Jacques Cousteau (JAC) NERR Nutrient Metadata
Feb 2004 to December 2004
Latest Update: May 22, 2025

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

a) Reserve contact

Michael J. Kennish
Institute of Marine and Coastal Sciences
Rutgers University
New Brunswick, New Jersey 08901
Phone: 732-932-6555 (ext. 240)
e-mail: kennish@imcs.rutgers.edu

a) Laboratory contact

Ronald J. Lauck, Jr.
Institute of Marine and Coastal Sciences
Rutgers University
New Brunswick, New Jersey 08901
Phone: 732-932-6555 (ext. 561)
e-mail: lauck@imcs.rutgers.edu

b) Other contacts and programs

Gregg P. Sakowicz
Field Researcher/SWMP Technician
Jacques Cousteau National Estuarine Research Reserve
Rutgers University Marine Field Station
800 Great Bay Blvd.
C/o 132 Great Bay Blvd.
Tuckerton, NJ 08087
Phone: 609-296-5260 (ext. 267)
e-mail: sakowicz@imcs.rutgers.edu

2) Research objectives

a) Monthly grab

Monthly grab samples for the Jacques Cousteau National Estuarine Research Reserve (JNEEER) are taken along a well-defined salinity gradient of the Mullica River-Great Bay estuarine system. The sites where the samples are taken along this salinity gradient include

Lower Bank and Chestnut Neck in the Mullica River and Buoy 126 and Buoy 139 in Great Bay (see site descriptions below). These four sampling sites span a distance of more than 30 km. In addition a monthly grab sample is taken in Little Egg Harbor estuary at Buoy 115 (see site description below). A major objective of this monitoring program is to determine the nutrient concentrations along the aforementioned salinity gradient over a long-term time series. Previous studies have shown that nitrogen standing stocks in the Mullica River-Great Bay Estuary largely consist of nitrate, ammonium, and nitrogen in organic combination. The nitrogen enters at the head of the estuary largely in inorganic form, but in Great Bay it is transformed mainly to organic combination. However, more data are needed to accurately assess the concentrations of the various nitrogen forms along the salinity gradient, and to determine seasonal variations in the concentrations over a protracted period of several years. It is also necessary to obtain continuous monthly measurements of phosphate, which is also a macronutrient of considerable importance to the system.

Monthly grab samples are needed to obtain accurate measurements of nitrate, ammonium, and phosphate because of their overriding importance to primary production in waters of the JNEERR. These data can then be compared to chlorophyll *a* measurements to assess their relationship to phytoplankton biomass. A major goal of JNEERR is to characterize biotic communities along the salinity gradient of the Mullica River-Great Bay Estuary, and it is therefore vital to obtain physical-chemical measurements (including nutrient concentrations) along the gradient. Nutrient data are also valuable to SWMP bio-monitoring projects being planned for 2004 and 2005. A part of this effort is to determine the nutrient concentrations along the salinity gradient, and how these concentrations are influencing biotic processes down-estuary. In addition, a long-term objective of monthly grab sampling is to develop a nutrient (nitrogen) budget for JNEERR. To develop a budget, data (concentrations) are needed on the various nitrogen species monitored at the SWMP sites as well as data collected on the nitrogen forms associated with atmospheric deposition. An accurate nutrient budget will be useful for analyzing the overall productivity of estuarine waters in the JNEERR, which will be important to resource managers of the system.

b) **Diel sampling program**

Diel sampling is conducted via an ISCO automated sampler at Buoy 126 in Great Bay to assess nutrient concentrations and changes in concentrations over tidal cycles. In addition, these data augment monthly grab samples taken at Buoy 126 (see above). It is believed that nutrients entering from the watershed estuary are not utilized within the Mullica River because of the lack of light penetration. The great depth of the river and the dark color from the tannins flowing down the river from the Pine Barrens hinder the utilization of these nutrients by planktonic organisms. Where the river empties into the bay, light penetration reaches the bottom and allows utilization of the nutrients by phytoplankton, making this region more productive. A major goal of ISCO sampling is to compare nutrient concentrations over a 24-hour period with phytoplankton rate processes. To this end, JNEERR is also deploying a backscatter fluorometer to obtain an accurate measure of phytoplankton biomass in the area of Buoy 126. By relating nutrient measures with chlorophyll *a* over a continuous diel period, it is hoped that a strong correlation can be made of the significance of nutrient inputs to phytoplankton rate processes in the system. Diel

sampling at Buoy 126 will also be useful in the development of a nutrient budget for the system.

