

**Rookery Bay (RKB) National Estuarine Research Reserve (NERR) Nutrient Metadata
(January 2016 – December 2016)
Latest Update: June 15, 2017**

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. Dataset and Research Descriptors

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2) Research Objectives

The four primary System Wide Monitoring Program (SWMP) stations and a secondary SWMP station are located in estuaries affected by watersheds demonstrating different patterns of land-use. Their placement addresses priority resource management issues that are identified in the Reserve's management plan. Specifically, the data from these stations provide valuable information concerning the effects of land-use activities on the quantity, quality, and timing of freshwater inflow into the reserve. Each bay studied exhibits a pattern of altered freshwater inflow.

a) Monthly Grab Sampling Program – The principal objective of the monthly grab sampling is to determine spatial and temporal differences in water quality between sites representing different land-use patterns.

b) Diel Sampling Program – The principal objective of the diel sampling is to quantify temporal variability over a lunar tidal cycle and to determine the impact of tidal water exchange within Henderson Creek (a source of freshwater into the Rookery Bay waterbody).

3) Research Methods

a) Monthly Grab Sampling Program

Monthly grab samples were collected at all four SWMP water quality stations: Henderson Creek, Middle Blackwater River, Faka Union Bay, and Fakahatchee Bay. Beginning in October 2012, grab samples were also collected at Pumpkin Bay which was designated a Secondary SWMP Station by the CDMO in October of 2016. Duplicate grab samples were taken every month at each of the water quality stations following the National Estuarine Research Reserve System Nutrient and Chlorophyll Monitoring Program and Database Design SOP v1.8. Slack low tide was generally not considered for the grab sampling events due to the travel time between sites and the time constraints with the contracted laboratory. Rainfall conditions prior to grab sampling were generally not considered due to constraints with the contracted laboratory.

Sample bottles were pre-cleaned by the contracted laboratory following their Quality Assurance Management Plan (available by request). The bottle kits for each station were labeled with a unique sample identification number and chain of custody sheets were completed for tracking the samples during laboratory analysis and in the laboratory database. Tubing for the water sampling device (peristaltic pump), carboys (for deionized water), and filter holders were pre-cleaned using a Florida Department of Environmental Protection (FLDEP) decontamination procedure (FLDEP SOP FC1000/DEP-QAA-01/001) which involved: cleaning the with phosphate-free soap, rinsing three times with tap water, soaking from 4 - 24 hours in a 10% hydrochloric acid bath, rinsing three times with deionized water, and drying for 24 hours. One to two days prior to field sampling, the filter holders were assembled with in-line filters (0.7 μm glass microfiber filters and 0.45 μm membrane filters).

At each water quality station, grab samples for dissolved nutrients were collected 0.5 meter below the surface (near surface grab) using a peristaltic pump. A filter holder attached to the peristaltic pump tubing was used to filter for dissolved nutrients in the field. Nitrile gloves were worn through the entire process of sample collection and filtering. Unfiltered parameters included chlorophyll *a*, phaeophytin *a*, total phosphorous (TP), total Kjeldahl nitrogen (TKN),

and total suspended solids (TSS). Filtered parameters included ammonium, (NH₄), nitrite + nitrate (NO₂NO₃), nitrite (NO₂), and orthophosphate (PO₄). Chlorophyll *a*/ phaeophytin *a* and TSS sample bottles were rinsed three times with the sample water and then filled to the shoulder, capped and immediately stored in a cooler with ice. The nitrite/ orthophosphate bottle was rinsed three times with the filtered water and then filled with the filtrate, capped, and immediately stored in a cooler with ice. The sample bottles for ammonia, nitrite + nitrate, total Kjeldhal nitrogen, and total phosphorus contained sulfuric acid for preservation and therefore were not rinsed before adding the samples. All sample bottles were made of translucent high-density polyethylene (HDPE) with the exception of the chlorophyll *a*/ phaeophytin *a* bottle which was an opaque amber HDPE bottle. To avoid cross contamination, the peristaltic pump tubing was rinsed thoroughly with deionized water after each sampling at each station and then rinsed thoroughly with sample water before sampling at each new station. New gloves and filters were used at each site. Additionally, an equipment blank using deionized water was performed at the end of each sampling event following all the same procedures. Samples were shipped overnight to the FLDEP lab in Tallahassee, FL.

At each site physical/chemical water quality parameters were measured at the same depth as the nutrient samples were collected. A YSI EXO1 datasonde and hand held display were used to record the measurements. Recorded parameters included salinity (ppt), specific conductivity (mS/cm), temperature (°C), dissolved oxygen (% and mg/L), pH, and turbidity (NTU). Equipment calibration was done according to FLDEP SOP 001/01.

b) Diel Sampling Program

Monthly diel samples were collected at the depth of the water quality datasonde (0.25 meters above the bottom) every 2.5 hours over a lunar day (24hr:48 min) using an ISCO refrigerated auto-sampler (model 6712FR). The sampler was stationed at the Rookery Bay dock, approximately 100 meters from the water quality station. Prior to sampling, the polyethylene bottles used in the auto-sampler were washed following the same FLDEP decontamination procedure as described above in the grab sampling methods. A day before the sampling was to begin, the ISCO auto-sampler was set up and programmed. The siphon hose was rinsed with 900 ml ambient water prior to programming the auto-sampler. Sample bottles for the laboratory analysis were pre-cleaned by the contracted laboratory following their Quality Assurance Management Plan (available by request). Bottle kits for each sample interval (11) were labeled with a unique sample identification number and chain of custody sheets were completed for tracking the samples during laboratory analysis and in the laboratory database.

Sample filtration: Nitrile gloves were worn during sample processing. At Rookery Bay's laboratory, each polyethylene bottle containing 1000 ml of sample water was shaken to homogenize the sample. A peristaltic pump with a filter holder attached to the sampling tube was used to filter for dissolved nutrients. For dissolved phosphorus and nitrite, HDPE sample bottles were filled with the filtrate, capped, and immediately stored in a cooler with ice. For ammonium and nitrite + nitrate, the HDPE sample bottles contained sulfuric acid for preservation and therefore were not rinsed before adding the filtrate, capped, and immediately stored in a cooler with ice. New filters were used for each sample. For the chlorophyll *a* samples, HDPE amber sample bottles were filled with at least 500 ml of unfiltered sample, capped, and immediately stored in a cooler with ice. Samples were shipped overnight to the FLDEP lab in Tallahassee, FL.

c) All Samples

Samples are placed on ice immediately after collection and kept on ice while shipped overnight to the FLDEP lab in Tallahassee, FL. Once at the lab, they are inventoried and placed in

the appropriate refrigerator/freezer. Refrigerators range from 0 to 6.0°C and freezers from -30.0 to -5.0°C.

4) Site Location and character

Lower Henderson Creek (rkblhnut):

Lat/Long (Decimal Degrees): 26.0257 N, 81.7332 W

The Lower Henderson Creek water quality station is located at the mouth of Henderson Creek. The monitoring site is approximately 5 km downstream of a four-lane highway (SR 951) that crosses Henderson Creek. The water quality data logger is located within the creek channel at the “manatee caution” marker. The diel samples were taken off the Rookery Bay Dock located within Henderson Creek approximately 100 meters from the water quality station. The creek is 5.8 km long (mainstream linear dimension), has an average mid-channel depth of approximately 2 meters at MHW, and an average width of 239 meters. At the sampling site, the depth is 2 meters at MHW and the width is 600 meters. Tides at Lower Henderson Creek are mixed and range from 0.23 m to 1.5 m (average 0.84 m). Salinity at this site ranged from 1.9 to 36.6 ppt during the year. Creek bottom habitats are predominantly fine sand and there is no bottom vegetation. The dominant marsh vegetation near the sampling site is red mangrove. The dominant natural vegetation of the watershed is hydric pine and cypress.

Upland land use near the sampling site includes residential areas with septic systems. Watershed activities that potentially impact the site include non-point source pollution from road runoff, drift of mosquito control pesticides, runoff from upstream agricultural areas and leachate from nearby residential septic systems and a weir structure located at SR 41. The amount of water released from this weir can sometimes mask natural tidal salinity patterns. The historic Henderson Creek watershed was approximately 50% under State ownership and much of this protected area had intact cypress sloughs and other wetland vegetation. Canals and water use for agriculture and human consumption have altered the hydroperiod of this watershed. Consequently, the Henderson creek watershed may receive non-point source pollution runoff from a variety of sources.

Middle Blackwater River (rkmbnut):

Lat/Long (Decimal Degrees): 25.9343 N, 81.5946 W

The Middle Blackwater River water quality station is located at the mouth of the river at navigational marker #17 within the channel. The “Middle” Blackwater labeling is to distinguish it from other historical sites. The water quality data logger is affixed to marker #17. The average depth at this marker is approximately 2 meters at MHW. The tidal range for Middle Blackwater River varies between 0.05 and 1.9 meters. Salinity at this site ranged from 1.5 to 37.0 ppt during the year. Salinity fluctuates with the tides and watershed rainfall. The substrate within the channel is a mixture of sand and silt with oyster shell and some organic matter mixed in. Mature red mangrove forests dominate the banks of the river.

Upstream influences consist of the Collier-Seminole State Park boat basin and upstream agricultural fields adjacent to Blackwater River’s main feeder canal (SR 41 canal). Nonpoint source pollution from agricultural operations and golf courses may affect this site. In addition, canals and roads built during the 1960’s (Picayune Strand, formerly Southern Golden Gate Estates) have caused significant disruptions to overland sheet-flow reducing the amounts of

freshwater flowing to this estuary. Despite these alterations, the salinity fluctuations of this site suggest that seasonal fluctuations in salinity are more closely correlated to watershed rainfall patterns than salinities of estuaries with water control structures, such as Henderson Creek.

