

Reserve Name JBNERR Water Quality Metadata

Months and year the documentation covers: 01/01/2013 to 12/31/2013

Latest Update: 02/26/2014

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 – Describe briefly the nature of the monitoring program resulting in this data set (for example, control versus impacted site, long term monitoring, spatial or temporal coverage, etc.). Describe the goal or purpose of this research.

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*) 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 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 or a scientific supply company.

The two-point turbidity calibration is performed using a 0 NTU (DI water) and 126 NTU standard purchased from a scientific company. YSI sonde 6600 v2 and v4 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 is tied with steel cable to an iron galvanized pole, which is plunged into the sediments at each sampling area. Data loggers are suspended from a pole at approximately 0.5 meter from the surface 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 27 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 transmits data to the NOAA GOES satellite, NESDIS ID # 3B0297EC. 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>, <http://nerrsdata.org>.

5) Site location and character – Describe your NERR site in general and the sampling sites associated with each YSI data logger. Include the following in your description for each sampling location. If certain characteristics apply to all sample sites or the entire Reserve they may be discussed in an overview:

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 reach 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 26.0 ppt to 42 ppt. The average depth at station 09 is 1 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' 36.8" N and 66° 14' 18.5" 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 relocation 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. Residence time of the water mass in the main bay has been estimated to be 5.5 days (JBNERR Site Profile, 2000), while station 9 is located in a semi closed coastal lagoon, residence time may be up to 3 times the main bay estimate.

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 27.0 ppt to 41.7 ppt. The average depth at station 10 is 1 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*), 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. Residence time of the water mass in the main bay has been estimated to be 5.5 days (JBNERR Site Profile, 2000), while station 10 is located in a semi closed coastal lagoon, residence time may be up to 3 times the main bay estimate.

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 (*Thalassia testudinum*). Tidal ranges in this area vary from 12 to 14 inches. The salinity at the vicinity of the monitoring station varies from 30.0 ppt to 38.0 ppt. The average depth at this station is of 2 meters. The YSI' sonde is deployed at about 1 foot 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 and 66° 13' 43.77 W. There is no freshwater input to this area. Residence time of the water mass in the main bay has been estimated to be 5.5 days (JBNERR Site Profile, 2000).

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*) 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 30.0 ppt to 38.0 ppt. The average depth of the site is 2 meters. There is no freshwater input to this area. The pole is located at 17° 55' 49.14258" N and 66° 12' 41.29771" W. Residence time of the water mass in the main bay has been estimated to be 5.5 days (JBNERR Site Profile, 2000).

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.

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 2013:

Station 09			
Date/Time In		Date/Time Out	
12/17/2012	11:00	1/16/2013	9:30
1/16/2013	9:45	1/29/2013	10:15
1/29/2013	10:30	2/12/2013	9:15
2/12/2013	9:45	2/26/2013	10:00
2/26/2013	10:30	3/13/2013	9:00
3/13/2013	9:15	3/25/2013	11:00
3/25/2013	11:15	4/9/2013	10:00
4/9/2013	10:30	4/23/2013	10:15
4/23/2013	10:30	5/7/2013	10:00
5/7/2013	10:15	5/21/2013	14:30
5/21/2013	14:45	6/4/2013	10:45
6/4/2013	11:00	6/20/2013	10:30
6/20/2013	10:45	7/1/2013	10:15
7/1/2013	10:30	7/16/2013	9:30
7/16/2013	9:45	8/14/2013	9:30
8/14/2013	9:45	8/28/2013	9:45
8/28/2013	10:00	9/9/2013	9:30
9/9/2013	9:45	9/24/2013	10:00
9/24/2013	10:15	10/8/2013	11:15
10/8/2013	11:30	10/23/2013	9:00
10/23/2013	9:15	11/5/2013	9:00
11/5/2013	9:15	11/20/2013	9:45
11/20/2013	10:00	12/3/2013	10:00
12/3/2013	10:15	12/17/2013	10:00
12/17/2013	10:15	01/17/2014	9:15

