Kachemak Bay Research Reserve (KAC) NERR Nutrient Metadata
January - December 2019
Latest update: 6/15/20

Note: This is a provisional metadata document; it has not been authenticated as of its download date. Contents of this document are subject to change throughout the QAQC process and it should not be considered a final record of data documentation until that process is complete. Contact the CDMO (cdmosupport@belle.baruch.sc.edu) or Reserve with any additional questions.

I. Data Set and Research Descriptors

1) Principal Investigators & Contact Persons

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2) Research objectives

The Kachemak Bay Research Reserve (KBRR) is a temperate region fjord with hydrographic conditions unique among the NERR system estuaries. The circulation in the bay is driven primarily by tidal forcing. Regional circulation is generally characterized by cyclonic ocean currents in the Gulf of Alaska flowing onto the shelf off of Cook Inlet. Nutrient rich bottom water is upwelled and mixed with the surface water. These enriched waters stream into Kachemak Bay and the inflow tends to stay along the southern shore while water flowing out of the bay stays along the northern shore. These trapped coastal flows divide the bay into two distinct ecosystems. As the inflowing water proceeds up the bay, fresh water runoff from the surrounding ice fields and watersheds dilute the salinity and increase the sediment load. The in-flowing water, therefore, initially supports a marine system while the northern out-flowing water is more estuarine. The vertical profile is stratified all year with the stratification increasing in strength during the summer. We are monitoring to quantify the variability of the nutrient stratification of both the marine and estuarine ecosystems within Kachemak Bay.

a) Monthly Grab
Monthly grab samples are collected to quantify the vertical and horizontal spatial variability of important nutrients in the water column at sites representing the marine and estuarine endpoints of the local salinity gradient.

b) Diel Sampling Program
Once per month, samples are collected every two hours thirty minutes (11 samples total) through a 24-hour tidal cycle to quantify the temporal variability of important nutrients in the water column as a function of tidal forcing.

3) Research methods

a) Monthly Grab Sampling Program
Monthly grab samples are collected at two depths (near-surface and near-bottom) at the Homer and Seldovia data sonde stations. Unless delayed by weather, all grab samples from both stations were taken within a 24-hour period. To clearly delineate the stratification, we attempt to sample near high tide. The Homer station is accessed year round by vehicle. Because the Seldovia station (24-kilometers from Homer) is not connected to the road system, access is via airplane or boat and is weather-dependent. At each station, two replicate (N=2) samples are collected using a triggered vertical Nisken bottle at a depth of one meter from the surface. Two replicates are also collected one meter from the bottom. All samples are transferred to wide-mouth Nalgene sample bottles that were previously acid washed (10% HCL), rinsed (3x) with distilled-deionized water, dried and followed by rinsing (3x) of ambient water prior to collection of the sample. Samples are immediately shielded from light and returned to the laboratory. Once in the laboratory, samples are shaken and processed for nutrient and chl-a analysis.

b) Diel Sampling Program
Within the same 24-hour period as our grab sample collection, we deploy an ISCO water sampler from a floating dock in the Homer Harbor. This device automatically samples 850 ml of water every 2 hrs 30 min. All samples are pumped into polyethylene sample bottles that were previously acid washed (10% HCL), rinsed (3x) with distilled-deionized water and dried. The 11 samples are kept in the dark and at the end of the 24-hr period are returned to the laboratory for immediate processing.

4) Site location and character

The KBRR includes approximately 4,000 square kilometers of terrestrial and marine habitats, making it the largest reserve in the NERR system. The bathymetry is characterized by a submerged moraine at the mouth of the Bay and deep trenches extending to almost 200-meters deep within the Bay. A 6-kilometer long spit extending south from the village of Homer (pop. 5,000) restricts Bay circulation patterns. The south side of the Bay is mostly deep and rocky and is lined by rugged snow covered mountains, while the north side is mostly shallow with mixed sediment shores. Fifteen glaciers flow into Kachemak Bay from the Harding icefield and the Grewingk-Yalik glacier complex. The large volume of sediments derived from these glaciers helps build and sustain the predominantly sand and gravel beaches surrounding the estuary. The Fox River Flats, at the head of the bay, is a huge salt marsh complex supporting thousands of migratory birds every spring and fall. During the summer, glacial melt water contributes approximately 70,000 cubic meters of fresh water each day to the inner Bay. Another 14 billion cubic meters of cold, nutrient-rich seawater from the Gulf of Alaska flows in and out of the outer Bay, partly driven by an 8-meter tidal range that results from the complex geomorphology of the Gulf of Alaska and Cook Inlet. Fjords such as Kachemak Bay often have a seasonally stratified water column that results when a surface layer

