:15	
6/3/2003	12:15	
6/10/2003	12:30	

6/17/2003	9:45	
6/24/2003	9:45	
7/1/2003	8:00	
7/8/2003	9:45	
7/15/2003	9:15	
7/22/2003	8:30	
7/29/2003	9:45	
7/29/2003	9:45	*
8/5/2003	9:15	
8/12/2003	9:45	
8/19/2003	10:00	
8/26/2003	11:15	
8/26/2003	11:15	*
9/2/2003	13:30	
9/10/2003	8:45	
9/23/2003	10:30	
9/23/2003	10:30	*
10/1/2003	9:45	
10/7/2003	9:30	
10/14/2003	9:45	
10/22/2003	10:00	
10/28/2003	12:30	
10/28/2003	12:30	*
11/13/2003	10:45	
11/26/2003	11:45	
11/26/2003	11:45	*
12/11/2003	11:15	
12/23/2003	9:00	
12/23/2003	9:00	*

* Duplicate Sample

(OC) Otter Point Creek

Date	Time collected
4/15/2003	13:30
4/23/2003	10:15
4/30/2003	10:45
5/8/2003	12:30
5/14/2003	9:30
5/21/2003	10:00
5/29/2003	9:45

6/4/2003	8:45	
6/11/2003	8:45	
6/18/2003	12:00	
6/25/2003	9:15	
7/2/2003	11:45	
7/9/2003	10:45	
7/16/2003	9:15	
7/23/2003	9:45	
7/30/2003	10:00	
7/30/2003	10:00	*
8/6/2003	10:00	
8/13/2003	10:30	
8/20/2003	9:30	
8/27/2003	12:15	
8/27/2003	12:15	*
9/2/2003	11:00	**
10/14/2003	9:00	
10/21/2003	9:15	
10/29/2003	10:15	
10/29/2003	10:15	*
11/12/2003	11:20	
11/25/2003	12:15	
11/25/2003	12:15	*
12/9/2003	11:30	***

* Duplicate Sample

**Station pulled for pier reconstruction from 9/2/03 - 10/14/03.

***Meter pulled for ice and lack of depth.

7) Associated researchers and projects

The Jug Bay Wetlands Sanctuary staff has been collecting weekly to monthly temperature, salinity, dissolved oxygen, and nutrient samples at the same location as the data logger at JB through 2003. Additionally, the staff samples at other sites throughout the Jug Bay marsh, which provide additional similar data at a larger spatial scale. Staff at the Anita C. Leight Estuary Center at Otter Point Creek, in conjunction with CBNERR/MD staff, has also been collecting bi-weekly to monthly temperature, salinity, dissolved oxygen, total suspended solids, chlorophyll a, and nutrient samples at the same location as datalogger OC and 5 other sites in the OPC marsh for 2003. Additional discrete data and semi-continuous wq and nutrient data is also available through the Department of Natural Resources Continuous

Monitoring Program (see www.eyesonthebay.net) that provides increased spatial coverage of many of the same parameters around both RR and OC sites for 2003.

8) Distribution –

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Section 1. Principal investigators and contact persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page <http://cdmo.baruch.sc.edu/>. Data are available in text tab-delimited format, Microsoft Excel spreadsheet format and comma-delimited format.

II. Physical Structure Descriptors

9) **Entry verification** – Nutrient samples are sent to Nutrient Analytical Services Laboratory (NASL) at the University of Maryland's Chesapeake Biological Laboratory. The samples are analyzed and problems in sample quality are indicated with an Analytical Problem Code (APC). Additionally, quality assurance/quality control (QA/QC) samples are analyzed and reviewed by NASL to ensure their instrumentation and analytical procedures are not producing erroneous results. Chlorophyll samples are sent to the Maryland Department of Health and Mental Hygiene (DHMH) for analysis. Data from DHMH is handled and QA/QC'd following similar protocols to those in place by NASL. The APC codes in use have been regionally accepted by all partners participating in water quality monitoring of the Chesapeake Bay under guidance of the Environmental Protection Agency's Chesapeake Bay Program Office (CBP). The nutrient data is sent from NASL to the Maryland Department of Natural Resources' Tidewater Ecosystem Assessment division where it is entered into our main water quality database and is merged with the time and date matched field and chlorophyll data. Any APC codes associated with nutrient or chlorophyll data that indicate the data should be rejected are

hidden and made unavailable. Data values that fall below CBP accepted Minimum Detection Limits (MDL) are hidden and a new value is set at the MDL and is flagged to indicate the value has been set to MDL. Once the data has been entered into the data management system, a series of reports and plots are generated for review by an analyst (Chris Heyer). Automatic range checks flag and report any data values that exceed the ranges. The analyst reviews the data and the range check reports to determine if the data are acceptable based on conditions at adjacent stations, weather at the time of sampling, and historic data. Data that are rejected during this QA/QC process are hidden. Once the data has undergone with QA/QC check by the analyst it is made final and available to the scientific community for use. This data is then sent to the DNR field office where a CBM NERR technician (John Zimmerelli) conforms this data into the correct NERR format and variable comment codes. This data is run through a final QA/QC check verifying missing data and calculated values, and an explanation for these data points is provided.

