Chesapeake Bay Maryland (CBM) **NERR Nutrient Metadata**
January – December 2023
Latest Update: August 27, 2025

I. Data Set and Research Descriptors

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2) Research objectives –

The principal objectives of this effort are to provide baseline nutrient concentration data at fixed sites throughout the Chesapeake Bay National Estuarine Research Reserve in Maryland's (CBM NERR) tidal waters. This information supports the National Estuarine Research Reserve's (NERR) System Wide Monitoring Program (SWMP) and supplements water quality information taken at the same fixed sites. Specific goals of this effort include: 1) tracking and recording nutrient conditions to better understand and explain current conditions with the aid of 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 five sites during 2022. Three sites are at the Jug Bay Component of the Reserve, one site is at the Otter Point Creek Component, and one site is at the Monie Bay Component. The three sites at Jug Bay were selected 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 the Reserve's other sites. The site at Monie Bay was selected to monitor marsh ecology due to its relatively undisturbed region and pristine conditions.

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 temporal and spatial changes. This nutrient information supplements water chemistry data to provide a complete picture of water quality at the NERR sites.

b) **Diel sampling program**
The goal of the diel sampling is to catalog short-term variability in nutrient concentrations across different tidal cycles at the Iron Pot Landing site. This site was moved from the Jug Bay Railroad site to the Iron Pot Landing location in September 2007. This temporal nutrient data provides a comprehensive look at the variation in water quality over a 24-hour period.

3) Research methods –

a) **Monthly grab sampling program**
Monthly nutrient grab samples were taken at the five principal water quality monitoring stations: Mataponi Creek, Railroad Bridge, Iron Pot Landing, Monie Bay, and Otter Point Creek. NERR protocol calls for duplicate monthly nutrient grab samples taken at all five sites on the same day within 3 hours of slack tide. Due to the large distances between the Jug Bay component, the Otter Point Creek component, and the Monie Bay component, and because they are completely different systems, the three different components were not all sampled on the same day. Instead, all three Jug Bay sites were sampled on the same day, while Otter Point Creek and Monie Bay were both sampled separately. In accordance with NERR protocol, duplicate samples were taken once monthly at each of the five sites and analyzed for chlorophyll a concentrations, nitrate, nitrite, ammonium, and ortho-phosphate. Single grab samples were also taken mid-month (biweekly), if possible, at the Otter Point Creek and Jug Bay sites. Additional parameters to include total suspended and volatile solids (replicate 1 samples only), total and dissolved nitrogen (replicate 1 samples only), and total and dissolved organic phosphorus (replicate 1 samples only) were also sampled at the same time. These parameters are available by choosing the yearly files data export option from www.nerrsdata.org or by contacting the Reserve directly (see contacts).

Duplicate whole water samples were collected using a horizontal Alpha Bottle lowered to the depth of the YSI instrument, 0.25 meters from the bottom. A sample was captured in the Alpha Bottle at the same time the YSI 6600V2 or EXO2 logged a water quality reading. This sample was decanted from the Alpha Bottle to a one-liter Nalgene bottle for filtering. After decanting the first sample the Alpha Bottle was lowered a second time to capture the duplicate sample. Nalgene bottles are only washed with Liquinox laboratory soap, rinsed three to five times with tap water and then rinsed three to five time with DI water. Acid washing is not used due to Chlorophyll sampling from the same bottle, to reduce the lysing of cells from 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 transport on ice to the analytical lab.

b) Diel sampling program

In addition to discrete grab samples taken at each of the five sites, additional diel data was collected once monthly beginning on January 04, 2023 at the Iron Pot Landing station located at the Jug Bay Component. Using an ISCO automated sampler, field teams conducted diel sampling as per NERR protocol. The unattended sampler was set at a depth of approximately 0.25 meters off the bottom, at the approximate depth as the associated YSI data sonde, and was programmed to sample every two- and one-half hours, over a twenty-four-hour period, starting at a scheduled YSI 6600V2 or EXO2 data collection interval. The ISCO sampler uses 1000mL plastic ISCO bottles. The bottles were washed only 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, to reduce the lysing of cells from 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 transported on ice to the lab. Ice was placed in the sample compartment of these samplers to preserve collected samples over the 25-hour (lunar day) deployment period. During each 25-hour deployment, 11 whole water samples were collected at 2.5-hour intervals and stored in the automated sampler until retrieved and filtered. Parameters were reported as with the grab samples.

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

See the following filtration Standard Operating Procedure:

A. Particulate sample filtration, processing, and storage

1. Chlorophyll

Chlorophyll samples are filtered in the same manner for all programs.

a) For every depth sampled, clean a 47 mm bell with deionized (DI) water. Set up unit for filtering. Be sure that there is a trap in line between the manifold and the vacuum source.

b) Place a Whatman 47 mm GF/F glass fiber filter pad (pore size = 0.7 µm) on the filter frit. Always use clean forceps when handling the filter pads.

c) Mix sample thoroughly by agitating and shaking the sample bottle vigorously, then rinse graduated cylinder three times with sample.

d) Agitate the sample again before measuring in the graduated cylinder. Fill graduated cylinder with sample and filter desired volume through filtration unit. Be sure to use a graduate that is close to the volume being filtered (ex: if you are only filtering 80 ml of sample use a 100 ml graduate). **Keep the vacuum pressure below 10 inches of Hg**.

e) Filter sufficient volume of sample (50-1500 ml) to solidly color the filter pad.

f) Record the total volume filtered on the foil square.

g) Agitate the squirt bottle of $MgCO_3$, as it settles rapidly. Add approximately 1 ml of $MgCO_3$ suspension (1.0 g $MgCO_3$ in 100 ml of DI water) to the last 50 ml of sample in the filtration bell.

NOTE: Samples for dissolved parameters are not to be collected from this filtrate.

h) The pad should be removed as soon as the sample is completely filtered. The pad should not be left on the frit under vacuum. If you are unable to remove it immediately, be sure to release the vacuum to avoid damaging the sample.

i) Using forceps, fold filter in half with sample inside and remove filter pad. Be sure forceps do not touch sample residue on the filter pads, because the sample will adhere to the forceps.

j) Place pad in pre-marked foil square, and carefully fold foil square in thirds, horizontally. Then fold the ends in to seal the filter inside. Be sure that the foil square is marked with date, station, sample type, sample layer, volume of sample filtered, and sample number. Place foil packet into zip-lock plastic bag and place in an ice chest.

k) Place the foils in the appropriately labeled bag in the field office freezer when you return to the office.

l) Record sample station number, date, volume filtered (L), depth (m), layer, start time, salinity, and field scientist sign-off on the volume sheet. This sheet is submitted to the laboratory with the samples

<u>NOTE: The filter pads for chlorophyll samples should be exposed to as little direct sunlight as possible. Store as soon as possible.</u>

2. **Total Suspended Solids/ Volatile Suspended Solids (TSS/TVS)**

a) Follow steps A.1.a. through A.1.d. above, setting up and rinsing one 47 mm filter bell and flask. The filter used is a pre-combusted and pre-weighed 47 mm GF/F filters (pore size = 0.7 μm). The VSS pads come in individually numbered petri dishes from CBL. Remove one pad from its individual petri dish and place on the filter screen. Record the pad number from the petri dish on the TSS/VSS foil label in the space marked "Pad #" as well as in the corresponding space on the volume sheet.

b) Filter 50 - 500 ml and filter through the filter pad leaving a noticeable color on the pad.

c) Make sure filter is sucked dry and rinse the filter pad using at least three - 10 ml rinses of DI water, sucking the pad dry after each rinse.

d) Using forceps, fold the filter in half. Place the filter in a foil square labeled with date, TSS/VSS, sample number, station, sample layer, and volume filtered, and VSS pad number.

e) Fold the foil square as described in step A.1.j. above. Place foil square in zip-lock bag and place in an ice chest.

f) Place the foils in the appropriately labeled bag in the Field Office freezer when you return to the office.

g) Record sample station number, date, volume filtered (L), TSS/VSS pad number, depth (m), layer, start time, salinity, and field scientist sign-off on the volume sheet. This sheet is submitted to the laboratory with the samples.

B. <u>Dissolved nutrient sample filtration & collection</u>

NOTE: The filtrate collected for this sample must come from the TSS/VSS filtration set-up. If you cannot get enough water through this pad to fill all tubes, then use plain GF/F filters to get enough filtrate. The filtrate may not come from pads or units that are in contact with $MGCO_3$ (CHLA).

1. The following steps are to be completed for collection of all filtrate for the samples below:

a) Run 50 ml of sample water through the filter.

b) Use this 50 ml of filtrate to rinse the flask and then discard.

c) Run more sample water through the filter and collect in the flask.