Station 19			
Date/Time In		Date/Time Out	
12/19/2012	9:15	1/23/2013	10:45
1/23/2013	11:00	2/5/2013	9:45
2/5/2013	10:00	2/19/2013	10:30
2/19/2013	10:45	3/5/2013	10:15
3/5/2013	10:15	3/19/2013	10:15
3/19/2013	11:00	4/3/2013	9:15
4/3/2013	9:30	4/18/2013	10:30
4/18/2013	10:45	4/30/2013	10:00
4/30/2013	10:00	5/14/2013	9:45
5/14/2013	10:00	5/29/2013	9:30
5/29/2013	10:00	6/18/2013	9:00
6/18/2013	9:15	6/25/2013	10:30
6/25/2013	10:45	7/9/2013	10:00
7/9/2013	10:15	8/6/2013	10:45
8/6/2013	11:00	8/20/2013	9:45
8/20/2013	10:00	9/4/2013	9:30
9/4/2013	Bad File	9/17/2013	Bad File
9/17/2013	9:30	10/1/2013	10:00
10/1/2013	10:15	10/15/2013	9:30
10/15/2013	9:45	10/29/2013	09:00
10/29/2013	9:30	11/12/2013	9:30
11/12/2013	9:45	11/26/2013	9:30
11/26/2013	9:45	12/10/2013	8:00
12/10/2013	8:15	12/19/13	11:30
12/19/2013	11:45	1/15/2014	10:15

Station 10			
Date/Time In		Date/Time Out	
12/17/2012	11:45	1/16/2013	10:30
1/16/2013	10:45	1/29/2013	11:00
1/29/2013	11:15	2/12/2013	10:00
2/12/2013	10:30	2/26/2013	10:45
2/26/2013	11:00	3/13/2013	9:45
3/13/2013	10:00	3/25/2013	12:00
3/25/2013	12:15	4/9/2013	11:00
4/9/2013	11:15	4/23/2013	10:45
4/23/2013	11:00	5/7/2013	10:45
5/7/2013	11:00	5/21/2013	14:00
5/21/2013	14:15	6/4/2013	10:00
6/4/2013	10:15	6/20/2013	9:45
6/20/2013	10:00	7/1/2013	11:00
7/1/2013	11:15	7/17/2013	9:45
7/17/2013	10:00	8/14/2013	10:15
8/14/2013	10:30	8/28/2013	10:30
8/28/2013	10:45	9/9/2013	12:15
9/9/2013	12:30	9/24/2013	9:00
9/24/2013	9:30	10/8/2013	10:45
10/8/13	11:00	10/23/2013	9:30
10/23/2013	9:45	11/5/2013	9:45
11/5/2013	10:00	11/20/2013	10:00
11/20/2013	10:30	12/3/2013	10:45
12/3/2013	11:00	12/17/2013	10:45
12/17/2013	11:00	1/17/2014	9:45

Station 20			
Date/Time In		Date/Time Out	
12/19/2012	10:15	1/23/2013	11:15
1/23/2013	11:30	2/5/2013	9:00
2/5/2013	9:15	2/19/2013	11:00
2/19/2013	11:15	3/5/2013	10:30
3/5/2013	10:45	3/19/2013	9:00
3/19/2013	9:45	4/3/2013	10:45
4/3/2012	11:15	4/18/2013	11:45
4/18/2013	12:00	4/30/2013	9:15
4/30/2013	10:00	5/14/2013	10:15
5/14/2013	10:30	5/29/2013	10:15
5/29/2013	10:30	6/18/2013	9:15
6/18/2013	9:30	6/25/2013	10:00
6/25/2013	10:15	7/9/2013	9:30
7/9/2013	10:00	8/6/2013	9:45
8/6/2013	10:00	8/20/2013	10:30
8/20/2013	10:45	9/4/2013	10:30
9/4/2013	10:45	9/17/2013	9:45
9/17/2013	10:00	10/1/2013	9:30
10/1/2013	9:45	10/15/2013	8:15
10/15/2013	8:45	10/29/2013	9:15
10/29/2013	9:30	11/12/2013	9:45
11/12/2013	10:15	11/26/2013	9:30
11/26/2013	9:45	12/10/2013	8:45
12/10/2013	10:45	12/19/2013	11:45
12/19/2013	12:00	01/15/2014	10:00

7) Distribution

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site (JBNERR) where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

NERR water quality data and metadata can be obtained 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 <http://cdmo.baruch.sc.edu/>. 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 collect 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).

