Jacques Cousteau (JAC) NERR 2022 Nutrient Metadata
January 2022-December 2022
Latest Update: October 16, 2025

I. Data Set and Research Descriptors

1) **Principal investigator(s) and contact persons**

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2) **Research objectives**

a) **Monthly grab sampling program**

Monthly grab samples for the Jacques Cousteau National Estuarine Research Reserve (JAC NERR) 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. An additional 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 JAC NERR. These data can then be compared to chlorophyll *a* measurements to assess their relationship to phytoplankton biomass. A major goal of JAC NERR 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. 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 JAC NERR. 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 JAC NERR, which will be important to resource managers of the system.

b) **Diel sampling program**

Diel sampling is conducted via an ISCO automated sampler at Chestnut Neck in the Mullica River to assess nutrient concentrations and changes in concentrations over tidal cycles. These data augment/are augmented by monthly grab samples taken at Chestnut Neck (see above). This is a change from prior years when the ISCO sampler was located at Channel Marker 126; this change was opted to study and better understand the influence of nutrients (particularly runoff) lower Mullica River, an area of interest for natural shellfish recruitment as well as nearby shellfish farms. This location is co-located with the jacnewq water-monitoring station, as well as being the closest option to the JAC NERR's jacncmet meteorological station.

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 JAC NERR 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 or before slack low tide conditions (+3 hour before low tide), approximately one month after the previous sampling period. 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 500 ml Nalgene 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. Samples were then frozen in a -20°C freezer and shipped to the Virginia Institute of Marine Sciences (VIMS) Analytical Service Center as soon as possible thereafter. The processed samples were then stored in a –20°C freezer until analyses were performed.

b) **Diel sampling program**

Monthly diel samples were taken at the principle long-term datasonde station Chestnut Neck (jacnewq). This constitutes a change from previous years (until 2019) during which diel sampling was conducted at the Buoy 126 (jacb6wq) station. This chance was done to sample waters exchanged by/in the mouth of the Mullica River, targeting areas of natural and commercial shellfish beds. Samples were collected monthly, at approximately 30-day intervals. Initiation of sampling was targeted to commence with the earliest low tide of the day and ran through the low tide of the next day. No distinction was made between spring and neap tide conditions. Twelve samples were collected over a lunar day at 2-hour-and-15-minute intervals using an ISCO auto-sampler. Samples were taken at a fixed depth, approximately 1 meter from the bottom. All samples were collected in clear, plastic, 1000 ml ISCO sample bottles that were previously acid washed (15% H_2SO_4), rinsed (5x) with distilled-deionized water. Samples were retrieved as soon as possible after completion of the auto-sampler program. Samples bottles were then immersed in ice in an opaque cooler at the Rutgers Marine Field Station to shield samples from light. Once in the laboratory, samples were shaken and processed for filtered for nutrient and Chl a analysis. Samples were then frozen in a -20°C freezer and shipped to the Virginia Institute of Marine Sciences (VIMS) Analytical Service Center as soon as possible thereafter. The processed samples were then stored in a –20°C freezer until analyses were performed.

4) **Site location and character**

The Jacques Cousteau National Estuarine Research Reserve (JAC NERR) at Mullica River/Great Bay is located on the northeast coast of the United States on the Atlantic Ocean.

The estuary is near Tuckerton, New Jersey about 14 kilometers north of Atlantic City. There were five active sampling stations in 2022. All locations can be characterized by having little macroalgae (few to no established beds in the immediate locale; only occasional seasonal and structurally-dependent fouling-type macroalgal communities), fast moving tidal currents, and tidal ranges of approximately 1m (although this can vary significantly depending on moon state, storm events, and coastal wind conditions (e.g.- "blow out tides" associated with strong offshore winds). All sites are in a relatively undisturbed area with minimal impact from development or pollution.

1) **Buoy 115 (B5)** - 39º 31.130' N, 74º17.230' 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. Full-time water-quality monitoring of this non-SWMP station was discontinued in 2003 after ice-floes tore the hardware and housings from the structure. The following site description is from 2002 (the more recent year-long dataset); we do not expect this description to differ significantly from present conditions: The depth of the bay at this site is approximately 3 meters. The bottom consists predominantly of sand with little shell or organic material. Groundwater inputs from margins of the estuary, as well as surface flow from Mullica River, account for most of the freshwater entering that affects this site. The input of freshwater from local precipitation and marsh surface runoff is of secondary importance. Flocculent material, possibly decaying alga from up-current (during ebb tides) SAV (submerged aquatic vegetation) beds located in the Little Egg Harbor section of Barnegat Bay, was occasionally observed as flotsam and in the water column during the collection of samples at jacb5nut and should be considered a characteristic of this sampling station. This site is not monitored via multiparameter sonde, so no environmental water quality (WQ) data beyond what it obtained at the time of nutrient grab sample collection are available for 2022.