3) **Research methods**

a) **Monthly grab sampling program**

Monthly grab samples were taken at four stations within the Mullica River-Great Bay estuary and at one station in the Little Egg Harbor estuary. Samples were taken at four principle JNEERR datasonde stations (Buoy 126, Buoy 139, Chestnut Neck and Lower Bank) and at one station in Little Egg Harbor estuary (Buoy 115). Samples were collected at approximately 30 day intervals. Effort was made to obtain grab samples at slack low tide conditions (+1 hour before and after slack low tide), and always on the same calendar day. No distinction was made between neap and spring tide conditions. Replicate (N=2) samples were collected by hand with a bucket at an approximate depth of 10 cm. All samples were collected in amber, nalgene, 500 ml sample bottles that were previously acid washed (15 % H_2SO_4), rinsed (5x) with distilled-deionized water, and rinsed (1x) with ambient water prior to collection of the sample. Samples were immediately placed on ice in a cooler and returned to the laboratory at the Rutgers Marine Field Station. Once in the laboratory, samples were shaken and processed for nutrient and Chl a analysis. The processed samples were then transported to Rutgers University, IMCS and stored in a –20 °C freezer until analyses were performed.

NOTE: All January-July 2004 samples were obtained and processed by Amanda McGuirk (Flynn). Gregg P. Sakowicz assumed responsibility for sample acquisition and processing for August-December 2004 as well as data assembly and metadata reporting for the 2004 period.

b) **Diel sampling program**

Monthly diel samples were taken at the principle long-term datasonde station Buoy 126. Samples were collected at approximately 30-day intervals. Sampling occurred during any tidal condition and no distinction was made between spring and neap tide conditions. Samples were collected over a lunar day (24hr:48min) time period at 2 hour intervals using an ISCO auto-sampler. Samples were taken at a fixed depth, approximately 2.0 meters from the bottom. All samples were collected in clear, plastic, 1000 ml ISCO sample bottles. Samples were retrieved as soon as possible after completion of the auto-sampler program. Samples were then transferred from the clear, plastic ISCO bottles to 500 ml amber nalgene bottles that were previously acid washed (15 % H_2SO_4), rinsed (5x) with distilled-deionized water, and rinsed (1x) with ambient water prior to collection of the sample. Samples were immediately placed on ice in a cooler and returned to the laboratory at Rutgers Marine Field Station. Once in the laboratory, samples were shaken and processed for nutrient and Chl a analysis. The processed samples were then transported to Rutgers University, IMCS and stored in a –20 °C freezer until analyses were performed.

NOTE: All January-July 2004 samples were obtained and processed by Amanda McGuirk (Flynn). Gregg P. Sakowicz assumed responsibility for sample acquisition and processing for August-December 2004 as well as data assembly and metadata reporting for the 2004 period.

4) **Site location and character**

The Jacques Cousteau National Estuarine Research Reserve (JNEERR) at the Mullica River-Great Bay estuary is located on the south-central coastline of New Jersey. The estuary is near Tuckerton, New Jersey about 14 kilometers north of Atlantic City. Water is the predominant habitat in the Jacques Cousteau National Estuarine Research Reserve, covering 27,599 ha (~60% of the area). Marsh blankets an additional 13,034 ha (>28% of the area). Forest cover is the next largest category; it amounts to 4,616 ha (~10% of the area). Developed landscape, which is relatively sparse, provides the least cover (553 ha or slightly over 1% of the area). Domestic development is concentrated in two small communities, Mystic Island and Tuckerton; the boundaries of these communities extend to within 3 km of the margin of Great Bay