of fresh water develops above denser cold seawater. But one unique feature of this high latitude NERR is that during the 6-month-long winter, when the watershed is frozen, this fresh surface layer disappears and the bay becomes wholly marine in nature.

The Homer water grab site is located on the north side of Kachemak Bay at 59.6028ºN and 151.4081ºW. One set of grab samples is collected one meter above bottom ("Deep") and the other is one meter from the surface ("Surface"). Data for the Homer site were collected from January through December 2010. Because of the large tidal range, the deep sample is collected from water depths of 7.5 to 16.8 meters. The bottom habitat is predominantly sand. Pollutants in the area are from the excessive boat traffic at the entrance of the Homer harbor, and a nearby fish waste outfall line. Throughout the year, salinity has ranged from 20.5 to 32.0 ppt, the surface site often having significantly lower salinity. Most of the freshwater during the summer comes from snow and ice melt on the glaciers. Starting in August, rainfall reduces salinity until November when the rain begins to shift to snow, and there is very little fresh water input into the bay.

The Seldovia water grab site is located on the south side of Kachemak Bay at 59.4413ºN, 151.7186ºW, approximately 24 kilometers southwest of the Homer site. As with the Homer site, samples are collected from the ferry terminal dock at one meter above the bottom and one meter below the water surface. Because of the large tidal range, the deeper sample is collected from water depths of 4.3 to 13.3 meters. The access to Seldovia is limited to boat or air because the site is located off the highway system. The bottom habitat is predominantly sand. Pollutants in the area are minimal. Throughout the year, salinity has ranged from 25.0 to 33.9 ppt at this site. Most of the freshwater during the summer comes from snow and ice melt on the glaciers. Starting in August, rainfall reduces salinity until November when the rain begins to shift to snow, and there is very little fresh water input into the Bay.

The diel sampling site is located in the Homer harbor on a marine fuel dock. The site is located at 59.60308ºN, 151.41815ºW, and has 4-meters of water at low tide. Placing the sampling site inside the harbor protects the equipment from winter storms and boat traffic that are often present at the grab site. The bottom habitat at this site is rocky. Because the site is on a fuel dock, there is the possibility of hydrocarbon pollutants in the water. The tidal range, salinity range, and freshwater input are the same as at the Homer grab site.

5) Code variable definitions

File name definitions: Reserve/deployment site/file definition/year
(ex: kacssnut2016= Kachemak Bay/Seldovia Surface/Nutrients/2016).

Monitoring Programs: Grab Sampling (1), Diel Sampling (2)

Station code	Sampling station	Sampling site code	Monitoring Program
kachsnut	Homer Surface	HS	1
kachdnut	Homer Deep	HD	1
kachhnut	Homer Harbor	HH	2
kacssnut	Seldovia Surface	SS	1
kacsdnut	Seldovia Deep	SD	1

6) Data collection period

The first water samples for the SWMP nutrient monitoring program were collected January 14, 2019 at 14:01 and the last were collected on December 20, 2016 at ?. It normally takes 30 minutes to collect the four grab samples—2 "surface" and 2 "deep"—at both the Homer and Seldovia sites. We report all times in Alaska Standard Time.