2) Buoy 126 (B6) - 39° 30'28.44"N, 74° 20'18.67"W- located three kilometers from Little Egg Inlet on the eastern side of Great Bay and is 100 meters from the nearest land that is a natural marsh island. This is a naturally deep area that has never been dredged, but it is located about 0.5 kilometers from an area in the Intracoastal Waterway that is dredged regularly. The datasonde at this location is attached to Intracoastal Waterway Channel Marker 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 coarse sand bottom with an extensive blue mussel bed surrounding the area. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface. Monitoring at this station began on 08/06/1996. In 2022, the reported temperature at this station ranged from -1.6°C to 28.0°C, with an average of 13.6°C. The reported salinity at this station ranged from 22.1 psu to 32.6 psu, with an average of 30.0 psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.37 m.

3) **Buoy 139 (B9)** – 39° 29'52.59"N, 74° 22'52.07"W*- is located 4 kilometers from Buoy

126 on the western side of Great Bay and is located about one to one and one-half kilometers from land. The datasonde at this location is attached to Intracoastal Waterway Channel Marker 139. The closest landform is an extensive salt marsh approximately 1.5 kilometers wide, which borders the upland area. This area is dredged by the U.S. Army Corp of Engineers approximately every five to six years to maintain the channel at a depth of approximately 2.5 meters. The surrounding depth of the bay is approximately 1.5 to 2 meters. This site is characterized by having maximum currents of about 1.5 knots with a muddy sand bottom and with little structure or shell. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface and above. Monitoring at this station began on 08/02/1996. In 2022, the reported temperature at this station ranged from -1.6°C to 29.7°C, with an average of 14.9°C. The reported salinity at this station ranged from 20.2 psu to 32.4 psu, with an average of 29.0 psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.21 m.

4) **Chestnut Neck (NE)** - 39° 32'52.37"N, 74° 27'38.77"W - located 12 kilometers up the Mullica River from the mouth of the river. The river begins at a line drawn between Graveling Point and Oysterbed Point on the northwestern side of Great Bay. The Mullica River at this location is quite wide, about 250 meters. The datasonde is attached to the dock of a small marina along the southern shore of the river adjacent to the main channel. This location has never been dredged. The site is characterized by having tidal currents of less than one knot, during both ebb and flood tide, and has a mixed organic mud/sand bottom. Freshwater input is primarily from groundwater and watershed runoff. Monitoring at this station began on 08/01/1996. In 2022, the reported temperature at this station ranged from -1.3°C to 30.5°C, with an average of 15.0°C. The reported salinity at this station ranged from 6.5 psu to 28.7 psu, with an average of 17.8 psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the aforementioned average and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.28 m.

5) **Lower Bank (BA)** - 39° 35'37.18"N, 74° 33'05.44"W- located 13 kilometers upriver of the Chestnut Neck location. The Mullica River at this site is about two hundred meters wide. The datasonde is located at the center of a bridge spanning the Mullica 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 three kilometers wide. This site can be characterized by having fast tidal currents, just over one knot, deep water, and fine mixed organic mud and sandy sediment. Freshwater input is primarily from groundwater and watershed runoff. Monitoring at this station began on 10/10/1996. In 2022, the reported temperature at this station ranged from -0.5°C to 31.9°C, with an average of 15.4°C. The reported salinity at this station ranged from 0.0 psu to 21.6 psu, with an average of 4.7 psu. It is important to note that fouling may have occasionally depressed some salinity readings and are "flagged" as such in the dataset, so the

aforementioned average and range may not be accurate. The maximum tidal range (including storm surge and drought-level data), as recorded by the datasonde, was 2.09 m.

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
B5	S	jacb5nut	39.51853, -74.28737	Feb 2002-present	NA	Optional/ Secondary SWMP
B6	P	jacb6nut	39.50790, -74.33850	Feb 2002-present	NA	NA
B9	P	jacb9nut	39.49794, -74.38113	Feb 2002-present	NA	NA
NE	P	jacnenut	39.54790, -74.46080	Feb 2002-present	NA	NA
BA	P	jacbanut	39.59370, -74.55150	Feb 2002-present	NA	NA

The following table summarize the nutrient data at the aforementioned stations for 2022:

	PO4F	NH4F	NO23F	DIN	CHLA_N
jacb5nut					
Min	0.0031	0.0066	0.0086	0.0289	2.5500
Max	0.0308	0.0680	0.0958	0.1428	14.6400
Average	0.0141	0.0287	0.0355	0.0701	7.9267
Std Dev	0.0090	0.0176	0.0285	0.0394	3.8770
jacb6nut					
Min	0.0075	0.0085	0.0083	0.0168	2.0700
Max	0.0320	0.1128	0.0705	0.1653	17.7400
Average	0.0191	0.0375	0.0319	0.0777	7.6142
Std Dev	0.0072	0.0277	0.0231	0.0458	3.9376
jacb9nut					
Min	0.0067	0.0092	0.0076	0.0176	1.9900
Max	0.0399	0.1167	0.0563	0.1729	14.7800
Average	0.0173	0.0428	0.0254	0.0929	7.6013
Std Dev	0.0104	0.0380	0.0212	0.0594	3.8104
jacnenut					
Min	0.0029	0.0066	0.0067	0.0171	0.8200
Max	0.0316	0.1529	0.1316	0.1899	22.2600
Average	0.0132	0.0512	0.0391	0.0914	6.7596
Std Dev	0.0072	0.0342	0.0226	0.0389	5.4946

jacbanut					
Min	BMDL*	0.0075	0.0594	0.0774	0.6600
Max	BMDL*	0.0192	0.3617	0.3752	18.7600
Average	N/A	0.0130	0.1731	0.2663	5.7146
Std Dev	N/A	0.0044	0.1076	0.1152	5.6218

BMDL= Below Method Detection Limit

5) **Code variable definitions**

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

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 2:15 interval.