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 support 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 Integrated Coastal Ocean Observing System (CaRICOOS) who monitors Real Time data from our SWMP stations.

II. Physical Structure Descriptors

9) Sensor specifications –

YSI 6600-V2 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

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% of 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

Dissolved Oxygen Qualifier:

The reliability of the dissolved oxygen (DO) data after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Many reserves have upgraded to the YSI 6600 EDS data sondes, which increases DO accuracy and longevity by reducing the environmental effects of fouling. The user is therefore advised to consult the metadata and to exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. The Research Coordinator at the specific NERR site should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor.

Depth Qualifier:

The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either depth or water 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 1.03 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 site 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.

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 datasonde, 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 F_Record 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 appear 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)
12/17/2012	1/16/2013	47.38	87.1	*6.21	0.7	
1/16/2013	1/29/2013	49.24	99.4	6.92	-0.4	
1/29/2013	2/12/2013	48.88	98.6	6.87	-0.2	
2/12/2013	2/26/2013	46.46	95.5	6.99	-0.2	
2/26/2013	3/13/2013	50.74	99.8	7.09	0	
3/13/2013	3/25/2013	49.13	100.1	7.08	0.5	
3/25/2013	4/9/2013	49.92	99	7.25	0	
4/9/2013	4/23/2013	49.99	92.3	7.03	-0.1	
4/23/2013	5/7/2013	50.1	92.5	7.06	0.8	
5/7/2013	5/21/2013	49.73	88.5	7.13	2.2	
5/21/2013	6/4/131	49.16	91.8	6.99	0	
6/4/2013	6/20/2013	50.03	100.3	7.02	1.9	
6/20/2013	7/1/2013	50.23	98.9	6.96	0	
7/1/2013	7/16/2013	49.69	75.4	7.17	45.1	
7/16/2013	8/14/2013	47.57	96.4	7	0.9	
8/14/2013	8/28/2013	49.11	64.3	7	29.6	
8/28/2013	9/9/2013	48.54	104.5	7.08	-0.1	
9/9/2013	9/24/2013	49.57	97.1	7.01	1.3	
9/24/2013	10/8/2013	49.45	99.8	*	0.0	
10/8/2013	10/23/2013	49.48	95.4	7.04	5.1	
10/23/2013	11/05/2013	50.3	98.4	7.06	2.3	
11/05/2013	11/20/2013	48.48	98.8	7.10	0.0	
11/20/2013	12/3/2013	48.15	100	7.02	0.0	
12/3/2013	12/17/2013	50.08	100.1	7.18	2.5	
12/17/2013	1/17/2014	46.15	98.6	7.08	1.8	

*bad sensor

STATION 10		Post Deployment Calibration Values			
		SpCond (50mS/cm)	DO%	pH (7)	Turb (0 NTU)
12/17/2012	1/16/2013	47.7	99.5	7.19	2.5
1/16/2013	1/29/2013	48	99.7	7.15	0.9
1/29/2013	2/12/2013	47.36	72.6	7.65	0.1
2/12/2013	2/26/2013	47.72	102.1	7	0.8
2/26/2013	3/13/2013	50.01	99.1	7.01	0.4
3/13/2013	3/25/2013	50.37	100.5	7	0.5
3/25/2013	4/9/2013	49.35	94.1	7	0
4/9/2013	4/23/2013	48.9	94	7.03	117.8
4/23/2013	5/7/2013	50.56	95.1	6.99	0.5
5/7/2013	5/21/2013	50.85	91.9	7.03	0.3
5/21/2013	6/4/131	48.23	96.6	7.12	0.5
6/4/2013	6/20/2013	47.80	97.1	6.94	1.5
6/20/2013	7/1/2013	50.20	101.7	7.45	3.7
7/1/2013	7/17/2013	48.3	100	6.99	2.7
7/17/2013	8/14/2013	48.02	97.8	7.06	-0.7
8/14/2013	8/28/2013	48.97	82.9	7.06	1
8/28/2013	9/9/2013	49.1	100.1	7.08	-0.6
9/9/2013	9/24/2013	48.37	100.6	7.04	-0.2
9/24/2013	10/8/2013	47.16	*	7.09	169.1
10/8/2013	10/23/2013	47.22	100.3	6.99	2.9
10/23/2013	11/05/2013	49.70	99.4	7.01	2.9
11/05/2013	11/20/2013	47.95	100.8	7.07	0.0
11/20/2013	12/3/2013	48.40	100.6	7.09	0.0
12/3/2013	12/17/2013	47.81	100.1	7.13	1.9
12/17/2013	1/17/2014	46.89	98.9	7.18	314.7