Faka Union Bay (rkbfunut):

Lat/Long (Decimal Degrees): 25.9005 N, 81.5159 W

The “Faka Union Bay” sonde is located at the mouth of the Faka Union Canal. The sonde is affixed to a manatee speed zone sign next to the main channel. The average depth at this site is approximately 2 meters at MHW. The tidal range for Faka Union Bay varies between 0.06 and 1.68 meters (average 0.79 m). Salinity at this site ranged from 0.3 to 35.3 ppt during the year. Salinities fluctuate daily with tides, seasonal rainfall, and management of upstream water control structures. The substrate within the channel is a mixture of sand and silt with some organic matter. Mature red mangrove forests and spoil islands dominate the banks of the canal. Upstream influences consist of the Port of the Islands development and marina. The watershed consists of an elaborate canal system (Picayune Strand, formerly Southern Golden Gate Estates) which has altered natural water drainage patterns into Faka Union Bay.

Fakahatchee Bay (rkbfbnut):

Lat/Long (Decimal Degrees): 25.8922 N, 81.4770 W

The Fakahatchee Bay sonde is located at the mouth of two rivers, Fakahatchee River and East River. The sonde is placed in a 4” PVC housing secured to a 6” PVC pipe. The average depth at MHW is approximately 1.5 meters. The tide range for Fakahatchee varies between 0.00 and 1.84 meters (average 0.80 m). Salinity at this site ranged 0.6 to 35.6 ppt during the year. Salinities fluctuate daily with the tides and seasonal rainfall. The substrate within the channel is a mixture of sand, silt and some organic matter. Mature red mangrove forests dominate the banks of the rivers.

Upstream there are minimal influences from the Picayune Strand State Forest with non-point source pollutants possible from the culverts under I-75 and US 41. Fakahatchee Strand State Preserve and Big Cypress National Park manage the headwaters of Fakahatchee Bay. Fakahatchee Bay’s watershed is considered the least altered.

Pumpkin Bay (rkbpbnut):

Lat/Long (Decimal Degrees): 25.9141 N, 81.5404 W

The site is located at the mouth of the Pumpkin River. The tide range for Pumpkin Bay varies between 0.00 and 1.64 meters (average 0.64 m). Salinity at this site ranged from 0.3 to 37.1 ppt during the year. The bottom habitat is predominantly fine sand and there is no bottom vegetation. Mature red mangrove forests dominate the Pumpkin River and the bay. Upland land use is minimal with the main influence US 41 and the Picayune Strand State Forest canal system, which has diverted freshwater. Typically, this site does not receive enough freshwater inflow.

5) Coded variable definitions

rkblhnut = Rookery Bay Lower Henderson nutrients (monthly grabs and diel sampling)

rkmbnbnut = Rookery Bay Middle Blackwater nutrients (monthly grabs)

rkbfunut = Rookery Bay Faka Union nutrients (monthly grabs)

rkbfbnut = Rookery Bay Fakahatchee Bay nutrients (monthly grabs)

rkbpbnut = Rookery Bay Pumpkin Bay nutrients (monthly grabs, Secondary SWMP station)

Monitoring Codes:

monthly grab sample program = 1

monthly diel sample program = 2

Replicate grab samples were denoted as 1 for the first sample and 2 for the second sample at each station in the “*Rep*” column. Since 1 diel sample was collected every 2.5 hrs., the replicate number was always denoted as 1 in the “*Rep*” column.

6) Data Collection Period

The System-Wide Monitoring Program nutrient sampling began in January 2002 at all the primary SWMP sampling stations. Sampling began in October 2012 at the Secondary SWMP station, rkbpbnut. For 2016, the data collection period was from January to December.

Monthly Grab Sampling

Station Code	Date Time Stamp (rep 1)	Date Time Stamp (rep 2)
rkbllhnut	1/7/2016 8:32	1/7/2016 8:39
rkbllhnut	2/3/2016 8:57	2/3/2016 9:03
rkbllhnut	3/2/2016 12:56	3/2/2016 13:01
rkbllhnut	4/6/2016 7:40	4/6/2016 7:45
rkbllhnut	5/17/2016 6:44	5/17/2016 6:50
rkbllhnut	6/2/2016 6:45	6/2/2016 6:52
rkbllhnut	7/6/2016 10:42	7/6/2016 10:43
rkbllhnut	8/9/2016 6:30	8/9/2016 6:35
rkbllhnut	9/7/2016 11:02	9/7/2016 11:06
rkbllhnut	10/12/2016 7:10	10/12/2016 7:17
rkbllhnut	11/9/2016 7:46	11/9/2016 7:51
rkbllhnut	12/7/2016 12:54	12/7/2016 13:01
rkbmbnut	1/7/2016 10:25	1/7/2016 10:29
rkbmbnut	2/3/2016 10:32	2/3/2016 10:35
rkbmbnut	3/2/2016 9:07	3/2/2016 9:11
rkbmbnut	4/11/2016 10:30	4/11/2016 10:35
rkbmbnut	5/17/2016 10:38	5/17/2016 10:45
rkbmbnut	6/2/2016 11:13	6/2/2016 11:18
rkbmbnut	7/6/2016 9:01	7/6/2016 9:06
rkbmbnut	8/9/2016 8:00	8/9/2016 8:06
rkbmbnut	9/7/2016 7:17	9/7/2016 7:23
rkbmbnut	10/12/2016 10:48	10/12/2016 10:54
rkbmbnut	11/9/2016 9:19	11/9/2016 9:24
rkbmbnut	12/7/2016 8:51	12/7/2016 8:57
rkbfunut	1/7/2016 12:10	1/7/2016 12:14
rkbfunut	2/3/2016 11:54	2/3/2016 11:59
rkbfunut	3/2/2016 10:25	3/2/2016 10:28

rkbfunut	4/11/2016 9:06	4/11/2016 9:12
rkbfunut	5/17/2016 9:23	5/17/2016 9:31
rkbfunut	6/2/2016 8:38	6/2/2016 8:42
rkbfunut	7/6/2016 8:16	7/6/2016 8:21
rkbfunut	8/9/2016 9:10	8/9/2016 9:15
rkbfunut	9/7/2016 8:27	9/7/2016 8:32
rkbfunut	10/12/2016 9:36	10/12/2016 9:41
rkbfunut	11/9/2016 10:42	11/9/2016 10:46
rkbfunut	12/7/2016 10:13	12/7/2016 10:17

rkbfbnut	1/7/2016 11:29	1/7/2016 11:33
rkbfbnut	2/3/2016 12:27	2/3/2016 12:30
rkbfbnut	3/2/2016 10:53	3/2/2016 10:58
rkbfbnut	4/11/2016 9:36	4/11/2016 9:41
rkbfbnut	5/17/2016 8:54	5/17/2016 9:01
rkbfbnut	6/2/2016 9:08	6/2/2016 9:13
rkbfbnut	7/6/2016 7:48	7/6/2016 7:56
rkbfbnut	8/9/2016 9:36	8/9/2016 9:41
rkbfbnut	9/7/2016 8:59	9/7/2016 9:05
rkbfbnut	10/12/2016 9:08	10/12/2016 9:14
rkbfbnut	11/9/2016 11:14	11/9/2016 11:19
rkbfbnut	12/7/2016 10:44	12/7/2016 10:49

rkbpbnut	1/7/2016 12:43	1/7/2016 12:46
rkbpbnut	2/3/2016 11:21	2/3/2016 11:26
rkbpbnut	3/2/2016 9:53	3/2/2016 9:58
rkbpbnut	4/11/2016 8:31	4/11/2016 8:37
rkbpbnut	5/17/2016 9:57	5/17/2016 10:02
rkbpbnut	6/2/2016 10:30	6/2/2016 10:35
rkbpbnut	7/6/2016 7:15	7/6/2016 7:18
rkbpbnut	8/9/2016 8:42	8/9/2016 8:47
rkbpbnut	9/7/2016 7:59	9/7/2016 8:03
rkbpbnut	10/12/2016 10:04	10/12/2016 10:09
rkbpbnut	11/9/2016 10:10	11/9/2016 10:15
rkbpbnut	12/7/2016 9:38	12/7/2016 9:44

Diel Sampling

Station Code	Date Time Stamp (begin)	Date Time Stamp (end)
rkbllnut	1/12/2016 9:00	1/13/2016 10:00
rkbllnut	2/9/2016 7:00	2/10/2016 8:00
rkbllnut	3/9/2016 7:00	3/10/2016 8:00
rkbllnut	4/20/2016 9:00	4/21/2016 10:00
rkbllnut	5/17/2016 5:00	5/18/2016 6:00
rkbllnut	6/21/2016 8:00	6/22/2016 9:00
rkbllnut	7/19/2016 7:00	7/20/2016 8:00

rkblhnut	8/16/2016 6:00	8/17/2016 7:00
rkblhnut	9/13/2016 5:00	9/14/2016 6:00
rkblhnut	10/18/2016 9:30	10/19/2016 10:30
rkblhnut	11/15/2016 8:30	11/16/2016 9:30
rkblhnut	12/13/2016 7:30	12/14/2016 8:30

7) Associated Researchers and Projects

As part of the SWMP, Rookery Bay NERR monitors 15-minute meteorological and water quality data which may be correlated with this nutrient/pigment dataset. The principal objective of these programs is to record long-term environmental data within Rookery Bay NERR in order to observe any changes or trends over time. The five water quality sites were also selected to represent various degrees of watershed hydrologic alteration. Both water quality and meteorological data are available at www.nerrsdata.org.

The nutrient data generated by Rookery Bay NERR are being used to analyze restoration targets established for the Picayune Strand Restoration Project (PSRP; formerly known as Southern Golden Gate Estates) which is a portion of the Comprehensive Everglades Restoration Plan (CERP). Additional datasets used in this analysis include a long-term fisheries survey (July 1998 to June 2013, October 2015 to the present), a shark demographics survey (May 2000 to the present), and an oyster reef/benthic crab survey (1999 to 2008). Florida DEP used the nutrient data to develop numeric nutrient criteria for the southwest region of Florida, which were approved by the Environmental Protection Agency.

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 2016.

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

The analytical results (electronic files) were provided monthly from the contracted laboratory to Julie Brader Drevenkar, Water Quality Program Manager. Upon receiving the results, Julie reviewed the data for errors. Julie was responsible for compilation and QA/QC of the final data set according to chapter 10 of the Centralized Data Management Office (CDMO) NERR SWMP Data Management Manual v 6.6. Beginning in October of 2016, SWMP Technician, Nick Roach took responsibility of the nutrient monitoring program. The data reported from the lab were in the required units making it unnecessary to convert the data prior to entering it into Microsoft Excel.