There are five nutrient monitoring stations in the Reserve: Lower Bank and Chestnut Neck sites in the Mullica River, Buoy 126 and 139 in Great Bay, and Buoy 115 in Little Egg Harbor. Data are reported here for the four principal datasonde stations (Lower Bank, Chestnut Neck, Buoy 126, and Buoy 139) along the estuarine salinity gradient, in addition to the site in Little Egg Harbor (Buoy 115). Data loggers are located at the Lower Bank, Chestnut Neck, Buoy 126, and Buoy 139 sites and an extensive water quality database has been developed for each site, with the exception of Buoy 115 in which data collection takes place on-demand via a hand-held YSI MDS 650 unit paired with a 600XL sonde.

The characteristics of the nutrient monitoring sites are summarized below:

Buoy 115 (B5) - 39° 31.130’ N, 74°17.230’ W- This most recent monitoring site is in Little Egg Harbor Bay, bordering the Edwin B. Forsythe Refuge on Holgate (Long Beach Island) about 3 km northeast of the Rutgers University Marine Field Station. The depth of the bay at this site is about 3 m, with a tidal range of 6.73 to 8.76 meters. The bottom consists of mainly of sand with little shell or organic material. The average pH is 8.0, with a range of 7.07 to 8.30. Salinity values averaged 30.8 ppt during 2002, with a range of 29.3 to 32.5 ppt. Groundwater inputs from margins of estuary as well as surface flow from Mullica River account for most of the freshwater entering that affect this site. The input of freshwater from local precipitation and marsh surface runoff is of secondary importance.

Buoy 126 (B6) - 39º 30.478' N, 74º 20.308' W- is located three kilometers from Little Egg Inlet on the eastern side of Great Bay. It is 100 meters from the nearest land - a natural marsh island. This is a relatively deep area that has never been dredged. It is located about 0.5 kilometers from an area in the Intracoastal Waterway that is dredged regularly. The dredged material is coarse sand. The data logger at this location is attached to Intracoastal Waterway Buoy 126 and is the closest monitoring station to Little Egg Inlet. This site can be characterized by having strong tidal currents (2-3 knots), fine to course sand bottom, and an

extensive blue mussel bed surrounding the area. Average physical-chemical measurements for this site in 2002 are as follows: (1) the depth was 3.0 meters, with a tidal range of 1.8 to 4.3 meters; (2) the salinity averaged 30.0 ppt, with a maximum of 32.6 ppt and a minimum of 19.6 ppt. Temperatures ranged from 1.2 to 28.2 degrees Celsius. Values for pH ranged from 7.4 - 8.2, with an average value of 7.9. Groundwater inputs from margins of estuary as well as surface flow from Mullica River account for most of the freshwater entering that affect this site. The input of freshwater from local precipitation and marsh surface runoff is of secondary importance.

Buoy 139 (B9) - 39º 29.883'N, 74º 22.873' W- is located 4 kilometers from Buoy 126 on the western side of Great Bay; it is located about 1-2 kilometers from land. The closest landform is an extensive salt marsh about 1.5 kilometers wide, which borders the upland area. This area is dredged every 5 to 6 years by the U.S. Army Corp of Engineers to maintain the channel at a depth of about 2.5 meters. The surrounding depth of the bay is about 1 to 2 meters deep. This site has maximum currents of about 1.5 knots. The bottom consists of muddy sand with little shell. The average depth is 2.47 meters, with a tidal range of 1.77 to 3.29 meters. The average pH is 8.0, with a range of 7.2 to 8.5. Salinity values averaged 26.1 ppt during 2001, with a range of 12.1 to 32.8 ppt. Most fresh water affecting this site derives from groundwater inputs along the margins of the estuary as well as surface flow from the Mullica River.