*bad sensor

STATION 19		Post Deployment Calibration Values			
		SpCond (50mS/cm)	DO%	pH (7)	Turb (0 NTU)
12/19/2012	1/23/2013	49.58	77.1	8.94	2.5
1/23/2013	2/5/2013	49.8	100.1	7	1.3
2/5/2013	2/19/2013	49.65	102.4	7.38	1.9
2/19/2013	3/5/2013	48.55	102.9	7.14	0.2
3/5/2013	3/19/2013	49.92	97.7	7.08	-0.5
3/19/2013	4/3/2013	49.1	92.6	7.11	1.2
4/3/2013	4/18/2013	49.36	68.7	7.05	-0.6
4/18/2013	4/30/2013	48.42	99.6	7.12	1.5
4/30/2013	5/14/2013	49.02	99.9	7.07	0
5/14/2013	5/29/2013	49.5	100.2	6.9	0.2
5/29/2013	6/18/2013	49.9	99.2	7.05	1.2
6/18/2013	6/25/2013	50.28	100	7.15	0
6/25/2013	7/9/2013	48.30	99.6	7.07	0
7/9/2013	8/6/2013	48.37	98.9	7.4	0.1
8/6/2013	8/20/2013	48.46	99.3	7.09	1.1
8/20/2013	9/4/2013	48.93	102.5	7.23	0
9/4/2013	9/17/2013	49.0	101.6	7.24	-0.9
9/17/2013	10/1/2013	48.62	99.3	6.98	0.2
10/1/2013	10/15/2013	50.03	99.6	7.24	1.9
10/15/2013	10/29/2013	48.76	93.9	7.30	0.9
10/29/2013	11/12/2013	49.06	99.7	7.13	-0.9
11/12/2013	11/26/2013	49.22	98.8	6.98	0.1
11/26/2013	12/10/2013	48.42	102	7.05	0
12/10/2013	12/19/2013	48.94	100.3	6.94	0.3
12/19/2013	1/15/2014	50.27	100.7	7.05	1.2

STATION 20		Post Deployment Calibration Values			
		SpCond (50mS/cm)	DO%	pH (7)	Turb (0 NTU)
12/19/2012	1/23/2013	46.91	101.2	7.29	0.9
1/23/2013	2/5/2013	49.52	98.1	7.09	0
2/5/2013	2/19/2013	49.57	101.4	7.17	1.5
2/19/2013	3/5/2013	47.89	101	7.13	0.8
3/5/2013	3/19/2013	49.65	98.5	7.05	-0.7
3/19/2013	4/3/2013	49.74	94.9	7.03	0
4/3/2013	4/18/2013	47.62	95	6.8	0.5
4/18/2013	4/30/2013	49.5	99.3	6.95	1
4/30/2013	5/14/2013	48.89	97.3	7	1
5/14/2013	5/29/2013	49.1	97.8	7.07	0.2
5/29/2013	6/18/2013	49.46	100.7	7.27	1.7
6/18/2013	6/25/2013	49.85	102.3	7.0	3.2
6/25/2013	7/9/2013	47.49	99.7	7.07	0.8
7/9/2013	8/6/2013	49.56	99.9	6.83	1.7
8/6/2013	8/20/2013	47.37	102.7	7.02	14.6
8/20/2013	9/4/2013	48.84	99.7	7.06	0.1
9/4/2013	9/17/2013	47.54	100	7.0	3.8
9/17/2013	10/1/2013	48.65	101.9	7.1	1.6
10/1/2013	10/15/2013	49	100.3	7.23	3.2
10/15/2013	10/29/2013	47.57	96.5	7.03	1.2
10/29/2013	11/12/2013	49.32	100.1	7.13	-0.2
11/12/2013	11/26/2013	48.94	102.1	7.06	0.5
11/26/2013	12/10/2013	50.05	100.1	7.10	0.8
12/10/2013	12/19/2013	47.93	100.2	7.08	0
12/19/2013	1/15/2014	49.32	100.3	7.17	2.8