Homer Surface

Site	Rep 1	Rep 2	Notes
kachsnut	01/17/2019 13:45	01/17/2019 13:50	
kachsnut	02/12/2019 13:40	02/12/2019 13:45	
kachsnut	03/13/2019 11:30	03/13/2019 11:35	
kachsnut	04/26/2019 18:00	04/26/2019 18:05	
kachsnut	05/16/2019 14:11	05/16/2019 14:16	Homer samples lost in May
kachsnut	06/11/2019 11:20	06/11/2019 11:25	
kachsnut	07/16/2019 13:24	07/16/2019 13:29	
kachsnut	08/21/2019 10:30	08/21/2019 10:35	
kachsnut	09/20/2019 11:10	09/20/2019 11:15	
kachsnut	10/15/2019 12:47	10/15/2019 12:52	
kachsnut	11/13/2019 11:11	11/13/2019 11:16	
kachsnut	12/18/2019 11:39	12/18/2019 11:44	

Homer Deep

Site	Rep 1	Rep 2	Notes
kachdnut	01/17/2019 13:55	01/17/2019 14:00	
kachdnut	02/12/2019 13:50	02/12/2019 13:55	
kachdnut	03/13/2019 11:40	03/13/2019 11:45	
kachdnut	04/26/2019 18:10	04/26/2019 18:15	
kachdnut	05/16/2019 14:21	05/16/2019 14:26	Homer samples lost in May
kachdnut	06/11/2019 11:30	06/11/2019 11:35	
kachdnut	07/16/2019 13:34	07/16/2019 13:39	
kachdnut	08/21/2019 10:40	08/21/2019 10:45	
kachdnut	09/20/2019 11:20	09/20/2019 11:25	
kachdnut	10/15/2019 12:57	10/15/2019 13:02	
kachdnut	11/13/2019 11:21	11/13/2019 11:26	
kachdnut	12/18/2019 11:49	12/18/2019 11:54	

Seldovia Surface

Site	Rep 1	Rep 2	Notes
kacssnut	01/18/2019 11:13	01/18/2019 11:18	
kacssnut	02/21/2019 12:02	02/21/2019 12:07	
kacssnut	03/12/2019 12:20	03/12/2019 12:25	
kacssnut	04/25/2019 10:30	04/25/2019 10:35	
kacssnut	05/15/2019 12:05	05/15/2019 12:10	
kacssnut	06/13/2019 06:55	06/13/2019 07:00	
kacssnut	07/18/2019 10:40	07/18/2019 10:45	
kacssnut	08/16/2019 13:00	08/16/2019 13:05	
kacssnut	09/19/2019 12:27	09/19/2019 12:32	
kacssnut	10/21/2019 12:30	10/21/2019 12:35	
kacssnut	11/14/2019 13:25	11/14/2019 13:30	
kacssnut	12/17/2019 11:17	12/17/2019 11:22	

Seldovia Deep

Site	Rep 1	Rep 2	Notes
kacsdnut	01/18/2019 11:23	01/18/2019 11:28	
kacsdnut	02/21/2019 12:12	02/21/2019 12:17	
kacsdnut	03/12/2019 12:30	03/12/2019 12:35	
kacsdnut	04/25/2019 10:40	04/25/2019 10:45	
kacsdnut	05/15/2019 12:15	05/15/2019 12:20	
kacsdnut	06/13/2019 07:05	06/13/2019 07:10	
kacsdnut	07/18/2019 10:50	07/18/2019 10:55	
kacsdnut	08/16/2019 13:10	08/16/2019 13:15	
kacsdnut	09/19/2019 12:37	09/19/2019 12:42	
kacsdnut	10/21/2019 12:40	10/21/2019 12:45	
kacsdnut	11/14/2019 13:35	11/14/2019 13:40	
kacsdnut	12/17/2019 11:27	12/17/2019 11:32	

Homer Harbor

Site	Diel Start	Diel End	Notes
kachhnut	01/14/2019 14:01	01/15/2019 15:01	
kachhnut	02/12/2019 14:05	02/13/2019 15:05	
kachhnut	03/12/2019 10:00	03/13/2019 11:00	
kachhnut	04/17/2019 17:00	04/18/2019 18:00	
kachhnut	05/14/2019 10:00	05/15/2019 11:00	
kachhnut	06/11/2019 14:10	06/12/2019 15:10	
kachhnut	07/16/2019 13:44	07/17/2019 14:44	
kachhnut	08/20/2019 13:00	08/21/2019 14:00	
kachhnut	09/19/2019 09:01	09/20/2019 10:01	
kachhnut	10/15/2019 11:50	10/16/2019 12:50	
kachhnut	11/13/2019 10:35	11/14/2019 11:35	
kachhnut	12/18/2019 10:52	12/19/2019 11:52	