10) Parameter Titles and Variable Names by Data Category

Required NOAA/NERRS System-wide Monitoring Program water quality parameters are denoted by an asterisks “*”.

Data Category	Parameter	Variable	Calculation Method	Unit of Measurement
Phosphorus and Nitrogen	Orthophosphate, filtered*	PO4F	Determined directly	mg/L as P
	Total Phosphorus	TP	TDP+PHOSP and determined directly	mg/L as P
	Total Dissolved Phosphorus	TDP	Determined directly	mg/L as P
	Particulate Phosphorus	PHOSP	Determined directly	mg/L as P
	Ammonium, filtered*	NH4F	Determined directly	mg/L as N
	Nitrite, filtered*	NO2F	Determined directly	mg/L as N
	Nitrate, filtered*	NO3F	NO23F - NO2F	mg/L as N
	Nitrite + Nitrate, filtered*	NO23F	Determined directly	mg/L as N
	Total Dissolved Nitrogen	TDN	Determined directly	mg/L as N
	Total Nitrogen	TN	TDN + PON	mg/L as N
	Particulate Organic Nitrogen and Particulate Nitrogen	PON	Determined Directly	mg/L as N
Plant Pigments	Chlorophyll a*	CHLA_N	Determined directly	µg/L
	Phaeophytin	PHEA	Determined directly	µg/L
Carbon	Particulate Organic Carbon and Particulate Carbon	POC	Determined directly	mg/L as C
Other Lab Parameters	Silicate, Filtered	SiO4F	Determined directly	mg/L as SI
	Total Suspended Solids	TSS	Determined directly	mg/L
	Total Volatile Solids	TVS	TSS – Total Fixed Solids (TFS)	mg/L

Notes:

1. Time is coded based on a 2400 hour clock and is referenced to Standard Time.
2. Reserves have the option of measuring either NO23 or NO2 or NO3.

11) Measured and Calculated Laboratory Parameters –

a) Variables Measured Directly

Nitrogen species: NO₂, NO₃, NH₄, TDN, PON
 Phosphorus species: PO₄F, TDP, PHOSP
 Other: CHLA, PHEA, SiO₄, TSS, POC,

b) Computed Variables

NO₃: NO₃-NO₂
 TN: TDN+PON
 TP: TDP+PHOS
 TVS: TSS-TFS

Note: April through October TP is the addition of TDP and PHOSP because nutrients are filtered for both dissolved and particulates. November through March whole water samples are collected only for Total Phosphorus, therefore TP is determined directly. However, there are no TP data November through December due to an error in submission. No particulates were submitted, only dissolved portions of Phosphorus are available.

12) Limits of Detection and Laboratory Methods – Dates in use for 2003.

Methods References, and Holding Times and Conditions.

Parameter (Units)	Detection Limit (or Range)	Method Reference	Holding Time and Condition
Orthophosphate (mg/L as P)	0.0006 mg/L	EPA method 365.1 (EPA 1979)	Freezing-28 d
Total Diss. Phosphorus (mg/L as P)	0.001 mg/L	Valderrama (1981)	Freezing-28 d
Particulate Phosphorus (mg/L as P)	0.0024 mg/L	Aspila et al. (1976)	Freezing-28 d
Nitrite (mg/L as N)	0.0002 mg/L	EPA method 353.2 (EPA 1979)	Freezing-28 d
Nitrite + Nitrate (mg/L as N)	0.0007 mg/L	EPA method 353.2 (EPA 1979)	Freezing-28 d
Ammonium (mg/L as N)	0.003 mg/L	EPA method 350.1 (EPA 1979)	Freezing-28 d
Total Dissolved Nitrogen (mg/L as N)	0.02 mg/L	D=Elia et al. (1977) Valderrama (1981)	Freezing-28 d
Particulate Organic Nitrogen (mg/L as N)	0.0105 mg/L	EPA method 440.0 (EPA 1997)	Freezing-28 d
Particulate Carbon (mg/L as C)	0.0633 mg/L	EPA method 440.0 (EPA 1997)	Freezing-28 d
Silicate (mg/L as Si)	0.01 mg/L	Technicon (1977)	4 °C - 28 d
Total Suspended Solids (mg/L)	2.4 mg/L	EPA method 160.2 (with slight modification) EPA (1979); APHA (1975)	Freezing-28 d
Total Volatile Solids	0.9 mg/L	APHA method 208 E (with modification) APHA (1975)	Freezing-28 d
Chlorophyll <i>a</i> (µg/L)			

Pheophytin <i>a</i> (µg/L)	0.1 µg/L	APHA (1981)	Freezing-28 d
	0.1 µg/L	APHA (1981)	Freezing-28 d

The MDL is determined as 3 times the standard deviation of a minimum of 7 replicates of a single low concentration sample.

13) Lab Methods

Parameter: PO₄

i) Method Summary: Ammonium molybdate and antimony potassium tartrate react in an acid medium with dilute solutions of phosphorus to form an antimony-phospho-molybdate complex which is reduced to an intensely blue-colored complex by ascorbic acid. Color is proportional to phosphorus concentration.

ii) Method References: Technicon Industrial Method No. 155-71W/Tentative. 1973. Technicon Industrial Systems. Tarrytown, New York, 10591.