Chestnut Neck (NE) - 39º 32.872' N, 74º 27.676' W - located 12 kilometers up the Mullica River from the mouth of the river, which begins at a line drawn between Graveling Point and Oysterbed Point on the northwestern side of Great Bay. The Mullica River at Chestnut Neck is quite wide, about 250 meters. A data logger is attached to the dock of a small marina along the southern shore of the river adjacent to the main channel. Sandy bottom sediments characterize the site. The location has never been dredged. The average depth at this site is 1.6 meters with a tidal range of from 0.5 to 2.5 meters. The depth in the middle of the Mullica River at this location is about 6 meters. The pH averages 7.3 for the year with a range of from 6.6 to 7.9. The average salinity here is 18.6 ppt, with a range of 2.7 to 27.5 ppt. Tidal currents are less than 1 knot at the site during both ebb and flood tide. Freshwater input is primarily from groundwater and land runoff.

Lower Bank (BA) - 39º 35.618' N, 74º 33.091' W - is located 13 kilometers upriver of the Chestnut Neck location. The Mullica River at this site is about 200 meters wide. A data logger is attached to a bridge going over the Mullica River and is located in the center of the river. The northern bank of the river is sparsely developed with single-family houses and has a steep bank about five meters high. The southern shore has an extensive marsh and fresh water wetland area about 300 kilometers wide. This site can be characterized by having fast tidal currents, just over 1 knot, deep water, and fine sand sediment. The average depth is 1.6 meters with a tidal range of 0.6 to 2.5 meters. Typical of New Jersey back-bays, pH ranges from 4.0 to 7.4. The salinity averages 4.6 ppt, with a range of from 0.0 to 18.6 ppt. The 2001 temperatures ranged from 0.0 to 31.1 degrees Celsius. Freshwater input at this site is primarily from groundwater and watershed runoff.

5) **Code variable definitions**

jacb5nut = Jacques Cousteau Reserve nutrient data for Buoy 115
jacb6nut = Jacques Cousteau Reserve nutrient data for Buoy 126
jacb9nut = Jacques Cousteau Reserve nutrient data for Buoy 139
jacnenut = Jacques Cousteau Reserve nutrient data for Chestnut Neck
jacbanut = Jacques Cousteau Reserve nutrient data for Lower Bank

The monitoring codes are set as “1” to indicate grab samples and “2” to indicate diel samples. Replicates are also given specific codes. Grab samples in which duplicates sample are taken utilize a “1” for the first sample and a “2” for the second sample. Diel samples are always labeled with a “1” since only one sample is taken at each 2 hr intervals.

6) Data Collection Period

DIEL SAMPLING

Site	Month	Start Date	Start Time	End Date	End Time
B6	January	No January sample due to ice			
B6	February	03/01/2004	10:00	03/02/2004	08:00
B6	March	04/01/2004	10:00	04/02/2004	08:00
B6	April	04/14/2004	10:00	04/15/2004	08:00
B6	May	05/13/2004	10:00	05/14/2004	08:00
B6	June	07/01/2007	10:00	07/02/2004	08:00*
B6	July	July 2004 ISCO samples not processed due to failure of DI machine**			
B6	August	8/26/2004	10:00	08/27/2004	08:00
B6	September	No September samples due to ISCO malfunction			
B6	October	10/26/2004	11:00	10/27/04	09:00
B6	November	11/29/2004	11:00	11/30/04	09:00
B6	December	No December samples due to ice-over			

*Due to weather, the June samples were postponed until July 1 and 2.
**The scheduled sampling for late July was not processed due to failure of source of DI water.

GRAB SAMPLING

Site	Month	Start Date	Rep 1 Time	Start Date	Rep2 Time
B5	January	No sample taken due to ice			
B5	February	2/27/2004	11:46	2/27/2004	11:49
B5	March	3/31/2004	12:15	3/31/2004	12:17
B5	April	4/12/2004	No samples due to high winds and unnavigable conditions.		
B5	May	5/12/2004	9:31	5/12/2004	9:34
B5	June	6/25/2004	9:54	6/25/2004	9:57
B5	July	7/26/2004	10:45	7/26/2004	10:47
B5	August	8/24/2004	10:42	8/24/2004	10:45
B5	September	9/30/2004	7:57	9/30/2004	7:59
B5	October	10/25/2004	12:25	10/25/2004	12:29
B5	November	11/23/2004	11:18	11/23/2004	11:20
B5	December	No sample taken due to ice			
B6	January	No sample taken due to ice			
B6	February	2/27/2004	10:08	2/27/2004	10:11
B6	March	3/31/2004	11:13	3/31/2004	11:16
B6	April	4/12/2004	10:51	4/12/2004	10:53
B6	May	5/12/2004	8:50	5/12/2004	8:53
B6	June	6/25/2004	9:15	6/25/2004	9:17