6) **Data Collection Period**

GRAB SAMPLING

Station Code	Date Collected	Time Replicate 1	Time Replicate 2
jacb5nut	1/25/2022	8:59	9:01
jacb5nut	2/10/2022	9:51	9:53
jacb5nut	3/2/2022	14:07	14:09
jacb5nut	4/11/2022	10:51	10:53
jacb5nut	5/12/2022	9:56	9:58
jacb5nut	6/15/2022	12:41	12:43
jacb5nut	7/11/2022	9:34	9:36
jacb5nut	8/24/2022	9:50	9:52
jacb5nut	9/20/2022	9:39	9:41
jacb5nut	10/10/2022	13:43	13:45
jacb5nut	11/7/2022	12:12	12:14
jacb5nut	12/12/2022	14:59	15:01
jacb6nut	1/25/2022	8:25	8:27
jacb6nut	2/10/2022	9:14	9:16

jacb6nut	3/2/2022	13:25	13:27
jacb6nut	4/11/2022	10:05	10:07
jacb6nut	5/12/2022	9:14	9:16
jacb6nut	6/15/2022	11:49	11:51
jacb6nut	7/11/2022	8:57	8:59
jacb6nut	8/24/2022	9:09	9:11
jacb6nut	9/20/2022	9:04	9:06
jacb6nut	10/10/2022	13:06	13:08
jacb6nut	11/7/2022	11:27	11:29
jacb6nut	12/12/2022	14:22	14:24
jacb9nut	1/25/2022	8:38	8:40
jacb9nut	2/10/2022	9:32	9:34
jacb9nut	3/2/2022	13:42	13:44
jacb9nut	4/11/2022	10:27	10:29
jacb9nut	5/12/2022	9:32	9:34
jacb9nut	6/15/2022	12:12	12:14
jacb9nut	7/11/2022	9:13	9:15
jacb9nut	8/24/2022	9:30	9:32
jacb9nut	9/20/2022	9:20	9:22
jacb9nut	10/10/2022	13:23	13:25
jacb9nut	11/7/2022	11:50	11:52
jacb9nut	12/12/2022	14:36	14:38
jacnenut	1/25/2022	10:11	10:13
jacnenut	2/10/2022	11:07	11:09
jacnenut	3/2/2022	16:17	16:19
jacnenut	4/11/2022	12:20	12:22
jacnenut	5/12/2022	11:47	11:49
jacnenut	6/15/2022	14:23	14:25
jacnenut	7/11/2022	11:20	11:22
jacnenut	8/24/2022	11:21	11:23
jacnenut	9/20/2022	11:08	11:10
jacnenut	10/10/2022	14:59	15:01
jacnenut	11/7/2022	13:51	13:53
jacnenut	12/12/2022	16:13	16:15
jacbanut	1/25/2022	10:57	10:59
jacbanut	2/10/2022	12:11	12:13
jacbanut	3/2/2022	15:35	15:37
jacbanut	4/11/2022	13:15	13:17
jacbanut	5/12/2022	12:33	12:35
jacbanut	6/15/2022	15:11	15:13

jacbanut	7/11/2022	12:09	12:11
jacbanut	8/24/2022	12:12	12:14
jacbanut	9/20/2022	12:00	12:02
jacbanut	10/10/2022	15:40	15:42
jacbanut	11/7/2022	14:36	14:38
jacbanut	12/12/2022	16:42	16:45

DIEL (ISCO) SAMPLING

Station Code	Month	Start Date	Start Time	End Date	End Time
jacnenut	January	1/24/2022	N/A	1/25/2022	N/A
jacnenut	February	2/09/2022	10:00	2/10/2022	10:45
jacnenut	March	3/01/2022	15:30	3/02/2022	16:15
jacnenut	April	4/27/2022	13:45	4/28/2022	14:30
jacnenut	May	5/19/2022	06:15	5/20/2022	07:00
jacnenut	June	6/07/2022	09:30	6/08/2022	10:15
jacnenut	July	7/12/2022	14:15	7/13/2022	15:00
jacnenut	August	8/04/2022	08:00	8/05/2022	08:45
jacnenut	September	9/14/2022	06:30	9/15/2022	07:15
jacnenut	October	10/18/2022	08:30	10/19/2022	09:15
jacnenut	November	11/09/2022	03:45	11/10/2022	04:30
jacnenut	December	12/19/2022	12:00	12/20/2022	12:45

7) **Associated researchers and projects**

A number of researchers have expressed interest in our 2022 nutrient data but prefer to wait until the review process is complete.

