Reserve Name JOB NERR Water Quality Metadata
Months and year the documentation covers: 01/01/2018 to 12/31/2018
Latest Update: 11/13/2019

I. Data Set and Research Descriptors

1) Principal investigator(s) and contact persons

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2) Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible) by Enid Malavé. Files are exported from EcoWatch in a comma-delimited format (*.CDF) and uploaded to the CDMO by Enid Malavé and Angel Dieppa where they undergo automated primary QAQC and become part of the CDMO's online provisional database. Excessive pre- and post-deployment data are removed from the file prior to upload with up to 2 hours of pre- and post-deployment data retained to assist in data management. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro by Enid Malavé and Angel Dieppa. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove any overlapping deployment data, append files, and export the resulting data file for upload to the CDMO. Upload after secondary QAQC results in ingestion into the database as provisional plus data, recalculation of cDepth or cLevel parameters, and finally tertiary QAQC by the CDMO and assimilation into the CDMO's authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. The final yearly file and metadata was submitted by Enid Malavé and Angel Dieppa. For more information on QAQC flags and codes, see Sections 11 and 12.

3) Research objectives –

The principal objective is to record and track long-term changes and short term variability in water quality parameters that can be associated to changes in estuarine habitats. Through this, we support management decisions based on scientific data. A secondary objective is to promote the access and use of reliable baseline information by federal and local agencies, universities, researchers, educators and local communities to enhance the process by which they make decisions regarding their daily activities. This data is also invaluable in the identification and development of future monitoring and research activities.

A total of four data loggers (YSI 6600 V2, YSI 6600 V4) are deployed in Jobos Bay. Two sondes are deployed in the inner lagoons of the Mar Negro Component and the other two in the Jobos Bay. The instruments are suspended from a pole at a distance at about 0.5 meters from the surface at each selected site. Data from stations 9, 10, 19 and 20 are being submitted to the Centralized Data Management Office as part of the System-Wide Monitoring Program. Measurements are taken at fifteen-minute intervals for approximately two-week periods. The sites are identified as representative of areas within the reserve and comparable to the sites that may be receiving impact from human activities from surroundings areas or may act as a habitat gradient in the Bay.

Station number nine (9), the impacted site, collects water quality data in a site associated with runoff from littoral and basin mangrove areas. This sampling station is located in the most inland lagoon, closest to the Thermoelectric Power Plant (oil and natural gas). It is subjected to runoff, which may include potential oil spill contamination from this industrial facility. Information compiled from historical environmental documents, indicate that station nine (9) was used as a disposal site for residues of the previously operating sugar mill operation, and therefore might have high organic input into the sediments.

Station number ten (10), located in a mangrove lagoon area towards the southwestern section of Mar Negro is considered the reference or non-impacted site.

Station number (19) is located over a sea grass bed (*Thalassia testudinum testudinum*) in the inner western part of the bay just northeast of Cayo Colchones. This station is located near the thermal outfall and operating piers of the Aguirre Power Plant Complex, both activities may have significant effects on sea grass communities. This area is exposed to barge stranding, sediment re-suspension and oil spills.

Station number (20) is located on the eastern inner bay section of the Cayos Caribe cays. This station is just south of the mangrove islets associated with the Reserve's coral reefs. Water streams coming through the coral platform may help characterize water conditions of the main marine currents reaching Jobos Bay, as well as possible effects of industrial and chemical activities associated with Phillips Core, AES Coal Energy Plant and Pharmaceuticals located just east to this system.

4) Research methods

The National Estuarine Research Reserve Water Quality Monitoring Program began sampling at Station nine (9) on December 20, 1995 and Station ten (10) on February 1, 1996. Monitoring at station 19 began in April 2004 and at station 20 in June 2004. Long term water quality monitoring is being performed at these stations.

Before each YSI 6600 or EXO-2 data logger is deployed, calibration and maintenance is performed following the Standard Operation Procedures of the NEERS. Calibration standards are only required for pH, salinity, and turbidity, all other parameters are done as described in the manual. Buffer solutions for two-point calibration (pH 7 and pH 10) are purchased from a scientific supply company. Salinity is calibrated with a specific conductance standard 50 mS/cm and is purchased from YSI.

The two-point turbidity calibration is performed using a 0 NTU (DI water) and 126 NTU (for 6600 sondes) and 124 FNU (for EXO-2) standard purchased from a scientific company. YSI sonde 6600 v4 and EXO 2 are equipped with dissolved oxygen optical sensors, both are allowed to sit at least 24 hours after proper calibration. Weather conditions and tide stage are recorded in the field observation log during deployment. Measurements of DO, pH, salinity, specific conductance, turbidity, and temperature are taken at the deployment time to check the accuracy and functionality of the instruments.

Each YSI data logger hangs inside a 6-inch diameter PVC pipe which is attached to a concrete filled PVC stable pole. Data loggers are at approximately 0.5 meter from the bottom of the selected site. Data is recorded every 15 minutes. The following measurements are recorded: date, time,

temperature, specific conductance, salinity, dissolved oxygen saturation, dissolved oxygen concentration, depth, pH, and turbidity, all station have an optical chlorophyll-a sensor. Chl-a is an optional parameter non-required for SWMP program. Approximately, every two weeks the data loggers are retrieved, inspected, cleaned, data is downloaded into a personal computer and re-calibrated as noted previously. The data logger is then ready to be deployed again.