B6	July	7/26/2004	10:29	7/26/2004	10:31
B6	August	8/24/2004	9:55	8/24/2004	9:57
B6	September	9/30/2004	7:26	9/30/2004	7:28
B6	October	10/25/2004	11:55	10/25/2004	11:57
B6	November	11/23/2004	10:49	11/23/2004	10:51
B6	December	No sample taken due to ice			
B9	January	No sample taken due to ice			
B9	February	2/27/2004	10:28	2/27/2004	10:31
B9	March	3/31/2004	11:32	3/31/2004	11:34
B9	April	4/12/2004	11:03	4/12/2004	11:05
B9	May	5/12/2004	9:07	5/12/2004	9:09
B9	June	6/25/2004	9:28	6/25/2004	9:31
B9	July	7/26/2004	10:07	7/26/2004	10:09
B9	August	8/24/2004	10:12	8/24/2004	10:15
B9	September	9/30/2004	7:38	9/30/2004	7:40
B9	October	10/25/2004	12:08	10/25/2004	12:10
B9	November	11/23/2004	11:02	11/23/2004	11:05
B9	December	No sample taken due to ice			
NE	January	No sample taken due to ice			
NE	February	2/27/2004	8:01	2/27/2004	8:03
NE	March	3/31/2004	9:45	3/31/2004	9:47
NE	April	4/12/2004	9:09	4/12/2004	9:11
NE	May	5/12/2004	7:16	5/12/2004	7:18
NE	June	6/25/2004	7:48	6/25/2004	7:51
NE	July	7/26/2004	8:05	7/26/2004	8:08
NE	August	8/24/2004	7:43	8/24/2004	7:45
NE	September	9/30/2004	6:30	9/30/2004	6:32
NE	October	10/25/2004	10:55	10/25/2004	10:57
NE	November	11/23/2004	13:01	11/23/2004	13:04
NE	December	12/21/2004	10:33	12/21/2004	10:35
BA	January	No sample due to ice			
BA	February	2/27/2004	7:34	2/27/2004	7:35
BA	March	3/31/2004	9:18	3/31/2004	9:21
BA	April	4/12/2004	8:43	4/12/2004	8:47
BA	May	5/12/2004	6:53	5/12/2004	6:57
BA	June	6/25/2004	7:27	6/25/2004	7:31
BA	July	7/26/2004	7:27	7/26/2004	7:32
BA	August	8/24/2004	7:14	8/24/2004	7:16
BA	September	9/30/2004	5:56	9/30/2004	5:59
BA	October	10/25/2004	10:31	10/25/2004	10:34
BA	November	11/23/2004	12:36	11/23/2004	12:38
BA	December	No sample due to ice			

Note: Time is coded based on a 2400 hour clock and is referenced to Eastern Standard Time (EST).

7) **Associated researchers and projects**

In 2004, Graduate Research Fellow (GRF), Amanda Flynn, conducted research regarding the distribution and flux of riverine dissolved organic carbon, nitrogen and phosphorus within the Mullica River-Great Bay estuarine system. Graduate Research Fellow (GRF) Jennifer Haag conducted research on atmospheric deposition of nutrients into the Mullica River-Great Bay estuarine system. Dr. Yuan Gao conducted research on atmospheric deposition of nutrients into the Mullica River-Great Bay estuarine system.