7) Associated researchers and projects

As part of the System-Wide Monitoring Program, the Kachemak Bay NERR also monitors meteorological and water quality data which may be correlated with the nutrient dataset. These data are available from the Research Coordinator or online at http://cdmo.baruch.sc.edu/.

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 process 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 2012.

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

VIMS Laboratory calculates and reports results using Excel spreadsheets in mg/L. Nutrient data are transferred 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. Steve Baird was responsible for this task.

10) Parameter Titles and Variable Names by Data Category

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

Data Category	Parameter	Variable Name	Units of Measure
Phosphorus	*Orthophosphate, Filtered	PO4F	mg/L as P
Nitrogen	*Nitrite + Nitrate, Filtered	NO23F	mg/L as N
	*Nitrite, Filtered	NO2F	mg/L as N
	*Nitrate, Filtered	NO3F	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
	Phaeophytin	PHEA	µg/L
Other Lab Parameters	Silicate, Filtered	SiO4F	mg/L as SI

Notes:
1. Time is coded based on a 2400 hour clock and is referenced to Alaska Standard Time (AST).
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:	NO2F, NO23F, NH4F
Phosphorus species:	PO4F
Plant Pigments:	CHLA, PHEA
Other:	SiO4F

b) Computed Variables

NO3:	NO23F - NO2F
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 Virginia Institute of Marine Science, Analytical Service Center. Table 1 lists the MDL values for each parameter, and these are reviewed and revised periodically.

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

Parameter	Start Date	End Date	MDL	Units	Lab
NH4F	01/01/2019	12/31/2019	0.0062	mg/L	VIMS
NO23F	01/01/2019	12/31/2019	0.0055	mg/L	VIMS
PO4F	01/01/2019	12/31/2019	0.0016	mg/L	VIMS
SiO4	01/01/2019	12/31/2019	0.0620	mg/L	VIMS
CHLA_N	01/01/2019	12/31/2019	0.02	µg/L	KBRR
PHEA	01/01/2019	12/31/2019	0.02	µg/L	KBRR

13) Laboratory Methods

a) Parameter: NH4F

1) Method References:
   a) U.S. EPA. 1974. Methods for Chemical Analysis of Water and Wastes. Pp.168-174
   b) Standard Methods for the Examination of Water and Wastewater, 14th edition. P. 410. Method 418A and 418B (1975)
   c) Annual Book of ASTM Standards, Part 31. "Water", Standard 1426-74, Method A, p. 237 (1976).
   d) 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.
2) Method Descriptor: Alkaline phenol and hypochlorite react with ammonia to form indophenol blue that is proportional to the ammonia concentration. The blue color formed is intensified with sodium nitroprusside. Reaction is heat catalyzed at 37° C.
3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at –20°C until analyzed.

b) Parameter: NO23F, NO3F and NO2F

1) Method References:
   a) SKALAR Method: Nitrate+Nitrite/Total Dissolved Nitrogen. Catnr. 461-353.2 issues 120293/MH/93128060
   b) U.S. EPA 1974 Methods for Chemical Analysis of Water and Wastes, pp. 207-212
   c) 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
   d) Grasshoff, K., M. Ehrhardt and K. Kremling. 1983. Methods of Seawater Analysis. Verlag Chemie, Federal Republic of Germany. 419 pp.
   e) 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.