2. Nitrate, Nitrite, Ammonia, Orthophosphate

a) Rinse the 3 like-numbered AA vials (4 ml polystyrene cups) and 3 caps three times with filtrate.

b) Fill the AA vials with filtrate up to ridge where the caps are seated.

c) Snap the caps on the vials. You should hear them snap twice to be fully seated.

d) Place the vials in an ice chest and then store the AA vials in the freezer upon return to the field office.

3. Total Dissolved Nitrogen & Phosphorus (TDN/TDP)

a) Rinse the TDN/P tube (30 ml borosilicate glass) and cap three times with whole water.

b) Flick all remaining water droplets out of the test tube and cap.

c) Rinse the 10 ml graduated cylinder three times with whole water.

d) Fill the graduated cylinder with 10 ml of whole water.
e) Carefully, pour the 10 ml of whole water into the test tube and cap tightly.
f) Place the test tube in an ice chest and then store the test tube in the freezer upon return to the field office.

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 of the Chesapeake Bay and Monie Bay on the lower eastern shore of the Chesapeake Bay. At CBM NERR, water quality and nutrient data are collected at five sites. Three sites are at the Jug Bay Component of the Reserve, one site is at the Otter Point Creek Component, and one site is at the Monie Bay 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 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 Monie Bay Component of the Reserve is located along the northern side of the Deal Island peninsula in Somerset County and is comprised of 3,426 acres of mesohaline saltwater marshes, tidal creeks, pine forests and shallow open water that provide habitat for many species.

All Chesapeake Bay Maryland NERR historical nutrient/pigment monitoring stations:

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
cbmipnut	P	Iron Pot Landing	38° 47' 45.60 N, 76° 43' 14.88 W	04/04/2003 - current	NA	NA
cbmmcnut	P	Mataponi Creek	38° 44' 35.88 N, 76° 42' 26.64 W	04/22/2003 - current	NA	NA
cbmocnut	P	Otter Point Creek	39° 27' 2.52 N, 76° 16' 28.56 W	04/15/2003 - current	NA	NA
cbmrrnut	P	Railroad	38° 46' 52.68 N, 76° 42' 49.32 W	04/04/2003 - current	NA	NA
cbmmbnut	S	Monie Bay	38° 12.513' N, 76° 48.276' W	2006 – current	NA	NA

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 (NAD 83) or 38.74331667, -76.70743333 (GIS format)

Site name	**Mataponi Creek**

Latitude and longitude	38° 44.599' N, 76° 42.446' W
Tidal range *(meters)*	0.6 m
Salinity range *(psu)*	< 0.1 psu
Type and amount of freshwater input	N/A
Water depth (*meters, MLW*)	0.7 m
Sonde distance from bottom (*meters*)	0.3 m
Bottom habitat or type	Soft sediment
Pollutants in area	N/A
Description of watershed	A small tributary off the upper tidal headwaters of the Patuxent River, MD

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 7 m wide at that point. The southern bank is steep and covered mainly with hardwood trees while the northern bank is tidal marsh. The associated 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. Freshwater inputs are not quantified. No USGS gage for streamflow is available. 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 and limited degree of anthropogenic activities occurring within the watershed of this site, MC is considered 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 name	**Railroad Bridge**
Latitude and longitude	38° 46.877' N, 76° 42.822' W
Tidal range *(meters)*	0.6 m
Salinity range *(psu)*	< 1.0 psu
Type and amount of freshwater input	yearly mean of approximately 350–430 cfs,
Water depth (*meters, MLW*)	1.4 m
Sonde distance from bottom (*meters*)	0.3 m
Bottom habitat or type	Soft sediment

Pollutants in area	Site is 1 km downstream from the Western Branch tributary, which receives tertiary treated effluent from a large wastewater treatment plant.
Description of watershed	Includes portions of the DC Metropolitan area but has dense tracks of protected riparian areas surrounding this portion of the river

Site RR is located in the mainstem of the upper tidal headwaters of the Patuxent River, Maryland. The site is slightly upstream (roughly 0.3 km) from Jackson's Landing at the Patuxent River Park (previous PR site). This section of the Patuxent River is approximately 70 m wide and average depth at the site is 1.4 m. The associated YSI sonde is deployed 0.25 m off the river bottom. Bottom habitat is soft sediment, and submerged macrophytes are evident in the shallow areas (<0.5 m MLW) during summer months. Mean tidal fluctuation is approximately 0.6 m. Salinities at this site are typically less than 1ppt throughout the year. The 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 1 km downstream of the confluence of the Western Branch tributary and the Patuxent River Mainstem. Thus water quality is influenced by Western Branch tributary which receives tertiary treated effluent from a large wastewater treatment plant (averaging 10-20 mgd) which discharges directly into the Western Branch tributary of the Patuxent River just upstream of site IP. There are no other known pollutants at this site. USGS streamflow for the closest gauge (Latitude 38°57'21.3" N, Longitude 76°41'37.3" W NAD 83): yearly mean of approximately 350–430 cfs. 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 and thus similar to the historic (1995-2002) site (Jug Bay) located at 38° 46' 50.6" N, 76° 42' 29.1" W.

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

Site name	**Iron Pot Landing**
Latitude and longitude	38° 47.760' N, 76° 43.248' W
Tidal range *(meters)*	0.6 m
Salinity range *(psu)*	0.1 psu
Type and amount of freshwater input	yearly mean of approximately 100–130 cfs, a wastewater treatment plant upstream of the site discharges about 15–30 cfs.
Water depth (*meters, MLW*)	1.6 m
Sonde distance from bottom (*meters*)	0.3 m
Bottom habitat or type	soft sediment, narrow submerged macrophyte grass beds downstream
Pollutants in area	A wastewater treatment plant upstream of the site discharges about 15–30 cfs
Description of watershed	2.09 km from the mouth of the Western Branch, downstream from a large WWTP, hardwood flora surrounding this portion of the river

Site IP is located 2.09 km from the mouth of Western Branch. The associated YSI sonde at IP is deployed vertically in a perforated PVC pipe and attached to a small pier near midchannel of the river and has an average depth of 1.6 m. The YSI is deployed 0.25 m off the river bottom. soft sediment, and narrow submerged macrophyte grass beds. USGS streamflow for the closest gauge (Latitude 38°48'51.2" N, Longitude 76°44'55.4" W NAD 83): yearly mean of approximately 100–130 cfs. In addition, a wastewater treatment plant upstream of the site discharges about 15–30 cfs. The river is approximately 15 m 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 grass beds 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. There are no other known pollutants at this location.

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

Site name	**Otter Point Creek**
Latitude and longitude	39° 27.047' N, 76° 16.474' W
Tidal range *(meters)*	0.3 m
Salinity range *(psu)*	Rarely over 0.1 psu
Type and amount of freshwater input	Yearly mean of approximately 90 cfs
Water depth (*meters, MLW*)	0.7 m
Sonde distance from bottom (*meters*)	0.3 m
Bottom habitat or type	Soft sediment, extremely fine and flocculent
Pollutants in area	Pollutants are mostly urban run-off, with some industrial discharge possible
Description of watershed	Tidally flooded marsh located at the headwaters of the Bush River

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 1 m on low tide. The site is approximately 0.3 km from the Anita C. Leight Estuary Center. Site OC is deployed vertically in a perforated PVC pipe and has an average depth of 0.7 m. The associated YSI data sonde is deployed 0.25 m off the creek bottom. Bottom habitat is extremely soft sediment, and submerged macrophyte communities inundate the site during summer months, creating a dense and almost impenetrable ground cover. Salinity at this station rarely rises above 0.1 ppt. USGS streamflow for the closest gauge (Latitude 39°26'21.4" N, Longitude 76°18'21.7" W NAD 83): yearly mean of approximately 90 cfs. 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 is periodically exposed to air at some 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, data sonde deployments at the site present many problems. These problems include periodic exposure of the sonde, and very high turbidity and sedimentation rates associated with tidal infiltration and wind and wave generated resuspension, which cause severe fouling of the probes. Water quality at the site represents 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, presence of dense macrophyte communities, and the effects of marsh processes on water quality. This site is thought to be representative of water quality within the Otter Point Creek component throughout most of the year, except for the summer months (June–October) when dense submerged macrophyte communities greatly influence the site. Pollutants are mostly urban run-off, with some industrial discharge possible.