USEPA. 1979. Method No. 365.1 *in* Methods for chemical analysis of water and wastes. United States Environmental Protection Agency, Office of Research and Development. Cincinnati, Ohio. Report No. EPA-600/4-79-020 March 1979. 460pp.

Froelich, P.N. and M.E.Q. Pilson. 1978. Systematic absorbance error with Technicon AutoAnalyzer II colorimeter. Water Res. 12:599-603.

iii) Preservation Method: Samples are immediately filtered through 47mm glass fiber filter pads, decanted into an Auto Analyzer vial, and placed on ice. Upon returning to the lab Auto Analyzer vial is placed in freezer at -20°C until analysis. Maximum holding time is 28 days.

Parameter: NH₄

i) Method Summary: Determination of ammonium is by the Berthelot Reaction in which a blue-colored compound similar to indophenol forms when a solution of ammonium salt is added to sodium phenoxide, followed by the addition of sodium hypochlorite. The addition of a potassium sodium tartrate and sodium citrate solution prevents precipitation of hydroxides of calcium and magnesium.

ii) Method References: Technicon Industrial Method No. 804-86T. August 1986. Technicon Industrial Systems. Tarrytown, New York, 10591.

Kerouel, R. and A. Aminot. 1987. Procédure optimisée hors-contaminations

pour l'analyse des éléments nutritifs dissous dans l'eau de mer. Mar. Environ. Res. 22:19-32.

iii) Preservation Method: Samples are immediately filtered through 47mm glass fiber filter pads, decanted into an Auto Analyzer vial, and placed on ice. Upon returning to the lab Auto Analyzer vial is placed in freezer at -20°C until analysis. Maximum holding time is 28 days.

Parameter: NO₂

i) Method Summary: Nitrite reacts under acidic conditions with sulfanilamide to form a diazo compound that couples with N-1-naphthylethylenediamine dihydrochloride to form a reddish-purple azo dye measured at 520 nm..

ii) Method References: Technicon Industrial Method No. 818-87T. February 1987. Technicon Industrial Systems. Tarrytown, New York, 10591.

iii) Preservation Method: Samples are immediately filtered through 47mm glass fiber filter pads, decanted into an Auto Analyzer vial, and placed on ice. Upon returning to the lab Auto Analyzer vial is placed in freezer at -20°C until analysis. Maximum holding time is 28 days.

Parameter: NO₃

i) Method Summary: Filtered samples are passed through a granulated copper-cadmium column to reduce nitrate to nitrite. The nitrite (originally present plus reduced nitrate) then is determined by diazotizing with sulfanilamide and coupling with N-1-naphthylethylenediamine dihydrochloride to form a colored azo dye. Nitrate concentration is obtained by subtracting the corresponding nitrite value from the nitrite + nitrate concentration.

ii) Method References: Technicon Industrial Method No. 158-71 W/A† Tentative. 1977. Technical Industrial Systems. Tarrytown, New York, 10591.

USEPA. 1979. Method No. 365.2 in Methods for chemical analysis of water and wastes. United States Environmental Protection Agency, Office of Research and Development. Cincinnati, Ohio. Report No. EPA-600/4-79-020 March 1979. 460pp.

iii) Preservation Method: Samples are immediately filtered through 47mm glass fiber filter pads, decanted into an Auto Analyzer vial, and placed on ice. Upon returning to the lab Auto Analyzer vial is placed in freezer at -20°C until analysis. Maximum holding time is 28 days.

Parameter: TDN/P and TN/P (Note: both total dissolved and totals are analyzed in the same manner field staff must note how samples are collected.)

Note: April through October TP is the addition of TDP and PHOSP because nutrients are filtered for both dissolved and particulates. November through March whole water samples are collected only for Total Phosphorus, therefore TP is determined directly.

i) Method Summary: The Shimadzu TOC-5000 uses a high temperature combustion method to analyze aqueous samples for TIC, TOC and non-purgeable organic carbon. Samples are treated with hydrochloric acid and sparged with ultra pure carrier grade air to drive off inorganic carbon. High temperature combustion (680 °C) on a catalyst bed of platinum-coated alumina balls breaks down organic carbon into carbon dioxide (CO₂). The CO₂ is carried by ultra pure air to a non-dispersive infrared detector (NDIR) where CO₂ is detected.

ii) Method References: Sugimura, Y. and Y. Suzuki. 1988. A high temperature catalytic oxidation method for the determination of non-volatile dissolved organic carbon in seawater by direct injection of a liquid sample. Mar. Chem. 24:105-131.

iii) Preservation Method: TDN/P samples are immediately filtered through 47mm glass fiber filter pads, 10mL of filtrate is decanted into a tall test tube and placed on ice. Upon returning to the lab tall test tubes are placed in freezer at –20°C until analysis. Maximum holding time is 28 days. (TN/P samples are 10mLs of whole water and are not filtered. Upon returning to the lab tall test tubes are placed in freezer at –20°C until analysis. Maximum holding time is 28 days.)