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 by request 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**

Monthly nutrient and plant pigment data files, in excel format, are sent to JNEERR by the Rutgers University, IMCS, Ecosystems Lab. Files consist of sampling station ID, date and time and parameter values expressed in unit concentrations. The Laboratory Supervisor, Ron

Lauck, verifies all parameter values in the excel file through cross comparison with the laboratory data sheets. The data are reviewed for values that appear erroneous or illogical. Any samples found to have questionable results are reanalyzed. JNEERR staff, Gregg P. Sakowicz, then review the data files for missing data denoted by " " and comment coded "M". Values below the detection limit (MDL) are replaced with the MDL value itself and comment coded with a "B".

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 Name	Units of Measure
Phosphorus and Nitrogen:			
	*Orthophosphate	PO4F	mg/L as P
	*Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	*Ammonium, Filtered	NH4F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L as N
Plant Pigments:			
	*Chlorophyll a	CHLA_N	µg/L

Notes:
1. Time is coded based on a 2400 hour clock and is referenced to Eastern Standard Time (EST).
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: NO23F, NH4F
Phosphorus species: PO4F
Other: CHLA

b) **Computed variables**
DIN: NO23F+NH4F

12) **Limits of detection**

Method Detection Limits (MDL), the lowest concentration of a parameter that an analytical procedure can reliably detect, have been established by the Rutgers University, IMCS, Ecosystems Laboratory. The MDL is determined as 3 times the standard deviation of a minimum of 7 replicates of a single low concentration sample. Table 1 presents the current MDL's; these values are reviewed and revised periodically. Methods are from Lachat Instruments QuikChem methods.

Table 1. Method Detection Limits (MDL) for measured water quality parameters.

Parameter	Variable	Method	MDL mg/L as N or P	Dates in use
Ammonium	NH4F	31-07-06-1-A	0.001	Jan 2003 -Dec 2004
Nitrate/Nitrite	NO23F	30-107-04-1-A	0.01	Jan 2003 -Dec 2004
Orthophosphate	PO4F	31-115-01-3-A	0.001	Jan 2003 -Dec 2004
Chlorophyll a	CHLA	EPA 445.0	0.01 (μg/L)	Jan 2003 -Dec 2004

13) **Laboratory methods**

i) **Parameter: PO4F**

Rutgers University, IMCS, Ecosystems Lab Laboratory Method
Method Reference: Lachat Instruments, 1993. QuikChem Method 31-115-01-3-A.
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter and subjected to ammonium molybdate and antimony potassium tartate under acidic conditions to form a complex. The complex is reduced with ascorbic acid to form a blue complex that absorbs light at 880 nm.
Preservation Method: Stored in dark at –20 °C for up to 30 days.

ii) **Parameter: NO23F**

Rutgers University, IMCS, Ecosystems Lab Laboratory Method
Method Reference: Lachat Instruments, 1992. QuikChem Method 30-107-04-1-A.
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter. Nitrate is reduced to nitrite by passage of sample through a copperized cadmium column. The nitrite (reduced nitrate plus original nitrite) is then determined with sulfanilamide under acidic conditions to form a diazonium ion. The diazonium ion is coupled with N-(1-naphthyl)ethylenediamine dihydrochloride, which results in a pink dye that absorbs at 520 nm.
Preservation Method: Stored in dark at -20 °C for up to 14 days.

iii) **Parameter: NH4F**

Rutgers University, IMCS, Ecosystems Lab Laboratory Method
Method Reference: Lachat Instruments, 1993. QuikChem Method 31-107-06-1-A.
Method Descriptor: Samples were filtered with a 0.45 μm membrane filter. The method used is based on the Berthelot reaction. Samples are subjected to hypochlorite-phenol, which results in indophenol blue. The indophenol blue is measured at 630 nm and is proportional to the ammonium concentration.
Preservation Method: Stored in dark at –20 °C for up to 3 days.