Monie Bay (MB) 38° 12.513' N, 76° 48.276' W (NAD 83)

Site name	**Monie Bay**
Latitude and longitude	38° 12.513' N, 76° 48.276' W
Tidal range *(meters)*	0.3 m
Salinity range *(psu)*	10-12 psu
Type and amount of freshwater input	Moderate freshwater inflow from little Monie Creek
Water depth (*meters, MLW*)	(**Mean low water** depth at site, NOT depth of sonde deployment. Indicate if this is an estimate or if the site has been surveyed.)
Sonde distance from bottom (*meters*)	0.25 m
Bottom habitat or type	Soft sediment, m
Pollutants in area	Limited agricultural activities, including chicken farming; and tidal flow
Description of watershed	Relatively undeveloped, vast tidal saltwater marshes and creeks

Site MB is located on Little Monie Creek within the Monie Bay watershed. The open water of tidal Monie Bay merges with the Wicomico River before reaching Tangier Sound and the Chesapeake Bay. The associated YSI sonde is deployed 0.25 m off of the creek bottom. Tides are semi-diurnal with mean ranges of approximately 0.3 m. Average water levels are generally lower in the winter due to north and northwest winds that increase water egress from the Chesapeake Bay and are generally higher in the spring and summer when southerly winds reverse the process. The Monie Bay watershed is relatively undeveloped with limited agricultural activities, including chicken farming. Water quality at the site is driven in part by tidal flow from the Chesapeake Bay mainstem as well as vast tidal saltwater marshes and creeks that make up the watershed. The Monie Bay Component is comprised of three main tidal tributaries, Little Monie Creek (where Site MB is located), Monie Creek and Little Creek, which range in salinity from mesohaline to oligohaline. Little Monie Creek has moderate freshwater inflow with salinity ranging from 10-12 ppt and moderate agricultural input. Somerset County in which Site MB is located is one of the most vulnerable counties to sea level rise in Maryland. Subsidence, relative sea level rise, and erosion are important processes affecting Monie Bay.

5) Coded variable definitions –

cbmrrnut = Chesapeake Bay Maryland Railroad Bridge (Jug Bay) nutrients
cbmmcnut = Chesapeake Bay Maryland Mataponi Creek nutrients
cbmipnut = Chesapeake Bay Maryland Iron Pot Landing nutrients
cbmocnut = Chesapeake Bay Maryland Otter Point Creek nutrients
cbmmbnut = Chesapeake Bay Maryland Monie Bay nutrients

Monitoring Program Codes:
1 = Monthly (biweekly) grab sample program
2 = Diel grab sample program

Rep Codes:
1 = replicate one, monthly and biweekly sampling
2 = replicate two, monthly grab sampling

6) Data collection period –

SWMP nutrient monitoring first began at Railroad Bridge (Jug Bay Wetlands Sanctuary) (RR) on April 4, 2003; Mataponi Creek (MC) on April 22, 2003; Iron Pot Landing (IP) on April 4, 2003; Otter Point Creek (OC) on April 15, 2003; and Monie Bay (MB) in 2006.

Sampling dates for 2023: Railroad Bridge (Jug Bay Wetlands Sanctuary) (RR) sampling began on January 04, 2023 and continued through December 12, 2023; Mataponi Creek (MC) sampling began on January 04, 2023 and continued through December 12, 2023; Iron Pot Landing (IP) sampling began on January 04, 2023 and continued through December 12, 2023; Otter Point Creek (OC) sampling began on January 25, 2023 and continued through December 6, 2023; DIEL sampling at Iron Pot Landing began on January 04, 2023 and continued through December 19, 2023; Monie Bay (MB) sampling began on January 17, 2023 and continued through December 5, 2023.

2023 data collection dates and times are as follows. All times are in Eastern Standard Time (EST).

Jug Bay (RR) (PXT0455) Monthly Grab Sample

Station Code	DateTimeStamp	Monitoring Program	Rep
cbmrrnut	01/04/2023 08:30	1	1
cbmrrnut	01/04/2023 08:31	1	2
cbmrrnut	02/02/2023 08:30	1	1
cbmrrnut	02/02/2023 08:31	1	2
cbmrrnut	03/02/2023 08:45	1	1
cbmrrnut	03/02/2023 08:46	1	2
cbmrrnut	04/04/2023 07:30	1	1
cbmrrnut	04/18/2023 08:30	1	1
cbmrrnut	04/18/2023 08:31	1	2
cbmrrnut	05/02/2023 07:30	1	1
cbmrrnut	05/16/2023 07:15	1	1
cbmrrnut	05/16/2023 07:16	1	2
cbmrrnut	05/30/2023 07:30	1	1
cbmrrnut	06/13/2023 07:15	1	1
cbmrrnut	06/27/2023 07:30	1	1
cbmrrnut	06/27/2023 07:31	1	2
cbmrrnut	07/11/2023 07:15	1	1
cbmrrnut	07/25/2023 07:45	1	1
cbmrrnut	07/25/2023 07:46	1	2
cbmrrnut	08/08/2023 07:30	1	1
cbmrrnut	08/29/2023 08:45	1	1
cbmrrnut	08/29/2023 08:46	1	2
cbmrrnut	09/12/2023 07:45	1	1
cbmrrnut	09/26/2023 07:45	1	1
cbmrrnut	09/26/2023 07:46	1	2
cbmrrnut	10/11/2023 08:15	1	1
cbmrrnut	10/24/2023 07:45	1	1
cbmrrnut	10/24/2023 07:46	1	2
cbmrrnut	11/08/2023 08:30	1	1
cbmrrnut	11/08/2023 08:31	1	2
cbmrrnut	12/12/2023 09:45	1	1

cbmrrnut	12/12/2023 09:46	1	2

Mataponi Creek (MC) (MTI0015) Monthly Grab Sample

Station Code	DateTimeStamp	Monitoring Program	Rep
cbmmcnut	01/04/2023 10:45	1	1
cbmmcnut	01/04/2023 10:46	1	2
cbmmcnut	02/02/2023 10:00	1	1
cbmmcnut	02/02/2023 10:01	1	2
cbmmcnut	03/02/2023 10:30	1	1
cbmmcnut	03/02/2023 10:31	1	2
cbmmcnut	04/04/2023 09:30	1	1
cbmmcnut	04/18/2023 11:15	1	1
cbmmcnut	04/18/2023 11:16	1	2
cbmmcnut	05/02/2023 09:30	1	1
cbmmcnut	05/16/2023 09:45	1	1
cbmmcnut	05/16/2023 09:46	1	2
cbmmcnut	05/30/2023 10:15	1	1
cbmmcnut	06/13/2023 09:00	1	1
cbmmcnut	06/27/2023 10:45	1	1
cbmmcnut	06/27/2023 10:46	1	2
cbmmcnut	07/11/2023 11:00	1	1
cbmmcnut	07/25/2023 10:45	1	1
cbmmcnut	07/25/2023 10:46	1	2
cbmmcnut	08/08/2023 10:00	1	1
cbmmcnut	08/29/2023 11:00	1	1
cbmmcnut	08/29/2023 11:01	1	2
cbmmcnut	09/12/2023 10:15	1	1
cbmmcnut	09/26/2023 10:45	1	1
cbmmcnut	09/26/2023 10:46	1	2
cbmmcnut	10/11/2023 11:15	1	1
cbmmcnut	10/24/2023 10:15	1	1
cbmmcnut	10/24/2023 10:16	1	2
cbmmcnut	11/08/2023 11:30	1	1
cbmmcnut	11/08/2023 11:31	1	2
cbmmcnut	12/12/2023 13:15	1	1
cbmmcnut	12/12/2023 13:16	1	2

Iron Pot Landing (IP) (WXT0013) Monthly Grab Sample

Station Code	DateTimeStamp	Monitoring Program	Rep
cbmipnut	01/04/2023 09:46	1	1
cbmipnut	01/04/2023 09:47	1	2
cbmipnut	02/06/2023 08:15	1	1
cbmipnut	02/06/2023 08:16	1	2

cbmipnut	03/02/2023 11:45	1	1
cbmipnut	03/02/2023 11:46	1	2
cbmipnut	04/04/2023 10:45	1	1
cbmipnut	04/18/2023 10:00	1	1
cbmipnut	04/18/2023 10:01	1	2
cbmipnut	05/02/2023 08:30	1	1
cbmipnut	05/16/2023 08:45	1	1
cbmipnut	05/16/2023 08:46	1	2
cbmipnut	05/30/2023 09:15	1	1
cbmipnut	06/13/2023 10:00	1	1
cbmipnut	06/27/2023 09:00	1	1
cbmipnut	06/27/2023 09:01	1	2
cbmipnut	07/11/2023 09:00	1	1
cbmipnut	07/25/2023 09:15	1	1
cbmipnut	07/25/2023 09:16	1	2
cbmipnut	08/08/2023 09:00	1	1
cbmipnut	08/29/2023 10:00	1	1
cbmipnut	08/29/2023 10:01	1	2
cbmipnut	09/12/2023 09:15	1	1
cbmipnut	09/26/2023 09:30	1	1
cbmipnut	09/26/2023 09:31	1	2
cbmipnut	10/11/2023 09:45	1	1
cbmipnut	10/24/2023 09:15	1	1
cbmipnut	10/24/2023 09:16	1	2
cbmipnut	11/08/2023 10:14	1	1
cbmipnut	11/08/2023 10:16	1	2
cbmipnut	12/12/2023 12:15	1	1
cbmipnut	12/12/2023 12:16	1	2