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

10) Parameter Titles and Variable Names by Category

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

Data Category	Parameter	Variable Name	Units of Measure
Phosphorus and Nitrogen:			
	Orthophosphate, Filtered*	PO4F	mg/L as P
	Total Phosphorus	TP	mg/L as P
	Ammonium, Filtered*	NH4F	mg/L as N
	Nitrite, Filtered*	NO2F	mg/L as N
	Nitrate, Filtered*	NO3F	mg/L as N
	Nitrite + Nitrate, Filtered*	NO23F	mg/L as N
	Dissolved Inorganic Nitrogen	DIN	mg/L as N
	Total Kjeldahl Nitrogen	TKN	mg/L as N
	Total Organic Nitrogen	TON	mg/L as N
Chemical Composition:			
	Total Suspended Solids	TSS	mg/L
Plant Pigments:			
	Chlorophyll <i>a</i> *	CHLA_N	µg/L
	Phaeophytin	PHEA	µg/L
Field Parameters (grabs only):			
	Water Temperature	WTEM_N	°C
	Specific Conductance	SCON_N	mS/cm
	Salinity	SALT_N	ppt
	Dissolved Oxygen	DO_N	mg/L
	%Dissolved Oxygen Saturation	DO_S_N	%
	pH	PH_N	pH units

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 NO₂ for individual analyses if they can show that NO₂ is a minor component relative to NO₃.

11) Measured or Calculated Laboratory Parameters**a) Parameters Measured Directly**

Phosphorus species: PO₄F, TP
 Nitrogen species: NH₄F, NO₂F, NO₂3F, TKN
 Chemical Composition: TSS
 Plant Pigments: CHLA and PHEA

b) Calculated Parameters

DIN: NO₂3F + NH₄F
 TN: TKN + NO₂F
 TON: TKN – NH₄F

12) Limits of Detection

Method Detection Limits (MDL), the minimum concentration of a parameter that an analytical procedure can reliably detect, were established by the Florida Department of Environmental Protection, Bureau of Laboratories. MDLs were determined using the U.S. Environmental Protection Agency MDL procedure found in Title 40 Code of Federal Regulations Part 136 (40 CFR 136, Appendix B, revision 1.11). Once the MDL was established using this method, verification was done prior to use. Verification included analyzing a known standard at 2-3 times the calculated MDL. Additionally, various checks and balances were used to ensure suitability of the MDL. Every year the labs employed verification checks on all MDLs. If the verification checks met the lab's acceptance criteria then the MDL was not recommended for change. The MDL for all parameters were determined by Florida Department of Environmental Protection, Bureau of Laboratories.

Parameter	Variable	MDL	Approved
Orthophosphate	PO ₄ F	0.004 mg/L	01/01/16-12/31/16
Ammonium	NH ₄ F	0.002 mg/L	01/01/16-12/31/16
Nitrite	NO ₂ F	0.002 mg/L	01/01/16-12/31/16
Nitrite +Nitrate	NO ₂ 3F	0.004 mg/L	01/01/16-12/31/16
Chlorophyll <i>a</i>	CHLA	0.55 µg/L	01/01/16-12/31/16
Phaeophytin	PHEA	0.4 µg/L	01/01/16-12/31/16
Kjeldahl Nitrogen	TKN	0.08 mg/L	01/01/16-12/31/16
Total Phosphorus	TP	0.002 mg/L	01/01/16-12/31/16
Total Suspended Solids*	TSS	2 mg/L	01/01/16-12/31/16

*MDL for Total Suspended Solids is 3 when conductivity is > 15,000 µmhos/cm.

13) Laboratory Methods

Chemical and biological analysis was performed by Florida Department of Environmental Protection, Bureau of Laboratories. FL DEP SOP hold times are as follows:

NH₄F, Ammonia Cool, ≤6 °C, H₂SO₄ to pH<2 28 days

NO ₂ F, Nitrite	Cool, ≤6 °C	48 hours
NO ₃ F, Nitrate-Nitrite	Cool, ≤6 °C, H ₂ SO ₄ to pH<2	28 days
TP, Total Phosphorous	Cool, ≤6 °C, H ₂ SO ₄ to pH<2	28 days
TKN, Total Kjeldahl Nitrogen	Cool, ≤6 °C, H ₂ SO ₄ to pH<2	28 days
TON, Total Organic Nitrogen	Cool, ≤6 °C, H ₂ SO ₄ to pH<2	28 days
PO ₄ F, Orthophosphate	Cool, to ≤6 °C	Filter w/in 15 minutes; Analyze w/in 48 hours.
TSS, Total Suspended Solids	Cool, to ≤6 °C	7 days.

*Note that hold times INCLUDE time spent in transport and held at the laboratory.

a) Parameter: PO₄F

EPA or other Reference Method: EPA 365.1

Method Reference: Standard Methods for Examination of Water and Wastewater, 20th ed.

Method Description: Ammonium molybdate and antimony potassium tartrate react in an acid medium with dilute solutions of phosphorus to form an antimony-phosphomolybdate complex. This complex is reduced to an intensely blue-colored complex by ascorbic acid. The color is proportional to the phosphorus concentration and is measured with a rapid flow autoanalyzer.

Preservation Method: Samples were filtered in the field and stored at 4 °C until analysis.

b) Parameter: TP

EPA or other Reference Method: EPA 365.1

Method Reference: Standard Methods for Examination of Water and Wastewater, 20th ed.

Method Description: Ammonium molybdate and antimony potassium tartrate react in an acid medium with dilute solutions of phosphorus to form an antimony-phosphomolybdate complex. All of the phosphorus present in the sample regardless of forms is measured by the persulfate digestion procedure.

Preservation Method: Samples were preserved with H₂SO₄ and stored at 4 °C until analysis.

c) Parameter: NH₄F

EPA or other Reference Method: EPA 350.1 Rev. 2.0 (1993) (no distillation)

Method Reference: Methods for Chemical Analysis of Water and Wastes

Method Description: 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. The color's absorbance is directly proportional to analyte concentration and is measured with a rapid flow autoanalyzer.

Preservation Method: Samples were preserved with H₂SO₄ and stored at 4 °C until analysis.

d) Parameter: NO₂F

EPA or other Reference Method: EPA 353.2

Method Description: A filtered sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite (that was originally present plus reduced nitrate) is determined by diazotizing with sulfanilamide and coupling with N-(1-naphthyl)-ethylenediamine dihydrochloride to form a highly colored azo dye, which is measured colorimetrically with a rapid flow autoanalyzer

Preservation Method: Samples were filtered in the field and stored at 4 °C until analysis.

e) Parameter: NO₃F

EPA or other Reference Method: EPA 353.2

Reference Method: Methods for Chemical Analysis of Water and Wastes

Method Description: A filtered sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite (that was originally present plus reduced nitrate) is determined by diazotizing with sulfanilamide and coupling with N-(1-naphthyl)-ethylenediamine dihydrochloride to form a highly colored azo dye, which is measured colorimetrically with a rapid flow autoanalyzer

Preservation Method: Samples were preserved with H₂SO₄ and stored at 4 °C until analysis.

f) Parameter: TKN

EPA or other Reference Method: EPA 351.2

Reference Method: Methods for Chemical Analysis of Water and Wastes

Method Description: A filtered sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite (that was originally present plus reduced nitrate) is determined by diazotizing with sulfanilamide and coupling with N-(1-naphthyl)-ethylenediamine dihydrochloride to form a highly colored azo dye, which is measured colorimetrically with a rapid flow autoanalyzer.

Preservation Method: Samples were preserved with H₂SO₄ and stored at 4 °C until analysis.

g) Parameter: TSS

EPA or other Reference Method: Standard Methods 2540 D-1997

Method Description: A well-mixed sample is filtered through a pre-weighed glass fiber filter. The filter and any residue are then dried to a constant weight at 103-105 °C. The filter is cooled in a desiccator, weighed and the result used to compute the TSS of the sample.

Preservation Method: Samples were stored at 4 °C until analysis.

h) Parameter: CHLA and PHEA

EPA or other Reference Method: SM 10200 H

Method Reference: Standard Methods for the Examination of Water and Wastewater, 20th Edition

Method Description: An extractive spectrophotometric technique was used to determine chlorophyll *a* concentrations. Samples were filtered immediately at the laboratory. Filters were placed in a tissue grinder with 2-3 ml of 90% aqueous acetone. Extracts steeped for at least 2 hours at 4 °C in the dark. Extracts were analyzed using a UV/VIS Spectrophotometer.

Preservation Method: Stored at 4 °C and filtered at the lab upon arrival.

14) Field and Laboratory QAQC programs

Based on Collier County Pollution Control and Prevention Department (CCPCP) Laboratory's Quality Assurance Management Plan version 04-02-08 (available by request) and FLDEP SOP 5361 QAQC manual and FLDEP Quality Manual (available by request).

a) Precision: is defined as the agreement or closeness of two or more results.

i) **Field Variability** – Duplicates (successive grabs at each station) were taken every month at each station.

ii) **Laboratory variability** – The RPD for matrix duplicates was measured either by the instrument or the analyst. When the average value of the concentration was above the PQL then the RPD must be no more than 20 % in order to be acceptable.

iii) **Inter-organizational splits** – The laboratory participates in external audit programs including split sample analysis with both public and private laboratories.

b) Accuracy: is defined as the agreement between the analytical results and the known concentration.

i) **Sample spikes-** A representative sample was spiked with known quantities (preferably approximately 2 to 10 times the practical quantitation limit (PQL)) of the analyte before processing. Percent recoveries were calculated for the added analyte. Matrix spike recoveries were indicators of sample matrix interference and contamination. The confidence range was set at $\pm 15\%$ for water matrices.

ii) **Standard reference material analysis** - Standard curves were checked against certified or other independently prepared standards during each analytical run. Control standards were analyzed at least every 20 samples. The correlation coefficient for a standard curve should be 0.995 or greater and the recovery for each calibrant above the PQL should be $\pm 10\%$.

iii) **Cross calibration exercised** – The laboratory participates in a number of Performance Testing (PT) studies and interlaboratory comparison studies every year. They include PT studies that are required as part of our lab's NELAC certification and others such as those conducted by the USGS. The results from these studies are posted at <http://depnet/burlabs/ptinfo.htm>. In addition, our nutrients group also participates in two round robins conducted by the Regional Ambient Monitoring Program (RAMP).

c) Other QAQC methods: Field equipment blanks were taken every monthly grab sampling event to indicate any potential contamination problems during sampling.