The data is processed through a standard quality control/quality assurance established for all 29 reserves within the system. It consists in submitting the raw data to the Centralized Data Management Office (CDMO) server where data undergoes through a macro to flag anomalies predetermine for each station. The data is sent back to the reserve to pass through a secondary QA/QC and finally resubmitted to CDMO for the final approval. Data may be available in different stages of the QA/QC process.

A Sutron Sat-Link2 transmitter was installed at the JOB20 station on 07/20/06 and a second station JOB09, transmits data to the NOAA GOES satellite, NESDIS ID # 3B0297EC and NESDIS ID # 3B0424AC respectively. The transmissions are scheduled hourly and contain four (4) data sets reflecting fifteen-minute data sampling intervals. Upon receipt by the CDMO, the data undergoes the same automated primary QAQC process detailed in Section 2 above. The "real-time" telemetry data become part of the provisional dataset until undergoing secondary and tertiary QAQC and assimilation in the CDMO's authoritative online database. Provisional and authoritative data are available at http://cdmo.baruch.sc.edu.

Station 20 telemetry was interrupted on 09/20/17 after Hurricane Maria destroyed the platform losing all the equipment. We are working to reestablish telemetry communication as time and equipment funds allow.

5) Site location and character –

The Jobos Bay National Estuarine Research Reserve (JBNERR) is located on the southern coastal plain of the island of Puerto Rico, a reserve within the West Indies geographical area. JBNERR is composed of two major areas: (1) Mar Negro, located on the western margin of the Bay, and (2) Cayos Caribe (a chain of 17 tear-shaped islets located to the southeast) and Cayos Barca (a chain of 7 tear-shaped islets located to the southwest boundaries) both with a back-reef system. The Mar Negro area comprises the bulk of the Reserve, and consists of mangrove forests and a complex system of lagoons and channels interspersed with salt and mud flats. Coral reefs and sea grass beds, with small beach deposits and upland areas fringe Cayos Caribe and Cayos Barca mangrove islands. Few areas in the watershed drain directly to the bay. Rio Seco to the north-east of the bay is active only during heavy rain events during the wet season. A small creek, Quebrada Coqui, near JBNERR's pier to the north of the bay, drains into an extensive mangrove fringe forest in a laminar flow. During heavy rain events, Station 09 received runoff water from upland and finally, a diffuse flow of water reaches the bay from the local aquifer.

Station 9 is an impacted site and is located on the northeastern section of the Mar Negro component. This sampling station is associated with mangrove lagoon areas and receives runoff from mudflats, the Thermoelectric Power Plant, and adjacent areas. The tidal range varies from 12 to 14 inches near the monitoring station. The salinity at the vicinity of the monitoring station varies from 22.1 ppt to 41.9 ppt. The average depth at station 09 is 1.22 meter. The bottom is covered by a thick layer of thin sediments with a high content of organic material. *Microcoleus sp.* (blue-green algae), brown and green algae (*Caulerpa sp.*) are also present at this site, but a better assessment is needed. The station pole was located at 17°56'34.87"N and 66°14'18.64"W until 09/02/2010 12:00PM, then it was relocated to 17° 56' 35.0" N and 66° 14' 18.9" W approximately 65.0 meters from original position. The relocalization was due to sedimentation issues and the construction of a new telemetry station. Fresh water input to the station comes only from runoff and rain. This station has been

subject of several studies indicating the presence of relatively high level of cooper and pesticides compared to other stations. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was more evident and wide distributed. Although it is not present at Station 9, it is present in the channels toward the station and we expect it will colonize the area in the near future.

Station 10 is located in a mangrove lagoon not impacted directly by any upland or marine activities. It provides a reference for comparison of data obtained in other stations, especially to the station in Mar Negro lagoon. The tidal range varies from 12 to 14 inches. The salinity at the vicinity of the monitoring station varies from 31.9 ppt to 40.6 ppt. The average depth at station 10 is 1.00 meter. The bottom is covered with a layer of fine sediments with organic material, followed by a layer of calcareous material mainly from shells and oysters. At this site, we can find sea grass (*Thalassia testudinum*), calcareous algae (*Halimeda* sp.), green algae (*Caulerpa* sp.) and brown algae (*Dictyota* sp.) among others. The pole is located at 17° 56' 19.00 N, 66° 15' 27.85 W. Fresh water input to the station comes only from runoff and rain. There is not any direct source of fresh water. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was more evident and wide distributed been observed in the perimeter of the station.

Station 19 is located on the western inner section of the bay at a distance of 233 meters from Cayo Colchones Mangroves over sea grass beds (*Thallasia testudinum*). Tidal ranges in this area vary from 12 to 14 inches. The salinity at the vicinity of the monitoring station varies from 33.1 ppt to 37.7 ppt. The average depth at this station is of 2.00 meters. The YSI' sonde is deployed at about .05 meter from the bottom. The bottom is of sandy composition. Sea grass, algae, echinoderms and other related organisms could be found in the area. The pole is located at 17° 56' 34.49"N, 66° 13' 43.77"W. There is no freshwater input to this area. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was more evident and wide distributed been observed in the perimeter of the station.