Parameter: POC/PON

i) Method Summary: Samples are combusted in pure oxygen (O₂) under static conditions. Products of combustion are passed over suitable reagents in the combustion tube where complex oxidation occurs. In the reduction tube, oxides of nitrogen (N) are converted to molecular N. The carbon dioxide (CO₂), water vapor and N are mixed and released into the thermal conductivity detector where the concentrations of the sample gases are measured.

ii) Method References: EPA Method 440.0 Determination of Carbon and Nitrogen in Sediments and Particulates of Estuarine/Coastal Waters Using Elemental Analysis. 1997. Zimmermann, C.F., C.W. Keefe and J. Bashe.

iii) Preservation Method: Samples are immediately filtered through 25mm glass fiber filter pads and placed on ice. Upon returning to the lab a foil

square containing the filter pads are placed in freezer at –20°C until analysis. Maximum holding time is 28 days.

Parameter: PHOSP

i) Method Summary: Samples concentrated on glass fiber filters are combusted in a muffle furnace at 550° for 90 minutes. Samples are later placed in plastic centrifuge tubes where they receive 10 ml of 1 N Hydrochloric Acid for extraction.

Ammonium molybdate and antimony potassium tartrate react in an acid medium with dilute solutions of phosphorus to form an antimony-phospho-molybdate complex which is reduced to an intensely blue-colored complex by ascorbic acid. Color is proportional to phosphorus concentration.

ii) Method References: Aspila, I., H. Agemian and A.S.Y. Chau. 1976. A semi-automated method for the determination of inorganic, organic and total phosphate in sediments. *Analyst*. 101:187-197.

iii) Preservation Method: Samples are immediately filtered through 47mm glass fiber filter pads, rinsed three times with De-ionized water, placed in a foil square, and then placed on ice. Upon returning to the foil square is placed in freezer at –20°C until analysis. Maximum holding time is 28 days.

Parameter: TSS/TVS

i) Method Summary: Total suspended solids (TSS) are the retained material on a tared glass filter pad after filtration of a well-mixed sample of water. Results are expressed in mg/L.

Total volatile solids (TVS) is a measurement of the volatilized material calculated from the measurement of a total suspended solid (TSS) sample minus the combusted remains.

ii) Method References: APHA. 1975. Method 208D. Total Nonfilterable Residue Dried at 103-105 °C (Total Suspended Matter) *in* Standard Methods for the Examination of Water and Wastewater, 14th Edition. American Public Health Association. Washington, D.C. 1193pp.

USEPA. 1979. Method No. 160.2 (with slight modification) in Methods for chemical analysis of water and wastes. United States Environmental Protection Agency, Office of Research and Development. Cincinnati, Ohio. Report No. EPA-600/4-79-020 March 1979. 460pp.

APHA. 1975. Method 208E (with modification). Total volatile and fixed residue @ 550°C *in* Standard Methods for the Examination of Water and

Wastewater, 14th Edition. American Public Health Association. Washington, D.C. 1193pp.

iii) Preservation Method: Samples are immediately filtered through a pre-weighed 47mm glass fiber filter pad, rinsed three times with De-ionized water, placed in a foil square, and then placed on ice. Upon returning to the foil square is placed in freezer at -20°C until analysis. Maximum holding time is 28 days.

Parameter: Chlorophyll and Phaeophytin

i) **Method Summary:** The chlorophyll and related compounds are extracted from the filtered algae with aqueous buffered 90% acetone solution. The concentration of the pigments is determined by measuring the light absorption of the extract.

The chlorophyll *a* content and pheophytin *a* content in every sample are calculated as follows:

Subtract the 750 nm OD value from the reading before acidification (OD₆₆₄ nm) and after acidification (OD₆₆₅nm). Using these corrected values in the equation as follows:

$$\text{Chlorophyll } a \text{ mg/M}^3 = \frac{26.7 (\text{OD } 664b - \text{OD } 665a) \times V1}{V2 \times L}$$

$$\text{Pheophytin } a \text{ mg/M}^3 = \frac{26.7 [1.7665a) - (664b)] V1}{V2 \times L}$$

where V1 = volume of extract in L
V2 = volume of sample in m³
L = light path length or width of cuvette in cm
OD664b, OD665a = optical density of 90% acetone
extract before and after acidification, respectively, these
calculations will be done by computer. In reports, both
calculated results are printed in the right most column
for each sample line.

ii) Method References: 1002 G. Chlorophyll “1.Spectrophotometric Determination of Chlorophyll a, b, and c (Trichromatic method)” Standard Methods for the Examination of Water and Waste Water, 14th Ed., American Public Health Association, 1976, 1029-1031.

10200 H. Chlorophyll “2. Spectrophotometric Determination of Standard Methods for the Examination of Water and Waste Water, 17th Ed., American Public Health Association, 1989, 10-31 - 10-34.

Chlorophyll- Spectrophotometric U.S. Environment Protection Agency,
Environmental Monitoring Systems Laboratory, Cincinnati, OH, Revised 3/91.

Standard Practices for Measurement of Chlorophyll Content of Algae in Surface Waters ASTM, D 3731 - 87, 15 - 18.

iii) Preservation Method: Samples are immediately filtered through a 47mm glass fiber filter pad, placed in a foil square, and then placed on ice. Upon returning the foil square is placed in freezer at –20°C until analysis. Maximum holding time is not to exceed 30 days.