15) QAQC flag definitions

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

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

16) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the sample or sample collection, sensor errors document common sensor or parameter specific problems, and comment codes are used to further document conditions or a

problem with the data. Only one general or sensor error and one comment code can be applied to a particular data point. However, a record flag column (F_Record) in the nutrient data allows multiple comment codes to be applied to the entire data record.

General errors

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

Sensor errors

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

Parameter Comments

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

Record comments

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

Cloud cover

CCL	clear (0-10%)
CSP	scattered to partly cloudy (10-50%)
CPB	partly to broken (50-90%)
COC	overcast (>90%)

CFY	foggy
CHY	hazy
CCC	cloud (no percentage)

Precipitation

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

Tide stage

TSE	ebb tide
TSF	flood tide
TSH	high tide
TSL	low tide

Wave height

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

Wind direction

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

Wind speed

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

WS4 > 30 to 40 knots
WS5 > 40 knots

17) Other remarks/notes

Data may be missing due to problems with sample collection or processing. Laboratories in the NERRS System submit data that are censored at a lower detection rate limit, called the Method Detection Limit or MDL. MDLs for specific parameters are listed in the Laboratory Methods and Detection Limits Section (Section II, Part 12) of this document. Concentrations that are less than this limit are censored with the use of a QAQC flag and code, and the reported value is the method detection limit itself rather than a measured value. For example, if the measured concentration of NO₃F 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.

A table of parameter hold times is listed below for every analyte.

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rklhnut	1/7/2016 8:32	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rklhnut	1/7/2016 8:39	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rkbmbnut	1/7/2016 10:25	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/21/16	1/14/16	1/14/16	1/12/16
rkbmbnut	1/7/2016 10:29	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rkbfbnut	1/7/2016 11:29	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rkbfbnut	1/7/2016 11:33	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rkbfunut	1/7/2016 12:10	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rkbfunut	1/7/2016 12:14	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rkbpbnut	1/7/2016 12:43	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rkbpbnut	1/7/2016 12:46	1/8/16	1/14/16	1/14/16	1/8/16	1/14/16	1/14/16	1/14/16	1/14/16	1/12/16
rklhnut	1/12/2016 9:00	1/13/16		1/20/16	1/13/16	1/14/16		1/19/16	1/19/16	
rklhnut	1/12/2016 11:30	1/13/16		1/20/16	1/13/16	1/14/16		1/19/16	1/19/16	
rklhnut	1/12/2016 14:00	1/13/16		1/20/16	1/13/16	1/14/16		1/19/16	1/19/16	
rklhnut	1/12/2016 16:30	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	1/12/2016 19:00	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	1/12/2016 21:30	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	1/13/2016 0:00	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	1/13/2016 2:30	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	1/13/2016 5:00	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	1/13/2016 7:30	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	1/13/2016 10:00	1/14/16		1/26/16	1/14/16	1/27/16		1/21/16	1/21/16	
rklhnut	2/3/2016 8:57	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/12/16	2/12/16	2/8/16
rklhnut	2/3/2016 9:03	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/12/16	2/12/16	2/8/16
rkbmbnut	2/3/2016 10:32	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/12/16	2/12/16	2/8/16
rkbmbnut	2/3/2016 10:35	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/12/16	2/12/16	2/8/16

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkbpbnut	2/3/2016 11:21	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/12/16	2/12/16	2/8/16
rkbpbnut	2/3/2016 11:26	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/15/16	2/15/16	2/8/16
rkbfunut	2/3/2016 11:54	2/4/16	2/11/16	2/10/16	2/4/16	2/11/16	2/10/16	2/12/16	2/12/16	2/8/16
rkbfunut	2/3/2016 11:59	2/4/16	2/11/16	2/10/16	2/4/16	2/11/16	2/10/16	2/12/16	2/12/16	2/8/16
rkbfbnut	2/3/2016 12:27	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/12/16	2/12/16	2/8/16
rkbfbnut	2/3/2016 12:30	2/4/16	2/10/16	2/10/16	2/4/16	2/15/16	2/10/16	2/12/16	2/12/16	2/8/16
rkbhlnut	2/9/2016 7:00	2/10/16		2/17/16	2/10/16	2/15/16		2/16/16	2/16/16	
rkbhlnut	2/9/2016 9:30	2/10/16		2/17/16	2/10/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/9/2016 12:00	2/10/16		2/17/16	2/10/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/9/2016 14:30	2/11/16		2/18/16	2/11/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/9/2016 17:00	2/11/16		2/18/16	2/11/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/9/2016 19:30	2/11/16		2/18/16	2/11/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/9/2016 22:00	2/11/16		2/18/16	2/11/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/10/2016 0:30	2/11/16		2/18/16	2/11/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/10/2016 3:00	2/11/16		2/18/16	2/11/16	2/15/16		2/18/16	2/18/16	
rkbhlnut	2/10/2016 5:30	2/11/16		2/18/16	2/11/16	2/23/16		2/18/16	2/18/16	
rkbhlnut	2/10/2016 8:00	2/11/16		2/18/16	2/11/16	2/23/16		2/18/16	2/18/16	
rkbmbnut	3/2/2016 9:07	3/3/16	3/11/16	3/15/16	3/3/16	3/7/16	3/14/16	3/15/16	3/15/16	3/7/16
rkbmbnut	3/2/2016 9:11	3/3/16	3/11/16	3/15/16	3/3/16	3/7/16	3/14/16	3/15/16	3/15/16	3/7/16
rkbpbnut	3/2/2016 9:53	3/3/16	3/11/16	3/15/16	3/3/16	3/7/16	3/20/16	3/15/16	3/15/16	3/7/16
rkbpbnut	3/2/2016 9:58	3/3/16	3/11/16	3/15/16	3/3/16	3/7/16	3/14/16	3/15/16	3/15/16	3/7/16
rkbfunut	3/2/2016 10:25	3/3/16	3/11/16	3/15/16	3/3/16	3/17/16	3/14/16	3/16/16	3/16/16	3/7/16
rkbfunut	3/2/2016 10:28	3/3/16	3/11/16	3/15/16	3/3/16	3/17/16	3/14/16	3/16/16	3/16/16	3/7/16
rkbfbnut	3/2/2016 10:53	3/3/16	3/11/16	3/15/16	3/3/16	3/14/16	3/14/16	3/16/16	3/16/16	3/7/16
rkbfbnut	3/2/2016 10:58	3/3/16	3/11/16	3/15/16	3/3/16	3/14/16	3/14/16	3/16/16	3/16/16	3/7/16
rkbhlnut	3/2/2016 12:56	3/3/16	3/11/16	3/15/16	3/3/16	3/14/16	3/15/16	3/16/16	3/16/16	3/7/16
rkbhlnut	3/2/2016 13:01	3/3/16	3/14/16	3/15/16	3/3/16	3/14/16	3/15/16	3/16/16	3/16/16	3/7/16