2) Method Descriptor: Nitrate is reduced to nitrite by a copper/cadmium redactor column. The nitrite ion then reacts with sulfanilamide to form a diazo compound. This compound then couples with n-1-napthylenediamine dihydrochloride to form a reddish/purple azo dye. The color development chemistry is the same as that used in Nitrite. Nitrate concentration equals the (nitrate + nitrite) concentration minus the nitrite concentration.
3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at –20°C until analyzed.

c) Parameter: SiO4F

1) Method References:
   a) SKALAR Method: Silicate Catnr. 563-052 issue 101899/MH/99208255
   b) U.S. EPA. 1974 Methods for Chemical Analysis of Water and Wastes, Method 370.1
   c) Grasshoff, K., M. Ehrhardt and K. Kremling. 1983. Methods of Seawater Analysis. Verlag Chemie, Federal Republic of Germany. Pp 374-376.
   d) EPA 600/R-97/072 Method 366.0 Determination of Dissolved Silicate 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.
2) Method Descriptor: This automated procedure for the determination of soluble silicates is based on the reduction of a silicomolybdate in acidic solution to "molybedenum blue" by ascorbic acid. Oxalic acid is introduced to the sample stream before the addition of ascorbic acid to eliminate interference from phosphates. The range is 0 - 1.4 mg Si/L.
3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at –20°C until analyzed.

d) Parameter: PO4F

1) Method References:
   a) SKALAR Method: O-Phosphate/Total Phosphate Catnr. 503-365.1, issue 042993/MH/93-Demol
   b) 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.
   c) EPA 600/R-97/072 Method 365.5 Determination of Orthophosphate 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.
2) Method Descriptor: Ammonium molybdate and antimony potassium tartrate react in a sulfuric acid environment to form an antimony-phospho-molybdo complex, which is reduced to a blue colored complex by ascorbic acid. Reaction is heat catalyzed at 40°C.
3) Preservation Method: The water sample is filtered through a 0.45 µm disposable disk filter and stored at –20°C until analyzed.

e) Parameter: CHLA, PHEA

1) Method Reference: EPA method 445.0; *UNESCO* (1994) Protocols for the joint global ocean flux study (JGOFS) core measurements. pp. 97-100.
2) Method Descriptor: CHLA is extracted in 10 ml 90% acetone. Five mL are decanted into a cuvette and fluorescence is measured and recorded (F_o). 150µL of 10% HCl are added to convert the CHLA to phaeopigments (PHAE). The fluorescence is again measured and recorded (F_a). The concentration (µg/L) of CHLA and PHAE are calculated using the F_o / F_a ratio.

3) Preservation Method: A known volume of sample (200 mL) is filtered onto a 25 mm GF/F filter, folded in half and wrapped in aluminum foil. Sample is stored at –70°C until analysis.

14) Field and Lab QA/QC Programs (KBRR)

a. **Precision**
   i. **Field Variability** – KBRR collected 2 successive grab samples for the determination of water mass variability.
   ii. **Laboratory Variability** – 10%
   iii. **Inter-organizational splits** – none

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

Field and Lab QA/QC Programs (VIMS)

VIMS participates in blind audits and split sample checks. Here is a list of programs VIMS participates in:

1) Chesapeake Program Split sample program (8 months per year)
2) Chesapeake Bay Program Blind Audit Program (2 per year)
3) USGS Blind Audit Program (1 per year)
4) NERR Program Blind Audit Program (1 per year)

15) QA/QC Programs 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) QA/QC 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

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
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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.

Due to budget cuts, we changed our nutrient sampling scheme as of 7/1/2011. Before July 1, 2011 we collected three successive replicate samples at each sampling station. After July, we reduced the grab samples to two replicate samples collected at each station. The diel sampling was also reduced from 12 samples (one sample collected every 2 hours 4 minutes) to 11 samples (one sample collected every 2 hours 16 minutes). Finally, since NO2 is a minor component relative to NO3, we now only measure NO23 and eliminated the measurement of NO2, which was oftentimes below the Method Detection Limit.

On 4/2013 we changed the ISCO sampling scheme to every 2 hours 30 minutes to have better sampling coverage over the entire tidal cycle. A tidal cycle is typically 24 hours and 50 minutes and our new sampling scheme covers a 25 hour time period.

Homer water grabs were lost after collection in May.