Iron Pot Landing (IP) (WXT0013) DIEL Sampling (Monthly start and end date and time only)

Station Code	Start DateTimeStamp	End DateTimeStamp	Monitoring Program	Rep
cbmipnut	01/04/2023 09:45	01/05/2023 10:45	2	1
cbmipnut	02/09/2023 09:15	02/10/2023 10:15	2	1
cbmipnut	03/01/2023 08:00	03/02/2023 09:00	2	1
cbmipnut	04/03/2023 07:45	04/04/2023 08:45	2	1
cbmipnut	05/15/2023 07:30	05/16/2023 08:30	2	1
cbmipnut	06/12/2023 07:45	06/13/2023 08:45	2	1
cbmipnut	07/10/2023 07:15	07/11/2023 08:15	2	1
cbmipnut	08/28/2023 07:30	08/29/2023 08:30	2	1
cbmipnut	09/26/2023 09:50	09/27/2023 10:50	2	1
cbmipnut	10/23/2023 08:45	10/24/2023 09:45	2	1
cbmipnut	11/08/2023 10:15	11/09/2023 11:15	2	1
cbmipnut	12/19/2023 09:15	12/20/2023 10:15	2	1

Otter Point Creek (OC) (XJG7035) Monthly Grab Sample

Station Code	DateTimeStamp	Monitoring Program	Rep
cbmocnut	01/25/2023 11:45	1	1
cbmocnut	01/25/2023 11:46	1	2
cbmocnut	02/15/2023 11:00	1	1
cbmocnut	02/15/2023 11:01	1	2
cbmocnut	03/21/2023 08:15	1	1
cbmocnut	03/21/2023 08:16	1	2
cbmocnut	04/06/2023 08:45	1	1
cbmocnut	04/20/2023 09:30	1	1
cbmocnut	04/20/2023 09:31	1	2
cbmocnut	05/04/2023 07:45	1	1
cbmocnut	05/18/2023 07:45	1	1
cbmocnut	05/18/2023 07:46	1	2
cbmocnut	06/01/2023 09:00	1	1
cbmocnut	06/15/2023 07:45	1	1
cbmocnut	06/15/2023 07:46	1	2
cbmocnut	06/29/2023 09:45	1	1
cbmocnut	07/12/2023 08:15	1	1
cbmocnut	07/26/2023 09:15	1	1
cbmocnut	07/26/2023 09:16	1	2
cbmocnut	08/07/2023 09:15	1	1
cbmocnut	08/23/2023 08:45	1	1
cbmocnut	08/23/2023 08:46	1	2
cbmocnut	09/05/2023 09:00	1	1
cbmocnut	09/21/2023 08:30	1	1
cbmocnut	09/21/2023 08:31	1	2
cbmocnut	10/04/2023 07:45	1	1
cbmocnut	10/18/2023 08:30	1	1
cbmocnut	10/18/2023 08:31	1	2
cbmocnut	11/07/2023 09:00	1	1
cbmocnut	11/07/2023 09:01	1	2
cbmocnut	12/06/2023 11:00	1	1
cbmocnut	12/06/2023 11:01	1	2

Monie Bay (MB) (LMN0028) Monthly Grab Sample

Station Code	DateTimeStamp	Monitoring Program	Rep
cbmmbnut	01/17/2023 12:00	1	1
cbmmbnut	01/17/2023 12:01	1	2
cbmmbnut	02/13/2023 10:00	1	1
cbmmbnut	02/13/2023 10:01	1	2
cbmmbnut	03/09/2023 09:45	1	1

cbmmbnut	03/09/2023 09:46	1	2
cbmmbnut	04/05/2023 11:15	1	1
cbmmbnut	04/05/2023 11:16	1	2
cbmmbnut	05/03/2023 08:45	1	1
cbmmbnut	05/03/2023 08:46	1	2
cbmmbnut	06/29/2023 08:30	1	1
cbmmbnut	06/29/2023 08:31	1	2
cbmmbnut	07/27/2023 09:00	1	1
cbmmbnut	07/27/2023 09:01	1	2
cbmmbnut	08/22/2023 09:00	1	1
cbmmbnut	08/22/2023 09:01	1	2
cbmmbnut	09/20/2023 11:00	1	1
cbmmbnut	09/20/2023 11:01	1	2
cbmmbnut	10/19/2023 11:45	1	1
cbmmbnut	10/19/2023 11:46	1	2
cbmmbnut	11/02/2023 11:30	1	1
cbmmbnut	11/02/2023 11:31	1	2
cbmmbnut	12/05/2023 11:15	1	1
cbmmbnut	12/05/2023 11:16	1	2

7) Associated researchers and projects–

As part of the SWMP long-term monitoring program, CBM NERR also monitors 15-minute meteorological and water quality data which may be correlated with this nutrient/pigment dataset. These data are available from the Research Coordinator or online at www.nerrsdata.org.

The Jug Bay Wetlands Sanctuary staff has been collecting weekly to monthly temperature, salinity, dissolved oxygen, and nutrient samples at various tidal and non-tidal sites throughout the Jug Bay marsh since 1989. One of their historic sites includes the current (RR) site as well as the historic (1995-2002) (JB) site. Sampling for their sites is done monthly throughout the year (when ice is not present) and includes parameters such as nitrate/nitrite, ammonium and chlorophyll a. 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 CBM NERR staff, have also been collecting bi-weekly to monthly temperature, salinity, dissolved oxygen, total suspended solids, chlorophyll a, and nutrient samples (to include nitrate/nitrite, ammonium, ortho-phosphate, total nitrogen and total phosphorus) at the same location as datalogger OC and 5 other sites in the Otter Point Creek marsh since 2002. For more information on either the Jug Bay Wetlands Sanctuary or Otter Point Creek monitoring, contact Kyle Derby, the Reserve's Research Coordinator.

An additional ten stations throughout the Monie Bay Component are monitored for water quality by reserve staff and data can be obtained by contacting the Reserve's Research Coordinator. Reserve staff also monitor sediment accretion or erosion using surface elevation tables in the Monie Bay marshes. The Maryland Department of the Environment collects information on fecal coliform contamination at different shellfish sampling stations located within the Monie Bay system. Routine and specialized habitat, wildlife monitoring studies have been conducted in the Monie Bay system by various units of Maryland Department of Natural Resources.

Additional discrete nutrient data and semi-continuous water quality data is also available through the Department of Natural Resources Continuous Monitoring Program (see http://eyesonthebay.dnr.maryland.gov/) that provides increased spatial coverage of many of the same parameters for 2021. This monitoring program included as many as 12 additional continuous monitoring sites (similar to the CBM NERR effort) throughout Maryland tidal waters sampled semi-continuously (every 15 minutes) from April-October 2021. In addition to the high temporal resolution of water quality at these sites, Maryland Department of Natural Resources also conducts water quality cruises between and amongst many of these same sites which are used to create interpolated water quality maps, providing a high degree of spatial resolution around their permanent continuous monitoring (YSI sonde) sites. Interpolated water quality maps are available for all three Chesapeake Bay Components through the Maryland Department of Natural Resources or CBM NERR. The Maryland Department of Natural Resources Continuous Monitoring Program began in 1999. For more information on this program and the water quality monitoring cruises see http://eyesonthebay.dnr.maryland.gov/.

The NERR system-wide monitoring program also collects meteorological data from a weather station located at the Jug Bay Component of the Reserve, specifically at the Jug Bay Wetlands Sanctuary. The weather station is maintained by the Maryland Department of Natural Resources Continuous Monitoring Program. The principal objectives are to record meteorological information for the Chesapeake Bay National Estuarine Research Reserve in Maryland. This information is available for the following: 1) to track and record atmospheric and meteorological conditions useful to help understand and explain additional data collected concurrently 2) to create a database capable of detecting long-term changes in weather patterns 3) to record and identify the impact of storms, hurricanes, heavy rain and other episodic weather events capable of influencing other environmental conditions such as water quality (as monitored by the SWMP effort) and to collect ancillary data in support of other research efforts. The weather station records temperature, relative humidity, barometric pressure, wind speed, wind direction, light as measured by a LI-COR Quantum Sensor, and precipitation.

8) Distribution –

NOAA retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The NERRS retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the NERR site where the data were collected should be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. 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.

Requested citation format:
NOAA National Estuarine Research Reserve System (NERRS). System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: www.nerrsdata.org; *accessed* 12 October 2021.

NERR nutrient data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see 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 www.nerrsdata.org. Data are available in comma separated version 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 (CBL). 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. 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. Data values that fall below CBL 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. 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. Once the data has undergone a QA/QC check by the analyst it is sent to the DNR field office where a CBM NERR technician (Lauren Cunningham) conforms the data into the correct NERR format and inserts variable flags and comment codes. Data received from the NASL are reported in the units required for the NERR CDMO dataset, and therefore do not require any conversions on the part of the CBM NERR.