Water Quality (WQ) and Meteorological (MET) data associated with these Nutrient (NUT) data can be obtained via download from the at www.nerrsdata.org . It is recommended that users utilize the new Advanced Query System (www.nerrsdata.org/aqs) to merge the nutrient and water-quality data into one seamless file.

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 2022.

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**

Monthly nutrient and plant pigment data files, in excel format, are sent to the JAC NERR by the Virginia Institute of Marine Sciences (VIMS) Analytical Service Center. Files consist of sample ID, sampling date, analysis date, and parameter values expressed in mg/L (ug/L for Chlorophyll). The data are reviewed for values that appear erroneous or illogical. Any samples found to have questionable results are reanalyzed. JAC NERR staff (Gregg P. Sakowicz, SWMP Technician/Field Researcher) then performs the following:

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 data category**

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
Field Parameters:			
	Water Temperature	WTEM_N	ºC
	Specific Conductivity	SCON_N	mS/cm^3
	Salinity	SALT_N	ppt
	Dissolved Oxygen	DO_S_N	% Saturation
	Dissolved Oxygen	DO_N	mg/L
	pH	PH_N	pH units
	Turbidity	TURB_N	FNU

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.

11) **Measured and calculated laboratory parameters**

a) **Variables measured directly**

Nitrogen species: NO23F, NH4F
Phosphorus species: PO4F
Other: CHLA_N

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 VIMS Analytical Service Center. Table 1 presents the current MDL's; these values are reviewed and revised periodically.

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

Parameter	Start Date	End Date	MDL	Revisited
NH4F	01/01/2022	12/31/2022	0.0062(mg/L)	01/05/2022, 01/06/2023
NO23F	01/01/2022	12/31/2022	0.0055(mg/L)	01/05/2022, 01/06/2023
PO4F	01/01/2022	12/31/2022	0.0029 (mg/L)	01/05/2022, 01/06/2023
CHLA	01/01/2022	12/31/2022	0.50 (ug/L)	01/05/2022, 01/06/2023

13) **Laboratory methods**

i) **Parameter: PO4F**

VIMS Laboratory Method SKALAR Method: O-Phosphate / Total Phosphate, Catnr. 503-365.1, issue 042993/MH/93-Demo1

Method Reference:

- Murphy, J. and J.P. Riley. 1962. A modified single solution method for the determination of phosphate in natural waters. Analytica Chim. Acta 27: 31-36
- EPA 600/R-97/072 Method 365.5 Determination of Orthophosphate in Estuarine and Coastal Waters by Automated Colorimetric Analysis. IN: Methods for the Determination of Chemical Substances in Marine and Estuarine Environmental Matrices -2nd Edition. National Exposure Research Laboratory, Office of Research and Development. U.S. EPA, Cincinnati, Ohio 45268

Method Descriptor: Ammonium molybdate and antimony potassium tartrate react in a sulfuric acid environment to form an antimony-phospho-molybdate complex, which is reduced to a blue colored complex by ascorbic acid. Reaction is heat catalyzed at 40°C. Range is 1 - 50 ppb.

Preservation Method: Preservation Method: 60 ml of sample is filtered through a Whatman® Nuclepore Track-Etched Membrane, 0.4 µm disposable disk filter (47 mm), and stored at –20°C until analyzed.

ii) **Parameter: NO23F**

VIMS Laboratory Method: SA461-353.2 - NO2+3

Method Reference:

- U.S. EPA. 1974. Methods for Chemical Analysis of Water and Wastes, pp. 207 -212.
- Wood, E.D., F.A.G. Armstrong, and F.A. Richards. 1967. Determination of nitrate in seawater by cadmium-copper reduction to nitrite. J. Mar. Biol. Assoc. U.K. 47: 23

- Grasshoff, K., M. Ehrhardt and K. Kremling. 1983. Methods of Seawater Analysis. Verlag Chemie, Federal Republic of Germany. 419 pp.
- EPA 600/R-97/072 Method 353.4. Determination of Nitrate and Nitrite in Estuarine and Coastal Waters by Gas Segmented Flow Colorimetric Analysis. IN: Methods for the Determination of Chemical Substances in Marine and Estuarine Environmental Matrices -2nd Edition. National Exposure Research Laboratory, Office of Research and Development U.S. EPA, Cincinnati, Ohio 45268.

Method Descriptor: Nitrate is reduced quantitatively to nitrite by cadmium metal in the form of an open tubular reactor. The nitrite thus formed plus any originally present in the sample is colorimetrically detected at 540 nm, following its diazotization with sulfanilamide, and subsequent coupling with N-1-naphthylethylenediamine dihydrochloride. The dissolved nitrate concentrations of the samples are calculated as NO3-N.