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkblhnut	3/9/2016 7:00	3/10/16		3/22/16	3/10/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/9/2016 9:30	3/10/16		3/22/16	3/10/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/9/2016 12:00	3/10/16		3/22/16	3/10/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/9/2016 14:30	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/9/2016 17:00	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/9/2016 19:30	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/9/2016 22:00	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/10/2016 0:30	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/10/2016 3:00	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/10/2016 5:30	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	3/10/2016 8:00	3/11/16		3/22/16	3/11/16	3/17/16		3/24/16	3/24/16	
rkblhnut	4/6/2016 7:40	4/7/16	4/15/16	4/14/16	4/7/16	4/18/16	5/5/16	4/18/16	4/18/16	4/11/16
rkblhnut	4/6/2016 7:45	4/7/16	4/15/16	4/14/16	4/7/16	4/18/16	4/21/16	4/18/16	4/18/16	4/11/16
rkbpbnut	4/11/2016 8:31	4/12/16	4/20/16	4/19/16	4/12/16	4/18/16	4/25/16	4/18/16	4/18/16	4/15/16
rkbpbnut	4/11/2016 8:37	4/12/16	4/20/16	4/19/16	4/12/16	4/18/16	4/25/16	4/18/16	4/18/16	4/15/16
rkbfunut	4/11/2016 9:06	4/12/16	4/21/16	4/19/16	4/12/16	4/18/16	4/25/16	4/18/16	4/18/16	4/15/16
rkbfunut	4/11/2016 9:12	4/12/16	4/21/16	4/19/16	4/12/16	4/18/16	4/25/16	4/18/16	4/18/16	4/15/16
rkbfbnut	4/11/2016 9:36	4/12/16	4/21/16	4/19/16	4/12/16	4/18/16	5/2/16	4/18/16	4/18/16	4/15/16
rkbfbnut	4/11/2016 9:41	4/12/16	4/21/16	4/19/16	4/12/16	4/18/16	5/2/16	4/18/16	4/18/16	4/15/16
rkbmbnut	4/11/2016 10:30	4/12/16	4/21/16	4/19/16	4/12/16	4/18/16	4/26/16	4/18/16	4/18/16	4/15/16
rkbmbnut	4/11/2016 10:35	4/12/16	4/21/16	4/19/16	4/12/16	4/18/16	4/26/16	4/18/16	4/18/16	4/15/16
rkblhnut	4/20/2016 9:00	4/21/16		5/3/16	4/21/16	5/5/16		4/26/16	4/26/16	
rkblhnut	4/20/2016 11:30	4/21/16		5/3/16	4/21/16	5/5/16		4/26/16	4/26/16	
rkblhnut	4/20/2016 14:00	4/21/16		5/3/16	4/21/16	5/5/16		4/26/16	4/26/16	
rkblhnut	4/20/2016 16:30	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	
rkblhnut	4/20/2016 19:00	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	
rkblhnut	4/20/2016 21:30	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkblhnut	4/21/2016 0:00	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	
rkblhnut	4/21/2016 2:30	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	
rkblhnut	4/21/2016 5:00	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	
rkblhnut	4/21/2016 7:30	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	
rkblhnut	4/21/2016 10:00	4/22/16		5/4/16	4/22/16	5/5/16		4/28/16	4/28/16	
rkblhnut	5/17/2016 5:00	5/18/16		5/26/16	5/19/16	5/24/16		5/25/16	5/25/16	
rkblhnut	5/17/2016 6:44	5/18/16	6/2/16	5/26/16	5/19/16	5/24/16	5/31/16	5/25/16	5/25/16	5/19/16
rkblhnut	5/17/2016 6:50	5/18/16	6/2/16	5/26/16	5/19/16	5/24/16	5/31/16	5/25/16	5/25/16	5/19/16
rkblhnut	5/17/2016 7:30	5/18/16		5/26/16	5/19/16	5/24/16		5/25/16	5/25/16	
rkbfbnut	5/17/2016 8:54	5/18/16	6/2/16	5/26/16	5/19/16	5/24/16	5/31/16	5/25/16	5/25/16	5/19/16
rkbfbnut	5/17/2016 9:01	5/18/16	6/2/16	5/26/16	5/19/16	5/24/16	5/31/16	5/25/16	5/25/16	5/19/16
rkbfunut	5/17/2016 9:23	5/18/16	6/2/16	5/26/16	5/19/16	5/24/16	5/31/16	5/25/16	5/25/16	5/19/16
rkbfunut	5/17/2016 9:31	5/18/16	6/2/16	5/26/16	5/19/16	5/24/16	6/1/16	5/25/16	5/25/16	5/19/16
rkbpbnut	5/17/2016 9:57	5/18/16	6/2/16	5/26/16	5/19/16	5/24/16	6/1/16	5/25/16	5/25/16	5/19/16
rkblhnut	5/17/2016 10:00	5/18/16		5/26/16	5/19/16	5/24/16		5/25/16	5/25/16	
rkbpbnut	5/17/2016 10:02	5/18/16	6/1/16	5/26/16	5/19/16	5/24/16	6/1/16	5/25/16	5/25/16	5/19/16
rkbmbnut	5/17/2016 10:38	5/18/16	6/1/16	5/26/16	5/19/16	5/24/16	6/1/16	5/25/16	5/25/16	5/19/16
rkbmbnut	5/17/2016 10:45	5/18/16	6/1/16	5/26/16	5/19/16	5/24/16	6/1/16	5/25/16	5/25/16	5/19/16
rkblhnut	5/17/2016 12:30	5/18/16		5/26/16	5/19/16	5/24/16		5/25/16	5/25/16	
rkblhnut	5/17/2016 15:00	5/19/16		5/27/16	5/19/16	5/24/16		5/31/16	5/31/16	
rkblhnut	5/17/2016 17:30	5/19/16		5/27/16	5/19/16	5/24/16		5/31/16	5/31/16	
rkblhnut	5/17/2016 20:00	5/19/16		5/27/16	5/19/16	5/24/16		5/31/16	5/31/16	
rkblhnut	5/17/2016 22:30	5/19/16		5/27/16	5/19/16	5/24/16		5/31/16	5/31/16	
rkblhnut	5/18/2016 1:00	5/19/16		5/27/16	5/19/16	5/24/16		5/31/16	5/31/16	
rkblhnut	5/18/2016 3:30	5/19/16		5/27/16	5/19/16	5/24/16		5/31/16	5/31/16	
rkblhnut	5/18/2016 6:00	5/19/16		5/27/16	5/19/16	5/24/16		6/1/16	6/1/16	
rkblhnut	6/2/2016 6:45	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkbhnut	6/2/2016 6:52	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbfunut	6/2/2016 8:38	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbfunut	6/2/2016 8:42	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbfbnut	6/2/2016 9:08	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbfbnut	6/2/2016 9:13	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbpbnut	6/2/2016 10:30	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbpbnut	6/2/2016 10:35	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbmbnut	6/2/2016 11:13	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbmbnut	6/2/2016 11:18	6/3/16	6/14/16	6/9/16	6/3/16	6/6/16	6/9/16	6/10/16	6/10/16	6/8/16
rkbhnut	6/21/2016 8:00	6/22/16		6/24/16	6/22/16	6/23/16		6/30/16	6/30/16	
rkbhnut	6/21/2016 10:30	6/22/16		6/27/16	6/22/16	6/23/16		6/30/16	6/30/16	
rkbhnut	6/21/2016 13:00	6/22/16		6/27/16	6/22/16	6/23/16		6/30/16	6/30/16	
rkbhnut	6/21/2016 15:30	6/23/16		7/5/16	6/23/16	6/28/16		7/5/16	7/5/16	
rkbhnut	6/21/2016 18:00	6/23/16		7/5/16	6/23/16	6/28/16		7/5/16	7/5/16	
rkbhnut	6/21/2016 20:30	6/23/16		7/5/16	6/23/16	6/28/16		7/7/16	7/7/16	
rkbhnut	6/21/2016 23:00	6/23/16		7/5/16	6/23/16	6/28/16		7/7/16	7/7/16	
rkbhnut	6/22/2016 1:30	6/23/16		7/5/16	6/23/16	6/28/16		7/7/16	7/7/16	
rkbhnut	6/22/2016 4:00	6/23/16		7/5/16	6/23/16	6/28/16		7/7/16	7/7/16	
rkbhnut	6/22/2016 6:30	6/23/16		7/5/16	6/23/16	6/28/16		7/7/16	7/7/16	
rkbhnut	6/22/2016 9:00	6/23/16		7/5/16	6/23/16	6/28/16		7/7/16	7/7/16	
rkbpbnut	7/6/2016 7:15	7/7/16	7/12/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16
rkbpbnut	7/6/2016 7:18	7/7/16	7/12/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16
rkbfbnut	7/6/2016 7:48	7/7/16	7/13/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16
rkbfbnut	7/6/2016 7:56	7/7/16	7/13/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16
rkbfunut	7/6/2016 8:16	7/7/16	7/12/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16
rkbfunut	7/6/2016 8:21	7/7/16	7/12/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16
rkbmbnut	7/6/2016 9:01	7/7/16	7/12/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkbmbnut	7/6/2016 9:06	7/7/16	7/12/16	7/12/16	7/7/16	7/13/16	7/13/16	7/19/16	7/19/16	7/11/16
rkblhnut	7/6/2016 10:42	7/7/16	7/13/16	7/12/16	7/7/16	7/13/16	7/15/16	7/19/16	7/19/16	7/11/16
rkblhnut	7/6/2016 10:43	7/7/16	7/13/16	7/12/16	7/7/16	7/13/16	7/15/16	7/19/16	7/19/16	7/11/16
rkblhnut	7/19/2016 7:00	7/20/16		7/22/16	7/20/16	8/1/16		8/2/16	8/2/16	
rkblhnut	7/19/2016 9:30	7/20/16		7/22/16	7/20/16	8/1/16		8/2/16	8/2/16	
rkblhnut	7/19/2016 12:00	7/20/16		7/22/16	7/20/16	8/1/16		8/2/16	8/2/16	
rkblhnut	7/19/2016 14:30	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	7/19/2016 17:00	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	7/19/2016 19:30	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	7/19/2016 22:00	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	7/20/2016 0:30	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	7/20/2016 3:00	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	7/20/2016 5:30	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	7/20/2016 8:00	7/21/16		7/22/16	7/21/16	8/1/16		8/3/16	8/3/16	
rkblhnut	8/9/2016 6:30	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/22/16	8/22/16	8/22/16	8/11/16
rkblhnut	8/9/2016 6:35	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/22/16	8/22/16	8/22/16	8/11/16
rkbmbnut	8/9/2016 8:00	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/17/16	8/22/16	8/22/16	8/11/16
rkbmbnut	8/9/2016 8:06	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/17/16	8/22/16	8/22/16	8/11/16
rkbpbnut	8/9/2016 8:42	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/22/16	8/22/16	8/22/16	8/11/16
rkbpbnut	8/9/2016 8:47	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/22/16	8/22/16	8/22/16	8/11/16
rkbfunut	8/9/2016 9:10	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/17/16	8/22/16	8/22/16	8/11/16
rkbfunut	8/9/2016 9:15	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/17/16	8/22/16	8/22/16	8/11/16
rkbfbnut	8/9/2016 9:36	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/18/16	8/22/16	8/22/16	8/11/16
rkbfbnut	8/9/2016 9:41	8/10/16	8/17/16	8/10/16	8/10/16	8/17/16	8/18/16	8/22/16	8/22/16	8/11/16
rkblhnut	8/16/2016 6:00	8/17/16		8/17/16	8/17/16	8/26/16		8/24/16	8/24/16	
rkblhnut	8/16/2016 8:30	8/17/16		8/17/16	8/17/16	8/26/16		8/24/16	8/24/16	
rkblhnut	8/16/2016 11:00	8/17/16		8/17/16	8/17/16	8/26/16		8/24/16	8/24/16	