Nutrient data are entered into a Microsoft Excel worksheet and processed using the NutrientQAQC Excel macro. The NutrientQAQC macro sets up the data worksheet, metadata worksheets, and MDL worksheet; adds chosen parameters and facilitates data entry; allows the user to set the number of significant figures to be reported for each parameter and rounds using banker's rounding rules; allows the user to input MDL values and then automatically flags/codes measured values below MDL and inserts the MDL; calculates parameters chosen by the user and automatically flags/codes for component values below MDL, negative calculated values, and missing data; allows the user to apply QAQC flags and codes to the data; produces summary statistics; graphs selected parameters for review; and exports the resulting data file to the CDMO for tertiary QAQC and assimilation into the CDMO's authoritative online database.

10) Parameter titles and variable names by category –

Required NOAA NERRS System-wide Monitoring Program nutrient parameters are denoted by an asterisk "*".

Data Category	Parameter	Variable Name	Units of Measure
Phosphorus and Nitrogen:			
	*Orthophosphate	PO4F	mg/L as P
	Total Dissolved Phosphorus	TDP	mg/L as P
	Dissolved Organic Phosphorus	DOP	mg/L as P
	*Ammonium, Filtered	NH4F	mg/L as N
	*Nitrite, Filtered	NO2F	mg/L as N
	*Nitrate, Filtered	NO3F	mg/L as N
	*Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L as N
	Dissolved Organic Nitrogen	DON	mg/L as N
	Total Dissolved Nitrogen	TDN	mg/L as N
Plant Pigments:			
	*Chlorophyll a	CHLA_N	µg/L
	Phaeophytin	PHEA	µg/L
Other Lab Parameters:			
	Total Suspended Solids	TSS	mg/L
	Total Volatile Solids	TVS	mg/L

Notes:

1. Time is coded based on a 2400 clock and is referenced to Standard Time.

2. Reserves have the option of measuring either NO2 and NO3 or they may substitute NO23 for individual analyses if they can show that NO2 is a minor component relative to NO3.

a) **Parameters measured directly**

Nitrogen species:	NH4F, NO2F, NO23F, TDN
Phosphorus species:	PO4F. TDP
Other:	CHLA_N, PHEA, SiO4F, TSS, TVS

b) **Calculated parameters**

NO3F	NO23F-NO2F
DIN	NO23F+NH4F
DON	TDN-NH4F-NO23F
DOP	TDP-PO4F

12) Limits of detection –

Parameter	Start Date	End Date	MDL	Date Revisited
CHLA_N	01/01/23	12/31/23	0.62	05/01/2023
NH4F	01/01/23	12/31/23	0.009	05/01/2023
NO2F	01/01/23	12/31/23	0.0009	05/01/2023
PHEA	01/01/23	12/31/23	0.74	05/01/2023
PO4F	01/01/23	12/31/23	0.0034	05/01/2023
TDN	01/01/23	12/31/23	0.05	05/01/2023
TDP	01/01/23	12/31/23	0.0015	05/01/2023
TSS	01/01/23	12/31/23	2.4	05/01/2023
TVS	01/01/23	12/31/23	0.9	05/01/2023
NO23F	01/01/23	05/01/23	0.0004	05/01/2023
NO23F	05/01/23	12/31/23	0.0009	05/01/2023

*NASL at CBL began using an updated version of the same instrumentation for NO23 analysis. Implementation of this new instrumentation resulted in an adjusted MDL for NO23.

Method Detection Limits (MDL), the lowest concentration of a parameter than an analytical procedure can reliably detect, have been established by NASL at CBL. NASL uses a continuous accumulation of blank and spike data from the entire year to assess detection limits, therefore, a specific analysis date for MDL re-assessment cannot be given for any parameter. Instead, based upon the continuous accumulation of data, any change from the previously established MDL went into effect on May 1, 2021. A detailed explanation of the MDL calculation protocol can be found at the following site.
https://www.umces.edu/sites/default/files/EPA_MDLRev2_13Dec2016.pdf

13) Laboratory methods –

a) **Parameter: PO4F**

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. This blue colored complex is suitable for photometric measurement. Color is proportional to phosphorus concentration.

ii) **Method References:** EPA365.1 Rev 2.0, 1993

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

b) **Parameter: NH4F**

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.
Filtered samples are complexed with sodium potassium tartrate and sodium citrate. The complexed sample reacts with alkaline phenol and hypochlorite, catalyzed by sodium nitroprusside, yielding an intense blue color suitable for photometric measurement.

ii) **Method References:** Standard Methods 4500-NH3 G-2011

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

c) **Parameter: NO2F**

i) **Method Summary:** Nitrite reacts under acidic conditions with sulfanilamide to form a diazo compound that couples with N-1-naphthylethylenediamine dihydrochloride to form an intense pink colored azo dye suitable for photometric measurement done at 520 nm.

ii) **Method References:** EPA 353.2 Rev 2.0, 1993

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

d) **Parameter: NO23F**

i) **Method Summary:** Filtered samples are passed through a granulated copper-cadmium column to reduce nitrate to nitrite. The nitrite, both that which was reduced from nitrate and nitrite that was originally present, is then determined by diazotizing with sulfanilamide and coupling with N-1-napthylethylenediamine dihydrochloride to form a colored azo dye.

ii) **Method References:** EPA 353.2, Rev 2.0, 1993

iii) **Preservation Method:** Samples are immediately filtered through 47 mm glass fiber filter pads with a nominal pore size of 0.7 µm, decanted into an Auto Analyzer vial, and placed on ice. Upon returning to the lab, the Auto Analyzer vial is placed in the freezer at –20ºC until analysis. Maximum holding time is 28 days.

e) **Parameter: CHLA_N / PHEA**

i) **Method Summary:** The chlorophyll and related compounds are extracted from the filtered phytoplankton cells with aqueous buffered 90% acetone solution. The cells are physically disrupted by mechanical grinding or sonication. The samples are refrigerated in the dark from 2 to 24 hours, then centrifuged to separate sample material from the extract. The sample extract is filtered through a 0.45 µm PTFE or nylon syringe filter before analysis due to waters from the Maryland portion of the Chesapeake Bay being relatively turbid. The concentration of the pigments is determined by measuring the light absorption of the extract. To determine phaeophytin and active ChlA, the extract is then acidified in 1N HCl, and reread. The concentrations are then calculated using Lorenzen's modified monochromatic equation.

The chlorophyll *a* content in every sample is calculated as follows:

Calculating Chlorophyll and Phaeophytin

AMT_FILT = SAMVOL_L in database.

Divide the following by 1000:
OD630B
OD645B
OD647B
OD663B
OD664B
OD665A
OD750A
OD750B

Divide the Amount Filtered (AMT_FILT) by 100

PHEO = 26.7*((1.7*(OD665A - OD750A)) - (OD664B - OD750B))) * (EXVOL_ML / (AMT_FILT * LIPAT_CM))

CHAA = 26.7*((OD664B - OD750B) - (OD665A - OD750A))) * (EXVOL_ML / (AMT_FILT * LIPAT_CM))

If:
ABS(OD664B - OD750B) < 0.00001 or
ABS(OD665A - OD750A) < 0.00001 or
(OD664B - OD750B) < (OD665A - OD750A) or
(OD664B - OD750B) > 2 * (OD665A - OD750A) or
(LIPAT_CM * AMT)FILT) < 0.00001
Then: Set PHEO = Null and Set CHAA = Null

If CHAA < 0.0 and is not Null, then set CHAA = 0.0

ii) **Method References:** EPA 446.0, SM 10200H.2b

iii) **Preservation Method:** Samples are immediately filtered through a 47 mm glass fiber filter pad (a small amount of magnesium carbonate is mixed with the sample water for preservation), placed in a foil square, and then placed on ice. Upon returning, the foil square is placed in the freezer at –20ºC until analysis. Maximum holding time is not to exceed 30 days.

f) **Parameter: TSS/TVS**

i) **Method Summary:** Total suspended solids (TSS) is the retained material on a standard, pre-weighed glass filter pad after filtration of a well-mixed sample of water, drying in a 105ºC drying oven overnight to remove any remaining water, and subsequent cooling in a desiccator. Total volatile solids (TVS) is the volatilized material that is lost on ignition from TSS by placing into a numbered porcelain crucible and dried in a muffle furnace at 500ºC for 1.5 hours, then allowed to cool in a desiccator. TVS is calculated from the measurement of a TSS sample minus the measurement of the quantity remaining after combustion. Both results are expressed in mg/L.

ii) **Method References:** TSS: EPA 160.2, SM2540 D-1997
TVS: SM2540

iii) **Preservation Method**: Samples are immediately filtered through a 47 mm glass fiber filter pad (0.7 µm pore size), placed in a foil square, and then placed on ice. Upon returning, the foil square is placed in the freezer at –20ºC until analysis. Maximum holding time is 28 days.

g) **Parameter: TDN/TDP**

i) **Method Summary:** This method is a potassium persulfate oxidation technique for nitrogen and phosphorus where, under initially alkaline conditions and heat, nitrate is the sole nitrogen product. As the potassium persulfate continues to oxidize, conditions become acidic and orthophosphate becomes the sole phosphorus product.