Station 20 is located in the inner eastern section at about 190 meters of Cayos Caribe Mangrove islets and at about 688 meters from the coral reef barrier. This station is the closest to Mar Caribe. It has a sandy bottom, with calcareous and coral fragments, sea grass (*Thalassia testudinum*) communities, echinoderms and other associated organisms. Tidal ranges in this area vary from 12 to 14 inches. The salinity at the vicinity of the monitoring station varies from 30.2 ppt to 37.5 ppt. The average depth of the site is 2.00 meters. There is no surface freshwater input to this area. The pole is located at 17° 55' 49.14"N, 66° 12' 41.30"W. Since 2015 an invasive seagrass, *Halophila stipulacea* was reported at Jobos Bay, it was after the pass of Hurricane Maria in September 21, 2017 that it was more evident and wide distributed been observed in the perimeter of the station.

Data from stations 9, 10, 19 and 20 is being submitted to the CDMO. Eight sondes are permanently devoted to taking readings from these two sites, to assure continuous readings while sondes are taken out of the water for data upload and maintenance. This will avoid data gaps for the stations between sonde maintenance procedures. Due to errors in calibration, turbidity data in these files is considered inadequate. All monitoring is considered long term.

SWMP Station Timeline:

Station Code	SWMP Status	Station Name	Location	Active Dates	Reason Decommissioned	Notes
job09wq	P	Station 9	17° 56' 34.88 N, 66° 14' 18.64 W	12/01/1995 00:00 - current	NA	NA
job10wq	P	Station 10	17° 56' 19.00 N, 66° 15' 27.85 W	02/01/1996 00:00 - current	NA	NA

job19wq	P	Station 19	17° 56' 34.49 N, 66° 13' 43.77 W	04/01/2002 00:00 - current	NA	NA
Job20wq	P	Station 20	17° 55' 49.14 N, 66° 12' 41.30 W	05/01/2002 00:00 - current	NA	NA
job06wq	P	Station 6	17° 56'5.95 N, 66° 13' 40.56 W	12/01/1996 00:00 - 12/01/1998 00:00	Did not represented natural conditions	Near to thermal outfall
job11wq	P	Station 11	17° 56' 40.59 N, 66° 15' 43.30 W	03/01/1996 00:00 - 12/01/1998 00:00	Subject to vandalism	
job18wq	P	Station 18	17° 56' 39.96 N, 66° 13' 54.77 W	10/01/1998 00:00 - 11/01/1998 00:00	Moved to station 19	Station 19 represent better general conditions

6) Data collection period – Include each YSI deployment and retrieval date and time (**first** and **last** readings in the water) for each monitoring site for the year. Do not include times of pre- and post-deployment or datasondes' transport. Note when data collection began initially for your Reserve or sample sites.

Station nine (9) water quality monitoring began on December 20, 1995.
Station ten (10) water quality monitoring began on February 1, 1996.
Station nineteen (19) water quality monitoring began on April 1, 2004.
Station twenty (20) water quality monitoring began on May 13, 2004.

Deployment and Retrieval Dates 2018:

Station 09			
Date/	**Time In**	**Date/**	**Time Out**
12/13/2017	11:00	01/24/2018	12:30
01/24/2018	13:15	02/20/2018	13:00
02/20/2018	13:15	03/19/2018	11:30
03/19/2018	12:15	04/10/2018	09:30
04/10/2018	09:45	05/02/2018	11:15
05/02/2018	11:45	06/05/2018	09:30
06/05/2018	10:00	07/02/2018	11:00
07/02/2018	13:00	07/23/2018	12:00
07/23/2018	13:15	08/15/2018	10:45
08/15/2018	11:15	08/28/2018	10:15
08/28/2018	10:45	09/12/2018	09:45
09/12/2018	10:15	10/01/2018	11:00
10/09/2018	11:45	11/07/2018	07:45

Station 19			
Date/	**Time In**	**Date/**	**Time Out**
12/13/2017	12:15	01/24/2018	13:00
01/24/2018	13:15	02/20/2018	11:30
02/20/2018	11:45	02/26/2018	01:15
03/19/2018	13:30	04/10/2018	10:30
04/10/2018	10:45	04/14/2018	16:00
05/02/2018	11:00	06/05/2018	09:00
06/05/2018	09:15	06/10/2018	10:15
07/02/2018	12:45	07/23/2018	10:45
07/23/2018	11:15	08/15/2018	10:00
08/15/2018	10:15	08/28/2018	09:45
08/28/2018	10:15	09/12/2018	12:00
09/12/2018	12:15	10/02/2018	09:45
10/02/2018	10:00	11/07/2018	09:45

11/07/2018	13:00	11/27/2018	08:30
11/27/2018	13:00	12/18/2018	09:15
12/18/2018	15:30	12/21/2018	08:00