Preservation Method: 60 ml of sample is filtered through a Whatman® Nuclepore Track-Etched Membrane, 0.4 µm disposable disk filter (47 mm), and stored at –20°C until analyzed.

iii) **Parameter: NH4F**
VIMS Laboratory Method: SA156-350.1 - NH3

Method Reference:
- U.S. EPA. 1974. Methods for Chemical Analysis of Water and Wastes, pp. 168-174.
- Standard Methods for the Examination of Water and Wastewater, 14th edition. p 410. Method 418A and 418B (1975).
- Annual Book of ASTM Standards, Part 31. "Water", Standard 1426-74, Method A, p 237 (1976).
- EPA 600/R-97/072 Method 349.0. Determination of Ammonia in Estuarine and Coastal Waters by Gas Segmented Continuous Flow Colorimetric Analysis. IN: Methods for the Determination of Chemical Substances in Marine and Estuarine Environmental Matrices -2nd Edition. National Exposure Research Laboratory, Office of Research and Development U.S. EPA, Cincinnati, Ohio 45268.

Method Descriptor: Ammonia reacts with alkaline phenol and hypochlorite to form indophenol blue in an amount that is proportional to the ammonia concentration. The blue color is intensified with sodium nitroprusside. The reaction is catalyzed by heat at 37°C. The range is 0.01 – 2.0 mg L-1.

Preservation Method: 60 ml of sample is filtered through a Whatman® Nuclepore Track-Etched Membrane, 0.4 µm disposable disk filter

(47mm), and stored at –20°C until analyzed.

iv) **Parameter: CHLA**
VIMS Analytical Service Center
Method Reference: EPA 445.o
Method Descriptor: Chlorophyll-containing phytoplankton in a measured volume of water are concentrated by vacuum filtration onto a glass fiber filter. The pigments are extracted from the phytoplankton onto a 90% acetone solution with the aid of a mechanical tissue grinder. The samples are steeped in the dark at 4°C for a minimum of two hours, but not to exceed 24 hours, to ensure complete extraction of the pigments. The filter slurry is centrifuged at 675 g for a minimum of 15 minutes or longer as necessary to clarify the solution. The supernatant is transferred to a glass cuvette and fluorescent is measured before and after certification with a 1.0 N HCl solution. A standard curve is prepared from known concentrations of chlorophyll a standards, and the concentration is reported in µg /L.

Preservation Method: Analyzed immediately; stored in dark at -20°C for "a few" days is permissible.

14) **Field and Laboratory QA/QC programs**

a) **Precision**
   i. **Field Variability** - For the monthly grab sampling program, JAC NERR collects two successive grab samples for the determination of water mass variability.
   ii. **Laboratory Variability** – replicates of all nutrient samples are run
   iii. **Inter-organizational Splits** – none

b) **Accuracy**
   i. **Sample Spikes** – blanks
   ii. **Standard Reference Material Analysis** – none
   iii. **Cross Calibration Exercises** – none

15) QAQC flag definitions – This section details the primary and secondary 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 – This section details the secondary QAQC Code definitions used in combination with the flags above.

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**

Data may be missing due to problems with sample collection or processing. Laboratories in the NERR 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.

NOTE: The B6 station sits within an interface between two bodies of water (Little Egg Harbor and Mullica River) that are often physically and chemically distinct, so some of the discrepancies between some replicates at this station may be accurate and "real" if the replicates were obtained from the two different "plumes" of water; this is something those performing collections attempt to avoid but visual cues may not be distinct enough to discern waters from each source at the time of collection.

No physical ("water quality") parameters are included in this dataset for the diel sample program because these data can be obtained via download from the Chestnut Neck station (jacnewq) at www.nerrsdata.org . It is recommended that users utilize the Advanced Query System (www.nerrsdata.org/aqs) to merge these nutrient and water-quality data into one seamless file.

While basic and notable weather information was inserted into the F_Record column for all grab samples, it is recommended that users of these data refer to the JAC NERR's meteorological dataset from the Nacote Creek Meteorological station (jacncmet) for weather information. The meteorological dataset can be accessed online at the CDMO home page http://cdmo.baruch.sc.edu/ or www.nerrsdata.org . It is recommended that users utilize the new Advanced Query System (www.nerrsdata.org/aqs) to merge nutrient, weather, and water-quality data into one seamless file

Additionally, regarding inserting comment codes concerning weather, only significant rain events potentially influencing the data were inserted into the diel portion of the dataset. If users seek to correlate the diel samples with weather conditions, it is recommended that they refer to the JAC NERR's meteorological dataset. The meteorological dataset can be accessed online at the CDMO home page http://cdmo.baruch.sc.edu/ or www.nerrsdata.org .

If discrepancies between replicate grab samples are observed they are flagged in the dataset with an "[SRD]" (denoting "Replicate values differ substantially") code in the dataset. It is up to the user to retain or discard these data during analyses.

Diel samples for January 2022 were not collected due to overnight deep-freezing temperatures concurrent with appropriate sampling periods that month; the dates of 01/25-26/2022 were used as placeholders in the dataset as typical for sample collection relative to grab sampling.