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.

pH Data

JOB09WQ: - From 01/10/13 at 15:01:00 to 01/16/13, bad pH data, broken sensor.

JOB19WQ: - From 1/1/13 to 1/23/13 at 10:45 suspect pH data due to biofouling. Presence of barnacles

JOB09WQ: - From 10/04/13 at 09:01:22 to 10/08/13 at 11:16:22, bad pH data, broken sensor.

JOB10WQ: - From 7/01/13 at 11:15 to 7/17/13 at 9:45, suspect data, cause unknown.

DO Data

JOB19WQ: - From 1/2/13 at 10:00 to 1/23/13 at 10:45 suspect DO data due to biofouling. Presence of barnacles blocking the wiper.

JOB10WQ: - From 10/02/13 at 12:45:59 to 10/08/13 at 10:46, all data lost, sensor malfunction.

Chlorophyll Data

JOB09WQ: - From 2/4/13 to 2/12/13 in several occasion the wiper parked near or over the optic eyes, repeated readings of 553 ug/l.

- From 3/25/13 at 11:30 to 4/9/13 at 10:00, all data rejected sensor malfunction.

JOB09WQ: - From 8/28/13 at 10:00 to 9/9/13 at 9:30, all data rejected, sensor malfunction.

JOB10WQ: -From 1/4/13 at 3:15 to 1/16/13 at 10:30 “biofouling” algae and barnacles blocking the optics.

JOB20WQ: - From 4/18/13 at 12:00 to 4/30/13 at 9:15, all data rejected, sensor malfunction.

JOB20WQ: - From 9/17/13 at 10:00 to 10/01/13 at 9:30, sensor swap from other sonde, when calibration check after deployment zero value with distilled water reading was 17.9, the same value it read in water.

Turbidity Data

JOB09WQ: -From 1/01/13 at 0:00 to 1/01/13 at 9:00 “biofouling” algae and barnacles blocking the optics

JOB10WQ: -From 1/4/13 at 3:15 to 1/16/13 at 10:30 “biofouling” algae and barnacles blocking the optics

JOB10WQ: -From 4/21/13 at 17:45 to 4/23/13 at 10:45 “biofouling” algae blocking the optics
-From 6/4/13 at 10:15 to 6/15/13 at 7:15 cause unknown.

JOB10WQ: -From 7/14/13 at 4:45 to 7/17/13 at 09:45 “biofouling” algae sometimes blocking the optics

JOB10WQ: -From 9/29/13 at 1:00 to 10/08/13 at 10:45 “biofouling” sediment blocking the optics

JOB10WQ: -From 12/25/13 at 22:45 to 1/17/14 at 9:45, sensor drift, “biofouling” hydroids, tunicates, algae and barnacles blocking the optics

JOB19WQ: - From 1/8/13 at 13:00 to 1/23/13 at 10:45 data show “biofouling” due to presence of barnacles and algae blocking the wiper.

-From 5/14/13 at 10:00 o 5/16/13 at 3:30, sensor drift.

-From 6/25/13 at 10:45 o 6/30/13 at 21:30, sensor drift.

JOB20WQ: -From 6/14/13 at 21:45 to 6/18/13 at 9:15 sensor drift due to fouling.

JOB20WQ: -From 8/25/13 at 18:45 to 8/27/13 at 22:30 sensor drift due to fouling.

Conductivity/Salinity

JOB20WQ: -From 5/09/13 at 19:30 to 5/10/13 at 5:30 low conductivity from possible aquifer discharge.

JOB09WQ: - From 11/2/13 at 13:30 to 11/6/13 at 0:45, all data impacted by significant rain event.