11/07/2018	10:00	11/27/2018	12:15
11/27/2018	12:30	12/18/2018	13:15
12/18/2018	13:30	01/16/2019	11:15

Station 10			
Date/	**Time In**	**Date Out**	**Time**
12/13/2017	11:45	01/05/2018	13:45
01/24/2018	12:30	02/20/2018	13:30
02/20/2018	14:00	03/19/2018	13:00
03/19/2018	13:15	04/10/2018	09:45
04/10/2018	10:00	05/02/2018	12:45
05/02/2018	13:00	06/05/2018	10:30
06/05/2018	11:00	06/23/2018	09:15
07/02/2018	12:45	07/23/2018	10:45
07/23/2018	13:30	08/15/2018	12:00
08/15/2018	12:15	08/28/2018	12:00
08/28/2018	12:15	09/12/2018	11:30
09/12/2018	11:45	10/02/2018	10:30
10/02/2018	10:45	11/02/2018	19:15
11/07/2018	10:45	11/27/2018	11:00
11/27/2018	11:30	12/18/2018	12:15
12/18/2018	12:30	01/16/2019	10:45

Station 20			
Date/	**Time In**	**Date/**	**Time Out**
12/13/2017	09:15	01/24/2018	11:30
01/24/2018	11:45	02/20/2018	10:45
02/20/2018	11:15	03/19/2018	13:45
03/19/2018	14:00	04/10/2018	11:15
04/10/2018	11:45	05/09/2018	12:15
05/09/2018	12:30	06/05/2018	11:15
06/05/2018	11:30	07/02/2018	12:45
07/02/2018	13:00	07/23/2018	10:45
07/23/2018	11:00	08/15/2018	09:30
08/15/2018	09:45	08/28/2018	09:30
08/28/2018	09:45	09/12/2018	09:15
09/12/2018	09:30	10/02/2018	09:30
10/02/2018	09:45	11/07/2018	09:15
11/07/2018	09:30	11/27/2018	10:00
11/27/2018	10:30	12/18/2018	13:45
12/18/2018	14:00	01/16/2019	11:30

***Note: All deployed sondes *in Station 9* are model 6600.**

7) 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:
National Estuarine Research Reserve System (NERRS). 2012. System-wide Monitoring Program. Data accessed from the NOAA NERRS Centralized Data Management Office website: www.nerrsdata.org; *accessed* 12 October 2012.

NERR water quality 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 text tab-delimited format.

8) Associated researchers and projects

The Jobos Bay NERR maintains four water quality monitoring stations as part of the System Wide Monitoring Program (SWMP) to monitor variability in the estuarine environment. Meteorological station collects continuous information that support water quality data intended to address short-term variability and long-term changes in estuarine water parameters within the bay (i.e., localized impacts of seasonal storms and hurricane events, variability due to tidal circulation, seasonal and interannual differences in rainfall, magnitude and influence of major events such hurricanes, spatial extent of oceanic and tidal forcing.

Dr. Carlos Rodriguez-Sierra, from the School of Environmental Health at the University of Puerto Rico, performed a 30-day cycle sampling for Persistent Organic Pollutants in air and water at SWMP stations 20 and 9 during May 2018.

Our water quality monitoring program is a key component of SWMP. Variables measured include Temperature, Dissolved Oxygen, Turbidity, pH, Salinity and Depth in 4 permanent stations equipped with YSI datasondes. The program supports a nutrient monitoring at the same stations, nitrogen, phosphorus, and chlorophyll are measured in a monthly basis. Also, a diel nutrient sampling is performed in a monthly basis.

SWMP data has been used by:

- Caribbean Regional Association for the Caribbean Regional Coastal Ocean Observing System (CariCOOS) who monitors Real Time data from our SWMP stations.
- Environmental Quality Board for their biennial Puerto Rico 305(b)/303(d) Integrated Report
- Puerto Rico Energy Power Authority (PREPA)
- Department of Natural and Environmental Resources

II. Physical Structure Descriptors

9) Sensor specifications –

YSI 6600EDS V2/ YSI 6600EDS V4 data sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 6560
Range: -5 to 50 C
Accuracy: +/- 0.15
Resolution: 0.01 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model#: 6560

Range: 0 to 100 mS/cm
Accuracy: +/- 0.5% of reading + 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Model#: 6560
Range: 0 to 70 ppt
Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 15% or reading
Resolution: 0.1% air saturation

Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6150 ROX
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 15% of the reading
Resolution: 0.01 mg/L

Parameter: Non-vented Level - Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1 m)
Accuracy: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH – bulb probe
Units: pH units
Sensor Type: Glass combination electrode
Model#: 6561
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90-degree scatter, with mechanical cleaning
Model#: 6136
Range: 0 to 1000 NTU
Accuracy: +/- 2% of reading or 0.3 NTU (whichever is greater)
Resolution: 0.1 NTU

Parameter: Chlorophyll Fluorescence
Units: micrograms/Liter
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 6025
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

YSI EXO-2 Sonde:

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor
Model#: 599870-01
Range: -5 to 50 C
Accuracy: -5 to 35: +/- 0.01, 35 to 50: +/- .005
Resolution: 0.01 C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model#: 599870-01
Range: 0 to 200 mS/cm
Accuracy: 0 to 100: +/- 0.5% of reading or 0.001 mS/cm; 100 to 200: +/- 1% of reading
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependant)

Parameter: Salinity
Units: practical salinity units (psu)/parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 psu
Accuracy: +/- 1.0% of reading pr 0.1 ppt, whichever is greater
Resolution: 0.01 psu

Parameter: Dissolved Oxygen % saturation
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
Range: 0 to 500% air saturation
Accuracy: 0-200% air saturation: +/- 1% of the reading or 1% air saturation, whichever is greater 200-500% air saturation: +/- 5% or reading
Resolution: 0.1% air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature, and salinity)
Units: milligrams/Liter (mg/L)
Sensor Type: Optical probe w/ mechanical cleaning
Model#: 599100-01
Range: 0 to 50 mg/L
Accuracy: 0-20 mg/L: +/-0.1 mg/l or 1% of the reading, whichever is greater
20 to 50 mg/L: +/- 5% of the reading
Resolution: 0.01 mg/L

Parameter: Non-vented Level - Shallow (Depth)

Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 33 ft (10 m)
Accuracy: +/- 0.013 ft (0.004 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: pH units
Sensor Type: Glass combination electrode
Model#: 599701(guarded) or 599702(wiped)
Range: 0 to 14 units
Accuracy: +/- 0.01 units within +/- 10° of calibration temperature, +/- 0.02 units for entire temperature range
Resolution: 0.01 units

Parameter: Turbidity
Units: formazin nephelometric units (FNU)
Sensor Type: Optical, 90-degree scatter
Model#: 599101-01
Range: 0 to 4000 FNU
Accuracy: 0 to 999 FNU: 0.3 FNU or +/-2% of reading (whichever is greater); 1000 to 4000 FNU +/-5% of reading
Resolution: 0 to 999 FNU: 0.01 FNU, 1000 to 4000 FNU: 0.1 FNU
Parameter: Chlorophyll
Units: micrograms/Liter
Sensor Type: Optical probe
Model#: 599102-01
Range: 0 to 400 ug/Liter
Accuracy: Dependent on methodology
Resolution: 0.1 ug/L chl a, 0.1% FS

Depth Qualifier:

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either vented or non-vented depth/level sensors. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.02 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or digital calibration log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR can be corrected.

In 2010, the CDMO began automatically correcting depth/level data for changes in barometric pressure as measured by the Reserve's associated meteorological station during data ingestion. These

corrected depth/level data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

NOTE: older depth data cannot be corrected without verifying that the depth offset was in place and whether a vented or non-vented depth sensor was in use. No SWMP data prior to 2006 can be corrected using this method. The following equation is used for corrected depth/level data provided by the CDMO beginning in 2010:
((1013-BP) * 0.0102) +Depth/Level = cDepth/cLevel.

Salinity Units Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report salinity in parts per thousand (ppt) units, the EXO sondes report practical salinity units (psu). These units are essentially the same and for SWMP purposes are understood to be equivalent, however psu is considered the more appropriate designation. Moving forward the NERR System will assign psu salinity units for all data regardless of sonde type.

Turbidity Qualifier:

In 2013, EXO sondes were approved for SWMP use and began to be utilized by Reserves. While the 6600 series sondes report turbidity in nephelometric turbidity units (NTU), the EXO sondes use formazin nephelometric units (FNU). These units are essentially the same but indicate a difference in sensor methodology, for SWMP purposes they will be considered equivalent. Moving forward, the NERR System will use FNU/NTU as the designated units for all turbidity data regardless of sonde type. If turbidity units and sensor methodology are of concern, please see the Sensor Specifications portion of the metadata.

Chlorophyll Fluorescence Disclaimer:

YSI chlorophyll sensors (6025 or 599102-01) are designed to serve as a proxy for chlorophyll concentrations in the field for monitoring applications and complement traditional lab extraction methods; therefore, there are accuracy limitations associated with the data that are detailed in the YSI manual including interference from other fluorescent species, differences in calibration method, and effects of cell structure, particle size, organism type, temperature, and light on sensor measurements.

10) Coded variable definitions

Sampling station:	Sampling site code:	Station code:
Station 9	ST09	job09wq
Station 10	ST10	job10wq
Station 19	ST19	job19wq
Station 20	ST20	job20wq

11) 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_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial

QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

-5 Outside High Sensor Range
-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
2 *Open - reserved for later flag*
3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
4 Historical Data: Pre-Auto QAQC
5 Corrected Data

12) 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 deployment or YSI data sonde, sensor errors are sensor specific, 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, but some comment codes (marked with an * below) can be applied to the entire record in the FRecord column.