Digested samples are buffered, passed through a granulated copper-cadmium column to reduce nitrate to nitrite. The nitrite then is determined by diazotizing with sulfanilamide and coupling with N-1-naphthylethylenediamine dihydrochloride to form a colored azo dye. Color is proportional to nitrogen concentration.

Sulfuric acid-antimony-molybdate solution is mixed the buffered, digested samples of orthophosphate, and subsequently with an ascorbic acid solution to form an antimony-phospho-molybdate complex which is reduced to an intensely blue-colored complex by the ascorbic acid. Color is proportional to phosphorus concentration.

ii) **Method References:**
TDN: Alkaline persulfate digestion, cadmium, EPA 353.2, SM #4500-N C, 4500-NO3 F
TDP: Alkaline persulfate digestion, EPA 365.1, Standard Methods #4500-P/B 5, #4500 P.E.

iii) **Preservation Method:** Samples are immediately placed in a 30 ml screw cap test tube and frozen. Upon delivery to the lab, the test tube is placed in the freezer at –20ºC until analysis. Maximum holding time is 28 days. Digested samples may be stored for up to a year.

14) Field and Laboratory QAQC 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 up to 12 additional 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** – 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 as laboratory duplicates, with all values recorded in a separate QA/QC data file. Laboratory duplicates serve as an indicator of instrument stability, consistency in laboratory sample preparation and analysis, as well as an estimate of field proficiency.

iii) **Inter-organizational splits** – All nutrient parameters for CBM NERR were analyzed by CBL.

b) **Accuracy**

i) **Sample spikes** – Sample outliers range from 85 to 115 percent. CBL typically gets 90 to 110 percent recovery. Typically, 10% of the total number of samples analyzed consist of laboratory spikes and/or laboratory duplicates. Certified parameters require laboratory spikes to be analyzed every 10 samples within an analytical run. A spike is prepared by adding a known volume of a standard to a known volume of a pre-analyzed sample. CBL routinely adds enough concentrated standard to provide a significant response on the instrument that is distinguishable from the original concentration of the sample. The spiked sample is analyzed, and its expected concentration calculated as the sum of the original concentration and the spike concentration, normalized for the constituent volumes. A comparison is made between the actual and expected values. These concentrations are the recorded in a separate QA/QC data file.

ii) **Standard reference material analysis –** High quality certified standard reference materials are supplied by Fluka, SPEX Certi Prep, Inorganic Ventures, and SPC Science. Final concentrations of standards are prepared by CBL to approximate typical estuarine concentrations, or the materials are prepared to specific concentrations by the vendor. Standard reference materials concentrations are prepared such that they fall in the middle of the calibration curve. Samples prepared in-house are then placed in pre-cleaned poly bottles and frozen. Standard reference materials must by analyzed at the beginning, end, and throughout every run as specified in each individual standard operating procedure. The analysis of frozen standard reference materials as a function of time also provides data on the effect of the preservation technique (freezing) on the integrity of the concentration of samples.

iii) **Cross calibration exercises** – NASL 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 Coordinated Split Sample Program, EPA Chesapeake Bay Program Blind Audit Program, USGS Standard Reference Sample Project, US EPA Method Validation Studies and International Council for the Exploration of the Sea Inter-comparison Exercise for Nutrients in Sea Water.

15) QAQC flag definitions –

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). QAQC flags are applied to the nutrient data during secondary QAQC to indicate data that are out of sensor range low (-4), rejected due to QAQC checks (-3), missing (-2), optional and were not collected (-1), suspect (1), and that have been corrected (5). All remaining data are flagged as having passed initial QAQC checks (0) when the data are uploaded and assimilated into the CDMO ODIS as provisional plus data. The historical data flag (4) is used to indicate data that were submitted to the CDMO prior to the initiation of secondary QAQC flags and codes (and the use of the automated primary QAQC system for WQ and MET data). This flag is only present in historical data that are exported from the CDMO ODIS.

-4	Outside Low Sensor Range
-3	Data Rejected due to QAQC
-2	Missing Data
-1	Optional SWMP Supported Parameter
0	Data Passed Initial QAQC Checks
1	Suspect Data
4	Historical Data: Pre-Auto QAQC
5	Corrected Data

16) QAQC code definitions –

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the sample or sample collection, sensor errors document common sensor or parameter specific problems, and comment codes are used to further document conditions or a problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point. However, a record flag column (F_Record) in the nutrient data allows multiple comment codes to be applied to the entire data record.

General errors

GCM	Calculated value could not be determined due to missing data

GCR	Calculated value could not be determined due to rejected data
GDM	Data missing or sample never collected
GQD	Data rejected due to QA/QC checks
GQS	Data suspect due to QA/QC checks
GSM	See metadata

Sensor errors

SBL	Value below minimum limit of method detection
SCB	Calculated value could not be determined due to a below MDL component
SCC	Calculation with this component resulted in a negative value
SNV	Calculated value is negative
SRD	Replicate values differ substantially
SUL	Value above upper limit of method detection

Parameter Comments

CAB	Algal bloom
CDR	Sample diluted and rerun
CHB	Sample held beyond specified holding time
CIP	Ice present in sample vicinity
CIF	Flotsam present in sample vicinity
CLE	Sample collected later/earlier than scheduled
CRE	Significant rain event
CSM	See metadata
CUS	Lab analysis from unpreserved sample

Record comments

CAB	Algal bloom
CHB	Sample held beyond specified holding time
CIP	Ice present in sample vicinity
CIF	Flotsam present in sample vicinity
CLE	Sample collected later/earlier than scheduled
CRE	Significant rain event
CSM	See metadata
CUS	Lab analysis from unpreserved sample

Cloud cover

CCL	clear (0-10%)
CSP	scattered to partly cloudy (10-50%)
CPB	partly to broken (50-90%)
COC	overcast (>90%)
CFY	foggy
CHY	hazy
CCC	cloud (no percentage)

Precipitation

PNP	none
PDR	drizzle
PLR	light rain
PHR	heavy rain
PSQ	squally
PFQ	frozen precipitation (sleet/snow/freezing rain)
PSR	mixed rain and snow

Tide stage

TSE	ebb tide
TSF	flood tide
TSH	high tide

TSL	low tide

Wave height

WH0	0 to <0.1 meters
WH1	0.1 to 0.3 meters
WH2	0.3 to 0.6 meters
WH3	0.6 to > 1.0 meters
WH4	1.0 to 1.3 meters
WH5	1.3 or greater meters

Wind direction

N	from the north
NNE	from the north northeast
NE	from the northeast
ENE	from the east northeast
E	from the east
ESE	from the east southeast
SE	from the southeast
SSE	from the south southeast
S	from the south
SSW	from the south southwest
SW	from the southwest
WSW	from the west southwest
W	from the west
WNW	from the west northwest
NW	from the northwest
NNW	from the north northwest

Wind speed

WS0	0 to 1 knot
WS1	> 1 to 10 knots
WS2	> 10 to 20 knots
WS3	> 20 to 30 knots
WS4	> 30 to 40 knots
WS5	> 40 knots

17) Other remarks/notes –

Data may be missing due to problems with sample collection or processing. Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Method Detection Limit or MDL. MDLs for specific parameters are listed in the Laboratory Methods and Detection Limits Section (Section II, Part 12) of this document. Concentrations that are less than this limit are censored with the use of a QAQC flag and code, and the reported value is the method detection limit itself rather than a measured value. For example, if the measured concentration of NO23F was 0.0005 mg/l as N (MDL=0.0008), the reported value would be 0.0008 and would be flagged as out of sensor range low (-4) and coded SBL. In addition, if any of the components used to calculate a variable are below the MDL, the calculated variable is removed and flagged/coded -4 SCB. If a calculated value is negative, it is rejected and all measured components are marked suspect. If additional information on MDL's or missing, suspect, or rejected data is needed, contact the Research Coordinator at the reserve submitting the data.

Note: The way below MDL values are handled in the NERRS SWMP dataset was changed in November of 2011. Previously, below MDL data from 2007-2010 were also flagged/coded, but either reported as the measured value or a blank cell. Any 2007-2011 nutrient/pigment data downloaded from the CDMO prior to November of 2011 will reflect this difference.

Significant rain events, typically associated with higher wind speeds, can cause abnormally elevated TSS/TVS values, as well as some other slightly elevated parameters. This is especially true in the areas of cmboc and cbmmc. Due to the shallow nature of these sites, high winds can stir up the bottom and increased streamflow is more likely to pick up extra sediments and nutrients that carry into these sites.