Sample Analysis Dates **for 2022:** 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). If measured values were below MDL, this resulted in <-4> [SBL] (CHB) flagging/coding.

Jacb5nut Grab Samples

Collect_Date	Collection Time	Rep	ChlA Analysis Date	NH4 analysis date	NO3+NO2 analysis date	PO4 analysis date
1/25/2022	8:59	1	2/17/2022	2/23/2022	2/23/2022	2/23/2022
1/25/2022	9:01	2	2/17/2022	2/23/2022	2/23/2022	2/23/2022
2/10/2022	9:51	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	9:53	2	2/23/2022	2/23/2022	2/23/2022	3/2/2022
3/2/2022	14:07	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	14:09	2	3/22/2022	3/28/2022	3/28/2022	3/28/2022
4/11/2022	10:51	1	5/10/2022	5/4/2022	5/4/2022	5/4/2022
4/11/2022	10:53	2	5/10/2022	5/4/2022	5/4/2022	5/4/2022
5/12/2022	9:56	1	6/6/2022	6/1/2022	6/1/2022	6/1/2022
5/12/2022	9:58	2	6/6/2022	6/1/2022	6/1/2022	6/1/2022
6/15/2022	12:41	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/15/2022	12:43	2	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
7/11/2022	9:34	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/11/2022	9:36	2	7/27/2022	8/11/2022	8/11/2022	8/11/2022
8/24/2022	9:50	1	9/13/2022	9/20/2022	9/20/2022	9/20/2022
8/24/2022	9:52	2	9/13/2022	9/20/2022	9/20/2022	9/20/2022
9/20/2022	9:39	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/20/2022	9:39	2	10/17/2022	10/14/2022	10/14/2022	10/14/2022
10/10/2022	13:43	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/10/2022	13:45	2	11/10/2022	11/3/2022	11/3/2022	11/3/2022
11/7/2022	12:12	1	11/28/2022	12/12/2022 *	12/12/2022 *	12/12/2022 *
11/7/2022	12:14	2	11/28/2022	12/12/2022 *	12/12/2022 *	12/12/2022 *
12/12/2022	14:59	1	1/9/2023	1/4/2023	1/4/2023	1/4/2023
12/12/2022	15:01	2	1/9/2023	1/4/2023	1/4/2023	1/4/2023

*samples held beyond the allowable time

Jacb6nut Grab Samples

Collect_Date	Collection Time	Rep	ChlA Analysis Date	NH4 analysis date	NO3+NO2 analysis date	PO4 analysis date
1/25/2022	8:25	1	2/17/2022	2/23/2022	2/23/2022	2/23/2022
1/25/2022	8:27	2	2/17/2022	2/23/2022	2/23/2022	2/23/2022
2/10/2022	9:14	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	9:16	2	2/23/2022	2/23/2022	2/23/2022	3/2/2022
3/2/2022	13:25	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022

3/2/2022	13:27	2	3/22/2022	3/28/2022	3/28/2022	3/28/2022
4/11/2022	10:05	1	5/10/2022	5/4/2022	5/4/2022	5/4/2022
4/11/2022	10:07	2	5/10/2022	5/4/2022	5/4/2022	5/4/2022
5/12/2022	9:14	1	6/6/2022	6/1/2022	6/1/2022	6/1/2022
5/12/2022	9:16	2	6/6/2022	6/1/2022	6/1/2022	6/1/2022
6/15/2022	11:49	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/15/2022	11:51	2	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
7/11/2022	8:57	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/11/2022	8:59	2	7/27/2022	8/11/2022	8/11/2022	8/11/2022
8/24/2022	9:09	1	9/13/2022	9/20/2022	9/20/2022	9/20/2022
8/24/2022	9:11	2	9/13/2022	9/20/2022	9/20/2022	9/20/2022
9/20/2022	9:04	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/20/2022	9:04	2	10/17/2022	10/14/2022	10/14/2022	10/14/2022
10/10/2022	13:06	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/10/2022	13:08	2	11/10/2022	11/3/2022	11/3/2022	11/3/2022
11/7/2022	11:27	1	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
11/7/2022	11:29	2	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
12/12/2022	14:22	1	1/9/2023	1/4/2023	1/4/2023	1/4/2023
12/12/2022	14:24	2	1/9/2023	1/4/2023	1/4/2023	1/4/2023

*samples held beyond the allowable time

Jacb9nut Grab Samples

Collect_Date	Collection Time	Rep	Chla Analysis Date	NH4 analysis date	NO3+NO2 analysis date	PO4 analysis date
1/25/2022	8:38	1	2/17/2022	2/23/2022	2/23/2022	2/23/2022
1/25/2022	8:40	2	2/17/2022	2/23/2022	2/23/2022	2/23/2022
2/10/2022	9:32	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	9:34	2	2/23/2022	2/23/2022	2/23/2022	3/2/2022
3/2/2022	13:42	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	13:44	2	3/22/2022	3/28/2022	3/28/2022	3/28/2022
4/11/2022	10:27	1	5/10/2022	5/4/2022	5/4/2022	5/4/2022
4/11/2022	10:29	2	5/10/2022	5/4/2022	5/4/2022	5/4/2022
5/12/2022	9:32	1	6/6/2022	6/1/2022	6/1/2022	6/1/2022
5/12/2022	9:34	2	6/6/2022	6/1/2022	6/1/2022	6/1/2022
6/15/2022	12:12	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/15/2022	12:14	2	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
7/11/2022	9:13	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/11/2022	9:15	2	7/27/2022	8/11/2022	8/11/2022	8/11/2022