General Errors

GIC	No instrument deployed due to ice
GIM	Instrument malfunction
GIT	Instrument recording error; recovered telemetry data
GMC	No instrument deployed due to maintenance/calibration
GNF	Deployment tube clogged / no flow
GOW	Out of water event
GPF	Power failure / low battery
GQR	Data rejected due to QA/QC checks
GSM	See metadata

Corrected Depth/Level Data Codes

GCC	Calculated with data that were corrected during QA/QC
GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GCS	Calculated value suspect due to questionable data
GCU	Calculated value could not be determined due to unavailable data

Sensor Errors

SBO	Blocked optic
SCF	Conductivity sensor failure
SDF	Depth port frozen
SDG	Suspect due to sensor diagnostics
SDO	DO suspect
SDP	DO membrane puncture

SIC Incorrect calibration / contaminated standard
SNV Negative value
SOW Sensor out of water
SPC Post calibration out of range
SQR Data rejected due to QAQC checks
SSD Sensor drift
SSM Sensor malfunction
SSR Sensor removed / not deployed
STF Catastrophic temperature sensor failure
STS Turbidity spike
SWM Wiper malfunction / loss

Comments
CAB* Algal bloom
CAF Acceptable calibration/accuracy error of sensor
CAP Depth sensor in water, affected by atmospheric pressure
CBF Biofouling
CCU Cause unknown
CDA* DO hypoxia (<3 mg/L)
CDB* Disturbed bottom
CDF Data apar to fit conditions
CFK* Fish kill
CIP* Surface ice present at sample station
CLT* Low tide
CMC* In field maintenance/cleaning
CMD* Mud in probe guard
CND New deployment begins
CRE* Significant rain event
CSM* See metadata
CTS Turbidity spike CVT* Possible vandalism/tampering
CWD* Data collected at wrong depth
CWE* Significant weather event

13) Post deployment information

STATION 09			Post Deployment Calibration Values		
Date In	Date Out	SpCond (50mS/cm)	DO%	pH (7)	Turb (0 NTU)
01/01/2018	01/24/2018	49.50	84.9	7.05	8.5
01/24/2018	02/20/2018	50.2	66.8	7.00	39.4
02/20/2018	03/19/2018	47.4	100.2	7.03	2.8
03/19/2018	04/10/2018	50.64	99.0	7.21	0.1
04/10/2018	05/02/2018	41.51	99.1	6.99	31.3
05/02/2018	06/05/2018	46.63	59.5	7.02	97.6**
06/05/2018	07/02/2018	44.70	25.4**	7.00	50.6**
07/02/2018	07/23/2018	48.07	84.0	6.96	12.0
07/23/2018	08/15/2018	50.90	98.0	7.01	0.40
08/15/2018	08/28/2018	51.31	99.8	7.01	0.30

08/28/2018	09/12/2018	49.06	98.0	7.04	0.40
09/12/2018	10/01/2018	54.07	111.0	6.98	3.0
10/09/2018	11/07/2018	50.20	93.6	6.98	2.9
11/07/2018	11/27/2018	48.94	96.4	7.24	0.5
11/27/2018	12/18/2018	49.20	99.9	7.04	2.0
12/18/2018	12/21/2018				

STATION 10		**Post Deployment Calibration Values**			
Date In	**Date Out**	**SpCond (50mS/cm)**	**DO%**	**pH (7)**	**Turb (0 NTU)**
01/01/2018	01/24/2018	44.51	98.8	*	13.92
01/24/2018	02/20/2018	50.33	92.5	7.19	5.91
02/20/2018	03/19/2018	48.78	91.5	7.14	1.47
03/19/2018	04/10/2018	49.90	99.4	6.93	2.43
04/10/2018	05/02/2018	46.00	97.1	7.03	2.96
05/02/2018	06/05/2018	26.91**	99.0	7.11	1.23
06/05/2018	06/23/2018	50.09	96.2	7.00	2.36
07/02/2018	07/23/2018	48.42	99.7	7.01	11.52
07/23/2018	08/15/2018	49.17	98.1	7.04	2.04
08/15/2018	08/28/2018	50.28	97.9	7.13	1.51
08/28/2018	09/12/2018	49.39	98.1	7.19	1.51
09/12/2018	10/02/2018	48.40	98.0	7.38	0.10
10/02/2018	11/07/2018	50.48	98.5	8.6*	0.23
11/07/2018	11/27/2018	48.53	97.9	7.15	0.44
11/27/2018	12/18/2018	*	98.6	7.19	0.25
12/18/2018	01/16/2019	48.30	98.8	7.04	0.42

STATION 19		**Post Deployment Calibration Values**			
Date In	**Date Out**	**SpCond (50mS/cm)**	**DO%**	**pH (7)**	**Turb (0 NTU)**
01/01/2018	01/24/2018	50.11	24.8	7.13	22.15
01/24/2018	02/20/2018	50.30	94.3	7.18	0.59
02/20/2018	03/19/2018	48.21	56.4	7.25	1.92
03/19/2018	04/10/2018	49.12	97.9	7.20	0.55
04/10/2018	04/14/2018	48.45	101.3	7.17	2.86