iv) **Parameter: DIN**

Rutgers University, IMCS, Ecosystems Lab Laboratory Method
Method Reference: N/A
Method Descriptor: Dissolved inorganic nitrogen is calculated by adding the ammonium concentration to the nitrate plus nitrite concentration. Ammonium and nitrate plus nitrite concentrations are determined as stated above.
Preservation Method: N/A

v) **Parameter: CHLA**

Rutgers University, IMCS, Ecosystems Lab Laboratory Method
Method Reference: US.EPA 1997. Method 445.0
Method Descriptor: Samples with a known volume were filtered with a 0.45 μm membrane filter. Samples were dissolved in 5 ml 90% acetone/ 10% $MgCO_3$ solution. Fluorescence determined using a Shimadzu RF-1501 spectrofluorometer.
Preservation Method: Filter is drawn dry, removed, placed in a glass tube with a phenolic screw cap, wrapped in aluminum foil and stored at –20 °C for up to 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

Unknown to JCNERR staff, the laboratory at Rutgers University, IMCS, froze the Reserve's grab and diel samples for indeterminate periods of time. Some samples were not processed until within days of the submission of this report. It is therefore safe to say that the majority, if not all, 2004 samples exceeded the approved holding period, and were denoted as such in the EQWin dataset.

Missing diel sample periods:

No diel sampling took place during the month of January 2004. Severe winter conditions caused the RUMFS boat-basin to freeze and ice floes within the bay, leaving all waters unnavigable.

No diel sampling occurred during the month of September 2004 due to a battery/equipment malfunction of ISCO sampler during the September deployment.

No diel sampling occurred in June 2004 due to unnavigable weather.

Due to weather, the June samples were postponed until July 1 and 2 and the scheduled sampling for late July was not processed due to failure of source of DI water.

No diel sampling took place during the month of December 2004. Winter conditions caused the RUMFS boat-basin and portions of the Mullica River and Little Egg Harbor to freeze over and become impassible.

Missing grab sample periods:

No grab sampling took place during the month of January 2004. Severe winter conditions caused the RUMFS boat-basin to freeze and ice floes within the bay, leaving all waters unnavigable.

No grab sample was obtained at Buoy 115 (B5) (an auxillary non-SWMP site) in April 2004 because of windy, unnavigable conditions.

No grab sampling took place during the month of December 2004 with the exception of Chestnut Neck. Winter conditions caused the RUMFS boat-basin and portions of the Mullica River and Little Egg Harbor to freeze over and become impassible.

Missing parameters within diel sampling periods:

The 04/15/04 04:00 CHLA sample is absent from the Diel Sampling dataset; the vial was reported by the analytical laboratory as having been broken in the centrifuge.

Missing parameters within grab sampling periods:

Both replicate CHLA values from the Buoy 115 grab samples for 06/25/04 are missing from the dataset. The laboratory reportedly received one vial broken and the other was broken in the centrifuge.

All values (PO4, NH4, NO23, and DIN) except CHLA are missing for the Lower Bank grab samples from 07/26/2004. The vials were either reported lost, or data were not recorded, by the laboratory performing analysis for those parameters.

One CHLA sample is missing from the 08/24/05 grab sampling period. The vial was broken in the centrifuge.

15) **QA/QC programs**

a) **Precision**

i) **Field variability**

JNEERR collects two successive grab samples for the monthly grab sample program.

ii) **Laboratory variability**

Rutgers University, IMCS, Ecosystems Lab analyzes a laboratory duplicate once for every nine samples.

iii) **Inter-organizational splits**

None

b) **Accuracy**

i) **Sample spikes**

Rutgers University, IMCS, Ecosystems Lab analyzes a matrix spike once for every ten samples.

ii) **Standard reference material analysis**

None

iii) **Cross calibration exercises**

None

16) **Other remarks**

On 05/22/2025 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.

		Historic	
Flag/code	***If also C***	**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> [GQD]	<3> [GCR]	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> [GCM]	M	Data missing, sample never collected or calculated value could not be determined due to missing data
<-3> [SNV] and <1> [SCC] for components		N	Negative calculated value
(CRE) or F_Record {CRE}		P	Significant precipitation (reserve defined, see metadata for further details)
<0> (CUS)		U	Lab analysis from unpreserved sample
<1> (CSM)		S	Data suspect, see metadata for further details