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkbhlhnut	8/16/2016 13:30	8/17/16		8/17/16	8/17/16	8/26/16		8/24/16	8/24/16	
rkbhlhnut	8/16/2016 16:00	8/18/16		8/21/16	8/18/16	8/22/16		8/24/16	8/24/16	
rkbhlhnut	8/16/2016 18:30	8/18/16		8/21/16	8/18/16	8/26/16		8/24/16	8/24/16	
rkbhlhnut	8/16/2016 21:00	8/18/16		8/21/16	8/18/16	8/22/16		8/24/16	8/24/16	
rkbhlhnut	8/16/2016 23:30	8/18/16		8/21/16	8/18/16	8/22/16		8/24/16	8/24/16	
rkbhlhnut	8/17/2016 2:00	8/18/16		8/21/16	8/18/16	8/22/16		8/24/16	8/24/16	
rkbhlhnut	8/17/2016 4:30	8/18/16		8/21/16	8/18/16	8/22/16		8/24/16	8/24/16	
rkbhlhnut	8/17/2016 7:00	8/18/16		8/21/16	8/18/16	8/22/16		8/24/16	8/24/16	
rkbmbnut	9/7/2016 7:17	9/8/16	9/16/16	9/9/16	9/8/16	9/21/16	9/15/16	9/20/16	9/20/16	9/13/16
rkbmbnut	9/7/2016 7:23	9/8/16	9/16/16	9/9/16	9/8/16	9/21/16	9/15/16	9/20/16	9/20/16	9/13/16
rkbpbnut	9/7/2016 7:59	9/8/16	9/16/16	9/9/16	9/8/16	9/21/16	9/15/16	9/20/16	9/20/16	9/13/16
rkbpbnut	9/7/2016 8:03	9/8/16	9/19/16	9/9/16	9/8/16	9/21/16	9/15/16	9/20/16	9/20/16	9/13/16
rkbfunut	9/7/2016 8:27	9/8/16	9/19/16	9/9/16	9/8/16	9/15/16	9/15/16	9/20/16	9/20/16	9/13/16
rkbfunut	9/7/2016 8:32	9/8/16	9/19/16	9/9/16	9/8/16	9/15/16	9/16/16	9/20/16	9/20/16	9/13/16
rkbfbnut	9/7/2016 8:59	9/9/16	9/20/16	9/9/16	9/9/16	9/21/16	9/16/16	9/20/16	9/20/16	9/13/16
rkbfbnut	9/7/2016 9:05	9/9/16	9/20/16	9/9/16	9/9/16	9/21/16	9/16/16	9/20/16	9/20/16	9/13/16
rkbhlhnut	9/7/2016 11:02	9/9/16	9/20/16	9/9/16	9/9/16	9/21/16	9/16/16	9/20/16	9/20/16	9/13/16
rkbhlhnut	9/7/2016 11:06	9/9/16	9/20/16	9/9/16	9/9/16	9/21/16	9/16/16	9/22/16	9/22/16	9/13/16
rkbhlhnut	9/13/2016 5:00	9/14/16		9/15/16	9/14/16	9/26/16		9/26/16	9/26/16	
rkbhlhnut	9/13/2016 7:30	9/14/16		9/15/16	9/14/16	9/26/16		9/27/16	9/27/16	
rkbhlhnut	9/13/2016 10:00	9/14/16		9/15/16	9/14/16	9/26/16		9/27/16	9/27/16	
rkbhlhnut	9/13/2016 12:30	9/14/16		9/15/16	9/14/16	9/26/16		9/27/16	9/27/16	
rkbhlhnut	9/13/2016 15:00	9/15/16		9/16/16	9/15/16	9/26/16		9/28/16	9/28/16	
rkbhlhnut	9/13/2016 17:30	9/15/16		9/16/16	9/15/16	9/26/16		9/28/16	9/28/16	
rkbhlhnut	9/13/2016 20:00	9/15/16		9/16/16	9/15/16	9/26/16		9/28/16	9/28/16	
rkbhlhnut	9/13/2016 22:30	9/15/16		9/16/16	9/15/16	9/26/16		9/28/16	9/28/16	
rkbhlhnut	9/14/2016 1:00	9/15/16		9/16/16	9/15/16	9/26/16		9/28/16	9/28/16	

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkbhlhnut	9/14/2016 3:30	9/15/16		9/16/16	9/15/16	9/26/16		9/28/16	9/28/16	
rkbhlhnut	9/14/2016 6:00	9/15/16		9/16/16	9/15/16	9/26/16		9/28/16	9/28/16	
rkbhlhnut	10/12/2016 7:10	10/13/16	10/28/16	10/27/16	10/13/16	10/21/16	11/7/16	10/25/16	10/25/16	10/17/16
rkbhlhnut	10/12/2016 7:17	10/13/16	10/28/16	10/27/16	10/13/16	10/21/16	11/7/16	10/26/16	10/26/16	10/17/16
rkbfbnut	10/12/2016 9:08	10/13/16	10/28/16	10/27/16	10/13/16	10/21/16	10/28/16	10/26/16	10/26/16	10/17/16
rkbfbnut	10/12/2016 9:14	10/13/16	10/28/16	10/27/16	10/13/16	10/21/16	10/28/16	10/26/16	10/26/16	10/17/16
rkbfunut	10/12/2016 9:36	10/13/16	10/28/16	10/25/16	10/13/16	10/21/16	11/7/16	10/26/16	10/26/16	10/17/16
rkbfunut	10/12/2016 9:41	10/13/16	10/28/16	10/25/16	10/13/16	10/21/16	11/7/16	10/26/16	10/26/16	10/17/16
rkbpbnut	10/12/2016 10:04	10/13/16	10/28/16	10/25/16	10/13/16	10/21/16	10/28/16	10/26/16	10/26/16	10/17/16
rkbpbnut	10/12/2016 10:09	10/13/16	10/31/16	10/25/16	10/13/16	10/21/16	10/28/16	10/26/16	10/26/16	10/17/16
rkbmbnut	10/12/2016 10:48	10/13/16	10/31/16	10/25/16	10/13/16	10/21/16	10/28/16	10/26/16	10/26/16	10/17/16
rkbmbnut	10/12/2016 10:54	10/13/16	10/31/16	10/25/16	10/13/16	10/21/16	10/28/16	10/26/16	10/26/16	10/17/16
rkbhlhnut	10/18/2016 9:30	10/19/16		11/3/16	10/19/16	10/21/16		10/27/16	10/27/16	
rkbhlhnut	10/18/2016 12:00	10/19/16		11/3/16	10/19/16	10/21/16		10/27/16	10/27/16	
rkbhlhnut	10/18/2016 14:30	10/19/16		11/3/16	10/19/16	10/21/16		10/28/16	10/28/16	
rkbhlhnut	10/18/2016 17:00	10/20/16		11/3/16	10/20/16	10/21/16		10/28/16	10/28/16	
rkbhlhnut	10/18/2016 19:30	10/20/16		11/3/16	10/20/16	10/21/16		10/28/16	10/28/16	
rkbhlhnut	10/18/2016 22:00	10/20/16		11/4/16	10/20/16	10/21/16		10/28/16	10/28/16	
rkbhlhnut	10/19/2016 0:30	10/20/16		11/4/16	10/20/16	10/21/16		10/31/16	10/31/16	
rkbhlhnut	10/19/2016 3:00	10/20/16		11/4/16	10/20/16	10/21/16		10/31/16	10/31/16	
rkbhlhnut	10/19/2016 5:30	10/20/16		11/4/16	10/20/16	10/21/16		10/31/16	10/31/16	
rkbhlhnut	10/19/2016 8:00	10/20/16		11/4/16	10/20/16	10/21/16		10/31/16	10/31/16	
rkbhlhnut	10/19/2016 10:30	10/20/16		11/4/16	10/20/16	10/21/16		10/31/16	10/31/16	
rkbhlhnut	11/9/2016 7:46	11/10/16	11/21/16	11/15/16	11/10/16	11/17/16	11/29/16	11/17/16	11/17/16	11/30/16
rkbhlhnut	11/9/2016 7:51	11/10/16	11/21/16	11/15/16	11/10/16	11/17/16	11/29/16	11/17/16	11/17/16	11/30/16
rkbmbnut	11/9/2016 9:19	11/10/16	11/21/16	11/15/16	11/10/16	11/22/16	12/6/16	11/17/16	11/17/16	11/30/16
rkbmbnut	11/9/2016 9:24	11/10/16	11/21/16	11/15/16	11/10/16	11/22/16	12/6/16	11/17/16	11/17/16	11/30/16

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkbpbnut	11/9/2016 10:10	11/10/16	11/21/16	11/15/16	11/10/16	11/17/16	11/30/16	11/17/16	11/17/16	11/30/16
rkbpbnut	11/9/2016 10:15	11/10/16	11/21/16	11/15/16	11/10/16	11/17/16	11/30/16	11/17/16	11/17/16	11/30/16
rkbfunut	11/9/2016 10:42	11/10/16	11/21/16	11/15/16	11/10/16	11/17/16	12/6/16	11/17/16	11/17/16	11/30/16
rkbfunut	11/9/2016 10:46	11/10/16	11/21/16	11/15/16	11/10/16	11/17/16	12/6/16	11/17/16	11/17/16	11/30/16
rkbfbnut	11/9/2016 11:14	11/10/16	11/23/16	11/15/16	11/10/16	11/17/16	12/1/16	11/17/16	11/17/16	11/30/16
rkbfbnut	11/9/2016 11:19	11/10/16	11/23/16	11/15/16	11/10/16	11/17/16	12/1/16	11/17/16	11/17/16	11/30/16
rkbhlnut	11/15/2016 8:30	11/16/16		11/21/16	11/16/16	11/22/16		11/22/16	11/22/16	
rkbhlnut	11/15/2016 11:00	11/16/16		11/21/16	11/16/16	11/22/16		11/22/16	11/22/16	
rkbhlnut	11/15/2016 13:30	11/16/16		11/21/16	11/16/16	11/22/16		11/22/16	11/22/16	
rkbhlnut	11/15/2016 16:00	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbhlnut	11/15/2016 18:30	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbhlnut	11/15/2016 21:00	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbhlnut	11/15/2016 23:30	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbhlnut	11/16/2016 2:00	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbhlnut	11/16/2016 4:30	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbhlnut	11/16/2016 7:00	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbhlnut	11/16/2016 9:30	11/17/16		11/28/16	11/17/16	11/30/16		11/28/16	11/28/16	
rkbmbnut	12/7/2016 8:51	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbmbnut	12/7/2016 8:57	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbpbnut	12/7/2016 9:38	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbpbnut	12/7/2016 9:44	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbfunut	12/7/2016 10:13	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbfunut	12/7/2016 10:17	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbfbnut	12/7/2016 10:44	12/8/16	12/19/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbfbnut	12/7/2016 10:49	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbhlnut	12/7/2016 12:54	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16
rkbhlnut	12/7/2016 13:01	12/8/16	12/13/16	12/13/16	12/8/16	12/9/16	12/15/16	12/12/16	12/12/16	12/13/16

Station Code	Date Collected	PO4F	TP	NH4	NO2	NO23	TKN	CHLA	PHEA	TSS
rkblhnut	12/13/2016 7:30	12/15/16		12/29/16	12/15/16	12/22/16		12/20/16	12/20/16	
rkblhnut	12/13/2016 10:00	12/15/16		12/29/16	12/15/16	12/22/16		12/20/16	12/20/16	
rkblhnut	12/13/2016 12:30	12/15/16		12/29/16	12/15/16	12/22/16		12/20/16	12/20/16	
rkblhnut	12/13/2016 15:00	12/15/16		12/29/16	12/15/16	12/22/16		12/20/16	12/20/16	
rkblhnut	12/13/2016 17:30	12/15/16		12/29/16	12/15/16	12/22/16		12/20/16	12/20/16	
rkblhnut	12/13/2016 20:00	12/15/16		12/29/16	12/15/16	12/22/16		12/20/16	12/20/16	
rkblhnut	12/13/2016 22:30	12/15/16		12/29/16	12/15/16	12/22/16		12/20/16	12/20/16	
rkblhnut	12/14/2016 1:00	12/15/16		12/29/16	12/15/16	12/22/16		12/21/16	12/21/16	
rkblhnut	12/14/2016 3:30	12/15/16		12/29/16	12/15/16	12/22/16		12/21/16	12/21/16	
rkblhnut	12/14/2016 6:00	12/15/16		1/3/17	12/15/16	12/22/16		12/21/16	12/21/16	
rkblhnut	12/14/2016 8:30	12/15/16		1/3/17	12/15/16	12/22/16		12/21/16	12/21/16	

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.