05/02/2018	06/05/2018	48.94	99.6	7.24	2.84
06/05/2018	06/10/2018	50.05	93.6	7.15	3.40
07/02/2018	07/23/2018	48.41	99.6	7.20	18.34
07/23/2018	08/15/2018	51.43	99.2	7.15	0.75
08/15/2018	08/28/2018	50.62	99.0	7.23	0.77
08/28/2018	09/12/2018	49.50	98.7	7.14	0.90
09/12/2018	10/02/2018	50.40	97.8	7.07	4.51
10/02/2018	11/07/2018	49.71	98.7	7.17	1.38
11/07/2018	11/27/2018	49.36	96.7	7.21	-1.09
11/27/2018	12/18/2018	49.99	98.5	6.99	1.96
12/18/2018	01/16/2019	48.05	99.2	7.04	0.40

STATION 20		Post Deployment Calibration Values			
Date In	Date Out	SpCond (50mS/cm)	DO%	pH (7)	Turb (0 NTU)
01/01/2018	01/24/2018	51.91	105.4	7.25	0.58
01/24/2018	02/20/2018	42.24	99.3	7.19	0.45
02/20/2018	03/19/2018	49.69	99.7	7.04	1.73
03/19/2018	04/10/2018	49.0	97.5	7.04	0.66
04/10/2018	05/02/2018	50.91	98.2	7.04	1.51
05/09/2018	06/05/2018	51.14	98.3	7.0	3.43
06/05/2018	07/02/2018	50.09	97.2	7.21	3.91
07/02/2018	07/23/2018	49.52	99.8	7.04	6.16
07/23/2018	08/15/2018	50.70	98.9	7.35	11.6
08/15/2018	08/28/2018	49	98.9	7.18	2.33
08/28/2018	09/12/2018	48.78	99.3	7.05	1.31
09/12/2018	10/02/2018	50.04	99.5	7.97	2.02
10/02/2018	11/07/2018	49.86	99.9	7.22	1.89
11/07/2018	11/27/2018	49.0	97.5	7.17	0.15
11/27/2018	12/18/2018	51.02	94.2	7.19	0.63
12/18/2018	01/16/2019	49.26	99.3	7.31	0.45

***Bad sensor, **Fouling**

14) Other remarks/notes

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NaNs in the dataset stand for "not a number" and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

Conductivity/Salinity comments:

JOB09WQ: New Conductivity sensor 18C101086 for 02A0155AA 6600 sonde on 06/04/2018

JOB10WQ: Post-Deployment read low value for standard same with read file from 5/24/2018 to 6/5/2018 at 10:30. Biofouling

JOB10WQ: From 07/02/2018 12:45 to 07/23/2018 10:45 the sonde at Station 10 is tied with a carabiner. The rope attached to this became tangled causing the sonde to sit higher in the tube than normal. SpCond and salinity data during this time were impacted by the change in depth. These data have been marked suspect.

JOB19WQ:

JOB20WQ: From 05/09/2018 to 06/05/2018, SCF. Change COND/TEMP sensor 16B101678 for 15G100841 Exo sonde on 04/27/2018

DO Data comments:

JOB09WQ: New Optical DO membrane (16C100119) for 16C100775 sensor on 01K0080AB 6600 sonde on 11/21/2018**.**

JOB10WQ: From 07/02/2018 12:45 to 07/23/2018 10:45 the sonde at Station 10 is tied with a carabiner. The rope attached to this became tangled causing the sonde to sit higher in the tube than normal. DO data during this time were impacted by the change in depth. DO data has been rejected during this deployment.

JOB19WQ:

JOB20WQ:

pH Data comments:

JOB09WQ: New pH sensor 16B for 01K0080B 6600 sonde on 06/27/2018

JOB09WQ: New pH sensor 18D for 02A0155AA 6600 sonde on 06/04/2018

JOB10WQ: New pH Unguarded sensor 16F for 13J101771 Exo sonde on 01/19/2018

JOB10WQ: New pH Unguarded sensor 16G for 14K101410 Exo sonde on 02/12/2018

JOB10WQ: New pH Unguarded sensor 18K for 13J101771 Exo sonde on 10/18/2018

JOB10WQ: New pH Unguarded sensor 18K for 14K101410 Exo sonde on 11/21/2018

JOB19WQ: New pH Unguarded sensor 16F for 14K101408 Exo sonde on 04/03/2018

JOB19WQ: New pH sensor 18D104344 for 16J100690 Exo sonde on 06/26/2018

JOB20WQ: New pH Unguarded sensor 16D for 13J101770 Exo sonde on 12/01/2017

JOB20WQ: New pH Unguarded sensor 16F for 15G100841 Exo sonde on 01/19/2018

JOB20WQ: Change pH sensor 14K101359 for 15G100841 from other Exo sonde on 10/18/2018

JOB20WQ: New pH Unguarded sensor 18K for 14K101407 Exo sonde on 11/21/2018

JOB20WQ: New pH Unguarded sensor 18K for 14K101359 pH sensor for 15G100841 Exo sonde on 12/10/2018.

Turbidity Data comments:

JOB09WQ: From 04/18/2018 at 03:15 to 05/02/2018 at 11:15 heavy biofouling crab inside cup.