14) Reporting of Missing Data and Data with Concentrations Lower than Method Detection Limits –

Nutrient/Chla comment codes and definitions are provided in the following table. Missing data are denoted by a blank cell “ ” and commented coded with an “M”. Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Method Detection Limit or MDL. MDL’s for specific parameters are listed in the Laboratory Methods and Detection Limits Section (Section II, Part 14) of this document. Measured concentrations that are less than this limit are replaced with the minimum detection limit value and comment coded with a “B” in the variable code comment column. For example, the measured concentration of NO23F was 0.0005 mg/L as N (MDL=0.0008), the reported value would be 0.0008 with a “B” placed in the NO23F comment code column. Calculated parameters are comment coded with a “C” and if any of the components used in the calculation are below the MDL, the calculated value is removed and also comment coded with a “B”. If a calculated value is negative, the value is removed and comment coded with an “N”.

Note: The way below MDL values are handled in the NERRS SWMP dataset was changed in November of 2011. Previously, below MDL data from 2002-2006 were also coded with a B, but replaced with -9999 place holders. Any 2002-2006 nutrient/pigment data downloaded from the CDMO prior to December November of 2011 will contain -9999s representing below MDL concentrations.

Comment Code	Definition
A	Value above upper limit of method detection
B	Value below method detection limit
C	Calculated value
D	Data deleted or calculated value could not be determined due to deleted data, see metadata for details
H	Sample held beyond specified holding time
K	Check metadata for further details
M	Data missing, sample never collected or calculated value could not be determined due to missing data
P	Significant precipitation (reserve defined, see metadata for further details)
U	Lab analysis from unpreserved sample

S	Data suspect, see metadata for further details
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- Samples collected April through October with a Rep Code of 1 were filtered for all reported parameters.
- Samples collected April through October with a Rep Code of 2 were filtered for core NERR nutrients (Chl A, TSS/TVS, Nitrite, Nitrate, Orthophosphate, Ammonium, Total Nitrogen, and Total Phosphorous).
- All samples collected November through March are core NERR nutrients only.
- Diel Samples were collected at the Rail Road Bridge site. Collection of these samples did not begin until July of 2003 due to CBM NERR being one year behind the rest of reserves build out of the nutrient sampling. CBM NERR also lacked a Sigma sampler, or ISCO sampler. A sampler was purchased in September of 2003 and until this purchase a borrowed SIGMA sampler was used for sampling.
- All TN, TP values for duplicates and Diel samples represent only dissolved portion of Nitrogen (TDP and TDN) in the system. Field Teams had been submitting filtrate to the labs with out particulate pads. In 2004 this has been rectified and whole water samples are being sent to the labs.

Anomalous Total Nitrogen and Total Dissolved Nitrogen Data

TN Data missing due to lab accident:

Date	Time	Station Code	Monitor Program	Rep
7/29/2003	8:15	cbmrrnut	1	1
9/2/2003	11:00	cbmocrnut	1	1

TDN Data missing due to lab accident:

Date	Time	Station Code	Monitor Program	Rep
7/29/2003	8:15	cbmrrnut	1	1
8/26/2003	9:45	cbmrrnut	1	2
9/2/2003	11:00	cbmocrnut	1	1

The following TN data is missing the PN component of the calculation due to a result of submitting filtered samples instead of whole water samples to the lab; therefore TN could not be calculated.

Date	Time	Station Code	Monitor Program	Rep
11/12/2003	11:20	cbmocrnut	1	1
11/13/2003	9:30	cbmrrnut	1	1
11/13/2003	10:45	cmbipnut	1	1
11/13/2003	11:45	cbmmcnut	1	1
11/25/2003	12:15	cbmocrnut	1	1
11/26/2003	9:45	cbmrrnut	1	1

11/26/2003	11:45	cmbipnut	1	1
11/26/2003	12:45	cbmmcnut	1	1
12/9/2003	11:30	cbmocnut	1	1
12/11/2003	0:15	cbmmcnut	1	1
12/11/2003	10:15	cbmrrnut	1	1
12/11/2003	11:15	cmbipnut	1	1
12/23/2003	8:00	cbmmcnut	1	1
12/23/2003	9:00	cmbipnut	1	1
12/23/2003	10:00	cbmrrnut	1	1

Anomalous Chlorophyll/Phaeophytin Data

Phaeophytin data rejected and deleted through QA/QC procedures

6/3/2003	12:15
6/10/2003	12:30
6/17/2003	9:45
6/24/2003	8:30
7/1/2003	8:00
7/15/2003	9:15
7/29/2003	11:45
9/2/2003	13:30
9/10/2003	8:45
9/23/2003	8:15
10/7/2003	9:30
10/28/2003	9:30
10/28/2003	12:30
10/29/2003	10:15

Chlorophyll data rejected and deleted through QA/QC procedures

6/3/2003	12:15
6/10/2003	12:30
6/17/2003	9:45
6/24/2003	8:30
7/1/2003	8:00
7/15/2003	9:15
9/2/2003	13:30
9/10/2003	8:45
10/7/2003	9:30
10/28/2003	9:30
10/29/2003	10:15

Anomalous Nitrogen Data

Missing NH₄, NO₂, NO₃, NO₃ data

7/30/2003	11:00
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Anomalous Phosphorous Data

Orthophosphate (PO4) data missing:

Date	Time	Station Code	Monitor Program	Rep
7/30/2003	11:00	cbmrrnut	2	1
9/25/2003	0:00	cbmrrnut	2	1
9/25/2003	2:30	cbmrrnut	2	1
9/25/2003	5:00	cbmrrnut	2	1
9/25/2003	7:30	cbmrrnut	2	1
9/25/2003	10:00	cbmrrnut	2	1
9/25/2003	12:30	cbmrrnut	2	1
12/3/2003	4:00	cbmrrnut	2	1
12/3/2003	6:30	cbmrrnut	2	1
12/3/2003	9:00	cbmrrnut	2	1

Particulate Phosphorus (PHOSP) data missing:

Date	Time	Station Code	Monitor Program	Rep
7/29/2003	8:15	cbmrrnut	1	2
7/29/2003	9:45	cmbipnut	1	2
7/29/2003	11:45	cbmmcnut	1	2
7/29/2003	10:00	cbmrrnut	2	1
7/29/2003	12:30	cbmrrnut	2	1
7/29/2003	15:00	cbmrrnut	2	1
7/29/2003	17:30	cbmrrnut	2	1
7/29/2003	20:00	cbmrrnut	2	1
7/29/2003	22:30	cbmrrnut	2	1
7/30/2003	1:00	cbmrrnut	2	1
7/30/2003	3:30	cbmrrnut	2	1
7/30/2003	6:00	cbmrrnut	2	1
7/30/2003	8:30	cbmrrnut	2	1
7/30/2003	11:00	cbmrrnut	2	1
7/30/2003	10:00	cbmocnut	1	2
8/26/2003	9:45	cbmrrnut	1	2
8/26/2003	11:15	cmbipnut	1	2
8/26/2003	12:45	cbmmcnut	1	2
8/27/2003	12:15	cbmocnut	1	2
9/23/2003	8:15	cbmrrnut	1	2
9/23/2003	10:30	cmbipnut	1	2
9/23/2003	12:15	cbmmcnut	1	2
10/28/2003	9:30	cbmrrnut	1 2	
10/28/2003	11:15	cbmmcnut	1 2	
10/28/2003	12:30	cmbipnut	1 2	
10/29/2003	10:15	cbmocnut	1 2	
11/12/2003	11:20	cbmocnut	1 1	
11/13/2003	9:30	cbmrrnut	1 1	
11/13/2003	10:45	cmbipnut	1 1	
11/13/2003	11:45	cbmmcnut	1 1	
11/25/2003	12:15	cbmocnut	1 1	
11/25/2003	12:15	cbmocnut	1 2	

11/26/2003 9:45	cbmrrnut	1	1	
11/26/2003 9:45	cbmrrnut	1	2	
11/26/2003 11:45	cmbipnut	1	1	
11/26/2003 11:45	cmbipnut	1	2	
11/26/2003 12:45	cbmmcnut	1	1	
11/26/2003 12:45	cbmmcnut	1	2	
12/9/2003 11:30	cbmocnut	1	1	
12/11/2003 0:15	cbmmcnut	1	1	
12/11/2003 10:15	cbmrrnut	1	1	
12/11/2003 11:15	cmbipnut	1	1	
12/23/2003 8:00	cbmmcnut	1	1	
12/23/2003 8:00	cbmmcnut	1	2	
12/23/2003 9:00	cmbipnut	1	1	
12/23/2003 9:00	cmbipnut	1	2	
12/23/2003 10:00	cbmrrnut	1	1	
12/23/2003 10:00	cbmrrnut	1	2	
Date	Time	Station Code	Monitor Program	Rep
9/24/2003 11:30	cbmrrnut	2		1
9/24/2003 14:00	cbmrrnut	2		1
9/24/2003 16:30	cbmrrnut	2		1
9/24/2003 19:00	cbmrrnut	2		1
9/24/2003 21:30	cbmrrnut	2		1
9/25/2003 0:00	cbmrrnut	2		1
9/25/2003 2:30	cbmrrnut	2		1
9/25/2003 5:00	cbmrrnut	2		1
9/25/2003 7:30	cbmrrnut	2		1
9/25/2003 10:00	cbmrrnut	2		1
9/25/2003 12:30	cbmrrnut	2		1
10/1/2003 9:30	cbmrrnut	2		1
10/1/2003 12:00	cbmrrnut	2		1
10/1/2003 14:30	cbmrrnut	2		1
10/1/2003 17:00	cbmrrnut	2		1
10/1/2003 19:30	cbmrrnut	2		1
10/1/2003 22:00	cbmrrnut	2		1
10/2/2003 0:30	cbmrrnut	2		1
10/2/2003 3:00	cbmrrnut	2		1
10/2/2003 5:30	cbmrrnut	2		1
10/2/2003 8:00	cbmrrnut	2		1
10/2/2003 10:30	cbmrrnut	2		1
10/28/2003 11:30	cbmrrnut	2		1
10/28/2003 14:00	cbmrrnut	2		1
10/28/2003 16:30	cbmrrnut	2		1
10/28/2003 19:00	cbmrrnut	2		1
10/28/2003 21:30	cbmrrnut	2		1
10/29/2003 0:00	cbmrrnut	2		1
10/29/2003 2:30	cbmrrnut	2		1
10/29/2003 5:00	cbmrrnut	2		1