Hold Times Table for 2023:

Sample hold times for 2023: Samples are held at -20°C. NERRS SOP allows nutrient samples to be held for up to 28 days (CHLA for 30) at -20°C, *plus allows for up to 5 days for collecting, processing, and shipping samples.* Samples held beyond that time period are flagged suspect <1> and coded (CHB). They are also highlighted in yellow below. If measured values were below MDL, this resulted in <-4> [SBL] (CHB) flagging/coding.

Sample Descriptor	Date Analyzed					
	PO4	TDN, TDP	NH4, NO2	NO23	TSS, TVS	CHLA_N, PHEA
1/4-1/5/2023; all DIEL samples	1/15/2023	1/18/2023	1/15/2023	2/2/2023	1/26/2023	Extracted: 1/09/23 Analyzed 1/10/23
1/4/2023, all grab samples	2/15/2023	2/27/2023	2/15/2023	2/13/2023	1/31/2023	Extracted: 1/09/23 Analyzed 1/10/23
1/17/2023, all grab samples	2/15/2023	2/27/2023	2/15/2023	2/13/2023	1/31/2023	Extracted: 1/23/23 Analyzed 1/24/23
1/25/2023, all grab samples	2/15/2023	2/27/2023	2/15/2023	2/13/2023	1/31/2023	Extracted: 1/31/23 Analyzed 2/01/23
2/2/2023, all grab samples	3/8/2023	3/6/2023	3/8/2023	3/3/2023	3/3/2023	Extracted: 2/20/23 Analyzed 2/21/23
2/9-2/10/2023; all DIEL samples	2/28/2023	2/27/2023	2/28/2023	2/28/2023	3/3/2023	Extracted: 2/20/23 Analyzed 2/21/23
2/6/2023, all grab samples	3/8/2023	3/6/2023	3/8/2023	3/3/2023	3/3/2023	Extracted: 2/20/23 Analyzed 2/21/23
2/13/2023, all grab samples	3/8/2023	3/6/2023	3/8/2023	3/3/2023	3/3/2023	Extracted: 2/20/23 Analyzed 2/21/23
2/15/2023, all grab samples	3/8/2023	3/6/2023	3/8/2023	3/3/2023	3/3/2023	Extracted: 2/20/23 Analyzed 2/21/23
3/1-3/2/2023, all DIEL samples	3/15/2023	3/31/2023	3/15/2023	3/16/2023	3/13/2023	Extracted: 3/8/23 Analyzed 3/9/23
3/2/2023, all grab samples	4/4/2023	5/9/2023	4/4/2023	4/3/2023	3/13/2023	Extracted: 3/8/23 Analyzed 3/9/23
3/9/2023, all grab samples	4/4/2023	5/9/2023	4/4/2023	4/3/2023	3/13/2023	Extracted: 3/16/23 Analyzed 3/17/23
3/21/2023, all grab samples	4/4/2023	5/9/2023	4/4/2023	4/3/2023	4/10/2023	Extracted: 4/6/23 Analyzed 4/7/23
4/3-4/4/2023; all DIEL samples	4/17/2023	5/17/2023	4/17/2023	4/19/2023	4/12/2023	Extracted: 4/10/23 Analyzed 4/11/23

4/4/2023, all grab samples	5/2/2023	5/26/2023	5/2/2023	5/1/2023	4/12/2023	Extracted: 4/19/23 Analyzed 4/20/23
4/5/2023, all grab samples	5/2/2023	5/26/2023	5/2/2023	5/1/2023	4/12/2023	Extracted: 4/19/23 Analyzed 4/20/23
4/6/2023, grab sample	5/2/2023	5/26/2023	5/2/2023	5/1/2023	4/12/2023	Extracted: 4/19/23 Analyzed 4/20/23
4/18/2023, all grab samples	5/2/2023	5/26/2023	5/2/2023	5/1/2023	5/1/2023	Extracted: 4/25/23 Analyzed 4/26/23
4/20/2023, all grab samples	5/2/2023	5/26/2023	5/2/2023	5/1/2023	5/1/2023	Extracted: 4/25/23 Analyzed 4/26/23
5/2/2023, all grab samples	6/2/2023	6/21/2023	6/2/2023	6/1/2023	5/12/2023	Extracted: 5/8/23 Analyzed 5/9/23
5/3/2023, all grab samples	6/2/2023	6/21/2023	6/2/2023	6/1/2023	5/12/2023	Extracted: 5/8/23 Analyzed 5/9/23
5/4/2023, grab sample	6/2/2023	6/21/2023	6/2/2023	6/1/2023	5/12/2023	Extracted: 5/31/23 Analyzed 6/1/23
5/15-5/16/2023; all DIEL samples	5/19/2023	5/26/2023	5/19/2023	5/23/2023	5/23/2023	Extracted: 5/31/23 Analyzed 6/1/23
5/16/2023, all grab samples	6/2/2023	6/21/2023	6/2/2023	6/1/2023	5/23/2023	Extracted: 5/31/23 Analyzed 6/1/23
5/18/2023, all grab samples	6/2/2023	6/21/2023	6/2/2023	6/1/2023	5/23/2023	Extracted: 5/31/23 Analyzed 6/1/23
5/30/2023, all grab samples	6/2/2023	6/21/2023	6/2/2023	6/1/2023	6/13/2023	Extracted: 6/12/23 Analyzed 6/13/23
6/12-6/13/2023, all DIEL samples	6/30/2023	7/5/2023	6/30/2023	6/22/2023	7/7/2023	Extracted: 6/20/23 Analyzed 6/21/23
6/1/2023, grab sample	6/30/2023	7/19/2023	6/30/2023	6/30/2023	6/16/2023	Extracted: 6/12/23 Analyzed 6/13/23
6/13/2023, all grab samples	6/30/2023	7/19/2023	6/30/2023	6/30/2023	6/26/2023	Extracted: 6/20/23 Analyzed 6/21/23
6/15/2023, all grab samples	6/30/2023	7/19/2023	6/30/2023	6/30/2023	6/26/2023	Extracted: 6/20/23 Analyzed 6/21/23
6/27/2023, all grab samples	6/30/2023	7/19/2023	6/30/2023	6/30/2023	7/25/2023	Extracted: 7/11/23 Analyzed 7/12/23
6/29/2023, all grab samples	6/30/2023	7/19/2023	6/30/2023	6/30/2023	7/25/2023	Extracted: 7/11/23 Analyzed 7/12/23
7/10-7/11/2023, all DIEL samples	7/19/2023	8/10/2023	7/19/2023	7/20/2023	7/25/2023	Extracted: 7/24/23 Analyzed 7/25/23
7/11/2023, all grab samples	8/3/2023	7/31/2023	8/3/2023	8/1/2023	7/25/2023	Extracted: 7/19/23 Analyzed 7/21/23
7/12/2023, grab sample	8/3/2023	7/31/2023	8/3/2023	8/1/2023	7/25/2023	Extracted: 7/19/23 Analyzed 7/21/23

7/25/2023, all grab samples	8/3/2023	7/31/2023	8/3/2023	8/1/2023	8/29/2023	Extracted: 7/19/23 Analyzed 7/21/23
7/26/2023, all grab samples	8/3/2023	7/31/2023	8/3/2023	8/1/2023	8/29/2023	Extracted: 8/1/23 Analyzed 8/2/23
7/27/2023, all grab samples	8/3/2023	7/31/2023	8/3/2023	8/1/2023	8/29/2023	Extracted: 8/1/23 Analyzed 8/2/23
8/7/2023, grab sample	9/11/2023	9/8/2023	9/11/2023	9/5/2023	8/29/2023	Extracted: 8/14/23 Analyzed 8/15/23
8/8/2023, all grab samples	9/11/2023	9/8/2023	9/11/2023	9/5/2023	8/29/2023	Extracted: 8/14/23 Analyzed 8/15/23
8/22/2023, all grab samples	9/11/2023	9/8/2023	9/11/2023	9/5/2023	8/29/2023	Extracted: 8/31/23 Analyzed 9/1/23
8/23/2023, all grab samples	9/11/2023	9/8/2023	9/11/2023	9/5/2023	8/29/2023	Extracted: 8/31/23 Analyzed 9/1/23
8/28-8/29/2023, all DIEL samples	9/7/2023	9/8/2023	9/7/2023	9/5/2023	9/18/2023	Extracted: 9/12/23 Analyzed 9/13/23
8/29/2023, all grab samples	9/11/2023	9/8/2023	9/11/2023	9/5/2023	9/18/2023	Extracted: 9/6/23 Analyzed 9/7/23
9/5/2023, grab sample	10/5/2023	10/16/2023	10/5/2023	10/2/2023	10/18/2023	Extracted: 9/18/23 Analyzed 9/19/23
9/12/2023, all grab samples	10/5/2023	10/16/2023	10/5/2023	10/2/2023	10/18/2023	Extracted: 9/18/23 Analyzed 9/19/23
9/20/2023, all grab samples	10/5/2023	10/16/2023	10/5/2023	10/2/2023	10/18/2023	Extracted: 9/28/23 Analyzed 9/29/23
9/21/2023, all grab samples	10/5/2023	10/16/2023	10/5/2023	10/2/2023	10/18/2023	Extracted: 9/28/23 Analyzed 9/29/23
9/26-9/27/2023, All Diel samples	10/2/2023	10/16/2023	10/2/2023	10/2/2023	11/2/2023	Extracted: 10/2/23 Analyzed 10/3/23
9/26/2023, all grab samples	10/5/2023	10/16/2023	10/5/2023	10/2/2023	10/18/2023	Extracted: 10/2/23 Analyzed 10/3/23
10/4/2023, grab sample	11/7/2023	11/28/2023	11/7/2023	11/6/2023	12/4/2023	Extracted: 10/10/23 Analyzed 10/11/23
10/11/2023, all grab samples	11/7/2023	11/28/2023	11/7/2023	11/6/2023	12/4/2023	Extracted: 10/19/23 Analyzed 10/20/23
10/18/2023, all grab samples	11/7/2023	11/28/2023	11/7/2023	11/6/2023	12/4/2023	Extracted: 10/25/23 Analyzed 10/26/23
10/19/2023, all grab samples	11/7/2023	11/28/2023	11/7/2023	11/6/2023	12/4/2023	Extracted: 10/25/23 Analyzed 10/26/23
10/23-10/24/2023, all DIEL samples	11/2/2023	11/28/2023	11/2/2023	11/6/2023	11/8/2023	Extracted: 10/31/23 Analyzed 11/1/23