JOB09WQ: New Turbidity sensor 18D101038 for 02A0155AA 6600 sonde on 06/04/2018

JOB10WQ: Change Turbidity sensor for 16 J100287 for Exo sonde 13J101771 on 09/10/2018.

JOB19WQ: New turbidity sensor 16J102175 for 16J100690 Exo sonde on 01/18/2018

JOB20WQ: New Turbidity sensor 16F102173 for 15G100841 Exo sonde on 09/11/2018

Depth Data Comments:

JOB20WQ: On 02/06/2018 the station had to be rebuild since it was severely affected by Hurricane Maria on September 21, 2017 were we lose the telemetry platform. Since the posts that hold the sonde tube had to be removed and a new installed, it looks we had a shift in the depth of the sonde.

JOB10WQ: From 07/02/2018 12:45 to 07/23/2018 10:45 the sonde at Station 10 is tied with a carabiner. The rope attached to this became tangled causing the sonde to sit higher in the tube than normal.
JOB19WQ: From 07/02/2018 12:45 to 07/23/2018 10:45 the sonde did not descend to the bottom of the deployment tube during this deployment. Depth data are considered suspect, all other parameters appear to be reading as normal.

Notes:

JOB09WQ
JOB10WQ: From 01/05/2018 at 14:00 to 01/24/2018 at 12:15 <-2> GPF Power failure/ low battery
JOB10WQ: From 06/23/2018 at 09:30:00 to 07/02/2018 at 12:15 <-2> GPF Power failure/ low battery
JOB20WQ: New Exo Wiper 18D102180 for 14K101410 Exo sonde on 05/31/2018
JOB19WQ: From 01/01/2018 at 0:00 to 01/24/2018 at 13:00 <-2> GPF Power failure/ low battery
JOB19WQ: From 02/26/2018 at 01:30 to 03/19/2018 at 13:15 <-2> GPF Power failure/ low battery
JOB19WQ: From 04/14/2018 at 16:15 to 05/02/2018 at 10:45 <-2> GPF Power failure/ low battery
JOB19WQ: From 06/10/2018 at 10:30 to 07/02/2018 at 10:00 <-2> GPF Power failure/ low battery
JOB20WQ: New Exo Wiper 18D102183 for 15G100841 Exo sonde on 06/26/2018
JOB20WQ: New Exo Wiper 18D102181 for 14K101407 Exo sonde on 06/26/2018
Other:

Significant rain events:

Date	Precipitation (mm)	Event associated with
01/06/2018	11.2	
01/07/2018	14.0	
01/08/2018	2.3	
01/09/2018	2.3	
01/10/2018	1.0	
01/11/2018	10.2	
01/13/2018	7.6	
01/27/2018	1.0	
02/06/2018	2.8	
02/09/2018	2.0	
02/11/2018	1.0	
02/12/2018	1.0	
02/18/2018	1.8	
02/21/2018	1.3	
02/28/2018	34.0	
03/15/2018	1.5	
03/19/2018	3.3	
03/24/2018	2.5	
03/27/2018	1.3	
04/09/2018	2.3	
04/12/2018	1.8	
04/16/2018	4.1	
04/19/2018	9.4	
04/26/2018	8.13	
04/27/2018	3.81	
05/03/2018	13.97	

05/04/2018	12.19	
05/06/2018	4.32	
05/08/2018	2.29	
05/09/2018	7.11	
05/11/2018	1.27	
05/12/2018	16.25	
05/13/2018	2.79	
05/17/2018	1.77	
05/18/2018	1.77	
05/20/2018	3.05	
05/24/2018	1.01	
05/25/2018	6.60	
05/29/2018	9.14	
05/30/2018	4.57	
06/10/2018	21.59	Tropical depression Beryl
06/17/2018	2.03	
06/19/2018	25.15	
06/20/2018	2.28	
06/22/2018	3.81	
06/23/2018	48.26	
06/24/2018	1.01	
07/09/2018	59.7	
07/16/2018	1.5	
07/19/2018	1.0	
07/22/2018	1.3	
07/23/2018	2.0	
07/24/2018	7.6	
08/12/2018	10.9	
08/16/2018	3.3	
08/17/2018	8.6	
08/18/2018	5.8	
08/24/2018	5.6	
08/25/2018	1.8	
08/30/2018	48.0	
09/05/2018	1.0	
09/14/2018	11.9	
09/15/2018	18.0	
09/16/2018	1.0	
09/17/2018	2.5	
09/18/2018	2.3	
09/24/2018	1.5	
09/29/2018	6.6	
09/30/2018	21.1	
10/04/2018	4.3	
10/11/2018	1.8	
10/12/2018	29.0	
10/13/2018	77.2	
10/17/2018	2.5	
11/04/2018	6.6	

11/11/2018	7.1	
11/13/2018	10.7	
11/14/2018	6.6	
11/15/2018	2.0	
11/16/2018	1.5	
11/17/2018	4.3	
11/21/2018	1.8	
12/11/2018	2.3	
12/14/2018	4.6	
12/16/2018	6.1	
12/22/2018	2.5	
12/25/2018	2.8	
12/27/2018	1.5	
12/28/2018	1.5	
12/29/2018	1.5	