8/24/2022	9:30	1	9/13/2022	9/20/2022	9/20/2022	9/20/2022
8/24/2022	9:32	2	9/13/2022	9/20/2022	9/20/2022	9/20/2022
9/20/2022	9:20	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/20/2022	9:20	2	10/17/2022	10/14/2022	10/14/2022	10/14/2022
10/10/2022	13:23	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/10/2022	13:25	2	11/10/2022	11/3/2022	11/3/2022	11/3/2022
11/7/2022	11:50	1	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
11/7/2022	11:52	2	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
12/12/2022	14:36	1	1/9/2023	1/4/2023	1/4/2023	1/4/2023
12/12/2022	14:38	2	1/9/2023	1/4/2023	1/4/2023	1/4/2023

*samples held beyond the allowable time

Jacnenut Grab Samples

Collect_Date	Collection Time	Rep	Chla Analysis Date	NH4 analysis date	NO3+NO2 analysis date	PO4 analysis date
1/25/2022	10:11	1	2/17/2022	2/23/2022	2/23/2022	2/23/2022
1/25/2022	10:13	2	2/17/2022	2/23/2022	2/23/2022	2/23/2022
2/10/2022	11:07	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	11:09	2	2/23/2022	2/23/2022	2/23/2022	3/2/2022
3/2/2022	16:17	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	16:19	2	3/22/2022	3/28/2022	3/28/2022	3/28/2022
4/11/2022	12:20	1	5/10/2022	5/4/2022	5/4/2022	5/4/2022
4/11/2022	12:22	2	5/10/2022	5/4/2022	5/4/2022	5/4/2022
5/12/2022	11:47	1	6/6/2022	6/1/2022	6/1/2022	6/1/2022
5/12/2022	11:49	2	6/6/2022	6/1/2022	6/1/2022	6/1/2022
6/15/2022	14:23	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/15/2022	14:25	2	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
7/11/2022	11:20	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/11/2022	11:22	2	7/27/2022	8/11/2022	8/11/2022	8/11/2022
8/24/2022	11:21	1	9/13/2022	9/20/2022	9/20/2022	9/20/2022
8/24/2022	11:23	2	9/13/2022	9/20/2022	9/20/2022	9/20/2022
9/20/2022	11:08	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/20/2022	11:08	2	10/17/2022	10/14/2022	10/14/2022	10/14/2022
10/10/2022	14:59	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/10/2022	15:01	2	11/10/2022	11/3/2022	11/3/2022	11/3/2022
11/7/2022	13:51	1	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
11/7/2022	13:53	2	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
12/12/2022	16:13	1	1/9/2023	1/4/2023	1/4/2023	1/4/2023
12/12/2022	16:15	2	1/9/2023	1/4/2023	1/4/2023	1/4/2023

*samples held beyond the allowable time

Jacbanut Grab Samples

Collect_Date	Collection Time	Rep	Chla Analysis Date	NH4 analysis date	NO3+NO2 analysis date	PO4 analysis date
1/25/2022	10:57	1	2/17/2022	2/23/2022	2/23/2022	2/23/2022
1/25/2022	10:59	2	2/17/2022	2/23/2022	2/23/2022	2/23/2022
2/10/2022	12:11	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	13:11	2	2/23/2022	2/23/2022	2/23/2022	3/2/2022
3/2/2022	15:35	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	15:37	2	3/22/2022	3/28/2022	3/28/2022	3/28/2022
4/11/2022	13:15	1	5/10/2022	5/4/2022	5/4/2022	5/4/2022
4/11/2022	13:17	2	5/10/2022	5/4/2022	5/4/2022	5/4/2022
5/12/2022	12:33	1	6/6/2022	6/1/2022	6/1/2022	6/1/2022
5/12/2022	12:35	2	6/6/2022	6/1/2022	6/1/2022	6/1/2022
6/15/2022	15:11	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/15/2022	15:13	2	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
7/11/2022	12:09	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/11/2022	12:11	2	7/27/2022	8/11/2022	8/11/2022	8/11/2022
8/24/2022	12:12	1	9/13/2022	9/20/2022	9/20/2022	9/20/2022
8/24/2022	12:14	2	9/13/2022	9/20/2022	9/20/2022	9/20/2022
9/20/2022	12:00	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/20/2022	12:00	2	10/17/2022	10/14/2022	10/14/2022	10/14/2022
10/10/2022	15:40	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/10/2022	15:42	2	11/10/2022	11/3/2022	11/3/2022	11/3/2022
11/7/2022	14:36	1	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
11/7/2022	14:38	2	11/28/2022	12/12/2022*	12/12/2022*	12/12/2022*
12/12/2022	16:42	1	1/9/2023	1/4/2023	1/4/2023	1/4/2023
12/12/2022	16:45	2	1/9/2023	1/4/2023	1/4/2023	1/4/2023