JOB10WQ: - From 11/2/13 at 16:15 to 11/5/13 at 9:00, all data impacted by significant rain event.

JOB19WQ: - From 11/2/13 at 8:30 to 11/6/13 at 5:30, all data impacted by significant rain event.

Other Remarks

JOB09WQ: -Extreme Low Tide caused by lunar perigee
5/27/2013 at 11:30 and 6/22/2013 at 11:15

-Extreme High Tide caused by lunar perigee
6/22/2013 from 22:30 to 23:15

JOB09WQ: - On 4/22/13 pH sensor new.

JOB09WQ: - From 9/5/13 at 10:00 to 9/9/13 at 9:30, all data impacted by significant rain event.

JOB10WQ: - On 5/17/13 New pH sensor installed.

JOB10WQ: -All data lost from 2/25/13 at 4:45 to 2/25/13 at 7:45 and 2/25/13 from 8:00 to 10:45 intermittent data.
Power failure/low battery.

JOB10WQ: -Extreme Low Tide caused by lunar perigee
5/27/2013 at 11:15

-Extreme High Tide caused by lunar perigee
6/25/2013 from 1:45

JOB10WQ: - From 9/5/13 at 4:30 to 9/9/13 at 12:15, all data impacted by significant rain event.

JOB19WQ: - On 2/13/13 ROX membrane replaced and pH sensor new.

JOB19WQ: - On 3/1/13 pH sensor new.

JOB19WQ: -Intermittent data loss from 4/15/13 at 18:15 to 4/18/13 at 10:30: Power failure/low battery.
Intermittent data loss from 5/18/13 at 12:15 to 5/29/13 at 9:45 and from 5/29/13 at 10:00 to 6/18/13 at 9:00 because instrument malfunction and disconnection due to strong movement.

JOB19WQ: - On 4/26/13 change turbidity sensor for 11D101047.

JOB19WQ: -Extreme Low Tide caused by lunar perigee

5/27/2013 at 11:45 to 13:00

-Extreme High Tide caused by lunar perigee

6/22/2013 from 22:30

-Biggest tide amplitude from 6/22/2013 from 22:30 to 6/22/13 11:15.

JOB19WQ: - From 9/4/13 to 9/17/13, all data lost didn't register any parameter, only date and hour.

JOB19WQ: - From 9/29/13 at 5:30 to 10/01/13 at 10:00, data lost due to low battery.

JOB20WQ: - On 4/11/13 new pH sensor.

JOB20WQ: - From 5/9/13 at 19:30 to 5/16/13 at 5:30 Low value for conductivity and Salinity, no apparent reason.

JOB20WQ: -Extreme Low Tide caused by lunar perigee

5/27/2013 at 12:30

-Extreme High Tide caused by lunar perigee

6/22/2013 23:15

-Biggest tide amplitude from 6/22/2013 from 23:15 to 6/22/13 13:00.

JOB20WQ: - From 9/5/13 at 19:30 to 9/16/13 at 9:30, all data impacted by significant rain event.

JOB20WQ: - From 9/4/13 to 9/18/13, sonde deployed at wrong depth. No effects on other Parameters that seems to fit conditions.

JOB20WQ: - On 9/23/13 DO sensor new.

Heavy Rain event: On 5/6/2013 1.97 inches of precipitation.

On 7/19/2013 Tropical wave 1.34 inches of precipitation

On 9/5/2013 Tropical Storm Gabrielle. 7.25 inches of precipitation

On 9/6/2013 1.03 inches of precipitation

On 9/8/2013 2.49 inches of precipitation

On 10/4/2013 1.24 inches of precipitation

On 10/8/2013 1.26 inches of precipitation

On 11/3/2013 2.24 inches of precipitation

Infield Maintenance: On 7/24/2013 in Station 20 cleaned sensor from 10:34am to 10:41am. Small barnacle removed from DO sensor.

On 7/24/2013 from 10:09am to 10:13am and 8/6/2013 from 12:10am to 12:15am in Station 10 cleaned sensors.

On 7/24/2013 from 09:46am to 09:54am and 8/6/2013 from 11:30am to 11:45am in Station 09 cleaned sensors.