10/24/2023, all grab samples	11/7/2023	11/28/2023	11/7/2023	11/6/2023	12/4/2023	Extracted: 10/31/23 Analyzed 11/1/23
11/2/2023, all grab samples	12/1/2023	1/4/2024	12/1/2023	12/1/2023	1/17/2024	Extracted: 11/6/23 Analyzed 11/7/23
11/7/2023, all grab samples	12/1/2023	1/4/2024	12/1/2023	12/1/2023	1/17/2024	Extracted: 11/13/23 Analyzed 11/14/23
11/8/2023, all grab samples	12/1/2023	1/4/2024	12/1/2023	12/1/2023	1/17/2024	Extracted: 11/13/23 Analyzed 11/14/23
11/8-11/9/2023, all DIEL samples	11/29/2023	11/30/2023	11/29/2023	11/29/2023	12/13/2023	Extracted: 11/29/23 Analyzed 11/30/23
12/5/2023, all grab samples	12/19/2023	1/12/2024	12/19/2023	1/3/2024	1/17/2024	Extracted: 12/11/23 Analyzed 12/12/23
12/6/2023, all grab samples	12/19/2023	1/12/2024	12/19/2023	1/3/2024	1/17/2024	Extracted: 12/11/23 Analyzed 12/12/23
12/12/2023, all grab samples	12/19/2023	1/12/2024	12/19/2023	1/3/2024	1/17/2024	Extracted: 1/8/24 Analyzed 1/9/24
12/19-12/20/2023, all DIEL samples	1/10/2024	1/17/2024	1/12/2024	1/3/2024	1/17/2024	Extracted: 1/10/23 Analyzed 1/11/23
* Sample held longer than allowed by NERRS protocols						

General sample parameter hold times within date of receipt by NASL:

Parameter	Hold Time
CHLA_N	28 days
NH4F	28 days
NO23F	28 days
NO2F	28 days
PHEA	28 days
PO4F	28 days
TDN***	28 days
TDP***	28 days
TSS	28 days
TVS	28 days

***Per NASL protocol, TDN/TDP samples are digested within 28 days of receipt and then analyzed within the next 28 days. NERRS protocol allows for TDN/TDP/TN/TP to be held for up to 6 months.

QA/QC "Check metadata for further details" (CSM)/{CSM}/[GSM] comments:

The following DIEL samples were not collected as the sampler did not collect enough water in each bottle to filter. It is believed there was ice present in the sampling strainer. <-2>[GDM](CSM):

Station Code	DateTimeStamp	Monitoring Program	Rep
cbmipnut	12/20/2023 02:45	2	1
cbmipnut	12/20/2023 05:15	2	1
cbmipnut	12/20/2023 07:45	2	1

The following TDN/TDP samples are missing due to a laboratory accident with the samples being damaged during processing <-2>[GDM](CSM):

Station Code	DateTimeStamp	Monitoring Program	Rep	TDN	F_TDN	TDP	F_TDP
cbmmcnut	02/02/2023 10:00	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmipnut	02/09/2023 16:45	2	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmipnut	03/01/2023 08:00	2	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmipnut	03/01/2023 15:30	2	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmipnut	03/01/2023 23:00	2	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmmcnut	03/02/2023 10:30	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmipnut	05/15/2023 07:30	2	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmmcnut	05/30/2023 10:15	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmrrnut	06/27/2023 07:30	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmipnut	06/27/2023 09:00	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmipnut	09/26/2023 12:20	2	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)

The following NH4/ NO2/ NO23 samples were both labeled CM3 so no distinction could be made between the two. <-2>[GDM](CSM):

Station Code	DateTimeStamp	Monitoring Program	Rep	NH4F	F_NH4F	NO2F	F_NO2F	NO23F	F_NO23F
cbmmcnut	04/04/2023 09:30	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)
cbmmcnut	04/18/2023 11:15	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)

The following TDP samples are flagged suspect. The lab data qualifier code indicates the samples were diluted or standard calibration range changed to bring concentration/sample within linear range. <1> [GSM]

Station Code	DateTimeStamp	Monitoring Program	Rep	TDP	F_TDP
cbmipnut	01/04/2023 22:15	2	1	0.1792	<1> [GSM]
cbmipnut	01/05/2023 00:45	2	1	0.2583	<1> [GSM]
cbmipnut	01/05/2023 03:15	2	1	0.2615	<1> [GSM]
cbmipnut	01/05/2023 05:45	2	1	0.3789	<1> [GSM]
cbmipnut	01/05/2023 08:15	2	1	0.2941	<1> [GSM]
cbmmbnut	05/03/2023 08:45	1	1	0.2608	<1> [GSM]
cbmipnut	05/15/2023 17:30	2	1	0.1806	<1> [GSM]
cbmipnut	05/16/2023 06:00	2	1	0.2280	<1> [GSM]
cbmmcnut	05/16/2023 09:45	1	1	0.3495	<1> [GSM]

cbmipnut	05/30/2023 09:15	1	1	0.2014	<1> [GSM]
cbmipnut	06/13/2023 10:00	1	1	0.1463	<1> [GSM]
cbmmcnut	06/27/2023 10:45	1	1	0.1903	<1> [GSM]
cbmocnut	06/29/2023 09:45	1	1	0.1196	<1> [GSM]
cbmmcnut	07/11/2023 11:00	1	1	0.2680	<1> [GSM]
cbmipnut	08/08/2023 09:00	1	1	0.2993	<1> [GSM]
cbmmcnut	08/08/2023 10:00	1	1	0.3723	<1> [GSM]
cbmipnut	08/28/2023 20:00	2	1	0.1819	<1> [GSM]
cbmmcnut	08/29/2023 11:00	1	1	0.3177	<1> [GSM]
cbmmcnut	09/12/2023 10:15	1	1	0.4001	<1> [GSM]
cbmmcnut	09/26/2023 10:45	1	1	0.2149	<1> [GSM]
cbmipnut	10/11/2023 09:45	1	1	0.1852	<1> [GSM]
cbmmcnut	10/24/2023 10:15	1	1	0.2487	<1> [GSM]
cbmrrnut	12/12/2023 09:45	1	1	0.2116	<1> [GSM]
cbmipnut	12/19/2023 14:15	2	1	0.2199	<1> [GSM]
cbmipnut	12/19/2023 16:45	2	1	0.1829	<1> [GSM]
cbmipnut	12/19/2023 19:15	2	1	0.1810	<1> [GSM]
cbmipnut	12/20/2023 00:15	2	1	0.1840	<1> [GSM]

The following TDN/TDP sample was broken during transport to the lab <-2> [GDM] (CSM):

Station Code	DateTimeStamp	Monitoring Program	Rep	TDN	F_TDN	TDP	F_TDP
cbmrrnut	10/24/2023 07:45	1	1		<-2> [GDM] (CSM)		<-2> [GDM] (CSM)

December grab and diel samples at IP were all elevated for ammonium (NH4F). The wastewater treatment plan upstream from the site showed significantly elevated nitrogen, phosphorus, and biochemical oxygen demand in effluent tests on December 19 and 20 which could partially explain this. Other parameters in December samples may have been impacted as well.