Due to the need for sample dilution by the lab for the sample to be analyzed, some chlorophyll *a*, pheophytin *a*, nitrite+nitrate, and nitrite MDLs are elevated. Some values are flagged as below sensor limits <-4> [SBL] while the value reported is higher than the normal MDL. These samples are as follows:

The grab sample taken at 1/7/2016 8:32, PHEA has a MDL of 1.7.

The grab sample taken at 1/7/2016 8:39, CHLA has a MDL of 3.4 and PHEA has an MDL of 2.5.

The diel sample taken at 1/12/2016 21:30, PHEA has a MDL of 1.1.

The grab sample taken at 2/3/2016 12:27, PHEA has a MDL of 0.5.

The grab samples taken at 2/3/2016 11:54 and 2/3/2016 11:59, NO2 has an MDL of 0.003.

The diel sample taken at 2/9/2016 19:30, PHEA has a MDL of 0.8.

The diel sample taken at 2/9/2016 22:00, PHEA has a MDL of 1.1.

The grab sample taken at 4/11/2016 10:35, PHEA has a MDL of 0.7.

The diel samples taken at 4/20/2016 16:30, 4/20/2016 21:30, 4/21/2016 2:30, and 4/21/2016 5:00, PHEA have a MDL of 0.8.

The diel sample at 4/21/2016 0:00, PHEA has a MDL of 1.0.

The grab samples taken at 5/17/2016 6:44, 5/17/2016 6:50, 5/17/2016 8:54, 5/17/2016 9:01, 5/17/2016 9:23, and 5/17/2016 9:31 NO2NO3 have a MDL of 0.008 with the lab citing "The MDL was elevated due to sample matrix".

The grab samples taken at 7/6/2016 7:15, 7/6/2016 7:18, 7/6/2016 7:48, 7/6/2016 7:56, 7/6/2016 9:01, 7/6/2016 9:06, 7/6/2016 10:42, and 7/6/2016 10:43 NO2F had a MDL of 0.004 with the lab explanation being "The MDL was elevated due to sample matrix interference."

For January 2016 grab samples, NH4F, NO2F, NO3F samples were not filtered due to a mix up with the lab. As a result, analyses may have been skewed by the presence of microbes or particulates that may have interfered with sample analysis or introduced additional nutrients. Measured values are likely higher than they would have been from filtered samples. This also impacted calculated parameters NO3, DIN, TN, and TON. All grab samples for these parameters have been marked 1 CSM or GSM.

The equipment blank sample for NH4 for the February Grab sampling event was over the MDL.

The diel sample collected at 02/09/2016 22:00, CHL was A-qualified where the value reported is the mean of two or more determinations.

The diel sample taken at 2/10/2016 08:00, NO3F was more than four times the standard deviation above the average.

The diel sample collected at 03/09/2016 12:00, PHEA was A-qualified where the value reported is the mean of two or more determinations.

The grab sample collected at 04/06/2016 07:40, TKN was analyzed beyond CDMO holding time due to technical trouble. Sample was held for 30 days before being analyzed.

The grab sample collected at 04/06/2016 07:40, TSS was A-qualified where the value reported is the mean of two or more determinations.

Grab samples for rkbpbnut, rkbfunut, rkbfbnut, and rkbmbnut collected on 04/11/2016 were taken later than scheduled due to bad weather and equipment error.

The grab sample collected at 04/11/2016 10:35, CHL was A-qualified where the value reported is the mean of two or more determinations.

The grab sample collected at 05/17/2016 10:45, TSS was A-qualified where the value reported is the mean of two or more determinations.

The diel sample collected at 5/17/2016 20:00, CHL-A and PHEA were A-qualified where the value reported is the mean of two or more determinations.

The grab sample collected at 06/02/2016 11:13, TSS was A-qualified where the value reported is the mean of two or more determinations.

The grab sample collected at 06/02/2016 11:18, TSS was A-qualified where the value reported is the mean of two or more determinations.

The grab sample collected at 06/02/2016 11:18, CHL-A and PHEA were A-qualified where the value reported is the mean of two or more determinations.

The grab sample collected at 07/06/2016 07:48, TSS was A-qualified where the value reported is the mean of two or more determinations.

The diel sample collected at 08/16/2016 11:00, CHL-A and PHEA were A-qualified where the value reported is the mean of two or more determinations.

The grab sample collected at 09/07/2016 07:17, NO2F was J-qualified “the analysis did not meet the quality control criteria.” With QC code MS “Recovery for the batch matrix spike was outside existing control limits.”

The grab sample collected at 09/07/2016 08:03, TSS was A-qualified where the value reported is the mean of two or more determinations and J-qualified “estimated value and/or the analysis did not meet established quality control criteria.” With QC code RPD “The precision, measured as relative percent difference (RPD), of batch replicate measurements was outside existing control limits.”

The diel sample taken at 9/13/2016 20:00, CHLA was more than four times the standard deviation above the average.

The grab sample collected at 10/12/2016 10:48 TSS was A-qualified where the value reported is the mean of two or more determinations.

The diel sample collected at 10/18/2016 22:00 CHL-A was A-qualified where the value reported is the mean of two or more determinations.

The diel samples collected on 10/19/2016 at 00:30, 03:00, 05:30, 08:00, and 10:30 for the parameters CHL-A and PHEA were J-qualified “estimated value and/or the analysis did not meet established quality control criteria.” An attached non-conformance report from the lab stated “Observation: Before blank was run, software froze during analysis, Subsequent QC passed. Resolution: Conservatively J-qualified data due to missing QC.”

For all grab samples collected on 11/09/2016 TSS values were Q-qualified where the sample was reanalyzed out of holding time. The lab stated that an incorrect specific conductance value was recorded on the chain of custody, which led to an incorrect analysis.

The grab sample collected at 11/09/2016 07:46 NH4 was J-qualified “estimated value and/or the analysis did not meet established quality control criteria.” With QC code MS “Recovery for the batch matrix spike was outside existing control limits.”

The grab sample collected at 11/09/2016 07:51 TP was J-qualified “estimated value and/or the analysis did not meet established quality control criteria.” With QC code MS “Recovery for the batch matrix spike was outside existing control limits.”

The grab sample collected at 11/09/2016 11:14 CHL-A and PHEA were A-qualified where the value reported is the mean of two or more determinations.

The grab samples collected at 11/09/2016 11:14 and 11:19 TKN values were V-qualified “Analyte was detected in both sample and method blank.”

Weather conditions based on Big Cypress Basin (BCB) Hydrologic Summary and Rainfall Reports:

January: The Big Cypress Basin [BCB] received record amounts of rainfall in January. Heavily influenced by the ongoing El Nino phenomenon, the prevailing weather pattern across south Florida remained wet and unseasonably warm throughout the month. Rainfall in the final week of January was particularly significant, pushing the monthly totals well beyond previous records held by the Basin. Rainfall recorded this past month exceeded the normal January average by over 500%. The basin-wide January average from twenty (20) stations topped 10.71 inches, fully 9 inches above the normal monthly average of 1.68 inches. This being of particular significance, since 9 inches represents a fair total for rainfall collected in a normal wet season summer month.

February: Weather conditions across the Big Cypress Basin [BCB] resumed a more normal pattern in February. Typical for winter, arriving cold fronts generated most of the rainfall, and monthly totals were slightly in excess of the norm. Canal levels and discharge rates continued to trend in the upper ranges throughout the month, as systems recovered from the record rainfall amounts received in late January. Rainfall recorded by 20 stations across the BCB registered an average of 2.43 inches, 27% more than the normal of 1.93 inches. Viewed in the historical perspective of the past twenty-five (25) years, February 2016 rainfall was in the normal to upper range, however clearly below the high of February 1998, when the Basin received 5.27 inches.

March: Weather in March was relatively quiet across the Big Cypress Basin [BCB]. Incoming cold fronts failed to generate significant rainfall, and persistent dry conditions left monthly totals well below the statistical average. Although canal and groundwater levels also maintained a downward track during the month, the trend lines remained consistently positive with respect to the BCB

historic averages for March. Rainfall patterns in March were typical for the winter-dry season - even if far less generous in terms of total precipitation. Rainfall recorded by 20 stations across the BCB registered an average of 0.55 inches, 76% less than the historic mean (2.26 inches). Notwithstanding the March deficit, the 2016 cumulative total for the BCB has now topped 13.73 inches, more than twice the normal expected by this time of year. Viewed in historical perspective, March 2016 rainfall was decidedly low range, well below 2010 when the Basin received a record 6.10 inches for the month.