10/29/2003 7:30	cbmrrnut	2	1
10/29/2003 10:00	cbmrrnut	2	1
10/29/2003 12:30	cbmrrnut	2	1
12/2/2003 10:30	cbmrrnut	2	1
12/2/2003 13:00	cbmrrnut	2	1
12/2/2003 15:30	cbmrrnut	2	1
12/2/2003 18:00	cbmrrnut	2	1
12/2/2003 20:30	cbmrrnut	2	1
12/2/2003 23:00	cbmrrnut	2	1
12/3/2003 1:30	cbmrrnut	2	1
12/3/2003 4:00	cbmrrnut	2	1
12/3/2003 6:30	cbmrrnut	2	1
12/3/2003 9:00	cbmrrnut	2	1
12/3/2003 11:30	cbmrrnut	2	1

Phosp. Data rejected (deleted) through QA/QC

Date	Time	Station Code	Monitor Program	Rep
6/10/2003	15:30	cbmmcnut	1	1
10/1/2003	11:00	cbmmcnut	1	1

Phosp data is suspect and flagged by Lab. Value exceed a theoretical equivalent, but is within analytical precision .

Date	Time	Station Code	Monitor Program	Rep
9/23/2003	8:15	cbmrrnut	1	1
9/23/2003	10:30	cmbipnut	1	1
10/7/2003	10:45	cbmmcnut	1	1

Anomalous TSS/TVS data

TSS data rejected (deleted) through QA/QC

Date	Time	Station Code	Monitor Program	Rep
7/29/2003	11:45	cbmmcnut	1	1
7/30/2003	10:00	cbmocnut	1	1
8/5/2003	10:15	cbmmcnut	1	1
8/12/2003	11:00	cbmmcnut	1	1
9/2/2003	14:15	cbmmcnut	1	1
10/1/2003	11:00	cbmmcnut	1	1
10/29/2003	10:15	cbmocnut	1	2

TVS data rejected through QA/QC

Date	Time	Station Code	Monitor Program	Rep
7/29/2003	11:45	cbmmcnut	1	1
7/30/2003	10:00	cbmocnut	1	1
7/30/2003	10:00	cbmocnut	1	2
8/5/2003	10:15	cbmmcnut	1	1
8/12/2003	11:00	cbmmcnut	1	1
8/27/2003	12:15	cbmocnut	1	1
8/27/2003	12:15	cbmocnut	1	2

9/2/2003	14:15	cbmmcnut	1	1
9/18/2003	8:15	cbmmcnut	1	1
10/1/2003	11:00	cbmmcnut	1	1

TSS data below method detection limit (MDL)

Date	Time	Station Code	Monitor Program	Rep
7/30/2003	10:00	cbmocrnut	1	2
8/27/2003	12:15	cbmocrnut	1	1
8/27/2003	12:15	cbmocrnut	1	2
9/18/2003	8:15	cbmmcnut	1	1
9/25/2003	0:00	cbmrrnut	2	1
9/25/2003	2:30	cbmrrnut	2	1
9/25/2003	5:00	cbmrrnut	2	1
9/25/2003	7:30	cbmrrnut	2	1
9/25/2003	10:00	cbmrrnut	2	1
9/25/2003	12:30	cbmrrnut	2	1
12/3/2003	4:00	cbmrrnut	2	1
12/3/2003	6:30	cbmrrnut	2	1
12/3/2003	9:00	cbmrrnut	2	1

TVS data below method detection limit (MDL)

Date	Time	Station Code	Monitor Program	Rep
4/29/2003	9:00	cmbipnut	1	1

TSS/TVS flagged (K) for incorrect sample fraction used (i.e. volume on filter sheet did not match volume recorded on foil pouch – lab had to choose a number)

Date	Time	Station Code	Monitor Program	Rep
5/13/2003	9:45	cmbipnut	1 1	

Anomalous Diel Data

July 03 Diel data reflects only core NERR nutrients only.

Dissolved samples (TDP) were submitted instead of whole water samples and could not calculate TP, with the exception of the following TDP data (missing).

Date	Time	Station Code	Monitor Program	Rep
7/29/2003	8:15	cbmrrnut	1	2
8/26/2003	9:45	cbmrrnut	1	2

Last sample not taken due to power failure.

Date	Time	Station Code	Monitor Program	Rep
7/30/2003	11:00	cbmrrnut	2	1

No Diel data sampled in August. Lost use of our loaner SIGMA sampler and purchased an ISCO sampler.

September TDP at 1100 lost due to lab accident – broken test tube

Date	Time	Station Code	Monitor Program	Rep
09/2/03	11:00	cbmocrnut	1	1

September Diel sampling had a power failure after five samples. Data missing for the following dates and times:

Date	Time	Station Code	Monitor Program	Rep
9/25/2003	0:00	cbmrrnut	2	1
9/25/2003	2:30	cbmrrnut	2	1
9/25/2003	5:00	cbmrrnut	2	1
9/25/2003	7:30	cbmrrnut	2	1
9/25/2003	10:00	cbmrrnut	2	1
9/25/2003	12:30	cbmrrnut	2	1

TDN/TDP at 1400 lost due to lab accident – tube cracked in freezer.

Date	Time	Station Code	Monitor Program	Rep
9/24/2003	14:00	cbmrrnut	2	1

Late October (10/28 and 10/29) Diel samples used as November Sampling due to scheduling conflicts.