*samples held beyond the allowable time

Jacnenut Diel Samples

Collect_Date	Collection Time	Rep	Chla Analysis Date	NH4 analysis date	NO3+NO2 analysis date	PO4 analysis date
2/9/2022	10:00	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/9/2022	12:15	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/9/2022	14:30	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/9/2022	16:45	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/9/2022	19:00	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/9/2022	21:15	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/9/2022	23:30	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022

2/10/2022	1:45	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	4:00	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	6:15	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	8:30	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
2/10/2022	10:45	1	2/23/2022	2/23/2022	2/23/2022	3/2/2022
3/1/2022	15:30	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/1/2022	17:45	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/1/2022	20:00	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/1/2022	22:15	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	0:30	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	2:45	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	5:00	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	7:15	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	9:30	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	11:45	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	14:00	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
3/2/2022	16:15	1	3/22/2022	3/28/2022	3/28/2022	3/28/2022
4/27/2022	13:45	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/27/2022	16:00	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/27/2022	18:15	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/27/2022	20:30	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/27/2022	22:45	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/28/2022	1:00	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/28/2022	3:15	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/28/2022	5:30	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/28/2022	7:45	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/28/2022	10:00	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/28/2022	12:15	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
4/28/2022	14:30	1	6/6/2022*	6/1/2022	6/1/2022	6/1/2022
5/19/2022	6:15	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/19/2022	8:30	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/19/2022	10:45	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/19/2022	13:00	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/19/2022	15:15	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/19/2022	17:30	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/19/2022	19:45	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/19/2022	22:00	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/20/2022	0:15	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/20/2022	2:30	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/20/2022	4:45	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
5/20/2022	7:00	1	6/27/2022*	6/28/2022*	6/28/2022*	6/28/2022*
6/7/2022	9:30	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022

6/7/2022	11:45	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/7/2022	14:00	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/7/2022	16:15	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/7/2022	18:30	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/7/2022	20:45	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/7/2022	23:00	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/8/2022	1:15	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/8/2022	3:30	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/8/2022	5:45	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/8/2022	8:00	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
6/8/2022	10:15	1	6/27/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022	6/28/2022 & 7/6/2022
7/12/2022	14:15	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/12/2022	16:30	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/12/2022	18:45	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/12/2022	21:00	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/12/2022	23:15	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/13/2022	1:30	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/13/2022	3:45	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/13/2022	6:00	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/13/2022	08:15	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/13/2022	10:30	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/13/2022	12:45	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
7/13/2022	15:00	1	7/27/2022	8/11/2022	8/11/2022	8/11/2022
8/4/2022	8:00	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/4/2022	10:15	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/4/2022	12:30	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/4/2022	14:45	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/4/2022	17:00	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/4/2022	19:15	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/4/2022	21:30	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/4/2022	23:45	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/5/2022	2:00	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/5/2022	4:15	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022

8/5/2022	6:30	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
8/5/2022	8:45	1	8/29/2022	9/6/2022	9/6/2022	9/6/2022
9/14/2022	6:30	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/14/2022	8:45	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/14/2022	11:00	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/14/2022	13:15	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/14/2022	15:30	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/14/2022	17:45	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/14/2022	20:00	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/14/2022	22:15	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/15/2022	0:30	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/15/2022	2:45	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/15/2022	5:00	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
9/15/2022	7:15	1	10/17/2022	10/14/2022	10/14/2022	10/14/2022
10/18/2022	8:30	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/18/2022	10:45	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/18/2022	13:00	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/18/2022	15:15	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/18/2022	17:30	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/18/2022	19:45	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/18/2022	22:00	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/19/2022	0:15	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/19/2022	2:30	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/19/2022	4:45	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/19/2022	7:00	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
10/19/2022	9:15	1	11/10/2022	11/3/2022	11/3/2022	11/3/2022
11/9/2022	3:45	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	6:00	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	8:15	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	10:30	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	12:45	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	15:00	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	17:15	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	19:30	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/9/2022	21:45	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/10/2022	0:00	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/10/2022	2:15	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
11/10/2022	4:30	1	11/28/2022	12/12/2022	12/12/2022	12/12/2022
12/19/2022	12:00	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/19/2022	14:15	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/19/2022	16:30	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/19/2022	18:45	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/19/2022	21:00	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023

12/19/2022	23:15	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/20/2022	1:30	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/20/2022	3:45	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/20/2022	6:00	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/20/2022	8:15	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/20/2022	10:30	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023
12/20/2022	12:45	1	1/18/2023	1/18/2023	1/18/2023	1/18/2023

*samples held beyond the allowable time