April: Rainfall totals across the Big Cypress Basin [BCB] were below normal in April. Groundwater levels kept a steady downward trend, but finished the month within normal range for this time of year. A few brief showers and some minor frontal activity in the latter half of the month, were insufficient to alter dry conditions which persisted throughout April. Rainfall totals for the month remained below par, topping off at 1.12 inches, far less than the normal of 2.43 inches, as averaged across 20 BCB stations. This month's tally brings the 2016 cumulative rainfall up to 14.90 inches, still above the totals expected by this time of year. Measured against the BCB period of record, conditions in April 2016 were dry, well below April 2010 when the Basin received a record 5.72 inches of rainfall.

May: Weather patterns turned decidedly wet this month as the Big Cypress Basin [BCB] transitioned out of the dry season. Changes in the weather became apparent early in the month, and by mid-May, the Basin felt a resurgence in humidity levels and higher daily temperatures, typical of the arriving wet season. This past month also marked the arrival of the second named Tropical Storm [TS] of the 2016 Season - Bonnie, which formed in the Atlantic but did not however threaten southwest Florida and the BCB area. Rainfall for the month was generous and exceeded the historic average. Groundwater levels in most of the monitored wells generally reflected this trend in the Collier County and Lower West Coast sites. Predictably, for the first time this year, increased runoff entering the canal system triggered outflows from the major BCB outfalls. By month's end the BCB canal system had been transitioned to wet season operational criteria. Rainfall this month was significant, in particular for the latter half, which included some fairly well distributed frontal activity. Aggregate totals for May averaged 5.85 inches, well above the historic mean of 3.49 inches. The 20 rainfall stations monitored in the BCB have now registered a cumulative 20.70 inches thus far in 2016, well ahead of the 11.97 inches typically received in an average year. Taken in historical perspective, May 2016 rainfall was in the upper range, but yet insufficient to top 1991 when the Basin received a record 8.6 inches for the month.

June: Wet season conditions continued to develop across the Big Cypress Basin [BCB] during the month, with increased precipitation generally attributable to typical summer weather patterns. Rainfall for June, normally one of the wettest months of the season, was slightly in excess of the historic basin-wide average. Also consistent with the seasonal cycle, groundwater levels across the BCB maintained a generally positive trend throughout the month. Canal system operations remained under wet season criteria for the month, and water levels generally kept a positive trend, with outflow noted at all outfalls. Rainfall this month was significant, mostly due to an uptick in late afternoon and early evening thunderstorm activity. Aggregate totals for June averaged 9.81 inches, a modest increase of about 7% over the historic mean of 9.15 inches. Reviewed in this context, this past month was still fairly average, certainly well below June 2005, when the Basin averaged record rainfall amounts totaling 18.6 inches. The 20 rainfall stations monitored in the BCB have now registered a cumulative 30.06 inches thus far in 2016, significantly ahead of the 20.95 inches typically received for an average year.

July: Weather conditions throughout July were fairly typical across the Big Cypress Basin [BCB]. Absent any significant tropical activity impacting the area, the characteristic pattern of afternoon and early evening thunderstorms held sway for most of this period. By month's end, the basin wide rainfall had tied the July statistical average, and all canal systems were outflowing. Consistent with the seasonal cycle, groundwater levels across the BCB maintained a generally upward trend for the month, and canal system operations were kept under wet season criteria. The competing influence

of easterly / westerly sea breeze was sufficient to generate significant rainfall across the Basin. Rainfall observed at 20 reporting stations averaged 8.55 inches, inching past the normal average of 8.51 inches. Reviewed in historical context, July's tally was fairly average, certainly well below 2001 when the Basin averaged record rainfall amounts totaling 14.6 inches. The accumulated precipitation for 2016 is now up to 39.06 inches, still well above the Basin's typical 29.49 inches, the total normally expected by this time of year.

August: August is normally the season's wettest month, and conditions this year did not disappoint. With the added emphasis of an active tropical season, rainfall across the Big Cypress Basin [BCB] easily exceeded the monthly average. Unsurprisingly, groundwater levels also remained positive for the month, and significant flow was recorded in all the BCB canals and outfalls. All systems were kept under wet season (flood control) operational status for the month. During August, the 2016 Atlantic hurricane season got under way in earnest, and by mid-month attention began to focus on a tropical wave, subsequently known as Tropical Depression #9, which was later upgraded to **Hurricane Hermine** on August 29th. Although Hermine spawned numerous rainfall-producing events across south Florida, it ultimately made landfall much further north in the panhandle, and well away from our area. Layered over the typical wet season weather pattern of late afternoon and early evening thunderstorms, additional weather disturbances in the Atlantic and the Gulf contributed significant rainfall across the Basin. August rainfall observed at 20 reporting stations averaged 10.69 inches, well past the normal average of 9.38 inches. Reviewed in historical context, the August tally was above average, even if well below the 1995 season when BCB averaged a record rainfall of 14.9 inches. The accumulated rainfall for 2016 is now 49.75 inches, notable if we recall that the typical BCB annual average is about 54 inches, a scant 4 inches of additional rain, with 4 months still left before the end of the year.

September: September is normally the last month of significant rainfall for the year, and conditions across the Big Cypress Basin [BCB] would generally bear this out. The basin-wide precipitation, which had been trending below normal earlier in the month, took a more positive turn, even if totals failed to match the BCB average by month's end. Consistent with the seasonal cycle, groundwater levels were positive in September. Similarly, canal levels in the BCB remained in the normal-upper range for most of the month, operating under full wet season (flood control) criteria, with significant outflow noted at all system outfalls. In late September (9/28), the District came under threat from **Hurricane Matthew**, the 14th named storm of the 2016 Atlantic Season. Attention of the District and all south Florida residents became more focused by Tuesday (10/4), after its status was upgraded to a Category 4, and hurricane warnings were extended for Lake Okeechobee and portions of the east coast. Although it caused considerable damage in the Caribbean and other coastal communities along the eastern seaboard, its impact to the District remained somewhat tempered by its deliberate offshore track. After skirting northwards along the coast, its felt effects over south Florida were much diminished by Friday (10/7), when it moved out of the District, having kept well away from the Lower West Coast / BCB area. The typical sea breeze weather pattern of late afternoon and early evening thunderstorms showed signs of weakening by mid-September, indicating a possible early transition out of the wet season. Notwithstanding any effects from Matthew, which proved minimal, a noticeable uptick in late September helped shore up monthly totals, and rainfall for the month topped 7.41 inches, as measured at 20 reporting stations across the BCB. Although respectable, this amount failed to match the normal average of 8.62 inches, and remains well below the record set in 2001 when the Basin received 15.71 inches in September. Notably, the Basin's 2016 rainfall through September now tops 56.93 inches, well above the historic average of 47.5 inches expected within this timeline, and by now well in excess of the 54 inches normally received during a typical year.

October: October 15th typically marks the official end of wet season, a reality borne out once again this year. After an initial spell of wet weather, conditions turned decidedly dry, and by month's end the Big Cypress Basin [BCB] was firmly in the dry season, having registered below average rainfall. Following on weather patterns noted in late September, the typical sea breeze effect of late

afternoon and early evening thunderstorms continued to diminish, effectively pointing to the start of dry season by mid-October. Rainfall for the month averaged 2.58 inches, as measured at 20 reporting stations across the BCB. This was 25% below the normal October average, far short of the 3.43 inches typically expected, and well below 1995 when the Basin received 13.3 inches for the month. Notably, the Basin's 2016 rainfall through October now tops 59.51 inches, well above the historic average of 50.70 inches expected within this timeline, and far in excess of the 54 inches typically received during a normal year. Further analysis of the 2016 BCB rainfall data indicates that a total of 43.3 inches was received between May and October, closely tracking the normal wet season average of 43.4 inches. This dataset also highlights 1995 once again, as the year with record wet season rainfall, when the BCB received 67.4 inches of rain. Records for the month indicated significant spatial variation across the BCB area.

November: In November, the first full month since the official start of the winter dry season, the Big Cypress Basin [BCB] received almost no rainfall. Unsurprisingly, water levels in the BCB canals dropped throughout the month, although most major systems continued to track the historic average, albeit in the low ranges. Consistent with this trend, the BCB and Lower West Coast groundwater monitoring wells also recorded diminished levels for November. The lack of meaningful rainfall follows a Basin-wide pattern first noted last month, at the onset of the dry season. Basin-wide records for November were hardly more encouraging, registering an average 0.25 inches, as measured at twenty (20) reporting stations. This was well below the 1.84 inches typically expected, and far less than 1998 when the BCB received 7.5 inches, the period of record maximum for November. The cumulative rainfall for 2016 now stands at 59.77 inches, which still represents a net improvement over the 54 inches typically received Basin-wide over a full annual period. A review of previous dry season cycles, indicates that current conditions - although dismal in terms of rainfall - still look positive in historic terms.

December: Dry conditions continued to prevail across the Big Cypress Basin [BCB] in December. In a weather pattern noted since October, the absence of meaningful frontal activity resulted in dismally low precipitation through the final month of the year. Unsurprisingly, most water levels in the BCB canals also continued to drop throughout December, with some of the systems underperforming the historic average. Consistent with this trend, the BCB and Lower West Coast groundwater monitoring wells also showed diminished levels for the month. Low precipitation rates were noted Basin-wide, with most BCB stations receiving far less than one (1") inch of rain. The December Basin average was hardly more encouraging, registering a mere 0.41 inches, as measured by twenty (20) reporting stations. This was well below the 1.60 inches typically expected, and far less than December 1997 when the BCB received a record 5.78 inches. A review of the past twelve months is somewhat more encouraging, the cumulative rainfall for 2016 now tops 60.2 inches, well in excess of the Basin-wide 54.3 inches typically received on an average year. Extending three months into the dry season, this weather pattern has now had measurable impacts, although current conditions have yet to match previous historic periods when drought conditions prevailed. As indicated by the US Drought Monitor Index, conditions during the past month slipped into "abnormally dry" over southwest Florida

Acknowledgement: The data included with this document were collected by the staff of the Florida Department of Environmental Protection at the Rookery Bay National Estuarine Research Reserve with funding through NOAA's Estuarine Research Division. Any products derived from these data should clearly acknowledge this source (please use the attached logos). This recognition is important for ensuring that this long-term monitoring program continues to receive the necessary political and financial support.