October(November) TDN/TDP at 0000 lost due to lab accident – tube cracked in freezer.

Date	Time	Station Code	Monitor Program	Rep
10/29/2003	0:00	cbmrrnut	2	1
10/29/2003	12:30	cbmrrnut	2	1

December Diel sampler stopped after 7 samples due to a frozen intake tube. Sample resumed after tube thawed out for the final sample. The following data are missing:

Date	Time	Station Code	Monitor Program	Rep
12/3/2003	4:00	cbmrrnut	2	1
12/3/2003	6:30	cbmrrnut	2	1
12/3/2003	9:00	cbmrrnut	2	1

Variable Comment Codes

15) QA/QC Programs –

a) Precision

- i) **Field Variability** – The Maryland Department of Natural Resources (MDNR) maintains CBM NERR sites in conjunction with their Continuous Monitoring Program, which maintains over 30 sites where water quality and nutrient data are collected. As such, field variability is checked with 10% of all samples being taken as duplicates. These duplicate samples are field duplicates taken as a replicate, or additional sample, taken concurrently at the time of sampling.
- ii) **Laboratory Variability** – The Chesapeake Biological Laboratory (CBL) is responsible for analyzing CBM NERR nutrient samples as well as other nutrient samples taken through MDNR's Continuous Monitoring Program. CBL verifies

the quality of their analytical process by running 10% of all samples through an additional test to duplicate procedures and check the accuracy of their reporting.

- iii) **Inter-organizational splits** - All nutrient parameters for CBM NERR were analyzed by CBL with the exception of Chlorophyll A which is sent to the Department of Health and Mental Hygiene (DHMH) where samples are analyzed using the same procedures as CBL but at no cost to CBM NERR and MDNR. DHMH is an EPA certified laboratory.

b) Accuracy

- i) **Sample Spikes** – Sample outliers range from 85 to 115 percent. CBL typically gets 90 to 110 percent recovery.
- ii) **Standard Reference Material Analysis** – none
- iii) **Cross Calibration Exercises** - Nutrient Analytical Services has participated in many cross calibration exercises. Participation in such programs is an excellent means of determining accuracy of results. Examples of such cross calibration exercises include the Chesapeake Bay Program Quarterly Split Samples, Chesapeake Bay Program Blind Audits, USGS Standard Reference Sample Project, US EPA Method Validation Studies and International Council for the Exploration of the Sea Intercomparison Exercise for Nutrients in Sea Water.

16) Other Remarks

On 5/15/2025 this dataset was updated to include embedded QAQC flags and codes for anomalous/suspect, rejected, missing, and below detection limit data. System-wide monitoring data beginning in 2007 were processed to allow for QAQC flags and codes to be embedded in the data files rather than using the original single letter codes used for the nutrient and pigment dataset along with the detailed sections in the metadata document for suspect, missing, and rejected data. Please note that prior to 2007, rejected data were deleted from the dataset so they are unavailable to be used at all. Suspect, missing, rejected and below minimum detection flags and appropriate three letter codes were embedded retroactively for dataset consistency. The QAQC flag/codes corresponding to the original letter codes are detailed below.

Flag/code	If also C	Historic Letter Code	Historic Code Definition
<1> [SUL]		A	Value above upper limit of method detection
<4> [SBL]	<4> [SCB]	B	Value below method detection limit
no need to flag/code unless combined		C	Calculated value
<3> [GOD]	<3> [GOR]	D	Data deleted or calculated value could not be determined due to deleted data, see metadata for details
<1> (CHB)		H	Sample held beyond specified holding time
<0> (CSM) unless other flag		K	Check metadata for further details
<2> [GDM]	<2> [GDM]	M	Data missing, sample never collected or calculated value could not be determined due to missing data
<3> [SNV] and <1> [SCQ] for components (CRE) or F_Record (CRE)		N	Negative calculated value
<0> (CUS)		P	Significant precipitation (reserve defined, see metadata for further details)
<1> (CSM)		U	Lab analysis from unpreserved sample
		S	Data suspect, see metadata for further details

The 2003 sampling year was an unusually wet and cool year for the Chesapeake Bay region with very high rainfalls and cooler temperatures. As such, data from this year may be atypical compared to future more “normal” years. On September 19, 2003, Hurricane Isabel came onshore in the Chesapeake Bay region creating unusually high tides, flooding and high winds. The hurricane lasted from September 19-25, 2003 with the bulk of the rain event happening on September 19 with an additional rainstorm occurring on September 21, 2003 bringing additional flooding to an already super saturated region. The hurricane brought severe flooding to the Chesapeake region, lasting for several days following the actual

hurricane. The flooding and high waters associated with the hurricane drove a salt wedge up the Bay creating higher than normal salinities and extreme high tides. Outside of a pulsed event of flooding, high salinities, larger inflows of freshwater and high turbidities, the effects of the Hurricane on Chesapeake Bay ecosystem were short and not terribly strong compared to similar storms such as Hurricane Floyd, which hit at low tide and cause severe scouring and erosion during a critical season. For more information on the effects of Hurricane Isabel, contact USGS or MDNR.

Diel sampling switched to beginning of the month starting in October to reduce scheduling conflicts with the arrival of the holiday season.